



# ExMax/RedMax/InMax – extra information EL-M



The „EL“ data sheet contains additional information for ExMax, RedMax and InMax actuators of the size „M“, for the optimization and simplification in regard to planning, installation and initial startup. It provides influences of external factors in reference to the safe initiation of the actuators, as well as technical references and problem solutions (error indication). With the error indication, functions can be examined and different error/problems can be adjusted locally.

- ▶ Power supply design
- ▶ Design of line cross section 24...48 VAC/DC
- ▶ Wiring alternatives for on-off, 3-pos, BF actuators
- ▶ Wiring alternatives for modulating actuators
- ▶ Use at ambient temperatures down to –20°C/–40°C
- ▶ Error indication – problem treatment/solution

For additional mechanical data have a look at extra information „ME-M“

## Power input depending on supply voltage

### Power supply design

The design of the on-site supply, depends on the selected motor running time and selected supply voltage. Accompanying values are „about values“, since there can be construction unit dispersions within electronics. The power consumption in the blocking position is run time independently with max. 10 W. The power consumption for the heater is approx. 16 W. The heating is running only if the motor is in idle position! The initial starting supply voltage required by the actuators power supply unit is around 2,0 A at 24 V for about 1 sec. (Please consider this while conceiving the cross section of the supply line). Power consumption is between 15 to 50 W acc. adjusted running time and supply voltage.

Voltage	Current	Rated current in acc. with motor running time				
		40 s	60 s	90 s	120 s	150 s
240 VAC	I <sub>rated</sub>	0,13 A	0,09 A	0,07 A	0,06 A	0,06 A
120 VAC	I <sub>rated</sub>	0,26 A	0,18 A	0,14 A	0,12 A	0,12 A
24 VDC	I <sub>rated</sub>	1,5 A	1,0 A	0,8 A	0,7 A	0,7 A

## Dimensioning of the line cross section with 24...48 VAC/DC supply voltages

### Dimensioning/Design of the supply line

On long distances between voltage supply and drive, voltage drops occur due to line resistances. As a consequence with 24 VAC/DC the actuator receives a too low tension and does not start. In order to prevent this, the cross section of the inlet line is to be designed/dimensioned accordingly. The accompanying formula allows the calculation of the necessary line cross section, perhaps provides the maximally permitted conduit length utilizing the existing line cross section. Alternatively the secondary voltage can be increased by selecting a transformer.

For calculation purposes, following characteristics are essential:

U<sub>v</sub> = supply voltage in [V]

A = line cross section in [mm<sup>2</sup>]

L = conduit length in [m]

Factor 0.0714 = drive-specific factor [Vmm<sup>2</sup>/m] (based on the electrical conductivity of electrolytic copper with a coefficient of 56 m/Ωmm<sup>2</sup>)

Formula for max. cable length „L“ at cable cross section „A“

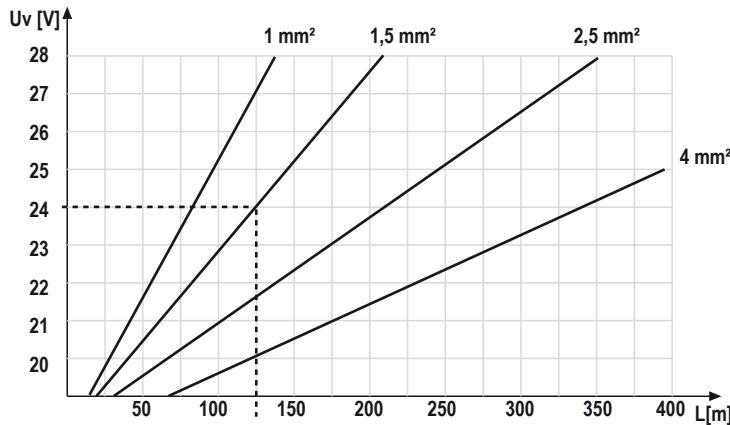
$$L = A \cdot (U_v - 18V) : 0,0714$$

Example: A = 1,5 mm<sup>2</sup>, U<sub>v</sub> = 24 V  
Length of cable L = 126 m

Formula of needed cable cross section „A“ at a cable length of „L“

$$A = 0,0714 \cdot L : (U_v - 18V)$$

Example: L = 250 m, U<sub>v</sub> = 30 V  
Cross section of A = 1,5 mm<sup>2</sup>

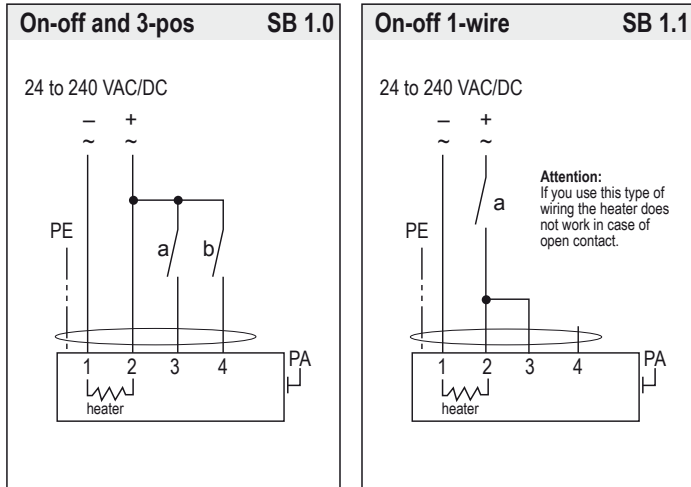


Example:  
24 V power supply with wire diameter 1,5 mm<sup>2</sup> = 126 m



## Wiring alternatives for on-off and 3-pos actuators with spring return

ExMax-...-F, ExMax-...-SF, RedMax-...-F, RedMax-...-SF, InMax-...-F, InMax-...-SF



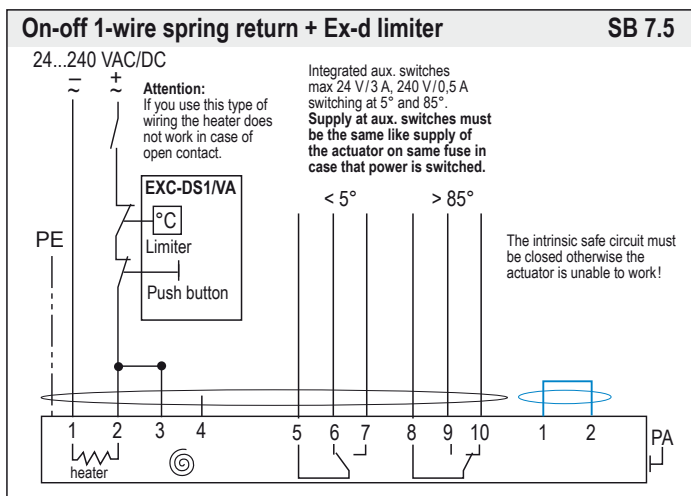
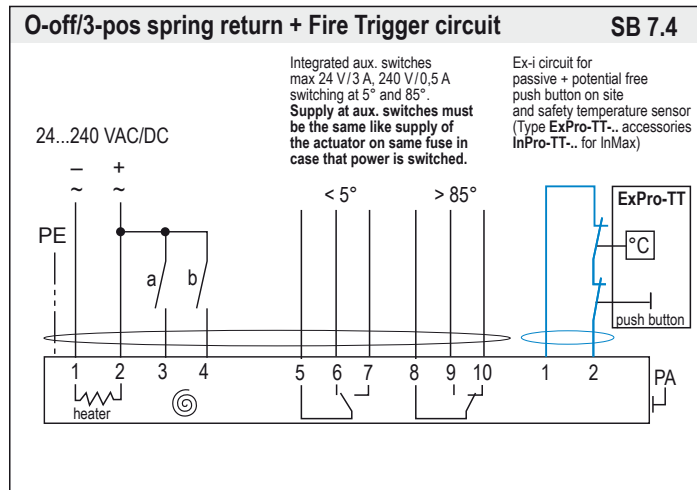
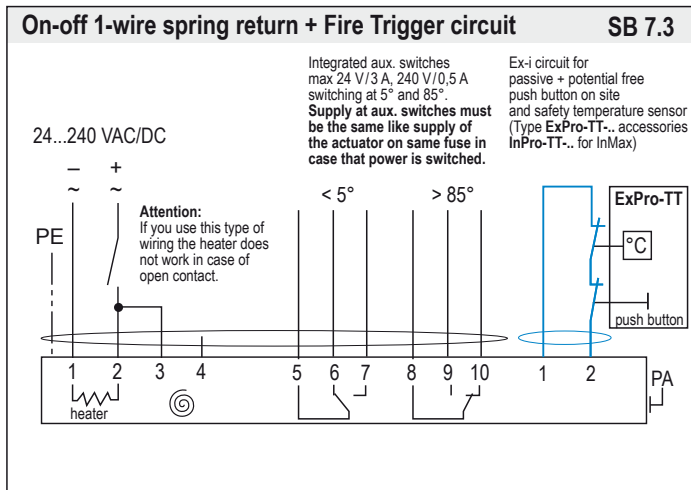
**Attention**

If 40 sec. or 60 sec. mode is selected for motor and/or spring return, the self adjustment of angle of rotation must be started.

Never use actuators without external torque/force min. 10 Nm.

## Wiring alternatives for BF actuators

ExMax-...-BF, RedMax-...-BF, InMax-...-BF



**Values of the Ex-i circuit**

$U_0 = 10,6 \text{ V}$   
 $I_0 = 11 \text{ mA}$   
 $P_0 = 30 \text{ mW}$   
 $C_i = 0$   
 $L_i = 0$

	IIC	IIB	IIA
$C_0$	830 nF	3,7 μF	4,5 μF
$L_0$	2 mH	5 mH	10 mH

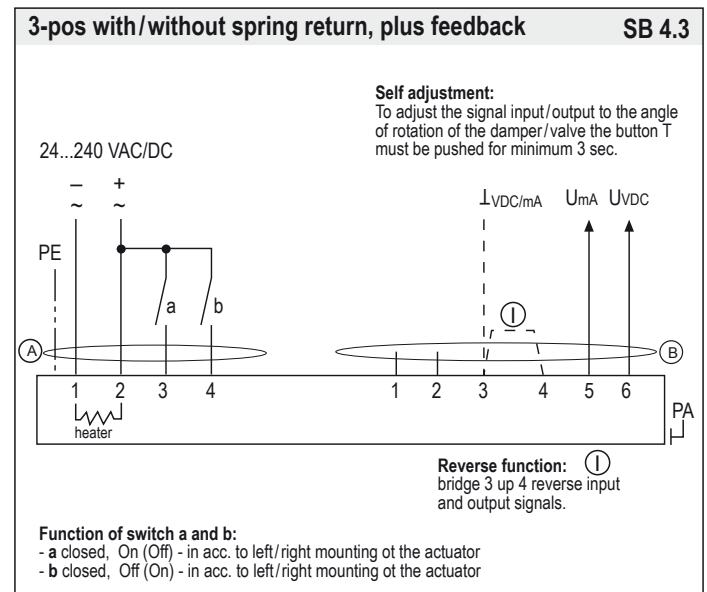
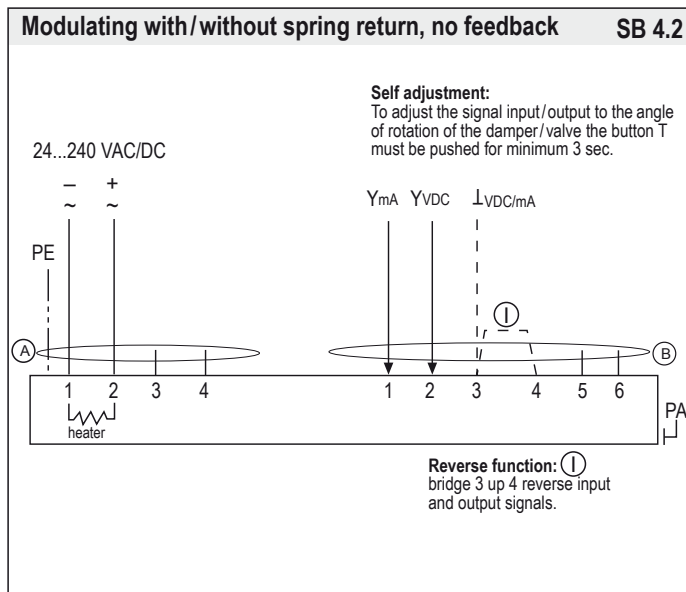
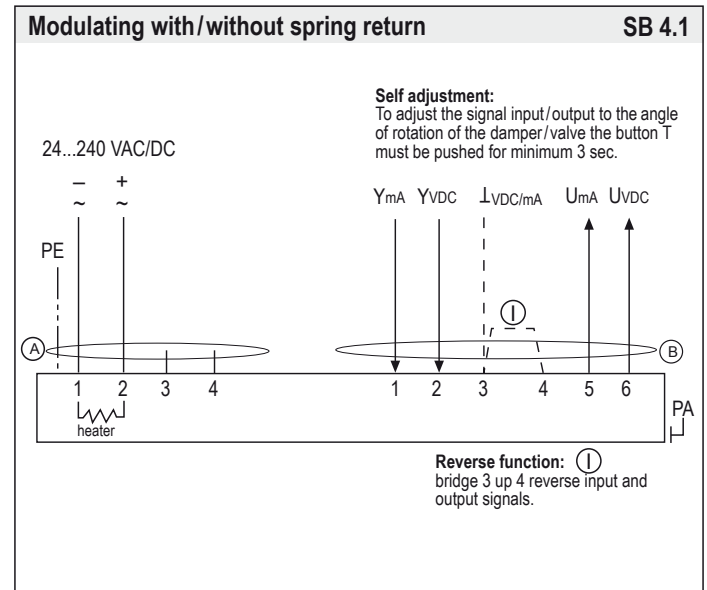
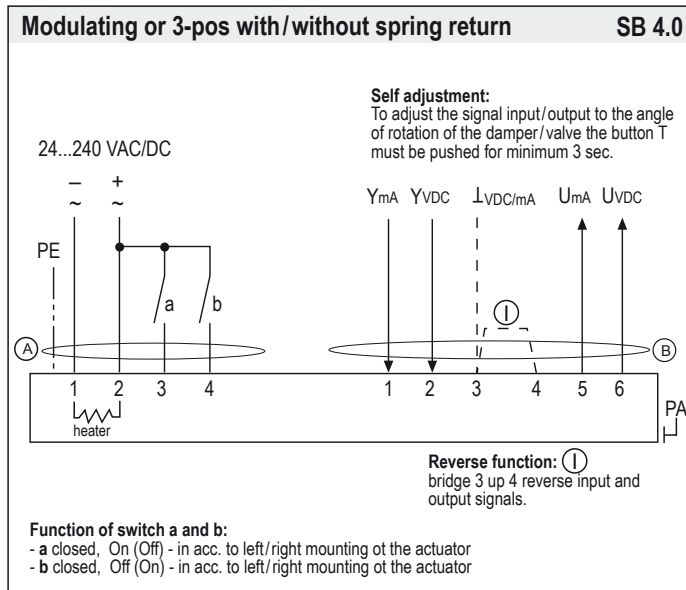
**Attention**

If 40 sec. or 60 sec. mode is selected for motor and/or spring return, the self adjustment of angle of rotation must be started.

Never use actuators without external torque/force min. 10 Nm.

## Wiring alternatives for modulating actuators with or without spring return

ExMax...-Y..., RedMax...-Y..., InMax...-Y..



### Over temperature, 3-pos-operation, heating by low ambient temperatures

#### I. Temperature rise

While operating the ...Max actuator following parameters have to be aligned:  
At overload resp. temperature rise the actuator will remain functionless until cooling.  
During cooling the LED is red.

#### II. 3-pos operation

...Max actuators are in the best way suitable for the 3-pos operation. To protect such elements as gears and mounting elements against harmful influences like minimum pulse time, ...Max actuators are protected via internal electronics.  
The internal electronic permits impulses > 0,1 sec., the pulse length must be 0,5 sec.  
By shift in direction the interval is 1 sec.

#### III. Use at low ambient temperature below -20°C

All ...Max actuators are equipped with a regulated integrated heating device designed for employments down to -40°C ambient temperature.  
The heater will be supplied automatically by connecting the constant voltage supply on the clamps 1 and 2.

Following parameters are to be considered by ambient temperature < 10°C:

1. After mounting the actuator must be immediately electrically connected.
2. The actuator will only be activated after the operating temperature has reached at least -20°C.
3. The adjustment options are only ensured after this heating up period.

#### IV. Mechanical protection

1. The actuator must be operated with an outside load of at least 10 Nm.
2. After installing the actuator to the damper/armature an automatic alignment has to be accomplished, in order to obtain a „gentle blockade/stop“. This function protects the damper/armature by reducing the end positions/blockade speed in order to avoid mechanical overload. The actuator aligns specifically once with 90 sec/90° onto each position, recognizes the blockade position in order to reduce the motor performance during operation briefly before reaching the end/blockade position.



## Error indication

Error/Symptom	Reason	Solution
<b>01</b> Actuator does not work LED does not light	<ul style="list-style-type: none"> <li>No power supply attached</li> <li>The actuator is operated beyond ex-prevention ambient temperature specifications and the internal temperature sensor did irreversibly shut down operations</li> </ul>	<ul style="list-style-type: none"> <li>Attach power supply and turn on</li> <li>Because of inadmissible operation the actuator drove out of safety relevant reasons into an irreversible condition and must be exchanged. Accompanying new installation the ambient temperature has to be reduced accordingly</li> </ul>
<b>02</b> Actuator does not work LED lights red	<ul style="list-style-type: none"> <li>The actuator is operated by a too high ambient temperature and the internal temperature sensor responded</li> </ul>	<ul style="list-style-type: none"> <li>Shut off actuator and let temperature decrease, reduce ambient temperature by suitable measures e.g. ventilation or other mounting position of the actuator</li> </ul>
<b>03</b> Actuator does not work LED lights green	<ul style="list-style-type: none"> <li>3-pos control signal is wired on both entrances</li> <li>Required torque is greater than actuators torque</li> <li>Control signals are not attached or attached on a wrong conductor</li> <li>Actuator is incorrect mounted and is blocked by an external stop unit</li> <li>Interchanged supply lines</li> </ul>	<ul style="list-style-type: none"> <li>Readjust/correct circuit</li> <li>Adjust a higher torque at the actuator if possible otherwise exchange for a type with higher torque</li> <li>Examine rule and adjusting signal in accordance with attached diagram</li> <li>Dismount actuator and testdrive without load for operability. Install actuator accordingly that the power transmissions runs without external blockade or torsion</li> <li>Wire 1 must be (-, N) and wire 2 (+, L)</li> </ul>
<b>04</b> Actuator does not work LED is red blinking	<ul style="list-style-type: none"> <li>The actuator has been mounted by temperatures of less than -20°C and did not reach its operating temperature of at least -20°C.</li> </ul>	<ul style="list-style-type: none"> <li>Ensure that a constant voltage supply on conductor 1-2 is existing.</li> <li>Wait until the required operating temperature is achieved by the actuators internal heating system. The actuator will start operating independently</li> </ul>
<b>05</b> Y-drive in the 3-pos mode can not gear into intermediate positions	<ul style="list-style-type: none"> <li>The conversion of constant mode on 3-pos-modus was not set</li> </ul>	<ul style="list-style-type: none"> <li>Recalibrate the actuator in accordance with assembly instructions</li> </ul>
<b>06</b> Actuator sits diagonally on the squared damper shaft	<ul style="list-style-type: none"> <li>The actuators have an angle of rotation of 95° inclusive 5° pretension. While assembling the pre-loading was not considered</li> </ul>	<ul style="list-style-type: none"> <li>Dismount actuator of the damper, use the enclosed socket wrench to draw up approx. 5° over the hand operated control device before remounting on the damper shaft. Consider additional information ME-M of the assembly instructions</li> </ul>
<b>07</b> A modulating actuator (Y) works with reduced angle of rotation and already reaches its end positions before 0 V/ 4 mA, respectively before 10 V/20 mA.	<ul style="list-style-type: none"> <li>At start up no self adjustment of angle of rotation was accomplished</li> </ul>	<ul style="list-style-type: none"> <li>Accomplish self adjustment of angle of rotation in accordance with assembly instruction</li> </ul>
<b>08</b> LED flashes irregularly and actuator does not work	<ul style="list-style-type: none"> <li>Actuator does not receive sufficient supply voltage</li> <li>Cable too long, voltage drop in the supply line too large</li> </ul>	<ul style="list-style-type: none"> <li>Increase line cross section or increase tension at the transformer/power supply unit</li> <li>Increase line cross section or increase tension</li> </ul>

# “ME-M” Extra information for ...Max – size M



The “ME-M” data sheet contains additional information for actuators of the size M for the optimization and simplification in regard to planning, installation and initial start up. It shows influences of external factors in reference to the safe operation of the actuators. In particular it represents the installation, as well as different kind of dampers, fire dampers and armatures. Additionally describing different accessories and their mounting to the actuator.

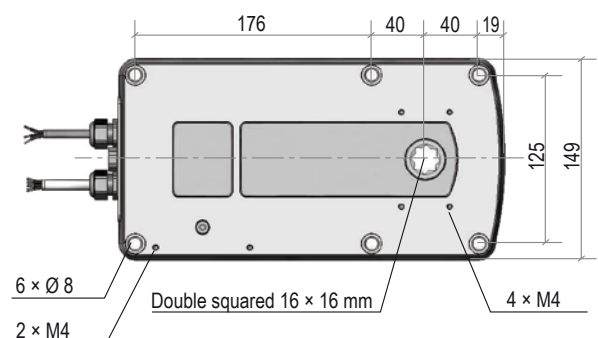
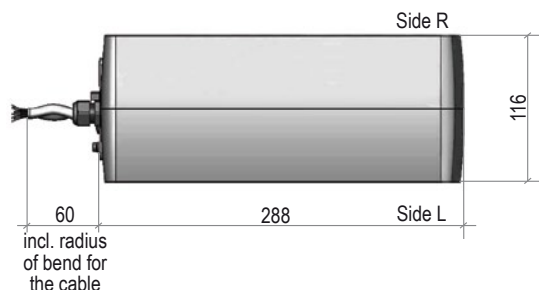
For additional electrical data have a look at extra information „EL-M“

- ▶ Dimensions, drill template
- ▶ Control elements: switch – push button – LED
- ▶ Outdoor installation
- ▶ Mounting using form-fitting shaft connection
- ▶ Mounting on butterfly valves and ball valves
- ▶ Mounting on fire dampers
- ▶ Mounting of ...Box and ...Switch

## Dimensions – drill template

### Dimension size M

Dimension in mm

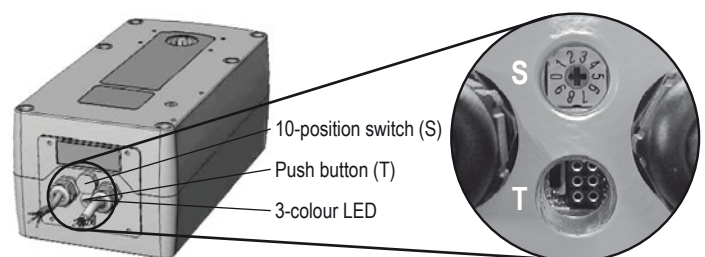


## Control elements: switch – push button – LED

### Specification

All actuators are equipped with a 10-position switch, a push button and a multicolor LED for programming. These control elements are to be found cable-laterally behind the two middle sectioned dummy plugs. For operation these must be removed. The calibration can be achieved despite lining up tension at the actuator. The explosion prevention is not effected. However it has to be of great concern that the dummy plugs must be rescrewed in order to comply with the IP-protection. The operation of the switch and button has to be done by means of a small screwdriver. Force with strong pressure and /or rotation is to be avoided in any case, since otherwise control electronics can be damaged irreparably. At poor visibility a flashlight (in Ex areas certified within the EX-range) should be used. Attitudes of torque and running time can be achieved also before mounting. The adjustment of angle of rotation can be started only with an outside load and accurate mounting.

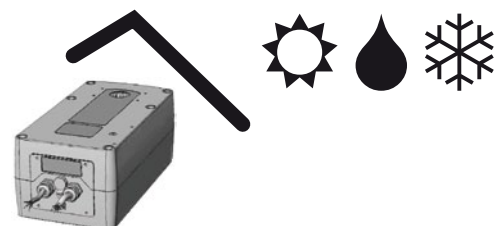
### Switch – push button – LED for programming, behind dummy plug



## Outdoor installation

### Specification

For outdoor installation it has to be certain that the actuator is protected against direct sun exposure (warmth and UV), rain and snow by employing an enclosure roof. Supply voltage is to be applied immediately after mounting in order to assure integrated heating at start. Since explosion proof actuators must have internal safety temperature limiters, these may not be exposed neither at storage nor during operation to a too high temperature. Otherwise the limiters could respond and switch of the actuator irreversibly.

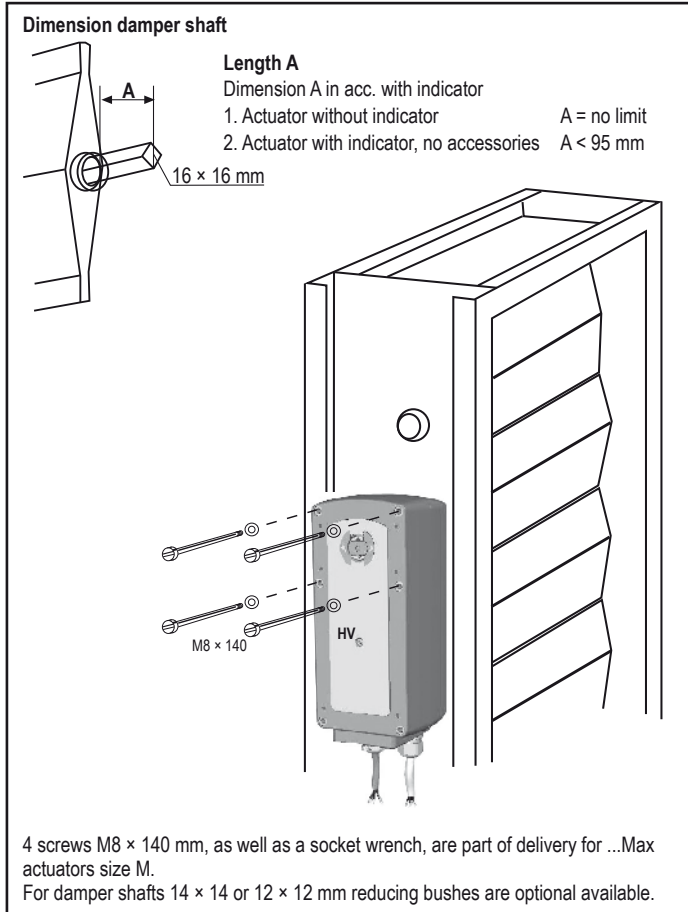


## Mounting instruction for ...Max actuators size M on air dampers

### Specification

...Max actuators size M are equipped with a 16 × 16 mm (double square) shaft connection. The form-fitting shaft connection is the most secure connection between damper shaft. The actuator will be connected firmly by means of four screws M8 × 140 mm (scope of supply) to the damper.

### Form-fitting mounting on square damper shaft



### Mounting instructions form-fitting shaft connection

It is to be considered that the actuators have a total angle movement of approx. 95° in order to realize a pretension on the damper. Therefore the actuator sits tilted on the damper shaft. In order to prevent this and to assure pretension to the damper the driving shaft has to be adjusted mechanically before connecting to the damper shaft. The provided socket wrench serves for the mechanical adjustment over the hand-operated control socket HV. The actuators are axially symmetrically developed. In case of spring return function the safety position must be selected by turning the actuator 180°.

#### Mounting:

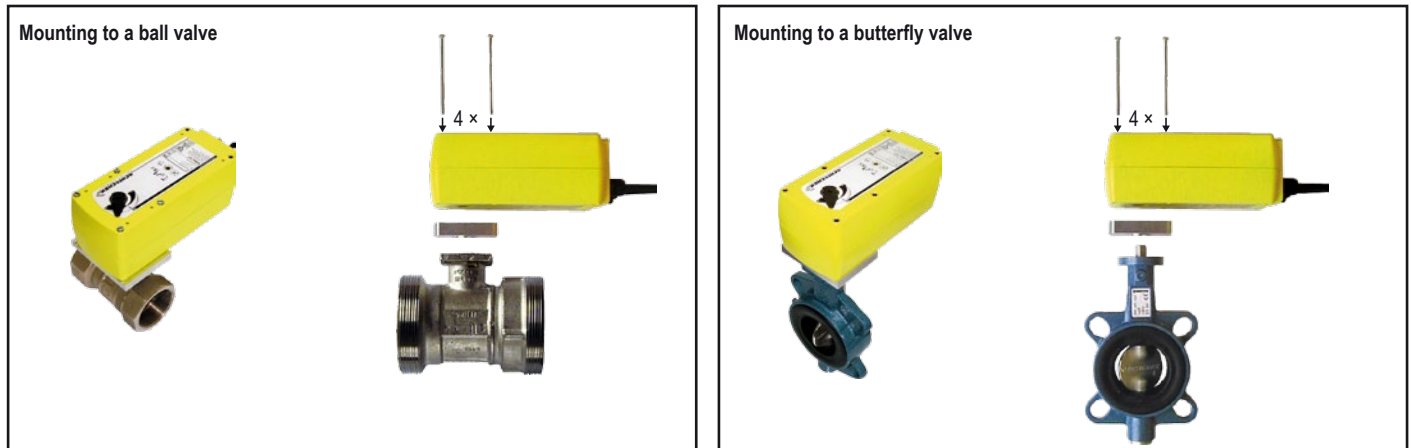
1. Affix tap hole M8 (in accordance with drill template) on the damper or to a mounting bracket.
2. Adjust drive shaft of the actuator with the socket wrench that the drive stands perpendicular to the damper before plugging actuator onto the damper shaft.
3. Plug actuator onto damper shaft and fix diagonally with 2 screws.
4. Remove the socket wrench.
5. Pivot and tighten the remaining screws.

**Note:** the drive shaft is selflocking produced and may only be mechanically adjusted either with the provided socket wrench or the optional accessory „HV-M“ manual override. External applied force to the shaft can lead to mechanical damage of the actuator.

## Mounting instructions for actuators size M on butterfly valve and ball valve

### Specification

Actuators of the size M are equipped with a 16 × 16 mm (double square) form-fitting shaft connection. For mounting to butterfly valves or ball valves a special mounting bracket in acc. with DIN EN ISO 5211 is required. Since this standard provides only certain basic conditions there can be substantial geometrical differences between armatures which require special adaptations.



## Mounting instructions for actuators size M on fire dampers

### Specification

Actuators of the size M are equipped with a 16 × 16 mm (double square) form-fitting shaft connection. The form-fitting shaft connection is the securest connection between damper shaft and actuator. The actuator is fixed with four screws directly to the fire damper and/or fixed to a mounting bracket. ExMax-...-BF and RedMax-...-BF actuators integrate an intrinsically safe circuit in order to connect an ExPro-TT-... sensor which works like a temperature limiter. InMax-... and InPro-TT-... are for non hazardous areas.

#### Assembly

It is to be considered that the actuators have a total angle of rotation of approx. 95° in order to realize a pretension on the damper. Therefore the actuator sits tilted on the damper shaft. In order to prevent this and to assure pretension to the damper the driving shaft has to be adjusted mechanically before connecting to the damper shaft. The provided socket wrench serves for the mechanical adjustment over the hand-operated control socket HV. The actuators are axially symmetrically developed. In case of a spring return function the safety position must be selected by turning the actuator 180°.

#### Mounting:

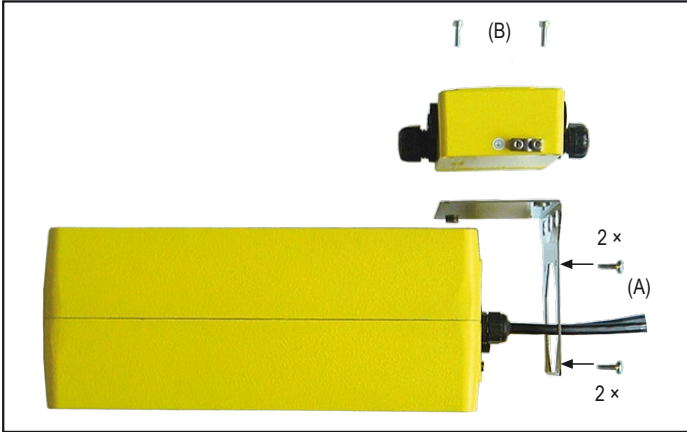
1. Affix tap hole M8 (in accordance with drill template) on the damper or to a mounting bracket.
2. Adjust drive shaft of the actuator with the socket wrench so that the drive stands perpendicular to the damper before plugging actuator on to the damper shaft.
3. Plug actuator onto damper shaft and fix diagonally with 2 screws.
4. Remove the socket wrench.
5. Pivot and tighten the remaining screws.
6. Mount temperature limiter type ExPro-TT-... / InPro-TT-...
7. Mount terminal box
8. Connect sensor on actuator

**Note:** the drive shaft is selflockingly produced and may only be mechanically adjusted either with the provided socket wrench or the optional accessory „HV-M“ manual override. External applied force to the shaft can lead to mechanical damage of the actuator.

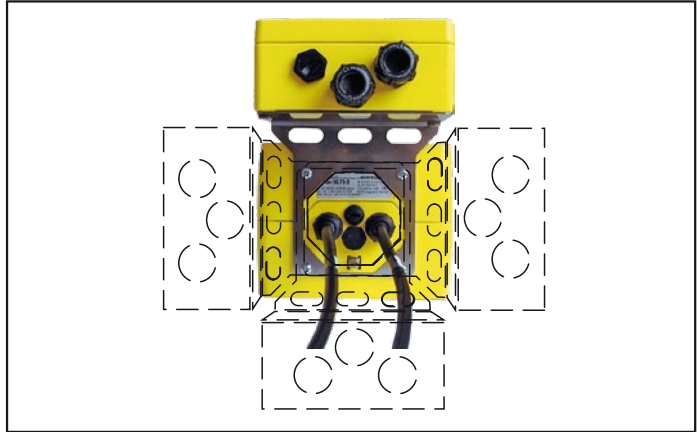
## Mounting of terminal boxes type ...Box via mounting bracket type MKK-M (accessory) to the actuator

### Specification

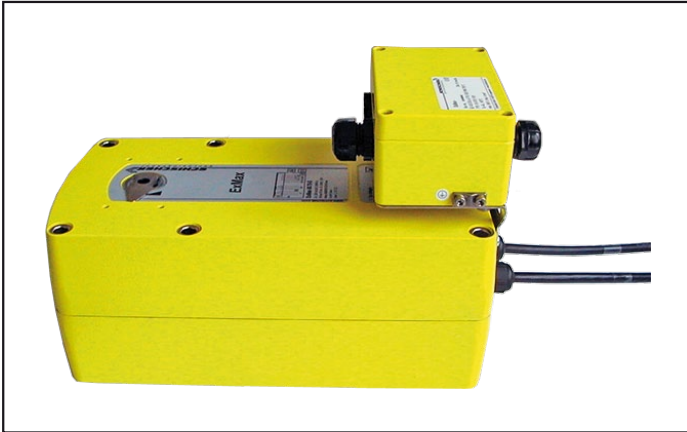
Screw mounting bracket MKK-M to the actuator (A)  
then screw terminal box to the mounting bracket (B)



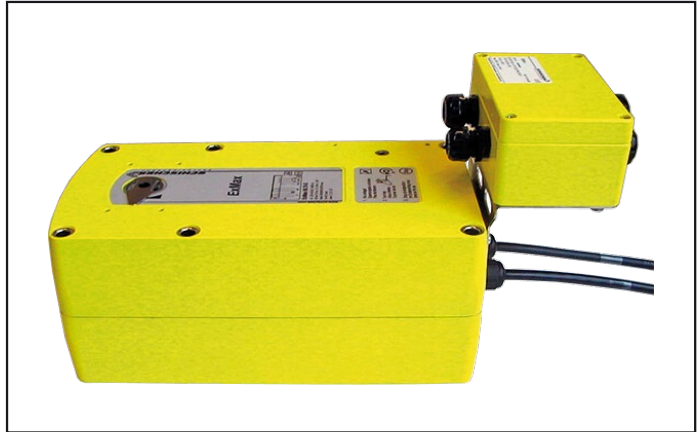
Mounting bracket MKK-M can be mounted every 90°



Terminal box mounted above the actuator



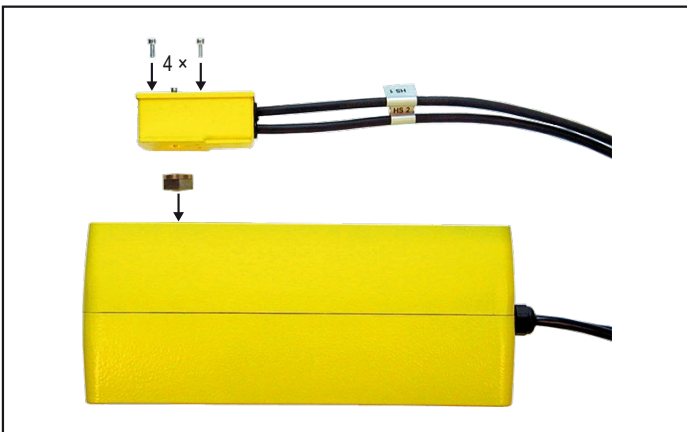
Terminal box mounted beside the actuator



## Mounting of ...Switch (accessory) to the actuator

### Specification

1. Put the squared connection part to the actuator, then mount ...Switch and fix it with 4 screws



2. ...Max with mounted ...Switch

