

MO-Series Manual Override Gearboxes

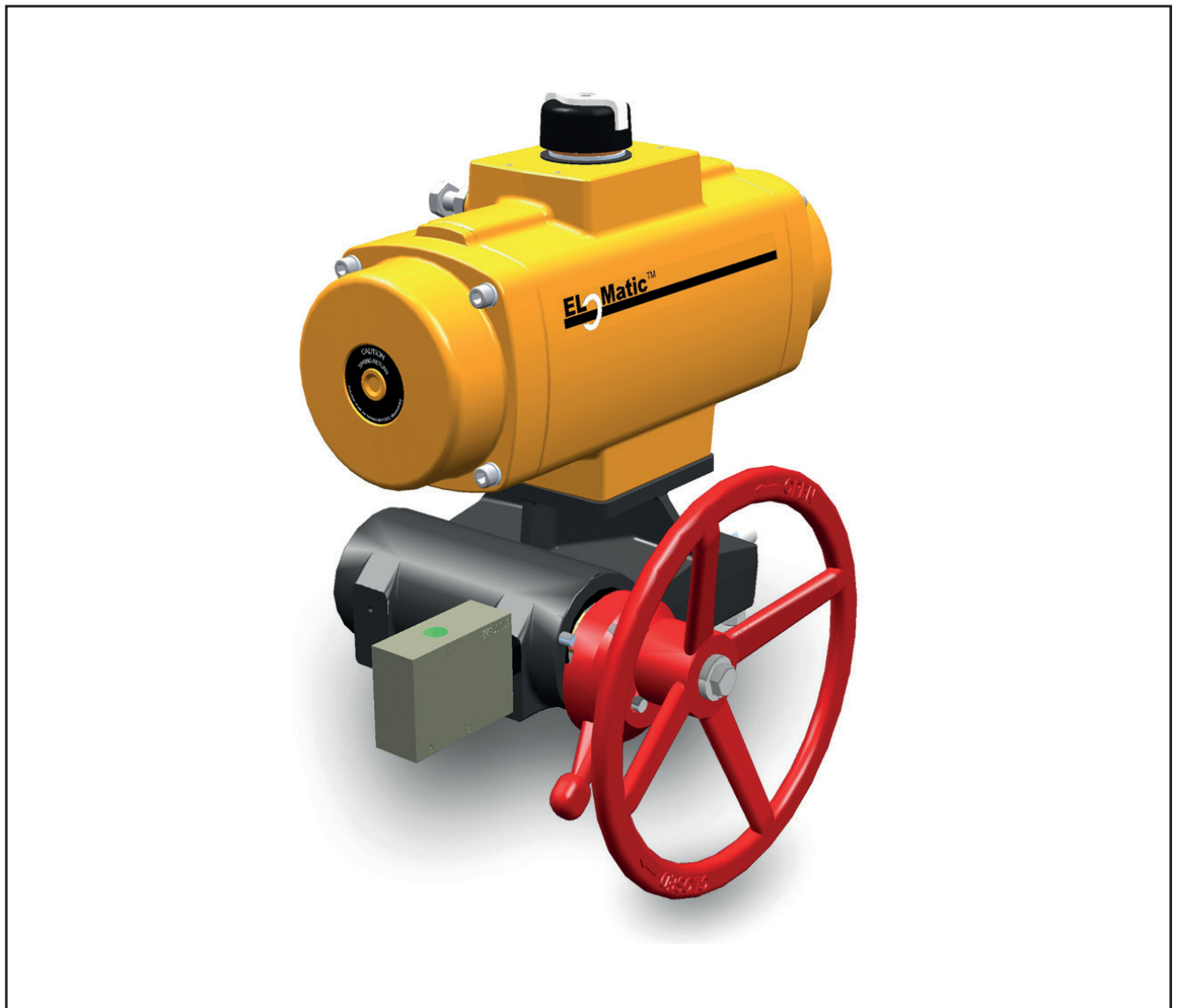


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Section: 1 Introduction

1.1 Description

The MO Declutchable Manual Override Gearboxes offer simple and reliable manual positioning of valves, dampers and other quarter-turn devices when overriding, existing pneumatic or hydraulic rotary actuators. All EL-O-Matic MO-gearboxes are suitable for indoor and outdoor use and combine rugged construction, light weight and modular design to provide the most efficient and cost effective solution to a full range of manual override requirements.

The self-locking worm gear design means safe and easy operation, positive manual positioning and extremely long life. For extra ease of operation the MO-600 is equipped with an extra gearbox to reduce the forces on the hand wheel.

The EL-O-Matic MO-gearboxes can be adapted to any quarter-turn actuator and may even be installed in the field on existing valves.

The top- and bottom drilling patterns are according the ISO 5211 and the drive connection to the valve is by means of a round bore with a key way. The key drive is according to DIN 6885A.

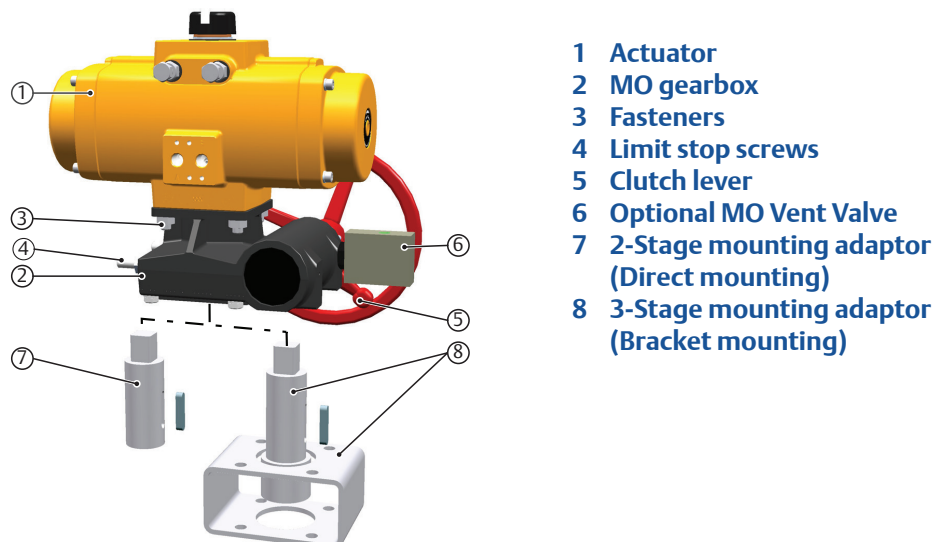
EL-O-Matic Manual Override gearboxes are available in five (5) models:

Table 1. Model overview

Model	Actuator size		See data sheet:	
	Double acting	Single acting (Spring Return)	Metric	Imperial
MO-10	FD25-FD40-FD65	FS25-FS40-FS65	EFM.07.MO-10.EN	EFI.07.MO-10.EN
MO-50	FD100-FD150-FD200	FS100-FS150-FS200	EFM.07.MO-50.EN	EFI.07.MO-50.EN
MO-160	FD350-FD600-FD950	FS350-FS600-FS950	EFM.07.MO-160.EN	EFI.07.MO-160.EN
MO-520	FD1600, FD2500, FD4000	FS1600, FS2500	EFM.07.MO-520/600.EN	EFI.07.MO-520/600.EN
MO-600		FS4000		

1.2 Manual Override (MO) Assembly Components

Figure 1 Manual Override components



- 1 Actuator
- 2 MO gearbox
- 3 Fasteners
- 4 Limit stop screws
- 5 Clutch lever
- 6 Optional MO Vent Valve
- 7 2-Stage mounting adaptor (Direct mounting)
- 8 3-Stage mounting adaptor (Bracket mounting)

Section: 2 MO gearbox mounting

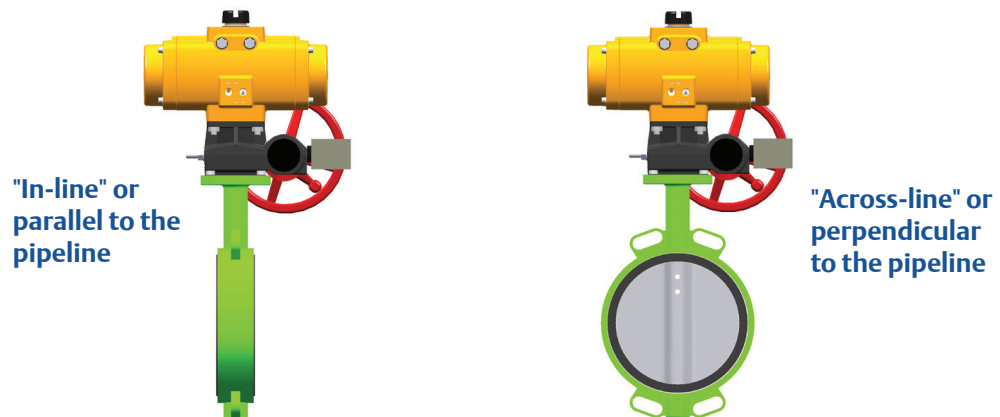
⚠ WARNING

Actuator and MO gearbox assembly must be isolated both pneumatically and electrically before any (dis)assembly is begun.
Before mounting or (dis)assembling the MO gearbox, consult the relevant sections of this manual.

2.1 MO Mounting Orientation

Pneumatic actuators are normally installed with the major axis parallel to the pipeline.
The normal mounting of the MO unit to the actuator is that the major axis of the actuator is at 90° to the MO hand wheel shaft and with the hand wheel on the opposite side of the actuator's air connections. This provides a convenient operation of the hand wheel at the side of the valve, without obstruction by the air connections or solenoid valve, if fitted.

Figure 2 MO gearbox mounting orientation



2.2 Hand wheel MO mounting instruction

To create a good connection between the shaft and hand wheel, the surface of both the shaft cone and the hand wheel cone have to be clean.

Apply the bellow listed tightening torque to the hand wheel screw.

Table 2. Tightening torque - hand wheel screw

Type	Tightening torque	
MO-10	8-10 Nm	(70-90 lb.in)
MO-50, 160, 520, 600	35-40 Nm	(310-354 lb.in)

2.3 Actuator and Valve Mounting Instructions

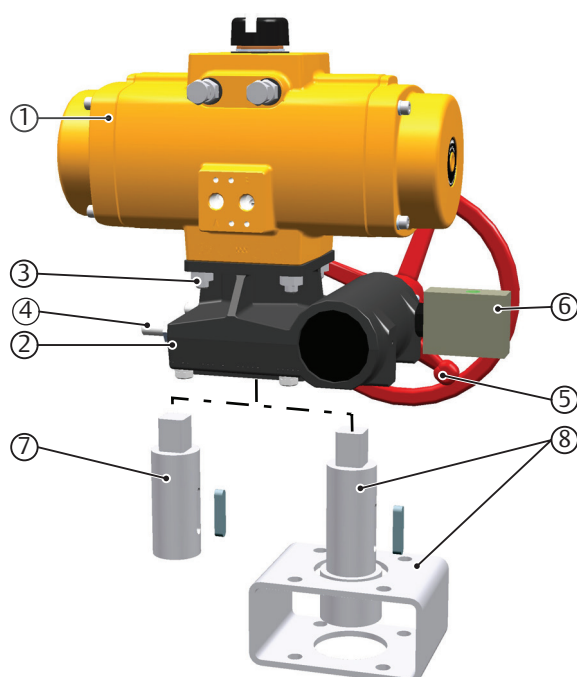
1. Be sure that the valve, the MO gearbox (2) and actuator (1) are in the same Position ("Open" or "Closed").
2. Insert mounting adaptor with key into MO drive sleeve. 2-Stage or 3-stage adaptors can be used and which may be machined to fit the valve stem (see figure 3)
 - Direct mount adaptor (7) or
 - Bracket mount adaptor(8).
 - For both adaptors the key drive is to DIN 6885A.
3. Rotate the MO hand wheel to position the output drive as necessary to mate with valve position.
4. Mount MO gearbox to the valve and bolt into place.
5. Mount actuator to top of MO and bolt into place with suitable fasteners.

Important

- In order to ensure good fastening practice of actuator and MO gearbox, we strongly recommend to use the outer drilling pattern of the actuator.
- See next tables for the recommended fastener sizes and applicable tightening torques.

We recommend to use studs for ease of mounting. Studs have a defined thread length fitting into the actuator and manual override and provide best thread engagement for applying suitable tightening torque onto the threads.

Actuator and Valve Mounting



- 1 Actuator
 - 2 MO gearbox
 - 3 MO to actuator fasteners
 - 4 Limit stop screws
 - 5 Clutch lever
 - 6 Optional MO Vent Valve
 - 7 2-Stage mounting adaptor (Direct mounting)
 - 8 3-Stage mounting adaptor (Bracket mounting)
-

Table 3. MO-Gearbox valve flange tightening torque

Actuator size	ISO 5211 pattern	Metric Thread	Torque (Nm)		Imperial Thread	Torque (lbf.ft)	
			Min.	Max.		Min.	Max.
MO-10	F05 inner	M6	4.5	5.0	1/4"-20	3.3	3.7
	F07 outer	M8	10.5	12.5	5/16"-18	7.7	9.2
MO-50	F07 inner	M8	10.5	12.5	5/16"-18	7.7	9.2
	F10 outer	M10	21.0	24.5	3/8"-16	15.5	18.1
MO-160	F10 inner	M10	21.0	24.5	3/8"-16	15.5	18.1
	F12 outer	M12	34.5	43.0	1/2"-13	25.4	31.7
	F14 outer	M16	90.0	104.0	5/8"-11	66.4	76.7
MO-520/ MO-600	F16 inner	M20	170.0	204.0	3/4"-10	125.4	150.5
	F25 outer	4x M16	90.0	104.0	4x 5/8"-11	66.4	76.7

Table 4. Actuator bottom flange ⁽²⁾ tightening torque

Actuator size	ISO 5211 pattern	Metric Thread	Torque (Nm)		Imperial Thread	Torque (lbf.ft)	
			Min.	Max.		Min.	Max.
25	F03 inner	M5	2.0	3.0	10-24UNC	1.5	2.2
	F05 outer	M6	4.5	5.0	1/4"-20	3.3	3.7
40, 65, 100	F05 inner	M6	4.5	5.0	1/4"-20	3.3	3.7
	F07 outer	M8	10.5	12.5	5/16"-18	7.7	9.2
150, 200, 350	F07 inner	M8	10.5	12.5	5/16"-18	7.7	9.2
	F10 outer	M10	21.0	24.5	3/8"-16	15.5	18.1
600	F10 inner	M10	21.0	24.5	3/8"-16	15.5	18.1
	F12 outer	M12	34.5	43.0	1/2"-13	25.4	31.7
950	F10 inner	M10	21.0	24.5	3/8"-16	15.5	18.1
	F14 outer	M16	90.0	104.0	5/8"-11	66.4	76.7
1600, 2500 ⁽¹⁾	F16 inner	M20	170.0	204.0	3/4"-10	125.4	150.5
	F25 outer	4x M16	90.0	104.0	4x 5/8"-11	66.4	76.7
4000	F16 inner	M20	170.0	204.0	3/4"-10	125.4	150.5
	F25 outer	8x M16	90.0	104.0	8x 5/8"-11	66.4	76.7

1. For actuator sizes 1600 and 2500 only 4 holes of the ISO5211 F25 drilling pattern are available.
2. In order to ensure good fastening, we recommend to use the outer drilling pattern of the actuator to mount the MO gearbox.
3. We recommend to use studs for ease of mounting. Studs have a defined thread length fitting into the actuator and manual override and provide best thread engagement for applying suitable tightening torque onto the threads.

Table 5. Recommended adaptor key

Gearbox model	Recommended key (DIN 6885A)
MO-10	8 x 7 x 22
MO-50	8 x 7 x 36
MO-160	12 x 8 x 63
MO-520/MO-600	25 x 14 x 80

2.4 Stroke adjustment of MO gearbox

⚠ CAUTION: USE LIMIT STOPS OF THE MO GEARBOX

During manual operation, the MO gearbox can generate more torque than the actuators can cope with.

In order to prevent damage to the actuator, it is strongly recommended to use the limit stops of the MO gearbox to set mechanically the end positions of the actuator and MO gearbox.

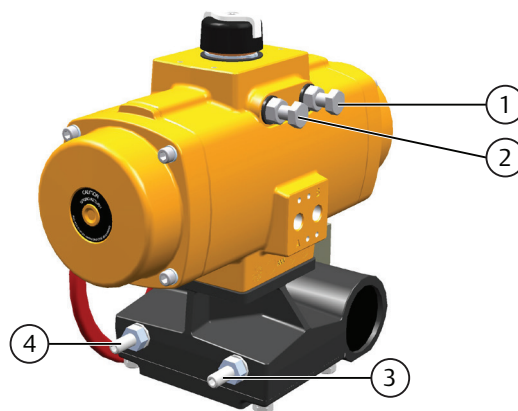
When the MO unit is fitted to the actuator it is important that the rotation of the MO unit is adjusted to the rotation of the actuator. This is carried out by means of the stroke adjustment screws fitted on the MO housing.

1. Turn out the both the limit stop screws (1, 2) of the actuator 1 full turn
2. Operate manually the assembly to the required closed position.
3. Set the first MO stop screw (3) and tighten the lock nut.
4. Turn in the Closed limit stop screw (1) of the actuator until resistance is felt. Turn out this limit stop screw 1/2 turn and tighten the lock nut.
5. Operate manually the assembly to the required open position.
6. Set the second MO stop screw (4) and tighten the lock nut.
7. Turn in the Open limit stop screw (2) of the actuator until resistance is felt. Turn out this limit stop screw 1/2 turn and tighten the lock nut.
8. Before actuator is operated, confirm that MO is not engaged.

Important:

These instructions are applicable for standard rotating applications (clock wise to "close"). In case of reverse acting applications (clock wise to "Open"), the limit stop bolts adjust also the opposite position.

Figure 3 Stroke adjustment screws.



Section: 3 MO Vent Valve Installation

The MO vent valves take care that the actuator is pneumatically isolated and the actuators air chambers are vented. During "manual override", vent valve reduces the required forces at the hand wheel and prevents accidental remote control.

Therefore we strongly recommend the use of vent valves on MO-gearboxes. EL-O-Matic offers two version of vent valves:

1. 3/2 Single vent valve. Used with all direct mount solenoids or with remote solenoids on spring return actuators.
2. 5/2 Double automatic vent valve. Used with remote solenoids on double acting actuators.

3.1 Vent valve assembly

1. Place the MO's clutch lever (2) in the "off" (disengaged) position.
2. Remove the protective plug (1) on the MO manifold.
3. Screw the vent valve into the threaded hole. The MO vent valve kit comes complete with two different plungers. Be certain to use the correct plunger for the MO size you are installing.
4. Loosen set screw and adjust vent valve alignment (requires a 3 mm Allen wrench).
5. Re-tighten set screw.
6. Make pneumatic connections as shown in figure 6.

Figure 4 MO Vent Valves

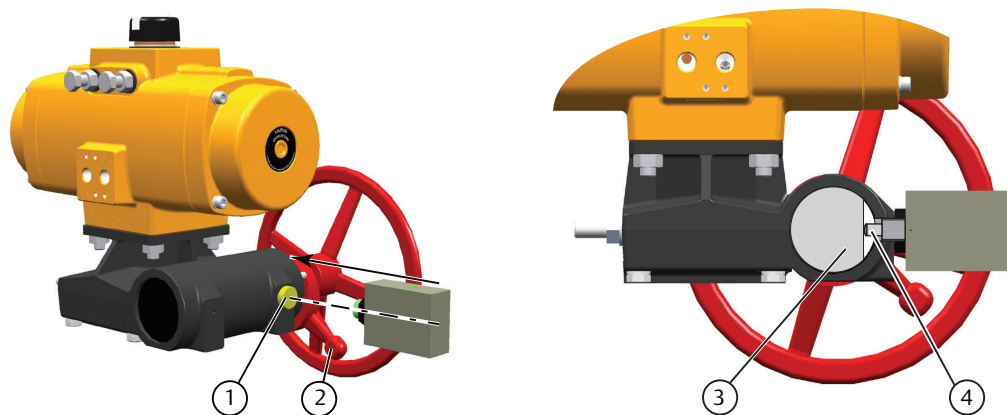
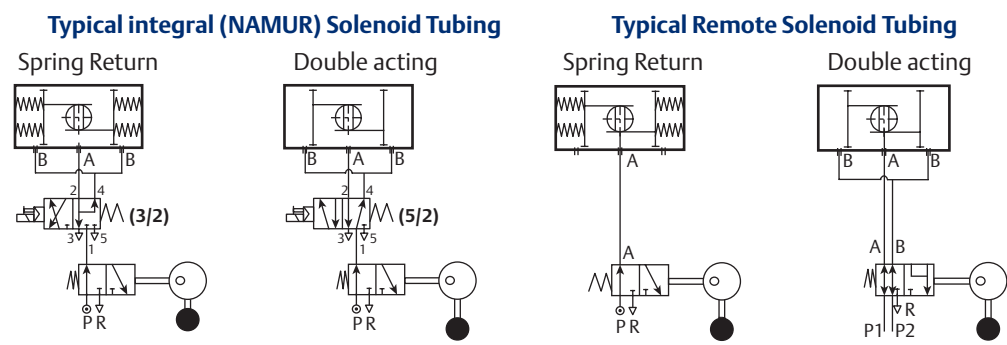


Figure 5 Pneumatic connections

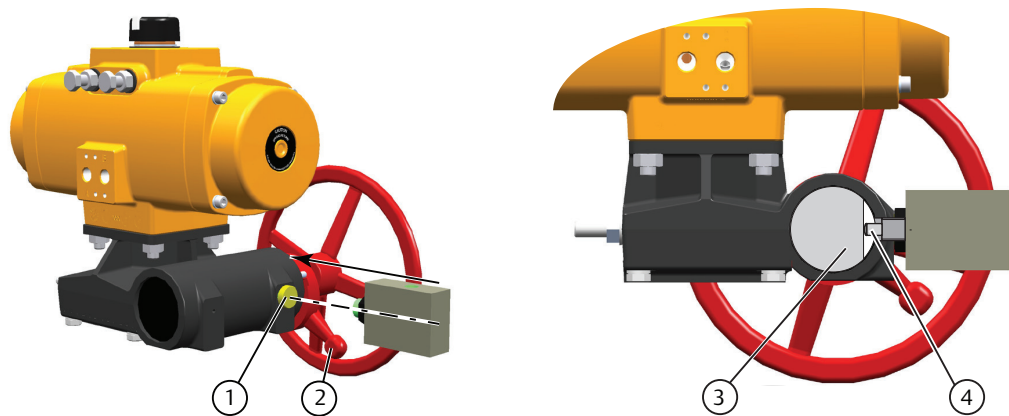


3.2 MO Vent Valve operation

With the clutch lever (2) in the OFF position, the hand wheel is dis-engaged and the valve is under remote control.

With the clutch lever (2) in the ON position, the hand wheel is engaged and air is exhausted via the vent valve. The valve will remain locked in this last position until operated with the clutch lever to OFF position again.

Figure 6



Section: 4 Troubleshooting

Issue: Lever will not move from OFF to ON during engagement.

Solution:

- Rotate the hand wheel a small amount during engagement, until the worm slots into the worm wheel.

Issue: Lever will not move from ON to OFF during disengagement.

Solution:

- If the actuator is in the middle of the stroke, vent the air.
- If the actuator is at the end of stroke, try reversing (Double Acting) the air.
- If the actuator is at the end of the stroke, try:
 - to apply air or
 - to vent the air (Spring return).
- If the actuator is mid stroke, apply a reduced air pressure, then increase or reduce the pressure until the actuator torque comes off the MO unit.

Issue: Hand wheel will not turn

Solution:

- Actuator is not vented.
- Valve is not free to rotate.
- Check that you are turning the hand wheel in the correct direction.
- The actuator and valve do not have the same "Open" or "Closed" position. Disassemble the actuator, MO gearbox and valve and reassemble according chapter 2.2.

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