Instruction Manual
D104738X012
April 2024

Fisher™ FIELDVUE™ 4400

Digital Position Transmitter

This manual applies to:

Device Type	0x1314
Device Revision	1
Firmware Revision	3
DD Revision	1

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Table of Contents

Section 1: Introduction

1.1 Scope of the Manual

This instruction manual includes specifications, installation, basic setup and configuration and maintenance and troubleshooting information for the Fisher FIELDVUE 4400 position transmitter.

This manual describes using the local interface or an Emerson handheld communicator, such as the AMS Trex Device Communicator, to setup and calibrate the instrument.

WARNING

Do not install, operate or maintain a FIELDVUE 4400 position transmitter without being fully trained and qualified in valve, actuator and accessory installation, operation and maintenance. To avoid personal injury or property damage, it is important to carefully read, understand and follow all of the contents of this manual, including all safety cautions and warnings. If you have any questions about these instructions, contact your Emerson sales office before proceeding.

Figure 1. FIELDVUE 4400 Digital Position Transmitter

X1858-1

Scan or click code for Installation Documents and Field Support.

1.2 Description

The FIELDVUE 4400 transmitter senses the position of rotary or sliding-stem valves, vents, dampers or other devices. It provides a precise 4 to 20 mA feedback signal to indicate equipment position with digital capability via HART® communication for process variable notifications and alerts/alarms. Position sensing uses a linkageless feedback design that eliminates direct contact with the measured device (e.g. valve, regulator, level, louver or other devices).

1.3 Specifications

Specifications for the FIELDVUE 4400 are shown in Table 1.

⚠ WARNING

This product is intended for a specific current range, temperature range and other application specifications. Applying different current, temperature and other service conditions may result in personal injury, property damage or malfunction of the product.

1.4 Educational Services

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Table 1. Specifications

Input Signal Source	Reference Accuracy
Hall Effect Sensor and magnet array	±1% of output span. Includes combined effects of hysteresis, linearity and deadband Limit Switch: 2% of travel span
Transmitter Output Signal	**Sensor Refresh Rate**
Analog 4 to 20 mA DC High saturation: 20.5 mA Low saturation: 3.8 mA High alarm (1): > 21.0 mA Low Alarm (1): < 3.6 mA **Digital** HART 1200 Baud Frequency Shift Keyed (FSK) HART Version 7 HART impedance requirements must be met to enable communication. Total shunt impedance across the master device connections (excluding the master and transmitter impedance) must be between 230 and 600 ohms. HART receive impedance: Rx: 28.06k ohms Cx: 5.84 nF **Output Current Limit** 30 mA DC maximum	100 ms / 10 Hz
	Repeatability
	±0.25% of span
	Electromagnetic Compatibility
	Meets EN61326-1:2013 Performance is shown in Table 2 and EN61326-3-2:2008 Performance is shown in Table 3
	General Electrical Safety - Environmental Conditions
	Use: Indoor and Outdoor Altitude: up to 2000 m Temperature: -40 to +80 °C / -40 to 176 °F Relative Humidity: 9.2 to 90% Supply Voltage Fluctuations: N/A, not connected to Mains Transient Overvoltage: Category I Pollution Degree: 4 Wet Locations: Yes
Recommended Power Supply	**Operating Ambient Temperature Limits (2)**
24 to 30 volts DC; 25 mA Instrument has reverse polarity protection. A minimum compliance voltage of 17.75 V DC (due to HART impedance requirement) is required to guarantee HART communication.	-40 to 80 °C / -40 to 176 °F
Integral Limit Switch	**Mounting**
Two isolated solid state limit switches, configurable throughout the calibrated travel range or actuated from a device alert Open State: 0 mA (nominal) Closed State: up to 1 A Supply Voltage: 8 to 30 V DC	The instrument can mount on the actuator of sliding-stem or rotary valves or it can be used for other applications. Refer to Bulletin D104740X012 for 4400 position monitor and magnet array dimensions.
Travel Limit Trip Points	**Actuator Compatibility**
Two	Stem Travel (Sliding-Stem Linear) Linear actuators with rated travel between 6.35 mm / 0.25 in. and 606 mm / 23.375 in. Shaft Rotation (Quarter-Turn Rotary) Rotary actuators with rated travel between 45° and 180° (3)

- continued -

Table 1. Specifications (continued)

Hazardous Area Approvals	Safety Instrumented System Classification
cCSAus – Flameproof (Ex d), Explosion-proof, Class I Div. 1, Class I Div. 2 (Canada & United States) ATEX – Flameproof, IECEx – Flameproof	SIL2 capable Refer to Safety Manual for Fisher FIELDVUE 4400 Digital Position Transmitter, D104753X012
Hazardous Area Approvals - PENDING	**Approximate Weight**
cCSAus – Intrinsically Safe, Dust Ignition-proof ATEX – Intrinsically Safe, Type n, Dust by intrinsic safety or by enclosure IECEx – Intrinsically Safe, Type n, Dust by intrinsic safety or by enclosure	Transmitter without mounting bracket: 1.8 kg / 4 lbs
Electrical Housing	**Construction Materials**
cCSAus – Type 4X, IP66 ATEX – IP66 IECEx – IP66	Housing, module base and terminal box: A03600 low copper aluminum alloy Elastomers: Fluorosilicone Mounting Hardware: Aluminum, stainless steel, and steel construction Pipe Plug: Steel with NCF coating

NOTE: Specialized instrument terms are defined in ansi/isa standard 51.1 - Process instrument terminology.

1. Only one high/low alarm available in a given configuration. Alarms are NAMUR NE43 compliant.
2. The temperature limits in this manual and any applicable standard or code limitation for valve should not be exceeded.
3. Rotary actuators with 180 degree rated travel require a special mounting kit; contact your Emerson sales office for kit availability.

Table 3. EMC Summary Results—Immunity per EN61326-1

Port	Phenomenon	Basic Standard	Test Level	Test Results[1][2]
Enclosure	Electrostatic discharge (ESD)	IEC 61000-4-2	4 kV contact 8 kV air	A
	Radiated EM field	IEC 61000-4-3	80 to 1000 MHz at 10 V/m with 1 kHz AM at 80% 1400 to 6000 MHz at 3 V/m with 1 kHz AM at 80%	A
	Radiated power frequency magnetic field	IEC 61000-4-8	30 A/m at 50 and 60 Hz	A
I/O signal/ control	Burst	IEC 61000-4-4	1 kV	A
	Surge	IEC 61000-4-5	1 kV (line to ground only, each)	B
	Conducted RF	IEC 61000-4-6	150 kHz to 80 MHz at 3 Vrms	A
Protective earth	Burst	IEC 61000-4-4	2 kV	A
	Surge	IEC 61000-4-5	2 kV (line to ground only)	B
	Conducted RF	IEC 61000-4-6	150 kHz to 80 MHz at 3 Vrms	A

1. A = No degradation during testing.
   B = Temporary degradation during testing, but is self-recovering.
   Specification limit = +/- 1% of span.
2. HART communication was considered as “not relevant to the process” and is used primarily for configuration, calibration and diagnostic purposes.

Table 2. EMC Summary Results—Immunity per EN61326-3-2

Port	Phenomenon	Basic Standard	Test Level	Test Results[1][2]
Enclosure	Electrostatic discharge (ESD)	IEC 61000-4-2	6 kV contact 8 kV air	A
	Radiated EM field	IEC 61000-4-3	80 to 1000 MHz at 10 V/m with 1 kHz AM at 80% 1400 to 2000 MHz at 10 V/m with 1 kHz AM at 80% 2000 to 2700 MHz at 3 V/m with 1 kHz AM at 80%	A
	Radiated power frequency magnetic field	IEC 61000-4-8	100 A/m at 50 and 60 Hz	A
I/O signal/ control	Burst	IEC 61000-4-4	1 kV	A
	Surge	IEC 61000-4-5	1 kV (line to ground only, each)	FS
	Conducted RF	IEC 61000-4-6	10 kHz to 80 MHz at 3 Vrms	A
Protective earth	Burst	IEC 61000-4-4	2 kV	A
	Surge	IEC 61000-4-5	1 kV (line to ground only)	A
	Conducted RF	IEC 61000-4-6	10 kHz to 80 MHz at 10 Vrms	A

1. A = no degradation during testing.
   B = temporary degradation during testing, but is self-recovering.
   FS = FAIL-SAFE.
   Specification limit = +/- 1% of span.
2. HART communication was considered as “not relevant to the process” and is used primarily for configuration, calibration and diagnostic purposes.

Section 2: Security

NOTICE

Physical security is an important part of any security program and is fundamental to protecting your system. Unauthorized personnel may potentially cause significant damage to and/or misconfiguration of end users equipment. This could be intentional or unintentional and must be protected against by restricting access of unauthorized personnel in your facility.

- The 4400 transmitter has several features to help protect against unintentional configuration changes:
  - System stores configuration and log data
  - 4400 Signed Firmware
  - Configuration lock switch
  - Cannot be connected directly to a network and cannot access the worldwide internet
- If unsecured, any device in the field is vulnerable to a physical attack; safety and security procedures must include mitigation by physical security controls.
- The following are unsecured, unencrypted inputs and outputs used by the 4400 transmitter:
  - AO – position feedback
  - DO – two solid state position limit switches
  - HART - used for digital communication
  - Zero pushbutton, Span pushbutton and LED indicator – used for local calibration
- The configuration lock switch, located under the terminal cover, will prohibit configuration and calibration changes over all interfaces. Refer to the Calibrate and Configure the Position Transmitter section (page 18) for additional information on the lock switch.
- The 4400 has optional applications for configuration and data viewing. When such applications are used, they must run on devices that are configured according to local security policies.
- The device has been developed using secure coding principals and procedures, including threat modeling and security specific testing. It has several interfaces for configuration, with each of them having an option to disable write options.
- There are multiple ways to configure the device, including:
  - The Zero pushbutton and the Span pushbutton, located under the cover.
  - The FDI (Field Device Integration) or DD (Device Description) used with asset manager software such as AMS Device Manager or a handheld communicator such as Emerson Trex.

- Product Operation Best Practices:
  - Ensure that operation personnel are trained both on local security policies and the secure operation of the 4400.
  - It is recommended that you set the configuration lock switch in the enabled position after configuration is complete.
  - Operate the device within a controlled and secured physical environment.
  - Operate the 4400 and the FDI/DD host within a controlled and secured network environment.
  - Configure the FDI/DD host to allow users to have least privilege access to the 4400, providing access to only what is absolutely required to perform their job function.
  - Apply security patches and updates as they are released.

NOTE

Work with your Emerson sales office to stay informed and obtain access to security patches and updates.

- Report security incidents and potential product vulnerabilities at:

  https://go.emersonautomation.com/reportvulnerability_en
- Password Management Best Practices:
  - Manage FDI/DD host user passwords per local security policy.
- Product Disposal Guidelines

When the device needs to be disposed of, consider the following aspects of device removal:

Identify whether the device can be reused in another part of the process or for testing or training purposes.

Identify what data is stored on the device and sanitize this data with the latest industry recommended methods. To restore the device back to factory defaults:

1. Set *Restore Configuration Defaults on Power Cycle* to *Reset Configuration*.
2. Save the variable setting by hitting Send.
3. Select *Reset Device*.
4. If using an FDI/DD host wait approximately 30 seconds for logs, variables, cycle counter and configuration change alert to update. The LED indicator, located under the cover, will turn off during the reset and come back on green when the reset is complete.

- If the device will not be reused, follow local disposal policy.

Section 3: Installation

⚠ WARNING

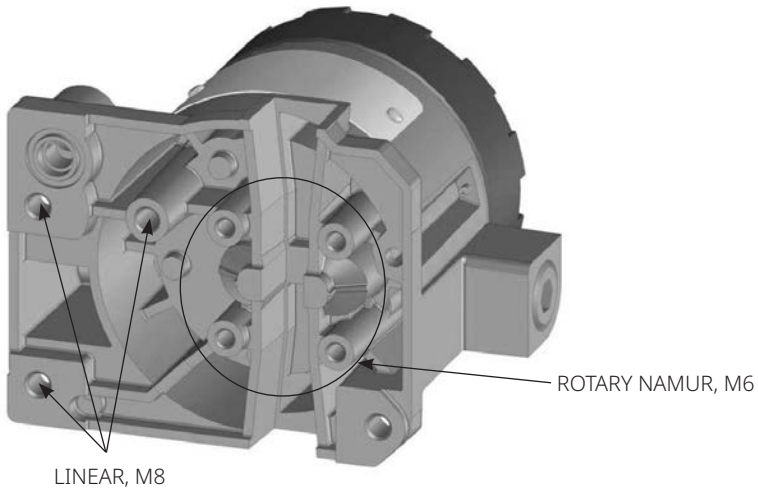
Avoid personal injury or property damage from sudden release of process pressure or bursting of parts. Before performing any installation procedures:

- **Always wear protective clothing, gloves and eyewear.**
- **Do not remove the actuator from the valve while the valve is still pressurized.**
- **Disconnect any operating lines providing air pressure, electric power, or a control signal to the actuator. Be sure the actuator cannot suddenly open or close the valve.**
- **Use bypass valves or completely shut off the process to isolate the valve from process pressure. Relieve process pressure from both sides of the valve.**
- **Use lock-out procedures to be sure that the above measures stay in effect while you work on the equipment.**
- **Check with your process or safety engineer for any additional measures that must be taken to protect against process media.**
- **Vent the pneumatic actuator loading pressure and relieve any actuator spring precompression so the actuator is not applying force to the valve stem; this will allow for the safe removal of the stem connector.**

3.1 General Mounting Guidelines

If ordered as part of a control valve assembly, the factory will mount the position transmitter on the actuator and calibrate the instrument. If you purchased the position transmitter separately, you will need a mounting a kit. The following procedures are general guidelines. See the instructions that come with the mounting kit for detailed information on mounting the position transmitter to a specific actuator model. Figure 2 shows the available mounting variations.

Figure 2. Mounting Variations



NOTICE

The magnet assembly material has been specifically chosen to provide a long-term stable magnetic field. However, as with any magnet, care must be taken care when handling the magnet assembly. Another high powered magnet placed in close proximity (less than 25 mm) can cause permanent damage. Potential sources of damaging equipment include, but are not limited to: transformers, DC motors, stacking magnet assemblies.

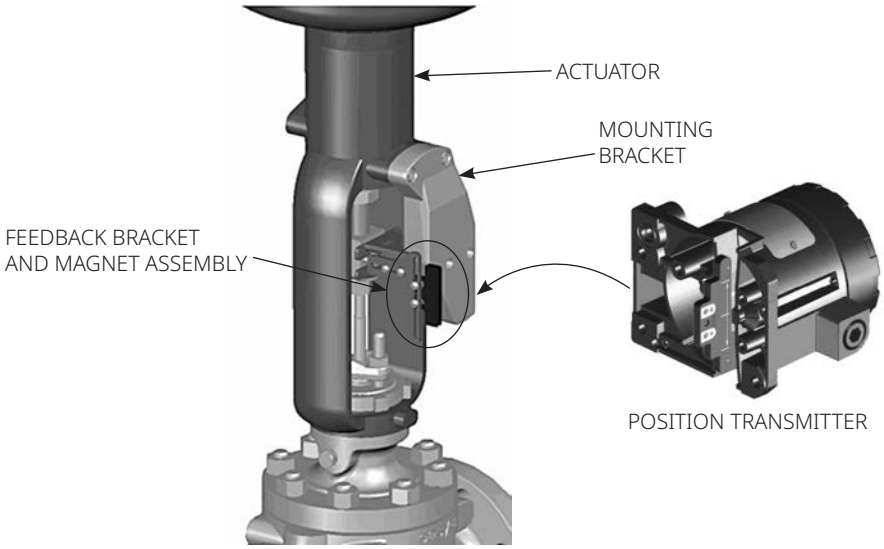
Use of High Power Magnets with the 4400

- **Magnetic Tip Screw Driver - Magnetic tip screw drivers can be used to work on the 4400 position transmitter. However, they should not be brought in close proximity to the magnet assembly (located at the back of the instrument) during process operations. Additionally, they should not be used inside the 4400 terminal box as they can cause the LED to flicker or change color.**
- **Calibrator Strap Magnets - These are high power magnets used to hold 4 to 20 mA calibrators. Normally, these calibrators would not be used while an instrument is controlling the process. High power magnets should be kept at least 15 cm / 6 in. from the 4400.**

NOTE

As a general rule, do not use less than 50% of the magnet assembly travel range for full travel measurement. Performance will decrease as the assembly is increasingly subranged. The linear magnet assemblies have a valid travel range indicated by arrows molded into the piece. This means that the hall sensor (the center point of the channel on the back of the 4400 housing) has to remain within this range throughout the entire valve travel. The linear magnet assemblies are symmetrical. Either end may be up. The magnet assembly may be referred to as a magnetic array in user interface tools.

Figure 3. Mounting Parts for Sliding-Stem Actuator with up to 210 mm / 8.25 in. Travel



3.2 Mounting on Sliding-Stem Linear Actuators

Bracket Mounted

Up to 210 mm / 8.25 in. Travel (Figure 3)

Before mounting, verify that linear travel is greater than one-half and not more than the recommended travel of the feedback kit.

1. Isolate the control valve from the process line pressure and release pressure from both sides of the valve body. Shutoff all pressure lines to the pneumatic actuator, releasing all pressure from the actuator. Use lock-out procedures to be sure that the above measures stay in effect while working on the equipment.
2. Attach to the mounting bracket to the actuator.
3. Loosely attach the feedback pieces and magnet assembly to the valve stem connector. Do not tighten the fasteners until the magnet assembly is centered and aligned in steps 4 and 5.

NOTE

Do not install a magnet assembly that is shorter than the physical travel of the actuator. Loss of feedback will result from the magnet assembly moving outside the range of the index mark in the feedback slot of the position transmitter housing.

Figure 4. Magnet Assembly Alignment, Fail Close

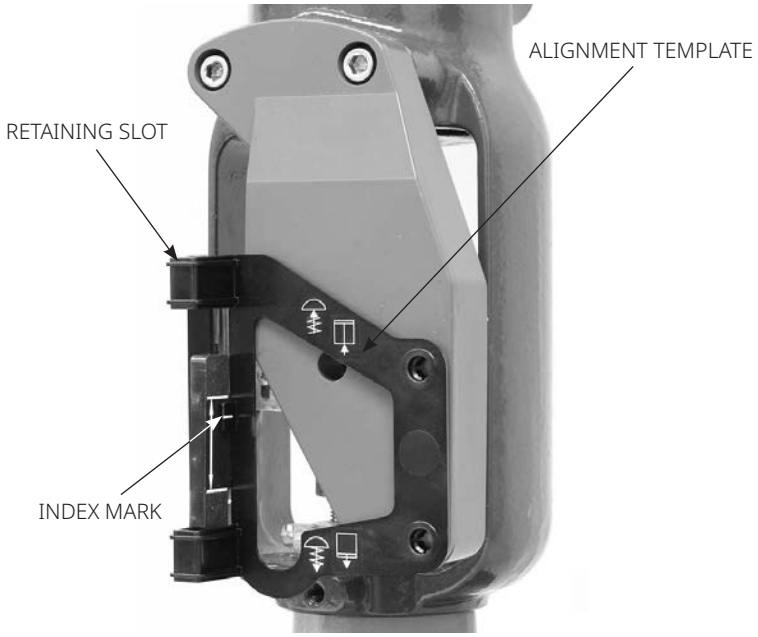
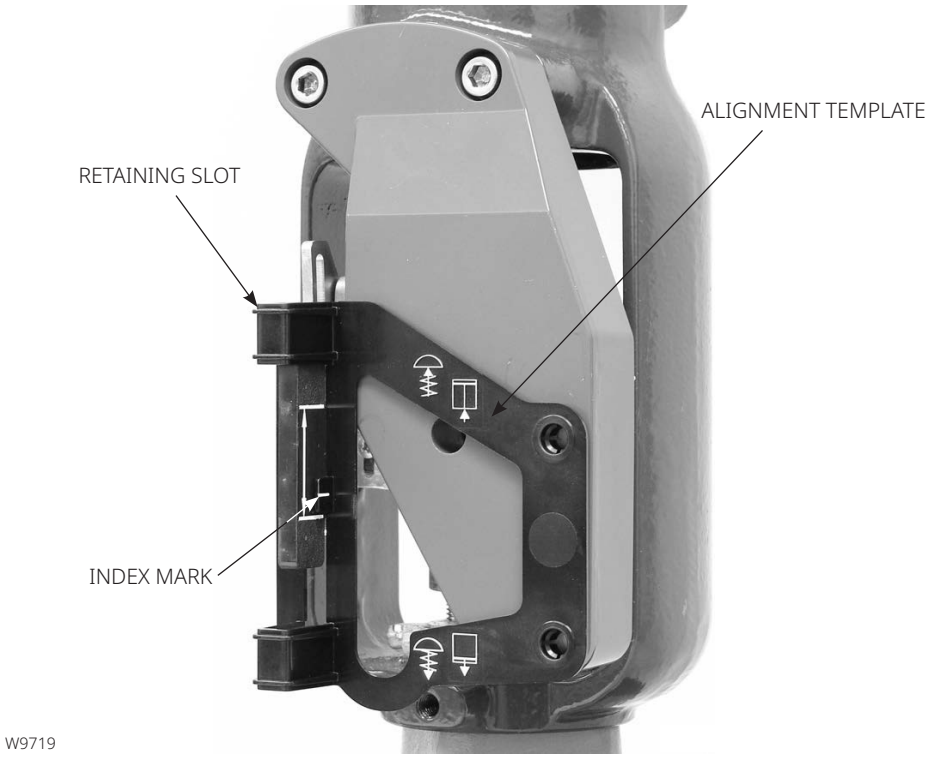


Figure 5. Magnet Assembly Alignment, Fail Open



4. Center the magnet assembly inside the retaining slot 5.7 mm / 0.22 in. away from the bottom base of the housing as measured from the center of the assembly bolt holes to the base of the housing (see Figure 4).
5. Align the magnet assembly as shown in Figure 5.
6. Tighten the fasteners.

NOTE

Use a flat end hex key to tighten the magnet assembly fasteners to a torque of 2.37 N•m / 21 lbf•in. for 4 mm screws and 5.08 N•m / 45 lbf•in. for 5 mm screws. For added security, especially in vibrating services, blue (medium) threadlocker may be used on the fasteners.

7. Mount the position transmitter to the mounting bracket, using the mounting bolts. Any of the mounting holes may be used for linear actuators.
8. Once the instrument is mounted, perform the local interface calibration procedure, as described in the Calibrate and Configure the Position Transmitter section.

9. Verify the magnet assembly position through the entire travel range before putting into service.

NOTE

Ensure that there is clearance between the magnet assembly and the 4400 housing slot throughout the full range of travel.

Actuators over 210 mm / 8.25 in. Travel (Figure 6)

1. Isolate the control valve from the process line pressure and release pressure from both sides of the valve body. Shut off all pressure lines to the pneumatic actuator, releasing all pressure from the actuator. Use lock-out procedures to be sure that the above measures stay in effect while working on the equipment.

Figure 6. Mounting on Sliding-Stem (Linear) Actuators over 210 mm / 8.25 in. Travel

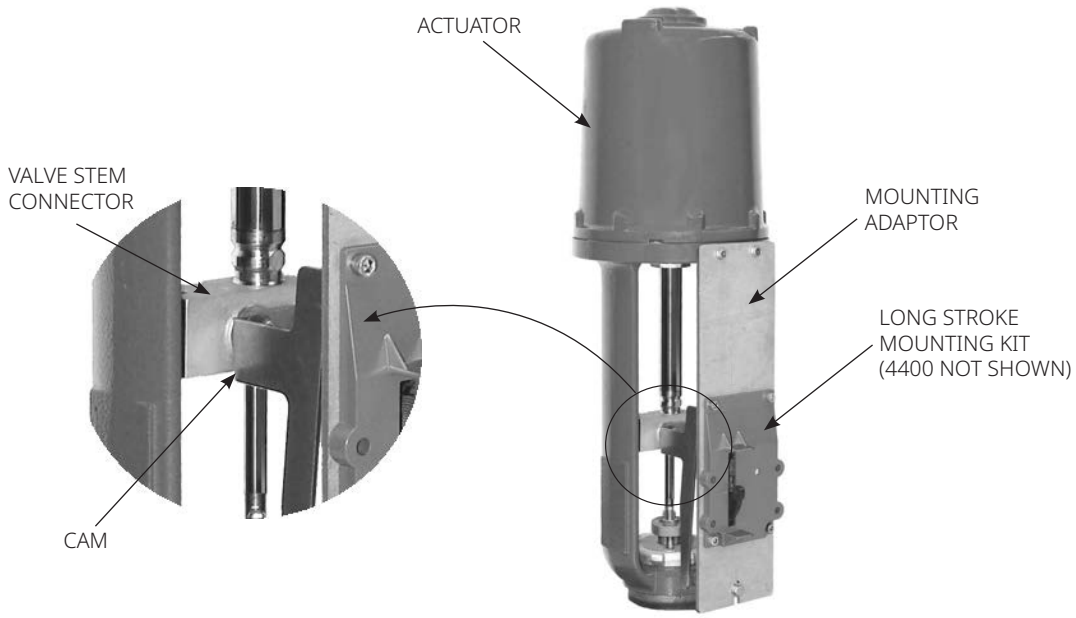
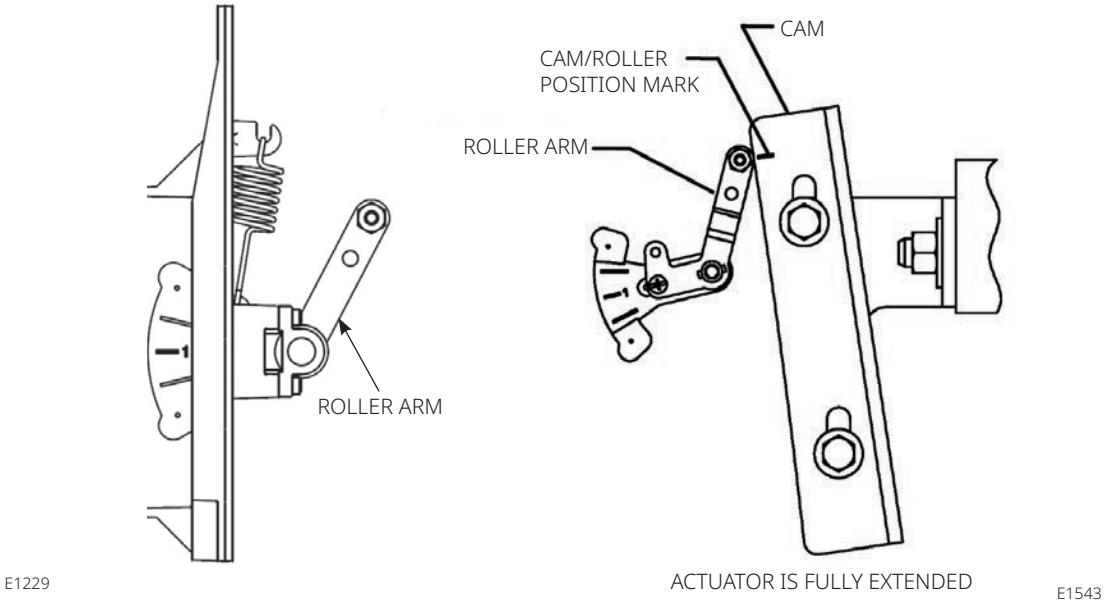


Figure 7. Roller Arm Variation Used for Sliding-Stem (Linear) Actuators over 210 mm / 8.25 in. Travel



2. Install the cam to the valve stem connector as described in the instructions included with the mounting kit.
3. Install the mounting adaptor to the actuator.
4. Attach the position transmitter and mounting kit assembly to the mounting adaptor. The roller on the position transmitter feedback arm will contact the actuator cam as it is being attached.

3.3 Quarter-Turn Rotary Actuators

The 4400 can be mounted to any quarter-turn rotary shaft actuator, as well as those that comply with the NAMUR guidelines. A mounting bracket and associated hardware are required. Refer to Figure 8.

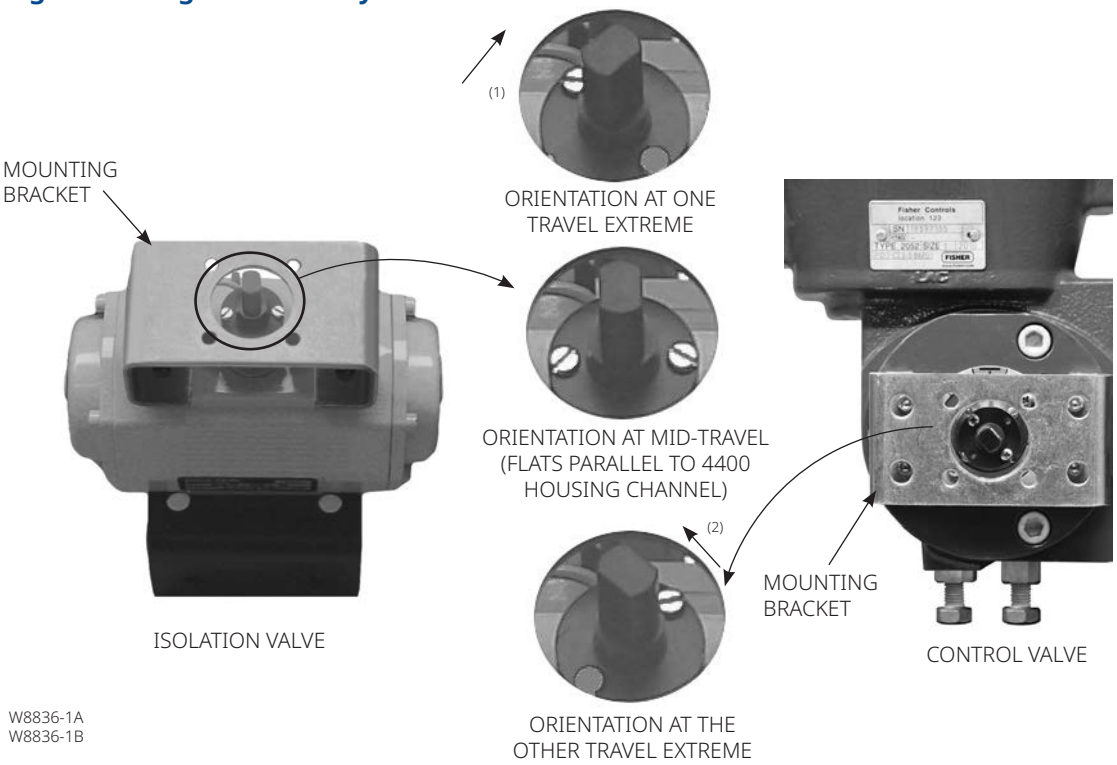
Before mounting, verify the rotary motion is 45 to 90 degrees of rotation.

1. Isolate the control valve from the process line pressure and release pressure from both sides of the valve body. Shut off all pressure lines to the pneumatic actuator, releasing all pressure from the actuator. Use lock-out procedures to be sure that the above measures stay in effect while working on the equipment.
2. Attach the magnet assembly to the actuator shaft. At mid-travel, the flats on the magnet assembly should be approximately parallel to the channel on the back of the 4400 housing, as shown in Figure 8.

NOTE

When the actuator is at its travel limit, the feedback array must always be at a 45° angle, regardless of the orientation of the position transmitter.

Figure 8. Magnet Assembly Orientation



NOTES:
1. IF THE ACTUATOR IS STROKED ALL THE WAY TO THE RIGHT OR CLOCKWISE, ATTACH THE MAGNET ASSEMBLY SO IT POINTS TO THE UPPER RIGHT CORNER OF THE INSTRUMENT.
2. IF THE ACTUATOR IS STROKED ALL THE WAY TO THE LEFT OR COUNTERCLOCKWISE, ATTACH THE MAGNET ASSEMBLY SO IT POINTS TO THE UPPER LEFT CORNER OF THE INSTRUMENT.

3. Install the mounting bracket on the actuator.
4. Attach the position transmitter to the mounting bracket using the four mounting bolts.
5. Check for clearance between the magnet assembly and the positioner feedback slot.
6. Once the instrument is mounted, perform the local interface calibration procedure, as described in the Calibrating the LUI section.
7. Verify that the magnet assembly remains centered throughout the entire rotating range.

3.4 Electrical Connections

Position Transmitter or Discrete Switch

The position transmitter circuit derives its operating power from the control system input channel in the same manner as a two-wire system.

The discrete switch is a solid state circuit (1 ampere maximum) which opens and closes based on a user configurable trip point. The trip point can be based on valve travel anywhere within the calibrated travel range. In order for the switch output to function, the position transmitter must be powered. If power is lost, the switch will always go to the open state. The output circuit, whether operating as a transmitter or switch, is galvanically isolated from the position control loop circuit such that different ground references between the two circuits are allowed.

Follow the steps below to connect field wiring to the 4400 transmitter.

⚠ WARNING

Select wiring and/or cable glands that are rated for the environment of use (such as hazardous area, ingress protection and temperature). Failure to use properly rated wiring and/or cable glands can result in personal injury or property damage from fire or explosion.

Wiring connections must be in accordance with local, regional and national codes for any given hazardous area approval.

Failure to follow the local, regional and national codes could result in personal injury or property damage from fire or explosion.

To avoid personal injury resulting from electrical shock, do not exceed maximum input voltage specified on the product nameplate. If the input voltage specified differs, do not exceed the lowest specified maximum input voltage.

Personal injury or property damage caused by fire or explosion may occur if electrical connections are attempted in a potentially explosive atmosphere or in an area that has been classified as hazardous. Confirm that area classification and atmosphere conditions permit the safe removal of the terminal box cover before proceeding.

NOTE

Do not use magnetic screwdrivers inside the 4400 terminal box, as they can cause the LED to flicker or change color.

NOTICE

Resistors are required when using limit switches. Failure to correctly install a limit switch resistor when required, as illustrated in Figure 10, could result in permanent damage to the 4400 transmitter.

1. Remove the terminal box cover.
2. Route the field wiring into the terminal box through the conduit connection, see Figure 9.

NOTE

Install conduit using local and national electrical codes relevant to the connection.

3. Connect the control system input channel positive wire to the LOOP + terminal (see Figure 10 for wiring diagram.)
4. Connect the control system input channel negative wire to the LOOP terminal (see Figure 10).
5. Install a 250 ohm resistor to provide correct impedance for HART communication on the LOOP - terminal.
6. Replace and hand tighten the cover on the terminal box.

Figure 9. Transmitter without Cover

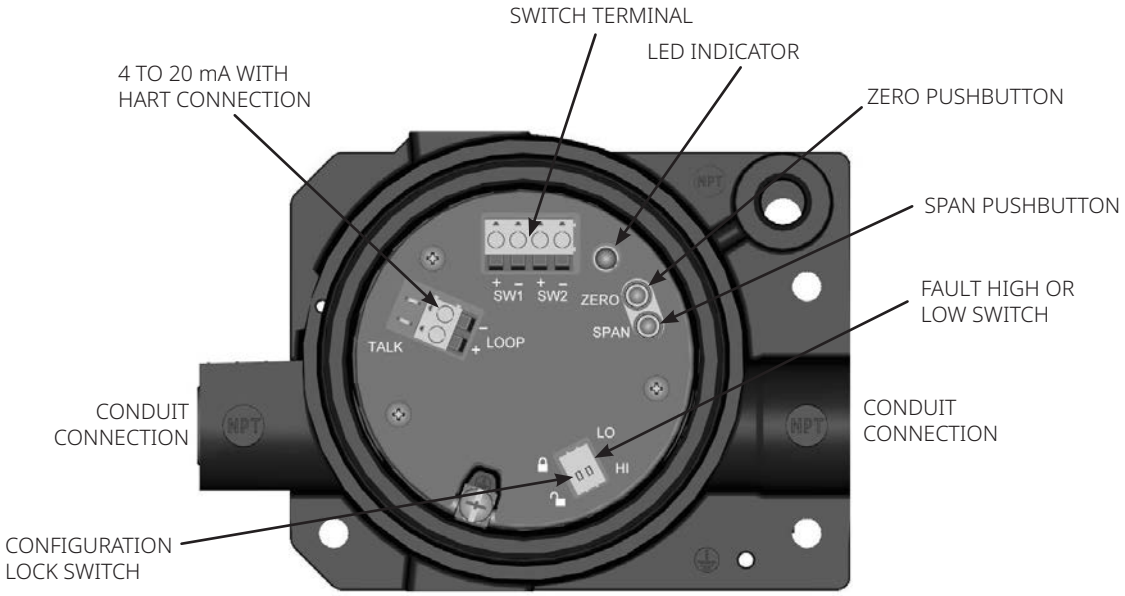
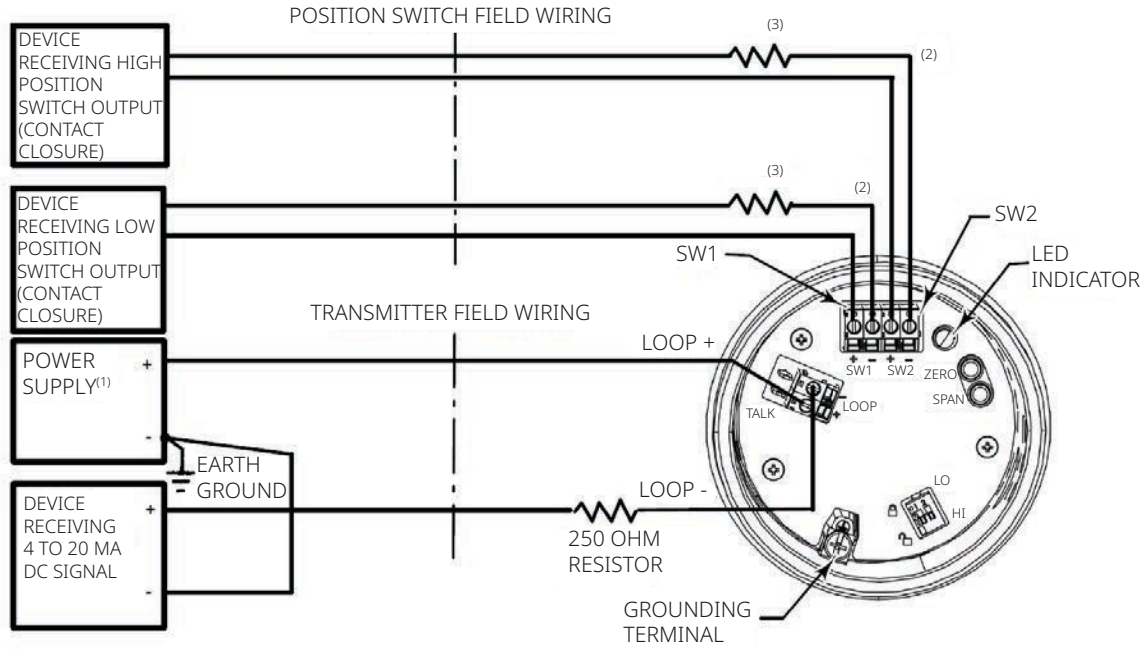


Figure 10. Wiring Diagram



NOTES:

1. RECEIVING DEVICE MAY BE ANALOG CURRENT INPUT TO DISTRIBUTED CONTROL SYSTEM, PROGRAMMABLE LOGIC CONTROLLER OR INDICATING DEVICE. INDICATING DEVICE CAN BE A VOLTMETER ACROSS A 250 OHM RESISTOR OR A CURRENT METER.
2. CONFIGURABLE SWITCH. DEFAULT SETTING: DURING NORMAL OPERATIONS, SW1 AND SW2 ARE ENERGIZED. SW1 AND SW2 ARE USER CONFIGURABLE AS TO WHETHER THEY ARE NORMALLY OPEN (NO) OR NORMALLY CLOSED (NC). AS SHIPPED FOR BOTH SWITCHES IS DEFINED AS NORMALLY OPEN, DISABLED. A TRIPPED (OR ALARM) CONDITION IS WITH THE SWITCH(ES) DE-ENERGIZED, WHICH CONNECTS THE COMMON (C) TERMINAL TO THE NORMALLY CLOSED (NC) TERMINAL.
   * WHEN THE SWITCH IS DEFINED AS NORMALLY OPEN, THE SWITCH WILL ALLOW THE CURRENT TO FLOW THROUGH ONCE IT IS ACTUATED (HIGH OR LOW LIMIT BEING TRUE). IN ZERO POWER STATE, NO CURRENT WILL FLOW THROUGH THE SWITCH.
   * WHEN THE SWITCH IS DEFINED AS NORMALLY CLOSED, THE SWITCH WILL NORMALLY ALLOW CURRENT FLOW. THE SWITCH WILL STOP THE CURRENT ONCE IT IS ACTUATED (HIGH OR LOW LIMIT BEING TRUE). IN ZERO POWER STATE, NO CURRENT WILL FLOW THROUGH THE SWITCH.
3. RESISTOR REQUIREMENTS: NOMINAL 1K OHM RECOMMENDED.

3.5 Calibrate and Configure the Position Transmitter

1. Install the latest version of the communication software on the user interface tool.

NOTE

This may include an FDI package or DD. Contact your Emerson sales office to ensure you have the latest software version or for information on locating the necessary files.

2. If you have not already done so, perform the Electrical Connections procedure on page 15.
3. Remove the cover to apply electrical power to the position transmitter.
4. Ensure the LED is solid green prior to calibrating the instrument.

NOTE

If the LED is not green, check the magnet assembly position and adjust as needed. Ensure the instrument is in service. If performing the calibration procedure after a failed calibration the LED will be blinking red. Cycle instrument power before attempting another calibration.

5. Proceed to the calibration procedure on the next page.

NOTE

The TALK terminals are located under the transmitter cover.

NOTE

In order to perform calibration and/or configuration procedures, the configuration lock switch (shown in Figure 9) must be in the unprotected position (🔓) and the instrument must be In Service.
Once calibration and configuration is complete, set the configuration lock switch to the protected position (🔒) to prevent configuration and calibration changes to the instrument.

Calibrate

NOTICE

When accessing the pushbuttons or terminals, proper means of electrostatic discharge protection is required. Failure to provide appropriate protection can cause the device to malfunction.

The primary function of the local user interface is for calibration. However, an LED on the local user interface can provide information for checking the status of the device, as well as connected equipment or valve, as follows:

Green:	Normal, no issues
Green blink:	Indicates an alert is active
Red solid:	Failure - replace device, solid red during calibration for 2 seconds only
Red blink:	Function Check, calibration error, Calibration in Progress and/or Out of Service.

NOTE

The cover must be removed for the LED on the local user interface to be visible, as well as to access the zero and span buttons.
Ensure the LED is solid green prior to calibrating the instrument. If the LED is is not solid green, check the magnet assembly position and adjust as needed to change to solid green.
If performing the calibration procedure after a failed calibration the LED will be blinking red. Cycle instrument power before attempting another calibration.

An Emerson handheld communicator provides access to calibration and setup information, as well as various service tools.

NOTE

The valve must move from open to closed, or vice versa, in order for the position transmitter to be calibrated. The Zero and Span buttons and LED (shown in Figure 9) are used during calibration. Press both for 3 to 8 seconds until the LED flashes red, see Calibration section below. Attempting to calibrate the device without moving the valve will result in the action being discarded; the operation of the device will be unchanged. The calibration function of the local user interface can be locked out from the HART master for security purposes.

Calibrating via the LUI

1. Ensure the instrument is In Service.
2. Verify the actuator or other device is at one end of travel.
3. Press both zero and span buttons for 3 to 8 seconds, then release. The LED will blink red after the buttons are released.
4. Move to the zero position and press and release the zero button. The red LED will remain solid for 2 seconds then resume blinking.
5. Move the actuator or other device to the other end of travel and press and release the span button. The red LED will remain solid for 2 seconds then resume blinking.
6. Calibration is complete when the LED turns solid green.

Using an Emerson Handheld Communicator

1. Connect to device using TREX or other handheld communicator.
2. Open the device and go to Process Variables to take out of service.
3. Once out of service go to Configure > Guided setup.
4. Start calibration and follow instructions to move to and select the Zero position. The red LED will remain solid for 2 seconds then resume blinking. You will then be instructed to set the Zero again or press next to set span.
5. Move the actuator or other device to the other end of travel and select span. The red LED will remain solid for 2 seconds. The handheld will ask to set again or continue.
6. Follow the prompts to fill in Calibration details.
7. Calibration is complete when the LED turns solid green.
8. Return the instrument to in service.

NOTE

The LED will blink red if calibration is not successful. If unsuccessful, check mounting and verify that at least 50% of the magnet assembly travel range is used.
In the event of an unsuccessful calibration the device reverts back to the prior calibration.

NOTE

The limit switches do not require an independent calibration; they are calibrated as part of the Zero and Span calibration.

3.6 Configuration

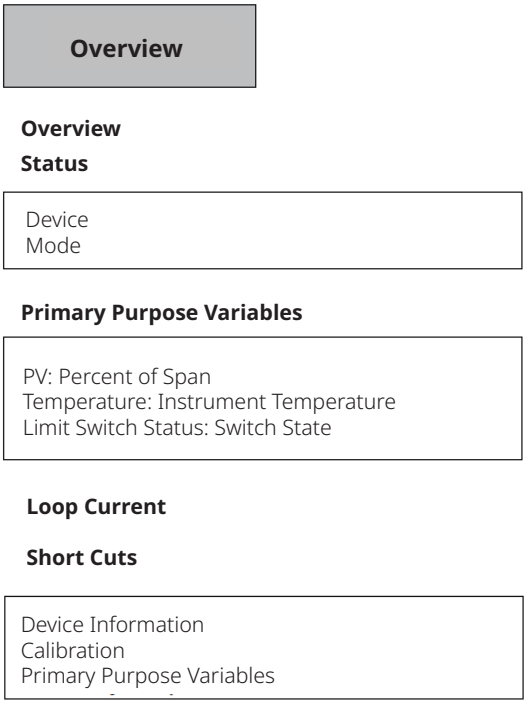
Smart Instruments are considered universal; they can be used with any final control element from any manufacturer. The default factory configuration of universal instruments may not fit or suit the application, therefore the ability to change or alter the device configuration is necessary.

This section describes the 4400 transmitters advanced features and parameters that can be accessed with a handheld communicator. See Figures 11, 12, 13 and 14 for the menu structure.

NOTE

Various menu items/parameters within the menu structure are defined alphabetically on the following pages.

Figure 11. Overview



Calibrate Time Delay
The 4400 captures the first end point and stores it indefinitely until the second end point is captured. This is used to provide baseline time for open/closed diagnostics/alerts.

Close State Dwell Time is the length of time, in seconds, the position remained in the closed state.

Cycle Counter
The capability of the instrument to record the number of times the travel changes direction. The change in direction must occur after the deadband has been exceeded before it can be counted as a cycle.

Deadband (Limit Switch)
The difference between the trip and reset points of a relay, set in percent (%).

Descriptor
Enter a descriptor for the application with up to 16 characters. The descriptor provides a longer user-defined electronic label to assist with more specific instrument identification than is available with the Tag.

Device includes Important information regarding the connected instrument such as device type, firmware and hardware revisions, functional options and the HART ID identifier.

Dynamic Variables:
Input Voltage
Instrument Temperature
Cycle Counter
Switch One State
Switch Two State
Last Time Closed
Last Time Open
Closed State Dwell Time
Open State Dwell Time
Percent of Span
Travel Accumulator

Instrument Date
Allows you to set the date on the instrument clock for use in stamping logged events. The order of year, month and day depends on the setting of the operating system. For example, enter the date in the form MM/DD/YYYY, where MM is two digits for the month (1 through 12), DD is two digits for the day (1 through 31) and YYYY is four digits for the year (1980 through 2040).

Instrument Time
Allows you to set the time. The instrument clock uses a 24-hour format. Enter the time in the form HH:MM:SS, where HH is two digits for the hour (00 to 23), MM is two digits for the minutes (00 to 59) and SS is two digits for the seconds (00 through 59).

When alerts are stored in the alert record, the date and time (obtained from the instrument clock) that they were stored is also stored in the record.

Instrument Serial Number
Enter the serial number on the instrument nameplate, up to 12 characters.

Figure 12. Configure

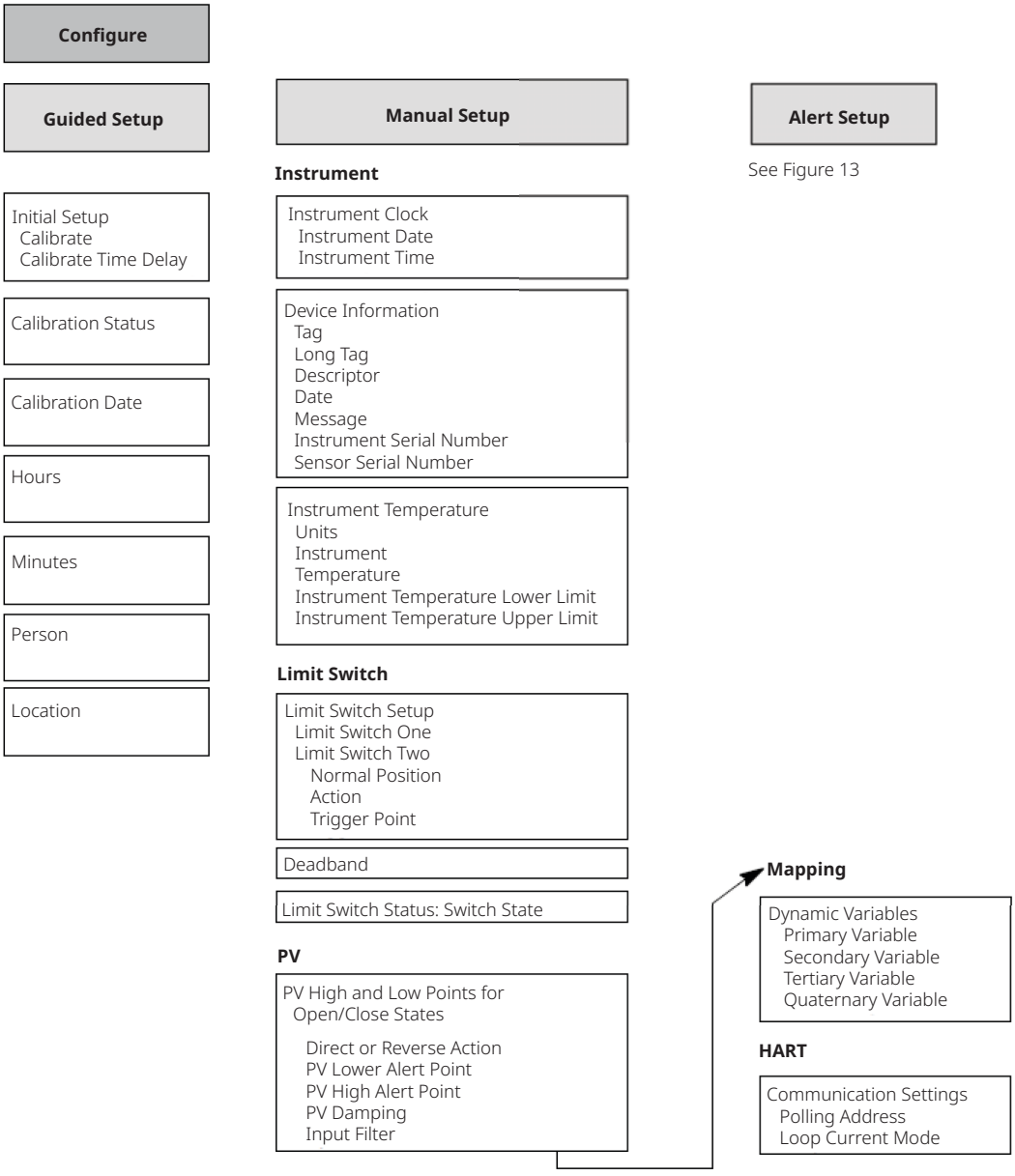


Figure 13. Configure: Alert Setup

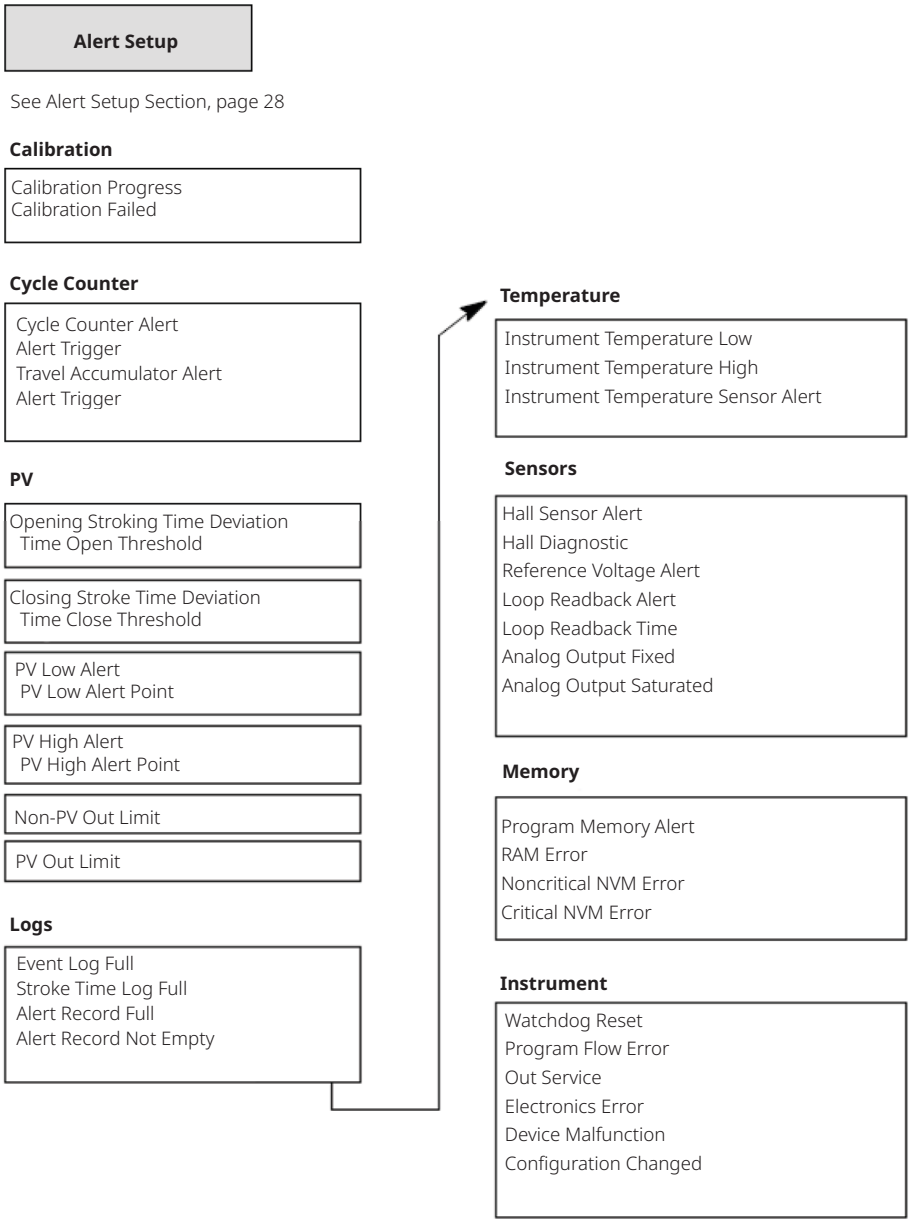


Figure 14. Service Tools

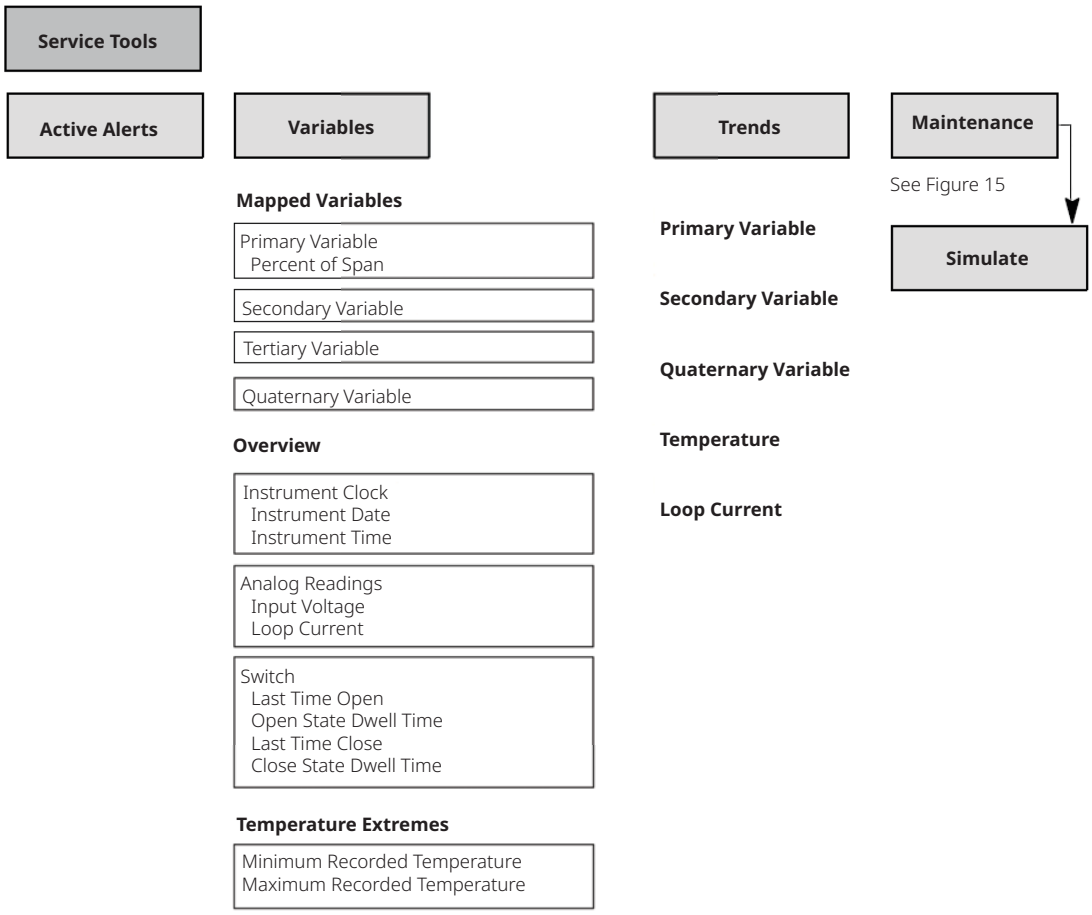
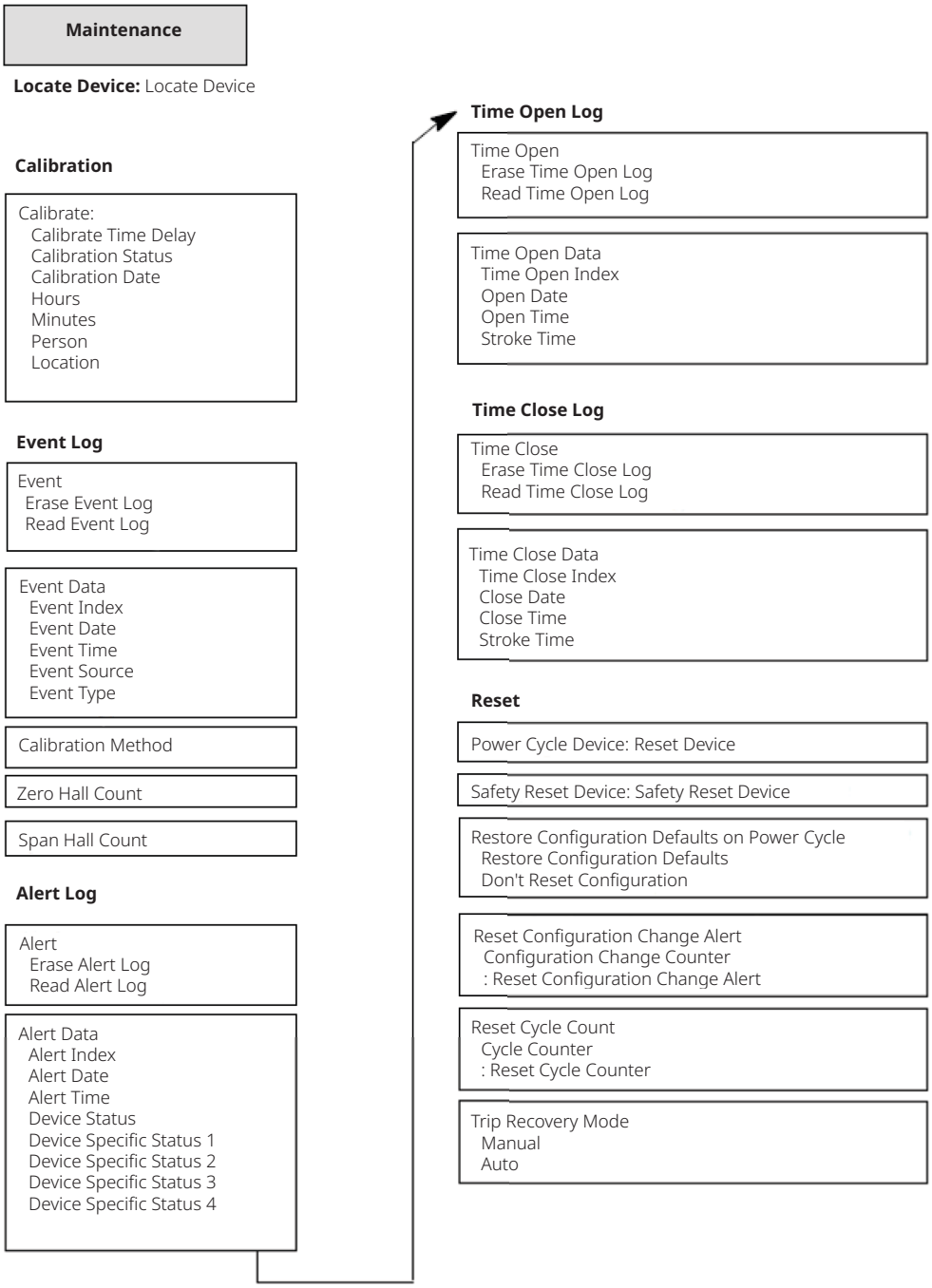


Figure 15. Service Tools: Maintenance



Limit Switch One
Limit Switch Two
Set the Normal Position (Open or Close), Action (Disable, Trip Above or Trip Below), the Trigger Point (equipment position desired for the switch to change state), and the Deadband (percent [%] of ranged travel around the trigger point, where the switch will not change state; default is 1%).

If the 4400 experiences a power interruption the switch will go to the open state. Upon loss of power the switches will default to the open state. Default is normally open.

NOTE

For SIL applications, the Limit Switch must be configured to Normally Closed.

Loop Current refers to the instrument's output current of 4 .0 mA to 20.0 mA for normal operation based on array position and calibration. Alert state outputs of High (21.5 mA) and Low (3.6 mA) are displayed when the device's travel sensor is out of range. Alert points of High or Low are configurable parameters.

Long Tag is a tag name of up to 32 characters used to help distinguish the instrument from other instruments.

Mapping
Allows configuration of the dynamic variables. The secondary, tertiary and quaternary variables can be mapped in any order from the drop down menu of the available variables (see Dynamic Variables above).

Message
Enter any message with up to 32 characters. The Message field provides the most specific user-defined means for identifying individual instruments in multi-instrument environments.

Mode
Instrument Mode allows you to place the device in-service for operational function or out-of-service for installation and maintenance task.

Open State Dwell Time is the length of time, in seconds, the position remained in the open state.

Polling Address is used by the Host to identify a field device on the wired maintenance port. It has no significance on the wireless network and can only be edited at the maintenance port. Default is 0, addressable range is 0 through 63.

Primary Variables
PV, SV, TV and QV are selectable variables that are broadcasted in HART from the device. PV (Primary Variable) is locked in for Percent (%) of Span and cannot be changed. Variable SV (Secondary Variable), TV (Tertiary Variable) and QV (Quaternary Variable) are selectable from the available dynamic variables (see page 26). Factory default settings are as follows:

PV: Percent of Span (locked, cannot be changed)
SV: Temperature: Instrument's internal temperature in degrees, selectable for °F or °C
TV: Limit Switch 1 Status: Current #1 switch state
QV: Limit Switch 2 Status: Current #2 switch state

Reset

Power Cycle Device resets the device and has the same effect as removing power from the instrument. It should only be used if the instrument has become unresponsive.

Safety Reset Device will restore the loop current if all safety critical alerts are resolved.

Restore Configuration Defaults on Power Cycle will restore the instrument to factory default configuration if enabled. This should be used as a last resort as it will reset all settings, including calibration.

Reset Configuration Change Alert will clear the configuration changed alert.

Reset Cycle Count will set the cycle counter value to zero.

Trip Recovery Mode determines the action to release the device from the safe state.

NOTE

When the 4400 position transmitter is used in SIS applications Trip Recovery Mode must be set to Manual.

When used in non-SIS applications the 4400 position transmitter Trip Recovery Mode should be set to Auto. If set to Manual and the device trips on sensor out of range it will lock and remain locked until reset via DD or cycle power.

Sensor Serial Number
Enter the serial number on the sensor nameplate, up to 12 characters.

Simulate
Provides enable/disable feature for simulation of alerts. Any alert can be simulated and viewed.

Status
Instrument alerts, when enabled, detect many operational and performance issues that may be of interest. If there are no alerts currently active, Status is shown as GOOD on a green background. When the Status is BAD, it will be seen on a red background and the menu item may be expanded to display a list of active alerts, together with their PlantWeb Alert categories, description, recommended actions and, where applicable, helpful troubleshooting procedures, images or variable values.

Last Close Time is the value, in seconds, of when the position moved from the open state to the closed state.

Last Open Time is the value, in seconds, of when the position moved from the closed state to the open state.

NOTE

Closed state default is 10% of span. Open state default is 90% of span.

Tag
Enter the Tag for the instrument (up to 8 characters). The Tag is the easiest way to distinguish between instruments in a multi-instrument environment. Use the Tag to label instruments electronically according to the requirements of your application.

Trends
Trend charts of the Primary, Secondary, Tertiary and Quaternary Variables, plus Instrument Temperature and Loop Current.

Alert Setup

Alerts, when enabled, detect many operational and performance issues that may be of interest. To view these alerts, you must open the appropriate status screen on a host system.

User configured alerts are grouped into four categories consistent with NAMUR NE 107:

Failure: Transmitter output signal is invalid due to due to malfunction in the field device or its sensors.

Function Check: Output signal temporarily invalid (e.g., frozen) due to ongoing work on the device.

Maintenance Required: Although the output signal is valid, a function will soon be restricted due to operational conditions.

Out of Specification: The device is operating outside its specified range or an internal diagnostic indicates deviations from measured or set values due to internal problems in the device or process characteristics.

NOTE

Various alerts are defined alphabetically below.

Analog Output Fixed indicates that the output is in fixed current mode, not tracking process.

Analog Output Saturated indicates that the analog output is saturated at 3.6 mA or 21.5 mA.

Closing Stroke Time Deviation is active when the time it takes for the valve to move from the open state to the closed state exceeds the defined Time Open Threshold. Disabled by default.

Critical NVM Error indicates that configuration data affecting the critical parameters in the memory is corrupted.

Cycle Counter Alert is set when the value exceeds the set Alert Trigger [expressed in percent (%)]. Reset the Cycle Counter to a value less than the alert trigger to clear the alert.

Hall Diagnostic indicates that the internal hall diagnostics has possible failure in the Hall circuitry.

Hall Sensor Alert indicates that the hall sensor reading has not been changing for ten consecutive samples or has violated one of the hard-coded limits.

Instrument Temperature High is active if the temperature is greater than the Instrument Temperature Upper Limit.

Instrument Temperature Low is active if the temperature is below than the Instrument Temperature Lower Limit.

Instrument Temperature Sensor Alert is active if the Temperature Sensor reading is outside the functional range.

Noncritical NVM Error indicates that non-critical configuration data in the memory is corrupted.

Non-PV Out Limit indicates that the process applied to the non-primary variable is outside the operating limits of the field device.

Opening Stroke Time Deviation is active when the time it takes for the valve to move from the closed state to the open state exceeds the defined Time Open Threshold. Disabled by default.

Out Service indicates the instrument is Out of Service, indicated by a red blinking light.

NOTE

The cover must be removed for the LED on the local user interface to be visible.

Program Flow Error indicates that the instrument is not performing the expected series of calculations.

Program Memory Alert is active if a pending Flash or NVM failure is present.

PV High Alert indicates that the primary variable has violated the user-specified PV High Alert Point [expressed in percent (%)].

PV Low Alert indicates that the primary variable has violated the user-specified PV Low Alert Point [expressed in percent (%)].

PV Out Limit indicates that the process applied to the primary variable is outside the operating limits of the field device.

RAM Error indicates an error in the RAM test.

Reference Voltage Failure is active if there is a failure associated with the internal voltage reference. If this alert is active, replace the printed wiring board assembly.

Travel Accumulator Alert is active when the Travel Accumulator value exceeds the Travel Accumulator Alert Point. It clears after you reset the Travel Accumulator to a value less than the alert point.

Watchdog Reset indicates the watchdog timer has timed out, triggering a hardware reset.

Section 4: Maintenance

There are no repairable or replaceable parts on the 4400 digital position transmitter, with the exception of the feedback array/magnet assembly. Contact your Emerson sales office if a replacement 4400 transmitter is needed; refer to the Parts Kits information below for feedback array kits.

4.1 Replacing the Magnetic Feedback Assembly

The magnet assembly material has been specifically chosen to provide a long-term stable magnetic field. Magnetic feedback assemblies generally only need to be replaced if you want to mount the 4400 transmitter on a different size or type of actuator. Follow the below instruction to remove and replace the magnet assembly.

⚠ WARNING

Refer to the WARNING at the beginning of the Installation section.

To remove the magnet assembly from the actuator stem, perform the following basic steps:

1. Remove the 4400 from the actuator.
2. Remove the screws holding the magnet assembly to the connector arm.
3. Install the new magnet assembly per the appropriate Mounting procedure (see page 8 for mounting guidelines and procedures).

Once the instrument is mounted, perform the calibration routine before putting back into service.

Replacing the Instrument

To replace an instrument that was previously mounted to a control valve with a new 4400 transmitter, follow the appropriate mounting procedure, found in the Installation section. Once the instrument is mounted, perform the calibration routine provided in the Calibrate and Configure the Position Transmitter section, before putting back into service.

Section 5: Parts Ordering

There are no repairable or replaceable parts on the 4400 digital position transmitter, with the exception of the feedback array/magnet assembly. Contact your Emerson sales office if a replacement 4400 transmitter is needed; refer to the Parts Kits information below for feedback array kits.

⚠ WARNING

Use only genuine Fisher replacement parts. Components that are not supplied by Emerson should not, under any circumstances, be used in any Fisher instrument. Use of components not supplied by Emerson may void your warranty, might adversely affect the performance of the instrument and could cause personal injury and property damage.

5.1 Parts Kits

Kit	Description	Part Number
1	Feedback Array Kit	
	Sliding Stem (Linear) [kit contains feedback array and hex socket cap screws, qty. 2, washer, plain, qty. 2, external tooth lock washer, qty. 2 (only with aluminum feedback array kit).	- - -
	210 mm / 8-1/4 in. kit contains feedback array and hex socket cap screws, qty. 4, washer, plain, qty. 4, external tooth lock washer, qty. 4 (only with aluminum feedback array kit) and insert]. Stainless steel kits only for use with stainless steel mounting kits.	
	7 mm / 1/4-in. Aluminum Stainless steel	 GG20240X012 GE65853X082
	19 mm / 3/4-in. Aluminum Stainless steel	 GG20240X022 GE65853X012
	25 mm / 1-in. Aluminum Stainless steel	 GG20240X032 GE65853X022
	38 mm / 1-1/2 in. Aluminum Stainless steel	 GG20240X042 GE65853X032
	50 mm / 2-in. Aluminum Stainless steel	 GG20240X052 GE65853X042
	110 mm / 4-1/8 in. Aluminum Stainless steel	 GG20240X082 GE65853X062
	210 mm / 8-1/4 in. Aluminum Stainless steel	 GG20243X012 GE65853X072

Kit	Description	Part Number
1	Feedback Array Kit (continued)	
	Rotary [Kit contains feedback assembly, pointer assembly, travel indicator scale and M3 machine pan head screws qty. 2].	
	Stainless steel kits only for use with stainless steel mounting kits.	
	Aluminum	GG10562X012
	Stainless steel	GG10562X022
	Rotary with Coupler [Kit contains feedback assembly and NAMUR coupler]	
	Aluminum	GE71982X012
	Stainless steel	GE71982X022

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