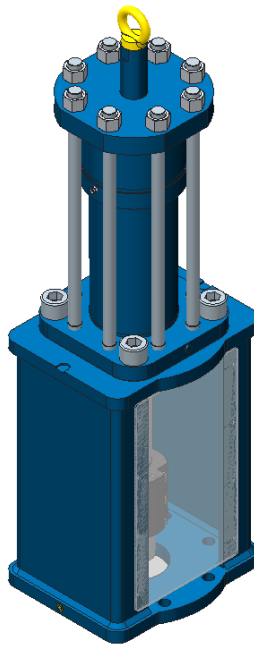


HLDA

DOUBLED-THRUST DOUBLE ACTING HYDRAULIC LINEAR ACTUATOR

MAN 668



Use and maintenance manual

2	23/05/18	Updated data-plate	<i>Ermanni</i>	<i>Orefici</i>	<i>Vigliano</i>
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NOTE:

BIFFI Italia S.r.l. pays the highest attention to collecting and verifying the documentation contained in this user manual. However BIFFI Italia S.r.l. is not liable for any mistakes contained in this manual, for damage or accidents due to the use of the latter. The information contained is of exclusive reserved ownership of BIFFI Italia S.r.l and may be modified without prior notice. All rights reserved.

1 General warnings



The 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.

1.1 GENERALITIES

BIFFI Italia S.r.l actuators are conceived, manufactured and controlled according to the Quality Control System in compliance with EN-ISO 9001 international regulation.

1.1.1 *Applicable regulation*

EN ISO 12100:2010: **Safety of machinery – General principles for design – Risk assessment and risk reduction**

2006/42/EC: **Machine directive.**

2014/68/EU: **Directive for pressure PED equipment**

2014/35/EU: **Directive for low voltage equipment**

2014/30/EU: **Directive for the electromagnetic compatibility**

2014/34/EU: **Directive and safety instructions for use in hazardous area**

1.1.2 *Terms and conditions*

Biffi Italia srl guarantees that all the items produced are free of defects in workmanship and manufacturing materials and meet relevant current specifications, provided they are installed, used and serviced according to the instructions contained in the present manual. The warranty can last either one year from the date of installation by the initial user of the product, or eighteen months from the date of shipment to the initial user, depending on which event occurs first. All detailed warranty conditions are specified in the documentation forwarded together with the product. This warranty does not cover special products or components not warranted by subcontractors, or materials that were used or installed improperly or were modified or repaired by unauthorized staff. In the event that a fault condition be caused by improper installation, maintenance or use, or by irregular working conditions, the repairs will be charged according to applicable fees. **The warranty and Biffi Italia srl**

liability shall lapse in the event that any modification or tampering whatsoever be performed on the actuator.

1.2 IDENTIFICATION PLATE

It is forbidden to modify the information and the marks without previous written authorization by BIFFI Italia S.r.l.
The plate fastened on the actuator contains the following information (Figure1).




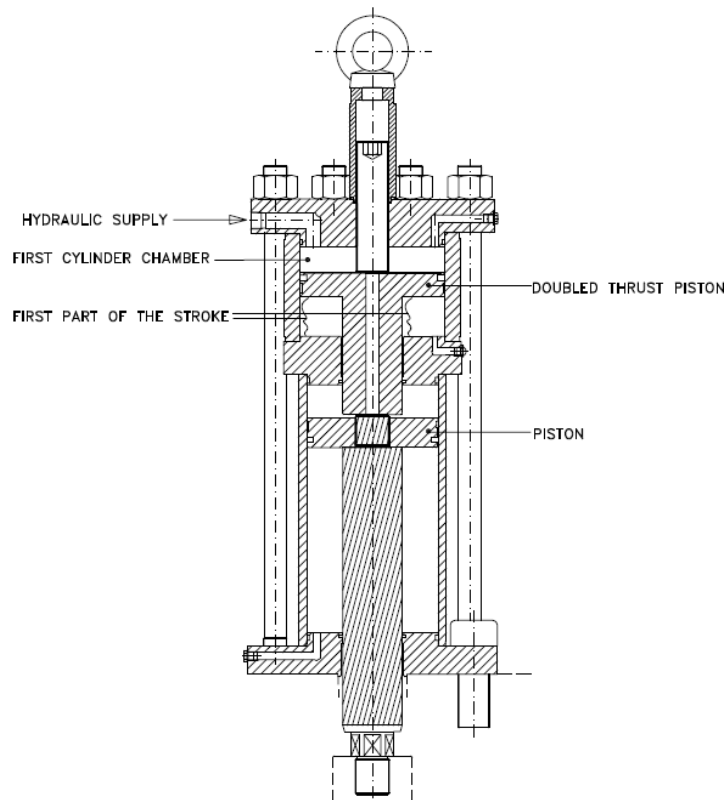
		BIFFI ITALIA Fiorenzuola d' Arda 29017(PC) - ITALY			
ORDER _____					
MODEL _____					
S/N _____			AMB. TEMP. _____		
TAG N° _____			ND _____		
SUPPLY PRES. RANGE _____			MOP _____		
FL. GROUP _____		PED CAT. _____		FL. TYPE _____	
CYL. PS _____		CYL. TS _____		MM/YYYY _____	
CYL.PT _____		TEST DATE _____		CYL WEIGHT _____	
		Ref.: _____		LY: _____	
				ISO _____	

Figure 1 – Data plate

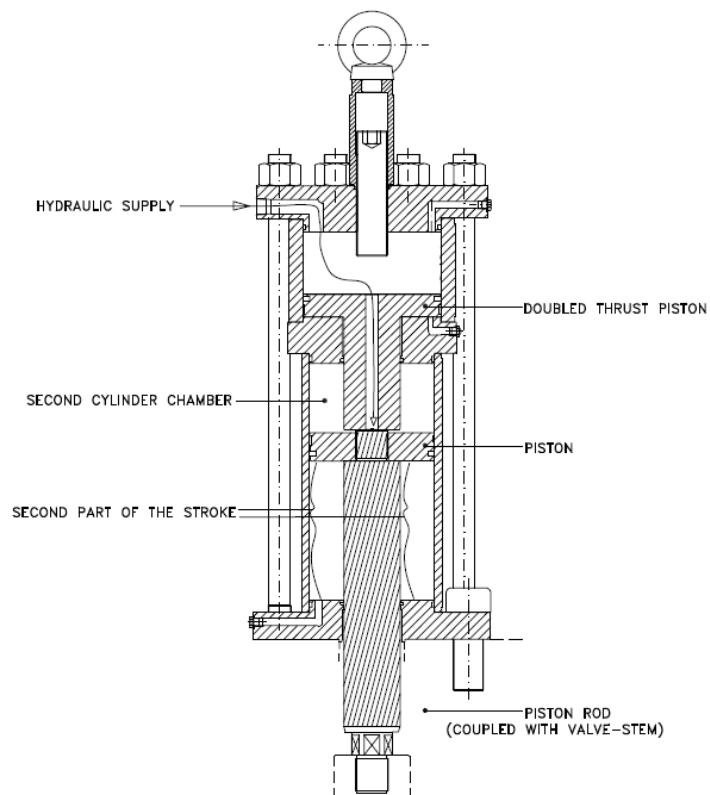
1.3 INTRODUCING THE ACTUATOR

HLDA double acting & doubled thrust hydraulic linear actuators, are suitable to operate the kind of linear valves with rising-stem or requiring a high thrust value in the first phase of valve opening and with lower values during the complete stroke (wedge gate valves, through conduit gate valves) for ON-OFF and modulating heavy-duty service. The actuator is made up of an hydraulic cylinder and a mounting pedestal complete with a joint for the coupling to the valve stem of actuator output stem. The valve is actuated in opening and in closing position by the actuator hydraulic cylinder that is pressurized in one or in the other direction.

In the first part of the stroke, the total thrust section is obtained by the double-piston



When the double piston has completed the stroke, the remaining stroke is performed only by the piston



The section ratio between the first part of the stroke and the remaining stroke is about two areas.

This type of solution, reduce the oil displacement of the actuator, allowing lower volume of the accumulators for the emergency strokes.

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.

BIFI can supply different types of control system following Customer's requirements.

The expected lifetime of actuator is approximately 25 years .

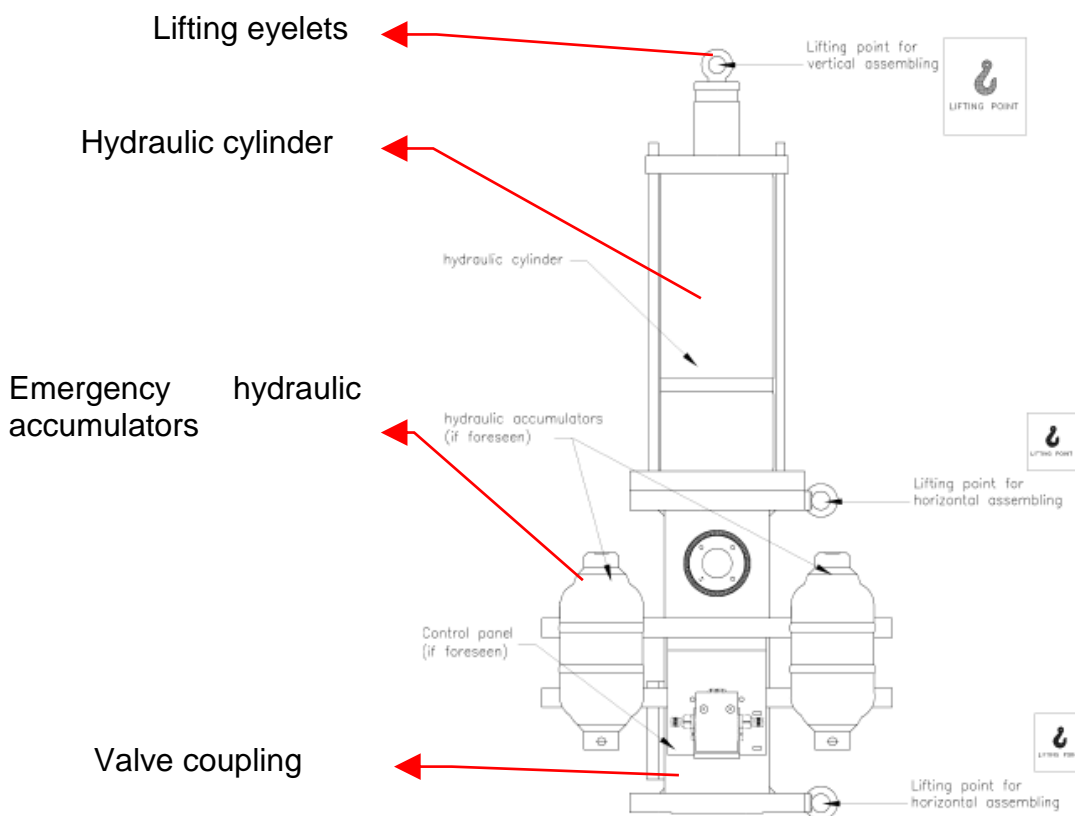


Figure 2 – Identification of actuator parts

HYDRAULIC DOUBLE CYLINDER DOUBLE ACTING ACTUATOR

Example:	HLDA	250K	135	300	MHP
HLDA	Actuator series				
250K	Max. allowable thrust (N)				
135	Cylinder diameter (mm)				
300	Stroke (mm)				
MHP	Manual override				

1.4 DATA SHEET

Supply fluid	Mineral oil or synthetic fluids
Design pressure	350 bar g
Output thrust	Double acting thrust up to 8000000 N
Operating temperature	Standard: from –30°C to +100°C Optional: from –60° to +140°C
Applications	Gate, Globe valves

2 Installation

2.1 CHECKS UPON ACTUATOR RECEIPT

- Check that the model, the serial number of the actuator and the technical data reported on the identification plate correspond with those of order confirmation (Sect. 1.2).
- 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 (Sect. 3.4) and of micro-switches (if any) (Sect. 3.5).

2.2 ACTUATOR HANDLING

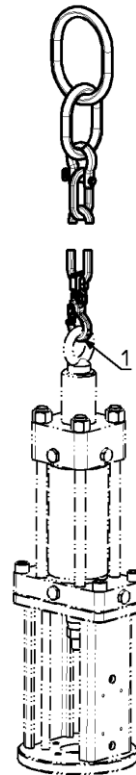


The lifting and handling should be made by qualified staff and in compliance with the laws and provisions in force.

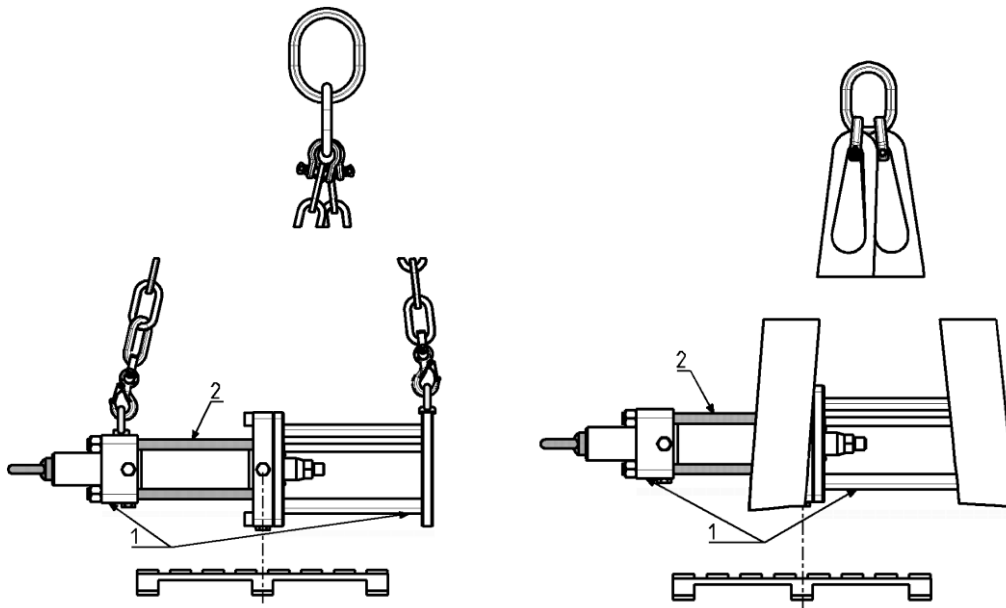
The fastening points are appropriate for the lifting of the actuator alone and not for the valve + actuator assembly. Avoid that during the handling, the actuator passes above the staff.

The actuator should be handled with appropriate lifting means. The weight of the actuator is reported on the delivery bill.

Picture 1 – Lifting points for HLDA actuators



1 = Lifting points (obligatory)


Picture 2 - Positioning by chains
Positioning by slings

1 = point of support - 2 = don't lay the actuator on tie-rods of cylinder



3 = don't lay the actuator on accessories (manual hand-pump, hydraulic control system etc.)

2.3 STORAGE

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

- Place it on a wood surface in order not to deteriorate the area of valve coupling.
- Make sure that plastic plugs are present on the hydraulic and electrical connections (if present).
- Check that the cover of the control group and of the limit switch box (if any) are 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. 3.3).

2.4 ACTUATOR ASSEMBLY ON THE VALVE

2.4.1 Types of assembly

The adapter pedestal in fabricated carbon steel is specifically designed for adaptation to any type of valve with provision for local indicator, limit switches and other accessories (on request).

Lift the actuator by safety-hook for chains using the lifting-points (see sect. 2.2) on the top of actuator for handling, transporting and assembling in vertical position (see picture 1). For handling, transporting and assembling the actuator in horizontal position by safety-hook for chains use the lifting-points on the top of cylinder head-flange and on coupling flange (see picture 2).

2.4.2 Assembly procedure



Failure to comply with the following procedures may impair product warranty. Installation, commissioning and maintenance and repair works should be carried out by qualified staff.

A non-conforming assembly could be the source of serious accidents.

For actuator assembly on the valve:

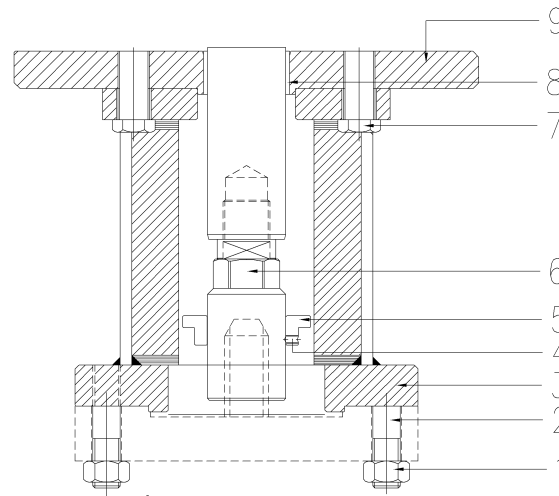


Check that the assembly position, as shown on the documentation, complies with system's geometry.

Check the consistency of the parts of actuator-valve coupling.

A) TO ASSEMBLE THE ACTUATOR ONTO THE VALVE BY BRACKET WITH THREADED JOINT PROCEED AS FOLLOWS:

PEDESTAL with THREADED COUPLING JOINT

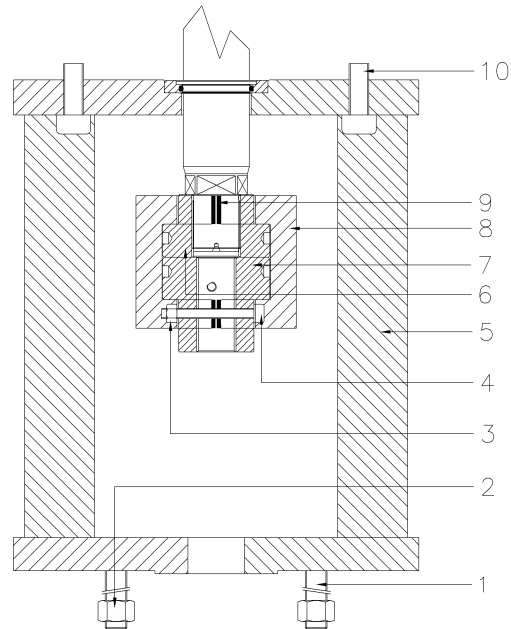


ITEM	DESCRIPTION
1	Nut
2	Stud bolt
3	Support joint
4	Index
5	Screw
6	Connecting joint
7	Screw
8	Bushing
9	Flange

- 1) 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). Lubricate the valve stem with grease in order to make the assembly easier.
- 2) Connect a sling to the support point of the actuator and lift it. To make easier the assembly, the valve stem has to be in perfect vertical position.
Note: *the eyebolt is sized for the lifting of the only actuator (NOT ACTUATOR+VALVE). Proper lifting points have to be foreseen for the valve.*
- 3) . Screw the actuator coupling joint onto the valve by rotating the actuator, or screw down the valve stem stroke-ring with Red Loctite 542 and fix the half-bearings. When the threaded holes of the actuator flange are in correspondence with the holes on the valve flange screw the proper stud bolts. Screw the nuts on the stud bolts and tighten up the valve flange is in contact with the actuator flange.
- 4) Tighten the nuts of the connecting stud bolts evenly with the torque prescribed in the table. The stud bolts must be made of ASTM A320 L7 steel, the nuts must be made of ASTM A194 grade 2 steel as minimum.

B) To assemble the actuator onto the valve by bracket with shell joint, perform the following operations:

PEDESTAL with SHELL COUPLING JOINT



ITEM	DESCRIPTION
1	Stud bolt
2	Nut
3	Nut
4	Screw
5	Pedestal
6	Actuator joint
7	Stem valve joint
8	Shell joint
9	Spacer
10	Screw

- 1) -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). Lubricate the valve stem with grease in order to make the assembly easier
- 2) To make easier the assembly, the valve stem has to be in perfect vertical position.
- 3) -Disassemble the two halves of actuator pedestal shell joint (item 8) by unscrewing the retaining screws (item 4),therefore disassemble the valve stem joint (item 7).
- 4) -Lift the actuator by utilizing the proper lifting eyelets, and unscrew the nuts and the stud bolts from the actuator pedestal.
- 5) -Assemble the actuator onto the valve, and arrange it in its correct vertical position proper to connection between valve stem and actuator cylinder rod.
- 6) -Screw the valve stem joint (item 7) on valve stem up to reach the proper position which allow the reassembly of the two halves of shell joint (item 8), tighten the joint fastening screws (item 4).

- 7) -Screw the stud bolts (item 1) into the actuator pedestal flange, and screw the nuts on the stud bolts.
- 8) -Tighten according to the nut (item 2) size torque requirements.



To operate refer to following table:

Table 1: *nuts tightening torque*

Threading	Tightening torque (Nm)
M8	20
M10	40
M12	70
M14	110
M16	160
M20	320
M22	420
M24	550
M27	800
M30	1100
M33	1400
M36	1700

The screwing values in Table 1 were calculated considering the materials ASTM A320 L7 for screws or tie rods and ASTM A194 gr.2H for the nuts.

2.5 HYDRAULIC CONNECTIONS



Check that the values of hydraulic supply available are compatible with those reported on the identification plate of the actuator.

The connections should be made by qualified staff.



Use pipes and connections appropriate as for type, material and dimensions.

Use motor fluid with purity degree ISO 4406 17/14 or NAS 1638 Class 8 (AS4059 Class 4B-F).



For special applications the lower contamination degree is required. Please refer to the documentation supplied.

- ❑ 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.
- ❑ 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

2.6 ELECTRICAL CONNECTIONS (IF ANY)



Use components appropriate as for type, material and dimensions

**The connections should be made by qualified staff
Before carrying out any operation, cut line power off**

Safety provisions as per CEI 64-8 regulation should be complied with (same as IEC 60364).

Remove plastic plugs from cables entries

- ❑ Screw firmly the cable glands.
- ❑ 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.

2.7 COMMISSIONING



Installation, commissioning and maintenance and repair works should be made by qualified staff.

Upon actuator commissioning please carry out the following checks:

- ❑ Check that paint is not be damaged during transport, if necessary

repair the damages to paint coat.

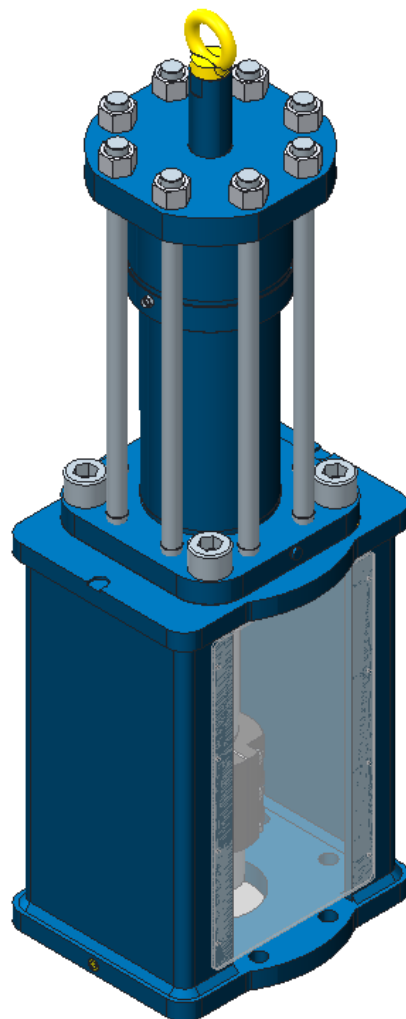
- Check that the values of hydraulic supply available in the system are compatible with those reported on the identification plate of the actuator (Figure 2) and on the documentation supplied.
- Check that the feed voltage values of the electric components (solenoid valve coils, micro-switches, pressure switches, etc.) are compatible with those reported on the identification plate of the actuator (Figure 1).
- Check that the setting of the components of the actuator control unit (pressure regulator, pressure switches, flow control valves, etc.) meet the plant requirements.
- Carry out all kinds of operations and check their proper execution (Sect. 3.3).
- Check the absence of leakages in the hydraulic connections.
If necessary tighten the nuts of the pipe-fittings
- Check proper operation of all the due signalling (valve position, hydraulic supply pressure etc.)
- Make a complete functional test in order to verify all the operations are executed according to operating schematic diagram supplied.

3 Operation and use

3.1 OPERATION DESCRIPTION

The supply fluid pressurizes the hydraulic-cylinder chamber relevant to the operation to carry out (opening or closing) (see following pages).

This pressure starts the linear motion of the piston and the consequent motion of the valve stem that is coupled.



For local or remote operations, please refer to technical documentation furnished with actuators.

The power and control systems are supplied on specific customer demand.

For all the relevant information please refer to the specific documentation supplied.

3.2 RESIDUAL RISKS



The actuator has parts under pressure.
Use the due caution.

Use individual protections provided for by the laws and provisions in force.

3.3 OPERATIONS

(refer to specific document: *BIFFI operating diagram* furnished)

3.3.1 Emergency manual operation (MHP)



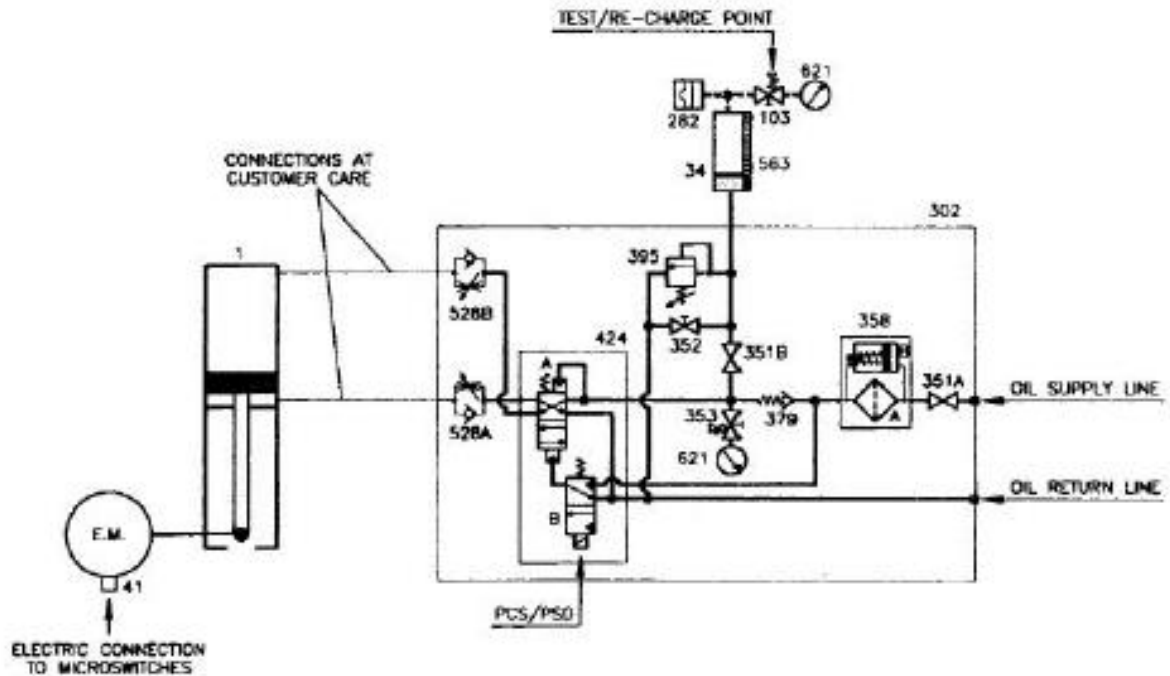
Refer to applicable control schematic in supplied documentation.

The HLA actuators can have an emergency manual override in addition to the local and/or remote control system which controls the oil supplied by a power pack for the “normal” actuator operation.

The emergency manual override mounted on the actuator, consists of an hydraulic manual override and a hydraulic manual selector to choose the actuator “Normal operation”, with oil supply from a power pack, or the “Emergency manual operation”. For nominal pressure until 105 bar the manual override is similar to chapter 7.2 table 3. For nominal pressure upper to 105 bar the manual override will be OMFB for carbon steel material, or dedicated model engineered by BIFFI for stainless steel material

3.3.2 Remote control operations :

Example of operating diagram for Double acting hydraulic linear actuator with Remote control :



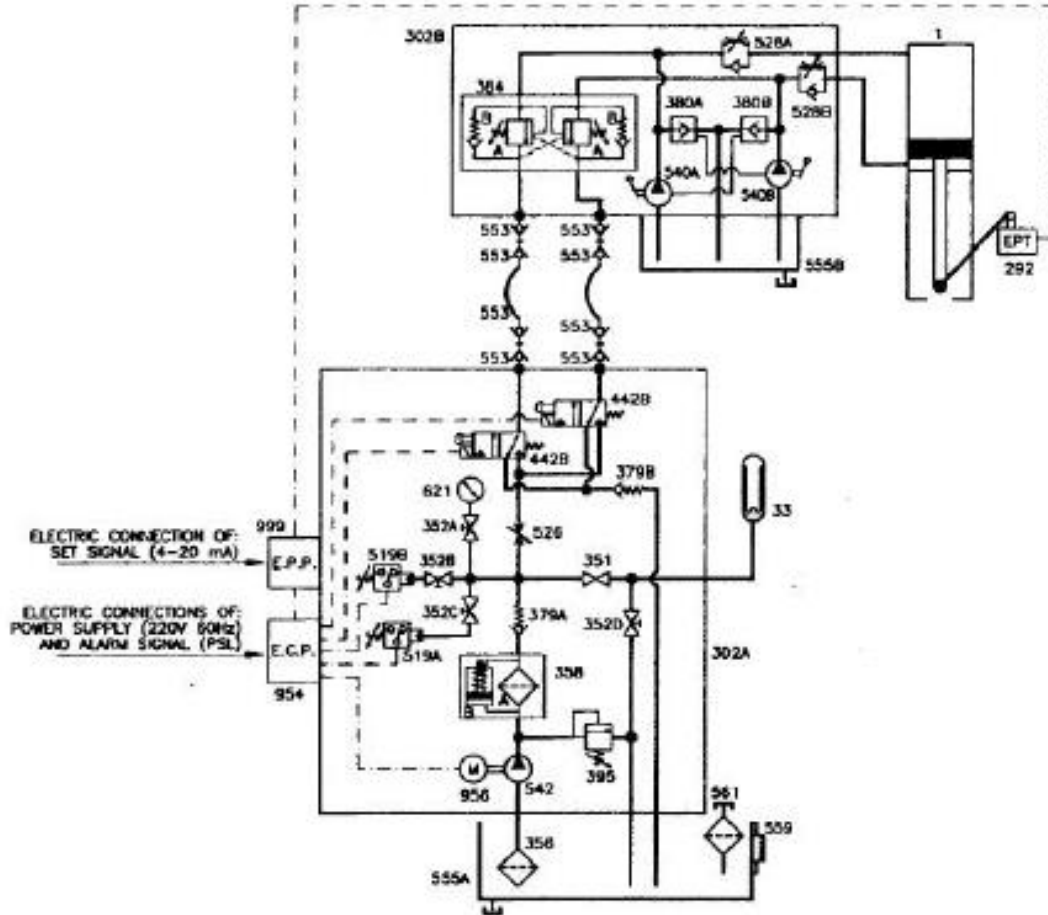
ELECTRIC REMOTE CONTROL TO OPEN
ENERGIZE PERMANENTLY THE SOLENOID VALVE 424A.
THE OPENING TIME IS ADJUSTABLE BY THE FLOW REGULATOR 528B.

ELECTRIC REMOTE CONTROL TO CLOSE
DE-ENERGIZE THE SOLENOID VALVE 424A.
THE CLOSING TIME IS ADJUSTABLE BY THE FLOW REGULATOR 528A.

- 1 DOUBLE ACTING HYDRAULIC LINEAR ACTUATOR
- 34 HYDRAULIC ACCUMULATOR (PISTON TYPE)
- 41 ELECTRIC MICROSWITCHES
- 103 NEEDLE VALVE WITH DRAIN VALVE
- 282 RUPTURE DISK
- 302 PANEL
- 351 STOP VALVE
- 352 NEEDLE VALVE
- 353 NEEDLE VALVE WITH DRAIN VALVE
- 358 HYDRAULIC FILTER WITH VISUAL INDICATOR
A - FILTER
B - CLOGGING VISUAL INDICATOR
- 379 CHECK VALVE
- 395 RELIEF VALVE
- 424 5/2 HYDRAULIC PILOT/SPRING RETURN SOLENOID VALVE
A - 5/2 HYDRAULIC PILOT/SPRING RETURN VALVE
B - 3/2 N.C. POPPET TYPE SOLENOID VALVE
- 528 UNIDIRECTIONAL FLOW REGULATOR (ADJUSTABLE SETTING)
- 563 PISTON POSITION VISUAL INDICATOR
- 621 PRESSURE GAUGE

NOTE:
THE DIAGRAM IS DRAWN WITH SOLENOID VALVES COILS NOT ENERGIZED.

Example of operating diagram for Double acting hydraulic linear actuator with Power pack :



ELECTROHYDRAULIC POWER UNIT OPERATION

THE OPERATION OF ELECTRIC MOTOR 956, WHICH DRIVES THE HYDRAULIC PUMP 542, IS CONTROLLED BY THE PRESSURE SWITCH 519A, THROUGH THE ELECTRIC CONTROL PANEL 954, SO TO MAINTAIN THE OIL PRESSURE, INTO THE ACCUMULATOR 33, WITHIN THE FIXED RANGE.

REGULATING SERVICE

THE ELECTRONIC POSITIONER 999 ENERGIZES THE SOLENOID VALVE 442A OR 442B IN ORDER TO REACH THE POSITION REQUIRED BY THE ELECTRIC SET SIGNAL.

LOCK IN POSITION

WHEN THE SOLENOID VALVES 442 ARE NOT ENERGIZED THE ACTUATOR IS LOCKED IN POSITION BY VALVE 384.

LOCAL CONTROL

IN CASE OF SET SIGNAL FAILURE, ACTUATE THE MANUAL OVERRIDE OF VALVE 442B TO OPEN OR 442A TO CLOSE DURING ALL THE VALVE STROKE.

EMERGENCY MANUAL OPERATION

IN CASE OF ELECTRIC SUPPLY FAILURE ACTUATE THE HAND PUMP 540A TO CLOSE OR 540B TO OPEN.

NOTE:

THE DIAGRAM IS DRAWN WITH SOLENOID VALVES COILS NOT ENERGIZED.

- 1 DOUBLE ACTING PNEUMATIC ACTUATOR
- 33 HYDRAULIC ACCUMULATOR (BLADDER TYPE)
- 292 ELECTRIC POSITION TRANSMITTER
- 302 PANEL
- 351 STOP VALVE
- 352 NEEDLE VALVE
- 356 HYDRAULIC FILTER
- 358 HYDRAULIC FILTER WITH VISUAL INDICATOR
A - FILTER
B - CLOGGING VISUAL INDICATOR
- 379 CHECK VALVE
- 380 PILOT OPERATED CHECK VALVE
- 384 DUAL PILOT OPERATED RELIEF VALVE WITH CHECK VALVES
A - PILOT OPERATED RELIEF VALVE
B - CHECK VALVE
- 395 RELIEF VALVE
- 442 3/2 N.C. POPPET TYPE SOLENOID VALVE (TEST PUSHBUTTON)
- 519 ELECTRIC PRESSURE SWITCH (ADJUSTABLE)
- 526 BIDIRECTIONAL FLOW REGULATOR (ADJUSTABLE SETTING)
- 528 UNIDIRECTIONAL FLOW REGULATOR (ADJUSTABLE SETTING)
- 540 HANDPUMP
- 542 HYDRAULIC ROTATING PUMP
- 553 QUICK CONNECTOR
- 555 OIL TANK
- 559 LEVEL GAUGE
- 561 OIL POURING PLUG WITH FILTER
- 621 PRESSURE GAUGE
- 954 ELECTRIC CONTROL PANEL
- 956 ELECTRIC MOTOR
- 999 ELECTRONIC POSITIONER

----- PNEUMATIC CONNECTION -----

----- HYDRAULIC CONNECTION -----

----- ELECTRIC CONNECTION -----

3.4 CALIBRATION OF THE ANGULAR STROKE

It is important that the mechanical stops of the actuator (and not those of the valve) stop the linear stroke at both extreme valve position (fully open and fully closed), 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.

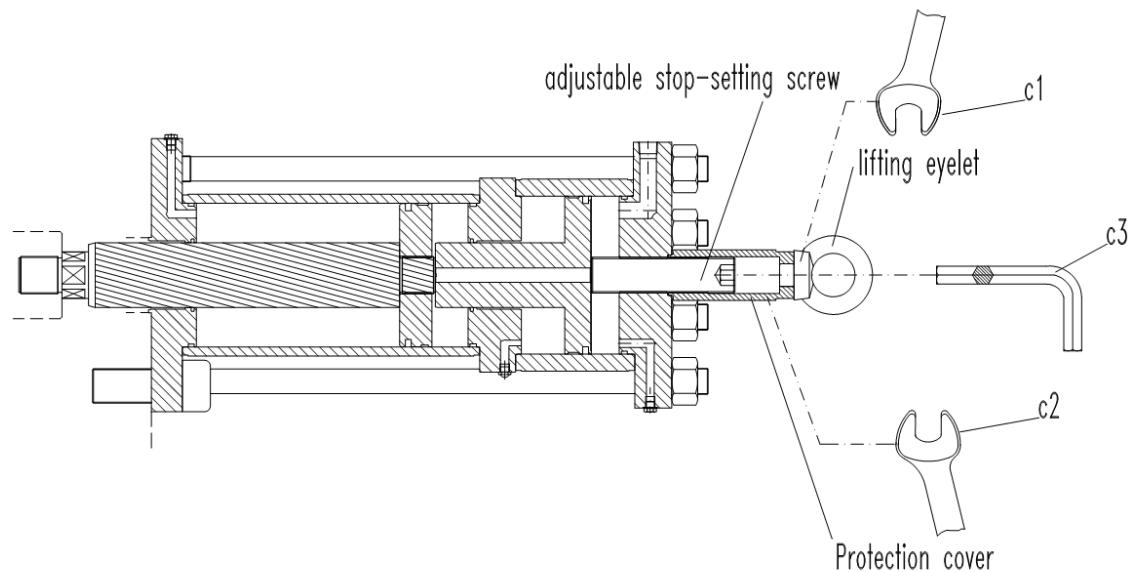


Figure 5 – Mechanical stopper

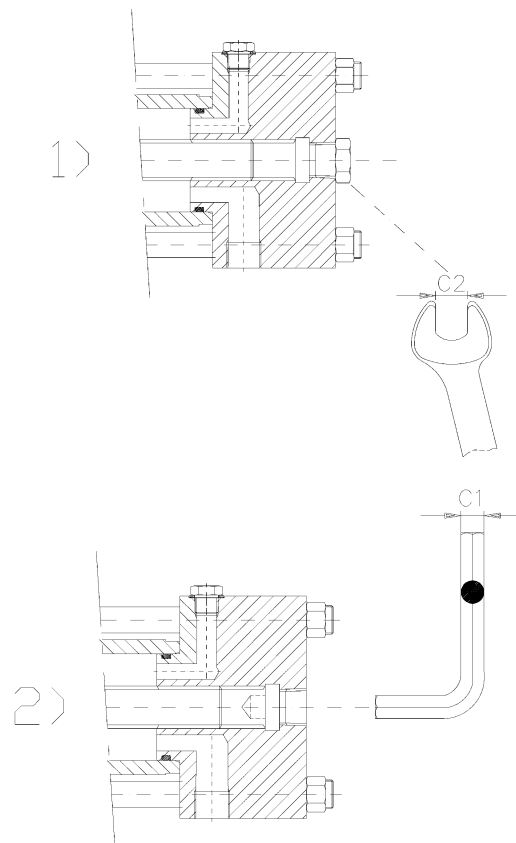
For the adjustment of the mechanical stop on the end flange of cylinder, follow these steps (Figure 6):

- ❑ Remove by using an hexagonal open wrench (c1) the lifting eyebolt.
- ❑ Unscrew half turn the protection cover by using an hexagonal wrench (c2)
- ❑ Insert a wrench for Allen keys (c3) in the through hole until reaching the adjustment screw.
- ❑ Keep the protection cover blocked with the wrench (c2).
- ❑ If the actuator angular stroke is stopped before reaching the upward position (fully open or closed), unscrew the adjusting screw by turning it anticlockwise with a proper wrench , until the valve reaches the right position
- ❑ If the actuator angular stroke is stopped beyond the upward position (fully open or closed valve), screw the stop screw by turning it clockwise until the valve reaches the right position.
- ❑ When the adjustment is over tighten the protection cover and the eyebolt.

HYDRAULIC CYLINDER SIZE	WRENCH C1 (mm)	WRENCH C2 (mm)	WRENCH C3 (mm)
075	22	10	36
100	22	10	36
135	22	10	36
175	22	14	46
200	27	14	46
235	27	17	65
280	27	17	65
300	36	17	110

For high pressure cylinder models, the mechanical stop is internal (without protection cover) proceed at the same way : (1) remove the plug and (2) operate the adjusting screw

Figure 6 – Mechanical stopper



3.5 CALIBRATION OF MICROSWITCHES (BIFFI LIMIT SWITCH BOX ONLY)



Operate only the micro-switch corresponding to the direction of operation being carried out, as clearly reported on the micro-switch.



If different micro-switches assembly or limit switch box is supplied, please refer to the specific documentation.

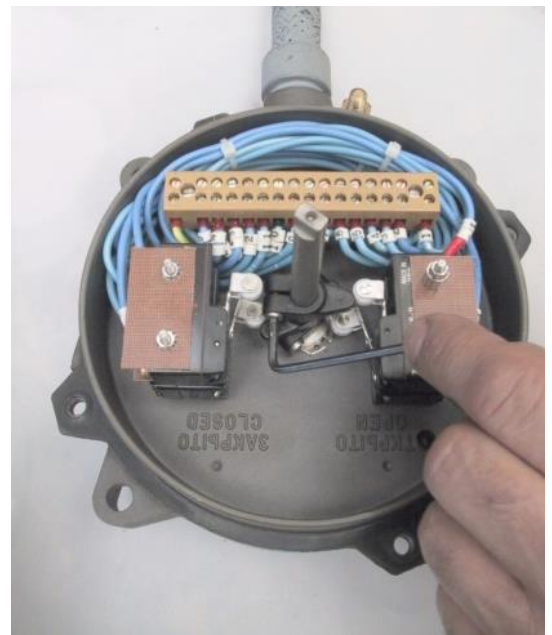
Micro-switches are placed inside a special box (Picture 7).

For micro-switches calibration please refer to the relative wiring diagram and follow these steps:

- ❑ Unscrew the fastening screws of the cover (Picture 7).
- ❑ Remove the cover paying attention not to deteriorate the gasket and the cylindrical and flat coupling surfaces.
- ❑ Operate the actuator (in opening or closing) with local hydraulic operation (Section 3.3)
- ❑ Unscrew the screw of the operating cam relative to the micro-switch to calibrate and adjust it according to the settings (Picture 8).
- ❑ Tighten the screw.
- ❑ Operate the actuator and adjust any other micro-switch with the procedure already described.
- ❑ Position the cover making sure the cam-carrier shaft grips with the index dragging shaft.
- ❑ Check that the cover and the index show the proper position of the valve (Picture 9).
- ❑ Tighten the screws.



Picture 7 – Micro-switches box



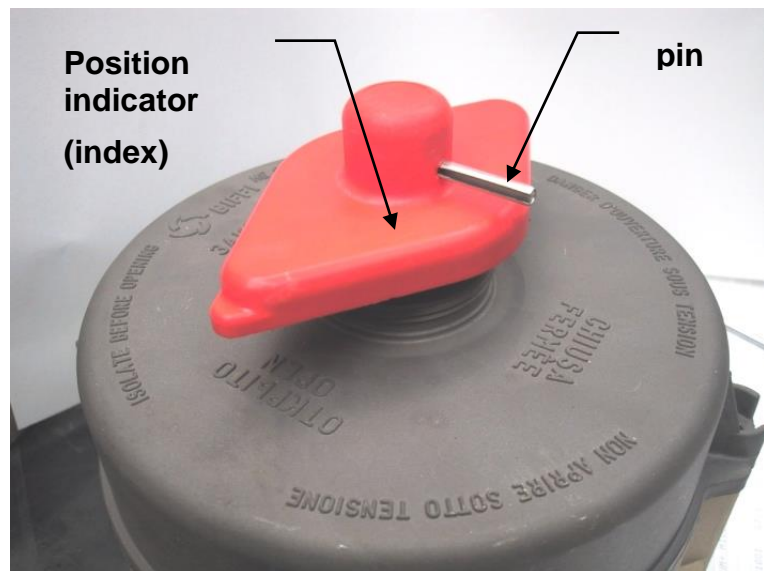
Picture 8 – Cam adjustment

If the index (Picture 9), does not signal the proper position of the valve but is turned by 90°:

- Remove the roll pin placed on the position indicator (index).
- Turn the indicator until reaching its proper positioning.
- Put the roll pin back in its position.



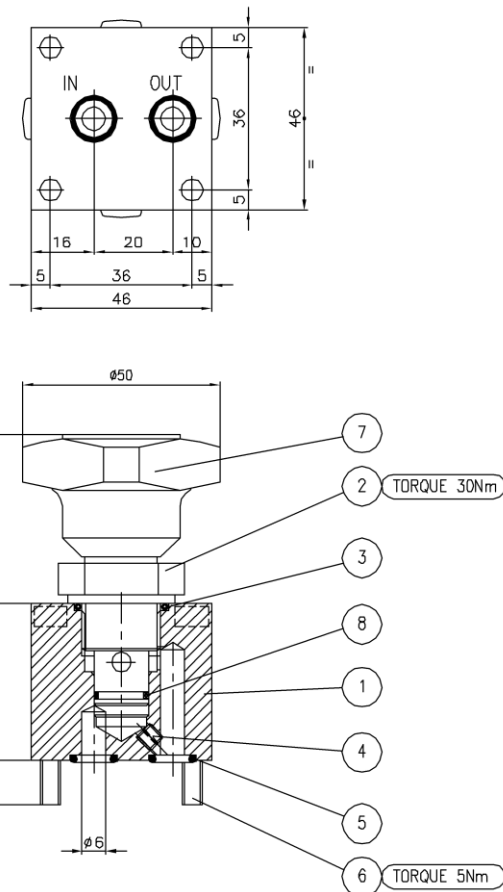
End of stroke micro-switches should be operated before the stop of the stroke of the actuator due to mechanical stops. Adjust the relative cams properly.



Picture 9 – Position indicator and pin for micro-switches box

3.5 CALIBRATION OF THE OPERATION TIME

For actuator models with control system it's possible regulate the speed of actuator operations. The calibration of the operation time is made by Biffi Italia S.r.L according to customer requirements and to technical data-sheet included in technical documentation. If necessary it's possible to modify or reset the operating time through two flow regulating valves (optional) placed on inlets of hydraulic cylinder (refer to specific technical documentation furnished with actuators scope of supply).



Technical features



Max. adjusted flow	(l/min.)	10
Max. working pressure	(bar)	250
Fluid viscosity range	(cSt)	5 - 750
Fluid temperature range	(°C)	-45 +60
Mass	(Kg)	0.70
Hydraulic fluid : mineral oils		
Recommended filtration : 19/15 ISO 4466 (25µ absolute)		
Seals in MFQ (FLUORO-SILICONE)		

POS	QTY	Denomination	Material	Type or Drawing
8	1	OR+2BK (INCLUDED IN CARTRIDGE POS.2)	MFQ-70Sh+PTFE	OR2-013 + 2BK
7	1	HAND WHEEL	11S (2D11)	29.102.378
6	4	SKREW	A4-70	VTCEI M5x45 UNI 5931
5	2	O-RING	MFQ-70Sh	OR 5-612
4	1	SCREW	A4-70	M5x5 UNI 5923
3	1	O-RING (INCLUDED IN CARTRIDGE POS.2)	MFQ-70Sh	OR 2-116
2	1	CARTRIDGE	AISI 316	FT 2287/2-14-FQSV
1	1	BODY	AISI 316	49.144.031
POS	QTY	Denomination	Material	Type or Drawing
2	1			
0	02/11/94	FIRST		Meridone
REV.	DATA	DESCRIZIONE MODIFICA		DISEGNATO
COMMESSA		DENOMINAZIONE		CONTROLLATO
		PANEL BIDIRECTIONAL FLOW REGULATOR DN6		CAD FILE
				SCALA
				1:1
				TOLLERANZE GENERALI
				CLASSE MEZZA UNI 5307

Picture 10 – Adjustment of operating time by flow-regulator valve (please refer to specific operating diagram, item 526,528 or 530)

To carry out the adjustment, operate the hand-wheel (turn clockwise the hand-wheel to increase the operating time or turn the hand-wheel counter-clockwise to decrease the operation time)

4 Operational tests and inspections

Important: To ensure the guaranteed SIL grade, according to IEC 61508, the functionality of actuator must be checked with regular intervals of time, as described in the Safety Manual



5 Maintenance



Before carrying out any maintenance operation, it is necessary to close the hydraulic feed line and exhaust the pressure from the actuator cylinder and from the control unit, to ensure safety of maintenance staff



Installation, commissioning and maintenance and repair works should be carried out by qualified staff.

5.1 PERIODIC MAINTENANCE

HLDA actuators are designed to operate long-term in heavy-duty operating conditions, without maintenance needs.



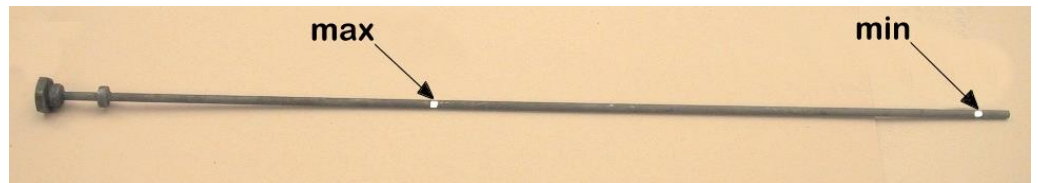
Periodicity and regularity of inspections is particularly influenced by specific environmental and working conditions.

They can be initially determined experimentally and then be improved according to actual maintenance conditions and needs.

Anyway every 2 years of operation the following is recommended:

- 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 there are no hydraulic leakages. If necessary tighten the nuts of the pipe-fittings.
- Check oil level (Pict. 11) into the hydraulic manual hand-pump, if present (see chapt. 5.1.1)
- Check the actuators did not undergo accidental damage with oil leakages found on site (Sect. 4.1.1).
- Check that improper closing of control-group cover did not produce the presence of condensation on it.
- Check the integrity of worn out parts (gaskets, pads etc.).
- If there is an oil filter on the actuator, bleed the condense water accumulated in the cup by opening the drain cock. Disassemble the cup periodically and wash it with soap and water; disassemble the filter: if this is made up of a sintered cartridge, wash it with nitrate

solvent and blow through with oil. If the filter is made of cellulose, it must be replaced when clogged.



Picture 11 – Level measuring stick

5.1.1 Check and restore oil level in the hydraulic manual handpump (refer to chapt. 7.2 table 3)

During the actuator operation the oil tank has to be closed (not in connection with the atmosphere). Then avoid cavitation it is necessary to proceed as follows for the check of oil level into the tank:

- 1) Unscrew the dipstick (1).
- 2) Move the actuator into open position.
- 3) Check that the oil level into the tank (4) is in correspondence of the “MAX LEVEL” notch of the dipstick.
- 4) By leaving the dipstick unscrewed move the actuator, by the pneumatic control or by the hand pump, to closed position.
- 5) Screw and tighten the dipstick.

If necessary substitute or added the oil, proceeding as follow:

- Remove the dipstick (1) from the tank cover (22).
- Unscrew the plug (27) and the washer (9) to drain all the oil.
- If some dirt or/and sludge is found in the oil drained from the tank, before filling with new oil in the tank, disassemble the oil tank tube, by unscrewing the two cap nuts (2), and clean the internal surfaces of the tank. If necessary substitute the gaskets (21) of the tank.
- Replace the plug (27) and the washer (9) into the plate (11) and tighten.
- Pour the new oil into the tank through the dipstick hole (1) on the cover (22).
- Replace the dipstick (1).
- Add oil (Table 2) if in the tank the level is BELOW MINIMUM Picture 13).



For refill use oil of the same brand as the one in the tanks.

The cleanliness level for actuator without control-system is NAS 8 minimum. For actuator with control system the cleanliness level is that required by singles components, in any case Biffi Italia S.r.L respect the customer requirements to scope of supply, for applicable cleanliness level, refer to document: technical data-sheet for actuators

Table 2: features of hydraulic oil suggested by BIFFI Italia S.r.l for refilling in different working condition:

Standard temperature conditions (-30°C/+85°):

Producer	AGIP
Name	ARNICA 22
Viscosity at 40° C	20.9 mm ² /s
Viscosity at 100° C	4.73 mm ² /s
Viscosity index ASTM	153
Flash point	192° C
Pour point	-42° C
Specific weight (at 15°C)	0,857 Kg/l

Equivalent oils:

SHELL TELLUS PLUS 22
 CHEVRON HYDRAULIC OIL AW ISO 22
 MOBIL DTE22
 EXXON UNIVIS N22
 EQUIVIS ZS22
 BP ENERGOL HLP-HM22
 CASTROL DYSPIN AWS22

Low temperature conditions (until -46°C):

Manufactured	SHELL
Name	AEROSHELL FLUID 41
Viscosity at -54° C	2300 cST
Viscosity at -40° C	491 cST
Viscosity at 40° C	14,1 cST
Viscosity at 100° C	5,30 cST
Viscosity index (ISO 2909)	>200
Flash point	105° C
Pour point	<-60° C
Specific weight	0,87 Kg/dm³

(or equivalent)

Low temperature conditions (until -60°C):

Manufactured Name	SYNTHESIS SYNTRASS-CS 500
Viscosity at -60° C	580 cST
Viscosity at -30° C	39cST
Viscosity at 20° C	5,8 cST
Viscosity at 50° C	2,1 cST
Flash point	152° C
Pour point	-68° C
Specific weight	0,897 Kg/dm3

(or equivalent)

5.2 EXTRAORDINARY MAINTENANCE

In case of need extraordinary maintenance can be performed on the parts of the actuator.



Anyway contact BIFFI ITALIA customer care.

5.2.1 Lubrication of mechanism

For normal duty the HLDA actuator is lubricated "for life". In case of high load and high and high frequency of operation it may be necessary to periodically restore the lubrication: it is advisable to apply a generous coating of grease on the contact surfaces of moving parts. For this operation is necessary to disassemble the closing plates (item 41 refer to table pag.34) from pedestal with coupling-joint.

The following grease is used by BIFFI for standard working temperature and suggested for re-lubrication:

AGIP MU/EP/2	AEROSHELL GREASE 7 or equivalent
<p>To be used in standard temperature conditions (-30°C/+85°C)</p> <p>NLGI consistency: 2</p> <p>Worked penetration: 280 dmm</p> <p>ASTM Dropping Point: 185°C</p> <p>Base oil viscosity at 40°C: 160 mm²/s</p> <p>ISO Classification: L-X-BCHB 2</p> <p>DIN 51 825: KP2K – 20</p> <p>Equivalent to: ESSO BEACON EP2 BP GREASE LTX2 SHELL ALVANIA GREASE R2 ARAL ARALUB HL2 CHEVRON DURALITH GREASE EP2 CHEVRON SPHEEROL AP2 TEXACO MULTIFAK EP2 MOBILPLEX 47 PETROMIN GREASE EP2</p>	<p>To be used in low temperature conditions (-60°C/+65°C)</p> <p>Colour: Buff</p> <p>Physical state: Semi-solid at ambient temperature</p> <p>Odour : Slight</p> <p>Density : 966 Kg/m³ at 15°C</p> <p>Flash Point : >215°C (COC)(Based on synthetic oil)</p> <p>Dropping point : 260°C (ASTM D-566)</p> <p>Product code : 001A0065</p> <p>Infosafe No.: ACISO GB/eng/C</p>

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 must be replaced with reference to the follow general sectional drawing and adopting the following procedures:

5.2.2 Replacement of cylinder seals (refer to table on pag. 34)



Before carrying out any maintenance operation, it is necessary to close the hydraulic feed line and exhaust the pressure from the actuator cylinder and from the control unit, to ensure safety of maintenance staff.

- 1) Unscrew the eyebolt (29) and the adjusting screw cover (22) from the cylinder end flange (13).
- 2) Measure the distance of the stop screw (19) with reference to the end flange (13) surface, so as to be able to easily restore the setting of the actuator mechanical stop, once the maintenance procedures have been completed.

- 3) Unscrew the stop screw (19) by turning it anticlockwise with an Allen wrench until the screw is complete with drawn inside the end flange threaded hole.
- 4) Unscrew the nuts (20) from the tie rods (18): they must be gradually unscrewed all at the same time.
- 5) Slide off the end flange (13) and the tube (16).
- 6) If the actuator control unit requires the cylinder chamber head flange side to be also filled with oil, and the piston rod seal ring (3) to be replaced, remove the screw (2) and the flange (1). Unscrew the piston rod (15) threaded end from the adaptor bush. Slide off the piston rod (15) from the head flange (1).
- 7) Disassemble the head flange.

Seals replacement

Prior to reassembly check that the actuator components are in good conditions and clean. Lubricate all the surfaces of the parts, which move in contact with other components, by a recommended grease. If the O-ring must be replaced, remove the existing one from its groove, clean the groove carefully and lubricate it with a protective oil or grease film. Assemble the new O-ring into its groove and lubricate it with a protective oil or grease film.

- 1) Replace the O-ring (5) of the head flange (1).
- 2) Replace the back-up-ring (4) of the end flange (13).
- 3) Replace the scraper-ring (33) into the flange (32) placed under the head flange

To replace the piston rod seal rings (3) proceed as follows :

- 1) Remove the existing seal ring (3) with its O-ring from their groove.
- 2) Clean the groove carefully and lubricate it with a protective oil or grease film.
- 3) Assemble the new O-ring into its groove and lubricate it with a protective oil or grease film.
- 4) Assemble the new seal ring (3) into the flange groove, inside its rubber O-ring, by bending it : take care that the bending radius is as large as possible to avoid damaged the seal. Then enlarge the seal ring with your fingers so as to restore its round shape: pay attention not to utilise any tools which can damage the seal ring.

To replace the piston seal ring (7) proceed as follows :

- 1) Remove the existing seal ring (7) with its O-ring from their groove.
- 2) Clean the groove carefully and lubricate it with a protective oil or grease film.

- 3) Assemble the new O-ring into its groove and lubricate it with a protective oil or grease film.
- 4) Assemble the new seal ring (7) on its rubber O-ring by introducing one side of it into the groove, then enlarge it with your fingers so as to fit it into the groove: take care to enlarge it uniformly without any tools which could possibly damage it. The elastic memory of the kind of Teflon the seal ring is made of allows the ring to shrink back to its previous dimension after a short time.

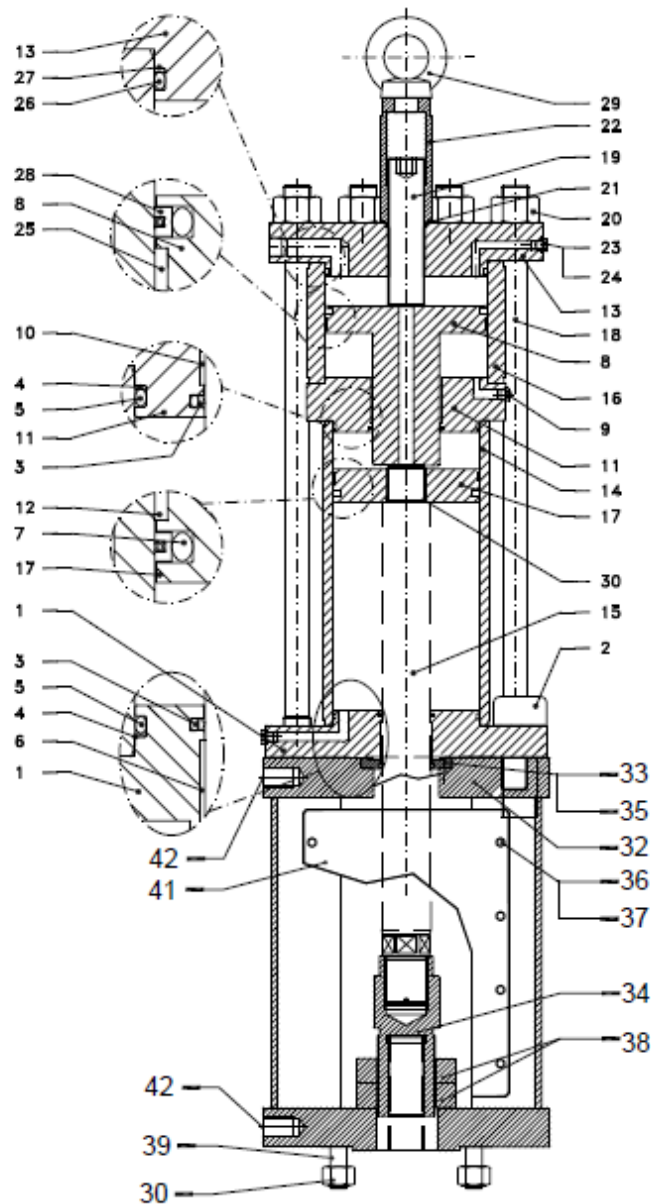
Reassembly :

- 1) Assemble the head flange (1), replace the washers if damaged.
- 2) Lubricate the piston rod (15) surface, with a protective oil or grease film and introduce it into the head flange hole, taking care not to damage the O-ring (5). Carefully clean the threaded end of the piston rod (15) and the threaded hole of the adaptor. Spread some sealant LOCTITE 452, or equivalent, on the rod threaded end and tighten.
- 3) Carefully clean the inside of the tube (14) and check that the entire surface, particular that of the bevels, is not damaged. Lubricate with a protective oil or grease film the tube internal surface and the bevels at the ends. Slide the tube onto the piston taking care not to damaged the seal ring (7): the tube bevel has to smoothly compress the seal ring; take care also not to damage the head flange O-ring (5).
- 4) Assemble the end flange by centring it on the inside diameter of the tube, taking care not to damage the O-ring (5).
- 5) Assemble the nuts (20) onto the tie rods (18). Tighten the nuts to the recommended torque, alternating between opposite corners.
- 6) Screw the stop screw (19) by turning it clockwise with an Allen wrench until it reaches its original position (the same distance with reference to the end flange surface).
- 7) Screw the protection cover (22) and the eyebolt (29) into the cylinder end flange.



Carry out a few operations (Sect. 3) to check there are no leakages from the gaskets.

DOUBLE ACTING HYDRAULIC LINEAR ACTUATOR SECTIONAL DRAWING



ITEM	Q.ty	DESCRIPTION	ITEM	Q.ty	DESCRIPTION
1	1	Head flange	23	2	Washer
2	4	Screw	24	2	Plug
3	2	Piston rod seal ring	25	1	Guide sliding ring for piston
4	2	Back-up ring	26	1	O-ring
5	2	O-ring	27	1	Back-up ring
6	1	Piston rod bushing	28	1	Piston seal ring
7	1	Piston seal ring	29	1	Lifting eyelet
8	1	Doble piston	30	1	O-ring
9	1	Exhaust silencer			
10	1	Intermediate flange bushing	32	1	Pedestal
11	1	Intermediate flange	33	1	Scraper ring flange
12	1	Guide sliding ring for piston	34	1	Shell joint
13	1	End flange	35	1	Scraper ring
14	1	Lower cylinder tube	36	16	Screw
15	1	Piston rod	37	16	Washer
16	1	Upper cylinder tube	38	2	Nut
17	1	Piston	39	4	Stud bolt
18	8	Tie rod	40	4	Nut
19	1	Stop setting screw	41	2	Plate
20	8	Nut	42	2	Dowel
21	1	O-ring			
22	1	Stop setting screw protection			

5.3 DISMANTLING AND DEMOLITION

Before starting the disassembly 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.



Before disassembling the actuator it is necessary to close the pneumatic feed line and discharge pressure from the cylinder of the actuator, from the control unit and from the accumulator tank, if present.

If actuator is still mounted onto the valve, loosen the threaded connections between valve and actuator (screws, tie rods, nuts)

Lift the actuator using the proper lifting points (see chapter 2.2).

If the actuator needs storage, before demolition, see chapter 2.3.

The demolition of the actuator both concerning any electrical and mechanical parts should be made by specialized staff

Separate the parts composing the actuator according to their nature (ex. metallic, and plastic materials, fluids etc.) and send them to differentiated waste collection sites, as provided for by the laws and provisions in force.

6 Troubleshooting

6.1 FAILURE OR BREAKDOWN RESEARCH

Event	Possible cause	Remedy
Actuator does not work	Lack of hydraulic supply	Open line stop valve
	Blocked valve	Repair or replace
	Wrong position of the distributor of the hydraulic manual override	Restore correct position
	Failure of the control system	Call BIFFI Italia S.r.l. Customer Service
	Clogged filter	Clean or replace the cartridge.
Actuator too slow	Low supply pressure	Restore (Sect. 1.4)
	Wrong calibration of flow regulator valves	Restore (Sect. 3.6)
Actuator too fast	Wear of the valve	Replace
	High supply pressure	Restore (Sect. 1.4)
Leakages on hydraulic or pneumatic circuits	Wrong calibration of flow regulator valves	Restore (Sect. 3.6)
	Deterioration and/or damage to gaskets	Call BIFFI Italia S.r.l. Customer Service.
Incorrect position of the valve	Wrong adjustment of mechanical stops	Restore (Sect. 3.4)
	Wrong warning of microswitches	Restore (Sect. 3.5)
Hydraulic manual pump does not work	handle positioned on remote control	Position the handle on the indication of the operation to make
	Leakages on the check valve of the hydraulic control group	Call BIFFI Italia S.r.l. Customer Service
Incorrect position of the valve	Wrong adjustment of mechanical stops	Reset (Par. 3.4)
	Wrong warning of micro-switches	Reset (Par. 3.5)

7 Layouts

7.1 SPARE PARTS ORDER

For spare parts order to the relevant BIFFI office please make reference to BIFFI order confirmation concerning all the supply, and serial number of the actuator (Sect. 1.2) for any specific spare part for a specific actuator model.

Please send every spare-parts request to :

BIFFI ITALIA s.r.l. - Servizio Assistenza Tecnica Clienti

Tel. : 0523-944523_____

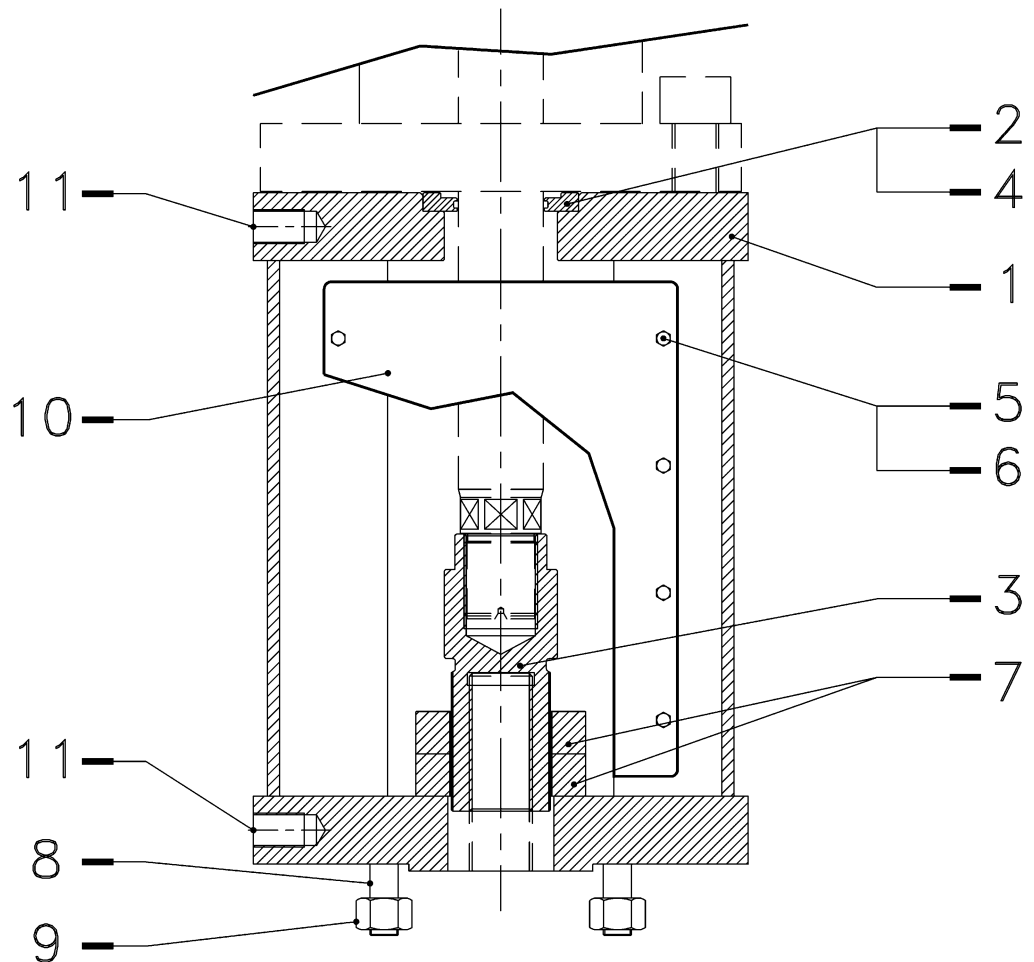
Fax: 0523-941885__ e-mail: spareservice@biffi.it

please specify :

- 1. actuator model;*
- 2. BIFFI acknowledgement ;*
- 3. spare parts code;*
- 4. quantity;*
- 5. transport condition;*
- 6. involved people.*

7.2 PARTS-LIST FOR MAINTENANCE AND REPLACING PROCEDURE

Table 1: Pedestal with coupling joint



ITEM	Q.ty	DESCRIPTION	MATERIAL
1	1	Pedestal	Carbon steel
2	1	Scraper ring flange	Stainless steel
3	1	Shell joint	Alloy steel
4	1	Scraper ring	NBR rubber ●
5	16	Screw	Stainless steel
6	16	Washer	Stainless steel
7	2	Nut	Stainless steel
8	4	Stud bolt	Stainless steel
9	4	Nut	Stainless steel
10	2	Plate	Carbon steel
11	2	Dowel	Stainless steel

● RECOMMENDED SPARE PARTS

Table 2: hydraulic cylinder

 BIFFI	DOUBLED THRUST CYLINDER	SECTIONAL DRAWING PAGE 1 of 2
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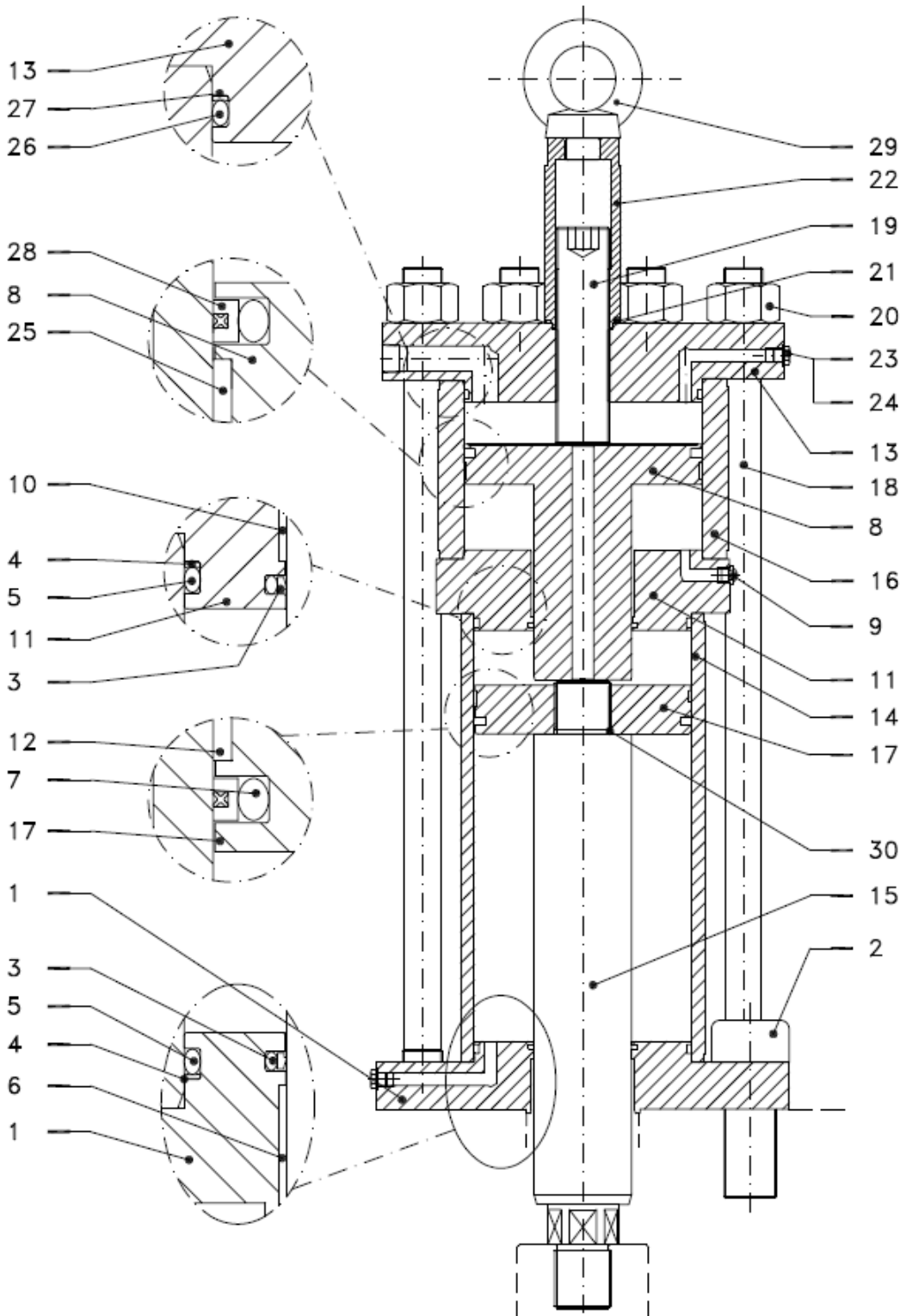
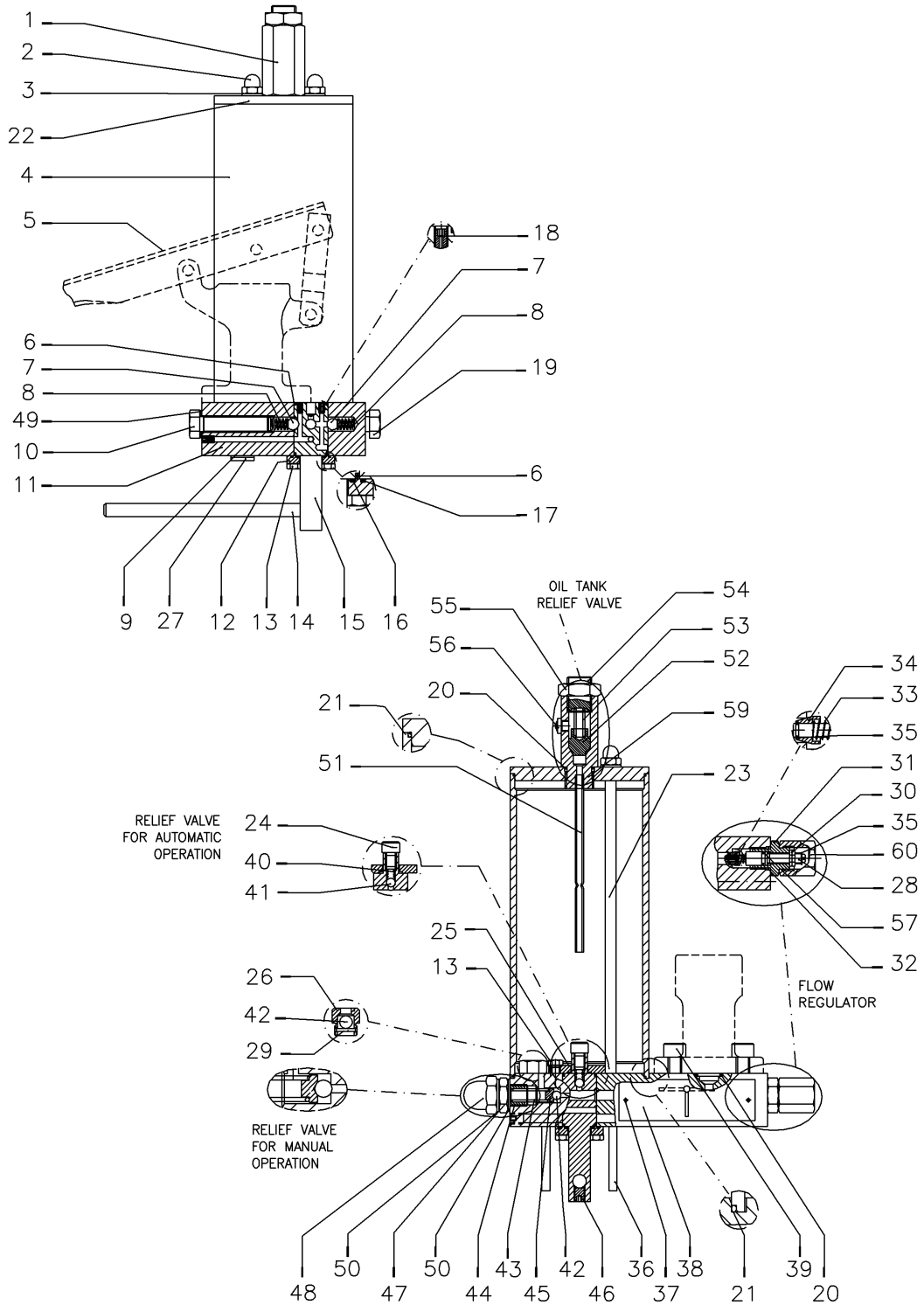
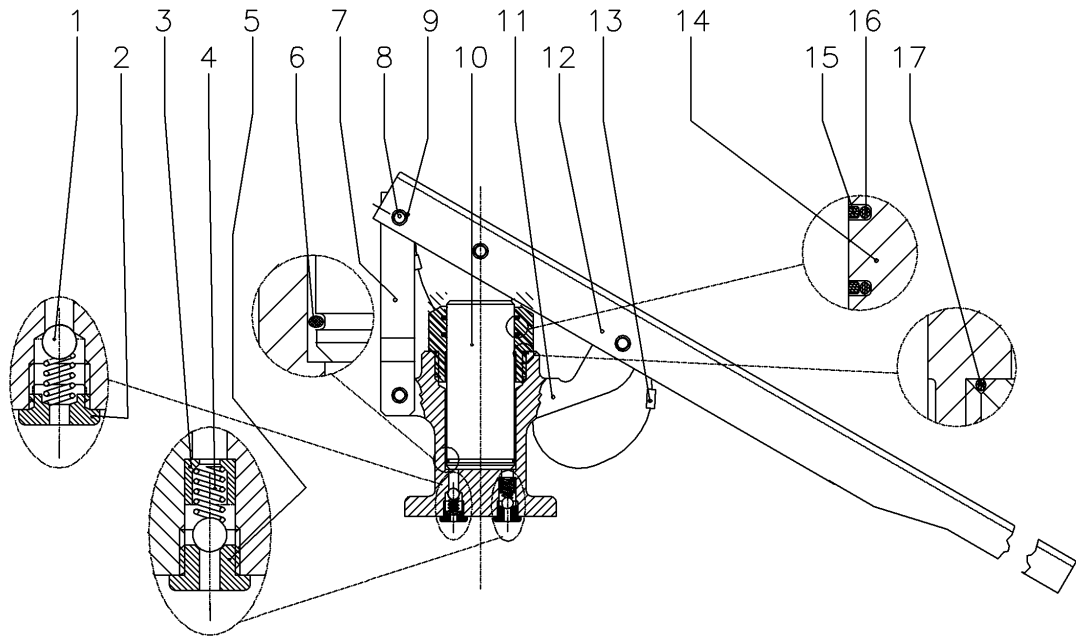


Table 3: Hydraulic control unit MHP

 BIFFI	HYDRAULIC CONTROL UNIT	table 5/a
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ITEM	Q.ty	DESCRIPTION	MATERIAL
1	2	Ball	Stainless steel
2	1	Delivery valve bush	Carbon steel
3	1	Suction valve bush	Carbon steel
4	2	Spring	Stainless steel
5	1	Suction valve seat	Carbon steel
6	1	Spring retainer ring	Carbon steel
7	1	Fork	Carbon steel
8	3	Pin	Stainless steel
9	6	Retainer ring	Carbon steel
10	1	Rod	Alloy steel (chromium plated)
11	1	Body	Carbon steel
12	1	Lever	Carbon steel
13	1	Split pin with rope	Carbon steel+nylon
14	1	Threaded bush	Aluminium
15	2	Rod seal ring	Teflon+graphite
16	2	O-Ring	Fluorosilicon rubber ●
17	1	O-Ring	Fluorosilicon rubber ●

(*) R.S.P. = RECOMMENDED SPARE PARTS

8 Date report for maintenance operations

Last maintenance operation date : (in factory, on delivery) :

..... exec. by :

..... exec. by :

..... exec. by :

Next maintenance operation date: exec. by :

..... exec. by :

..... exec. by :

Start-up date : (in factory, on delivery).....

(on plant)