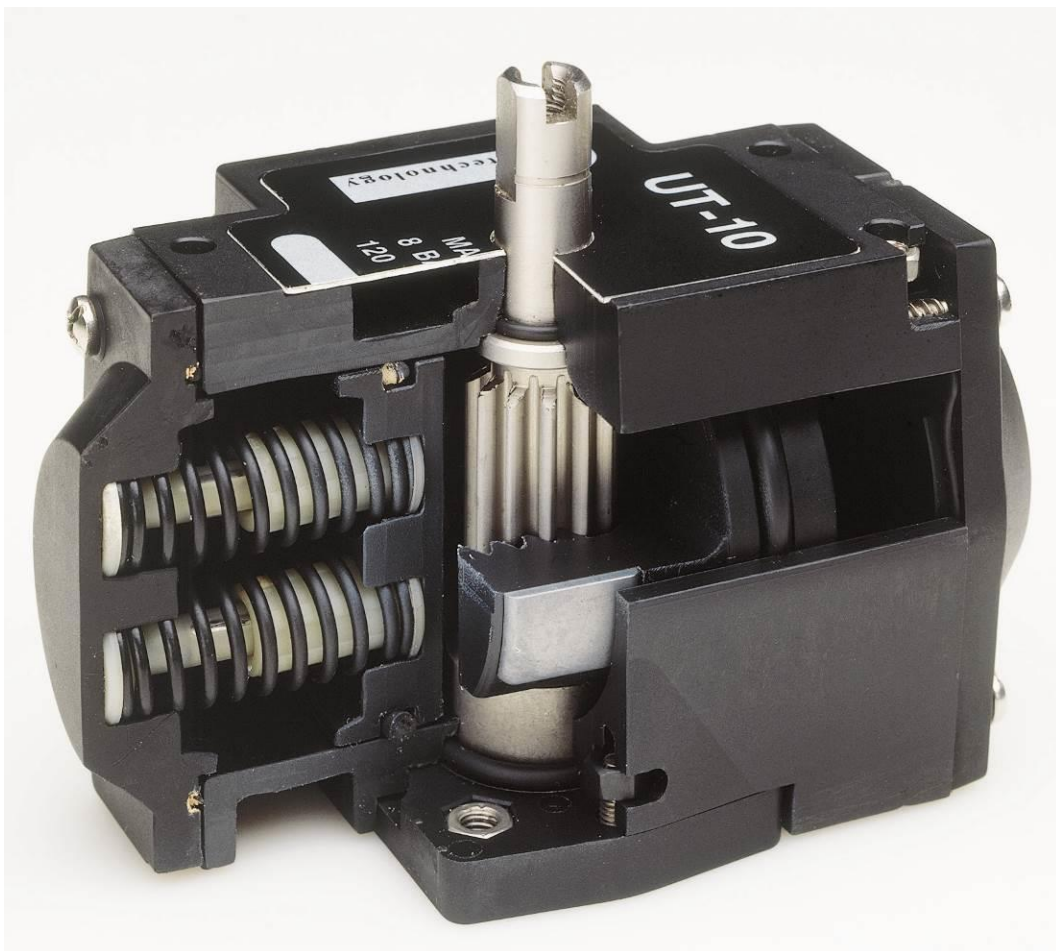

***Max-Air* TECHNOLOGY**
Rack & Pinion Pneumatic Actuators
UT-UP SERIES



**INSTALLATION, OPERATION
& MAINTENANCE MANUAL**

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CHAPTER 1: INTRODUCTION

1 - 1 PRODUCT DESCRIPTION

Emme Technology offers a broad range of pneumatic rack & pinion actuators. **Emme Technology** actuators are designed to operate with dry or lubricated air media, but will function equally well with non-corrosive and inert gas or light hydraulic oil. The actuators are offered in two different configurations: double acting and spring return. Each actuator can be easily converted from double acting to spring return (or vice versa) by insertion (or removal) of spring cartridges.

Emme Technology provides two engineered polymer actuator series, with good mechanical properties and with superior resistance against harsh environments or aggressive chemical substances:

Series UT: Our Technopolymer (Polyarylamide) actuators offer a great mechanical properties/ weight ratio.

Series UP: Made in Glass-reinforced Polypropylene, these actuators offer a superior resistance against corrosive chemical agents and are suitable for use in harsh environments.

Emme Technology actuators are equipped in the standard configurations with the following unique features:

- Body and End Caps made in polymer material;
- External open/closed indication;
- Pre – loaded springs of non – metallic material;
- Carbon steel electroless nickel coated pinions;
- Shaft bearings isolate the pinion gear from the housing and support the shaft for high cycle application;
- Pistons are epoxy powder coated for corrosion resistance;
- Angle of rotation: 90°;
- Air line connections ¼” GAS (or ¼” NPT);
- “NAMUR” VDI/VDE 3845 and ISO 5211 dimensions on all sizes.

Note: all illustrations and pictures in this manual refer to both Technopolymer series UT and Polypropylene series, whatever surface color or appearance

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2 - 2 GENERAL SAFETY INSTRUCTIONS

The Products supplied by **Emme Technology** have been designed with safety in mind. Some hazards cannot be guarded against and the instructions below **MUST BE COMPLIED WITH** for safe operations. These instructions cannot cover all circumstances; **USER** of the product is responsible for using safe-working practices at all times.

1. **Emme Technology** products are designed for installation in designated area, which are to be kept clean and free of obstructions that may restrict safe access to the controls and maintenance access points.
2. Access to the equipment should be kept restricted to the personnel responsible for installation, operation and maintenance and they must be trained, adequately qualified and supplied with adequate tools for their respective tasks.
3. **Emme Technology** requires that, all personnel that are responsible for installation, operation or maintenance of the equipment, will comply with all local and industry based safety instructions and regulations. Personnel protection safety equipment must be worn where local rules apply. User shall prevent any unauthorized person to mount, dismantle or remount, operate and repair the actuator
4. Clear and easy access to the unit must be maintained at all times.
5. While using the actuator, ensure that approved technical rules & regulations e.g. trading regulations, regulations for prevention of accidents, local safety regulations and any other applicable regulations are followed.
6. During repairs/maintenance of the actuator at site, the user shall take at least the following precautions:
 - Provide adequate working platform near the actuator.
 - Make actuator and pressure supply lines pressureless and harmless i.e. switch off the pumps, empty the actuators and the pipelines.
 - Disconnect all accessories connected to the actuator.
7. An improper sizing of actuator/valve system can result in damages both on the actuator and the actuated valve. Operation in these cases will increase risk from hazards.
8. Operating the actuator beyond its project limitations may damage internal and external components and, therefore, could prove potentially dangerous for operating and maintenance personnel. Special attention must be paid to:
 - temperature limitations;
 - aggressive environments or strong chemicals, not suitable for components material;
 - pressure limitations.



IMPROPER INSTALLATION, OPERATION OR MAINTENANCE OF EMME TECHNOLOGY SRL TECHNOPLYMER AND POLY-PROPYLENE ACTUATORS SERIES "UT & UP" COULD RESULT IN INJURIES.

CHAPTER 2: TECHNICAL FEATURES & DATA

2 - 1 METHOD OF OPERATION

DOUBLE ACTING

Rotation occurs when compressed air is supplied to the actuator through Port 4, connected to the interior cavity between the pistons, or through Port 2, connected to the end cap area.

AIR TO OPEN - COUNTER CLOCKWISE ROTATION

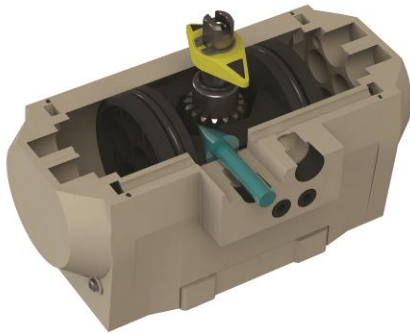


fig. 2.a

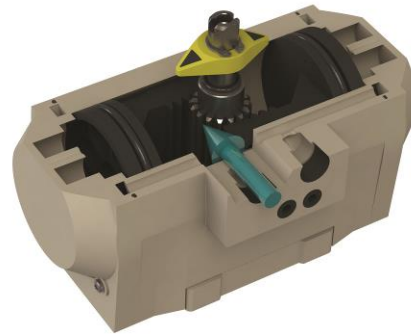


fig. 2.b

Pressure to Port 4, as shown in **Figure 2.a** and **2.b**, fills the inboard cavity pushing both pistons outward and exhausting air through Port 2. As the pistons extend they rotate the pinion counter clockwise (when viewed from the top of the actuator).

AIR TO CLOSE - CLOCKWISE ROTATION

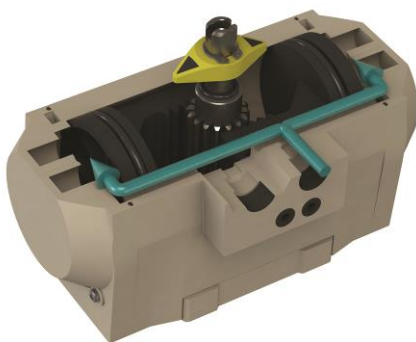


fig. 2.c

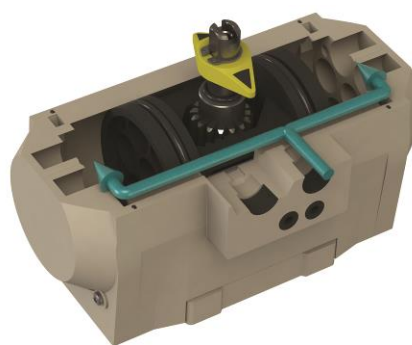


fig. 2.d

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As shown in **Figure 2.c** and **2.d**, pressure to Port 2 fills the outboard cavities pushing both pistons inward and exhausting air through Port 4. As the pistons retract they rotate the pinion clockwise (when viewed from the top of the actuator).

SPRING RETURN

In this configuration the closed position occurs with spring cartridges, which are located between the pistons and end caps.

AIR TO OPEN - COUNTER CLOCKWISE ROTATION

To achieve CCW rotation, supply air to Port 4 as in Double Acting actuator. The air fills the inboard cavity pushing both pistons outward and exhausting air through Port 2. As the pistons extend they rotate the pinion counter clockwise (when viewed from the top of the actuator).

AIR TO CLOSE - CLOCKWISE ROTATION

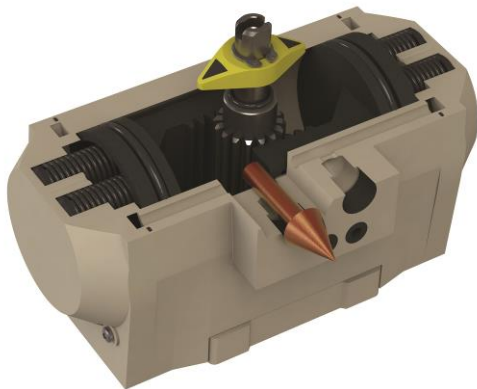


fig. 2.e

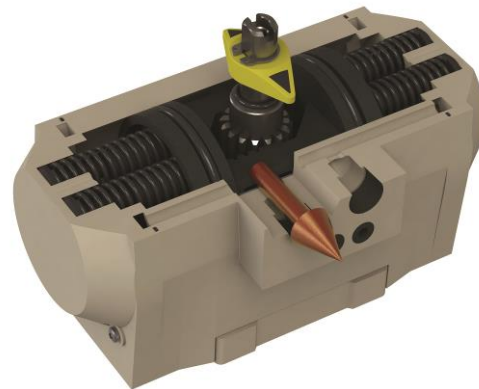


fig. 2.f

Relieving pressure from the inboard cavity through Port 4, as shown in **Figure 2.e** and **2.f**, allows the spring cartridges to push both pistons inward. As the pistons retract they rotate the pinion clockwise (when viewed from the top of the actuator).

Although **Max-Air** actuator typically operates counter clockwise to open and clockwise to close as in the above pictures, it is possible to change this style of operation. Changing the piston orientation with respect to pinion convert the actuator from a fail clockwise actuator to a fail counter clockwise unit.

2 - 2 TECHNICAL DATA & WORKING CONDITIONS

- Operating Media – Dry or lubricated air, non-corrosive and inert gas or light hydraulic oil.
- Air supply: 2 Bar (30 PSIG) to 8 Bar (120 PSIG) maximum. *A safety valve is recommended.*
- Temperature: Standard from –20°C a +80°C (–10°F to +176°F) and –50°C +150°C available on request.
- Lubrication: Factory lubricated for life under normal working conditions with **Exxon CAZAR K2** or equivalent.
- Application: Suitable for both indoor and/or outdoor applications.

2 - 3 SPECIAL CONDITIONS

When installing actuators on dampers or large diameter butterfly/ball valves, we strongly suggest to implement flow reducers on in/out ports, to avoid hammer shocks and possible fatigue episodes.

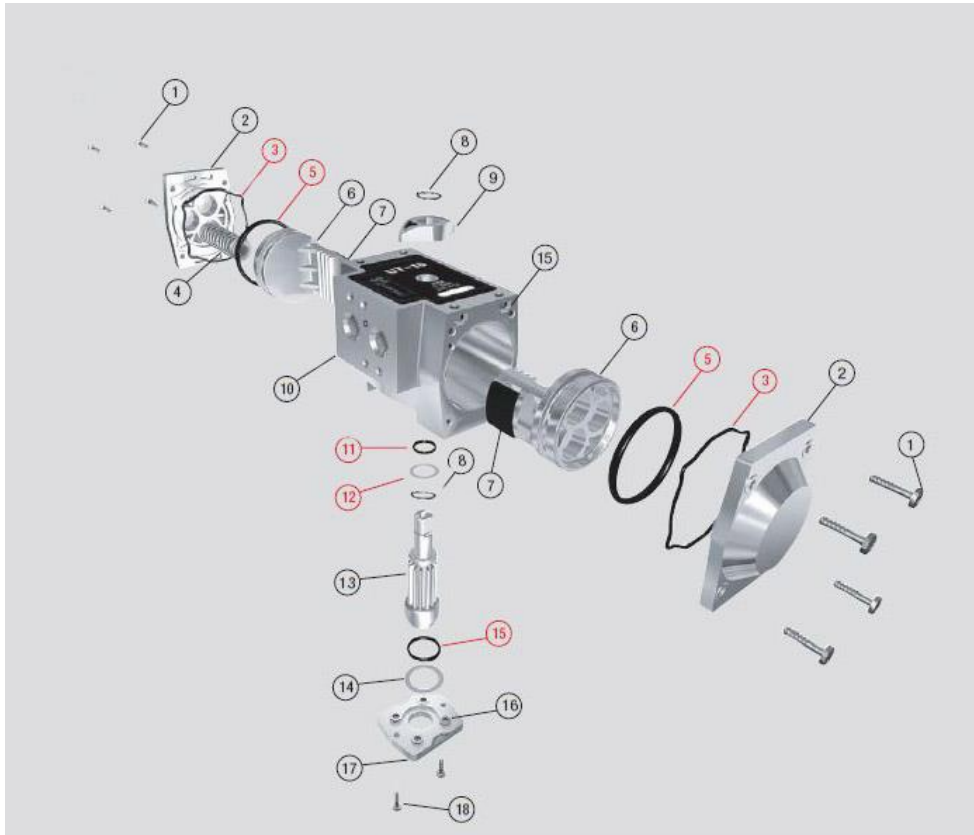
Other special working conditions, either on application and environmental side, aren't specifically addressed in this document and aren't covered by our warranty. Please contact **Emme Technology** technical offices for feasibility and suggestions.

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2 - 4 EXPLODED VIEW & PART LIST



ITEM	DESCRIPTION	MATERIAL	REMARKS
1	END CAP SCREW	AISI 304 STAINLESS STEEL	
2	END CAP	(UT) TECHNO-POLYMER (UP) POLYPROPYLENE	
3	END CAP O-RING	BUNA-N (NBR 70)	
4	SPRING CARTRIDGE	SPRING STEEL and TECHNO-POLYMER	
5	PISTON O-RING	BUNA-N (NBR 70)	
6	PISTON	DIE CAST ALUMINUM 5076	
7	PISTON SKATE	ALLOY UNI 3717 (ASTM B240) or TECHNO-POLYMER	
8	SNAP RING	AISI 304 STAINLESS STEEL	
9	INDICATOR	TECHNO POLYMER	
10	BODY	(UT) TECHNO-POLYMER (UP) POLYPROPYLENE	
11	UPPER PINION O-RING	BUNA-N (NBR 70)	
12	WASHER	AISI 304 STAINLESS STEEL	
13	PINION	(UT) NICKEL PLATED CARBON STEEL (UP) STAINLESS STEEL AISI 303	Option: AISI 303 for (UT)
14	WASHER	TEMPERED STAINLESS STEEL	
15	LOWER PINION O-RING	BUNA-N (NBR 70)	
16	FLANGE NUTS	AISI 304 STAINLESS STEEL	
17	FLANGE	(UT) TECHNO-POLYMER (UP) POLYPROPYLENE	
18	FLANGE SCREWS	AISI 304 STAINLESS STEEL	
19	BOLTS	AISI 304 STAINLESS STEEL	

CHAPTER 3: INSTALLATION

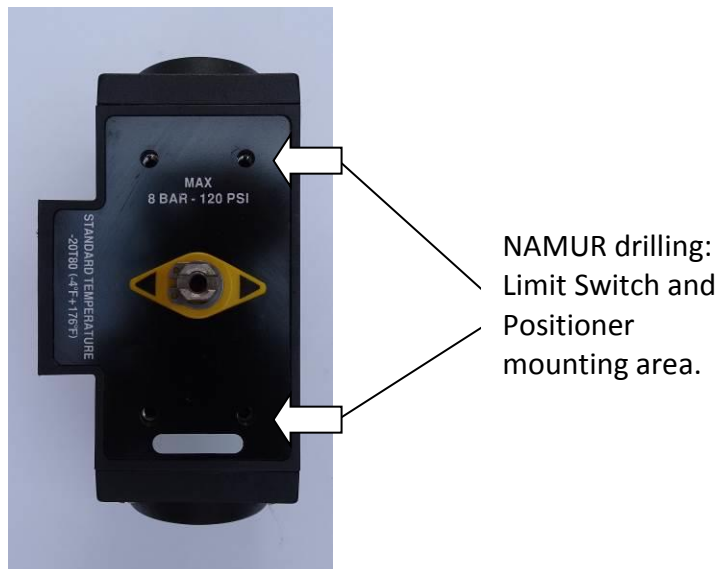
Emme Technology actuators can be fitted on many styles of quarter-turn valves, including ball, butterfly and plug and dampers in accordance with the instructions contained in this chapter.

Emme Technology actuators are designed according to ISO 5211 to be easy to install. The pinion presents a double – square female drive to allow a large flexibility in mounting. Other female drive couplings or different drillings are available on request.

TYPE	Available ISO 5211 couplings		
UT/UP 10/11	F03 (Ø36)	F04 (Ø42)	
UT/UP 13/14	F04 (Ø42)	F05 (Ø50)	F07 (Ø70)
UT/UP 18/19	F04 (Ø42)	F05 (Ø50)	F07 (Ø70)

On the top face of **Emme Technology** actuators there is a NAMUR standard mounting pattern for easy installation of accessories for position survey and/or control devices (Micro Switch Boxes, Positioners, ecc):

Fig. 3.a shows an actuator in the normal position (closed) with the pinion flats and the indicator – drive milling perpendicular to the body.



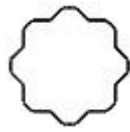
The Air Ports are NAMUR standard ¼" Gas or ¼" NPT for easy solenoid valve connection.

The pinion presents a double – square female drive to allow a large flexibility in mounting; it allows the assembling on valves stem, or coupling, with square key at 45° or at 90° indifferently. On request, bottom pinion female key may be done as double D.

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Double
Square
key



Double D
key

Installation procedure

1. Check the coupling female pinion drive – valve stem.
2. Make sure that the valve and the actuator are both in the **closed** position before proceeding (actuator position as in **fig. 3.a**).
3. If needed, install mounting bracket on the valve and hand tighten all fasteners; be sure not to fully torque bolts until entire assembly is correctly aligned and installed.
4. Mounting:
 - a. **Mounting with brackets**: Place coupling on valve stem and the actuator on mounting bracket. Align valve and actuator in order to eliminate forces on the system; tighten all the assembly fasteners.
 - b. **Direct mounting**: Position the actuator on valve; use caution while inserting the valve stem into the double square female pinion drive. Insert the screws from the bottom side of the valve flange and manually tighten them and align the assembly in order to eliminate the forces on the system; tighten all assembly fasteners. If the actuator has been purchased with already inserted screws, engage it on the valve stem and fix the screws with nuts on the bottom side of valve flange.
5. Actuate the unit several times to ensure that it works properly. If the unit does not work properly, disassemble the unit and repeat steps 1 – 4. If the problem persists, contact your local **Emme Technology** representative. Check the valve also for possible defects.



When activating the valve, be sure operator is far from moving parts. Special caution must be observed with spring return actuators.

6. On Technopolymer and Polypropilene actuators adjustment isn't available. Correct 0° and 90° position are pre-set in factory.

CHAPTER 4: MAINTENANCE

Maintenance instructions provide the end user with necessary information for standard examination of O-rings and soft parts for wear. Repair kits consisting of all soft parts are readily available. We recommend periodical inspections every 150000 - 200000 work cycles, depending on work and installation characteristics.

4 - 1 DISASSEMBLING PROCEDURE FOR THE SUBSTITUTION OF O-RINGS

CAUTION – PLEASE READ CAREFULLY

- BEFORE CARRYING OUT ANY MAINTENANCE ON EMME TECHNOLOGY ACTUATORS, IT IS **ESSENTIAL** THAT THE ACTUATOR IS **NOT UNDER PRESSURE** AND IS **FREE OF ANY ACCESSORIES**.
- FOR YOUR SAFETY, IT IS ABSOLUTELY NECESSARY, BEFORE DISASSEMBLING A SPRING RETURN ACTUATOR, THAT THE UNIT IS IN THE **FAILSAFE** POSITION (SPRINGS EXTENDED AND NOT COMPRESSED).

Note: Bracketed numbers refer to the actuator exploded view – § 2.4

1. Disconnect all electrical and air supplies from the actuator.
2. Remove the actuator from the mounting bracket and place in a clean environment.
3. After removing the end cap screws (ref. 1), remove the end caps (ref. 2) and, if present, the internal springs (ref. 4).

Note: always remove the screws with a cross pattern and with at least two passes.

4. Remove O-Rings (ref. 3) from the end caps and inspect their wear and lubrication.
5. Using a wrench on the appropriate mill on the upper part of pinion (ref. 13), turn the pinion counter-clockwise until the pistons (ref. 6) protrude further out from the cylinder to be removed.

Note: If the actuator has a clockwise opening rotation (**mounting B**), pinion must be rotated accordingly.

6. Remove the pistons (ref. 6) by hand or with pliers, taking the pistons from the spring grooves and using caution not to damage the pistons' surfaces.
7. Remove O-Rings (ref. 5) and thrust block (ref. 7) from the pistons.
8. Remove the indicator snap ring (ref. 8) and the indicator itself (ref. 9).

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9. Remove the screws (ref. 18) from the bottom side of the flange (ref. 17) and turn upside down the actuator. Firmly tap the upper part of the pinion on a wood surface, to prevent damage of the pinion. Remove the unit flange – pinion through the bottom of the body.
10. Remove the pinion from the flange.
11. Remove the washer (ref. 14).
12. Remove the O-Rings and other components (ref. 15, 11, 12, 8) from the pinion.
13. Inspect and replace the following wearing parts as necessary:

General	Ref.	Description	Qty
End caps (ref. 2)	3	End cap O-Rings	2
Pistons (ref. 6)	5	Piston O-Ring	2
Pinion (rif. 13)	11	Upper Pinion O-Ring	1
	15	Lower Pinion O-Ring	1

4 - 2 ASSEMBLY PROCEDURE

**ATTENTION
BEFORE PROCEEDING, VERIFY THAT**

- **ALL SURFACES ARE WITHOUT SCRATCHES AND/OR BURRS.**
- **ALL WEAR PARTS ARE PROPERLY LUBRICATED.**

Note: Bracketed numbers refer to the actuator exploded view – § 2.4

1. Insert O-Rings and other components (ref. 15, 11, 12, 8) on pinion (ref. 11) according to original placement.
2. Insert the pinion into the actuator body (ref. 8) from its bottom side.
3. Place the washer (ref. 14) in its seat in the flange.
4. Place the bottom flange in its position engaging the bottom end of the pinion, and fix the flange to the body with the screws (ref. 18). During the operation, pay attention that

washer (ref. 14) and bottom pinion OR (ref. 15) from the bottom side of the flange (ref. 17) keep their position.

5. Turn upside down the actuator and add the indicator (ref. 9) and the snap ring (ref. 8).
6. **Intermediate test:** using a wrench and acting on the appropriate mill on the upper part of the pinion. Manually rotate the pinion to make sure it freely rotates.
7. Insert the O-Rings (ref. 5) and thrust blocks (ref. 7) on the pistons (ref. 6).
8. **Piston insertion:** This operation can be performed in two different ways in order to obtain (opening phase) either a counter clockwise actuator (**mounting A**) or a clockwise actuator (**mounting B**).

In next lines, “left” and “right” direction are defined as follows. Place the actuator body on a flat surface and face the air supply holes: “left” and “right” are defined accordingly.

Mounting A:

Left piston insertion

- a. Place the actuator in a stand up position on its right side with the pinion bottom end facing you and the supply holes on your right.
- b. To obtain the counter clockwise rotation (mounting A) it is necessary to insert the rack of the piston to the left of the pinion.
- c. Insert the left piston applying pressure with hands until the piston is completely in the body.

Right piston insertion

- a. Place the actuator in a stand up position on its left side with the pinion bottom end facing you and the supply holes on your left.
- b. Insert the rack of the piston to the left of the pinion.
- c. Insert the right piston applying pressure with hands until the piston is completely in the body.

Mounting B:

Follow the same steps as above, but inserting the rack of both pistons on the right of the pinion.

9. Actuator positioning phase:

- a. Place the actuator in a stand up position on a flat surface with the upper part of the pinion on the right side.
- b. Manually apply pressure to the piston, as this will assist to compress the opposite piston.
- c. While continuing to apply pressure, use a wrench on the appropriate mill of the upper portion of the pinion and rotate the pinion counter clockwise. At this point there must be a clicking sound due to the interlocking between the piston rack and the pinion tooth. Make sure to create a single sound per tooth.

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- d. After each individual sound, rotate the pinion clockwise; verify whether the pinion Namur mill is about 10° beyond the perpendicular to the body axis. If not, repeat step 9c.
- e. Double check the correct assembly of the actuator, verifying that in the open position the pistons are at equal distances from the main bore border.

10. End cap mounting:

- a. Insert the end cap O-Rings (ref. 3) into their grooves by following the shape of the grooves with a finger to ensure that the O-Rings are properly seated.
- b. Insert the springs (if present) in their appropriate seats.
- c. Insert the end cap screws (ref. 1) and tighten them to the factory torque standard:

ACTUATOR TYPE	TORQUE Nm (In·Lbs)
UT/UP 10/11	6 (52)
UT/UP 13/14/18/19	8 (70)

Note: if springs are present, before tightening the screws there is a thin gap between the caps and the body. This is normal.

Note: always tighten the screws with a cross pattern and with at least two passes.

4 - 3 SPRING CARTRIDGE INSERTION

CAUTION – PLEASE READ CAREFULLY

- BEFORE CARRYING OUT ANY MAINTENANCE ON EMME TECHNOLOGY ACTUATORS, IT IS ESSENTIAL THAT THE ACTUATOR IS NOT UNDER PRESSURE AND IS FREE OF ANY ACCESSORIES.

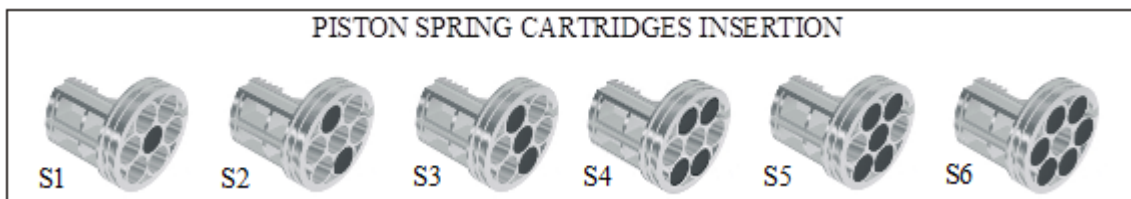
Emme Technology actuators can be easily converted from Double Acting to Spring Return by changing the spring number and configuration inside the end cap. The number of the springs loaded affects the torque value the actuator will be able to generate during its working cycle. See **Emme Technology** data sheets to properly size a spring return actuator.

Springs Installation Procedure:

1. Remove the end cap screws from the end caps.
2. Remove both end caps.
3. Place the actuator in a stand up position and insert the correct number of spring cartridges into the first side of the actuator (i.e. UT13–S3 = 3 springs for each actuator side). Refer to

following table for spring placement. It is strongly advised to insert the plastic part of the cartridge without the deep hole into the seats of the pistons.

4. Place the first cap above the cartridges, matching its seats with the springs. Due to cartridges, the cap does not adhere perfectly to the body. This is normal.
5. Tighten the four screws of the end cap, slightly forcing against the springs the cap closure.
Note: *always tighten the screws with a cross pattern and with at least two passes.*
6. Repeat steps 3-5 for the other side of the actuator.



Note: *UT-UP 10/11 may house up to 3 springs per piston.*

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WARRANTY

Emme Technology Srl warrants the "Actuators, series MT" to be free from defects in materials and workmanship when these products are used for the purposes for which they were designed and manufactured.

Emme Technology Srl sole liability and the Purchaser's sole remedy under this Warranty is limited to the refund, repair or replacement of the actuator, the choice depending on an agreement between Emme Technology Srl and the Purchaser. Emme Technology Srl will not be liable for any repairs, labor, material or other expenses that are not specifically authorized in writing by Emme Technology Srl. In no event shall Emme Technology Srl be liable for any direct or consequential damages arising from any failure originated from whatsoever cause.

Limitations. Warranty expires upon reaching one of the following conditions:

- A time limit of 18 (eighteen) months from original purchase date;
- A time limit of 12 (twelve) months from first installation date;

Exclusions. Warranty is null and void in the following cases:

- the product(s) have been disassembled, modified or altered in any way other than for standard servicing purposes as detailed in I&O manual;
- failure to comply with proper installation, handling or servicing of the product(s) as detailed in I&O manual;
- improper use of the product(s) for purposes for which they were not designed and manufactured.

Any valid claim in compliance with above limitations and exclusions must be written and received by Emme Technology, which reserves the right to inspect the product(s) either at the Customer location or at Emme Technology manufacturing plant.

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