Product Standardization

Office of Design and Construction
Campus Operations

November 22, 2017

Overview

In the past several years, Bowling Green State University has gone through a radical transformation with new and/or renovated facilities. Since 2013 over $225 million, worth of construction has occurred on campus. These projects are all successful when measuring them against commonly accepted construction metrics. That it is not say each of these projects was delivered perfectly; quite the contrary. Each project presents unique challenges and exposes areas requiring attention. One glaring example is the discontinuity between buildings with certain materials. In a recent meeting with Campus Operations the idea of expanding a campus design standards to include specific materials for some applications was advanced. Products specifically mentioned in this conversation includes:

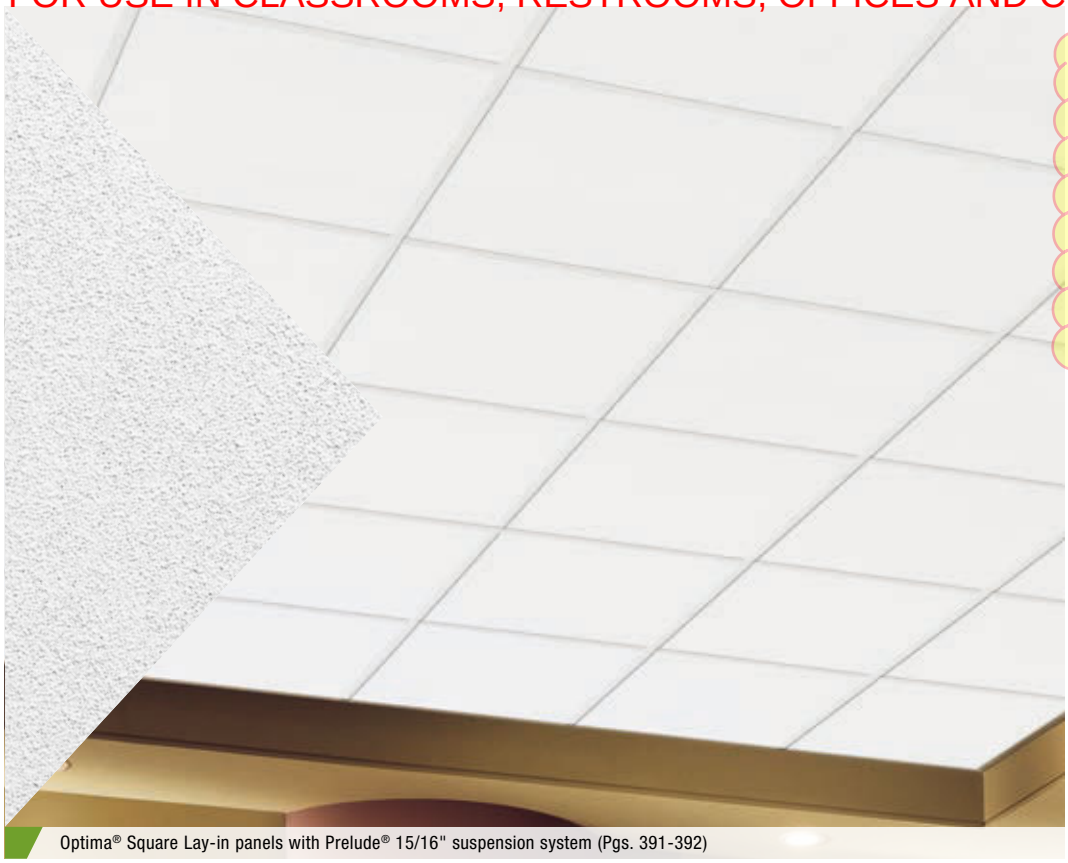
- Acoustical Ceiling Tile
- Paint
- Plumbing Fixtures
- Building Automation System
- Exit Lighting
- Fire Alarm System
- Bollards
- Turf Mix

Campus Operations has advanced sole-sourcing specific products as a means to lower cost of ownership. In response, the Office of Design and Construction, and Campus Operations collaborated on developing this manual of products. Design teams are now being directed to specifically include these products when developing project specifications.

OPTIMA®
Square Lay-in
fine texture

10-YEAR REPLACEMENT PANEL AVAILABILITY
3152, 3153

FOR USE IN CLASSROOMS, RESTROOMS, OFFICES AND COMMON AREAS



Optima® Square Lay-in panels with Prelude® 15/16" suspension system (Pgs. 391-392)

* ACT selected for renovation projects to match that which is already installed in surrounding areas.

plus... capabilities to do more

armstrongceilings.com/capabilities
See more photos at:
armstrongceilings.com/photogallery

Smooth-textured Optima® panels provide excellent acoustical absorption and more standard-size options than any other texture in the line.

KEY SELECTION ATTRIBUTES

- Outstanding acoustical performance for open plan areas, both Articulation Class (180-200) and NRC (0.90-1.00)
- Items with PB suffix are manufactured with a plant-based binder
- Optima® PB panels are part of the Sustain™ portfolio and meet the most stringent sustainability compliance standards today
- Smooth, clean, durable finish – Washable, Impact-resistant, Scratch-resistant, Soil-resistant
- Energy-saving high light-reflective finish
- Non-directional visual reduces scrap and installation time
- Sag-resistant large-size panels
- Compatible with TechZone® Ceiling Systems (Pgs. 337-344)
- Item 3352 available with Create!™ printed images and patterns, see pages 245-247
- 30-Year Limited System Warranty against visible sag, mold, and mildew

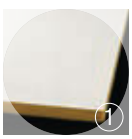
TYPICAL APPLICATIONS

- Open plan offices
- Computer rooms
- Corridors (walls-to-deck)
- Auditoriums
- Waiting rooms/nurses' stations
- Areas with indirect lighting systems

COLOR

White
(WH)

DETAILS



1. Optima® Square Lay-in
2. Optima Square Lay-in with Prelude® 15/16" suspension system

OPTIMA®

Square Lay-in
fine texture

PLANT BASED BINDER
As Noted

Declare℠
Living Building Challenge Compliant
PB Suffix Only

SUSTAIN™
High Performance Sustainable Ceiling Systems
PB Suffix Only

UP TO 71% RECYCLED CONTENT

Calculate LEED contribution at armstrongceilings.com/greengenie

LEED®: energy management; construction waste mgmt; regional materials (▲ LOCATION DEPENDENT); design for flexibility; EPD; recyclable/extended producer resp.; biobased materials (▲ PB ONLY); recycled content; sourcing of raw materials; material ingredient reporting (▲ PB ONLY); low emitting/materials (▲ PB ONLY); lighting quality; acoustics

VISUAL SELECTION

PERFORMANCE SELECTION

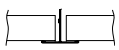
Dots represent high level of performance. $$$$

Edge Profile	Susp. Dwg. Pgs. 407-411 armstrongceilings.com/catdwgs	Item No.	Dimensions (Inches)	UL Classified Acoustics NRC + CAC =	Total Acoustics[1]	Articulation Class AC	Fire Performance	Light Reflect	Anti-Mold & Mildew Bio-Block	Sag Resist Humi-Guard+	Certified Low VOC Emissions	Durability: Wash	Durability: Impact	Durability: Scratch	Durability: Soil	Recycled Content	Recycle Program	30-Yr Warranty
OPTIMA®																		
15/16" Square Lay-in	1	**1462**	4 x 48 x 1"	N/A	N/A	–	N/A	Class A	0.90 •	•	•	–	•	•	•	•	•	•	•
	1	**1463**	4 x 60 x 1"	N/A	N/A	–	N/A	Class A	0.90 •	•	•	–	•	•	•	•	•	•	•
	1	**1400**	6 x 48 x 1"	N/A	N/A	–	N/A	Class A	0.90 •	•	•	–	•	•	•	•	•	•	•
	1	**1404**	6 x 60 x 1"	N/A	N/A	–	N/A	Class A	0.90 •	•	•	–	•	•	•	•	•	•	•
	1	**3156**	20 x 60 x 1"	0.95 •	N/A	–	190 •	Class A	0.90 •	•	•	–	•	•	•	•	•	•	•
	1	**3150** **3150PB**	24 x 24 x 3/4"	0.90 •	N/A	–	180 •	Class A	0.90 •	•	•	– •	•	•	•	•	•	•	•
	1	**3152** **3152PB**	24 x 24 x 1"	0.95 •	N/A	–	190 •	Class A	0.90 •	•	•	– •	•	•	•	•	•	•	•
	1	**3352**	24 x 24 x 1"	0.90 •	26	–	200 •	Class A	0.90 •	•	•	–	•	•	•	•	•	–	•
	1	**3159**	24 x 24 x 1-1/2"	1.00 •	N/A	–	200 •	Class A	0.90 •	•	•	–	•	•	•	•	•	•	•

[1] Total Acoustics® ceiling panels have an ideal combination of noise reduction and sound-blocking performance in one product.
Optima items with the PB suffix are included in the Sustain™ portfolio and carry Declare℠ certification.

SUSPENSION SYSTEMS

15/16"



Prelude®

Blizzard White – Suspension System Finish
A color and texture coordinated suspension system to complement Optima® ceiling panels for a monolithic look and feel.

PHYSICAL DATA

Material
3150, 3156, 3159, 1462, 1463, 1400, 1404, 3152 – Fiberglass with DuraBrite® acoustically transparent membrane 3352 – Fiberglass with DuraBrite acoustically transparent membrane; CAC backing

Surface Finish
DuraBrite with factory-applied latex paint

Fire Performance
ASTM E84 and CAN/ULC S102 surface burning characteristics. Flame Spread Index 25 or less. Smoke Developed Index 50 or less (UL labeled).

ASTM E1264 Classification
Type XII, Form 2, Pattern E
Fire Class A

Humidity/Sag Resistance
HumiGuard® Plus ceiling panels are recommended for areas subject to high humidity, up to, but not including, standing water and outdoor applications.

Mold/Mildew Protection
Ceiling panels with BioBlock® resist the growth of mold and mildew.

VOC Emissions (PB suffix items only)
Third-party certified compliant with California Department of Public Health CDPH/EHLB/Standard Method Version 1.1, 2010. This standard is the guideline for low emissions in LEED, CalGreen Title 24, ANSI/ASHRAE/USGBC/IES Standard 189; ANSI/GBI Green Building Assessment Protocol.

Primary (Embodied) Energy
See all LCA information on our EPDs.

High Recycled Content
Contains greater than 50% total recycled content. Total recycled content based on product composition of post-consumer and pre-consumer (post-industrial) recycled content per FTC guidelines.

Acoustical Details
Some items have CAC backing. CAC backing may be available as a special order. A CAC value of 37 can be achieved by backloading fiberglass products with item 769 or 770.

Insulation Value
1400, 1404, 1462, 1463,
3152, 3156, 3352, –
R Factor – 4.0 (BTU units)
R Factor – 0.70 (Watts units)
3150 – R Factor – 3.0 (BTU units)
R Factor – 0.53 (Watts units)
3159 – R Factor – 6.0 (BTU units)
R Factor – 1.05 (Watts units)

Application Consideration
Do not mix Optima panels and Optima® Health Zone™ panels in the same room.

30-Year Performance Guarantee & Warranty
When installed with Armstrong® Suspension System. Details at armstrongceilings.com

Weight; Square Feet/Carton
1400 – 0.13 lbs/SF; 24 SF/ctn
1404 – 0.16 lbs/SF; 30 SF/ctn
1462 – 0.44 lbs/SF; 16 SF/ctn
1463 – 0.44 lbs/SF; 20 SF/ctn
3150, 3150PB – 0.44 lbs/SF; 128 SF/ctn
3152, 3152PB – 0.45 lbs/SF; 96 SF/ctn
3159 – 0.61 lbs/SF; 64 SF/ctn
3156 – 0.47 lbs/SF; 100 SF/ctn
3352 – 0.46 lbs/SF; 96 SF/ctn

Minimum Order Quantity
1 carton, excludes other size panels

Metric Items Available
3150M, 3152M, 3156M, 3159M –
Metric items are subject to extended lead times and minimum quantities. Contact your representative for more details.

OPTIMA®

Square Lay-in
fine texture

PLANT BASED BINDER
As Noted

Declare℠
Living Building Challenge Compliant
PB Suffix Only

SUSTAIN™
High Performance Sustainable Ceiling Systems
PB Suffix Only

UP TO 71% RECYCLED CONTENT

Calculate LEED contribution at armstrongceilings.com/greengenie

LEED® v4: energy management ✓ | construction waste mgmt ✓ | regional materials ✓ | design for flexibility ✓ | EPD ✓ | recyclable/extended producer resp. ✓ | biobased materials ✓ | recycled content ✓ | sourcing of raw materials ✓ | material ingredient reporting ✓ | low emitting/materials ✓ | lighting quality ✓ | acoustics ✓

▲ LOCATION DEPENDENT ▲ PB ONLY ▲ PB ONLY ▲ PB ONLY

VISUAL SELECTION

PERFORMANCE SELECTION

Dots represent high level of performance.

Edge Profile	Susp. Dwg. Pgs. 407-411 armstrongceilings.com/catdwgs	Item No.	Dimensions (Inches)	UL Classified Acoustics NRC	+	CAC	=	Total Acoustics[1]	Articulation Class AC	Fire Performance	Light Reflect	Anti-Mold & Mildew Bio-Block	Sag Resist Humi-Guard+	Certified Low VOC Emissions	Durability: Wash	Durability: Impact	Durability: Scratch	Durability: Soil	Recycled Content	Recycle Program	30-Yr Warranty
OPTIMA®																					
15/16" Square Lay-in	1	**3151** **3151PB**	24 x 48 x 3/4"	0.90 •	+	N/A	=	–	180 •	Class A	0.90 •	•	•	– •	•	•	•	•	•	•	•
	1	**3153** **3153PB**	24 x 48 x 1"	0.95 •	+	N/A	=	–	190 •	Class A	0.90 •	•	•	– •	•	•	•	•	•	•	•
	1	**3353**	24 x 48 x 1"	0.90 •	+	26	=	–	200 •	Class A	0.90 •	•	•	–	•	•	•	•	•	–	•
	1	**3155**	24 x 48 x 1-1/2"	1.00 •	+	N/A	=	–	200 •	Class A	0.90 •	•	•	–	•	•	•	•	•	•	•
	1	**3356**	24 x 48 x 1-1/2"	0.95 •	+	26	=	–	200 •	Class A	0.90 •	•	•	–	•	•	•	•	•	–	•
	1	**3164**	24 x 60 x 3/4"	0.90 •	+	N/A	=	–	180 •	Class A	0.90 •	•	•	–	•	•	•	•	•	•	•
	1	**3161**	24 x 72 x 3/4"	0.90 •	+	N/A	=	–	180 •	Class A	0.90 •	•	•	–	•	•	•	•	•	•	•
	1	**3162**	24 x 96 x 3/4"	0.90 •	+	N/A	=	–	180 •	Class A	0.90 •	•	•	–	•	•	•	•	•	•	•
	1	**3158**	30 x 30 x 1"	0.95 •	+	N/A	=	–	190 •	Class A	0.90 •	•	•	–	•	•	•	•	•	•	•
	1	**3157**	30 x 60 x 1"	0.95 •	+	N/A	=	–	190 •	Class A	0.90 •	•	•	–	•	•	•	•	•	•	•
	1	**3160** **3160PB**	48 x 48 x 1"	0.95 •	+	N/A	=	–	190 •	Class A	0.90 •	•	•	– •	•	•	•	•	•	•	•
	1	**3154**	48 x 96 x 1"	0.95 •	+	N/A	=	–	190 •	Class A	0.90 •	•	•	–	•	•	•	•	•	•	•

[1] Total Acoustics® ceiling panels have an ideal combination of noise reduction and sound-blocking performance in one product.
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FIBERGLASS

OPTIMA®

Square Lay-in
fine texture

PLANT BASED BINDER
As Noted

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LEED®: energy management ✓, construction waste mgmt ✓, regional materials ✓, design for flexibility ✓, EPD ✓, recyclable/extended producer resp. ✓, biobased materials ✓, recycled content ✓, sourcing of raw materials ✓, material ingredient reporting ✓, low emitting/materials ✓, lighting quality ✓, acoustics ✓

▲ LOCATION DEPENDENT ▲ PB ONLY ▲ PB ONLY ▲ PB ONLY

VISUAL SELECTION

PERFORMANCE SELECTION

Dots represent high level of performance.

$$$$

Edge Profile	Susp. Dwg. Pgs. 407-411 armstrongceilings.com/catdwgs	Item No.	Dimensions (Inches)	UL Classified Acoustics NRC + CAC = Total Acoustics[1]	Articulation Class AC	Fire Performance	Light Reflect	Anti-Mold & Mildew Bio-Block	Sag Resist Humi-Guard+	Certified Low VOC Emissions	Wash (Durability)	Impact (Durability)	Scratch (Durability)	Soil (Durability)	Recycled Content	Recycle Program	30-Yr Warranty
OPTIMA®																	
15/16" Square Lay-in	1	FS **FastSize™ Panels**	W: 4" – 48" / L: 4" – 120" 1" Thick	N/A N/A –	N/A	Class A	0.90 •	•	•	–	•	•	•	•	•	•	•
	1	**Other Size Panels**	W: 4" – 24" / L: 4" – 96" 3/4" Thick	N/A N/A –	N/A	Class A	0.90 •	•	•	–	•	•	•	•	•	•	•
	1	**Other Size Panels**	W: 4" – 42" / L: 4" – 120" W: 4" – 48" / L: 4" – 114" 1-1/2" Thick	N/A N/A –	N/A	Class A	0.90 •	•	•	–	•	•	•	•	•	•	•

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FS **FastSize**: Factory-finished, made-to-order sizes, shipped fast (1 carton min.)

SUSPENSION SYSTEMS

15/16"

Prelude®

Blizzard White – Suspension System Finish

A color and texture coordinated suspension system to complement Optima® ceiling panels for a monolithic look and feel.

PHYSICAL DATA

Material
3153, 3155, 3158 – Fiberglass with DuraBrite® acoustically transparent membrane 3353, 3356 – Fiberglass with DuraBrite acoustically transparent membrane; CAC backing

Surface Finish
DuraBrite scrim with factory-applied latex paint

Fire Performance
ASTM E84 and CAN/ULC S102 surface burning characteristics. Flame Spread Index 25 or less. Smoke Developed Index 50 or less (UL labeled).

ASTM E1264 Classification
Type XII, Form 2, Pattern E
Fire Class A

Humidity/Sag Resistance
HumiGuard® Plus ceiling panels are recommended for areas subject to high humidity, up to, but not including, standing water and outdoor applications.

Mold/Mildew Protection
Ceiling panels with BioBlock® resist the growth of mold and mildew.

VOC Emissions (PB suffix items only)
Third-party certified compliant with California Department of Public Health CDPH/EHLB/Standard Method Version 1.1, 2010. This standard is the guideline for low emissions in LEED, CalGreen Title 24, ANSI/ASHRAE/USGBC/IES Standard 189; ANSI/GBI Green Building Assessment Protocol.

Primary (Embodied) Energy
See all LCA information on our EPDs.

High Recycled Content
Contains greater than 50% total recycled content. Total recycled content based on product composition of post-consumer and pre-consumer (post-industrial) recycled content per FTC guidelines.

Acoustical Details
Some items have CAC backing. CAC backing may be available as a special order. A CAC value of 37 can be achieved by backloading fiberglass products with item 769 or 770.

Insulation Value
3153, 3158, 3353, 3154, 3160, 3157 –
R Factor – 4.0 (BTU units)
R Factor – 0.70 (Watts units)
3151, 3161, 3162, 3164 –
R Factor – 3.0 (BTU units)
R Factor – 0.53 (Watts units)
3155, 3356 –
R Factor – 6.0 (BTU units)
R Factor – 1.05 (Watts units)

Application Consideration
Do not mix Optima panels and Optima® Health Zone™ panels in the same room.

30-Year Performance Guarantee & Warranty
When installed with Armstrong® Suspension System. Details at armstrongceilings.com

Weight; Square Feet/Carton
3151, 3151PB – 0.44 lbs/SF; 128 SF/ctn
3153, 3153PB, 3160, 3160PB – 0.45 lbs/SF; 96 SF/ctn
3155, 3356 – 0.61 lbs/SF; 64 SF/ctn
3158 – 0.47 lbs/SF; 75 SF/ctn
3353 – 0.46 lbs/SF; 96 SF/ctn
3154 – 0.45 lbs/SF; 128 SF/ctn
3157 – 0.56 lbs/SF; 100 SF/ctn
3161 – 0.43 lbs/SF; 96 SF/ctn
3164 – 0.43 lbs/SF; 100 SF/ctn
3162 – 0.42 lbs/SF; 128 SF/ctn

Minimum Order Quantity
1 carton, excludes other size panels

Metric Items Available
3151M, 3153M, 3154M, 3155M, 3158M, 3160M, 3353M, 3356M – Metric items are subject to extended lead times and minimum quantities. Contact your representative for more details.

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SCHEDULE

Interior Finishes

CMU - Concrete, Split Face, Scored, Smooth, High Density, Low Density,
Coat 1: B25W00025 - PrepRite® Interior/Exterior Latex Block Filler White
75-125 sq ft/gal
Coat 2: A87W00151 - SuperPaint® Interior Latex Satin Extra White
Coat 3: A87W00151 - SuperPaint® Interior Latex Satin Extra White

METAL: Galvanized; Ceilings, Duct work
Coat 1: B42W00181 - Pro Industrial Waterborne Acrylic Dryfall White Flat
Coat 2: B42W00181 - Pro Industrial Waterborne Acrylic Dryfall White Flat
6.0 mils wet, 1.7 mils dry per coat

Structural Steel Columns, Joists, Trusses, Beams, Miscellaneous
Coat 1: B66W00310 - Pro Industrial Pro-Cryl® Universal Acrylic Primer Off White
Coat 2: B66W00611 - Pro Industrial High Performance Acrylic - Gloss Extra White
Coat 3: B66W00611 - Pro Industrial High Performance Acrylic - Gloss Extra White
6.0 mils wet, 2.5 mils dry per coat

Walls, Ceilings, Gypsum Board- Satin Finish (Applicable to Both Satin and Flat Finish)
Coat 1: B28W02600 - ProMar® 200 Zero VOC Interior Latex Primer White
Coat 2: A87W00151 - SuperPaint® Interior Latex Satin Extra White
Coat 3: A87W00151 - SuperPaint® Interior Latex Satin Extra White
4 mils wet, 1.7 mils dry per coat

Walls, Ceilings, Gypsum Board- Flat Finish
Coat 1: B28W02600 - ProMar® 200 Zero VOC Interior Latex Primer White
Coat 2: A06W00151 - A-100® Exterior Latex Flat Extra White
Coat 3: A06W00151 - A-100® Exterior Latex Flat Extra White
4 mils wet, 1.7 mils dry per coat

High Performance Interior Paint Systems

Galvanized and Aluminum
Coat 1: B66W00310 - Pro Industrial Pro-Cryl® Universal Acrylic Primer Off White
Coat 2: B66W00611 - Pro Industrial High Performance Acrylic - Gloss Extra White
Coat 3: B66W00611 - Pro Industrial High Performance Acrylic - Gloss Extra White
6.0 mils wet, 2.5 mils dry per coat

Walls, Ceilings, Gypsum Board
Coat 1: B28W02600 - ProMar® 200 Zero VOC Interior Latex Primer White
4 mils wet, 1.5 mils dry
Coat 2: B66W00651 - Pro Industrial High Performance Acrylic - Semi-Gloss Extra White

Coat 3: B66W00651 - Pro Industrial High Performance Acrylic - Semi-Gloss Extra White
6.0 mils wet, 2.5 mils dry per coat

Exterior Finishes

Concrete Floors (non-vehicular), Patios, Porches, Steps and Platforms
Coat 1: 50.148154 - CLRSHLD WBCLRSLR WLK
Coat 2: 50.148154 - CLRSHLD WBCLRSLR WLK
Per Customer Spec
END OF SECTION

SURFACE PREPARATION

1) Aluminum
Remove all oil, grease, dirt, oxide and other foreign material by cleaning per SSPC-SP1, Solvent Cleaning.

2) Block (Cinder and Concrete)
Remove all loose mortar and foreign material. Surface must be free of laitance, concrete dust, dirt, form release agents, moisture curing membranes, loose cement, and hardeners. Concrete and mortar must be cured at least 30 days at 75°F.The pH of the surface should be between 6 and 9,unless the products to be used are designed to be used in high pH environments such as Loxon. On tilt-up and poured-in-place concrete, commercial detergents and abrasive blasting may be necessary to prepare the surface. Fill bug holes, air pockets, and other voids with a patching compound such as ConSeal.

3) Brick
Must be free of dirt, loose and excess mortar, and foreign material. All brick should be allowed to weather for at least one year followed by wire brushing to remove efflorescence. Treat the bare brick with one coat of Loxon Exterior Acrylic Masonry Primer, or Loxon Conditioner.

4) Cement Composition Siding/Panels
Remove all surface contamination by washing with an appropriate cleaner, rinse thoroughly and allow to dry. Existing peeled or checked paint should be scraped and sanded to a sound surface. Pressure clean, if needed, with a minimum of 2100 psi pressure to remove all dirt, dust, grease, oil, loose particles, laitance, foreign material, and peeling or defective coatings. Allow the surface to dry thoroughly. The pH of the surface should be between 6 and 9,unless the products to be used are designed to be used in high pH environments such as Loxon.

5) Drywall (Interior and Exterior)
Must be clean and dry. All nail heads must be set and spackled. Joints must be taped and covered with a joint compound. Spackled nail heads and tape joints must be sanded smooth and all dust removed prior to painting. Exterior surfaces must be spackled with exterior grade compounds.

6) Exterior Composition Board (Hardboard)
Some composition boards may exude a waxy material that must be removed with a solvent prior to coating. Whether factory primed or unprimed, exterior composition board siding (hardboard) must be cleaned thoroughly and primed with an alkyd primer.

7) Galvanized Metal
Allow to weather a minimum of 6 months prior to coating. Clean per SSPC-SP1 using detergent and water or a degreasing cleaner, then prime as required. When weathering is not possible or the surface has been treated with chromate's or silicates, first Solvent Clean per SSPC-SP1 and apply a test area, priming as required. Allow the coating to dry at least one week before testing. If adhesion is poor, Brush Blast per SSPC-SP7 is necessary to remove these treatments.

8) Plaster
Must be allowed to dry thoroughly for at least 30 days before painting. Rooms must be ventilated while drying; in cold, damp weather, rooms must be heated. Damaged areas must be repaired with an appropriate patching material. Bare plaster must be cured and hard. Textured, soft, porous, or powdery plaster should be treated with a solution of 1-pint household vinegar to 1 gallon of water. Repeat until the surface is hard, rinse with clear water and allow to dry. The pH of the surface should be between 6 and 9, unless the products to be used are designed to be used in high pH environments.

9) Previously Coated Surfaces
Maintenance painting will frequently not permit or require complete removal of all old coatings prior to repainting. However, all surface contamination such as oil, grease, loose paint, mill scale, dirt, foreign matter, rust, mold, mildew, mortar, efflorescence, and sealers must be removed to assure sound bonding to the tightly adhering old paint. Glossy surfaces of old paint films must be clean and dull before repainting. Thorough washing with an abrasive cleanser will clean and dull in one operation, or, wash thoroughly and dull by sanding. Spot prime any bare areas with an appropriate primer. Recognize that any surface preparation short of total removal of the old coating may compromise the service length of the system. Check for compatibility by applying a test patch of the recommended coating system, covering at least 2 to 3 square feet. Allow to dry one week before testing adhesion per ASTM D3359. If the coating system is incompatible, complete removal is required.

10) Solvent Cleaning
Solvent Cleaning is a method for removing all visible oil, grease, soil, drawing and cutting compounds, and other soluble contaminants. Solvent cleaning does not remove rust or mill scale. Change rags and cleaning solution frequently so that deposits of oil and grease are not spread over additional areas in the cleaning process. Be sure to allow adequate ventilation. For complete instructions, refer to Steel Structures Paint Council Surface Preparation Specification No. 1. (SSPC-SP1)

11) Hand Tool Cleaning
Hand Tool Cleaning removes all loose mill scale, loose rust, and other detrimental foreign matter. It is not intended that adherent mill scale, rust, and paint be removed by this process. Mill scale, rust, and paint are considered adherent if they cannot be removed by lifting with a dull putty knife. Before hand tool cleaning, remove visible oil, grease, soluble residues, and salts by the methods outlined in SSPC-SP1. For complete instructions, refer to Steel Structures Paint Council Surface Preparation Specification No. 2 (SSPC-SP2)

12) Power Tool Cleaning
Power Tool Cleaning removes all loose mill scale, loose rust, and other detrimental foreign matter. It is not intended that adherent mill scale, rust, and paint be removed by this process. Mill scale, rust, and paint are considered adherent if they cannot be removed by lifting with a dull putty knife. Before power tool cleaning, remove visible oil, grease, soluble residues, and salts by the methods outlined in SSPC-SP1. For complete instructions, refer to Steel Structures Paint Council Surface Preparation Specification No.3.(SSP-PC3)

13) Power Tool Cleaning to Bare Metal
Metallic surfaces that are prepared according to this specification, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxide corrosion products, and other foreign matter. Slight residues of rust and paint may be left in the lower portions of pits if the original surface is pitted. Prior to power tool surface preparation, remove visible deposits of oil or grease by any of the methods specified in SSPC-SP1, Solvent Cleaning, or other agreed upon methods. For complete instructions, refer to Steel Structures Paint Council Surface Preparation Specification No.11. (SSPC-SP11)

14) Wood (Exterior)
Must be clean and dry. Prime and paint as soon as possible. Knots and pitch streaks must be scraped, sanded, and spot primed before a full priming coat is applied. Patch all nail holes and imperfections with a wood filler or putty and sand smooth.

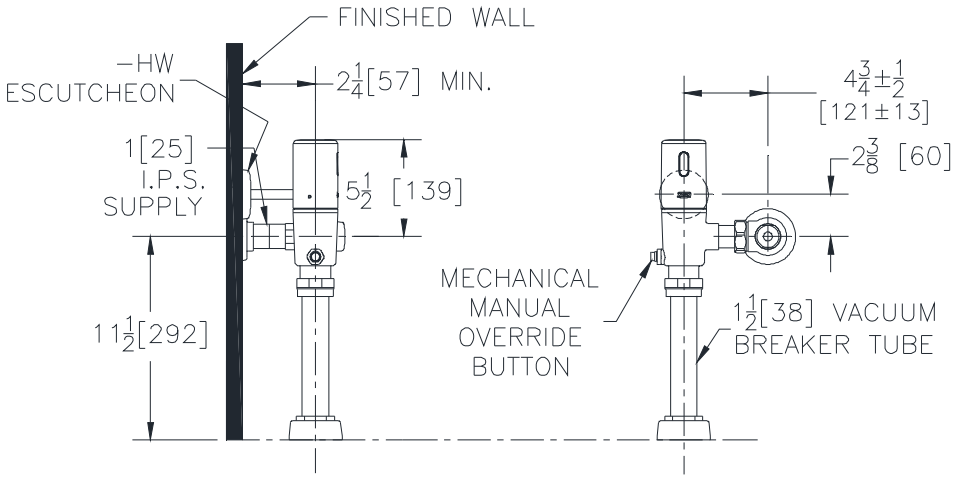
15) Wood (Interior)
All finishing lumber and flooring must be stored in dry, warm rooms to prevent absorption of moisture, shrinkage, and roughening of the wood. All surfaces must be sanded smooth, with the grain, never across it. Surface blemishes must be corrected and the area cleaned of dust before coating.

END OF SPECIFICATION

AquaSense® Model TAG _____

ZTR6200-ONE-HW

Hardwired 1.1 GPF Sensor Operated Water Closet Flush Valve



ADA DESIGNED

Suffix Options (Check/Specify Appropriate Opptions)

- ☐ **-YJ** Split Ring Pipe Support
- ☐ **-YK** Solid Ring Pipe Support
- ☐ **-YO** Bumper on Angle Stop
- ☐ **-**_____ Other

Accessories (Order separate as specified)

Compatible with -HW Version:

P6900-ACA-BA 7.6VDC Plug-In ACA Power Supply
Powers up to 4 valves

P6000-HW6 7.6VDC Hardwired Power Converter
Powers up to 8 valves

Others:

P6800-PJB-4 Power Junction Box (4 outputs)

P6800-PJB-8 Power Junction Box (8 outputs)

P6800-EXT 10' Extension Cable with Connectors

NOTE: Performance guaranteed with Zurn EcoVantage® fixtures. Please consult Zurn Technical Services at 1-800-997-3876 to discuss the paired performance of this valve with other manufacturers fixtures.

Architectural/Engineering Approval

The information contained in this document is subject to change without notice.

ZURN INDUSTRIES, LLC. ♦ COMMERCIAL BRASS OPERATION
5900 ELWIN BUCHANAN DRIVE ♦ SANFORD NC 27330
PHONE: 1-800-997-3876 ♦ FAX: 919-775-3541
WWW.ZURN.COM
IN CANADA: ZURN INDUSTRIES LIMITED
7900 GOREWAY DRIVE UNIT 10 ♦ BRAMPTON, ONTARIO L6T5W6
PHONE: 905-405-8272 FAX: 905-405-1292

Engineering Specifications

Exposed chrome plated flushometer valve with a polished robust metal cap exterior.

- Hardwired using 7.6VDC Power Supply
- Filtered Piston Kit
  - Chloramine resistant
- Proprietary DR resistant low lead brass alloy
- Actuator
  - Solenoid Activated
- Mechanical Manual Override Button
- Includes 10' power supply cable
- Control Stop
  - Internal siphon-guard protection
  - Vandal resistant stop cap
  - Sweat solder kit
  - Cast wall flange with set screw
- Vacuum Breaker
  - High back pressure
  - One piece hex coupling nut
- Internal seals
  - Chloramine resistant
- Adjustable tailpiece
- Spud coupling and flange for top spud connection

WaterSense Meets EPA Criteria Certified by IAPMO R&T

*This product should be used with a WaterSense labeled counterpart with a compatible flush volume to ensure that the entire system meets the requirements for water efficiency and performance.

AquaSense® is a registered trademark of Zurn Industries, LLC.

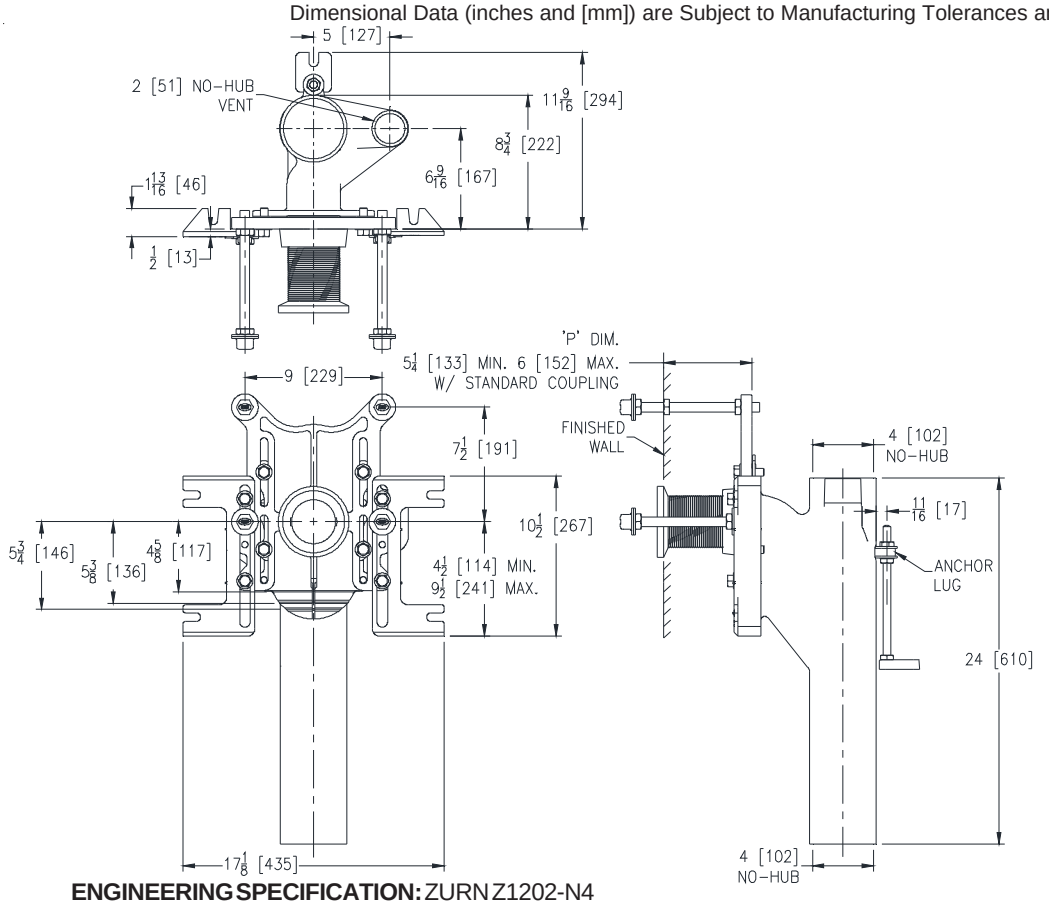
Z1202-N4

EZCARRY® ADJUSTABLE VERTICAL HIGH PERFORMANCE SIPHON JET NO-HUB WATER CLOSET CARRIER SYSTEM

SPECIFICATION SHEET

TAG _____

Dimensional Data (inches and [mm]) are Subject to Manufacturing Tolerances and Change Without Notice



Product Number	Approx. Wt. lbs [kg]
Z1202-N4	65 [29]

Note:

1. Z coupling, Min. 'P' Dim. Obtainable=2 [51]
   ZQ coupling, Min. 'P' Dim. Obtainable=5 [127]
2. Feet bolted to floor using min. 1/2 [13] dia. anchors.
3. Rear anchor foot required for secure installation.
4. 2 [51] No-Hub vent connection regularly furnished on right hand side. Left hand available when specified (Suffix -VL)
5. Auxiliary inlet available right (-JR) or left (-JL) or both sides (-JJ) when specified.

ENGINEERING SPECIFICATION: ZURN Z1202-N4

EZCarry® vertical siphon jet water closet carrier system with high performance waterway and 4" [102mm] no-hub connections. System includes Dura-Coated cast iron main fitting with hydro-mechanically optimized sweep and extended 2" [51mm] vent, adjustable gasketed faceplate, universal floor mounted pre-fab slotted foot supports, heavy-duty 1/2" [13mm] rear anchor tie down, fixture bolts, trim, stud protectors, bonded “Neo-Seal” gasket, and corrosion resistant, adjustable 3" [76mm] dia. X 6" [152mm] coupling with integral test cap designed to increase flow velocity and line carry. EZCarry® system complies with the requirements of ASME A112.6.1M up to a 500 lbs [227 kg] static load rating.

OPTIONS (Check/specify appropriate options)

Z1202-N4 4 [102] No-Hub Stack, Single Inlet, 2 [51] Right Hand Vent

PREFIXES

____ Z D.C.C.I. System with Zurn ZZ Adjustable Coupling*
____ ZQ D.C.C.I. System with NPT Faceplate, Non-Adjustable Coupling

SUFFIXES

____ -A Auxiliary Support Assembly (For 'P' Dim. Greater than 18 [457])
____ -CC Corrosion Resistant Cast Iron Coupling (2-1/4 [57] to 12 [305])
____ -CE EZ-Set™ Coupling (Available 6 [152] ,12 [305] or longer when specified. Minimum length=5 [127])
____ -CL Custom Length Standard Coupling with Integral Test Cap (Specify Length 4, 8, 10, 12 [102, 203, 254, 305])
____ -CS 2-1/4 [57] Polymer Coupling with Integral Test Cap
____ -F Floor Mounted, Back Outlet Fixture Support
____ -G Galvanized Cast Iron
____ -JJ Two 2 [51] Auxiliary Inlets
____ -JL 2 [51] Left-Hand Auxiliary Inlet
____ -JR 2 [51] Right-Hand Auxiliary Inlet
____ -M Auxiliary Foot Support (for 'P' Dim. 10 thru 18 [254 thru 457])
____ -RYK Unistrut Pre-Fab Foot Support
____ -RYK17 One Piece Unidtrut Pre-Fab Foot
____ -VL Left Hand Vent Connection
____ -VP Vandal-Proof Trim
____ -45 Finishing Frame for Siphon Jet System
____ -50 Flush Valve Supply Support for Water Closets

* Regularly furnished unless otherwise specified.

Zurn Industries, LLC | **Specification Drainage Operation**
1801 Pittsburgh Avenue, Erie, PA U.S.A. 16502 · Ph. 855-663-9876, Fax 814-454-7929
In Canada | **Zurn Industries Limited**
3544 Nashua Drive, Mississauga, Ontario L4V 1L2 · Ph. 905-405-8272, Fax 905-405-1292
www.zurn.com

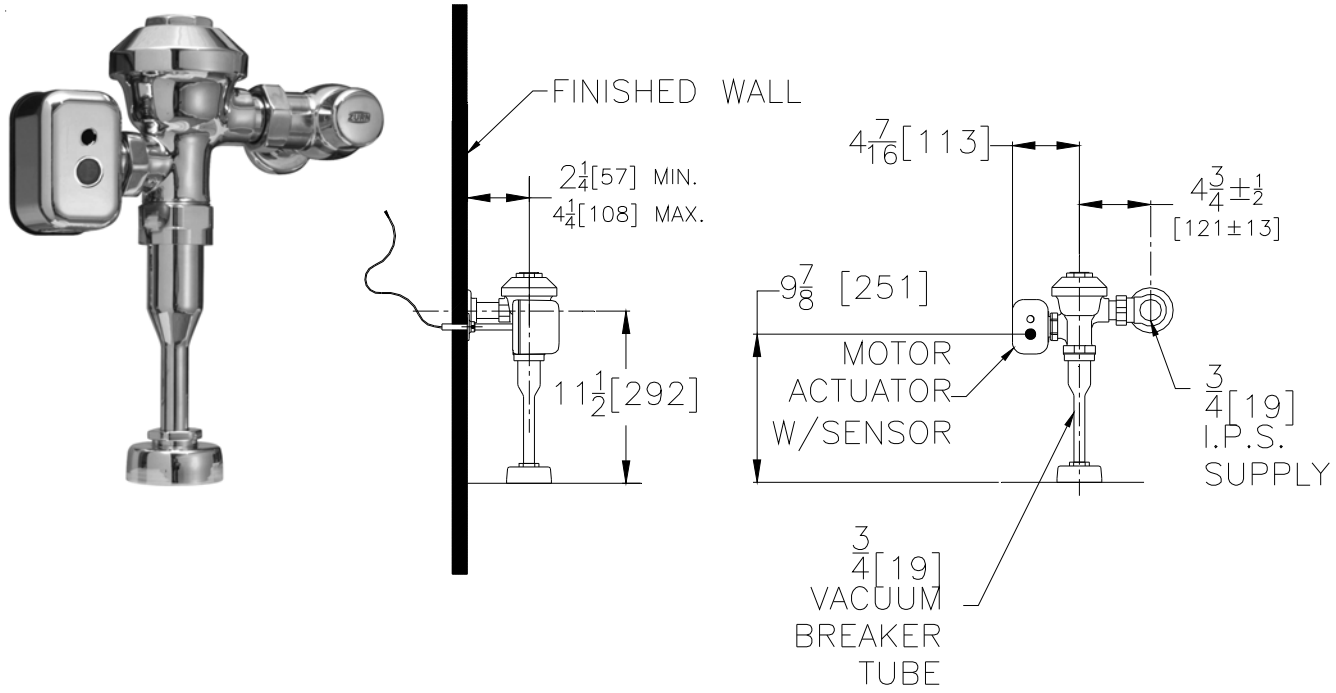
Rev. H
Date: 12/20/2016
C.N. No. 135841
Prod. | Dwg. No. Z1202-N4

AquaSense® AV Model

TAG _____

Exposed ZEMS6003AV-ULF-IS Model

Sensor Operated Hardwired 0.125 GPF High Efficiency Valve for use with 0.125 GPF Ultra Low Flow 3/4" Urinals



Suffix Options (Check/Specify Appropriate Options)

_____	**-VP**	Vandal Resistant Stop Screw
_____	**-YJ**	Split Ring Pipe Support
_____	**-YK**	Solid Ring Pipe Support
_____		Other

Accessories (Order seperate as specified)

P6000-PC6	Plug-in Power Converter (Up to 4 valves)
P6000-MJ	Mini Junction Box
P6000-HW6	Hardwire Power Converter (Up to 8 valves)

NOTE: MUST USE EITHER ZURN P6000-HW6 HARDWIRE POWER CONVERTER OR ZURN P6000-PC6 PLUG-IN POWER CONVERTER TO ENSURE PROPER OPERATION. USING A POWER CONVERTER OTHER THAN ZURN MAY RESULT IN OPERATION MALFUNCTION OR UNIT FAILURE.

The information contained in this document is subject to change without notice.
Please contact Zurn for most up to date information.

ENGINEERING SPECIFICATION: ZURN ZEMS6003AV-ULF-IS AquaSense® 'AV' Exposed Hardwired Automatic Sensor Flush Valve For 3/4" Urinals- Exposed, quiet diaphragm-type, chrome plated, .125 GPF flushometer valve with a polished exterior. Complete with Zurn's AquaVantage® TPE, chloramine resistant, dual seal diaphragm with a clog resistant, filtered by-pass. The valve incorporates a motorized actuator, an integral infrared convergence-type proximity sensor and a manual push-button override into an all-metal, polished chrome plated housing. The valve is complete with high back pressure vacuum breaker, one piece hex coupling nut, adjustable tailpiece, spud coupling and flange for top spud connection. Control stop has internal siphon-guard protection, vandal resistant stop cap, sweat solder kit, and a cast wall flange with set screw. Internal seals are made of chloramine resistant materials.

This space is for Architectural/Engineering Approval

ZURN INDUSTRIES, LLC. ♦ COMMERCIAL BRASS OPERATION ♦ 5900 ELWIN BUCHANAN DRIVE ♦ SANFORD NC 27330
Phone: 1-800-997-3876 ♦ Fax: 919-775-3541 ♦ World Wide Web: www.zurn.com
In Canada: ZURN INDUSTRIES LIMITED ♦ 3544 Nashua Drive ♦ Mississauga, Ontario L4V1L2 ♦ Phone: 905-405-8272 Fax: 905-405-1292

AquaVantage® is a registered trademark of Zurn Industries, LLC.
AquaSense® is a registered trademark of Zurn Industries, LLC.

Rev. B
Dwg. No. 200301
Date:5/4/10
Product No. ZEMS6003AV-ULF-IS

ZURN®

AquaSense®
TAG _____

Z6930-XL

AquaSense Battery Powered Faucet

ADA DESIGNED

ZURN LEAD FREE PRODUCTS

Engineering Specification

ADA compliant, battery powered, chrome plated sensor faucet for retrofit and new construction.

- Flow Rate
  - 1.5 gpm Vandal Resistant Aerator
- Occupant Detection
  - Infrared convergence-type proximity sensor
  - Thirty Second Time out feature
- Spout module
  - Chrome Plated Cast Brass
- Also Includes
  - In-line filter
  - 4 "AA" batteries
  - Inlet for a 1/2"[13] ball riser

Flow Control Options

- ☐ **-F** 0.5 gpm/1.9 Lpm Vandal-Resistant Non-Aerated
- ☐ **-J** 1.5 gpm/ 5.7 Lpm Vandal-Resistant Laminar Flow
- ☐ **-K** 1.0 gpm/ 3.8 Lpm Vandal-Resistant Laminar Flow
- ☐ **-L** 1.0 gpm/ 3.8 Lpm Vandal-Resistant Aerator
- ☐ **-M** 0.35 gpm/1.3 Lpm Vandal-Resistant Non-Aerated
- ☐ **-N** 0.5 gpm/ 1.9 Lpm Vandal-Resistant Laminar Flow

Power Supply Choices (Sold Separately)

- ☐ **-ACA** 6 VDC Plug-In Power Converter
- ☐ **-HW6** Hardwired Power Converter

Optional Power Supply Accessories

- ☐ **-CWB** Connector Wire for Hardwire Install
- ☐ **-MJ** Mini Junction Box

NOTE: For Hardwire applications furnish P6000-HW6 power converter. Order P6000-HW6 power converter seperately.
The P6000-HW6 and P6000-MJ will power up to 8 sensor faucets.

Accessories

- ☐ **-ADM** Above Deck Mixer
- ☐ **-ADM-2** Above Deck Mixer w/8" Cover Plate
- ☐ **-CP4** Cover Plate 4"[102] Centers
- ☐ **-CP8** Cover Plate 8"[203] Centers
- ☐ **-DSA** Drug Screening Applications (Hardwired Applications)
- ☐ **-H4** Wrist Blade Handle for ADM
- ☐ **-MT** Mixing Tee
- ☐ **-MV** Temperature Mixing Valve
- ☐ **-SH** Supply Hoses for Mixing Valve
- ☐ **-SSH** Single Stainless Supply Hose (-XL)
- ☐ **-TMV** Thermostatic Mixing Valve for Multiple Faucets
- ☐ **-TMV-1** Thermostatic Mixing Valve for Single Faucets
- ☐ **-_____** Other

Zurn Lead Compliant products (-XL) are manufactured to comply with state laws and local codes that mandate lead content levels less than one quarter of one percent (0.25%) total lead content by weighted average.

Architectural/Engineering Approval

ZURN INDUSTRIES, LLC. ♦ COMMERCIAL BRASS OPERATION
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www.zurn.com
In Canada: ZURN INDUSTRIES LIMITED
3544 Nashua Drive ♦ Mississauga, Ontario L4V1L2
Phone: 905-405-8272 Fax: 905-405-1292

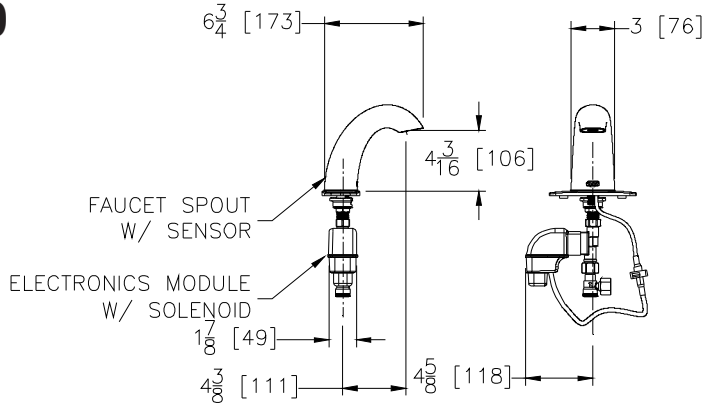
AquaSense® is a registered trademark of Zurn Industries, LLC.

The information contained in this document is subject to change without notice.
Please contact Zurn for most up to date information.

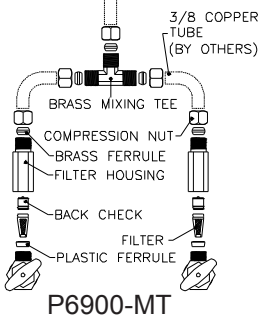
TYPICAL Z6930

AquaSense Battery Powered Faucet

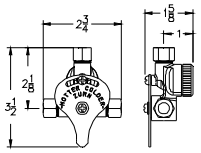
NOTE: Recommended through hole diameter to properly mount the spout/ shank is 1-1/8" to 1-1/4".



Optional Mixing Valves



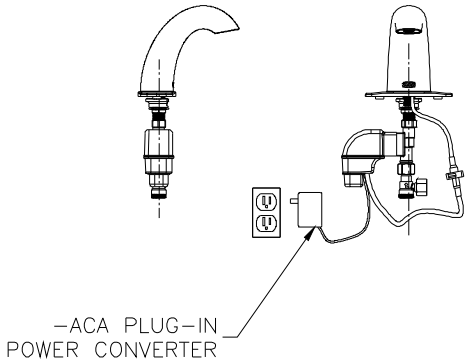
P6900-MT
Mixing Tee



P6900-MV
Temperature Mixing Valve

TYPICAL Z6930-ACA

AquaSense Plug-In Powered Faucet



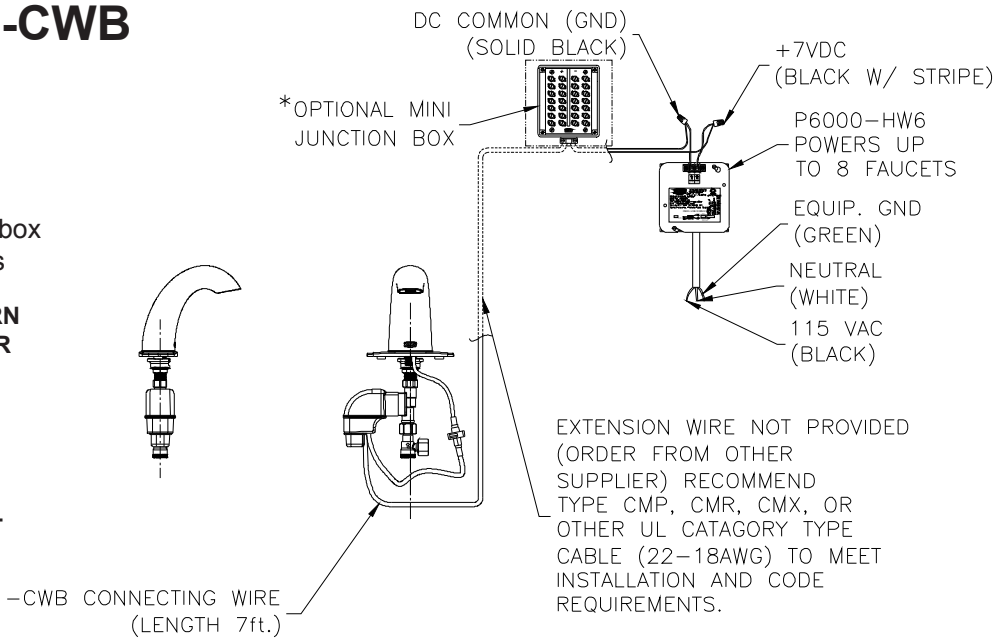
TYPICAL Z6930-CWB

AquaSense Hardwire

Powered Faucet

Optional:
* Optional -MJ mini junction box for connecting up to 8 faucets

NOTE: MUST USE EITHER ZURN P6000-HW6 HARDWIRE POWER CONVERTER OR ZURN P6000-ACA PLUG-IN POWER CONVERTER TO ENSURE PROPER OPERATION. USING A POWER CONVERTER OTHER THAN ZURN MAY RESULT IN OPERATION MALFUNCTION OR UNIT FAILURE.



AquaSense® is a registered trademark of Zurn Industries, LLC.

ELKAY®
SPECIFICATIONS

Elkay Gourmet Single Hole Bar Faucet Pull-out Spray and Lever Handle

Model(s) LKGT1042

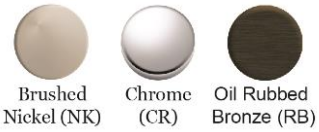
PRODUCT SPECIFICATIONS

Elkay Gourmet Single Hole Bar Faucet Pull-out Spray and Lever Handle. Faucet has a flow rate of 1.75 GPM, and is made of Brass material, with a Ceramic Disc valve. Faucet requires 1 faucet holes.

Mounting Type:	Deck Mount
Special Features:	Low Flow Solid Brass Construction
Spray Type:	Pull Out
Finish:	Brushed Nickel (NK), Chrome (CR), Oil Rubbed Bronze (RB)
Handle Type:	Lever Handle
Deck Clearance:	5"
Spout Reach:	8-3/4"
Spout Height:	7-3/8"
Hole Drillings:	1
Material:	Brass
Valve Type:	Ceramic Disc
Valve Connection:	3/8" Female Compression Hose Assembly
Flow Rate:	1.75 GPM
Faucet Hole Size (min):	1-3/8"
Countertop Thickness:	2-1/2
Spout Swing Rotation:	110°
Spout Type:	Pull-out Spray
Spray Functions:	Aerated, Spray

OPTIONAL ACCESSORIES

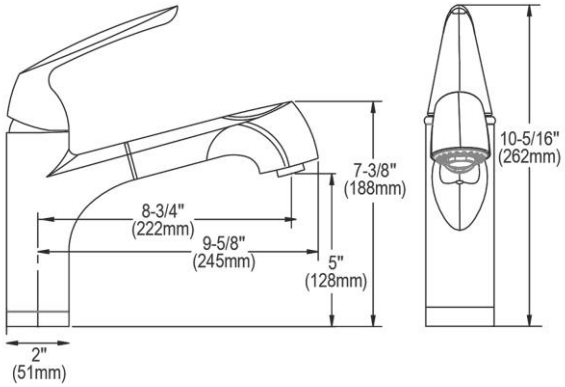
LKGT1054CR - Elkay Soap / Lotion Dispenser, Chrome (CR)
LKGT1054NK - Elkay Soap / Lotion Dispenser, Brushed Nickel (NK)
LKGT1054RB - Elkay Soap / Lotion Dispenser, Oil Rubbed Bronze (RB)



AMERICAN PRIDE. A LIFETIME TRADITION.
Like your family, the Elkay family has values and traditions that endure. For almost a century, Elkay has been a family-owned and operated company, providing thousands of jobs that support our families and communities.

Product Compliance: ADA & ICC A117.1
ASME A112.18.1/CSA B125.1
NSF 61
NSF 372 (lead free)

Clean and Care Manual (PDF)
Installation Instructions (PDF)
Limited Lifetime Warranty (PDF)



PART:_____QTY: _____

PROJECT:_____

CONTACT:_____

DATE:_____

NOTES:_____

APPROVAL:

In keeping with our policy of continuing product improvement, Elkay reserves the right to change product specifications without notice. Please visit elkay.com for the most current version of Elkay product specification sheets. This specification describes an Elkay product with design, quality, and functional benefits to the user. When making a comparison of other producers' offerings, be certain these features are not overlooked.

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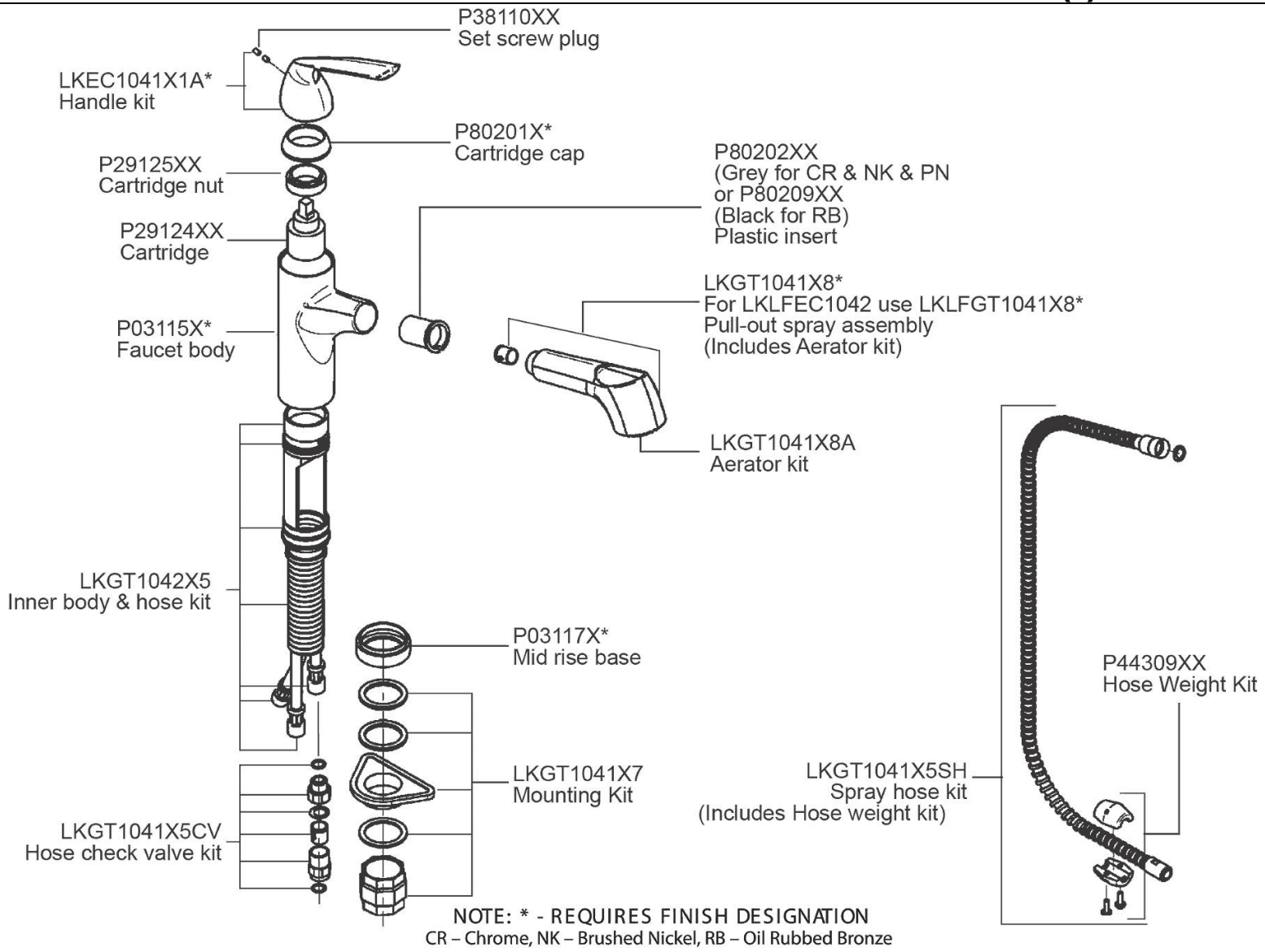
Elkay Gourmet Single Hole Bar Faucet Pull-out Spray and Lever Handle

Model(s) LKGT1042



elkayusa.com

NOTE: * -REQUIRES FINISH DESIGNATION
CR - Chrome, NK - Brushed Nickel, RB - Oil Rubbed Bronze, PN - Polished Nickel

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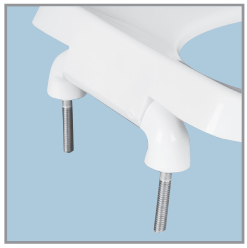
COMMERCIAL EXTRA HEAVY-DUTY PLASTIC TOILET SEAT



PLASTIC HINGES WITH STAINLESS STEEL POSTS AND PINTLES

STA-TITE® COMMERCIAL FASTENING SYSTEM™

MODEL # **COLOR #**

3155CT/3155SSCT _____

DESCRIPTION:

Open front less cover, elongated, extra heavy-duty, injection molded solid plastic toilet seat. Features four molded-in bumpers, non self-sustaining (3155CT) or self-sustaining (3155SSCT) check hinges with non-corrosive 300 Series stainless steel posts and pintles and STA-TITE® Commercial Fastening System™. Seat contains DuraGuard® Antimicrobial* Built-In Seat Protection™. This seat complies with IAPMO/ANSI Z124.5-2013 Plastic Toilet Seats as a class Commercial Heavy Duty.

* DuraGuard® Antimicrobial does not protect users against bacteria, viruses, or other disease organisms. Always clean and wash this product thoroughly before and after each use.

SPECIFICATIONS:

Size:	Elongated
Material:	Plastic
Style:	Open Front less Cover
Bumpers:	Four
Hinges:	Plastic Non Self-Sustaining (3155CT) or Self-Sustaining (3155SSCT) with 300 Series Stainless Steel Posts and Pintles
Fastening System:	STA-TITE® Commercial Fastening System™

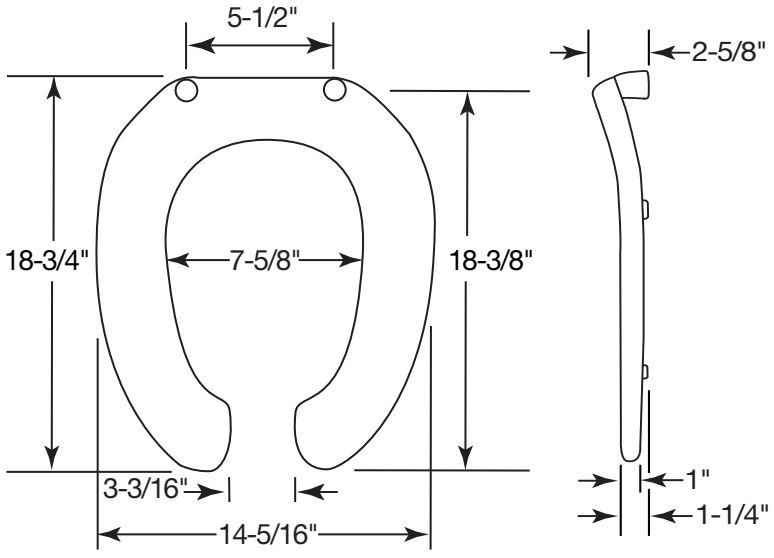
FEATURES:

STA-TITE® Commercial Fastening System™

DuraGuard® Antimicrobial Built-In Seat Protection™

Non-Corrosive 300 Series Stainless Steel Posts and Pintles

DIMENSIONS:



Proudly Made in the USA

Bemis Manufacturing Co., Sheboygan Falls, WI 53085
www.ToiletSeats.com

Phone: 800-558-7651 Fax: 800-292-3647
©2014 0B7012296 REVC

KOHLER®

Kingston™
Bowl
K-4325

Features
- Vitreous china.
- Elongated bowl.
- Siphon jet.
- Wall-mount.
- 1-1/2" top spud.
- 1.28 gpf (4.8 lpf) or 1.6 gpf (6 lpf) depending on flushometer specified.
- 10-1/2" (267 mm) x 9" (229 mm) water area.
- 26-1/2" (673 mm) x 16-1/2" (419 mm) x 13-1/4" (337 mm).
- Will replace K-4330 and K-4330-L bowls.

Optional Accessories
K-10673 WAVE Touchless Toilet 1.28 gpf Flushometer
K-13516 Manual 1.6 GPF WC Flushometer
K-13517 Manual 1.28 GPF WC Flushometer
K-10674-SV WAVE DC 1.6 GPF WC Flushometer
K-10956-SV Tripoint™ DC 1.28 GPF WC Flushometer
K-10957-SV Tripoint™ DC 1.6 GPF WC Flushometer
K-4731-C Commercial Heavy-Duty Toilet Seat
K-4731-GC Commercial Elongated Toilet Seat
K-4731-SC Commercial Heavy-Duty Toilet Seat
K-10956 Tripoint™ DC 1.28 GPF WC Flushometer
K-10674 Wave DC 1.6 GPF WC Flushometer
K-10957 Tripoint™ DC 1.6 GPF WC Flushometer

Components
Additional included component/s: Spud.

ADA | **CSA B651** | **OBC**

WaterSense Meets EPA Criteria Certified by IAPMO R&T

Codes/Standards
ASME A112.19.2/CSA B45.1
DOE - Energy Policy Act 1992
EPA WaterSense®
California Energy Commission (CEC)
ADA
ICC/ANSI A117.1
CSA B651
OBC

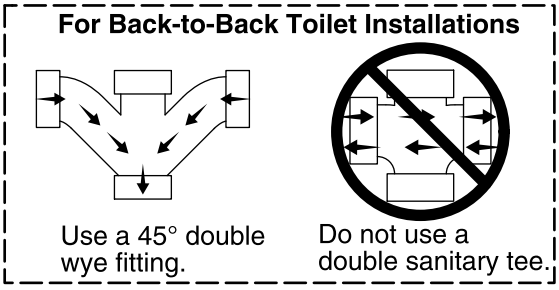
KOHLER® One-Year Limited Warranty
See website for detailed warranty information.

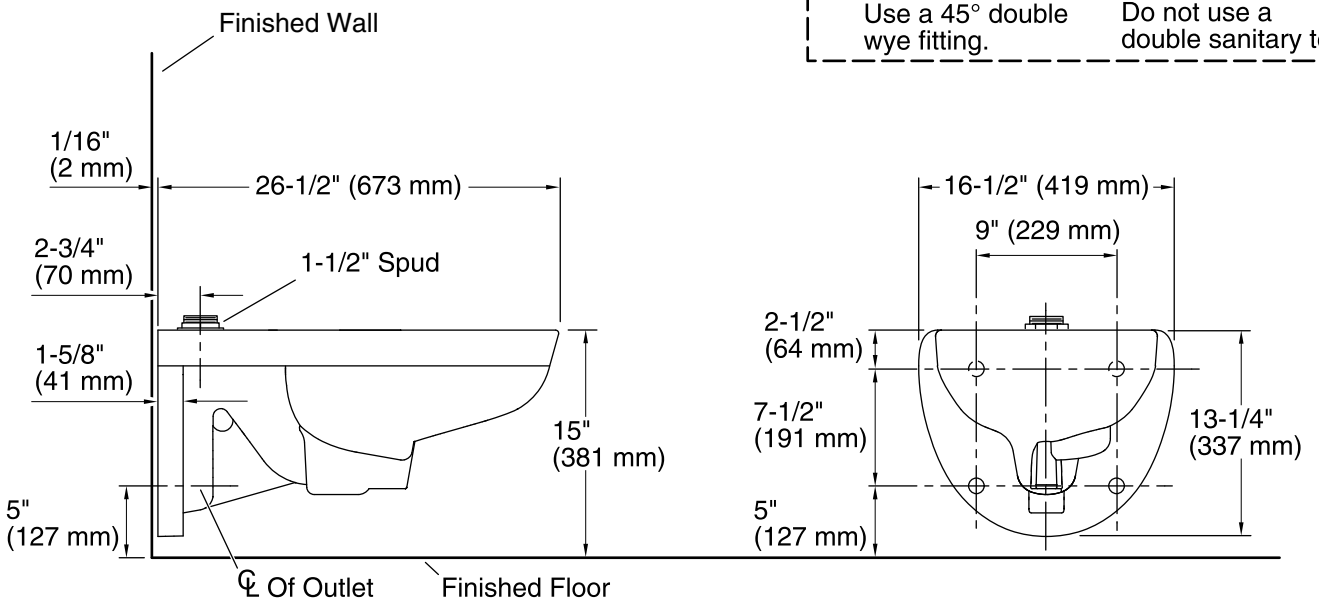
Available Color/Finishes
Color tiles intended for reference only.

Color	Code	Description
	0	White
	96	Biscuit
	47	Almond
	7	Black Black™

KOHLER®

Kingston™
Bowl
K-4325





Technical Information

All product dimensions are nominal.

Toilet type:	Flushometer, Wall-mount
Waste Outlet:	Wall
Bowl shape:	Elongated front
Spud size:	1-1/2", Inlet, Top
Trap passageway:	2-1/8" (54 mm)
Water surface size:	10-1/2" x 9" (267 mm x 229 mm)
Rim to water surface:	5-1/4" (133 mm)
Seat-mounting holes:	5-1/2" (140 mm)

Fixture Supply Requirements

Min static pressure:	35 psi (241.3 kPa)
Max static pressure:	80 psi (551.6 kPa)
Min flowing pressure:	25 psi (172.4 kPa)
Min flow rate:	25 gpm (94.6 lpm)

Notes

Install this product according to the installation instructions.

Refer to manufacturer's instructions and local codes for flushometer requirements.

For back-to-back toilet installations: Use only a 45° double wye fitting.

ADA, OBC, CSA B651 compliant when installed to the specific requirements of these regulations.

Plumbing Codes require elongated toilets and elongated, open-front toilet seats in public bathrooms.

Accessibility standards require controls to be located on the open side of the toilet.

Bardon™
High-Efficiency Urinal
K-4991-ET

Features
- Washout urinal.
- 3/4" top spud.
- 0.125 gpf (0.47 lpf) to 1.0 gpf (3.8 lpf).
- 14" (356 mm) extended rim.
- Will replace K-4904-ET.

Material
- Vitreous china.

Water Conservation & Rebates
- WaterSense-compliant when used with a 0.125 gpf or 0.5 gpf WaterSense flushometer.

Recommended Accessories
K-10668 WAVE DC 1/8 GPF Urinal Flushometer
K-10949 Tripoint™ DC 1/8 GPF Urinal Flushometer
K-13520 Manual 1/8 GPF Urinal Flushometer
K-7528 WAVE HES 1/8 GPF Urinal Flushometer
K-7546 Tripoint™ HES 1/8 GPF Urinal Flushometer
K-10675 WAVE DC 0.5 GPF Urinal Flushometer
K-10958 Tripoint™ DC 0.5 GPF Urinal Flushometer
K-7537 Tripoint™ HES 0.5 GPF Urinal Flushometer
K-7526 WAVE HES 0.5 GPF Urinal Flushometer
K-13519 Manual 0.5 GPF Urinal Flushometer
K-10676 WAVE DC 1.0 GPF Wshdwn Flushometer
K-10960 Tripoint™ DC 1.0 GPF Wshdwn Flushometer
K-13518 Manual 1.0 GPF Wshdwn Flushometer
K-7539 Tripoint™ HES 1.0 GPF Blwout Flushometer
K-7542 Tripoint™ HES 1.0 GPF Wshdwn Flushometer
K-7527 WAVE HES 1.0 GPF Wshdwn Flushometer

Components
Additional included component/s: 3/4" inlet spud, 2" outlet spud, Strainer, and Hangers (2).

ADA | **CSA B651**

Codes/Standards
ASME A112.19.2/CSA B45.1
DOE - Energy Policy Act 1992
EPA WaterSense®
California Energy Commission (CEC)
ADA
ICC/ANSI A117.1
CSA B651

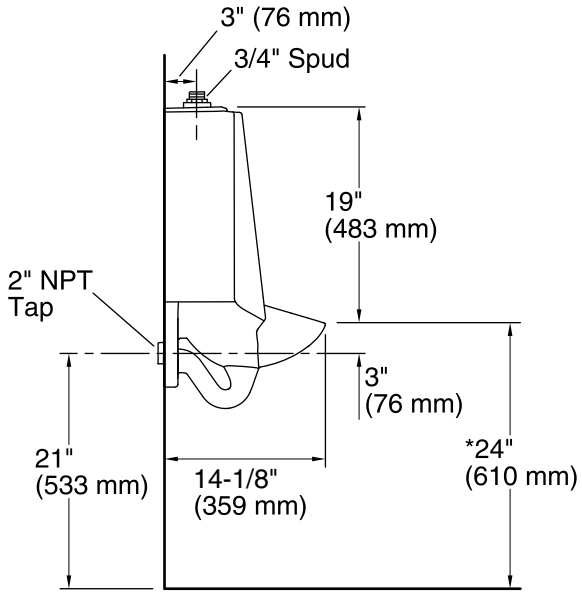
KOHLER® One-Year Limited Warranty
See website for detailed warranty information.

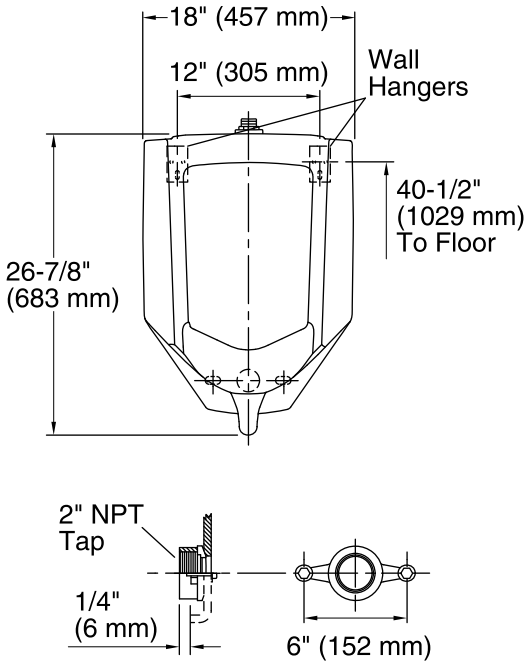
Available Color/Finishes
Color tiles intended for reference only.

Color	Code	Description
	0	White
	96	Biscuit
	47	Almond
	7	Black Black™

Bardon™
High-Efficiency Urinal
K-4991-ET

*Urinal complies with ADA requirements when rim is mounted no higher than 17" (432 mm) from finished floor.





Spud Detail

Technical Information

All product dimensions are nominal.

Flush outlet technology:	Washout
Spud size:	3/4", Inlet, Top
Min. Water per Flush:	0.125 gal (0.5 L)
Max. Water per Flush:	1 gal (3.8 L)

Designed for the above water use when installed with a water-saving flushometer.

Notes

Install this product according to the installation guide.

Refer to manufacturer's instructions and local codes for flushometer requirements.

ADA, CSA B651 compliant when installed to the specific requirements of these regulations.

Pinoir®

Wall-mount Bathroom Sink

K-2035-1

Features

- Vitreous china.
- Wall-mount.
- Oval basin.
- With overflow.
- Single faucet hole.
- Designed for a small space.
- 22" (559 mm) x 18" (457 mm)

Recommended Accessories

K-7605-P Angle Supply with Stop (pair)
K-8998 P-Trap

Components

Product includes:
K-2028-1 Wall-mount Bathroom Sink
K-2057 Bathroom Sink Shroud
Additional included component/s: Rubber pads, hanger, and shroud accessory pack.

ADA | **CSA B651** | **OBC**

Codes/Standards

ASME A112.19.2/CSA B45.1
ADA
ICC/ANSI A117.1
CSA B651
OBC

KOHLER® One-Year Limited Warranty

See website for detailed warranty information.

Available Color/Finishes

Color tiles intended for reference only.

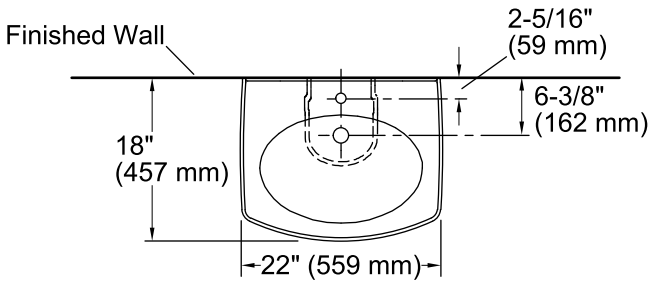
Color	Code	Description
	0	White
	96	Biscuit
	47	Almond

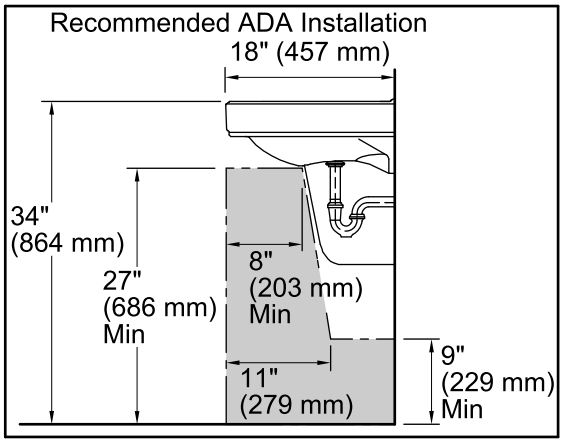
KOHLER®

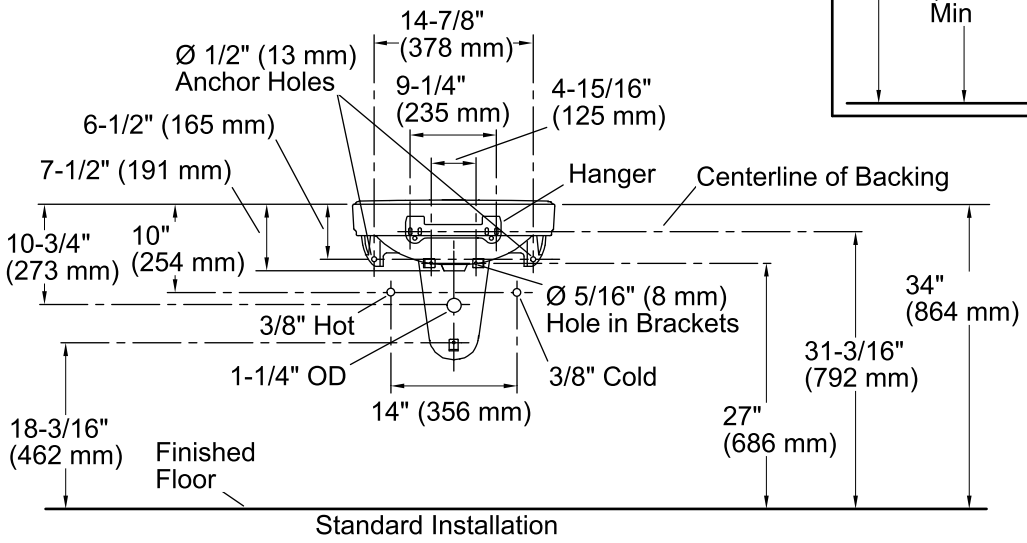
Pinoir®

Wall-mount Bathroom Sink

K-2035-1







Technical Information

All product dimensions are nominal.

Bowl configuration:	Single
Installation:	Wall-mount
Bowl area (Only)	Length: 18" (457 mm) Width: 12" (305 mm) Water depth: 4" (102 mm)
Number of deck holes:	1
Faucet hole(s):	1-3/8" (35 mm)
Drain hole:	1-3/4" (44 mm)

Notes

Install this product according to the installation instructions.

ADA, OBC, CSA B651 compliant when installed to the specific requirements of these regulations.

Caxton® Oval
Bathroom Sink
K-2210

Features
- Vitreous china.
- Under-mount
- With overflow.
- Available with KOHLER Artist Editions designs
- 19-1/4" (489 mm) x 16-1/4" (413 mm)

Recommended Accessories
K-8998 P-Trap

Components
Additional included component/s: 1193643 Basin Clamps.

ADA | **CSA B651**

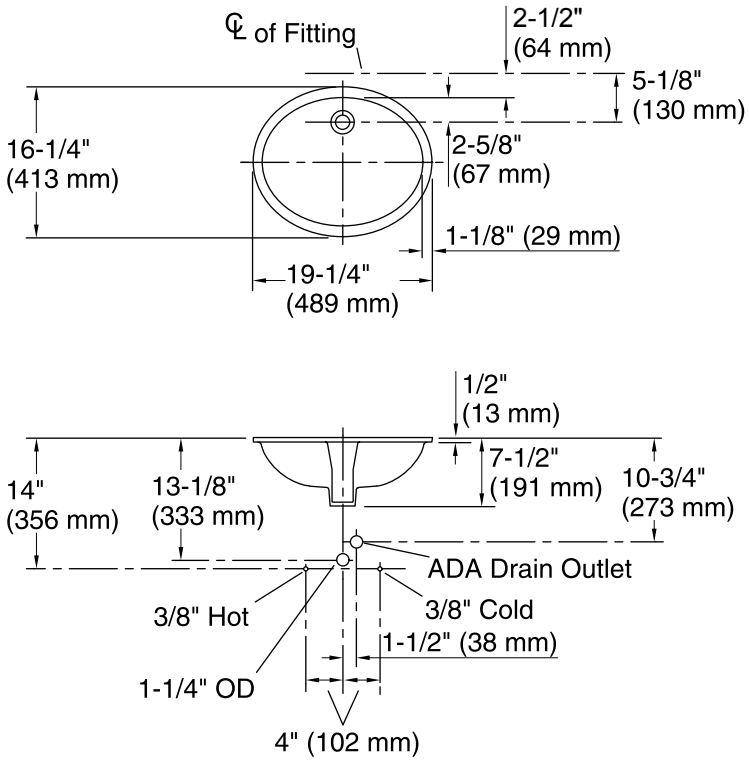
Codes/Standards
ASME A112.19.2/CSA B45.1
ADA
ICC/ANSI A117.1
CSA B651

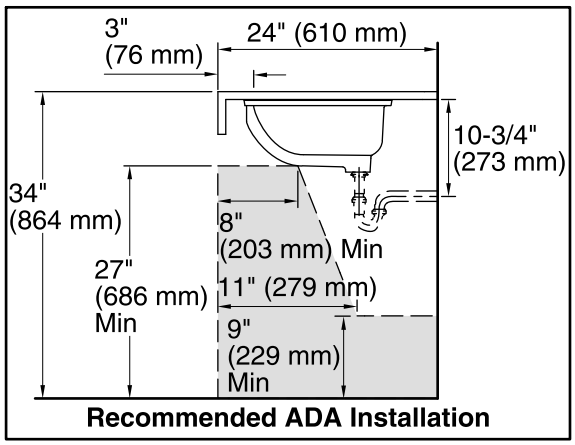
KOHLER® One-Year Limited Warranty
See website for detailed warranty information.

Available Color/Finishes
Color tiles intended for reference only.

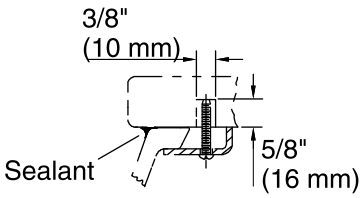
Color	Code	Description
	0	White
	96	Biscuit
	47	Almond
	NY	Dune
	95	Ice™ Grey
	G9	Sandbar
	33	Mexican Sand™
	K4	Cashmere
	58	Thunder™ Grey
	7	Black Black™

Caxton® Oval
Bathroom Sink
K-2210

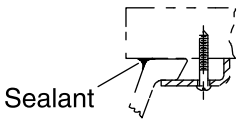




Recommended ADA Installation



Marble Installation



Wood Installation

Technical Information

All product dimensions are nominal.

Installation:	Under-mount
Bowl area	Length: 17" (432 mm) Width: 14" (356 mm) With overflow: Yes Water depth: 4" (102 mm)
Bowl area	With overflow: Yes
Drain hole:	1-3/4" (44 mm)
Template:	1151011-7, required, not included

Notes

Install this product according to the installation instructions.

NOTICE: Countertop manufacturer or cutter must use the current product template available at www.kohler.com, or by calling 1-800-4KOHLER. Kohler Co. is not responsible for cutout errors when the incorrect cutout template is used.

ADA, CSA B651 compliant when installed to the specific requirements of these regulations.

KOHLER®

Devonshire®

Under-mount Bathroom Sink

K-2350

Features

- Vitreous china.
- Under-mount.
- Oval basin.
- No faucet holes; requires wall- or counter-mount faucet.
- Coordinates with other products in the Devonshire collection.
- 16-7/8" (430 mm) x 13-11/16" (348 mm)

Recommended Accessories

K-9018 P-Trap

Components

Additional included component/s: 1193643 Basin Clamps.

ADA

Codes/Standards

ASME A112.19.2/CSA B45.1
ADA
ICC/ANSI A117.1

KOHLER® One-Year Limited Warranty

See website for detailed warranty information.

Available Color/Finishes

Color tiles intended for reference only.

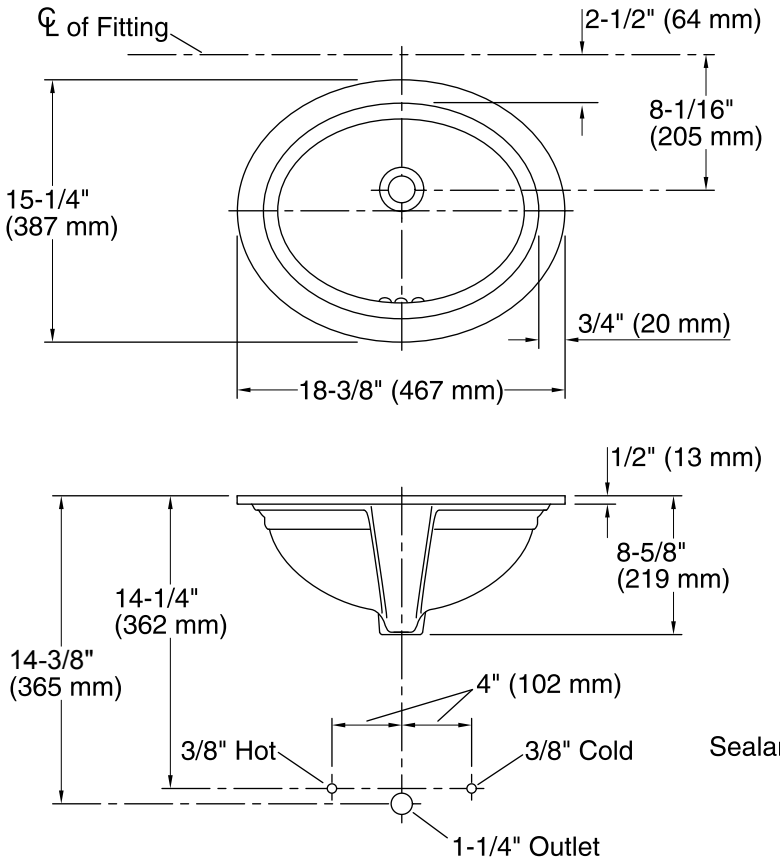
Color	Code	Description
	0	White
	96	Biscuit
	47	Almond
	NY	Dune
	95	Ice™ Grey
	G9	Sandbar
	33	Mexican Sand™
	K4	Cashmere
	58	Thunder™ Grey
	7	Black Black™

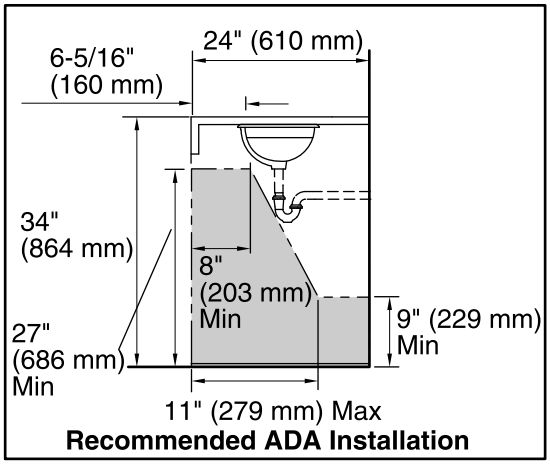
KOHLER®

Devonshire®

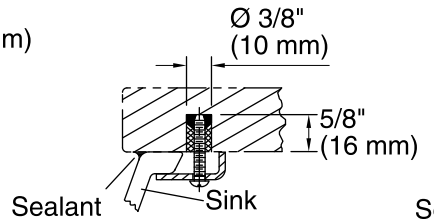
Under-mount Bathroom Sink

K-2350

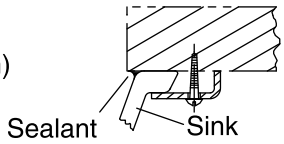




Recommended ADA Installation



Marble Installation



Wood Counter Installation

Technical Information

All product dimensions are nominal.

Bowl configuration:	Single
Installation:	Under-mount
Bowl area (Only)	Length: 16-7/8" (429 mm) Width: 13-11/16" (348 mm) Water depth: 4-3/16" (106 mm)
Drain hole:	1-3/4" (44 mm)
Template:	1289470-7, required, not included

Notes

Install this product according to the installation instructions.

NOTICE: Countertop manufacturer or cutter must use the current product template available at www.kohler.com, or by calling 1-800-4KOHLER. Kohler Co. is not responsible for cutout errors when the incorrect cutout template is used.

ADA compliant when installed to the specific requirements of these regulations.

ELKAY®
SPECIFICATIONS

Elkay Lustertone Stainless Steel 19-1/2" x 22" x 5-1/2" Single Bowl Top Mount ADA Sink
Model(s) LRAD202255

PRODUCT SPECIFICATIONS

Elkay Lustertone Stainless Steel 19-1/2" x 22" x 5-1/2", Single Bowl Top Mount ADA Sink. Sink is manufactured from 18 gauge 304 Stainless Steel with a Lustertone finish, Rear Center drain placement, and Bottom only pads.

Installation Type:	Top Mount
Material:	304 Stainless Steel
Finish:	Lustertone
Gauge:	18
Sound Deadening:	Bottom only pads
Number of Bowls:	1
Sink Dimensions:	19-1/2" x 22" x 5-1/2"
Bowl 1 Dimensions:	16" x 16" x 5-3/8"
Drain Size:	3-1/2" (89mm)
Drain Location:	Rear Center
Minimum Cabinet Size:	24"
Mounting Hardware:	Part # 64090012 included for countertops up to 3/4" (19mm) thick
Cutout Template #:	1000001263

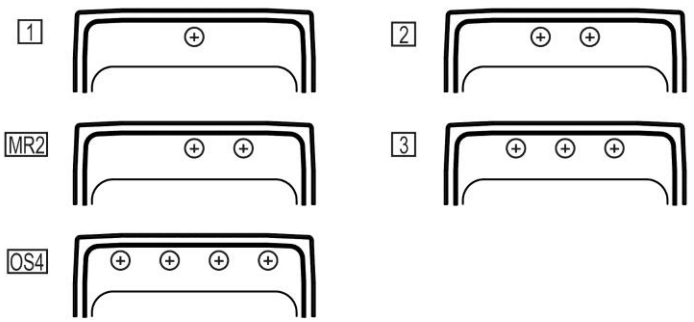
Template is available for download at elkay.com

Cutout Dimensions for Top Mount Installation:
18-7/8" x 21-3/8" (479mm x 543mm) with 1-1/2" (38mm) corner radius

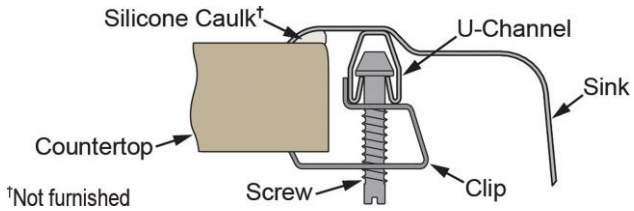
This sink is compliant to ADA and ANSI/ICC A117.1 accessibility requirements when installed according to the requirements outlined in these standards.

Hole Drilling Configurations:

1-1/2" (38mm) Diameter Faucet Holes on 4" (102mm) Centers



Installation Profile:



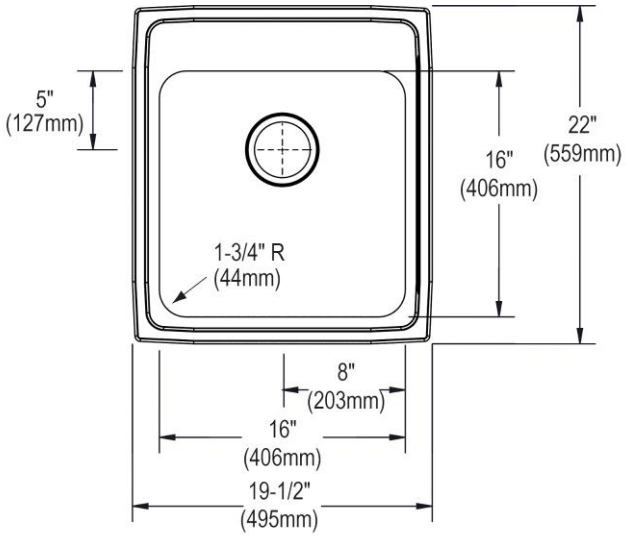
AMERICAN PRIDE. A LIFETIME TRADITION.
Like your family, the Elkay family has values and traditions that endure. For almost a century, Elkay has been a family-owned and operated company, providing thousands of jobs that support our families and communities.

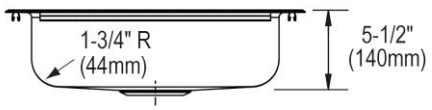
Sinks are listed by IAPMO® as meeting the applicable requirements of the Uniform Plumbing Code®, International Plumbing Code®, and National Plumbing Code of Canada.

Product Compliance: ADA & ICC A117.1
ASME A112.19.3/CSA B45.4
BUY AMERICAN ACT

Clean and Care Manual (PDF)
Installation Instructions (PDF)
Limited Lifetime Warranty (PDF)

Similar models are available with: Quick-Clip Mounting System, additional ADA depths, CuVerro antimicrobial copper





PART:_____QTY: _____

PROJECT:_____

CONTACT:_____

DATE:_____

NOTES:_____

APPROVAL:_____

In keeping with our policy of continuing product improvement, Elkay reserves the right to change product specifications without notice. Please visit elkay.com for the most current version of Elkay product specification sheets. This specification describes an Elkay product with design, quality, and functional benefits to the user. When making a comparison of other producers' offerings, be certain these features are not overlooked.

OPTIONAL ACCESSORIES

Bottom Grid:	LKWOBG1616SS
Cutting Board:	CB1713, CBS1316
Drain:	LK99
Faucet:	LKGT1041, LKGT2041
Hardware:	LK364, LK463
Rinsing Basket:	LKWRB1316SS, LKWERBSS
Sinkmate:	LKSMHSL
Soap Dispenser:	LKGT1054

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MicroNet BACnet Plant Controller

SPECIFICATIONS

HARDWARE

Dimensions
10-15/16 H x 8-3/8 W x 2-9/32 D in. (278 x 213 x 58 mm).

Enclosure
Optional rugged sheet metal enclosure conforms to NEMA-1.

Mounting
Panel mount.

Power Supply Input
20.4 to 30 Vac, 50/60 Hz.

Power Consumption
50 VA at 24 Vac.

AGENCY LISTINGS

US
FCC Part 15, Class A.

UL 916, File #E71385 Category PAZX

UL 864, Category UUKL, File #S5381 Smoke-Control Equipment

Canadian
UL Listed to Canadian Safety Standards (CAN/CSA 22.2).

CUL Listed to Standards ULC/ORD-C100-92 (Smoke Control System Equipment) and CAN-ULC-S527 (Control Units for Fire Alarm Systems)

Australian
Meets requirements to bear the C-Tick Mark.

European Community
EMC Directive 89/336/EEC
EN61326

MicroNet BACnet Plant Controller MNB-1000

The TAC I/A Series™ MicroNet™ BACnet™ Plant Controller is an interoperable controller with native BACnet/IP, BACnet Ethernet, and MS/TP communications support and routing functionality between physical networks. The controller features: Sensor Link (S-Link) support; remote I/O support; LED status and output indication; two Ethernet ports; screw terminal blocks; and a panel-mount subbase with a removable electronics module.

The Plant Controller's sequence of operation and BACnet image are fully programmable using WorkPlace Tech Tool, and can be applied to a wide range of mechanical equipment. Typical applications include central station air handlers, VAV air handlers, and cooling towers.

The MicroNet BACnet Plant Controller can function either in a standalone mode or as part of a BACnet building automation system (BAS) network. The MNB-1000 is BACnet Testing Laboratories (BTL) listed as a BACnet Application Specific Controller (B-ASC).

AMBIENT LIMITS

Operating Temperature
-40 to 140 °F (-40 to 60 °C).

Shipping and Storage Temperature
-40 to 160 °F (-40 to 71 °C).

Humidity
5 to 95% non-condensing.

WIRING TERMINALS

Remote I/O (IO+, IO-, SLD)
Removable screw terminals; single AWG #14 (2.08 mm^2) wire or up to two AWG #18 (0.823 mm^2) or smaller wires.

MS/TP (MS+, MS-, SLD)
Removable screw terminals; single AWG #14 (2.08 mm^2) wire or up to two AWG #18 (0.823 mm^2) or smaller wires.

I/O Points
Fixed screw terminals; single AWG #14 (2.08 mm^2) wire or up to two AWG #18 (0.823 mm^2) or smaller wires.

Power
Removable screw terminals; up to two AWG #14 (2.08 mm^2) or smaller wires.

Continued on next page.

Schneider Electric

Continued from first page.

INPUTS FROM MN-SX MICRONET SENSOR

Space Temperature
32 to 122 °F (0 to 50 °C).

Space Humidity
5 to 95% RH, non-condensing.

Local Setpoint
Adjustable within limits set by application programming tool.

Fan Operation and Speed Mode
On/off, speed (low/medium/high), or auto.

System Mode
Heat, cool, off, or auto.

Emergency Heat
Enable or disable.

UNIVERSAL INPUTS (12)

Universal Input characteristics are software-configured to respond to one of the following input types:

10k ohm Thermistor with 11k ohm Shunt Resistor
Sensor operating range -40 to 250 °F (-40 to 121 °C), model TSMN-57011-850, TS-5700-850 series, or equivalent.

1k ohm Balco
-40 to 250 °F (-40 to 121 °C), model TSMN-81011, TS-8000 series, or equivalent.

1k ohm Platinum
-40 to 240 °F (-40 to 116 °C), model TSMN-58011, TS-5800 series, or equivalent.

1k ohm Resistive
0 to 1500 ohms.

10k ohm Resistive
0 to 10.5k ohms.

Analog Voltage
Range 0 to 5 Vdc.

Analog Current
Range 0 to 20 mA; requires external 250 ohm shunt resistor (AD-8969-202).

Digital
Dry switched contact; detection of closed switch requires less than 300 ohms resistance; detection of open switch requires more than 2.5k ohms.

DIGITAL INPUTS (4)

Dry Switched Contact
Detection of closed switch requires less than 300 ohms resistance; detection of open switch requires more than 2.5k ohms.

FAST PULSE INPUT (DIGITAL INPUT ONLY)

Minimum Rate
1 pulse per 4 minutes.

Maximum Rate
10 pulses per second.

DIGITAL OUTPUTS – TRIAC (8)

12 VA at 24 Vac, 50/60 Hz, each output individually isolated.

UNIVERSAL OUTPUTS (8)

0 to 20 mA
Output load from 80 to 550 ohms.

0 to 10 V
With external 500 ohms, 1/2 W, 1% resistor.

Capable of Driving Functional Devices RIBU1C Relay
UO configured for 0 to 20 mAdc, no external resistor.

20 VDC OUTPUT

20 Vdc ±10% at 100 mA.

OPTIONS

MNB-1000-ENC
Wall-mount enclosure

MNB-BASE-1000
Controller Base assembly only

MNB-CNTLR-1000
Controller assembly only

MNB-15
Remote I/O Module

S-Link Sensors
Temperature and humidity Wall Sensors with digital communication

TSMN Series
Room Temperature Sensors

MODEL

Part Number	Inputs and Outputs[a]			
	UI	DI	UO	DO (Triac)
MNB-1000	12	4	8	8

a. The I/O point count can be greatly expanded with the addition of one to eight Remote I/O Modules, each of which adds 15 I/O points. Refer to the MNB-1000-15 Remote I/O Module sales data sheet, F-27487.

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FEATURES

- The MicroNet BACnet Plant Controller's sequence of operation and BACnet image are fully programmable using WorkPlace Tech Tool.
- Capability to function in standalone mode or as part of a TAC I/A Series building automation network.
- Removable electronics module mates with panel-mounted subbase.
- Removable terminals for power and communications, to facilitate commissioning.
- Integral MS/TP jack for direct connection of PC with WorkPlace Tech Tool Suite.
- Optional rugged, NEMA 1 sheet metal enclosure.
- MS/TP DIP switch addressable.
- Service pin button for BACnet "I am" message broadcast.
- Isolated EIA-485 (formerly RS-485) transceiver for MS/TP communications.
- MS/TP baud rate selection from 9.6 up to 76.8 kbaud.
- LED indication of MS/TP and Ethernet IP communication activity, controller status, DO state, and UO state.
- Application-programmable LED provides on/off indication of a user-defined application parameter.
- Firmware upgradeable over the network.
- 72 hour, battery-backed real time clock.
- BBMD, remote connectivity across subnets.
- Support for Remote I/O Modules and S-Link Sensor.
- IP/Ethernet bridge.
- BACnet router functionality.

COMMUNICATIONS

BACnet Networks

The MicroNet BACnet Plant Controller incorporates a fully functional BACnet router between its 3 fully configurable communications ports.

MS/TP

Isolated EIA-485 (formerly RS-485) transceiver, providing support for up to 128 MS/TP devices communicating at 9.6 up to 76.8 kbaud, using standard MS/TP wiring methods.

Ethernet/IP

Dual 10/100 Ethernet ports with modular RJ-45 jacks. Both ports are set to be an Ethernet Bridge, saving on network wiring.

BACnet Ethernet

Standard BACnet Ethernet communications.

BACnet/IP

Communications choices are Standard BACnet/IP, BBMD, or Foreign Device.

S-Link

The Sensor Link (S-Link) communications wiring provides power and a communication interface for one MN-Sx TAC I/A Series MicroNet sensor. The various MN-Sx sensors can provide room temperature, room humidity, setpoint adjustment, and occupancy override. This connection uses two-wire, unshielded cable and is not polarity sensitive. Maximum S-Link bus length is 200 ft (61 m).

Remote I/O

The remote I/O communications wiring provides an interface for one to eight optional MNB-1000-15 Remote I/O Modules, which can be used to expand upon the Plant Controller's onboard I/O.

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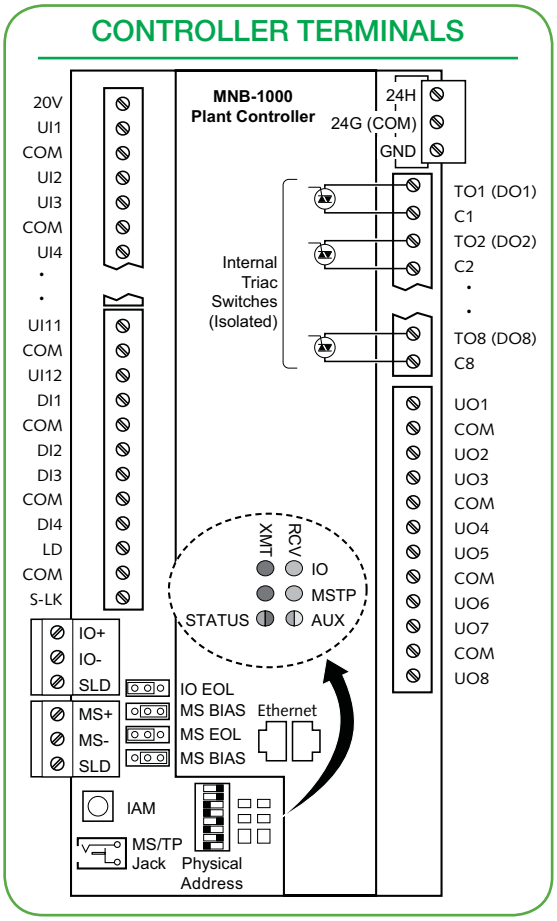
CONTROLLER TERMINALS



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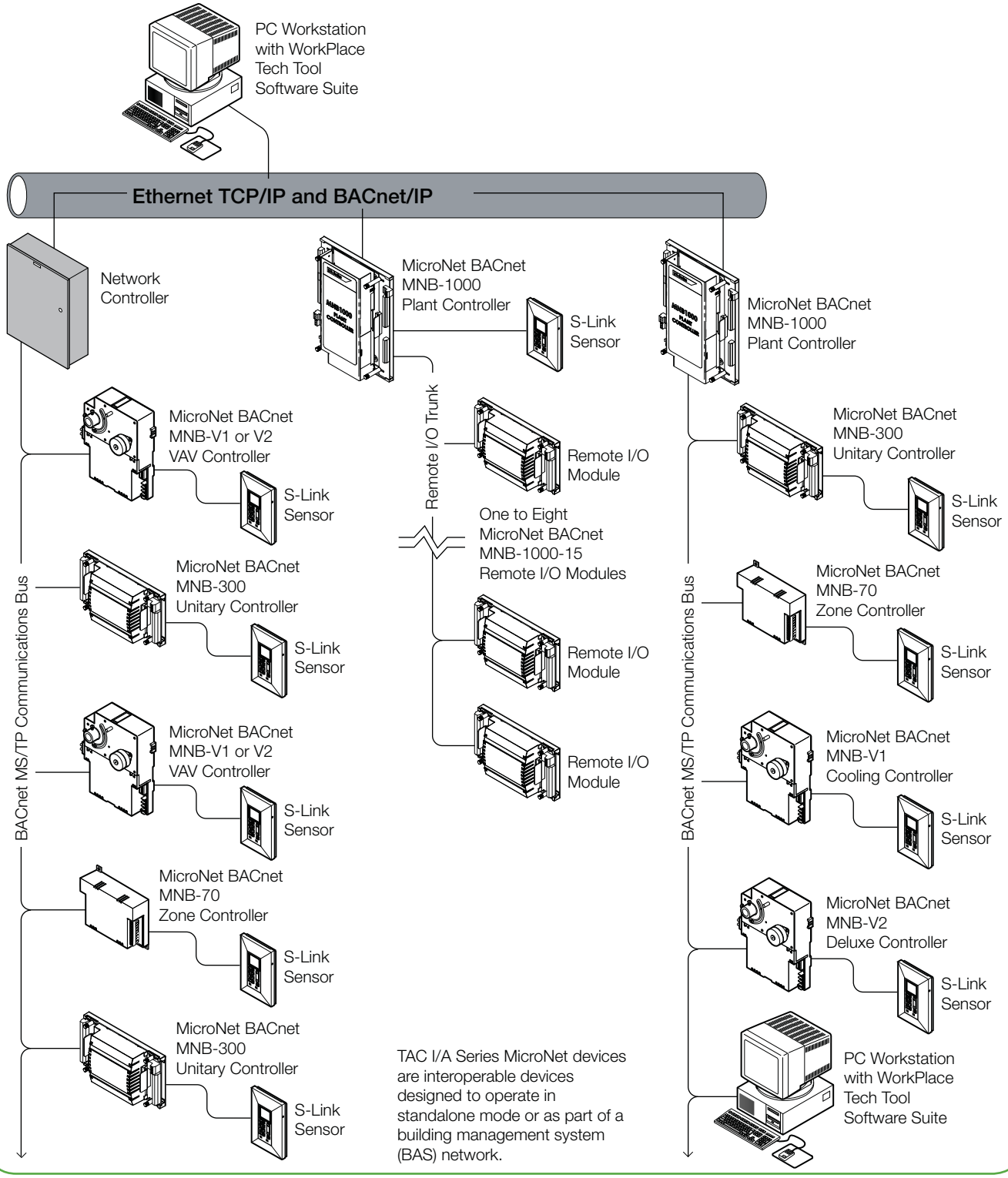
TAC I/A SERIES BACnet TOPOLOGY



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MicroNet

BACnet Remote I/O Module

The TAC I/A Series® MicroNet™ BACnet™ Remote I/O Module is designed to be an extension of the MNB-1000 Plant Controller, so as to expand the controller's I/O count.

When programmed using WorkPlace Tech Tool, each module increases the count by 15 inputs and outputs. Up to eight modules can be connected to a given MNB-1000 controller, for a potential increase of 120 I/O points, total. In this way, the controller's existing 32 onboard I/O can be expanded to 47 I/O points (with one module), up to a maximum total of 152 I/O points (with eight modules).

The Remote I/O Module features: LED indication of compatibility, communication status, and output indication; screw terminal blocks; a panel-mount sub-base with removable electronics module; a fallback I/O function; a DIP switch for addressing; and automated, over-the-network firmware upgrades.

SPECIFICATIONS

HARDWARE

Dimensions
3-15/16 H x 7 W x 2-3/16 D in
(100 x 178 x 56 mm).

Enclosure
Optional enclosure conforms to NEMA-1. Meets UL 94-5V flammability ratings for plenum application use.

Mounting
Panel mount.

Power Supply Input
20.4 to 30 Vac, 50/60 Hz.

Power Consumption
16 VA at 24 Vac.

AGENCY LISTINGS

US
UL 916, File #E71385 Category PAZX FCC Part 15, Class A.

Canadian
UL Listed to Canadian Safety Standards (CAN/CSA 22.2).

Australian
Meets requirements to bear the C-Tick Mark.

European Community
EMC Directive 89/336/EEC
EN61326

AMBIENT LIMITS

Operating Temperature
-40 to 140 °F (-40 to 60 °C).

Shipping and Storage Temperature
-40 to 160 °F (-40 to 71 °C).

Humidity
5 to 95% non-condensing.

WIRING TERMINALS

I/O Points
Fixed screw terminals; single AWG #14 (2.08 mm^2) wire or up to two AWG #18 (0.823 mm^2) or smaller wires.

Remote I/O
Removable screw terminals; single AWG #14 (2.08 mm^2) wire or up to two AWG #18 (0.823 mm^2) or smaller wires.

Power
Removable screw terminals; up to two AWG #14 (2.08 mm^2) or smaller wires.

Specifications continued on next page.

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Specifications continued from first page.

UNIVERSAL INPUTS (6)

Universal Input characteristics are software-configured to respond to one of the following input types:

10k ohm Thermistor with 11k ohm Shunt Resistor
Sensor operating range -40 to 250 °F (-40 to 121 °C), model TSMN-57011-850, TS-5700-850 series, or equivalent.

1k ohm Balco
-40 to 250 °F (-40 to 121 °C), model TSMN-81011, TS-8000 series, or equivalent.

1k ohm Platinum
-40 to 240 °F (-40 to 116 °C), model TSMN-58011, TS-5800 series, or equivalent.

1k ohm Resistive
0 to 1500 ohms.

10k ohm Resistive
0 to 10.5k ohms.

Analog Voltage
Range 0 to 5 Vdc.

Analog Current
Range 0 to 20 mA; requires external 250 ohm shunt resistor (AD-8969-202).

Digital
Dry switched contact; detection of closed switch requires less than 300 ohms resistance; detection of open switch requires more than 2.5k ohms.

Standard Pulse Input (UI1-UI6)
Minimum Rate
1 pulse per 4 minutes.
Maximum Rate
1 pulse per second.

DIGITAL OUTPUTS – TRIAC (6)

12 VA at 24 Vac, 50/60 Hz, each output individually isolated.

UNIVERSAL OUTPUTS (3)

0 to 20 mA
Output load from 80 to 550 ohms.

0 to 10 V
With external 500 ohms, 1/2 W, 1% resistor.

Capable of Driving Functional Devices RIBUI1C Relay
UO configured for 0 to 20 mAdc, no external resistor.

MODEL

Model	Description	Inputs and Outputs		
		UI	UO	DO (Triac)
MNB-1000-15	Remote I/O Module	6	3	6

OPTIONS

MNB-BASE-15	Controller Base Assembly Only
MNB-CNTLR-15	Controller Cover Assembly Only
MNB-300-ENC	Wall-mount Enclosure
TSMN Series	Room Temperature Sensors

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FEATURES

- Removable electronics module mates with panel-mounted subbase.
- Optional NEMA 1 enclosure.
- Removable terminals for power and communications, to facilitate commissioning.
- LED indication of compatibility, UO and DO (TO) state, and communication state (with the MNB-1000 controller).
- Fallback I/O function, in case of loss of communication between the Remote I/O Module and the MNB-1000 controller.
- DIP switch addressable (the MNB-1000 controller has a fixed address on the remote I/O network).
- Firmware upgraded automatically whenever the connected MNB-1000 controller's firmware is upgraded. Also, when a Remote I/O Module is physically connected to the MNB-1000 controller, its firmware is automatically upgraded if needed.

COMMUNICATIONS

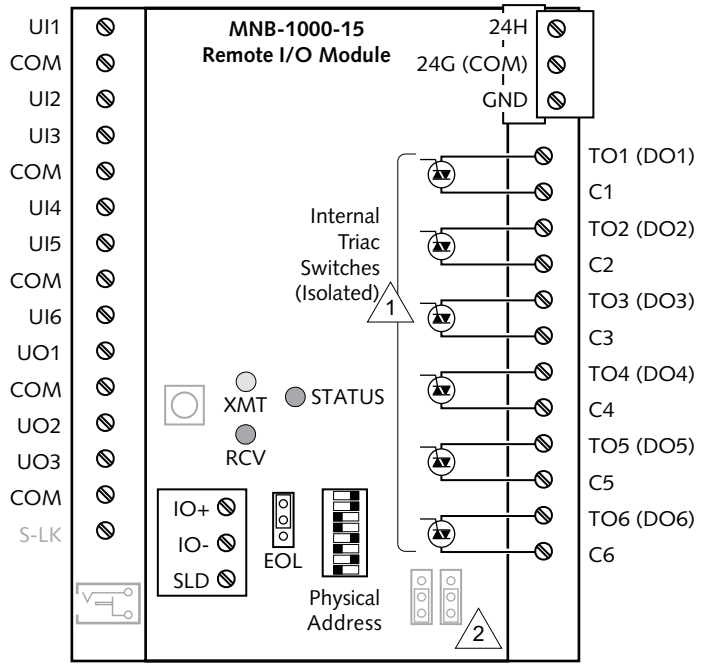
Remote I/O

The remote I/O communications wiring provides an interface between the MNB-1000-15 Remote I/O Module and the MNB-1000 Plant Controller.

I/O Fallback Function

The Remote I/O Module's outputs are driven directly by the MNB-1000 Plant Controller, in which the application resides. If communications between the module and the controller is lost, the module's outputs are set to fallback values that were previously sent to the module during normal communications.

REMOTE I/O MODULE TERMINALS



1 AC voltage for Triac switches must be supplied externally.

2 Bias for the remote I/O network is provided by the permanently enabled, built-in bias resistors on the MNB-1000 controller. The jumper-set bias resistors located under the cover of the Remote I/O Module are set to "Disabled" at the factory, and are not to be used for this purpose.

General Notes:

- Components are shown in their approximate locations.
- Features shown in gray, although present, are not used in the Remote I/O Module.

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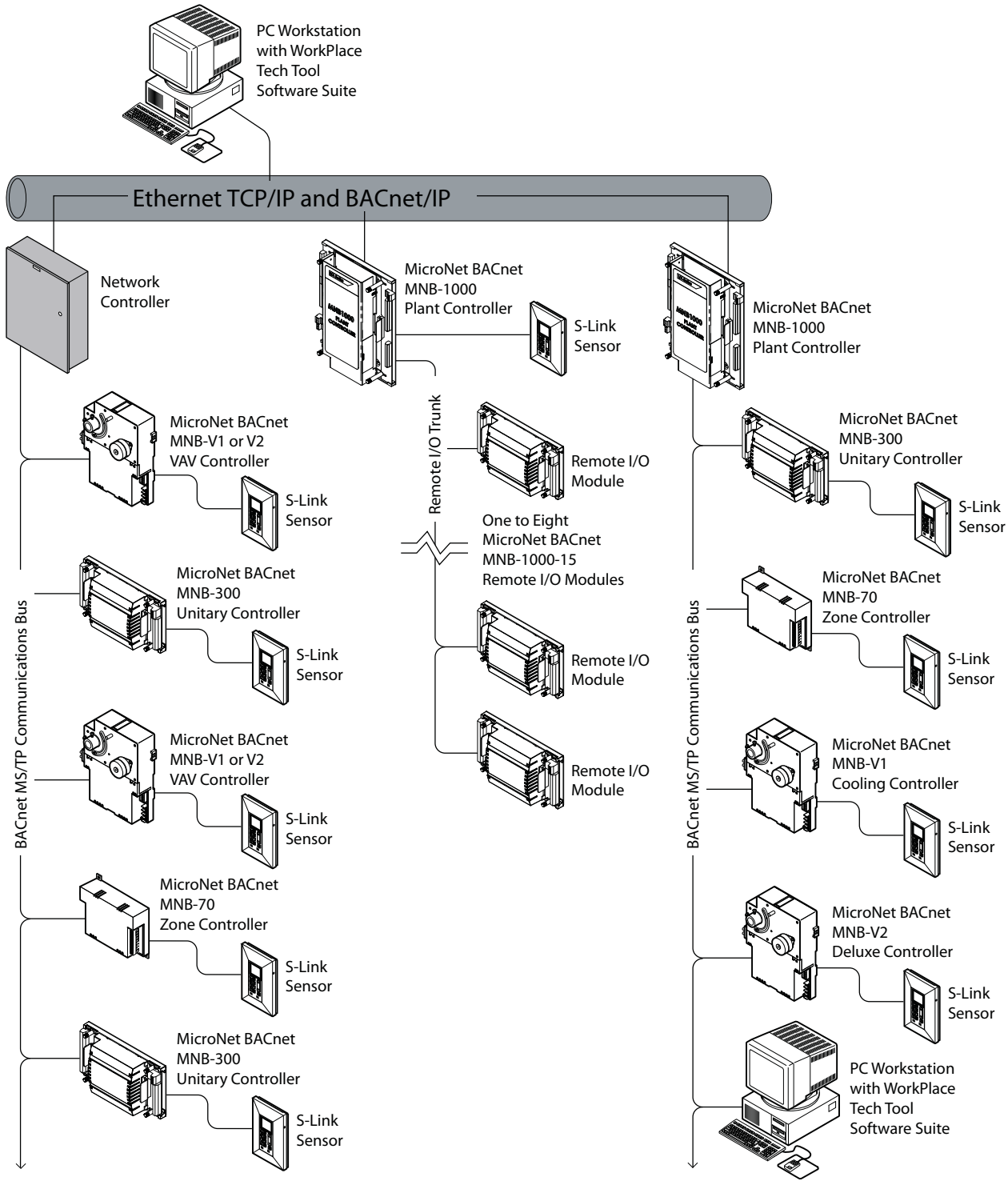
ARCHITECTURE



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MNB-70 BACnet Zone Controller

SPECIFICATIONS

HARDWARE

Dimensions
3-5/8 H x 5 W x 1-19/32 D in
(92 x 127 x 41 mm).

Enclosure
Conforms to NEMA-1. Meets UL 94-5VA flammability ratings for plenum application use.

Mounting
Panel mount.

Power Supply Input
20.4 to 30 Vac, 50/60 Hz.

Power Consumption
15 VA at 24 Vac plus DO loads.

AGENCY LISTINGS

US
UL 916, File #E71385 Category PAZX FCC Part 15, Class A.

Canadian
UL Listed to Canadian Safety Standards (CAN/CSA 22.2).

Australian
Meets requirements to bear the C-Tick Mark.

BTL Listing
B-ASC

European Community
EMC Directive 89/336/EEC
EN61326

BACnet Zone Controller

The TAC I/A Series® MicroNet BACnet Zone Controller is an interoperable controller with native BACnet MS/TP communications support. The controller features: three universal inputs; three digital (Triac) outputs; one universal output; Sensor Link (S-Link) support; LED status indication; and an "I-Am" button.

When programmed using WorkPlace Tech Tool, the Zone Controller provides a wide range of control strategies for applications such as unit heaters, cabinet heaters, fan coil units, small unit ventilators, heat pumps, and single/dual loop control strategies.

The MicroNet BACnet Zone Controller can function either in a standalone mode or as part of a BACnet building automation system (BAS) network.

AMBIENT LIMITS

Operating Temperature

32 to 131 °F (0 to 55 °C).

Shipping and Storage Temperature
-40 to 160 °F (-40 to 71 °C).

Humidity
5 to 95% non-condensing.

WIRING TERMINALS

Fixed Screw terminals
single AWG #14 (2.08 mm^2) wire or up to two AWG #18 (0.823 mm^2) or smaller wires.

INPUTS FROM MN-SX MICRONET™ SENSOR

Space Temperature
32 to 122 °F (0 to 50 °C).

Space Humidity
5 to 95% RH, non-condensing.

Local Setpoint
Adjustable within limits set by application programming tool.

Override Pushbutton
For standalone occupancy control or occupancy override.

Specifications continued on next page.

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Specifications continued from first page.

Fan Operation and Speed Mode
On/off, speed (low/medium/high), or auto.

System Mode
Heat, cool, off, or auto.

Emergency Heat
Enable or disable.

UNIVERSAL INPUTS (3)
Universal Input characteristics are software-configured to respond to one of the following input types:

10 k ohm Thermistor with 11 k ohm Shunt Resistor
Sensor operating range -40 to 250 °F (-40 to 121 °C), TAC model TSMN-57011-850, TS-5700-850 series, or equivalent.

1 k ohm Balco
-40 to 250 °F (-40 to 121 °C), TAC model TSMN-81011, TS-8000 series, or equivalent.

1 k ohm Platinum
-40 to 240 °F (-40 to 116 °C), TAC model TSMN-58011, TS-5800 series, or equivalent.

1 k ohm Resistive
0 to 1500 ohms.

10 k ohm Resistive
0 to 10.5 k ohms.

Analog Voltage
Range 0 to 5 Vdc.

Analog Current
Range 0 to 20 mA, requires external 250 ohm shunt resistor (AD-8969-202).

Digital
Dry switched contact; detection of closed switch requires less than 300 ohms resistance; detection of open switch requires more than 2.5 k ohms.

Standard Pulse Input
Minimum Rate
1 pulse per 4 minutes.

Maximum Rate
1 pulse per second.

DIGITAL OUTPUTS – TRIAC (3)

DO1 plus DO2 Rating
24 VA total at 24 Vac, 50/60 Hz, high side switching.

DO3 Rating
12 VA at 24 Vac, 50/60 Hz, high side switching

UNIVERSAL OUTPUT (1)

0 to 20 mA
Output load from 80 to 550 ohms.

0 to 10 V
With external 500 ohms, 1/2 W, 1% resistor.

Capable of Driving Functional Devices
RIBUI1C Relay
UO configured for 0 to 20 mAdc, no external resistor.

MODEL

Model	Inputs and Outputs		
	UI	UO	DO (Triac)
MNB-70	3	1	3

OPTIONS

MNA-FLO-1	TAC MicroNet enclosure, used if wiring to flexible conduit is required
S-Link Sensors	Temperature and humidity wall sensors with digital communication
TSMN Series	Room temperature sensors

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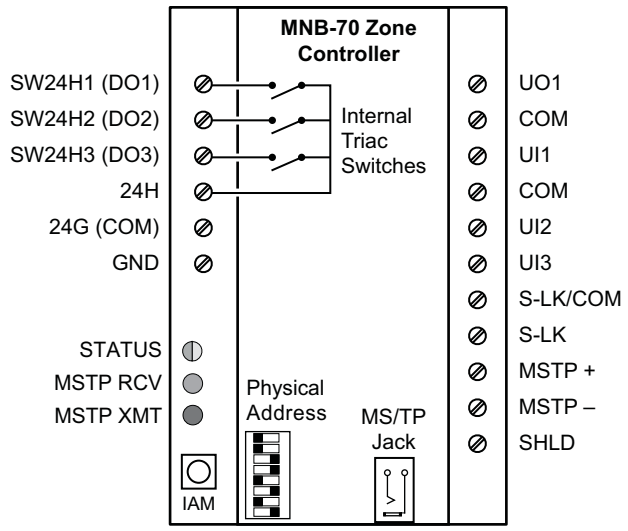
FEATURES

- The MicroNet BACnet Zone Controller's sequence of operation and BACnet image are fully programmable using WorkPlace Tech Tool. The controller can be applied to all common zone HVAC applications.
- Capability to function in standalone mode or as part of a BACnet building automation network.
- Integral MS/TP jack for direct connection of PC with WorkPlace Tech Tool.
- DIP switch addressable.
- Service pin button for BACnet "I am" message broadcast.
- Isolated EIA-485 transceiver for MS/TP communications.
- MS/TP baud rate selection from 9.6 up to 76.8 kbaud.
- LED indication of MS/TP communication activity and controller status.
- Firmware upgradeable over the network.

ZONE CONTROLLER TERMINALS



COMMUNICATIONS

BACnet Networks

The MicroNet BACnet Zone Controller incorporates an isolated EIA-485 transceiver for BACnet MS/TP communications at 9.6 up to 76.8 kbaud using standard MS/TP wiring methods. Up to 128 TAC MicroNet BACnet controllers can be connected to an MS/TP sub-net without repeaters.

S-Link

The Sensor Link (S-Link) communications wiring provides power and a communication interface for one MN-Sx TAC I/A Series MicroNet sensor. The various MN-Sx sensors can provide room temperature, room humidity, setpoint adjustment, and occupancy override. This connection uses two-wire, unshielded cable and is not polarity sensitive. Maximum S-Link bus length is 200 ft (61 m).

BACNET COMPLIANCE

BACnet Application Specific Controller (B-ASC).

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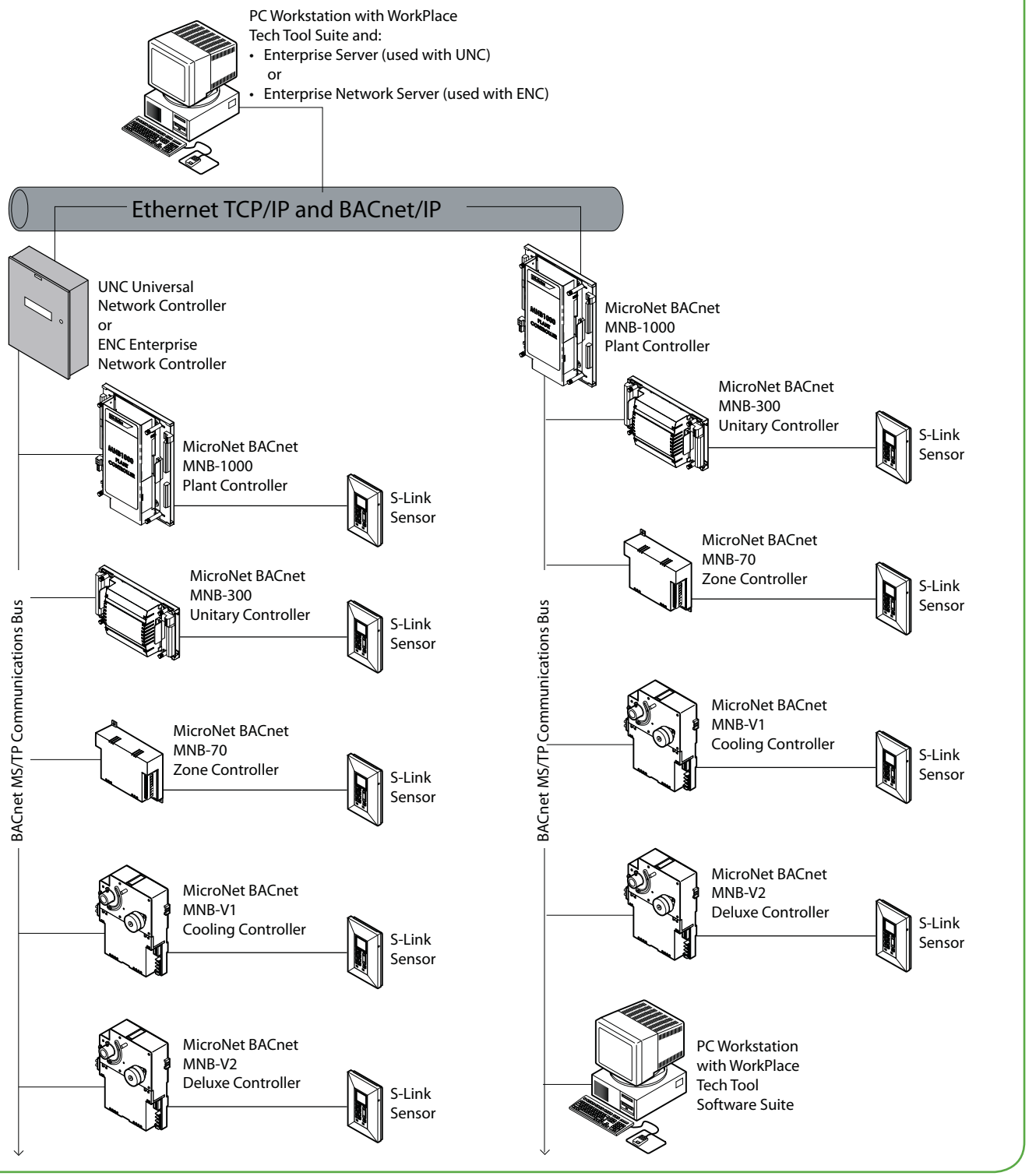
ARCHITECTURE



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MicroNet BACnet VAV Controllers

SPECIFICATIONS

HARDWARE

Dimensions
7-3/4 H x 6-1/4 W x 2-1/2 D in (197 x 159 x 63 mm).

Enclosure
Cover meets UL 94-5VA flammability ratings for plenum application use.

Optional enclosure for conduit applications, conforms to NEMA-1.

Mounting
Shaft mount.

Power Supply Input
20.4 to 30 Vac, 50/60 Hz.

Power Consumption
15 VA at 24 Vac plus DO loads.

AGENCY LISTINGS

US
FCC Part 15, Class A.

UL 916, File #E71385 Category PAZX

UL 864, Category UUKL, File #S5381 Smoke-Control Equipment

Canadian
UL Listed to Canadian Safety Standards (CAN/CSA 22.2).

CUL Listed to Standards ULC/ORD-C100-92 (Smoke Control System Equipment) and CAN-ULC-S527 (Control Units for Fire Alarm Systems)

Australian
Meets requirements to bear the C-Tick Mark.

BTL Listed
B-ASC

European Community
EMC Directive 89/336/EEC, EN61326

MicroNet BACnet VAV Controllers MNB-Vx

The TAC I/A Series™ MicroNet™ BACnet™ VAV (Variable Air Volume) Controllers are interoperable controllers with native BACnet MS/TP communications support. All models incorporate: an integral actuator with manual override; an integral, patented, pressure transducer; three universal inputs; Sensor Link (S-Link) support; LED status indication; and over-the-shaft damper mounting. See the model chart for optional features.

When programmed using WorkPlace Tech Tool, the controllers provide a wide range of control strategies for pressure-dependent and pressure-independent terminal boxes with or without reheat capabilities.

The MicroNet BACnet VAV controllers can function either in a standalone mode or as part of a BACnet building automation system (BAS) network.

AMBIENT LIMITS

Operating Temperature
32 to 131 °F (0 to 55 °C).

Shipping and Storage Temperature
-40 to 160 °F (-40 to 71 °C).

Humidity
5 to 95% non-condensing.

WIRING TERMINALS)

Fixed Screw Terminals
Single AWG #14 (2.08 mm^2) wire or up to two AWG #18 (0.823 mm^2) or smaller wires.

VELOCITY PRESSURE INPUT

Control Range
0.004 to 1.5 in. of W.C.

Over Pressure Withstand
±20 in. of W.C.

Accuracy
±5% at 1.00 in. of W.C. with laminar flow at 77 °F (25 °C) and suitable flow station.

Sensor Type
Self-calibrating flow sensor (differential pressure).

Tubing Connections
Barb fittings for 0.170 in. I.D. FRPE polyethylene tubing or 1/4" O.D./0.125" I.D. Tygon® tubing (high and low pressure taps).

Continued on next page.

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Continued from first page.

Tubing Length
5 ft. (1.52 m) maximum, each tube.

INPUTS FROM MN-SX MICRONET SENSOR

Space Temperature
32 to 122 °F (0 to 50 °C).

Space Humidity
5 to 95% RH, non-condensing.

Local Setpoint
Adjustable within limits set by application programming tool.

Override Pushbutton
For standalone occupancy control or occupancy override.

Fan Operation and Speed Mode
On/off, speed (low/medium/high), or auto.

System Mode
Heat, cool, off, or auto.

Emergency Heat
Enable or disable.

UNIVERSAL INPUTS (3)

Universal Input characteristics are software-configured to respond to one of the following input types:

10 k ohm Thermistor with 11 k ohm Shunt Resistor
Sensor operating range -40 to 250 °F (-40 to 121 °C), model TSMN-57011-850, TS-5700-850 series, or equivalent.

1 k ohm Balco
-40 to 250 °F (-40 to 121 °C), model TSMN-81011, TS-8000 series, or equivalent.

1 k ohm Platinum
-40 to 240 °F (-40 to 116 °C), model TSMN-58011, TS-5800 series, or equivalent.

1 k ohm Resistive
0 to 1500 ohms.

10 k ohm Resistive
0 to 10.5 k ohms.

Analog Voltage
Range 0 to 5 Vdc.

Analog Current
Range 0 to 20 mA, requires external 250 ohm shunt resistor (AD-8969-202).

Digital
Dry switched contact; detection of closed switch requires less than 300 ohms resistance; detection of open switch requires more than 2.5 k ohms.

Standard Pulse Input

Minimum Rate
1 pulse per 4 minutes.

Maximum Rate
1 pulse per second.

ACTUATOR OUTPUTS

Torque Rating
53 lb-in. (6 N-m).

Stroke
Fully adjustable from 0° to 90°.

Timing
Approximately 3 minutes at 60 Hz (3.6 minutes at 50 Hz) for 90° rotation at 24 Vac.

Position Indication
Provides a visual indication of position.

Manual Override
Pushbutton to allow manual positioning of the damper.

Damper Linkage
1/2 in. (12.75 mm) or 3/8 in. (9.5 mm) diameter round shaft extending 7/8 in. (22.23 mm) minimum from terminal box. 3/8 in. (9.5 mm) diameter shaft requires AM-135 adapter kit.

DIGITAL OUTPUTS – TRIAC

DO1 plus DO2 Rating
24 VA total at 24 Vac, 50/60 Hz, high side switching.

DO3 Rating
12 VA at 24 Vac, 50/60 Hz, high side switching.

UNIVERSAL OUTPUT

0 to 20 mA
Output load from 80 to 550 ohms.

0 to 10 V
With external 500 ohms, 1/2 W, 1% resistor.

Capable of Driving Functional Devices RIBUI1C Relay
UO configured for 0 to 20 mAdc, no external resistor.

MODELS

Part Number	Description	Inputs and Outputs		
		UI	UO	DO (Triac)
MNB-V1	Cooling only	3	—	—
MNB-V2	Deluxe	3	1	3

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FEATURES

- The MicroNet BACnet VAV controllers' sequence of operation and BACnet image are fully programmable using WorkPlace Tech Tool. The controllers can be applied to all common VAV configuration and reheat control strategies.
- Capability to function in standalone mode or as part of a BACnet building automation network.
- Air balancing performed via BACnet, using VAV Flow Balance software, through direct connection or over the network.
- Integral MS/TP jack for direct connection of PC with WorkPlace Tech Tool and Flow Balance tool.
- Integrated packaging with actuator, pressure transducer, and controller.
- Integral actuator features manual override and travel limit stops for easy set up and adjustment.
- Optional plenum-rated enclosure for use if wiring to flexible conduit is required.
- MS/TP DIP switch addressable.
- Isolated EIA-485 (formerly RS-485) transceiver for MS/TP communications.
- MS/TP baud rate selection from 9.6 up to 76.8 kbaud.
- LED indication of MS/TP communication activity and controller status.
- Firmware upgradeable over the network.
- Support for S-Link Sensor.
- Damper position feedback to the BACnet BAS via integral hall effect sensor.
- Stable flow control down to 0.004 in. W.C. differential pressure.
- Provides flow balancing for networked and standalone VAV controllers. Features include:
  - Local network control.
  - Damper and fan adjustment.
  - Setpoint monitoring and adjustment.
  - Flow validation and calibration (1, 2, or 3 point calibration).
  - Sequence, calibration, and control setpoint logs.

COMMUNICATIONS

BACnet Networks

The MicroNet BACnet VAV controllers incorporate an isolated EIA-485 (formerly RS-485) transceiver for BACnet MS/TP communications at 9.6 up to 76.8 kbaud using standard MS/TP wiring methods. Up to 128 MicroNet BACnet controllers can be connected to an MS/TP sub-net without repeaters.

S-Link

The Sensor Link (S-Link) communications wiring provides power and a communication interface for one MN-Sx TAC I/A Series MicroNet sensor. The various MN-Sx sensors can provide room temperature, room humidity, setpoint adjustment, and occupancy override. This connection uses two-wire, unshielded cable and is not polarity sensitive. Maximum S-Link bus length is 200 ft (61 m).

BACnet COMPLIANCE

BACnet Application Specific Controller (B-ASC).

OPTIONS

MNA-FLO-1

MicroNet Enclosure, used if wiring to flexible conduit is required

S-Link Sensors

Temperature and Humidity Wall Sensors with Digital Communication

TSMN Series

Room Temperature Sensors

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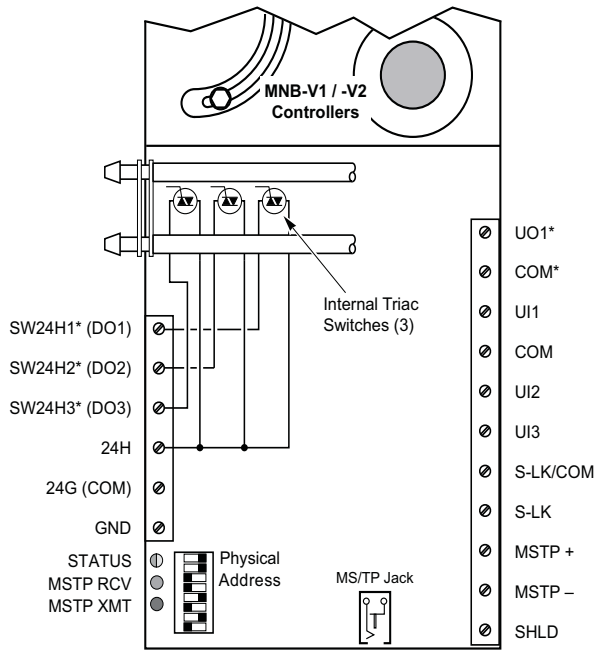
VAV CONTROLLER TERMINALS



* Asterisks indicate terminals that apply to the MNB-V2 controller but not to the MNB-V1.

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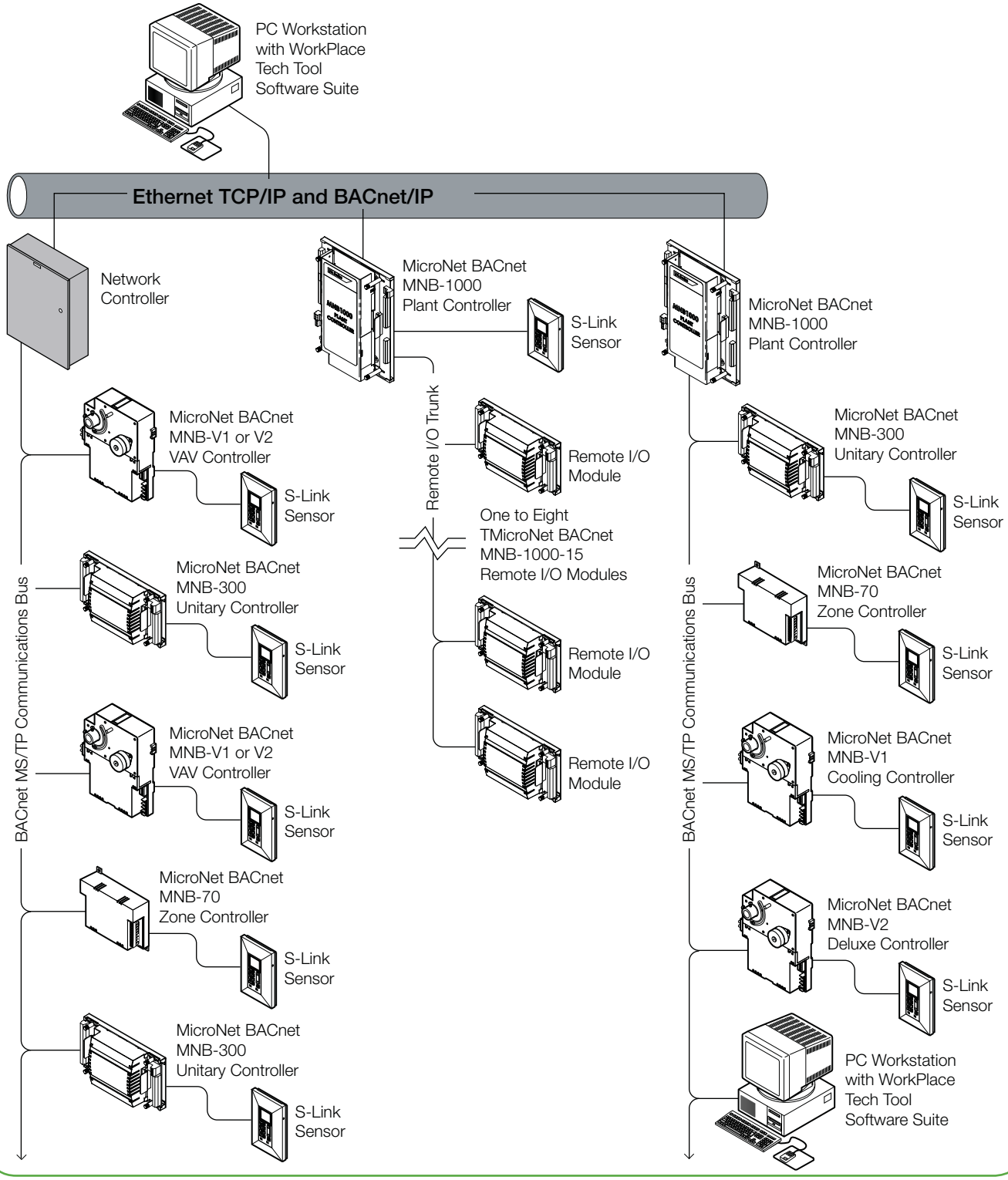
TAC I/A SERIES BACNET TOPOLOGY



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Schneider Electric 1354 Clifford Avenue, P.O. Box 2940, Loves Park, IL 61132-2940, USA 1-888-444-1311 www.schneider-electric.com/buildings

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• F-3200 SERIES •
IN-LINE ELECTROMAGNETIC FLOW METER

Wafer style meter is also available

Faraday's Law states that a voltage will be induced in a conductor (the conductive fluid) when it passes through a magnetic field (generated by the meter) and that voltage will be directly proportional to the velocity of the conductor (the fluid). This voltage is measured by electrodes on opposite sides of the flow tube and used to calculate the flow velocity.

DESCRIPTION

ONICON F-3200 series in-line electromagnetic flow meters are suitable for measurement of electrically conductive liquids in a wide variety of applications. Inherently bi-directional, each F-3200 flow meter is equipped with ONICON's advanced transmitter option. The F-3200 provides a single analog 4-20mA output for flow rate and two programmable pulse outputs. The advanced transmitter is also equipped with a graphic display that may be used to monitor short term trend data or to facilitate batch processing functions using the optional relay output module.

APPLICATIONS

- Chilled water, hot water, condenser water & water/glycol/brine solutions used in HVAC
- Bi-directional flow for primary/secondary bypass
- Process flow with conductivity greater than 5µS/cm
- Domestic/municipal water

GENERAL SPECIFICATIONS

ACCURACY

Accurate to within:

- ± 0.2% of reading from 1.6 to 33 ft/s
- ± 0.0033 ft/s from 0.033 to 1.6 ft/s

(continued on back)

CALIBRATION

Every ONICON F-3200 series flow meter is wet calibrated in a flow laboratory against standards that are directly traceable to international standards. A certificate of calibration accompanies every meter.

FEATURES

Exceptional Performance & Accuracy - F-3200 series meters deliver ± 0.2% of reading accuracy with as little as 3 diameters of straight pipe upstream of the meter, a level of performance unmatched by other products.

Easy to Install and Use - Every ONICON meter is individually calibrated, configured and programmed using customer specific application data. Complex field programming is not required.

Excellent Long Term Reliability - ONICON electromagnetic flow meters have no moving parts. In addition, state-of-the-art electronics and proprietary noise filtering algorithms ensure years of accurate, trouble-free performance. This makes them the ideal choice for critical measurement applications or applications where water quality is less than ideal.

Installation Flexibility - The F-3200 is an ideal choice for difficult installations as it only requires 3 diameters of straight pipe upstream and 2 diameters downstream for proper operation, in most applications.

Redundant Outputs – For critical installations, meters equipped with the redundant output option provide complete signal redundancy for all three output signals from the flow meter. This option includes an additional integral transmitter with dedicated connections to the main processor, providing a cost effective alternative to a second, redundant flow meter.

For energy measurement applications, specify the F-3200 flow meter together with the System-10 BTU Meter to form an energy measurement system with unsurpassed accuracy and reliability.

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www.onicon.com • sales@onicon.com

GENERAL SPECIFICATIONS (cont.)

SENSING METHOD
Electromagnetic sensing (no moving parts)

AMBIENT TEMPERATURE RANGE
-4° to 140° F

OUTER BODY MATERIAL OPTIONS
- Carbon Steel, painted
- 316 Stainless Steel

FLOW TUBE (internal)
304 Stainless Steel

CONNECTION TYPES AVAILABLE
- ANSI Class 150 Flange
- ANSI Class 300 Flange
- Wafer

ELECTRICAL CONNECTIONS
- Use 18-22 AWG shielded cable

FLUID CONDUCTIVITY
- 5 µS/cm minimum

POWER SUPPLY OPTIONS
- 100 - 240 VAC, 45 - 66 Hz, 12 VA typical
- 18 - 45 VDC, 10 W typical
  Or 18 - 45 VAC, 45-66 Hz, 12 VA typical

DISPLAY
Backlit 16 character, 8 line graphic LCD displays: flow rate and velocity, flow direction and totals, short term trend data and error messages.

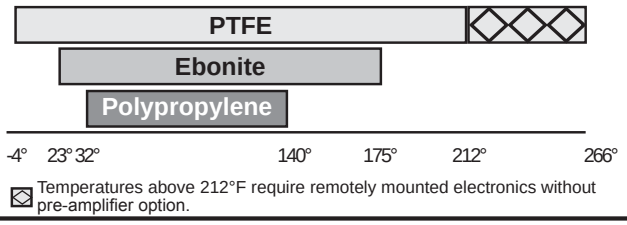
OUTPUT SIGNALS PROVIDED
- Isolated 4 - 20mA analog output for flow rate
- (2) Isolated programmable digital/pulse outputs (configurable for frequency, pulse, alarm or directional flow)
- (Optional) Redundant output option with second isolated analog output for flow rate and two additional isolated programmable pulse outputs
- (Optional) MODBUS RTU (RS485)
- (Optional) HART

ELECTRONICS ENCLOSURE
- Painted aluminum housing, NEMA 6 (IP67)
- (Optional) Remote mount w/o pre-amplifier, maximum distance from sensor - up to 325 ft @ conductivities ≥ 200µS/cm
- (Optional) Remote mount with pre-amplifier, maximum distance from sensor - 1640ft

MAXIMUM OPERATING PRESSURE
230 - 580 psi depending on liner material and flange rating (Consult ONICON when higher pressure ratings are required)

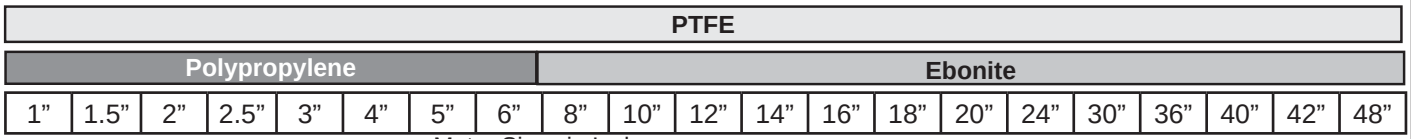
APPROVALS CE

Liner Material vs. Operating Temperature (°F)



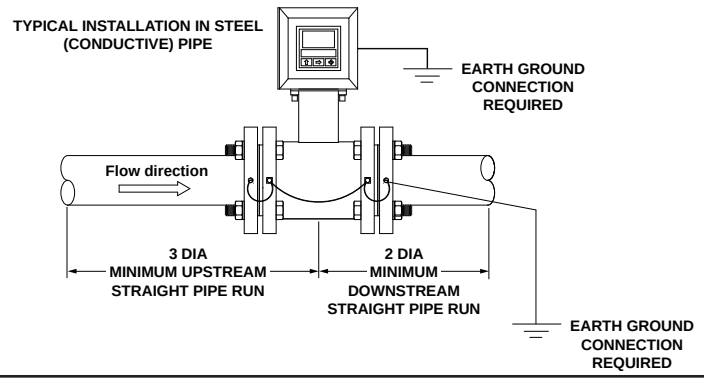
Temperatures above 212°F require remotely mounted electronics without pre-amplifier option.

Liner Material vs. Meter Size



1"	1.5"	2"	2.5"	3"	4"	5"	6"	8"	10"	12"	14"	16"	18"	20"	24"	30"	36"	40"	42"	48"

Meter Sizes in Inches (other sizes available upon request)



F-3200 Model Numbering System

F-32BB - CDE
❍ ◆ ❖ ■

❍ BB = Meter Size in Inches
01 = 1" 06 = 6"
15 = 1.5" 08 = 8"
02 = 2" 10 = 10"
25 = 2.5"
03 = 3" Above 10":
04 = 4" BB = meter size
05 = 5"

◆ C = Body Material & Liner Material
1 = Carbon steel / PTFE
2 = Carbon steel / Polypropylene
3 = Carbon steel / Ebonite

❖ D = Wafer or Flange Connection
0 = Wafer
1 = ANSI 150 Flange
3 = ANSI 300 Flange

■ E = Integral or Remote Mount Electronics Enclosure
1 = Integral Mount
2 = Remote Mount w/o pre-amplifier
3 = Remote Mount with pre-amplifier

Default configurations include the following:
- (2) 316 SS electrodes
- Viton o-rings on polypropylene lined meters

OPERATING RANGE

Meter Size (Inches)	Flow Rate (GPM) (0.1 ft/sec* - 33 ft/sec)
1	0.2 - 79
1.25	0.4 - 130
1.5	0.6 - 203
2	0.9 - 317
2.5	1.6 - 536
3	2.4 - 812
4	3.8 - 1,268
5	5.9 - 1,981
6	8.5 - 2,853
8	15 - 5,072
10	24 - 7,925
12	34 - 11,412
14	47 - 15,533
16	61 - 20,288
18	77 - 25,678
20	95 - 31,701
24	137 - 45,649
30	214 - 71,326
36	308 - 102,710
40	380 - 126,803
42	417 - 139,800
48	547 - 182,596

*Note: The default low flow cut-off is set for 0.1 ft/sec

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System used for chilled water system.

• SYSTEM-10-BAC BTU METER •
BACnet MS/TP COMPATIBLE

DESCRIPTION

The System-10 BTU Meter provides highly accurate thermal energy measurement in chilled water, hot water and condenser water systems based on signal inputs from two matched temperature sensors (included) and any of ONICON's insertion or inline flow meters (ordered separately). The System-10-BAC provides energy, flow and temperature data on a local alphanumeric display and to the network via the BACnet communications MS/TP driver. An optional auxiliary input is also available to totalize pulses from another device and communicate the total directly to the network.

APPLICATIONS

Chilled water, hot water and condenser water systems for:

- Commercial office tenant billing
- Central plant monitoring
- University campus monitoring
- Institutional energy cost allocation
- Performance/efficiency evaluations
- Performance contracting energy monitoring

FEATURES

BACnet Compatible Serial Communications - Provides complete energy, flow and temperature data to the control system through a single BACnet MS/TP network connection, reducing installation costs.

Simple Installation and Commissioning - Factory programmed and ready for use upon delivery. All process data and programming functions are accessible via front panel display and keypad.

Single Source Responsibility - One manufacturer is responsible for every aspect of the energy measurement process, ensuring component compatibility and overall system accuracy.

N.I.S.T. Traceable Calibration with Certification - Each Btu measurement system is individually calibrated using application specific flow and temperature data and is provided with calibration certifications.

Precision Solid State Temperature Sensors - Custom calibrated and matched to an accuracy better than ±0.15° F over calibrated range.

Highly Accurate Flow Meters - Insertion turbine and inline turbine flow meters are accurate to within ±0.5% of rate at the calibrated typical flow rate and within ±2% of rate over an extended 50:1 turndown range (0.4 - 20 ft/s).

Complete Installation Package - All mechanical installation hardware, color coded interconnecting cabling and installation instructions are provided to ensure error-free installation and accurate system performance.

ORDERING INFORMATION

The System-10 BTU Meter is sold complete with temperature sensors and standard thermowells. Flow Meters are purchased separately.

ITEM #	DESCRIPTION
SYSTEM-10=BAC	System-10 BTU Meter BACnet compatible
SYSTEM-10-OPT1	Add for 6" and larger pipes
SYSTEM-10-OPT2	Add for 2.5" - 3" copper tube
SYSTEM-10-OPT3	Add for 4" copper tube
SYSTEM-10-OPT4	Upgrade to outdoor thermowells (pair)
SYSTEM-10-OPT5	Upgrade to hot tap thermowells (pair)
SYSTEM-10-OPT8	High temperature sensors (over 200° F)
SYSTEM-10-OPT9	Add one analog output
SYSTEM-10-OPT10	Add four analog outputs
SYSTEM-10-OPT11	Auxiliary pulse input
Choose from the following flow meters:	
F-1100/F-1200	Insertion Turbine Flow Meter (1¼"-72")
F-1300	Inline Turbine Flow Meter (¾" - 1")
F-2000 Series	Full Bore Vortex Flow Meter
F-3000 Series	Full Bore Electromagnetic Flow Meter
F-3500	Insertion Electromagnetic Flow Meter (3"-72")
Refer to catalog for flow meter installation kits. Consult with ONICON for additional flow meter types.	

UL LISTED
PROCESS CONTROL EQUIPMENT
3GF5

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www.onicon.com E-mail: sales@onicon.com

SYSTEM-10-BAC BTU METER SPECIFICATIONS

CALIBRATION

Flow meter and temperature sensors are individually calibrated, followed by a complete system calibration. Field commissioning is also available.

ACCURACY

Differential temperature accuracy ±0.15° F over calibrated range

Computing nonlinearity within ±0.05%

PROGRAMMING

Factory programmed for specific application

Field programmable via front panel interface

MEMORY

Non-volatile EEPROM memory retains all program parameters and totalized values in the event of power loss.

DISPLAY

Alphanumeric LCD displays total energy, total flow, energy rate, flow rate, supply temperature and return temperature

Alpha: 16 character, 0.2" high; Numeric: 6 digit, 0.4" high

OUTPUT SIGNALS

BACnet Points List (MS/TP)

Name	BACnet Object Type	Units
Total Energy	Analog Value	Btu, kW-hrs or ton-hrs
Energy Rate	Analog Input	Btu/hr, kW or tons
Total Flow	Analog Value	gallons, liters or meters³
Flow Rate	Analog Input	gpm, gph, mgd, l/s, l/m, l/hr or m³/hr
Supply Temperature	Analog Input	°F or °C
Return Temperature	Analog Input	°F or °C
Energy Total Reset	Binary Value	Not applicable
Flow Total Reset	Binary Value	Not applicable
Auxiliary Input Total	Analog Value	Pulse Accumulator
Auxiliary Input Reset	Binary Value	Not applicable

RS 485, 2-wire (Half Duplex)

Baud Rate: 76800, 38400, 19200 or 9600 bps

Isolated solid state dry contact for energy total

Contact rating: 100 mA, 50V

Contact duration: 0.5, 1, 2, or 6 sec

Optional Analog Output(s) (4-20 mA, 0-10 V or 0-5 V):

One or four analog output(s) available for flow rate, energy rate, supply/return temps, or delta-T.

LIQUID FLOW SIGNAL INPUT

0-15 V pulse output from any ONICON flow meter.

TEMPERATURE SENSORS

Solid state sensors are custom calibrated using N.I.S.T. traceable temperature standards.

Current based signal (mA) is unaffected by wire length.

TEMPERATURE RANGE

Liquid temperature range: 32° to 200° F

Optional liquid temperature range: 122° to 302° F

Ambient temperature range: 40° to 120° F

MECHANICAL

ELECTRONICS ENCLOSURE:

Standard: Steel NEMA 13, wall mount, 8"x10"x4"

Optional: NEMA 4 (Not UL listed)

Approximate weight: 12 lbs.

TEMPERATURE THERMOWELLS:

Standard: ½" NPT brass thermowells (length varies with pipe size) with junction box

Note: 6" pipes and larger require SS thermowell option

Optional:
- ½" NPT stainless steel thermowells
- Outdoor junction box with thermal isolation
- Hot tap thermowells with isolation valves are available in plated brass or stainless steel

ELECTRICAL

INPUT POWER*:

Standard: 24 VAC 50/60 Hz, 300 mA

Optional: 120 VAC 50/60 Hz, 200 mA
230 VAC, 50 Hz, 150 mA

*Based on Btu meters configured for network connection without the optional analog outputs

INTERNAL SUPPLY:

Provides 24 VDC at 200 mA to electronics and flow meter

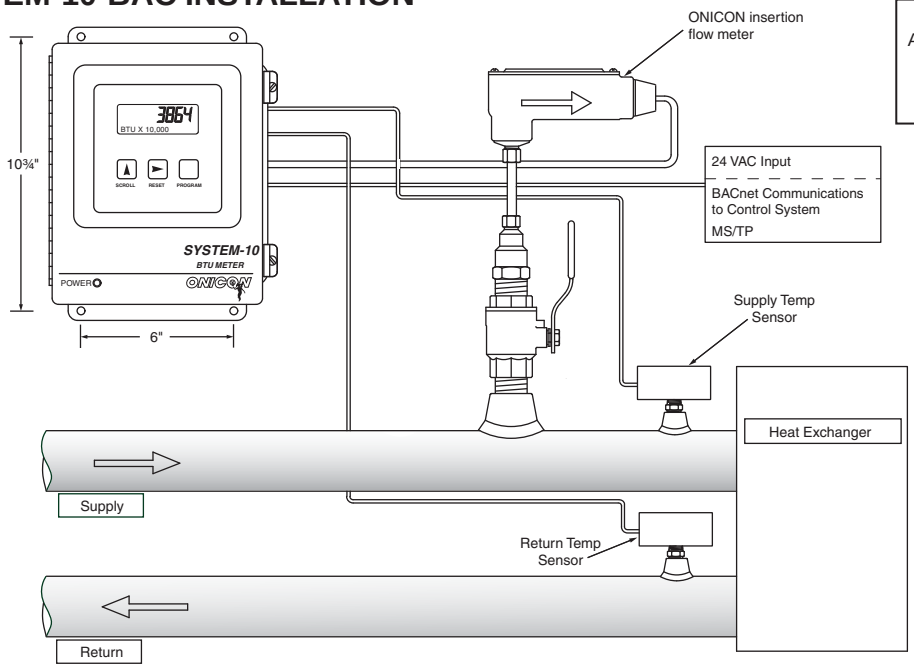
WIRING:

Temperature signals: Use 18 - 22 ga twisted shielded pair

Flow signals: Use 18 - 22 ga shielded - see flow meter specification sheet for number of conductors

NOTE: Specifications are subject to change without notice.

TYPICAL SYSTEM-10-BAC INSTALLATION



Insertion turbine flow meter shown. Any ONICON flow meter may be used with the System-10 BTU meter. Consult with ONICON for additional flow meter types.

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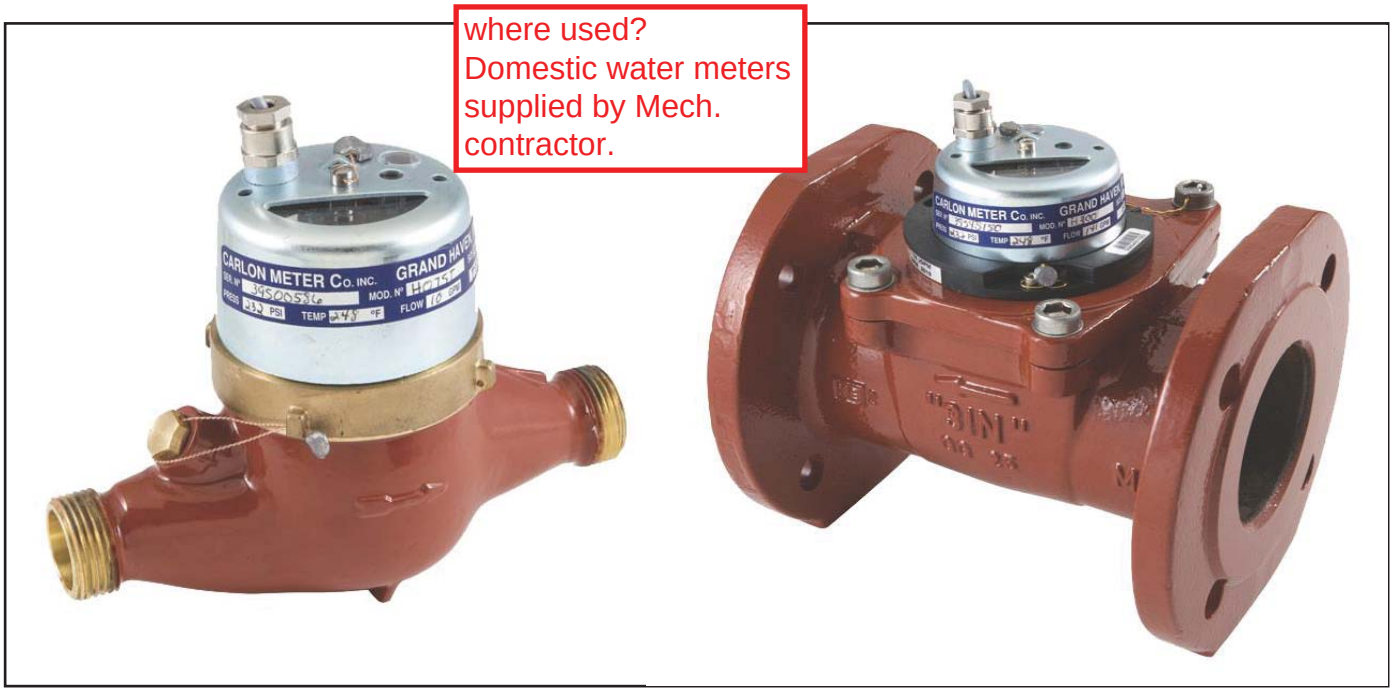
HOT WATER MULTI–JETS & TURBINES



Have a hot water application that requires a high degree of accuracy with low maintenance features? Carlon Meter has a family of meters for you. Our hot water turbine meters are available in sizes ¾" to 6"; with larger sizes available upon request. Carlon turbine meters provide +/- 2% accuracy at flow rates from 1 GPM up to 2,860 GPM and 227 psi. Our hot water turbine meters will handle temperatures up to 250°F. The 2" and larger models have a register that is capable of rotating 340 degrees for the ease of reading the meter after installation. Our turbine meters are available in totalizing and electric contact configurations so that you can run your other process equipment (Carlon valves, timers, controllers and chemical pumps) directly from our turbine meter.

CARLON METER

1710 EATON DRIVE • GRAND HAVEN, MICHIGAN 49417
PHONE (616) 842-0420 • FAX (616) 842-1265
E-MAIL CARLON@CARLONMETER.COM • WEBSITE WWW.CARLONMETER.COM

METER SELECTION CHART

METER SIZE	TOTALIZING MODEL	ELECTRIC CONTACT	CONTACT SETTINGS	*CONTINUOUS FLOW	FLOW RANGE
¾"	H075T	H075EC	1 / 10 / 100 GPC	11 GPM	1 - 20 GPM
1"	H100T	H100EC	1 / 10 / 100 GPC	26 GPM	2 - 50 GPM
1½"	H150T	H150EC	10 / 100 GPC	44 GPM	3 - 85 GPM
2"	H200T	H200EC	10 / 100 GPC	66 GPM	3 – 132 GPM
3"	H300T	H300EC	100 / 1000 GPC	141 GPM	14 - 198 GPM
4"	H400T	H400EC	100 / 1000 GPC	264 GPM	9 - 792 GPM
6"	H600T	H600EC	100 / 1000 GPC	880 GPM	35 - 1320 GPM
8"	H800T	H800EC	100 / 1000 GPC	1100 GPM	44 - 2201 GPM

***Continuous Flow:** The size of meter selected should be based upon continuous flow, GPM, as opposed to pipe size. For example, if it is determined that continuous flow is 500 GPM, a 4" meter should be selected. Head loss = 1.5 psi at continuous flow.

ORDERING INFORMATION: Select the meter model number from the Meter Selection Chart above. For EC models, specify model number shown followed by choice of contact pulse setting desired.

Example: 2" Meter with Electric Contact and 100 gallons per contact = H200EC-100 GPC.

METER DIMENSIONS

METER SIZE	MODEL	LENGTH	HEIGHT	WIDTH	WEIGHT
¾"	H075T / H075EC	7½"	6"	3¾ "	4½ lbs.
1"	H100T / H100EC	10¼"	7¼"	4"	7 lbs.
1½"	H150T / H150EC	11⅞"	8⅛"	5 ½"	11½ lbs.
2"	H200T / H200EC	7⅞"	12½"	6 ½"	32 lbs.
3"	H300T / H300EC	8⅞"	13"	7 ⅞"	39 lbs.
4"	H400T / H400EC	9⅞"	13½"	8 ⅝"	46 lbs.
6"	H600T / H600EC	11⅞"	14¼"	11¼"	72 lbs.
8"	H800T / H800EC	13⅞"	14¾"	13⅜"	100 lbs.

SPECIFICATIONS

Pressure Rating: 7 - 227 psi.
Temperature Range: 35° - 250°F. Protect the meter from freezing.
PH Level Range: 6.5 – 8.0
Accuracy: +/- 1.5% of maximum flow when operating between minimum and maximum flow range.
Register Options: U.S. Gallons and Liter / Cubic Meter.
Specifics for EC Models only: Switching voltage is 24VAC, 100mA maximum
Electrical Data: Registers conform to NEMA 4 and IP65
Larger Sizes: Available upon request.

Installation Instructions:

A. For all types of hot water turbine meters:
1. Flush the line thoroughly after all plumbing changes to prevent contaminates from entering the turbine.
2. 2" – 6" meters may be installed either horizontally or vertically with inlet port facing the water supply line. ¾", 1" and 1½" meters are recommended to be mounted horizontal.

B. For EC type hot water turbine meters:
1. Connect the terminals on the pulse head to the meter input on the controlling device.
2. Connect your controlling device to the water treatment equipment (pumps, valves, etc.). Note GPC setting to determine frequency of operation.
3. This meter is not designed for outdoor installation.

Helpful Hints:
1. Install a Carlon Slow-Closing Valve downstream of your water meter. This will eliminate possible meter damage from water hammer in your system.
2. Install a Carlon Strainer upstream of your water meter to protect the meter and any other in-line process equipment from becoming jammed by particulate matter in your system.
3. Carlon turbine meters 2" and larger, have an epoxy coated cast iron main base. Sizes ¾", 1" and 1½" are Multi-Jet type meters with bronze main case.

Warranty: Carlon Meter, Inc. warrants its products to be free of defect in material or workmanship for a period of twelve months from the date of purchase. Contact us to obtain a copy of our complete statement of warranty.

ACCUTROL LLC

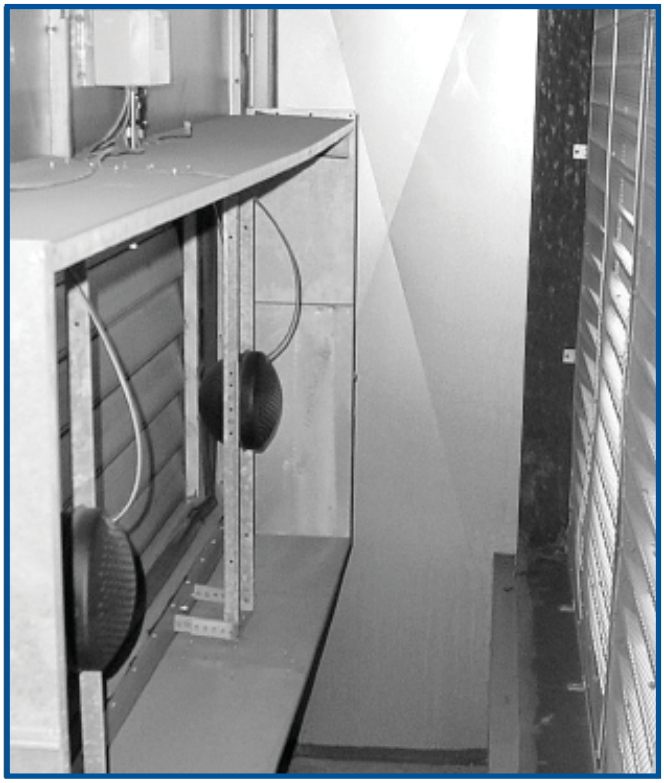
Tek-Air Airflow Products

IAQ-Tek

OUTDOOR AIR VOLUME MEASURING SYSTEM
US PATENT # 6,450,043 B1

A complete system for measuring outdoor air intake volume over a wide range of conditions.

- Probes require minimal straight runs of duct
- Simple installation
- Operates over -40° to 120° F
- Setup Wizard
- Resistant to Contamination



Probes Mounted Before a Damper

PRODUCT SUMMARY

One of the most significant parameters associated with indoor air quality is the volume of fresh outdoor air being drawn into a building through the ventilation system. If indoor air quality is to be assured, the volume of outdoor air must be accurately measured so that it can be controlled.

Existing technologies for measuring airflow volume are better suited for use in supply and exhaust ductwork where filtered air, higher velocities, and straight runs exist. **IAQ-Tek** incorporates a measurement probe designed specifically for the low velocities and high turbulence associated with outdoor air intakes.

OUTDOOR AIR MEASUREMENT

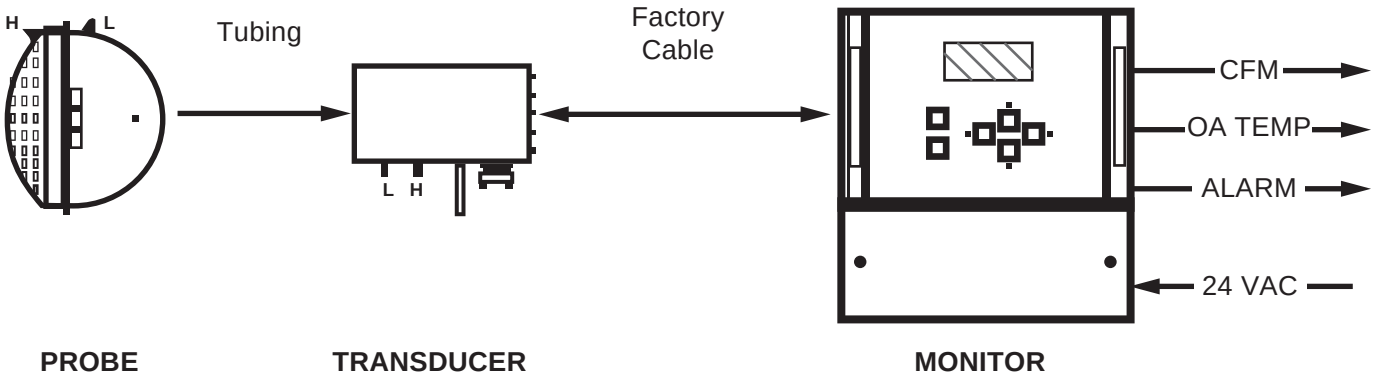
Whether a custom air handler installed in a penthouse or a commercial rooftop unit, air typically passes through an intake louver, modulating outdoor air damper, and into a return air mixing plenum. Usually the distance between these components is short, and the airflow very turbulent, making the use of conventional pitot and thermal measurement devices ineffective.

Complicating matters are the wide variety of intake configurations including louvers, rain hoods, and inlet screens. When it comes to outdoor air, there is never a good location to make an airflow measurement.

SETUP WIZARDS

The IAQ-Tek includes an 80 character display and keypad with three series of preprogrammed instructions to lead setup persons through the proper routine. Instructions are specific for Temperature Control Contractor, Air Balancer and User addressing each individual requirement.

O.A. Volume Measurement System IAQ2000



OUTDOOR AIR PROBE

The patented (#6,450,043 B1) airflow measurement probe is unlike any conventional airflow measurement device and represents a significant improvement on previous technology. Used either singly or in multiples, each probe will measure airflow accurately when located in the small space between the intake louvers and the outdoor air damper. Output is not affected by the turbulence created by the louver, or the modulating damper. The unique design of the probe makes it immune to turbulence. The combination of the size, the dimples on the front and the large chambers work to create a stable velocity pressure that is used to calculate air velocity.

IAQ-TEK TRANSDUCER

The velocity pressure developed by the probe(s) is connected to a high accuracy differential pressure transducer assembly. The assembly includes a NEMA-4 enclosure which is suitable for mounting outdoors or in the intake plenum. The transducer assembly includes auto-zero and a temperature stabilization circuit to ensure maintenance-free operation.

The transducer assembly also includes a thermistor which is used to compensate for changes in air inlet temperature as well as to provide the outside air temperature to the building management system.

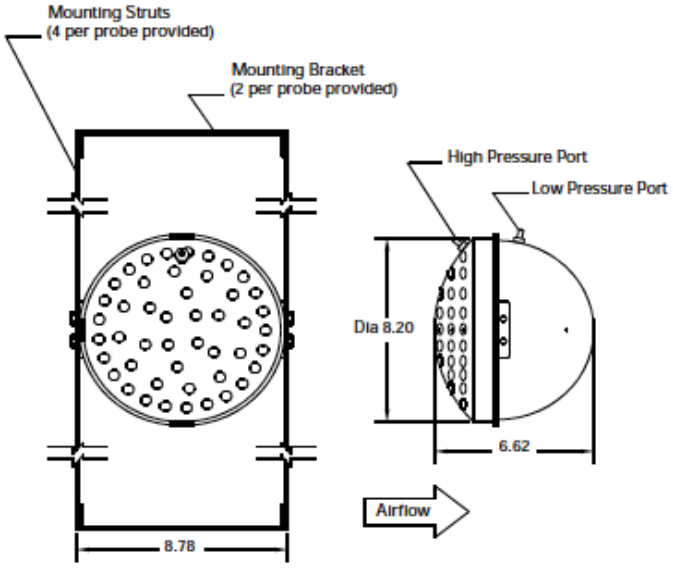
IAQ-TEK MONITOR

The IAQ-Tek Monitor is connected to the transducer assembly. The monitor accepts the incoming pressure and temperature signals. Using a unique wizard the monitor is configured to calculate the outside air volume based on the specific conditions of the installation such as altitude, area and probe flow coefficient. Two analog outputs are available for airflow and outside air temperature.

O.A. Volume Measurement System IAQ2000

Probe Mounting & Dimensions

Single Probe Mounting



NOTE: Consult factory for sizes not covered in the chart below. For areas > 100sq. ft., consult the factory.

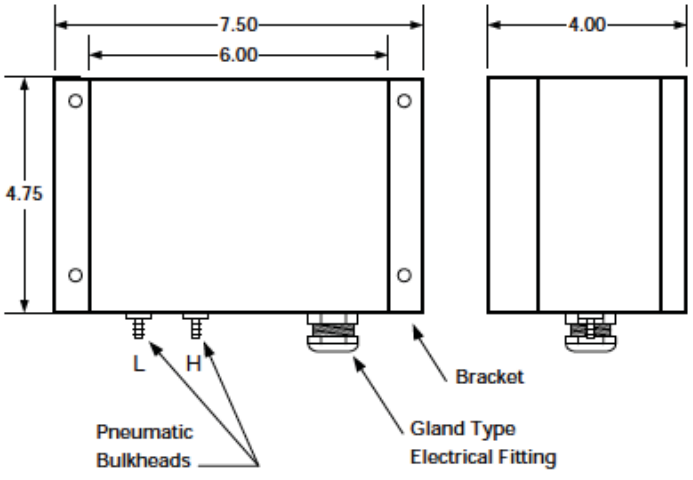
HOW MANY PROBES TO USE?

To determine the number of probes, use the chart at right. Calculate the aspect ratio first by dividing the longer dimension of the width or height, by the shorter of the two. Then calculate the area in square feet by multiplying the width by height (inches), and dividing by 144 square inches to convert to square feet.

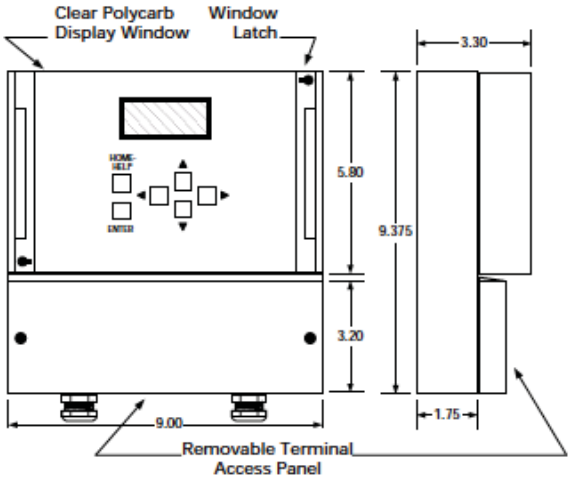
Proceed down the aspect ratio column and compare the area shown to the area calculated. When the calculated area falls between the lowest and highest area in the box, read the number of probes required in the left most column.

# of Probes	Aspect Ratio * 1 to 1.5	>1.5 to 2.5	>2.5 to 5
1	to 12 sq.ft.	to 9 sq.ft.	to 6 sq.ft.
2	>12 to 24 sq.ft.	>9 to 22 sq.ft.	>6 to 18 sq.ft.
3	--	--	>18 to 24 sq.ft.
4	>24 to 48 sq.ft.	>22 to 45 sq.ft.	>24 to 30 sq.ft.
5	--	--	>30 to 36 sq.ft.
6	>48 to 64 sq.ft.	>45 to 58 sq.ft.	>36 to 42 sq.ft.
7	--	--	>42 to 48 sq.ft.
8	>64 sq.ft.	>58 sq.ft.	>48 sq.ft.

Transducer and Monitor Dimensional Data



Transducer Dimensions



Monitor Dimensions

IAQ2000 Model Code Matrix

T-IAQ2 □ 0 □

Transducer Option
- 1 - 0.10"
- 2 - 0.25"
- 3 - 0.50"
- 4 - 1.00"
- 5 - 2.50"
- 6 - 5.00"
- 7 - 10.0"
- 8 - 15.0"
- 9 - 25.0"

IAQ Probe Qty
- 0 - No IAQ Probes
- 1-8 - (8 max per transmitter)

Note: Consult your local AccuTrol representative for further information. (for your local representative listing, visit www.accutrolllc.com)

SPECIFICATIONS

System Accuracy

Velocity for 0.1" transducer

200 to 1000 fpm; +/- 5% reading
75 to 200 fpm; +/- 10% reading

Higher ranges available. Consult your local representative for more information.

Probe and Transducer

Temperature

Operating: -40 to 120°F
Storage: -40 to 150°F

Probe

Material: PVC/ABS
Fire rating: UL-94-VO and UL-94-5VB
Size: 8.5" diameter, 7.5" depth
Weight: 1.5lbs.
Tubing connections: 1/4" barb fittings

Transducer

Enclosure: NEMA-4X water tight
Enclosure size: 6" W x 4.75" H x 3.5" D
Mounting footprint: 7.5" W x 4.75" H
Weight: 1.5 lbs.
Tubing connections: 1/4" barb fittings
Electrical connection: Factory provided integral cable

Monitor

Temperature

Operating: 30 to 110°F
Storage: -40 to 150°F

Enclosure

Type: NEMA-4X water tight
Size: 9" W x 9.5" H x 3.5" D
Mounting footprint: 9.0" W x 9.5" H
Weight: 3.5 lbs.

Power

Supply voltage: 24 VAC, limits 19 to 31 VAC
Power: 25 VA

Digital Input for Fan Status Interlock

Type: Dry Contact

Analog Outputs

Type: Powered and isolated 4-20mA
Scaling:
cfm: user set
temp: -30° to 120°F
Output load: 0-600 ohms

Digital Alarm Output

Type: dry contact, SPDT
Rating: 0.5 amps max.
State: normally energized

Display

Type: LCD, backlit
Size: 4 lines - 20 characters per line

Contents and specifications are subject to change without notice.

ACCUTROL LLC
600 Pepper Street, Monroe, CT 06468
Voice: 203-445-9991 Fax: 203-261-1981
www.accutrolllc.com

Your Accutrol Representative is:

MicroNet Sensors

MCS-4000

The TAC I/A Series MicroNet™ Sensors (MN-Sxxx series) are a family of digital wall temperature and humidity sensors for use with TAC I/A Series MicroNet controllers. These sensors feature a Sensor Link (S-Link) communication protocol which provides a simple two-wire interface for power and exchange of sensor and subbase information. Subbase information includes selecting occupancy override, fan speed, operating mode, or emergency heat.

Continued on next page.

SPECIFICATIONS

TEMPERATURE SENSOR

Type
Precision thermistor.

Range
32 to 122 °F (0 to 50 °C).

HUMIDITY SENSOR

Element
Type: . . . . . Thermoset polymer capacitive sensor.
Accuracy: . . . . . .±2% RH at 77 °F (25 °C).

Range
5 to 95%, non-condensing.

Hysteresis
±1.2% RH maximum.

Immersion
Extended exposure to equal to or greater than 90% RH causes a reversible 3% shift. Sensor will recover from short term exposure to liquid water or condensation. Repeated exposure will degrade the performance of the sensor.

Dimensions
4-21/32 H x 3 W x 1 D in (118.5 x 76.2 x 24 mm).

Enclosure
Conforms to NEMA-1 requirements.

Surge Immunity Compliance
IEEE C62.41 (IEEE-587, Category A & B).

AGENCY LISTINGS

FCC
Class B.

UL Listed
UL-916 (File # E71385 Category PAZX).
UL Listed to Canadian Safety Standards (CAN/CSA C22.2).

European Community – EMC Directive 89/336/EEC
Emissions and Immunity EN61326

AMBIENT LIMITS

Operating Temperature
32 to 122 °F (0 to 50 °C).

Shipping and Storage Temperature
-40 to 160 °F

Humidity
5 to 95% RH, non-condensing.

HARDWARE

Wiring Terminals
Four (4) screw terminals. AWG #18 to #24 (0.823 mm2 maximum) wire.

Display
Setpoints, input spans, and units vary with the controller application.

Range
-99 to 999 or -9.9 to 99.9.

Units
°F, °C, or %.
Command Options (S4xx and S5xx Models)
Varies with the controller application.

System Mode
Heat/Cool/Off/Auto (except MN-S4xx-FCS).

Fan Mode
Off/On/Speed (Low, Medium, High)/Auto.

Override
Occupied/Unoccupied (except MN-S4xx-FCS).

Emergency Heat
Enable/Disable (MN-S5xx models only).

Schneider Electric

Continued from first page.

Available in twelve models, MN-Sxxx series sensors provide an integral analog-to-digital conversion for elimination of sensor-to-controller noise effects and wire resistance offset.

Using the digital wall sensor, the operator can monitor performance and edit operational settings. MN-Sxxx series sensors are suitable for direct-wall, 2 x 4 electrical box, 1/4 DIN electrical box, or surface box mounting.

The MN-Sxxx series sensor measures room conditions and transmits the information to the controller via the S-Link. A single sensor is connected directly to an application specific TAC I/A Series MicroNet controller via low-cost, unshielded, twisted-pair cable. The connection between the sensor and controller is not polarity-sensitive.

A convenient connection to either a MicroNet LonWorks® or MicroNet BACnet network is provided as an option with each sensor in the series. If the LonWorks network wiring is connected to the sensor, a PC running WorkPlace Tech Tool or a third party Network Management Tool can be connected to the network at the sensor. This feature allows convenient access to the MicroNet LonWorks network.

FEATURES

- Contemporary, low-profile packaging.
- Digital zone temperature indication (selectable for 0.1 or 1 degree display resolution of °F or °C).
- Self-compensating temperature conversions remove the need to calibrate over time.
- Digital zone humidity indication (selectable for 0.1 or 1% RH display resolution).
- Long-life humidity sensing element with excellent resistance to contamination and condensation.
- Pushbutton override capabilities allow occupants to switch to timed occupied mode for after hours operation.
- Displays selected system values such as setpoints, outdoor air temperature, and operating mode.
- Provides the ability to change operating modes.
- Directly connects to selected TAC I/A Series MicroNet controllers via low-cost, unshielded, twisted-pair cable, which provides both power and communication.
- Separate wiring subbase and electronics.
- LonWorks network jack for convenient network access.
- S-Link jack for Pocket I/A access to the connected controller.

SOFTWARE SPECIFICATIONS

DIGITAL DISPLAY (MN-S3XX, MN-S4XX AND MN-S5XX MODELS ONLY)

Custom field-configurable sensor displays.

Auto-ranging of displayed values.

Occupant command capabilities.

Adjustable minimum/maximum limit setpoint values.

Controller driven, automatically configured, customized display/command values.

TYPICAL MN-S3XX, -S4XX, OR -S5XX DISPLAY/CHANGE VALUES.

Model Family	Value	Display	Change
S3xx, S4xx, S5xx	Zone Temperature	Yes	No
S4xx, S5xx	Outdoor Air Temperature	Yes	No
S4xx, S5xx	Percent Humidity	Yes	No
S3xx[a], S4xx[a], S5xx	Heating Setpoint, Cooling Setpoint, Unoccupied Heat, Unoccupied Cool	Yes	Yes
S4xx, S5xx	Mode Heating/Cooling/Auto/Off	Yes	Yes[b]
S4xx, S5xx	Fan (On/Speed (Low/Medium/High), Auto	Yes	Yes

a S3xx and S4xx-FCS models have a single setpoint.
b S4xx-FCS models do not allow mode changes.

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COMMUNICATIONS

S-Link

Sensor Link (S-Link) communications wiring provides power and communication interface to the TAC I/A Series MicroNet sensor (MN-Sxxx series). It uses two-wire, unshielded cable and is not polarity sensitive. From some sensor models, the user can view and adjust application parameters. Maximum wire length allowed between a controller and the TAC I/A Series MicroNet sensor is 200 ft. (61 m).

BACnet or LonWorks Network

The BACnet or LonWorks network wiring can be connected to the second set of terminals in the sensor base. This optional connection allows convenient access to the LonWorks network at the sensor.

MODELS

Model		Description	Keypad	Display
Temperature Sensor	Temperature and Humidity Sensor			
MN-S1	MN-S1HT	Sensor only	None	None
MN-S2	MN-S2HT	Sensor with override	One button	LED Override Status Indication
MN-S3[b]	MN-S3HT[b]	Sensor with setpoint adjustment and override	Three button	Digital LCD[a] and LED Override Status Indication
MN-S4[b]	MN-S4HT[b]	Sensor with setpoint, override, and controller mode functions	Six-button	Digital LCD[c] and LED Override Status Indication
MN-S4-FCS[b]	MN-S4HT-FCS[b]	Sensor with setpoint, On/Off and Fan speed functions	Six button	Digital LCD[c] and LED Fan Status Indication
MN-S5[b]	MN-S5HT[b]	Sensor with setpoint, override, controller mode functions, and emergency heat key/indication	Seven button	Digital LCD[c] and LED Override and Emergency Heat Indication

a LCD displays value and setpoint.
b Allows viewing of alarms and diagnostics.
c LCD displays values, setpoints, and controller mode functions.

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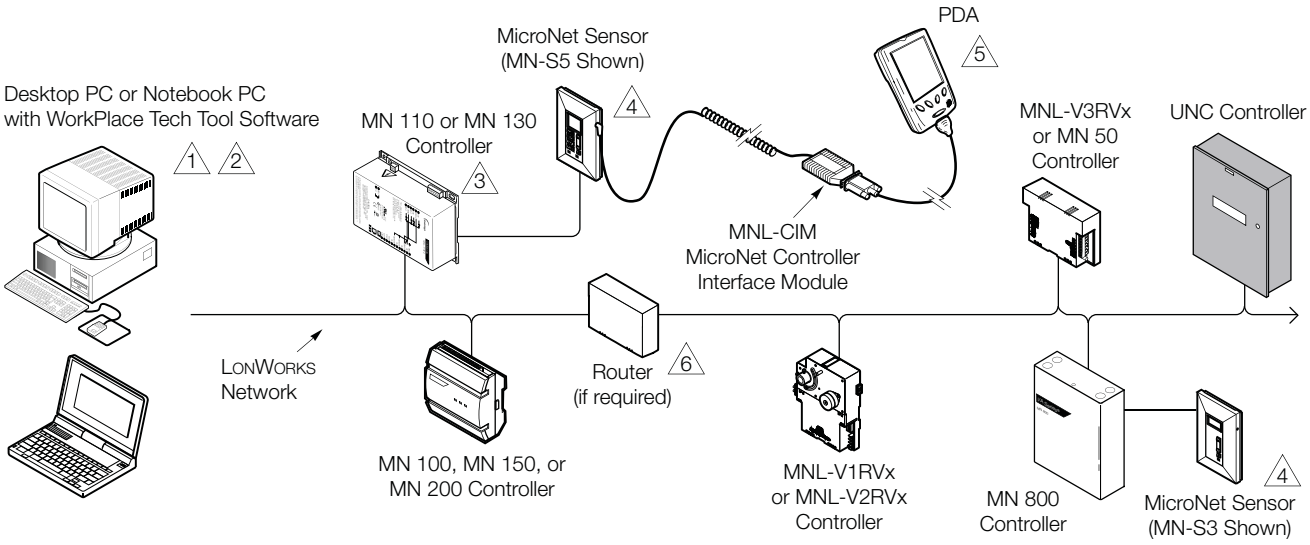
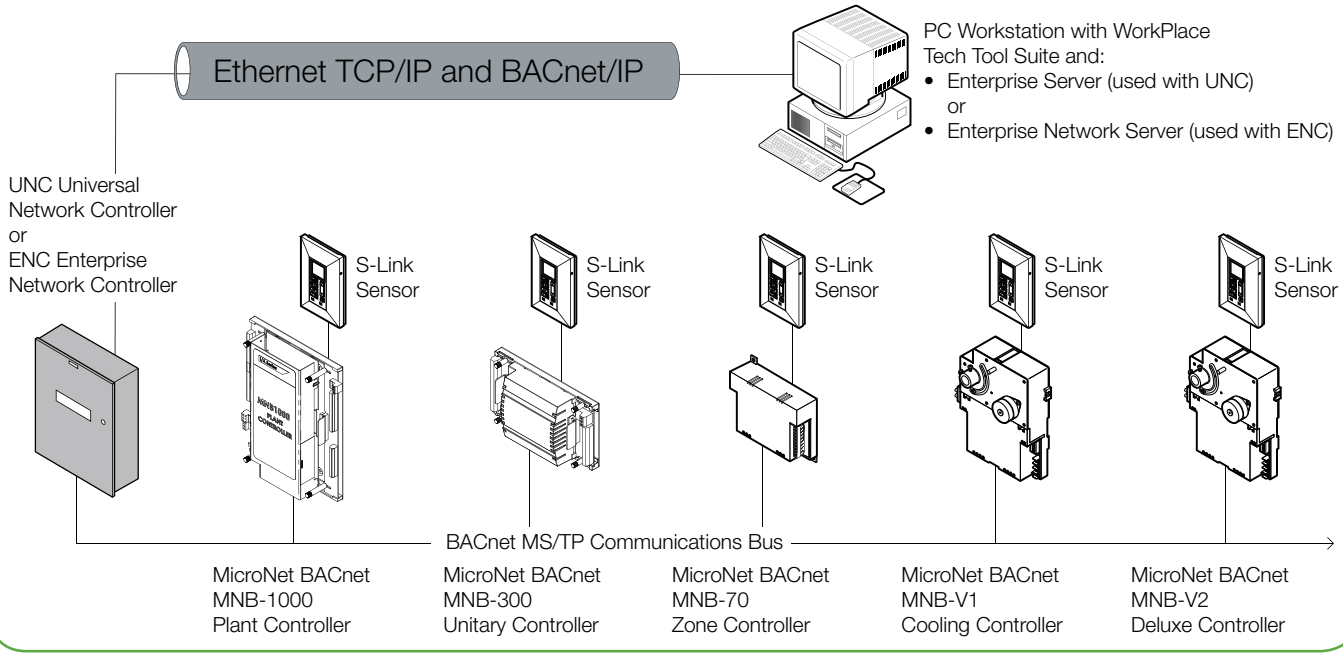
ARCHITECTURE



1. A PC can be connected to the LonWorks TP/FT-10 Network, either directly or through the LonWorks® network jack of a LonWorks controller or MN-Sxxx Wall Sensor. The PC must have an Echelon® LonTalk® adapter card.
2. Programming any of the TAC I/A Series controllers, or the TAC I/A Series MN 800 controller, requires WorkPlace Tech Tool.
3. This controller is not suitable for exposed mounting on a wall or panel, or in any other easily accessible place due to the possibility of personal contact with the high-voltage terminals. It must be mounted inside a suitable grounded metal enclosure.
4. MicroNet Sensors can be connected to any MN controller.
5. A PDA running the Pocket I/A interface software may be used to communicate with TAC MicroNet I/A Series controllers.
6. When routers are used, WorkPlace Tech is able to communicate through them to any of the TAC I/A Series devices on the network.



On October 1st, 2009, TAC became the Buildings Business of its parent company Schneider Electric. This document reflects the visual identity of Schneider Electric, however there remains references to TAC as a corporate brand in the body copy. As each document is updated, the body copy will be changed to reflect appropriate corporate brand changes.

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Schneider Electric 1354 Clifford Avenue, P.O. Box 2940, Loves Park, IL 61132-2940, USA 1-888-444-1311 www.schneider-electric.com/buildings

F-26290-10 November 2009 tl

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ET Series

SPECIFICATIONS

	For TAC Vista, I/NET, Continuum, and I/A	1000 Ohm Platinum	1000 Ohm BALCO
Output	1.8K Ohms @ 77° F (25° C) Vista 10K Ohms @ 77° F (25° C) I/Net 10K Ohms @ 77° F (25° C) Continuum 10K Ohms @ 77° F (25° C) with 11K Ohms shunt resistor I/A	1K Ohms @ 32°F (0°C)	1000 Ohms @ 70°F (21°C)
Temperature Range	-40° to 302° F (-40° to 150° C)	-58° to 392°F (-50 to 200°C) -50° to 275°F (-45.5° to 134.8°C)	-40° to 240°F (-40° to 116°C)
Interchangeability	+/- 0.2 C (0° to 70° C)		
Temperature Coefficient		0.00385 Ohm/Ohm/°C	2.2 Ohms/°F
Dissipation Constant Stability	3 mW / C		
Accuracy	+/- 0.2° C (0° to 70° C) +/- 0.4° F (32° to 158° C)	+/- 0.06% @ 32°F (0°C) Single Point +/- 1.0 Ohm @ 70°F (Averaging)	+/- 0.1%
Operating Humidity	0 to 90% RH non-condensing		

Application

Thermistors offer high accuracy and interchangeability over a wide temperature range. The ET series can be used in the following applications:

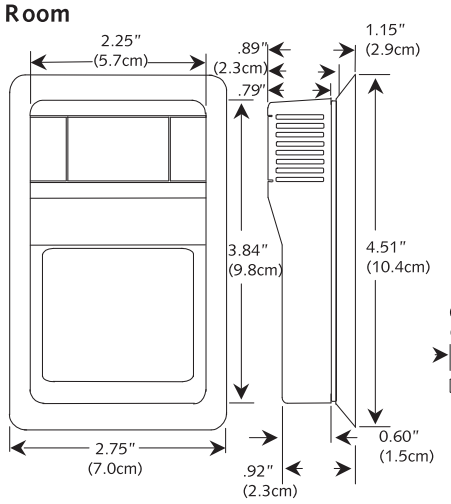
- Space
- Duct
- Immersion
- Averaging
- Strap-On
- Bead/Bullet
- Outdoor Air

Features

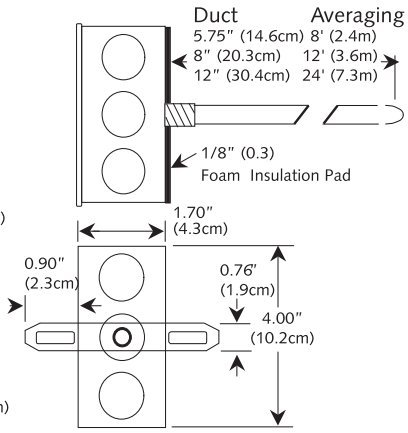
- Offer high accuracy and interchangeability over a wide temperature range.
- Non-polarity sensitive

DIMENSIONS

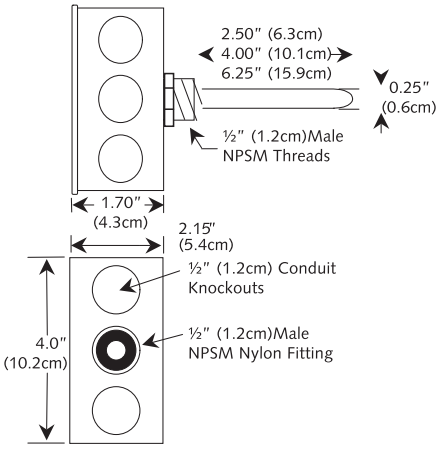
Room



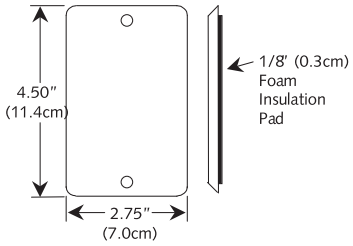
Duct / Averaging



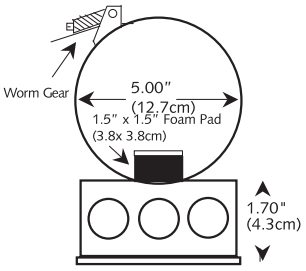
Immersion



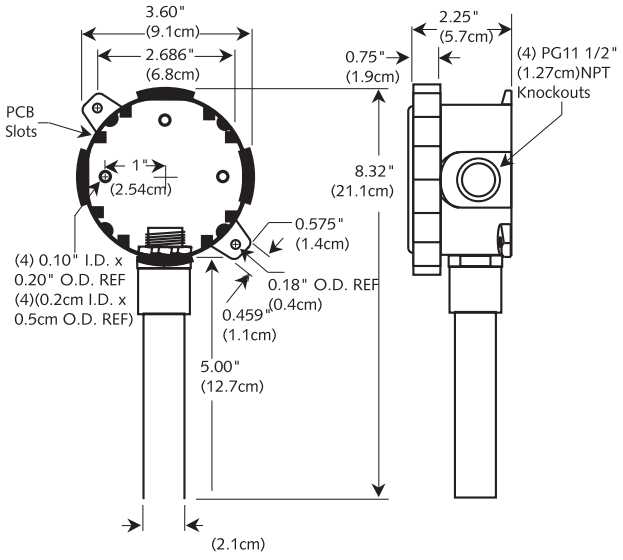
Stainless Plate



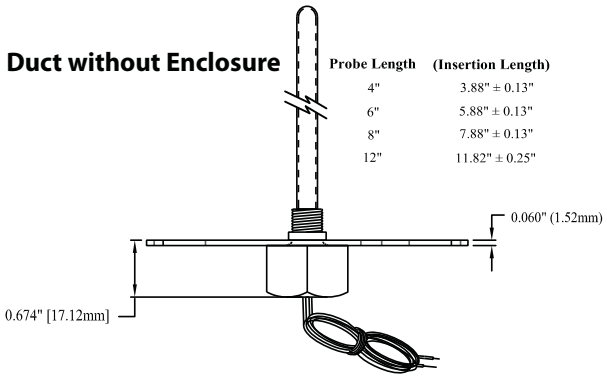
Strap-On



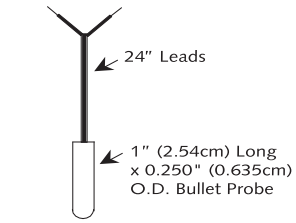
Outside Air



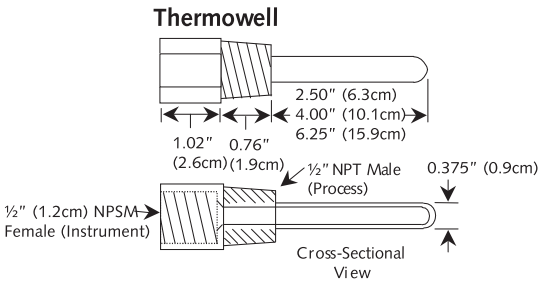
Duct without Enclosure



Bullet Probe



Thermowell



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INSTALLATION

Room Temperature Sensors

This unit is suitable for either drywall mounting or junction box mounting. The room sensor is provided with screw terminal blocks for all connections. Remove the cover from the unit and mount the housing base to the wall using the (2) 6/32" x 1" machine screws. Replace the cover and tighten down, using the (2) 1/16" Allen Screws located on the bottom of the enclosure.

Duct and Duct Averaging Sensors

Duct temperature sensors - drill a 3/8" hole in the duct and insert the probe through the hole until the foam pad is tight to the duct. Now insert (2) screws through the mounting holes in flange and tighten them until the unit is held firmly to the duct. Duct Averaging sensors - Drill a 3/8" hole in the duct and insert the averaging element through the hole until the foam pad is tight to the duct. Now insert the (2) screws through the holes in the mounting flange and tighten until the unit is held firmly to the duct. The sensor should then be strung in a criss-cross pattern throughout the duct using the mounting clips provided, in a pattern that covers the greatest surface area of the duct, to insure that there is no stratification. When bending the copper tubing, be careful that you use a gradual bend and that you DO Not kink the copper tubing.

Immersion Temperature Sensors

The Fluid Immersion-type sensors are provided with a 2 ½", 4", or 6 ¼" insertion length, 304 series stainless steel thermowell. The thermowell has a 1/2" NPT external or process thread and a 1/2" NPS Female process thread. Heat transfer compound may be used but it is not necessary.

Strap-On Temperature Sensors

The TAC Strap-On sensors, are provided in a NEMA 1 rated junction box with an adjustable 2" to 5" pipe clamp. The unit should be mounted on the bottom side of the pipe to ensure proper heat transfer and a true temperature reading. Heat transfer compound and insulating the sensor will help the overall accuracy of the sensor. By ordering extra straps, and fastening them together, it is possible to make them fit larger pipes.

Outside Air Temperature Sensors

The TAC Outdoor Air temperature sensors are provided in a weatherproof enclosure. An optional weatherproof Aluminum Bell Box or NEMA 4X Polycarbonate enclosure is also available upon request for an additional charge. All of the mounting hardware is provided with the sensor. Be sure to mount the sensor out of direct sunlight, with the sensor probe pointing downward.

Stainless Plate Temperature Sensors

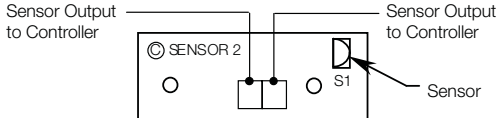
The TAC Stainless Plate temperature sensors are mounted on the back of a 1 Gang stainless steel plate. The foam pad will insulate the sensor from any drafts in the wall. (2) 6/32" x 1" machine screws are provided for junction box mounting. Be sure that the sensor is not mounted on an outside wall, due to the extreme temperature changes from either drafts or heat transfer.

WIRING

For wiring Information on room temperature sensors, please refer to the following documents:

System	F-Number
Vista	F-27616
I/NET	F-27617
Continuum	F-27618
I/A	F-27619

Diagram for ET Sensors Except ETR



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ORDERING INFORMATION

Temperature Sensor Description	TAC Vista	I/NET	Continuum	I/A	1000 Ohm Platinum	1000 Ohm BALCO
Room	ETR100	ETR200	ETR500	ETR800	-	-
Room with Setpoint	ETR101	ETR201	ETR501	ETR801	-	-
Room with Override Pushbutton	ETR102	ETR202	ETR502	ETR802	-	-
Room with Setpoint and Override Pushbutton	ETR103	ETR203	ETR503	ETR803	-	-
Wallplate (Stainless Steel)	ETP100	ETP200	ETP500	ETP800		
4” Duct (Galvanized Steel Enclosure)	ETD100-4	ETD200-4	ETD500-4	ETD800-4	ETDPK0-4	ETDBK0-4
6” Duct Galvanized Steel Enclosure)	ETD100-6	ETD200-6	ETD500-6	ETD800-6	ETDPK0-6	ETDBK0-6
8” Duct (Galvanized Steel Enclosure)	ETD100-8	ETD200-8	ETD500-8	ETD800-8	ETDPK0-8	ETDBK0-8
12” Duct (Galvanized Steel Enclosure)	ETD100-12	ETD200-12	ETD500-12	ETD800-12	ETDPK0-12	ETDBK0-12
4” Duct without Enclosure	ETD100-NE-4	ETD200-NE-4	ETD500-NE-4	ETD800-NE-4	ETDPK0-NE-4	ETDBK0-NE-4
6” Duct without Enclosure	ETD100-NE-6	ETD200-NE-6	ETD500-NE-6	ETD800-NE-6	ETDPK0-NE-6	ETDBK0-NE-6
8” Duct without Enclosure	ETD100-NE-8	ETD200-NE-8	ETD500-NE-8	ETD800-NE-8	ETDPK0-NE-8	ETDBK0-NE-8
12” Duct without Enclosure	ETD100-NE-12	ETD200-NE-12	ETD500-NE-12	ETD800-NE-12	ETDPK0-NE-12	ETDBK0-NE-12
2.5” Immersion (Galvanized Steel Enclosure)*	ETI100-2	ETI200-2	ETI500-2	ETI800-2	ETIPK0-2	ETIBK0-2
4” Immersion (Galvanized Steel Enclosure)*	ETI100-4	ETI200-4	ETI500-4	ETI800-4	ETIPK0-4	ETIBK0-4
6.25” Immersion (Galvanized Steel Enclosure)*	ETI100-6	ETI200-6	ETI500-6	ETI800-6	ETIPK0-6	ETIBK0-6
8’ Averaging (Flexible Copper)	ETA100-8	ETA200-8	ETA500-8	ETA800-8	-	-
12’ Averaging (Flexible Copper)	ETA100-12	ETA200-12	ETA500-12	ETA800-12	ETAPK0-12	ETABK0-12
24’ Averaging (Flexible Copper)	ETA100-24	ETA200-24	ETA500-24	ETA800-24	ETAPK0-24	ETABK0-24
Outside Air	ETO100	ETO200	ETO500	ETO800	-	-
Strap On	ETS100	ETS200	ETS500	ETS800	-	-
Bead / Bullet	ETB100	ETB200	ETB500	ETB800	-	-

* Length indicates immersion depth.

Miscellaneous Options	Code
LCD Display in Fahrenheit (for room units only)	-LCD
LED Indicator* (for room units with override only)	-LED
Thermometer Indicator (for room units only)	-TI
RS232 Communication Jack (for use with I/NET systems only)	-RS232
Four-Pin RJ11 Communication Jack (for use with TAC Vista and Continuum systems only)	-RJ4

* Not available on I/A, 1000 Ohm Platinum, or 1000 Ohm BALCO.

Well Type	Part Number
2.5” Stainless Steel Well*	ETI-WELL-2S
4” Stainless Steel Well*	ETI-WELL-4S
6.25” Stainless Steel Well*	ETI-WELL-6S

* Length indicates immersion depth.

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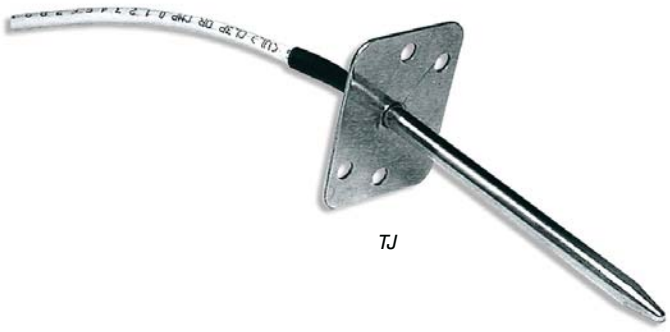
VAV Discharge Temperature Sensors

TJ Series



TJ

SPECIFICATIONS

5 Year Warranty

Wiring	22 AWG; 2-wire: RTD/Thermistor
Probe	Stainless Steel
Operating Temp	-25° to 105°C (-13° to 221°F)*
	LINITEMP OPTION
Input Power	Class 2; 5 to 30VDC
Output	10mV/°C
Operating Temp	-25° to 105°C (-13° to 221°F)
Calibration Error	1.5°C (2.7°F) typical; 2.5°C (4.5°F) max. at 25°C (77°F)*
Error over Temp	1.8°C (3.24°F) typical; 3.0°C (5.4°F) max. over 0° to 70°C (32° to 158°F) range; 2.0°C (3.6°F) typical, 3.5°C (6.3°F) max. over -25° to 105°C (-13° to 221°F) range

Increased cable length affects the readings of lower resistance RTDs (100R platinum, RTD).

** Room temperature error documented on each unit.*

VAV Discharge Air Sensor For Reheat Applications

FEATURES

- *Stainless steel duct probe with mounting flange...quick, easy installation*
- *Plenum rated cable standard*
- *4" or 8" (102 mm or 204 mm) duct probes for application flexibility*
- *2-wire installation (optional quick disconnect)...installs in just a few short minutes*
- *Installation ready for VAV systems and plenum areas...saves money on job commissioning and warranty service*

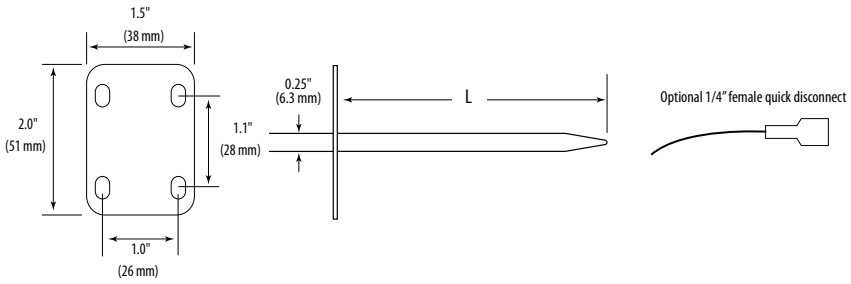
DESCRIPTION

The **TJ Series** temperature sensors are highly accurate and cost effective, with trouble-free installation. The sensor is encased in a sturdy corrosion-resistant stainless steel probe. A variety of RTD/thermistor sensor and probe length options are available for maximum versatility in applications.

APPLICATIONS

- *VAV reheat boxes*
- *Dual duct boxes*
- *Fan coils*
- *Prove that the hot water valve or electric heat is functioning properly*
- *Check individual reheating stages*
- *Check for hot water valve leaks*
- *Determine if damper actuators are functioning on dual duct boxes*

DIMENSIONAL DRAWING



To compute Linitemp Temperature

mV reading/10 - 273.15 = Temperature in °C

Class	Pt RTD		Balco RTD	THERMISTOR											
Type	**100 Ohm**	**1000 Ohm**	**1000 Ohm**	**2.2k**	**3k**	**10k Type 2**	**10k Type 3**	**10k Dale**	**10k 3A221**	**10k "G" US**	**20k**	**20k "D"**	**100k**	**10k Type 2**	**10k Type 3**
Accuracy	±0.3°C	±0.3°C	±1% @70°C	±0.2°C	±0.2°C	±1.0°C	±0.2°C	±0.2°C	±1.1°C	±0.2°C	Consult	Consult	Consult	±0.1°C 20/70°C	±0.1°C
	0.00385 curve	0.00385 curve		0/70°C	0/70°C	-50/150°C	0/70°C	-20/70°C	0/70°C	0/70°C	Factory	Factory	Factory	±0.2°C 0/20°C	0/70°C
Temp. Response*	PTC	PTC	PTC	NTC	NTC	NTC	NTC	NTC	NTC	NTC	NTC	NTC	NTC	NTC	NTC
														High Accuracy	

*PTC: Positive Temperature Coefficient

*NTC: Negative Temperature Coefficient

STANDARD RTD AND THERMISTOR VALUES (Ohms Ω)

°C	°F	100 Ohm	1000 Ohm	1000 Ohm	2.2k	3k	10k Type 2	10k Type 3	10k Dale	10k 3A221	10k "G" US	20k NTC	20k "D"	100k	10k Type 2	10k Type 3
-50	-58	80.306	803.06	740.46	154,464	205,800	692,700	454,910	672,300	-	441,200	1,267,600	-	-	692,700	454,910
-40	-40	84.271	842.71	773.99	77,081	102,690	344,700	245,089	337,200	333,562	239,700	643,800	803,200	3,366,000	344,700	245,089
-30	-22	88.222	882.22	806.02	40,330	53,730	180,100	137,307	177,200	176,081	135,300	342,000	412,800	1,770,000	180,100	137,307
-20	-4	92.160	921.60	841.00	22,032	29,346	98,320	79,729	97,130	96,807	78,910	189,080	220,600	971,200	98,320	79,729
-10	14	96.086	960.86	877.46	12,519	16,674	55,790	47,843	55,340	55,252	47,540	108,380	122,400	553,400	55,790	47,843
0	32	100.000	1,000.00	913.66	7,373	9,822	32,770	29,588	32,660	32,639	29,490	64,160	70,200	326,600	32,770	29,588
10	50	103.903	1,039.03	952.25	4,487	5,976	19,930	18,813	19,900	19,901	18,780	39,440	41,600	199,000	19,930	18,813
20	68	107.794	1,077.94	991.82	2,814	3,750	12,500	12,272	12,490	12,493	12,260	24,920	25,340	124,900	12,500	12,272
25	77	109.735	1,097.35	1,013.50	2,252	3,000	10,000	10,000	10,000	10,000	10,000	20,000	20,000	100,000	10,000	10,000
30	86	111.673	1,116.73	1,035.18	1,814	2,417	8,055	8,195	8,056	8,055	8,194	16,144	15,884	80,580	8,055	8,195
40	104	115.541	1,155.41	1,077.68	1,199	1,598	5,323	5,593	5,326	5,324	5,592	10,696	10,210	53,260	5,323	5,593
50	122	119.397	1,193.97	1,120.52	811.5	1,081	3,599	3,894	3,602	3,600	3,893	7,234	6,718	36,020	3,599	3,894
60	140	123.242	1,232.42	1,166.13	561.0	747	2,486	2,763	2,489	2,486	2,760	4,992	4,518	24,880	2,486	2,763
70	158	127.075	1,270.75	1,210.75	395.5	527	1,753	1,994	1,753	1,751	1,990	3,512	3,100	17,510	1,753	1,994
80	176	130.897	1,308.97	1,254.55	284.0	378	1,258	1,462	1,258	1,255	1,458	2,516	2,168	12,560	1,258	1,462
90	194	134.707	1,347.07	1,301.17	207.4	-	919	1,088	917	915	1,084	1,833	1,542	9,164	919	1,088
100	212	138.506	1,385.06	1,348.38	153.8	-	682	821	679	678	816.8	1,356	1,134	6,792	682	821
110	230	142.293	1,422.93	1,397.13	115.8	-	513	628	511	509	623.6	1,016	816	5,108	513	628
120	248	146.068	1,460.68	1,447.44	88.3	-	392	486	389	388	481.8	770	606	3,894	392	486
130	266	149.832	1,498.32	1,496.28	68.3	-	303	380	301	299	376.4	591	456	3,006	303	380
Sensor Codes		**B**	**C**	**I**	**E**	**F**	**D**	**H**	**J**	**S**	**R**	**M**	**U**	**T**	**W**	**Y**

ORDERING INFORMATION

TJ [ ] [ ] [R] [ ] [ ]

Probe Length "L"
- **B** = 4"(102mm)
- **D** = 8"(204mm)

Sensor Type
- **B** = 100R platinum, RTD
- **C** = 1k platinum, RTD
- **D** = 10k T2, Thermistor
- **E** = 2.2k, Thermistor
- **F** = 3k, Thermistor
- **G** = 10k CPC, Thermistor
- **H** = 10k T3, Thermistor
- **I** = 1k Balco (Nickel-iron) RTD
- **J** = 10k Dale, Thermistor
- **K** = 10k w/11k shunt, Thermistor
- **M** = 20k NTC, Thermistor
- **N** = 1800 ohm, Thermistor
- **P** = 10mV/°C, Linitemp
- **R** = 10k US, Thermistor
- **S** = 10k 3A221, Thermistor
- **T** = 100k, Thermistor
- **U** = 20k "D", Thermistor
- **W** = 10k T2 high accuracy, Thermistor
- **Y** = 10k T3 high accuracy, Thermistor
- **Z** = 10k E1, Thermistor
- **CC** = 15k, Thermistor

Output
- **R** = Resistive

Cal Certificate
- **0** = None
- **1** = 1 Point Cal Cert
- **2** = 2 Point Cal Cert

Option
- **0** = Standard 5 ft. cable, No QDs
- **1** = 1/4" Female Quick Disconnects (QD)
- **2** = 1/4" QDs with 8 ft. leadwires
- **3** = 10 ft. cable, no QDs

Example:

TJ	B	D	R	2	1

ACCESSORIES

Temperature range converter (AA10xxxx)

AA10xxxx

TC-1101, TC-1102 & TC-1103 Series

Two-Position, Electric Room Thermostats General Instructions

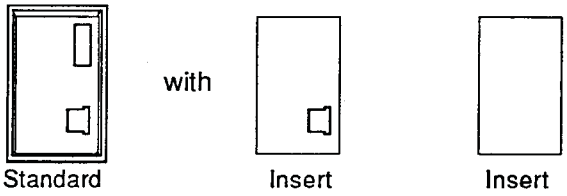
APPLICATION

For low or line voltage on-off control of fan coils, fans motor starters, contactors, two-position electric actuators.

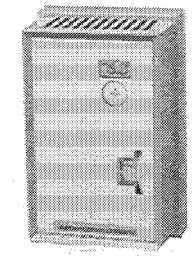
SPECIFICATIONS:

Setpoint Dial Range: See Table 1.
Sensing Element: Bimetal.
Differential: 2°F (1°C).
Electrical Switch: Snap action SPDT.
Rating: See Table 3.
Connections: Color coded 6" leads.
Cover: Beige plastic as standard and brushed bronze cover insert.
Location: NEMA Type 1 indoor only.
Mounting: Flush or surface 2 x 4 switch box or directly to wall (24 volt only).
Dimensions: 4-3/8 Hx 2-7/8 W x 1-5/8 D in. (111 x 73 x 41 mm).
Anticipators: Anticipators are recommended for all thermostats mounted on concrete walls, or other wall surfaces that change temperature slowly or have reduced response time to changes in space temperature. Response time is further reduced for thermostats with guards that restrict air flow over the thermostat. Anticipators are recommended on thermostats that are subjected to restricted air flow conditions and in small spaces for human occupancy, e.g., hotel guest rooms and offices.

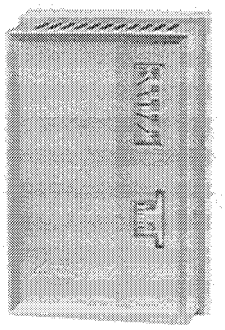
Standard Models Include (Company identification shown on cover and inserts.)



One (1) Blank cover insert
One (1) Cover insert with setpoint dial output
One (1) 5/64" Allen head screw for securing cover to thermostat base
One (1) 5/64" Allen wrench
Two (2) Dial stop pins to limit setpoint range
Two (2) Mounting screws



TC-110X with Digital Thermometer Kit Installed



Full Dial Cover Shown
(Covers must be ordered separately except as noted.)

Options for Schneider Electric only (for quantities of 24 or more each part number)

Add *dash-number* (-XXX) suffix to base part number for desired option. For metal covers, specify TC2-110X-XXX. All models include dial stop pins to limit setpoint range.

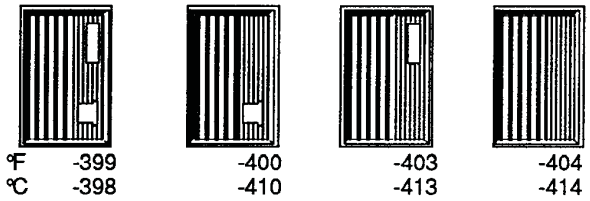


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Table-1 Specifications for Standard Models.

Part Number		Setpoint Dial Range	Company Identification
Plastic Cover	**Metal Cover**		
TC-1101	TC2-1101	55-85°F	Schneider Electric
TC-1101-116	TC2-1101-116	13-29°C	
TC-1101-500	TC2-1101-500	55-85°F	
TC-1101-602	TC2-1101-602	55-85°F	
TC-1101-770	-	55-85°F	Schneider Electric
TC-1102	TC2-1102	45-75°F	Schneider Electric
TC-1102-770	-	45 to 75	Schneider Electric
TC-1103	TC2-1103	75-105°F	Schneider Electric
TC-1103-602	TC2-1103-602	75 to 105	
TC-1103-770	-	75 to 105	Schneider Electric

Table-2 Agency Approvals

Configuration	Part Number	UL	CSA
Metal Cover Option[a]	TC2-1101 TC2-1101-116 TC2-1102 TC2-1103	NO	YES
Plastic Cover	TC-1101 TC-1101-116 TC-1101-770 TC-1102 TC-1102-770 TC-1103 TC-1103-770	YES	NO
24 VAC Parallel Heat Anticipation	TC-1101-500	NO	NO
24 Vac Night Depression	TC-1101-602 TC-1103-602	NO	NO

[a] Only available as factory assembly; do not convert from plastic to metal cover in the field. TC2-110x-500 and TC2-110x-602 are not CSA approved.

Table-3 Accessories.

Wholesale Number	Replaces Model	Description
20-695	10-15	Aspirating box, satin finish
20-707	10-53	Metal thermostat guard
20-712	10-59	Internal stop kit
20-715	10-62	Clear cover thermostat guard
20-850	—	Thermostat mounting plate
20-881	N2-4	Thermostat calibration wrench
21-473	10-73	Drywall mounting bracket
21-800	10-72	Setpoint adjustment cover (black)
21-801	10-81-48	Setpoint adjustment cover (Euro-white)
21-876	10-76	Opaque cover thermostat guard
22-022	—	Thermostat conversion kit
22-023	—	Thermostat conversion kit
22-138	MCS-GA	Branch tap gauge adaptor
900-002	—	Thermostat calibration kit

Table-4 Maximum Electrical Ratings

Switch Action	Full Load Amps		Locked Rotor Amps		Pilot Duty (VA)
	24/120 Vac	**240 Vac**	**24/120 Vac**	**240 Vac**	
Make for Heating	4.4 Orange to Brown Lead	2.2 Orange to Brown Lead	26.4 Orange to Brown Lead	13.2 Orange to Brown Lead	40 @ 24 Vac 210 @ 120/240 Vac
Make for Cooling	3.0 Orange to Red Lead	1.5 Orange to Red Lead	18 Orange to Red Lead	9 Orange to Red Lead	

ACCESORIES

AT-61 Series	Brushed bronze cover inserts
AT-82 Series	Digital thermometer Plastic cover kit (Schneider Electric)
AT-82-770	Digital thermometer plastic cover kit (Robertshaw)
AT-101	Lock cover kit
AT-104	Dial stop pins (NOTE: Pins included with each unit.)
AT-504	Plaster hole cover kit (small)
AT-505	Surface mounting base
AT-546	Auxiliary mounting base
AT-602	Selector switch sub-base DP4T
AT-603	Selector switch sub-base one DP4T, one DPDT
AT-1100 Series	Thermostat guards
PKG-1093	Digital thermometer battery replacement kit
TOOL-13	Contact burnishing tool

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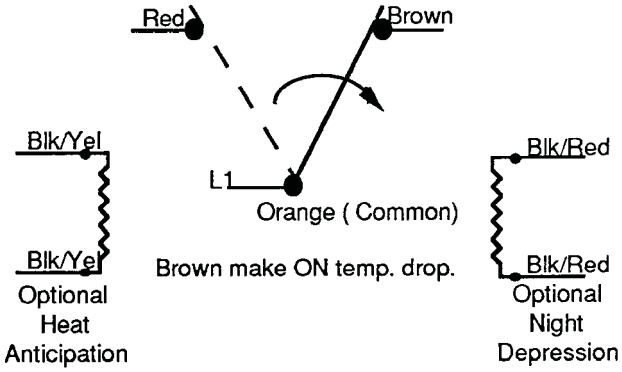

Figure-1 TC-1100 Series Switch Action and Lead Identification.

PRE-INSTALLATION

Inspection

Inspect the carton for damage. If damaged, notify the appropriate carrier immediately. If undamaged, open the carton and inspect the device for obvious damage. Return damaged products.

Required Installation Items

- Wiring diagrams
- Tools (not provided):
  - Volt-ohm meter
  - Appropriate screwdriver for mounting screws and terminal connections
- Appropriate accessories
- Mounting screws, two (2) provided for securing to a 2 x 4 conduit box

INSTALLATION

Caution:

1. Installer must be qualified, experienced technician.
2. Make all connections in accordance with the wiring diagram, and in accordance with national and local electrical codes. Class I wiring is required unless all circuits to contacts are powered from Class II source. *Use copper conductors only.*
3. Do not exceed ratings of the device.

Mounting

Thermostats require upright mounting on a properly flat vertical surface. Locate the thermostat where it will be exposed to unrestricted circulation of air which represents the average temperature of the controlled space.

Caution: Do not locate the thermostat near sources of heat or cold, such as lamps, motors, sunlight or concealed ducts or pipes, or where there is a danger of electrocution (i.e. shower rooms).

The thermostat is designed for service in any normally encountered human environment. Avoid locations where excessive vibration, moisture, corrosive fumes or vapors are present. NEMA Type 1 covers are intended for indoor use primarily to provide a degree of protection against contact with the enclosed equipment.

Thermostats with guards that restrict air flow must have heating or cooling anticipation.

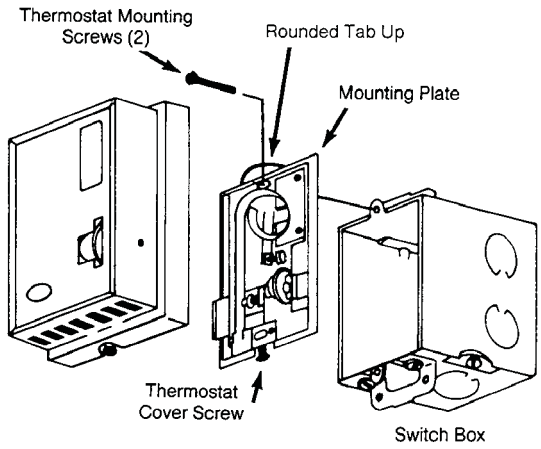

Figure-2 Thermostat Mounting

Procedure

1. Pull all wires.
2. Make electrical connections to thermostat. (Typical heat anticipation and night depression wiring diagrams are shown in Figures 7 through 9.)
3. Remove thermostat cover and fasten thermostat to box or wall.
4. Attach thermostat cover.

CHECKOUT

After installing a thermostat, make an initial check of the switching action. Verify the switch action by listening to and watching the switch contacts or by using a voltmeter between the proper sides of the switch.

1. Run the setpoint dial to a temperature above ambient. This should cause the thermostat to make a circuit between orange and brown leads.
2. Turn the setpoint dial setting down below ambient. This should cause the thermostat to make a circuit between orange and red leads.

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CALIBRATION (See Figure 3)

All thermostats are precision calibrated at the factory and normally will not require any further attention. However, if recalibration is necessary, proceed as follows:

1. Turn off control power and power to night depression circuit, where applicable.
2. Set setpoint dial to correspond to actual stable room temperature, as read from an accurate thermometer.
3. Remove thermostat cover. Do not breathe on the thermostat or handle excessively as this will affect the accuracy of the final calibration.
4. If contact blade is the made to left (red) contact, with a small screwdriver, turn calibration screw counterclockwise (looking at head of screw) until blade makes to right (brown) contact.

Note: Each complete turn of screw changes calibration approximately 15°F (8°C).

Now turn screw very slowly clockwise until blade just makes the left (red) contact. Thermostat is now properly calibrated.

If contact blade is originally made to the right (brown) contact, turn calibration screw slowly clockwise until element just makes the left (red) contact. Thermostat is now properly calibrated.

5. Replace thermostat cover.
6. Connect power to thermostat.
7. Recheck calibration about 30 minutes later to be sure heat from handling of or breathing on bimetal element did not result in an erroneous setting.

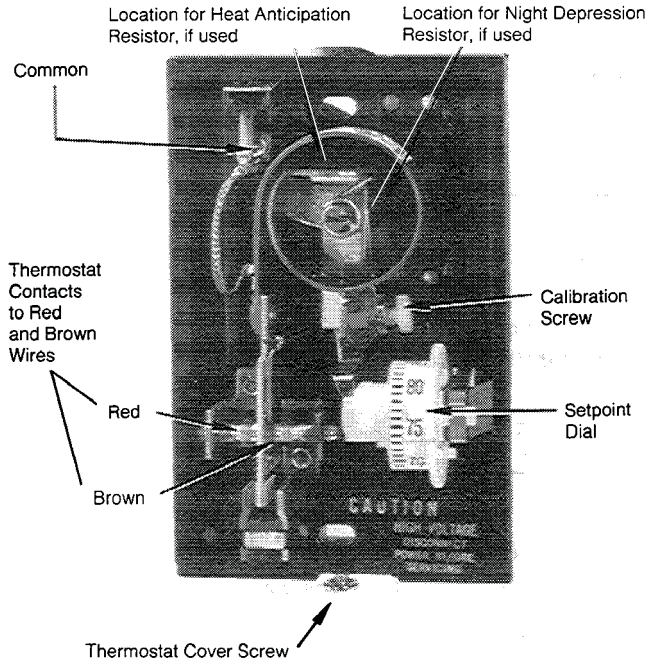

Figure-3

HEAT ANTICIPATION (See Figures 7 and 8)

Parallel heat anticipation is recommended for :

- Systems with excess heating capacity that can cause objectionable space temperature swings.
- Thermostats mounted on walls (i.e., concrete) that change temperature slowly and/or have insufficient air flow over the device.

COOLING ANTICIPATION (See Figure 8)

Parallel cooling anticipation is recommended for:

- Cooling anticipations where current draw exceeds 1 ampere. Cooling lockout (self heat of the thermostat causing over cooling of the space) can occur on these applications.
- Systems with excess cooling capacity that can cause objectionable space temperature swings.
- Thermostats mounted on walls (i.e., concrete) that change temperature slowly and/or have restricted air flow over the device.

CONCEALED CONTROL DIAL

Knurled Dial Removal (See Figure 4)

1. Remove thermostat cover.
2. Secure the control dial with hand so that the dial will not rotate.
3. Place needle nose pliers at knurled ring of the control dial at the points where the knurled ring is attached to the control dial.
4. Twist the pliers at each knurled ring attachment point until the entire knurled ring of the control dial is removed.

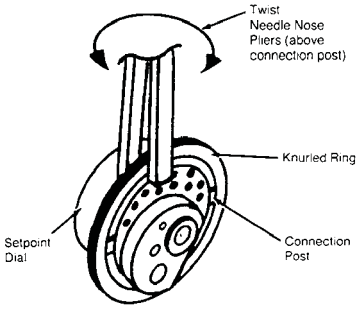

Figure-4 Knurled Dial Removal.

LIMIT CONTROL DIAL RANGE

Dial Stop Pin Insertion (See Figure 5)

1. Remove thermostat cover.
2. Secure the control dial with hand so that the dial will not rotate.
3. Place a dial stop pin in the jaws of a needle nose pliers.
4. Insert the dial stop pin in the appropriate hold on either (or both) side(s) of the control dial to restrict dial rotation.

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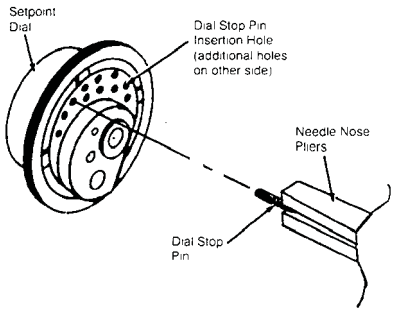

Figure-5 Dial Stop Pin Insertion.

COVER INSERT INSTALLATION (See Figure 6)

1. Select appropriate cover insert.

Note: If blank insert is used, the knurled ring must be removed from the setpoint dial. See Knurled Dial Removal. Also, remove dial window by sliding and/or pressing window from front of cover.

2. Remove protective backing and protective skin on face of cover insert.
3. Press insert uniformaly on thermostat with logo in lower left-hand corner.

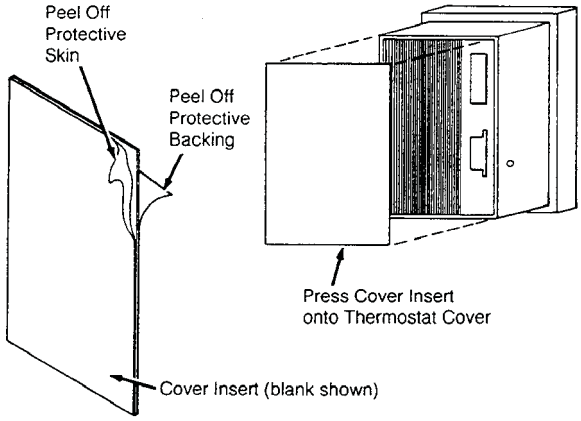

Figure-6 Cover Insert Installation.

MAINTENANCE

Regular maintenance of the total system is recommended to assure sustained optimum performance.

Open areas at bottom and around base of thermostat should be kept clean and free from obstructions to allow proper flow of air. If switch contacts need cleaning, this may be done with TOOL-13 (burnishing tool).

Note: Thermostat may require calibration after cleaning the contacts.

REPAIR

These thermostats are not field repairable. Replace entire device.

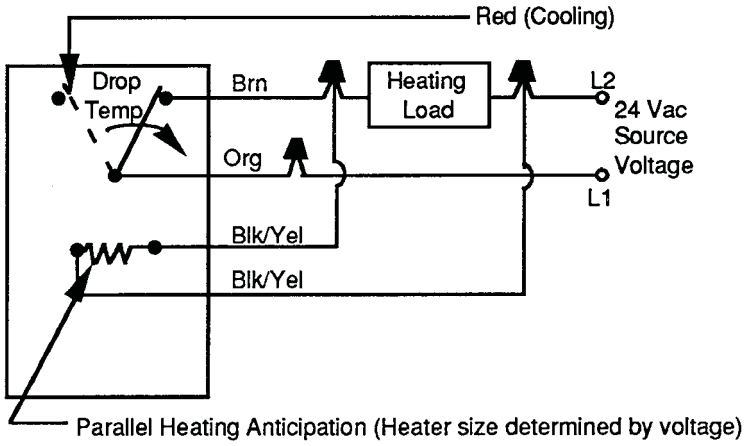

Figure-7 TC-110x-500 Typical of Parallel Heat Anticipation.

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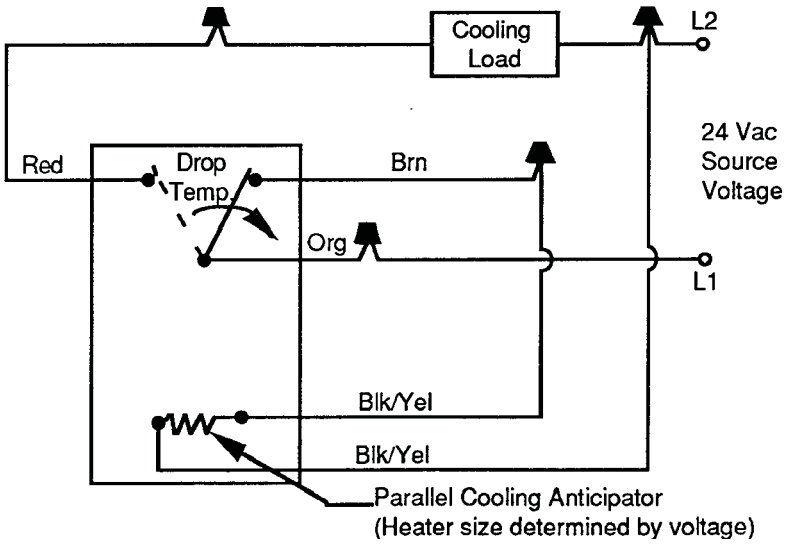

Figure-8 TC-110x-500 Typical of Parallel Cooling Anticipation.

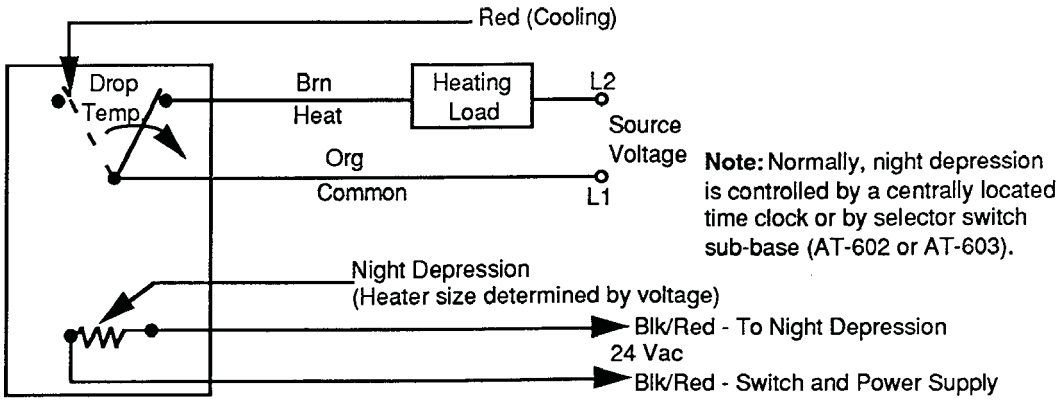

Figure-9 TC-110x-602 Typical of Night Depression.

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F-18785-10

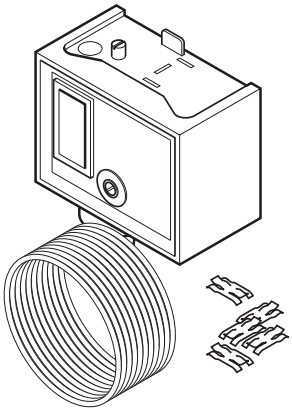
TC-5231 Series, TC-5232, & TC-5241 Series

Low Temperature Thermostats
General Instructions

Application

The TC-5231, TC-5232, and TC-5241 low temperature thermostats are used to control temperature in air conditioning or refrigeration systems. The low temperature thermostat measures the coldest one-foot section along the entire 20-foot sensing element.

The low temperature thermostats are applicable to various applications such as: low temperature control of steam coils; frost indication in storehouses or orchards; temperature control of freezer cabinets, display cases, beverage coolers, milk cooling tanks, and air conditioners.



Features

- 20 ft. (6.1 m) element senses temperature over a large area. Control responds to coldest one-foot section of the sensor.
- Adjustable setpoint from 35 to 60°F (1.7 to 15.5°C) with 5°F (3°C) fixed differential.
- SPDT and DPST versions.
- Rated for use at 17 full load amps (120/208/240 Vac), 24 non-inductive amps (120/208/240 Vac), and 16 non-inductive amps (24 Vac). Capable of controlling refrigeration equipment directly.
- UL and CSA approved.
- Capillary clips provided.

Applicable Literature

- Electric/Electronic Products Catalog, F-27382
- Environmental Controls Application Manual, F-21335

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SPECIFICATIONS

Setpoint Dial Range: Dual marked 35 to 60°F (1.7 to 15.5°C).

Sensing Element: Vapor pressure type, copper construction.

Response: To lowest temperature sensed by any one-foot section of its element. Altitude causes the control to operate approximately 1°F colder per 1000 ft. of elevation.

Differential: 5°F (3°C) fixed.

Electrical Switch: Snap action SPDT or DPST. Refer to Table-1.
Ratings, Refer to Table-1 and Table-2.

Connections:
TC-52xx, Screw terminals.

Mounting: In any position on any surface not subject to excessive vibration.

Housing: Molded gray PVC plastic cover with a zinc-plated steel main enclosure with a 1/2 in. conduit opening.

Ambient Temperature Limits:
Shipping and Storage, -40 to 150°F (-40 to 66°C).
Operating, Must be 5°F (3°C) above setpoint to a maximum of 150°F (66°C) at case.
Thermal Sensing Element, 300°F (149°C).

Humidity:
Enclosure, 5 to 95% RH, non-condensing.
Thermal Sensing Element, 0 to 100% RH.

Enclosure Rating: NEMA Type 1.

Dimensions:
Case, 2.7 H x 3.44 W x 1.97 D in. (69 x 87 x 50 mm).
Element, 3/32 in. O.D. x 20 ft. length (2.4 mm x 6.1 m).

Agency Approvals: UL 873 Temperature-Indicating and -Regulating Equipment and CSA Certified.

Table-1 Model Chart.

Model Number	Device Type	Electrical Switch	Voltage Vac	Full Load Amps	Locked Rotor Amps	Pilot Duty (VA)	Non-Inductive Amps
TC-5231	Low temp auto reset	SPDT[e]	24[a]	—	—	100	16
			120	17	102	720	24
			208				
			240[c]				
			277	—	—	—	7.2
TC-5232	Low temp auto reset	DPST[d]	24[a]	—	—	100	16
			120[c]	24	144	125	24
			208[c]				
			240[c]				
			277	—	—	—	7.2
TC-5241	Low temp manual reset[b]	SPDT[e]	24[a]	—	—	100	16
			120	17	102	720	24
			208				
			240[c]				
			277	—	—	—	7.2

[a] Less than 0.5 Amp is not recommended.
[b] Reset cannot be accomplished until the sensed temperature is at least 5°F above setpoint.
[c] Full load and locked rotor ratings are suitable for hermetic compressors only.
[d] Limit two separate circuit loads with common return to < 5885 VA. Only one load may be a motor load.
[e] Do not exceed pilot duty rating on one side of switch.

Table-2 DC Ratings for TC-5232 Only.

Volts	FLA	LRA	NIA	PD VA
120	4.6	46	3	57.5
240	2.3	23	0.5	57.5
600	—	—	—	57.5

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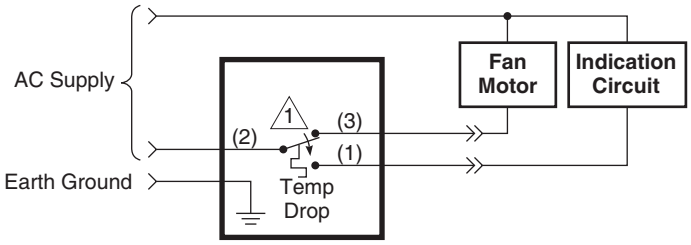
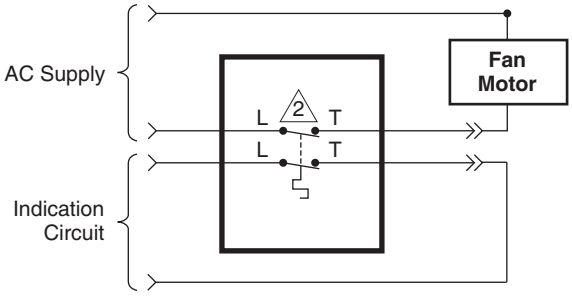
TYPICAL APPLICATIONS (wiring diagrams)



1 Terminals (2) and (1) close on temperature drop.

Figure-1 TC-5231 and TC-5241 Typical Application.



2 Terminals L-T open on temperature drop.

Note: Contacts are not rated for dry circuit applications. Less than 1 Amp is not recommended.

Figure-2 TC-5232 Typical Application.

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INSTALLATION

Inspection

Inspect the package for damage. If damaged, notify the appropriate carrier immediately. If undamaged, open the package and inspect the device for obvious damage. Return damaged products.

Requirements

- Job wiring diagrams
- Tools (not provided):
  - Voltage meter/indicator
  - Appropriate drill and drill bit for mounting screws
  - Appropriate screwdrivers and wrenches
- Mounting screws, two (2) #10 maximum (not provided)
- Capillary mounting clips (5 provided)
- Training: Installer must be a qualified, experienced technician

WARNING

- The TC-5231 series, TC-5232, and TC-5241 series devices are designed for use *only* as operating controls. Where an operating control failure would result in personal injury and/or loss of property, it is the responsibility of the installer to add devices (safety, limit controls) that protect against, or systems (alarm, supervisory systems) that warn, of control failure.
- Disconnect the power supply (line power) before and during installation to prevent possible electrical shock and equipment damage.
- Make all connections in accordance with the wiring diagram and in accordance with the National and Local Electrical Code. *Use copper conductors only.*
- Do not restore electrical power until installation is complete.

CAUTION

- Do not exceed the electrical ratings indicated on the label inside the cover of the device.
- Avoid locations where excessive moisture, corrosive fumes, or vibration are present. Use only in locations suitable for NEMA Type 1 rated devices.

Mounting

CAUTION

- Do not kink the capillary or the thermostat will be damaged.
- To achieve optimum performance, do not mount the thermal element in a vertical pattern.

1. Select a location that permits proper capillary routing. It is important not to twist or strain the control body or shifting of the calibration may result.

NOTE

- Use only the mounting holes provided in the control frame. Make sure the mounting surface is flat. Mounting the device to an uneven surface may cause improper control operation.
- Do not let any part of the capillary touch any surface that is colder than the desired sensing area.
- Do not crush or deform the sensing element when clamping.
- Do not cut the capillary or bulb. Avoid sharp bends, kinks, strains, or pinch marks in the capillary. Never allow the capillary to rest against sharp edges or rub against metal surfaces.

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2. Provide a drip loop in the capillary if the body is mounted in any position other than upright. The thermal element is usually located on the downstream side of the coil.
3. Allow slack so that the capillary is not taut. Install the thermal element securely in the controlled media for maximum sensing capability and minimum vibration damage.
4. Serpentine the element in a horizontal pattern so that it is exposed to all areas where low temperatures are possible. See Figure-3.
5. Secure the element into place using the five capillary clips provided.
6. Remove the cover. See Figure-4.
7. Mount the case with two screws (#10 maximum) in the screw slots in the back of the case. See Figure-6.
8. Connect the appropriate wiring. Follow the wiring instructions in the Wiring section.

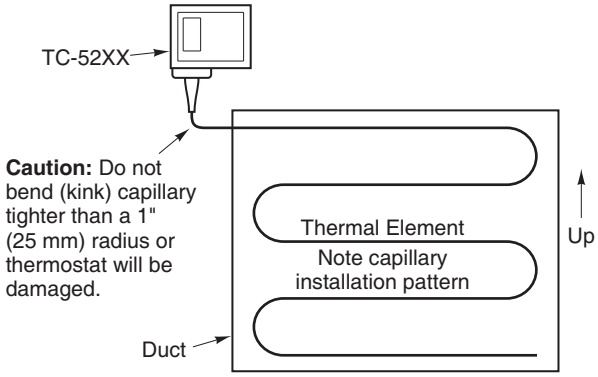

Figure-3 Thermal Element Location.

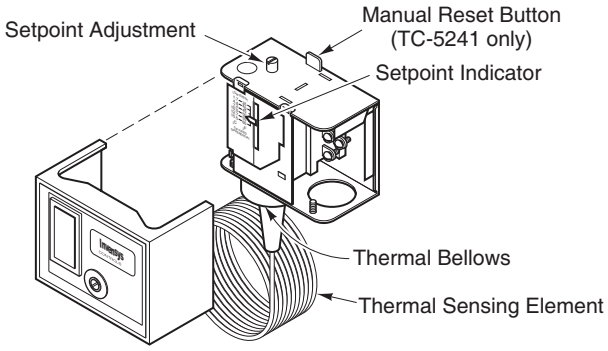

Figure-4 TC-52xx with Cover Removed.

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Wiring

NOTE

Do not adjust the pointer beyond the highest and lowest marks on the scaleplate. The scaleplate is only for reference, and the final settings should be verified with a thermometer.

▼ ***CAUTION***

The terminals must not be bent, cut off, drilled, or retapped.

1. Provide a drip loop in the wiring to prevent water from reaching the thermostat.
2. Loosen the green grounding screw provided on the TC-52xx case to connect the unit to earth ground.
3. Loosen the terminal screws and make the appropriate power wiring connections to the numbered terminals. The TC-52xx case has an opening for a 1/2 in. conduit fitting. See Figure-1 and Figure-2 for TC-52xx models.
4. Replace the cover.
5. Adjust the setpoint by turning the setpoint screw until the scale pointer is properly positioned.
6. Check for proper operation of the device. Follow the instructions in the Checkout section.
7. At initial start-up of the equipment, observe the capillary for excessive vibration and make corrections as required.

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CHECKOUT

▼ ***CAUTION***

The unit includes a mechanical stop to prevent adjustment below 35°F (2°C). Do not attempt to set below 35°F (2°C), or the device may be damaged.

1. If the ambient temperature at the thermal element is within the 35 to 55°F (2 to 13°C) setpoint range, turn the adjustment screw located in the top of the case until the setpoint exceeds the ambient temperature. Confirm that the snap acting switch has operated.
2. Turn the setpoint adjustment screw until the indicating pointer is at the desired setpoint temperature.
3. On the TC-5241 model, push the manual reset button to put the thermostat into service.

Manual Operation of Switch

▼ ***CAUTION***

- When the sensed temperature is below setpoint, the switch is open (terminals 2–3 on TC-52x1 and terminals L–T on TC-5232), and the tab at the end of the bellows lever is down. The switch can be momentarily closed by lifting the tab with a screwdriver. See Figure-5.
- Do not attempt to manually operate the thermostat in any other way as this can damage equipment and void the warranty.

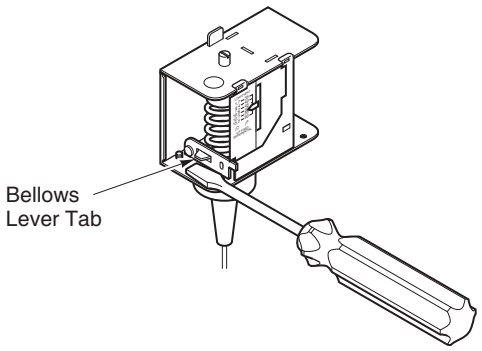

Figure-5 Manual Operation of Switch on TC-5231 and TC-5241.

CALIBRATION

All thermostats are precision calibrated at the factory.

REPAIR

This thermostat is not field repairable. Replace the device if necessary.

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DIMENSIONAL DATA

Dimensions are shown in inches (millimeters).

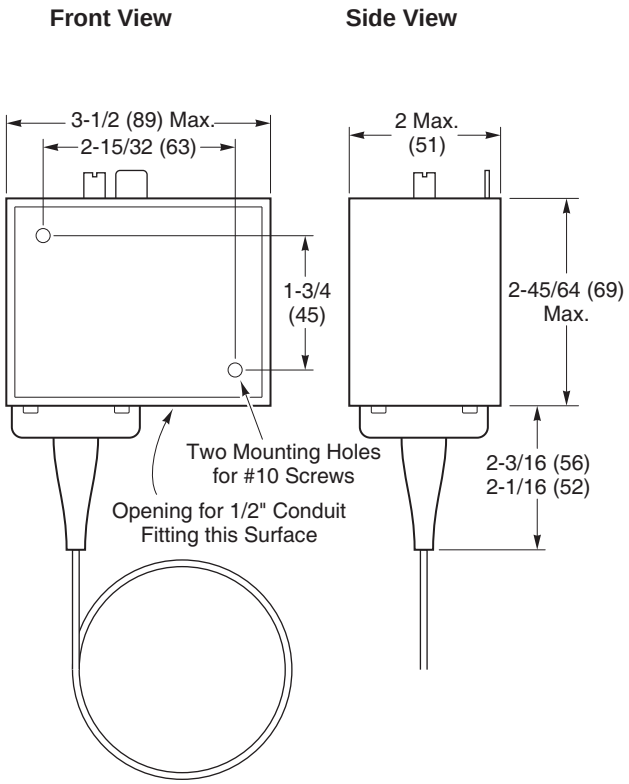

Figure-6 TC-52xx Mounting Dimensions.

On October 1st, 2009, TAC became the Buildings business of its parent company Schneider Electric. This document reflects the visual identity of Schneider Electric, however there remains references to TAC as a corporate brand in the body copy. As each document is updated, the body copy will be changed to reflect appropriate corporate brand changes.

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www.schneider-electric.com/buildings

Standard Duct and Wall CO_2 Sensors

CDE & CWE Series

SPECIFICATIONS

3 Year Warranty

Input Power	Class 2; 20 to 30VDC/24AC 50/60Hz; 100mA max.
Analog Output	4-20mA (clipped & capped)/0-10VDC (selectable)
Operating Temp Range	0° to 50°C (32° to 122°F)
Operating Humidity Range	0 to 95% RH noncondensing
Housing Material	High impact ABS plastic
Terminal Block Torque *CDE* *CWE*	 0.5-0.6N-m (4.4-5.3 in-lbf) max. 0.2N-m (2.0 in-lbf) max.
Terminal Block Wire Size *CDE* *CWE*	 24-12 AWG (0.25-2.5mm²) 28-20 AWG (0.08-0.5mm²)
Sensor Type	Non-dispersive infrared, diffusion sampling
Output Range	0-2000 ppm
Accuracy	±30 ppm ±2% of measured value*
Repeatability	±20 ppm ±1% of measured value
Response Time	<60 seconds for 90% step change

RTD/Thermistors in wall housings are not compensated for internal heating of product. EMC Conformance: Low voltage directive 2006/95/EC & EMC directive 2004/108/EC. EMC Special Note: Connect this product to a DC distribution network or an AC/DC power adaptor with proper surge protection (EN 61000-6-1:2007 specification requirements).

** Measured at NTP*

Note: Rough handling and transportation may cause a temporary reduction of CO_2 sensor accuracy. With time, the ABC function will tune the readings back to the correct accuracy range. The default tuning speed is limited to 30 ppm per week.

Field-Selectable 4-20mA/0-10VDC Output

FEATURES

- *Microprocessor-based design increases accuracy and reduces installation time*
- *Non-dispersive infrared technology repeatable to ±20 ppm ±1% of measured value...high accuracy measurements*
- *Innovative self-calibration algorithm...easy to maintain*
- *5-year calibration interval (recommended)*
- *Low ambient sensitivity*
- *Output 4-20mA/0-10V for flexible control system interface*
- *3-year factory warranty from date of purchase*

DESCRIPTION

The **CDE** and **CWE** are non-dispersive infrared (NDIR) sensors designed for measuring environmental CO_2 concentration in ventilation systems and indoor living spaces. Their measurement range of 0-2000 ppm makes them compliant with ASHRAE and other standards for ventilation control

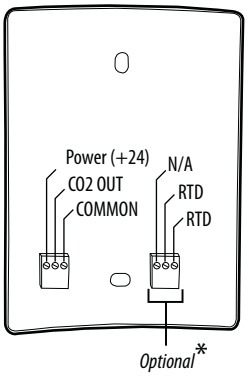
The **CWE/CDE Series** provides a user-selectable 4-20mA or 0-10VDC output for versatility. Microprocessor-based digital electronics & a unique self-calibration algorithm improves long-term stability & accuracy.

APPLICATIONS

- *Controlling ventilation in response to occupancy*
- *Facilitating compliance with ASHRAE 62.1 standard for air quality*
- *Office buildings, conference rooms, schools, retail stores, etc.*

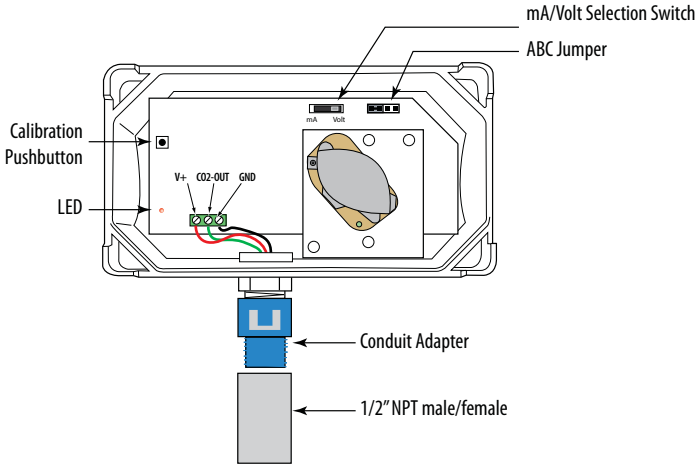
WIRING DIAGRAMS

CWE Wall Mount



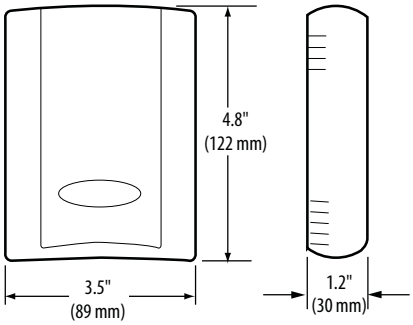
** Note: Connector blocks and headers for optional features are not included with non-option models.*

CDE Duct Mount

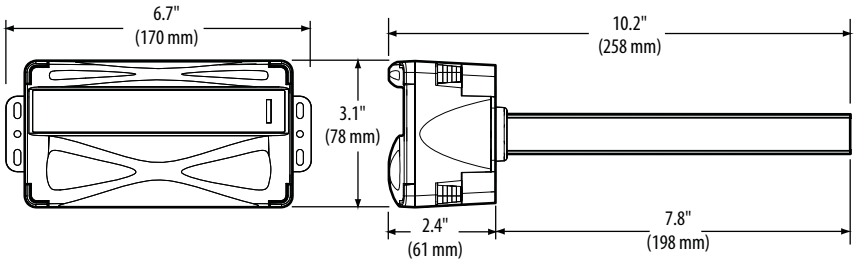


DIMENSIONAL DRAWINGS

CWE Wall Mount



CDE Duct Mount



ORDERING INFORMATION

CE

Duct Mount

CDE *(No Options)*

Wall Mount, Temp. Option

Sensor Type

CWE [ ]

SB = 100R Platinum, RTD
SC = 1k Platinum, RTD
SD = 10k T2, RTD, Thermistor
SE = 2.2k, Thermistor
SF = 3k, Thermistor
SG = 10k CPC, Thermistor
SH = 10k T3, Thermistor
SJ = 10k Dale, Thermistor
SK = 10k w/11k shunt, Thermistor
SM = 20k NTC, Thermistor
SN = 1800 ohm, Thermistor
SR = 10k US, Thermistor
SS = 10k 3A221, Thermistor
ST = 100k, Thermistor
SU = 20k "D" Thermistor
SW = 10k T2 high accuracy, Thermistor
SY = 10k T3 high accuracy, Thermistor
SZ = 10k E1, Thermistor

Housing

[ ]

Blank = Cloud white
B = Black

Example:

CWE [SH] [B]

Wall Mount, No Temp. Option

Housing

CWE [ ]

Blank = Cloud white
B = Black

Example:

CWE [B]

ACCESSORIES

Calibration kits and gases (AA01, AA26, AA27, AA28, AA29)
Handheld air quality testers (1010, 1008, 770)
Replacement covers for wall units (AA51, AA51B)
Replacement cloud white wall housing (AA55)

1010

AA01

AA55

AA51/AA51B

Deluxe Duct & Outdoor Humidity Sensors

HD & HO Series

1% or 2% NIST, or Standard 2%, 3%, or 5%

FEATURES

- *Thin-film capacitive sensor element recovers from 100% saturation*
- *Fully interchangeable element to 1%, 2%, 3%, or 5% accuracy...no calibration (1% not available on HO models)*
- *Replace element in the field...maintain accuracy and minimize downtime*
- *Duct sensor element can be serviced without disturbing conduit*
- *Polarity insensitive two-wire 4-20mA or 3-wire 0-5/0-10VDC versions...flexible systems compatibity*
- *Potted circuitry prevents costly condensate shorts*
- *Calibration-free interchangeable NIST traceable HS element*
- *HS element is microprocessor profiled with on-board nonvolatile memory*
- *Multi-point digital calibration to NIST standards*
- *NIST certification available*
- *Minimizes field calibration downtime*

DESCRIPTION

HD & **HO Series** Deluxe humidity transmitters provide an ideal solution for measuring relative humidity in a wide range of conditions. All devices are equipped with a thin-film capacitive sensor that is easily replaceable in the field. These sensors are calibrated to NIST standards, with certificates available (see Ordering Information; choose "N" in NIST block). Temperature sensing options are also available. The duct mounted HD is encased in a die cast metal housing for extra strength. The outdoor HO housing is completely weather proof – the most rugged sensor available. All Deluxe HD and HO models come with a standard five-year warranty.†

SPECIFICATIONS

5 Year Warranty

INPUT POWER	
Voltage Model*	Class 2; 12-30VDC/24VAC, 15mA max.
mA Model	Class 2; Loop powered 12-30VDC only, 30mA max.
OUTPUT	
Voltage Model	3-wire, observe polarity
mA Model	2-wire, not polarity sensitive (clipped and capped)
HUMIDITY	
HS Element†	Digitally profiled thin-film capacitive (32 bit mathematics) U.S. Patent 5,844,138
Accuracy at 25°C from 10-80% RH (Multi-point calibration, NIST traceable)**	HD only: ±1% at 20-40% RH in mA output mode; (multi-point calibration, NIST traceable) all models: 2%, 3%, or 5% (specify)
Temperature Effect, Duct Model	±0.1% RH/°C above or below 25°C (typical)
Temperature Effect, Outdoor Model	4-20mA version: (0.0013x%RHx(T°C-25)); 0-5 V/0-10V versions: (0.0015x%RHx(T°C-25))–(%RHx0.0008xabs(T°C-25))
Scaling	0-100% RH
Hysteresis	1.5% typical
Linearity	Included in accuracy spec.
Reset Rate***	24 hours
Stability	±1%@20°C (68°F) annually, for two years
TEMPERATURE	
Optional Temp Transmitter Output *HO Transmitter Accuracy* *HD Transmitter Accuracy*	Digital, 4-20mA (clipped & capped) or 0-5V/0-10V output ±1.3°C (±2.3°F) typical; ±0.5°C (1.0°F) typical
OPERATING ENVIRONMENT	
Operating Humidity Range	0 to 100% RH noncondensing
Operating Temp Range	-40° to 50°C (-40° to 122°F)

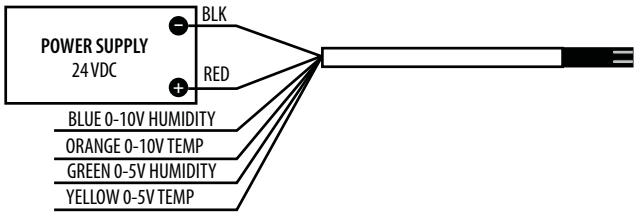
† All Deluxe models come with a standard five-year warranty. The HS sensing element has a 1-year warranty. The element is not a part of the 5-year product warranty.
** One side of transformer secondary is connected to signal common, so an Isolation transformer or dedicated power supply may be required.*
*** Specified accuracy with 24VDC supplied power with rising humidity. RTD/Thermistors are not compensated for internal heating of product.*
**** Reset Rate is the time required to recover to 50% RH after exposure to 90% RH for 24 hours.*
Shielded cabling is required for conformance to EMC standards. Technical information is available from factory upon request or is available on our website: www.veris.com.
EMC Conformance - CE Option: Low Voltage Directive 2006/95/EC and EMC Directive 2004/108/EC.
EMC Special Note: Connect this product to a DC distribution network or an AC/DC power adaptor with proper surge protection (EN 61000-6-1 specification requirements).

APPLICATIONS

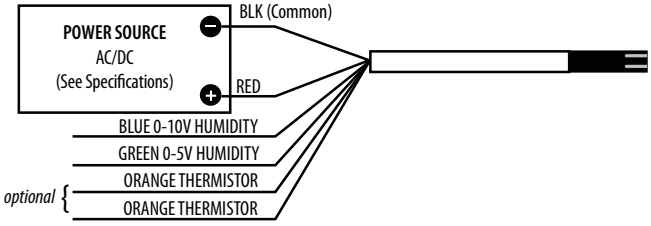
- *Controlling HVAC systems for improved comfort & energy savings*
- *Museums, schools, printing shops, and other locations requiring humidity control*
- *Facilitating compliance with ASHRAE standards for environmental control and indoor air quality*

WIRING DIAGRAMS

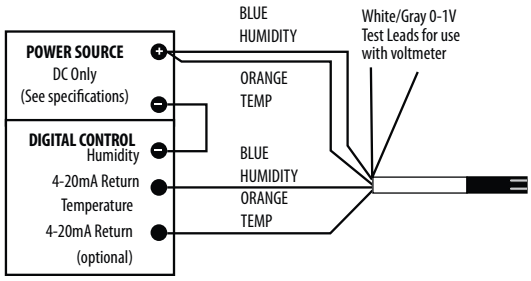
HD/HO 0–5V/0–10V Temperature Transmitter Versions



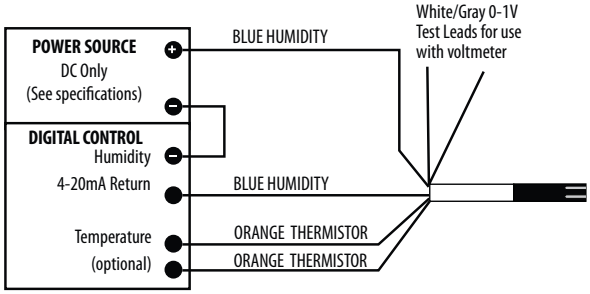
HO (0–5V/0–10V Resistance Versions)



HD/HO 4-20mA Temperature Transmitter Versions

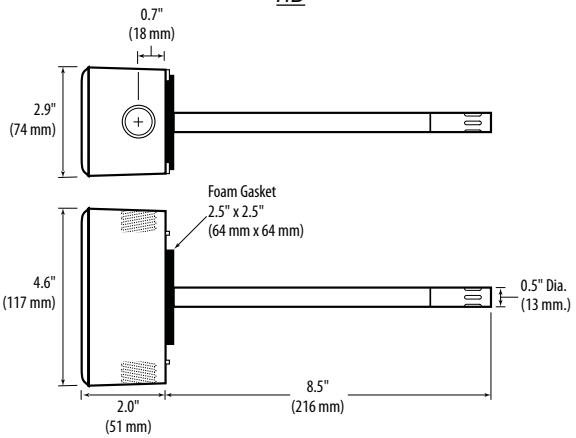


HO 4-20mA Resistance Versions

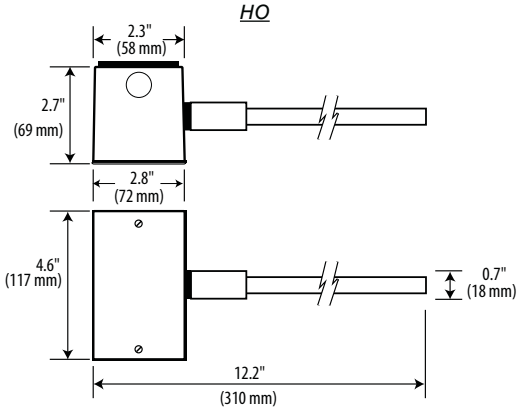


DIMENSIONAL DRAWINGS

HD



HO



ORDERING INFORMATION

Enclosure	Accuracy	NIST	Output	US or EU	Temp.
H					
D = RH Duct **O** = Outdoor	**1** = 1%* **2** = 2% **3** = 3% **5** = 5%	**N** = NIST 1% & 2% only **X** = None 2%, 3%, 5% only	**M** = 4-20mA **V** = 0-5V/0-10VDC	**S** = Standard **C** = CE	**T** = Temp **X** = No Temp (Stop here)

**1% not available on HO*

Example: (No Temp)

H	O	2	X	M	S	X

Example: (With Temp)

H	D	2	N	V	C	T	C	2

Humidity Transmitter Combination

Sensor Type	Range	OPTION Temp Cert
A = Transmitter	**1** = -40° to 50°C (-40° to 122°F) **2** = 0° to 50°C (32° to 122°F)	**Blank** = None **1** =1pt Cal **2** = 2pt Cal

Humidity RTD/Thermistor Combination

Sensor Type	OPTION Temp Cert
B = 100R Platinum, RTD **C** = 1k Platinum, RTD **D** = 10k T2, Thermistor **E** = 2.2k, Thermistor **F** = 3k, Thermistor **G** = 10k CPC, Thermistor **H** = 10k T3, Thermistor **J** = 10k Dale, Thermistor **K** = 10k with 11k shunt, Thermistor **M** = 20k NTC, Thermistor **N** = 1800 ohm TAC, Thermistor **Q** = 1uA/˚C, Linitemp **R** = 10k US, Thermistor **S** = 10k 3A 221, Thermistor **T** = 100k, Thermistor **U** = 20k "D", Thermistor **W** = 10k T2 high accuracy, Thermistor **Y** = 10k T3 high accuracy, Thermistor **Z** = 10k E1, Thermistor	**Blank** = None **1** =1pt Cal **2** = 2pt Cal

ACCESSORIES

Water guard (AA42)
Replacement humidity element (HS)

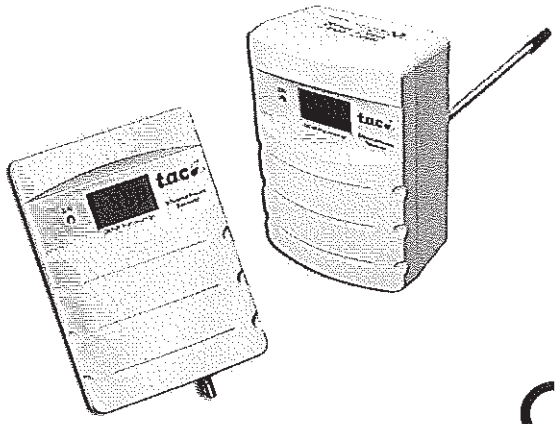
AA42

HS

EPP-EPD-EPU SERIES

EPP-EPD-EPU SERIES

Digital Pressure Transducer Dry Media



NOTICE

- This product is not intended for life or safety applications.
- Do not install this product in hazardous or classified locations.
- Read and understand the instructions before installing this product.
- Turn off all power supplying equipment before working on it.
- The installer is responsible for conformance to all applicable codes.

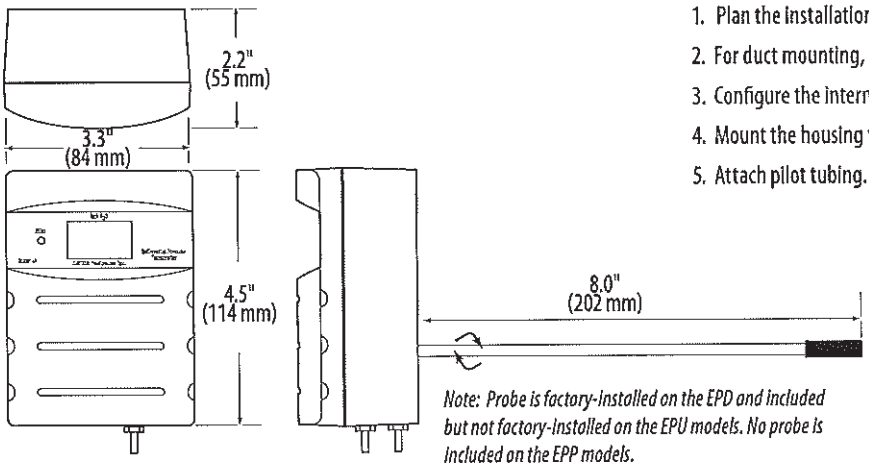
PRODUCT IDENTIFICATION

	Enclosure	Range	Local Display
EP	□	□	□
	D = Duct P = Panel	101 = 0-1"W.C./0-250Pa 102 = 0-10"W.C./0-2.500kPa	Blank = No Display -LCD = LCD Display

	Enclosure	Range	Local Display
EP	U	105	□
	= Universal	= 0-10"W.C./0-2.500kPa	Blank = No Display -LCD = LCD Display

EPU105-LCD

DIMENSIONS



Note: Probe is factory-installed on the EPD and included but not factory-installed on the EPU models. No probe is included on the EPP models.

Installer's Specifications

Media Compatibility	Dry air or inert gas
Input Power	12-30VDC, or 24VAC nominal
Output	Field-selectable: 2-wire, loop-powered 4-20mA (DC only, clipped and capped), or 3-wire 0-5V/0-10V
Pressure Ranges:	
EPD101/EPP101	Unidirectional: 0.1/0.25/0.5/1.0" W.C. F.S., switch selectable Bidirectional: ±0.1/±0.25/±0.5/±1.0" W.C. F.S., switch selectable Unidirectional: 25 Pa/50 Pa/100 Pa/250 Pa, F.S., switch selectable Bidirectional: ±25 Pa/±50 Pa/±100 Pa/±250 Pa, F.S., switch selectable
EPD102/EPP102	Unidirectional: 1.0/2.5/5.0/10" W.C. F.S., switch selectable Bidirectional: ±1.0/±2.5/±5.0/±10" W.C. F.S., switch selectable Unidirectional: 0.250 kPa/0.500 kPa/1.000 kPa/2.500 kPa, F.S., switch selectable Bidirectional: ±0.250 kPa/±0.500kPa/±1.000 kPa/±2.500 kPa, F.S., switch selectable
EPU105	Unidirectional: 0.1/0.25/0.5/1.0/2.5/5/10" W.C. F.S., switch selectable Bidirectional: ±0.1/0.25/0.5/1.0/2.5/5/10" W.C. F.S., switch selectable Unidirectional: 25Pa/50Pa/100Pa/250Pa/0.5kPa/1kPa/2.5kPa F.S., switch selectable Bidirectional: ±25Pa/50Pa/100Pa/250Pa/0.5kPa/1kPa/2.5kPa F.S., switch selectable
Response Time	Standard: T95 in 20 sec, Fast: T95 in 2 sec, Jumper selectable
Mode	Unidirectional or bidirectional, jumper selectable
Display (option)	Signed 3-1/2 digit LCD, indicates pressure, overrange indicator
Proof Pressure	3 psid (20.6kPa)
Burst Pressure	5 psid (34.5kPa)
Accuracy	±1% F.S. (Combined linearity and hysteresis)
Temperature Effect	1" (250Pa) models: 0.05%/°C; 10" (2.5kPa) models: 0.01%/°C (Relative to 25°C) 0° to 50°C (32° to 122°F)
Zero Drift (1-year)	1" (250Pa) models: 2.0% max.; 10" (2.5kPa) models: 0.5% max.
Zero Adjust	Pushbutton auto-zero and digital input (2-pos terminal block)
Operating Environment	0°- 60°C (32° to 140°F); 0 to 90% RH non-condensing
Fittings	Brass barb; 0.24" (6.1mm) o.d.
Physical	UL 94 V-0 Fire Retardant ABS

EMC Conformance: EN 61000-6-3:2001 Class B, EN 61000-6-1:2001, EN 61000-3-2:2000, EN 61000-3-3:2001, EMC Test Methods: CISPR 22:1997 (Amended A1:2000, Class B A2:2002), IEC 61000-4-2:2002, IEC 61000-4-3:2006, IEC 61000-4-4:2004, IEC 61000-4-5:2001, IEC 61000-4-6:2004, IEC 61000-4-8:2001, IEC 61000-4-11:2004. EMC Special Note: Connect this product to a DC distribution network or an AC/DC power adaptor with proper SURGE PROTECTION (EN 61000-6-1:2001 specification requirements).

QUICK INSTALL

1. Plan the installation. Panel or duct mount?
2. For duct mounting, thread the probe into the rear of the device housing.
3. Configure the internal tubing for the selected installation method.
4. Mount the housing vertically.
5. Attach pilot tubing.

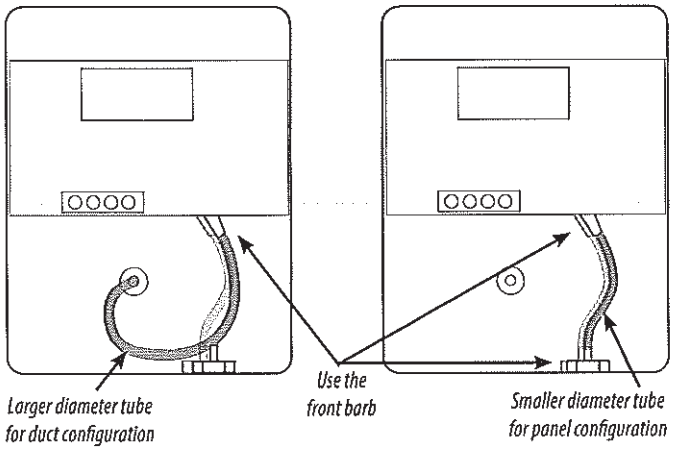
ACCESSORIES

AA54 Duct Probe Replacement Kit.

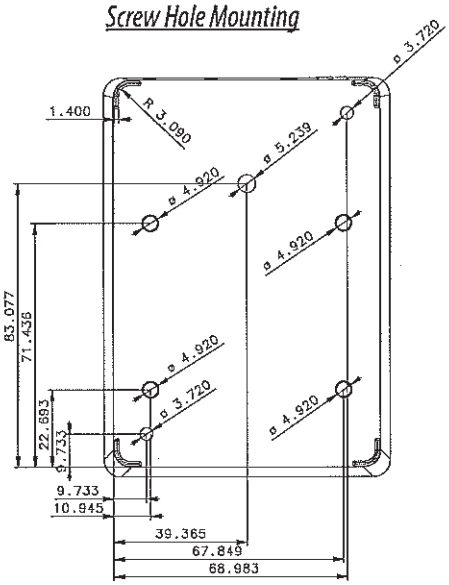
INSTALLATION

1. Plan the installation. Panel or duct mount?
2. For duct mount applications, thread the probe into the back of the device housing.
3. Configure the internal tubing for the selected installation method as shown below. Use the larger diameter tubing for the duct mount configuration.

Tubing for Duct Mount *Tubing for Panel Mount*



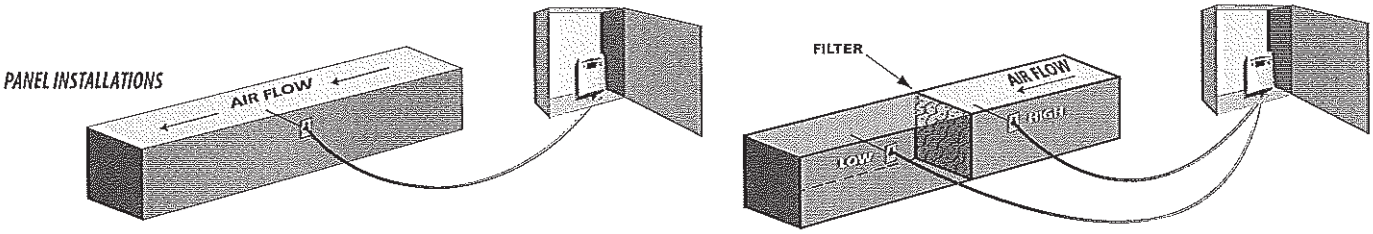
Screw Hole Mounting



4. Mount transducer (see the screw hole diagram, right). Position transducer vertically.

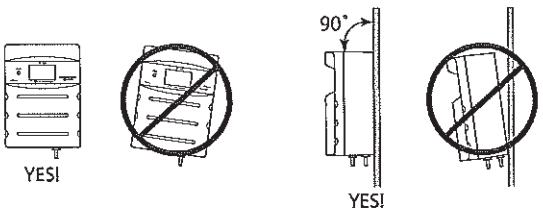
Static Pressure *Differential Pressure*

PANEL INSTALLATIONS



Static Pressure *Differential Pressure*

DUCT INSTALLATIONS



5. Determine length of pilot tubing needed.

WIRING & CONFIGURATION

Connect transmitter to control system and power supply as indicated below.
Optional: Connect ZERO terminals to digital output (contact closure) of control system.
Use switch to select voltage (V) or current (mA) mode.
Jumper JP4: select 0-10V or 0-5V output span. (Voltage mode only).
Jumper JP5: select bidirectional or unidirectional mode.
Jumper JP7: select inches W.C. or Pascal scale
Jumper JP8: select fast or standard response time.
Align the arrow (not the slot) on the rotary switch to desired full-scale range. LCD models will momentarily indicate selected range.

OPERATION

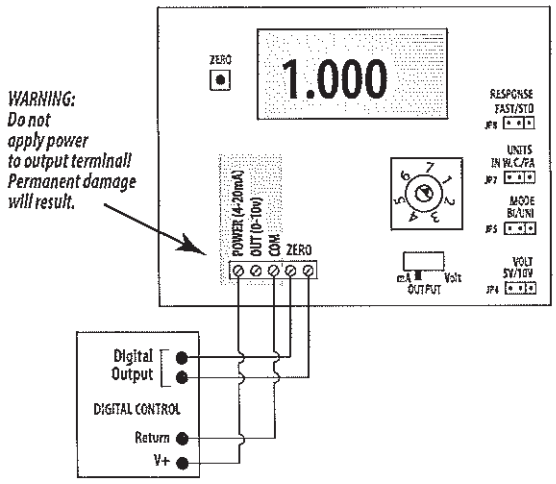
IMPORTANT: EPD/EPU Series employ ceramic capacitive sensors and sophisticated temperature compensation circuitry. Sensor achieves best accuracy after initial warm-up period. During the first few minutes of operation, readings at zero pressure and lowest pressure ranges will appear erroneous. Following this initial warm-up period, PX Series will maintain specified accuracy and stability.

LCD DISPLAY: Display momentarily indicates range "SET" when selection is made. Pressure is normally indicated on display. Units are in inches water column (in. W.C.), Pascals (Pa) or kilopascals (kPa) as indicated on the display. Display shows OVER when pressure is over range.

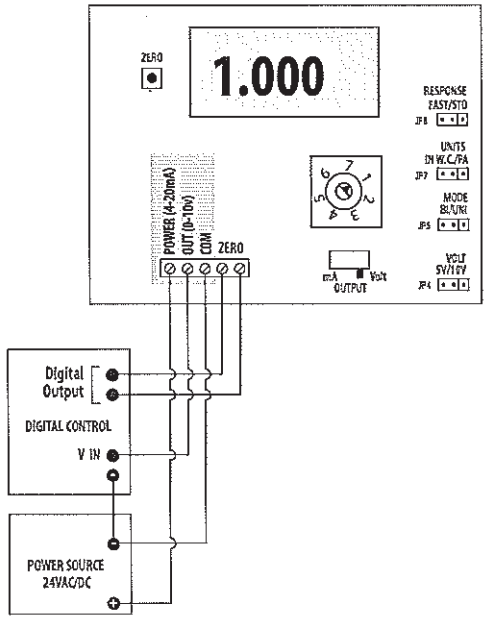
ZERO: Press and hold the ZERO pushbutton for 2 seconds or provide contact closure on 'AUX ZERO' terminal to automatically reset output and display to zero pressure. To protect the unit from accidental zero, this feature is enabled only when detected pressure is within about 0.1 in. W.C. (25Pa) of factory calibration.

Wiring Diagrams

2-wire, 4-20mA



3-wire, 0-5V/0-10V



Range Selection Guide

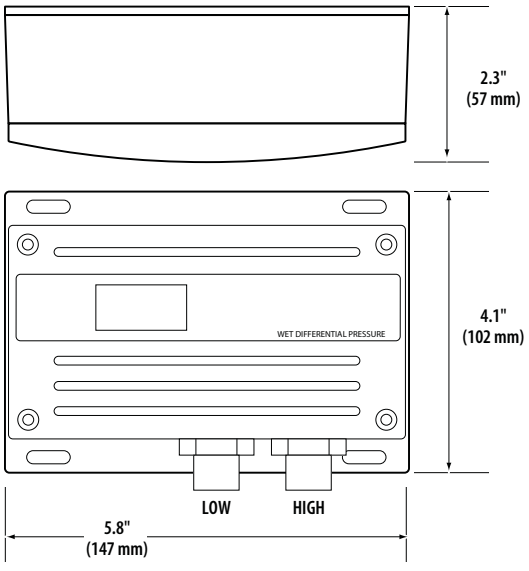
	EPP101/EPD101		EPP102/EPD102		EPU105	
Rotary Switch Position	Inches W.C.	Pascal	Inches W.C.	Pascal	Inches W.C.	Pascal
0	0.1	25	1	250	0.1	25
1	0.25	50	1	250	0.25	50
2	0.5	100	1	250	0.5	100
3	1	250	1	250	1	250
4	1	250	2.5	0.5kPa	2.5	0.5kPa
5	1	250	5	1kPa	5	1kPa
6	1	250	10	2.5kPa	10	2.5kPa
7	1	250	10	2.5kPa	10	2.5kPa

EPW Series

Quick Install

1. Affix the backplate to a mounting surface (wall, duct, sheet metal, etc.).
2. Plumb the ports to "HI" and "LO" sides of the pressure differential. Wrap the fitting with 2-3 turns of Teflon tape, hand tighten, then use a wrench to make two more turns.
3. Wire the sensor. See the Wiring section on page 2 for details.
4. Configure the jumpers as desired. See the Configuration section on page 3 for details.

Dimensions



Differential Pressure Transducer Wet Media

Installer's Specifications

Media Compatibility . . . . . 17-4 PH stainless steel
Power Consumption
EPW2: . . . . . 20mA max.
Input Power
EPW: . . . . . 12 to 30VDC, 24VAC nom.
EPW2: 12-24VDC
Output
EPW: . . . . . 3-wire transmitter; user selectable 4-20mA/0-5V/0-10V*
EPW2: . . . . . .2-wire transmitter; 4-20mA; polarity insensitive (clipped and capped)*
Pressure Ranges (switch selectable)
103. . . . . .0-50psig (5/10/25/50psid) / 0-3.45 bar (0.34/0.69/1.72bar)
104. . . . . .0-100psig (10/20/50/100psid) / 0-6.89bar (0.69/1.38/3.45bar)
105. . . . . .0-250psig (25/50/125/250psid) / 0-17.24bar (1.72/3.45/8.62bar)
Status Indication
EPW: . . . . . Dual color LED: solid green=normal, blinking green=low>high, solid red=over range, blinking red=over pressure
Proof Pressure. . . . . .2x max.; F.S. range
Burst Pressure. . . . . .5x max.; F.S. range
Accuracy @ 25°C . ±1% F.S.** combined linearity, hysteresis, and repeatability;
EPW: . . . . . .Range D accuracy = ±2% F.S.**
Surge Dampening . . . . . Electronic, selectable (1-second or 5-second averaging)
Temperature Compensated Range . . . .0° to 50°C (32° to 122°F);
TC Zero<±1.5% of product F.S. per sensor;
TS Span<±1.5% of product F.S. per sensor
Sensor Operating Range-20° to 85°C (-4° to 185°F)
Long Term Stability . ±0.25% per year (all models)
Zero Adjust . . . . . Pushbutton autozero;
. . . . . digital input (2-position terminal block)
Operating Environment . . . . . -10° to 55°C (14° to 131°F); 10 to 90% RH non-condensing
Fittings. . . . . .1/8" NPT female, stainless 17-4 PH
Physical . . . . . .White powder-coated aluminum

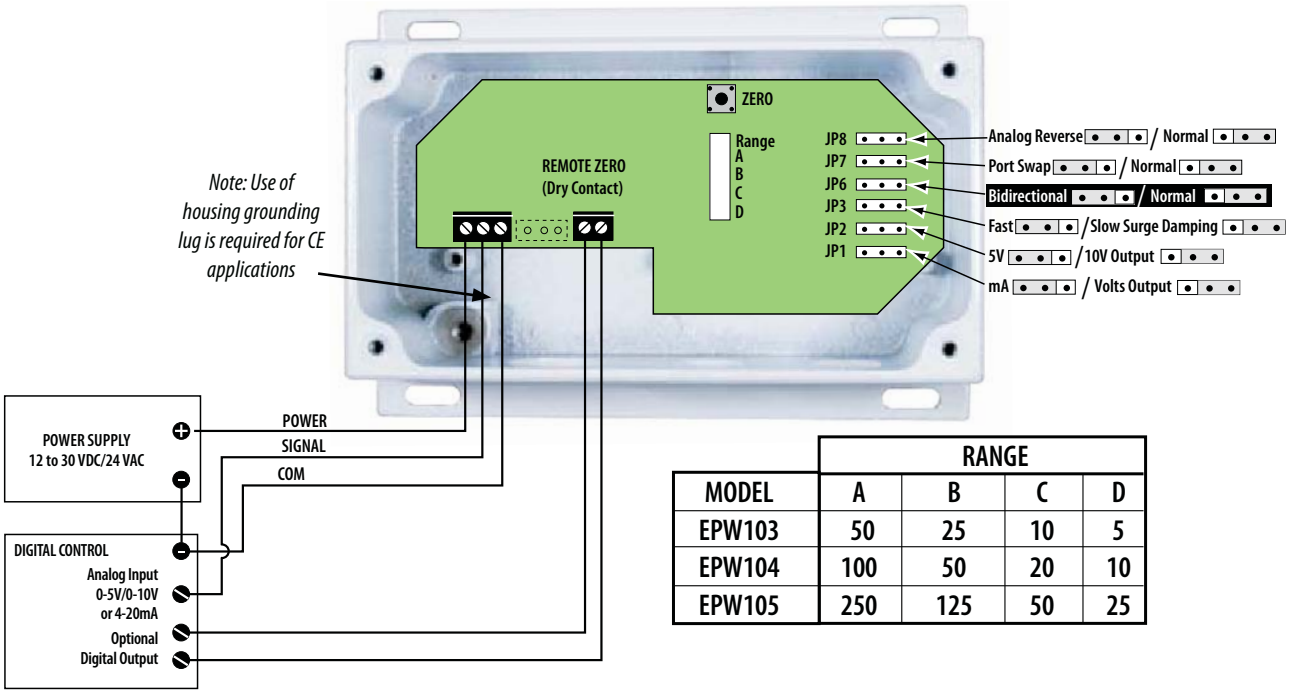
To conform to EMC standards, use shielded cabling. Minimum input voltage for 4-20mA operation: 250Ω loop (1-5V) = 12VDC; 500Ω loop (2-10V) = 15VDC.*

*** Full Scale is defined as the full span of the selected range in bidirectional*

Schneider Electric

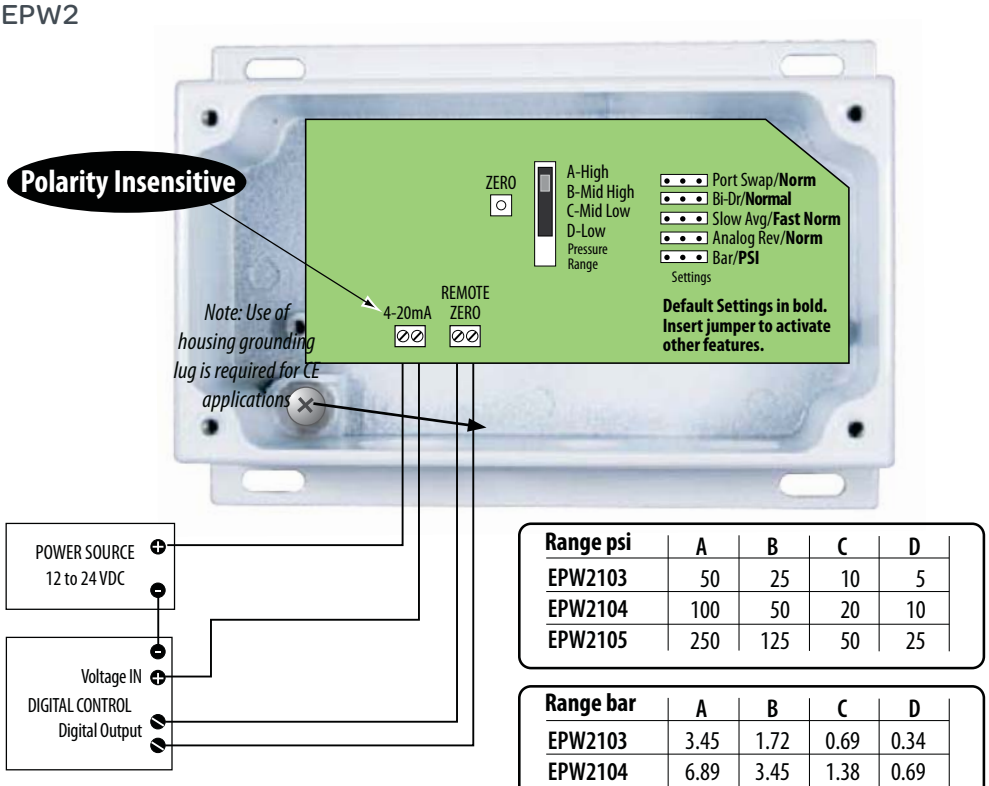
Installation/Wiring

EPW



	RANGE			
MODEL	A	B	C	D
EPW103	50	25	10	5
EPW104	100	50	20	10
EPW105	250	125	50	25

EPW2



Range psi	A	B	C	D
EPW2103	50	25	10	5
EPW2104	100	50	20	10
EPW2105	250	125	50	25

Range bar	A	B	C	D
EPW2103	3.45	1.72	0.69	0.34
EPW2104	6.89	3.45	1.38	0.69
EPW2105	17.24	8.62	3.45	1.72

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Configuration

EPW

JP1: Voltage (V) or current (mA) mode.

JP2: 0-10V or 0-5V output span (Voltage mode only).

JP3: Slow or fast mode. Slow mode provides 5-second averaging for surge dampening; fast mode provides 1-second averaging.

JP6: Bidirectional or Normal. Normal mode range is from zero to full scale differential pressure. Bi-directional mode changes range from minus full scale to plus full scale differential pressure. Output will be at one half when the differential pressure is zero (see table below).

JP7: Port Swap or Normal. This setting is used to remedy situations when the "HI" & "LO" ports to the pressure transducer are incorrectly plumbed. Use jumper JP7 to reverse polarity of pressure ports. This jumper makes the "HI" port "LO" and the "LO" port "HI".

JP8: Analog Reverse or Normal. Normal mode output increases as pressure increases. Reverse mode output is maximum when pressure differential is zero and decreases as pressure increases.

RANGE: Use range switch to select full-scale differential pressure.

EPW2

Fast or Slow: Slow mode provides 5-second averaging for surge dampening; fast mode provides 1-second averaging.

Bidirectional or Normal: Normal mode range is from zero to full scale differential pressure. Bi-directional mode changes range from minus full scale to plus full scale differential pressure. Output will be at one half when the differential pressure is zero (see table below).

Port Swap: This setting is used to remedy situations when the "HI" & "LO" ports to the pressure transducer are incorrectly plumbed. Use jumper "Port Swap" to reverse polarity of pressure ports. This jumper makes the "HI" port "LO" and the "LO" port "HI".

Analog Reverse or Normal: Normal mode output increases as pressure increases. Reverse mode output is maximum when pressure differential is zero and decreases as pressure increases.

Range: Use range switch to select full-scale differential pressure. Select psi or bar by positioning jumper.

Bi-directional Operation

Input Conditions (psi)		Result	Outputs Read
Hi Port	Lo Port	DP	4-20mA
100	0	+100	20
100	50	+50	16
50	50	0	12
50	100	-50	8
0	100	-100	4

Operation

LED INDICATOR (EPW Only)

GREEN ON (solid): Normal

GREEN (blinking): Low > High - Use port swap jumper or bidirectional mode.

RED ON (solid): Differential Pressure is too high. Select a higher range on device.

RED (blinking): Gauge pressure has exceeded sensor; F.S. Reduce line pressure or replace with a higher range device.

ZERO

Press and hold the "ZERO" push-button for 2 seconds or provide contact closure on auxiliary "REMOTE ZERO" terminal to automatically reset output to ZERO pressure. To protect the unit from accidental ZERO, this feature is enabled only when detected pressure is within 5% of factory calibration.

Product Identification

EPW

Range
- 103 = 0-50psig
- 104 = 0-100psig
- 105 = 0-250psig

Local Display
- Blank = No Display
- LCD = LCD Display

EPW2

Range
- 103 = 0-50psig
- 104 = 0-100psig
- 105 = 0-250psig

Local Display
- Blank = No Display
- LCD = LCD Display

Select operational range according to the max. gauge pressure, NOT differential pressure. Example: For hi-gauge pressure = 90psig, select the 100psig model.

Note: The EPW Series is 3-wire. The EPW2 Series is 2-wire, loop-powered.

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Available Products

Part Number	Product Description
EPW103	Differential Pressure Transducer - Wet Media 0-50 psig 0-5VDC/0-10VDC/4-20mA
EPW103-LCD	Differential Pressure Transducer - Wet Media 0-50 psig 0-5VDC/0-10VDC/4-20mA w/LCD
EPW104	Differential Pressure Transducer - Wet Media 0-100 psig 0-5VDC/0-10VDC/4-20mA
EPW104-LCD	Differential Pressure Transducer - Wet Media 0-100 psig 0-5VDC/0-10VDC/4-20mA w/LCD
EPW105	Differential Pressure Transducer - Wet Media 0-250 psig 0-5VDC/0-10VDC/4-20mA
EPW105-LCD	Differential Pressure Transducer - Wet Media 0-250 psig 0-5VDC/0-10VDC/4-20mA w/LCD
EPW2103	Differential Pressure Transducer - Wet Media 0-50 psig 4-20mA
EPW2103-LCD	Differential Pressure Transducer - Wet Media 0-50 psig 4-20mA w/LCD
EPW2104	Differential Pressure Transducer - Wet Media 0-100 psig 4-20mA
EPW2104-LCD	Differential Pressure Transducer - Wet Media 0-100 psig 4-20mA w/LCD
EPW2105	Differential Pressure Transducer - Wet Media 0-250 psig 4-20mA
EPW2105-LCD	Differential Pressure Transducer - Wet Media 0-250 psig 4-20mA w/LCD

Notice:

This product is not intended for life or safety applications.

Do not install this product in hazardous or classified locations.

Read and understand the instructions before installing this product.

Turn off all power supplying equipment before working on it.

The installer is responsible for conformance to all applicable codes.

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DIFFERENTIAL PRESSURE SWITCH

KDPS SERIES

DESCRIPTION

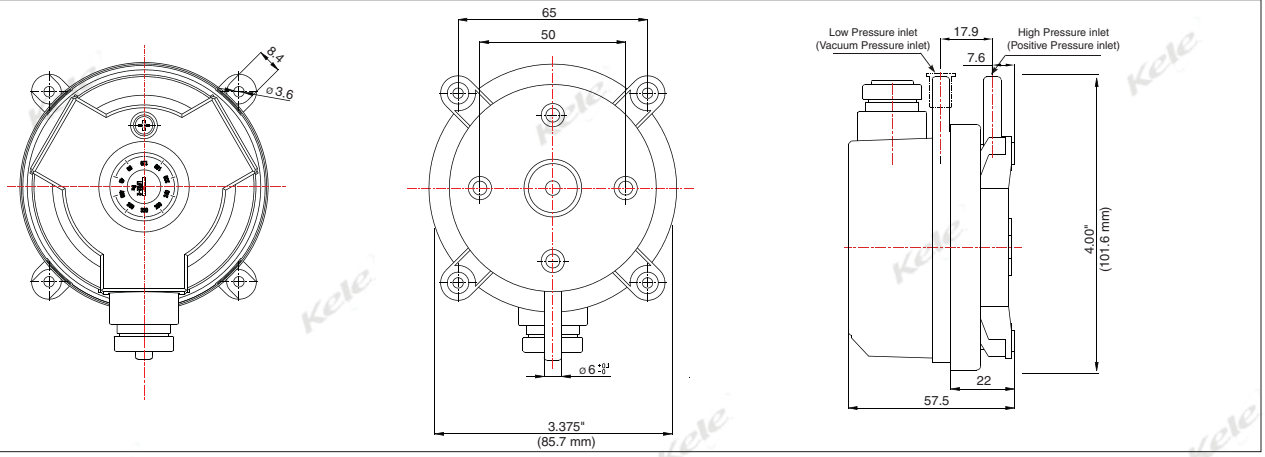
The **Kele KDPS Series Adjustable Differential Pressure Switches** are general-purpose, airflow-proving switches designed for HVAC and building automation applications. The **KDPS Series** can be used to sense positive, negative, or differential air pressure. It is housed in a rugged plastic enclosure with a removable cover protecting the set point adjustment knob and snap action switch terminals. Electrical connections are made through a 7/8" diameter opening with M20X1.5 conduit connection. Optional 1/2" NPT connection is available by adding "F" to the part number.

KDPS Series

FEATURES

- ***Transparent cover for setpoint confirmation***
- ***Easy, field adjustable set point***
- ***Dual scales***
- ***Installer kit with PVC tubing included***

DIMENSIONS



SPECIFICATIONS

Contact Rating	1.5A (0.4A) @ 250V
Contact Type	SPDT
Differential	
KDPS-02/03	0.04" WC (10 Pa)
KDPS-04/05	0.08" WC (20 Pa)
KDPS-10	0.40" WC (100 Pa)
KDPS-25	0.60" WC (150 Pa)
Operating Pressure Measurement Range	20" WC (5 kPa)
KDPS-02	0.08" to 0.80" WC (20 to 200 Pa)
KDPS-03	0.12" to 1.20" WC (30 to 300 Pa)
KDPS-04	0.16" to 1.60" WC (40 to 400 Pa)
KDPS-05	0.20" to 2.00" WC (50 to 500 Pa)
KDPS-10	0.80" to 4.0" WC (200 to 1000 Pa)
KDPS-25	2.0" to 10.0" WC (500 to 2500 Pa)
Media Compatibility	Air, non-combustible and inert gases
Operating Temperature	-40° to 185°F (-40° C to 85°C)
Mounting	Diaphram positioned in any vertical plane
Enclosure	IP54 (with cover) similar to NEMA 12
Process Connection	0.25" (6.0mm) diameter for 0.25" ID Tubing
Wiring Terminations	0.25" (6.4 mm) copper alloy
Approvals	CE, RoHS
Weight	0.38 lb (0.17 kg)
Warranty	1 year

ORDERING INFORMATION

MODEL	DESCRIPTION
KDPS-02	Differential pressure switch, 0.08" to 0.80" WC (20 to 200 Pa)
KDPS-03	Differential pressure switch, 0.12" to 1.20" WC (30 to 300 Pa)
KDPS-04	Differential pressure switch, 0.16" to 1.6" WC (40 to 400 Pa)
KDPS-05	Differential pressure switch, 0.20" to 2.00" WC (50 to 500 Pa)
KDPS-10	Differential pressure switch, 0.80" to 4.0" WC (200 to 1000 Pa)
KDPS-25	Differential pressure switch, 1.0" to 10.0" WC (500 to 2500 Pa)

Note: Add "F" to part number for 1/2" NPT connection - Example KDPS-02F

Hawkeye® 708/908 Series

THE INDUSTRY STANDARD!

Solid- & Split-Core Adjustable Setpoint Digital Output Current Switches

The **Hawkeye 708/908** Series solid- and split-core adjustable current sensors provide accurate, reliable and maintenance-free fan and pump status indication.

APPLICATIONS

Monitor fans, pumps, motors & other electrical loads for proper operation

- Detect belt loss and motor failure...ideal for fan and pump status
- Replace pressure switches and other electromechanical devices
- Verify lighting circuit loads
- Monitor critical motors (compressor, fuel, etc.)
- Industrial process equipment status (OEM)

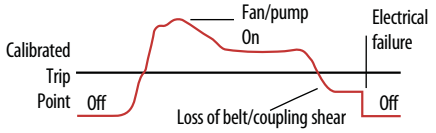
CURRENT SENSING THE ULTIMATE PROOF OF FLOW

Maximize Reliability
Minimize Installed Cost

Cost effective...reduced installation & service costs

- Adjustable set-point...1 to 135A (708), 2.5 to 135A (908)
- More reliable & cost-effective than differential pressure switches... no fitting or tapping
- 100% solid-state, no moving parts to fail
- Output status LEDs for fast setup
- Polarity insensitive output...easy wiring
- Adjustable mounting bracket...easy placement
- Self-gripping iris eliminates the need for drill mounting...easy installation
- 5-year limited warranty

Detects belt loss/coupling shear!



Now you can easily detect when drive belts slip, break, or pump couplings shear. In fact, a typical HVAC motor that loses its load has a reduction of current draw of up to 50%. That's why our sensors are the industry standard for status.

ORDERING INFORMATION

MODEL	AMPERAGE RANGE	OUTPUT TYPE	OUTPUT RATING (MAX.)	TRIP POINT ADJUSTMENT	STATUS OPEN LED	STATUS CLOSED LED
Solid-Core						
H701	1-135A	N.O. Solid-state	1.0A@30VAC/DC	●		
H706*	1-135A	N.C. Solid-state	0.1A@30VDC	●	●	●
H708	1-135A	N.O. Solid-state	1.0A@30VAC/DC	●	●	●
H709**	1-135A	N.O. Solid-state	0.2A@120VAC/DC	●	●	●
Split-Core						
H906*	2.5-135A	N.C. Solid-state	0.1A@30VDC	●	●	●
H908	2.5-135A	N.O. Solid-state	1.0A@30VAC/DC	●	●	●
H909	2.5-135A	N.O. Solid-state	0.2A@120VAC/DC	●	●	●

**Hx06 Models require a constant source of 5-30VDC power to the status contacts.*
***CE not currently available on this product*

CE c UL us LISTED 3T60 UL 508 E150462

ACCESSORIES

DIN Rail Clip Set...See page 234

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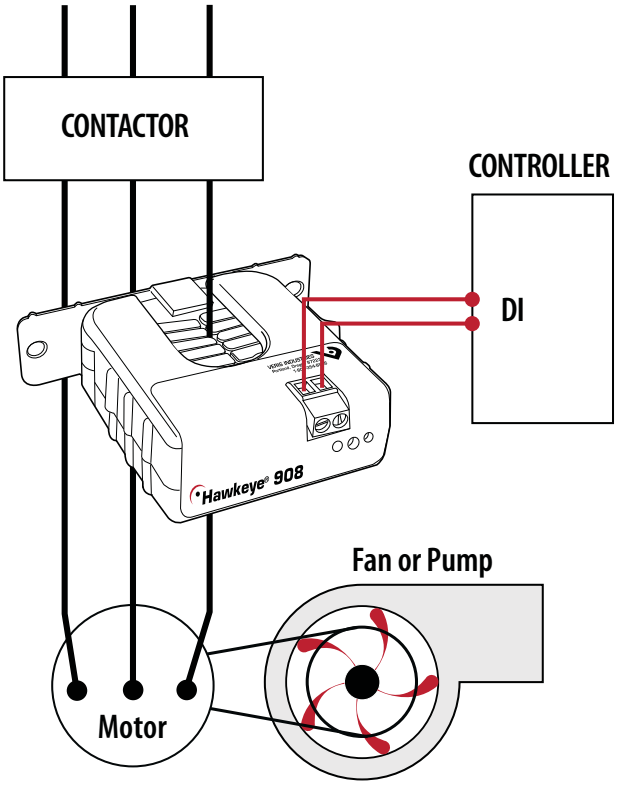
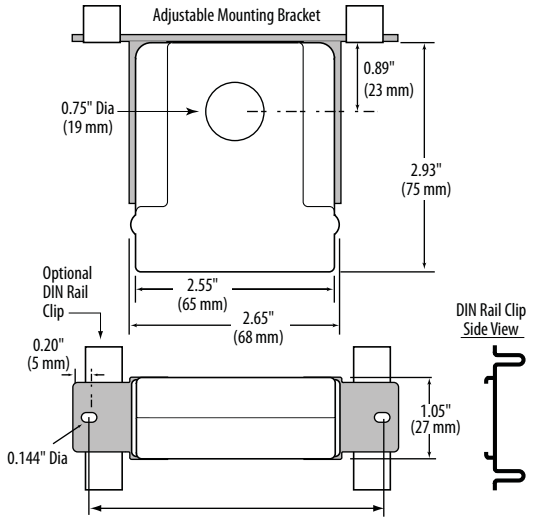
APPLICATIONS/WIRING EXAMPLE

Monitoring Fan /Pump Motors for Positive Proof of Flow

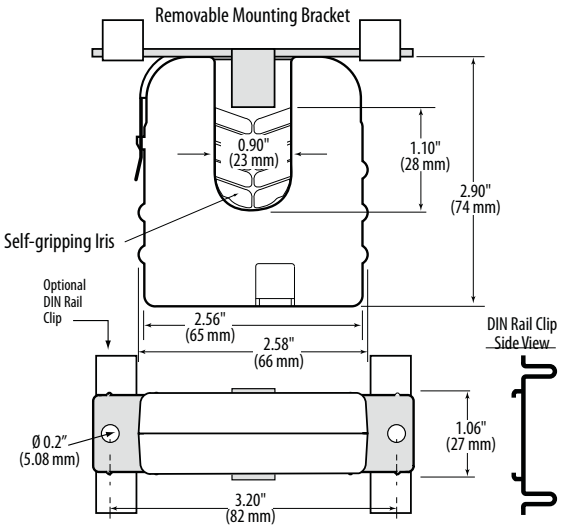


DIMENSIONAL DRAWINGS

H708



H908



SPECIFICATIONS

Sensor Power	Induced from line
Output	Digital switch (see ordering table)
Insulation Class	600VAC rms
Frequency Range	50/60Hz.
Temperature Range	-15° to 60°C
Humidity Range	0 - 95% non-condensing
Trip Setpoint	Adjustable 1-135A
Hysteresis	10% Typical
Dimensions (708)…(L x W x H)	2.93" (75mm) x 2.65" (68mm) x 1.05" (27mm)
Sensor Hole Size (708)	0.75" (19mm) diameter
Dimensions (908)…(L x W x H)	2.90" (74mm) x 2.58" (66mm) x 1.06" (27mm)
Sensor Opening Size (908)…(L x W)	1.10" (28mm) x .90" (23mm)
Status Contacts (Hx06 Models):	
Supply Voltage	5-30VDC, continuous supply
Off-state Leakage (max.)	24µA@30VDC
On-state Voltage Drop	1.7VDC (max.)@0.1A

Do not use the LED status indicators as evidence of applied voltage.

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ENCLOSED POWER SOURCE - 100 VA, 24 VAC CLASS 2 OUTPUTS

PSH200A, PSH300A, PSH500A, PSMN300A, PSMN500A

Functional Devices, Inc. RIB

DESCRIPTION

The **PSH200A, PSH300A** and **PSH500A** are power sources that are pre-packaged in a metal enclosure and provide isolated, 24 VAC, 100VA, Class 2 outputs. The panel mount versions **PSMN200A, PSMN300A** and **PSMN500A** are provided without the metal enclosure. All models accept 480/277/240/120 VAC input and have combination on/off switch/circuit breakers to control each output. Other handy features include LED indication of each output and terminal strip wiring. The **PSH200A** and **PSMN200A** have five 40VA Class 2 outputs; the **PSH300A** and **PSMN300A** have three 100VA Class 2 outputs and the **PSH500A** and **PSMN500A** have five 100VA Class 2 outputs.

PSH300A

MADE IN USA

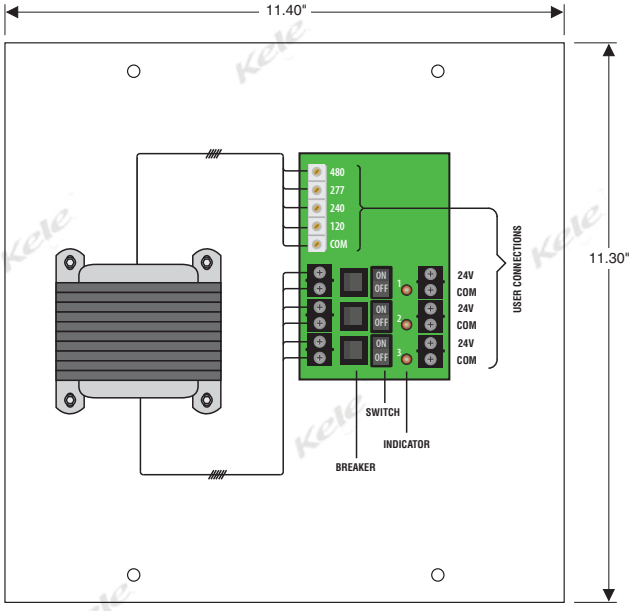
FEATURES

- ***NEMA 1 enclosed or panel mount models***
- ***Combination on/off switch/circuit breakers for each output***
- ***Terminal strip wiring***
- ***LED indication of each output***
- ***Class 2, UL Listed***

SPECIFICATIONS

Primary Voltage	480/277/240/120 VAC 50/60 Hz
Output Voltage	Isolated 24 VAC, 100 VA Class 2
Output Control	Combination on/off switch and 4A circuit breaker for each 24 VAC output
Output Indication	Red LED for each 24 VAC output
Dimensions	
PSH Models:	12.125"H x 12.125"W x 6.0"D (30.8 x 30.8 x 15.2 cm)
PSMN Models:	11.33"H x 11.4"W x 7.0"D (22.8 x 28.9 x 17.8 cm)
Approvals	CE, RoHS
Weight	
PSH200A:	18.6 lb (8.44 kg)
PSH300A:	18.0 lb (8.17 kg)
PSH500A:	30.16 lb (13.68 kg)
PSMN200A:	12.38 lb (5.62 kg)
PSMN300A:	12.55 lb (5.69 kg)
PSMN500A:	20.6 lb (9.34 kg)
Warranty	1 Year

WIRING



ORDERING INFORMATION

MODEL	DESCRIPTION
PSH200A	Enclosed power source 480/277/240/120 VAC to 24 VAC, five 40 VA outputs with enclosure
PSH300A	Enclosed power source 480/277/240/120 VAC to 24 VAC, three 100 VA outputs with enclosure
PSH500A	Enclosed power source 480/277/240/120 VAC to 24 VAC, five 100 VA outputs with enclosure
PSMN200A	Panel mount power source 480/277/240/120 VAC to 24 VAC, five 40 VA outputs, panel mount
PSMN300A	Panel mount power source 480/277/240/120 VAC to 24 VAC, three 100 VA outputs, panel mount
PSMN500A	Panel mount power source 480/277/240/120 VAC to 24 VAC, five 100 VA outputs, panel mount

	ACCESSORIES
APS53-TC	Terminal cover for PSH500A/PSH300A

Features

- UL Listed to meet code requirements
- 96VA load capacity
- Output On/Off control switch
- Breaker protected 24Vac Output
- Simple power connections
- Useful 120Vac convenience outlet
- Installation ready

Catalog # LD02100 Enclosed Power Supply

The **UL Listed CPS120-024-100 Power Supply** is a sturdy self-contained power source rated @ 96VA. It provides simple power connections and has an illuminated control switch on the 24V output, which is fitted with a protective circuit breaker. The unit also provides a convenient unswitched 120V power point and is installation ready.

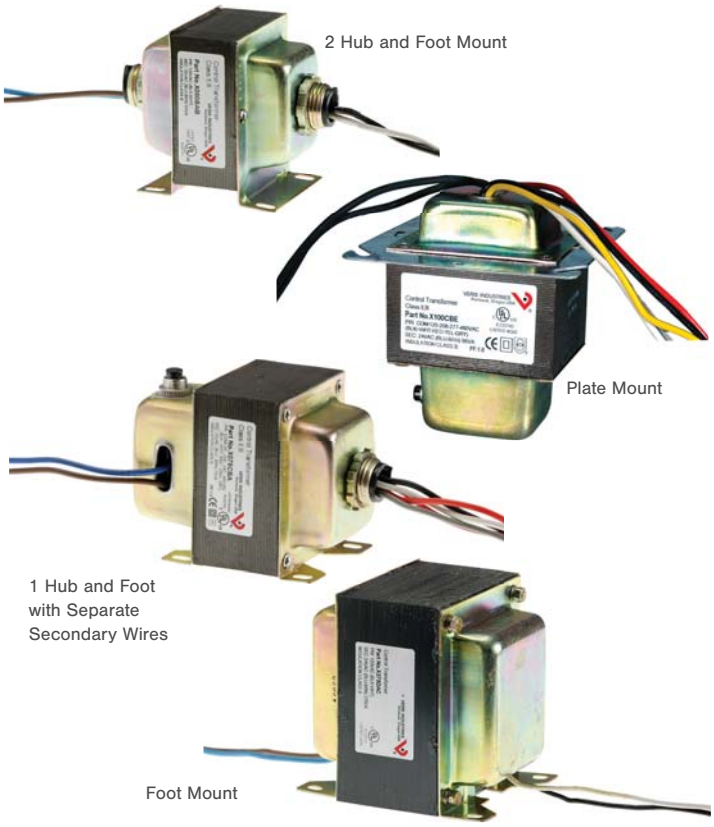
Specifications

Input:	120VAC, 60Hz, 6 Amp max. (1Amp max. used by 24V supply).
Output:	24VAC, 60Hz, 4Amp max. continuous. 120VAC, 60Hz, 5Amp max at convenience outlet. (Unswitched)
Protective Device:	24VAC supply with 4Amp re-settable thermal circuit breaker. 120VAC supply, none.
Controls:	Double pole switch with power indicating lamp, fitted on the primary of the 24V transformer. 120V convenience outlet power uncontrolled.
Connections:	One 5 position terminal block with combination head screws and wire clamps. Provided connection for 120VAC input, 24VAC output and safety ground.
Enclosure:	Three piece steel enclosure, with 4, ¼″O mounting holes, and standard ⅞″ Ø, top and bottom knockouts. Removable outer cover fitted with an indicator lamp ‘peephole’, and a removable control switch access plate.
Dimensions:	6⅛″H x 5¼″W x 4¼″D.
Operating Temp:	-15ºF to 140ºF (-25ºC to 60ºC).
Weight:	6.10 Lbs. (2.8 Kg.)
Standard Accessories:	Instruction/ Installation sheet, Warranty Card.
Safety Approvals:	UL Listed for the US and Canada, UL File # E207801

Ordering Information

Catalog #	Mfg #	Description
LD02100	CPS120-024-100	Enclosed 96VA Power Supply

X Series

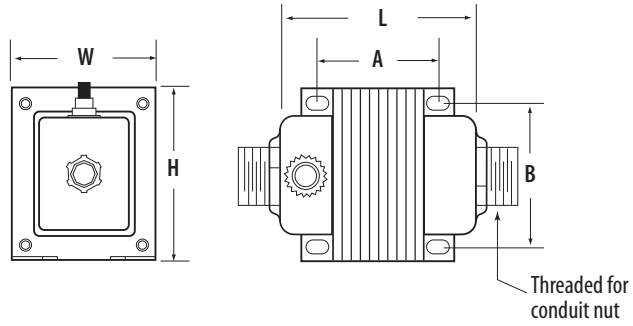


SPECIFICATIONS

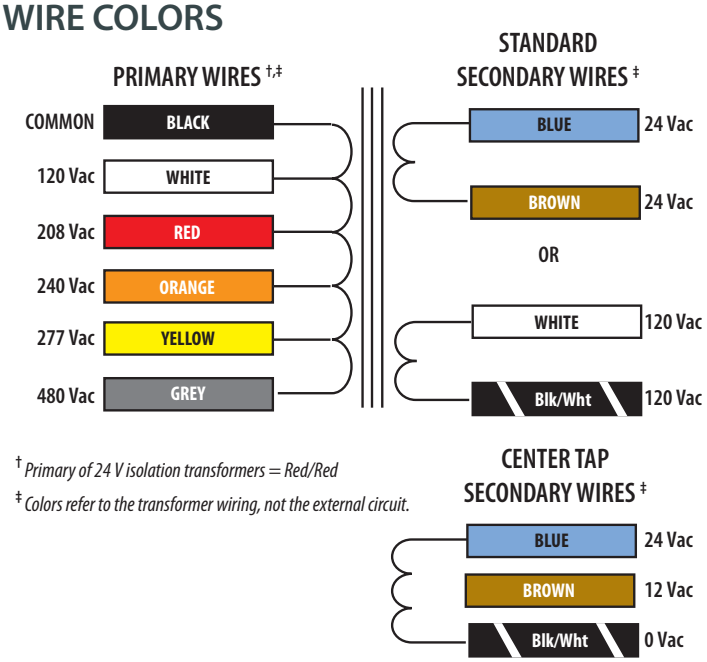
Frequency	50/60 Hz
Operating Temperature	-40 to 65 °C (-40 to 149 °F)
No Load Voltage	27 to 28 Vac
Hub Style	Fits 1/2" electrical k.o.
Wire	UL 1015, 18 AWG*
Wire Length	8 inches
Limited Warranty	5 years

**X085AAA, X375DAC have 14 AWG secondary wires.*

DIMENSIONAL DRAWING



WIRE COLORS



† *Primary of 24 V isolation transformers = Red/Red*

‡ *Colors refer to the transformer wiring, not the external circuit.*

FEATURES

- UL listings for all models simplify panel building requirements
- Threaded hub options maximize installation flexibility
- One stop shopping...save time by ordering along with other Veris products

DESCRIPTION

Veris X Series Control Transformers are a convenient source of control power for HVAC control and building automation applications. A wide variety of UL-listed transformers are available with single and dual threaded hub mounting options. Multiple current limiting options are available, including a circuit breaker in some models. Save ordering time and purchase order costs when buying other Veris sensors by including transformers in your order.

APPLICATIONS

- Controller power
- Driving relays and other digital I/O circuits
- Powering sensors

ORDERING INFORMATION

MODEL	VA	PRIMARY VOLTAGE (VAC)	SECONDARY VOLTAGE (VAC)	CURRENT LIMITING METHOD	CLASS	MOUNTING	SEPARATED PRIMARY & SECONDARY WIRES	UL	CE	L	W	H	A	B
STANDARD														
X020AAA	20	120	24	Inherent	2	1HUB+FT		●	●	2.3	1.9	2.6	1.59	1.69
X020ACA		277		Inherent	2	1HUB+FT		●	●	2.3	1.9	2.6	1.59	1.69
X020ADA		24		Inherent	General	1HUB+FT		●	●	2.3	1.9	2.6	1.59	1.69
X040AAA	40	120		Inherent	2	1HUB+FT		●	●	2.7	2.2	2.9	1.98	1.81
X040AAB		120		Inherent	2	2HUB+FT	●	●	●	2.7	2.2	2.9	1.98	1.81
X040ACA		277		Inherent	2	1HUB+FT		●	●	2.7	2.2	2.9	1.98	1.81
X040ADA		24		Inherent	2	1HUB+FT		●	●	2.7	2.2	2.9	1.98	1.81
X040AMB		120/208/240/277		Fuse	2	2HUB+FT	●	●	●	2.7	2.2	2.9	1.98	1.81
X040BNA		120/208/240		Fuse	2	1HUB+FT		●	●	2.7	2.2	2.9	1.98	1.81
X040BPC		24	12/24	Fuse	2	Foot	●	●	●	2.7	2.2	2.9	1.98	1.81
X050BAA	50	120	24	Fuse	2	1HUB+FT		●	●	2.8	2.2	2.9	2.06	1.81
X050BAB		120		Fuse	2	2HUB+FT	●	●	●	2.8	2.2	2.9	2.06	1.81
X050BCA		277		Fuse	2	1HUB+FT		●	●	2.8	2.2	2.9	2.06	1.81
X050BGB		208/240		Fuse	2	2HUB+FT	●	●	●	2.8	2.2	2.9	2.06	1.81
X050CAA		120		Circuit Breaker	2	1HUB+FT		●	●	3.5	2.5	3.1	1.91	2.03
X050CBA		120/240/277/480		Circuit Breaker	2	1HUB+FT		●	●	3.5	2.5	3.1	1.91	2.03
X050CBB		120/240/277/480		Circuit Breaker	2	2HUB+FT	●	●	●	3.5	2.5	3.1	1.91	2.03
X050CCA		277		Circuit Breaker	2	1HUB+FT		●	●	3.5	2.5	3.1	1.91	2.03
X050CEB		208/240/277/480	120	Circuit Breaker	General	2HUB+FT	●	●	●	3.5	2.5	3.1	1.91	2.03
X050CEG		208/240/277/480		Circuit Breaker	General	Plate, 90° Sec Elbow	●	●	●	3.5	4.0	4.0	3.38	3.38
X050CHA		120/208/240/480	24	Circuit Breaker	2	1HUB+FT		●	●	3.5	2.5	3.1	1.91	2.03
X050CHB		120/208/240/480		Circuit Breaker	2	2HUB+FT	●	●	●	3.5	2.5	3.1	1.91	2.03
X050CNA		120/208/240		Circuit Breaker	2	1HUB+FT		●	●	3.5	2.5	3.1	1.91	2.03
X050CNB		120/208/240		Circuit Breaker	2	2HUB+FT	●	●	●	3.5	2.5	3.1	1.91	2.03
X050COA		120/208/240/277/480		Circuit Breaker	2	1HUB+FT		●	●	3.5	2.5	3.1	1.91	2.03
X050COB		120/208/240/277/480		Circuit Breaker	2	2HUB+FT	●	●	●	4.3	2.5	3.1	2.70	2.00
X050DLB		220		None	2	2HUB+FT	●	●	●	2.8	2.2	2.9	2.06	1.81
X075CAA	75	120		Circuit Breaker	2	1HUB+FT		●	●	3.9	2.5	3.1	2.31	2.03
X075CAB		120		Circuit Breaker	2	2HUB+FT	●	●	●	3.9	2.5	3.1	2.31	2.03
X075CBA		120/240/277/480		Circuit Breaker	2	1HUB+FT		●	●	3.9	2.5	3.1	2.31	2.03
X075CHA		120/208/240/480		Circuit Breaker	2	1HUB+FT		●	●	3.9	2.5	3.1	2.31	2.03
X085AAA	85	120		Inherent	General	1HUB+FT		●	●	3.2	3.8	3.2	2.2	3.14
X100CAA	99	120		Circuit Breaker	2	1HUB+FT		●	●	4.1	2.5	3.1	2.51	2.03
X100CAB		120		Circuit Breaker	2	2HUB+FT	●	●	●	4.1	2.5	3.1	2.51	2.03
X100CBA		120/240/277/480		Circuit Breaker	2	1HUB+FT		●	●	4.3	2.5	3.1	2.70	2.03
X100CBB		120/240/277/480		Circuit Breaker	2	2HUB+FT	●	●	●	4.3	2.5	3.1	2.70	2.03
X100CBE		120/208/277/480		Circuit Breaker	2	Plate		●	●	4.3	4.0	4.0	3.38	3.38
X100CHB		120/208/240/480		Circuit Breaker	2	2HUB+FT	●	●	●	4.3	2.5	3.1	2.70	2.03
X100CKB		480	120	Circuit Breaker	General	2HUB+FT	●	●	●	4.1	2.5	3.1	2.51	2.03
X100CLB		220	24	Circuit Breaker	2	2HUB+FT	●	●	●	4.1	2.5	3.1	2.51	2.03
X150CAA	150	120		Circuit Breaker	General	1HUB+FT		●	●	3.5	3.8	3.2	2.08	3.26
X175BAB	175	120		Fuse	General	2HUB+FT	●	●	●	4.1	3.8	3.2	3.19	3.14
X175CAB		120		Circuit Breaker	General	2HUB+FT	●	●	●	4.1	3.8	3.2	3.19	3.14
X240DAA	240	120		None	General	1HUB+FT	●	●	●	3.7	3.8	4.5	3.24	3.18
X375DAC	375	120		None	General	Foot	●	●	●	4.3	3.8	4.5	3.83	3.18
CENTER TAP														
X020APC	20	24	12/24	Inherent	2	Foot	●	●	●	2.3	1.9	2.6	1.59	1.69
X040BQC	40	120/208/240		Fuse	2	Foot	●	●	●	2.7	2.2	2.9	1.98	1.81
X100CRC	100	120/240		Circuit Breaker	2	1HUB+FT	●	●	●	4.3	2.5	3.1	2.70	2.03

**The CE mark indicates RoHS2 compliance.*

60W Single Output Industrial DIN Rail Power Supply MDR-60 series

■ Features :

- Universal AC input/Full range
- Protections: Short circuit / Overload / Over voltage
- Cooling by free air convection
- Can be installed on DIN rail TS-35/7.5 or 15
- Class I, Div 2 Hazardous Locations T4
- LED indicator for power on
- DC OK relay contact
- No load power consumption<0.75W
- 100% full load burn-in test
- 3 years warranty

SPECIFICATION

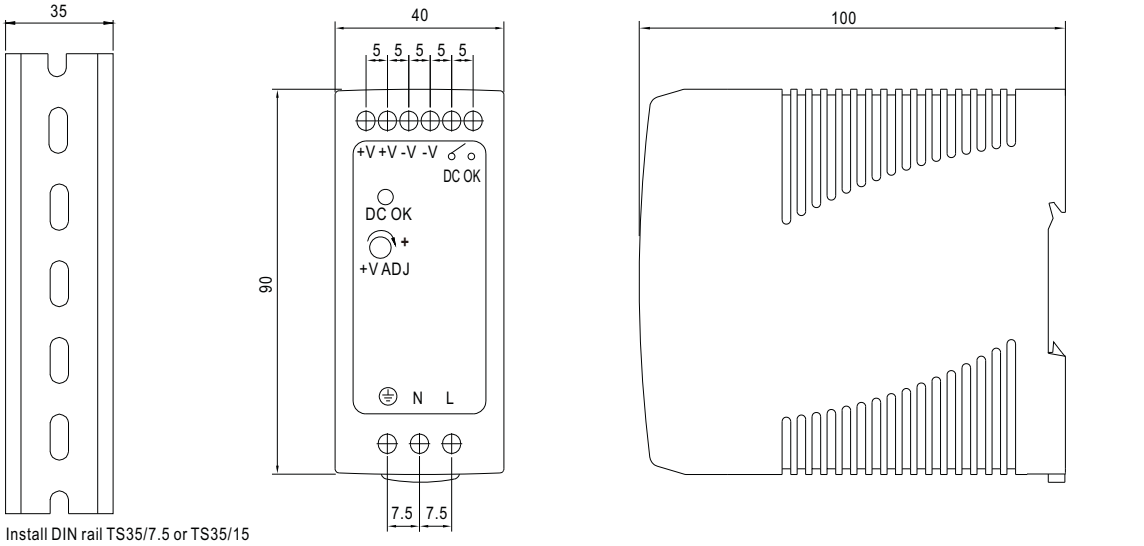
MODEL		MDR-60-5	MDR-60-12	MDR-60-24	MDR-60-48
OUTPUT	DC VOLTAGE	5V	12V	24V	48V
	RATED CURRENT	10A	5A	2.5A	1.25A
	CURRENT RANGE	0 ~ 10A	0 ~ 5A	0 ~ 2.5A	0 ~ 1.25A
	RATED POWER	50W	60W	60W	60W
	RIPPLE & NOISE (max.) Note.2	80mVp-p	120mVp-p	150mVp-p	200mVp-p
	VOLTAGE ADJ. RANGE	5 ~ 6V	12 ~ 15V	24 ~ 30V	48 ~ 56V
	VOLTAGE TOLERANCE Note.3	±2.0%	±1.0%	±1.0%	±1.0%
	LINE REGULATION	±1.0%	±1.0%	±1.0%	±1.0%
	LOAD REGULATION	±1.5%	±1.0%	±1.0%	±1.0%
	SETUP, RISE TIME Note.5	500ms, 30ms/230VAC 500ms, 30ms/115VAC at full load			
	HOLD UP TIME (Typ.)	50ms/230VAC 20ms/115VAC at full load			
INPUT	VOLTAGE RANGE	85 ~ 264VAC 120 ~ 370VDC			
	FREQUENCY RANGE	47 ~ 63Hz			
	EFFICIENCY (Typ.)	78%	86%	88%	87%
	AC CURRENT (Typ.)	1.8A/115VAC 1A/230VAC			
	INRUSH CURRENT (Typ.)	COLD START 30A/115VAC 60A/230VAC			
	LEAKAGE CURRENT	<1mA / 240VAC			
PROTECTION	OVERLOAD	105 ~ 150% rated output power			
		Protection type : Constant current limiting, recovers automatically after fault condition is removed			
	OVER VOLTAGE	6.25 ~ 7.25V	15.6 ~ 18V	31.2 ~ 36V	57.6 ~ 64.8V
		Protection type : Shut down o/p voltage, re-power on to recover			
FUNCTION	DC OK SIGNAL	Relay contact rating(max.): 30V/1A resistive			
ENVIRONMENT	WORKING TEMP.	-20 ~ +70℃ (Refer to "Derating Curve")			
	WORKING HUMIDITY	20 ~ 90% RH non-condensing			
	STORAGE TEMP., HUMIDITY	-40 ~ +85℃, 10 ~ 95% RH			
	TEMP. COEFFICIENT	±0.03%/℃ (0 ~ 50℃)			
	VIBRATION	Component : 10 ~ 500Hz, 2G 10min./1cycle, period for 60min. each along X, Y, Z axes ; Mounting : Compliance to IEC60068-2-6			
SAFETY & EMC (Note 4)	SAFETY STANDARDS	UL508, UL60950-1, TUV EN60950-1,Class I, Div. 2 Group A, B, C, D Hazardous Locations T4 approved			
	WITHSTAND VOLTAGE	I/P-O/P:3KVAC I/P-FG:2KVAC O/P-FG:0.5KVAC			
	ISOLATION RESISTANCE	I/P-O/P, I/P-FG, O/P-FG:>100M Ohms / 500VDC / 25℃/ 70% RH			
	EMC EMISSION	Compliance to EN55011, EN55022 (CISPR22), EN61204-3 Class B, EN61000-3-2,-3			
	EMC IMMUNITY	Compliance to EN61000-4-2, 3, 4, 5, 6, 8, 11, EN55024, EN61000-6-2, EN61204-3, heavy industry level, criteria A			
OTHERS	MTBF	299.2K hrs min. MIL-HDBK-217F (25℃)			
	DIMENSION	40*90*100mm (W*H*D)			
	PACKING	0.33Kg; 42pcs/14.8Kg/0.82CUFT			

NOTE

1. All parameters NOT specially mentioned are measured at 230VAC input, rated load and 25℃ of ambient temperature.
2. Ripple & noise are measured at 20MHz of bandwidth by using a 12" twisted pair-wire terminated with a 0.1uf & 47uf parallel capacitor.
3. Tolerance : includes set up tolerance, line regulation and load regulation.
4. The power supply is considered a component which will be installed into a final equipment. The final equipment must be re-confirmed that it still meets EMC directives. For guidance on how to perform these EMC tests, please refer to “EMI testing of component power supplies.” (as available on http://www.meanwell.com)
5. Length of set up time is measured at first cold start. Turning ON/OFF the power supply may lead to increase of the set up time.

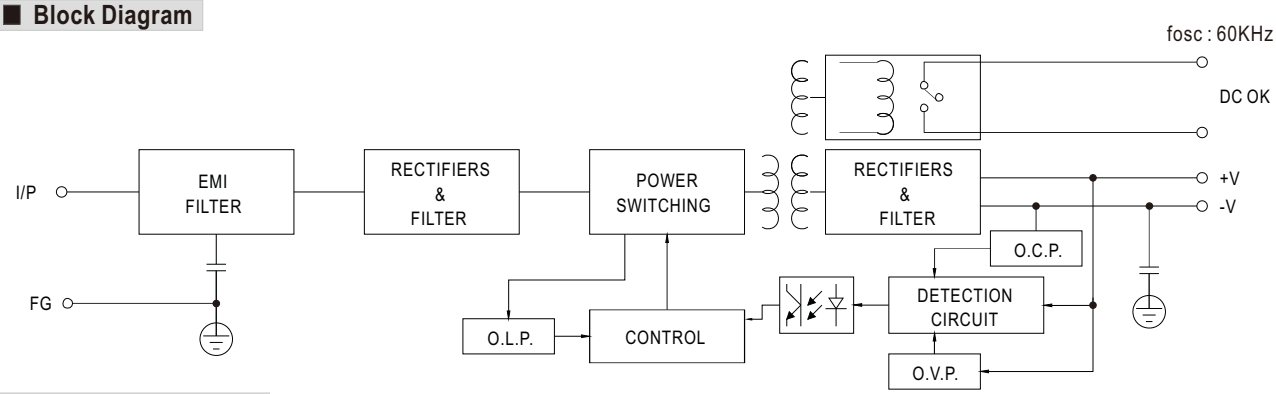
■ Mechanical Specification

Case No.962A Unit:mm



Install DIN rail TS35/7.5 or TS35/15

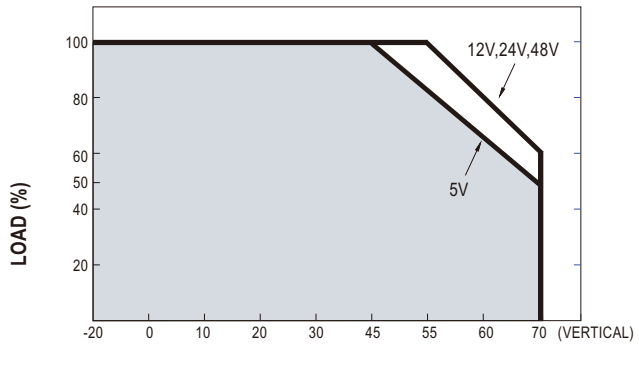
■ Block Diagram



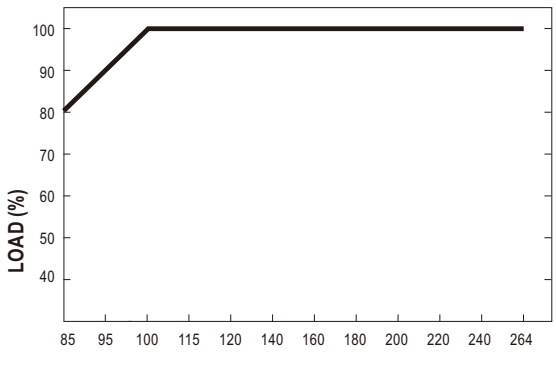
■ DC OK Relay Contact

Contact Close	PSU turns on / DC OK.
Contact Open	PSU turns off / DC Fail.
Contact Ratings (max.)	30V/1A resistive load.

■ Derating Curve



■ Output Derating VS Input Voltage



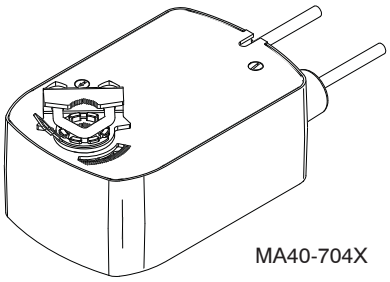
MA40-704X Series
MA41-707X Series
MA41-715X Series

SmartX Actuators
Spring Return Two-Position
General Instructions

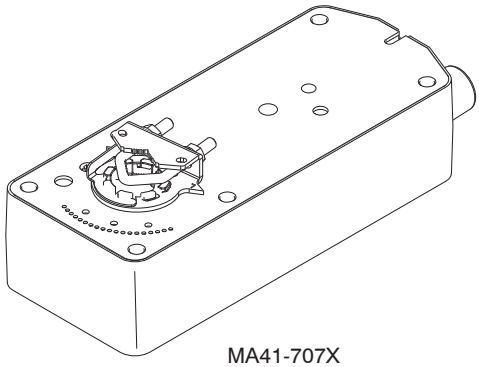
Application

SmartX ™ Direct Coupled Actuators are designed to be used in both damper and valve control applications. The follow general instructions are for damper applications, refer to the Applicable Literature table for valve literature.

The MA40-704X, MA41-707X and MA41-715X series spring return actuators are used for the on-off, fail safe control of dampers and valves in HVAC systems.



MA40-704X



MA41-707X
MA41-715X

Features

- Two-position actuator controlled by SPST controller
- 133 lb-in (15 N-m), 60 lb-in (7 N-m), and 35 lb-in (4 N-m) torque models
- 24 Vac/DC, 120 Vac, and 230 Vac models
- Rugged die cast housings rated for NEMA 2 / IP54
- Overload protection throughout rotation
- Optional built-in auxiliary switch to provide for interfacing or signaling
- Provides 95° of rotation
- Visual position indicator provided
- Provides true mechanical clockwise or counterclockwise spring return operation for reliable fail safe application and positive close-off in air tight damper applications
- Direct mount to round or square damper shafts
- Rotation limiting available
- MA41-7153 series actuators can be double-mounted (gang mounting) to accommodate high torque application requirements
- Five year warranty
- MA41-707X-XXX and MA41-715X-XXX equipped with manual override

Applicable Literature

F-Number	Description	Audience	Purpose
F-26750	MX40-6XXX-2XX, MX4X-7XXX-2XXSeries Actuator/ Linkage Assemblies General Instructions	– Sales Personnel – Application Engineers – Installers – Service Personnel – Start-up Technicians	Describes the globe valve actuator/linkage assembly's features, specifications, and possible applications. Provides step-by-step mounting instructions.
F-26751	VX-2000 Series Ball Valve Assembly Installations Instructions	– Sales Personnel – Application Engineers – Installers – Service Personnel – Start-up Technicians	Describes the actuator/linkage/ball valve assembly's features, specifications, and possible applications. Provides step-by-step mounting instructions.
F-26646	MX4X-7XXX, MX40-6XXX Series SmartX Actuator Selection Guide	– Sales Personnel – Application Engineers – Installers – Service Personnel – Start-up Technicians	Provides actuator specifications and part number cross referencing of phased out actuators with the new direct-coupled actuators.
F-26752	VX-2000, VX-7000 Series Ball/Linked Globe Linked Valve Assemblies Actuator/Linkage Assemblies Selection Guide	– Sales Personnel – Application Engineers – Installers – Service Personnel – Start-up Technicians	Provides part number cross referencing of phased out globe and ball valve assemblies with the new direct-coupled actuators.
F-26080	EN-205 Water System Guidelines	– Application Engineers – Installers – Service Personnel – Start-up Technicians	Describes Schneider Electric approved water treatment practices.
F-13755	CA-28 Control Valve Sizing	– Application Engineers – Installers – Service Personnel – Start-up Technicians	Provides charts, equations, and diagrams to assist in the configuration of valve system applications. TOOL-150, valve sizing slide rule may be purchased separately.
F-11080	Valve Selection Chart Water		
F-11366	Valve Selection Chart Steam (two-way valves only)		

Actuator Inputs

Control Signal: On-off, spring return. SPST control contacts or Triacs (500 mA rated).
Power Input: See Table-1. All 24 Vac circuits are Class 2. All circuits 30 Vac and above are Class 1.
Connections: 3 ft. (91 cm) appliance cables, 1/2 in. conduit connector. For M20 Metric conduit, use AM-756 adaptor.

Actuator Outputs

Electrical:

Auxiliary Switches,
MA41-715X-502 and MA41-707X-502, Two SPDT 7A (2.5A) @250 Vac, UL listed; one fixed @ 5° and one adjustable 25 to 85°.
MA40-7040-501 and MA40-7041-501, One SPDT 6A (1.5A) @250 Vac, UL listed; adjustable 15 to 95° (MIN to 1 scale).
MA40-7043-501, One SPDT 6A (1.5A) @24 Vac, UL listed; adjustable 15 to 95° (MIN to 1 scale).

Mechanical:

Stroke, Angle of rotation 95° ± 5° maximum. Adjustable 30° to 95° with AM-689 installed on MA41-715X or MA41-707X series. Stroke limiter is standard on MA40-704X series.

Damper Shaft Clamp,
MA40-704X, The factory installed universal clamp is used for shafts up to 5/8" (15 mm) diameter or up to 1/2" (13 mm) square. AM-710 accessory clamp is required when mounting actuators to shafts up to 3/4" (19 mm) diameter or up to 1/2" (13 mm) square.
MA41-715X or MA41-707X, The factory installed universal clamp is used for shafts up to 3/4" (19 mm) diameter or up to 1/2" (13 mm) square. AM-687 accessory clamp is required when mounting actuators to shafts up to 1.05" (27 mm) in diameter or up to 5/8" (15 mm) square.

Position Indicator, Visual indicator.
MA41-715X and MA41-707X, -5 to 90° (-5° is spring return position).
MA40-704X, 0 to 1 (0 is spring return position).

Nominal Damper Area, Actuator sizing should be done in accordance with damper manufacturer's specification.
Direction of Rotation, Clockwise or counterclockwise rotation determined by actuator mounting.
Manual Override, MA41-707X and MA41-715X rotation is adjustable from -5° to 85° using manual override crank.

Environment

Ambient Temperature Limits:
Shipping & Storage, -40 F to 160°F (-40 to 71°C).
Operating, -22 to 140°F (-30 to 60°C).
Humidity: 15 to 95% RH, non-condensing.
Location:
MA41-715X and MA41-707X, NEMA 1 (IEC IP30). NEMA 2 (IEC IP54) with conduit connector in the down position.
MA40-704X, NEMA 2 (IEC IP54) no restrictions.

Agency Listings

UL 873: Underwriters Laboratories (File # E9429 Category Temperature-Indicating and Regulating Equipment).
CUL: UL Listed for use in Canada by Underwriters Laboratories. Canadian Standards C22.2 No. 24.
European Community: EMC Directive (89/336/EEC). Low Voltage Directive (72/23/EEC).
Australia: This product meets requirements to bear the C-Tick Mark according to the terms specified by the Communications Authority under the Radiocommunications Act 1992.

Table-1 Model Chart.

Part Numbers	Actuator Power Input								Auxiliary Switch	Approximate Timing in Seconds @ 70° (21°C)[a]		Output Torque Rating lb-in (N-m)[b]		
	Voltage	VA		Watts						Powered	Spring Return	Minimum	Maximum Stall	Manual Override
		50 Hz	60 Hz	Running 50 Hz	Running 60 Hz	DC Amps	Holding 50 Hz	Holding 60 Hz						
MA41-7153	24 Vac ± 20% 22-30 Vdc	9.8	9.7	7.5	7.5	0.29	2.8	2.8	No	<190	<30	133 (15)	350 (40)	Yes
MA41-7153-502									Two[c]					Yes
MA41-7150	120 Vac ±10%	11.7	10.0	8.8	8.4	—	3.6	5.0	No					Yes
MA41-7150-502									Two[c]					Yes
MA41-7151	230 Vac ±10%	15.5	10.6	9.5	8.5	—	4.6	3.3	No					Yes
MA41-7151-502									Two[c]					Yes
MA41-7073	24 Vac ± 20% 22-30 Vdc	4.8	4.8	3.2	3.2	0.13	0.8	0.8	No	<80	<40	60 (7)	250 (28)	Yes
MA41-7073-502									Two[c]					Yes
MA41-7070	120 Vac ±10%	10.7	5.6	4.2	3.6	—	2.0	1.2	No					Yes
MA41-7070-502									Two[c]					Yes
MA41-7071	230 Vac ±10%	17.0	8.0	5.1	4.0	—	2.7	1.4	No					Yes
MA41-7071-502									Two[c]					Yes
MA40-7043	24 Vac ± 20% 22-30 Vdc	4.4	4.4	2.9	2.9	0.11	0.8	0.8	No	<50	<26	35 (4)	150 (17)	No
MA40-7043-501									One					No
MA40-7040	120 Vac ±10%	6.4	4.3	3.8	3.4	—	1.6	1.2	No					No
MA40-7040-501									One[d]					No
MA40-7041	230 Vac ±10%	5.8	4.6	4.1	3.9	—	1.5	1.2	No					No
MA40-7041-501									One[d]					No

[a]Timing was measured with no load applied to the actuator.
[b]De-rating is required at low temperatures.
[c]One adjustable from 25 to 85° rotation and one set to operate @ 5° fixed.
[d]One adjustable from 15 to 95° rotation (MIN to 1 scale).

ACCESSORIES

For use with MA41-7XXX:

AM-671	Universal Mounting Bracket, AM-693 is required
AM-672	Universal Mounting Bracket, AM-693 is required
AM-673	Mounting Bracket
AM-674	Weather Shield
AM-675	Base Mounting Plate for AM-674
AM-676	Universal Shaft Extension
AM-714	Weather Shield (polycarbonate)
AM-756	Metric Conduit Adapter M20 x 1.5 to 1/2" NPT
AM-761	7-inch Anti-rotation Bracket
AM-762	9-inch Anti-rotation Bracket

For use with MA40-7043:

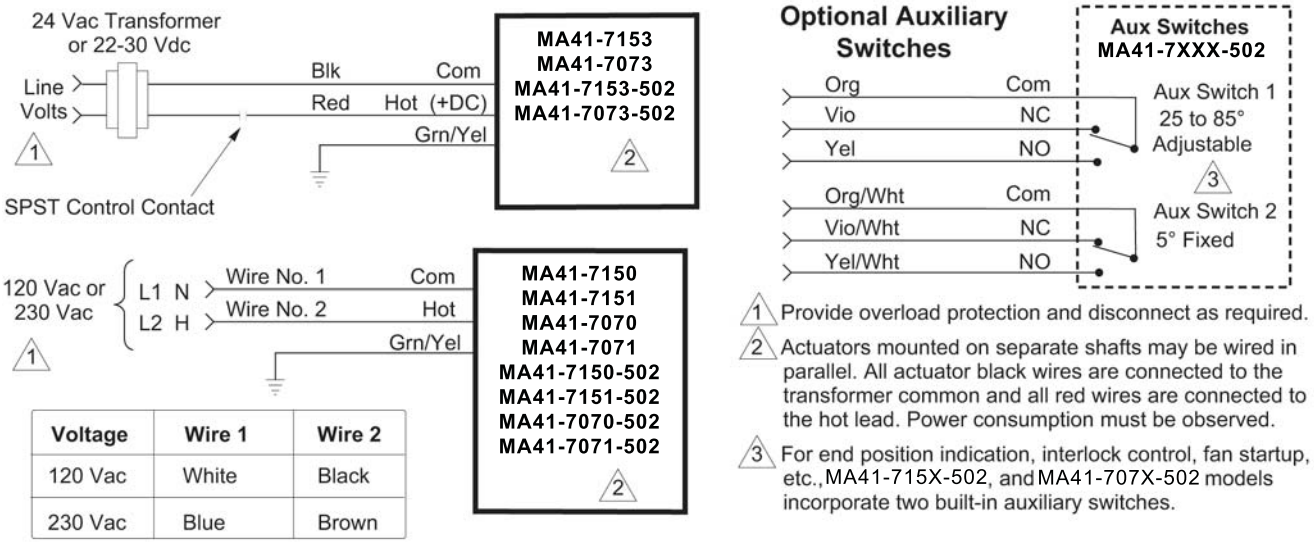
AM-709	Position Indicator and Stroke Limiter
AM-710	Universal Clamp for up to 3/4" diameter shafts
AM-711	Crankarm for up to 1/2" round shaft
AM-712	Crankarm Adapter Kit
AM-713	Mounting Bracket for Honeywell Mod IV, M6415 type actuators and new installations
AM-715	Crankarm Adapter Kit for Honeywell Mod IV, M6415 type actuators and new installations

For use with MA41-7073, MA41-7153

AM-686	Damper Position Indicator
AM-687	Universal Clamp for up to 1.05" (27 mm) diameter shafts
AM-688	Replacement Universal Clamp
AM-689	Rotation Limiter
AM-690	Crankarm for round shafts up to 3/4" (19 mm)
AM-691	Crankarm for jackshafts up to 1.05" (27 mm)
AM-692	V-bolt Kit for AM-690 and AM-691 Crankarm
AM-693	Damper Linkage Kit
AM-758	Short "U" Mounting Bracket
AM-759	Tall "U" Mounting Bracket
AM-760	Slotted "L" Mounting Bracket
AM-763	1/8" Hex Crank for Manual Override

TYPICAL APPLICATIONS (wiring diagrams)

Figure-1 through Figure-3 illustrate typical wiring diagrams for spring return floating actuators. See Table-1 for model selection.



Voltage	Wire 1	Wire 2
120 Vac	White	Black
230 Vac	Blue	Brown

1. Provide overload protection and disconnect as required.
2. Actuators mounted on separate shafts may be wired in parallel. All actuator black wires are connected to the transformer common and all red wires are connected to the hot lead. Power consumption must be observed.
3. For end position indication, interlock control, fan startup, etc., MA41-715X-502, and MA41-707X-502 models incorporate two built-in auxiliary switches.

MA41-707X-502 and MA41-715X-502 units manufactured prior to the date code 0141 (October 6, 2001) used the following color coding for the auxiliary switches:

Auxiliary Switch 1

Orange:	Fixed auxiliary switch common (com)
Yellow:	Fixed auxiliary switch normally closed (NC)
Violet:	Fixed auxiliary switch normally open (NO)

Auxiliary Switch 2

Orange/white:	Adjustable auxiliary switch common (com)
Violet/white:	Adjustable auxiliary switch normally closed (NC)
Yellow/white:	Adjustable auxiliary switch normally open (NO)

The label information on these units is incorrect. If replacing these units, the auxiliary switch operation of the replacement actuator will be per the product label.

Figure-1 Typical Wiring Diagram for 24 Vac Basic and Double Auxiliary Switch Models.

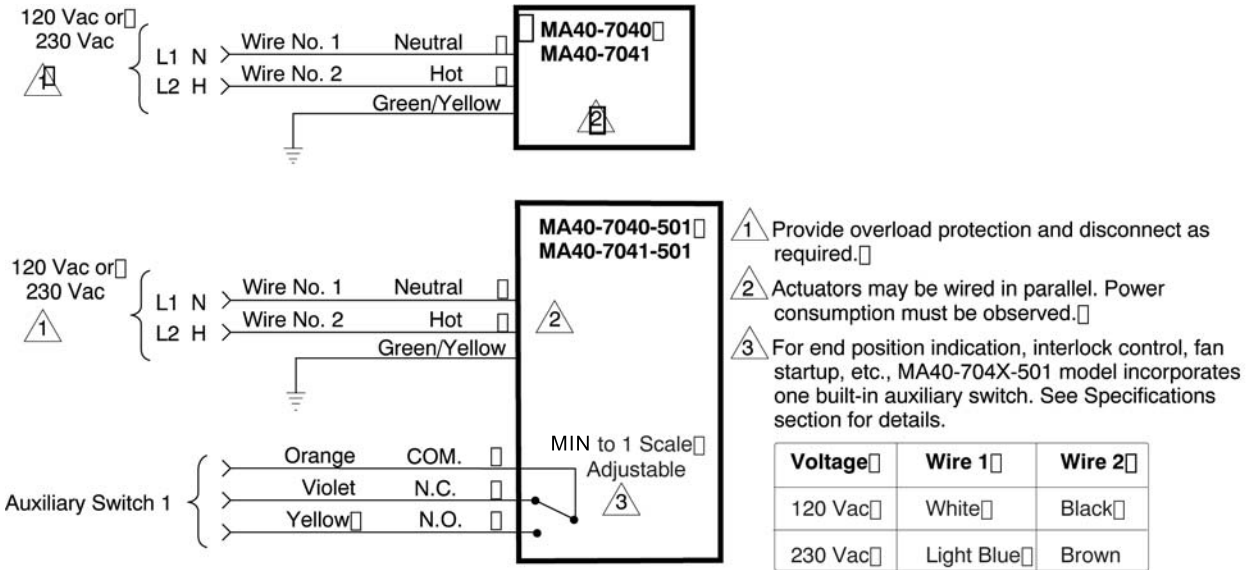


Figure-2 Typical Wiring Diagram for 120 Vac or 230 Vac Basic and Single Auxiliary Switch Models.

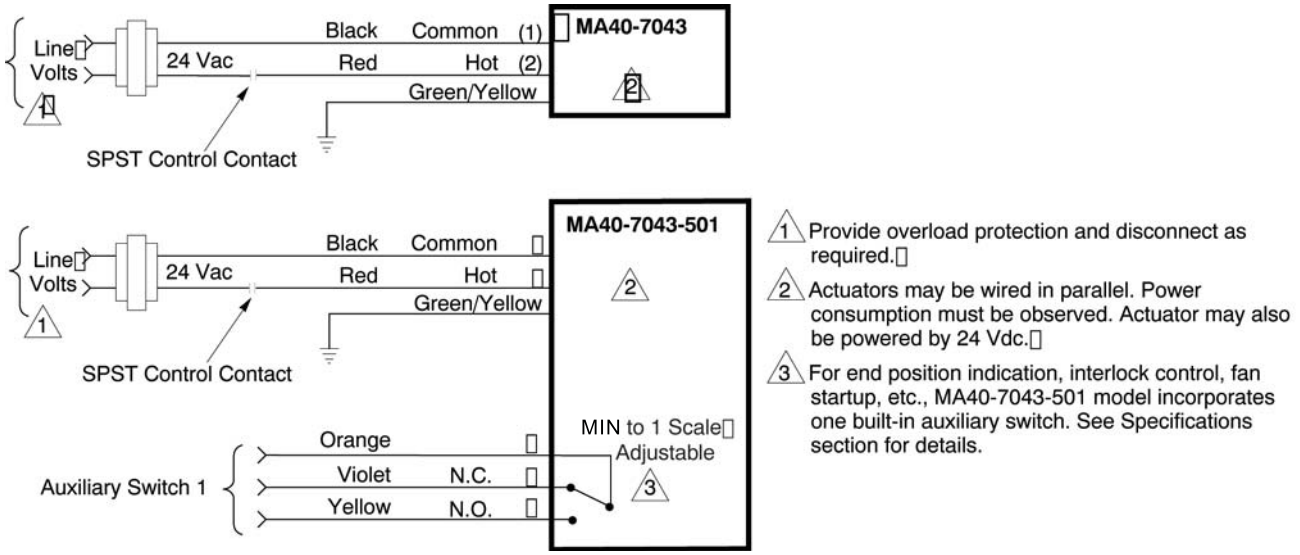


Figure-3 Typical Wiring Diagram for 24 Vac Basic and Single Auxiliary Switch Models.

INSTALLATION

Inspection

Inspect the package for damage. If damaged, notify the appropriate carrier immediately. If undamaged, open the package and inspect the device for obvious damage. Return damaged products.

Requirements

- Job wiring diagrams
- Tools (not provided):
  - #8 sheet metal screws
  - 10mm open end wrench or socket wrench
  - 7/16 inch, open end wrench or socket wrench
  - 1/8 inch, allen wrench
  - Appropriate screwdriver(s)
- Appropriate accessories
- Training: Installer must be a qualified, experienced technician

Precautions

General

Warning:

- Electrical shock hazard! Disconnect the power supply (line power) before installation to prevent electric shock and equipment damage.
- Make all connections in accordance with the job wiring diagram and in accordance with national and local electrical codes. Use copper conductors only.

Caution:

- Avoid electrical noise interference. Do not install near large contactors, electrical machinery, or welding equipment.
- Do not drill holes in actuator body. Six pre-drilled holes are located on each side, under the label, to accept #10-24 thread-forming screws for mounting accessories.

Caution: The MX41-707X & MX41-715X actuators are equipped with a manual override.

- The manual override is to be used only when power is not applied to the unit.
- If the universal clamp is not set to 0° on the position indicator, manually wind the actuator in the direction indicated with hex wrench from -5° to 0° and lock with a screwdriver.
- When operating manual override, back off 5° from full open mechanical stop to ensure proper release.
- Do not attempt to use the manual override with actuators mounted in tandem. Damage to the gear train may occur.

Federal Communications Commission (FCC)

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in residential installations. This equipment generates, uses, and can radiate radio frequency energy and may cause harmful interference if not installed and used in accordance with the instructions. Even when instructions are followed, there is no guarantee that interference will not occur in a particular—Which can be determined by turning the equipment off and on—the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/television technician for help.

Canadian Department of Communications (DOC)

Note: This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numerique de la classe B respecte toutes les exigences du Reglement sur le material broilleur du Canada.

European Standard EN 55022

Warning: This is a Class B digital (European Classification) product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Location

Caution: Avoid locations where excessive moisture, corrosive fumes, vibration, or explosive vapors are present.

Mounting

Caution: To remain in NEMA 2/IP54 compliance, the MA4X-715X and MA4X-707X series actuators should be mounted with conduit end down.

Mount the SmartX Actuator directly on the damper shaft in locations that clear the maximum dimensions of the actuator case and allow the actuator to be mounted flush to the surface of the terminal box and perpendicular to the damper shaft.

Note: Some terminal boxes have sheet metal screw heads or other protrusions near the damper shaft. In these cases, a spacer or shim may be added under the anti-rotation bracket of the actuator to make the actuator perpendicular to the shaft.

Damper Actuator Sizing

Correct sizing of the actuator is necessary for proper control of dampers. The area of damper that can be controlled by a given actuator is dependent upon the type of damper, the quality of the damper, the pressure drop across the damper in the closed position, and the velocity of the air flow through the damper. To obtain actual damper torque requirements, contact the damper manufacturer.

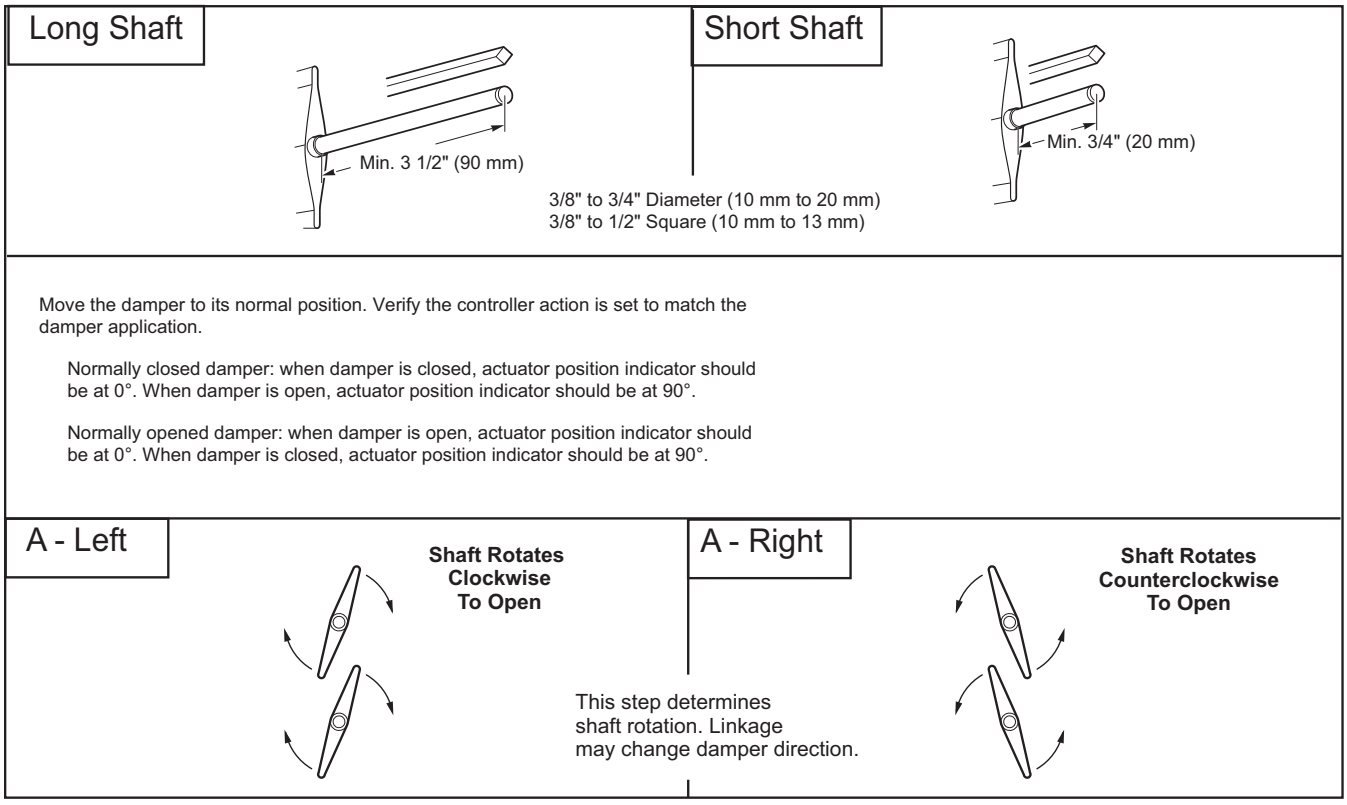
Damper Shaft Sizing

Use the “Long Damper Shaft” mounting instructions if the damper shaft is at least 3-1/2” (90 mm) long.

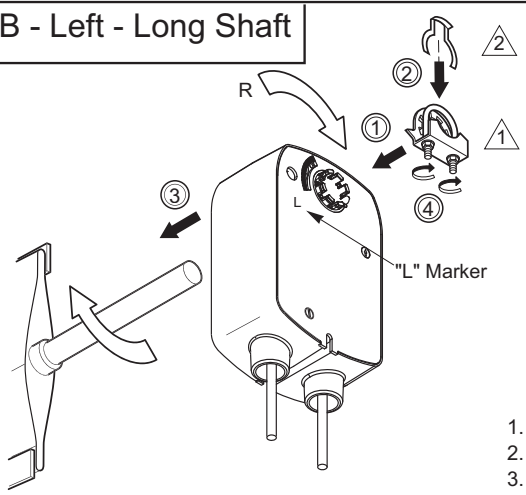
Use the “Short Damper Shaft” mounting instructions if the damper shaft is shorter than 3-1/2” (90 mm) or the area around the damper shaft is too narrow to allow standard mounting, as described in the “Short Damper Shaft” mounting section.

MA40-704X Series Installation

Note: The MA40-704X series actuator comes equipped with standard universal mounting clamp. For damper shafts larger than 5/8” (16 mm) in diameter, the AM-710 universal mounting clamp is required (order separately). The AM-710 clamp accommodates shafts sizes up to 3/4” (19 mm) diameter shafts.

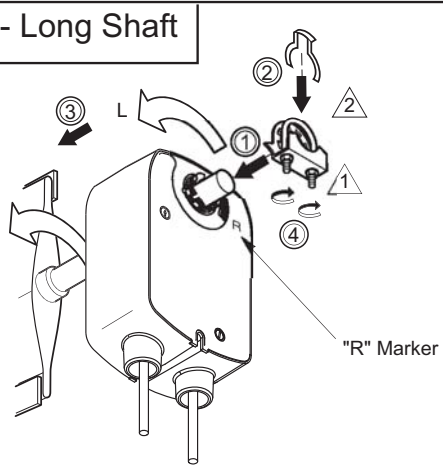


B - Left - Long Shaft



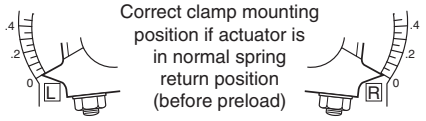
1. Universal mounting clamp.
2. Retaining clip.

B - Right - Long Shaft



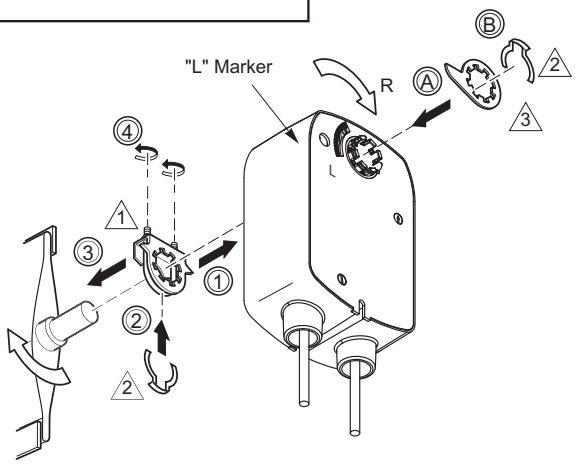
1. Universal mounting clamp.
2. Retaining clip.

1. Assemble mounting clamp.
2. Assemble retaining clip.
3. Place actuator over shaft.
4. Hand tighten clamp nuts.



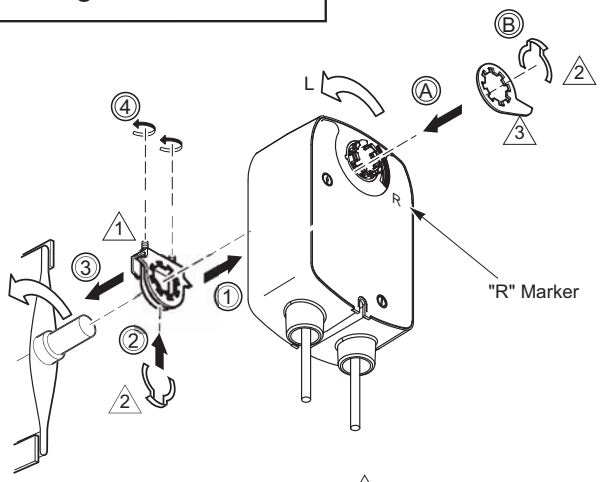
Correct clamp mounting position if actuator is in normal spring return position (before preload)

B - Left - Short Shaft



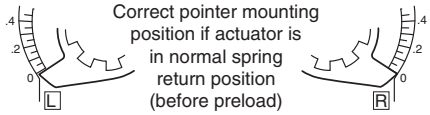
1. Universal clamp.
2. Retaining clip.
3. Damper position indicator.

B - Right - Short Shaft



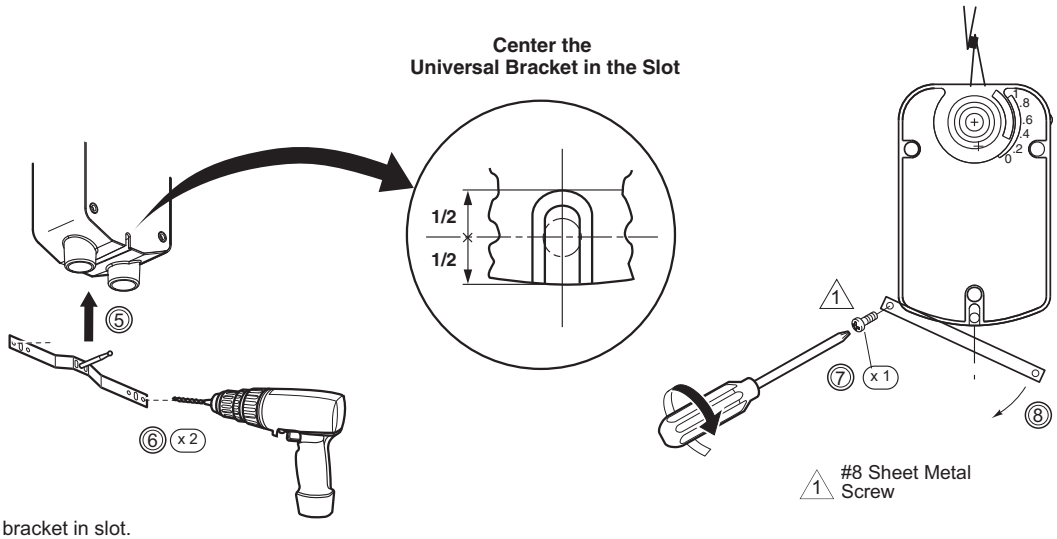
1. Universal clamp.
2. Retaining clip.
3. Damper position indicator.

A. Assemble damper position indicator.
B. Assemble retaining clip.
1. Position mounting clamp.
2. Assemble retaining clip.
3. Slide actuator over shaft.
4. Hand tighten clamp nuts.



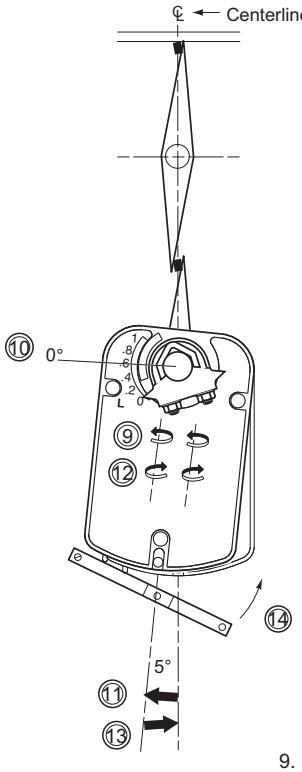
Correct pointer mounting position if actuator is in normal spring return position (before preload)

C - Left and Right

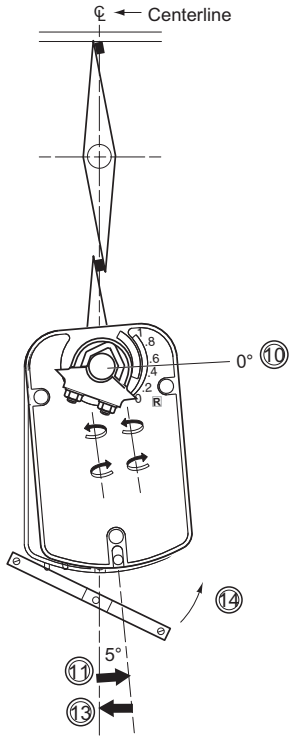


5. Center bracket in slot.
6. Drill two holes.
7. Start one screw.
8. Swing bracket down.

D- Left

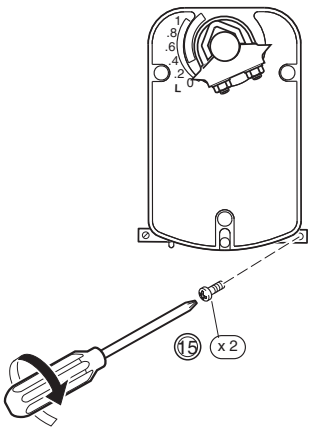


D- Right

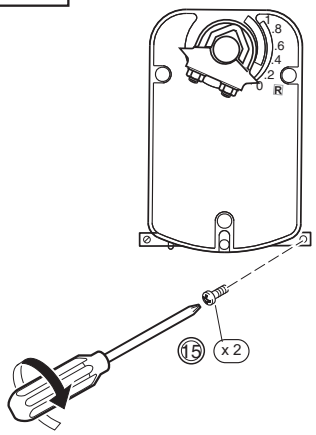


9. Loosen clamp nuts.
10. Check that the shaft is in full zero position.
11. Swing actuator 5° in the direction of travel. Do not move shaft.
12. Tighten clamp nuts to 4 to 6 lb-ft (5.4 to 8.2 N-m) of torque.
13. Move bottom of actuator back into position.
14. Pivot bracket back into position.

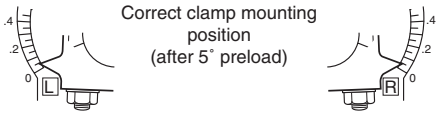
E- Left



E - Right



15. Tighten bracket screws.



MA41-707X and MA41-715X Series Installation

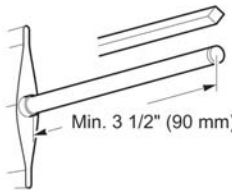
Caution: Do not drill additional holes in the actuator body. Six pre-drilled holes are located on each side, under the label, to accept #10-24 thread-forming screws for mounting accessories.

Note: The MA41-707X and MA41-715X series actuators come equipped with standard universal mounting clamp installed. For damper shafts larger than 3/4” (19 mm) in diameter, the AM-687 universal mounting clamp is required (order separately). The AM-687 clamp accommodates round shaft sizes up to 1.05” (27 mm) in diameter or 5/8” (16 mm) square shafts.

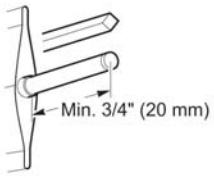
Caution: The MA41-707X and MA41-715X actuators are equipped with a manual override.

- The manual override to be used only when power is not applied to the unit.
- If the universal clamp is not set to 0° on the position indicator, manually wind the actuator in the direction indicated with hex wrench from -5° to 0° and lock with a screwdriver.
- When operating manual override, back off 5° from full open mechanical stop to ensure proper release.
- Do not attempt to use the manual override with actuators mounted in tandem. Damage to the gear train could occur.
- Using power tools to adjust the manual override will cause damage to the gears.
- To unlock manual override without power, crank the manual override in the direction indicated a minimum of 5°.

Long Shaft



Short Shaft



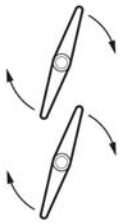
3/8" to 3/4" Diameter (10 mm to 20 mm)
3/8" to 1/2" Square (10 mm to 13 mm)

Move the damper to its normal position. Verify the controller action is set to match the damper application.

Normally closed damper: when damper is closed, actuator position indicator should be at 0°. When damper is open, actuator position indicator should be at 90°.

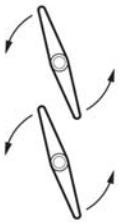
Normally opened damper: when damper is open, actuator position indicator should be at 0°. When damper is closed actuator position indicator should be at 90°.

A - Left



Shaft Rotates Clockwise To Open

A - Right



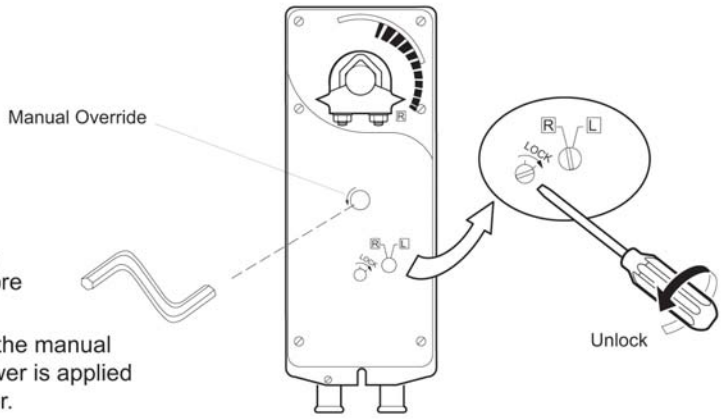
Shaft Rotates Counterclockwise To Open

This step determines shaft rotation. Linkage may change damper direction.

B

For MA41-707X and MA41-715X only (manual override).

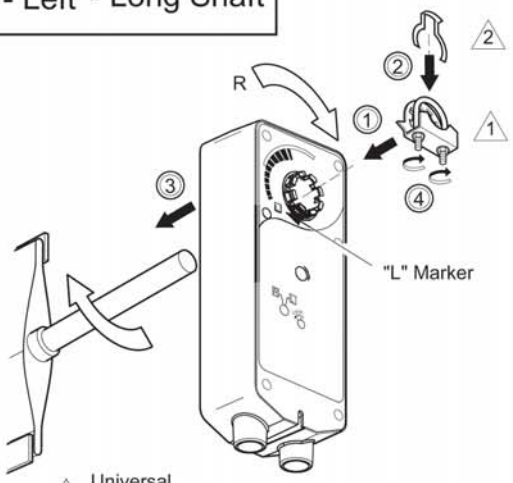
If position indicator does not point to zero: Unlock the actuator.
Insert hex wrench into manual override.
Crank the actuator so the indicator points to 0°.
Lock the actuator.



Fully engage hex wrench into manual override before winding.

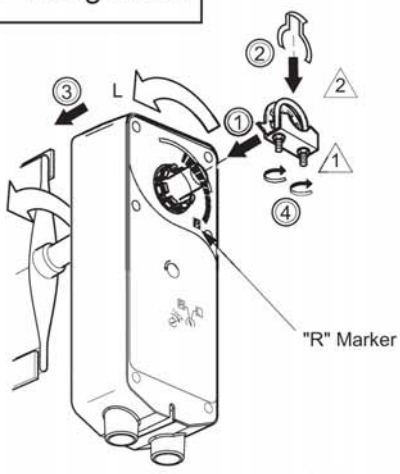
Caution: Do not crank the manual override if power is applied to the actuator.

C - Left - Long Shaft



1. Universal mounting clamp.
2. Retaining clip.

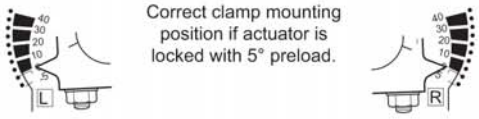
C - Right - Long Shaft



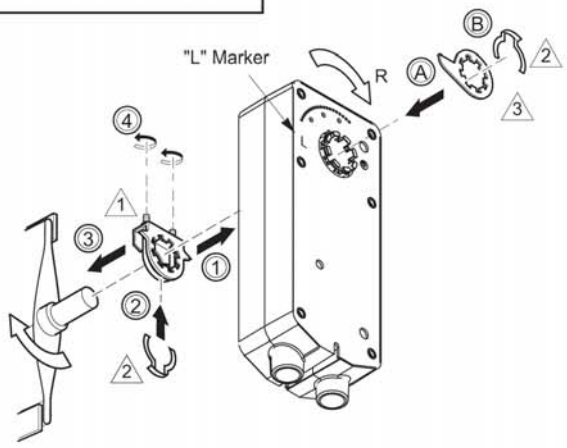
1. Universal mounting clamp.
2. Retaining clip.

1. Assemble mounting clamp.
2. Assemble retaining clip.
3. Place actuator over shaft.
4. Hand tighten clamp nuts.

For MA41-707X and MA41-715X actuators:

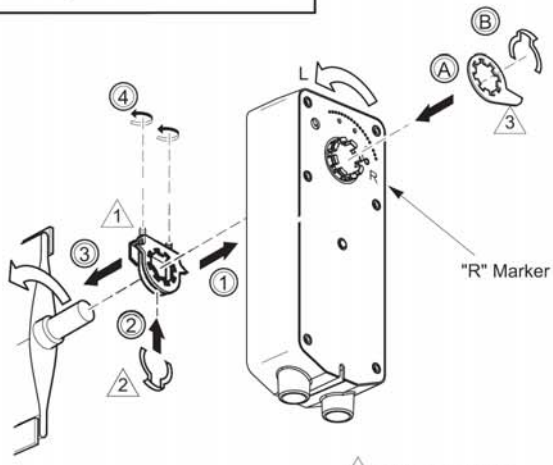


C - Left - Short Shaft



1. Universal clamp.
2. Retaining clip.
3. Damper position indicator.

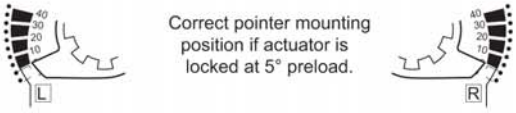
C - Right - Short Shaft



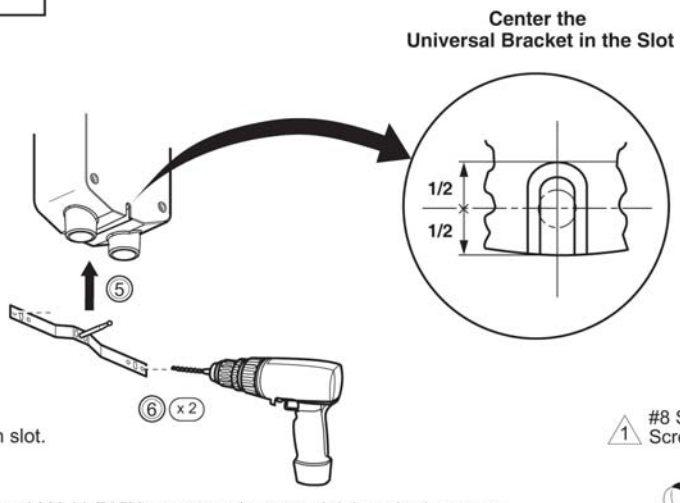
1. Universal clamp.
2. Retaining clip.
3. Damper position indicator.

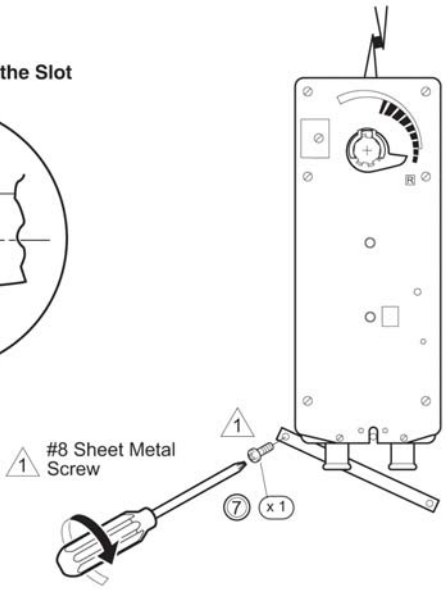
A. Assemble damper position indicator.
B. Assemble retaining clip.
1. Position mounting clamp.
2. Assemble retaining clip.
3. Slide actuator over shaft.
4. Hand tighten clamp nuts.

For MA41-707X and MA41-715X actuators:



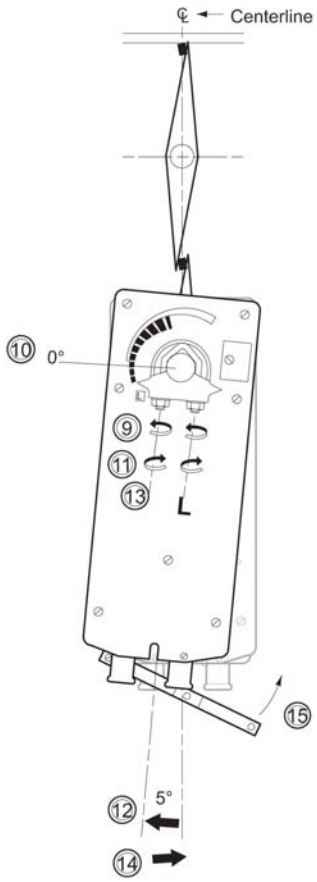
D - Left and Right



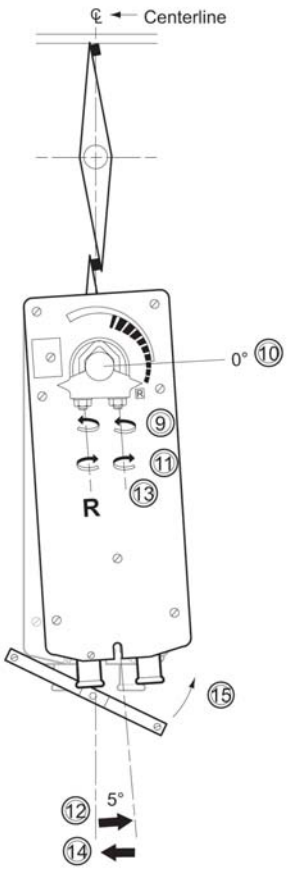


5. Center bracket in slot.
6. Drill two holes.
7. Start one screw.
   For MA41-707X and MA41-715X actuators, insert and tighten both screws.

E- Left



E- Right

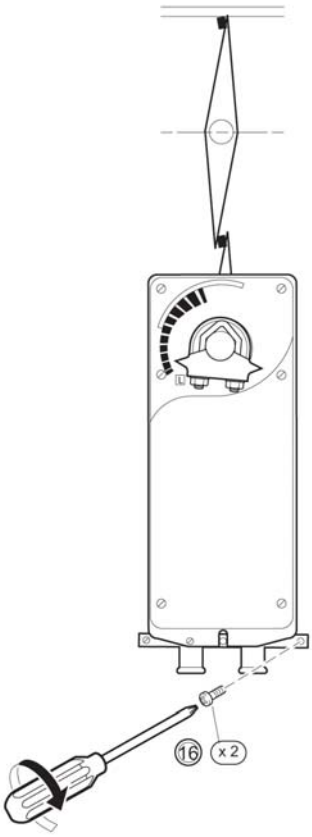


8. Loosen clamp nuts.
9. Check that the shaft is in full zero position.

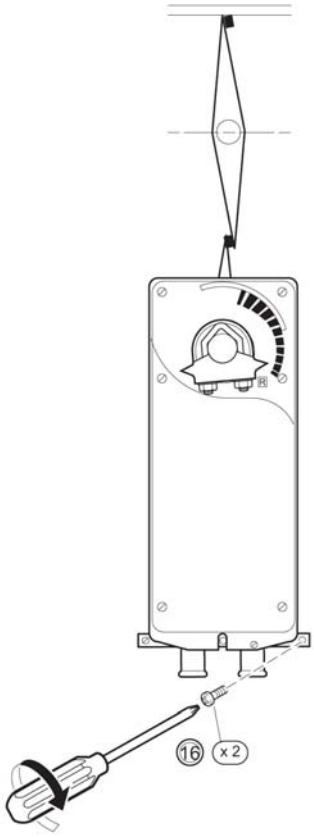
For MA41-707X and MA41-715X only:

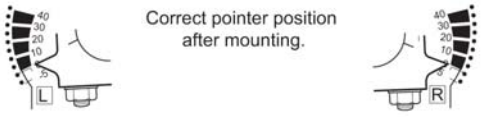
10. Tighten clamp nuts to 8 - 10 ft-lb (11 - 14 Nm).
    This completes the installation for MA41-704X and MA41-715X.

F- Left



F- Right





The lock on MA41-707X and MA41-715X will release on first power-up.

Jackshaft Installation

(MA40-704X Series)

The MA40-704X actuator is designed for use with jackshafts up to 3/4" (19 mm) in diameter. In most applications, the MA40-704X actuator may be mounted in the same manner as a standard damper shaft application. If the jackshaft diameter is larger than 5/8" (16 mm) in diameter, the optional AM-710 universal clamp must be used.

(MA41-715X and MA41-707X Series)

The MA41-715X and MA41-707X actuators are designed for use with jackshafts up to 1.05" (27 mm) in diameter. In most applications, the actuator may be mounted in the same manner as a standard damper shaft application. If the jackshaft diameter is larger than 3/4" (19 mm) in diameter, the optional AM-687 universal clamp must be used.

Multiple Actuator Mounting

If more torque is required than one actuator can provide a second actuator may be mounted to the damper shaft, using the AM-673 multiple mounting bracket. See Figure-4.

Multiple actuators may be powered from one transformer provided the following rules are followed:

- The total current draw of the actuators (VA rating) is less than or equal to the rating of the transformer and less than the rating of the control circuit.
- Polarity on the secondary of the transformer is strictly followed.
  - All L2 wires from all actuators are connected to the common lead on the transformer.
  - All L1 wires from all actuators are connected to the hot lead.

Caution: Mixing the L2 and L1 wires on one lead of the transformer may result in erratic operation or failure of the actuator and/or controls.

Caution: Do not attempt to use the manual override with actuators mounted in tandem. Damage to the gear train may occur.

Multiple actuators positioned by the same control signal may be powered from multiple transformers provided the following rules are followed:

- The transformers are properly sized.
- All L2 wires from all actuators are tied together and tied to the negative lead of the control signal.

Table-2 Power Wiring Color Code.

Part Number	L1	L2
MA41-7XX3 MA41-7XX3-502	Red	Black
MA41-7XX0 MA41-7XXX-502	Black	White
MA41-7XX1 MA41-7XXX-502	Brown	Light Blue

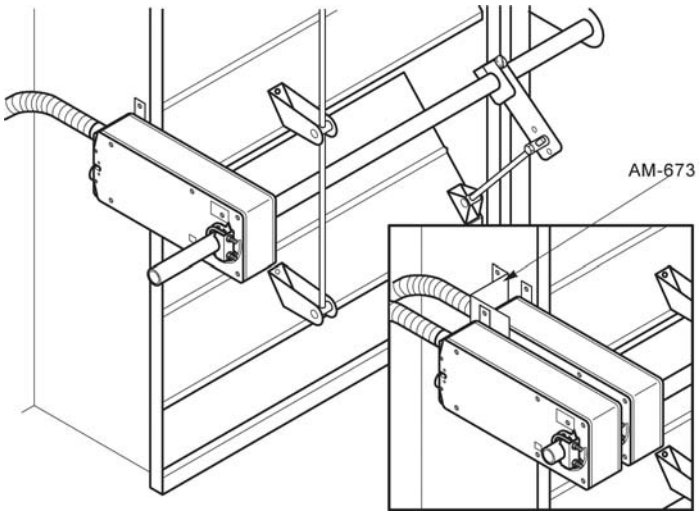


Figure-4 Mounting Multiple Actuators.

Wiring Requirements

Control and Power Leads

See Table-3 for power wiring data. Refer to Figure-1 through Figure-3 for typical wiring applications.

Note: Class 2 control and power lead wiring must be routed separately from line voltage wiring and any other non-class 2 circuits. Line voltage, auxiliary switch, and auxiliary switch leads must be connected to a class 1 circuit.

Table-3 Power Wiring Data.

Actuator Voltage	Part Number	Maximum Wire Run in ft. (m) (5% Voltage Drop)		
		14 AWG	16 AWG	18 AWG
24 Vac 22-30 Vdc	MA41-7153 MA41-7153-502	330 (101)	200 (61)	130 (40)
24 Vac 22-30 Vdc	MA40-7043 MA40-7043-501	1100 (335)	700 (213)	440 (134)
24 Vac 22-30 Vdc	MA41-7073 MA41-7073-502	600 (183)	500 (152)	254 (77)

Auxiliary Switches

The MA40-704X-501 series actuators include one built-in SPDT auxiliary switch which can be used for interfacing or signaling (e.g., for fan start-up). The switch is adjustable between 15° and 95° of rotation (MIN to 1 scale).

The MA41-715X-502 and MA41-707X-502 series actuators include two built-in SPDT auxiliary switches which can be used for interfacing or signaling (e.g., for fan start-up). The switch position near the normal (spring return) position is fixed at 5°. The other is adjustable between 25° and 85° of rotation.

Adjusting the Switching Point

Refer to Table-4 for auxiliary switch rating.

Adjusting the switching point for MA40-704X-501

1. The actuator must be in its normal (spring return) position.
2. Use a flat screw driver to rotate the switch pointer until it is at the desired switch position on the MIN to 1 scale.

Adjusting the switching point for MA41-715X-502 or MA41-707X-502

1. The actuator must be in its normal (spring return) position.
2. Insert a 1/8” allen wrench into the hex hole located in the center of the adjustable switch pointer.
3. Rotate the wrench until the switch pointer is at the desired switch position in degrees, from 25 to 85°.

Table-4 Auxiliary Switch Rating.

Part Number	Voltage	Resistive Load	Inductive Load
MA40-7043-501	24 Vac	6A	1.5A
MA40-7040-501	250 Vac	6A	1.5A
MA40-7041-501			
MA41-707X-502	250 Vac	7A	2.5A
MA41-715X-502			

Rotation Limitation

Rotation Limitation for MA40-704X Series

The Stop Block is used in conjunction with the tab on the universal clamp or the AM-709 position indicator. In order to function properly, the clamp or indicator must be mounted correctly.

The Stop Block controls the rotational output of the MA40-704X and MF40-704X-501 actuators. It is used in applications where a damper has a designed rotation that is less than 90°, for example with a 45° or 60° rotating damper.

1. Determine the amount of damper rotation required. The actuator stop block provides limited rotation from 40° to 95°.
2. Loosen the screw securing the stop block to the actuator.

Note: The actuator is shipped with the Stop Block mounted to the “L” side. If the damper application requires the “R” side face the installer, simply remove the Stop Block and screw and move it to the new location.

---

3. Slide the stop block into position, so that its edge lines up with the degree graduation on the actuator face which corresponds with the required rotation. See Figure-5.
4. Secure the stop block in place.
5. Test the damper rotation by applying power. Re-adjust if necessary.

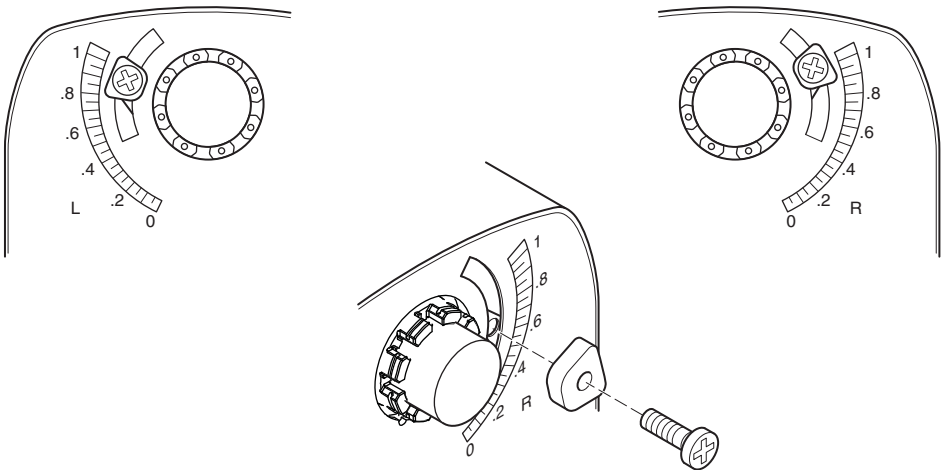


Figure-5 Adjusting Stop Block for Limited Rotation.

Rotation Limitation for MA41-715X and MA41-707X Series

The AM-689 rotation limiter is used in conjunction with the tab on the universal clamp or the AM-686 position indicator which comes with the AM-689. In order to function properly, the clamp or indicator must be mounted correctly.

The AM-689 rotation limiter controls the rotational output of the MA41-715X, MA41-715X-502, MA41-707X, and MA41-707X-502 actuators. It is used in applications where a damper has a designed rotation that is less than 90°, for example with a 45° or 60° rotating damper.

1. Determine the amount of damper rotation required.
2. Locate the AM-689 rotation limiter on the actuator so that its edge lines up with the degree graduation on the actuator face which corresponds with the required rotation. See Figure-6.
3. Find the appropriate cross-hair location through the slot of the rotation limiter. This is the mounting location for the retaining screw.
4. Pierce through the label material to allow easy fastening of the retaining screw.
5. Position the rotation limiter back to the desired position, making sure the locating “teeth” on the rotation limiter are engaged into the locating holes on the actuator.
6. Fasten the rotation limiter to the actuator using the self-tapping screw provided.
7. Test the damper rotation by applying power. Re-adjust if necessary.

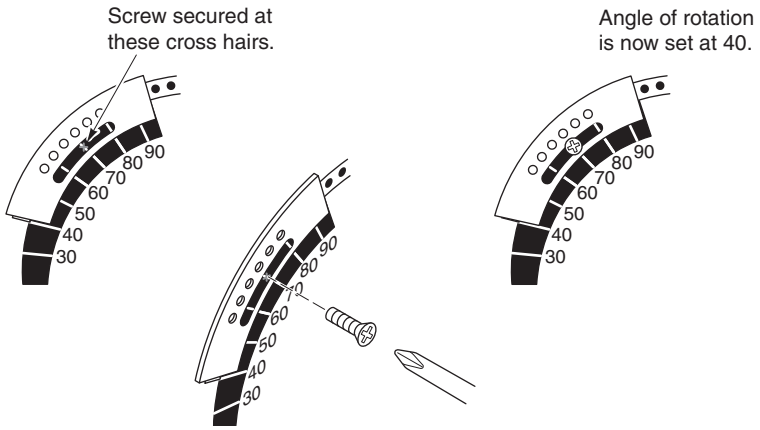


Figure-6 Securing the AM-689 Rotation Limiter.

CHECKOUT

After the entire system has been installed and the actuator has been powered up, the following check can be made for proper system operation. Check for correct operation of the damper while actuator is being stroked.

1. Apply power to the actuator. Actuator and damper should be driven to their powered position.
2. On the MA4X-7XXX-50X models, check for correct auxiliary switch operation.
3. Break power to the actuator. Actuator and damper should return to their normal, or spring return position.

Table-5 Power Wiring Color Code.

Part Number	L1	L2
MA4X-7XX3 MA4X-7XX3-502	Red	Black
MA4X-7XX0 MA4X-7XXX-502	Black	White
MA4X-7XX1 MA4X-7XXX-502	Brown	Light Blue

THEORY OF OPERATION

The actuators are mounted directly onto a damper shaft using a universal V-clamp. When power is applied, the actuator rotates 95° to its powered position, at the same time tensing the spring return safety mechanism. When power is removed, the spring returns the actuator to its normal position. The actuators provide true mechanical spring return operation for reliable, positive close-off on air tight dampers.

The MA41-707X, MA41-707X-502, MA41-715X, and MA41-715X-502 actuators are equipped with a graduated position indicator showing -5° to 90°. The MA40-704X and MA40-704X-501 are equipped with a graduated position indicator showing 0 to 1.

The MA40-704X-501 models are provided with 1 built in auxiliary switch. The SPDT switch is provided for interfacing or signaling, for example, fan start-up. The switching function is adjustable between 15° to 95° rotation (MIN to 1 scale).

The MA41-715X-502 and MA41-707X-502 models are provided with 2 built in auxiliary switches. The SPDT switches are provided for interfacing or signaling, for example, fan start-up. The switching function is adjustable on one switch between 25° to 85° rotation and the other switch is fixed at 5°.

The MA41-707X-XXX and MA41-715X-XXX actuators are equipped with a manual override mechanism. This allows the actuator to be manually positioned at any point between -5° and 85°. This mechanism is accessible on both sides of the actuator and can be used to ensure tight close-offs for valves and dampers. The manual override should not be used while a unit is powered or on units that are mounted in tandem.

MAINTENANCE

Regular maintenance of the total system is recommended to assure sustained optimum performance. The actuators are maintenance free.

FIELD REPAIR

None. Replace with a functional actuator.

DIMENSIONAL DATA

Figure-7 and Figure-8 dimensions are in inches (mm).

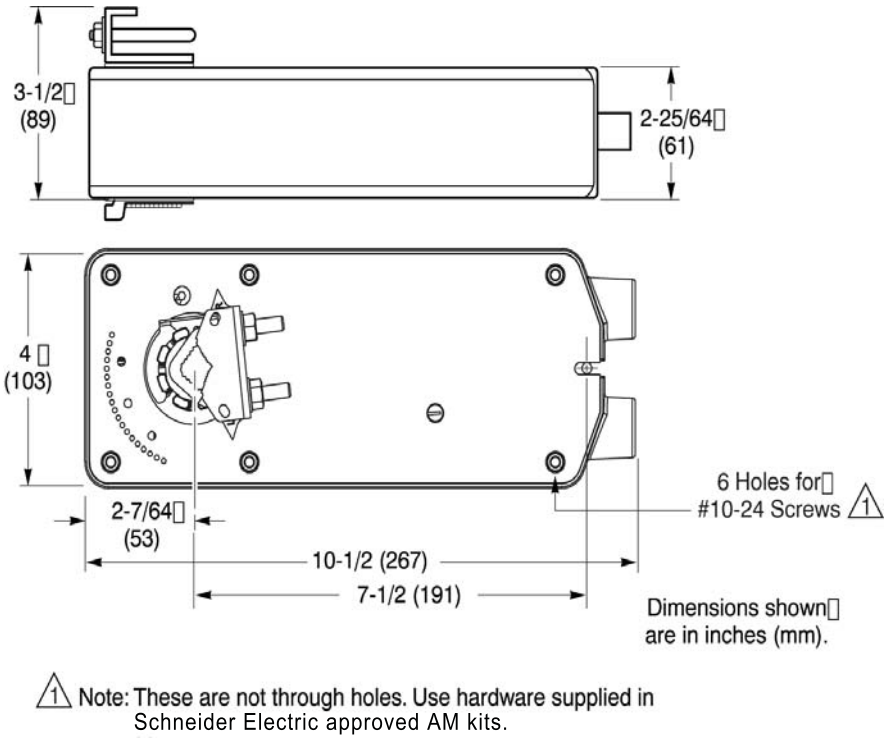


Figure-7 MA41-707X or MA41-715X Series Mounting Dimensions.

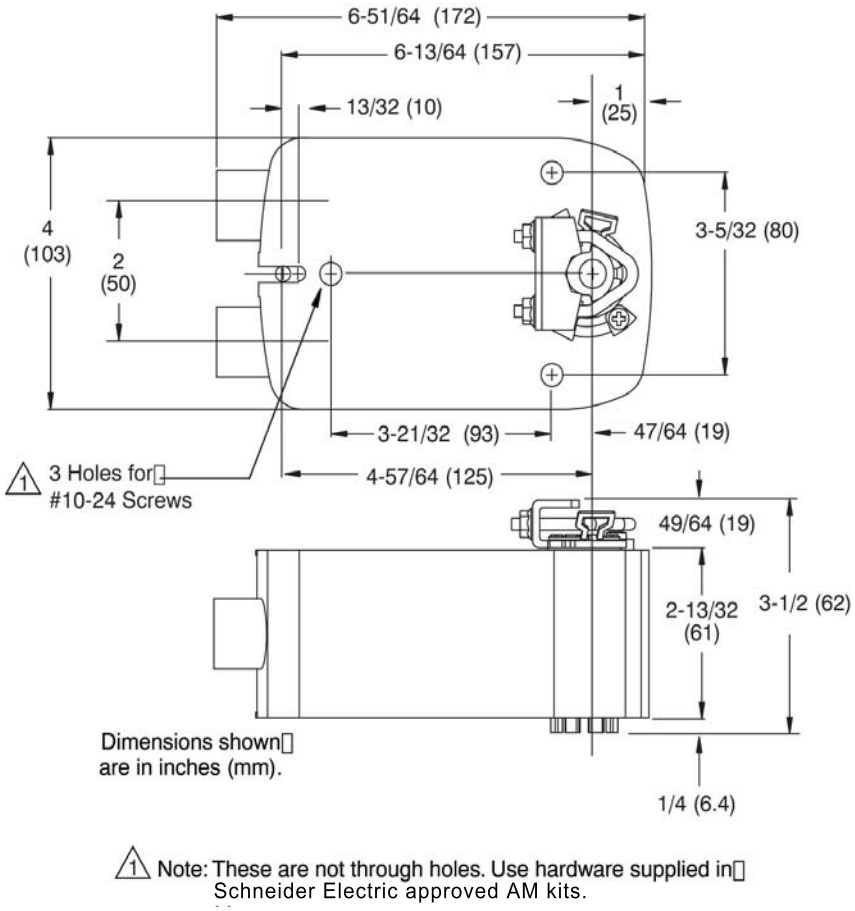


Figure-8 MA40-704X Series Mounting Dimensions.

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F-26642-9

August 2014

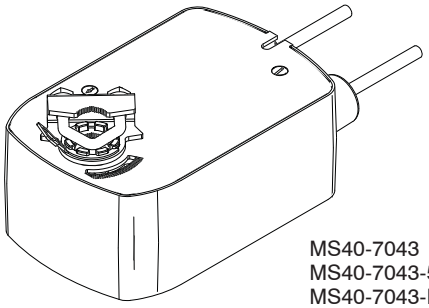
MS40-7043 Series
MS41-7073 Series
MS41-7153 Series

SmartX Actuators
Spring Return Proportional
General Instructions

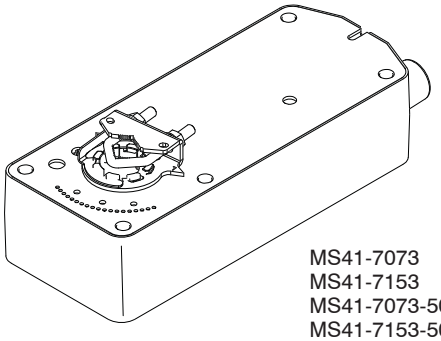
Application

SmartX Actuators (Direct Coupled) are designed to be used in both damper and valve control applications. The following general instructions are for damper applications. Refer to the Applicable Literature table for valve literature.

The MS4X-7XX3 series spring return actuators provide proportional modulation control of dampers and valves in HVAC systems.



MS40-7043
MS40-7043-501
MS40-7043-MP
MS40-7043-MP5



MS41-7073
MS41-7153
MS41-7073-502
MS41-7153-502

Features

- Proportional models controlled by 6-9 Vdc, 2-10 Vdc, or 4-20 mA with the addition of a 500 ohm resistor
- 133 lb-in (15 N-m), 60 lb-in (7 N-m) or 35 lb-in (4 N-m) of torque
- Rugged die-case housings rated for NEMA 2 / IP54
- Optional built-in auxiliary switch to provide for interfacing or signaling
- Provides 95° of rotation
- Visual position indicator provided
- Provides true mechanical clockwise or counterclockwise spring return operation for reliable fail safe application and positive close-off in air tight damper applications
- MS40-7043-MPX models controlled by 6-9 Vdc with auxiliary 20 Vdc power supply provides power to controllers, replacing MP-5XXX/MPR-5XXX electrohydraulic actuators
- Direct mount to round or square damper shafts
- Switch provided for selection of direct or reverse acting control mode
- Rotation limiting available
- MS41-7153 SmartX Actuators can be double-mounted (gang mounting) to accommodate high torque application requirements
- Five year warranty
- MS41-7073 and MS41-7153 SmartX Actuators are equipped with manual override

Applicable Literature

F-Number	Description	Audience	Purpose
F-26750	MA4X-XXXX-2XX, MF4X-XXXX-2XX, MS4X-XXXX-2XX Series Actuator/Linkage Assemblies General Instructions	– Sales Personnel – Application Engineers – Installers – Service Personnel – Start-up Technicians	Describes the globe valve actuator/linkage assembly's features, specifications, and possible applications. Provides step-by-step mounting instructions.
F-26751	VX-2000 Series Ball Valve Assembly Installations Instructions	– Sales Personnel – Application Engineers – Installers – Service Personnel – Start-up Technicians	Describes the actuator/linkage/ball valve assembly's features, specifications, and possible applications. Provides step-by-step mounting instructions.
F-26646	MX4X-7XXX, MX40-6XXX SmartX Actuator Selection Guide	– Sales Personnel – Application Engineers – Installers – Service Personnel – Start-up Technicians	Provides actuator specifications and part number cross referencing of phased out actuators with the new direct-coupled actuators.
F-26752	VX-2000, VX-7000, MX4X-7XXX, MX40-6XXX Linked Globe Valve Assemblies Actuator/Linkage Assemblies with SmartX Actuators	– Sales Personnel – Application Engineers – Installers – Service Personnel – Start-up Technicians	Provides part number cross referencing of phased out globe and ball valve assemblies with the new direct-coupled actuators.
F-26080	EN-205 Water System Guidelines	– Application Engineers – Installers – Service Personnel – Start-up Technicians	Describes Schneider Electric approved water treatment practices.
F-13755	CA-28 Control Valve Sizing	– Application Engineers – Installers – Service Personnel – Start-up Technicians	Provides charts, equations, and diagrams to assist in the configuration of valve system applications. TOOL-150, valve sizing slide rule may be purchased separately.
F-11080	Valve Selection Chart Water		
F-11366	Valve Selection Chart Steam (two-way valves only)		

SPECIFICATIONS

Actuator Inputs

Control Signal:x13 See Table-1.
Power Input:x13 See Table-1. All 24 Vac circuits are Class 2.
Connections: :13 3 ft. (91 cm) plenum rated cable for MS40-7043-XXX and 3 ft. (91 cm) appliance cables for MS41-7153-XXX and MS4X-7073-XXX, 1/2" (13 mm) conduit connectors. For M20 Metric conduit, use AM-756 adaptor.

Actuator Outputs

Electrical:
Position Feedback Voltage "AO":
MS40-7043, MS41-7153 and MS41-7073 2 to 10 Vdc (max. 0.5 mA) output signal for position feedback or to operate up to four additional slave actuators.
Auxiliary Switches:
MS40-7043-MP5 and MS40-7043-501 One SPDT 6A (1.5A) @ 24 Vac, adjustable 0 to 95° (0 to 1 scale).
MS41-7153-502 and MS41-7073-502 Two SPDT 7A (2.5A) @ 250 Vac, one fixed @ 5° and one adjustable 25 to 85°.
Auxiliary Power Supply:
MS40-7043-MP and MS40-7043-MP5 +20 Vdc @ 25 mA (max).
Mechanical:
Stroke: Angle of rotation 95° ±5°. Adjustable 30° to 95° with AM-689 installed on MS41-7153-XXX or MS41-7073-XXX. MS40-7043-XXX models are adjustable 40° to 95° by adjusting the stop block position on the actuator.
Damper Shaft Clamp:
MS40-7043-XXX The factory installed universal clamp is used for shafts up to 5/8" (15 mm) diameter or up to 1/2" (13 mm) square. AM-710 accessory clamp is required when mounting actuators to shafts up to 3/4" (19 mm) diameter or up to 1/2" (13 mm) square.
MS41-7153-XXX or MS41-7073-XXX The factory installed universal clamp is used for shafts up to 3/4" (19 mm) diameter or up to 1/2" (13 mm) square. AM-687 accessory clamp is required when mounting actuators to shafts up to 1.05" (27 mm) diameter or up to 5/8" (15 mm) square.
Position Indicator: Visual indicator.
MS41-7153 and MS41-7073 -5 to 90° (-5° is spring return position).
MS40-7043 0 to 1 (0 is spring return position).
Nominal Damper Area: Actuator sizing should be done in accordance with damper manufacturer's specifications.
Direction of Rotation: Clockwise or counterclockwise rotation determined by actuator mounting.
Manual Override: MS41-7073 and MS41-7153 are equipped with a manual rotation adjustment from -5° to 85°.
Right/Left Switch Permits reverse acting/direct acting rotation.

Environment

Ambient Temperature Limits:
Shipping & Storage -40 to 160°F (-40 to 71°C).
Operating -22 to 140°F (-30 to 60°C).
Humidity: 15 to 95% RH, non-condensing.
Location:
MS41-7153-XXX and MS41-7073-XXX NEMA 1 (IEC IP30). NEMA 2 (IEC IP54) with conduit connector in the down position.
MS40-7043-XXX NEMA 2 (IEC IP54) no restrictions.

Agency Listings

UL 873: Underwriters Laboratories (File #E9429 Category Temperature-Indicating and Regulating Equipment).
CUL: UL Listed for use in Canada by Underwriters Laboratories. Canadian Standards C22.2 No. 24-93.
European Community: EMC Directive (89/336/EEC). Low Voltage Directive (72/23/EEC)
Australia: This product meets requirements to bear the C-Tick Mark according to the terms specified by the Communications Authority under the Radiocommunications Act 1992.

Table-1 Specifications.

Part Number	SmartX Actuator Power Input							Approximate Timing in Seconds @ 70°F (21°C)		Auxiliary Switch	Output Torque Rating lb.-in. (N-m)		Auxiliary Power Supply	Input
	Voltage	Running					Hold-ing	Powered	Spring Return		Min.	Max. Stall		
		50 Hz		60 Hz		DC Amps	50/60 Hz							
		VA	W	VA	W		W							
MS40-7043	24 Vac ± 20% 22-30 Vdc	5.6	4.2	5.6	4.2	0.15	2.4	<130	<25	No	35 (4)	150 (17)	None	2-10 Vdc or 4-20 mA w/ 500 Ω
MS40-7043-501										One				
MS41-7073		5.8	4.6	5.8	4.6	0.17	2.3	<195	<30	No	60 (7)	250 (28)		
MS41-7073-502										Two				
MS41-7153		9.8	7.4	9.7	7.4	0.28	2.9	<190	<30	No	133 (15)	350 (40)		
MS41-7153-502										Two[f]				
MS40-7043-MP	24 Vac ± 20% 22-30 Vdc	6.6	5.0	6.6	5.0	0.17	3.2	<130	<25	No	35 (4)	150 (17)	+20 Vdc 25 mA Max.	6-9[c] Vdc
MS40-7043-MP5										One				

ACCESSORIES

AM-671	Universal Mounting Bracket, AM-693 is required
AM-672	Universal Mounting Bracket, AM-693 is required
AM-673	Multiple Actuator Mounting Bracket (MA40-7153 series)
AM-674	Weather Shield
AM-675	Base Mounting Plate for AM-674
AM-676	Universal Shaft Extension, AM-710 required
AM-703	Input Rescaling Module, adjusts signals to 2-10 Vdc, zero and span adjustment
AM-704	Interface, pulse width modulation
AM-705	Positioner (NEMA 4 housing)
AM-706	Min and/or Manual Positioner for flush panel mount
AM-708	500Ω resistor for 0 to 20 mA control signal
AM-714	Weather Shield (polycarbonate)
AM-756	Metric Conduit Adapter M20 x 1.5 to 1/2" NPT
AM-761	7-inch replacement anti-rotation bracket
AM-762	9-inch replacement anti-rotation bracket

MS41-7153-XXX and MS41-7073-XXX

AM-686	Damper Position Indicator
AM-687	Universal Clamp for up to 1.05" (27 mm) diameter shafts
AM-688	Replacement Universal Clamp
AM-689	Rotation Limiter
AM-690	Crank Arm for round shafts up to 3/4" (19 mm)
AM-691	Crank Arm for jackshafts up to 1.05" (27 mm)
AM-692	V-bolt Kit for AM-690 and AM-691 Crank Arms
AM-693	Damper Linkage Kit
AM-758	Short "U" mounting bracket for replacing Honeywell Mod III type actuators and new installations, AM-690 or AM-691 is required
AM-759	Tall "U" mounting bracket for replacing Honeywell Mod IV type actuators and new installations, AM-690 or AM-691 is required
AM-760	Slotted "L" mounting bracket, AM-690 or AM-691 is required
AM-763	Crank for manual override

MS40-7043-XXX

AM-709	Damper Position Indicator
AM-710	Universal Clamp for up to 3/4" diameter shafts
AM-711	Crankarm for up to 1/2" round shaft
AM-712	Crankarm Adaptor Kit
AM-713	Mounting Bracket for Honeywell Mod IV, M6415 type actuators, and new installations
AM-715	Crankarm Adaptor Kit for Honeywell Mod IV M6415 type actuators, and new installations
AM-717	Replacement Universal Clamp

Table-2 Auxiliary Power Supply.

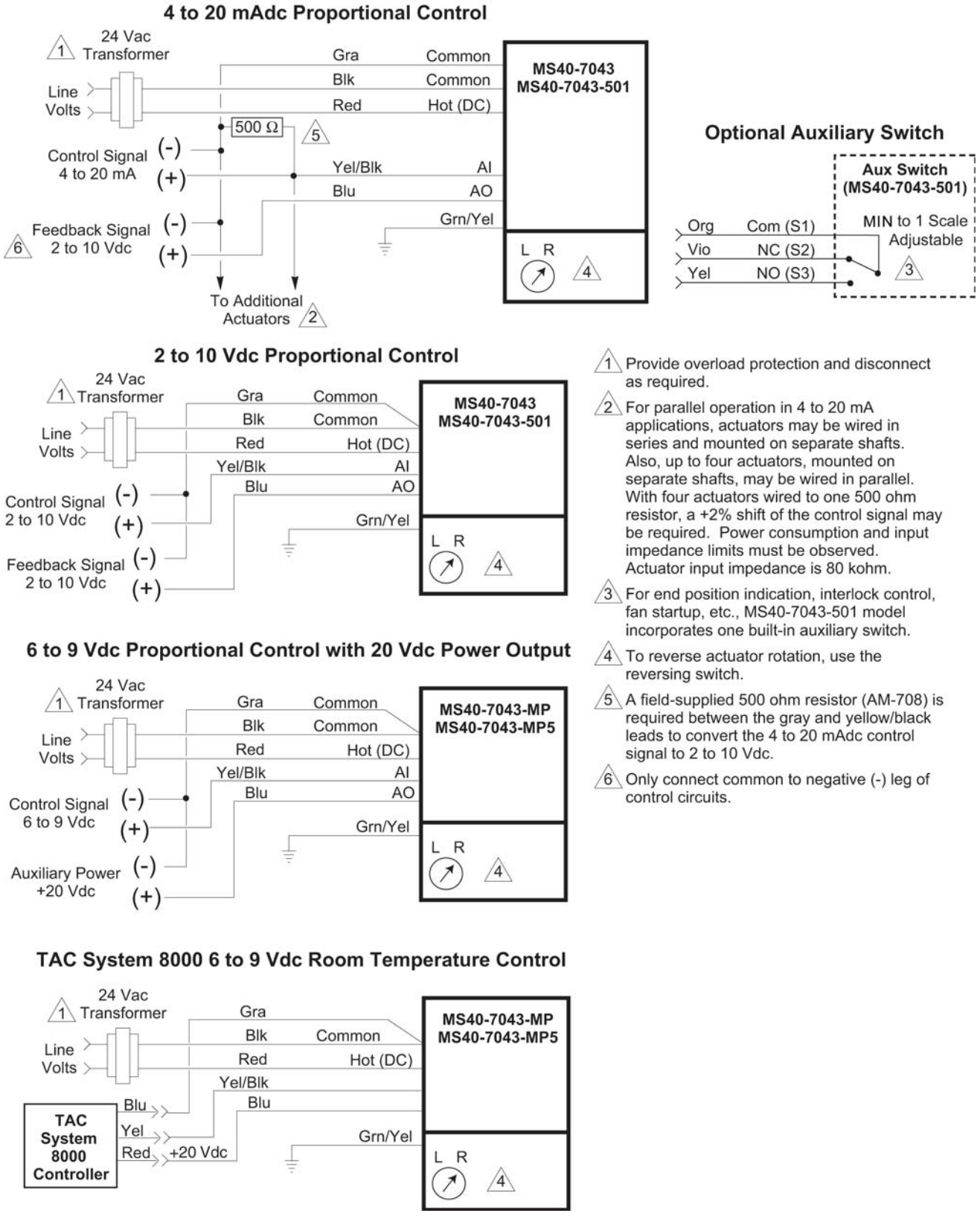
Model #	**Rating**	
MS40-7043-MP or MS40-7043-MP5	+ 20 Vdc, 25 mA Maximum	
Control Wires	Blue (+)	Grey (-)

TYPICAL APPLICATIONS (wiring diagrams)

Figure-1 and Figure-2 illustrate typical wiring diagrams for spring return proportional actuators. See Table-1 for model selection and control signal specifications.

Caution: This product contains a half-wave rectifier power supply and must not be powered off transformers used to power other devices utilizing non-isolated full-wave rectifier power supplies. Refer to EN-206, Guidelines for Powering Multiple Devices from a Common Transformer, F-26363 for detailed information.

Note: DC operation is applicable to models manufactured after date code 0212.



1 Provide overload protection and disconnect as required.

2 For parallel operation in 4 to 20 mA applications, actuators may be wired in series and mounted on separate shafts. Also, up to four actuators, mounted on separate shafts, may be wired in parallel. With four actuators wired to one 500 ohm resistor, a +2% shift of the control signal may be required. Power consumption and input impedance limits must be observed. Actuator input impedance is 80 kohm.

3 For end position indication, interlock control, fan startup, etc., MS40-7043-501 model incorporates one built-in auxiliary switch.

4 To reverse actuator rotation, use the reversing switch.

5 A field-supplied 500 ohm resistor (AM-708) is required between the gray and yellow/black leads to convert the 4 to 20 mAdc control signal to 2 to 10 Vdc.

6 Only connect common to negative (-) leg of control circuits.

Figure-1 Proportional Control of System 8000 Room Temperature Controller Application of MS40-7043-XXX SmartX Actuator.

MS41-7073-XXX and MS41-7153-XXX

Caution: This product contains a half-wave rectifier power supply. It must not be powered with transformers that are used to power other devices utilizing non-isolated full-wave rectifier power supplies. Refer to EN-206, Guidelines for Powering Multiple Devices from a Common Transformer, F-26363 for detailed information.

MS41-707X-502 and MS41-715X-502 units manufactured prior to the date code 0141 (October 6, 2001) used different color coding for the auxiliary switches.

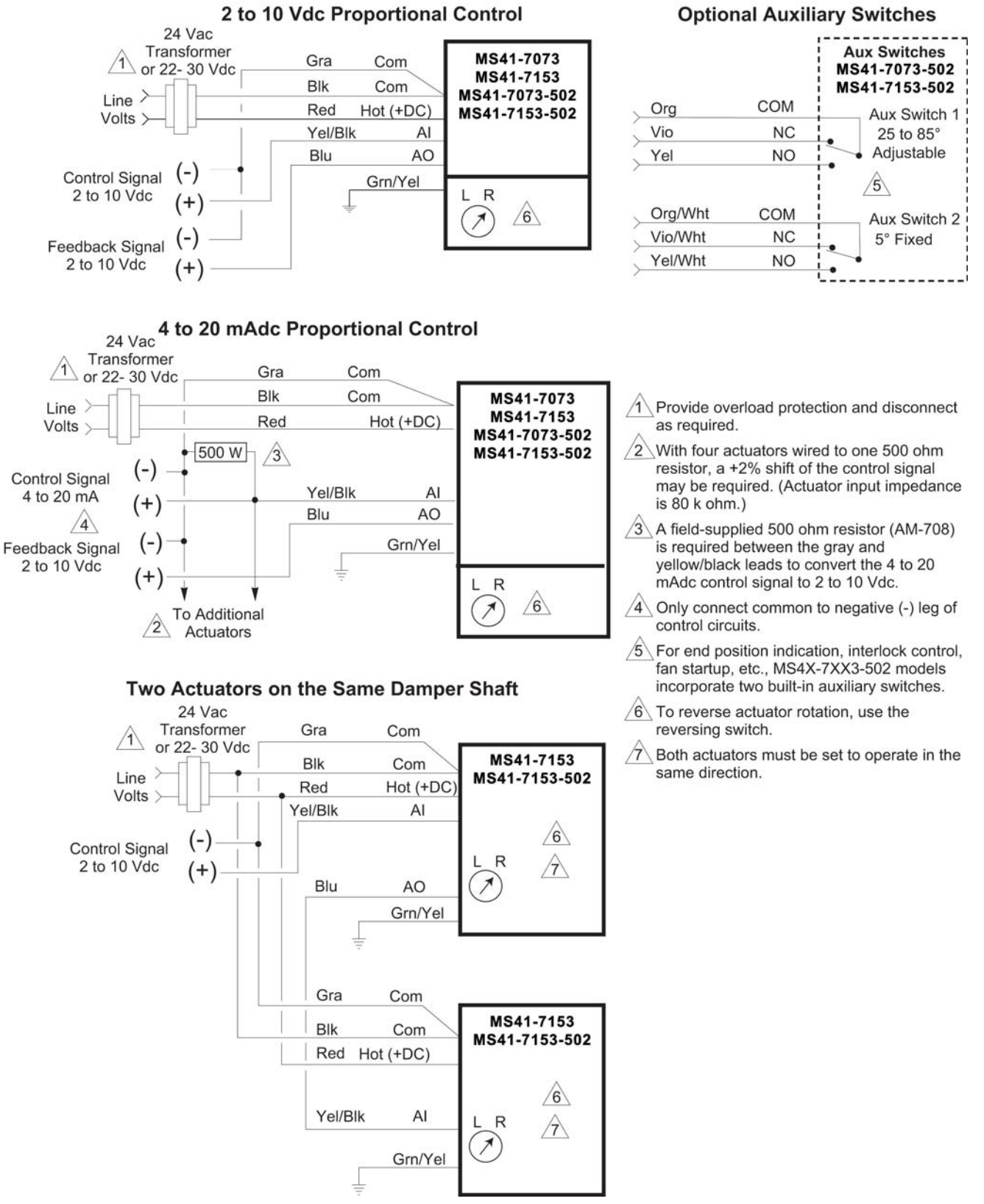
Auxiliary Switch 1

Orange:	Fixed auxiliary switch common (com)
Yellow:	Fixed auxiliary switch normally closed (NC)
Violet:	Fixed auxiliary switch normally open (NO)

Auxiliary Switch 2

Orange/white:	Adjustable auxiliary switch common (com)
Violet/white:	Adjustable auxiliary switch normally closed (NC)
Yellow/white:	Adjustable auxiliary switch normally open (NO)

The label information on these units is incorrect. If replacing these units, the auxiliary switch operation of the replacement actuator will be per the product label and Figure-2.



1. Provide overload protection and disconnect as required.
2. With four actuators wired to one 500 ohm resistor, a +2% shift of the control signal may be required. (Actuator input impedance is 80 k ohm.)
3. A field-supplied 500 ohm resistor (AM-708) is required between the gray and yellow/black leads to convert the 4 to 20 mAdc control signal to 2 to 10 Vdc.
4. Only connect common to negative (-) leg of control circuits.
5. For end position indication, interlock control, fan startup, etc., MS4X-7XX3-502 models incorporate two built-in auxiliary switches.
6. To reverse actuator rotation, use the reversing switch.
7. Both actuators must be set to operate in the same direction.

Figure-2 Typical Wiring Diagrams for Proportional Control 24 Vac Basic and Double Auxiliary Switch Models.

INSTALLATION

Inspection

Inspect the package for damage. If damaged, notify the appropriate carrier immediately. If undamaged, open the package and inspect the device for obvious damage. Return damaged products.

Requirements

- Job wiring diagrams
- Tools (not provided):
  - #8 sheet metal screws (Universal Bracket)
  - 10mm open end wrench or socket wrench (Universal V-clamp)
  - 1/8 inch, allen wrench (Aux. Switch)
  - Appropriate screwdriver(s)
  - Drill and appropriate bits
- Appropriate accessories
- Training: Installer must be a qualified, experienced technician

Precautions

General

Warning:

- Electrical shock hazard! Disconnect the power supply (line power) before installation to prevent electric shock and equipment damage.
- Make all connections in accordance with the job wiring diagram and in accordance with national and local electrical codes. Use copper conductors only.

Caution:

- Avoid electrical noise interference. Do not install near large contactors, electrical machinery, or welding equipment.
- MS41-707X and MS41-715X Manual override to be used only when power is not applied to unit.
- When operating manual override, back off 5° from full open mechanical stop to ensure proper release.
- MS41-707X and MS41-715X Do not attempt to use the manual override with actuators mounted in tandem. Damage to the gear train may occur.
- Do not drill holes in actuator body. Six pre-drilled holes are located on each side, under the label, to accept #10-24 thread forming screws for mounting accessories.

Federal Communications Commission (FCC)

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in residential installations. This equipment generates, uses, and can radiate radio frequency energy and may cause harmful interference if not installed and used in accordance with the instructions. Even when instructions are followed, there is no guarantee that interference will not occur in a particular setting—Which can be determined by turning the equipment off and on—the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/television technician for help.

Canadian Department of Communications (DOC)

Note: This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numerique de la classe B respecte toutes les exigences du Reglement sur le material broilleur du Canada.

European Standard EN 55022

Warning: This is a Class B digital (European Classification) product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Location

Caution: Avoid locations where excessive moisture, corrosive fumes, vibration, or explosive vapors are present.

Mounting

Caution: To remain in NEMA 2/IP54 compliance, the MS41-715X and MS41-707X series actuators should be mounted with conduit end down.

Mount the SmartX Actuator directly on the damper shaft in locations that clear the maximum dimensions of the actuator case and allow the actuator to be mounted flush to the surface of the terminal box and perpendicular to the damper shaft.

MS41-707X and MS41-715X If the universal clamp is not set to 0° on the position indicator, manually wind the actuator in the direction indicated with hex wrench from -5° to 0° and lock with a screwdriver.

Note: Some terminal boxes have sheet metal screw heads or other protrusions near the damper shaft. In these cases, a spacer or shim may be added under the anti-rotation bracket of the actuator to make the actuator perpendicular to the shaft.

Damper Actuator Sizing

Correct sizing of the actuator is necessary for proper control of dampers. The area of damper that can be controlled by a given actuator is dependent upon the type of damper, the quality of the damper, the pressure drop across the damper in the closed position, and the velocity of the air flow through the damper. To obtain actual damper torque requirements, contact the damper manufacturer.

Damper Shaft Sizing

Use the “Long Damper Shaft” mounting instructions if the damper shaft is at least 3-1/2” (90 mm) long.

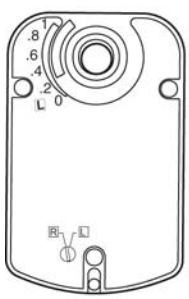
Use the “Short Damper Shaft” mounting instructions if the damper shaft is shorter than 3-1/2” (90 mm) or the area around the damper shaft is too narrow to allow standard mounting, as described in the “Short Damper Shaft” mounting section.

Changing Direction of Rotation

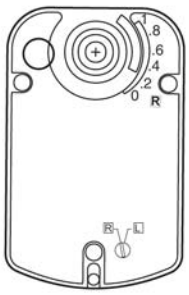
The MS40-7043, MS41-7074, and MS41-7153 actuators are equipped with a switch to control the direction of rotation. The switch can be set to “L” (left) or “R” (right) rotation. An actuator set to “L” will have a clockwise rotation when viewed from the left side. When viewed from the right side the rotation will be counterclockwise. Refer to Figure-3.

Caution: These are spring return actuators. It is possible to switch to a direction that moves the actuator against the -5° positive stop. Example: Viewing the actuator from the left side with the switch set to “R” and an increasing signal. The actuator will attempt to rotate beyond the -5° stop and will stall.

MS40-704X

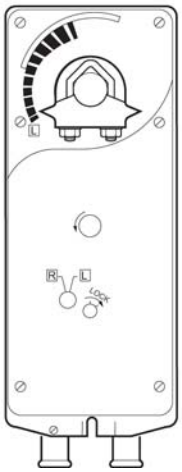


Viewed from L side:
Switch on [L] – Clockwise rotation on increasing signal
Switch on [R] – Counterclockwise rotation on increasing signal

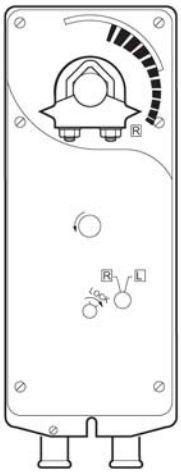


Viewed from R side:
Switch on [R] – Counterclockwise rotation on increasing signal
Switch on [L] – Clockwise rotation on increasing signal

MS41-707X, MS41-715X-XXX



Viewed from L side:
Switch on [L] – Clockwise rotation on increasing signal
Switch on [R] – Counterclockwise rotation on increasing signal

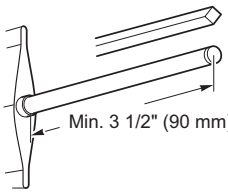


Viewed from R side:
Switch on [R] – Counterclockwise rotation on increasing signal
Switch on [L] – Clockwise rotation on increasing signal

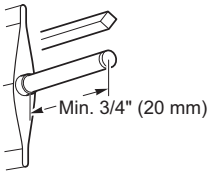
Figure-3 Rotation Switch Settings.

Note: The MS40-704X SmartX Actuator comes equipped with standard universal mounting clamp. For damper shafts larger than 5/8” (16 mm) in diameter, the AM-710 universal mounting clamp is required (order separately). The AM-710 clamp accommodates shafts sizes up to 3/4” (19 mm) diameter shafts.

Long Shaft



Short Shaft



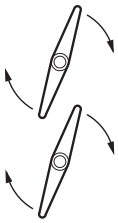
3/8" to 3/4" Diameter (10 mm to 20 mm)
3/8" to 1/2" Square (10 mm to 13 mm)

Move the damper to its normal position. Verify the controller action is set to match the damper application.

Normally closed damper: when damper is closed, actuator position indicator should be at 0°. When damper is open, actuator position indicator should be at 90°.

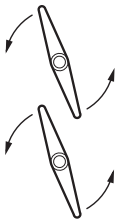
Normally opened damper: when damper is open, actuator position indicator should be at 0°. When damper is closed, actuator position indicator should be at 90°.

A - Left



Shaft Rotates Clockwise To Open

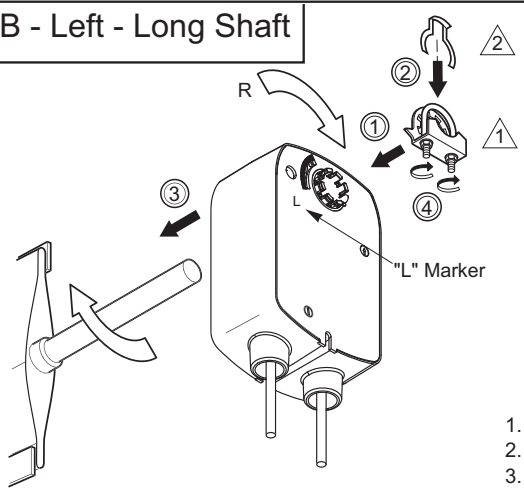
A - Right



Shaft Rotates Counterclockwise To Open

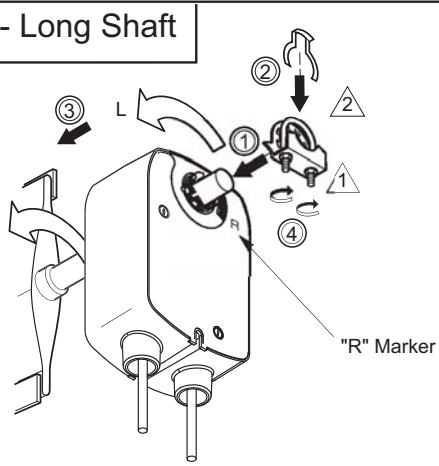
This step determines shaft rotation. Linkage may change damper direction.

B - Left - Long Shaft



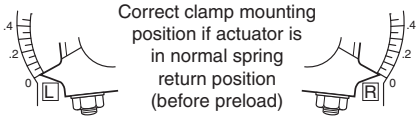
1. Universal mounting clamp.
2. Retaining clip.

B - Right - Long Shaft

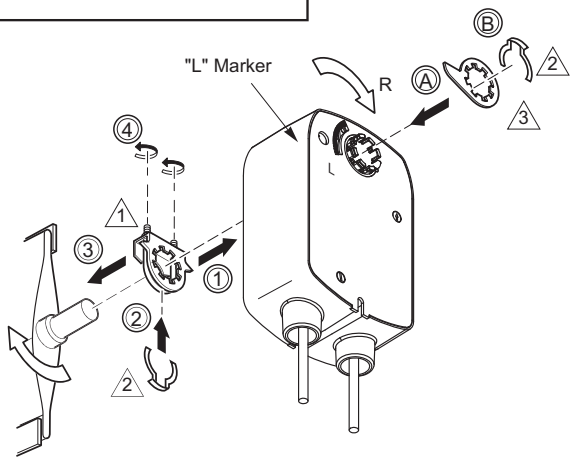


1. Universal mounting clamp.
2. Retaining clip.

1. Assemble mounting clamp.
2. Assemble retaining clip.
3. Place actuator over shaft.
4. Hand tighten clamp nuts.

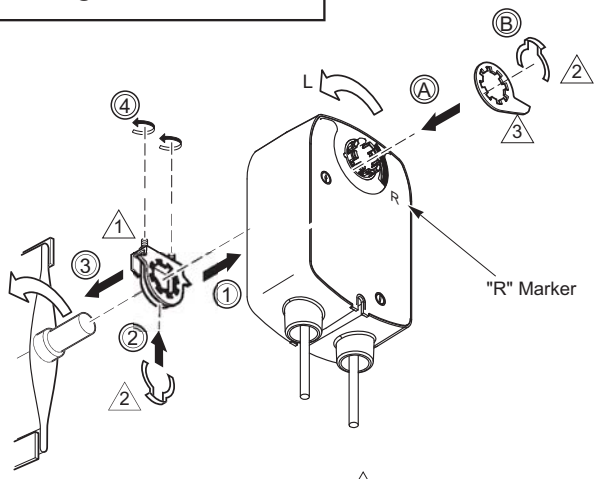


B - Left - Short Shaft



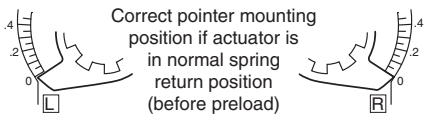
1. Universal clamp.
2. Retaining clip.
3. Damper position indicator.

B - Right - Short Shaft

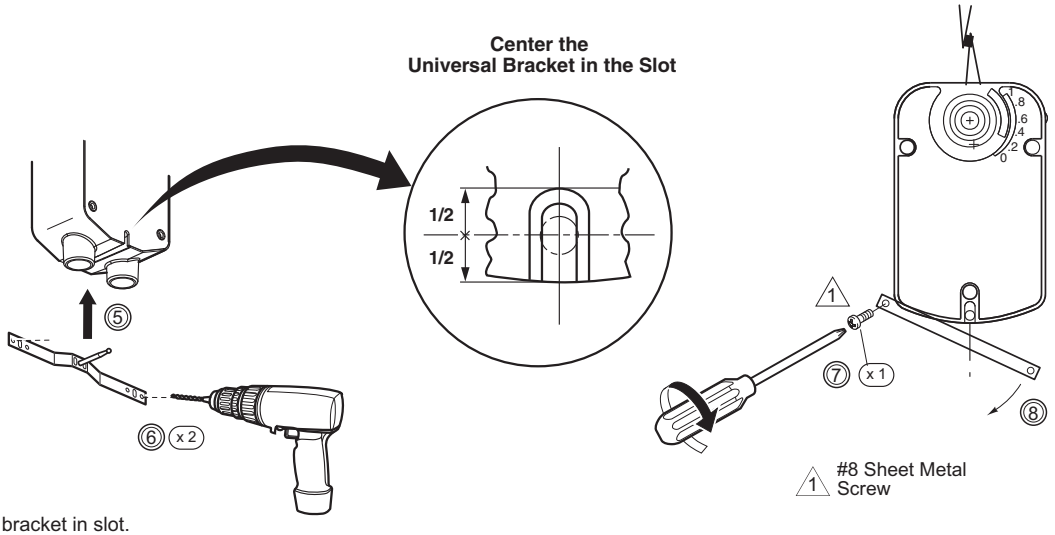


1. Universal clamp.
2. Retaining clip.
3. Damper position indicator.

A. Assemble damper position indicator.
B. Assemble retaining clip.
1. Position mounting clamp.
2. Assemble retaining clip.
3. Slide actuator over shaft.
4. Hand tighten clamp nuts.

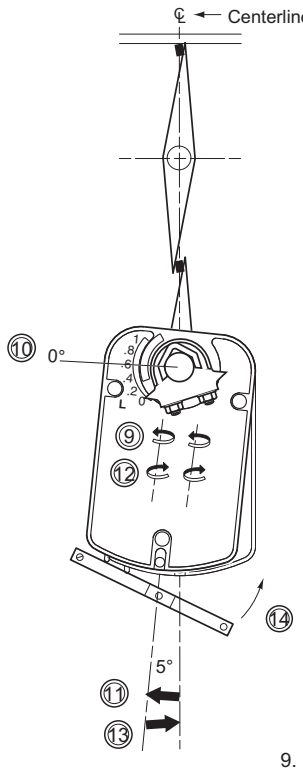


C - Left and Right

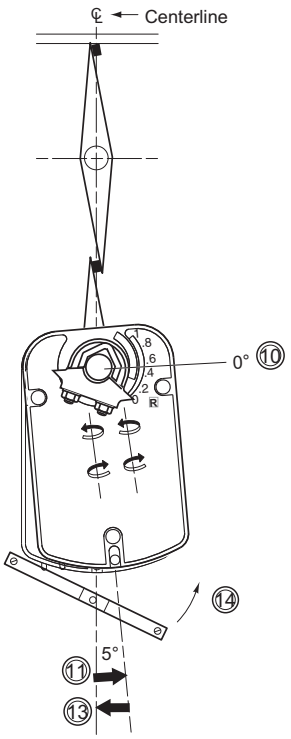


5. Center bracket in slot.
6. Drill two holes.
7. Start one screw.
8. Swing bracket down.

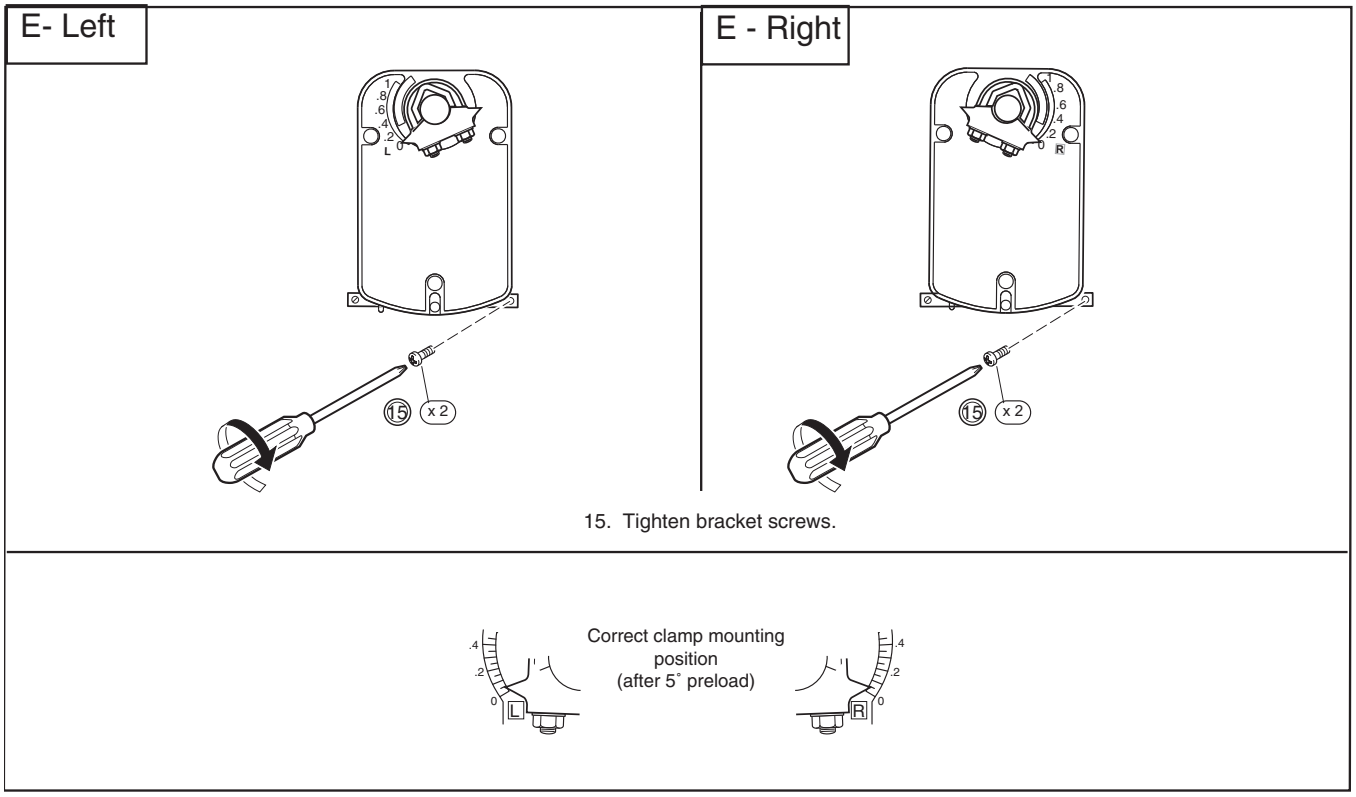
D- Left



D- Right



9. Loosen clamp nuts.
10. Check that the shaft is in full zero position.
11. Swing actuator 5° in the direction of travel. Do not move shaft.
12. Tighten clamp nuts to 4 to 6 lb-ft (5.4 to 8.2 N-m) of torque.
13. Move bottom of actuator back into position.
14. Pivot bracket back into position.



15. Tighten bracket screws.

MS41-707X and MS41-715X SmartX Actuator Installation

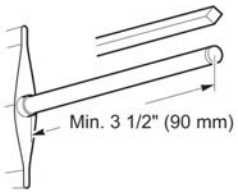
Caution: Do not drill additional holes in the actuator body. Six pre-drilled holes are located on each side, under the label, to accept #10-24 thread-forming screws for mounting accessories.

Note: The MS41-707X and MS41-715X series actuators come equipped with standard universal mounting clamp installed. For damper shafts larger than 3/4” (19 mm) in diameter, the AM-687 universal mounting clamp is required (order separately). The AM-687 clamp accommodates round shaft sizes up to 1.05” (27 mm) in diameter or 5/8” (16 mm) square shafts.

Caution: The MS41-707X and MS41-715X actuators are equipped with a manual override.

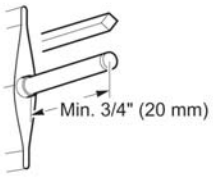
- The manual override to be used only when power is not applied to the unit.
- If the universal clamp is not set to 0° on the position indicator, manually wind the actuator in the direction indicated with hex wrench from -5° to 0° and lock with a screwdriver.
- When operating manual override, back off 5° from full open mechanical stop to ensure proper release.
- Do not attempt to use the manual override with actuators mounted in tandem. Damage to the gear train could occur.
- Using power tools to adjust the manual override will cause damage to the gears.
- To unlock manual override without power, crank the manual override in the direction indicated a minimum of 5°.

Long Shaft



3/8" to 3/4" Diameter (10 mm to 20 mm)
3/8" to 1/2" Square (10 mm to 13 mm)

Short Shaft

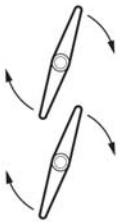


Move the damper to its normal position. Verify the controller action is set to match the damper application.

Normally closed damper: when damper is closed, actuator position indicator should be at 0°. When damper is open, actuator position indicator should be at 90°.

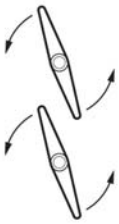
Normally opened damper: when damper is open, actuator position indicator should be at 0°. When damper is closed actuator position indicator should be at 90°.

A - Left



Shaft Rotates Clockwise To Open

A - Right



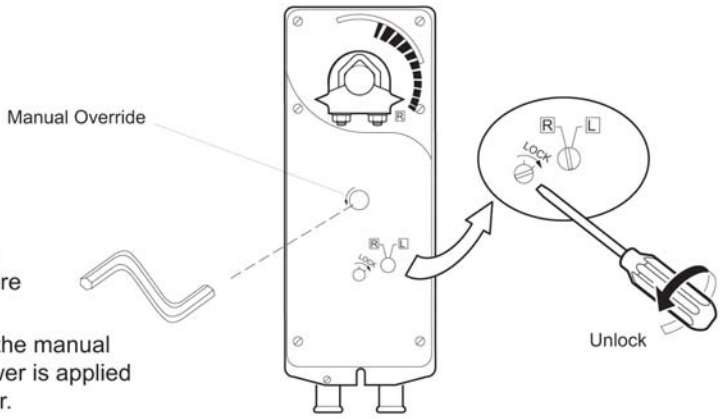
Shaft Rotates Counterclockwise To Open

This step determines shaft rotation. Linkage may change damper direction.

B

For MS41-707X and MS41-715X only (manual override).

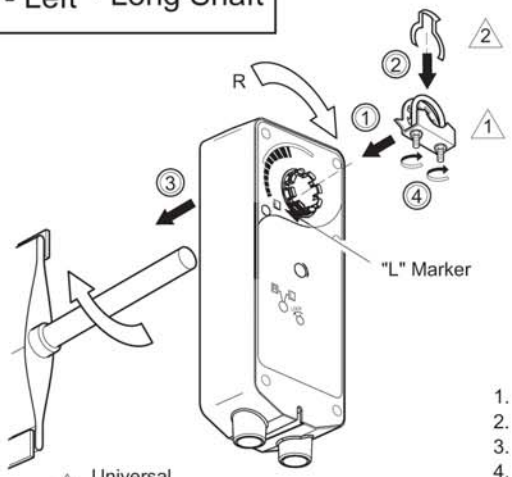
If position indicator does not point to zero: Unlock the actuator.
Insert hex wrench into manual override.
Crank the actuator so the indicator points to 0°.
Lock the actuator.



Fully engage hex wrench into manual override before winding.

Caution: Do not crank the manual override if power is applied to the actuator.

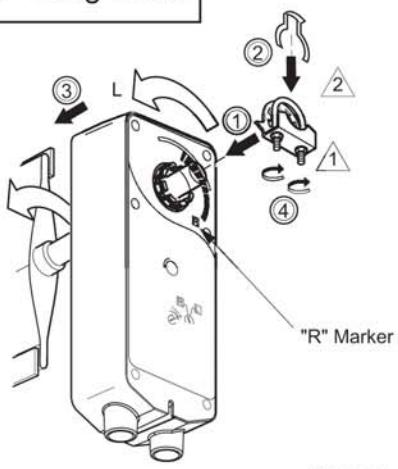
C - Left - Long Shaft



1. Universal mounting clamp.
2. Retaining clip.

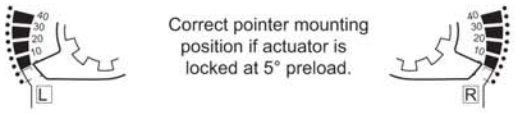
1. Assemble mounting clamp.
2. Assemble retaining clip.
3. Place actuator over shaft.
4. Hand tighten clamp nuts.

C - Right - Long Shaft



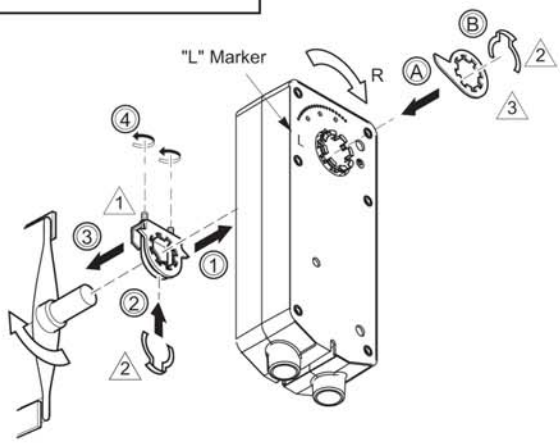
1. Universal mounting clamp.
2. Retaining clip.

For MS41-707X and MS41-715X actuators:



Correct pointer mounting position if actuator is locked at 5° preload.

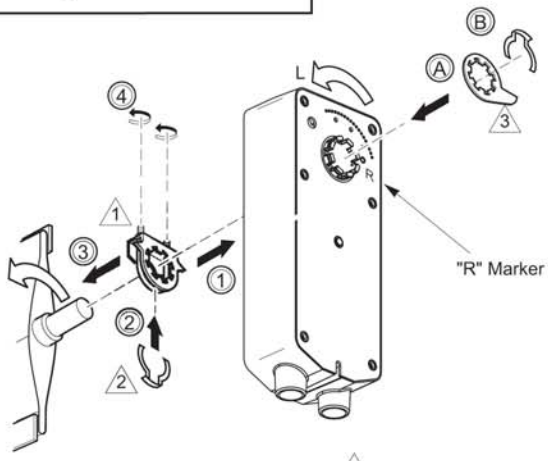
C - Left - Short Shaft



1. Universal clamp.
2. Retaining clip.
3. Damper position indicator.

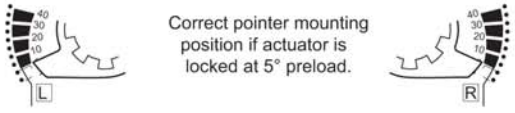
A. Assemble damper position indicator.
B. Assemble retaining clip.
1. Position mounting clamp.
2. Assemble retaining clip.
3. Slide actuator over shaft.
4. Hand tighten clamp nuts.

C - Right - Short Shaft



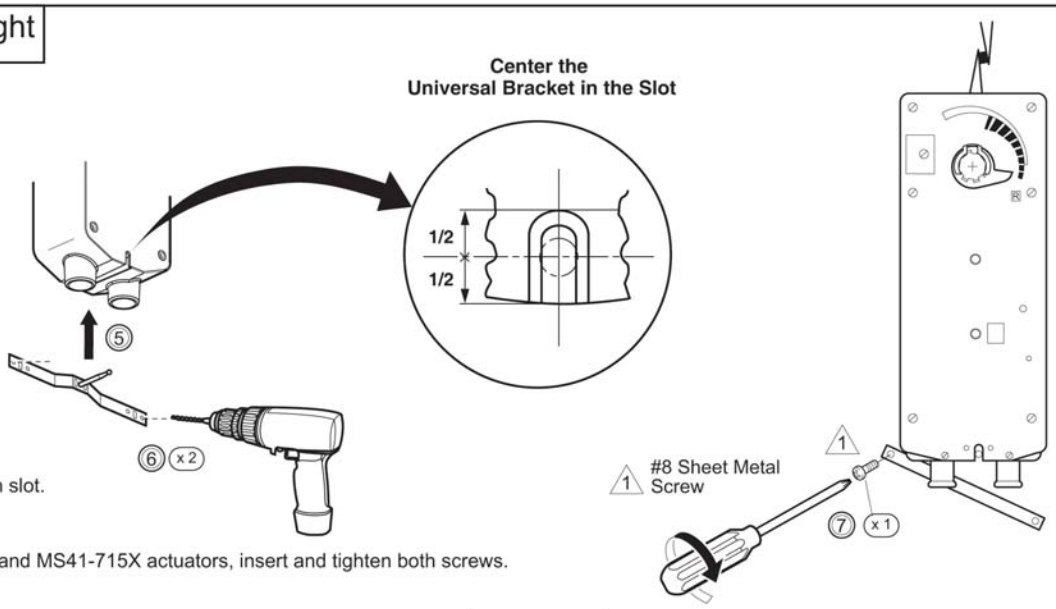
1. Universal clamp.
2. Retaining clip.
3. Damper position indicator.

For MS41-707X and MS41-715X actuators:



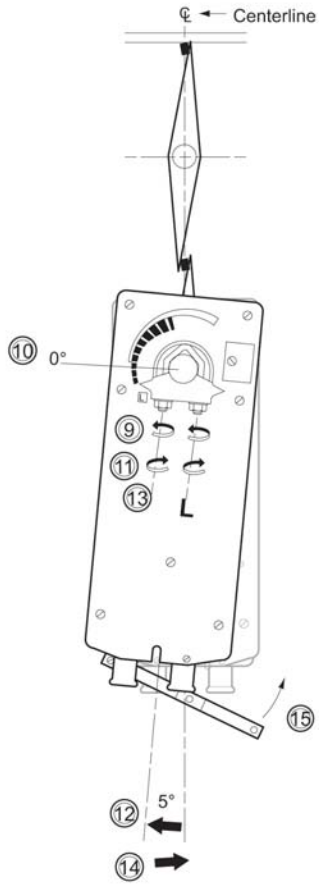
Correct pointer mounting position if actuator is locked at 5° preload.

D - Left and Right

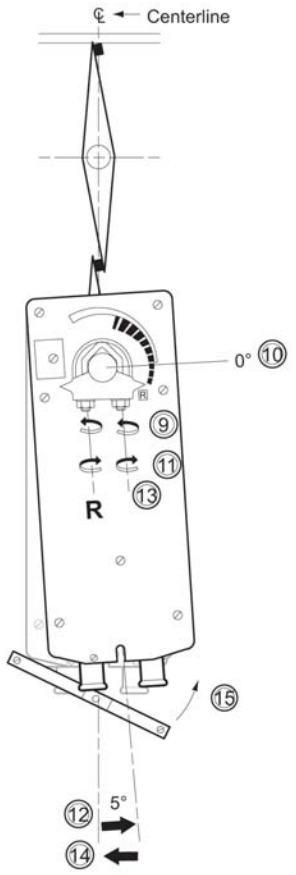


5. Center bracket in slot.
6. Drill two holes.
7. Start one screw.
   For MS41-707X and MS41-715X actuators, insert and tighten both screws.

E- Left



E- Right



8. Loosen clamp nuts.
9. Check that the shaft is in full zero position.

For MS41-707X and MS41-715X only:

10. Tighten clamp nuts to 8 - 10 ft-lb (11 - 14 Nm). This completes the installation for MA41-704X and MA41-715X.

Jackshaft Installation

(MS40-7043 Series)

The MS40-7043 actuator is designed for use with jackshafts up to 3/4” (19 mm) in diameter. In most applications, the MS40-7043 actuator may be mounted in the same manner as a standard damper shaft application. If the jackshaft diameter is larger than 5/8” (16 mm) in diameter, the optional AM-710 universal clamp must be used.

(MS41-7153 and MS41-7073 Series)

The MS41-7153 and MS41-7073 actuators are designed for use with jackshafts up to 1.05” (27 mm) in diameter. In most applications, the actuator may be mounted in the same manner as a standard damper shaft application. If the jackshaft diameter is larger than 3/4” (19 mm) in diameter, the optional AM-687 universal clamp must be used.

Multiple Actuator Mounting (MS41-7153 only)

If more torque is required than one actuator can provide, a second actuator may be mounted to the jackshaft or standard damper shaft, using the AM-673 multiple mounting bracket. See Figure-4.

Caution: MS41-707X, 715X - Do not attempt to use the manual override with actuators mounted in tandem. Damage to the gear train may occur.

Multiple actuators may be powered from one transformer provided the following rules are followed:

- The total current draw of the actuators (VA rating) is less than, or equal to, the rating of the transformer.
- Polarity on the secondary of the transformer is strictly followed.
  - All Black wires from all actuators are connected to the common lead on the transformer.
  - All Red wires from all actuators are connected to the hot lead.

Caution: Mixing the Black and Red wires on one lead of the transformer may result in erratic operation or failure of the actuator and/or controls.

Multiple actuators positioned by the same control signal may be powered from multiple transformers provided the following rules are followed:

- The transformers are properly sized.
- All Black wires from all actuators are tied together and tied to the negative lead of the control signal.

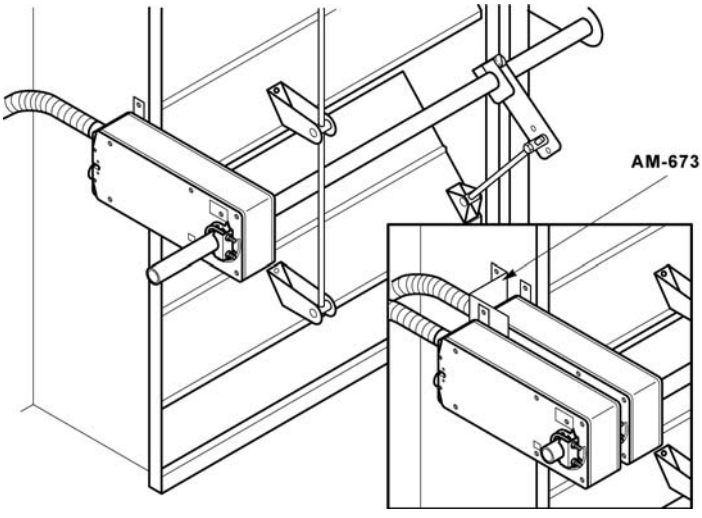


Figure-4 Mounting Multiple Actuators.

Wiring Requirements

Control Leads

See Table-3 for power wiring data. Refer to Figure-1 and Figure-2 for typical wiring.

Table-3 Power Wiring.

Actuator Voltage	Part Number	Maximum Wire Run in ft. (m)					
		12 AWG	14 AWG	16 AWG	18 AWG	20 AWG	22 AWG
24 Vac 22-30 Vdc	MS40-7043 (-MP)	1100 (335)	700 (213)	430 (131)	270 (82)	170 (52)	110 (34)
	MS40-7043-501 (MP5)						
	MS41-7073	1000 (305)	640 (195)	400 (122)	250 (76)	160 (49)	100 (30)
	MS41-7073-502						
	MS41-7153	600 (183)	380 (116)	240 (73)	150 (46)	90 (27)	60 (18)
	MS41-7153-502						

Auxiliary Switch

MS40-7043-501(-MP5) SmartX Actuators include one built-in SPDT auxiliary switch which can be used for interfacing or signaling (e.g., for fan start-up). The switch is adjustable between 0° and 95° of rotation (0 to 1 scale).

The MS41-7153-502 and MS41-7073-502 SmartX Actuators include two built-in SPDT auxiliary switches which can be used for interfacing or signaling (e.g., for fan start-up). The switch position near the normal (spring return) position is fixed at 5°. The other is adjustable between 25° and 85° of rotation.

Adjusting the Switching Point

Refer to Table-4 for auxiliary switch rating.

Adjusting the switching point for MS40-7043-501 (-MP5)

1. The actuator must be in its normal (spring return) position.
2. Use a flat screw driver to rotate the switch pointer until it is at the desired switch position on the MIN to 1 scale.

Adjusting the switching point for MS41-7153-502 or MS41-7073-502

1. The actuator must be in its normal (spring return) position.
2. Insert a 1/8” allen wrench into the hex hole located in the center of the adjustable switch pointer.
3. Rotate the wrench until the switch pointer is at the desired switch position in degrees, from 25 to 85°.

Table-4 Auxiliary Switch Rating.

Part Number	Voltage	Resistive Load	Inductive Load
MS40-7043-501 (MP5)	24 Vac	6A	1.5A
MS41-7073-502	250 Vac	7A	2.5A
MS41-7153-502			

Rotation Limitation

Rotation Limitation for MS40-7043 Series SmartX Actuators

The Stop Block is used in conjunction with the tab on the universal clamp or the AM-709 position indicator. In order to function properly, the clamp or indicator must be mounted correctly.

The Stop Block controls the rotational output of the MS40-7043 and MS41-7043-501 actuators. It is used in applications where a damper has a designed rotation that is less than 90°, for example with a 45° or 60° rotating damper. It can also be used to provide a minimum damper position which is easily set, or changed, without removing the actuator from the damper.

1. Determine the amount of damper rotation required. The actuator stop block provides limited rotation from 40° to 95°.
2. Loosen the screw securing the stop block to the actuator.

Note: The actuator is shipped with the Stop Block mounted to the "L" side. If the damper application requires the "R" side face the installer, simply remove the Stop Block and screw and move it to the new location.

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3. Slide the stop block into position, so that its edge lines up with the degree graduation on the actuator face which corresponds with the required rotation. See Figure-5.
4. Secure the stop block in place.
5. Test the damper rotation by applying power and the required control signal. Re-adjust if necessary.

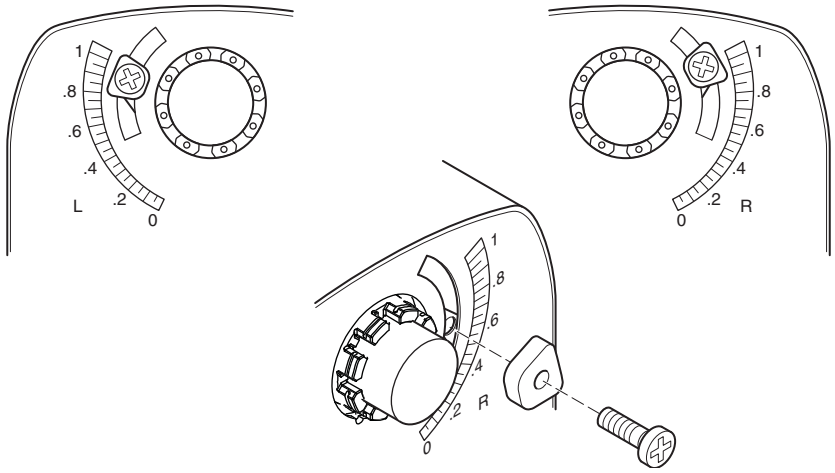

Figure-5 Adjusting Stop Block for Limited Rotation.

Rotation Limitation for MS41-7153 and MS41-7073 SmartX Actuators

The AM-689 rotation limiter is used in conjunction with the tab on the universal clamp or the AM-686 position indicator which comes with the AM-689. In order to function properly, the clamp or indicator must be mounted correctly.

The AM-689 rotation limiter controls the rotational output of the MS41-7153, MS41-7153-502, MS41-7073, and MS41-7073-502 actuators. It is used in applications where a damper has a designed rotation that is less than 90°, for example with a 45° or 60° rotating damper. It can also be used to provide a minimum damper position which is easily set, or changed, without removing the actuator from the damper.

1. Determine the amount of damper rotation required.
2. Locate the AM-689 rotation limiter on the actuator so that its edge lines up with the degree graduation on the actuator face which corresponds with the required rotation. See Figure-6.
3. Find the appropriate cross-hair location through the slot of the rotation limiter. This is the mounting location for the retaining screw.
4. Pierce through the label material to allow easy fastening of the retaining screw.
5. Position the rotation limiter back to the desired position, making sure the locating “teeth” on the rotation limiter are engaged into the locating holes on the actuator.
6. Fasten the rotation limiter to the actuator using the self-tapping screw provided.
7. Test the damper rotation by applying power and the required control signal. Re-adjust if necessary.

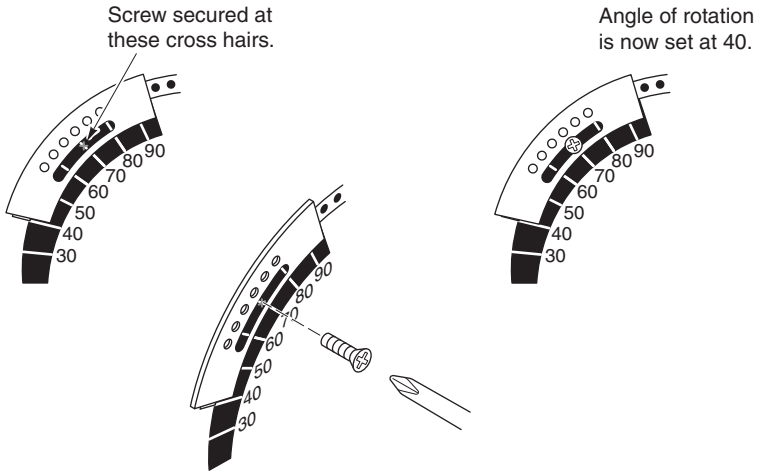

Figure-6 Securing the AM-689 Rotation Limiter.

Minimum Damper Positioning

Note: When using the AM-689 rotation limiter with an MS41-7073 or MS41-7153 actuator to provide a minimum damper position, the short shaft mounting procedure must be used to mount the actuator.

Caution:

- The AM-689 rotation limiter should not be used with an MS41-7073 or MS41-7153 actuator to provide a minimum damper position in outdoor air damper applications. The rotation limiter prevents the damper from reaching the full-closed position. This may cause coils to freeze or may cause other system problems to occur.

1. Position the damper to its minimum position by providing the appropriate control signal to the MS41-7073 or MS41-7153.
2. Place the position indicator onto the actuator spline in the approximate position shown in Figure-7. Fasten it with the retaining clip.
3. Place the AM-689 rotation limiter on the actuator so that it either makes contact with, or is as close as possible to, the edge of the indicator. See Figure-8.
4. Make sure that the locating teeth are engaged into the locating holes on the actuator. If all of the mounting teeth do not align with the holes, the mounting location of the indicator to the spline may have to be moved. The rotation limiter would then be remounted to get the best position match of both parts.
5. Find the cross-hair location through the slot of the rotation limiter. This is the mounting location for the retaining screw.
6. Pierce through the label material to allow easy fastening of the retaining screw.
7. Fasten the rotation limiter to the actuator using the self tapping screw provided.
8. Test the damper operation by applying power and the required control signal. Re-adjust if necessary.

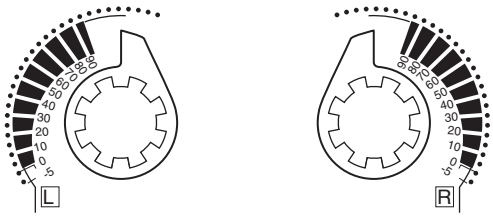

Figure-7 Installing the Position Indicator.

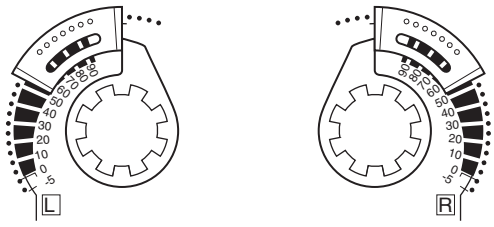

Figure-8 Positioning the Rotation Limiter.

CHECKOUT

After the entire system has been installed and the actuator has been powered up, the following check can be made for proper system operation. Check for correct operation of the damper while actuator is being stroked.

1. Apply power to the actuator. Actuator and damper should be driven to their powered position as determined by the control signal.
2. On the MS4X-7XXX-50X models, check for correct auxiliary switch operation.
3. Break power to the actuator. Actuator and damper should return to the spring return position.

Note: Check that the transformer(s) are sized properly.

- If a common transformer is used with multiple actuators, make sure that polarity is observed on the secondary. This means connecting all Black wires to one leg of the transformer and all Red wires to the other leg of the transformer.
- If multiple transformers are used with one control signal, make sure all Black wires are tied together and tied to control signal negative (-).
- Controllers and actuators must have separate 24 Vac power sources.

Go, No Go Test

1. Turn 24 Vac power to actuator off.
2. Disconnect and temporarily insulate the yellow/black input wire.
3. With “L” side of the actuator facing the installer, set the L/R switch to “R.”
4. Turn actuator power back on.
5. Switch the L/R switch to the “L” position.
6. The actuator should drive to the full counterclockwise position.

THEORY OF OPERATION

The actuators are mounted directly onto a damper shaft using a universal V-clamp. When the actuator is powered and a Vdc or mAdc control signal is applied to the actuator by the controller, the actuator rotates to a position determined by the control signal. At the same time the spring return mechanism is tensed. When power is removed from the actuator, the spring returns the actuator to its normal position. The actuators provide true mechanical spring return operation for reliable, positive close-off on air tight dampers.

The MS40-704X-501 models are provided with one built-in auxiliary switch. The SPDT switch is provided for interfacing or signaling, for example, fan startup. The switching function is adjustable between 15° and 95° rotation (MIN to 1 scale).

All MX4X-7XX3-XXX series actuators use a brushless DC motor which is controlled by a microprocessor. The microprocessor supplies intelligence to provide a constant rotation rate and to know the actuator’s exact normal position. The microprocessor monitors and controls the brushless DC motor’s rotation and provides a digital sensing function to prevent damage to the actuator in a stall condition. The actuator may be stalled anywhere in its normal rotation without the need for mechanical end switches.

The MS41-707X-502 and MS41-715X-502 models are provided with two built-in auxiliary switches. The SPDT switches are provided for interfacing or signaling, for example, fan startup. The switching function is adjustable on one switch between 25° and 95° rotation, and the other switch is fixed to operation at 5° rotation.

All MS41-7XX3 and MS41-7XX3-5XX actuators provide a 2 to 10 Vdc feedback signal corresponding to the actuator position as determined by the control signal. MS40-7043-MP and MS40-7043-MP5 models provide a 20 Vdc, 25 mA power supply used to power TAC System 8000 controllers in lieu of position feedback.

The MS41-707X-XXX and MS41-715X-XXX actuators are equipped with a manual override mechanism. This allows the actuator to be manually positioned at any point between -5° and 85° rotation. This mechanism is accessible on both sides of the actuator and can be used to ensure tight close-offs for valves and dampers. The manual override should not be used while a unit is powered or on units that are mounted in tandem.

MAINTENANCE

Regular maintenance of the total system is recommended to assure sustained optimum performance. The MS4X series actuators are maintenance free.

FIELD REPAIR

None. Replace with a functional actuator.

DIMENSIONAL DATA

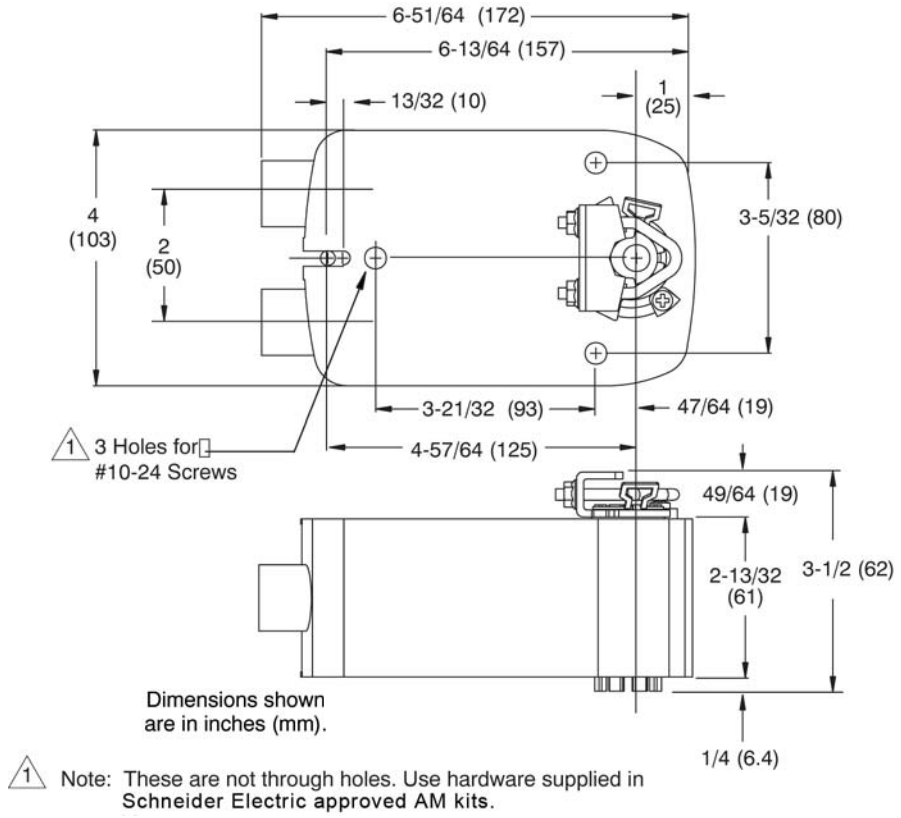

Figure-9 MS40-7043 Spring Return Damper Actuator Dimensions.

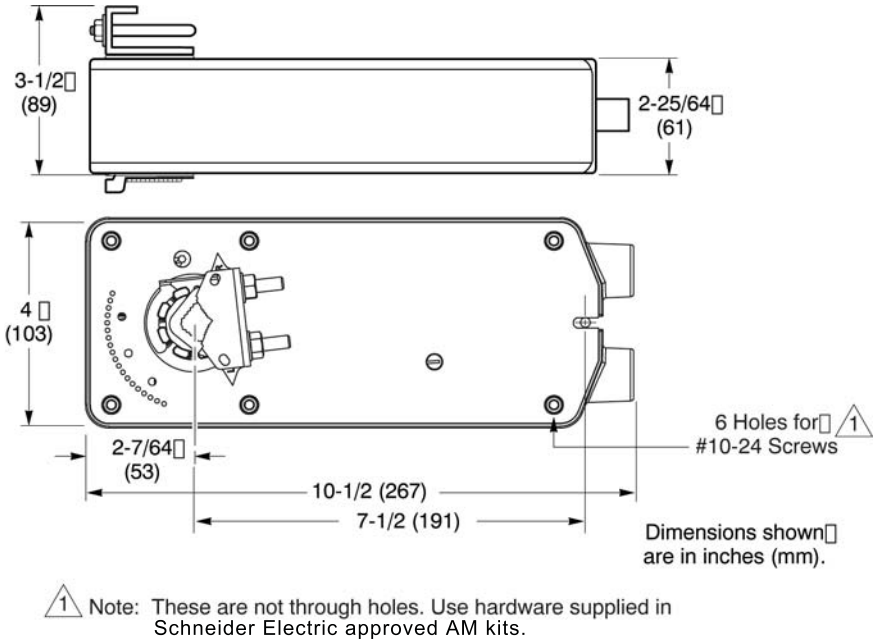

Figure-10 MS41-7073 and MS41-7153 Spring Return Damper Actuator Dimensions.

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Vx-7000 & Vx-9000 Series
Mx4x-6xxx & Mx4x-7xxx Series

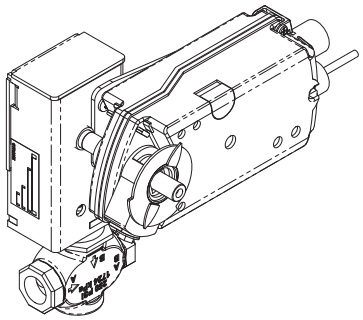
Linked Globe Valve Assemblies
SmartX Actuator/Linkage Assemblies
Selection Guide

Globe Valve Assemblies

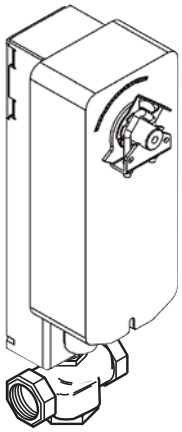
The VA, VF, and VS-7000 and -9000 series Linked Globe Valve Assemblies are complete actuator/valve assemblies that accept two position, floating, or proportional control, respectively, from a DDC system or from a thermostat, for control of hot water, chilled water and steam coils. These valve assemblies consist of linked spring return and non-spring return actuators mounted on 1/2" up to 6" (15 mm to 150 mm) 2-way and 3-way globe valve bodies, using a specially designed linkage assembly. 3-way assemblies are available for mixing (1/2" to 6") and diverting (1/2" to 2") applications. This linkage uses a rack and pinion mechanism to translate the rotary motion of the direct-linked actuator into the linear motion necessary to lift or lower the valve stem.

Typical applications include reheat on VAV boxes, fan coil units, hot and chilled water coils in air handling units, unit ventilators, and central system applications.

Linkage kits are available separately to allow field assembly of SmartX actuators to valve bodies.



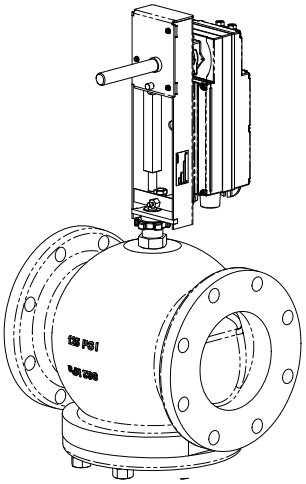
2-Way Linked Globe Valve Assembly (SmartX Non-Spring Return Model shown)



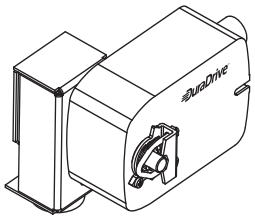
3-Way Linked Globe Valve Assembly (SmartX Spring Return Model shown)

SmartX Actuator/Linkage Assemblies

The SmartX Actuator/Linkage Assemblies consist of MA, MF, and MS actuators pre-assembled to linkages that are designed to be fitted onto 1/2" to 2" (15 mm to 50 mm metric) VB-7000 and 2-1/2" to 6" (65 mm to 80 mm metric) sizes of VB-9000 globe valve bodies.



2-Way Linked Flanged Globe Valve Assembly (SmartXSpring Return Model shown)



Actuator/Linkage Assembly (SmartXSpring Return Model shown)

Applicable Literature

F-Number	Description	Audience	Purpose
F-26642	MA40-704x Series, MA4x-707x Series, MA4x-715x Series SmartX Spring Return Two-Position Actuators General Instructions	– Sales Personnel – Application Engineers – Installers – Service Personnel – Start-up Technicians	Describes the actuator's features, specifications, and possible applications. Provides step-by-step mounting instructions.
F-26644	MF4x-7xx3, MF4x-7xx3-50x SmartX Spring Return Floating Actuator General Instructions		
F-26645	MS4x-7xx3, MS4x-7xx3-50x SmartX Spring Return Proportional Actuator General Instructions		
F-27211	MF41-6043/MS41-6043 Series, MF41-6083/ MS41-6083 Series Non-Spring Return Direct Coupled Actuator Installation Instructions		
F-27212	MF41-6153, MS41-6153 Non-Spring Return Direct Coupled Actuator Installation Instructions		
F-27213	MF41-6043/MF41-6083 Series Non-Spring Return Rotary 24 Vac Three-Position Control Electronic Damper Actuators General Instructions		
F-27214	MS41-6043/MS41-6083 Series Non-Spring Return Rotary 24 Vac Modulating Control 0 to 10 Vdc Electronic Damper Actuators General Instructions		
F-27215	MF41-6153/MS41-6153 Series Non-Spring Return Rotary Electronic Damper Actuators General Instructions		
F-26744	MF41-6343 SmartX Non-Spring Return Direct Coupled Actuator General Instructions		
F-26745	MS41-634x SmartX Non-Spring Return Direct Coupled Actuator General Instructions		
F-26749	MF40-7173 SmartX Spring Return Direct Coupled Actuator General Instructions		
F-26646	Mx4x-7xxx, Mx40-6xxx Series SmartX Actuator Selection Guide	– Sales Personnel – Application Engineers – Installers – Service Personnel – Start-up Technicians	Provides actuator specifications and part number cross referencing of phased out actuators with the new Schneider Electric direct-coupled actuators.
F-27216	MF41/MS41-6043 Series 24 Vac, 35 lb-in. Non-Spring Return, Direct-Coupled Electronic Damper Actuators Submittal Sheet	– Sales Personnel – Application Engineers	Describes features and specifications of the Mx41-6043 series actuators.
F-27217	MF41/MS41-6083 Series 24 Vac, 70 lb-in., Non-Spring Return Direct-Coupled Electronic Damper Actuators Submittal Sheet	– Sales Personnel – Application Engineers	Describes features and specifications of the Mx41-6083 series actuators.
F-27218	MF41/MS41-6153 Series, 24 Vac, 133 lb-in., Non-Spring Return, Direct-Coupled Electronic Damper Actuators Submittal Sheet	– Sales Personnel – Application Engineers	Describes features and specifications of the Mx41-6153 series actuators.
F-26785	Vx-2x13-5xx-9-xx, Vx-7xxx-xxx-4-xx, Mx4x-7xxx, and Mx41-6xxx Series, DuraLynx Ball Valve Assemblies, Globe Linked Valve Assemblies, and SmartX Actuator/Linkage Assemblies Cross-Reference Guide	– Sales Personnel – Application Engineers	Provides part number cross referencing of phased-out devices with the DuraLynx Ball Valve Assemblies, Globe Linked Valve Assemblies, and SmartX Actuator/Linkage Assemblies .
F-11080	Valve Selection Chart Water	– Application Engineers – Installers – Service Personnel – Start-up Technicians	Provides charts, equations, and diagrams to assist in the configuration of valve system applications. TOOL-150, valve sizing slide rule may be purchased separately.
F-11366	Valve Selection Chart Steam (2-way valves only)		
F-13755	CA-28 Control Valve Sizing		
F-26080	EN-205 Water System Guidelines		Describes Schneider Electric approved water treatment practices.

F-Number	Description	Audience	Purpose
F-24380	VB-7211 Series 1/2" to 1-1/4" Union Straightway NPT Stem Up Open, 2-Way Valves General Instructions	– Sales Personnel – Application Engineers – Installers – Service Personnel – Start-up Technicians	Describes the valve's features, specifications, and possible applications. Provides step-by-step mounting, installation, and checkout instructions.
F-26075	VB-7213 Series 1/2" to 2" Screwed NPT Stem Up Open, 2-Way Valves General Instructions		
F-26077	VB-7215 Series 15 mm to 50 mm Screwed Rp Stem Up Open, 2-Way Valves General Instructions		
F-24384	VB-7221 Series 1/2" to 1-1/4" Union Straightway NPT Stem Up Closed, 2-Way Valves General Instructions		
F-26073	VB-7223 Series 1/2" to 2" Screwed NPT Stem Up Closed, 2-Way Valves General Instructions		
F-26079	VB-7225 Series 15 mm to 50 mm Screwed Rp Stem Up Closed, 2-Way Valves General Instructions		
F-26074	VB-7313 Series 1/2" to 2" Screwed NPT 3-Way Mixing Valves General Instructions		
F-26078	VB-7315 Series 15 mm to 50 mm Screwed Rp 3-Way Mixing Valves General Instructions		
F-26076	VB-7323 Series 1/2" to 2" Screwed NPT 3-Way Diverting Valves General Instructions		
F-24382	VB-9213 Series 2-1/2" to 6" Screwed or Flanged Stem Up Open, 2-Way Valves General Instructions		
F-25672	VB-9215 Series 65 mm and 80 mm Screwed Stem Up Open, 2-Way Valves General Instructions		
F-24386	VB-9223 2-1/2" to 6" Screwed or Flanged Stem Up Closed, 2-Way Valves General Instructions		
F-25673	VB-9225 Series 65 mm and 80 mm Screwed Stem Up Closed, 2-Way Valves General Instructions		
F-24393	VB-9313 Series 2-1/2" to 6" Screwed or Flanged 3-Way Mixing Valves General Instructions		
F-25674	VB-9315 Series 65 mm and 80 mm Screwed 3-Way Mixing Valves General Instructions		

Selection Guide Contents

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Features and Benefits

Features	Benefits
Thermal isolation.	Protects the actuator from cold or excess heat generated by chilled water, hot water, or steam passing through the valve. Discourages condensation.
Valve sizes 1/2" to 6" and 15 mm to 150 mm (Union Straightway, NPT, Flanged, Metric) 2-Way and 3-Way.	Satisfies a wide range of application requirements.
Brushless DC motors used in all floating and proportional spring return actuators, in floating and proportional 300 lb-in. non-spring return actuators, and in two-position 133 and 150 lb-in. spring return actuators.	Provides better accuracy with longer actuator service life.
Optional built-in auxiliary switch interfacing.	Provides safety interfacing and signaling.
All models equipped with pigtail leads.	Eases installation. Reduced electrician costs.
Optional manual operating lever on many spring return and non-spring return assemblies.	Allows manual positioning of the valve.
NEMA 4 (IEC IP56) actuator enclosure for some actuators.	Mx40-717x series actuators with customer supplied conduit connectors provide water tight security.
Linkage kits are available separately.	Easy field assembly of actuator to valve body.
Spring-loaded TFE valve packing.	Self adjusting. No tightening required.
250 psig valve body static pressure rating per ANSI Standards (B16.15—1985) for screwed cast bronze bodies. 125 psig valve body static pressure rating for cast iron flanged bodies.	Meets most demanding pressure requirements.
Robust structural steel linkage.	Ensures precise alignment of the shaft to the valve stem for extended life of the assembly.
Up to 250 psig (1724 kPa) close-off.	Meets variety of close-off requirements.
Overload protection on actuator.	Eliminates excessive stem force and over heating of actuator.
Position indicator.	Allows for quick check of valve position.
Spring return models with normally open or normally closed configurations.	Meets all fail safe mode applications.
1/2” to 2” 3-way valve sizes are offered in either a mixing or diverting configuration.	Increases application flexibility.

Linked Globe Valve Assembly

Part Numbering System

Linked Globe Valve Assemblies

V X - X X X X - X X X - X - X X

Control Signal Type
A = Two Position
F = Floating
S = Proportional

Configuration ⚠1
721, 921 = 2-Way, Stem Up Open
722, 922 = 2-Way, Stem Up Closed
731, 931 = 3-Way, Mixing
732 = 3-Way, Diverting

Connection
1 = Union Straightway
3 = Threaded NPT (Bronze) or Flanged (Cast Iron)
4 = Union Sweat End
5 = Metric Thread (Rp)

Actuator

Two Position
MA40-7043=536
MA40-7043-501=537
MA40-7040=532
MA40-7040-501=533
MA40-7041=534
MA40-7041-501=535
MA40-7173=576
MA40-7170=572
MA40-7171=574
MA41-7153=556
MA41-7153-502=557
MA41-7150=552
MA41-7150-502=553
MA41-7151=554
MA41-7151-502=555
MA41-7073=546
MA41-7073-502=547
MA41-7070=542
MA41-7070-502=543
MA41-7071=544

Proportional
MS41-6043=505
MS41-6083=506
MS41-6153=508
MS41-6343=516
MS40-7043=536
MS40-7043-501=537
MS40-7043-MP=538
MS40-7043-MP5=539
MS41-7073=546
MS41-7073-502=547
MS41-7153=556
MS41-7153-502=557
MS40-7173=576
MS40-7170=572
MS40-7171=574

Floating
MF41-6043=505
MF41-6083=506
MF41-6153=508
MF41-6343=516
MF40-7043=536
MF40-7043-501=537
MF41-7073=546
MF41-7073-502=547
MF41-7153=556
MF41-7153-502=557
MF40-7173=576

Pattern Code
4 = Straightway (Bronze)
5 = Globe Flanged (Cast Iron)

Port Code

Size	2-Way C_V	2-Way P Code	3-Way C_V Mixing	3-Way C_V Diverting	3-Way P Code
1/2"	0.4	1	—	—	
	1.3	2	2.2	2.2	02
	2.2	3	—	—	
	4.4	4	4.4	4.4	04
3/4"	5.5	5	—	—	
	7.5	6	7.5	7.5	06
1"	10.0	7	—	—	
	14.0	8	14.0	15.0	08
1-1/4"	20.0	9	20.0	20.0	09
1-1/2"	28.0	10	28.0	28.0	10
2"	40.0	11	41.0	40.0	11
2-1/2"	56.0	12	67[a]	—	12
	65.0	12	74[b]	—	12
3"	85.0	13	91[a]	—	13
	85.0	13	101[b]	—	13
4"	145.0	14	170	—	14
5"	235.0	15	290	—	15
6"	350.0	16	390	—	16

	k_{VS}		k_{VS} Mixing	k_{VS} Diverting	
15 mm	0.3	1	—	—	
	1.1	2	1.9	—	02
	1.9	3	—	—	
	3.8	4	3.8	—	04
20 mm	4.8	5	—	—	
	6.5	6	6.5	—	06
25 mm	8.7	7	—	—	
	12.0	8	12.0	—	08
32 mm	17.0	9	17.0	—	09
40 mm	24.0	10	24.0	—	10
50 mm	35.0	11	36.0	—	11
65 mm	56.0	12	58.0	—	12
80 mm	73.0	13	78.0	—	13

[a] Threaded valve body.

⚠1 The configuration of the valve assembly determines the valve stem position and flow, as shipped from the factory. See the table below.

Valve Assemblies	Valve Body Action	Factory Shipped Position[c]		Action[c]
		Valve Stem	Flow	
VX-721X-XXX-4-P VX-921X-XXX-X-P	2-Way Stem Up Open	Up	Open	A to AB Flow decreases as actuator rotates CW
VX-722X-XXX-4-P VX-922X-XXX-X-P	2-Way Stem Up Closed	Up	Closed	A to AB Flow increases as actuator rotates CW
VX-731X-XXX-4-P VX-931X-XXX-X-P	3-Way Mixing	Up	Flow B to AB	A to AB Flow increases as actuator rotates CW B to AB Flow decreases as actuator rotates CW
VX-732X-XXX-4-P	3-Way Diverting	Up	Flow B to AB	B to A Flow increases as actuator rotates CW B to AB Flow decreases as actuator rotates CW

[c] The actuator is factory mounted with the "L" side facing up and the actuator rotation switch (if present) set to "L." The actuator rotates CW as the control signal

Actuator/Linkage Assemblies for Globe Valves

Models and Specifications

SmartX Spring Return Assemblies

Table-1 Mx4x-7xxx Series Spring Return Actuator/Linkage Assemblies.

Actuator/ Linkage Assembly Part Numbers	Power Input								SPDT Auxiliary Switches	Approximate Timing in Seconds @ 70 °F (21 °C) with No Load		Actuator Output Torque Rating lb.-in. (N-m)	Manual Override	Linkage Part Numbers
	Voltage 50/60 Hz	Running					Holding			Powered	Spring Return			
		50 Hz		60 Hz		DC Amps	50 Hz	60 Hz						
		VA	W	VA	W		W	W						
MA40-7043-200	24 Vac ± 20% 22-30 Vdc	4.4	2.9	4.4	2.9	0.11	0.8	0.8	No	<50	<26	35 (4)	No	AV-611
MA40-7043-201									One[a]				No	
MA40-7040-200	120 Vac ± 10%	6.4	3.8	4.3	3.4	—	1.6	1.2	No	<50	<26		No	
MA40-7040-201									One[a]				No	
MA40-7041-200	230 Vac ± 10%	5.8	4.1	4.6	3.9	—	1.5	1.2	No	<50	<26		No	
MA40-7041-201									One[a]				No	
MF40-7043-200[b]	24 Vac ± 20% 22-30 Vdc	5.9	4.4	5.9	4.4	0.17	2.9	2.9	No	<130	<25		No	
MF40-7043-201[b]									One[a]				No	
MS40-7043-200[b]	24 Vac ± 20% 22-30 Vdc	5.6	4.2	5.6	4.2	0.15	2.4	2.4	No				No	
MS40-7043-201[b]									One[a]				No	
MS40-7043-202	24 Vac ± 20% 22-30 Vdc	6.6	5.0	6.6	5.0	0.17	3.2	3.2	No				No	
MS40-7043-203									One				No	
MA41-7073-200	24 Vac ± 20% 22-30 Vdc	4.8	3.2	4.8	3.2	0.13	0.8	0.8	No	<80	<40	60 (7)	Yes	AV-602
MA41-7073-202									Two[c]				Yes	
MA41-7073-220									No				Yes	AV-607-1
MA41-7070-200	120 Vac ± 10%	10.7	4.2	5.6	3.6	—	2.0	1.2	No				Yes	AV-602
MA41-7070-202									Two[c]				Yes	
MA41-7070-220									No				Yes	AV-607-1
MA41-7071-200	230 Vac ± 10%	17.0	5.1	8.0	4.0	—	2.7	1.4	No				Yes	AV-602
MA41-7071-202									Two[c]				Yes	
MA41-7071-220									No				Yes	AV-607-1
MF41-7073-200	24 Vac ± 20% 22-30 Vdc	6.2	4.8	6.2	4.8	0.18	2.8	2.8	No	<195	<30		Yes	AV-602
MF41-7073-202									Two[c]				Yes	
MF41-7073-220									No				Yes	AV-607-1
MS41-7073-200	24 Vac ± 20% 22-30 Vdc	5.8	4.6	5.8	4.6	0.17	2.3	2.3	No	<195	<30		Yes	AV-602
MS41-7073-202									Two[c]				Yes	
MS41-7073-220									No				Yes	AV-607-1
MA41-7153-200	24 Vac ± 20% 22-30 Vdc	9.8	7.5	9.7	7.5	0.29	2.8	2.8	No	<190	<30	133 (15)	Yes	AV-602
MA41-7153-202									Two[c]				Yes	
MA41-7153-220									No				Yes	AV-607-1
MA41-7150-200	120 Vac ± 10%	11.7	8.8	10.0	8.4	—	3.6	5.0	No				Yes	AV-602
MA41-7150-202									Two[c]				Yes	
MA41-7150-220									No				Yes	AV-607-1

Table-1 Mx4x-7xxx Series Spring Return Actuator/Linkage Assemblies. (Continued)

Actuator/ Linkage Assembly Part Numbers	Power Input								SPDT Auxiliary Switches	Approximate Timing in Seconds @ 70 °F (21 °C) with No Load		Actuator Output Torque Rating lb.-in. (N-m)	Manual Override	Linkage Part Numbers
	Voltage 50/60 Hz	Running					Holding			Powered	Spring Return			
		50 Hz		60 Hz		DC Amps	50 Hz	60 Hz						
		VA	W	VA	W		W	W						
MA41-7151-200	230 Vac ± 10%	15.5	9.5	10.6	8.5	—	4.6	3.3	No	<190	<30	133 (15)	Yes	AV-602
MA41-7151-202									Two[c]				Yes	
MA41-7151-220									No				Yes	AV-607-1
MF41-7153-200	24 Vac ± 20% 22-30 Vdc	9.8	7.7	9.7	7.7	0.30	3.3	3.3	No				Yes	AV-602
MF41-7153-202									Two[c]				Yes	
MF41-7153-220									No				Yes	AV-607-1
MS41-7153-200	24 Vac ± 20% 22-30 Vdc	9.8	7.4	9.7	7.4	0.28	2.9	2.9	No				Yes	AV-602
MS41-7153-202									Two[c]				Yes	
MS41-7153-220									No				Yes	AV-607-1

[a] One switch, adjustable from 0 to 95° rotation (0 to 1 scale).
[b] With plenum-rated cable.
[c] One switch, adjustable from 25° to 85° rotation and one set to operate @ 5° fixed.

	Auxiliary Switch Ratings		
	Mx41-715x-502 / Mx41-707x-502	Mx40-7043-501	Mx40-7040-501
AC Rating	4 A resistive @ 250 Vac	6 A resistive @ 24 Vac	6 A resistive @ 250 Vac
DC Rating	12 to 30 Vdc, DC 2 A		

Table-2 Mx40-717x Series SmartX Spring Return Actuator/Linkage Assemblies.

Part Numbers	Power Input @ 50/60 Hz				SPDT Auxiliary Switches	Approximate Timing in Seconds @ 70 °F (21 °C) with No Load		Actuator Output Torque Rating lb.-in. (N-m)	Linkage Part Numbers
	Voltage	VA		Running Watts		Powered	Spring Return		
		Running	Holding						
MA40-7173-200	24 Vac ± 20%	7.4	5.1	5.3	No	162	72	150 (17)	AV-602
	22-30 Vdc	5.0	3.0	5.0	No				
MA40-7173-220	24 Vac ± 20%	7.4	5.1	5.3	No				AV-607-1
	22-30 Vdc	5.0	3.0	5.0	No				
MA40-7170-200	120 Vac ± 10%	8.4	6.6	6.2	No				AV-602
MA40-7170-220					No				AV-607-1
MA40-7171-200	240 Vac ± 10%	9.8	8.5	6.5	No				AV-602
MA40-7171-220					No				AV-607-1
MF40-7173-200	24 Vac ± 20%	8.1	5.3	5.8	No				AV-602
	22-30 Vdc	5.7	3.6	5.7	No				
MF40-7173-220	24 Vac ± 20%	8.1	5.3	5.8	No				AV-607-1
	22-30 Vdc	5.7	3.6	5.7	No				
MS40-7173-200	24 Vac ± 20%	7.8	4.7	5.5	No	147	65		AV-602
	22-30 Vdc	5.6	2.5	5.0	No				
MS40-7173-220	24 Vac ± 20%	7.8	4.7	5.5	No				AV-607-1
	22-30 Vdc	5.6	2.5	5.0	No				
MS40-7170-200	120 Vac ± 10%	8.5	5.2	6.4	No				AV-602
MS40-7170-220					No				AV-607-1
MS40-7171-200	240 Vac ± 10%	10.8	9.0	7.2	No				AV-602
MS40-7171-220					No				AV-607-1

Non-Spring Return Assemblies

Table-3 Non-Spring Return SmartX Actuator/Linkage Assemblies.

Part Numbers	Power Input @ 50/60 Hz				SPDT Auxiliary Switches	Approximate Timing in Seconds @ 70 °F (21 °C) with No Load	Actuator Output Torque Rating lb.-in. (N-m)	Linkage Part Numbers
	Voltage	VA		Watts				
		Running	Holding					
MF41-6043-200[a]	24 Vac +20/-15%	2.3	—	2.0	No	90 @ 60 Hz	35 (4)	AV-611
MS41-6043-200	24 Vac +20/-15%	3.3	1.2	3.0	No	108 @ 50 Hz		
MF41-6083-200	24 Vac +20/-15%[b]	2.3	—	2.0	No	125 @ 60 Hz 150 @ 50 Hz	70 (8)	
MS41-6083-200	24 Vac +20/-15%[b]	3.3	1.2	3.0	No			
MF41-6153-200	24 Vac +20/-15%[c]	3.0	—	3.0	No		133 (15)	
MF41-6153-220	24 Vac +20/-15%[c]	3.0	—	3.0	No			AV-607-1
MS41-6153-200	24 Vac +20/-15%[c]	5.0	1.2	4.0	No			AV-611
MS41-6153-220	24 Vac +20/-15%[c]	5.0	1.2	4.0	No			AV-607-1
MF41-6343-230	24 Vac ± 20%	5.7	4.1	3.9	No	162	300 (34)	AV-609-1
	22-30 Vdc	4.1	3.0	4.1	No			
MS41-6343-230	24 Vac ± 20%	5.6	4.0	3.6	No	148		
	22-30 Vdc	3.4	2.2	3.4	No			

[a] With plenum-rated cable.
[b] Minimum voltage at high temperatures: 24 Vac, +20%, -10% at 90 to 130 °F ambient.
[c] Minimum voltage at high temperatures: 24 Vac, +20%, -5% (MF models) and 24 Vac, +20%, -10% (MS models) at 85 to 130 °F ambient.

Linkage Kits for Field Mounting Globe Valves and Actuators

Models and Specifications

Table-4 Linkage Kits.

Linkage Kit[a]	Actuator	Factory-Assembled Valve Sizes 2-way & 3-way	Field-Assembled to VB Valve Bodies 2-way & 3-way
AV-602	Mx41-707x Mx41-715x Mx40-717x	1” to 2" 1-1/4" to 2” 1-1/2” to 2"	1” to 2"
AV-611	Mx41-6043 Mx41-6083	1/2” to 2" 1” to 2”	1/2” to 2"
	Mx41-6153 MA40-704x MF40-7043 MS40-7043	1-1/2” to 2" 1/2” to 2" 1/2” to 2" 1/2” to 2"	1/2” to 2"
AV-607-1	Mx41-6153 Mx41-707x Mx41-715x Mx40-717x	2-1/2” to 4”	2-1/2” to 4”
AV-609-1	Mx41-6343	5” to 6”	2-1/2” to 6”

[a] Refer to Table-7, Table-8, Table-9, and Table-10 for complete details.

System Design Considerations

Linked Globe Valve Assemblies

Note: The information in this section describes characteristics of the VB-7xxx and VB-9xxx valve bodies, which are used in the Vx-7xxx and Vx-9xxx valve assemblies. This information is also useful when installing the Mx4x-xxxx-2xx series actuator/linkage assemblies onto these valve bodies.

Control Precision

2-Way Valves: All valves have modified equal percentage flow characteristics. That is, for equal increments of valve stem stroke, the change in flow rate with respect to valve stroke may be expressed as a constant percent of the flow rate at the time of the change. The change of flow rate with respect to valve stroke is relatively small when the valve plug is near the valve seat and relatively high when the valve plug is nearly wide open. See Figure-1 for typical modified equal percentage flow characteristics of VB-72xx and VB-92xx series valves.

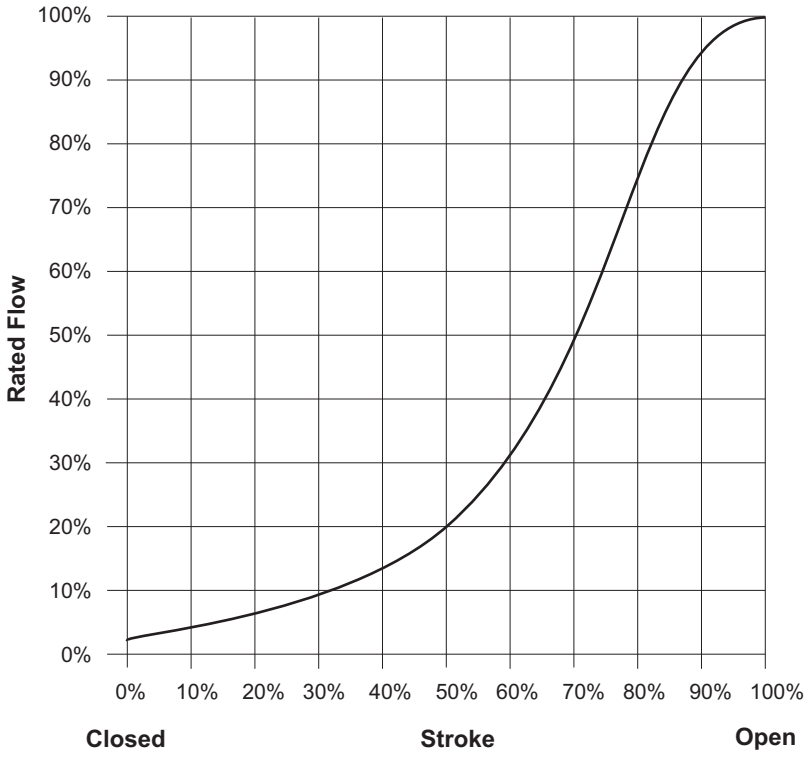


Figure-1 Typical Modified Equal Percentage Flow Characteristics.

3-Way Valves: 3-way mixing valves are designed so that the flow from either of the inlet ports to the outlet is approximately linear, which means the total flow from the outlet is almost constant over the stroke of the valve stem. See Figure-2 for typical flow characteristics of the VB-731x and VB-931x series valve bodies.

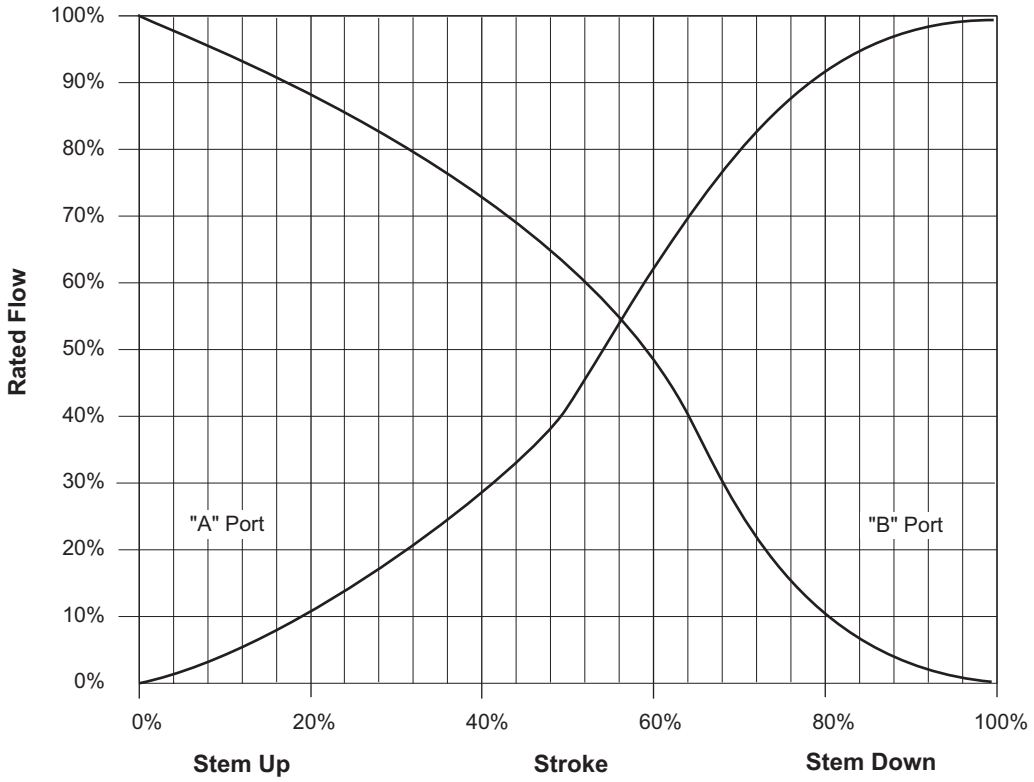


Figure-2 Typical Flow Characteristics.

Rangeability

Rangeability is the ratio of rated flow to the minimum controllable flow through a valve.

2-Way Valves: Table-5 lists the rangeability for VB-72xx and VB-92xx series globe valves. Refer to the model charts on the following pages for detailed valve information.

Table-5 Rangeability.

Nominal Valve Size		Port Code (P)	Nominal Rangeability
Standard	**Metric**		
1/2"	15 mm	1	5:1
		2	15:1
		3	25:1
		4	40:1
3/4"	20 mm	5	50:1
		6	60:1
1"	25 mm	7	60:1
		8	75:1
1-1/4"	32 mm	9	75:1
1-1/2"	40 mm	10	75:1
2"	50 mm	11	75:1
2-1/2"	65 mm	12	75:1
3"	80 mm	13	75:1
4"	—	14	75:1
5"	—	15	75:1
6"	—	16	75:1

3-Way Valves: For mixing valves, control begins as soon as plug displacement allows flow. Thus, the rangeability of 3-way valves normally exceeds 500:1, which is the reciprocal of 0.2% nominal leakage.

Temperature/Pressure Ratings

See Figure-3 for temperature and pressure ratings of 2-way and 3-way valves. Ratings conform with published values and disclaimer.

VB-7xxx-0-x-P and VB-9xxx-0-4-P (Cast Bronze Body)

Standards: Pressure to ANSI B16.15, Class 250, with 400 psi (2758 kPa) up to 150°F (65 °C), decreasing to 346 psi (2386 kPa) at 281°F (138 °C).

Materials: Valve body is made of bronze, ASTM B584. Valve trim is 316 stainless steel stem, brass plug, metal-to-metal or EPDM disc with PTFE packing parts and silicone packing grease.

VB-9xxx-0-5-P (Cast Iron Body with Flanged End Fittings)

Standards: Pressure to ANSI B16.1, Class 125, with 200 psi (1379 kPa) up to 150 °F (65 °C), decreasing to 169 psi (1165 kPa) at 281°F (138 °C).

Materials: Valve body is made of cast iron, ASTM A126 Class B. Valve trim is 316 stainless steel stem, brass plug, metal-to-metal or EPDM disc with PTFE packing parts and silicone packing grease.

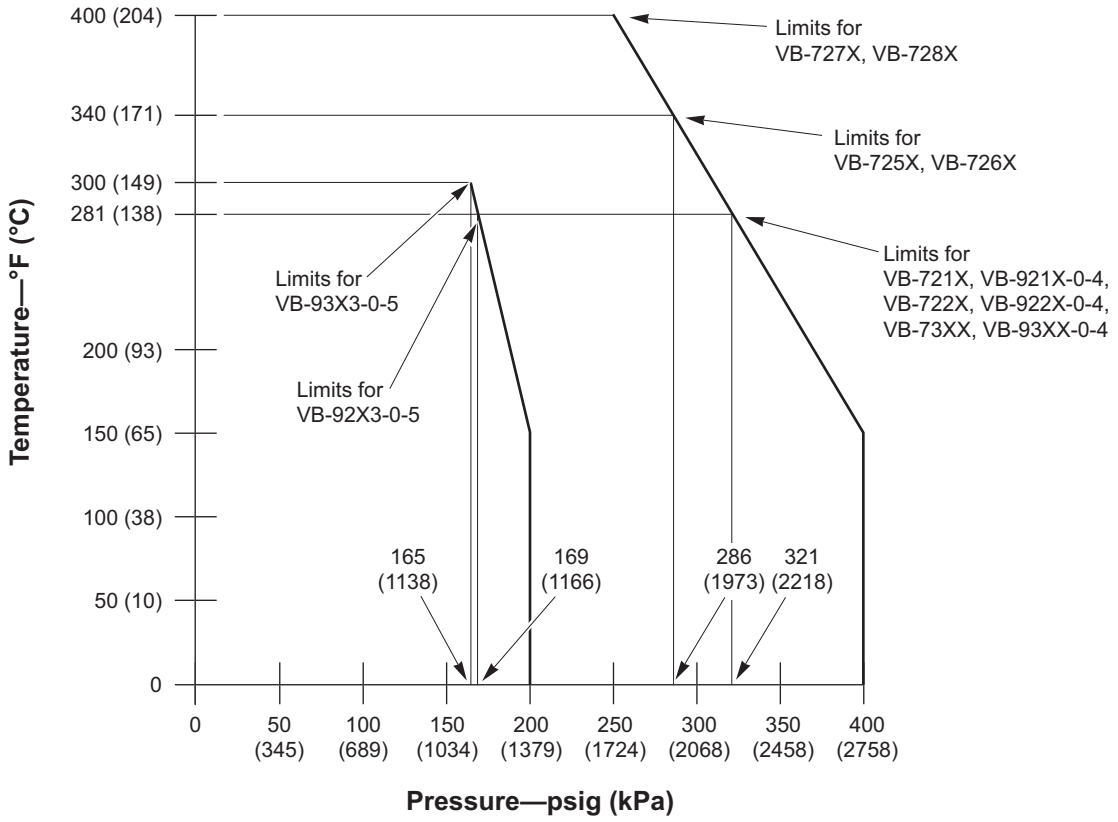


Figure-3 Temperature and Pressure Ratings for VB-7xxx and VB-9xxx Series Globe Valves.

Close-off Ratings

Nominal actuator close-off ratings are based on ANSI IV (0.01% leakage) with EPDM discs and PTFE discs in steam applications. Metal-to-metal trim such as brass 3-way and high temperature stainless are designed for ANSI III (0.1% leakage). Seat leakage for reduced port versions of metal-to-metal seats may match the full port versions, allowing up to 1% on the 0.4 Cv plugs.

Installation Considerations

Mounting Angle of Valve Assembly

Be sure to allow the necessary clearance around the valve assembly. The valve assembly must be mounted so that the valve stem is at least 5° above the horizontal. This ensures that any condensate that forms on the valve body will not travel into the linkage or actuator, where it may cause corrosion. On steam applications, where the ambient temperature approaches the limit of the actuator, the valve assembly must be mounted 45° from vertical. See *Actuator/Linkage Assemblies General Instructions, F-26635* for details.

Insulation of Linked Globe Valve Assembly

The globe valve should be completely insulated to minimize the effect of heat transfer and condensation at the actuator.

Caution: The actuator/linkage must not be insulated. Doing so will result in excess heat or condensation within the actuator.

Temperature Limits for Globe Valve Assembly

When installing the globe valve assembly, observe the minimum and maximum temperature limits given in the *Actuator Specifications and Valve Assembly Mounting Dimensions* section of this document.

Sizing and Selection

Two-position Control

Two-position control valves are normally selected “line size” to keep pressure drop at a minimum. If it is desirable to reduce the valve below line size, then 10% of “available pressure” (that is, the pump pressure differential available between supply and return mains with design flow at the valve location) is normally used to select the valve.

Proportional Control

Proportional control valves are usually selected to take a pressure drop equal to at least 50% of the “available pressure.” As “available pressure” is often difficult to calculate, the normal procedure is to select the valve using a pressure drop at least equal to the drop in the coil or other load being controlled (except where small booster pumps are used) with a minimum recommended pressure drop of 5 psi (34 kPa). When the design temperature drop is less than 60°F (33°C) for conventional heating systems, higher pressure drops across the valve are needed for good results (Table-6).

Table-6 Conventional Heating System.

Design Temperature Load Drop °F (°C)	Recommended Pressure Drop[a] (% of Available Pressure)	Multiplier on Load Drop
60 (33) or More	50%	1 x Load Drop
40 (22)	66%	2 x Load Drop
20 (11)	75%	3 x Load Drop

[a] Recommended minimum pressure drop = 5 psi (34 kPa).

Secondary Circuits with Small Booster Pumps: 50% of available pressure difference (equal to the drop through load, or 50% of booster pump head).

3-Way Proportional Mixing Valves Used to Bypass Flow

When 3-way proportional linked globe valve assemblies are used to control flow through a heating or cooling coil, the valve assembly is piped on the outlet side of the load to throttle the water flow through the load, and therefore control the heat output of the load (Figure-4).

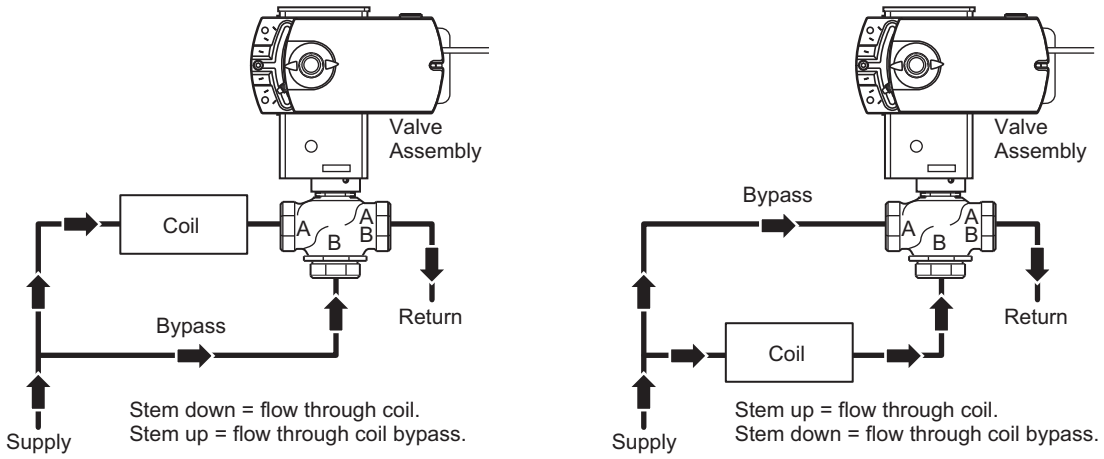


Figure-4 Typical Piping of 3-Way Mixing Valve for Control of Heating or Cooling Coil.

3-Way Proportional Mixing Valves Used to Blend Water Flows

Proportional 3-way mixing valves used to blend two water flows (Figure-5) control the heat output by varying the water temperature to the load at constant flow. These valves do not require high pressure drops for good control results. They can be sized for a pressure drop of 20% of the "available pressure" or equal to 25% of the pressure drop through the load at full flow.

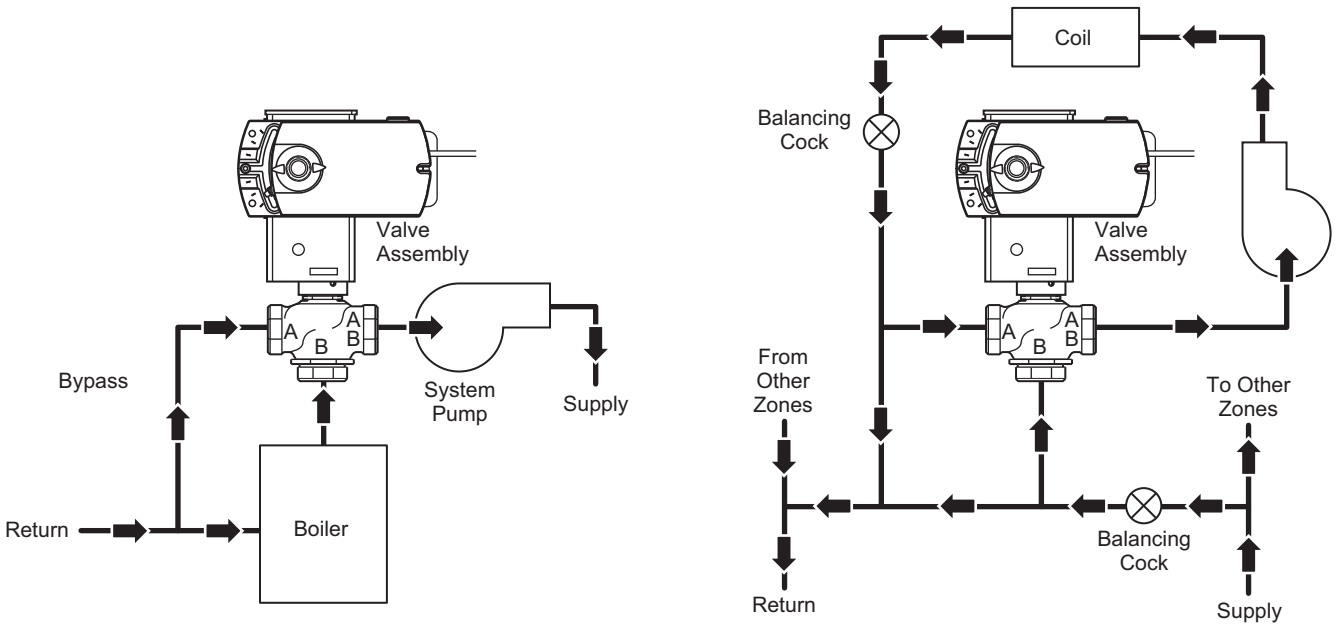


Figure-5 Typical 3-Way Mixing Valve Piping for Proportional Control Used to Blend Two Water Flows.

3-Way Diverting Valves

Proportional and two-position 3-way diverting linked globe valve assemblies are used to control the flow of hot or chilled fluids in heating systems, cooling coils, or other load by diverting the flow to either the load or a bypass. The valve must be piped with one inlet and two outlets. (Figure-6).

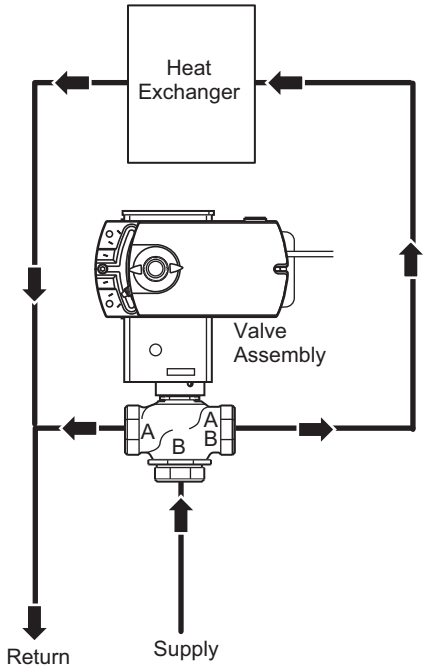


Figure-6 Typical 3-Way Diverting Valve Piping.

Cavitation Limitations on Valve Pressure Drop

A valve selected with too high a pressure drop can cause erosion of discs and/or wire drawing of the seat. In addition, cavitation can cause noise, damage to the valve trim (and possibly the body), and choke the flow through the valve.

Do not exceed the maximum differential pressure (pressure drop) for the valve selected. Refer to the chart in Figure-7.

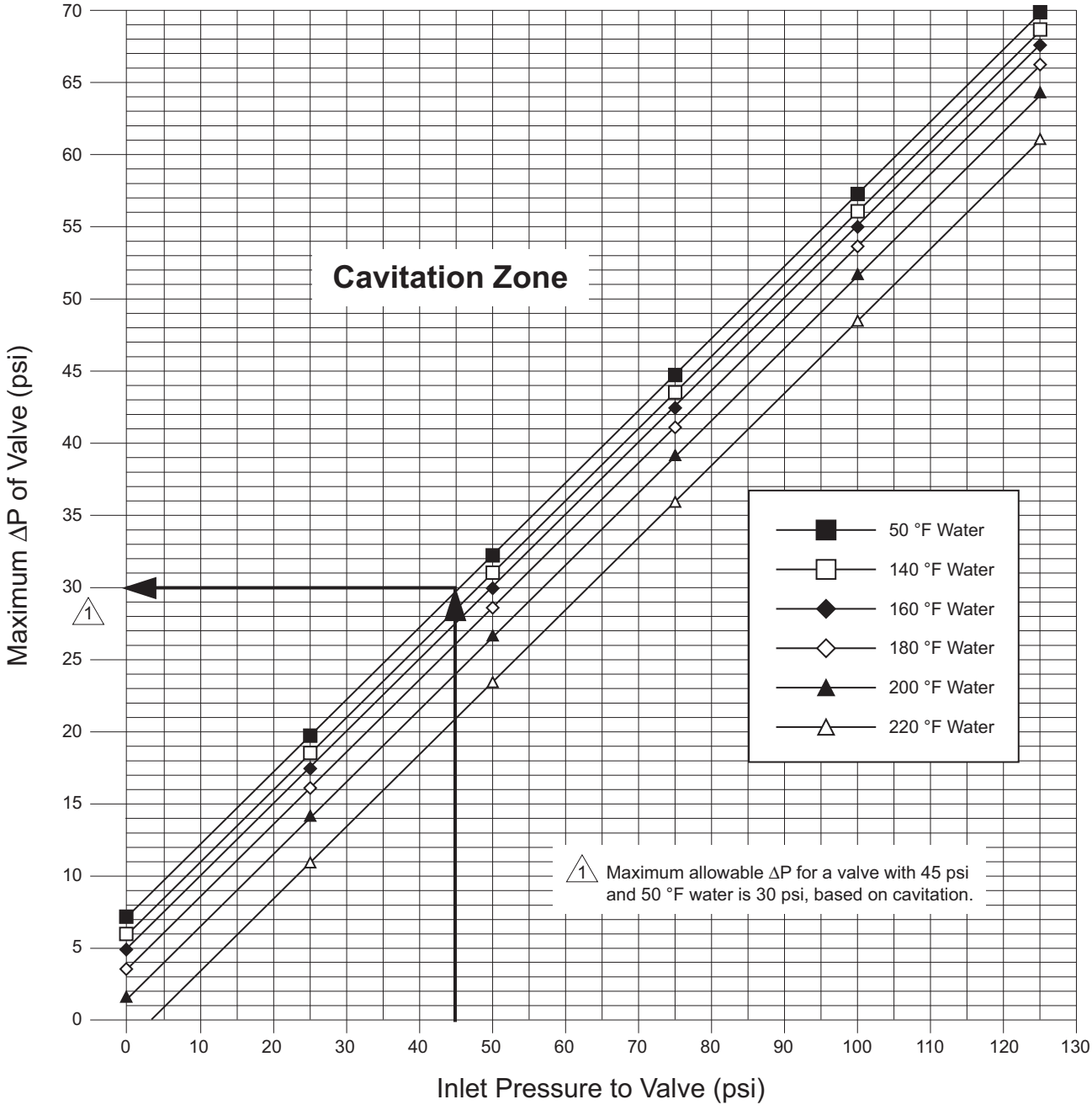


Figure-7 Maximum Allowable Differential Pressure (DP) for Water Valves.

Additional Valve Sizing Information

For additional valve sizing information, refer to the “Applicable Literature” section for a list of documents pertaining to valve sizing.

Valve/Actuator Combinations

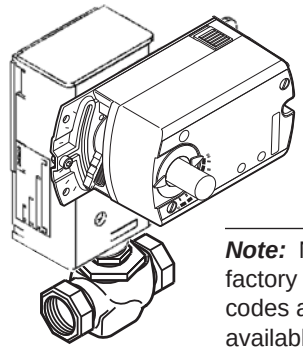
2-Way Linked Globe Valve Assemblies

Non-Spring Return Models

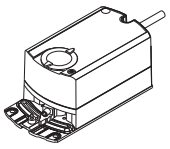
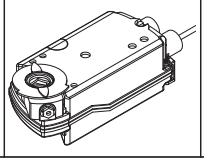
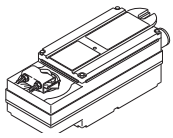
Note: Choose a valve assembly having a close-off pressure capability sufficient for the application.

Table-7 2-Way Linked Globe Valve Assemblies with Non-Spring Return SmartX Actuators — Performance Chart.

Non-Spring Return
2-Way Linked Globe Valve Assemblies



Note: Not all factory actuator codes are available.

Actuator Torque Rating (minimum)			
35 lb-in. (4 N-m)	70 lb-in. (8 N-m)	133 lb-in. (15 N-m)	300 lb-in. (34 N-m)
Actuator Model (Actuator Code)			
Floating MF41-6043 (505) **Proportional** MS41-6043 (505)	**Floating** MF41-6083 (506) **Proportional** MS41-6083 (506)	**Floating** MF41-6153 (508) **Proportional** MS41-6153 (508)	**Floating** MF41-6343 (516) **Proportional** MS41-6343 (516)
Linkage Kit Part Number			
AV-611 (1/2" to 2")	AV-611 (1" to 2")	AV-611 (1-1/2" to 2") AV-607-1 (2-1/2" to 4")	AV-609-1 (5" and 6")

Valve Assembly Part Number [a]	P Code	Valve Size in. (mm)	Cv[b]	kvs[b]	Actuator Close-off Pressure psi[cd]					
							Single Actuator	Dual Actuator[e]	Single Actuator	Dual Actuator[e]
Vx-7211-xxx-4-P Vx-7213-xxx-4-P Vx-7215-xxx-4-P[f] Vx-7221-xxx-4-P Vx-7223-xxx-4-P Vx-7225-xxx-4-P[f]	**01**	1/2 (15)	0.4	0.3	225	—	—	—	—	—
	02		1.3	1.1						
	03		2.2	1.9						
	04		4.4	3.8						
	05	3/4 (20)	5.5	4.8						
	06		7.5	6.5						
	07	1 (25)	10.0	8.7	100	130	—	—	—	—
	08		14.0	12						
	09	1-1/4 (32)	20.0	17	60	100	—	—	—	—
Vx-7213-xxx-4-P Vx-7215-xxx-4-P[f]	**10**	1-1/2 (40)	28.0	24	40	70	140	—	—	—
Vx-7223-xxx-4-P Vx-7225-xxx-4-P[f]	**11**	2 (50)	40.0	35	20	40	80	—	—	—
Vx-9213-xxx-4-P[g] Vx-9213-xxx-5-P[h] Vx-9215-xxx-4-P[f] Vx-9223-xxx-4-P[g] Vx-9223-xxx-5-P[h] Vx-9225-xxx-4-P[f]	**12**	2-1/2 (65)	56.0[g]	48[g]	—	—	33	70	46	96
			65.0[h]	56[h]						
	13	3 (80)	85.0	73	—	—	22	48	31	66
	14	4 (N/A)	145.0	125	—	—	12	27	18	38
	15	5 (N/A)	235.0	203	—	—	—	—	11	24
	16	6 (N/A)	350.0	303	—	—	—	—	8	17

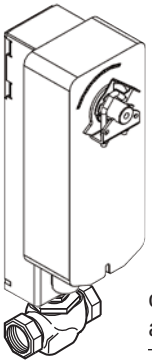
[a] To determine a specific part number, see the "Linked Globe Valve Assembly Part Numbering System".
[b] kvs = m3/h (DP = 100 kPa) kvs = Cv / 1.156 Cv = kvs x 1.156
[c] Close-off ANSI IV (.01%) for soft seats. For seat leakage ratings see "Applicable Literature" section for the list of literature on specific valve bodies.
[d] Close-off pressure ratings describe only the differential pressure which the actuator can close-off with adequate seating force. Consult valve body specifications for other limitations. The rating value is the pressure difference between the inlet and outlet ports.
[e] Dual actuators are not available as factory assemblies
[f] Metric thread 15 to 80 mm (Rp 1/2 to Rp 3).
[g] Threaded valve body.
[h] Flanged valve body.

Spring Return Models

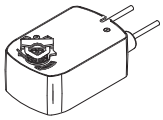
Note: Choose a valve assembly having a close-off pressure capability sufficient for the application.

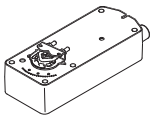
Table-8 2-Way Linked Globe Valve Assemblies with Spring Return SmartX Actuators — Performance Chart.

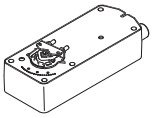
SmartX Spring Return 2-Way Linked Globe Valve Assemblies[a]

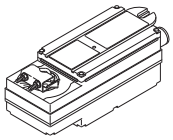


Note: Not all factory actuator codes are available.









Actuator Torque Rating (minimum)			
35 lb-in (4 N-m)	60 lb-in (7 N-m)	133 lb-in (15 N-m)	150 lb-in (17 N-m)
Actuator Model (Actuator Code)			
Two-Position MA40-704x(532) (533) (534) (535) (536) (537) **Floating** MF40-7043 (536) (537) **Proportional** MS40-7043 (536) (537) (538) (539)	**Two-Position** MA41-707x (542) (543) (544) (545) (546) (547) **Floating** MF41-7073 (546) (547) **Proportional** MS41-7073 (546) (547)	**Two-Position** MA41-715x (552) (553) (554) (555) (556) (557) **Floating** MF41-7153 (556) (557) **Proportional** MS41-7153 (556) (557)	**Two-Position** MA40-717x (572) (574) (576) **Floating** MF40-7173 (576) **Proportional** MS40-717x (572) (574) (576)
Linkage Kit Part Number			
AV-611 (1/2" to 2")	AV-602 (1" to 2") AV-607-1 (2-1/2" to 4")	AV-602 (1-1/4" to 2") AV-607-1 (2-1/2" to 4") AV-609-1 (5" to 6")	

Valve Assembly Part Number [b]	P Code	Valve Size in. (mm)	Cv[c]	kvs[c]	Actuator Close-off Pressure psi[de]					
						Single Actuator	Dual Actuator[f]	Single Actuator	Dual Actuator[f]	Single Actuator	Dual Actuator[f]
Vx-7211-xxx-4-P Vx-7213-xxx-4-P Vx-7215-xxx-4-P[g] Vx-7221-xxx-4-P Vx-7223-xxx-4-P Vx-7225-xxx-4-P[g]	01	1/2 (15)	0.4	0.3	250	—	—	—	—	250	—
	02		1.3	1.1	250	—	—	—	—		—
	03		2.2	1.9	250	—	—	—	—		—
	04		4.4	3.8	250	—	—	—	—		—
	05	3/4 (20)	5.5	4.8	250	—	—	—	—		—
	06		7.5	6.5	250	—	—	—	—		—
	07	1 (25)	10.0	8.7	125	180	—	—	—		—
	08		14.0	12	125	180	—	—	—		—
	09	1-1/4 (32)	20.0	17	75	120	—	200	—		—
Vx-7213-xxx-4-P Vx-7215-xxx-4-P[g] Vx-7223-xxx-4-P Vx-7225-xxx-4-P[g]	10	1-1/2 (40)	28.0	24	50	80	—	140	—	160	—
	11	2 (50)	40.0	35	25	40	—	80	—	120	—
Vx-9213-xxx-4-P[h] Vx-9213-xxx-5-P[i] Vx-9215-xxx-4-P[g] Vx-9223-xxx-4-P[h] Vx-9223-xxx-5-P[i] Vx-9225-xxx-4-P[g]	12	2-1/2 (65)	56.0[h]	48[h]	—	24	52	33	70	40	84
			65.0[i]	56[i]							
	13	3 (80)	85.0	73	—	16	35	22	48	27	57
	14	4 (N/A)	145.0	125	—	9	20	12	27	15	33
	15	5 (N/A)	235.0	203	—	—	—	—	9	—	10
	16	6 (N/A)	350.0	303	—	—	—	—	6	—	7

a For field assembly only. Factory actuator/linkage/valve assemblies are not offered.
b To determine a specific part number, see the Linked Globe Valve Assembly Part Numbering System,
c kvs = m^3/h (DP = 100 kPa) kvs = Cv / 1.156 Cv = kvs x 1.156
d Close-off ANSI IV (.01%) for soft seats. For seat leakage ratings see "Applicable Literature" section for the list of literature on specific valve bodies.
e Close-off pressure ratings describe only the differential pressure which the actuator can close-off with adequate seating force. Consult valve body specifications for other limitations. The rating value is the pressure difference between the inlet and outlet ports.
f Dual actuators are not available as factory assemblies.
g Metric thread 15 to 80 mm (Rp 1/2 to Rp 3).
h Threaded valve body.
i Flanged valve body.

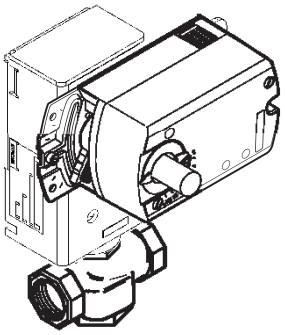
3-Way Linked Globe Valve Assemblies

Non-Spring Return Models

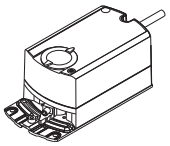
Note: Choose a valve assembly having a close-off pressure capability sufficient for the application.

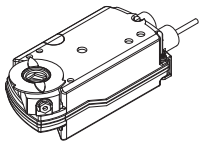
Table-9 3-Way Linked Globe Valve Assemblies with SmartX Non-Spring Return Actuators — Performance Chart.

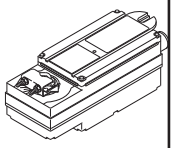
Non-Spring Return 3-Way Linked Globe Valve Assemblies[a]



Note: Not all factory actuator codes are available.







Actuator Torque Rating (minimum)			
35 lb-in (4 N-m)	70 lb-in (8 N-m)	133 lb-in (15 N-m)	300 lb-in. (34 N-m)
Actuator Model (Actuator Code)			
Floating MF41-6043 (505) **Proportional** MS41-6043 (505)	**Floating** MF41-6083 (506) **Proportional** MS41-6083 (506)	**Floating** MF41-6153 (508) **Proportional** MS41-6153 (508)	**Floating** MF41-6343 (516) **Proportional** MS41-6343 (516)
Linkage Kit Part Number			
AV-611 (1/2” to 2”)	AV-611 (1” to 2”)	AV-611 (1-1/2” to 2”) AV-607-1 (2-1/2” to 4”)	AV-609-1 (2-1/2” to 6”)

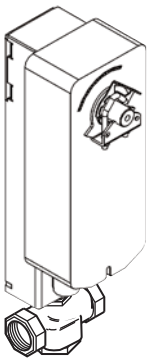
Valve Assembly Part Number [b]	P Code	Valve Size in. (mm)	Cv[c]	kvs[c]	Actuator Close-off Pressure psi[ad]					
							Single Actuator	Dual Actuator[e]	Single Actuator	Dual Actuator[e]
Vx-7313-xxx-4-P Vx-7315-xxx-4-P[f]	02	1/2 (15)	2.2	1.9	225	—	—	—	—	—
	04		4.4	3.8						
	06	3/4 (20)	7.5	6.5						
	08	1 (25)	14.0	12.0	100	180	—	—	—	—
	09	1-1/4 (32)	20.0	17	60	120	—	—	—	—
	10	1-1/2 (40)	28	24	40	75	140	—	—	—
	11	2 (50)	41	36	20	40	80	—	—	—
Vx-7323-505-4-P	02	1/2 (15)	2.2	1.9	250	—	—	—	—	—
	04		4.4	3.8						
	06	3/4 (20)	7.5	6.5						
	08	1 (25)	15.0	13.0						
	09	1-1/4 (32)	20.0	17.3						
	10	1-1/2 (40)	28	24.2						
	11	2 (50)	40	34.6						
Vx-9313-xxx-4-P[g] Vx-9313-xxx-5-P[h] Vx-9315-xxx-4-P[f]	12	2-1/2 (65)	67.0[g]	58[g]	—	—	33	70	46	96
			74.0[h]	64[h]						
	13	3 (80)	91.0[g]	79[g]	—	—	22	48	31	66
			101.0[h]	87[h]						
	14	4 (N/A)	145.0	125	—	—	12	27	18	38
	15	5 (N/A)	235.0	203	—	—	—	9	—	24
	16	6 (N/A)	350.0	303	—	—	—	6	—	17

[a] Refer to Figure-5 and Figure-6 for typical piping diagram for 3-way linked globe valve assemblies.
[b] To determine a specific part number, see the Linked Globe Valve Assembly Part Numbering System.
[c] kvs = m^3/h (DP = 100 kPa) kvs = Cv / 1.156 Cv = kvs x 1.156
[d] Close-off ANSI III (0.1%) for metal-to-metal seats with pressure at inlet (port A). For seat leakage ratings see “Applicable Literature” section for the list of literature on specific valve bodies.
[e] Dual actuators are not available as factory assemblies.
[f] Metric thread 15 to 80 mm (Rp 1/2 to Rp 3).
[g] Threaded valve body.
[h] Flanged valve body.

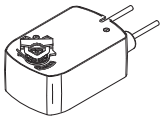
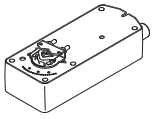
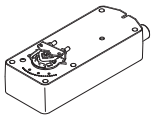
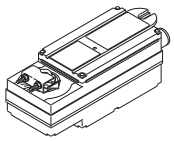
SmartX Spring Return ModelsLinked Globe Valve Assemblies Specifications

Table-10 3-Way Linked Globe Valve Assemblies with Spring Return Actuators — Performance Chart.

Spring Return
3-Way Linked Globe Valve Assemblies[a]



Note: Not all factory actuator codes are available.

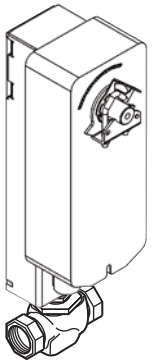
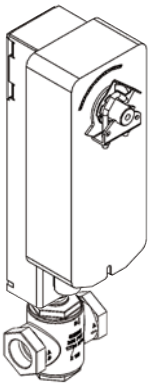
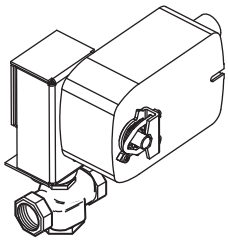
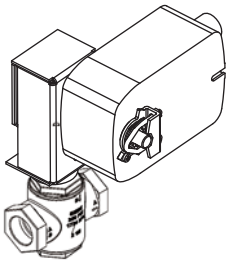





Actuator Torque Rating (minimum)			
35 lb-in[b] (4 N-m)	60 lb-in (7 N-m)	133 lb-in (15 N-m)	150 lb-in (17 N-m)
Actuator Model (Actuator Code)			
Two-Position MA40-704x (532) (533) (534) (535) (536) (537) **Floating** MF40-7043 (536) (537) **Proportional** MS40-7043 (536) (537) (538) (539)	**Two-Position** MA41-707x (542) (543) (544) (545) (546) (547) **Floating** MF41-7073 (546) (547) **Proportional** MS41-7073 (546) (547)	**Two-Position** MA41-715x (552) (553) (554) (555) (556) (557) **Floating** MF41-7153 (556) (557) **Proportional** MS41-7153 (556) (557)	**Two-Position** MA40-717x (572) (574) (576) **Floating** MF40-7173 (576) **Proportional** MS40-717x (572) (574) (576)
Linkage Kit Part Number			
AV-605 (1/2" to 2")	AV-602 (1" to 2") AV-607-1 (2-1/2" to 4")	AV-602 (1-1/2" to 2") AV-607-1 (2-1/2" to 4") AV-609-1 (5" and 6")	AV-602 (1-1/2" to 2") AV-607-1 (2-1/2" to 4") AV-609-1 (5" and 6")

Valve Assembly Part Number [c]	P Code	Valve Size in. (mm)	Cv[d]	kvs[d]	Actuator Close-off Pressure psig[be]						
						Single Actuator	Dual Actuator[f]	Single Actuator	Dual Actuator[f]	Single Actuator	Dual Actuator[f]
Vx-7313-2xx-4-P Vx-7315-xxx-4-P[g]	02	1/2 (15)	2.2	1.9	250	—	—	—	—	250	—
	04		4.4	3.8	250	—	—	—	—		—
	06	3/4 (20)	7.5	6.5	250	—	—	—	—		—
	08	1 (25)	14.0	12.0	125	180	—	—	—		—
	09	1-1/4 (32)	20.0	17	75	100	—	—	—		—
	10	1-1/2 (40)	28	24	50	70	—	140	—	160	—
	11	2 (50)	41	36	25	40	—	80	—	120	—
Vx-7323-xxx-4-P	02	1/2 (15)	2.2	1.9	250	—	—	—	—	—	—
	04		4.4	3.8	250	—	—	—	—	—	—
	06	3/4 (20)	7.5	6.5	250	—	—	—	—	—	—
	08	1 (25)	15	13.0	250	—	—	—	—	—	—
	09	1-1/4 (32)	20	17.3	250	—	—	—	—	—	—
	10	1-1/2 (40)	28	24.2	250	—	—	—	—	—	—
	11	2 (50)	40	34.6	250	—	—	—	—	—	—
Vx-9313-xxx-4-P[h] Vx-9313-xxx-5-P[i] Vx-9315-xxx-4-P[g]	12	2-1/2 (65)	67.0[h]	58[h]	—	24	52	33	70	40	84
			74.0[i]	64[i]							
	13	3 (80)	91.0[h]	79[h]	—	16	35	22	48	27	57
			101.0[i]	87[i]							
	14	4 (N/A)	145.0	125	—	9	20	12	27	15	33
	15	5 (N/A)	235.0	203	—	—	—	—	9	—	10
	16	6 (N/A)	350.0	303	—	—	—	—	6	—	7

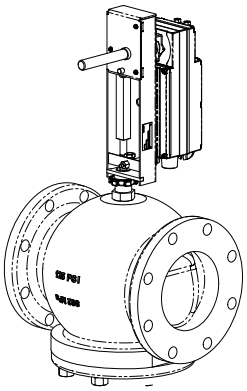
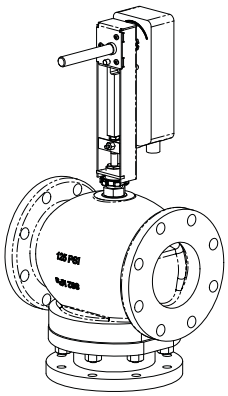
[a] Refer to Figure-5 and Figure-6 for typical piping diagram for 3-way linked globe valve assemblies.
[b] Only the 35 lb-in actuators are applicable for retrofit on VB-9000 and older valves 1/2" through 1-1/4" (32 mm). Actuator mounting is compatible with any valve which can accept an AV-400 or AV-600 linkage.
[c] To determine a specific part number, see the Linked Globe Valve Assembly Part Numbering System.
[d] kvs = m^3/h (DP = 100 kPa) kvs = Cv / 1.156 Cv = kvs x 1.156
[e] Close-off ANSI III (0.1%) for metal-to-metal seats with pressure at inlet (port A). For seat leakage ratings see "Applicable Literature" section for the list of literature on specific valve bodies.
[f] Dual actuators are not available as factory assemblies.
[g] Metric thread 15 to 80 mm (Rp 1/2 to Rp 3).
[h] Threaded valve body.

Table-11 Specifications for 1/2” to 2” Vx-7xxx-5xx-4-P Series and 2-1/2” and 3” Vx-9xxx-5xx-4-P Series Linked Globe Valve Assemblies.

		2-Way	3-Way
Linked Globe Valve Assemblies		 1/2” through 2” Valve Assemblies  2-1/2” and 3” Valve Assemblies	 1/2” through 2” Valve Assemblies  2-1/2” and 3” Valve Assemblies
Applications		Chilled or Hot Water, or Steam	Chilled or Hot Water
Type of End Fitting		NPT, Rp Screwed	NPT, Rp Screwed
		Union Straightway (up to 1-1/4”)	
Size		**Vx-7xxx-5xx-4-P** 1/2" through 2" (15 mm through 50 mm) **Vx-9xxx-5xx-4-P** 2-1/2" and 3" (65 mm and 80 mm)	
Action		Stem Up Open or Stem Up Closed	Mixing or Diverting
Valve Assembly Series[a]		Vx-72xx-5xx-4-P Vx-92xx-5xx-4-P	Vx-73xx-5xx-4-P Vx-93xx-5xx-4-P
Flow Type		Equal Percentage[b]	Linear[b]
Valve Body Materials	**Body**	Bronze	Bronze
	Seat	Bronze	Bronze
	Stem	Stainless Steel	Stainless Steel
	Plug	Brass	Brass
	Packing	Spring-loaded TFE	Spring-loaded TFE
	Disc	EPDM	—
Linkage Materials	**Housing**	Corrosion-Resistant Steel	Corrosion-Resistant Steel
	Rack & Pinion	Steel	Steel
ANSI Pressure Class (Figure-3)		250 psig (1724 kPa), up to 400 psig (2758 kPa) below 150 °F (66 °C)[c]	250 psig (1724 kPa), up to 400 psig (2758 kPa) below 150 °F (66 °C)[c]
Pressure Class (VB-7xx5)		PN16	PN16
Rangeability		See Table-5	500:1
Seat Leakage		ANSI Class IV (.01%)	ANSI Class III (0.1%)
STEAM			
Inlet Pressure — Maximum		35 psig (241 kPa)	—
Fluid Temperature — Maximum		281 °F (138 °C)	—
Allowable Differential Pressure[d]		20 psi (138 kPa)	—
WATER			
Fluid Temperature — Minimum		**1/2” through 2”** 20 °F (-7 °C) **2-1/2” and 3”** 40 °F (4 °C)	**1/2” through 2”** 20 °F (-7 °C) **2-1/2” and 3”** 40 °F (4 °C)
Fluid Temperature — Maximum		**1/2” through 3”** 281 °F (138 °C)	**1/2” through 3”** 300 °F (149 °C)
Allowable Differential Pressure[d]		35 psi (241 kPa) Max. for Normal Lifespan (refer to "Cavitation Limitations on Valve Pressure Drop" on page 15)	35 psi (241 kPa) Max. for Normal Lifespan (refer to "Cavitation Limitations on Valve Pressure Drop" on page 15)

[a] To determine a specific part number, see the Linked Globe Valve Assembly Part Numbering System.
[b] For a detailed description of the flow, see page 9 (2-way valves) or page 10 (3-way valves).
[c] Do not apply the above pressure rating to the piping system.
[d] Maximum recommended differential pressure. Do not exceed the recommended differential pressure (pressure drop) or the integrity of valve parts may be affected. Exceeding the maximum recommended differential pressure voids the product warranty.

Table-12 Specifications for 2-1/2” to 6” Vx-9xxx Linked Globe Valve Assemblies.

		2-Way	3-Way
Linked Globe Valve Assemblies			
Applications		Chilled or Hot Water, or Steam	Chilled or Hot Water
Type of End Fitting		Flanged	Flanged
Size		2-1/2 in. through 6 in. 65 mm through 150 mm	2-1/2 in. through 6 in. 65 mm through 150 mm
Action		Stem Up Open or Stem Up Closed	Mixing
Valve Assembly Series		Vx-92xx-5xx-5-P	Vx-931x-5xx-5-P
Flow Type		Equal Percentage[a]	Linear[a]
Valve Body Materials	**Body**	Cast Iron	Cast Iron
	Seat	Bronze	Bronze
	Stem	Stainless Steel	Stainless Steel
	Plug	Bronze	Bronze
	Packing	Spring-loaded TFE	Spring-loaded TFE
	Disc	Composite	—
Linkage Materials	**Housing**	Corrosion-Resistant Steel	Corrosion-Resistant Steel
	Rack & Pinion	Steel	Steel
ANSI Pressure Class (Figure-3)		125 psig (862 kPa), 200 psig (1379 kPa) below 150 °F (66 °C)[b]	125 psig (862 kPa), 200 psig (1379 kPa) below 150 °F (66 °C)[b]
Rangeability		75:1	Exceeds 500:1
Seat Leakage		ANSI Class IV (.01%)	ANSI Class III (0.1%)
STEAM			
Inlet Pressure — Maximum		35 psig (241 kPa)	—
Fluid Temperature — Maximum		281 °F (138 °C)	—
Allowable Differential Pressure[c]		20 psi (138 kPa)	—
WATER			
Fluid Temperature — Minimum		40 °F (4 °C)	40 °F (4 °C)
Fluid Temperature — Maximum		281 °F (138 °C)	300 °F (149 °C)
Allowable Differential Pressure[c]		35 psi (241 kPa) Max. for Normal Lifespan (refer to "Cavitation Limitations on Valve Pressure Drop" on page 15)	35 psi (241 kPa) Max. for Normal Lifespan (refer to "Cavitation Limitations on Valve Pressure Drop" on page 15)

[a] For a detailed description of the flow, see page 9 (2-way valves) or page 10 (3-way valves).

[b] Do not apply the above pressure rating to the piping system.

[c] Maximum recommended differential pressure. Do not exceed the recommended differential pressure (pressure drop) or the integrity of valve parts may be affected. Exceeding the maximum recommended differential pressure voids the product warranty.

SmartX Actuator Specifications and Valve Assembly Mounting Dimensions

Valve Assemblies with MF41-6043, MS41-6043, MF41-6083, and MS41-6083 Actuators

Note: Standard Linked Valve Assemblies use the basic MF41-6043, MS41-6043, MF41-6083, and MS41-6083 actuators. Specifications for the non-standard Mx41-6043/6083-502, -510, -520, -522 actuators are provided here for reference. Linked Valve Assemblies using these non-standard actuators may be special-ordered by contacting the factory or field-mounted using the AV-60x linkage kit for globe valve assemblies.

SmartX Actuator Specifications

Inputs

Control Signal

MF41-6043 and MF41-6083 — Floating three-position control, 24 Vac.

MS41-6043 and MS41-6083 — Proportional, 0 to 10 Vdc; input resistance 100 kΩ.

Control signal adjustment available with MS41-6043/6083-520 and MS41-6043/6083-522:

Start point (offset) — Between 0 and 5 Vdc (factory setting = 0 Vdc)

Span — 2 to 30 Vdc

Power Requirements

All 24 Vac circuits are Class 2.

Part Number	Power Input @ 50/60 Hz			
	Voltage[a]	Running VA	Holding VA	Watts
MF41-6043 and MF41-6083	24 Vac +20/-15%	2.3	—	2.0
MS41-6043 and MS41-6083	24 Vac +20/-15%	3.3	1.2	3.0

[a] 24 Vac +20/-10% for ambient temperatures 90 to 130 °F (Mx41-6083 only).

Connections

3 ft. (0.9 m) long, 18 AWG leads, plenum-rated.

Motor Type

Synchronous

Outputs

Electrical

Feedback potentiometer available for MF41-6043/6083-510: 0 to 1000 Ω < 10 mA

Position feedback voltage for MS41-6043/6083: 0 to 10 Vdc, 1 mA

Auxiliary Switches: Dual auxiliary switches available with MF41-6043/6083-502, MS41-6043/6083-502, MF41-6043/6083-522 and MS41-6043/6083-522:

AC Rating: 24 Vac, 4 A resistive, 2 A inductive **Switching hysteresis:** 3°

DC Rating: 12 to 30 Vdc, DC 2 A

Timing:

Part Number	Timing in Sec.	
	At 60 Hz	At 50 Hz
MF41-6043 MS41-6043	90	108
MF41-6083 MS41-6083	125	150

Switch Range:

Switch A — 0 to 90° range in 5° intervals
Recommended range usage — 0 to 45°
Factory setting — 5°
Switch B — 0 to 90° range in 5° intervals
Recommended range usage — 45 to 90°
Factory setting — 85°

Mechanical

Output torque rating: 35 lb-in. (4 N-m) for Mx41-6043; 70 lb-in. (8 N-m) for Mx41-6083

Stroke: Normal angle of rotation is 90°, limited to a maximum of 95°. Field adjustable to limit travel on either end of stroke.

Position indicator: Adjustable pointer is provided for position indication.

Output shaft setscrew: Tightening torque 55 to 60 lb-in. (6.3 to 6.8 N-m).

Environment

Temperature Limits

Shipping and storage: -40 to 158 °F (-40 to 70 °C) ambient.

Operating: Minimum allowable valve fluid temperature: 20 °F (-7 °C).
Maximum allowable ambient: -25 to 130 °F (-32 to 55 °C) maximum ambient at maximum valve fluid temperature of 250 °F (121 °C).

Humidity

5 to 95% RH, non-condensing.

Locations

NEMA Type 2 (IEC IP54).

Agency Listings (Actuator)

UL

UL-873, Underwriters Laboratories.

cUL

Canadian Standards C22.2 No. 24-93.

European Community

EMC Directive (89/336/EEC). Emissions (EN50081-1). Immunity (EN50081-2).

Dimensions — 1/2” to 2” Globe Valve Assemblies

Valve Assembly Part Number	Valve Size in.	Valve Dimensions in inches (millimetres)								
		2-Way (Refer to Figure-8 and Figure-10)					3-Way (Refer to Figure-9)			
		A	B	C	D	E	A	C	D	E
Union Straightway (N.C.) VF-7221-50x-4-P VS-7221-50x-4-P	1/2	4-3/16 (106)	2-11/16 (68)	1-3/16 (30)	1-1/8 (29)	6-3/8 (162)	—			
	3/4	4-15/16 (125)	3-3/16 (81)	1-3/16 (30)	1-1/8 (29)	6-3/8 (162)				
	1	6 (152)	3-5/8 (92)	1-3/4 (44)	1-3/16 (30)	6-7/16 (164)				
	1-1/4	6-1/4 (159)	3-15/16 (100)	1-3/4 (44)	1-7/16 (37)	6-11/16 (170)				
Union Straightway (N.O.) VF-7211-50x-4-P VS-7211-50x-4-P	1/2	4-3/16 (106)	2-7/16 (62)	1-3/16 (30)	1-1/8 (29)	6-3/8 (162)	—			
	3/4	4-15/16 (125)	2-13/16 (72)	1-1/16 (27)	1-1/8 (29)	6-3/8 (162)				
	1	6 (152)	3-1/8 (79)	1-3/16 (30)	1-13/16 (46)	7-1/16 (179)				
	1-1/4	6-1/4 (159)	3-5/16 (84)	1-3/8 (35)	1-13/16 (46)	7-1/16 (179)				
NPT/Metric Thread 2-Way (N.C.) VF-7223-50x-4-P VF-7225-50x-4-P VS-7223-50x-4-P VS-7225-50x-4-P 3-Way VF-7313-50x-4-P VF-7315-50x-4-P VF-7323-50x-4-P VF-7325-50x-4-P VS-7313-50x-4-P VS-7315-50x-4-P VS-7323-50x-4-P VS-7325-50x-4-P	1/2	3-1/16 (78)	—	1-3/16 (30)	1-1/8 (29)	6-3/8 (162)	3-1/16 (78)	1-3/16 (30)	1-1/8 (29)	6-3/8 (162)
	3/4	3-5/8 (92)		1-3/16 (30)	1-1/8 (29)	6-3/8 (162)	3-5/8 (92)	1-3/16 (30)	1-1/8 (29)	6-3/8 (162)
	1	4-5/8 (117)		1-3/4 (44)	1-3/16 (30)	6-7/16 (164)	4-5/8 (118)	1-3/4 (44)	1-3/16 (30)	6-7/16 (164)
	1-1/4	4-5/8 (117)		1-3/4 (44)	1-7/16 (37)	6-11/16 (170)	4-5/8 (118)	1-3/4 (44)	1-7/16 (37)	6-11/16 (170)
	1-1/2	5-3/8 (136)		1-13/16 (46)	1-9/16 (40)	6-13/16 (173)	5-3/8 (137)	1-13/16 (46)	1-9/16 (40)	6-13/16 (173)
	2	6-1/8 (156)		2-1/4 (57)	2-1/4 (57)	7-1/2 (190)	6-1/8 (156)	2-1/4 (57)	2-1/4 (57)	7-1/2 (190)
NPT/Metric Thread 2-Way (N.O.) VF-7213-50x-4-P VF-7215-50x-4-P VS-7213-50x-4-P VS-7215-50x-4-P	1/2	3-1/16 (78)	—	1-3/16 (30)	1-1/8 (29)	6-3/8 (162)	—			
	3/4	3-5/8 (92)		1-1/16 (27)	1-1/8 (29)	6-3/8 (162)				
	1	4-5/8 (117)		1-3/16 (30)	1-13/16 (46)	7-1/16 (179)				
	1-1/4	4-5/8 (117)		1-3/8 (35)	1-13/16 (46)	7-1/16 (179)				
	1-1/2	5-3/8 (136)		1-1/2 (38)	1-7/8 (48)	7-1/8 (181)				
	2	6-1/8 (156)		1-9/16 (40)	2-1/8 (54)	7-3/8 (187)				

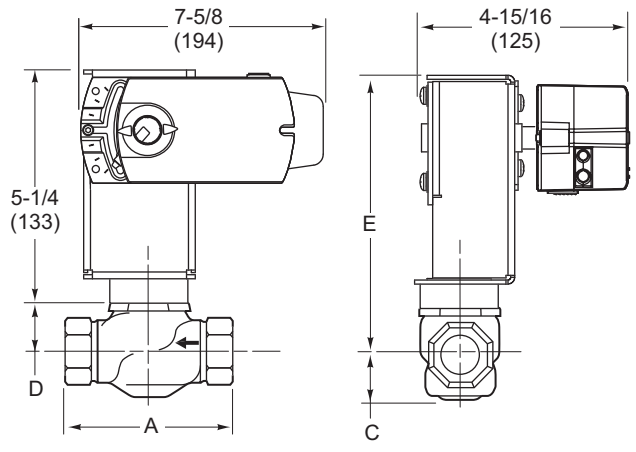


Figure-8 Mx41-6043 or Mx41-6083 with 2-Way Globe Valve with AV-611 Linkage.

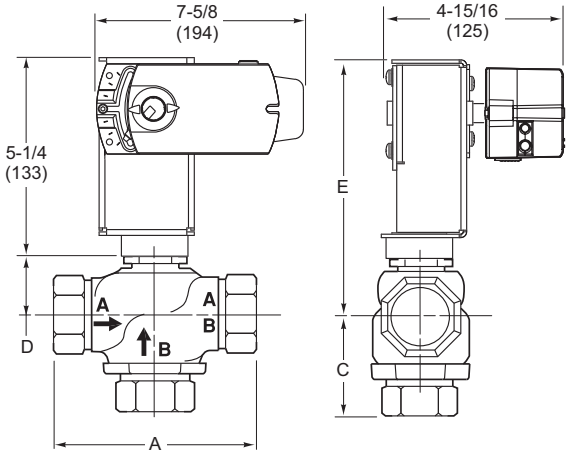


Figure-9 Mx41-6043 or Mx41-6083 with 3-Way Globe Valve with AV-611 Linkage.

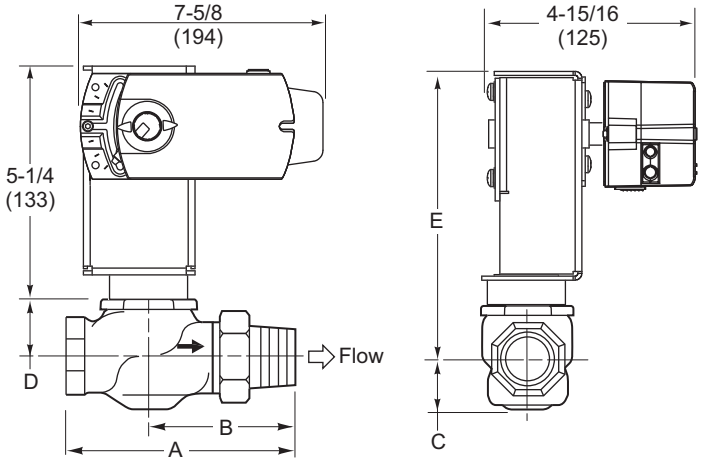


Figure-10 Mx41-6043 or Mx41-6083 with 2-Way Union Straightway Globe Valve with AV-611 Linkage.

Valve Assemblies with Mx41-6153 SmartX Non-Spring Return Actuators

SmartX Actuator Specifications

Inputs

Control Signal

MF41-6153— Three-position.

MS41-6153— Proportional, 0 to 10 Vdc or 2 to 10 Vdc selectable.

Power Requirements

All 24 Vac circuits are Class 2.

Part Number	Power Input @ 50/60 Hz			
	Voltage[a]	Running VA	Holding VA	Watts
MF41-6153	24 Vac +20/-15%	3.0	—	3.0
MS41-6153	24 Vac +20/-15%	5.0	1.2	4.0

[a] 24 Vac, +20%, -5% (MF models) and 24 Vac, +20%, -10% (MS models) for ambient temperatures 85 to 130 °F.

Connections

3 ft. (0.9 m) long plenum-rated cable, 18 AWG color coded leads.

Motor Type

Brushless motor technology with stall protection.

Outputs

Electrical

Position feedback voltage for MS41-6153: 0 to 10 Vdc, 1 mA max.

Timing: Approx. 125 sec. at 60 Hz; 150 sec. at 50 Hz.

Mechanical

Output torque rating: 133 lb-in (15 N-m).

Stroke: Angle of rotation is limited to a nominal 90° (maximum 95°), field adjustable to limit travel on either end of stroke.

Position indicator: Adjustable pointer is provided for position indication.

Environment

Temperature Limits

Shipping and storage: -40 to 158 °F (-40 to 70 °C) ambient.

Operating: -25 to 130 °F (32 to 55 °C)

Humidity

5 to 95% RH, non-condensing.

Locations

NEMA 1 (IEC IP10).

Agency Listings (Actuator)

UL

UL-873, Underwriters Laboratories.

European Community

EMC Directive (89/336/EEC). Low Voltage Directive (72/23/EEC).

cUL

Canadian Standards C22.2 No. 24-93.

Dimensions — 1/2” to 2” Globe Valve Assemblies

Valve Assembly Part Number	Valve Size in.	Valve Dimensions in inches (millimetres)								
		2-Way (Refer to Figure-11 and Figure-13)					3-Way (Refer to Figure-12)			
		A	B	C	D	E	A	C	D	E
Union Straightway (N.C.) Vx-7221-xxx-4-P	1	6 (152)	3-5/8 (92)	1-3/4 (44)	1-3/16 (30)	6-7/16 (164)	—			
	1-1/4	6-1/4 (159)	3-15/16 (100)	1-3/4 (44)	1-7/16 (37)	6-11/16 (170)				
Union Straightway (N.O.) Vx-7211-xxx-4-P	1	6 (152)	3-1/8 (79)	1-3/16 (30)	1-13/16 (46)	7-1/16 (179)	—			
	1-1/4	6-1/4 (159)	3-5/16 (84)	1-3/8 (35)	1-13/16 (46)	7-1/16 (179)				
NPT/Metric Thread 2-Way (N.C.) Vx-7223-xxx-4-P Vx-7225-xxx-4-P 3-Way Vx-73xx-xxx-4-P	1	4-5/8 (117)	—	1-3/4 (44)	1-3/16 (30)	6-7/16 (164)	4-5/8 (118)	1-3/4 (44)	1-3/16 (30)	6-7/16 (164)
	1-1/4	4-5/8 (117)		1-3/4 (44)	1-7/16 (37)	6-11/16 (170)	4-5/8 (118)	1-3/4 (44)	1-7/16 (37)	6-11/16 (170)
	1-1/2	5-3/8 (137)		1-13/16 (46)	1-9/16 (40)	6-13/16 (173)	5-3/8 (137)	1-13/16 (46)	1-9/16 (40)	6-13/16 (173)
	2	6-1/8 (156)		2-1/4 (57)	2-1/4 (57)	7-1/2 (190)	6-1/8 (156)	2-1/4 (57)	2-1/4 (57)	7-1/2 (190)
NPT/Metric Thread 2-Way (N.O.) Vx-7213-xxx-4-P Vx-7215-xxx-4-P	1	4-5/8 (117)	—	1-3/16 (30)	1-13/16 (46)	7-1/16 (179)	—			
	1-1/4	4-5/8 (117)		1-3/8 (35)	1-13/16 (46)	7-1/16 (179)				
	1-1/2	5-3/8 (137)		1-1/2 (38)	1-7/8 (48)	7-1/8 (181)				
	2	6-1/8 (156)		1-9/16 (40)	2-1/8 (54)	7-3/8 (187)				

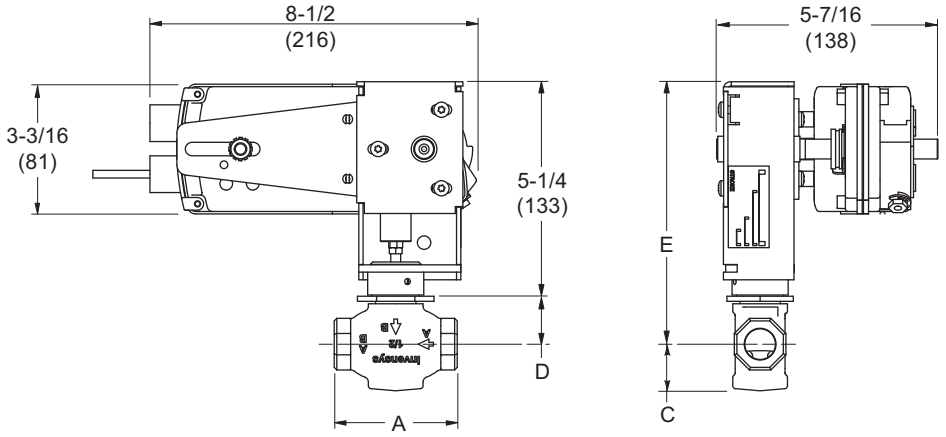


Figure-11 Mx41-6153 with 1/2” to 2” 2-Way Globe Valve with AV-611 Linkage.

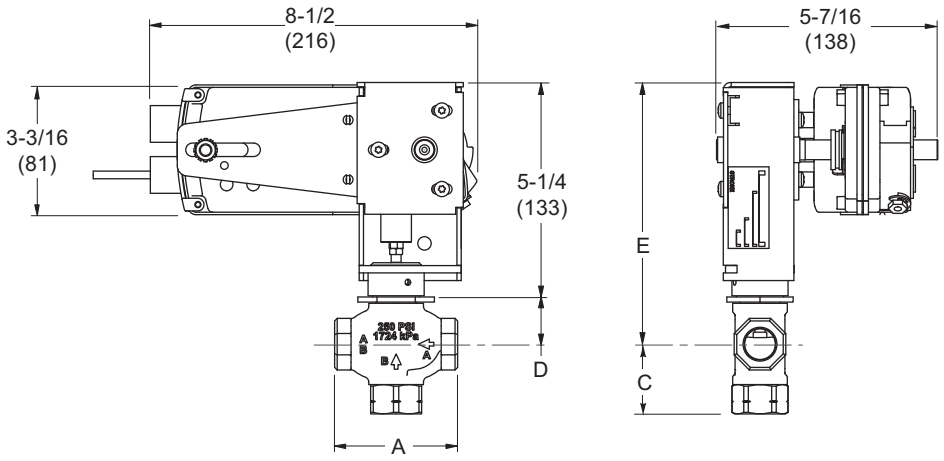


Figure-12 Mx41-6153 with 1/2” to 2” 3-Way Globe Valve with AV-611 Linkage.

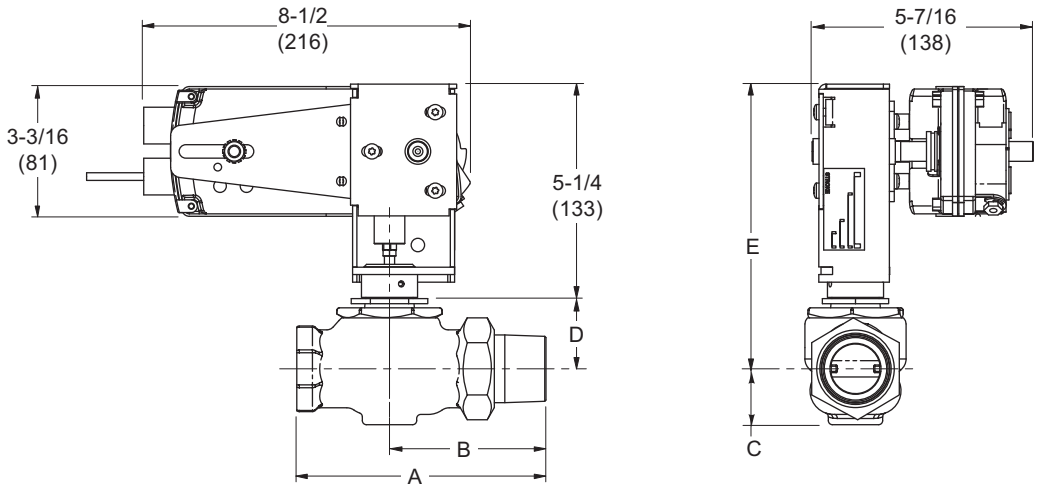


Figure-13 Mx41-6153 with 1” or 1-1/4” Union Straightway Globe Valve with AV-611 Linkage.

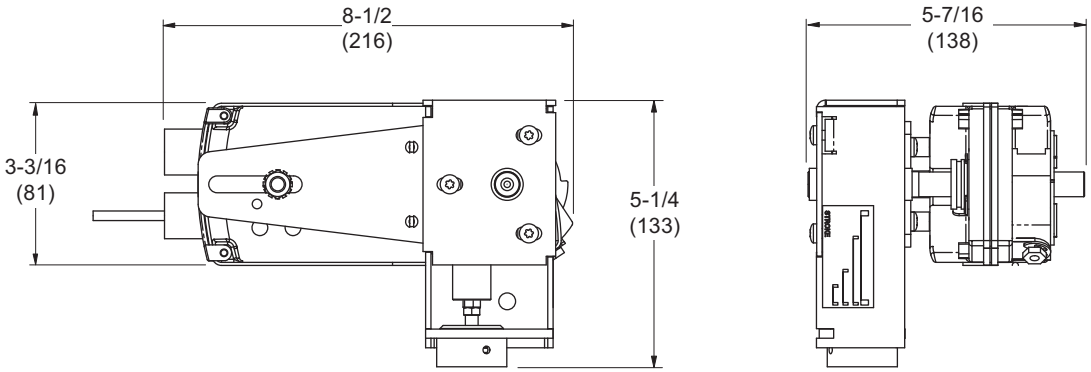


Figure-14 Mx41-6153 Actuator/Linkage Assembly with AV-611 Linkage.

Dimensions — 2-1/2” and 3” Screwed Globe Valve Assemblies

Valve Assembly Part Number		Valve Size in.	Valve Dimensions in inches (millimetres)							
			2-Way (Refer to Figure-15)				3-Way (Refer to Figure-16)			
			A	C	E	H	A	C	E	H
NPT/Metric Thread		2-1/2	8-1/2 (216)	3-13/16 (97)	16-3/4 (425)	6-5/8 (168)	8-1/2 (216)	4-5/8 (117)	16-3/4 (425)	6-5/8 (168)
2-Way (N.O.) **Vx-9213-508-4-P** **Vx-9215-508-4-P** **2-Way (N.C.)** **Vx-9223-508-4-P** **Vx-9225-508-4-P**	**3-Way** **Vx-9313-508-4-P** **Vx-9315-508-4-P**	3	9-1/2 (241)	4-1/4 (108)	17-1/4 (438)	7-1/4 (184)	9-1/2 (241)	5 (127)	17-1/4 (438)	7-1/4 (184)

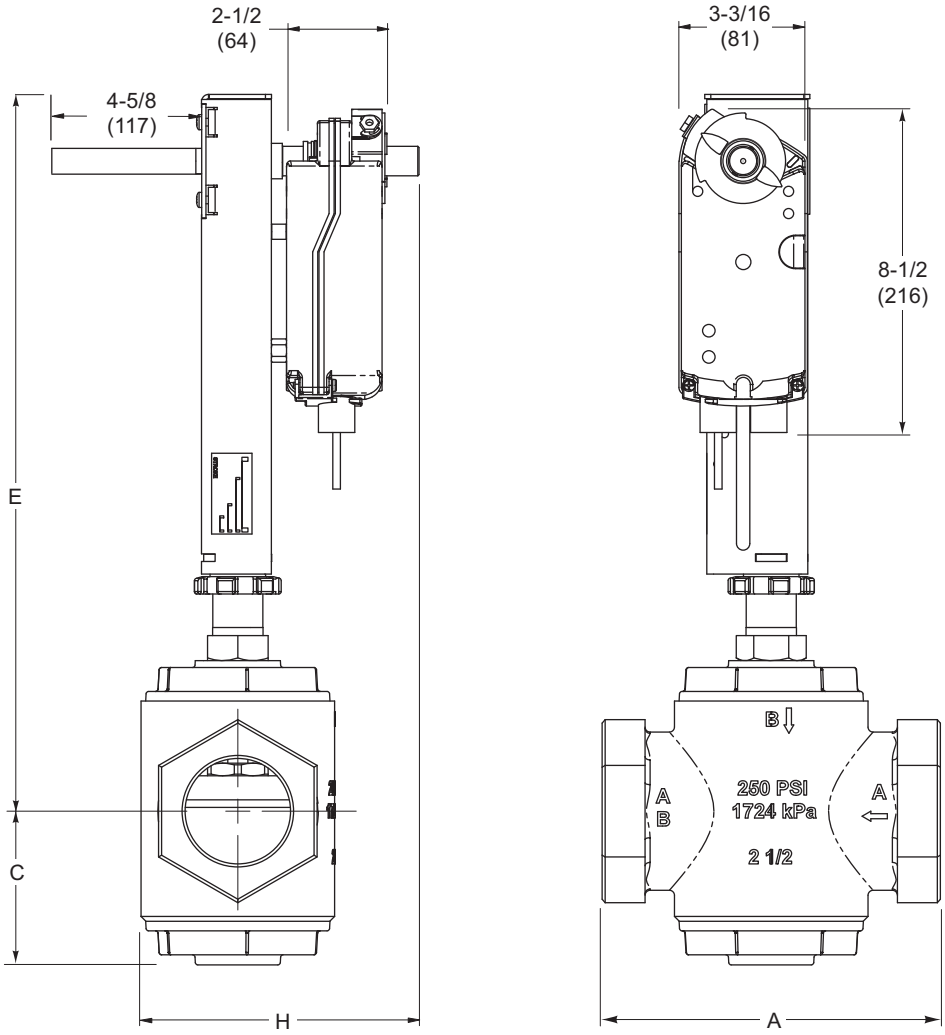


Figure-15 Mx41-6153 with 2-1/2” or 3” Screwed 2-Way Globe Valve with AV-607-1 Linkage.

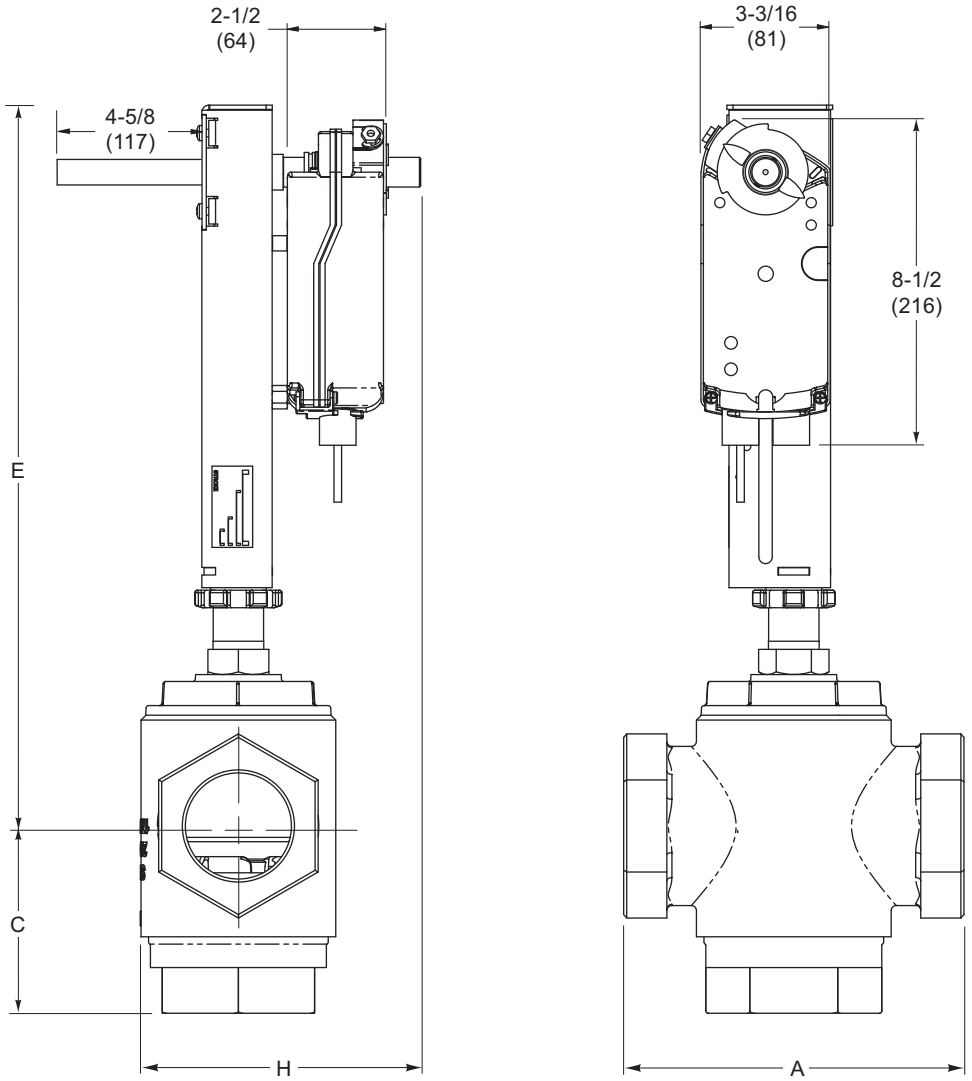


Figure-16 Mx41-6153 with 2-1/2” or 3” Screwed 3-Way Globe Valve With AV-607-1 Linkage.

Dimensions — 2-1/2” to 4” Flanged Globe Valve Assemblies

Valve Assembly Part Number	Valve Size in.	Valve Dimensions in inches (millimetres)											
		2-Way (Refer to Figure-17)						3-Way (Refer to Figure-18)					
		A	C	E	F	G	H	A	C	E	F	G	H
ASA Flanged 2-Way (N.O.) Vx-9213-508-5-P 3-Way Vx-9313-508-5-P	2-1/2	8-1/2 (216)	3-1/2 (89)	16-5/8 (422)	7 (178)	5-1/2 (140)	8-1/8 (206)	8-1/2 (216)	5-3/8 (136)	17-1/4 (438)	7 (178)	5-1/2 (140)	8-1/8 (206)
	3	9-1/2 (241)	3-3/4 (95)	17-1/4 (438)	7-1/2 (190)	6 (152)	8-1/2 (216)	9-1/2 (241)	6-3/8 (162)	16-3/4 (426)	7-1/2 (190)	6 (152)	8-1/2 (216)
	4	11-1/2 (292)	4-1/2 (114)	18-1/8 (460)	9 (229)	7-1/2 (190)	9-1/8 (232)	11-1/2 (292)	8-1/2 (276)	18-1/4 (464)	9 (229)	7-1/2 (190)	9-1/8 (232)
ASA Flanged 2-Way (N.C.) Vx-9223-508-5-P	2-1/2	8-1/2 (216)	4 (107)	17-1/4 (438)	7 (178)	5-1/2 (140)	8-1/8 (206)	—					
	3	9-1/2 (241)	5 (127)	16-3/4 (426)	7-1/2 (190)	6 (152)	8-1/2 (216)						
	4	11-1/2 (292)	7-1/8 (181)	18-1/4 (464)	9 (229)	7-1/2 (190)	9-1/8 (232)						

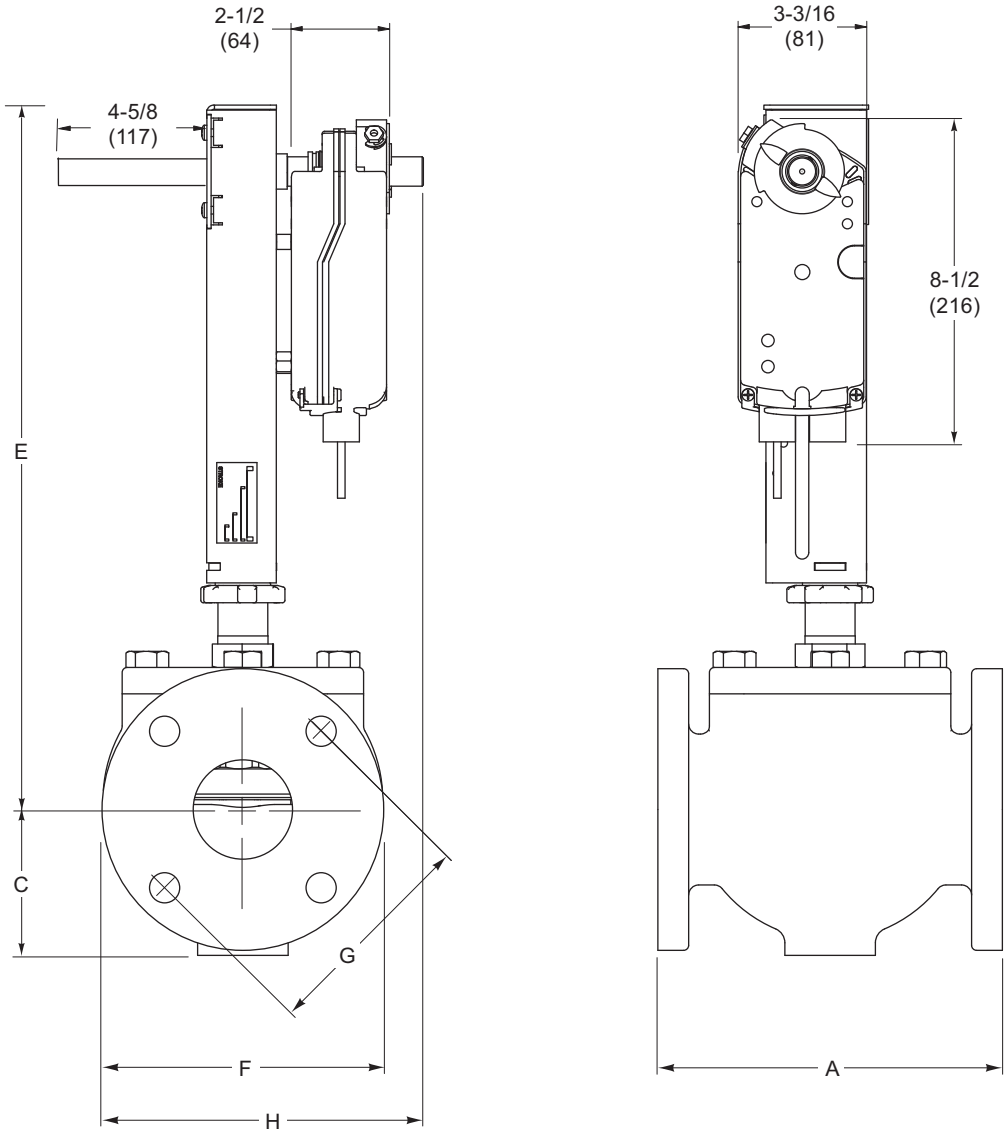


Figure-17 Mx41-6153 with 2-1/2” to 4” Flanged 2-Way Globe Valve With AV-607-1 Linkage.

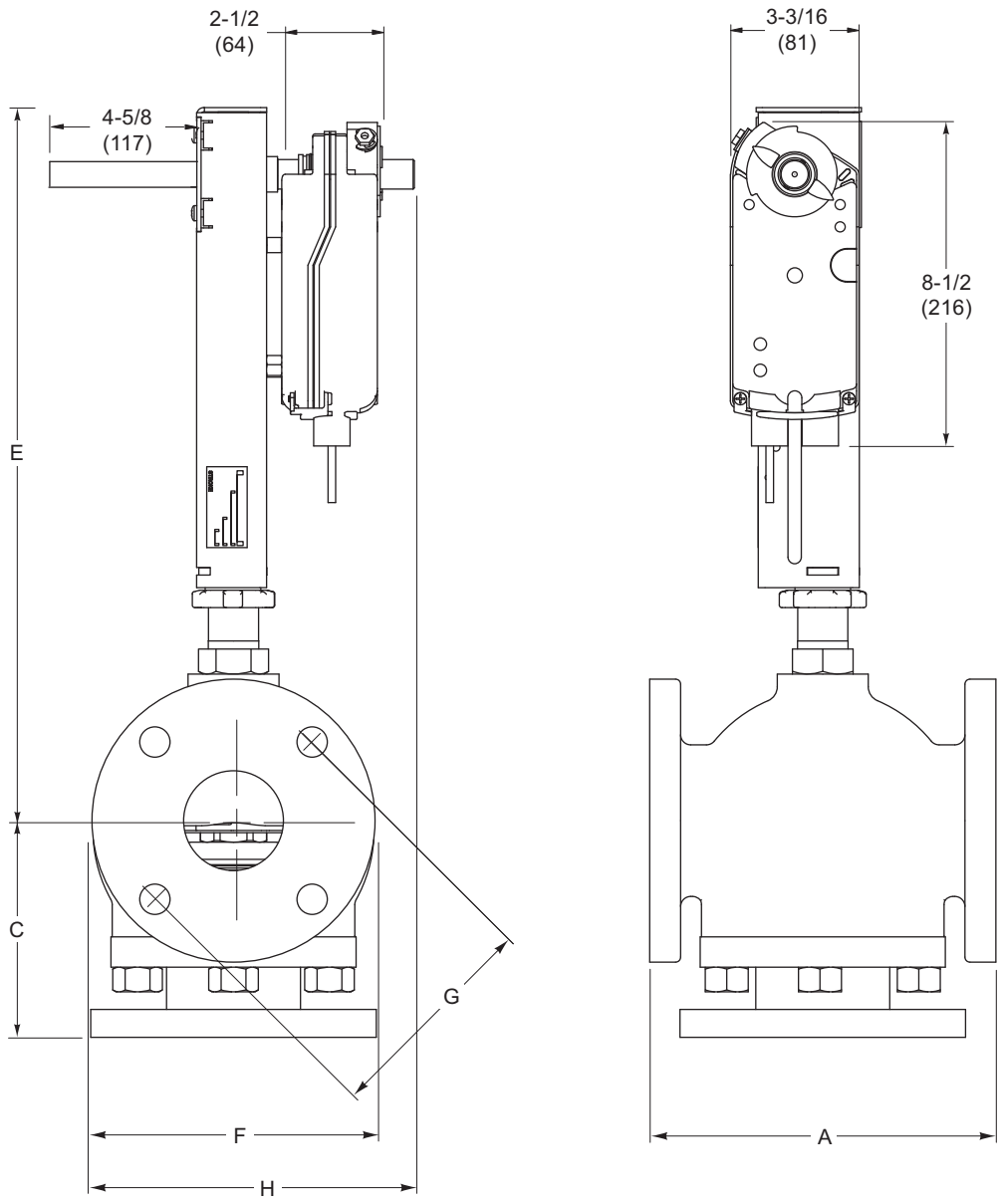


Figure-18 Mx41-6153 with 2-1/2” to 4” Flanged 3-Way Globe Valve With AV-607-1 Linkage.

Valve Assemblies with Mx41-6343 SmartX Non-Spring Return Actuators

SmartX Actuator Specifications

Inputs

Control Signal

MF41-6343—SPDT floating control output, Triacs (500 mA rated), or 2 SPST contacts.
MS41-6343—Proportional, 2 to 10 Vdc or 4 to 20 mAdc with the addition of a 500-ohm resistor (not included).

Power Requirements

All 24 Vac and 22-30 Vdc circuits are Class 2. All circuits 30 Vac and above are Class 1.

Part Number	Power Input @ 50/60 Hz			
	Voltage	Running VA	Holding VA	Watts
MF41-6343	24 Vac ± 20%	5.7	4.1	3.9
	22-30 Vdc	4.1	3.0	4.1
MS41-6343	24 Vac ± 20%	5.6	4.0	3.6
	22-30 Vdc	3.4	2.2	3.4

Connections

36” (91 cm) long appliance cables, 1/2" conduit connector. For M20 Metric conduit, use AM-756 adaptor.

Motor Type

Brushless DC.

Outputs

Electrical

Stroke: Electronically limited to 92° ±1°. (MS) Mechanically Limited To 101° ±1°(MF).

Timing: Approx. 148 sec for proportional (MS) model, 162 sec. for floating (MF) model.

Mechanical

Output torque rating: 300 lb-in (34 N-m) minimum, 650 lb-in (73.7 N-m) maximum.

Position indicator: Pointer and scale are provided for position indication.

Direction of rotation: CW or CCW rotation is available through reversible mounting.

Manual override: Activated by the manual override crank.

Environment

Temperature Limits

Shipping and storage: -40 to 160 °F (-40 to 71 °C) ambient.
Operating: -25 to 140 °F (-32 to 60 °C).

Humidity

5 to 95% RH, non-condensing.

Locations

NEMA 1 (IEC IP10), NEMA 4 (IEC IP56) with customer supplied water tight conduit connectors.

Agency Listings (Actuator)

UL

UL 873, Underwriters Laboratories (File #9429 Category Temperature-Indicating and Regulating Equipment).

European Community

EMC Directive (2004/108/EC). Low Voltage Directive (72/23/EEC).

cUL

Canadian Standards C22.2 No. 24-93.

Australia

This product meets requirements to bear the C-Tick Mark according to the terms specified by the Communications Authority under the Radiocommunications Act 1992.

Dimensions — 5” and 6” Flanged Globe Valve Assemblies

Valve Assembly Part Number[a]	Valve Size in.	Valve Dimensions in inches (millimetres)											
		2-Way (Refer to Figure-19)						3-Way (Refer to Figure-20)					
		A	C	E	F	G	H	A	C	E	F	G	H
ASA Flanged 2-Way Vx-9213-516-5-P 3-Way Vx-9313-516-5-P	5	13 (330)	5 (127)	20-1/4 (514)	10 (254)	8-1/2 (216)	10-1/4 (260)	13 (330)	8-3/4 (222)	20 (508)	10 (254)	8-1/2 (216)	10-1/4 (260)
	6	14 (356)	5-1/2 (140)	21 (533)	11 (280)	9-1/2 (241)	10-3/4 (273)	14 (356)	9-3/4 (248)	20-7/8 (530)	11 (280)	9-1/2 (241)	10-3/4 (273)
ASA Flanged 2-Way Vx-9223-516-5-P	5	13 (330)	6-3/4 (171)	20 (508)	10 (254)	8-1/2 (216)	10-1/4 (260)	—					
	6	14 (356)	7-3/8 (187)	20-7/8 (530)	11 (280)	9-1/2 (241)	10-3/4 (273)						

[a] Mx41-6343 actuators (actuator code 516) for 5” and 6” valves only.

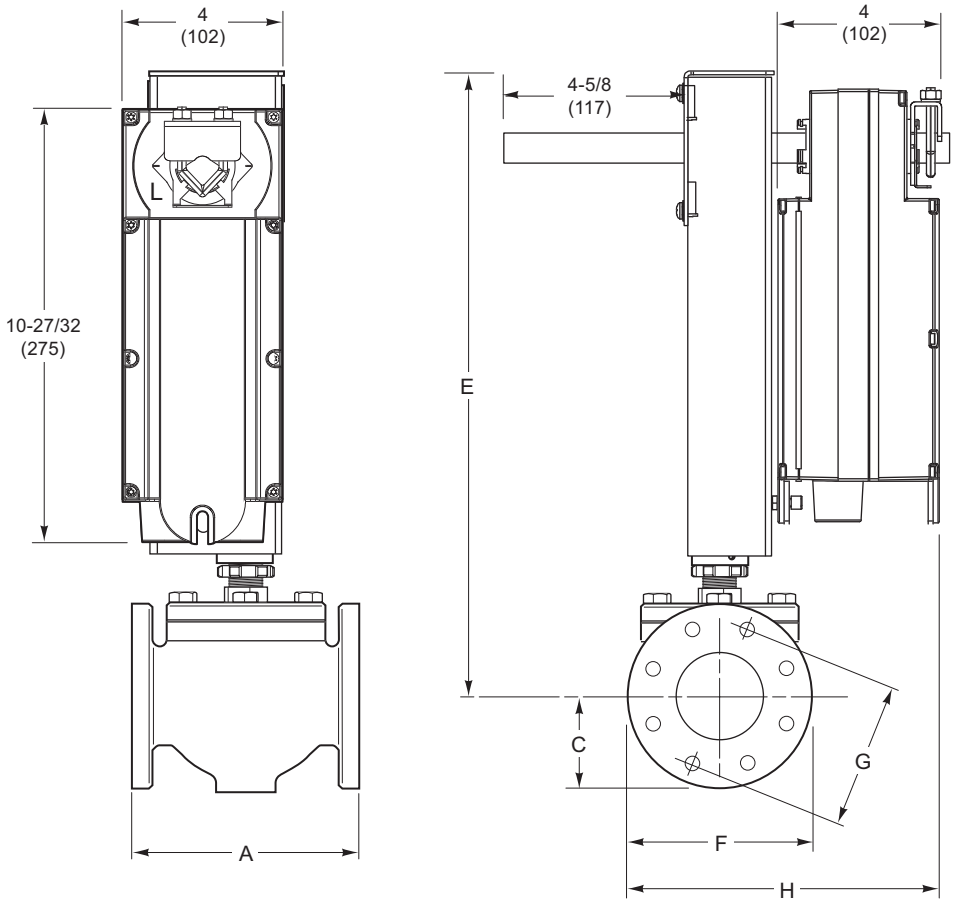


Figure-19 Mx41-6343-2xx with Flanged 2-Way Globe Valve With AV-609-1 Linkage.

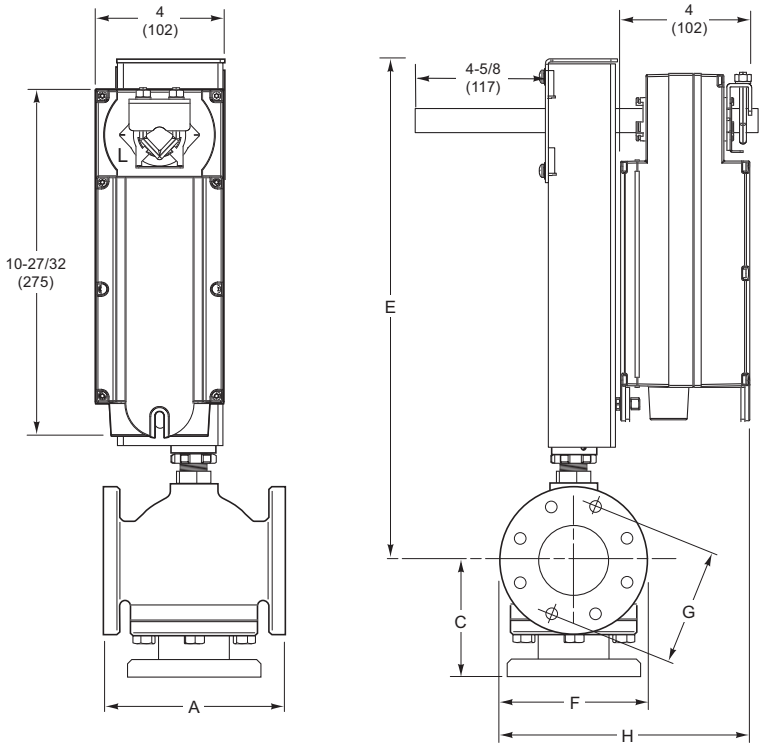


Figure-20 Mx41-6343-2xx with Flanged 3-Way Globe Valve With AV-609-1 Linkage.

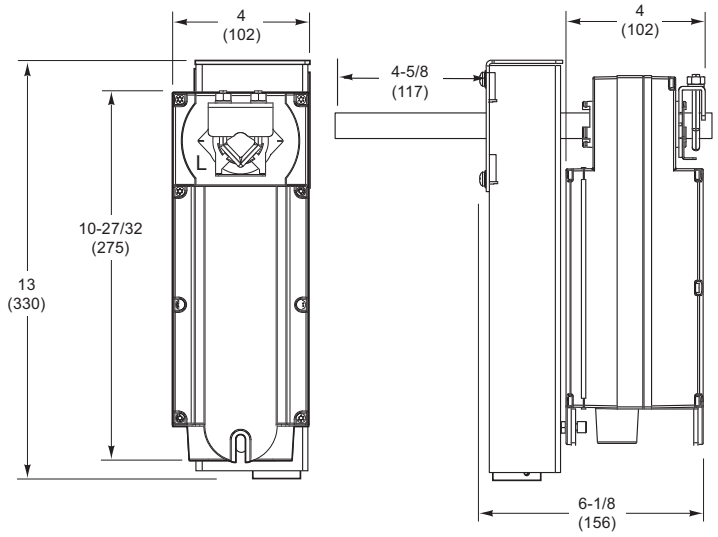


Figure-21 Mx41-6343-230 Actuator/Linkage Assembly With AV-609-1 Linkage.

Valve Assemblies with Mx40-704x SmartX Spring Return Actuators

SmartX Actuator Specifications

Inputs

Control Signal

MA40-704x—ON/OFF SPST control contacts or Triacs (500 mA rated)
MS40-7043—Proportional, 2 to 10Vdc or 4 to 20 mAdc with 500 Ω resistor.
MS40-7043 MP/MP5—Proportional 6 to 9 Vdc.
MF40-7043—Floating point control, 24 Vac.

Power Requirements

All 24 Vac circuits are Class 2.

Part Number	Voltage 50/60 Hz	Running				Holding	
		50 Hz		60 Hz		50 Hz	60 Hz
		VA	W	VA	W	W	W
MA40-7043	24 Vac ± 20%	4.4	2.9	4.4	2.9	0.8	0.8
MS40-7043	24 Vac ± 20%	5.6	4.2	5.6	4.2	2.4	2.4
MF40-7043	24 Vac ± 20%	5.9	4.4	5.9	4.4	2.9	2.9
MS40-7043-MP	24 Vac ± 20%	6.9	5.0	6.6	5.0	3.2	3.2
MS40-7043-MP5	24 Vac ± 20%						
MA40-7040	120 Vac ± 10%	6.4	3.8	4.3	3.4	1.6	1.2
MA40-7041	230 Vac ± 10%	5.8	4.1	4.6	3.9	1.5	1.2

Connections

MA40-704x and MA40-704x-501—3 ft. (0.9 m) long, appliance cables, 1/2" conduit connector. For M20 Metric conduit, use AM-756 adaptor.
MF40-7043 and MF40-7043-501, MS40-7043 and MS40-7043-501—3 ft. (0.9 m) long, plenum rated cables, 1/2" conduit connector. For M20 Metric conduit, use AM-756 adaptor.

Motor Type

MA40-704x — Brush.
MF40-7043, MS40-7043 — Brushless DC.

Outputs

Electrical

Auxiliary Switches: One auxiliary switch available with Mx40-7043-501 and MS40-7043-MP5, SPDT 6A resistive @ 24 Vac, adjustable 0 to 95° (0 to 1 scale). Switch meets VDE requirements for 6 (1.5)A, 24Vac.

One auxiliary switch available with MA40-7040-501 or MA40-7041-501, SPDT 6A resistive @ 250 Vac, adjustable 0 to 95° (0 to 1 scale). Switch meets VDE requirements for 6 (1.5)A, 250 Vac.

Position Feedback Voltage "AO": 2 to 10 Vdc (maximum 0.7 mA) output signal for position feedback or operation of up to four slave actuators.

Control Mode: Switch provided for selection of direct acting or reverse acting control mode on proportional models.

Timing: MA-704x - Approx. 50 sec.
MF- and MS-7043 - Approx. 130 sec.

Auxiliary Power Supply: MS40-7043-MP and MS40-7043-MP5—+20 Vdc @ 25 mA (max.)

Mechanical

Stroke: Angle of rotation is limited to a maximum of 95°, with mechanical stop.

Output torque rating: Mx40-704x—35 lb-in (4 N-m)

Position indicator: Visual indicator with a scale numbered from 0 to 90°, provided for position indication.

Environment

Temperature Limits

Shipping and storage: -40 to 160 °F (-40 to 71 °C) ambient.

Operating: Minimum allowable valve fluid temperature: 20 °F (-7 °C).
Maximum allowable ambient: 115 °F (46 °C) maximum ambient at maximum valve fluid temperature.

Humidity

5 to 95% RH, non-condensing.

Locations

NEMA Type 2 (IEC IP54)

SmartX Actuator Specifications (Continued)

Agency Listings (Actuator)

UL	UL 873, Underwriters Laboratories (File #9429 Category Temperature-Indicating and Regulating Equipment).
European Community	EMC Directive (89/336/EEC). Low Voltage Directive (72/23/EEC).
CUL	Canadian Standards C22.2 No. 24.
Australia	This product meets requirements to bear the C-Tick Mark according to the terms specified by the Communications Authority under the Radiocommunications Act 1992.

Dimensions — 1/2” to 2” Globe Valve Assemblies

Valve Assembly Part Number	Valve Size in.	Valve Dimensions in inches (millimetres)								
		2-Way (Refer to Figure-22 and Figure-24)					3-Way (Refer to Figure-23)			
		A	B	C	D	E	A	C	D	E
Union Straightway (N.C.) Vx-7221-xxx-4-P	1/2	4-3/16 (106)	2-11/16 (68)	1-3/16 (30)	1-1/8 (29)	7 (178)	—			
	3/4	4-15/16 (125)	3-3/16 (81)	1-3/16 (30)	1-1/8 (29)	7 (178)				
	1	6 (152)	3-5/8 (92)	1-3/4 (44)	1-3/16 (30)	7-1/16 (179)				
	1-1/4	6-1/4 (159)	3-15/16 (100)	1-3/4 (44)	1-7/16 (37)	7-5/16 (186)				
Union Straightway (N.O.) Vx-7211-xxx-4-P	1/2	4-3/16 (106)	2-7/16 (62)	1-3/16 (30)	1-1/8 (29)	7 (178)	—			
	3/4	4-15/16 (125)	2-13/16 (72)	1-1/16 (27)	1-1/8 (29)	7 (178)				
	1	6 (152)	3-1/8 (79)	1-3/16 (30)	1-13/16 (46)	7-11/16 (195)				
	1-1/4	6-1/4 (159)	3-5/16 (84)	1-3/8 (35)	1-13/16 (46)	7-11/16 (195)				
NPT/Metric Thread 2-Way (N.C.) Vx-7223-xxx-4-P Vx-7225-xxx-4-P 3-Way Vx-73xx-xxx-4-P	1/2	3-1/16 (78)	—	1-3/16 (30)	1-1/8 (29)	7 (178)	3-1/16 (78)	1-3/16 (30)	1-1/8 (29)	7 (178)
	3/4	3-5/8 (92)		1-3/16 (30)	1-1/8 (29)	7 (178)	3-5/8 (92)	1-3/16 (30)	1-1/8 (29)	7 (178)
	1	4-5/8 (118)		1-3/4 (44)	1-3/16 (30)	7-1/16 (179)	4-5/8 (117)	1-3/4 (44)	1-3/16 (30)	7-1/16 (179)
	1-1/4	4-5/8 (118)		1-3/4 (44)	1-7/16 (37)	7-5/16 (186)	4-5/8 (117)	1-3/4 (44)	1-7/16 (37)	7-5/16 (186)
	1-1/2	5-3/8 (137)		1-13/16 (46)	1-9/16 (40)	7-7/16 (189)	5-3/8 (137)	1-13/16 (46)	1-9/16 (40)	7-7/16 (189)
	2	6-1/8 (156)		2-1/4 (57)	2-1/4 (57)	8-1/8 (206)	6-1/8 (156)	2-1/4 (57)	2-1/4 (57)	8-1/8 (206)
NPT/Metric Thread 2-Way (N.O.) Vx-7213-xxx-4-P Vx-7215-xxx-4-P	1/2	3-1/16 (78)	—	1-3/16 (30)	1-1/8 (29)	7 (178)	—			
	3/4	3-5/8 (92)		1-1/16 (27)	1-1/8 (29)	7 (178)				
	1	4-5/8 (118)		1-3/16 (30)	1-13/16 (46)	7-11/16 (195)				
	1-1/4	4-5/8 (118)		1-3/8 (35)	1-13/16 (46)	7-11/16 (195)				
	1-1/2	5-3/8 (137)		1-1/2 (38)	1-7/8 (48)	7-3/4 (197)				
	2	6-1/8 (156)		1-9/16 (40)	2-1/8 (54)	8 (203)				

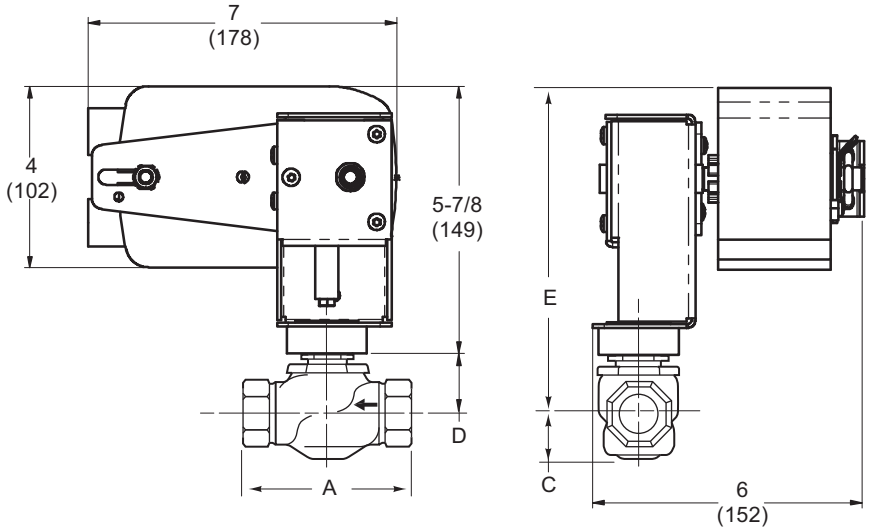


Figure-22 Mx40-704x-2xx with 1/2” to 2” 2-Way Globe Valve With AV-611 Linkage.

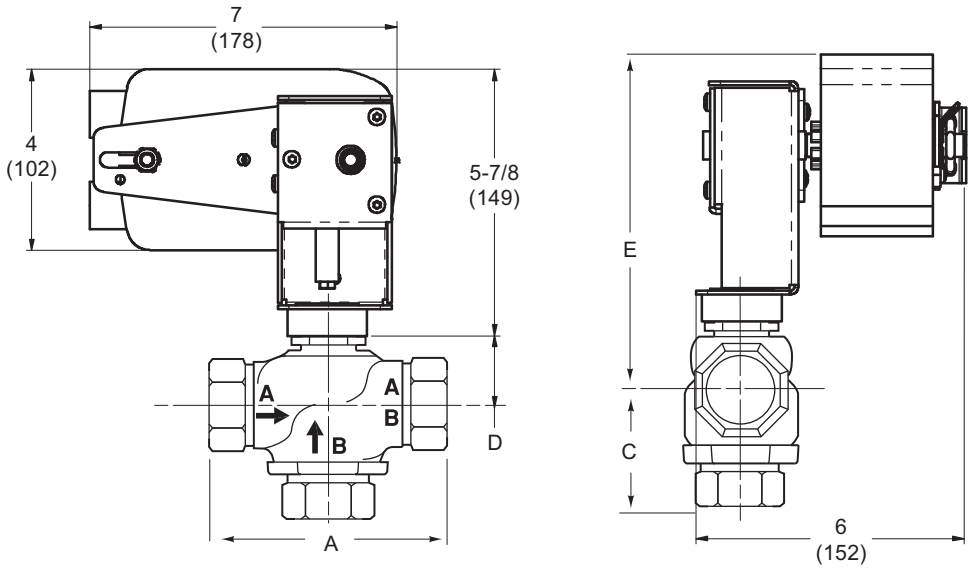


Figure-23 Mx40-704x-2xx with 1/2” to 2” 3-Way Globe Valve With AV-611 Linkage.

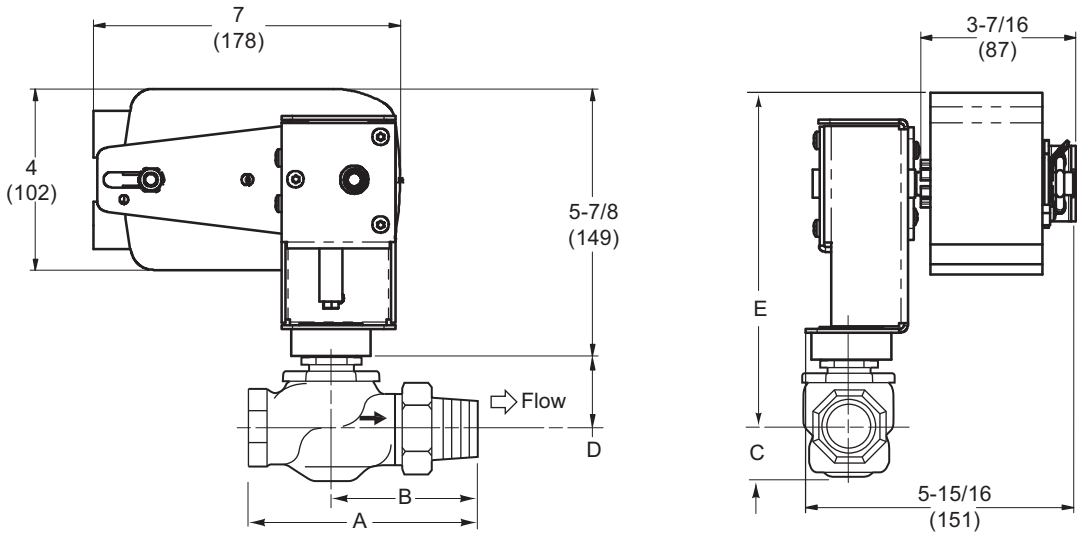


Figure-24 Mx40-704x-2xx with 1/2” to 1-1/4” Union Straightway Globe Valve With AV-611 Linkage.

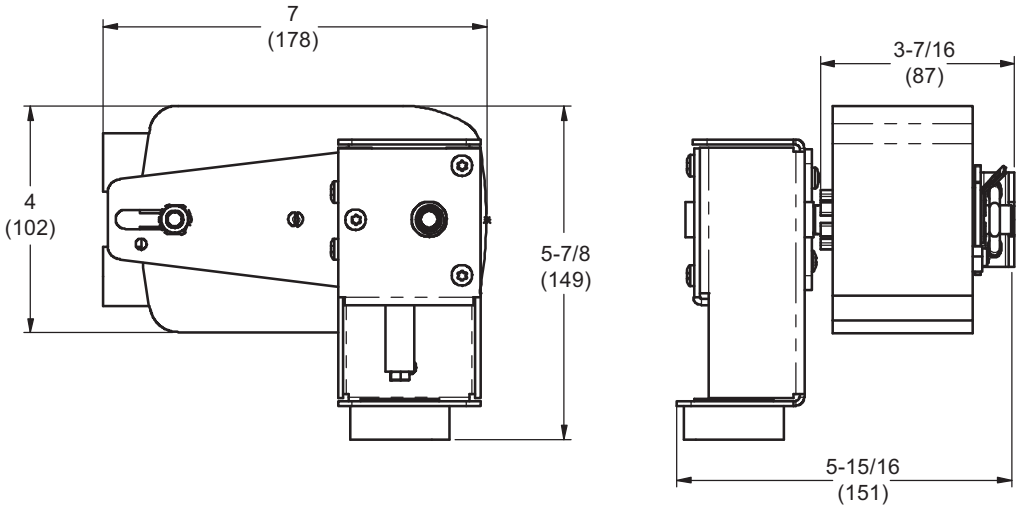


Figure-25 Mx40-704x-2xx Linked Actuator Assembly With AV-611 Linkage.

Valve Assemblies with Mx41-707x and Mx41-715x SmartX Spring Return Actuators

SmartX Actuator Specifications

Inputs

Control Signal

MA41-707x, MA41-715x—ON/OFF SPST control contacts or Triacs (500 mA rated).

MF41-7073, MF41-7153—Floating point control, 24 Vac.

MS41-7073, MS41-7153—Proportional, 2 to 10 Vdc or 4 to 20 mAdc with 500 Ω resistor.

Power Requirements

All 24 Vac circuits are Class 2.

Part Number	Voltage 50/60 Hz	Running				Holding	
		50 Hz		60 Hz		50 Hz	60 Hz
		VA	W	VA	W	W	W
MA41-7153-xxx	24 Vac ± 20%	9.8	7.5	9.7	7.5	2.8	2.8
MS41-7153-xxx	24 Vac ± 20%	9.8	7.4	9.7	7.4	2.9	2.9
MF41-7153-xxx	24 Vac ± 20%	9.8	7.7	9.7	7.7	3.3	3.3
MA41-7150-xxx	120 Vac ± 10%	11.7	8.8	10.0	8.4	3.6	5.0
MA41-7151-xxx	230 Vac ± 10%	15.5	9.5	10.6	8.5	4.6	3.3
MA41-7073-xxx	24 Vac ± 20%	4.8	3.2	4.8	3.2	0.8	0.8
MS41-7073-xxx	24 Vac ± 20%	5.8	4.6	5.8	4.6	2.3	2.3
MF41-7073-xxx	24 Vac ± 20%	6.2	4.8	6.2	4.8	2.8	2.8
MA41-7070-xxx	120 Vac ± 10%	10.7	4.2	5.6	3.6	2.0	1.2
MA41-7071-xxx	230 Vac ± 10%	17.0	5.1	8.0	4.0	2.7	1.4

Connections

3 ft. (0.9 m) long, appliance cable, 1/2" conduit connectors. For M20 metric conduit, use AM-756 adapter.

Motor Type

MA41-707x — Brush.

MA41-715x, MF41-7073, MF41-7153, MS41-7073, MS41-7153 — Brushless DC.

Outputs

Electrical

Two auxiliary switches available with Mx41-715x-502, and Mx41-707x-502, SPDT 7A resistive @ 250 Vac, one fixed @ 5° and one adjustable 25 to 85°. Switches meet VDE requirements for 7 (2.5)A, 250 Vac.

Position Feedback Voltage "AO": 2 to 10 Vdc (maximum 0.5 mA) output signal for position feedback or operation of up to four slave actuators.

Control Mode: Switch provided for selection of direct acting or reverse acting control mode on proportional models.

Timing: MA41-707x - Approx. 80 sec.
MF41 and MS41-7073 - Approx. 195 sec.
Mx41-715x - Approx. 190 sec.

Mechanical

Stroke: Angle of rotation is limited to a maximum of 95°, with mechanical stop.

Output torque rating: Mx41-707x—60 lb-in (7 N-m).
Mx41-715x—133 lb in (15 N-m).

Position indicator: Visual indicator with a scale numbered from 0 to 90°, provided for position indication.

Manual override: Rotation is adjustable from -5o to 85o by using manual override crank.

Environment

Temperature Limits

Shipping and storage: -40 to 160 °F (-40 to 71 °C) ambient.

Operating: Minimum allowable valve fluid temperature: 20 °F (-7 °C).
Maximum allowable ambient: 115 °F (46 °C) maximum ambient at maximum valve fluid temperature.

Humidity

5 to 95% RH, non-condensing.

Locations

NEMA 2 (IEC IP54) with conduit connector in the down position.

SmartX Actuator Specifications (Continued)

Agency Listings (Actuator)

UL	UL 873, Underwriters Laboratories (File #9429 Category Temperature-Indicating and Regulating Equipment).
European Community	EMC Directive (89/336/EEC). Low Voltage Directive (72/23/EEC).
CUL	Canadian Standards C22.2 No. 24.
Australia	This product meets requirements to bear the C-Tick Mark according to the terms specified by the Communications Authority under the Radiocommunications Act 1992.

Dimensions — 1/2” to 2” Globe Valve Assemblies

Valve Assembly Part Number	Valve Size in.	Valve Dimensions in inches (millimetres)								
		2-Way (Refer to Figure-26 and Figure-28)					3-Way (Refer to Figure-27)			
		A	B	C	D	E	A	C	D	E
Union Straightway (N.C.) Vx-7221-xxx-4-P	1	6 (152)	3-5/8 (92)	1-3/4 (44)	1-3/16 (30)	12-13/16 (325)	—			
	1-1/4	6-1/4 (159)	3-15/16 (100)	1-3/4 (44)	1-7/16 (37)	13-1/16 (332)				
Union Straightway (N.O.) Vx-7211-xxx-4-P	1	6 (152)	3-1/8 (79)	1-3/16 (30)	1-13/16 (46)	13-7/16 (341)	—			
	1-1/4	6-1/4 (159)	3-5/16 (84)	1-3/8 (35)	1-13/16 (46)	13-7/16 (341)				
NPT/Metric Thread 2-Way (N.C.) Vx-7223-xxx-4-P Vx-7225-xxx-4-P 3-Way Vx-73xx-xxx-4-P	1	4-5/8 (118)	—	1-3/4 (44)	1-3/16 (30)	12-13/16 (325)	4-5/8 (118)	1-3/4 (44)	1-3/16 (30)	12-13/16 (325)
	1-1/4	4-5/8 (118)		1-3/4 (44)	1-7/16 (37)	13-1/16 (332)	4-5/8 (118)	1-3/4 (44)	1-7/16 (37)	13-1/16 (332)
	1-1/2	5-3/8 (137)		1-13/16 (46)	1-9/16 (40)	13-3/16 (335)	5-3/8 (137)	1-13/16 (46)	1-9/16 (40)	13-3/16 (335)
	2	6-1/8 (156)		2-1/4 (57)	2-1/4 (57)	13-7/8 (352)	6-1/8 (156)	2-1/4 (57)	2-1/4 (57)	13-7/8 (352)
NPT/Metric Thread 2-Way (N.O.) Vx-7213-xxx-4-P Vx-7215-xxx-4-P	1	4-5/8 (118)	—	1-3/16 (30)	1-13/16 (46)	13-7/16 (341)	—			
	1-1/4	4-5/8 (118)		1-3/8 (35)	1-13/16 (46)	13-7/16 (341)				
	1-1/2	5-3/8 (137)		1-1/2 (38)	1-7/8 (48)	13-1/2 (343)				
	2	6-1/8 (156)		1-9/16 (40)	2-1/8 (54)	13-3/4 (349)				

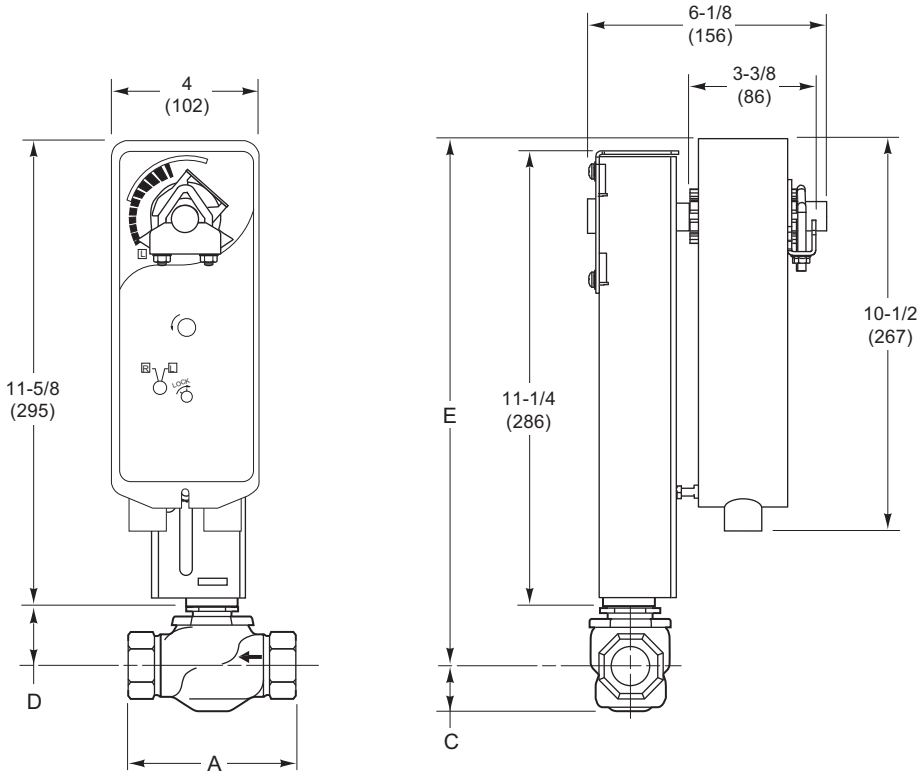


Figure-26 Mx41-715x-2xx or Mx41-707x-2xx with 1” to 2” 2-Way Globe Valve With AV-602 Linkage.

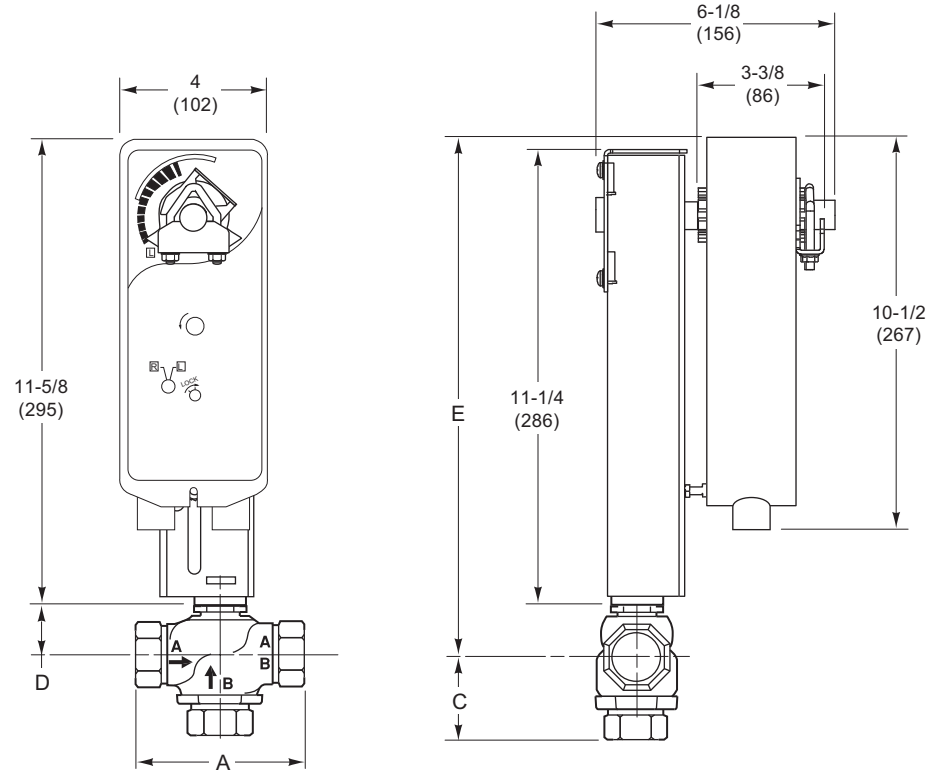


Figure-27 Mx41-715x-2xx or Mx41-707x-2xx with 1” to 2” 3-Way Globe Valve With AV-602 Linkage.

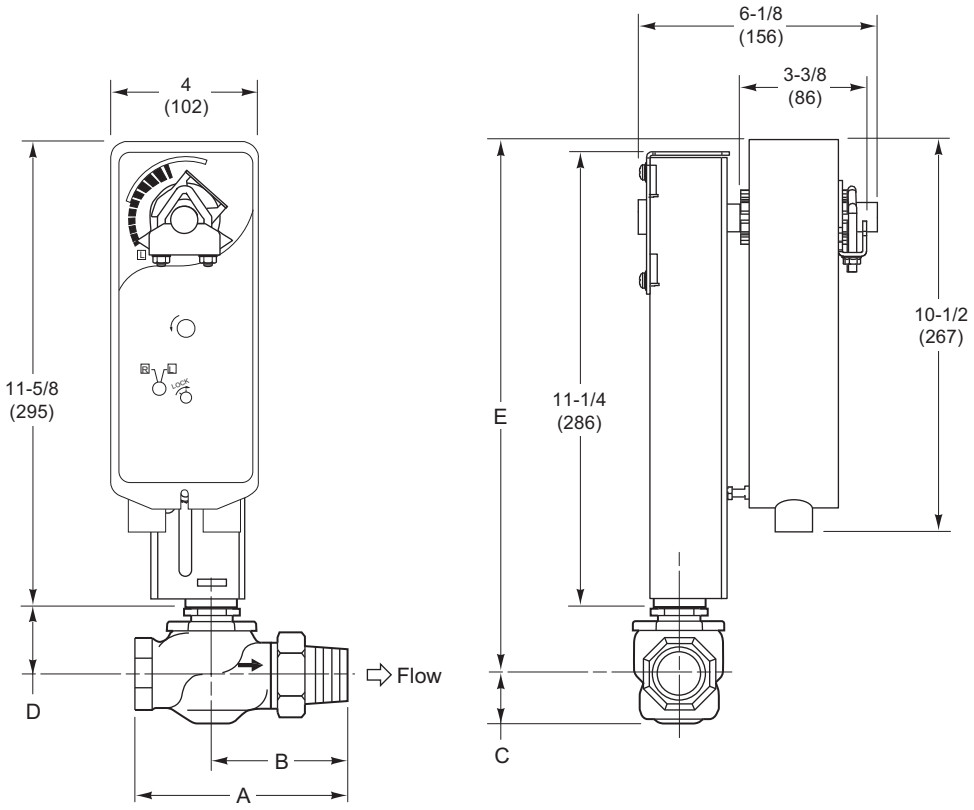


Figure-28 Mx41-715x-2xx or Mx41-707x-2xx with 1” or 1-1/4” Union Straightway Globe Valve With AV-602 Linkage.

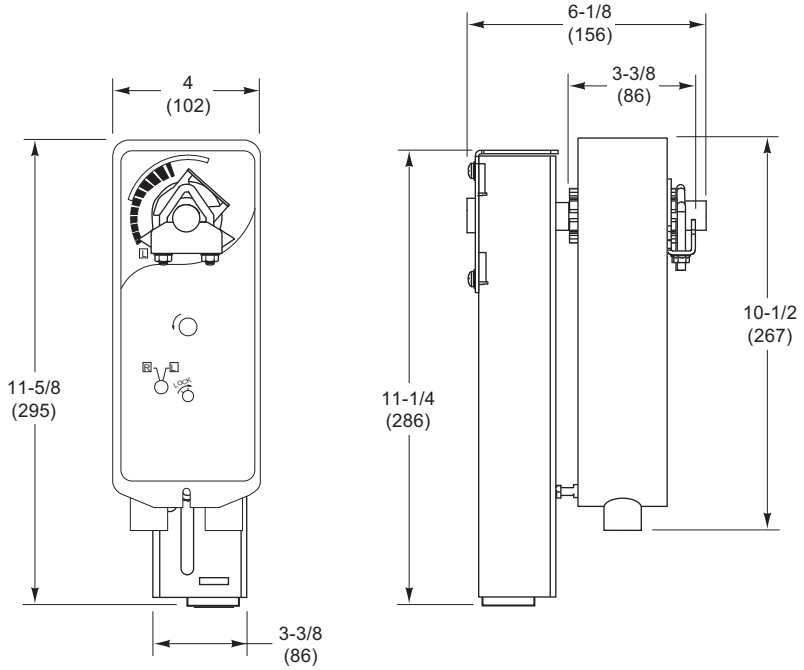


Figure-29 Mx41-715x-2xx or Mx41-707x-2xx Linked Actuator Assembly With AV-602 Linkage.

Dimensions — 2-1/2” and 3” Screwed Globe Valve Assemblies

Valve Assembly Part Number		Valve Size in.	Valve Dimensions in inches (millimetres)							
			2-Way (Refer to Figure-30)				3-Way (Refer to Figure-31)			
			A	C	E	H	A	C	E	H
NPT/Metric Thread		2-1/2	8-1/2 (216)	3-13/16 (97)	17-1/8 (435)	7-1/4 (184)	8-1/2 (216)	4-5/8 (117)	17-1/8 (435)	7-1/4 (184)
2-Way (N.O.) **Vx-9213-xxx-4-P** **Vx-9215-xxx-4-P** **2-Way (N.C.)** **Vx-9223-xxx-4-P** **Vx-9225-xxx-4-P**	**3-Way** **Vx-9313-xxx-4-P** **Vx-9315-xxx-4-P**	3	9-1/2 (241)	4-1/4 (108)	17-5/8 (448)	7-1/2 (191)	9-1/2 (241)	5 (127)	17-5/8 (448)	7-1/2 (191)

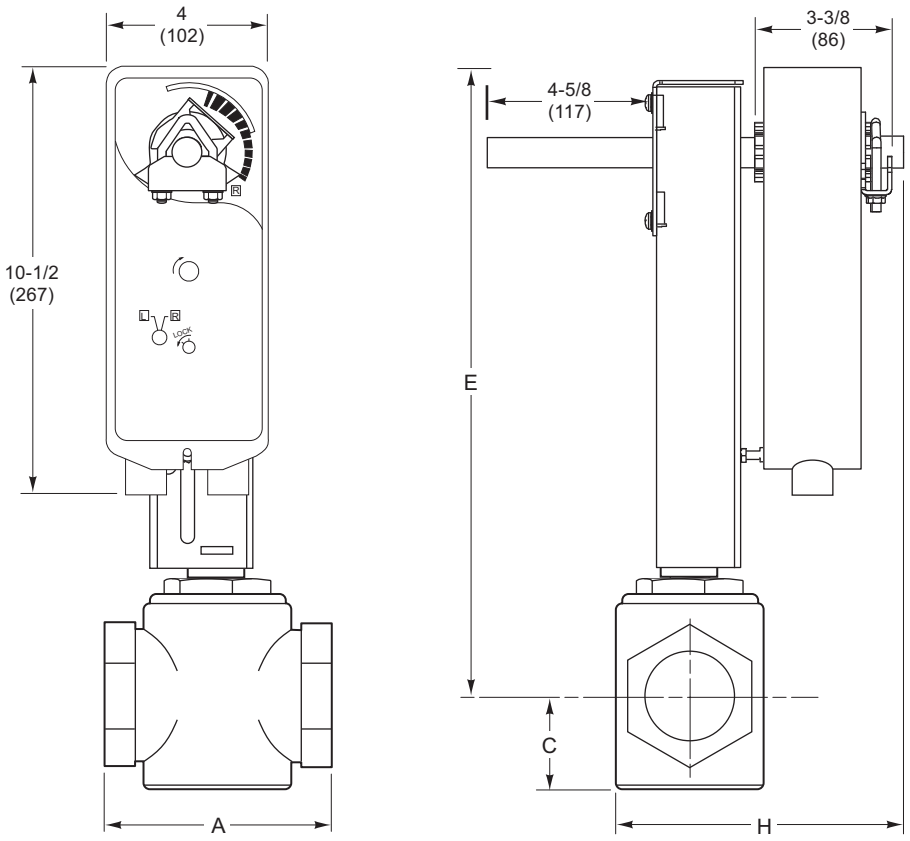


Figure-30 Mx41-715x-2xx or Mx41-707x-2xx with 2-1/2” or 3” 2-Way Screwed Globe Valve With AV-607-1 Linkage.

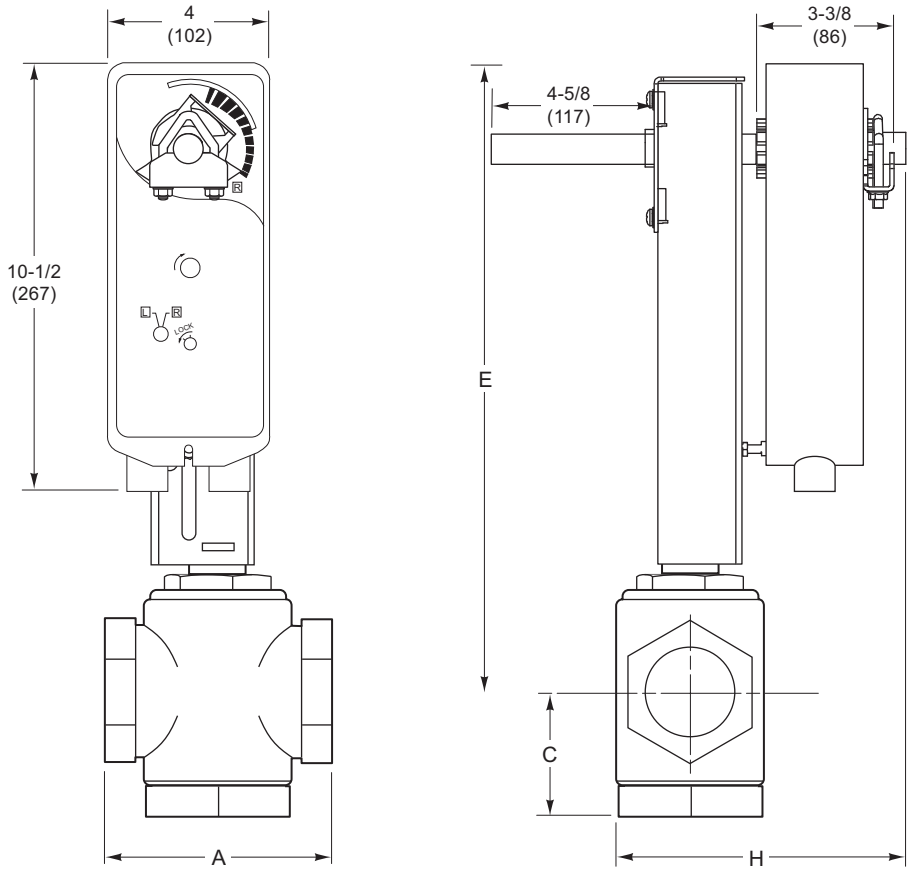


Figure-31 Mx41-715x-2xx or Mx41-707x-2xx with 2-1/2” or 3” 3-Way Screwed Globe Valve With AV-607-1 Linkage.

Dimensions — 2-1/2” to 6” Flanged Globe Valve Assemblies

Valve Assembly Part Number	Valve Size in.	Valve Dimensions in inches (millimetres)											
		2-Way (Refer to Figure-32)						3-Way (Refer to Figure-33)					
		A	C	E	F	G	H	A	C	E	F	G	H
ASA Flanged 2-Way (N.O.) Vx-9213-xxx-5-P 3-Way Vx-9313-xxx-5-P	2-1/2	8-1/2 (216)	3-1/2 (89)	16-1/2 (419)	7 (178)	5-1/2 (140)	8-3/8 (213)	8-1/2 (216)	5-3/8 (136)	17-5/8 (448)	7 (178)	5-1/2 (140)	8-3/8 (213)
	3	9-1/2 (241)	3-3/4 (95)	17-5/8 (448)	7-1/2 (190)	6 (152)	8-3/4 (222)	9-1/2 (241)	6-3/8 (162)	17-1/2 (444)	7-1/2 (190)	6 (152)	8-3/4 (222)
	4	11-1/2 (292)	4-1/2 (114)	18-1/2 (470)	9 (229)	7-1/2 (190)	9-3/8 (238)	11-1/2 (292)	8-1/2 (276)	18-5/8 (473)	9 (229)	7-1/2 (190)	9-3/8 (238)
	5[a]	13 (330)	6-3/4 (171)	19-5/8 (498)	10 (254)	8-1/2 (216)	9-5/8 (244)	13 (330)	8-3/4 (222)	19-1/2 (445)	10 (254)	8-1/2 (216)	9-5/8 (244)
	6[a]	14 (356)	7-3/8 (187)	20-1/2 (521)	11 (280)	9-1/2 (241)	10-1/8 (257)	14 (356)	9-3/4 (248)	20-1/4 (514)	11 (280)	9-1/2 (241)	10-1/8 (257)
ASA Flanged 2-Way (N.C.) Vx-9223-xxx-5-P	2-1/2	8-1/2 (216)	4 (107)	17-5/8 (448)	7 (178)	5-1/2 (140)	8-3/8 (213)	—					
	3	9-1/2 (241)	5 (127)	17-1/2 (444)	7-1/2 (190)	6 (152)	8-3/4 (222)						
	4	11-1/2 (292)	7-1/8 (181)	18-5/8 (473)	9 (229)	7-1/2 (190)	9-3/8 (238)						

[a] Mx41-707x actuators are not used with 5” and 6” valves.

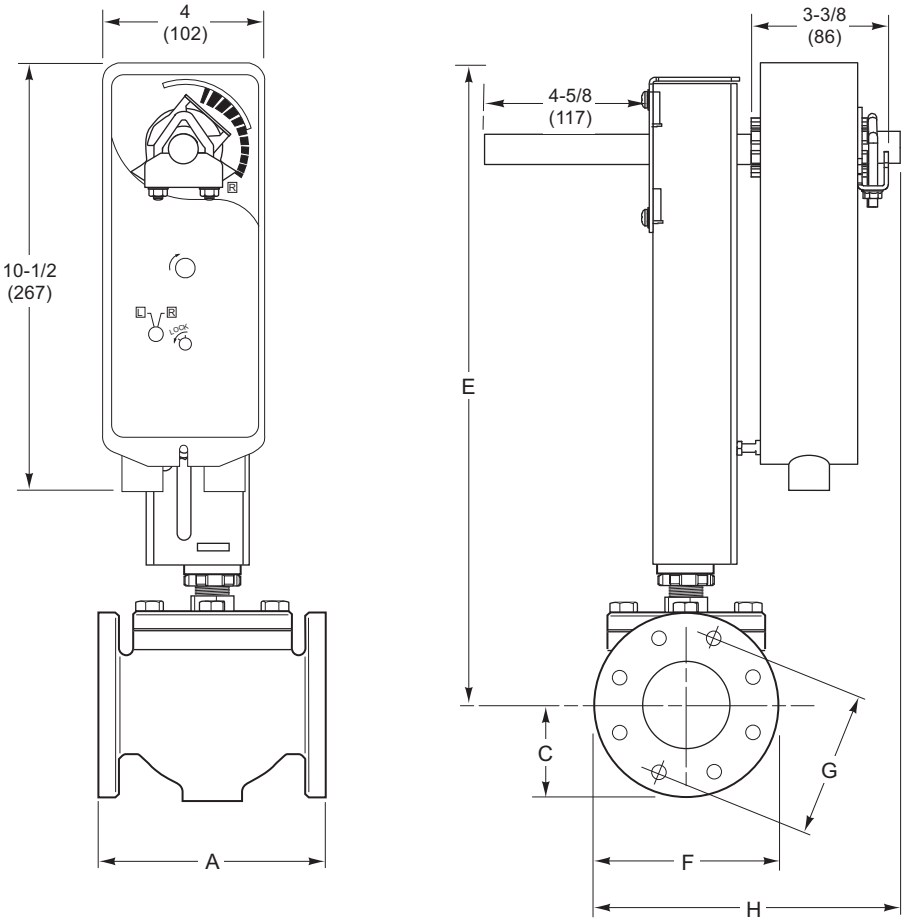


Figure-32 Mx41-715x-2xx or Mx41-707x-2xx with 2-1/2” to 4” 2-Way Flanged Globe Valve with AV-607-1 Linkage.

Mx40-715X-230 with 5" and 6" 2 way flanged Globe Valve with AV-609-1 linkage

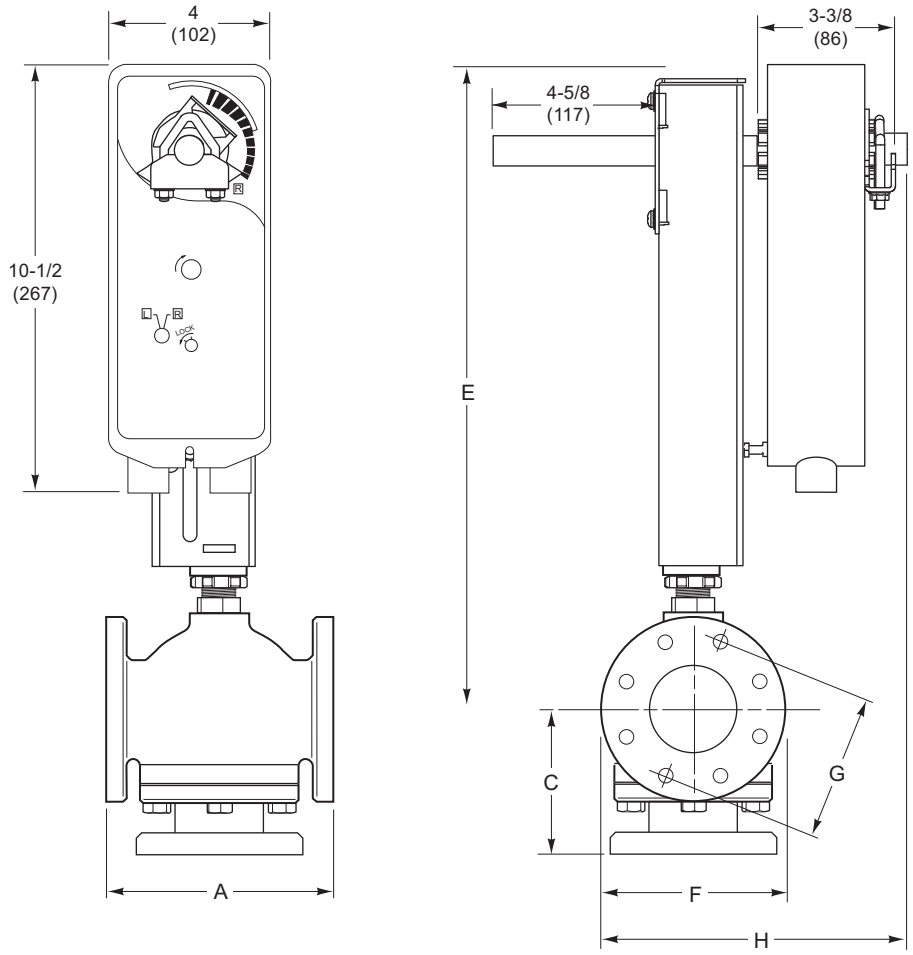


Figure-33 Mx41-715x-2xx or Mx41-707x-2xx with 2-1/2” to 4” 3-Way Flanged Globe Valve With AV-607-1 Linkage.

Mx40-715X-230 with 5" and 6" 3 way flanged Globe Valve with AV-609-1 linkage

Valve Assemblies with Mx40-717x Series SmartX Spring Return Actuators

SmartX Actuator Specifications

Inputs

Control Signal

MA40-717x—Two wire, SPST or Triacs.

MF40-7173—SPDT floating control output, Triacs (500 mA rated), or 2 SPST contacts.

MS40-717x—Proportional, 2 to 10 Vdc or 4 to 20 mAdc with the addition of a 500-ohm resistor (not included).

Power Requirements

All 24 Vac and 22-30 Vdc circuits are Class 2.

Part Numbers	Power Input @ 50/60 Hz			
	Voltage	Running VA	Holding VA	Watts
MA40-7173	24 Vac ±20%	7.4	5.1	5.3
	22-30 Vdc	5.0	3.0	5.0
MS40-7173	24 Vac ±20%	7.8	4.7	5.5
	22-30 Vdc	5.6	2.5	5.0
MF40-7173	24 Vac ±20%	8.1	5.3	5.8
	22-30 Vdc	5.7	3.6	5.7
MA40-7170	120 Vac ±10%	8.4	6.6	6.2
MS40-7170	120 Vac ±10%	8.5	5.2	6.4
MA40-7171	240 Vac ±10%	9.8	8.5	6.5
MS40-7171	240 Vac ±10%	10.8	9.0	7.2

Impedance

2 to 10 Vdc, 121 KΩ. 4 to 20 mAdc, 500 Ω (user supplied). (MS40-717x models only)

Connections

Class 1 Power: 2 ft. (61 cm) long appliance cable, 1/2" conduit connector.

Class 2 Power & Control: 36" (91 cm) long appliance cable

Motor Type

Brushless DC.

Outputs

Electrical

Stroke: Rotation is electronically limited to a maximum of 92° ± 1°(MS). MF & MA are mechanically limited to 101° ±1°.

Output torque rating:

Mx40-717x—150 lb-in (17 N-m).

Timing: Approx. 147 sec. for MS models; 162 sec. for MF and MA models.

Mechanical

Position indicator: Pointer and scale are provided from 0 to 95°, provided for position indication.

Direction of rotation: Cw or ccw rotation is available through reverse mounting.

Environment

Temperature Limits

Shipping and storage: -40 to 160 °F (-40 to 71 °C) ambient.

Operating: Minimum allowable valve fluid temperature: 20 °F (-7 °C). Maximum allowable ambient: 133 °F (56 °C) maximum ambient at maximum valve fluid temperature.

Humidity

5 to 95% RH, non-condensing.

Locations

NEMA 1 (IEC IP10), NEMA 4 (IEC IP56) with customer supplied water tight conduit connectors.

Agency Listings (Actuator)

UL

UL 873, Underwriters Laboratories (File #9429 Category Temperature-Indicating and Regulating Equipment).

European Community

EMC Directive (2004/108/EC). Low Voltage Directive (72/23/EEC).

CUL

Canadian Standards C22.2 No. 24-93.

SmartX Actuator Specifications (Continued)

Australia	This product meets requirements to bear the C-Tick Mark according to the terms specified by the Communications Authority under the Radiocommunications Act 1992.

Dimensions — 1/2” to 2” Globe Valve Assemblies

Valve Assembly Part Number	Valve Size in.	Valve Dimensions in inches (millimetres)							
		2-Way (Refer to Figure-34)				3-Way (Refer to Figure-35)			
		A	C	D	E	A	C	D	E
NPT NC Vx-722x/Vx-73x3	1/2”	3-1/16 (78)	1-3/16 (30)	1-1/8 (29)	12-3/8 (314)	3-1/16 (78)	1-3/16 (30)	1-1/8 (29)	12-3/8 (314)
	3/4”	3-5/8 (92)	1-3/16 (30)	1-1/8 (29)	12-3/8 (314)	3-5/8 (92)	1-3/16 (30)	1-1/8 (29)	12-3/8 (314)
	1”	4-5/8 (117)	1-3/4 (44)	1-3/16 (30)	12-7/16 (316)	4-5/8 (117)	1-3/4 (44)	1-3/16 (30)	12-7/16 (316)
	1-1/4”	4-5/8 (117)	1-3/4 (44)	1-7/16 (37)	12-11/16 (322)	4-5/8 (117)	1-3/4 (44)	1-7/16 (37)	12-11/16 (322)
	1-1/2	5-3/8 (137)	1-13/16 (46)	1-9/16 (40)	12-13/16 (325)	5-3/8 (137)	1-13/16 (46)	1-9/16 (40)	12-13/16 (325)
	2	6-1/8 (156)	2-1/4 (57)	2-1/4 (57)	13-1/2 (343)	6-1/8 (156)	2-1/4 (57)	2-1/4 (57)	13-1/2 (343)
NPT NO Vx-7213	1/2”	3-1/16 (78)	1-3/16 (30)	1-1/8 (29)	12-3/8 (314)				
	3/4”	3-5/8 (92)	1-1/16 (27)	1-1/8 (29)	12-3/8 (314)				
	1”	4-5/8 (117)	1-3/16 (30)	1-13/16 (46)	12-7/16 (316)				
	1-1/4”	4-5/8 (117)	1-3/8 (35)	1-13/16 (46)	13-1/16 (346)				
	1-1/2	5-3/8 (137)	1-1/2 (38)	1-7/8 (48)	13-1/8 (333)	—			
	2	6-1/8 (156)	1-9/16 (40)	2-1/8 (54)	13-3/8 (340)				

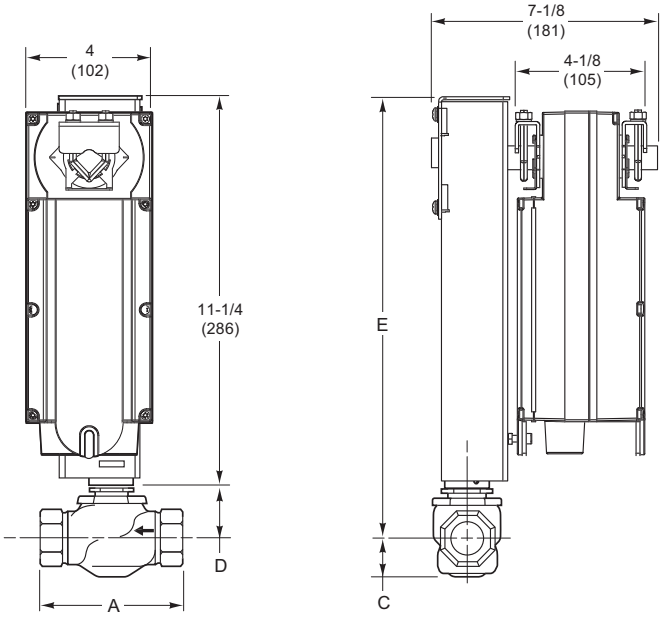


Figure-34 Mx40-717x with 1-1/2” or 2” 2-Way Globe Valve With AV-602 Linkage.

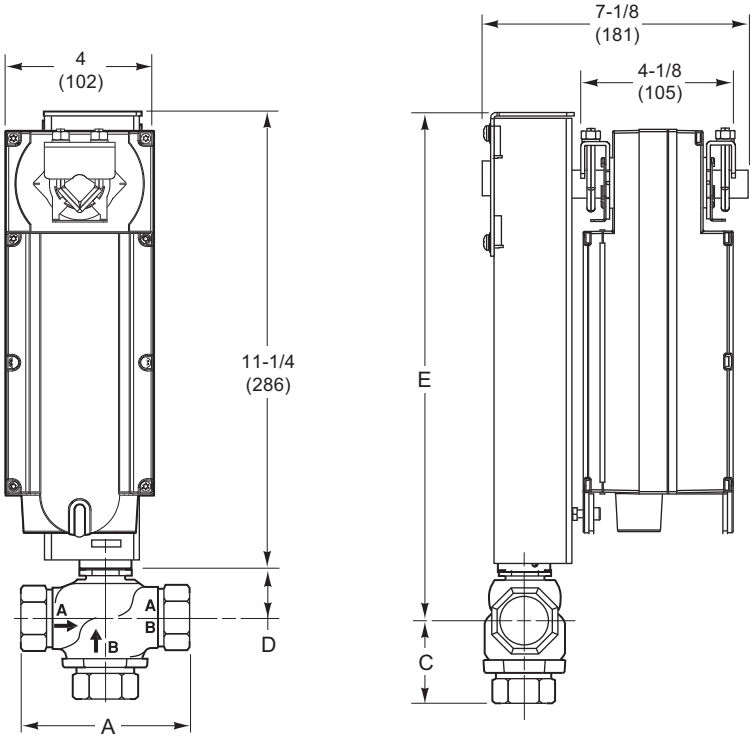


Figure-35 Mx40-717x with 1/2” or 2” 3-Way Globe Valve With AV-602 Linkage.

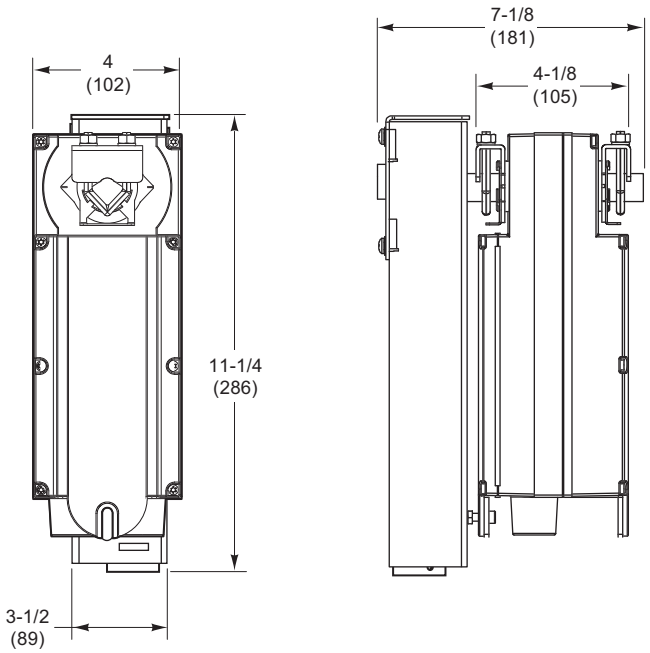


Figure-36 Mx40-717x with Linked Actuator Assembly With AV-602 Linkage.

Dimensions — 2-1/2” and 3” Screwed Globe Valve Assemblies

Valve Assembly Part Number	Valve Size in.	Valve Dimensions in inches (millimetres)							
		2-Way (Refer to Figure-37)				3-Way (Refer to Figure-38)			
		A	C	E	H	A	C	E	H
NPT/Metric Thread									
2-Way (N.O.) Vx-9213-xxx-4-P Vx-9215-xxx-4-P 3-Way Vx-9313-xxx-4-P Vx-9315-xxx-4-P / **2-Way (N.C.) Vx-9223-xxx-4-P Vx-9225-xxx-4-P**	2-1/2	8-1/2 (216)	3-13/16 (97)	16-3/4 (425)	7-5/8 (194)	8-1/2 (216)	4-5/8 (117)	16-3/4 (425)	7-5/8 (194)
	3	9-1/2 (241)	4-1/4 (108)	17-1/4 (438)	7-7/8 (200)	9-1/2 (241)	5 (127)	17-1/4 (438)	7-7/8 (200)

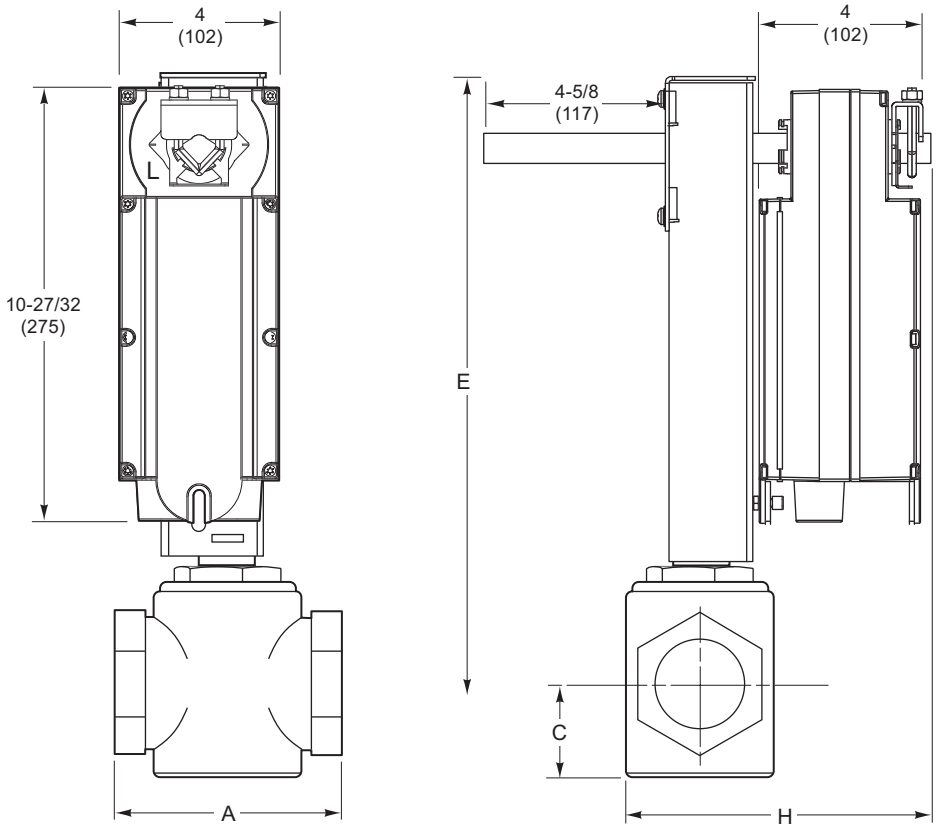


Figure-37 Mx40-717x-2xx with 2-1/2” or 3” 2-Way Screwed Globe Valve With AV-607-1 Linkage.

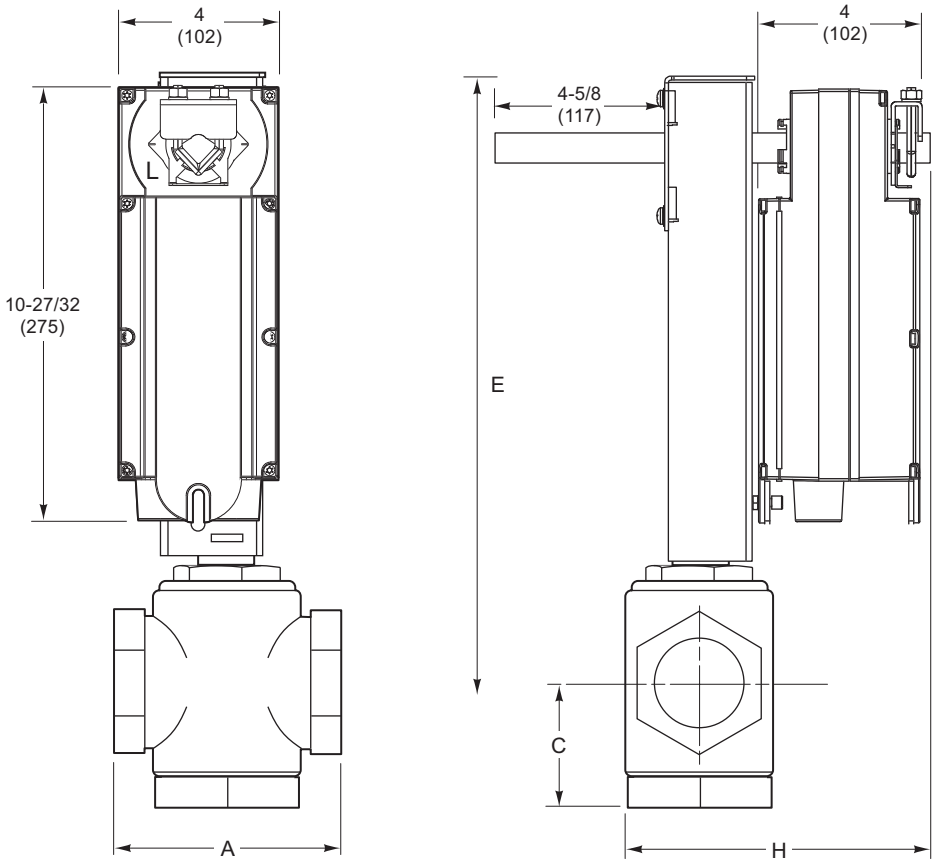


Figure-38 Mx40-717x-2xx with 2-1/2” or 3” 3-Way Screwed Globe Valve With AV-607-1 Linkage.

Dimensions — 2-1/2” to 6” Flanged Globe Valve Assemblies

Valve Assembly Part Number	Valve Size in.	Valve Dimensions in inches (millimetres)											
		2-Way (Refer to Figure-39)						3-Way (Refer to Figure-40)					
		A	C	E	F	G	H	A	C	E	F	G	H
ASA Flanged 2-Way (N.O.) Vx-9213-xxx-5-P 3-Way Vx-9313-xxx-5-P	2-1/2	8-1/2 (216)	3-1/2 (89)	16-5/8 (422)	7 (178)	5-1/2 (140)	8-3/4 (222)	8-1/2 (216)	5-3/8 (136)	17-1/4 (438)	7 (178)	5-1/2 (140)	8-3/4 (222)
	3	9-1/2 (241)	3-3/4 (95)	17-1/4 (438)	7-1/2 (190)	6 (152)	9 (229)	9-1/2 (241)	6-3/8 (162)	17 (432)	7-1/2 (190)	6 (152)	9 (229)
	4	11-1/2 (292)	4-1/2 (114)	18-1/4 (464)	9 (229)	7-1/2 (190)	9-3/4 (248)	11-1/2 (292)	8-1/2 (276)	18-1/4 (464)	9 (229)	7-1/2 (190)	9-3/4 (248)
	5	13 (330)	6-3/4 (171)	19-1/4 (489)	10 (254)	8-1/2 (216)	10-1/4 (260)	13 (330)	8-3/4 (222)	19 (485)	10 (254)	8-1/2 (216)	10-1/4 (260)
	6	14 (356)	7-3/8 (187)	20 (508)	11 (280)	9-1/2 (241)	10-3/4 (273)	14 (356)	9-3/4 (248)	19-7/8 (505)	11 (280)	9-1/2 (241)	10-3/4 (273)
ASA Flanged 2-Way (N.C.) Vx-9223-xxx-5-P	2-1/2	8-1/2 (216)	4 (107)	17-1/4 (438)	7 (178)	5-1/2 (140)	8-3/4 (222)	—					
	3	9-1/2 (241)	5 (127)	17 (432)	7-1/2 (190)	6 (152)	9 (229)						
	4	11-1/2 (292)	7-1/8 (181)	18-1/4 (464)	9 (229)	7-1/2 (190)	9-3/4 (248)						

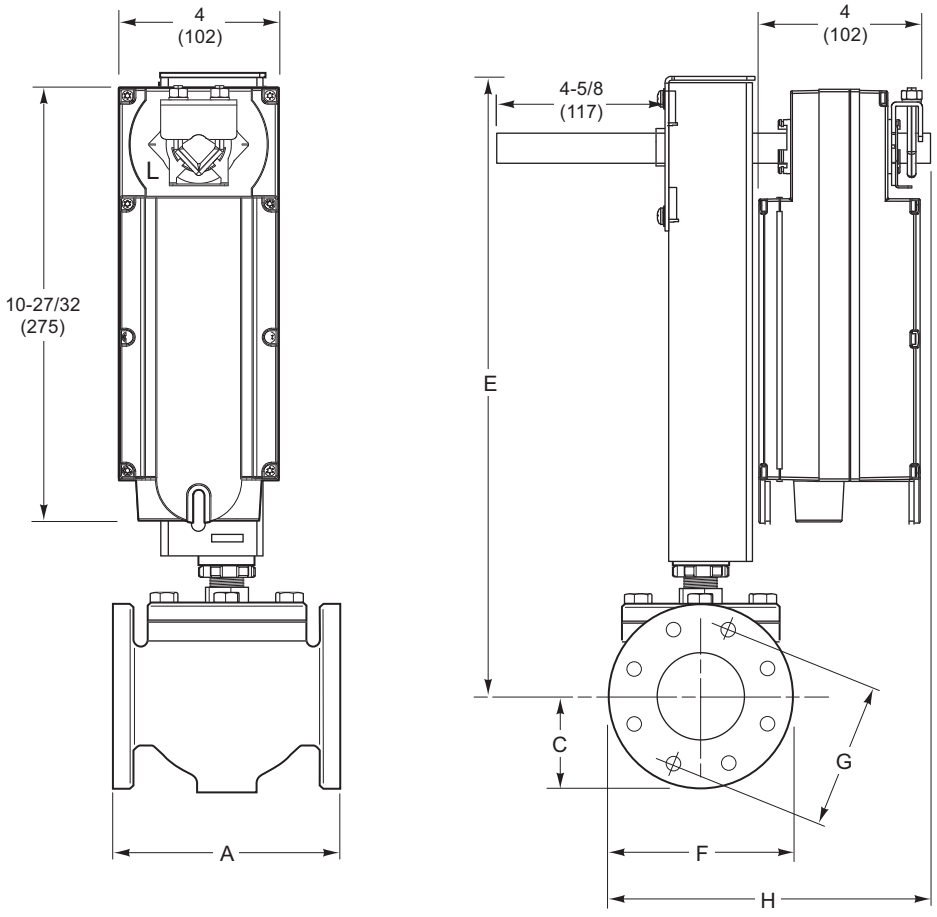


Figure-39 Mx40-717x-2xx with 2-1/2” to 4” 2-Way Flanged Globe Valve With AV-607-1 Linkage.

Mx40-717X-230 with 5" and 6" 2 way flanged Globe Valve with AV-609-1 linkage

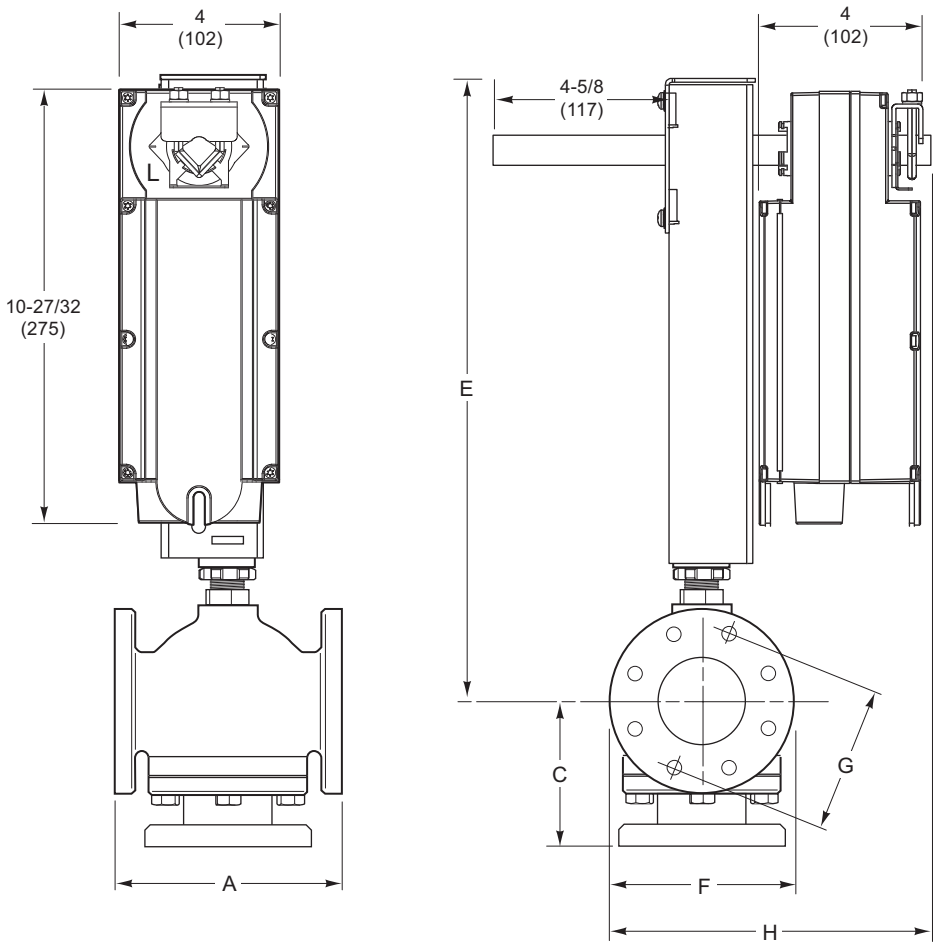


Figure-40 Mx40-717x-2xx with 2-1/2” to 4” 3-Way Flanged Globe Valve With AV-607-1 Linkage.

Mx40-717X-230 with 5" and 6" 2 way flanged Globe Valve with AV-609-1 linkage

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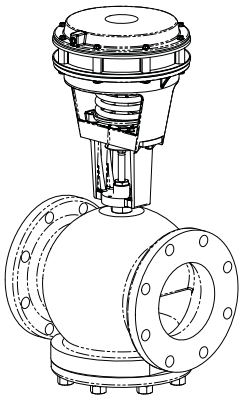
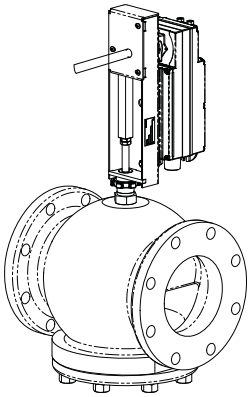
Vx-8xx3-xxx-5-x, VB-8xx3 Series

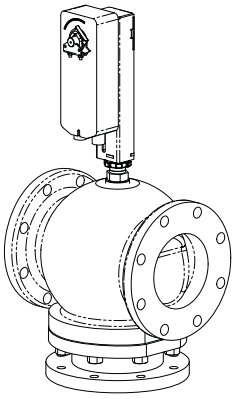
2-1/2” to 6” Flanged, Two-Way Stem Up Open/Closed, Three-Way Mixing/Diverting Pneumatic and Electric/Electronic Globe Valve Assemblies



VK-82x3 with MK-6911



Vx-82x3 with Mx4x-6343



Vx-8303 with Mx4x-7xxx

Vx-8xx3 Series Balanced Plug Valve Assemblies

Schneider Electric VA, VF, VK, VK4, VS and VU-8xx3-xxx-5-P series valve assemblies are complete actuator/valve assemblies that accept two-position, floating, and proportional electric/electronic and proportional pneumatic control signals, for control of chilled water, hot water, or low pressure steam. These valve assemblies consist of pneumatic, electric, or electronic valve actuators either direct-coupled or linked to a 2-1/2” to 6” 2-way or 3-way valve body with ASA flanged end connections.

VB-8xx3 Series Valve Bodies

VB-8xx3-0-5-P valve bodies are also available separately to allow field mounting of a variety of Forta, Schneider Electric SmartX® or pneumatic actuators using the appropriate linkage.

Features

- Balanced plug design provides high close-offs using economical actuation
- Up to 125 psi (856 kPa) close-off on 2-way models, 35 psi (240 kPa) on 3-way models
- Universal 3-way valve can be piped in either mixing or diverting configurations
- Valve sizes 2-1/2” to 6”, ASA 125 flanged
- A variety of Forta, Schneider Electric SmartX and pneumatic actuators are available, either as factory assemblies or for field assembly
- ANSI IV shutoff (0.01% of Cv) on 2-way models, ANSI III (0.1% of Cv) on 3-way models
- Self-adjusting spring loaded TFE/EPDM packing
- Normally open,normally closed, and non-spring return models available
- Expanded temperatures 20° to 281°F
- ISO 9001:2000 Certified Quality Management System

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May, 2016 tc

Applicable Literature

F-Number	Description	Audience	Purpose
F-26642	MA40-704x Series, MA4x-707x Series, MA4x-715x Series, SmartX Actuators Spring Return Two-Position General Instructions	– Sales Personnel – Application Engineers – Installers – Service Personnel – Start-up Technicians	Describes the actuators' features, specifications, wiring information and possible applications. Provides step-by-step mounting instructions.
F-26644	MF40-7043, MF4x-7073 Series and MF4x-7153 Series General Instructions		
F-26742	MA40-717x SmartX Actuators Spring Return Two-Position General Instructions		
F-27120	MAx1-720x Two Position Series, MFx1-7103 Floating Series, MSx1-7103 Proportional Series Linear SmartX Actuators General Instructions		
F-26744	MF41-6343 SmartX Actuators Non-Spring Return Floating General Instructions		
F-27599	M400 Series, M800 Series, M1500 Series Schneider Electric Forta universal input Non-Spring Return actuator General Instructions		
F-26745	MS41-6343 SmartX Actuators Non-Spring Return Proportional General Instructions		
F-26749	MF40-7173 SmartX Actuators Spring Return Floating General Instructions		
F-13895	MK-6600 Series, MK-6800 Series, and MK-6911 General Instructions		
F-26645	MS40-7043, MS41-7073, MS41-7153 SmartX Actuators Spring Return Proportional General Instructions		
F-26748	MS40-7173 SmartX Actuators Spring Return Proportional General Instructions		
F-27683	M900 Series Forta Universal Spring Return Actuator General Instructions		
F-27082	AV-607-1, AV-609-1 Linkage General Instructions		Describes the linkage's features, specifications, and possible applications. Provides step-by-step mounting instructions.
F-27193	VB-8213 Series Valve Body General Instructions		Describes the valve body's features, specifications, and possible applications. Provides step-by-step mounting instructions.
F-27194	VB-8223 Series Valve Body General Instructions		
F-27197	VB-8303 Series Valve Body General Instruction		
F-26080	EN-205 Water System Guidelines	– Sales Personnel – Application Engineers – Service Personnel	Describes Schneider Electric approved water treatment practices

Product Guide Contents

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Document Number: F-27199-8

Globe Valve Assembly Part Numbering System and Selection Procedure

To select a globe valve assembly, choose the following:

V x - 8 x x 3 - x x x - 5 - x x

Step 1

Control Signal Type

A = 2-Position (SPST)
B = Valve Body
F = Floating (SPDT)
K = Pneumatic
K4 = Pneumatic w/ Positive Positioner
S = Proportional (Vdc, mAdc)
U= Universal Floating/Vdc/mAdc input

Step 3

End Connection

3 = ASA Flanged

Step 5

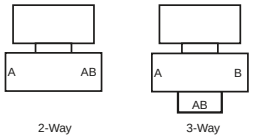
Pattern

5 = ASA Flanged

Step 2

Valve Body Configuration

821 = 2-Way Stem Up Open, Brass Trim
822 = 2-Way Stem Up Closed, Brass Trim
830 = 3-Way Mixing/Diverting, Brass Trim



2-Way 3-Way

Valve Assemblies	Valve Body Action	Factory Shipped Position		Action (As actuator strokes & valve stem goes down)
		Valve Stem	Flow	
Vx-8213-xxx-5-P	2-Way Stem Up Open (Normally open if spring return actuator)	Up	Open	A to AB flow decreases
Vx-8223-xxx-5-P	2-Way Stem Up Closed (Normally Closed if spring return actuator)	Up	Closed	A to AB flow increases
Vx-8303-xxx-5-P	3-Way Mixing [a] (Normally stem up if spring return actuator	Up	Flow B to AB	AB to B flow decreases AB to A flow increases
	3-Way Diverting [a] (Normally stem up if spring return actuator)	Up	Flow AB to B	B to AB flow decreases A to AB flow increases

[a] May be piped as mixing (two inlets, one outlet) or diverting (one inlet, two outlets)

Step 4

Actuator Code

TAC DuraDrive Electric Actuators

Code	Model	Spring Return	Code	Model	Spring Return
Two-Position			***Proportional***		
552	MA41-7150	Yes	512	MS41-6340	No
554	MA41-7151	Yes	514	MS41-6341	No
556	MA41-7153	Yes	516	MS41-6343	No
572	MA40-7170	Yes	556	MS41-7153	Yes
574	MA40-7171	Yes	572	MS40-7170	Yes
576	MA40-7173	Yes	574	MS40-7171	Yes
594	MA61-7201	Yes	576	MS40-7173	Yes
595	MA61-7200	Yes	596	MS61-7203	Yes
596	MA61-7203	Yes			
Floating					
516	MF41-6343	No			
556	MF41-7153	Yes			
576	MF40-7173	Yes			
596	MF61-7203	Yes			

Electric Actuators

Universal		
686	M1500A	No

Pneumatic Actuators

602 [a]	MK-6811	Yes
652 [b]	MK-6911	Yes

[a] AK-42309-500 positive positioner recommended
[b] AK-42309-500 positive positioner required

Step 6

Port Code

Size	2-Way		3-Way	
	Cv	P Code	Cv	P Code
2-1/2"	56	12	80 [c] 95 [d] 115 [e]	12
3"	85	13	110 [c] 120 [d] 120 [e]	13
4"	145	14	190 [f]	14
5"	240	15	290 [f]	15
6"	370	16	500 [f]	16

[c] Mixing configuration, flow from either A or B to A
[d] Diverting configuration, flow AB to A.
[e] Diverting configuration, flow AB to B.
[f] All flow configurations.

Note: Consult Table 1 and Tables 7 to 13 to confirm that the actuator/valve combination is feasible and that close-off and maximum differential pressures are suitable for the application.

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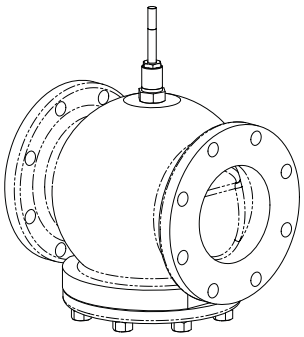
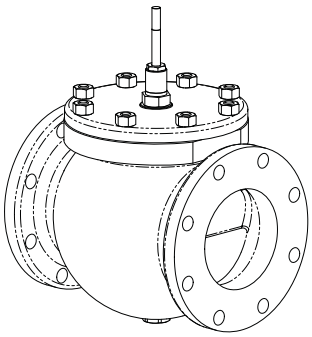
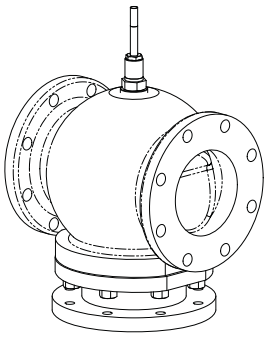
Globe Valve Bodies

Table 1. Specifications for Globe Valve Bodies

		Application			
		Chilledor Hot Water, Steam		Chilledor Hot Water	
		Flanged			
		 VB-8213	 VB-8223	 VB-8303	
Size		2-1/2” to 6”	2-1/2” to 6”	2-1/2” to 6”	
Valve Body		VB-8213-0-5-P	VB-8223-0-5-P	VB-8303-0-5-P	
Valve Body Action		2-Way Stem Open (Normallyopen if spring return actuator)	2-Way Stem Up Closed (Normallyclosed if spring return actuator)	3-Way Mixing/Diverting[a] (Normallystem up if spring return actuator)	
Material	Flow Type	Modified Equal %	Modified Equal %		
	Body	Cast Iron	Cast Iron	Cast Iron	
	Seat	Forged Brass	Forged Brass	Forged Brass	
	Stem	Stainless Steel	Stainless Steel	Stainless Steel	
	Plug	Forged Brass	Forged Brass	Forged Brass	
	Packing	Spring Loaded TFE/EPDM	Spring Loaded TFE/EPDM	Spring Loaded TFE/EPDM	
	Seat Ring	EPDM	EPDM	None	
ANSI Pressure Class, psig		125			
Maximum Inlet Pressure Steam psig (kPa)		35 (240)		—	
Allowable Control Media Temperature, °F (°C) [b]		20°F to 281°F (−7°C 138°C)			
Close-Off Pressure, psi (kPa)		125 (856)[c]		35 (240)[c]	
P Code	Valve Size, In.	Cv (kvs)		Cv (kvs) Mixing [d]	Cv (kvs) Diverting [d]
12	2-1/2	56 (48)	56 (48)	80 (69)	95 (82) [e] 115 (99) [f]
13	3	85 (74)	85 (74)	110 (95)	120 (104) [g]
14	4	145 (125)	145 (125)	190 (164)	190 (164) [g]
15	5	240 (208)	240 (208)	290 (251)	290 (251) [g]
16	6	370 (320)	370 (320)	500 (433)	500 (433) [g]

[a] VB-8303 valves will also operate satisfactorily as two-way angle valves if either end (side) port is closed off.
[b] CAUTION: Freeze protection required for temperatures below 32°F (0 °C). Avoid ice formation on stems.
[c] Valve in closed position. See Table-9 to Table-14 for maximum allowable differential pressure for valve in any open position.
[d] VB-8303 may be piped as either mixing or diverting, bottom (AB) port common.
[e] Diverting configuration, flow AB to A ports.
[f] Diverting configuration, flow AB to B ports.
[g] All diverting flow configurations, flow AB to either A or B ports.

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Electric and Pneumatic Actuators and Linkages

Table 2. Floating and Proportional Non-Spring Return Electric Schneider Electric Forta and Schneider Electric SmartX Actuators

Actuator Part Number	Actuator Code	Control Signal Type	Power Input @ 50/60 Hz				Timing, sec.[a]		Output Force or Torque	Manual Override
			Voltage	VA		Watts	50 HZ	60 HZ		
				Running	Holding					
M1500A[b]	686	Floating (SPDT)	24 Vac ±10% 20-30 Vdc	24[c]	—	—	60 or 300 adj[d]		337 lb-in (1500 N)	Yes
		Proportional (Vdc or mAdc)					20 sec 1"[e] of stroke			
MF41-6343[f]	516	Floating (SPDT)	24 Vac ±20%	5.7	4.1	3.9	162	162	300 lb-in (34 N-m)	
			22-30 Vdc	4.1	3.0	4.1				
MS41-6341[f]	514	Proportional (Vdc or mAdc)	240 Vac ±10%	9.0	8.1	5.0	148	148	300 lb-in (34 N-m)	
MS41-6340[f]	512	Proportional (Vdc or mAdc)	120 Vac ±10%	7.5	6.2	4.7	148	148	300 lb-in (34 N-m)	
MS41-6343[f]	516	Proportional (Vdc or mAdc)	24 Vac ±10%	5.6	4.0	3.6	148	148	300 lb-in (34 N-m)	
			22-30 Vdc	3.4	2.2	3.4				

[a] Approximate timing @ 70°F (21°C) with no load.
[b] Requires AV-822 linkage, if field assembled.
[c] Requires a 50 VA transformer for sizing.
[d] For the floating control signal only.
[e] Proportional control.
[f] Actuator plus linkage is available as an assembly by adding -220 (AV-607-1 linkage) or -230 (AV-609-1 linkage) after the actuator number. Refer to Table -8 for a complete offering. Mx41-634x is not compatible with the AV-607-1 linkage

Actuator Part Number	Actuator Code	Control Signal Type	Power Input							Timing, sec.[a]		Output Force, lbf (N)	Manual Override
			Voltage 50/60 Hz	Running				DC Amp	Holding				
				50 Hz		60 Hz			50 Hz	60 Hz	Powered	Spring Return	
				VA	W	VA	W		W	W			
MA61-7200	595	2-Position (SPST or Triac)	120 Vac ±10%	11.7	8.8	10.0	8.4	—	3.6	5.0	<190	<40	220 (979) minimum 495 (2202 max. stall	Yes
MA61-7201	594		230 Vac ±10%	15.5	9.5	10.6	8.5	—	4.6	3.3				
MA61-7203	596		24 Vac ±20% 22-30 Vdc	9.8	7.5	9.7	7.5	0.29	2.8	2.8				
MF61-7203	596	Floating (SPDT)	24 Vac ±20% 22-30 Vdc	9.8	7.7	9.7	7.7	0.3	3.3	3.3				
MS61-7203	596	Proportional (Vdc or mAdc)	24 Vac ±20% 22-30 Vdc	9.8	7.4	9.7	7.4	0.28	2.9	2.9				

[a] Approximate timing @ 70°F (21°C) with no load.

Table 4. Two-Position, Floating and Proportional Spring Return Electric 133 lb-in SmartX Actuators

Actuator Part Number	Actuator Code	Control Signal Type	Power Input							Timing, sec.[a]		Torque, lb-in (N-m)[b]	Manual Override
			Voltage 50/60 Hz	Running				DC Amp	Holding				
				50 Hz		60 Hz			50 Hz	60 Hz	Powered	Spring Return	
				VA	W	VA	W		W	W			
MA41-7150[cd]	552	2-Position (SPST	120 Vac ±10%	11.7	8.8	10.0	8.4	—	3.6	5.0	<190	<30	133 (15)	Yes
MA41-7151[c]	554		230 Vac ±10%	15.5	9.5	10.6	8.5	—	4.6	3.3				
MA41-7153[c]	556		24 Vac ±20% 22-30 Vdc	9.8	7.5	9.7	7.5	0.29	2.8	2.8				
MF41-7153[c]	556	Floating (SPDT)	24 Vac ±20% 22-30 Vdc	9.8	7.7	9.7	7.7	0.3	3.3	3.3				
MS41-7153[c]	556	Proportional (Vdc or mAdc)	24 Vac ±20% 22-30 Vdc	9.8	7.4	9.7	7.4	0.3	2.9	2.9				

[a] Approximate timing @ 70°F (21°C) with no load.
[b] De-rating required for spring return actuators at low temperatures.
[c] Actuator plus linkage is available as an assembly by adding -220 (AV-607-1 linkage) or -230 (AV-609-1 linkage) after the actuator number. Refer to Table-8 for a complete offering.
[d] The CE Directive is not applicable to this model.

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Table 5. Two-Position, Floating and Proportional Spring Return Electric 150 lb-in SmartX Actuators

Actuator Part Number	Actuator Code	Control Signal Type	Power Input @ 50/60 Hz				Approximate Timing, Seconds@ Approximate Timing, Seconds @ 70°F (21°C with no load)		Actuator Output Torque Rating, lb-in (N-m)[a]	Manual Override
			Voltage	VA		Running Watts	Powered	Spring Return		
				Running	Holding					
MA40-7170	572	2-Position (SPST)	120 Vac ±10%	8.4	6.6	6.2	162	72	150 (17)	No
MA40-7171	574		240 Vac ±10%	9.8	8.5	6.5				
MA40-7173	576		24 Vac ±20%	7.4	5.1	5.3				
			22-30 Vdc	5.0	3.0	5.0				
MF40-7173	576	Floating	24 Vac ±20%	8.1	5.3	5.8				
			22-30 Vdc	5.7	3.6	5.7				
MS40-7170	572	Proportional (Vdc or mAdc)	120 Vac ±10%	8.5	5.2	6.4	147	65		
MS40-7171	574		240 Vac ±10%	10.8	9.0	7.2				
MS40-7173	576		24 Vac ±20%	7.8	4.7	5.5				
			22-30 Vdc	5.6	2.5	5.0				

[a] De-rating required for spring return actuators at low temperatures.

Table-6. Forta Universal Input, 202 lbf, Spring Return

Actuator [a] Part Number	Actuator Code	Control Signal Type	Power Input @ 50/60 Hz				Timing, Sec.[b]		Output Force	Manual Override
			Voltage	VA [c]		Watts	50 Hz	60 Hz		
				Running	Holding					
M900AR M900ARW	650 660	Floating (SPDT) Proportional (Vdc or mAdc)	24 Vac 20-30 Vdc	24 Va	6 Va	21	60 or 300 adj[d] .98 - 1.2" @ 20 Sec		202 lb-in (900 N)	Yes

[a] Requires AV-822 linkage.
[b] Approximate timing @ 70°F (21°C with no load).
[c] Requires a 50 VA transformer for sizing.
[d] For floating control only.
[e] Proportional control.

Table-7. Proportional Spring Return Pneumatic Actuators

Actuator Part Number [a]	Actuator Code	Nominal Spring Range, psig (kPa) [b]	Effective Area, in^2 (cm^2)
MK-6811	602	5 to 10 (34 to 69)	50 (323)
MK-6911 w/AK-42309-500	652	5 to 10 (34 to 69)	50 (323)

[a] K-42309-500 Positive Positioner (order separately) optional for 2-1/2" to 5" valves, required for 6" valves. VK4 factory valve assemblies include positive positioner.
[b] Field adjustable with positive positioner.

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Table-8. Linkage Kits and Actuator/Linkage Assemblies for Field Assembly

Application	Actuator	Linkage Kit [a]	Actuator/Linkage Assembly
2-1/2” to 5” 2-Way & 3-Way	MK-6811 [b]	AV-497	—
6” 2-Way & 3-Way	MK-6911 [b]		—
2-1/2” to 5” 2-Way and 3-Way (1” nominal stroke)	MA41-7150 MA41-7151 MA41-7153 MA40-7170 MA40-7171 MA40-7173 MF41-6343 [a] MF41-7153 MF40-7173 MS41-6340 [a] MS41-6341 [a] MS41-6343 [a] MS41-7153 MS40-7170 MS40-7171 MS40-7173	AV-607-1	MA41-7150-220 MA41-7151-220 MA41-7153-220 MA40-7170-220 MA40-7171-220 MA40-7173-220 MF41-7153-220 MF40-7173-220 MS41-7153-220 MS40-7170-220 MS40-7171-220 MS40-7173-220
6” 2-Way & 3-Way (1-3/4” nominal stroke)		AV-609-1	MA41-7150-220 MA41-7151-220 MA41-7153-220 MA40-7170-220 MA40-7171-220 MA40-7173-220 MF41-7153-220 MF40-7173-220 MS41-7153-220 MS40-7170-220 MS40-7171-220 MS40-7173-220
2-1/2” to 4” only 2-Way & 3-Way	M900AR, M900ARW M900AE, M900AEW	AV-822	—
2-1/2” to 6” 2-Way & 3-Way (1” nominal stroke)	M1500A	AV-822	—

[a] Mx61-720x Actuators require no separate linkage. Mx41-634x is not compatible with AV-607-1.

[b] AK-42309-500 (order separately) optional for 2-1/2” to 5” valve, required for 6” valve. VK4 valve assemblies include positive positioner.

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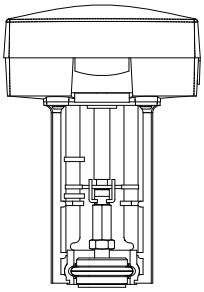
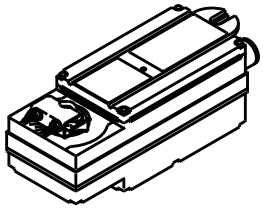
Valve/Actuator Combinations and Operating Pressure Differentials

2/3-way Globe Valve Assemblies

Note: Choose a valve assembly with a maximum operating differential pressure capability sufficient for the application. Consult Table-1 on page 5 for close-off pressure ratings. Not all actuator and valve body combinations are offered as factory assemblies.

3-Way Electric Spring Return Models

Table-9. 2-Way Globe Valve Assemblies with Electric Non-Spring Return Actuators

Non-Spring Return 2-Way Globe Valve Assemblies					M1500A	Mx41-634x	
							
					Actuator Output Rating (Minimum)		
					Change to 337 lbf (1500 N)	300 lb-in (34 N-m)	
					Actuator Model (Actuator Code)		
					Floating/Proportional M1500A (686)	Floating MF41-6343 (516) Proportional MS41-6340 (512) MS41-6341 (514) MS41-6343 (516)	
					Linkage Kit Part Number		
					AV-812 (2 1/2" to 6")	AV-609-1 (6")	
Valve Assembly Part Number [a]	P Code	Valve Size in.	C_v [b]	k_{vs} [b]	Maximum Allowable Operating Differential Pressure [c], psi (kPa)		
						Single Actuator	Dual Actuator[d]
Vx-8213-xxx-5-P Vx-8223-xxx-5-P	12	2-1/2	56	48	35 (240)	—	—
	13	3	85	74		—	—
	14	4	145	125		—	—
	15	5	240	208		—	—
	16	6	370	320		35 (240)	35 (240)

[a] See Globe Valve Assembly Part Numbering System and Selection Procedure to determine a specific part number.

[b] $k_{vs} = m^3/h\ (\Delta P = 100\ kPa)$ $k_{vs} = C_v / 1.156$ $C_v = gpm / \sqrt{\Delta P}\ (in\ psi)$.

[c] Maximum allowable differential across the valve in any open position. Less than 20 psi recommended for quieter service. Consult Table-1 on page 5 for close-off pressure ratings.

[d] Dual actuators are not available as a factory assembly.

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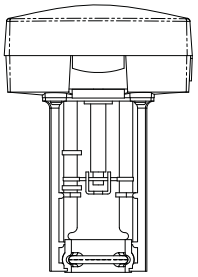
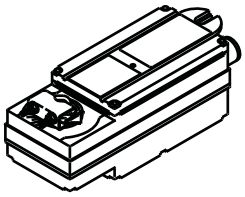
Valve/Actuator Combinations and Operating Pressure Differentials

2/3-way Globe Valve Assemblies

Note: Choose a valve assembly with a maximum operating differential pressure capability sufficient for the application. Consult Table-1 on page 5 for close-off pressure ratings. Not all actuator and valve body combinations are offered as factory assemblies.

3-Way Electric Non-Spring Return Models

Table-10. 3-Way Globe Valve Assemblies with Electric Non-Spring Return Actuators

Non-Spring Return 3-Way Globe Valve Assemblies					M1500A	Mx41-634x	
							
					Actuator Output Rating (Minimum)		
					337 lbf (1500 N)	300 lb-in (34 N-m)	
					Actuator Models (Actuator Codes)		
					Floating/Proportional M1500A (686)	Floating MF41-6343 (516) Proportional MS41-6340 (512) MS41-6341 (514) MS41-6343 (516)	
					Linkage Kit Part Number		
					AV-812 (2 1/2" to 6")	AV-609-1 (6")	
Valve Assembly Part Number [a]	P Code	Valve Size in.	C_v [b]	k_{vs} [b]	Maximum Allowable Operating Differential Pressure [c], psi (kPa) (Mixing/Diverting)		
						Single Actuator	Dual Actuator [d]
Vx-8303-xxx-5-P	12	2-1/2	80[e]	69[e]	35 (240)	—	—
			95[f]	82[f]			
			115[g]	99[g]			
	13	3	110[e]	95[e]			
			120[f]	104[f]			
			120[g]	104[g]			
	14	4	190[h]	164[h]			
	15	5	290[h]	251[h]			
	16	6	500[h]	433[h]		32 (219) 28 (192)	35 (240)

[a] See Globe Valve Assembly Part Numbering System and Selection Procedure to determine a specific part number.

[b] $k_{vs} = m^3/h$ ($\Delta P = 100$ kPa) $k_{vs} = C_v / 1.156$ $C_v = gpm / \sqrt{\Delta P}$ (in psi).

[c] Maximum allowable differential across the valve in any open position. Less than 20 psi recommended for quieter service. Consult Table-1 on page 5 for close-off pressure ratings.

[d] Dual actuators are not available as a factory assembly.

[e] Mixing configuration, ports A and B are inlets, AB port is outlet.

[f] Diverting configuration, flow AB to A port.

[g] Diverting configuration, flow AB to B port.

[h] All flow configurations, mixing or diverting.

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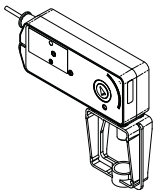
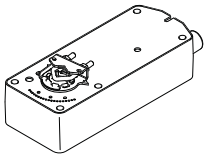
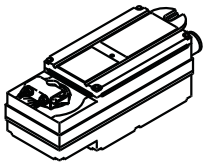
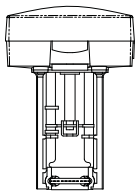
Valve/Actuator Combinations and Operating Pressure Differentials

2/3-way Globe Valve Assemblies

Note: Choose a valve assembly with a maximum operating differential pressure capability sufficient for the application. Consult Table-1 on page 5 for close-off pressure ratings. Not all actuator and valve body combinations are offered as factory assemblies.

2-Way Electric Spring Return Models

Table-11. 2-Way Globe Valve Assemblies with Electric Spring Return Actuators

Spring Return 2-Way Globe Valve Assemblies					Mx61-720x	Mx41-715x	Mx40-717x	M900Axx (-S2) [a]
								
					Actuator Output Rating (minimum)			
					220 lbf (979 N)	133 lb-in (15 N-m)	150 lb-in (17 N-m)	202 lbf-in (900 N)
					Actuator Models (Actuator Codes)			
					Two-Position MA61-7200 (595) MA61-7201 (594) MA61-7203 (596) Floating MF61-7203 (596) Proportional MS61-7203 (596)	Two-Position MA41-7150 (552) MA41-7151 (554) MA41-7153 (556) Floating MF41-7153 (556) Proportional MS41-7153 (556)	Two-Position MA40-7170 (572) MA40-7171 (574) MA40-7173 (576) Floating MF40-7173 (576) Proportional MS40-7170 (572) MS40-7171 (574) MS40-7173 (576)	Floating/ Proportional (Universal) M900AR (650) M900ARW (660)
					Linkage Kit Part Number			
					None (Part of Actuator)	AV-607-1 (2-1/2" to 5") AV-609-1 (6")	AV-607-1 (2-1/2" to 5") AV-609-1 (6")	AV-822 (2-1/2" to 4")
Valve Assembly Part Number [b]	P Code	Valve Size in.	C_v [c]	k_{vs} [b]	Maximum Allowable Operating Differential Pressure [d], psi (kPa)					
						Single Actuator	Dual Actuator [e]	Single Actuator	Dual Actuator [d]	Single Actuator
Vx-8213-5xx-5-P Vx-8223-5xx-5-P	12	2-1/2	56	48	35 (240)	35 (240)	—	35 (240)	—	35 (240)
	13	3	85	74						
	14	4	145	125						
	15	5	240	208						—
	16	6	370	320	—	22 (151)	35 (240)	25 (171)	35 (240)	—

[a] S2 auxiliary switches may be added in the field. Order 880 0104 000.

[b] See Globe Valve Assembly Part Numbering System and Selection Procedure to determine a specific part number.

[c] $k_{vs} = m^3/h$ ($\Delta P = 100$ kPa) $k_{vs} = C_v / 1.156$ $C_v = gpm / \sqrt{\Delta P}$ (in psi).

[d] Maximum allowable differential across the valve in any open position. Less than 20 psi recommended for quieter service. Consult Table-1 on page 5 for close-off pressure ratings.

[e] Dual actuators are not available as factory assemblies.

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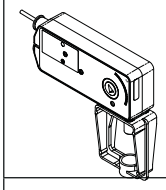
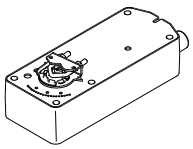
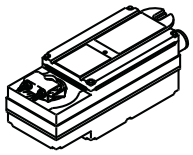
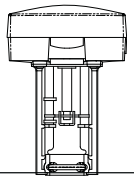
Valve/Actuator Combinations and Operating Pressure Differentials

2/3-way Globe Valve Assemblies

Note: Choose a valve assembly with a maximum operating differential pressure capability sufficient for the application. Consult Table-1 on page 5 for close-off pressure ratings. Not all actuator and valve body combinations are offered as factory assemblies.

3-Way Electric Spring Return Models

Table-12. 3-Way Globe Valve Assemblies with Electric Spring Return Actuators

Spring Return 3-Way Globe Valve Assemblies					Mx61-720x	Mx41-715x		Mx40-717x		M900Axx (-S2) [a]
										
					Actuator Output Rating (minimum)					
					220 lbf (979 N)	133 lb-in (15 N-m)		150 lb-in (17 N-m)		202 lbf-in (900 N)
					Actuator Models (Actuator Codes)					
					Two-Position MA61-7200 (595) MA61-7201 (594) MA61-7203 (596) Floating MF61-7203 (596) Proportional MS61-7203 (596)	Two-Position MA41-7150 (552) MA41-7151 (554) MA41-7153 (556) Floating MF41-7153 (556) Proportional MS41-7153 (556)		Two-Position MA40-7170 (572) MA40-7171 (574) MA40-7173 (576) Floating MF40-7173 (576) Proportional MS40-7170 (572) MS40-7171 (574) MS40-7173 (576)		Floating/ Proportional (Universal) M900AR (650) M900ARW (660)
					Linkage Kit Part Number					
					None (Part of Actuator)	AV-607-1 (2-1/2" to 5") AV-609-1 (6")		AV-607-1 (2-1/2" to 5") AV-609-1 (6")		AV-822 (2-1/2" to 4")
Valve Assembly Part Number [b]	P Code	Valve Size in.	C_v [c]	k_{vs} [c]	Maximum Allowable Operating Differential Pressure [d], psi (kPa) (Mixing/Diverting)					
						Single Actuator	Dual Actuator[e]	Single Actuator	Dual Actuator[d]	Single Actuator
Vx-8303-5xx-5-P	12	2-1/2	80[f]	69[f]	35 (240)/ 35 (240)	35 (240)	—	35 (240)/ 35 (240)	—	35 (240)/ 35 (240)
			95[g]	82[g]						
			115[h]	99[h]						
	13	3	110[f]	95[f]						
			120[g]	104[g]						
			120[h]	104[h]						
	14	4	190[i]	164[i]						
	15	5	290[i]	251[i]		32 (219)/ 28 (192)	35 (240)/ 35 (240)	35 (240)/ 31 (212)	35 (240)/35 (240)	—
	16	6	500[i]	433[i]	—	15 (103)/ 11 (75)	—	16 (110) / 12 (82)	35 (240)/ 31 (214)	—

[a] S2 auxiliary switches may be added in the field. Order 880 0104 000.

[b] See Globe Valve Assembly Part Numbering System and Selection Procedure to determine a specific part number.

[c] $k_{vs} = m^3/h$ ($\Delta P = 100$ kPa) $k_{vs} = C_v / 1.156$ $C_v = gpm / \sqrt{\Delta P}$ (in psi).

[d] Maximum allowable differential across the valve in any open position. Less than 20 psi recommended for quieter service. Consult Table-1 on page 5 for close-off pressure ratings.

[e] Dual actuators are not available as factory assemblies.

[f] Mixing configuration, ports A and B are inlets, AB port is outlet.

[g] Diverting configuration, flow AB to A port.

[h] Diverting configuration, flow AB to B port.

[i] All flow configurations, mixing or diverting.

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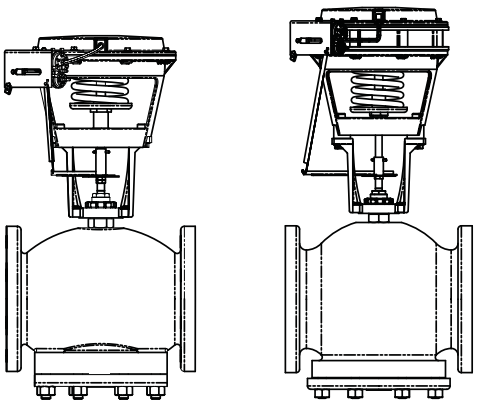
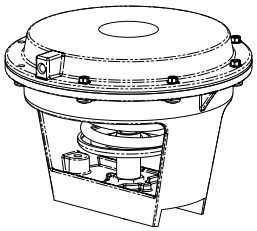
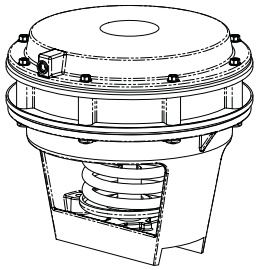
Valve/Actuator Combinations and Operating Pressure Differentials

2/3-way Globe Valve Assemblies

Note: Choose a valve assembly with a maximum operating differential pressure capability sufficient for the application. Consult Table-1 on page 5 for close-off pressure ratings. Not all actuator and valve body combinations are offered as factory assemblies.

2-Way Pneumatic Spring Return Models

Table-13. 2-Way Globe Valve Assemblies with Pneumatic Spring Return Actuators

Spring Return					MK-6811 [b]	MK-6911 [b]
2-Way Globe Valve Assemblies 						
					Actuator Models (Actuator Codes)	
					MK-6811 (602)	MK-6911 (652)
					Linkage Kit Part Number	
					AV-497	AV-497
					Spring Range, psig (kPa)	
					5 to 10 (34 to 69)[a]	5 to 10 (34 to 69)[a]
Valve Assembly Part Number [b]	P Code	Valve Size in.	C_v [c]	k_{vs} [c]	Maximum Allowable Operating Differential Pressure [d], psi (kPa)	
VK-8213-602-5-12 VK-8223-602-5-12 VK4-8213-602-5-12 VK4-8223-602-5-12	12	2-1/2	56	48	35 (240)	—
VK-8213-602-5-13 VK-8223-602-5-13 VK4-8213-602-5-13 VK4-8223-602-5-13	13	3	85	74		—
VK-8213-602-5-14 VK-8223-602-5-14 VK4-8213-602-5-14 VK4-8223-602-5-14	14	4	145	125		—
VK-8213-602-5-15 VK-8223-602-5-15 VK4-8213-602-5-15 VK4-8223-602-5-15	15	5	240	208		—
VK4-8213-652-5-16 VK4-8223-652-5-16	16	6	370	320	—	35 (240)

[a] Spring range field adjustable with positive positioner.

[b] AK-42309-500 positive positioner optional for 2-1/2" to 5" valve, required for 6" valve. Supplied as standard on VK4 factory valve assemblies. See Globe Valve Assembly Part Numbering System and Selection Procedure to determine a specific part number.

[c] $k_{vs} = m^3/h$ ($\Delta P = 100$ kPa) $k_{vs} = C_v / 1.156$ $C_v = gpm / \sqrt{\Delta P}$ (in psi).

[d] Maximum allowable differential across the valve in any open position. Less than 20 psi recommended for quieter service. Consult Table-1 on page 5 for close-off pressure ratings.

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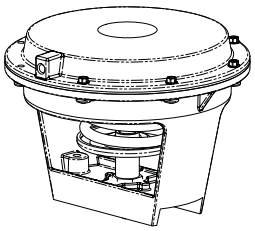
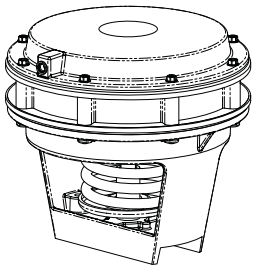
Valve/Actuator Combinations and Operating Pressure Differentials

2/3-way Globe Valve Assemblies

Note: Choose a valve assembly with a maximum operating differential pressure capability sufficient for the application. Consult Table-1 on page 5 for close-off pressure ratings. Not all actuator and valve body combinations are offered as factory assemblies.

3-Way Pneumatic Spring Return Models

Table-14. 3-Way Globe Valve Assemblies with Pneumatic Spring Return Actuators

Spring Return 3-Way Globe Valve Assemblies					MK-6811 [b]	MK-6911 [b]
						
					Actuator Models (Actuator Codes)	
					MK-6811 (602)	MK-6911 (652)
					Linkage Kit Part Number	
					AV-497	AV-497
					Spring Range, psig (kPa)	
					5 to 10 (34 to 69)[a]	5 to 10 (34 to 69)[a]
Valve Assembly Part Number [b]	P Code	Valve Size in.	C_v [c]	k_{vs} [c]	Maximum Allowable Operating Differential Pressure [d], psi (kPa) (Mixing/Diverting)	
VK-8303-602-5-12	12	2-1/2	80[e]	69[e]	35 (240)/ 35 (240)	—
			95[f]	82[f]		
			115[g]	99[g]		
VK-8303-602-5-13	13	3	110[e]	95[e]		
			120[f]	104[f]		
			120[g]	104[g]		
VK-8303-602-5-14	14	4	190[h]	164[h]		
VK-8303-602-5-15 VK4-8303-602-5-15	15	5	290[h]	251[h]		—
VK4-8303-652-5-16	16	6	500[h]	433[h]	—	35 (240)/ 35 (240)

[a] Spring range field adjustable with positive positioner.

[b] AK-42309-500 positive positioner optional for 2-1/2" to 5" valve, required for 6" valve. Supplied as standard on VK4 factory valve assemblies. See Globe Valve Assembly Part Numbering System and Selection Procedure to determine a specific part number.

[c] $k_{vs} = m^3/h$ ($\Delta P = 100$ kPa) $k_{vs} = C_v / 1.156$ $C_v = gpm / \sqrt{\Delta P}$ (in psi).

[d] Maximum allowable differential across the valve in any open position. Less than 20 psi recommended for quieter service. Consult Table-1 on page 5 for close-off pressure ratings.

[e] Mixing configuration, ports A and B are inlets, AB port is outlet.

[f] Diverting configuration, flow AB to A port.

[g] Diverting configuration, flow AB to B port.

[h] All flow configurations, mixing or diverting.

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Actuator Specifications and Valve Assembly Mounting Dimensions

Valve Assemblies with MF41-6343 and MS41-6340, MS41-6341, and MS41-6343 Non-Spring Return Electric SmartX Actuators

Actuator Specifications	
Inputs	
Control Signal	MF41-6343: SPDT Floating Control, Triacs (500 mA rated), or 2 SPST contacts.
	MS41-634x: Proportional, 2 to 10 Vdc or 4 to 20 mAdc with the addition of a 500 ohm resistor (not included).
Power Requirements	All 24 Vac and 22-30 Vdc circuits are Class 2. All circuits 30 Vac and above are Class 1.
Connections	
Class 1 Power:	24 inch (61 cm) long appliance cables; 18 AWG color coded leads,
Class 2 Power & Control:	36 inch (91 cm) long, 22 AWG appliance cable color coded leads. 1/2" conduit connector. For M20 metric conduit, use AM-756 Adapter.
Motor Type	Brushless DC
Outputs	
Electrical	Stroke: Proportional models electronically limited to a maximum of 92±1°; floating model mechanically limited to 101° ±1°.
Mechanical	Timing: Approximate timing is 148 sec. for proportional models; 162 sec. for floating models.
	Manual Override: Activated by the manual override crank.
	Output torque rating: 300 lb-in (34 N-m) minimum.
	Position indicator: Pointer and scale are provided for position indicator.
Environment	
Temperature Limits	Shipping and storage: -40 to 160 °F (-40 to 71 °C) ambient. Operating: -25° to 140 °F (-32° to 60°C) ambient temperature. Maximum allowable ambient: 124°F (51°C) at maximum valve fluid temperature of 281°F (138°C). Minimum allowable valve fluid temperature 20°F (-7°C).
Humidity	5 to 95% RH, non-condensing.
Locations	NEMA Type 1 (IEC IP30), NEMA Type 4 (IEC IP56) with customer-supplied water tight conduit connectors.
Agency Listings (Actuator)	
UL	UL 873, Underwriters Laboratories (File# E9429 Category Temperature-Indicating and Regulating Equipment).
European Community	EMC Directive (2004/108/EC). Low Voltage Directive (72/23/EEC)
cULus	EMC Directive (2004/108/EC). Low Voltage Directive (72/23/EEC)
Australia	This product meets requirements to bear the C-Tick Mark according to the terms specified by the Communications Authority under the Radiocommunications Act 1992.

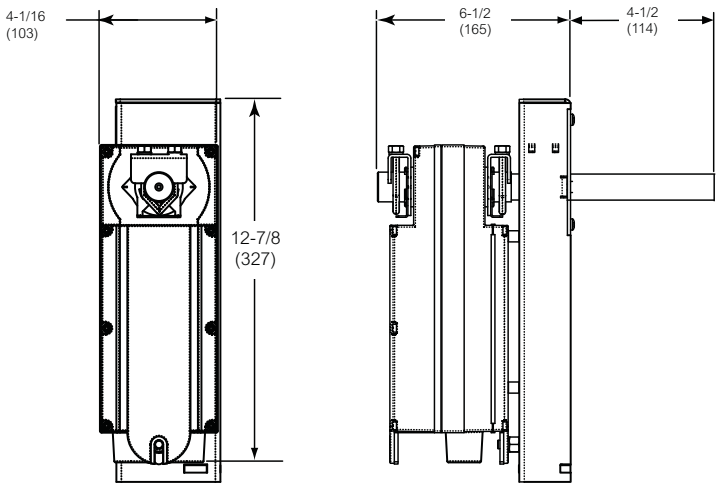

Figure-1 Mx41-634x-230 Actuator/Linkage Assembly

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Dimensions - 6” Flanged Globe Valve Assemblies													
Valve Assembly Part Number	Valve Size	Valve Dimensions in inches (millimeters)											
		2-Way (Refer to Figure-2)						3-Way (Refer to Figure-3)					
		A	C	E	F	G	H	A	C	E	F	G	H
2-Way Vx-8213-51x-5-16 3-Way Vx-8303-51x-5-16	6”	14 (356)	7-1/2 (190)	19-15/16 (507)	11 (280)	9-1/2 (241)	12 (305)	14 (356)	9-3/4 (248)	20-1/4 (515)	11 (280)	9-1/2 (241)	12 (305)
2-Way Vx-8223-516-5-16	6”	14 (356)	6-1/4 (159)	21-3/8 (543)	11 (280)	9-1/2 (241)	12 (305)	—	—	—	—	—	—

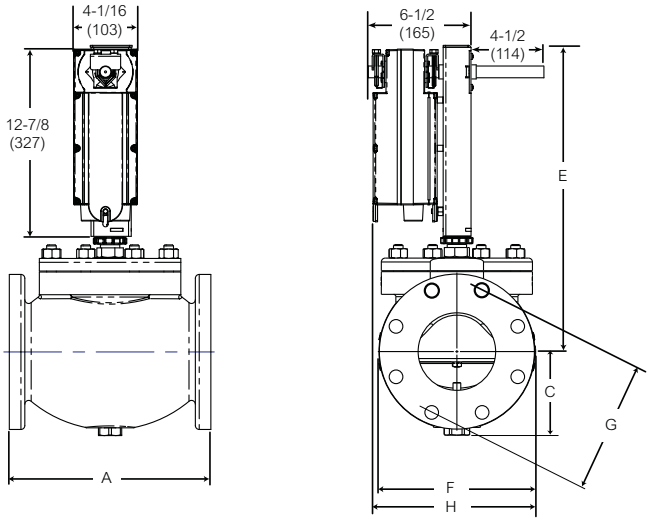

Figure-2 Mx41-634x with 6” Flanged 2-Way Globe Valves

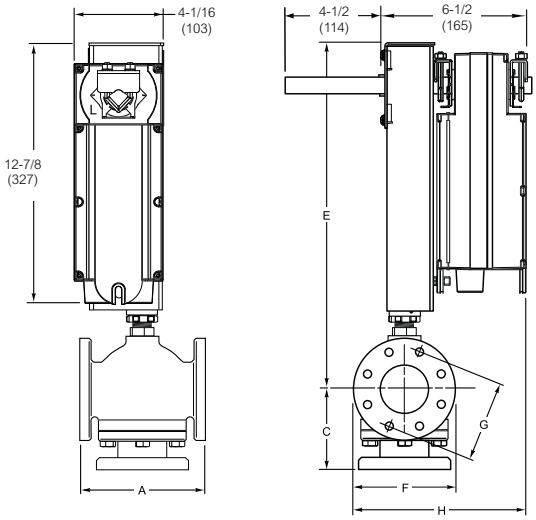

Figure-3 Mx41-634x with 6” Flanged 3-Way Globe Valves

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Valve Assemblies with Schneider Electric Forta M900Axx (-S2)Series, U-Bolt Mounting Style Series, Spring Return 202 lbf Electric Linear Actuators

Actuator Specifications	
Inputs	
Control Signal	M900AR/M900ARW (Spring Return UP) M900AE/M900AEW (Spring Return Down): Universal input signal, including floating, 0-10 Vdc, 2-10 Vdc, or 4-20 mA with 500 ohm resistor (included), reverse and direct acting, and proportional sequencing input signal ranges.
Power Requirements	Voltage: 24 Vac ±10% @ 50/60 Hz, 20-30 Vdc. Power Input: 24 VA running, 50 VA transformer sizing.
Connections	Screw terminals; conduit knockouts.
Motor Type	Brushless DC
Outputs	
Electrical	2 - 10 Vdc feedback Auxiliary switch: Available on M900AxW-S2. Rated 2A @ 24 Vac. 2 SPDT Rated 4A @24 Vac. S2 models available from factory need to be field assembled onto valve bodies.
Mechanical	Output force rating: 202 lbf (900 N) minimum.
	Timing: Floating 60 or 300 seconds, Proportional 20 seconds @ 1" stroke
	Position indicator: Provided.
	Manual Override: Activated by the manual override crank.
	Linear stroke: The stroke is 2" maximum, the input control signal requires a minimum 3/8" (9 mm) travel and a maximum 1.25" (31.75mm) travel anywhere within the 2" (52 mm) stroke window.
Environment	
Temperature Limits	Shipping and storage: -13° to 149°F (-25° to 65°C) ambient. Operating: 14° to 122°F (-10 to 50°C) at maximum valve fluid temperature of 55°F (13°C). 14° to 113°F (-10 to 45°C) at maximum valve fluid temperature of 281°F (138°C). 14° to 107°F (-10 to 42°C) at maximum valve fluid temperature of 300°F (149°C). 14° to 100°F (-10 to 38°C) at maximum valve fluid temperature of 340°F (171°C). 14° to 90°F (-10 to 32°C) at maximum valve fluid temperature of 366°F (171°C).
Humidity	5 to 95% RH, non-condensing.
Locations	M900Ax NEMA 2 or M900AxW NEMA 4 with all conduit connectors used and vertically mounted.
Agency Listings (Actuator)	
cULus	UL 873, Underwriters Laboratories (File# E9429 Category Temperature-Indicating and Regulating Equipment).
European Community	EMC Directive (89/336/EEC).

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Document Number: F-27199-8

Dimensions - 2-1/2” to 4” Flanged Globe Valve Assemblies

Valve Assembly Part Number	Valve Size	P Code	Valve Dimensions in inches (millimeters)									
			2-Way					3-Way				
			A	C	E[a]	F	G	A	C	E[a]	F	G
VU-8213-650-5-P	2-1/2”	12	8-9/16 (217)	4 (102)	14-23/32 (374)	7 (178)	5-1/2 (140)					
	3”	13	9-1/2 (241)	4-5/8 (117)	15-11/32 (390)	7-1/2 (191)	6 (152)					
	4”	14	11-1/2 (292)	5-1/12 (140)	15-7/32 (412)	9 (229)	7-1/2 (191)					
VU-8303-650-5-P	2-1/2”	12						8-9/16 (217)	5-7/16 (138)	15-5/32 (410)	7 (178)	5-1/2 (140)
	3”	13						9-1/2 (241)	6-3/8 (162)	17-3/32 (434)	7-1/2 (191)	6 (152)
	4”	14						11-1/2 (292	8-7/16 (214)	19-5/32 (487)	9 (229)	7-1/2 (191)
VU-8223-650-5-P	2-1/2”	12	8-9/16 (217)	4 (102)	14-23/32 (374)	7 (178)	5-1/2 (140)					
	3”	13	9-1/2 (241)	4-1/4 (108)	14-31/32 (380)	7-1/2 (191)	6 (152)					
	4”	14	11-1/2 (292)	4-15/16 (125)	15-21/32 (398)	9 (229)	7-1/2 (191)					

[a] Allow an additional 3” (76 mm) of height for cover removal on the NEMA 2 models and 5” (127 mm) on the NEMA 4 models.

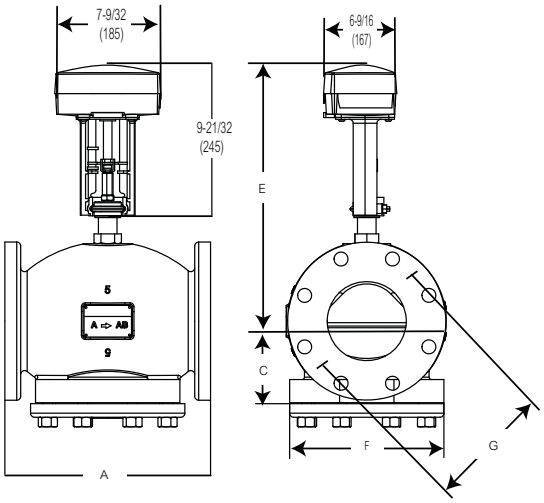

Figure-4 M900Ax Series U-Bolt Style with Flanged 2-Way Globe Valves

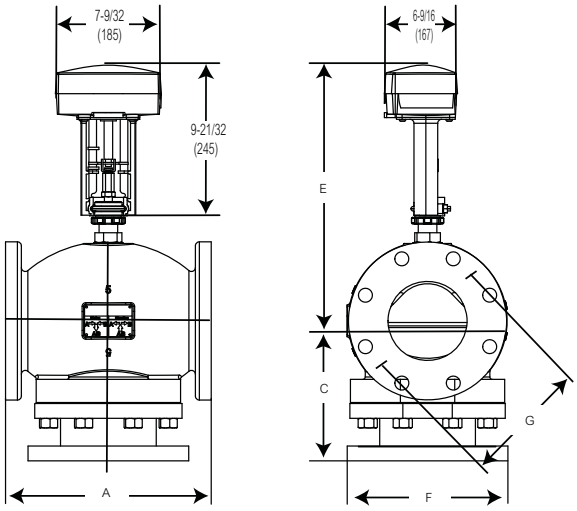

Figure-5 M900Ax Series U-Bolt Style with Flanged 3-Way Globe Valves

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Valve Assemblies with Schneider Electric Forta M1500A Series, U-Bolt Mounting Style Series, Non-Spring Return 337 lbf Electric Linear Actuators

Actuator Specifications	
Inputs	
Control Signal	M1500A: Universal input signal, including floating, 0-10 Vdc, 2-10 Vdc, or 4-20 mA with 500 ohm resistor (included), reverse and direct acting, and proportional sequencing input signal ranges.
Power Requirements	Voltage: 24 Vac ±10% @ 50/60 Hz, 20-30 Vdc. Power Input: 24 VA running, 50 VA transformer sizing.
Connections	Screw terminals; conduit knockouts.
Motor Type	Brushless DC
Outputs	
Electrical	2 - 10 Vdc feedback Auxiliary switch: Available on M1500A-S2. Rated 2A @ 24 Vac. 2 SPDT Rated 4A @24 Vac.
Mechanical	Output force rating: 337 lbf (1500 N) minimum.
	Timing: Floating 60 or 300 seconds, Proportional 15 seconds @ 1/2" stroke
	Position indicator: Provided.
	Manual Override: Activated by the manual override crank.
	Linear stroke: Up to maximum of 3/8" to 2" (9 mm to 52 mm) nominal, self adjusting.
Environment	
Temperature Limits	Shipping and storage: -13° to 149°F (-25° to 65°C) ambient. Operating: 14° to 122°F (-10 to 50°C) at maximum valve fluid temperature of 55°F (13°C). 14° to 113°F (-10 to 45°C) at maximum valve fluid temperature of 281°F (138°C). 14° to 107°F (-10 to 42°C) at maximum valve fluid temperature of 300°F (149°C). 14° to 100°F (-10 to 38°C) at maximum valve fluid temperature of 340°F (171°C). 14° to 90°F (-10 to 32°C) at maximum valve fluid temperature of 366°F (171°C).
Humidity	5 to 95% RH, non-condensing.
Locations	NEMA 2 with both conduit connectors used and vertically mounted.
Agency Listings (Actuator)	
cULus	UL 873, Underwriters Laboratories (File# E9429 Category Temperature-Indicating and Regulating Equipment).
European Community	EMC Directive (89/336/EEC).

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Dimensions - 2-1/2” to 6” Flanged Globe Valve Assemblies

Valve Assembly Part Number	Valve Size	P Code	Valve Dimensions in inches (millimeters)									
			2-Way					3-Way				
			A	C	E[a]	F	G	A	C	E[a]	F	G
VU-8213-686-5-P	2-1/2”	12	8-9/16 (217)	4 (102)	12-29/32 (328)	7 (178)	5-1/2 (140)					
	3”	13	9-1/2 (241)	4-5/8 (117)	12-5/8 (320)	7-1/2 (191)	6 (152)					
	4”	14	11-1/2 (292)	5-1/12 (140)	13-3/8 (339)	9 (229)	7-1/2 (191)					
	5”	15	13 (330)	6-15/16 (176)	14-15/16 (379)	10 (254)	8-1/2 (216)					
	6”	16	14 (356)	7-1/2 (191)	18-23/32 (475)	11 (279)	9-1/2 (241)					
VU-8303-686-5-P	2-1/2”	12						8-9/16 (217)	5-7/16 (138)	12-19/32 (320)	7 (178)	5-1/2 (140)
	3”	13						9-1/2 (241)	6-3/8 (162)	12-25/32 (325)	7-1/2 (191)	6 (152)
	4”	14						11-1/2 (292	8-7/16 (214)	13-27/32 (352)	9 (229)	7-1/2 (191)
	5”	15						13 (330)	8 13/16 (224)	15-5/32 (385)	10 (254)	8-1/2 (216)
	6”	16						14 (356)	7-1/2 (191)	18-17/32 (471)	11 (279)	9-1/2 (241)
VU-8223-686-5-P	2-1/2”	12	8-9/16 (217)	4 (102)	13-7/32 (336))	7 (178)	5-1/2 (140)					
	3”	13	9-1/2 (241)	4-1/4 (108)	13-9/32 (345)	7-1/2 (191)	6 (152)					
	4”	14	11-1/2 (292)	4-15/16 (125)	14-27/32 (377)	9 (229)	7-1/2 (191)					
	5”	15	13 (330)	5-7/16 (138)	16-7/32 (412)	10 (254)	8-1/2 (216)					
	6”	16	14 (356)	7-1/2 (191)	19-29/32 (506)	11 (279)	9-1/2 (241)					

[a] Allow an additional 3” (76 mm) of height for cover removal.

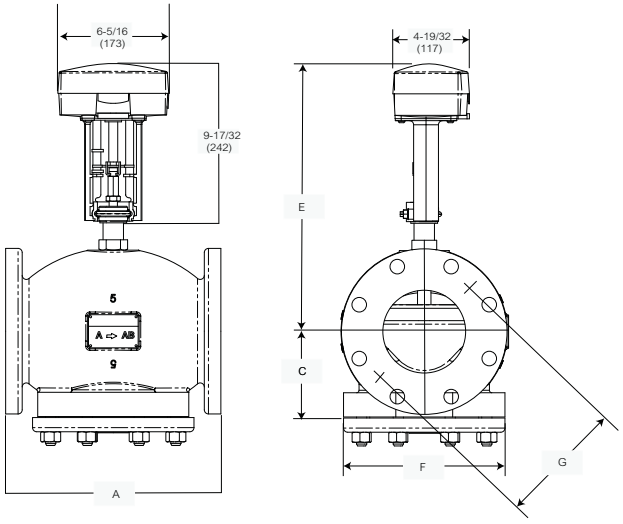

Figure-6 M1500A Series U-Bolt-style with Flanged 2-Way Globe Valves

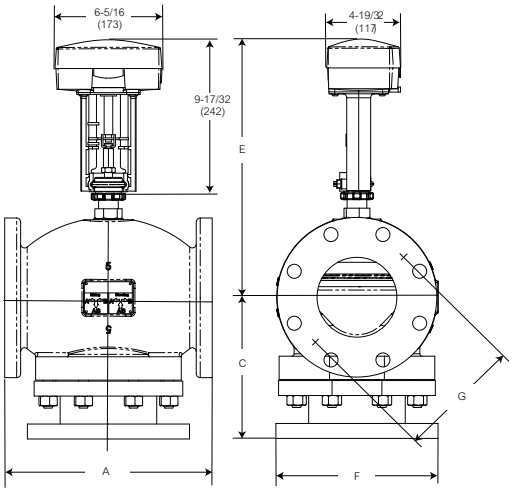

Figure-7 M1500A Series U-Bolt-style Flanged 3-Way Globe Valves

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Valve Assemblies with Mx61-720x Spring Return Linear Electric SmartX Actuators

Inputs

Control Signal

MA61-720x: SPST Two-position Control, Triacs (500 mA rated)

MF61-7203: SPDT Floating Point Control, 24 Vac Triacs (500 mA rated), or 2 SPST contacts.

MS61-7203: Proportional, 2 to 10 Vdc or 4 to 20 mAdc with an external 500 ohm resistor.

Power Requirements

All 24 Vac circuits are Class 2.

Actuator Code	Part Number	Power Input @ 50/60 Hz							
		Voltage 50/60 Hz	Running				DC Amps	Holding	
			50 Hz		60 Hz			50 Hz	60 Hz
			VA	W	VA	W		W	W
595	MA61-7200	120 Vac ±10%	11.7	8.8	10.0	8.4	—	3.6	5.0
594	MA61-7201	230 Vac ±10%	15.5	9.5	10.6	8.5	—	4.6	3.3
596	MA61-7203	24 Vac ±20% 22-30 Vdc	9.8	7.5	9.7	7.5	0.29	2.8	2.8
596	MF61-7203		9.8	7.7	9.7	7.7	0.30	3.3	3.3
596	MS61-7203		9.8	7.4	9.7	7.4	0.28	2.9	2.9
590	MS61-7203-40								
597	MS61-7203-50								

Connections

3 ft. (91 cm) long appliance cables; 1/2" conduit connectors. For metric conduit use AM-756 adapter.

Motor Type

Brushless DC

Outputs

Electrical

Control mode switch: Provided for selection of direct acting or reverse acting control mode on MS61-7203 proportional models.

Position feedback voltage: 2 to 10 Vdc (max. 0.5 mA) position feedback signal (MS61-7203).

Mechanical

Output force rating: 220 lbf (979 N) minimum, 495 lbf (2202 N) maximum stall.

Timing: Approximate timing is 190 seconds.

Position indicator: Provided on actuator and linkage for position indication.

Manual override: Activated by the manual override crank.

Linear Stroke: 1" (25 mm) nominal.

Environment

Temperature Limits

Shipping and storage: -40 to 160°F (-40 to 71°C) ambient.
Operating: 0°F to 140°F (- 18°C to 60°C) ambient temperature. Maximum allowable ambient 140°F (60°C) at maximum fluid temperature of 281°F (138°C). Minimum allowable valve fluid temperature: 20°F (-7°C).

Humidity

5 to 95% RH, non-condensing.

Locations

NEMA 2, UL Type 2, IEC IP54, with customer-supplied water tight conduit connectors.

Agency Listings (Actuator)

UL

UL 873, Underwriters Laboratories (File #E9429 Category Temperature-Indicating and Regulating Equipment).

European Community

EMC Directive (89/336 EEC). Low Voltage Directive (72/23/EEC).

cULus

Canadian Standards C22.2 No. 24-93.

Australia

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Dimensions - 2-1/2” to 5” Flanged Globe Valve Assemblies

Valve Assembly Part Number	Valve Size	P Code	Valve Dimensions in inches (millimeters)									
			2-Way (Refer to Figure-8)					3-Way (Refer to Figure-9)				
			A	C	E	F	G	A	C	E	F	G
2-Way Vx-8213-59x-5-P 3-Way Vx-8303-59x-5-P	2-1/2”	12	8-9/16 (217)	4 (102)	12-3/8 (314)	7 (178)	5-1/2 (140)	8-9/16 (217)	5-7/16 (138)	13-3/4 (349)	7 (178)	5-1/2 (140)
	3”	13	9-1/2 (241)	4-5/8 (117)	12-5/8 (320)	7-1/2 (191)	6 (152)	9-1/2 (241)	6-3/8 (162)	14 (356)	7-1/2 (191)	6 (152)
	4”	14	11-1/2 (292)	5-1/12 (140)	13-3/8 (340)	9 (229)	7-1/2 (191)	11-1/2 (292)	8-7/16 (214)	14-3/4 (375)	9 (229)	7-1/2 (191)
	5”	15	13 (330)	6-15/16 (176)	15-1/8 (384)	10 (254)	8-1/2 (216)	13 (330)	8-13/16 (224)	15-1/8 (384)	10 (254)	8-1/2 (216)
2-Way Vx-8223-59x-5-P	2-1/2”	12	8-9/16 (217)	4 (102)	13 (330)	7 (178)	5-1/2 (140)	—	—	—	—	—
	3”	13	9-1/2 (241)	4-1/4 (108)	14-1/2 (368)	7-1/2 (191)	6 (152)	—	—	—	—	—
	4”	14	11-1/2 (292)	4-15/16 (125)	15-3/8 (391)	9 (229)	7-1/2 (191)	—	—	—	—	—
	5”	15	13 (330)	5-7/16 (138)	16-5/16 (415)	10 (254)	8-1/2 (216)	—	—	—	—	—

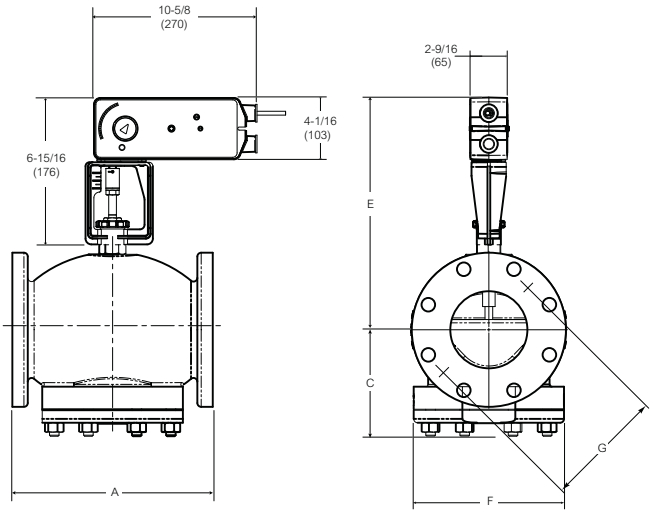

Figure-8 Mx61-720x with 2-1/2” to 5” Flanged 2-Way Globe Valves

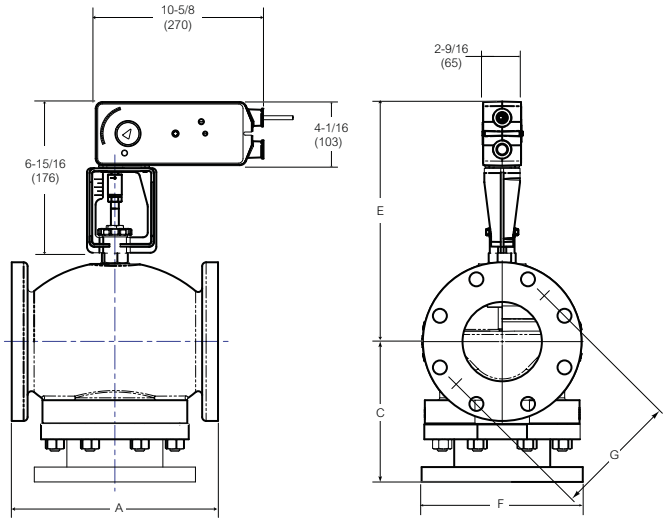

Figure-9 Mx41-720x with 2-1/2” to 5” Flanged 3-Way Globe Valves

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Inputs	
Control Signal	MA41-715x: SPST Two-position Control, Triacs (500 mA rated)
	MF41-7153: SPDT Floating Point Control, 24 Vac, Triacs (500 mA rated), or 2 SPST contacts.
	MS41-7153: Proportional, 2 to 10 Vdc or 4 to 20 mAdc with an external 500Ω resistor.
Power Requirements	All 24 Vac circuits are Class 2.

Actuator Code	Part Number	Voltage 50/60 Hz	Power Input @ 50/60 Hz					
			Running				Holding	
			50 Hz		60 Hz		50 Hz	60 Hz
			VA	W	VA	W	W	W
552	MA41-7150	120 Vac ±10%	11.7	8.8	10.0	8.4	3.6	5.0
554	MA41-7151	230 Vac ±10%	15.5	9.5	10.6	8.5	4.6	3.3
556	MA41-7153	24 Vac ±20% 22-30 Vdc	9.8	7.5	9.7	7.5	2.8	2.8
556	MF41-7153		9.8	7.7	9.7	7.7	3.3	3.3
556	MS41-7153		9.8	7.4	9.7	7.4	2.9	2.9

Connections	3 ft. (91 cm) long appliance cables; 1/2" conduit connectors. For metric conduit use AM-756 adapter.
Motor Type	Brushless DC
Outputs	
Electrical	Control mode switch: Provided for selection of direct acting or reverse acting control mode on MS41-7153 proportional models.
	Auxiliary switches: Two auxiliary switches available with Mx41-715x-502, SPDT 7A resistive @ 250 Vac, one fixed @ 5° and one adjustable 25° to 85°. Switches meet VDE requirements for 7A (2.5A) @ 250 Vac
	Position feedback voltage: 2 to 10 Vdc (maximum 0.5 mA) output signal for position feedback or operation of up to four slave actuators (MS41-7153 only).
Mechanical	Output torque rating: 133 lb-in (15 N-m) minimum.
	Timing: Approximate timing is 190 seconds.
	Position indicator: Pointer and scale are provided for position indication.
	Manual override: Activated by the manual override crank.
	Stroke: Electronically limited to a maximum of 95°; with mechanical stop.
Environment	
Temperature Limits	Shipping and storage: -40 to 160°F (-40 to 71°C) ambient. Operating: -22 to 140°F (-30 to 60°C) ambient temperature. Maximum allowable ambient: 115°F (46°C) at maximum valve fluid temperature of 281°F (138°C). Minimum allowable valve fluid temperature: 20°F (-7°C).
Humidity	5 to 95% RH, non-condensing.
Locations	NEMA Type 2, UL Type 2, IEC IP54.
Agency Listings (Actuator)	
UL	UL 873, Underwriters Laboratories (File #E9429 Category Temperature-Indicating and Regulating Equipment).
European Community	EMC Directive (89/336 EEC). Low Voltage Directive (72/23/EEC).
cULus	Canadian Standards C22.2 No. 24.
Australia	This product meets requirements to bear the C-Tick Mark according to the terms specified by the Communications Authority under the Radiocommunications Act 1992.

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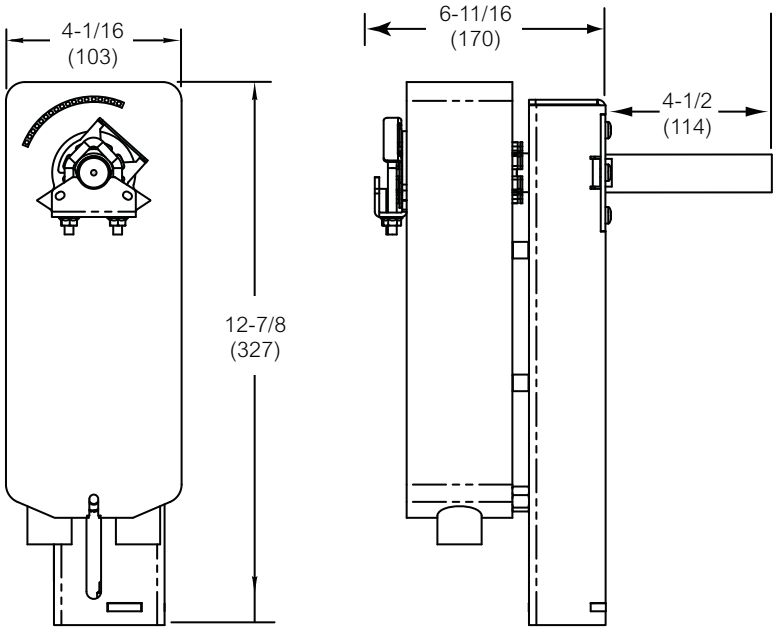

Figure-10 Mx41-715x-220 Actuator/Linkage Assembly

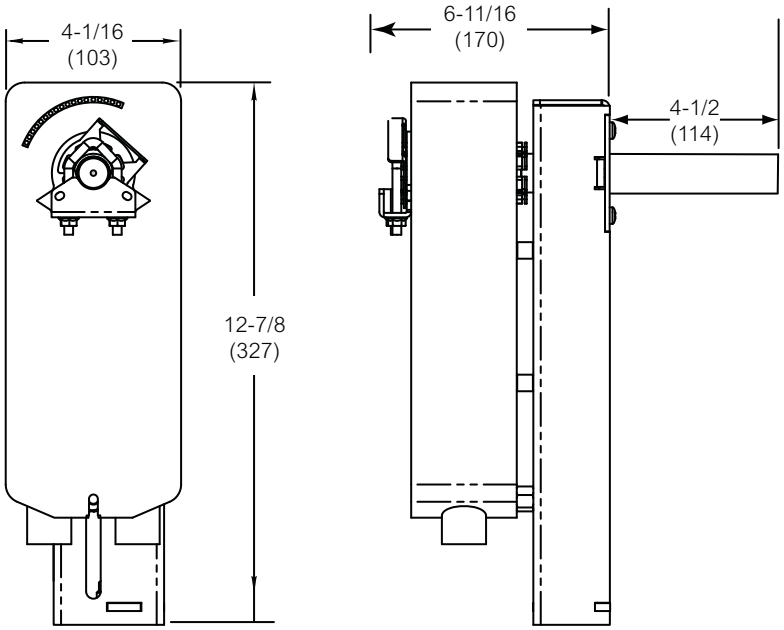

Figure-11 Mx41-715x-230 Actuator/Linkage Assembly

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Dimensions - 2-1/'2" to 6" Flanged Globe Valve Assemblies

Valve Assembly Part Number	Valve Size	P Code	Valve Dimensions in inches (millimeters)											
			2-Way (Refer to Figure-12)						3-Way (Refer to Figure-13)					
			A	C	E	F	G	H	A	C	E	F	G	H
2-Way Vx-8213-55x-5-P 3-Way Vx-8303-55x-5-P	2-1/2"	12	8-9/16 (217)	4 (102)	17-5/8 (448)	7 (178)	5-1/2 (140)	8-3/8 (213)	8-9/16 (217)	5-7/16 (138)	17-5/8 (448)	7 (178)	5-1/2 (140)	8-3/8 (213)
	3"	13	9-1/2 (241)	4-5/8 (117)	17-1/2 (444)	7-1/2 (191)	6 (152)	8-3/4 (222)	9-1/2 (241)	6-3/8 (162)	17-1/2 (444)	7-1/2 (191)	6 (152)	8-3/4 (222)
	4"	14	11-1/2 (292)	5-1/12 (140)	18-5/8 (473)	9 (229)	7-1/2 (191)	9-3/8 (238)	11-1/2 (292)	8-7/16 (214)	18-5/8 (473)	9 (229)	7-1/2 (191)	9-3/8 (238)
	5"	15	13 (330)	6-15/16 (176)	18-9/16 (472)	10 (254)	8-1/2 (216)	10-1/16 (256)	13 (330)	8-13/16 (224)	18-5/8 (473)	10 (254)	8-1/2 (216)	10-1/16 (256)
	6"	16	14 (356)	7-1/2 (190)	19-15/16 (507)	11 (280)	9-1/2 (241)	12 (305)	14 (356)	9-3/4 (248)	20-9/16 (522)	11 (280)	9-1/2 (241)	12 (305)
2-Way Vx-8223-55x-5-P	2-1/2"	12	8-9/16 (217)	4 (102)	16-1/2 (419)	7 (178)	5-1/2 (140)	8-3/8 (213)	—	—	—	—	—	—
	3"	13	9-1/2 (241)	4-1/4 (108)	17-5/8 (448)	7-1/2 (191)	6 (152)	8-3/4 (222)	—	—	—	—	—	—
	4"	14	11-1/2 (292)	4-15/16 (125)	18-1/2 (470)	9 (229)	7-1/2 (191)	9-3/8 (238)	—	—	—	—	—	—
	5"	15	13 (330)	5-7/16 (138)	19-3/4 (502)	10 (254)	8-1/2 (216)	10-1/16 (256)	—	—	—	—	—	—
	6"	16	14 (356)	6-1/4 (159)	21-3/8 (543)	11 (280)	9-1/2 (241)	12 (305)	—	—	—	—	—	—

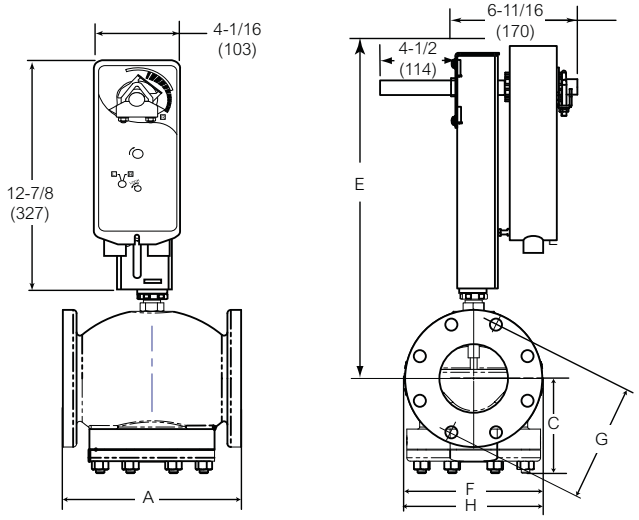

Figure-12 Mx41-715x with Flanged 2-Way Globe Valves

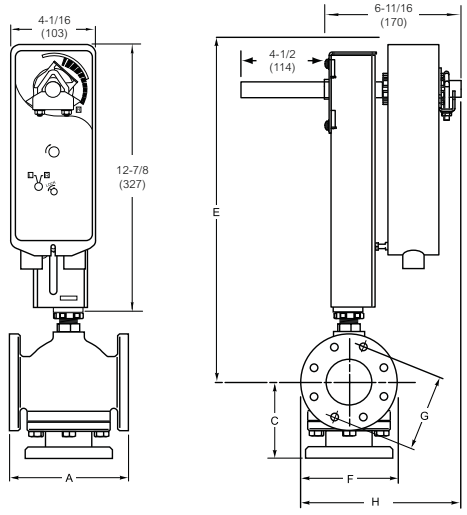

Figure-13 Mx41-715x with Flanged 3-Way Globe Valves

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Valve Assemblies with Mx40-717x Spring Return Electric SmartX Actuators

Actuator Specifications

Inputs

Control Signal	MA40-717x: SPST Two-position Control, Triacs (500 mA rated)
	MF40-7173: SPDT Floating Point Control, 24 Vac or 22-30 Vdc, Triacs (500 mA rated), or 2 SPST contacts.
	MS40-7173: Proportional, 2 to 10 Vdc or 4 to 20 mAdc with the addition of a 500 ohm resistor (not included).
Power Requirements	All 24 Vac and 22-30 Vdc circuits are Class 2.

Actuator Code	Part Number	Power Input @ 50/60 Hz			
		Voltage	Running VA	Holding VA	Watts
572	MA40-7170	120 Vac ±10%	8.4	6.6	6.2
574	MA40-7171	240 Vac ±10%	9.8	8.5	6.5
576	MA40-7173	24 Vac ±20%	7.4	5.1	5.3
		22-30 Vdc	5.0	3.0	5.0
576	MF40-7173	24 Vac ±20%	8.1	5.3	5.8
		22-30 Vdc	5.7	3.6	5.7
572	MS40-7170	120 Vac ±10%	8.5	5.2	6.4
574	MS40-7171	240 Vac ±10%	10.8	9.0	7.2
576	MS40-7173	24 Vac ±20%	7.8	4.7	5.5
		22-30 Vdc	5.6	2.5	5.0

Connections	
Class 1 Power:	2 ft. (61 cm) long appliance cables;
Class 2 Power & Control:	36 inch (91 cm) long 22 AWG color coded appliance cable. 1/2" conduit connectors. For metric conduit use AM-756 adapter.
Motor Type	Brushless DC

Outputs

Mechanical	Output torque rating: 150 lb-in (17 N-m).
	Timing: Approximate timing is 147 sec. for proportional models; 162 sec. for floating and two-position models.
	Position indicator: Pointer and scale are provided for position indication.
	Stroke: Proportional models electronically limited to a maximum of 92° ±1°. Floating & 2-position models mechanically limited to 101 ±1°

Environment

Temperature Limits	Shipping and storage: -40 to 160°F (-40 to 71°C) ambient. Operating: -25 to 140 °F(-32 to 60 °C) ambient temperature. Maximum allowable ambient: 133°F (56°C) at maximum valve fluid temperature of 281°F (138°C). Minimum allowable valve fluid temperature: 20°F (-7°C).
Humidity	5 to 95% RH, non-condensing.
Locations	NEMA Type 1, NEMA Type 4; UL Type 4 (IEC IP56), with customer supplied water tight conduit connectors.

Agency Listings (Actuator)

UL	UL 873, Underwriters Laboratories (File #E9429 Category Temperature-Indicating and Regulating Equipment).
European Community	EMC Directive (2004/108/EC). Low Voltage Directive (72/23/EEC).
cULus	Canadian Standards C22.2 No. 24-93.
Australia	This product meets requirements to bear the C-Tick Mark according to the terms specified by the Communications Authority under the Radiocommunications Act 1992.

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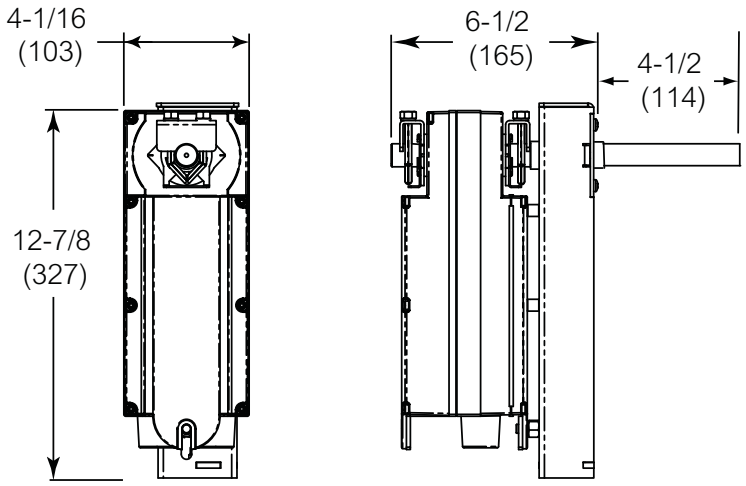

Figure-14 Mx40-717x-220 Actuator/Linkage Assembly

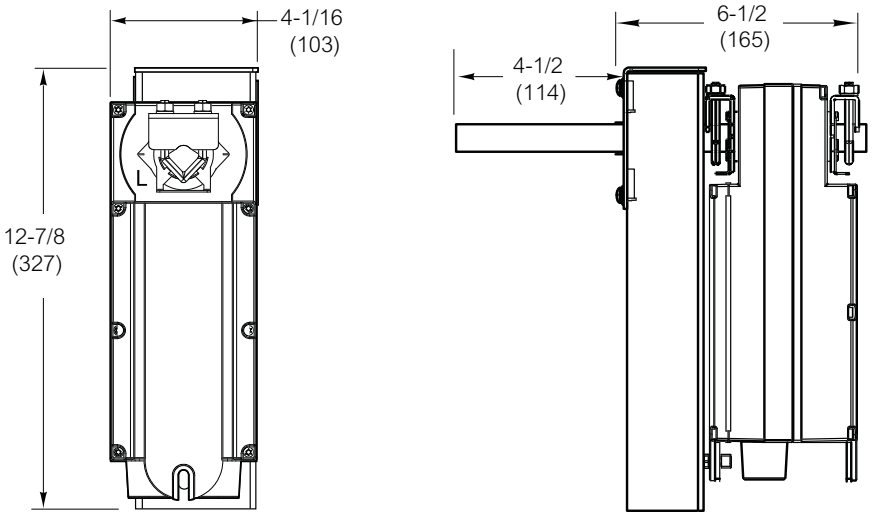

Figure-15 Mx40-717x-230 Actuator/Linkage Assembly

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Dimensions - 2-1/"2" to 6" Flanged Globe Valve Assemblies

Valve Assembly Part Number	Valve Size	P Code	Valve Dimensions in inches (millimeters)											
			2-Way (Refer to Figure-16)						3-Way (Refer to Figure-17)					
			A	C	E	F	G	H	A	C	E	F	G	H
2-Way Vx-8213-57x-5-P 3-Way Vx-8303-57x-5-P	2-1/2"	12	8-9/16 (217)	4 (102)	17-1/4 (438)	7 (178)	5-1/2 (140)	8-3/4 (222)	8-9/16 (217)	5-7/16 (138)	17-1/4 (438)	7 (178)	5-1/2 (140)	8-3/4 (222)
	3"	13	9-1/2 (241)	4-5/8 (117)	17 (432)	7-1/2 (191)	6 (152)	9 (229)	9-1/2 (241)	6-3/8 (162)	17 (432)	7-1/2 (191)	6 (152)	9 (229)
	4"	14	11-1/2 (292)	5-1/12 (140)	18-1/4 (464)	9 (229)	7-1/2 (191)	9-3/4 (248)	11-1/2 (292)	8-7/16 (214)	18-1/4 (464)	9 (229)	7-1/2 (191)	9-3/4 (248)
	5"	15	13 (330)	6-15/16 (176)	18-3/16 (462)	10 (254)	8-1/2 (216)	10-1/16 (256)	13 (330)	8-13/16 (224)	17-1/4 (464)	10 (254)	8-1/2 (216)	10-1/16 (256)
	6"	16	14 (356)	7-1/2 (190)	19-15/16 (507)	11 (280)	9-1/2 (241)	12 (305)	14 (356)	9-3/4 (248)	20-1/4 (515)	11 (280)	9-1/2 (241)	12 (305)
2-Way Vx-8223-57x-5-P	2-1/2"	12	8-9/16 (217)	4 (102)	16-5/8 (422)	7 (178)	5-1/2 (140)	8-3/4 (222)	—	—	—	—	—	—
	3"	13	9-1/2 (241)	4-1/4 (108)	17-1/4 (438)	7-1/2 (191)	6 (152)	9 (229)	—	—	—	—	—	—
	4"	14	11-1/2 (292)	4-15/16 (125)	18-1/4 (464)	9 (229)	7-1/2 (191)	9-3/4 (248)	—	—	—	—	—	—
	5"	15	13 (330)	5-7/16 (138)	19-3/8 (492)	10 (254)	8-1/2 (216)	10-1/16 (256)	—	—	—	—	—	—
	6"	16	14 (356)	6-1/4 (159)	21-3/8 (543)	11 (280)	9-1/2 (241)	12 (305)	—	—	—	—	—	—

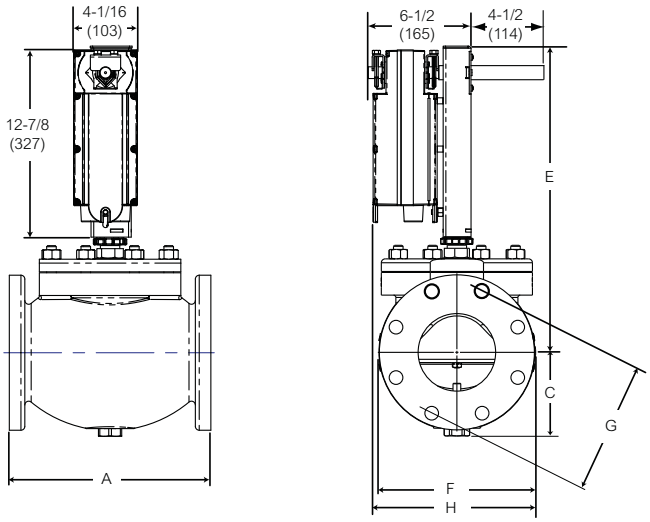

Figure-16 Mx40-717x with Flanged 2-Way Globe Valves

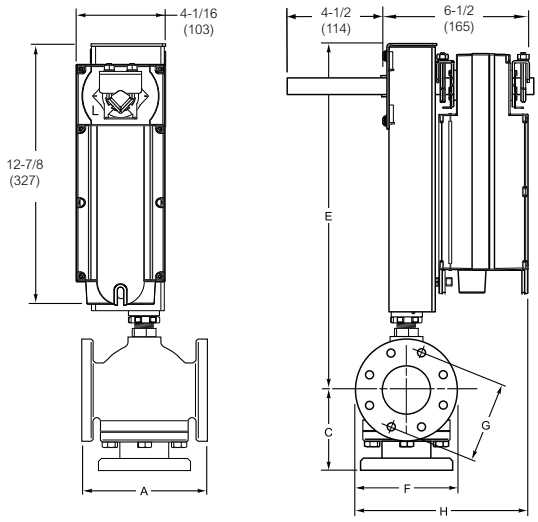

Figure-17 Mx40-717x with Flanged 3-Way Globe Valves

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Actuator Specifications	
Inputs	
Control Signal	5 to 10 psig (34 to 69 kPa). Positive positioner start point adjustable 1 to 12 psi (7 to 83 kPa). Positive positioner span adjustable 2 to 13 psi (14 to 89 kPa).
Supply Pressure	15 to 20 psig (103 to 137 kPa) nominal, 30 psig (205 kPa) maximum.
Air Connections	1/8 in FNPT
Effective Area	50 sq. in. (323 cm^2)
Outputs	
	MK-6811: 1" (25 mm) nominal stroke. MK-6911: 1-3/4" (45 mm) nominal stroke.
Environment	
Temperature Limits	Shipping and storage: -40 to 160 °F (-40 to 71 °C) ambient. Operating: -20°F to 220°F (-29°C to 104°C). Maximum allowable ambient: 220°F (104°C) at maximum valve fluid temperature of 281°F (138°C). Minimum allowable valve fluid temperature: 20°F (-7°C).
Positive Positioner	AK-42309-500 recommended for 5" valve, required for 6" valve. Order separately. Supplied as standard on VK4 factory valve assemblies.

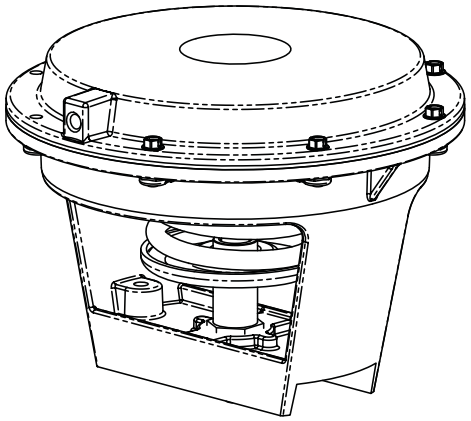

Figure-18 MK-6811 Actuator

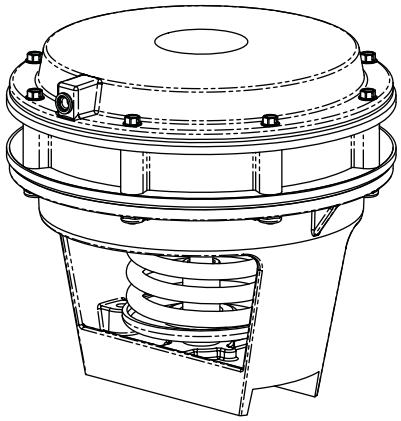

Figure-19 MK-6911 Actuator

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Dimensions - 2-1/2" to 6" Flanged Globe Valve Assemblies

Valve Assembly Part Number [a]	Valve Size	P Code	Valve Dimensions in inches (millimeters)									
			2-Way (Refer to Figure-20 and Figure-22)					3-Way (Refer to Figure-21 and Figure-23)				
			A	C	E	F	G	A	C	E	F	G
2-Way VK-8213-602-5-P VK4-8213-6x2-5-P 3-Way VK-8303-602-5-15 VK4-8303-6x2-5-P	2-1/2"	12	8-9/16 (217)	4 (102)	15-7/8 (403)	7 (178)	5-1/2 (140)	8-9/16 (217)	5-7/16 (138)	15-5/8 (397)	7 (178)	5-1/2 (140)
	3"	13	9-1/2 (241)	4-5/8 (117)	16-1/4 (413)	7-1/2 (191)	6 (152)	9-1/2 (241)	6-3/8 (162)	16-1/4 (413)	7-1/2 (191)	6 (152)
	4"	14	11-1/2 (292)	5-1/12 (140)	16-7/8 (429)	9 (229)	7-1/2 (191)	11-1/2 (292)	8-7/16 (214)	16-7/8 (429)	9 (229)	7-1/2 (191)
	5"	15	13 (330)	6-15/16 (176)	18-3/16 (462)	10 (254)	8-1/2 (216)	13 (330)	8-13/16 (224)	18-3/16 (462)	10 (254)	8-1/2 (216)
	6"	16	14 (356)	7-1/2 (190)	18-3/16 (462)	11 (280)	9-1/2 (241)	14 (356)	9-3/4 (248)	21-9/16 (548)	11 (280)	9-1/2 (241)
2-Way VK-8223-602-5-P VK4-8223-6x2-5-P	2-1/2"	12	8-9/16 (217)	4 (102)	18-3/16 (462)	7 (178)	5-1/2 (140)	—	—	—	—	—
	3"	13	9-1/2 (241)	4-1/4 (108)	16-5/8 (422)	7-1/2 (191)	6 (152)	—	—	—	—	—
	4"	14	11-1/2 (292)	4-15/16 (125)	17-7/8 (454)	9 (229)	7-1/2 (191)	—	—	—	—	—
	5"	15	13 (330)	5-7/16 (138)	19-3/8 (492)	10 (254)	8-1/2 (216)	—	—	—	—	—
	6"	16	14 (356)	6-1/4 (159)	22-15/16 (583)	11 (280)	9-1/2 (241)					

[a] VK4 factory assemblies include AK-42309-500 positive positioner. Positive positioner optional for 2-1/2" to 5", required for 6".

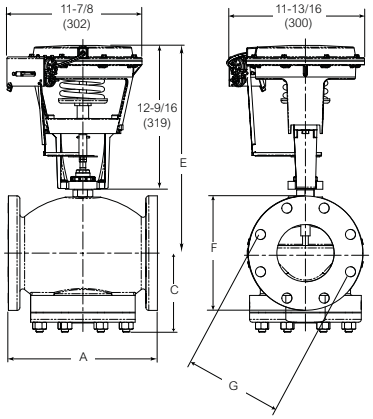

Figure-20 MK-6811 with Flanged 2-Way Globe Valves[a]

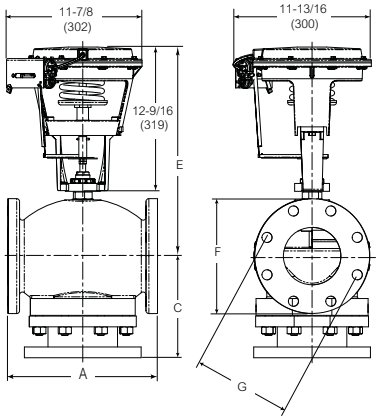

Figure-21 MK-6811 with Flanged 3-Way Globe Valves[a]

[a] Shown with positive positioner

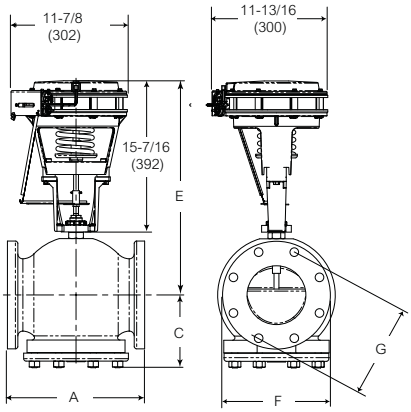

Figure-22 MK-6911 with Flanged 2-Way Globe Valves [a]

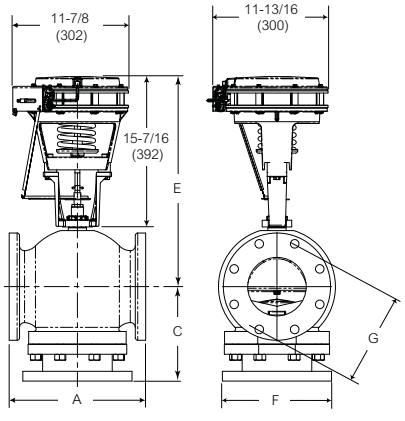

Figure-23 MK-6911 with Flanged 3-Way Globe Valves[a]

[a] Shown with positive positioner

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System Design Considerations: Linked Globe Valve Assemblies

The information in this section describes characteristics of the VB-8xx3 valve bodies, which are used in the Vx-8xx3 valve assemblies. This information is also useful when installing the Mx4x-xxxx-2xx series actuator/linkage assemblies onto these valve bodies.

Control Precision: 2-Way Valves

The flow curve shown in Figure-24 is representative of all sizes. All valve plugs have lower gain when nearly closed to enhance control at low demand. Two-way valves are nominally equal percentage and normally used for water and low pressure steam.

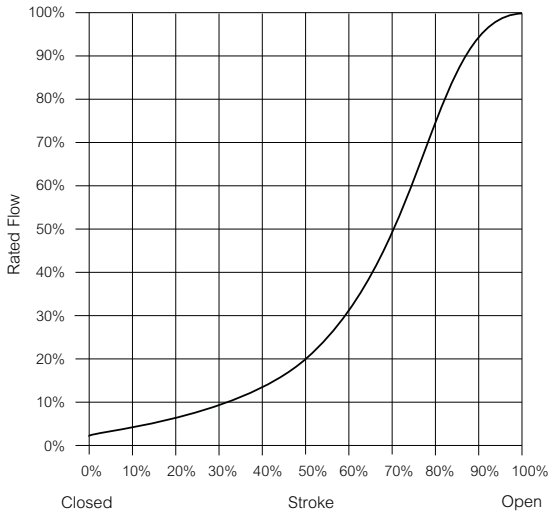

Figure-24 Typical Modified Equal Percentage Flow Characteristics

3-Way Valves

3-way mixing valves are designed so that the flow from either of the inlet ports to the outlet is nominally linear, which means the total flow from the outlet is almost constant over the stroke of the valve stem. The flow is limited at the initial opening similar to an equal percentage curve to enhance system stability. See Figure-25 for typical flow characteristics of the VB-8303 series valve bodies.

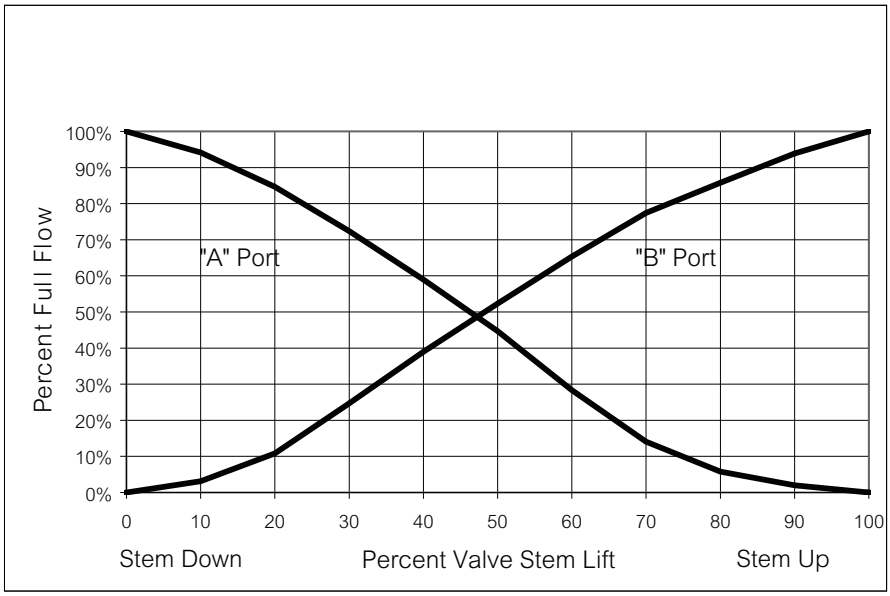

Figure-25 Typical Flow Characteristics

Rangeability

Rangeability is the ratio of rated flow to the minimum controllable flow through a valve. The nominal rangeability of the VB-8xx3 Series is greater than 100:1.

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Temperature/Pressure Ratings

See Figure-26 for temperature and pressure ratings of 2-way and 3-way valves. Ratings conform with published values and disclaimer.

VB-8xx3-0-5-P (Cast Iron Body with Flanged End Fittings)

Standards: Pressure to ANSI B16.1, Class 125, with 200 psi (1379 kPa) up to 150 °F (65 °C), decreasing to 169 psi (1165 kPa) at 281°F (138 °C).

Materials: Valve body: Cast iron, ASTM A126 Class B.

Trim: Stainless steel stem, forged brass plug, metal-to-metal or EPDM seat ring with TFE/EPDM packing parts and silicone packing grease.

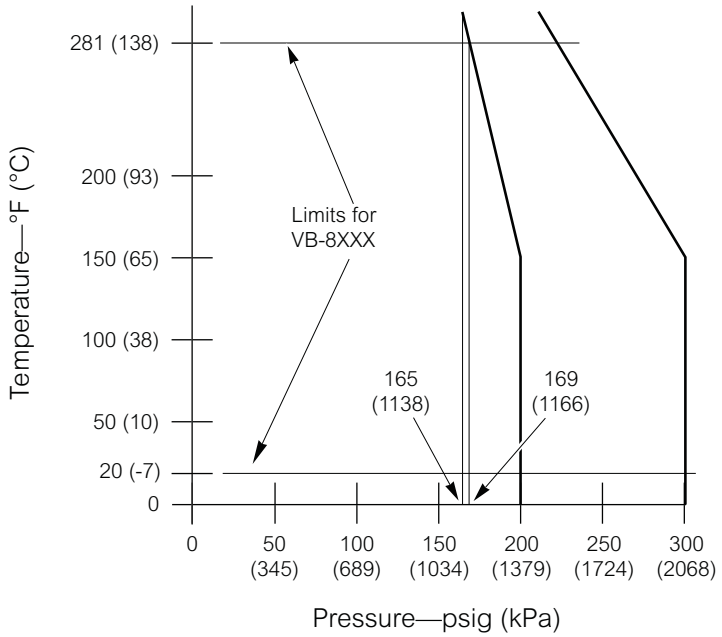

Figure-26 Temperature and Pressure Ratings for VB-8xx3 Series Globe Valves

Close-off Ratings

Nominal actuator close-off ratings are based on ANSI IV (0.01% leakage) for valves with EPDM seat rings such as VB-8213 and VB-8223. Metal-to-metal trim valves such as VB-8303 are designed for ANSI III (0.1% leakage).

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Installation Considerations

Mounting Angle of Valve Assembly

Be sure to allow the necessary clearance around the valve assembly. The valve assembly must be mounted so that the valve stem is at least 5° above the horizontal. This ensures that any condensate that forms on the valve body will not travel into the linkage or actuator, where it may cause corrosion. On steam applications, where the ambient temperature approaches the limit of the actuator, the valve assembly must be mounted 45° from vertical.

Insulation of Linked Globe Valve Assembly

The globe valve should be completely insulated to minimize the effect of heat transfer and condensation at the actuator.

The actuator/linkage must not be insulated. Doing so will result in excess heat or condensation within the actuator.

Temperature Limits for Globe Valve Assembly

When installing the globe valve assembly, observe the minimum and maximum temperature limits given in the Actuator Specifications and Valve Assembly Mounting Dimensions section of this document.

Sizing and Selection

Flow Coefficient (C_v)

Sizing a valve requires selecting a flow coefficient (Cv), which is defined as the flow rate in gallons per minute (GPM) of 60°F water that will pass through the fully open valve with a 1 psi pressure drop (Dp). It is calculated according to the formula:

$$C_v = \frac{GPM}{\sqrt{\Delta P}}$$

Since the flow rate and resultant pressure drop through the heat exchanger is usually specified, the only variable normally available in sizing a valve is the valve pressure drop. The following information can be used to determine what pressure drop to use in calculating a valve Cv. Using the calculated Cv, refer to Step 6 on page 4 to select the valve body with the nearest available Cv.

Be sure to check that the anticipated pressure drop across the valve will not exceed the close-off pressure ratings in Table-1 and the maximum pressure differential ratings listed in Table-8 to Table-13.

Two-position Control

Two-position control valves are normally selected “line size” to keep pressure drop at a minimum. If it is desirable to reduce the valve below line size, then 10% of “available pressure” (that is, the pump pressure differential available between supply and return mains with design flow at the valve location) is normally used to select the valve.

Proportional Control

Proportional control valves are usually selected to take a pressure drop equal to at least 50% of the “available pressure.” As “available pressure” is often difficult to calculate, the normal procedure is to select the valve using a pressure drop at least equal to the drop in the coil or other load being controlled (except where small booster pumps are used) with a minimum recommended pressure drop of 5 psi (34 kPa). When the design temperature drop is less than 60°F (33°C) for conventional heating systems, higher pressure drops across the valve are needed for good results (Table-15).

Table-15 Conventional Heating System

Design Temperature Load Drop °F (°C)	Recommended Pressure Drop [a] (% of Available Pressure)	Multiplier on Load Drop
60 (33) or More	50%	1 x Load Drop
40 (22)	66%	2 x Load Drop
20 (11)	75%	3 x Load Drop

[a] Recommended minimum pressure drop = 5 psi (34 kPa).

Secondary Circuits with Small Booster Pumps

50% of available pressure difference (equal to the drop through load, or 50% of booster pump head).

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Document Number: F-27199-8

3-Way Mixing Valves Used to Bypass Flow

When 3-way linked globe valve assemblies are used to control flow through a heating or cooling coil, the valve assembly is piped as a mixing valve on the outlet side of the coil to throttle the water flow through the load, and therefore control the heat output of the coil (Figure-27).

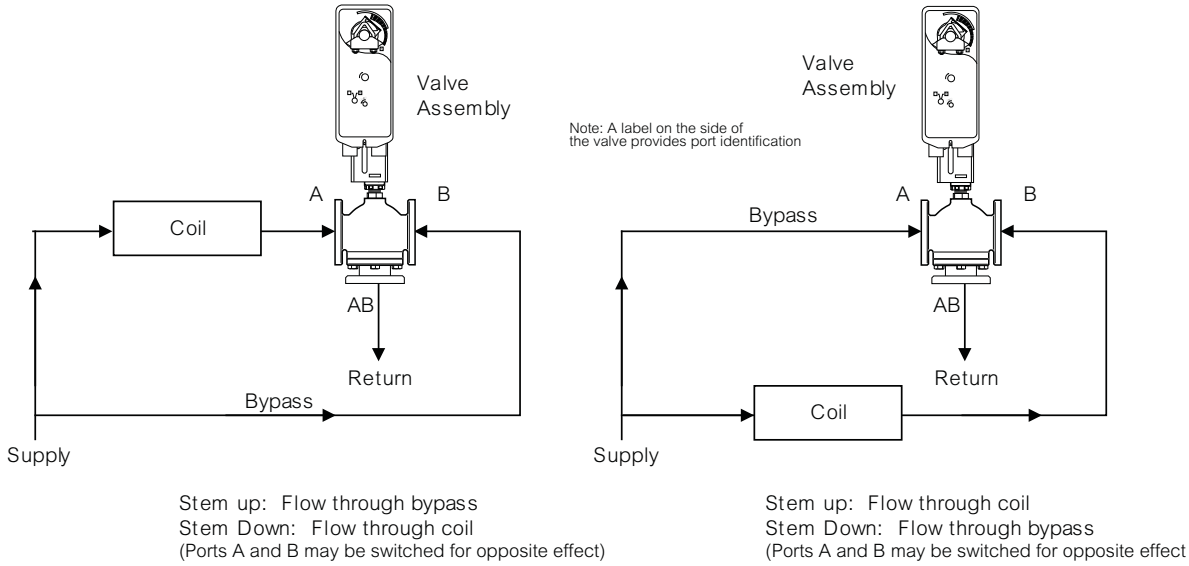

Figure-27 Typical Piping Choices for VB-8303 as 3-Way Mixing Valve for Control of Heating or Cooling Coil

3-Way Mixing Valves Used to Blend Water Flows

Three-way mixing valves used to blend two water flows (Figure-28) control the heat output by varying the water temperature to the load at constant flow. These valves do not require high pressure drops for good control results. They can be sized for a pressure drop of 20% of the "available pressure" or equal to 25% of the pressure drop through the load at full flow.

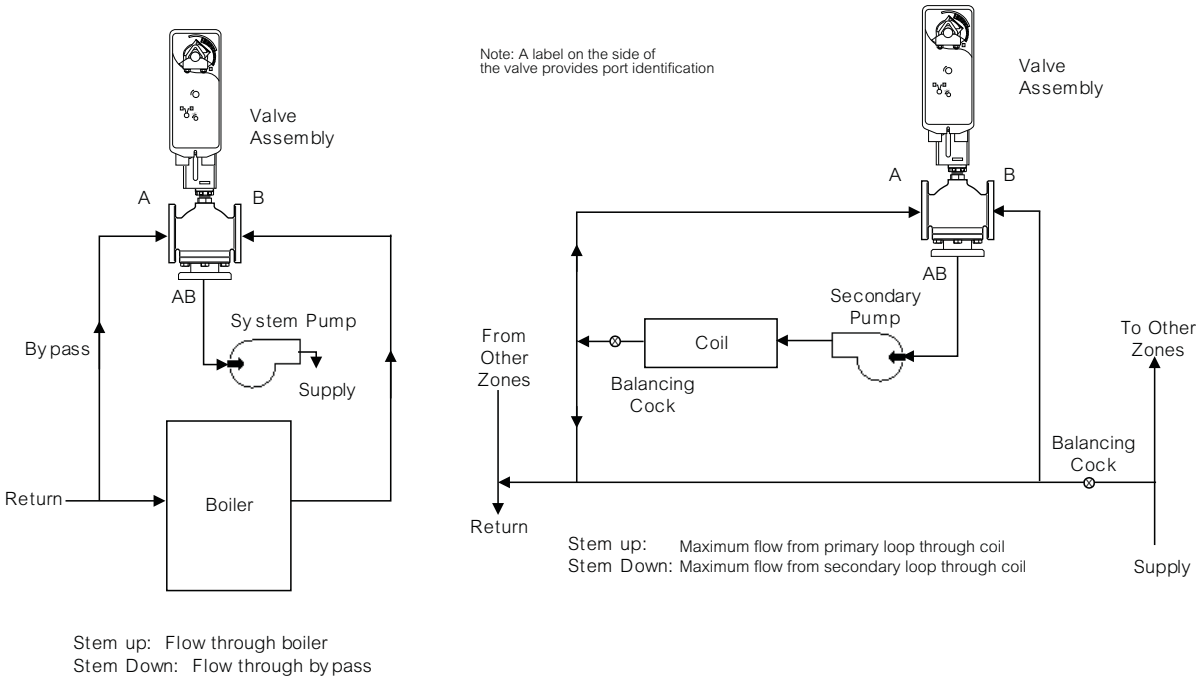

Figure-28 Typical Piping Choices for VB-8303 as 3-Way Mixing Valve for Proportional Control Used to Blend Two Water Flows.

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3-Way Diverting Valves

Proportional and two-position 3-way diverting linked globe valve assemblies are used to control the flow of hot or chilled fluids in heating systems, cooling coils, or other load by diverting the flow to either the load or a bypass. The valve must be piped with one inlet and two outlets. (Figure-29).

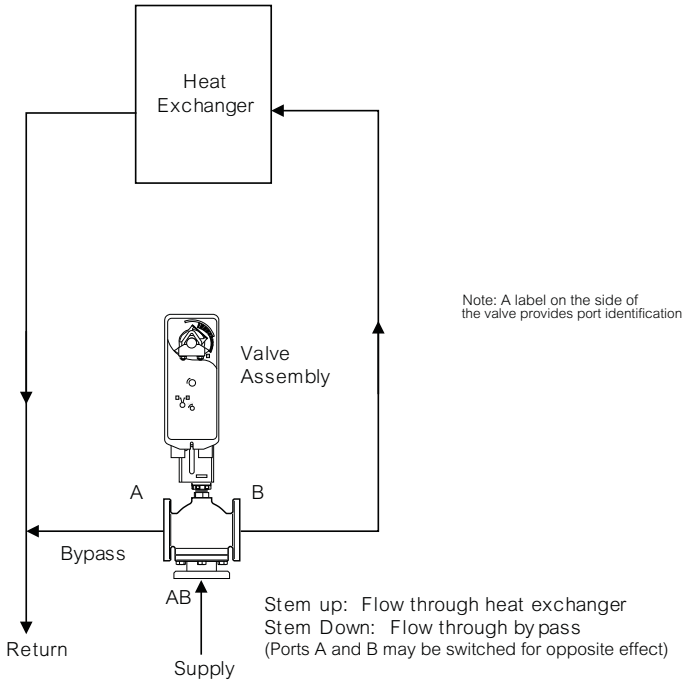

Figure-29 Typical Piping of VB-8303 as 3-Way Diverting Valve

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VBB/VBS Series Ball Valves with Two-Position Actuators

Inspection

Inspect the package for damage. If package is damaged, notify the appropriate carrier immediately. If undamaged, open the package and inspect the device for obvious damage. Return damaged products.

Requirements

NOTICE

RISK OF EQUIPMENT DAMAGE

- Read and understand the instructions before installing or servicing this product.
- Do not install this product in hazardous or classified locations.
- Turn off all power supplying equipment before working on it.
- Make all connections in accordance with the electrical wiring diagram.
- Do not exceed the product's ratings or maximum limits.
- Use copper conductors only.
- Avoid installation locations exposed to vibration, excessive moisture, and/or corrosive or explosive vapors.
- Avoid electrical noise interference. Do not install near large conductors, electrical machinery, or welding equipment.
- When making wiring connections within the actuator, do not put leads or connectors below the motor.
- This product is a class 2 device.
- The installer is responsible for conformance to all applicable codes.

Failure to follow these instructions may cause equipment damage.

If this product is used in a manner not specified by the manufacturer, the protection provided by the product may be impaired.

No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

Tools (not provided)

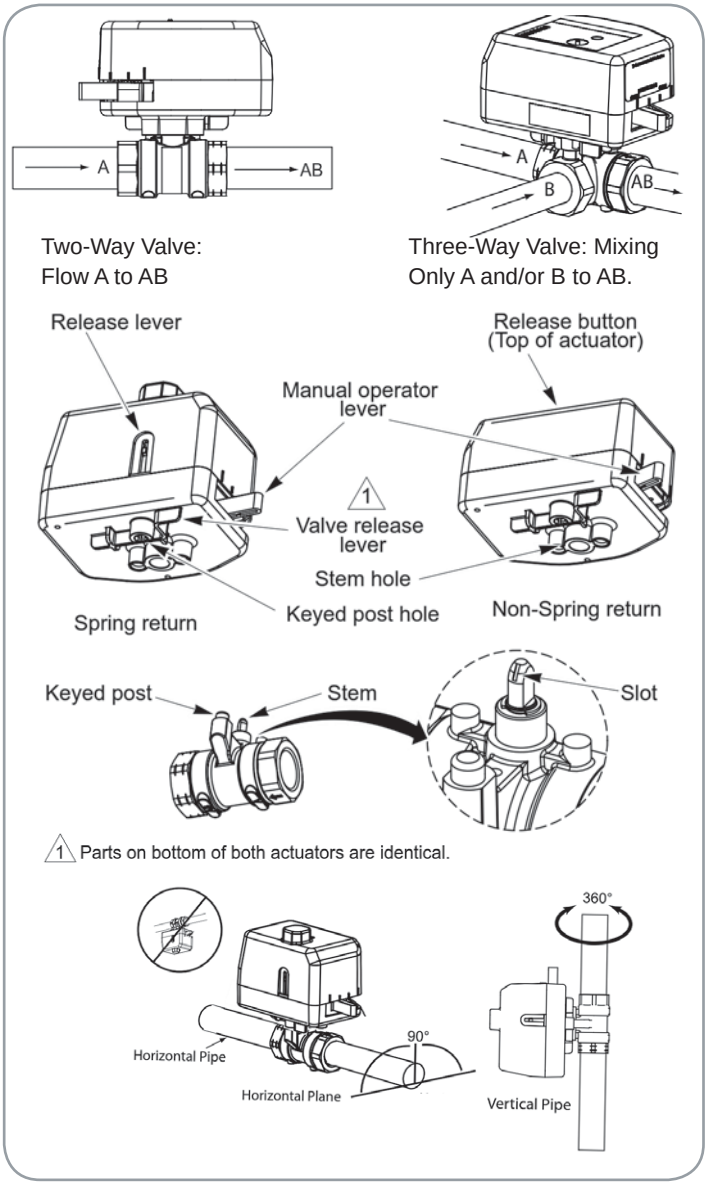
- Wrench/adjustable spanners: 24…42mm (1"…1-5/8")
- Pipe wrench according to pipe size
- Volt-ohm multimeter
- Phillips Head screwdriver

Training

- Installer must be a qualified, experienced technician

Other accessories

- As appropriate.



Piping

NOTICE

RISK OF EQUIPMENT DAMAGE

- Do not install in open systems using substantial make-up water.
- Follow proper water treatment practices and system procedures.

Failure to follow these instructions may cause equipment damage.

These valves must be piped according to the water flow diagram. Two-Way valve flow should go A to AB. Three-way valves should be applied only as mixing valves (see diagram).

Best Practice Guidelines

It is recommended to fit a strainer upstream of the valve to increase reliability and to follow water treatment guidelines as detailed in VDI 2035.

Recommendations

The pipework system should be flushed prior to the operation.

Mounting

The valves can be mounted in horizontal or vertical piping. When installed in horizontal piping, the actuator must be above the valve body. It can be tilted left or right but it must not be tilted below 90° from vertical.

Installation Notes

- It is the responsibility of the installer or product specifier to verify media compatibility of the valves construction materials with the supplier of water treatment/heat transfer solution.
- Confirm there is no overhead water source that may drip onto valve actuator.
- In normal service, some condensation may occur on or around the valve. A drip pan may be necessary or the valve body may be insulated.
- Do not cover the actuator or obstruct the manual operator lever.
- Reference product label and Product Datasheet F-27895 for additional product specifications.

Installing the Valve Body

1. Apply PTFE tape to the male pipe thread.
2. Hand screw the pipe into the valve, turning it as far as it will go.
3. Use a wrench to fully tighten the valve to the pipe. Do not over tighten or strip the threads.

Installing the Actuator on the Valve Body for M21xxxx Unit

1. Turn the valve stem so the slot on top of the stem is pointing towards the large keyed post.
2. Align the valve body with the actuator to ensure the stem lines up with the large stem hole and the large keyed post lines up with the post hole on the bottom of the actuator.
3. Press the valve and actuator together to assemble.

Installing the Actuator on the Valve Body for M22xxxx Unit

1. Turn the valve stem so that the slot on the top of the stem is pointing towards the large keyed post.
2. Insert the allen wrench into the manual crank shaft on the top of the actuator. Crank eight turns in the direction indicated on the label. In the last turn, align the indicator notch to the opening in the crankshaft. Press the button around manual crankshaft to lock in place. Remove and replace allen wrench in cover slot.
3. Align the valve body with the actuator to ensure the stem lines up with the large stem hole and the large keyed post lines up with the post hole on the bottom of the actuator.
4. Press the valve and actuator together to assemble.
5. The first time the valve is operated electrically, the manual operating lever of the actuator will move to the automatic position. The manual operating lever can be used to allow flushing of the system after installation.

Removing the Actuator

NOTICE

RISK OF EQUIPMENT DAMAGE

- Do not use the valve body to manually open the actuator.

Failure to follow this instruction will result in damage to the actuator.

1. Press and hold the valve release lever inward, towards the valve.
2. Lift the actuator from the valve.

Checkout

Make sure the valve stem rotates freely before and after installing the actuator. If the stem does not operate freely it may indicate that the stem was damaged and may require that the valve be replaced. After the piping is under pressure, check the valve body and the connections for leaks. After the valve and actuator are installed, power the actuator and check the operation by varying the control signal. On spring return models, the valve should return to its normal position when power is removed.

Theory of Operation

When powered, the actuator moves to the desired position, winding the spring return system. When power is removed the spring returns the actuator to the normal position. This series of two-position spring return valve assemblies can be purchased with an optional built-in auxiliary SPDT end switch for interfacing or signaling; for example, zone pump burner control. The auxiliary switch is designed for contact closure after the valve is more than 50% open. Do not exceed the published switch electrical ratings. The manual override lever is designed to manually position the actuator to install on the valve or to manually position the valve. Turning the allen wrench in the manual crankshaft while power is applied or in the opposite direction as shown on the label will cause permanent damage. Use only the allen wrench provided with a maximum torque of 10 in-lb.

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Power Action (Two-Position)

Control Signal	Spring Return Open Actuator	Spring Return Closed Actuator
Power On	A to AB Closed	A to AB Open
Power Off	A to AB Open	A to AB Closed

* Two-Way valve operation described. For a three-way valve, A to AB operation is the same. B to AB operation is opposite that of A to AB operation.

Wiring

Make all connections according to job wiring diagrams and in compliance with local and national electrical codes. Refer to diagrams shown for typical wiring.

NOTE:

- Multiple actuators may be connected to a single controller.
- Do not exceed the maximum current draw of the controller.
- Use of a properly sized, inherently limited, Class 2 transformer is recommended.
- Use only 18…24 AWG copper wire for all connectors.

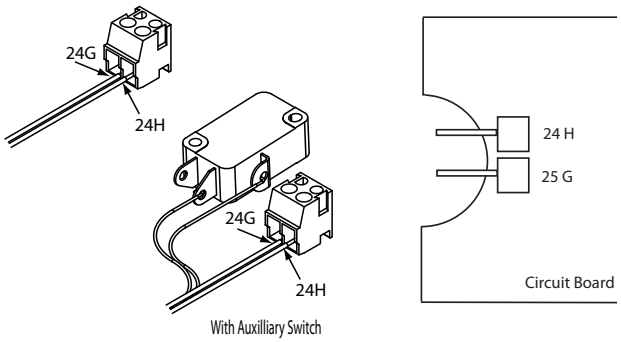
Maintenance

The ball valve assembly itself requires no maintenance. The stem and packing design eliminates the need for packing adjustment for the life of the valve. However, regular maintenance of the total heating and cooling system is recommended to ensure sustained optimum performance.

Field Repair

Neither valve nor actuator are field repairable. Replace entire unit as necessary.

Wiring Terminals			
Board Marking	**Terminal Marking**	**AC Control Signal**	**DC Control Signal**
24H	2	24v	+
24G	1	24v	-



24V Wiring (M2x0Axx)

Terminal Marking	AC Input 50/60 Hz	DC Input 50/60 Hz	Lead Colors
1	24 Vac	-24 Vdc	Black
2	24 Vac	+24 Vdc	Red
SPST Aux Switch			Orange
			Yellow

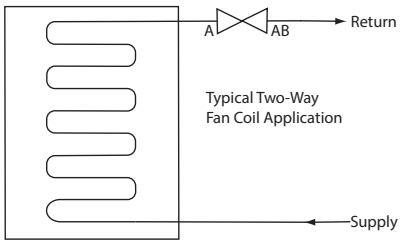
Universal Wiring (M2x0MAxx) Wire Color Table

(100 through 277 50/60 Hz)

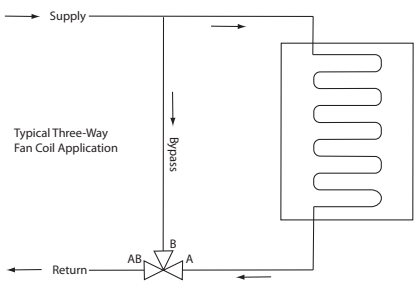
		Lead Colors
N/HOT		Blue
HOT/HOT		Brown
Ground Lead	GND	Green with Yellow Stripe
SPST Aux Switch		Orange
		Yellow

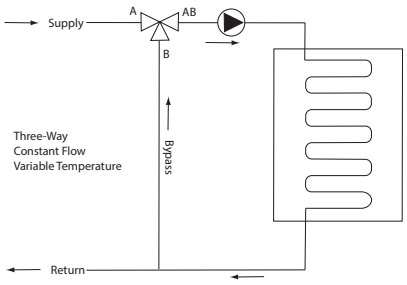
Application Drawing

Typical applications. For simplicity, balancing valves and control devices not shown.



Mixing applications





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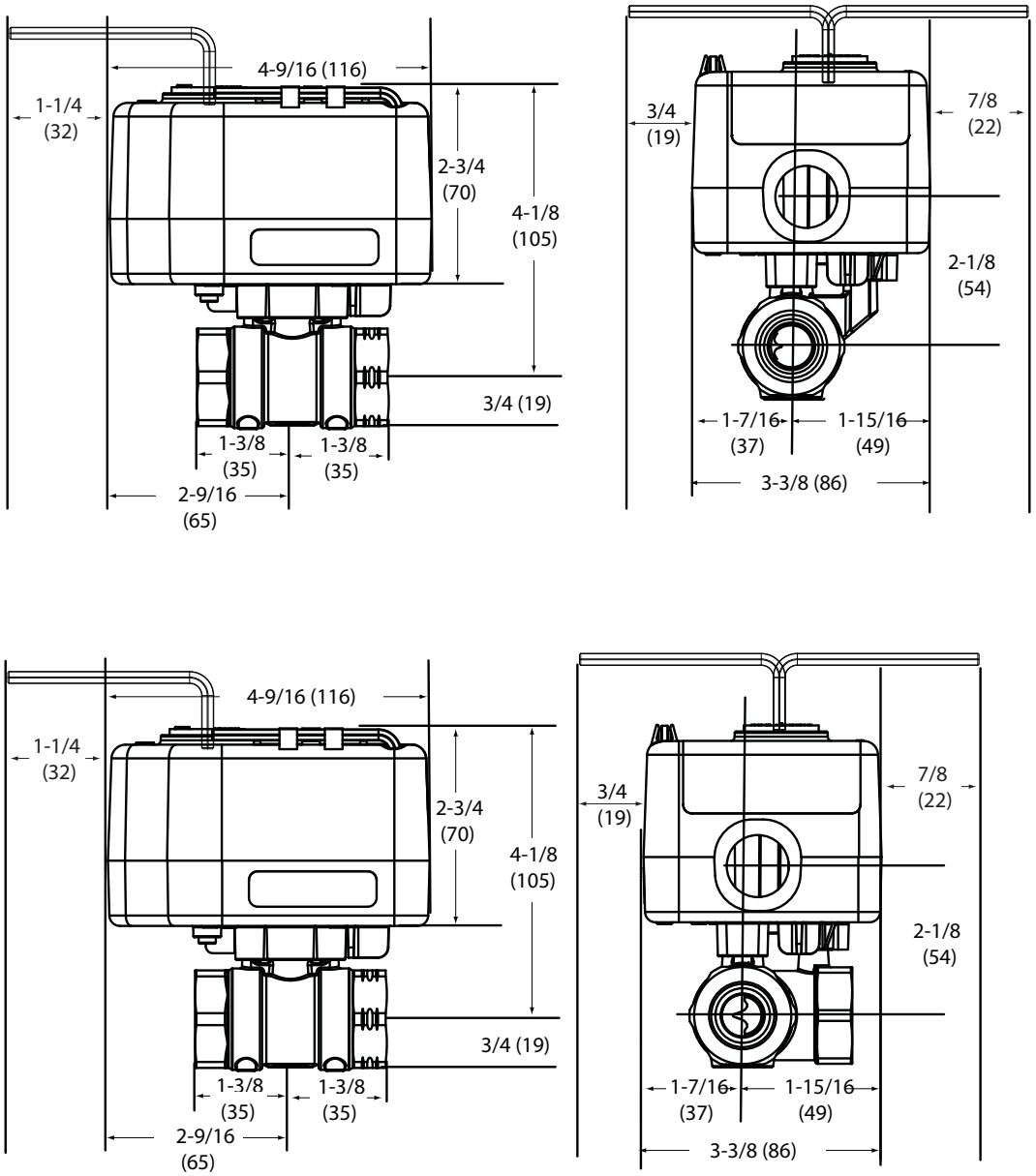
Dimensions



All dimensions shown in inches (mm) format and are rounded to the nearest 1/16".
An additional 1 in (25 mm) is required to remove the actuator from the valve.

Agency Listings

UL873: Underwriters laboratories (File #E9429 Category Temperature Indicating and Regulating Equipment)

CUL: Listed for use in Canada by Underwriters Laboratory. Canadian Standards C22.2 No. 24.

European Community: EMC Directive (2004/108/EC). Low Voltage Directive 2014/35/EU.

Australia: This product meets requirements to bear RCM according to the terms specified by the Communications Authority under the Radio Communications Act of 1992.

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VBB/VBS Series Ball Valves with Proportional Actuators

Inspection

Inspect the package for damage. If package is damaged, notify the appropriate carrier immediately. If undamaged, open the package and inspect the device for obvious damage. Return damaged products.

Requirements

NOTICE

RISK OF EQUIPMENT DAMAGE

- Read and understand the instructions before installing or servicing this product.
- Do not install this product in hazardous or classified locations.
- Turn off all power supplying equipment before working on it.
- Make all connections in accordance with the electrical wiring diagram.
- Do not exceed the product's ratings or maximum limits.
- Use copper conductors only.
- Avoid installation locations exposed to vibration, excessive moisture, and/or corrosive or explosive vapors.
- Avoid electrical noise interference. Do not install near large conductors, electrical machinery, or welding equipment.
- When making wiring connections within the actuator, do not put leads or connectors below the motor.
- This product is a class 2 device.
- The installer is responsible for conformance to all applicable codes.

Failure to follow these instructions may cause equipment damage.

If this product is used in a manner not specified by the manufacturer, the protection provided by the product may be impaired.

No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

Tools (not provided)

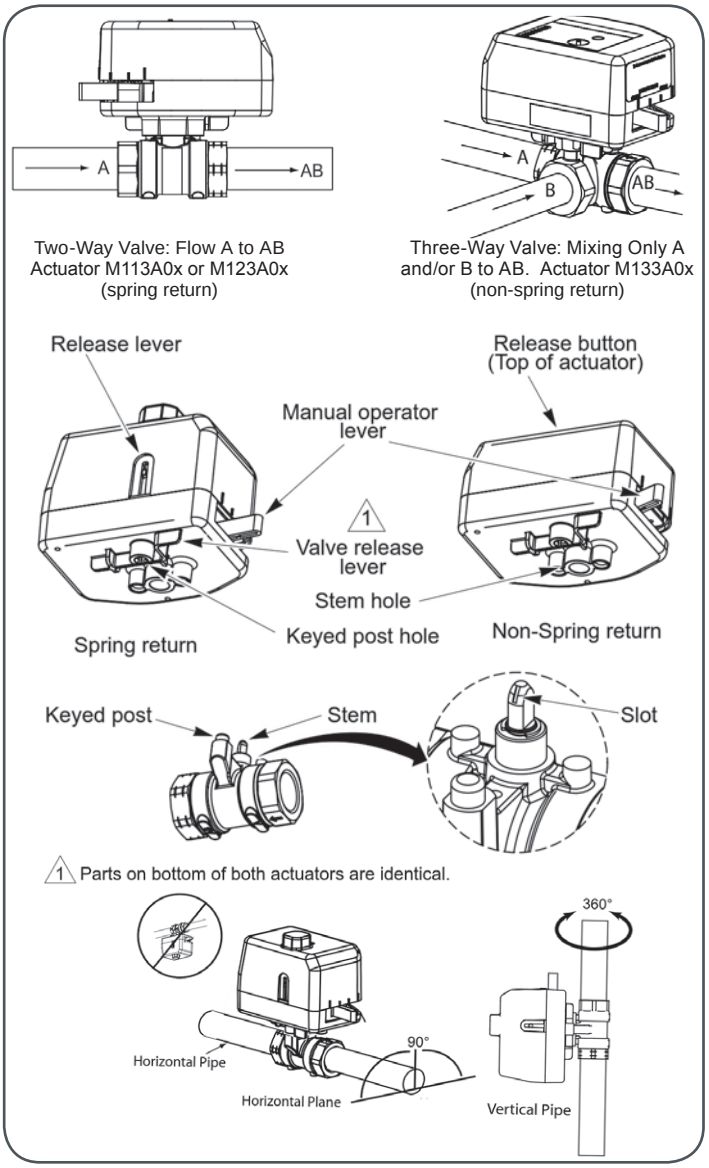
- Wrench/adjustable spanners: 24…42mm (1"…1-5/8")
- Pipe wrench according to pipe size
- Volt-ohm multimeter
- Phillips Head screwdriver

Training

- Installer must be a qualified, experienced technician

Other accessories

- As appropriate.



Piping

NOTICE

RISK OF EQUIPMENT DAMAGE

- Do not install in open systems using substantial make-up water.
- Follow proper water treatment practices and system procedures.

Failure to follow these instructions may cause equipment damage.

These valves must be piped according to the water flow diagram. Two-Way valve flow should go A to AB. Three-way valves should be applied only as mixing valves (see diagram).

Best Practice Guidelines

It is recommended to fit a strainer upstream of the valve to increase reliability and to follow water treatment guidelines as detailed in VDI 2035.

Recommendations

The pipework system should be flushed prior to the operation.

Mounting

The valves can be mounted in horizontal or vertical piping. When installed in horizontal piping, the actuator must be above the valve body. It can be tilted left or right but it must not be tilted below 90° from vertical.

Installation Notes

- Confirm there is no overhead water source that may drip onto valve actuator.
- In normal service, some condensation may occur on or around the valve. A drip pan may be necessary or the valve body may be insulated.
- Do not cover the actuator or obstruct the manual operator lever.
- Reference product label and Product Datasheet F-27895 for additional product specifications.

It is the responsibility of the installer or product specifier to verify media compatibility of the valves construction materials with the supplier of water treatment/heat transfer solution.

Installing the Valve Body

Apply PTFE tape to the male pipe thread. Hand screw the pipe into the valve, turning it as far as it will go. Use a wrench to fully tighten the valve to the pipe. Do not over tighten or strip the threads.

Installing the Actuator on the Valve Body

1. Turn the valve stem so the slot on top of the stem is pointing towards the large keyed post.
2. Do one of the following:

- For a spring return actuator, press the red lever down and rotate the manual operating lever to align the stem hole with the valve stem. Then slide the red lever up to lock the manual lever in place.
- For a non-spring actuator, press and hold the red release button on the top of the actuator and rotate the manual operating lever to align the stem hole with the valve stem, then release the red button.

3. Align the valve body with the actuator so the stem lines up with the large stem hole and the large keyed post lines up with the post hole on the bottom of the actuator.
4. Firmly press the valve and actuator together to lock into place.

The first time the valve is operated electrically, the manual operating lever of the actuator will move to the automatic position. The manual operating lever can be used to allow flushing of the system after installation.

Removing the Actuator

NOTICE

RISK OF EQUIPMENT DAMAGE

- Do not use the valve body to manually open the actuator.

Failure to follow this instruction will result in damage to the actuator.

NOTE: Make sure the valve stem rotates freely before and after installing the actuator. If the stem does not operate freely it may indicate that the stem was damaged and may require that the valve be replaced.

1. Press and hold the valve release lever inward, towards the valve.
2. Lift the actuator from the valve.
3. After the piping is under pressure, check the valve body and the connections for leaks.
4. After the valve and actuator are installed, power the actuator and check the operation by varying the control signal. On spring return models, the valve should return to its normal position when power is removed.

Theory of Operation

This series of proportional valve actuator assemblies is designed to make incremental adjustments to flow based on the control signal input. This actuator is not intended for continuous use in zero dead band control systems.

When power is removed for more than two seconds, spring return valve assemblies return to their normal position. Non-spring return valve assemblies remain at their last position when power is removed. The spring return feature should not be used for routine, normal operation.

Proportional Actuators perform a self-calibration cycle on power-up. The actuator will run to the open direction for approximately 20 seconds and then closed direction for approximately 2 ½ min (60 Hz) or 3 ½ min (50Hz). Once this cycle is complete, the actuator will then accept and respond to the control signal.

NOTE: Do not use the manual operator while power is applied to the actuator. If the actuator is manually positioned while power is applied, the calibration cycle must be completed again for the actuator to function properly. To recalibrate the actuator, cycle power off for more than 6 seconds.

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Wiring

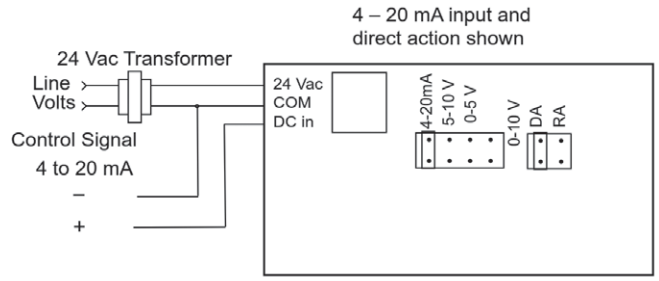
Make all connections according to job wiring diagrams and in compliance with local and national electrical codes. See the diagrams for typical wiring.

NOTE:

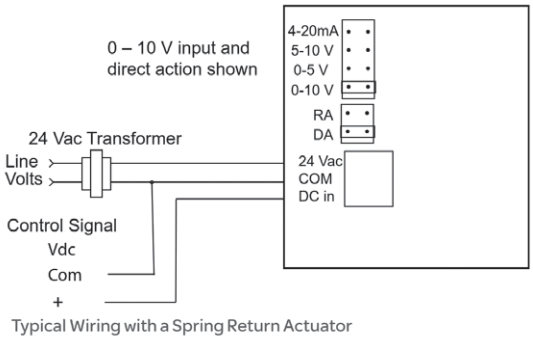
- Multiple actuators may be connected to a single controller.
- Do not exceed the maximum current draw of the controller.
- Use only one spring return actuator per 10 VA transformer.
- Use properly sized, inherently limited, Class 2 transformer(s).
- Use only 18…24 AWG (0.75…0.22 mm^2) copper wire for all connectors.
- For 4…20 mA dc control, a separate isolation transformer must be used with each valve.

Control Signal and Action Selection

The control signal input is selected by means of the input signal jumper on the actuator circuit board. Control action is also selectable with the control action jumper. All actuators are shipped with the input signal jumper set for a 0…10 Vdc control signal and the control action jumper set for direct action (DA; valve opens with increasing control signal). For more information see Guidelines for Powering Multiple Actuators EN-206 (F-26363).



Typical Wiring with a Non-Spring Return Actuator



Typical Wiring with a Spring Return Actuator

Maintenance

The ball valve assembly itself requires no maintenance. The stem and packing design eliminates the need for packing adjustment for the life of the valve. However, regular maintenance of the total heating and cooling system is recommended to establish sustained optimum performance.

Field Repair

Neither valve nor actuator are field repairable. Replace entire unit as necessary.

Agency Listings

European Community: EMC Directive 2014/30/EU. Low Voltage Directive 2014/35/EU. UL873: Underwriters laboratories (File #E9429 Category Temperature Indicating and Regulating Equipment) CUL: Listed for use in Canada by Underwriters Laboratory. Canadian Standards C22.2 No. 24. Australia: This product meets requirements to bear the RCM mark according to the terms specifi ed by the Communications Authority under the Radio Communications Act of 1992.

Power/Failure Action (Proportional)

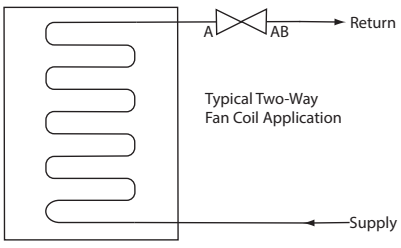
Control Signal	Position upon power loss		
	Non-Spring Return Actuator	Spring Return Open Actuator - Fail Open	Spring Return Closed Actuator - Fail Closed
DA jumpered - increase in control signal will open A to AB	Maintain last position	Will spring A to AB open	Will spring A to AB closed
RA jumpered - increase in control signal will close A to AB			

NOTE: Two-Way valve operation described. For a three-way valve, A to AB operation is the same. B to AB operation is opposite that of A to AB operation.

Application Schematics

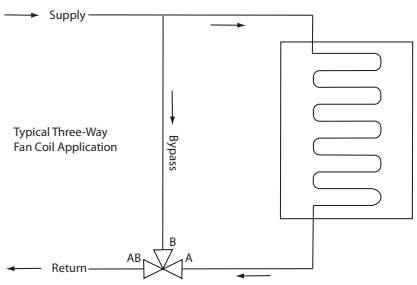
Typical applications

For simplicity, balancing valves and control devices are not shown.

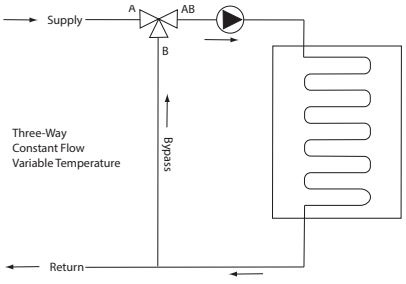


Typical Two-Way Fan Coil Application

Mixing applications



Typical Three-Way Fan Coil Application



Three-Way Constant Flow Variable Temperature

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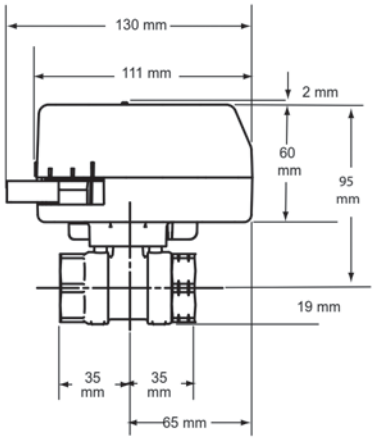
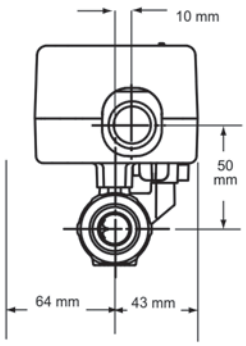
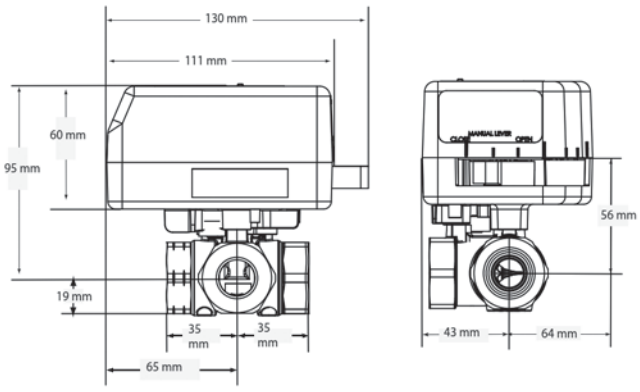
Dimensions

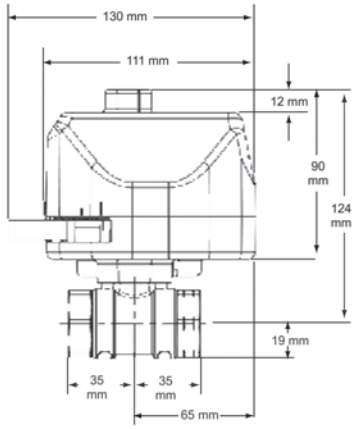


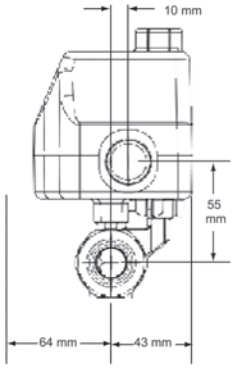


Two-Way Non-Spring Return

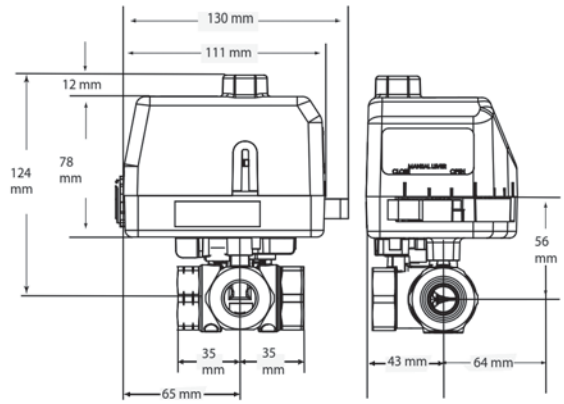


Three-Way Non-Spring Return





Two-Way Spring Return



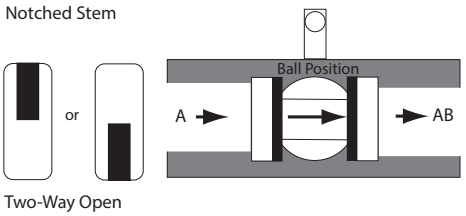
Three-Way Spring Return

An additional 1 in (25 mm) is required to remove the actuator from the valve.

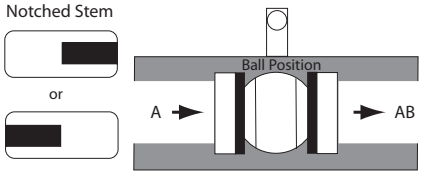
Flow Direction

A notch is cut into the tip of the valve stem. This notch is an external indicator of the closed portion of the ball within the valve. Check the notch position prior to assembling the actuator to verify the ball is orientated in the correct plane.

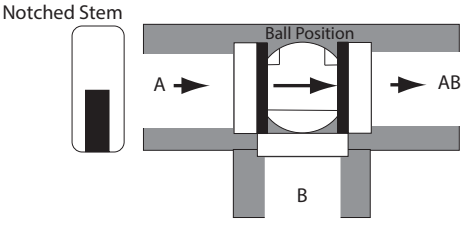
The drawings below indicate the stem notch position and the corresponding ball valve flow path.



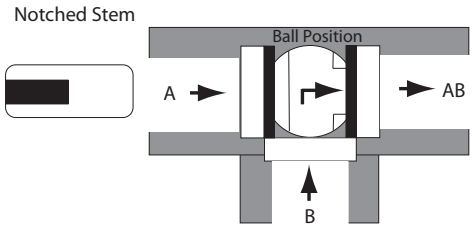
Two-Way Open



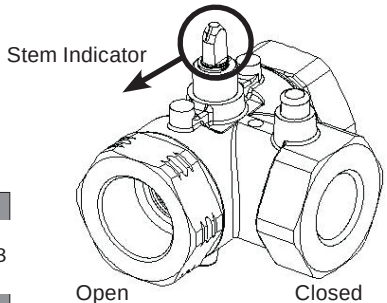
Two-Way Closed



Three-Way, A-Port Open, B-Port Closed



Three-Way, A-Port Closed, B-Port Open



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VBB/VBS Series Ball Valve Assemblies

Application

The VBB and VBS Series valves with SmartX Actuators are Two-Way or Three-way, 1/2” or 3/4” (15 mm or 20 mm), characterized ball valves. The M1 and M2 SmartX Actuators are direct coupled
to the VBB/VBS Series valves and accept two-position, floating or proportional control signals from a DDC system, controller, or thermostat for control of hot or chilled water, or solutions of up to 60% glycol.
Typical applications include VAV reheat, fan coil units, hot and chilled water coils in air handling units, heat pumps and unit ventilators.

Features

- Easy product selection — all actuators fit all valve bodies.
- Fast, easy actuator installation — no linkage or tools required.
- Flow characterizing insert provides equal percentage flow characteristic for stable, accurate floating and proportional control.
- ANSI IV seat leakage (0.01%) for both Two-Way and Three-way valves (A and B port).
- Brass and stainless steel trim models.
- Cvs from 0.3…10.
- Normally open, normally closed, and non-spring return assemblies available.
- Two-position, Floating or Proportional (0…5 Vdc, 0…10 Vdc, 5…10 Vdc, or 4…20 mA dc, jumper selectable).
- Proportional actuator is direct or reverse acting, jumper selectable.
- RoHS Compliant (VBS Assemblies).
- Reach Compliant.

Applicable Literature

- VBB and VBS Series Two-position Spring-Return Ball Valves Installation Instructions, F-27392.
- VBB and VBS Series Floating Spring Return and Non-spring Return Ball Valves Installation Instructions, F-27393.
- VBB and VBS Series Proportional Spring Return and Non-spring Return Ball Valves Installation Instructions, F-27394.
- VBB and VBS Series Brochure, F-27681.
- EN-205 Water System Guidelines, F-26080.
- EN-206 Guidelines for Powering Multiple Actuators, F-26363.

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April, 2016 tc

Specfications

Actuator

Voltage		24 Vac for floating and proportional 110…230 Vac for two position multi-voltage types
Power Requirements		See Table-1, Table-2, and Table-3.
Control Signal		2-Position, Floating, or Proportional; half wave rectified power supply
Timing, Full Open to Full Close		See Table-1, Table-2 and Table-3.
Manual Operating Lever / Position Indicator		Standard on all models.
Auxiliary End Switch (optional)		SPST 24 Vac/Vdc, 101 mA…5 A max.
Materials		Thermoplastic base and cover. Approved for use in air plenums.
Shipping & Storage Temperature Limit		-40…169 °F (-40…76°C).
Operating Temperature Limit at max fluid temp.	Floating	32…140 °F (0…60 °C)
	Proportional	32…140 °F (0…60 °C)
	Two-Position	32…169 °F (0…76°C)
	Humidity	5…95% relative humidity, non-condensing.
Locations		NEMA 2, IEC IP31. Indoor Use Only.
Seat Material		PTFE.
Characterized Insert		Glass-filled PEEK.

Valve

Service[a]	Hot and chilled water, up…60% glycol.
System Static Pressure Limit	600 psi (4137 kPa).
Fluid Temperature Limit	20…250°F (-7…121°C).
Cv (Kv)	See Table-4, Table-5, Table-6, and Table-7.
Close-off Pressure[b]	130 psi Two-Way; 70 psi Three-Way
Differential Pressure	30 psi normal operation 20 psi quiet operation.
Seat Leakage	ANSI class IV (0.01%) at both A and B ports with pressure at inlet.
End Connections	NPT threaded (VBxxNxx) and Rp threaded (VBxxRxx).
Rangeability	Greater than 300:1.
Body Material	Forged brass.
Stem Material	Stainless steel anti-blow out stem with dual Viton™ o-rings.
Ball Material	Chrome plated brass (VBB series) or stainless steel (VBS series).

a. Not rated for steam service.

b. Close-off is defined as the maximum allowable pressure drop to which a valve may be subjected while fully closed.

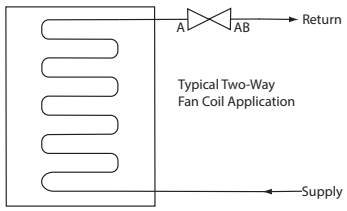
Agency Listings

UL873 (Actuator)	Underwriters Laboratories (File #E9429 Temperature Indicating and Regulating Equipment).
cULus (Actuator)	Listed for use in Canada by Underwriters Laboratories. Canadian Standards C22.2 No. 24.
European Community	EMC Directive 2014/30/EU, M2 (2004/108/EC). Low Voltage Directive 2014/35/EU.
Australia	This product meets requirements to bear the RSM Mark according to the terms specified by the Communications Authority under the Radio Communications Act of 1992.
Plenum Rating	Actuators with terminal block or plenum cable leads are plenum rated per UL file number E9429.
CRN Number	#OCO970.9087TN.
RoHS Compliant	VBS valves and M1/M2 actuators comply with European Directive RoHS 2 Directive 2011/65/EU. Please consult factory for part number specific compliance.
REACH Compliant	Compliant as defined in Article 33 of the REACH regulation No. 1907/2006.

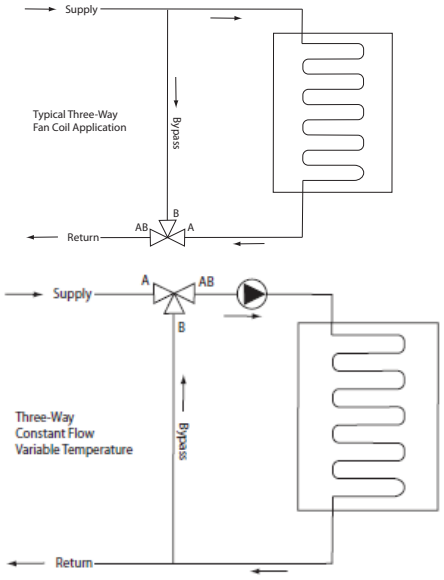
Application Schematics

Typical applications

For simplicity, balancing valves and control devices are not shown.



Mixing applications



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Product Selection: Actuators

Table-1: Two-Position Actuators

Part Number	Control Signal	Spring Return Action (Valve Normal Position)	VA / Voltage	Leads	Stroke Timing (g)	Spring Return Timing (g)	End Switch
M210A00	Two-Position	Normally Open	3.5/1.8 at 24 Vac/24 Vdc	Removeable Terminal Block[b]	50 sec	35 sec.	
M210A01				10 ft. (3.05 m) Plenum Cable[c]			
M210A11							SPST
M210A02				18 in. (45 cm) Appliance Wire			
M210A12							SPST
M210M02			3.5/1.8 at 24 Vac/24 Vdc	18 in. (45 cm) Appliance Wire			
M210M12							SPST
M220A00		Normally Closed	3.5/1.8 at 24 Vac/24 Vdc	Removeable Terminal Block[b]			
M220A01				10 ft. (3.05 m) Plenum Cable[c]			
M220A11							SPST
M220A02				18 in. (45 cm) Appliance Wire			
M220A12							SPST
M220M02			6.0/6.0 at 100 V -277 Vac, 50/60 Hz				
M220M12							SPST

Table-2 Floating Actuators

Part Number	Control Signal	Spring Return Action (Valve Normal Position)	VA @ 24 Vac 50/60 Hz	Leads	Stroke Time, sec. 50/60 Hz	Time-out Delay, sec. 50/60 Hz
M131A00	Floating	None	2.3/2.4	Terminal Block[b]	159/135	N/A[f]
M131A01				10 ft. (3.05 m) Plenum Cable[c]		
M132A00			2.5/2.5	Terminal Block[b]		217/181
M132A01				10 ft. (3.05 m) Plenum Cable[c]		
M112A00		Normally Open	3.2/3.3[d]	Terminal Block[b]		
M112A01				10 ft. (3.05 m) Plenum Cable[c]		
M122A00		Normally Closed		Terminal Block[b]		
M122A01				10 ft. (3.05 m) Plenum Cable[c]		

Table-3 Proportional Actuators

Part Number	Control Signal	Spring Return Action (Valve Normal Position)	VA @ 24 Vac 50/60 Hz	Leads	Stroke Time, sec. 50/60 Hz	Time-out Delay, sec. 50/60 Hz
M133A00	Proportional[a] (0…5 Vdc, 0…10 Vdc, 5…10 Vdc, 4…20 mA dc [e])	None	2.7/2.8	Terminal Block[b]	159/135	200/166
M133A01				10 ft. (3.05 m) Plenum Cable[c]		
M113A00		Normally Open	2.7/2.8[d]	Terminal Block[b]		
M113A01				10 ft. (3.05 m) Plenum Cable[c]		
M123A00		Normally Closed		Terminal Block[b]		
M123A01				10 ft. (3.05 m) Plenum Cable[c]		

a. Jumper selectable. Default configured for 0…10 Vdc input signal, direct acting control.
b. All terminal block and appliance wire units accept a 1/2” (12.7 mm) conduit connector fitting (.875” diameter (22.2 mm)).
c. All plenum cable units include an integral 3/8” (9.5 mm) conduit connector fitting.
d. Size transformer for 10 VA per actuator.
e. For 4…20 mA control, a separate isolated transformer must be used with each valve.
f. No time-out feature. Controller must provide time-out after three minutes.
g. Nominal.

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Product Selection: Brass Trim Valves

Table-4 Two-Way Brass Trim Valve Bodies

Size	Part Number	End Connection	Cv (Kv)	Size	Part Number	End Connection	Cv (Kv)
1/2"	VBB2N00	NPT	0.3 (0.3)	15 mm (Rp 1/2)	VBB2R00	Rp [a]	0.3 (0.3)
	VBB2N01		0.7 (0.6)		VBB2R01		0.7 (0.6)
	VBB2N02		1.2 (1.0)		VBB2R02		1.2 (1.0)
	VBB2N03		2.1 (1.8)		VBB2R03		2.1 (1.8)
	VBB2N04		3.5 (3.0)		VBB2R04		3.5 (3.0)
	VBB2N05		4.7 (4.1)		VBB2R05		4.7 (4.1)
	VBB2N06		7.7 (6.7)		VBB2R06		7.7 (6.7)
	VBB2N07 [b]		10 (8.7)		VBB2R07[b]		10 (8.7)
3/4"	VBB2N10		0.3 (0.3)	20 mm (Rp 3/4)	VBB2R10		0.3 (0.3)
	VBB2N11		0.7 (0.6)		VBB2R11		0.7 (0.6)
	VBB2N12		1.2 (1.0)		VBB2R12		1.2 (1.0)
	VBB2N13		2.1 (1.8)		VBB2R13		2.1 (1.8)
	VBB2N14		3.5 (3.0)		VBB2R14		3.5 (3.0)
	VBB2N15		4.7 (4.1)		VBB2R15		4.7 (4.1)
	VBB2N16		7.7 (6.7)		VBB2R16		7.7 (6.7)
	VBB2N17 [b]		10 (8.7)		VBB2R17 [b]		10 (8.7)

a. Metric Pipe Thread-Female

b. Full Port Model without characterized disc.

Table-5 Three-Way Brass Trim Valve Bodies

Size	Part Number	End Connection	Cv (Kv) A Port	Cv (Kv) B Port	Size	Part Number	End Connection	Cv (Kv) A Port	Cv (Kv) B Port
1/2"	VBB3N00	NPT	0.3 (0.3)	0.3 (0.3)	15 mm (Rp 1/2)	VBB3R00	Rp [a]	0.3 (0.3)	0.3 (0.3)
	VBB3N01		0.6 (0.5)	0.8 (0.7)		VBB3R01		0.6 (0.5)	0.8 (0.7)
	VBB3N02		1.0 (.85)	0.8 (0.7)		VBB3R02		1.0 (.85)	0.8 (0.7)
	VBB3N03		2.0 (1.7)	1.5 (1.3)		VBB3R03		2.0 (1.7)	1.5 (1.3)
	VBB3N04		3.0 (2.6)	1.5 (1.3)		VBB3R04		3.0 (2.6)	1.5 (1.3)
	VBB3N05		4.5 (3.9)	2.7 (2.3)		VBB3R05		4.5 (3.9)	2.7 (2.3)
	VBB3N06		7.3 (6.3)	4.1 (3.5)		VBB3R06		7.3 (6.3)	4.1 (3.5)
	VBB3N07[b]		10.0 (8.7)	4.8 (4.1)		VBB3R07[b]		10.0 (8.7)	4.8 (4.1)
3/4"	VBB3N10		0.3 (0.3)	0.3 (0.3)	20 mm (Rp 3/4)	VBB3R10		0.3 (0.3)	0.3 (0.3)
	VBB3N11		0.6 (0.5)	0.8 (0.7)		VBB3R11		0.6 (0.5)	0.8 (0.7)
	VBB3N12		1.0 (.85)	0.8 (0.7)		VBB3R12		1.0 (.85)	0.8 (0.7)
	VBB3N13		2.0 (1.7)	1.5 (1.3)		VBB3R13		2.0 (1.7)	1.5 (1.3)
	VBB3N14		3.0 (2.6)	1.5 (1.3)		VBB3R14		3.0 (2.6)	1.5 (1.3)
	VBB3N15		4.5 (3.9)	2.7 (2.3)		VBB3R15		4.5 (3.9)	2.7 (2.3)
	VBB3N16		7.3 (6.3)	4.1 (3.5)		VBB3R16		7.3 (6.3)	4.1 (3.5)
	VBB3N17[b]		10.0 (8.7)	4.8 (4.1)		VBB3R17[b]		10.0 (8.7)	4.8 (4.1)

a. Metric Pipe Thread-Female

b. Full Port Model without characterized disc.

Application Note for Two-Way and Three-way Valves

The VBB/VBS Series Ball Valves are Characterized Control Ball Valves. They are designed so that flow thru the A-port exhibits equal percentage flow. Thus, the A-port is the control port.

In a Three-way valve, the B-port is the bypass port. Flow thru the B-port is designed to be less than that of the A-port. In most applications, this reduced flow compensates for the pressure drop that is seen by the coil supplied by the A-port.

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Product Selection: Stainless Steel Trim Valves

Table-6 Two-Way Stainless Steel Trim Valve Bodies

Size	Part Number	End Connection	Cv (Kv)	Size	Part Number	End Connection	Cv (Kv)
1/2”	VBS2N00	NPT	0.3 (0.3)	15 mm (Rp 1/2)	VBS2R00	Rp [a]	0.3 (0.3)
	VBS2N01		0.7 (0.6)		VBS2R01		0.7 (0.6)
	VBS2N02		1.2 (1.0)		VBS2R02		1.2 (1.0)
	VBS2N03		2.1 (1.8)		VBS2R03		2.1 (1.8)
	VBS2N04		3.5 (3.0)		VBS2R04		3.5 (3.0)
	VBS2N05		4.7 (4.1)		VBS2R05		4.7 (4.1)
	VBS2N06		7.7 (6.7)		VBS2R06		7.7 (6.7)
	VBS2N07 [b]		10 (8.7)		VBS2R07[b]		10 (8.7)
3/4”	VBS2N10		0.3 (0.3)	20 mm (Rp 3/4)	VBS2R10		0.3 (0.3)
	VBS2N11		0.7 (0.6)		VBS2R11		0.7 (0.6)
	VBS2N12		1.2 (1.0)		VBS2R12		1.2 (1.0)
	VBS2N13		2.1 (1.8)		VBS2R13		2.1 (1.8)
	VBS2N14		3.5 (3.0)		VBS2R14		3.5 (3.0)
	VBS2N15		4.7 (4.1)		VBS2R15		4.7 (4.1)
	VBS2N16		7.7 (6.7)		VBS2R16		7.7 (6.7)
	VBS2N17 [b]		10 (8.7)		VBS2R17 [b]		10 (8.7)

a. Metric Pipe Thread-Female

b. Full Port Model without characterized disc.

Table-7 Three-Way Stainless Steel Trim Valve Bodies

Size	Part Number	End Connection	Cv (Kv) A Port	Cv (Kv) B Port	Size	Part Number	End Connection	Cv (Kv) A Port	Cv (Kv) B Port
1/2”	VBS3N00	NPT	0.3 (0.3)	0.3 (0.3)	15 mm (Rp 1/2)	VBS3R00	Rp [a]	0.3 (0.3)	0.3 (0.3)
	VBS3N01		0.6 (0.5)	0.8 (0.7)		VBS3R01		0.6 (0.5)	0.8 (0.7)
	VBS3N02		1.0 (.85)	0.8 (0.7)		VBS3R02		1.0 (.85)	0.8 (0.7)
	VBS3N03		2.0 (1.7)	1.5 (1.3)		VBS3R03		2.0 (1.7)	1.5 (1.3)
	VBS3N04		3.0 (2.6)	1.5 (1.3)		VBS3R04		3.0 (2.6)	1.5 (1.3)
	VBS3N05		4.5 (3.9)	2.7 (2.3)		VBS3R05		4.5 (3.9)	2.7 (2.3)
	VBS3N06		7.3 (6.3)	4.1 (3.5)		VBS3R06		7.3 (6.3)	4.1 (3.5)
	VBS3N07[b]		10.0 (8.7)	4.8 (4.1)		VBS3R07[b]		10.0 (8.7)	4.8 (4.1)
3/4”	VBS3N10		0.3 (0.3)	0.3 (0.3)	20 mm (Rp 3/4)	VBS3R10		0.3 (0.3)	0.3 (0.3)
	VBS3N11		0.6 (0.5)	0.8 (0.7)		VBS3R11		0.6 (0.5)	0.8 (0.7)
	VBS3N12		1.0 (.85)	0.8 (0.7)		VBS3R12		1.0 (.85)	0.8 (0.7)
	VBS3N13		2.0 (1.7)	1.5 (1.3)		VBS3R13		2.0 (1.7)	1.5 (1.3)
	VBS3N14		3.0 (2.6)	1.5 (1.3)		VBS3R14		3.0 (2.6)	1.5 (1.3)
	VBS3N15		4.5 (3.9)	2.7 (2.3)		VBS3R15		4.5 (3.9)	2.7 (2.3)
	VBS3N16		7.3 (6.3)	4.1 (3.5)		VBS3R16		7.3 (6.3)	4.1 (3.5)
	VBS3N17[b]		10.0 (8.7)	4.8 (4.1)		VBS3R17[b]		10.0 (8.7)	4.8 (4.1)

a. Metric Pipe Thread-Female

b. Full Port Model without characterized disc.

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Ball Valve Assembly Selection Procedure

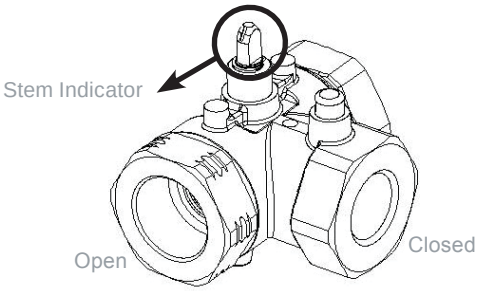
1. Select the actuator. When selecting a ball valve assembly, you must know the control signal type and voltage to first select an actuator. Consult the following tables: Table-1 covers two-position actuator specifications and model numbers, Table-2 covers floating actuator specifications and model numbers and Table-3 covers proportional actuator specifications and model numbers.
2. Select the valve body. The valve body model number is selected based on the line size (1/2" or 3/4", 15 mm or 20 mm), ball material trim, and flow coefficient (Cv/Kv) required. Consult Table-4 and Table-5 for brass trim valve body specifications and model numbers and Table-6 and Table-7 for stainless steel trim valve body specifications and model numbers. See "Flow Coefficient Selection" for information in determining the flow coefficient.

Other considerations

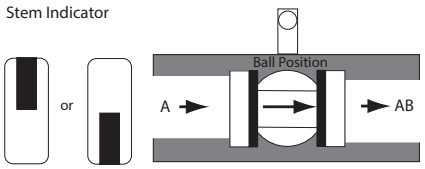
1. General service conditions: Make sure the actuator is suitable for the anticipated ambient conditions and that the valve body is compatible with the system fluid temperature and pressure requirements.
2. Close-off pressure: Confirm that the VBB/VBS ball valve's close off rating is suitable for the valve control application.
3. Space requirements: If mounting space limitations are a consideration, check the actuator/valve assembly dimensions.
4. Pipe reducers: Refer to Tables for estimating effective Cvs when using pipe reducers.
5. Ordering information. You may order the actuator and valve body separately or as a factory assembly. To order a complete valve and actuator assembly, specify the valve body part number and the actuator part number separated by a "+." Example: To order actuator valve body VBB2N15 and M112A00 as a factory valve/actuator assembly, specify VBB2N15+M112A00.

Flow Direction

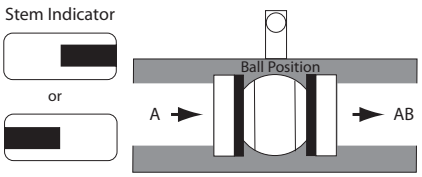
A notch cut into the stem indicator at the tip of the valve stem is an external indicator of where the closed portion of the ball sits internally. Check the notch position prior to assembling the actuator to verify the ball is orientated in the correct plane.



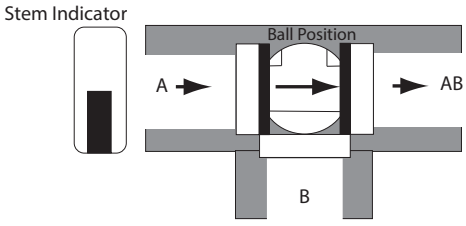
In the drawings below, the black mark on the stem indicator represents this stem notch.



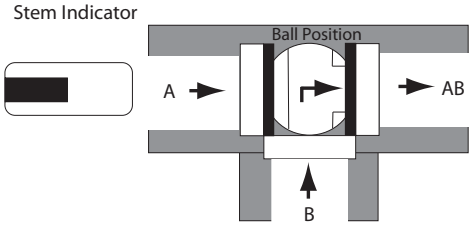
Two-Way Open



Two-Way Closed



Three-Way, A-Port Open, B-Port Closed



Three-Way, A-Port Closed, B-Port Open

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Document Number: F-27395-9

Application Notes

The VBB/VBS Series Ball Valves are valve actuator assemblies designed to make incremental adjustments to flow based on the control signal input. The actuators are not intended for continuous use in zero dead band control systems.

SmartX Two-Position Spring Return Actuators

When powered, the actuator moves to the desired position, winding the spring return system. When power is removed, the spring returns the actuator to the normal position. Two position spring return actuators can be purchased with an optional built-in auxiliary SPST end switch for interfacing or signaling; for example, zone pump burner control. Do not use the manual operator while power is applied to the actuator. Manual positioning of the actuator while power is applied is NOT recommended.

SmartX Floating/Proportional Spring Return Actuators

When power is applied to the actuator, there is a 3-second delay before the solenoid latches and the gear train is engaged. Upon power loss, the solenoid releases after 2 seconds, allowing the actuator to spring return to normal position. This prevents the loss of valve position during brief outages. The spring return feature should not be used for routine, normal operation.

SmartX Proportional Spring Return and Non-Spring Return Actuators

The control signal input and action is selected by means of the input signal jumper on the actuator circuit board. All actuators are shipped with the input signal jumper set for a 0…10 Vdc control signal and the control action jumper set for direct action (DA; valves opens with increasing control signal). Multiple actuators may be connected to a single controller. Do not exceed the maximum current draw of the controller or transformer. When using a 4…20 mA dc control signal, a separate isolation transformer must be used with each actuator.

Proportional Actuators perform a self-calibration cycle on power-up. The actuator will run to the open direction for approximately 20 seconds and then closed direction for approximately 2 ½ min (60 Hz) or 3 ½ min (50Hz). See Table-2 for exact timing. Once this cycle is complete, the actuator will then accept and respond to the control signal.

Manual positioning of the actuator while power is applied is NOT recommended. If the actuator is manually positioned while power is applied, the calibration cycle will need to be completed again for the actuator to function properly. To recalibrate the actuator, cycle power off for more than 6 seconds.

SmartX Floating Spring Return and Non-Spring Return Actuators

Spring Return and Non-Spring Return actuators with time-out will automatically limit the running time of the actuator. The time-out feature automatically cuts off the control signal to the valve after three minutes (see Table-1) of continuous operation. Upon change in control signal direction, the actuator will resume operation. The controller or thermostat used to operate the Non-Spring Return Floating actuator without timeout must be configured to turn off the control signal after being continuously on for three minutes. Multiple actuators may be connected to a single controller. Do not exceed the maximum current draw of the controller or transformer.

Power/Failure Action

	Control Signal	Position upon loss of power		
		Non-Spring Return Actuator	Spring Return Open Actuator - Fail Open	Spring Return Closed Actuator - Fail Closed
Floating	Power to "Open" terminal will open A to AB	Maintain last position	Will spring A to AB open	Will spring A to AB closed
Proportional	DA jumpered - increase in control signal will open A to AB	Maintain last position	Will spring A to AB open	Will spring A to AB closed
	RA jumpered - increase in control signal will close A to AB	Maintain last position	Will spring A to AB open	Will spring A to AB closed

	Control Signal	Spring Return Open Actuator	Spring Return Closed Actuator
2-Position	Power On	A to AB Closed	A to AB Open
	Power Off	A to AB Open	A to AB Closed

Note: Two-Way valve operation described. For a Three-way valve, A to AB operation is the same. B to AB operation is opposite that of A to AB operation.

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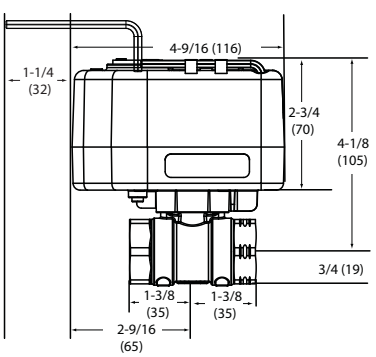
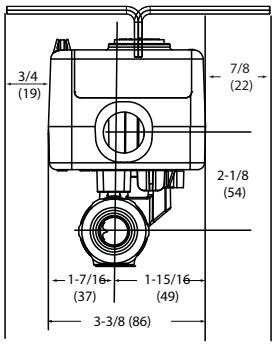
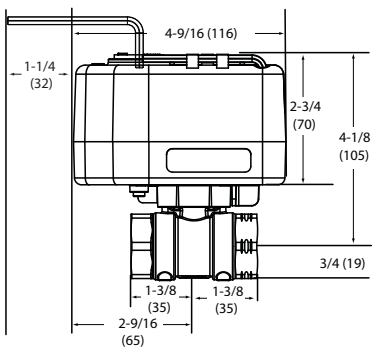
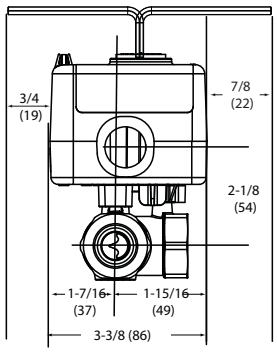
Dimensions



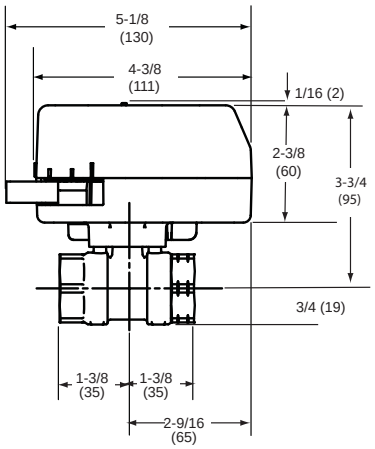


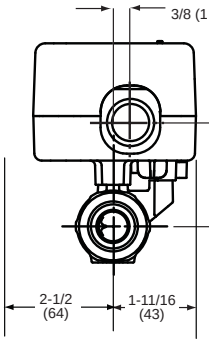
Two-Way Spring Return Two Position Assembly
Shipping Weight: 2.8 lbs (1270 g)



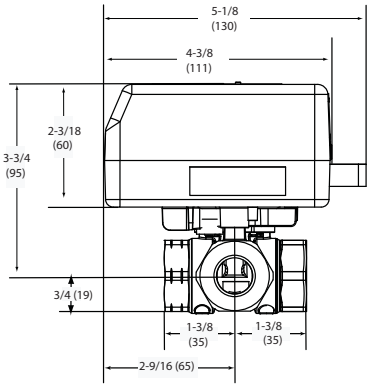


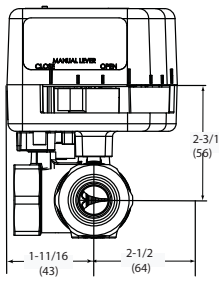
Three-Way Spring Return Two Position Assembly
Shipping Weight: 3.0 lbs (1360 g)



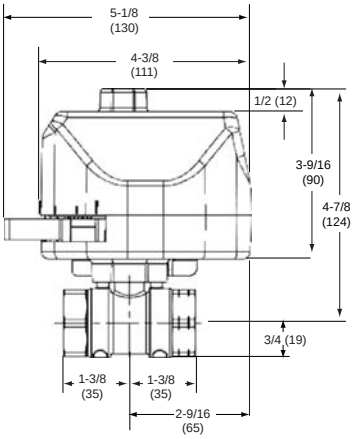


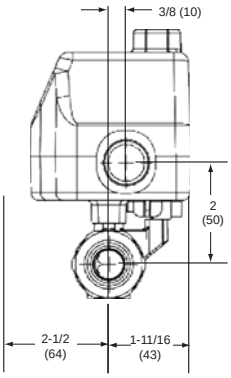
Two-Way Floating/Proportional Non-Spring Return Assembly Shipping Weight: 2.2 lbs (998 g)



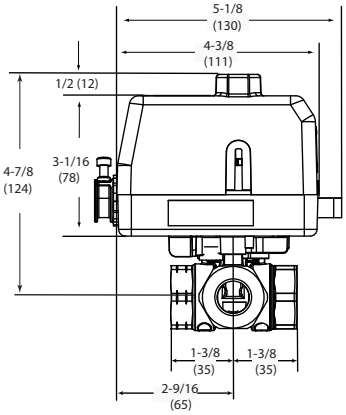


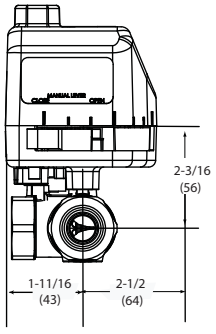
Three-Way Floating/Proportional Non-Spring Return Assembly Shipping Weight: 2.4 lbs (1089 g)





Two-Way Spring Return Floating/Proportional Spring Return Assembly Shipping Weight: 2.4 lbs (1089 g)





Three-WayFloating/Proportional Spring Return Assembly Shipping Weight: 2.6 lbs (1180 g)

All dimensions shown in inches (mm) format and are rounded to the nearest 1/16". An additional 1 in (25 mm) is required to remove the actuator from the valve.

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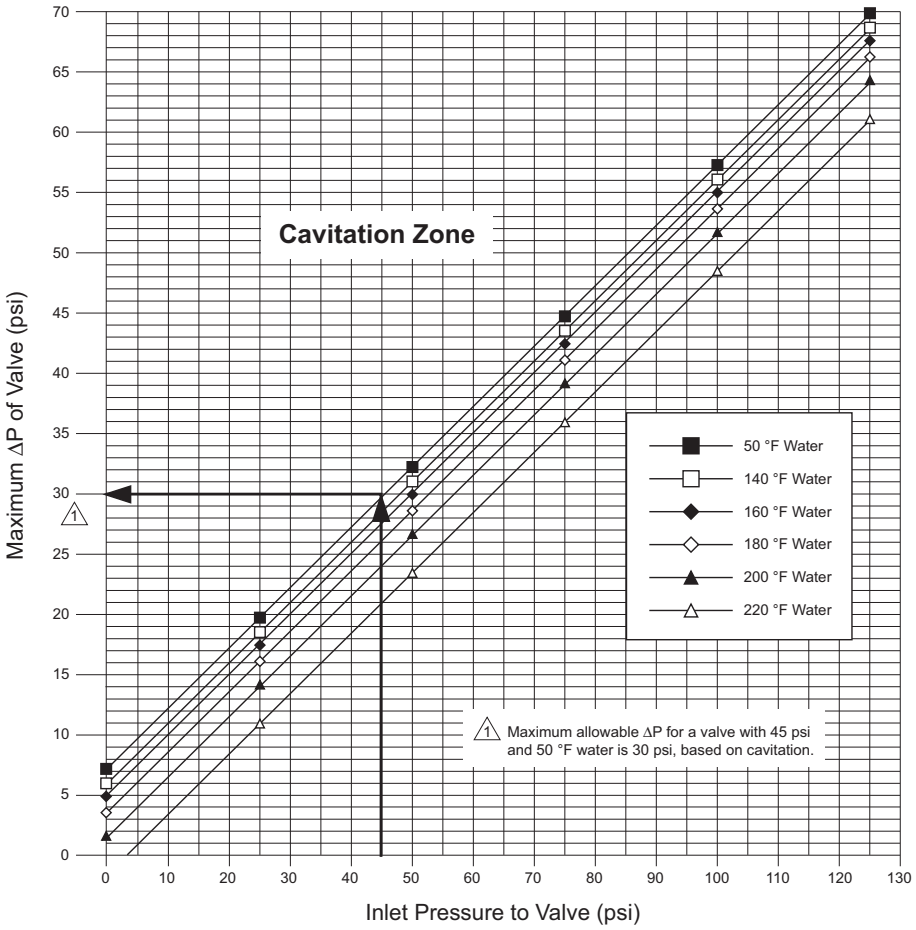
Cavitation Limits On Valve Pressure Drop

A valve selected with a pressure drop that is too high can cause erosion or wire drawing of the flow characterizing insert. In addition, cavitation can cause noise, damage to the valve trim (and possibly the valve body), and choke flow through the valve. Do not exceed the maximum differential pressure drop for the valve selected.



Pressure Drop Selection

Modulating control valves are usually selected to take a pressure drop of at least 50% of the “available pressure.” As “available pressure” is often difficult to calculate, the normal procedure is to select a valve using a pressure drop at least equal to that in the coil or other load being controlled (except where small booster pumps are used) with a minimum pressure drop of at least 5 psi (34 kPa). When the design temperature drop is less than 60°F (33°C) for conventional heating systems, higher pressure drops across the valve are needed for good results (see below).

Pressure Drop

Design Temperature Load Drop °F (°C)	Recommended Pressure Drop (% of available pressure)	Multiplier on Load Drop
60 (33) or more	50%	1 x Load Drop
40 (22)	69%	2 x Load Drop
20 (11)	70%	3 x Load Drop

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Flow Coefficient Selection

When sizing a valve, you must select a flow coefficient (Cv), which is defined as the flow rate in U. S. gallons per minute (GPM) of 60 °F water that will pass through a fully open valve with 1 psi pressure drop (Δp; kv = m3/h with a 1 bar ΔP). It is calculated using the formula:

$Cv = GPM/(\sqrt{\Delta P})$ (ΔP is in psi) or $Kv = (m3/h)/(\sqrt{\Delta P})$ (ΔP is in bar)

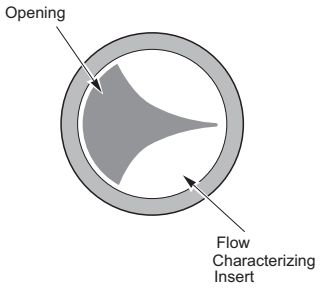
Since the flow rate through the heat exchanger is usually specified, the only variable normally available in sizing a valve is the pressure drop. The following information can be used to determine what pressure drop to use in calculating a valve Cv. Once you have determined the Cv, consult Table-4, Table-5, Table-6 and Table-7 to select the valve body having the nearest Cv.

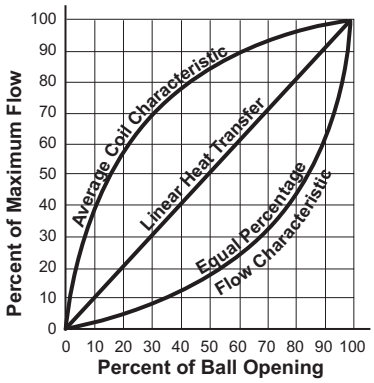
Two and Three-way Valve GPM Chart

Valve Differential Pressure (ΔP)	Both	Three-way	Two-Way	Three-way	Two-Way	Three-way	Two-Way	Three-way	Two-Way	Three-way	Two-Way	Three-way	Two-Way	Both
	0.3 Cv	0.6 Cv	0.7 Cv	1.0 Cv	1.2 Cv	2.0 Cv	2.1 Cv	3.0 Cv	3.5 Cv	4.5 Cv	4.7 Cv	7.3 Cv	7.7 Cv	10 Cv
0.5 psi	0.2	0.4	0.5	0.7	0.8	1.4	1.5	2.1	2.5	3.2	3.3	5.2	5.4	7.1
1 psi	0.3	0.6	0.7	1.0	1.2	2.0	2.1	3.0	3.5	4.5	4.7	7.3	7.7	10.0
2 psi	0.4	0.9	1.0	1.4	1.7	2.8	3.0	4.2	4.9	6.4	6.6	10.3	10.9	14.1
3 psi	0.5	1.1	1.2	1.7	2.1	3.5	3.6	5.2	6.1	7.8	8.1	12.6	13.3	17.3
4 psi	0.6	1.3	1.4	2.0	2.4	4.0	4.2	6.0	7.0	9.0	9.4	14.6	15.4	20.0
5 psi	0.67	1.5	1.6	2.2	2.7	4.5	4.7	6.7	7.8	10.1	10.5	16.3	17.2	22.4
6 psi	0.7	1.6	1.7	2.4	2.9	4.9	5.1	7.3	8.6	11.0	11.5	17.9	18.9	24.5
7 psi	0.8	1.8	1.9	2.6	3.2	5.3	5.6	7.9	9.3	11.9	12.4	19.3	20.4	26.5
8 psi	0.85	1.9	2.0	2.8	3.4	5.7	5.9	8.5	9.9	12.7	13.3	20.6	21.8	28.3
9 psi	0.9	2.0	2.1	3.0	3.6	6.0	6.3	9.0	10.5	13.5	14.1	21.9	23.1	30.0
10 psi	0.95	2.1	2.2	3.2	3.8	6.3	6.6	9.5	11.1	14.2	14.9	23.1	24.3	31.6

Flow Characteristics

The VBB/VBS series two- and three-way ball valve assemblies provide equal percentage flow, which is achieved with a flow characterizing insert. The parabolic shape of the orifice allows a gradual change in flow, so that equal movements of the valve stem, at any point of the flow range, change the existing flow an equal percentage, regardless of the flow rate. As shown in the graph to the right a ball valve equipped with the flow insert mirrors the flow characteristic of the coil, resulting in linear heat transfer.





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Using Pipe Reducers with Ball Valves

This chart provides estimated effective Cvs when using pipe reducers with ball valve assemblies. Use these estimated effective Cvs in place of the rated Cvs when reducers or increasers are located within 6 pipe diameters upstream and 3 pipe diameters downstream of the valve.

⚠ WARNING

RISK OF PIPE FAILURE

- Do not use a valve sized less than one-half the pipe run size. Erosion or wire draw may cause pipe failure in the reduction area.

Failure to follow this instruction may result in death or serious injury.

Two-Way Valves

Valve Size in (mm)	Valve Body		Cv (Kv)	Estimated Effective Cv (Kv)				
				Pipe Size in Inches				
	NPT Threaded	RP Threaded		1/2	3/4	1	1-1/4	1-1/2
1/2 (15)	VBx2N00	VBx2R00	0.3 (0.3)	0.3 (0.3)	0.3 (0.3)	0.3 (0.3)	–	–
	VBx2N01	VBx2R01	0.7 (0.6)	0.7 (0.6)	0.7 (0.6)	0.7 (0.6)	–	–
	VBx2N02	VBx2R02	1.2 (1.0)	1.2 (1.0)	1.2 (1.0)	1.2 (1.0)	–	–
	VBx2N03	VBx2R03	2.1 (1.8)	2.1 (1.8)	2.1 (1.8)	2.1 (1.8)	–	–
	VBx2N04	VBx2N04	3.5 (3.0)	3.5 (3.0)	3.3 (2.8)	3.1 (2.7)	–	–
	VBx2N05	VBx2N05	4.7 (4.1)	4.7 (4.1)	4.4 (3.8)	4.1 (3.5)	–	–
	VBx2N06	VBx2N06	7.7 (6.7)	7.7 (6.7)	6.6 (5.7)	5.5 (4.8)	–	–
	VBx2N07	VBx2N07	10 (8.7)	10 (8.7)	8.5 (7.4)	7.0 (6.0)	–	–
3/4 (20)	VBx2N10	VBx2R10	0.3 (0.3)	–	0.3 (0.3)	0.3 (0.3)	0.3 (0.3)	0.3 (0.3)
	VBx2N11	VBx2N11	0.7 (0.6)	–	0.7 (0.6)	0.7 (0.6)	0.7 (0.6)	0.7 (0.6)
	VBx2N12	VBx2N12	1.2 (1.0)	–	1.2 (1.0)	1.2 (1.0)	1.2 (1.0)	1.2 (1.0)
	VBx2N13	VBx2N13	2.1 (1.8)	–	2.1 (1.8)	2.1 (1.8)	2.1 (1.8)	2.1 (1.8)
	VBx2N14	VBx2N14	3.5 (3.0)	–	3.5 (3.0)	3.5 (3.0)	3.5 (3.0)	3.5 (3.0)
	VBx2N15	VBx2N15	4.7 (4.1)	–	4.7 (4.1)	4.6 (4.0)	4.5 (3.9)	4.4 (3.8)
	VBx2N16	VBx2N16	7.7 (6.7)	–	7.7 (6.7)	7.5 (6.5)	7.3 (6.3)	7.2 (6.2)
	VBx2N17	VBx2N17	10 (8.7)	–	10 (8.7)	9.5 (8.2)	9.0 (7.8)	7.2 (6.2)

Three-Way Valves

Valve Size in (mm)	Valve Body		Cv (Kv)	Estimated Effective Cv (Kv)				
				Pipe Size in Inches				
	NPT Threaded	RP Threaded		1/2	3/4	1	1-1/4	1-1/2
1/2 (15)	VBx3N00	VBx3R00	0.3 (0.3)	0.3 (0.3)	0.3 (0.3)	0.3 (0.3)	–	–
	VBx3N01	VBx3R01	0.6 (0.5)	0.6 (0.5)	0.6 (0.5)	0.6 (0.5)	–	–
	VBx3N02	VBx3R02	1.0 (.9)	1.0 (.9)	1.0 (.9)	1.0 (.9)	–	–
	VBx3N03	VBx3R03	2.0 (1.7)	2.0 (1.7)	2.0 (1.7)	2.0 (1.7)	–	–
	VBx3N04	VBx3R04	3.0 (2.6)	3.0 (2.6)	2.9 (2.5)	2.8 (2.4)	–	–
	VBx3N05	VBx3R05	4.5 (3.8)	4.5 (3.8)	4.2 (3.6)	3.9 (3.3)	–	–
	VBx3N06	VBx3R06	7.3 (6.2)	7.3 (6.2)	6.2 (5.3)	5.1 (4.4)	–	–
	VBx3N07	VBx3R07	10.0 (8.5)	10.0 (8.5)	8.5 (7.4)	7.0 (6.0)	–	–
3/4 (20)	VBx3N10	VBx3R10	0.3 (0.3)	–	0.3 (0.3)	0.3 (0.3)	0.3 (0.3)	0.3 (0.3)
	VBx3N11	VBx3R11	0.6 (0.5)	–	0.6 (0.5)	0.6 (0.5)	0.6 (0.5)	0.6 (0.5)
	VBx3N12	VBx3R12	1.0 (.9)	–	1.0 (.85)	1.0 (.85)	1.0 (.9)	1.0 (.9)
	VBx3N13	VBx3R13	2.0 (1.7)	–	2.0 (1.7)	2.0 (1.7)	2.0 (1.7)	2.0 (1.7)
	VBx3N14	VBx3R14	3.0 (2.6)	–	3.0 (2.6)	3.0 (2.6)	2.9 (2.5)	2.9 (2.5)
	VBx3N15	VBx3R15	4.5 (3.8)	–	4.5 (3.8)	4.4 (3.8)	4.3 (3.7)	4.2 (3.6)
	VBx3N16	VBx3R16	7.3 (6.2)	–	7.3 (6.2)	7.1 (6.1)	6.9 (5.9)	6.8 (4.1)
	VBx3N17	VBx3R17	10.0 (8.5)	–	10.0 (8.5)	9.5 (8.2)	9.0 (7.8)	7.2 (6.2)

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April, 2016 tc

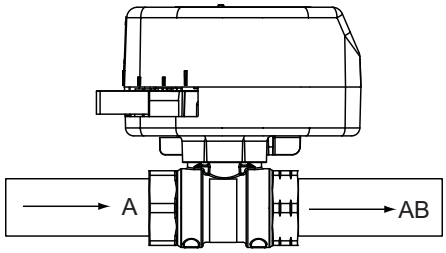
Water System Maintenance

All heating and cooling systems are susceptible to valve and system problems caused by improper water treatment and system storage procedures.The following guidelines are to help avoid valve and water system problems resulting from improperly treated water or storage procedures, and to obtain maximum life from the valves.

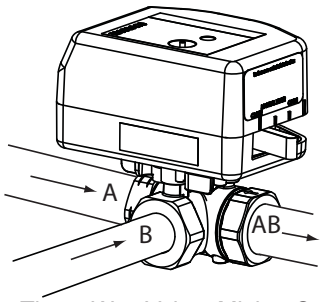
To maintain non-damaging conditions, clean the system prior to start up. Use a nitrite or molybdate based treatment program. Use filtration equipment where needed. Properly store off-line systems and monitor water treatment results using corrosion test coupons. Durability of valve stems, balls, seats, and packing is dependent on maintaining non-damaging water conditions. Inadequate water treatment or filtration, not in accordance with chemical supplier/ASHRAE handbook recommendations, can result in corrosion, scale, and abrasive particle formation. Scale and particulates can result in stem and packing scratches, and can adversely affect packing life and other parts of the hydronic system. Follow the advice of a water treatment professional. Consult EN-205 Water and Steam System Guidelines, Engineering Information, F-26080, for further details.

Piping

These valves must be piped so the flow is in the direction of the diagrams below. Flow is from A (and/or B) to AB.



Two-Way Valve: Flow A to AB



Three-Way Valve: Mixing Only
A and/or B to AB.

Maintenance

The ball valve assembly itself requires no maintenance. The stem and packing design eliminates the need for packing adjustment for the life of the valve. However, regular maintenance of the total heating and cooling system is recommended to provide sustained optimum performance.

Field Repair

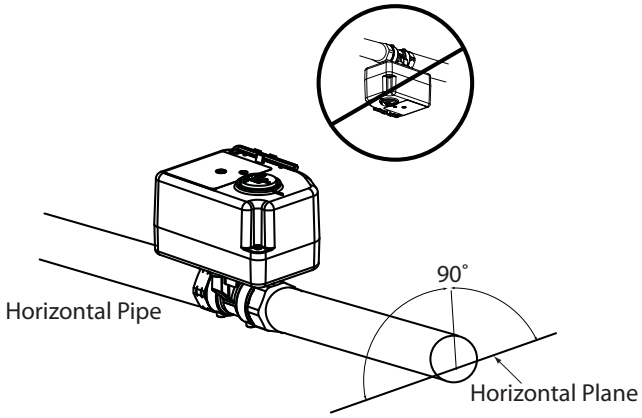
Neither valve nor actuator are field repairable. Replace entire unit as necessary.

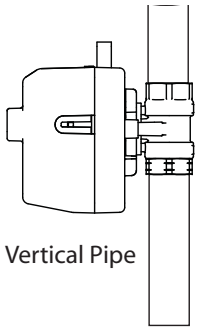
Patents

US Patents for VBB/VBS Series Valves and M1/M2 Series Actuators:
5815365, 6044857, 6073907, 7111643, 7131635, 7367544, 7559531.
Other US and foreign patents pending.

Mounting

The valves can be mounted in horizontal or vertical piping. When installed in horizontal piping, the actuator must be above the valve body. When installed in horizontal piping the actuator can be tilted left or right but it must not be tilted below 90° from vertical.





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IDEC GENERAL-PURPOSE RELAYS

RH, RJ, RR SERIES

DESCRIPTION

IDEC general-purpose relays are available in the **RH Series** blade-style relays and the **RR Series** pin-style relays and the **RJ Series** compact relays.

The **RH Series** features a 10A switching capacity. They are available in SPDT, DPDT, 3PDT, and 4PDT contact configurations, driven by AC or DC coils, and they have blade terminals for socket mounting.

The **RR Series** has a 10A contact rating. The **RR Series** relays are available in SPDT, DPDT, and 3PDT configurations driven by AC or DC coils, and they have pin or blade terminals for socket mounting.

The **RJ Series** is compact to reduce space requirements. They are available in a 12A SPDT version and an 8A DPDT version. They are driven by AC or DC coils and have blade terminals for socket mounting.

RJ Series RH Series RR Series

FEATURES

- ***Blade style, pin style, and compact models***
- ***Indicator light and/or check button available***
- ***Surface or DIN rail mount***
- ***UL recognized, CSA certified***

SPECIFICATIONS

COIL RATINGS

RH SERIES

RATED VOLTAGE		RATED CURRENT (mA) ±15% @ 20°C 60 Hz SPDT	DPDT	3PDT	4PDT	50 Hz SPDT	DPDT	3PDT	4PDT	COIL RESISTANCE (Ω) ±10% @ 20°C SPDT	DPDT	3PDT	4PDT
AC	12	75	100	140	165	86	121	165	196	165	39.3	25.3	21.2
	24	37	50	70	83	42	60.5	81	98	83	153	103	84.5
	120	7.5	–	14.2	16.5	8.6	–	16.4	19.5	16.5	–	10,800	7,360
	240	4.3	–	7.1	8.3	4.9	–	8.2	9.8	8.3	–	12,100	9,120
		SPDT		DPDT		3PDT		4PDT		SPDT	DPDT	3PDT	4PDT
DC	12	64		75		120		125		188	160	100	96
	24	32		36.9		60		62		750	650	400	388

RR Series

RATED VOLTAGE		Rated Current (mA) ±15% @ 20°C 60 Hz	50 Hz	COIL RESISTANCE (Ω) ±10% @ 20°C
AC	12	210	245	365
	24	105	121	182
	120	20.5	24	35
	240	10.5	12.1	18
DC	12	120		–
	24	60		–

RJ Series

	MODELS		Rated Current (mA) ±15% @ 20°C WITHOUT LED[1] 60 Hz	50 Hz	WITH LED[1] 60 Hz	50 Hz	COIL RESISTANCE (Ω) ±10% @ 20°C
AC	BLADE & PCB	24V	37.5	43.9	41.1	47.5	243
		120V	7.5	8.8	7.4	8.7	6,400
DC	BLADE	24V	22.1		25.7		1,080
	PCB	24V	22.1		–		1,080

1. LED indicator is only available on Blade relays.

Maximum continuous applied voltage
- **RH, RR**: 110% of rated voltage
- **RJ**: 140% of rated voltage

Pull-in voltage
- **RH, RR, RJ/AC**: 80% of rated voltage
- **RJ, RJ/DC**: 70% of rated voltage

Drop-out voltage
- **AC**: 30% or more of rated voltage
- **DC**: 10% or more of rated voltage

Contact material
- **RH**: Silver cadmium oxide
- **RR**: Silver
- **RJ**: Silver nickel alloy

CONTACT RATINGS

RH SERIES (UL ratings)

VOLTAGE	RESISTIVE RH1 RH2	RH3	RH4	GENERAL USE RH1 RH2	RH3	RH4	HORSEPOWER RATING RH1 RH2	RH3	RH4
240V AC	10A	7.5A	7.5A	7A	6.5A	5A	1/3 hp	1/3 hp	–
120V AC	–	10A	10A	–	7.5A	7.5A	1/6 hp	1/6 hp	–
30V DC	10A	10A	–	7A	–	–	–	–	–
28V DC	–	–	10A	–	–	–	–	–	–

RR SERIES (UL ratings)

VOLTAGE	RESITIVE (A)	INDUCTIVE (A) cosΘ= 0.3	MOTOR LOAD (hp)
240 AC	10	7	1/3
120 AC	10	7.5	1/4
30 DC	10	7	–

RJ Series (UL ratings)

	CONTACT	RJ1S	RJ2S
Resistive Load (Maximum)	N.O.	12A @ 250 VAC/30 VDC	8A @ 250 VAC/30 VDC
	N.C.	12A @ 250 VAC; 6A @ 30 VDC	8A @ 250 VAC; 4A @ 30 VDC
Inductive Load (Maximum)	N.O.	7.5A @ 250 VAC; 6A @ 30 VDC	4A @ 250 VAC; 4A @ 30 VDC
	N.C.	7.5A @ 250 VAC; 3A @ 30 VDC	4A @ 250 VAC; 2A @ 30 VDC

Contact resistance
- **RH**: 50 mΩ maximum
- **RR**: 30 mΩ maximum
- **RJ**: 50 mΩ maximum

Operate time
- **RH, RR**: 25 ms maximum
- **RJ**: 15 ms maximum

Release time
- **RH, RR**: 25 ms maximum
- **RJ**: 10 ms maximum

Min load
- **RH**: 24 VDC/30 mA, 5 VDC/100 mA
- **RR**: 24 VDC/10 mA, 5 VDC/20 mA
- **RJ**: 5 VDC/100 mA

Operating temp: -22° to 158°F (-30° to 70°C)

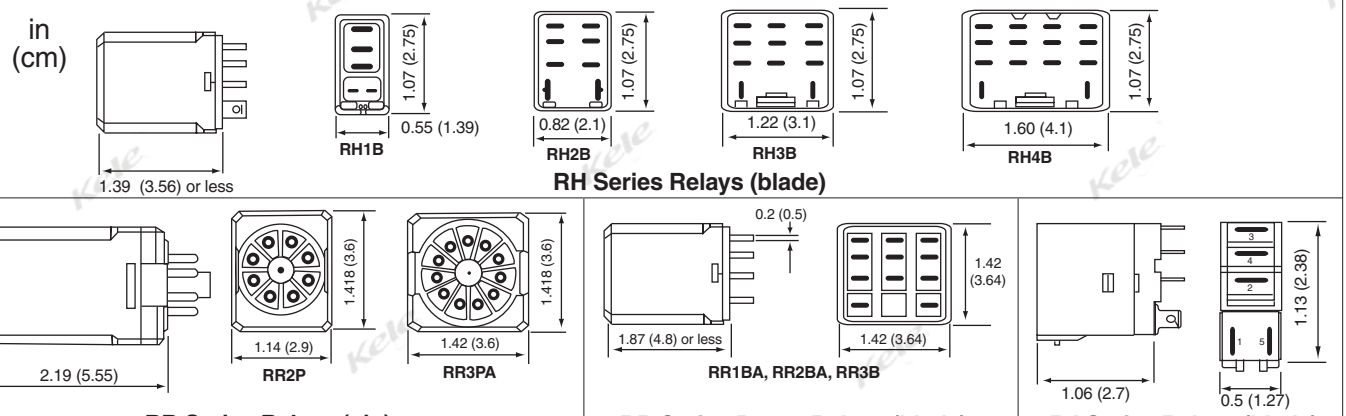
Agency approvals: UL-recognized component, **(RH, RR):** File #E66043, **(RJ):** File #E55996, CSA certified, File #LR35144; CE certified (not RR blade style)

Warranty: 1 year

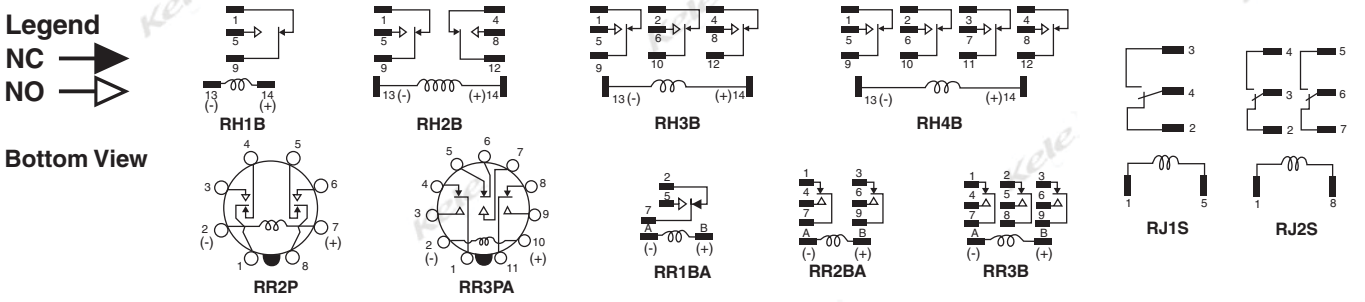
IDEC GENERAL-PURPOSE RELAYS

RH, RJ, RR SERIES

DIMENSIONS



WIRING



ORDERING INFORMATION

MODEL	DESCRIPTION	
RH1B	Relay, SPDT, blade (use SH1B-05 socket)	
RH2B	Relay, DPDT, blade (use SH2B-05 socket)	
RH3B	Relay, 3PDT, blade (use SH3B-05 socket)	
RH4B	Relay, 4PDT, blade (use SH4B-05 socket)	
	U	Standard relay
	UL	Indicator light
	ULC	Indicator light and check button
		AC12V 12 VAC coil voltage
		AC24V 24 VAC coil voltage
		AC120V 120 VAC coil voltage
		AC240V 240 VAC coil voltage
		DC12V 12 VDC coil voltage
		DC24V 24 VDC coil voltage

RH1B	U	AC24V

MODEL	DESCRIPTION	
RR2P	Relay, DPDT, 8 pin (use SR2P-05 or SR2P-06)	
RR3PA	Relay, 3PDT, 11 pin (use SR3P-06 socket)	
RR1BA	Relay, SPDT, 11 blade (use SR3B-05 socket)	
RR2BA	Relay, DPDT, 11 blade (use SR3B-05 socket)	
RR3B	Relay, 3PDT, 11 blade (use SR3B-05 socket)	
	U	Standard relay
	UL	Indicator light
	ULC	Indicator light and check button
		AC12V 12 VAC coil voltage
		AC24V 24 VAC coil voltage
		AC120V 120 VAC coil voltage
		AC240V 240 VAC coil voltage
		DC12V 12 VDC coil voltage
		DC24V 24 VDC coil voltage

RR2P	U	AC24V

Example: **RR2PUAC24V** DPDT relay 8 pin with 24VAC coil

MODEL	DESCRIPTION	
RJ1S	Relay, SPDT (use SJ1S-05B socket)	
RJ2S	Relay, DPDT (use SJ2S-05B socket)	
	C	No options
	CL	LED indicator
		A24 24 VAC coil voltage
		A120 120 VAC coil voltage
		D24 24 VDC coil voltage

RJ1S	C	A24

RELATED PRODUCTS

		PAGE
DIN-3F	35 mm DIN rail, steel, 39.4" (1m), RoHS compliant	**860**
DIN-3F, BAM-1000	DIN rail	**860**
SH, SR, SJ Series	Relay sockets	**1123**

FUNCTIONAL DEVICES RELAY IN A BOX
RIB, RIBT PILOT SERIES

DESCRIPTION

The **Relay In A Box (RIB) Pilot Series** controls most BAS, HVAC, low-horsepower motor and lighting applications. The relays come mounted and pre-wired in a housing, saving the installer the time, trouble, and expense of buying separate components (relay, socket, mounting rail, and enclosure) and assembling them on the job or at the shop.

The **RIB Pilot Series** has a protruding 1/2" or 3/4" NPT nipple from which all wires exit (except T series). To install, remove a conduit knockout in the equipment, insert the wires and nipple through the hole, tighten the locknut, and connect the wires.

RIB Pilot Series - 10A Relays
The RIB Pilot Series has relay contacts rated for 10A and is used to control light electrical loads, drive power relays/ contactors, or sense the voltage being fed to electrical loads. The **RIB Pilot Series** requires a low coil-drive current and is provided with circuitry to allow powering the relay coil from a wide range of AC or DC voltages.

RIBT Series - High/Low Voltage Separation
The **RIBT Series** is designed to provide physically separate entrances for connections to the relay input coil and output contacts. Relay contact wires exit the housing through a 1/2" or 3/4" NPT nipple. The cover of the **RIBT Series** is removable, and the coil drive wires can enter the housing through one of two convenient openings with star bushings or 1/2" conduit. The coil drive wires are secured to screw terminals within a separate wiring compartment in the **RIBT Series**. Most of the **RIB's** in the **Pilot Series** are also available in the **RIBT Series**.

MADE IN USA

Functional Devices, Inc. RIB®

RIBU1C

RIBU1S

c UL us

FEATURES

- ***Convenient and economical to use***
- ***Relay status indicator via LED***
- ***Coil uses low current and accepts a wide range of AC and DC voltages***
- ***Closed/Open/Auto switch option available***
- ***Nipple- or screw-mountable***
- ***Compact, gray plastic enclosure***
- ***Color-coded wires for eliminating errors***
- ***UL listed for UL916 Energy Management and UL864 Fire***
- ***Made in the USA***

SPECIFICATIONS - GENERAL

Frequnecy	50/60 Hz
Wire Length	16" (40.6 cm)
Life Rating	10 million cycles minimum mechanical
Relay Status	LED, ON - relay activated
Operating Temperature	-30° to 140°F (-34° to 60°F)
Operating Humidity	5-95% RH non-condensing
Housing Type	Plenum rated, NEMA 1, NEMA 4
Conduit Hub	1/2" NPT, 3/4" NPT
Dimensions	
A size enclosures	1.7" H x 2.8" W x 1.5" D (4.32 x 7.11 x 3.81 cm)
B size enclosures	4.0" H x 4.0" W x 1.8" D (10.16 x 10.16 x 4.57 cm)
G size enclosures	2.3" H x 3.2"W x 1.8" D (5.84 x 8.13 x 4.57 cm)

Approvals	UL listed, UL 916 Energy Management UL 864 Fire, cUL listed, CSFM, UL File S7312
Warranty	1 year

Coil pull-in/drop-out (nominal values)

	PULL-IN		DROP-OUT	
COIL DRIVE	**DC**	**AC**	**DC**	**AC**
10-30 VAC/VDC	10	9	2.8	2.1
24 VAC/VDC	20	18	3.8	3
120 VAC	–	102	–	9
208-277 VAC	–	176	–	13

RELAYS & CONTACTORS

FUNCTIONAL DEVICES RELAY IN A BOX

RIB, RIBT PILOT SERIES

SPECIFICATIONS - PILOT SERIES

MODEL	TYPE	COIL DRIVE	SIZE/ HUB	OVR SW	RELAY CONTACT RATINGS	RELAY CONTACT WIRING	RELAY COIL DRIVE DATA
RIBU1C* **RIBU1C-N4†**	1-SPDT	10-30 VAC/VDC 120 VAC 50/60 Hz	A-1/2	–	10A resistive 120/240/277 VAC 10A resistive 28 VDC 480 VA pilot duty 240/277 VAC 480 VA ballast 277 VAC 600W tungsten 120 VAC N.O. 240W tungsten 120 VAC N.C. 1/3 hp for N.O. 120/240 VAC 1/6 hp for N.C. 120/240 VAC 1/4 hp for N.O. 277 VAC 1/8 hp for N.C. 277 VAC	**Relay #1** NC (blue) COM (yellow) NO (orange) **Relay #2** (if present) NC (gray) COM (purple) NO (brown)	**Wiring** **Relay #1** Common - White/Yellow wire 10-30 VAC/VDC - White/Blue wire 120 VAC - White/Black wire 208-277 VAC - White/Brown wire **Relay #2** (if present) Common - White/Purple wire 10-30 VAC/VDC - Gray/White wire 120 VAC - White/Red wire 208-277 VAC - White/Orange wire **Input Current** 30 mA @ 10 VAC 32 mA @ 12 VAC 42 mA @ 24 VAC 50 mA @ 30 VAC 25 mA @ 120 VAC 35 mA @ 208-277 VAC 12 mA @ 10 VDC 14 mA @ 12 VDC 16 mA @ 24 VDC 18 mA @ 30 VDC
RIBU2C*	2-SPDT		G-3/4	–			
RIBH1C* **RIBH1C-N4†**	1-SPDT	10-30 VAC 208-277 VAC 50/60 Hz	A-1/2	–			
RIBH2C*	2-SPDT		G-3/4	–			
RIBU1SC*	1-SPDT	10-30 VAC/VDC 120 VAC 50/60 Hz	G-1/2	Yes-2	10A resistive 277 VAC 480 VA pilot duty 277 VAC 480 VA ballast 277 VAC 600W tungsten 120 VAC N.O. 240W tungsten 120 VAC N.C. 1/3 hp for N.O. 120-240 VAC 1/6 hp for N.C. 120-240 VAC 1/4 hp for N.O. 277 VAC 1/8 hp for N.C. 277 VAC Status Contact on **RIBU1SM** and **RIBH1SM**: 5A max @ 277 VAC	Auto / Manual (yellow) Common N.C. - Closed / Open (blue) N.C. N.O. - Closed (orange) N.O. **Relay #1** (orange) (orange) Closed / Open / Auto **Relay #2 of RIBU2S2** Closed (brown) Open (brown) Auto **Relay #2 of RIBU2SC** NC (gray) COM (purple) NO (brown) **STATUS** = 2nd Pole of switch of **RIBU1SM**, **RIBH1SM** Closed (brown) Open (purple) Auto (gray)	
RIBH1SC*	1-SPDT	10-30 VAC 208-277 VAC 50/60 Hz	G-1/2	Yes-2			
RIBU1S*	1-SPST-NO**	10-30 VAC/VDC 120 VAC 50/60 Hz	G-1/2	Yes			
RIBU2SC	1-SPST-NO** 1-SPDT		G-3/4	Yes			
RIBU2S2	2-SPST-NO**		B-3/4	Yes-2			
RIBU1SM	1-SPST-NO**		G-1/2	Yes + Status			
RIBH1S*	1-SPST-NO**	10-30 VAC/VDC 208-277 VAC 50/60 Hz	G-1/2	Yes			
RIBH1SM	1-SPST-NO**		G-1/2	Yes + Status			
RIB2401D* **RIB2401D-N4†**	1-DPDT	24 VAC/VDC 120 VAC 50/60- Hz	A-1/2	–	10A resistive 30 VDC 10A resistive 277 VAC 1/2 hp for N.O. 120/240 VAC 1/3 hp for N.C. 120/240 VAC	NC (blue) COM (yellow) NO (orange)	**Wiring** Common - White/Yellow wire 24 VAC/VDC - White/Blue wire 120 VAC - White/Black wire 208-277 VAC - White/Brown wire **Input Current** 24 mA @ 18 VAC 20 mA @ 20 VDC 32 mA @ 24 VAC 24 mA @ 30 VDC 40 mA @ 30 VAC 36 mA @ 30 VDC 31 mA @ 120 VAC (RIB2401D) 36 mA @ 208-277 VAC (RIB2402D)
RIB2402D **RIB2402D-N4†**	1-DPDT	24 VAC/VDC 208-277 VAC 50/60 Hz	A-1/2	–	10A resistive 30 VDC 10A resistive 277 VAC 180 VA pilot duty 120 VAC 1/8 hp for N.C. 120 VAC	NC (gray) COM (purple) NO (brown)	
RIBL3C	3-SPST-NO	10-30 VAC/VDC 50/60 Hz	B-1/2	–	10A resistive 120-277 VAC 10A resistive 28 VDC 480 VA pilot duty 240-277 VAC 480 VA ballast 277 VAC 600W tungsten 120 VAC N.O. 240W tungsten 120 VAC N.C. 1/3 hp for N.O. 120-240 VAC 1/6 hp for N.C. 120-240 VAC 1/4 hp for N.O. 277 VAC 1/8 hp for N.C. 277 VAC	**Relay #1** (black) (black) **Relay #2** (blue) (blue) **Relay #3** (yellow) (yellow) **Relay #4 (if present)** NC (gray) COM (purple) NO (brown)	**Wiring** Common - White/Red wire Relay#1 - White/Black wire Relay#2 - White/Blue wire Relay#3 - White/Yellow wire Relay#4 - White/Brown wire (if present) **Input Current** 30 mA @ 10 VAC 12 mA @ 10 VDC 32 mA @ 12 VAC 14 mA @ 12 VDC 42 mA @ 24 VAC 16 mA @ 24 VDC 50 mA @ 30 VAC 18 mA @ 30 VDC
RIBL4C	3-SPST-NO 1-SPDT		B-1/2	–			
SIB02S	SPDT Manual Switch	–	A-1/2	Yes	Switch ratings 20A 277 VAC	(blue) (yellow) (orange)	No Relay Switch Only

ORDERING INFORMATION

Order by model number

* Models may be ordered in **RIBT Series** with high/low voltage separation.

** Can be ordered normally closed by adding **- NC** after model number.

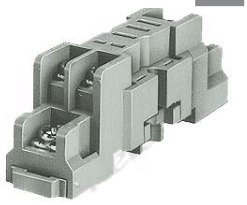
† **N4** has NEMA 4 housing

IDEC RELAY SOCKETS
SH, SJ, SR SERIES

DESCRIPTION

The **SH** and **SR Series** of IDEC relay sockets are for use with the IDEC **RH / RR Series** relays and **RTE Series** timers. The **SH** and **SR Series** include both blade and pin style sockets and are available for one, two, three and four pole relays. The **SH** and **SR** sockets can be DIN rail or surface mounted. The **SJ Series** of IDEC relay sockets are for use with the IDEC **RJ1S** and **RJ2S Series** relays. They can be DIN rail or surface mounted.

SJ1S, SJ2S



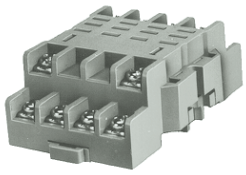
SH1B-05

FEATURES

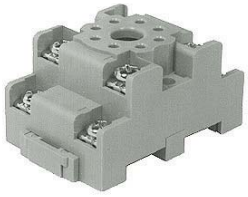
- ***Use with IDEC RH / RR / RJ relays and RTE timers***
- ***Screw terminals with captive wire clamp***
- ***Surface or DIN rail mount***
- ***UL recognized, CSA certified and CE approved***

SH2B-05

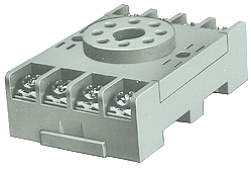
SH3B-05



SH4B-05



SR2P-05



SR2P-06

SR3P-06

SR3B-05

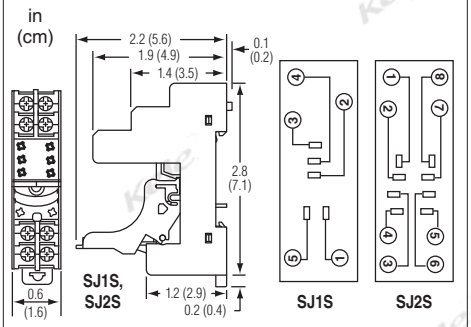
SPECIFICATIONS

Model	Socket Type	Rated Voltage	Rated Current	Hold Down Clip or SpringWire Size	Wire Size	Weight	Approvals
SJ1S-05B	Blade, DIN rail or surface mount	250V	12A	Lever: SJ9Z-C1 (provided)	Two 14 AWG	0.06 lb (0.03 kg)	UL recognized File #E62437, CSA certified File #LR84913, CE
SJ2S-05B	Blade, DIN rail or surface mount	250V	8A	Lever: SJ9Z-C1 (provided)	Two 14 AWG	0.07 lb (0.034 kg)	UL recognized File #E62437, CSA certified File #LR84913, CE
SH1B-05	Blade, DIN rail or surface mount	250V	10A	Spring: SYS-02F1; Clip: SFA-101, SFA-202	Two 12 AWG	0.06 lb (0.03 kg)	UL recognized File #E62437, CSA certified File #LR35144e, CE
SH2B-05	Blade, DIN rail or surface mount	300V	10A	Spring: SY4S-02F1; Clip: SFA-101, SFA-202	Two 12 AWG	0.10 lb (0.05 kg)	UL recognized File #E62437, CSA certified File #LR35144e, CE
SH3B-05	Blade, DIN rail or surface mount	300V	10A	Spring: SH3B05F1; Clip: SFA-101, SFA-202	Two 12 AWG	0.13 lb (0.06 kg)	UL recognized File #E62437, CSA certified File #LR35144e, CE
SH4B-05	Blade, DIN rail or surface mount	300V	10A	Spring: SH4B-02F1; Clip: SFA-101, SFA-202	Two 12 AWG	0.16 lb (0.07 kg)	UL recognized File #E62437, CSA certified File #LR35144e, CE
SR2P-05	8-Pin DIN rail or surface mount	300V	10A	Spring: SR2B-02F1 (RR2P only); Clip: SFA-203 (RTE-P1 only)	Two 12 AWG	0.10 lb (0.05 kg)	UL recognized File #E62437, CSA certified File #LR35144e, CE
SR2P-06	8-Pin, DIN rail or surface mount	300V	10A	Spring: SR2B-02F1 (RR2P only); Clip: SFA-202 (RTE-P1 only)	Two 12 AWG	0.10 lb (0.05 kg)	UL recognized File #E62437, CSA certified File #LR35144e, CE
SR3P-06	11-Pin, DIN rail or surface mount	300V	10A	Spring: SR3B-02F1 (RR only); Clip: SFA-202 (RTE-P2 only)	Two 12 AWG	0.13 lb (0.06 kg)	UL recognized File #E62437, CSA certified File #LR35144e, CE
SR3B-05	Blade, DIN rail or surface mount	300V	10A	Spring: SR3B-02F1 (RR3PA only); Clip: SFA-202 (RTE-P2 only)	Two 12 AWG	0.14 lb (0.06 kg)	UL recognized File #E62437, CSA certified File #LR35144e, CE

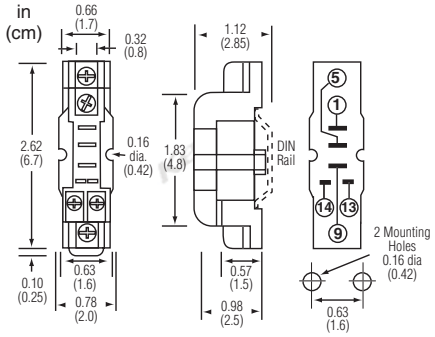
IDEC RELAY SOCKETS

SH, SJ, SR SERIES

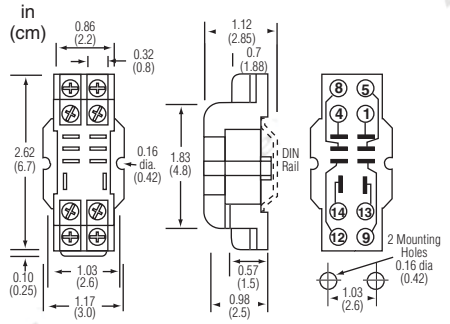
DIMENSIONS



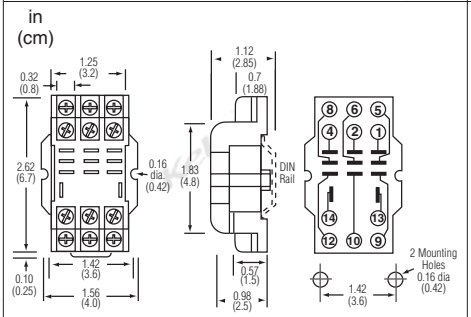
SJ1S, SJ2S



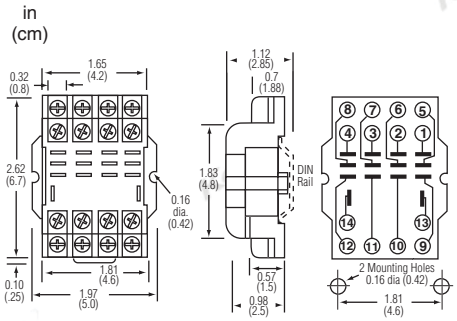
SH1B-05



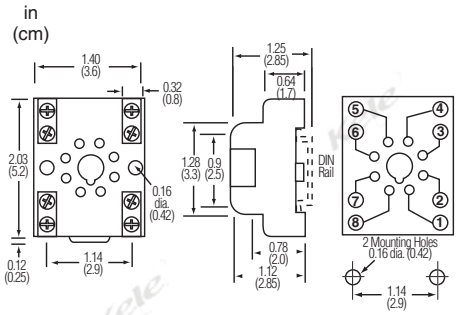
SH2B-05



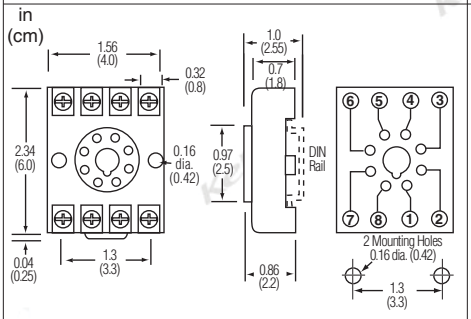
SH3B-05



SH4B-05



SR2P-05



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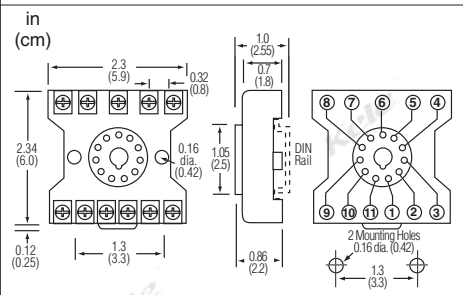
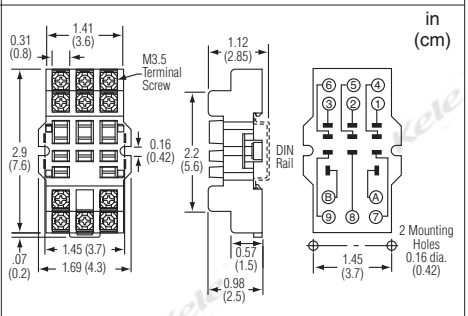


SR3P-06



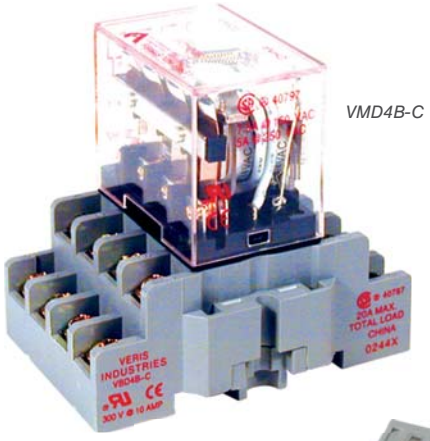
SR3B-05

ORDERING INFORMATION

MODEL	DESCRIPTION
SH1B-05	Relay socket, SPDT blade type, DIN/surface mount
SH2B-05	Relay socket, DPDT blade type, DIN/surface mount
SH3B-05	Relay socket, 3PDT blade type, DIN/surface mount
SH4B-05	Relay socket, 4PDT blade type, DIN/surface mount
SJ1S-05B	Relay socket, SPDT blade type, DIN/surface mount
SJ2S-05B	Relay socket, DPDT blade type, DIN/surface mount
SR2P-05	Relay socket, DPDT pin type, DIN/surface mount
SR2P-06	Relay socket, DPDT pin type, DIN/surface mount
SR3B-05	Relay socket, three-pole blade type, DIN/surface mount
SR3P-06	Relay socket, 3PDT pin type, DIN/surface mount

RELATED PRODUCTS		PAGE
DIN-3F, BAM-1000	DIN rail	**860**
RH, RJ, RR series	Relay	**1121**
RTE Series	Time delay relay	**1158**

VMD4B & VMD4B-C Series



VMD4B-C

VBD4B-C

VMD4B-F

VBD4B-F

SPECIFICATIONS

Operating Temp. Range	-40 to 55 °C (-40 to 131 °F)
Coil Operating Range	85% to 110% of rated voltage
Coil Drop-out Voltage Threshold	15% of rated voltage
Expected Relay Life	Electrical (@ rated current) 100,000 cycles; Mechanical (unpowered) 10,000,000 cycles
Operating Time	20 msec typical
Dielectric Strength	1500 Vac RMS
WARRANTY	
Limited Warranty	5 years

TYPICAL COIL PERFORMANCE	
	Power Consumption
AC Coils	1.5 VA
DC Coils	1.5 W
CONTACT RATINGS	
Resistive	10 A @ 120 Vac
	10 A @ 277 Vac
	10 A @ 28 Vdc
Motor	1/3 HP @ 120 Vac
	1/2 HP @ 250 Vac
Pilot Duty	B300

SOCKET RELAYS IN A WIDE RANGE OF FEATURES AND COIL VOLTAGES

FEATURES

FULL FEATURED MODEL:

- Color-coded push button...allows manual operation of relay. AC coils red, DC coils blue
- Removable override lever...when activated, locks push button and contacts in the powered position
- Flag indicator...shows relay status in manual or powered condition
- LED status lamp...shows coil "ON" or "OFF" status
- I.D. tag/write-on plastic label...used for identification of relays in multi-relay circuits
- 2-way side or DIN rail mounting system...retrofits existing panel mounting and 35 mm DIN rail
- Mating hold-down clip...secures relay to socket (-F sockets)

DESCRIPTION

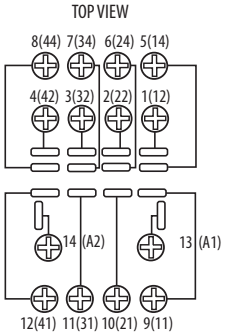
The Veris VMD4B Series are 4PDT blade-style relays for socket/DIN mounting. Both the full-featured and standard DIN rail sockets are compatible with both the VMD4B-C and VMD4B-F relays and feature a slim, attractive design.

The standard VMD4B-C model is economical and reliable. The full-featured VMD4B-F includes an LED and a flag indicator for convenient status viewing and a push-button test feature for easy troubleshooting. The finger-safe sockets reduce risk, and the hold-down clip keeps the device secure. Enhanced safety and dependability.

WIRING DIAGRAM

VBD4B Sockets

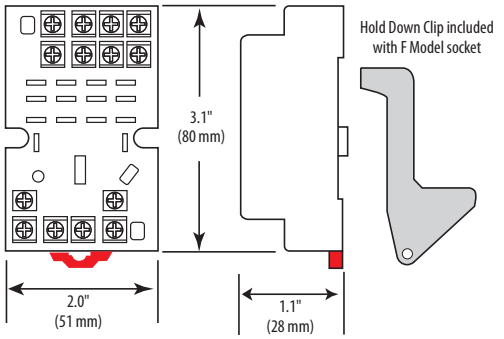
Function	NEMA (IEC) Terminal	
Coil (+)*	14	(A2)
Coil (-)*	13	(A1)
COMM1	9	(11)
N.O.1	5	(14)
N.C.1	1	(12)
COMM2	10	(21)
N.O.2	6	(24)
N.C.2	2	(22)
COMM3	11	(31)
N.O.3	7	(34)
N.C.3	3	(32)
COMM4	12	(41)
N.O.4	8	(44)
N.C.4	4	(42)



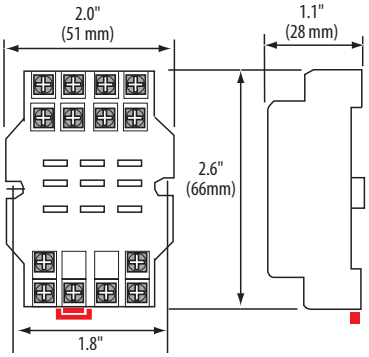
**Observe polarity for relays with DC coil voltages only*

DIMENSIONAL DRAWINGS

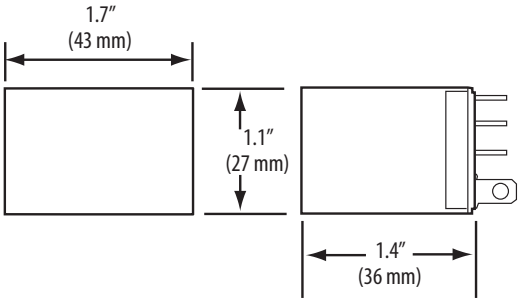
VBD4B-F Socket



VBD4B-C Socket



VMD4B Relays



ORDERING INFORMATION

MODEL	RELAY TYPE	AMPERAGE RANGE	COIL VOLTAGE	MIN. SWITCHING CURRENT	FULL FEATURED	UL	CE
VMD4B-C24D	4PDT	10 A	24 Vac	100 mA@5 Vdc		●	●
VMD4B-C24A			24 Vac			●	●
VMD4B-C120A			120 Vac			●	●
VMD4B-F24D			24 Vdc		●	●	●
VMD4B-F24A			24 Vac		●	●	●
VMD4B-F120A			120 Vac		●	●	●

**The CE mark indicates RoHS2 compliance. Note: These relays are UL Listed when used with Veris sockets.*

SOCKET ORDERING INFORMATION

MODEL	AMPERAGE RATING	VOLTAGE RATING	FINGER SAFE	HOLD DOWN CLIP	UL	CE
VBD4B-C	10 A	300 V			●	●
VBD4B-F	16 A		●	●	●	●

When relays and sockets are used together, amperage rating is the lesser of the two ratings.

ACCESSORIES

DIN Rail, Stop Clip (AV01, AV02)

PANEL FABRICATION

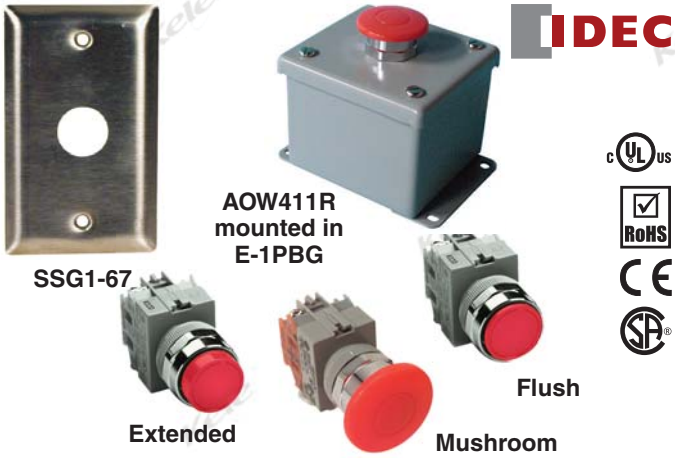
IDEC PUSHBUTTON SWITCHES
ABW, AOW SERIES

DESCRIPTION

The **ABW** and **AOW Series** push button switches are for manual control of fans, pumps, compressors, or control circuits.

FEATURES

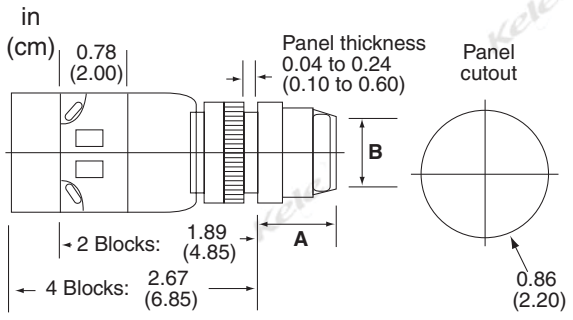
- ***Flush, extended, or mushroom style available***
- ***Snap-fit blocks with N.O. and N.C. contacts***
- ***Self-cleaning silver contacts***
- ***Rugged, oil-tight construction***



SPECIFICATIONS

Contact Rating	10A, 600 VAC/VDC; 5mA, 3 VAC/ VDC minimum
Contact Resistance	50 mΩ maximum (inital value)
Contact Material	Silver
Electrical Life	500,000 minimum operations
Protection Rating	NEMA 1, 2, 3R, 4, 4X, 12, 13
Insulation	600V
Applicable Wire Size	
Minimum	1 x 22 AWG
Maximum	2 x 14 AWG or 1 x 12 AWG
Mechanical Life	500,000 minimum operations
Operating Temperature	-13° to 122°F (-25° to 50°C)
Panel Thickness	Panel thickness adjustment ring, 0.04" to 0.24" (0.10 to 0.61 cm)
Approvals	UL listed, File #E68961; CSA certified, File #LR48366
Warranty	1.5 years

DIMENSIONS



PUSHBUTTONS	A	B
Flush	0.507 (1.30)	Ø 0.936 (2.40)
Extended	0.741 (1.90)	Ø 0.936 (2.40)

ORDERING INFORMATION

MODEL	DESCRIPTION
ABW	Momentary action push-button switch
AOW	Maintained action push-button switch
1	Flush (includes colored buttons of red, green, and black)
2	Extended (specify color below, red standard)
4	Mushroom (specify color below, red standard)
	# Normally open contacts (max 2)
	# Normally closed contacts (max 2)
	Button color for extended and mushroom models
	B = Black, G = Green, R = Red

ABW **1** **0** **1**

Example: **ABW101** Momentary flush push button with one normally closed contact

RELATED PRODUCTS

E-1PBG	One-hole NEMA 12/13 push-button enclosure
E-2PBG	Two-hole NEMA 12/13 push-button enclosure
E-3PBG	Three-hole NEMA 12/13 push-button enclosure
E-4PBG	Four-hole NEMA 12/13 push-button enclosure
HW-C01	Normally closed contact
HW-C10	Normally open contact
NWAR-27	Emergency stop label 2.75" (6.99 cm) round
SSG1-67	Wall plate box mount 7/8" hole
TW-DB	Dummy block (needed when only 1 HW-C10 or HW-C01 is used)

***Holes are 22.5 mm in a vertical arrangement.**

DESCRIPTION

APW Series replaceable incandescent and LED pilot lights can be mounted on control panels to provide immediate visual status of mechanical equipment such as fans, pumps, compressors, or control circuits.

FEATURES

- ***Rugged, oil-tight construction***
- ***Bezel-threaded lock ring for easy panel installation***
- ***Incandescent or LED lamps***
- ***Small size***
- ***Excellent visibility***
- ***Multiple voltage input ranges***

SSG1-67

APW299D-G-24 mounted in E-1PBG

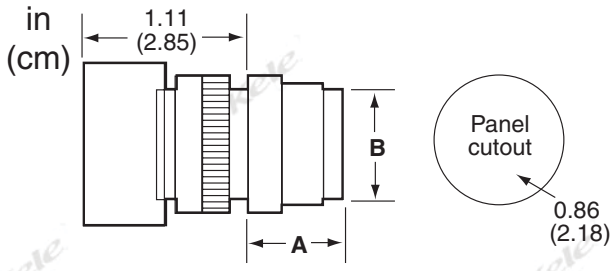
APW199D-R-24

APW299D-G-24

SPECIFICATIONS

Materials Of Construction	
Lens	Acrylic
Base	Nylon
Bezel	Chrome-plated die-cast zinc
Applicable Wire Size	
Minimum	1 x 22 AWG
Maximum	2 x 14 AWG or 1 x 12 AWG
Mounting	0.86” (2.2 cm) hole
Panel Thickness	Panel thickness adjustment ring 0.04" to 0.24" (0.10 to 0.61 cm)
Lamps	T3-1/4 miniature bayonet base
LED	6 VDC, 52 mA; 12 VAC/VDC, 26 mA; 24 VAC/VDC,13 mA; 120 VAC, 8 mA; 1,000,000 hrs average life
Incandescent	6.3V, 1W; 12V, 1W; 24V, 1W; 3000 hrs average life
Protection Rating	NEMA 1, 2, 3, 3R, 4, 4X, 12, 13
Approvals	UL listed, File #E65961; CSA certified, File #LR48366
Warranty	1 year

DIMENSIONS



PILOT LIGHTS	A	B
Dome	0.98 (2.49)	Ø 0.94 (2.36)
Flush	0.62 (1.57)	Ø 0.94 (2.36)

ORDERING INFORMATION

PILOT LIGHTS

INCANDESCENT		LED	
MODEL	**STYLE**	**MODEL**	**STYLE**
APW299 - † - ††	**Dome**	**APW299D - † - ††**	**Dome**
APW199 - † - ††	**Round flush**	**APW199D - † - ††**	**Round flush**
† Lens Color Code: R-Red, **G**-Green, **A**-Amber, **S**-Blue, **W**-White **†† Lamp Voltage Code: 6**-6 VAC/VDC, **12**-12 VAC/VDC, **24**-24 VAC/VDC		**† Lens Color Code: R**-Red, **G**-Green, **A**-Amber, **S**-Blue, **W**-White, **Y**-Yellow **†† Lamp Voltage Code: 6**-6 VDC, **12**-12 VAC/VDC, **24**-24 VAC/VDC, **120**-120 VAC	

REPLACEMENT LAMPS

INCANDESCENT		LED		
MODEL	**VOLTAGE**	**MODEL**	**VOLTAGE**	**COLOR**
IS-6	6.3V	**LSTD-6†**	6 VDC	**G** - Green
IS-12	12V	**LSTD-1†**	12 VAC/VDC	**R** - Red **A** - Amber
IS-24	24V	**LSTD-2†**	24 VAC/VDC	**W** - White
IS-120	120V	**LSTD-H2†**	120 VAC	**PW** - Pure White **S** - Blue

RELATED PRODUCTS

E-1PBG	**One-hole NEMA 12/13 push-button enclosure**
E-2PBG	**Two-hole NEMA 12/13 push-button enclosure**
E-3PBG	**Three-hole NEMA 12/13 push-button enclosure**
E-4PBG	**Four-hole NEMA 12/13 push-button enclosure**
SSG1-67	**Wall plate box mount 7/8" hole**

***Holes are 22.5 mm in a vertical arrangement.**

White face with red letters only.
Similarly designed Lithonia Exit Lights also acceptable

CE Series
LED Emergency Exit

DESCRIPTION
The CE Series offers quality and value with a compact and attractive LED based AC or emergency exit. The white or black housing is made of high impact UL flame rated thermoplastic. Snap together canopy, housing and removable chevrons for quick and easy installation. Universal single or double-face. The remote capacity option will run 4 CIR/COR Series single remote lamp-heads or 2 double CIR/COR remotes.

tradeSELECT

APPLICATION
The CE Series can be applied in stair-wells, hallways, offices and other commercial applications.

FEATURES
- AC Only or Emergency with battery models
- LED life-cycle of more than 10 years
- Molded-in template for Quick installation
- Dual-voltage 120 or 277V AC input
- Includes long-life Nickel Cadmium battery for UL recognized 90 minute emergency lighting
- Remote capacity or extended runtime option
- Damp Location Listed 20°C to 30°C (68°F to 86°F)
- Provided with test switch and AC-On indicator
- Canopy included

STANDARDS, CERTIFICATION, AND COMPLIANCES
UL924 Listed for Damp Location
NFPA 101 and NFPA 70
OSHA

WARRANTY
2 year full unit warranty

ENERGY CONSUMPTION

	120 VAC	277 VAC
CAR	1.78W	1.88W
CAG	1.52W	1.48W
CER	1.78 W	1.88 W
CEG	1.49 W	1.57 W
CERRC	3.60 W	4.14 W
CEGRC	3.28 W	3.81 W

ORDERING GUIDE

Catalog Number	Description
CAR	White Thermoplastic Exit, Universal Face, Red LED AC Only Exit
CAG	White Thermoplastic Exit, Universal Face, Green LED AC Only Exit
CARB	Black Thermoplastic Exit, Universal Face, Red LED AC Only Exit
CAGB	Black Thermoplastic Exit, Universal Face, Green LED AC Only Exit
CER	White Thermoplastic Exit, Universal Face, Red LED Emergency Exit
CERB	Black Thermoplastic Exit, Universal Face, Red LED Emergency Exit
CEG	White Thermoplastic Exit, Universal Face, Green LED Emergency Exit
CEGB	Black Thermoplastic Exit, Universal Face, Green LED Emergency Exit
CERRC	White Thermoplastic Exit, Universal Face, Red LED Emergency Exit,Remote Capacity
CERRCB	Black Thermoplastic Exit, Universal Face, Red LED Emergency Exit,Remote Capacity
CEGRC	White Thermoplastic Exit, Universal Face, Green LED Emergency Exit, Remote Capacity

Note: Remote Capacity Exit will only power the Compass Indoor and Outdoor Remote (CIR and COR Series)

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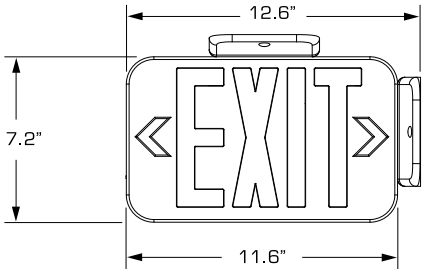
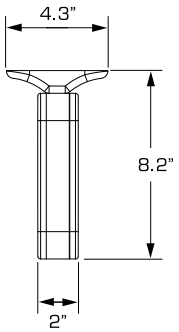
DIMENSIONS





Single Carton Weight: 2 lbs.
Master Carton Quantity: 6 each

ACCESSORIES

WGLX Wireguard - 10” H X 14” W X 2¼” D
CIR Series - Matching LED Indoor Remote Heads
COR Series - Matching LED Outdoor Remote Heads

CIRS CIRD C0RD C0RS

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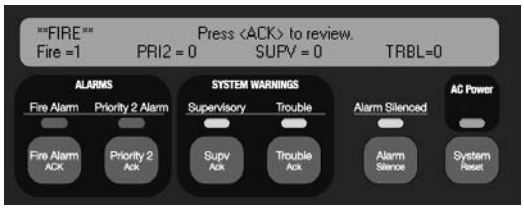
4100ES OPERATING INSTRUCTIONS
FOLLOWING AN ALARM, SUPERVISORY, OR TROUBLE CONDITION

YOUR SAFETY AND THE SAFETY OF THOSE AROUND YOU ALWAYS COMES FIRST.
Actions taken during a fire depend upon local practices. Be sure you know what to do.

Systems Using Individual Acknowledge

ALARM
RED LED FLASHES AND TONE ALERT PULSES



1. Unlock and open the panel door. The appearance of the alphanumeric display depends on whether the Display 1st Alarm Option is enabled.
   - **If Display 1st Alarm Option is enabled.** The display alternates between two screens similar to Screen 1 and Screen 2 (which is a detailed description of the 1st alarm) below.

Screen 1

```
**FIRE**                Press (ACK) to review.
FIRE = 1    PRI2=0      SUPV=0      TRBL=0
```

Screen 2

```
FIRST FLOOR EAST WING     ROOM 31
PULL STATION
```

   - **If Display 1st Alarm Option is not enabled**. Only a screen similar to Screen 1 appears, indicating the total number of alarm conditions present on the system.

2. Press the <ALARM ACK> key under the flashing red LED. *Read* the alphanumeric display. Continue to press the ALARM ACK key until all alarms are acknowledged. When this occurs, the tone-alert turns off and the ALARM led changes from flashing to ON steady.

Silencing the Signals

1. Press the ALARM SILENCE key and read the display. The alphanumeric display reads "ALARM SILENCE IN PROGRESS" and the ALARM SILENCED LED turns on steady.

   Note: The Disable switch on the 4100 front panel is not to be used during an alarm condition to silence the notification appliances.

Resetting the System

1. When the alarm condition has been cleared, restore or replace all affected devices (smoke detectors, motion sensors, etc.) in accordance with the instructions provided with each device.
2. Reset the system as follows:
   - FIRE ALARM Condition. Press the SYSTEM RESET key.
   - PRIORITY 2 ALARM Condition. Reset these conditions using either the System Reset key or a dedicated CONTROL key, located on left side of panel.

   After a delay, the red ALARM LED flashes and the tone-alert sounds with a pulsing tone.
3. Press the <ALARM ACK> key under the flashing red LED. Continue to press the ALARM ACK> key until all alarm conditions have been acknowledged.

   After a delay, the display reads "SYSTEM IS NORMAL".

SUPERVISORY/TROUBLE
YELLOW LED FLASHES AND TONE ALERT ON STEADY

1. Unlock and open the panel door. The alphanumeric display shows the number of abnormal conditions. (This example describes managing a Trouble condition. A Supervisory condition is handled similarly.)

```
**TROUBLE**             Press (ACK) to review.
FIRE = 0    PRI2=0      SUPV=0      TRBL=1
```

2. Press the <TBL ACK> key under the flashing yellow LED. Read and follow instructions on the alphanumeric display. The display shows the area and type of problem, as shown in the example below. The tone alert momentarily silences and then resounds.

```
FIRST FLOOR EAST WING     ROOM 31
FIRE MONITOR ZONE       OPEN CKT TROUBLE
```

3. Press the <TBL ACK> key under the flashing yellow LED again to review the abnormal status. The alphanumeric display shows the area and type of problem, the tone-alert silences, and the SYSTEM TROUBLE LED turns on steady. Read the alphanumeric display and then investigate the problem to determine its cause.
4. If a Trouble condition exists, restore or replace the defective equipment (switch, wire, device, etc.) in accordance with the equipment's instructions.

   Note: When the abnormal condition causing the trouble clears, the yellow LED flashes and the tone-alert sounds steady.
5. Press the <TROUBLE ACK> key under the flashing yellow LED. The alphanumeric display shows the system status.
6. Press the <TROUBLE ACK> key again. After a delay the system shows the following:

```
          SYSTEM IS NORMAL
      9:27:40     TUE 29 NOV 00
```

Note: If your system switch configuration does not match this sheet, consult Simplex for specific operations. Simplex is listed in the Yellow Pages.

In case of trouble, notify:

Name: _____

Address _____

Phone # _____

FRAME AND MOUNT THESE INSTRUCTIONS ADJACENT TO THE PANEL.
SEE OPERATOR'S MANUAL FOR DETAILED OPERATION.

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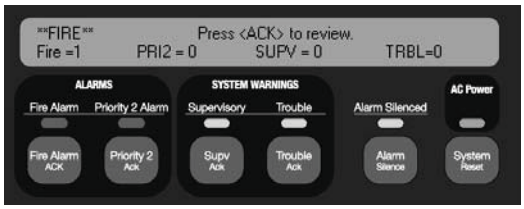
574-852 Rev. A

4100ES OPERATING INSTRUCTIONS
FOLLOWING AN ALARM, SUPERVISORY, OR TROUBLE CONDITION

YOUR SAFETY AND THE SAFETY OF THOSE AROUND YOU ALWAYS COMES FIRST.
Actions taken during a fire depend upon local practices. Be sure you know what to do.

Systems Using Global Acknowledge

ALARM
RED LED FLASHES AND TONE ALERT PULSES



1. Unlock and open the panel door. The appearance of the alphanumeric display depends on whether the Display 1st Alarm Option is enabled.
   - **If Display 1st Alarm Option is enabled.** The display alternates between two screens similar to Screen 1 and Screen 2 (which is a detailed description of the 1st alarm) below.

Screen 1

```
**FIRE**                Press (ACK) to review.
FIRE = 1    PRI2=0      SUPV=0      TRBL=0
```

Screen 2

```
FIRST FLOOR EAST WING     ROOM 31
PULL STATION
```

   - **If Display 1st Alarm Option is not enabled**. Only a screen similar to Screen 1 appears, indicating the total number of alarm conditions present on the system.

2. Press the <ALARM ACK> key under the flashing red LED. *Read* the alphanumeric display. The tone-alert turns off and the ALARM led changes from flashing to ON steady.

Silencing the Signals

1. Press the ALARM SILENCE key and read the display. The alphanumeric display reads "ALARM SILENCE IN PROGRESS" and the ALARM SILENCED LED turns on steady.

   Note: The Disable switch on the 4100 front panel is not to be used during an alarm condition to silence the notification appliances.

Resetting the System

1. When the alarm condition has been cleared, restore or replace all affected devices (smoke detectors, motion sensors, etc.) in accordance with the instructions provided with each device.

2. Reset the system as follows:
   - FIRE ALARM Condition. Press the SYSTEM RESET key.
   - PRIORITY 2 ALARM Condition. Reset these conditions using either the System Reset key or a dedicated CONTROL key, located on left side of panel. Refer to

   After a delay, the red ALARM LED flashes and the tone-alert sounds with a pulsing tone.

3. Press the <ALARM ACK> key under the flashing red LED. Continue to press the ALARM ACK> key until all alarm conditions have been acknowledged.

   After a delay, the display reads "SYSTEM IS NORMAL".

SUPERVISORY/TROUBLE
YELLOW LED FLASHES AND TONE ALERT ON STEADY

1. Unlock and open the panel door. The alphanumeric display shows the number of abnormal conditions. (This example describes managing a Trouble condition. A Supervisory condition is handled similarly.

```
**TROUBLE**             Press (ACK) to review.
FIRE = 0    PRI2=0      SUPV=0      TRBL=1
```

2. Press the <TBL ACK> key under the flashing yellow LED. Read and follow instructions on the alphanumeric display. The display shows the area and type of problem, as shown in the example below. The tone alert momentarily silences and then resounds.

```
FIRST FLOOR EAST WING     ROOM 31
FIRE MONITOR ZONE       OPEN CKT TROUBLE
```

3. Press the <TBL ACK> key under the flashing yellow LED again to review the abnormal status. The alphanumeric display shows the area and type of problem, the tone-alert silences, and the SYSTEM TROUBLE LED turns ON steady. Read the alphanumeric display and then investigate the problem to determine its cause.

4. If a Trouble condition exists, restore or replace the defective equipment (switch, wire, device, etc.) in accordance with the equipment's instructions.

   The Trouble condition automatically clears when the abnormal condition has been corrected.

   After a short delay, the system returns to normal and displays the following.

```
          SYSTEM IS NORMAL
       9:27:40     TUE 29 NOV 00
```

Note: If your system switch configuration does not match this sheet, consult Simplex for specific operations. Simplex is listed in the Yellow Pages.

In case of trouble, notify:

Name: _____

Address_____

Phone # _____

FRAME AND MOUNT THESE INSTRUCTIONS ADJACENT TO THE PANEL.
SEE OPERATOR'S MANUAL FOR DETAILED OPERATION.

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574-852 Rev. A

Features

Master Controller (top) bay:

- 32-Bit Master Controller with color-coded operator interface including raised switches for high confidence feedback
- Dual configuration program CPU, convenient service port access, and capacity for up to 2500 addressable points
- CPU assembly includes 2 GB dedicated compact flash memory for on-site system programming and information storage
- System power supply (SPS) and charger (9 A total) with on-board: NACs, IDNet addressable device interface, programmable auxiliary output and alarm relay
- Available with InfoAlarm Command Center expanded content user interface (see data sheet S4100-0045)
- Upgrade kits are available for existing control panels

Standard addressable interfaces include:

- IDNet addressable device interface with 250 points that support TrueAlarm analog sensing and operate with *either shielded or unshielded* twisted pair wiring
- Remote annunciator module support via RUI (remote unit interface) communications port

Optional modules include:

- Building Network Interface Module (BNIC) for Ethernet connectivity options (see data sheet S4100-0061)
- Electrically isolated output IDNet 2 (two loop) and IDNet 2+2 (four loop) modules with short circuit isolation output loops allowing use with either shielded or unshielded, twisted or untwisted single pair wiring
- Fire Alarm Network Interfaces, DACTs, city connections, and up to five (5) RS-232 ports for printers and terminals
- IP communicator compatibility
- MAPNET II addressable device modules and MAPNET II quad isolator modules
- Alarm relays, auxiliary relays, additional power supplies, IDC modules, NAC expansion modules
- Service modems, VESDA Air Aspiration Systems interface, ASHRAE BACnet Interface, TCP/IP Bridges
- LED/switch modules and panel mount printers
- Emergency communications systems (ECS) equipment; 8 channel digital audio or 2 channel analog audio
- Battery brackets for seismic area protection (see page 2)

Compatible with Simplex® remotely located 4009 IDNet NAC Extenders, up to ten per IDNet SLC

4100ES and upgrade kits are UL Listed to:

- UL 864, Fire Detection and Control (UOJZ), and Smoke Control Service (UUKL)
- UL 2017, Process Management Equipment (QVAX)
- UL 1076, Proprietary Alarm Units-Burglar (APOU)
- UL 1730, Smoke Detector Monitor (UULH)
- UL 2572, Mass Notification Systems (PGWM)); refer to data sheet S4100-0034 for audio equipment
- ULC S527, Control Units for Fire Alarm Systems

4100ES Cabinets are Available with
One, Two or Three Bays

Software Feature Summary

CPU provides dual configuration programs:

- Two programs allow for optimal system protection and commissioning efficiency with one active program and one reserve
- Downtime is reduced because the system stays running during download

PC based programmer features:

- Convenient front panel accessed Ethernet port for quick and easy ***download*** of site-specific programming
- Modifications can be ***uploaded*** as well as downloaded for greater service flexibility
- ***AND***, firmware enhancements are made via software downloads to the on-board flash memory

Introduction

4100ES Series Fire Detection and Control Panels provide extensive installation, operator, and service features with point and module capacities suitable for a wide range of system applications. An on-board Ethernet port provides fast external system communications to expedite installation and service activity. Dedicated compact flash memory archiving provides secure on-site system information storage of electronic job configuration files to meet NFPA 72 (*National Fire Alarm and Signaling Code*) requirements.

Modular design. A wide variety of functional modules are available to meet specific system requirements. Selections allow panels to be configured for either Stand-Alone or Networked fire control operation. InfoAlarm Command Center options provide convenient expanded display content (detailed on data sheet S4100-0045).

* See pages 5 and 6 for product that is UL or ULC listed and additional listing information. This product has been listed by the California State Fire Marshal (CSFM) pursuant to Section 13144.1 of the California Health and Safety Code. See CSFM Listing 7165-0026:251(4100ES) for allowable values and/or conditions concerning material presented in this document. Accepted for use – City of New York Department of Buildings – MEA35-93E. Additional listings may be applicable; contact your local Simplex product supplier for the latest status. Listings and approvals under Simplex Time Recorder Co. are the property of Tyco Fire Protection Products.

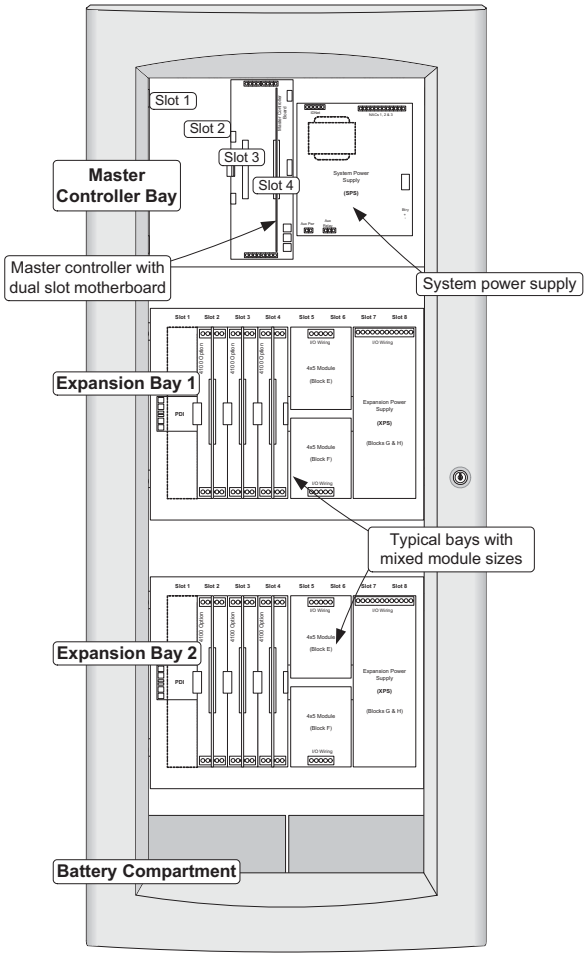
Module Bay Description

The Master Controller Bay (top) includes a standard multi-featured system power supply, the master controller board, and operator interface equipment.

The Expansion Bays include a Power Distribution Interface (PDI) for new 4" x 5" flat design option modules and also accommodate 4100-style modules.

The Battery Compartment (bottom) accepts two batteries, up to 50 Ah, to be mounted within the cabinet without interfering with module space.

The following illustration identifies bay locations using a three bay cabinet for reference.



4100ES Module Bay Reference

Mechanical Description

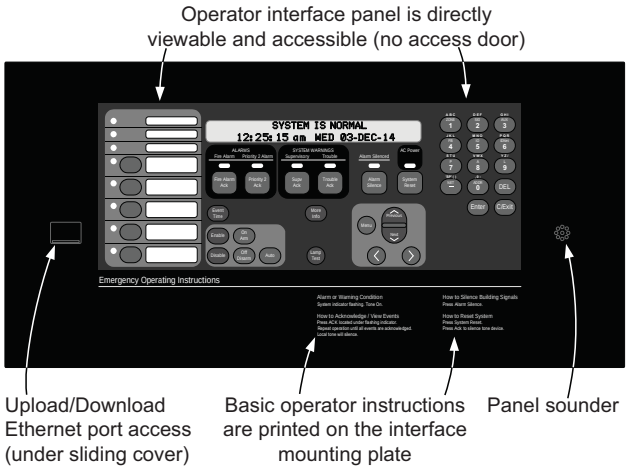
- Boxes can be close-nippled; each box provides convenient stud markers for drywall thickness and nail-hole knockouts for quicker mounting
- Smooth box surfaces are provided for locally cutting conduit entrance holes exactly where required
- Cabinet assembly design has been seismic tested and is certified to IBC and CBC standards as well as to ASCE 7 categories A through F, requires battery brackets as detailed on data sheet S2081-0019

Mechanical Description *(Continued)*

- The latching dress panel (retainer) assembly easily lifts off for internal access
- NACs are mounted directly on power supply assemblies providing minimized wiring loss, compact size, and readily accessible terminations
- Packaging supports traditional 4100-style motherboard with daughter cards
- Modules are power-limited (except as noted, such as relay modules)
- The NEMA 1/IP30 box is ordered separately and available for early installation
- Doors are available with tempered glass inserts or solid; boxes and doors are available in platinum or red
- Boxes and door/retainer assemblies are ordered separately per system requirements; refer to data sheet S4100-0037 for details

Operator Interface Detail Reference

The following illustration identifies the primary functions of the operator interface.



Software Feature Summary

- TrueAlarm individual analog sensing with front panel information and selection access
- "Dirty" TrueAlarm sensor maintenance alerts, service and status reports including "almost dirty"
- TrueAlarm magnet test indication appears as distinct "test abnormal" message on display when in test mode
- TrueAlarm sensor peak value performance report
- ***"Install Mode"*** allows grouping of multiple troubles for uninstalled modules and devices into a single trouble condition (typical with future phased expansion); with future equipment and devices grouped into a single trouble, operators can more clearly identify events from the commissioned and occupied areas
- Module level ground fault searching assists installation and service by locating and isolating modules with grounded wiring
- ***"Recurring Trouble Filtering"*** allows the panel to recognize, process, and log recurring intermittent troubles (such as external wiring ground faults), but only sends a single outbound system trouble to avoid nuisance communications
- WALKTEST silent or audible system test performs an automatic self-resetting test cycle

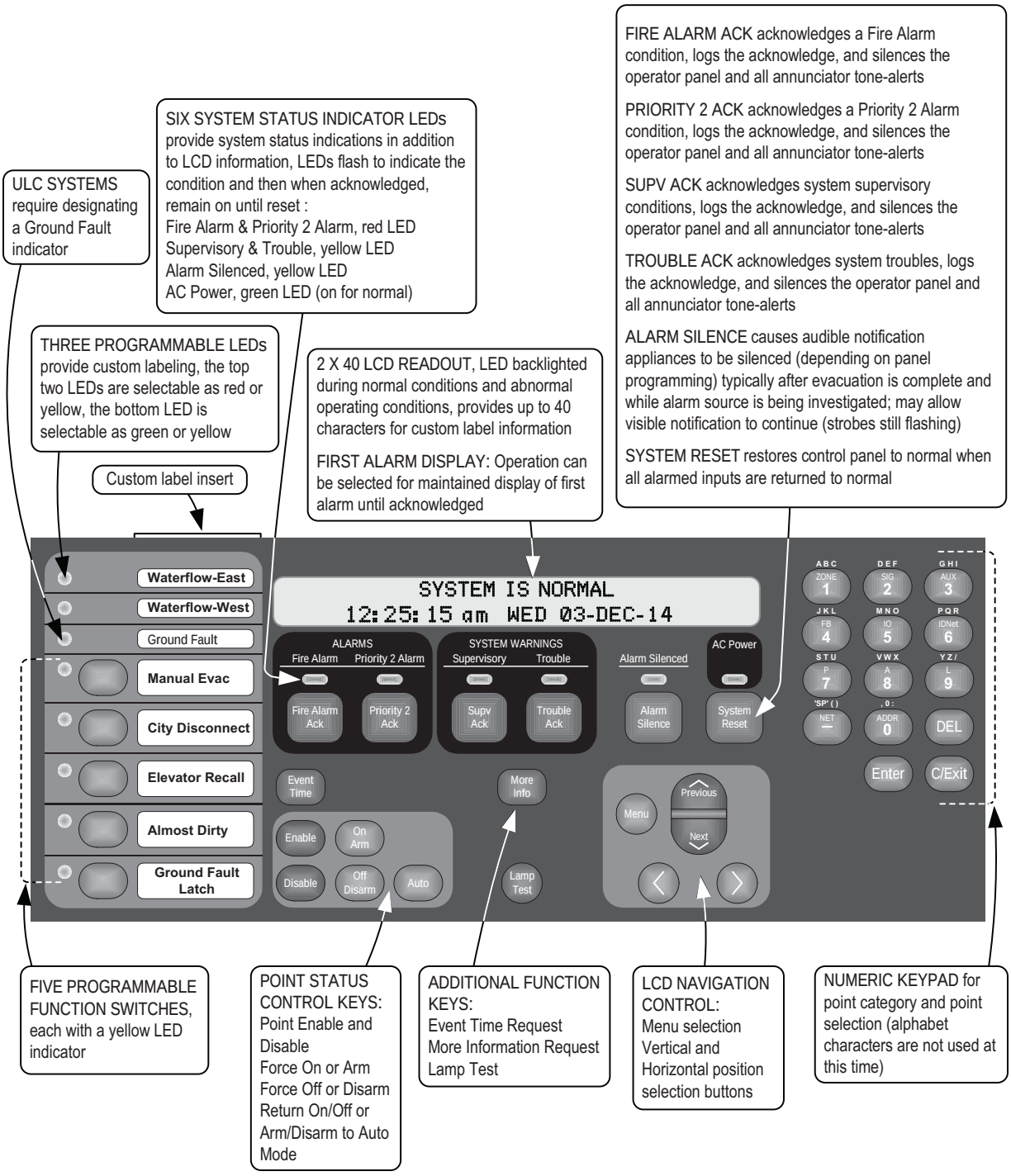
Operator Interface

Convenient Status Information. With the locking door closed, the glass window allows viewing of the display, status LEDs, and available operator switches. Features include a two-line by 40-character, wide viewing angle (super-twist) LCD with status LEDs and switches as shown in the illustration below.

LED indicators describe the general category of activity being displayed with the LCD providing more detail. For the authorized user, unlocking the door provides access to the control switches and allows further inquiry by scrolling the display for additional detail.

Operator Interface Features

- Convenient and extensive operator information is provided using a logical, menu-driven display
- Multiple automatic and manual diagnostics for maintenance reduction
- Alarm and Trouble History Logs (up to 1250 entries for each, 2500 total events) are available for viewing from the LCD, or capable of being printed to a connected printer, or downloaded to a service computer
- Convenient PC programmer label editing
- Password access control



Compatible Peripheral Devices

The 4100ES is compatible with an extensive list of remote peripheral devices including printers, CRT/keyboards (up to five total), and both conventional and addressable devices including TrueAlarm analog sensors.

Addressable Device Control

Overview. The 4100ES provides standard addressable device communications for IDNet compatible devices and accepts optional modules for communications with MAPNET II compatible devices. Using a two wire communications circuit, individual devices such as manual fire alarm stations, TrueAlarm sensors, conventional IDC zones, and sprinkler waterflow switches can be interfaced to the addressable controller to communicate their identity and status.

Addressability allows the location and condition of the connected device to be displayed on the operator interface LCD and on remote system annunciators. Additionally, control circuits (fans, dampers, etc.) may be individually controlled and monitored with addressable devices.

Addressable Operation. Each addressable device on the communication channel is continuously interrogated for status condition such as: normal, off-normal, alarm, supervisory, or trouble. Both Class B and Class A operation are available. Sophisticated poll and response communication techniques ensure supervision integrity and allow for "T-tapping" of the circuit for Class B operation. Devices with LEDs pulse the LED to indicate receipt of a communications poll and can be turned on steady from the panel.

IDNet Channel Capacity. The CPU bay system power supply (SPS) provides an IDNet signaling line circuit (SLC) that supports up to 250 addressable monitor and control points intermixed on the same pair of wires. Additional 250 point IDNet circuit modules are available, refer to IDNet 2 and IDNet 2+2 modules on page 7.

IDNet, MAPNET II, IDNet 2, and IDNet 2+2 SLC Wiring Common Specifications

Maximum Distance from Control Panel per Device Load	1 to 125	4000 ft (1219 m); 50 ohms
	126-250	2500 feet (762 m); 35 ohms
Connections		Terminals for 18 to 12 AWG (0.82 mm^2 to 3.31 mm^2)
IDNet and MAPNET II Specifications		
Wire Type	Preferred	Shielded twisted pair (STP)
	Acceptable*	Unshielded twisted pair (UTP)
IDNet and MAPNET II Wiring, Total Wire Length Allowed With "T" Taps for Class B Wiring		Up to 10,000 ft (3 km); 0.58 µF
IDNet 2 and IDNet 2+2 Wiring Specifications		
Wire Type		Shielded or unshielded, twisted or untwisted wire*
Total Wire Length Allowed With "T" Taps for Class B Wiring		Up to 12,500 ft (3.8 km); 0.60 µF
Maximum Capacitance Between IDNet 2 Channels		1 µF
IDNet 2 and IDNet 2+2 Module Compatibility: IDNet communicating devices and TrueAlarm sensors *including* QuickConnect and QuickConnect2 sensors		

* Some applications may require shielded wiring. Review your system with your local Simplex product supplier.

True*Alarm* System Operation

Addressable device communications include operation of TrueAlarm smoke and temperature sensors. Smoke sensors transmit an output value based on their smoke chamber condition and the CPU maintains a current value, peak value, and an average value for each sensor. Status is determined by comparing the current sensor value to its average value. Tracking this average value as a continuously shifting reference point filters out environmental factors that cause shifts in sensitivity.

Programmable sensitivity of each sensor can be selected at the control panel for different levels of smoke obscuration (shown directly in percent) or for specific heat detection levels. To evaluate whether the sensitivity should be revised, the peak value is stored in memory and can be easily read and compared to the alarm threshold directly in percent.

CO sensor bases combine an electrolytic CO sensing module with a TrueAlarm analog sensor to provide a single multiple sensing assembly using one system address. The CO sensor can be enabled/disabled, used in LED/Switch modes and custom control, and can be made public for communication across a fire alarm Network. (refer to data sheet S4098-0052 for details)

TrueAlarm heat sensors can be selected for fixed temperature detection, with or without rate-of-rise detection. Utility temperature sensing is also available, typically to provide freeze warnings or alert to HVAC system problems. Readings can selected as either Fahrenheit or Celsius.

TrueSense Early Fire Detection. Multi-sensor 4098-9754 provides photoelectric and heat sensor data using a single 4100ES IDNet address. The panel evaluates smoke activity, heat activity, ***and their combination***, to provide TrueSense early detection. For more details on this operation, refer to data sheet S4098-0024.

Diagnostics and Default Device Type

Sensor Status. TrueAlarm operation allows the control panel to automatically indicate when a sensor is almost dirty, dirty, and excessively dirty. The NFPA 72 requirement for a test of the sensitivity range of the sensors is fulfilled by the ability of TrueAlarm operation to maintain the sensitivity level of each sensor. CO Sensors track their 10 year active life status providing indicators to assist with service planning. Indicators occur at: 1 year, 6 months, and when end of life is reached.

Modular TrueAlarm sensors use the same base and different sensor types (smoke or heat sensor) and can be easily interchanged to meet specific location requirements. This allows intentional sensor substitution during building construction when conditions are temporarily dusty. Instead of covering smoke sensors (causing them to be disabled), heat sensors may be installed without reprogramming the control panel. The control panel will indicate an incorrect sensor type, but the heat sensor will operate at a default sensitivity to provide heat detection for building protection at that location.

CPU Bay Module Details

Master Controller and Motherboard:

- Mounts in Slot 4 of a two slot motherboard (Slots 3 and 4 of the Master Controller Bay) and provides one Class B or Class A, RUI communications channel, available at Slot 4
- RUI communications controls up to 31 devices per master controller (on one or multiple RUI channels); devices include: MINIPLEX transponders, 4603-9101 LCD Annunciators, 4602-9101 Status Command Units (SCU), 4602-9102 Remote Command Units (RCU), 4602 Series LED Annunciator Panels, and 4100 Series 24 I/O and LED/Switch modules
- Up to four RUI channels are supported; use up to three 4100-1291 RUI expansion modules as required
- Optional Service Modem 4100-6030 mounts onto the master controller board with its own on-board connections
- Slot 3 of the motherboard is primarily for the 4100-6078 Network Interface Board with media modules, and secondarily for the 4100-6038 Dual RS-232 Board (4100-6038 is required for 2120 System connections)

System Power Supply: (see page 9 for more detail)

- Rating is 9 A total with "Special Application" appliances; 4 A total for "Regulated 24 DC" appliance power
- Outputs are power-limited, except for the battery charger
- Provides system power, battery charging, auxiliary power, auxiliary relay, earth detection, on-board IDNet communications channel for 250 points, three on-board NACs, and provisions for either an optional City Connect Module or an optional Alarm Relay Module
- **IDNet SLC Output** provides Class B or Class A communications for up to 250 addressable devices (as described on page 4)

System Power Supply *(Continued)*:

- **Three, 3 A On-Board NACs**, conventional reverse polarity operation; rated 3 A for Special Application appliances and 2 A for Regulated 24 DC power, with electronic control and overcurrent protection; selectable as Class B or Class A, and for synchronized strobe or SmartSync horn/strobe operation over two wires
- **NACs can be selected** as auxiliary power outputs derated to 2 A for continuous duty; the total auxiliary power output per SPS is limited to 5 A
- **Battery Charger** is dual rate, temperature compensated, and charges up to 50 Ah sealed lead-acid batteries mounted in the battery compartment (33 Ah for single bay cabinets); also is UL listed for charging up to 110 Ah batteries mounted in an external cabinet (see data sheet S2081-0012 for details)
- **Battery and Charger Monitoring** includes battery charger status and low or depleted battery conditions; status information provided to the master controller includes analog values for: battery voltage, charger voltage and current, actual system voltage and current, and individual NAC currents
- **2 A Auxiliary Power Output** is selectable for detector reset, door holder, or coded output operation
- **Auxiliary Relay** is selectable as N.O. or N.C., rated 2 A @ 32 VDC, and is programmable as a trouble relay, either normally energized or normally de-energized, or as an auxiliary control
- **Optional City Connect Module** (4100-6031, with disconnect switches, or 4100-6032, without disconnect switches) can be selected for conventional dual circuit city connections
- **Optional Alarm Relay Module** (4100-6033) provides three Form C relays that are used for Alarm, Trouble, and Supervisory, rated 2 A resistive @ 32 VDC

Master Controller Selection Information

4100ES Master Controller and Expansion Bay Selection* (Canadian models have low battery cutout)

Model	Model Type and Listing			Description	Supv.**	Alarm**
4100-9111	120 VAC Input		UL	4100ES Master Controller Assembly **with LCD and operator interface**, 9 A system power supply/battery charger (SPS), 250 point IDNet interface, 3 NACs, auxiliary relay, and external RUI communications interface	373 mA	470 mA
4100-9112	English	120 VAC, Canadian	ULC			
4100-9113	French					
4100-9211	220-240 VAC Input		UL			
4100-9131	120 VAC Input		UL	4100ES Master Controller Assembly, **no display, no operator interface**, 9 A system power supply/battery charger (SPS), 250 point IDNet interface, 3 NACs, auxiliary relay, and external RUI communications interface	363 mA	425 mA
4100-9132	English, 120 VAC, Canadian		ULC			
4100-9230	220-240 VAC Input		UL			
4100-9121 (not ULC listed)	Redundant Master Controller, two bay assembly; top bay contains LCD and operator interface, CPU card assembly, and 4100ES, 9 A system power supply/battery charger (SPS); second bay contains CPU card in Slot 2, and LCD and operator interface; 120 VAC, 60 Hz input; **NOTE: RUI connections require use of 4100-1291 RUI expansion modules**				718 mA	937 mA

4100ES Master Controller Upgrades for Existing 4100 Series Fire Alarm Control Panels*

Model	Panel Type	Includes
4100-7150	1000 pt 4100 (4100+)	New Master Controller CPU card, 4100ES door assembly with LCD and user interface, and Ethernet connection
4100-7152	512 pt 4100	Same as 4100-7150 plus a Universal Power Supply
4100-7158	4100U **or** 1000 pt 4100 (4100+) **previously upgraded** to 4100U	New Master Controller CPU card with Ethernet Connection Upgrade Kit **(door assembly with LCD and user interface are not included)** for: • 4100U **with or without** LCD and operator interface, **or** • 4100+ **without** LCD and operator interface, **or** • An existing 4100 (512 pt) or 4100+ (1000 pt) panel that was previously **upgraded** to a 4100U Master Controller and Display

* For InfoAlarm Command Center expanded content display products, refer to data sheet S4100-0045. *(Continued on next page)*

** Note: Master Controller current does not subtract from 9 A output rating.

Master Controller Selection Information *(Continued)*

Master Controller Accessories

4100-2300	Expansion Bay Assembly; **order for each required expansion bay** (not required for 4100-9121)
4100-2303	Legacy Module Stabilizer Bracket, used when expansion bays have legacy slot style modules
4100-2301	Expansion Bay Upgrade Kit for mounting 4100ES style (4" x 5" modules) in existing 4100 style panels; **Note:** When using this kit to upgrade a 4100+ transponder, a **4100-0620 Transponder Interface Card (TIC)** is also required for communications to the 4100ES module

Master Controller Upgrades for Existing 4020 Series Fire Alarm Control Panel

Model	Description
4100-9833	4020 Master Controller Upgrade to 4100ES; Includes New Master Controller with LCD & operator interface assembly, 8 VDC Converter and RUI Interface in a single bay cabinet with locking glass door and retainer; mounts as an adjunct panel close-nippled to existing 4020 cabinet; also includes 8 VDC box-to-box power and communications harness and solid filler panel for the existing 4020 Master Controller bay

Module Selection Information

Communication Modules

Model	Description		Size	Supv.	Alarm
4100-6078	For Master Controller; mounts in Slot 3	Modular Network Interface; each requires two media modules (below)	1 Slot	46 mA	46 mA
4100-6061	For Redundant Master Controller		1 Slot	46 mA	46 mA
4100-6056	Wired Media Module	Select two media cards as required; mounts on 4100-6078 or 4100-6061; Class B or Class X operation	N.A.	55 mA	55 mA
4100-6057	Fiber Optic Media Module		N.A.	25 mA	25 mA
4100-6047	Building Network Interface Card (BNIC), refer to data sheet S4100-0061 for details		2 Blocks	291 mA	291 mA
4100-6055	Network Access Dial-in Service Modem, mounts to 4100-6078 or 4100-6061 Network Interface Card, requires telephone line connection		N.A.	60 mA	60 mA
4100-1291	Remote Unit Interface Module (RUI); up to three maximum per control panel		1 Slot	85 mA	85 mA
4100-6030	Service Port Modem, local panel access only, mounts to Master Controller Module, requires telephone line connection, accesses same information as front panel port		N.A.	70 mA	70 mA
4100-6031	**Select one per SPS** (fits on SPS)	City Circuit, with disconnect switches; For use with SPS only, not RPS	N.A.	20 mA	36 mA
4100-6032		City Circuit, w/o disconnect switches	N.A.	20 mA	36 mA
4100-6033		Alarm Relay, 3 Form C relays, 2 A @ 32 VDC; for SPS or RPS	N.A.	15 mA	37 mA
4100-6101	Physical Bridge, Class B, includes 1 modem module and 2 wired modules		1 Slot	210 mA	210 mA
4100-6102	Physical Bridge, Class X, includes 2 modem and 2 wired modules		2 Slots	300 mA	300 mA
4100-6038	Dual Port RS-232 with 2120 interface (slot module)	3 maximum of RS-232 type modules per panel	1 Slot	132 mA	132 mA
4100-6046	Dual Port RS-232 standard interface (4 x 5 module)		1 Block	60 mA	60 mA
4100-6045	Decoder Module		3 Slots	85 mA	163 mA
4100-6048	VESDA Aspiration System Interface		1 Slot	132 mA	132 mA
4100-6052	DACT, Point or Event Reporting; 1 shipped unless 4100-7908 is selected; 2 max. per system; includes 2, 2080-9047 cables, 14 ft (4.3 m) long, RJ45 plug and spade lugs		1 Slot	30 mA	40 mA

Expansion, System and Remote Power Supplies and Accessories (Canadian models have low battery cutout)

Model	Voltage/Listing		Description	Size	Supv.	Alarm
4100-5101	120 VAC	UL	**Expansion Power Supply (XPS)**; 9 A output, 3 built-in Class A/B NACs; NAC operation is same as SPS, see page 5 for details	2 Blocks	50 mA	50 mA
4100-5103	120 VAC, Canadian	ULC				
4100-5102	220-240 VAC	UL				
4100-5115	NAC Expansion Module, 3 NACs, Class A/B, **mounts on XPS only**			N.A.	25 mA	25 mA
4100-5111	120 VAC	UL	**Additional System Power Supply (SPS)**; 9 A power supply/charger with 250 point IDNet channel, 3 Class A/B NACs, add IDNet device currents separately	4 Blocks	175 mA	185 mA
4100-5112	120 VAC, Canadian	ULC				
4100-5113	220-240 VAC	UL				
4100-5125	120 VAC	UL	**Remote Power Supply (RPS)**; 9 A power supply/charger similar to SPS except no IDNet channel or City Circuits; will accept one 4100-6033	4 Blocks	150 mA	185 mA
4100-5126	120 VAC, Canadian	ULC				
4100-5127	220-240 VAC	UL				

Continued on next page

Module Selection Information *(Continued)*

Expansion, System and Remote Power Supplies and Accessories *(Continued)*

Model	Description	Size	Current
4100-5152	12 VDC Power Option, 2 A maximum	1 Block	1.5 A maximum
4100-0156	8 VDC Converter, required for multiple Physical Bridge Modules, 3 A maximum	1 Block	included w/loads
4100-0636	Box Interconnection Harness Kit (non-audio); **order one for each close-nippled cabinet**		
4100-0638	4100 Slot Module Additional 24 VDC Harness; **need when 4100 Slot module requirements exceed 2 A from SPS**		

8 Zone Initiating Device Circuits*

Model	Type	Supv.	Alarm
4100-5005	Class B	75 mA	195 mA
4100-5015	Class A	75 mA	195 mA

* IDC Modules are 1 Slot size

Expansion Signal Module and Options (1.5 A Class B except as noted)

Model	Description		Supv.	Alarm
4100-5116	Converts 1 NAC in to 3 NACs out; 1 Block size		18 mA	80 mA
4100-1266	Expands 3 NACs to 6	select one; mounts on 4100-5116	0.6 mA	60 mA
4100-1267	Converts 3 NACs to Class A		0.6 mA	30 mA

Addressable Interface Modules (refer to location reference on pages 8 and 9)

Model	Description		Supv.	Alarm
4100-3109*	**IDNet 2 Module**, 250 point capacity; electrically isolated output with **two** short circuit isolating Class B or Class A output loops, 1 block; standard on EPS with IDNet 2 Module; alarm currents for 50 and above devices includes 20 device LEDs in alarm	no devices	50 mA	60 mA
		50 devices	90 mA	150 mA
		125 devices	150 mA	225 mA
		250 devices	250 mA	350 mA
4100-3110*	**IDNet 2+2 Module,** 250 point capacity; electrically isolated output with **four** short circuit isolating Class B or Class A output loops, 1 block; mounts in expansion bay or available master controller bay module locations only, not applicable for EPS mounting; alarm currents for 50 and above devices includes 20 device LEDs in alarm	no devices	50 mA	60 mA
		50 devices	90 mA	150 mA
		125 devices	150 mA	225 mA
		250 devices	250 mA	350 mA
4100-3111*	**IDNet Short Circuit Isolating Loop Output Module**; mount up to two on a 4100-3109 module; for use with 4100-3109 modules; this option is for aftermarket field installation only			

***Note:** Loading per IDNet device (no LEDs on) = 0.8 mA supervisory and 1 mA alarm.
Each IDNet 2 and IDNet 2+2 Short Circuit Isolating Loop Output can be individually controlled for system diagnostics and can be assigned a public point for Fire Alarm Network annunciation.

Model	Description		Supv.	Alarm
4100-3102	MAPNET II Module, 127 point capacity, add devices separately; Module size = 2 Slots; Loading per MAPNET II device = 1.7 mA	Module without devices	255 mA	275 mA
		Fully loaded module, total	471 mA	491 mA
4100-3103	Isolator Module **for MAPNET II communications**; converts a single connected SLC into four isolated outputs selectable as Class A or Class B; up to two Isolator Modules can be connected to one SLC; Module size = 1 Slot; **NOTE:** Compatible with MAPNET II Remote Isolators only		50 mA	50 mA

Relay Modules; Nonpower-limited (for mounting in expansion bay only, refer to location reference on pages 8 and 9)

Model	Description	Resistive Ratings		Inductive Ratings		Size	Supv.	Alarm
4100-3202	4 DPDT w/feedback	10 A	250 VAC	10 A	250 VAC	2 Slots	15 mA	175 mA
4100-3204	4 DPDT w/feedback	2 A	30 VDC/VAC	1/2 A	30 VDC/120 VAC	1 Block	15 mA	60 mA
4100-3206	8 SPDT	3 A	30 VDC/120 VAC	1-1/2 A	30 VDC/120 VAC	1 Block	15 mA	190 mA

Current Calculation Notes:

1. To determine total supervisory current, add currents of modules in panel to base system value **and** all external loads powered by panel power supplies.
2. To determine total alarm current, add currents of modules in panel to base system alarm current **and** add all panel NAC loads **and** all external loads powered from panel power supplies.

Continued on next page

Module Selection Information *(Continued)*

End User Programming Software (requires 4100-8802)

Model	Description
4100-8802	Programming Software (select)

End User Programming Software Selection (select maximum of one each from below)

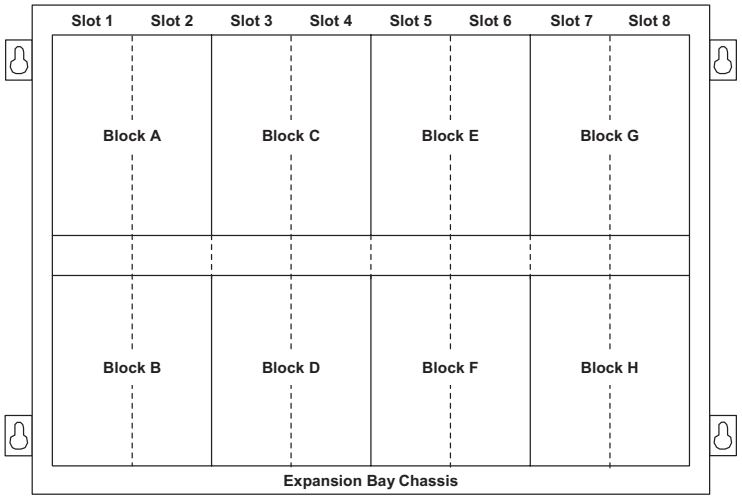
Model	Description
4100-0292	Custom Labels Editing; allows editing of 40 Character Custom Labels for non-system user points
4100-0296	Access Level/Passcode Editing; allows user to re-assign Access Levels and Passcodes for each display function; Acknowledge, Alarm Silence, System Reset, Point Enable/Disable, WALKTEST Enable/Disable, Clear History Logs, Change Time & Date, etc.
4100-0295	Port Vectoring Setup and Control; Allows vectoring of events to PC Annunciator, Printers, LCD Annunciators, etc.
4100-0298	WALKTEST Configuration Setup and Control; Allows user to create or edit WALKTEST groups used to test system initiating devices and signals by a single person, these groups allow an inspector to conduct a one-person WALKTEST in a specific area of a building (or different buildings), and limit the activation of the building signals to only the intended area; up to 8 WALKTEST groups are supported

Miscellaneous Accessories

Model	Description
4100-1279	Single blank 2” display cover; **4100-2302** provides a single plate for a full bay
4100-9856*	4100ES Canadian French Appliqué Kit; Simplex, 4100ES, Contrôle Incendie
4100-9857*	4100ES English Appliqué Kit; Simplex, 4100ES, Fire Control
4100-9858*	4100ES InfoAlarm Remote Display English Appliqué Kit; Simplex, Operator Interface, 4100ES
4100-9859*	4100ES InfoAlarm Remote Display Canadian French Appliqué Kit; Simplex, Interface de l’operateur, 4100ES
4100-9868	Special Purpose Appliqué Kit: Simplex, Elevator Recall Control and Supervisory Control Unit, 4100ES
4100-9869	Special Purpose Appliqué Kit: Simplex, Sprinkler Waterflow and Supervisory Station, 4100ES
4100-9835	Termination and Address Label Kit (for module marking); provides additional labels for field installed modules
4100-6029	Smoke Management Application Guide; **required for UUKL listing**
4100-6034	Tamper Switch, one per cabinet assembly if required; monitors solid door for panels with solid door; monitors the internal retainer panel for panels with glass door (not the glass door); has a built-in addressable IDNet IAM
2081-9031	Series resistor for WSO, IDCs (N.O. water flow and tamper on same circuit, wires after water flow and before tamper) 470 Ω, 1 W, encapsulated, two 18 AWG leads (0.82 mm^2), 2-1/2” L x 1-3/8” W x 1” H (64 mm x 35 mm x 25 mm)

*** Note:** 4100ES **English** Appliqués are included with 4100ES Upgrade and Retrofit Kits for mounting 4100ES in 4100, 2120, 2001, and Autocall back boxes so that upgrades can be easily identified as 4100ES. 4100ES Appliqué Kits are available for applications such as to update Remote InfoAlarm Displays connected to a panel that was upgraded to 4100ES or for an existing 4100U when the New Master Controller is upgraded to 4100ES and only a software upgrade is required. **When required, French appliqués are ordered separately.**

Expansion Bay Module Loading Reference



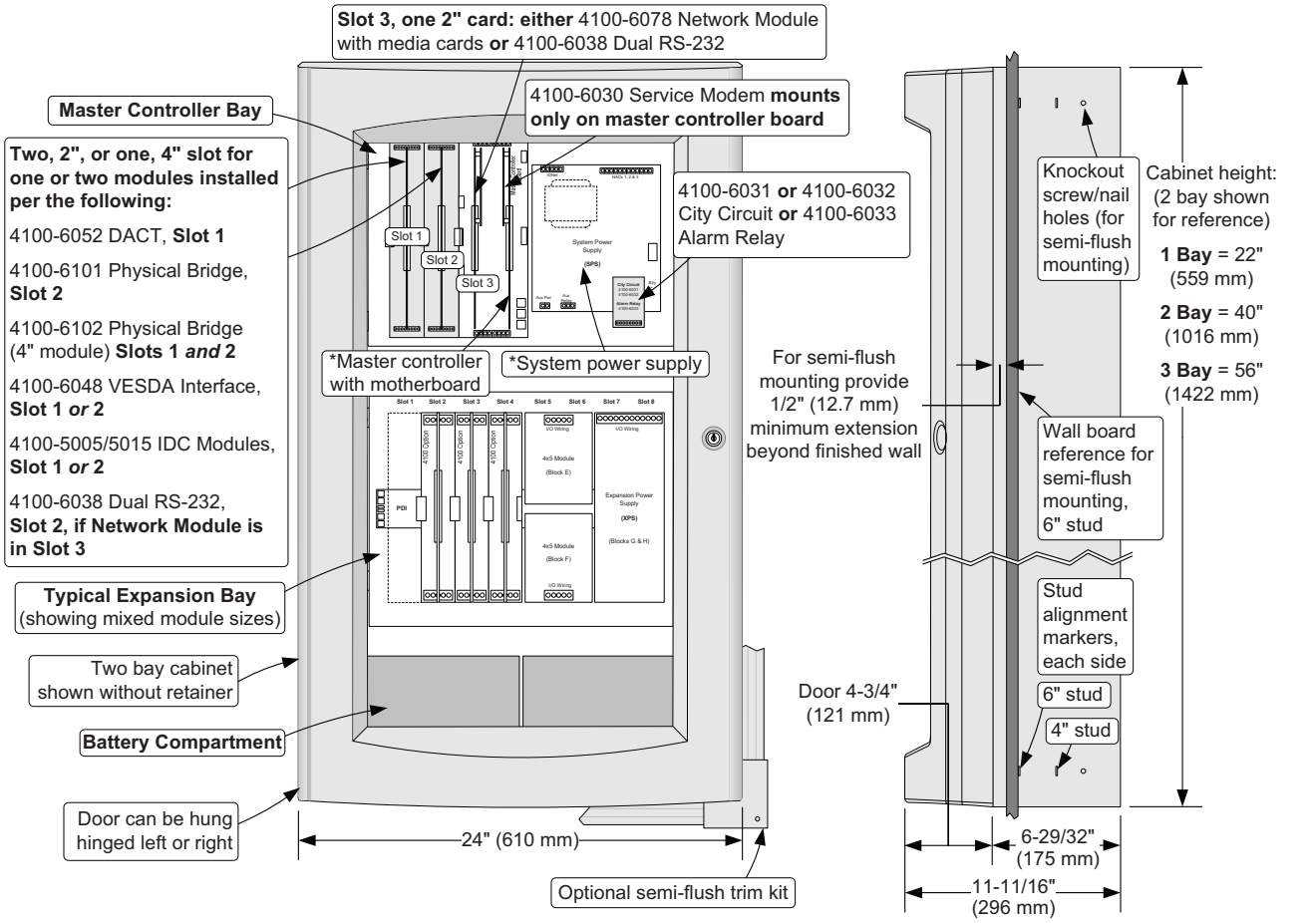
Size Definitions: Block = 4” W x 5” H (102 mm x 127 mm) card area
Slot = 2” W x 8” H (51 mm x 203 mm) motherboard with daughter card

Description		Mounting
IDNet 2, IDNet 2+2 Modules		1 Block
4, 2 A Relays	**NON Power-limited**	1 block
4, 10 A Relays		4”, 2 slots
8, 3 A Relays		1 block
VESDA Interface		2”, 1 Slot
Class B IDC		2”, 1 Slot
Class A IDC		2”, 1 Slot
MAPNET II Module		4”, 2 Slots
MAPNET II/IDNet Isolator		2”, 1 Slot
Class B Physical Bridge		2”, 1 Slot
Class X Physical Bridge		4”, 2 Slots
Decoder Module		6”, 3 Slots
System or Remote Power Supply		Blocks E, F, G & H ONLY
Expansion Power Supply		Blocks G & H ONLY
NAC Expansion Module		On XPS ONLY

General Specifications

Input Power	System Power Supplies (SPS) Expansion Power Supplies (XPS) Remote Power Supplies (RPS)	120 VAC Models	4 A maximum @ 102 to 132 VAC, 60 Hz	
		220-240 VAC Models	2 A maximum @ 204 to 264 VAC, 50/60 Hz; separate taps for 220/230/240 VAC	
Power Supply Output Ratings for SPS, XPS, and RPS (nominal 28 VDC on AC; 24 VDC on battery backup)	Total Power Supply Output Rating	**Including module currents and auxiliary power outputs;** 9 A total for "Special Application" appliances; 4 A total for "Regulated 24 DC" power (see below for details)		Output switches to battery backup during mains AC failure or brownout conditions
	Auxiliary Power Tap	2 A maximum	Rated 19.1 to 31.1 VDC	
	NACs Programmed for Auxiliary Power	2 A maximum per NAC; 5 A maximum total		
Special Application Appliances	Simplex horns, strobes, and combination horn/strobes and speaker/strobes (contact your Simplex product representative for compatible appliances)			
Regulated 24 DC Appliances	Power for other UL listed appliances; use associated external synchronization modules where required			
Battery Charger Ratings for SPS and RPS (sealed lead-acid batteries)	Battery capacity range	UL listed for battery charging of 6.2 Ah up to 110 Ah (batteries larger than 50 Ah require a remote battery cabinet); ULC listed for charging up to 50 Ah batteries		
	Charger characteristics and performance	Temperature compensated, dual rate, recharges depleted batteries within 48 hours per UL Standard 864; to 70% capacity in 12 hours per ULC Standard S527		
Environmental	Operating Temperature	32° to 120°F (0° to 49° C)		
	Operating Humidity	Up to 93% RH, non-condensing @ 90° F (32° C) maximum		
Additional Technical Reference	Installation Instructions	574-848		
	Operating Instructions	579-197		

Mounting and CPU Bay Module Reference (* indicates supplied modules)



NOTE: A system ground must be provided for Earth Detection and transient protection devices. This connection shall be made to an approved, dedicated Earth connection per NFPA 70, Article 250, and NFPA 780.

Additional 4100ES Data Sheet Reference

Subject	Data Sheet	Subject	Data Sheet
Introducing the 4100ES	S4100-0060	SafeLINC Internet Interface	S4100-0062
4100ES Enclosures	S4100-0037	Agent Release Applications	S4100-0040
4100ES Control Panels with EPS+ Power Supplies for TrueAlert Addressable Notification	S4100-0100	Fire Alarm Network Overview	S4100-0055
		Network Communications	S4100-0056
4100ES Audio and Firefighter Phone Modules	S4100-0034	Network Display Unit (NDU)	S4100-0036
LED/Switch Modules & Printer	S4100-0032	Addressable Device Compatibility	S4090-0011
Remote Annunciators	S4100-0038	Remote Battery Charger	S4081-0002
MINIPLEX Transponders	S4100-0035	TFX Interface Module	S4100-0042
Building Network Interface (BNIC)	S4100-0061	Master Clock Interface	S4100-0033
InfoAlarm Command Center	S4100-0045	2120 BMUX Module	S4100-0048
Graphic I/O Modules	S4100-0005	TrueInsight Remote Service	S4100-0063

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Features

Emergency voice/alarm communications provide:

- Alarm/evacuation signal generation with multiple built-in tones
- Standard or customized digital message storage and message generation
- Automatic or manual operation
- Mass Notification operation

Multiple channels are available:

- Analog audio systems provide dual channel operation
- Digital audio systems provide up to eight channels over a single wire pair

Communications features:

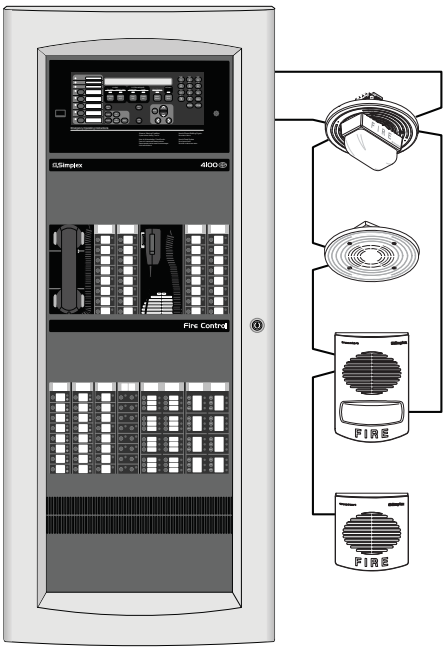
- Up to five supervised remote microphone inputs
- Spoken voice coding from the digital message player
- Multiple digitally recorded human voice messages
- Spoken WALKTEST system testing
- Separate evacuation, drill, and optional "All Clear" voice messages and tones
- Ready-to-talk microphone indicator on front panel audio control module
- Local panel speaker for tone/message broadcast verification
- MINIPLEX Voice Transponders are available for distributed audio

Amplifiers are available with analog or digital input:

- Flex-35 (35 W) and Flex-50 (50 W) amplifiers provide a dual channel design with configurable operation modes
- 100 W primary and backup, single channel amplifiers include a built-in power supply
- Amplifiers are available for 25 VRMS or 70.7 VRMS output with on-board, power-limited NACs (only one voltage choice per system)
- Built-in Temporal Pattern horn tone provides default backup signal operation
- Optional modules provide power-limited NAC expansion, convert Class B NACs to Class A operation, and provide Constant Supervision Operation for Non-Alarm Audio (NAA) applications (NAA requires additional hardware, and software revision 11.08 or higher)

Firefighter telephone systems:

- Master telephone can simultaneously talk with up to 6 remote telephones and can be connected as an audio input for broadcast messages
- Ring signal on remote firefighter telephone indicates that a call request is initiated and a hold signal indicates that a connected line has been deselected
- Telephone circuits are supervised for open and short circuits, too many telephones connected, and the master telephone is supervised for cord integrity
- Degraded mode allows remote telephones to remain connected to each other in the event of a communications loss



4100ES Fire Alarm Control Panel with
Voice and Firefighter Telephone Options

Listed to:

- UL 864, Fire Detection and Control (UOJZ), and Smoke Control Service (UUKL)
- UL 2017, Process Management Equipment (QVAX)
- UL 1076, Proprietary Alarm Units-Burglar (APOU)
- UL 2572, Mass Notification Systems (PGWM)
- ULC S527, Control Units for Fire Alarm Systems

Description

4100ES Audio Systems provide voice communication, alarm tones, and/or digitally prerecorded voice messages to alert occupants of fire or other emergency situations. Evacuation signaling may be automatically generated via alarm initiated event programs or by firefighting personnel using the operator controls.

4100U Series Products Note. The audio system modules and features listed in this data sheet are both compatible with, and listed for use with 4100U series fire alarm control panels. Contact your local Simplex® product supplier for details.

* See page 5 for product that is listed as UL or ULC and additional product listing details. This product has been approved by the California State Fire Marshal (CSFM) pursuant to Section 13144.1 of the California Health and Safety Code. See CSFM Listing 7165-0026:251 for allowable values and/or conditions concerning material presented in this document. Accepted for use – City of New York Department of Buildings – MEA35-93E. Additional listings may be applicable; contact your local Simplex product supplier for the latest status. Listings and approvals under Simplex Time Recorder Co. are the property of Tyco Fire Protection Products.

Audio Controller Module Description

The Audio Controller Module provides digitized alarm tones and digitally recorded voice messages and message construction, and manages both microphone inputs and other auxiliary inputs connected to the optional Auxiliary Audio Input Module. Tones and voice messages are digitally recorded and stored in the audio control module's message memory.

Two versions are available: **Analog** and **Digital**. Systems must be either analog or digital, not intermixed. One audio control module controls the entire audio system.

Common audio control board features:

- On-board digital message memory provides up to 2 minutes at normal or 1 minute at high resolution
- Connects to optional 4-input audio input modules (two maximum) for a total of up to 6 microphones and 11 distinct audio inputs
- Memory expansion is available to provide up to 8 minutes or 32 minutes at normal resolution (4 minutes or 16 minutes at high resolution)
- Connections for a Master Microphone and one Remote Microphone, compatible with standard or noise-canceling microphones
- Master telephone to audio interface connection uses the audio bay's Power Distribution Interface Module (PDI)
- Local panel speaker output with on-board volume control
- On-board download port for message loading
- The microphone ready-to-talk LED is located on the front panel audio control module (see p. 4) and requires connection to a 64 LED/64 switch controller
- Audio risers, either digital or analog, may be directly connected to 31 remote nodes; for applications requiring audio risers to more than 31 remote nodes, alternate connection methods are available, contact your Simplex product representative for details

Analog Audio Controller Modules

Analog audio control modules are for systems that require one or two simultaneous channels of audio information per the following feature summary.

- Built-in 10 VRMS riser output eliminates the need for separate riser amplifiers available as Class B or Class A
- Messages can play on one or both risers simultaneously, with the same or a different message
- Analog audio controllers are for connection to analog input audio amplifiers and audio risers only
- On-board status LEDs assist with setup and troubleshooting

Digital Audio Controller Modules

Digital audio control modules are for systems that require more than two simultaneous channels of audio information per the following feature summary.

- Up to 8 channels of information at normal resolution are available (4 channels at high resolution) on one twisted wire pair
- Primary 1 Digital Audio Riser (DAR) output can be either wired Style 4 or Style 7; Primary 2 DAR is an identical, separate output for Style 4 connections, typically to local MINIPLEX voice transponders
- Digital audio controllers are for connection to digital input audio amplifiers and digital audio risers only

Audio Tone List

The Temporal 3 Pattern is available for compatible tones (1/2 sec on, 1/2 sec off, 1/2 sec on, 1/2 sec off, 1/2 sec on, 1-1/2 sec off) to indicate evacuation. The following is a list of the standard audio tones.

- **Horn,** continuous 520 Hz tone, primarily used for coded systems or general temporal pattern signaling; 520Hz tone is compliant with NFPA 72 Low Frequency Signal Requirements for Sleeping Areas
- **Chime,** a digitally recorded mechanical chime tone, normally used free-running or for coded operation
- **Bell,** a digitally recorded mechanical bell sound, normally used free-running, for coded systems, or general temporal pattern signaling
- **Fast Whoop,** a quickly ascending tone
- **Slow Whoop,** a slowly ascending tone
- **High/Low,** with high frequency of 750 Hz for 100 ms and low frequency of 500 Hz for 400 ms
- **Beep,** 500 Hz tone of 0.7 s on, 0.7 s off
- **Stutter,** 500 Hz tone with on and off times of 100 ms
- **Wail,** ascends, then descends between 600 to 940 Hz
- **GSA Tone,** continuous 2000 Hz tone

Audio Controller Message Description

Zone Coded Signaling is available using tones or spoken numbers. Spoken coded messages can be used in place of conventional pulse tone coding to eliminate counting and interpretation of the zone coded location. For example, a fire alarm zone such as First Floor East, Smoke Detector Room 23 will be Code 1123.

Two possible transmission schemes are:

1. Conventional Zone Coded Signaling where T = Tone: **T...T...TT...TTT...T...T...TT...TTT...**
2. Spoken Coded Signaling: *Code, one..one..two..three; Code, one..one..two..three*

The Audio Controller has the ability to precede spoken codes with phrases and alert tones. As an alternative, the previous example could have been preceded with a chime tone. The word "*code*" could be replaced with the phrase "*Doctor Firestone, please dial...*".

Preprogrammed Special Messages can be ordered. Up to 32 minutes of special phrases and messages are available to meet specific applications. The standard Evacuation Message is: *"Attention... Attention... Attention...An emergency has been reported.... All occupants walk to the nearest stairway exit and walk down to your assigned re-entry floor or main lobby... Do not use the elevator... Walk to the nearest stairway.... Do not use the elevator.... Walk to the nearest stairway."*

Custom Message Ordering is summarized below:

Model	Description	
4100-8804	Select when **Custom Messages are required,** choose message types from below as required (minimum quantity of one)	
4100-0822	**Custom Messages from Tape**	Order (1) 4100-082x for each (2) complete messages without spliced phrases; **or** for each (50) spliced phrases
4100-0823	**Custom Messages from Transcript; NOTE:** Send transcript in advance to Applications Engineering to verify phrase quantity	
4100-0824	**Custom Messages from Archive**	
	CO Relocation Message; Temporal 4 Pattern horn tone with English male voice instruction; identify as "UCSET1393" when ordering	

Audio Amplifiers General Description

4100ES audio amplifiers are available as dual channel models rated for 35 W (Flex-35) or 50 W (Flex-50) and as single channel 100 W models with on-board NACs (notification appliance circuits) for convenient field wiring. Common features are summarized as follows:

- *Analog* input amplifier models are for single or dual channel system operation
- *Digital* input amplifier models are for multi-channel system operation providing up to eight channels over a single twisted wire pair
- Amplifiers are power-limited with models available providing 25 VRMS, or 70.7 VRMS output
- When Non-Alarm Audio (NAA) applications (such as for background music, paging, or for Mass Notification) are required, optional Constant Supervision modules provide continued speaker zone supervision during the page or while background music is playing; due to the NAA supervision requirements, when amplifiers are used for paging or playing background music, output power is derated to 70% of alarm output rating (24.5 W, 35 W, and 70 W); during alarm conditions full amplifier output power is available
- Linear power output stages are traditional Class B designs for low distortion and low EMI
- An on-board 500 Hz temporal pattern horn tone on each amplifier provides a default backup tone
- Supervision actively monitors amplifier gain in real time, comparing output level to input level
- On-board test switches can be activated to test and observe amplifier backup
- On-board overcurrent protection protects against overloads and short circuits
- Each amplifier communicates to the host CPU and allows voltage and current values to be accessed from the fire alarm control panel operator interface

Flex-35 and Flex-50 Amplifiers, General

Flex-35 and Flex-50 amplifiers are a ***self-backup dual channel design*** that provides a total of 35 W or 50 W of audio power with the following common feature summary:

- Self-backup feature allows NACs connected to a disabled amplifier channel to be routed to the remaining channel with the full 35 W or 50 W providing the single channel as selected by the fire alarm control panel programming; *external backup amplifiers are not required*
- Three standard on-board audio NACs are each rated for 2 A maximum and are capable of being routed to either desired amplifier channel
- Compatible power supplies include the: Expansion Power Supply (XPS), Remote Power Supply (RPS), or System Power Supply (SPS); power supplies with single amplifiers can provide power for other compatible applications within their rated output
- *Digital models* of the Flex-35 and Flex-50 have a digital decoder module that selects one or two of the input channels as desired
- Selectable reduced output levels of -12 dB or -6 dB are available for non-emergency audio output, selectable per channel

Flex-35 Amplifiers

- Each Flex-35 channel is capable of up to 35 W output with a total of 35 W
- Channels can be divided as 0 W and 35 W; 17.5 W and 17.5 W; 10 W and 25 W; or any combination that totals 35 W or less

Flex-50 Amplifiers

- Each Flex-50 channel is capable of up to 50 W output with a total output of 50 W
- Channels can be divided as 0 W and 50 W; 25 W and 25 W; 10 W and 40 W; or any combination that totals 50 W or less

Dual Flex-35 or Flex-50 Connections

- *Two* Flex-35 amplifiers, or *two* Flex-50 amplifiers can connect to a *single* Expansion Power Supply (XPS) in the same audio expansion bay (amplifiers must be the same model number); XPS output is dedicated to amplifier power
- Mounting for dual Flex-35 or Flex-50 amplifiers is Blocks A & B for amplifier 1, Blocks C & D for the XPS, blocks E & F are not used, and Blocks G & H are for amplifier 2 (see page 7 for mounting reference)

100 W Audio Amplifiers

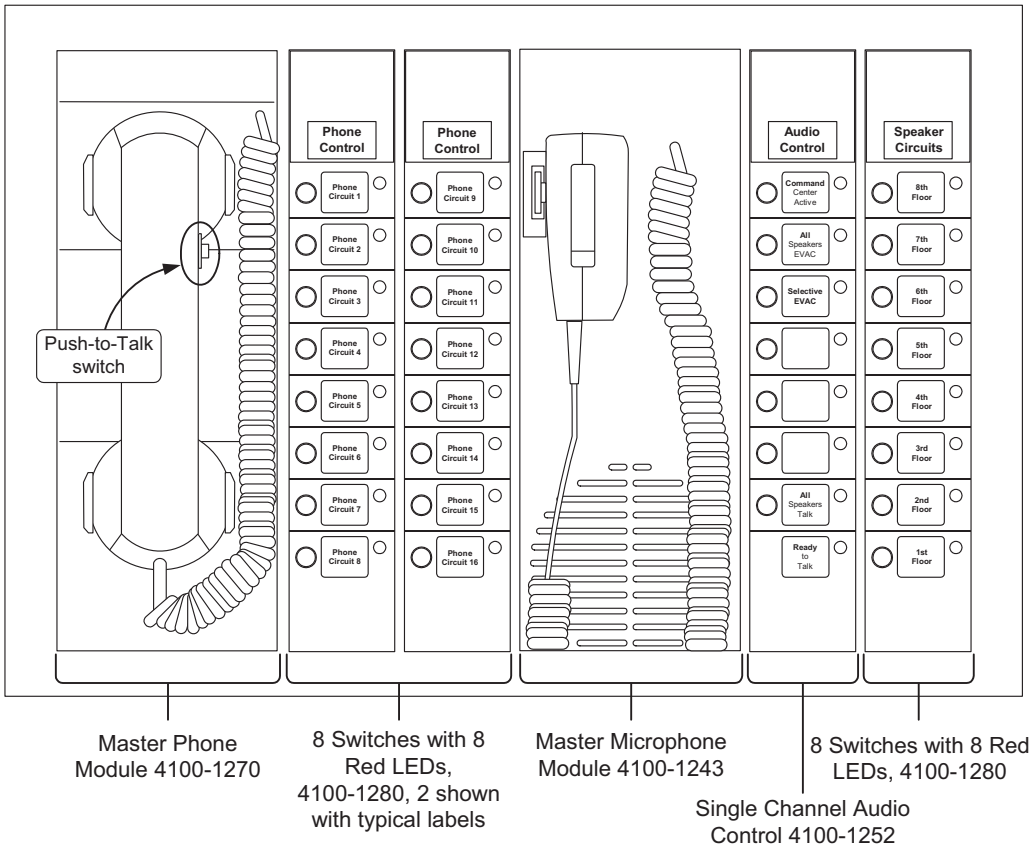
100 W amplifiers provide single channel operation per the following feature summary:

- Six standard on-board Class B audio NACs are each rated for 2 A maximum
- 100 W amplifiers include a built-in power supply and use system battery backup
- Amplifier and power supply size requires four continuous blocks of expansion bay size
- A *single* 100W primary amplifier *or* both a primary and a backup amplifier can be located on a single expansion bay (refer to page 7 for bay loading)
- Redundant (backup) amplifiers interconnect directly to minimize wiring connections and their power is routed through the NACs of the primary amplifier
- Redundant amplifier operation can be configured as one-for-one or one-for-many depending on specific requirements
- Digital models of these amplifiers have a digital decoder module that selects the desired input channel per system requirements
- Selectable reduced output levels of -12 dB or -6 dB are available for non-emergency audio output

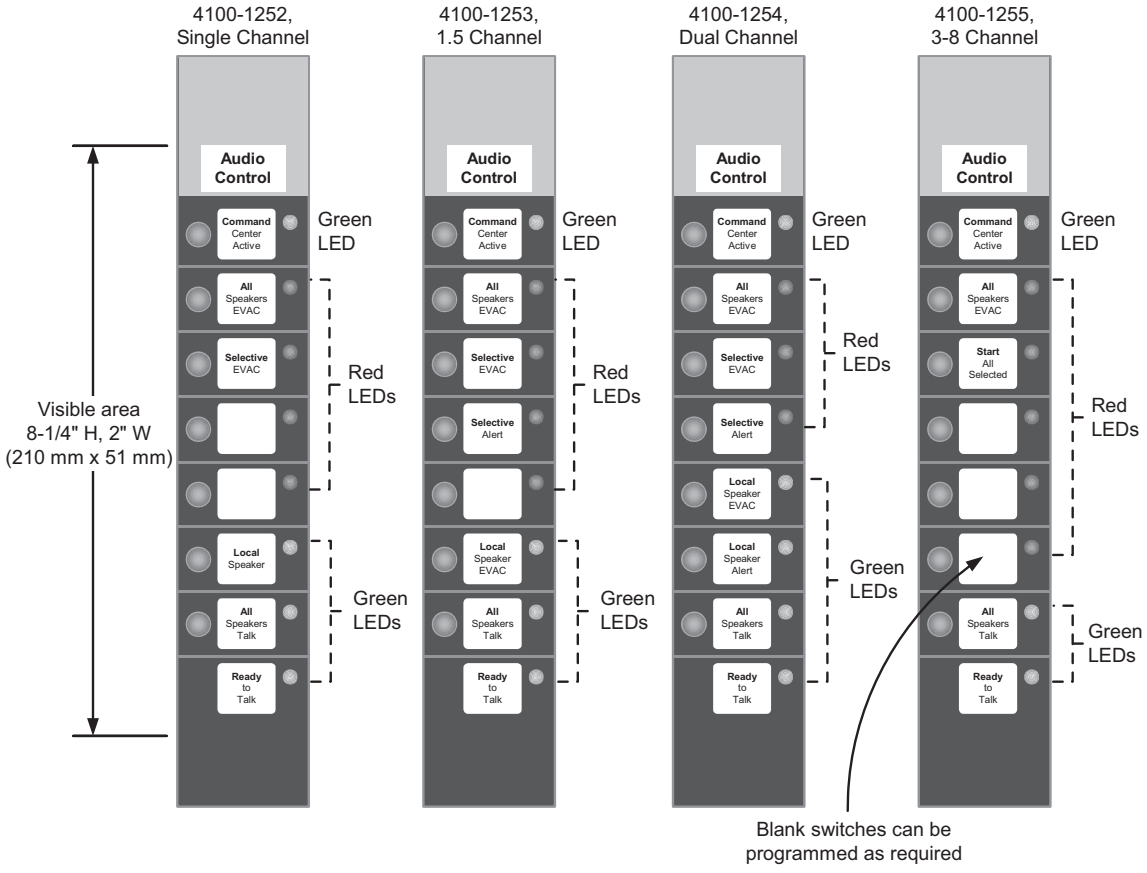
Audio NAC Expansion Modules

- For applications requiring additional NACs, modules are available for on-board expansion and further expansion is available with the chassis mounted 4100-5116 Expansion Signal Module
- 100 W Amplifiers support optional modules that convert the six audio NACs to Class A or to increase the Class B audio NACs to twelve
- **NOTE:** Adding NAC expansion modules does not increase amplifier power beyond the stated ratings

Audio Bay Reference with Single Channel Audio Control and Firefighter Telephone Modules



Audio Control Modules



Emergency Voice/Alarm Communications Equipment Product Selection

NOTE: Select systems as *either* analog *or* digital. When amplifiers are used for Non-Alarm Audio paging or background music with Constant Supervision, *output power is derated to 70% of alarm power* (24.5 W, 35 W, and 70 W); full output is available for alarm.

Analog Emergency Voice/Alarm Communications Equipment, Constant Supervision Compatible

Model	Description		Details		
4100-9620	Basic Analog Audio Operation with microphone, requires dedicated expansion bay		Includes: Expansion Bay, 4100-1210 Analog Controller Board, Microphone Module, and Audio Expansion Bay Kit		
4100-1210	Analog Controller Board only; order expansion bay and audio expansion bay kit separately		Controller board mounts in Blocks A and B		
4100-1361	25 VRMS output	Flex-35, 35 W Amplifier, constant supervision compatible	NAC rating = 1.4 A	35 W, or 100 speakers max.	Includes three on-board Class B audio NACs; power is supplied from an XPS, RPS, or SPS*
4100-1362	70.07 VRMS output		NAC rating = 0.5 A		
4100-1312	25 VRMS output	Flex-50, 50 W Amplifier, constant supervision compatible	NAC rating = 2 A	50 W, or 100 speakers max.	
4100-1313	70.7 VRMS output		NAC rating = 0.707 A		

100 W *Analog* Amplifiers with Power Supply, Constant Supervision Compatible

Model/Output Voltage		Power Supply Input/Listing		Description	Details	
25 VRMS	70.7 VRMS					
4100-1314	4100-1315	120 VAC, 60 Hz	UL	Primary 100 W Amplifier	Includes six, Class B audio NACs; NAC rating = 100 speakers maximum; 2 A @ 25 VRMS (50 W); 1.414 A @ 70.7 VRMS (100 W)	ULC models have low battery dropout circuit
4100-1316	4100-1317	120 VAC, 60 Hz	ULC			
4100-1318	4100-1319	220/230/240 VAC, 50/60 Hz	UL			
4100-1320	4100-1321	120 VAC, 60 Hz	UL	Backup 100 W Amplifier	Uses the six Class B NACs of primary amplifier	
4100-1322	4100-1323	120 VAC, 60 Hz	ULC			
4100-1324	4100-1325	220/230/240 VAC, 50/60 Hz	UL			

Digital Emergency Voice/Alarm Communications Equipment, Constant Supervision Compatible

Model	Description		Details		
4100-9621	Basic Digital Audio Operation with microphone, requires dedicated expansion bay		Includes: Expansion Bay, 4100-1311 Digital Controller Board, Microphone Module, and Audio Expansion Bay Kit		
4100-1311	Eight Channel Digital Controller Board only; order expansion bay and audio expansion bay kit separately		Controller board mounts in Blocks A and B		
4100-1363	25 VRMS output	Flex-35, 35 W Amplifier, constant supervision compatible	NAC rating = 1.4 A	35 W, or 100 speakers max.	Includes three on-board Class B audio NACs; power is supplied from an XPS, RPS, or SPS*
4100-1364	70.07 VRMS output		NAC rating = 0.5 A		
4100-1326	25 VRMS output	Flex-50, 50 W Amplifier, constant supervision compatible	NAC rating = 2 A	50 W, or 100 speakers max.	
4100-1327	70.7 VRMS output		NAC rating = 0.707 A		

100 W *Digital* Amplifiers with Power Supply, Constant Supervision Compatible

Model/Output Voltage		Power Supply Input/Listing		Description	Details	
25 VRMS	70.7 VRMS					
~~4100-1328~~	4100-1329	120 VAC, 60 Hz	UL	Primary 100 W Amplifier	Includes six, Class B audio NACs; NAC rating = 100 speakers maximum; 2 A @ 25 VRMS (50 W); 1.414 A @ 70.7 VRMS (100 W)	ULC models have low battery dropout circuit
4100-1330	4100-1331	120 VAC, 60 Hz	ULC			
4100-1332	4100-1333	220/230/240 VAC, 50/60 Hz	UL			
~~4100-1334~~	4100-1335	120 VAC, 60 Hz	UL	Backup 100 W Amplifier	Uses the six Class B NACs of primary amplifier	
4100-1336	4100-1337	120 VAC, 60 Hz	ULC			
4100-1338	4100-1339	220/230/240 VAC, 50/60 Hz	UL			

Audio Options for use with *either* Analog or Digital Systems (see page 2 for custom message ordering)

Amplifier and Related Audio Options

Model	Description		Details and Mounting Reference	
4100-1245	Flex-35/50 Expansion NAC Module; adds three Class B audio NACs	Choose one per amplifier	Mounts on Flex-35/50 assembly; NAC ratings = 1.5 A, 35/50 W, or 100 speakers maximum; *Supv. = 8.4 mA, Alarm = 60 mA*	
4100-1246	Flex-35/50 Class A Adapter Module; converts three on-board NACS to Class A operation		Mounts on Flex-35/50 assembly; NAC ratings = 2 A, 50 W, or 100 speakers maximum; *Supv. = 1 mA, Alarm = 30 mA*	
4100-1248	100 W Amplifier Expansion NAC Module; NAC ratings = 1.5 A, 50 W, or 100 speakers max.	Choose one per amplifier	Provides six additional Class B audio NACs, mounts on 100 W amplifier assembly; *Supv. = 17 mA, Alarm = 60 mA*	
4100-1249	100 W Class A Adapter Module; NAC ratings = 2 A, 50 W, or 100 speakers maximum		Converts six on-board NACs to Class A operation, mounts on 100 W amplifier assembly; *Supv. = 1 mA, Alarm = 60 mA*	
4100-1259	25 VRMS Output; NAC rating = 2 A, 50 W, or 100 speakers maximum	Constant Supervision Adapter for three NACs; select per amplifier output (not compatible with amplifier NAC expansion modules)	*Supv. = 10 mA on batteries; Alarm = 35 mA*	Converts three Class B audio NACS to Class A or Class B Constant Supervision NACs; mounts on Flex-35/50 or 100 W amplifier assembly; use two for the six NACs on 100 W amplifiers;
4100-1260	70.7 VRMS Output; NAC rating = 0.707 A, 50 W, or 100 speakers maximum		*Supv. = 38 mA Alarm = 70 mA*	

* Refer to data sheet S4100-0031 for power supply details.

(*continued on next page*)

Emergency Voice/Alarm Communications Equipment Product Selection *(Continued)*

Amplifier and Related Audio Options *(Continued)*

Model	Description	Details and Mounting Reference	
4100-5116	Expansion Signal Module; three, 1.5 A Class B NACs; up to five maximum per amplifier; NAC rating = 1.5 A, 50 W, or 100 speakers maximum	Converts one NAC input to three NAC outputs; selects between two inputs; for Flex-35/50 amplifiers only, two input NACs are required; Single Block module mounts in expansion bay; *Supv. = 20 mA; Alarm = 80 mA*	
4100-1266	Expansion Signal Module NAC Expander; NAC rating = 1.5 A, 50 W, or 100 speakers maximum	Expands module capacity to six, Class B NACs; *Supv. = 0.84 mA; Alarm = 60 mA*	These modules mount on the 4100-5116; select one max. per 4100-5116 as required
4100-1267	Expansion Signal Module Class A Adapter; NAC rating = 1.5 A, 50 W, or 100 speakers maximum	Converts 3 Class B, NACs to Class A; *Supv. = 1 mA; Alarm = 30 mA*	
4100-1268	Expansion Signal Module Constant Supervision Adapter for 25 VRMS or 70.7 VRMS; NAC rating = 1.4 A, 50 W, or 100 speakers maximum	Converts 3 Class B NACs to Class B or Class A Constant Supervision NACs; *Supv. = 38 mA on batteries (constant supervision deactivated); Alarm = 70 mA*	
4081-9018	End-of-line resistor harness for 70.7 VRMS NACs; 10 kΩ, 1 W		
4100-2300	Expansion Bay Hardware; **order one for each expansion bay**		
4100-2320	Audio Bay-to-Bay Interconnection Harness Kit; **order one for each audio bay addition**		
4100-0637	Audio Box Interconnection Harness Kit; **order one for each close-nippled audio cabinet**		

Audio Input and Controller Options (see page 2 for custom message ordering)

Model	Description	Details and Mounting Reference	
4100-1240	Auxiliary Audio Input Module; four additional (unsupervised) inputs per module; 2 maximum	Inputs for 10 VRMS, 25 VRMS, 70.7 VRMS, line level (0.707 VRMS), or microphone; 1 Block; *current = 10 mA*	
4100-1241	8 Minute Message Expansion Module	Provides 8 minutes at normal resolution or 4 minutes at high resolution, *Supv. = 2 mA; Active = 17 mA*	Mounts to audio controller module
4100-1242	32 Minute Message Expansion Module	Provides 32 minutes at normal resolution or 16 minutes at high resolution; *Supv. = 2 mA; Active = 17 mA*	

Operator Interface and Related Options

Model	Description	Details and Mounting Reference	
4100-1243	Microphone Module (mike); for Fire Alarm Control Panels	One maximum per audio system; front panel module that requires 2 Slots (4"), locate on expansion bay only; space behind for 4100ES flat modules only	*Supervisory current = 2.4 mA Active current = 6 mA*
4100-1244	Remote Microphone Module; for Remote Annunciator Panels	Front panel module that requires 2 Slots (4"), locate on expansion bay only; space behind for 4100ES flat modules only; distance limited to 4000 ft (1219 m)	
4003-9803	Remote Microphone Module	Mounted on plate with controls, for 2-gang box mount, see data sheet S4100-0053 for details	
4100-1252	1 Channel (audio or mike)	Operator Interface LED/Switch Modules	Single Slot LED/switch modules; connects to a 4100-1288 or 4100-1289 LED/switch controller in the same bay; space behind controller accepts 4100ES flat modules only (see drawings on p. 4); *current = 24 mA*; Additional adjacent LED/switch modules, as shown on p. 4, are used as required for specific speaker circuit selection (refer to data sheet S4100-0032 for LED/switch module availability)
4100-1253	1.5 Channel (audio + mike)		
4100-1254	2 Channel (full audio)		
4100-1255	3-8 Channel (8 channel normal res. messages, 4 channels of high res. messages)		
4100-1288	64 LED/64 Switch Controller Module with mounting plate	Refer to data sheet S4100-0032 for details	Mounts behind the LED/switch modules; has provisions for one 4100-1289 Controller Module
4100-1289	64 LED/64 Switch Controller Module without mounting plate		Mounts on extra space of 4100-1288; controls additional 64 LEDs and 64 switches

Firefighter Telephone System Products

Model	Description	Details and Mounting Reference
4100-1270	Master Telephone with Control Module and three Class B telephone NACs, one maximum per audio system; for use in Fire Alarm Control Panels only; includes one 4100-1272 Module	Front panel module; space behind for 4100ES flat modules only; phone control module included, mounted on bay module mounting plate; for individual telephone circuit control, use LED/switch modules; *Supv. = 80 mA; in use = 140 mA + remote phones (see table on page 7)*
4100-1271	Remote Master Telephone	Mounts in Remote Annunciator Panel only (see S4100-0038)
4100-1272	Expansion Telephone Control Module with three Class B telephone NACs	Expansion module for additional telephone circuits in main control or transponders; *Supv. = 80 mA; in use = 140 mA + remote phones*
4100-1273	Telephone NAC Class A Adapter Module	Mounts to 4100-1270 or -1272; no additional current required

Network and MINIPLEX Transponder Audio Connection Options

Model	Description		Details
4100-0623	Network Audio Riser Controller Module for control of either an analog or digital riser module		Typically for Network nodes without an audio controller, used for NAA applications; mounts in Block A; *current = 35 mA*
4100-0621	Dual Channel *Analog* Audio Riser Module	Select one, mounts in Block B	Accepts two separate audio signals from host; controlled by Transponder Interface Module; *current = 25 mA when active*
4100-0622	3-8 Channel *Digital* Audio Riser Module; with NAA input		Receives and decodes digital inputs; up to eight audio channels; *current = 70 mA;* NAA input for 25, 70.7, or 0.707 VRMS
4100-1341	MCC (Multiple Command Center) Digital Audio Riser Interface		Selects a single digital audio channel and converts it to an analog line level for input to an analog 4100ES/ 4100U/4100 Legacy voice panel; *current = 70 mA*
4100-9854	4100/4100+ Legacy bay mounting kit		Use to mount 4100-1341 MCC Digital Audio Riser Interface in legacy panel
4100-1258	NPU to 4100ES Audio Interconnect Module; mounts in 4100ES Audio cabinet		Dual terminal block module with harnesses for connecting to the Audio Controller and Telephone Control module (requires 1 Block)

Firefighter Telephone System Description

Firefighter telephone systems provide two-way communications for facilities where radio communications may not be available or are unreliable. They are typically used during active firefighting conditions, during a fire alarm investigation, or during fire alarm system inspection and test.

System Operation. Connections are made using a common talk line (party line) that includes a Master Telephone and up to six remote telephones. Remote telephones call into the Master by either being taken off-hook or by being plugged into a telephone jack. The Master Telephone location receives a ring-in tone with a visible LED indicator for each telephone circuit. When the call is received, the operator selects the calling telephone circuit using the assigned switch control. The operator at the master location can place the original telephone circuit on hold and connect to additional telephone circuits or add them to the talk line.

Master Telephone Operation. The Master Telephone connects directly into a telephone interface module. A Push-to-Talk (PTT) switch provides the operator with voice input control. Each master telephone uses local LED/switch modules to select telephone circuits and to silence any subsequent call-ins until selected.

Telephone Circuit Control. A call request causes the local call-in tone sounder and assigned telephone circuit LED to pulse quickly. Pushing the calling circuit's switch silences the local sounder and connects that circuit to the talk line. Activating the switch again places that circuit on hold with a hold tone being heard at the remote telephones and causing that circuit's LED to pulse slowly. Subsequent pushes toggles from active to hold. Activating a telephone circuit switch when no call is incoming places a request to pick up on remote telephones equipped with local LEDs. Master telephones can be also be connected as an input to an audio controller module to allow audio system message broadcasting without using a microphone.

Remote Master Telephones mount in Remote Annunciator Cabinets and are wired as the only connection to a telephone circuit. By adding local LED/switch modules, operation is that of the Master Telephone.

Remote telephones are available cabinet mounted or for plugging into a dedicated telephone jack. Each hears a ring tone when a call-in is selected and a hold tone when placed on hold. When on hold, the remote telephones are each separated from the talk line.

The Telephone Interface Module provides three Class B (Class A option is available) telephone circuits, connection for a master telephone, and a telephone riser input. One module is supplied when selecting a Master Telephone. Additional telephone interface modules can be added as required. Telephone circuit outputs can be programmed as remote telephones, as a Remote Master, or for telephone riser operation. Telephone circuits are supervised for opens, shorts, and overload conditions. The Master Telephone is supervised for broken cord or off-hook.

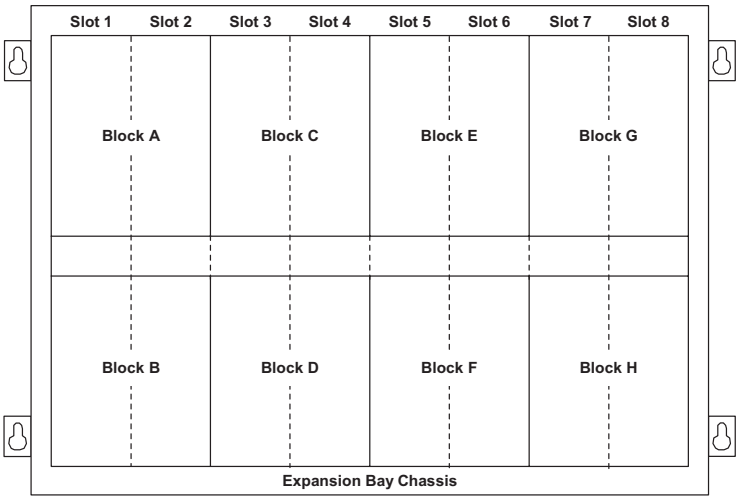
Telephone riser operation can be programmed to provide a telephone riser output that is used to interconnect telephone interface modules in different locations. This output type has ring and hold tones disabled.

Degraded Mode. If the telephone interface module loses communications with the host fire alarm control panel, telephone circuits off-hook are automatically connected to the talk line allowing any telephone to talk to another simply by being picked up (or plugged in).

Master Telephone Control Current with Remote Telephones. The following table lists Master Telephone Control current with the addition of remote firefighter telephones.

Remote Phones	0	1	2	3	4	5	6
Current (mA)	140	180	220	250	276	304	329

Expansion Bay Module Loading Reference



Size Definitions: Block = 4" W x 5" H (102 mm x 127 mm) card area
Slot = 2" W x 8" H (51 mm x 203 mm) motherboard with daughter card

Description	Mounting
Audio Controller Modules	Blocks A & B
Network Riser Controller Module	Block A
Audio Riser Modules	Block B
SPS or RPS	Blocks E, F, G & H ONLY
XPS	Blocks G & H ONLY*
Flex-35 Amplifiers, 2 max /bay*	Blocks E & F; C & D; or A & B
Flex-50 Amplifiers, 2 max/bay*	Blocks E & F or C & D
100 W Amplifiers, 1 max/bay	Blocks E, F, G & H
100 W Backup Amplifiers, 1 max. per bay with primary amplifier	Blocks A, B, C & D
Master or Remote Phone Module	Blocks A & B
Master or Remote Microphone Module	Two vertical Blocks, any location (except next to telephone)
Telephone Module	1 Block
Expansion Signal Module	1 Block
Operator LED/Switch Modules	1 Slot
NPU to 4100ES Audio Interconnect Module	1 Block

* **NOTE:** When mounting dual Flex amplifiers on an expansion bay, special mounting rules apply.

General Specifications

Input Power

Power Supplies; SPS, XPS, RPS, and 100 W Amplifiers	120 VAC Models	4 A maximum @ 102 to 132 VAC, 60 Hz
	220-240 VAC Models	2 A maximum @ 204 to 264 VAC, 50/60 Hz; with taps for 220/230/240 VAC

Amplifier Ratings

Built-in Tones	500 Hz horn tone operated at temporal pattern, provided when amplifiers are separated from audio controller		
Flex-35 Amplifiers: 4100-1361 4100-1362 4100-1363 4100-1364	Input Voltage	19 to 35 VDC from adjacent power supply	
	Supervisory Current	425 mA with power stage supervised	
		85 mA in low power mode	
	Alarm Current @ full output power	5.5 A with continuous horn tone	*Use this value for power supply loading*
		1.64 A average, with temporal pattern horn	*Use this value for battery backup reference*
Flex-50 Amplifiers: 4100-1312 4100-1313 4100-1326 4100-1327	Input Voltage	19 to 35 VDC from adjacent power supply	
	Supervisory Current	425 mA with power stage supervised	
		85 mA in low power mode	
	Alarm Current @ full output power	5.55 A with continuous horn tone	*Use this value for power supply loading*
		2.27 A average, with temporal pattern horn	*Use this value for battery backup reference*
100 W Amplifiers and Backup Amplifiers: *4100-1314, 4100-1316, 4100-1318, 4100-1320, 4100-1322, 4100-1324*; **4100-1328, 4100-1330, 4100-1332, 4100-1334, 4100-1336, 4100-1338**	Supervisory Current	400 mA (*analog*); 220 mA (**digital**) with power stage supervised	
		85 mA in low power mode	
	Alarm Current @ full output power	9.6 A with continuous horn tone	
		3.8 A average, with temporal pattern horn	*Use this value for battery backup reference*
Total Amplifier Power per Cabinet	300 W maximum		

Audio Controller Ratings

Current Requirements	4100-9620, 4100-1210	Analog = 225 mA supervisory	Add for local speaker in alarm: *75 mA min. volume; 190 mA half volume; 333 mA full volume*; Add microphone current separately; *Supv.= 2.4 mA; Active = 30 mA*
	4100-9621, 4100-1311	Digital = 85 mA supervisory	
Analog Riser Distance	Up to 10,000 ft (3048m) total with 18 AWG (0.82 mm^2) shielded twisted pair (STP)		
Digital Riser Distance; 18 AWG unshielded, twisted pair (UTP) required, except as noted (refer to Installation Instructions 574-844)*	Up to 2500 ft (762 m) from 4100-1311 Digital Controller to 4100-0622 Digital Audio Riser or 4100-1341 MCC Digital Riser Interface; up to 2500 ft (762 m) between 4100-0622 Digital Audio Riser Modules or 4100-1341 MCC Digital Riser Interfaces (signal is reformatted and repeated); wire runs over 100 ft (30 m) require UTP wire		
	*** NOTE: Wire runs of 100 ft (30 m) or less require shielded twisted pair wire (STP)**		

Firefighter Telephone Distance Ratings

Distance	7500 ft (2286 m) distance to farthest phone, 18 AWG shielded twisted pair (STP)

Battery Charger, System and Remote Power Supply (sealed lead-acid batteries)

Battery capacity range	UL listed for battery charging of 6.2 Ah up to 110 Ah (batteries larger than 50 Ah require a remote battery cabinet); ULC listed for charging up to 50 Ah batteries
Charger characteristics and performance	Temperature compensated, dual rate, recharges depleted batteries within 48 hours per UL Standard 864, to 70% capacity in 12 hours per ULC Standard S527

Environmental and Installation Instruction Reference

Operating Temperature Range	32° to 120°F (0° to 49° C)			
Operating Humidity Range	Up to 93% RH, non-condensing @ 90° F (32° C) maximum			
Installation Instructions Reference	Flex Amplifiers	579-173	Constant Supervision NAC Modules	579-515
	Digital/Analog Amplifiers	579-174	Firefighter Phones	579-226

Additional 4100ES Data Sheet Reference

Subject	Data Sheet	Subject	Data Sheet	Subject	Data Sheet
Basic Panel with EPS/EPS+	S4100-0100	Network Display Unit (NDU)	S4100-0102	Remote Firefighter Phones	S2084-0001
Enclosures	S4100-0037	LED/Switch Modules	S4100-0032	Mic. Multiplex Module	S4100-0053
MINIPLEX Transponders	S4100-0103	S/V, Addressable Strobe	S4906-0006	Remote Battery Charger	S4081-0002
Speakers	S4902-0003	S/V, SmartSync Strobe	S4906-0003	Remote Annunciators	S4100-0038

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Features

Panel mounted annunciation modules for use with 4100ES/4100U Fire Alarm Control Panels, Remote Annunciators, and Network Display Units (NDU):

- Modules mount on front of panel bay providing convenient access and high visibility
- Panel monitors switches for user input and controls LED indicators to annunciate function status
- Compact 64 LED/64 switch controller modules mount on back of LED/switch modules

LED/Switch Modules:

- Raised momentary switches provide tactile feedback
- Alternate action operation provides on/off functions
- High intensity LEDs provide clear status annunciation
- Slide-in labels provide custom on-site labeling (label kit is ordered separately)

8 LED, 8 Switch Modules:

- One status LED per switch
- Available as all red LEDs or all yellow LEDs

16 LED, 8 Switch Modules:

- Two status LEDs per switch
- Available with two LEDs per switch as: red/yellow, yellow/yellow, red/green, or green/yellow

16 LED, 16 Switch Modules:

- One status LED per switch in 2" (51 mm) module
- Available as all red LEDs, or 8 red and 8 yellow
- Two configurations are available, one with pluggable LEDs, refer to illustrations on page 2 and product selection details on page 4

24 LED, 24 Switch Modules:

- Double slot module with one red status LED per switch

HOA (Hand-Off-Auto) Switch Modules:

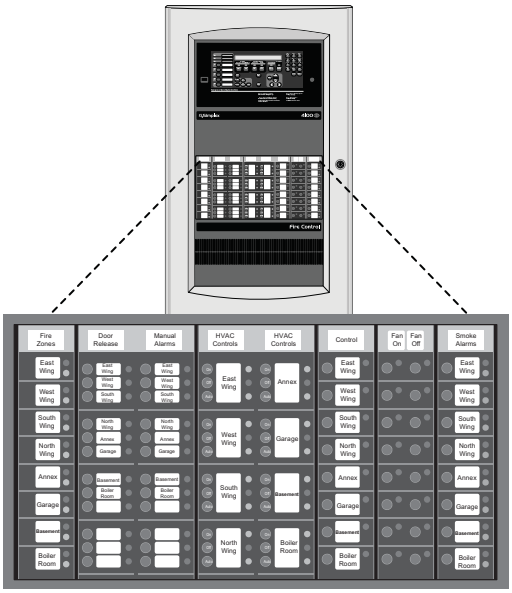
- Eight controls in a double slot module, each control has three switches for status selection and one LED per switch position
- Switch selection is On/Hand, Off, and Auto

Available with three HOA Module LED Options:

- On/Hand (green LED), Off (red LED) and Auto (green LED)
- On/Hand (green LED), Off (red LED) and Auto (white LED) to comply with International Building Code (IBC) requirements
- On/Hand (green LED), Off (yellow LED) and Auto (green LED) for applications requiring no red LEDs
- Available with or without switch buttons labels (On, Off, Auto)

LED Modules with 8 or 16 pluggable LEDs:

- 8 LED Module has red LEDs, 16 LED module has 8 red with 8 yellow
- Red, yellow, green, or blue LEDs are available in packages of eight (8) to change color on-site per application requirement (ordered separately)



4100ES 2-Bay Fire Alarm Control Panel
with Sample of Available LED/Switch Modules

Features *(Continued)*

24 Point I/O Module for external connections:

- Each point is selectable as either a switch input (momentary or maintained) or lamp/relay driver output
- Multiple switch monitoring modes are available

Panel mounted printer (see pages 6 and 7 for details)**:**

- Records system events and provides 20 visible lines

Listed to:

- UL Std. 864, Fire Detection and Control (UOJZ), and Smoke Control Service (UUKL)
- UL Std. 2017, Process Management Equipment (QVAX)
- UL Std. 1076, Proprietary Alarm Units-Burglar (APOU)
- UL Std. 1730, Smoke Detector Monitor (UULH)
- ULC Std. S527-99

Description

Annunciation Options. 4100ES/4100U fire alarm panels support a variety of switch input and LED status indicators to complement the information and controls available at the operator interface. These modules provide a convenient interface efficiently packaged onto the front panel space of the cabinet bay. Additionally, the panel mounted printer can conveniently record system status without requiring a separately located printer.

* Refer to additional listing details on page 4. This product has been approved by the California State Fire Marshal (CSFM) pursuant to Section 13144.1 of the California Health and Safety Code. See CSFM Listing 7165-0026:251 for allowable values and/or conditions concerning material presented in this document. It is subject to re-examination, revision, and possible cancellation. Additional listings may be applicable; contact your local Simplex® product supplier for the latest status. Listings and approvals under Simplex Time Recorder Co. are the property of Tyco Fire Protection Products.

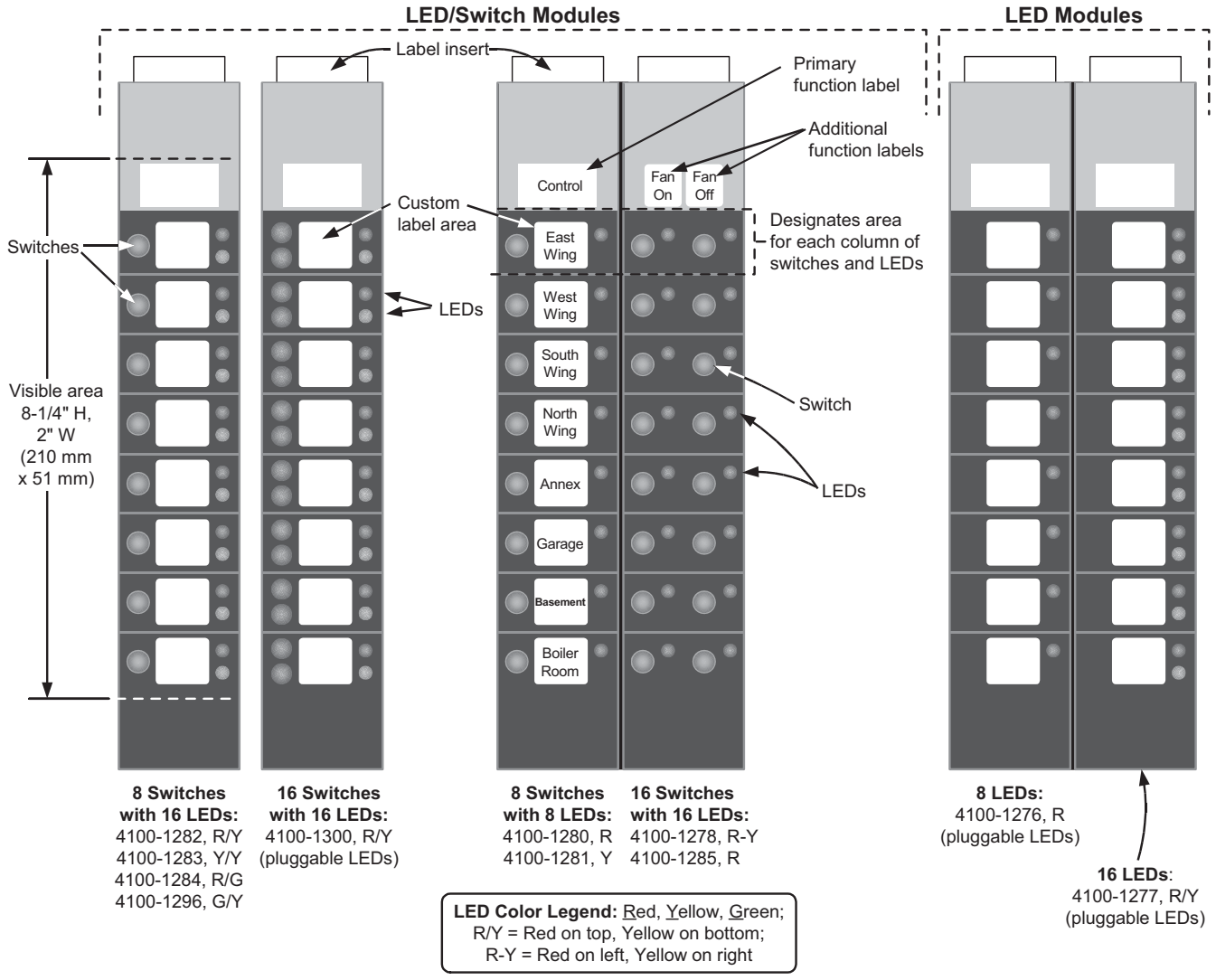
Description *(Continued)*

Easy Interface. Switches are alternate action ON/OFF (depending on programming selection) using a tactile feel, raised rubber button. High efficiency LEDs provide clear status annunciation readily visible through the glass door.

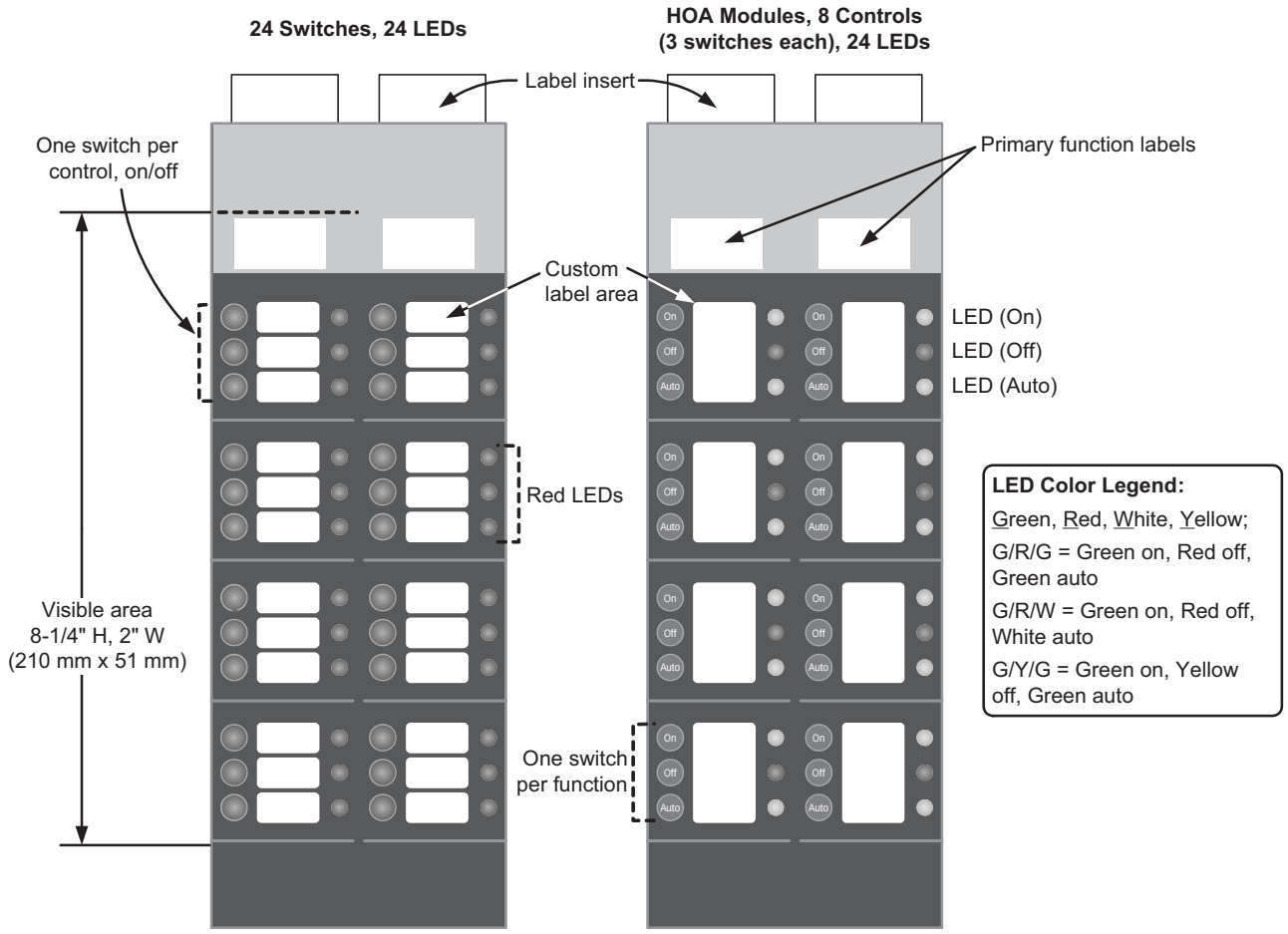
Selectable Functions. Switch functions, LED status indications, and printer output is selected when the control panel CPU is customized for site specific requirements. Slide-in labels are locally printed to indicate the exact function of the LEDs and switches.

The 24 Point I/O Module is selectable for input switch type and supervision type. Outputs are selectable for steady on or pulsing to drive remotely connected relays, incandescent lamps, or LEDs.

LED/Switch Module Detail Reference



HOA and 24/24 LED/Switch Module Detail Reference



LED Color Legend:

Green, Red, White, Yellow;

G/R/G = Green on, Red off, Green auto

G/R/W = Green on, Red off, White auto

G/Y/G = Green on, Yellow off, Green auto

4100-1287

HOA Modules, G/R/G LEDs:
4100-1286, with labeled switches as shown
4100-1295, with unlabeled switches (not shown)

HOA Modules for IBC Applications, G/R/W LEDs:
4100-1275, with labeled switches as shown
4100-1299, with unlabeled switches (not shown)

HOA Modules, G/Y/G LEDs:
4100-1302, with labeled switches as shown
4100-1301, with unlabeled switches (not shown)

LED/Switch Module Product Selection (panel mounted switches are momentary pushbutton)

LED/Switch Modules, General Purpose (LED/switch controller and label kit is ordered separately)

Model	LEDs per Switch	LED Color(s)	Custom Label Area	LED Quantity	Switch Quantity
4100-1280	One	Red	Per module and per switch	8	8
4100-1281	One	Yellow			
4100-1282	Two	Red on top, Yellow on bottom	Per module and per switch	16	8
4100-1283	Two	Yellow on top and bottom			
4100-1284	Two	Red on top, Green on bottom			
4100-1296	Two	Green on top, Yellow on bottom			
4100-1285	One	Red	One per column of 8 LED/switch pairs (see illustration on page 2)	16	16
4100-1278	One	8 Red on left, 8 Yellow on right			
4100-1300*	One	With pluggable LEDs; shipped Red on top, Yellow on bottom	Per module and per LED/switch pair		
4100-1287	One	Red	Per module and per switch	24	24

* UL, ULC, and CSFM listed only.

LED Only Modules and LED Kits (LED/switch controller and label kit is ordered separately)

Model	Description	
4100-1276	Eight (8) LED Module with Red LEDs; custom label area per module and per LED	LEDs are pluggable; select LED kits as required to change LED color
4100-1277	Sixteen (16) LED Module; Red LED on top and Yellow LED on bottom at each position; custom label area per module and per LED pair	
4100-9843	Yellow	Kits of 8 LEDs; order as required for modules with pluggable LEDs to change LED color on-site per application requirement; compatible with LED Modules 4100-1276, 4100-1277, and 4100-1300 (Blue is typically used for Ancillary Device status indication per ULC S527)
4100-9844	Green	
4100-9845	Red	
4100-9855	Blue	

LED/Switch Modules, HOA (Hand-Off-Auto) with Green/Red/Green LEDs
(LED/switch controller and label kit is ordered separately)

Model	Operation	Switch Function (Location)	LED Description
4100-1286	Eight function HOA (On, Off, Auto) Control Module with labeled switches; custom label area per module and per LED/switch set	On (top)	Green LED
		Off (middle)	Red LED
		Auto (bottom)	Green LED
4100-1295	Eight function HOA (On, Off, Auto) Control Module, same as 4100-1286 except switches are unlabeled		

LED/Switch Modules, HOA (Hand-Off-Auto) with Green/Red/White LEDs for IBC Applications
(LED/switch controller and label kit is ordered separately)

Model	Operation	Switch Function (Location)	LED Description
4100-1275	Eight function HOA (On, Off, Auto) Control Module with labeled switches; LED colors meet International Building Code (IBC) requirements; custom label area per module and per LED/switch set	On (top)	Green LED
		Off (middle)	Red LED
		Auto (bottom)	White LED
4100-1299	Eight function HOA (On, Off, Auto) Control Module, same as 4100-1275 except switches are unlabeled		

LED/Switch Modules, HOA (Hand-Off-Auto) with Green/Yellow/Green LEDs
(LED/switch controller and label kit is ordered separately)

Model	Operation	Switch Function (Location)	LED Description
4100-1302**	Eight function HOA (On, Off, Auto) Control Module with labeled switches; for applications requiring no red LEDs; custom label area per module and per LED/switch set	On (top)	Green LED
		Off (middle)	Yellow LED
		Auto (bottom)	Green LED
4100-1301**	Eight function HOA (On, Off, Auto) Control Module, same as 4100-1302 except switches are unlabeled		

** UL, ULC, and CSFM listed only.

Continued on next page

LED/Switch Module Product Selection *(Continued)*

LED/Switch Controller Modules and Accessories

Model	Description	
4100-1288	64 LED/64 Switch Controller Module **with** mounting plate; controls up to 64 LEDs and interfaces to up to 64 switches; mounts behind the LED/switch modules and has provisions for one 4100-1289 Controller Module	**NOTE:** LED/switch controllers and their connected modules must be in the same bay.
4100-1289	64 LED/64 Switch Controller Module **without** mounting plate; mounts on extra space of 4100-1288; controls an additional 64 LEDs and 64 switches	
4100-0636	Harness Kit, Power and Communications	One of each is required per 4100-1288 that is located in the same bay as two Flex-35/50 amplifiers and an SPS
4100-0641	Harness Kit, 26 Position Flex Cable, 14-1/2" (368 mm) long	
4100-1290	24 Point I/O Module for external connections, select each point as either input or output; 2" (51 mm) wide, 1 Slot	
4100-1294	LED/Switch Module Slide-in Labels, **required when LED/switch or LED only modules are present**; order one per cabinet	
4100-1279	Single blank 2" display cover; order as required (8 fill a bay front); two maximum in a row between LED/switch modules	

Panel Mounted Printer (refer to pages 6 and 7 for printer details)

Model	Description
4100-1293	Panel Mount Thermal Printhead Printer, supplied with one roll of paper
4190-9803	Replacement Paper for 4100-1293 Printer, one roll

LED/ Switch Modules and Controllers Specifications

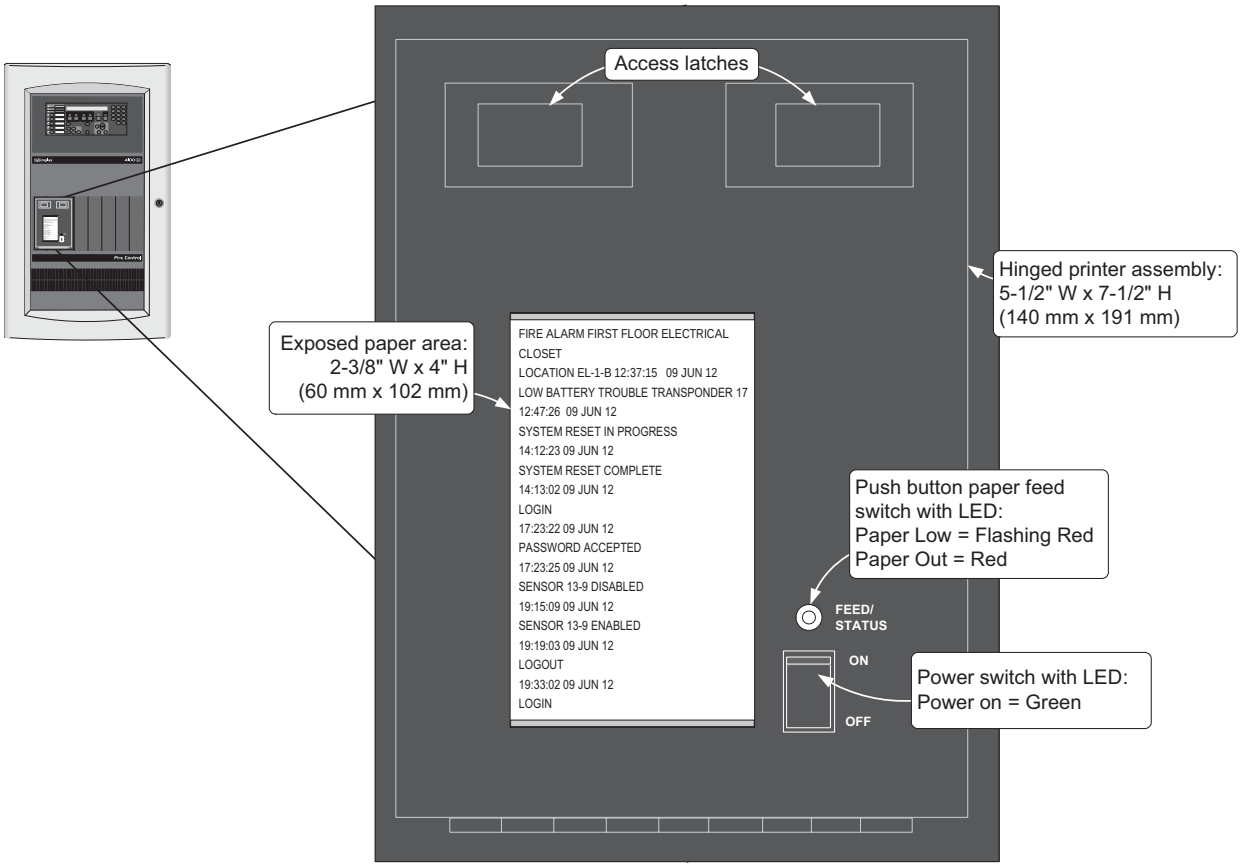
(For additional LED/Switch Module information, refer to Installation Instructions 574-843)

64 LED/64 Switch Controller Modules (4100-1288 and 4100-1289)	
Input Voltage	19 to 33 VDC, from control panel
Current, No LEDs On	20 mA @ 24 VDC
Current, All 64 LEDs On	210 mA @ 24 VDC (approx. 3 mA/LED)
Mounting Reference	Bracket of 4100-1288 attaches to the back of the LED/switch modules
Controllers per Bay	Maximum of two per bay; for control of LED/switch modules **within that bay only**
Bay Location Reference	Slots 1 & 2 or Slots 3 & 4; mounts onto the back of the LED/switch modules
Clearance Behind Controller Module	Space accepts low profile 4100ES/4100U modules only
24 Point I/O Module (4100-1290)	
Module Current	Supervisory = 34 mA; Alarm = 75 mA (add output currents separately)
Switch Input Details	Momentary or maintained, 2 or 3 position; max. distance is 2500 ft (762 m) or 65 Ω
Output Current	150 mA @ 24 VDC per point; inrush current is limited for use with incandescent bulbs
Output Details	Diode suppress relay loads at the coil; max. distance is 600 ft (183 m) or 2 Ω
General Specifications	
Operating Temperature Range	32° to 120°F (0° to 49° C)
Operating Humidity Range	Up to 93% RH, non-condensing @ 90° F (32° C) maximum

Additional Data Sheet Reference

Subject	Data Sheet	Subject	Data Sheet
4100ES Basic Panel Modules and Accessories	S4100-0031	Network Display Unit (NDU)	S4100-0036
4100ES Audio/Phone Modules	S4100-0034	Enclosure Reference	S4100-0037
MINIPLEX Transponders	S4100-0035	Remote Annunciators	S4100-0038

Model 4100-1293 Panel Mount Printer Details



Printer Specifications

(For additional printer information, refer to Installation Instructions 579-249)

Electrical & Communications		
Input Voltage		19 to 33 VDC, from control panel
Current	Standby	125 mA @ 24 VDC
	Printing	800 mA @ 24 VDC
Communications		RS-232, 9600 baud, from control panel RS-232 module
Print Characteristics		
Print Format		Fixed thermal printhead producing black characters
Characters		11 x 28 dot matrix; alarm information printed in bold
Paper Format		40 columns; 6 lines per inch; 20 lines visible; paper is wound onto top take-up reel, paper can be manually unwound from take-up reel and rewound using Feed switch
Paper Speed		1.33 in/sec maximum
Print Speed		312 cps
Sound Output		55 dB maximum, with cabinet door open
Paper (one roll included)		
Type and Size		Thermal; 2.35” wide, 160 ft long (60 mm x 49 m)
Replacement Paper		4190-9803, 1 roll
Mounting Specifications		
Bay Location Reference		Requires 3 expansion bay slots, can be located as required
Clearance Behind Printer		Space accepts low profile 4100ES/4100U modules only
Environmental Specifications		
Operating Temperature Range		32° to 120°F (0° to 49° C)
Operating Humidity Range		Up to 93% RH, non-condensing @ 90° F (32° C) maximum

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Features

Simplex® 4100ES Box and door options:

- Boxes are available sized for one, two, or three equipment bays, each with a battery bay located at the bottom
- Colors include platinum or red
- Doors are glass front with modular dress panels, or solid
- Models are available with box and door combined for single package shipping, or packaged separately
- Enclosures are NEMA 1 rated; wall mount enclosures are also IP30 rated
- Refer to individual 4100ES data sheets for product application listings (see list on page 2)

Door and dress panel selection is coordinated with cabinet function:

- Glass doors with modular dress panels provide visibility of annunciation and interface modules for Control Panels, Network Display Units (NDU), and Remote Annunciators
- Solid doors are for MINIPLEX Transponders and utility function cabinets where module visibility is not required

4100ES Enclosure details:

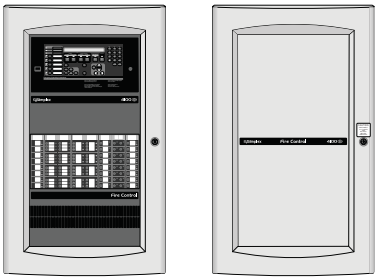
- Latching dress panels easily lift off for internal access
- Smooth box surfaces are provided for locally cutting conduit entrance holes exactly where required
- Alignment markers are provided at the top and bottom of each box side for 6” (152 mm) or 4” (102 mm) wall studs
- Knockout screw/nail holes are supplied for semi-flush mounting

Upright cabinet rack packaging reference:

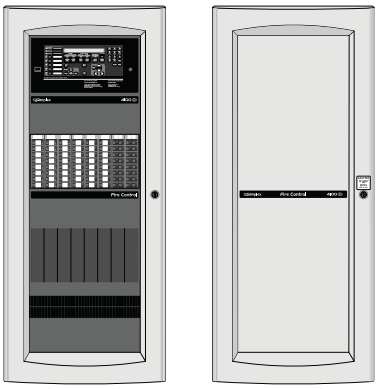
- For use with Bud Industries Inc. special cabinet rack model number 45964
- Refer to page 2 for cabinet rack listing

* For 4100ES one, two, and three bay cabinets with associated equipment: Products are listed by the California State Fire Marshal (CSFM) pursuant to Section 13144.1 of the California Health and Safety Code. See CSFM Listing 7165-0026:251 for allowable values and/or conditions concerning material presented in this document. Accepted for use – City of New York Department of Buildings – MEA35-93E. Additional listings may be applicable, contact your local Simplex product supplier for the latest status. Listings and approvals under Simplex Time Recorder Co. are the property of Tyco Fire Protection Products.

4100ES One Bay Cabinets



4100ES Two Bay Cabinets



4100ES Three Bay Cabinets

Cabinet Rack Enclosure (shown with door open)

Enclosure Selection Chart (refer to pages 3 and 4 for dimensions)

Note: *Door keys are shipped with system Master Controller, see Miscellaneous Accessories below for additional keys*

Combined Box and Door Selection (select if box and door are to be shipped together)

Description	Platinum 1 Bay	Platinum 2 Bay	Platinum 3 Bay	Red 1 Bay	Red 2 Bay	Red 3 Bay
Box with Glass Door and Dress Panel	2975-9444	2975-9445	2975-9446	2975-9441	2975-9442	2975-9443
Box with Solid Door	2975-9450	2975-9451	2975-9452	2975-9447	2975-9448	2975-9449

Separate Box and Door Selection (select if boxes and doors are required to be shipped separately)

Description	Platinum 1 Bay	Platinum 2 Bay	Platinum 3 Bay	Red 1 Bay	Red 2 Bay	Red 3 Bay
Box	2975-9438	2975-9439	2975-9440	2975-9407	2975-9408	2975-9409
Glass Door and Dress Panel	4100-2104	4100-2105	4100-2106	4100-2124	4100-2125	4100-2126
Solid Door	4100-2114	4100-2115	4100-2116	4100-2134	4100-2135	4100-2136

Cabinet Rack Mounting (refer to page 4 for additional details)

Model	Description	#45964 Listings
#45964, from Bud Industries Inc.	Special upright cabinet rack for 4100ES; 19" (483 mm) E.I.A.; gray texture; includes front polycarbonate door and rear louvered door, both keyed with Simplex "B" keys	UL and ULC listed only as of document revision date; cabinets are listed with the Simplex 4100ES product line
4100-2140	Master Controller Rack Mount Kit, **one required per master controller**	Master Controller and Option Bays each require 9 Rack Units; 15.75" height (400 mm)
4100-2145	Option Bay Rack Mounting Kit, **one required per expansion bay**	
4100-2144	Power Distribution Module (PDM) Rack Mount Kit, order PDM separately per system voltage, **one required per cabinet rack**	

Power Distribution Modules

Model	Voltage	Description
4100-0634	120 VAC	Power Distribution Module (PDM); select per system voltage; **one required per 4100ES box or cabinet rack**
4100-0635	220/230/240 VAC	

Miscellaneous Accessories

Model	Description	
252-019	Door key, one is shipped with system Master Controller, order for replacement or when extra keys are needed; (Simplex "B" key)	
4100-9856	Canadian French Appliqué Kit, for 1, 2, or 3 bay sizes	
4100-9857	4100ES Appliqué Retrofit Kit, for 1, 2, or 3 bay sizes; use to identify 4100ES features when new door is not used; included with Master Controller Upgrade kits as detailed on data sheet S4100-0031	
4100-9868	Special Purpose Appliqué Kit: Simplex, Elevator Recall Control and Supervisory Control Unit, 4100ES	
4100-9869	Special Purpose Appliqué Kit: Simplex, Sprinkler Waterflow and Supervisory Station, 4100ES	
4100-9835	Termination and Address Label Kit, for module marking	**NOTE:** One kit is supplied for each cabinet; order this if required for additional field module installation
4100-9837	Green LED Power-on Indicator Kit, **required for ULC listing of MINIPLEX transponder**	Mounts using knockout provided in solid door
2975-9813	Platinum semi-flush box trim	1 $^{7}/_{16}$" (37 mm) wide, four corners and trim pieces for top, bottom, and sides
2975-9812	Red semi-flush box trim	

Battery Reference

Model	Capacity	Model	Capacity	Battery Notes
2081-9272	6.2 Ah	2081-9287	25 Ah	1. Sealed lead-acid batteries, 12 VDC each; two required per battery location.
2081-9274	10 Ah	2081-9276	33 Ah	2. Battery selection is required if batteries are internal.
2081-9288	12.7 Ah	2081-9296	50 Ah	3. Select one size per battery set
2081-9275	18 Ah			4. Refer to data sheet S2081-0006 for battery details.

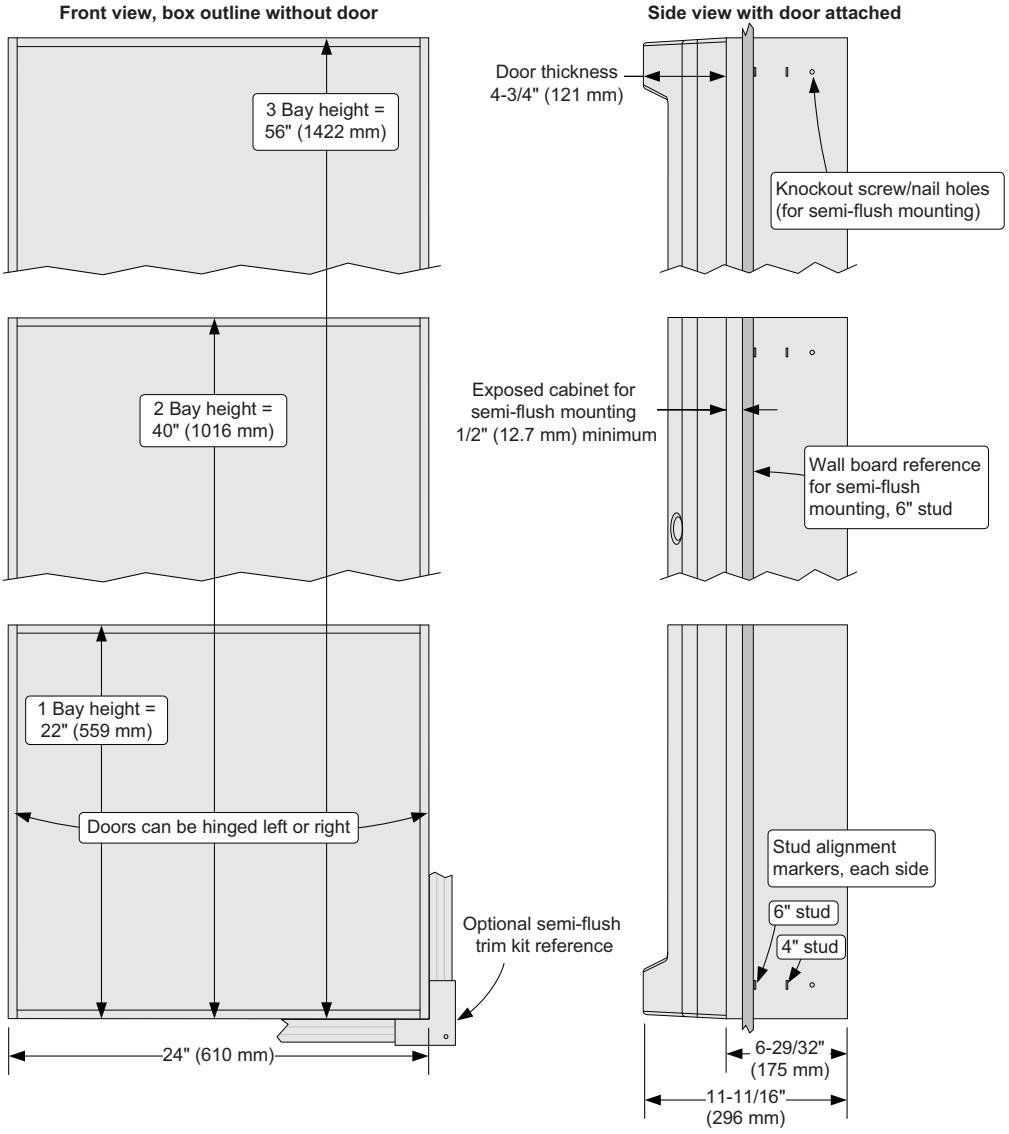
Battery Accessories

Model	Description
4100-0650	Battery Shelf, **required for 50 Ah batteries**
4100-5128	Battery Distribution Terminal Block, mounts to side of box, required for all close-nippled cabinets unless cabinet receives all power from power supplies and batteries located in the adjacent cabinet

Wall Mounted Enclosure Installation Reference

NOTE:
A system ground must be provided for Earth Detection and transient protection devices. This connection shall be made to an approved, dedicated Earth connection per NFPA 70, Article 250, and NFPA 780.

For additional installation information refer to Installation Instructions 579-117.



Additional Data Sheet Reference

Subject	Data Sheet	Subject	Data Sheet
4100ES Panels with EPS Power Supplies	S4100-0100	Network Display Unit (NDU) with EPS Power Supplies	S4100-0102
4100ES Basic Panel Modules and Accessories	S4100-0031		
MINIPLEX Transponders with EPS Power Supplies	S4100-0103	Network Display Unit (NDU)	S4100-0036
MINIPLEX Transponders	S4100-0035	Remote Annunciators	S4100-0038
LED/Switch Modules	S4100-0032	InfoAlarm Command Center	S4100-0045
4100ES Audio/Phone Modules	S4100-0034	Remote Battery Charger	S4081-0002

Console Package Reference

Front View

Side View

Rear View

Cabinet Rack Specifications

Type		Upright cabinet rack for exclusive use with Simplex 4100ES Fire Alarm Products
Supplier		Order from Bud Industries Inc. (www.budind.com)
Model Number		45964
Outside Dimensions	Height	69-7/8” (1775 mm)
	Width	24-1/16” (611 mm)
	Depth	22” (559 mm)
Color		Gray texture
Panel Space Width		19” E.I.A. (483 mm)
Front Door		Surface mount with 1/8” thick (3.18 mm) smoke gray polycarbonate, locked with Simplex “B” key, hinged on left of cabinet
Rear Door		Ventilated top and bottom, locked with Simplex “B” key
Sides		Side panels are removable from the inside for rack-to-rack mounting
Bottom		Pan attached for battery mounting
Levelers		Includes 4 stem levelers on bottom
Installation Instructions		579-229

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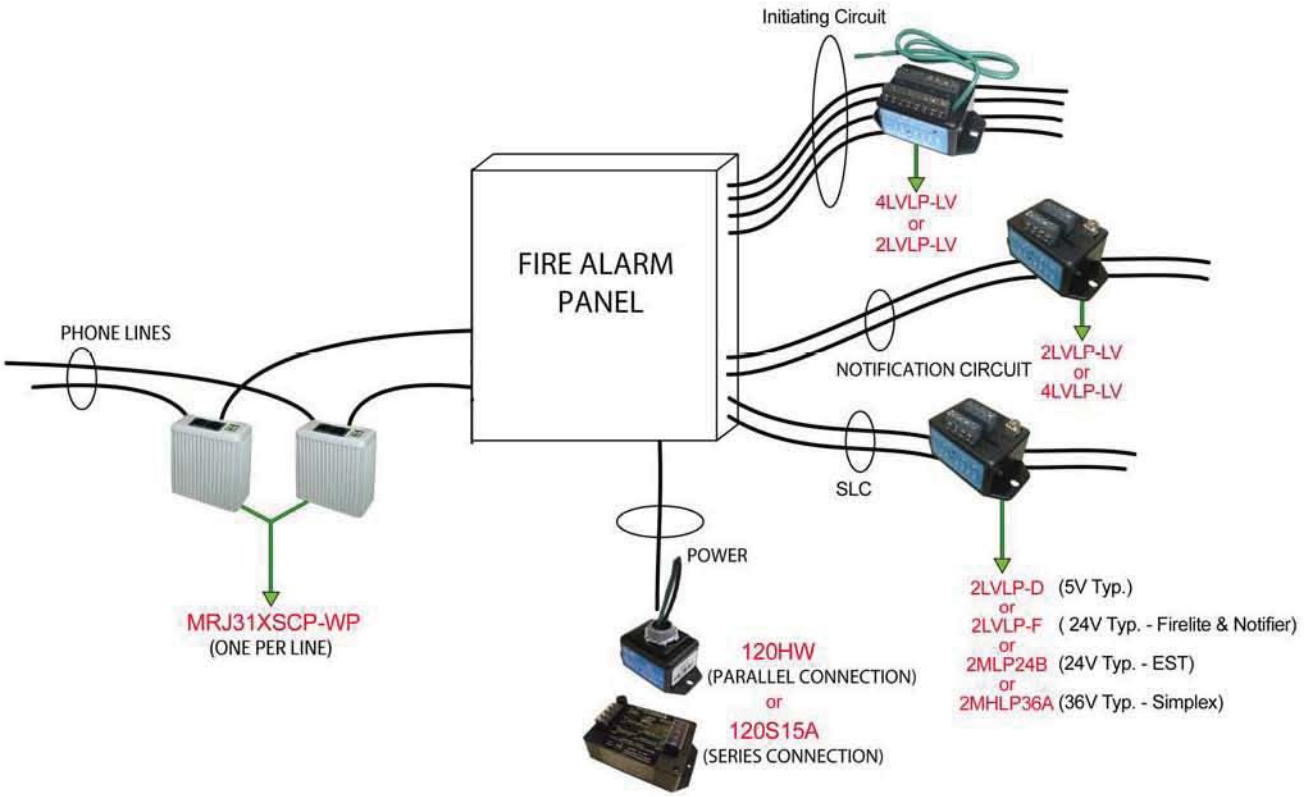
TYPICAL FIRE ALARM APPLICATIONS



	MODEL #	APPLICATION
		Rev 8/6/03
☆	DTK-FPK:	*Fire Kit. Protects 120V Power & RJ31X Dialer (2 Pair Telco). Wiresettable fusing and patch cord - NEW! Kit contains: (1) 120HW, (2) MRJ31XSCP-WP*
☆	DTK-2LVLP-D:	*Protects SLC Data lines, (5V typical), 2 pair, series connection*
☆	DTK-2LVLP-F:	*Fire Alarm Systems. Protects SLC Data lines, (24V circuits), 2 pair, series connection. Recommended for Firelite and Notifier installations.*
☆	DTK-2MLP24B:	*Replaceable modular unit with base. Protects SLC Data lines, (13-24V circuits), 2 pair, series connection. Recommended for EST Signature installations*
☆	DTK-2MHLP36A:	*Replaceable modular hybrid unit with base. Protects SLC Data lines, (25-36V circuits), 2 pair, series connection. Recommended for Simplex installations*
☆	DTK-MB10:	*Base for MLP series*
☆	DTK-2LVLP-LV:	*15-30V Initiating and Notification circuits, 2 pair, series connection*
☆	DTK-4LVLP-LV:	*15-30V Initiating and Notification circuits, 4 pair, series connection*
☆	DTK-120HW:	*Protects 120V Power, Hardwire Suppressor, Parallel connection*
☆	DTK-120S20A:	*Protects 120V/240V 20A Power, Hardwire, Series connection*
☆	DTK-MRJ31XSCP-WP:	*Protection for one Dialer (two telephone lines)*

1 800-753-2345 **www.ditekcorp.com**

FIRE ALARM SYSTEM PROTECTION

DTK-120HW

Hardwire 120 Volt Parallel Surge Protector

- Parallel wiring configuration
- Diagnostic indicator confirms ground presence, unit function and power on
- UL Listed

DTK-120S15A

Hardwire 120 Volt Series Surge Protector

- Series wiring configuration
- Multi-stage hybrid protection
- Multiple diagnostic indicators monitor protection status, ground presence, ground fault and fuse status
- Excellent RFI/EMI filtering improves equipment performance
- Also available in 20 amp model - DTK-120S20A
- UL Listed

DTK-MRJ31XSCP-WP

Alarm Panel Dialer Surge Protector

- Provides both overvoltage and over-amperage protection for a single phone line
- “Plug and Play” modular RJ31X connection with self resetting fusing
- Patch cord included
- UL Listed

DTK-FPK Series

Convenient Surge Protection Kits for Fire Alarm Panels

- Basic surge protection for power and two dialers
- FPK1 contains (1) DTK-120HW and (2) MRJ31XSCP-WP
- FPK2 contains (1) DTK-120S15A and (2) MRJ31XSCP-WP (pictured)

NOTE:

For a complete surge protection solution, add the DTK-2MHLP-WB Series or the LVLP Series to protect SLC loops, NAC’s, and IDC’s (see next page for details)

Features

Provides additional notification appliance circuit (NAC) capacity with flexible operation modes and power-limited design

Four, Class B NACs are standard:

- Rated 2 A each for conventional reverse polarity 24 VDC notification appliances and providing multiple operation modes
- Can be selected to provide synchronization for Simplex® visible notification strobe flashes
- Capable of controlling TrueAlert non-addressable notification appliances operating with SmartSync two-wire control mode**

Input control options:

- IDNet addressable communications from a Simplex model 4007ES, 4010, 4010ES, 4100ES, or 4100U Fire Alarm Control Panel**
- Or from one or two conventional 24 VDC NACs with multiple output control options

IDNet communications control benefits:

- Provides status monitoring and individual NAC control using a single address per 4009 IDNet NAC Extender
- Supports IDNet "Device Level" earth fault location

WALKTEST operation is available with either input choice

Internal 8 A power supply/battery charger:

- Charges internal batteries up to 12.7 Ah or up to 18 Ah batteries in external cabinet
- Provides status monitoring of battery, input power, and earth faults
- Rated 8 A for "Special Application" appliances; including Simplex 4901, 4903, 4904, and 4906 Series horns, strobes, horn/strobes, and speaker/strobes
- Rated 6 A for "Regulated 24 DC" appliance power

Optional 4009 IDNet NAC Extender modules:

- IDNet Communications Repeater provides Class B or Class A output
- IDNet Communications Fiber Optic Receiver/Repeater, available as Class B or Class X
- Four additional Class B NACs, rated 1.5 A for Special Application appliances; 1 A for Regulated 24 DC appliance power
- Class A, Two Circuit Adapter Module

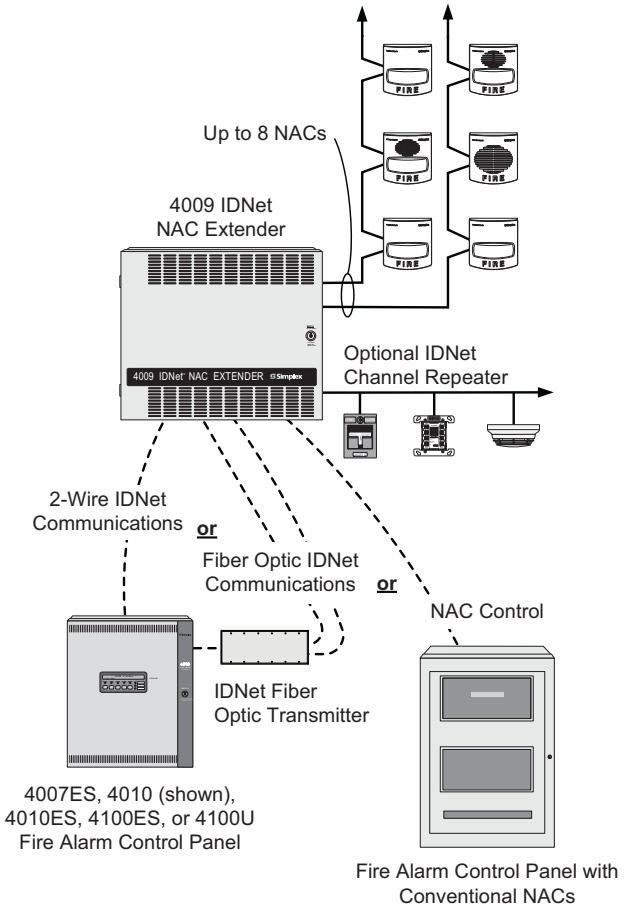
UL Listed to Standard 864

External Accessories

IDNet communication fiber optic transmitters:

- For applications requiring the data integrity available with fiber optic communications
- Available as Class B or Class X
- Mounts in standard six-gang electrical box

External battery cabinet for 18 Ah batteries



4009 IDNet NAC Extender Connection Reference Drawing

Introduction

ADA Compliance. Complying with the notification requirements of ADA (Americans with Disabilities Act) may require more notification appliance power than is available within the fire alarm control panel. When additional power is required, a Simplex 4009 IDNet NAC Extender can provide up to 8 A of NAC power with up to eight, supervised reverse polarity NACs.

Location Flexibility. The 4009 IDNet NAC Extender can be mounted close to a compatible dedicated host panel or can be located remotely for convenient power distribution. Multiple operation modes and multiple connection options further increase location flexibility.

Additional Information. For additional operation detail and application information, refer to Installation Instructions 574-181 and field wiring diagram 842-068.

* ULC listed model is 4009-9202CA. This product has been approved by the California State Fire Marshal (CSFM) pursuant to Section 13144.1 of the California Health and Safety Code. See CSFM Listing 7300-0026:214 for allowable values and/or conditions concerning material presented in this document. Accepted for use – City of New York Department of Buildings – MEA35-93E. Additional listings may be applicable; contact your local Simplex product supplier for the latest status. Listings and approvals under Simplex Time Recorder Co. are the property of Tyco Fire Protection Products.

** 4100U requires revision 11 software or higher for compatibility. 4010 requires revision 2 software or higher for compatibility.

Application and Operation Information

IDNet Addressable Communications Compatible. Up to ten (10), 4009 IDNet NAC Extenders can be controlled per 4007ES, 4010ES, 4100ES, or 4100U IDNet communications channel; up to five (5) can be controlled on the 4010 IDNet communications channel. Each output NAC can be individually controlled for general alarm or selective area notification requiring only one point address per Extender. Individual Extender NACs can also be manually controlled from the host panel. IDNet controlled extenders will inform the host panel of troubles via IDNet communications. 4007ES, 4010ES, 4100ES, and 4100U control panels control using multi-point rules, refer to data sheet S4090-0011 for details.

Optional IDNet Repeaters. IDNet communications can be repeated with the optional IDNet Repeater Module or with the optional Fiber Optic Receiver Module. Up to 100 of the IDNet channel points can be repeated once (refer to pages 3 and 5 for details). Repeated IDNet communications also support the "device level" earth fault location utility of the host panel.

Hardwire Control Applications. For applications where an existing (or new) conventional NAC needs additional power, the 4009 IDNet NAC Extender can be controlled directly from the NAC. Either one or two NACs, from either the same, or from different host fire alarm control panels, can be connected to control the 4009 IDNet NAC Extender output NACs. Multiple control selections provide flexible operation. (Refer to page 4 for more detail.) Alarms from the host panel will activate the four, 4009 IDNet NAC Extender NACs (or optionally, eight NACs) to extend the alarm.

The 4009 IDNet Extender monitors itself and each of its output NACs for trouble conditions, including earth faults. Extenders wired to conventional NACs will indicate a trouble by opening the path to the NAC's end-of-line resistor, but retaining the ability to respond to alarms. Individual troubles are also annunciated by LEDs located on the 4009 IDNet NAC Extender main circuit board. (Refer to page 7 for more diagnostic information.)

Product Selection

Standard Models

Model	Description	
4009-9201	120 VAC input	4009 IDNet NAC Extender with 4, Class B NACs and 8 A power supply
4009-9202CA*		
4009-9301	240 VAC input	

* ULC listed model

Optional Modules (for on-site installation)

Model	Description		Comments
4009-9807	Additional four point NAC module, rated 1.5 A Special Application appliances; 1 A for Regulated 24 DC appliance power, Class B		One maximum
4009-9808	Dual Class A adapter (for two NAC outputs)		Select as required (4 maximum)
4009-9809	IDNet Repeater, output is Class A or Class B		Select **either** an IDNet Repeater **or** a Fiber Optic Receiver as required; one transmitter can connect to one receiver
4009-9810	Fiber Optic Receiver	Class B	
4009-9811		Class A (IDNet), Class X (fiber)	
4009-9805	Red Appliqué for door		Select if required
2975-9801	Semi-Flush Trim Kit	Beige trim	1-7/16" wide (78 mm), use if required for semi-flush installations
2975-9802		Red trim	

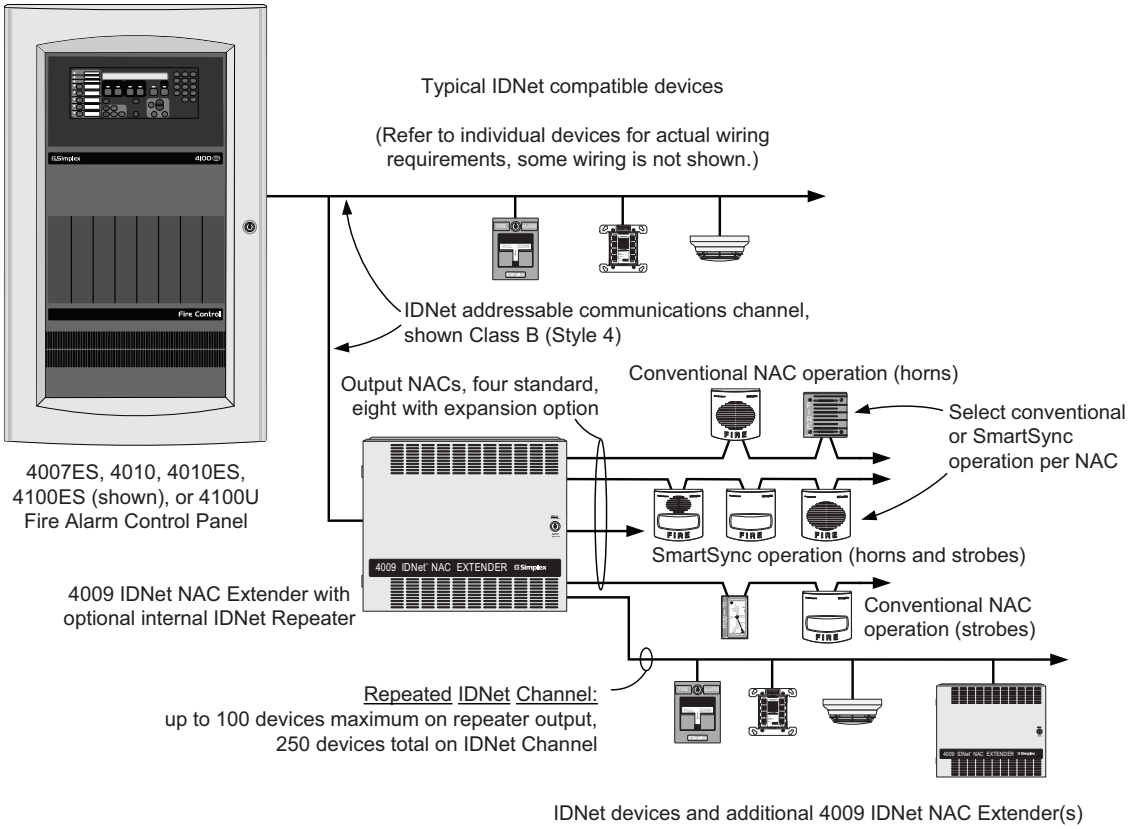
Battery Selection (select battery size per system requirements)

Model	Description	Comments
2081-9272	6.2 Ah Battery, 12 VDC	Two batteries are required, 24 VDC operation
2081-9274	10 Ah Battery, 12 VDC	
2081-9288	12.7 Ah Battery, 12 VDC	
2081-9275	18 Ah Battery, 12 VDC	Requires external battery cabinet, two batteries are required, 24 VDC operation

External Accessories (select per system requirements)

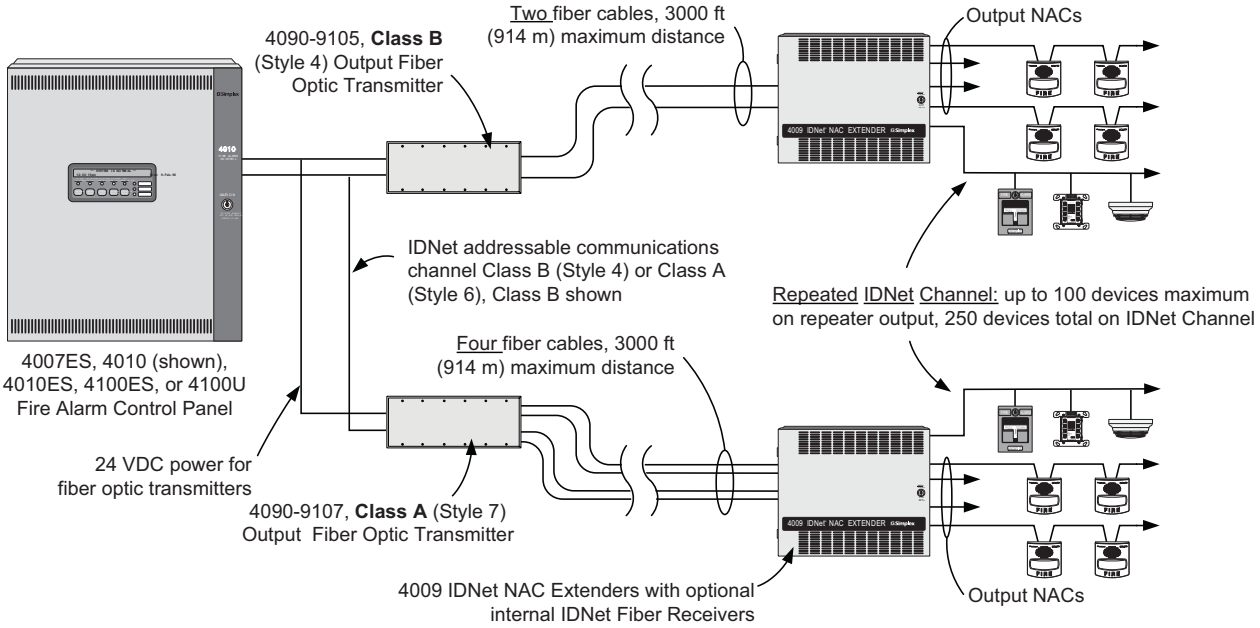
Model	Description		Comments
4090-9105	IDNet Fiber Optic Transmitter	Class B operation	Mounts in six-gang electrical box, refer to page 4 for mounting details
4090-9107		Class X operation	
4009-9801	External battery cabinet for up to 18 Ah batteries, beige		16-1/4" W x 13-1/2" H x 5-3/4" D (413 mm x 343 mm x 146 mm)
4081 Series	End-of-Line Resistor Harnesses; see data sheet S4081-0003 for details		

Typical IDNet Connection Example



NOTE: Up to ten (10) 4009 IDNet NAC Extenders may be connected per 4007ES, 4010ES, 4100ES, or 4100U IDNet channel, up to five (5) on the 4010 IDNet channel. IDNet communications can be repeated only once (can pass through only one series connected repeater or one fiber optic receiver).

Typical Fiber Optic System Connections



NOTE: Up to ten (10) 4009 IDNet NAC Extenders may be connected per 4007ES, 4010ES, 4100ES, or 4100U IDNet channel, up to five (5) on the 4010 IDNet channel. IDNet communications can be repeated only once (can pass through only one series connected repeater or one fiber optic receiver). Fiber optic transmitters connect to only one receiver in a 4009 IDNet NAC Extender.

Hardwire Control Connection Information

NAC Input Selections. The 4009 IDNet NAC Extender can be selected to:

- Track input NAC operation **or** to provide a locally generated code, selectable per NAC input
- If selected for local coding, NAC outputs can be either **Temporal Coded** or **60 Beats/min March Time Coded,** one code selection per extender (input NACs must be on continuous with Alarm)
- Additionally, NAC outputs can be selected to provide the Simplex strobe synchronization signal. This signal will synchronize the flashes of synchronized strobes but will be ignored by free-run strobes and audible devices. (Strobes are for operation by noncoded NACs.)

NAC input to NAC output control can be selected for standard and optional NACs per the following table:

Conventional NAC Output Operation Options

Input	A	B	C
NAC 1	NACs 1 & 2, 5 & 6	NACs 1-4	NACs 1-8
NAC 2	NACs 3 & 4, 7 & 8	NACs 5-8	None

SmartSync NAC Output Operation

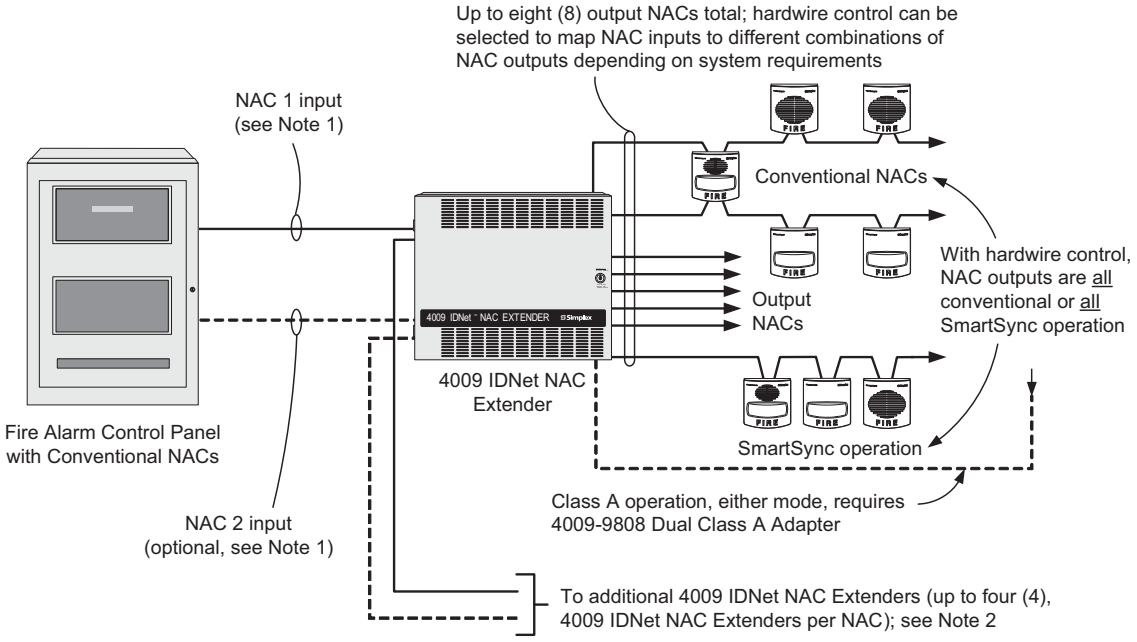
Input	NAC Control Function	
NAC 1	Strobe Control	All NAC outputs (1-8)
NAC 2	Horn Control	

SmartSync Notification Appliance Control

The TrueAlert Notification Appliance product line includes addressable and non-addressable operation. Non-addressable models are available with 2-wire SmartSync operation or conventional 4-wire operation. The following details apply to use with the 4009 IDNet NAC Extender:

- TrueAlert non-addressable models with SmartSync operation allow audible notification to be separately controlled over the same wire pair that controls visible notification
- 4009 IDNet NAC Extenders can be selected to provide SmartSync operation whether controlled by IDNet communications or conventional NACs
- IDNet control allows output NACs to be **individually selected** for conventional **or** SmartSync operation
- With NAC input control, **all** output NACs are selected for either conventional **or** SmartSync operation
- Refer to data sheet S4009-0003 for TrueAlert Addressable operation details, contact your local Simplex product supplier for further information on specific TrueAlert notification appliances

Hardwire Control NAC Connection One-Line Reference Diagram



Notes:

1. For separate audible and visible output NAC control, or SmartSync NAC output operation, two (2) input NACs are required. NAC 1 is "on-until-reset" and NAC 2 is "on-until-silenced."
2. To synchronize strobe flash outputs for up to four (4) 4009 IDNet NAC Extenders, use the synchronized strobe output from a Synchronized Flash Module (4905-9914 for Class B operation, 4905-9922 for Class A operation) or, if available, from a NAC selected to provide synchronized strobe flash output. **NOTE: DO NOT USE a NAC selected for SmartSync operation for this function.**

Refer to Installation Instructions 574-181 for additional information and application guidance

4009 IDNet NAC Extender Specifications

Input Ratings	120 VAC Input (4009-9201)	3A @ 102-132 VAC, 60 Hz
	240 VAC Input (4009-9301)	1.5A @ 204-264 VAC, 50/60 Hz
	Hardwire Control from External NACs, Input Requirements	Conventional reverse polarity operation
		5 mA maximum; 16 to 33 VDC
Output Ratings	Total Rating	8 A, Special Application appliances 6 A, Regulated 24 DC appliance power
	Standard NACs	2 A each, Special Application or Regulated 24 DC appliance power
	Optional NACs (requires 4009-9807)	1.5 A each, Special Application appliances 1 A each, Regulated 24 DC appliance power
	Special Application Appliances	Simplex non-addressable horns, strobes, and combination horn/strobes and speaker/strobes (contact your Simplex product representative for compatible appliances)
	Regulated 24 DC Appliances	Power for other UL listed appliances; use associated external synchronization modules where required
	Strobe Operation	Up to 33 strobes per NAC can be synchronized; output NACs configured for Simplex synchronized strobe operation are synchronized to each other
	Auxiliary Output	500 mA @ 24 VDC nominal

Optional Modules Ratings

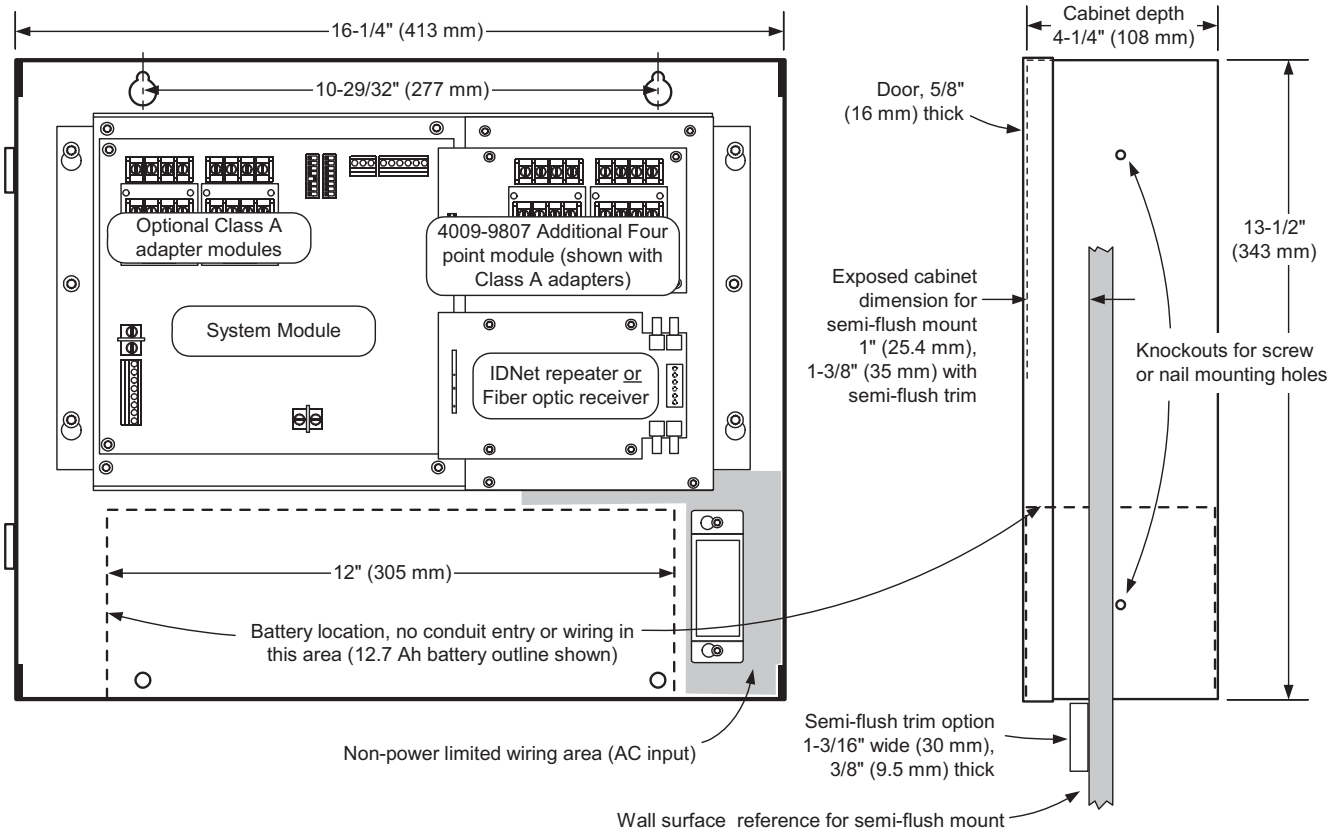
IDNet Repeater Module (4009-9809)	Input Power	70 mA @ 24 VDC, system supplied
	IDNet Input, One Address	Maximum distance from IDNet source is 2500 ft (762 m)
	IDNet Output Specifications	Repeated IDNet output for up to 100 devices (total IDNet devices not to exceed 250 per channel)
		Maximum distance to farthest device is 2500 ft (762 m)
		Total distance including “T-taps” is 10,000 ft (3048 m)
		Class A loop maximum distance is 2500 ft (762 m), no “T” taps
Fiber Optic Receiver Modules		
Input Current		4009-9810, Class B, 65 mA @ 24 VDC, system supplied
		4009-9811, Class X, 80 mA @ 24 VDC, system supplied
IDNet Output Specifications		Same as those for Repeater Module (see above)
Fiber Optic Transmission Distance		3000 ft (914 m) maximum
General (LED status indicators are listed on page 7, dimensions and mounting details are on page 6)		
Operating Temperature		32° to 120° F (0° to 49° C)
Operating Humidity Range		10% to 90% RH from 32° F to 104° F (0° C to 40° C)
Wiring Connections*		Terminal blocks for 18 AWG (stranded) to 12 AWG (solid)

Fiber Optic Transmitter Specifications

Input Voltage	18.9-32 VDC from compatible listed fire alarm supply
Input Current	4090-9105, Class B, 30 mA @ 24 VDC
	4090-9107, Class X, 35 mA @ 24 VDC
Fiber Optic Connections and cable requirements	Multimode, graded index, 50/125µm, 62.5/125 µm, 100/40 µm, or 200 µm
	Type ST connectors
	4090-9105, Class B operation, two fiber cables required
	4090-9107, Class X operation, four fiber cables required
Module Size (with mounting bracket)	6-13/16” W x 3-3/4” H x 1-1/8” D (173 mm x 95 mm x 29 mm)
On-board Status Indicators	Green LED flashing = transmit
	Red LED flashing = receive
	Separate red LED on 4090-9107 = Class X receive
Communications	Simplex IDNet
Fiber Optic Transmission Distance	3000 ft (914 m) maximum
Wiring Connections*	Terminal blocks for 18 AWG (stranded) to 12 AWG (solid)
Operating Humidity	10% to 90% RH from 32° to 104° F (0° to 40° C)
Operating Temperature	32° F to 120° F (0° to 49° C)

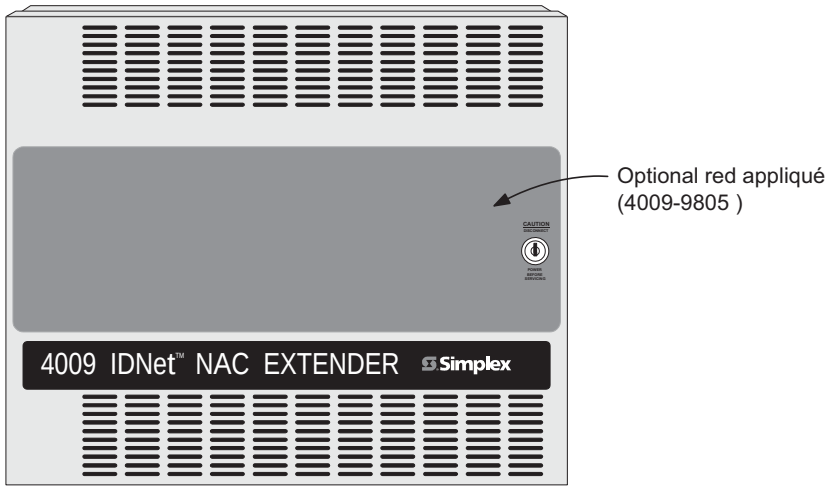
* Metric wire equivalents: 18 AWG = 0.82 mm^2; 12 AWG = 3.31 mm^2

4009 IDNet NAC Extender Mounting and Module Placement Information

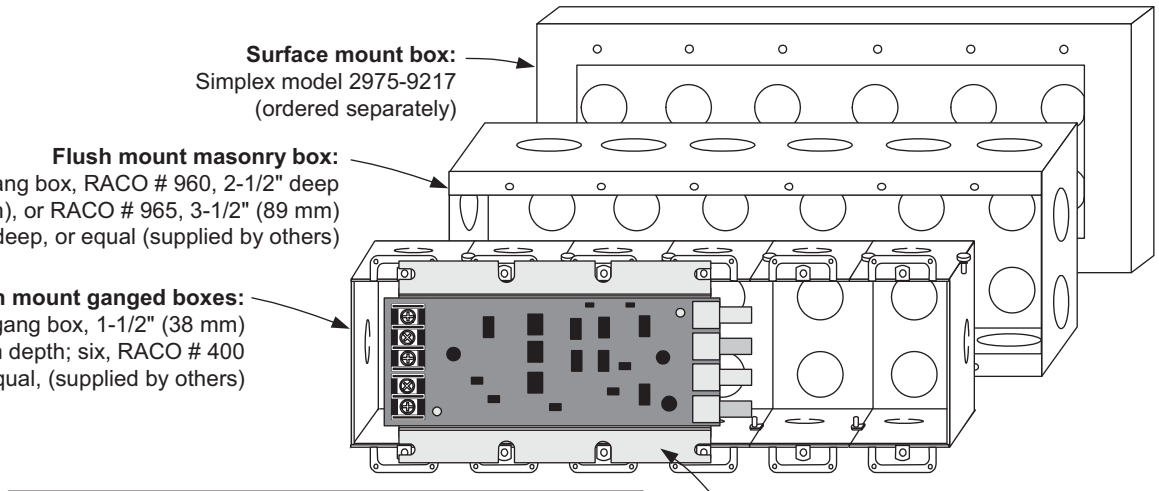


NOTE: Recommended conduit entrance varies with module selection. Refer to general installation instructions 574-181, specific module installation instructions, and to field wiring diagrams 842-068 before locating conduit entrance.

4009 IDNet NAC Extender Cabinet with Door Detail



4090-9105/9107 IDNet Fiber Optic Transmitter Mounting Information



Service Diagnostic Features

Power-up Self-Diagnostics. Upon power-up, the 4009 IDNet NAC Extender tests each module and performs earth fault diagnostics. Trouble conditions are communicated to the host control panel and are also displayed on diagnostic status LEDs in the 4009 IDNet NAC Extender. When connected via IDNet communications, detailed status information is available at the host. When controlled with conventional NAC inputs, common troubles are signaled by providing a polarized open circuit that disconnects the NAC wiring from its end-of-line resistor but still allows a reversed polarity alarm to be received.

Door Mounted Reference Label. The 4009 IDNet NAC Extender has a detailed programming and diagnostic label inside the front door that provides a quick reference for both installation and checkout.

LED Status Indicators are provided for the following:

- **Each NAC** (standard and optional) has a dedicated yellow LED that:
  - During supervision provides a slow flash to indicate a short circuit condition and a fast flash to indicate an open circuit
  - During an alarm, the LED follows the NAC output (on steady or flashing with coded output)
- **Four, general status yellow LEDs** provide nine separate indications listed in priority of urgency. As a trouble is eliminated, any remaining trouble(s) will then be indicated until the 4009 IDNet NAC Extender is returned to normal operation.
- **AC power status** is indicated by a green LED that is on when AC is normal. During low AC (brownout) conditions or with no AC, the LED is off. Additional power and battery status is indicated by the general status LEDs.

4009 IDNet NAC Extender Current Calculation Chart

Step 1. Calculate Basic Extender Battery Requirements (minus NAC loads)

Panel, NAC Options, and Auxiliary Power (underlined model numbers are optional modules)

Model	Description		Supervisory Current	Actual Supervisory	Alarm Current	Actual Alarm
4009-9201	120 VAC input	Basic Panel	85 mA	85 mA	185 mA	185 mA
4009-9301	240 VAC input					
4009-9807	Additional Four Point NAC		40 mA	+_____	40 mA	+_____
4009-9808	Dual Class A Adapter (no additional current)		–	–	–	–
Auxiliary Power Output			(500 mA maximum)	+_____	(500 mA maximum)	+ **[A1]** _____
				Basic Panel Supervisory Current	= **[S1]** _____	
					Basic Panel Alarm Current	= **[A2]** _____

Step 2. Calculate IDNet Output Module and Device Current (if used)

4009-9809	IDNet Repeater	Select one per Extender	70 mA	+_____	70 mA	+_____
4009-9810*	Fiber Optic Receiver, Class B		65 mA		65 mA	
4009-9811*	Fiber Optic Receiver, Class X		80 mA		80 mA	
IDNet Devices (connected to Repeater or Receiver above), 0.7 mA each, maximum of 100			Total devices x 0.7 mA each	+_____	Total devices x 0.7 mA each	+_____
				IDNet Module Supervisory Current	**[S2]** = ____	
					IDNet Module Alarm Current	= **[A3]** _____

* Note: IDNet Fiber Optic Transmitter current is supplied from the host fire alarm control panel

Step 2. Calculate Available NAC Current

Maximum Available Current	**= 8 A***
Subtract Auxiliary Power Output	**- [A1]** _____
Subtract IDNet Module Current	**- [A3]** _____
Available NAC Current	**= [A4]** _____

* 8 A for Special Application Appliances; 6 A for Regulated 24 DC Appliances

Step 3. Calculate Actual NAC Loading (Limited to Available NAC Current per Step 2.)

NAC Type	NAC Circuit #	NAC Alarm Current
Standard Panel NACS, 2 A maximum per NAC	Circuit 1	+_____
	Circuit 2	+_____
	Circuit 3	+_____
	Circuit 4	+_____
Optional Four Point NAC Module, 1.5 A maximum Special Application rating, 1 A maximum Regulated 24 DC rating, per NAC	Circuit 5	+_____
	Circuit 6	+_____
	Circuit 7	+_____
	Circuit 8	+_____
	Total Actual NAC Load Alarm Current	= **[A5]** _____

Step 4. Calculate Total Supervisory Current

Total Supervisory Current = Basic Panel Current **[S1]** + IDNet Module Current **[S2]** = _____

Step 5. Calculate Total Alarm Current

Total Alarm Current = Basic Panel Current **[A2]** + IDNet Module Current **[A3]** + Actual NAC Current **[A5]** = _____

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Features

Rechargeable, sealed lead-acid batteries:

- Lead-calcium grid structure with immobilized electrolyte in absorbent separator
- Low maintenance with no need to add water
- Low self-discharge characteristics
- One-piece, high impact polystyrene cell cover with high reliability dual seal construction
- UL 924 recognized pressure relief valves

Available in a variety of capacities:

- Batteries for internal mounting range from 6.2 Ah up to 50 Ah, depending on control panel cabinet size
- Larger batteries, up to 110 Ah, mount in external battery cabinets with models available with internal chargers

Battery cabinets with chargers:

- Battery cabinets with charger communicate with their connected fire alarm control panel and are available for 4100ES/4010ES/4100U Series and 4010 Series panels

Description

Simplex® rechargeable sealed-lead acid batteries provide reliable and repeatable discharge and recharge characteristics for use in fire alarm and other systems applications. They are designed with immobilized electrolyte in an absorbent separator, allowing them to provide rated capacity on the first cycle.

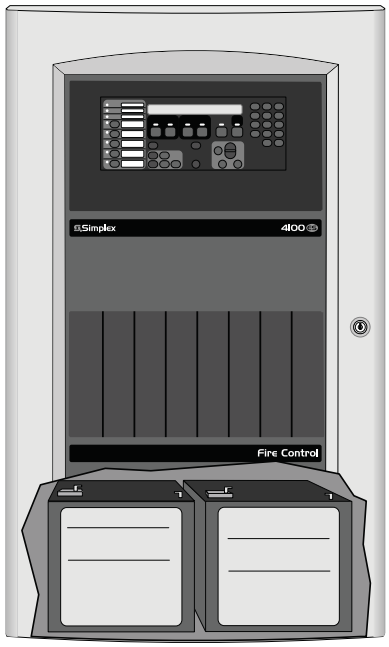
Because of their sealed construction, packaging is allowed within the system electronics enclosure (see illustration on page 2). When this is applicable, the quantity of system cabinets and the battery wiring distances are both minimized. Where required, external battery cabinets can be close-nippled to the control panel to house larger batteries with battery chargers available in some battery cabinet sizes.

Battery Details

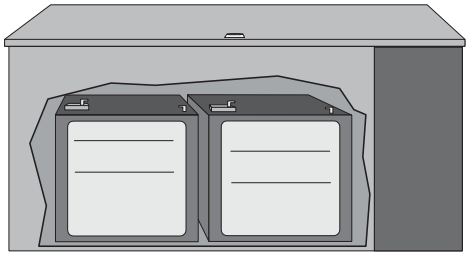
Charging. These batteries are intended to be used with compatible Simplex battery chargers.

Series Connections. These batteries are required to be connected in series to produce 24 V system voltage. Battery sets must be of identical voltage, model number, appearance, and approximately the same date of manufacture for proper operation.

Testing. Battery capacity testing is recommended to be performed by using a sealed lead-acid battery tester designed to withdraw a minimum of battery charge. The preferred tester applies a variety of amplitude and duration controlled test pulses that compares terminal voltage against those predicted for the specific battery size. (Testing is available through your local Simplex product supplier.)



Compatible Sealed Lead-Acid Batteries can be Installed Inside Fire Alarm Control Panel Cabinets



Remote Battery Cabinets are Available for Larger Battery Requirements

Battery Details *(Continued)*

Shipping. Sealed lead-acid batteries are shipped via ground or sea transportation only. They are not shipped via air.

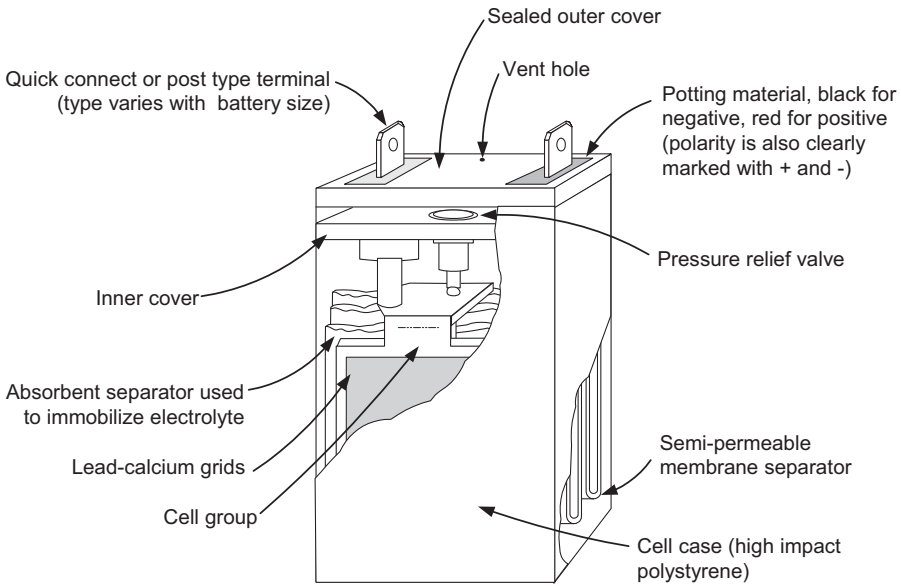
Disposal. Battery chemicals and materials can be recycled. Refer to information shipped with the battery or on its case. Return to the battery manufacturer or to a similarly qualified battery processing facility for proper disposal.

Seismic Activity Applications. Battery brackets are available for systems tested for compliance with specific batteries. Please refer to data sheet S2081-0019 for details.

* Refer to details on page 4 and to the referenced individual product data sheets for agency listing status of battery cabinets and chargers. The batteries detailed in this document meet the requirements of UL, ULC, and Factory Mutual for use with respective equipment battery chargers as listed on page 3. Contact your local Simplex product supplier for proper battery selection per system requirements. Listings and approvals under Simplex Time Recorder Co. are the property of Tyco Fire Protection Products.

Battery Construction Reference

Actual appearance will vary with battery size.



Battery Size Specifications

Battery Model	Capacity @ 20 Hour Discharge Rate	Width*	Depth*	Height with Terminals	Approximate Weight*
2081-9272	**6.2 Ah**	6-1/8” (156 mm)	2-5/8” (67 mm)	4” (102 mm)	5.75 lbs (2.6 kg)
2081-9274	**10 Ah**	6” (153 mm)	4-1/16” (103 mm)	4” (102 mm)	9.2 lbs (4.2 kg)
2081-9288	**12.7 Ah**	6” (153 mm)	4” (102 mm)	4” (102 mm)	9 lbs (4.1 kg)
2081-9275	**18 Ah**	7-1/4” (184 mm)	3-3/8” (86 mm)	6-5/8” (168 mm)	14.3 lbs (6.5 kg)
2081-9287	**25 Ah**	6-5/8” (168 mm)	5” (127 mm)	7” (178 mm)	19.4 lbs (8.8 kg)
2081-9271 (rectangular case, typically for service)	**33 Ah**	12-1/2” (318 mm)	3-3/8” (86 mm)	7-1/16” (179 mm)	26.6 lbs (12.1 kg)
2081-9276 (“square” case, use for new)	**33 Ah**	7-3/4” (197 mm)	5-1/4” (133 mm)	6-3/4” (171 mm)	26.5 lbs (12 kg)
2081-9296	**50 Ah**	9” (229 mm)	5-1/2” (140 mm)	8-7/8” (225 mm)	41.8 lbs (19 kg)
2081-9279	**110 Ah**	11-3/16” (284 mm)	10-1/2” (267 mm)	9” (230 mm)	82 Lbs (37 kg)

* Dimensions and weight are per battery and are for reference only. Exact size may vary. Refer to the tables on page 3 for mounting compatibility. These batteries are 12 V each and series connected for 24 V system use.

NOTE: When wired in series for 24 V output, these batteries are to be of identical voltage, appearance, model number, and approximately the same date of manufacture.

General Battery Specifications

Nominal Voltage Rating	12 Volts per battery
Discharge Rating	20 Hour Rate
Typical Charge/Discharge Cycles	100 to 150
Preferred Charge Temperature Range	60° F to 90° F (15.6°C to 32.2° C)

Battery Compatibility for Fire Alarm Control Panel Mounting

NOTE: Refer to individual fire alarm control panel product data sheets for additional battery application information

Battery Model	Capacity	Simplex Control Panel Model Series (see legend and notes below)								
		4003EC	4004R	4007ES & 4005	4006 & 4008	4009 (all models)	4010	4010ES	4100ES/ 4100U	4100 & 4120 (2, 4 or 6-Unit)
2081-9272	6.2 Ah	✓	✓	✓	✓	✓	✓	✓	✓	✓
2081-9274	10 Ah	✓	✓	✓	✓	✓	✓	✓	✓	✓
2081-9288	12.7 Ah	✓	✓	✓	✓	✓	✓	✓	✓	✓
2081-9275	18 Ah	**Ext**	Note 3	✓	**Ext**	**Ext**	Note 2	✓	✓	✓
2081-9287	25 Ah	**Ext**	Note 3	**Ext**	**Ext**	**NA**	✓	✓	✓	✓
2081-9271 rectangular	33 Ah	**Ext**	Note 3	**Ext**	**NA**	**NA**	Note 3	✓	✓	**Ext**
2081-9276 "square"	33 Ah	**Ext**	Note 3	**Ext**	**NA**	**NA**	Note 3	✓	✓	✓
2081-9296	50 Ah	**NA**	Note 3	**NA**	**NA**	**NA**	Note 3	Note 6	**2 or 3 bay**	**Ext**
2081-9279	110 Ah	Requires external battery cabinet, compatible with 4100ES, 4010ES, 4100, and 4120 Series only								

✓ **=** Can be placed in the respective equipment cabinet

Ext = External battery cabinet is required, refer to selection chart on page 4

NA = Not applicable/not compatible

NOTES:

1. These batteries meet the requirements of UL, ULC, and Factory Mutual for use with respective equipment battery chargers listed above. Contact your local Simplex product supplier for proper battery selection per system requirements.
2. 4010 Cabinets will accommodate 2081-9275, 18 Ah batteries, but will not allow bottom entry conduit.
3. Use 4081 series companion cabinet and charger, refer to page 4.
4. Some control panel models are listed for battery replacement reference only.
5. For 2 bay international applications only, 50 Ah batteries will fit in the cabinet.

External Battery Cabinet Compatibility Reference

Battery Cabinets without Chargers (connects to charger in panel)

Cabinet	Panel Compatibility	Battery					
		2081-9275 18 Ah*	2081-9287 25 Ah	2081-9271 Rectangular 33 Ah	2081-9276 Square 33 Ah	2081-9296 50 Ah	2081-9279 110 Ah
2081-9280	4100ES, 4010ES, 4100U, and 4100+	**NA**	**NA**	**NA**	**NA**	**NA**	✓
2081-9281 2081-9282	multiple	✓	✓	✓	✓	✓	**NA**
4009-9801	multiple	✓	✓**	**NA**	**NA**	**NA**	**NA**
4009-9802	multiple	✓	**NA**	✓	**NA**	**NA**	**NA**

Battery Cabinets with Chargers

Cabinet	Panel Compatibility	2081-9275 18 Ah*	2081-9287 25 Ah	2081-9271 Rectangular 33 Ah	2081-9276 Square 33 Ah	2081-9296 50 Ah	2081-9279 110 Ah
4081-9301 4081-9302	4004R and 4010	✓	✓	✓	✓	✓	**NA**
4081-9306 4081-9308	4100ES, 4010ES, and 4100U	**NA**	**NA**	**NA**	**NA**	✓	✓

* Batteries smaller than those listed are normally mounted in the product cabinet

** 25 Ah capacity was effective as of 7/2005.

✓ = Can be placed in the respective equipment cabinet

NA = Not applicable/not compatible

External Battery Cabinet Specification Reference

Battery Cabinets Without Chargers; Shallow Design with Front Door

Model	Color	Listings	Description		Dimensions
2081-9281	Beige	UL and FM	2-Unit, 4100 style cabinet **without** charger; with locking solid door and battery shelf, primarily for use with 50 Ah batteries		25-3/4" W x 20-3/4" H x 6-3/4" D (654 mm x 527 mm x 171 mm)
2081-9282	Red				
4003-9860	Beige	Multiple	Intended for use with 4003EC systems, for up to 33 Ah batteries (refer to 4003EC data sheet S4003-0002)		9-1/2" H x 24" W x 9" D (241 mm x 610 mm x 229 mm)
4009-9801*	Beige	UL and FM	For up to 25 Ah batteries*	External battery cabinet **without** charger, with locking solid door and battery harness; for close-nippled mounting to fire alarm control panel cabinet	16-1/4" W x 13-1/2" H x 5-3/4" D (413 mm x 343 mm x 146 mm)*
4009-9802	Beige	UL	For up to 33 Ah batteries		25-3/4" W x 20-3/4" H x 4-1/8" D (654 mm x 527 mm x 105 mm)

* Depth increased for 25 Ah batteries effective 7/2005.

Chargers for use with 4010 Fire Alarm Control Panels and 4004R Suppression Release Systems

(refer to data sheet S4081-0001)

Model	Color	Input Voltage	Description	Dimensions
4081-9301	Beige	120 VAC	Battery cabinet **with** charger for the 4010 and 4004R fire alarm control panel; **for up to 50 Ah batteries**; with front door *Listings include: UL, ULC, FM, CSFM, and MEA (NYC), see data sheet for details*	22-1/2" W x16-3/4" H x 8-3/8" D (572 mm x 425 mm x 213 mm)
4081-9302	Red			

Battery Cabinet Without Charger for 110 Ah Batteries; for use with compatible panel mounted chargers

(refer to data sheet S2081-0012)

Model & Listings	Color	Cabinet Description	Compatible Chargers	Charger Description	Dimensions
2081-9280 *Listings include: UL and CSFM*	Red	Battery cabinet for 2081-9279, 110 Ah batteries; includes 80 A battery fuse, terminals and battery connection cables; see data sheet for details	4010-9xxx Series	4010ES Main System Supply (MSS)	26-1/2" W x 12" H x 12" D (673 mm x 305 mm x 305 mm)
			4100-9xxx Series	4100ES/4100U System Power Supplies (SPS)	
			4100-5111 4100-5112 4100-5113	4100ES/4100U Additional SPS	
			4100-5125 4100-5126 4100-5127	4100ES/4100U Remote Power Supply (RPS)	
			4100-5120 4100-5121 4100-5122	4100ES/4100U TrueAlert Addressable Power Supply (TPS)	
			4100-0104 4100-0114 4100-0124	4100 Legacy power supplies	

4100ES/4010ES/4100U Compatible Battery Cabinet With Charger for 110 Ah Batteries (for ULC listed systems and for other applications unable to use panel mounted power supply charger; *refer to data sheet S4081-0002*)

Model	Color	Input Voltage	Description	Dimensions
4081-9306	Red	120 VAC	Battery cabinet with charger for up to 110 Ah batteries; **NOTE:** Required for ULC listed charging of 110 Ah batteries*; Listings include: UL, ULC, FM, CSFM, and MEA (NYC), see data sheet for details*	27-7/8" W x 13-1/2" H x 14-5/8" D (708 mm x 343 mm x 371 mm)
4081-9308	Red	220/230/240 VAC, multi-tapped		
4100-9837	Green LED Power-on Indicator Kit, **required for ULC listing,** mounts above access panel using knockout provided			

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Features

Remote LCD annunciator for use with Simplex® model:

- 4100ES and 4100U fire alarm control panels
- Legacy products 4100, 4120, and 4020 fire alarm control panels, and 4100/4120 Universal Transponders

Information display features:

- Maintained display of first alarm is available with 4100ES and with 4100U at software revision 11.11 or higher
- Wide viewing angle, super-twist LCD technology with green LED backlighting
- Two lines of 40 characters each
- LED status indicators
- During battery backup, backlighting is disabled until there is switch activity

Controls include:

- Switches for system acknowledge, alarm silence, and system reset
- Four programmable control switches
- Lamp/LCD test

Wiring information:

- RUI (Remote Unit Interface) communications require a single twisted, shielded wire pair
- Separate wiring is required for 24 VDC control panel power

Flush mount on standard electrical boxes

Options:

- 2975-9206, Surface mount box
- 4603-9111, Brushed stainless steel trim

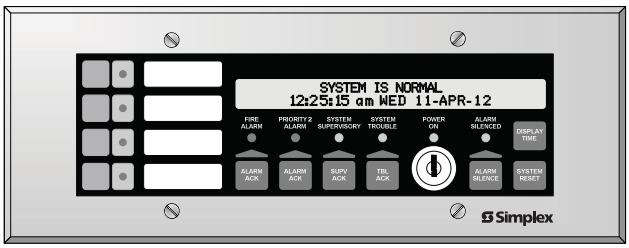
UL Listed to Standard 864

Description

Remote Control and Annunciation is provided using an 80 character, back-lit, alphanumeric display. Information is presented in clear, descriptive English language and includes: **Point Status** (alarm, trouble, etc.); **Alarm Type** (smoke detector, manual station, etc.); **Number of System Alarms**, **Supervisory Conditions**, and **Trouble Conditions**; and a **Custom Location Label**.

Wiring. A single twisted, shielded wire pair provides serial RUI communications that also supports other Simplex serial annunciators on the same wire pair.

Multiple Indications. Alarm, Supervisory, and Trouble conditions are also indicated by dedicated LEDs and a tone-alert audible sounder. Each condition has a dedicated acknowledge push-button switch that silences the tone-alert but leaves the LED on until all conditions in that category are restored to normal. Switch operation is either globally or individually acknowledgeable, determined by the control panel operation.



4603-9101 LCD Annunciator

Description *(Continued)*

Repeated operation of the appropriate acknowledge switch will scroll the LCD display showing activity in the sequence of occurrence. The tone-alert also pulses to indicate the operation of any of the push-button switches.

Consult local code requirements for guidance in determining applications and location of the 4603-9101 LCD annunciator.

Operation

System Controls. Notification appliances can be deactivated by pressing the "ALARM SILENCE" switch. (Exact operation is determined by the host control panel such as visible appliances remaining on until system is reset.) Pressing the "SYSTEM RESET" switch restores the system to normal operation. When system activity is normal, the LCD displays the time, date, and "SYSTEM IS NORMAL."

Control Switches. Four programmable "CONTROL" switches and associated LEDs are included. Typical applications include manual evacuation, door holder release bypass, and elevator capture bypass.

Keyswitch Enable. All switches on the annunciator are controlled by the "ENABLE" keyswitch with a key that is removable only in the disabled position. A brief lamp/LCD test is performed whenever the keyswitch is changed from enabled to disabled.

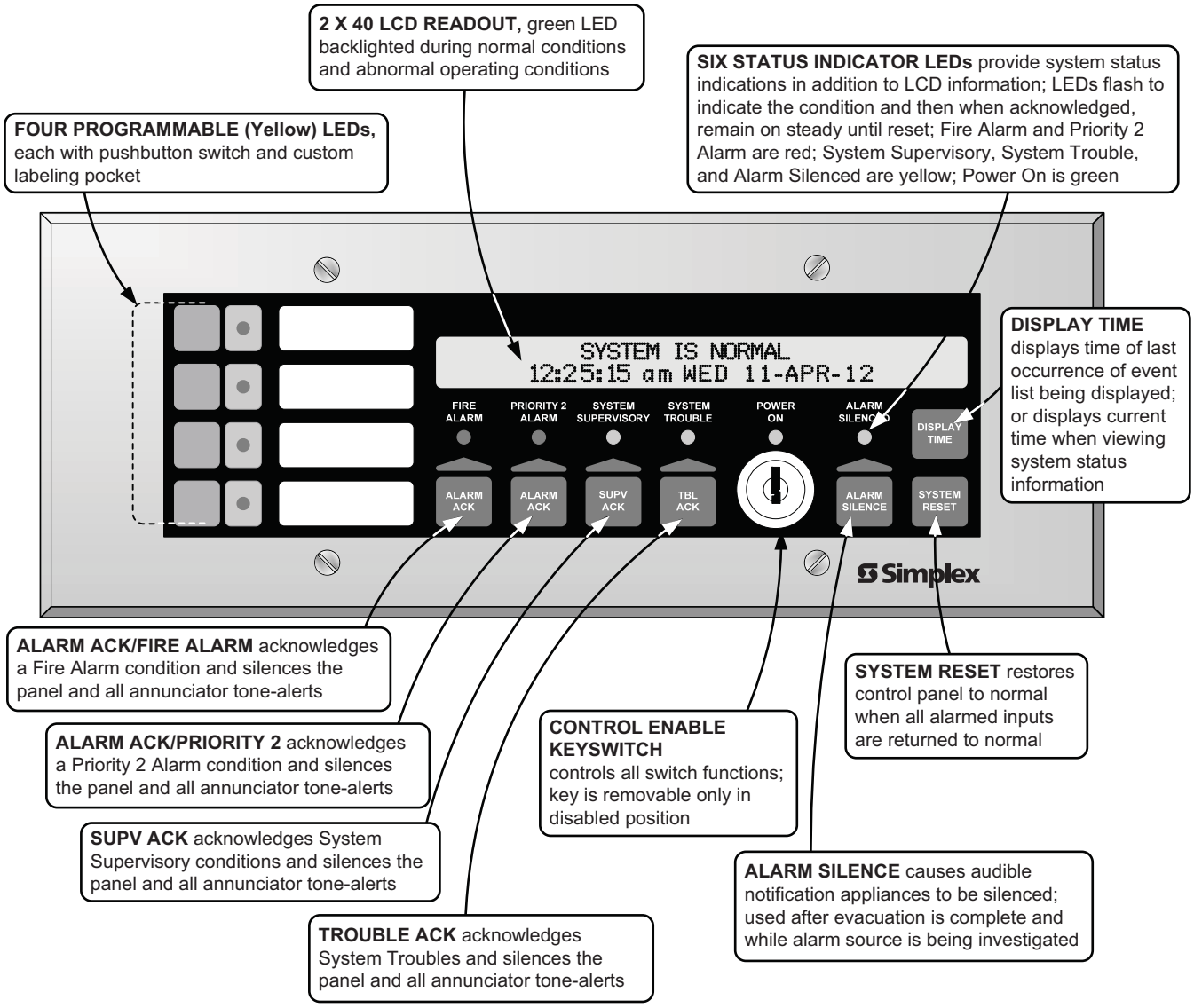
Battery Backup Operation. During battery backup, the LED backlighting is disabled to conserve battery power. When an annunciator switch is activated, the backlighting is automatically enabled. After approximately 30 seconds of inactivity, the backlighting will again be disabled.

* This product has been approved by the California State Fire Marshal (CSFM) pursuant to Section 13144.1 of the California Health and Safety Code. See CSFM Listing 7120-0026:179 for allowable values and/or conditions concerning material presented in this document. It is subject to re-examination, revision, and possible cancellation. Accepted for use – City of New York Department of Buildings – MEA35-93E. Additional listings may be applicable; contact your local Simplex product supplier for the latest status. Listings and approvals under Simplex Time Recorder Co. are the property of Tyco Fire Protection Products.

Product Selection

Model	Description	
4603-9101	Remote LCD Annunciator with beige trim	Refer to specifications on page 3 for additional details
4603-9101C	Remote LCD Annunciator with beige trim, for Canada	
4603-9111	Brushed stainless steel trim option	
2975-9206	Matching surface mount box; ivory finish	
2081-9044	Overvoltage protector; required where annunciator communications and power wiring exits and enters a building; refer to data sheet S2081-0016 for details	

4603-9101 Operator Information



4603-9101 LCD Annunciator Specifications

For additional information, refer to Installation Instructions 574-031.

General Operating Specifications		
Voltage		20.4 to 32 VDC, system supplied
Normal Operating Current		175 mA, backlighting enabled
Battery Standby Current	Supervisory	45 mA, backlighting disabled
	Alarm	200 mA, backlighting enabled and local tone-alert sounding
Operating Temperature Range		32° to 120° F (0° to 49° C)
Operating Humidity Range		10% to 90% from 32° F to 104° F (0° C to 40° C)

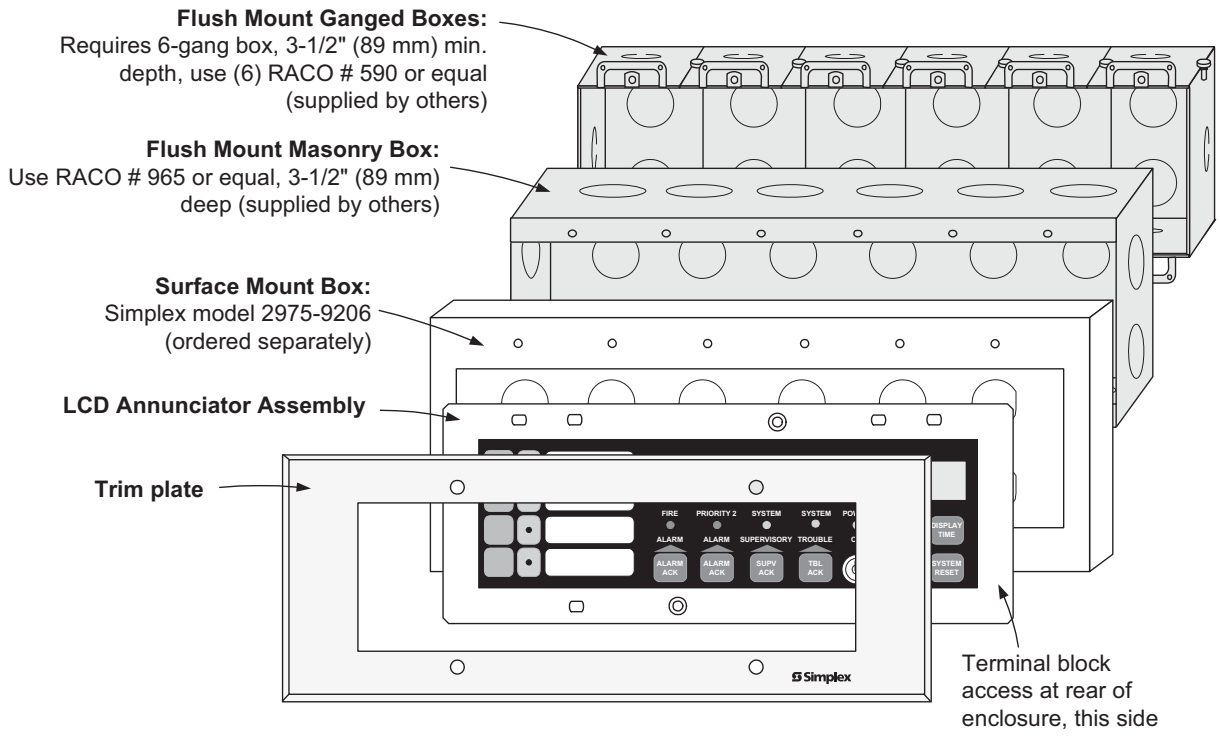
Communications		
4100ES/4100U Capacity, Per RUI Output	Type	RUI (Remote Unit Interface) external annunciator communications line SLC (signaling line circuit)
	Capacity	Up to 31 remote annunciators/MINIPLEX transponders per channel including the 4603-9101 LCD Annunciator, the 4602-9101 Status Command Unit (SCU), and 4602-9102 Remote Command Unit (RCU); refer to data sheet S4100-0031 for additional 4100ES information
Wiring Requirements	Data	Single twisted, shielded pair, 18 AWG (0.82 mm^2)
	Power	18 to 12 AWG (0.82 mm^2 to 3.31 mm^2) wires for 24 VDC system power
	Earth	A dedicated earth ground connection to the electrical box is required for proper ESD and EMI protection; wire in accordance with NFPA 70 (*National Electrical Code*) Article 250

Mounting Information	
NOTE: General Conduit Entrance Requirement	Conduit entrance must be located a minimum of 2 ¾" (70 mm) from the front of the box to clear assembly
Trim Dimensions	4 ½" H x 11 $^{13}/_{16}$" W (114 mm x 300 mm)
Standard Trim Finish	Steel, painted beige
4603-9111, Optional Trim	Brushed stainless steel (ordered separately); supplied with both slotted and tamper resistant screws
Boxes for Flush Mounting (supplied by others)	6-Gang, 3 ½" (89 mm) deep: RACO 965, 6-gang masonry box; RACO 590, gangable switch box, 6 required; or equal

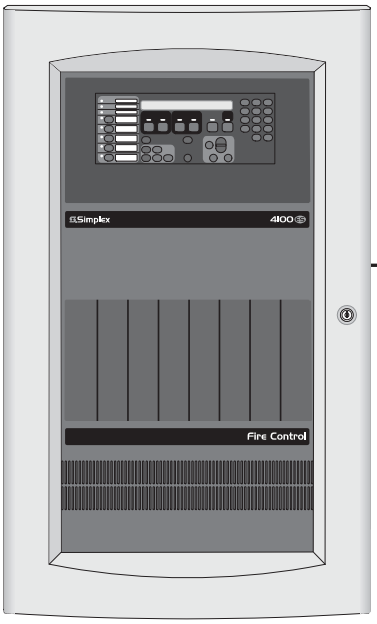
2975-9206, Surface Mount Box Option (ordered separately)	
Dimensions	11 $^{31}/_{32}$" W x 4 ⅝" H x 2 ¾" D (304 mm x 117 mm x 70 mm)
Finish	Painted steel, ivory finish

Mounting Information

NOTE: Conduit entrance must be located a minimum of 2-3/4" (70 mm) from the front of the box to clear assembly. Review box choice with assembly layout before selecting conduit entrance location.



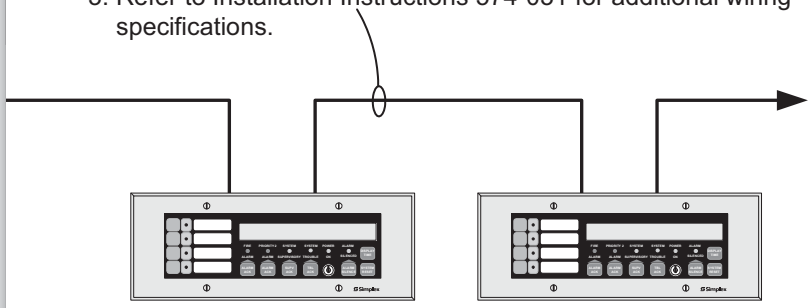
Wiring Reference



Fire Alarm Control Panel
(4100ES shown)

Wiring Notes:

1. Communications require a single 18 AWG twisted, shielded pair.
2. Power requires two, 18 to 12 AWG wires for 24 VDC system power, plus Earth Ground to each electrical box.
3. Refer to Installation Instructions 574-031 for additional wiring specifications.



4603-9101 LCD Annunciators

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UL, ULC, CSFM Listed; FM Approved;
*MEA (NYC) Acceptance**

Visible Notification Appliances with Speaker and Multi-Candela Strobe; Non-Addressable

Features

Speaker/visible (S/V) notification appliances with multi-tapped speaker and multi-tapped high intensity xenon strobe with synchronized flash:

- Rugged, high impact, flame retardant thermoplastic housings are available for wall or ceiling mount
- Operation is compatible with ADA requirements (refer to important wall mount installation information on page 4)

Wall mount S/V features:

- Housings are available in red or white with clear lens with contrasting white or red "FIRE" lettering
- Covers are available separately to convert housing color

Ceiling mount S/V features:

- Housing is white with clear lens
- Red "FIRE" lettering is printed on two sides

Audible notification appliance (speaker):

- High quality voice and tone reproduction with taps for ¼, ½ , 1, or 2 W, at 25 or 70.7 VRMS
- Capacitor input for connection to supervised notification appliance circuits
- Speakers are wired separately from strobe wiring
- UL listed to Standard 1480 and ULC-S541*
- Compliant with NFPA 72, 520 Hz Low Frequency Signal Requirements for Sleeping Areas

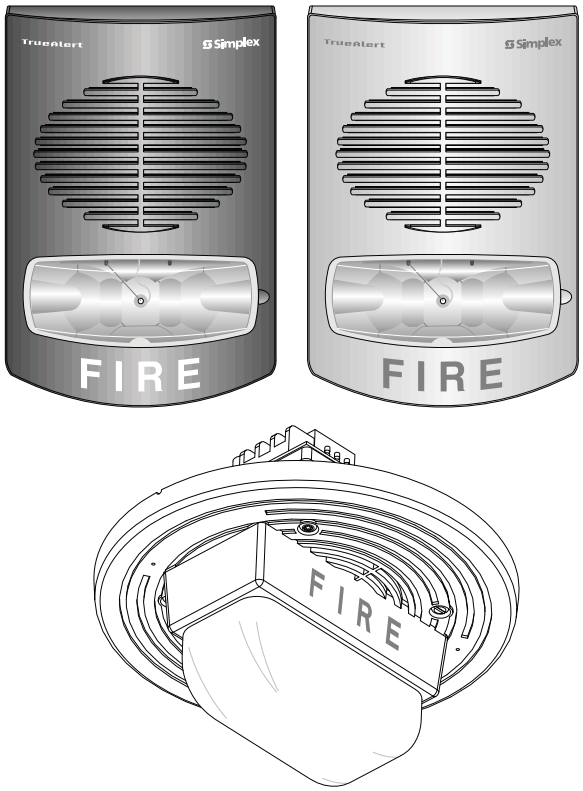
Visible notification appliance (strobe):

- 24 VDC xenon strobe; intensity is selectable as 15, 30, 75, or 110 candela with visible selection jumper secured behind strobe housing
- Strobes are activated from NACs selected to provide Simplex® strobe synchronization signals or from separate strobe Synchronization Modules that are available for Class B or Class A operation
- Regulated circuit design ensures consistent flash output and provides controlled inrush current
- UL listed to Standard 1971 and ULC-S526*

Options for wall mounted S/Vs:

- Red or white adapters to cover surface mounted electrical boxes
- Red adapter for mounting to Simplex 2975-9145 boxes
- Red wire guard

* See page 2 for additional listing details and wire guard listings. This product has been approved by the California State Fire Marshal (CSFM) pursuant to Section 13144.1 of the California Health and Safety Code. See CSFM Listing 7320-0026:247 for allowable values and/or conditions concerning material presented in this document. Accepted for use – City of New York Department of Buildings – MEA35-93E. Additional listings may be applicable; contact your local Simplex product supplier for the latest status. Listings and approvals under Simplex Time Recorder Co. are the property of Tyco Fire Protection Products.



Wall and Ceiling Mount S/Vs

Description

Multi-Candela TrueAlert S/Vs with speaker and synchronized strobe provide convenient installation to standard electrical boxes with extensions. The enclosure designs are both impact and vandal resistant and provide a convenient strobe intensity selection. Since each model can be selected for strobe intensity output, on-site model inventory is minimized and changes encountered during construction can be easily accommodated.

Wall mount S/V housings are a one-piece assembly (including lens) that mounts to a 4" square electrical box with extension (see details on page 4). The cover can be quickly removed (a tool is required) and covers are available separately for color conversion.

Ceiling mount S/Vs also install using 4" electrical boxes with an extension (see details on page 4).

Strobe Intensity Selection

During installation, a selection plug at the back of the housing determines the desired strobe intensity. An attached flag with black letters on a highly visible yellow background allows the selected intensity to be seen at the side of the strobe lens.

Synchronized Strobes

Multiple Strobes. When multiple strobes and their reflections can be seen from one location, synchronized flashes reduce the probability of photo-sensitive reactions as well as the annoyance and possible distraction of random flashing. The multi-candela strobes of these S/Vs are activated by NACs that provide the Simplex synchronization format. For additional information, refer to data sheet S4905-0003.

Strobe Application Selection

Proper selection of visible notification is dependent on occupancy, location, local codes, and proper applications of: the *National Fire Alarm and Signaling Code* (NFPA 72), ANSI A117.1; the appropriate model building code: BOCA, ICBO, or SBCCI; and the application guidelines of the Americans with Disabilities Act (ADA).

Product Selection

Wall Mount Multi-Candela S/Vs

Model	Housing Color	"FIRE" Lettering	Listings	Description	Housing Dimensions with Lens
4906-9151	Red	White	UL & ULC	Multi-tapped Speaker with Multi-Candela Synchronized Strobe; strobe intensity selectable as: 15, 30, 75, or 110 candela	7 ¼" H x 5" W x 2 ⅝" D (184 mm x 127 mm x 67 mm)
4906-9153	White	Red			

Ceiling Mount Multi-Candela S/V

Model	Housing Color	"FIRE" Lettering	Listings	Description	Dimensions
4906-9154	White	Red	UL	Multi-tapped Speaker with Multi-Candela Synchronized Strobe; strobe intensity selectable as: 15, 30, 75, or 110 candela	Housing = 7 ½" (191 mm) diameter, ½" (13 mm) deep Strobe lens protrusion = 2 ⅝" (67 mm) above speaker housing Depth into box = 2 ¾" (70 mm)
4906-9157	White	Red	ULC		

Wall Mount S/V Adapters

Model	Description		Dimensions
4905-9946	Surface mount red adapter skirt	Required when mounting to surface mounted electrical box, 4" square, 1 ½" deep with 1 ½" deep extension	7 ¾" H x 5 ⅜" W x 3 3/16" D (197 mm x 137 mm x 81 mm) depth with S/V = 5 ⅞" (149 mm)
4905-9947	Surface mount white adapter skirt		
4905-9903	Adapter Plate, red, required to mount S/V on 2975-9145		8 5/16" H x 5 ¾" W x 0.060" Thick (211 mm x 146 mm x 1.5 mm)
2975-9145	Mounting box, red, for surface or flush mount, requires adapter plate 4905-9903 (this box may be available for retrofit applications)		7 ⅞" H x 5 ⅛" W x 2 ¾" D (200 mm x 130 mm x 70 mm)

Wall Mount S/V Replacement Covers

Model	Description	Dimensions
4905-9996	Red S/V cover with white "FIRE" lettering	7 ¼" H x 5" W x 1 ⅜" D (184 mm x 127 mm x 35 mm)
4905-9997	White S/V cover with red "FIRE" lettering	

Synchronized Flash Control Modules

Model	Description		Dimensions
4905-9914*	Synchronized Flash Module, Class B operation	Epoxy encapsulated with in/out 18 AWG (0.82 mm^2) wire leads, rated for 2 A NAC, requires 5 mA for power	1 ⅜" W x 2 7/16" L x 13/16" H (35 mm x 62 mm x 20 mm)
4905-9922*	Synchronized Flash Module, Class A operation		

Wall Mount S/V Wire Guard

Model	Description	Dimensions
4905-9998	Wire guard with mounting plate, red, compatible with surface and semi-flush boxes (UL listed by Space Age Electronics Inc.)	8 ⅜" H x 6 5/16" W x 3 ¼" D (213 mm x 154 mm x 79 mm)

Ceiling Mount Tile Bridge

Model	Description	Dimensions
2905-9946	Tile Bridge	See diagram on page 4

* Refer to data sheet S4905-0003 for additional flash control module information

S/V Specifications

Common Specifications	Environmental	32° to 122° F (0° to 50° C); 10% to 93%, non-condensing at 100° F (38° C)
	Connections	Terminal blocks for 18 AWG to 12 AWG (0.82 mm^2 to 3.31 mm^2); two wires per terminal for in/out wiring

Speaker Specifications

Input Voltage		25 or 70.7 VRMS, see Note 1 below
Power Taps		¼, ½, 1, and 2 W
Frequency Response	Fire Alarm	400 to 4000 Hz
	General Signaling	125 to 12 kHz

Speaker Output Ratings @ 10 ft (3 m) (see Note 1 below)		Wattage Tap	**¼ W**	**½ W**	**1 W**	**2 W**
	UL Listed Models, Reverberant Chamber Test, per UL 1480		76 dBA	79 dBA	82 dBA	85 dBA
	Wall Mount Models **4906-9151** and **4906-9153**, Anechoic Chamber Test, per ULC-S541		77 dBA	80 dBA	83 dBA	86 dBA*
	Ceiling Mount Model **4906-9157**, per ULC-S541	25 VRMS Input	81.6 dBA	84.3 dBA	87.1 dBA*	89.7 dBA*
		70.7 VRMS Input	80.9 dBA	84.1 dBA	87.3 dBA*	90.2 dBA*

* **NOTE:** Select taps as indicated to satisfy the ULC fire alarm applications requirement of 85 dBA minimum

	Attenuation	**Angle**	**Attenuation**	**Angle**
Polar Dispersion Reference (per ULC-S541 Anechoic Chamber Testing)	-3 dB	+/- 30° off-axis	-6 dB	+/- 55° off-axis

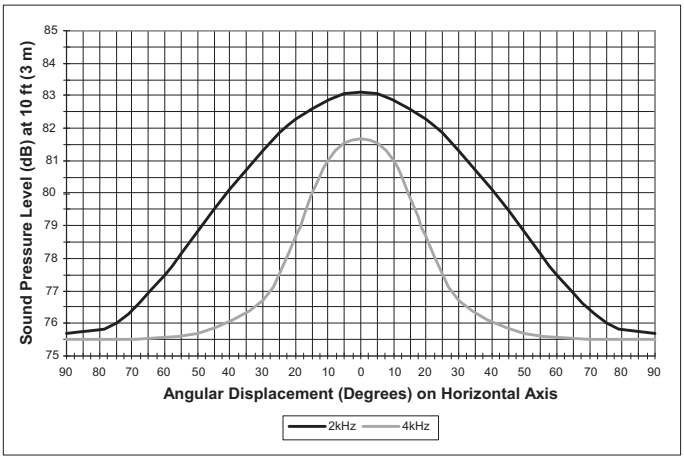
Strobe Specifications

Rated Voltage Range			Regulated 24 VDC; 16 VDC to 33 VDC, see Note 2 below			
Flash Rate and Synchronized NAC Loading			1 Hz; with up to 35 synchronized strobes maximum per NAC			
Wall Mount	Housing Dimensions (with lens)		7 ¼" H x 5" W x 2 ⅝" D (184 mm x 127 mm x 67 mm)			
	Maximum RMS Current Rating per Strobe Setting		**15 cd**	**30 cd**	**75 cd**	**110 cd**
			60 mA	**94 mA**	**186 mA**	**252 mA**
	Reference RMS Currents at other voltages	18 VDC	53 mA	84 mA	165 mA	224 mA
		24 VDC	40 mA	63 mA	124 mA	168 mA
Ceiling Mount	Housing Dimensions		Speaker housing = 7 ½" (191 mm) diameter, ½" deep (13 mm); lens protrusion above speaker housing = 2 ⅝" (67 mm); depth into box = 2 ¾" (70 mm)			
	Maximum RMS Current Rating per Strobe Setting		**15 cd**	**30 cd**	**75 cd**	**110 cd**
			75 mA	**125 mA**	**233 mA**	**316 mA**
	Reference RMS Currents at other voltages	18 VDC	67 mA	111 mA	207 mA	281 mA
		24 VDC	50 mA	83 mA	155 mA	211 mA

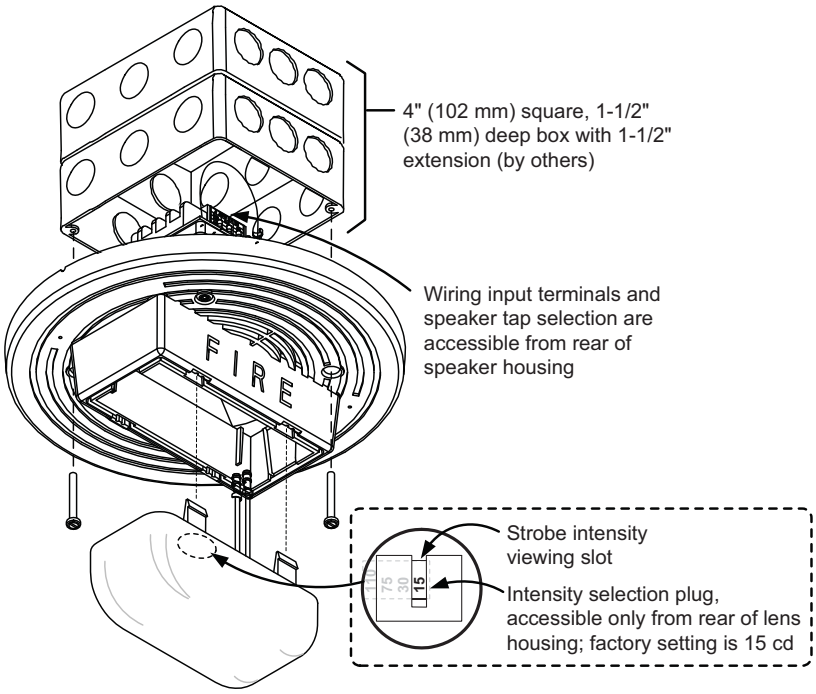
NOTES:

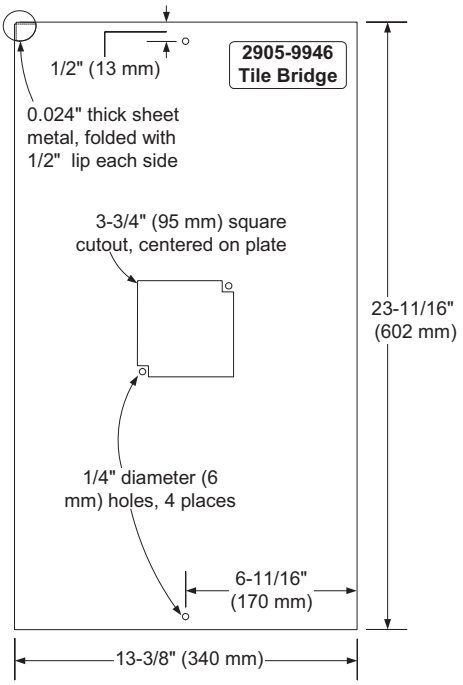
1. Speakers are for connection to conventional fire alarm audio circuits. Anechoic speaker output ratings are typically more representative of actual installed sound output.
2. The maximum RMS strobe current listed is the device nameplate rating. Strobe designs are constant wattage and the maximum RMS current rating occurs at the lowest allowable operating voltage. (RMS is root mean square and refers to the effective value of a varying current waveform.)

Speaker Directional Characteristics Reference

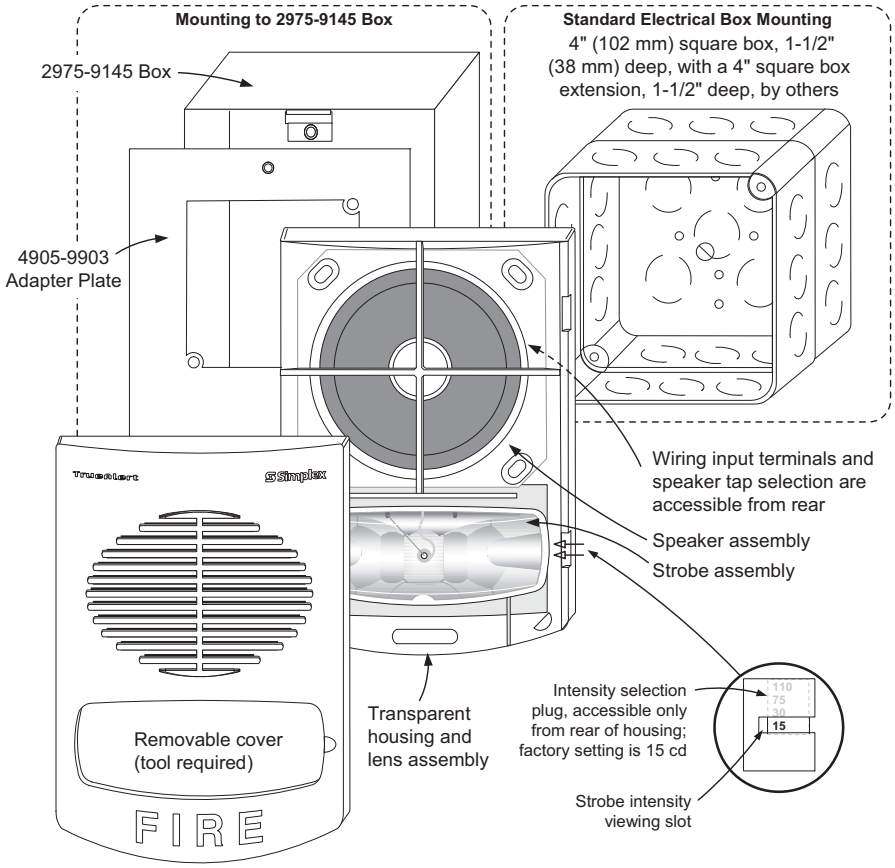


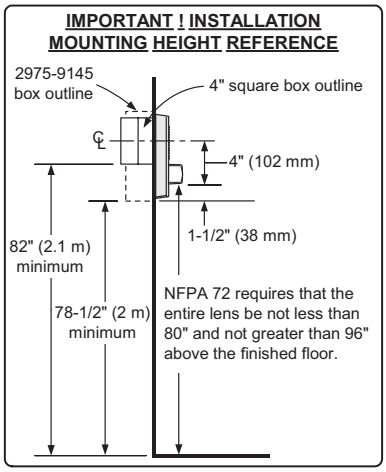
Ceiling Mount S/V Installation Reference and Tile Bridge Dimensions

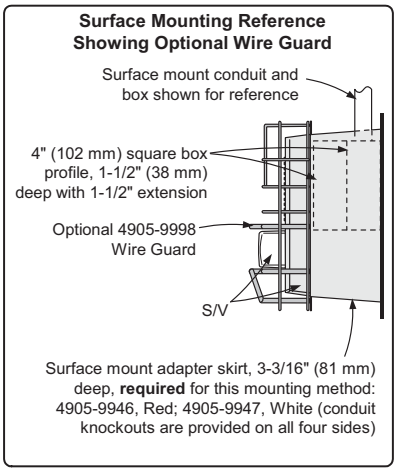




Wall Mount Installation Reference







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Simplex® TrueAlert Multi-Candela Notification Appliances

*UL, ULC, CSFM Listed; FM Approved; MEA (NYC) Acceptance**

Visible Notification Appliances with Synchronized Flash; Non-Addressable, Smart*Sync* Operation Compatible

Features

Visible only (V/O) 24 VDC notification appliances with high output xenon strobe, available for wall or ceiling mount:

- Intensity is selectable as 15, 30, 75, or 110 candela with visible selection jumper secured behind strobe housing
- Operation is compatible with ADA requirements (refer to important installation information on page 3)
- Polarized input allows connection to compatible reverse polarity, supervised notification appliance circuit (NAC)
- Regulated circuit design ensures consistent flash output and provides controlled inrush current
- Rugged, high impact, flame retardant thermoplastic housings are available in red or white with clear lens
- Listed to UL 1971 and ULC S526

Strobes provide synchronized flash for use with:

- Simplex® fire alarm control panels with NACs selected to provide strobe synchronization or SmartSync two-wire control
- 4009 IDNet NAC Extenders
- Separate strobe Synchronization Modules that are available for Class B or Class A operation
- Separate SmartSync Control Modules (SCMs) that provide Class B or Class A output from conventional NAC inputs

Strobe housings provides flexible, easy, and convenient semi-flush or surface wall mounting:

- Rear of housing does not extend into box
- Wall mount strobes easily mount to single gang, double gang, or 4-inch square outlet box
- Ceiling mount strobes mount to single gang boxes

Wall mount strobe features:

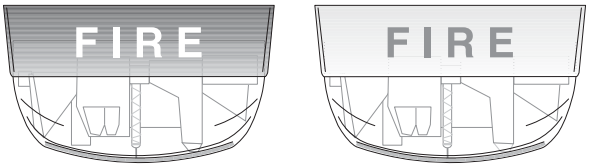
- Wiring terminals are accessible from the front of the housing providing easy access for installation, inspection, and testing
- Covers are available separately to convert housing color

Optional adapters and wire guards:

- Wall mount strobe adapters are available to cover surface mounted electrical boxes and to adapt to Simplex 2975-9145 boxes
- UL listed red wire guards are available for wall or ceiling mount strobes*

* Refer to page 2 for guard listing. This product has been approved by the California State Fire Marshal (CSFM) pursuant to Section 13144.1 of the California Health and Safety Code. See CSFM Listing 7125-0026:316 for allowable values and/or conditions concerning material presented in this document. Refer to page 2 for listing status of wire guards. Additional listings may be applicable; contact your local Simplex product supplier for the latest status. Listings and approvals under Simplex Time Recorder Co. are the property of Tyco Fire Protection Products.

Wall Mount Strobes



Ceiling Mount Strobes

Description

Multi-Candela TrueAlert synchronized strobes provide convenient installation to standard electrical boxes. The enclosure designs are both impact and vandal resistant and provide a convenient strobe intensity selection. Since each model can be selected for intensity output, on-site model inventory is minimized and changes encountered during construction can be easily accommodated.

Wall mount strobe housings are a one-piece assembly (including lens) that mounts to a single or double gang, or 4" square standard electrical box. The cover can be quickly removed (a tool is required) and covers are available separately for color conversion.

Ceiling mount strobes install using standard single gang electrical boxes. Color choice is determined by model number.

Strobe Intensity Selection

During installation, a selection plug at the back of the housing determines the desired strobe intensity. An attached flag with black letters on a highly visible yellow background allows the selected intensity to be seen at the side of the strobe lens.

Strobe Application Reference

Proper selection of visible notification is dependent on occupancy, location, local codes, and proper applications of: the *National Fire Alarm Code* (NFPA 72), ANSI A117.1; the appropriate model building code: BOCA, ICBO, or SBCCI; and the application guidelines of the Americans with Disabilities Act (ADA).

Synchronized Strobes

Multiple Strobes. When multiple strobes and their reflections can be seen from one location, synchronized flashes reduce the probability of photo-sensitive reactions as well as the annoyance and possible distraction of random flashing. These multi-candela strobes are synchronized over a two-wire circuit when connected to compatible NACs, to compatible Synchronized Flash Modules, or to SmartSync Control Modules.

SmartSync Two-Wire Control

Some applications desire the audible notification appliances to be capable of being silenced before the alarm condition is reset (on-until-silenced) while the visible notification appliances are kept activated until the alarm condition is reset (on-until-reset). SmartSync operation mode provides this function using a single circuit (two-wire operation).

SmartSync Control Sources

SmartSync two-wire control is available from:

- 4006, 4007ES Hybrid, 4008, 4010, 4010ES, 4100ES, and 4100U Fire Alarm Control Panels (refer to individual product data sheets for more information)
- 4009 IDNet NAC Extenders (refer to data sheet S4009-0002)
- SmartSync Control Module (SCM) Model 4905-9938 (refer to data sheet S4905-0003)

Additional SmartSync compatible notification appliances include separate horns and combination horn/strobe notification appliances.

Product Selection

Multi-Candela Visible Notification Appliances (Strobes)

Model	Mounting	Housing Color	"FIRE" Lettering	Description
4906-9101	Wall	Red	White	Multi-candela strobe with intensity selectable as: 15, 30, 75, or 110 candela; synchronized flash rate; SmartSync two-wire control compatible
4906-9103		White	Red	
4906-9102	Ceiling	Red	White	
4906-9104		White	Red	

Wall Mount Strobe Adapters

Model	Description		Dimensions
4905-9937	Red	Surface Mount Adapter Skirt; use to cover 1-1/2" (38 mm) deep surface mounted boxes	5-3/8" H x 5-1/4" W x 1-5/8" D (136 mm x 133 mm x 41 mm) Total depth with strobe = 4-3/8" (111 mm)
4905-9940	White		
4905-9931	Red Adapter Plate for mounting to Simplex 2975-9145 box (typically for retrofit, may be mounted vertical or horizontal)		8-5/16" x 5-3/4" x 0.060" Thick (211 mm x 146 mm x 1.5 mm)
2975-9145	Red Mounting Box, requires Adapter Plate 4905-9931		7-7/8" x 5-1/8" x 2-3/4" D (200 mm x 130 mm x 70 mm)

Ceiling Mount Strobe Adapter

Model	Description	Dimensions
4905-9910	Surface Mount Adapter Plate; zinc plated; **required for mounting to handy box; not needed when using 4905-9926 guard**	4-7/8" x 3-1/8" x 0.060" D (124 mm x 79 mm x 1.5)

Synchronization Modules (refer to data sheet S4905-0003 for additional information)

Model	Description		Dimensions
4905-9914	Class B	Synchronized Flash Module; epoxy encapsulated with in/out 18 AWG (0.82 mm^2) wire leads, rated for 2 A NAC, requires 5 mA for power	1-3/8" x 2-7/16" x 13/16" (35 mm x 62 mm x 20 mm)
4905-9922	Class A		
4905-9938	SmartSync Control Module with Class B or Class A output; mounts in 4" (102 mm) square box		4" x 4-1/8" x 1-1/4" D (102 mm x 105 mm x 32 mm)

Replacement Covers and Guards

Model	Description		Dimensions
4905-9992	Red cover with white "FIRE" lettering	For Wall mount strobes	5-1/8" H x 5" W x 1-1/2" D (130 mm x 127 mm x 38 mm)
4905-9993	White cover with red "FIRE" lettering		
4905-9961*	Wall mount	Red wire guard with mounting plate, compatible with semi-flush or surface mounted boxes	6-1/16" H x 6-1/16" W x 3-1/8" D (154 mm x 154 mm x 79 mm)
4905-9926*	Ceiling mount		6-1/8" x 4-3/8" x 2-7/8" deep (156 mm x 111 mm x 73 mm)

* UL listed by Space Age Electronics Inc.

Strobe Specifications

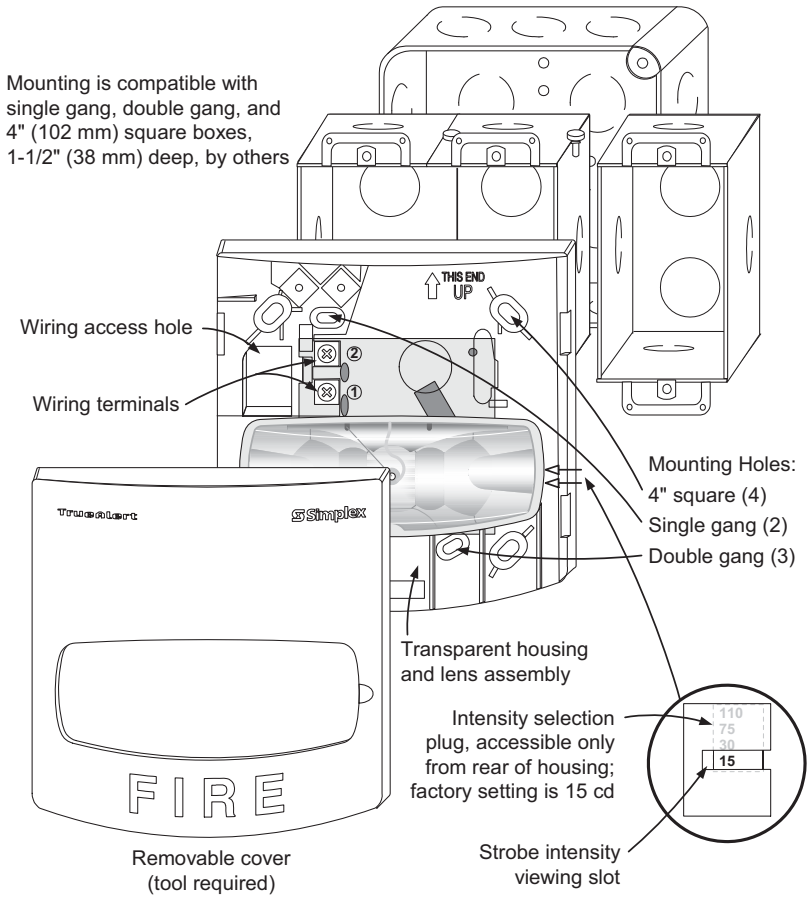
Wall Mount or Ceiling Mount, Common Specifications

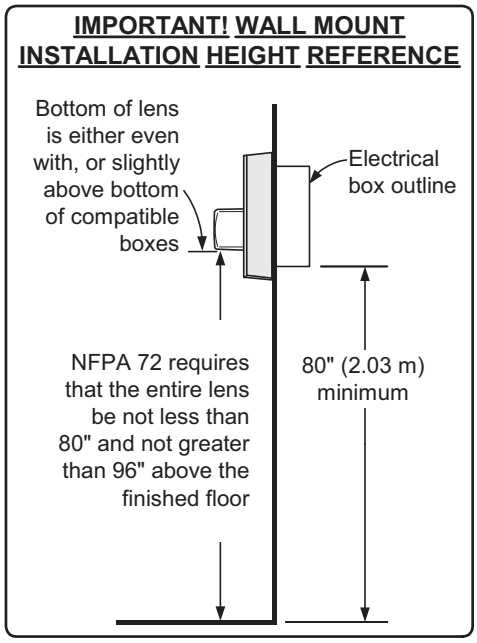
Rated Voltage Range			Regulated 24 VDC; see Note 1 below			
Flash Rate			1 Hz			
Synchronized NAC Loading			Up to 35 synchronized strobes maximum per NAC			
Temperature Range			32° to 122° F (0° to 50° C)			
Humidity Range			10% to 93%, non-condensing at 100° F (38° C)			
Connections			Terminal blocks for 18 AWG to 12 AWG (0.82 mm^2 to 3.31 mm^2); two wires per terminal for in/out wiring			
Wall Mount	Housing Dimensions (with lens)		5-1/8" H x 5" W x 2-3/4" D (130 mm x 127 mm x 70 mm)			
	Maximum RMS Current Rating per Strobe Setting (see Note 2 below)		**15 cd**	**30 cd**	**75 cd**	**110 cd**
			60 mA	**94 mA**	**186 mA**	**252 mA**
	Reference RMS Currents at other voltages	18 VDC	53 mA	84 mA	165 mA	224 mA
		24 VDC	40 mA	63 mA	124 mA	168 mA
Ceiling Mount	Housing Dimensions (with lens)		4-3/4" L x 2-5/16" W x 2-5/8" D (121 mm x 75 mm x 67 mm)			
	Maximum RMS Current Rating per Strobe Setting (see Note 2 below)		**15 cd**	**30 cd**	**75 cd**	**110 cd**
			75 mA	**125 mA**	**233 mA**	**316 mA**
	Reference RMS Currents at other voltages	18 VDC	67 mA	111 mA	207 mA	281 mA
		24 VDC	50 mA	83 mA	155 mA	211 mA

NOTES:

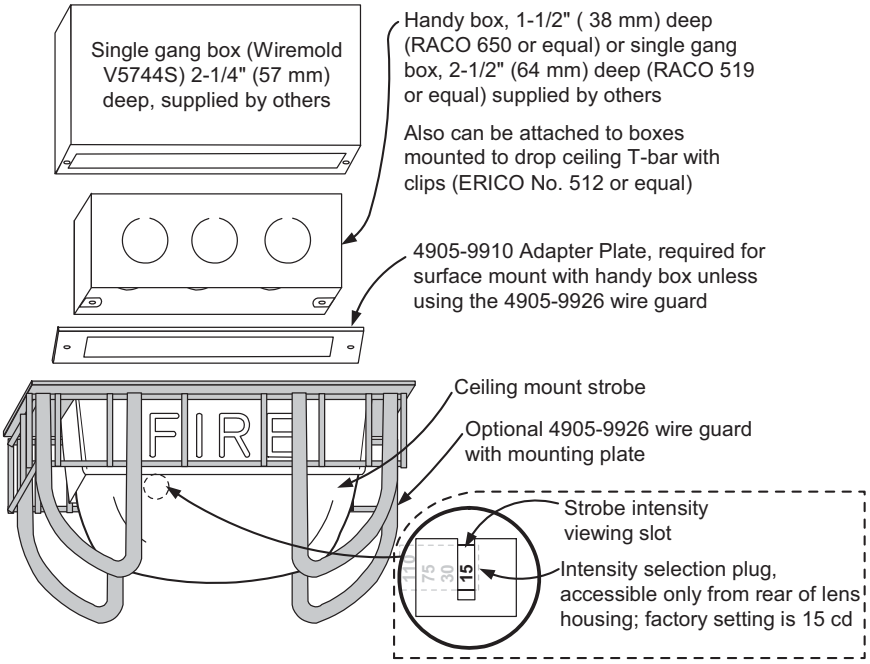
1. "Regulated 24 VDC" refers to the voltage range of 16 to 33 VDC per UL Standard 1971, *Signaling Devices for the Hearing Impaired*. This voltage range is the absolute operating range. Operation outside of this range may cause permanent damage to the strobe. Please note that 16 VDC is the lowest operating voltage that is allowed at the last appliance on the NAC under worst case conditions.
2. The maximum RMS current listed is the device nameplate rating. Strobe designs are constant wattage and the maximum RMS current rating occurs at the lowest allowable operating voltage. (RMS is root mean square and refers to the effective value of a varying current waveform.)

Installation Reference, Surface or Semi-Flush Wall Mounting

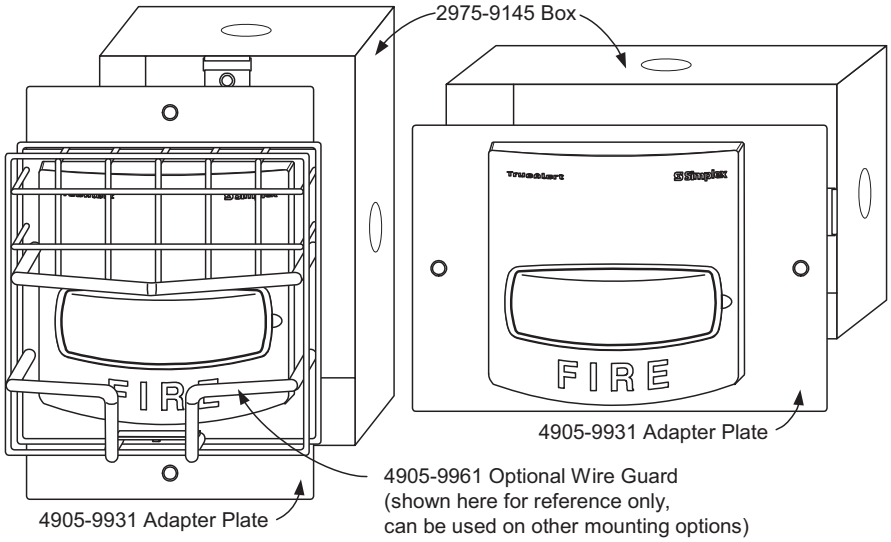




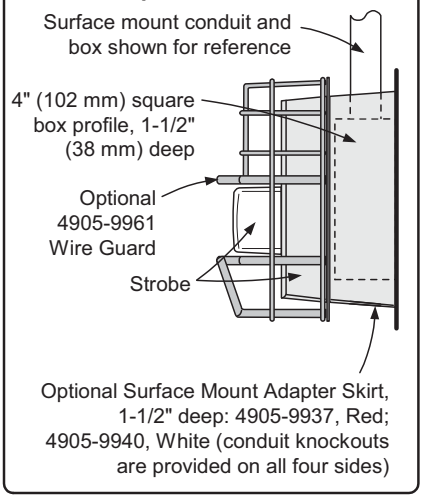
Ceiling Mount Strobe Installation Reference



Wall Mount Installation Reference; Adapter Plate, Guard, and Adapter Skirt



Surface Mounting Reference with Optional Adapter Skirt and Optional Wire Guard



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Features

TrueAlarm analog sensing provides:

- Digital transmission of analog sensor values via IDNet or MAPNET II two-wire communications

For use with the following Simplex® products:

- 4007ES, 4010, 4010ES, 4100ES, and 4100U Series control panels; and 4008 Series control panels with reduced feature set (refer to data sheet S4008-0001 for details)
- 4020, 4100, and 4120 Series control panels, Universal Transponders, and 2120 TrueAlarm CDTs equipped for MAPNET II operation

Fire alarm control panel provides:

- Peak value logging allowing accurate analysis of each sensor for individual sensitivity selection
- Sensitivity monitoring satisfying NFPA 72 sensitivity testing requirements; automatic individual sensor calibration check verifies sensor integrity
- Automatic environmental compensation, multi-stage alarm operation, and display of sensitivity directly in percent per foot
- Ability to display and print detailed sensor information in plain English language

Photoelectric smoke sensors provide:

- Seven levels of sensitivity from 0.2% to 3.7% (refer to additional information on page 3)

Heat sensors provide:

- Fixed temperature sensing
- Rate-of-rise temperature sensing
- Utility temperature sensing
- Listed to UL 521 and ULC-S530

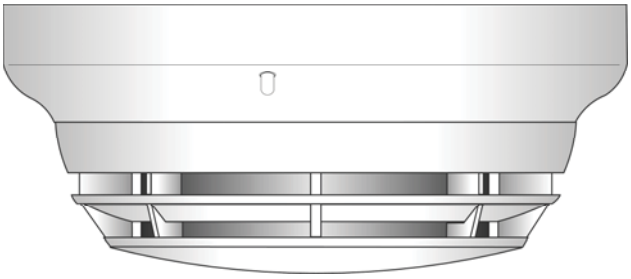
General features:

- Operation is for ceiling or wall mounting
- Listed to UL 268 and ULC-S529
- Louvered smoke sensor design enhances smoke capture by directing flow to chamber; entrance areas are minimally visible when ceiling mounted
- Designed for EMI compatibility
- Magnetic test feature is provided
- Different bases are available to support a supervised or unsupervised output relay, and/or a remote LED alarm indicator

Additional base reference:

- For isolator bases, refer to data sheet S4098-0025
- For sounder bases, refer to data sheet S4098-0028
- For photo/heat sensors, refer to data sheet S4098-0024 (single address) and S4098-0033 (dual address)

* These products have been approved by the California State Fire Marshal (CSFM) pursuant to Section 13144.1 of the California Health and Safety Code. See CSFM Listings 7272-0026:218, 7271-0026:231, 7270-0026:216, and 7300-0026:217 for allowable values and/or conditions concerning material presented in this document. Accepted for use – City of New York Department of Buildings – MEA35-93E. Additional listings may be applicable, contact your local Simplex product supplier for the latest status. Listings and approvals under Simplex Time Recorder Co. are the property of Tyco Fire Protection Products.



4098-9714 TrueAlarm Photoelectric Sensor Mounted in Base

Description

Digital Communication of Analog Sensing. TrueAlarm analog sensors provide an analog measurement digitally communicated to the host control panel using Simplex addressable communications. At the control panel, the data is analyzed and an average value is determined and stored. An alarm or other abnormal condition is determined by comparing the sensor's present value against its average value and time.

Intelligent Data Evaluation. Monitoring each sensor's average value provides a continuously shifting reference point. This software filtering process compensates for environmental factors (dust, dirt, etc.) and component aging, providing an accurate reference for evaluating new activity. With this filtering, there is a significant reduction in the probability of false or nuisance alarms caused by shifts in sensitivity, either up or down.

Control Panel Selection. Peak activity per sensor is stored to assist in evaluating specific locations. The alarm set point for each TrueAlarm sensor is determined at the host control panel, selectable as more or less sensitive as the individual application requires.

Timed/Multi-Stage Selection. Sensor alarm set points can be programmed for timed automatic sensitivity selection (such as more sensitive at night, less sensitive during day). Control panel programming can also provide multi-stage operation per sensor. For example, a 0.2% level may cause a warning to prompt investigation while a 2.5% level may initiate an alarm.

Sensor Alarm and Trouble LED Indication. Each sensor base's LED pulses to indicate communications with the panel. If the control panel determines a sensor is in alarm, or is dirty or has some other type of trouble, the details are annunciated at the control panel and that sensor base's LED will be turned on steadily. During a system alarm, the control panel will control the LEDs such that an LED indicating a trouble will return to pulsing to help identify the alarmed sensors.

True*Alarm* Sensor Bases and Accessories

Sensor Base Features

Base mounted address selection:

- Address remains with its programmed location
- Accessible from front (DIP switch under sensor)

General features:

- Automatic identification provides default sensitivity when substituting sensor types
- Integral red LED for power-on (pulsing), or alarm or trouble (steady on)
- Locking anti-tamper design mounts on standard outlet box
- Magnetically operated functional test

Sensor Bases

4098-9792, Standard Sensor Base

4098-9789, Sensor Base with wired connections for:

- 2098-9808 Remote LED alarm indicator **or** 4098-9822 relay (relay is unsupervised and requires separate 24 VDC)

Supervised Relay Bases (not compatible with 2120 CDT)**:**

- **4098-9791, 4-Wire Sensor Base,** use with remote or locally mounted 2098-9737 relay, requires separate 24 VDC
- **4098-9780, 2-Wire Sensor Base**, use with remote or locally mounted 4098-9860 relay, no separate power required
- Supervised relay operation is programmable and can be manually operated from control panel
- Includes wired connections for remote LED alarm indicator **or** 4098-9822 relay (relay is unsupervised and requires separate 24 VDC)

Sensor Base Options

2098-9737, Remote or local mount supervised relay:

- DPDT contacts for resistive/suppressed loads, power limited rating of 3 A @ 28 VDC; non-power limited rating of 3 A @ 120 VAC (requires external 24 VDC coil power)

4098-9860, Remote or local mount supervised relay:

- SPDT dry contacts, power limited rating of 2 A @ 30 VDC, resistive; non-power limited rating of 0.5 A @ 125 VAC, resistive

4098-9822, LED Annunciation Relay:

- Activates when base LED is on steady, indicating local alarm or trouble
- DPDT contacts for resistive/suppressed loads, power limited rating of 2 A @ 28 VDC; non-power limited rating of 1/2 A @ 120 VAC, (requires external 24 VDC coil power)

4098-9832, Adapter plate:

- Required for surface or semi-flush mounting to 4” square electrical box and for surface mounting to 4” octagonal box
- Can be used for cosmetic retrofitting to existing 6-3/8” diameter base product

2098-9808, Remote red LED Alarm Indicator:

- Mounts on single gang box (shown in illustration to right)

Description

TrueAlarm sensor bases contain integral addressable electronics that constantly monitor the status of the detachable photoelectric or heat sensors. Each sensor’s output is digitized and transmitted to the system fire alarm control panel every four seconds.

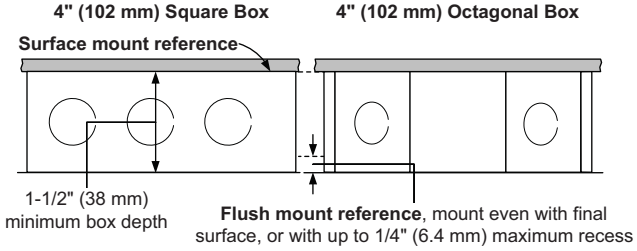
Since TrueAlarm sensors use the same base, different sensor types can be easily interchanged to meet specific location requirements. This feature also allows intentional sensor substitution during building construction. When conditions are temporarily dusty, instead of covering the smoke sensors (causing them to be disabled), heat sensors may be installed without reprogramming the control panel. Although the control panel will indicate an incorrect sensor type, the heat sensor will operate at a default sensitivity providing heat detection for building protection at that location.

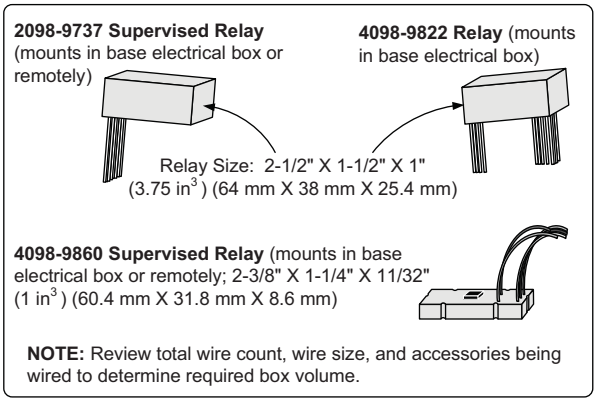
Mounting Reference

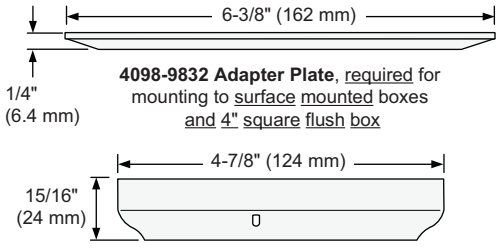
Electrical Box Requirements: (boxes are by others)

Without relay in the box: 4" octagonal or 4" square, 1-1/2" deep; single gang, 2" deep

With relay in the box : 4" octagonal or 4" square, 1-1/2" deep, with 1-1/2" extension ring







TrueAlarm Bases
4098-9780, 4098-9789, 4098-9791, & 4098-9792

True*Alarm* Sensors

Features

Sealed against rear air flow entry

Interchangeable mounting

EMI/RFI shielded electronics

Heat sensors:

- Selectable rate compensated, fixed temperature sensing with or without rate-of-rise operation
- Rated spacing distance between sensors:

Fixed Temp. Setting	UL & ULC Spacing	FM Spacing, Either Fixed Temperature Setting
135° F (57.2° C)	60 ft x 60 ft (18.3 m)	20 ft x 20 ft (6.1 m) for fixed temperature only; **RTI = Quick**
155° F (68° C)	40 ft x 40 ft (12.2 m)	50 ft x 50 ft (15.2 m) for fixed temperature with either rate-of-rise selection; **RTI = Ultra Fast**

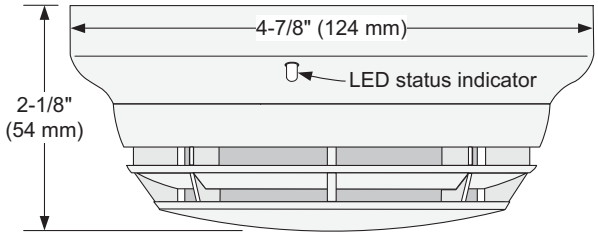
Smoke Sensors:

- Photoelectric technology sensing
- 360° smoke entry for optimum response
- Built-in insect screens

4098-9714 Photoelectric Sensor

TrueAlarm photoelectric sensors use a stable, pulsed infrared LED light source and a silicon photodiode receiver to provide consistent and accurate low power smoke sensing. Seven levels of sensitivity are available for each individual sensor, ranging from 0.2% to 3.7% per foot of smoke obscuration. Sensitivities of 0.2%, 0.5%, and 1% are for special applications in clean areas. Standard sensitivities are 1.5%, 2.0%, 2.5%, 3.0%, and 3.7%. Application type and sensitivity are selected and then monitored at the fire alarm control panel.*

The sensor head design provides 360° smoke entry for optimum response to smoke from any direction. Due to its photoelectric operation, air velocity is not normally a factor, except for impact on area smoke flow.



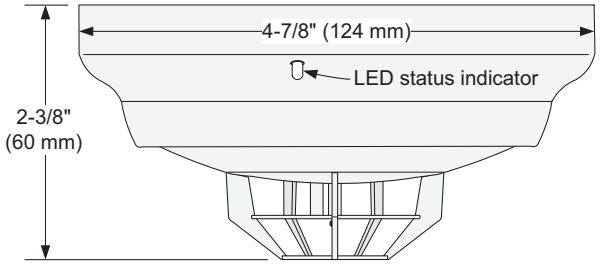
4098-9714 Photoelectric Sensor with Base

4098-9733 Heat Sensor

TrueAlarm heat sensors are self-restoring and provide rate compensated, fixed temperature sensing, selectable with or without rate-of-rise temperature sensing. Due to its small thermal mass, the sensor accurately and quickly measures the local temperature for analysis at the fire alarm control panel.

Rate-of-rise temperature detection is selectable at the control panel for either 15° F (8.3° C) or 20° F (11.1° C) per minute. Fixed temperature sensing is independent of rate-of-rise sensing and programmable to operate at 135° F (57.2° C) or 155° F (68° C). In a slow developing fire, the temperature may not increase rapidly enough to operate the rate-of-rise feature. However, an alarm will be initiated when the temperature reaches its rated fixed temperature setting.

TrueAlarm heat sensors can be programmed as a utility device to monitor for temperature extremes in the range from 32° F to 155° F (0° C to 68° C). This feature can provide freeze warnings or alert to HVAC system problems. *Refer to specific panels for availability.*



4098-9733 Heat Sensor with Base

<u>WARNING</u>: In most fires, hazardous levels of smoke and toxic gas can build up before a heat detection device would initiate an alarm. In cases where Life Safety is a factor, the use of smoke detection is highly recommended.

Application Reference

Sensor locations should be determined only after careful consideration of the physical layout and contents of the area to be protected. Refer to NFPA 72, the *National Fire Alarm and Signaling Code*. On smooth ceilings, smoke sensor spacing of 30 ft (9.1 m) may be used as a guide.*

* For detailed application information including sensitivity selection, refer to Installation Instructions 574-709.

TrueAlarm Analog Sensing Product Selection Chart

TrueAlarm Sensor Bases (for use with Sensors 4098-9714 and 4098-9733)

(Refer to Application Manual 574-709 and Installation Instructions 574-707 for additional information)

Model	Description	Compatibility	Mounting Requirements
4098-9792	Standard Sensor Base	No options	4" octagonal or 4" square box, 1-1/2" min. depth; or single gang box, 2" min. depth
4098-9789	Sensor Base with connections for Remote LED Alarm Indicator **or** Unsupervised Relay	2098-9808 Remote Alarm Indicator **or** 4098-9822 Unsupervised Relay	4" octagonal or 4" square box **Note:** Box depth requirements depend on total wire count and wire size, refer to accessories list below for reference. ** **NOTE:** 4098-9791 and 4098-9780 are NOT compatible with the 2120 CDT
4098-9791**	4-Wire Sensor Supervised Relay Base with connections for LED Indicator **or** Unsupervised Relay	2098-9737 Supervised Remote Relay 2098-9808 Remote Alarm Indicator **or** 4098-9822 Unsupervised Relay	
4098-9780**	2-Wire Sensor Supervised Relay Base with connections for LED Indicator **or** Unsupervised Relay	4098-9860 Supervised Remote Relay 2098-9808 Remote Alarm Indicator **or** 4098-9822 Unsupervised Relay	

TrueAlarm Sensors

Model	Description	Compatibility	Mounting Requirements
4098-9714	Photoelectric Smoke Sensor	Bases 4098-9792, 4098-9789, 4098-9791, and 4098-9780	Refer to base requirements
4098-9733	Heat Sensor		

TrueAlarm Sensor/Base Accessories

Model	Description	Compatibility	Mounting Requirements
2098-9737	Supervised Relay, mounts remote or in base electrical box	For use with 4098-9791 base	**Remote Mounting** requires 4" octagonal or 4" square box, 1-1/2" minimum depth **Base Mounting** requires 4" octagonal box, 2-1/8" deep with 1-1/2" extension ring
4098-9860	Supervised Relay, mounts remote or in base electrical box	For use with 4098-9780 base	
2098-9808	Remote Red LED Alarm Indicator on single gang stainless steel plate	Bases 4098-9789, 4098-9791, and 4098-9780	Single gang box, 1-1/2" minimum depth
4098-9822	Unsupervised Relay, tracks base LED status; Note: Mounts only in base electrical box	Bases 4098-9789, 4098-9791, and 4098-9780	4" octagonal box, 2-1/8" deep with 1-1/2" extension ring
4098-9832	Adapter Plate	Bases 4098-9792, 4098-9789, 4098-9791, and 4098-9780	**Required** for surface or semi-flush mounted 4" square box and for surface mounted 4" octagonal box

Specifications

General Operating Specifications		
Communications and Sensor Supervisory Power		IDNet or MAPNET II communications, auto-selected, 1 address per base
Communications Connections		Screw terminals for in/out wiring, 18 to 14 AWG (0.82 mm^2 to 2.08 mm^2)
Remote LED Alarm Indicator Current		1 mA typical, no impact to alarm current
Remote LED Alarm Indicator and Relay Connections		Color coded wire leads, 18 AWG (0.82 mm^2)
UL Listed Operating Temperature Range		32° to 100° F (0° to 38° C)
Operating Temperature Range	with 4098-9733 Heat Sensor	32° to 122° F (0° to 50° C)
	with 4098-9714 Smoke Sensor	15° to 122° F (-9° to 50° C)
Storage Temperature Range		0° F to 140° F (-18° C to 60° C)
Humidity Range		10 to 95% RH
4098-9714 Smoke Sensor Air Velocity Rating		0-4000 ft/min (0-1220 m/min)
Housing Color		Frost White
4098-9791 Base With Supervised Remote Relay 2098-9737 (see page 2 for contact ratings)		
Externally Supplied Relay Coil Voltage		18-32 VDC (nominal 24 VDC)
Supervisory Current		270 μA, from 24 VDC supply
Alarm Current with 2098-9737 Relay		28 mA, from 24 VDC supply
4098-9780 Base With Supervised Remote Relay 4098-9860 (see page 2 for contact ratings)		
Power		Supplied from communications
4098-9822 Unsupervised Relay, Requirements for Bases 4098-9789. 4098-9791, and 4098-9780 (see page 2 for contact ratings)		
Externally Supplied Relay Coil Voltage		18-32 VDC (nominal 24 VDC)
Supervisory Current		Supplied from communications
Alarm Current		13 mA from separate 24 VDC supply

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Features

Individually addressable manual fire alarm stations with:

- Power and data supplied via IDNet or MAPNET II addressable communications using a single wire pair
- Operation that complies with ADA requirements
- Visible LED indicator that flashes during communications and is on steady when the station has been activated
- The NO GRIP Single Action Station and Retrofit Kit are available with a more easily operated pull lever for applications where anticipated users may find the standard station lever difficult to activate
- Pull lever that protrudes when alarmed
- Break-rod supplied (use is optional)
- Models are available with single or double action (breakglass or push) operation
- UL listed to Standard 38

Compatible with the following Simplex® control panels:

- Model Series 4007ES, 4008, 4010, 4010ES, 4100ES, 4100U, 4020, 4100, and 4120 fire alarm control panels equipped with either IDNet or MAPNET II communications
- Model Series 2120 Communicating Device Transponders (CDTs) equipped with MAPNET II communications

Compact construction:

- Electronics module enclosure minimizes dust infiltration
- Allows mounting in standard electrical boxes
- Screw terminals for wiring connections

Tamper resistant reset key lock (keyed same as Simplex fire alarm cabinets)

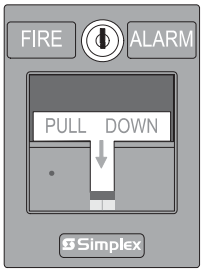
Multiple mounting options:

- Surface or semi-flush with standard boxes or matching Simplex boxes
- Flush mount adapter kit
- Adapters are available for retrofitting to commonly available existing boxes

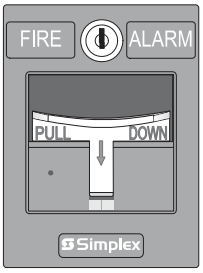
Description

The Simplex addressable manual station combines the familiar Simplex manual station housing with a compact communication module that is easily installed to satisfy demanding applications. Its integral individual addressable module (IAM) constantly monitors status and communicates changes to the connected control panel via IDNet or MAPNET II communications wiring.

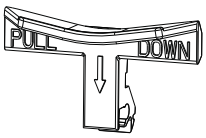
* Refer to page 2 for specific model listings. This product has been approved by the California State Fire Marshal (CSFM) pursuant to Section 13144.1 of the California Health and Safety Code. See CSFM Listing 7150-0026:224 for allowable values and/or conditions concerning material presented in this document. Additional listings may be applicable; contact your local Simplex product supplier for the latest status. Listings and approvals under Simplex Time Recorder Co. are the property of Tyco Fire Protection Products.



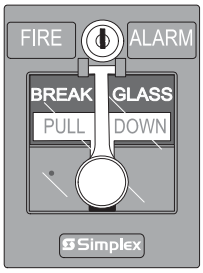
4099-9004
Single action



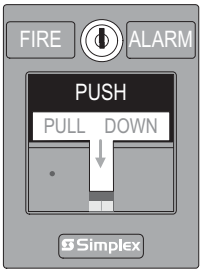
4099-9021
NO GRIP
Single action



4099-9805
NO GRIP
Retrofit kit



4099-9005
Breakglass



4099-9006
Push

With 2099-9828
Institutional
Cover kit

Operation

Activation of the 4099-9004 single action manual station requires a firm downward pull to activate the alarm switch. Completing the action breaks an internal plastic break-rod (visible below the pull lever, use is optional). The use of a break-rod can be a deterrent to vandalism without interfering with the minimum pull requirements needed for easy activation. The pull lever latches into the alarm position and remains extended out of the housing to provide a visible indication.

Single Action NO GRIP Station 4099-9021. For applications such as California Building Code, Title 24, which requires "Controls and operating mechanisms shall be operable with one hand and shall not require tight grasping, pinching or twisting of the wrist" the model 4099-9021 station provides a more easily operated pull lever compared to standard stations. Retrofit of existing stations is available using the 4099-9805 Retrofit kit.

Double Action Stations (Breakglass) require the operator to strike the front mounted hammer to break the glass and expose the recessed pull lever. The pull lever then operates as a single action station.

Double Action Stations (Push Type) require that a spring loaded interference plate (marked PUSH) be pushed back to access the pull lever of the single action station.

Station reset requires the use of a key to reset the manual station lever and deactivate the alarm switch. (If the break-rod is used, it must be replaced.)

Station testing is performed by physical activation of the pull lever. Electrical testing can be also performed by unlocking the station housing to activate the alarm switch.

Addressable Manual Station Product Selection

Addressable Manual Stations, Red Housing with White Letters and White Pull Lever

Model	Description	Housing	Pull Lever	Listings
4099-9004	Single Action, English	FIRE ALARM	PULL DOWN	UL, ULC, FM, CSFM
4099-9004CB	Single Action, Bilingual English and French	FEU FIRE	TIREZ PULL	ULC
4099-9004CF	Single Action, French	ALARME FEU	ABAISSEZ	
4099-9004PO	Single Action, Portuguese	FOGO ALARME	PUXE	UL, FM
4099-9004SP	Single Action, Spanish	ALARMA FUEGO	JALE	
4099-9005	Double Action, Breakglass operation, English	FIRE ALARM	PULL DOWN	UL, ULC, FM, CSFM
4099-9005PO	Double Action, Breakglass operation, Portuguese	FOGO ALARME	PUXE	UL, FM
4099-9005SP	Double Action, Breakglass operation, Spanish	ALARMA FUEGO	JALE	
4099-9006	Double Action, Push operation, English	FIRE ALARM	PUSH PULL DOWN	UL, ULC, FM, CSFM
4099-9006PO	Double Action, Push operation, Portuguese	FOGO ALARME	EMPURRE PUXE	UL, FM
4099-9006SP	Double Action, Push operation, Spanish	ALARMA FUEGO	EMPUJE JALE	
4099-9021	Single Action NO GRIP operation, English	FIRE ALARM	PULL DOWN	UL, ULC, FM, CSFM

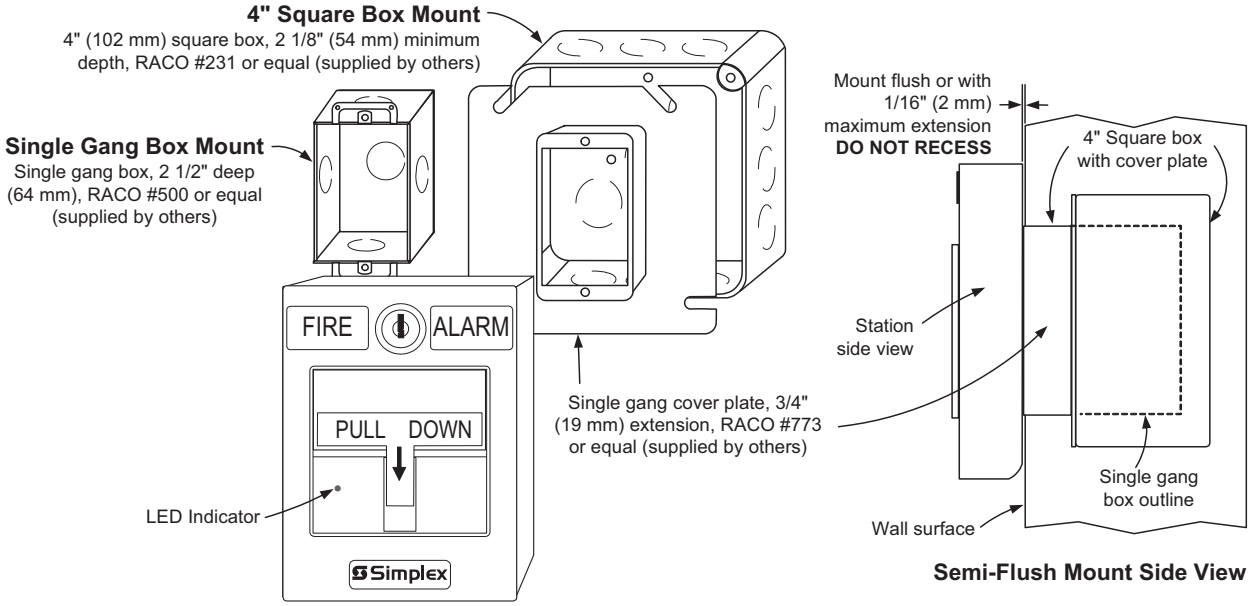
Accessories (refer to pages 3 and 4 for details)

Model	Description	Model	Description
2975-9022	Cast aluminum surface mount box, red	2099-9803	Replacement breakglass
2975-9178	Surface mount steel box, red	2099-9804	Replacement break-rod
2099-9813	Semi-flush trim plate for double gang switch box, red	2099-9828	Institutional cover kit for field installation on 4099-9004; Note: Covers LED indicator
2099-9819	Flush mount adapter kit, black	2099-9814	Surface trim plate for Wiremold box V5744-2, red
2099-9820	Flush mount adapter kit, beige		
4099-9805	Retrofit Kit for field conversion of a single action station to a NO GRIP station; refer to Installation Instructions 579-1007 for details		

Specifications (refer to Installation Instructions 579-1135 for additional information)

Power and Communications	IDNet or MAPNET II communications, 1 address per station
Address Means	DIP switch, 8 position
Wire Connections	Screw terminal for in/out wiring, for 18 to 14 AWG wire (0.82 mm^2 to 2.08 mm^2)
UL Listed Temperature Range	32° to 120° F (0° to 49° C) intended for indoor operation
Humidity Range	Up to 93% RH at 100° F (38° F)
Housing Color	Red with white raised lettering
Material	Housing and pull lever are Lexan polycarbonate or equal
Pull Lever Color	White with red raised lettering
Housing Dimensions	5" H x 3 ¾" W x 1" D (127 mm x 95 mm x 25 mm)

Addressable Manual Station Semi-Flush Mounting

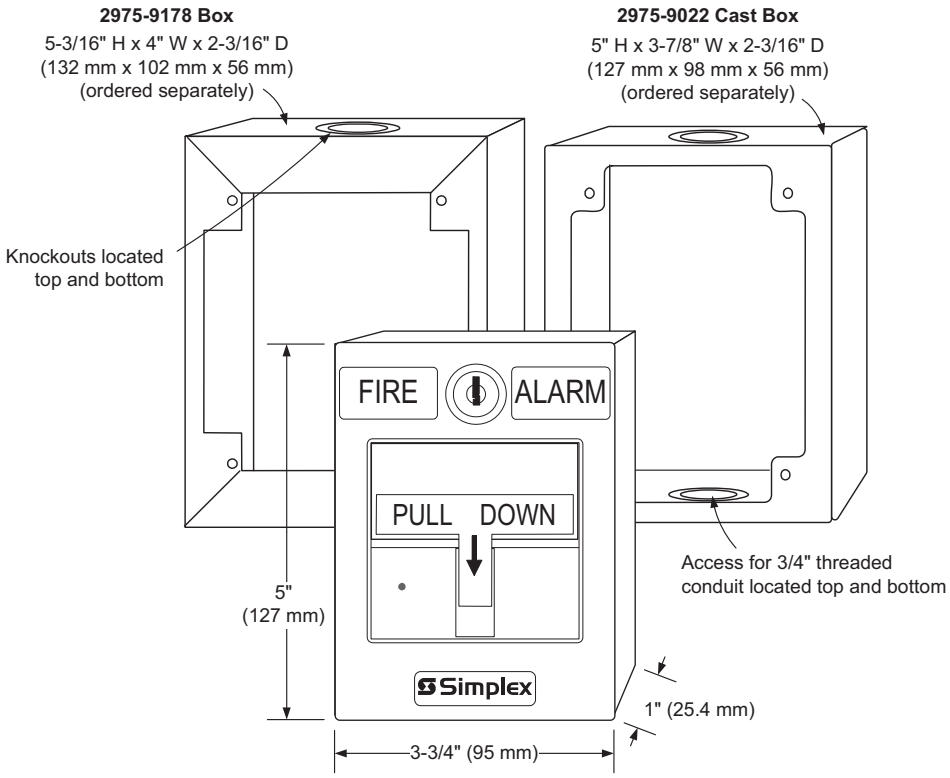


Semi-Flush Mount Side View

Addressable Manual Stations Surface Mounting

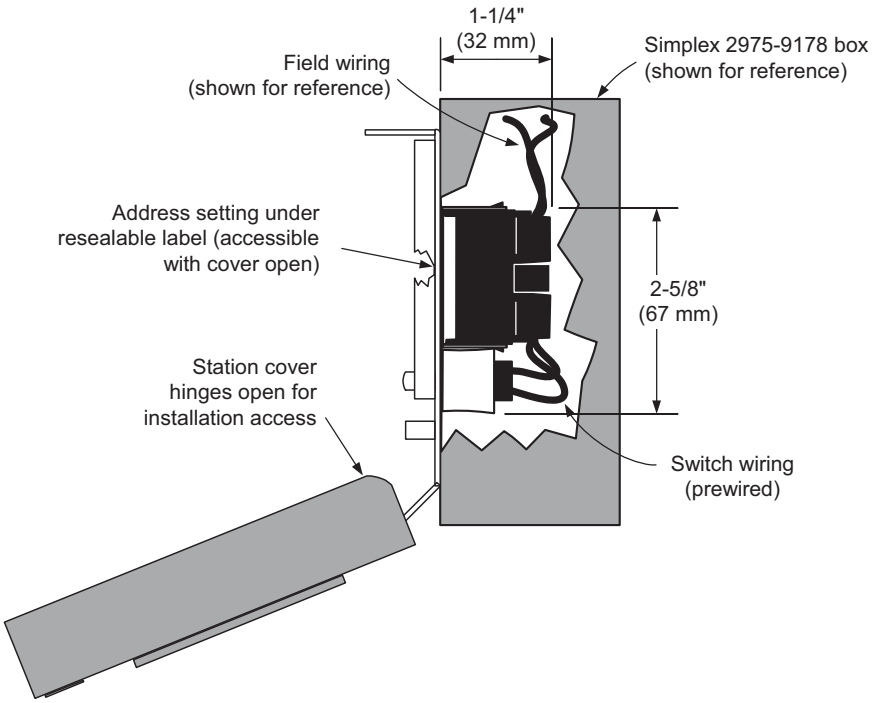
Preferred Mounting. For surface mounting of these addressable manual stations, the preferred electrical boxes are shown in the illustration to the right.

Additional Mounting Reference. Refer to page 4 for Wiremold box mounting compatibility.



4099 Series Addressable Manual Station

Surface Mount Side View with Internal Detail



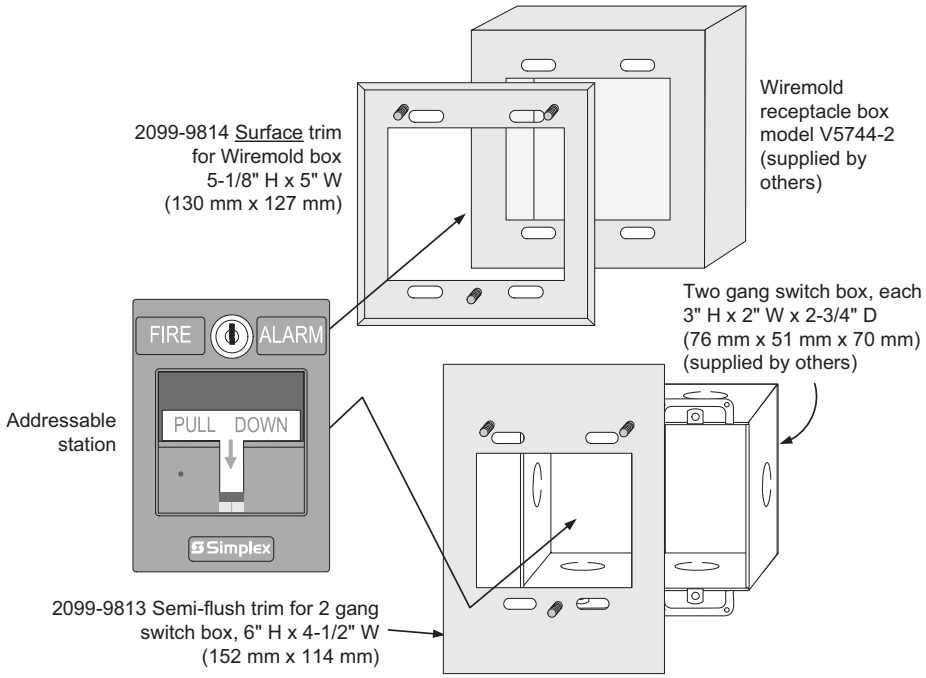
Application Reference

Refer to NFPA 72, the *National Fire Alarm and Signaling Code*, and all applicable local codes for complete requirements for manual stations. The following summarizes the basic requirements.

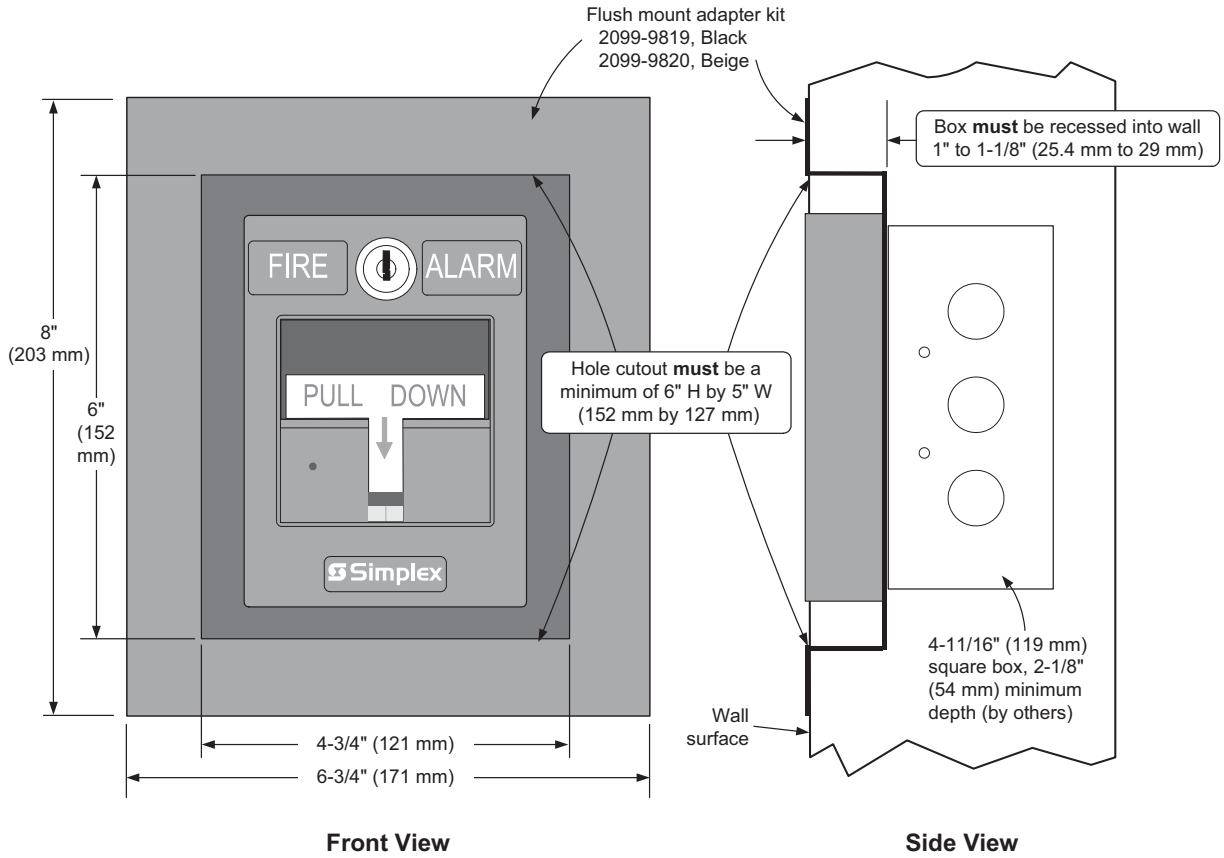
1. Stations shall be located in the normal path of exit and distributed in the protected area such that they are unobstructed and readily accessible.
2. Mounting shall be with the operable part not less than 42 in (1.07 m) and not more than 48 in (1.22 m) above floor level.
3. At least one station shall be provided on each floor. Additional stations shall be provided to obtain a travel distance not more than 200 ft (61 m) to the nearest station from any point in the building.
4. When manual station coverage appears limited in any way, additional stations should be installed.

Addressable Manual Station, Additional Mounting Information

For retrofit and new installations, additional compatible mounting boxes and the required adapter plates are shown in the illustration to the right.



Addressable Manual Station, Flush Mounting Information



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Features

IDNet or MAPNET II addressable communications supply both data and power over a single wire pair to provide:**

- Supervised Class B monitoring of normally open, dry contacts
- Total wiring distance from IAM to supervision resistor(s) of up to 500 ft (152 m)
- Monitored connection is compatible with Simplex® 2081-9044 Overvoltage Protectors for outdoor wiring or electrically noisy applications
- For use in indoor locations up to 158° F (70° C) such as attic spaces or similar applications

For use with following Simplex control panels:

- Model Series 4007ES, 4008, 4010, 4010ES, and 4100ES fire alarm control panels for IDNet communications
- Model Series 4100/4100U/4100ES, 4120, 4020, and 2120 Communicating Device Transponders (CDTs) equipped with MAPNET II communications

Model 4090-9001:

- Enclosed design minimizes dust infiltration
- Mounts in standard single gang electrical box
- Screw terminals for wiring connections
- Visible LED flashes to indicate communications
- Optional covers are available to allow LED to be viewed after installation (requires mounting bracket, ordered separately)

Model 4090-9051:

- Encapsulated design for extended exposure to high humidity (LED is not present on this model)
- Color coded 18 AWG leads for wiring

IDNet communications provides current limited monitoring:

- Provides monitoring of tamper switch (supervisory) and waterflow switch (alarm) on same circuit using one point
- Available with IDNet communications only

Multiple operation modes are available and are selectable at the control panel:

- Contact closure status can be tracked
- Momentary contact closure conditions can be selected at the panel to be latched or tracked (not available with the 2120 CDT)

UL listed to Standard 864

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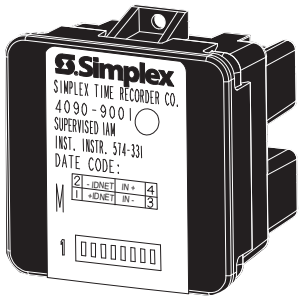
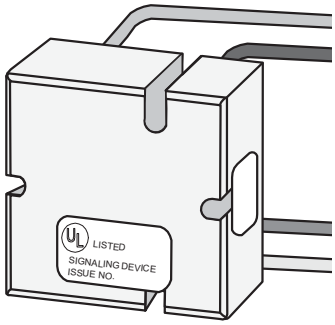


4090-9001 Supervised IAM
(shown approximately 3/4 size)



4090-9051 Supervised IAM
(shown approximately 3/4 size)

Description

Individual addressable modules (IAMs) receive both power and communications from a two-wire MAPNET II or IDNet circuit. They provide location specific addressability to a single initiating device (such as single station smoke detector alarm contacts or heat detector contacts) or multiple devices at the same location by monitoring normally open dry contacts and the wiring to an end-of-line resistor.

Model 4090-9001 is packaged in a thermoplastic housing and provides screw terminal connections and a status indicating LED.

Model 4090-9051 is an encapsulated package with wire leads. It does not provide a status indicating LED.

Operation

Contact Closure. Closure of the monitored contact(s) initiates an alarm or other response as programmed at the fire alarm control panel. An open in the monitored circuit wiring will cause a trouble to be reported.

Panel Selections. Selections can be made at the control panel to maintain the alarm condition if the initiating device contacts are momentary, such as from a rate-of-rise heat detector, or to track the device contact status (not available with the 2120 CDT).

Current Limited Operation Applications

For use with IDNet communications only, these IAMs can provide quad-state sensing of normal, open circuit, short circuit, and current limited conditions. (Program type is "T-sense.") With the proper end-of-line and current limiting resistors, dual functions such as tamper switch and waterflow switch monitoring can be determined and communicated by a single addressable point.

IAM Product Selection

Model	Description
4090-9001	Supervised IAM, mounted in thermoplastic housing with screw terminals; see applicable options below
4090-9051	Supervised IAM, encapsulated with wire leads

Optional Trim Plates and Mounting Bracket for Model 4090-9001

Model	Description
4090-9806	For semi-flush mounted box — Trim plate with LED viewing window, requires 4090-9810 mounting bracket, includes mounting screws; galvanized steel
4090-9807	For surface mounted box
4090-9810	Mounting bracket, mounts IAM to electrical box and provides screw holes for trim plate, **required for optional trim plates**

End-of-Line Resistor Harnesses (ordered separately as required)

Model	Reference No.	Description
4081-9004	733-886	6.8 kΩ, 1/2 W; Standard end-of-line resistor harness for N.O. contact supervision
4081-9003	733-896	4.7 kΩ, 1/2 W — Use for current limited monitoring applications
4081-9005	733-984	1.8 kΩ, 1/2 W

Specifications

Electrical

Power and Communications		MAPNET II or IDNet, auto selected, 1 address per IAM
Input Requirements		Normally open, dry contacts
Wire Connections	4090-9001	Screw terminals for in/out wiring, 18 to 14 AWG wire (0.82 mm^2 to 2.08 mm^2)
	4090-9051	Color coded wire leads, 18 AWG (0.82 mm^2), 8" long (203 mm)
Reference Documents	Installation Instructions	574-331 for 4090-9001; 579-572 for 4090-9151
	Field Wiring Diagrams	842-073 for IDNet operation; 841-804 for MAPNET II operation

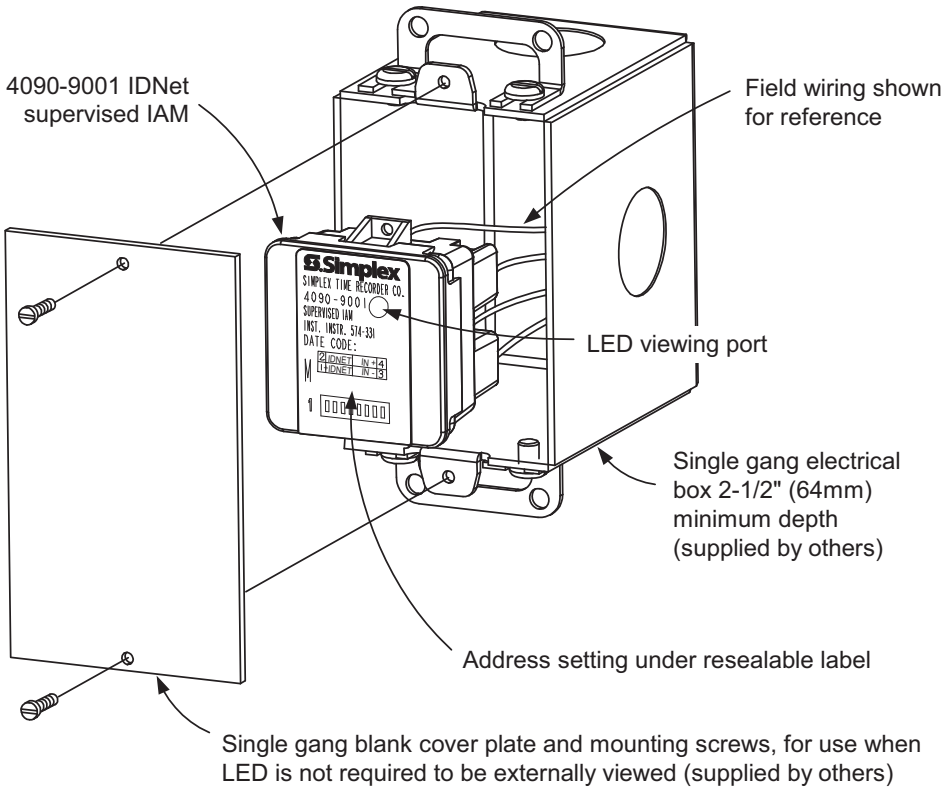
Wiring Distances

Distance from IAM to Contacts	500 ft (152 m) maximum without protectors
	400 ft (122 m) maximum with 2081-9044 Overvoltage Protectors
Wiring Distance Reference per channel, MAPNET II or IDNet Communications	2500 ft (762 m) maximum from fire alarm control panel
	10,000 ft (3048 m) maximum total wiring distance (including T-Taps)

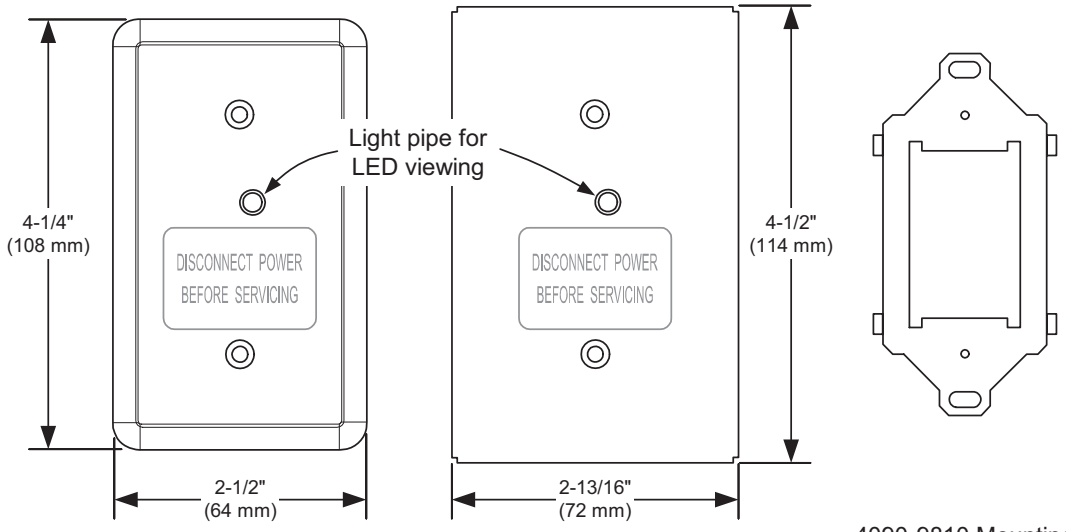
Mechanical

Dimensions	4090-9001	1-9/16" W x 1-3/4" H x 1-1/4" D (40 mm x 44 mm x 32 mm)
	4090-9051	1-9/16" W x 1-9/16" H x 9/16" D (40 mm x 40 mm x 14 mm)
Housing Material, 4090-9001		Black thermoplastic
Encapsulation Material, 4090-9051		Epoxy, beige
Temperature Range		32° to 158° F (0° to 70° C); intended for indoor operation
Humidity Range		Up to 93% RH at 100° F (38° C)

Mounting Information



Mounting Reference, Single Gang Blank Cover Plate



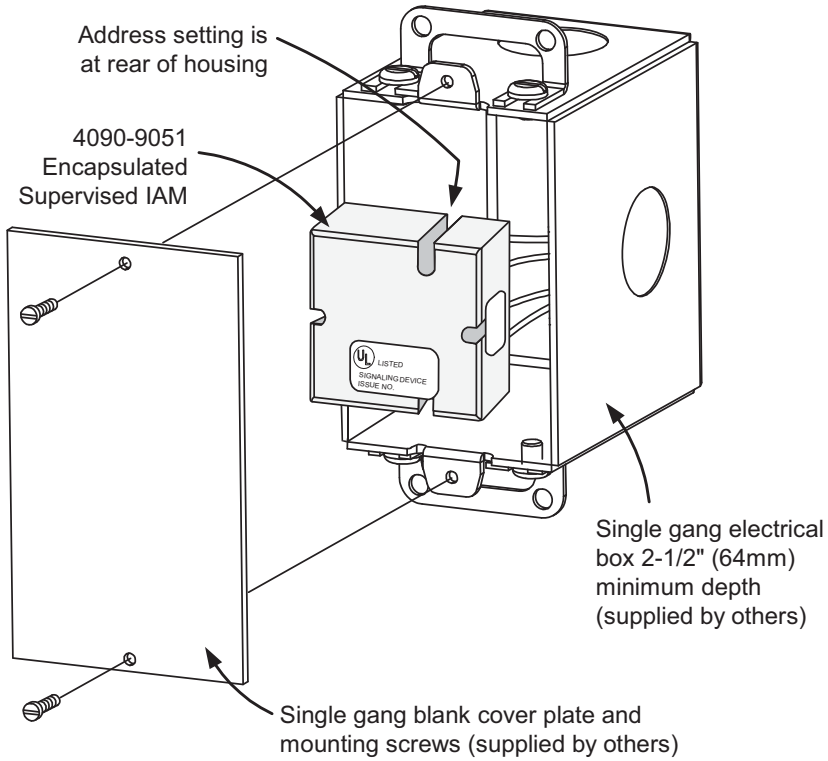
4090-9806, Trim plate for semi-flush mounted box

4090-9807, Trim plate for surface mounted box

4090-9810 Mounting bracket, ordered separately

NOTE: These mounting plates require mounting bracket 4090-9810.

Optional Trim Plates and Mounting Bracket for Visible LED



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Features

Individual Addressable Relay Module (Relay IAM):

- IDNet addressable control for use with Simplex® fire alarm control panel models 4007ES, 4008, 4010, 4010ES, 4100ES, and 4100U
- A single addressable point provides control and status tracking of a Form "C" contact
- Low power latching relay design allows IDNet communications to supply both data and module power
- Relay is set to OFF on initial power up and upon loss of IDNet communications

Compact, sealed construction:

- Enclosed design minimizes dust infiltration
- Mounts in standard 4" (102 mm) square electrical box, optional adapter bracket is available to mount in a 4 $^{11}/_{16}$" (119 mm) square electrical box
- Screw terminals for wiring connections
- Visible LED flashes to indicate communications
- Optional covers are available to allow LED to be viewed after installation

UL listed to Standard 864

Description

IDNet Relay IAMs allow fire alarm control panels to control a remotely located Form "C" contact using IDNet addressable communications for both data and module power. Typical applications would be for switching local power for control functions such as elevator capture, or control of HVAC components, pressurization fans, dampers, etc. Relay status is also communicated requiring only one device address.

Product Selection

Model	Description
4090-9002	Relay IAM

Optional Adapter and Trim Plates

Model	Description	
4090-9813	Adapter plate to fit 4 $^{11}/_{16}$" (119 mm) square electrical box	
4090-9801	For semi-flush mounted box	Trim Plate, galvanized steel, with LED viewing window; includes mounting screws
4090-9802	For surface mounted box	

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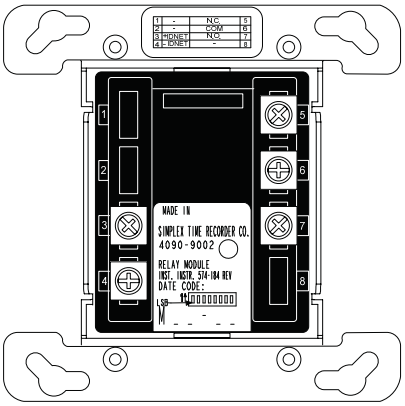
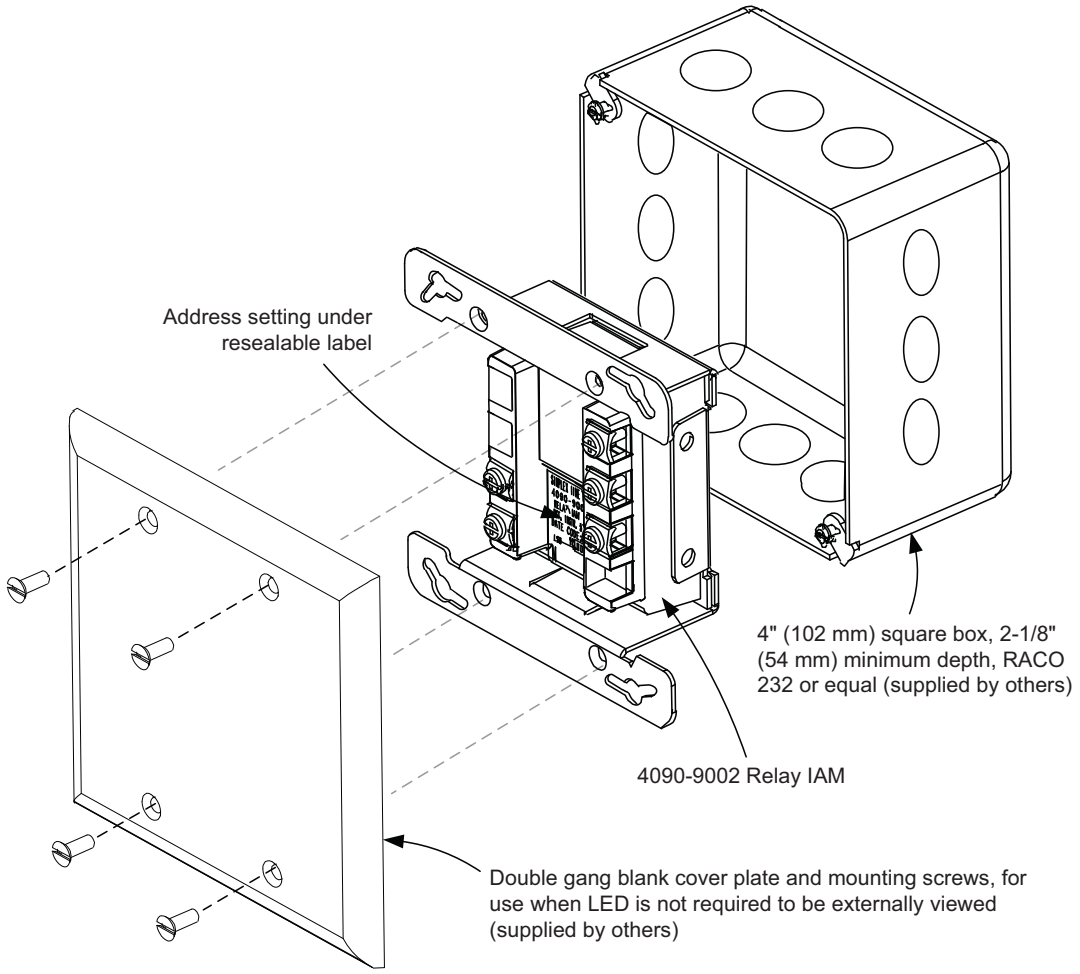


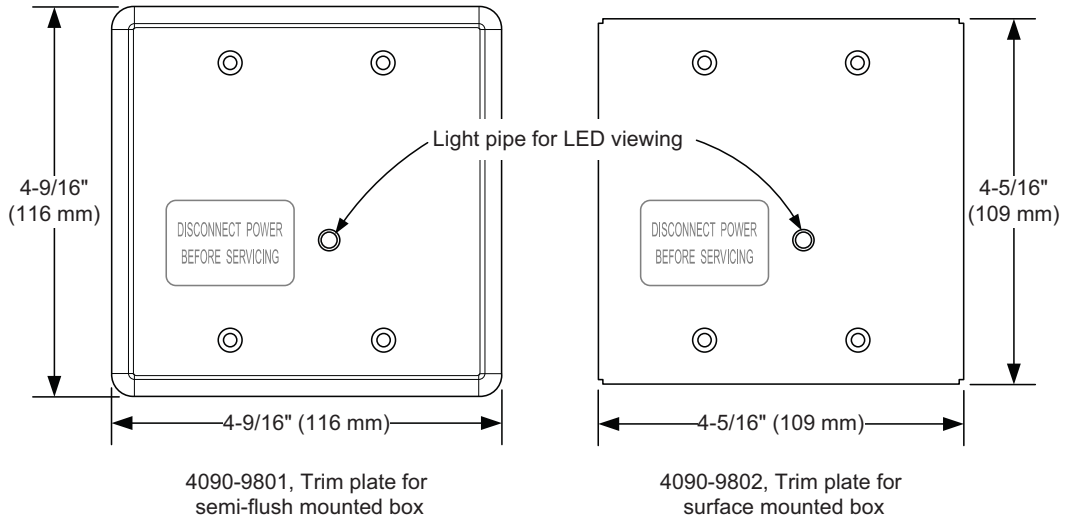
4090-9002 IDNet Relay IAM Package
(shown approximately 1/2 size)

Specifications

Communications	IDNet communications, 1 address per device	
Relay IAM Power	Supplied by IDNet communications	
Contact Ratings* (not rated for incandescent switching)		
Type	Form C, SPDT	
Power-Limited	2 A @ 24 VDC, resistive	from listed fire alarm supply
	1 A @ 24 VDC, inductive	
Nonpower-Limited	0.5 A @ 120 VAC, resistive	
* Provide circuit fusing and transient suppression as required per application. DC inductive loads can typically be diode suppressed; 120 VAC loads may require RC networks or varistors, depending on device type. Refer to the installation instructions for additional information.		
Wire Connections	Screw terminals for in/out wiring, 18 to 14 AWG wire (0.82 to 2.08 mm^2)	
IDNet Communications Wiring Reference	Up to 2500 ft (762 m) from control panel	
	Up to 10,000 ft (3048 m) total wiring distance (including T-Taps)	
	Compatible with Simplex 2081-9044 Overvoltage Protectors	
Dimensions	4 ⅛" H x 4 ⅛" W x 1 ⅜" D (105 mm x 105 mm x 35 mm)	
Housing Material	Black thermoplastic	
Mounting Plate	Sheet metal, galvanized	
Temperature Range	32° to 120° F (0° to 49° C), intended for indoor operation	
Humidity Range	Up to 93% RH at 100° F (38° C)	
Installation Instructions	574-184	



Mounting Reference, Double Gang Blank Cover Plate



4090-9801, Trim plate for semi-flush mounted box

4090-9802, Trim plate for surface mounted box

Optional Trim Plates for Visible LED

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Multi-Application Peripherals and Accessories

Fire Alarm Control Relays, Track Mounted and Encapsulated, 4098-9843 and 2088 Series

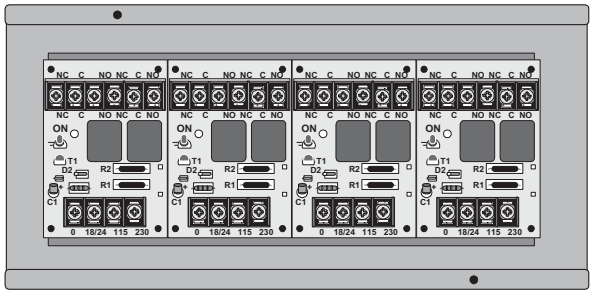
UL Listed*
(Air Products)

FEATURES

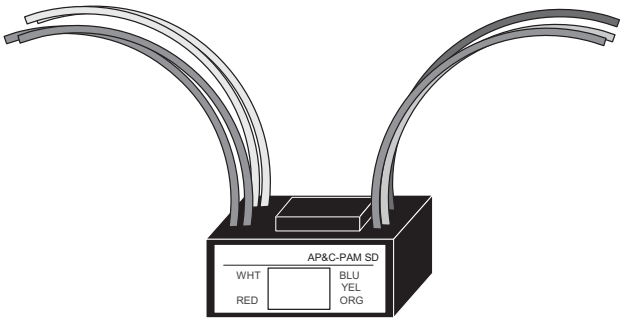
- **UL listed as Control Unit Accessory (UOXX)**
- **Track mount package availability:**
  - Single or four relay module, with or without enclosure, with SPDT or DPDT contacts
  - LED indicates relay coil status
  - Enclosures provide status LED viewing ports
  - Multiple coil voltage inputs, diode polarized
  - Modules are track mounted with “Snap-Apart” feature design
- **Single encapsulated SPDT relay package with color coded 18 AWG wire leads, available in two versions:**
  - **2088-9021 (PAM-1)** Provides diode polarized multiple input voltage ability and LED indication
  - **4098-9843 (PAM-SD)** Provides a diode polarized 24 VDC coil with in/out wiring

SPECIFICATIONS (refer to page 2 for dimensions)

Track Mount Relays		
Contact Ratings		10 A @ 115 VAC, resistive
Coil Voltage		18-35 VAC/VDC, 115, or 230 VAC
Coil Current		• SPDT models = 15 mA • DPDT models = 35 mA
Terminal Block Ratings		up to 14 AWG
Encapsulated Relays		
Connections		18 AWG color-coded wire leads
2088-9021		
Contact Ratings		10 A @ 115 VAC, resistive
Coil Ratings	**Voltage**	18-35 VAC/VDC, 115, or 230 VAC
	Current	15 mA @ 24 VAC/VDC, 115, or 230 VAC
4098-9843		
Coil Ratings		18-35 VDC input, 15 mA @ 24 VDC
Contact Ratings		• 10 A @ 115 VAC • 7 A @ 28 VDC • 250 μA @ 5 VDC
General Specifications (all models)		
Temperature Range		-58° F to 185° F (-50° C to 85° C)



2088-9020, MR204/C, Four DPDT Relay Package with Enclosure (shown with cover removed)



Encapsulated Relay Package
(typical of 2088-9021, PAM-1 and 4098-9843, PAM-SD)

DESCRIPTION

These multi-purpose control relays offer SPDT or DPDT, 10 Amp contacts in a variety of mechanical packages. Models are available for coil operation by one of four input voltages allowing a single relay to be energized from a voltage source of 18-35 VDC or VAC, 115 VAC, or 230 VAC (not available with 4098-9843). Voltage selection is made by wiring to the appropriate input terminals.

Each relay model (except model 4098-9843) contains a red LED which indicates that the relay coil is energized.

Mounting options are varied for application flexibility. Track mounted relays may be “snapped apart” from a standard four-module assembly and used independently if desired.

* Product listings are by Air Products & Controls, Ltd. per model numbers shown on page 2.

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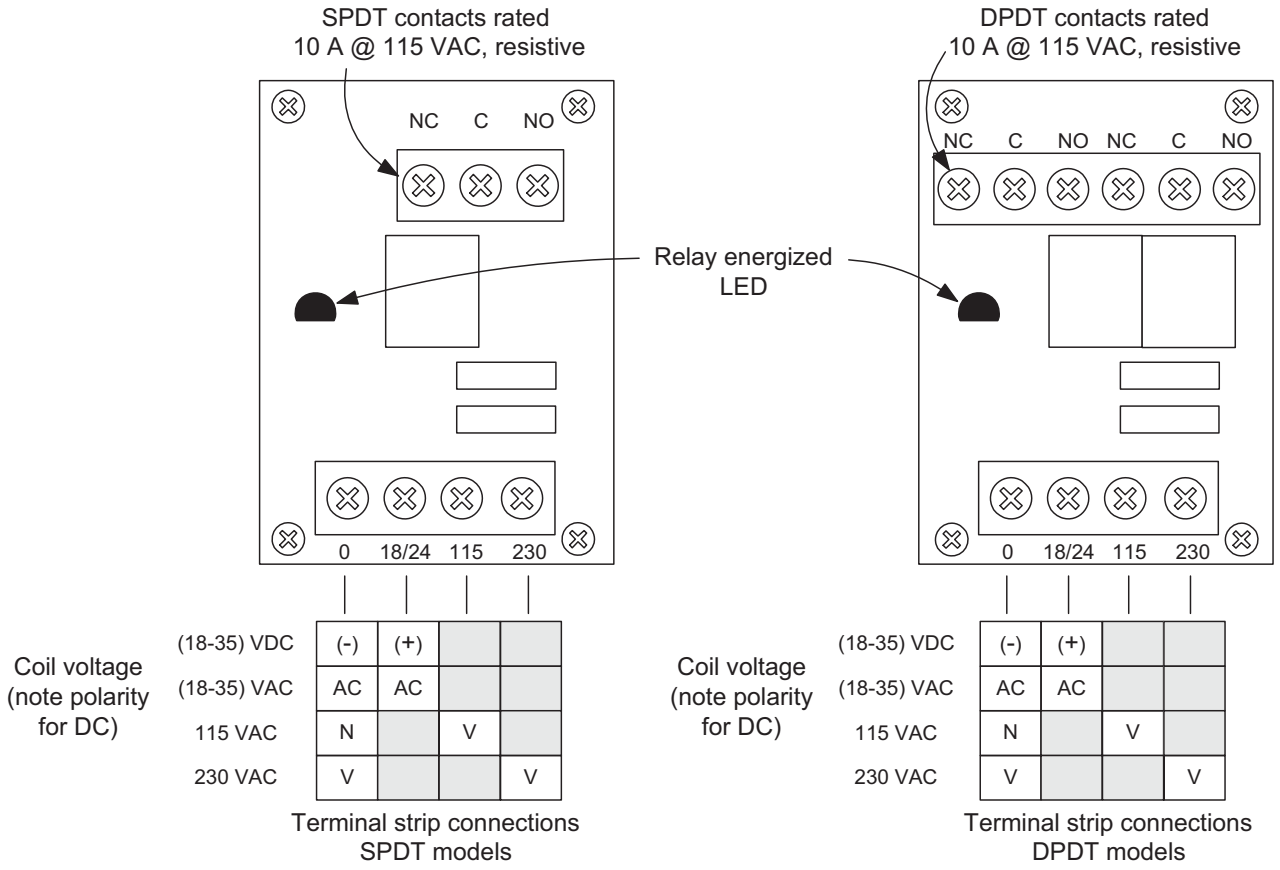
RELAY SELECTION CHART

Reference Number	Air Products Model	Relay Type	Relay Quantity	Packaging	Dimensions
2088-9007	MR-101/T	SPDT	Single	Track mount, without enclosure	3” H x 2 1/8” W x 1 1/2” D (76 mm x 54 mm x 38 mm)
2088-9009	MR-201/T	DPDT			
2088-9008	MR-101/C	SPDT		Track mount with enclosure	6 1/8” H x 3 1/4” W x 2 1/2” D (156 mm x 83 mm x 64 mm)
2088-9010	MR-201/C	DPDT			
2088-9017	MR-104/T	SPDT	Four	Track mount, without enclosure	3” H x 8 1/2” W x 1 1/2” D (76 mm x 216 mm x 38 mm)
2088-9019	MR-204/T	DPDT			
2088-9018	MR-104/C	SPDT		Track mount with enclosure	6 1/8” H x 9 1/2” W x 2 1/2” D (156 mm x 241 mm x 64 mm)
2088-9020	MR-204/C	DPDT			
2088-9021	PAM-1	SPDT	Single	Encapsulated, multi-voltage coil, color coded 18 AWG wire leads, with coil status LED	1 1/2” H x 1” W x 7/8” D (38 mm x 25.4 mm x 22 mm)
4098-9843	PAM-SD			Encapsulated, 24 VDC coil, color coded 18 AWG wire leads (no LED)	1 1/2” H x 1 3/16” W x 13/16” D (38 mm x 30 mm x 21 mm)

TRACK MOUNT RELAY WIRING REFERENCE



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Features

Dual port, bi-directional communications short circuit isolator:

- Compatible with Simplex® 4007ES, 4008, 4010ES, 4100ES, or 4100U Series fire alarm control panel IDNet Signaling Line Circuits (SLCs) providing: IDNet, IDNet+, IDNet 1+, IDNet 2, or IDNet 2+2 output loops (see additional information on pages 2 and 3)
- Either port can serve as an input or output, ports are automatically separated when a communications short circuit occurs
- Isolation can also be activated from the control panel for system diagnostics
- Mounts in standard 4" (102 mm) square electrical box, optional adapter plate is available to mount in a 4 $^{11}/_{16}$" (119 mm) square electrical box
- LED flashes to indicate communications; optional covers are available to view LED after installation
- TrueAlarm sensor base IDNet Isolators are also available, refer to data sheet S4098-0025 for details
- UL listed to Standard 864

Earth fault isolation reduces time to fix wiring problems:

- Built-in control panel diagnostics assist in locating earth fault conditions – the most common installation wiring problem

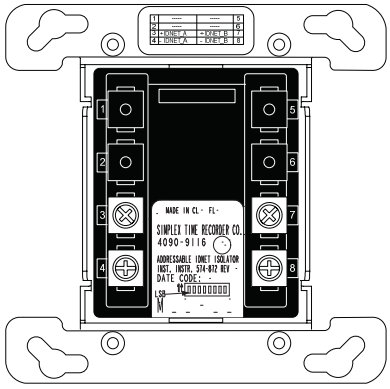
For Class B or Class A wiring:

- Communications are monitored from either port
- Class A wired SLCs can optimize operation by maintaining communications with devices outside of the isolated wiring section

Description

4090-9116 Addressable IDNet Communications Isolators provide IDNet communications isolation to improve installation convenience and increase system integrity. Isolation is automatically activated when an output short circuit is detected and isolation can also be selected manually from the control panel to assist with troubleshooting wiring problems.

Operation. Isolators power-up in isolation mode and are directed to connect by the control panel. If the output wiring is acceptable, the isolator will connect to the rest of the circuit. If the output wiring is shorted, the isolator remains isolated.



4090-9116 Addressable IDNet Isolator
(shown approximately 1/2 size)

Description *(Continued)*

Status Tracking. The isolator reports back to the panel when it is in isolation mode and the extent of shorted wiring is reported back to the panel by identifying device addresses that are not communicating. [Isolators are assigned sequentially to low number addresses to expedite SLC power-up.]

Earth Faults. During installation, earth faults frequently occur. Finding these faults normally requires extensive wiring disconnection. With the 4090-9116 Addressable IDNet Isolator, earth faults on the IDNet communications lines can be quickly located to assist in their repair and to restore the system wiring to normal.

Product Selection

Model	Description	
4090-9116	Addressable IDNet Communications Isolator	
4090-9813	Adapter plate to fit 4 $^{11}/_{16}$" (119 mm) square electrical box	
4090-9801	For semi-flush mounted box	Optional trim plate with LED viewing window, includes mounting screws; galvanized steel
4090-9802	For surface mounted box	

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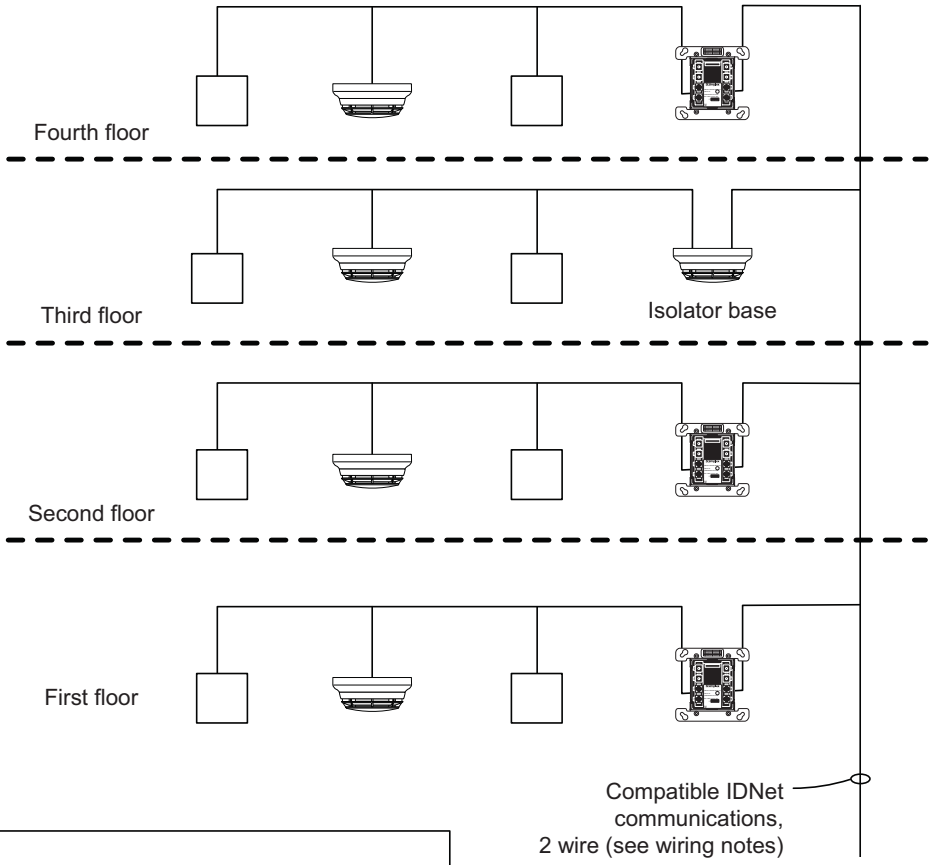
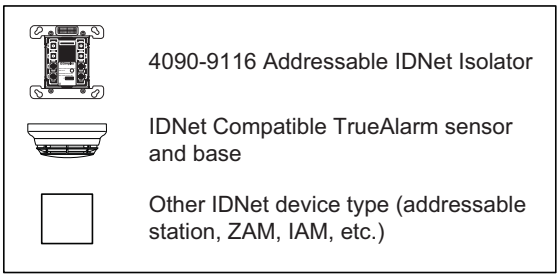
Multi-Floor Isolator Example 1

Short Circuit Isolation. The one-line diagram on this page shows a multiple floor example with Class B IDNet communications for each floor starting at an isolator. (A sensor in the 4098-9793 Isolator Base is shown for reference as an alternate isolating device.) If floor wiring beyond the isolator should experience a short circuit, each floor is automatically separated from the next, preventing the short circuit from disabling the entire IDNet communications wiring.

Earth Fault Isolation. In the event of an earth fault, each floor can be individually isolated using built-in control panel diagnostics. With individual floor control, the earth fault can be isolated to the floor level to narrow the search area. By adding more isolators, the section required to be isolated can be reduced, allowing more devices to remain active.





Simplex 4100ES Series Fire Control Panel (shown for reference)

Wiring Notes:

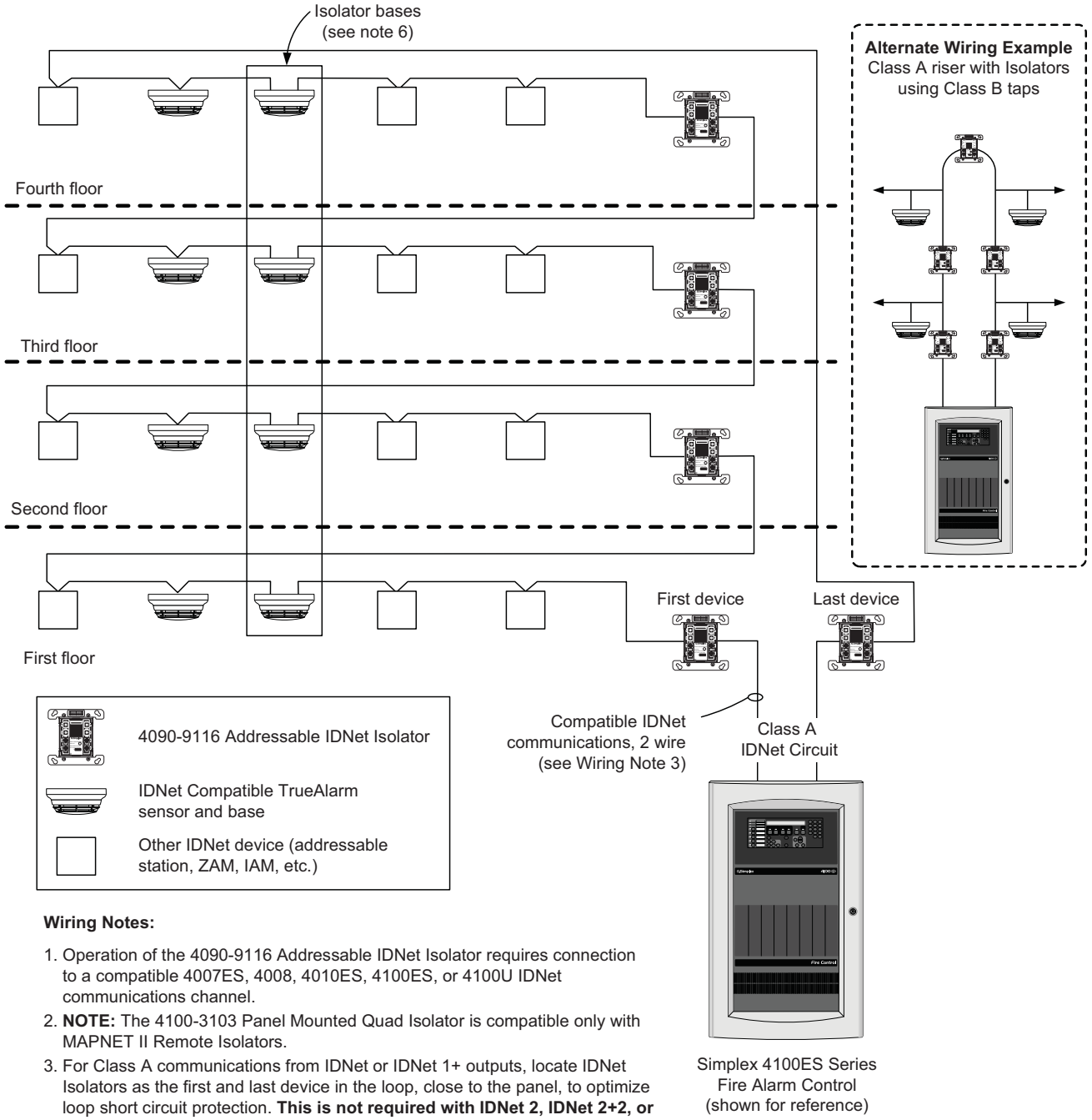
1. Operation of the 4090-9116 Addressable IDNet Isolator requires connection to a compatible 4007ES, 4008, 4010ES, 4100ES, or 4100U IDNet communications channel.
2. **NOTE:** The 4100-3103 Panel Mounted Quad Isolator is compatible only with MAPNET II Remote Isolators.
3. Maximum line resistance between the panel and an isolator, and between two isolators, is 10 Ω or 780 ft (238 m) with 18 AWG wire.
4. This is a one-line drawing showing only IDNet communications wiring.
5. Some IDNet devices require additional wiring for power. Refer to specific devices for details.

Multi-Floor Isolator Example 2

Class A Wiring. The illustration below is a modification of Example 1. Each floor is wired as a Class A connection, and a sensor mounted in a 4098-9793 Isolator Base has been added for reference. This illustrates that with additional isolators (either the 4090-9116 or the Isolator Base), there is a reduction in the number of isolated devices in the event of a short circuit.

Diagnostic Assistance. Communications from an IDNet 2, IDNet 2+2, or IDNet+ output provide individual short circuit isolation and allow individual output control to provide assistance in locating wiring faults.

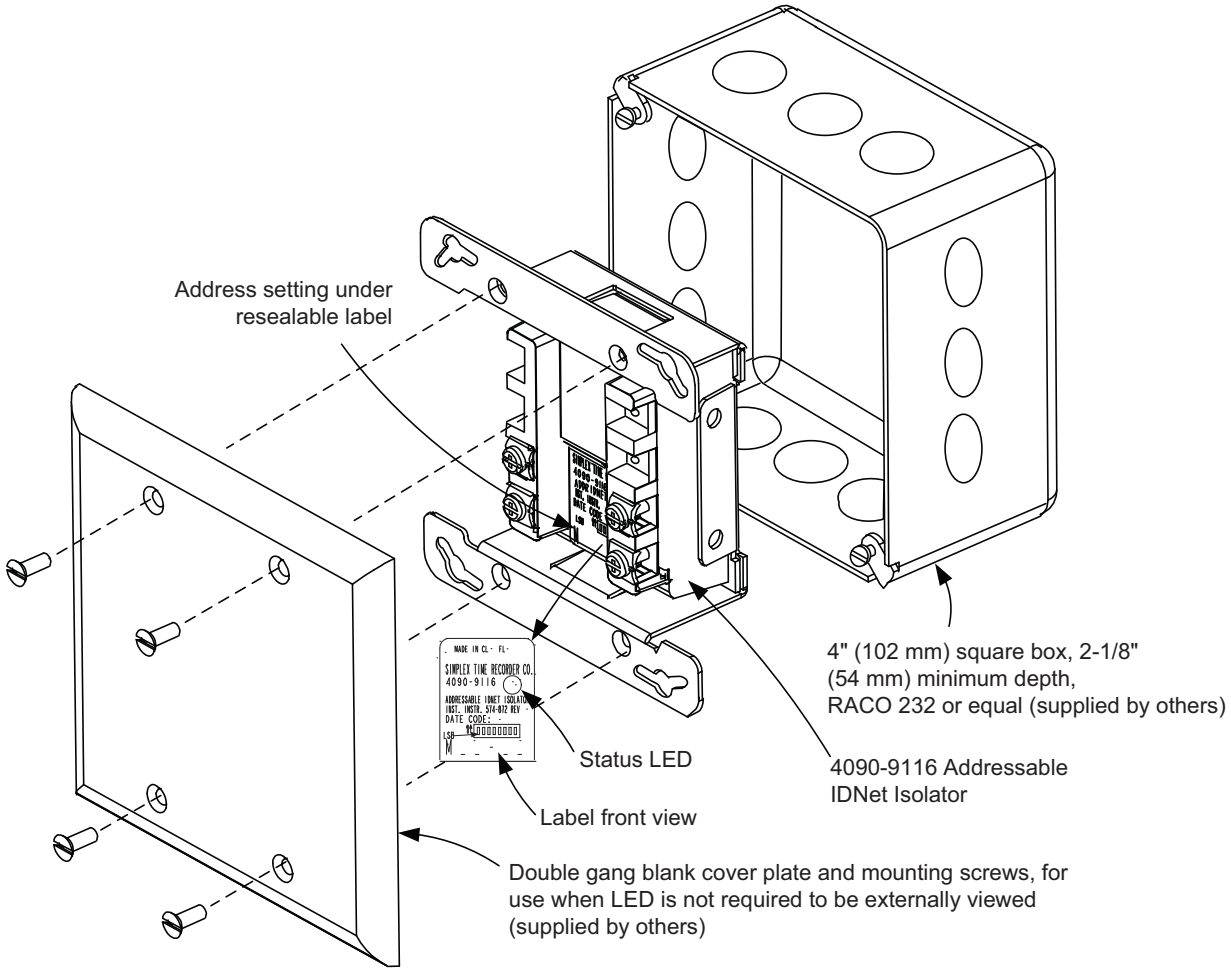
Note: When wiring Class A IDNet communications provided by IDNet or IDNet 1+ outputs, locate isolators as the first and last devices in the loop, close to the panel, to provide loop short circuit isolation operation (as shown below).



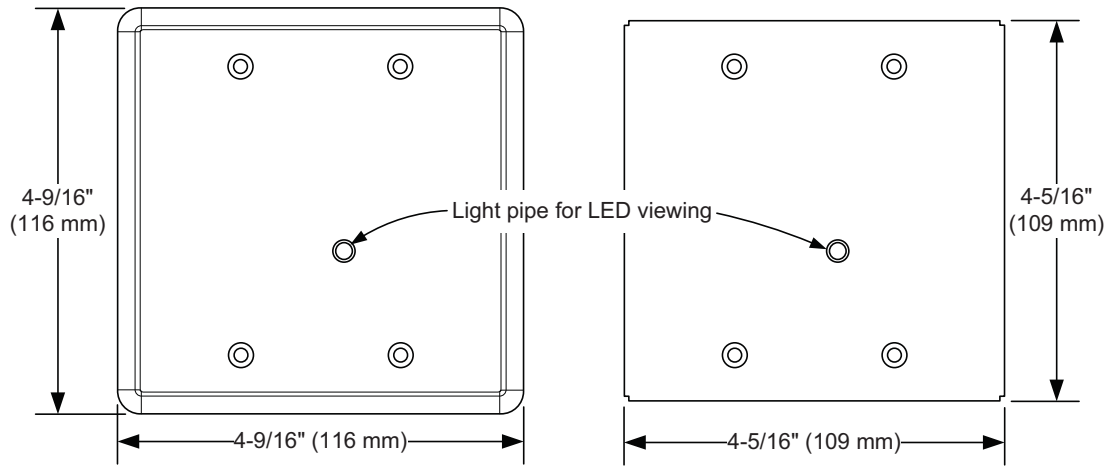
Wiring Notes:

1. Operation of the 4090-9116 Addressable IDNet Isolator requires connection to a compatible 4007ES, 4008, 4010ES, 4100ES, or 4100U IDNet communications channel.
2. **NOTE:** The 4100-3103 Panel Mounted Quad Isolator is compatible only with MAPNET II Remote Isolators.
3. For Class A communications from IDNet or IDNet 1+ outputs, locate IDNet Isolators as the first and last device in the loop, close to the panel, to optimize loop short circuit protection. **This is not required with IDNet 2, IDNet 2+2, or IDNet+ outputs.**
4. Maximum line resistance between the panel and an isolator, and between two isolators, is 10 Ω or 780 ft (238 m) with 18 AWG wire.
5. This is a one-line drawing showing only IDNet communications wiring.
6. Some IDNet devices require additional wiring for power. Refer to specific devices for details.

Mounting Information



Mounting Reference, Double Gang Blank Cover Plate



4090-9801, Trim plate for
semi-flush mounted box

4090-9802, Trim plate for
surface mounted box

Optional Trim Plates for Visible LED

Specifications

Electrical

Communications	IDNet communications, 1 address per device
Compatibility	4007ES, 4008, 4010ES, 4100ES, and 4100U providing: IDNet, IDNet+, IDNet 1+, IDNet 2, or IDNet 2+2 communications output; (not compatible with 4100-3103 Panel Mounted Quad Isolator)
Power	Consumes one unit load, power is supplied from IDNet SLC
Wire Connections	Screw terminals for input and output wiring, 18 to 14 AWG wire (0.82 mm^2 to 2.08 mm^2)

Wiring Distances

IDNet Wiring Reference	Up to 2500 ft (762 m) from fire alarm control panel
	Up to 10,000 ft (3048 m) total wiring distance (including T-Taps)
	Maximum line resistance between panel and isolator, or between isolators is 10 ohms; [18 AWG (0.82 mm^2) = 780 ft (238 m)]
	Compatible with Simplex 2081-9044 Overvoltage Protectors

Mechanical

Dimensions	4 ⅛" H x 4 ⅛" W x 1 ⅜" D (105 mm x 105 mm x 35 mm)
Package	Black thermoplastic housing on metal mounting plate
Temperature	32° to 120° F (0° to 49° C) indoor operation only
Humidity Range	10 to 90% RH at 90° F (32° C)
Installation Instructions	574-872

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*UL, ULC, CSFM Listed; FM Approved; MEA (NYC) Acceptance**

Addressable Duct Sensor Housings with TrueAlarm Photoelectric Sensor; Available with Multiple Relay Control

Features

Compact air duct sensor housing with clear cover to monitor for the presence of smoke**

Includes factory installed TrueAlarm photoelectric smoke sensor and features:

- Individual sensor information processed by the host control panel to determine sensor status
- Digital transmission of analog sensor values via IDNet or MAPNET II, 2-wire communications
- Programmable sensitivity, consistent accuracy, environmental compensation, status testing, and monitoring of sensor dirt accumulation

Model 4098-9755:

- Basic duct sensor housing (no relay output) powered by IDNet/MAPNET II communications

Model 4098-9756:

- Duct sensor housing with supervised output for multiple remote relays; requires separate 24 VDC; includes one relay
- Relay output is under panel control
- At the panel, relay output can be activated manually or in response to a separate alarm or other input

General features:

- UL listed to Standard 268A
- Clear cover allows visual inspection
- Test ports provide functional smoke testing access with cover in place
- Mounts to rectangular ducts or round ducts; minimum size is 8" (203 mm) square or 18" (457 mm) diameter
- Magnetic test feature for alarm initiation at housing
- Optional weatherproof enclosure is available separately (refer to data sheet S4098-0032)

Diagnostic LEDs (on interface board):

- Red Alarm/Trouble LED for sensor status and communications polling display
- Yellow LED for open or shorted trouble indication of supervised relay control (4098-9756 only)

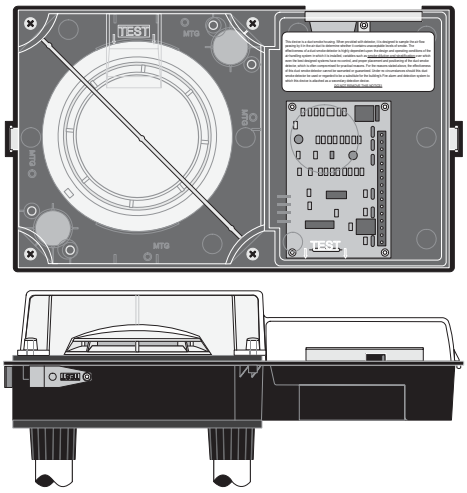
Sampling tubes (ordered separately):

- Available in multiple lengths to match duct size
- Installed and serviced with housing in place

Remote module options (ordered separately):

- Remote red status/alarm LED (2098-9808)
- Remote test station with LED (2098-9806)
- 4098-9843 remote relays (refer to page 2 for details)

* These products have been approved by the California State Fire Marshal (CSFM) pursuant to Section 13144.1 of the California Health and Safety Code. See CSFM Listing 3240-0026.241 for allowable values and/or conditions concerning material presented in this document. It is subject to re-examination, revision, and possible cancellation. Accepted for use – City of New York Department of Buildings – MEA35-93E. Additional listings may be applicable; contact your local Simplex product supplier for the latest status. Listings and approvals under Simplex Time Recorder Co. are the property of Tyco Fire Protection Products.



Duct Sensor Housing, Front and Bottom View

2098-9808

2098-9806

Remote Status/Alarm Indicator and Test Station

Introduction

Operation. Simplex® compact air duct smoke sensor housings provide TrueAlarm operation for the detection of smoke in air conditioning or ventilating ducts. Sampling tubes are installed into the duct allowing air to be directed to the smoke sensor mounted in the housing.

TrueAlarm Sensor Operation

Digital Communication of Analog Sensing. Analog information from the sensor is digitally communicated to the control panel where it is analyzed. Sensor input is stored and tracked as an average value with an alarm or abnormal condition being determined by comparing the sensor's present value against its average.

Intelligent Data Evaluation. Monitoring each photoelectric sensor's average value provides a software filtering process that compensates for environmental factors (dust, dirt, etc.) and component aging, providing an accurate reference for evaluating new activity. The result is a significant reduction in the probability of false or nuisance alarms caused by shifts in sensitivity, either up or down.

** Please note that smoke detection in air ducts is intended to provide notification of the presence of smoke *in the duct*. It is not intended to, and will not, replace smoke detection requirements for open areas or other non-duct applications.

TrueAlarm Sensor Operation *(Continued)*

Control Panel Selection. Peak activity per sensor is stored to assist in evaluating specific locations. The alarm set point for each sensor is determined at the control panel, selectable as the individual application requires.

Sensor Status LED. Each sensor housing's red status LED (located on the electrical interface board) pulses to indicate communications with the panel. If the control panel determines that a sensor is in alarm, or that it is dirty or has some other type of trouble, the details are annunciated at the control panel and that sensor housing's status LED will be turned on steadily. During a system alarm, the control panel will control the LEDs such that an LED indicating a trouble will return to pulsing to help identify any alarmed sensors. (Remote Status/Alarm LEDs track the operation of the sensor housing LED.)

Photoelectric Sensing

TrueAlarm photoelectric sensors use a stable, pulsed infrared LED light source and a silicon photodiode receiver to provide consistent and accurate low power smoke sensing.

Photoelectric Sensing *(Continued)*

Typically duct sensor applications require less sensitive settings (such as 2.5% per foot obscuration) due to the ducts being a relative dirty environment. However, the standard seven levels of TrueAlarm sensor sensitivity are available for each individual sensor, ranging from 0.2% to 3.7% per foot of smoke obscuration. Sensitivity is selected and monitored at the fire alarm control panel.

Fire Alarm Control Panel Features

- Individual smoke sensitivity selection
- Sensitivity monitoring that satisfies NFPA 72 sensitivity testing requirements
- Peak value logging allows accurate analysis for sensitivity selection
- Automatic, once per minute individual sensor calibration check verifies sensor integrity
- Automatic environmental compensation
- Smoke sensitivity is displayed in percent per foot
- Ability to display and print detailed sensor information in plain English language
- Relays of model 4098-9756 are under panel control for ON, OFF, or override

Duct Sensor Selection Chart

Duct Smoke Sensor Housing with Photoelectric Sensor*

Model	Description	Compatibility
4098-9755	Basic Duct Sensor Housing; operating power is supplied by either IDNet or MAPNET II communications (no relay output)	Simplex fire alarm control panel models: 4100ES, 4010ES, 4008, 4010, 4100U, and legacy products 4020, 4100/4100+, and 4120. Also 2120 CDT if configured for MAPNET II, TrueAlarm operation
4098-9756	Duct Sensor Housing with supervised multiple relay output, requires separate 24 VDC fire alarm power and 4081-9008 end-of-line resistor harness; includes one 4098-9843 relay	Same as above except relay operation is not compatible with 2120 CDT; Relay output is for up to 15 total 4098-9843 Relays (additional relays are ordered separately)

Remote LED Indicator and Test Station, Select One if Required

Model	Description	Compatibility	Mounting
2098-9808	Red LED status indicator on single-gang stainless steel plate	4098-9755 4098-9756	Use single gang box, 3" H x 2" W x 2" D (76 mm x 51 mm x 51 mm)
2098-9806	Test Station with keyswitch and red LED status indicator, on single-gang stainless steel plate; (turning switch to "TEST" initiates alarm for system testing)		

Epoxy Encapsulated Remote Relay and End-of-Line Resistor

Model	Description	Compatibility	Location
4098-9843	Relay; single Form C (7 A @ 120 VAC); refer to pages 3 and 4 for additional relay information; one included with 4098-9756; wiring is 18 AWG (0.82 mm^2) color coded wire leads	4098-9756 only; connect up to 15	Locate relays within 3 ft (1 m) of device being controlled per NFPA 72
4081-9008	End-of-Line Resistor Harness; 10 kΩ, 1/2 W; (ref. 733-894); required to supervise remote relay coil connection	4098-9756	At last relay location

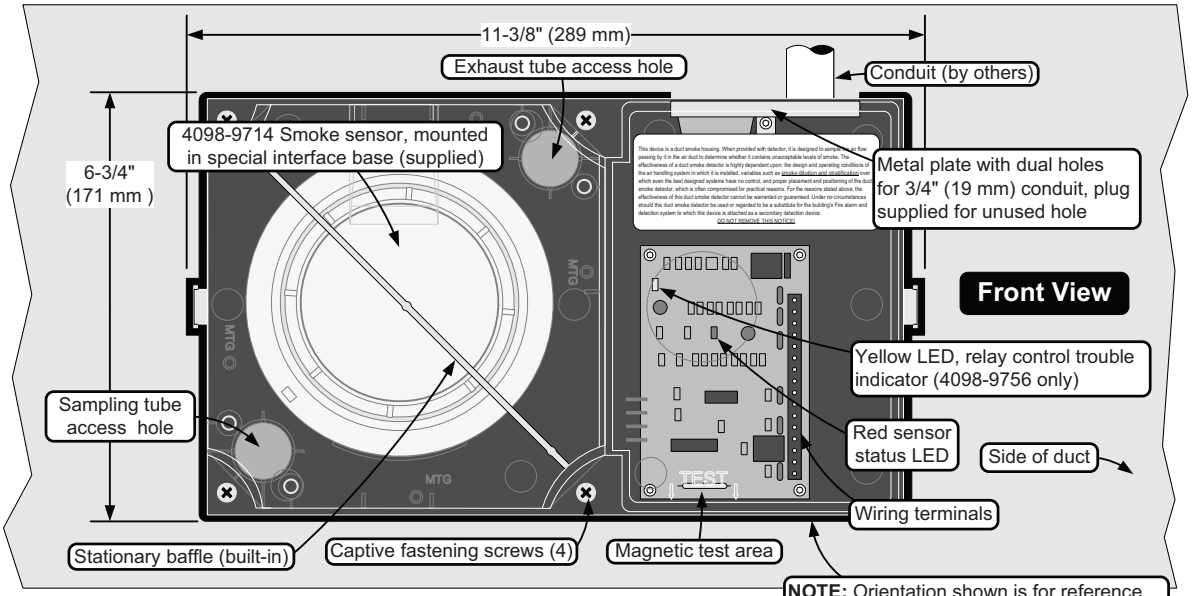
* Each duct housing includes an internally mounted model 4098-9714 TrueAlarm photoelectric sensor and an exhaust tube. A correctly sized sampling tube (ordered per application) is required, refer to chart below.

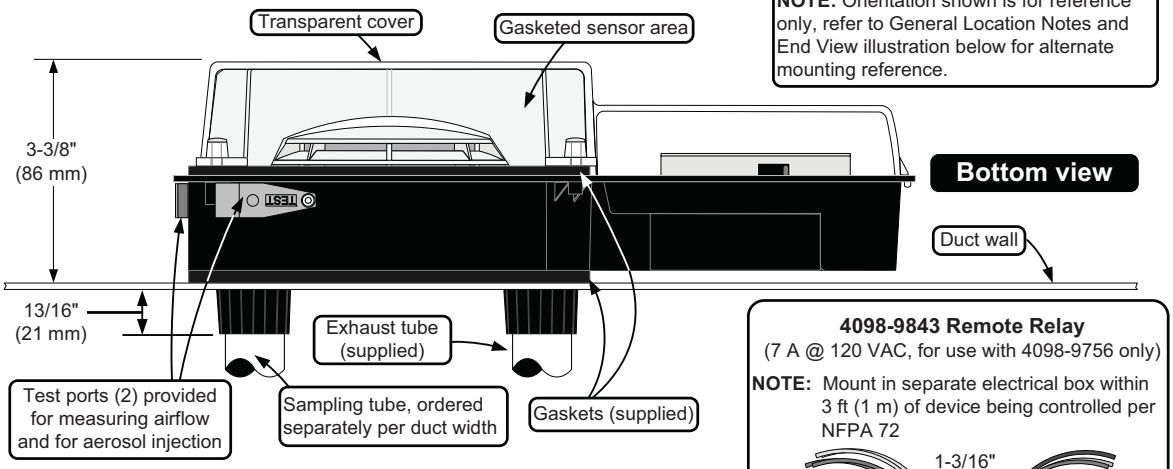
Sampling Tube Selection Chart, Ordered Separately Per Duct Width, Select One

Overall Duct Width	Tube Required	Suggested Cut Length
12" (305 mm)	**4098-9854**	1/2" (12.7 mm) longer than duct width
13" to 23" (330 mm to 584 mm)	**4098-9855**	1/2" (12.7 mm) longer than duct width
24" to 46" (610 mm to 1168 mm)	**4098-9856**	3 in" (76 mm) longer than duct width
46" to 71" (1168 mm to 1803 mm)	**4098-9857**	3 in" (76 mm) longer than duct width
71" to 95" (1803 mm to 2413 mm)	**4098-9858**	3 in" (76 mm) longer than duct width

Duct Sensor Housing Detail Reference

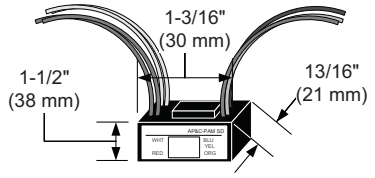
NOTE: Refer to Installation Instructions 574-776 for additional installation detail and maintenance information.

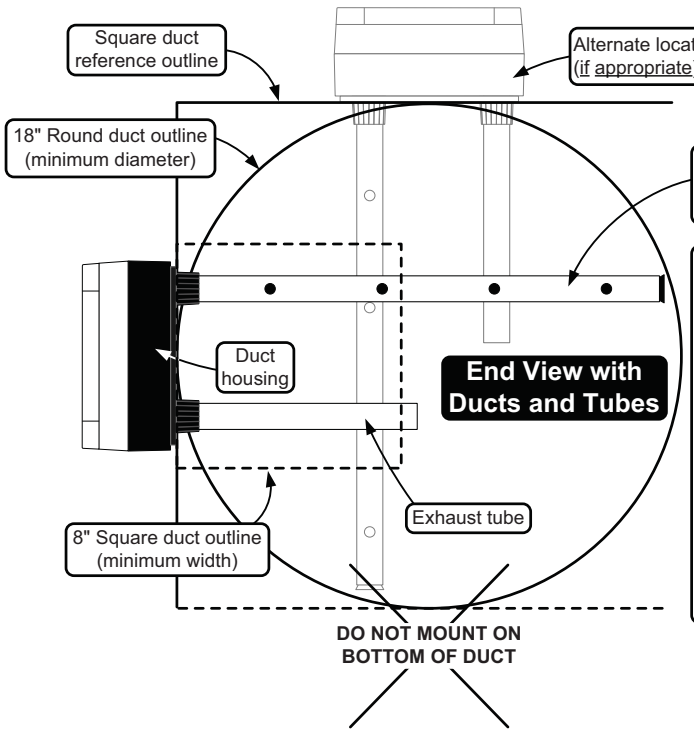




4098-9843 Remote Relay
(7 A @ 120 VAC, for use with 4098-9756 only)

NOTE: Mount in separate electrical box within 3 ft (1 m) of device being controlled per NFPA 72

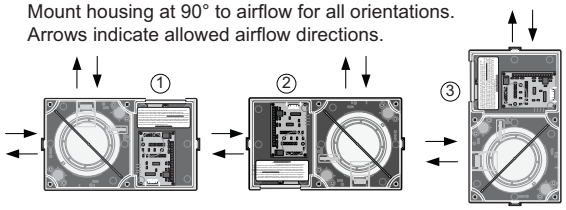




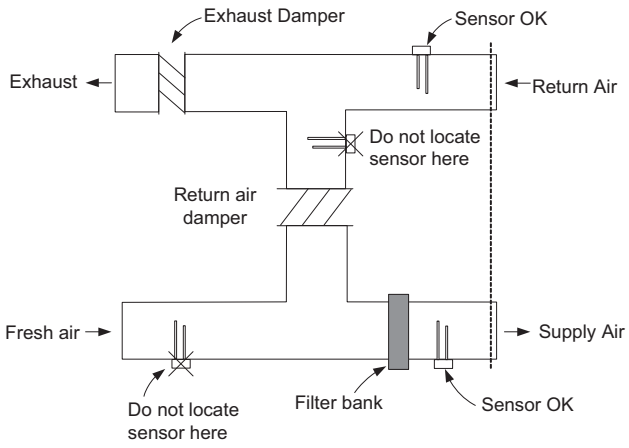
Sampling tube, keyed for proper hole alignment **with holes facing into airflow** (template is provided for proper tube installation). (Housing is shown as position 2 per note 2 below.)

General Location Notes:

1. Testing performed under the auspices of the Fire Detection Institute (FDI) recommended when sampling tubes are not located vertically, that they be positioned horizontally in the upper half of the duct to account for possible stratification.
2. Three duct side mounting options are available as shown below. Mount housing at 90° to airflow for all orientations. Arrows indicate allowed airflow directions.



Duct Sensor Location Reference



Additional Information. Refer to NFPA 90A, *Standard for the Installation of Air Conditioning and Ventilating Systems*; NFPA 72, the *National Fire Alarm and Signaling Code*; and the *NEMA Guide for Proper Use of Smoke Detectors in Duct Applications*, and Installation Instructions 574-776.

Duct Sensor Location Considerations:

1. Proper duct smoke detection location must ensure adequate airflow within the duct housing.
2. Duct air velocity rating is 300 to 4000 ft/min (91 to 1220 m/min). Pressure differential between intake and exhaust tubes is required to be between 0.015 to 1.55 inches of water (0.381 to 39.37 mm).
3. Ensure accessibility for test and service.
4. Proper Locations: downstream side of filters to detect fires in the filters; in return ducts, ahead of mixing areas; upstream of air humidifier and cooling coil.
5. Other locations and orientations may be required for proper duct smoke detection depending on duct access, system design, and duct airflow testing. Contact your local Simplex product supplier for assistance.

Locations to Avoid:

1. Where dampers closed for comfort control would interfere with airflow.
2. Next to outside air inlets (unless the intent is to monitor smoke entry from that area).
3. In return air damper branch ducts and mixing areas where airflow may be restricted.

Specifications

General Mechanical and Environmental	
Air Velocity Range (linear ft/min)	300 to 4000 ft/min (91 to 1220 m/min)
Sensor Sensitivity Range	0.2% to 3.7% per foot of obscuration, selectable at host control panel
UL Listed Temperature Range	32° F to 100° F (0° C to 38° C)
Operating Temperature Range	32° F to 122° F (0° C to 50° C)
Storage Temperature Range	0° F to 140° F (-18° C to 60° C)
Humidity Range	10% to 95% RH, non-condensing
Wiring Connections	Terminal blocks, 18 to 12 AWG (0.82 mm^2 to 3.31 mm^2)
Housing Color	Black base with clear cover
Remote Status/Alarm LED and Test Station with Remote Status/Alarm LED	
Remote Alarm LED Current	1.2 mA, no impact to 24 VDC alarm current (2098-9808 or 2098-9806)
Test Station Keyswitch Current	3.3 mA, no impact to 24 VDC alarm current (2098-9806)
Remote Alarm LED and Test Station Distance	250 ft (76 m) maximum
Addressable Operation	
Data Communications	IDNet or MAPNET II communications, auto-select, one address per housing; provides operating power to model 4098-9755
Model 4098-9756 with Supervised Multiple Relay Control, Requires Separate Fused 24 VDC from Fire Alarm Power Supply	
Input Voltage	18-32 VDC (24 VDC nominal)
Standby Current	3 mA @ 24 VDC
Alarm Current	15 mA @ 24 VDC; add 15 mA for each 4098-9843 relay
Supervised Remote Relay Control Output	For use with 4098-9843 relay only, quantity of 15 maximum; distance of 500 ft (152 m) maximum; requires 4081-9008 (ref. 733-894) 10 kΩ, 1/2 W end-of-line resistor
4098-9843 Relay Output Ratings, Single Form C, use with Model 4098-9756 Only	
Coil Current	15 mA @ 24 VDC, up to 15 maximum per relay control output
Relay Contacts	7 A at 0.35 PF @ 28 VDC & 120 VAC; 250 μA @ 5 VDC
Location Distance	500 ft (152 m) maximum to relay coils; locate relays within 3 ft (1 m) of device being controlled per NFPA 72

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Simplex®

TrueAlarm® Analog Sensing

UL, ULC Listed;
*CSFM Approved**

Weatherproof Duct Housing
Enclosure 4098-9845

Features

Weatherproof duct housing enclosure for use with the following TrueAlarm addressable duct sensor housings** (ordered separately)**:**

- 4098-9755, Standard Duct Sensor Housing
- 4098-9756, Duct Sensor Housing with Relay Output

Addressable duct sensor housing details:

- Photoelectric sensor and exhaust tube are supplied
- Sampling tube is ordered separately per duct size
- Continuous communications actively monitors status of electronic circuits
- Refer to Simplex data sheet S4098-0030 for additional duct sensor housing details

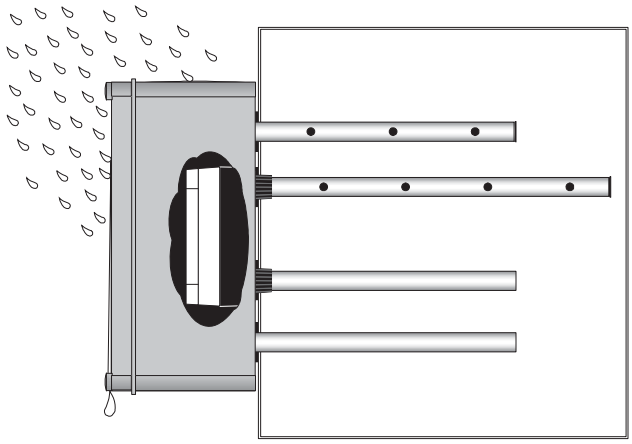
Weatherproof duct housing enclosure features:

- Circulation of conditioned air from the air duct helps maintain the sensor housing at its rated temperature range
- Nonmetallic material does not require painting
- Captive cover screws
- Intake and exhaust tubes for weatherproof duct housing enclosure are supplied
- A full size mounting template and all required gaskets are supplied for installation convenience
- UL listed to Standard 268A
- NEMA 4X rating

Description

Smoke detection system designs that require smoke detection monitoring of an HVAC duct that is exposed to environmental extremes must provide protection against the anticipated temperatures and total weather conditions. The 4098-9845 Weatherproof Duct Housing Enclosure provides for the circulation of conditioned air around the internally mounted addressable duct sensor housing to maintain the sensor housing at its rated temperature range and provide protection from ambient environmental extremes.

* This product has been approved by the California State Fire Marshal (CSFM) pursuant to Section 13144.1 of the California Health and Safety Code. See CSFM Listing 7300-0026:245 for allowable values and/or conditions concerning material presented in this document. It is subject to re-examination, revision, and possible cancellation. This product was not ULC listed or approved by FM or MEA (NYC) as of document revision date. Additional listings may be applicable, contact Simplex for the latest status.



Side View of Weatherproof Duct Housing Enclosure 4098-9845 with Duct Tube Detail and Cutaway Showing Sensor Housing (refer to page two for details)

Specifications

4098-9845 Weatherproof Duct Housing Enclosure		
Air Velocity Range (linear ft/min)	300 to 4000 ft/min (91 to 1220 m/min)	Refer to graph on page 4 for additional information
UL Listed External Temperature Range	-40° to 158° F (-40° to 70° C)	
UL Listed External Humidity Conditions	Up to 100% RH	
NEMA Enclosure Category	4X	
Construction	Solid body and door, light gray, PBT/PC blended plastic, UL94-5VA flammability rating, UV stabilized	
Dimensions	22 1/8" W x 15" H x 7 1/8" D (562 mm x 381 mm x 181 mm)	
Addressable Duct Sensor Housing 4098-9755/9756		
UL Listed Temperature Range	32° to 100° F (0° to 38° C)	
Operating Temperature Range	32° to 122° F (0° to 50° C)	
Storage Temperature Range	0° to 140° F (-18° to 60° C)	
Humidity Range	10% to 90% RH, non-condensing	

** TrueAlarm sensor designs and their operation are protected by one or more of the following U.S. Patents: 5,155,468; 5,173,683; 5,543,777; 5,400,014; 5,552,765; 5,552,763; 4,796,025; DES. 377,460.

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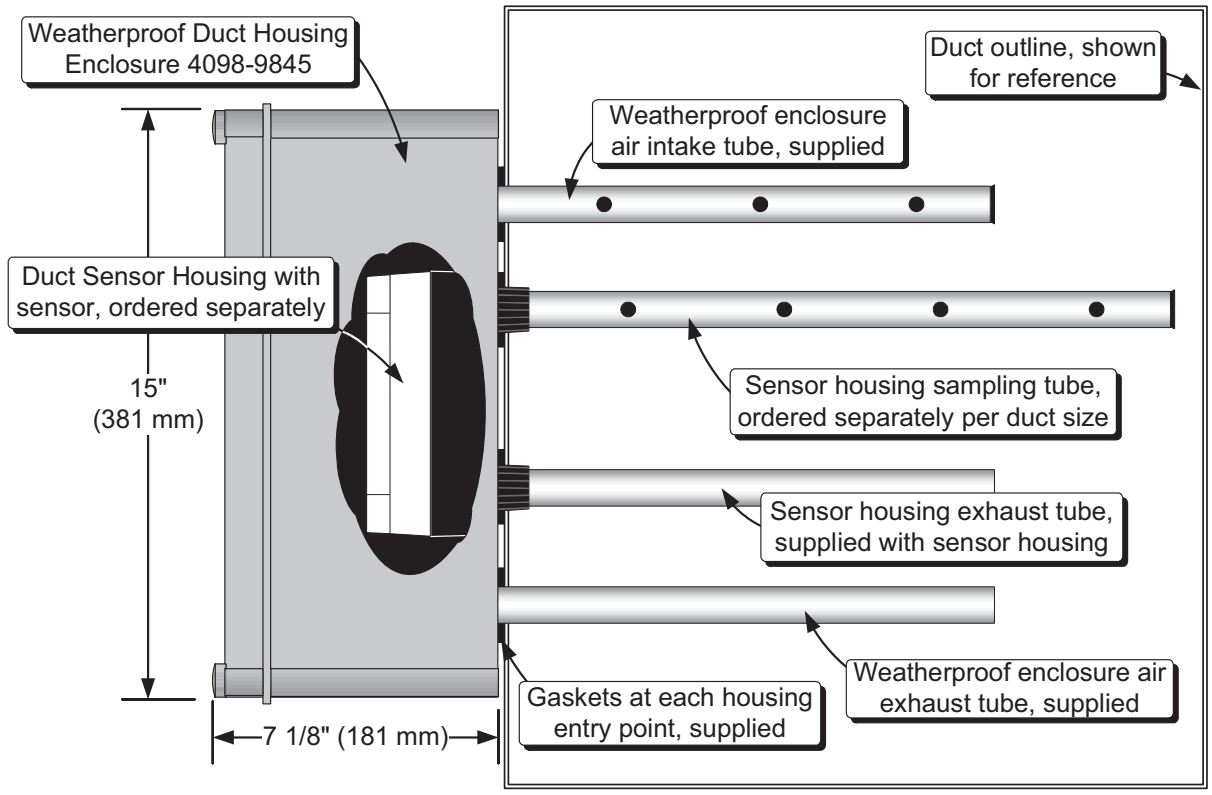
Location Considerations

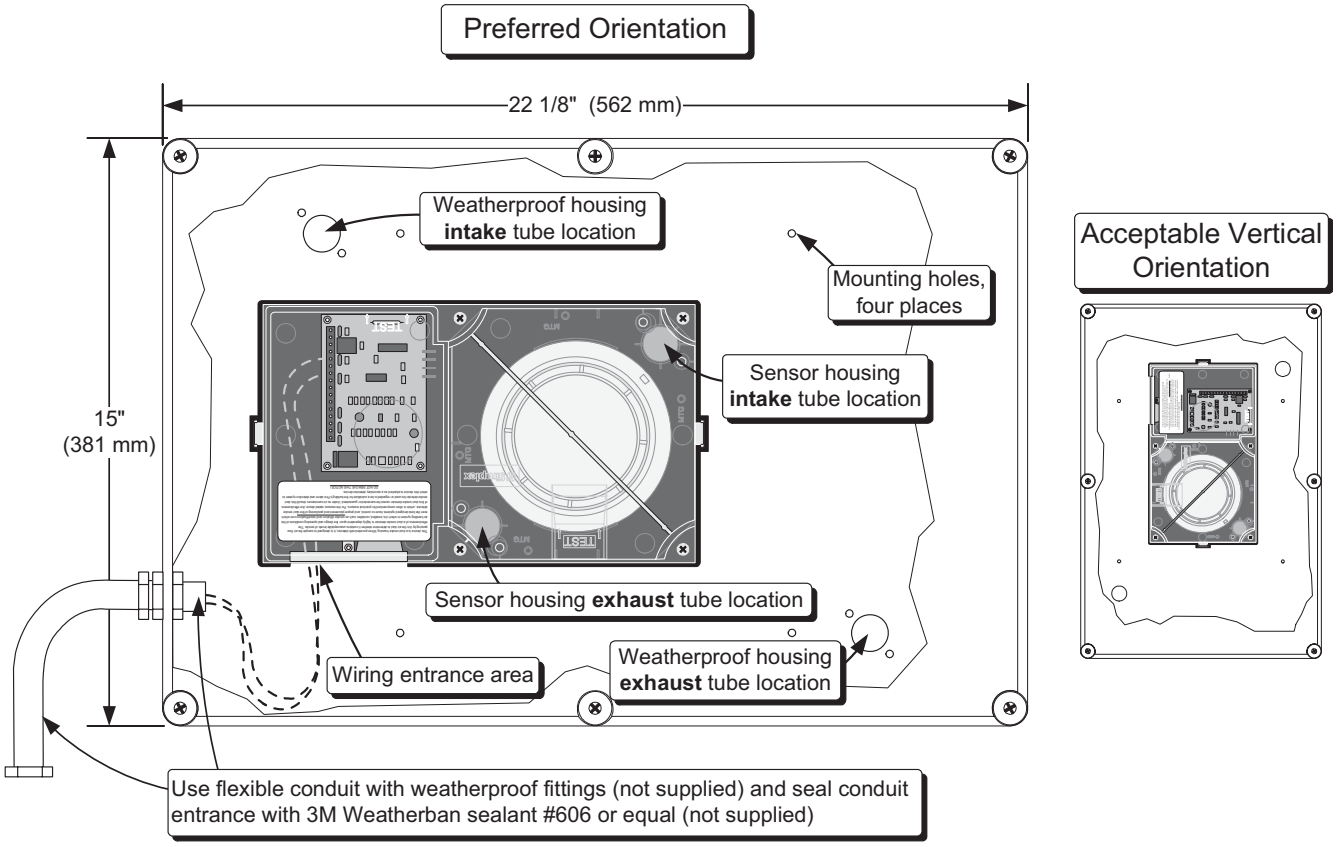
1. **DO NOT locate the 4098-9845 Weatherproof Duct Housing Enclosure in direct sunlight.**
2. Do locate the 4098-9845 Weatherproof Duct Housing Enclosure on the shaded/sheltered side of an exposed HVAC duct. Where this is not possible or where minimal protection would be provided, use a sheetmetal or equivalent canopy that provides ventilated shelter for the enclosure.
3. Ensure that the final mounting location will provide convenient access to the enclosure for maintenance.
4. Refer to Installation Instructions 574-922 for additional installation information.

Installation Reference, Side View



Installation Reference, Front View Showing Preferred and Alternate Orientations

NOTE: Refer to Installation Instructions 574-922 for additional information.

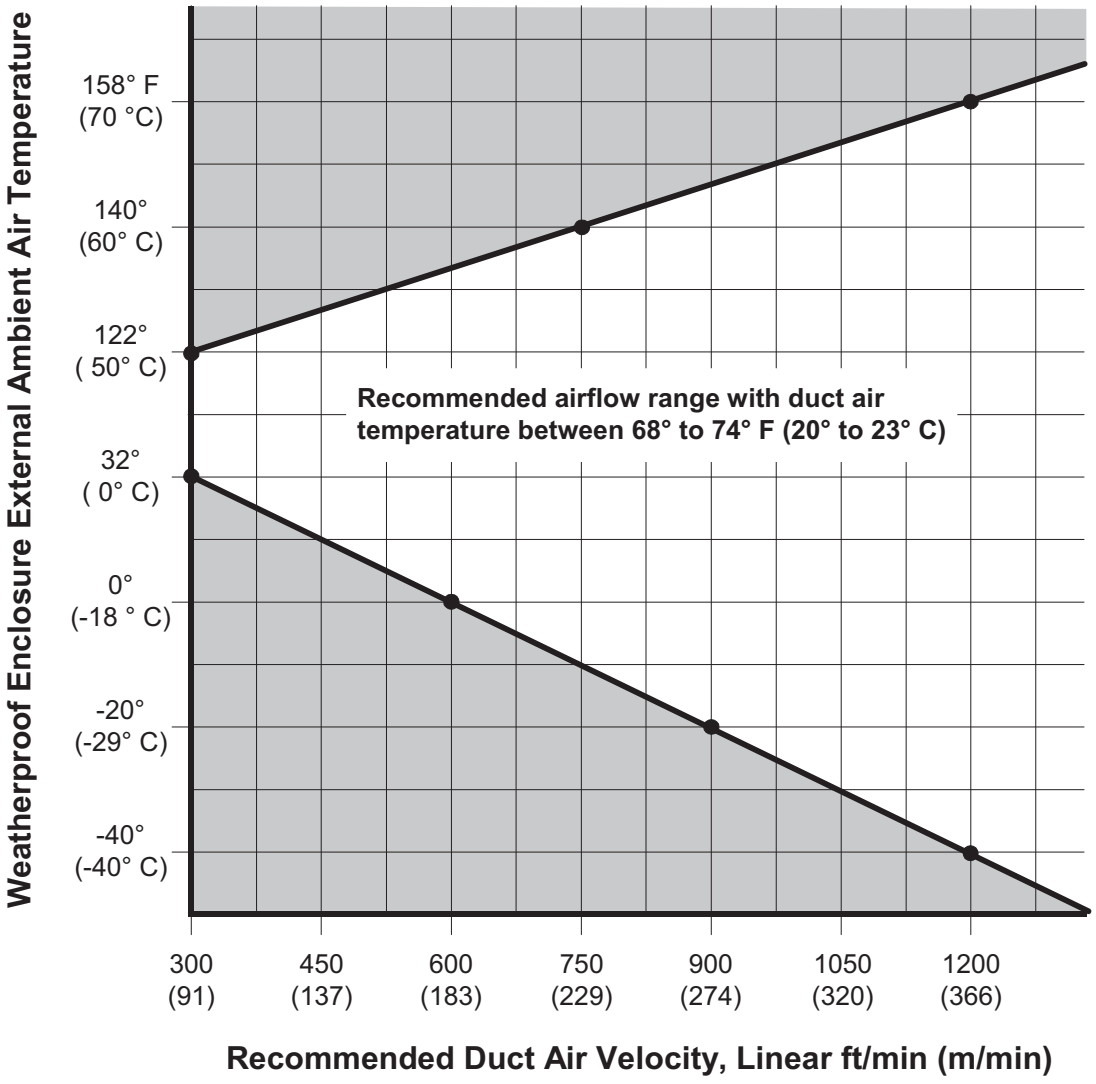


Application Reference, Ambient Temperature vs. Recommended Airflow Graph

The graph shown below presents the results of controlled laboratory testing performed on a typical 4098-9845 Weatherproof Enclosure protecting an internally mounted duct sensor housing. The external ambient air temperature of the 4098-9845 Weatherproof Enclosure was varied throughout its UL listed operating temperature range. Temperatures were recorded within the protected duct sensor housing with varying duct air velocities of air maintained between 68° and 74° F (20° to 23° C).

This graph illustrates how an increase in the test airflow velocity allows the airflow through the weatherproof enclosure to maintain the duct sensor housing at its rated range as the ambient temperature of the weatherproof enclosure is varied throughout temperatures anticipated for exterior air duct locations.

PLEASE NOTE that for typical external air duct applications, heating air would be hotter than 74° F and cooling air would be lower than 68° F, extending the acceptable airflow range accordingly.



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Simplex®
Westminster, Massachusetts 01441-0001 USA
visit us on the world wide web at ***www.simplexnet.com***

All specifications and other information shown were current as of printing and are subject to change without notice.

THE NEW BOLLARDS
FROM NEENAH.
NEENAH
FOUNDRY
NF

Now that they're available in cast iron, steel, stainless steel and brushed aluminum, our bollards are fully compatible with your ideas.

- Designs range from simple to decorative
- 71 bollard configurations to choose from
- Cast bollards are designed to fit over standard 4" pipe
- Cast bollards are designed for pre-existing or new bollard installations
- Cast bollards can be provided with or without chain attachments
- Bollard options can be used to coordinate with a wide range of Neenah product offerings, from downspouts to grates and detectable warning plates
- Bollards can be painted in a wide range of colors
- 100% American Made

NEENAH FOUNDRY

THE NEW FAMILY OF NEENAH BOLLARDS.

STEEL & ALUMINUM

STRAIGHT PIPE

STEEL
CAT. R-8450-S
Inside Diameter: 4", 6", 8", 10", 12"
Length: 4', 6', 8'

STAINLESS STEEL
CAT. R-8450-SS
Inside Diameter: 6", 8"
Length: 6', 8'

HORSE SHOE U

STEEL
CAT. R-8450-H3
CAT. R-8450-H4
Outside Diameter: 3.5", 4"

STAINLESS STEEL
CAT. R-8450-HS3
CAT. R-8450-HS4
Outside Diameter: 3.5", 4"

BRUSHED ALUMINUM
CAT. R-8450-HA3
CAT. R-8450-HA4
Outside Diameter: 3.5", 4"

FLAT BACK U

STEEL
CAT. R-8450-F3
CAT. R-8450-F4
Outside Diameter: 3.5", 4"

STAINLESS STEEL
CAT. R-8450-FS3
CAT. R-8450-FS4
Outside Diameter: 3.5", 4"

BRUSHED ALUMINUM
CAT. R-8450-FA3
CAT. R-8450-FA4
Outside Diameter: 3.5", 4"

COLOR OPTIONS

STANDARD COLORS

9005 JET BLACK | 6020 CHROME GREEN | OIL BAKED

CUSTOM COLORS

Neenah offers a wide range of custom bollard colors to coordinate with the color scheme of any project.

To view available color options visit:
www.ralcolors.net

Custom Color RAL 8016 Mahogany Brown

CAST IRON

CAT. R-8401-43AA	CAT. R-8401-43AB	CAT. R-8401-43AC	CAT. R-8402-43AA	CAT. R-8402-43AB	CAT. R-8402-43AC	CAT. R-8403-43AA	CAT. R-8403-43AB	CAT. R-8403-43AC	CAT. R-8401-43BA	CAT. R-8401-43BB
40.4 Inches	40.4 Inches	40.4 Inches	40.4 Inches	40.4 Inches	40.4 Inches	40.4 Inches	40.4 Inches	40.4 Inches	38 Inches	38 Inches
121 Lbs.	101 Lbs.	89 Lbs.	114 Lbs.	94 Lbs.	82 Lbs.	121 Lbs.	101 Lbs.	89 Lbs.	115 Lbs.	95 Lbs.

CAT. R-8401-43BC	CAT. R-8402-43BA	CAT. R-8402-43BB	CAT. R-8402-43BC	CAT. R-8403-43BA	CAT. R-8403-43BB	CAT. R-8403-43BC
38 Inches	38 Inches	38 Inches	38 Inches	38 Inches	38 Inches	38 Inches
83 Lbs.	108 Lbs.	88 Lbs.	76 Lbs.	115 Lbs.	95 Lbs.	83 Lbs.

LIT BOLLARDS

CAT. R-8401-43CA	CAT. R-8401-43CB	CAT. R-8401-43CC	CAT. R-8402-43CA	CAT. R-8402-43CB	CAT. R-8402-43CC	CAT. R-8403-43CA	CAT. R-8403-43CB	CAT. R-8403-43CC	CAT. R-8401-43DA	CAT. R-8401-43DB
38 Inches	38 Inches	38 Inches	38 Inches	38 Inches	38 Inches	38 Inches	38 Inches	38 Inches	36 Inches	36 Inches
120 Lbs.	100 Lbs.	88 Lbs.	113 Lbs.	93 Lbs.	81 Lbs.	120 Lbs.	100 Lbs.	88 Lbs.	118 Lbs.	98 Lbs.

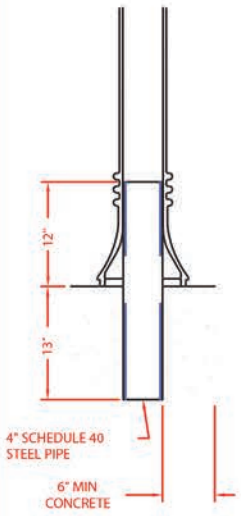
CAT. R-8401-43DC	CAT. R-8402-43DA	CAT. R-8402-43DB	CAT. R-8402-43DC	CAT. R-8403-43DA	CAT. R-8403-43DB	CAT. R-8403-43DC
36 Inches	36 Inches	36 Inches	36 Inches	36 Inches	36 Inches	36 Inches
86 Lbs.	111 Lbs.	91 Lbs.	79 Lbs.	118 Lbs.	98 Lbs.	86 Lbs.

NEENAH CAST IRON BOLLARDS INSTALLATION GUIDE

With multiple installation options our cast iron bollards are built to last and give you the flexibility to make every job as easy as possible. Whether it's new or existing concrete, whatever you need to do, we have the tools and expertise to get it done right.

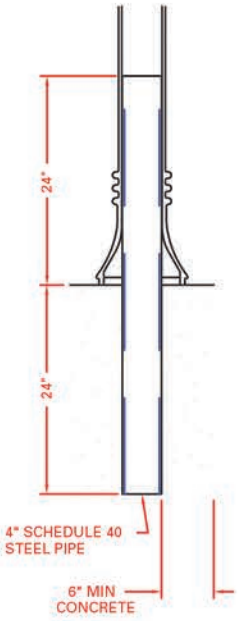
STANDARD EMBEDDED PIPE POST FOR NEW CONCRETE

R-8400-A (standard without light)
R-8400-AL (lighted)



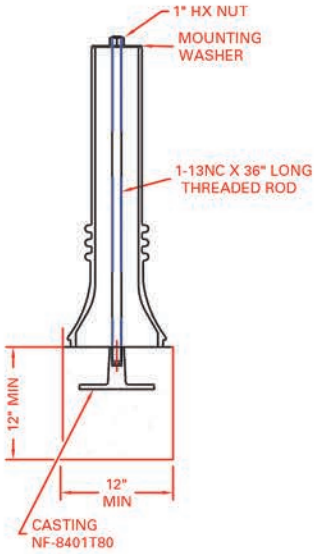
EMBEDDED PIPE POST FOR NEW CONCRETE

R-8400-B (without light)
R-8400-BL (lighted)



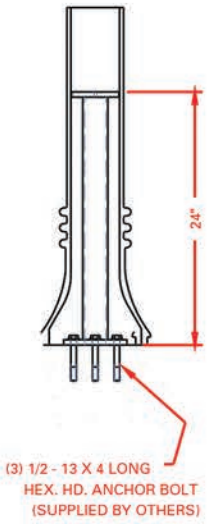
BOLLARD w/ ANCHOR CASTING FOR NEW CONCRETE

R-8400-C

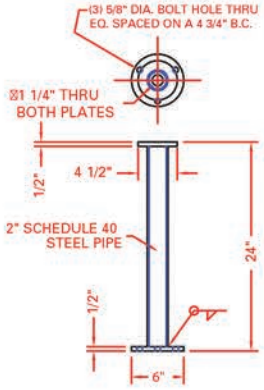


PIPE POST w/ MOUNTING FLANGE FOR EXISTING CONCRETE

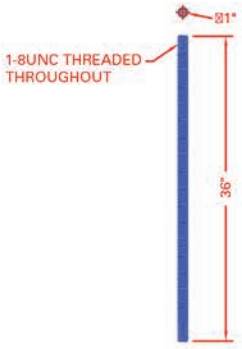
R-8400-D (without light)
R-8400-DL (lighted)



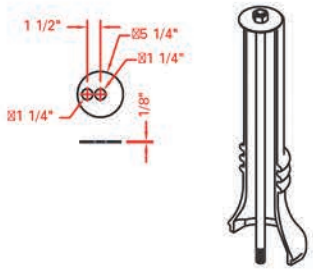
MOUNTING PIPE



THREADED ROD DETAIL



STAMPED STEEL WASHER DETAIL



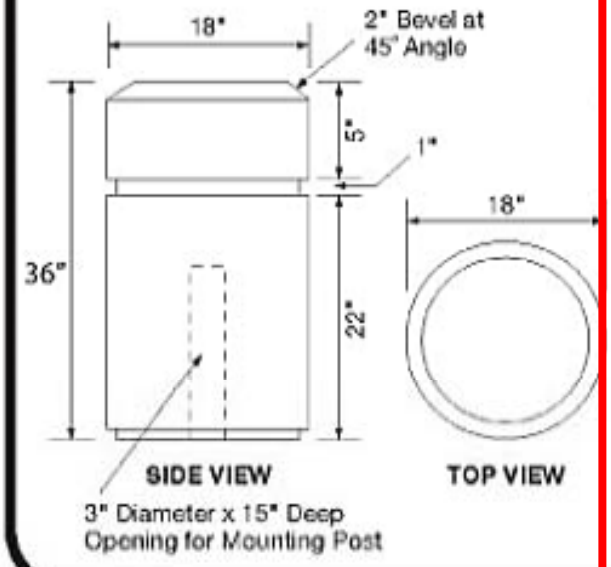
CASTING AMERICA'S BACKBONE

Located in Neenah, WI, Neenah Foundry has been supplying quality castings such as manhole frames, lids and grates for our great nation since 1872. We pour 500 tons of material every day to make thousands of products and create over 900 jobs. It's our painstaking quality control and attention to detail that make Neenah the foundry more industry professionals rely on.

To learn more about what Neenah Foundry can do for you, visit us online at www.neenahfoundry.com

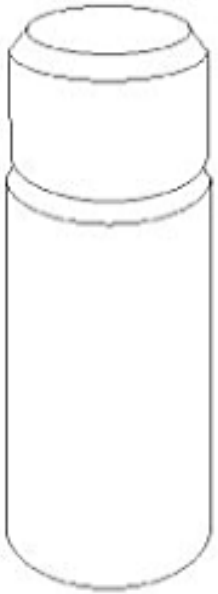
American Eagle Round Concrete 18" x 36" Bollard

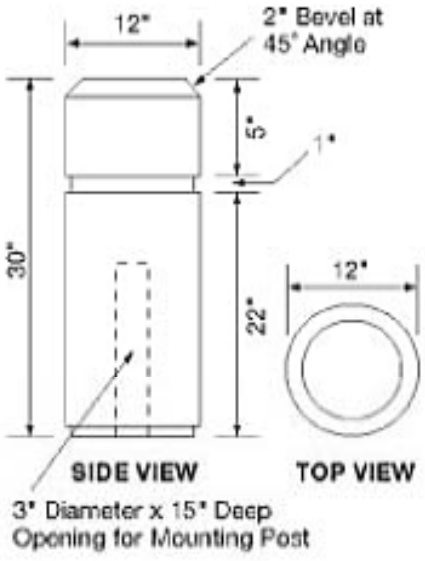
Weight 670 lbs.



American Eagle Round Concrete 12" x 30" Bollard

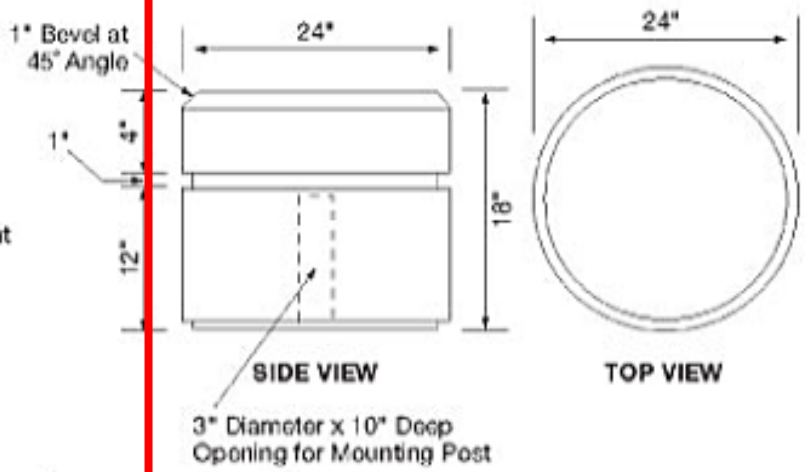
Weight 300 lbs.





American Eagle Round Concrete 24" x 18" Bollard

Weight 700 lbs.



AMERICAN EAGLE PRECAST, LLC

17301 Conant Avenue Detroit, MI 48212-1198
Phone: 313-893-6700 Fax: 313-893-5322
www.americaneagleprecast.com

JOHN DEERE LANDSCAPES GREAT LAKES HYDROSEED MIXTURE (20-12-250)

LOT #L152-13-640

SELL BY 6/14
DATE TESTED 3/13

CONTAINS	PURE SEED	GERM.	ORIGIN
PROTOTYPE PERENNIAL RYEGRASS	39.80%	90.00%	OREGON
ARC KENTUCKY BLUEGRASS	29.10%	85.00%	WASH
BOREAL CREEPING RED FESCUE	14.88%	85.00%	CANADA
BRITTANY CHEWINGS FESCUE	14.84%	85.00%	OREGON
OTHER CROP SEEDS	0.09%		
INERT MATTER	1.28%		
WEED SEEDS	0.01%		

NOXIOUS WEED SEEDS NONE FOUND

NET WT 50 LBS
AMS 635

LESCO
1385 East 36th Street
Cleveland OH 44114

Under the seed laws of several states arbitration is required as a prerequisite to maintaining a legal action against the seller of the seed in any dispute relating to the quality or performance of the seed sold. The purchaser shall file a complaint along with the required filing fee, (where applicable), with the Commissioner or Chief Agricultural Officer within such time as to permit inspection of the crops, plants or trees by the designated agency and the seedsman from whom the seed was purchased. A copy of the complaint shall be sent to the seller by certified or registered mail or as otherwise provided by the statue