



**BERNARD®
CONTROLS**

Invest in Confidence



BT SWITCH RANGE



Start Up Guide

SUG_18000 EN - Ind. B
Art : 5100637

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1 SAFETY

This device complies with current applicable safety standards.

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

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

2 PACKAGING, STORAGE AND MAINTENANCE

2.1 Packaging

BT actuators packaging is comprised of a dual-layer carton 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 provided in the contract.

2.2 Storage

Actuators should be stored under a shelter, in a clean and dry place and at a stable ambient temperature.



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

BT actuator includes electrical components and lubricated gear stages. Even with a weatherproof enclosure, oxidation, seizing and other alterations may occur if actuator is not correctly stored.



Heating resistor should be connected to power supply especially if the storage place is wet.

What to check after storage

1. Visually check the electrical equipment.
To open / close the control compartment, see §5.5.1.
2. Manually operate buttons, selectors, etc., to ensure their proper mechanical functionality.
3. Operate the actuator with the handwheel for a few travels.

What to check on pre-installed actuators

If you expect a long period between actuator mounting and electrical wiring:

1. Put desiccant pouches in the actuator or replace the existing ones.
2. Visually check that cable entries and cover are tightly closed.

2.3 Maintenance

All BT actuators feature lifetime lubrication and therefore require no specific maintenance, if they were correctly commissioned and used in conditions foreseen by design.

3 MECHANICAL INSTALLATION

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 handle the actuator by handwheel to avoid damage on actuator gearing.
- cable glands must not be oriented upwards (loss of water tightness).
- It is not recommended to position motor downwards.

4 EMERGENCY MANUAL COMMAND

BT actuators feature a handwheel for emergency operation. This handwheel does not turn during electrical operation.

It features a foldable handle: you can fold it during electrical operation and unfold it if you need to operate the actuator manually.



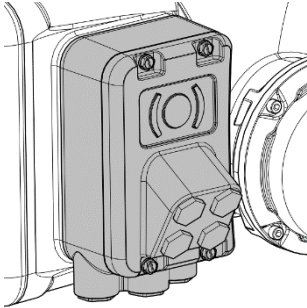
Beware, automatic clutch. Use the Manual Command only when electric motor commands are inactive or local knob on OFF.

5 COMMISSIONING

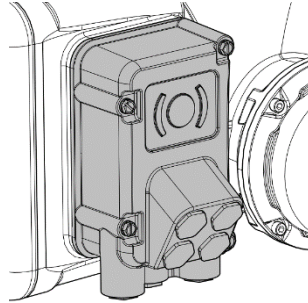
5.1 Opening connection area

According to your need, actuator can be wired:

- On the actuator through the connection compartment
- Using a connector previously wired



Connection compartment



Connector

Both feature 3 cable entries (2×M20 & 1×M25) on their bottom and 4 cable entries (4×M20) on their front.



Do not supply wires with electric power until:

- 1) wiring is finished
- 2) connection compartment is closed or connector is plugged on the actuator.

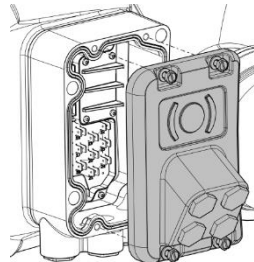
If you need to open connection compartment or connector after wiring, previously cut off power supply to the actuator.

5.1.1 Opening connection compartment

In order to access connections, you need to open connection compartment.

How to open connection compartment

1. Using a 10mm open end wrench or 10×1.5mm flat blade screwdriver, unscrew the 4 Hex head screws fastening cover on the housing.
2. Remove the cover.

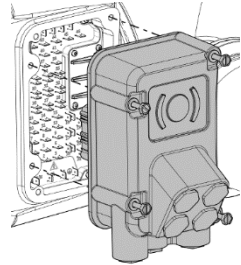


5.1.2 Opening connector

As the wiring is done inside the connector, you have first to remove the connector, then open it.

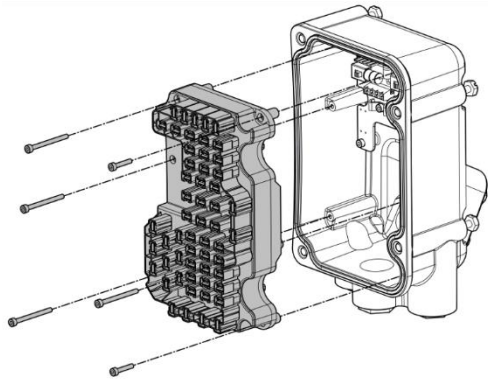
How to remove connector

1. Using a 10mm open end wrench or 10×1.5mm flat blade screwdriver, unscrew the 4 Hex head screws fastening cover on the housing.
2. Pull the connector out of the housing.



How to open connector

1. Using the 2.5mm Allen key, unscrew the 6 screws fixing the terminal plate on the connector body.
2. Remove the terminal plate.

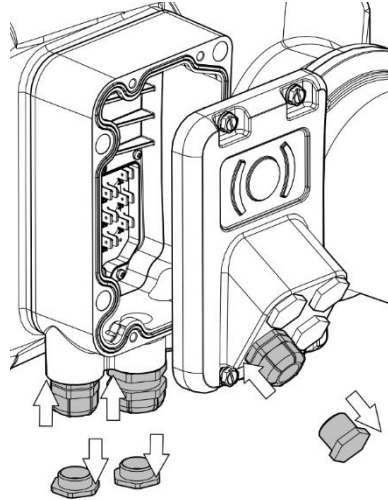


5.2 Installing cable glands

How to install cable glands

For each cable entry used

1. Remove plug from the cable entry with 24mm (M20 entry) or 32mm (M25 entry) open-end wrench.
2. Separate sealing nut from its cable gland.
3. Screw and tighten cable gland in the cable entry.
4. Thread the sealing nut on the cable and pass the cable through the cable gland.



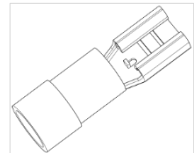
Unused entries must be kept closed by their plugs as they are part of the components allowing actuator IP68 protection setting.

5.3 Wiring motor and control cables

Crimping the wires

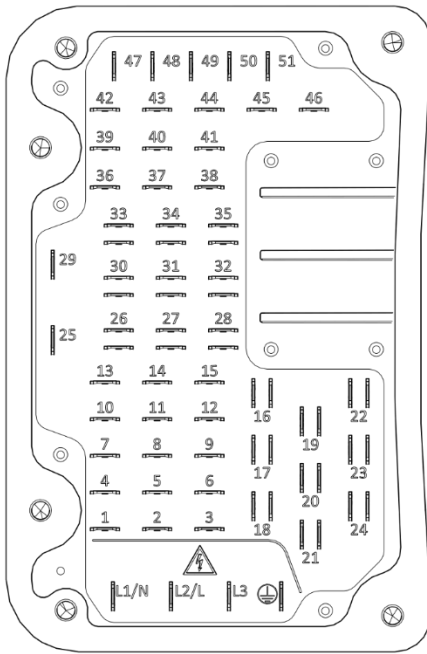
Terminal plate is fitted with tab terminals, compatible with 6.35mm crimp receptacle lugs with insulated funnel.

These lugs allow wire section up to 6 mm².



- ➔ Once cables are installed in the cable glands, crimp end of every wire to be connected with a lug.

Terminal plate



Control terminals

They are numbered from 1 to 51.

16 to 24, 26 to 28 and 30 to 35 have 2 tabs in order to create shunts between terminals if needed.

Motor terminals (3Ph/1Ph)

To get default clockwise rotation, wire cables in the L1, L2, L3 direct order.

To reverse default rotation, reverse:

- for 3Ph, any couple taken from L1, L2, L3
- for 1Ph, L1 & L3



Both motor thermal protection, torque limit switches, heating resistor must be connected to your control system in order to prevent potential damage to the actuator or valve.

How to wire actuator

The wiring must be done according to the wiring diagram of your actuator.

1. Make sure that power supply voltage matches information on the label on the side of the actuator.
2. Connect motor power supply wires on terminals marked L1, L2 & L3 according to your wiring diagram.
3. Fix the ground cable on the ground terminal.
4. Connect control and signaling wires on terminals 1-51.



5. Tighten sealing nut on the cable gland when you have finished wiring.
6. Ensure whole cable glands are correctly tightened.

5.4 Checking direction of rotation of motor



A motor rotating in the wrong direction can damage the actuator.

How to check correct motor direction of rotation

1. Check that the valve is at an intermediate position.
2. If not, bring it to this intermediate position using the handwheel.
3. Power the actuator and send an electrical command.
4. Watch the direction of movement of the position indicator and check that this movement is consistent with the command sent.



If the direction is wrong, switch off the power from the actuator.

Do not handle the wires under power.

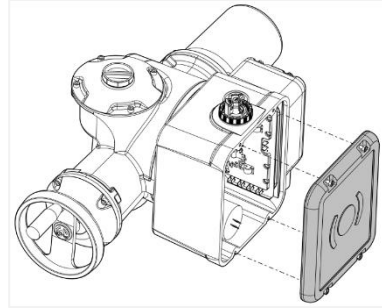
5. Switch off power supply of the actuator.
6. Open the connection compartment according to §5.5.1.
7. Switch 2 phase wires according to motor type as indicated in §5.3.
8. Switch the power on to the actuator and send a command again to assess correct direction of rotation of the actuator.
9. Re-assemble the cover following the re-assembly procedure at §5.5.1.

5.5 Opening control compartment

5.5.1 Opening control compartment

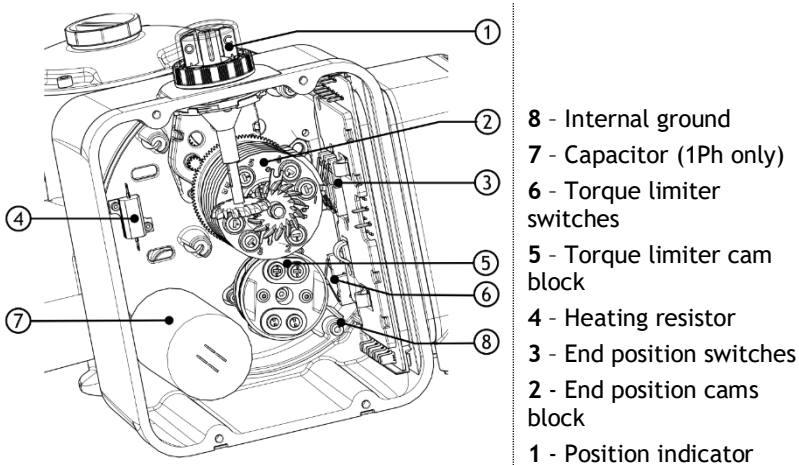
How to open control compartment

1. With 10mm angled socket wrench or flat blade screwdriver, untighten the 4 screws.
2. At the first opening, push and slightly turn the cover on itself.
3. Remove the cover.



5.5.2 Control components (with cover open)

Following drawing shows most of the components you can find in the actuator.

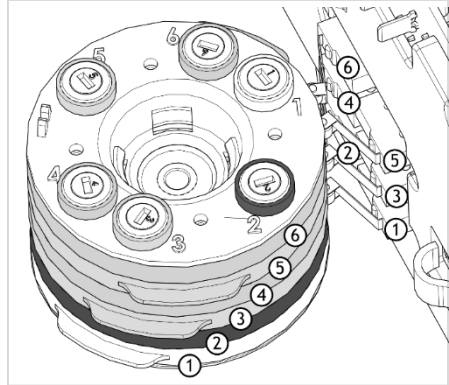


5.5.3 Cams block detail

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

Cams block is composed of 4 to 6 cams, which has a specific function and trips a specific switch.

Each cam can be set with its screwdriver imprints on the top of the cam block, identified by the number of the cam and a ring of the color of the cam.



Rep.	Color	Function
1	White	Counter-clockwise (OPEN) travel limit
2	Black	Clockwise (CLOSED) travel limit
3 & 5	Beige	Counter-clockwise signaling
4 & 6	Gray	Clockwise signaling



Except for specific valve configuration:

- clockwise direction generally matches **closing** direction
- counter-clockwise generally matches **opening** direction



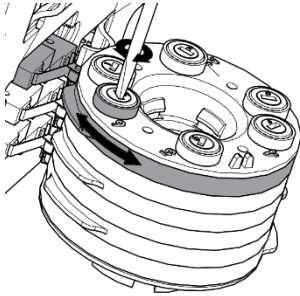
5.6 Setting travel limits

How to adjust a single cam



Make sure that cams get to the switch lever according to its inclination direction, otherwise you could damage the switch.

At the desired position of the actuator output:



- 1) Turn the setting screw of the corresponding cam with a flat blade screwdriver.

The cam ring is then turning.

- 2) Set the cam ring until you hear a click from the switch. It indicates the switch is tripped.

The actuator stops on open or closed position when corresponding travel limit switch is tripped by its cam.

How to adjust cams for both directions

1. Drive the valve to the **CLOSED** travel limit position.
2. Set the cam corresponding to **CLOSED** travel limit switch (2).
3. Drive the output slightly in the counter-clockwise direction using manual override.
4. Set the cam corresponding to clockwise signaling switch (4).
5. Resume steps 3 & 4 for a 2nd clockwise signaling cam (6) if present.
6. Drive the actuator to the **OPEN** travel limit position.
7. Resume settings steps 2 to 5 for counter-clockwise direction (cams 1, 3, & 5 if present).
8. Perform complete valve counter-clockwise and clockwise electrical operations.
The motor should stop when the corresponding cams are reached.

5.7 Wiring and setting position feedback (OPTION)

Two components can be used for position feedback:

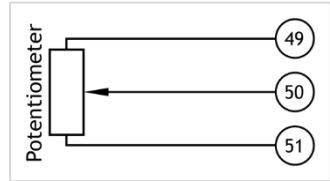
- a potentiometer
- a position transmitter recopying position to a 4-20 mA signal

5.7.1 Wiring and setting potentiometer

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

For clockwise closing:

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



Resistance value is measured between **49** and **50** terminals.

Signal inversion

To change the signal variation direction, invert potentiometer wires on the terminal block (e.g. for a connection on 49/50/51, invert 49 and 51).

How to set potentiometer

You can set 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.

5.7.2 Wiring and setting position transmitter 4-20 mA

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

Electrical connections

To connect position transmitter, refer to the wiring diagram supplied. Filtered or stabilized power supply should be provided within the 12 to 32 VDC range. Maximum admissible resistance for the wiring are given 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 a counter-clockwise closing actuator, it provides a signal that rises from closed to open positions.

If an opposite signal variation is required, simply move 2 jumpers 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 set position transmitter

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



This settings must be done using actuator electrical operation.

1. Connect a milliamperimeter to read the output current.
2. Drive actuator to the position corresponding to the 0/4 mA. As a standard, it is the position at the end of operation in clockwise direction, which is **CLOSED** position.
3. While holding the pinion located just under the plate marked «0% position», adjust the potentiometer 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 pt. 3 is reached. The potentiometer is then positioned at the beginning of its track.
6. Precisely adjust the 0/4mA using the position transmitter screw marked “0/4mA”.
7. Drive the actuator to the position corresponding to the 20 mA. As a standard, it is the position at the end of operation in counter-clockwise direction, which is **OPEN** position.
8. Turn the screw marked “20mA” in order to read exactly 20 mA on the milliamperimeter.
9. Come back to the **CLOSED** position and check that for 0% position, the signal current shows a close to 0/4 mA and repeatable value.

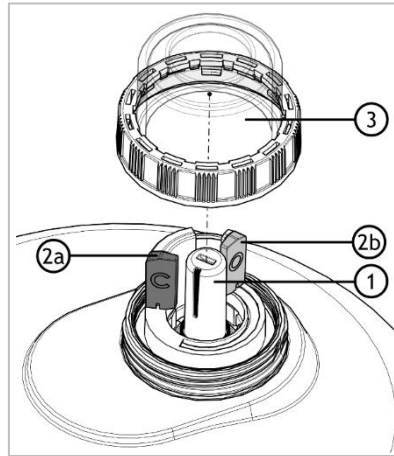
5.8 Position indicator

5.8.1 Handling position indication

Position indication can indicate travels from 90° to 300°. Angle sector (gray arrow) is marked out by 2 markers hold on 2 rotating rings: (2a) red tagged “C” (**CLOSED**) and (2b) green marker tagged “O” (**OPEN**).

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

It can be turned to be better viewed in operation using flat blade screwdriver shape on its top. The angle sector can follow and be set according to position indicator.



5.8.2 Opening / Closing position indicator



You do not have to open the control compartment to set the indicator.

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

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

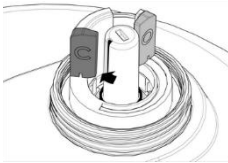


Make sure that the actuator cap is correctly reassembled on its base, otherwise actuator tightness is not guaranteed anymore.

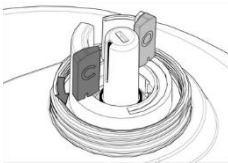
5.8.3 Setting indicator

To set position indicator

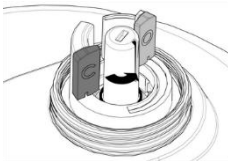
1. Open indicator as shown at §5.8.2.
2. Operate the actuator electrically towards **CLOSED** position until it stops on end position switch.



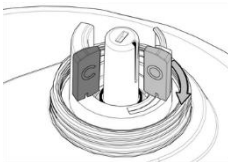
3. Set the position indicator position if necessary.
4. Set the “C” marker in front of the indicator slit.



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



6. Set the “O” marker in front of the indicator slit.



5.8.4 Changing closing direction indication

As a standard, BT actuator is configured to close clockwise. If the actuator must close counter-clockwise, you can modify opening and closing set orientation of the position indicator.

To change closing direction indication

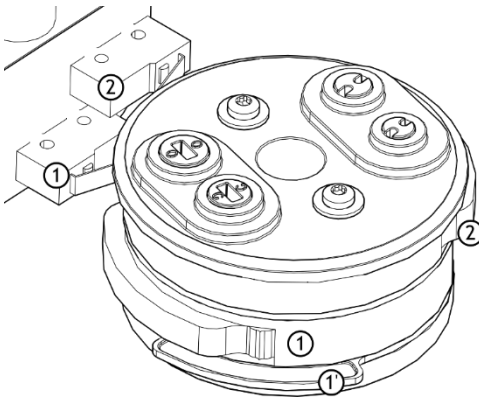
1. Open the indicator.
2. Remove and switch the red marker tagged “C” (CLOSE) with the green marker tagged “O” (OPEN).
3. Close the indicator.



5.9 Torque limiter

5.9.1 Torque limiter operation

The actuator is protected by a torque limiting device in case of over-torque. This torque limiter consists in a cams block triggering a switch.



2' - Counter-clockwise
direction torque scale

2 - Counter-clockwise
direction cam

1' - Clockwise direction
torque scale

1 - Clockwise direction
cam

Torque limiter is triggered as (1) or (2) cams trip their corresponding switches (1) or (2) when rotating.

Torque limiter is fitted with 2 scale rings (1') and (2') to adjust torque limit for both directions. They have torque graduations in percentage of the maximum torque deliverable by the actuator.



Torque limiter provides a maintained contact (except 127 and 180 rpm models for BT25 & BT50).



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

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

5.9.2 Setting torque limiter



Torque scale sectors are factory-set and are a reference for cams setting.

Do not modify their position or you will not be able to accurately adjust torque limiter anymore what could cause actuator to malfunction and damages to actuator and valve.

Actuators are set and tested in factory according to torque values stated by valve maker. If no torque is specified, the actuator is supplied with limiter set to the maximum output torque.

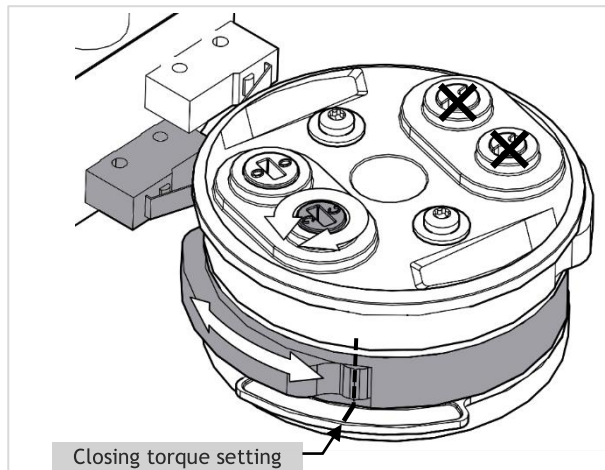
In both of these cases, torque limiter can still be adjusted if necessary.

To adjust torque limits, set cams to match the desired percentage of maximum torque



To set torque limiter, use **C** and **O** marked screwdriver imprints only.

1. For **closing torque limit**, set cam (1) mark on the percentage desired on the scale (1'), using the screwdriver imprint **C** marked on the top of cams block.



2. For **opening torque limit**, set cam (2) mark on the percentage desired on the scale (2') using the screwdriver imprint marked **O** on the top of cams block.

5.10 Heating resistor

Each actuator includes a heating resistor.

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



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

In case of water intrusion:

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

5.11 Closing control compartment

How to close control compartment

1. Position the cover with the screws in front of corresponding tappings.
2. Retighten the 4 screws on the housing.

5.12 Closing connection areas



Check that seal is clean and well inserted in its housing.

How to close connection compartment

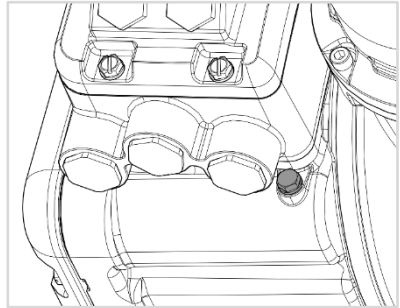
1. Put back the cover on connection compartment or plug back the connector on the actuator
2. With 10mm angled socket wrench or flat blade screwdriver, tighten the cover on the housing with its 4 screws.

5.13 Wiring the external ground

The external ground is located at the bottom right of the actuator connection area.

How to plug external ground

1. Crimp the end of the earth cable with a 6mm stud hole tubular lug.
2. Thread the spring lock washer then the lug on the 6 mm screw.
3. Screw this assembly in the tapered hole with a 10mm eye wrench or open-end wrench.



6 OPERATION TESTS

This test allows to check operation when the actuator stops on a position.

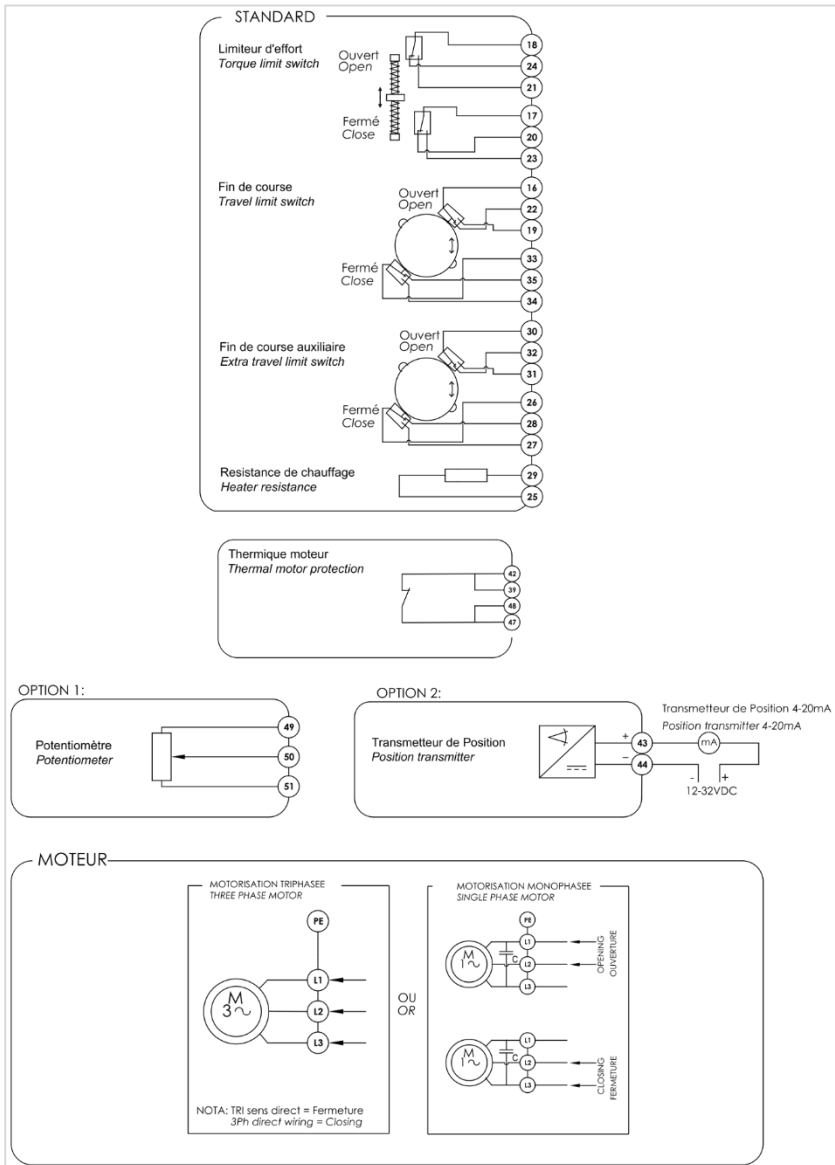
How to check operation

1. Using the handwheel, bring the valve at the middle of its travel.
2. Send an opening command.
3. Check that:
 - a. Opening auxiliary functions (e.g. signaling) are triggered first
 - b. The actuator stops at the **OPEN** end position.
4. Send a closing command.
5. Check that:
 - a. Closing auxiliary functions (e.g. signaling) are triggered
 - b. The actuator stops at the **CLOSED** end position.



In case of an issue on one of these tests, check cams settings.

Appendix - Standard wiring diagram



This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

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