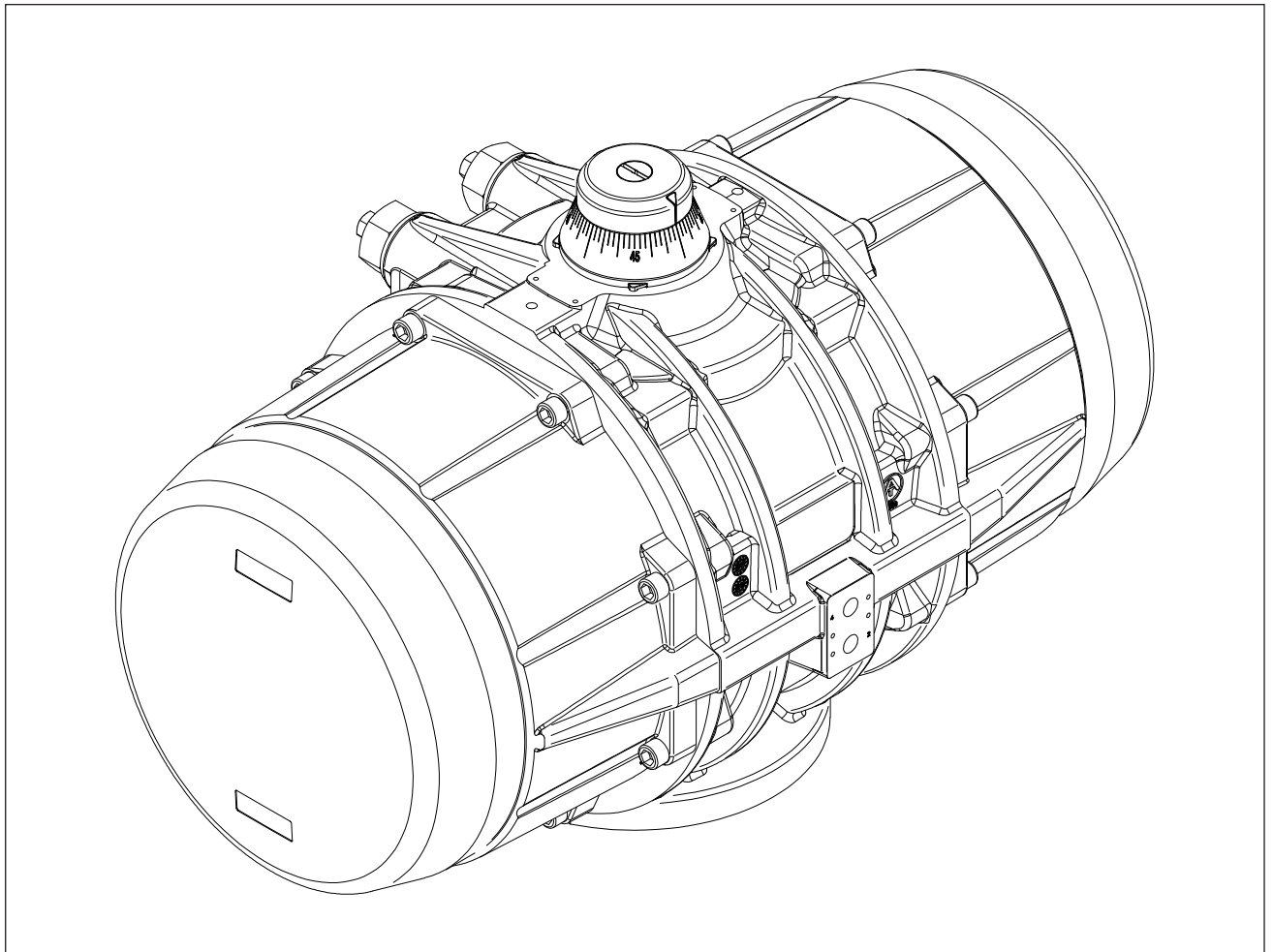


Original instructions



4th Generation Upgrade Series → AT1001U

Power Technology Upgrade Series → PT1000 U

Rack&Pinion actuators

Note on these mounting and operating instructions

These mounting and operating instructions assist you in mounting and operating the device safely. The instructions are binding for handling AIR TORQUE devices. The images shown in these instructions are for illustration purposes only. The actual product may vary.

- For the safe and proper use of these instructions, read them carefully and keep them for later reference.
- If you have any questions about these instructions, contact AIR TORQUE's After-sales Service Department (aftersales@airtorque.it).



The mounting and operating instructions for the devices are included in the scope of delivery. The latest documentation is available on our website at www.airtorque.it

Definition of signal words

DANGER

Hazardous situations which, if not avoided, will result in death or serious injury

WARNING

Hazardous situations which, if not avoided, could result in death or serious injury

NOTICE

Property damage message or malfunction

Note

Additional information

Tip

Recommended action

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1 Safety instructions and measures

Intended use

The AIR TORQUE actuators are designed for the automation and operation of quarter-turn valves such as butterfly valves, ball valves and plug valves in both indoor and outdoor applications. Depending on the configuration, the actuator is suitable for on/off or modulating duties. The actuator can be used in process and industrial plants.

The actuator is designed to operate under exactly defined conditions (e.g. temperature, pressure, travel). Therefore, operators must ensure that the actuator is only used in operating conditions that meet the specifications used for sizing the actuator at the ordering stage. In case operators intend to use the actuator in other applications or conditions than specified, contact AIR TORQUE.

AIR TORQUE does not assume any liability for damage resulting from the failure to use the device for its intended purpose or for damage caused by external forces or any other external factors.

- ➔ Refer to the technical data and nameplate for limits and fields of application as well as possible uses.

Reasonably foreseeable misuse

The actuator is not suitable for the following applications:

- Use outside the limits defined during sizing and by the technical data.
- Use outside the limits defined by the accessories connected to the actuator.

Furthermore, the following activities do not comply with the intended use:

- Use of non-original spare parts.
- Performing service and repair work not described in these instructions.

Qualifications of operating personnel

The actuator must be mounted, started up, serviced and repaired by fully trained and qualified personnel only; the accepted industry codes and practices are to be observed. According to these mounting and operating instructions, trained personnel refers to individuals who are able to judge the work they are assigned to and recognize possible hazards due to their specialized training, their knowledge and experience as well as their knowledge of the applicable standards.

Personal protective equipment

We recommend wearing the following personal protective equipment when handling the AIR TORQUE actuators:

- Protective gloves and safety footwear when mounting or removing the actuator.
- Eye protection and hearing protection while the actuator is operating.
- ➔ Check with the plant operator for details on further protective equipment.

Revisions and other modifications

Revisions, conversions or other modifications of the product are not authorized by AIR TORQUE. They are performed at the user's own risk and may lead to safety hazards, for example. Furthermore, the product may no longer meet the requirements for its intended use.

Safety devices

The AIR TORQUE pneumatic actuators alone do not have any special safety equipment.

Warning against residual hazards

To avoid personal injury or property damage, plant operators and operating personnel must prevent hazards that could be caused in the actuator by the signal pressure, stored spring energy or moving parts by taking appropriate precautions. They must observe all hazard statements, warning and caution notes in these mounting and operating instructions.

Responsibilities of the operator

The operator is responsible for proper operation and compliance with the safety regulations. Operators are obliged to provide these mounting and operating instructions as well as the referenced documents to the operating personnel and to instruct them in proper operation.

Furthermore, the operator must ensure that operating personnel or third persons are not exposed to any danger.

These instructions should not supersede or replace any customer's plant safety or work procedures. If a conflict arises between these instructions and the customer's procedures, the differences should be resolved in writing between an authorized end user's representative and an authorized AIR TORQUE representative.

Responsibilities of operating personnel

Operating personnel must read and understand these mounting and operating instructions as well as the referenced documents and observe the specified hazard statements, warnings and caution notes. Furthermore, the operating personnel must be familiar with the applicable health, safety and accident prevention regulations and comply with them.

Referenced standards and regulations

- AIR TORQUE actuators are designed, produced and classified according to the European Atex directive 2014/34/EU and U.K. Regulation S.I. 2016 No. 1107 (as amended). Before using the actuators in potentially explosive atmosphere areas, verify the actuator compliance with the required ATEX and UKCA classification.
- ➔ Refer to the nameplate and the ATEX / UKCA safety instructions.
- AIR TORQUE actuators are SIL certificated.
- ➔ Refer to the SIL Certificate available from AIR TORQUE for the actuators SIL capability.
- Referring to Machine Directive 2006/42/EC and U.K. Regulation S.I. 2008 No. 1597 (as amended), actuators are classified as "partly machinery" (see Declaration of incorporation).

Therefore, the actuator cannot to be put into service until the machinery and/or the final system, where the actuator is incorporated, will be declared in compliance with the requirements of the Directive.

- The AIR TORQUE pneumatic actuators are designed according to the criteria of
 - Article 1, paragraph 2. j) ii) of the Pressure equipment directive (PED) 2014/68/EU.
 - Part 1, section 4, schedule 1, paragraph 1. j) ii) of U.K. Regulation S.I. 2016 No. 1105 (as amended).
- Therefore, according to the directive 2014/68/EU and U.K. Regulation S.I. 2016 No. 1105 (as amended) they are not to be considered pressure equipments.
- Refer to the EU Declaration of Conformity available from AIR TORQUE.
- The AIR TORQUE actuators are in compliance with the TR CU 10/2011 and TR CU 12/2011.

Referenced documentation

The further documents apply in addition to these mounting and operating instructions:

- Mounting and operating instructions for the valve, available from the valve manufacturer,
- Mounting and operating instructions for control and signal devices (positioner, solenoid valve, etc.) available from devices manufacturer,
- ATEX safety manual,
- SIL safety manual for use in safety-instrumented systems.

1.1 Notes on possible severe personal injury

DANGER

Risk of bursting due to incorrect opening of pressurized equipment or components.

Pneumatic actuators are pressure equipment that may burst when handled incorrectly. Flying projectile fragments or components can cause serious injury or even death.

- Before starting any work on the actuator disconnect all pneumatic / hydraulic / electrical supplies and discharge the pressure from the actuator.

Risk of severe personal injury due to suspended loads falling.

- Stay far from suspended or moving loads.
- Close off and secure the transport paths.

1.2 Notes on possible personal injury

WARNING

Crush hazard arising from moving parts.

The actuator and the valve assembly contains moving parts, which can injure hands or fingers.

- Do not touch or insert hands or finger into moving parts.

- Before starting any work on the actuator disconnect all pneumatic / hydraulic / electrical supplies and discharge the pressure from the actuator.
- Do not block the movement of the pinion and the pistons by inserting objects into the actuator.

Risk of personal injury due to preloaded and compressed springs.

End caps are under tension due to compressed springs. Furthermore incorrect spring cartridges disassembly could result in serious injury.

- Before starting any work on the actuator disconnect all pneumatic / hydraulic / electrical supplies and discharge the pressure from the actuator.
- Make sure that the actuator is in the closed position (0°) while disassembling the end caps and the stop screws have been correctly removed.
- Do not disassemble individual spring cartridges.
- For spring cartridges service contact AIR TORQUE.

Risk of lifting equipment tipping over and risk of damage to lifting accessories due to exceeding the rated lifting capacity.

- Use only approved lifting equipment and accessories whose maximum lifting capacity is higher than the actuator weight (including the packaging, if applicable).

Risk of personal injury through incorrect operation, use or installation as a result of information on the actuator being illegible.

Over time, markings, labels and nameplates on the actuator may become covered with dirt or become illegible in some other way. As a result, hazards may go unnoticed and the necessary instructions not followed. There is a risk of personal injury.

- Keep all relevant markings and inscriptions on the device in a constantly legible status.
- Immediately renew damaged, missing or incorrect nameplates or labels.

1.3 Notes on possible property damage

NOTICE

Risk of actuator damage due to the use of inappropriate tools.

Certain tools are required to work on the actuator.

- Do not use damaged tools. Refer to section 15.1 'Tools'.

Risk of actuator damage due to excessively high or low tightening torques.

Observe the specified torques on tightening actuator components (bolts and nuts). Excessive tightening torques lead to parts wearing out quicker. Parts that are not tightened enough may loosen.

- Refer to section 15.2 'Tightening torques'.

Risk of actuator damage due to the use of unsuitable lubricants.

The lubricants to be used depend on the actuator material and operating temperatures. Unsuitable lubricants may corrode and damage the components.

→ *Use only lubricants approved by AIR TORQUE . Refer to section 15.3 'Lubricants'.*

Risk of actuator damage due to incorrectly attached slings.

→ *Do not attach load-bearing slings to the travel stop.*

2 Markings on the device

2.1 Actuator nameplate sample

a) 4th Generation Upgrade series

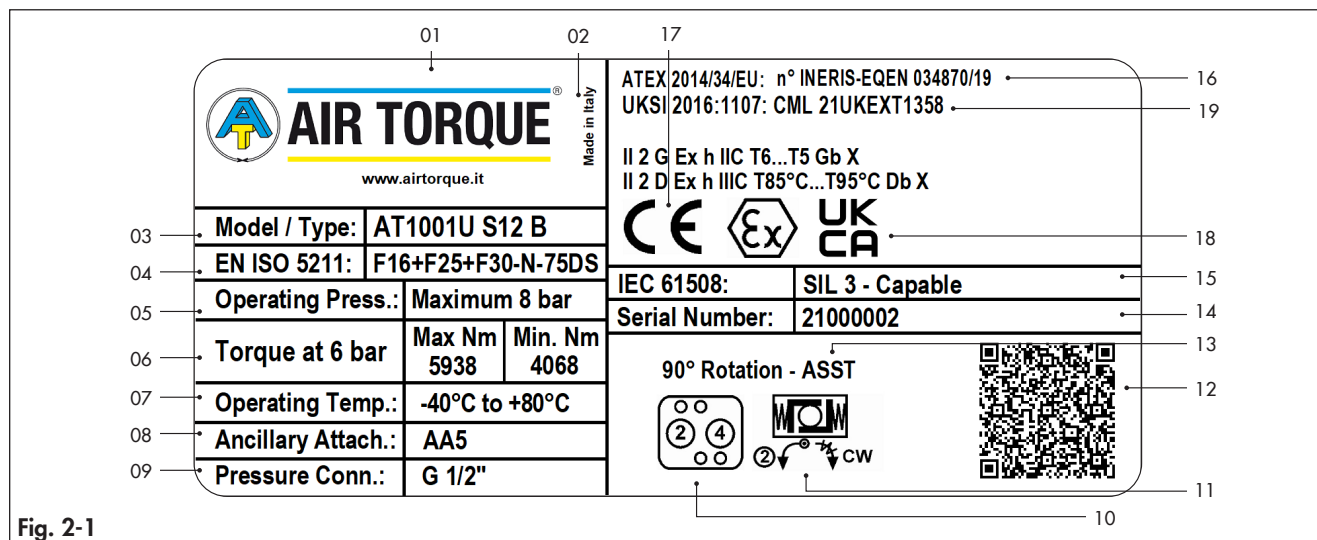


Fig. 2-1

Table 2-1

Position	Description
01	Manufacturer name and trade mark
02	Country of origin
03	Actuator model
04	Standard reference and actuator attachment designation
05	Maximum operating pressure
06	Output torque at specified supply pressure – for Double acting: Max. output torque = Nominal torque at 5,5 bar (Nominal pressure) – for Single acting: Max. output torque = Air Start output torque at specified supply pressure Min. output torque = Spring End output torque
07	Operating temperature range
08	Ancillary attachment, interface according to actuator size
09	Pressure connections and interface
10	Air connections (Port 2 and Port 4 identification)
11	Action and Rotation – for Double acting: direction of rotation while the actuator is pressurized through Port 2 or Port 4 – for Single acting: direction of rotation while the actuator is pressurized through Port 2 and indication of fail safe direction for spring action
12	QR code
13	Angle of rotation and assembly type
14	Actuator serial number
15	SIL marking - IEC 61508
16	ATEX marking - 2014/34/EU Directive
17	CE marking
18	UKCA marking
19	UKSI 2016:1107 marking

i Note

Refer to the Catalogue 4thGU-E for actuators available options and ordering codes.

b) Power Technology Upgrade series

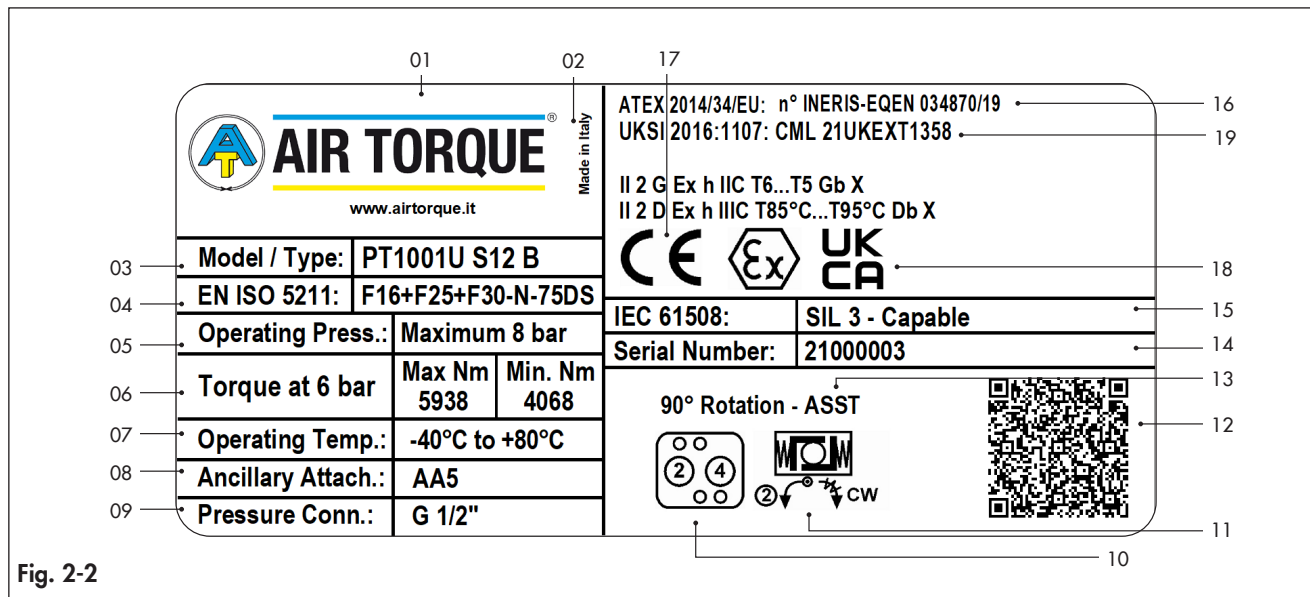


Fig. 2-2

Table 2-2

Position	Description
01	Manufacturer name and trade mark
02	Country of origin
03	Actuator model
04	Standard reference and actuator attachment designation
05	Maximum operating pressure
06	Output torque at specified supply pressure – for Double acting: Max. output torque = Nominal torque at 5,5 bar (Nominal pressure) – for Single acting: Max. output torque = Air Start output torque at specified supply pressure Min. output torque = Spring End output torque
07	Operating temperature range
08	Ancillary attachment, interface according to actuator size
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12	QR code
13	Angle of rotation and assembly type
14	Actuator serial number
15	SIL marking - IEC 61508
16	ATEX marking - 2014/34/EU Directive
17	CE marking
18	UKCA marking
19	UKSI 2016:1107 marking

i Note

Refer to the data sheet 2.1.7.1 for other nameplate types.

i Note

Refer to the Catalogue PTU-E for actuators available options and ordering codes.

3 Design and principle of operation

The AIR TORQUE rack and pinion actuators are devices for remote operation (on/off or modulating duties) of different industrial valves such as ball valves, butterfly valves and plug valves.

The actuators are available in two configurations: double acting and single acting.

1. DOUBLE ACTING

Refer to Fig. 3-2.

In case of the double acting configuration air pressure will be necessary for both strokes (A and B).

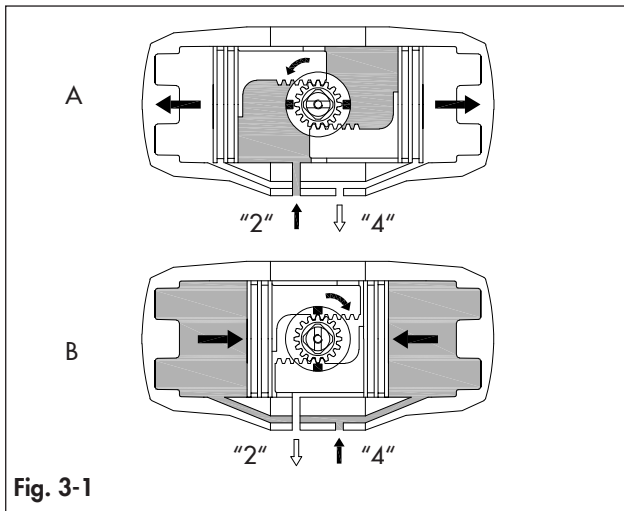


Fig. 3-1

2. SINGLE ACTING

Refer to Fig. 3-1.

When air pressure is supplied through port "2" (A') into the actuator body, the linear force applied on the piston surface generates the pinion rotation, driving the valve to a defined position. At the same time the actuator springs are compressed.

When air pressure is discharged (B'), the springs are automatically released, driving the rack and pistons back to the original position and thus the valve to the fail-safe position.

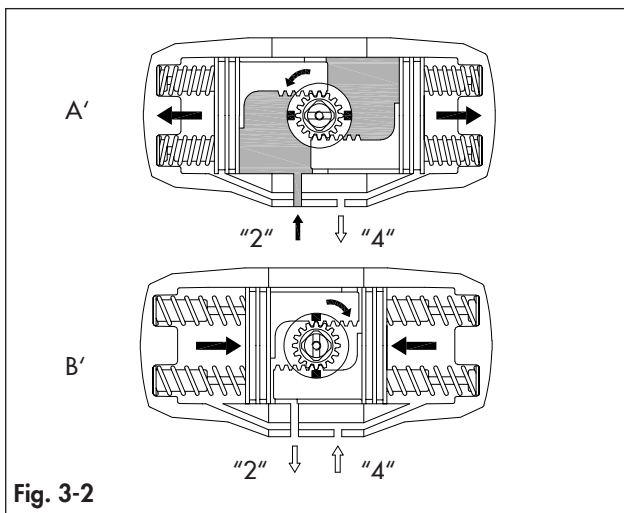


Fig. 3-2

The actuators can be controlled by different options:

- direct mounting of control devices (for example a solenoid valve or a manifold) with NAMUR interface,
- threaded connections (to pressurize port "2" and "4") with air lines from separate electro-pneumatic control system.

3.1 Direction of action and fail positions

The standard rotating direction for the AIR TORQUE actuators is clockwise to close.

Standard actuators are designed for 90° rotating angle, with travel stop allowing adjustment (Fig. 3-3) for ±5° on both close and open positions.

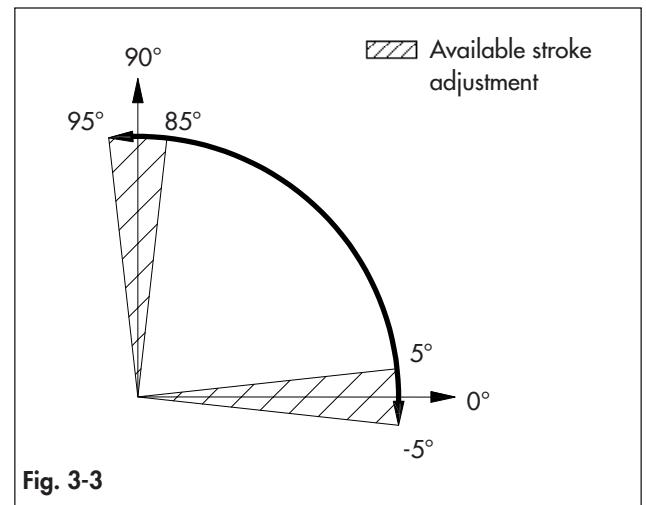


Fig. 3-3

For single acting actuator in case of pressure, power or signal failure the springs drive the actuator in the fail position that can be FAIL OPEN or FAIL CLOSE.

i Note

If the actuator is controlled by a control system the FAIL position may be different from FAIL OPEN or FAIL CLOSE.

- ➔ Refer to the actuator model technical data for the FAIL position.
- ➔ Refer to section 2.1 'Actuator nameplate sample' (Table 2-1, position 11) for the fail action and direction of rotation available options.

3.2 Complementary/accessory parts

Gearbox

It is an emergency manual override system designed to provide manual operation to drive the actuator and the valve in the safe position when the supply pressure is not available in case of any emergency situation. The actuator and the valve are operated rotating a handwheel. (Fig. 3-4)

→ Refer to the gearbox instruction manual available from AIR TORQUE.

NOTICE

Risk of actuator damage due to incorrect gearbox stroke adjustment.

- Make sure that the actuator and the gearbox are correctly oriented, with reference to the rotation direction required.
- Make sure that the stroke of the gearbox does not exceed the stroke allowed by the actuator.

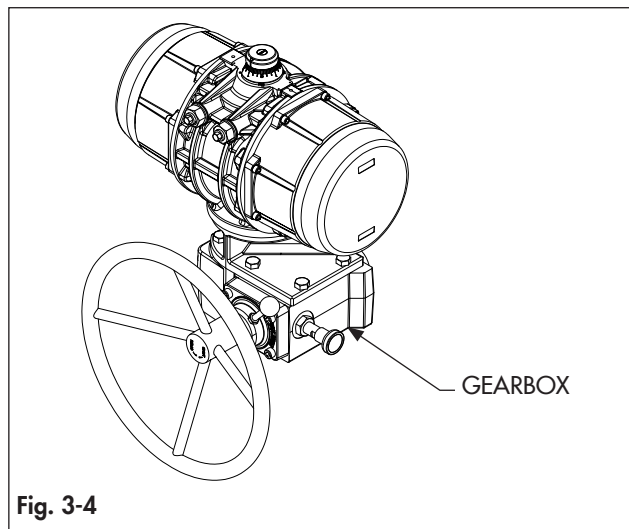


Fig. 3-4

Block and safety lock-out system

The block and safety lock-out system permits to lock the actuator and the valve in specific cases, despite the fail action of the actuator. (Fig. 3-5)

→ Refer to technical data T.D.S. 4.3.1.

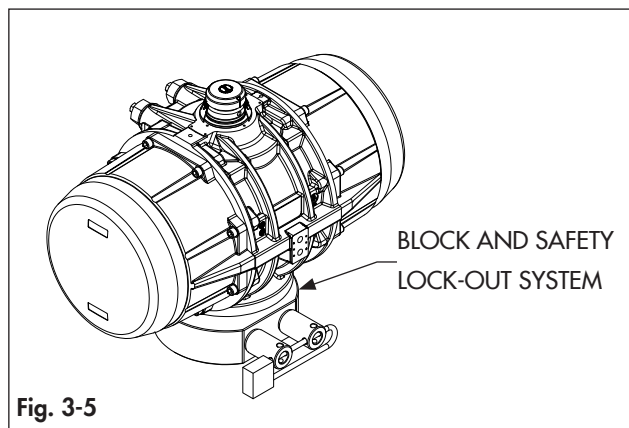


Fig. 3-5

3.3 Technical data

The nameplate provides information on the actuator configuration.

- Refer to section 2.1 'Actuator nameplate sample'.
- More informations are available in the actuator model technical data sheet available from AIR TORQUE.

Power operating media

- Use dry or lubricated air or inert gas.
- Make sure the operating media is compatible with the actuator internal parts and lubricant.
- In case of pressure medium different than Group 2 fluids according to the PED 2014/68/EU, contact AIR TORQUE.
- The operating media must have a dew point equal to -20°C (-4°F) or at least 10°C (18°F) below the ambient temperature.
- The maximum particle size contained into the operating media must not exceed $30\ \mu\text{m}$.

Supply pressure

- The maximum operating pressure is:
 - $7\ \text{bar}$ ($101,5\ \text{Psi}$) for double acting actuators,
 - $8\ \text{bar}$ ($116\ \text{Psi}$) for single acting actuators.
- Refer to section 2.1 'Actuator nameplate sample' (Table 2-1 and Table 2-2).
- For double acting and single acting actuators the working pressure is from $2.5\ \text{bar}$ ($36\ \text{Psi}$) up to the maximum operating pressure.
- Refer to the actuator model technical data for output torque values related to the working pressure range.

Operating temperature

The nameplate provides indication on the operating temperatures.

- "ST" actuators for standard temperatures from -40°C (-40°F) to $+80^{\circ}\text{C}$ ($+176^{\circ}\text{F}$).
- "HT" actuators for high temperatures from -15°C ($+5^{\circ}\text{F}$) to $+150^{\circ}\text{C}$ ($+302^{\circ}\text{F}$).
- "LLT2" actuators for extremely low temperatures from -60°C (-76°F) to $+80^{\circ}\text{C}$ ($+176^{\circ}\text{F}$).
- Refer to the data sheet RP10600E for the soft spare parts material and lubricant type in relation to the different working temperature ranges.

Stroking time

The stroking time depends on several factors such as supply pressure, supply system capacity (tubing diameter, pneumatic accessories flow capacity), valve type, valve torque, applied safety factor, cycle frequency, temperatures, etc. Nevertheless, an indication of the stroking time in clearly defined conditions is available in the actuator model technical data sheet.

4 Shipment and on-site transport

The work described in this section is only to be performed by fully trained and qualified personnel.

4.1 Accepting the delivered goods

After receiving the shipment, proceed as follows:

1. Check the scope of delivery. Check that the specifications on the actuator nameplate match the specifications in the delivery note. See the 'Markings on the device' section for nameplate details.
2. Check the shipment for transportation damage. Report any damage to AIR TORQUE and the forwarding agent (refer to delivery note).
3. Determine the weight and dimensions of the units to be lifted and transported in order to select the appropriate lifting equipment and lifting accessories. Refer to the transport documents and to the actuator model Technical data sheet.

4.2 Removing the packaging from the actuator

Do not open or remove the packaging until immediately before mounting the actuator.

Leave the actuator in its transport container or on the pallet to transport it on site.

Dispose and recycle the packaging in accordance with the local regulations.

4.3 Transporting and lifting the actuator

⚠ DANGER

Risk of severe personal injury due to suspended loads falling.

- Stay far from suspended or moving loads.
- Close off and secure the transport paths.

⚠ WARNING

Risk of lifting equipment tipping over and risk of damage to lifting accessories due to exceeding the rated lifting capacity.

- Use only approved lifting equipment and accessories whose maximum lifting capacity is higher than the actuator weight (including the packaging, if applicable).

ⓘ NOTICE

Risk of actuator damage due to incorrectly attached slings.

Only attach load slings to vertically lift the actuator on its own. The lifting points must not be used to lift the actuator and valve assembly.

- Do not attach load-bearing slings to the travel stop or to accessories.
- Do not use damaged or defective slings.

- Do not shorten the slings with knots or bolts or other makeshift devices.
- Observe lifting instructions (see section 4.3.2).

💡 Tip

Our after-sales service can provide more detailed transport and lifting instructions on request.

4.3.1 Transporting the actuator

The actuator can be transported using proper lifting equipment (e.g. crane or forklift).

- Leave the actuator in its transport container or on the pallet to transport it.
- Observe the transport instructions.

Transport instructions

- Protect the actuator against external influences (e.g. impact).
- Do not damage the corrosion protection (paint, surface coatings). Repair any damage immediately.
- Protect the actuator against moisture and dirt.
- Observe permissible temperatures (refer to the section 3.3 'Technical data').

4.3.2 Lifting the actuator

Observe the ruling regulations concerning the lifting operations.

To mount large actuators onto the valve, use lifting equipment (e.g. crane or forklift) to lift it.

Do not drill extra holes into the actuator.

Do not use the actuator lifting points to lift the actuator and valve assembly.

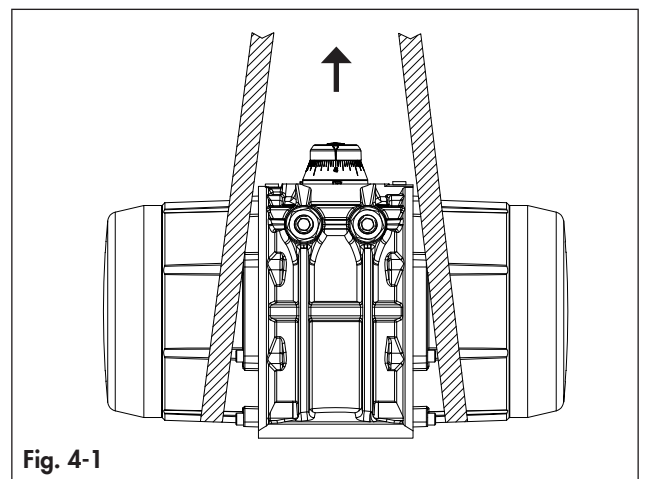


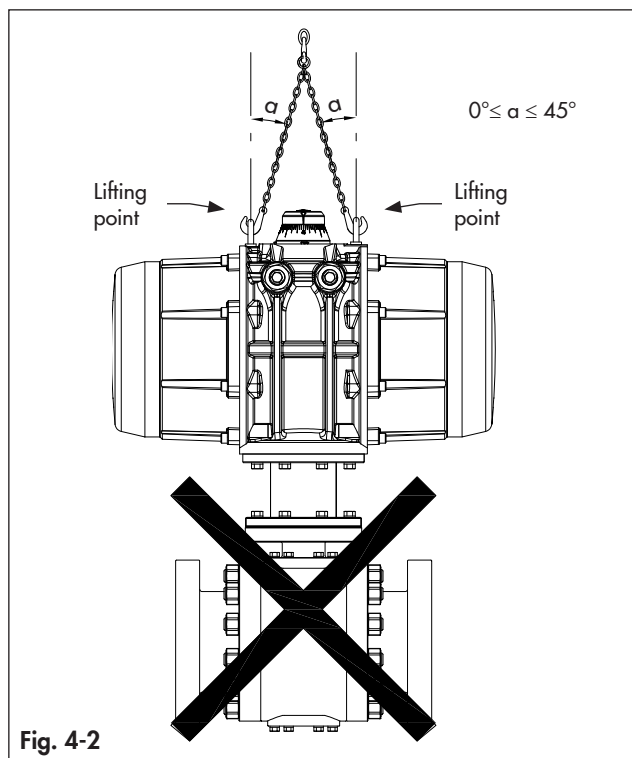
Fig. 4-1

Use appropriate tackles and slings to lift the actuator.

- Refer to technical data sheet for the actuator weight.

Lifting instructions

- Secure slings on the object to be transported against slipping.
- Make sure the slings can be removed from the actuator once it has been mounted on the valve.
- Prevent the actuator from tilting or tipping.
- Do not leave loads suspended when interrupting work for longer periods of time.
- Use a hook with safety latch to secure the slings from slipping during lifting and transporting.
- On request two threaded holes are available to lift the actuator by means of eyebolts or similar components as shown in Fig. 4-2. Do not lift the actuator and valve assembly from these lifting points.



Storage instructions

- Store the actuator in a clean and dry place.
- Temperature limits are defined by the rubber components material.
- ➔ Refer to the 'Rubber components storage instruction' (T 3.3.3.1 EN).
- When the valve and actuator are already assembled, also observe the valve storage conditions. Refer to the valve documentation.
- Protect the actuator against external influences (e.g. impact).
- Secure the actuator in the stored position against slipping or tipping over.
- Do not damage the corrosion protection (paint, surface coatings). Repair any damage immediately.
- Protect the actuator against moisture and dirt.
- Make sure that the ambient air is free of acids or other corrosive media.
- Do not place any objects on the actuator.
- Keep for future references the relevant technical documentation of the actuator.
- Do not remove the plastic plugs from the air connections.

Tip

Our after-sales service (aftersales@airtorque.it) can provide more detailed storage instructions on request.

4.4 Storing the actuator

NOTICE

Risk of actuator damage due to improper storage.

- ➔ Observe the storage instructions.
- ➔ Observe the rubber components storage instructions (T 3.3.3.1 EN).
- ➔ Avoid long storage times. Contact AIR TORQUE in case of different storage conditions or long storage periods.

Note

It is recommended to regularly check the actuator and the prevailing storage conditions during long storage times.

5 Mounting and assembly

The work described in this section is only to be performed by fully trained and qualified personnel.

5.1 Preparation for installation

If the actuator was shipped already assembled over the valve, the setting of the actuator and control system (if any) should have been already done by the valve manufacturer or automation center.

If the actuator was shipped separately from the valve, the setting of the actuator and control system must be done while assembling the actuator on top of the valve.

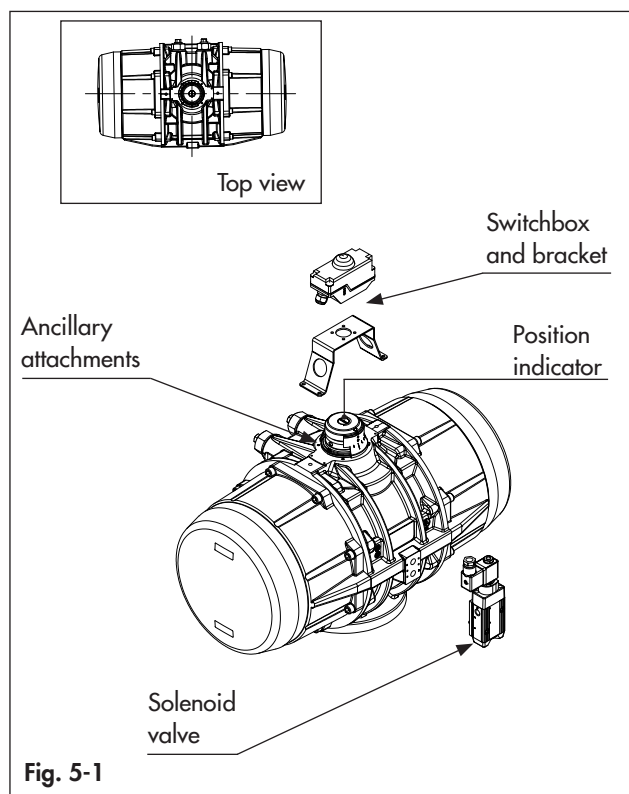
The actuator assembly on valve can be performed by:

- Mounting directly the actuator over the valve interface
- Assembling a bracket and a coupling between the actuator and the valve.

5.2 Control and signal devices assembly

The AIR TORQUE actuators can be controlled by directly mounted devices or remote control systems. Therefore AIR TORQUE actuators have direct mounting interfaces (Fig. 5-1) in order to allow control and signal devices assembly (e.g. solenoid valve, positioner, switchbox, etc) and threaded connections for remote control systems.

- ➔ Refer to the documentation available from control and signal devices manufacturers for mounting and operating instructions.



5.3 Mounting the actuator over the valve

⚠ DANGER

Risk of bursting in the actuator

Pneumatic actuators are pressure equipment that may burst when handled incorrectly. Flying projectile fragments or components can cause serious injury or even death.

- ➔ Before starting any work on the actuator disconnect all pneumatic/hydraulic/electrical supplies and discharge the pressure from the actuator.

⚠ WARNING

Crush hazard arising from moving parts.

The actuator and the valve assembly contains moving parts, which can injure hands or fingers.

- ➔ Do not touch or insert hands or finger into moving parts.
- ➔ Before starting any work on the actuator disconnect all pneumatic/hydraulic/electrical supplies and discharge the pressure from the actuator.
- ➔ Do not impede the movement of the pinion and the pistons by inserting objects into the actuator.

⚠ WARNING

Risk of damage and malfunction due to torque limit violation.

Considering the maximum actuator output torque, the maximum air supply pressure and the maximum valve torque, according to ISO 5211, the actuator maximum transmissible output torque must not exceed the torque limit in relation to the available ISO flange and the drive shaft connection.

- ➔ Refer to section 2 'Markings on the device' for nameplate details.

⚠ WARNING

Risk of personal injury due to preloaded and compressed springs.

End caps are under tension due to compressed springs. Furthermore incorrect spring cartridges disassembly could result in serious injury.

- ➔ Before starting any work on the actuator disconnect all pneumatic/hydraulic/electrical supplies and discharge the pressure from the actuator.
- ➔ Make sure that the actuator is in the closed position (0°).

ⓘ NOTICE

Risk of actuator damage due to excessively high or low tightening torques.

Observe the specified torques on tightening actuator components (bolts and nuts). Excessive tightening torques lead to parts wearing out quicker. Parts that are not tightened enough may loosen.

- ➔ Refer to section 15.2 'Tightening torques'.

Mounting and assembly

Before mounting the actuator over the valve, make sure the following conditions are met:

- The actuator is not damaged.
 - The type designation, material and temperature range of the actuator match the ambient conditions (temperatures etc.). Refer to 'Markings on the device' in section 2 for nameplate details.
 - Check compatibility of the valve stem to the actuator bore. The length, size and configurations must match.
 - Check compatibility of actuator, valve and bracket bolting pattern.
 - Before fitting the actuator over the valve, make sure that the actuator and the valve are correctly oriented, with reference to the rotation direction and fail action required.
 - Make sure that the tubing, fittings and seals connected to the actuator are cleaned to prevent foreign matter/objects entering into the actuator's chambers.
- When fitting accessories over the actuators, assemble them in such a way that the emergency controls are easily accessible for emergency manual operation.
 - Check that the exhaust ports are not obstructed.
 - Remove the plugs from the actuator air connections during installation and operation, protect and close the air connections which may not being used immediately.
 - Make sure that the operating pressure media composition used for the actuator operation meets the operating conditions given in this manual and corresponds to what the actuator was manufactured for. Refer to section 3 'Design and principles'.
 - It is the user responsibility to ensure that actuator and control components must be protected from electrical spikes, surge and lightning strikes as well as all magnetic fields.
 - Prevent any dangerous and/or corrosive substances in the working environment enter into the internal chambers by using adequate filters and/or solenoid valves and/or any other appropriate system.

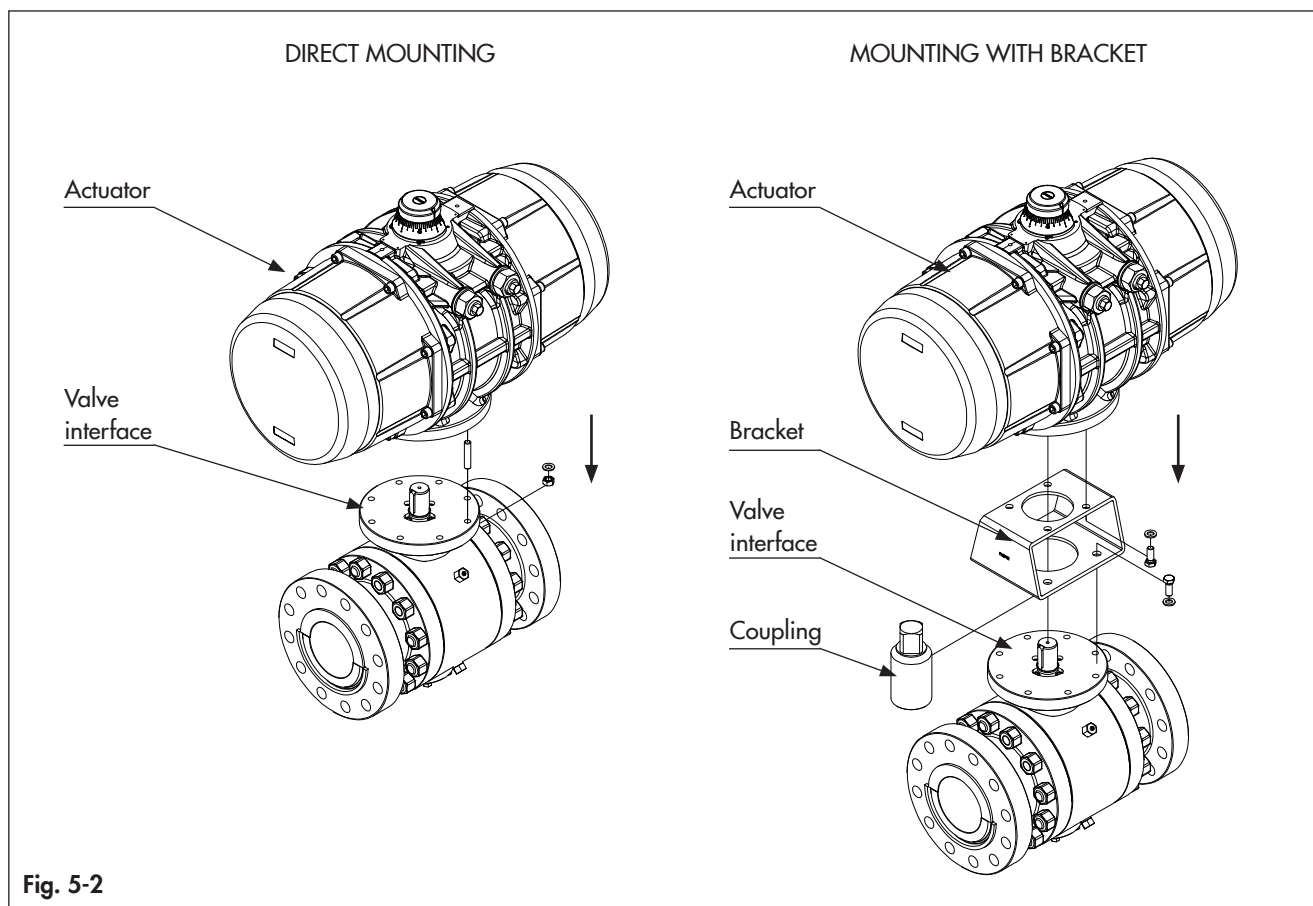


Fig. 5-2

Refer to Fig. 5-2 and proceed as follows to mount the actuator over the valve:

1. Disconnect any electrical/pneumatic/hydraulic power supply.
2. Lay out the necessary material and tools to have them ready during mounting.
3. The actuator is supplied in the fail position (for single-acting), so drive the valve in the right position as per the actuator fail position.
4. Clean the actuator's bore and the bottom flange.
5. Clean the valve and the actuator interface to remove completely any lubricant.

6. Place the bracket, if any, over the valve flange, tighten all bolts and nuts and apply the correct tightening torque.
7. Assemble the coupling at first into the valve stem before the assembly of the actuator.
8. Lift the actuator.

⚠ WARNING***Risk of damage due to incorrect alignment***

- *Support the actuator with the lifting equipment until the connection bolts are completely tightened.*
- *Make sure to align correctly the dowel pins or the spigot, if any.*

-
9. Align the valve stem/coupling to the actuator's bore.
 10. Carefully lower the actuator and engage the valve stem/coupling into the actuator's bore without forcing and driving the actuator into the position only with the weight of the actuator itself.
 11. Fix the actuator over the valve flange/bracket with the connection bolts.
 12. Tighten the connection bolts at the correct tightening torque as per ISO 5211.

6 Start-up

The work described in this section is only to be performed by fully trained and qualified personnel.

⚠ WARNING

Risk of personal injury during actuator air exhaust.

In case of pneumatic version the actuator is operated with air. As a result, air is exhausted during operation.

- ➔ *Install the air exhaust components in such a way that exhaust ports are not located at eye level and the actuator does not discharge at eye level in the work position.*
 - ➔ *Use suitable silencers and vent plugs.*
 - ➔ *Wear eye and hearing protection when working near the actuator.*
-

⚠ WARNING

Risk of personal injury through incorrect operation, use or installation as a result of information on the actuator being illegible.

Over time, markings, labels and nameplates on the actuator may become covered with dirt or become illegible in some other way. As a result, hazards may go unnoticed and the necessary instructions not followed. There is a risk of personal injury.

- ➔ *Keep all relevant markings and inscriptions on the device in a constantly legible state.*
 - ➔ *Immediately renew damaged, missing or incorrect nameplates or labels.*
-

Verify the compatibility and connect the actuator to the pressure supply line and/or to the control system, if any, with fittings and pipes as per actuator model and plant specifications.

7 Operation

The work described in this section is only to be performed by fully trained and qualified personnel.

⚠ WARNING

Risk of personal injury during actuator air exhaust.

In case of pneumatic version the actuator is operated with air. As a result, air is exhausted during operation.

- *Install the air exhaust components in such a way that exhaust ports are not located at eye level and the actuator does not discharge at eye level in the work position.*
- *Use suitable silencers and vent plugs.*
- *Wear eye and hearing protection when working near the actuator.*

⚠ WARNING

Crush hazard arising from moving parts.

The actuator and the valve assembly contains moving parts, which can injure hands or fingers.

- *Do not touch or insert hands or finger into moving parts.*
- *Before starting any work on the actuator disconnect all pneumatic / hydraulic / electrical supplies and discharge the pressure from the actuator.*
- *Do not impede the movement of the pinion and the pistons by inserting objects into the actuator.*

⚠ WARNING

Risk of personal injury through incorrect operation, use or installation as a result of information on the actuator being illegible.

Over time, markings, labels and nameplates on the actuator may become covered with dirt or become illegible in some other way. As a result, hazards may go unnoticed and the necessary instructions not followed. There is a risk of personal injury.

- *Keep all relevant markings and inscriptions on the device in a constantly legible state.*
- *Immediately renew damaged, missing or incorrect nameplates or labels.*

⚠ WARNING

Risk of bursting due to pressurized external chambers of spring return actuator, "Port 4" air connection.

Spring Return Pneumatic actuators are pressure equipment that may burst when pressurized incorrectly in the spring chambers. Flying projectile fragments or components can cause serious injury or even death.

- *Only the internal chamber, "Port 2" air connection, of spring return actuators must be pressurized.*
- *Refer to section 3 "Design and principle of operation" for the function details.*
- *The use of close loop system is allowed.*

The actuator can be operated after connecting it to the supply line and adjusting the stroke.

Double acting actuators require alternate connection ports to be pressurized and vented for stroking.

Single acting actuators work on air stroke or spring stroke by pressurizing or venting respectively the connection ports.

- Refer to section 3 'Design and principle of operation'.
- Choose the accessories, control elements, tubing and fittings for adequate flow rates so as not to constrict flow or cause high pressure drop affecting the performance of the actuator.
- In case the plant specifications require a supply pressure for the actuator lower than the maximum supply pressure marked in the actuator nameplate, label the actuator with reduced supply pressure (e.g. "Max. supply pressure limited to ... bar").

8 Malfunctions

The work described in this section is only to be performed by fully trained and qualified personnel.

8.1 Troubleshooting

Malfunction	Possible reasons	Recommened action
Uneven rotation	Inadeguate supply	Check the supply system and make sure that the supply pressure is correct.
	Missing lubricant	Disassemble the actuator, lubricate all the sliding parts and reassemble the actuator.
	Worn components	Disassemble the actuator, inspect and replace the worn/damaged components.
	Control system	Make sure the control system components are correctly assembled. Check the control system documentation and contact the manufacturer.
	Faulty valve	In case of actuator mounted over the valve, check the valve documentation and contact the manufacturer.
Incomplete rotation	Incorrect stroke adjustment	Follow the indications in section 9.5.6 for correct stroke adjustment.
	Foreign object left inside	Disassemble the actuator, inspect and remove any foreign object.
	Incorrect assembly after maintenance	Disassemble and reassemble the actuator correctly.
	Control system	Make sure the control system components are correctly assembled. Check the control system documentation and contact the manufacturer.
	Faulty valve	In case of actuator mounted over the valve, check the valve documentation and contact the manufacturer.
Loss of power	Inadeguate supply pressure	Check the control system and make sure that the supply pressure is correct.
	Supply pipe blocked, compressed or with sealing problems	Check all the tubing and fittings, remove any foreign object/damaged component.
	Actuator seals leakage	Disassemble the actuator, inspect and replace any damaged seals.
	Blocked air exhaust hole	Remove plugs or foreign objects from the exhaust hole.
	Faulty valve	In case of actuator mounted over the valve, check the valve documentation and contact the manufacturer.

i Note

Contact AIR TORQUE after-sales service (aftersales@airtorque.it) for malfunctions not listed in the table.

8.2 Emergency action

The plant operator is responsible for emergency action to be taken in the plant.

9 Service

The work described in this section is only to be performed by fully trained and qualified personnel.

⚠ DANGER

Risk of bursting due to incorrect opening of pressurized equipment or components.

Pneumatic actuators are pressure equipment that may burst when handled incorrectly. Flying projectile fragments or components can cause serious injury or even death.

- ➔ Before starting any work on the actuator disconnect all pneumatic/hydraulic/electrical supplies and discharge the pressure from the actuator.

⚠ WARNING

Risk of personal injury due to preloaded and compressed springs.

End caps are under tension due to compressed springs. Furthermore incorrect spring cartridges disassembly could result in serious injury.

- ➔ Before starting any work on the actuator disconnect all pneumatic/hydraulic/electrical supplies and discharge the pressure from the actuator.
- ➔ Make sure that the actuator is in the closed position (0°) while disassembling the end caps and the stop screws have been correctly removed.
- ➔ Do not disassemble individual spring cartridges.
- ➔ If spring cartridges service is necessary, contact AIR TORQUE.

⚠ WARNING

Crush hazard arising from moving parts.

The actuator and the valve assembly contains moving parts, which can injure hands or fingers.

- ➔ Do not touch or insert hands or finger into moving parts.
- ➔ Before starting any work on the actuator disconnect all pneumatic/hydraulic/electrical supplies and discharge the pressure from the actuator.

ⓘ NOTICE

Risk of actuator damage due to excessively high or low tightening torques.

Observe the specified torques on tightening actuator components (bolts and nuts). Excessive tightening torques lead to parts wearing out quicker. Parts that are not tightened enough may loosen.

- ➔ Observe the specified tightening torques in section 1.5.2.

ⓘ Note

- The product warranty becomes void if service or repair work not described in these instructions is performed without prior agreement by AIR TORQUE's After-sales Service.
- Only use original spare parts by AIR TORQUE, which comply with the original specifications.

With the information given below, AIR TORQUE provides the end user with all the required information necessary for service.

Under normal conditions, the actuator requires only periodic observation to ensure proper operation. However, due to critical working conditions and a natural components ageing effect even if properly stored, a preventive service program is essential to ensure good performance, safe operation and an extended life of the actuator. AIR TORQUE recommend to perform the service not later than reaching the first limit between cycles number limit and time limit. One cycle consists of nominal 90° angular travel in both directions (i.e. 90° to open + 90° to close).

- ➔ Spare kits are available for seals and bearing replacement. (refer to the 'Part list' in section 9.2)
- ➔ Refer to the Rubber products storage instructions (T3.3.3.1 EN).

Table 9-1

ACTUATOR OUTPUT TORQUE RANGE	CYCLES NUMBER LIMIT	TIME LIMIT
3.000 Nm ÷ 8.000 Nm	50.000	48 Months/4 years from installation or
8.000 Nm ÷ 16.000 Nm	30.000	60 Months/5 years from production date.

Cycles number limit and time limit have been defined for actuators with sizing safety factor at least 1.3 and operating at specific conditions:

- Supply pressure ≤ 5,5 bar.
- Supply media: air or inert gas, not corrosive, dry or lightly lubricated, without impurity.
- Working temperature from 10°C up to 30°C.

ⓘ Note

Any deviation from these operating conditions may affect the recommended cycles number limit and time limit.

- ➔ For actuators with "HT" or "LLT2" operating temperatures (refer to section 3.3 'Technical data') the recommended cycles number and time limit may be reduced by 50%.
- ➔ For actuators operating in Safety instrumented systems where a certain SIL level is required, cycles number limit and time limit may be significantly reduced.

9.1 Preparation for servicing

1. Lay out the necessary material and tools to have them ready for the intended work.
2. Put the actuator out of operation referring to section 10 'Decommissioning'.
3. Remove the actuator from the valve referring to section 11 'Removal'.

9.2 Part list

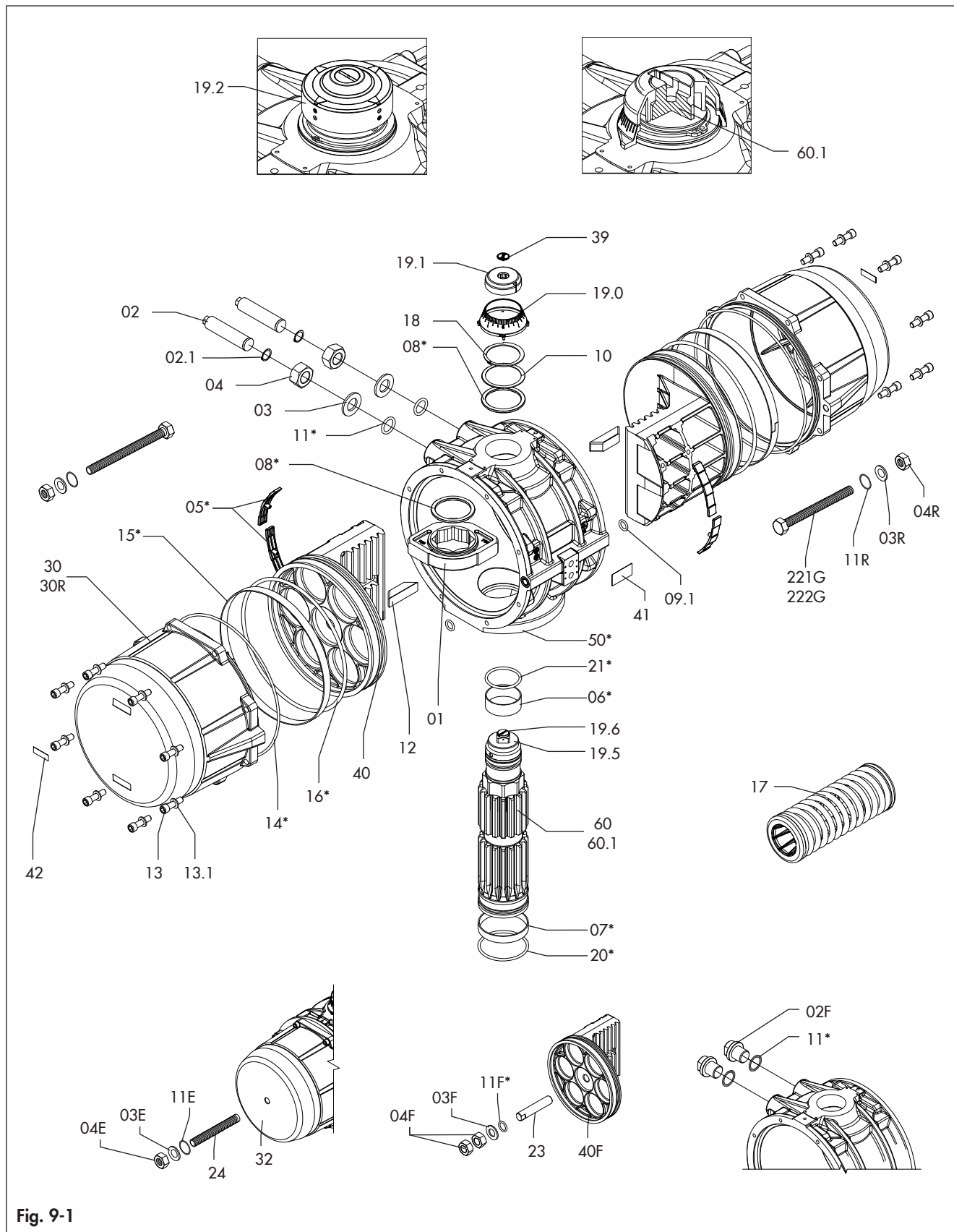


Table 9-2

PART N° 1)		UNIT Q.TY	NOTE	DESCRIPTION
01		1		OCTI-CAM (Stop arrangement)
02		2		ANTI BLOW-OUT STOP CAP SCREW
02.1 2)		2		SPRING CLIP (Stop screws)
03		2		WASHER (Anti blow-out stop cap screw)
03E		2	for special "R" construction models	WASHER (External cap screw)
03F				WASHER (Internal cap screw)
03R		2	for models with extra travel stop adjustment	WASHER (Extra travel Stop adjustment screw)
04		2		NUT (Stop screw)
04E		2	for special "R" construction models	NUT (External cap screw)
04F		2		NUT (Internal cap screw)
04R		2	for models with extra travel stop adjustment	NUT (Extra travel Stop adjustment screw)
05*	◇	2		BEARING (Piston back)
06*	◇	1		BEARING (Pinion top)
07*	◇	1		BEARING (Pinion bottom)
08*	◇	2		THRUST BEARING (Pinion)
09.1*	◇ •	2		O-RING (External chamber air connection)
10		1		THRUST WASHER (Pinion)
11*	◇ •	2		O-RING (Stop screw)
11E*	◇ •	2	for special "R" construction models	O-RING (External cap screw)
11F*	◇ •	2		O-RING (Internal cap screw)
11R*	◇ •	2	for models with extra travel stop adjustment	O-RING (Extra travel stop adjustment screw)
12		2		PISTON GUIDE
13		16		CAP SCREW (End cap)
13.1		16		WASHER (Cap screw)
14*	◇ •	2		O-RING (End cap)
15*	◇	2		BEARING (Piston head)
16*	◇ •	2		O-RING (Piston)
17		max. 12		SPRING (Cartridge)
18		1		SPRING CLIP (Pinion)
19.0		1		GRADUATED RING
19.1		1		POSITION INDICATOR
19.2 2)		1		MULTIFUNCTION POSITION INDICATOR
19.5		1		TOP ADAPTOR
19.6		2		HEX SOCKET SCREW (Top adaptor)
20*	◇ •	1		O-RING (Pinion bottom)
21*	◇ •	1		O-RING (Pinion top)
23		2	for special "R" construction models	INTERNAL CAP SCREW
24		2		EXTERNAL CAP SCREW
30		2		END CAP
32		2	for special "R" construction models	THREADED END CAP
39		1		CAP SCREW (Indicator)
40		2		PISTON
40F		2	for special "R" construction models	THREADED PISTON
41		1		ACTUATOR IDENTIFICATION LABEL
42		1		END CAP LABEL

Service

PART N° ¹⁾	UNIT Q.TY	NOTE	DESCRIPTION
50	1		BODY
60	1		DRIVE SHAFT
60.1 ²⁾	1		INTEGRAL DRIVE SHAFT
221G	2	for models with 50% extra travel stop adj.	STOP SCREW (extra travel Stop adjustment)
222G	2	for models with 100% extra travel stop adj.	STOP SCREW (extra travel Stop adjustment)

NOTES:

- 1) * Suggested spare parts.
Components included in spare part kits are indicated as follows:
- ◇ included in complete spare parts kit
 - included in o-rings kit
- 2) Available on request

9.3 Disassembly

⚠ WARNING

Risk of personal injury due to unsuitable workbench and incorrect handling.

The total actuator approximate weight is from 250 kg up to 320 kg depending on the configuration. Heavy weight components can cause personal injuries and or get damaged if not handled carefully.

- ➔ Operate in a safe area on a workbench suitable for the actuator size and weight.
- ➔ Make sure the equipment and the tools (coupling, vice,...) are suitable for the actuator size and weight.
- ➔ Make sure the components are always correctly aligned and in a stable position while servicing.

9.3.1 Position indicator and graduated ring removal

Refer to Fig. 9-1 and Fig 9-2.

- Remove cap screw (39), if any.
- Lift the position indicator (19/19.1) off the top drive shaft. If necessary pry gently with a screwdriver.
- Lift the graduated ring (19.0) off the body, if any. If necessary pry gently with a screwdriver.

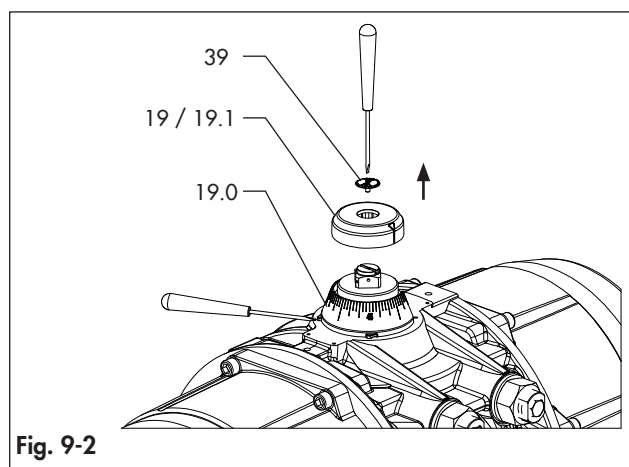


Fig. 9-2

9.3.2 Stop cap screws removal

Refer to Fig. 9-1 and Fig 9-3.

- In case of special "R" construction remove the cap screws (02F) along with the o-rings (11).
- Remove the spring clips (02.1), if any.
- Remove the nuts (04) and washers (03) (11) from the stop screws (02) along with the o-rings (11).
- Unscrew the screws (02) at least 80 mm out from the body.

In case of actuator with extra travel stop adjustment or special "R" construction (Fig. 9-3):

- loosen the nut (04R/04E),

- unscrew partially the stop screw (221G/222G/24) out from the actuator, making sure that the stop screw (221G/222G/24) is not in contact anymore with the piston assembly.

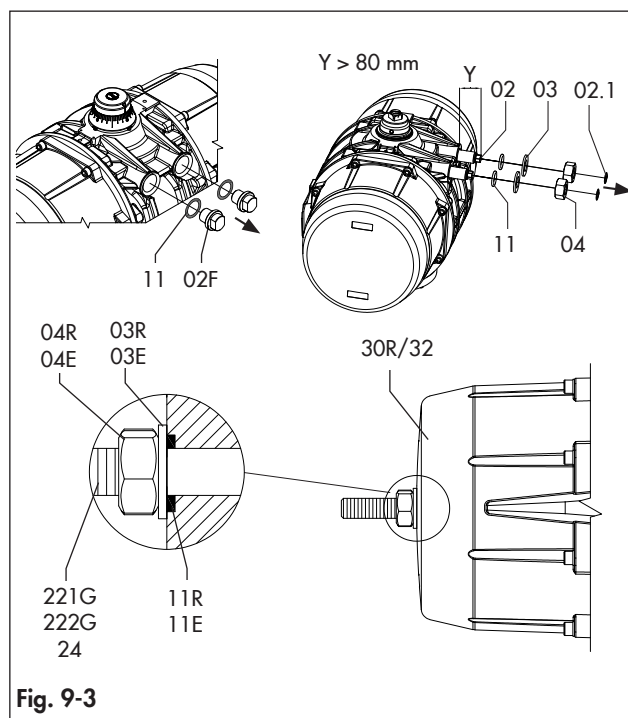


Fig. 9-3

9.3.3 End caps disassembly

Refer to Fig. 9-1, Fig 9-4, Fig 9-5 and Fig. 9-6.

Disassemble one end cap at a time.

⚠ WARNING

Risk of personal injury due to compressed springs.

End caps are under tension due to compressed springs.

- ➔ Before starting any work on the actuator disconnect all pneumatic / hydraulic / electrical supplies from the actuator and exhaust the pressure from the power module.
- ➔ Make sure that the actuator is in the closed position (0°) before disassembling.
- ➔ Make sure that the stop cap screw nuts (04/04E/04F) have been correctly removed or loosen as per section 9.3.2.

ⓘ NOTICE

Risk of components damage due to incorrect disassembly.

During disassembly the end caps can be damaged due to uneven force generated by compressed springs.

- ➔ Remove the end caps as shown in Fig. 9-4 keeping a constant distance (A = B) between the actuator body and the end cap interface.
- ➔ Observe the specified sequence shown in Fig. 9-5.

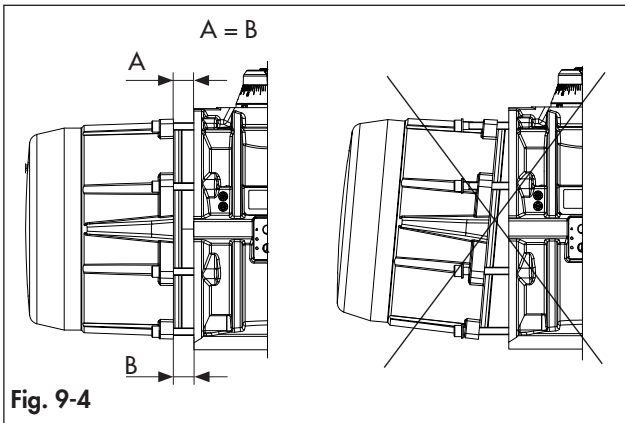


Fig. 9-4

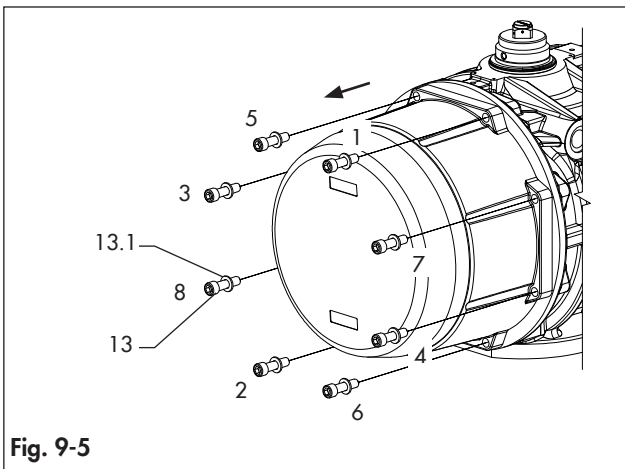


Fig. 9-5

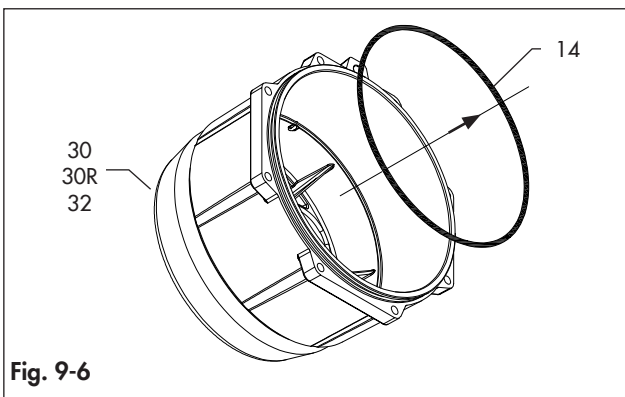


Fig. 9-6

Spring return actuators

- Release the springs compression by partially unscrewing each end cap screw (13) 1 turn at a time as per the sequence shown in Fig. 9-5 for 4/5 turns.

⚠ WARNING

Risk of personal injury due to compressed springs.
 End caps are under tension when the springs are compressed.
 ➔ If there is still force on the end cap (30/30R/32) after unscrewing the end cap screws (13) for 4/5 turns the spring cartridge may have been damaged or the pistons are not completely closed: stop the disassembly and contact AIR TORQUE.

- Completely unscrew and remove the end cap screws (13) and washers (13.1).
- Remove the end caps (30/30R/32).
- Remove the spring cartridges (17).
- Remove the o-rings (14). (Fig. 9-6)

Double acting actuators

- Unscrew completely the end cap screws (13) and washers (13.1) as per the sequence shown in the Fig. 9-5.
- Remove the end caps (30/30R/32).
- Remove the o-rings (14). (Fig. 9-6)

9.3.4 Pistons disassembly

Refer to Fig. 9-1 and Fig. 9-7.

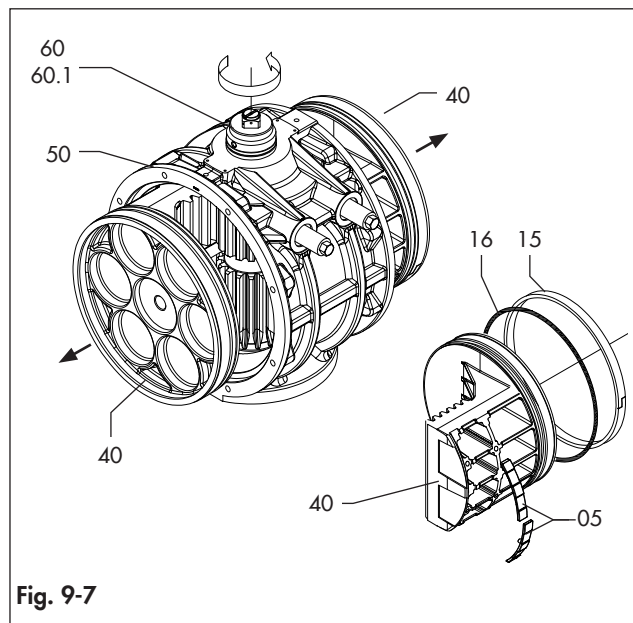


Fig. 9-7

Holding the body (50) with a bench vice or a similar device, rotate the drive shaft (60/60.1) until the pistons (40) are disengaged.

- Remove o-rings (16), the piston backs (05) and the piston head bearings (15).

9.3.5 Drive shaft disassembly

Refer to Fig. 9-1 and Fig 9-8.

⚠ NOTICE

Risk of spring clip damage due to incorrect disassembly.
 During disassembly the spring clip (18) can get overstressed if not carefully handled.

- ➔ Use proper tools to disassemble the spring clip.
- ➔ In case of spiral spring clip (18) refer to the disassembly and reassembly instructions available from AIR TORQUE.

- Remove the spring clip (18) by means of snap-ring pliers or a screwdriver for spiral rings.

- Remove the thrust washer (10) and the external thrust bearing (08).
- Apply downward force to the top of the drive shaft (60/60.1), until it is partially out of the bottom of the body and remove the internal thrust bearing (08) and the octi-cam (01).
- Push the drive shaft (60/60.1) completely out of the body. If needed, gently tap the top of the drive shaft (60) with a plastic hammer.
- Remove the drive shaft top bearing (06) and bottom bearing (07).
- Remove the drive shaft top o-ring (21) and bottom o-ring (20).

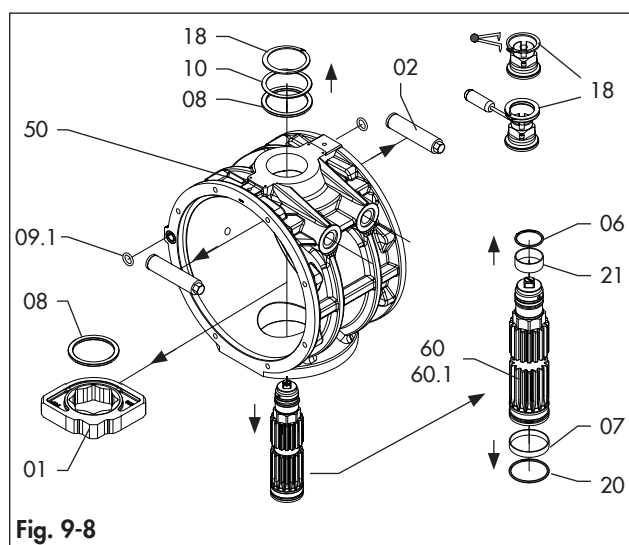


Fig. 9-8

9.4 Service operations

Inspect and clean every single component.

Inspect, clean and replace bolts, screws and nuts, if needed.

Discard and replace the damaged soft components available in the spare part kits.

→ Refer to the spare parts kit data sheet [RP10600E] and to the Rubber products storage instructions [T 3.3.3.1 EN].

Clean and lubricate every o-ring housing.

→ Refer to the section 15.3 'Lubricants'.

9.5 Reassembly

⚠ WARNING

Risk of personal injury due to unsuitable workbench and incorrect handling.

The total actuator approximate weight is from 250 kg up to 320 kg depending on the configuration. Heavy weight components can cause personal injuries and or get damaged if not handled carefully.

- Operate in a safe area on a workbench suitable for the actuator size and weight.
- Make sure the equipment and the tools (coupling, vice,...) are suitable for the actuator size and weight.

→ Make sure the components are always correctly aligned and in a stable position while servicing.

Proceed as follows for the standard assembly (AS-ST code indicated in the nameplate).

- Refer to the TYAS technical data sheet in case of actuators with different function/rotation.
- Refer to the catalogue for actuators different assembly codes.

ⓘ NOTICE

Risk of actuator damage due to the use of unsuitable lubricants.

The lubricants to be used depend on the actuator material and operating temperatures.

→ Only use lubricants approved by AIR TORQUE. Refer to section 15.3 'Lubricants'.

9.5.1 Drive shaft reassembly

Refer to Fig. 9-1, Fig. 9-9, Fig. 9-10 and Fig. 9-11.

- Place the drive shaft top bearing (06) and bottom bearing (07).
- Lubricate and place the drive shaft top o-ring (21) and bottom o-ring (20).
- Lubricate the external surface of the bearings and o-rings placed onto the drive shaft (60/60.1) as per the Fig. 9-9.

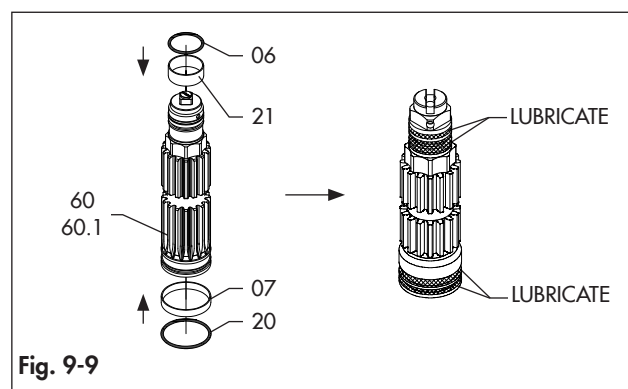


Fig. 9-9

- Fasten the screws (02) from inside the body (50) until they are outside the body for at least 80 mm. (Fig. 9-10)
- Insert partially the drive shaft (60/60.1) into the body (50). (Fig. 9-10)
- Place the octi-cam (01) through the body (50) onto the drive shaft (60/60.1). Refer to the Fig. 9-11 for the correct placement of the octi-cam (01).
- Place the internal thrust bearing (08).
- Insert completely the drive shaft (60/60.1) into the body (50).
- Place external thrust bearing (08) and thrust washer (10).

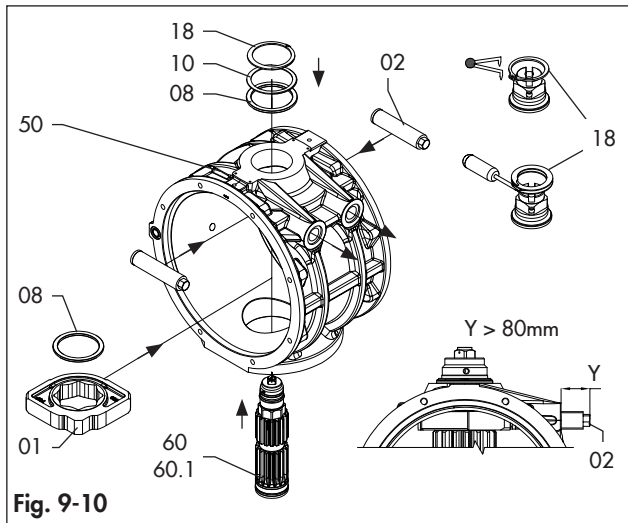
NOTICE

Risk of spring clip damage due to incorrect assembly.

During reassembly the spring clip (18) can get overstressed if not carefully handled.

- Use proper tools to reassemble the spring clip.
- Replace the spring clip (18) if it has been overstressed and loosened.
- In case of spiral spring clip (18) refer to the disassembly and reassembly instructions available from AIR TORQUE.

- Place the spring clip (18) by means of by means of snapping pliers or a screwdriver for spiral rings.



- For special "R" construction fasten partially the cap screw (23) in the piston (40F).

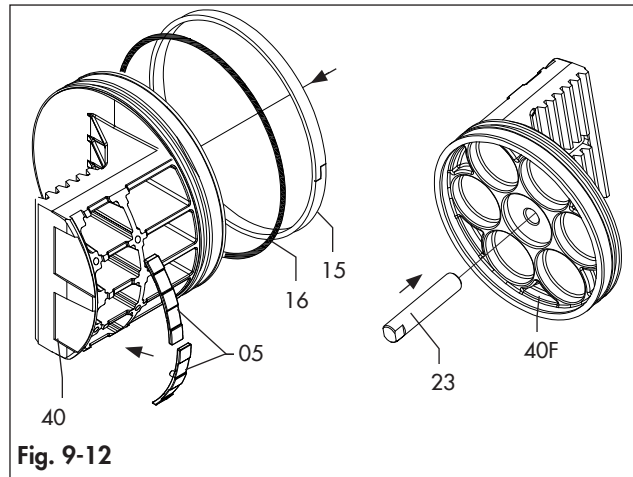


Fig. 9-12

NOTICE

Risk of damage due to unsuitable workbench.

Heavy components can cause personal injuries and or get damaged if not handled carefully.

- Make sure the coupling is suitable for the actuator size and weight.
- The coupling must be properly fixed to the workbench.
- Make sure the components are always correctly aligned and in a stable position.

- Insert the female connection of the drive shaft (60/60.1) in a properly fixed coupling joint. (Fig. 9-13)
- Make sure that the octi-cam (01) is in the right position as per the Fig. 9-11 referring to the stop screws (02).
- Rotate the body (50) about 40°-45° clockwise from top view, as shown in Fig. 9-13. Make sure the octi-cam (01) is correctly oriented as per Fig. 9-13.

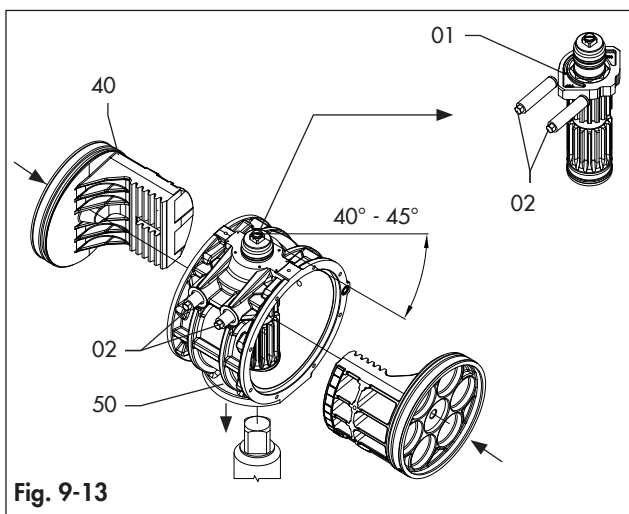
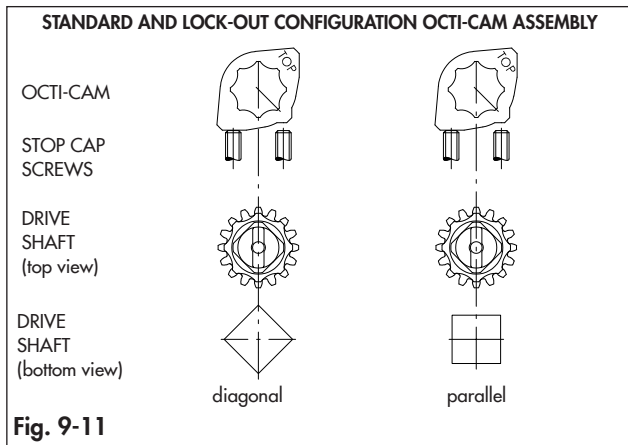


Fig. 9-13

9.5.2 Pistons reassembly

Refer to Fig. 9-1 and from Fig. 9-12 to Fig. 9-15.

Proceed as follows to reassemble standard actuator pistons with a 90° angle of rotation and clockwise to close. Refer to the TYAS technical data sheet in case of actuators with different function/rotation.

- Lubricate and place onto the pistons (40) the o-rings (16), piston backs (05) and the head bearings (15).
- Lubricate the internal surface of the body (50) and the piston (40) rack teeth and place the piston guides (12).

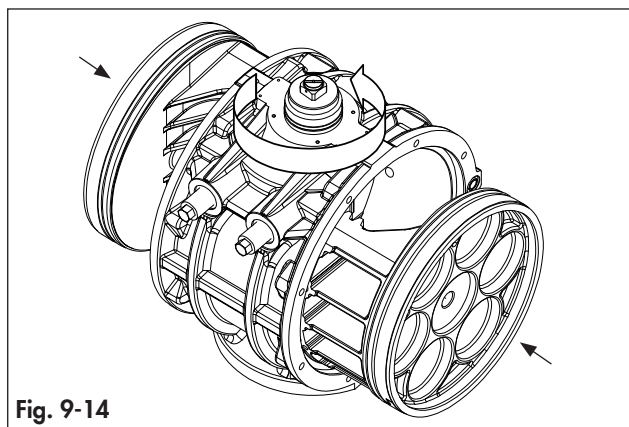


Fig. 9-14

- Insert and press the two pistons (40) simultaneously inside the body (50) until the pistons are engaged.
- Then rotate the body (50) anticlockwise from top view until the stroke is completed.
- With pistons completely closed (0° position) as per Fig. 9-15, referring to the axis of the body, the rotation obtained must be about over 0° up to 5°.
- With pistons completely closed (0° position) as per Fig. 9-15 the dimension “A” must be the same on both sides.

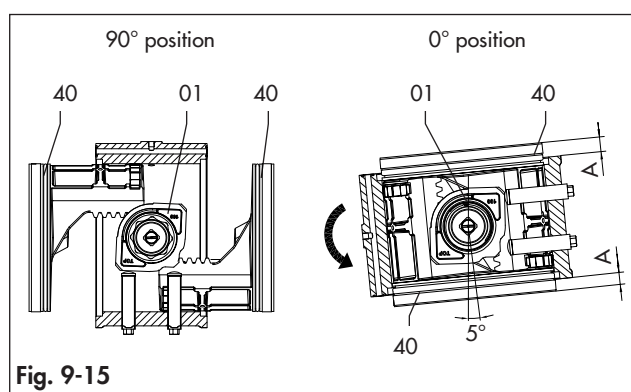


Fig. 9-15

For special “R” construction:

- Fasten or unscrew the screws (23) to push the pistons in the 0° position (Fig. 9-15).
- Lubricate and place the o-rings (11F) over the screws (23).
- Fix the screws (23) in position tightening the nuts (04F) along with the washer (03F).

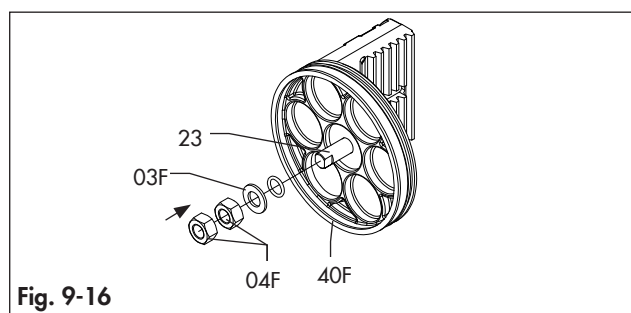


Fig. 9-16

9.5.3 End caps reassembly

⚠ WARNING

Risk of personal injury due to unsuitable workbench and incorrect handling.

Heavy components can cause personal injuries and or get damaged if not handled carefully.

- ➔ Operate in a safe area on a workbench suitable for the actuator size and weight.
- ➔ Keep the actuator in a stable position by means of proper supporting equipment.
- ➔ Make sure the components are always correctly aligned while reassembling the end caps.

Assemble one end cap (30/30R) at a time.

- In case of actuator with extra stop travel adjustment or special “R” construction:
 - fasten the stop screws (221G/222G/24) into the end caps (30R/30E) as shown in Fig. 9-16.
 - lubricate and place the o-rings (11R/11E),
 - place the washer (03R/03E) and fasten partially the nuts (04R/04E).
- ➔ Refer to the data sheet [T.D.S. 2.1.5.1.1] for extra travel stop adjustment.

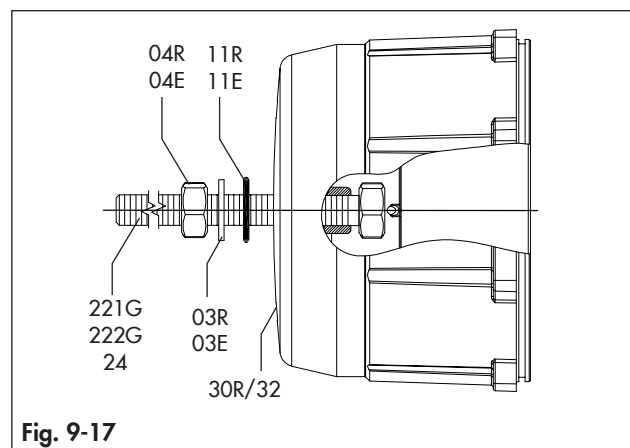


Fig. 9-17

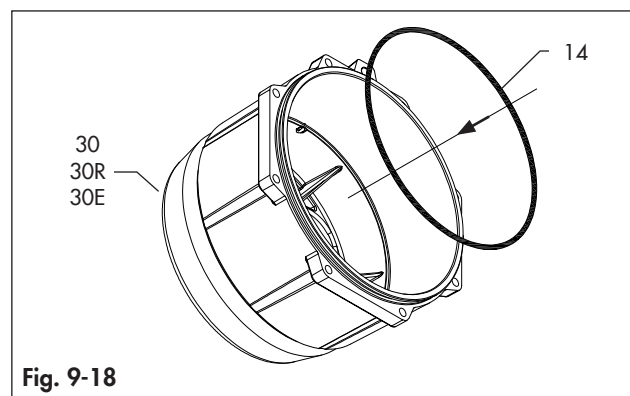


Fig. 9-18

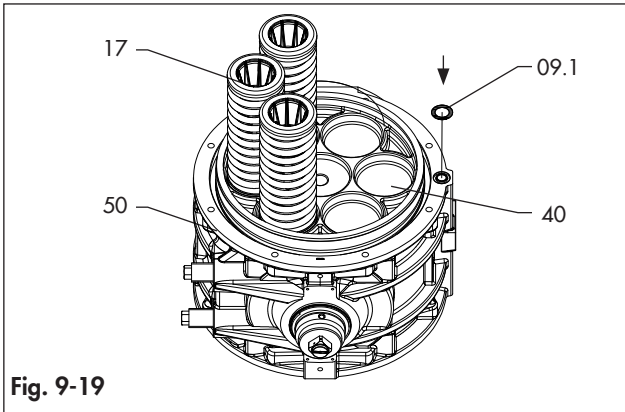


Fig. 9-19

- Place the end caps o-ring (14) into the groove as shown in Fig. 9-18 making sure that the o-ring is stable in its housing.
- Place the actuator in vertical position. as per Fig. 9-19.
- In case of spring return actuator, place the correct quantity of spring cartridges (Fig. 9-19) in the correct position as indicated in Fig. 9-20 depending on the actuator configuration.
- Lubricate and place the o-ring (09.1) over the body (50). (Fig. 9-19)

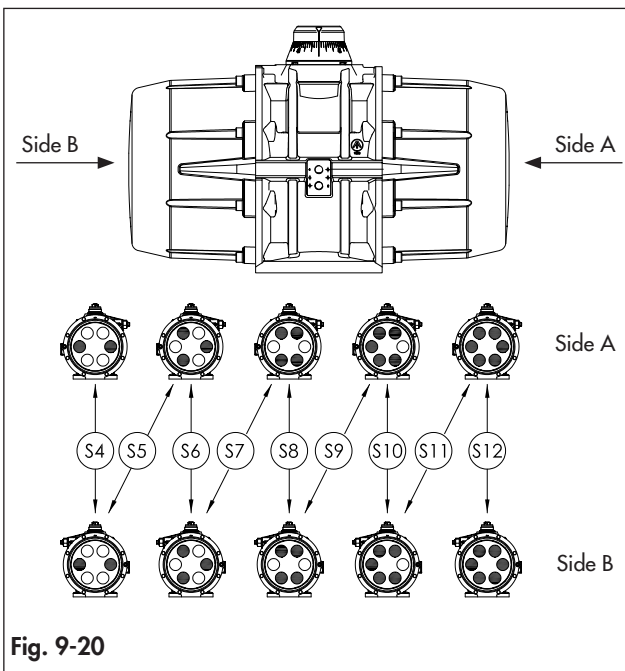


Fig. 9-20

- Place the end cap (30/30R/03E).
- Fix the end cap (30) fastening partially the cap screws (13) 1 turn at a time following the sequence indicated in Fig 9-22.

NOTICE

Risk of components damage due to incorrect assembly. During reassembling the end caps can be damaged due to uneven force generated by compressed springs.

- Assemble the end caps as shown in Fig. 9-21 keeping a constant distance ($A = B$) between the actuator body and the end cap interface.
- Observe the specified sequence shown in Fig. 9-22.

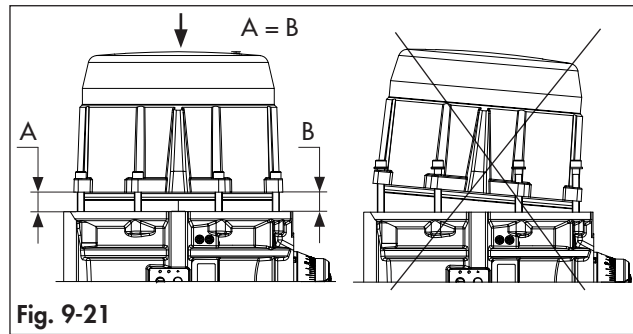


Fig. 9-21

- Complete the fastening of the end cap screws (13) tightening 1 turn at a time for each screw in the sequence shown in Fig. 9-22.
- Refer to the section 15.2 'Tightening torques'. (Table 15.1)

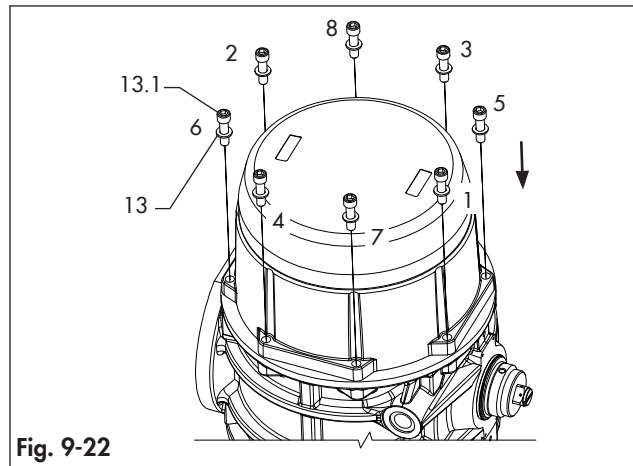


Fig. 9-22

9.5.4 Position indicator reassembly

Refer to Fig. 9-1 and Fig. 9-23.

- Fix the graduated ring (19.0) into the body, if any.
- Place the indicator (19/19.1) referring to the correct actuator position.
- Fasten the indicator screw (39), if any. (Fig. 9-23)

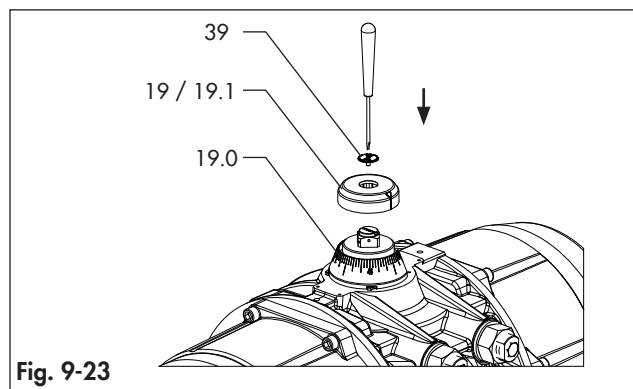


Fig. 9-23

9.5.5 Stop cap screws reassembly

Refer to Fig. 9-1, Fig. 9-24 and Fig. 9-25.

- Lubricate and place the o-rings (11) over the body (50).
- Fasten the cap screws (02F), if any, making sure the o-rings (11) are correctly in position.
- Fasten the nut (04) along with the washer (03) onto both stop screws (02).
- Assemble the spring clips (02.1), if any, after the stroke adjustment (section 9.5.6).

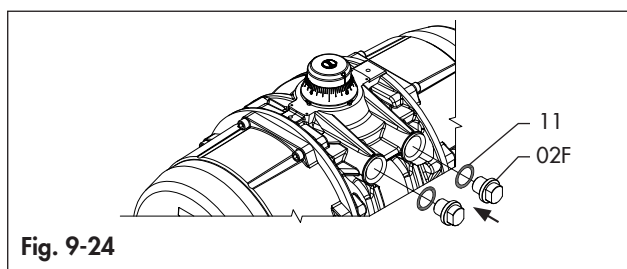


Fig. 9-24

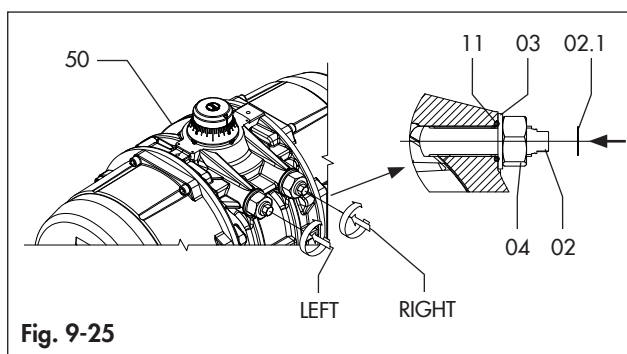


Fig. 9-25

9.5.6 Stroke adjustment

Refer to Fig. 9-1 and Fig. 9-25.

Close position

- With the actuator in close position (0° position) referring to Fig. 9-15 for pistons position, screw or unscrew the right stop screw (02) 1 turn at a time until the desired stop position is achieved. In case of spring return actuator, a pneumatic supply may be necessary.

⚠ WARNING

Risk of personal injury due to pneumatic supply.

Stop screws are not still properly tightened. Any pneumatic supply can eject the stop screws out from the actuator body.

- ➔ Before starting pressurizing the actuator, make sure the stop screws are screwed at least for a length equal to the screw diameter. Refer to the 'Tightening torques' (Table 15.3) for the screw dimensions.
- Holding the stop screw (02) in position, tighten the stop adjustment nut (04) to lock the stop screw (02) and assemble the spring clip (02.1).
- ➔ Refer to the section 15.2 'Tightening torques'. (Table 15.3)

Open position

- With the actuator in open position (90° position), screw or unscrew the left stop screw (02) 1 turn at a time until the desired stop position is achieved.
- Holding the stop screw (02) in position, tighten the stop adjustment nut (04) to lock the stop screw (02) and assemble the spring clip (02.1).
- ➔ Refer to the section 15.2 'Tightening torques'. (Table 15.3)
- Regulate the extra travel stop adjustment, if any.
- ➔ Refer to the data sheet [T.D.S. 2.1.5.1.1] for extra stop travel adjustment.

9.5.7 Mounting the actuator over the valve

Refer to the section 5.3 'Mounting the actuator over the valve'.

10 Decommissioning

The work described in this section is only to be performed by fully trained and qualified personnel.

⚠ DANGER

Risk of bursting due to incorrect opening of pressurized equipment or components.

Pneumatic actuators are pressure equipment that may burst when handled incorrectly. Flying projectile fragments or components can cause serious injury or even death.

→ Before starting any work on the actuator disconnect all pneumatic/hydraulic/electrical supplies and discharge the pressure from the actuator.

⚠ WARNING

Risk of personal injury due to preloaded and compressed springs.

End caps are under tension due to compressed springs. Furthermore incorrect spring cartridges disassembly could result in serious injury.

→ Before starting any work on the actuator disconnect all pneumatic/hydraulic/electrical supplies and discharge the pressure from the actuator.

→ Make sure that the actuator is in the closed position (0°).

⚠ WARNING

Risk of personal injury during actuator air exhaust.

In case of pneumatic version the actuator is operated with air. As a result, air is exhausted during operation.

→ Wear eye and hearing protection when working near the actuator.

⚠ WARNING

Crush hazard arising from moving parts.

The actuator and the valve assembly contains moving parts, which can injure hands or fingers.

→ Do not touch or insert hands or finger into moving parts.

→ Before starting any work on the actuator disconnect all pneumatic/hydraulic/electrical supplies and discharge the pressure from the actuator.

→ Do not impede the movement of the pinion and the pistons by inserting objects into the actuator.

ⓘ NOTICE

Risk of actuator damage due to excessively high or low tightening torques.

Follow the specified torques to tighten actuator components (bolts and nuts). Excessive tightening torques lead to parts wearing out quicker. Parts that are not tightened enough may loosen.

→ Refer to section 15.2 'Tightening torques'.

To decommission the actuator for service work or before removing it from the valve, proceed as follows:

1. Put the valve and its accessories out of operation in a safe position. Refer to the documentation available from the valve manufacturer.
2. Disconnect the pneumatic/electrical supply to depressurize the actuator. In case of single acting actuator, make sure the actuator reaches the FAIL position once depressurized.

11 Removal

The work described in this section is only to be performed by fully trained and qualified personnel only.

Before removing from the valve, make sure the actuator is put out of operation. Refer to section 10 'Decommissioning'.

⚠ DANGER

Risk of bursting due to incorrect opening of pressurized equipment or components.

Pneumatic actuators are pressure equipment that may burst when handled incorrectly. Flying projectile fragments or components can cause serious injury or even death. Before working on the actuator:

- ➔ Before starting any work on the actuator disconnect all pneumatic/hydraulic/electrical supplies and discharge the pressure from the actuator.

⚠ WARNING

Risk of personal injury during actuator air exhaust.

In case of pneumatic version the actuator is operated with air. As a result, air is exhausted during operation.

- ➔ Wear eye and hearing protection when working near the actuator.

⚠ WARNING

Risk of personal injury due to preloaded and compressed springs.

End caps are under tension due to compressed springs.

Furthermore incorrect spring cartridges disassembly could result in serious injury.

- ➔ Before starting any work on the actuator disconnect all pneumatic/hydraulic/electrical supplies and discharge the pressure from the actuator.
- ➔ Make sure that the actuator is in the closed position (0°).

⚠ WARNING

Crush hazard arising from moving parts.

The actuator and the valve assembly contains moving parts, which can injure hands or fingers.

- ➔ Do not touch or insert hands or finger into moving parts.
- ➔ Before starting any work on the actuator disconnect all pneumatic/hydraulic/electrical supplies and discharge the pressure from the actuator.
- ➔ Do not impede the movement of the pinion and the pistons by inserting objects into the actuator.

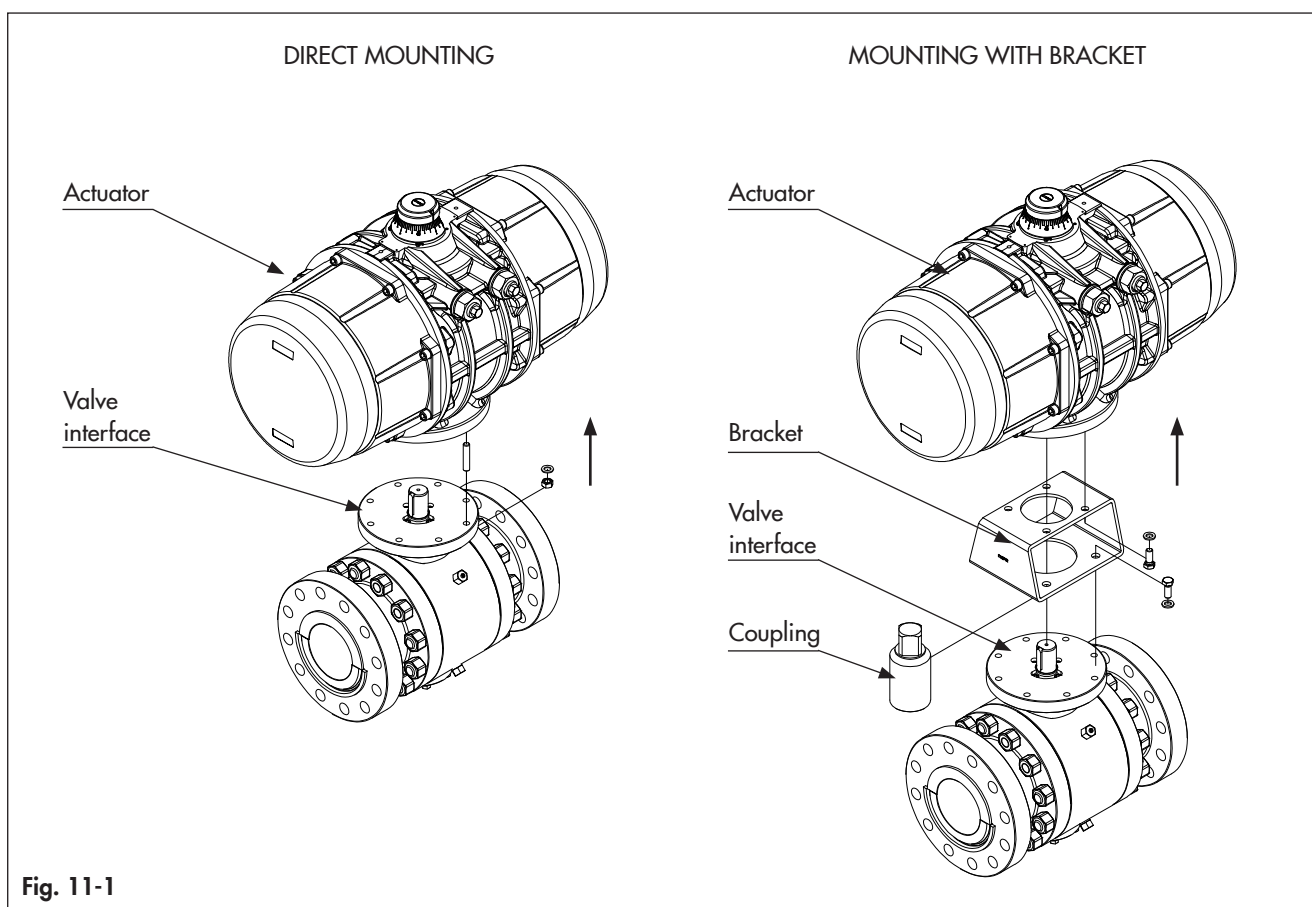


Fig. 11-1

Removal

Proceed as follows to remove the actuator from the valve referring to Fig. 11-1, making sure to not expose the plant to any risk:

1. Disconnect any electrical/pneumatic/hydraulic power supply from the actuators and make sure the actuator itself is depressurized.
2. Disconnect all electrical wirings of the control or signal devices, if any.
→ Refer to the control or signal devices documentation for safe disassembly.
3. Remove the bolts and nuts from the valve flange and remove the actuator from the valve. Refer to the ISO 5211 for correct tightening torques.
4. Remove the coupling.
5. Remove the bracket from the actuator, if any.
6. Remove the control or signal devices, if any.
→ Refer to the control or signal devices documentation for safe disassembly.

12 Repairs

If the actuator does not function properly according to how it was originally sized or does not function at all, it is defective and must be repaired or replaced.

NOTICE

Risk of actuator damage due to incorrect repair work.

- Do not perform any repair work on your own.
 - Contact AIR TORQUE after-sales service (aftersales@airtorque.it) for repair work.
-

13 Disposal

At the end of their life cycle AIR TORQUE actuators can be completely disassembled and disposed sorting the components by the different materials.

→ Observe local, national and international refuse regulations.

All materials have been selected in order to ensure minimal environmental impact, health and safety of personnel during their installation and maintenance, provided that, during use, they are not contaminated by hazardous substances.

Oil, grease and electric components may require special treatment before disposal.

→ Contact waste management companies and/or local authorities.

⚠ WARNING

Risk of personal injury due to preloaded and compressed springs.

End caps are under tension due to compressed springs.

Furthermore incorrect spring cartridges disassembly could result in serious injury.

→ *Before starting any work on the actuator disconnect all pneumatic / hydraulic / electrical supplies and discharge the pressure from the actuator.*

→ *Make sure that the actuator is in the closed position (0°).*

→ *Do not disassemble individual spring cartridges.*

→ *For spring cartridges service contact AIR TORQUE.*

The disposal is to be performed by fully trained and qualified personnel only.

- Decommission and remove the actuator (refer to section 10 'Decomissioning' and section 11 'Removal').
- Create a large area around the actuator in order to work in safe conditions without obstacles that can interfere with the disposal operation.
- Dismantle the actuator sorting the components by the different materials.

14 Certificates

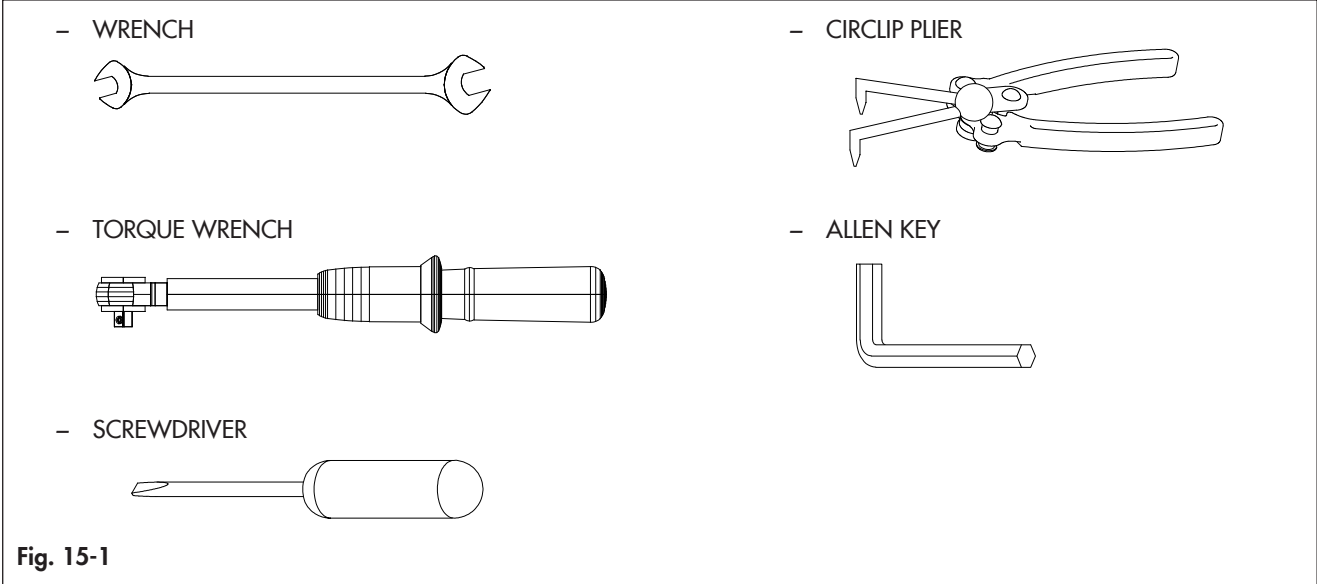
The following certificates and documents are available from AIR TORQUE:

- EU Declaration of Conformity,
- ATEX Directive 2014/34/EU,
- SIL Certificate,
- Machine Directive 2006/42/EC,
- DNV Type Approval
- IP67 and IP68 Degree of protection,
- TR CU 010/2011,
- UKCA certification.

15 Annex

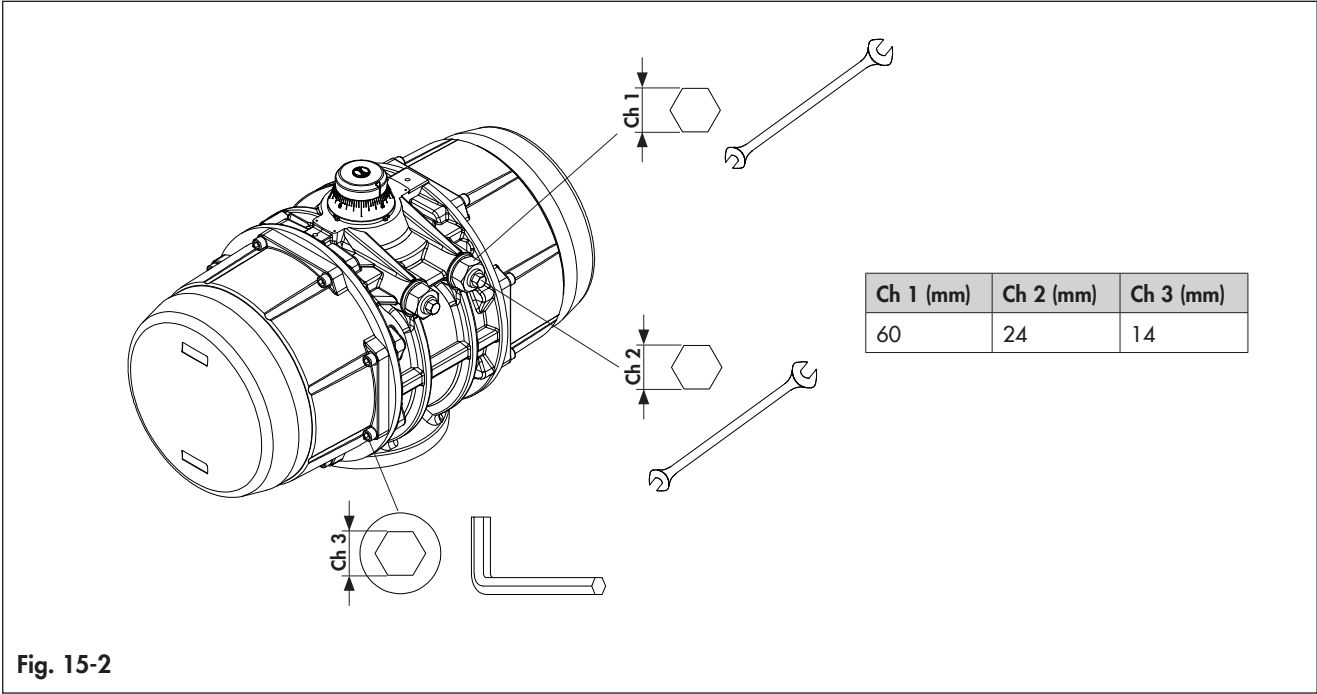
15.1 Tools

15.1.1 Tools list

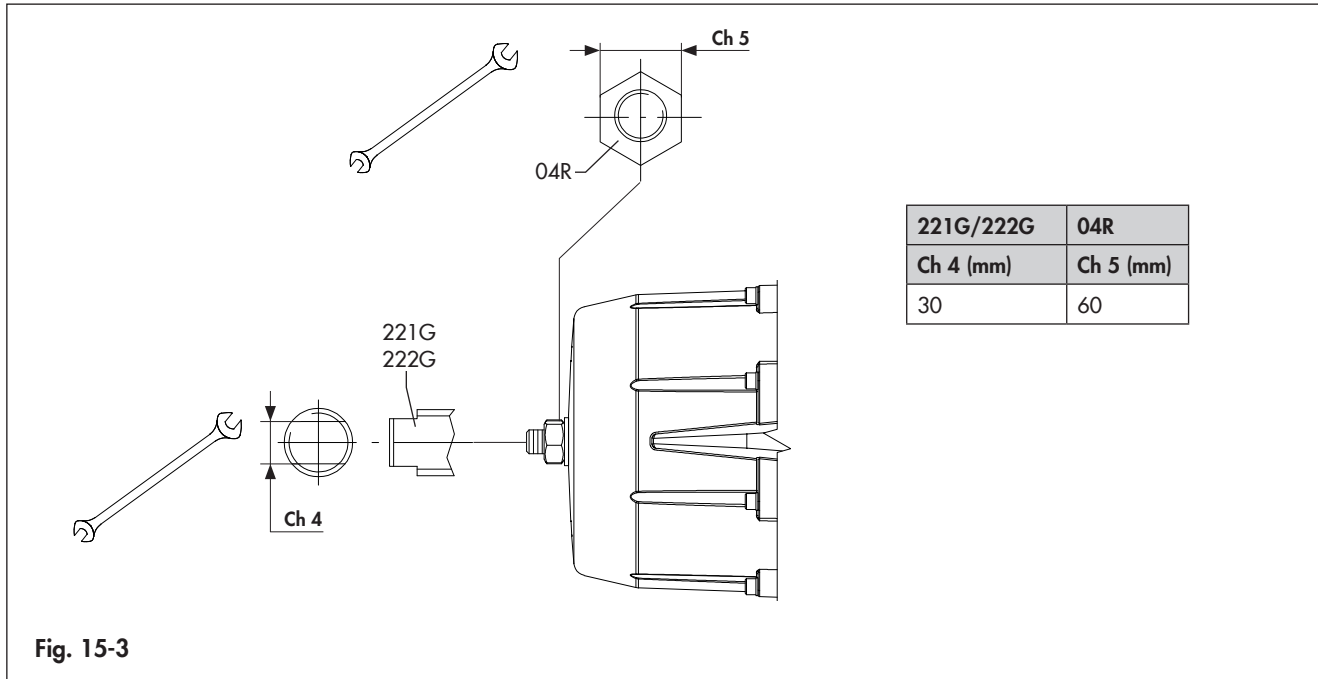


15.1.2 Tools dimensions

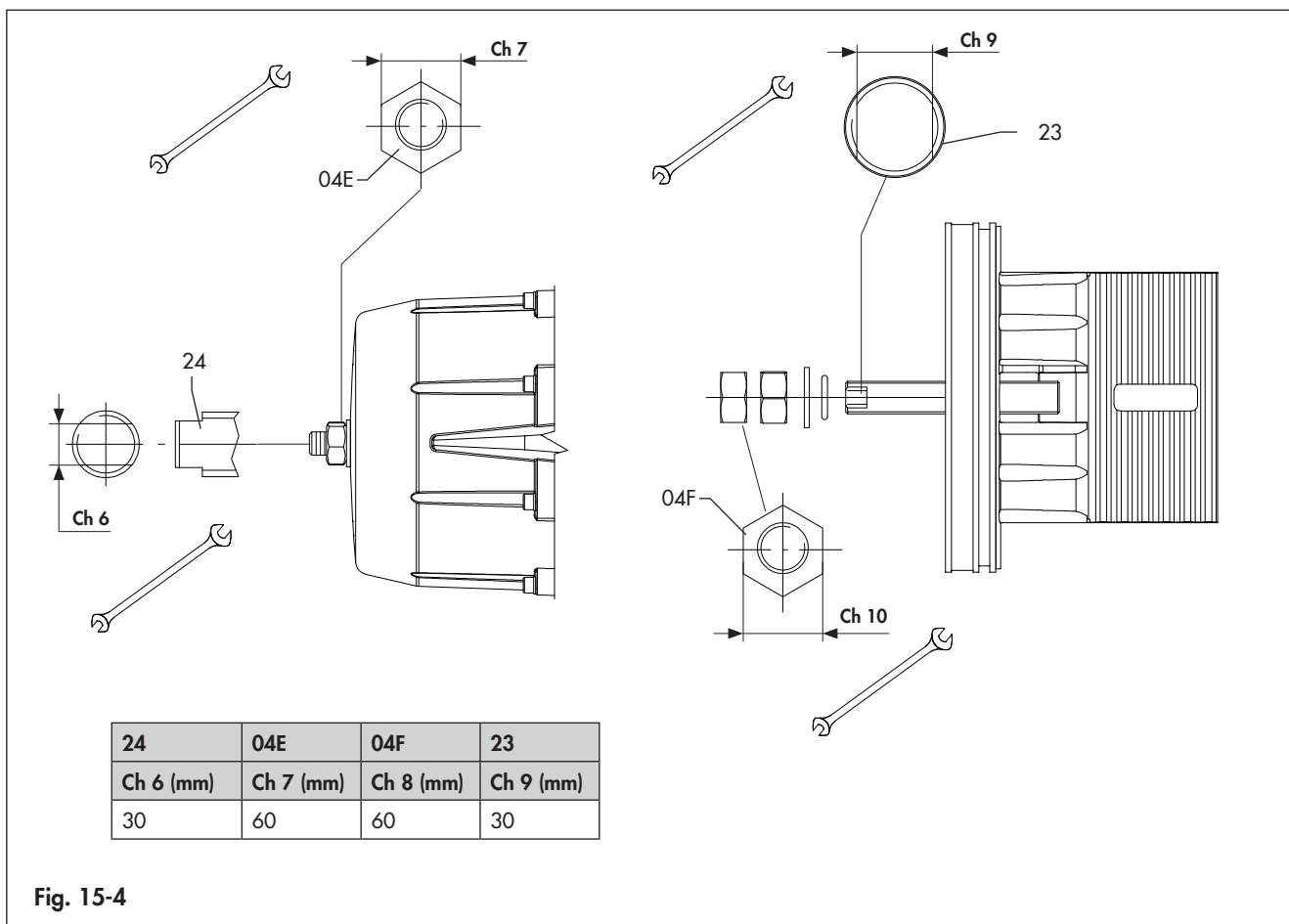
- Stop screws (02) and nuts (04); end cap screws (13).



- Extra travel stop adjustment screws tools (50% and 100% adjustment).



- Special "R" construction.



15.2 Tightening torques

- All the tightening torques are intended in Nm.
- Tightening torque tolerance: $\pm 10\%$.
- The tightening torques are based on a friction coefficient of 0.12 with a lubricated fixing elements (bolts or nuts) threads.
- After long operating times or use at temperatures above 80°C, the breakaway torque may be significantly higher.

Table 15-1: End cap screws (13) or nuts (13.2)

THREAD	TIGHTENING TORQUE (Nm)
M16	150 ÷ 160

Table 15-3: Stop screws nuts (04)

THREAD	TIGHTENING TORQUE (Nm)
M39	1000 ÷ 1050

Table 15-5: Ancillary attachments

SIZE ¹	THREAD	TIGHTENING TORQUE (Nm)
AA 4	M5	4 ÷ 5
AA 5	M6	8 ÷ 9

NOTE:

1. Refer to section 2.1 'Actuator nameplate sample'.

Table 15-2: Extra travel stop adjustment nuts (04R)

THREAD	TIGHTENING TORQUE (Nm)
M39	1000 ÷ 1050

Table 15-4: Pressure connection (if any)

THREAD	TIGHTENING TORQUE (Nm)
M5	4 ÷ 5
M6	8 ÷ 9

Table 15-6: Special "R" construction nut (04F)

THREAD	TIGHTENING TORQUE (Nm)
M39	1000 ÷ 1050

15.3 Lubricants

The AIR TORQUE actuators are factory lubricated for the life of the actuator in normal working conditions.

→ Refer to the data sheet [RP10600E] for Lubricant type in relation to the different working temperature ranges.



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