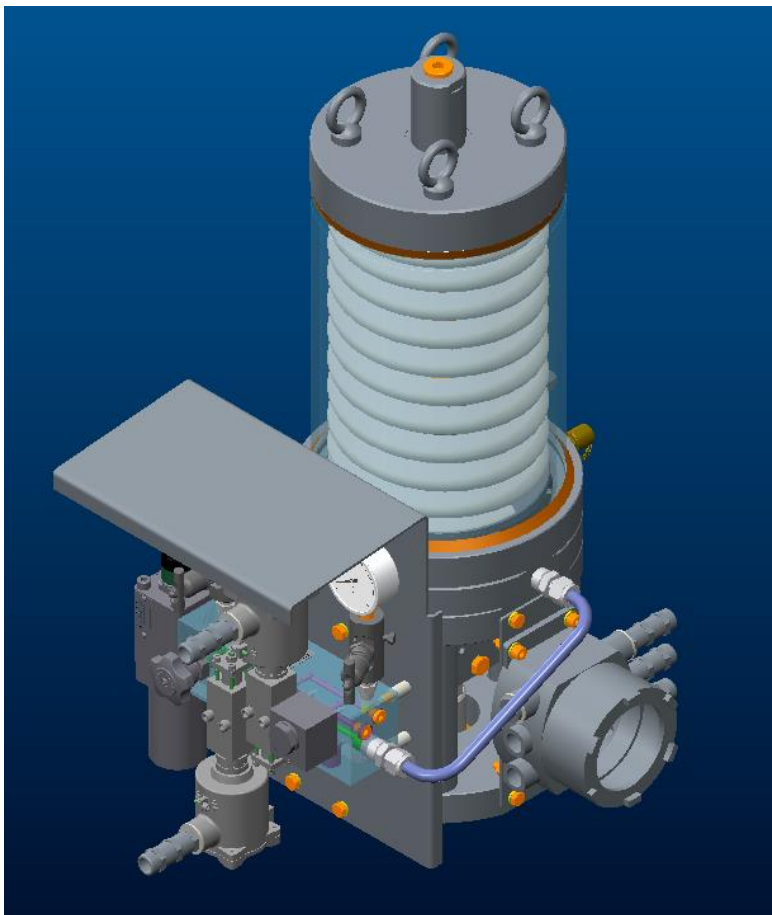



Linear hydraulic actuator

SC/VH Series

Single acting version type SC/VHS

INSTRUCTION MANUAL 5020




Engineering
GREAT Solutions

<i>20/07/2021</i>	<i>3</i>	<i>Added Section 14</i>	<i>R. Moncada</i>	<i>N. Zenoni</i>
<i>28/09/2020</i>	<i>2</i>	<i>Revised label at Section 4</i>	<i>G. Alfieri</i>	<i>A. Negri</i>
<i>27/09/2017</i>	<i>1</i>	<i>Revision</i>	<i>N. Mores</i>	<i>G. Alfieri</i>
<i>25/07/2017</i>	<i>0</i>	<i>Issue</i>	<i>N. Mores</i>	<i>G. Alfieri</i>
Date	Revision	Description	Compiled	Approved

STI S.r.l. has taken every care in collecting and verifying the documentation contained in this Instruction Manual. The information herein contained are reserved property of STI S.r.l.


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1 GENERAL INFORMATIONS

1.1 General Warnings

<p>Important</p> 	<p>This Instruction Manual is an integral part of the machine, it should be carefully read before carrying out any operation and it should be kept for future references.</p> <p>This Instruction Manual covers the SC/VHS actuators in the base version without any accessories and/or control panel.</p> <p>In case accessories and/or control panel are foreseen mounted on the actuator an additional Section to this Instruction Manual will be attached to the specific actuator.</p> <p>This Instruction Manual is realized in accordance with the Directive 2006/42/CE.</p>
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1.2 Generalities

STI S.r.l. actuators are conceived, manufactured and controlled according to the Quality Control System in compliance with EN ISO 9001 International Standard.

1.3 Manufacturer

With respect to Machinery Directive 2006/42/EC the Manufacturer of the described SC/VHS actuator series, is **STI S.r.l.** as specified on the machinery label.

Address :**STI S.r.l.**

Via Dei Caravaggi, 15

24040 Levate (Bergamo) – Italy

1.4 Terms and conditions

STI S.r.l. guarantees each single product to be free from defects and to conform to current goods specifications. The warranty period is one year from the date of installation by the first user, or eighteen months from the date of shipment to the first user, whichever occurs first.

The warranty does not cover special products or components not covered by warranty in their turn by subcontractors. No warranty is given for products which have been subject to improper storage, improper installation, misuse, or corrosion, or which have been modified or repaired by unauthorised personnel. Repair work due to improper use will be charged at standard rates.

1.5 Manufacturer's Liability

STI S.r.l. declines all liability in the event of:

- use of the actuator in contravention of local safety at work legislation
- incorrect installation, disregard or incorrect application of the instructions provided on the actuator label and in this manual
- modifications without STI's authorisation
- work done on the unit by unqualified or unsuitable persons.

1.6 Applicable Standards and Directives

- EN ISO 12100: 2010: Safety of machinery - General principles for design. Risk asses and risk reduction.
- EN ISO 80079-36: 2016: Non-electrical equipment for explosive atmospheres – Basic method and requirement.
- EN ISO 80079-37: 2016: Non-electrical equipment for explosive atmospheres – Non electrical type of protection constructional safety “c”, control of ignition source “b”, liquid immersion “k”.
- 2006/42/EC Machinery Directive.
- 2014/68/EU Pressure Equipments Directive (PED)
- 2014/34/EU Directive concerning equipment for use in potentially explosive atmospheres (ATEX)
- 2014/35/EU Directive for Low Voltage Equipment (LV)**
- 2014/30/EU Directive relating to the Electromagnetic Compatibility (EMC)**

** Applicable only when electrical control panel is supplied integrate with the actuator.

1.7 Symbology Used

1.7.1 Signs of warning

Be careful where these symbols are shown, they indicate a potentially hazardous situation and they warn that if the steps are not properly performed, MAY RESULT CAUSING serious injury, death or long-term risks to the health of exposed persons.



GENERAL DANGER



DANGER POWER SUPPLY



CRUSHING HAZARD

1.7.2 Sings of obligation



General obligation (with the possible supplementary signboard)



Must wear protective clothing.



Obligation to wear protective footwear.



Is required to wear a helmet.



Is required to protect the eyes.



Obligation to protect your hearing.

2 DEVICE DESCRIPTION

2.1 General Description

SC/VHS single acting hydraulic actuators are suitable for the operation of linear valves for ON-OFF and modulating heavy-duty service.

The actuator is made up of a hydraulic cylinder, with internal return spring, which is necessary to transmit the linear motion for the valve operation.

Two different versions are available depending on the position reached by the piston rod in case of loss of hydraulic pressure: fail extend (FE) and fail retract (FR).

When requested the linear stroke of the valve is adjustable by means of the external mechanical stop for upward position and by the adjustment of the coupling of valve stem to actuator joint for the downward position.

The actuator pedestal has a flange with threaded holes to fix the actuator to the valve.

STI can offer different types of control system according to specific Customer's requirements.

2.2 Identification of the Main Parts

The SC/VHS actuator is composed by the following main parts:

- 1) Adapting valve assembly (optional)
- 2) Hydraulic linear actuator with internal spring package
- 3) Stop setting screw kit (optional)
- 4) Coupling Joint (optional)

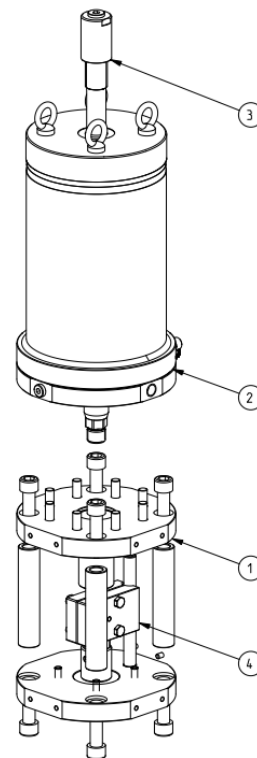
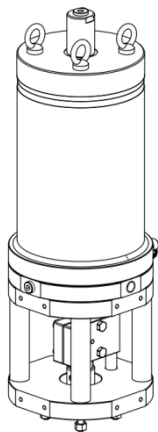
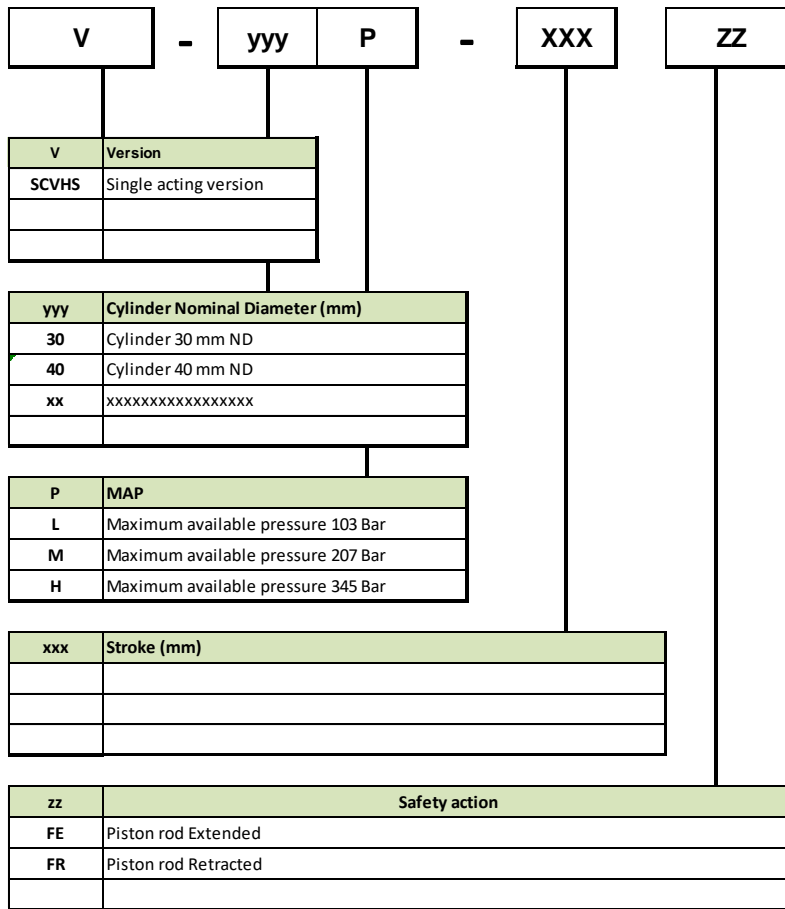


Fig. 1: Main parts for SC/VHS actuator type

2.3 Actuator coding description






3 TECHNICAL DATA

DATA	
Supply medium	Hydraulic fluid (see Section 8.6)
Operating temperature ranges	Standard : -20°C +100°C Optional : -60°C +100°C
Cylinder max. available pressures (MAP)	Up to 345 bar (special version on request)
Cylinder design pressures	Up to 380 bar (special version on request)
Operating pressure range	Data are available on actuator nameplate (depending on customer requirements and specifications.)
Max operating thrust	Data are available on actuator nameplate
Applications	On-Off Modulating service (on request)


The identification label fastened on the actuator contains the main actuator operating condition. It is forbidden to modify the information and the marks without previous written authorization by STI S.r.l.

4 IDENTIFICATION LABEL


SC/VHS actuators are suitable to be installed in classified areas **Zone 1, 21 and Zone 2, 22** with the degree of protection as marked in the identification label.


 STI s.r.l. Via Dei Caravaggi 15 - 24040 LEVATE (BG)-ITALY www.imi-critical.com - FAX +39 035 2928247			
 II 2 GD		Ref. INERIS EQEN 032506/17	
Ex h II <input type="checkbox"/> T <input type="checkbox"/> Gb / Ex h III C T <input type="checkbox"/> °C Db		Certificate IECEX INE 19.0025	
Order	<input type="text"/>	Serial N°	<input type="text"/>
Model	<input type="text"/>	Stroke	<input type="text"/> mm
Rated Thrust	<input type="text"/> KN	Max. allowable Pressure	<input type="text"/> bar
Pressure Range	min <input type="text"/> / max <input type="text"/> bar	Year	<input type="text"/>
Temp. Range	min <input type="text"/> / max <input type="text"/> °C	Valve TAG	<input type="text"/>
Degree of Protection IP66/67M according to IEC/EN 60529			


5 INSTALLATION

	<p>Important: Not performing the following procedures will invalidate the product guarantee.</p>
---	---

5.1 Transport

	<p>Important: The lifting and handling should be made by qualified staff and in compliance with the laws and provisions in force.</p>
---	--

	<p>Warning: Lift the actuator using the eyelets as shown in Fig.2. The fastening points are appropriate for the lifting of the actuator alone and not for the valve + actuator assembly.</p>
---	---

	<p>Warning: Avoid that during the handling, the actuator passes above the staff. The actuator should be handled with appropriate lifting means. The weight is reported on the delivery bill and on overall-dimensions drawings furnished with the documents accompanying the actuator. For base actuator dimensions and weights please consult www.stiactuation.com</p>
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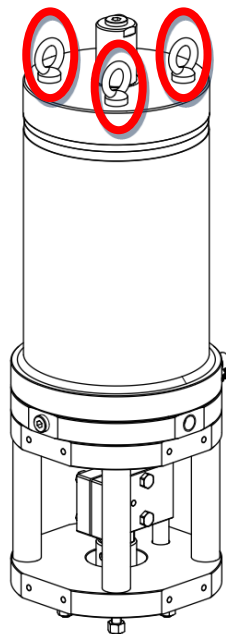


Fig. 2 – Lifting points for SC/VHS actuator type

5.2 Reception

- Check that the model, the serial number of the actuator and the technical data reported on the identification label correspond with those of order confirmation (Sect. 4).
- Check that the actuator is equipped with the fittings as provided for by order confirmation.
- Check that the actuator was not damaged during transportation: if necessary renovate the painting according to the specification reported on the order confirmation.
- If the actuator is received already assembled with the valve, its settings have already been made at the factory.
- If the actuator is delivered separately from the valve, it is necessary to check, and, if required, to adjust, the settings of the mechanical stops when provided (Sect. 7.2).

5.3 Storage

All the actuators SC/VHS leave the factory in perfect condition. Performances of each unit are guaranteed by individual test and data reported on a specific test certificate issued for each unit. In order to maintain these characteristics until the SC/VHS actuator is installed on site, proper attention must be observed for preservation during the storage period.

If the actuator needs storage, before installation follow these steps:

- Place it on a wood surface pallet or on metallic support, so that they are not in direct contact with the ground, in order not to deteriorate the area of valve coupling, later it must be packed with appropriate covering.
- Make sure that plastic plugs are present on the hydraulic and electrical connections (if present).
- Check that the limit switch box (if any) is properly closed.

If the storage is long-term or outdoor:

- Keep the actuator protected from direct weather conditions.
- Replace plastic plugs of hydraulic and electrical connections (if any) with metal plugs that guarantee perfect tightness.
- Coat with oil, grease or protection disc, the valve coupling area.
- Periodically operate the actuator (Sect.6).


5.4 Requirements of Stability

- Conditions in which the machinery meets the requirement of stability during use, transportation, assembly, dismantling when out of service, testing or foreseeable breakdowns, are shown in Fig.2.
- The actuator must be put, with extreme caution, in a right position on a plane surface and with adapted capacity to the load to support.
- Do not use actuator eye bolts lifting of valve-actuator package.
- Concerning the requirement of stability during installation and disassembling it 's possible to refer to the next chapters 5.6 and 5.7.

5.5 Interface document and dimensional drawing

- Hydraulic diagrams, wiring diagrams and dimensional drawing are furnished with document accompanying the actuator.

5.6 Installation

	<p>Warning: Before proceeding with any Installation the following instructions must be respected:</p> <ul style="list-style-type: none"> - Always wear protective clothing, gloves, and eyewear to prevent personal injury. - Use the lifting point foreseen on the actuator to move the actuator: if different instructions are not well specified the lifting points foreseen on the actuator must be used only to move the actuator. - Check with your process or safety engineer for any additional measures that must be taken to protect against process media.
---	---

5.6.1 Checks to be performed before installation

If the SC/VHS actuator is purchased separately, proceed as follows before assembling it onto the valve:

- 1) Check that the coupling dimensions of the actuator/coupling block flange and stem meet the specified coupling dimensions.
- 2) Prepare the necessary tools for the assembly and setting of the unit.
- 3) Check that the outer surface of the actuator is free from dust and dirt.
- 4) Clean the actuator flange and remove anything that might prevent a perfect adherence to the actuator/coupling block flange and joint especially all traces of grease.

5.6.2 Assembling of the actuator on the valve

The actuator can be assembled on top of the valve flange by using the lifting eyelets installed on hydraulic cylinder flange.

The assembly position of the actuator, with reference to the valve, must comply with the plant requirements.

To assemble the actuator onto the valve proceeds as follows:

- Check that the coupling dimensions of the valve flange and stem, or of the relevant extension, meet the actuator coupling dimensions (valve stem and flange).
- To make easier the assembly, the valve stem has to be in perfect vertical position.
- Disassemble the two halves of actuator shell joint (Fig. 7.2) by unscrewing the retaining screws.
- Lift the actuator by utilizing the proper lifting eyelets, and unscrew the nuts and the stud bolts from the actuator pedestal.
- Assemble the actuator onto the valve, and arrange it in its correct vertical position proper to connection between valve stem and actuator cylinder rod.
- Connect the valve stem and the actuator stem in their place into the shell joint and refit the second half, tighten the screws fixing common
- Screw the stud bolts into the actuator pedestal flange, and screw the nuts on the stud bolts.
- Tighten according to the nut size torque requirements.

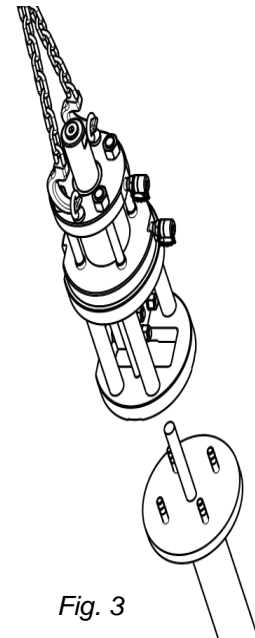


Fig. 3



Important 	<p>To guarantee the correct transmission of thrust from the actuator to valve stem without phenomena of slip it is important to remove any trace of oil and/or grease from the mating surfaces of valve and actuator or bracket and tighten the nuts fixing the bolts with the torque specified into the following Table 1</p>
---	--

Table 1

Threading	Tightening torque (Nm)	Threading	Tightening torque (Nm)
M8	20	M24	550
M10	40	M27	800
M12	70	M30	1200
M14	110	M33	1400
M16	150	M36	1800
M20	300		


The torque values in Table 1 have been calculated considering the materials ASTM A320 grade L7 or ASTM A193 grade B7 for screws or tie rods and ASTM A194 grade 4 for the nuts. Alternative bolting permitted i.e. ASTM A193 B8M (or B8M3) for tie rods and ASTM A194 Gr.8M for the nuts, provided that yield strength of screws or tie rods is over than 450 Mpa.

5.6.3 Hydraulic Connections

Warning 	<p>Check that the values of hydraulic supply available are compatible with those reported on the identification label of the actuator.</p> <p>Use pipes and connections appropriate as for type, rating, material and dimensions.</p> <p>The connection should be made by qualified staff.</p>
---	--

- Properly deburr the ends of rigid pipes.
- Properly clean the interior of pipes sending through them plenty of the supply fluid used in the system.
- Carry out the flushing operation before assembling the pipes.
- Mould and fasten the connection pipes so that no irregular strains at entries or loosening of threaded connections occur.
- Make the connections according to the operating diagram.
- Check the absence of leakages from hydraulic connections. If necessary tighten the nuts of the pipe-fittings.

5.6.4 Electrical Connections (If any)


Warning 	Before carrying out electrical connections, switch off any power and control lines. Use components appropriate as for type, material and dimensions. The connections should be made by qualified staff.
---	---

- Introduce connection cables.
- Make the connections in compliance with applicable wiring diagrams on the documentation supplied.
- Screw the cable gland.
- Replace the plastic plugs of unused entries with metal plugs.

5.6.5 Earthing connection

If the earthing connection is not guaranteed through mechanical parts where actuator is mounted, it is necessary ensure a directly earthing connection on provided point of actuator.

5.7 Disassembling

<p>Warning</p> 	<p>Before starting the disassembly operations it is mandatory to disconnect the hydraulic power and to exhaust the cylinder and any other pressure retaining component mounted on the actuator.</p> <p>Before removing the screws between actuator and valve or adaptor flange or mounting bracket, the actuator should be connected with appropriate lifting means. Lift the actuator as shown in Fig.4. The lifting points, see Fig. 2, are appropriate for handling the actuator alone and <u>not</u> for the valve + actuator assembly.</p>
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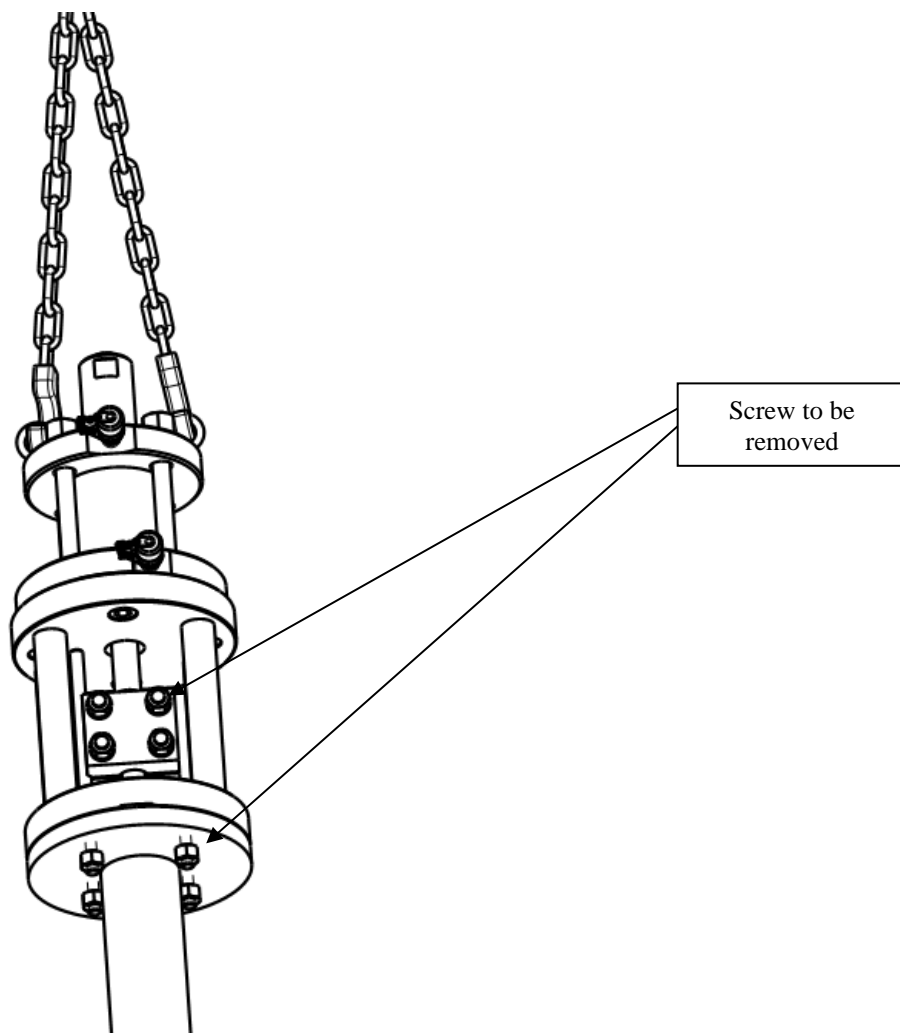


Fig. 4 – Disassembling of the actuator

6 OPERATION AND USE

6.1 Operation description

The SC/VHS type are single acting hydraulic actuator designed for on-off and control service and applicable over a wide range of pressure, temperatures and environments.

Depending on which effect the spring is intended for, the cylinder is pressurized to move the valve either opens or closes.

6.2 Intended use


The machinery covered in this Instruction Manual is single acting hydraulic SC/VHS actuator type designed to operate a linear industrial valve (globe valves, gate valves, choke valves, ..) for ON-OFF or modulating heavy duty service.

This SC/VHS actuator is produced by **STI srl** [Manufacturer] and identified by a label with a product designation code. **STI srl** will not be liable for any possible damage or physical injury resulting from use in other than the designated applications or by lack of care during installation, operation, adjustment and maintenance of the machine. Such risks lie entirely with the user. Depending on the specific working conditions, additional precautions may be requested. Considering that **STI srl** has no direct control over particular applications, operation or maintenance conditions, it is the operator's responsibility to comply with all applicable safety rules.

Inform **STI srl** urgently if you face unsafe situations not described in this Instruction Manual. It is the sole responsibility of the operator to ensure that the local health and safety regulations are adhered to.

SC/VHS actuator is designed in accordance with the applicable International Rules and Specifications, but the following Regulations must be observed in any case:

- the general and safety regulations
- the plant specific regulations and requirements
- the proper use of personal and protective devices (glasses, clothing, gloves, etc)
- the proper use of tools, lifting and transport equipment.

<p>Warning</p> 	<p>It is severely forbidden to use the SC/VHS actuators type for purpose or application other than those for which it was designed and here above specified</p>
---	--


6.3 Reasonably foreseeable misuse

A short list of reasonably foreseeable misuse :

- Installation in ambient with not planned conditions: i.e. climatic conditions different from the specified conditions;
- Insert incorrect fluid into the system;
- Supply pressure out of required range;
- Lifting of the actuator with valve through eye bolts.

6.4 Operating limits

Operating conditions are described in paragraph 3, the label fastened on the actuator contains the main actuator operating condition for the specified application.

<p>Warning</p> 	<p>It is severely forbidden to use the actuator under conditions other than those provided on the identification label.</p>
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6.5 Residual Risks

<p>Warning</p> 	<p>The actuator has parts under pressure. Use the due caution. Use individual protections provided for by the laws and provisions in force.</p>
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- Risk due to movements of loads during load displacements, assemblage and maintenance servicing.
- Electrical risk due to an incorrect application of the instruction.
- Crushing during assemblage and maintenance servicing.
- Extreme metal temperature at high (over than 80°C) or very low values as consequence of ambient temperature as to be considered as a risk of person injury in case of contact.
- Emissions of hazardous substances when special hydraulic fluid, different from these indicated at paragraph 8.6, are used as motive energy. (In this case it is recommended to refer to the material safety data sheet of the hydraulic fluid which is used).

7 Instructions for the operator

7.1 Start Up


During the start-up of the actuator, proceed as follows:

- Check that the pressure and quality of the hydraulic fluid (filtering degree,....) are as prescribed.
- Check that the feed voltage values of the electric components (solenoid valve coils, micro-switches, pressure switches, etc.) are as prescribed.
- Connect the actuator to the hydraulic feed line with fittings and tubing in accordance to project specifications. They must be sized correctly in order to guarantee the necessary oil flow for the operation of the actuator, with pressure drops not exceeding the maximum allowable value. The shape of the connecting piping must not cause excessive stress to the inlets of the actuator. The piping must be suitably fastened so as not to cause excessive stress or loosening of threaded connections, if the system undergoes strong vibrations.
- Every precaution must be taken to ensure that any solid or liquid contaminants, which may be present in the hydraulic pipework to the actuator, are removed to avoid possible damages to the unit or loss of performance.
- The inside of the pipes used for the connections must be well-cleaned before use: wash them with suitable substances and blow through them with oil or nitrogen. The ends of the tubes must be well deburred and cleaned.
- Connect the electrical feed, control and signal lines to the actuator, by linking them up with the terminal blocks of the electrical components. In order to do this, the housing covers must be removed without damaging the coupling surfaces, the O-rings or the gaskets.
- Remove the plugs from the cable entries.
- For electrical connections use components (cable glands, cables, hoses, conduits) in line with project and hazardous area requirements and codes applicable to the plant specifications (mechanical protection and/or explosion-proof protection).
- Screw the cable glands tightly into the threaded inlets, so as to guarantee the weatherproof and explosion-proof protection (if applicable).
- Insert the connection cables into the electrical enclosures through the cable glands, and connect the cable wires to the terminals according to the applicable wiring diagram.
- If conduits are used, it is advisable to carry out the connection to the electrical enclosures by inserting hoses so as not to cause anomalous stress on the housing cable entries.
- Replace the plastic plugs of the unused enclosure entries by metal ones, to guarantee perfect weatherproof tightness and to comply with the explosion-proof protection codes (where applicable).

Once the connections are completed:

- check that the actuator controls work properly (remote control, local control, emergency controls, etc.)
- operate the actuator and check that it functions correctly, that the operation times meet the plant requirements and that there are no leakages in the hydraulic connections. If necessary tighten the nuts of the pipe fittings.
- Check that the required remote signals (valve position, oil pressure, etc.) are correct.
- Check that the setting of the components of the actuator control unit (pressure regulator, pressure switches, flow control valves, etc.) meet the plant requirements.
- Remove all rust and, in accordance with the applicable painting specifications, repair paint-coat that has been damaged during transport, storage or assembly.

7.2 Stroke adjustment (when optional travel stops are provided)

Important 	<p>It is assumed that the following instructions are executed in the workshop using oil as the power fluid. Instructions are applicable when the actuator is already installed on the valve.</p>
---	--

It is important that the travel stops of the actuator (and not those of the valve) stop the linear stroke at upper end of valve position, except when this is required by the valve operation.

The setting of the open/closed valve position (upward position) is performed by adjusting the travel stop screw into the end flange of the hydraulic cylinder and by the adjustment of the coupling of valve stem to actuator joint for the downward position.

For the adjustment of the travel stop screw in the end flange of the hydraulic cylinder proceed as follows (Fig.5):

- Loosen the plug (3.4) from the travel stop protection (3.2) keeping the latter locked with a proper wrench key.
- Adjust the valve stroke screw/unscrew the travel stop screw (3.1)
- After detected the right position, tight the travel stop protection (3.2) against the cylinder end flange keeping the stopper screw (3.1) locked Screw the plug (3.4) into the travel stop protection (3.2).

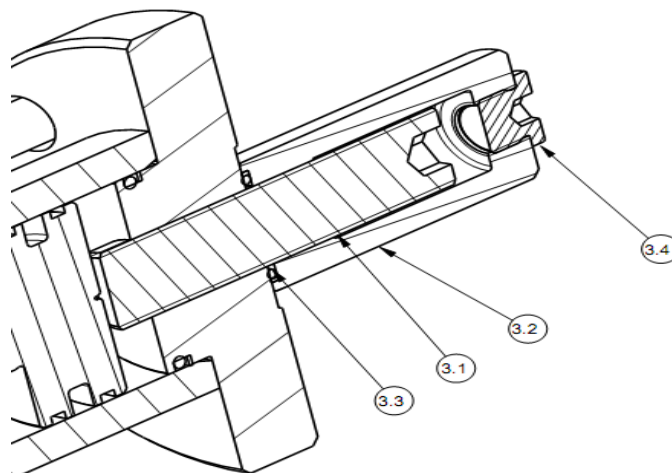




Fig. 5 – Stroke adjustment

	<p>After stroke adjustment, operate the actuator with hydraulic supply to check that the actuator moves properly and that there are no leakages</p>
---	---

7.3 Manual Override

When requested, a manual override to move the actuator in case of lack of hydraulic pressure is supplied as an integral part of the actuator itself.

For the single acting actuators type SC/VHS the manual override is based on cylinder with hydraulic hand pump type HP.

<p>Important</p> 	<p>Position of the valve and position of the manual override in relation to the actuator availability MUST be always known.</p> <p>The following paragraph 7.3.1 provides the information to enable the operator to know the position of the manual override.</p> <p>Position of the valve is provided by the local indicator described at paragraph 2.2 item 6).</p>
---	--

7.3.1 Indication of position of the manual override type HP

For this type of Manual Override a specific **Instruction Manual 2094** is available.

By means a selector lever it is possible to select LOCAL or REMOTE operation. (see Figure 6)
 When lever of the local selector is in LOCAL position, identified by a specific label fixed on device, the manual override HP is engaged, consequently the actuator cannot be operated by remote inhibiting its safety function. To restore the automatic function the selector lever must be rotated 90° clockwise towards the position identified by the label REMOTE.

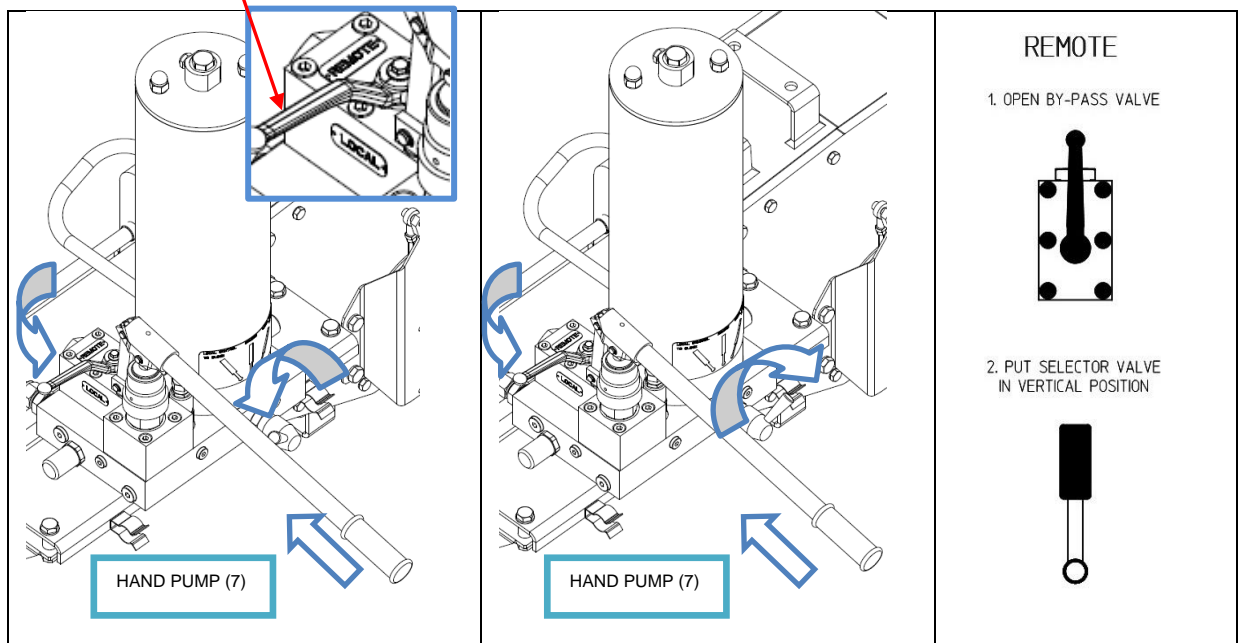



Fig. 6 – HP device


7.3.2 Restoring automatic operation


In addition to the basic instructions enclosed in the specific **Instruction Manual 2094**, the following steps, after the restoring of automatic operation, are recommended for actuators used in **SIL applications**:

- restore the supply pressure inside the actuator's cylinder;
- operate the actuator with supply pressure;
- by exhausting the supply pressure check that the actuator is able to reach the fully closed position, in case of fail close actuator, or the fully open position in case of fail open actuator. It is possible to verify the correctness of the fully stroked position by checking the position indicator or limit switches, if fitted.
- In case the actuator is not able to reach fully stroke, verify the position of manual override following the instructions enclosed in the specific Instruction Manuals.

8 MAINTENANCE

Important 	<p>Before performing any maintenance operations always wear protective gloves, clothing, and eyewear.</p>
---	---


Warning 	<p>Before proceeding with any maintenance operation the following instructions must be respected:</p> <ul style="list-style-type: none"> - Disconnect any operating lines providing hydraulic pressure, electric power, or a control signal to the actuator. Be sure the actuator cannot suddenly open or close the valve - Close the hydraulic feed line and make sure that there is no pressure in the actuator cylinder and the control unit, to ensure safety of maintenance staff.
---	---

	<p>Warning: Use only STI original spare parts. STI cannot accept responsibility for any damages that occur from using spare parts or fastening materials from other manufacturers.</p> <p>If STI products (i.e. gasket, o-ring etc) have been on store for longer periods check these for corrosion or deterioration before using these products.</p>
--	--

8.1 Periodic Inspections

Inspect the general conditions at regular intervals: recommended frequency of inspection is one time every two years but this frequency could be changed depending on the installation and working conditions.

- Check that the actuator operates the valve correctly and with the required operating times. If the actuator operation is very infrequent, carry out a few opening and closing operations with all the existing controls (remote control, local control, emergency controls, etc.), if this is allowed by the conditions of the plant.
- Check that the signals to the remote control desk are correct.
- Check that the hydraulic supply pressure value is within the required range.
- If there is an filter on the actuator please check the proper functionality.
- Check that the external components of the actuator are in good conditions.
- Check all the paint-coat of the actuator. If some areas are damaged, repair the paint-coat according to the applicable specification.
- Check that there is no leak in the hydraulic connections. If necessary tighten the nuts of the pipe-fittings.

	<p>Warning: Take care that a build-up of dust or dirt on the actuator can inhibit cooling and contribute to increase surface temperature. The user should plan and provide for a periodic cleaning/maintenance program that will maintain the external surface of the actuator free from excessive layer of dust.</p>
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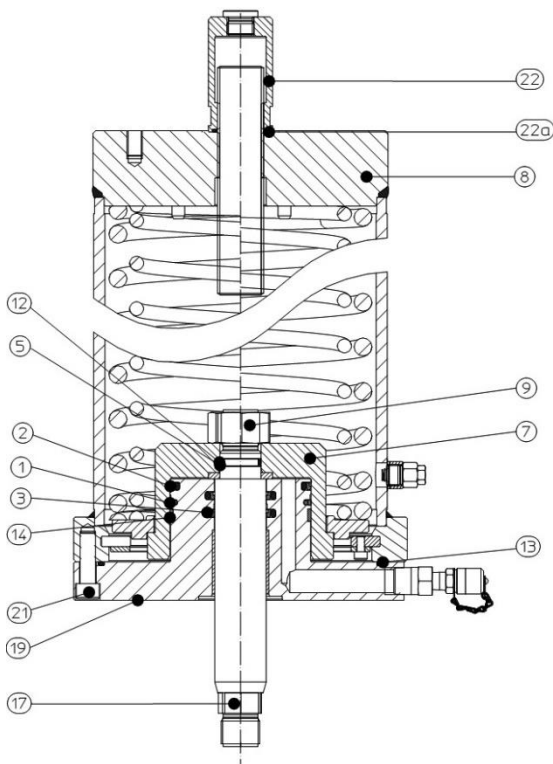
8.2 Special maintenance

Under normal condition the actuator doesn't need special maintenance.

If there are leaks in the hydraulic cylinder or a malfunction in the mechanical components, or in case of scheduled preventive maintenance, the actuator must be disassembled and seals or any other defective parts must be replaced.

Replacement of seals must be done with reference to the attached sectional drawing and adopting the relevant procedures.

8.2.1 Fail extend version (FE)



Before dismantling the cylinder remove the actuator from the valve or the valve coupling joint. (see paragraph 2.2)

8.2.1.1 Replacement of piston seals (Fig. 7.1)

Remove the nuts (21) fixing the head flange (19) to the spring cartridge (8). Remove the head flange (19). Remove all the external (1), (2) and internal (3) seals from piston/head flange. Remove the sliding ring (14). Remove the seal (13) between the head flange and spring cartridge. Clean and lubricate all the seal grooves and then mount the new seals and sliding ring.

8.2.1.2 Replacement of piston rod seal (Fig. 7.1)

Remove the cylinder tube (7) from the spring cartridge. Unscrew completely the nut (9) allowing the piston rod (17) to be removed from the cylinder tube; remove now the seal (12) and the back-up ring (5). Clean and lubricate all the seal groove and mount the new seal and

back-up ring; reassemble then the tie rod.

8.2.1.3 Final reassembling (Fig. 7.1)

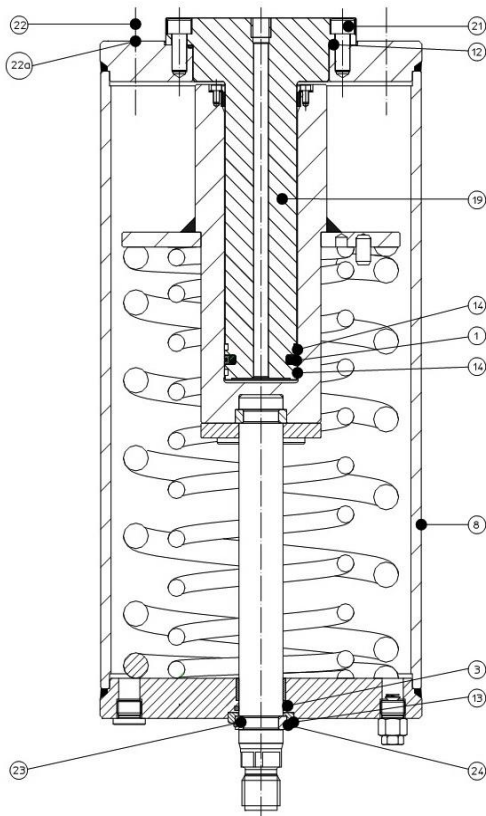
Before the final reassembling clean and lubricate all surfaces in contact with seals.

Reassemble the piston tube (7) and piston/head flange (19) fixing the assembly on the spring cartridge with the screws (21).

8.2.1.4 Replacement of stopper protection seals (when provided)

Remove travel stop protection (22) and replace the seal (22a) if necessary.

8.2.2 Fail retract version (FR)



Before dismounting the cylinder remove the actuator from the valve or the valve coupling joint (see paragraph 2.2)

8.2.2.1 Replacement of piston seals (Fig. 7.2) Fig. 7.2

Remove the nuts (21) fixing the piston (19) to the end flange of the spring cartridge (8). Remove the piston (19).

Remove the external seal (12) and piston seal (1). Remove the sliding ring (14). Clean and lubricate all the seal grooves and then mount the new seals and sliding ring.

Before the final reassembling clean and lubricate all surfaces in contact with seals.

Reinstall the seal (12) and then reassemble the piston (19) fixing it on the end flange of the spring cartridge with the screws (21).

8.2.2.2 Replacement of piston rod seal (Fig. 7.2)

Before to replace the piston rod seal (3) it is mandatory that the piston has been completely reassembled, as per previous instruction 8.2.2.1.

The piston rod must be then moved a few mm using an hydraulic pump or similar device connected to the piston entry to pressurize the cylinder.

Remove the holding ring (24) and retaining rings (23) and then remove the spring holding flange (13). Remove the seal (3). Clean and lubricate the seal groove and mount the new seal. Reassemble the spring holding flange (13) fixing it with retaining rings (23) and holding ring (24).

Release the pressure on the cylinder.

8.2.2.3 Replacement of stopper protection seals (when provided)


Remove travel stop protection (22) and replace the seal (22a) if necessary.

8.3 General Repairs

When needed, general repairs which require mechanical parts must only be carried out with Manufacturer's original spare parts.

Original spare parts must be required to the Manufacturer with reference to the item numbers shown in the next Section 10.

To ensure that right spare is provided, **serial number** printed on the SC/VHS type label must be specified when spares are ordered.

<p>Important</p> 	<p>After maintenance operations carry out a few actuator operations to check that its stroking is regular and that there is no leak through the seals and fittings.</p>
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8.4 Mechanism Lubrication

SC/VHS type does not need lubrication during his life. However it's possible to utilize following grease during special maintenance operations.

AGIP MU EP 2 or equivalent	AEROSHELL GREASE 7 or equivalent
<p>To be used in standard temperature conditions: -20°C/+100°C</p> <p>NLGI consistency: 2 Worked penetration: 280 dmm ASTM Dropping Point: 185°C Base oil viscosity at 40°C: 160 mm²/s ISO Classification: L-X-BCHB 2 DIN 51 825: KP2K - 20</p>	<p>To be used in low temperature conditions: -60°C/+100°C</p> <p>Colour: Yellow/Brown Physical state: Semi-solid at ambient temperature Odour : Slight Density : 966 Kg/m³ at 15°C Flash Point :>215°C (COC) (Based on synthetic oil) Dropping point :>260°C (ASTM D-566) Product code : 001A0065 Infosafe No.: ACISO GB/eng/C</p>

8.5 Hydraulic Fluid

Recommended hydraulic fluids to operate the SC/VHS actuators are listed here below.

Equivalent fluids can be used provided they have the same characteristics of the below recommended fluids.


AGIP ARNICA 22	AEROSHELL Fluid 41
To be used in standard temperature conditions: (-20°C/+100°C)	To be used in low temperature conditions: -60°C/+100°C
Manufacturer: Agip	Manufacturer: Shell
Viscosity at 40°C: 22 cSt	Viscosity at 40°C: 14,1 cSt
Viscosity at 100°C: 4,94 cSt	Viscosity at 100°C: 5,30 cSt
Viscosity Index: 157	Viscosity Index: > 200
Flash point COC: 192 °C	Flash point COC: 105 °C
Pour Point: < -39 °C	Pour Point: < -60 °C
Mass density at 15°C: 0,857 Kg/l	Mass density at 15°C: 0,87 Kg/l


9 TROUBLESHOOTING


Event	Possible cause	Remedy
Actuator doesn't work properly	Lack of hydraulic supply	Check supply line
	Defective main valve	Consult valve manufacturer documentation
	Failure of the control group	Call STI s.r.l. - Customer Care Dept.
Actuator too slow	Low supply pressure	Adjust supply pressure
	Incorrect speed control settings	Adjust speed controls to increase flow
	Wear of the main valve	Consult valve manufacturer documentation
Actuator too fast	High supply pressure	Reset
	Incorrect speed control settings	Adjust speed controls to decrease flow
Leakages on hydraulic circuits	Deterioration and/or damage to gaskets and or loosed fittings	Tightness loosed fittings Call STI s.r.l. - Customer Care Dept..
	Damage to fittings	Call STI s.r.l. - Customer Care Dept.
Leakages on hydraulic cylinder	Damage to seals	Replace cylinder seals
Incorrect position of the valve	Wrong adjustment of mechanical stops	Re-adjust setting
	Wrong electric limit switches indication.	Re-adjust setting

10 PARTS LIST GENERAL ASSEMBLY

This section includes the drawings and parts lists of each component and subassembly of SC/VHS type.

	Important: When ordering spare parts, please indicate the serial number embossed on the actuator identification label.
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	Important: When ordering spare parts, please refer to the spare part kit on the attached drawings.
---	---

	Important: When ordering spare parts, use ONLY original STI spare parts.
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10.1 Cylinder version with spring package

10.1.1 Piston rod extended in case of loss of power (single spring pack configuration)

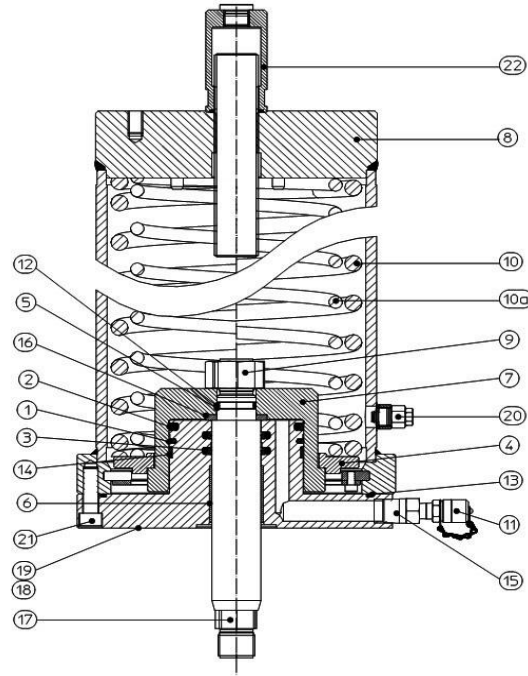


Figure 8

Item	Description	Material
1	Piston Seal	PTFE/NBR(*)
2	Piston Seal	PTFE/NBR(*)
3	Rod Seal	PTFE/NBR(*)
4	Spring support plate	Carbon Steel
5	Back-up Ring	NBR (or PTFE)
6	Bushing	Steel/Bronze/PTFE
7	Cylinder Tube	Carbon Steel
8	Spring Cartridge	Carbon Steel
9	Nut	Carbon Steel
10	Standard Spring	Alloy Steel
10a	Optional Spring (when requested by thrusts configuration)	Alloy Steel
11	Drain plug	Carbon Steel
12	O-ring	NBR(*)
13	O-ring	NBR(*)
14	Sliding Ring for Piston	PTFE + Graphite
15	Adaptor	Stainless Steel
16	Support Washer	Alloy Steel
17	Piston rod	Alloy Steel
18	Plug	Stainless Steel
19	Head Flange	Carbon Steel
20	Drain Valve	Stainless Steel
21	Screw	Carbon Steel
22	End stopper kit (optional)	Stainless Steel

(*) NBR standard material for temperature range from -20°C up to +100°C

Fluorosilicon rubber or equivalent material for temperature range from -60°C up to +100°C.

10.1.2 Piston rod extended in case of loss of power (double spring pack configuration)

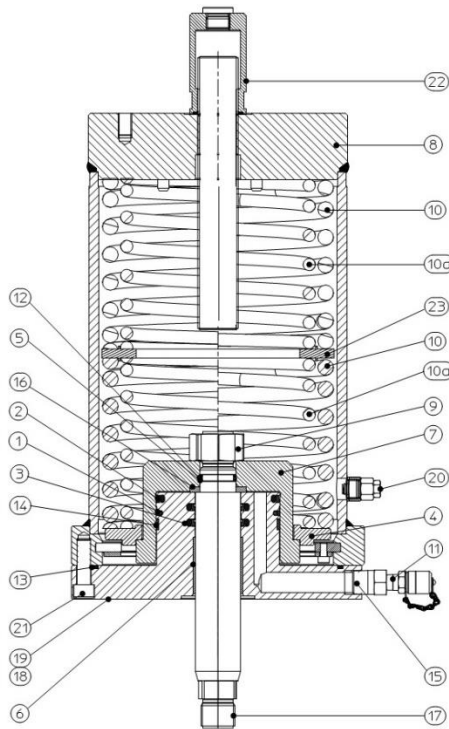


Figure 9

Item	Description	Material
1	Piston Seal	PTFE/NBR(*)
2	Piston Seal	PTFE/NBR(*)
3	Rod Seal	PTFE/NBR(*)
4	Spring support plate	Carbon Steel
5	Back-up Ring	NBR (or PTFE)
6	Bushing	Steel/Bronze/PTFE
7	Cylinder Tube	Carbon Steel
8	Spring Cartridge	Carbon Steel
9	Nut	Carbon Steel
10	Standard Spring	Alloy Steel
10a	Optional Spring (when requested by thrusts configuration)	Alloy Steel
11	Drain plug	Carbon Steel
12	O-ring	NBR(*)
13	O-ring	NBR(*)
14	Sliding Ring for Piston	PTFE + Graphite
15	Adaptor	Stainless Steel
16	Support Washer	Alloy Steel
17	Piston rod	Alloy Steel
18	Plug	Stainless Steel
19	Head Flange	Carbon Steel
20	Drain Valve	Stainless Steel
21	Screw	Carbon Steel
22	End stopper kit (optional)	Stainless Steel
23	Spring packs separator	Carbon Steel

(*) NBR standard material for temperature range from -20°C up to +100°C
 Fluorosilicon rubber or equivalent material for temperature range from -60°C up to +100°C.

10.1.3 Piston rod retracted in case of loss of power (single spring pack configuration)

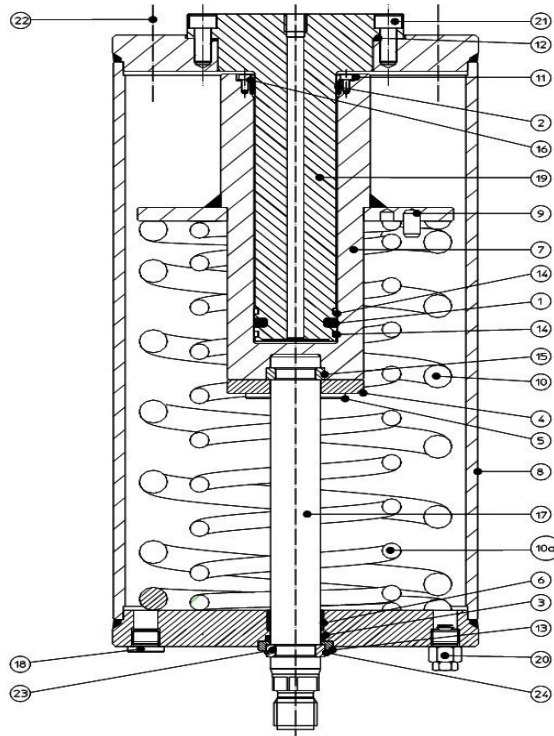


Figure 10

Item	Description	Material
1	Piston Seal	PTFE/NBR(*)
2	Piston Bushing	Steel/Bronze/PTFE
3	Piston Rod Seal	PTFE/NBR(*)
4	Piston Support Plate	Carbon Steel
5	Screw	Carbon Steel
6	Piston Rod Bushing	Steel/Bronze/PTFE
7	Cylinder Tube	Carbon Steel
8	Spring Cartridge	Carbon Steel
9	Spring Reference Ping	Carbon Steel
10	Standard Spring	Alloy Steel
10a	Optional Spring (when requested by thrusts configuration)	Alloy Steel
11	Screw	Carbon Steel
12	O-ring	NBR(*)
13	Spring Holding Flange	Carbon Steel
14	Sliding Ring for Piston	PTFE + Graphite
15	Piston Rod Retaining Rings	Carbon Steel
16	Bushing Support Washer	Stainless Steel
17	Piston rod	Alloy Steel
18	Plug	Stainless Steel
19	Piston	Carbon Steel
20	Drain Valve	Stainless Steel
21	Screw	Carbon Steel
22	End stopper kit (optional)	Stainless Steel
23	Retaining Rings	Carbon Steel
24	Holding Ring	Carbon Steel

(*) NBR standard material for temperature range from -20°C up to +100°C

Fluorosilicon rubber or equivalent material for temperature range from -60°C up to +100°C.

10.1.4 Piston rod retracted in case of loss of power (double spring pack configuration)

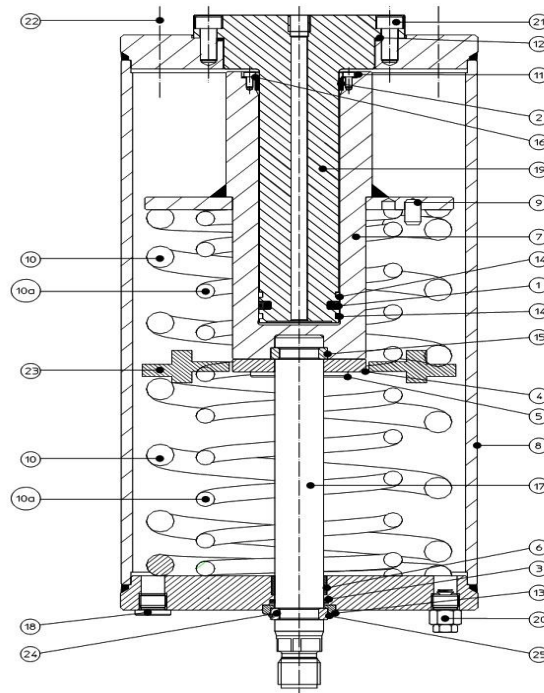


Figure 11

Item	Description	Material
1	Piston Seal	PTFE/NBR(*)
2	Piston Bushing	Steel/Bronze/PTFE
3	Piston Rod Seal	PTFE/NBR(*)
4	Piston Support Plate	Carbon Steel
5	Screw	Carbon Steel
6	Piston Rod Bushing	Steel/Bronze/PTFE
7	Cylinder Tube	Carbon Steel
8	Spring Cartridge	Carbon Steel
9	Spring Reference Ping	Carbon Steel
10	Standard Spring	Alloy Steel
10a	Optional Spring (when requested by thrusts configuration)	Alloy Steel
11	Screw	Carbon Steel
12	O-ring	NBR(*)
13	Spring Holding Flange	Carbon Steel
14	Sliding Ring for Piston	PTFE + Graphite
15	Piston Rod Retaining Rings	Carbon Steel
16	Bushing Support Washer	Stainless Steel
17	Piston rod	Alloy Steel
18	Plug	Stainless Steel
19	Piston	Carbon Steel
20	Drain Valve	Stainless Steel
21	Screw	Carbon Steel
22	End stopper kit (optional)	Stainless Steel
23	Spring Pack Separator	Carbon Steel
24	Retaining Rings	Carbon Steel
25	Holding Ring	Carbon Steel

(*) NBR standard material for temperature range from -20°C up to +100°C

Fluorosilicon rubber or equivalent material for temperature range from -60°C up to +100°C.

10.2 Valve adaptation assembly (optional)

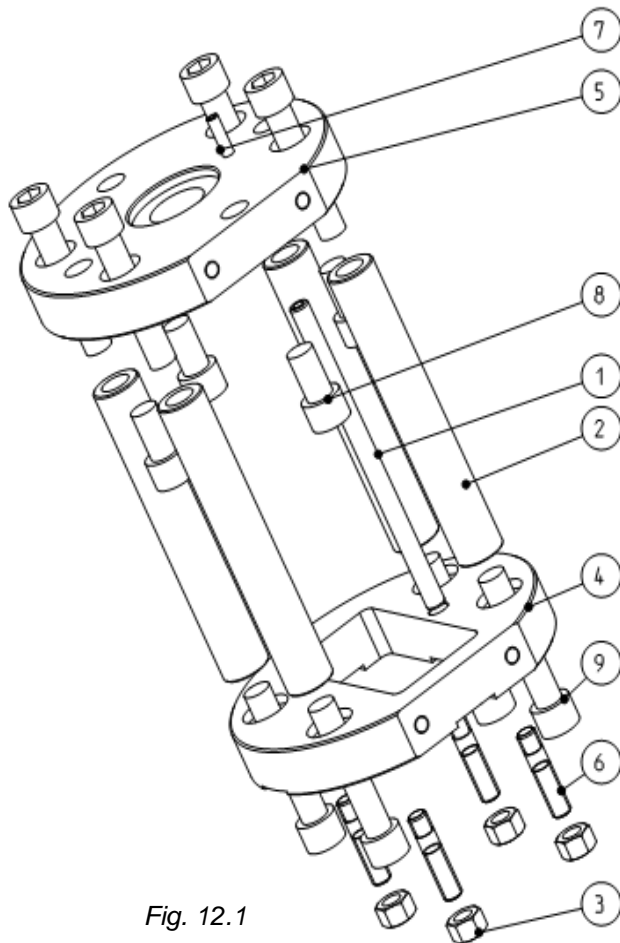


Fig. 12.1

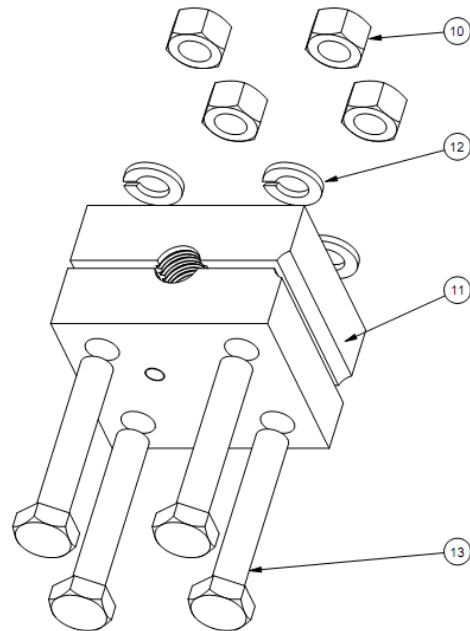


Fig. 12.2

Fig. 12 – Valve adaptation assembly

Valve adaptation part list

Item	Description	Qty	Material	Spare Parts
1	Antirotation bar	1	Stainless steel	
2	Column	4	Carbon steel	
3	Nut	4	Carbon steel	
4	Lower flange	1	Carbon steel	
5	Upper flange	1	Carbon steel	
6	Stud bolt	4	Carbon steel	
7	Screw	1	Stainless steel	
8	Screw	4	Carbon steel	
9	Screw	8	Carbon steel	
10	Nut	4	Stainless steel	
11	Valve coupling joint	1	Stainless steel	
12	Washer	4	Stainless steel	
13	Screw	4	Stainless steel	

(*) NBR standard material for temperature range from -20°C up to +100°C.

(**) Quantity depends on the model.

10.3 Stopper protection assembly for cylinder (when supplied)

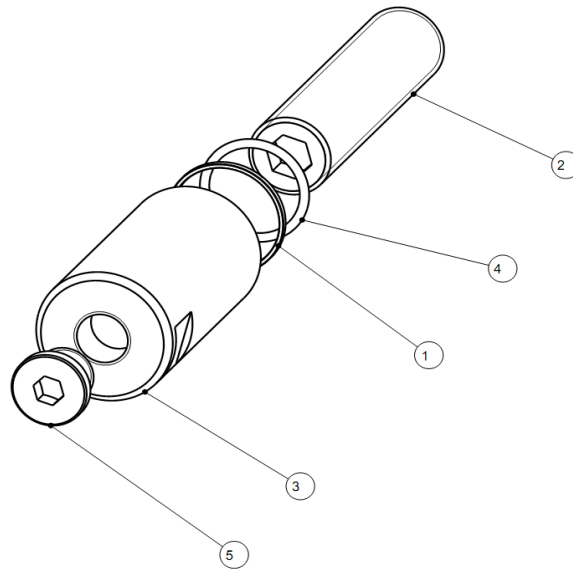


Fig. 13 – Stop protection assembly for cylinder

Stop protection assembly part list

Item	Description	Qty	Material	Spare Parts
1	O-ring	1	PTFE	
2	Travel stop screw	1	Carbon steel	
3	Travel stop protection	1	Carbon steel	
4	O-ring	1	NBR (*)	
5	Plug	1	Stainless steel	#

(*) NBR standard material for temperature range from -20°C up to +100°C.

11 SPARE PARTS

Spare part kit for single acting actuator SC/VHS type

General references for the recommended spare parts are shown in the tables of Section 10.

Individual kit, including all the recommended spares, can be ordered directly to STI srl provided that serial number of the actuator or specific purchasing order for the original actuator is indicated in the request.

12 DECOMMISSIONING

Disposal and recycling



Warning: Before disassembling actuator it is necessary to intercept the hydraulic connection to discharge hydraulic cylinder and control unit to the atmosphere. If present discharge also the pressure from back-up tank.



Warning: Refer to section 5.1 and section 5.4 to lifting and storage procedure



Warning: If the actuator can be operated, put the actuator in fail safe position and unscrew totally the stopper screw.

Warning: The demolition of actuator parts should be made from specialized personnel.

Before starting a large area should be created around the actuator so to allow any kind of movement without problems of further risks created by work site.

Subject	Hazardous	Recyclable	Disposal
Metals	No	Yes	Use licensed recyclers
Plastics	No	Yes	Use specialist recyclers
Rubber (seals and o-rings)	Yes	No	May require special treatment before disposal, use specialist waste disposal companies
Oil and grease	Yes	Yes	May require special treatment before disposal, use specialist waste disposal companies
Electric and Electronic equipment	Yes	Yes	Use specialist recyclers




Warning: Do not re-use parts or components which appear to be in good condition after they have been checked or replaced by qualified personnel and declared unsuitable for use.



Important: In all cases check local authority regulation before disposal

13 DECLARATION of INCORPORATION

This Declaration is available only for actuators placed on the market and/or put into service in the territory of the European Union.

	<p align="center">DICHIARAZIONE CE di INCORPORAZIONE (ai sensi dell'allegato II Sezione B della Direttiva Macchine 2006/42/CE)</p> <p align="center">EC DECLARATION of INCORPORATION (in accordance with EC Machinery Directive 2006/42/EC Annex II Section B)</p>
<p>La Sottoscritta STI S.r.l. con sede in Via Dei Caravaggi, 15 – 24040 Levate (BG) – ITALIA dichiara, in qualità di costruttore sotto la propria responsabilità, che la quasi-macchina qui identificata:</p> <p><i>We, STI S.r.l. based in Via Dei Caravaggi, 15 – 24040 Levate (BG) – ITALY, hereby declares, as the manufacturer under its sole responsibility, that the partly completed machinery here below identified:</i></p> <p>Denominazione Generica: Attuatore Lineare Idraulico Generic Denomination: Linear Hydraulic Actuator Tipi/Types: SC/VH (Versione doppio effetto / Double acting version) SC/VHS (Versione singolo effetto / Single acting version)</p> <ul style="list-style-type: none"> ▪ rispetta i seguenti RESS della Direttiva 2006/42/CE <i>complies with the following EHSRs of Directive 2006/42/EC:</i> 1.1.1 - 1.1.2 - 1.1.3 - 1.1.5 - 1.2.1 - 1.2.2 - 1.3.1 - 1.3.2 - 1.3.4 - 1.3.7 - 1.3.8 - 1.4.1 - 1.5.1 - 1.5.2 - 1.5.3 - 1.5.4 - 1.5.5 - 1.5.6 - 1.5.7 - 1.5.13 - 1.6.1 - 1.7.1 - 1.7.2 - 1.7.3 - 1.7.4 ▪ è destinata ad essere incorporata/assemblata in un'altra macchina, quasi-macchine o apparecchi. <i>is intended to be incorporated into a completed machinery or assembled with other partly completed machinery or equipment.</i> ▪ non può essere messa in servizio prima che la macchina finale in cui sarà incorporata o con cui verrà assemblata sia stata dichiarata conforme alle disposizioni della direttiva 2006/42/CE. <i>must not be put into service until the final machinery into which it is to be incorporated has been declared in conformity with the provisions of Machinery Directive 2006/42/EC.</i> ▪ è conforme alle seguenti Norme Armonizzate e altre Direttive, quando applicabili al materiale installato <i>complies with the following Standards and Directives, when applicable to the material installed:</i> <ul style="list-style-type: none"> - Norma EN ISO 12100 (Ed.2010) / <i>Standard EN ISO 12100 (Ed.2010)</i> - Norma EN ISO 4413 (Ed.2010) / <i>Standard EN ISO 4413 (Ed.2010)</i> - Direttiva bassa tensione (DBT) 2014/35/UE / <i>Low Voltage Directive (LVD) 2014/35/EU</i> - Direttiva compatibilità elettromagnetica (EMC) 2014/30/UE <i>Electromagnetic Compatibility Directive (EMC) 2014/30/EU</i> <p>La documentazione tecnica pertinente è stata compilata in conformità dell'allegato VII Sezione B: persona autorizzata alla costituzione: STI srl c/o STI srl Via Dei Caravaggi 15 – 24040 Levate (BG) Italia <i>The relevant technical documentation is compiled in accordance with the provisions of ANNEX VII Section B; person authorised to compile: STI srl at STI srl Via Dei Caravaggi 15 – 24040 Levate (BG) Italia.</i></p> <p>Informazioni pertinenti riguardanti la quasi-macchina saranno trasmesse, in risposta ad una motivata richiesta, alle Autorità Nazionali. <i>The relevant information concerning the partly completed machinery will be transmitted, in response to a motivated request, to the National Authorities.</i></p> <p>Il modello, il numero di matricola, l'anno di costruzione, i dati del costruttore sono riportati sulla targa fissata alla quasi-macchina. <i>The model, serial number, year of manufacture, the manufacturer's data are shown on the nameplate attached to the partly completed machinery.</i></p> <p>Levate, 06 Maggio 2020 L'Amministratore Delegato</p>	

14 ACTUATORS TO BE PLACED ON THE MARKET IN GREAT BRITAIN (ENGLAND, WALES AND SCOTLAND)

For Actuators to be placed on UK market (England, Wales and Scotland) the following is valid:

Applicable Regulations

- Supply of Machinery (Safety) Regulations 2008
- Pressure Equipment (Safety) Regulations 2016
- Equipment and Protective Systems Intended for use in Potentially Explosive Atmospheres Regulations 2016

A proper UK Declaration of Conformity will be issued according to the Applicable Regulations.

Label

Every SC/V valve actuator is provided with a label contains the main operating conditions and serial number. The label may change if the SC/V valve actuator is sold with reference to a Certificate of product and/or system issued by Notified Body Exterior or Certificate of Conformity issued by STI S.r.l..

Labels for UK market are:



	STI s.r.l. Via Dei Caravaggi 15 24040 LEVATE(Bg)-ITALY www.imi-critical.com - FAX +39 035 2928247	UK CA
	II2GD Ref. XXXXXXXXXX	IP66/67M
Ex h II <input type="checkbox"/> T <input type="checkbox"/> Gb / Ex h III C T <input type="checkbox"/> °C Db Certificate IECEx INE 19.0025		
MODELLO Model	<input type="text"/>	DN Size <input type="text"/> CORSA Stroke <input type="text"/> mm
MATRICOLA Ident. N°	<input type="text"/>	Tag N° <input type="text"/>
SEGNALE Signal	3-15 Psi <input type="checkbox"/> 4-20mA <input type="checkbox"/>	CAMPO SPECIALE Special Range <input type="text"/>
AZIONE Action	Reverse <input type="checkbox"/> Direct <input type="checkbox"/>	On-Off <input type="checkbox"/> ALIM. Supply <input type="text"/> bar

Figure 1 – label for UKSI/IECEx SC/V version



	STI s.r.l. Via Dei Caravaggi 15 24040 LEVATE(Bg)-ITALY www.imi-critical.com - FAX +39 035 2928247	UK CA 0496
 I12GD Ref. XXXXXXXXXX	IP66/67M	
Ex h II <input type="checkbox"/> T <input type="checkbox"/> Gb / Ex h III C T <input type="checkbox"/> °C Db Certificate IECEx INE 19.0025		
PS <input type="checkbox"/> bar	TMax <input type="checkbox"/> °C	Tmin <input type="checkbox"/> °C
MODELLO Model <input type="checkbox"/>	DN Size <input type="checkbox"/>	CORSA Stroke <input type="checkbox"/> mm
MATRICOLA Serial n° <input type="checkbox"/>	Tag N° <input type="checkbox"/>	
SEGNALE Signal <input type="checkbox"/>	ANNO DI FABBRICA Year of fabrication <input type="checkbox"/>	
AZIONE Action <input type="checkbox"/>	ALIMENTAZIONE Supply <input type="checkbox"/> bar	

Figure 2 – label for UKSI/IECEX/PER SC/V version





	STI s.r.l. Via Dei Caravaggi 15 24040 LEVATE(Bg)-ITALY www.imi-critical.com - FAX +39 035 2928247	UK CA
 I12GD Ref. XXXXXXXXXX	IP66/67M	
Ex h II <input type="checkbox"/> T <input type="checkbox"/> Gc / Ex h III C T <input type="checkbox"/> °C Dc Certificate IECEx INE 19.0025		
MODELLO Model <input type="checkbox"/>	DN Size <input type="checkbox"/>	CORSA Stroke <input type="checkbox"/> mm
MATRICOLA Ident. N° <input type="checkbox"/>	Tag N° <input type="checkbox"/>	
SEGNALE Signal 3-15 Psi <input type="checkbox"/> 4-20mA <input type="checkbox"/>	CAMPO SPECIALE Special Range <input type="checkbox"/>	
AZIONE Action Reverse <input type="checkbox"/> Direct <input type="checkbox"/>	On-Off <input type="checkbox"/>	ALIM. Supply <input type="checkbox"/> bar

Figure 3 – label for UKSI/IECEX SC/V version with non-metallic cylinders

Warning	
	It is severely forbidden to use the SC/V valve actuator under conditions other than those provided on the label.
Important	
	It is forbidden to modify the information and the marks without previous written authorization by STI S.r.l.. Do not remove the label and/or replace with other label.

STI S.r.l.

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