centork
VALVE CONTROL

Multi-turn pneumatic actuator
4P0 and 4P1 SERIES

Installation and maintenance
User manual

THIS USER MANUAL HAS BEEN DEVELOPED FOR centork MULTI-TURN PNEUMATIC ACTUATORS 4P0 and 4P1 SERIES

⚠ CAUTION

centork multi-turn pneumatic actuators are high value devices. In order to prevent damage in their handling, setting and use it is essential to follow and observe all the points in this user manual, operate under actuators' designated use, and observe health and safety rules, standards and directives, as other national regulations as well.

centork multi-turn pneumatic actuators must be handled with care and caution.

IMPORTANT NOTE

The contents in this manual are subject to change due to the quality improvement without individual notice.

INDEX

1. CENTORK MULTI-TURN PNEUMATIC ACTUATORS: INTRODUCTION

Designated used of the actuator

The multi-turn pneumatic actuator is a device designed to be coupled to a general-purpose industrial valve, to carry out its movement. The movement is stopped by limit switching or by torque (thrust) switching.

The multi-turn pneumatic actuators are operated by mean of a lubricated rotary air motor, vane type.

Pneumatic air motors

Vane air motors offer a unique form of drive and incorporate advantages not found in other prime movers.

- ✓ Air motors stop and start almost instantly and provide extremely variable torque and speed without complicated controls. Simple and inexpensive variable speed and torque control with a flow control valve and/or pressure regulator. Controllable over a wide speed range.
- ✓ They can operate in hot, corrosive, and wet environments without damage, and are unaffected by continuous stalling or overload. In addition, they are instantly reversible and, unlike electric motors, run cool and start without shock, meaning there is no heat build-up and no electric sparks to damage the motor.
- ✓ Because they are cooled constantly by injected air, air motors will generally not overheat even at high speed. This fact, in conjunction with the fact that they cannot burn out and do not produce electric sparks, means that air motors have long been a popular choice in environments where there is a danger of explosion. And, while explosion-proof electric motors are available, they are both considerably larger and more expensive than their air motor equivalents.
- ✓ An air motor slows down when load increases. Its torque increases at the same time until it matches the load. The air motor continues to provide increased torque until it stalls, then maintains the stalled condition without harming the motor. As the load is reduced, an air motor increases speed and the torque decreases to match the reduced load. When the load is either increased or decreased, speed can be controlled by increasing or decreasing air pressure.
- ✓ Stored energy in the form of compressed air, enters the sealed motor chamber and exerts pressure against the vanes of a rotor. The rotating element is a slotted rotor mounted on a drive shaft. Each slot of the rotor is fitted with a freely sliding rectangular vane. The vanes are extended to the housing walls using springs, cam action, or air pressure, depending on the motor design. Air is pumped through the motor input, which pushes on the vanes creating the rotational motion of the central shaft.
- ✓ Vane air motors are the most widely used design of air motors. They are available in abroad range of power and can operate in any position. Offering a lighter and more compact motor solution when compared with piston air motor of similar power.

The control valves, filters, lubricators, air pressure regulators, flow control valves are NOT CENTORK scope of supply, as standard.

Other applications should be consulted CENTORK before. CENTORK is not liable for any possible damages resulting from use in other than designated applications. Such risk lies entirely on the user.

2. SAFETY INSTRUCTIONS

The scope of this manual is to enable a competent user to install, operate, adjust and inspect a CENTORK electric actuator. These instructions must be observed, otherwise a safe operation of the actuator in no longer warrantee. **A negligence handling might cause severe damages to valves, people, and actuator as well.**

When handling electric equipment, the health and safety standards (EN 60.204, 73/23/EEC directives) and any other national legislation applicable must be observed.

Works on the multi-turn pneumatic actuator and its control system or equipment must only be carried out by a skilled and qualified technician himself or by specially instructed personnel, in accordance with the applicable electrical engineering rules, health and safety Directives and any other national legislation applicable.

A negligence handling might cause severe damages to valves, people, and actuator as well. Under no circumstances should any modification or alteration be carried out on the actuator as this could very well invalidate the conditions which the device was designed.

Do not use combustible gases to drive this motor. Air motors have not been designed for withstanding an internal explosion.

Wear eye protections: Air stream from product may contain solid or liquid materials that can result in eye or skin damage.

Wear hearing protection. Sound level from motor may exceed 85 db(A).

Do not stay in line with the air stream. Connect the sound absorber on the exhaust air port or valve connection.

Do not use higher pressures than those recommended for your model. Refer to proper datasheet or contact to CENTORK for any additional clarification. Also, damage will occur if the product is driven at higher speeds that those recommended, as well. Do not run the motor at high speeds with no load. This will result in excessive internal heat that may cause motor damage.

3. TRANSPORT AND STORAGE

3.1 Transport

- **CENTORK multi-turn pneumatic actuators must be transported in sturdy packing**. During transport measures should be adopt in order to prevent impacts, hits. CENTORK delivers its actuators ex-work.
- **For transport purposes, handwheels are supplied separately.**
- **Hits or impacts against wall, surfaces or objects might cause severe damage on Multi-turn pneumatic actuator**. In these cases, after such events, a technical inspection must be done by CENTORK technicians.
- **Do not attach to the handwheel ropes or hooks to lift by hoist.**
- The valve-actuator unit cannot be lifted/manipulated employing any lifting point of the actuator; Actuator has been designed and sized in order to motorize industrial valves, and withstand the forces and torque required.
- **Covers have to be properly closed (Tight) and sealed. Cable entries on electrical connection cover must be sealed. Protection plug supplied by CENTORK are only adequate for storing in dry and ventilated places, for short period of time. In other conditions protection plug must be replaced with metallic plug sealed with PTFE tape.**
- **Motor air ports are protected by mean of sealed plugs, keep them for future maintenance and storage. Do not use thread tape to seal pipe/motor threads.**
- Each Actuator is delivered with a set of technical documentation (User manual, datasheet, diagrams…), which has to be carefully stored.

3.2 Storage and commissioning

Despite of their high degree of protection (IP67 as standard, and IP68 optional) condensation – presence of water- can occur inside the multi-turn pneumatic actuators by incorrect and negligent handling of the actuators. This may damage sensitive internal parts during the storage. This problem can be avoided by observing the following points.

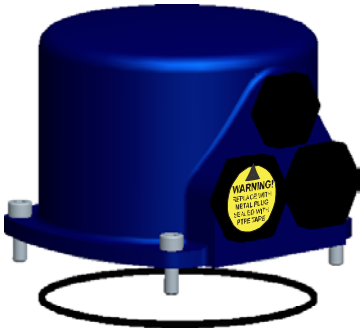
3.2.1 Commissioning

- Verify the actuator to insure correct model number, torque, operating speed, options and special components, enclosure type, and the actuator control before installation or use. It is important to verify that the actuator is appropriate for the requirements of the valve and the intended application. If there is any discrepancy, please contact with your local distributor, or CENTORK, to solve that discrepancy. Once the multi-turn pneumatic actuator has been set up, CENTORK decline any responsibility related to discrepancies.
- Check (Visual inspection) in order to detect possible damages caused during transport or storage. **Checking should include a visual inspection of electric compartment, and switching and signalling unit compartment.**
- Check that the painting work of the actuator is not been damaged. Retouch it when damaged.
- Check that electrical connection cover and switching and signalling unit cover and are correctly closed ant tight. Cable entries on electrical connection cover must be sealed. Protection plug supplied by CENTORK are only adequate for storing in dry and ventilated places, for short period of time. In other conditions **protection plug must be replaced with metallic plug sealed with PTFE tape.**
- **Check that motor air ports are protected and sealed by mean of plugs.**
- Each Actuator is delivered with a set of technical documentation (User manual, datasheet, diagrams…), which has to be carefully stored.
- If damages like shocks, cracks, hits or others due to an improper handling, or humidity inside the equipment due to improper storage appear, contact CENTORK or your nearest distributor.
- When proceed (Optional elements), check that all external accessories such as relief valves or gauges are attached and are not damaged before operating product.

3.2.2 Storage

- **Store in a clean, cool, dry and ventilated place. Protect against humidity from the floor. Use pallets, wooden frames, cage boxes or shelves.**
- Check that electrical connection cover and switching and signalling unit cover and are correctly closed ant tight.
- Cable entries on electrical connection cover must be sealed. Protection plug supplied by CENTORK are only adequate for storing in dry and ventilated places, for short period of time. **In other conditions protection plug must be replaced with metallic plug sealed with PTFE tape.**

- Do not store the actuator directly on the ground!
- Cover it to protect it from dust and dirt. Cover the machined parts with suitable protection against corrosion. Do not employ plastic bags, as they can cause condensation.
- Each Actuator is delivered with a set of technical documentation (User manual, datasheet, diagrams…), which has to be carefully stored.
- Use clean, dry air to remove condensation. Lubricate motor with a small amount of oil in chamber. Rotate shaft by hand several times.

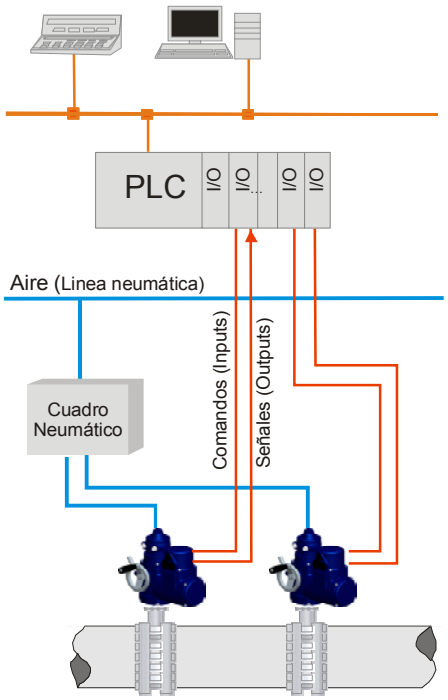


For other storage conditions or, and long time periods (More than 5 months) contact to manufacturer.

4. CONDITIONS OF SERVICE FOR PNEUMATIC ACTUATORS

4.1 Multi-turn pneumatic actuator: Main description and purpose

- Multi-turn pneumatic actuator is an apparatus or device formed by an electric motor, coupled to a main gearbox unit, which transmits motion and torque to valves.
- The multi-turn pneumatic actuators are operated by mean of a lubricated rotary air motor, vane type. Stored energy in the form of compressed air, enters the sealed motor chamber and exerts pressure against the vanes of a rotor. The rotating element is a slotted rotor mounted on a drive shaft. Each slot of the rotor is fitted with a freely sliding rectangular vane.
- The control valves, filters, lubricators, air pressure regulators, flow control valves are NOT CENTORK scope of supply, as standard.
- A switching and signalling unit, inside of the multi-turn pneumatic actuator, allows providing torque and limit switching operation. **Limit and torque switches must be included on the Electric manoeuvre in order to prevent overloads on valve and actuator which might cause a fatal damage on valve and actuator.**
- Multi-turn pneumatic actuator must be controlled by a external pneumatic control cabinet with all elements needed (Control valves, filters, lubricators, air pressure regulators…), designed according to actuator technical features.



- Multi-turn pneumatic actuators are provided with a declutchable manual override system in order to operate manually in case of emergency or fail of power supply.
- Multi-turn pneumatic actuator can be coupled directly to valve, or maybe, through gearbox units (Bevel, spur and worm gearboxes).

The multi-turn pneumatic actuator is a device designed to be coupled to a general-purpose industrial valve, to carry out its movement. The movement is stopped by limit switching or by torque (thrust) switching. Other applications should be consulted CENTORK before. **CENTORK is not liable for any possible damages resulting from use in other than designated applications. Such risk lies entirely on the user.**

4.2 Application

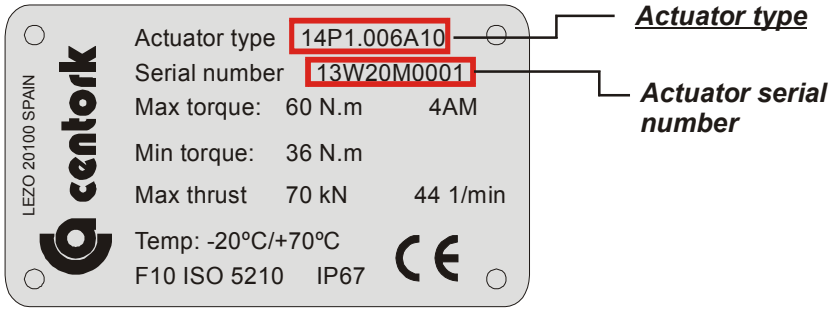
The multi-turn pneumatic actuator is a device designed to be coupled to a general-purpose industrial valve, to carry out its movement. The movement is stopped by limit switching or by torque (thrust) switching. Other applications should be consulted CENTORK before. CENTORK is not liable for any possible damages resulting from use in other than designated applications. Such risk lies entirely on the user.

CENTORK multi-turn pneumatic actuators have been designed for valve actuation.

The scope of the present user manual instructions is for standard version, CLOCKWISE-to-CLOSE sense of rotation. **A correct operation cannot be warranty in case of different sense of rotation valve/actuator. For counter-clockwise valves, consult CENTORK.**

4.3 Actuator identification

The actuator serial number allows defining and identifying all actuator data. It will be required for any consult concerning to the multi-turn pneumatic actuator.



4.4 Temperature range

CENTORK Multi-turn pneumatic actuators work in a temperature range from -20ºC to +70ºC.

4.5 Actuator and motor duty service

Multi-turn pneumatic actuator has been designed for valve motorization, which requires ON-OFF and inching (Modulating) duty service. Air motors are unaffected by continuous stalling or overload. In addition, they are instantly reversible and run cool and start without shock. To insure optimal working conditions for the vane air motors, the air supply must be dry, filtered and lubricated.

- *ON-OFF duty service*: Multi-turn pneumatic actuator has been designed as S2-30 min duty cycle at nominal torque, according to IEC standards: Nominal torque is rated to 50% of max tripping torque (100%), value marked on actuator nameplates. Higher nominal torques can reduce the actuator's service life.
- *Inching or modulating duty service*: Multi-turn pneumatic actuator has been designed as S4-100%, Nominal torque is rated to 50% of max tripping torque (100%), value marked on actuator nameplates. Higher nominal torques can reduce the actuator's service life.

4.6 Air motor: Pressure, flow. Torque and speed control

4.6.1 Working pressure

The vane type air motor has been designed for 3 to 7 barg air pressure range. Lower than 3 barg, the motor performance drops. For each model CENTORK has its motor technical graphs (torque-speed-air consumption), consult CENTORK for any additional information.

Air line restrictions on the inlet side of the motor will result in performance loss. Therefore it is important to make sure that the desired air pressure is available at the motor during operation. The pressure reading at the compressor or pressure regulator may be different then the pressure available at the motor

4.6.2 Air flow

Air supply, directional control valve and pressure regulator should be selected based upon the air consumption of the motor.

Air lines connected to motor should be the same size or the next size larger than the inlet port for efficient output and speed control. Use the proper sized fasteners. For the most efficient output and control of speed, use air lines that are the same size as the motor inlet port if the connection is less than 2 meters. For longer connections, use the next pipe size larger than the motor intake port. Connect lines to motor in the proper direction.

Performance loss can also occur by an exhaust restriction generating back pressure on the outlet side of the motor. An insufficiently sized silencer, valve or coupling is usually the cause. Clean the compressed air connection with low pressure air to remove any dirt from the line before connecting to the ports.

4.6.3 Air quality

To insure optimal working conditions for the vane air motors, the air supply must be dry, filtered and lubricated. An automatic air line lubricator should be installed in the air line as close as possible and no more than 1/2 meter from the air motor. Install the lubricator level with or above the air motor so that the oil mist will blow directly into or fall down into the motor.

Install a 5-micron filter in the air line before the connection to the motor. Next install an air pressure regulator to control motor speed and torque. The vane air motors should be lubricated sufficiently. Oil-less operations are possible in certain applications.

Recommended oil: **Gast AD220** or **SAE 10W** high detergent or non-detergent motor oil.

Do not overfeed oil or exhaust air may become contaminated.

Excessive moisture in air line may cause rust or ice to form in the muffler when air expands as it passes through the motor. Install a moisture separator in the air line and an after cooler between compressor and air receiver to help prevent moisture problems.

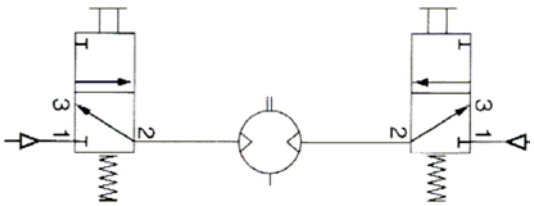
Fill the oil reservoir to the correct level. Check and maintain correct oil frequently.

Connect the sound absorber on the exhaust air port or valve connection.

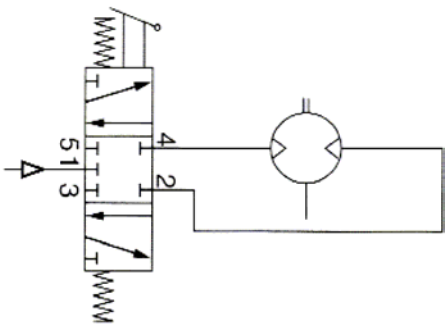
	Motor model		
	0.18TN4P	**0.37TN4P**	**0.55TN4P**
Ports (inlet)	2x1/4NPT	2x1/2NPT	2x1/2NPT
Continous operation	1 drop/min	1 drop/min	1 drop/min
Intermitent operation	1 drop/min each 1.5m³	1 drop/min each 1.5m³	1 drop/min each 1.5m³

4.7 Control valves

The CENTORK vane air motors can be used both as a uni-directional and as a bi-directional air motor. For the reversible motor you can use either a 5/3 or two 3/2 valve to gain directional control.



Bi-directional motor with two 3/2 valves



Bi-directional motor with 5/3 valve.

Directional control valve and pressure regulator should be selected based upon the air consumption of the motor, and Ex protection mode type, and the requirements for the Ex area classification.

As standard, control valves are not included in the CENTORK scope of supply. Consult CENTORK.

4.8 Air fluid

The air supply must be dry, filtered and lubricated.

Gast Air Motors can be driven with Nitrogen instead of air, just ensure adequate ventilation.

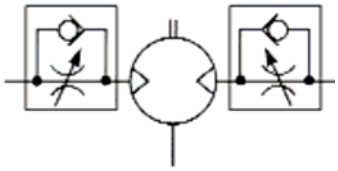
Do not use combustible gases to drive this motor.

4.9 Air motor control

Controlling the speed and torque of an air motor is achieved by regulating the air supply; a relatively cheap and simple operation. Two methods are available, throttling and pressure regulation.

4.9.1 Throttling

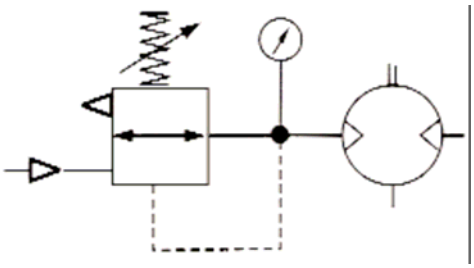
The air flow is controlled by placing a flow control valve at the inlet port or the outlet port of the air motor. Throttling will reduce the maximum speed of the motor but will not affect the starting performance; the air pressure is unaffected at low flow conditions i.e. starting. Note the difference in the graph between throttling on the inlet port and outlet port.



Inlet throttling, bi-directional motor.

4.9.2 Pressure regulator

The speed and power can also be reduced by installing a pressure regulator on the incoming air supply. The pressure regulator reduces the air pressure to the motor. A pressure regulator is always fitted on the inlet port. By using a pressure regulator the torque on the output shaft will be affected, starting torque is best controlled with this method.



Pressure regulation, uni-directional motor.

When both the speed and the torque are to be controlled the best configuration is to use a pressure regulator in the line to the motor and a flow control valve on the outlet port. This way every point in the torque-speed graph can be set accurately.

4.10 IP protection degree

- CENTORK Multi-turn pneumatic actuators are designed in their standard version with IP67 (acc. EN 60.529) environmental protection although IP68 protection may be supplied on request. **IP67 and IP68 protection degree is only guarantee employing proper protection plug and cable gland (For cable entries**), according to IP degree (See chapter ELECTRIC CONNNECTIONS). It is necessary to observe storing and maintenance rules written on TRANSPORT AND STORAGE chapter as well.

4.11 Painting and protection against corrosion

- CENTORK has designed three protection degrees: Standard protection, P1 and P2. For technical details, consult CENTORK.
- CENTORK standard protection: Multi-turn pneumatic actuator are coated with an epoxy- two components primer (Film thickness depends on protection class selected, actuators are coated with intermediates primers) followed by a polyurethane component paint coat. The standard colour is blue RAL 5.003. Other colours are possible (Option). Other film thickness under request.

5. PNEUMATIC CONNECTIONS

The air vane motor has 2 inlet ports. Those inlet ports of CENTORK actuators shipped are protected by mean of plugs. Remove the plastic port plugs, retain if you likely to decommission and store the product in the future.

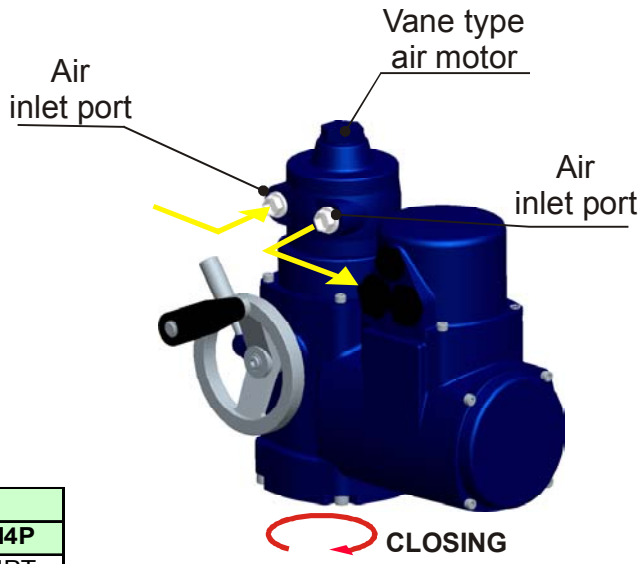
The inlet port size depends on actuator model. Motor model is defined and indicated on actuator technical datasheets delivered with the actuator.

For the most efficient output and control of speed, use air lines that are the same size as the motor inlet port if the connection is less than 2 meters.

Clean the compressed air connection with low pressure air to remove any dirt from the line before connecting to the ports.

Do not use thread tape to seal pipe/motor threads. Use only the proper pipe sealant on the thread.

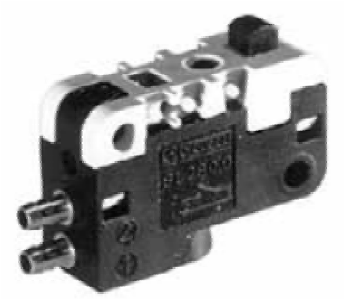
Inlet air ports: The actuator sense of rotation depends on inlet port connection. Verify the proper connection.



	Motor model		
	0.18TN4P	**0.37TN4P**	**0.55TN4P**
Inlet ports	2x1/4NPT	2x1/2NPT	2x1/2NPT

Pneumatic microswitches

For 4P0 and 4P1 multi-turn pneumatic actuators fitted with SPDT pneumatic microswitches (open and close, limit and torque) connection, use **Barb connection for semi-rigid tubing PNE016 de 2,7 x 4**



6. MOUNTING TO THE VALVE

6.1 Pre-Installation Inspection

- Verify the actuators nameplate to insure correct model number, torque, operating speed, voltage and enclosure type before installation or use.
- It is important to verify that the output torque of the actuator is appropriate for the torque requirements of the valve and that the actuator duty cycle is appropriate of the intended application

6.2 Output size

Check whether actuator output flange suits the flange of the valve to be driven. The latter should have been designed following the ISO5210 or ISO5211 standard, for standard application, or following the customer's specifications, for special application.

6.3 Output type

Check that the type of flange-coupling of the actuator suits the valve to be driven (diameters and lengths). Those manufactured as Standard at CENTORK follow the ISO5210/5211 standards. Types of output drive:

- **Output type A**: If not otherwise specified in the order, it is supplied blank. The thread must be machined according to the stem of the valve to be driven. For the dismounting and machining of this type of output, see Appendix. Output type A models can withstand axial loads and torque
- **Output type B0, B1, B2, C**: It is supplied machined to the dimensions stated in the ISO 5210/5211 or DIN 3338 standard. Output type B and C models **cannot withstand axial loads**.
- **Output type B3, B4**: It is supplied blank. For the dismounting and machining of this type of output, see Appendix.

6.4 Mounting:

- Check size and the type of output match the valve to be driven.
- Degrease the mounting surfaces at actuator and valve thoroughly.
- Slightly grease the input shaft of the valve to be driven.
- Fit the actuator into the valve. In the event of a threaded output (type A), use the handwheel for turning the nut over the threaded stem.
- **Do not lift the actuator by the handwheel**
- The actuator may be mounted in any position. Before mounting, check proper orientation actuator and valve in order to simplify access to handwheel, switching and terminal compartments (Maintenance and start-up tasks).
- Reserve the space for maintenance routines and tasks.
- Using ISO Class 8.8 quality bolts, fasten crosswise controlling the applied torque according to the table in Appendix

If actuator has been supplied already assembled onto the valve by valve manufacturer, DO NOT DISMOUNT the actuator, or even MODIFY the actuator mounting position without the authorisation of the latter, otherwise, valve manufacturer setting might be affected, and serious damage may be caused both to the valve and to the actuator.

7. ELECTRIC AND PNEUMATIC CONNECTIONS

CAUTION: Safety instructions on chapter 2 must be observed. Work on electrical system or equipment must only be carried out by skilled and qualified technician, according to safety standards.

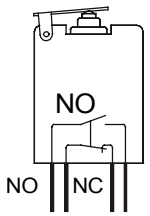
The type of pneumatic and electric diagram depends on the valve to be operated, the application requirement and specifications. Contact your distributor or CENTORK, for any clarification or support.

7.1 Wiring diagram (electric manoeuvre)

Multi-turn pneumatic actuator must be controlled by an external electric&pneumatic cabinet with all elements needed. Wiring diagram and schematic pneumatic control circuit should be designed according to actuator and valve features.

Multi-turn pneumatic actuator datasheet, supplied with the actuator, includes a **PROPOSED WIRING DIAGRAM and PNEUMATIC CONTROL circuit**, delivered with other technical documentation**. The following points should be observed:**

- We recommend switching off the corresponding control valve always directly by the limit or torque switch (opening and closing). **Torque switches must be included on Electric/pneumatic manoeuvre in order to protect actuator and valve from undesired overloads**. Each valve manufacturer decides whether the switching off at both ends is made by torque switching or by limit switching.
- The maximum delay for switching off the motor with the signal of the torque or limit microswitch cannot exceed 100 msegs.
- **Torque and limit (electric type) microswitches have 1NO+1NC contacts, only the same potential can be connected through both circuits. For different potentials, two double microswitches must be used.**
- Torque microswitches signals are **non-maintained signals**, when motor stops after a over-torque condition torque signals may reset (Non-maintained). Relays or another device must be employed (See wiring diagram)
- Connect the internal and external earth cable terminal ⏚ to the earth connection located inside and outside of electric actuator.

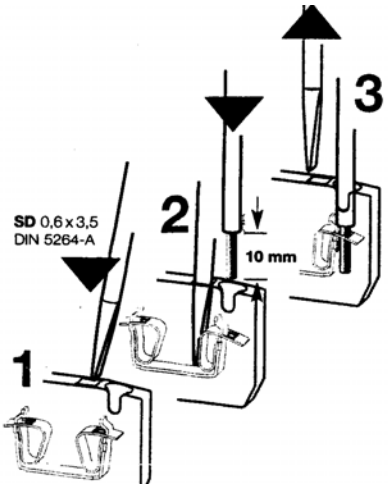


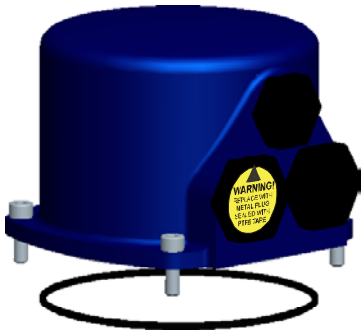
In annexe, it is enclosed the technical features of the signalling elements of the actuator, such us, electric microswitches, pneumatic microswitches, potentiometers…. It must be observed the max. allowable values for each component.

7.2 Terminal plan and wiring

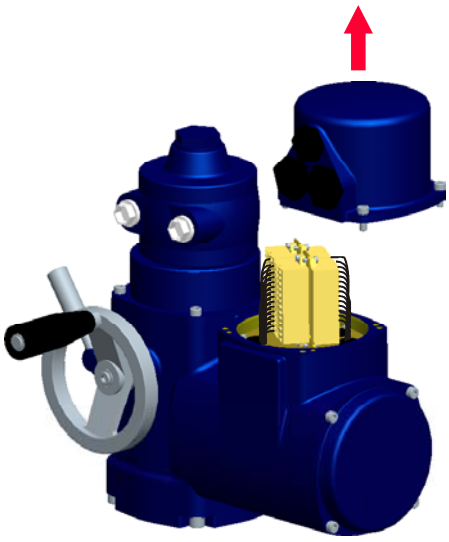
The electric connection diagram or terminal plan is depicted on the multi-turn pneumatic actuator datasheet, supplied with the actuator, and it can be found printed on a label inside of electrical compartment cover.

- Open the electrical cover.
- **Feed the cable(s) through the cable glands . Fix proper cable glands according to IP67 or IP68 protection degree.** Fix proper cable glands according to IP67 or IP68 protection degree. **Replace the protection plug with suitable metallic protection plug sealed with PTFE**. (Figure 6.3) Tighten cable glands and protection plugs to ensure enclosure IP67 (IP68 if applicable).
- With a suitable screwdriver (SD 0,6x3,5 DIN 5264-A), connect the cables for the control signals according to the electric connection diagram. (Figure 6.2 and Figure 6.4)





- Connect the **internal earth cable terminal** ⏚ to the earth connection located inside of electric connection cover (M5 screw hole).
- Connect the external earth cable terminal ⏚ to the earth connection terminal (See picture)
- Once you have checked that the connections have been properly carried out, close the connection cover and check the proper connection, the state of the o-ring seal and the proper installation of the latter, greasing it slightly. Fasten the 4 screws crosswise.
- Once you have checked that the connections have been properly carried out, close the connection cover and check the proper connection, the state of the o-ring seal and the proper installation of the latter, greasing it slightly. Fasten the 4 screws crosswise.



7.3 Cable installation in accordance with EMC

Signal cables are susceptible to interference. Lay cables being susceptible to interference or sources of interference at the highest possible distance from each other. The interference immunity of signal cables increases if the cables are laid close to the ground potential.

- If possible, avoid laying long cables and make sure that they are installed in areas being subject to low interference. Avoid long parallel paths with cables being either susceptible to interference or interference sources.
- For the connection of remote signals (Position transmitters) screened cables must be used.

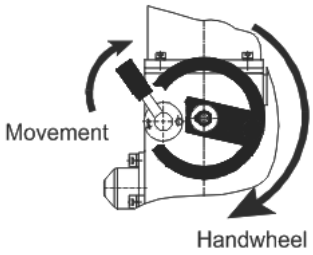
8. MANUAL OPERATION

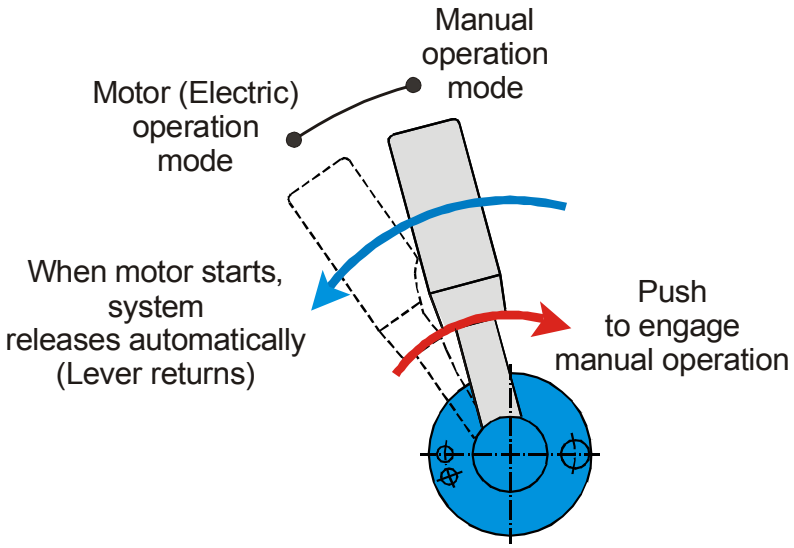
CENTORK actuators are fitted with a handwheel for the manual actuation of the valve. In the case of simultaneous motorised and manual working, the motorised one will always be the preferential one, "***motor priority***".

⚠ **Once the handwheel has been engaged is not possible to disengage, the override engagement lever returns automatically to motor position when the motor is operated. Do not press the lever when motor is running.**

Procedure of engagement of manual operation:

- Turn the changeover lever 20º clockwise while slightly turning the handwheel.
- When you notice an increase in the resistance of the wheel, the manual control is engaged.
- Run the valve in the desired direction. Standard sense of rotation is clockwise to close. For greater operating speed you can connect any powertool, pneumatic or electric, to the hand-wheel shaft. The maximum speed allowed is 150 rpm.

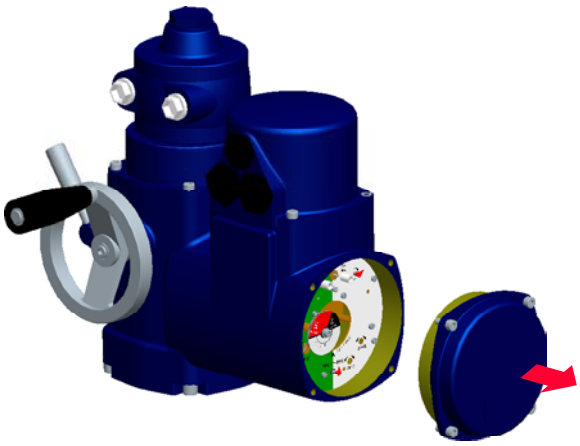


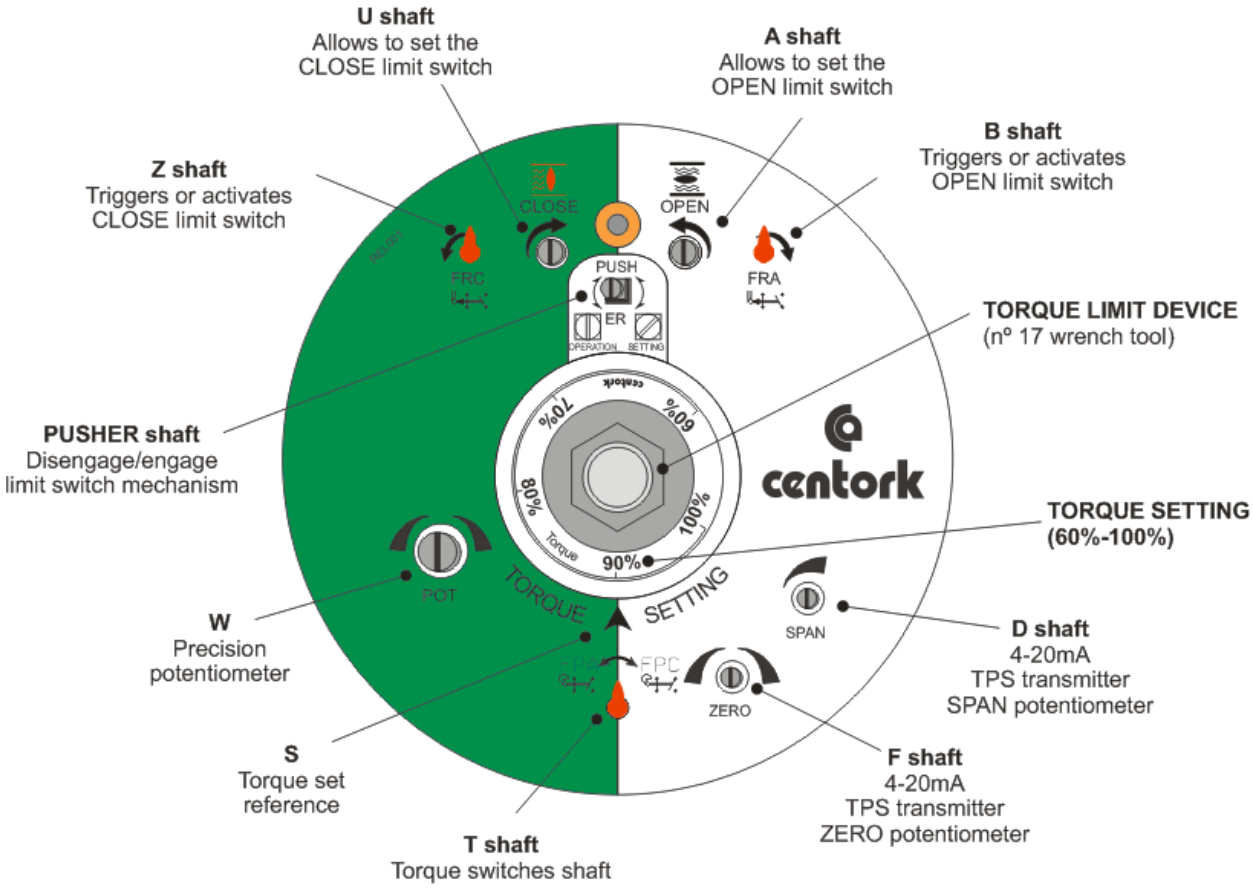


9. SWITCHING AND SIGNALLING UNIT

Remove 4 bolts and take off the cover at the switching and signalling compartment.

Cover with (left) and without (right) mechanical valve position indicator





Switching and signaling unit, front plate view

10. SETTING AND PRELIMINARY TEST

Safety rules and standard should be observed (See SAFETY INSTRUCTIONS chapter). Work at the open actuator under voltage must only be performed if it is assured that for the duration of the work there is no danger of explosion. In other conditions actuator should be carry to a safe area.

- Setting and preliminary test can only be done when finished the wiring (See 7 chapter), pneumatic connection (See 5 chapter) and mounting on valve (See 6 chapter). Electric manoeuvre (Electric cabinet) and devices should be ready and checked.
- A commissioning routine is recommended (Visual inspection) according to instructions described on 3.2.1 chapter.
- Both the torque and the limit switches setting must be carried out in accordance with the characteristics of the valve to be driven. **Each valve manufacturer decides whether the switching off at both ends is made by torque switching or by limit switching.**
- **If actuator has been supplied already assembled onto the valve, valve manufacturer should NOT modify the settings made originally by the manufacturer modified on site without the authorisation of the latter, otherwise, serious damage may be caused both to the valve and to the actuator.**

CENTORK recommend to move the valve to an intermediate position manually, -via handwheel device- (According to 8 chapter) in order to execute the test routines descried below, avoiding problems due to incorrect routines or user's mistakes.

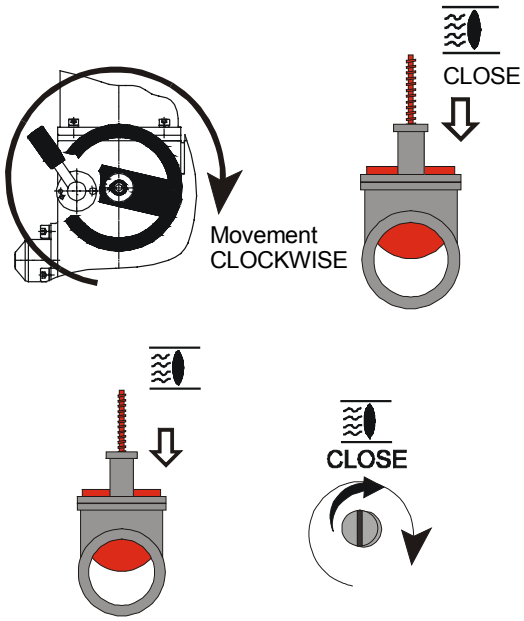
Just when user finishes a setting routine, covers must be closed, checking their O-ring (Sealing)!

10.1 Actuator and valve (Sense of rotation)

Multi-turn pneumatic actuator and valve sense of rotation must be the same. Electric actuator sense of rotation criteria is CLOCKWISE TO CLOCK. Sense of rotation is critical for many components (Microswitches, potentiometer, 4-20 mA transmitter). **A correct operation cannot be warranty in case of different sense of rotation valve/actuator)**

- Operate the Electric actuator via handwheel (See Manual operation chapter).
- Check that running the handwheel clockwise, valve moves to close. If the turn direction is not correct, stop immediately and verify.

Motor (Sense of rotation)
Check that motor pneumatic connection (Inlet ports) have been correctly done.



10.2 Limit switch setting

10.2.1 Closed position limit switch setting

- Manually turn the valve to the desired CLOSED position.
- Disengaged **PUSHER SHAFT**: With a suitable screwdriver press the **PUSHER SHAFT** 3 mm and turn it 45º, ensure that it does not return to its original height (See figure 8.4.1)

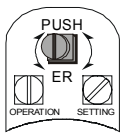


Fig. 8.4.1
Switching and signalling unit engaged to actuator.

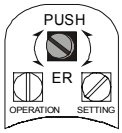


Fig. 8.4.2
Switching and signalling unit disengaged

- Note: Pusher shaft allow to engage/disengage the switching and signalling unit from Electric actuator gears. (Figures 8.4.1 and 8.4.2)
- Turn **U spindle** clockwise (Figure 8.4.3) until **Z spindle** turns Counter-clockwise (At this moment FRC microswitch triggers). Just before FRC microswitch was tripped, red arrow of **Z spindle** should be pointed to vertical: When **Z spindle** (Red arrow) turns to left the FRC microswitch is tripped.
- If, by accident, it has been carried on turning past the tripping of the FRC microswitch, turn U **spindle** in the opposite direction (counter-clockwise) until the Z spindle returns vertical (Figure 8.4.5)

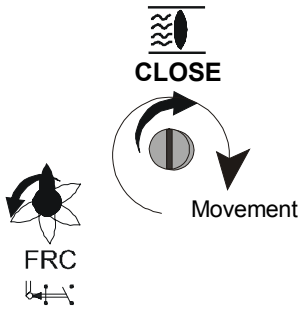


Fig. 8.4.1

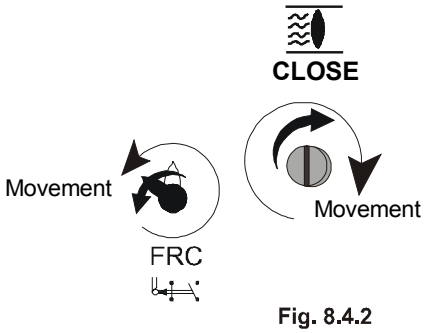


Fig. 8.4.2

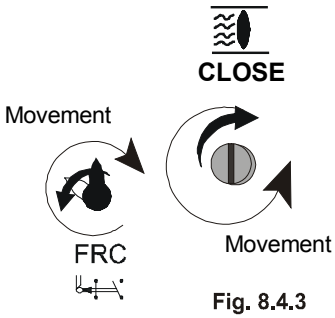


Fig. 8.4.3

ENGAGE **PUSHER SHAFT**: Turn back selector 'PUSHER'. Check that go back to its initial position (Figure 8.4.2). **This point is fundamental for the correct setting of the limit switches: Ensure that PUSHER shaft is correctly engaged.**

NOTE: For greater speed in long runs, small electric or pneumatic screwdriver can be used.

10.2.2 Open position limit switch setting

- Manually turn the valve to the desired OPEN position.
- Disengaged **PUSHER SHAFT**: With a suitable screwdriver press the **PUSHER SHAFT** 3 mm and turn it 45º, ensure that it does not return to its original height (See figure 8.4.1)
- Turn **A spindle** Counter-clockwise (Figure 8.5.1) until **B spindle** turns clockwise (At this moment FRA microswitch triggers). Just before FRA microswitch was tripped, red arrow of **B spindle** should be pointed to vertical: When **B spindle** (Red arrow) turns to right the FRA microswitch is tripped.
- If, by accident, it has been carried on turning past the tripping of the FRA microswitch, turn **A spindle** in the opposite direction (clockwise) until the **B spindle** returns to vertical. Figure 8.5.3)
- ENGAGE **PUSHER SHAFT**: Turn back selector 'PUSHER'. Check that go back to its initial position (Figure 8.4.2). **This point is fundamental for the correct setting of the limit switches: Ensure that PUSHER shaft is correctly engaged.**

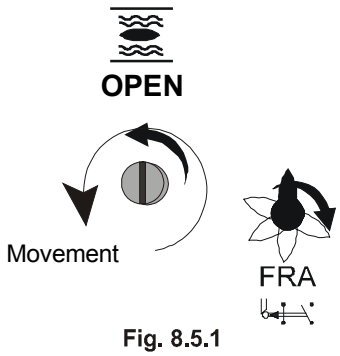


Fig. 8.5.1

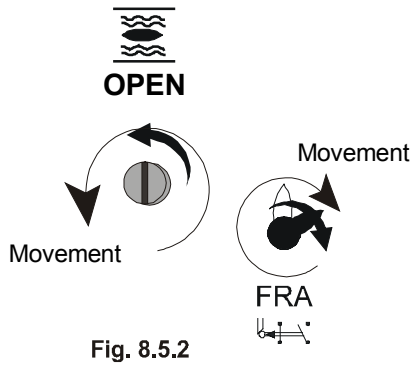


Fig. 8.5.2

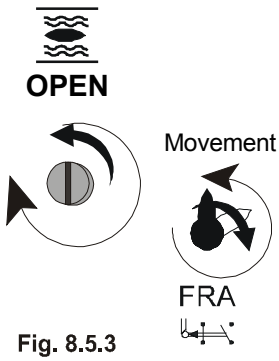


Fig. 8.5.3

10.3 Torque switching setting

CENTORK Electric actuators leave the factory tested and set for its Max. Torque (100%), as standard. Adjustment torque range is 60% up to 100% of Max. Torque rated on nameplates. **Guarantee is not valid if the user exceeds this range (60%-100%), or if torque microswitches are not employed.**

Torque mechanism design

Torque mechanism always acts as soon as actuator output torque exceeds the value set (Torque setting) It is used as protection throughout the whole valve travel and during the limit switch tripping. It also remains active during manual operation, thereby protecting the valve from any torque excess caused by the handwheel.

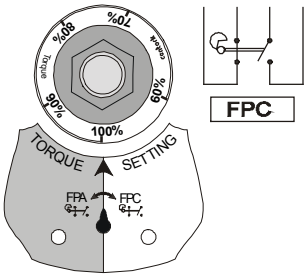


Fig. 8.6.1

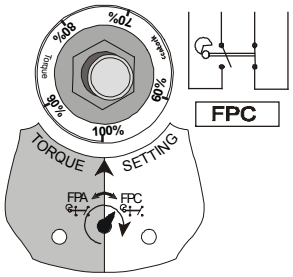


Fig. 8.6.2
(OverTORQUE)

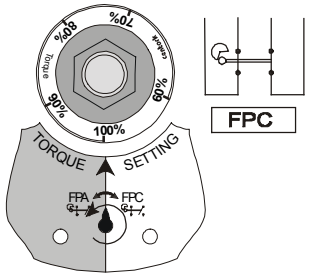


Fig. 8.6.3

- When torque on valve shaft exceeds the value set, e.g. running to close, **T shaft** turns to the right (Pointing to FPC), at the same time central SHAFT releases (See figures 8.6.1 and 8.6.2). FPC microswitch is tripped. Automatically, or when actuator starts running to opposite direction, mechanism returns or resets. Notice that central SHAFT latches again. (Figure 8.6.3)

Torque setting Procedure:

- Using a No.17 wrench, turn the P Torque regulator or **Torque Limit Device** until the desired torque matches with the **S torque reference** arrow on the dial. (Figures 8.6.4 and 8.6.5)

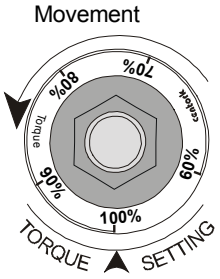


Fig. 8.6.4

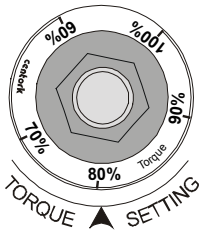


Fig. 8.6.5

10.4 Torque regulator locking device

As an option, the multi-turn pneumatic actuator can be delivered with a locking device (disc) for the torque regulator setting. The motorized valve might have been set and adjusted in valve or distributor facilities. Setting (open and close limit switch and torque setting values) might have already done by them.

If actuator has been supplied already assembled onto the valve, valve manufacturer should NOT modify the settings made originally by the manufacturer modified on site without the authorisation of the latter, otherwise, serious damage may be caused both to the valve and to the actuator.

Guarantee is not valid if the torque regulator locking device has been manipulated.

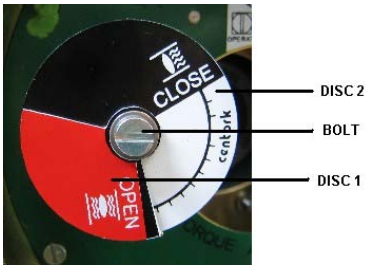
10.5 Mechanical position indicator setting (optional)

Limit switches must be set before!

Mechanical Position Indication dial turns between CLOSE and OPEN position depending on the model and valve stroke. This is achieved with the addition of a suitable gearing according to the number of turns per valve stroke. If the latter varies, the gearing must be changed.

Procedure:

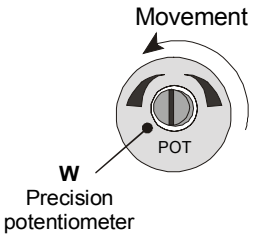
- Run actuator to the CLOSED position.
- Unscrew the bolt and turn the dial with the symbol (CLOSED) until it matches with the mark ◄ on cover.
- Run actuator to the OPEN position, and proceed exactly with disc containing OPEN symbol.
- Screw the bolt



10.6 Potentiometer POT setting (optional)

Limit switches must be set before!

Potentiometer is selected according to valve stroke. A suitable gearing unit reduce valve stroke (Number of turns) to less than one turn, this movement is measured by potentiometer located on switching and signalling unit.



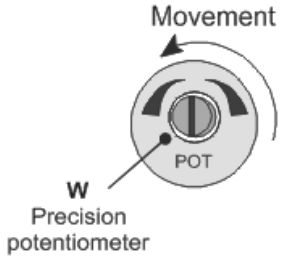
- Run the actuator to the CLOSED position.
- With a suitable screwdriver, turn the **spindle (W)** of the potentiometer POT, counter-clockwise, to its top end.
- Check that potentiometer value is 0 Ohms.
- Run the actuator to the OPEN position.
- Check that potentiometer value reaches its maximum (Ohms)

CAUTION: **The potentiometer is a high precision electromechanical device and should be handled carefully. It is necessary to use a suitable screwdriver for its setting.**

10.7 4-20 mA transmitter TPS setting (optional)

4-20 mA transmitter are selected according to valve stroke. A suitable gearing unit reduce valve stroke (Number of turns) to less than one turn, this movement is measured by potentiometer, and converted to current signal by TPS transmitter. If valve stroke changes, TPS transmitter may not work properly.

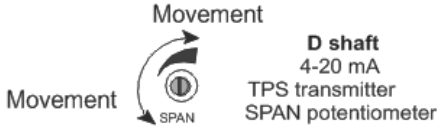
Limit switches must be set before. This element must be adjusted for a correct operation



0/4-20 mA transmitter are selected according to valve stroke. A suitable gearing unit reduce valve stroke (Number of turns) to less than one turn, this movement is measured by potentiometer, and converted to current signal by TPS transmitter. If valve stroke changes, TPS may not work properly.

Procedure:

- Run the actuator to the CLOSED position (sensor in minimum signal).
- With a suitable screwdriver, turn the **W** spindle of the potentiometer POT, counter-clockwise, to its top end.
- Adjust the output current with the ZERO (**F** spindle) trimmer potentiometer until its reading is close to 4mA or 0mA



- Run the actuator to the OPEN position (sensor in maximum signal).

- Adjust the output current with the SPAN (**D** spindle) trimmer potentiometer until its reading is close to the maximum current of 20mA.
- Run the actuator back to the CLOSED position and check that the minimum current is 4mA or 0mA. If this is not the case, repeat points 1, 3, 4 and 5 until optimum adjustment values are reached.

⚠ **CAUTION: The TPS electronic position transmitter is a high precision electronic device and should be handled carefully. It is necessary to use a suitable screwdriver for its setting.**

11. MAINTENANCE

CAUTION: Safety instructions on chapter nº2 must be observed. Work at the open actuator under voltage must only be performed if it is assured that for the duration of the work there is no danger of explosion. In other conditions actuator should be carry to a safe area.

CENTORK actuators are supplied greased from the factory for their lifetime, needing practically no maintenance.

11.1 After commissioning

- Check for damage on paint caused by transport, assembly or handling and repair the damage carefully in order to ensure complete protection against corrosion.
- **Make sure that all the o-ring seals are correctly mounted and that the cable glands are firmly fastened, and protection plug for cable entry not used have been replaced with metallic protection plug sealed with PTFE tape, in order to ensure the IP67, IP68 protection.**
- Check that switching and signalling cover and connection cover screws are correctly fastened.
- **Check the correct tightening of the bolts between the actuator and the valve.**
- Check the correct greasing of the gear housing.
- The most important condition for reliable service of the CENTORK actuators is the fact of having carried out a correct commissioning and set-up procedure.
- Check and maintain the oil level frequently.

11.2 Maintenance for service

CENTORK recommends for a preventive maintenance programme. Approximately 3 months after commissioning and then every 9/12 months:

- **Check the correct tightening of the bolts between the actuator and the valve.**
- **Take advantage of each revision to check the proper tightening of the covers, of the handwheel lock and the external electric connection.**
- **Check cable entries.**
- **Visual inspection inside of switching and signalling, and electrical compartments.**
- Contact with valve manufacturer in order to know about maintenance routines of valve.
- Check and maintain the oil level frequently.
- Check intake and exhaust filters after first 500 hours of operation. Clean filters and determine how frequently filters should be checked during future operation. This one procedure will help assure the motor's performance and service life.

In the event of infrequent service, perform a test run every 6 months in order to ensure the availability of service of the actuator.

11.3 Electric actuator's service life

- Electric actuator service life is rated to 20.000 cycles.
- Each cycle is formed by an opening manoeuvre (Valve close position to valve open position) and a closing manoeuvre (Valve open position to valve close position).
- 50 turns has been considered as standard valve stroke reference.

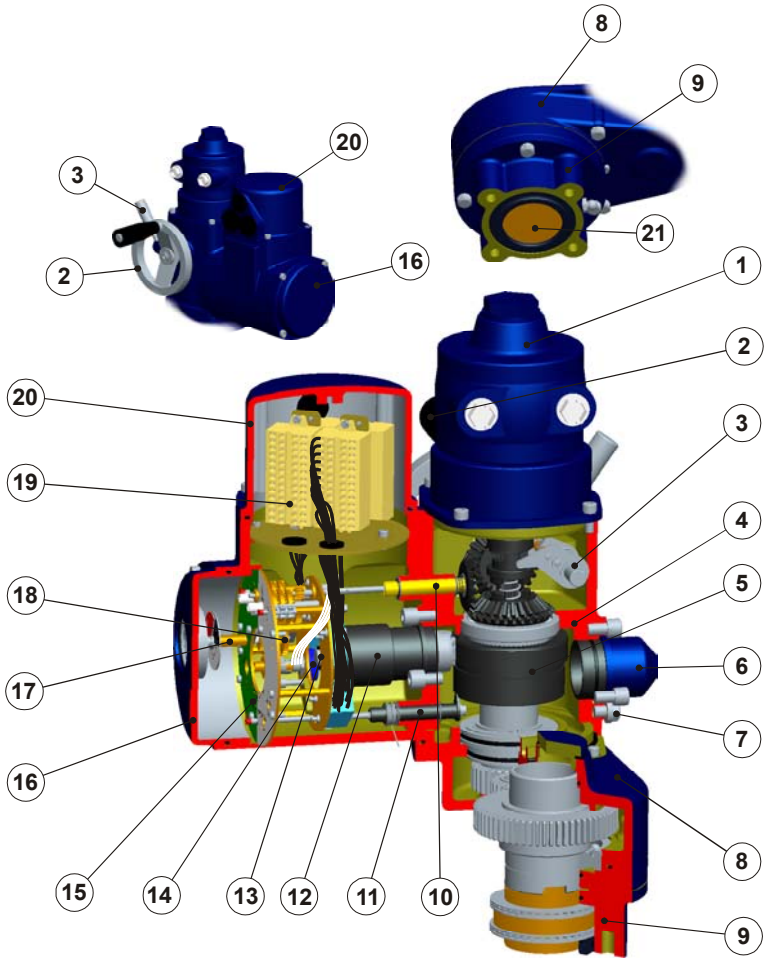
12. TECHNICAL SUPPORT

Each actuator is supplied with a datasheet on A4 format. The following is included: Multi-turn pneumatic actuator datasheet, the electric and pneumatic connection diagram and user manual.

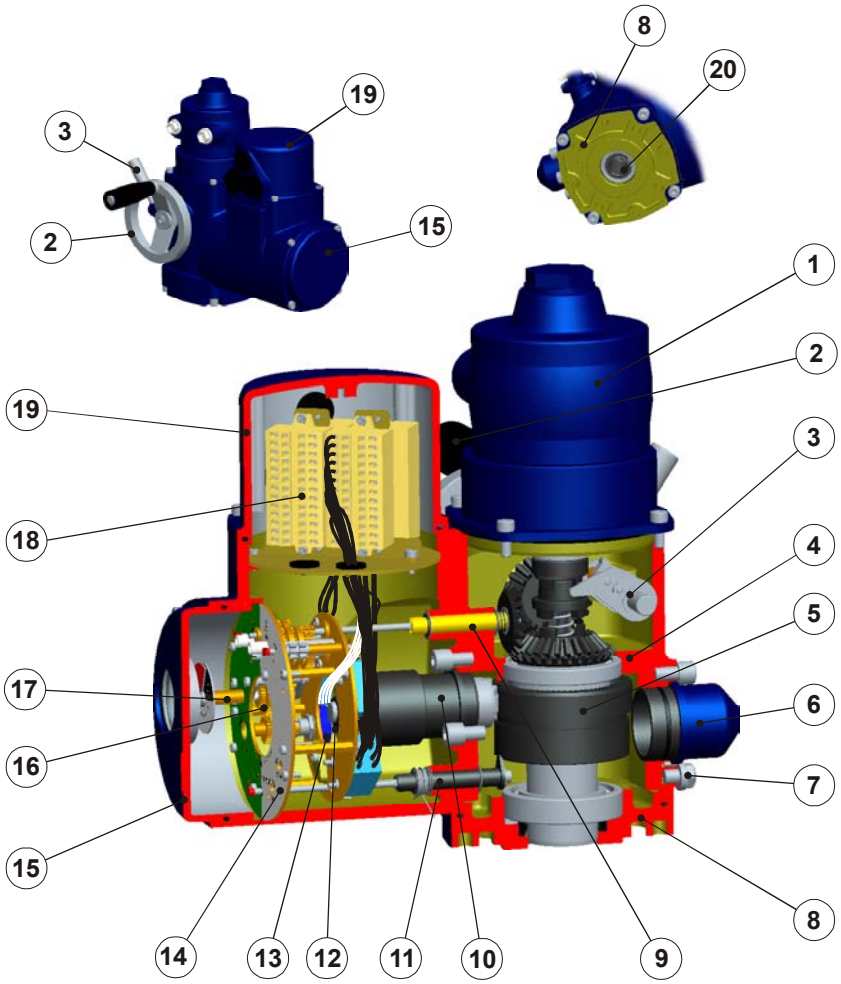
For any claim or information request, the SERIAL NUMBER included on this datasheet or on the Electric actuator nameplates should be used. Electric actuator manufacturer address: See on Manual covers.

13. SPARE LIST

Due to the wide range of models and types, it is not possible to include all spare part list. In this chapter is its described the spare part list corresponding to two actuator configuration.
For an accurate reference/part definition is important to indicate the actuator serial number, this number is marked on actuator nameplates, all actuator features can be identified easily.



Mark	Description	QTY	Mark	Description	QTY
1	Pneumatic air motor	1	12	Torque switching shaft subassembly	1
2	Handwheel with lever	1	13	Torque lock device	1
3	Override declutch lever	1	14	Potentiometer subassembly	1
4	Actuator casing	1	15	Switching and signalling unit	1
5	PTCS planetary gear system	1	16	Switching and signalling unit cover	1
6	Energy absorber subassembly	1	17	Gearing unit subassembly	1
7	External ground earth connection	1	18	Visual indicator subassembly	1
8	Spur gearbox	1	19	Limit and torque microswitches (DPDT) subasembly	1
9	A/F10 thrust base module	1	20	Electric cover	1
10	Motion measuring shaft subassembly	1	21	Removable insert bushing (A type)	1
11	Torque regulator subassembly	1	22		



Mark	Description	QTY	Mark	Description	QTY
1	Pneumatic air motor	1	11	Torque switching shaft subassembly	1
2	Handwheel with lever	1	12	Torque lock device	1
3	Override declutch lever	1	13	Potentiometer subassembly	1
4	Actuator casing	1	14	Switching and signalling unit	1
5	PTCS planetary gear system	1	15	Switching and signalling unit cover	1
6	Energy absorber subassembly	1	16	Gearing unit subassembly	1
7	External ground earth connection	1	17	Visual indicator subassembly	1
8	Output flange (ISO5210)	1	18	Limit and torque microswitches (DPDT) subasembly	1
9	Motion measuring shaft subassembly	1	19	Electric cover	1
10	Torque regulator subassembly	1	20	B0 output type	1

APENDIX: OUTPUT TYPES

OUTPUT TYPE A Size F-07 (ISO 5210)

Disassembly:

Employing a suitable tool, remove the retaining ring (3) which fix the removable bronze bush (1).
Push in order to extract this piece.

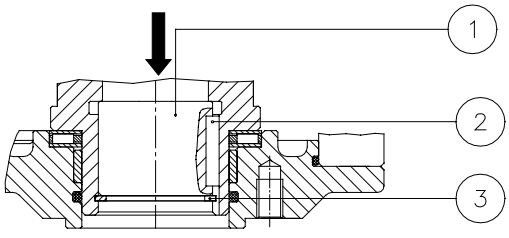


Figure 1

Assembly:

Having machined the removable bush according to valve stem dimensions, refit the drive bus (1) into the output shaft bore, align the keyway (2) in its output shaft shape.
Refit the retaining ring (3).

OUTPUT TYPE A Size F-10/F-16/F-25 (ISO 5210)

Disassembly:

Push and press the removable bronze bush (2) in order to extract the cover (4), axial bearings (3) and removable bronze bush (2)

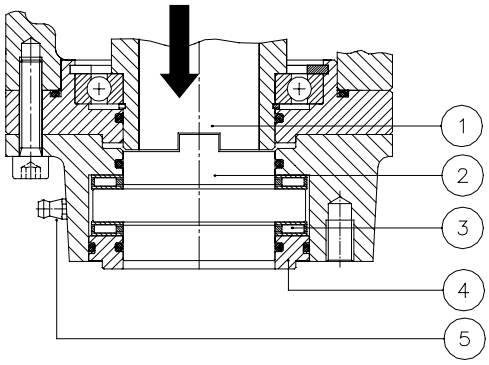


Figure 2

Assembly:

Having machined the removable bronze bush according to valve shaft, clean toughly this piece. Apply grease on axial bearings and discs (3). Assemble axial disc on removable bush (2), finally insert the cover (4). Check O-rings on cover.

Apply grease on. Insert the removable bush on output type A base casting unit and output shaft, notice that dog coupling (Tooth) on bushing should match with actuator hollow output shaft (1).Verify O-ring (4).

For maintenance, grease can be supply thought grease nipple (5).

OUTPUT TYPE A Size F-14 (ISO 5210)

Disassembly

- Remove retaining ring (5) and unscrew the stop ring (4) employing a suitable tool.
- Push and press the removable bronze bush (1) in order to extract it.

Assembly:

- Having machined the removable bush according to valve stem dimensions, refit the drive bus (1) into the output shaft bore (3), align the keyway (2) in its output shaft shape.
- Screw the stop ring (4) employing a suitable tool.
- Refit the retaining ring (5).

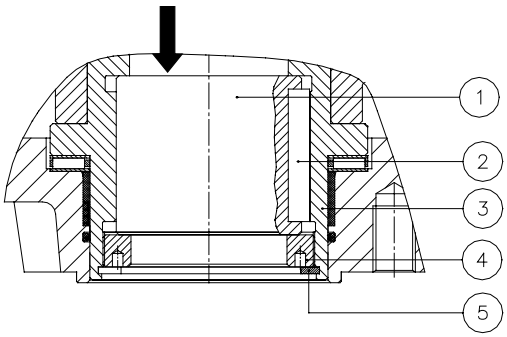


Figure 3

OUTPUT TYPE B3 Size F-07/F-10/F-14/F-16/F-25 (ISO 5210)

Disassembly:

- Employing a suitable tool, remove the retaining ring (4) which fix the removable steel bush (1).
- Push in order to extract this piece.

Assembly:

- Having machined the removable steel bush according to valve stem dimensions, refit the drive bus (1) into the output shaft bore, align the keyway (2) in its output shaft shape.
- Refit the retaining ring (4).

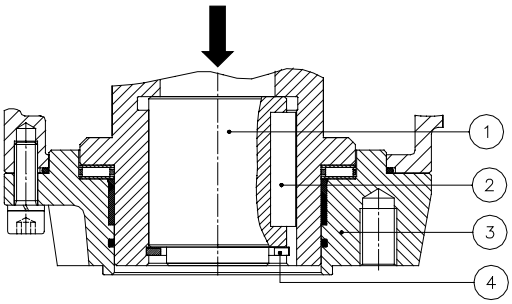


Figure 4

OUTPUT TYPE B0 Size F-10 / F-14

B0 output type is supplied, already machined, according to dimensions published in technical datasheets.

Disassembly:

- Employing a suitable tool, remove the retaining ring (3) which fix the removable steel bush (1).Removable bush is located inside of output shaft (2)
- Push in order to extract this piece.

Assembly:

- Having machined the removable steel bush according to valve stem dimensions, refit the drive bus (1) into the output shaft bore
- Refit the retaining ring (3).

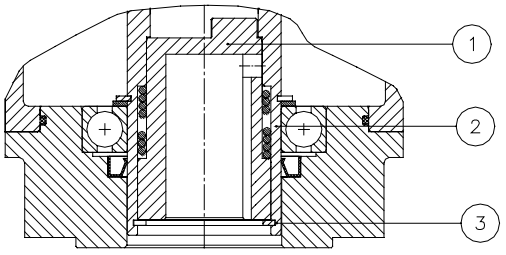


Figure 5

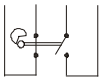
APENDIX: FASTEN BOLTS (CLASS 8.8)

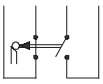
	FRICTION FACTOR		
BOLT	***LOW***	***MEDIUM***	***HIGH***
M4	4.2	6	8
M6	6.2	8.2	10
M8	15	21	24
M10	30	41	48
M12	49	68	85
M14	85	108	130
M16	130	165	200
M18	170	240	280
M20	240	340	410
M30	800	1150	1350
M36	1450	2050	2400

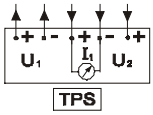
Torque values in N.m
Steel bolts class 8.8

WIRING DIAGRAMS, TERMINAL PLANS, LEGENDS AND SYMBOLS.

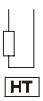
For further technical information, consult CENTORK technical datasheet or contact directly with CENTORK. CENTORK address can be found printed on manual covers.

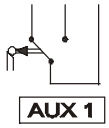
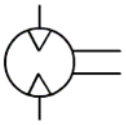
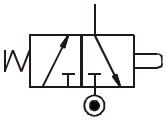
<table>
<tr><th>SYMBOL</th><th>DESCRIPTION</th><th>TECHNICAL FEATURES</th></tr>
<tr><td> 
FPC 1</td><td>FPC:
CLOSE torque microswitch.</td><td rowspan="4">– Microswitch with silver contacts
– Type of contact: 1 NA / 1 NC
– Protection degree: IP67
– Contacts: One fast acting
– Mech. Life: 5.10^6
– Electr. live: 5.10^6
– Microswitch circuits NO+NC contacts, only the same potential can be connected through both circuits. For different potentials, two double microswitches must be used.

<table><tr><td rowspan="2">Silver contacts</td><td colspan="3">AC</td><td colspan="3">DC</td></tr><tr><td>30V</td><td>125V</td><td>250V</td><td>30V</td><td>125V</td><td>250V</td></tr><tr><td>Resistence</td><td>8A</td><td>6A</td><td>5A</td><td>2A</td><td>0.6A</td><td>0.4A</td></tr></table></td></tr>
<tr><td> 
FPA 1</td><td>FPA:
OPEN torque microswitch.</td></tr>
<tr><td> 
FRC 1</td><td>FRC:
CLOSE limit microswitch.
(CLOSE end position)</td></tr>
<tr><td> 
FRA 1</td><td>FRA:
OPEN limit microswitch.
(OPEN end position)</td></tr>
<tr><td> 
BLK</td><td>BLK:
Movement signalling microswitch. As actuator output shaft rotates or moves, a cam acts and switches ON-OFF this BLK microswitch.</td><td>– Microswitch with silver contacts
– Type of contact: 1 NA (SPDT)
– Protection degree: IP67
– Contacts: One fast acting
– Mech. Life: 3.10^7
– Electr. live: 3.10^7

<table><tr><td rowspan="2">Silver contacts</td><td colspan="3">AC</td><td colspan="3">DC</td></tr><tr><td>30V</td><td>125V</td><td>250V</td><td>30V</td><td>125V</td><td>250V</td></tr><tr><td>Resistence</td><td>4A</td><td>4A</td><td>4A</td><td>2A</td><td>0.6A</td><td>0.4A</td></tr></table></td></tr>
<tr><td> 
POT 1</td><td>POT:
Precision Potentiometer</td><td>– 10 kOhms (other values on request).
– Ohmic value tolerance : ±20% std. (±10% optional).
– Linearity : <1%.
– Power : 1W max.
– Turning angle : 340º± 5%
– Life : 106 cycles.
– Temperature range : -55ºC , +125ºC..</td></tr>
<tr><td> 
TPS</td><td>TPS:
4-20 mA transmitter</td><td>Output Signal (current) :
2 wires :4....20 mA .
3 and 4 wires :0/4....20 mA.

Output signal (voltage) (option) :
4 wires : 0-10 V.

Maximum supply :30 V. AC/DC
Maximum resistance :600 Ohms
2 wires : $R_{L\max} = \frac{V_{cc} - 18}{2 \cdot 10^{-3}} (Ohms)$
Precision : <1%.
R_{Lmin} (voltage reference) : 1.2 kOhms.
Temperature : -25ºC to +70ºC</td></tr>
<tr><td> 
HT</td><td>HT:
Heater (space heater for anti-condensation)</td><td>– Supply voltage : 220V A.C . or 24V DC.
– Power consumption : 5 - 7 W.</td></tr>
</table>

<table>
<tr>
<td> 
</td>
<td><u>AUX1:</u>
Auxiliary switches for middle- valve positions</td>
<td>
– Microswitch with silver contacts
– Type of contact: 1 NA (SPDT)
– Protection degree: IP67
– Contacts: One fast acting
– Mech. Life: 3.10^7
– Electr. live: 3.10^7
<table>
<tr><td rowspan="2">Silver contacts</td><td colspan="3">AC</td><td colspan="3">DC</td></tr>
<tr><td>30V</td><td>125V</td><td>250V</td><td>30V</td><td>125V</td><td>250V</td></tr>
<tr><td>Resistence</td><td>4A</td><td>4A</td><td>4A</td><td>2A</td><td>0.6A</td><td>0.4A</td></tr>
</table>
</td>
</tr>
<tr>
<td>  </td>
<td><u>MOTOR</u>
Reversible, vane type air motor</td>
<td>Reversible air motor: Manufacturer GAST</td>
</tr>
<tr>
<td>  </td>
<td><u>PNEUMATIC switches</u>
FRC: Close limit switch
FRA: Open limit switch
FPC: Close torque switch
FPA: Open torque switch</td>
<td>Low force position detector
Orifice diameter: 2 mm
Operating pressure: 3 to 8 bar
Temperature range of fluid : -20ºC a +50ºC
Temperature range of storage: -40ºC + 70ºC
Response time (activation/release) <15 ms</td>
</tr>
</table>

centork
VALVE CONTROL

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