USER INSTRUCTIONS

Installation
Operation
Maintenance
Safety

Logix™ 3800zb

Digital Positioner

FCD AIIOM001030_EN 02/23

Experience In Motion

CONTENTS

1 QUICK START GUIDE

1.1 Logix 3800zb Positioner Features

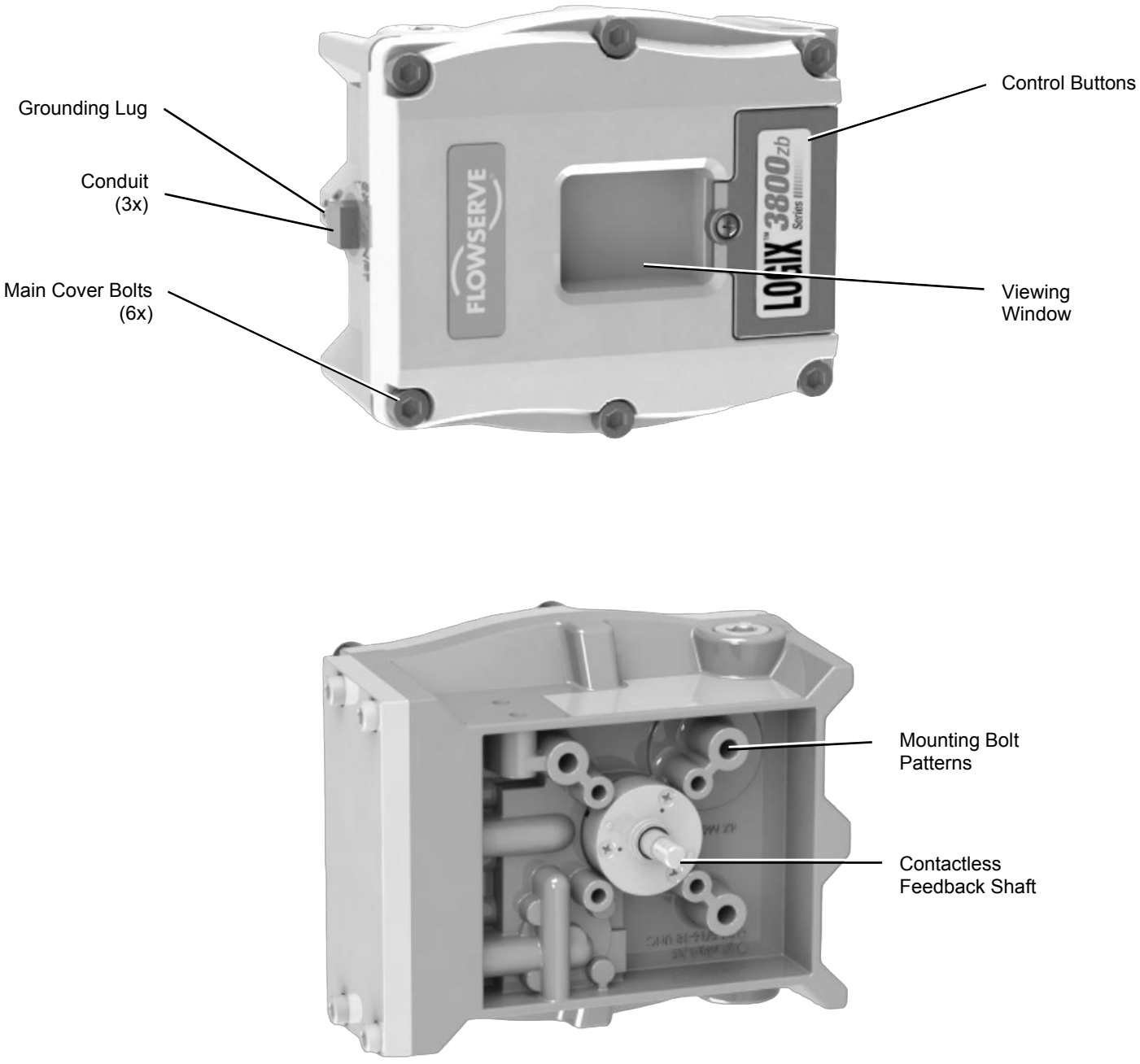

Figure 1: Logix 3800zb External Positioner Features

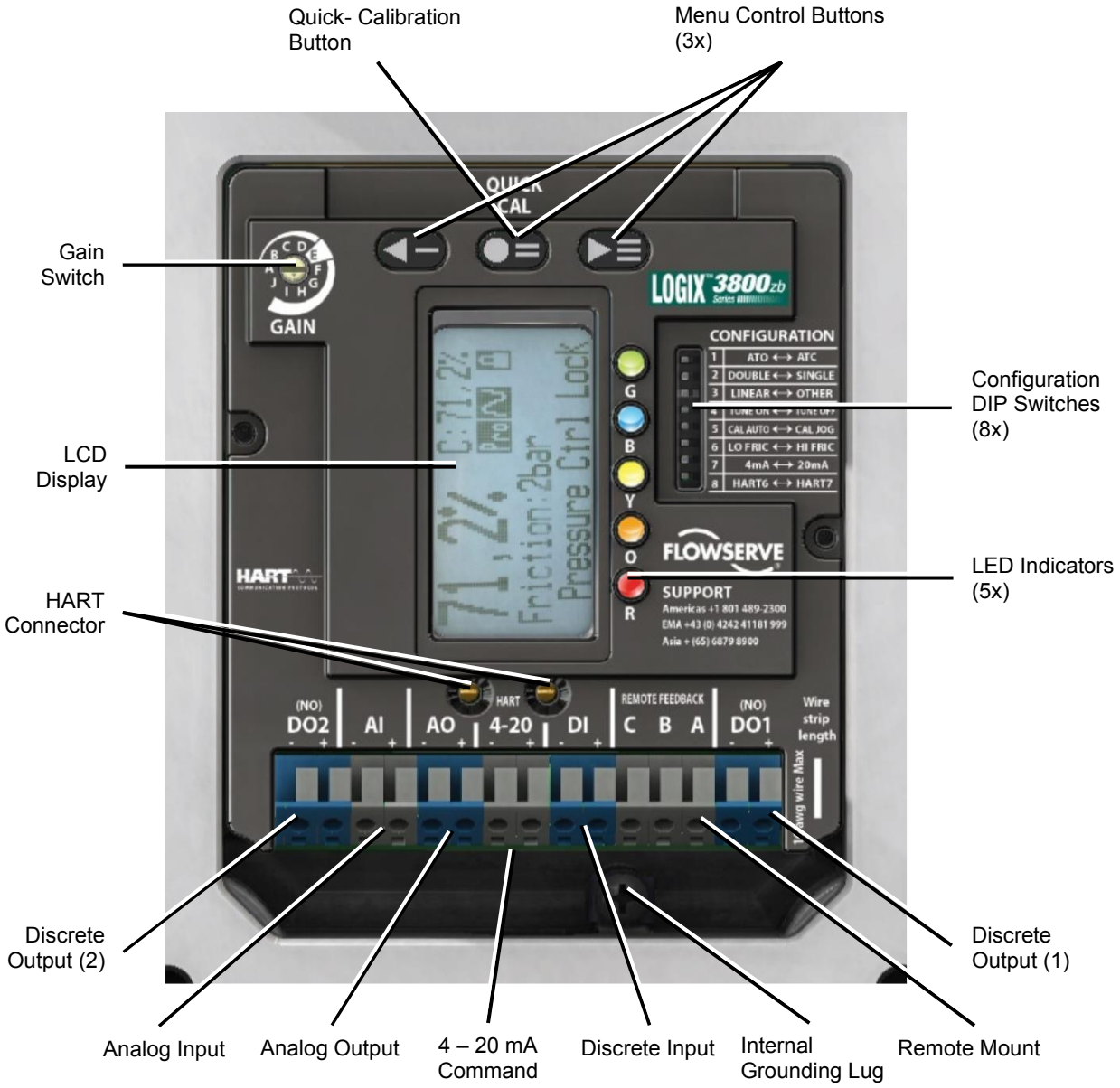

Figure 2: Logix 3800zb (HART) Internal Positioner Features

1.2 Safety

⚠ CAUTION: *Before installation, read all safety related information in section 2 Safety Information.*

1.3 Installation - Direct mount

MOUNTING
Securely mount the positioner to the actuator using the bolt pattern on the back of the positioner. See section 4, Installation – Mounting, for more detail.

FEEDBACK
Connect feedback linkage. Align the follower arm to move freely within the expected range of valve travel. Over-rotating the feedback shaft will not damage the unit.

NATURAL GAS CONNECTIONS
The natural gas connections to the actuator are accomplished using an approved 4-Way dual solenoid valve (Double acting). See section 5, Installation - Tubing, for more detail.

⚠ CAUTION: *Connecting the natural gas supply may cause the valve to move. Before connecting supply, ensure the valve is isolated.*

Connect the natural gas supply to the input port of the appropriate 4-Way valve block. See section 15, Positioner Specifications, for natural gas specifications.

ELECTRICAL CONNECTIONS

⚠ CAUTION: *Connecting the 4-20 mA signal may cause the valve to move. Before connecting electrical signal, ensure the valve is isolated.*

Connect a 4-20 mA signal to the terminals labeled “4-20” or the tabs labeled “HART.” The tabs should only be used for temporary testing and are not meant as a permanent connection. A signal above 3.8 mA will activate the positioner. LEDs on the positioner will light up indicating power is connected.

The solenoid valve is electrically connected to the positioners digital outputs using XP approved conduit connections.

1.4 Installation - Remote mount

MOUNTING
The Flowserve Zero Bleed Automation Package provides a solution for remote mount installations that includes the positioner and solenoid-controlled valve block as one panelized package. This package can be mounted to existing installation panels or can be used stand alone. The positioner can also be mounted in a customer specific remote mount application installation. For additional remote mount installation options and details see section 5 and 6.

1.5 Configuration

Set the configuration dip switches. See section 8, Operation – Dip Switch Configuration, for more detail.

AIR ACTION DIP SWITCH (ATO◄►ATC)
For increasing pressure in port A to open the valve (air to open) select "ATO." For increasing pressure in port A to close the valve (air to close) select "ATC."

ACTUATOR SWITCH (DOUBLE◄►SINGLE)
For double-acting actuators select "DOUBLE." For single-acting actuators, select "SINGLE."

CHARACTERIZATION SWITCH (LINEAR◄►OTHER)
For a linear relationship between the command signal and the position of the valve, select" LINEAR." To customize the characterization curve, select "OTHER." Other curves can be chosen using the LCD menu, a handheld device, or DTM. See Appendix C – Programmed Flow Characterization Options for a table and graph describing the "OTHER" options.

AUTO TUNE SWITCH (TUNE ON◄►TUNE OFF)
For the QUICK-CAL calibration to automatically select custom tuning parameters, select TUNE ON (preferred). For default tuning parameters, select TUNE OFF.

JOG CALIBRATION SWITCH (CAL AUTO◄►CAL JOG)
For valves with a mechanical stop at the fully opened position (most valves), select CAL AUTO. For valves with no mechanical stop, select CAL JOG. This allows the user to set the upper limit of travel by jogging the position manually.

VALVE STABILITY SWITCH (LO FRIC◄►HI FRIC)
Not applicable.

SIGNAL AT CLOSED SWITCH (HART) (4mA◄►20mA)
For a 4mA signal to move the valve to a closed position, select 4mA. For a 20mA signal to move the valve to closed, select 20mA.

HART SWITCH (HART) (HART 6◄►HART 7)
For HART 6 protocol, select HART6. For HART 7 protocol, select HART7.

1.6 Calibration

⚠ CAUTION: *During the QUICK-CAL operation the valve may stroke unexpectedly. Notify proper personnel that the valve will stroke, and make sure the valve is properly isolated.*

QUICK-CAL
The QUICK-CAL button is used to initiate an automatic stroke calibration. This stroke calibration determines the closed (0%) and open (100%) positions of the valve and gathers information about the response of the valve to determine the control gains. The gains are automatically set. After a QUICK-CAL calibration, the positioner is ready to control.

To perform a QUICK-CAL, press and hold the QUICK-CAL button for approximately 3 seconds, then release.

During the calibration, the LED lights will flash Yellow-Red-Yellow-Green indicating the calibration is in progress. After the calibration is complete, the LED lights should flash Green-Green-Green-Green indicating a successful calibration.

➲ NOTE: *This first time the QUICK-CAL is performed, the positioner will also complete a Full Calibration. This will extend the time required for the calibration. This happens with Standard and Pro diagnostic levels.*

GAIN SWITCH
After the calibration, (and at any time during operation), fine tune the gains by adjusting the Selectable GAIN Switch. Selecting "A" through "D" will provide a more stable or slower response. Selecting "F" through "J" will provide a more active or quicker response. The "E" position is the default and is typically more stable.

--- END OF QUICK START GUIDE ---

2 SAFETY INFORMATION

2.1 Using This Document

Product users and maintenance personnel should thoroughly review this manual before installing, operating, or performing any maintenance on the positioner.

The following instructions are designed to assist in unpacking, installing and performing maintenance as required on Logix™ 3800zb positioners.

Separate Flow Control Products User Instructions cover the valve, actuator, or other portions of the system and other accessories. Refer to the appropriate instructions when this information is needed. The design of FLOWSERVE valves, actuators, and accessories are for specific applications considering medium, pressure, and temperature in most cases. For this reason, do not use them in other applications without first contacting the manufacturer.

2.2 Terms Concerning Safety

The safety terms **NOTE**, **CAUTION**, **WARNING** and **DANGER** are used in these instructions to highlight particular hazards and to provide additional information on aspects that may not be readily apparent. **DANGER** **WARNING** and **CAUTION** notes must be strictly followed to avoid possible injury to personnel or damage to equipment or property.

NOTE: *Indicates and provides additional technical information, which may not be obvious.*

CAUTION: *Proper precautions must be observed to avoid minor personal injury and property damage.*

DANGER: *Indicates that death, severe personal injury and/or substantial property damage can occur if proper precautions are not taken.*

Compliance with notes about installation, operation, maintenance and technical documentation (e.g. in the operating instruction, product documentation or on the positioner) is essential to avoid faults, which in themselves might directly or indirectly cause severe personal injury or property damage.

2.3 Protective Clothing

FLOWSERVE positioners use high-pressure gas to operate. Use eye protection when working around pressurized equipment. Follow proper procedures for working with natural gas.

DANGER: *Standard industry safety practices must be adhered to when working on this or any process control product. Specifically, use personal protective equipment as warranted.*

2.4 Qualified Personnel

Qualified personnel are people who, on account of their training, experience, instruction and their knowledge of relevant standards, specifications, accident prevention regulations and operating conditions, have been authorized by those responsible for the safety of the plant to perform the necessary work and who can recognize and avoid possible dangers.

In unpacking, installing and performing maintenance as required on FLOWSERVE products, product users and maintenance personnel should thoroughly review this manual before installing, operating, or performing any maintenance.

2.5 Valve and Actuator Variations

These instructions cannot claim to cover all details of all possible product variations, nor can they provide information for every possible example of installation, operation scenario, or maintenance requirement. Qualified personnel should follow the instructions provided and only use the product for its defined purpose. If clarification is needed or there are any uncertainties in this respect, particularly in the event of missing product-related information, immediately contact the appropriate Flowserve sales office. Contact information is listed at the back of this manual.

2.6 Spare Parts

Use only FLOWSERVE original components. FLOWSERVE cannot accept responsibility for any damages that occur from using components or fastening materials from other manufacturers. If FLOWSERVE products (especially sealing materials) have been in storage for longer periods, check them for corrosion or deterioration before using these products. See Appendix G - How To Order for more information.

2.7 Service / Repair

CAUTION: *Proper precautions must be strictly observed to avoid possible personal injury and property damage.*

Modifying this product, substituting non-factory parts, or using maintenance procedures other than outlined in this instruction could drastically affect performance and be hazardous to personnel and equipment, and may void existing warranties.

There are moving parts between the actuator and the valve. To avoid injury FLOWSERVE provides pinch-point-protection in the form of cover plates, especially with side-mounted positioners. Special attention is required when removing these plates for inspection, service or repair. Refit the cover plates after completing work.

Logix 3800zb positioner repair is limited to the replacement of sub-assemblies and circuit boards with FLOWSERVE-manufactured replacements as outlined in this manual.

DANGER: *Substitution with non-factory positioner components may impair safety.*

⚠ CAUTION: *Before returning products to FLOWSERVE for repair or service, provide a certificate to FLOWSERVE which confirms that the product has been decontaminated and is clean; FLOWSERVE will not accept deliveries if a certificate is not provided (a form is available from FLOWSERVE).*

Apart from the operating instructions and the necessary accident prevention directives valid in the country of use, follow all recognized regulations for safety and good engineering practices.

2.8 Natural Gas Service

The use of natural gas as an actuation medium with a FLOWSERVE Logix 3800zb positioner and solenoid valve is acceptable.

⚠ CAUTION: *The natural gas used must be sweet natural gas. Use of sour natural gas may cause positioner to fail prematurely.*

DANGER: *The solenoid-controlled valve, controlled by the Logix 3800zb, is vented directly to atmosphere. The sweet natural gas as the supply requires piping to route the exhausted natural gas to a safe environment. Refer to section 5.5, Venting, for venting details.*

⚠WARNING: *With natural gas is used as an actuation medium, appropriately rated gas tight electrical feedthroughs are required at each positioner housing conduit connection for Explosionproof and Flameproof installations. Refer to sections 6.2.4 for additional details.*

3 PRE-INSTALLATION

3.1 Storage

It is mandatory to store FLOWSERVE control valves and instruments in a clean, dry environment. Prevent flooding of the equipment, including rainwater, that can pool in packaging materials. Prevent dirt or sand accumulation in the pneumatic and valve ports. Plastic caps are fitted to protect positioner ports from ingress of foreign materials. These caps should be removed before fitting with conduit or air supply lines.

If FLOWSERVE products have been in storage for longer periods, check them for corrosion or deterioration before using these products. The end user must provide fire protection for FLOWSERVE products.

NOTE: *The positioner is not IP66/NEMA 4X certified until installed and temporary plugs have been fitted with tubing, conduit or permanent plugs.*

3.2 Unpacking

While unpacking the valve and Logix 3800zb positioner, check the packing list against the materials received. Each shipping container includes a list describing the system and accessories included.

In the event of shipping damage, contact the shipper immediately. Should any problems arise, please contact a FLOWSERVE Flow Control Division representative. Phone numbers are at the back of the manual.

Remove the plastic plugs (blue color) from the conduit ports before installing. Replace with plugs that will seal the opening using, ½" NPT or M20 threaded plug, depending on the housing, which is clearly marked.

CAUTION: *The plastic plugs in the conduit ports are intended only to protect the threads during shipment. Failure to replace these with a sealing plug may result in liquid and debris ingress and damage to the positioner.*

DANGER: *When lifting a valve/actuator assembly with lifting straps, be aware that the center of gravity may be above the lifting point. Therefore, support must be given to prevent the valve/actuator from rotating and falling. Failure to do so can cause serious injury to personnel or damage to nearby equipment.*

3.3 Pre-installation Inspection

When installing a positioner, check the feedback shaft for damage and that the plugs and cover are in place. If there is contamination in the positioner, clean the positioner components gently with a soft damp cloth. One may remove some parts for better access. Do not get water on the electronics assembly.

3.4 Label Verification

Verify that the labels match the intended application. See section 17 , Hazardous Location Specifications for more details.

NOTE: *The installer should mark the checkbox on the label that is appropriate for the intended use of the Logix 3800zb.*

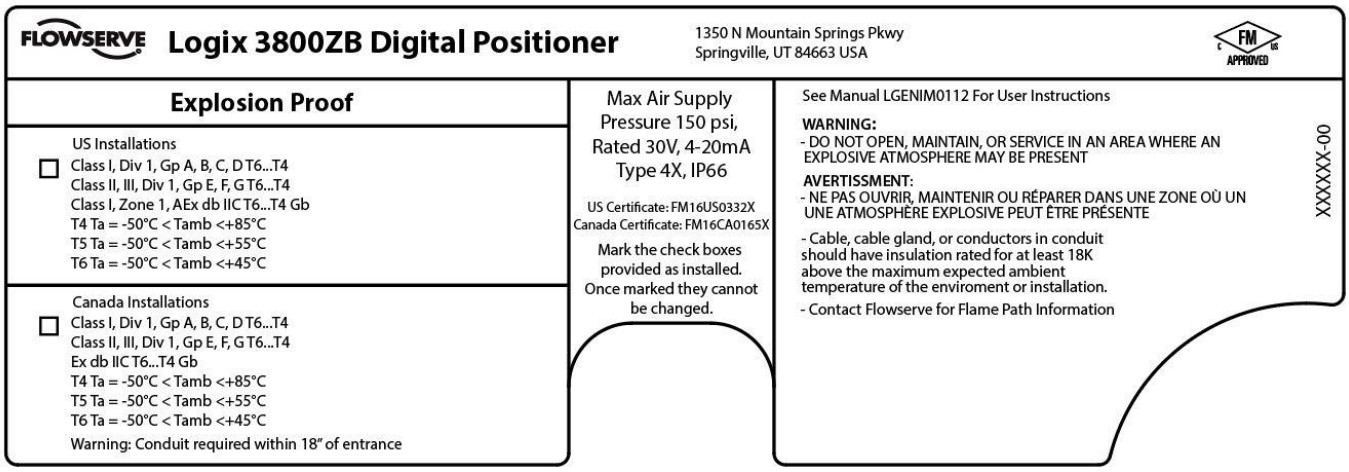

Figure 3: Certification Labels (Explosion Proof Housing)

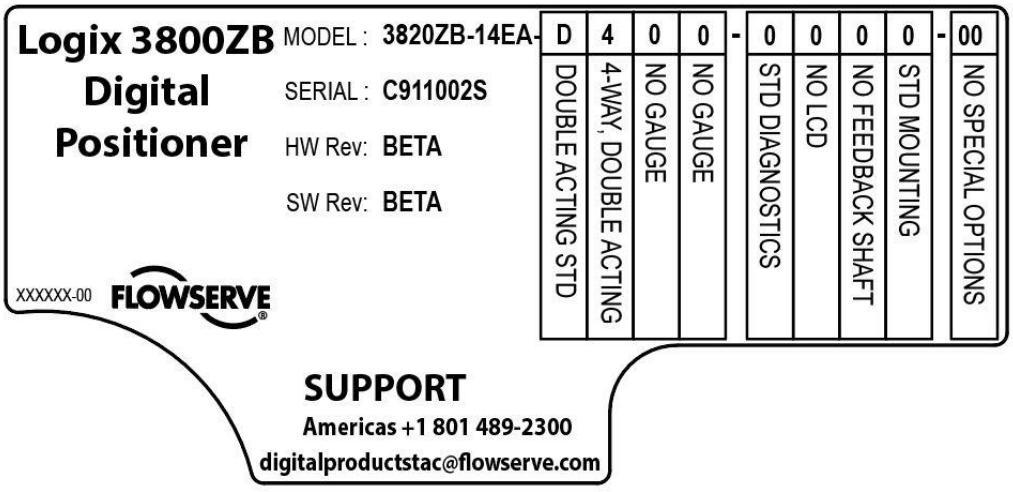

Figure 4: Model Code Label

4 INSTALLATION – MOUNTING

NOTE: *The Logix 3800zb positioner can be mounted in any orientation.*

4.1 Mounting to Mark One Linear Valves

To attach a Logix 3800zb positioner to a Valtek linear Mark I valve, refer to Figure 5: Mounting to Mark I Linear Valve and proceed as outlined below. Refer to Figure 11 if using a Namur shaft. Refer to, APPENDIX G - HOW TO ORDER, for complete linear actuator mounting kit listings. Note: The Logix 3800zb is only certified for use with Valtek Linear Mark I Valves 50, 100 or 200 sizes.

1 Remove washer and nut from follower pin assembly. Insert pin into the appropriate hole in follower arm, or locate the pin along the slot in the follower arm based on stroke length. The stroke lengths are located on the follower arm. Make sure the stamped side of the arm is toward the unthreaded end of the pin. Reinstall the lock washer and tighten the nut to complete follower arm assembly.

2 Slide the slot in the follower arm assembly over the flats on the position feedback shaft on the back of the positioner. The follower arm will be specific to a D shaft or a Namur shaft. Rotate the arm until the arm is pointing toward the side of the positioner with ports A, B, and Supply. Slide the lock washer over the threads on the shaft and tighten down the nut.

NOTE: *The feedback shaft has a clutch mechanism that allows for over-rotation of the shaft for easy adjustments.*

3 Align the bracket with the three outer mounting holes on the positioner. Fasten with 5/16-18 UNC bolts.

4 Screw one mounting bolt into the hole on the yoke mounting pad nearest the cylinder. Stop when the bolt is approximately 3⁄16" from being flush with the mounting pad.

5 Slip the large end of the slotted mounting hole in the back of the positioner/bracket assembly over the mounting bolt. Slide the small end of the teardrop under the mounting bolt and align the lower mounting hole.

6 Insert the lower mounting bolt and tighten the bolting.

7 Position the take-off arm mounting slot against the stem clamp mounting pad. Apply Loctite 222 to the take-off arm bolting and insert through washers into stem clamp. Leave bolts loose.

8 Center the take-off arm on the follower pin.

9 Align the take-off arm with the top surface of the stem clamp and tighten bolt. Torque to 120 in-lb.

NOTE: *If mounted correctly, the follower arm should be horizontal when the valve is at 50% stroke and should move approximately ±30° from horizontal over the full stroke of the valve. A stroke calibration error will occur if the positioner is mounted incorrectly, and the indicator lights will blink a RRYG code indicating the position sensor has gone out of range on one end of travel, or the travel is too small. Reposition the feedback linkage or the positioner to correct the error.*

NOTE: *To virtually eliminate non-linearity, use the Linearization feature in the Custom Characterization page of the DTM.*

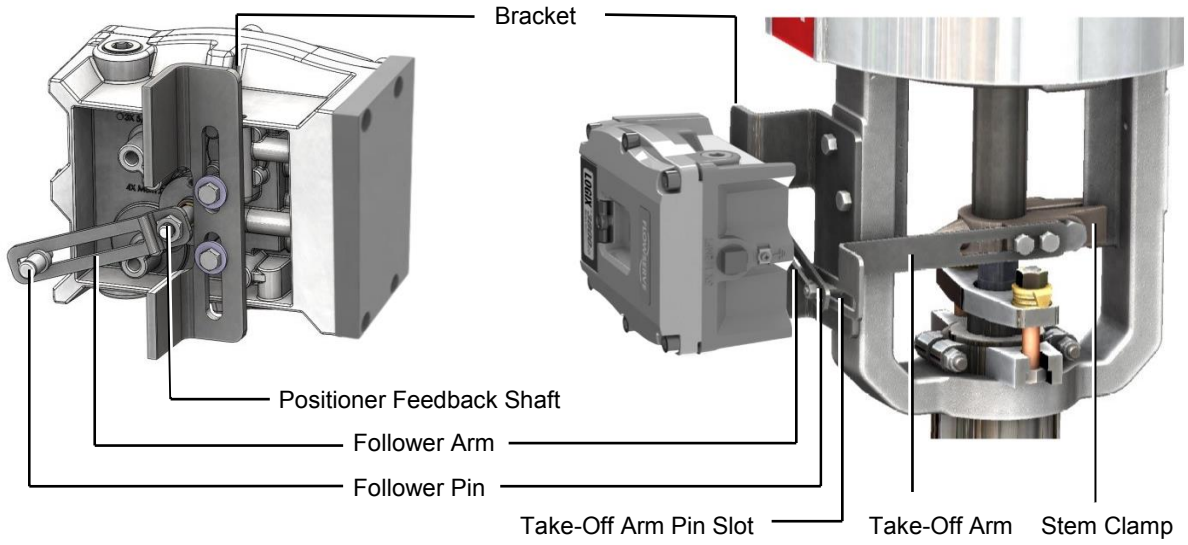

Figure 5: Mounting to Mark I Linear Valve

5 INSTALLATION - TUBING

5.1 Direct Mount

After mounting to the actuator, tube the 4-Way valve block port connections to the actuator using the appropriate fitting connectors. For best performance, use 10 mm (3/8 inch) tubing for 645 square cm (100 square inches) actuators or larger.

5.2 Determine Gas Supply Action

Connections using a 4-Way valve block for actuator control, are shown in Figure 6.

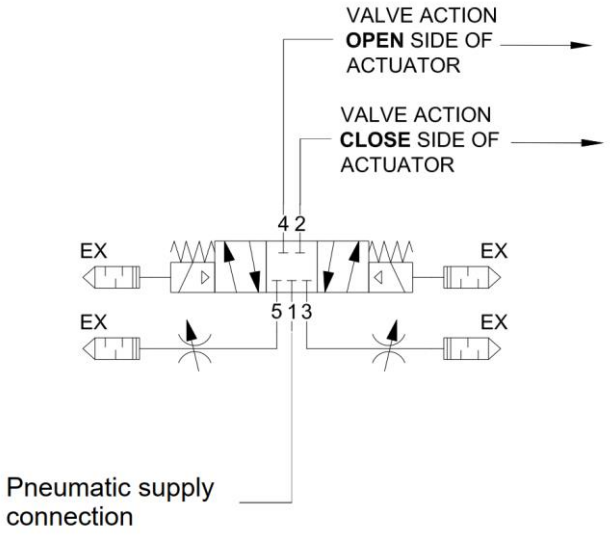

Figure 6: 4-Way valve actuator connection

When a pneumatic supply is present at port “1”, and the solenoid for port “4” is energized, port “4” delivers gas. Typically, the tubing from port “4” is connected to the side of the actuator that results in the gas compressing the actuator spring. When tubed this way, the spring is designed to return the valve to the fail-safe state should supply gas or power to the unit fail or be turned off.

Tube the port labeled “4” to the side of the actuator that must receive gas to begin moving away from the fail-safe state.

If gas from “4” should open the valve, set the Air Action configuration DIP switch on the positioner to Air-to-Open, otherwise set it to Air-to-Close. The Air-to-Open and Air-to-Close selection is only a reflection of the tubing. When selecting air action during configuration, the selection tells the control which way the actuator was tubed.

If the valve is double acting, port the valve labeled “2” to the other side of the actuator, otherwise plug port “2”.

DANGER: *Proper tubing orientation is critical for the positioner to function correctly and have the correct failure mode. The backward tubing could cause an unsafe failure mode.*

Example: Tubing Linear Double-Acting Actuators

For a linear air-to-open actuator, the tubing from port “4” is connected to the bottom side of the actuator (closest to the valve). Tube the “2” port of the positioner to the top side of the actuator. See Figure 7: Linear, Double Acting, Air to Open. For a linear air-to-close actuator the tubing configuration is reversed.

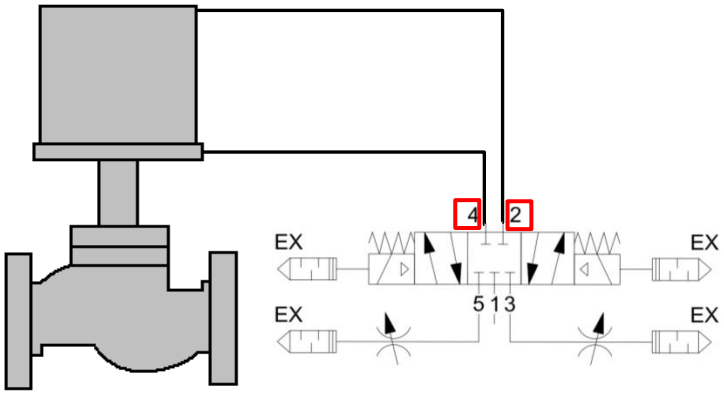

Figure 7: Linear, Double Acting, Air to Open

Example: Rotary Double-Acting Actuators

For a rotary actuator, route tubing from Port “4” to the far side of the actuator and tubing from port “2” to the side of the actuator closer to the transfer case. Follow this tubing convention regardless of air action. On rotary actuators, the transfer case orientation determines the air action. See Figure 8: Rotary, Double Acting, Air to Open.

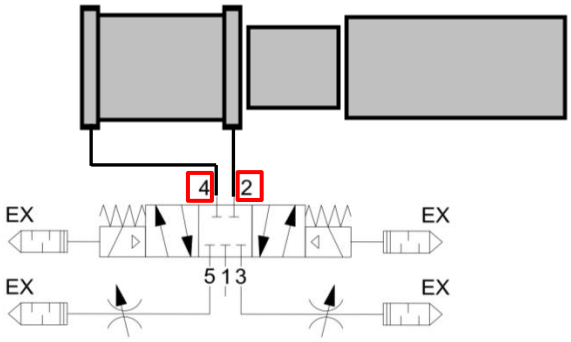

Figure 8: Rotary, Double Acting, Air to Open

Example: Tubing Single-Acting Actuators

For single-acting actuators, tubing for port “4” is always to the pneumatic side of the actuator regardless of air action. Port “2” is plugged. See Figure 9: Linear, Single Acting, Air to Open.

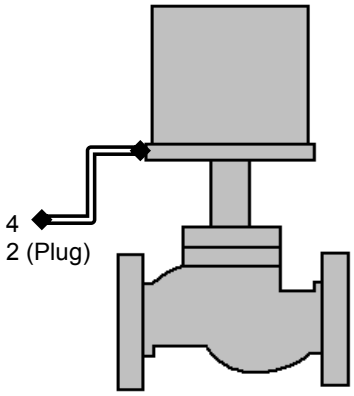

Figure 9: Linear, Single Acting, Air to Open

5.3 Connect Supply Port

In applications where the supply pressure is higher than the maximum actuator pressure rating of the supply, a regulator is required to lower the pressure to the actuator’s maximum rating.

DANGER: *Exceeding the maximum actuator supply pressure may cause the actuator to explode, causing death, injury or property damage.*

5.4 Purging

Purging allows the non-pressurized side of a single acting actuator to fill with clean exhaust gas instead of moist atmospheric air. This configuration helps prevent corrosion of actuator components in harsh environments. Figure shows the purging configuration. Contact your local FLOWSERVE Representative for more information regarding the purging option.

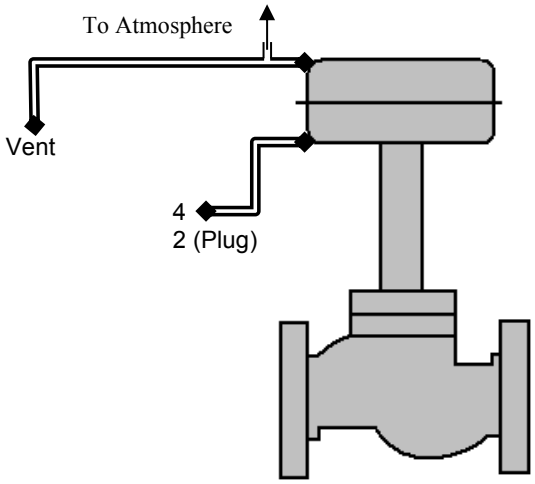

Figure 10: Purging

5.5 Venting

Venting for the Logix 3800zb controlled 4-Way valve block happens at ports “3” and “5” to the atmosphere. When supply air is substituted with sweet natural gas, piping must be used to route the exhausted natural gas to a safe environment. Speed control valves may be installed at ports “3” and “5” to adjust flow to the actuator. See Figure 11: Exhaust Vent

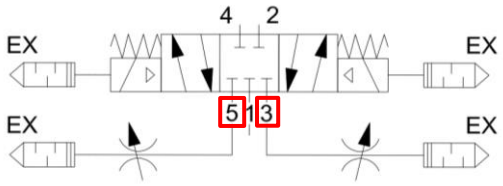

Figure 11: Exhaust Vent

5.6 Remote Mount

The Logix 3800zb can be remote mounted away from the actuator using the Flowserve Zero Bleed Automation Package and the Flowserve Logix Remote mount P/N LGENIM0001-01. See Figures 12 and 13.

The Logix 3800zb positioner can also be separately mounted in a customer specific remote mount application. The end user would supply their own 4-Way solenoid-controlled valve and remote mount feedback. See section 16 for valve and feedback unit requirements.

The tubing requirements are the same for the remount mount options as defined in sections 5.1 through 5.5.

➲ NOTE: *The tubing run for remote applications is restricted to a maximum length of 100ft.*

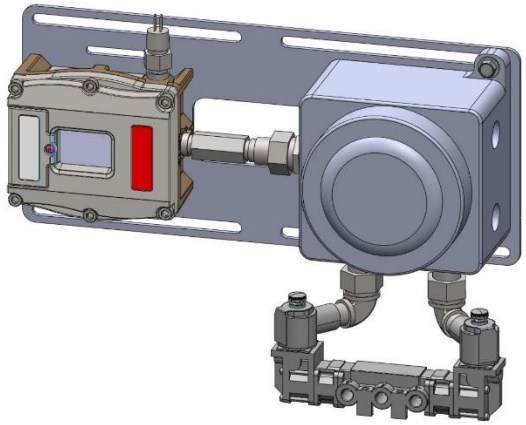

Figure 12: Logix 3800zb Automation Package

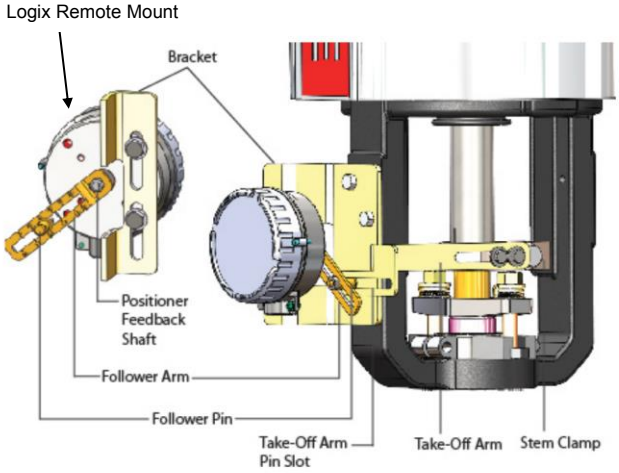

Figure 13: Logix Remote Mount – Valtek Linear mounting example

6 INSTALLATION – ELECTRICAL CONNECTIONS

⚠ CAUTION: *Connect only wires with compatible electrical signals to the terminals. Voltages or currents outside the specified range can damage the circuit boards.*

6.1 Electrical Terminals

Figure 14 shows the terminals on the positioner unit labeled for HART protocol.

Figure 14: Terminal Diagram (HART ONLY)

6.2 Command Input (4-20 mA) Connection

Wire 4-20 mA current source to the input terminal labeled "HART 4-20". The Logix 3800zb has spring loaded terminal blocks that do not require tools. Depending on the current source, a HART filter may be required. See section 12, Maintenance – Troubleshooting.

➲ NOTE: *The polarity of the terminals is labeled on the cover; however, the command input connection is polarity insensitive.*

6.2.1 Compliance Voltage

Output compliance voltage refers to the maximum voltage the current source can provide. A current loop system consists of the current source, wiring resistance, barrier resistance (if present), and the Logix 3800zb impedance.

The Logix 3800zb requires that the current loop system allows for a 10 VDC drop across the positioner at maximum loop current. The current loop system should have a minimum compliance voltage greater than 10 VDC and a maximum less than 32 VDC. The current operating range is from 4 to 20 mA. See Figure 15: Compliance Voltage.

To determine if the loop will support the Logix 3800zb, perform the calculation in the following equation. The Available Voltage must be greater than 10VDC to support the Logix 3800zb.

Equation 1

$$\text{Available Voltage} = \text{Controller Voltage } (@\text{Current}_{max}) - \text{Current}_{max} \times (\text{R}_{\text{barrier}} + \text{R}_{\text{wire}})$$

Example:

$\text{Current}_{\text{max}} = 20\text{mA}$

$\text{R}_{\text{barrier}} = 300\Omega$

$\text{R}_{\text{wire}} = 25\Omega$

$\text{Available Voltage} = 19\text{ V} - 0.020\text{ A} \times (300\Omega + 25\Omega)$

$\text{Available Voltage} = 12.5\text{ V}$

The available voltage (12.5 V) is greater than the required voltage (10.0 V) therefore; this system will support the Logix 3800zb. The Logix 3820 has an input resistance equivalent to 500 Ω at a 20 mA input current.

⚠ CAUTION: *Always limit the current for 4-20 mA operation. Never connect a voltage source directly across the Logix 3800zb terminals. Permanent circuit board damage may occur.*

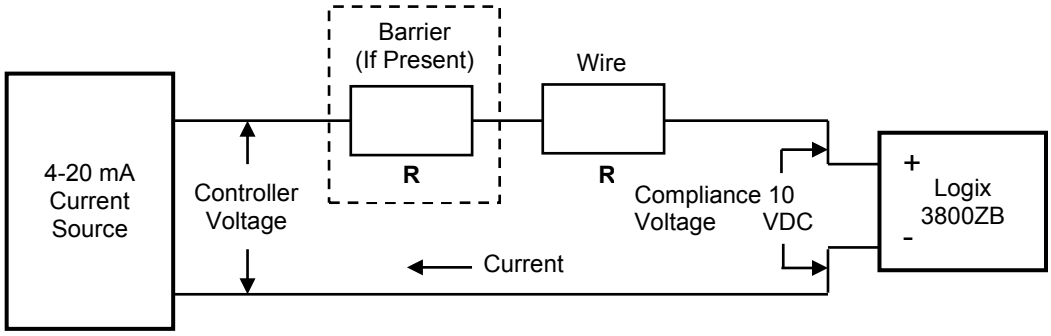

Figure 15: Compliance Voltage

6.2.2 Cable Requirements

The Logix 3800zb digital positioner utilizes the HART Communication protocol. It is superimposed on the 4-20 mA current signal. The two frequencies used by the HART protocol are 1200 Hz and 2200 Hz. Calculate cable length restrictions to prevent distortion of the HART communication signal and cable capacitance. The cable length must be limited if the capacitance is too high. Selecting a cable with lower capacitance/foot rating will allow longer cable runs. In addition to the cable capacitance, the network resistance also affects the allowable cable length.

For installation practices and allowable cable lengths refer to the latest version of the HART Field Communications Protocol Application Guide, HART HCF LIT.

NOTE: 24–16 AWG gauge wire sizes should be used for connection to the spring terminals. Wire sizes outside of this gauge range may not form a good connection or may cause damage to the terminals.

The input loop current signal to the Logix 3800zb digital positioner should be in shielded cable. By tying shields to ground at only one end of the cable removes environmental and electrical noise. Connect the shield wire to the source, not at the positioner.

6.2.3 Conduit

This product has three electrical conduit connections in thread size 1/2" NPT. Located near the conduit connection is the thread size for the conduit of the positioner. Conduit fittings must match equipment housing threads before installation. If threads do not match, obtain suitable adapters or contact a FLOWSERVE representative.

6.2.4 Grounding

The grounding terminals, located by the electrical conduit ports should be used to provide the unit with an adequate and reliable earth ground reference. Tie the outer grounding terminal to the same ground as the electrical conduit. Tie the inner grounding terminal to the cable shield.

NOTE: *For maximum conducted immunity tie both sides of the shield to a common earth reference.*

Figure 6 shows the conduit and grounding connections on the positioner.

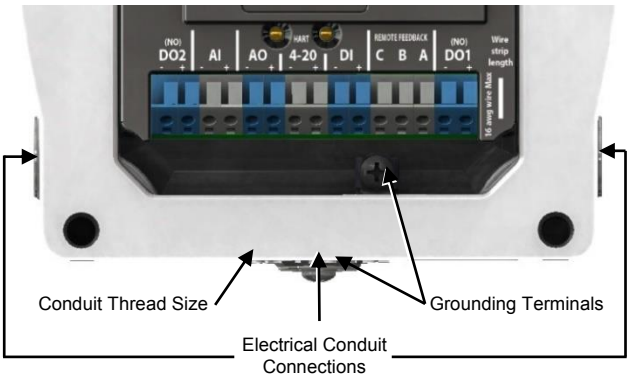

Figure 15: Conduit and Grounding (HART)

6.2.5 Electromagnetic Compatibility

The Logix 3800ZB digital positioner has been designed, per standards EN61000-4-3 Radiated Immunity and EN55011 Radiated Emissions, to operate correctly in electromagnetic (EM) fields found in typical industrial environments. The following precautions should be taken to adhere to these standards:

- Do not use the positioner in environments with excessively high EM field strengths (i.e. greater than 10 V/m)
- Do not use portable EM devices such as hand-held two-way radios within 30 cm of the device.

Ensure proper wiring and shielding techniques of the control lines, and route control lines away from electromagnetic sources that may cause unwanted electrical noise. To help eliminate noise use an electromagnetic line filter; contact a FLOWSERVE representative for line filter recommendations.

In the event of a severe electrostatic discharge near the positioner, the device should be inspected to ensure correct operability. It may be necessary to recalibrate the Logix 3820 positioner to restore operation.

6.3 Auxiliary I/O Circuits

The Logix 3820 contains the following auxiliary circuits: an Analog Output (AO), an Analog Input (AI), two Discrete Outputs (DO1 & DO2) used specifically for controlling the 4-Way valve block solenoids, a Discrete Input (DI), and the Remote Mount. Labels for each connection to each circuit are on the cover adjacent to the terminals.

6.3.1 Analog Output

The Analog Output function produces a 4-20 mA signal that corresponds to the position of the valve. Output follows actual position of the valve, including all failure modes of positioner except the loss of power. An output of < 1.0 mA is transmitted when the positioner loses power.

Calibration of the analog output signal is performed using the display menu, a HART handheld communicator, the ValveSight DTM or the LCD menu.

The AO does not interfere with positioner operation.

The AO signal corresponds with the configuration of the Signal At Closed DIP switch setting. If the valve closes with a four mA signal, the AO will show a four mA signal when closed. If the valve closes with a 20 mA signal, the AO will show a 20 mA signal when closed. This can be changed with an AO calibration.

⚠ CAUTION: *Proper ESD precautions must be observed during AO connection to a power supply or loop calibrator to avoid possible personal injury and property damage in the case of an over-voltage incident. Perform the following precautions prior to connecting the AO to power: ground the positioner, ground the power supply source and ground the technician performing the connection.*

➲ NOTE: *The AO has an internal fuse. In the event of a surge this fuse could be damaged and leave the AO nonfunctional.*

For AO function connect AO terminals in series with a 10 to 40 VDC power supply, including a method to determine the current. The AO current will follow the valve position and will have a range of 4-20mA. See Figure 17 for more info.

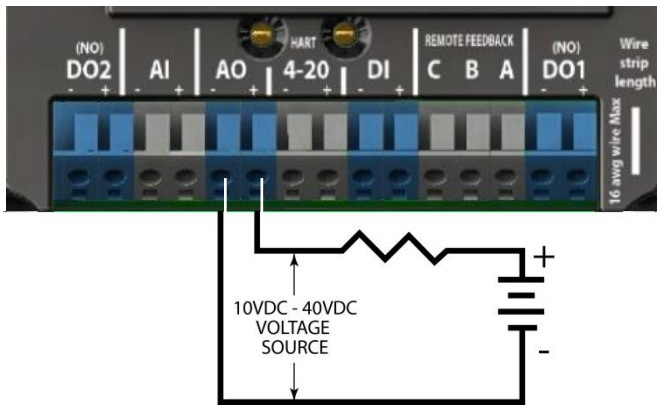

Figure 16: Analog Output Circuit

6.3.2 Auxiliary Analog Input

The AI circuit requires that the current loop system allows for a 10 VDC drop across the positioner at maximum loop current. The current operating range is from 4 to 20 mA. See Figure 8 for more details.

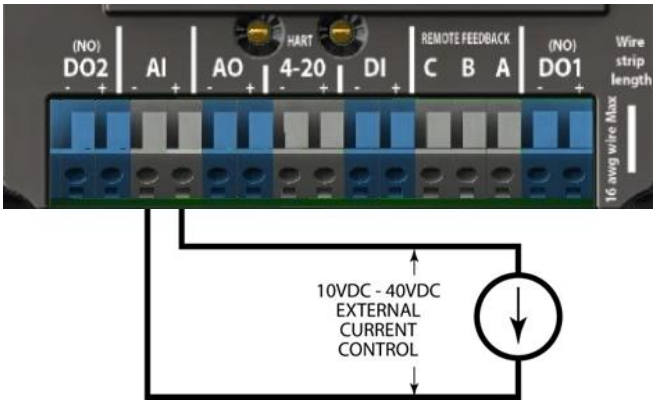

Figure 17: Auxiliary Analog Input Circuit

6.3.3 Discrete Output 1 and 2

DO1 and DO2 are both normally open outputs and are exclusively used to control a 4-Way solenoid-controlled valve block which drives the actuator. See Figure 9 for connection detail.

⚠ CAUTION: There is a maximum 24VDC at 400mA rating for the DO output circuits. Exceeding these limits will damage the outputs. 4-Way valve 24V solenoid current consumption must be less that the output rating.

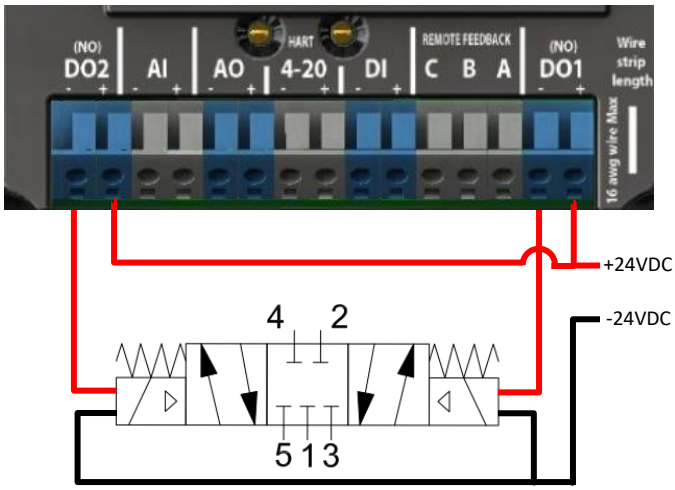

Figure 18: Discrete Output 1 and 2 Solenoid connection

6.3.4 Discrete Input

Use the Discrete Input to signal the positioner to begin a partial stroke test, or move to a predefined position as long as the signal remains.

Supply a low voltage (or no voltage) to indicate a normal state. Raise the voltage to indicate the tripped state.

The configuration of the discrete output signal is done using the display menu, a HART handheld Communicator, or the ValveSight DTM.

⚠ **CAUTION:** *During the use of the Discrete Input function, the valve may stroke unexpectedly. Follow internal procedures, ensuring that the configured movement of the valve (performing a PST or moving to a set-point) is allowed. Notify proper personnel that the valve will stroke, and make sure the valve is properly isolated if required.*

For the DI function, wire the DI terminals in series with a 3.5 to 40 VDC power supply as shown in Figure 20. Keep the voltage low under normal circumstances. Raise the voltage to create a tripped input state.

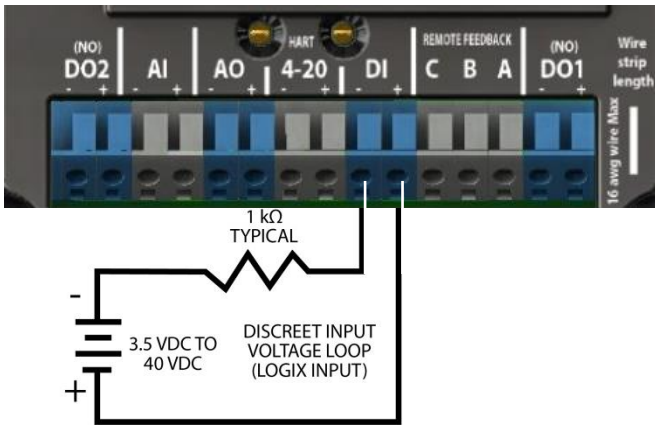

Figure 19: Discrete Input Circuit

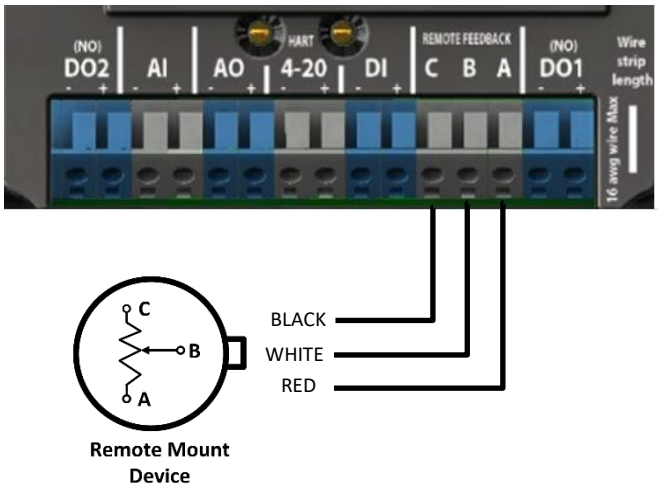

Figure 20: Remote Mount Circuit (HART)

6.3.5 Remote Mount

Use the remote mount option where excessive vibration or environmental factors prevent the placement of a positioner directly on the valve. The remote mount is an integrated part of the Logix 3800zb circuitry. Wire the remote mount with Black to terminal C, White to terminal B, and Red to terminal A. For HART units, maximum cable length should be less than 30.5m (100ft). See

Figure 20 for remote mount connections.

See section 15.5 Remote Mount Specifications for additional specifications.

6.3.6 I/O Circuit Specification Summary

See Table 1: Auxiliary Circuit Status for detail on the status and condition of each circuit.

Table 1: Auxiliary Circuit Status

Circuit	Condition	Status Indication
AO	Monitoring Position (typical 4-20mA)	Output (mA)
	Less than 10 V on AO terminals.	No Loop Power
AI	Monitoring AI Terminals (typical 4-20mA)	Input (mA)
	Less than 7 V on AI terminals.	No Loop Power
DI	Low (input < 2.5 VDC)	Off
	High (input > 8.0 VDC)	On

7 OPERATION - HOW IT WORKS

7.1 Basic Operation (HART)

The Logix 3800ZB digital positioner is a two-wire 4-20 mA input digital valve positioner which uses the HART protocol to allow two-way remote communications. The positioner is completely powered by the 4-20 mA input signal. Start-up current must be at least 3.8 mA. The positioner is configurable through the local user interface, hand-held or DTM. The Logix 3800zb positioner can control both double and single-acting pneumatic actuators with linear or rotary mountings.

The Logix 3800zb digital positioner is an electronic and pneumatic closed-loop feedback instrument. Figure 21 shows a schematic of the Logix 3800zb.

7.2 Position Definition

Inn Analog HART mode, the position at 0% is always defined as the valve in a closed position and 100% is always defined as the valve in an open position.

In HART Analog Source, the 4-20 mA signal is converted to a position (in percent). During loop calibration, the signals corresponding to 0% and 100% are defined.

7.3 Command Input and Final Command

The Command Input signal (in percent) passes through a characterization/limits modifier block. This function is done in software, which allows for in-the-field customer adjustment. The characterization block can apply no adjustment (Linear), one of several pre-defined characterization curve adjustments (including several Equal Percent), or a 21-point custom characterization curve adjustment. In Linear mode, the input signal is passed straight through to the control algorithm in a 1:1 transfer. With the pre-defined Equal Percent (=%) characterization curve, the input signal is mapped to a standard rangeability equal percent curve. If custom characterization is enabled, the input signal is mapped to a custom, user-defined 21-point output curve. The custom user-defined 21-point output curve is defined using a handheld or ValveSight software. Also, two user-defined features, soft limits and tight shutoff may affect the position. The actual command being used to position the stem after the evaluation of characterization curves and user limits is called the final command.

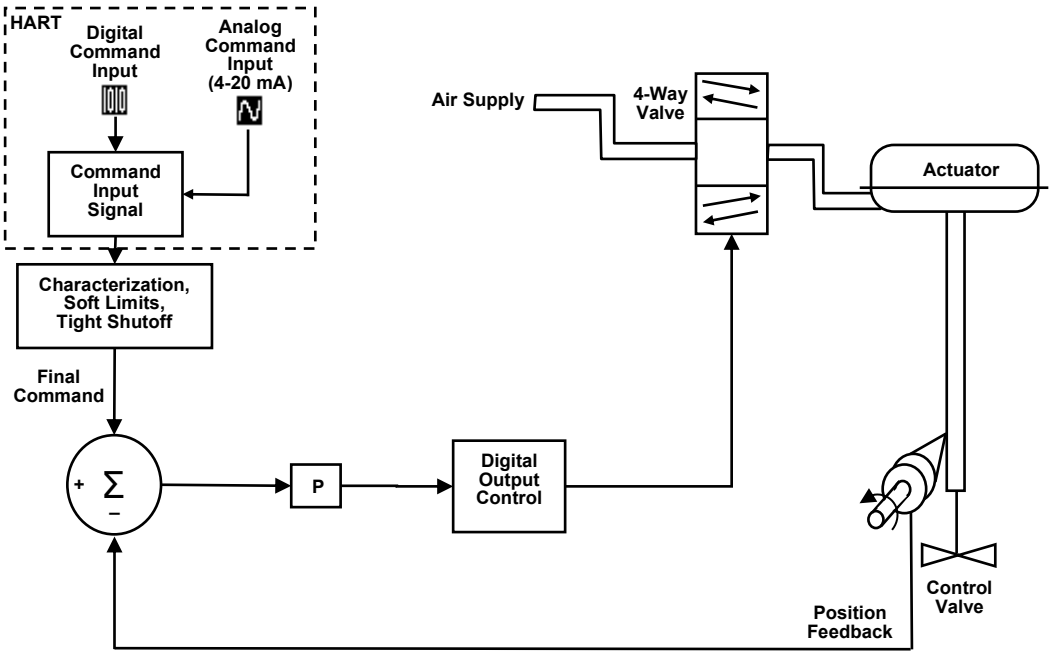

Figure 21: Principles of Operation of Logix 3800zb

7.4 Control Loop

The Logix 3800zb uses a proportional control loop, stem-positioning algorithm. A stem position sensor provides a measurement of the stem movement. The final command is compared against the stem position. If any deviation exists, the control algorithm sends a signal to the digital output control to move the 4-Way valve in a direction, depending upon the deviation. The actuator pressures change, and the stem begins to move. The stem movement reduces the deviation between final command and stem position. This process continues until the deviation goes to zero.

7.5 Detailed Sequence of Positioner Operations

A more detailed example explains the control function. Assume the unit is configured as follows:

- The unit is in Analog command source. (if using HART)
- Custom characterization is disabled (therefore characterization is Linear).
- No soft limits enabled. No final value cutoff set.
- Valve has zero deviation with a present input signal of 50%
- Loop calibration (if using HART): 4 mA = 0% command, 20 mA = 100% command.
- Write to Final_Value to change command.
- The actuator is tubed and positioner is configured air-to-open.

Given an input command of 50%, since custom characterization is disabled, the command source is passed 1:1 to the final command. Since zero deviation exists, the stem position is also at 50%. With the stem at the desired position, the 4-Way valve will be unenergized at a middle position that balances the pressures above and below the piston in the actuator. This is commonly called the null position.

Assume the input signal changes from 50% to 75%. The positioner sees this as a command source of 75%. With linear characterization, the final command becomes 75%. Deviation is the difference between final command and Stem Position: Deviation = 75% - 50% = +25%, where 50% is the present stem position. With this positive deviation, the control algorithm sends a signal to the 4-Way valve. from its present position. As the 4-Way valve opens, the supply air is applied to the bottom of the actuator, and the air is exhausted from the top of the actuator. This new pressure differential causes the stem to start moving towards the desired position of 75%. As the stem moves, the Deviation begins to decrease. This process continues until the Deviation goes to zero. At this point, the 4-Way valve will close. The desired stem position is achieved when the stem movement stops.

8 OPERATION – DIP SWITCH CONFIGURATION

The Logix 3800zb local user interface allows the user to calibrate, configure the basic operation, and tune the response of the positioner without additional tools or configurators.

Before placing the unit in service set the DIP Switches to the desired control options. The DIP Switch settings do not take effect immediately, but are activated only by performing a Stroke calibration (pressing the "QUICK-CAL" button for 3 seconds). However, the DIP switch settings may be edited from the DTM or Handheld at any time. See Figure 22: Local User Interface.

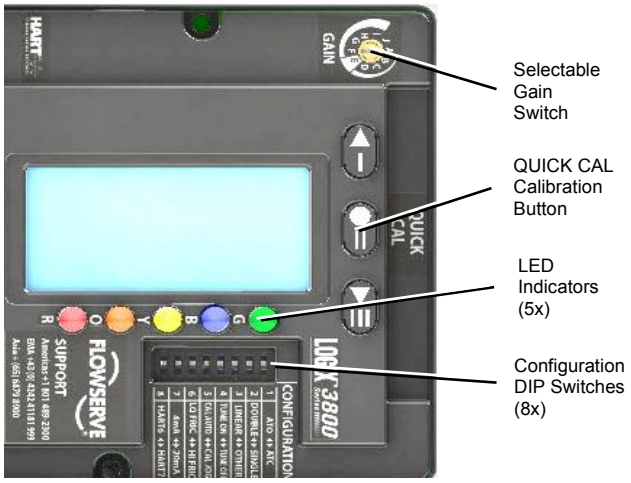

Figure 22: Local User Interface

8.1 Air Action Switch (ATO◄►ATC)

The air action switch must be set to match the configuration of the valve/actuator mechanical tubing connection. The tubing determines the air action of the system.

ATO – Increasing pressure from Port A causes the valve to open.

ATC – Increasing pressure from Port A causes the valve to close.

8.2 Actuator Switch (DOUBLE◄►SINGLE)

The actuator switch must be set to match the configuration of the actuator. The diagnostics and control depend on the accurate selection of this switch. .

Double – When there is pressure on both sides of the actuator Select Double.

Single – When there is pressure on only one side of the actuator select Single.

8.3 Characterization Switch (LINEAR◄►OTHER)

The Characterization Switch allows a better match between the input command and the actual fluid flow through the valve. The positioner makes a correction by applying an adjustment to the input command according to a characterization curve. Usually, valves that have non-linear flow characteristics require a characterization curve to be specified.

Linear – Select Linear if the actuator position should be directly proportional to the command input signal. (For most rotary valves, this setting gives an =% Cv characteristic due to their inherent =% characteristics.)

Other – To select one of the pre-set characterization curves or a custom curve choose Other. The default is the Linear Characterization. Other custom curves such as a standard 30:1 equal percent range ability curves are available in the diagnostic tools. To select one of the other curve options, use the LCD menu, a Handheld or the ValveSight DTM. To modify the Custom curve, use the DTM.

8.4 Auto-Tune Switch (TUNE ON◄►TUNE OFF)

This switch controls whether the positioner will automatically tune itself during the stroke calibration (Quick-Cal), or use preset tuning parameters. On is recommended in most cases.

On – Selecting On enables an auto tune feature that will automatically determine the positioner gain settings. Response parameters measured during the latest Quick-Cal determine the automatic tuning. The valve response is a combination of these response parameters and the current position of the Selectable GAIN Switch.

Off – Selecting Off forces the positioner to use one of the factory preset tuning sets determined by the Selectable GAIN Switch. Settings "B" through "J" are progressively higher predefined tuning sets.

Selecting "A" on the Selectable Gain Switch during a Quick-Cal allows the user to use and preserve manually adjusted gains. The calibration only sets the position limits in this case. See section 9, Operation – Calibration And Control9, for more details.

➲ **NOTE:** *The gain switch is LIVE meaning that regardless of the Auto-Tune selection, the gain settings can be adjusted at any time during operation by changing the selectable Gain switch position. See Figure 23: Selectable Gain Switch.*

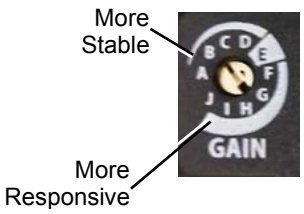

Figure 23: Selectable Gain Switch

8.5 Jog Calibration Switch (CAL AUTO◄►CAL JOG)

This switch selects between Auto and Jog calibration modes.

Auto – The Auto setting works for most valves if the fully opened position of the valve has a mechanical stop. In Auto mode during a stroke calibration (Quick-Cal), the positioner will fully close the valve and register the 0% position, then fully open the valve to register the 100% position.

Jog – Use the Jog setting if the fully opened position of the valve has no hard stop and is manually set. In Jog mode during a stroke calibration (Quick-Cal), the positioner will fully close the valve and register the 0% position, then wait for the user to move the valve to the 100% open position using the Up and Down buttons. Press the ACCEPT/QUICK-CAL button to accept the 100% location.

See section 9, Operations – Calibration and Control, for more information.

8.6 Valve Stability Switch (LO FRIC◄►HI FRIC)

Not applicable.

8.7 Signal at Closed Switch (HART) (4mA◄►20mA)

Normally this will be set to 4 mA for an Air-To-Open actuator configuration, and 20 mA for Air-To-Close.

4 mA – Selecting 4 mA will make the valve close when the signal is low (4 mA) and open when the signal is high (20 mA).

20 mA – Selecting 20 mA will make the valve close when the signal is high (20 mA) and open when the signal is low (4 mA).

➲ NOTE: *When using an Analog Output (AO) function, the AO signal corresponds with the Signal At Closed selection. If the valve closes with a 4 mA signal, the AO will show a 4 mA signal at closed. If the valve closes with a 20 mA signal, the AO will show a 20 mA signal at closed.*

8.8 HART Switch (HART) (HART 6◄►HART 7)

For HART 6 protocol, select HART6. For HART 7, select HART7.

9 OPERATION – CALIBRATION AND CONTROL

9.1 Quick-Cal Calibration

The QUICK-CAL button is used to initiate an automatic stroke calibration. This stroke calibration determines the closed (0%) and open (100%) positions of the valve and gathers information about the response of the valve to determine the gains. The gains are automatically set. After a stroke calibration, the positioner is ready to control.

To perform a QUICK-CAL, press and hold the QUICK-CAL button for approximately 3 seconds.

While the automatic calibration is in progress, the LED lights will flash Y-R-Y-G (yellow-red-yellow-green) status codes indicating the calibration progress.

➲ NOTE: *This first time the QUICK-CAL is performed, the positioner will also complete a Full Calibration. This will extend the time required for the calibration. This happens with Standard and Pro diagnostic levels.*

9.2 Jog Calibration

If the valve/actuator assembly has **no** internal mechanical stop at the fully open position, set the Jog Calibration Switch (DIP 5) to Cal Jog. In this case, press and hold the QUICK-CAL button for approximately 3 seconds.

This process initiates the jog stroke calibration. The positioner will then close the valve and set the zero position. The zero position is automatically always set at the valve seat. At this point, the LED‘s will flash in a sequence of Y-R-Y-G (yellow-red-yellow-green) which indicates that the user must use the jog keys to position the valve to approximately 100% manually.

Use the button and button to position the valve at approximately 100% open.

Press the ACCEPT/QUICK-CAL button to proceed.

Once complete, there are no more required user actions during calibration. The calibration is complete when the lights return to a sequence that starts with a green light.

The jog calibration process will only allow the user to set the span. If an elevated zero is needed, a handheld or ValveSight DTM are required.

9.3 Additional Hot Key Calibrations

Hot keys can be used to initiate other function and component calibrations, such as a command input calibration, an analog input calibration, an analog output calibration and a feedback calibration. Refer to APPENDIX F – HOT KEYS for information about initiating these calibrations.

9.4 Tuning Options

Use the Selectable GAIN Switch to adjust the gain at any time during operation. This adjustment takes effect immediately. For faster response select settings above “E” (F-J). For a more stable response, select settings below “E” (B-D). See Figure 23: Selectable Gain Switch.

Quick-Cal Custom Gains **–** This is typically the fastest way to achieve ideal gains. Set the Auto-Tune Configuration Switch to “On” and the Selectable GAIN Switch to “E.” Then perform a Quick-Cal. During the Quick-Cal, custom tuning parameters will be determined based on measured response parameters. Fine tune the gains by adjusting the Selectable GAIN Switch. Selecting “D” “C” or “B” will progressively provide a more stable response. Selecting “F” through “J” will progressively provide a more active response. In most cases selecting “E” will give the best results and is the default setting for all actuator sizes. Raising or lowering the Selectable Gain Switch setting is a function of the positioner/valve response to the control signal, and is not actuator size dependent.

Standard Preset Gains – If standard, preset gains are desired, set the Auto-Tune Configuration Switch to Off. After performing a Quick-Cal, use the Selectable GAIN switch to the desired level (“B” – “J”). The standard, preset gain settings are not affected by Quick-Cal.

It may be necessary to set the gain switch BEFORE the Quick Cal. Very fast stroking valves may need to be at lower gains and very slow stroking valves may need to be at higher gains.

Custom Manual Gains – To set gains manually, set the selectable GAIN switch to “A.” Changing the switch from “B” to “A” will write the standard “B” settings into the “A” parameters, allowing a starting point for modification. Similarly, changing the switch from “J” to “A” will write the standard “J” settings into the “A” parameters. Custom tuning values can then be entered using the Display Menu, a Handheld or ValveSight DTM. With the Selectable GAIN Switch set to “A,” the tuning will not be modified during a Quick-Cal.

9.5 Factory Reset

To perform a factory reset, hold the QUICK-CAL button while applying power. Factory reset causes a reset of all the internal variables to factory defaults, including calibration. The positioner must be re-calibrated after a factory reset. Restore tag names and other user configured limits, alarm settings, and valve information.

NOTE: *For HART position, a factory reset will always reset the command source to analog 4-20 mA.*

CAUTION: *Performing a factory reset may result in the inability to operate the valve until properly reconfigured. Notify proper personnel that the valve may stroke, and make sure the valve is properly isolated.*

10 OPERATION – USER INTERFACE

10.1 LCD

The optional LCD provides a variety of useful information and functions. The Main View shows important information using icons and scrolling status lines. See Figure 25 for more detail.

Use the directional buttons to navigate from the Main View to the LCD menu. This menu provides detailed information and allows the user to perform common functions.

NOTE: *The LCD backlight may change brightness during use and is normal. The backlight uses any residual power not used by other functions of the circuitry. When current supply is low (4mA) the screen will appear darker. When current supply is high (20mA) the screen will appear brighter. Also note, the LCD may not be readable at temperatures below -20°C (-4°F) and temperatures above 70°C (158°F).*

The main view provides an instant display of important status parameters: Position, Final Command, Scrolling Status Message, Current Alarm Status and Status Icons.

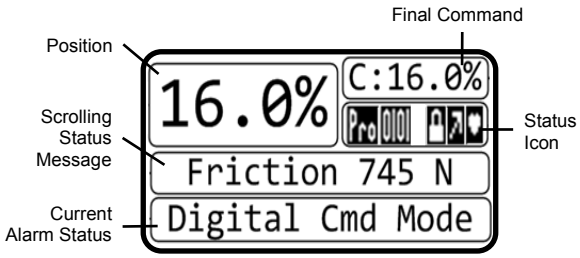

Figure 24: Display Main View

10.1.1 Position and Final Command

Shown always are the current Position and Final Command. The Final Command is the command adjusted according to a Characterization Curve, Tight Shut Off, or Soft Limits that have been applied. Final Command should match the Position.

10.1.2 Scrolling Status Messages

The Scrolling Status Message provides the following information as applicable:

Date and Time – The date and time format is adjustable.

Ambient Temperature – This is the temperature inside the positioner.

DIP Switch Override – This indicates that the Configuration (DIP) Switches do not reflect the actual configuration of the positioner. Changing a Configuration Switch after a Quick-Cal, or if the configuration is hanged from the DTM will cause a Dip Switch Override. Performing a Quick-Cal will reset the configuration to what the Configuration Switches show, which may not be desirable in this case. Ensure the Configuration Switches are set properly before performing a Quick-Cal.

NOTE: *The Scrolling Status Message function is disabled by default. Activate Scrolling Status Messages through the display menu.*

10.1.3 Current Alarm Status

The Current Alarm Status area shows the highest priority alarm, warning, alert or status indication. This matches the code indicated by the flashing LEDs.

10.1.4 Status Icons

Status icons continuously show the state of the features and modes. See Table 2: Status Icons for more details.

Standard diagnostics are position-based diagnostics.

Command Source Icons – The positioner is in Analog Command mode if it is using the 4-20 mA signal to control the location of the valve. In Digital Command mode, a HART positioner ignores the 4-20 command and responds to the position command given through HART. In Out Of Service mode, the positioner is performing a calibration, signature, partial stroke test, is in a factory reset state, or another off-line mode.

Communications Icons – When the positioner is sending or receiving data via the HART communication protocol, the heart icon will be displayed. During burst mode, a pulsating heart icon will be displayed.

Table 2: Status Icons

Icon Location	Icon	Icon Meaning
Level		Standard
Command Source		Analog command mode
		Digital command mode
		Out of service
Communications		HART communication currently in progress
		HART Burst mode in progress

10.2 LCD Menu Features

To enter the menu briefly press or button. A menu tree can be found in Appendix A – Lcd Menu Tree Overview. Menu features are fully described in Appendix B – Lcd Menu Tree Descriptions.

10.3 LEDs and Status Codes

LEDs give two types of status codes. The first type is a single color NAMUR status. The second type is a 4-blink status that correlates to a specific positioner error or condition. Regardless of the type of code (1 blink or 4), the LEDs always indicate a code corresponding to the highest priority alarm, warning, alert or status that is currently active.

10.3.1 Single Blink NAMUR Color Codes

If buttons on the positioner have not been pressed recently, the positioner will blink one color. This color represents one of the 5 conditions outlined in the NAMUR standard, NE-107. These are listed in Table 3: NE 107 Status Code. How these colors are assigned to specific conditions can be customized in the DTM.

Table 3: NE 107 Status Code

Single Blink Color	NE 107 Indication
G	Diagnostics active – No issues
B	Maintenance
Y	Out of specification
O	Check function
R	Failure

10.3.2 4-Blink Status Codes

When a button is pressed on the positioner, the color code will expand to a 4-color sequence. This corresponds to one of the specific status indications listed in Appendix D – 4-Blink Status Codes. When multiple codes are active, only the highest priority condition is represented by the blink code. To see all of the active alarms and status conditions, use a DD or DTM.

10.4 Tamper Lock

In order to prevent unintentional adjustments of the configuration, tuning, or control of the valve, the Tamper Lock feature may be used. This is set in the DTM and disables the buttons and menus except for the ability to view the status of the positioner. When locked, the positioner may be temporarily unlocked by entering a PIN. The PIN may be entered using LCD. The tamper lock feature can also be disabled in the DTM.

10.5 Write Protect (HART)

Similar to the tamper lock feature, write protect prevents unauthorized changes from across the network. Write protect restricts configuration changes and activation of diagnostics and calibrations. Write protect can be enabled and disabled by holding the hot key sequence and for 9 seconds. The blue LED will light, indicating write protect has been enabled or disabled. The LED lights will flash status code Y-G-B-B when write protect is enabled and status code R-O-Y-B when it is disabled.

NOTE: *The write protect function is supported by firmware code version 1.07 and later.*

10.6 Batch Schedule Task (BST)

The Batch Schedule Task (BST) function is a Pro positioner model function designed to allow a user to schedule the performance of a sequence of diagnostic tasks. The BST is valuable for tracking changes in system operation over time, which can be useful in identifying a developing or existing problem. The BST is managed through the DTM and allows the following diagnostic tasks to be scheduled in a batch task sequence:

- Signature Ramp
- Signature Step
- Partial Stroke Test
- PST History
- Sensor Calibration
- Event History
- Event Capture
- Trends
- NAMUR NE 107
- Information Annunciator
- Calibration Errors
- Tech Annunciator

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10.7 Hot Keys

Hot keys are button combinations used to quickly access different features. They are available to press when the LCD screen is showing the Main view. See Table 4: Hot Keys. or for more detailed instruction, see Appendix F – Hot Keys.

Table 4: Hot Keys

	I	II	III	From Dashboard
Brief Button Press				Navigate Menu
				Continue in Menu
				Navigate Menu
				Abort Calibration
3 Sec Press				Quick-Cal*
				Command Reset (HART)
				PST
				View Code Version
				Adjust LCD Screen Contrast
				Local Valve Control
				I/O Calibrations (HART)
6 Sec Press				
				Control with Remote Mount
				Low Level Calibration Functions
9 Sec Press				Enable and Disable Write Protect (HART)
Seq. Press				Clear PST fail error message (Hold III for 3 Sec, then briefly press II)

*A full calibration (Quick-Cal with other diagnostic evaluations) will run the first time, if a full calibration has not been completed.

10.8 Viewing Version Numbers (No LCD)

The firmware version numbers may be checked at any time except during a calibration. To see the version number, hold the and the buttons for 3 seconds. Then briefly press the button too see the major version and the button for minor version number. The codes are in a 3-blink sequence. The sequence corresponds to a number as shown in Table 5: Version Number Codes.

To exit the version viewing mode, briefly press the button. This will not alter the operation of the positioner.

Table 5: Version Number Codes

1st Blink Color	2nd Blink Color	3rd Blink Color	Version Number
G	G	G	0
G	G	B	1
G	G	Y	2
G	G	O	3
G	G	R	4
G	B	G	5
G	B	B	6
G	B	Y	7
G	B	O	8
G	B	R	9
G	Y	G	10
G	Y	B	11
G	Y	Y	12
G	Y	O	13
G	Y	R	14
G	O	G	15
G	O	B	16
G	O	Y	17
G	O	O	18
G	O	R	19
G	R	G	20
G	R	B	21
G	R	Y	22
G	R	O	23
G	R	R	24
B	G	G	25

11 OPERATION – DIAGNOSTIC LEVELS

The Logix 3800zb digital positioners offers standard diagnostics, “Standard”.

- “**Standard**” diagnostics provide complete safety and position-related diagnostics and data.

For more detail, see Table 6: Logix 3800zb Features.

Table 6: Logix 3800zb Features

Features	Standard
Quick Calibration Button	X
5-LED Indicator	X
8-DIP Configuration	X
10-Position Gain Adjustment Switch	X
Remote Mount Option	X
Teminal Voltage < 10.0 V	X
Alarms Stamped with Time and Date	X
Off-Line Diagnostics *(Ramp Test, Step Test, HDRL, Partial Stroke Test)*	X*
On-Line Data Monitor *(Monitor and Save Sensor Data)*	X*
Analog Output (HART)	X

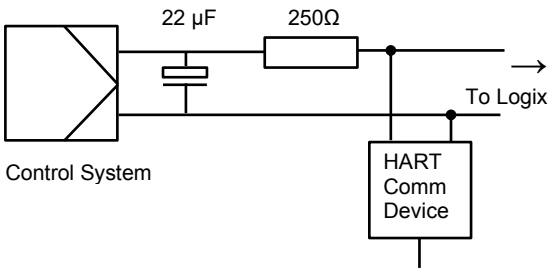
*Excludes pressure and force data.

12 MAINTENANCE – TROUBLESHOOTING

Below are some common solutions related to commissioning.
For additional help with errors, refer to Appendix D – 4-Blink Status Codes.

12.1 Troubleshooting Guide (HART)

Table 7: Troubleshooting Guide (HART)

Failure	Probable Cause	Corrective Action
No LED is blinking.	1. Current source too low. 2. The current source voltage is too low.	1. Verify current source supplies at least 3.8 mA. 2. Verify voltage source supplies at least 10VDC at terminals of device.
Erratic communications.	1. Current source bandwidth is not limited to 25Hz. 2. Maximum cable length or cable impedance exceeded. 3. HART modem not receiving enough power. 4. Interference with I.S. barrier. 5. The current source is stripping (filtering) HART signal.	1. Maximum allowable current source rate of change is 924 mA per second. 2. Check cable size, length and capacitance. 3. Verify laptop battery is not low. 4. Must use HART compatible I.S. barrier. 5. Use a 250Ω resistor and a 22 µF capacitor to create a HART filter according to the following schematic. 
The unit does not respond to analog commands.	1. The positioner is in digital command mode. 2. An error occurred during calibration.	1. Switch to analog command mode using the one of the following procedures. a. Valve Sight DTM b. Handheld communicator c. Hot key – Hold ◄► for 3 seconds 2. Check Status Codes. Correct calibration error. Recalibrate.
Valve position reading is not accurate.	1. Stroke not calibrated. 2. Analog input not calibrated. 3. Tight shutoff is active. 4. Custom characterization or soft stops are active.	1. Perform a Stroke calibration (Quick-Cal). 2. Perform an Analog input calibration. 2. Verify Tight Shutoff settings. 3. Verify custom characterization or soft-stop limits.
The position is driven fully open or closed and will not respond to the command.	1. Bad stroke calibration. 2. The relay sensor or magnet is not connected. 3. Selected the wrong air action in the software. 4. Actuator tubing is backward.	1. Perform stroke calibration (Quick-Cal) 2. Verify hardware connections. 3. Check ATO (Air-to-open) and ATC (Air-to-Close) settings. Recalibrate using Quick-Cal to apply settings. 4. Verify ATO/ATC actuator tubing.

Sticking or hunting operation of the positioner	1. Contamination of the 4-Way control valve. 2. Control tuning parameters not correct. 3. Packing friction is high. 4. Improper sizing of Valve/Actuator for process conditions.	1. Check air supply for proper filtering and meeting ISA specifications ISA-7.0.01. 2. Lower proportional gain settings. Use the Gain switch. 3. Verify the Valve and Actuator are sized properly for operating conditions.
LCD backlight is flickering or dim.	1. The backlight uses any residual power not used by other functions of the circuitry.	1. Fluctuations in the LCD backlight are normal. No action required.

13 MAINTENCANCE - REPAIR

13.1 Training and Precautions

The replacement of the kits listed in section 15, Positioner Specifications, must be by a technician trained in positioner function and handling of static sensitive devices. Remove from hazardous area prior to working through any maintenance procedures.

⚠ **CAUTION:** *Use eye protection when servicing.*

⚠ **CAUTION:** *Depressurize the positioner before servicing.*

⚠ **CAUTION:** *When touching the circuit boards, observe precautions for handling electrostatically sensitive devices.*

13.2 Cleaning

With the cover in place and with cover bolts torqued to spec, the positioner may be cleaned by spraying with water. The positioner may be wiped with a soft cloth. Do not use abrasive materials, detergents, or chemicals.

13.3 Scheduled Maintenance

The supply gas filter(s) should be scheduled for regular maintenance as required to maintain supply gas quality. Any contamination found in the filter, requires visual inspection inside of the positioner for contamination. Any contamination found in the positioner, requires replacement of the positioner.

13.4 Required Tools and Equipment

The Logix 3800zb digital positioner has modular components that can be replaced using the tools shown in Figure 25.

Philips Screwdriver #2 _____

6.0 mm Hex Key _____

5.0 mm Hex Key _____

Figure 25: Tools List

13.5 Torque Specification for Screws

Table 8: Torque Specification shows the Logix 3800zb torque specifications. Torque all screws to the proper specification to avoid damaging components or loosening of the screws during use.

Table 8: Torque Specification

Screw or Bolt	Type	Torque
Outer Cover (6 Bolts)	6 mm Hex	5.6 N-m (50 in-lb)
End Cover (4 Bolts)	5 mm Hex	2.8 N-m (25 in-lb)
Inner Cover (2 Screws)	Philips	0.9 N-m (8 in-lb)
Electronic Assembly (5 Screws)	Philips	0.9 N-m (8 in-lb)
Feedback Shaft Cover (3 screws)	Phillips	0.9 N-m (8 in-lb)

13.6 Replacing the Electronics

Refer to Figure 26: Piezo Installation and Figure 27: Replacing the Electronics.

Removal:

1 Make sure the valve is bypassed or in a safe condition.
2 Disconnect power to the positioner.
3 Remove the inner cover by removing the two PCB cover retaining screws.
4 Unscrew the five electronics module retaining screws.
5 Gently remove the electronics by holding the terminal block and lifting the electronics from the housing.

Installation:

1 Verify that the 4 pressure sensor O-rings are in the electronics assembly.
2 Verify that the piezo O-rings are placed in the Housing.
3 Verify that the piezo is plugged into the bottom of the electronics assembly.
4 Place the electronics assembly into the housing, aligning the pressure sensor O-rings with the four holes in the housing.
5 Tighten the 5 electronics assembly screws down, in a star-shaped pattern, to verify even pressure.
6 Torque screws to 0.9 N-m (8 in-lb).
7 Place inner cover over electronics assembly and tighten screws in a back and forth pattern to verify even pressure.
8 Torque screws to 0.9 N-m (8 in-lb).
9 Reconnect the valve, mounting, and power as directed by this manual.
10 Recalibrate as directed by this manual.

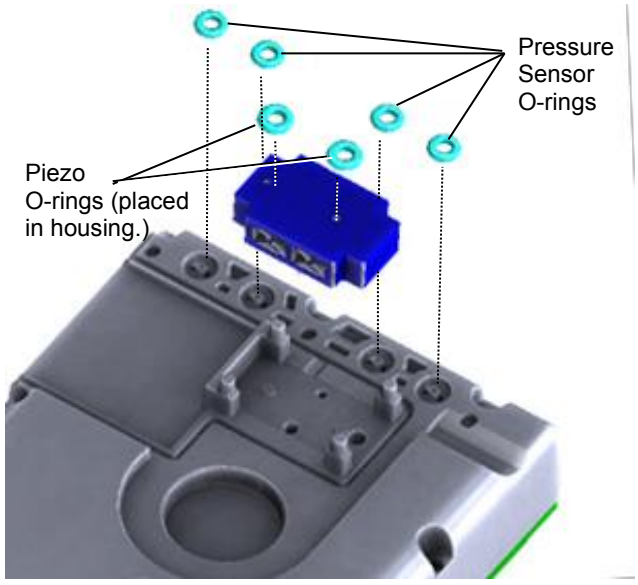


Figure 26: Piezo Installation

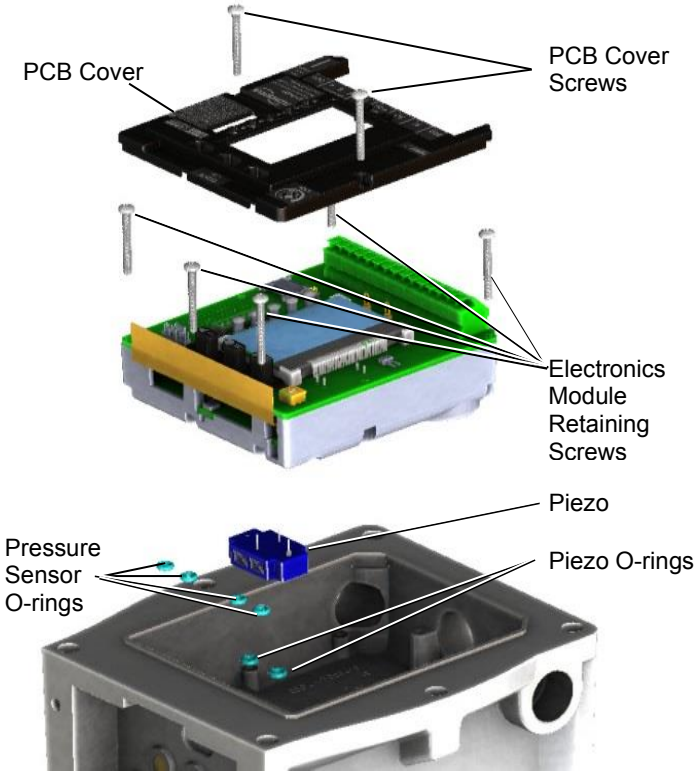


Figure 27: Replacing the Electronics

13.7

13.8 Replacing the Shaft Assembly

Refer to Figure 28: Replacing the Shaft Assembly

Removal:

1. Make sure the valve is bypassed or in a safe condition.
2. Disconnect power and conduit to the positioner.
3. Unmount the positioner from actuator and disengage the shaft assembly from the follower arm assembly.
4. Place the positioner facedown so that the shaft is pointing up and use a Phillips Screwdriver #2 to remove the three feedback screws.
5. Discard the shaft assembly and screws.

Installation:

1. Apply 3M Scotch-Weld Threadlocker TL22 or Loctite 243 to the three holes on the back of the positioner housing.
2. Insert and align the new shaft assembly with the back of the housing.
3. Using a Phillips Screwdriver #2, torque the three screws to 0.9 N-m (8 in-lb).
4. Adjust the positioner to the correct mounting orientation. Connect the shaft assembly to the follower arm assembly within the working range of the shaft assembly. Finish mounting the positioner.
5. Reconnect power as directed by this manual.
6. Perform a Stroke Calibration as directed by this manual.

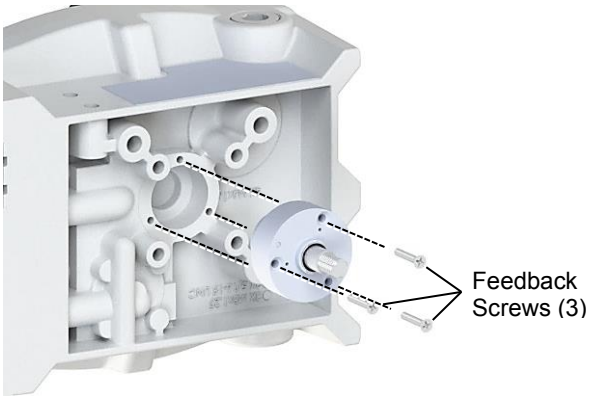


Figure 28: Replacing the Shaft Assembly

13.9 Ordering Spare Parts

For spare part kits and part numbers, see Appendix G - How To Order.

13.10 Disposal

Although the Logix 3800zb is not within the scope of the Waste Electronics and Electrical Equipment (WEEE) Directive 2012/19/EU, disposal of this product should be handled by a specialized recycling facility; not by municipal waste collection services. Proper disposal is essential to the protection of the environment and community. If proper disposal is not possible, the positioner may be returned to Flowserve for disposal. Call your local sales representative for more information regarding Flowserve's disposal process and associated fee.

14 MAINTENANCE - HELP FROM FLOWSERVE

14.1 Phone Support

Over-the-phone troubleshooting is available for positioner issues. Should your positioner be experiencing problems, or if you have questions that are not answered by this manual, feel free to call your local sales representative or a Quick Response Center (QRC).

Contact your nearest FLOWSERVE sales representative.
Europe +43 (0) 4242 41181 999
North America +1 801 489-2300
Asia + (65) 6879 8900
digitalproductstac@flowserve.com

See the back cover of this manual for additional contact details.

14.2 Returning the Logix 3800zb Positioner for Service

Returning the unit is an option if troubleshooting is unable to solve the problem. Please follow the steps below.

1. Request a Return Goods Authorization (RGA) form. The form should arrive in an email.
2. Remove all fittings, brackets, filters, feedback arms, etc. from the unit before packaging.
3. When operating the unit with a gas other than clean air requires the related MSDS with the unit.
4. Complete the RGA form. Write any particular issues with the positioner you would like us to evaluate. Please include the customer name and contact information.
5. When packaging, please secure the unit in a method that will ensure it will reach our facility undamaged (the weight of positioners will often settle through packing peanuts and pop large air pockets).
6. Please insert a copy of the completed RGA form inside the package and write the RGA number on the outside of the package. Send the unit to the address at the bottom of the form.

If the cause of the unit failure is found to be a manufacturing defect and the unit is within the warranty period it will be repaired free of charge. There is a fee for the evaluation in the event there is no problem found with the unit, and the unit is still under warranty. A fee will be charged for the evaluation if the warranty does not cover the cause of the unit failure. A quote will be provided showing the cost of the repair. Waiving of the fee requires the customer to purchase a new positioner.

15 POSITIONER SPECIFICATIONS

15.1 Input Signal

Table 9: Input Signal (HART)

Power Supply	Two-wire, 4-20 mA 10.0 VDC plus line losses
Input Signal Range	4 - 20 mA
Compliance Voltage	10 to 32 VDC @ 20 mA
Effective Resistance	500 Ω @ 20 mA Typical
Minimum Required Operating Current	4.0 mA
Maximum Shutdown Current	3.6 mA
Power Interruption Time Limit	After applying power for at least 1 minute, a 40 ms power interruption will not cause the positioner to reset.
Power-up time	Time from the application of power to begin controlling valve < 1.0 second.
Communications	HART protocol (Logix 382X- only)
Wire	Spring Terminal 24-16 AWG
Cable	Refer to the HART Field Communications Protocol Application Guide, HART HCF LIT

15.2 Pneumatic Supply

Table 10: Air Supply

Acceptable Supply Gasses	Air, sweet natural gas, nitrogen, and CO2 are acceptable supply gasses. Sour natural gas is not acceptable. For Type nA and Type tb installation, only connect air or inert gas to the air supply inlet.

15.3 Analog Output (HART)

Table 11: 4 to 20 mA Analog Output Specification

Power Supply Range	10.0 to 40 VDC, (24 VDC Typical)
Current Signal Output	4 to 20 mA
Linearity	1.25% F.S.
Repeatability	0.25% F.S.
Hysteresis	1.0% F.S.
Operating Temperature	-55 to 85°C (-67 to 185°F)

15.4 Stroke Output

Table 12: Stroke Output

Feedback shaft Rotation	Min 15°, Max 110° (with spring bias) Max 180° (without spring bias) 60° recommended for linear applications.

15.5 Remote Mount Specifications

Table 13: Remote Mount Module Specifications

Remote Mount Device	Use only with Logix™ Remote-Mount Option device.
Max Cable and Tube Distance	30.5 m (100 ft) for ½" dia. tubing 9.1 m (30 ft) for ¼" dia. tubing
Operating Temperature	-55 to 124°C (-67 to 255°F)

➲ **NOTE:** *When using tubing near maximum lengths the positioner performance may be degraded.*

15.6 Positioner Performance Characteristics

Table 14: Performance Characteristics

Better than or equal to the following values on a 25 square inch Mark I actuator.	
Resolution	≤ 0.25%
Linearity	+/-0.8%
Repeatability	≤ 0. 05%
Hysteresis	≤ 1.0%
Deadband	≤ 0. 1%
Sensitivity	≤ 0.25%
Stability	≤ 0.4%
Long term drift	≤ 0.5%
Supply Pressure Effect	≤ 0.2% per 10 psi (0.69 bar)

➲ **NOTE:** *Performance tested according to ISA 75.13.*

15.7 Temperature

Table 15: Temperature

Operating Temperature Range	-55 to 85°C (-67 to 185°F)
Transport and Storage Range	-55 to 85°C (-67 to 185°F)

➲ **NOTE:** *Reduced performance possible at low and high temperatures. LCD may not be readable at temperatures below -20°C (-4°F) and temperatures above 70°C (158°F).*

15.8 Physical Specifications

Table 16: Physical Specifications

Housing Material	Cast, powder-painted Copper-free aluminum (EN AC-43400/EN AC-AlSi10Mg(Fe)) Cast, stainless steel (A-743-CN7M (ALLOY 20))
Soft Goods	Fluorosilicone / Fluorocarbon / Buna-N
Weight of Base Positioner Without Accessories	4 kg (8.8 lbs.) – Aluminum 8 kg (17.6 lbs.) – Stainless Steel (Alloy 20)

15.9 ValveSight DTM Software Specifications

Table 17: ValveSight DTM Software Specifications

Computer	Minimum Pentium processor running Windows 2000, XP, Server 2003, Server 2003 R2, Server 2008 (32-bit & 64-bit Versions), Server 2008 R2 (32-bit & 64-bit Versions), and 7 (32-bit & 64-bit Versions). Memory: >64MB Available HARD Disk Space : >64MB
Ports	One minimum available with eight maximum possible. (Can also communicate via serial, and USB connections)
HART Filter	Often required in conjunction with some DCS hardware.

15.10 Positioner Dimensions - Explosion Proof Housing

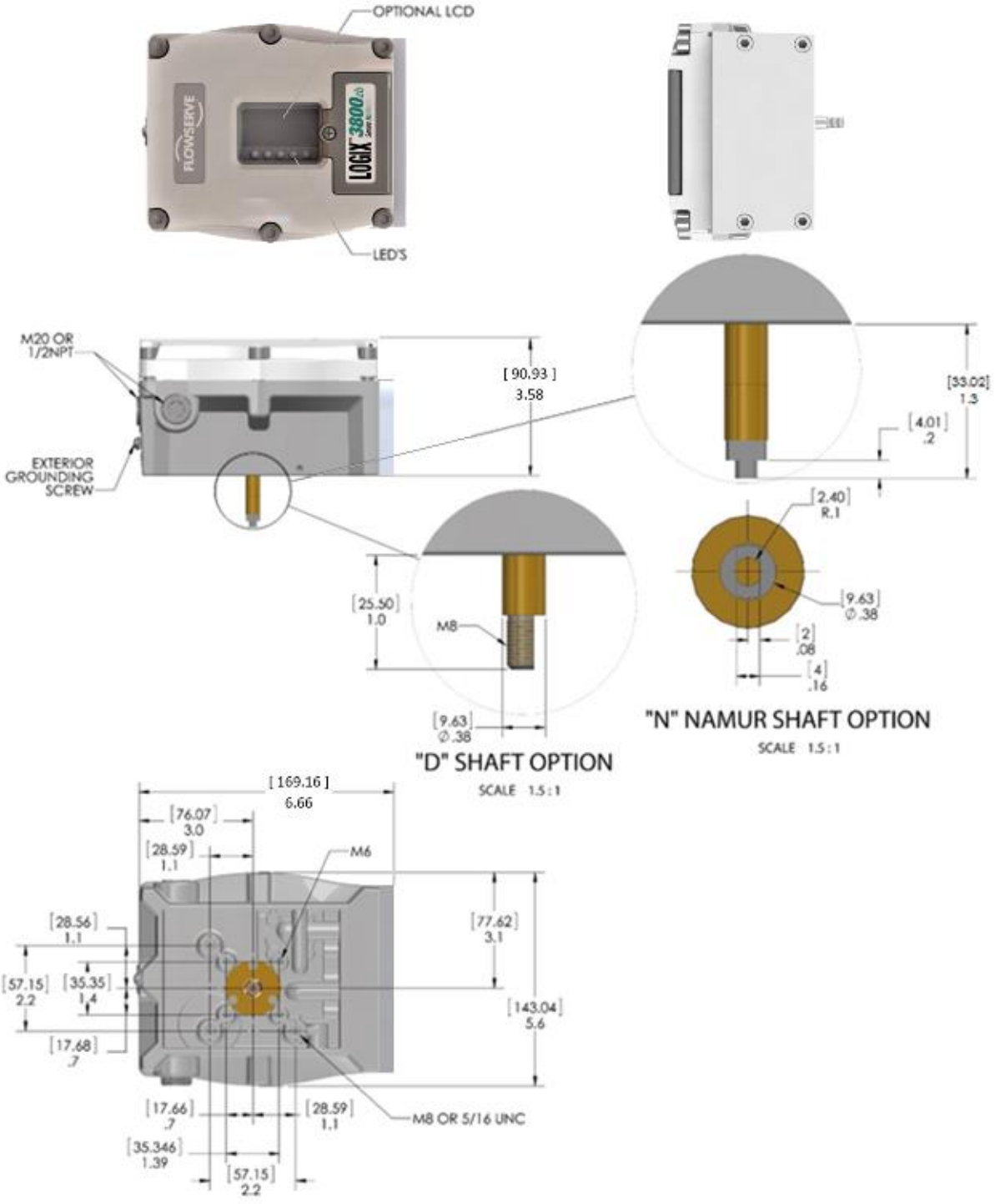


Figure 29: Positioner Physical Dimensions

16 Custom Installation hardware requirements

16.1.1 4-Way Valve

The 4-Way valve must be Explosion Proof certified for Class I Div. 1 installations and meet the following electrical parameters:

1. Operating voltage 24VDC ± 10%
2. Inrush current less than 400mA
3. Holding current less than 400mA

16.1.1 Remote mount feedback

The remote mount feedback must be potentiometer based and Explosion Proof certified for Class I Div. I installations. The potentiometer resistance must be between 5K to 50K ohms. (5000 to 50,000 ohms)

17 Hazardous Location Specifications

17.1 Hazardous Location Information

Table 18: Logix 3800zb Ex Hazardous Location Information

	Certification Code	Area	Protection Method	Markings	Temperature Code	Enclosure Ratings
FM C US APPROVED	**45**	US / CANADA	US Explosion Proof	XP - Class I, Div 1, Groups A,B,C,D, T6…T4	T4 = -50C to +85C T5 = -50C to +55C T6 = -50C to +45C	**Type 4X, IP66**
			Canada Explosion Proof	XP - Class I, Div 1, Groups B,C,D, T6…T4		
			Dust	Class II, III, Div 1, Groups E,F,G T6…T4		

17.2 Warnings and Special Conditions for Safe Use

Warning!

- DO NOT OPEN, MAINTAIN OR SERVICE IN AN AREA WHERE AN EXPLOSIVE ATMOSPHERE MAY BE PRESENT

Special Conditions for Safe Use:

- Use appropriately rated cable insulation at higher temperatures.
- Contact Flowserve for Flame Path information.
- The Model 38X0 and 38X1 Positioner enclosures contain aluminum and are considered to present a potential risk of ignition by impact or friction. Care must be taken into account during installation and use to prevent impact or friction. Clean only with damp cloth.
- Provisions shall be made externally to provide transient overvoltage protection to a level not to exceed 140% of the peak rated input voltage.
- Using the box provided on the nameplate, the User shall permanently mark the type of protection chosen for the specific installation. Once the type of protection has been marked it shall not be changed.
- Potential electrostatic charging hazard. Clean only with a damp cloth.
- Discontinue use of equipment if the fasteners securing the enclosure cover or the cover window are damaged. Contact Flowserve for repair.
- Cable, cable guard, or conductors in conduit should have insulation rated for at least 18K above the maximum expected ambient temperature of the environment or installation.

AVERTISSEMENT:

- La substitution de composants peut compromettre la sécurité intrinsèque.
- NE PAS OVRIR, MAINTENIR OU SERVIR DANS UNE ZONE OU UNE ATMOSPHÈRE EXPLOSIVE PEUT ÈTRE PRÈSENTE

Assessed to the following US standards:
FM Class 3600:2011, FM Class 3610:2015, FM Class 3611:2016, FM Class 3615:2006, FM Class 3616:2011, FM Class 3810:2005, ANSI/ISA-12.12.01-2016, ANSI/ISA 60079-0:2013, ANSI/UL 60079-1:2015, ANSI/ISA 60079-11:2014, ANSI/ISA 60079-15:2012, ANSI/ISA-60079-31: 2015, ANSI/ISA 61010-1:2004, ANSI/UL 50E:2015, ANSI/IEC 60529:2014

Assessed to the following CSA standards:
CSA C22.2 NO. 0.4-04:2017, CSA C22.2 NO. 0.5-16:2016,
CSA C22.2 No. 25-1966:1966 (Reaffirmed 2014), CSA C22.2 No.30-M1986:1986 (Reaffirmed 2016), CSA C22.2 No.94.2:2015, CSA C22.2 No. 213-16:2016, CSA C22.2 No. 1010.1:2004, CAN/CSA C22.2 No. 60079-0:2015, CAN/CSA C22.2 No. 60079-1:2016,
CAN/CSAC22.2 No. 60079-11:2014, CAN/CSAC22.2 No. 60079-15:2016,
CAN/CSA-C22.2 No. 60079-31:2015, CSA C22.2. 60529:2005 (Reaffirmed 2015)

Assessed to the following EMC standards (EMC Directive 2014/30/EU/EC):

EN 61000-3-2	IEC 61000-4-3	IEC 61000-4-6
EN 61000-3-3	IEC 61000-4-4	IEC 61000-4-8
IEC 61000-4-2	IEC 61000-4-5	IEC 61000-4-11

EN 61326-1:2006 – for use in industrial environments EN 61326-1:2013
EN 55011 Class A Group 1
Namur NE 21 Version: 22.08.2007

17.3 Maintenance

Follow routine maintenance. See section 12, Maintenance – Troubleshooting.

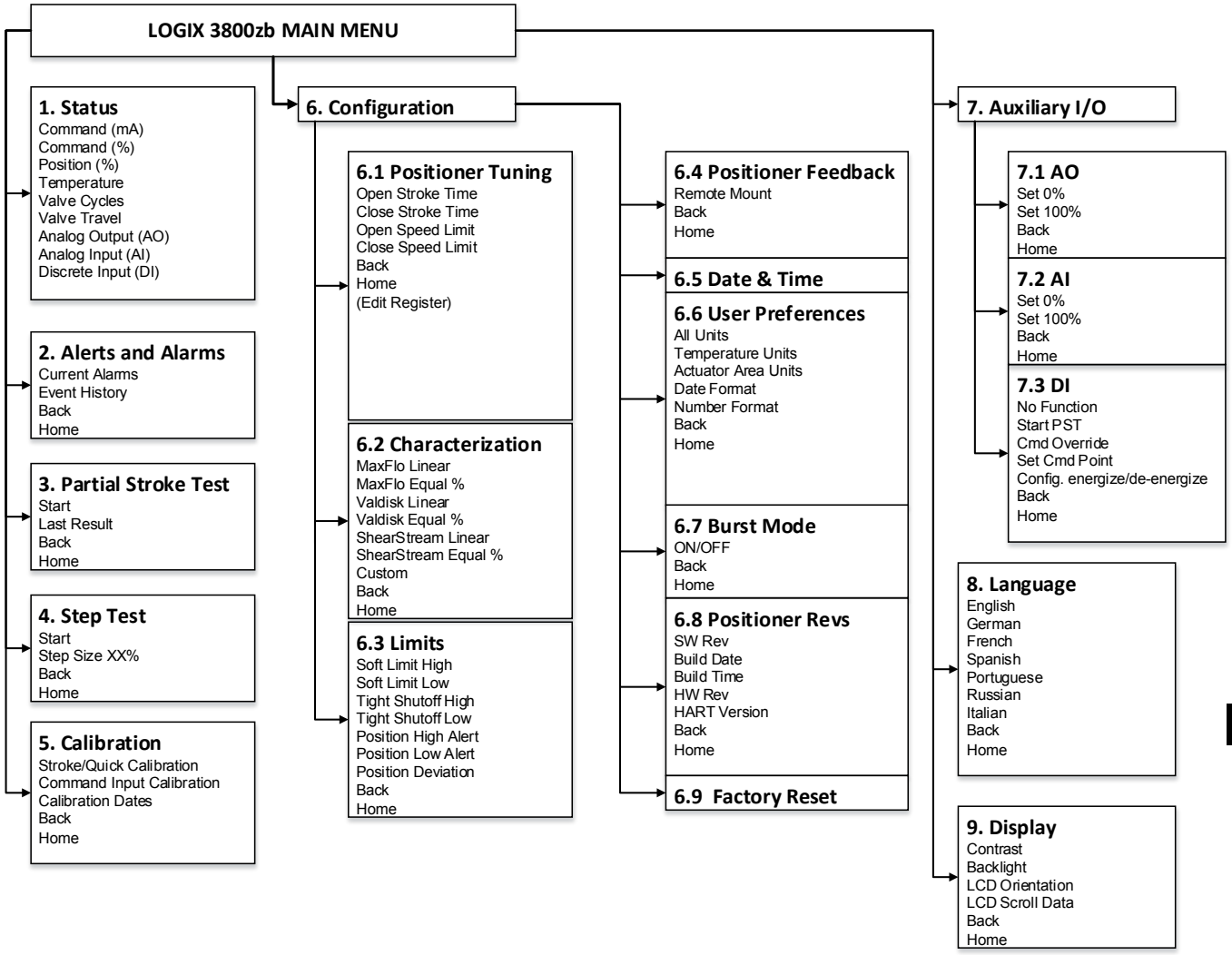
17.4 Repair and Replacement

Report any failure of the FLOWSERVE Logix 3800zb Valve Positioner immediately to FLOWSERVE. Replace faulty components according to section 0 of this manual or return the positioner to FLOWSERVE for service. With experience and the right parts, repair times for any component can be less than an hour. Assume a 24-hour mean time to repair for safety availability calculations.

17.5 Training Requirements

A service technician trained in the installation and maintenance of process instrumentation activities should perform activities specified in this manual.

APPENDIX A – LCD MENU TREE OVERVIEW



A

APPENDIX B – LCD MENU TREE DESCRIPTIONS

Menu Feature	Description	Menu Location
Status	The Status menu is used to view information about the configuration and operation of the system.	1
Command (mA)	Command (mA) displays the final command in mA.	1.1
Command (Percent)	Command (Percent) displays the final command in %.	1.2
Position (Percent)	Position (Percent) displays the valve position in %.	1.3
Temperature (User Units)	Temperature (User Units) displays the temperature inside the positioner.	1.4
Reference Pressure PR (User Units)	PR (User Units) displays the pressure in port R. This port R is the atmospheric reference pressure. It is subtracted from the others.	1.9
Valve Cycles (Cycles)	Valve Cycles (Cycles) are counted each time the positioner changes direction. The movement must be beyond a dead-band window. This window is set to 0.5% as a default, but can be changed using the DTM.	1.13
Valve Travel (Percent)	Valve Travel (Percent) is counted in small increments every time the valve moves beyond the dead-band window. The display of travel is in % of full stroke.	1.14
Analog Output (AO)	The Analog Output provides a 4-20 mA feedback mechanism, indicating the position of the valve, to the host system.	1.15
Analog Input (AI)	The Analog Input provides a 4-20 mA input mechanism to interface with process variable transmitters.	1.16
Discrete Input (DI)	The Discrete Input provides a way for the user to either trigger a PST or command the valve to a predetermined set point.	1.19
Back		1.20
Alerts and Alarms	The Alerts and Alarms menu show current and past alarms, warnings, alerts, and calibrations.	2
Current Alarms	Current Alarms displays all events that are actively sounding.	2.1
Event History	Event History displays past 32 events including alarms, warnings, alerts, and calibrations. Displayed is the event that occurred most recently, first (event 32) with later events recorded below. Each event would have a timestamp and shows if it was turning on or off.	2.2
Back		2.3
Partial Stroke Test	The Partial Stroke Test (PST) menu provides the user the ability to start a PST and see the results of the latest PST.	3
Start	Start allows the user to initialize the (PST).	3.1
Last Result	Last Result shows “Pass” or “Fail” from the last PST attempt.	3.2
Back		3.3
Step Test	The purpose of the step test is to allow the user to easily evaluate the performance of the positioner from the local interface	4
Start	Start allows the user to initialize the step test.	4.1
Step Size XX%	Defaulted to 50%. The Step Size shall be user settable from 2% to 100%	4.2
Back		4.3
Calibration	The Calibration menu allows the user to calibrate the positioner’s sensors. The positioner can accurately control with only a Quick-Cal. Typically this is all that is needed. Calibrate the friction calibration of the positioner when upgrading to Pro diagnostics.	5

Menu Feature	Description	Menu Location
Stroke/Quick Calibration	Stroke/Quick Calibration starts an automatic calibration of the position feedback sensor. The stroke calibration determines the closed (0%) and open (100%) positions of the valve and gathers information about the response of the valve (such as valve stroke time) to determine the gains. The gains automatically are then set. After a stroke calibration, the positioner is ready to control.	5.1
Command Input Calibration	Command Input Calibration is used to adjust the input range. Set the lowest current (Set 0%) and the highest current used (Set 100%). The default input range is 4 to 20 mA. The “Set 0%” value must be lower than the “Set 100% value.	5.2
Calibration Dates	Calibration Dates lists the most recent date of each calibration.	5.3
Back		5.4
Configuration		
Positioner Tuning		6.1

Menu Feature	Description	Menu Location
Open Stroke Time	Open Stroke Time is the fastest time it took the valve to stroke from 0% to 100% during Quick-Cal.	6.1.1
Close Stroke Time	Close Stroke Time is the fastest time it took the valve to stroke from 100% to 0% during Quick-Cal.	6.1.2
Open Speed Limit	Open Speed Limit and Closed Speed Limit are used to prevent the valve from moving too quickly. Speed limits help when the process is sensitive to rapid flow or pressure changes. This shows the time (in seconds) that the positioner will allow the valve to travel a full stroke. This speed limit applies to smaller movements of the valve too.	6.1.3
Close Speed Limit	Open Speed Limit and Closed Speed Limit are used to prevent the valve from moving too quickly. Speed limits help when the process is sensitive to rapid flow or pressure changes. This shows the time (in seconds) that the positioner will allow the valve to travel a full stroke. This speed limit applies to smaller movements of the valve too.	6.1.4
Back		6.1.5
(Edit Register)	Reserved for service only for writing and reading variables in system.	6.1.6
Characterization	The Configuration – Characterization menu allows the user to change the characterization of the command. This allows a better match between the input command and the actual fluid flow through the valve. This feature is typically used with valves that have non-linear flow characteristics. The positioner makes a correction by applying an adjustment to the input command according to a characterization curve. The table in this appendix shows the available characterization curve options. Each point of the Custom curve can be adjusted using the ValveSight DTM.	6.2
MaxFlo Linear	See Appendix C – Programmed Flow Characterization Options for characteristic curve data and illustrated curves	6.2.1
MaxFlo Equal %	See Appendix C – Programmed Flow Characterization Options for characteristic curve data and illustrated curves	6.2.2
Valdisk Linear	See Appendix C – Programmed Flow Characterization Options for characteristic curve data and illustrated curves	6.2.3
Valdisk Equal %	See Appendix C – Programmed Flow Characterization Options for characteristic curve data and illustrated curves	6.2.4
ShearStream Linear	See Appendix C – Programmed Flow Characterization Options for characteristic curve data and illustrated curves	6.2.5
ShearStream Equal %	See Appendix C – Programmed Flow Characterization Options for characteristic curve data and illustrated curves	6.2.6
Custom	Select Custom for a standard 30:1 linear, equal percent rangeability curve. The curve may be customized point-by-point. To modify the Custom curve, use the ValveSight DTM. See Appendix C – Programmed Flow Characterization Options for characteristic curve data and illustrated curves	6.2.7
Back		6.2.8
Limits	Limits allows the user to limit the movement of the valve. Shutoff allows the user to shut the valve with all available force tightly.	6.3
Soft Limit High	This feature is used to simulate physical blocks on the valve that restrict movement past a set point. Once the Soft Limit is set, the positioner will not attempt to move the valve position (final command) beyond the set point, regardless of the analog or digital command input signal.	6.3.1

Menu Feature	Description	Menu Location
Soft Limit Low	This feature is used to simulate physical blocks on the valve that restrict movement past a set point. Once the Soft Limit is set, the positioner will not attempt to move the valve position (final command) beyond the set point, regardless of the analog or digital command input signal.	6.3.2
Position High Alert	Position High Alert Algorithm for customer's choice	6.3.3
Position Low Alert	Position Low Alert Algorithm for customer's choice	6.3.4
Position Deviation	Position Deviation Alert Algorithm for customer's choice	6.3.5
Back		6.3.6
Position Feedback	The positioner shall attempt to control using the pressure sensors as valve position feedback in the event that the feedback linkage breaks.	6.4
Remote Mount	The Remote Mount ADC Count	6.4.1
Back		6.4.2
Date & Time	Use the Up and Down buttons to set the time and date. The format of the time and date is displayed above the input fields.	6.5
User Preferences	The User Preferences menu allows the user to format how information is displayed.	6.6
All Units	(**North American**, *SI*)	6.6.1
Temperature Units	(**degrees F**, *degrees C*)	6.6.2
Actuator Area Units	(**in2**, *cm2*)	6.6.3
Date Format	(**Mon/Day/Year**, *Day.Mon.Year*)	6.6.4
Number Format	(**Decimal Point**, *Comma*)	6.6.5
LCD Orientation	(Standard, Rotate 180˚)	6.6.6
Back		6.6.7
Burst Mode	Burst Mode continuously transmits HART information.	6.7
ON/OFF	On/Off – Use this feature to turn burst mode on and off.	6.7.1
Back		6.7.2
Positioner Revs		6.8
SW Rev	The revision of the embedded software.	6.8.1
Bld Date	The date of the embedded software build.	6.8.2
Bld Time	The time of day of the embedded software build.	6.8.3
HW Rev	The revision of the main board.	6.8.4
HART Ver	The revision of the HART protocol (6, or 7).	6.8.5
Back		6.8.6
Factory Reset	Use this feature to reset all variables to their factory default state. All of the internal variables are reset including calibration to factory defaults. The positioner must be re-calibrated after a factory reset. Tag names and other user configured limits, alarm settings, and valve information will also be lost and require restoring. A factory reset will always reset the command source to analog 4-20 mA.	6.9
Auxiliary I/O	The terminal block gives options for analog output (AO), Analog input (AI), Discrete Input (DI) and Discrete Output (DO) 1 and 2.	7
AO		7.1

B

Menu Feature	Description	Menu Location
Set 0%	Set the current (mA) that will correspond to the 0% (closed) valve position.	7.1.1
Set 100%	Set the current (mA) that will correspond to the 100% (open) valve position.	7.1.2
Back		7.1.3
AI		7.2
Set 0%	Set the current (mA) that will correspond to the 0% (closed) valve position.	7.2.1
Set 100%	Set the current (mA) that will correspond to the 100% (open) valve position.	7.2.2
Back		7.2.3
DI		7.3
No Function	No Action	7.3.1
Start PST	Trigger to start a PST	7.3.2
Cmd Override	Trigger to start a Cmd Overide	7.3.3
Set Cmd Point	Change Set Cmd Point variable.	7.3.4
Back		7.3.5
Language		8
English		8.1
German		8.2
French		8.3
Spanish		8.4
Portuguese		8.5
Russian		8.6
Italian		8.7
Back		8.8
Display		9
Contrast	LCD Contrast. Customer's Choice	9.1
Backlight	LCD Backlight. Customer's Choice	9.2
LCD Orientation	(Standard, Rotate 180˚)	9.3
Back		9.4

APPENDIX C – PROGRAMMED FLOW CHARACTERIZATION OPTIONS

The characterization menu allows the user to change the characterization of the command. This allows a better match between the input command and the actual fluid flow through the valve. This feature is typically used with valves that have non-linear flow characteristics. The positioner makes a correction by applying an adjustment to the input command according to a characterization curve. The table below shows the available characterization curve options. Each point of the Custom curve can be adjusted using the ValveSight DTM.

Command Input	Final Command							
	Characterization DIP set to "Linear"	Characterization DIP set to "Other"						
	Linear	MaxFlo Linear	MaxFlo =%	Valdisk Linear	Valdisk =%	Shear-Stream Linear	Shear-Stream =%	Custom (Default) (Linear =%)
0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.0	5.00	6.50	1.00	13.00	4.00	25.00	8.00	0.62
10.0	10.00	11.60	2.00	20.00	6.00	35.00	14.00	1.35
15.0	15.00	16.20	3.00	26.25	7.80	44.00	17.00	2.22
20.0	20.00	20.50	4.40	32.10	9.30	50.20	21.00	3.25
25.0	25.00	24.60	5.80	37.50	11.50	55.50	24.00	4.47
30.0	30.00	28.50	7.40	42.60	14.00	60.20	27.50	5.91
35.0	35.00	32.40	9.30	47.40	16.50	64.30	31.50	7.63
40.0	40.00	36.20	11.20	51.80	19.30	68.00	35.50	9.66
45.0	45.00	40.00	13.50	56.00	22.50	71.50	39.50	12.07
50.0	50.00	43.80	16.10	60.00	26.00	74.70	43.90	14.92
55.0	55.00	47.60	19.10	63.60	30.00	77.70	48.10	18.31
60.0	60.00	51.50	22.40	67.20	34.70	80.50	52.80	22.32
65.0	65.00	55.50	26.20	70.60	39.60	83.20	57.40	27.08
70.0	70.00	59.50	30.60	73.90	45.10	85.90	62.40	32.71
75.0	75.00	63.80	35.70	77.20	51.30	88.40	67.50	39.40
80.0	80.00	68.20	41.70	81.30	57.80	90.80	72.90	47.32
85.0	85.00	73.00	48.90	84.00	64.80	93.20	78.60	56.71
90.0	90.00	78.40	57.70	87.80	72.50	95.50	84.70	67.84
95.0	95.00	85.00	69.20	92.10	81.30	97.80	91.20	81.03
100.0	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

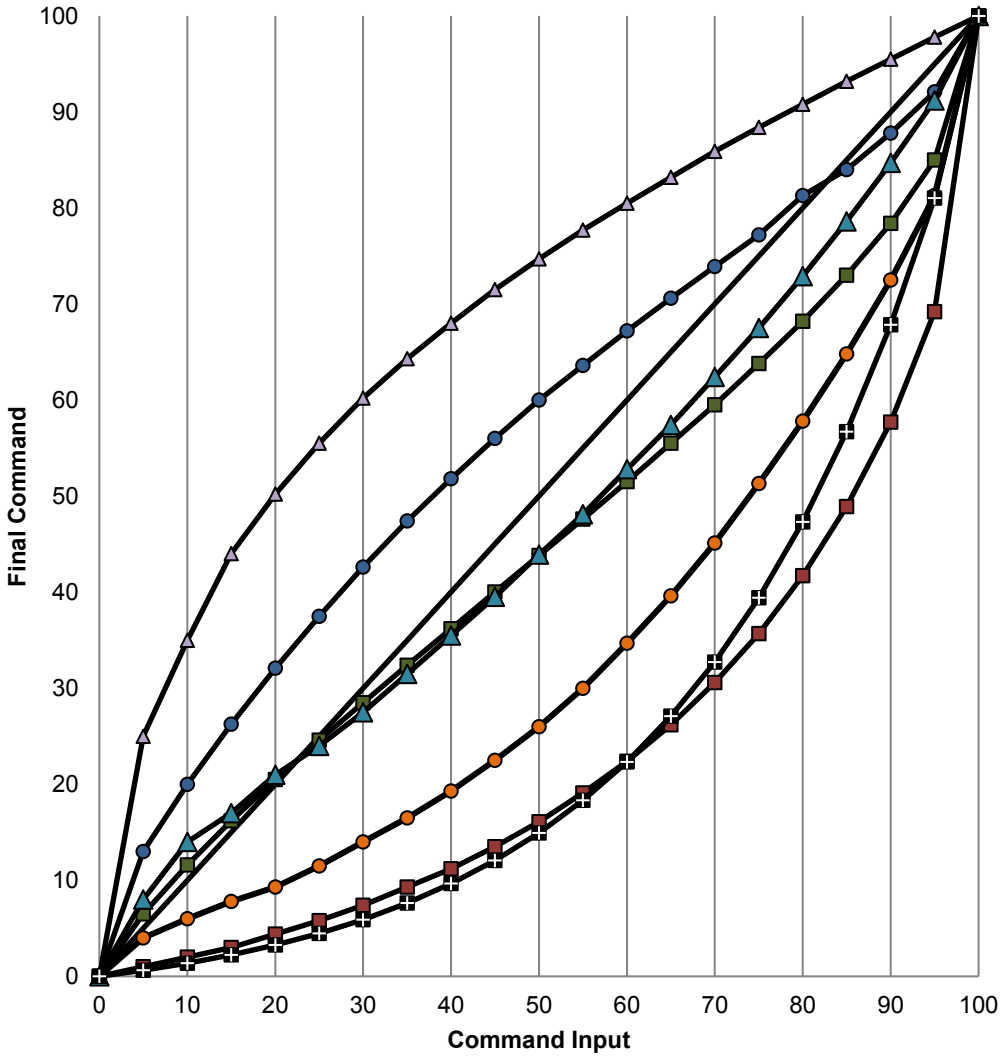


Figure 29: Characterization Curve Options

APPENDIX D – 4-BLINK STATUS CODES

➲ NOTE: *The order of sorting is* G B Y O R .

APPENDIX E – STATUS CODE DESCRIPTIONS

Name	Description	Possible Solution	LED Color Code
Actuator Cycles Warning	The actuator cycle limit has been exceeded. Each cycle represents two reversals of the direction of valve movement. The cycle counting criterion and count limit are set by the user to track the usage of the valve.	Follow routine procedures for maintenance when the limit is reached such as checking the actuator seals and lubrication. After maintenance, reset the travel accumulator.	Y G G Y
Actuator Travel Warning	The total accumulated actuator travel limit has been exceeded. The travel is accumulated in both directions. The travel counting criterion and limit are set by the user to track the usage of the valve.	Follow routine procedures for maintenance when the limit is reached such as checking the actuator seals and lubrication. After maintenance, reset the travel accumulator.	Y G G Y
Analog In Set 0%	An Analog Input Calibration has been started using the buttons (not LCD) and the positioner is waiting for the user to adjust the loop current to 0% and press the QUICK-CAL button to accept.	Complete the calibration.	G R O Y
Analog In Set 100%	An Analog Input Calibration has been started using the buttons (not LCD) and the positioner is waiting for the user to adjust the loop current to 100% and press the QUICK-CAL button to accept.	Complete the calibration.	G R O O
Analog Input Above ADC Range	During Command Loop Calibration, the 100% signal was out of the Analog to Digital Converter (ADC) range.	Replace the electronics assembly.	R G G B
Analog Input Below ADC Range	During Command Loop Calibration, the 0% signal was out of the Analog to Digital Converter (ADC) range.	Replace the electronics assembly.	R G G B
Analog Input Calibration in Progress	The command input calibration sequence is in progress.	The calibration can be canceled from the Auxiliary Input Calibration page of the DTM, from the handheld, or by briefly pressing all three buttons at once.	Y R Y G
Analog Input No Loop Power	The Auxiliary Input terminals have no loop power. The positioner previously detected power on the terminals.	Check terminal connection. Mask the alarm if the circuit is not used.	R Y Y R
Analog Input Range Too Small	During an Analog Input loop calibration, the difference between the signal at 0% and the signal at 100% was too small.	Recalibrate making sure to use a larger difference between command signal limits.	R G G B
Analog Output Calibration in Progress	The analog output calibration sequence is in progress.	The calibration can be canceled from the Analog Output Calibration page of the DTM, from the handheld, or by briefly pressing all three buttons at once.	Y R Y G

E

Name	Description	Possible Solution	LED Color Code
Analog Output Error	The Analog Output circuit is not producing the expected output current.	Check AO loop wiring and ensure adequate compliance voltage. Replace electronics assembly if the error persists.	R Y Y O
Analog Output No Loop Power	The Analog Output terminals have no loop power. The positioner previously detected power on the terminals.	Check terminal connection. Mask the alarm if the circuit is not used.	R Y Y Y
Analog Output Range Too Small	During a Analog Output calibration the difference between the milliamp signal at 0% and the milliamp signal at 100% was too small.	Recalibrate making sure to use a larger difference between signal limits. This notification can be cleared by briefly pressing the QUICK-CAL button.	R G Y R
AO Input Set 0%	An Analog Output Calibration has been started using the buttons (not LCD) and the positioner is waiting for the user to adjust the output current to 0% via the I and III Buttons, then press the QUICK-CAL button to accept.	Complete the calibration.	G Y O G
AO Input Set 100%	An Analog Output Calibration has been started using the buttons (not LCD) and the positioner is waiting for the user to adjust the output current to 0% via the I and III Buttons, then press the QUICK-CAL button to accept.	Complete the calibration.	G Y O O
Bellows Cycles Warning	The bellows cycle limit has been exceeded. The bellows may be reaching the end of its fatigue life. Each cycle represents two reversals of the direction of bellows movement. The cycle counting criterion and count limit are set by the user to track the usage of the valve.	Follow routine procedures for maintenance when the limit is reached such as checking bellows for cracking or leaking. After maintenance, reset the cycle accumulator.	Y G G Y
Bellows Travel Warning	The bellows cycle limit has been exceeded. The bellows may be reaching the end of its fatigue life. Each cycle represents two reversals of the direction of valve movement. The cycle counting criterion and count limit are set by the user to track the usage of the valve.	Follow routine procedures for maintenance when the limit is reached such as checking bellows for cracking or leaking. After maintenance, reset the cycle accumulator.	Y G G Y
Button Stuck On	One of the three buttons (internal or external) is stuck in the on state.	Manipulate the buttons to attempt to unstick them. Clean the buttons with soft moist cloth to prevent buildup of debris.	Y Y O G
Calibration Required	A factory reset was performed and the positioner has not yet been calibrated. The unit will not respond to commands and will remain in the failsafe position until a calibration is successfully completed.	Perform a Stroke Calibration (QUICK-CAL) by holding the QUICK-CAL button down for 3 seconds, or perform a Pressure or Friction calibration if desired. See section 9, Operation – Calibration And Control for warnings.	R G R G
Calibration Succeeded	The last calibration succeeded.	Blink code will terminate automatically.	G G G G
Calibration Type Set	The user has selected a combination of key presses (Hot Key) that initiates a calibration. The positioner is waiting for the user to select the type of calibration to run.	Refer Appendix F – Hot Keys to see the calibration options.	G O Y Y

Name	Description	Possible Solution	LED Color Code
Command Input Set 0%	A Command Input Calibration has been started using the buttons (not LCD) and the positioner is waiting for the user to adjust the loop current to 0% and press the QUICK-CAL button to accept.	Complete the calibration.	G R Y G
Command Input Set 100%	A Command Input Calibration has been started using the buttons (not LCD) and the positioner is waiting for the user to adjust the loop current to 100% and press the QUICK-CAL button to accept.	Complete the calibration.	G R Y Y
Command Amplitude Alarm	The amplitude of the command signal is above the alarm limit. This could mean the control loop has larger swings than desirable.	Verify the limits are set at an appropriate level. Review the control loop parameters and equipment. Adjust as necessary.	R Y O Y
Command Amplitude Warning	The amplitude of the command signal is above the warning limit. This could mean the control loop has larger swings than desirable.	Verify the limits are set at an appropriate level. Review the control loop parameters and equipment. Adjust as necessary.	Y Y O Y
Command Frequency Alarm	The frequency of the command signal is above the alarm limit. This could mean the control loop is oscillating faster than normal.	Verify the limits are set at an appropriate level. Review the control loop parameters and equipment. Adjust as necessary.	R Y O Y
Command Frequency Warning	The frequency of the command signal is above the warning limit. This could mean the control loop is oscillating faster than normal.	Verify the limits are set at an appropriate level. Review the control loop parameters and equipment. Adjust as necessary.	Y Y O Y
Command Input Above ADC Range	During Command Loop Calibration, the 100% signal was out of the Analog to Digital Converter (ADC) range.	Replace the electronics assembly.	R G G G
Command Input Below ADC Range	During Command Loop Calibration, the 0% signal was out of the Analog to Digital Converter (ADC) range.	Replace the electronics assembly.	R G G G
Command Input Calibration in Progress	The command input calibration sequence is in progress.	The calibration can be canceled from the Command Calibration page of the DTM, from the handheld, or by briefly pressing all three buttons at once.	Y R Y G
Command Input Range Too Small	During a Command Loop Calibration, the difference between the signal at 0% and the signal at 100% was too small. The system is designed to accept a difference greater than 5 mA.	Recalibrate making sure to use a larger difference between command signal limits. The difference must exceed 5 mA.	R G G G
CPU Usage Warning	The CPU usage is too high.	Update the firmware.	Y Y Y O
DI Active Alert	The voltage to the DI has changed, triggering an action defined by the user.	No action is required. The function of the DI can be set in the DTM, using a handheld, or from the LCD menu.	G G O O
DI Command Override	The a Discrete Input (DI) has been configured to override the input command, positioning the valve at a preconfigured set point. The DI signal is active and the positioner is attempting to control the valve at the set point.	Configure the DI function and set point using the menu, a handheld or the Configuration page of the DTM.	G R G R

E

Name	Description	Possible Solution	LED Color Code
Digital Command Mode	The input command is set by a digital HART command instead of the 4-20 mA signal.	The input command source can be changed back to the 4-20 mA signal by using a handheld, the Dashboard page of the DTM, or performing a manual Command Reset. Perform the Command Reset by holding both the I and III buttons and briefly pressing the QUICK-CAL button.	G G Y Y
Factory Reset State	The positioner is in factory reset state. Calibration is required to enable control.	Perform a Stroke Calibration (QUICK-CAL).	R G R R
Fail Safe Position Error	The fail direction (on loss of air) that the user selected does not match the fail direction detected by the positioner.	Check the Air to Open / Air to Close DIP switch on the positioner. Also, review the actuator spring and tubing configuration.	R G O G
Feedback Calibration in Progress	A feedback calibration sequence is in progress. Turn the follower arm 2 full rotations over 10 seconds.	Rotate the follower arm 2 full rotations over 10 seconds. The calibration can be canceled from the Sensor Calibration page of the DTM, from the handheld, or by briefly pressing all three buttons at once.	Y R Y G
Feedback Linkage Alarm	The feedback linkage is broken or the position feedback sensor is out of range.	Fix broken linkage or recalibrate the stroke.	R R Y G
Flash CRC Error	The FLASH program memory is corrupt. This will trigger the Memory Error Warning.	Reprogram the main board with the latest firmware. If this error persists, replace the main board.	Y Y Y R
Incompatible Software Alarm	The board has been reprogrammed with software that changes its communications type (FF, HART, etc.)	Reprogram the board with the correct software.	R R R B
Initializing	The positioner has powered up and is displaying a blink sequence 3 times.	Wait for 3 blink sequences to complete.	G G Y R
Jog Calibration Set 100% Position	During a jog calibration, the unit is waiting for the user to manually adjust the valve position to the desired 100% open position.	Use the I and III buttons on the positioner to adjust the valve to the desired fully open position. Press the QUICK-CAL button to accept adjustments.	Y G G R
Jog Command Mode	The positioner has been placed in a local override mode where the valve can only be stroked using the I and III buttons. The positioner will not respond to analog or digital input commands from HART.	Control the valve using the I and III buttons. This mode may be cancelled by briefly pushing the QUICK-CAL button.	G R R Y
Local Interface Off	Control and configuration features are locked at the positioner's local interface. This is to prevent unauthorized or accidental adjustments. The buttons can still be used to view information on the LCD. The status code is only present for a short time when the user attempts to make a change through the display menu.	The DTM's Local Interface page is used to unlock the local interface, turn this feature on and off, and to set the PIN. For temporary access, a Personal Identification Number (PIN) can be entered from the positioner if an LCD is installed.	G G Y G

Name	Description	Possible Solution	LED Color Code
Low Battery Warning	The battery for the real time clock is low. The battery is designed for a 15+ year life with the positioner unpowered. The battery is not required for the positioner to control properly, but is used only to maintain the time and date upon loss of power. The time and date affect the time stamps of alarms, warnings and other events. This warning could be caused by rapidly power cycling the positioner.	The battery is not replaceable. Verify or reset the time and date. Replace the electronics assembly if the problem persists for several days.	Y R R G
No Motion Time Out	During a stroke calibration, there was no valve motion detected. Because some valves are quite large, this indicator can take up to 9 minutes to detect an error.	Check linkages and air supply to make sure the system is properly connected. If the time out occurred because the actuator is very large then simply retry the QUICK-CAL and the positioner will automatically adjust for a larger actuator by doubling the time allowed for movement. This error may be cleared by briefly pushing the QUICK-CAL.	R G Y Y
NVMEM CRC Error	The CRC test of the internal data did not pass. This may affect the function of the positioner in various ways or not at all. This will trigger the Memory Error Warning.	Error may clear with time. If error persists, cycle power and complete a QUICK-CAL. If the error still persists, perform a factory reset or replace the main circuit board.	Y Y Y R
Partial Stroke Test Failed Warning	Measured times or forces during the last partial stroke test did not pass the criteria set by the user. This may be an indication of corrosion build-up on the valve stem or in the actuator, low or restricted supply pressure, or a sticking positioner relay.	This warning will clear upon completion of a successful partial stroke test.	Y G R R
Partial Stroke Test Scheduled	The schedule established by the user shows that a partial stroke test is due.	Follow internal procedures to initiate a partial stroke test (PST). A partial stroke test will cause the valve to move suddenly and the positioner will not respond to commands while the PST is in progress. See the Partial Stroke Test page of the DTM to verify PST settings.	G Y Y R
Piezo Voltage Low Alarm	The voltage to the piezo is too low. The piezo may be damaged. This may prevent the proper failure position upon loss of signal/power. This condition may occur briefly on an air-to-close valve that is held for long periods of time in the closed position, or an air-to-open valve held in the open position.	Ensure the supply pressure is not low. If alarm persists for more than 30 minutes, the Piezo assembly is damaged. Replace the pilot relay.	R R R Y
Piezo Voltage Low Warning	The voltage to the piezo is too low. The piezo may be damaged. This may prevent the proper failure position upon loss of signal/power. This condition may occur briefly on an air-to-close valve that is held for long periods of time in the closed position, or an air-to-open valve held in the open position.	Ensure the supply pressure is not low. If alarm persists for more than 30 minutes, the Piezo assembly is damaged. Replace the pilot relay.	Y R R Y

E

Name	Description	Possible Solution	LED Color Code
Position Amplitude Alarm	The amplitude of the position signal is above the alarm limit. The positioner is controlling the position of the valve with large corrections.	Verify the limits are set at an appropriate level. Adjust the selectable Gain switch to a lower setting or use the "Hi Friction" setting. Perform a QUICK-CAL which sets the gains based on valve response. Check for high friction. If the problem persists, replace the relay.	R Y O O
Position Amplitude Warning	The amplitude of the position signal is above the warning limit. The positioner is controlling the position of the valve with large corrections.	Verify the limits are set at an appropriate level. Adjust the selectable Gain switch to a lower setting or use the "Hi Friction" setting. Perform a QUICK-CAL which sets the gains based on valve response. Check for high friction. If the problem persists, replace the relay.	Y Y O O
Position Deviation Alarm	The difference between the command and the actual position has been greater than the user set limit for longer than a user set time.	Review active alarms and warnings to find root causes of this alarm. The deviation settings can be changed in the Valve Health page of the DTM.	R R R R
Position Feedback Calibration Required	Position feedback calibration required	Perform a Position Feedback Calibration. See Appendix F – Hot Keys.	R G R B
Position Frequency Alarm	The frequency of the position signal is above the alarm limit. The positioner is controlling the position of the valve with rapid corrections.	Verify the limits are set at an appropriate level. Adjust the selectable Gain switch to a lower setting or use the "Hi Friction" setting. Perform a QUICK-CAL which sets the gains based on valve response. Check for high friction. If the problem persists, replace the relay.	R Y O O
Position Frequency Warning	The frequency of the position signal is above the warning limit. The positioner is controlling the position of the valve with rapid corrections.	Verify the limits are set at an appropriate level. Adjust the selectable Gain switch to a lower setting or use the "Hi Friction" setting. Perform a QUICK-CAL which sets the gains based on valve response. Check for high friction. If the problem persists, replace the relay.	Y Y O O
Position High Limit Alert	The position has reached, or is exceeding, a user defined upper position indicator. This is similar to a limit switch indicator.	Set the limit to a higher value if more travel is needed, or adjust the command signal back in the specified range.	Y G G G
Position Low Limit Alert	The position has reached, or is exceeding a user defined lower position indicator. This is similar to a limit switch indicator.	Set the limit to a lower value if more travel is needed, or adjust the command signal back in the specified range.	Y G G G

Name	Description	Possible Solution	LED Color Code
Position Range Too Small	During calibration, the range of motion of the position feedback arm was too small for optimum performance.	Check for loose linkages and/or adjust the feedback pin to a position closer to the follower arm pivot to create a larger angle of rotation and recalibrate. The minimum angle of rotation should be greater than 15 degrees. Briefly pressing the QUICK-CAL button acknowledges this condition and the positioner will operate using the short stroke calibration if otherwise a good calibration.	R G G Y
Position Sensor Failure Alarm	The feedback arm may be disconnected from the valve assembly or the sensor has failed.	Check the feedback arm linkage. Recalibrate. If the problem persists return the unit for repair.	R Y R G
Power On	Power On	No issues.	G G G G
Pressure Calibration in Progress	A pressure calibration sequence is in progress.	The calibration can be canceled from the Pressure Calibration page of the DTM, or by briefly pressing the QUICK-CAL button.	Y R Y G
RAM Cylic Redundancy Check Error	The RAM data memory is corrupt. This will trigger the Memory Error Warning.	If this error persists, replace the main board.	Y Y Y O
Remote Mount Out of Range	During stroke calibration the remote mount ADC count was above or below the acceptable range.	Adjust remote mount POT and recalibrate.	R G B G
Settle Time Out	During calibration, the position feedback sensor or supply pressure (for pressure calibration) showed movement, but did not settle.	Check for loose linkages or a loose positioner sensor. Check for regulated supply pressure. This error may appear on some very small actuators during the initial calibration. Recalibrating may clear the problem, or this error may be cleared by briefly pushing the QUICK-CAL button.	R G Y G
Signature or Partial Stroke Test in Progress	The positioner is in Out of Service (OOS) mode because a test or signature has been initiated. These include Step Test, Ramp Test, or Partial Stroke Test.	Signatures and tests can be defined, initiated, and cancelled through the Off-Line Diagnostics pages of the DTM.	G R G G
Soft Stop High Limit Alert	The Final Command would move the valve beyond the user set Soft Limit, but the internal software is holding the position at the limit. The function is similar to a mechanical limit stop except it is not active if the unit is un-powered.	If more travel is needed, reset the Soft Limits. If not, adjust the Final Command signal back into the specified range.	G Y G Y
Soft Stop Low Limit Alert	The Final Command would move the valve beyond the user set Soft Limit, but the internal software is holding the position at the limit. The function is similar to a mechanical limit stop except it is not active if the unit is un-powered.	If more travel is needed, reset the Soft Limits. If not, adjust the Final Command signal back into the specified range.	G Y G Y
Software Download Complete	The software download is complete.	New software is ready to be activated.	B B B G
Software Download in Progress	The system is downloading new software.	No action is required. Wait for the system to indicate that the software download is complete.	B B B B

Name	Description	Possible Solution	LED Color Code
Software Download Paused	Software download has been paused by the user.	Restart the software download.	B B B O
Software Download Waiting	The system is waiting for data during a download.	There has been some time pass where no communication has occurred during a software download. Check the signal lines.	B B B Y
Squawk Mode	A user has set the positioner to flash a special sequence so that it can be visually located.	This mode is cancelled if one of the following occurs: 1) The QUICK-CAL button is briefly pressed. 2) The Squawk mode is selected again remotely. 3) More than one hour has passed since the command was issued.	G B B B
Stroke Calibration in Progress	A stroke calibration sequence is in progress.	The calibration can be canceled from the Sensor Calibration page of the DTM, from the handheld, or by briefly pressing the QUICK-CAL button.	Y R Y G
Stroke Shift	The 0% and 100% valve positions have both shifted in the same direction since the last stroke calibration. This may be related to a bent or adjusted feedback linkage, or loose positioner mounting.	Ensure the feedback linkage is not bent and the positioner is mounted securely. This notification can be cleared by briefly pressing the QUICK-CAL button.	R G R Y
Stroke Span Decrease	The 0% and 100% valve positions are closer together compared to the last stroke calibration. This could indicate debris or build up at valve seat.	Inspect valve or schedule valve for inspection. This notification can be cleared by briefly pressing the QUICK-CAL button.	R G R Y
Stroke Span Increase	The 0% and 100% valve positions are farther apart compared to the last stroke calibration. This could indicate seat wear.	Inspect valve or schedule valve for inspection. This notification can be cleared by briefly pressing the QUICK-CAL button.	R G R Y
Software Download Fail	During a software download, an error occurred in the communications, preventing completion.	Check communication lines. Check for enough loop current. Restart SW download function. If error persists, request a service technician to reprogram the electronics assembly.	B B B R
System Exception Warning	System has logged an internal error.	Update the firmware.	Y Y Y O
Temperature Calibration Required	Temperature Calibration Required	Contact your Flowserve representative.	R G O R
Temperature High Warning	The temperature of the internal electronics has exceeded the manufacturer set limit of 85°C (176°F). High temperature may affect performance or limit the life of the positioner.	Regulate the temperature of the positioner by shading or cooling supply gas. If the temperature reading is in error, replace the main board.	Y Y G G
Temperature Low Warning	The temperature of the internal electronics has exceeded the manufacture set limit of -40°C (-40°F). Low temperature may inhibit responsiveness and accuracy.	Regulate the temperature of the positioner. If the temperature reading is in error, replace the main circuit board.	Y Y G G
Test Mode	Test mode is active.	Power cycle to leave test mode.	G G R R

Name	Description	Possible Solution	LED Color Code
Tight Shut Off Mode	Also called MPC. The Final Command is beyond the user set limit for the tight shutoff feature and the positioner is applying full actuator pressure to close (or open) the valve. This is a normal condition for all valves when closed. The factory default setting triggers this at command signals below 1%. This indication may also occur on 3 way valves at both ends of travel if the upper Tight Shut Off value has been set.	If tight shutoff is not desired reset the tight shutoff limits or adjust the command signal inside of the specified Tight Shut Off values.	G G G Y
Valve Closed Too Far Warning	While the valve was in use, it closed farther than it did at the last calibration by 0.5%.	Check the feedback arm linkage and ensure the valve stem connection is tight. Recalibrate the stroke. If the process cannot be interrupted a service technician may be able to adjust the calibration.	Y Y G Y
Valve Cycles Warning	The valve cycle limit has been exceeded. Each cycle represents two reversals of the direction of valve movement. The cycle counting criterion and count limit are set by the user to track the usage of the valve.	Follow routine procedures for maintenance when the limit is reached such as checking the packing tightness, and checking linkages for wear, misalignment, and tightness. After maintenance, reset the cycle accumulator.	Y G G Y
Valve Opened Too Far Warning	While the valve was in use, it opened farther than it did at the last calibration by 0.5%.	Check the feedback arm linkage and ensure the valve stem connection is tight. Recalibrate the stroke. If the process cannot be interrupted a service technician may be able to adjust the calibration.	Y Y G Y
Valve Travel Warning	The total accumulated valve travel limit has been exceeded. The travel is accumulated in both directions. The travel counting criterion and limit are set by the user to track the usage of the valve.	Follow routine procedures for maintenance when the limit is reached such as checking the packing tightness, and checking linkages for wear, misalignment, and tightness. After maintenance, reset the travel accumulator.	Y G G Y

APPENDIX F – HOT KEYS

Hot keys are quick button combinations to access different features without the use of the LCD menu. This table shows the key combinations and the related features.

Function	Step	Procedure	Button		
			I	II	III
Access Menu	Access the user menu.	Press **I** or **III** briefly.	Brief		Brief
	Select menu item.	Press **I** or **III** as needed.	As Needed		As Needed
	Exit the user menu.	Select the Back or Exit option in the menu and press **II** briefly.		Brief	
Quick Cal*	Initiate a Quick-Cal stroke calibration.*	Hold **II** for 3 seconds.		3s	
	(For Jog Calibration, set 100% position.)	Press **II** briefly.		Brief	
	Abort a Quick-Cal stroke calibration (or End Jog Cal).	Press **II** briefly.		Brief	
Factory Reset	Set positioner to Factory Reset state.	Hold **II** while applying power to the positioner.		Brief	
Local Valve Control	Initiate local valve control.	Hold **I** and **III** together for 3 seconds.	3s		3s
	Move valve toward opened position.	Press **I** as needed.	As Needed		
	Move valve toward closed position.	Press **III** as needed.			As Needed
	Exit local valve control.	Press **II** briefly.		Brief	
Run PST	Begin Partial Stroke Test	Hold **III** for 3 seconds.			3s
	Abort Partial Stroke Test	Press **II** briefly.		Brief	
Command Source Reset (HART)	Change from digital command to analog command.	Hold **I** for 3 seconds.	3s		
Command Input Calibration (HART)	Initiate calibrations.	Hold **I**, **II** and **III** together for 3 seconds.	3s	3s	3s
	Select Command Input calibration and allow setting 0%.	Press **II** briefly.		Brief	
	Set 0%	Set input value and press **II** briefly.		Brief	
	Set 100% and complete calibration.	Set input value and press **II** briefly to complete calibration.		Brief	
	Abort calibration at any time.	Press **I**, **II** and **III** together briefly.	Brief	Brief	Brief
Analog Input Calibration (HART)	Initiate calibrations.	Hold **I**, **II** and **III** together for 3 seconds.	3s	3s	3s
	Select Analog Input calibration and allow setting 0%.	Press **I** briefly.	Brief		
	Set 0%	Set input value and press **II** briefly.		Brief	
	Set 100% and complete calibration.	Set input value and press **II** briefly to complete calibration.		Brief	
	Abort calibration at any time.	Press **I**, **II** and **III** together briefly.	Brief	Brief	Brief

Function	Step	Procedure	Button		
			I	II	III
Analog Output Calibration (HART)	Initiate calibrations.	Hold **I**, **II** and **III** together for 3 seconds.	3s	3s	3s
	Select Analog Output calibration and allow setting 100%	Press **III** briefly.			Brief
	Adjust output current to 100% position	Press **I** or **III** as needed.	Brief		Brief
	Store the 100% value and allow setting 0%.	Press **II** to move to the next step.		Brief	
	Adjust output current to 0% position.	Press **I** or **III** as needed.	Brief		Brief
	Complete calibration.	Press **II** to complete calibration.		Brief	
	Abort calibration at any time.	Press **I**, **II** and **III** together briefly.	Brief	Brief	Brief
Feedback Calibration	Initiate low level calibration functions.	Hold **I**, **II** and **III** together for 6 seconds.	6s	6s	6s
	Initiate feedback calibration function.	Press **I** briefly. Then rotate feedback arm all the way around.	Brief		
	Abort calibration at any time.	Press **I**, **II** and **III** together briefly.	Brief	Brief	Brief
View Software Versions	View SW version.	Hold **I** and **II** together for 3 seconds. (Major SW version will be shown.)	3s	3s	
	View Minor SW version.	Press **III** briefly.			Brief
	View Major SW version.	Press **I** briefly. (You can toggle back and forth.)	Brief		
	Exit viewing SW versions.	Press **II** briefly.		Brief	
Adjust LCD Screen Contrast	Enter contrast adjusting mode.	Hold **II** and **III** together for 3 seconds.		3s	3s
	Select higher contrast.	Press **I** as needed.	As Needed		
	Select lower contrast.	Press **III** as needed.			As Needed
	Exit contrast adjusting mode.	Press **II** briefly.		Brief	
Remote Mount Toggle	Change from RM to Positioner or back.	Hold **I** and **III** together for 6 seconds.	6s		6s

*A full calibration will run if no previous full calibration has been performed since factory reset.

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APPENDIX G - HOW TO ORDER

Table 19: Spare Parts Kits

Ref.	Description	Part No.
1	Electronics Module:	
	HART, LCD, Remote Mount (no IS)	373354.999.000
2	Piezo Assembly	218797.999.000
3	Feedback Assembly:	
	D Shaft KIT, LOGIX 38X	381225.999.000
	Reverse Spring D Shaft KIT, LOGIX 38X	603675.999.000
	NAMUR Shaft KIT LOGIX 38X	381226.999.000
	DD Shaft KIT LOGIX 38X	381227.999.000
	Reverse Spring DD Shaft KIT, LOGIX 38X	603676.999.000
	NAF Shaft KIT LOGIX 38X	381228.999.000
4	Direct Mounting Kit:	
	Alum. Ex d Housing	373043.999.000

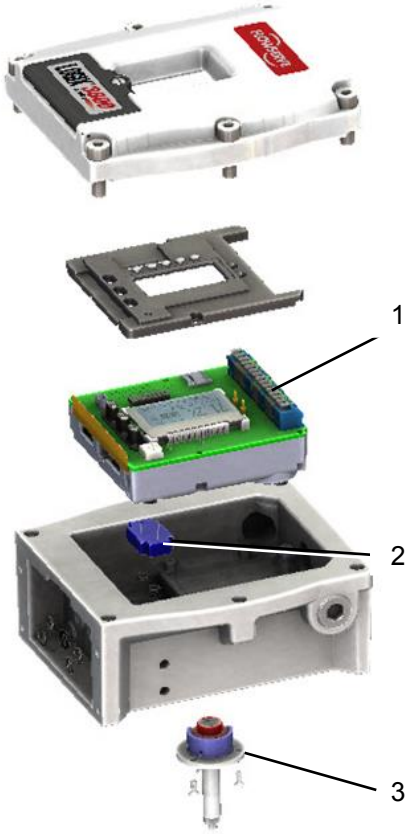

Figure 30: Spare Parts

Table 20: Linear Actuator Mounting Kits (D Shaft)

Positioner Mounting Kits, Logix 3800zb, Valtek Linear Actuators				
Stainless Steel				
SPUD	**Size 25**	**Size 50**	**Size 100/20**	**Size 300/400**
2	380558.150.000	380442.150.000		
2.62		381232.150.000	380298.150.000	
2.88			380298.150.000	
3.38			380417.150.000	380424.150.000
4.75			380417.150.000	380424.150.000
Mounting kits consist of all bracketing, bolting, stem clamps and stem clamp bolting, etc. required to mount the Logix 3800zb positioner. It does not include any actuator parts nor yoke clamps and bolting. Contact Flowserve for assistance in selected the correct mounting kit.				

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Table 21: Logix 3800zb Positioner Model Code

Selection	Description	Code
Base Model	Logix 3800zb Series	38
Communication	HART [1]	2
Housing	Aluminum – Ex d	1
	Stainless Steel – Ex d	2
Certifications	US Explosion Proof, Class I, Div 1, Gp A,B,C,D, Class II, Gp E,F,G, Class III CANADA Explosion Proof Class I, Div 1, Gp B,C,D, Class II, Gp E,F,G,Class III	45
Threaded Connections	Mounting: 5/16" 18 UNC, Conduit: 1/2" NPT	E
	Mounting: M8 x 1.25, Conduit: M20 x 1.5	M
Diagnostics	Standard Diagnostics (Standard Functionality)	0
Display	LCD[2]	1
Feedback Shaft	No Feedback Shaft	0
	D - 316 Stainless Steel Shaft (Valtek Standard)	1
	NAMUR - 316 Stainless Steel Shaft (VDI/VDE 3845)	2
	DD - 316 Stainless Steel Shaft (Logix 3200/3400 retrofit mounting)	3
	NAF – 316 Stainless Steel Shaft	4
	DD - 316 Stainless Steel Shaft (Valtek Standard)	5
	D - 316 Stainless Steel Shaft (Reverse Spring for long stroke)	6
	DD - 316 Stainless Steel Shaft (Reverse Spring for long stroke)	7
Mounting	Standard Mounting	0
Special Options	No Special Options	00
	Special Options	ZZ

Example: 3821ZB-45E-0110-00

1 HART 6 standard. Can be configured as HART 7 in the field.
2 LCD required for Remote Mount.
3 Only available with Ex d Housing

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To find your local Flowserve representative please use the Sales Support Locator System found at:

- www.flowserve.com
- digitalproductstac@flowserve.com
- Europe +43 (0) 4242 41181 999
- North America +1 801 489-2300
- Asia + (65) 6879 8900

www.flowserve.com/en/maximize-production-new-logix-3800-positioner

Download 3800 Manual

(Certification information in manual may not be applicable. Valid certifications are found on positioner labels.)

For more information about Flowserve Corporation, contact www.flowserve.com or call USA 1-800-225-6989.

Flowserve Headquarters
5215 N. O'Connor Blvd. Suite 2300
Irving, Tx. 75039
Phone: +1 972 443 6500

Flowserve Corporation
Flow Control Division
1350 N. Mt. Springs Parkway
Springville, UT 84663 USA
Phone: +1 801 489 8611
Fax: +1 801 489 3719

Flowserve Canada Inc.
9044 18th Street
Edmonton, Alberta
Canada T6P 1K6
Phone: +1 780 449 4850
Fax:+1 780 449 4850

Flowserve (Singapore) Pte Ltd.
12 Tuas Avenue 20
Republic of Singapore 638824
Phone:+ 65 6879 8900
Fax: +65 6862 4940

Flowserve Australia Pty Ltd.
14 Dalmore Drive
Scoresby, Victoria 3179 Australia
Phone: +61 397 593 300
Fax: +61 397 593 301

Brazil - Flowserve Ltda .
Rua Tocantins, 128
São Caetano do Sul, SP 09580-130
Brazil
Phone: +55 11 2169 6300
Fax: +55 11 2169 6313

Flowserve (Austria) Control Valves gmbH
Control Valves - Villach Operation
Kasernengasse 6
Villach, Carinthia Austria A-9500
Phone: +43 (0)4242 41181 0
Fax: +43 (0)4242 41181 50

Flowserve Netherlands
Ambachtsstraat 15
3176 PR Poortugaal
The Netherlands
Phone: +31 10 524 1050
Fax: +31 10 524 1055

Flowserve (China)
No. 35 Baiyu Road
Suzhou City, Jiangsu
China, 215021
Phone: +86 512 6255 2388

Flowserve India Controls
Plot No.4, 1 A, Road No. 8
Export Promotion Industrial Park (EPIP)
Whitefield, Bangalore – 560 066
Karnataka, India
Phone: +91 80 401 46217
Fax: +91 80 28 410286 -287

Flowserve Abahsain (Saudi Arabia) Flow Control Company Ltd.
Plot 10 & 12 Phase 4
2nd Industrial Area
Dammam Kingdom of Saudi Arabia 31952
Phone: +966 3 857 3150 X 243
Fax: +966 3 8574243

South Africa (Pty.) Ltd;
Unit N. 1
12 Director Road
Spartan, Ext 2, Kempton Park
Gauteng, South Africa
Phone: +27 11 923-7330
Fax: +27 11 974 6420

Flowserve Russia/Belorussia
2/1,Gamsonovsky Lane
115191 Moscow, Russia
Phone: +7 495 781-5977 / 79
Fax: +7 495 781-5979

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Initial release	February 9, 2023	0.0