

**Electronic actuator with built-in position controller and transmitter for control of dampers, guide vanes and valves**

### MS-35M4-LR

Mi-281gb / 2010-01-27



© AB MICATRONE 2010-01-27 [H:\Apps \ Typeset \ Mima \ Mi-281gb\_100127.vp]

### Table of content

APPLICATION . . . . .	1
DESIGN . . . . .	2
ACCESSORIES . . . . .	2
OPERATING . . . . .	3
FLOW LINEARIZATION . . . . .	4
INITIAL SETTINGS . . . . .	5
DIMENSIONS . . . . .	6
ELECTRICAL CONNECTIONS . . . . .	7
TECHNICAL DATA . . . . .	8
ACCESSORIES . . . . .	8

### APPLICATION

The actuator MS-35M4-LR is designed for positioning and control of dampers, guide vanes and valves.

Control signal is selectable and can either be a current or voltage. Position output signal of either type also available.

The actuator has a selectable function that can linearize the flow thru valve when used with Micatrone valve reduction, MTS-70.

## 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 4 adjustable limit switches:

- 2 pcs for adjusting the rotation angle between 0...130°
- 2 pcs potential-free changing contact adjustable in any position of the rotation angle

The actuator has a built-in control function for positioning the actuator using a continues current or voltage signal.

The controller compare the input signal (set value) with the built-in potentiometer position (actual value) and controls the actuator into a position where the actual value equals the set value. A neutral zone of 2% of the full range where the actuator is in a stand still is used to avoid actuator movement caused by temporary interference on the input signal.

The control signal can be selected for current or voltage input. The working range of the control signal can be programmed for the entire or a part of the range, e.g. 4...20 mA or 0...5 Volt.

Starting position and control range is programmable between 0...130°. Rotation direction is selectable with miniature switch. The actuator has a selectable function that can linearize the flow thru valve when used with Micatrone valve reduction, MTS-70.

For simple and fast adjustment, the controller is fitted with LED diodes which indicate when the actuator is closing or opening and a 10-step bar graph for the current position. The actuator can be controlled manually using the push buttons on the circuit board.

## ACCESSORIES

### MTS-10

#### Push-rod lever kit

MTS-10 is used when a damper shall be controlled using a push-rod linkage.

The kit include:

- Mounting bracket with bolts for the actuator
- Lever for the actuator output shaft
- Ball-joints for the lever, 2 pcs
- Spring-loaded push-rod

### MTS-20

#### Steel wire pulley kit

MTS-20 is used when controlling guillotine dampers with steel wire.

The kit include:

- Mounting bracket with bolts for the actuator
- Wire pulley for the actuator output shaft

### MTS-70

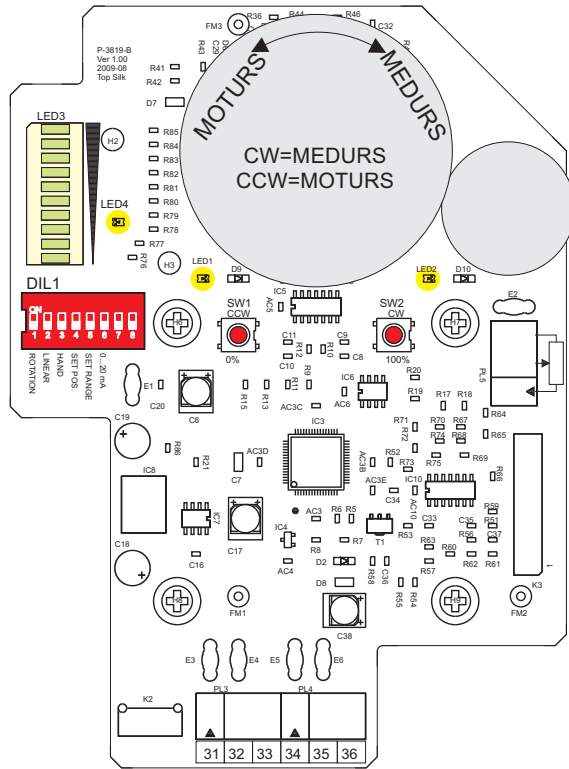
#### Micatrone valve reduction kit

MTS-70 is used when the actuator is mounted to a butterfly valve.

The MTS-70 is a reduction that increases the torque when the valve is in, or close to, the seat position where the most torque is needed. The torque is 160 Nm, when the valve is in its closed position. When the actuator begin to open the torque decreases in comparison to the opening angle.

## OPERATING

Thru the text, the words CW and CCW are mentioned. They relate to which direction the large gear head is turning, see figure below.



### Push buttons SW1 and SW2

Below the large gear, two push buttons are located. They are used for both manual control of the actuator and to program the positioning- and control signal. When the status indicator [LED4] flashes 2,3 or 4 times, the push buttons are activated. Read chapter "INITIAL SETTINGS" on page 5 for further instructions.

### LED diodes LED1 and LED2

The LED diodes indicate the actuator having control signal.. LED1 indicates CCW turn and LED2 indicates CW turn.

### Bar graph LED3

The bar graph indicates actual angle of turn in 10 steps. When the actuator is in fully closed position, the entire bar graph is off, i.e no light. At 10% opening angle (% of set control range) the first bar is lit, etc. Full opening angle is indicated by all 10 bars lit.

If flow linearization is selected (DIL1:2 in pos ON) the bar graph indicates the flow thru the valve.

### Status indicator LED4

At normal operation and automatic control of the actuator, the status indicator is always lit.

If Manual operation is selected [DIL1:3] the status indicator is flashing 2 times repeatedly.

If programming the positioning signal is selected [DIL1:4] the status indicator is flashing 3 times repeatedly and if programming the control signal is selected [DIL1:5] the status indicator is flashing 4 times repeatedly.

## Miniature switch (DIL switch) DIL1

On the left side of the printed circuit board, a 8-throw ON-OFF miniature switch is located. Its functions are described in the following table.

No	OFF	ON
1	<p><b>CCW</b> turn with increasing control signal. Alternative: <b>Direct</b> control signal with flow linearization on butterfly valves.</p>	<p><b>CW</b> turn with increasing control signal. Alternative: <b>Reverse</b> control signal with flow linearization on butterfly valves.</p>
2	<p>The actuator angle of turn (control range) is proportional against the control signal  Position output signal is proportional against the angle of turn (control range).</p>	<p>Flow linearization thru butterfly valves typical for dimension DN100. Used together with reduction kit MTS-70. The flow thru the valve is proportional against the control signal  Position output signal is proportional against the flow thru the valve.</p>
3	AUTO	<p>Manual operation of the actuator. The actuator can be operated Counter Clock-Wise <b>CCW</b> using [SW1] and Clock-Wise <b>CW</b> using [SW2].  <b>NOTE!</b> This position is a programming mode and the angle of turn is NOT controlled automatically.</p>
4	AUTO	<p>Programming of position output signal. See chapter "INITIAL SETTINGS" on page 5 for further instruction.  <b>NOTE!</b> This position is a programming mode and the angle of turn is NOT controlled automatically.</p>
5	AUTO	<p>Programming of control signal. See chapter "INITIAL SETTINGS" on page 5 for further instruction.  <b>NOTE!</b> This position is a programming mode and the angle of turn is NOT controlled automatically.</p>
6	<p>Position output signal on terminal 34 is 0...10 Volt for the control range.</p>	<p>Position output signal on terminal 35 is 4...20 mA for the control range.</p>
7	Use Volt-signal on terminal 31 as control signal.	Use mA-signal on terminal 32 as control signal.
8	Not used. Must be set in position OFF.	

Factory settings are all switches in position OFF (if not otherwise agreed upon order).

## FLOW LINEARIZATION

The built-in position controller is equipped with a function that linearize the flow thru a butterfly valve. The linearization is designed to conform with Micatrone valve reduction, MTS-70, and soft-seated butterfly valves for dimension DN65...DN200.

Micatrone stock soft-seated butterfly valves (MTT) in dimension DN50 to DN200. The MTS-70 can be mounted on most valves that conform with ISO 5211 standard top flange.

The linearization function is achieved by placing miniature switch DIL1:2 in position ON.

Input control signal (set value) determines how much flow is desired thru the valve. If the input control signal is less than 1% of the control range, the valve will be fully closed. When the input control signal is above 99%, the valve will be in fully opened position. At e.g. 30% input control signal (3 Volt if 0...10 Volt is selected), the valve will position for approximately 30% flow thru the valve.

**NOTE!** This is only valid if the differential pressure over the valve in the water pipe is constant regardless of the valves position.

The position output signal and the LED bar graph indicate the flow thru the valve. When the valve has reached the set position, the control input signal (set value) and the position output signal (actual value) will be the same.

### 3-way valves

If one wants to use 2 separate valves for a simulated 3-way valve function, the MS-35M4-LR actuator is fitted with a function that allow one valve to move in the opposite direction of a second valve. This function is activated by placing both miniature switch DIL1:1 and DIL1:2 in position ON for the actuator that controls the return flow.

Input control signal is recalculated in such a way that min. input signal will result in a set value of 100% and max input signal a set value of 0%.

E.g. At 30% control input signal (3 Volt of 0...10 Volt is selected) the set value is recalculated for 70% signal and the return valve will control into a 70% flow position of the max flow. In this way, same control input signal is used for both valves. The valves will move against each other to obtain 100% flow regardless off mixing ratio.

The second actuator that control the outgoing flow, miniature switch DIL1:1 is placed in position OFF and DIL1:2 in position ON.

## INITIAL SETTINGS

### Setting of limit switches and angle of turn

If the actuator is fitted with valve reduction, MTS-70, at delivery, point 1...5 are already carried out.

- 1 Place DIL1:3 in position ON and connect power supply voltage to the actuator. The status indicator will flash twice repeatedly.
- 2 Manually operate the actuator till fully closed position using the push buttons located below the large gear. If you are using the right push button [SW2] to close the actuator, the direction is correct set. If you are using the left push button [SW1] to close the actuator you need to change the direction of turn. Place DIL1:1 in position ON to change the direction.
- 3 Limit switch G1, closest to the main circuit board, is the end limit for clock-wise **CW** turn. Limit switch G2, above G1, is the end limit for counter clock-wise **CCW** turn. Adjust limit cam G1 (G2 if opposite direction is used) so the actuator stops at fully closed position. The cam should affect the limit switch from the side closest to the electric motor. (and from the other side if using reverse direction).
- 4 Manually operate the actuator to fully opened position using the push-buttons located below the large gear. Push the left-side button [SW1] (right-hand button [SW2] if reverse turn is selected) to open the actuator.
- 5 Limit switch G1, closest to the main circuit board, is the end limit for clock-wise **CW** turn. Limit switch G2, above G1, is the end limit for counter clock-wise **CCW** turn. Adjust limit cam G1 (G2 if opposite direction is used) so the actuator stops at fully opened position. The cam should affect the limit switch from the side farthest to the electric motor. (and from the other side if using reverse direction).

### Setting of positioning output signal

If the actuator is fitted with valve reduction, MTS-70, at delivery, point 6...13 are already carried out.

- 6 Turn the large gear head by hand clock-wise (counter clock-wise if reverse direction is used) until the LED bar graph is fully off. No bars should be lit.
- 7 Manually operate the actuator to fully closed position. Place DIL1:4 in position ON and DIL1:3 in position OFF. The status indicator flashes 3-times repeatedly.
- 8 Press the left push-button [SW1] and keep it pressed until the status indicator begin to flash rapidly, then release the button. Check that the LED bar graph is off. Do not touch or turn the large gear head, otherwise the settings will be ruined.
- 9 Place DIL1:3 in position ON. The status indicator will flash twice repeatedly.

10 Manually operate the actuator to its fully opened position. Do not touch the large gear head.

11 Place DIL1:3 in position OFF. The status indicator will flash 3 times repeatedly.

12 Press the right-handed push button [SW2] and keep it pressed until the status indicator flashes rapidly, then release the button. Check that the LED bar graph is lit, alla 10 bars should be lit.

13 Place DIL1:4 in position OFF to end the programming of positioning output signal. The actuator will be positioned by the control input signal and the status indicator is continuously lit..

### Setting of control input signal

14 On delivery the input signal is set to 0...10 Volt (terminal 31). If a mA-signal is used (terminal 32) miniature switch DIL1:7 must be set in position ON (4...20 mA is factory setting).

15 The control input signal range can be set within 0...10 Volt resp. 0...20 mA, e.g. 0...5 Volt, 2...10 Volt or 4...12 mA.

16 Place DIL1:5 in position ON. Status indicator will flash 4 timed repeatedly.

17 Connect the desired input signal to control the actuator to its fully closed position, e.g. 2 Volt, on terminal 31 (terminal 32 if the input signal is mA and DIL1:7 is in position ON).

18 Press and keep down the left push button [SW1] until the status indicator flashes rapidly, then release the button.

19 Connect the desired input signal to control the actuator to its fully opened position, e.g. 5 Volt, on terminal 31 (terminal 32 if the signal is mA and DIL1:7 is in position ON).

20 Press and keep down the right push button [SW2] until the status indicator flashes rapidly, then release the button.

21 Place DIL1:5 in position OFF to end the programming of control input signal. The actuator will be positioned by the control input signal and the status indicator is continuously lit.

### Restoring factory settings

The actuator is adjusted for a 0...130° turn and a input control signal of 0...10 Volt (4..20 mA).

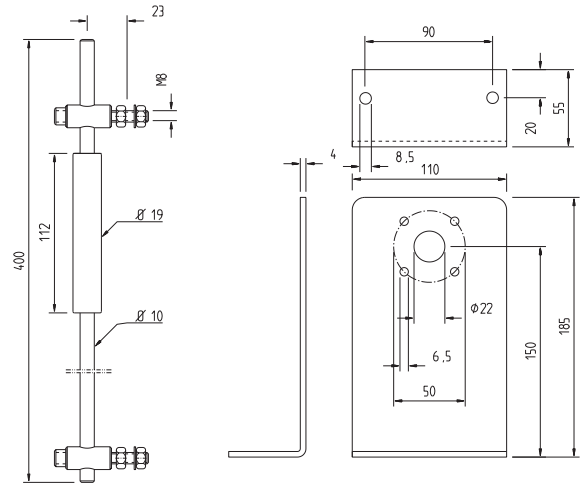
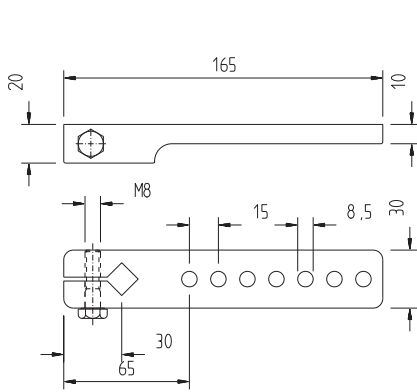
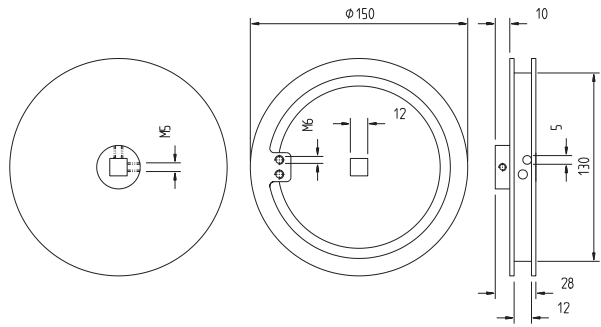
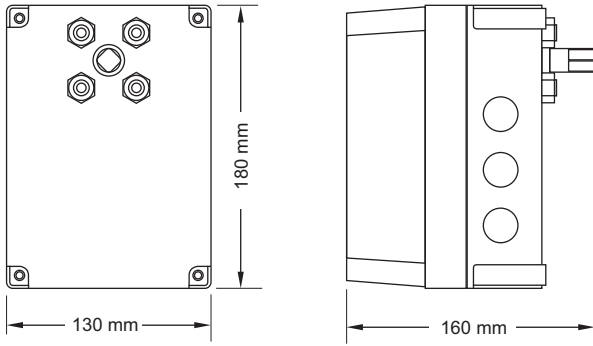
22 Place DIL1:4 in position ON (positioning output signal/angle of turn) and/or DIL1:5 in position ON (control signal). The status indicator should flash 3 or 4 times repeatedly.

23 Press both push buttons simultaneously [SW1 and SW2], keep them pressed until the status indicator flashes rapidly, then release them.

24 Place DIL1:4 and DIL1:5 in position OFF to end the programming. The actuator will be positioned by the control input signal and the status indicator is continuously lit.

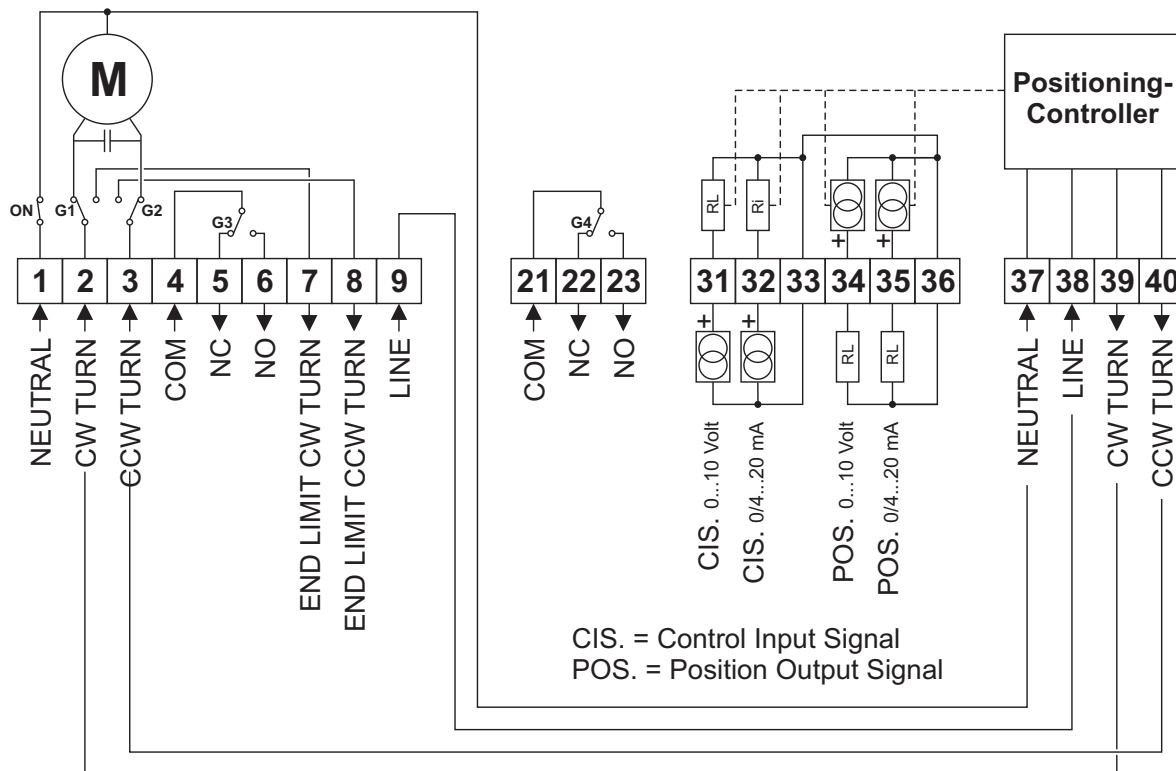
Note. Factory settings could be changed at delivery depending on delivery agreements.

# DIMENSIONS



**ELECTRICAL CONNECTION**

**MS-35M4-LR**



## TECHNICAL DATA

### Actuator

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.
Turn angle:	Adjustable 0...130°
Supply voltage:	230 VAC, +15, -10 % 24 VAC, +15, -10 %
Power consumption:	Max. 14VA
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:	
- EI-motor	1-phase, synchronous
- Gears	Steel hardened
- Output shaft	Steel ø15mm 12x12mm
- Enclosure	Black poly carbonate
Weight:	2,7kg excl accessories
Load limit switches:	250 VAC for 50 000 changes: 3 A 250 VDC for 50 000 changes: 0.2 A

### Positioning Controller

Control signal (mA):	0/4...20 mA $R_i = 33 \text{ ohm}$
Control signal (Volt):	0...10 Volt $R_L = 430 \text{ kOhm}$
Position signal (mA):	0/4...20 mA $\text{max } R_L = 500 \text{ ohm}$
Position signal (Volt):	0...10 Volt $R_i = 0 \text{ ohm}$
Starting point:	Programmable 0...130°
Control range:	Programmable 0...130°
Neutral zone:	2% (set value)

## ACCESSORIES

- Steel wire pulley kit MTS-20
- Push-rod lever kit MTS-10
- Valve reduction kit MTS-70

**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](http://www.micatrone.se)  
**E-mail:** [info@micatrone.se](mailto:info@micatrone.se)