



**BERNARD®  
CONTROLS**

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# AT SWITCH RANGE

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*Start Up Guide*

SUG\_17010\_EN - Ind. F  
Art : 5100830

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# 1 SAFETY

This device complies with current applicable safety standards.

The installation, maintenance, and use of this unit require a skilled and trained staff.

Please carefully read this entire document before mounting and starting up the actuator.

## 2 PACKAGING, STORAGE AND MAINTENANCE

### 2.1 Packaging

The packaging of AT SWITCH actuators is comprised of a dual-layer cardboard box strapped on a pallet. For certain non-EU countries or on request, the pallets are heat treated to standard NIMP 15 and IPPC stamped.

This packaging is identical for shipping by road, air or sea, unless otherwise indicated in the contract.

### 2.2 Storage

Actuators should be stored under a shelter, in a clean and dry place, and protected from wide temperature variations.



- Avoid placing the actuator directly on the floor.
- Check that the plugs on cable entries are correctly tightened.
- Check that the cover screws are correctly tightened to ensure weatherproof sealing of the cover.

AT SWITCH actuators include electrical components and lubricated gear stages. Even with a weatherproof enclosure, oxidation, galling and other alterations may occur if actuators are not correctly stored.



The heating resistance should be connected to the power supply, especially if the storage place is humid.

#### What to check after storage

1. Visually check the electrical equipment.
2. Manually operate micro switches, buttons, selectors, etc., to ensure their proper mechanical function.
3. Manually operate the actuator for a few travels.

## **What to check on pre-installed actuators**

If you expect a long delay between actuator valve mounting and electrical wiring, visually check that the cable entries and cover are tightly closed.

## **2.3 Maintenance**

All AT SWITCH actuators feature lifetime lubrication and therefore require no specific maintenance, under the condition that they were correctly commissioned and used in the conditions they were designed for.

## **2.4 Actuator end-of-life**

Although Bernard Controls actuators are designed to last, replacement may become necessary over time. If no specific provisions were foreseen in your local guidelines or in your contract, please consult local recyclers to dispose of your actuator.

### **Recycling and disposal guidelines**

Check your local guidelines. Otherwise, we suggest following these general recommendations:

1. Disassemble your actuator and separate and sort the parts.
2. While disassembling, collect greases and oils. These substances are hazardous and must not be released into the environment. The same applies to batteries.
3. Arrange for controlled waste disposal of the disassembled material or for separate recycling according to materials.
4. Observe the regional regulations for waste disposal.

### **Product disassembly and part sorting**

We recommend that the replaced product be disassembled, and that the parts be separated and sorted according to the following categories (if present):

- greases and oils,
- metals: aluminum, copper/brass, zinc, iron/steel, stainless steel, mixed metals,
- plastics,
- batteries,
- electronic scrap: boards, capacitors, etc.

### 3 ASSEMBLY

The actuator should be secured directly to the valve using proper bolts or via a proper interface.

After assembly, the actuator can operate in any position.

However:



- Do not lift or handle the actuator by its handwheel to avoid shaft and gear damage.
- Cable glands must not be oriented upwards (loss of watertightness).
- It is recommended not to position the motor downwards.

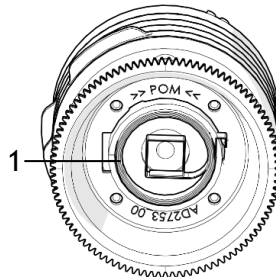


If the actuator is delivered mounted on the valve, basic calibration should have been carried out by the valve supplier. In this case, you do not need to calibrate the travel limits and torque limiter again.

#### For actuators with a cam block spring (class III)

The spring (1) is located under the cam block. Both positions and number of turns have been calibrated in factory according to customer request.

Before mounting the actuator on the valve, manually or electrically put the actuator in the same position as the valve: either both open or both closed (i.e., the travel limit for the open or closed position should be triggered).



Once the actuator is mounted on the valve, the precise calibration of the opening and closing positions can be done according to § 5.3.

## 4 EMERGENCY MANUAL COMMAND

AT Switch actuators feature a handwheel for emergency operation.

### 4.1 Automatic clutching

All AT Switch actuators except AT7 have automatic clutching of the manual control.



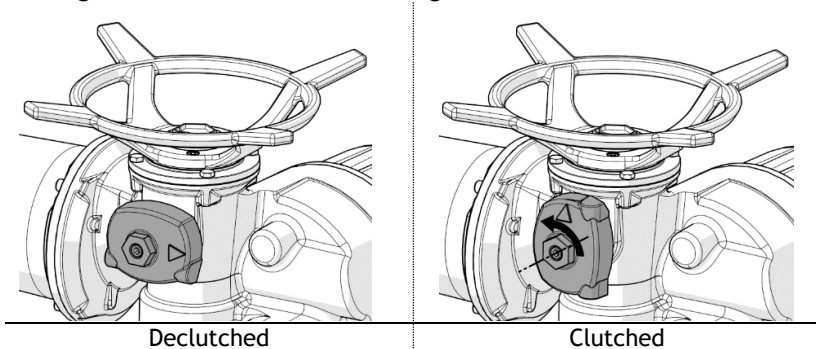
Caution, automatic clutch. Use the emergency manual command only when electric motor commands are inactive. Backlash risk.

Their handwheels feature a foldable handle allowing to avoid potentially harmful turning protruding parts during electrical operation. This handle can be folded during electrical operation and unfold it if you need to operate the actuator manually.

### 4.2 Manual clutching (AT7 only)

AT7 has a handle to clutch emergency handwheel and operate the actuator manually. You can clutch the handwheel by turning upwards the knob below it.

In case clutching is difficult, you can ease the clutching by slightly turning the handwheel while turning the knob.



Emergency manual command automatically declutches in case of electrical operation.

## 5 ELECTRICAL COMMISSIONING

### 5.1 Opening/Closing electrical compartment

You need to open the electrical compartment to wire the actuator.

#### Position indicator option

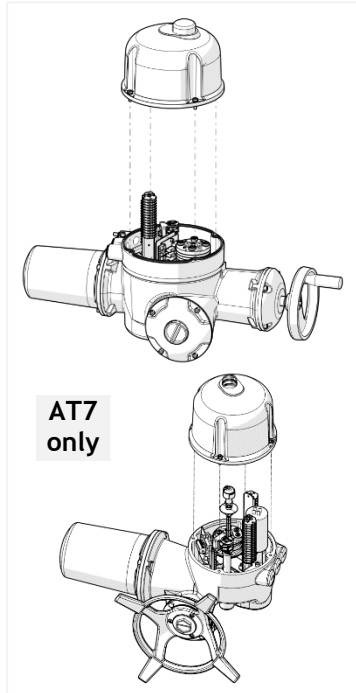
If the closing direction is not standard (clockwise), please configure the position indicator accordingly (see § 5.4) if this operation has not already been performed.

#### How to open electrical compartment

1. With a 10 mm angled socket wrench or a flat blade screwdriver loosen the 4 screws.
2. Remove the cover along the axis of the position indicator (see § 5.2).

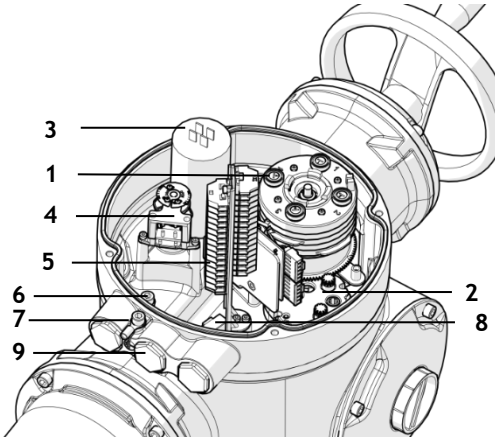
#### How to close electrical compartment

1. Position the cover with the indicator window opposite the position indicator.
2. Insert the cover on the position indicator until it reaches the housing.
3. With a 10 mm angled socket wrench or a flat blade screwdriver, tighten the 4 screws on the housing.



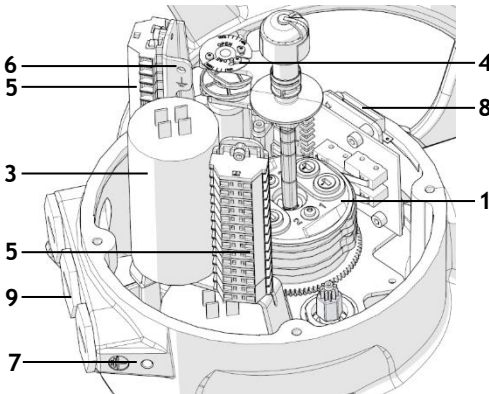
## 5.2 Wiring

### 5.2.1 Components (with cover open)



- 9 - Cable entry plugs
- 8 - Heating resistance
- 7 - External ground terminal
- 6 - Internal ground terminal
- 5 - Terminal blocks
- 4 - Torque limiter
- 3 - Capacitor (only for single phase actuators)
- 2 - Modular reduction gear
- 1 - Cam block

**AT7 only**



The actuator and its components are wired to internal terminal blocks.

### 5.2.2 Installing cable glands

AT SWITCH actuators can be fitted with 3×M20 / 3×¾” NPT cable glands.

#### How to install cable glands

For each cable entry used

1. Remove the plug from the cable entry with a 30-mm (ISO) / 29-mm (NPT) open-end wrench .
2. Separate the sealing nut from its cable gland.
3. Screw and tighten the cable gland in the cable entry.
4. Thread the sealing nut on the cable and pass the cable through the cable gland.
5. When the wiring is finished, tighten the sealing nut on the cable gland.



Unused entries must be kept closed by their plug.

### 5.2.3 Wiring

- **Internal wiring**

To **perform the wiring**, remove the cover and pass the cables through the cable glands, then connect the wires on the terminal blocks.

Please refer to the supplied wiring diagram for terminal numbering. Both the heating resistance (9) and torque limiter (5) switches must be integrated into your control system to prevent potential damage to the actuator or valve.

- **Ground terminals wiring**

Attach a ground wire fitted with a 6 mm ring terminal to the internal (7) and external (8) ground terminals.

### 5.2.4 Checking wiring

You need to check the wiring once it is finished.

#### How to check the wiring

1. Make sure that the power supply voltage matches the information on the label located on the side of the actuator.
2. Check that the cable glands are correctly tightened.
3. Manually drive the valve (see § 0) to a mid-travel position.
4. Electrically operate a counterclockwise rotation and check that the motor rotates in the right direction.
5. Manually press on the counterclockwise travel limit switch, which should stop the motor.
6. Repeat steps 4 and 5 for the clockwise direction.



If any fault is detected at this stage, please check all wiring.

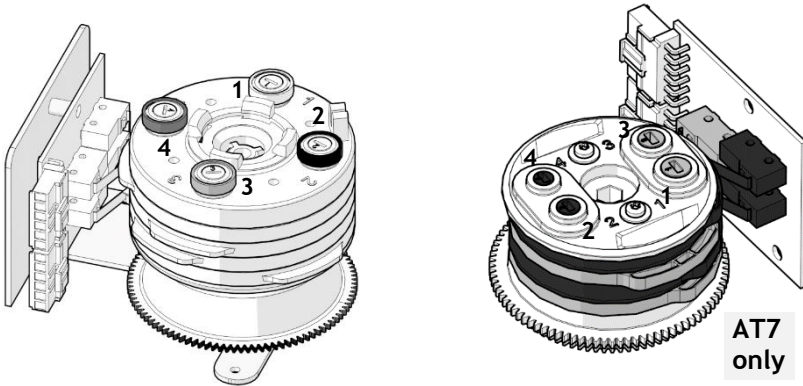
## 5.3 Setting of travel limits

### 5.3.1 Cam-block detail

To stop the movement at end positions, the AT SWITCH actuator features a set of cams integrated as a cam block. Cams trip switches to switch off the power at end positions, or for signaling.

The cam block is made up of 4 cams. Each one has a specific function and trips a specific switch.

Each cam can be calibrated thanks to a screwdriver imprint on the top of the cam block. The correspondence between a cam and its screwdriver imprint can be determined thanks to numbers and colors (see figure opposite).



| Rep. | Color<br>(except AT7) | Function                                     |
|------|-----------------------|----------------------------------------------|
| 1    | White                 | Clockwise (usually CLOSED) travel limit      |
| 2    | Black                 | Counterclockwise (usually OPEN) travel limit |
| 3    | Beige                 | Clockwise signaling                          |
| 4    | Gray                  | Counterclockwise signaling                   |



Except for specific valve configurations:

- **Clockwise** direction generally matches **closing** direction.
- **Counterclockwise** generally matches **opening** direction.

### 5.3.2 How to set the cams

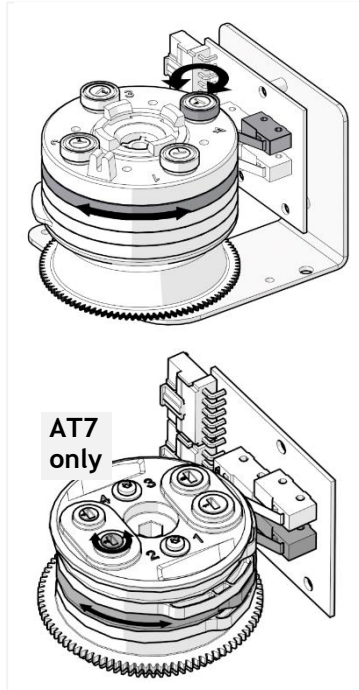


In the case of actuators with a cam block spring (class III), make sure that the actuator has been prepared according to §0.



Make sure that the cam operates the lever in the right direction; otherwise the switch could be damaged.

1. Drive the valve to the **CLOSED** travel limit position.
2. Insert a flat blade screwdriver in the imprint corresponding to the **CLOSED** travel limit switch (2) and push slightly downwards to unlock it.
3. Turn the imprint until you hear a click from the switch. This indicates that it has been tripped by the cam ring.
4. Release the imprint and check that it goes back to its original position.
5. Drive the output slightly in the counterclockwise direction using the manual command.
6. Perform steps 2 to 4 for the clockwise signaling switch (4).
7. Drive the actuator to the **OPEN** travel limit position.
8. Perform steps 2 to 4 for the counterclockwise direction (cams 1 & 3).
9. Perform complete counterclockwise and clockwise electrical operations. The motor should stop when the corresponding cams are reached.



## 5.4 Setting of position indicator (OPTION)

### 5.4.1 AT (except AT7) setting

#### Handling position indication

The position indicator **(A)** can indicate travels from 90° to 300°.

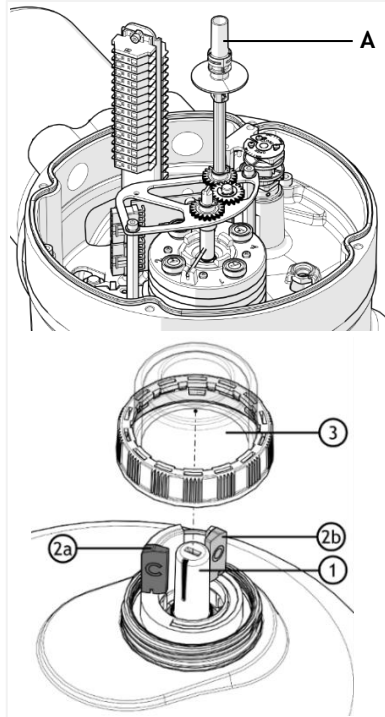
The angle is indicated by 2 markers held by 2 rotating rings:

- **(2a)**: red marker tagged “C” (for CLOSED).
- **(2b)**: green marker tagged “O” (for OPEN).

The position indicator **(1)** features a slit on its side to indicate the current position between CLOSED and OPEN.

It can be turned to be better viewed in operation using the flat blade screwdriver imprint on the top.

The angle between the 2 markers can vary depending on the calibration of travel limits.



#### Opening/Closing position indicator



You do not have to remove the actuator cover to set the indicator.

To open the indicator, unscrew the black ring at the base of the transparent cap of the indicator **(3)** and remove it.

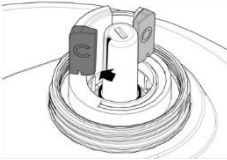
To close the indicator, put back the transparent cap **(3)** on the base of the indicator and screw the black ring on the base.



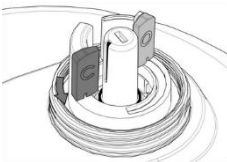
Make sure that the actuator cap is correctly reassembled on its base, otherwise the tightness of the actuator is not guaranteed anymore.

## To set position indicator

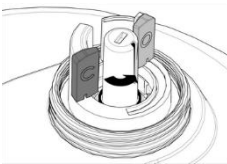
1. Open the indicator.
2. Operate the actuator electrically towards the CLOSED position until it stops on the end position switch.



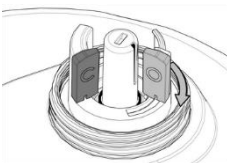
3. Set the position of the position indicator if necessary.
4. Set the red "C" marker in front of the indicator slit.



5. Operate the actuator electrically towards the OPEN position until it stops on the end position switch.



6. Set the green "O" marker in front of the indicator slit.



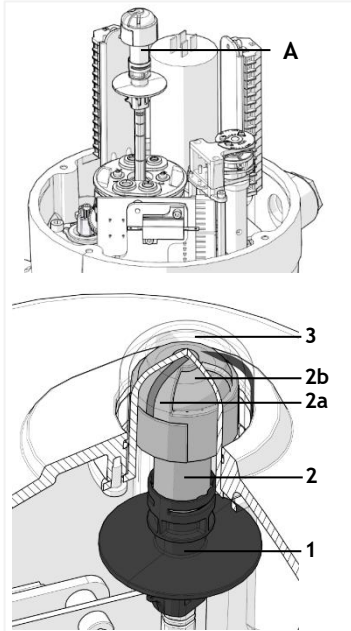
### 5.4.2 AT7 setting

#### Handling position indication

The position indicator (**A**) can indicate travels from 90° to 300°.

It consists in:

- a support (**1**) locked on the rotation axis of the cam block thus reflecting actuator output rotation
- an indicator head (**2**) able to rotate in the support (**1**) and composed of:
  - a external part (**2a**) with a **red mark** indicating **CLOSED position**
  - an internal part (**2b**) with a **green mark** indicating **OPEN position** and independently adjustable in rotation
- a transparent cap (**3**) with a black reference mark indicating the current position, fixed on the cover.



The angle between the 2 marks can vary depending on the setting of travel limits.

#### To set position indicator for AT7

1. Remove the cover as indicated at §5.1 if it is not already.
2. Drive the valve to the CLOSED position.
3. Re-position the cover on the actuator and turn (**2**) to match the red mark with the reference mark of the cap (**3**).
4. Drive the valve to the OPEN position.
5. While holding (**2a**) in position to keep its setting, turn (**2b**) to match the reference mark.
6. Check the settings driving the valve back to CLOSED position then again to the OPEN position. If necessary, resume the incorrect setting.

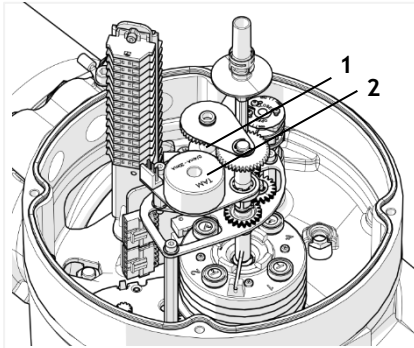
## 5.5 Calibration of position feedback (OPTION)

### 5.5.1 Position feedback board

Two components can be used for position feedback:

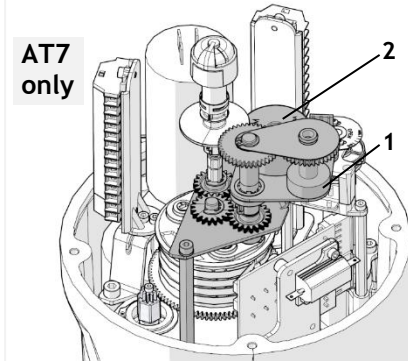
- a potentiometer (1).
- a “TAM” (2), which gives position feedback from a 4-20 mA signal.

The potentiometer can be used alone (**Positioner**) or can be combined with the TAM (**Position transmitter**).



### 5.5.2 Position transmitter (OPTION)

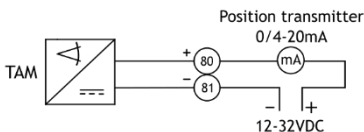
The position transmitter delivers a 4 to 20 mA signal that is linearly proportional to the opening percentage of the valve.



### Electrical connections

To connect the TAM, please refer to the supplied wiring diagram.

A filtered or stabilized power supply should be provided within the 12 to 32 VDC range. The maximum admissible resistances for the wiring are indicated in the following table:



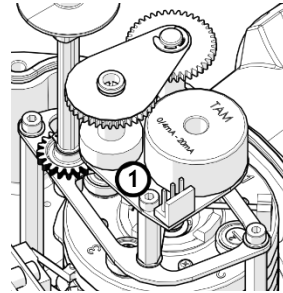
| DC supply (volts) | Max. admissible resistance (ohms) |
|-------------------|-----------------------------------|
| 12                | 150                               |
| 24                | 750                               |
| 32                | 1050                              |

## Signal direction inversion

If the TAM transmitter is fitted on an actuator which closes in the counterclockwise direction, it provides a signal that increases from the closed position to the open position.

If an opposite signal variation is required, simply move 2 jumpers (1) on the board near the potentiometer:

- direct signal: jumpers on 1-3 and 2-4.
- reversed signal: jumpers on 1-2 and 3-4.



## How to calibrate TAM

You must always start by calibrating the 0/4 mA setting.

1. Connect a milliammeter with or without load to read the output current.
2. Drive the actuator to the position corresponding to 0/4 mA. As a standard, it is the position at the end of an operation in the clockwise direction, which is the CLOSED position.
3. While holding the pinion located just under the plate marked "0% position", adjust the potentiometer by turning its screw so that you reach the range where the current is at its minimal value.
4. Turn the screw backwards to find the range where the current starts to regularly increase.
5. Turn again the screw backwards and stop as soon as the minimum value determined at step 3 is reached. The potentiometer is then positioned at the beginning of its track.
6. Precisely adjust the 0/4 mA using the TAM screw marked "0/4mA".
7. Drive the actuator to the position corresponding to 20 mA. As a standard, it is the position at the end of an operation in the counterclockwise direction, which is the OPEN position.
8. Turn the screw marked "20 mA" so that it reads 20 mA on the milliammeter.

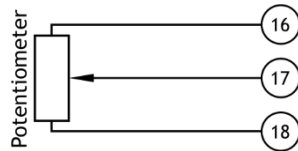
9. Come back to the closed position and check that for the 0% position, the signal current shows a value close to 0/4 mA and repeatable.

## 5.6 Calibration of positioner (OPTION)

The potentiometer used for actuator signal feedback is driven by the position indicator rod.

For clockwise closing:

- The 0% position indicates a closed valve.
- The 100% position indicates an open valve.



The resistance value is measured between terminals 16 and 17.

### How to calibrate potentiometer

You can calibrate the zero of the potentiometer with the **0% position screw**. Use a flat blade screwdriver to turn this screw.

1. Drive the actuator to the **CLOSED** position.
2. Hold the pinion located just under the plate marked with the **0% position** while turning the potentiometer screw.
3. Adjust the potentiometer so that the resistance value exceeds 0 Ohm and regularly increases, then turn backwards to reach the closest value to 0 Ohm.
4. Drive the actuator to the **OPEN** position and write down the resistance value corresponding to the 100% position.
5. Come back to the **CLOSED** position and check that the resistance shows a repeatable near zero value for the 0% position.

### Signal inversion

To change the signal variation direction, invert the potentiometer wires on the terminal block (e.g. for a connection on 16/17/18, invert 16 and 18).

## 5.7 Heating resistance

Each actuator includes a heating resistance.

As soon as the actuator is installed in the field, it is required to supply the resistance to prevent condensation.



- Immediately put the cover back in place after start-up while ensuring its seal is clean. Never leave the electrical components of the actuator without their protective cover.

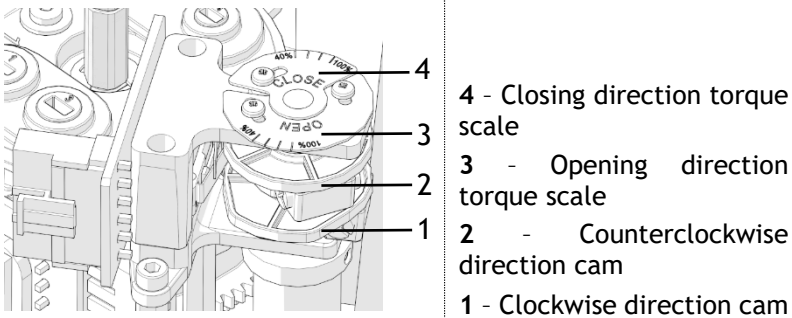
In case of water intrusion:

- Dry the electrical components before putting back the cover.
- Check the electrical insulation.

## 6 TORQUE LIMITING DEVICE

### 6.1 Torque limiter operation

The actuator is protected by a torque limiting device in case of over-torque.



The torque limiter is triggered as cams (1) or (2) trigger their corresponding switches when rotating.

The torque limiter is fitted with 2 scale disks (3) and (4) to adjust the torque limits for both directions. They have torque graduations from 40 to 100% of the maximum torque deliverable by the actuator.



The torque limiter provides a maintained contact.



If the actuator stops in a position which is not the one required, please check that:

- the valve stem is clean and well lubricated.
- the valve stem does not jam in the nut.
- the valve stuffing box is not too tight.

## 6.2 Torque limiter calibration



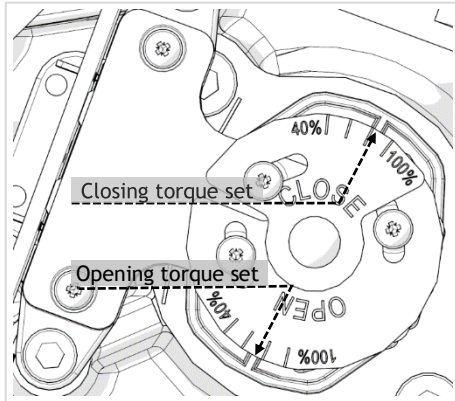
The torque scale sectors are factory-set and are a reference for cam calibration. Do not modify their position or you will not be able to accurately adjust the torque limiter anymore.

Actuators are calibrated and tested in factory according to the torque stated on orders. If no torque is specified, the actuator is supplied with the limiter calibrated to the maximum output torque.

In both cases, the torque limiter can still be adjusted if necessary.

To adjust the torque limits, set the cam's longest rib to match the required percentage of maximum torque

1. For the **closing torque limit**, set the cam's (1) longest rib on the required percentage on the CLOSE scale
2. For the **opening torque limit**, set the cam's (2) longest rib on the required percentage on the OPEN scale



On the opposite figure, the closing torque limit is just upper 80% and the opening torque limit is just below 80%.

### How to adjust a cam

1. Turn the setting screw of the corresponding cam with a flat blade or a Philips screwdriver.



# BERNARD CONTROLS GROUP

## CORPORATE HEADQUARTERS

4 rue d'Arsonval - CS 70091 / 95505 Gonesse CEDEX France

Tel.: +33 (0)1 34 07 71 00 / Fax: +33 (0)1 34 07 71 01

[mail@bernardcontrols.com](mailto:mail@bernardcontrols.com)

## CONTACT BY OPERATING AREAS

### > AMERICA

#### **NORTH AMERICA**

BERNARD CONTROLS UNITED STATES  
HOUSTON

[inquiry.usa@bernardcontrols.com](mailto:inquiry.usa@bernardcontrols.com)  
Tel. +1 281 578 66 66

#### **SOUTH AMERICA**

BERNARD CONTROLS LATIN AMERICA  
[inquiry.southamerica@bernardcontrols.com](mailto:inquiry.southamerica@bernardcontrols.com)  
Tel. +1 281 578 66 66

### > ASIA

#### **CHINA**

BERNARD CONTROLS CHINA &  
BERNARD CONTROLS CHINA NUCLEAR  
BEIJING  
[inquiry.china@bernardcontrols.com](mailto:inquiry.china@bernardcontrols.com)  
Tel. +86 (0) 10 6789 2861

#### **KOREA**

BERNARD CONTROLS KOREA  
SEOUL  
[inquiry.korea@bernardcontrols.com](mailto:inquiry.korea@bernardcontrols.com)  
Tel. +82 2 553 6957

#### **SINGAPORE**

BERNARD CONTROLS SINGAPORE  
SINGAPORE  
[inquiry.singapore@bernardcontrols.com](mailto:inquiry.singapore@bernardcontrols.com)  
Tel. +65 65 654 227

### > EUROPE

#### **BELGIUM**

BERNARD CONTROLS BENELUX  
NIVELLES (BRUSSELS)  
[inquiry.belgium@bernardcontrols.com](mailto:inquiry.belgium@bernardcontrols.com)  
[inquiry.holland@bernardcontrols.com](mailto:inquiry.holland@bernardcontrols.com)  
Tel. +32 (0)2 343 41 22

#### **FRANCE**

BERNARD CONTROLS FRANCE &  
BERNARD CONTROLS NUCLEAR FRANCE  
GONESSE (PARIS)  
[inquiry.france@bernardcontrols.com](mailto:inquiry.france@bernardcontrols.com)  
Tel. +33 (0)1 34 07 71 00

#### **GERMANY**

BERNARD CONTROLS DEUFRA  
TROISDORF (KÖLN)  
[inquiry.germany@bernardcontrols.com](mailto:inquiry.germany@bernardcontrols.com)  
Tel. +49 2241 9834 0

#### **ITALY**

BERNARD CONTROLS ITALIA  
RHO (MILANO)  
[inquiry.italy@bernardcontrols.com](mailto:inquiry.italy@bernardcontrols.com)  
Tel. +39 02 931 85 233

#### **RUSSIA**

BERNARD CONTROLS RUSSIA  
[inquiry.russia@bernardcontrols.com](mailto:inquiry.russia@bernardcontrols.com)  
Tel. +33 (0)1 34 07 71 00

#### **SPAIN**

BERNARD CONTROLS SPAIN  
MADRID  
[inquiry.spain@bernardcontrols.com](mailto:inquiry.spain@bernardcontrols.com)  
Tel. +34 91 30 41 139

### > INDIA, MIDDLE EAST & AFRICA

#### **AFRICA**

BERNARD CONTROLS AFRICA  
ABIDJAN - IVORY COAST  
[inquiry.africa@bernardcontrols.com](mailto:inquiry.africa@bernardcontrols.com)  
Tel. + 225 21 34 07 82

#### **INDIA**

BERNARD CONTROLS INDIA  
[inquiry.india@bernardcontrols.com](mailto:inquiry.india@bernardcontrols.com)  
Tel. +971 4 880 0660

#### **MIDDLE-EAST**

BERNARD CONTROLS MIDDLE-EAST  
DUBAI - U.A.E.  
[inquiry.middleeast@bernardcontrols.com](mailto:inquiry.middleeast@bernardcontrols.com)



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