

### Electric actuator for control of dampers, guide vanes and similar applications

# MS-35M

mi-276gb / 2009-03-10



#### Application

Actuator MS-35M is designed to control dampers, guide vanes, etc. in different process applications and industrial environments.

The actuator can be connected to control systems, 2-point controllers, 3-point controllers and together with a servo controller even to continuous controllers

#### Design

The actuator has a solid construction to allow installation in harsh environments such as boiler plants and similar industrial environments. The actuator can be mounted in any position and demands in most cases no further maintenance.

The actuator is fitted with 3 adjustable limit switches:

- 2 pcs for adjusting the rotation angle between 0...180°
- 1 pc potential-free changing contact adjustable in any position on the rotation angle

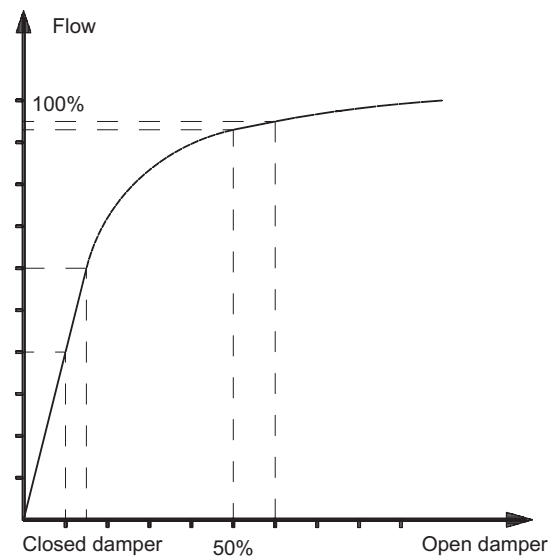
#### Mounting of actuator with lever and push-rod for the control of dampers in air and gas ducts.

Actuator controlled dampers can be used for two different types of applications:

- 2-position function (ON-OFF), i.e. open or closed position
- Control function, i.e. the damper is used for controlling a pressure or flow inside the duct by positioning the damper in all positions between open and closed.

#### Characteristics of damper

Most types of dampers, butterfly dampers, multi louvre dampers and guide vanes has a unique characteristic for the flow according to withstanding diagram:



The diagram shows that the flow increase rapidly when the damper begin to open. 90% of the max flow is achieved with only 40% of the opening angle. This is preferred when a rapid increase of the flow is desired. On the opposite, this is a problem when you desire a rapid decrease in flow when moving to closed position. In control applications, the characteristic of the dampers can cause major problems to obtain the desired position control.

In On-Off applications, the characteristics of the damper is often no problem, even in rapid closing application since the fully opened position often can be limited to approx. 90% of the max. flow.

In control applications, problem with the stability of the control circuit can occur. This is a result of the controller, at a given deviation, will result in equal output control signal independent of the damper position is 10% open or 50% open. If the controller gives an output control signal that moves the damper opening from 10 to 15%, the flow will increase about 20%. If the movement of the damper is from 50 to 55% opening, the flow will only increase about 2%. A difference of 10 times, depending of the position of the damper.

Near the closed position of the damper an other problem can occur, caused by to much play in the mechanical linkage between the damper and the actuator. A small play will result in a large change of the flow.

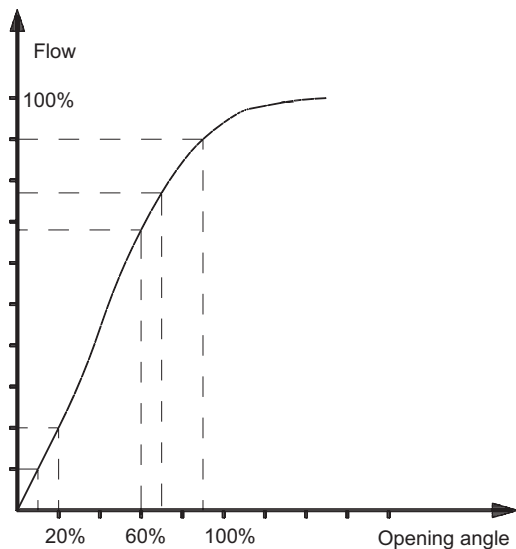
**Known disadvantages with control dampers should always be minimized through a mounting of the actuator and lever that will considerably improve the control properties.**

The figures below show:

- How the actuator should be placed compared to the lever on the damper.
- How the lever on the actuator should be mounted and adjusted.
- How the ratio between the length of the actuators lever compared to the lever on the damper

The illustrations shows the initial position in mounting (closed damper)

Following the illustrations when mounting the actuator and linkage will result in an almost linear ratio between the actuators rotation angle and the flow, specially near fully closed position and up to 90% of the max flow.



**Install and mount the actuator and linkage in following order:**

- 1 Mount the actuator on the bracket. Place the actuator according to figure without fixing it. Mount the lever on the damper according to figure for the initial position (closed damper).
- 2 Mount the ball-joints on both levers (actuator and damper):

If the lever of the damper is only fitted with one fixing hole, mount the ball-joint into that hole and measure the distance to the centre shaft of the damper. Mount the ball-joint on the actuators lever with the measured distance on the damper multiplied with 2/3 between ball-joint and actuator output shaft.

Example:

*If the distance between the dampers centre shaft and the ball-joint location (equal to fixing hole) on the lever is measured to 120 mm, the distance between the ball-joint on actuators lever and the actuator output shaft should be:*

$$\frac{120 \times 2}{3} = 80\text{mm}$$

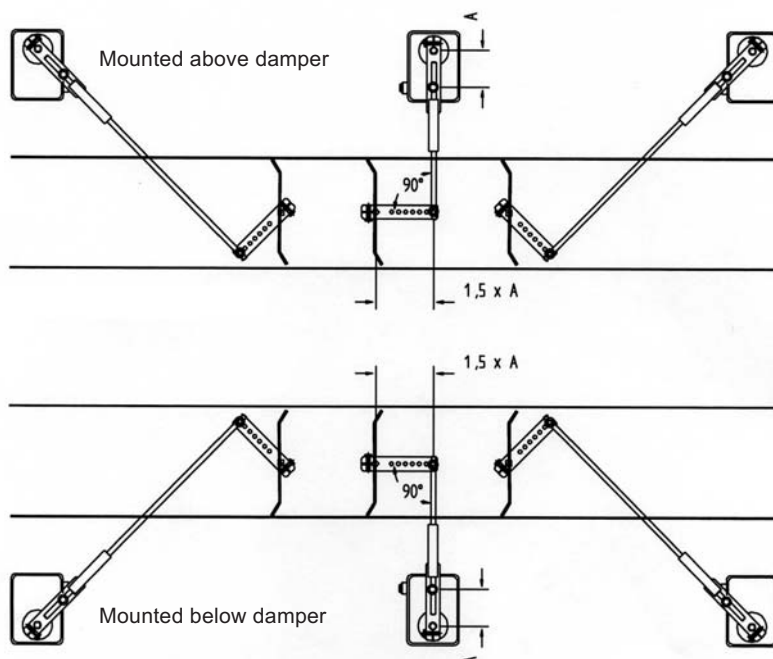
*If the dampers lever is fitted with several fixing holes, begin with mounting the ball-joint on the actuators lever, use the fixing hole closest to the output shaft.*

*Measure the distance between the ball-joint and the actuator output shaft. Mount the ball-joint on the dampers lever, use the fixing hole that will correspond to the measured distance on the actuator multiplied with 1.5*

Example:

*The distance between actuator output shaft and lever ball-joint is 80 mm. The distance between the damper centre shaft and lever ball-joint should be :*

$$80 \times 1.5 = 120\text{mm}$$

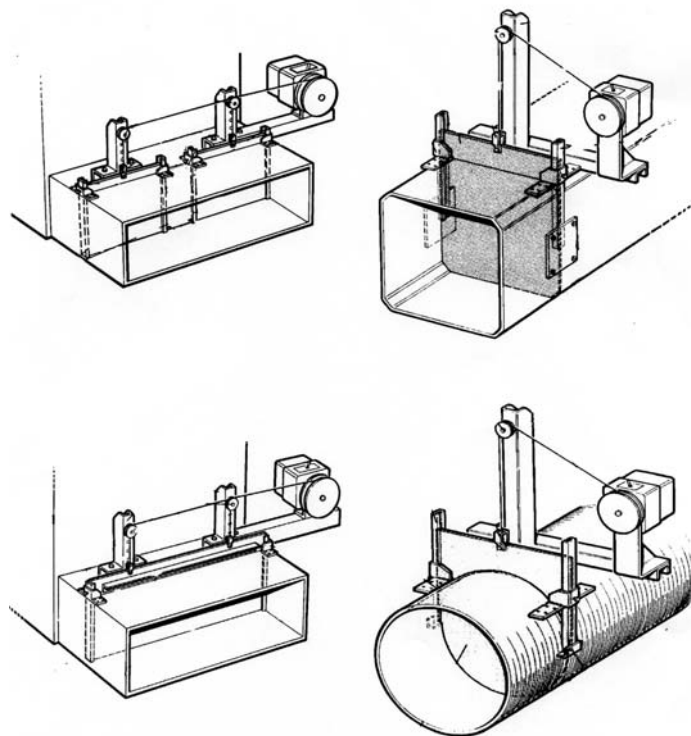


- 3 Mount the push-rod between the ball-joints on the actuator and damper.
- 4 If the lever on the damper is not possible to rotate freely on the centre shaft, loosen the bolt that fixes the lever so it is possible to rotate the lever on the shaft without moving the damper.
- 5 Try out a location of the actuator side-ways and vertically to achieve an angle of 90° between the lever on the damper and the push-rod and at the same time that the push-rod and actuator lever are parallel.  
Following adjustments are available to obtain this :
  - 5.a The position of the actuator lever can be adjusted 360° by using the release mechanism for the output shaft inside the motor.
  - 5.b The length of the push-rod can be adjusted at each ball-joint. If the push-rod is too short , it can be extended by manufacturing a new steel shaft of round  $\varnothing$  10mm steel material that is threaded with a M10 thread at one end.
- 6 Mount the actuator steel bracket to a solid and a suitable ground.  
If there is no suitable way to fix the bracket to achieve the adjustment according to paragraph 4, make a solid stand of L or U steel girder.

**Adjustment according to paragraph 4 must be achieved.**

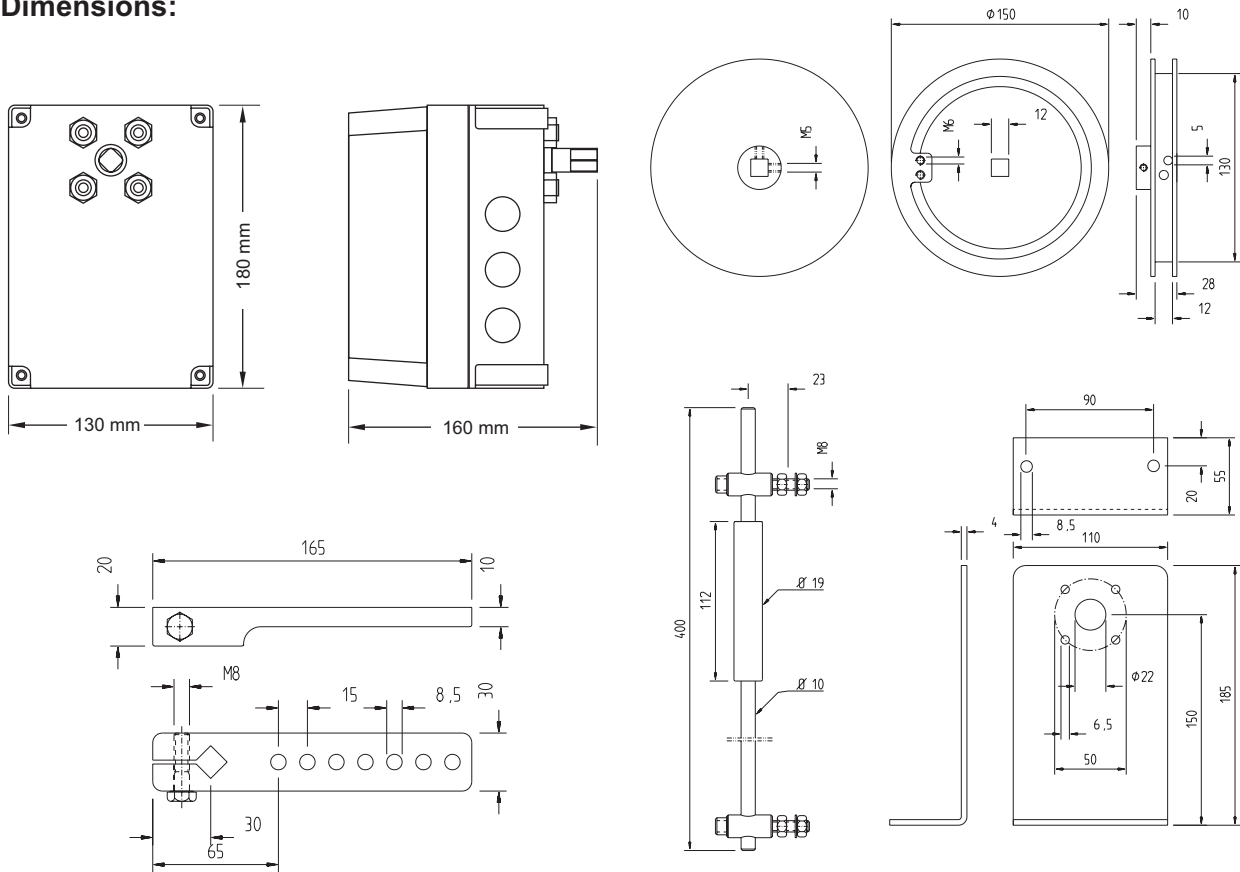
### Mounting of actuator with steel wire pulley for control of guillotine dampers in air and gas ducts

Below standing illustrations shows different installations with actuator controlling the damper using steel-wire and pulley.



- 7 When everything is mounted and tightened, release the actuator output shaft and place the damper in closed position.  
Adjust the cam closest to the printed circuit board inside the actuator to set the "closed" position of the actuator, tighten the screw on the cam.  
Release the output shaft again and place the damper in fully opened position. Adjust the cam above to set the "open" position of the actuator, tighten the screw on the cam.
- 8 Final check with damper in closed position:
  - 8.a The actuator lever should be parallel to the push-rod.
  - 8.b The push-rod should be in 90° angle against the damper's lever.
  - 8.c The distance between ball-joint and centre shaft should be 1.5 times compared to the distance on the actuator lever.

## Dimensions:



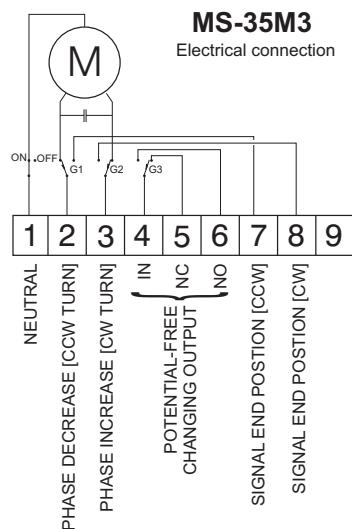
## Technical data:

Duty ratio:	Class I 100%
Torque:	Nom. 30 Nm, Max. 35 Nm
Rotation speed:	
@ 50 Hz voltage cycle:	90° at 60 sec.
@ 60 Hz voltage cycle:	90° at 50 sec.
Rotation angle:	Adjustable 0...320°
Supply voltage:	230 VAC, +15, -10 %
Power consumption:	Max. 10 VA
Ambient temp:	Standard -15...+55 °C
Degree of protection:	IP 54
Cable entries:	3 x M20 x 1,5
Electrical conn:	2 x 1,5 mm <sup>2</sup> /per terminal
Material:	
El-motor	1-phase, synchronous
Gears	Steel
Output shaft	Steel ø15mm 12x12mm
Enclosure	Black poly carbonate
Weight:	2,4kg excl accessories
Load limit switches:	
	250 VAC for 50 000 changes: 3 A
	250 VDC for 50 000 changes: 0.2 A

## Accessories:

- Steel wire pulley kit MTS-20
- Push-rod lever kit MTS-10
- Potentiometer kit MTS-50
- Heat resistor kit MTS-60
- Extra limit switch MTS-30/40

## Electric connection standard MS-35M3:



**AB Micatrone**  
Åldermansvägen 3  
SE-171 48 SOLNA  
SWEDEN

**Telephone: +46 8-470 25 00**  
**Fax: +46 8-470 25 99**  
**Internet: www.micatrone.se**  
**E-mail: info@micatrone.se**