DVC-FF Discrete Valve Controller
DVM-FF Discrete Valve Monitor

TopWorx discrete valve controllers integrate sensors, bus communications, pilot valve, and termination points into a variety of enclosures, delivering the ultimate in modularity.

- Direct Mount with no brackets
- Intrinsically Safe Zone 0 (Cl I, Div 1)
- 5 DI and 3 DO
- Seamless integration with Networx products

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502.969.8000 phone 502.969.5911 fax info@topworx.com

TOPWORX

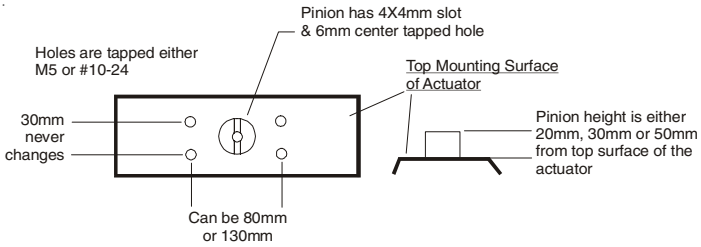
Lumitech DVC-FF & DVM-FF

ISO 5211/NAMUR Actuator Accessory Mounting

The TopWorx Lumitech DVC and DVM product line is a FOUNDATION Fieldbus (FF) compatible direct mount valve control and/or monitoring package for any ISO5211/NAMUR actuator.

Though specifically designed for direct interface with ISO 5211/NAMUR accessory mounting dimensions, the unit can be used on nearly any non-NAMUR actuator utilizing one of TopWorx's VIP Bracket Kits. Our bracket kits are manufactured in-house from stainless steel flat and bar stock, providing superior stability and corrosion resistance for the life of the product. These mounting kits may be found in the VIP Mounting Kits section of the TopWorx Process Automation Solutions Pricing Guide (publication L-L106), attainable through our distribution network, or on-line at **www.topworx.com**. See Figure 1 for the ISO 5211/NAMUR accessory mounting standard.

Figure 1
ISO 5211/NAMUR standard



Since the Lumitech unit is designed for direct mounting to ISO 5211/NAMUR actuators, you will realize a cost and labor savings on projects since there are no mounting brackets to purchase or install.

Mechanical Installation Procedures

Your Lumitech package comes complete with all necessary fasteners for mounting to any ISO/NAMUR actuator. The holes on the top accessory mounting pad are tapped either M5 or #10-24 (see Figure 1 above), both of which are included in the hardware package.

Reference Figure 2 for all steps below.

Step 1
Thread the M5 or #10 stud into the holes on the top surface of the actuator on the same side as the air ports of the actuator. Tighten the studs using good mechanical practices. The enclosure is designed to be transversely mounted to the length of the actuator.

When mounting the unit using the 80mm spaced holes, the crescent shaped spacer must be used under the enclosure.

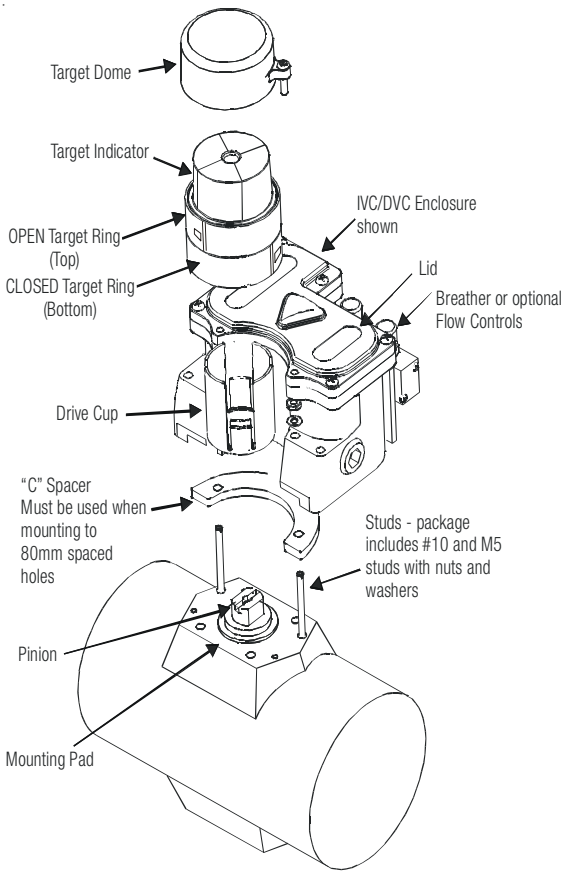
Step 2
Slide the enclosure mounting feet over the installed studs and secure with the washers and nuts provided.

Step 3
Attach the Drive Cup to the actuator pinion. Align the tang on the bottom with the slot in the actuator pinion.

Step 4
To install the target assembly, first determine the position of the valve. Typically, a valve is in the CLOSED position when received new. Slide the target assembly (Core Indicator and Target Rings) over the Drive Cup with one of the Red "Closed" quadrants facing the enclosure body. Push the assembly down until it bottoms out.

Step 5
Install the Dome with the captured screws through the enclosure lid.

Figure 2. Mechanical Installation Exploded View



Enclosure / Target Materials of Construction	
Enclosure Body and Lid	Polybutylene Teraphthalate (PBT) / Polycarbonate Blend
LED Lens	Polycarbonate
Enclosure O-ring	Silicone
All Enclosure Inserts	Stainless Steel
Spool Valve Manifold Gasket	Silicone
Target Core and Target Rings	Polybutylene Teraphthalate (PBT) / Polycarbonate Blend
Dome	Polycarbonate

Mounting to a non-NAMUR actuator?

TopWorx is the expert at designing interface brackets for almost anything. Our portfolio of over 1500 pre-designed bracket kits is the most extensive in the industry.

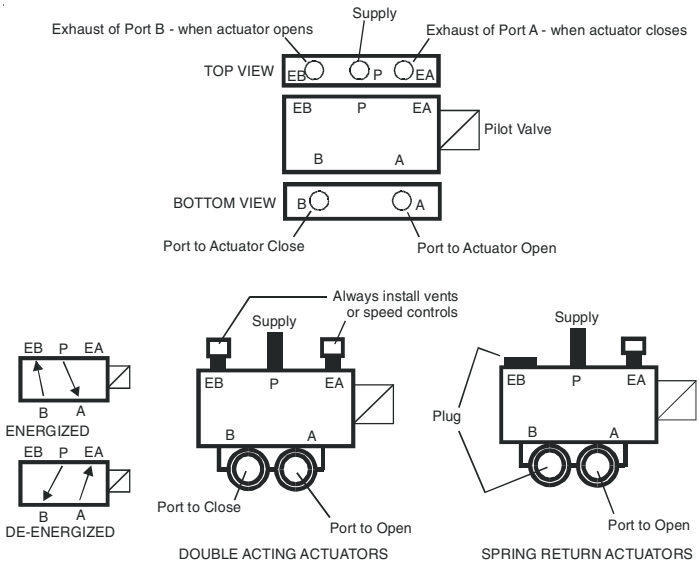
Let us design and manufacture a mounting kit for you! Contact us at **www.topworx.com** or **502.969.8000**.

Pneumatic Hookup Procedures

Prior to connecting the supply air to the spool valve, flush the system to remove any debris or contaminates. Galvanized pipe can easily flake and contaminate the system and therefore is not recommended.

4-Way Spool Valves

The TopWorx spool valve is a 5 port, 4-way valve driven by a piezo pilot valve, or valves. The electrical hookup of the pilot is covered in the Fieldbus Specification section. The spool valve supply port and work ports are 1/4 NPT. The exhaust ports are 1/8 NPT, marked as follows for the DVC:

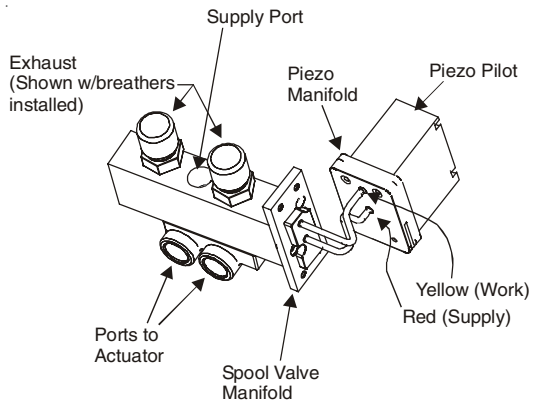


Highly Recommended

TopWorx highly recommends Locktite 567 brand thread sealant. Do not use a hard setting pipe compound. If Teflon thread seal tape is used, start the wrap on the second thread from the leading thread of the fitting. This will prevent tape shreds from contaminating the spool valve seals.

Flow controls (AL-M21) or Breathers (AL-M31) should be installed in the exhaust posts to keep debris from falling into the spool valve and damaging the seals.

Figure 3
Piezo Pilot/Spool Valve Assembly for DVC-FF



Spool Valve Specifications for DVC-FF

Spool Valve Specifications	
Medium	Dried/filtered air (5 micron)
Max Operating Pressure	100psi (0.7 MPa)(6.89 Bar)
Min Operating Pressure	40psi (0.28 MPa)(2.76 Bar)
Ambient Temperature Range	22^0 to 122^0F (-5^0 to 50^0C)
Flow Coefficient	1.2 Cv
Environment Rating	Type 4, 4X, IP56
Port Size	1/4" NPT(Supply & Work), 1/8" NPT(Exhaust)
Pilot Operator Manual Override	Non-Locking Push Type
Valve Body	Diecast aluminum, dichromate and / or epoxy coating. Stainless steel option.
Valve Seals	Buna-N

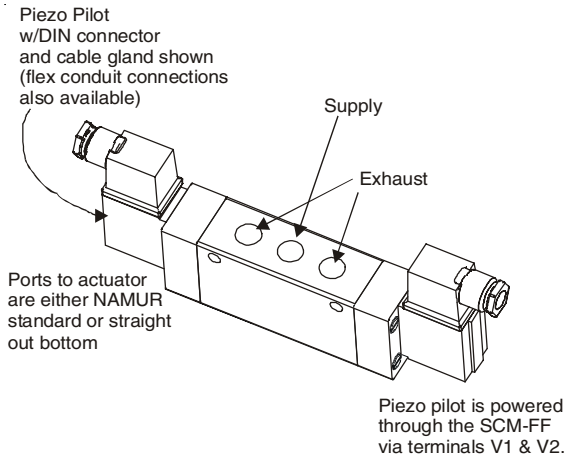


Figure 4
Dual Piezo Pilot (NAMUR or Bolt-on) Spool Valve for DVM-FF

The above combination of DVM and Spool Valve is for Fail-in-Last Position and Center Block applications.

Don't forget!

TopWorx has a complete line of breathers, flow controls, regulators and filters.

Check out **www.topworx.com** or call us at **502.969.8000** for more details

FOUNDATION Fieldbus Specifications

The FOUNDATION Fieldbus Sensor Communications Module (hereinafter referred to as SCM-FF) combines integral switch relays for position sensing with FOUNDATION Fieldbus communications and pilot valve output drivers.

The FOUNDATION Fieldbus SCM-FF (Figure 5)

For the SCM-FF, note the wiring for the pilot valve. In the DVC, the Orange (or Red) lead is terminated on V1+. The Black lead is terminated on V1-. If using a Dual Pilot valve with a DVM, attach the open valve wiring to the V1 terminal, and the close valve wiring to the V2 terminals.

If an Auxiliary dry contact is used, attach wiring to the AUX terminals.

Attach Fieldbus wiring to the FF terminals. These terminals are not polarity sensitive. For testing of the pneumatics and calibration of the target assembly, a 9 to 32 VDC power supply can be used with the calibration switch to open and close the valve without a fieldbus loop attached.

Flash Reset Button

When there is an overtime alarm, the LED from the direction the valve was traveling will blink. The Flash Reset Button will stop the flashing LEDs.

Jumper Settings

There is one jumper accessible to the user. The settings are as follows:

SIM - Simulation allows the Discrete Input or Discrete Output Blocks to be manually supplied when the Simulate_D parameter is enabled. When Simulate_D is disabled, the simulate value and status track the actual Value and Status of the valve. Each Discrete Input or Discrete Output Function Block has a SIMULATE_D parameter and can be enabled or disabled separate from any other block. To enable simulate a two step process is used. First, the jumper must be installed in the SIM position on the device. Second, the SIMULATE_D must be written to enable. To verify simulate is active, read the BLOCK_ERR parameter. When simulate is disabled, the block error will clear and the Transducer information supplies the Blocks. Output blocks supply data to the transducer block. When enabled, simulation allows manual supply of value and status in either direction.

Simulate should not be used in an operating plant because it was designed for testing only. It does not provide bumpless transfer and could be hazardous during plant operation.

WrtPrt - If set, no writes from anywhere are allowed, except to disable WRITE_LOCK. Block parameters will continue to be updated by transducer values and control will continue. This is useful when a device is configured and you want to prevent anyone from making changes to it.

The WRITE_LOCK parameter for the device, it is located in the Resource Block. There are two methods to use this parameter to lock the device from having its parameters changed. Hard WRITE_LOCK requires that both the jumper be set to the WrtPrt position, and the Resource Block setting “Hard Write Lock” be enabled. Soft WRITE_LOCK requires only the Resource Block parameter “Soft Write Lock” be set.

To verify Write_Lock is active, read the BLOCK_ERR parameter. When Write_Lock is disabled, the block error will clear.

Shipped for Normal Operation - the jumper is to the far left. This is the default setting. All of the DVC-FF settings are available to be configured by the end user.

Calibration of the FOUNDATION Fieldbus SCM-FF

The OPEN and CLOSED limit switches encapsulated within the SCM-FF may be calibrated using a DC power supply set between 9-32V, or calibrated once connected to the Fieldbus network.

Step 1

Verify the piezo pilot is wired properly as described in 3.1, Step 1, or if using external pilot(s), with the DVM as described in Figure 5.

Step 2

Connect the power supply, or Fieldbus wires, to the FF terminals. The terminals are not polarity sensitive. With power now applied to the FF terminals, you can manually stroke the valve using the Calibration Switch on the SCM-FF.

Step 3

Place calibration switch to the CLOSE position.

Step 4

Loosen the target center screw, and rotate the bottom target clockwise until the RED LED lights. Tighten the target center screw.

Step 5

Place calibration switch in the OPEN position.

Step 6

Loosen the target center screw, and rotate the upper target counter-clockwise until the GREEN LED lights. Be sure to hold the bottom target in place while rotating the upper target. Tighten the target center screw.

Step 7

Cycle the valve CLOSED and OPEN a few times using the calibration switch to verify both limit switches are maintaining their set points.

Step 8

Place calibration switch in the FF position. If using a power supply to calibrate, disconnect leads to the supply, and connect the Fieldbus loop when ready to put into service.

Step 9

Manipulate the transducer parameters as necessary for desired mode of operation.

NOTE: If using a reverse acting actuator, re-calibrate switches using Steps 3-6, but rotate counter-clockwise for close and clockwise for open. Reverse Action must be set in the Transducer Block (see “Transducer Block Initialization, Single-Dual Action”, pg.7).

Figure 5. Wiring Terminals for FOUNDATION Fieldbus SCM-FF

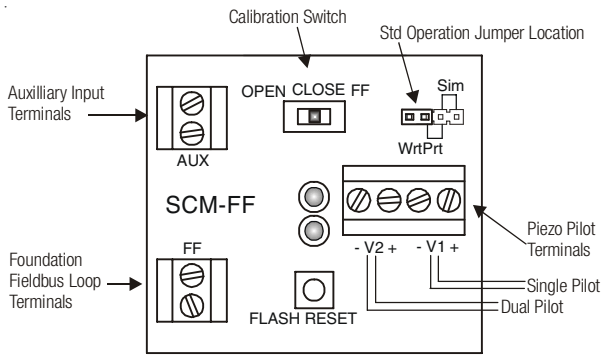


Table 1. Intrinsically Safe Entity Parameters

Vmax	24V
Imax	250mA
Ci	2.5nF
Li	192uH
Pmax	1.2W

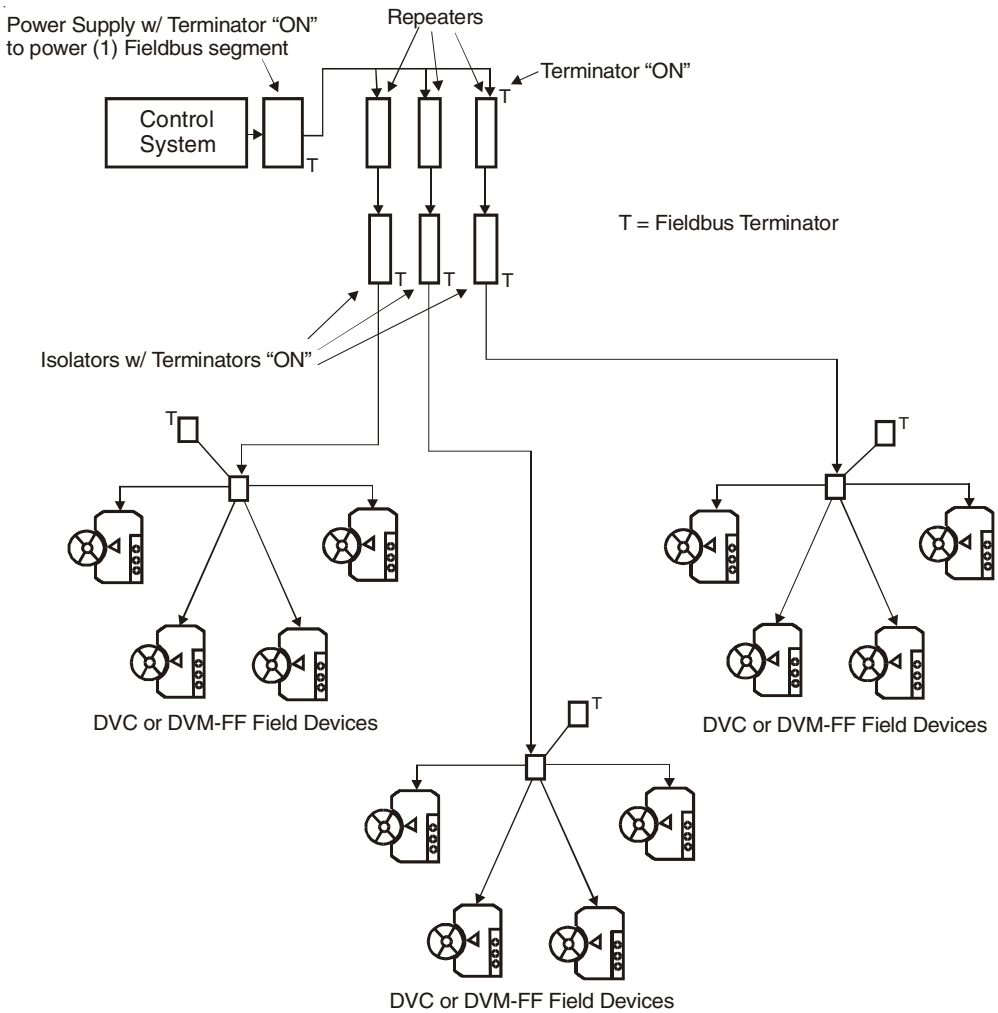
Table 2. Electrical Specifications

Valve Drivers	6VDC w/ 500 ohm series load output
Current Consumption	18mA max
Maximum Applied Voltage	35VDC
Operating Voltage	9-32VDC

Table 3. Fieldbus Specifications

Topology	Point to Point Bus with Spurs Daisy Chain Tree
Cable	Twisted Pair
Bus Length	1900m (max)
Transmission Speed	31.25 kbit/s
Intrinsically Safe	Yes
Function Block Execution Times	DO 60mS DI 60mS

Figure 6
FOUNDATION Fieldbus Topology for DVC/DVM-FF Devices



Blocks and the User Application

The Fieldbus Foundation has defined a standard for building user applications. The Foundation standard is built around "Blocks." Blocks are used to represent different types of functions that the device performs and provide a way of grouping different parameters and functionality together in an easy to understand framework. A Fieldbus Foundation device has a Resource Block, Transducer Block, and Function Blocks. See Figure 7.

Once the hardware of the TopWorx Sensor-Communication Module (hereafter known as SCM-FF) is set up, fieldbus communication is used to set the transducer parameters to get the functionality desired. The desired transducer functionality is associated with a function block. The host system is then used to link the function blocks together, and the application is downloaded to all of the devices in the loop.

Resource Block

The Resource Block describes characteristics of the fieldbus device such as the device name, manufacturer, and serial number. There is only one resource block per device.

Transducer Blocks

Transducer Blocks are the connection of Function Blocks to the real world. The Function Blocks are typically standard between devices, so that they may be linked together to form easily constructed, interoperable applications. The Channels of a transducer block can be attached to a function block for use in the application. Many of the settings unique to a Fieldbus Device are defined in the transducer block parameters.

Function Blocks

Function Blocks provide the control system behavior. The input and output parameters of Function Blocks can be linked over the fieldbus. The execution of each Function Block is precisely scheduled. There can be many function blocks in a single user application. See Figure 8. In the SCM-FF, there are 5 discrete input and 3 discrete output function blocks.

Figure 7
Process Instrument and its Blocks

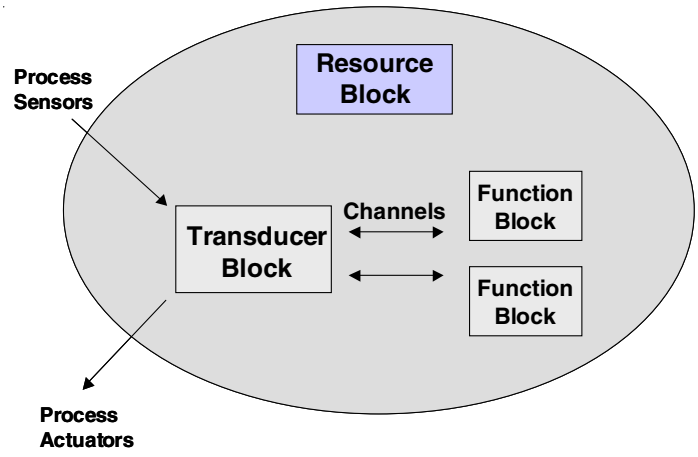
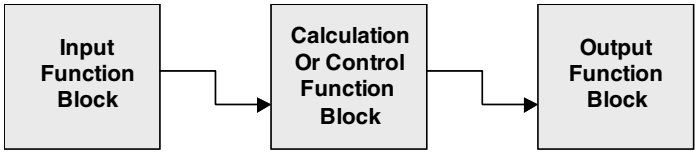


Figure 8
An application is built by linking together function blocks.



Resource Block

The resource block contains the hardware specific characteristics associated with a device. It has no input or output parameters. This block of contained parameters includes such things as Manufacturer's ID and revision information. For a complete listing of the Resource Block Parameters, see Appendix 1.

Restart

There are 4 restarts available for the Resource Block Restart parameter according to the FOUNDATION Fieldbus specifications. TopWorx has added a custom choice, "Reset with Factory Defaults," that is implemented by writing 0x05 to the RESTART parameter. This 5th restart is used to reset the device to factory default initial values. These values differ from the Foundation standard initial values, which leave many of the transducer parameters uninitialized. This command does not affect the Resource Restart 0x03, which is a restart with defaults according to Fieldbus Foundation specifications.

Writing command "Reset with Factory Defaults (0x05,)" is the same as the FOUNDATION Fieldbus standard "Restart with Defaults" with Command (0x03) with the differences listed in Table 4.

Warning

Do not power down the device for 40 seconds after you execute a "Restart with Factory Defaults." Non-Volatile Random Access Memory (NVRAM) is being written and it needs to complete before it loses power. The device condition is unpredictable if an early power cycle is executed.

Table 4. Reset with Factory Defaults

Block	Parameter	Initialization Value
TRANSDUCER	CYCLE_TIME_OPEN_LIM	10.00
TRANSDUCER	CYCLE_TIME_CLOSE_LIM	10.00
TRANSDUCER	CALIBRATION_SWITCH_ARM	ENABLED
TRANSDUCER	LED_ENABLED	ENABLED
TRANSDUCER	ACTION_ELEMENT	SINGLE
TRANSDUCER	BOARD_TEMPERATURE_HI_LIM	60.0
TRANSDUCER	BOARD_TEMPERATURE_LO_LIM	-10.0
DI1	CHANNEL	Open Limit
DI2	CHANNEL	Close Limit
DI3	CHANNEL	AUX
DI4	CHANNEL	Open Timer
DI5	CHANNEL	Close Timer
DO1	CHANNEL	Open/Close
DO2	CHANNEL	No Transducer Connection
DO3	CHANNEL	No Transducer Connection

Transducer Block Initialization

There are several settings in the transducer block that should be set before commissioning of the SCM-FF.

Through these parameters, a user can configure a wide range of diagnostics and alarms. These include cycle timers, and counters, as well as temperature monitoring. These alarm conditions can be configured through a transducer channel to all come in one DI Block.

Also, the user may configure the SCM-FF for use in Single or Dual pilot valves for Direct or Reverse Acting applications, all through convenient Transducer settings.

(a) Diagnostics & Alarming

There will be 5 limit parameters that must be set during calibration. These parameters will vary with the type of valve the device is operating. The alarm priorities must also be set, depending on the application.

By simply changing the settings in the transducer, all the diagnostic limits and functional settings can be set by the end user.

1. **Cycle Times**
   Set the **Cycle Time Open Limit** (Cycle_Time_Open_Lim) and the **Cycle Time Close Limit** (Cycle_Time_Close_Lim) parameters to the maximum amount of time in seconds the valve is allowed to complete its stroke before an alarm condition is invoked. If the LEDs are enabled, they will blink for local notification of the time limit alarms. If the Cycle Time Open Limit is exceeded, the green LED will flash. If the Cycle Time Close Limit is exceeded, the red LED will flash. Pushing the Alarm Reset Pushbutton on the board will stop the flashing.

   The default setting for both the Cycle Time Open and Cycle Time Closed Time Limit is 10 seconds.

2. **Cycle Count**
   Set the **Cycle Count Limit** (Cycle_Count_Lim) parameter to the maximum number of valve cycles allowed before a Cycle Count Alarm condition is activated.

   The default setting for the Cycle Count Limit is 50000 cycles.

3. **Temperature**
   The **Temperature High Limit** (Temperature_High_Lim) parameter should be set to alarm when the temperature sensor reads above a user specified value and the **Temperature Low Limit** (Temperature_Low_Lim) will be set to alarm when the temperature sensor reads below a user specified value.

   The default setting for the Temperature High Limit is 50°C. The default setting for the Temperature Low Limit is -10°C.

(b) Functional Settings

1. **Single-Dual Action**
   The ACTION_ELEMENT parameter is used to determine whether the actuator is single or double acting, or what direction the actuator goes when energized. A single pilot valve uses one output of the board (labeled V1), while a double pilot valve uses 2 outputs to control the valve. The 4 settings of the ACTION_ELEMENT parameter are Single Action, Double Action, Single Action-Reverse Acting, and Double Action-Reverse Acting. “Reverse Acting” is to be used when the energized state is to close the valve.

   The Default setting for Action Element is Double Action.

2. **Channel 13**
   Channel 13 is a user configurable input channel. The user can define the functionality of a DI block associated with Channel 13 by selecting the appropriate bits in the CHANNEL_13_MASK parameter. One of several alarms can be used to trigger a DI including cycle count, over stroke timer, temperature or any combination of these. The unit is shipped with Channel 13 set up for over/under temperature indication.

The following is a list of bit selections for Channel 13. Simply select the appropriate bit to activate the desired functionality.

0x00, No Selection
0x01, Cycle Count
0x02, Time to Open
0x04, Time to Close
0x08, Board Temp Hi
0x10, Board Temp Lo

(c) Calibration Switch Functionality

The SCM-FF is shipped in a mode where the calibration switch is active. A 9 to 32 VDC power supply can be used to activate and deactivate the device, to open and close the valve, and set the target.

In order to enable the calibration switch in a safe manner, three conditions are required to be true simultaneously. These are:

1. CALIBRATION_SWITCH_ARM parameter is TRUE/Armed. The operator may consider this like a calibration switch lock out parameter when disabled.
2. **The calibration switch on the SCM-FF must be in the FF position. This allows smooth transition to the manual control condition.**
3. Transducer block must be in the Out Of Service (OOS) mode. This sets all of the connected output parameters to a BAD status, allowing upstream controllers to recognize the device is not controlled by the control scheme.

The CALIBRATION_SWITCH_STATE parameter transitions to Enabled when all three conditions have been met simultaneously. This parameter will transition to the disabled state when the Transducer Block is placed into service or the CALIBRATION_SWITCH_ARM is set to disabled.

NOTE
When the transducer mode changes from OOS mode, the valve will go to the FF position calculated at the time regardless of the current position of the valve or the Calibration switch.

Table 5. Transducer Parameters for Calibration

Transducer Parameters to be set before an application is configured. For a complete list of transducer parameters, refer to Appendix 2.

Index #	Name	Description	Units	Initial Values
461	ACTION_ELEMENT	Selects whether actuator is Single Action (0x1), Double Action (0x3), Single Action - Reverse Acting, (0x4), Double Action - Reverse Acting (0x6)	N/A	0x1
462	LED_ENABLE	Enable the LED indicators(hi-power mode 0x1) or operate without LED indication (Lo-power mode 0x0)	N/A	Enabled
463	FAULT_STATE_TB	Valve will fault to open (0x0), close (0x1) or stop (0x2) when a transducer error occurs.(Transducer Fault State)	N/A	Close
464	CALIBRATION_SWITCH_ARM	Arm the use of the manual control on the device. See description of calibration switch functionality below.	N/A	Armed
468	CHANNEL_13_MASK	Used to determine which parameters are associated with Channel 13.	N/A	0x18
473	CYCLE_COUNT_PRI	Priority of the cycle count limit alarm.	N/A	0
474	CYCLE_COUNT_LIM	The number of cycles before an alarm is generated.	N/A	50,000
475	CYCLE_TIME_OPEN_PRI	The priority of the open time limit alarm.	N/A	0
476*	CYCLE_TIME_OPEN_LIM	The maximum time allowed for the valve to open without generating an alarm.	Sec	10.00
477	CYCLE_TIME_CLOSE_PRI	The priority of the close time limit alarm.	Sec	0
478*	CYCLE_TIME_CLOSE_LIM	The maximum time allowed for the valve to close without generating an alarm.	Sec	10.00
479	BOARD_TEMPERATURE_PRI	The priority of the board temperature alarm.	C	0
480	BOARD_TEMPERATURE_HI_LIM	The highest temperature allowed without generating an alarm. Board should operate below this limit.	C	50
481	BOARD_TEMPERATURE_LO_LIM	The lowest temperature allowed without generating alarm. Board should operate above this limit.	C	-10

*The timer accuracy for stroke time open and stroke time closed is 60mS minimum.

Fieldbus Foundation Transducer Channel Architecture

The SCM-FF has one transducer block with 13 channels. The 5 DI and 3 DO function blocks will link to these transducer channels through the standard channel selection capability. (See Function Blocks)

The 13 Transducer Channels are listed in Table 6.

Table 6. Transducer Channels

Transducer Channel #	Input (I) Output (O)	Function	Notes
0		No connection	
1	O	Open/Close	Readback = isOpened/isClosed
2	O	Open	Readback = isOpened
3	O	Close	Readback = isClosed
4	O	Stop	Readback = isStopped
5	O	Open/Close/Stop	Readback = Opening, isOpened, Closing, isClosed, isStopped
6	I	Valve is Opened/Valve is Closed	
7	I	Valve is opened	
8	I	Valve is closed	
9	I	Auxiliary limit switch input	
10	I	Cycle Time Open Alarm (CTOA)	
11	I	Cycle Time Closed Alarm (CTCA)	
12	I	Cycle Count Alarm (CCA)	
13	I	Masked Alarm	CTOA I CTCA I CCAI TMPH (Temperature High) ITMPL (Temperature Low)

Notes on Channels

Channels 1 and 5
These are Multi-value DO blocks standard with Fieldbus Foundation. Channel 1 is intended for use with a single control signal, while Channel 5 is to be used with a dual control signal.

Channels 2, 3 and 4
Channels 2, 3 and 4 use 0 = false and 1 = true for open, close, and stop. This gives a more comfortable interface for users more familiar with ladder logic. In the situation where Open and Close are both true (or false) at the same time, the last input is rejected as invalid.

Readback signals are 0 = false and 1 = true for is-opened, is-closed or is-stopped. The use of Channels 2, 3 and 4 cannot be used simultaneously with channels 1 or 5.

Channels 4 and 5
Available with a Dual-Control Pneumatic valve (transducer parameter index 461 ACTION_ELEMENT must be set to 0X3 or to 0X6).

Channels 6, 7 and 8
Echoes the Readback information from channels 1, 2 and 3.

Channel 9
Reflects the input from a dry contact type of input wired into the Auxiliary input screw terminals and uses 0 = closed, 1 = opened reflecting the contact condition.

Channels 10, 11 and 12
Reflects alarm conditions in the valve. When something needs to happen in response to these error conditions, a DI should be used to publish the state of the alarm condition.

These channels use 0 = false (no alarm), 1 = true (alarm condition exists). CTOA, CTCA, and CCA are transducer channels that allow alarms to be scheduled into the system. These alarms are:

Cycle Time Open Alarm (CTOA – Channel 10)
Cycle Time Closed Alarm (CTCA – Channel 11)
Cycle Count Alarm (CCA – Channel 12)

Above inputs are used in preventative maintenance and indicate when a valve is operating outside of acceptable times. These channels exist so that some action on the loop can be scheduled in critical applications. Cycle times may increase with an increase in valve stiction, and/or a loss of air pressure. The times and counts used as alarm limits are user settable (see Appendix 2).

Regardless of whether these alarms are linked to function blocks, these FF standard alarms are always reported to the alarm handling host when one of these conditions exists and the corresponding priority is set to greater than 1.

Channel 13
Stimulates activity when a set of alarm conditions exist. This channel uses a user-settable mask to allow any of five alarm conditions to cause the linkable DI parameter to become true. Channel 13 is a masked OR function. It includes the previous alarms, as well as a Temperature High (TMPH), and Temperature Low (TMPL) alerts. For TMPH and TMPL, a sensor is used to sense the temperature of the circuit board. The user can select which of these alerts on Channel 13 are to be used by masking out the undesired ones.

Transducer Special Diagnostic Features

During installation, a special diagnostic parameter called BLOCK_ALMS_ACTIVE can be used to alert the user of configuration errors specific to the device. This block is used to conveniently identify some of the issues that may arise with installing the SCM-FF. The values returned are explained below:

a. None Active - No active block alarms are active.
b. Invalid Mode - The computed actual mode for the block is not supported the block's actual mode will go to out of service.
c. Mode Error - The mode calculator detected an error.
d. Both Contacts Closed - Both contacts are closed.
e. Conflicting Channels Assigned - Conflicting output channels have been assigned. (SEE DO Block Section for a description of the correct configuration of output channels).
f. Open without Close - An 'Open' output channel has been assigned without a 'Close' channel.
g. No Output Channels - No output channels have been assigned.
h. Out Of Service - Transducer block is out of service.
i. Invalid Input - The target position is not valid for the current device configuration. Check the target setting to insure that it is in the correct position.

Discrete INPUT Blocks (DI Block)

There are 5 Discrete Input Blocks available on the SCM-FF. The DI block takes the manufacturer's discrete input data, selected by channel number, and makes it available to other function blocks at its output. These DI blocks become available to the user when linked to one of the Transducer Channels available for inputs.

A host may retrieve internal information at any time and alarms are reported as they occur. To make a light come on or another valve close requires a DI to publish the information on the bus.

Channels

The 5 DI Function Blocks in the device are associated to the real world by setting the CHANNEL parameter to the desired Transducer Channel. Figure 9 shows the relationship between Transducer channels and the DI assigned channels. The output of the DI block (viewed in the OUT_D parameter) is defined by the DI block's CHANNEL assignment. The valid settings for the CHANNEL parameters are listed in Table 7.

By resetting a DI CHANNEL parameter to a different transducer channel number (0, 6-13, see Table 7) an end user may customize the functionality of the SCM-FF to fit a particular application requiring DI's on temperature limits and cycle counts instead of the defaults.

Figure 9. Channel Assignment for DI Function Blocks

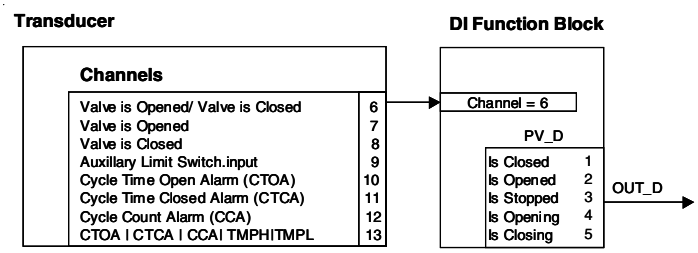


Table 7. Discrete Input Channel Assignments

DI Channel Assignment	Definition	OUT_D Values
0	No Connection	
6	Open/Close - Input	0, Is Closed 1, Is Opened 2, Is Stopped 3, Is Opening 4, Is Closing
7	Open - Input	0, Not open 1, Is opened
8	Close - Input	0, Not closed 1, is closed
9	Aux	0, Auxiliary Dry Contact Closed 1, Auxiliary Dry Contact Open
10	Time to Open	0, Last time to open OK 1, Last time to open exceeded limit
11	Time to Close	0, Last time to close OK 1, Last time to close exceeded limit
12	Cycle Count	0, Cycle Count Hasn't Exceeded limit 1, Cycle Count Exceeded Limit
13	Channel 13	Used to determine which parameters are associated with Channel 13. 0x00, No Selection, 0x01, Cycle Count, 0x02, Time To Open, 0x04, Time To Close, 0x08, Board Temp Hi, 0x10, Board Temp Lo

Contact TopWorx for platform specific configuration guides to assist you in the configuration of your FOUNDATION Fieldbus device.

Discrete OUTPUT Blocks (DO Block)

There are 3 FOUNDATION Fieldbus standard DO blocks and 5 output channels. The DO blocks take discrete control data and translate it to actuation in the field. These blocks are used to open and close the valve. There are 4 different strategies provided to open and close a valve, depending on the system being used, and whether a single or dual action pilot valve is being used.

Single Block Control Method, Single Action (Default)

Set the Channel Parameter of DO1 to 1(Open/Close Output), and DO2 and DO3 to 0 (No Connection). The valve is now controlled by the wiring going to the V1 terminals. By writing a 0 or a 1 to this DO block will now open and close the valve.

Single Block Control Method, Dual Action

Set the Channel Parameter of DO1 to 5 (Open/Close/Stop Output), and DO2 and DO3 to 0. The valve is now controlled by the wiring going to the V1 terminals and V2 terminals. By writing a 0 or a 1 to this DO block will now open and close the valve. Note that in order to use this method, the ACTION_ELEMENT parameter of the Transducer Block must be set to 0x03 Double Action or 0x06 Double Action - Reverse Acting. Writing a 2 to the DO block will de-energize both the V1 and V2 terminals, stopping a valve using a block center type of pneumatic valve.

Dual Block Control Method, Single Action

Set the Channel Parameter of DO1 to 2 (Open), DO2 to 3 (Close), and DO3 to 0. Now by writing a 1 to DO1, the valve will Open. Changing this value back to 0, and writing a 1 to DO2 will cause the valve to close.

Three Block Control Method, Dual Action

In order to use this method, the ACTION_ELEMENT parameter of the Transducer Block must be set to 0x03 Double Action or 0x06 Double Action - Reverse Acting. Set the Channel Parameter of DO1 to 2 (Open) , DO2 to 3 (Close), and DO3 to 4 (Stop). Now by writing a 1 to DO1, the valve will Open. Changing this value back to 0, and writing a 1 to DO2 will cause the valve to close. Changing this value back to 0, and writing a 1 to DO3 will cause the outputs to terminals V1 and V2 to turn off, stopping an actuator using a block center pneumatic valve.

Note on Energize to Close

To energize to close (also called Reverse Acting), the ACTION_ELEMENT parameter must be reset to 0x4 for a Single Action valve, and 0x6 to a Double Action valve. See the Transducer section for more details.

Table 8. Discrete Output Channel Assignments

DO Channel Assignment	Definition	READBACK_D Values*	Control Method
0	No Connection		
1	Open/Close - Output	0, Is Closed 1, Is Opened 2, Is Stopped 3, Is Opening 4, Is Closing	Single Block, Single Action
2	Open - Output	0, Not Open 1, Is Opened	Multi-Block, Single or Dual Action
3	Close - Output	0, Not Closed 1, Is Closed	Multi-Block, Single or Dual Action
4	Stop - Output	0, Not stopped 1, Is Stopped	Multi-Block, Dual Action
5	Open/Close/Stop Output	0, Is Closed, 1, Is Opened 2, Is Stopped 3, Is Opening 4, Is Closing	Single Block, Dual Action

* To use the READBACK_D values for the BKCAL_OUT_D parameter of the DO block, two options must be selected.

1. In the Resource Block the “Output Readback” option should be selected.

2. In the DO Block under IO_OPTS, select the “Use PV for BKCAL_OUT” option.

Configuration Error Handling

In order to minimize configuration errors, several write checking features have been added to the SCM-FF. Write checks to the CHANNEL parameter of the DO blocks should prevent illegal configurations. These illegal configurations are:

1. If the two-state **Channel 1 Open-Close** has been assigned, an attempt to assign Channel 2 Open, Channel 3 Close or the Channel 5 Open/Close/Stop channels will be rejected with a write check.
2. If the three-state **Channel 5 Open-Close-Stop** has been assigned, an attempt to assign the Channel 2 Open, the Channel 3 Close or the Channel 1 Open/Close channels will be rejected with a write check.
3. If the channel you are trying to assign has already been assigned to another Function Block, the write will be rejected with a write check.
4. If the Open channel has been assigned and the Close channel has not, an ‘Open without Close’ block alarm is generated by the block. NO OTHER LOCK-OUTS ARE IMPLEMENTED (no write-check). This becomes an open only valve. Without the close signal, the last position will be maintained.
5. If the Close channel has been assigned and the Open channel has not, a ‘Conflicting Channels Assigned’ block alarm is generated by the block. NO OTHER LOCK-OUTS ARE IMPLEMENTED (no write-check). This becomes a close only valve.

Error handling for the configuration of channels has been modified as well. The Transducer Block has a special BLOCK_ALARMS_ACTIVE parameter which may be used to diagnose a configuration problem. The configuration errors are listed in Table 9.

Table 9. Transducer Block’s BLOCK_ALARMS_ACTIVE Parameter

Value	Meaning	Description
0x00000000	None Active	No active block alarms, the block's actual mode will go to out of service.
0x00000002	Invalid Mode	The actual mode for the block is not supported.
0x00000004	Mode Error	The mode calculator detected an error.
0x00080000	Both Contacts Closed	Both contacts are closed.
0x00100000	Conflicting Channels Assigned	Conflicting output channels have been assigned, please review and correct.
0x00200000	Open without Close	An 'Open' output channel has been assigned without a 'Close' channel.
0x00400000	No Output Channels	No output channels have been assigned, i.e. there can be no action.
0x00800000	Out of Service	Transducer block is out of service.
0x01000000	Invalid Input	The target position is not valid for the current device configuration.

Appendix 1
Complete Resource Block Parameter Listing

ST_REV	The revision level of the static data associated with the function block. To support tracking changes in static parameter attributes, the associated block's static revision parameter will be incremented each time a static parameter attribute is written but the value is not changed.
TAG_DESC	The user description of the intended application of the block.
STRATEGY	The strategy field can be used to identify grouping of blocks. This data is not checked or processed by the block.
ALERT_KEY	The identification number of the plant unit. This information may be used in the host for sorting alarms, etc.
MODE_BLK	The actual, target, permitted, and normal modes of the block.
BLOCK_ERR	This parameter reflects the error status associated with the hardware of software components associated with a block. It is a bit string, so that multiple errors may be shown.
RS_STATE	State of the function block application state machine.
TEST_RW	Read/write test parameters - used only for conformance testing.
DD_RESOURCE	String identifying the tag of the resource which contains the Device Description for this resource.
MANUFAC_ID	Manufacturer identification number - used by an interface device to locate the DD file for the resource.
DEV_TYPE	Manufacturer's model number associated with the resource - used by interface devices to location the DD file for the resource.
DD_REV	Revision of the DD associated with the resource - used by an interface device to locate the DD file for the resource.
GRANT_DENY	Options for controlling access of host computer and local control panels to operating, tuning and alarm parameters of the block.
HARD_TYPES	The types of hardware available as channel numbers.
RESTART	Allows a manual restart to be initiated. Several degrees of restart are possible. They are 1: Run, 2: Restart resource, 3: Restart with defaults, 4: Restart processor; and 5: Restart with factory defaults.
FEATURES	Used to show supported resource block options.
FEATURES_SEL	Used to select resource block options. Enable 0 x 32 bit to allow readbacks from function blocks.
CYCLE_TYPE	Identifies the block execution methods available for this resource.
CYCLE_SEL	Used to select the block execution method for this resource.
MIN_CYCLE_T	Time duration of the shortest cycle interval of which the resource is capable.
FREE_SPACE	Percent of memory available for further configuration. Zero in a preconfigured resource.
FREE_TIME	Percent of the block processing time that is free to process additional blocks.
SHED_RCAS	Time duration at which to give up on computer writes to function block RCAS locations. Shed from RCAS shall never happen when SHED_RCAS=0.
SHED_ROUT	Time duration at which to give up on computer writes to function block Rout locations. Shed from Rout shall never happen when SHED_ROUT = 0.
FAULT_STATE	Condition set by loss of communication to an output block, fault promoted to an output block or a physical contact. When Fault State condition is set, then output function blocks will perform their FSTATE actions.
SET_FSTATE	Allows the Fault State condition to be manually initiated by selecting Set.
CLR_FSTATE	Writing a Clear to this parameter will clear the device fault state if the field condition, if any, has cleared.
MAX_NOTIFY	Maximum number of unconfirmed alert notify message possible.

Appendix 1
Complete Resource Block Parameter Listing (cont'd)

LIM_NOTIFY	Maximum number of unconfirmed alert notify messages allowed.
CONFIRM_TIME	The time the resource will wait for confirmation of receipt of a report before trying again. Retry shall not happen when CONFIRM_TIME = 0.
WRITE_LOCK	If set, no writes from anywhere are allowed, except to clear WRITE_LOCK. Block inputs will continue to be updated.
UPDATE_EVT	This alert is generated by any change to the static data.
BLOCK_ALM	The block alarm is used for all configuration, hardware, connection failure or system problems in the block. The cause of the alert is entered in the subcode field. The first alert to become active will set the Active status in the Status attribute. As soon as the Unreported status is cleared by the alert reporting task, another block alert may be reported without clearing the Active status, if the subcode has changed.
ALARM_SUM	The current alert status, unacknowledged states, unreported states, and disabled states of the alarms associated with the function block.
ACK_OPTION	Selection of whether alarms associated with the block will be automatically acknowledged.
WRITE_PRI	Priority of the alarm generated by clearing the write lock.
WRITE_ALM	This alert is generated if the write lock parameter is cleared.
ITK_VER	Major revision number of the interoperability test case used in certifying this device as interoperable. The format and range of the version number is defined and controlled by the Fieldbus Foundation. Note: The value of this parameter will be zero (0) if the device has not been registered as interoperable by the FF.
BLOCK_ALMS_ACT	Provides list of all active block alarms in the block.
SUPPORTED_MODES	The modes supported by this particular block.
IKEY	TopWorx revision control.
REVISION_ID	TopWorx revision control.
REVISION_DATE	TopWorx revision control.

Appendix 2
Complete Transducer Parameter Listing

Param. Number	Index	Name	Type	Description	Units	Initial Values
	448	Block 2	XDUCER_BLOCK			
1	449	ST_REV	Simple, uint16	Simple, uint16, Parameter 1		
2	450	TAG_DESC	Simple, Octet Str	Simple, Octet Str, Parameter 2		
3	451	STRATEGY	Simple, uint16	Simple, uint16, Parameter 3		
4	452	ALERT_KEY	Simple, uint8	Simple, uint8, Parameter 4		
5	453	MODE_BLK_RESOURCE	Record, Mode Struct	Record, Mode Struct, Parameter 5		
6	454	BLOCK_ERR	Simple, Bit String	Simple, Bit String, Parameter 6		
7	455	UPDATE_EVT	Record, Event update	Record, Event Update, Parameter 7		
8	456	BLOCK_ALM	Record, Alarm Discrete	Record, Alarm Discrete, Parameter 8		
9	457	FINAL_VALUE_D	Record, VS Discrete	Value from the connected Channels.		
10	458	SP_D	Record, VS Discrete	This is the FINAL_VALUE_D processed with mode, Fault State etc and sent to the driver. This is the position the valve should be in.		
11	459	FINAL_POSITION_VALUE_D	Record, VS Discrete	This is the read-back position going to Function Block. It is derived from the limit switch input values.		
12	460	DISCRETE_STATE	Simple, Bit String	This describes some of the discrete, low level values: 0x01 Auxiliary 0x02 Write Protect Jumper 0x04 Simulate Jumper 0x08 Valve 1 Active 0x10 Valve 2 Active		
13	461	ACTION_ELEMENT	Simple, uint8	Selects whether actuator is single acting (0x1) or double acting (0x3), single energize to close (0x4), double energize to close (0x6)		Single
14	462	LED_ENABLE	Simple, uint8	Enable the LED indicators (hi-power mode 0x01) or operate without LED indication (Lo-power mode 0x00)		Enabled
15	463	FAULT_STATE_TB	Simple, uint8	Valve will fault to open (0x0), close (0x1) or stop (0x2) when a transducer error occurs. (Transducer Fault State)		Close
16	464	CALIBRATION_SWITCH_ARM	Simple, uint8	Arm the use of the manual control on the device. See description of calibration switch functionality below.		Armed
17	465	CALIBRATION_SWITCH_POSITION	Simple, uint8	The current position of the Calibration switch. 0x0, Close, for when the manual switch is in the close position 0x1, Open, the manual switch is in the open position, 0x2, FF, the manual switch is in the FF position.		
18	466	CALIBRATION_SWITCH_STATE	Simple, uint8	If 0x00 the user cannot stroke valve using calibration switch. If value is 0x01 the valve can be moved using calibration switch.		
19	467	CLEAR_CYCLE_COUNT	Simple, uint8	Resets the cycle counter to 0. (always reads zero)		
20	468	CHANNEL_13_MASK	Simple, Bit String	Used to determine which parameters are associated with Channel 13. 0x00, No Selection, 0x01, Cycle Count, 0x02, Time To Open, 0x04, Time To Close, 0x08, Board Temp Hi, 0x10, Board Temp Lo		BoardTemp Hi & BoardTemp Low 0x18
21	469	LAST_TIME_OPEN	Simple, Float	The amount of time taken to complete the last open cycle.		
22	470	LAST_TIME_CLOSE	Simple, Float	The amount of time taken to complete the last close cycle.		
23	471	CYCLE_COUNT	Simple, uint32	Counter that increments each time the valve opens or closes. The counter increments on partial opens or closes as well. This is actually a 1/2 cycle counter.		
24	472	BOARD_TEMPERATURE	Simple, Float	The temperature of the printed circuit board, as determined by board mounted temperature sensor.	C	
25	473	CYCLE_COUNT_PRI	Simple, uint8	Priority of the cycle count limit alarm. 0 - do nothing (disabled) 1 - show alarm but don't don't send it out on the bus 2-7 normal priority 8-16 critical priority		0

Appendix 2
Complete Transducer Parameter Listing (cont'd)

Param. Number	Index	Name	Type	Description	Units	Initial Values
26	474	CYCLE_COUNT_LIM	Simple, Float	The number of cycles before an alarm is generated.		50,000
27	475	CYCLE_TIME_OPEN_PRI	Simple, uint8	The priority of the open time limit alarm. 0 - do nothing (disabled) 1 - show alarm but don't don't send it out on the bus 2-7 normal priority 8-16 critical priority		0
28	476	CYCLE_TIME_OPEN_LIM	Simple, Float	The maximum time allowed for the valve to open without generating an alarm.	Sec	10.00
29	477	CYCLE_TIME_CLOSE_PRI	Simple, uint8	The priority of the close time limit alarm. 0 - do nothing (disabled) 1 - show alarm but don't don't send it out on the bus 2-7 normal priority 8-16 critical priority	Sec	0
30	478	CYCLE_TIME_CLOSE_LIM	Simple, Float	The maximum time allowed for the valve to close without generating an alarm.	Sec	10.00
31	479	BOARD_TEMPERATURE_PRI	Simple, uint8	The priority of the board temperature alarm. 0 - do nothing (disabled) 1 - show alarm but don't don't send it out on the bus 2-7 normal priority 8-16 critical priority	C	0
32	480	BOARD_TEMPERATURE_HI_LIM	Simple, Float	The highest temperature allowed without generating an alarm. Valve and process should operate below this limit.	C	50
33	481	BOARD_TEMPERATURE_LO_LIM	Simple, Float	The lowest temperature allowed without generating alarm. Valve and process should operate above this temperature value.	C	-10
34	482	CYCLE_COUNT_ALM	Record, Alarm Float	Alarm indication if number of open and close cycles exceeds the cycle count limit		
35	483	CYCLE_TIME_OPEN_ALM	Record, Alarm Float	Alarm indication if time to open exceeds limit.		
36	484	CYCLE_TIME_CLOSE_ALM	Record, Alarm Float	Alarm indication if time to close exceeds limit.		
37	485	BOARD_TEMPERATURE_ALM	Record, Alarm Float	Alarm indication if the temperature of the board is not within limits		
38	486	SUPPORTED_MODES	Simple, Bit String	The modes supported by this particular block.		

Appendix 3
Complete Discrete Input Block Parameter Listing

ST_REV	The revision level of the static data associated with the function block. To support tracking changes in static parameter attributes, the associated block's static revision parameter will be incremented each time a static parameter attribute is written but the value is not changed.
TAG_DESC	The user description of the intended application of the block.
STRATEGY	The strategy field can be used to identify grouping of blocks. This data is not checked or processed by the block.
ALERT_KEY	The identification number of the plant unit. This information may be used in the host for sorting alarms, etc.
MODE_BLK	The actual, target, permitted, and normal modes of the block.
BLOCK_ERR	This parameter reflects the error status associated with the hardware of software components associated with a block. It is a bit string, so that multiple errors may be shown.
PV_D	Either the primary discrete value for use in executing the function, or a process value associated with it.
OUT_D	The primary discrete value calculated as a result of executing the function.
SIMULATE_D	Allows the transducer discrete input or output to the block to be manually supplied when simulate is enabled. When simulation is disabled, the simulate value and status track the actual value and status.
XD_STATE	Index to the text describing the states of a discrete for the value obtained from the transducer.
OUT_STATE	Index to the text describing the states of a discrete output.
GRANT_DENY	Options for controlling access of host computer and local control panels to operating, tuning and alarm parameters of the block.
IO_OPTS	Options which the user may select to alter input and output block processing.
STATUS_OPTS	Options which the user may select in the block processing of status.
CHANNEL	The number of the logical hardware channel that is connected to this I/O block. This information defines the transducer to be used going to or from the physical world.
PV_FTIME	Time constant of a single exponential filter for the PV, in seconds.
FIELD_VAL_D	Raw value of the field device discrete input, with a status reflecting the transducer condition. 0=Close; 1=Option; 2=Stop.
UPDATE_EVT	This alert is generated by any change to the static data.
BLOCK_ALM	The block alarm is used for all configuration, hardware, connection failure or system problems in the block. The cause of the arlert is entered in the subcode field. The first alert to become active will set the Active status in the Status attribute. As soon as the Unreported status is cleared by the alert reporting task, another block alert may be reported without clearing the Active status, if the subcode has changed.
ALARM_SUM	The current alert status, unacknowledged states, unreported states, and disabled states of the alarms associated with the function block.
ACK_OPTION	Selection of whether alarms associated with the block will be automatically acknowledged.
DISC_PRI	Priority of the discrete alarm.
DISC_LIM	State of discrete input which will generate an alarm.
DISC_ALM	The status and time stamp associated with the discrete alarm.
XDUVER_VAL_D	The value and status received from the transducer block on the selected channel.
BLOCK_ALMS_ACT	Provides list of all active block alarms in this block.
SUPPORTED_MODES	The modes supported by this particular block.

Appendix 4
Complete Discrete Output Block Parameter Listing

ST_REV	The revision level of the static data associated with the function block. To support tracking changes in static parameter attributes, the associated block's static revision parameter will be incremented each time a static parameter attribute is written but the value is not changed.
TAG_DESC	The user description of the intended application of the block.
STRATEGY	The strategy field can be used to identify grouping of blocks. This data is not checked or processed by the block.
ALERT_KEY	The identification number of the plant unit. This information may be used in the host for sorting alarms, etc.
MODE_BLK	The actual, target, permitted, and normal modes of the block.
BLOCK_ERR	This parameter reflects the error status associated with the hardware of software components associated with a block. It is a bit string, so that multiple errors may be shown.
PV_D	Either the primary discrete value for use in executing the function, or a process value associated with it.
SP_D	The discrete setpoint of this block.
OUT_D	The primary discrete value calculated as a result of executing the function.
SIMULATE_D	Allows the transducer discrete input or output to the block to be manually supplied when simulate is enabled. When simulation is disabled, the simulate value and status track the actual value and status.
PV_STATE	Index to the text describing the states of a discrete PV.
XD_STATE	Index to the text describing the states of a discrete for the value obtained from the transducer.
GRANT_DENY	Options for controlling access of host computer and local control panels to operating, tuning and alarm parameters of the block.
IO_OPTS	Options which the user may select to alter input and output block processing.
STATUS_OPTS	Options which the user may select in the block processing of status.
READBACK_D	This indicates the readback of the actual discrete valve or other actuator position, in the transducer state.
CAS_IN_D	This parameter is the remote setpoint value of a discrete block, which must come from another Fieldbus block, or a DCS block through a defined link.
CHANNEL	The number of the logical hardware channel that is connected to this I/O block. This information defines the transducer to be used going to or from the physical world.
FSTATE_TIME	The time in seconds from detection of fault of the output block remote setpoint to the output action of the block output if the condition still exists.
FSTATE_VAL_D	The preset discrete SP_D value to use when fault occurs. This value will be used if the I/O option Fault State to value is selected.
BKCAL_OUT_D	The output value and status provided to an upstream discrete block. This information is used to provide bumpless transfer to closed loop control.
RCAS_IN_D	Target setpoint and status provided by a supervisory Host to a discrete control to output block.
SHED_OPT	Defines action to be taken on remote control device timeout.
RCAS_OUT_D	Block setpoint and status provided to a supervisory Host for back calculation and to allow action to be taken under limiting conditions or mode change.
UPDATE_EVT	This alert is generated by any change to the static data.
BLOCK_ALM	The block alarm is used for all configuration, hardware, connection failure or system problems in the block. The cause of the alert is entered in the subcode field. The first alert to become active will set the Active status in the Status attribute. As soon as the Unreported status is cleared by the alert reporting task, another block alert may be reported without clearing the Active status, if the subcode has changed.
XDUCER_VAL_D	The value and status received from the transducer block on the selected channel.
BLOCK_ALMS_ACT	Provides list of all active block alarms in this block.
SUPPORTED_MODES	The modes supported by this particular block.

Zone 0

Telemetering Equipment for use in Hazardous Locations

CE 0539 Ex II 1 G D c UL us LISTED

EEx ia IIC T4 Tamb = 80°C max
DEMKO 02 ATEX 0223499X
Ui:24VDC, Ii:250mA, Pi:1,2W, Ci:2,5nF, Li:192µH
Intrinsically Safe / Securite Intrinseque
Cl I Div 1,Groups A,B,C,D; Type 4, 4X & IP56

Zone 2

Telemetering Equipment for use in Hazardous Locations

CE 0539 Ex II 3 G D c UL us LISTED

EEx nC [L] IIC T4 Tamb = 80°C max
DEMKO 02 ATEX 130955X
Electrical Rating: 9-32VDC, 20mA
Cl I Div 2,Groups A,B,C,D; Type 4, 4X & IP56

Special Conditions of Safe Use (All installations)

1. The following pneumatic parameter shall be observed
   gas pressure medium
   for occasionally explosive mixture ≤1, 1 bar
   for non-explosive mixture ≤12 bar
2. Combustible gases, which are explosive in the absence of oxygen, shall not be used as medium
3. For medium pressure higher than 1.1 bar, the medium shall not be explosive.
4. The terminal AUX shall only be connected to a simple apparatus with cable length not exceeding 3m.
5. Clean only with a damp cloth to prevent possibility of electrostatic discharge.
6. All conductors used in wiring this unit must be rated ≥ 90°C
7. Clean only with a damp cloth to prevent possibility of electrostatic discharge.

Warranty

TopWorx warrants that each item of new equipment manufactured by it will be free from defects in material and workmanship under normal use and service; its obligation under this Warranty, being limited to making good, at its factory, and part of parts thereof, which shall be returned to it with transportation charges prepaid, within one year after the date of the purchase of such equipment by the original purchaser, and which its examination shall disclose to its satisfaction to have been thus defective. TopWorx however, assumes no risk or liability for results of the use of the products purchased from it.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, WHETHER OF MERCHANTABILITY FITNESS, OR OTHERWISE EXPRESSED OR IMPLIED, AND ALL OTHER OBLIGATIONS OR LIABILITIES AND TOPWORX NEITHER ASSUMES , NOR AUTHORIZES ANY PERSON TO ASSUME FOR IT ANY OTHER LIABILITY IN CONNECTION WITH THE SALE OF THIS EQUIPMENT.

No claims for labor in replacing defective parts and equipment and consequential damages will be allowed by the Company.

This Warranty shall not apply to equipment which has been subjected to misuse, negligence or accident.

This Warranty shall not apply to any equipment which shall have been repaired or altered, outside the Company's factory so as to affect such equipment's stability or reliability in the judgement of the Company.

Customer Feedback Form

For us to better serve you, we need your comments. Please take the time to fill out this questionnaire. We value your feedback!

Contact_____

Company_____

Address_____

City_____ State_____ Zip_____ Country_____

Telephone_____ Fax_____

Email_____

What type of company do you work for? ☐ Distributor ☐ Valve Automator ☐ Systems Integrator ☐ End User ☐ Other

In what industry are the TopWorx devices being used? ☐ Chemical ☐ Food & Beverage ☐ Pharmaceutical ☐ Power

☐ Oil & Gas ☐ Pulp & Paper ☐ Wastewater ☐ Other

Briefly describe the process where the devices are being used?_____

_____

Which TopWorx products are being installed: _____

Date TopWorx products are being installed:_____

Was the product easy to mount?_____

Was the product easy to calibrate and address (if applicable)?_____

Was the product easy to commission (if applicable)?_____

Was the Instruction Manual thorough and easy to read and understand?_____

What improvements, if any, would you make to this product or the Instruction Manual?_____

_____

Please fax your replies to TopWorx at **502.969.5911**. If you prefer, email your comments and suggestions to **info@topworx.com**. For an overview of the additional TopWorx products available, please visit our website at **www.topworx.com**.

We look forward to serving you with Speed & Excellence. Thanks for your feedback!

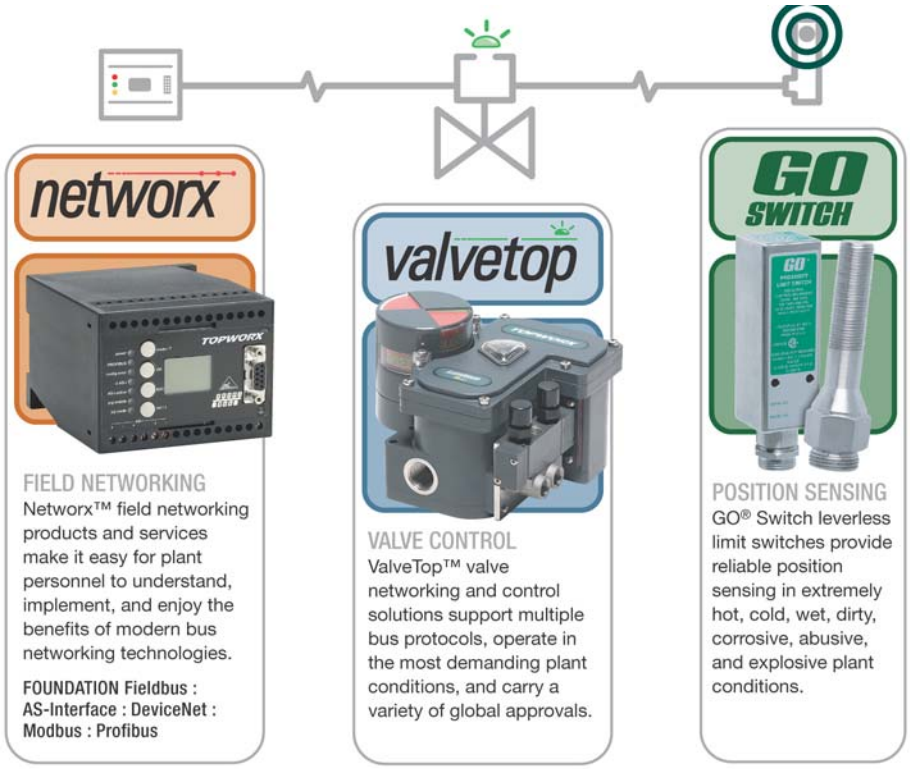
About Valvetop™

Valvetop valve networking and control devices link on/off valves to process control systems via a variety of fieldbus protocols. Valvetop valve controllers and monitors support multiple bus protocols, operate in the most demanding plant conditions, and carry a variety of global approvals. Whether your application is rotary or linear, fieldbus or conventional, hazardous or general purpose, we have a suitable solution for you.

For inquiries, contact TopWorx at: 502.969.8000
www.topworx.com
info@topworx.com

About TopWorx

TopWorx is the leader in field networking, valve control, and position sensing solutions for the process industries. Our products and services help plants, mills, and pipelines improve their performance by making it easy to implement modern automation technologies.



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