

Design and Application Details

Principle of Operation

As shown in the block diagram below, the SMARTLINK™ MRV System synchronously positions 2, 3, or 4 valves with 0.1-degree precision and repeatability. During burner startup, the user's burner management system or flame safety device drives the system to user-commissioned standby, purge, and light-off positions. After burner startup, the user's process (or temperature) controller drives SMARTLINK™ MRV with a 4-20mA firing rate command.

The **Control Interface** stores a 22 point, user-commissioned position profile for each valve and translates the firing rate command into synchronized, digital position commands that are sent to the Valve Actuators over a dedicated communications network.

The **Valve Actuators** perform a high-speed control loop to achieve their position setpoints without overshoot. Valve positions are continuously transmitted digitally by the Valve Actuator over the communications network to the Control Interface for verification of proper valve position. The Control Interface also provides a 4-20mA output signal that represents actual burner firing rate for process monitoring. This 4-20mA output is also used to indicate the actual position of the valve selected during the commissioning process.

The **SMARTLINK™ MRV Control Interface** includes a set of switches and lights to allow the user to perform the following functions:

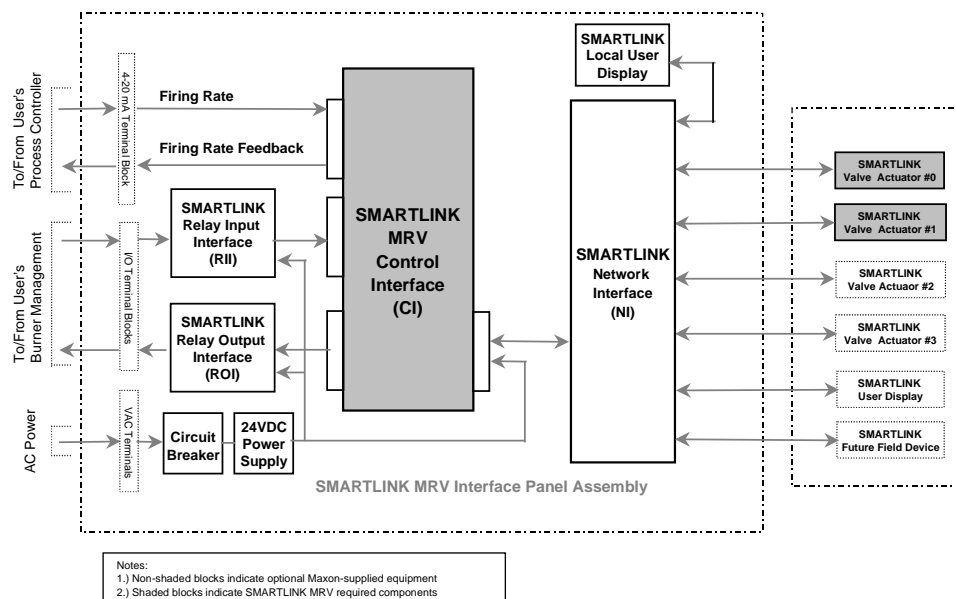
- 1) Customize the position profile and commission each valve for precision burner tuning,

- 2) Display the operating mode of the system and indicate alarm/fault codes,
- 3) Display and change system operating parameters (such as loss of signal operation and valve speed),
- 4) Electronically lock the device to prevent tampering, and
- 5) Locally control burner firing rate in a manual mode.

The **communications network** between the Valve Actuator and the Control Interface is composed of 4 signal wires: 24VDC, Common, Data-A, and Data-B. The Control Interface continuously monitors valve status over the digital network and updates several relay driver outputs. These outputs drive interface relays that indicate when the system is in a light-off, purge, or alarm state. An output (Control Enable) is also provided for the user's combustion system permissive circuit. If a SMARTLINK™ fault condition is detected, such as a stuck valve or corrupted position memory, this output is de-energized and the burner system is turned off.

An **optional User Display** with a 4-line x 20-character LCD is also available to easily commission the system locally or hundreds of feet away near the burner or field instrumentation. The User Display also shows all alarm and fault conditions (as text messages), time stamps the last 6 shutdown events, performs system/valve maintenance functions, stores up to 5 system profiles, and restores the system profile if the Control Interface is replaced.

SMARTLINK™ MICRO-RATIO® Valve (MRV) System Block Diagram



Specifications

SMARTLINK™ MRV System Specifications

(For all Interface Panel configurations with factory-wired relay interface modules and power supply)

Position Accuracy	0.1 degrees
Number of Valves	2, 3, or 4
Valve Commissioning Profile	22 field-adjustable positions for each valve including standby, purge and light-off
Firing Rate Command	4-20mA isolated input; 4.8V burden @ 20mA
Firing Rate Feedback	0-20mA isolated output 400 ohm max load
Power	120-230 VAC universal power supply; provides 24VDC output to all system components 2 Valve System: 610W max 3 Valve System: 90W max 4 Valve System: 118W max
Low to High Fire Modulation Speed	20, 40, or 60 seconds (user selectable)
Temperature Range (Ambient)	All components except user display: -40°F to 158°F (-40°C to 70°C)
Approvals	FM Class 1, Division 2: Groups A,B,C,D, T4 (when provided with specialized NEMA 4X enclosures)
Relay Outputs	Form A (N.O.), Dry Contacts Contact Ratings: 250VAC/DC @ 12 Amps
Relay Inputs	120VAC, 230VAC, or 24VDC solid-state

SMARTLINK™ MRV Component Specifications

Control Interface	
Power Input	24VDC, 0.1 Amps
Firing Rate Command	4-20mA isolated input; 4.8V burden @ 20mA
Spare Current Input	4-20mA isolated input; 4.8V burden @ 20mA
Firing Rate Feedback	4-20mA isolated output; 400 ohm max load
Relay Driver Outputs	Open collector, 30VDC & 100mA (max)
Digital Inputs	5-24VDC @ 10mA (max)
Enclosure	1"W x 4.65"H x 3.85"D plastic enclosure Universal DIN rail-mounted
Wiring Terminals	Keyed, plug-type screw terminals Terminals accept 14-24 gauge wire
Enclosure	1" W x 4.65"H x 3.85"D DIN rail-mounted
Relay Output Interface	
Electromechanical Output Relays (6)	Dry Contacts: Form A (normally-open) Max Contact Voltage: 250 VAC/DC Max Contact Current: 12 A (continuous)
Enclosure	1" W x 4.65"H x 3.85"D DIN rail-mounted
Relay Input Interface	
Solid State Input Relays (6)	Input On-State Voltage: 120VAC, 230VAC, or 24VDC depending on model Input On-State Current: 25mA Input Off-State Leakage Current: 4mA (max)
Enclosure	1" W x 4.65"H x 3.85"D DIN rail-mounted
Network Interface	
Network Input Connection (1)	24VDC field device power & common Data communication (polarity insensitive)
Network Output Connections (7)	24VDC field device power & common Data communication (polarity insensitive)
Enclosure	1" W x 4.65"H x 3.85"D DIN rail-mounted
User Display	
Power input	24VDC, 0.13 Amps
Display	4 line x 20 character, back-lit, LCD display
Temperature Range (Ambient)	-20°F to 122°F (-29°C to 50°C)
Enclosure	5.5"H x 4.25"W x 1.75"D DIN rail-mounted
Universal Power Supply	
Power Input	120-230 VAC
Power Output	24VDC, 6 Amps (max)
Enclosure	5.0"H x 2.12"W x 5.0"D DIN rail-mounted
Valve-Actuator Assembly	
Power Input	24VDC, 25W max
Maximum Travel Time	14 seconds (open to close)
Enclosure (Actuator)	7.69"H x 4.4"W x 4.4"D NEMA 4X



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Valve Body Capacities

Valve Body Performance Table - 1" thru 4"

Size	Maximum Cv Rating	Minimum Controllable Cv Rating	Maximum Inlet Pressure (psig)	Maximum Body Pressure (psig)	Maximum Fluid Temperature (see note 1)	
					Iron & Steel (°F)	Brass (°F)
1"	27	.50	100	100	250	400
1.25"	70	.60	100	100	250	400
1.5"	105	.70	100	100	250	400
2"	190	1.30	100	100	250	400
2.5"	260	2.40	90	100	250	400
3"	360	3.00	60	100	250	400
4"	750	5.00	30	100	250	---

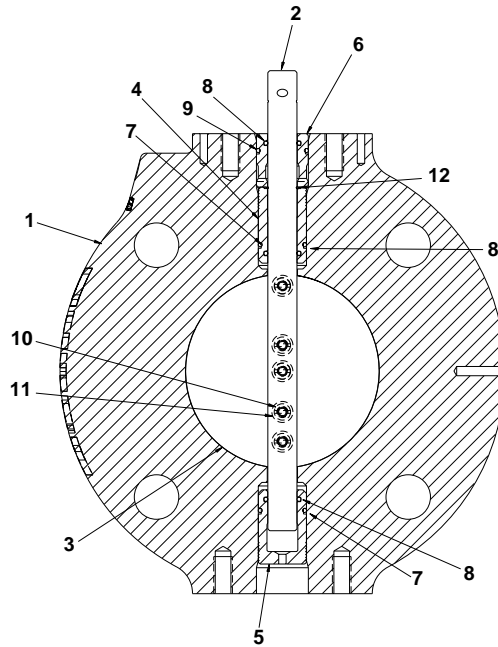
Note 1: Temperatures listed depict limitations of valve body components only. If fluid temperature is greater than 158°F, contact Maxon when applying SMARTLINK™ Actuator to valve body assembly.

Valve Body Performance Table - 6" thru 16"

Size	Maximum Cv Rating	Minimum Controllable Cv Rating	Maximum Inlet Pressure (psig)	Maximum Body Pressure (psig)	Maximum Fluid Temperature (°F) (see note 1)
6"	1425	12.5	5	100	250
8"	2500	22	5	100	250
10"	4500	35	5	100	250
12"	6400	50	5	100	250
14"	8800	67	5	100	250
16"	11700	88	5	100	250

Note 1: Temperatures listed depict limitations of valve body components only. If fluid temperature is greater than 158°F, contact Maxon when applying SMARTLINK™ Actuator to valve body assembly.

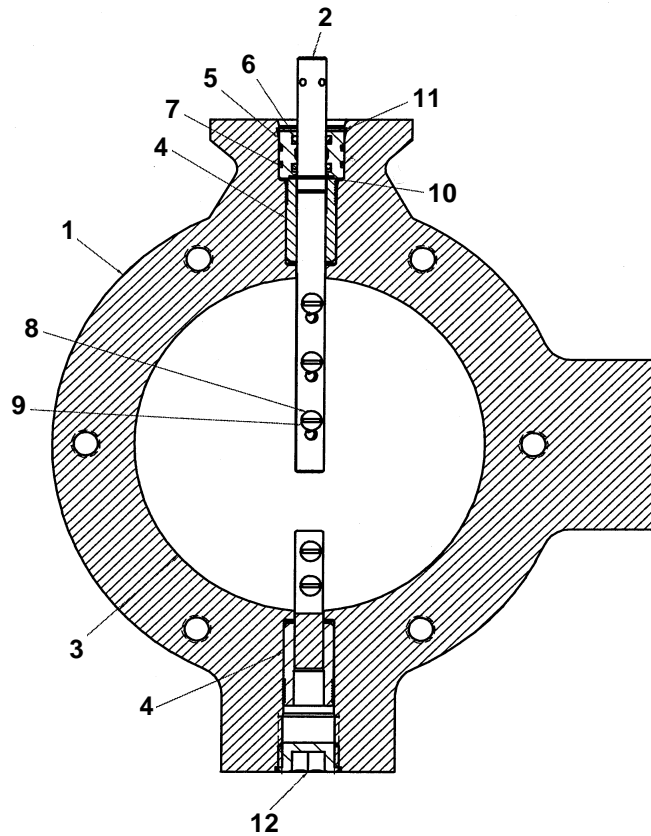
Valve Body Specifications



Valve Body Material Specifications - 1" thru 4"

Item No.	Description	Valve Body Assembly		
		GP Flat Faced	GP Raised Faced	Oxy Flat Faced
1	Valve Body	Gray Iron ASTM A157 GR, G3000	Carbon Steel ASTM A216 GR, WCB	Brass ASTM B62 UNS No. C83600
2	Valve Stem	303 Stainless Steel - ASTM A157 GR, G3000		
3	Butterfly Disc	304 Stainless Steel - ASTM A240 Type 304 UNS No. S30400		
4	Top Bushing	Bronze - ASTM B271, B505 and B584 UNS No. C93200		
5	Bottom Bushing			
6	Top Shim Bushing			
7	O-Ring	Buna-N		Viton
8	O-Ring			
9	O-Ring			
10	Screw	18-8 Stainless Steel		
11	Washer	304 Stainless Steel		
12	Retaining Ring	316 Stainless Steel		

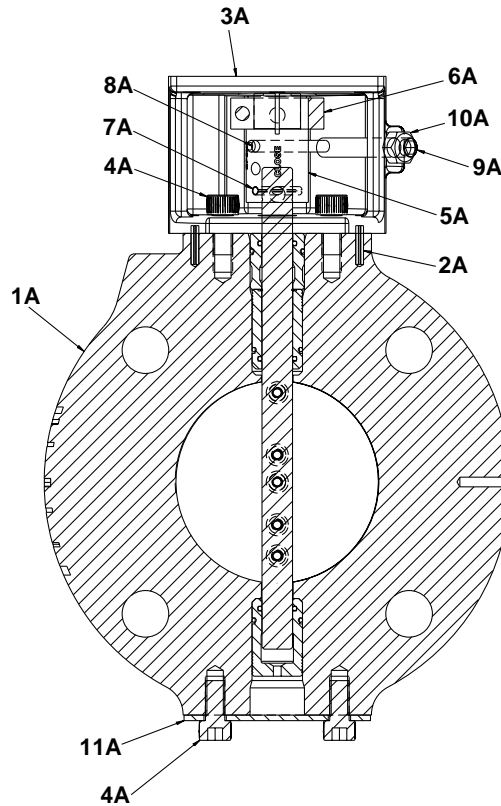
Valve Body Specifications



Valve Body Material Specifications - 6" thru 16"

Item No.	Description	Valve Size	
		6" & 8"	10" - 16"
1	Valve Body	Gray Iron - ASTM A157 GR, G3000	
2	Valve Stem	316 Stainless Steel - ASTM A276	
3	Butterfly Disc	304 Stainless Steel - ASTM A167 UNS No. S30400	Carbon Steel - ASTM A108 UNS No. G10180
4	Top & Bottom Bushing	Bronze - ASTM B271, B505 and B584 UNS No. C93200	
5	Shim Bushing		
6	O-Ring	Buna-N	
7	O-Ring		
8	Screw	304 Stainless Steel	Zinc Plated Carbon Steel
9	Hex Nut	316 Stainless Steel	Zinc Plated Carbon Steel
10	Retaining Ring	Carbon Steel - SAE 1060-1090 UNS No. G10600-G10900	
11	Retaining Ring		
12	Pipe Plug	Alloy Steel - ASTM A322 UNS G40370	

Capacities and Specifications



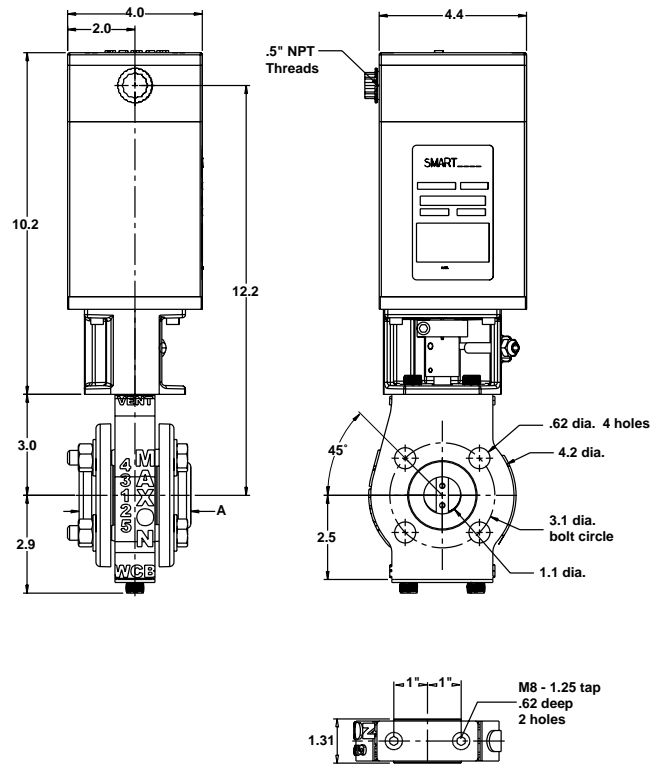
SMARTLINK Valve Body Assembly Material Specifications

Item No.	Description	SMARTLINK Component Material Specifications
1A	Valve Body Sub-assembly	Assembly per pages 7406 & 7407
2A	Locating Spring Pin	Zinc Plated Carbon Steel
3A	Adapter Bracket	ASTM B179 T6 Aluminum
4A †	Socket Head Cap Screw	Zinc Plated Carbon Steel
5A	Coupling	ASTM A582 Type 303 Stainless Steel
6A	Locking Collar	18-8 Type 303 Stainless Steel
7A	Spring Pin	Zinc Plated Carbon Steel
8A	Dowel Pin	303 Stainless Steel
9A	Hard Stop Screw	18-8 Stainless Steel
10A	Hard Stop Nut	Stainless Steel
11A †	Cover Plate	Aluminum

† - These items used only on sizes 1" thru 4"

Dimensions (in inches)

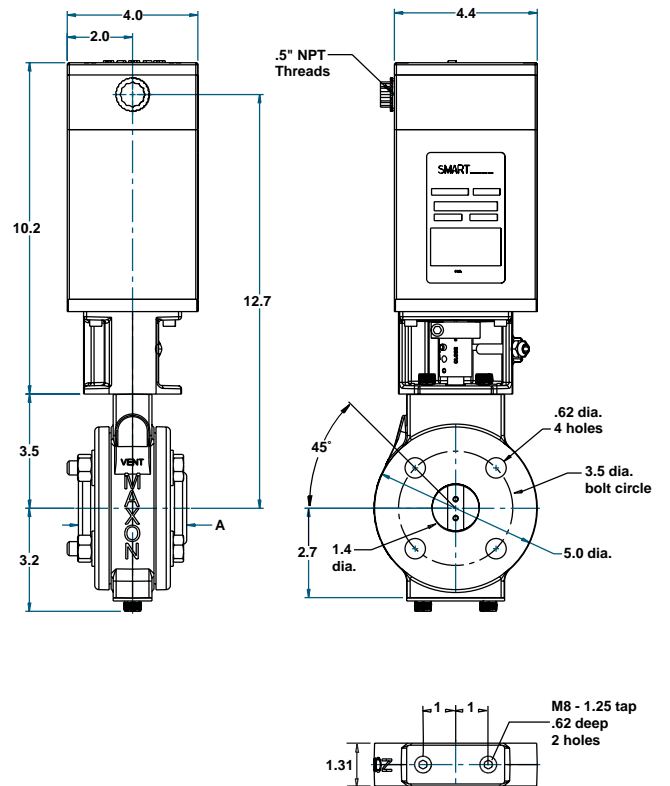
1" SMARTLINK™ Valve Actuator



Flange Dimension "A"

Iron	Threaded	2.87
Steel	Threaded	3.15
	Socket Welded	2.84
Brass	Threaded	2.81
	Solder Cup	3.51

1.25" SMARTLINK™ Valve Actuator

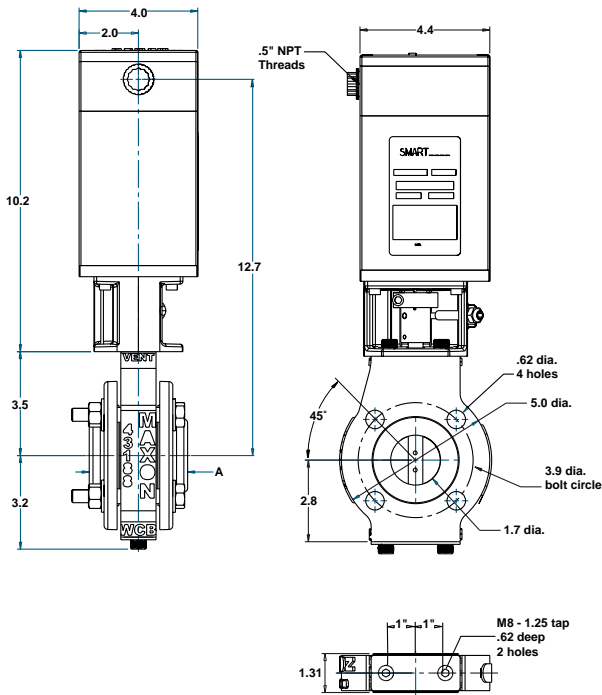


Flange Dimension "A"

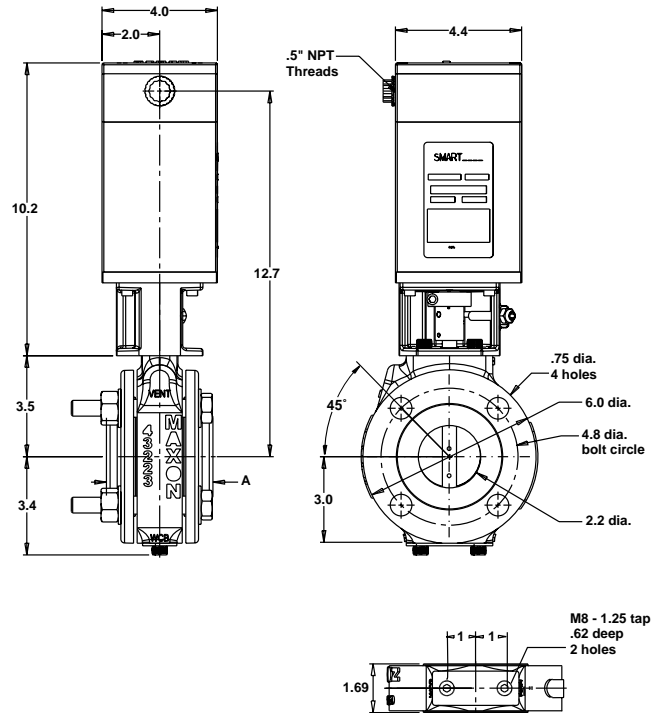
Iron	Threaded	3.05
Steel	Threaded	3.12
	Socket Welded	3.05
Brass	Threaded	3.05
	Solder Cup	3.63

Dimensions (in inches)

1.5" SMARTLINK™ Valve Actuator



2" SMARTLINK™ Valve Actuator



Flange Dimension "A"

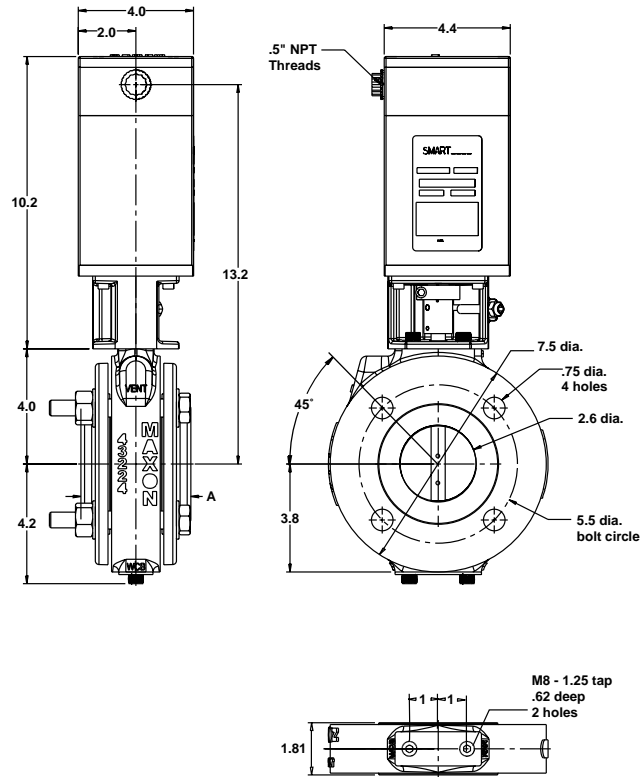
Iron	Threaded	3.27
Steel	Threaded	3.23
	Socket Welded	3.24
Brass	Threaded	3.15
	Solder Cup	3.88

Flange Dimension "A"

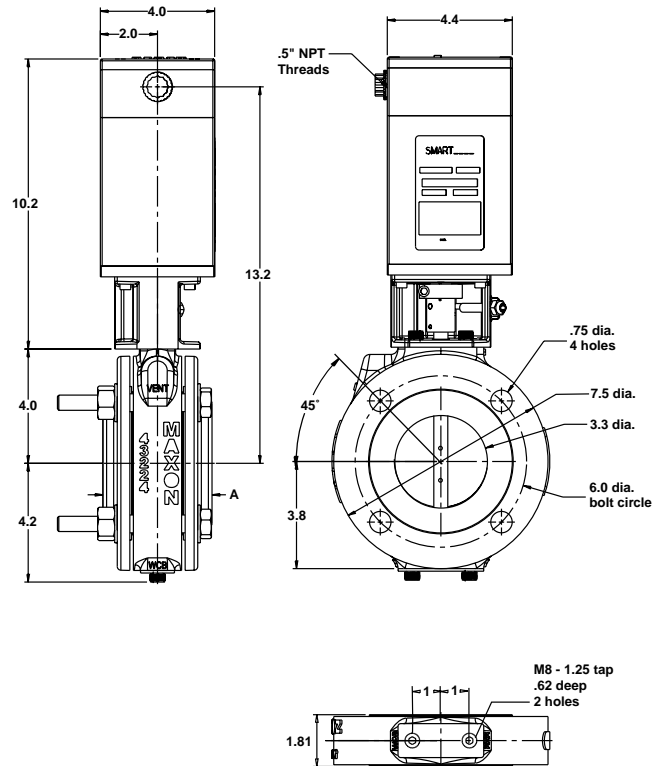
Iron	Threaded	3.43
Steel	Threaded	3.56
	Socket Welded	3.51
Brass	Threaded	3.72
	Solder Cup	4.62

Dimensions (in inches)

2.5" SMARTLINK™ Valve Actuator



3" SMARTLINK™ Valve Actuator



Flange Dimension "A"

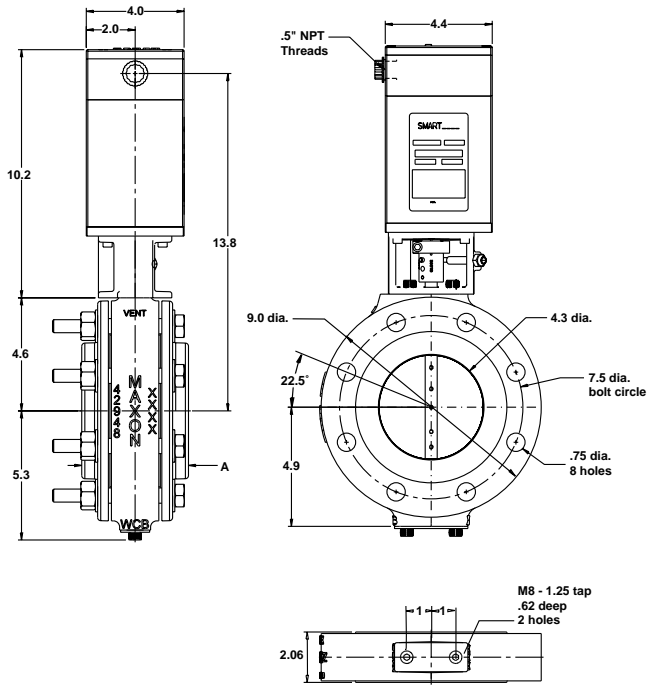
Iron	Threaded	3.72
	Socket Welded	3.79
Steel	Threaded	3.67
	Socket Welded	3.79
Brass	Threaded	3.80
	Solder Cup	5.27

Flange Dimension "A"

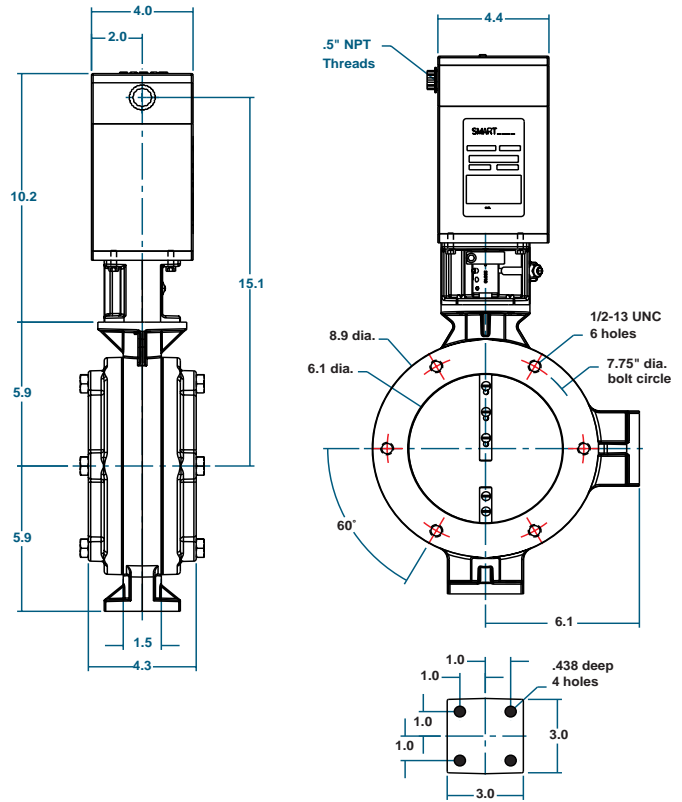
Iron	Threaded	3.83
	Socket Welded	4.03
Steel	Threaded	4.13
	Socket Welded	4.03
Brass	Threaded	4.02
	Solder Cup	5.09

Dimensions (in inches)

4" SMARTLINK™ Valve Actuator



6" SMARTLINK™ Valve Actuator

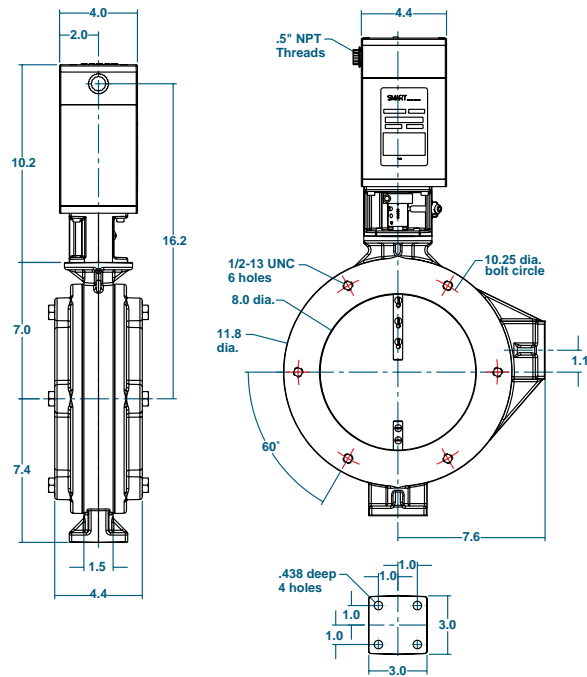


Flange Dimension "A"

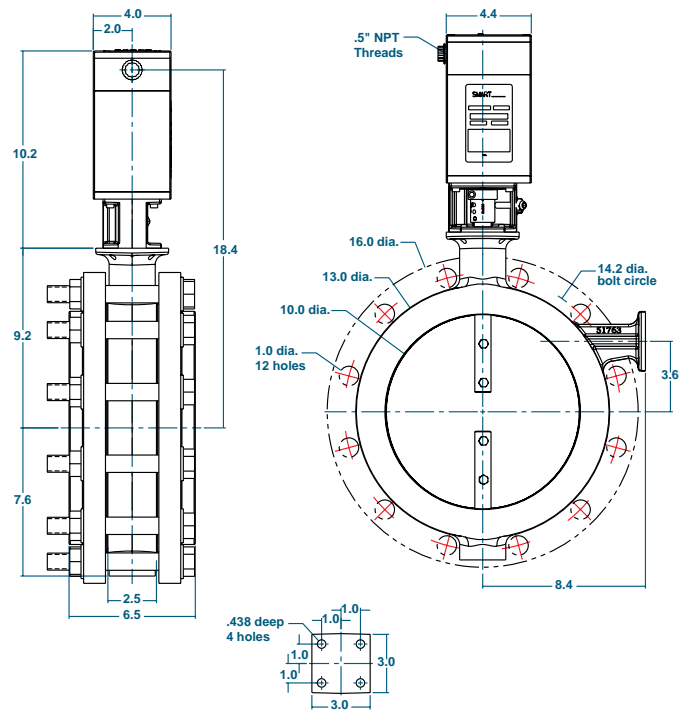
Iron	Threaded	4.13
Steel	Threaded	4.06
	Socket Welded	4.06

Dimensions (in inches)

8" SMARTLINK™ Valve Actuator



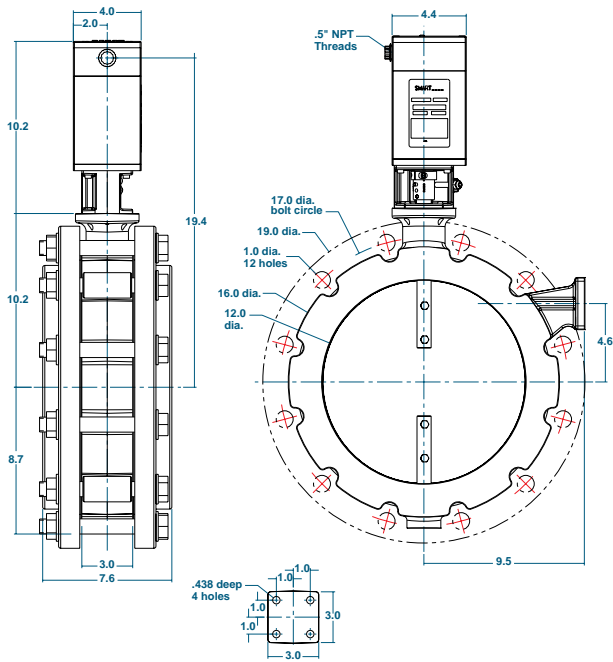
10" SMARTLINK™ Valve Actuator



Note: Flanges are shipped loose.

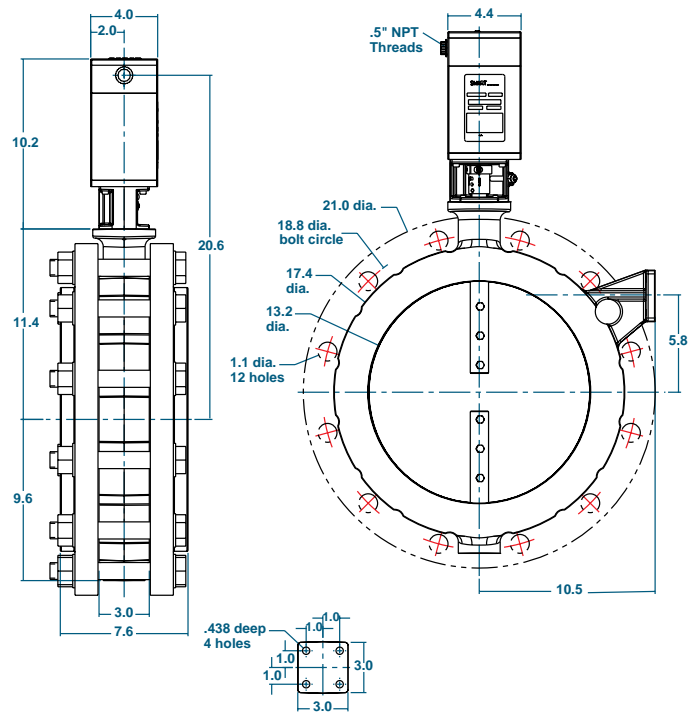
Dimensions (in inches)

12" SMARTLINK™ Valve Actuator



Note: Flanges are shipped loose.

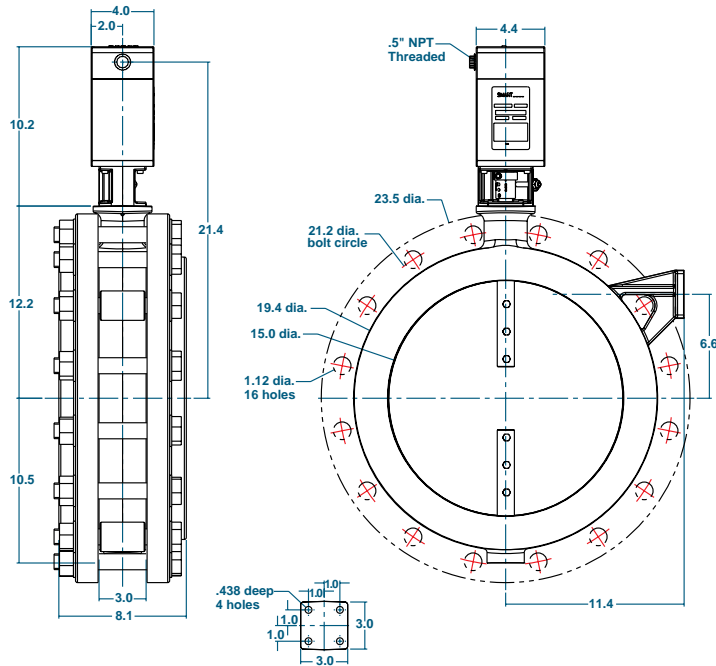
14" SMARTLINK™ Valve Actuator



Note: Flanges are shipped loose.

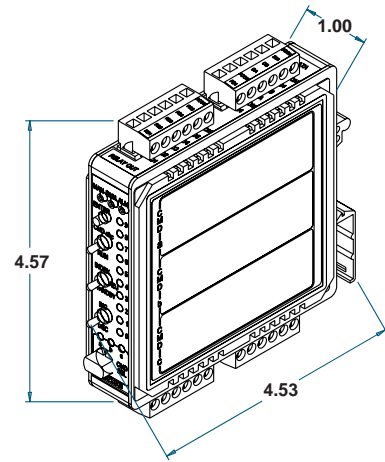
Dimensions (in inches)

16" SMARTLINK™ Valve Actuator



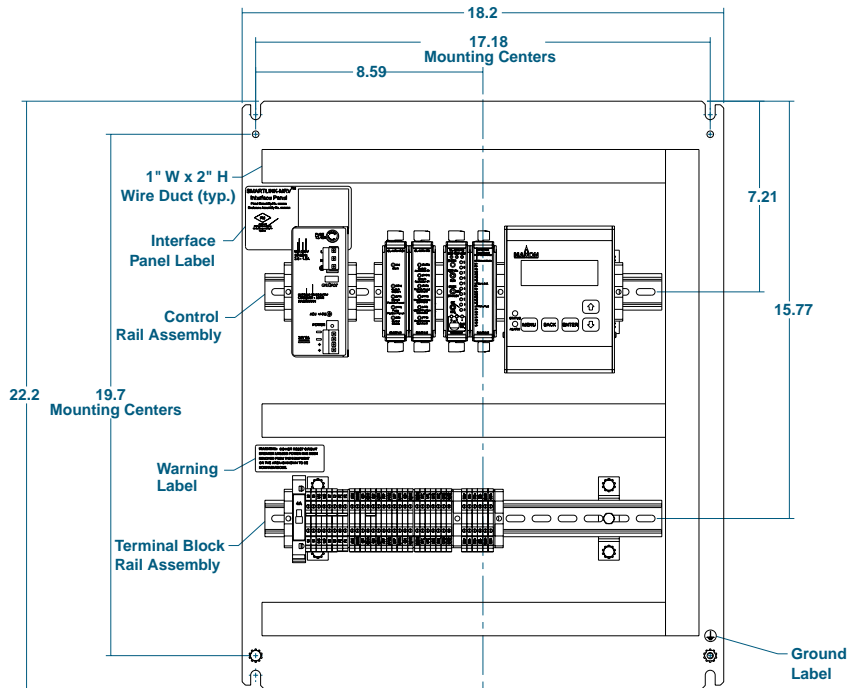
Note: Flanges are shipped loose.

Control Interface



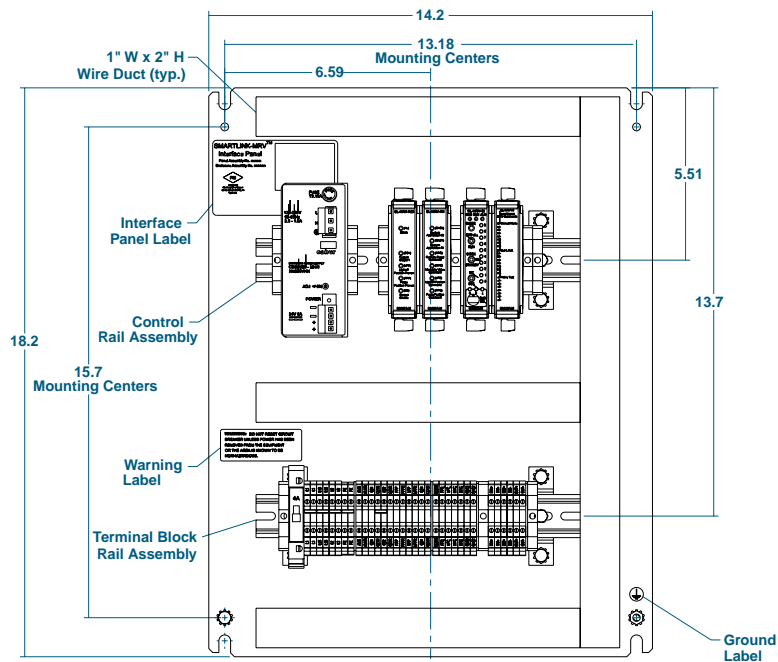
Dimensions (in inches)

24 x 20" SMARTLINK™ MRV Interface Panel (without enclosure)



NOTE: Maximum Options Shown

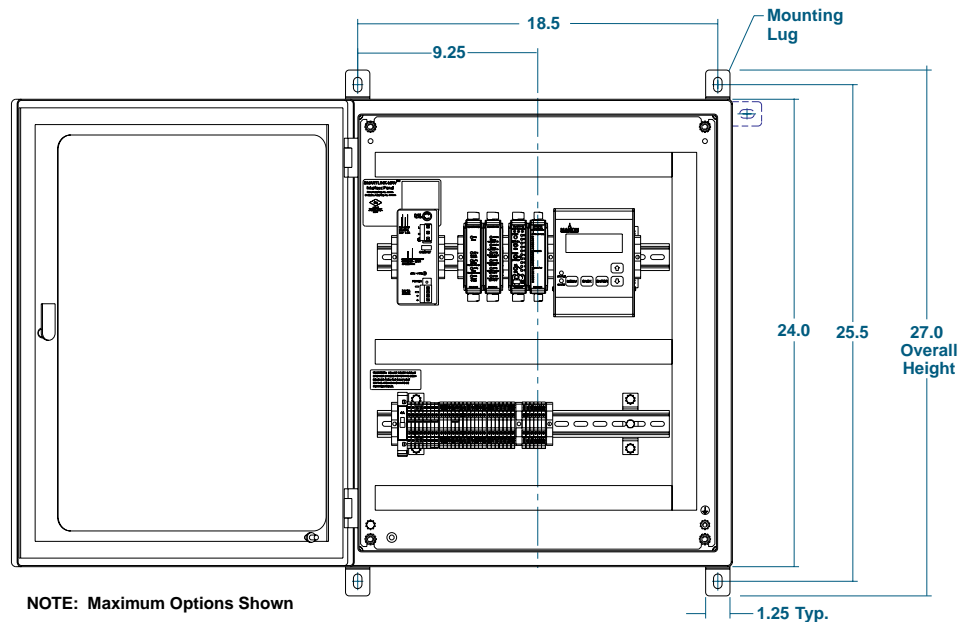
20 x 16" SMARTLINK™ MRV Interface Panel (without enclosure)



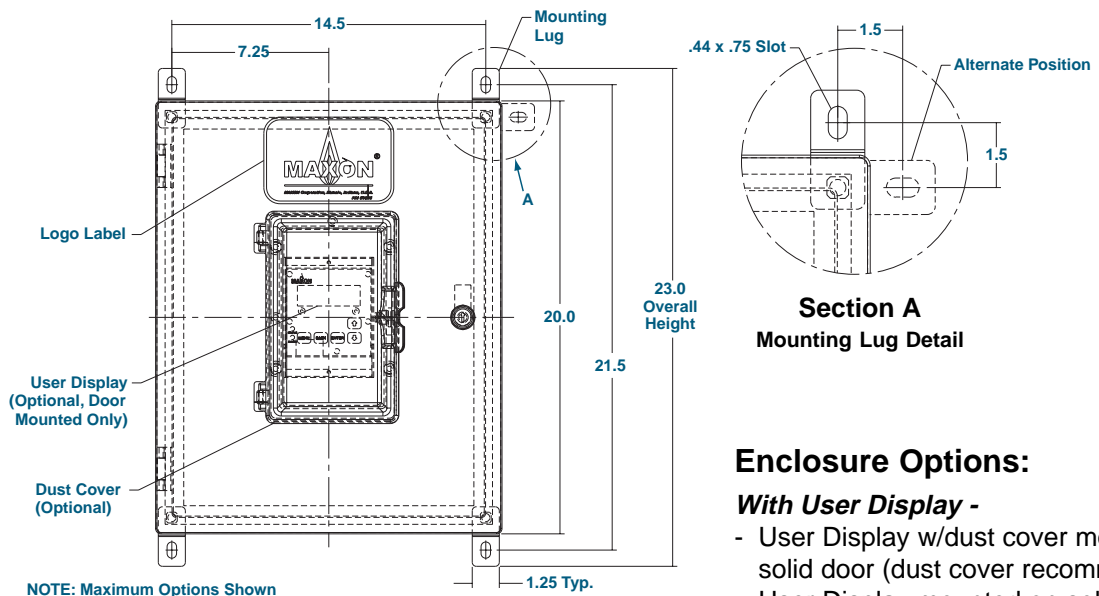
NOTE: Maximum Options Shown

Dimensions (in inches)

24 x 20" SMARTLINK™ MRV Interface Panel (with enclosure)



20 X 16" SMARTLINK™ MRV Interface Panel (with enclosure)



Enclosure Options:

With User Display -

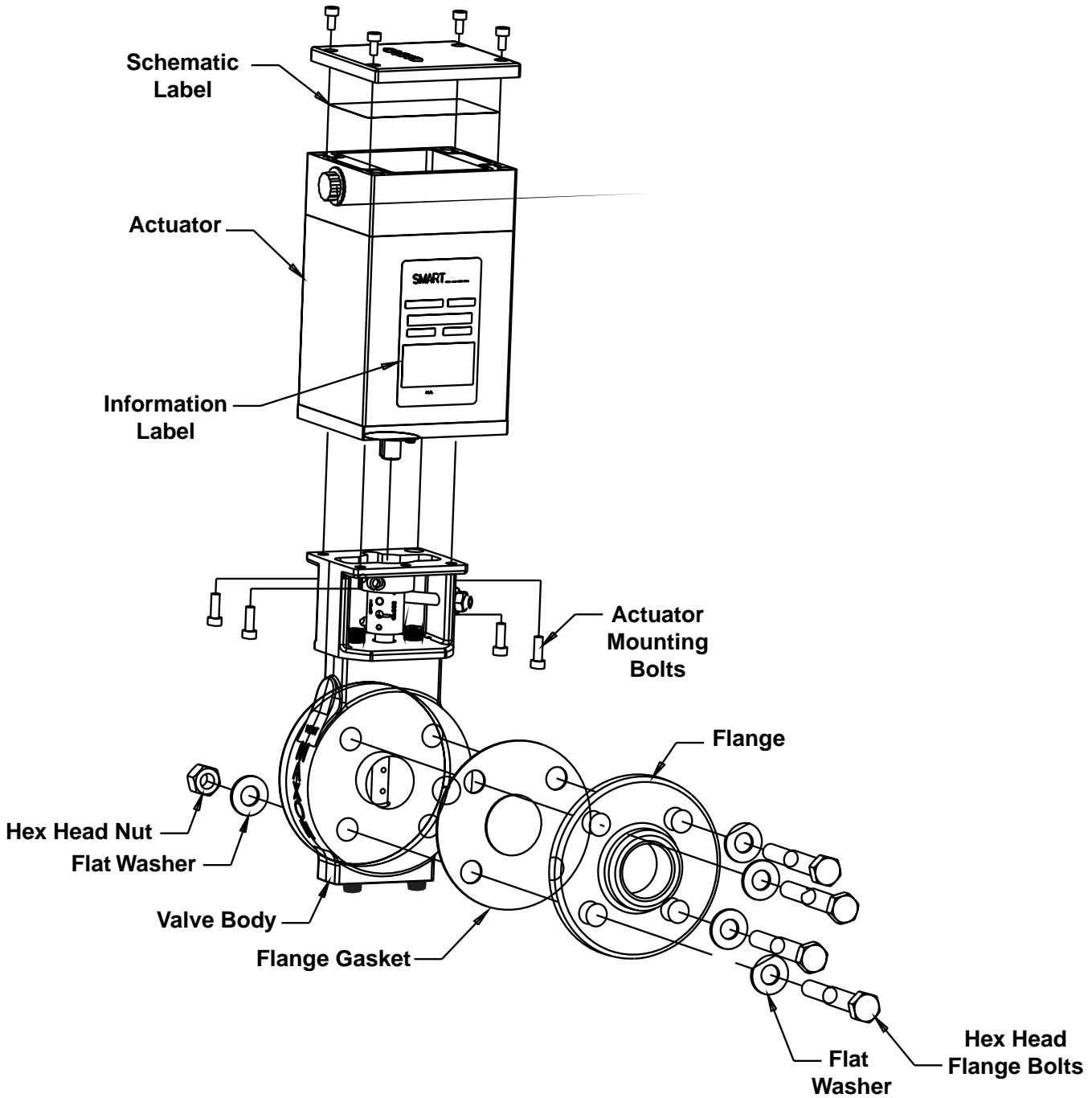
- User Display w/dust cover mounted on solid door (dust cover recommended)
- User Display mounted on solid door without dust cover

Without User Display -

- Window in door
- Solid door

Component Identification

Valve Body & Actuator



Contact Esys for more information about this product:
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