


INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS FOR LINER PNEUMO-HYDRAULIC UNITS

5					
4					
3					
2					
1	Revision	03/10/2022	UT	QM	GM
0	First issue	01/03/2022	UT	QM	GM
N°	DESCRIPTION	DATE	ISSUED	VERIFIED	APPROVED
REVISION INDEX					

LINEAR PNEUMO-HYDRAULIC UNITS - UI – UP – UT SERIES

TEMPERATURE RANGE	0°C/+50°C 32°F/+122°F
PRESSURE RANGE	2 / 10 Bar - 0,2 / 1 MPa - 29 / 145 Psi
MINIMUM OPERATING VALVE AIR PRESSURE	3,5 Bar - 0,35 MPa - 51 Psi
PNEUMATIC CIRCUIT FLUID	FILTERED COMPRESSED AIR, WITH OR WITHOUT LUBRICATION, COMPLIANT TO ISO 8573-1: 2010 [7:4:4]
 HYDRAULIC CIRCUIT FLUID	HYDRAULIC OIL ISO 46
	HYDRAULIC OIL ISO 22
	HYDRAULIC OIL NSF H1 ISO 46 (FOOD AND BEVERAGE)



WARNING: FOR OIL TYPE WHICH UNIT IS FILLED UP, CHECK THE QR CODE ENGRAVED ON RESERVOIR CYLINDER



THIS PRODUCT IS NOT SUITABLE TO CONVEY HAZARDOUS MEDIA/MATERIALS

1. DOCUMENT PURPOSE..... 3

2. MANUFACTURER IDENTIFICATION DATA 3

3. GENERAL SAFETY WARNINGS..... 4

4. GENERAL DESCRIPTION AND FORESEEN USE..... 5

5. GENERAL LIMITS..... 11

6. STORAGE 11

7. DEVICE HANDLING 12

8. DEVICE INSTALLATION..... 13

9. START-UP, COMMISSIONING..... 14

10. MAINTENANCE..... 14

11. DISMANTLING 19

12. TROUBLESHOOTING..... 19

1. DOCUMENT PURPOSE

This document is completing essential part of the product.

The purpose of this document is to provide the necessary information to the Customers, designers, maintenance and operating personnel, in order that all persons involved in the use of this product for whole foreseen life cycle, work in conformity with guidelines contained in this document, for safety and protection of all personnel.

This document **MUST** be read before proceeding to operate the product.

This document contains instructions for a life cycle structured in the following way:

- A. Design and plant/system documentation
- B. Storage
- C. Installation and start-up
- D. Use
- E. Maintenance
- F. Dismantling



The images shown in this document could be indicative and may not correspond exactly to the product chosen. The detailed product references for the supply are provided in separate documentation if necessary

2. MANUFACTURER IDENTIFICATION DATA

The identification of the company Bonesi Pneumatik srl as the manufacturer of the product takes place in accordance with the legislation in force through the sub-listed acts:

- o Identification label or engraving
- o Installation, operation and maintenance instructions

The product has been designed and manufactured in:

Bonesi Pneumatik S.r.l.
Contacts:

Via Aurelio Robino, 11720025 – Legnano – (MI) – ITALY.
Tel. 0331-448000

E-mail info@bonesipneumatik.it

A specific plate or label, applied on the product, contains the marking information.



It is severely forbidden remove the engraving/ label and/or replace it with other product's label.

In case of label damaged, removed from product or just completely unreadable, the customer or final user MUST inform **Bonesi Pneumatik S.r.l.**



3. GENERAL SAFETY WARNINGS

Before proceeding with instructions read carefully all general warnings to provide general safety and individual protection. If necessary, due to environment, use the following protective items:



- Protective visor
- Protective gloves
- Protective wear
- Protection glasses
- Safety shoes
- Breath mask to avoid particles/aerosol

Safety through compliance of use instructions.

- The use and maintenance document **MUST** be read before proceeding work of all personnel in charge
- Additional documents and/or safety datasheets **MUST** be considered as complement parts of this document
- The employer is responsible for the disclosure of this document to all personnel who will interact with the product by training staff.
- Operators that interact with the product have the duty to read this document before carrying out any action, adopting the specific safety requirements to make safe any type of human-machine interaction.
- In addition to strictly adhering to what is written in this document, the operators must in any case adopt and comply with the general accident prevention regulations laid down by Community directives, the local laws and the safety and health procedures adopted in the workplace
- Personnel in charge of installation, use, maintenance and dismantling of this product **MUST** be qualified and trained operators with all work manners and safety operation for the areas involved.
- Before proceeding with the activation of the system, and consequently of this product, check that this operation does not cause dangerous situations for people and things.
- Keep the machine, the product and the workplace clean and tidy.
- Use the system and product only in good conditions. Possible malfunctions can increase the risk level
- It is necessary to regularly check all flexible pipes and connections and all mechanical connections
- In case of mechanical damage the system **MUST** be stopped immediately, air and power supply must be shut down and residual air in the circuit must be discharged
-  In case of oil leaks, follow the instructions contained in this document
-  In case of contact with oil refer to oil Material Safety Data Sheet



THIS PRODUCT IS NOT SUITABLE TO CONVEY HAZARDOUS MEDIA/MATERIALS



NEVER OVERSTEP THE PARAMETERS WRITTEN IN THIS DOCUMENT



BEFORE ANY REPAIR AND/OR MAINTENANCE SERVICE, THE AIR SUPPLY MUST BE SHUT DOWN

4. GENERAL DESCRIPTION AND FORESEEN USE

The pneumo-hydraulic actuator is supplied tested and ready for use, it does not require any other operation in addition to the pneumatic and electrical connections (if provided) and fixing to the structure / machine. The linear pneumo-hydraulic actuator is a device designed and manufactured for linear displacements. It is NOT allowed to apply radial loads or axial loads to the rod end with values higher than the maximum thrust and / or traction values shown in the Technical Data Section.

It is allowed to use the device only for the prescribed purpose. Any use other than that mentioned above can represent an unpredictable danger.



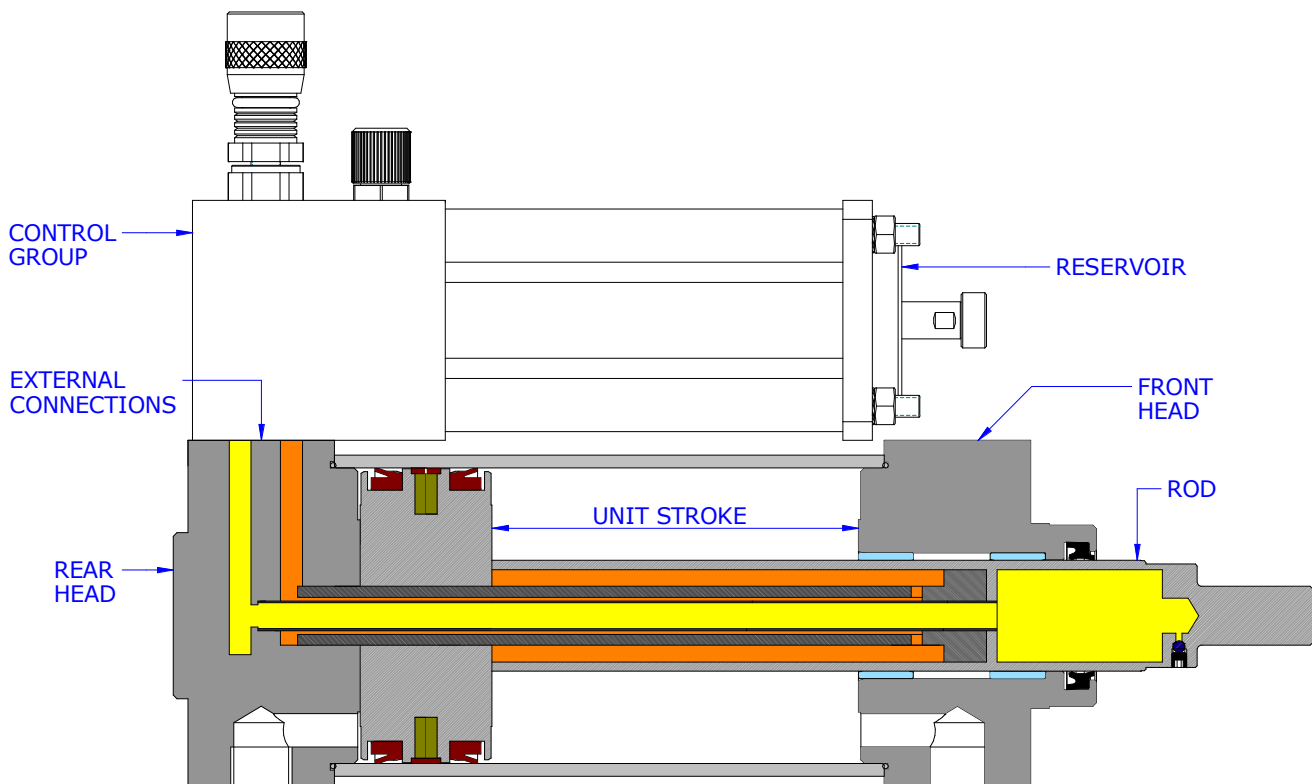
The use of device IS ABSOLUTELY NOT allowed for lifting things or people



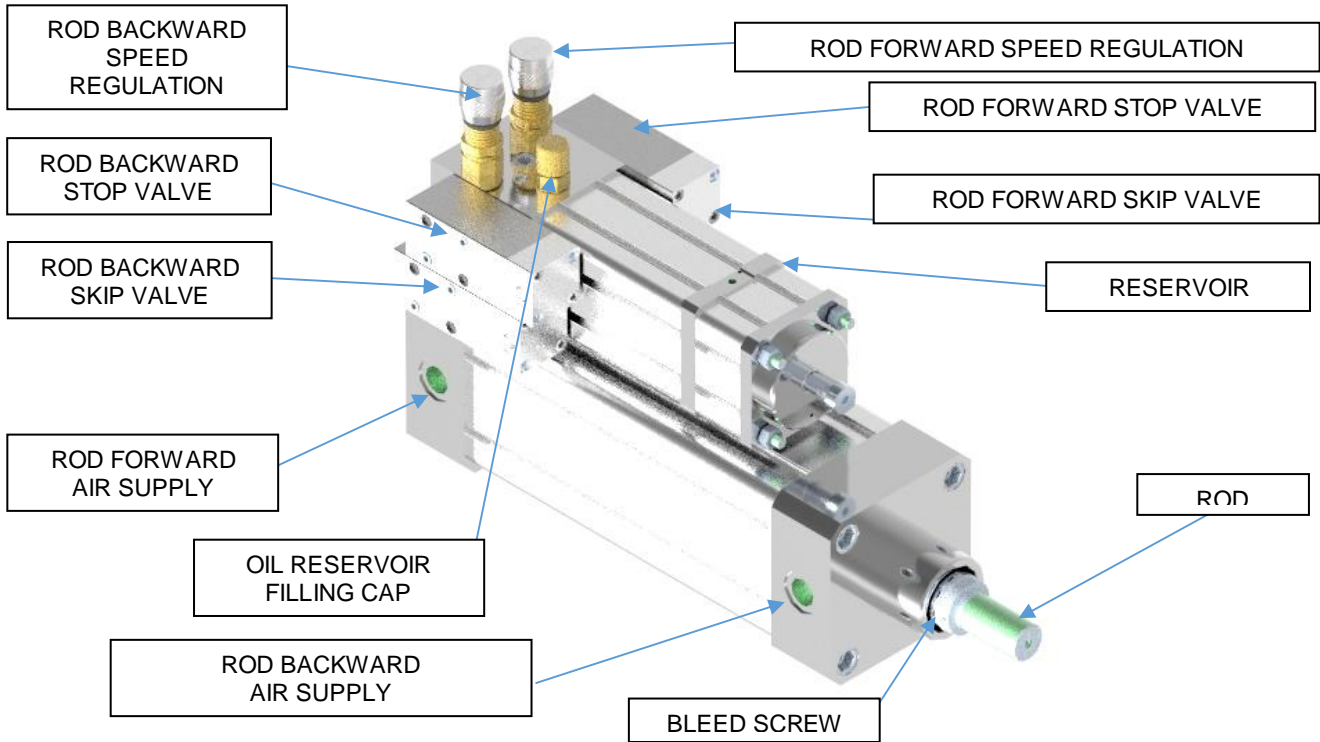
Use rules

- Basic requirements to read, comprehend and follow instructions contained in this document are basics of product itself. Avoid basics shall turn invalid the warranty from manufacturer
- Put the machine in safety condition is MANDATORY
- Use controls suitable for the safety of things and people is MANDATORY
- Use of guards/protections and/or safety systems for people safety is MANDATORY
- Operative fluid: filtered compressed air, lubricated or not compliant to ISO 8573-1: 2010 [7:4:4]
- Air pressure range: see table in page 1
- Temperature range: see table in page 1

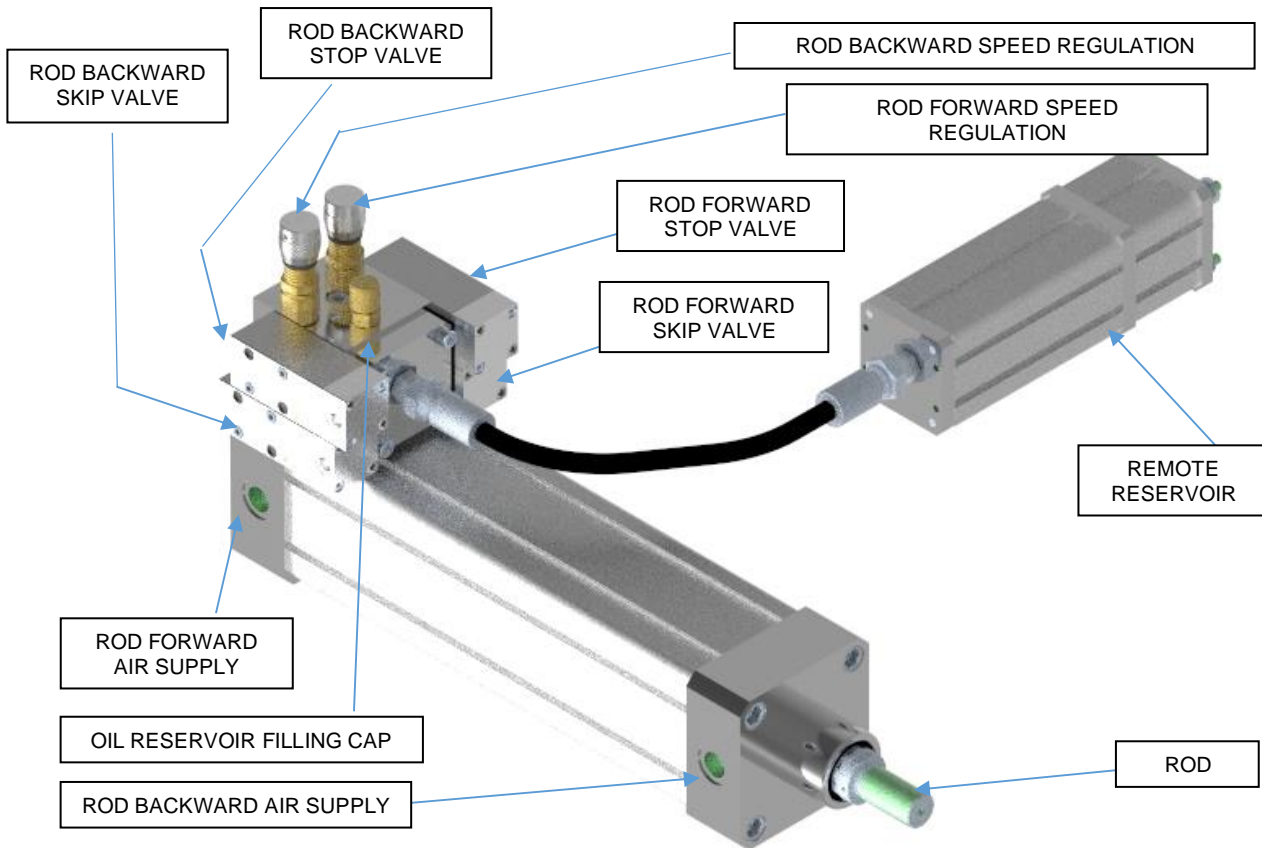
The unit is a pneumatic actuator with an internal hydraulic circuit used to manage the speed of movement and/or the possible stops of the rod at any intermediate point of the actuator stroke. The hydraulic circuit is obtained in the actuator rod, through coaxial pipes. A hydraulic piston allows to create two hydraulic chambers. When the pneumatic piston moves pushed by the air it pushes the oil inside a hydraulic chamber towards the external connection. When the pneumatic piston moves in the opposite direction it pushes the oil of the other hydraulic chamber. The external connections are connected to a group where the oil is managed (flow regulation and valves) and where a recovery tank is fixed to compensate the different volume of the hydraulic chambers. The following figure shows the unit diagram.



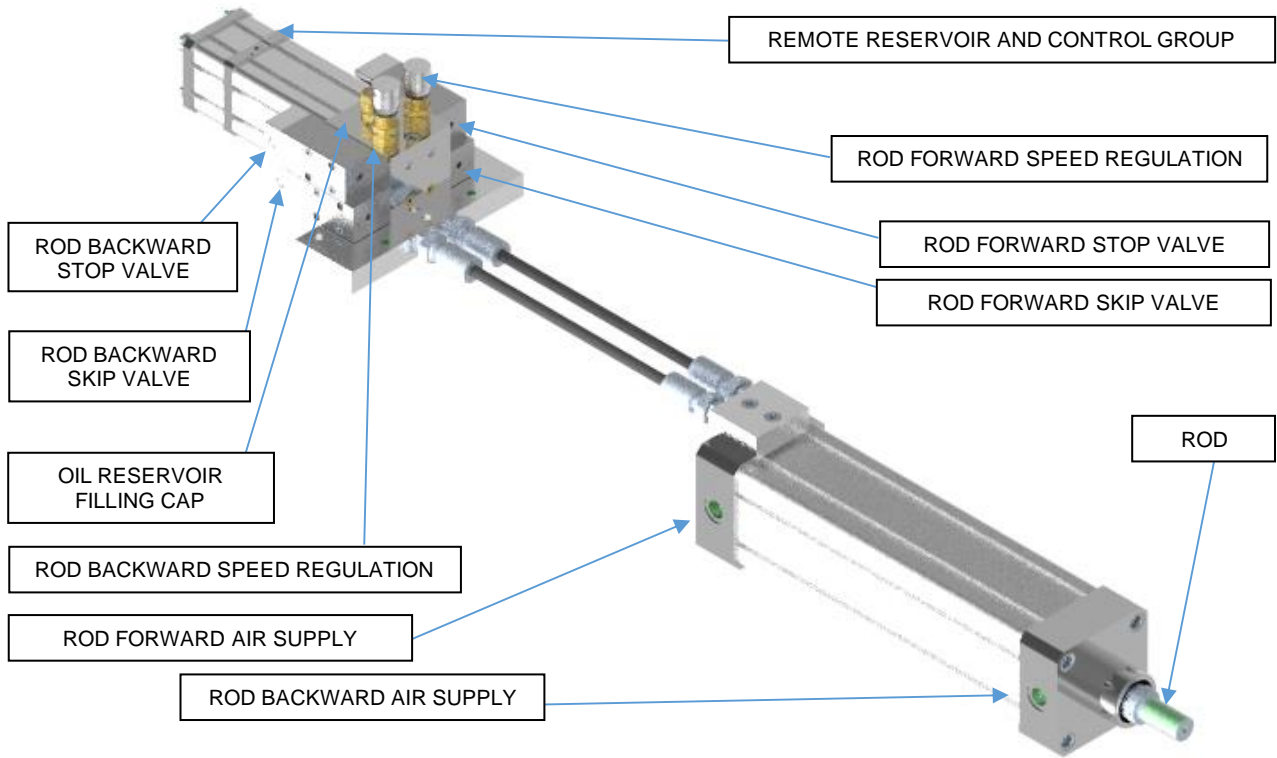
Standard Unit UI



Standard Unit UB

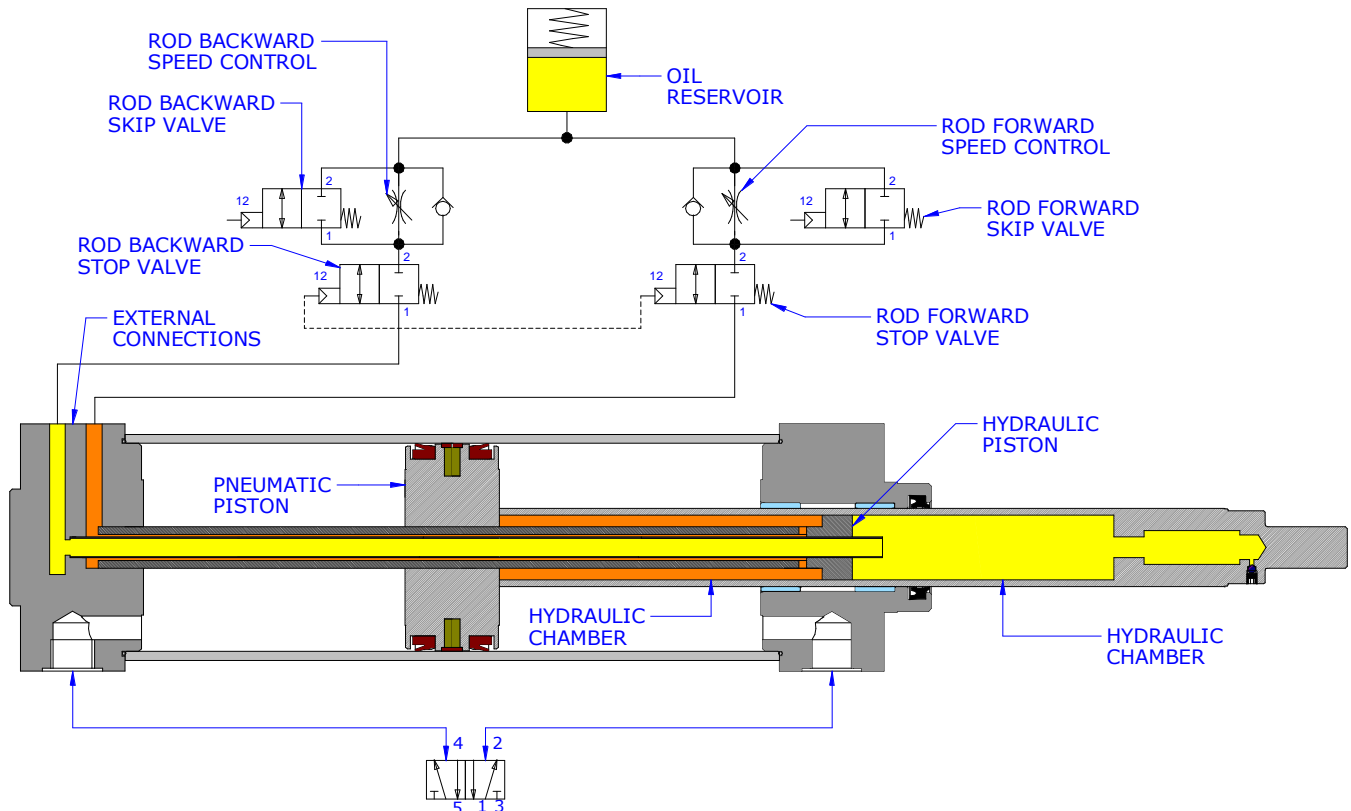


Standard Unit UT

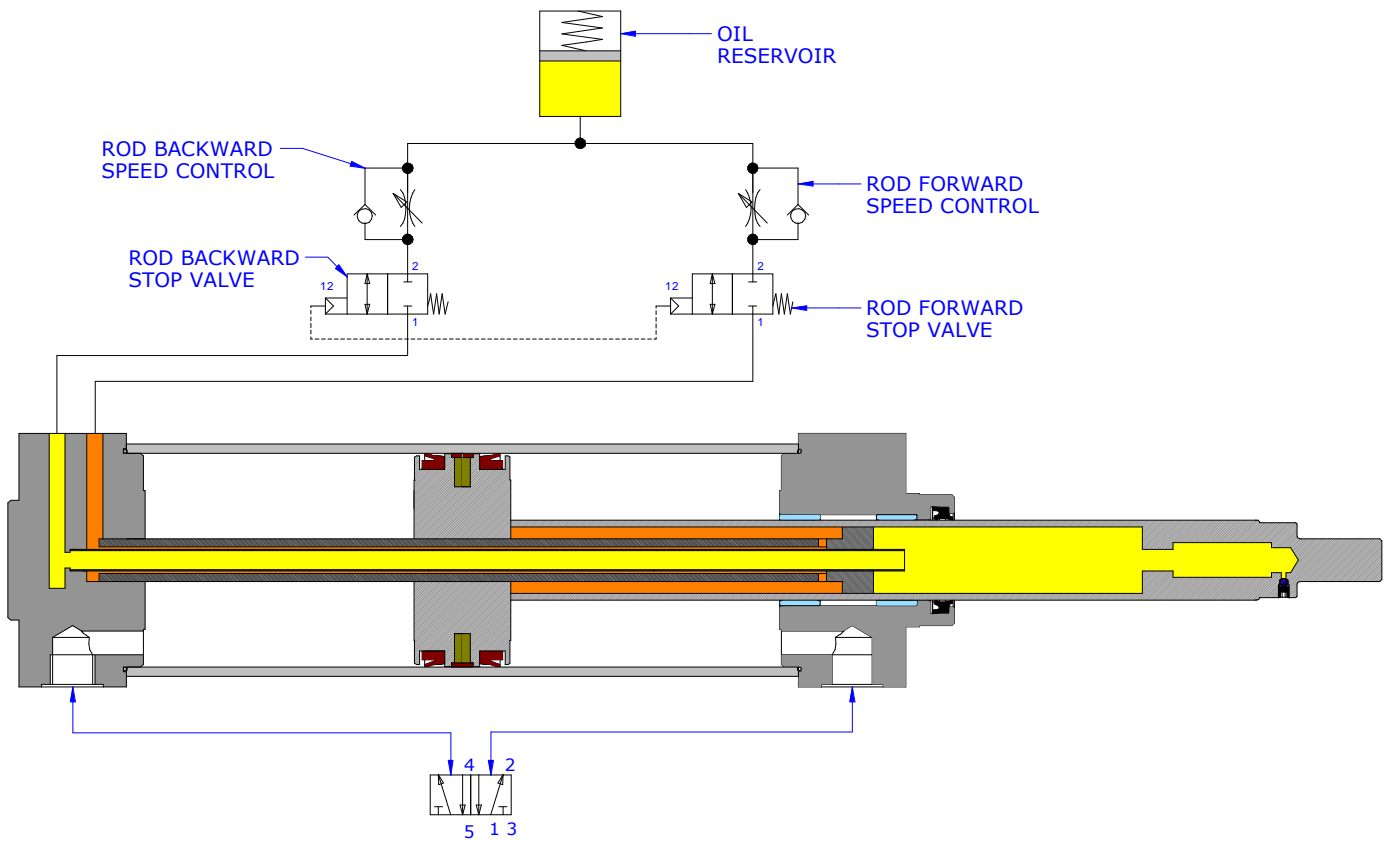


⚠ WARNING: FOR **UB** AND **UT** UNITS, WHICH HAVE PARTIALLY OR TOTALLY RESERVOIR REMOVED, THE OIL CIRCUIT IS CLOSED, UNDER PRESSURE AND TESTED. THE HYDRAULIC PIPES BETWEEN UNIT AND RESERVOIR MUST NOT BE DISCONNECTED FOR ANY REASON.

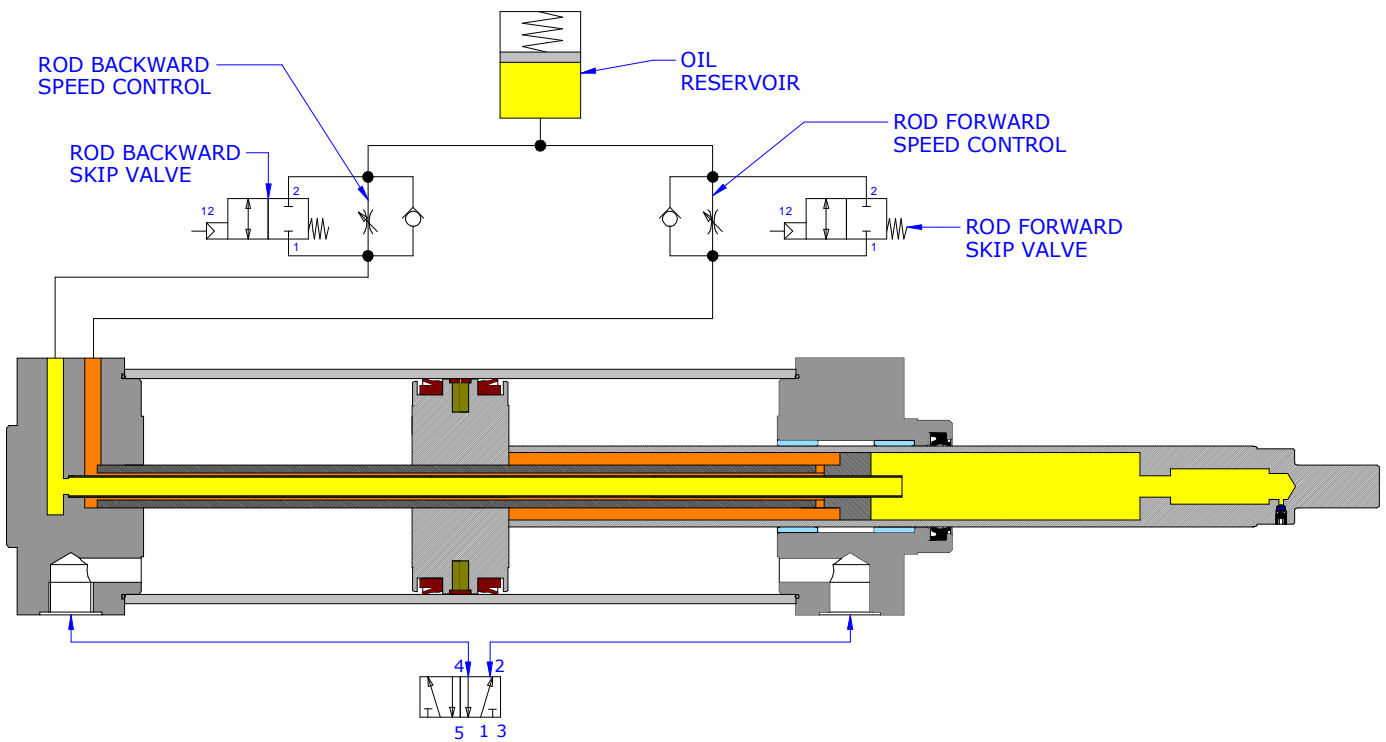
SCHEME EXAMPLE WITH SKIP + STOP FUNCTIONS (N.C. shown)



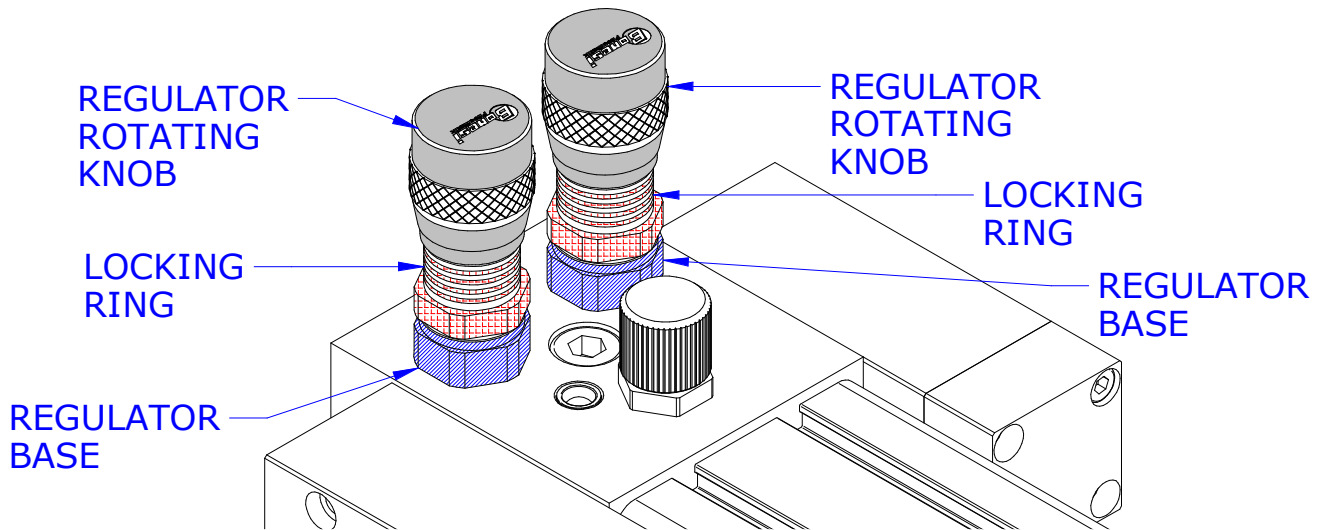
SCHEME EXAMPLE WITH STOP FUNCTIONS (N.C. shown)




SCHEME EXAMPLE WITH SKIP FUNCTIONS (N.C. shown)




USE OF FLOW REGULATORS



The regulator is a precise instrument that shall be used in the correct way and with careful manners

- 1 – Hold the regulator knob, rotate the locking ring in clockwise direction until the ring get inside the knob
- 2 – To adjust the speed, rotate the knob in counterclockwise direction (twist off) to increase the speed and in clockwise direction (tighten) to decrease the speed
- 3 –  Rotate with hands (DO NOT ABSOLUTELY USE TOOLS) in clockwise direction the locking ring to make it move away from knob and get closer to regulator base to lock regulator in required position and avoid any accidental rotation

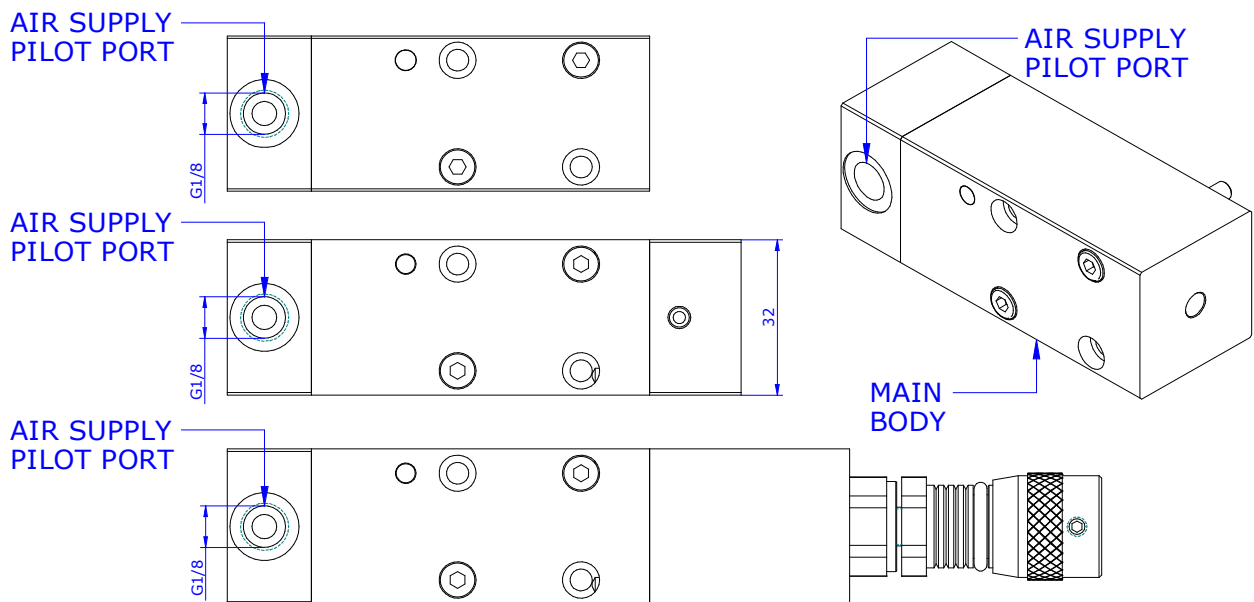
 The regulator completely tightened closes the hydraulic circuit disabling the movement of the rod

HYDRAULIC VALVES

The control valves of hydraulic circuit can be directly pneumatically operated ore electrically operated with servo-pilot

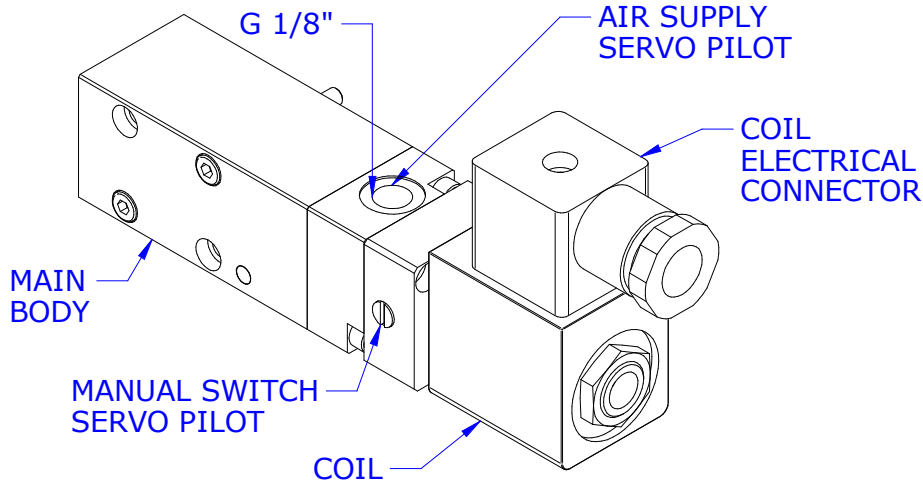
DIRECT PNEUMATIC OPERATED VALVE G 1/8" (BSPP)

Regardless of the choice of the type of valve, normally open or normally closed, the overall dimensions of the main body do not change and the pilot supply port is in the same position (Min. 3.5 Bar).



ELECTRIC OPERATED VALVE with pneumatic servo-pilot G 1/8" (BSPP)

Regardless of the choice of the type of valve, normally open or normally closed, and the choice of the coil (supply voltage), they all have the same overall dimensions as the main body and the same pilot supply port (Min. 3 Bar).



Electrically operated valves must be supplied with compressed air for the servo pilot operation. The valves are also equipped with a manual control switch that allows occasional operation even in the absence of electricity or for maintenance / testing.

TECHNICAL DATA

Maximum thrust (forward) and traction (backward) values of the units as a function of the supply air pressure.

Bore \ Pressure		Pressure					
		2 bar	3 bar	4 bar	5 bar	6 bar	7 bar
50 mm.	FORWARD	370 N	555 N	740 N	925 N	1110 N	1295 N
	BACKWARD	295 N	442 N	589 N	736 N	884 N	1031 N
63 mm.	FORWARD	583 N	875 N	1166 N	1458 N	1750 N	2041 N
	BACKWARD	482 N	723 N	964 N	1205 N	1446 N	1687 N
80 mm.	FORWARD	965 N	1448 N	1930 N	2413 N	2895 N	3378 N
	BACKWARD	864 N	1296 N	1728 N	2160 N	2592 N	3024 N
100 mm.	FORWARD	1531 N	2296 N	3061 N	3826 N	4592 N	5357 N
	BACKWARD	1319 N	1979 N	2639 N	3299 N	3958 N	4618 N
125 mm.	FORWARD	2414 N	3621 N	4828 N	6035 N	7242 N	8449 N
	BACKWARD	2136 N	3204 N	4272 N	5341 N	6409 N	7477 N

BORE	FIXING HOLES	TIGHTENING TORQUE	SUPPLY PORTS SIZE (BSPP)
------	--------------	-------------------	--------------------------

50	M 8	15 Nm	G 1/4
63	M 8	15 Nm	G 3/8
80	M 10	30 Nm	G 3/8
100	M 10	30 Nm	G 1/2
125	M 12	52 Nm	G 1/2

5. GENERAL LIMITS

Limits of use include intended use and reasonably foreseeable misuse. Besides all safety prescriptions mentioned before, other aspects under consideration include the following:

- Use limits -> the unit has only one operating mode. It is designed and built to perform only its intended function. The conditions of use are specified in this document and based upon temperature and pressure parameters, radial and axial loads and correct installation operations
- Space limits -> There are no moving parts outside the unit, except the rod that carry out the work and the reservoir shaft that moves to recover oil volume. There are no space requirements other than those relating to its size, the size of the connected parts, the room involved in the movement of the parts, the pipes and the physical space required by an operator for installation, maintenance and uninstallation. The unit is not located in the operator's work area and all the safety devices and / or protections inserted in the machine must take into account the view and ergonomics
- Time limits -> The life limit of the unit is defined by the application and proper maintenance of the unit and connected parts

6. STORAGE

The storage must be done following the listed prescriptions:

1. Seals are often stored as spare parts for prolonged periods. Most rubbers change in physical properties during storage and ultimately become unserviceable due, e.g., to excessive hardening softening, cracking, crazing or other surface degradation.
These changes may be the result of particular factors or combination of factors, such as the action of deformation, oxygen, ozone, light, heat, humidity or oils and solvents. With a few simple precautions, the shelf life of these products can be considerably lengthened.
Fundamental instructions on storage, cleaning and maintenance of elastomeric seal elements are described in international standards, such as: DIN 7716/BS 3F68:1977, ISO 2230 or DIN 9088.
The standards give several recommendations for the storage and the shelf life of elastomers, depending on the material classes. The following recommendations are based on the several standards and are intended to provide the most suitable conditions for storage of rubbers and actuators.
They should be observed to maintain the optimum value of the parts.
2. The storage temperature should preferable be between +5 °C and +30 °C.
3. Direct contact with sources of heat such as boilers, radiators and direct sunlight should be avoided
4. If the product is taken from low temperature storage, care should be taken to avoid first use at that temperature as it may have stiffened components. In this case the temperature of the product should be raised to approximately +10 °C before it is put into service
5. The relative humidity in the store room should be below 70 %. Very moist or very dry conditions should be avoided. Condensation shall not occur.
6. Elastomeric seals should be protected from light sources, in particular direct sunlight or strong artificial light with an ultraviolet content. The individual storage box for actuator offer the best protection.

7. Precaution should be taken to protect stored actuators from all sources of ionising radiation likely to cause damage to stored articles.
8. Where possible, elastomeric materials should be protected from circulating air by wrapping, storage in airtight containers or by other suitable means. As ozone is particularly deleterious to some elastomeric seals, storage rooms should not contain any equipment that is capable of generating ozone, such as mercury vapour lamps, high voltage electrical equipment, electric motors or other equipment which may give rise to electric sparks or silent electrical discharges. Combustion gases and organic vapour should be excluded from storage rooms as they may give rise to ozone via photochemical processes.
9. In case of actuator spare parts, elastomeric materials should, wherever possible, be stored in a relaxed condition free from tension, compression or other deformation. Where articles are packed in a strain-free condition they should be stored in their original packaging.
10. Elastomeric seals should not be allowed to come into contact with solvents, oils, greases or any other semi-solid materials at any time during storage, unless so packed by the Bonesi Pneumatik.
11. If cleaning is necessary, DO NOT use soap and water or methylated spirits. Water should not be permitted to come into contact with actuator components, seals and polyurethane rubbers. Disinfectants or other organic solvents as well as sharp-edged objects, MUST not be used.
12. Shelf life and shelf life control. The useful life of an elastomeric seal will depend to a large extent on the type of rubber. When stored under the recommended conditions (above sections) the below given shelf life of several materials should be considered.

AU / PU	4 years	FKM / VMQ / FVMQ	10 years
NBR	6 years	FFKM	18 years
EPDM	8 years	PTFE	unlimited

Where:

- AU/PU -> Polyurethane
- NBR -> Nitrile rubber
- EPDM -> Ethylene-Propylene Diene Monomer
- FKM -> Fluoro elastomer
- VMQ -> Silicones elastomer
- FVMQ -> Fluorosilicones elastomer
- FFKM -> Perfluor elastomer
- PTFE -> **Polytetrafluoroethylene**

13. Elastomeric seals should be inspected after the given period. After this giving an extension period is possible. Rubber details and components less than 1.5 mm thick are liable to be more seriously affected by oxidation degradation even when stored in satisfactory conditions as recommended. Therefore they may be inspected and tested more frequently than it is mentioned above.
14. Rubber details/seals in assembled components should be exercised at least every 12 months. The maximum period a rubber detail/seal is allowed to remain assembled within a stored unit, without inspection, is the total of the initial period stated above and the extension period.

7. DEVICE HANDLING

The device looks like a normal pneumatic actuator with the addition of a tank and a control unit. In addition to normal care, pay particular attention to handling the control unit, regulators and valves. DO NOT lift the unit by the regulators and / or the tank

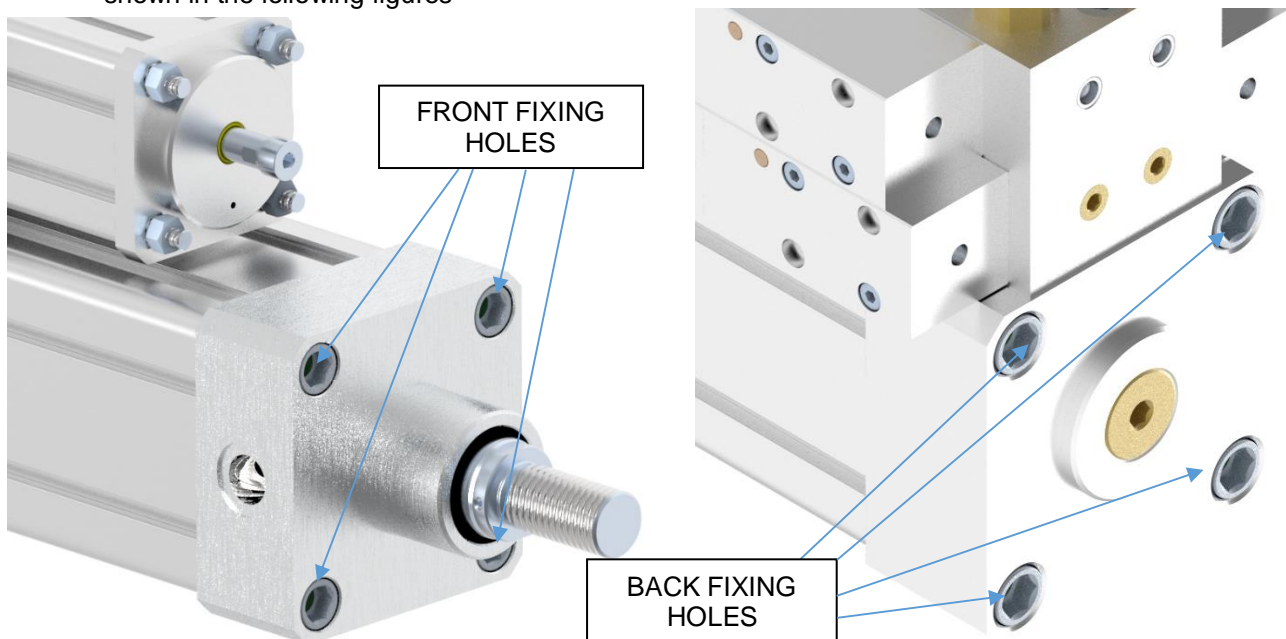
8. DEVICE INSTALLATION

The unit must be installed in such a way that the pneumatic cylinder is fixed and that the rod is free to move axially. Do not fix the cylinder and rod with such constraints as to produce radial loads and / or bending of the rod itself.

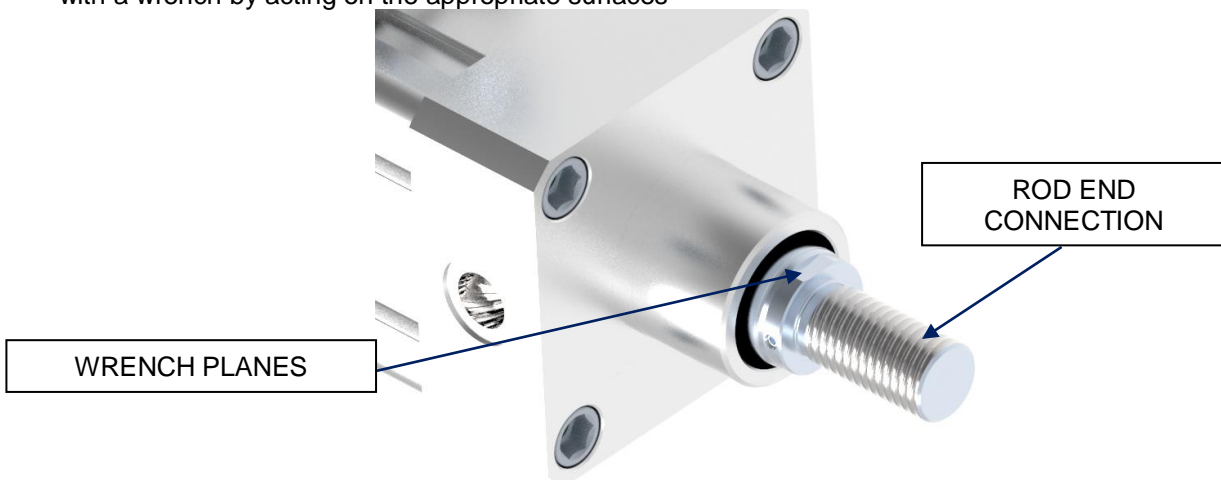
The pneumatic connections, pipe diameter and control valves of the pneumatic actuator must be of adequate capacity to avoid jerky operation of the unit

For the installation and commissioning of the device, in addition to the mandatory safety precautions, the points listed must be followed:

1. Tighten and ensure the device to a suitably sized structure using the fasteners provided on the heads, shown in the following figures



2. Tighten the fixing screw with tightening torque indicated in Technical Data
3. Tighten the nut and / or the connection accessory on the terminal, taking care to keep the terminal locked with a wrench by acting on the appropriate surfaces



⚠ WARNING: THE ROD END CONNECTION WORKS ALSO AS A PLUG FOR OIL CIRCUIT. UNSCREWING THE ROD END PART COULD RESULT IN A LOSS OF OIL OF THE THE HYDRAULIC CIRCUIT

4. Install the device keeping free the correct space necessary for operator regulation

5. Install the device making sure that external parts do not conflict, especially with regulators, during the movement of said parts and/or the unit itself

The UI, UP and UT units can be mounted in any position. The oil in the circuit is always kept under pressure due to a specific recovery system in the tank. The remote tank can also be mounted in any position. The closer the tank is to the linear unit, the more precise the intervention of the SKIP and STOP valves will be.

9. START-UP, COMMISSIONING



Before supplying the unit with compressed air, check the following:

- a) The connections have been made with correct fittings and pipes
- b) Pressure of compressed air and ambient temperature values comply with indications given
- c) Fixing screws of the unit are properly tightened
- d) The device is properly electrically grounded (if necessary)

Supply the device with low pressure (2 – 3 Bar) and check the correspondence to the desired functions

Minimum requirements and useful tips for correct operation of the unit:

1. Air pressure for servo-pilot SKIP e STOP-----> MIN. 3,5 Bar
2. Air pressure for unit movement -----> MIN. 2,0 Bar
3. In case of unit with STOP valve on both directions, supply the pilots simultaneously to perform the STOP function
4. The use of the unit in very fast reciprocating motion, especially with strokes over 200 mm, can lead to oil heating with consequent degradation and loss of efficiency

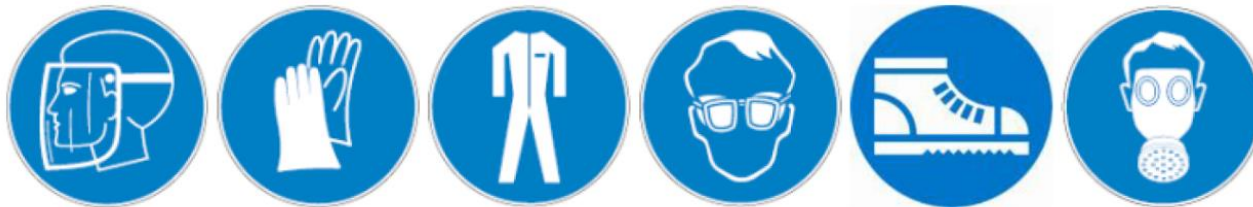


The force table indicates the maximum thrust and traction values with the oil circuit totally open. When the oil flow is regulated, an opposition of the hydraulic circuit is obtained which decreases these values

10. MAINTENANCE

Before carrying out any maintenance operation on the device, provide for the general safety and individual protection measures necessary for this operation.

In particular, due to the use of hydraulic oil, observe the following precautions (see also General Safety Warnings):




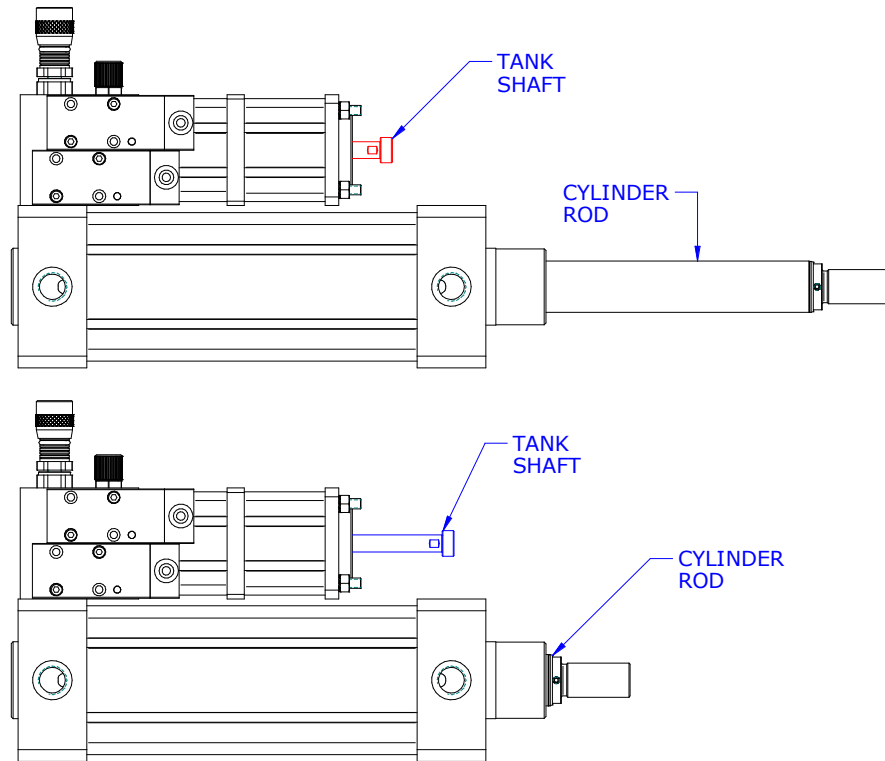
- Protective visor
- Protective gloves
- Protective wear
- Protection glasses
- Safety shoes
- Breath mask to avoid particles/aerosol



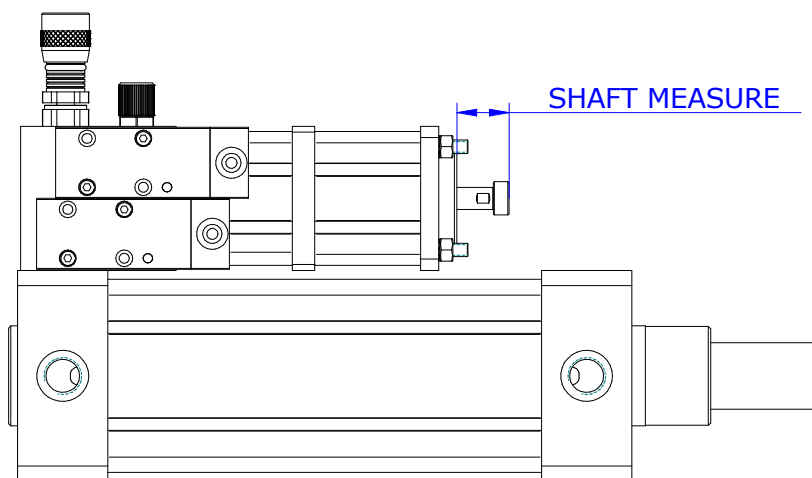
In case of contact and / or aerosol with oil, refer to the safety data sheet of the product

The simple but essential operations to be carried out for product maintenance are listed below:

- The connections of the units are protected with plastic sub-caps. DO NOT remove these protections in environments with dusty atmosphere. Their removal facilitates the entry of dust into the cylinder, with possible damage to parts of the cylinder itself. For the connections, preferably use fittings with cylindrical thread and with compression seals.
- Periodic cleaning of the surfaces of the units to avoid the formation of layers of dust.
- Check for any oil leaks due to wear of the seals
-  Check the correct movement of the tank shaft. The shaft is retracted with the extension of the cylinder rod and is extended with the return to the rest position of the rod itself as shown in the following image.



- Occasionally check the tightness of the locking screws of the unit to the structure.
- Check for any oil leaks by measuring the minimum extension of the tank shaft, highlighted in the following figure, when the rod is fully extended. The standard measure is approximately 11, 13 or 23 mm, depending on the size of reservoir. The minimum measure is 6 mm

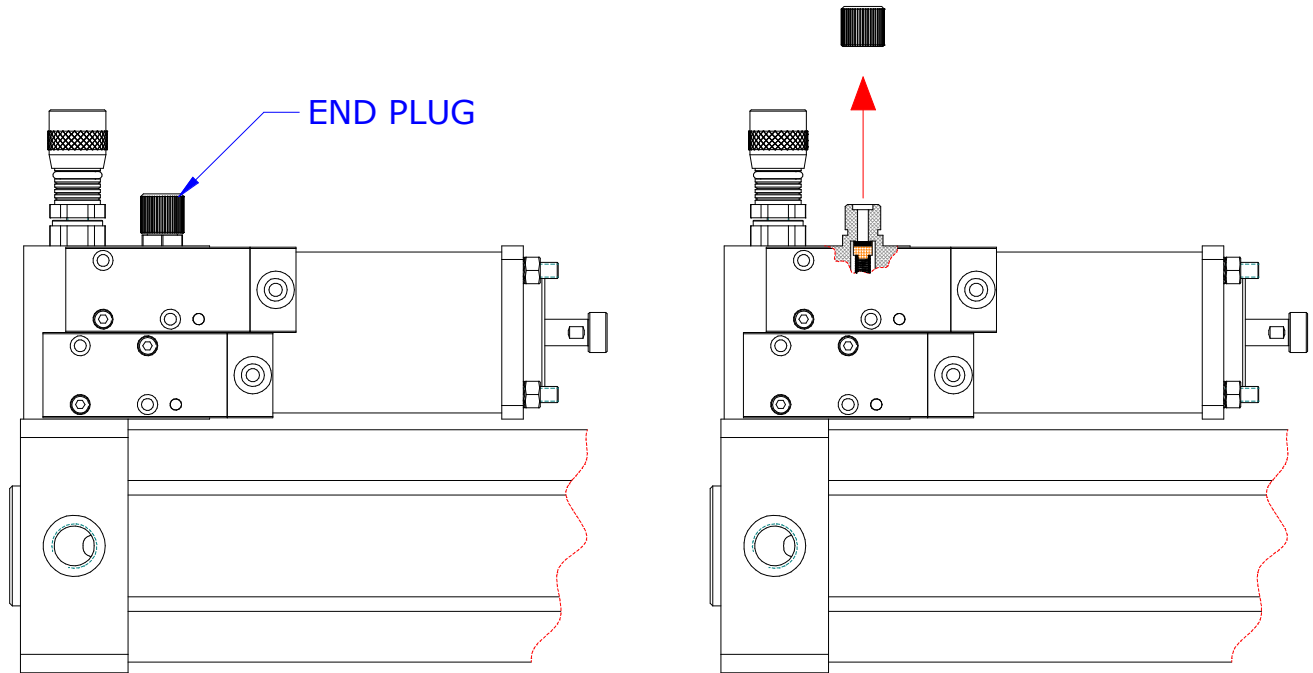


Never open the unit. The oil in the hydraulic circuit is always under light pressure and could cause damage. If necessary, act on the bleed screw as explained below

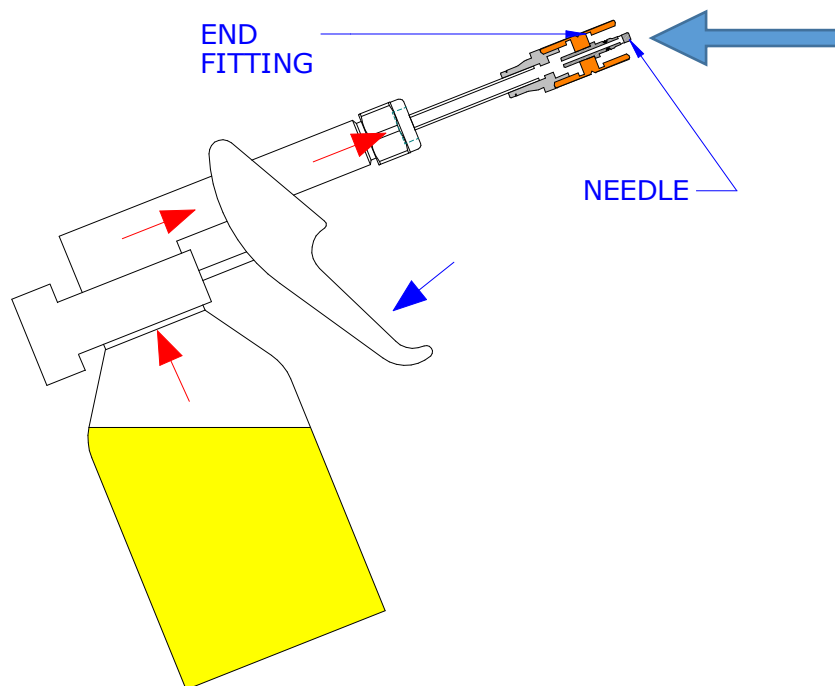
PLEASE NOTE: Under normal unit functioning, top-up operations should not be necessary, therefore, after testing, a guarantee seal is applied to the BLEED SCREW which must not be removed by the user Customer, this could cause the contractual guarantee period to lapse.

FILLING / TOPPING UP OF THE UNIT

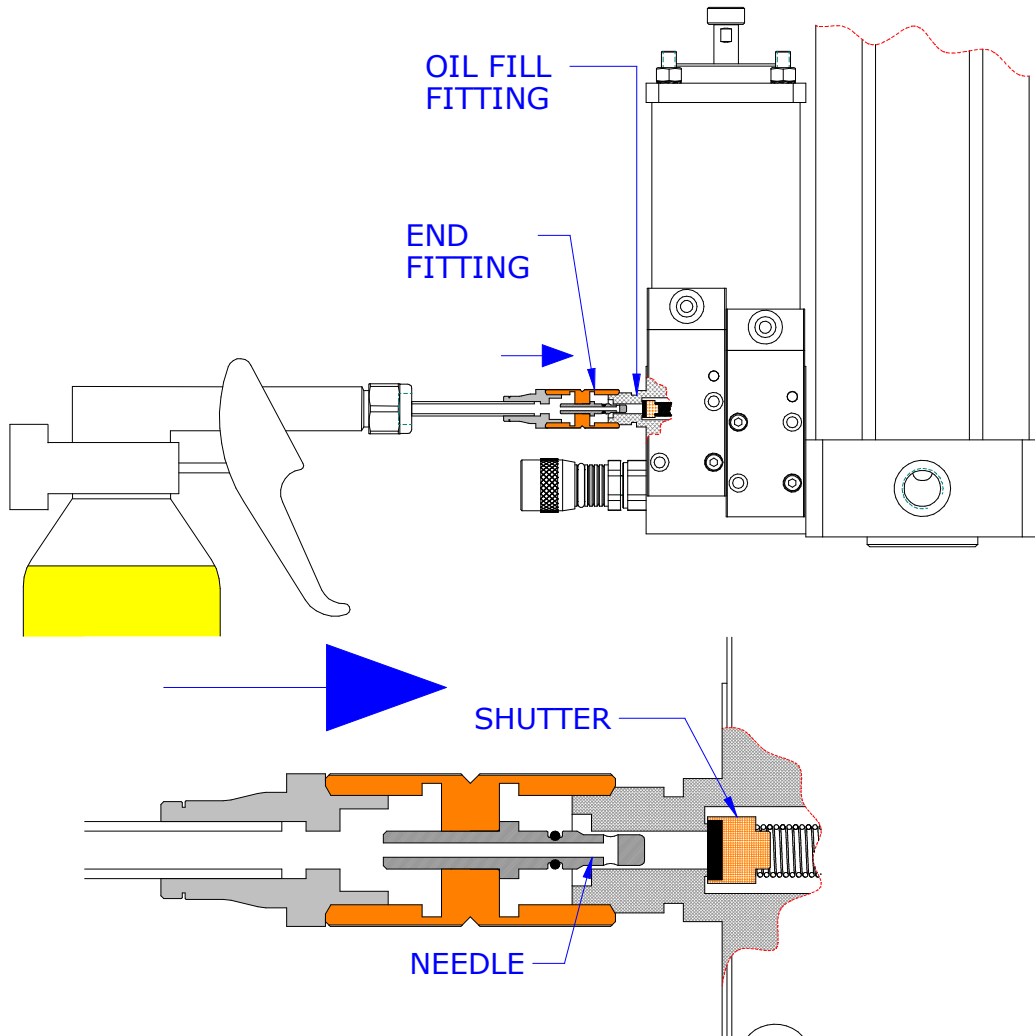
- A -> Prepare the unit with the cylinder rod completely extended (rod all out of the unit)
- B -> Adjust the speed regulators to maximum opening by turning the knobs or screws in counterclockwise direction
- C -> On the control group, remove the FILL FITTING COVER



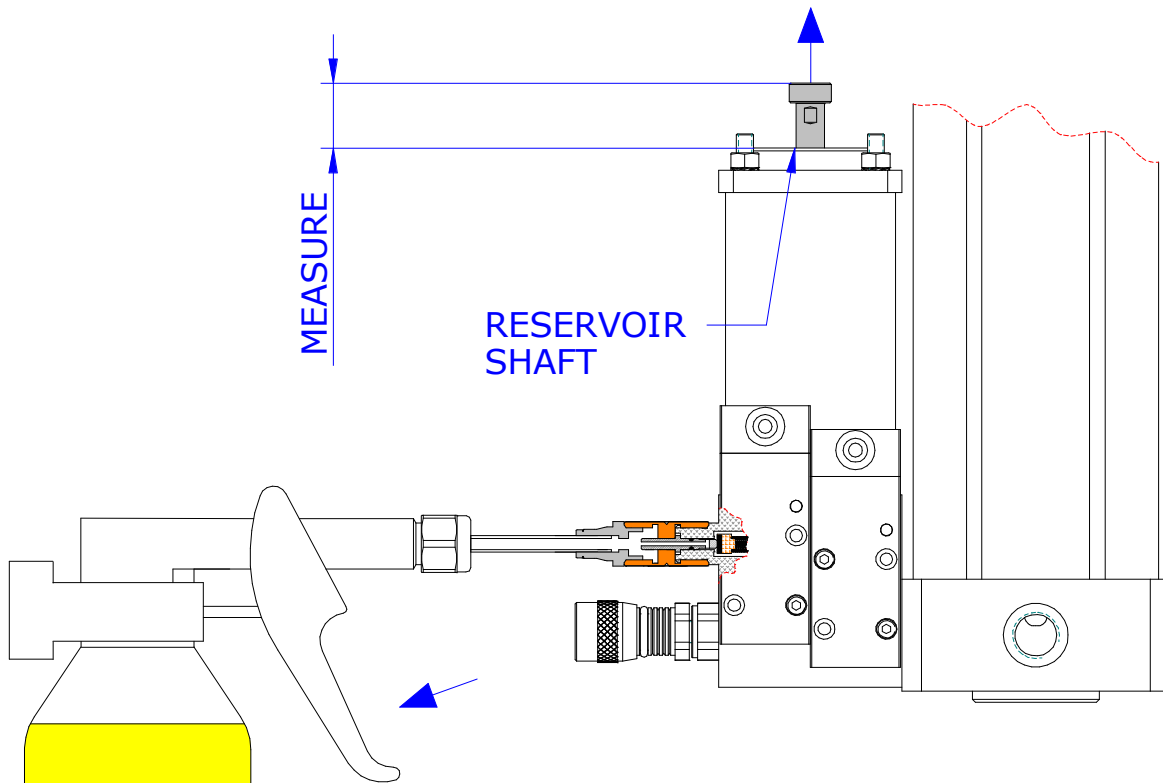
- D -> Prepare the pump with the correct type of oil in the vessel. Pump the oil until it draw off the needle of the end fitting to let air come out



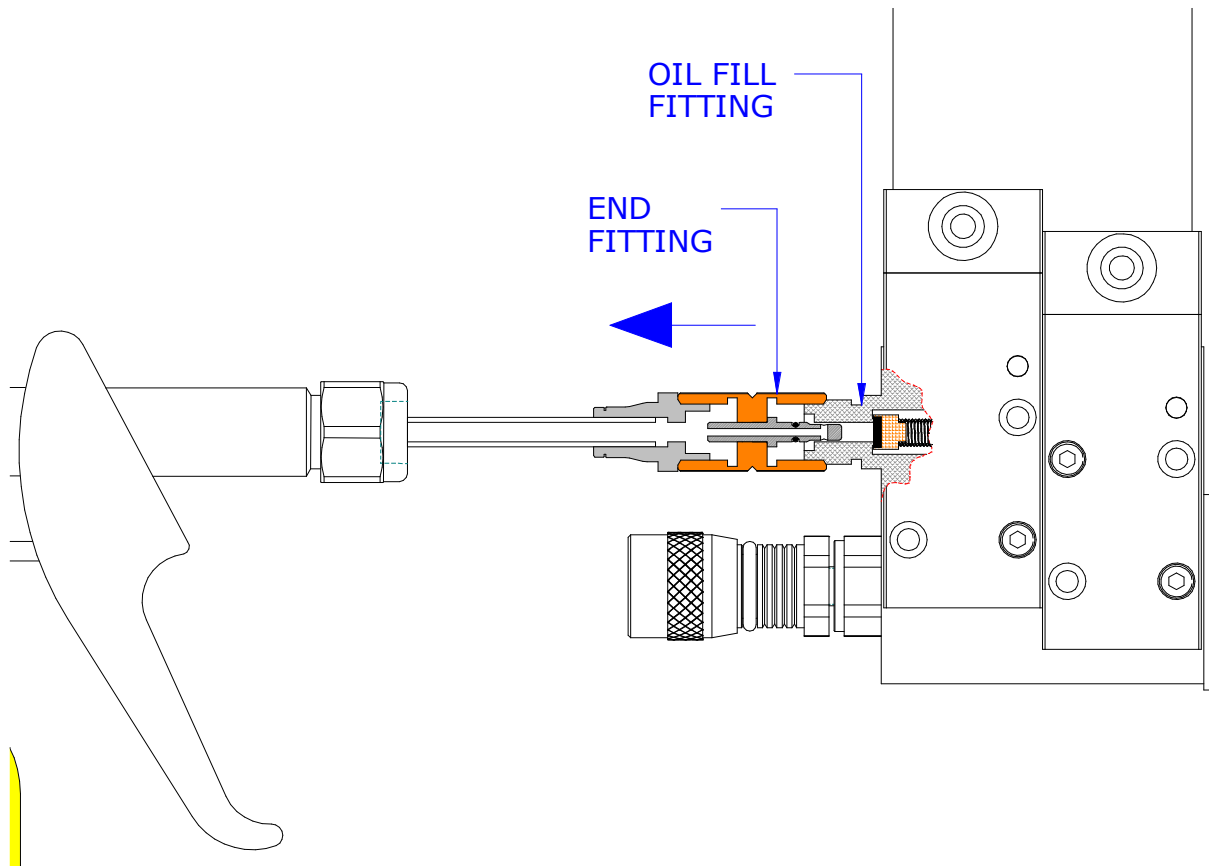
- E -> If possible, place the unit in vertical position with the rod upwards. Screw the end fitting of the pump to the oil fill fitting of the unit. Only in last millimetres of screwing the needle opens the one-way shutter inside the oil fill fitting of the unit. Screw completely the end fitting of the pump



F -> Pump the oil inside the unit and let the reservoir shaft lift up until the measure indicated in the instruction document (11 – 13 – 23 mm) depending on the size of the reservoir



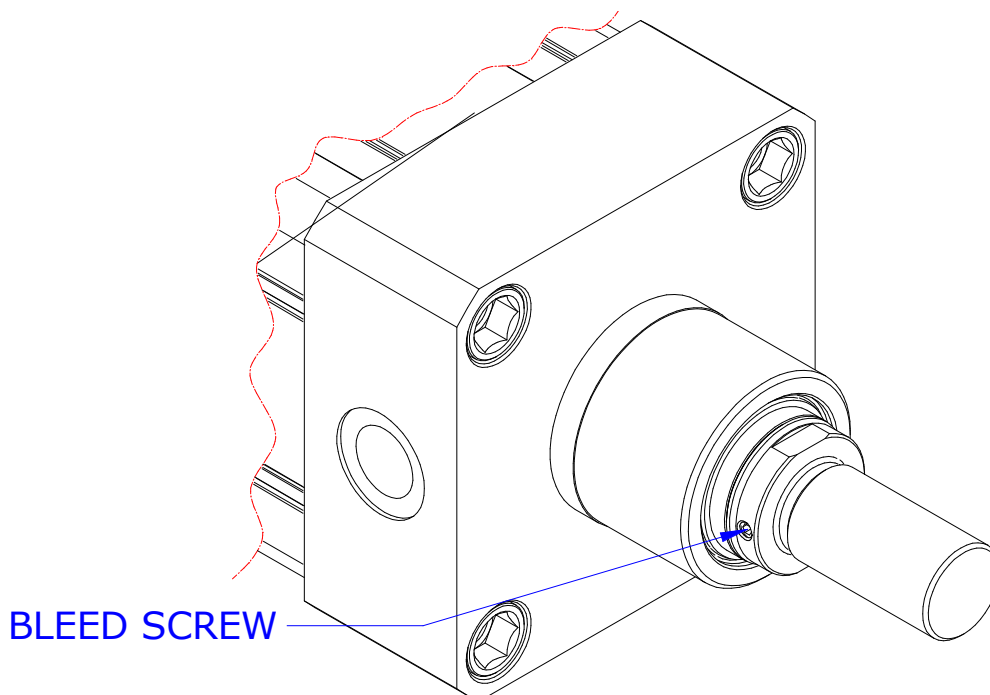
G -> Unscrew the end fitting of the pump to the oil fill fitting of the unit.



H -> With the unit placed in vertical position with rod upwards, or at least, with bleed screw placed at the highest point of the unit, drain out the eventual air entered into the oil circuit by the use of the bleed screw. Loosening the bleed screw, air bubbles will come out from drain hole



ATTENTION: LOOSEN ONLY ½ - 1 TURN THE BLEED SCREW



1. Make some unit cycles with rod back and forward and then repeat the air purge described in Point H

11. DISMANTLING

To proceed with dismantling operation, shut down air and power supply of the machine/system where the actuator is installed, or, isolate the actuator. Drain oil from bleed screw. Separate and collect all materials. Respect all safety warnings listed in this document. Proceed with dispose of waste material following local laws.

12. TROUBLESHOOTING

DETECTED ISSUE/FAILURE	POSSIBLE CAUSE	ACTION TO PERFORM
THE UNIT ROD DOES NOT MOVE IN EXTENSION (FORWARD)	The extension air chamber is not supplied correctly	Check the proper function and air pressure value of unit control valve
	Problem solved Y/N? N ->	Go to following point
	The speed regulator for extension direction is completely closed	Check the regulator and, if necessary, rotate the knob in counterclockwise direction to let oil flow in the circuit
	Problem solved Y/N? N ->	Go to following point
	The extension STOP valve is closed	Verify the type and state of STOP valve (normally open or closed) and restore the conditions of free oil flow
	Problem solved Y/N? N ->	Contact Fromm Packaging
THE UNIT ROD DOES NOT MOVE IN RETRACTION (BACKWARD)	The retraction air chamber is not supplied correctly	Check the proper function and air pressure value of unit control valve
	Problem solved Y/N? N ->	Go to following point
	The speed regulator for retraction direction is completely closed	Check the regulator and, if necessary, rotate the knob in counterclockwise direction to let oil flow in the circuit
	Problem solved Y/N? N ->	Go to following point
	The retraction STOP valve is closed	Verify the type and state of STOP valve (normally open or closed) and restore the conditions of free oil flow
	Problem solved Y/N? N ->	Contact Fromm Packaging
THE UNIT MOVES BY FITS AND STARTS	Air pressure not enough	Check air pressure measure of unit control valve and restore the correct value
	Problem solved Y/N? N ->	Go to following point
	Possible oil missing	If the unit should behave with fits and starts, stop the unit. Extend the unit rod. Open the bleed screw and let air come out. Fill up the unit until the level indicated in this document
	Problem solved Y/N? N ->	Contact Fromm Packaging