

ExMax ¼ turn actuators – size S

Electrical, explosion proof rotary actuators with integrated Ex-i tripping circuit for safety temperature trigger ExPro-TT
On-off / 3-pos. control mode, 24...240 VAC/DC, 95° angle of rotation incl. 5° pretension
5/10 – 15 Nm with safety operation (spring return)
ATEX tested in acc. with directive 2014/34/EU for zone 1, 2, 21, 22

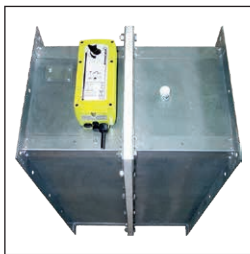
ExMax - ... - BF
ExMax - ... - CTS
ExMax - ... - VAS

Subject to change!

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

Type	Torque	Supply	Motor running time	Spring return	Control mode	Feedback	Wiring diagram
ExMax- 5.10 - BF	5 / 10 Nm	24...240 VAC/DC	3 / 15 / 30 / 60 / 120 s/90°	3 or 10 s/90°	On-off, 3-pos.	2 x aux. switches + Ex-i tripping circuit	SB 7.0/7.1
ExMax- 15 - BF	15 Nm	24...240 VAC/DC	3 / 15 / 30 / 60 / 120 s/90°	3 or 10 s/90°	On-off, 3-pos.	2 x aux. switches + Ex-i tripping circuit	SB 7.0/7.1
ExMax- ... - CTS	Types as above with aluminium housing and seawater resistant coating (cable glands brass nickel-plated)						
ExMax- ... - VAS	Types as above with stainless steel housing for aggressive ambient (cable glands brass nickel-plated)						

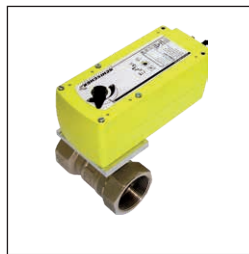
Product views and applications



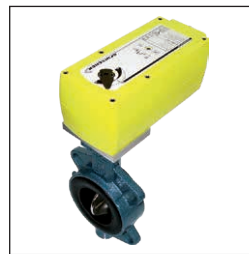
Fire damper



Safety 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 3,5 kg weight, universal functions and technical data, an integrated heater and an optional stainless steel housing 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 and torques as well as spring return times, according to the actuator type, 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 and self locking.

...Max-...-BF actuators are equipped with spring return fail safe function, with 2 integrated auxiliary switches for end position indication and an intrinsically safe tripping circuit for connecting the ...Pro-TT-... safety temperature trigger. Standard shaft connection is a double square direct coupling with 12 x 12 mm.

Different accessories are available to adapt auxiliary switches, terminal boxes or adaptations for ball valves and throttle valves and other armatures.

Highlights

- › For all types of gases, mists, vapours and dusts in zones 1, 2, 21 and 22
- › Universal supply unit from 24...240 VAC/DC
- › Motor running times 3–15–30–60–120 s/90° adjustable on site
- › On-off and 3-pos. control with spring return function, running times ~ 3–10 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
- › 5–10–15 Nm actuators in the same housing size
- › 100 % overload protected and self locking
- › Compact design and small dimension (L x W x H = 210 x 95 x 80 mm)
- › Direct coupling to the damper shaft with double square connection 12 x 12 mm
- › 95° angle of rotation inclusive 5° pretension
- › Robust aluminium housing (optional with seawater resistant coating) or in stainless steel
- › IP66 protection
- › Simple manual override included + preparation for comfortable manual override
- › Gear made of stainless steel and sinter metal
- › Weight only ~ 3,5 kg
- › Integrated heater for ambient temperatures down to –40 °C
- › Integrated safety temperature sensor
- › Integrated equipment for manual adjustment (push button, lamp, switch)
- › Preparation for adaptable and adjustable auxiliary switches type ...Switch
- › Wide range of accessories

Technical data

Technical data	ExMax- 5.10 - BF	ExMax- 15 - BF
Torque motor (min.)	5 / 10 Nm selectable on site	15 Nm
Torque spring (F)	min. 10 Nm	min. 15 Nm
Torque blockade	In blockade and end positions torques are higher than above specified torques for motor and spring.	
Dimensioning of external load	Upon spring return the external load should be max. 80 % of torque spring (F).	
Supply voltage / frequency	24...240 VAC/DC \pm 10 %, self adaptable, frequency 50...60 Hz \pm 20 %	
Power consumption	max. starting currents see ① Extra information (in acc. with voltage, $I_{start} \gg I_{rated}$), approx. 5 W holding power, approx. 16 W for heater	
Protection class	Class I (grounded)	
Angle of rotation and indication	95° incl. \sim 5° pretension, mechanical value indication	
Working direction	Selectable by left/right mounting to the damper/valve shaft	
Motor running times	3 / 15 / 30 / 60 / 120 s/90° selectable on site	
Motor	Brushless DC motor	
Control mode	On-off and 3-pos. in acc. with wiring, selectable on site	
Spring return (F)	Spring return upon voltage interruption, response time up to 1 sec. after voltage interruption	
Spring return running time (F)	\sim 3 or 10 s/90° selectable on site	
3 sec. mode – spring return	\sim 3 to 4 s/90° angle of rotation acc. to external load	
Safety operations at 10 sec. (F)	min. 10,000 acc. to construction of damper and ambient	
at 3 sec. (F)	min. 1,000 acc. to construction of damper and ambient	
Ex-i tripping circuit	Intrinsically safe circuit to connect the ExPro-TT... safety temperature trigger directly to the actuator with M12 quick connection	
Auxiliary switches	2 integrated auxiliary switches, switching at 5° and 85° angle of rotation, potential free. Grid fuse-protection is recommended! U_{max}/I_{max} AC = 250 V/5 A; U_{min} AC/DC = 5 V; After one-time operation with $U > 24$ V AC/DC or $I > 100$ mA: U_{min} AC/DC = 12 V U_{max}/I_{max} DC = 48 V/1 A; I_{min} AC/DC = 5 mA; I_{min} AC/DC = 100 mA	
Axle of the actuator	Double square 12 x 12 mm, direct coupling, 100 % overload protected and self locking up to 15 Nm	
Electrical connection	Cable \sim 1 m, wire cross section 0.5 mm ² , equipotential bonding 4 mm ² . Connections in hazardous areas require an Ex-e terminal box!	
Diameter of cable	\sim Ø 9.6 mm	
Cable gland	M16 x 1.5 mm	
Manual override	Use delivered socket wrench, max. 4 Nm	
Heater	Integrated, controlled heater for ambient temperature down to -40 °C	
Housing material	Aluminium die-cast housing, coated. Optional with seawater resistant coating (...-CTS) or stainless steel housing, No. 1.4581 / UNS-J92900 / similar AISI 316Nb (...-VAS)	
Dimensions (L x W x H)	210 x 95 x 80 mm, for diagrams see ① Extra information	
Weight	\sim 3,5 kg aluminium housing, stainless steel \sim 7 kg	
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	
Operating 3 sec. motor run time	In 3 s mode the motor will work only after 1 minute of voltage supply. While open/close operation (open voltage supply and shut it down) motor works only with speed of 15 s/90°	
≥ 15 sec. motor run time	at 15 / 30 / 60 / 120 s 100 % of ED is permitted (ED = duty cycle)	
Wiring diagrams	SB 7.0 / 7.1	SB 7.0 / 7.1
Scope of delivery	Actuator, 4 screws M4 x 100 mm, 4 nuts M4, Allen key for simple manual override	
Parameter at delivery	5 Nm, 30 s/90°	15 Nm, 30 s/90°

Approbations

ATEX Directive	2014/34/EU	Ex-i circuit data	see table (T 1.0)
EU-Type Examination	EPS 17 ATEX 1 132 X	CE Marking	CE 0158
IECEx Conformity	IECEx EPS 17.0065X	EMC Directive	2014/30/EU
Marking Gases	II 2 (2) G Ex db [ib Gb] IIC T6, T5 Gb	Low Voltage Directive	2014/35/EU
Marking Dusts	II 2 (2) D Ex tb [ib Db] IIIC T80°C, T95°C Db	Enclosure Protection	IP66 in acc. with EN 60529

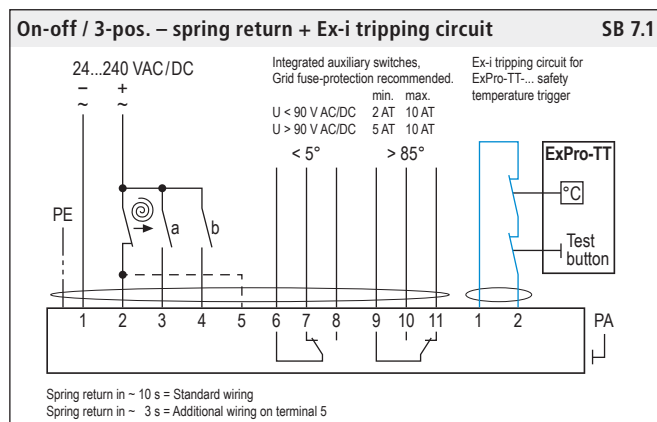
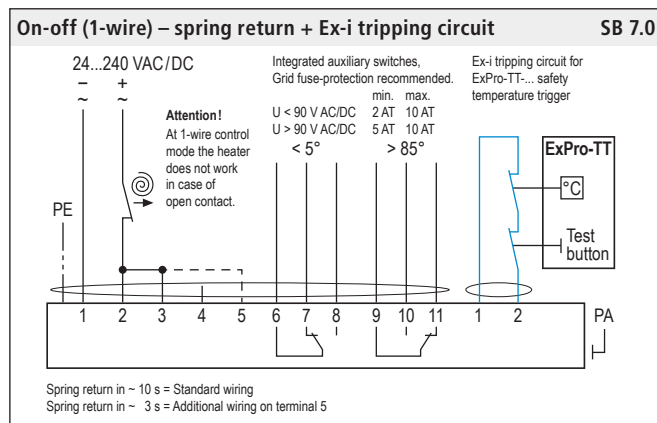
Electrical connection

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).

When installed, the electrical protection shall be designed with regard to the inrush current and the starting current (see additional data sheet – extra information).

Integrated auxiliary switches signal the rotation angle's position. U_{min} and I_{min} change once the switches were operated with higher voltage or current.



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

$U_o = 5,88 \text{ V}$	IIC	IIB	IIA
$I_o = 24,75 \text{ mA}$	$L_o = 50 \text{ mH}$	50 mH	50 mH
$P_o = 37 \text{ mW}$	$C_o = 43 \text{ }\mu\text{F}$	$1000 \text{ }\mu\text{F}$	$1000 \text{ }\mu\text{F}$
$C_i = 0$			
$L_i = 0$			



Caution

During commissioning apply a self adjustment drive.

Regard duty cycle at motor running times!

Never use spring return actuators without external load.

Risk of injury due to rotating handwheel for actuators with spring return!

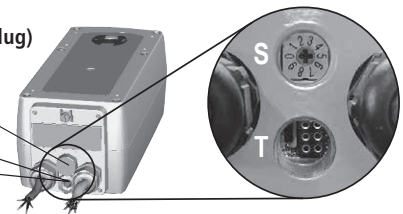
Parameters, adjustments and failure indication

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

10-position switch (S)

Push button (T)

3-colour LED



Parameter selection

Example:

ExMax-5.10-BF

Requested parameter:

Torque 10 Nm

Motor running time 60 s/90°

Result:

Switch position **08**

Type	Torques	
ExMax- 5.10 -BF ▶	5 Nm	10 Nm
ExMax- 15 -BF ▶	15 Nm	
	▼	▼
Running times	Position of switch (S)	
3 s/90° ▶	00	05
15 s/90° ▶	01	06
30 s/90° ▶	02	07
60 s/90° ▶	03	08
120 s/90° ▶	04	09

Functions, adjustments and parameters

A) Self adjustment of angle of rotation

Turn switch (S) to position 02 (low torque) or 07 (high torque). Press button (T) for a minimum of 3 seconds. The actuator drives to both end positions and detects the blocking positions. The LED flashes GREEN during adjustment.

The adjustment takes about 60 seconds (30 sec. "On", 30 sec. "Off").

B) Selecting motor running time and torque

Adjust parameters only if actuator is in idle state or without applied potential. Turn switch (S) to the position required for the intended operation acc. to table above. The selected parameters will be carried out at the actuator's next operation.

C) Selecting spring return time

Spring return time is selected by wiring.

D) Function of the ExPro-TT... in the Ex-i tripping circuit

When the ...Pro-TT's tripping circuit is opened the actuator runs into its end position with spring return.

E) Additional information for control in 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 open = motor doesn't work
The rotation direction (I and II) depends on left/right mounting of the actuator to the damper. To reverse the rotation direction (by motor) exchange the electrical wiring of terminal 3 and 4.

Installation

Ex area –
zone 1, 2, 21, 22



Safe area



Auxiliary switches *
see Technical data

Supply *
24...240 VAC/DC ± 10 %

* electrical wiring see diagrams

- Do not open the cover when circuits are live
- Connect potential earth
- Close all openings to ensure enclosure protection
- Clean only with damp cloth, avoid dust accumulation

Warning! The enclosure with a coating must not be used in areas affected by charge-producing processes, mechanical friction and separation processes, electron emission, and pneumatically conveyed dust.

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 with. 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 thermal 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 integrated heater. During commissioning apply a self adjustment drive.

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 12 x 12 mm. For round shafts adaptors/clamping connection (accessories, e.g. KB-S) are available. 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. Operation with 3 sec. motor running time

Note following:

- The 3 sec. motor running time mode is only available in switch position 0 and 5 and at a constant supply voltage applied for a minimum of 1 minute on terminal 1 and 2.
- The actuator opens at voltage on terminal 3 (resp. closes) and closes at voltage on terminal 4 (resp. opens) – depending on mounting position of the actuator.
- The max. duty ratio is 10 % resp. 1 cycle/minute. Between two fully 3 sec. cycles in the same direction there must be a minimum intermission of 1 minute. Trying to run the actuator in the same direction in less than the required minimum of 1 minute the function will be blocked for the rest of the idle period. Later the release for the next cycle is made automatically by an internal timing relay.
- Same function is applied on spring return actuators, fail safe operation is regarded same as a motor running cycle.
- Trying to use the 1 wire On-off methode in switch position 0 and 5, software changes the motor running time temporarily and automatically to 15 s/90° to protect the actuator for overheating due to uncontrolled duty ratio.

F. 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.

G. 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.

H. 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.

- After mounting the actuator must be immediately electrically connected.
- 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.
- The adjustment options are only ensured after this heating up period.

I. 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 irreversibly. 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!

J. Synchron mode

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

K. Mechanical protection

Actuators must be operated with a minimum external load.

After installing the actuator to the damper/armature a self adjustment drive has to be performed in order to protect the damper/armature against mechanical overload. During operation the actuator reduces briefly its speed (motor power) before reaching the end position for a "gentle" blockade/stop.

L. Intrinsically safe circuits

The actuator has a flameproof enclosure acc. to EN 60079. 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 is performed intrinsically safe!

M. 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 used for test purposes of actuator's function.

❗ Extra information (see additional data sheet)

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

Special solutions and accessories

...-CTS	Types in aluminium housing with seawater resistant coating, parts nickel-plated
...-VAS	Types in stainless steel housing, parts nickel-plated
Adaptions	for dampers and valves on request
ExMax-...-S3	Ambient temperature up to +60 °C (T4), 110...240 VAC/DC, 25 % ED
ExMax-...-S7	Actuator shock approved up to 500 g
ExPro-TT-...	Safety temperature trigger for fire dampers
ExBox-...	Ex-e terminal boxes for zone 1, 2, 21, 22

MKK-S	Mounting bracket for boxes type ...Box-... directly on actuator
ExSwitch	2 external aux. switches, adjustable for zone 1, 2, 21, 22
HV-S...	Comfortable manual override for ...Max actuators size S
KB-S	Clamp for damper shafts Ø 10...20 mm and □ 10...16 mm
AR-12-xx	Reduction part for 12 mm square connection to 11, 10, 9 or 8 mm shafts
BSH-S	Mounting holder for actuators in fire danger areas
Kit-S8	Cable glands nickel-plated

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