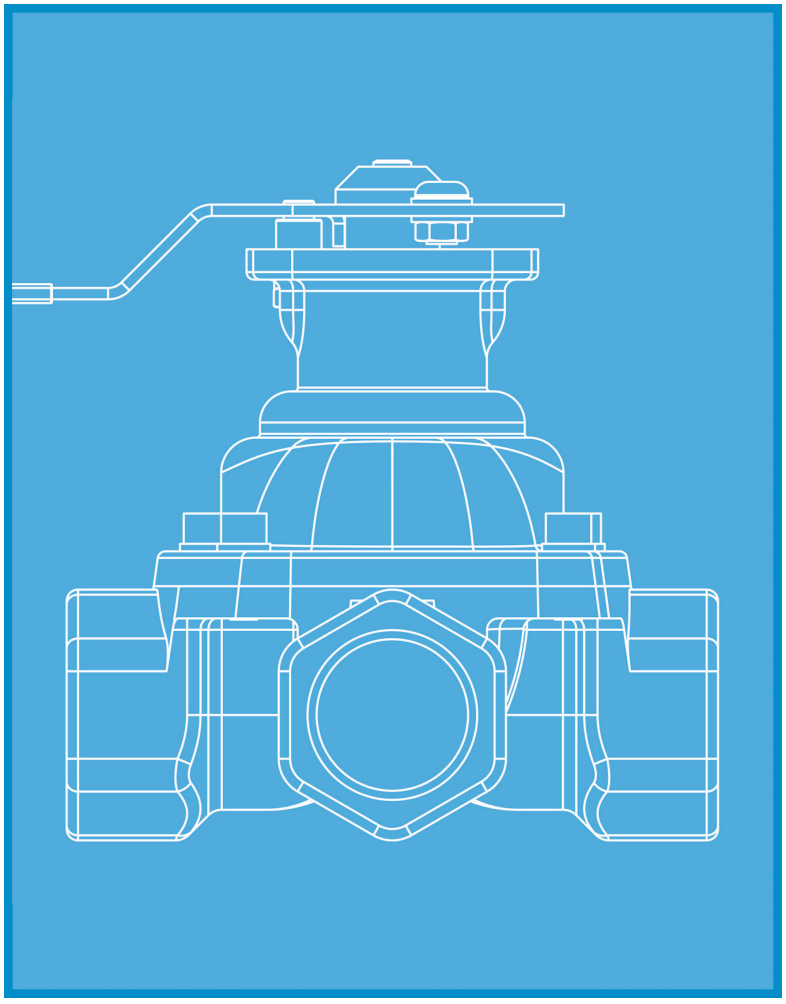
Emech®
Hot/Cold Water Mixing Valve - Model F3 Threaded Installation, Operation & Maintenance Manual



Please read and save these instructions

Armstrong®

442-EN - CPAC0012

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Introduction

Congratulations on selecting the Emech product from Armstrong. Armstrong devotes considerable care and attention to the design of its products. To obtain the best performance from them, the customer should read this manual from cover to cover. It contains important installation and operating instructions.

The customer must strictly adhere to the safety tips, troubleshooting advice, cautions and warnings appearing throughout this manual. Along with the warnings, instructions and procedures in this manual, the customer should also observe such other procedures generally applicable to equipment of the same type.

If the customer does not follow these and other such warnings, instructions and procedures, the product may not perform as expected. More seriously, it may cause property damage, personal injury, production down-time and other losses.

The customer should train its employees and contractors in the safe use of Armstrong products in relation to the customer's specific application. If the customer does not understand a point in this manual, contact Armstrong or its authorised representative.

Datasheet

Model F3 Mixing Valve General Features

The Emech 3-port valve utilizes ceramic shear action disc technology to provide tight shut-o, high pressure dierential capability, and long life integrity. Combined with the Emech electronic actuator, high performance stand alone closed loop temperature control is possible.

The extremely hard nature of ceramic produces outstanding resistance to wear and cavitation damage compared with conventional elastomer and plastic seated valves, minimizing seal replacement requirements and plant down time.

Valve Features

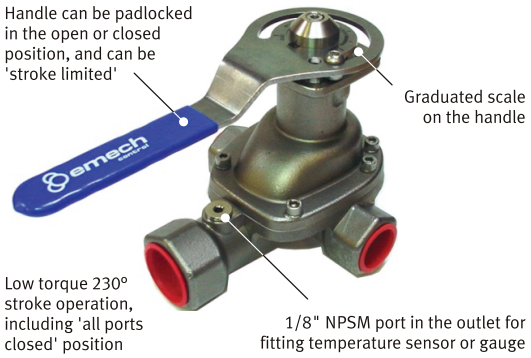
- ISO 5211, 5210 actuator flange mounting
- Constructed of CF8M (316) stainless steel
- Ceramic discs: durable, corrosion resistant
- End connection: NPT (contact Armstrong for other end connection options e.g. flanged)
- Elastomer seal material options
- Top entry allows inline access to internal valve parts
- Size range: 3/4” (20 mm), 1” (25 mm), 1 1/2” (40 mm) and 2” (50 mm)
- Temperature range: -13°F to 257°F (-25°C to 125°C)
- Rated pressure 145 psi (10 bar), designed to ASME B16.34
- BUBBLE TIGHT (zero leakage) shut off*
- Manual handle option, lockable in both open and closed position
- Manual handle kit includes stroke limiting feature

Emech Electronic Mixing Control

The Emech F3 3-port valve can be fitted with the Emech G1 electronic actuator, and Emech temperature probe. The calibrated temperature probe (NTC) fits the tapping in the outlet port, and connects via cable for the G1 actuator. With this temperature feedback signal, the G1 actuator provides temperature control accuracy +/-0.9°F (0.5°C) over 32°-212°F (0°-100°C) control range.

Even with sudden changes of inlet pressure and temperature to the F3 valve, the G1 controller aggressively minimizes oulet temperature variations. Contact Armstrong for this and other mix control options.

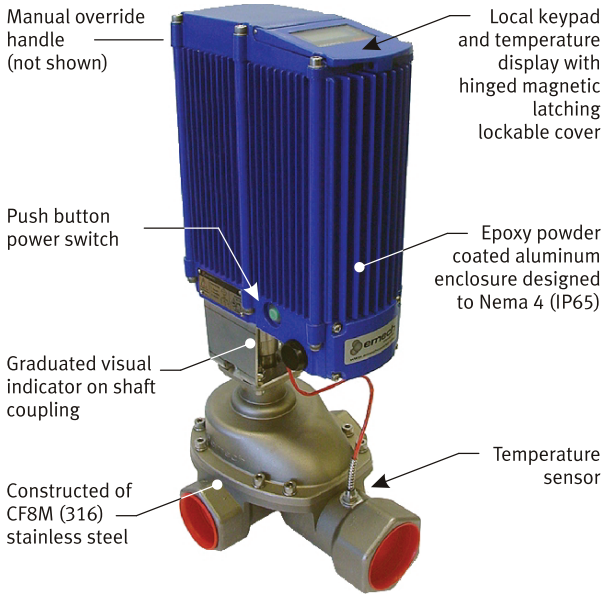
*Note: Seat seal performs beyond the requirements of ANSI B16.104 and FCI 70-2, Classes V and VI.



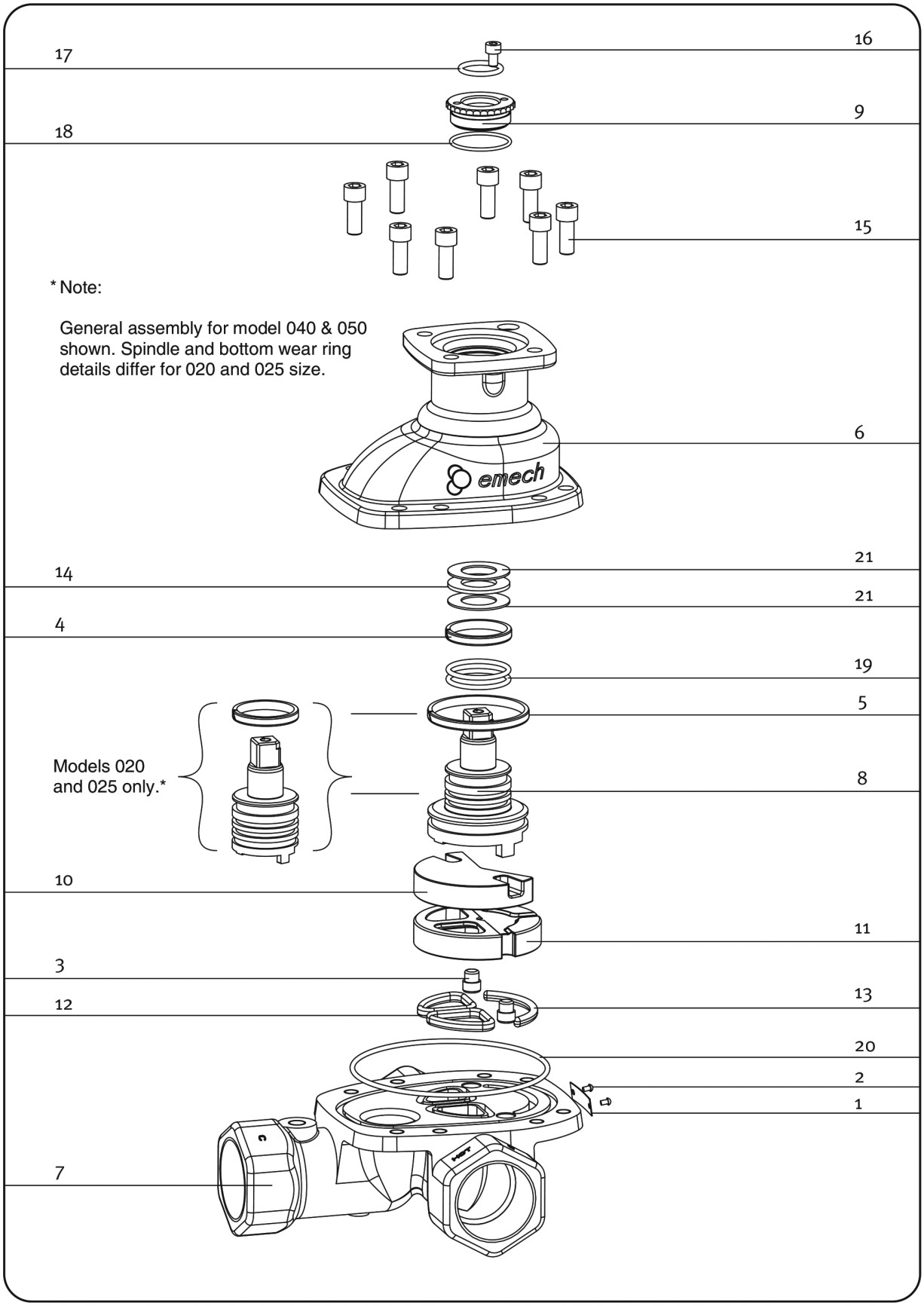
Features of the Emech G1 Actuated Digital Mixer

- Analog (4-20mA input and output ports)
- Electrical stepper motor control
- Speed, position, and acceleration control
- User defined ‘2-speed’ stroke can eliminate water hammer
- Precise positioning achieving 0.03° valve seat placement
- Local closed loop control of temperature
- External RS232 connection (cable supplied) communication for special mode conguration.
- Local/remote control options
- Two operating modes: Stand alone control via onboard keypad or Remote control via external 4-20mA
- Failsafe position feedback (non-contact absolute encoder)
- Keypad: 4 membrane switches with ‘dual touch’ safety features
- Display: 3.5 digit LCD display with back light
- Push button power switch providing soft start electronic control

(See CPAC0002 IOM for details about the Emech G1 Digital Actuator)



Parts and Materials



Part	Description	Quantity	Material	Code:	F3020	F3025	F3040	F3050*
				Inlet Size:	3/4" (20 mm)	1" (25 mm)	1-1/2" (40 mm)	2" (50 mm)
1	Name Plate	1	316 stainless steel					
2	Hammer Drive Screw	2	316 stainless steel					
3	Pin	2	316 stainless steel					
4	Top Wearing	1	trim dependent		1)	1)	1)	1)
5	Bottom Wear Ring	1	trim dependent		1)	1)	1)	1)
6	Bonnet	1	CF8M (316) stainless steel					
7	Body	1	CF8M (316) stainless steel					
8	Spindle	1	316 stainless steel					
9	Gland Nut	1	316 stainless steel					
10	Top Disc	1	trim dependant		2)	2)	2)	2)
11	Bottom Disc	1	trim dependant		2)	2)	2)	2)
12	Inlet Energizers	2	silicon rubber		1)	1)	1)	1)
13	Disc Energizer	1	silicon rubber		1)	1)	1)	1)
14	Needle Roller Bearing	1	C-Cr steel		1)	1)	1)	1)
15	Screw Body/Bonnet	6 or 8	304 stainless steel					
16	Screw Locking	1	304 stainless steel					
17	O-Ring Gland Internal	1	trim dependant		1)	1)	1)	1)
18	O-Ring Gland External	1	trim dependant		1)	1)	1)	1)
19	O-Ring Spindle	2	trim dependant		1)	1)	1)	1)
20	O-Ring Body/Bonnet	1	trim dependant		1)	1)	1)	1)
21	Thrust Washer	2	C-Cr steel		1)	1)	1)	1)

*** Replaced by F3050R**

Spares	F3020	F3025	F3040	F3050
1) Included in Valve Trim F3 - Seal Kits	CPSK0019	CPSK0020	CPSK0021	CPSK0022
2) Included in Valve Trim F3 - Ceramic Disc Sets	CPSK0009	CPSK0010	CPSK0011	CPSK0012
3) Locating Pins	CPME0059	CPME0059	CPME0081	CPME0088

Actuation Options	Description	Model Code
Electric actuators	G12 310 in.lb (35 Nm)	G12
	G13 885 in.lb (100 Nm)	G13
Handle Kits	3/4" (20 mm) & 1" (25 mm) valves	CPSK0003
	1-1/2" (40 mm) & 2" (50 mm) valves	CPSK0004

Emech F3 - Actuation Options

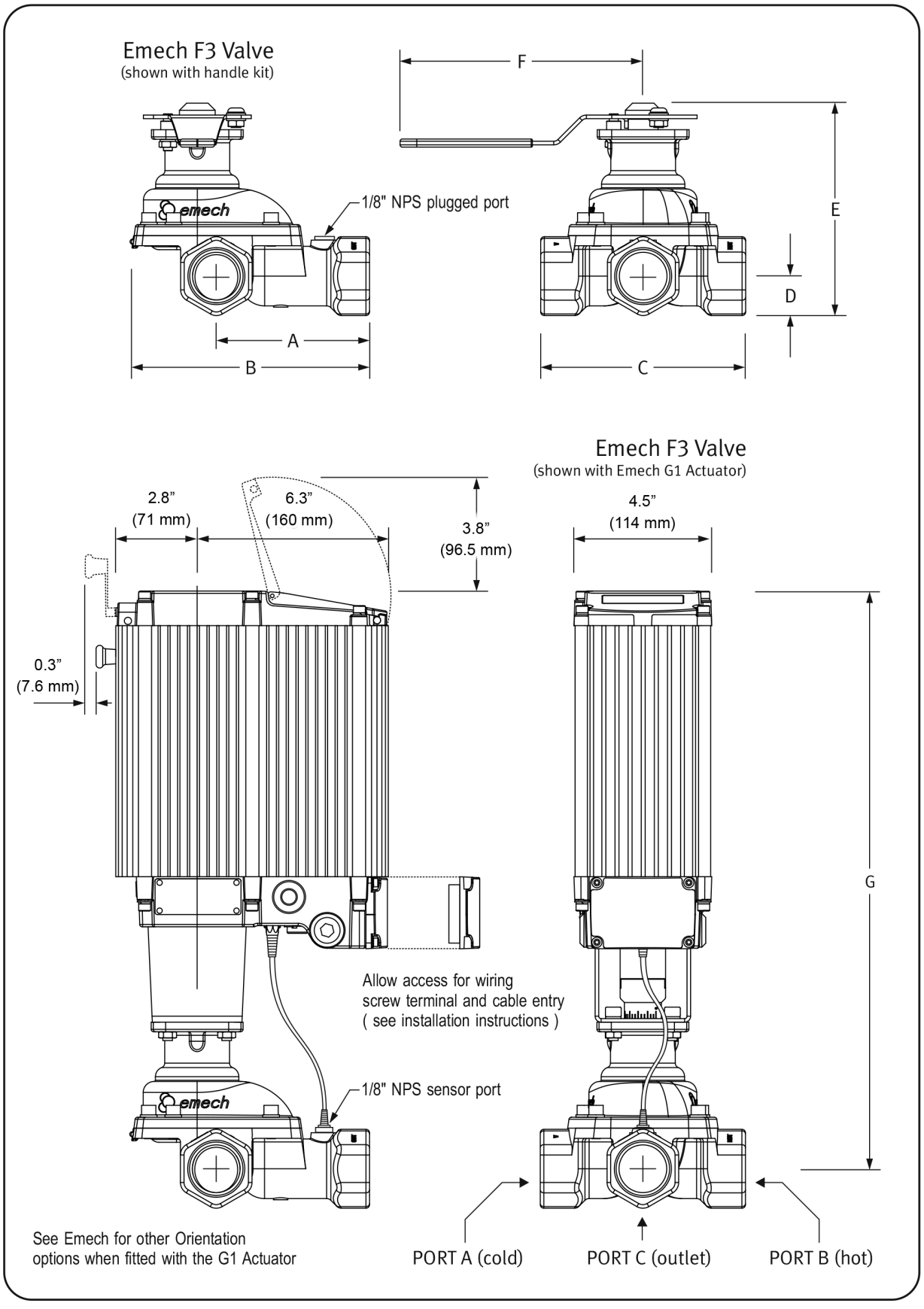
	F3 Valve Size	Recommended Emech Actuator Model
Electronic Actuators	020, 025 and 040	G12
	050	G13
Handle Kits	020 and 025	CPSK0003
	040	CPSK0004

Trim Selection

The following table is Armstrong's recommendation for trim selection.

Compound	Maximum recommended fluid temperature in Emech valves	Application	Compound compatibility recommendations
EPDM	-13 to +257°F	All water and Glycol applications	Water, steam, hydroxides, solvents, alcohols, several acids, ketone & silicone oils.

Dimensions


Emech F3 Valve
(shown with handle kit)
F
E
D
1/8" NPS plugged port
A
B
C
Emech F3 Valve
(shown with Emech G1 Actuator)
2.8"
(71 mm)
6.3"
(160 mm)
3.8"
(96.5 mm)
4.5"
(114 mm)
0.3"
(7.6 mm)
G
Allow access for wiring
screw terminal and cable entry
(see installation instructions)
1/8" NPS sensor port
See Emech for other Orientation
options when fitted with the G1 Actuator
PORT A (cold)
PORT C (outlet)
PORT B (hot)

Technical Data

Nominal Valve Size[1]		**3/4" (20 mm)**	**1" (25 mm)**	**1 1/2" (40 mm)**	**2" (50mm) Sani**
	A	3.58" (91 mm)	4.25" (108 mm)	5.16" (131 mm)	
	B	5.43" (138 mm)	6.42" (163 mm)	7.83" (199 mm)	
	C	4.72" (120 mm)	4.72" (120 mm)	6.77" (172 mm)	
	D	0.91" (23 mm)	1.14" (29 mm)	1.30" (33 mm)	
	E	5.20" (132 mm)	5.71" (145 mm)	7.09" (180 mm)	
	F	6.50" (165 mm)	6.50" (165 mm)	8.03" (204 mm)	
	G	17.64" (448 mm)	17.91" (455 mm)	19.06" (484 mm)	
Operational Stroke °rotational	with Handle kit	230	230	230	
	with G1 Actuator	350	350	350	
Thread size : Inlet NPT	(inch)	3/4"	1"	1 1/2"	
Thread size : Outlet NPT	(inch)	1"	1 1/4"	1 1/2"	
Flow characteristics - 2 Ports Open (160° open)					
Cv (Kv): USgpm at dP=1 psi, 68°F (m3/h at dP=1 bar, 20°C)		8.1 (7)	12.5 (10.9)	19.6 (17)	47.5 (41.3)
Flow @ 29psi dP	U.S.Gpm (lpm)	44 (165)	68 (257)	106 (401)	257 (973)
Minimum controllable flow*	U.S.Gpm (lpm)	0.9 (4)	4.7 (18)	6.9 (26)	19.0 (70)
*with Emech G1 actuator					
Flow characteristics - 2 Ports Open (90° open)					
Cv (Kv): USgpm at dP=1 psi, 68°F (m3/h at dP=1 bar, 20°C)		6.3 (5.5)	10.0 (8.7)	14.5 (12.6)	40.3 (35)
Flow @ 29psi dP	U.S.Gpm (lpm)	34 (130)	54 (205)	78 (297)	218 (825)

Leakage Characteristics

The F3 Emech ceramic shear action valves have bubble tight (zero leakage) shut-off. The Emech seat seal performs beyond the requirements of ANSI B16.104 and FCI 70-2 Classes V and VI.

Body Pressure Rating - Designed to ASME B16.34					
dPmax		As per the operating pressure			
Operating Pressure @ <257°F (125°C) psi (bar)		145 (10)	145 (10)	145 (10)	145 (10)
Physical Characteristics Weight (approx)					
Valve only	lb (kg)	4.0 (2.0)	5.5 (2.5)	11.0 (5.0)	22.0 (10.0)
Valve and Emech G12 Actuator	lb (kg)	23.0 (10.5)	24.5 (11.0)	30.0 (13.6)	49 (22.2)[1]
Valve Topworks Dimensions For Actuator Mounting (Spigot/bolts as per ISO 5210/ISO 5211)					
Shaft/Stem Connection	sw.std (mm)	0.39" (10)	0.39" (10)	0.55" (14)	0.55" (14)
Topworks 4 holes	PCD (mm)	1.97" (50)	1.97" (50)	2.76" (70)	2.76" (70)
Topworks, PCD hole Ø	inch (mm)	0.26" (6.5)	0.26" (6.5)	0.33" (8.5)	0.33" (8.5)
Topworks, Spigot diameter	inch (mm)	1.38" (35.1)	1.38" (35.1)	2.17" (55.1)	2.17" (55.1)
Valve mounting restrictions		None	None	None	None

Notes:

(1) Note G12 actuator is recommended for 3/4" (20 mm), 1" (25 mm), and 1 1/2" (40 mm) F3 sizes. The G13 is recommended for the F3 size 2" (50 mm) valve.

- All specifications are for water.
- Flows are quoted without terminal fittings, restrictors, or non-return valves on the inlets. (Non-return valves are recommended.)
- If operating at more than one maximum rated condition, contact Armstrong to confirm the application is appropriate.

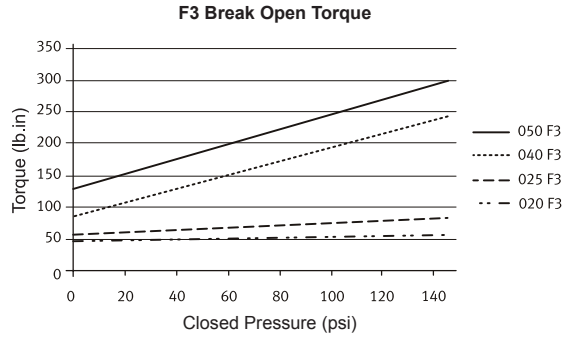
Definitions:

dP	Differential pressure across the valve from inlet to outlet.
dP max.	Maximum allowable valve closed differential pressure across the valve from inlet to outlet.
Operating Pressure	Valve body pressure rating.

Operating Torque

F3 Break Open Torques

Break Open Torque (in.lb)			
Valve Size	Shut off Pressure (psi)		
	0	72.5	145
020 F3	47	52	57
025 F3	57	72	85
040 F3	85	165	245
050 F3	132	217	302



Note:

1. The charted seating and unseating torques are the sum of all friction and resistance for opening and closing of the disc against the indicated pressure differential for normal service.
2. The relationship between values are linear, and can therefore be interpolated between nominated values.
3. The effect of dynamic torque is not considered in the table.
4. In sizing operators it is not necessary to include safety factors.
5. Break-open torques are approximately equal to the shut-off torques.

The charted values are based on clean liquid service at temperatures between 32°F to 212°F (0°C to 100°C) with no internal deposition or chemical attack, operated a minimum of once a day. *

For conditions that vary from those noted above, apply the following application factors.

* Frequency of operation		Service conditions		
< once per day	+15%	Dry service		+30%
< once per week	+25%	Light slurry semi-solids		+40%
< once per month	+40%	Heavy slurry and some solids		+70%
< once per year	+80%	Temperature	-13°F to 14°F (-25°C to -10°C)	+40%
			14°F to 32°F (-10°C to 0°C)	+15%
			Over 212°F to 257°F (100°C to 125°C)	+30%

Note: The above factors are cumulative but never more than 2x the value shown in the Break Open Torque tables above.

Emech F3 - Standard Valve Model Codes

Model Codes	Description	End Connection	Hot/Cold Water Mixing Units
F3020	F3 VALVE 3/4” (20 mm) NPT	Screwed NPT	E20W
F3025	F3 VALVE 1” (25 mm) NPT	Screwed NPT	E25W
F3040	F3 VALVE 1-1/2” (40 mm) NPT	Screwed NPT	E40W

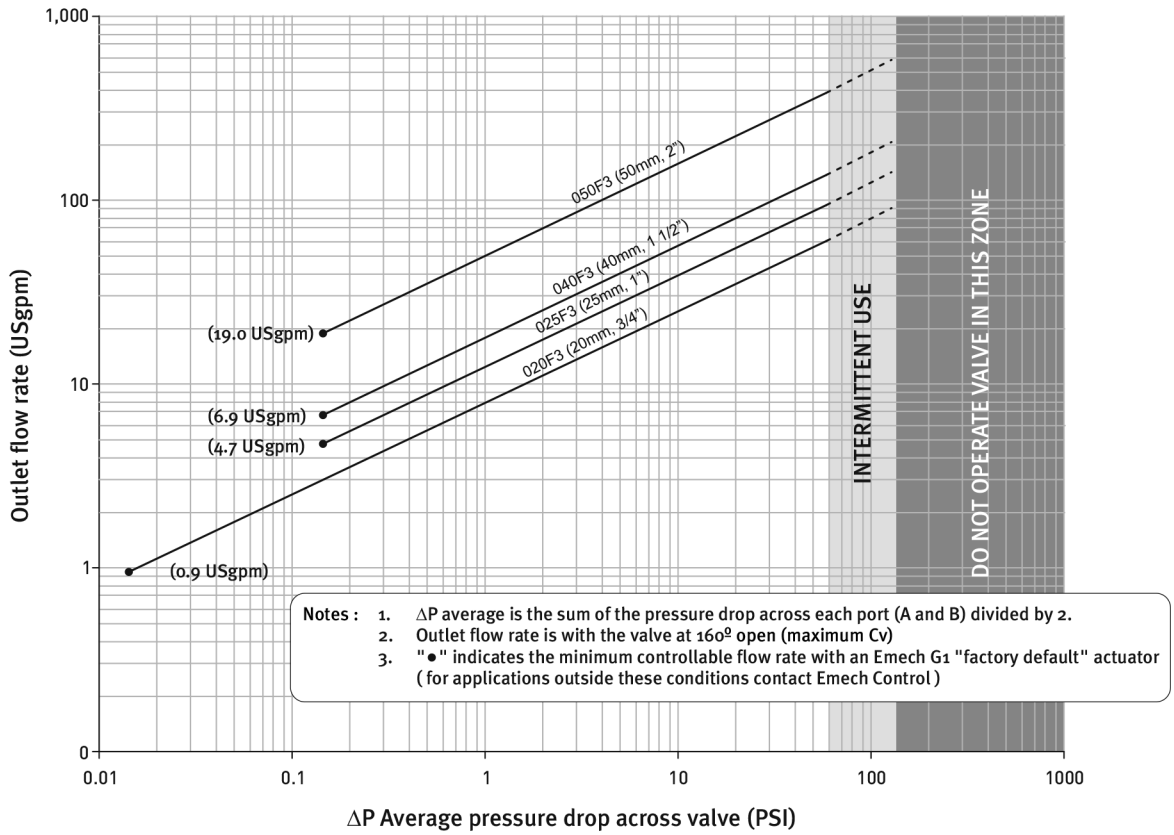
Emech F3 - Valve Model Codes on request

Model Codes	Description	End Connection	Hot/Cold Water Mixing Units
F3020T	F3 VALVE 3/4” (20 mm) SANI	Tri-Clover	E20WT
F3025T	F3 VALVE 1” (25 mm) SANI	Tri-Clover	E25WT
F3040T	F3 VALVE 1-1/2” (40 mm) SANI	Tri-Clover	E40WT
F3050T	F3 VALVE 2” (50 mm) SANI	Tri-Clover	E50WT

The Hot/Cold Water Mixing Units includes Valve, Actuator, Mounting Kit, Serial Cable, Temperature Sensor, Spanner and all relevant IOMs.

Flow Characteristics

F3 Flow chart



US flowrate co-efficients - Cv values															
Valve size (inch)	Valve Opening (Degrees)														
	10	30	60	90	120	150	160	170	200	230	260	270	300	330	350
3/4"	0.0	3.2	4.7	6.3	7.1	7.8	8.1	7.8	7.1	6.3	5.8	4.2	2.6	1.1	0.0
1"	0.0	5.0	7.5	10.0	11.1	12.2	12.5	12.2	11.1	10.0	9.2	6.7	4.2	1.7	0.0
1-1/2"	0.0	7.2	10.9	14.5	16.7	18.8	19.6	18.8	16.7	14.5	13.3	9.7	6.0	2.4	0.0
2"	0.0	20.1	30.2	40.3	43.4	46.5	47.5	46.5	43.4	40.3	36.9	26.8	16.8	6.7	0.0

Note:

1) Cv = The flow rate of water in U.S. gpm that will pass through a valve with a pressure drop of 1 psi @ 68°F.
2) When the F3 valve is opened between 110° and 210° the valve is mixing. In this range use ΔPaverage in the sizing formula.
3) For accurate sizing for temperature control mixing see Armstrong website for sizing program.

Simplified sizing formula

LIQUID

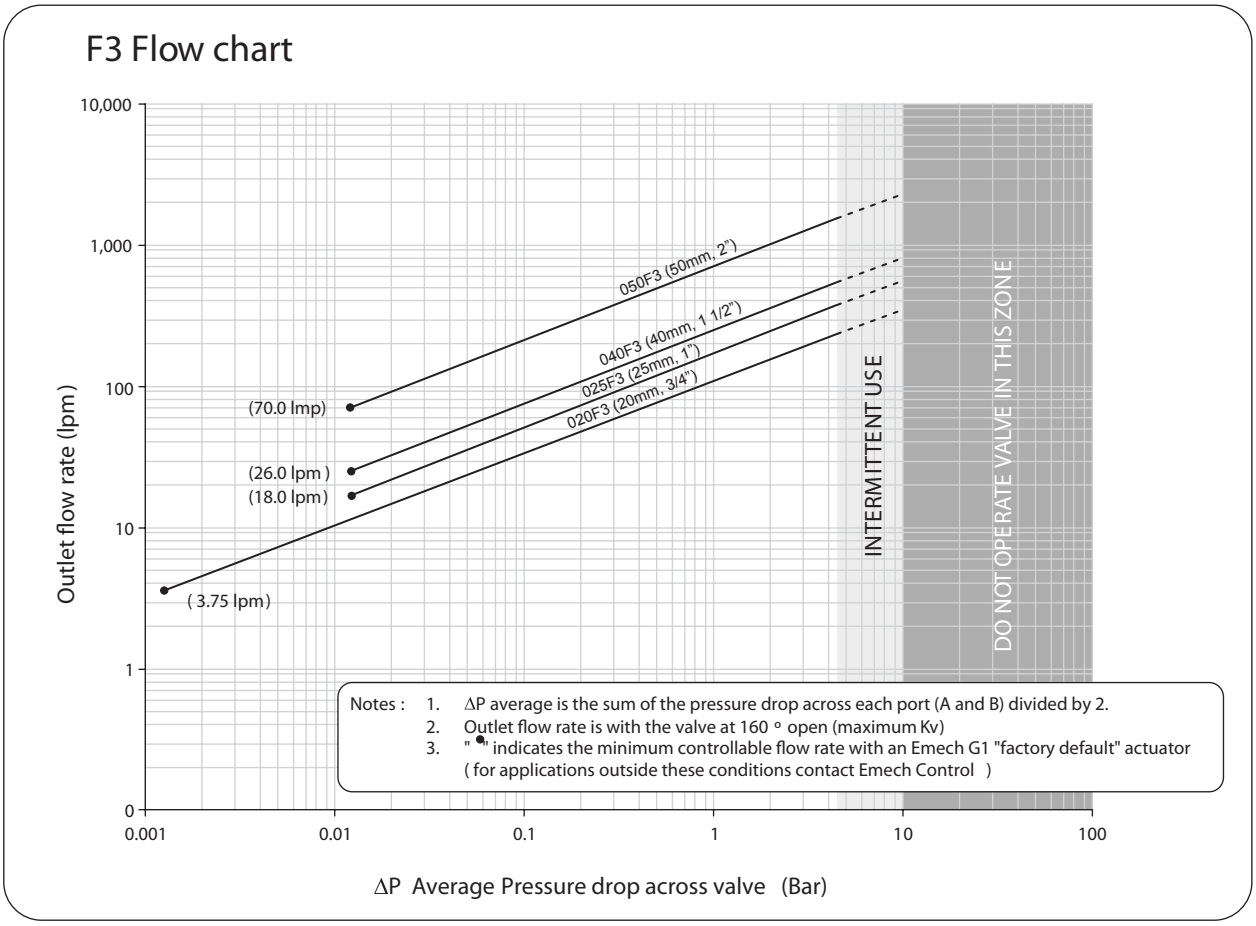
$$C_{v\,(1\ port)} = Q\sqrt{\frac{S.G.}{\Delta P}}$$

$$C_{v\,(mixing)} = Q\sqrt{\frac{S.G.}{\Delta P_{average}}}$$

WHERE: $\Delta P_{average} = \frac{\Delta P_{port\ A} + \Delta P_{port\ B}}{2}$

Q = Flow through valve (USgpm)
S.G. = Specific gravity (water = 1)
ΔP = Pressure drop across open valve ports (psi)

Flow Characteristics – continued



Metric flowrate co-efficients - Kv values															
Valve size (mm)	Valve Opening (Degrees)														
	10	30	60	90	120	150	160	170	200	230	260	270	300	330	350
20	0.0	2.8	4.1	5.5	6.1	6.8	7.0	6.8	6.1	5.5	5.0	3.7	2.3	0.9	0.0
25	0.0	4.4	6.5	8.7	9.6	10.6	10.9	10.6	9.6	8.7	8.0	5.8	3.6	1.5	0.0
40	0.0	6.3	9.5	12.6	14.5	16.4	17.0	16.4	14.5	12.6	11.6	8.4	5.3	2.1	0.0
50	0.0	17.5	26.3	35.0	37.7	40.4	41.3	40.4	37.7	35.0	32.1	23.3	14.6	5.8	0.0

Note:

1) Kv = The flow rate of water in m^3/hr that will pass through a valve with a pressure drop of 1 bar (100kpa) @ 20°C.
2) When the F3 valve is opened between 110° and 210° the valve is mixing. In this range use ΔP average in the sizing formula.
3) For accurate sizing for temperature control mixing see Armstrong website for sizing program.

Simplified sizing formula

LIQUI D

$$Kv\ (1\ port) = Q\sqrt{\frac{S.G.}{\Delta P}}$$

$$Kv\ (mixing) = Q\sqrt{\frac{S.G.}{\Delta P\ average}}$$

HEAD LOSS

$$HL\ (1\ port) = \frac{10.194\ \Delta P}{S.G.}$$

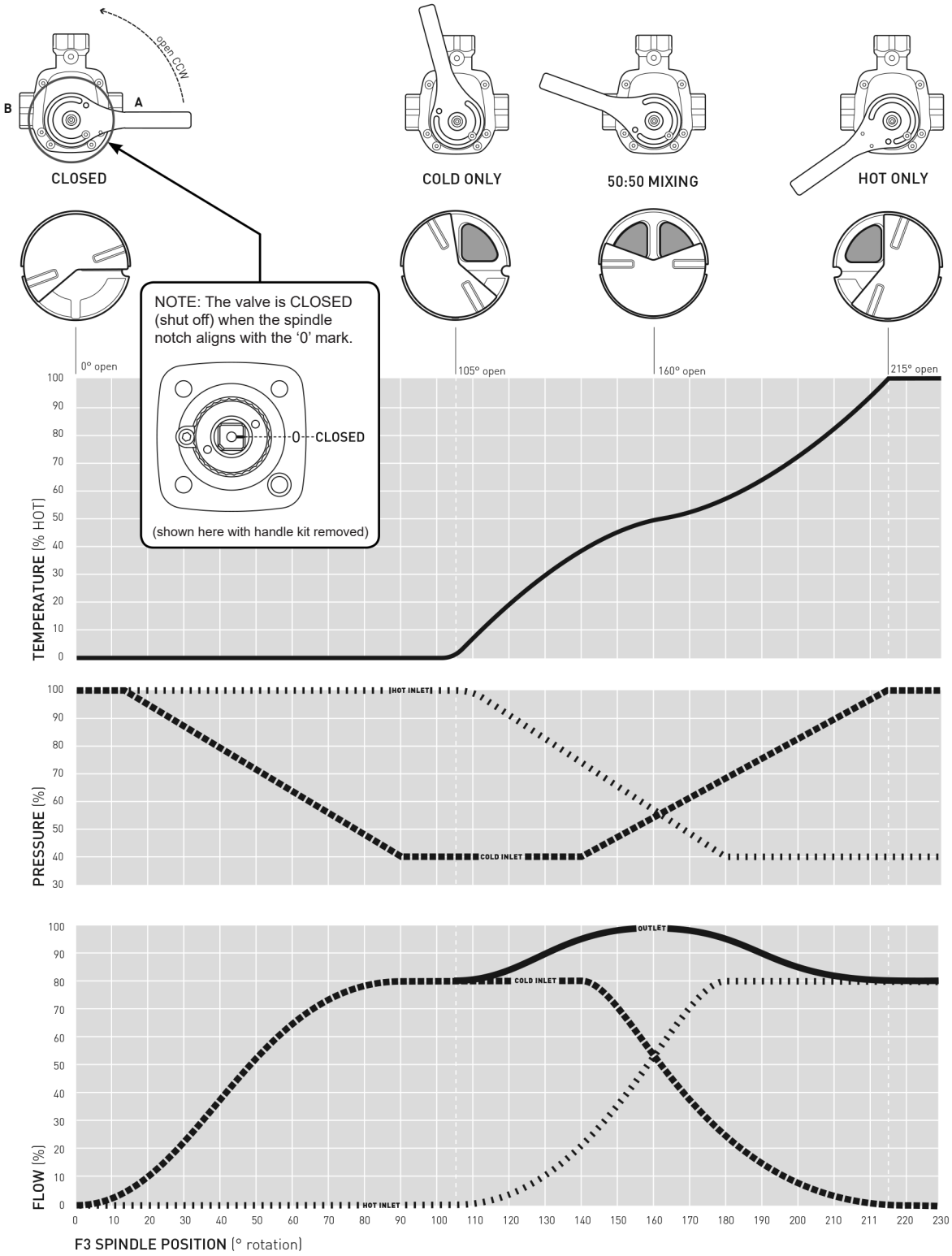
$$HL\ (mixing) = \frac{10.194\ \Delta P\ average}{S.G.}$$

WHERE: $\Delta P\ average = \frac{\Delta P\ port\ A + \Delta P\ port\ B}{2}$

Q = Flow through valve (m^3/hr)
S.G. = Specific gravity (water = 1)
ΔP = Pressure drop across open valve ports (bar)
HL = Head loss (m)

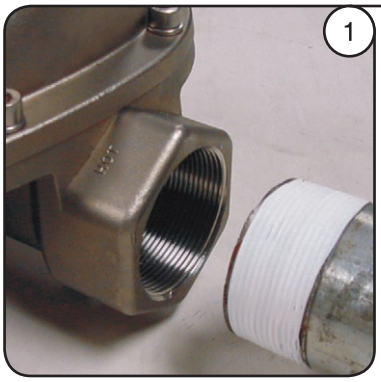
Operating Characteristics

Representation of typical flow, pressure and temperature characteristics of the F3 valve through 215° of rotation.



Designs, materials, weights and performance ratings are approximate and subject to change without notice. Visit **armstrong**international.com for up-to-date information.

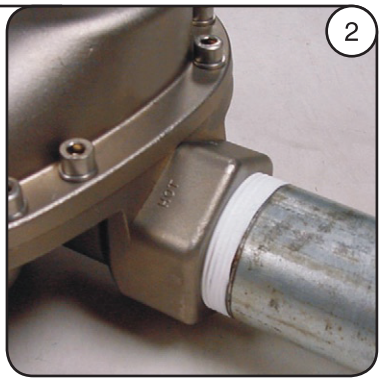
Installation



When installing the valve in line, be sure to follow good practice using either sealing tape or thread adhesive in the joints.

The valve may be attached straight to the pipework.

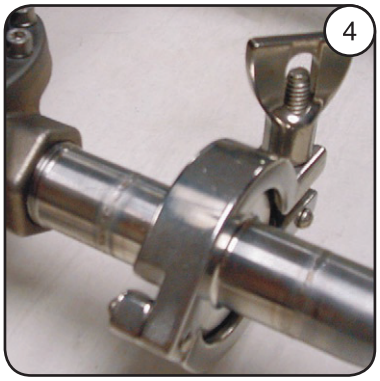
Note: Be sure to consider the ease of removing the valve should this become necessary in the future. See images 3 and 4 for typical installation methods.



Note: For valve maintenance, the bonnet screws can be removed and full access to the internal components is possible.

The valve may be connected to the pipe work with a union style of fitting as per image 3.

The valve may be connected to the pipe work with a thread adapter and a clamp style fitting. e.g. Tri-Clover™ (image 4).



CAUTION: **Prior to installation ensure that the pipes leading to the valve are clear from debris which may block or damage the valve on commissioning.**

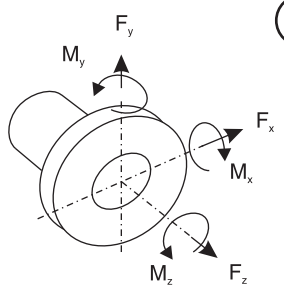
WARNING: **Only trained personnel familiar with pipe work and pressure systems should install and maintain Emech equipment. Failure to do so may result in serious personal injury!**

WARNING: **Depressurize pipe work to atmospheric pressure and drain all fluids from the pipe work before working on the valve. Failure to do so may result in serious personal injury!**

WARNING: **Ensure that the intended maximum operating pressure of the line does not exceed the pressure rating of the valve. Failure to do so may result in serious personal injury!**

WARNING: **Check valves are strongly recommended upstream of the valve inlets. Failure to install them may cause undesirable back-flow and may result in serious personal injury and equipment damage!**

WARNING: **The valve must be supported adequately so as not to over stress the pipe work and or the valve body. See image 5 and Table 2.1 below for the maximum nozzle loads on the valves. Application of loads above these values may result in serious personal injury and equipment damage!**



Nozzle load orientations

Table 2.1: Maximum Nozzle Forces and Moments

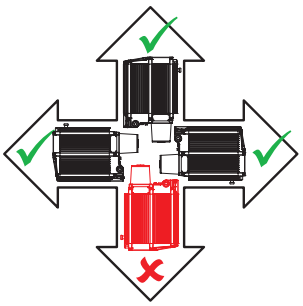
Valve Size	Force -F_x F_y F_z	Moment - M_x M_y M_z
3/4" (20 mm)	56lbf. (250 n)	620 lbf.in (70 Nm)
1" (25 mm)	90 lbf. (400 n)	1150 lbf.in (130 Nm)
1-1/2" (40 mm)	180 lbf. (800 n)	2655 lbf.in (300 Nm)
2" (50 mm)	450 lbf. (2000 n)	5310 lbf.in (600 Nm)

Recommended Installation

2.1 Recommended Installation

Note: All Emech valves and actuators when purchased as a system, being ExxW Model code, are shipped fully assembled and factory set to the customer requirements specified at time of purchase.

Step 1: Location Considerations



For F3 valves mounted with an Emech G1 electronic actuator ensure the installation location offers suitable access to the electrical connection terminals, the manual override handle, actuator power switch, display and keypad.

Do not install the actuator near or in high pressure wash down areas. The units must NOT be installed upside down. For manually operated F3 valves ensure suitable access to the handle for safe operation.

Step 2: Recommended Installation

See Figure 2.6 (page 15) for a recommended F3 valve installation schematic.

MUST HAVE

- Check valves (poppet style) MUST be fitted upstream of the valve inlet ports and as close as practicable to the inlets.
- Pipe work adequately supported.
- A 24Vdc regulated power supply.

RECOMMENDED

- Isolation valves are RECOMMENDED on the supply lines.
- A failsafe solenoid operated spring to close isolation valve linked at an external temperature switch post valve outlet is highly RECOMMENDED for over temperature failure modes (see item 2 on figure 2.6).
- Ensure mechanical protection of the wiring (e.g. use armour conduit).
- It is RECOMMENDED to place wiring in screened conduit or cables.
- Ensure pipe works are straight for as long as practicable to the Emech valve inlets and any cable conduit is fully sealed on both ends against water ingress.
- Use appropriate inlet pipe diameters and supply pressure to cope with required application flows.

Considerations

- Consider strainers if water supply carries pipe scale or other particulates that may damage valve seat and seals.
- Consider gauge points for temperature and pressure on inlets and outlets.

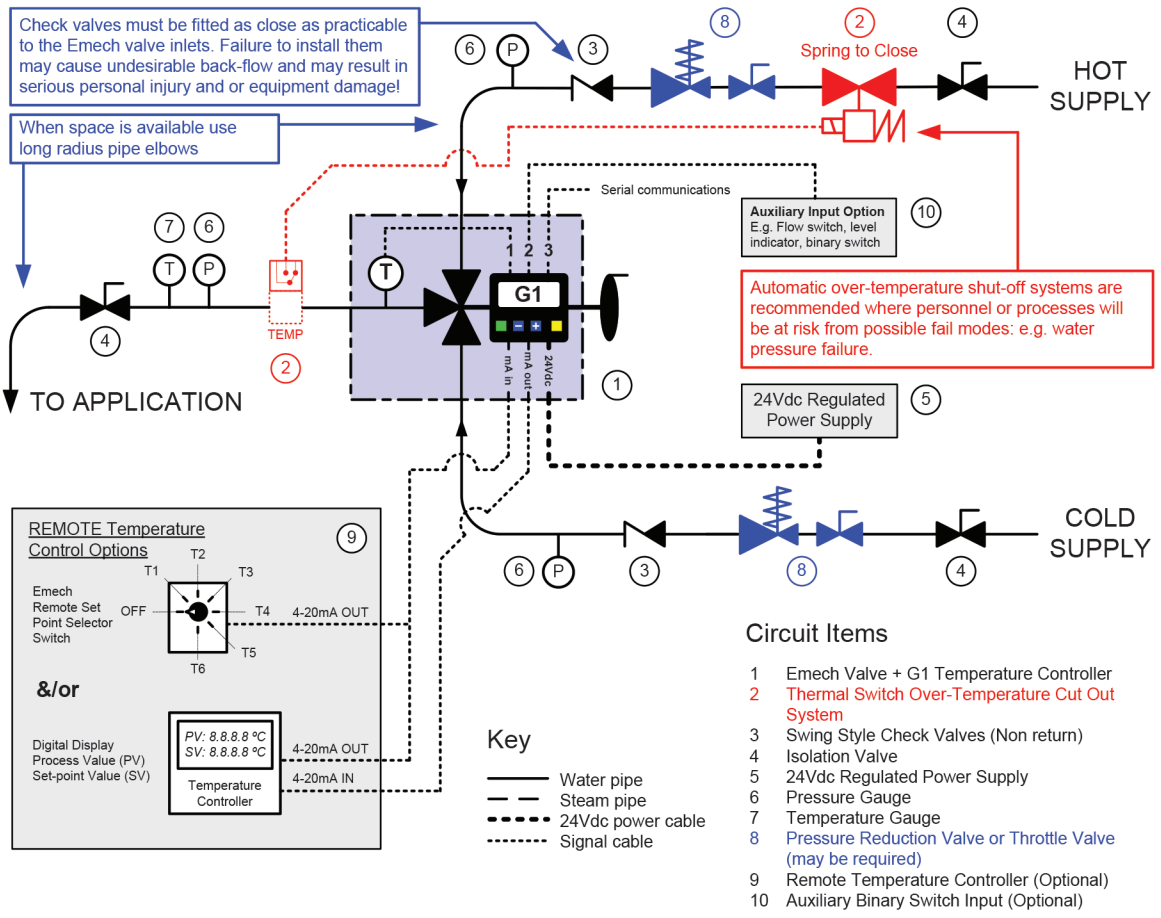
Manual Operations Considerations

- By setting the position of the “stroke limiting” stop, an approximate maximum temperature setting can be made. This is a safety feature to minimize the possibility of operator injury. Handle kits are supplied with fitting instructions (CPMI0029).
- The flow rate control can be achieved by either a throttle valve on the inlets or outlet, or by presetting the supply pressures. For most circuits throttle valves at the mixing valve inlets work best.

IMPORTANT: Users must consider safety implications when designing their installations using manually operated F3’s. Emech recommend a spring to close isolation valve prior to the hot inlet of the F3 valve triggered by a failsafe temperature switch near the valve outlet. (See items highlighted red in Figure 2.6 on page 11).

Recommended Installation – continued

Figure 2.6: Recommended Emech water mixing valve installation schematic.



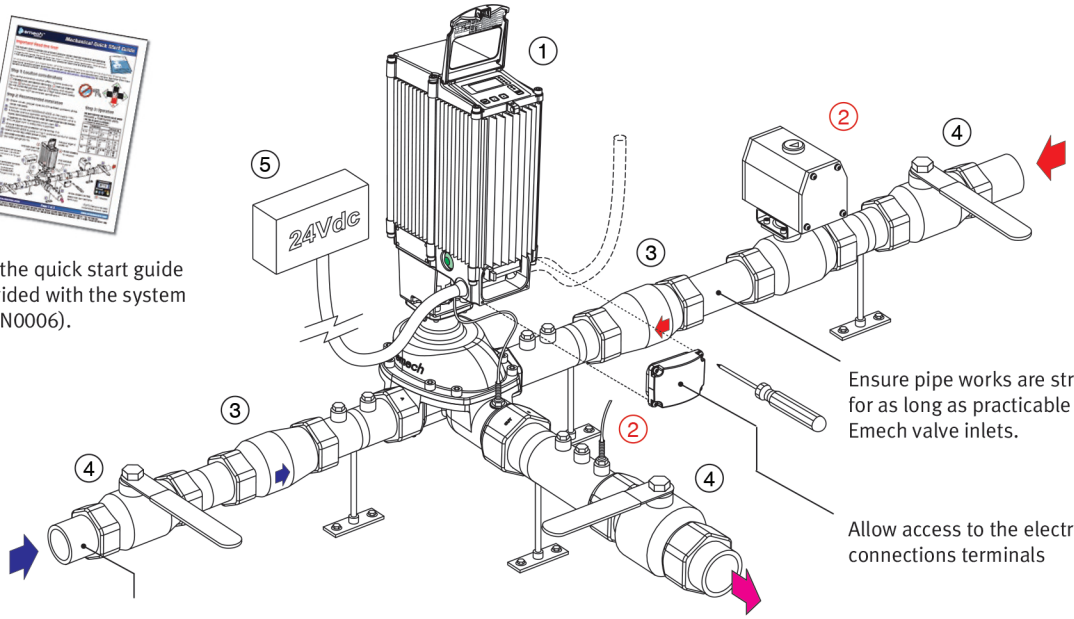
Key

- Water pipe
- Steam pipe
- 24Vdc power cable
- Signal cable

Circuit Items

1. Emech Valve + G1 Temperature Controller
2. Thermal Switch Over-Temperature Cut Out System
3. Swing Style Check Valves (Non return)
4. Isolation Valve
5. 24Vdc Regulated Power Supply
6. Pressure Gauge
7. Temperature Gauge
8. Pressure Reduction Valve or Throttle Valve (may be required)
9. Remote Temperature Controller (Optional)
10. Auxiliary Binary Switch Input (Optional)

See the quick start guide provided with the system (EOIN0006).

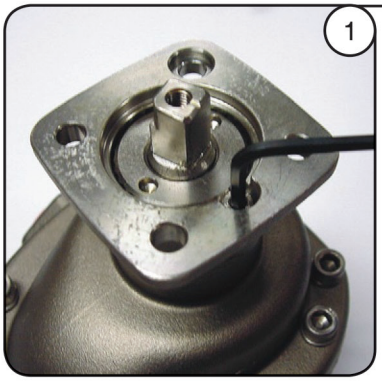


Ensure pipe works are straight for as long as practicable to the Emech valve inlets.

Allow access to the electrical connections terminals

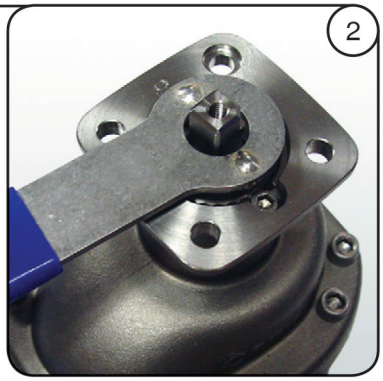
Use appropriate inlet pipe diameters and supply pressures to cope with required application flows.

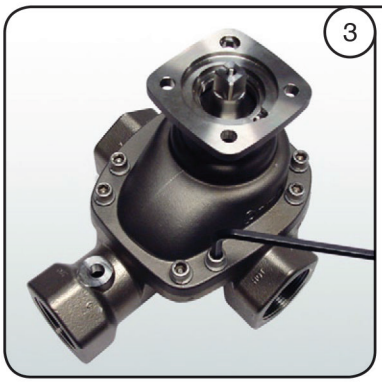
Maintenance – Disassembly



CAUTION!
Before dismantling the Emech® valve, ensure all upstream and downstream pressurized pipe work is isolated approximately. Ensure the pressure and fluids are drained from the valve and pipework.

Remove the gland nut locking screw (image 1). Fit the gland nut wrench into the two holes provided in the top of the gland nut and unwind counterclockwise to remove the gland nut from the bonnet (image 2).

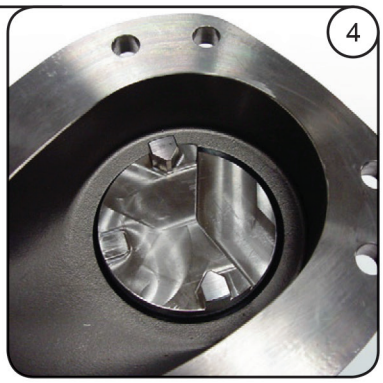


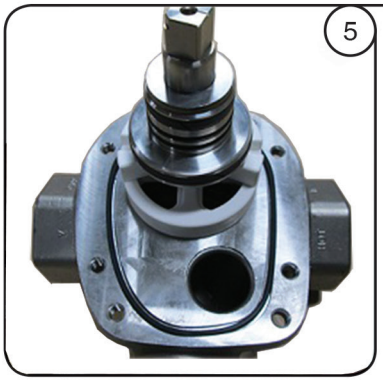


Use an allen wrench to remove the bonnet bolts that fasten the bonnet to the body (image 3).

Carefully remove the bonnet from the body particularly if the valve is mounted in a vertical position.

The spindle may detach from the rotating disc and remain in the bonnet, this will need to be removed (image 4).

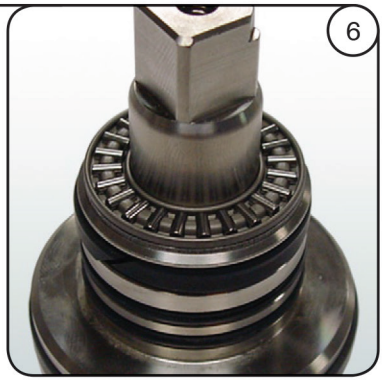




Note that the rotating disc is not fastened to the spindle. Take care that the rotating disc is not dropped as the bonnet assembly is removed (image 5).

The spindle may separate the two discs. In which case remove the bottom disc. If the discs are stuck together, remove both from the valve body.

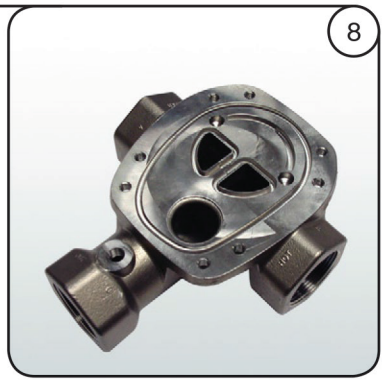
Check that the flat washers and needle roller bearing assembly is on the spindle (image 6). You may have to remove these from the bonnet bore.



Remove the two O-rings and two wear rings from the spindle.

Remove the bonnet/body seal, and the three energizer seals found under the discs (image 7). Inspect the pins and check for wear. Replace if worn. See page 6, Spare Item 3 for replacement pins.

Clean all grease and dirt form parts not being replaced. Ensure that the spindle seal surfaces are protected from damage while the valve is disassembled (image 8).



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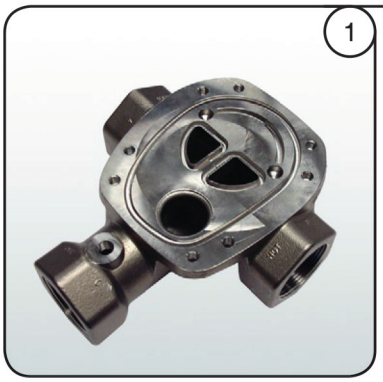
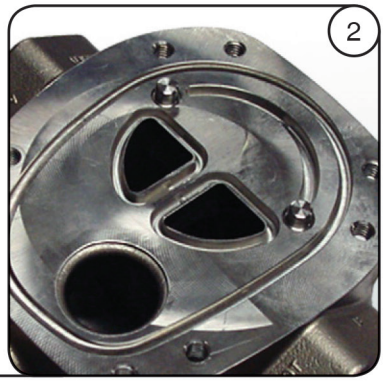
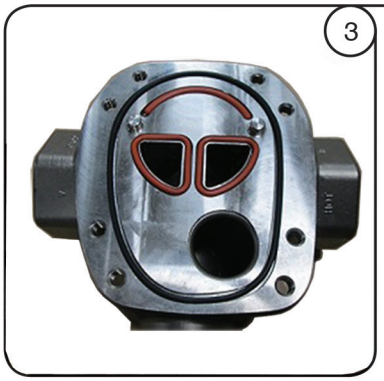
Maintenance – Reassembly



PREPARATION: Ensure the assembly area is completely dirt free. Ensure also that the valve parts are clean and ready to be reassembled. Check all valve part for damage or wear.

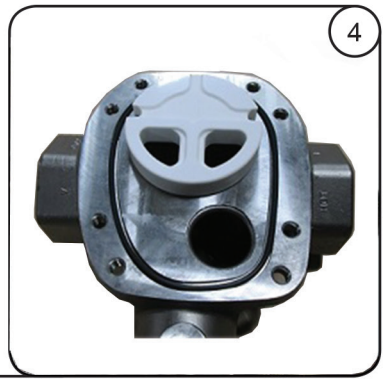
Insert pins (Image 2).

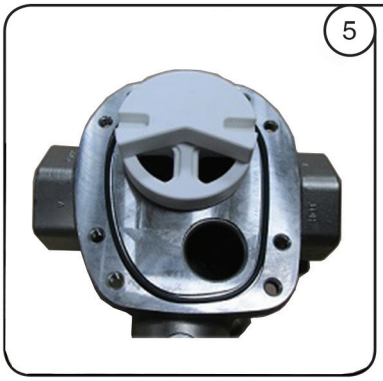




In the valve body fit the energizers and body/bonnet seal (image 3).

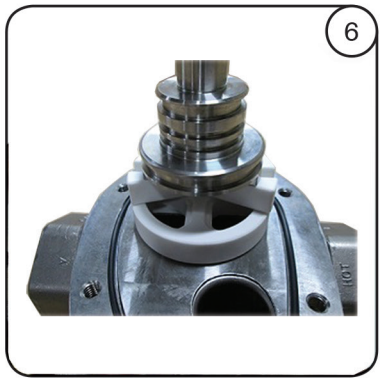
Note: The energizers are not symmetrical. Correct orientation will allow the energizers to be inserted easily with no distortion. Lightly grease the energizer seals before fitting Place the bottom disc onto the valve body (image 4). Apply a light even coat of grease to the top surface of the bottom disc.





Place the top disc on the bottom disc and bed it down by rotating one on the other (image 5).

Ensuring the spindle grooves are clear of dust or dirt, check the spindle fits neatly into the slots on the top disc. The spindle should be a moderately loose fit in the top disc. If the spindle does not sit flat, check for burring on the lugs and remove if necessary (image 6). NOTE: The spindle is not symmetrical and inserts in only one orientation.

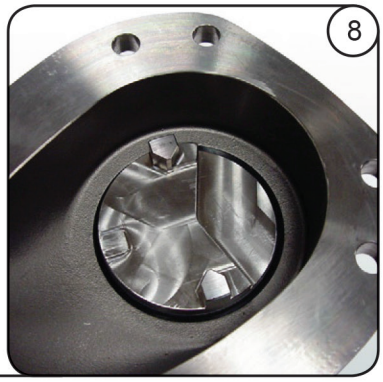


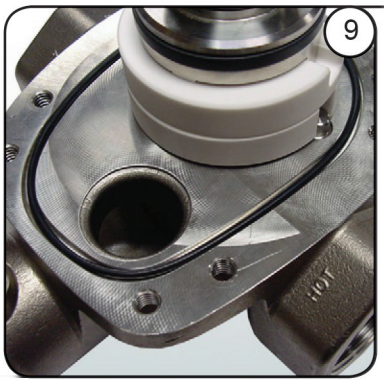
Maintenance – Reassembly – continued

Fit the two O-rings and Wear Rings to the spindle.

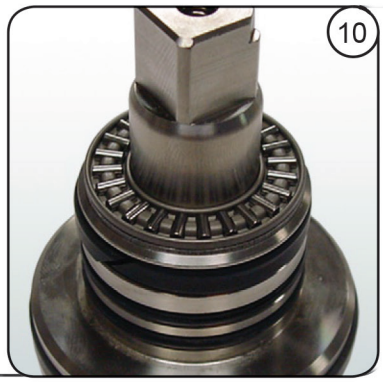
Apply a light even coat of grease to the spindle bearing surfaces and the O-rings (image 7).

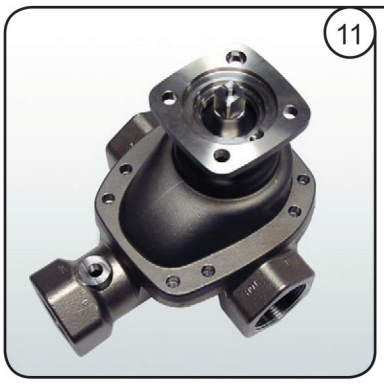
Check the fit of the spindle in the bonnet (image 8) then remove and place on the top of the disc (image 9).





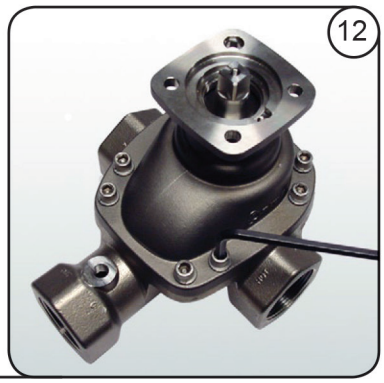
Lightly grease both sides of the thrust washer and place on the spindle. Place on the needle roller bearing (image 10) and apply further grease (approx. 60% of the void space). Lightly grease both sides of the second thrust washer and place on the bearing.





Align the discs with the spindle on top before gently lowering the bonnet over the spindle down to the body (image 11).

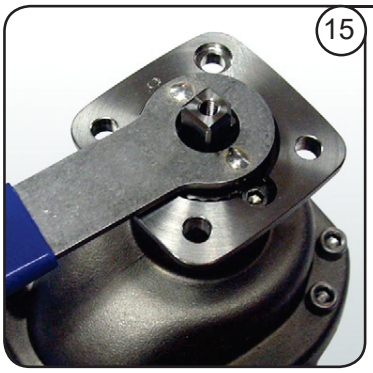
Secure down the bonnet with the allen head cap screws using an allen wrench (image 12). Tighten the cap screws as per torque values given in table 4.1.



Rotate the spindle one full rotation. The movement should be smooth and even with no variation in torque (image 13).

Grease inside and outside of the gland nut, paying particular attention tot he thread. Insert the inside O-ring in the gland nut and then the external O-ring (image 14).

Maintenance – Reassembly – continued



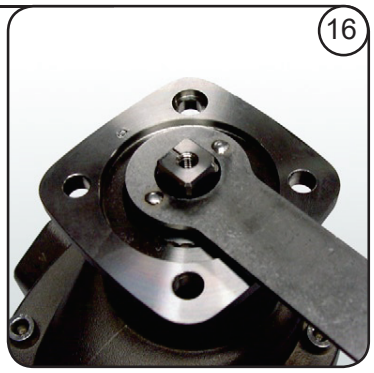
With the gland wrench provided, screw the gland nut down until it bottoms out. **Do not over-tighten!** (Image 16).

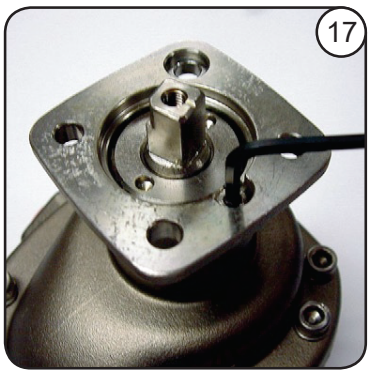
Back the gland nut off 3 notches for the F3020, F3025, F3040, and F3050 valve sizes. If the notch does not align with the locking screw head, back the gland nut off further to align.

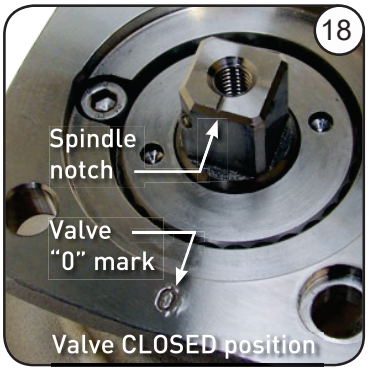
Insert the locking screw after applying a thread locking adhesive (e.g. Loctite 262) (image 18). Tighten the locking screw as per the torque values given in table 4.1.

Note: Rotate the spindle 1-2 times to ensure the operating torque is constant, and the rotating action is smooth.

Note: The valve MUST be in the CLOSED position before mounting the actuator or handle kit (image 18).







See section 5.0 for Emech G1 actuator mounting kit. Note: handle kits are supplied with separate assembly instruction.

Table 4.1: Nominal Tightening Torques for Lubricated Stainless Steel Socket Head Cap Screws

Metric Cap Screw			UNC Cap Screw		
Size	Torque (Nm)	Torque (inlb)	Size	Torque (Nm)	Torque (inlb)
M3	1.3	12			
M4	2.9	26	#8-32	3	27
M5	5.7	50	#10-24	5.5	49
M6	10	89	1/4"	11	97
M8	25	221	5/16"	22	195
M10	47	416	3/8"	39	345
M12	82	726	1/2"	95	841

Table 4.2: Recommended Lubricants and Thread Adhesives

Description	Manufacturer/Model Code	Used for:
Food Safe Teflon Lubricant*	mx6Inox	Ceramic discs; o-rings; wear rings; bonnet bore lubrication; roller thrust bearing lubricant

*Sachets of this lubricant are included in the Seal Kits.

Mounting Emech® G1 Actuators

1.0 Preparing the actuator for assembly onto Emech® valves

Before fitting the actuator to the valve assembly, ensure the actuator is in the zero position. All new or replacement Emech actuators are shipped in the zero position. To check the actuator position or to re-zero an actuator follow section 1.1 if a power supply is available or section 1.2 for manual re-zeroing.

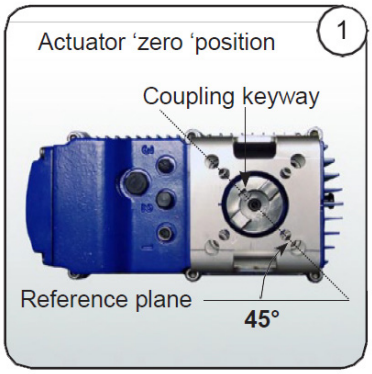
1.1 Automatically zeroing the actuator (24Vdc power supply required)

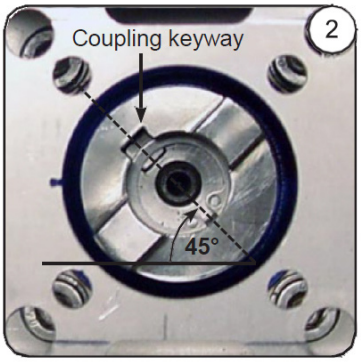
Power on the actuator (a 24Vdc regulated power supply is required). Refer Section 3 of the G1 actuator installation, operation and maintenance manual for electrical installation. With a temperature sensor connected to Port 1 of the actuator ensure the actuator is in Temperature Controller mode (hold mode and press down (-) on the actuator keypad to toggle between Positioner or Temperature mode). Now disconnect the temperature probe from the actuator. The actuator will move automatically to the 'zero' position and display "E2" on the keypad display.

1.2 Manually zeroing the actuator

If there is no power available to 'zero' the actuator it is possible to use the actuator's manual override handle to adjust the actuator shaft position.

The actuator 'zero' is achieved when the coupling keyway is at 45° to the reference plane as indicated in images 1 and 2.





2.0 Actuator mounting orientation

To accommodate installation space restrictions the actuator may be mounted to an Emech valve in any one of four positions. The instructions provided in this document explain how to mount the actuator in the standard orientation for each type of Emech valve. To mount the actuator in one of the other three off-set orientations (see figure 2.1) follow the directions outlined in section

2.1 Nonstandard mounting orientations

Ensure the valve is in the "0" position by following the standard mounting instructions for the valve in the relevant chapter of this document. When it comes to placing the graduated coupling onto the valve spindle orientate the coupling so the "0" mark aligns with the desired off set direction as indicated in figure 2.1.

Continue with the standard mounting instructions. Ensure the notch (zero indication on bracket) in the actuator bracket aligns with the coupling "0" when the actuator is fitted to the valve.

The valve and actuator will operate as per a standard mounting assembly.

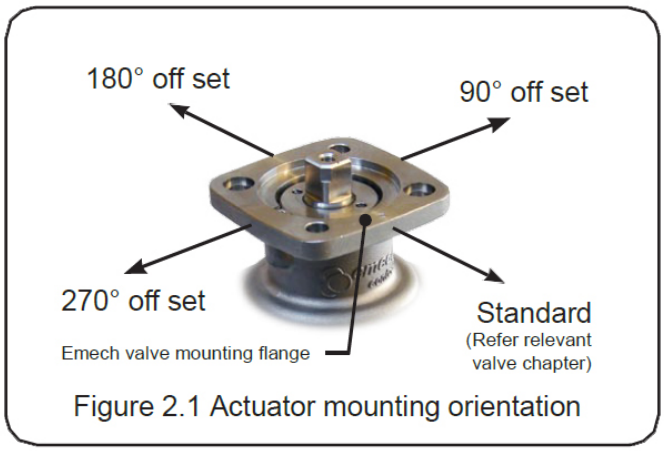


Figure 2.1 Actuator mounting orientation

Mounting Emech® G1 Actuators – continued

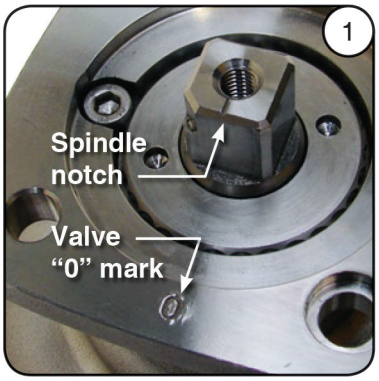
Note: The actuator may be mounted in any one of four positions.

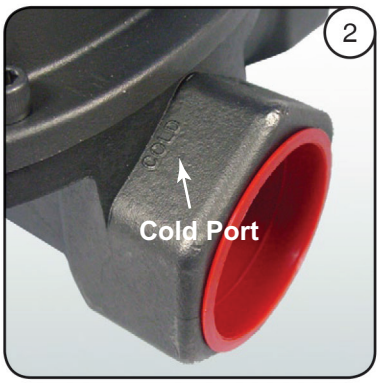
The instructions below explain how to mount the actuator facing the outlet port as per image on page 7.

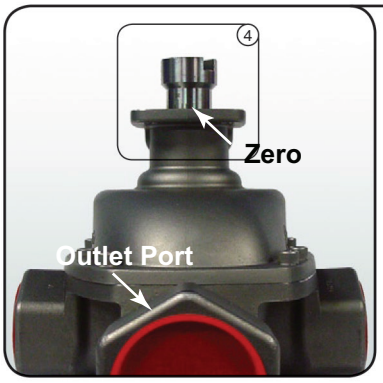
To ensure the actuator is in the 'zero' position, power on the actuator (a 24V DC regulated power supply is required). Ensure the actuator is in Temperature Controller mode - hold mode and press down (-) on the actuator keypad to toggle between Temperature and Positioner mode.

Once in temperature mode, disconnect the temperature probe from the actuator. The actuator will move automatically to the 'zero' position and the keypad display will show "E2".

Set the Valve position to closed. Ensure the notch on the spindle (image 1) points towards the valve "0" mark and the cold port (image 2) which is the fully closed position for the valve seats and the default cold port (image 2).



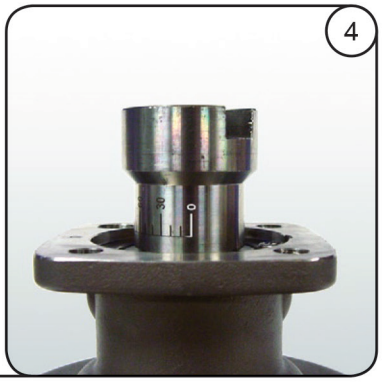


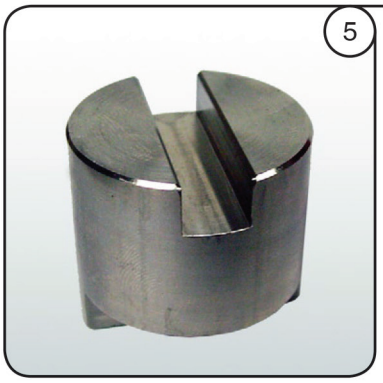


Place the graduated coupling (image 3) on the spindle & ensure the zero points to the outlet port (image 4).

If the actuator is to be mounted in one of the other three positions, rotate the graduated coupling so that the "ZERO" mark will line up with the notch in the bracket (image 8) of the actuator, when valve is fully coupled to actuator.

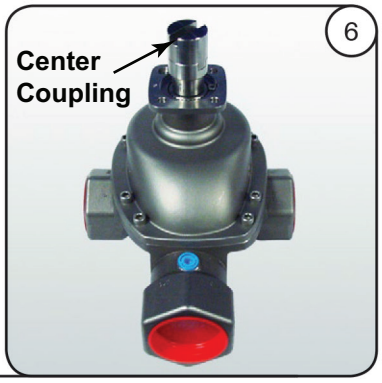
DO NOT MOVE THE SPINDLE FROM ITS ZERO POSITION WHEN USING ONE OF THE OTHER POSITIONS FOR THE ACTUATOR.





Place the center coupling (image 5) on the graduated coupling (image 6).

Continued...



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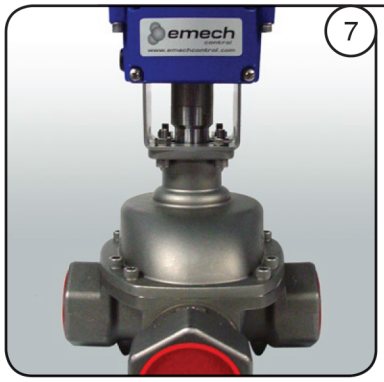
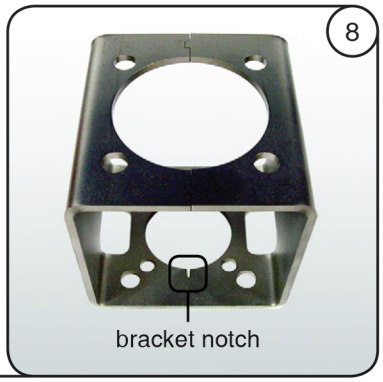
Mounting Emech® G1 Actuators – continued



Place the actuator on the valve in the desired position (image 7). The zero mark on the coupling (image 4) should align with the notch on the bracket (image B).

Insert one M8 X 25 socket cap screw into one of the mounting holes with M8 Spring Washer and Nut. Insert the remaining three cap screws and fasten.



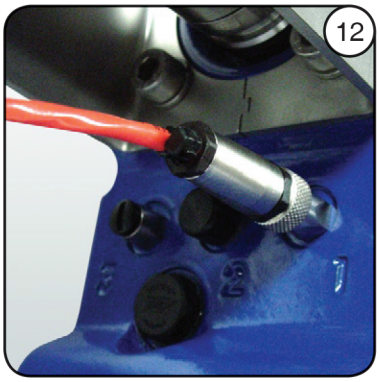
Ensure the bonded washer (image 0) is on the sensor (image 10).

Screw the sensor into the outlet port of the valve (image 11) and tighten before connecting the sensor to the actuator.

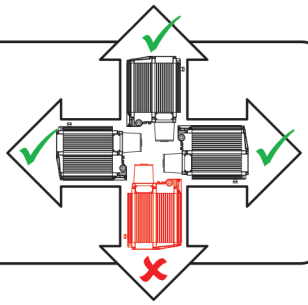
Plug the sensor connector into the actuator input port labelled “1” and hand tighten . The actuator is now assembled correctly (image 12).

WARNING!! DO NOT USE A WRENCH TO SCREW THE SENSOR INTO THE ACTUATOR.

See section 5.0 of the actuator Installation, Operation and Maintenance manual for software configuration.



THE ACTUATOR MUST NOT BE INSTALLED UPSIDE DOWN OR SUBJECT TO HIGH PRESSURE WASH DOWN



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Emech®
Hot/Cold Water Mixing Valve - Model F3 Threaded Installation, Operation & Maintenance Manual

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