Micatrone®

Operating and installation manual

Electrical Actuator for Control of Dampers, Guide Vanes and Valves

MS-250M4

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Features

The actuator MS-250M4 is designed for control of dampers, guide vanes and valves in control systems. Connection can be made to control systems, two-position controllers, 3-point controllers and, together with a servo controller, also to continuous controllers.

Design

The actuator has a rugged construction suitable in boiler room applications as well as in hard industrial environments.

The actuator comprises three modules:

- ❑ Electromotor,
- ❑ gear housing with hand wheel
- ❑ control unit.

The control unit includes condenser, fixed torque limit switches and adjustable limit cams. Available accessories are position potentiometer and heating resistance. The actuator can be mounted in any position and requires normally no maintenance.

In the standard execution there are four limit switches:

- ❑ 2 for adjustment of the rotation angle 0...180°
- ❑ 2 for signalling of intermediate position

The actuator can be equipped with one potentiometer and heating element.

For control of the actuator, connect control voltage between the terminals 1-2 or 1-3. The desired rotation direction can easily be adjusted by means of a switch.

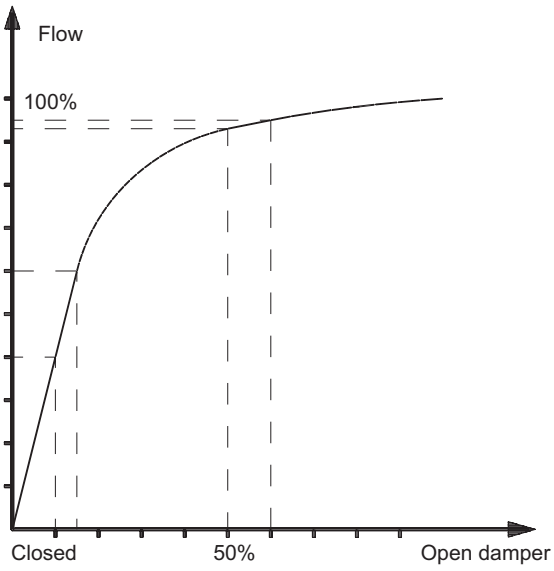
For protection against overheating the standard equipment comprises a thermo-fuse. If the temperature increase above the motors limit the fuse will break the electrical circuit inside the motor. When the motor has cooled down and the temperature is within limit, the electrical circuit will automatically close again and the motor will continue its operation.

Installation of actuator with lever and pull rod for control of dampers in air and flue gas ducts

Actuator controlled dampers have applications of two different types:

- ❑ 2-position function, i.e. the damper is fully open or fully closed.
- ❑ Controlling function, i.e. the damper controls air pressure or flow, by placing itself in all positions between fully open and fully closed.

Most dampers, e.g. single or multiple leaf dampers and guide vanes, have a characteristic for flow in line with the curve below:



It is evident that the air flow increases very fast as the damper starts opening. 90% of the maximum flow is reached at 40% of the opening angle.
This is favourable if a fast opening function is required, unfavourable if a fast closing function is required. For a controlling function the damper characteristic often results in big problems.

At 2-position function the characteristic gives no major problem, not even in the case of fast closing, as fully open can be limited to about 90% of the maximum flow in most cases.

When controlling, problems may occur with the control loop stability. This is due to the fact that the controller, at a certain control deviation, gives the same signal to the actuator whether the damper is open to 10% or e.g. to 50%. If the controller gives a signal which increases the damper opening from 10% to 15%, a flow increase of about 20% will be achieved. If the damper opening increases from 50% to 55%, the flow increase will be about 2%. That is a difference of 10 times!

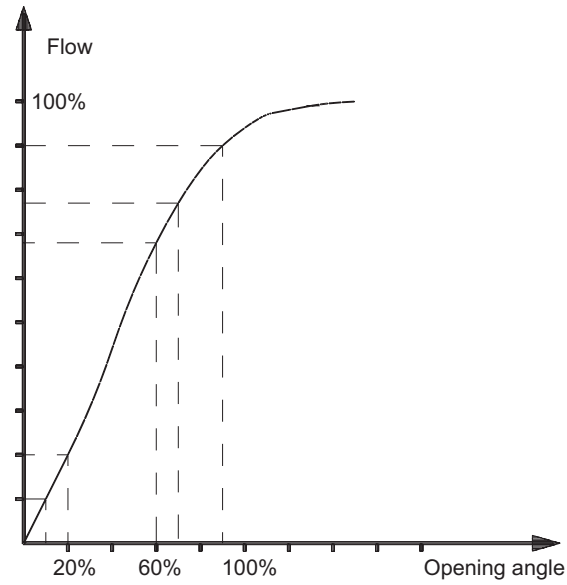
Near the closed position there might be a play in the coordination between the damper blade(s) and the actuator. A small play gives a big flow change.

The above mentioned disadvantages with controlling dampers can and should always be remedied through an installation which ameliorates the control quality considerably.

The figures below show:

- How to place the actuator in relation to the damper lever.
- How to adjust the actuator.
- The ratio between the actuator lever and the damper lever length.

The actuator is mounted above the damper. The figures show the initial position (closed damper). This type of installation gives an almost linear ratio between the actuator rotation angle and the air flow, especially near the closed position and up to 90% of the total flow.



Installation should be made in the following order:

1 Place the actuator in accordance with the figure without fastening it with screws.

2 Mount the damper lever as per the figure for closed damper.

Mounting of ball joints on the actuator and damper levers: If the damper lever has only one hole, mount the ball joint in it and measure the distance to the damper shaft. Mount the ball joint on the actuator lever at the measured distance multiplied by 2/3.

Example:

If the distance between damper shaft and ball joint is 165 mm, the distance between actuator shaft and ball joint will be:

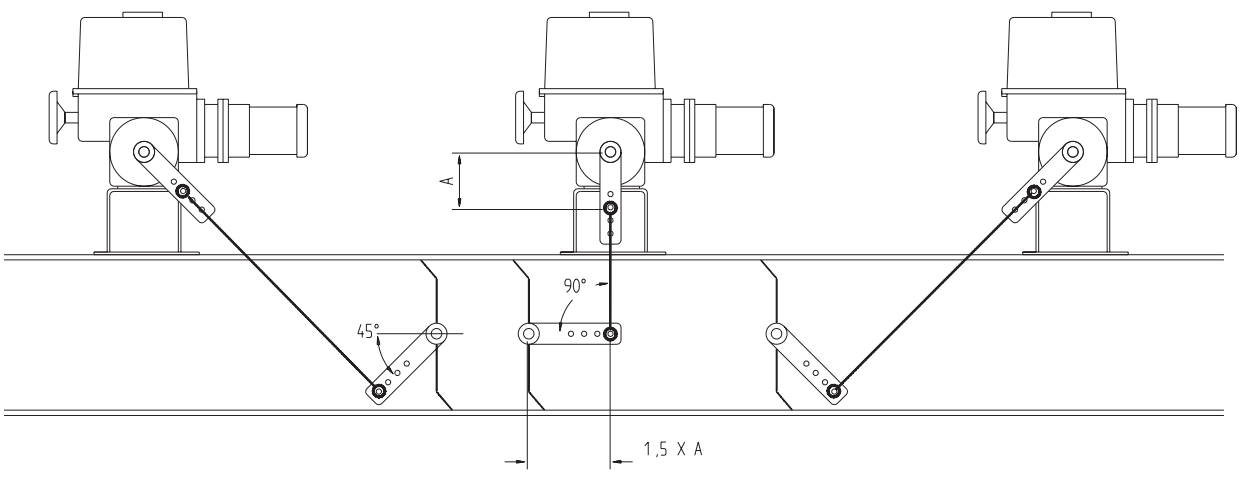
$$\frac{165 \times 2}{3} = 110 \text{mm}$$

If the damper lever has several holes, start mounting the ball joint on the actuator lever, in one of the holes nearest to the actuator shaft. Measure the distance between shaft and ball joint. Then mount the ball joint on the damper lever at the measured distance multiplied by 1,5.

Example:

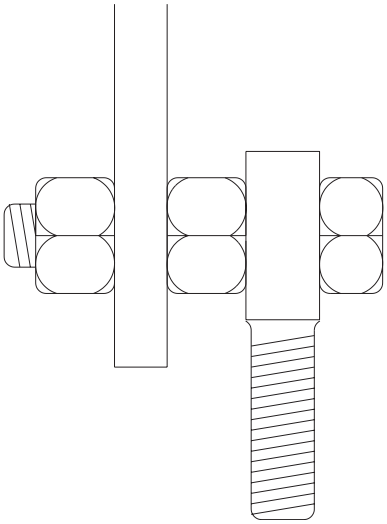
The distance between actuator shaft and ball joint is 110 mm. The distance between damper shaft and ball joint will then be:

$$110 \times 1{,}5 = 165 \text{mm}$$



Ball Joints & Pull rod

Mount the ball joints in accordance with the figure.

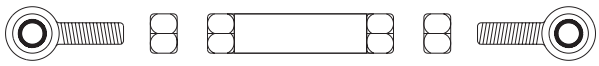


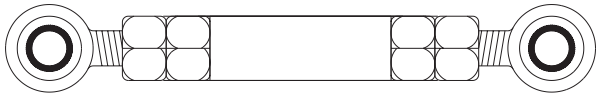
3 Measure the distance between the ball joint centres and note it down.

Make a pull rod as follows:

The pull rod can be made of solid rounds with a diameter of at least 20 mm. In this case the length will be the measured centre distance less 70 mm. Tap for M12 thread at both ends.

The pull rod can also be made of a thick-walled tube with an inner diameter of at least 12 mm. The length in this case is the measured centre distance less 90 mm for the tube. Weld a M12 nut together with each end.

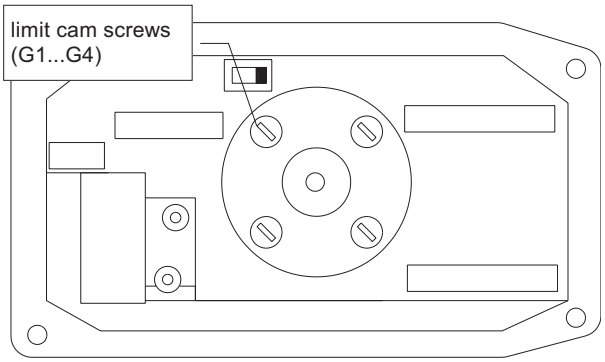




Mount the pull rod between the ball joints.

4 Now check where the actuator can be placed sideways and vertically so that -the angle between the damper lever and the pull rod is 90° -the pull rod and the actuator lever are parallel. If necessary, adjust the pull rod length before fastening the actuator with screws.

5 When everything is mounted and fixed, disengage the actuator and set the damper in closed position.
Adjust the limit switches as follows:



Press and turn the adjustment screw 1 (white branding) until the white cam disk tappet presses the limit position 1. Check that the limit position is pressed from the same direction as the cut-off wheel rotates against closed position.

Set the damper in fully open position.

Press and turn the adjustment screw 2 (black branding) until the black cam disk tappet presses the limit position 2.

Check that the limit position is pressed from the same direction as the cut-off wheel rotates against open position.

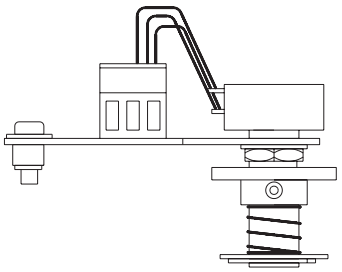
Make the electrical connections of the actuator and check that the actuator rotates in the right direction.

- ❑ Phase on terminal nr 2 - rotation against closed position.
- ❑ Phase on terminal nr 3 - rotation against open position.

If the rotation direction is wrong, change the direction by means of the switch on the printed circuit card. With the switch in centre position there is no rotation.

Installation of potentiometer kit MTS-250

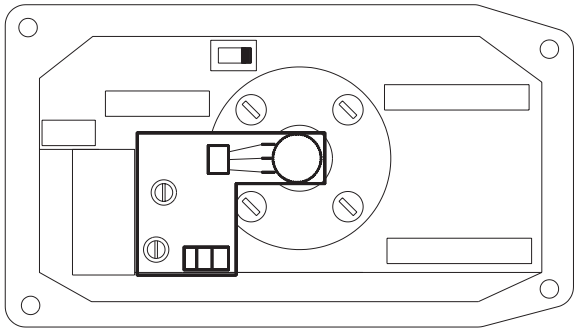
The potentiometer is connected to the actuator gear via a safety clutch through the rotating cut-off wheel unit. The potentiometer rotates a full stroke at 180° rotation of the output shaft.



Installation:

1 Check that the potentiometer is branded with the correct resistance value.

2 Remove the actuator housing.



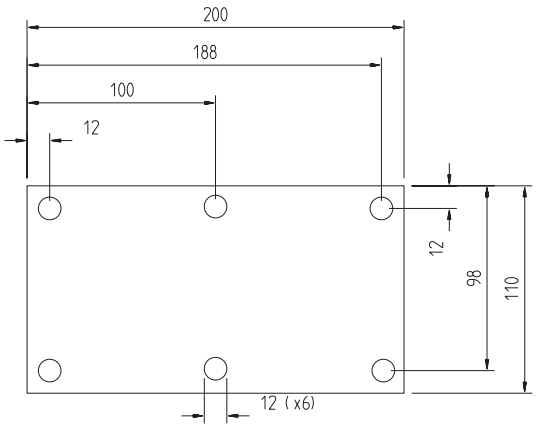
3 Press down the lower clutch of the potentiometer to the cut-off wheel centre. Fasten the printed circuit card with screws into the built-in spacing-pins in the actuator.

4 Run the actuator to the minimum position (closed damper).

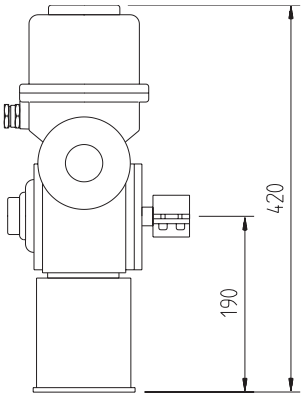
5 Turn the upper clutch of the potentiometer to mechanical stop in the same direction as the cut-off wheel rotates against closed position.

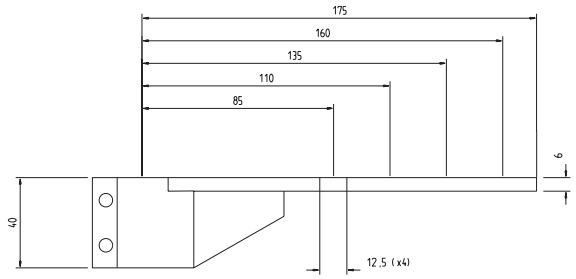
6 Check the resistance value.

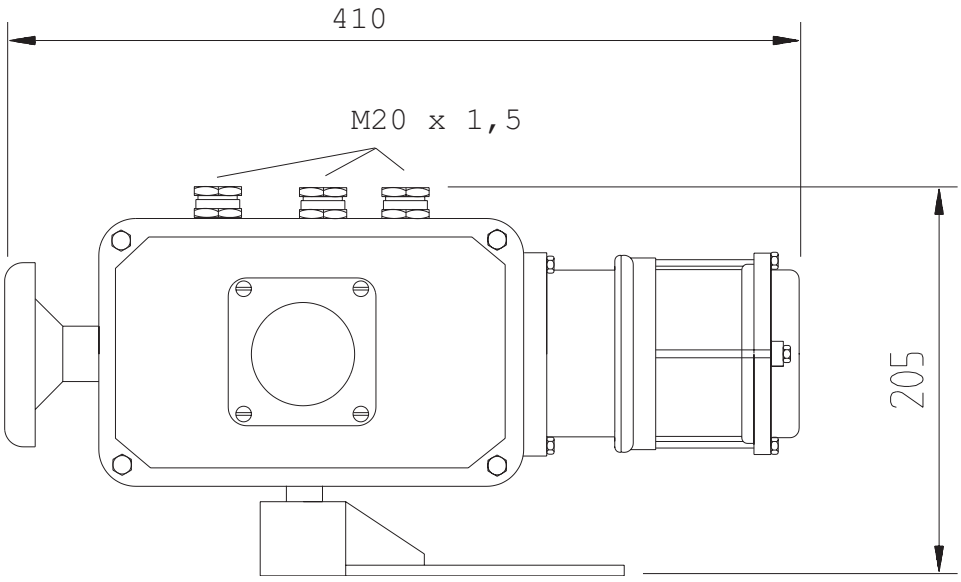
7 Run the actuator to the maximum position (open damper), maximum 180° rotation on the output shaft. Check the resistance value.



Dimensions:







Technical data:

Operating type:	Class III 50%
Torque:	Max. 250 Nm
El. motor protection:	Thermal
Overload protection:	2 pcs load dependent micro switches. Set to 250 Nm.
Position indicator:	Mechanical
Running time:	
50 Hz control voltage:	90° at 60 s.
60 Hz control voltage:	90° at 50 s.
Rotation angle:	Adjustable 0...180°
Control voltages:	230 VAC, +15, -10 %
Electromotor load:	Max. current 0.6 A
Nominal control voltage:	Max. capacity 1132 VA
Ambient temperature:	Standard -5...+70 °C With heating (MTS-260): -20...+70 °C
Protection class:	Standard IP 65
Cable entries:	3 X M20X1,5
Electric connections:	2 x 1,5 mm^2/per terminal
Material:	
Electromotor	1-phase, 230 VAC 50Hz Capacitor motor
Gear	Hardened steel
Output shaft	Steel
Framing & housing	Cast aluminium
Weight:	17 kg
Colour:	Blue, red hand wheel
Load on limit switches	250 VAC for 50 000 switchings: 3 A 250 VDC for 50 000 switchings: 0,2 A

Accessories:

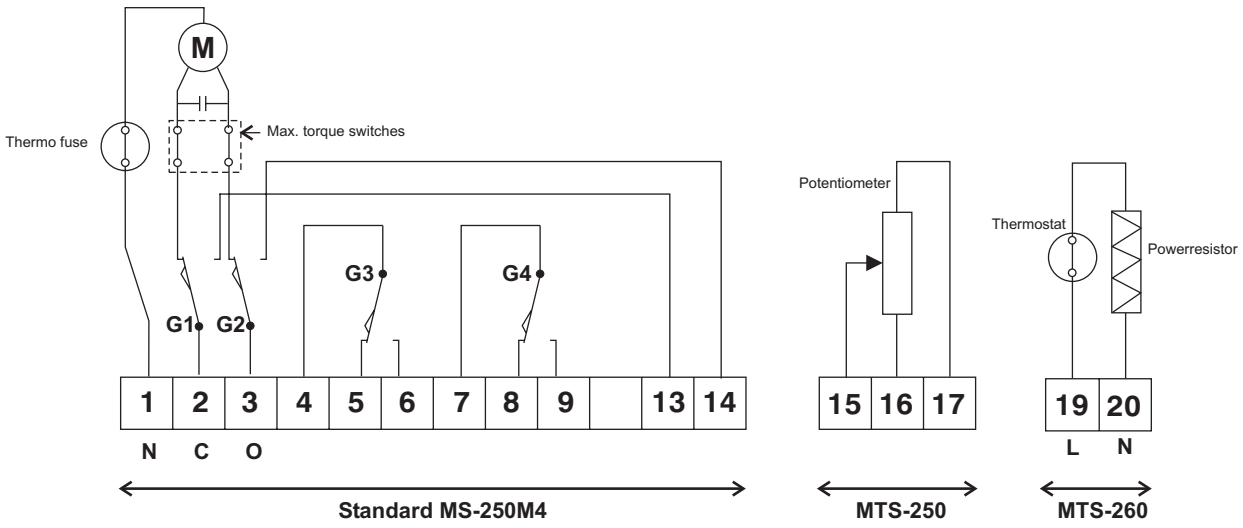
Level potentiometer MTS-250

Rotation angle:	About 160 degrees
Resistance:	100, 1K, 5K, or 10K ohms
Linearity:	± 5 %
Max. power loading:	100 ohm = 2 W others = 1 W
Max. current:	100 ohm = 140 mA 1K ohm = 30 mA 5K ohm = 14 mA 10K ohm = 10 mA
Max. voltage:	100 ohms = 14 Volts 1K ohms = 30 Volts 5K ohms = 70 Volts 10K ohms = 100 Volts
Insulation resistance:	1000 Mohms (at 500 VDC)
Actual life-Number of rotations:	1x1000000 times

Heating element kit MTS-260

Supply voltage:	230 VAC
Lowest ambient temperature:	-20 °C
Thermostat closing temperature:	4 ± 3 °C
Thermostat breaking temperature:	13 ± 3 °C

Electrical diagram for standard connection and with accessories:



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