# ExMax ¼ turn actuators – size M

**ExMax - ... - BF**
**ExMax - ... - CTM**

**Subject to change!**

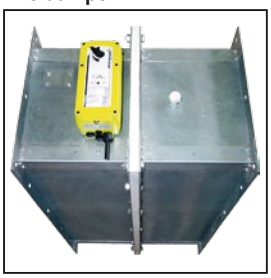
Electrical, explosion proof rotary actuators with integrated Ex-i circuit for thermal tripping device
On-off / 3-pos. control mode, 24…240 VAC/DC, 95° angle of rotation incl. 5° pretension
30 – 50 – 60 Nm with safety operation (spring return)
ATEX tested in acc. with directive 2014/34/EU for zone 1, 2, 21, 22

## Compact. Easy installation. Universal. Cost effective. Safe.

| Type | Torque | Supply | Motor running time | Spring return | Control mode | Feedback | Wiring diagram |
|---|---|---|---|---|---|---|---|
| **ExMax- 30 - BF** | 30 Nm | 24...240 VAC/DC | 40 / 60 / 90 / 120 / 150 s/90° | ~ 20 s/90° | On-off, 3-pos. | 2 × limit switches + Ex-i trip circuit | SB 7.2 + 7.3 |
| **ExMax- 50 - BF** | 50 Nm | 24...240 VAC/DC | 40 / 60 / 90 / 120 / 150 s/90° | ~ 20 s/90° | On-off, 3-pos. | 2 × limit switches + Ex-i trip circuit | SB 7.2 + 7.3 |
| **ExMax- 60 - BF** | 60 Nm | 24...240 VAC/DC | 40 / 60 / 90 / 120 s/90° | ~ 20 s/90° | On-off, 3-pos. | 2 × limit switches + Ex-i trip circuit | SB 7.2 + 7.3 |
| **ExMax- ... - CTM** | Types as above with aluminium housing and seawater resistant coating (cable glands brass nickel-plated) | | | | | | |

## Product views and applications

**Fire damper**



**Ball valve**

**Throttle valve**

## Description

The ExMax actuators are a revolution for safety, fire and shut-off dampers, VAV systems, ball valves, throttle valves and other motorized applications for HVAC systems in chemical, pharmaceutical, industrial and offshore/onshore plants, for use in Ex-areas zone 1, 2 (gas) and zone 21, 22 (dust).
Highest protection class (ATEX) and IP66 protection, small dimensions, only 9,5 kg weight, universal functions and technical data, an integrated heater guarantee safe operation even under difficult environmental conditions. High quality brushless motors guarantee long life.
All actuators are programmable and adjustable on site. Special tools or equipment are not required. Motor running times are selectable or adjustable on site. The integrated universal power supply is self adaptable to input voltages in the range of 24...240 VAC/DC. The actuators are 100 % overload protected.
...Max-...-BF actuators are equipped with spring return fail safe function, with 2 integrated auxiliary switches for end position indication and an intrinsically safe trip circuit for connecting the ...Pro-TT-... safety temperature trigger. Standard shaft connection is a double square direct coupling with 16 × 16 mm.
Different accessories are available to adapt auxiliary switches, terminal boxes or adaptions for ball valves and throttle valves and other armatures.

## Highlights

- ▶ For all type of gas, mists, vapours and dust for use in zone 1, 2, 21 and 22
- ▶ Universal supply unit from 24…240 VAC/DC
- ▶ Motor running times 40–60–90–120–150 s/90° adjustable on site
- ▶ On-off and 3-pos. control with spring return function, running time ~ 20 s/90°
- ▶ Ex-i circuit for direct connection of the ...Pro-TT-... safety temperature trigger
- ▶ 2 integrated auxiliary switches, switching at 5° and 85° angle of rotation
- ▶ 30–50–60 Nm actuators in the same housing size
- ▶ 100 % overload protected
- ▶ Compact design and small dimension (L × W × H = 288 × 149 × 116 mm)
- ▶ Direct coupling to the damper shaft with double square connection 16 × 16 mm
- ▶ 95° angle of rotation inclusive 5° pretension
- ▶ Robust aluminium housing (optional with seawater resistant coating)
- ▶ IP66 protection
- ▶ Simple manual override included + preparation for comfortable manual override
- ▶ Gear made of stainless steel and sinter metal
- ▶ Weight only ~ 9,5 kg
- ▶ Integral heater for ambient temperatures down to −40 °C
- ▶ Integral safety temperature sensor
- ▶ Integral equipment for manual adjustment (push button, lamp, switch)
- ▶ Preparation for adaptable and adjustable auxiliary switches type ...Switch
- ▶ Wide range of accessories



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| Technical data | ExMax- 30 - BF | ExMax- 50 - BF | ExMax- 60 - BF | |
|---|---|---|---|---|
| Torque motor (min.) | 30 Nm | 50 Nm | 60 Nm | |
| Torque spring (F) | min. 30 Nm | min. 50 Nm | min. 60 Nm | |
| Dimension of external torque | Above mentioned torques are min. torques in blocked position, external torque should be max. 80 % of max. actuator torque but min. 10 Nm | | | |
| Supply voltage / frequency | 24...240 VAC/DC, ± 10 %, self adaptable, frequency 50...60 Hz ± 20 % | | | |
| Power consumption | max. starting currents see ⓘ Extra information (in acc. with voltage, $I_{start} >> I_{rated}$), approx. 5 W holding power, approx. 16 W for heater | | | |
| Protection class | Class I (grounded) | | | |
| Angle of rotation and indication | 95° incl. ~ 5° pretension, mechanical value indication | | | |
| Working direction | selectable by left/right mounting to the damper/valve shaft | | | |
| Motor running times | 40 / 60 / 90 / 120 / 150 s/90° | 40 / 60 / 90 / 120 / 150 s/90° | 40 / 60 / 90 / 120 s/90° | selectable on site |
| Motor | Brushless DC motor | | | |
| Spring return (F) | ~ 20 s/90°, function in the event of loss of power | | | |
| Safety operation | min. 10,000 in acc. with construction of damper and ambient | | | |
| Response time spring return | up to 1 sec. after power failure | | | |
| Control mode | On-off and 3-pos. in acc. with wiring, selectable on site | | | |
| Intrinsically safe circuit | Ex-i circuit to connect the ExPro-TT-... safety temperature trigger | | | |
| IS connection | Directly to the actuator with M12 quick connection | | | |
| Integrated aux. switches | 2 aux. switches, switching at 5° and 85° angle of rotation | | | |
| Axle of the actuator | Double square 16 × 16 mm, direct coupling, 100 % overload protected | | | |
| Electrical connection | Cable ~ 1 m, wire cross section 0.5 mm², equipotential bonding 4 mm². | | | |
| | Connections in hazardous areas require an Ex-e terminal box! | | | |
| Diameter of cable | ~ Ø 9,6 mm | ~ Ø 9,6 mm | ~ Ø 9,6 mm | |
| Cable gland | M16 × 1.5 mm | | | |
| Manual override | Use delivered socket wrench, max. 4 Nm | | | |
| Integral heater | Integral, controlled heater for ambient temperature down to −40 °C | | | |
| Housing material | Aluminium die-cast housing, coated. Optional with seawater resistant coating (...-CTM) | | | |
| Dimensions (L × W × H) | 288 × 149 × 116 mm, for diagrams see ⓘ Extra information | | | |
| Weight | ~ 9,5 kg aluminium housing | | | |
| Ambients | Storage temperature −40…+70 °C, working temperature −40…+40 °C at T6 and −40…+50 °C at T5 | | | |
| Humidity | 0...90 % rH, non condensing | | | |
| Operation mode | 100 % ED are permitted (ED = duty cycle) | | | |
| Maintenance | Maintenance free relative to function, maintenance must comply with regional standards, rules and regulations | | | |
| Wiring diagrams | SB 7.2 + 7.3 | SB 7.2 + 7.3 | SB 7.2 + 7.3 | |
| Scope of delivery | Actuator with 1 m cable, 4 screws M8 × 140 mm, 4 nuts M8, Allen key for simple manual override | | | |
| Parameter at delivery | 30 Nm, 90 s/90° | 50 Nm, 90 s/90° | 60 Nm, 90 s/90° | |

## Approbations

| | |
|---|---|
| ATEX directive | 2014/34/EU |
| EC type-approved | PTB 04 ATEX 1028 X |
| IECEx certified | IECEx PTB 07.0057X |
| Approval for gas | II 2 (1) G Ex d [ia] IIC T6, T5 |
| Approval for dust | II 2 (1) D Ex tD [iaD] A21 IP66 T80, T95°C |
| Ex-i circuit data | see table (T 1.0) |
| | |
| CE identification | CE № 0158 |
| EMC directive | 2014/30/EU |
| Low voltage directive | 2014/35/EU |
| Enclosure protection | IP66 in acc. with EN 60529 |
| | |
| EAC | № TC RU C-DE.ГБ08.B.01510 |
| Approval for gas | 1Ex d [ia Ga] IIC T6/T5 Gb X |
| Approval for dust | Ex tD[iaD] A21 IP66 T80°C/T95°C |

## Special solutions and accessories

| | |
|---|---|
| ...-CTM | Types in aluminium housing with seawater resistant coating, parts nickel-plated |
| VAMH | Casing in VA for ...Max actuators size M |
| ExBox-... | Ex-e terminal boxes for zone 1, 2, 21, 22 |
| MKK-M | Mounting bracket for boxes type ...Box-... directly on actuator |
| ExPro-TT-... | Safety temperature trigger for fire dampers |
| ExSwitch | 2 external aux. switches, adjustable for zone 1, 2, 21, 22 |
| HV-MK | Comfortable manual override for ...Max actuators size M |
| AR-16-xx | Reduction part for 16 mm square connection to 14 or 12 mm shafts |
| Kit-S8 | Cable glands nickel-plated |
| Adaptions | for dampers and valves on request |
| ExMax-...-S3 | Ambient temperature up to +60 °C (T4), 110...240 VAC/DC, 25 % ED |



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## Electrical connection

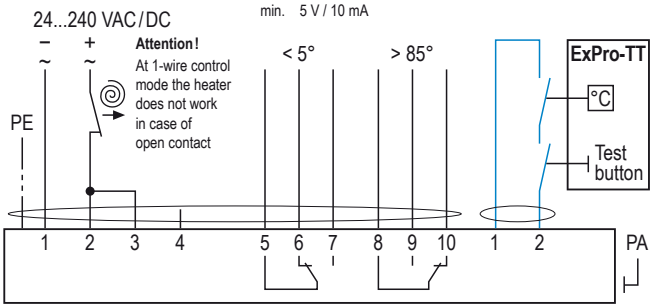
All actuators are equipped with a universal supply unit working at a voltage range from 24...240 VAC/DC. The supply unit is self adjusting to the connected voltage!
The safety operation of the spring return function works if the supply voltage is cut.
For electrical connection inside hazardous areas an Ex-e terminal box, certificated in acc. with ATEX is required (e.g. ExBox).
An over-current protection fuse < 10 A has to be provided by installer.
Note: the initial current is appr. 2 A for 1 second.

### On-off (1-wire) – spring return + Ex-i trigger circuit SB 7.2

**Supply at auxiliary switches must be the same as supply of actuator and on same fuse in case of power is switched.**

Integral fixed set aux. switches, potential free contacts switching at 5° and 85° angle of rotation max. 24 V / 3 A – 250 V / 0.25 A min. 5 V / 10 mA

Ex-i trip circuit for ExPro-TT-... safety temperature trigger

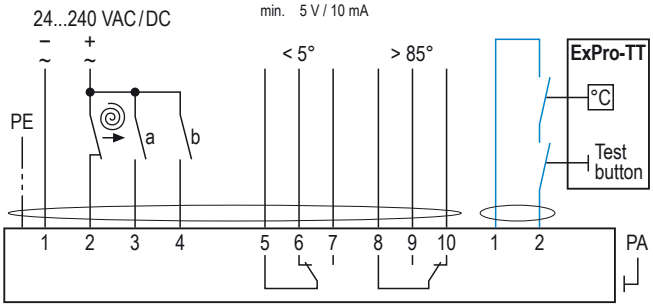



### On-off / 3-pos. – spring return + Ex-i trigger circuit SB 7.3

**Supply at auxiliary switches must be the same as supply of actuator and on same fuse in case of power is switched.**

Integral fixed set aux. switches, potential free contacts switching at 5° and 85° angle of rotation max. 24 V / 3 A – 250 V / 0.25 A min. 5 V / 10 mA

Ex-i trip circuit for ExPro-TT-... safety temperature trigger




### Ex-i intrinsic safe data – for temperature trigger ExPro-TT T 1.0

$U_o$ = 10,6 V
$I_o$ = 11 mA
$P_o$ = 30 mW
$C_i$ = 0
$L_i$ = 0

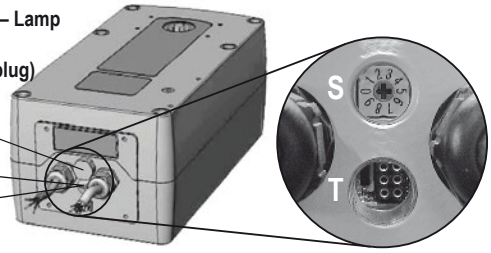
| | IIC | IIB | IIA |
|---|---|---|---|
| $L_o$ | 2 mH | 5 mH | 10 mH |
| $C_o$ | 830 nF | 3,7 µF | 4,5 µF |

### ⚠ Attention ⚠

During commissioning apply a self adjustment drive.
Regard duty cycle at motor running times!
Never use spring return actuators without external load.

## Parameters, adjustments and failure indication

**Switch – Push button – Lamp for adjustment (behind the blanking plug)**




### Parameter selection

Example:
ExMax-30-BF

**Requested parameter:**
Torque 30 Nm
Motor running time 90 s/90°

**Result:**
Switch position 02

| Type | | Torques |
|---|---|---|
| **ExMax- 30 -BF** | ▶ | **30 Nm** |
| ExMax- 50 -BF | ▶ | 50 Nm |
| ExMax- 60 -BF | ▶ | 60 Nm |
| | | ▼ |

| Running times | | | Position of switch (S) | |
|---|---|---|---|---|
| 40 | s/90° | ▶ | 00 | 05 |
| 60 | s/90° | ▶ | 01 | 06 |
| **90** | **s/90°** | ▶ | **02** | 07 |
| 120 | s/90° | ▶ | 03 | 08 |
| 150 | s/90° | ▶ | 04 | 09 |

### Functions, adjustments and parameters

**A) Self adjustment of angle of rotation:**
Switch (S) into position 02, then push button (T) for minimum 3 seconds. The actuator will drive into both end positions to be adjusted. LED indicates GREEN.
Adjustment time needs approx. 180 sec. (90 sec. "On", 90 sec. "Off"). After that, switch (S) into the position acc. with your required torque and running time.

**B) Selection of running time and torque:**
Put switch (S) into the correct selected position in acc. to above table.
The selected parameter will work at next operation of the actuator.
Adjustment can be done even without supply voltage. If supply voltage is available turn switch only if actuator is not running.

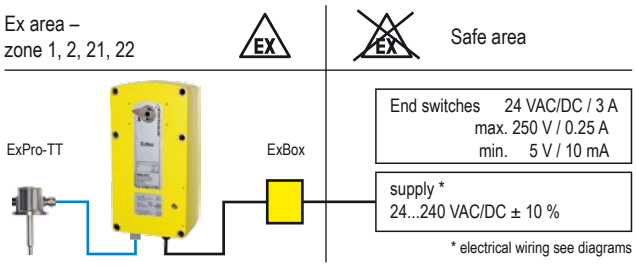
**C) Function of the ExPro-TT-... in the Ex-i circuit:**
If the sensor opens the Ex-i circuit the actuator runs into its safety end-position with spring return.

**D) Additional information for 3-pos. operation:**

| | | | |
|---|---|---|---|
| a closed, b open | = direction I | a and b closed | = motor doesn't work |
| b closed, a open | = direction II | a and b opened | = motor doesn't work |

The rotation direction (I and II) depends on left/right mounting of the actuator to the damper/valve. You can change direction of the motor by changing electrical wiring of terminal 3 and 4.

### Installation




- Do not open the cover when circuits are live
- Supply cables must be installed in a fixed position and protected against mechanical damage
- Connect potential earth
- Avoid temperature transfer from process (e.g. hot gas) to actuator (note max. ambient temperature!)
- Note ambient temperature
- Close all openings with min. IP66
- Regard all regional standards, rules and regulations
- Flameproof enclosure is protected against mechanical damages acc. to EN 60079-ff
- For outdoor installation a protective housing against rain, snow and sun should be applied to the actuator, as well as a constant supply at terminal 1 and 2 for the integral heater
- Use for wiring an explosion proof Ex-e terminal box
- Actuators are maintenance free, an annual function test is recommended
- Clean only with damp cloth, avoid dust accumulation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## Important information for installation and operation

**A. Installation, commissioning, maintenance**

All national and international standards, rules and regulations for hazardous Ex-areas must be complied. Certified apparatus must be installed in accordance with manufacturer instructions. If the equipment is used in a manner not specified by the manufacturer, the safety protection provided by the equipment may be impaired. For electrical installations design, selection and erection, EN/IEC 60079-14 can be used.
For electrical connection an Ex-e terminal box is required (e.g. ExBox-...).
**Attention:** If the actuator is put out of operation all Ex rules and regulations must be applied. You have to cut the supply voltage before opening the terminal box!
The cables of the actuator must be installed in a fixed position and protected against mechanical and thermical damage. Connect potential earth. Avoid temperature transfer from armature to actuator! Close all openings with min. IP66.
For outdoor installation a protective weather shield against sun, rain and snow should be applied to the actuator as well as a constant supply at terminal 1 and 2 for the integral heater.
Actuators are maintenance free. An annual inspection is recommended. For electrical installations inspection and maintenance, EN/IEC 60079-17 can be used. Ex-actuators must not be opened by the customer.

**B. Manual override**

Manual override only if supply voltage is cut. Use delivered socket wrench with slow motions, usage can be tight.
**Attention:** Releasing or letting go the Allen key too fast at manual operating actuators with spring return causes risk of injury!

**C. Shaft connection, selection of running time**

Actuators are equipped with a direct coupling double square shaft connection of 16 × 16 mm. The housing of the actuator is axially symmetrically built to select Open-close direction of the spring return function by left-right mounting. Using the 10-position switch different motor running times and spring return running times can be selected on site in acc. to the actuator type.

**D. Temperature trigger ...Pro-TT-...**

The actuator ...Max-...-BF will work only with the temperature trigger ExPro-TT-...

**E. 3-position control mode**

...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. It ignores impulses < 0,5 s, the cyclic duration must be min. 0,5 s. At changing direction the pause is 1 s.

**F. Spring return**

Spring return function works only if the supply voltage for terminal 1 or 2 is cut. In the event of an electrical interruption, the spring returns to its end position even if supply voltage is available again during return function. Thereafter operation will continue.

**G. Operation at ambient temperatures below −20 °C**

All 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.

1. After mounting the actuator must bei immediately electrically connected.
2. The heater switches on automatically when actuator reaches internally −20 °C. It heats up the actuator to a proper working temperature, then heater switches off automatically. Actuator will not run during heating process.
3. The adjustment options are only ensured after this heating up period.

**H. Excess temperatures**

In acc. to the ATEX rules and regulations Ex actuators must be protected against excess temperature. The internal thermostat works as a maximum limiter and, in the event of failure at incorrect temperatures, shuts off the actuator irreversible. An upstream connected temperature sensor stops the actuator before reaching its max. temperature. This safety feature is reversible, after cooling down the actuator is completely functional again. In this case the failure must be eliminated immediately on site!

**I. Synchron mode**

Do not connect several actuators to one shaft or link mechanically together.

**J. Mechanical protection**

The actuator must be operated with an outside load of at least 10 Nm.
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 position’s/blockade speed in order to avoid mechanical overload. The actuator alignes specifically once with 90 s/90° onto each position and recognizes the blockade position in order to reduce the motor performance during operation briefly before reaching the end/blockade position.

**K. Intrinsically safe circuits**

The actuator itself has a flameproof enclosure. The supply of the push button (adjustment drive), the 10-position switch (adjustment of torque and running time), the LED indicator and the sensor connection ExPro-TT are intrinsically safe!

**L. Routine tests of fire dampers**

For periodic inspection of fire dampers cut off the supply line (current of actuator).
The test button at ExPro-TT-... is only for test aims of actuator’s function.

### ⓘ Extra information (see additional data sheet)

Additional technical information, dimensions, installation instruction, illustration and failure indication

## Accessory ExSwitch – adaptable Ex-d auxiliary switch

For an end or inclined position indication it is possible to retrofit external, adjustable, explosion proof auxiliary switches type ExSwitch. The switch housing is mounted directly to the actuator and the switches are linked to the actuator’s square connector. The switches deliver a potential free output and can be adjusted separately. They are connected by the included cable tail.

## Accessory ExBox – adaptable Ex-e terminal box

For electrical connection of ...Max actuators inside the hazardous area an Ex-e terminal box is required. ExBoxes are appropriate terminal boxes and placed at the disposal. To adapt the ...Box directly to the actuator housing a mounting bracket type MKK-M is required.

| | |
|---|---|
| ExBox- BF | for ...Max-...-BF with integral auxiliary switches |



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