

# M3000



## Valve Actuator - Forta M3000

The Forta M3000 is an electro-mechanical actuator for the control of two-way and three-way plug valves in:

- commercial hot water and chilled water systems
- large heating systems
- air handling systems

The Forta M3000 is either controlled by an increase/decrease signal or by a modulating control signal.

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

Mounting on to valves is quick and simple without any or linkage kits.

For Satchwell valves a linkage is included (see PART NUMBERS on page 2).

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.

The actuator is supplied by 24 V AC. It can provide 16 V DC voltage supply for older controllers.

## SPECIFICATIONS

Part numbers . . . . . see table on page 2  
 Supply voltage . . . . . 24 V AC +25%/ -20%, 50–60 Hz  
 Power consumption . . . . . average 25 VA  
 Transformer sizing . . . . . 50 VA

### Running time

Modulating 10-25 mm (0.39 - 1 in.) . . . . . 15 s  
 Modulating 25-32 mm (1 - 1.26 in.) . . . . . 20 s  
 Modulating 32-52 mm (1.26 - 2.05 in.) . . . . . 30 s  
 Increase/decrease . . . . . 300 s/60 s  
 Stroke . . . . . 9–52 mm (0.35 - 2.04 in.)  
 Thrust . . . . . 3000 N (670 lbf.)  
 Duty cycle . . . . . max. 20%/60 minutes

### Analog input

Voltage . . . . . 0–10 V  
 Impedance . . . . . min 100 kOhm

### Digital inputs VH–VC

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

### Output G1

Voltage . . . . . 16 V DC  $\pm$ 0.3 V  
 Load . . . . . 25 mA, short-circuit proof

### Output Y

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

### Ambient temperature

Operation . . . . .  $-10 - +50$  °C (14°F - 122°F)  
 Storage . . . . .  $-10 - +50$  °C (14°F - 122°F)  
 Ambient humidity . . . . . max. 90% RH  
 Enclosure rating . . . . . IP 55  
 Sound power level . . . . . max. 50 dBA

### Standards

Emission . . . . . EN 50081-1:1992  
 Immunity . . . . . EN 50082-1:1992  
 Heat . . . . . IEC-68-2-2  
 Humidity . . . . . IEC-68-2-3  
 Cold . . . . . IEC-68-2-1  
 Vibration . . . . . IEC-68-2-6

### Material

Housing . . . . . aluminium  
 Cover . . . . . ABS plastic  
 Color . . . . . black/red  
 Weight . . . . . 1.8 kg (3.96 lb.)  
 Dimensions (mm) . . . . . see table on page 2

**DIMENSIONS mm (in)**

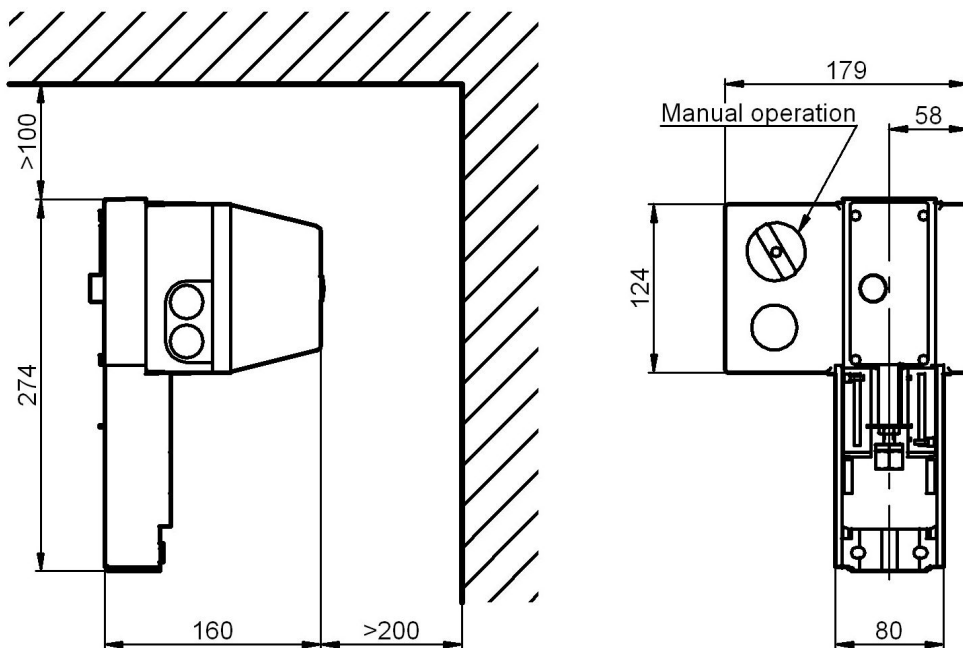


Fig 1

**FUNCTION**

**The actuator**

The brushless DC-motor of the actuator turns a screw via a gear wheel. The screw provides a linear movement which moves the stem of the valve.

**Control signal**

M3000 can either be controlled by an increase/decrease signal or by a variable direct voltage.

If an increase/decrease signal is used, the actuator normally moves inwards up an increase signal and outwards down a decrease signal, see Settings.

**Manual operation**

Manual operation possible using the adjustment knob (see Fig. 1).

**Position feedback**

Forta actuators are equipped with a 2–10 V DC position feedback signal, where 2 V always corresponds to the closed position and 10 V to the open position.

**End point switches**

When actuators are controlled in sequence, it is possible to use the end point switches that have set positions. They will toggle when the valve is fully open or fully closed, respectively.

Designation	Explanation	Part Number
M3000	modulating control signal or increase/decrease signal	880-0500-000
M3000-S2	modulating control signal or increase/decrease signal with end point switches	880-0510-000
M3000 + L7SV	modulating control signal or increase/decrease signal including a linkage for Satchwell valves	880-0520-000
M3000-S2 + L7SV	modulating control signal or increase/decrease signal with end point switches, including a linkage for Satchwell valves	880-0530-000

### MOUNTING

The actuator may be mounted horizontally, vertically and in any position in between, but not upside down, see figure 2.

To mount the actuator on a valve, first slide the actuator onto the valve neck and connect the square nut on the valve spindle into the groove on the actuator cross bar. Then slide the 'U' bolt brace into the groove on the valve neck and secure the nuts.

### 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 mm<sup>2</sup> (AWG 16). Other cables should be max. 200 m (656 ft.) and have a cross-sectional area of min. 0.5 mm<sup>2</sup> (AWG 20).

### MOUNTING

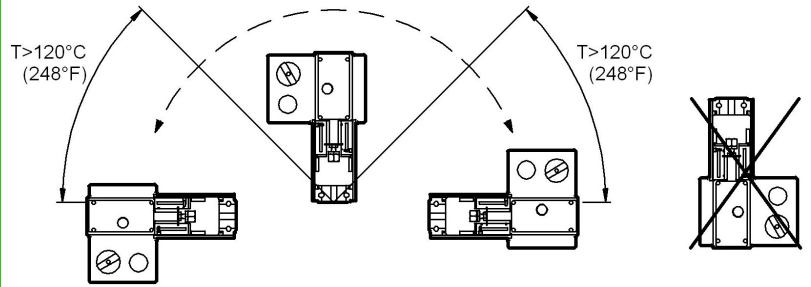


Fig 2

### CONNECTIONS

Block	Function	Description
G	24 V AC	Supply voltage
G0	24 V AC rtm	
X1	Input	Control signals (VH, VC short-circuited to G0) Supply for RC Feedback signal
MX	Input, neutral	
VH	Increase	
VC	Decrease	
G1	16 V DC	
Y	0-100%	

### WIRING

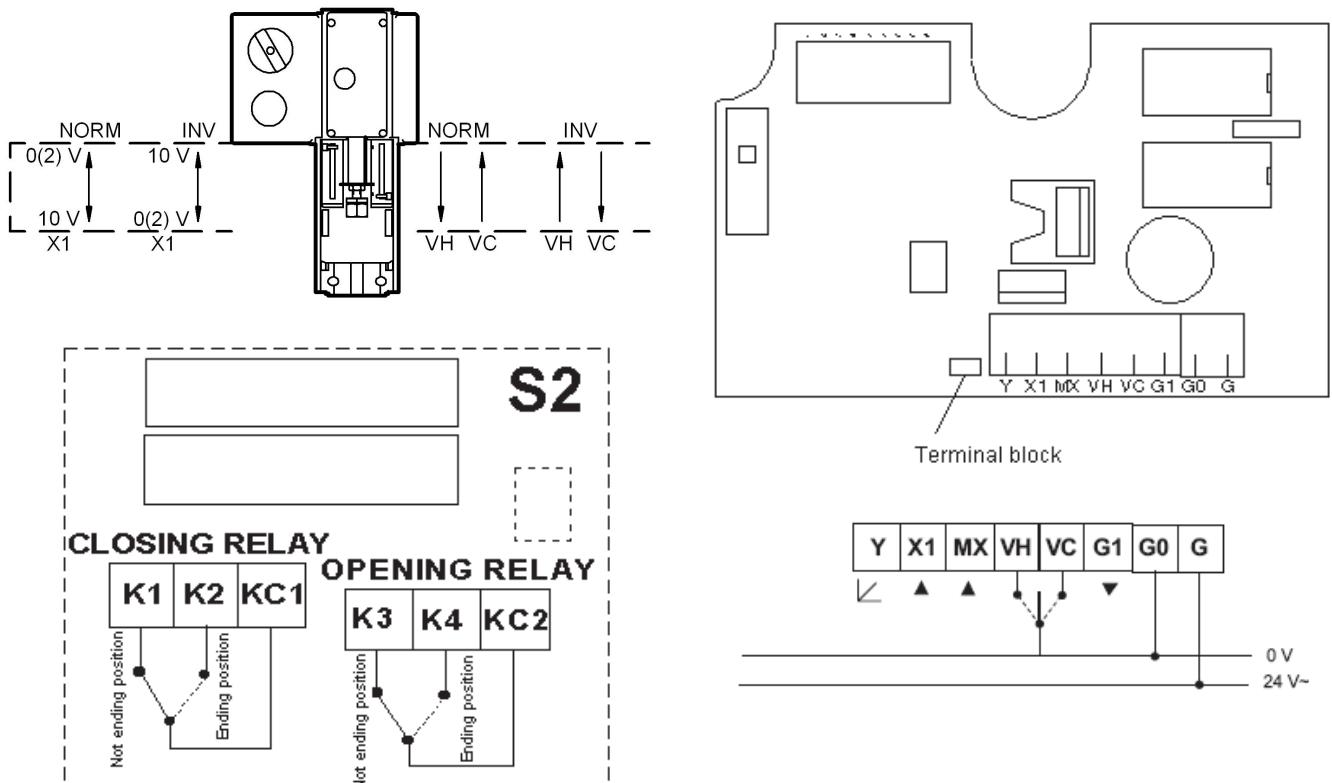
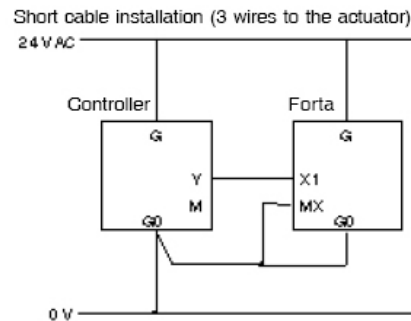
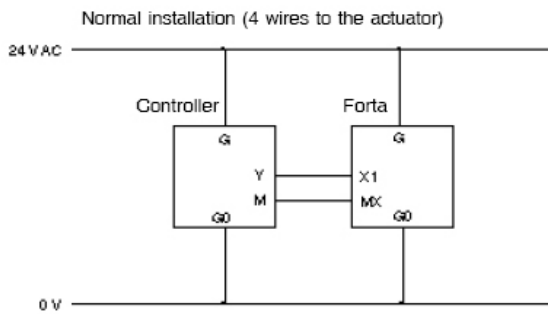
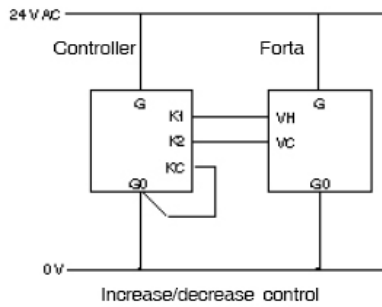
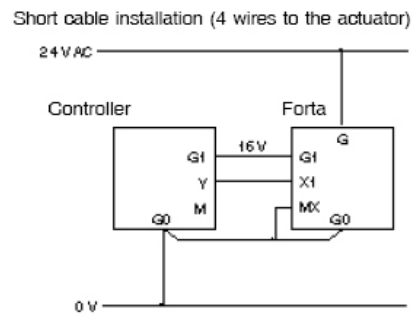
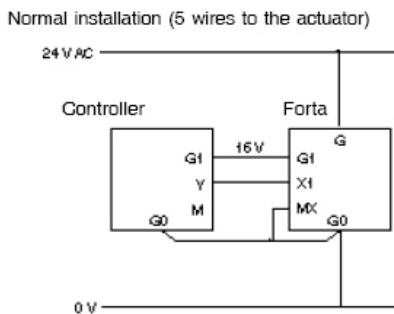


Fig 3

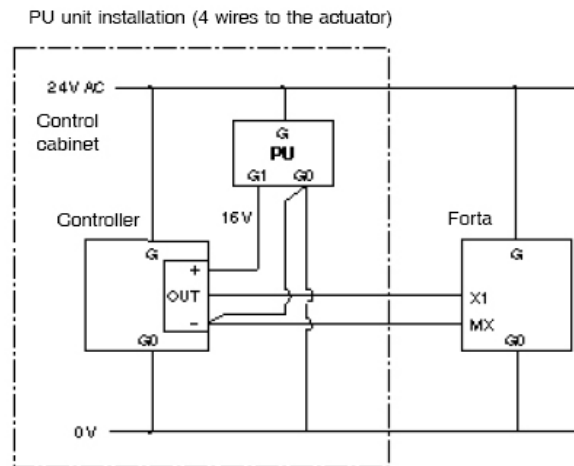
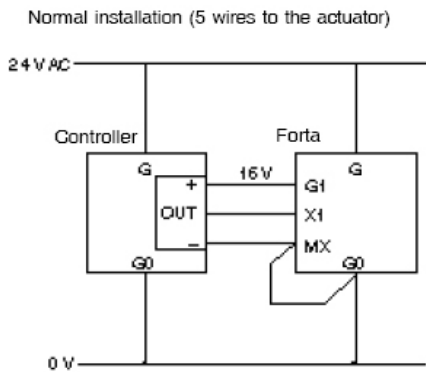
WIRING EXAMPLES



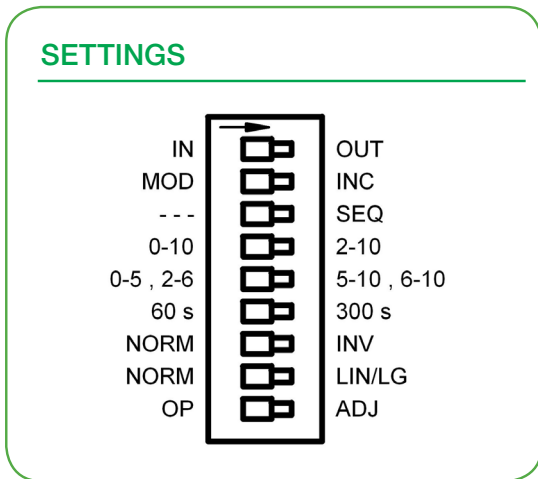
Modulating control, 24 V AC supply to the controller  
(TAG 239W, TAG 6711, TAG Xenta, TAG 8000, TAG 230U, TAG 2000, TAG 9000, TAG 77xx)



Modulating control, 16 V DC supply to the controller  
(TAG 218E/RM, TAG 221L, TAG 228R/RL/RF, TAG 239W, TAG 258R/RL, TAG 268R/RL/RF)



Modulating control, galvanically isolated output in the controller (TAG 6501, TAG 6505)



Function Position		Description	
"OFF"	"ON"		
1	In	Out	Valve closing screw direction
2	Modulating	Increase/decrease	Control (not at Sequence)
3	–	Sequence	Sequence control
4	0-10 V	2-10 V	Voltage range
5	0-5 V, 2-6 V	5-10 V, 6-10 V	Part of voltage range
6	60 s	300 s	Running time
7	Normal	Inverted	direction of movement
8	Normal	Linear/Logarithmic	Valve characteristic
9	Operation	End position adjust (mom.)	Operation/End position adjustment

There are nine switches in a row on the circuit board. On delivery ("Factory"), all switches are in the "OFF" position.

**1 Valve Closing Screw Direction—IN / OUT**

IN direction of movement is used when the screw of the actuator moves inwards (up) to close the valve. OUT direction of movement is used when the screw of the actuator moves outwards (down) to close the valve.

**2 Control signal—MOD / INC**

TAC Forta can either be controlled by a variable direct voltage, for a modulating signal (MOD), or by an increase/decrease signal (INC).

**3 Sequence or parallel control— --- / SEQ**

With sequence (or parallel) control (SEQ), two actuators/valves can be controlled with one control signal. For each actuator using part signal control it is possible to determine which voltage range to use an upper one for 5-10 V (6-10 V) or a lower one with 0-5 V (2-6 V). If the switch NORM / INV is in the NORM position, the higher voltage corresponds to 100% flow and the lower one to 0%. With the INV position selected you the opposite function is obtained.

**Note!** If sequence or parallel control is not used, the switch --- / SEQ must be in the OFF position, as the switch MOD / INC is not valid during sequence or parallel control.

**4 Voltage range—0-10 / 2-10**

Choice of either 0-10V or 2-10V control voltage signal

**5 Part of voltage range—**

Choice to split voltage range  
low: 0 - 5 V (2 - 6 V)  
high: 5-10V (6 - 10 V)

If switch 7 is in the NORM position, the higher voltage corresponds to 100% flow and the lower one

to 0%. To achieve the opposite function, switch 7 should be put in its INV position.

**6 Running time—60 s / 300 s**

On increase/decrease control, it is possible to select a running time between 60 s or 300 s. With modulating control, the running time is always 15 s / 20 s / 30 s depending on stroke.

**7 Direction of movement—NORM / INV**

When normal direction of movement is used, the screw of the actuator moves inwards up when the control voltage decreases or if the actuator gets a decrease signal. With the NORM / INV switch, the direction of movement relative to signal change can be reversed.

**8 Linearization—NORM / LIN/LG**

The motorized valve characteristics can be modified. The setting LIN/LG will change characteristics of an equally modified percentage (EQM) valve to behave in an almost linear function. However, with the LIN/LG set on a motorized valve designed for linear flow the valve will operate with "Quick open characteristics". i.e. with a small control signal, the valve will be almost completely open.

**Note!** For the actuator to register new settings for the switches, the supply voltage must be cut, the settings made, and then the power reconnected or the end position adjustment must be initiated again (see point 9). (This does not apply to the switch OP/ADJ).

**9 End position adjustment— OP / ADJ**

This switch is only used to adjust the end positions when the actuator is commissioned. Momentarily put the switch in the ON position. The actuator will automatically find the end positions of the valve. At the end of the adjustment all the other dip switch settings (1 to 8) will be read again.

## ACTUATOR INSTALLATION

The switches on the circuit board should be set before the actuator is installed.

To make an end position adjustment, switch the dip-switch »OP/ADJ« into its ADJ position, when the supply voltage has been turned on, and then back to its OP position.

When an end position adjustment is made, Forta closes the valve and opens it fully. The adjustment is finished by the actuator closing the valve again; the electronic circuitry then adjusts the stroke and the running time to the valve. The set values are stored in the EEPROM of the actuator so that they will remain after a loss of voltage.

When the end position adjustment is complete, the actuator starts to control the valve according to the control signal.


## MAINTENANCE

The actuator is maintenance-free.

## ACCESSORIES

S2-Forta . . . . . 880-0104-000  
 Circuit board M3000. . . . . 1-001-0680-0  
 Linkage Satchwell valves L7SV. . . . . 880-0126-000  
 See data sheet "Valves and actuators Summary"  
 (F-10-06)

Accessory for 4÷20 mA control signal factory-supplied.

 **Hot media hazard. Before removing actuator from valve or opening the valve, ensure that the valve control medium is isolated and relieve the pressure. Work should only be carried out by a competent engineer.**