

M400



Globe Valve Actuator

M400 is a flexible electro-mechanical actuator for the control of two-way and three-way linear globe valves in:

- heating systems
- air handling systems

M400 is primarily designed for applications where the demands on actuator speed and thrust are relatively small.

The M400 is either controlled by an increase/decrease signal or by a modulating control signal.

The Forta M400 has a high resolution PCBA for fine valve plug position and excellent flow control.

The electronic circuitry of the actuator ensures that the running time is consistent, regardless of the valve stroke.

It is easy to mount and connect the actuator, with direct connection to the Venta valve series without any mounting kits. The M400 is available with a mounting kit for Satchwell valves, linkage kits are also available for valves of other manufacture.

The working range of the actuator is adjusted automatically depending on the stroke of the valve. The electronic circuitry of the actuator then takes care of the adjustment of the valve end positions and auxillary switch points.

2-10V Feedback signal is available on both modulation and on increase/decrease control.

Standards

Emission/Immunity	EMC 2004/108/CE
 according to EN 61326-1:2006
Heat	IEC-68-2-2
Humidity	IEC-68-2-3
Cold	IEC-68-2-1
Vibration	IEC-68-2-6

Material

Housing/Yoke	Aluminium
Cover	ABS/PC plastic
Colour	Aluminium/Grey
Weight	1.8 kg (3.96 lb)

SPECIFICATIONS

Supply Voltage 24V AC +/- 25%, 50-60Hz
24V DC +/- 10%

Power Consumption,
running 5W
rest 4W
average 6VA
Transformer sizing 30 VA

Running time

Modulating 60 s
Increase/decrease 300 s/60 s
Stroke 9–32 mm
Factory set stroke 20 mm
Thrust, nominal 400 N
Duty cycle .20% Full load (80% half load, amb. temp.)

Modulating / Proportional Analogue Input (X1-MX)

Voltage range 0–10 V
Impedance min 100 kΩ
Selectable input signals 0-10V / 2-10V, 0-5V / 2-6V,
5-10V, 6-10V

Digital inputs VH–VC (Floating control)

Voltage across open input 24 V AC
Current through closed input 5 mA
Pulse time min. 20 ms

Output G1

Voltage 16 V DC ±0.3 V
Load 25 mA, short-circuit proof

Output Y (Position feedback signal)

Voltage 2-10 V (0-100%)
Load 2 mA

Environmental

Operation temperature –10 – +50 °C
Storage temperature –10 – +50 °C
Ambient humidity max. 90% RH
Enclosure rating IP 54
Sound power level max. 32 dBA

PART NUMBERS

Designation	Explanation	Part Number
M400	modulating control signal or increase/decrease signal	880-0230-030
M400-S2	modulating control signal or increase/decrease signal and end point switches	880-0231-030
M400+L2SV	modulating control signal or increase/decrease signal including a linkage for Satchwell valves	880-0620-000
M400-S2+L2SV	modulating control signal or increase/decrease signal and end point switches, including a linkage for Satchwell valves	880-0621-000

FUNCTION

The actuator

The actuator utilises a brushless DC motor to accurately position the main spindle via a gearbox in accordance to the control signal received from the controller.

Upon initial power up and activation of calibration switch 9. The actuator undertakes a full stroke cycle to learn the valve end stop positions and to calibrate the full running stroke time. End switch point adjustment is also calibrated during this process.

Control signal

The Forta M400 can either be controlled by an increase/decrease signal or by a selection of variable direct voltages.

If an increase/decrease signal is used, the actuator normally retracts inwards (Up) on an increase signal and Extends Outwards (Down) on a decrease signal, see Settings.

Manual operation

There is a manual operation handle on the actuator, see figure 2. When the handle is lowered, the power supply to the motor is automatically cut and the actuator can be operated manually by rotating the handle thus lowering or raising the actuator spindle. The actuator is factory supplied with the actuator in manual operation mode.

Position feedback

Forta actuators are equipped with a 2–10 V DC position feedback signal, where 2 V corresponds to the closed position and 10 V to the open position (depending of switch nr.1).

Calibration

When the actuator is initially installed upon a valve and/or the valve is later maintained or serviced, calibration by Dip Switch 9 is mandatory. If calibration is not performed the actuator may not be able to properly modulate within the actual stroke of the valve.

DIMENSIONS mm

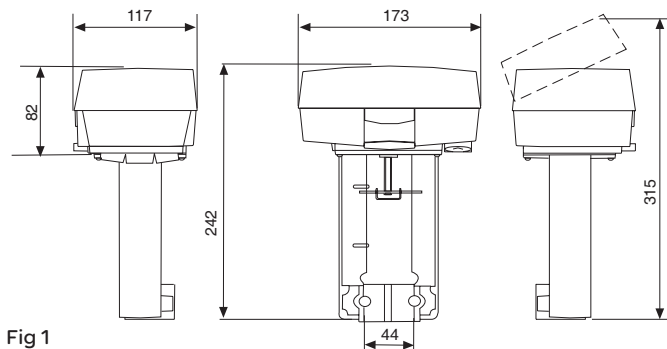


Fig 1

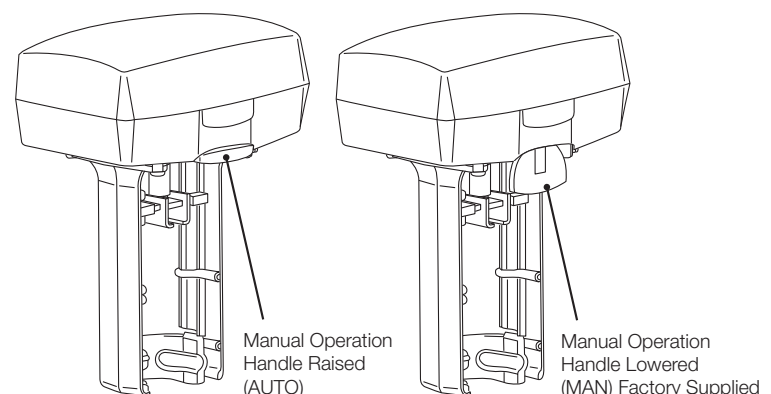


Fig 2

End point switches

When fitted, end point switches toggle when the valve is at 5% and 95% of the valves open or closed position.

End point switches can be utilized to indicate valve stroke end positions and for relay control of separate plant equipment.

End point switches will also allow the actuators to be controlled in sequence when combined with splitting the modulation control signal, thus providing a high system turn down ration of the plant.

MOUNTING

The actuator may be mounted horizontally, vertically and in any position in between, but not upside down, see figure 3. If the media temperature is above 120°C, install the actuator at an angle over the pipework to reduce the radiant heat influence.

N.B.! Do not use the actuator for old DN15 valves V298, V282, V294, V384, V386 and V394.

To mount the actuator on a valve, first screw the square nut onto the valve stem so that it is flush with the stem top, ensuring the existing flanged nut on the valve stem has clearance for the cross bar, then slide the actuator onto the valve neck, aligning the square nut on the valve spindle to fit into the groove on the cross bar. Then slide the 'U' bolt brace over the groove on the valve neck to protrude through the actuator yoke mount and secure with the flanged nuts.

Finally, tighten and secure the valve stem flanged nut against the cross bar.

It may be necessary to operate the manual override lever to align the actuator cross bar with the valve stem.

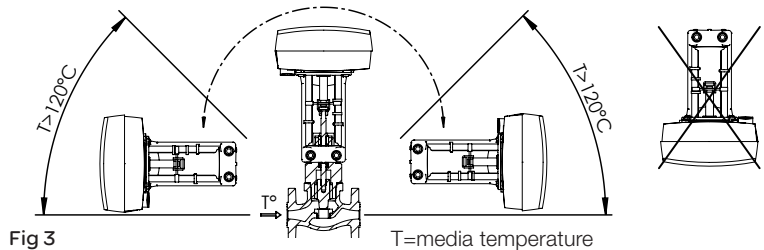
WARNING: If replacing an installed actuator: Depressurize the valve before removing the existing actuator and check integrity of the valve stem and plug by manually moving the stem up and down. If the valve stem and plug have been damaged, the stem may blow out under pressure and cause injury and equipment damage.

Cable lengths

The cables to G, G0 and G1 should be max. 100 m (328 ft.) and have a cross-sectional area of min. 1.5 mm² (AWG 16).

Other cables should be max. 200 m (656 ft.) and have a cross-sectional area of min. 0.5 mm² (AWG 20).

MOUNTING



CONNECTIONS/PCB LAYOUT

Note: according to Switch 7

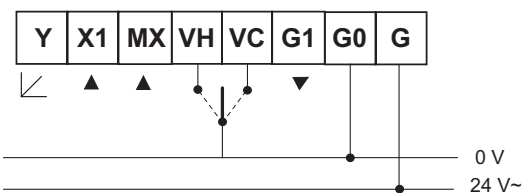
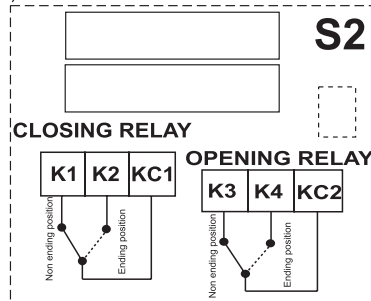
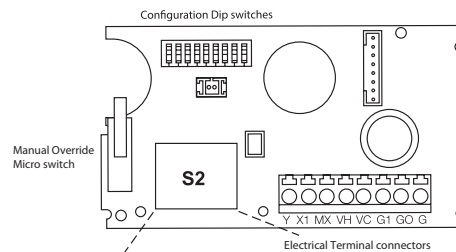
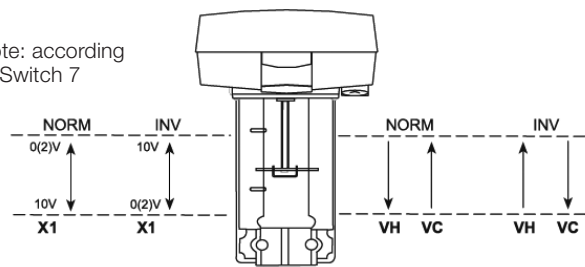


Fig 4

ELECTRICAL CONNECTIONS

Block	Function	Description
G	24 V AC	Supply voltage
G0	24V AC rtn	Supply voltage
X1	Input	Control signals
MX	Input, neutral	Modulating input control
VH	Increase	Floating input Control
VC	Decrease	(VH, VC short circuited to G)
G1	16 V DC	Local controller supply
Y	0-100%	2-10V Feedback signal

N.B.! When installed with 3 conductors, where the control signal reference is connected to G0, the motor current of the actuator will cause varying voltage loss in the cable and thus in the reference level. Forta, which has a highly sensitive control signal input, will detect the varying signal and follow it, which makes it difficult for the actuator to find a stable position. This variation may be accepted in simplified installations on the following conditions: the cables between the controller and actuator are shorter than 100 m, the cross-sectional area is larger than 1.5 mm² (AWG 16) and the cables are only connected to one actuator. Please refer to the figures labelled "Wiring Examples" for wiring instructions.

WIRING EXAMPLES

Typical Wiring

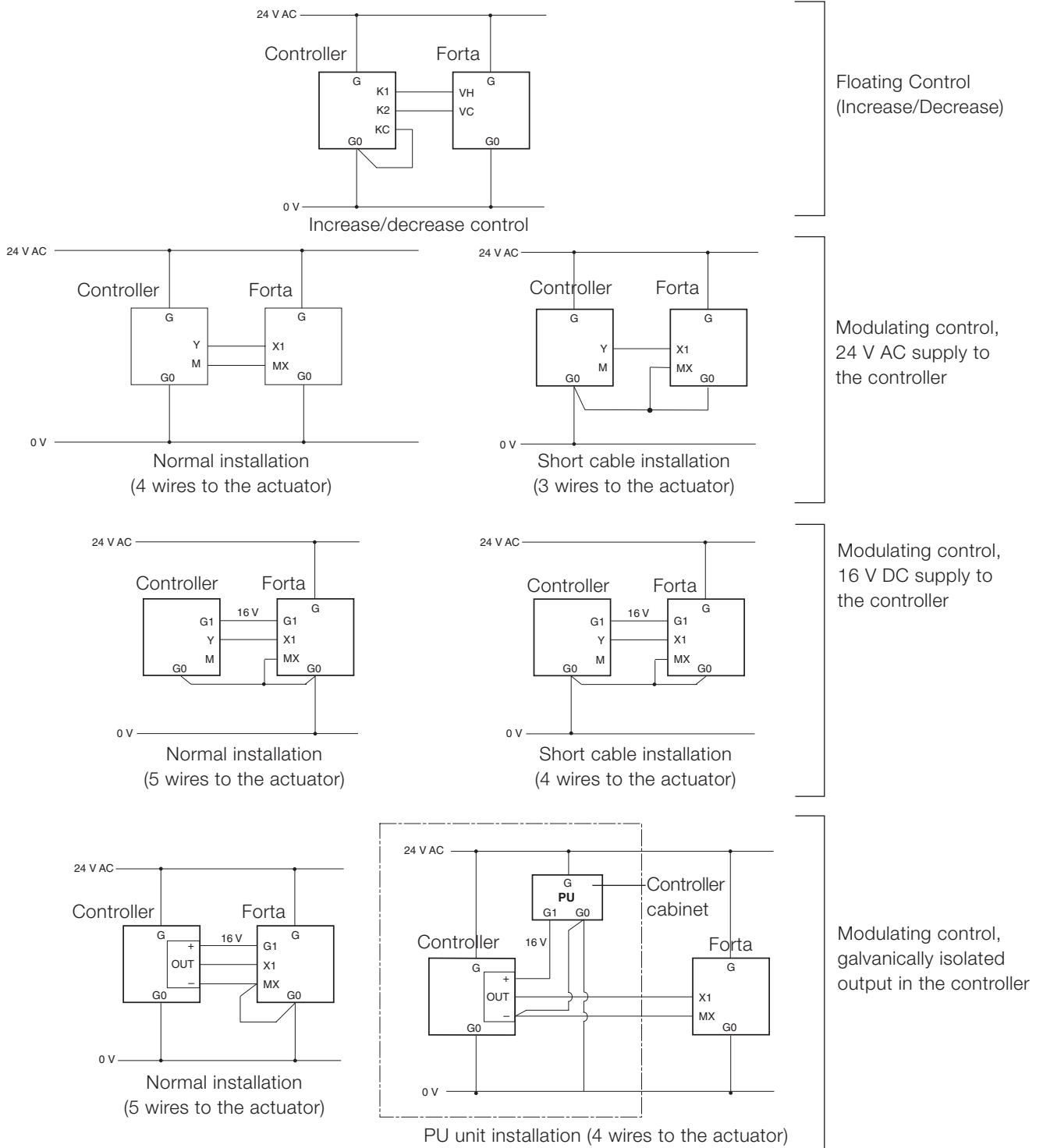
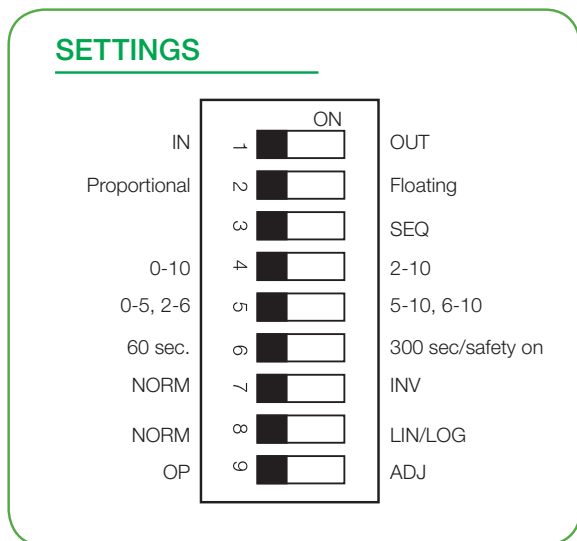


Fig 5 2-10V Feedback (Y) referenced to G0

PROGRAM SWITCH SETTINGS FOR THE FORTA NON-SPRING RETURN ACTUATOR



Switch Number	Description	OFF Position	ON Position
1	Valve closing screw direction (influences the feedback signal and end point relay switch)	IN - Actuator retracts up to 'close' the valve	OUT - Valve extends down to 'close' the valve
2	Control mode	Proportional /modulating signal.	Floating signal.
3	Sequence operation (proportional control only)	Normal operation.	Sequence control (SEQ)
4	Input voltage range	0 to 10 Vdc.	2 to 10 Vdc.
5	Sequence voltage range (proportional control only)	0 to 5 Vdc (Sw. 4 OFF) or 2 to 6 Vdc (Sw. 4 ON)	5 to 10 Vdc (Sw.4 OFF) or 6 to 10 Vdc (Sw. 4 ON)
6	Running time (floating Control) or Safety function (2-10V control)	60 sec. / safety Off	300 sec. / safety On
7	Direction of movement	Normal [NORM] - (Direct action) High voltage signal = 100% flow	Inverse [INV] - Reverse Action High Voltage signal = 0% flow
8	Valve characteristic	Normal [NORM]	Linear / Logarithmic (LIN / LOG) (changes a EQ% valve to Linear or changes a Linear valve to quick opening)
9	Input signal/ Stroke Calibration	Operation (OP)	Stroke Callibration [ADJ] (monetary switch to initiate stroke calibration / end position adjustment)

Units are factory shipped with all nine switches in a default "OFF" position.

Notes for Dipswitch settings

Sequence (or parallel) control (switch 3 [SEQ]):
Allows two actuators (and valves) to be controlled by one control signal. The input voltage range (switch 4) and Sequence voltage range (switch 5) define the working range of the control signal the actuator will respond to.

Running Time / Safety Function (switch 6 [60s/300s]), Dual function :

- a) defines the running time under floating control.
Running time under modulation control is always defined according to the valve
- b) selects security function in the event of a loss in control signal X1 (2-10V only). In this mode the valve will move to mid sition if the control signal =0V. (e.g. to ensure the heating plant is providing some heat for occupants in the event of local BMS failure)

N.B.

For the actuator to register any changes to the switch settings, the power supply voltage must be removed or the manual override lever lowered. Changes to the switch settings will be recognised after power is restored or the manual override lever raised.

COMMISSIONING

The switches on the circuit board should be set before the actuator is installed. There are no other switches or potentiometers to be set or adjusted.

To initiate stroke calibration / end position adjustment after first powering up the actuator, the switch >>OP/ADJ<< needs to be momentary moved to the ADJ (ON) position and then back to the normal OP (OFF) position.

During stroke calibration / end position adjustment, the Forta will first close the valve and then open it fully, thereafter it will close the valve according to the closed valve position as determined by dipswitch no.1

The electronic circuitry in the Forta will program the running time and end relay switch points according to the valve stroke and end limits.

Following completion of the stroke calibration / end position adjustment the actuator will position the valve according to the control input signal

End point position adjustment is **mandatory** every time the actuator is installed on a valve and/or the valve is serviced.

WARNING: If replacing an installed actuator: Depressurize the valve before removing the existing actuator and check integrity of the valve stem and plug by manually moving the stem up and down. If the valve stem and plug have been damaged, the stem may blow out under pressure and cause injury and equipment damage

MAINTENANCE

The actuator is maintenance-free.

ACCESSORIES

S2-Forta	
(end point switch relay)	880-0104-000
Circuit board M400.....	1-001-0673-0
Yoke Heater.....	880-0109-000
	(-10°C amb / -8°C media)
Stem Heater.....	880-0108-000
	(-10°C amb / -20°C media)
Stem Extension, VG210R/VG310R.....	AV-823