

M310 is an electro-mechanical actuator for the control of two-way and three-way plug valves in:

- domestic hot water systems
- heating systems
- air handling systems

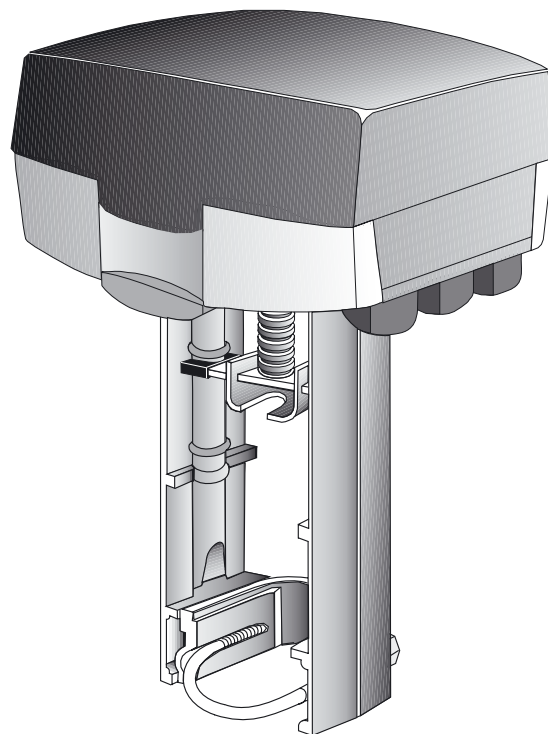
M310 is either controlled by an increase/decrease signal or by a modulating 0–10 V control signal. Modulating control makes for a faster positioning of the actuator.

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

It is easy to mount and connect the actuator. It can be mounted directly onto TAC's control valves. However, some DN15 valves require the use of an adapter kit.

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 TAC controllers.



TECHNICAL DATA, M310

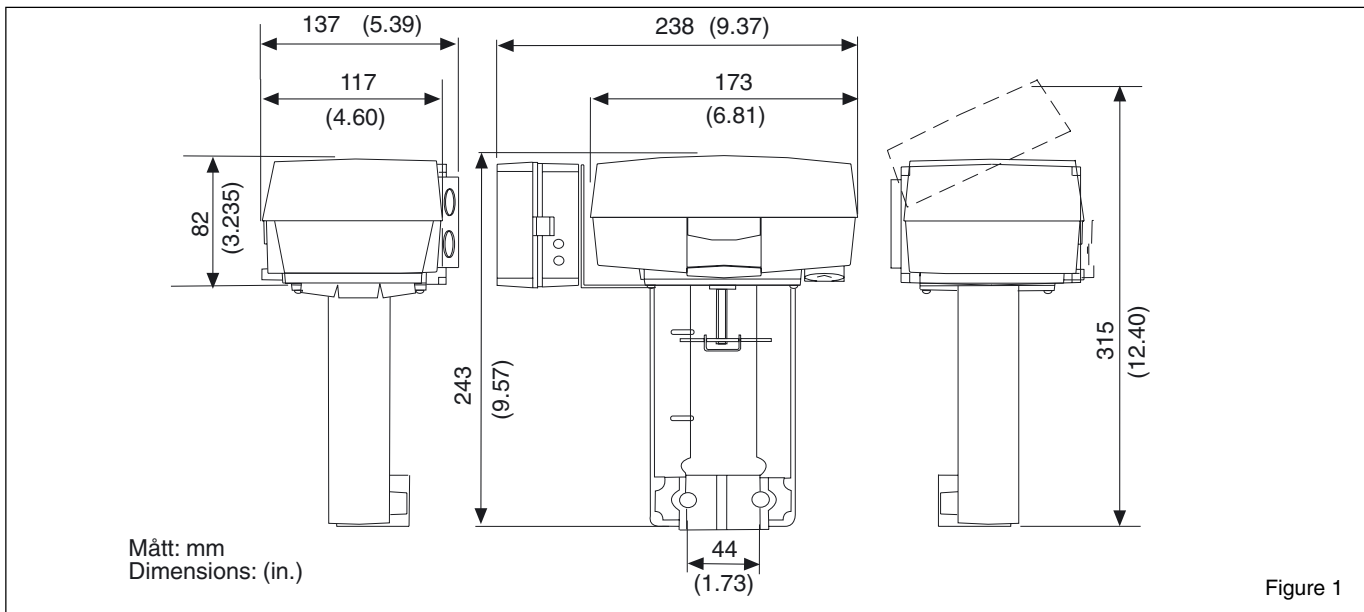
Part numbers see the table on the next page
 Supply voltage 24 V AC +10%/ -40%, 50–60 Hz
 Power consumption average 6 VA
 Transformer sizing 30 VA
 Running time:
 Modulating 10–25 mm (0.39 - 1 in.) 15 s
 Modulating 25–32 mm (1 - 1.26 in.) 20 s
 Increase/decrease 300 s/60 s
 Close off time with STS, at power failure:
 Stroke 10–25 mm (0.39 - 1 in.) max. 20 s
 Stroke 25–32 mm (1 - 1.26 in.) max. 25 s
 Stroke:
 Range 10–32 mm (0.39 -1.26 in.)
 Factory set stroke 15 mm (0.59 in.)
 Thrust 300 N (67 lbf)
 Duty cycle max. 20%/60 minutes
 Analog input:
 Voltage 0–10 V
 Impedance min 100 kΩ
 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 ±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
 Sound power level max. 38 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 (without 0-return unit only) IEC-68-2-6
 Enclosure rating IP 54
 Material:
 Housing aluminium
 Cover ABS/PC plastic
 Colour aluminium/black
 Weight 1.8 kg (3.96 lb.)
 Dimensions (mm) refer to the table on the next page

PART NUMBERS

| Designation | Explanation | Part number |
|-------------|---|--------------|
| M310 | modulating control signal or increase/decrease signal | 880-0210-030 |
| M310-S2 | modulating control signal or increase/decrease signal and end point switches | 880-0211-030 |
| M310-ST5 | modulating control signal or increase/decrease signal and self testing safety device | 880-0212-040 |
| M310-S2-ST5 | modulating control signal or increase/decrease signal with endpoint switches and self testing safety device | 880-0213-040 |

DIMENSIONS



FUNCTION

The actuator

The brushless DC-motor of the actuator turns a screw via a gear wheel. The motor receives a control signal from a controller. The screw gets a linear movement which moves the stem of the valve.

Control signal

M310 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 on an increase signal and outwards on a decrease signal, see Settings.

Manual operation

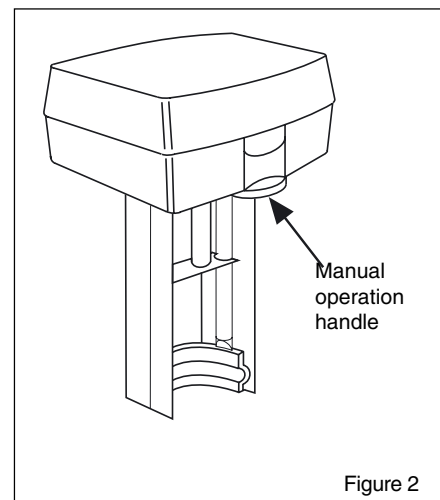
There is a manual operation handle on the actuator, see figure 2. When it is lowered, the motor stops. Then, the actuator can be operated manually if the handle is turned.

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.



MOUNTING

The actuator may be mounted horizontally, vertically and in any position in between, but **not** upside down, see figure 3.

To mount the actuator on a valve, slide the actuator onto the valve neck, thus making the square nut on the valve spindle fit into the groove on the cross bar. Then slide the brace into the groove on the valve neck and secure the nuts.

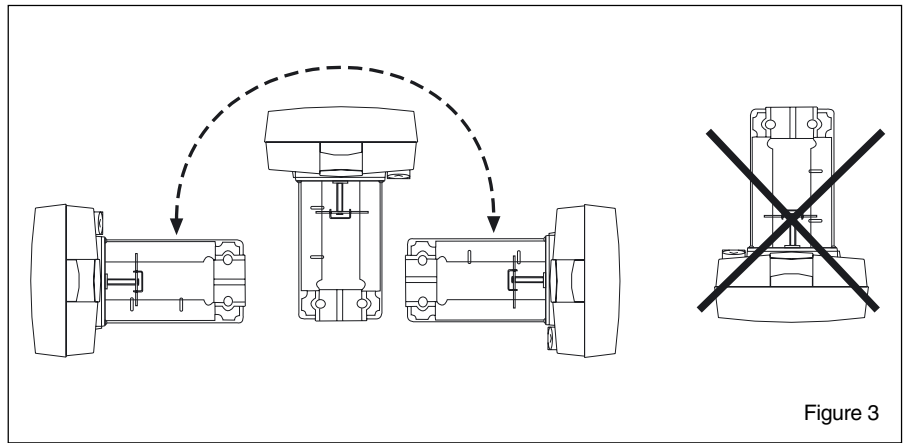


Figure 3

SELF TESTING SAFETY DEVICE, STS

STS is a processor controlled, battery operated safety device which monitors the presence of supply voltage to Forta actuators. The device supplies the actuator with power so that the actuator is able to close the valve in the event of a loss of power.

The battery is tested periodically during normal operation. Moreover, it is charged continuously for maintenance purposes.

Batteries for the STS uses NiCd.



Figure 4

TECHNICAL DATA, STS

| | | | |
|-----------------------------------|---------------------------------|---------------------------------|--|
| Supply voltage, G | 24 V AC $\pm 10\%$ | Ambient temperature | $-10\text{ }^{\circ}\text{C} - +50\text{ }^{\circ}\text{C}$ (14 $^{\circ}\text{F} - 122^{\circ}\text{F}$) |
| G0 | return | Ambient humidity | max 65 % RH |
| Output voltage AC-DC, GF | 24 V DC $\pm 10\%$ | Enclosure rating | IP 44 |
| G0F | return, alt. 24 V AC $\pm 10\%$ | Standards: | |
| Time to toggle AC to DC | max. 5 s | Emission | EN 50081-1:1992 |
| DC voltage supplied during | 70 s | Immunity | EN 50082-1:1992 |
| Inputs: | | Heat | IEC-68-2-2 |
| Battery A | 8.4 V DC—min 600 mAh | Cold | IEC-68-2-1 |
| Outputs: | | Materials: | |
| Battery B, “rapid charging” | 115 mA | Box | PC Makrolon 8035 |
| Alarm outputs KC, K1 and K2 | | Lid | PC Makrolon 8035 |
| | 2 A—24 V AC two-way SPDT | Bracket | SS 1412-2 |
| Indication: | | Colour | black |
| Green LED | Normal operation | Weight, including battery | 0.3 kg (0.7 lb.) |
| Red LED | Alarm | Dimensions | please refer to the dimension drawing |
| Red LED on circuit board | Rapid charging is active | | |
| Settings: | | | |
| Bypass MAN | no jumper, external button | | |
| Bypass AUTO | jumper on, internal function | | |

CONNECTIONS

| Block Function | Description |
|----------------|----------------|
| G | 24 V AC |
| G0 | 24 V AC rtrn |
| X1 | Input |
| MX | Input, neutral |
| VH | Increase |
| VC | Decrease |
| G1 | 16 V DC |
| Y | 0–100 % |

NB.! 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 (328 ft.), 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.

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).

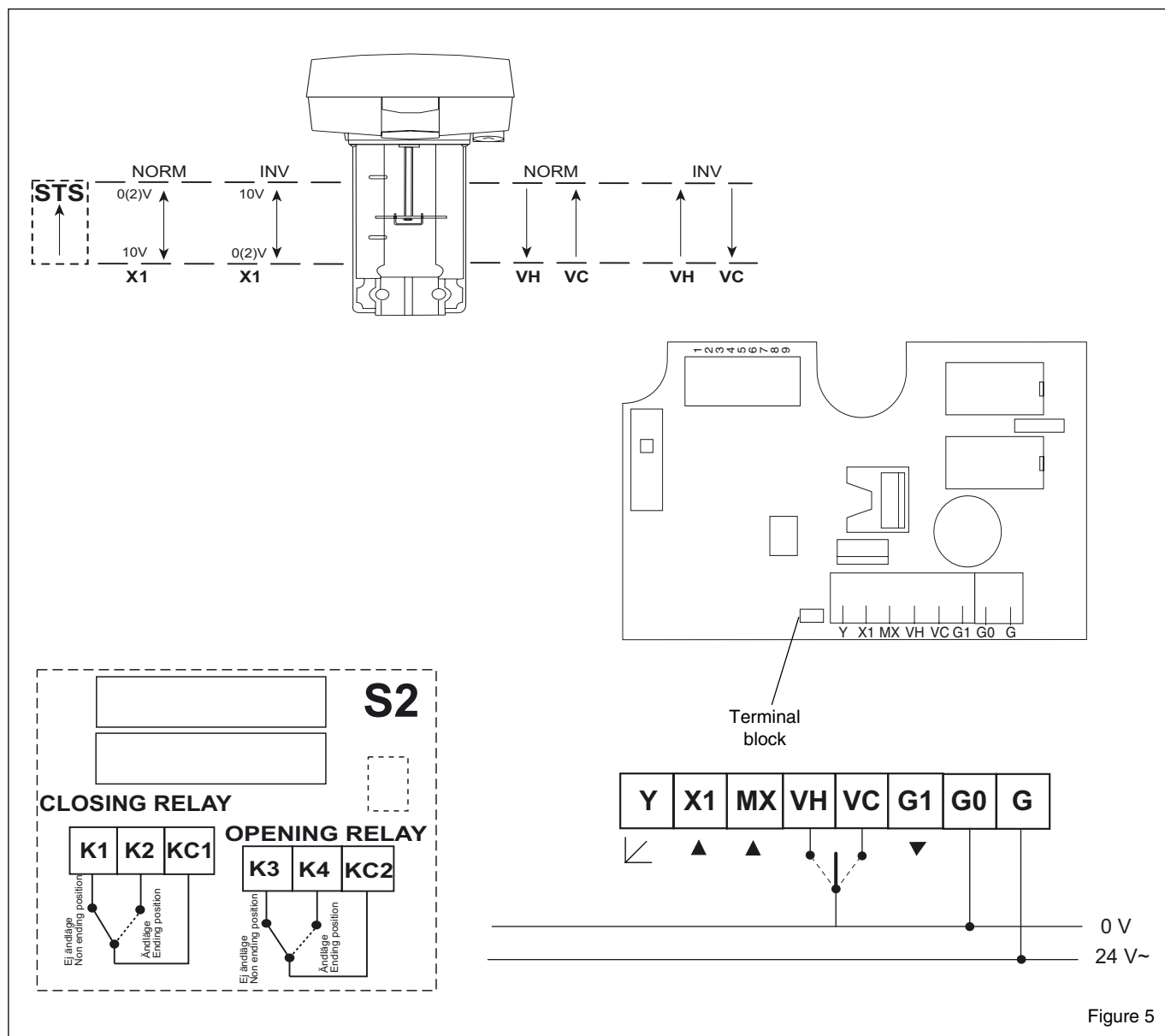
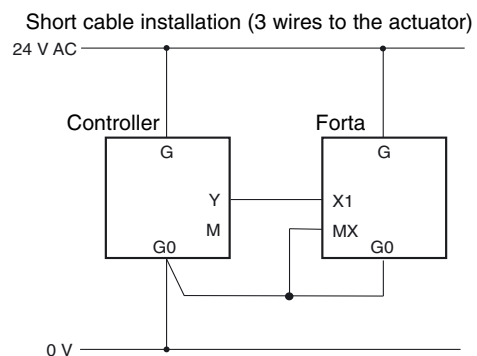
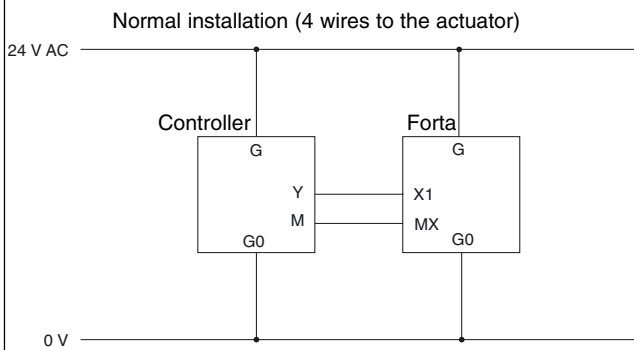
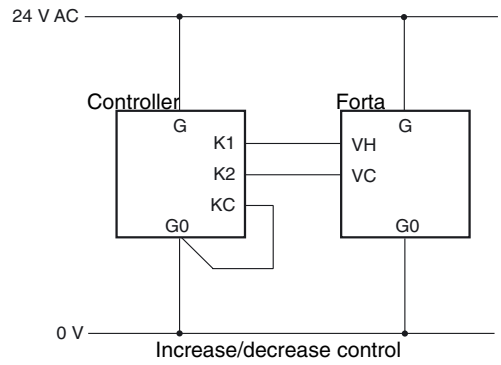
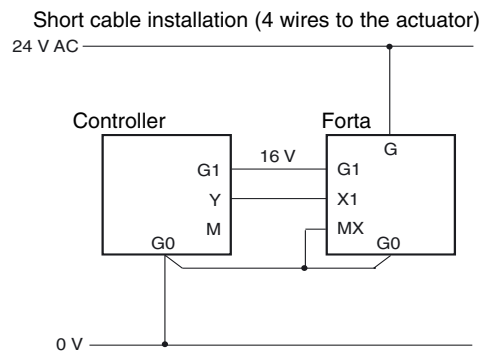
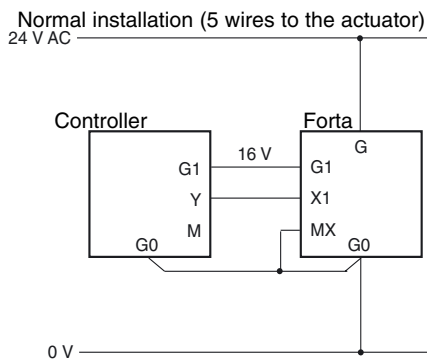


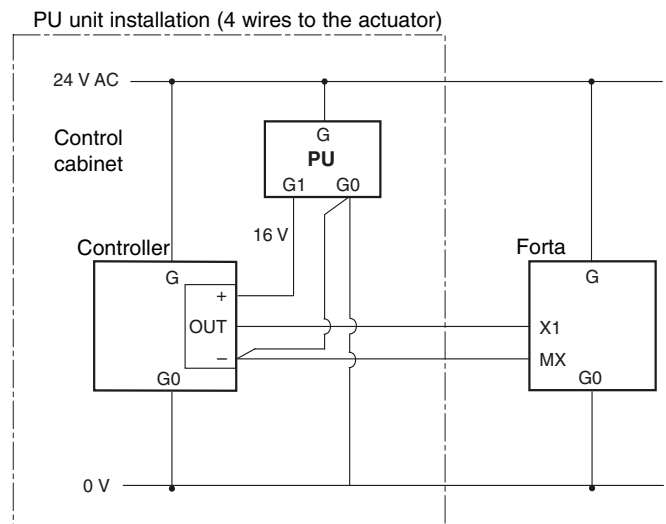
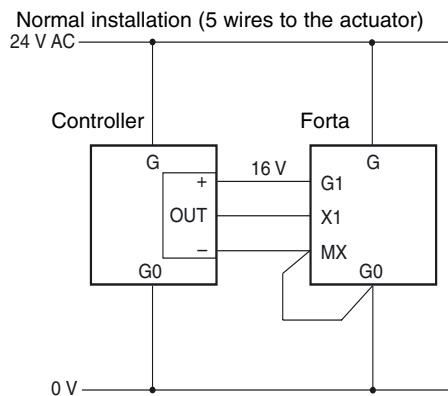
Figure 5



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

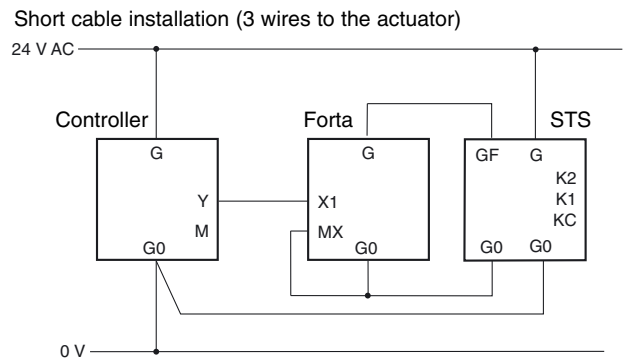
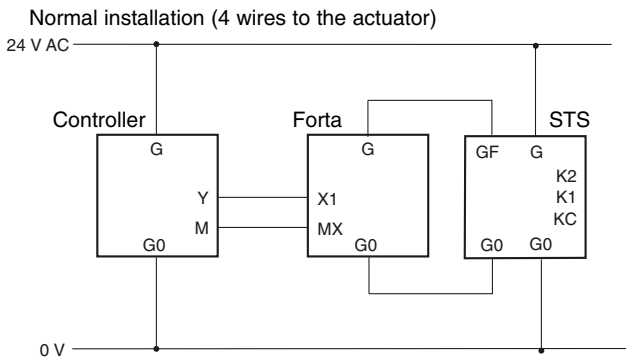
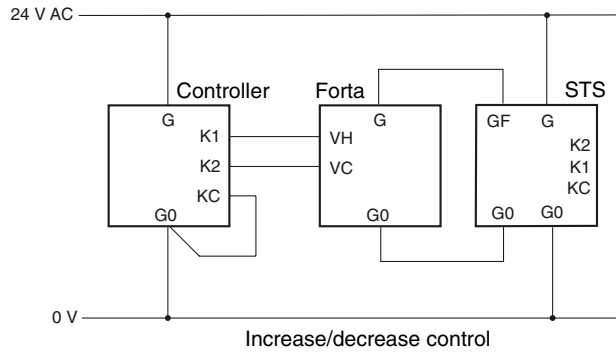


Modulating control, 16 V DC supply to the controller
(TAC 218E/RM, TAC 221L, TAC 228R/RL/RF, TAC 239W, TAC 258R/RL, TAC 268R/RL/RF)

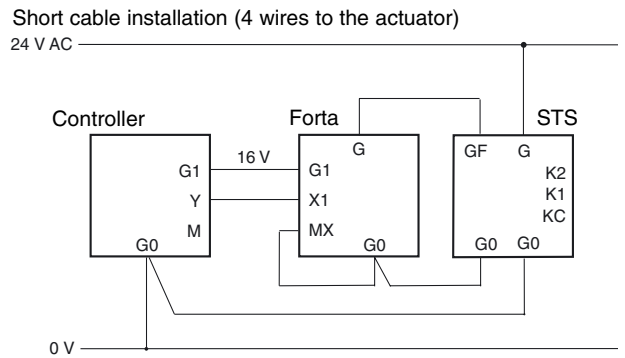
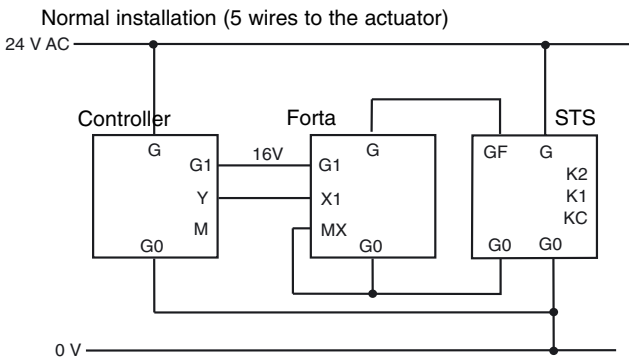


Modulating control, galvanically isolated output in the controller (TAC 6501, TAC 6505)

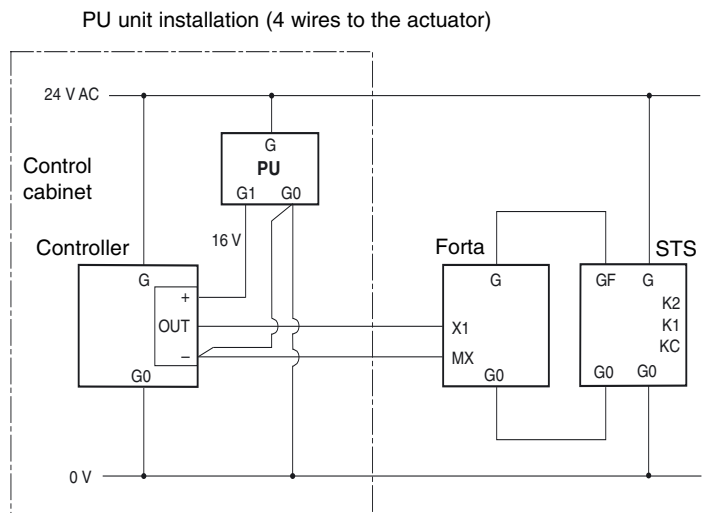
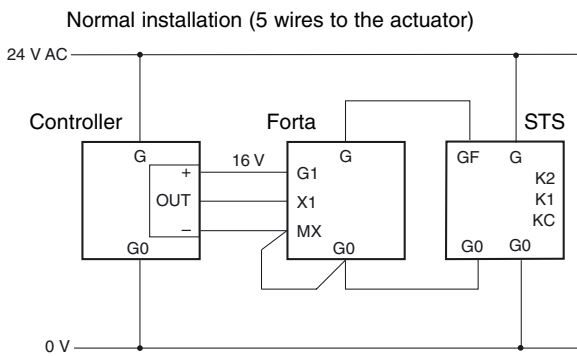
Figure 6



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



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



Modulating control, galvanically insulated output in the controller (TAC 6501, TAC 6505)

Figure 7

| | | | Function in the "OFF" pos. | "ON" position | Description |
|----------|--|------------|-------------------------------|----------------------------|-----------------------------------|
| IN | | OUT | 1 In | Out | Valve closing screw direction |
| MOD | | INC | 2 Modulating | Increase/decrease | Control (not at Sequence) |
| --- | | SEQ | 3 - | Sequence | Sequence control |
| 0-10 | | 2-10 | 4 0-10 V | 2-10 V | Voltage range |
| 0-5, 2-6 | | 5-10, 6-10 | 5 0-5 V, 2-6 V | 5-10 V, 6-10 V | Part of voltage range |
| 60 s | | 300 s | 6 60 s | 300 s | Running time |
| NORM | | INV | 7 Normal | Inverted | Direction of movement |
| NORM | | LIN/LG | 8 Normal | Linear/Logarithmic | Valve characteristic |
| OP | | ADJ | 9 Operation | End position adjust (mom.) | Operation/End position adjustment |

Figure 8

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 to close the valve.

OUT direction of movement is used when the screw of the actuator moves outwards to close the valve.

Note! At power failure, the STS closes according to this switch. Y = 2 V at close valve.

2 Control signal—MOD / INC

TAC Forta can either be controlled by a variable direct voltage, a so called 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 by only one control signal.

For each of these you can choose which part of the voltage range to use, the upper one, 5-10 V (6-10 V) or the lower one, 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 NORM / INV in the INV position you will get the opposite function.

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

You can choose whether to use the control signal voltage range 0-10 V or 2-10 V.

5 Part of voltage range—0-5, 2-6 / 5-10. 6-10

You can choose which part of a voltage range to use, the lower one 0-5 V (2-6 V) or the upper one 5-10 V (6-10 V).

If the switch is in the NORM position, the higher voltage corresponds to 100% flow and the lower one to 0%. To achieve the opposite function, the switch should be put in its INV position.

6 Running time—60 s / 300 s

With increase/decrease control, you can choose a running time between 60 s or 300 s.

With modulating control, the running time is always 15 s / 20 s / 30 s.

7 Direction of movement—NORM / INV

When normal direction of movement is used, the screw of the actuator moves inwards when the control voltage decreases or if the actuator gets a decrease signal.

With the switch NORM / INV, the direction of movement can be changed.

8 Linearization—NORM / LIN/LG

The motorized valve characteristics can be modified. If you wish for the characteristics to be affected, the setting LIN/LG will make the characteristics of an equally modified percentage (EQM) valve almost linear.

On the other hand, with LIN/LG a motorized valve equipped with a linear valve will operate with "Quick open characteristics". This means that with a small control signal, the valve will be almost completely open.

Note! For the actuator to register new settings of the switches, the supply voltage must be cut or the manual operation handle lowered, the settings done, and then the handle raised again.

Please refer to illustration on page 2.

(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.

ACTUATOR INSTALLATION

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

To make an end position adjustment, you only have to switch the 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

| | |
|--|--------------|
| Circuit Board M310/315 Spare | 1-001-0672-0 |
| TAC Forta Handbook (GB) | 0-004-7804 |
| S2-Forta | 880-0104-000 |
| STS-Forta M310/800 | 880-0107-010 |
| NiCd batteries for the STS | 1-001-9024-0 |
| Adapter kit for DN15- V298 | 880-0252-000 |
| Adapter kit for DN15 -V282/ V294/ V384/ V386/ V394 | 880-0253-000 |

