

# ValvePoint®

valve communication and control



connecting the process

# Connecting the process. StoneL.

Our focus is to enable process users to cut costs and improve operating performance by adopting proven, field based communication technologies. As a result, StoneL has become the leading supplier of both valve communication and control with ValvePoint and process networking solutions with FieldLink.

StoneL's FieldLink program enables you to link your automated valves and plant instruments into your process control architecture. The ValvePoint program offers a broad array of communication and monitoring products that enable discrete automated valves to think and communicate.

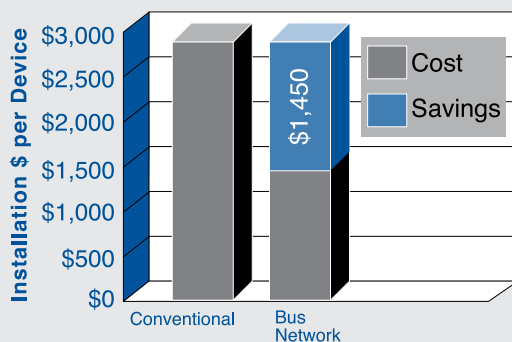
We are committed to offering exceptional value with premium quality products that operate reliably and consistently in extreme hazardous process environments. In order to support that commitment, StoneL has implemented ISO 9001 quality standards and has received product certifications to comply with rigorous international hazard protection standards.

To complete our value proposition, StoneL has established competent distribution channels around the globe to assist you in applying and supporting our products. Whether your plant is located in France, Indonesia or Indiana, StoneL has a representative to provide the support you need to connect your process.

**ValvePoint**<sup>®</sup>  
valve communication and control



StoneL delivers field based communication technology with FieldLink process networking components and ValvePoint valve communication and control products.



By adopting standardized communication networking systems from StoneL, users typically save over 30% compared to conventionally wired systems.



Contact a distributor near you for application assistance by directing your browser to [www.stonel.com](http://www.stonel.com)



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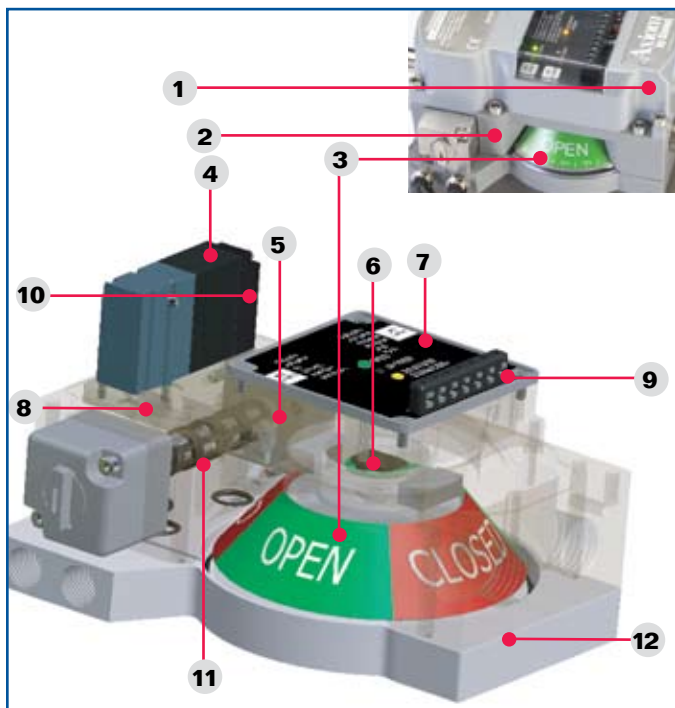
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39	<b>5</b>	Standard	4 to 20mA @ 10 to 40VDC Standard analog feedback with no mechanical vibration
39	<b>7</b>	High Performance	4 to 20mA @ 10 to 40VDC Long life analog feedback with high vibration

The Axiom is a discrete valve communication and control device for quarter-turn automated valves (patent pending.) Its advanced position sensor offers reliable long-life performance with push-button settings that may be made quickly and conveniently.

The integral pneumatic pilot valve offers contemporary features which further enhance the operating performance of your automated valve system. And, the Axiom's rugged construction will withstand your most challenging plant environments.



**1. The Axiom is corrosion proof, temporarily submersible and suitable for use in Hazardous areas.** Designed for NEMA 4, 4X & 6; (IP67) Class I & II Div 2 Nonincendive (Ex nA, Zone 2) and Class I & II Div 1 and 2 (Ex ia, Zones 0,1, & 2) Intrinsically Safe.

**2. High strength durable enclosure and pneumatic manifold** are constructed of anodized aluminum and epoxy coated. Impact resistant cover is made of high strength Lexan polycarbonate. All fasteners are stainless steel.

**3. High visibility mechanical and electronic indication** confirm OPEN/CLOSED position and solenoid status for greater safety and convenience.

**4. Universal burn out proof solenoid** operates on less than 0.6 watts of power and standard version will accept either 24VDC or 120VAC, reducing stocking requirements.

**5. Electronic sensing, switching and communication components are sealed** and potted inside function module to protect against residual moisture, vibration and corrosives.

**6. High accuracy position sensor system** is solid state with no moving wear points for highly reliable and precise position feedback.

**7. Push button set points** for Open & Closed accurately lock in position settings. Settings remain locked in when power is removed and reapplied.

**8. Integral pneumatic valve** operates on standard plant air and will cycle most actuators in less than 2 seconds.

**9. Wiring and maintenance access is quick** and convenient for easy set-up and installation.

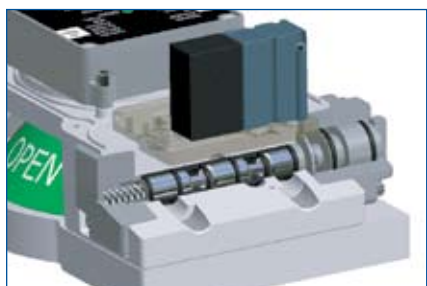
**10. Internal manual pneumatic valve override** is standard enabling local automated valve operation.

**11. Standard five way, two position valve** operates both double and single-acting actuators and features a re-breather to feed instrument air into spring side of actuator to keep out corrosives.

**12. Axiom directly attaches to VDI/VDE 3845 (Namur) sizes 1 & 2** actuator accessory patterns and may be readily adapted for other actuator applications.

# Pneumatic Control

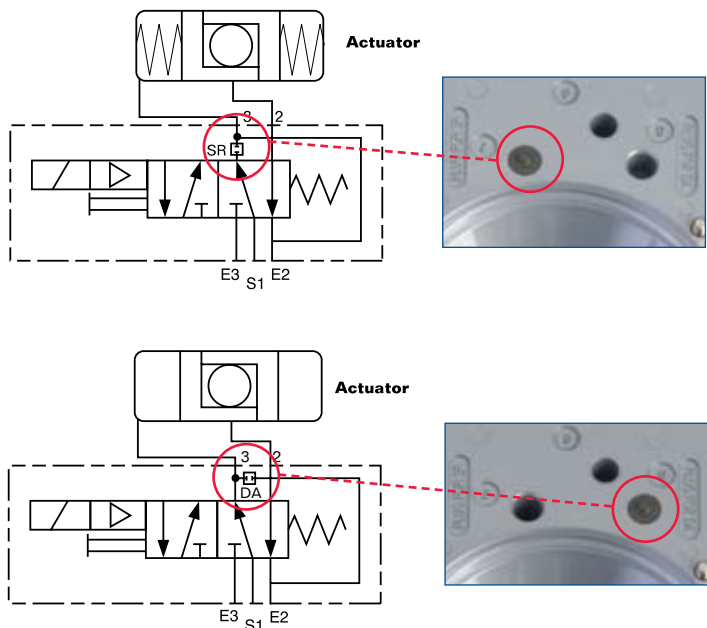
The Axiom's pneumatic valve system consists of a low power pilot that drives the main high flow spool valve. Pilots may be selected for conventional, intrinsically safe or bus networking applications. Both stages of the pneumatic valve system have been designed for long life, high tolerance to air line contaminants and ease of maintenance should components become fouled.



## Special Features

- Pilot poppet and main spool design offer long life, exceptional tolerance to dirty air and tight shut-off.
- Spool and pilot valve may be conveniently removed and cleaned should large contaminants become lodged in the valve.
- Universal solenoid may be used for standard AC or DC applications.
- 5-way, 2 position spring return configuration may be used for either single or double-acting actuators. Dual coil shuttle piston versions are also available for fail in last position.
- Low power consumption of solenoid reduces current flow on bus networks enabling more units and longer distances on a single segment.
- Rebreather channels exhausted air from pressurized side of actuator into spring side preventing ingestion of contaminated air from the environment that may corrode springs or actuator internals.
- Standard internal manual override enables convenient setup.

## Spring Return Actuator



## Pneumatic Valve Specifications

Valve Design	Pilot operated spool valve
Pilot Operator Options	Solenoid Coil or Piezo <sup>1</sup>
Configuration	
Single Pilot	5-way, 2 position spring return
Dual Pilot	Shuttle piston, 5-way, 2 position
Flow Rating	0.75 Cv (Kv=0.64 based on flow unit m <sup>3</sup> /h)
Porting	1/4" NPT
Operating Pressure	40 to 120 psi (2.7 to 7.5 bar)
Filtration Requirements	40 micron (Piezo, 30 micron)
Operating Temperature <sup>2</sup>	See pilot specifications below
Operating Life	1 million cycles
Manual Override	Internal momentary
Material of Construction	
Spool	Nickel Plated Aluminum
Body	Epoxy coated anodized aluminum
O-Ring Spacers	Polysulphone
End Caps & Fasteners	Stainless Steel
O-Rings	Nitrile Compound

### Piezo Pilot<sup>1</sup>

Filtration Requirements	Dried/30 micron
Operating Temperature	-10° to 60° C (14° to 140° F)
DC Power	2 mA @ 6.5 VDC

### Solenoid Pilot<sup>2</sup>

Electrical Ratings	
H option	0.6 watt @ 22 VDC min., up to 130 VAC max.
E (I.S.) option	0.5 watt
Operating Voltage Range	12-15 VDC
D option	0.5 watt @ 24 VDC
B option	1.8 watt @ 24 VDC
AC Current Consumption	18 mA (1H or 2H)
Operating Temperature <sup>2</sup>	-20° to 65° C (-4° to 150° F) <sup>2</sup>
IS Entity Parameters	U <sub>i</sub> = 28 VDC
	l <sub>i</sub> = 120 mA
	C <sub>i</sub> = 0
	L <sub>i</sub> = 0
	P <sub>i</sub> = 1.0 watt

1 Piezo used for bus powered Foundation Fieldbus applications only.  
 2 Extended temperature option (-40° to 80°C) available. Specify -T at end of model number.

Dual pilot options may be selected for special applications such as shuttle piston for fail in last position. External manual override options are also readily available. For special valve configurations with non-standard manual override features please consult StoneL.



## Sensing & Communication Module

### Open and Closed Settings

Switches correspond to a particular valve position and are set using the push button panel on the module's sealed membrane pad. Simply operate the actuator to the open position (using standard internal manual override) and push the "Set Open" button. Operate the actuator to the closed position and push the "Set Closed" button. Position settings remain locked in when power is removed and reapplied. (See pages 28 to 37 for more information.)



### DeviceNet VCT (92)

Configuration	(2) Discrete Inputs (Open & Closed) (1) 4-20 mA Auxiliary Input (2) Discrete Outputs (Drive Solenoids) <sup>5</sup>
Other Features	Stores number of actuations Stores date of last service Predetermined output fail state

### FOUNDATION Fieldbus VCT, Bus Powered (93)

Configuration	(2) Discrete Inputs (Open & Closed) (2) Discrete Outputs (Drive Piezo) <sup>3</sup>
Current Input	16 mA quiescent
Voltage Range	9 to 32 VDC
Other Features	Stores number of actuations Stores date of last service Predetermined output fail state

### FOUNDATION Fieldbus VCT, Bus Powered (94)

Configuration	(2) Discrete Inputs (Open & Closed) (2) Externally Powered Discrete Outputs (Drive Solenoids) <sup>5</sup>
Signal Current Input	16 mA quiescent
Signal Voltage Range	9 to 32 VDC
External Voltage Input	24 VDC
External Current Input	Solenoid dependent
Other Features	Stores number of actuations Stores date of last service Predetermined output fail state

### Modbus VCT (95)

Configuration	(2) Discrete Inputs (Open & Closed) (1) 4-20 mA Auxiliary Input (2) Discrete Outputs (Drive Solenoids) <sup>5</sup>
External Voltage	24 VDC
Devices per Network	32
Other Features	Predetermined output fail state

1. Specify Solenoid Option "\_ H"  
2. Specify IS Solenoid Option "\_ E"

3. Specify Piezo Option "\_ A"  
4. Specify Solenoid Option "\_ D"  
5. Specify Solenoid Option "\_ B"



### SST Switching Sensors (33)

Configuration	(2) Two wire solid state Switching outputs (1) or (2) Solenoid Power Input(s) <sup>1</sup>
Output	Normally Open (SPST)
Maximum Current	
Inrush	2.0 Amps
Continuous	0.25 Amps
Min. On Current	2.0 mA
Max. Leakage Current	0.5 mA
Voltage Range	20 to 125VDC/125VAC
Max. Voltage Drop	7.0 Volts @ 100 mA
Short Circuit	Protected from Direct Application of up to 125 VDC/VAC

### Namur Sensors (44)

Configuration	(2) Namur Outputs (1) or (2) Solenoid Power Input(s) <sup>2</sup>
Output	Conforms to DIN 19234
Current Ratings	Target On I < 1.0 mA Target Off I > 2.1 mA
Voltage Range	7 to 24 VDC

### AS-Interface VCT (96)

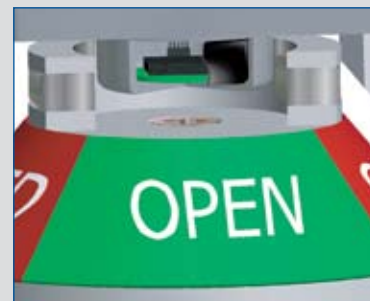
Configuration	(2) Discrete Inputs (Open & Closed) (2) Auxiliary Discrete Inputs (2) Discrete Outputs (Drive Solenoids) <sup>4,5</sup>
AS-I Version	2.1
Input Voltage	26.5 to 31 VDC
Devices per Network	31

### AS-Interface VCT (97) with Extended Addressing

Configuration	(2) Discrete Inputs (Open & Closed) (2) Auxiliary Discrete Inputs (1) Discrete Output (Drive Solenoid) <sup>4</sup>
AS-I Version	2.1
Input Voltage	26.5 to 31 VDC
Devices per Network	62

### Position Sensor System

The Axiom utilizes a magnetic resistive (Mag Res) sensor system that monitors exact valve position. The Mag Res sensor system is also tolerant of lateral and vertical shaft movement which may be experienced in high cycle worn actuators without affecting rotational measurement. No cams, shafts and other mechanical apparatus are required that are prone to wear and binding.





# Diagnostic Systems

**Reduce plant down time and cut maintenance costs with AS-Interface diagnostics.**

The AMI96 model features optional on-board diagnostic systems which may predict potential automated valve malfunctions. As a result, plant down time may be reduced by repairing discrete automated valves which, when called upon to operate, would have failed to do so. And, should problems occur during normal operation, maintenance personnel will be aided in rapidly locating failure causes thus reducing maintenance time and speeding valve repair and operation renewal.

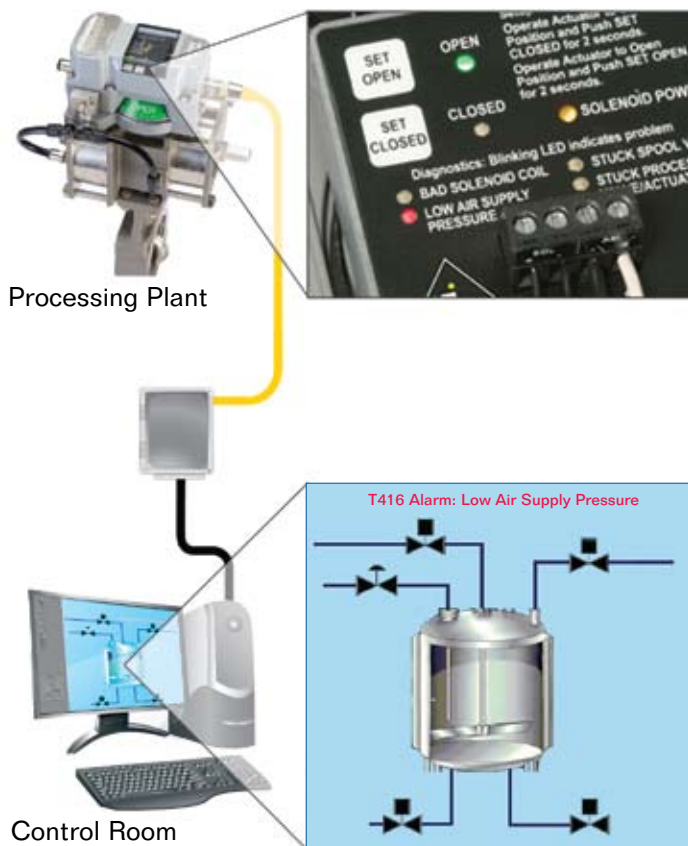


## Diagnostic Alerts & Capabilities

- Low pneumatic supply pressure**  
 Should supply pressure drop below operational threshold level a local and remote alert will be activated.
- Malfunctioning solenoid**  
 A shorted or opened solenoid circuit will be identified during operation with a local and remote alert.
- Stuck pneumatic spool or pilot valve**  
 Should either the pilot poppet or main spool be stuck for any reason (air line contamination, freezing etc.) a local and remote alert will be energized.
- Stuck process valve/actuator**  
 If the Axiom stalls in mid stroke and no on-board problem sources are identified an alert will be energized locally and remotely that the problem source is located in the valve/actuator assembly.
- Remote switch setting**  
 Open and Closed limit switch settings may be made with on-board push buttons or remotely through the control system.
- Identification "winking"**  
 To positively confirm the field device identity the control room may initiate the "wink" function which flashes both open and closed LEDs without affecting valve operational status.  
  
 Alerts are cleared automatically when normal operating conditions are restored.

## Control System Interface

AS-Interface 2.1 or greater level protocol may be used to interface up to 31 Axiom units into the control system. Communication bits may be mapped into standard DCS or PLC as desired. No special software is required. See StoneL FieldLink program for information about the cost saving benefits and easy installation of the AS-Interface protocol.



Diagnostic Specifications	
Protocol	AS-Interface (AMI96) Version 2.1 or greater
Input Voltage	26.5 to 31.6 VDC (AS-i power supply)
Devices per Network	31
Input Configuration	(1) Open & (1) Closed (1) Low Supply Pressure (1) Bad Solenoid Coil or Stuck Spool/Pilot Valve*
Output Configuration	(1) Stuck Process Valve/Actuator (1) Solenoid Power 0.5 W @ 24VDC (1) Wink Operation (1) Remote Set Open (1) Remote Set Closed
Pressure Accuracy	± 2 psi (0.13 bar)
Supply Pres. Default	40 psi (2.7 bar) minimum
System Interface	AS-i 2.1 master or greater required

\* Local display identifies specific problem.

## Manifold and Mounting System

The Axiom manifold system directly attaches the communication and control module to the actuator and ports air from the pneumatic valve to the actuator. Included in the manifold system are:

1. Stainless steel actuator shaft adaptor and fastener.
2. Epoxy coated anodized aluminum actuator adaptor and pneumatic manifold with o-rings and stainless steel fasteners.

The manifold system readily adapts to VDI/VDE 3845 Namur sizes 1 and 2. Special variations may be made for sizes 3, 4 and non-standardized quarter-turn actuator mounting patterns.

The manifold and mounting system are specified and **sold separately** from the Axiom communication and control module.

Mounting system kits are specific to actuator manufacturer. For kit numbers visit: [www.stonel.com](http://www.stonel.com)



### Other Specifications and Ratings

#### Materials of Construction

Housing & Mounting Manifold	Epoxy coated anodized aluminum
Cover & Visual Indicator	Lexan® polycarbonate
Fasteners & Mounting Adaptors	Stainless Steel
Pneumatic Valve	See Pneumatic Valve Specifications on page 5

#### Temperature Ratings (pneumatic valve dependent)

Piezo Pilots	-10° to 60° C (14° to 140° F)
Solenoid Pilots	-20° to 65° C (-4° to 150° F) Special solenoid pilot -40° to 80°C (-40° to 176°F) available. Please consult factory.

#### Position Sensor System

Accuracy	Within 1°
Repeatability	Within 1°
Setting Buffer	2° from set point (Rotational distance from original set point where switch will energize on return stroke.)
Dead Band	3° from set point (Rotational distance from original set point where switch will de-energize.)
Maximum Rotational Range	120°

#### Operating Life

Pneumatic Valve	1 Million Cycles
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#### Warranty

Mechanical Components	2 Years
Electronic Components	5 Years

#### Nonincendive Ratings

NEC/CEC	Class I, Groups A, B, C & D, Div. 2
IEC/ATEX	Class II, Groups F & G, Div. 2 EEx nA IIC T5, Zone 2

#### Intrinsically Safe Ratings

Models AMI44 & AMI93 Only

NEC/CEC	Class I, Groups A, B, C & D, Div. 1 & 2
IEC/ATEX	Class II, Groups E, F & G, Div. 1 & 2 EEx ia IIC T5, Zones 0, 1, & 2

#### Enclosure Protection

NEC/CEC	4, 4X & 6
IEC/ATEX	IP67

For approval information visit [www.stonel.com/approvals](http://www.stonel.com/approvals)



**Model Selector**

AMI	Function	Pneumatic Valve			Enclosure	Conduit/Connectors	Capabilities	Visual Indicator	
		No Ext. Override	External Override	Latching Ext. Over.					
AMI	<b>Sensor Modules</b> 33 (2) SST Sensors	<b>Single Solenoid Spring Return</b> 24 VDC or 120VAC Universal (Use with Function 33)  24 VDC (0.5 watt) (Use with Function 96 and 97)  24 VDC (1.8 watt) (Use with Function 92, 94, 95, and 96)  12 VDC Intrinsically Safe (Use with Function 44)  <b>Dual Solenoid Shuttle Piston (not available with Function 97)</b> 24 VDC or 120VAC Universal (Use with Function 33)  24 VDC (1.8 watt) (Use with Function 92, 94, 95, and 96)  12 VDC Intrinsically Safe (Use with Function 44)  <b>Single Piezo Spring Return</b> Intrinsically Safe or Standard (Use with Function 93)  <b>Dual Piezo Shuttle Piston</b> Intrinsically Safe or Standard (Use with Function 93)				<b>A</b> North America (NEC/CEC) <b>V</b> International (IEC/ATEX)	<b>02</b> (2) 1/2" NPT <b>05</b> (2) M20 <b>10</b> (1) 4-Pin Mini-Connector <b>11</b> (1) 5-Pin Mini-Connector <b>13</b> (1) 4-Pin Micro-Connector <b>15</b> (1) 5-Pin Micro-Connector <b>17</b> (1) 6-Pin Micro-Connector <b>18</b> (1) 8-Pin Micro-Connector <b>19</b> (1) 6-Pin Mini-Connector <b>20</b> (1) 7-Pin Mini-Connector <b>21</b> (1) 8-Pin Mini-Connector	<b>S</b> Standard  <b>D</b> Diagnostics (Use with Function 96 and 0.5 watt pneumatic valve 1D, 3D, or 5D)	<b>RA</b> Red Closed/ Green Open
	44 (2) Namur Sensors Intrinsically Safe (I.S.; DIN 19234)		<b>1H</b>	<b>3H</b>	<b>5H</b>				
	<b>Valve Communication Terminals (VCT)</b> 92 DeviceNet		<b>1D</b>	<b>3D</b>	<b>5D</b>				
	93 FOUNDATION Fieldbus (Bus Powered; I.S.)		<b>1B</b>	<b>3B</b>	<b>5B</b>				
	94 FOUNDATION Fieldbus (Externally Powered)		<b>1E</b>	<b>3E</b>	<b>5E</b>				
	95 Modbus								
	96 AS-Interface		<b>2H</b>	<b>4H</b>					
	97 AS-Interface (with Extended Addressing)		<b>2B</b>	<b>4B</b>					
			<b>2E</b>	<b>4E</b>					
			<b>1A</b>	<b>3A</b>	<b>5A</b>				
	<b>2A</b>	<b>4A</b>							

**Model Examples: AMI961DA02DRA**

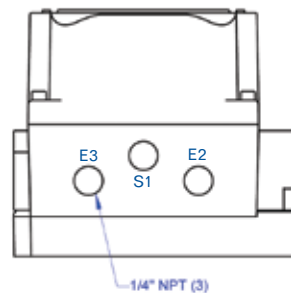
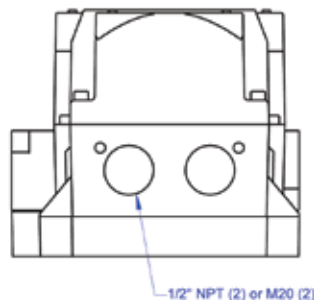
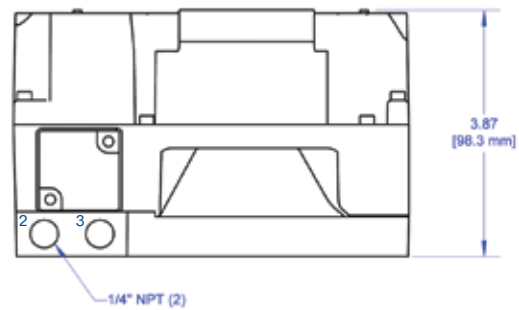
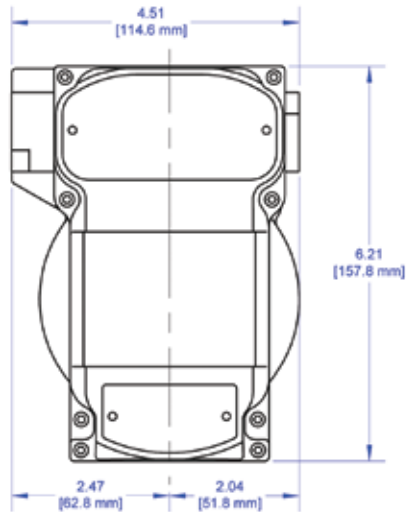
**AMI331HV05SRA**

**AMI971DA02SRA-T**

(Note: Specify -T suffix for extended temperature.)

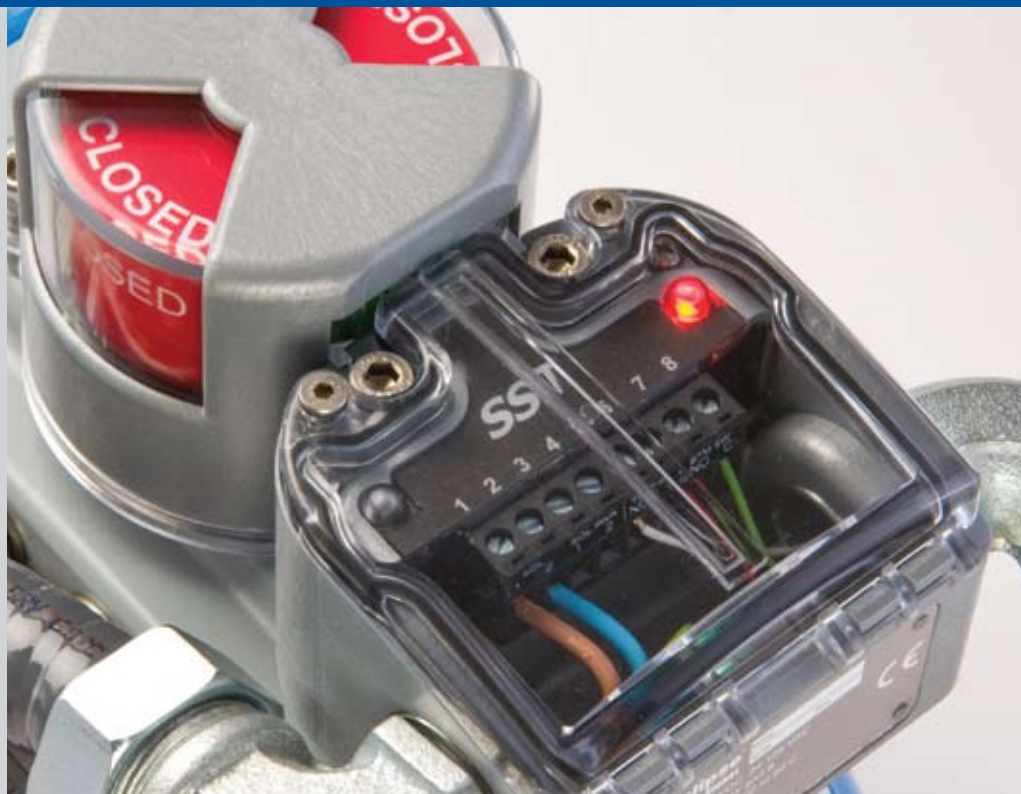
Manifold and Mounting System required for all and sold separately.

**Dimensions**  
Inches [mm]



StoneL's Eclipse features dual solid state sensors with optional communications neatly integrated into a sealed module. The function module and trigger/indicator attach quickly and conveniently to standard VDI/VDE 3845 (Namur) actuator accessory mounting pads.

The Eclipse series is available in non-incendive and intrinsically safe versions (EN) for hazardous areas with a removable module and in a general purpose completely sealed micro-connector version (EG).



## Feature Rich Design Offers Incredible Value

- Position sensors, communication electronics and power outputs for solenoids are integrated into an extremely compact, rugged enclosure.
- Red/Green visual indicator boldly displays valve status, and coordinates with Red/Green LEDs.
- Fully submersible and capable of high pressure wash down.
- Eclipse sensors and electronics are fully sealed to eliminate hazard threat and corrosion problems.
- Direct attachment to ISO/Namur mounting pads.
- High intensity red and green LEDs indicate electronic switch status to confirm electrical operation.
- Sensor triggers are adjustable in 3.5 degree increments through 360 degrees for precision and flexibility.
- All mechanical parts are made of Lexan® or stainless steel for corrosion resistance and durability.
- No moving mating parts assure long life and trouble-free operation.

## EN: The Ultimate in Convenience, Reliability and Cost Effectiveness in Class I, Div. 2 Areas

- Suitable for all hazardous areas.
- Rated for NEMA 4, 4X, 6 (intrinsically safe and nonincendive approved: IP68).
- Additional termination points and dual conduit entries eliminate junction boxes for solenoid valve termination.
- Convenient wiring compartment and pre-labeled terminal strip enables rapid installation.



## Triggering & Visual Indicator



**Red/Green option**



**Flow line option**

Red and green visual indication is viewable from 360 degrees around the automated valve and from above at distances up to 70 feet. The yellow flow line indicator is also available, which is viewable from all angles at a distance up to 30 feet.

Eclipse solid state inductive sensors are activated by stainless steel targets embedded into the visual indicator drum. Open and Closed targets may be independently adjusted in 3.5 degree increments.

## EG: Convenient Micro-Connector Wiring

- Available with additional built in connector for solenoid termination.
- Micro-connectors with potted and sealed enclosure eliminate any threat of moisture contamination in wiring.
- Electronic module integrated permanently into enclosure.



## Sensing, Communication and Visual Indication

The Eclipse offers incredible value and space efficiency. Communications, position sensing, power outputs and auxiliary inputs are sealed in the Eclipse function module.



Select from Namur sensors, SST switching sensors, or AS-Interface, DeviceNet, Modbus or Foundation Fieldbus communication terminals.

All are fully solid state and sealed.

(For more detailed information please see pages 28 through 34.)



**MODBUS** DeviceNet.



### SST Switching Sensors (33)

Configuration	(2) SST Switching Sensors (2) Wire Terminations for one Solenoid
Output	Select either NO or NC Models
Maximum Current	
Inrush	2.0 Amps
Continuous	0.3 Amps
Min. On Current	2.0 mA
Max. Leakage Current	0.5 mA
Voltage Range	8 to 125VDC / 24 to 125VAC
Max. Voltage Drop	7.0 Volts @ 100 mA

### Namur Sensors (44)

Configuration	(2) NAMUR Sensors (2) Wire Terminations for one Solenoid
Output	Conforms to DIN 19234
Current Ratings	Target On <1.0 mA Target Off >3.0 mA
Voltage Range	6 to 29 VDC

### AS-Interface VCT (96)

Configuration	(2) Sensor Inputs (2) Auxiliary Inputs (2) Power Outputs (Solenoids)
Max. Current	160mA, Both Outputs Combined (Current Limited to 200mA)
Outputs, Max. Power	4 Watts, Both Outputs Combined
Outputs, Voltage	25 to 30 VDC

### AS-Interface VCT (97) with Extended Addressing

Configuration	(2) Sensor Inputs (2) Auxiliary Discrete Inputs (1) Power Output (Solenoid)
Max. Current	100mA
Outputs, Max. Power	2.4 Watts
Outputs, Voltage	25 to 30 VDC

### DeviceNet VCT (92)

Configuration	(2) Discrete Inputs (Open & Closed)
	(2) Power Outputs (Solenoids)
	(1) 4-20 mA Auxiliary Input
Outputs, Max. Power	4 Watts, Both Outputs Combined
Outputs, Voltage	24 VDC

### Bus Powered FOUNDATION Fieldbus VCT (93)

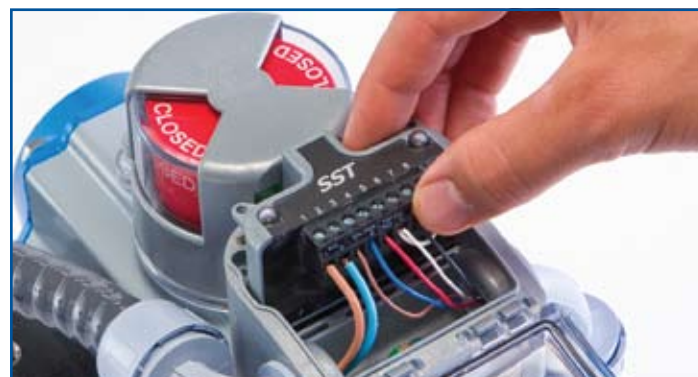
Configuration	(2) Discrete Inputs, DI (Open & Closed)
	(2) Discrete Outputs, DO (Piezo Valves)
Outputs	2mA @ 6.5 VDC each; Current Limited to 2mA (Bus Powered)
Other Features	Stores Number of Actuations Stores Date of Last Service Predetermined Output Fail State

### Externally Powered FOUNDATION Fieldbus VCT (94)

Configuration	(2) Discrete Inputs, DI (Open & Closed)
	(2) Power Outputs, DO (Solenoids)
Outputs	4 watts @ 24VDC Both Outputs Combined; Current Limited to 200mA (Externally Powered)
Other Features	Stores Number of Actuations Stores Date of Last Service Pre-determined Output Fail State

### Modbus VCT (95)

Configuration	(2) Discrete Inputs (Open and Closed)
	(2) Power Outputs (Solenoids)
	(1) 4-20mA Auxiliary Input
Outputs	4 watts @ 24 VDC Both Outputs Combined (Current Limited to 200mA)
Devices per Network	32
Other Features	Pre-determined Output Fail State



EN features a removable, fully sealed dual module to facilitate quick, convenient maintenance and wiring.

## Nonincendive & Intrinsically Safe Model Selector

Model Example: EN92C02RA

	Function	Enclosure	Conduit/Connectors	Visual Indicator
<b>EN</b>	<b>Sensor/Switching Modules</b>	<b>C</b> North American (NEC/CEC)	<b>02</b> (2) 1/2" NPT Conduit Entry	<b>RA</b> Red Closed Flow Line <b>FA</b> T-1 3-Way (90° rotation) <b>1A</b> T-2 3-Way (90° rotation) <b>2A</b> T-2 3-Way (90° rotation) <b>XA</b> Special  See Visual Indications Designations chart on page 15
	<b>33</b> (2) SST N.O. Sensors		<b>05</b> (2) M20 Conduit Entry	
	<b>34</b> (2) SST N.C. Sensors	<b>D</b> International (IEC/ATEX)	<b>11</b> (1) 5-Pin Mini Connector	
	<b>Intrinsically Safe Models</b>		<b>12</b> (1) 5-Pin Mini and (1) 3-Pin Mini Connector	
	<b>44</b> (2) Namur Sensors (DIN 19234) (available with conduit/connector options 02, 05, or 11)		*Consult factory for additional quick connector options	
	<b>Valve Communication Terminals (VCT)</b>			
	<b>92</b> DeviceNet			
	<b>93</b> FOUNDATION Fieldbus (Bus Powered; I.S.)			
	<b>94</b> FOUNDATION Fieldbus (Externally Powered)			
	<b>95</b> Modbus			
<b>96</b> AS-Interface				
<b>97</b> AS-Interface with Extended Addressing				

## General Purpose Model Selector

Model Example: EG96C23FA

	Function	Enclosure	Connectors	Visual Indicator
<b>EG</b>	<b>Sensor/Switching Modules</b>	<b>C</b> General Purpose, Universal	<b>23</b> (1) 4-Pin Micro Connector, Metallic	<b>RA</b> Red Closed Flow Line <b>FA</b> T-1 3-Way (90° rotation) <b>1A</b> T-2 3-Way (90° rotation) <b>2A</b> T-2 3-Way (90° rotation) <b>XA</b> Special  See Visual Indications Designations chart on page 15
	<b>33</b> (2) SST N.O. Sensors (available with connector options 23 or 26)		<b>24</b> (2) 4-Pin Micro Connectors, Metallic	
	<b>34</b> (2) SST N.C. Sensors (available with connector options 23 or 26)	<b>25</b> (1) 5-Pin Micro Connector, Metallic		
	<b>Intrinsically Safe Modules</b>	<b>26</b> (1) 5-Pin and (1) 4-Pin Micro Connector, Metallic		
	<b>44</b> Namur Sensors (DIN 19234) (available with connector option 23 only)			
	<b>Valve Communication Terminals (VCT)</b>			
	<b>92</b> DeviceNet (available with connector options 25 or 26)			
	<b>93</b> FOUNDATION Fieldbus (Bus Powered; I.S.) (available with connector options 23 or 24)			
	<b>94</b> FOUNDATION Fieldbus (Externally Powered) (available with connector options 25 or 26)			
	<b>95</b> Modbus (available with connector options 25 or 26)			
<b>96</b> AS-Interface (available with connector options 23 or 24)				
<b>97</b> AS-Interface with Extended Addressing (available with connector options 23 or 24)				

## Eclipse Mounting (Required for all Eclipse and sold separately)

- 960701** Namur Sizes 1 and 2
- 960710** Namur Size 3
- 960704** Namur Size 4
- 795702** Jamesbury VPVL 350 to 500
- 795703** Jamesbury VPVL 550 to 800

Consult factory for other non-Namur applications.

- Kits conform to standard ISO/NAMUR actuator patterns.
- All kits stainless steel.
- Namur size 3 kit 960710 fit all shaft sizes. Namur size 3 kit 960703 is obsolete.

**Other Specifications and Ratings**

**Materials of Construction**

Housing	Lexan® Polycarbonate
Drum Components	Lexan® Polycarbonate
Fasteners	Stainless Steel
Triggers and Coupling	Stainless Steel

**Temperature Range** -40° C to 80° C (-40° F to 176° F)

**Operating Life** Unlimited

**Warranty**

Dual Module	Five Years
Mechanical Components	Two Years

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**Nonincendive Ratings**

EN Models

NEC/CEC	Class I Division 2 Groups A, B, C, D Class II Division 2 Groups F, G
IEC/ATEX	EEx nA IIC T5, Zone 2

**Intrinsically Safe Ratings**

EN Models

NEC/CEC	Class I Divisions 1 and 2 Groups A, B, C, D Class II Divisions 1 and 2 Groups E, F, G
IEC/ATEX	EEx ia IIC T5, Zones 0,1, & 2

**Enclosure Ratings**

EN and EG Models

NEC/CEC	4, 4X & 6C
IEC/ATEX	IP68

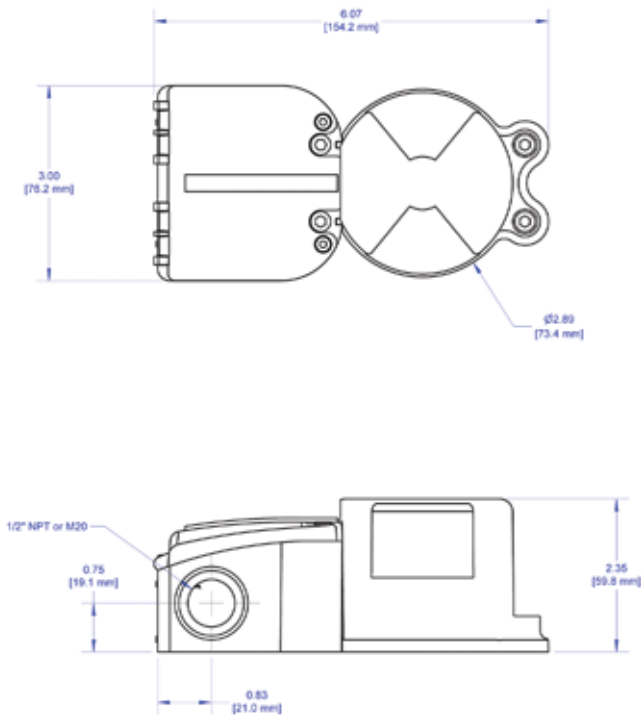
For approval information visit [www.stonel.com/approvals](http://www.stonel.com/approvals)



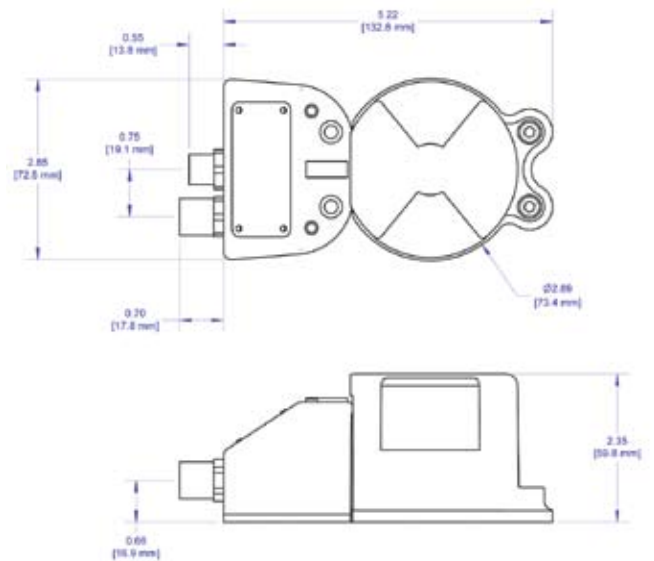
**Dimensions**

Inches [mm]

**Eclipse EN**



**Eclipse EG**



# Visual Indicator (VI)

Clearly view valve position status from up to 75 feet with StoneL's Stand Alone Visual Indicator. The indicator's rugged Lexan® construction makes it resistant to physical damage and tolerant to most corrosives.

You may conveniently attach the visual indicator directly to actuators with the VDI/VDE 3845 (Namur) mounting pattern featured on most contemporary actuators. Other mounting configurations are also available for non-Namur actuators and valve operators.



## Stand Alone Visual Indicator (VI)

The stand alone visual indicator features the same materials and viewability as the Eclipse trigger and visual indicator.

Features include:

- Direct attachment to VDI/VDE 3845 (ISO/Namur) actuator mounting pads.
- High impact Lexan® construction offers superior durability and corrosion resistance.
- Readily adaptable to most quarter-turn actuators.
- Offers high visibility, positive confirmation for all of your automated valve systems.



## Model Selector

VI	Indicator and Trigger*
<b>R</b>	Red Closed
<b>1</b>	Three Way
<b>2</b>	Three Way
<b>X</b>	Special (must use spec number)

\*See Visual Indicator Designations Chart on page 15

## Visual Indicator Mounting (required for all VI)

**960801** Namur Sizes 1 and 2

**960803** Namur Size 3

**960804** Namur Size 4

Consult factory for other non-Namur applications.

- Kits conform to standard ISO/NAMUR actuator patterns.
- All kits stainless steel.
- Namur size 3 kit fits all shaft sizes.

## Specifications and Ratings

### Materials of Construction

Housing	Lexan® Polycarbonate
Drum Components	Lexan® Polycarbonate
Fasteners	Stainless Steel
Coupling	Stainless Steel

**Operating Life** Unlimited

**Temperature Range** -40° C to 82° C (-40° F to 180° F)

### Warranty

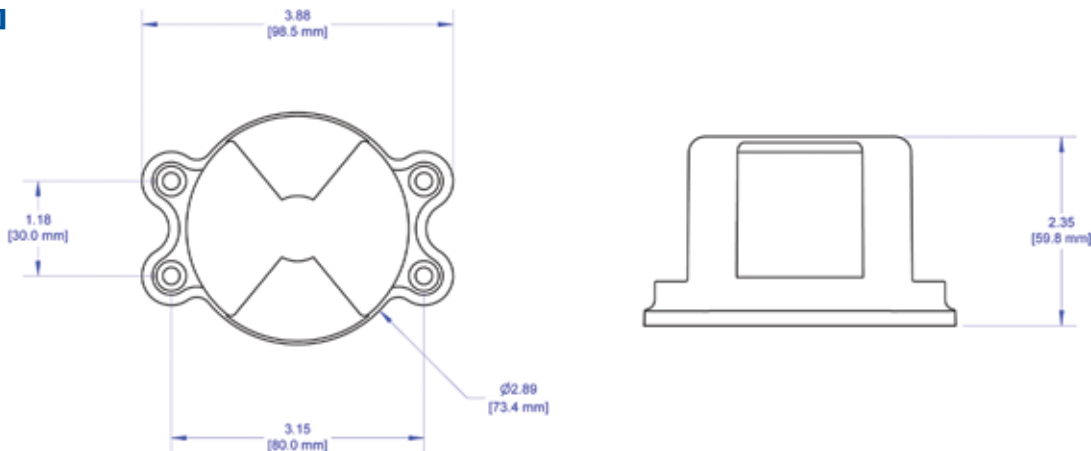
Two Years

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## Dimensions

Inches [mm]



## Visual Indication Designations

Visual Indications Chart applies to all ValvePoint platforms. See model numbers on the following pages to determine the option available for each platform:

Axiom . . . . . page 9  
 Eclipse . . . . . page 12  
 Quartz . . . . . page 20

DESIGNATION	0°	90°	180°
<b>R</b>	<b>CLOSED</b>	<b>OPEN</b>	
<b>G</b>	<b>CLOSED</b>	<b>OPEN</b>	
<b>F</b> <i>(Eclipse Only)</i>			
<b>1</b>			
<b>2</b>			
<b>3</b>		<b>CLOSED</b>	
<b>4</b>			
<b>5</b>			
<b>C</b>	 <b>0%</b> <b>50%</b> <b>100%</b>		
<b>X</b>	Specialty Configuration - please consult factory		

The Quartz is available in explosion proof (QX), nonincendive and intrinsically safe (QN) and general purpose (QG) versions. The robust epoxy coated anodized aluminum construction makes this platform extremely durable and well suited for use in corrosive, heavy wash down environments. A broad range of switching, position transmitter and communication options may be selected to accommodate most applications.

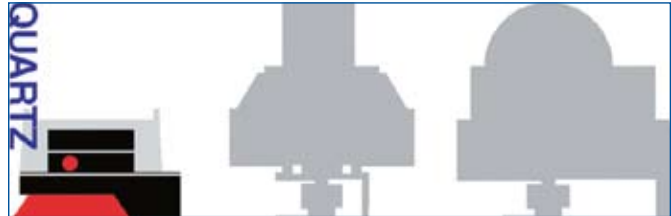
This versatile platform adapts to a wide variety of valve systems. Attach the Quartz to quarter-turn actuators, manual operators, linear operators and positioners using readily available stainless steel mounting systems.



**The Stonel Quartz series is durable, corrosion resistant, and versatile, making it ideal for most of your process valve monitoring requirements.**



### Save Space with Low Profile Design



Clearance above the actuator is critical in complex piping systems. Quartz boldly displays valve position and encloses all electrical components in an explosion-proof compartment with less than 5" clearance requirement.

### Wide Variety of Switch/Sensor Functions



**Proximity Switches**



**Mechanical Switches**

A wide variety of switch/sensor communications and position transmitters may be selected for the Quartz series. Options include 2, 4 or 6 mechanical or proximity switches, position transmitters with or without switches, and the Stonel dual module with two SST or two Namur sensors or AS-Interface, DeviceNet or FOUNDATION Fieldbus communication capabilities.

### Speed Installation with LED Indication

Stonel's coordinated visual indicator and LEDs give you an extra measure of safety and increased convenience during plant start-up and operation. Green visual indication and green LED means the valve is open and the computer circuit is properly operating. Red visual indication and red LED means the valve is closed and the computer is properly matched. All systems are functioning properly.



## Features

### 1. Enclosures Optimized for Environment



**QX:** Explosion-proof, water tight and corrosion-proof enclosure is approved for use in div.1/zone 1 hazardous areas.



**QN:** Nonincendive is approved for all div.2/zone 2 hazardous environments with proximity sensors using a clear cover. Intrinsically safe Namur sensors or passive switches are available for div.1/zone 0 applications.



**QG:** General purpose features a clear Lexan cover with mechanical switches. All enclosures are rated NEMA 4, 4x, and 6.

### 2. Rapid Enclosure Access

Screw-on cover allows quick enclosure access, saving you valuable maintenance and set-up time. The cover provides a vapor tight seal and allows entry to internal components in less than five seconds.

### 3. Faster Wiring

Pre-wired and labeled terminal strip enables quick, convenient attachment of field wires.

### 4. Wide Variety of Switching & Communication

Switching options include dual module sensors and communication, Maxx-Guard proximity switches and mechanical switches. Continuous signal output is available in a 4 to 20 mA position transmitter.

### 5. Quick Set Cams are Easy to Adjust

Touch and Tune switch settings allow you to make adjustments in seconds without the use of tools.

### 6. Dual Shaft O-ring Seals Eliminate Corrosion

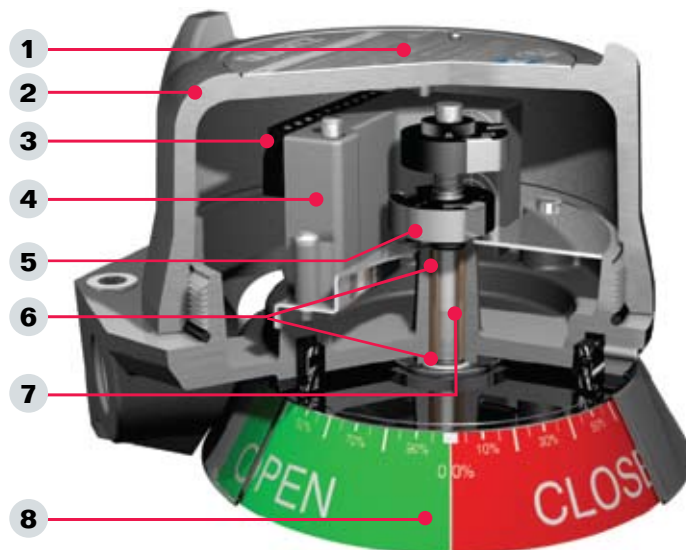
Top inner and bottom outer shaft o-rings seal the drive bushing from both external corrosives and internal contaminants that enter the enclosure.

### 7. Special drive bushing assures long cycle life

The oil impregnated brass bushing maintains smooth operation and eliminates the potential for shaft seizure due to actuator shaft eccentricity.

### 8. Space Saving Visual Indication

Visual indicator offers excellent viewability without sacrificing accessibility or adding to space requirements. Indicators are also available with continuous percentage or three-way indication.



### Eliminate Seal Fittings in Division 1 and 2 Areas

FM<sub>us</sub> ratings certify the Quartz QX series with proximity switches for use without seal fittings in all hazardous areas. By passing special pressure piling tests, the all aluminum enclosure was certified for this elite distinction. Now, a time-consuming procedure can be safely eliminated in division 1 and division 2 areas.

### Consolidate Your Components and Minimize Costs

The Quartz design offers up to three conduit entries with extra wire terminations. By terminating solenoid valves in the switch enclosure, significant savings are realized by eliminating a junction box, wiring, conduit materials and labor.



## Applications and Adaptation



### Quartz Mounting Systems

Low profile convenient mounting systems are readily available in stainless steel for most non-Namur and Namur (VDI/VDE 3845) actuators. You get direct output on rotary actuators, and easy access to positioner internal adjustments.



### Manual Valves

Proper fit and operation are assured with StoneL's custom designs for each manual valve. Hundreds of unique mounting systems have been designed and fabricated for manually operated valves.



### Linear Operators

Precision ball joint connections attach the Quartz to valve travel stems. Stroke lengths ranging from 20mm to 150mm (3/4" to 6") may be easily accommodated.



### Positioners

Quartz position transmitter and switches may be retrofitted directly to most positioners. You get direct output on rotary actuators, and easy access to positioner internal adjustments.



### Position Transmitter

The Quartz two-wire 4 to 20 mA position transmitter offers exceptional accuracy, reliability and performance. It may be directly attached to positioners or actuators in both linear and quarter-turn applications.

Span Range	35° to 270° (Adjustable)
Linearity Error, Standard	± 0.85° Maximum
High Performance	± 0.35°
Cycle Life, Standard	2 Million Rotations Minimum
High Performance	50 Million Rotations Minimum
Temperature Range	-40° to 80° C (-40° to 176° F)

## Quartz Expeditor

### Fill Control Applications

Fill tanks and hoppers rapidly and accurately. The Quartz Expeditor's field adjustable intermediate position reduces flow as the full level approaches. You get fast, economical "topping off" of every batch.

### Flow Dampening Applications

The Quartz Expeditor allows fast closure yet gentle, gradual shut-off from a preset intermediate position. You get prolonged piping life, improved process flow performance and less potential for catastrophic failure.

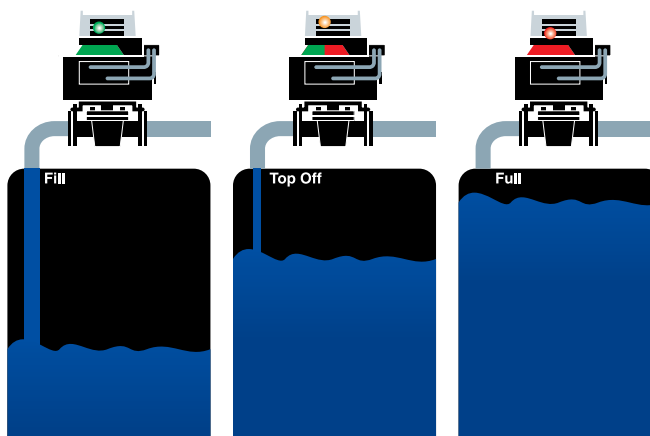
### Emergency Shut Down (ESD) Applications

Test your ESD valves by actuating them to a preset intermediate position that does not shut down the process. Reduce costs and increase safety by eliminating several cumbersome manual operations.



### Communication Enabled Expeditor

Now you can improve process performance and take advantage of incredible cost savings by utilizing proven bus networking technology with the communication enabled Expeditor. The Expeditor functions are available in the Quartz with either AS-Interface or DeviceNet protocols. An additional switch and cam are integrated into the VCT which may be set to a pre-determined intermediate position enabling fill control, flow dampening or ESD capabilities. Please specify the "82" or "86" for DeviceNet or AS-Interface Expeditor respectively.



The Expeditor enables three position control of On/Off valves in combination with two standard solenoid valves.

## Sensors and Communications

### Dual Module System

The Quartz series is available with the dual module in its various configurations. Two solid state sensors and/or communications and other electronics are sealed in for the



ultimate in reliability and convenience. All dual module versions have a 5 year warranty. (For more detailed information please see pages 28 through 39.)



### SST Switching Sensors (33)

Configuration (2) SST Switching Sensors  
Terminations for Solenoid  
Electrical Ratings 0.3 Amps @ 125 VAC/DC

### Namur Sensors (44)

Configuration (2) Namur Sensors  
Terminations for Solenoid  
Intrinsically safe (DIN 19234)  
Voltage Range 6 to 29 VDC  
Current Ratings Target On I < 1 mA  
Target Off I > 3 mA

### AS-Interface VCT (96)

Configuration (2) Sensor Inputs  
(2) Auxiliary Inputs  
(2) Power Outputs (Solenoids)  
Max. Current 160mA, Both Outputs Combined  
(Current Limited to 200mA)  
Outputs, Max. Power 4 Watts, Both Outputs Combined  
Outputs, Voltage 25 to 30 VDC

### AS-Interface VCT (97) with Extended Addressing

Configuration (2) Sensor Inputs  
(2) Auxiliary Discrete Inputs  
(1) Power Output (Solenoid)  
Max. Current 100mA  
Outputs, Max. Power 2.4 Watts  
Outputs, Voltage 25 to 30 VDC

### DeviceNet VCT (92)

Configuration (2) Discrete Inputs  
(Open & Closed)  
(2) Power Outputs (Solenoids)  
(1) 4-20 mA Auxiliary Input  
Outputs, Max. Power 4 Watts, Both Outputs Combined  
Outputs, Voltage 24 VDC

### FOUNDATION Fieldbus VCT, Bus Powered (93)

Configuration (2) Discrete Inputs, DI  
(Open & Closed)  
(2) Discrete Outputs, DO  
(Piezo Valves)  
Outputs 2mA @ 6.5 VDC each; Current Limited to 2mA (Bus Powered)

### FOUNDATION Fieldbus VCT, Externally Powered (94)

Configuration (2) Discrete Inputs, DI  
(Open & Closed)  
(2) Power Outputs, DO  
(Solenoids)  
Outputs 4 watts @ 24VDC Both Outputs Combined; Current Limited to 200mA (Externally Powered)

### Modbus VCT (95)

Configuration (2) Discrete Inputs  
(Open & Closed)  
(2) Power Outputs (Solenoids)  
Outputs (1) 4-20 mA Auxiliary Input  
4 Watts @ 24 VDC Both  
Outputs Combined (Current Limited to 200mA)

## Switch/Sensor Options

### SST Solid State Sensors



SST sensors have an unlimited application life and are ideal for AC and DC computer input circuits. (See page 38 for more details.)

Operation Cam Selectable NO or NC  
Electrical Ratings 0.3 Amps @ 125VAC/DC  
Max Leakage Current 0.5 mA  
Maximum Voltage Drop 6.5 Volts @ 10 mA  
Operating Life Unlimited

### Maxx-Guard Switches



Maxx-Guard reed switches with SPDT tungsten contacts are suitable for 125VAC computer inputs and 240VAC moderate power applications. SPDT rhodium contacts are designed for either 24VDC or 125VAC low power computer inputs. SPST ruthenium contacts are ideal for either 24VDC or 125VAC low power computer inputs. (See page 38 for more details.)

Electrical Ratings SPST (See page 38)  
Electrical Ratings SPDT (See page 38)  
Seal Hermetically Sealed  
Operating Life 5 Million Cycles

### Mechanical Switches (DPDT)



DPDT switches are available for isolation of two circuits operating at the same time. One DPDT operates identically to two SPDT being actuated simultaneously.

(See page 39 for more details.)  
Electrical Ratings 4.5 Amp @ 125/250 VAC  
Operating Life 250,000 Cycles

### Mechanical Switches (SPDT)



Mechanical silver contact switches are ideal for high power applications. Gold SPDT contacts may be used for low power applications. (See page 39 for more details.)

Electrical Ratings (Silver) 10 Amp @ 125/250 VAC  
0.5 Amp @ 125 VDC  
Operating Life (Silver) 400,000 cycles  
Electrical Ratings (Gold) 1.0 Amp @ 125 VAC  
0.5 Amp @ 30 VDC  
Operating Life (Gold) 100,000 Cycles

## Explosion Proof Model Selector (Aluminum Cover)

Model Example: QX33E02SRA

	Function	Enclosure	Conduit Entries	Visual Indication
<b>QX</b>	<b>Sensor/Switching Modules (Proximity Type)</b> <b>33</b> SST N.O. Switching Sensor Dual Module  <b>Valve Communication Terminals (VCTs)</b> <b>92</b> DeviceNet <b>93</b> FOUNDATION Fieldbus (Bus Powered; I.S.) <b>94</b> FOUNDATION Fieldbus (Externally Powered) <b>95</b> Modbus <b>96</b> AS-Interface <b>97</b> AS-Interface (with extended addressing)  <b>Mechanical Switches</b> <b>2V</b> (2) SPDT Switches <b>2W</b> (2) SPDT Switches, Gold Contact <b>4V</b> (4) SPDT Switches <b>4W</b> (4) SPDT Switches, Gold Contact <b>14</b> (2) DPDT Switches  <b>Expeditors (Proximity Type)</b> <b>82</b> DeviceNet <b>86</b> AS-Interface	<b>E</b> North American (NEC/CEC)  <b>R</b> International (IEC/ATEX)  All <b>QX</b> models have epoxy coated anodized aluminum housing and cover.	<b>02</b> (1) 3/4" NPT & (1) 1/2" NPT <b>03</b> (1) 3/4" NPT & (2) 1/2" NPT <b>05</b> (2) M20 <b>06</b> (3) M20	<b>SRA</b> Red-Closed Green-Open <b>SGA</b> Green-Closed Red-Open <b>S1A</b> T1 Three Way <b>S2A</b> T2 Three Way <b>S3A</b> T3 Three Way <b>S4A</b> T4 Three Way <b>S5A</b> T5 Three Way <b>S0A</b> No Indication <b>SXA</b> Special  See Visual Indications Designations Chart on page 15
	<b>Switches/Sensors</b> <b>2</b> (2) Switches <b>4</b> (4) Switches <b>5</b> Position Transmitter with (2) or No Switches <b>7</b> High Performance Position Transmitter with (2) or No Switches <b>8</b> Expeditor (only available with <b>H</b> or <b>Y</b> switches)	<b>Proximity</b> <b>P</b> SPST Maxx-Guard <b>L</b> SPST Maxx-Guard (LED) <b>G</b> SPDT Maxx-Guard (low current) <b>H</b> SPDT Maxx-Guard (3 amp) <b>S</b> SPDT Maxx-Guard (LED) <b>Y</b> Expeditor Only (3 Switches) <b>F</b> PNP Solid State 3-wire P+F <b>O</b> No Switches <b>X</b> SST Sensor (LED)		

Mounting system required for all and sold separately.

## Nonincendive & Intrinsically Safe Model Selector (Clear Cover)

Model Example: QN33C02SRA

	Function	Enclosure	Conduit Entries	Visual Indication
<b>QN</b>	<b>Sensor/Switching Modules (Proximity Type)</b> <b>33</b> SST N.O. Switching Sensor Dual Module <b>44</b> Namur Dual Module (DIN 19234; IS)  <b>Valve Communication Terminals (VCTs)</b> <b>92</b> DeviceNet <b>93</b> FOUNDATION Fieldbus (Bus Powered; I.S.) <b>94</b> FOUNDATION Fieldbus (Externally Powered) <b>95</b> Modbus <b>96</b> AS-Interface <b>97</b> AS-Interface (with extended addressing)  <b>Expeditors (Proximity Type)</b> <b>82</b> DeviceNet <b>86</b> AS-Interface	<b>C</b> North American (NEC/CEC)  <b>D</b> International (IEC/ATEX)  All <b>QN</b> models have clear Lexan® cover and anodized aluminum housing.	<b>02</b> (1) 3/4" NPT & (1) 1/2" NPT <b>03</b> (1) 3/4" NPT & (2) 1/2" NPT <b>05</b> (2) M20 <b>06</b> (3) M20	<b>SRA</b> Red-Closed Green-Open <b>SGA</b> Green-Closed Red-Open <b>S1A</b> T1 Three Way <b>S2A</b> T2 Three Way <b>S3A</b> T3 Three Way <b>S4A</b> T4 Three Way <b>S5A</b> T5 Three Way <b>S0A</b> No Indication <b>SXA</b> Special  See Visual Indications Designations Chart on page 15
	<b>Switches/Sensors</b> <b>2</b> (2) Switches <b>4</b> (4) Switches <b>5</b> Position Transmitter with (2) or No Switches <b>7</b> High Performance Position Transmitter with (2) or No Switches <b>8</b> Expeditor (only available with <b>H</b> or <b>Y</b> switches)	<b>Proximity</b> <b>P</b> SPST Maxx-Guard <b>L</b> SPST Maxx-Guard (LED) <b>G</b> SPDT Maxx-Guard (low current) <b>H</b> SPDT Maxx-Guard (3 amp) <b>S</b> SPDT Maxx-Guard (LED) <b>Y</b> Expeditor Only (3 Switches) <b>F</b> PNP Solid State 3-wire P+F <b>O</b> No Switches <b>X</b> SST Sensor (LED)		
	<b>Intrinsically Safe</b> <b>J</b> SPST Maxx-Guard; Passive <b>M</b> SPDT Maxx-Guard; Passive <b>N</b> P+F NAMUR Sensors			

Mounting system required for all and sold separately.

**General Purpose Model Selector (Clear Cover)**

**Model Example: QG2VC02SRA**

	Function	Enclosure	Conduit Entries	Visual Indication*
<b>QG</b>	<b>Mechanical Switches</b>	<b>C</b> General Purpose, Universal  All <b>QG</b> models have clear Lexan® cover and anodized aluminum housing.	<b>02</b> (1) ¾" NPT & (1) ½" NPT	<b>SRA</b> Red-Closed Green-Open
	<b>2V</b> (2) SPDT Switches		<b>03</b> (1) ¾" NPT & (2) ½" NPT	<b>SGA</b> Green-Closed Red-Open
	<b>2W</b> (2) SPDT Switches, Gold Contact		<b>05</b> (2) M20	<b>S1A</b> T1 Three Way
	<b>4V</b> (4) SPDT Switches		<b>06</b> (3) M20	<b>S2A</b> T2 Three Way
	<b>4W</b> (4) SPDT Switches, Gold Contact			<b>S3A</b> T3 Three Way
<b>14</b> (2) DPDT Switches			<b>S4A</b> T4 Three Way	
				<b>S5A</b> T5 Three Way
				<b>S0A</b> No Indication
				<b>SXA</b> Special

Mounting system required for all and sold separately.

\*See Visual Indications Designations chart on page 15

**Other Specifications and Ratings**

**Materials of Construction**

Housing & Aluminum Cover	Epoxy coated anodized marine grade aluminum
Clear Cover & Indicator	Lexan® polycarbonate
Elastomer Seals	Buna-N; Optional Viton and EPDM
Drive Shaft	Stainless steel
Drive Bushing	Brass, oil impregnated
Fasteners	Stainless Steel

**Temperature Ratings**

Mechanical Components	-40° to 80° C (-40° to 176° F)
Dual Modules	-40° to 80° C (-40° to 176° F)
Maxx-Guard & SST	-40° to 80° C (-40° to 176° F)

**Warranty**

Mechanical Components	Two Years
SST & Dual Modules	Five Years

Lexan® is a registered trademark of General Electric Corporation.

**Explosion Proof Ratings**

QX Models

NEC/CEC	Class I Divisions 1 and 2 Groups B, C, D Class II Divisions 1 and 2 Groups E, F, G
IEC/ATEX	EEx d IIC T5 - T6, Zones 1 & 2

**Nonincendive Ratings**

QN Models

NEC/CEC	Class I Division 2 Groups A, B, C, D Class II Division 2 Groups F, G
IEC/ATEX	EEx nA IIC T5, Zone 2

**Intrinsically Safe Ratings**

QN Models (Function Dependent)

NEC/CEC	Class I Divisions 1 and 2 Groups A,B,C,D Class II Divisions 1 and 2 Groups E,F,G
IEC/ATEX	EEx ia IIC T5, Zones 0,1,& 2

**Enclosure Protection**

QX, QN and QG Models

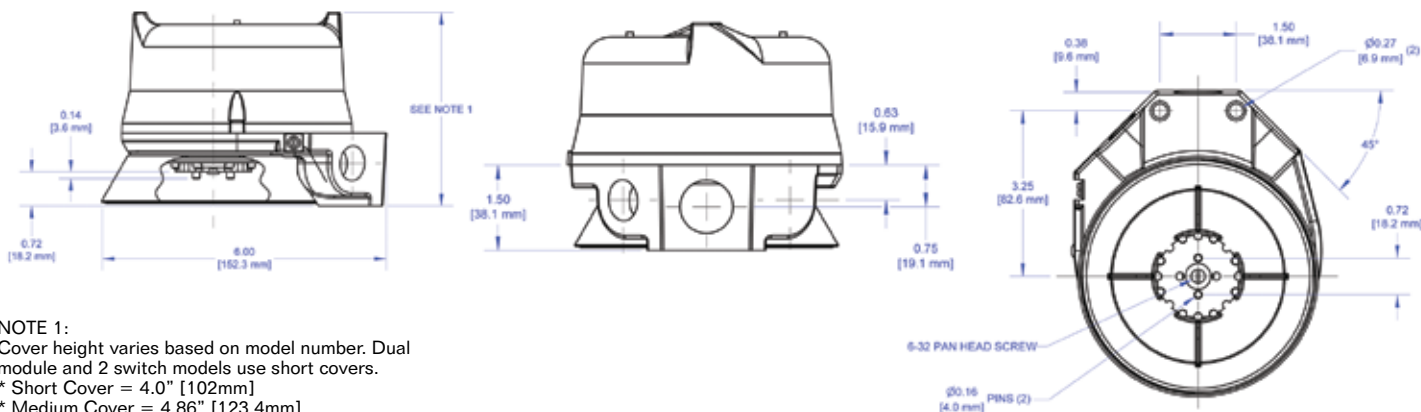
NEC/CEC	4, 4X & 6
IEC/ATEX	IP67

For approval information visit [www.stonel.com/approvals](http://www.stonel.com/approvals)



**Dimensions**

Inches [mm]

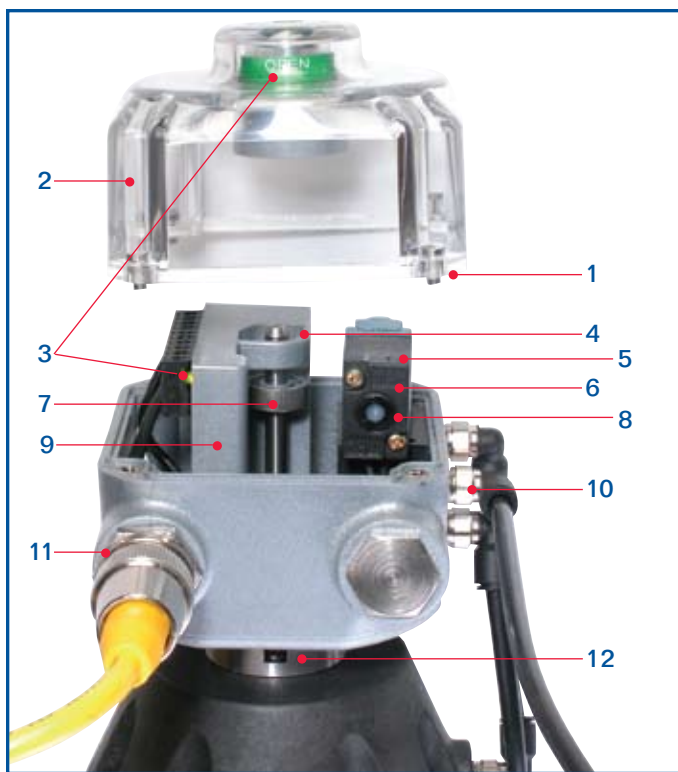


NOTE 1:  
Cover height varies based on model number. Dual module and 2 switch models use short covers.  
\* Short Cover = 4.0" [102mm]  
\* Medium Cover = 4.86" [123.4mm]  
\* Tall Cover = 6.12" [155.4mm]

# Prism

The Prism Series, designed for corrosive process environments, attaches directly to Sanitary Diaphragm and Angle Valves.

This rugged, feature-rich platform offers a full array of communication and switching options as well as discrete integral pneumatic control for single-acting valve actuator operation.



**1. The Prism may be washed down and temporarily submerged** with no adverse affects. It is rated NEMA 4, 4x, and 6. It may be used in Div. 2/Zone 2 areas (Nonincendive) or Div.1/Zones 0 & 1 (Intrinsically Safe) hazardous applications.

**2. Enclosure features high strength polycarbonate** with excellent corrosion resistance and exceptional temperature stability.

**3. Visual electronic and mechanical position indication** confirm valve and switch status for added safety.

**4. Solid state proximity sensors** monitor Open/Closed discrete valve position with precision and reliability.

**5. Integral pneumatic valve** is isolated from environmental contamination, offers high tolerance to dirty air and enables rapid valve operation.

**6. Solenoid options** available for 120VAC and 24VDC. Select Piezo option for bus powered FOUNDATION Fieldbus Applications.

**7. Self Adjusting triggering system** provides consistent Open and Closed indication even with diaphragm compression. No resetting is required.

**8. Manual override** enables valve operation without electrically energizing.

**9. Dual module system** seals all position sensing, communication and control electronics in a compact vibration proof package.

**10. NPT port connections are stainless steel reinforced** for long life sealing under high torque stress conditions.

**11. Water proof quick connectors, compression fittings or conduit connections** are available for convenient, reliable attachment to plant electrical systems.

**12. Stainless steel adaptor system** locks Prism securely to valve actuator and provides stability for shaft interface.



## Sensing & Communication Module

The Prism features StoneL's dual module system with field proven reliability in all on/off applications: Namur (intrinsically safe), SST (switching) and VCTs (valve communication terminals). Dual modules have a 5-year warranty.

(For more detailed information please see pages 28 through 37.)



### SST Switching Sensors (33)

Configuration	(2) SST Switching Sensors (2) Wire Terminations (Solenoid) Select either NO or NC Models
Output	
Maximum Current	
Inrush	2.0 Amps
Continuous	0.3 Amps
Min. On Current	2.0 mA
Max. Leakage Current	0.5 mA
Voltage Range	8 to 125VDC / 24 to 125VAC
Max. Voltage Drop	7.0 Volts @ 100 mA

### Namur Sensors (44)

Configuration	(2) NAMUR Sensors (2) Wire Terminations (Solenoid)
Output	Conforms to DIN 19234
Current Ratings	Target On I < 1.0 mA Target Off I > 3.0 mA
Voltage Range	6 to 29 VDC

### AS-Interface VCT (96)

Configuration	(2) Sensor Inputs (2) Auxiliary Inputs (2) Power Outputs (Solenoids)
Max. Current	160mA, Both Outputs Combined (Current Limited to 200mA)
Outputs, Max. Power	4 Watts, Both Outputs Combined
Outputs, Voltage	25 to 30 VDC



### AS-Interface VCT (97) with Extended Addressing

Configuration	(2) Sensor Inputs (2) Auxiliary Discrete Inputs (1) Power Output (Solenoid)
Max. Current	100mA
Outputs, Max. Power	2.4 Watts
Outputs, Voltage	25 to 30 VDC

### DeviceNet VCT (92)

Configuration	(2) Discrete Inputs (Open & Closed) (2) Power Outputs (Solenoids) (1) 4-20 mA Auxiliary Input
Outputs, Max. Power	4 Watts, Both Outputs Combined
Outputs, Voltage	24 VDC

### Bus Powered Foundation Fieldbus VCT (93)

Configuration	(2) Discrete Inputs, DI (Open & Closed) (2) Discrete Outputs, DO (Piezo Valves)
Outputs	2mA @ 6.5 VDC each; Current Limited to 2mA (Bus Powered)
Temperature Range	-40° to 82°C (40°F to 180°F)

### Externally Powered Foundation Fieldbus VCT (94)

Configuration	(2) Discrete Inputs, DI (Open & Closed) (2) Power Outputs, DO (Solenoids)
Outputs	4 Watts @ 24VDC Both Outputs Combined; Current Limited to 200mA (Externally Powered)
Temperature Range	-40° to 82°C (40°F to 180°F)

### Modbus VCT (95)

Configuration	(2) Discrete Inputs (Open & Closed) (2) Power Outputs (Solenoids) (1) 4-20 mA Auxiliary Input
Outputs	4 Watts @ 24VDC Both Outputs Combined (Current Limited 200mA)
Temperature Range	-40° to 82° C (40°F to 180°F)

### Valve Diagnostics Cut Maintenance Costs

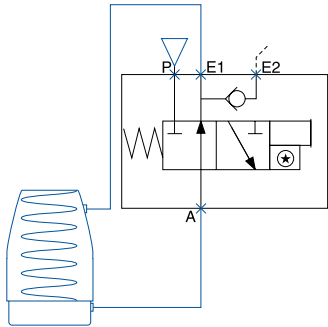
StoneL's dual modules with FOUNDATION Fieldbus feature valve stroke timing, cycle count and maintenance dating. This information is stored in the dual module and may be retrieved by the control system to determine valve system repair or replacement scheduling. Other protocols feature different forms of diagnostics depending on the protocol functionality. See dual module protocol specifications for more details.



## Pneumatic Control & Other Specifications

The three way, two position spring return pneumatic valve is designed to operate single acting actuators. Working mechanisms on the valve are completely isolated from the environment enabling pneumatic control to be located in the field at the actuator with no threat of contamination. A standard rebreather enables exhaust

air from the pressurized actuator cylinder to be channeled into the spring side actuator chamber preventing the ingestion of contaminated air from the outside environment. Select a solenoid valve for conventional or device bus applications or a piezo valve for FOUNDATION Fieldbus bus powered applications.



### General Pneumatic Specifications (Solenoid & Piezo)

Configuration	3-Way, 2-Position, Spring Return
Porting	1/8" NPT all pressurized ports
Rebreather Port	4-40 size
Flow Ratings	Cv - 0.1 (Kv - 1.4)
Rebreather	Standard on all models; Diverts air from Exhausting Cylinder into Actuator Spring Side, Excess air exhausted to atmosphere
Operating Life	1 Million Cycles
Operating Pressure	40psi to 120psi (2.6 to 8 bar)

### Solenoid Valve ☉ = ☐



A poppet style valve with exceptional tolerance to dirty air, the solenoid valve may be used for most conventional AC or DC applications. The DC (low power) version may be used on AS-Interface, Modbus, DeviceNet bus powered applications and on Foundation

Fieldbus (94) externally powered applications.

### Solenoid Valve Specifications

Filtration Requirements	40 Micron
Operating Temperature	-18°C to 50°C (0°F to 120°F)
DC Power Requirements	1.8 Watts @ 24VDC (0.075mA)
AC Inrush Current	0.09 Amps @ 120VAC
AC Holding Current	0.06 Amps @ 120VAC
AC Coil	Warranted Against Burn Out

### Piezo Valve ☉ = ☐



The Piezo valve is ideally suited for use with the Foundation Fieldbus (FF) bus powered output module (93). Each module output provides up to 2mA @ 6.5 VDC which is sufficient to drive the piezo valve. Specifically designed for ON/OFF

discrete applications, the piezo valve may remain energized for extended periods of time with no memory effect.

### Piezo Valve Specifications

Filtration Requirements	30 Micron
Operating Temperature	-10°C to 60°C (14°F to 140°F)
DC Power Requirements	2mA @ 6.5VDC
Hazardous Ratings	Ex ia IIC T6

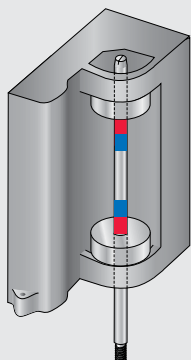
## Self Adjusting Triggering System

Triggering cams adjust automatically over the valve diaphragm operating life. Cams are fitted snugly to the shaft assuring stability under high amplitude vibration at varying frequencies and temperatures.

### Self Adjustment Sequence

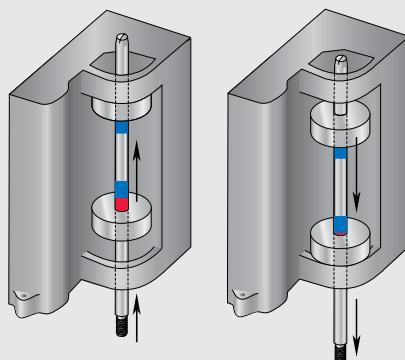
#### 1. Installation

Cams are manually set to outer limits when fitted to actuation system. (Open at top; Closed at bottom)



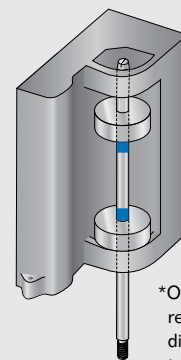
#### 2. Automatic Initial Setting

On operation, cams are automatically positioned to proper set points by module stops at top and bottom.



#### 3. Operational Self Adjustment

As diaphragm compresses over time, closed cam is automatically repositioned.\*



\*Open travel stops recommended on diaphragm actuators to maintain consistent travel with varying process line pressures.

## Nonincendive & Intrinsically Safe Model Selector

Model Number Example: **PM961BS09RS**

	Function	Pneumatic Valve	Conduit/Connectors	Visual Indicator	Valve Size
<b>PM</b>	<b>Sensor Modules</b>	<b>11</b> No Pneumatic Valve	<b>S02</b> (2) 1/2" NPT	<b>R</b> Red Closed/Green Open	<b>S*</b> 1/4" to 2" (1/8" to 1 1/4" stroke)
	<b>33</b> (2) SST N.O. Switching Sensors <b>44</b> (2) Namur Sensors (I.S.; DIN 19234)	<b>1A</b> 3-way Piezo (Recommended for use with Function option 93)	<b>S05</b> (2) M20	<b>G</b> Green Closed/Red Open	<b>L*</b> 2" to 4" (1 1/4" to 2 1/4" stroke)
	<b>Valve Communication Terminals (VCT)</b>	<b>1B</b> 3-way 24VDC 1.8 W	<b>S09</b> (2) Cable Glands		*Mounting system required. Order kit separately.
	<b>92</b> DeviceNet VCT	<b>1C</b> 3-way 120VAC 7.2 W	<b>S11</b> (1) 5-Pin Mini-Connector		
	<b>93</b> FOUNDATION Fieldbus VCT (Bus Powered; I.S.)	<b>1D</b> 3-way 24VDC 0.5 W (Recommended for use with Function options 33, 44, 92, 94, 95, 96 and 97)	<b>S13</b> (1) 4-Pin Micro-Connector		
	<b>94</b> FOUNDATION Fieldbus VCT (Externally Powered)	<b>1E</b> 3-way 12VDC (Recommended for use with Function option 44.)	<b>S14</b> (2) 4-Pin Micro-Connector		
	<b>95</b> Modbus VCT		<b>S15</b> (1) 5-Pin Micro-Connector		
	<b>96</b> AS-Interface VCT				
	<b>97</b> AS-Interface VCT (with extended addressing)				

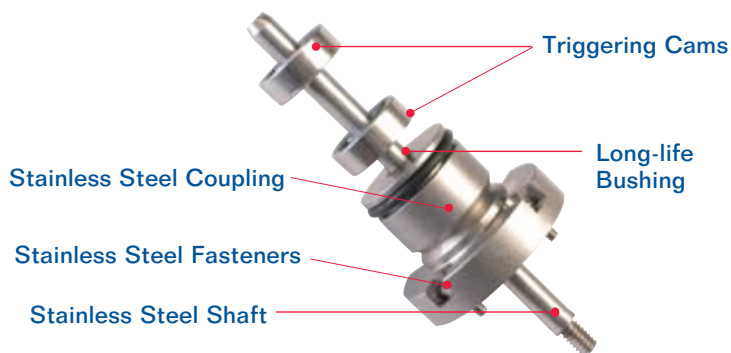
Mounting system required for all and sold separately.

### Prism Mounting System

Prism adapting systems are designed specifically for each actuator manufacturer and model. The adaptor coupling, made of stainless steel, also integrates a corrosion proof, ultra long-life bushing. This system stabilizes the shaft from lateral motion and assures reliable, low friction movement over the actuator's life.

- Required for all
- Order kit separately
- For kit numbers, consult factory or visit [www.stonel.com](http://www.stonel.com)

Note: Kit numbers are specific to valve size and manufacturer.



### Other Specifications and Ratings

#### Materials of Construction

Housing & Cover	Polycarbonate
Fasteners	Stainless Steel
Triggering Cams	Stainless Steel Banded Polycarbonate
Shaft	Stainless Steel
Valve Manifold	Polysulfone with Stainless Steel Reinforced NPT
<b>Temperature Range</b> with solenoid	-40° C to 82° C (-40° F to 180° F) Max. Ambient 50° C (120° F)

**Operating Life** 1 Million Cycles

#### Warranty

Dual Module	Five Years
Other Mechanicals	Two Years

#### Nonincendive Ratings

NEC/CEC Classes I and II, All Groups, Div. 2

#### Intrinsically Safe Ratings

NEC/CEC Classes I and II, All Groups, Div. 1 & 2

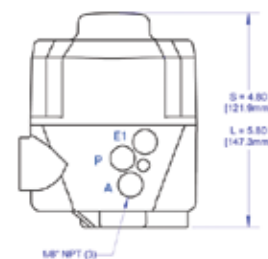
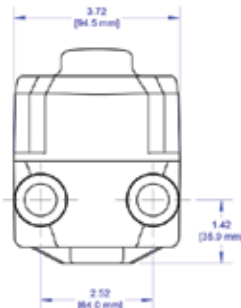
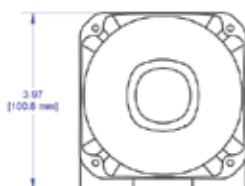
#### Enclosure Protection

NEMA 4, 4X and 6; IP67

For approval information visit [www.stonel.com/approvals](http://www.stonel.com/approvals)

### Dimensions

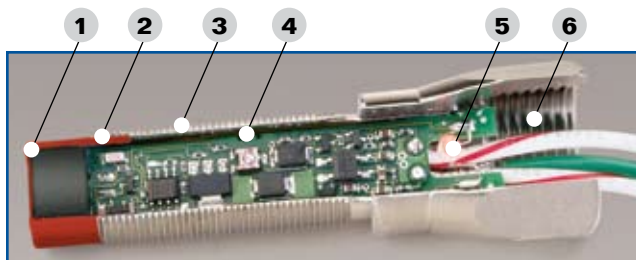
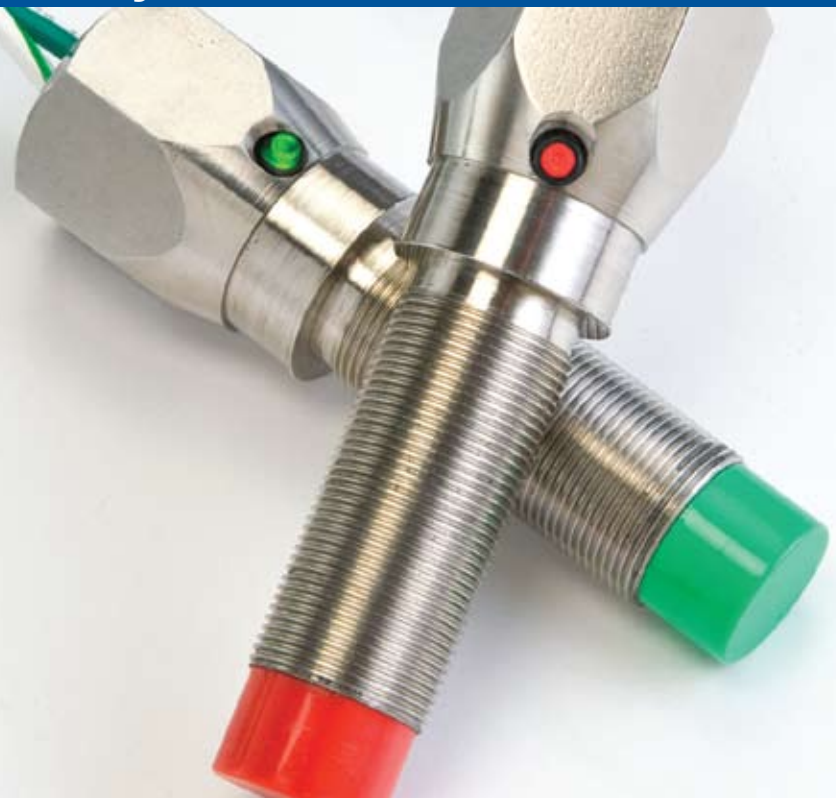
Inches [mm]



# Hawkeye

The solid state Hawkeye sensor is ideal for point sensing in corrosive and hazardous process environments. The standard Red/Green LEDs also speed your setup and installation by confirming power up and switch status.

The Hawkeye is rated for use in hazardous areas using nonincendive intrinsically safe protection concepts.



## 1. Lexan® Sensing Head Triggers on Any Metal

Inductive sensing technology detects metal targets at distances up to 4mm.

## 2. Stainless Steel Body is Rugged and Corrosion Proof

Hawkeye sensors are machined from a solid block of 316 stainless steel.

## 3. Stainless Steel Lock Washers and Fasteners Secure Hawkeye Permanently to Mount

Adaptor brackets are available in L or straight.

## 4. Circuit is Conformally Coated and Potted

Hawkeye sensor may be fully submersed and is shock and vibration tolerant.

## 5. High Intensity LED Brightly Displays Switch Status

Red and green LEDs may be selected to indicate open or closed status.

## 6. 1/2" Conduit Entry or Mini-Connector Available

Choose from a direct conduit entry for hazardous areas or a plug-in mini-connector for rapid attachment in general purpose environments.

## Linear Applications

Each pair (red and green) of Hawkeye sensors is tuned to operate independently in either long stroke or short stroke applications down to 6mm (1/4 inch). The Hawkeye may be triggered by existing valve hardware eliminating costly magnets and triggering systems and cutting installation time.

## Model Selector

HK	Function*	Housing	Conduit/Connectors	Features
<b>30</b>	SST Sensors Normally Open	<b>7</b> Stainless Steel	<b>7</b> 1/2" NPT	<b>SR</b> Red LED <b>SG</b> Green LED
<b>31</b>	SST Sensors Normally Closed		<b>8</b> 3-Pin Mini-Connector in Stainless Steel	
<b>40</b>	Namur (DIN 19234)			
* For 3-wire sensors (PNP, NPN) please consult factory.				

### SST Switching Sensors (30 and 31)

Maximum Current	
Inrush	2.0 Amps
Continuous	0.3 Amps @ 125VAC/VDC
Minimum Current	2.0 mA
Max. Leakage Current	0.5 mA
Voltage Range	8 to 125VDC / 24 to 125VDC
Max. Voltage Drop	6.5V @ 10 mA / 7.0V @ 100 mA

### Namur Sensor (40)

Output	Conforms to DIN 19234
Current Ratings	Target On <1.0 mA Target Off >3.0 mA
Voltage Range	6 to 29 VDC

## Specifications and Ratings

### Materials of Construction

Housing and Fasteners	316 Stainless Steel
Sensing Head	Lexan® Polycarbonate
LED Lens	Polycarbonate

### Other Specifications

Conduit Connection	1/2" NPT
Wiring	36" (0.9 meter) length, 18 gauge multi-strand
Sensing Distance	4mm* (0.16 inches)
Temperature Range	-40° to 82° C (-40° to 180° F)
Warranty	Five Years

\* sensing distance will vary depending on target material.

### Nonincendive Ratings

NEC/CEC	Class I, Div. 2 Groups A,B,C,D Class II, Div. 2 Groups F,G
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### Intrinsically Safe Ratings

NEC/CEC (applies to Function 30 & 31 with 1/2" NPT)	Class I, II, III, Div. 1 All Groups
--	-------------------------------------

### Enclosure Protection

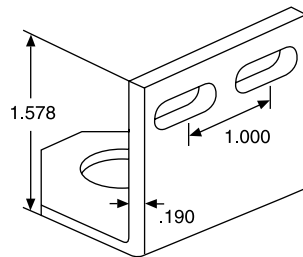
NEMA	4, 4X and 6; IP67
------	-------------------



## Dimensions

Inches [mm]

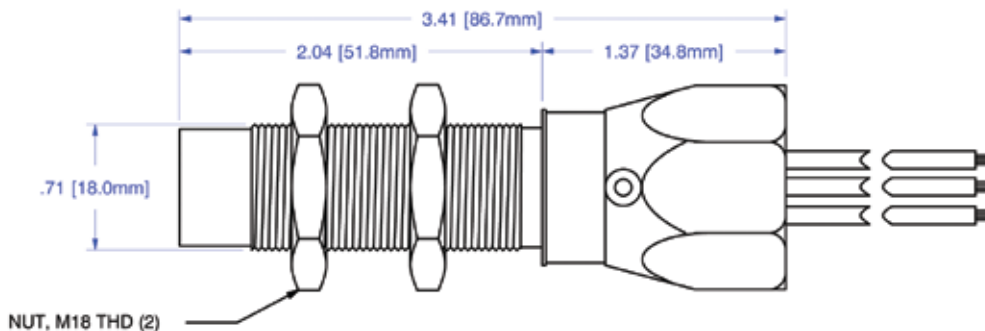
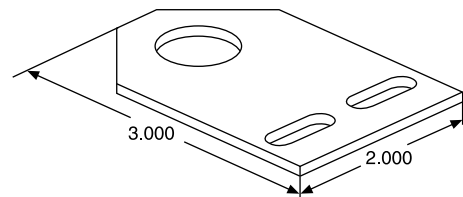
**Adaptor L Bracket**  
Model Number 425552  
Dimensions



### Adaptor Straight Bracket

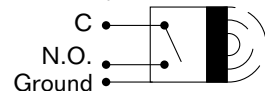
Model Number 425551

Dimensions

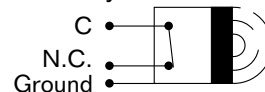


### Wiring Diagrams

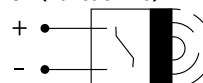
Normally Open (Function 30)



Normally Closed (Function 31)



Namur (Function 40)



# Valve Communication Terminals (VCTs)

StoneL VCT platforms feature fully sealed, solid state, modular electronic systems warranted for a full five years. A solid state magnetic resistive sensor provides continuous position feedback in the C-Module used in the Axiom platform. Dual inductive position sensors provide feedback for the Dual Module used in the Eclipse, Prism and Quartz platforms.

On-board microprocessors, position sensors, output controllers and more are included to consistently operate the valve-actuator assembly and precisely communicate parameters to the plant's control system.



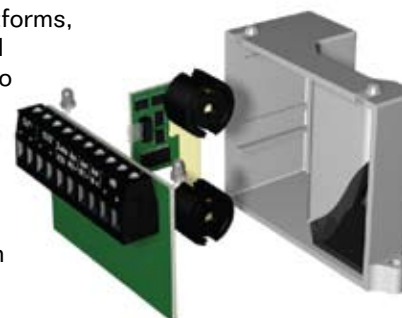
## C-Module

Used in the Axiom platform, the C-Module (Continuous sensing) integrates a magnetic resistive sensor system to monitor exact valve position throughout the rotational range. Push button or remote Open and Closed position setting along with microprocessor based operation make this state of the art system convenient, reliable, and smart.



## Dual Module

Used in the Eclipse, Prism, and Quartz platforms, the Dual Module (Dual sensing) integrates two inductive sensors to directly monitor Open and Closed valve positions. Settings are made by adjusting cams with stainless steel targets for simple and reliable operation.



## REFERENCE CHART

PAGE	FUNCTION	DESCRIPTION
30-31	<b>96</b>	AS-Interface
30-31	<b>97</b>	AS-Interface with Extended Addressing
29	<b>92</b>	DeviceNet
32-33	<b>93</b>	Foundation Fieldbus (Bus Powered)
32-33	<b>94</b>	Foundation Fieldbus (Externally Powered)
34	<b>95</b>	Modbus
36	<b>44</b>	NAMUR Sensor; DIN 19234 (C-Module)
37	<b>44</b>	NAMUR Sensor; DIN 19234 (Dual-Module)
36	<b>33</b>	SST Switching Sensor (C-Module)
37	<b>33</b>	SST Switching Sensor (Dual-Module)

Position Sensing →

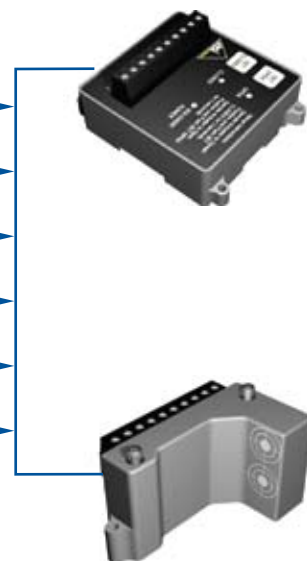
Communication →

Control Outputs →

Diagnostics →

Power Outputs →

Auxiliary Inputs →



# DeviceNet Dual Module

## DeviceNet Protocol

DeviceNet dramatically cuts installation costs by integrating up to 62 devices on a 4-wire trunk network. DeviceNet interfaces directly with many popular PCs and PLCs including Allen Bradley, GE Fanuc and others. The DeviceNet protocol is based on CAN (Controller Area Network) technology originally developed for automotive applications and extensively used throughout that industry.

**DeviceNet.** DeviceNet enables you to directly attach simple discrete and complex analog devices. Power is carried over two wires with data on another bundled two wires making up the four wire bus. DeviceNet has been designed for, and proven in, mission critical applications such as anti-lock brakes and air bags. It also has high noise immunity, making it suitable for industrial and process environments.

DeviceNet VCTs feature an electronic data sheet (EDS), which includes a definition of the device's configured parameters and public interfaces to those parameters. ODVA (Open DeviceNet Vendors Association) and StoneL maintain a directory of the EDS files for you to download from our Web Site.

## System Benefits

- Save over 30% on installation costs.
- Power and communication supplied over 4-wire bus.
- Install up to 62 devices on the same bus network.
- Cycle count for automated valve and other diagnostics available.
- Electronic Data Sheet provides for rapid commissioning of devices.
- Auxiliary bus-powered 4 to 20 mA input attaches conventional analog devices for more wire savings.
- Open/Closed sensor inputs and 2 power outputs available to handle all On/Off automated valve applications.
- Hot insertion of devices may be done without dropping bus power (non-hazardous applications.)

## Economic Analysis

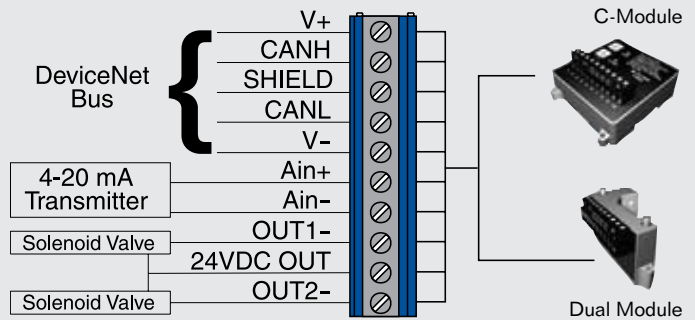
	Conventional	DeviceNet
VCT with Solenoid	\$ 500	\$ 680
Conduit & Wiring (\$8/ft)	\$1,200	\$ 300
I/O Cards; DeviceNet Scanner	\$ 30	\$ 100
Power Supply	\$ 10	\$ 10
Total Installed Cost (per VCT)	\$1,740	\$1,090

A \$650 or 37% savings has been demonstrated using DeviceNet over conventional systems. This analysis is based on 20 VCTs in a hazardous area. More savings may be realized for design time reduction, space savings, wiring flexibility and additional devices on the same network.

## Network Specifications

Topology	Trunk line with drop and branch lines, trunk terminators required		
Cabling	Two separate shielded twisted pairs contained in one shielded cable (DeviceNet Specifications.)		
Number of Devices	62 per network		
Data Delivery	8 bytes of data for I/O; can be unlimited if using fragmentation services		
Current Carrying Capacity	8 Amps @ 24 VDC (Thick cable)		
Cable Length (Thick cable)	Dependent on bus transmission rate (see table below)		
Transmission	Drop Length		
Rate	Trunk Length	Maximum	Cumulative
125 kb/s	500m (1,640ft)	6m (20ft)	156m (512ft)
250 kb/s	250m (820ft)	6m (20ft)	78m (256ft)
500 kb/s	100m (328ft)	6m (20ft)	39m (128ft)
Communication Method	Master/Slave, multi-master and peer-to-peer polling		
Data Signal	Non-Return to zero with bit stuffing		
Error Detection	Automatic retransmission of corrupted messages and autonomous switching off of defective nodes		

## VCT Wiring Diagram (92)



## VCT Specifications (92)

Configuration	(2) Discrete Inputs (Open & Closed) (2) Power Outputs (Solenoids) (1) 4-20 mA Auxiliary Input, 8 Bit Resolution; No Additional Power Source Required
Baud Rates	Software Selectable 125K, 250K or 500K baud
Messaging Outputs	Polling, Cyclic & Change of State Max. Current 160mA, Both Outputs Combined (Current Limited to 250mA)
Max. Power Outputs, Voltage	4 Watts, Both Outputs Combined 24 VDC
Temperature Range	-40° to 82°C (-40° to 180°F)

DeviceNet is a trademark of the Open DeviceNet Vendor Association, Inc.

## AS-Interface VCT

### Actuator Sensor Interface Protocol

Up to 31 VCTs (96) or 62 VCTs (97) may be linked on a single pair of wires using the AS-Interface protocol. Power and control is supplied to solenoid valves over the AS-Interface two wire network.

The AS-Interface (Actuator Sensor Interface) protocol is becoming a worldwide standard for discrete apparatus and now offers analog input capabilities. The AS-Interface network is simple, reliable and field proven. It is suitable for both general purpose and hazardous area process environments.



AS-Interface is designed to complement higher level bus networks. It is well suited to directly gateway into existing networks using

Modbus or Modbus+, which have become de facto standards for SCADA in the process industries. AS-Interface also conveniently gateways into PROFIBUS, DeviceNet and Ethernet.

### System Benefits

- Cut installation costs by over 40%.
- Suitable for both hazardous and general purpose environments (nonincendive and explosion proof.)
- Simple electronics for robust performance.
- Two wire unshielded cable for both power and data delivery is very low cost.
- High tolerance to electromagnetic interference.
- Easy to install and understand.
- Free choice of network topology.
- Gateways seamlessly to higher level networks.
- Offers diagnostic capabilities with the Axiom series (see page 7)

### Economic Analysis

	Conventional	AS-i
VCT with Solenoid	\$ 500	\$ 580
Conduit & Wiring (\$8/ft)	\$1,200	\$ 240
I/O Cards; Gateway (AS-i)	\$ 30	\$ 100
Power Supply	\$ 10	\$ 50
Total Installed Cost (per VCT)	\$1,740	\$ 970

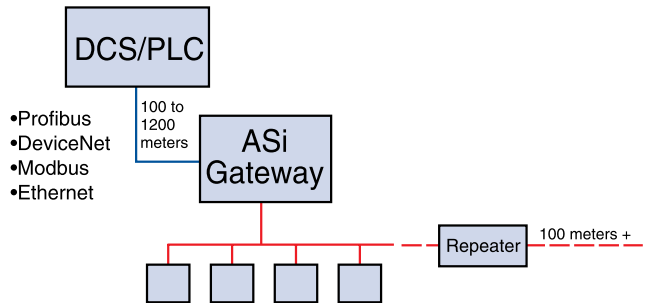
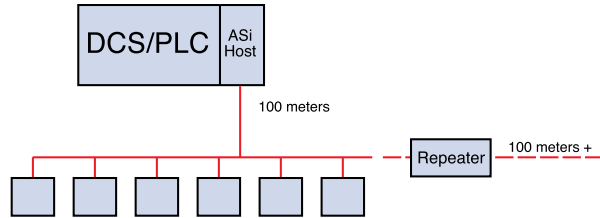
A \$770 or 44% savings has been demonstrated using AS-Interface over conventional systems. This analysis is based on 10 VCTs in a hazardous area. More savings may be realized for space savings, wiring flexibility and additional devices on the same network.

### Network Specifications

Topology	Linear, Star, Tree or Ring
Devices per Network	62, maximum
Addressing	AS-i Master or Handheld
Cabling	Unshielded 2-wire for Data & Power (30VDC up to 8 Amps) Standard Round or AS-i Flat
Cable Length*	100 meters per master or 300 meters with two repeaters
Transmission Rate	167 Kbits/second
Signal Coding	Manchester type with Alternating Pulse Modulation
Cycle Time	10 msec. max. with 62 Devices
Data per Message	4 bit bi-directional
Access Procedure	Master/Slave
Error Detection	1 parity bit + signal quality monitoring

\*Cable length may be extended beyond 300 meters by wiring parallel repeaters.

### Typical AS-Interface Configurations





# AS-Interface VCT

## VCT Specifications (96)

Configuration	(2) Discrete Sensor Inputs (2) Auxiliary Discrete Inputs (2) Power Outputs (Solenoids)
Max. Current	160mA, Both Outputs Combined (Current Limited to 200mA)
Auxiliary Inputs	24 VDC @ 120 mA (Self Powered)
Outputs, Max. Power	4 Watts, Both Outputs Combined
Outputs, Voltage	25 to 30 VDC
Temperature Range	-40° to 82°C (-40° to 180°F)
Configuration Code	F4; User Defined 4 in/2 out
AS-i Version	2.1
Devices per Network	31

## VCT Specifications with Extended Addressing (97)

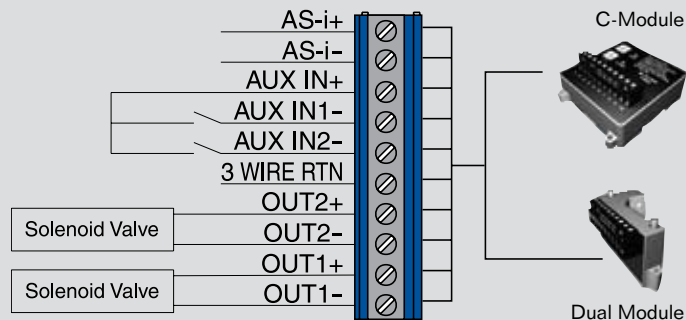
Configuration	(2) Discrete Sensor Inputs (2) Auxiliary Discrete Inputs (1) Power Output (Solenoid)
Max. Current	100mA
Output, Max. Power	2.4 watts
Output, Voltage	25 to 30 VDC
Temperature Range	-40° to 82°C (-40° to 180°F)
Configuration Code	A4; User Defined 4 in/1 out
AS-i Version	2.1
Devices per Network	62

### AXIOM C-Module Only

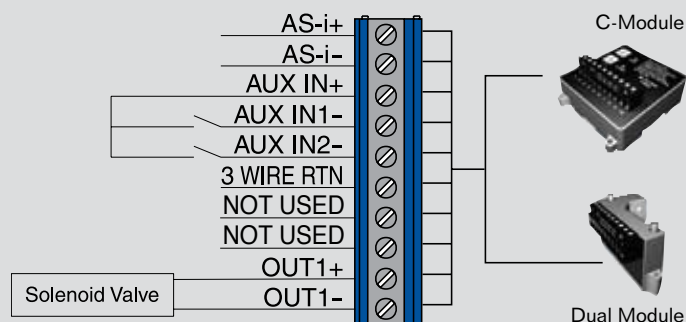
## VCT Specifications (96) with Diagnostics (D) Capabilities

Protocol	AS-Interface (AMI96) Version 2.1 or greater
Input Voltage	26.5 to 31.6 VDC (AS-i power supply)
Devices per Network	31
Input Configuration	(1) Open & (1) Closed (1) Low Supply Pressure (1) Bad Solenoid Coil or Stuck Spool/Pilot Valve* (1) Stuck Process Valve/Actuator
Output Configuration	(1) Solenoid Power 0.5 W @ 24VDC (1) Wink Operation (1) Remote Set Open (1) Remote Set Closed
Pressure Accuracy	± 2 psi (0.13 bar)
Supply Pres. Default	40 psi (2.7 bar) minimum
System Interface	AS-i 2.1 master or greater required

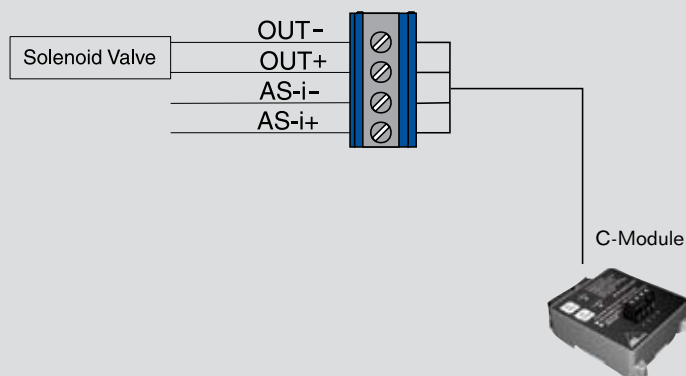
## VCT Wiring Diagram (96)



## VCT Wiring Diagram with Extended Addressing (97)



## VCT Wiring Diagram (96) with Diagnostics (D) Capabilities



## FOUNDATION Fieldbus VCT

### FOUNDATION Fieldbus™ Protocol

Designed for use in the process industries, FOUNDATION fieldbus offers multi-drop capabilities, long trunk length, and is fully compatible with intrinsic safety circuits. FOUNDATION fieldbus H1 level has been designed as the ideal digital bus replacement for the 4 to 20 mA analog standard in the process industries.



FOUNDATION fieldbus has a unique user layer that features Device Description (DD) and a set of communication blocks. The DD is a standardized description of the functions in a device. It enables the

host device to learn about capabilities of other devices on the network even though some capabilities may have never been seen before. Function blocks, one type of communication block in the user layer, describe the control and I/O behavior of the device in object form. By interconnecting function blocks, the user may construct PID control loops and other process control algorithms.

The physical layer of FOUNDATION fieldbus has been designed to operate with intrinsically safe wiring. It is standardized by ISA, S50.02-1992 and IEC 1158.2.

© 2002 Fieldbus Foundation

### System Benefits

- Same bus may be used for both analog and discrete process instrumentation.
- Intrinsic safety wiring option for hazardous environments.
- Standardized function block descriptions represent process variables and speed control setup. (Multiple function blocks may reside in a single device.)
- Long bus length of 1900m (6,175ft) and spurs up to 120m (390ft) span most process systems.
- Bus wiring may be the same as standard 4 to 20 mA wiring to further reduce wiring costs.
- FF is a worldwide standard for use in the process industry and is supported by many of the world's process instrumentation suppliers.
- FF dual module offers separately powered (isolated from bus) power outputs, or bus powered outputs.

### Economic Analysis

	<u>Conventional</u>	<u>FF</u>
VCT with Piezo	\$ 500	\$ 990
Conduit & Wiring (\$8/ft)	\$1,200	\$ 200
I/O Cards; FF Master	\$ 30	\$ 100
Power Supply	\$ 10	\$ 10
Total Installed Cost	\$1,740	\$1,300

FOUNDATION fieldbus VCTs offer a \$440 wiring savings over conventional monitors. This analysis is based on 10 VCTs in a hazardous area. More savings may be realized for space savings, wiring flexibility and additional devices on the same network or by IS wiring.

### Network Specifications

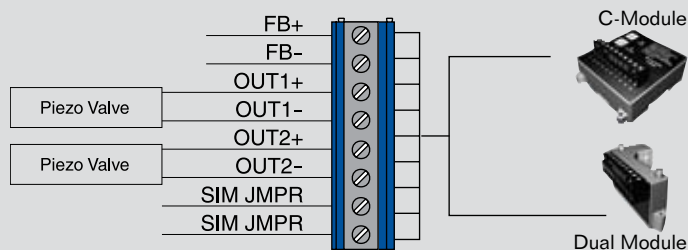
Topology	Bus/tree, terminators required
Cabling	Shielded twisted pair
Bus Power	Typically 20mA/device at 9 to 32 VDC
Number of Devices	2 to 16 per network typical
Data Delivery	Unlimited
Max. Cable Length	1900 meters, 120 meters/spur
Transmission Rate	31.25 kbits/second
Cycle Time	Link Active Scheduler determines priority
Communication Method	Delegated token passing with cyclic and acyclic option
Data Signal	Manchester Biphase-L decoding with synchronous serial signaling
Error Detection	Frame check sequence comparison

## FOUNDATION Fieldbus VCT

### VCT Specifications (93) Bus Powered (uses piezo)

Configuration	(2) Discrete Inputs, DI (Open & Closed)
Outputs	(2) Discrete Outputs, DO (Piezo Valves)
Temperature Range	2mA @ 6.5 VDC each; Current Limited to 2mA (Bus Powered)
Other Features	-40° to 82°C (-40° to 180° F) Stores Number of Actuations Stores Date of Last Service Predetermined Output Fail State

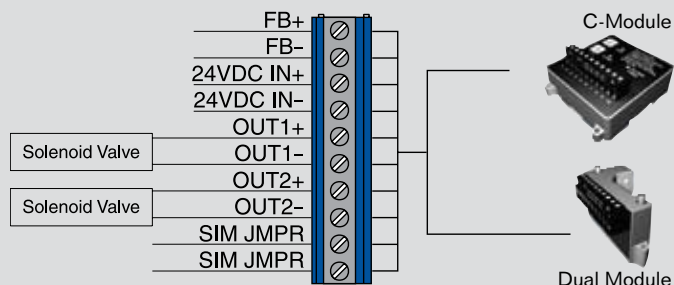
### VCT Wiring Diagram (93) Bus Powered



### VCT Specifications (94) Externally Powered

Configuration	(2) Discrete Inputs, DI (Open & Closed)
Outputs	(2) Power Outputs, DO (Solenoids)
Temperature Range	4 watts total @ 24VDC Both outputs combined (Current Limited to 200mA) (externally powered)
Other Features	-40° to 82°C (-40° to 180° F) Stores Number of Actuations Stores Date of Last Service Predetermined Output Fail State

### VCT Wiring Diagram (94) Externally Powered



### Piezo Ultra Low Power Valve for use with (93) Bus Powered FOUNDATION Fieldbus

Use either the 0.5 Cv or the 1.3 Cv Namur mount pneumatic valve with StoneL FOUNDATION Fieldbus Bus Powered VCTs. These are Ultra Low Power valves that use piezo technology to actuate, utilizing just 2mA @ 7.5VDC to operate either device. Both of these 5-Way 2 position, spring return pneumatic valves are designed to meet the Namur standards for actuator pad mount solenoid valves.



0.5 Cv (443015)



1.3 Cv (443016)

### Piezo Specifications 0.5 Cv and 1.3 Cv Models

Configuration	Piezo Operated 5-way spool valve, 2 position, spring return
Operating Pressure	36 to 120 psi (2.5 to 7.5 bar)
Media	Dried / filtered air (30 micron)
Manual Override	External
Operating Life	1 million cycles
Operating Temperature	-10° to 60° C (14° to 140° F)
DC Coil Power	2mA@6.5VDC
Operating Voltage	5.5 to 9 VDC
Mounting	2 Screws (M5) per Namur standards
Connection	Plug to DIN 43650B
Electrical Protection	EEEx ia IIC T6

#### Namur Mount 0.5Cv (443015)

Flow Rating	Cv - 0.5 (Kv - 7.1)
Manifold Porting	G 1/4" (BSP)
Exhaust Porting	G 1/4" (BSP)

#### Namur Mount 1.3Cv (443016)

Flow Rating	Cv - 1.3 (Kv - 18.5)
Manifold Porting	G 1/4" (BSP)
Exhaust Porting	G 1/4" (BSP)



## Modbus VCTs

### Modbus Protocol

Modbus has been the de facto standard for interfacing field I/O systems to the DCS in the process industries for the

# MODBUS

past 15 years. Many plants are currently using

Modbus based field networks. This enables rapid connection into the existing control architecture using existing software drivers.

The Modbus protocol uses either an RS232, RS422 or an RS485 serial interface for its physical layer (wiring topology and electrical connections). For field use RS485 is the preferred serial interface featuring a long trunk length (over 1200 meters) and 32 drops to individual field devices. Since RS485 does not carry power, an additional 24 VDC power supply wire pair is recommended to power the field devices.

### System Benefits

- Same bus may be used for both analog and discrete process instrumentation.
- Interfaces readily into most DCS systems and software.
- Install up to 32 devices on the same trunk network.
- Long bus length of up to 1200m (4,000 ft).
- Separately powered outputs supply up to 4 watts.
- Voltage regulator keeps output for powering auxiliary solenoids at 24 VDC with supply levels as low as 10 VDC.
- Modbus Dual Module accepts a standard 4 to 20 mA input from conventional analog instrumentation.

### Economic Analysis

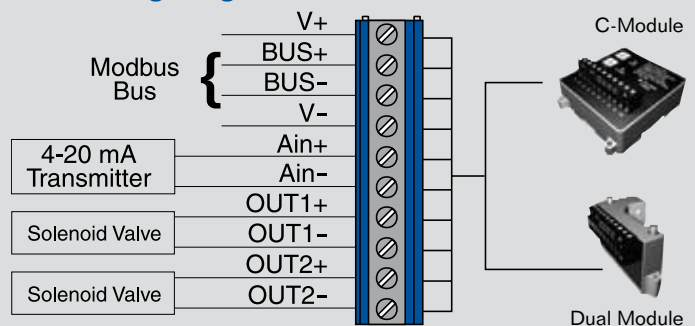
	<u>Conventional</u>	<u>Modbus</u>
VCT with Solenoid	\$500	\$680
Conduit and Wiring (\$8/ft)	\$1,200	\$200
I/O Cards; Modbus Interface	\$30	\$20
Power Supply	<u>\$10</u>	<u>\$10</u>
Total Installed Cost	\$1,740	\$910

Modbus VCTs offer an \$850 wiring savings over conventional monitors. This analysis is based on 10 VCTs in a hazardous area. More savings may be realized for space savings, wiring flexibility and additional devices on the same network.

### Network Specifications

Topology	Bus/tree, terminators required
Cabling	One shielded twisted pair for signal and one pair for 24 VDC supply.
Bus Power	Must have auxiliary 24 VDC supply
Max. Number of Devices	32 per network
Data Delivery	Unlimited
Max. Cable Length	1,200 meters (4,000 feet)
Typical Data Access	Cyclic Polling using Query-Response Method
Transmission Rate	1.2 to 115 kbits/second
Approximate Cycle Time	74 msec for 32 field devices @ 38.4 kbits/second
Error Detection	Cyclic Redundancy Check

### VCT Wiring Diagram (95)



### VCT Specifications (95)

Configuration	(2) Discrete Inputs (Open and Closed) (2) Power Outputs (Solenoids) (1) 4-20mA Auxiliary Input, 10 Bit Resolution
Input Impedance	250 Ω
Outputs	4 Watts @ 24 VDC Both Outputs Combined (Current Limited to 200mA)
Outputs, Max. Power	4 Watts, Both Outputs Combined
Outputs, Volt. Supply	24 VDC (Regulated with range from 10 to 24 VDC)
Transmission Rate	Software selectable for 9.6, 19.6 or 38.4 kbits/sec
Transmission Mode	RTU (Remote Terminal Unit)
Temperature Range	-40° to 82° C (-40° to 180° F)
Other Features	Predetermined Output Fail State



## C-Modules - Switching & Namur (Axiom)



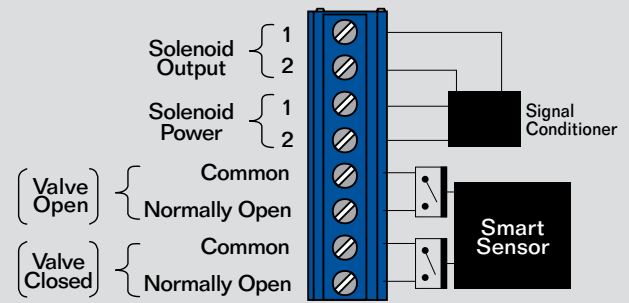
### C-Modules

Used in the Axiom platform, the C-Module (Continuous sensing) integrates a magnetic resistive sensor system to monitor exact valve position throughout the rotational range. Push button or remote Open and Closed position setting along with microprocessor based operation make this state of the art system convenient, reliable, and smart.

### Specifications and Ratings SST Switching Sensors (33)

Configuration	(2) Two wire solid state
Switching outputs	(1) or (2) Solenoid Power Input(s)
Output	Normally Open (SPST)
Maximum Current	
Inrush	2.0 Amps
Continuous	0.25 Amps
Min. On Current	2.0 mA
Max. Leakage Current	0.5 mA
Voltage Range	20 to 125VDC/125VAC
Max. Voltage Drop	7.0 Volts @ 100 mA
Short Circuit	Protected from Direct Application of up to 125 VDC/VAC

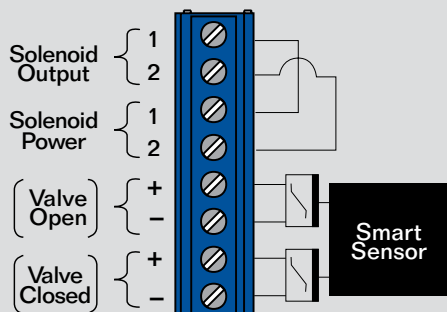
### SST Wiring Diagram (33) Single Solenoid



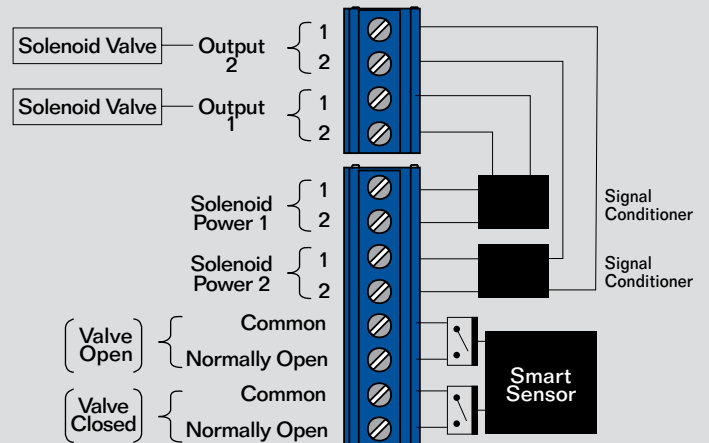
### Namur Sensors (44)

Configuration	(2) Namur Outputs
	(1) or (2) Solenoid Power Input(s)
Output	Conforms to DIN 19234
Current Ratings	Target On $I \leq 1.0$ mA
	Target Off $I \geq 2.1$ mA
Voltage Range	7 to 24 VDC

### Namur Wiring Diagram (44)



### SST Wiring Diagram (33) Dual Solenoid



## Dual Modules - Switching & Namur (Eclipse, Prism, & Quartz)



### SST & Namur Dual Modules

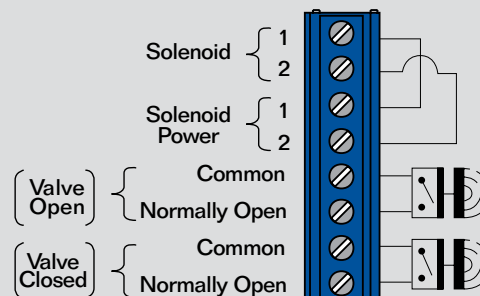
The Dual Module integrates two separate sensor circuits and solenoid wire terminations in a fully sealed module. Sensor circuits are available in either SST switching or Namur outputs. Each SST sensor circuit and each Namur sensor circuit are electrically isolated. Although they are packaged together they operate independently.

### Specifications and Ratings

#### SST Switching Sensors (33)

Configuration	(2) SST Solid State Sensors (2) Wire Terminations for One Solenoid
Operation	Cam Selectable NO or NC
Maximum Current	
Inrush	2.0 Amps @ 125 VAC/VDC
Continuous	0.3 Amps @ 125 VAC/VDC
Minimum On Current	2.0 mA
Max Leakage Current	0.5 mA
Voltage Range	18 to 125 VDC 24 to 125 VAC
Maximum Voltage Drop	6.5 Volts @ 10 mA 7.0 Volts @ 100 mA

#### SST Wiring Diagram (33)

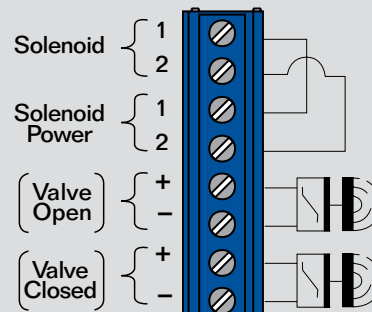


#### Namur Sensors (44)

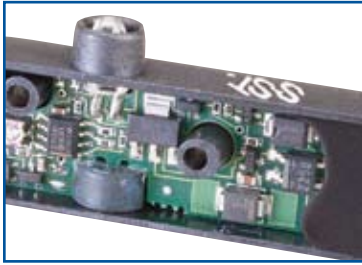
Configuration	(2) Namur Sensors (2) Wire Terminations for One Solenoid
Voltage Range	6 to 29 VDC
Current Ratings	Target On $I < 1$ mA Target Off $I > 3$ mA
Temperature Range	-40° to 82° C (-40° to 180° F)
Warranty	Five Years
Operating Life	Unlimited

*(Use Namur sensor with intrinsic safety repeater barrier. Conforms to DIN 19234 standard.)*

#### Namur Wiring Diagram (44)



## Proximity Sensors (Quartz)



### SST Switching Sensor

Solid state SST proximity sensors are ideal for use in AC and DC computer input circuits. They are robust and well suited for general applications in control



### SST Switching Sensors ( \_X)

Operation	Cam Selectable NO or NC
Maximum Current	
Inrush	2.0 Amps @ 125 VAC/VDC
Continuous	0.3 Amps @ 125 VAC/VDC
Minimum On Current	2.0 mA
Leakage Current	Less than 0.50 mA
Voltage Range	8 to 125 VDC 24 to 125 VAC
Maximum Voltage Drop	6.5 Volts @ 10 mA 7.0 Volts @ 100 mA
Temperature Range	-40° to 82° C (-40° to 180° F)
Operating Life	Unlimited



### Maxx-Guard Proximity Switch

Maxx-Guard hermetically sealed reed switches are suitable for computer input circuits and general purpose applications. SPDT tungsten contacts are designed for 125VAC computer

inputs and 240VAC moderate power applications. SPDT rhodium contacts are suitable for both 24VDC and 120VAC computer inputs. SPST ruthenium contacts are ideal for either 24VDC or 125VAC low power computer inputs.

### Specifications and Ratings

#### Maxx-Guard Proximity Switch (G, H, M & S) Single-Pole Double-Throw (SPDT)

Temperature Range	-40° to 82° C (-40° to 180° F)
Seal	Hermetically Sealed
Operating Life	5 Million Cycles
Warranty	Two Years

#### G Switch

Configuration	SPDT
Electrical Ratings	0.30 Amp @ 24VDC 0.2 Amp @ 120VAC
Max. Voltage Drop	0.1 Volts @ 10mA 0.5 Volts @ 100mA
Contact Composition	Rhodium

#### H Switch

Configuration	SPDT
Electrical Ratings	240 VAC max; 3 Amp max 100 Watts max; 2.0 Watts min
Max. Voltage Drop	0.1 Volts @ 10mA 0.5 Volts @ 100mA
Contact Composition	Tungsten

#### M Switch

Configuration	SPDT; Passive (Intrinsically Safe)
Electrical Ratings	0.15 Amp @ 24VDC
Max. Voltage Drop	0.1 Volts @ 10mA 0.5 Volts @ 100mA
Contact Composition	Rhodium

#### S Switch

Configuration	SPDT (LED)
Electrical Ratings	0.30 Amp @ 125VAC
Max. Voltage Drop	3.5 Volts @ 10 mA 6.5 Volts @ 100 mA
Contact Composition	Tungsten

### Specifications and Ratings

#### Maxx-Guard Proximity Switch (J, L & P) Single-Pole Single-Throw (SPST)

Temperature Range	-40° to 82° C (-40° to 180° F)
Seal	Hermetically Sealed
Operating Life	5 Million Cycles
Warranty	Two Years

#### J Switch

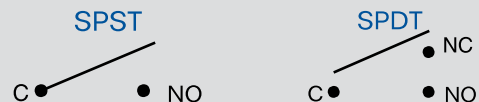
Configuration	SPST; Passive (Intrinsically Safe)
Electrical Ratings	0.15 Amp @ 30VDC
Max. Voltage Drop	0.1 Volts @ 10mA 0.5 Volts @ 100mA
Contact Composition	Ruthenium

#### L Switch

Configuration	SPST (LED)
Electrical Ratings	0.15 Amp @ 30 VDC/125VAC
Max. Voltage Drop	3.5 Volts @ 10 mA 6.5 Volts @ 100 mA
Contact Composition	Ruthenium

#### P Switch

Configuration	SPST
Electrical Ratings	0.15 Amp @ 30VDC/125VAC
Max. Voltage Drop	0.1 Volts @ 10mA 0.5 Volts @ 100mA
Contact Composition	Ruthenium





# Mechanical Switches and Transmitters (Quartz)



## Mechanical Switch (SPDT)

Low cost single-pole double-throw mechanical switches with silver contacts are recommended for high power 125 VAC applications. Gold contacts may be used in 30 VDC computer input applications.



## Specifications and Ratings

### Silver Contacts (V Function)

Electrical Ratings	10 Amp @ 125/250 VAC
	0.5 Amp @ 125 VDC
Temperature Range	-40° to 82° C (-40° to 180° F)
Operating Life	400,000 Cycles

*Not recommended for electrical circuits operating at less than 20 mA @ 24VDC.*

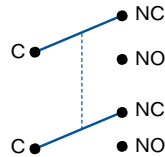
### Gold Contacts (W Function)

Electrical Ratings	1.0 Amp @ 125 VAC
	0.5 Amp @ 30 VDC
Temperature Range	-40° to 82° C (-40° to 180° F)
Operating Life	100,000 Cycles



## Mechanical Switch (DPDT)

Double-pole double-throw mechanical switches enable two electrical circuits to be activated simultaneously. Each switch circuit is electrically isolated from the other. As with standard silver contacts, DPDT switches are designed to operate in high power applications.



## 14 Function

Electrical Ratings	4.5 Amp @ 125/250 VAC
Temperature Range	-40° to 82° C (-40° to 180° F)
Operating Life	250,000 Cycles

*Not recommended for electrical circuits operating at less than 20 mA @ 24VDC.*



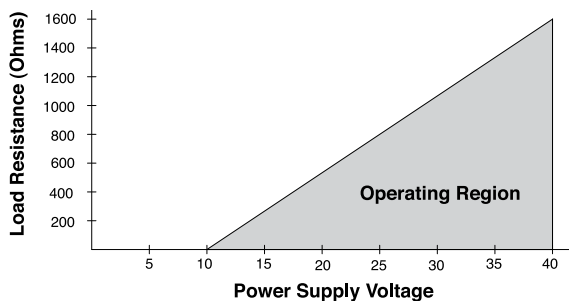
## 4 to 20 mA Position Transmitter

Position transmitters provide a precise 4 to 20 mA signal on a two wire DC loop. Control valves and dampers are accurately monitored through their range of travel offering you assurance of exact valve position at all times. Select a standard potentiometer or a vibration proof, high-performance potentiometer on your position transmitter.

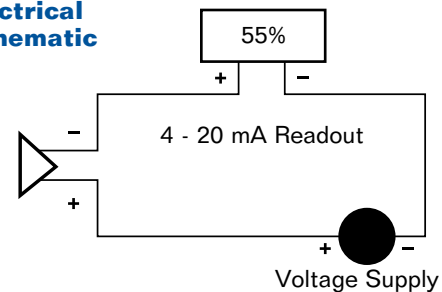
Output	Two Wire 4 to 20 mA
Supply Source	10-40 VDC
Span Range*	35° to 270° (Adjustable)
Maximum Loading	700 Ohms @ 24 VDC
Linearity Error	
Standard (5)	+/-0.85° Maximum
High Perf. (7)	+/- 0.35°
Cycle Life	
Standard (5)	2 Million Rotations
High Perf. (7)	50 Million Rotations
Vibration Tolerance	
Standard (5)	Acceptable
High Per. (7)	Outstanding
Temperature Range	-40° to 82° C (-40° to 180° F)

\*Please consult factory for higher spans.

## Load Curve



## Electrical Schematic



## Enclosure Standards and Protection Concepts

### NEMA Enclosure Standards

NEMA (National Electrical Manufacturers' Association) has established standards for enclosures to provide protection from environmental contamination. A description of the more common standards is listed below. Type definitions are from NEMA 250-1997. For more detailed

and complete information, NEMA Standards Publication 250-1997, "Enclosures for Electrical Equipment (1000 Volts Maximum)" should be consulted. This Standards Publication, as well as all other NEMA publications, is available from IHS at 1-800-854-7179.

### Standards for Non-Hazardous Locations

**Type 1:** Enclosures constructed for indoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment and to provide a degree of protection against falling dirt.

**Type 2:** Enclosures constructed for indoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment, to provide a degree of protection against falling dirt, and to provide a degree of protection against dripping and light splashing of liquids.

**Type 3:** Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt, rain, sleet, snow, and windblown dust; and that will be undamaged by the external formation of ice on the enclosure.

**Type 3R:** Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt, rain, sleet, and snow; and that will be undamaged by the external formation of ice on the enclosure.

**Type 3S:** Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt, rain, sleet, snow, and windblown dust; and in which the external mechanism(s) remain operable when ice laden.

**Type 4:** Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt, rain, sleet, snow, windblown dust, splashing water, and hose-directed water; and that will be undamaged by the external formation of ice on the enclosure.

**Type 4X:** Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt, rain, sleet, snow, windblown dust, splashing water, hose-directed water, and corrosion; and that will be undamaged by the external formation of ice on the enclosure

**Type 5:** Enclosures constructed for indoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt; against settling airborne dust, lint, fibers, and flyings; and to provide a degree of protection against dripping and light splashing of liquids.

**Type 6:** Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt; against hose-directed water and the entry of water during occasional temporary submersion at a limited depth; and that will be undamaged by the external formation of ice on the enclosure.

**Type 6P:** Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt; against hose-directed water and the entry of water during prolonged submersion at a limited depth; and that will be undamaged by the external formation of ice on the enclosure.

**Type 12:** Enclosures constructed (without knockouts) for indoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt; against circulating dust, lint, fibers, and flyings; and against dripping and light splashing of liquids.

**Type 12K:** Enclosures constructed (with knockouts) for indoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt; against circulating dust, lint, fibers, and flyings; and against dripping and light splashing of liquids.

**Type 13:** Enclosures constructed for indoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt; against circulating dust, lint, fibers, and flyings; and against the spraying, splashing, and seepage of water, oil, and non-corrosive coolants.

### Standards for Hazardous Locations (replaced by NEC/CEC Hazardous Area Codes)

**Type 7:** Enclosures constructed for indoor use in hazardous locations classified as Class I, Division 1, Groups A, B, C, or D as defined in NFPA 70.

**Type 8:** Enclosures constructed for either indoor or outdoor use in hazardous locations classified as Class I, Division 1, Groups A, B, C, and D as defined in NFPA 70.

**Type 9:** Enclosures constructed for indoor use in hazardous locations classified as Class II, Division 1, Groups E, F, or G as defined in NFPA 70.

**Type 10:** Enclosures constructed to meet the requirements of the Mine Safety and Health Administration, 30 CFR, Part 18.

### Comparison of Specific Applications of Enclosures for Outdoor Nonhazardous Locations

Provides a degree of protection against the following environmental conditions	Type of Enclosure						
	3	3R*	3S	4	4X	6	6P
Incidental contact with the enclosed equipment	X	X	X	X	X	X	X
Rain, snow, and sleet**	X	X	X	X	X	X	X
Sleet ***	...	...	X	...	...	...	...
Windblown dust, lint, fibers, and flyings	X	...	X	X	X	X	X
Hosedown	...	...	...	X	X	X	X
Corrosive agents	...	...	...	...	X	...	X
Occasional temporary submersion	...	...	...	...	...	X	X
Occasional prolonged submersion	...	...	...	...	...	...	X

\* These enclosures may be ventilated.

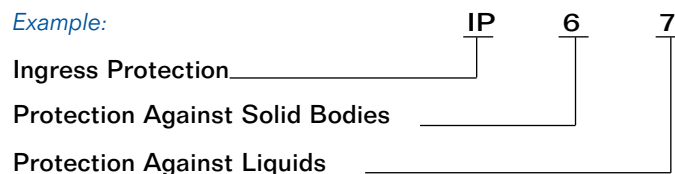
\*\* External operating mechanisms are not required to be operable when the enclosure is ice covered.

\*\*\* External operating mechanisms are operable when the enclosure is ice covered.

### IEC Enclosure Standards

The International Electrotechnical Commission has established enclosure standards for protection from environmental contamination as shown below. These standards are used widely in Europe, the Middle East, Africa and parts of Asia.

Example:



#### Protection Against Solid Bodies

- 0: no special protection
- 1: protected against solid objects greater than of 50mm ø
- 2: protected against solid objects greater than 12mm ø
- 3: protected against solid objects greater than 2.5mm ø
- 4: protected against solid objects greater than 1mm ø
- 5: dust protected
- 6: dust-tight

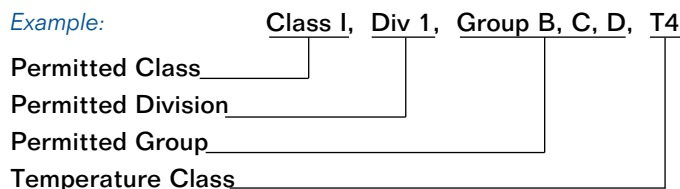
#### Protection Against Liquids

- 0: no special protection
- 1: protected against vertical falling water drops
- 2: protected against vertical falling water drops when enclosure is tilted at 15°
- 3: protected against sprayed water
- 4: protected against splashing water
- 5: protected against water jets
- 6: protected against heavy seas
- 7: protected from the effects of temporary immersion
- 8: protected from the effects of continuous immersion

## Hazardous Area Descriptions

### National Electrical Code (NEC) 500

Traditional standards used in North America.



#### Permitted Class

**Class I:** Gas Vapors  
**Class II:** Dusts  
**Class III:** Fibers

#### Permitted Division

**Division 1:** Gasses or vapors exist under normal conditions  
**Division 2:** Gasses or vapors are present but are normally contained and can escape only through accident or abnormal operation

#### Permitted Group

**Group A:** Acetylene  
**Group B:** Hydrogen or Equivalent  
**Group C:** Ethyl Ether, Ethylene or Cyclopropane  
**Group D:** Gasoline, hexane, naphtha, benzene, butane, propane, alcohol, acetone, benzol, lacquer, and natural gas  
**Group E:** Metal Dust  
**Group F:** Carbon Black  
**Group G:** Flour, starch, grain dusts

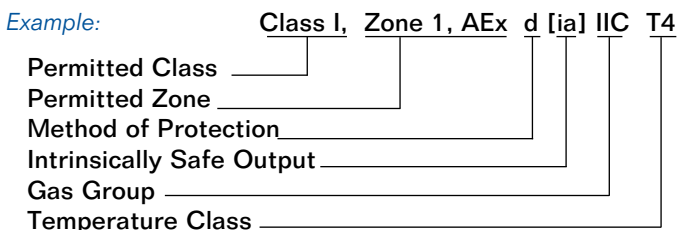
#### Temperature Class\*

**T1:** 450°C (842°F)  
**T2:** 300°C (572°F)  
**T3:** 200°C (392°F)  
**T4:** 135°C (275°F)  
**T5:** 100°C (212°F)  
**T6:** 85°C (185°F)

\* Device may be exposed to gases whose ignition temperature is higher than this value.

### National Electrical Code (NEC) 505

North American Standards developed to harmonize with IEC standards.



#### Permitted Class

**Class I:** Gas Vapors  
**Class II:** Dusts  
**Class III:** Fibers

#### Permitted Zone

**Zone 0:** Gas present continuously  
**Zone 1:** Gas present intermittently  
**Zone 2:** Gas present under abnormal operation

#### Protection Method

**e:** Increased Safety: no arcs sparks or hot surfaces  
**d\*:** Flame proof: contain explosion and quench flame  
**m:** Encapsulation, Zone 1: keep flammable gas out  
**nA:** Nonsparking equipment  
**nC:** Sparking equipment in which the contacts are suitably protected other than by restricted breathing enclosure  
**nR:** Restricted breathing  
**\*[ia]:** Intrinsically safe, Zone 0, 1, and 2  
**\*[ib]:** Intrinsically safe, Zone 1 and 2

#### Gas Group

**IIC:** Acetylene  
**IIB + H2:** Hydrogen or equivalents  
**IIB:** Ethyl Ether, Ethylene or Cyclopropane  
**IIA:** Gasoline, hexane, naphtha, benzine, butane, propane, alcohol, acetone, benzol, lacquer, and natural gas

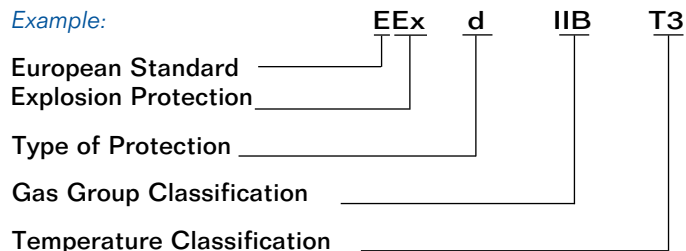
#### Temperature Class\*

**T1:** 450°C (842°F)  
**T2:** 300°C (572°F)  
**T3:** 200°C (392°F)  
**T4:** 135°C (275°F)  
**T5:** 100°C (212°F)  
**T6:** 85°C (185°F)

\* Device may be exposed to gases whose ignition temperature is higher than this value.

## IEC & EU (European) Standards

The IEC (International Electrotechnical Commission) markings are as follows:



### Type of Protection

- d:** flameproof enclosure - contain explosion and quench flame
- p:** pressurized enclosure - fill with inert gas
- ia:** intrinsically safe for Zone 0 - limit energy
- ib:** Intrinsically safe for Zone 1 - limit energy
- o:** oil immersion
- s:** special protection
- e:** increased safety - no arcing, sparking or hot surfaces
- m:** encapsulation - sealed arcing devices or non-arcing
- q:** sand-filled
- nL:** nonincendive - limited energy
- nA:** nonincendive - non sparking
- me:** encapsulation/increased safety

### Gas Group Classification

- IIC:** Acetylene and hydrogen
- IIB:** Diethyl ether, ethylene, cyclopropane and others
- IIA:** Gasoline, hexane, butane, naphtha propane, isoprene and many others

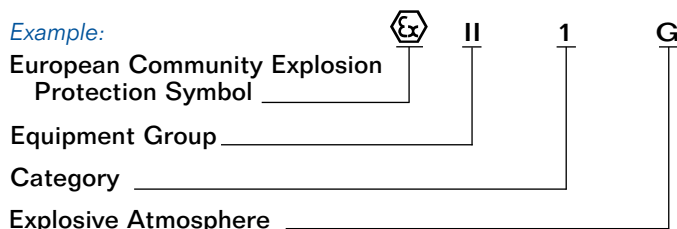
### Temperature Classification\*

- T1:** 450°C (842°F)
- T2:** 300°C (572°F)
- T3:** 200°C (392°F)
- T4:** 135°C (275°F)
- T5:** 100°C (212°F)
- T6:** 85°C (185°F)

\* Device may be exposed to gases whose ignition temperature is higher than this value.

## ATEX Marking (94/9/EC)\*

European requirements centered around the safety of hazardous area equipment that became mandatory on July, 1 2003. All equipment exported into European member countries must meet the ATEX hazardous and essential health and safety requirements for acceptance.



### Equipment Group

- I:** Mines
- II:** Other than mines

### Category

- 1:** Zone 0
- 2:** Zone 1
- 3:** Zone 2

### Explosive Atmosphere

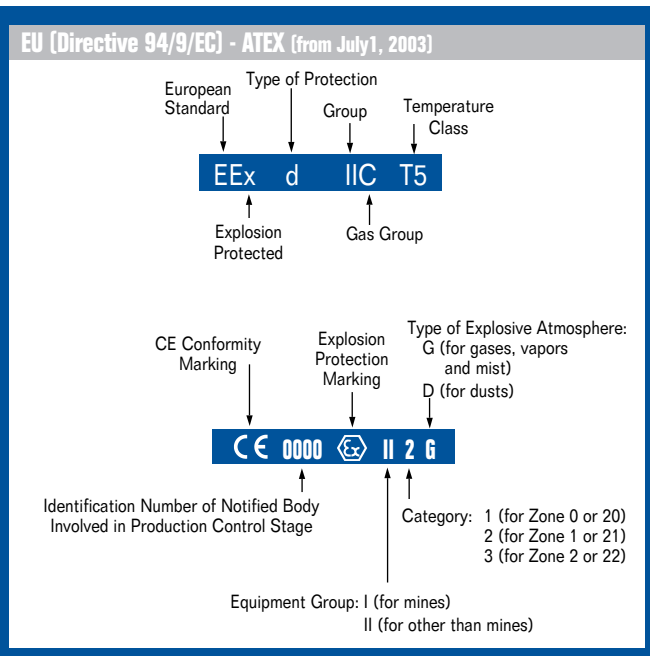
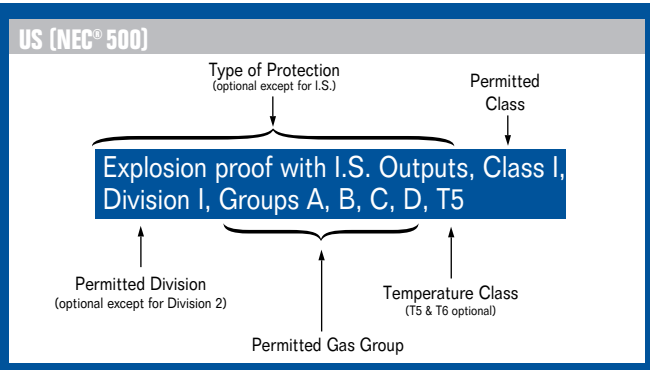
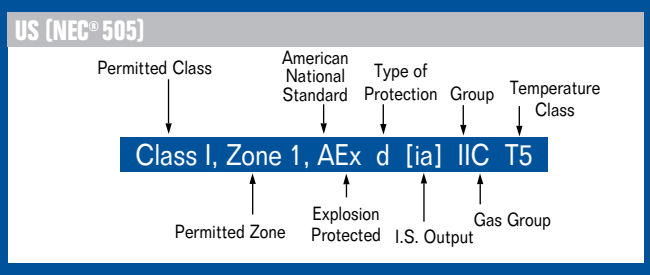
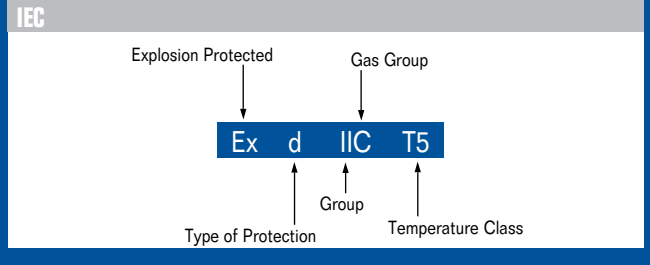
- G:** Gases/Vapors
- D:** Dusts

The ATEX markings are in addition to the standard Zone markings and indicate compliance to the new directives.

## Expert Guide to Hazardous Locations



### Ex Marking



### Acronyms

- CENELEC** - European Committee for Electrotechnical Standardization
- EU** - European Union
- IEC** - International Electrotechnical Commission
- I.S.** - Intrinsically Safe
- MSHA** - Mine Safety and Health Administration
- NEC®** - National Electric Code®

### Area Classification

	Flammable Material Present Continuously	Flammable Material Present Intermittently	Flammable Material Present Abnormally
<b>IEC/EU</b>	<b>Zone 0</b> (Zone 20 - dust)	<b>Zone 1</b> (Zone 21 - dust)	<b>Zone 2</b> (Zone 22 - dust)
<b>US NEC® 505</b>	<b>Zone 0</b>	<b>Zone 1</b>	<b>Zone 2</b>
<b>NEC® 500</b>	<b>Division 1</b>		<b>Division 2</b>

IEC classification per IEC 60079-10.  
 EU classification per EN 60 079-10.  
 US classification per ANSI/NFPA 70 National Electric Code® (NEC®) Article 500 or Article 505

### Apparatus Grouping

Typical Gas/Dust/Fiber	US (NEC® 505) IEC EU	US (NEC® 505)
Acetylene	Group IIC	Class I/Group A
Hydrogen	(Group IIB + H)	Class I/Group B
Ethylene	Group IIB	Class I/Group C
Propane	Group IIA	Class I/Group D
Methane	Group I*	Mining*
Metal Dust	None	Class II/Group E
Coal Dust	None	Class II/Group F
Grain Dust	None	Class II/Group G
Fibers	None	Class III

\*Not within scope of NEC®. Under jurisdiction of MSHA.

### Temperature Class

Maximum Surface Temperature	US (NEC® 505) IEC EU	US (NEC® 505)
450° C	T1	T1
300° C	T2	T2
280° C		T2A
260° C		T2B
230° C		T2C
215° C		T2D
200° C	T3	T3
180° C		T3A
165° C		T3B
160° C		T3C
135° C	T4	T4
120° C		T4A
100° C	T5	T5
85° C	T6	T6

# Chemical Compatibility

The chemical compatibility reference guide has been developed to assist you in selecting the best StoneL products and material options for your applications. While this chart should assist you in selecting compatible materials, it is not a substitute for careful testing of a specific product in your operating environment. For additional assistance please contact StoneL technical support.

## Key

- A No effect (Recommended)
- B Moderate effect
- U Severe effect (Not Recommended)
- FC Fusion coating recommended on polycarbonate
- No test data or experience available

Chemical	Aluminum	Polycarbonate	Brass, 360	Stainless Steel	Epoxy
Acetic Acid	A	B	U	A	B
Acetone	A	FC	A	A	U
Acetylene	A	--	A	A	A
Alcohol, Amyl-	B	FC	A	A	A
Alcohol, Butyl-	B	FC	A	A	A
Alcohol, Ehtyl-	B	FC	A	B	A
Ammonia, liquid	A	--	A	A	A
Ammonium hydroxide	B	FC	U	B	A
Beer	A	A	A	A	A
Benzene	B	FC	A	A	B
Boric acid	B	A	A	B	A
Brine	U	B	U	B	--
Bromine	U	FC	A	U	U
Calcium carbonate	U	--	--	B	A
Calcium Chloride	B	A	U	B	A
Carbon tetrachloride	U	FC	A	B	A
Chlorine	B	FC	A	B	--
Chromic acid	U	B	U	U	B
Citric acid	U	B	B	A	A
Creosote	B	FC	B	B	--
Ethyl chloride	--	--	B	A	A
Ethylene	A	--	--	A	--
Ethylene oxide	U	--	--	B	A
Fluorine	B	--	--	A	U
Freon (and other similar refrigerant)	B	--	A	A	A
Gasoline	A	FC	A	A	A
Heptane and hexane	A	B	--	A	A
Hydrochloric acid, 10%	U	A	U	U	A
Hydrogen (gas)	A	--	A	A	--
Hydrogen peroxide	A	A	B	B	B
Hydrogen sulfide	B	A	A	A	A
Isopropyl ether	A	A	--	A	U
Jet fuel (JP 4,5,6)	A	--	--	A	A
Kerosene	A	--	A	A	A
Methane	A	--	--	B	--

Chemical	Aluminum	Polycarbonate	Brass, 360	Stainless Steel	Epoxy
Methyl chloride	U	FC	A	A	A
Methyl ethyl ketone	B	FC	--	A	B
Methylene chloride	B	FC	--	A	A
Naptha	A	FC	--	B	A
Natural gas	A	--	A	A	--
Nickel chloride	U	FC	--	B	A
Nitric acid (10%)	B	A	U	A	A
Nitric acid (80%)	U	B	--	B	U
Nitrous oxide	U	--	--	B	--
Oils (animal)	A	B	--	A	A
Oil (diesel)	A	A	--	A	A
Oil (mineral)	A	B	--	A	A
Phosphoric acid (85%)(air free)	U	B	U	U	B
Potassium chloride	U	A	U	B	A
Potassium hydroxide (10%)	U	FC	B	A	A
Potassium hydroxide (70%)	U	FC	B	A	A
Potassium phosphate	U	---	--	A	--
Propane (LP Gas)	A	A	A	B	A
Soaps and detergents	B	B	A	A	A
Sodium chloride	B	A	U	B	A
Sodium hydroxide (10%) (caustic soda)	U	B	--	A	A
Sodium hydroxide (50%) (caustic soda)	U	FC	-	B	A
Sodium phosphate (monobasic)	U	--	B	A	A
Sulfur dioxide	B	B	B	A	A
Sulfuric acid (7-40%)	U	A	U	U	A
Tannic acid	B	B	A	B	A
Toluol and toluene	A	FC	--	A	B
Turpentine	B	B	A	B	B
Urea	B	A	--	B	--
Vinyl Chloride	B	--	--	B	--
Water, salt	U	--	--	B	A

\*Temperatures less than 30° C





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