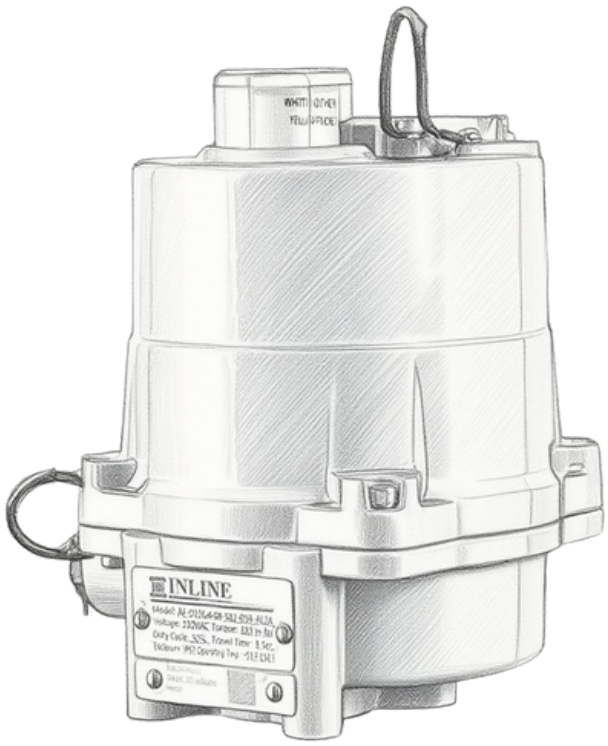


CW2 Automated Ball Valve with Integrated Timer

INSTALLATION & OPERATIONS MANUAL

For Electric Actuators Models AE-D21 & AE-D22

Please read the entire manual carefully prior to installing, operating, or servicing this product. Failure to comply with these instructions may cause personal injury and/or property damage and may void the warranty of the unit. Always retain this manual for future reference.

Repairing this equipment while under warranty without prior permission of LAKOS Corp. or the direction of an approved LAKOS service location may void warranty.

The shipping container has been specifically designed to prevent damage while in transit. Please check the unit thoroughly upon receipt and note any damage on the delivery receipt. If damage is found, you must then file a claim promptly with the carrier

1. Safety Instructions

- Use certified personnel for the installation/maintenance.
- Read the manual and the wiring diagram on the top cover before installation.
- Confirm the marked voltage on the nameplate of the actuator housing.
- Before wiring, ground the PE wire of the actuator.
- This product can be used indoors and outdoors.
- This product is not explosion-proof. Please avoid flammable and explosive environments.
- Note that this product's ambient temperature must be within the temperature range marked on the product nameplate.
- Ensure the installation specifications follow local safety regulations.
- Check configuration and specifications before assembling. Move to an accessible workspace before assembly and installation.
- All assembly or wiring work should be performed with the power OFF.
- Models with a supercapacitor may still have remaining power when the power is off.
- Avoid having metal materials come in contact with any parts of the circuit board.
- To manually operate the actuator during regular actuation, use the appropriate device to check the surface temperature. If the surface temperature exceeds 60°C, wear appropriate gloves before operating.
- Do not use the handwheel or manual output shaft for support during transportation.
- Please use anti-shock and moisture-proof packaging.

2. Product Features

- Compact, lightweight, high torque, and fast speeds.
- The adaptable shaft bore design allows various valve stems, bushings, and adapters.
- Meets ISO 12944 C03-02 anti-corrosion standard. Three layers of epoxy polyester powder surface coating protect the actuator in an urban industrial environment and moderate sulfur dioxide levels for 5 to 15 years.
- Equipped with a brushless DC motor that provides high efficiency, low heat, and longevity without carbon brushes, no powder pollution.
- Standard multiple protections.
- No clutch for manual operation.
- Large angle valve opening position design.
- Manual purge button.

3. Shipment

- Do not use the handwheel or manual output shaft for support during transportation.
- Please use anti-shock and moisture-proof packaging.

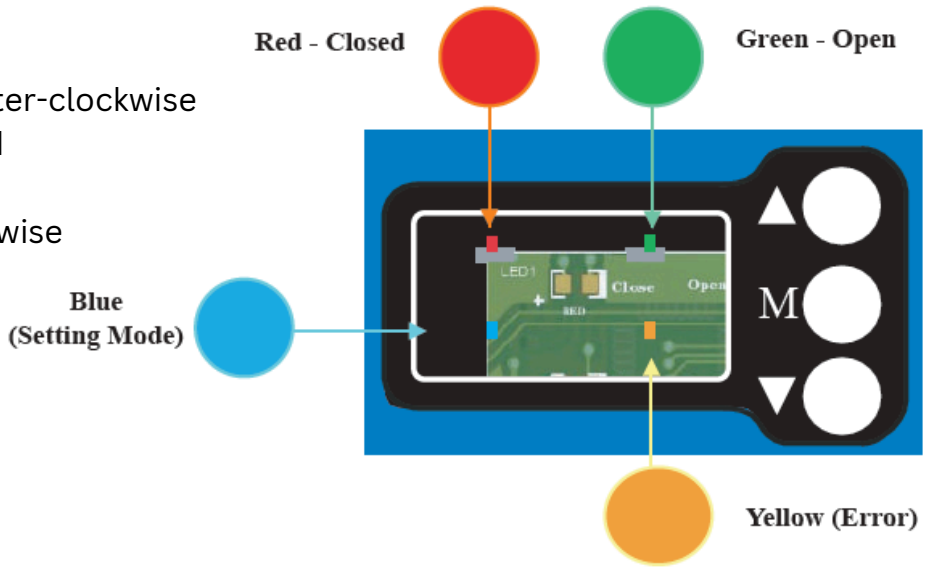
4. Store

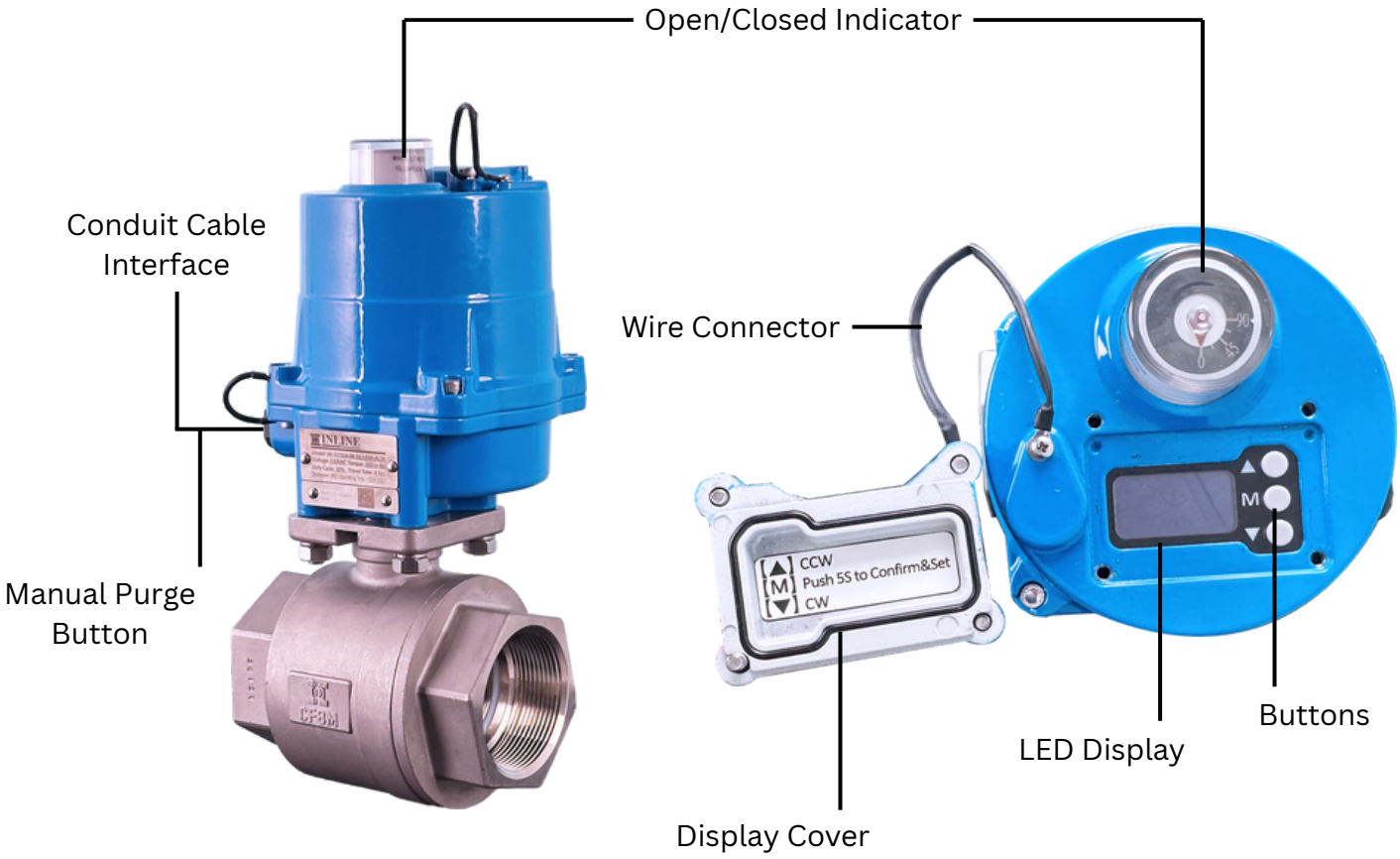
- Store the actuator in a clean and dry environment and avoid extreme temperatures.
- Avoid placing the actuator in an environment with gases that can damage metal materials. Do not remove the dust plug.
- Long-term storage requires the following before use:
  - Visual inspection of electrical components.
  - Check the manual operation by cycling with the handwheel or wrench.
  - Trial operation of the actuator.

5. Product Overview

User Interface

▲: Operates actuator counter-clockwise
M: Access setting mode and confirm functions
▼: Operates actuator clockwise





6. Technical Specs

Basic Parameters

Model	Torque		Weight		Motor Power	Manual Overide	ISO 5211 Mounting Hole Pattern	Female Output Drive Dimension	Start/Run/Max Current			
									Amps			
	N·m	in-lb	KG	lb	W			mm	24V DC	24V AC	110V AC	220V AC
D21	35	310	2.1	4.6	15	8mm Hex	F05/F07	14X14↓16	1.4	1.9	0.65	0.45
D22	50	443	2.1	4.6	15	8mm Hex	F05/F07	14X14↓16	1.4	1.9	0.65	0.45

Note:
Refer to the actuator drawing for mounting dimension details

Frequency of Starting

Model	Duty Cycle S2	90° Travel Time	
	@70°C	DC/AC 24V	AC 110V/220V
D21	15min	11S	8S
D22	15min	14S	12S

Note: The duty cycle data listed on the table is based on CSA certification.

$$Duty\ Cycle = \frac{Travel\ Time}{Travel\ Time + Rest\ Time} \times 100\%$$

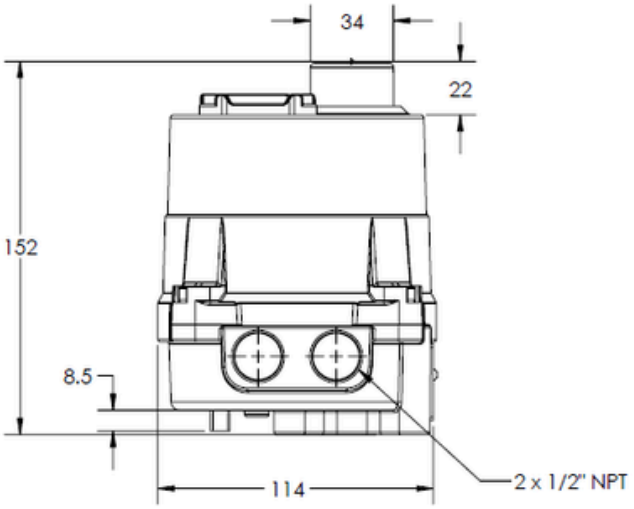
$$Rest\ Time = \frac{Travel\ Time \times (1\text{-}Duty\ Cycle)}{Duty\ Cycle}$$

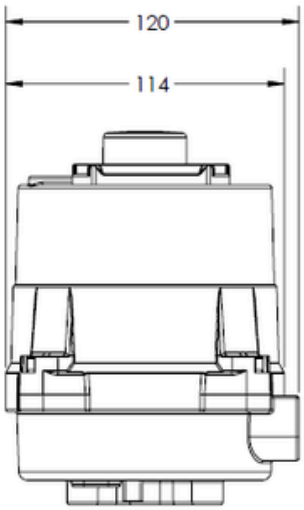
For example:
Model D21 is 30% at 70°C, travel time is 11S on 24V DC/AC, based on the equation above, the rest time on 24V DC/AC would be 26S.

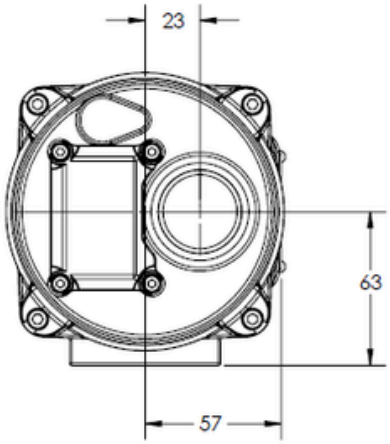
$$Rest\ Time = \frac{11 \times (1\text{-}30\%)}{30\%} = 26S$$

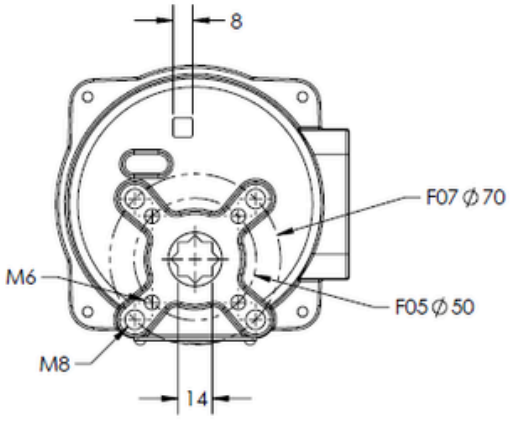
The test requirement per En15714-2:
At 0-5% and 95%-100% travel, the load is 100% of the rated torque
At 5-95% travel, the load is 30% of the rated torque
Inline's test requirement is higher than En15714-2:
At 0-15% and 85-100% travel, the load is 100% of the rated torque
At 15%-85% travel, the load is 40% of the rated torque.

7. Dimensional Drawings







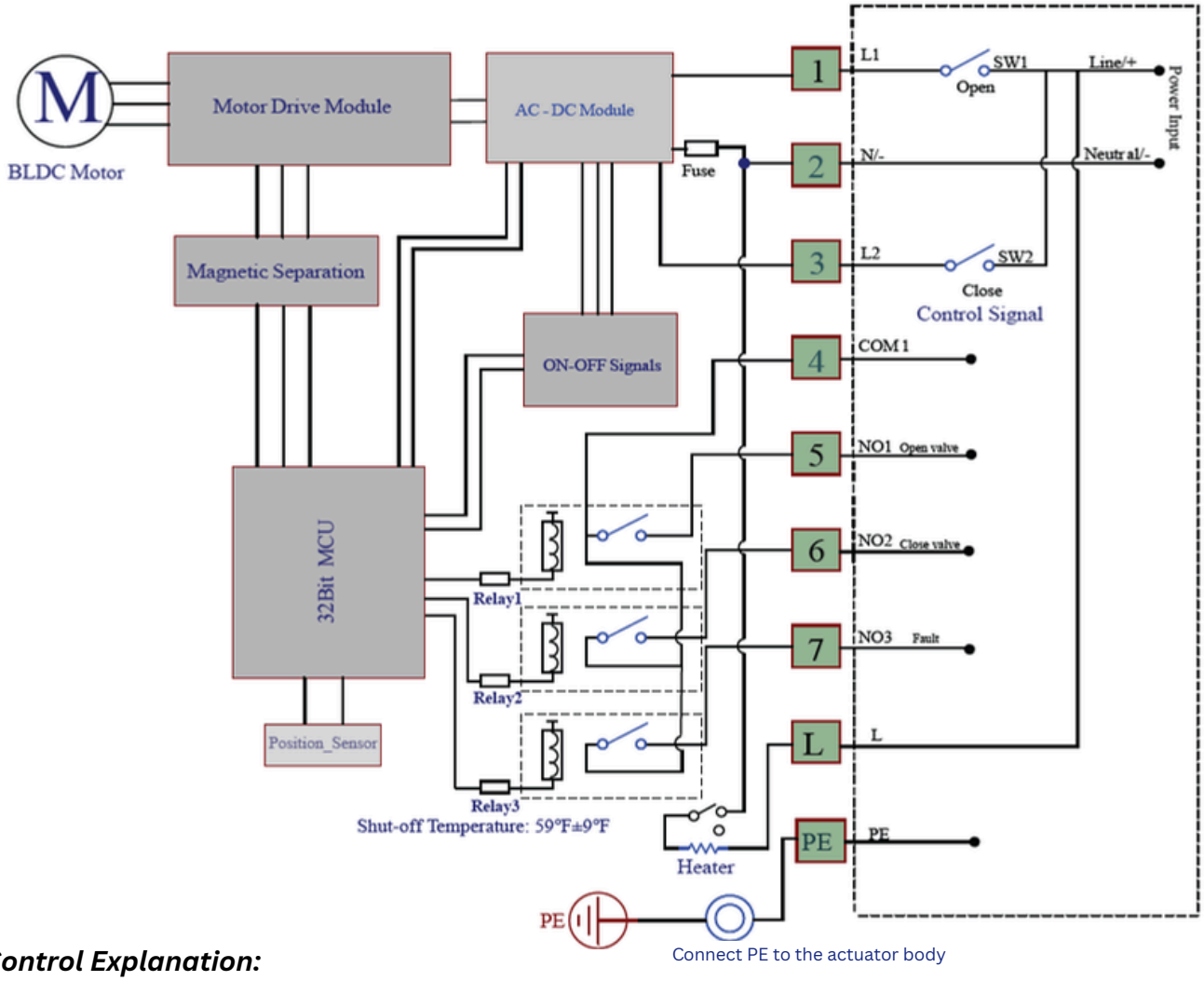


8. Actuator and Valve Assembly

1. **Inspection**
   - Check the compatibility of the valve's torque and the actuator's torque. (Valve torque ≤ 77% of actuator rated torque)
   - Check that environmental temperature limits do not exceed the operating temperature limits of the actuator.
   - Check the compatibility of the valve and actuator connection. (Please refer to the dimensional drawings on pages 13-14)
   - Verify that all electrical ratings and specifications meet installation requirements.
2. **Assembly**
   - Assembly must be performed without electricity.
   - Please confirm that the valve and actuator are both in the fully open or fully closed position. If not, please put them both in the fully open or closed position.
   - Assembly: Fit the valve's stem into the actuator shaft bore and lock all fasteners. After tightening, sealant should be applied around the bolts as a thread anti-loosening mark.
   - After Assembly, ensure the actuator and the valve are both in the open or closed position, then manually drive the actuator open and closed once.

9. Wiring

- Before wiring, please check the nameplate on the actuator shell to confirm whether the connected voltage is correct.
- Disconnect power before wiring to avoid electric shock or damage to the circuit board.
- For the wiring schematic diagram, please refer to the wiring schematic diagrams on pages 15-17 or follow the wiring diagram on the actuator.
- If the ordered product includes a pre-wired cable, use the cable connections for on-site wiring. Be sure to use the correct wire color. If the product ordered does not contain external wiring, open the cover for wiring. PLEASE REMOVE COVER CAREFULLY AS USER INTERFACE IS WIRED TO THE CONTROL BOARD.
- The actuator's ground wire (PE) must be connected.



Control Explanation:

SW1	SW2	Valve Position	Feedback Signal
ON	OFF	Open Valve	[4] connects to [5]
OFF	ON	Close Valve	[4] connects to [6]

- [1], [2] and [3] are for power supply. Please check that polarity, voltage and amperage are correct prior to connecting wires to avoid damage.
- When power is off, feedback signals are not available.
- Connections [4] through [7] are for feedback relay.
- Output relay switch ratings: 110VAC/0.8A; 250VAC/0.5A; DC30V/1A.

Attention:

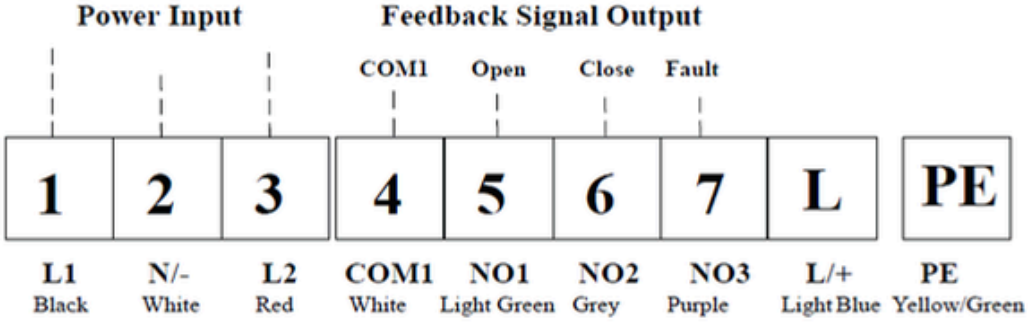
- Please check the nameplate on the actuator and confirm the connected voltage.
- If the wiring requires opening the actuator enclosure, please disassemble it carefully since the user interface is connected to the control board. Please do not disconnect or damage the connection wire.
- Be sure of the correct orientation before re-attaching the cover.

9. Wiring Schematic Diagram

110VAC / 220VAC

Relay Output: 0.8A/110VAC
0.5A/250VAC
1A/30VDC

AE-D2 and higher On-Off Wiring Diagram



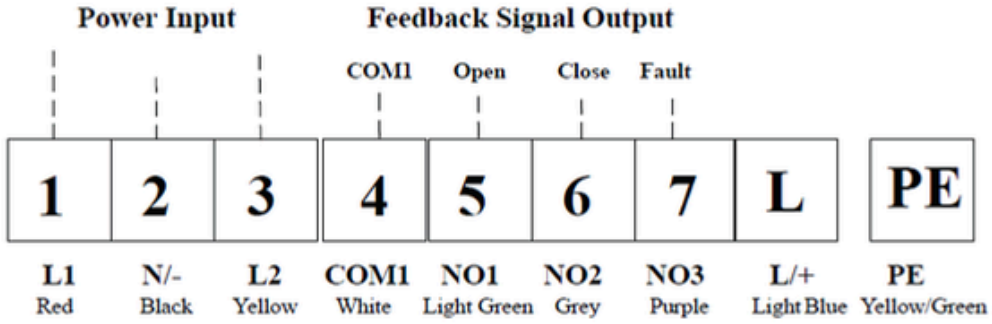
Description:

1. **Power to terminals 1 and 2 rotates actuator counter-clockwise to open. Open Relay connecting terminals 4 to 5 provides a signal when fully open.**
2. **Power to terminals 3 and 2 rotates actuator clockwise to close. Close Relay connecting terminals 4 to 6 provides a signal when fully closed.**
3. **Fault Relay connecting terminals 4 to 7 provides a signal when actuator is experiencing a problem and is unable to function properly.**

24VDC / 24VAC

Relay Output: 0.8A/110VAC
0.5A/250VAC
1A/30VDC

AE-D2 and higher On-Off Wiring Diagram



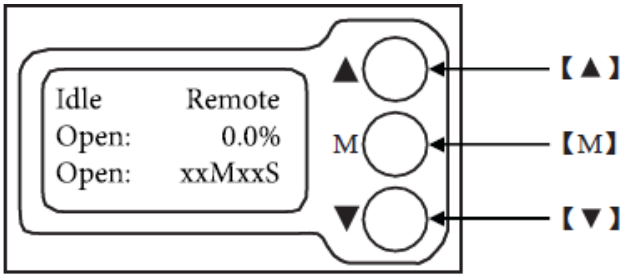
Description:

1. **Power to terminals 1 and 2 rotates actuator counter-clockwise to open. Open Relay connecting terminals 4 to 5 provides a signal when fully open.**
2. **Power to terminals 3 and 2 rotates actuator clockwise to close. Close Relay connecting terminals 4 to 6 provides a signal when fully closed.**
3. **Fault Relay connecting terminals 4 to 7 provides a signal when actuator is experiencing a problem and is unable to function properly.**

10. Automatic Timer Instructions

The actuator is supplied in the fully closed position. When power is turned on, actuator will turn to the fully open position immediately and then proceed with the timer settings. The default timer is 00M08S for the OpenTime and 04H00M for the CloseTime.

User Interface



- Scroll up button: Select menu items and adjust numeric values.
- Save, confirm, return, exit selections, and shift between modes.
- Scroll down button: Select menu items, adjust numeric values, and shift numeric positions when inputting code.

Timer Settings:

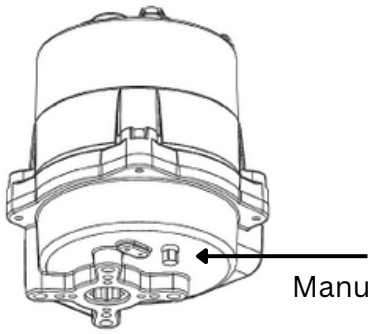
1. Press and hold [M]. An “E” will flash on the bottom right until the main menu appears. Release the button.
2. Scroll down [▼] to UserSetting.
3. Press [M] to select.
4. The screen will show "Enter Code: 0000". This is the default. Just press [M] again.
5. A menu will appear. Scroll down [▼] to OpenTime.
6. Press [M] to select. You will now set the OpenTime. Note: Open time is the time the valve stays fully open. It does not include the time to cycle to the fully open or fully closed position.
7.
    a. The screen will now show 00M00S indicating you can now set the “00”s to the desired number of minutes and seconds you wish the actuator to stay open. To enter the minutes and seconds, move the cursor to the desired position by pressing [▼]. As you continue to press [▼], it will toggle through the positions.
    b. To change the “00”s to the desired time, move the cursor to the desired position and press [▲]. This will advance the 0 to 1. Continue to press [▲] until you reach the desired number (0-9). Note that the number in the tens position for minutes and seconds (00M and 00S) can only be set to a maximum of “5”.
8. Once you have set the desired minutes and seconds, press [M] to confirm the OpenTime. This will also return you to the previous menu.
9. Scroll down M [▼] to CloseTime.

10. Press [M] to select. You can now set the CloseTime. Note: The closed time is the length of time the valve stays closed. It does not include the time to cycle to the fully open or fully closed position.
11. Scroll down [▼] to UserSetting.
    a. The screen will now show 00H00M indicating you can now set the “00”s to the desired number of hours and minutes you wish the actuator to stay closed. To enter the hours and minutes, move the cursor to the desired position by pressing [▼] As you continue to press [▼], it will toggle through the positions.
    b. To change the “00”s to the desired time, move the cursor to the desired position and press [▲]. This will advance the 0 to 1. Continue to press [▲] until you reach the desired number (0-9). Note that the number in the tens position for minutes (00M) can only be set to a maximum of “5”.
12. Once you have set the desired minutes and seconds, press [M] to confirm the CloseTime. This will also return you to the previous menu.
13. Scroll down [▼] to Return.
14. Press [M]. This returns you M to the main menu.
15. Scroll down [▼] to Exit.
16. Press M [M] to Confirm.

Actuator timer is now set. After exiting the menu, the actuator will turn according to the timer settings.

11. Manual Operation

- Do not perform mechanical manual operations while the power is on.
- When operating manually, pay attention to the position indication or dial, and do not exceed the stroke range.
- Note that manual override operation is slow and there is increased resistance.
- The directions below are only for standard (open counter-clockwise / close clockwise) configurations.



- **Tool:** Wrench
- **Size:** 8mm
- **D2 Series:** Turn wrench clockwise and the actuator will open (maximum position) the valve.
- **D2 Series:** Turn wrench counter-clockwise and the actuator will close (minimum position) the valve.

12. Fault Types and Troubleshooting

Fault Light Indication	Error Type	Problem	Solution
All lights on the actuator are off	Issue with power/ voltage or fuse	When power is turned on, the actuator does not move and all lights are off	Please see detailed instructions on page 12. 1. Check if display wire is connected (Note: it is short) 2. Check whether the external input power is the correct voltage. 3. Check whether the voltage at the power input terminal of the circuit board is normal. 4. Check whether the fuse is normal
The yellow fault light flashes quickly (flashes once every 0.2 seconds), and the other lights are off.	Motor stalled	Stall time exceeds 3 seconds.	1. Check whether the valve is in the correct position for actuator rotation. 2. Check travel stops. 3. Check whether the valve is blocked.
The yellow fault light flashes slowly (flashes once every 2 seconds), and the other lights are off.	Temperature is too high	The temperature exceeds the upper limit.	1. Confirm that the power supply to the actuator does not exceed the specified values for the actuator. 2. Confirm that the duty cycle does not exceed the limits of the actuator (refer to p. 4). 3. Check whether the ambient temperature exceeds the operating temperature marked on the actuator nameplate.
	Overcurrent	Valve torque exceeds the maximum current value of the actuator.	1. Check whether the valve torque exceeds 1.3 times the rated torque of the actuator. If so, use an actuator with a higher torque.
	Signal position sensor failure	Unable to detect encoder position.	1. Check if the wiring connection is loose. If so, tighten or replace the connector.
	Mechanical failure	There is a fault in the actuator transmission.	Contact Factory

Notes