

# Fisher™ D4 Control Valve with Gen 2 easy-Drive™ Electric Actuator

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Figure 1. Fisher D4 Control Valve with Gen 2 easy-Drive Electric Actuator



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## Introduction

### Scope of Manual

This instruction manual provides installation, maintenance, and parts information for the Fisher D4 control valve with Gen 2 easy-Drive electric actuator. For Gen 1 electric actuators, use Fisher D4 with easy-Drive Instruction Manual ([D103597X012](#)).

Do not install, operate, or maintain a D4 control valve with Gen 2 easy-Drive electric actuator 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 the contents of this manual, including all safety cautions and warnings. If you have any questions about these instructions, contact your [Emerson sales office](#) or Local Business Partner before proceeding.

Table 1. Specifications

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
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| <p><b>Valve Body Sizes and End Connection Styles<sup>(1)</sup></b><br/>See table 2</p> <p><b>Maximum Inlet Pressures and Temperatures<sup>(1)</sup></b><br/>If the valve nameplate shows an ASME pressure-temperature class, maximum inlet pressure and temperature is consistent with the applicable class per ASME B16.34. If the nameplate does not show an ASME class, it will show a maximum cold working pressure at 38°C (100°F) (for example, 293 bar [4250 psi])</p> <p><b>Maximum Pressure Drops<sup>(1)</sup></b><br/>See table 4</p> <p><b>Shutoff Classification per ANSI/FCI 70-2 and IEC 60534-4</b><br/>Class IV</p> <p><b>Material Temperature Capabilities<sup>(1)</sup></b><br/>Valve Body Assembly:<br/><i>Standard Bonnet O-Ring:</i> -40 to 135°C (-40 to 275°F)<br/><i>Optional Fluorocarbon Bonnet O-Ring:</i> -23 to 204°C (-10 to 400°F)</p> <p><b>Flow Characteristic</b><br/>Equal percentage</p> <p><b>Flow Direction</b><br/>Flow up only</p> <p><b>Port Diameters</b><br/>See table 2</p> <p><b>Valve Plug Travel</b><br/>19 mm (0.75 inch)</p> <p><b>Valve Plug Style</b><br/>Micro-Form valve plug</p> <p><b>Available Actuator Configurations</b><br/>On/off (snap acting)<br/>Positioning (flow or pressure control)</p> | <p><b>Power Requirements</b><br/>9-30VDC, minimum 4 amp power supply required (fuse to 5 amps)</p> <p><b>Maximum Current Draw</b><br/>4 amps</p> <p><b>Idle Current Draw</b><br/>15 mA at 24VDC, 25 mA at 12VDC</p> <p><b>Conduit Connections</b><br/>Two 3/4 NPT connections</p> <p><b>Stroke Length</b><br/>19 mm (0.75 inch)</p> <p><b>Nominal Stroke Speed<sup>(2)</sup></b><br/>3.9 mm/s (0.15 inch/s) at 24 VDC<br/>2.2 mm/s (0.09 inch/s) at 12 VDC</p> <p><b>Hazardous Area Approvals</b><br/>CSA (C/US): Explosion-Proof Class I, Division 1, Groups C and D, T6, Ex d IIA T6, Class I, Zone 1, AEx d IIA T6<br/>ATEX Flameproof - Gas:<br/>⊕ II 2 G, Ex db IIA T6<br/>IECEx Flameproof - Gas: Ex db IIA T6</p> <p><b>Enclosure Rating</b><br/>Type 4X and IP66</p> <p><b>Duty Cycle</b><br/>50% maximum</p> <p><b>Enclosure Material</b><br/>Cast aluminum alloy with powder coat paint</p> <p><b>Approximate Weight:</b><br/>22 - 51 kg (49 - 113 lbs), depending upon construction</p> |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

1. The pressure or temperature limits in the referenced tables and any applicable ASME code limitations should not be exceeded.

2. 10% variation can be expected, based on temperature and pressure of application.

## Description

The D4 control valve with easy-Drive electric actuator is a compact, rugged valve designed primarily for high-pressure throttling applications. This valve is ideal for use on pressure and flow control applications within the oil and gas production industry. The D4 valve also makes an excellent dump valve for high-pressure separators and scrubbers.

The D4 control valve meets the metallurgical requirements of NACE MR0175/ISO 15156 without environmental limits for temperatures below 135°C (275°F). If the temperature is above 135°C (275°F), the N07718 Belleville washers will impose some limits, as shown in table 3.

## Specifications

Table 1 lists specifications for the D4 control valve with easy-Drive electric actuator. Some of the specifications for a given control valve as it originally comes from the factory are stamped on a nameplate located on the lower actuator enclosure.

## Educational Services

For information on available courses for the Fisher D4 control valve with easy-Drive electric actuator, as well as a variety of other products, contact:

Emerson Automation Solutions  
 Educational Services - Registration  
 Phone: 1-641-754-3771 or 1-800-338-8158  
 E-mail: education@emerson.com  
 emerson.com/fishervalvetraining

Table 2. Valve Sizes and Connection Styles

| VALVE SIZE, NPS | PORT DIAMETER, (INCHES)         | SCREWED  | RAISED FACE (RF) FLANGED |       |       |                  | RING TYPE JOINT (RTJ) FLANGED |                  |
|-----------------|---------------------------------|----------|--------------------------|-------|-------|------------------|-------------------------------|------------------|
|                 |                                 | 4250 psi | CL150                    | CL300 | CL600 | CL900 and CL1500 | CL600                         | CL900 and CL1500 |
| 1               | 0.25, 0.375, 0.5, 0.75          | X        | X                        | X     | X     | X                | X                             | X                |
| 2               | 0.25, 0.375, 0.5, 0.75, 1, 1.25 | X        | X                        | X     | X     | X                | X                             | X                |

X = Available construction.

Table 3. D4 Environmental Limits for NACE MR0175/ISO 15156 with Sour Trim

| MAXIMUM TEMPERATURE |     | MAXIMUM H <sub>2</sub> S PARTIAL PRESSURE |      | COMPATIBLE WITH ELEMENTAL SULFUR |
|---------------------|-----|-------------------------------------------|------|----------------------------------|
| °C                  | °F  | MPa                                       | psia |                                  |
| 232                 | 450 | 0.2                                       | 30   | No                               |
| 204                 | 400 | 1.4                                       | 200  | No                               |
| 199                 | 390 | 2.3                                       | 330  | No                               |
| 191                 | 375 | 2.5                                       | 360  | No                               |
| 149                 | 300 | 2.8                                       | 400  | No                               |
| 135                 | 275 | No Limit                                  |      | Yes                              |

Table 4. Fisher D4 easy-Drive Maximum Pressure Drop

| PORT DIAMETER |       | MAXIMUM PRESSURE DROP <sup>(1)</sup> |                     |
|---------------|-------|--------------------------------------|---------------------|
| mm            | Inch  | Bar                                  | psi                 |
| 6.4           | 0.25  | 293                                  | 4250 <sup>(1)</sup> |
| 9.5           | 0.375 | 293                                  | 4250 <sup>(1)</sup> |
| 12.7          | 0.5   | 247                                  | 3576 <sup>(1)</sup> |
| 19.1          | 0.75  | 105                                  | 1518                |
| 25.4          | 1     | 56                                   | 814                 |
| 31.8          | 1.25  | 34                                   | 495                 |

1. Downstream pressure, P2, is limited to 2250 psig.

## Installation

### ⚠ WARNING

Always wear protective gloves, clothing, and eyewear when performing any installation operations to avoid personal injury.

To avoid personal injury or property damage caused by bursting of pressure-retaining parts or by uncontrolled process fluid, be certain the service conditions do not exceed the limits shown on the valve nameplate and in table 1. Use pressure-relieving devices required by government or accepted industry codes and good engineering practices.

Check with your process or safety engineer for any additional measures that must be taken to protect against process media.

If installing into an existing application, also refer to the WARNING at the beginning of the Maintenance section in this instruction manual.

### ⚠ WARNING

For explosion-proof applications, ensure the actuator cover is properly bolted before applying power to the actuator. Personal injury or property damage may result from fire or explosion if power is applied to the actuator with the cover removed in a hazardous area.

For explosion-proof applications, install rigid metal conduit and a conduit seal no more than 457 mm (18 inches) from the actuator. Personal injury or property damage may result from explosion if the seal is not installed.

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.

### CAUTION

When ordered, the valve configuration and construction materials were selected to meet particular pressure, temperature, pressure drop, and controlled fluid conditions. Responsibility for the safety of process media and compatibility of valve materials with process media rests solely with the purchaser and end-user. Since some body/trim material combinations are limited in their pressure drop and temperature ranges, do not apply any other conditions to the valve without first contacting your [Emerson sales office](#) or Local Business Partner.

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To avoid product damage, inspect the valve before installation for any damage or any foreign material that may have collected in the valve body. Also remove any pipe scale, welding slag, or other foreign material from the pipeline.

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### **⚠ WARNING**

Avoid personal injury or property damage caused by possible actuator failure. The use of a rigidly-mounted support on the actuator casing may cause additional stress on the actuator leading to premature wear and/or failure of the actuator components.

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### **CAUTION**

To avoid product damage, inspect the valve before installation for any damage or any foreign material that may have collected in the valve body. Also remove any pipe scale, welding slag, or other foreign material from the pipeline.

---

1. Before installing the control valve assembly, inspect it for any damage and for any foreign material that may have collected in the valve body.
2. Remove any pipe scale, welding slag, and other foreign material from the pipeline.
3. The control valve can be installed in any position, but normally the actuator is vertical above the valve. Install the valve so the flow direction arrow on the side of the valve indicates the direction of the process flow.
4. Install the valve following local and national piping codes when they apply to the application. For screwed connections, treat the external pipe threads with a good grade pipe compound. For flanged valves, use suitable gaskets between valve and pipeline flanges.
5. If continuous operation is required during maintenance and inspection, install a conventional three-valve bypass around the valve.

## Special Instructions for “Safe Use” and Installations in Hazardous Locations

### ATEX/IECEX

### **⚠ WARNING**

To avoid static discharge from the enclosure, do not rub or clean the enclosure with solvents. To do so could result in an explosion. Clean with a mild detergent and water only.

The enclosure is non-conducting and may generate an ignition-capable level of electrostatic charges under certain extreme conditions. The user should ensure that the equipment is not installed in a location where it may be subjected to external conditions (such as high-pressure steam) which might cause a build-up of electrostatic charges on non-conducting surfaces. Additionally, cleaning of the equipment shall only be done with a damp cloth.

To avoid damage to the enclosure, when screws are fully tightened into blind holes in enclosure walls, with no washer fitted, at least one full thread shall remain free at the base of the hole.

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## Startup Overview

Figure 2. Flowchart

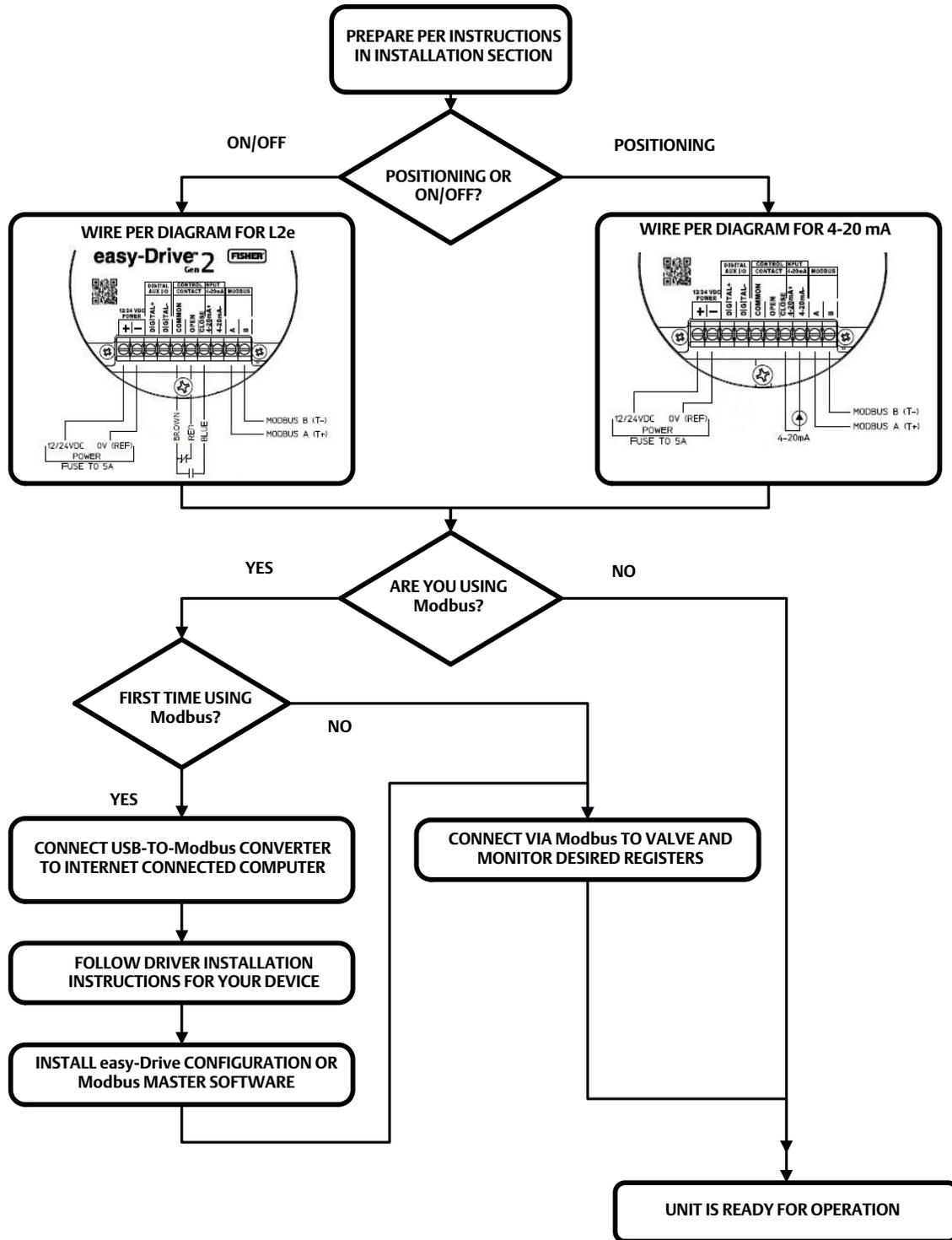
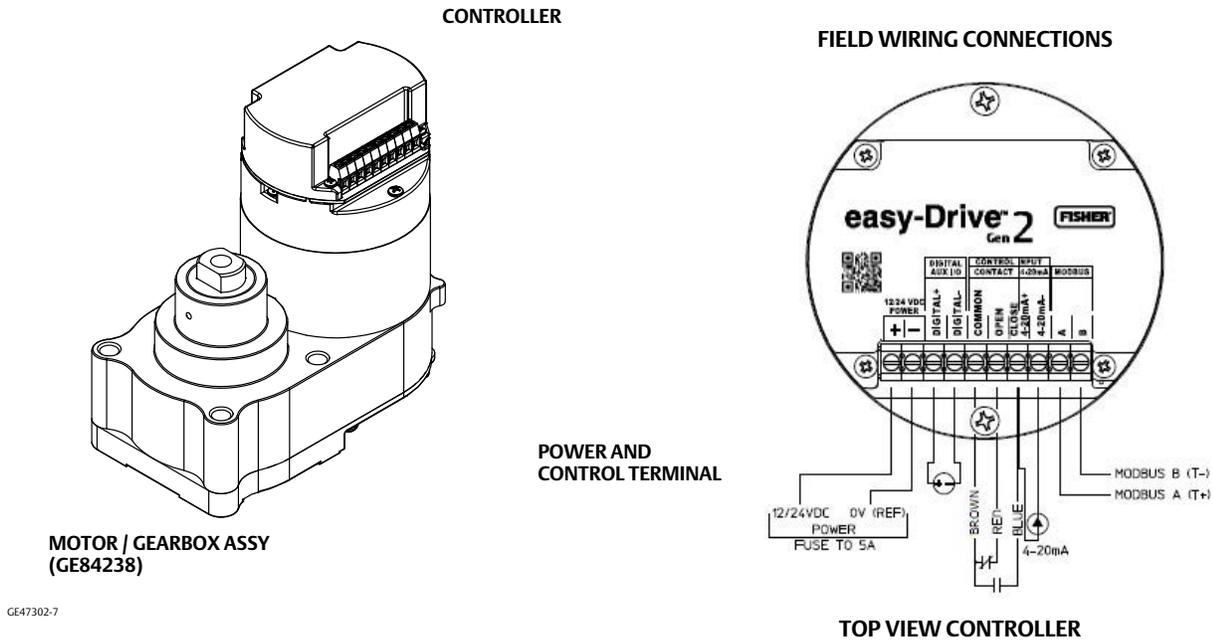


Figure 3. Fisher D4 Valve with Gen 2 easy-Drive Actuator Wiring Diagram



## Power Requirements

Ensure a stable DC power source is available, maintaining less than 5% ripple and sufficiently surge protected for the application. A 4 amp (minimum) power supply is required.

## Wiring Instructions

1. Observe local wiring requirements for hazardous location usage.
2. Conduit seals within 450 mm (18 inches) of the enclosure port are required for explosion-proof installation.
3. 18AWG (0.52mm<sup>2</sup>) to 12AWG (3.31mm<sup>2</sup>) wire size required.
4. Fuse system to 5A.
5. Connect enclosure and analog signal shields.
6. Ensure power is turned off before connecting the wires.

## Power

1. Connect 12 or 24 VDC reference to: –
2. Connect 12 or 24 VDC positive to: +
3. Be sure to tighten terminals sufficiently to ensure solid mechanical connection.

Figure 4. Wiring - Analog Input

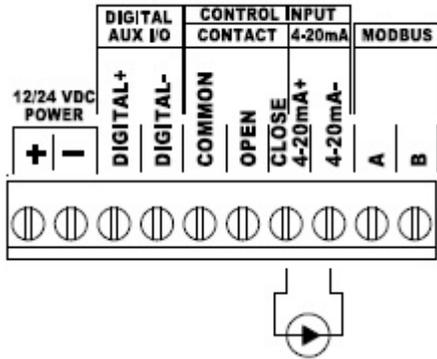


Figure 5. Wiring - L2e

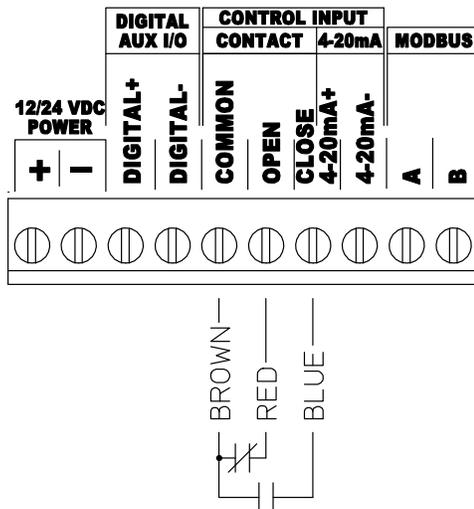


Figure 6. Wiring - Single Dry Contact

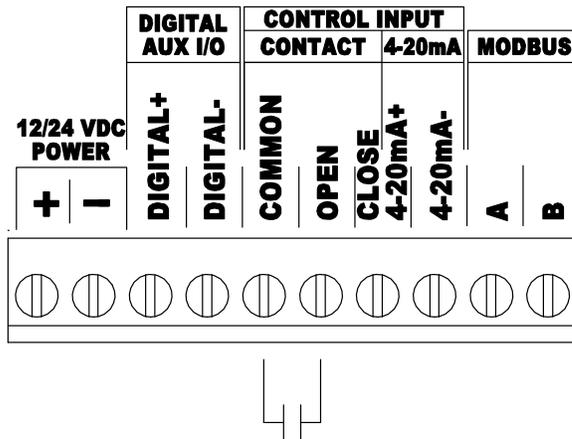


Figure 7. Wiring - Modbus Input

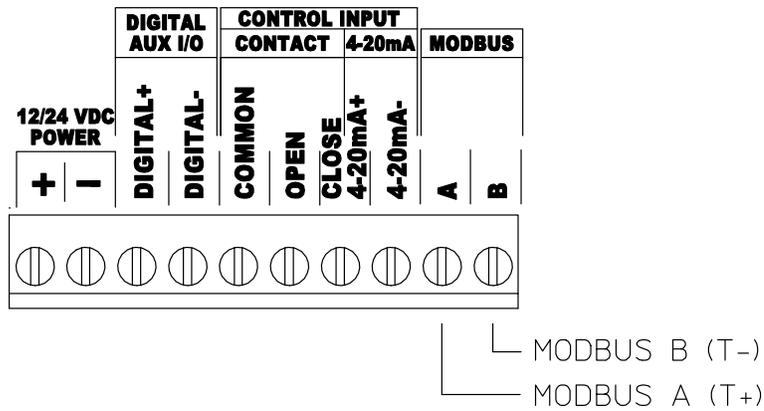


Figure 8. Wiring - Auxiliary Digital I/O set to input (40080=0)

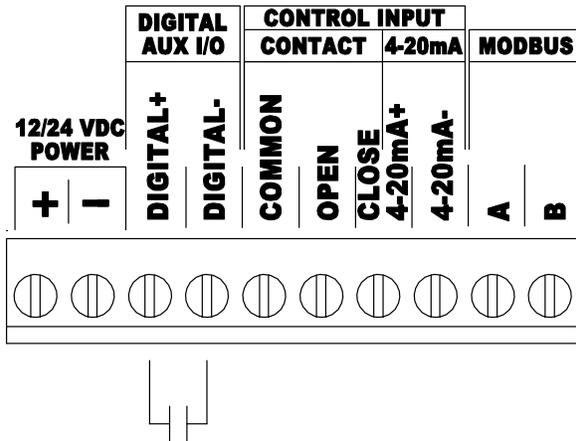
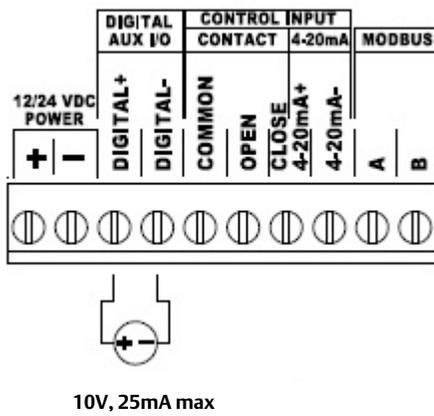


Figure 9. Wiring - Auxiliary Digital I/O set to output (40080=1)



## Default Input Signals

The D4 with easy-Drive comes from the factory calibrated and ready for use with the following default input signals shown in table 5.

Table 5. D4 easy-Drive Default Input Signals

| CONFIGURATION | ON/OFF                 | POSITIONING |
|---------------|------------------------|-------------|
| Input Signal  | L2e (dual dry contact) | 4-20 mA     |

If the input signal of the application matches table 5, proceed to the Wiring Instructions section. If the input signal of the application does not match table 5, proceed to the Configuration section.

## Configuration

### Input Configuration

There are 2 functional configurations available for the easy-Drive electric actuator: On/Off and Positioning. It is possible to change an actuator from On/Off to Positioning after it has been delivered from the factory using a positioning license key. See licensing section.

All available input signals are shown in table 6.

Table 6. All Available Input Signals

| CONFIGURATION  | ON/OFF |                                |                    | POSITIONING |                   |
|----------------|--------|--------------------------------|--------------------|-------------|-------------------|
| Control Source | Modbus | Local                          |                    | Modbus      | Local             |
| Input Signal   | Modbus | L2e Dual Dry Contact (default) | Single Dry Contact | Modbus      | 4-20 mA (default) |

If you are using the default inputs signals, and the valve has not been disassembled or adjusted in any way, there is no need to recalibrate the assembly. You can proceed directly to Startup (page 18).

### Changing the Inputs from Default Settings

All configuration within the valve is done by setting values in Modbus registers. This can be done using any Modbus master (flow computer, PLC, PC). Configuration software, providing a visual interface to the registers, is available through your Emerson local business partner or the Fisher website, at [www.fisher.com/easyDrive](http://www.fisher.com/easyDrive).

## Modbus setup

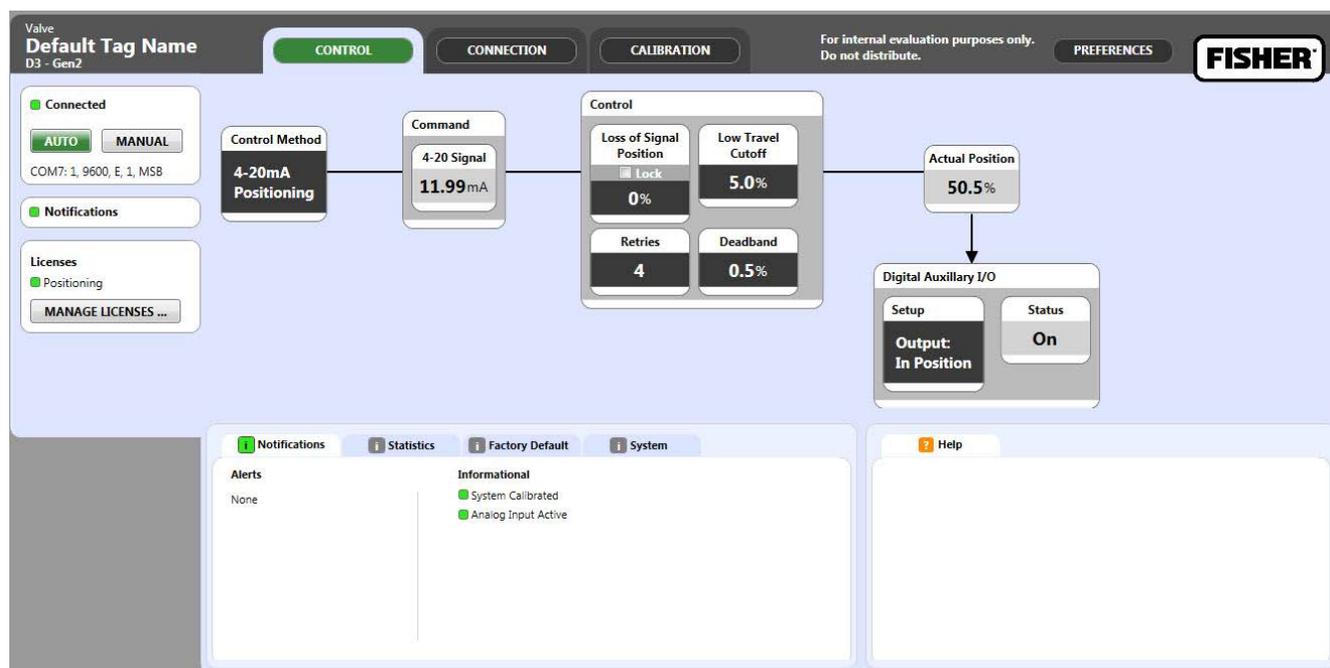
Use of a serial or USB to RS-485 device is required to connect to the actuator. Refer to manufacturer's requirements for installation. The D4 with easy-Drive electric actuator Modbus factory defaults are Address 1, 9600 baud, even parity, 1 stop bit, MSB.

When a connection has been achieved, the actuator may be configured to accept the input signal over the Modbus link (ignoring the physical inputs) and the Modbus settings may be changed to accommodate the network to which it is attached. Other changes to functionality are possible, such as:

- Low level cutoff: 40054 (default is 5%)
- Position upon loss of signal: 40053 (default is 0%)

See Appendix A for a full map of Modbus registers and their functions.

Figure 10. Fisher easy-Drive Configuration Software



## Connecting using the Fisher easy-Drive configuration software

The Fisher easy-Drive configuration software allows configuration and diagnosing of the Fisher easy-Drive electric actuator with a graphical interface. Connect a PC to the actuator using a USB or serial device to Modbus RTU converter using the wiring instructions above. The USB or serial device will be visible in the drop menu under Serial Port Settings. Baud rate and parity should be set to the Modbus settings of the actuator. Default actuator settings are address 1, 9600 baud, even parity, 1 stop bit, MSB. Press the AUTO button in the upper left corner to connect to the valve.

Use the Fisher easy-Drive configuration software (figure 10) to make the desired changes, or register values may be changed to allow different functionality.

### Note

If an actuator is on/off, a Modbus command of 0-499 in register 40001 will cause the valve to close fully, while a value of 500-1000 will cause the valve to open fully. The command register has one implied decimal point.

## Initial Setup

The control method selection determines what control signal to which the valve will respond. Only the control signal selected will result in movement of the valve; all others will be ignored. The control methods available are dependent upon the licensing tier purchased with the valve. The functions for each tier are shown below.

- On/Off Tier
  - Dual Contact On/Off
  - Single Contact On/Off
  - Modbus On/Off
- Positioning Tier - License required (see Licensing section)
  - Dual Contact On/Off
  - Single Contact On/Off
  - Modbus On/Off
  - Modbus Positioning
  - 4-20mA Positioning
  - 4-20mA Level

When using the easy-Drive Configuration Tool, clicking on the “Control Method” box will create a drop menu as shown. Select the desired control source; the selection will turn yellow. A box with Pending Changes will appear showing all changers. Press “APPLY” and the valve will immediately respond to that signal only.

Figure 11.



## Calibration Instructions

### **⚠ WARNING**

To avoid personal injury or property damage, be aware that the valve will open fully and then close fully during the calibration cycle.

If an easy-Drive valve has been shipped from the Fisher factory, it is not necessary to perform a span calibration. If, however, the valve has a new controller board or maintenance has been performed on the valve, such as trim

replacement, it will be necessary to perform a span calibration. A span calibration is accomplished by the following method:

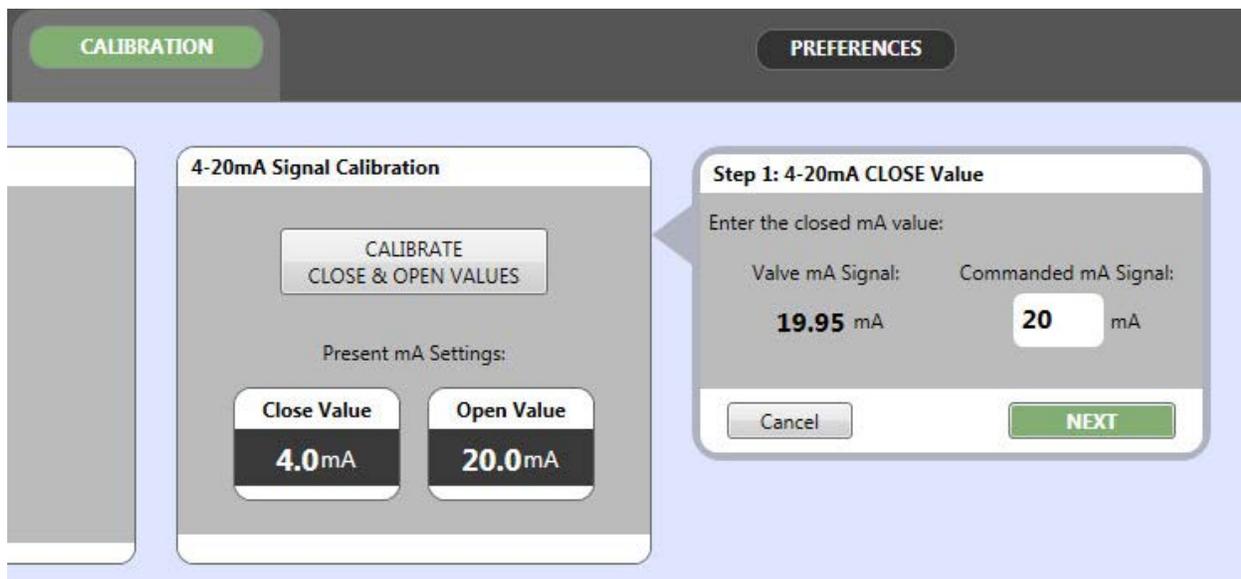
1. Ensure the process and valve are in a safe state – the valve may move during this operation
2. Press the CALIBRATE SPAN button to initiate the span calibration. The software will show a progress bar during the calibration and display Valve Span Calibrated when complete.

## Analog Input Calibration

For valves using 4-20mA as a control source, several options are available to customize control of the actuator. Use a 4-20mA signal generator to provide the desired signal. It is possible to calibrate the 4-20mA signal in reverse acting or split-ranging with the method below with at least 4mA of signal difference between the close and open values. The example shows a valve being changed from normal to reverse acting during the calibration process.

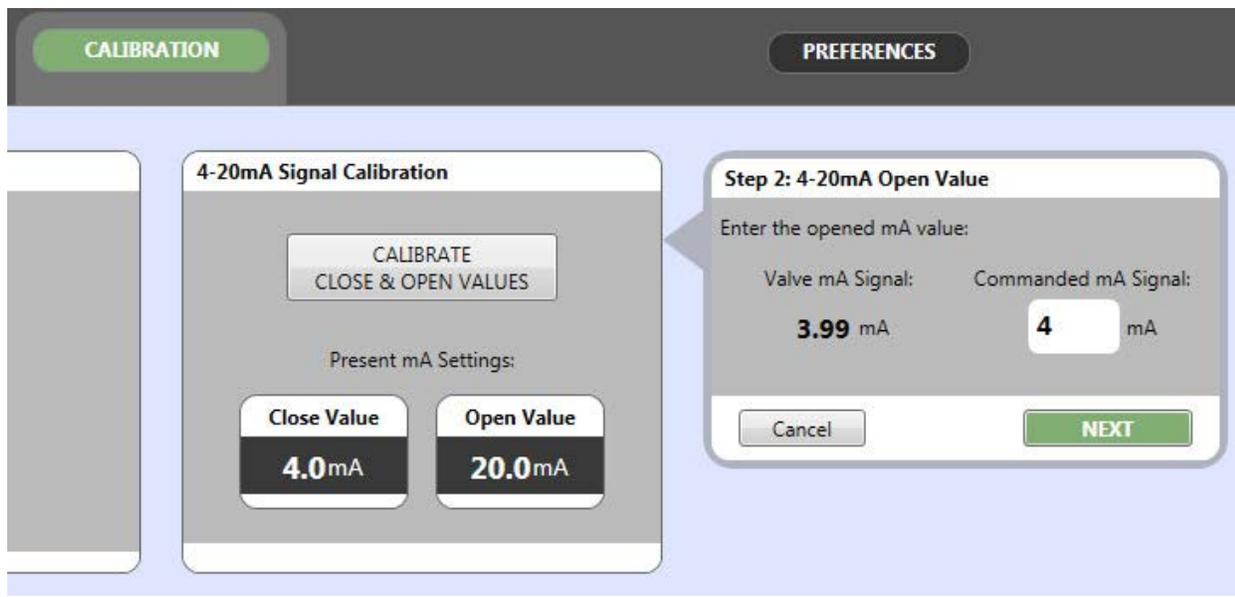
1. With the Control Method set to 4-20mA Positioning or 4-20mA Level, enter the Calibration screen and the 4-20mA Signal Calibration window will be visible.
2. Click the CALIBRATE CLOSE & OPEN VALUES button. A separate window will open to guide through the process.
3. Set the 4-20mA signal to the desired value for when the valve is to be closed.
4. Enter this value into the Calibrated mA Signal text box and press Next

Figure 12.



5. Set the 4-20mA signal to the desired value for when the valve is to be open.
6. Enter this value into the Calibrated mA Signal text box and press Next

Figure 13.



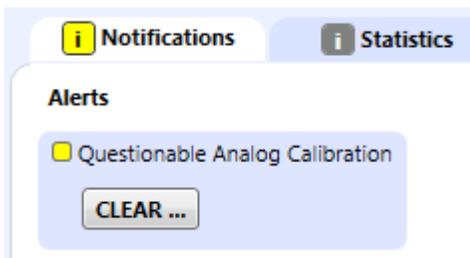
7. If the Close and Open values are as expected, press Confirm to accept these values. If not, press Cancel to restart the process.

**Note**

Note 1: The value of the 4-20mA signal must have at least 4mA difference between the close and open signals. A differential less than that amount will cause the actuator to reject the calibration and use the previous values.

Note 2: Should the entered values vary more than 10% from the expected 4-20mA values; the actuator will accept the calibration and a Notification displaying “Questionable Analog Calibration” will result.

Figure 14.



**Calibration with the use of Modbus**

1. After the unit has been properly wired and fused per instructions in the Wiring section of this instruction manual, turn power to the unit on.
2. Calibrate using Modbus:
  - a. Send position command of 0% to actuator to prevent unexpected motion. Valve will move to commanded position following the calibration procedure.

- b. Send a value of 1 to register 40043. Valve plug will move to fully open position and then to fully closed. The valve plug will then return to the commanded position.

If a Modbus connection is not available, and recalibration is desired, use the appropriate calibration method as determined by the control method of your valve.

### Calibration without the use of Modbus

1. Turn power to the actuator off.
2. Wait for 10 seconds to ensure all circuits have discharged.
3. Return power to the actuator and use the appropriate calibration method for your control signal. Calibration sequence must be done within 15 seconds of power being switched on.
4. For On/Off operation using L2e dual-input dry contact:
  - a. Close the contact to create a short between pins COMMON and OPEN – valve plug will not move at this time.
  - b. Close the contact to create a short between pins COMMON and CLOSE – valve plug will move to the upper, open position and then to the lower, closed position.
5. For On/Off operation using single dry contact:
  - a. Close the contact to create a short between pins COMMON and OPEN – valve plug will not move at this time.
  - b. Open the contact to create an open circuit between pins COMMON and OPEN – valve plug will move to the upper, open position and then to the lower, closed position.
6. For positioning operation using 4-20mA:
  - a. Apply a 20mA signal between pins 4-20mA - and 4-20mA + – valve plug will not move at this time.
  - b. Apply a 4mA signal between pins 4-20mA - and 4-20mA + – valve plug will move to the upper stop, immediately followed by moving to the lower, closed position.
  - c. If calibration of the analog input is desired to improve positional accuracy, an optional operation is listed in the next section titled Analog Input Calibration.
7. The unit is now calibrated.

### Licensing

The Gen 2 easy-Drive actuator has two differing modes of operation: On/Off and Positioning. The On/Off mode is intended for snap-acting applications where the valve is either fully open or fully closed. In this mode, the valve plug cannot remain at any intermediate position; it will move to a fully closed or fully open position only. For applications that require the actuator to control over the full range of motion, it is necessary to have a Positioning license installed. A positioning license will allow access to 4-20mA positioning, 4-20mA level control and Modbus positioning.

Positioning licenses can be purchased with the actuator and installed at the factory or can be installed at a later date by use of a license key on a USB license dongle. Installation of the license can be completed using the configuration software.

1. Insert the USB license dongle into the computer connected to the Gen 2 easy-Drive actuator.

Figure 15.



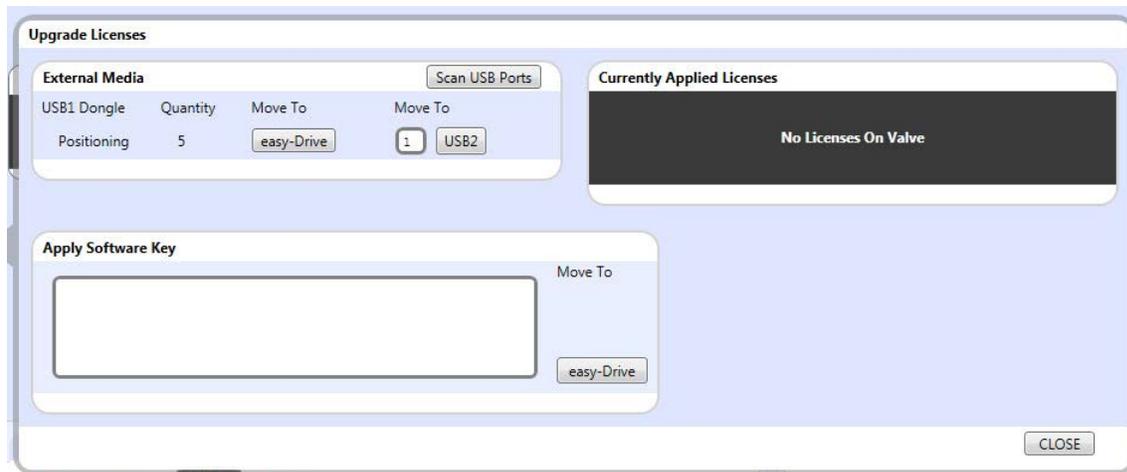
2. Click the button labelled **MANAGE LICENSES** on the left side of the configuration software screen.

Figure 16.



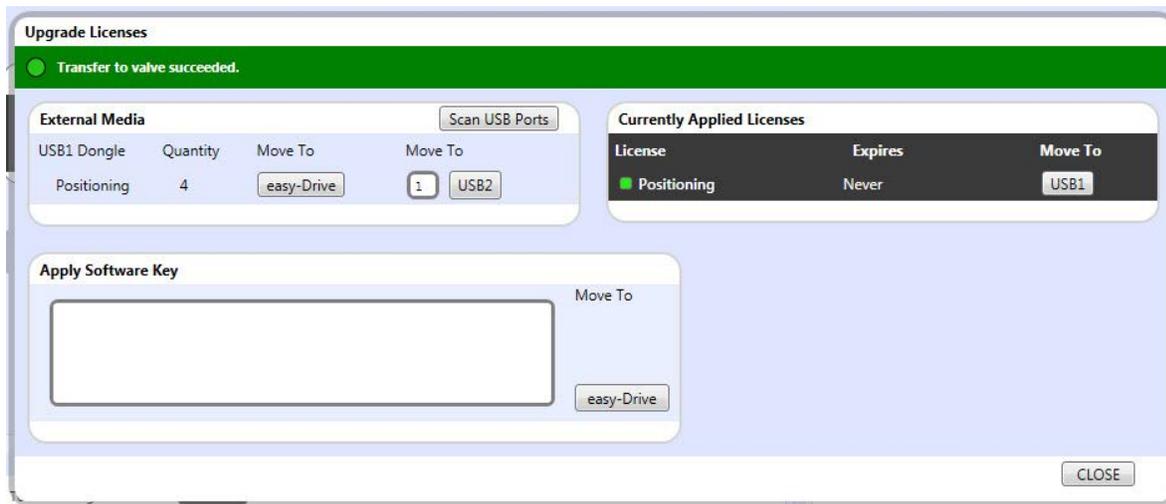
3. The license control screen will open, showing all licenses installed on the USB and the actuator.

Figure 17.



4. After verifying the presence of the desired license on the USB license dongle, click the button labelled 'easy-Drive' under Move To, and the license will be transferred to the valve as shown below

Figure 18.



- It is also possible to transfer licenses from one USB license dongle to another. Place two dongles into the computer with the configuration software. Type in the number of licenses to move and click USB 2 to move the licenses.

## Start Up

### **⚠ WARNING**

To avoid personal injury or property damage, be aware that the valve will move and respond to an input signal during start up.

- Before turning on power to the unit, be sure that a closed signal is being commanded to the unit.
  - Dry-Contact: contact is open.
  - L2e (Dual Dry Contact): Contact closed across pins COMMON and CLOSE.
  - Analog Input: signal = 4mA.
  - Modbus: position demand = 0.
- Turn on power to the unit.
- Apply a change in position demand to ensure unit responds properly.
  - Dry-Contact:
    - Closed contact between pins COMMON and OPEN will open the valve.
    - Dual contact / L2e only: Closed contact between pins COMMON and OPEN will open the valve. Closed contact between pins COMMON and CLOSE will close the valve.
  - Analog Input: valve will respond to proportional demand.
  - Modbus: valve will respond to positional demand in register 40001. 0 = fully closed and 1000 = fully open.

4. If the valve does not respond as expected, proceed to Troubleshooting guide on page 19.
5. Check conduit ports.
  - Conduit seal must be in place within 450mm (18 inches) of the enclosure.
  - Unused conduit ports must be sealed with an explosion-proof port plug.
6. Replace the cover and tighten all 8 bolts to 20 N-m (15 ft-lbs).

## Troubleshooting

1. Unit does not move.
  - a. Verify that 12VDC to 24VDC is present on the power terminals as shown on the cover. Green heartbeat LED will pulse near Modbus terminals when power is present.
  - b. Verify that all wires are firmly attached on both ends.
  - c. Verify that wires are connected to the correct terminals - see Wiring in the manual.
  - d. Verify mode of operation (on/off or positioning) matches control signal.
  - e. Verify mode of control (local or Modbus) matches control signal.
2. Unit does not respond to 4-20mA signal
  - a. Verify that 12VDC to 24VDC is present on the power terminals as shown on the cover.
  - b. Verify that the 4-20mA signal is wired correctly and that the terminals are firmly on the wires.
  - c. Verify mode of operation matches control signal (local control: 40067=0, positioning: 40065=1).
  - d. Check the value of the analog input in register 40026 to determine if it is 0 or greater.
    - i. If register 40026 shows 0, the 4-20mA may be wired backwards. Swap wire and attempt again.
3. Diagnostics show a Motor Stall Fault.
  - a. The easy-Drive electric actuator is designed to operate in a manner consistent with a pneumatic actuator. This means that if the valve plug can not move to its commanded position, the actuator will stop, without damage, and issue a Motor Stall Fault warning. When the command signal changes outside of the deadband (Modbus register 40036), it will attempt to move again. Recalibrate the actuator span per instructions in the Startup section of this manual.

## Maintenance

Refer to figure 22.

Valve parts are subject to normal wear and must be inspected and replaced as necessary. The frequency of inspection and maintenance depends on the severity of the service conditions.

### **⚠ WARNING**

Avoid personal injury from sudden release of process pressure or bursting of parts. Before performing any maintenance operations:

- Do not remove the actuator from the valve while the valve is still pressurized.
- Always wear protective gloves, clothing, and eyewear when performing any maintenance operations to avoid personal injury.
- 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 on both sides of the valve. Drain the process media from both sides of the valve.
- Vent the power actuator loading pressure and relieve any actuator spring precompression.
- Use lock-out procedures to be sure that the above measures stay in effect while you work on the equipment.
- The valve packing box may contain process fluids that are pressurized, *even when the valve has been removed from the pipeline*. Process fluids may spray out under pressure when removing the packing hardware or packing rings.
- Check with your process or safety engineer for any additional measures that must be taken to protect against process media.

### **⚠ WARNING**

For explosion-proof applications, ensure the actuator cover is properly bolted before applying power to the actuator. Personal injury or property damage may result from fire or explosion if power is applied to the actuator with the cover removed in a hazardous area.

Do not remove the actuator cover for 10 minutes after power is disconnected if the UPS option is installed.

For explosion-proof applications, install rigid metal conduit and a conduit seal no more than 457 mm (18 inches) from the actuator. Personal injury or property damage may result from explosion if the seal is not installed.

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.

## Valve Plug and Seat Ring

### Disassembly

Key Numbers are referenced in figures 21 and 22.

1. Isolate the control valve from the line pressure, release pressure from both sides of the valve body (key 1), and drain the process media from both sides of the valve.

**CAUTION**

The following steps are intended to prevent damage to the valve plug (key 3) and seat ring (key 2) during the removal of the bonnet and actuator.

2. For Positioning Actuators
  - Command the valve to anywhere between 10% and 20% travel.
  - Isolate power and signal.
  - Proceed to step 3.
 For ON/OFF Actuators
  - Command the valve to open or close, and cut the power when the valve is at mid-stroke.
  - Isolate power and signal.
  - Proceed to step 3.
3. Break the hammer nut (key 6) loose with a hammer. Continue turning the hammer nut by using a hammer or a large adjustable wrench, tightened around one ear of the hammer nut. If the bonnet is stuck on the valve, continue to unscrew the hammer nut. The hammer nut will contact the spring pins (key 7) and will force the bonnet out of the valve. Carefully lift the actuator, bonnet, and valve plug assembly from the valve body.

**⚠ WARNING**

The spring pins must always be in place during valve operation. They provide a safeguard against injury when the unit is being disassembled.

4. Use a socket wrench to loosen the seat ring (key 3).
5. Remove the seat ring (key 3) and seat ring gasket (key 9) from the valve body.
6. To replace the plug, the stem nut (key 42) must be removed to expose the groove pin (key 4). Open the explosion-proof enclosure (key 60), using a 13mm wrench.
7. Remove the stem nut (key 42) using a 11/16 inch wrench; insert a punch in the hole in the stem to restrict rotation of the stem while removing the stem nut. The travel indicator (key 32) may need to be moved to expose the hole.
8. Push the stem downward just far enough to expose the groove pin (key 4) on the plug.
9. Remove the plug by driving out the groove pin and unscrewing the valve plug from the stem.

**⚠ WARNING**

Be careful to avoid damaging the seating surface on the valve plug or seat ring as damage in these areas will allow excessive leakage at shutoff. Avoid damaging the highly polished valve stem surface. A damaged valve stem could cut the packing and allow process fluid to leak to the atmosphere.

Table 7. Torque for Seat Ring (Key 3)

| VALVE SIZE | RECOMMENDED TORQUE |        |
|------------|--------------------|--------|
|            | NPS                |        |
| 1          | N•m                | Lbf•ft |
| 1          | 407                | 300    |
| 2          | 698                | 515    |

## Assembly

1. Make sure the bonnet O-ring (key 8) is on the bonnet and lubricated with lithium grease (key 49).
2. Install the plug (key 2) on the stem (key 47) and insert a new groove pin (key 4).
3. Push the plug and stem upward to ensure the threads on the top of the stem are exposed. Thread the stem nut (key 42) onto the top of the stem and tighten the stem nut (key 42) to 39 N•m (29lbf•ft). Insert a punch in the hole in the stem to restrict rotation while tightening the stem nut.
4. Replace the top of the explosion proof enclosure (key 60) and tighten cap screws (key 64) to 20 N•m (15 lbf•ft).
5. Thoroughly clean the seat ring and bonnet threads in the valve body (key 1). Also clean the valve body seat ring gasket surfaces.
6. Apply anti-seize lubricant (key 54) to the threads of the seat ring (key 3), and its mating threads in the valve body.
7. Apply anti-seize lubricant (key 54) to the seat ring gasket (key 9) and install into the valve body.
8. Screw the seat ring into the valve body. Use a socket wrench to tighten the seat ring to the torque values shown in table 7. Remove all excess lubricant after tightening.
9. Lubricate (key 54) the threads on the valve body and hammer nut and the contact surfaces of the bonnet and hammer nut flange. Install the bonnet and actuator assembly with pinned valve plug onto the valve body. Tighten the hammer nut using an adjustable wrench until the nut stops turning. A few hammer blows will be required to ensure that the assembly is tight.

## Valve Packing

### **▲ WARNING**

Observe the warning at the start of the Maintenance section.

The valve stem packing can only be accessed from within the valve body.

## Disassembly

1. Disassemble the valve per steps 1 through 12 of the Valve Plug and Seat Ring Disassembly section in this instruction manual.
2. Unscrew the packing retainer (key 10) from the bonnet (key 5).
3. Remove the five Belleville springs (key 11), packing spacer (key 14), packing (key 13), and two anti-extrusion rings (key 12) from the bonnet, using a formed wire hook. To aid in packing removal, the stem may be removed.
4. Clean and inspect the packing box wall to ensure that the packing surfaces are not damaged. If the surface condition is damaged, and cannot be improved by light sanding, replace the bonnet by contacting your [Emerson sales office](#) or Local Business Partner.
5. Inspect the valve stem for scratches or wear, and valve plug for wear or damage. Replace if necessary.

Figure 19. Fisher D4 Packing Installation

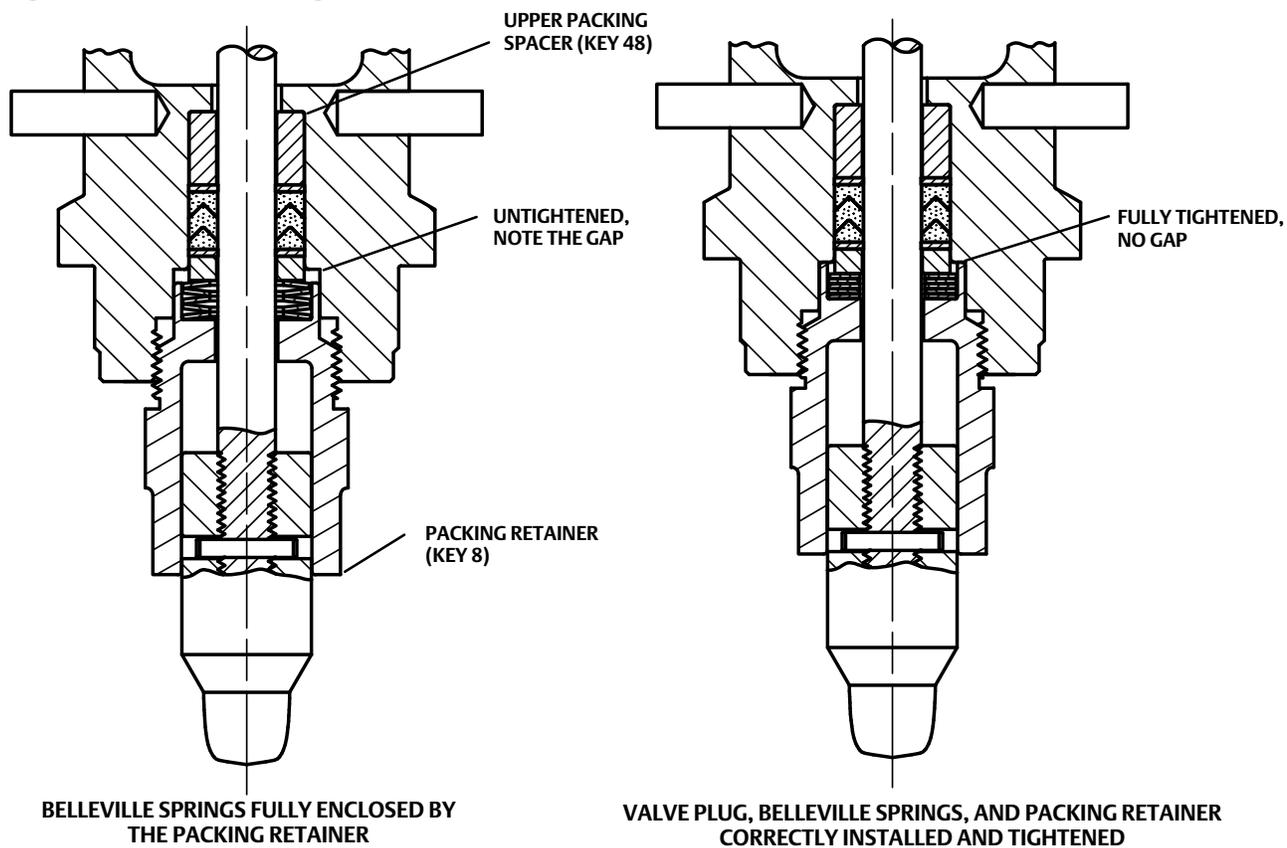
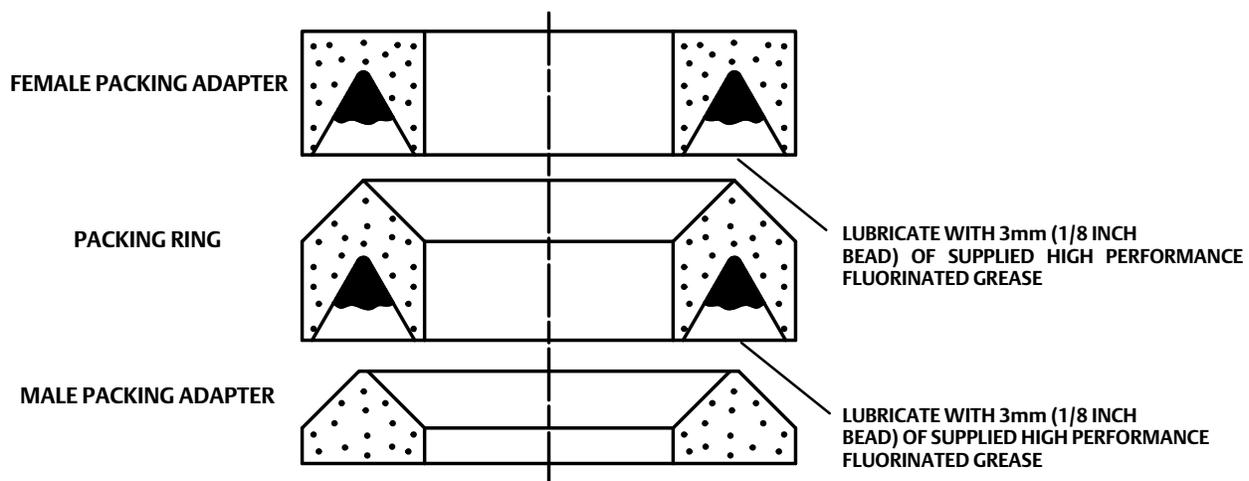


Figure 20. Lubrication Locations on Packing



## Assembly

Refer to figures 19, 20, 21, and 22.

1. If the stem was removed during packing disassembly, insert the stem back into the valve/actuator assembly.
2. Ensure the upper packing spacer (key 48) is installed, as shown in figure 19.
3. Using a non-marring installation tool, such as a 12-inch length of 1/2 inch PVC pipe, push the first anti-extrusion washer (key 12) fully into the packing box by hand. Then, use the packing spacer (key 14) to fully seat the anti-extrusion washer by firmly tapping the packing spacer against the anti-extrusion washer with a hammer and the PVC pipe.
4. Remove the packing spacer from the packing bore.

### CAUTION

**All D4 packing kits include a single use packet of high performance fluorinated grease. This is the only acceptable D4 packing lubricant.**

#### Note

In the following procedure, carefully install each packing ring individually over the valve stem and push completely into the packing box with a non-marring tube. A 12-inch length of 1/2 inch PVC pipe works well for this. It is recommended that the lubricated packing rings be installed individually rather than pushed in as a set.

5. Apply a 3mm (1/8 inch) bead of the supplied high performance fluorinated grease (key 44) around the groove of the female packing adaptor as shown in figure 20 and install over the valve stem (key 16).
6. Apply a 3mm (1/8 inch) bead of the supplied high performance fluorinated grease (key 44) around the groove of the packing ring as shown in figure 20 and install over the valve stem.
7. Install the male packing adaptor, lower anti-extrusion washer (key 10), and lower packing spacer over the valve stem as shown in figure 19.
8. Firmly press all packing parts into the packing bore with a tube.
9. Install the five Belleville springs (key 11) over the valve stem. The Belleville springs should be single-stacked with the inside diameter of the inner spring contacting the packing spacer (key 14), and the outside diameter of the outer spring contacting the packing retainer (key 10).
10. Lubricate the threads of the packing retainer with anti-seize and install into the bonnet using a 1-5/8 inch wrench. Make sure the Belleville springs are completely enclosed by the packing retainer as shown in figure 19.
11. Torque the packing retainer to 136 N•m (100 lbf•ft). The packing retainer has been installed correctly when a metal-to-metal contact has been made between the packing retainer end and the bonnet (key 5). The packing retainer threads should be completely enclosed by the bonnet.
12. Follow steps 1 through 9 of the Valve Plug and Seat Ring Assembly section in this instruction manual.

## Parts Ordering

Each D4 control valve is assigned a serial number, which can be found on the nameplate. Refer to the number when contacting your [Emerson sales office](#) or Local Business Partner for assistance or when ordering replacement parts.

### **⚠ WARNING**

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

## Parts Kits

|                                                        |             |
|--------------------------------------------------------|-------------|
| LICENSE KEY (5 LICENCES)                               | GE83574X022 |
| CONTROLLER BOARD UPGRADE/REPLACEMENT KIT (ON/OFF)      | GE83055X012 |
| CONTROLLER BOARD UPGRADE/REPLACEMENT KIT (POSITIONING) | GE83126X012 |
| GEARBOX REPLACEMENT                                    | GE84238X012 |

## Repair Kits

### Note

All repair kits are supplied with hydrogenated nitrile bonnet O-ring. FKM (fluorocarbon) bonnet O-ring must be ordered separately when required.

| Description                                                                                                     | Part Number |
|-----------------------------------------------------------------------------------------------------------------|-------------|
| * Packing Repair Kit<br>Includes key numbers 4, 8, 12 (2 req'd),<br>13, and high performance fluorinated grease | RD4X0000012 |

## Parts List

### Note

For part numbers not shown, contact your [Emerson sales office](#) or Local Business Partner.

| Key | Description              | Part Number |
|-----|--------------------------|-------------|
| 1   | Valve Body               |             |
| 2*  | Valve Plug               |             |
|     | S41000 / S41600 HT       |             |
|     | NPS 1 valve              |             |
|     | 0.25 inch port diameter  | 20C3692X012 |
|     | 0.375 inch port diameter | 20C3693X012 |
|     | 0.5 inch port diameter   | 20C3694X012 |
|     | 0.75 inch port diameter  | GE01557X012 |
|     | NPS 2 valve              |             |
|     | 0.25 inch port diameter  | GE00992X012 |
|     | 0.375 inch port diameter | GE00993X012 |
|     | 0.5 inch port diameter   | GE00994X012 |
|     | 0.75 inch port diameter  | GE01558X012 |
|     | 1-inch port diameter     | GE01561X012 |
|     | 1.25 inch port diameter  | GE01555X012 |

\* Recommended spare parts

| Key | Description              | Part Number | Key | Description                                     | Part Number |
|-----|--------------------------|-------------|-----|-------------------------------------------------|-------------|
| 2*  | Valve Plug (continued)   |             | 4*  | Groove Pin                                      | GE01163X012 |
|     | S17400 H1150 Dbl         |             | 5   | Bonnet                                          |             |
|     | NPS 1 valve              |             | 6   | Hammer Nut                                      |             |
|     | 0.25 inch port diameter  | 20C3692X032 | 7   | Spring Pin                                      |             |
|     | 0.375 inch port diameter | 20C3693X032 | 8*  | Bonnet O-ring                                   |             |
|     | 0.5 inch port diameter   | 20C3694X032 |     | Hydrogenated Nitrile                            |             |
|     | 0.75 inch port diameter  | GE01557X032 |     | -46 to 149°C (-50 to 300°F)                     | 10C3680X012 |
|     | NPS 2 valve              |             |     | FKM, -23 to 204°C (-10 to 400°F)                | 10C3680X022 |
|     | 0.25 inch port diameter  | GE00992X032 | 9*  | Seat Ring Gasket                                |             |
|     | 0.375 inch port diameter | GE00993X032 |     | For NPS 1 valve                                 | 1B198636042 |
|     | 0.5 inch port diameter   | GE00994X032 |     | For NPS 2 valve                                 | 1B198836042 |
|     | 0.75 inch port diameter  | GE01558X032 | 10  | Packing Retainer                                |             |
|     | 1-inch port diameter     | GE01561X032 | 11  | Belleville Springs, 5 req'd                     |             |
|     | 1.25 inch port diameter  | GE01555X032 | 12* | Anti-Extrusion Washer, 2 req'd                  | 12B6335X022 |
|     | Tungsten Carbide         |             | 13* | Packing Set                                     | 12B6667X012 |
|     | NPS 1 valve              |             | 14  | Packing Spacer                                  |             |
|     | 0.25 inch port diameter  | 20C3696X012 | 16  | Valve Nameplate                                 |             |
|     | 0.375 inch port diameter | 20C3697X012 | 17  | Drive Screw                                     |             |
|     | 0.5 inch port diameter   | 20C3698X012 | 18* | O-ring                                          | 13A9576X052 |
|     | 0.75 inch port diameter  | 20C3699X012 | 19  | Stem O-ring                                     | 1K7561X0072 |
|     | NPS 2 valve              |             | 32  | Travel Indicator                                |             |
|     | 0.25 inch port diameter  | 20C3682X012 | 42  | Stem Nut                                        |             |
|     | 0.375 inch port diameter | 20C3683X012 | 47* | Valve Stem                                      | GE48549X012 |
|     | 0.5 inch port diameter   | 20C3685X012 | 48  | Upper packing spacer                            |             |
|     | 0.75 inch port diameter  | 20C3686X012 | 49  | Lubricant (lithium grease)                      |             |
|     | 1-inch port diameter     | 20C3687X012 | 54  | Lubricant (anti-seize)                          |             |
|     | 1.25 inch port diameter  | 20C3688X012 | 56* | High Performance Fluorinated Grease             |             |
|     |                          |             |     | Packing Lubricant                               |             |
| 3*  | Seat Ring                |             | 58  | Enclosure O-ring                                |             |
|     | S17400 H1150 Dbl         |             | 59  | Motor/gearbox/controller assembly               |             |
|     | NPS 1 valve              |             | 60  | Upper Enclosure                                 |             |
|     | 0.25 inch port diameter  | GE00982X032 | 61  | Lower Enclosure                                 |             |
|     | 0.375 inch port diameter | GE00983X032 | 62  | Motor Cap Screws (4 req'd)                      |             |
|     | 0.5 inch port diameter   | GE00984X032 | 63  | Motor Cap Screw Washers (4 req'd)               |             |
|     | 0.75 inch port diameter  | GE00985X032 | 64  | Enclosure Cap Screws (8 req'd)                  |             |
|     | NPS 2 valve              |             | 65  | Enclosure Cap Screw Retaining Washers (8 req'd) |             |
|     | 0.25 inch port diameter  | GE00986X032 | 66  | Ground Screw                                    |             |
|     | 0.375 inch port diameter | GE00987X032 | 68  | Certification Nameplate                         |             |
|     | 0.5 inch port diameter   | GE00988X032 | 69  | easy-Drive Label                                |             |
|     | 0.75 inch port diameter  | GE00989X032 |     |                                                 |             |
|     | 1-inch port diameter     | GE00990X032 |     |                                                 |             |
|     | 1.25 inch port diameter  | GE00991X032 |     |                                                 |             |
|     | Tungsten Carbide         |             |     |                                                 |             |
|     | NPS 1 valve              |             |     |                                                 |             |
|     | 0.25 inch port diameter  | GE07347X012 |     |                                                 |             |
|     | 0.375 inch port diameter | GE07363X012 |     |                                                 |             |
|     | 0.5 inch port diameter   | GE07364X012 |     |                                                 |             |
|     | 0.75 inch port diameter  | GE07365X012 |     |                                                 |             |
|     | NPS 2 valve              |             |     |                                                 |             |
|     | 0.25 inch port diameter  | GE07389X012 |     |                                                 |             |
|     | 0.375 inch port diameter | GE07394X012 |     |                                                 |             |
|     | 0.5 inch port diameter   | GE07397X012 |     |                                                 |             |
|     | 0.75 inch port diameter  | GE07398X012 |     |                                                 |             |
|     | 1-inch port diameter     | GE07399X012 |     |                                                 |             |
|     | 1.25 inch port diameter  | GE07406X012 |     |                                                 |             |

Figure 21. D4 Valve Assembly

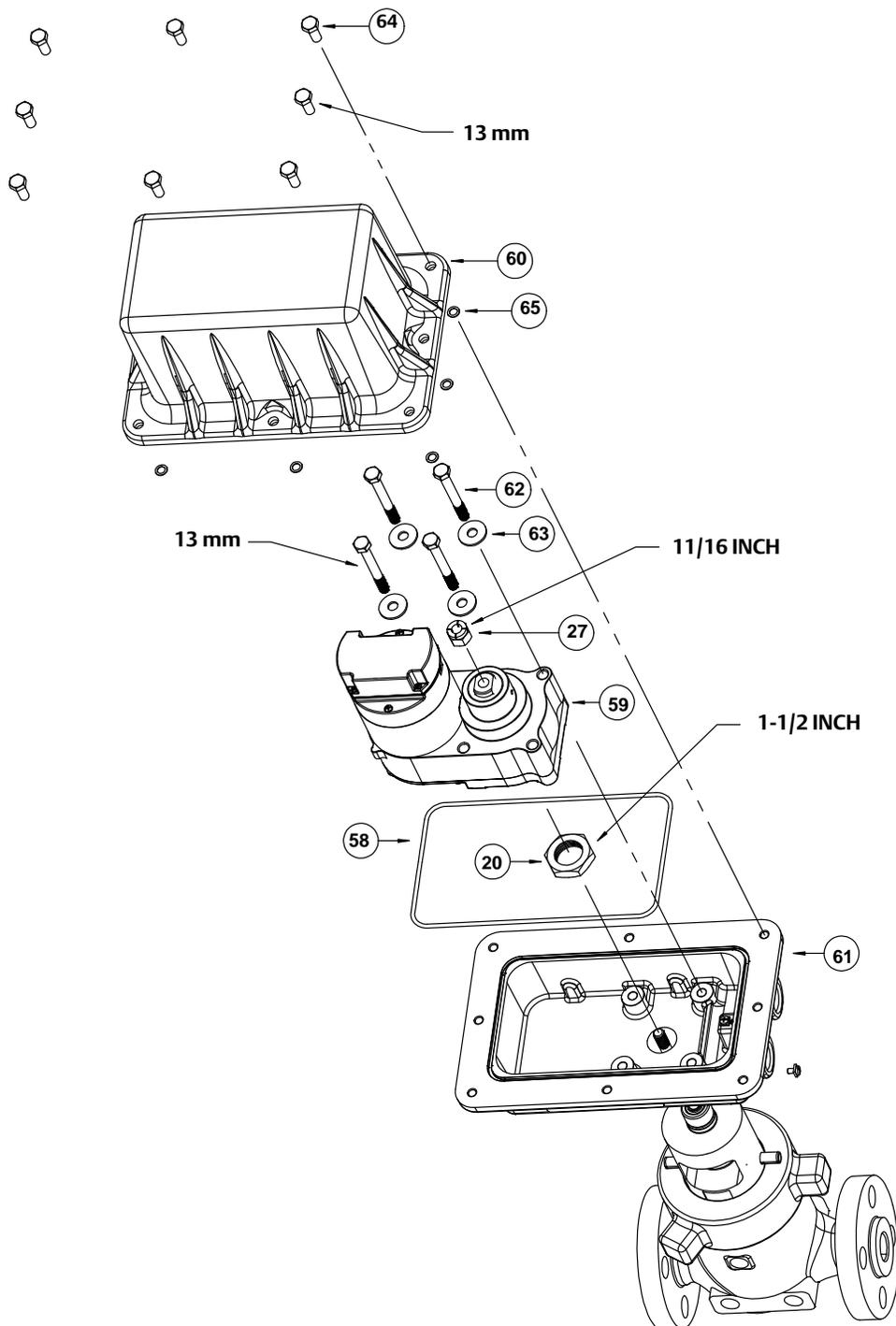
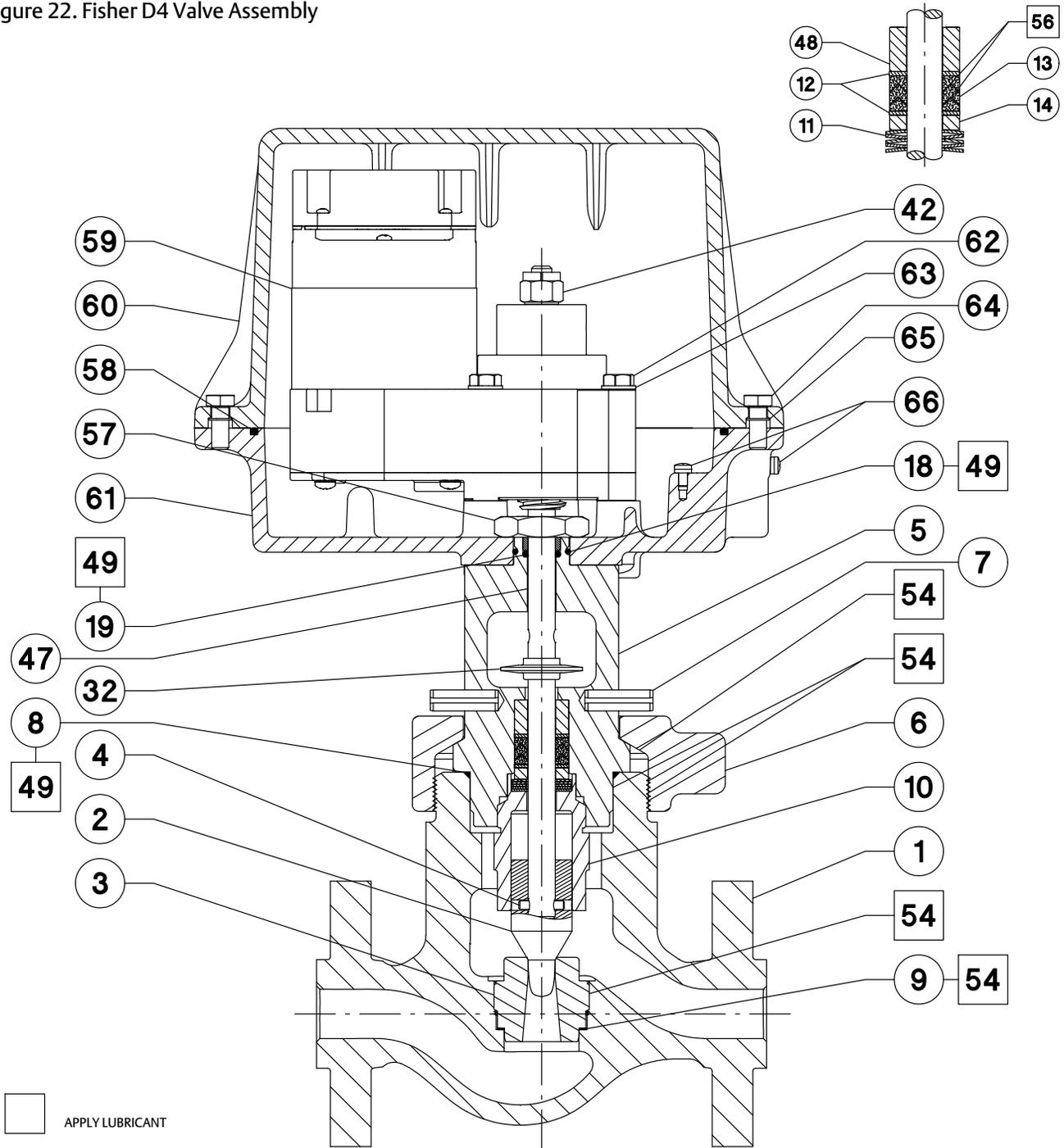


Figure 22. Fisher D4 Valve Assembly



GE49375-B

# Appendix A - Modbus

## A.1 Register Summary

Table 8. Gen 2 easy-Drive Actuator Modbus Map

| Type   | Name                                | MB Register  | Default | R/W | Values     | Notes                                                                                                                                                                                                                                                           |
|--------|-------------------------------------|--------------|---------|-----|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| uint16 | Modbus position command (100=10.0%) | 40001        | 0       | R/W | 0-1000     | Modbus command value with one implied decimal place (1000=100.0%). R/W at all times but only used in Modbus control mode. In on/off mode 0-499 will result in a move to 0% and 500-1000 will result in a move to 100%.                                          |
| uint16 | Digital output                      | 40002        | 0       | R/W | 0,1        | 0=no voltage supplied to terminals, 1=voltage supplied to terminals (Only used when output setup is set for Remote controlled)                                                                                                                                  |
| uint16 | Reset error codes                   | 40003        | 0       | R/W | 0,1        | Value of 1 will clear faults. Will automatically set back to 0.                                                                                                                                                                                                 |
| uint16 | RESERVED                            | 40004        |         |     |            |                                                                                                                                                                                                                                                                 |
| uint16 | RESERVED                            | 40005        |         |     |            |                                                                                                                                                                                                                                                                 |
| uint16 | RESERVED                            | 40006        |         |     |            |                                                                                                                                                                                                                                                                 |
| uint16 | RESERVED                            | 40007        |         |     |            |                                                                                                                                                                                                                                                                 |
| uint16 | RESERVED                            | 40008        |         |     |            |                                                                                                                                                                                                                                                                 |
| uint16 | RESERVED                            | 40009        |         |     |            |                                                                                                                                                                                                                                                                 |
| uint16 | Actual position (100=10.0%)         | 40010        | 0       | R   | 0-1000     | Present position of the actuator relative to span with 1 implied decimal place (1000=100.0%). Valid for all control modes.                                                                                                                                      |
| uint16 | Commanded position (100=10.0%)      | 40011        | 0       | R   | 0-1000     | Present position command of the actuator relative to span (1000=100.0%). Valid for all control modes.                                                                                                                                                           |
| uint16 | Diagnostic Flags                    | 40012        | 0       | R   | 0-65535    | Bit flags - see chart                                                                                                                                                                                                                                           |
| uint16 | Digital status                      | 40013        | 0       | R   | 0 - 1      | 0=no connection between terminals, 1=connection between terminals (Status of digital input or output)                                                                                                                                                           |
| uint32 | Total Running Time (min)            | 40014, 40015 | 0       | R   | 4294967296 | Total number of minutes the actuator has been powered on since time has been reset                                                                                                                                                                              |
| uint32 | Total Open Time (min)               | 40016, 40017 | 0       | R   | 4294967296 | Total number of minutes the actuator has been at 100% of travel since time has been reset                                                                                                                                                                       |
| uint32 | Total Closed Time (min)             | 40018, 40019 | 0       | R   | 4294967296 | Total number of minutes the actuator has been at 0% of travel since time has been reset                                                                                                                                                                         |
| uint32 | Number of Closed (Cycle count)      | 40020, 40021 | 0       | R   | 4294967296 | Total number of close cycles the actuator has performed since reset. One open/close cycle counts as 1.                                                                                                                                                          |
| uint32 | Number of Power Cycles              | 40022, 40023 | 0       | R   | 4294967296 | Total number of times the actuator has been powered on.                                                                                                                                                                                                         |
| uint32 | Number of Movements                 | 40024, 40025 | 0       | R   | 4294967296 | Total number of movements the actuator has performed. Move must be at least 5% of rated travel for cycle to increment.                                                                                                                                          |
| uint16 | Analog input control value          | 40026        | 0       | R   | 0-2400     | Value of the analog signal in mA with 2 implied decimals. In analog control mode, this is the command value and is subject to the analog settings in registers 40046 to 40059. Always active but a slower refresh rate when unit is not in analog control mode. |
| uint16 | Incoming voltage                    | 40027        | 0       | R   | 0-350      | Diagnostic register - value of incoming voltage with 1 implied decimal.                                                                                                                                                                                         |
| uint16 | Latch Open State                    | 40028        | 0       | R   | 0 - 1      | Normally open latch state                                                                                                                                                                                                                                       |

-Continued-

| Type   | Name                                | MB Register  | Default       | R/W | Values        | Notes                                                                                                                                                                                                                                                                                                                                                    |
|--------|-------------------------------------|--------------|---------------|-----|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| uint16 | Latch Close State                   | 40029        | 0             | R   | 0 - 1         | Normally closed latch state                                                                                                                                                                                                                                                                                                                              |
| uint16 | RESERVED                            | 40030        |               |     |               |                                                                                                                                                                                                                                                                                                                                                          |
| uint16 | RESERVED                            | 40031        |               |     |               |                                                                                                                                                                                                                                                                                                                                                          |
| uint16 | RESERVED                            | 40032        |               |     |               |                                                                                                                                                                                                                                                                                                                                                          |
| uint16 | RESERVED                            | 40033        |               |     |               |                                                                                                                                                                                                                                                                                                                                                          |
| uint16 | RESERVED                            | 40034        |               |     |               |                                                                                                                                                                                                                                                                                                                                                          |
| uint16 | RESERVED                            | 40035        |               |     |               |                                                                                                                                                                                                                                                                                                                                                          |
| uint16 | RESERVED                            | 40036        |               |     |               |                                                                                                                                                                                                                                                                                                                                                          |
| uint16 | RESERVED                            | 40037        |               |     |               |                                                                                                                                                                                                                                                                                                                                                          |
| uint16 | RESERVED                            | 40038        |               |     |               |                                                                                                                                                                                                                                                                                                                                                          |
| uint16 | RESERVED                            | 40039        |               |     |               |                                                                                                                                                                                                                                                                                                                                                          |
| uint16 | Test Register - 16 bit              | 40040        | 45964         | R   | 45964         | Fixed register to test correct reading of 16 bit registers - Hex=B38C, Binary=1011001110001100                                                                                                                                                                                                                                                           |
| uint32 | Test Register - 32 bit              | 40041, 40042 | 3,012,341,331 | R   | 3,012,341,331 | Fixed register to test correct reading of 32 bit registers - Hex=B38C AE53, Binary=1011001110001100101011001010011                                                                                                                                                                                                                                       |
| uint16 | Span calibration                    | 40043        | 0             | R/W | 0,1           | Value of 1 will initiate span calibration. Will automatically set back to 0.                                                                                                                                                                                                                                                                             |
| uint16 | RESERVED                            | 40044        |               |     |               |                                                                                                                                                                                                                                                                                                                                                          |
| uint16 | RESERVED                            | 40045        |               |     |               |                                                                                                                                                                                                                                                                                                                                                          |
| uint16 | RESERVED                            | 40046        |               |     |               |                                                                                                                                                                                                                                                                                                                                                          |
| uint16 | RESERVED                            | 40047        |               |     |               |                                                                                                                                                                                                                                                                                                                                                          |
| uint16 | RESERVED                            | 40048        |               |     |               |                                                                                                                                                                                                                                                                                                                                                          |
| uint16 | RESERVED                            | 40049        |               |     |               |                                                                                                                                                                                                                                                                                                                                                          |
| uint16 | Loss of signal position (100=10.0%) | 40050        | 0             | R/W | 0-1001        | Position to which valve plug will be driven upon loss of signal. Loss of signal is based upon the active control mode. 0-1000=0-100.0% with 1 implied decimal point. In on/off mode 0-499 will result in movement to 0% while 500-1000 will result in movement to 100%. A value of 1001 in any control mode is the setting for "lock-in-last".           |
| uint16 | Modbus timeout (s)                  | 40051        | 60            | R/W | 0-65535       | Time without a valid Modbus message is seen (to any address) before "loss of signal" motion is engaged when in Modbus control mode. Only active in Modbus control mode. 0=disabled                                                                                                                                                                       |
| uint16 | Dual contact timeout (s)            | 40052        | 60            | R/W | 0-3600        | Time without a digital signal being low (contact made) from either digital input as viewed by voltage level on the digital input terminals. If neither contact has been made (pulled input low) within the timeout period, the valve plug will be moved to the loss-of-signal position. Only active in the local, on-off, dual contact mode. 0=disabled. |

-Continued-

| Type   | Name                                     | MB Register | Default | R/W | Values   | Notes                                                                                                                                                                                                                                                                                                                                                                       |
|--------|------------------------------------------|-------------|---------|-----|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| uint16 | Deadband (10=1.0%)                       | 40053       | 5       | R/W | 0-250    | Minimum percentage signal change to elicit a movement response based upon end position of last movement. For example, if the previous command resulted in the actuator moving to 31.2% of travel and deadband is set to 100 (10.0%), setpoint must command valve to 21.2% or 41.2% before valve will move to new position. Default is set set to minimize signal dithering. |
| uint16 | Low travel cutoff position (100=10.0%)   | 40054       | 50      | R/W | 0-999    | Analog input command, in percent with one implied decimal (50=5.0%), below this value will result in the valve plug moving to the closed position. Active in both local and Modbus control modes.                                                                                                                                                                           |
| uint16 | Analog on/off close position (100=10.0%) | 40055       | 400     | R/W | 0-999    | When the valve is in 4-20mA on/off mode, this value is the point at which the valve will close. It must be set to a smaller value than the analog on/off open position. Percentage position value with one implied decimal (400=40.0%).                                                                                                                                     |
| uint16 | Analog on/off open position (100=10.0%)  | 40056       | 500     | R/W | 1-1000   | When the valve is in 4-20mA on/off mode, this value is the point at which the valve will open. It must be set to a larger value than the analog on/off close position. Percentage position value with one implied decimal (500=50.0%).                                                                                                                                      |
| uint16 | Analog Close Value                       | 40057       | 40      | R   | 31 - 220 | The analog value, in mA with one implied decimal (40=4.0mA), that defines the closed position                                                                                                                                                                                                                                                                               |
| uint16 | Analog Open Value                        | 40058       | 200     | R   | 31 - 220 | The analog value, in mA with one implied decimal (200=20.0mA), that defines the open position                                                                                                                                                                                                                                                                               |
| uint16 | Number of retries                        | 40059       | 2       | R/W | 0-4      | When the valve plug encounters an obstruction, how many attempts will it make to move past that point, assuming no change in the command signal within the deadband range                                                                                                                                                                                                   |
| uint16 | RESERVED                                 | 40060       |         |     |          |                                                                                                                                                                                                                                                                                                                                                                             |
| uint16 | RESERVED                                 | 40061       |         |     |          |                                                                                                                                                                                                                                                                                                                                                                             |
| uint16 | RESERVED                                 | 40062       |         |     |          |                                                                                                                                                                                                                                                                                                                                                                             |
| uint16 | RESERVED                                 | 40063       |         |     |          |                                                                                                                                                                                                                                                                                                                                                                             |
| uint16 | RESERVED                                 | 40064       |         |     |          |                                                                                                                                                                                                                                                                                                                                                                             |
| uint16 | RESERVED                                 | 40065       |         |     |          |                                                                                                                                                                                                                                                                                                                                                                             |
| uint16 | RESERVED                                 | 40066       |         |     |          |                                                                                                                                                                                                                                                                                                                                                                             |
| uint16 | Control Source                           | 40067       | 0       | R/W | 0-5      | 0=Dual Contact On/Off 1=Single Contact On/Off, 2=Modbus On/Off, 3=Modbus Positioning, 4=4-20 Positioning, 5=4-20 Level                                                                                                                                                                                                                                                      |
| uint16 | Valve Type                               | 40068       | 1       | R/W | 1-10     | 1=D3, 2=D4                                                                                                                                                                                                                                                                                                                                                                  |
| uint16 | RESERVED                                 | 40069       |         |     |          |                                                                                                                                                                                                                                                                                                                                                                             |
| uint16 | RESERVED                                 | 40070       |         |     |          |                                                                                                                                                                                                                                                                                                                                                                             |
| uint16 | RESERVED                                 | 40071       |         |     |          |                                                                                                                                                                                                                                                                                                                                                                             |
| uint16 | RESERVED                                 | 40072       |         |     |          |                                                                                                                                                                                                                                                                                                                                                                             |
| uint16 | RESERVED                                 | 40073       |         |     |          |                                                                                                                                                                                                                                                                                                                                                                             |
| uint16 | Modbus address                           | 40074       | 1       | R/W | 1-247    | Slave Address of the actuator                                                                                                                                                                                                                                                                                                                                               |
| uint16 | Baud Rate                                | 40075       | 5       | R/W | 4,5,6,7  | 4=4800 baud, 5=9600 baud (default), 6=19200 baud, 7=38400 baud                                                                                                                                                                                                                                                                                                              |
| uint16 | Parity                                   | 40076       | 0       | R/W | 0,1,2    | 0=Even, 1=Odd, 2=None                                                                                                                                                                                                                                                                                                                                                       |
| uint16 | Modbus stop bits                         | 40077       | 1       | R/W | 0,1,2    | 1 stop bit is the standard with even and odd parity while 2 stop bits is the standard for none.                                                                                                                                                                                                                                                                             |
| uint16 | MSB/LSB                                  | 40078       | 0       | R/W | 0,1      | 0=MSB (Big Endian), 1=LSB (Little Endian)                                                                                                                                                                                                                                                                                                                                   |
| uint16 | RESERVED                                 | 40079       |         |     |          |                                                                                                                                                                                                                                                                                                                                                                             |

-Continued-

| Type   | Name                          | MB Register  | Default     | R/W  | Values                | Notes                                                                                                                                                                                                                               |
|--------|-------------------------------|--------------|-------------|------|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| unit16 | Digital I/O selection         | 40080        | 1           | R/W  | 0,1                   | 0=9V sinking digital input, 1=25mA at 10V digital output                                                                                                                                                                            |
| unit16 | Digital I/O output setup      | 40081        | 0           | R/W  | 0,1,2,3               | Valid only when Digital I/O selection is set to Output (1) - 0=In position, 1=Fully closed, 2=Fully open, 3 = Remote controlled (driven by Digital Output register)                                                                 |
| unit16 | Digital I/O input setup       | 40082        | 0           | R/W  | 0,1                   | Valid only when Digital I/O selection is set to Input (0) - 0=Reference only (status appears in 40013 and does nothing else), 1=Override (status appears in 40013 and valve plug is moved to safe position noted in register 40050) |
| unit16 | RESERVED                      | 40083        |             |      |                       |                                                                                                                                                                                                                                     |
| unit16 | RESERVED                      | 40084        |             |      |                       |                                                                                                                                                                                                                                     |
| unit16 | RESERVED                      | 40085        |             |      |                       |                                                                                                                                                                                                                                     |
| unit16 | RESERVED                      | 40086        |             |      |                       |                                                                                                                                                                                                                                     |
| unit16 | RESERVED                      | 40087        |             |      |                       |                                                                                                                                                                                                                                     |
| unit16 | RESERVED                      | 40088        |             |      |                       |                                                                                                                                                                                                                                     |
| unit16 | RESERVED                      | 40089        |             |      |                       |                                                                                                                                                                                                                                     |
| unit16 | RESERVED                      | 40090        |             |      |                       |                                                                                                                                                                                                                                     |
| unit16 | RESERVED                      | 40091        |             |      |                       |                                                                                                                                                                                                                                     |
| unit16 | RESERVED                      | 40092        |             |      |                       |                                                                                                                                                                                                                                     |
| unit16 | RESERVED                      | 40093        |             |      |                       |                                                                                                                                                                                                                                     |
| uint32 | Device Tag                    | 40094-40113  | †easyDrive2 | R/W  | 0 - 255 per character | Device Tag (20 character UTF8 string)                                                                                                                                                                                               |
| uint32 | Valve serial number           | 40114, 40115 | 0           | R/W* | 0-4,294,967,296       | Valve assembly serial number assigned at Fisher assembly plant                                                                                                                                                                      |
| uint32 | Motor serial number           | 40116, 40117 | 0           | R/W* | 0-4,294,967,296       | Motor/gearbox serial number                                                                                                                                                                                                         |
| uint32 | Motor revision                | 40118, 40119 | 0           | R/W* | 0-4,294,967,296       | Motor/gearbox revision                                                                                                                                                                                                              |
| uint32 | PCB serial number             | 40120, 40121 | 0           | R/W* | 0-4,294,967,296       | PCB serial number                                                                                                                                                                                                                   |
| uint16 | PCB revision                  | 40122, 40123 | 0           | R/W* | 0-4,294,967,296       | PCB revision                                                                                                                                                                                                                        |
| uint16 | Flash Firmware major revision | 40124        | 0           | R    | 0-65535               | From flash firmware when compiled                                                                                                                                                                                                   |
| uint16 | Flash Firmware minor revision | 40125        | 0           | R    | 0-65535               | From flash firmware when compiled                                                                                                                                                                                                   |
| uint16 | Flash Firmware mod revision   | 40126        | 0           | R    | 0-65535               | From flash firmware when compiled                                                                                                                                                                                                   |
| uint16 | Flash Firmware build revision | 40127        | 0           | R    | 0-65535               | From flash firmware when compiled                                                                                                                                                                                                   |
| uint16 | Boot Firmware major revision  | 40128        | 0           | R    | 0-65535               | From boot firmware when compiled                                                                                                                                                                                                    |
| uint16 | Boot Firmware minor revision  | 40129        | 0           | R    | 0-65535               | From boot firmware when compiled                                                                                                                                                                                                    |
| uint16 | Boot Firmware mod revision    | 40130        | 0           | R    | 0-65535               | From boot firmware when compiled                                                                                                                                                                                                    |
| uint16 | Boot Firmware build revision  | 40131        | 0           | R    | 0-65535               | From boot firmware when compiled                                                                                                                                                                                                    |
| Uint32 | PCB test date                 | 40132, 40133 | 0           | R/W* | 0-4,294,967,296       | Seconds since January 1st, 2000, Board Supplier Functional Test Date                                                                                                                                                                |
| Uint32 | Motor test date               | 40134, 40135 | 0           | R/W* | 0-4,294,967,296       | Seconds since January 1st, 2000, Motor Supplier Test Date                                                                                                                                                                           |
| Uint32 | System completion date        | 40136, 40137 | 0           | R/W* | 0-4,294,967,296       | Seconds since January 1st, 2000, Final Assembly Test Date                                                                                                                                                                           |

UINT16 – unsigned 16 bit variable, can take value 0-65535.

UINT32 – unsigned 32 bit variable, can take value 0-4294967295.

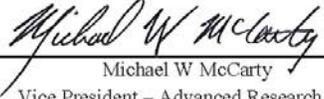
(Reserved) – registers used for development use only.

† - 32bit register contains data that spans two registers – reads and write of data needs to be performed within the same Modbus command function to ensure coherency of data.

Table 9. Diagnostic Fault Flags

| Hex Value | Bit Mask            | Description                                                 | Value | Bit | Definition                                                                                                                                      |
|-----------|---------------------|-------------------------------------------------------------|-------|-----|-------------------------------------------------------------------------------------------------------------------------------------------------|
| 0x8000    | 1000 0000 0000 0000 | Fault in N.V. Memory – system has restored default settings | 32768 | 15  | A memory fault has occurred and the actuator has been restored to factory defaults. Contact your Emerson Local Business Partner.                |
| 0x8000    | 1000 0000 0000 0000 | Fault in N.V. Memory – system has restored default settings | 32768 | 15  | A memory fault has occurred and the actuator has been restored to factory defaults. Contact your Emerson Local Business Partner.                |
| 0x4000    | 0100 0000 0000 0000 | Motor Assembly Stall                                        | 16384 | 14  | The actuator is unable to move to the commanded position and has stopped. Follow troubleshooting guide in Help section to remedy.               |
| 0x2000    | 0010 0000 0000 0000 | Discrete Input override mode active                         | 8192  | 13  | The digital input has detected a closed contact and the actuator has moved to its safe position. Check switch input device status.              |
| 0x1000    | 0001 0000 0000 0000 | System or Watchdog fault                                    | 4096  | 12  | The actuator has experienced a fatal error and shut down. Contact your Emerson Local Business Partner.                                          |
| 0x0800    | 0000 1000 0000 0000 | Analog Input calibration value not in expected range        | 2048  | 11  | The analog values entered do not match the analog signal level. Check analog signal value and value entered.                                    |
| 0x0400    | 0000 0100 0000 0000 | Valve travel distance calibration not in legal range        | 1024  | 10  | The valve travel distance is outside the acceptable range. Confirm valve type and that no obstructions are present.                             |
| 0x0200    | 0000 0010 0000 0000 | Analog Input span calibration not in legal range            | 512   | 9   | The analog values for open and close are less than 4mA and previous values have been maintained. Calibrate analog input with differential >4mA. |
| 0x0100    | 0000 0001 0000 0000 |                                                             | 256   | 8   |                                                                                                                                                 |
| 0x0080    | 0000 0000 1000 0000 | Valve was shutdown while moving                             | 128   | 7   | Actuator was powered down during a move and actual position may vary from commanded. Recalibrate the valve span.                                |
| 0x0040    | 0000 0000 0100 0000 | Valve span calibrated (informational)                       | 64    | 6   | Span has been calibrated and actuator is ready.                                                                                                 |
| 0x0020    | 0000 0000 0010 0000 | Valve position controller active (informational)            | 32    | 5   | Actuator is active and ready.                                                                                                                   |
| 0x0010    | 0000 0000 0001 0000 | Loss of signal active                                       | 16    | 4   | Control signal not present. Signal is <3mA, timeout period exceeded (40051 or 40052).                                                           |
| 0x0008    | 0000 0000 0000 1000 |                                                             | 8     | 3   |                                                                                                                                                 |
| 0x0004    | 0000 0000 0000 0100 | Modbus command has been sent (starts a calibrated system)   | 4     | 2   | The actuator is successfully moving the valve.                                                                                                  |
| 0x0002    | 0000 0000 0000 0010 | Analog input initialized (system has seen input >3mA/1V)    | 2     | 1   | 4-20mA analog input has a valid signal present                                                                                                  |
| 0x0001    | 0000 0000 0000 0001 | Start delay active (within 15 second calibration window)    | 1     | 0   | Span calibration using physical inputs allowed during startup                                                                                   |

## Appendix B - Certificate of Conformance

|                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                  |  |
| <h3>EU Declaration of Conformity</h3>                                                                                                                                                                                                                                                                                                                                                                             |                                                                                     |
| <p>We, the manufacturer,</p> <p><b>Emerson Process Management<br/>Fisher Controls International LLC<br/>205 South Center Street<br/>Marshalltown, Iowa 50158 USA</b></p>                                                                                                                                                                                                                                          |                                                                                     |
| <p>declare under our sole responsibility that the following product(s);</p> <p><b>Electric Actuator<br/>easy-Drive</b></p>                                                                                                                                                                                                                                                                                        |                                                                                     |
| <p>to which this declaration relates, is in conformity with the provisions of the following European Community Directives, including the latest amendments, as shown in the attached schedule.</p> <p>Assumption of conformity is based on the application of the harmonized standards and, when applicable or required, a European Community Notified Body certification, as shown in the attached schedule.</p> |                                                                                     |
| <p><br/>Michael W. McCarty<br/>Vice President – Advanced Research and Marketing</p> <p>26-May-2016<br/>Date</p>                                                                                                                                                                                                               |                                                                                     |
| <p><b>European Contact</b><br/>Emerson Process Management   Group Services SAS   Rue Paul-Baudry   B.P. 10   68701 Cernay Cedex France</p>                                                                                                                                                                                                                                                                        |                                                                                     |
| EDOCS ID: FCS_55                                                                                                                                                                                                                                                                                                                                                                                                  | Page 1 of 2                                                                         |

**EMC Directive – 2014/30/EU**

All models  
EN 61326-1:2013

**ATEX Directive – 2014/34/EU (Applicable only if this mark  appears on the product)**

Certificate – **SIRA12ATEX1168X – Group II Category 2 G** – Flameproof  
easy-Drive  
Ex db IIA T6(Ta ≤ 70°C) Gb  
Standards used: EN60079-0:2012/A11:2013, EN60079-1:2014

ATEX Notified Body for EC-Type Examination Certificate(s)  
SIRA Certification Service – Notified Body Number: 0518  
Unit 6, Hawarden Industrial Park,  
Hawarden, CH5 3US  
United Kingdom

ATEX Notified Body for Quality Assurance  
SGS Baseefa Limited – Notified Body Number: 1180  
Rockhead Business Park  
Staden Lane, Buxton, Derbyshire SK17 9RZ  
United Kingdom

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