Installation, Operation and Maintenance Manual
MAN 623 Rev. 5
April 2024

Biffi RPHD

Double-Acting Hydraulic Actuator

BIFFI

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NOTICE

Biffi Italia s.r.l. pays the highest attention to collecting and verifying the documentation contained in this Installation, Operation and Maintenance (IOM) 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.

Section 1: General Warnings

NOTICE

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

UNI EN ISO 12100-1: 2005:	Safety of machinery – Basic notions, general design principles. Part 1 - Basic terminology, method.
UNI EN ISO 12100-2: 2005:	Safety of machinery – Basic notions, general design principles. Part 2 - Technical principles and specification.
2006/42/EC:	Machine directive.
97/23/EC:	Directive for pressure PED equipment (until 18 July 2016) 2014/68/EU from 19 July 2016
2006/95/EC:	Directive for low voltage equipment (until 19 April 2016) 2014/35/EU from 20 April 2016
2004/108/EC:	Directive for the electromagnetic compatibility (until 19 April 2016) 2014/30/EU from 20 April 2016
94/9/CE:	Directive and safety instructions for use in hazardous area (until 19 April 2016) 2014/34/EU from 20 April 2016

1.1.2 Terms and Conditions

Biffi Italia s.r.l. 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 s.r.l. liability shall lapse in the event that any modification or tampering whatsoever be performed on the actuator.

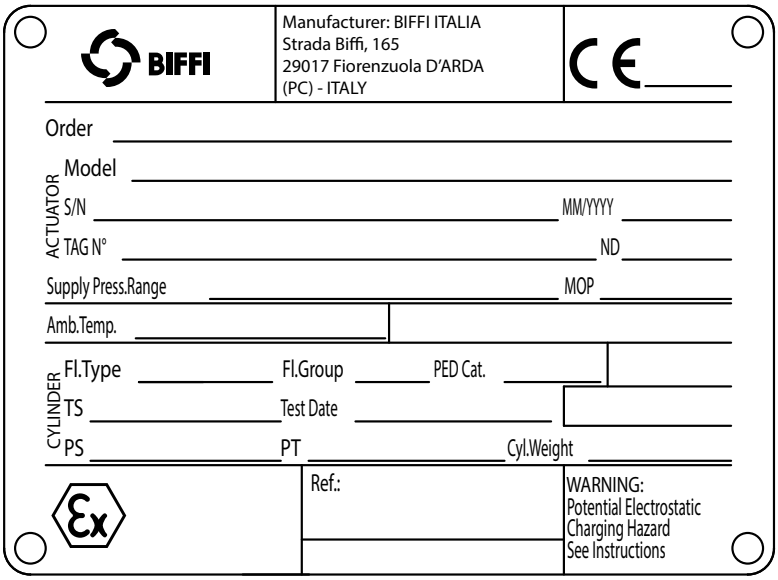
1.2 Identification Plate

⚠ WARNING

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, see Figure 1.

Figure 1. Data Plate



1.3 Introducing the Actuator

RPHD are hydraulic high-pressure double-acting actuators, suitable for any quarter-turn application such as ball, plug, butterfly valves or dampers, in both ON-OFF and MODULATING heavy-duty service.

The actuator (see Figure 2) is made up of a rack and pinion mechanism, which transforms the linear movement of the hydraulic cylinder (on closing or opening), into the rotary movement for the valve operation. The surfaces of the pinion and rack are threaded to guarantee a low friction and a long life. External travel stops allow precise angular stroke adjustment between 80 and 100°.

Totally enclosed, weatherproof housing, made of nodular cast iron for maximum strength and suitable for use in hostile environments.

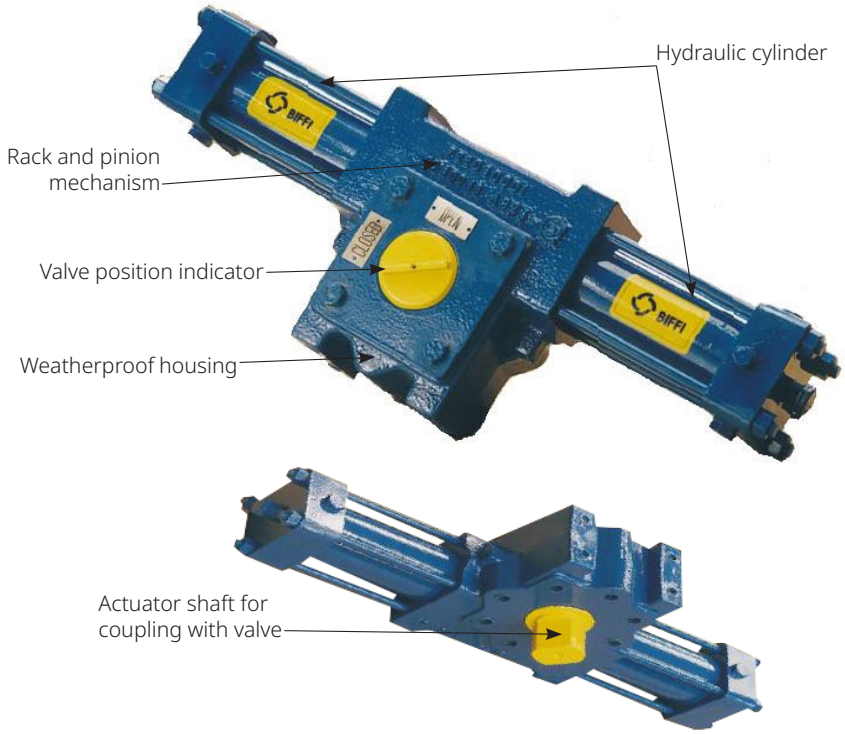
The actuator is assembled onto the valve by connecting the actuator-housing flange to the valve flange by a spool piece and the actuator shaft to the valve stem by a stem extension.

The mounting flange, on the housing top, can be utilized for the assembly of limit switches, position transmitter, positioner etc., which are actuated by the actuator output shaft.

The actuator housing is provided, on the front face and in the rear face (optional), with threaded holes for the assembly of accessories (control panels, air storage tank, etc.).

The expected lifetime of actuator is approximately 25 years.

Figure 2. Identification of Actuator Parts



1.4 Data Sheet

Supply fluid	Hydraulic oil or fire-resistant fluid
Operating temperature	Standard: from -20 to +80 °C Optional: from -60 to +100 °C (over contact factory)
Design pressure	Design pressure of the cylinder 220 barg
Supply pressure	Please refer to technical document: “actuator data sheet”
Max. operating torque	Up to 2600 Nm

Section 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 (Section 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 (Section 3.4) and of microswitches (if any) (Section 3.5).

2.2 Actuator Handling

NOTICE

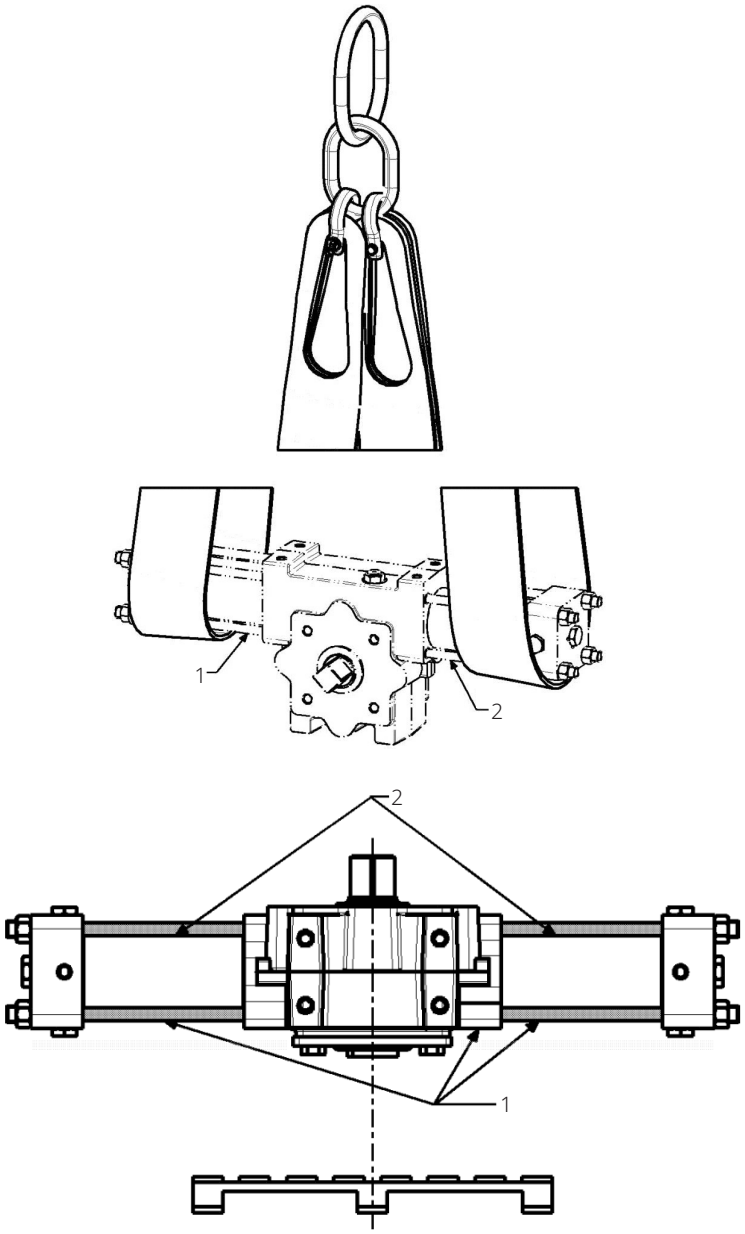
The lifting and handling should be made by qualified staff and in compliance with the laws and provisions in force.

⚠ WARNING

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.

Figure 3. Lifting and Storage Method

1 and 2= LIFTING POINTS (OBLIGATORY)



⚠ WARNING

1 = point of support (lifting points)
2 = do not lay the actuator on tie-rods
Do not lay the actuator on accessories (manual hand pump, manual jackscrew, hydraulic control group, 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 protection of the control system 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 the valve coupling area with oil, grease or protection disc.
- Periodically operate the actuator (Section 3.3).

2.4 Actuator Assembly on the Valve

2.4.1 Types of assembly

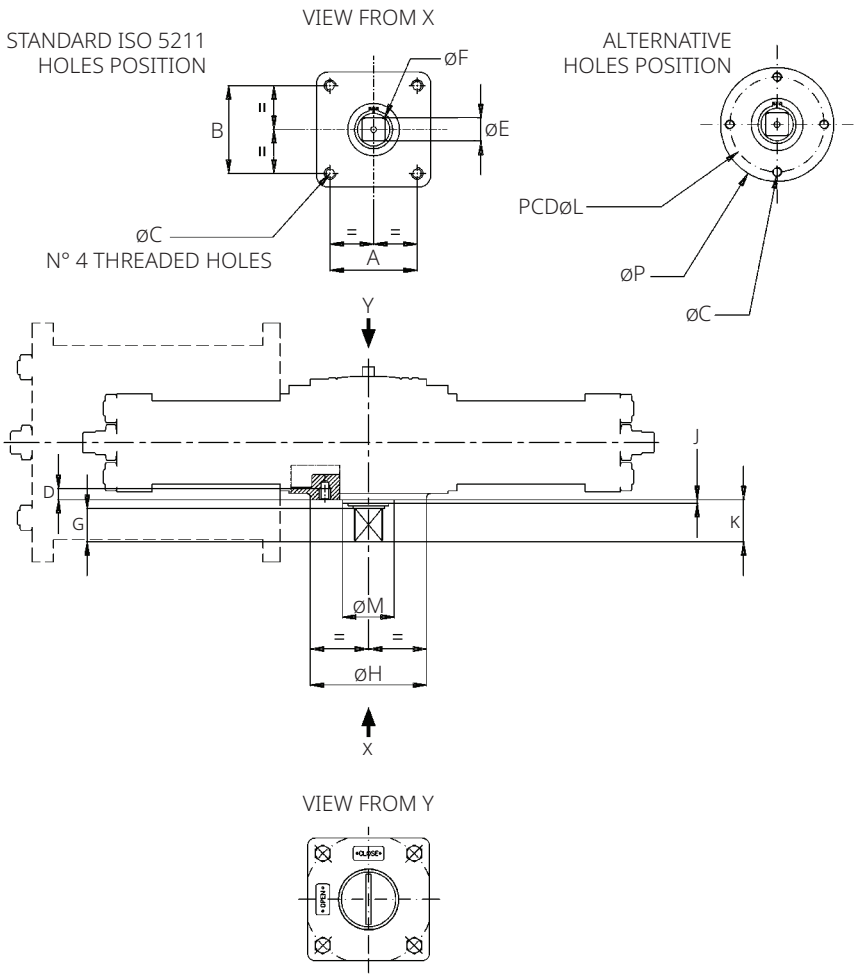
For coupling to the valve, the housing is provided with a flange with threaded holes according to Biffi standard table (Table 1). The number, dimensions and diameter of the holes are made in accordance with ISO 5211. The actuator is provided with a spool-piece and a stem extension for coupling to the valve. The assembly position of the actuator, with reference to the valve, must comply with the plant requirements (cylinder axis parallel or perpendicular to the pipeline axis).

NOTICE

To fix the actuator to the valve flange, the stud bolts and nuts supplied by Biffi must be used. In case the actuator is supplied without stud bolts and nuts, the following materials must be used as a minimum:

- ASTM A193 Grade L7 for Stud Bolts
- ASTM A194 Grade 4 for Nuts

Figure 4. RPHD Hydraulic Actuators - Coupling Dimensions



Notes:
- All dimensions are in mm
- Actuator shown in closed position

Table 1. TN1312

Actuator Model	A $^{\pm 0,2}$	B $^{\pm 0,2}$	ØC	D	ØE $^{0}_{-0,1}$	ØF $^{0}_{-0,5}$	G	ØH	K	J	L	ØM $^{0}_{-0,2}$	ØP
RPHD-10 RPHS-10	49.5	49.5	M8	10	16	21	23	66	30	3	70	40	90
RPHD-20 RPHS-20	72.1	72.1	M10	12	22	29	25	92	32	3	102	50	125
RPHD-40 RPHS-40	88.4	88.4	M12	15	28	37	34	112	42	3	125	60	150
RPHD-80 RPHS-80	99	99	M16	23	37	49	45	132	55	3	140	75	175

2.4.2 Assembly Procedure

NOTICE

Failure to comply with the following procedures may impair product warranty.

⚠ WARNING

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:

NOTICE

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.

- Operate the actuator so that it reaches the position matching valve position (Section 3.3).
- Lubricate valve stem with oil or grease.
- Properly clean and remove grease from valve coupling flange surfaces.
- Connect, if supplied separately, the stem extension onto the valve stem and fasten it with the special fastening pins.
- Lift the actuator using the special lifting points (Section 2.2).
- Install the actuator so that valve stem inserts in the coupling area. This coupling should be made without forcing.
- Fasten the two parts with the threaded connections (screws, tie rods, nuts). If holes of coupling flanges are not aligned, adequately operate the actuator if necessary move the mechanical stops backwards (Section 3.4).
- Fasten threaded connections. Please refer to Table 2.

Table 2. Nuts Tightening Torque

Threading	Tightening torque (Nm)
M8	20
M10	40
M12	70
M16	160

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

2.5 Hydraulic Connections

NOTICE

Check if the values of hydraulic supply available in the system are compatible with those reported on the identification plate of the actuator. The connections should be made by qualified staff.

NOTICE

Use pipes and connections appropriate as per type, material and dimensions.
Use motor fluid with purity degree ISO 4406 17/14 or NAS 1638 Class 8 (AS4059 Class 4B-F).

⚠ WARNING

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

- Properly deburr the ends of rigid pipes if present.
- Properly clean the interior of pipes sending through them plenty of the supply fluid used in the system.
- Shape and fasten the connection pipes so that no irregular strains at entries or loosening of threaded connections occur.
- Make the connections according to the functional diagram.
- Check the hydraulic connections for leakage.

NOTICE

For the characteristics of the motor fluid, please refer to the documentation supplied.

2.6 Electrical Connections (If Any)

⚠ WARNING

Use components appropriate as per 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 plugs of unused entries with metal plugs.

2.7 Commissioning

⚠ WARNING

Installation, commissioning, and maintenance and repair works should be made by qualified staff. Any calibration relative to functional aspects of the actuator are preset at the factory. Before any modifications, please read the IOM.

Upon actuator commissioning, please carry out the following checks:

- Check that the values of hydraulic supply available in the system are compatible with those reported on the identification plate of the actuator (Figure 1) and on the documentation supplied.
- Check the power voltage of electrical components complies with the one reported on the documentation supplied.
- Check the cylinder and hydraulic connections for leakages.
- Check that the paint is intact and if necessary, renovate it according to the specification on order confirmation.
- Conduct all kinds of operations and check if they were properly executed (Section 3.3).
- Check the proper operation of all the warnings.

Section 3: Operation and Use

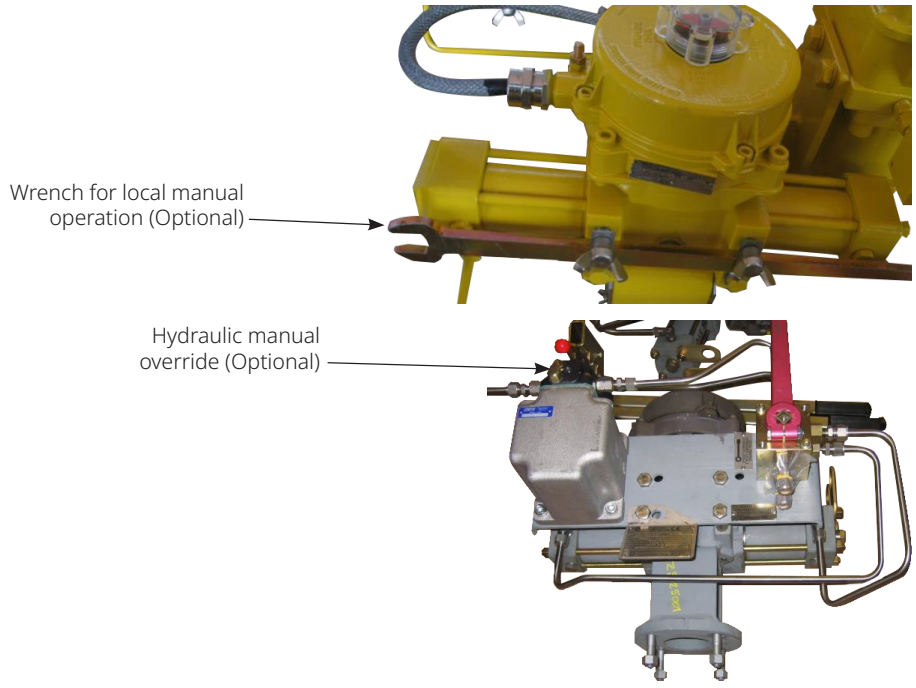
3.1 Operation Description

The oil supply 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 rotation motion of the rack and pinion mechanism, to which the valve stem is coupled. Pressurize the other cylinder chamber to return at the starting position.

For local or remote operations, please refer to Sections 3.1, 3.2 and 3.3, and prior to technical documentation furnished with actuators.

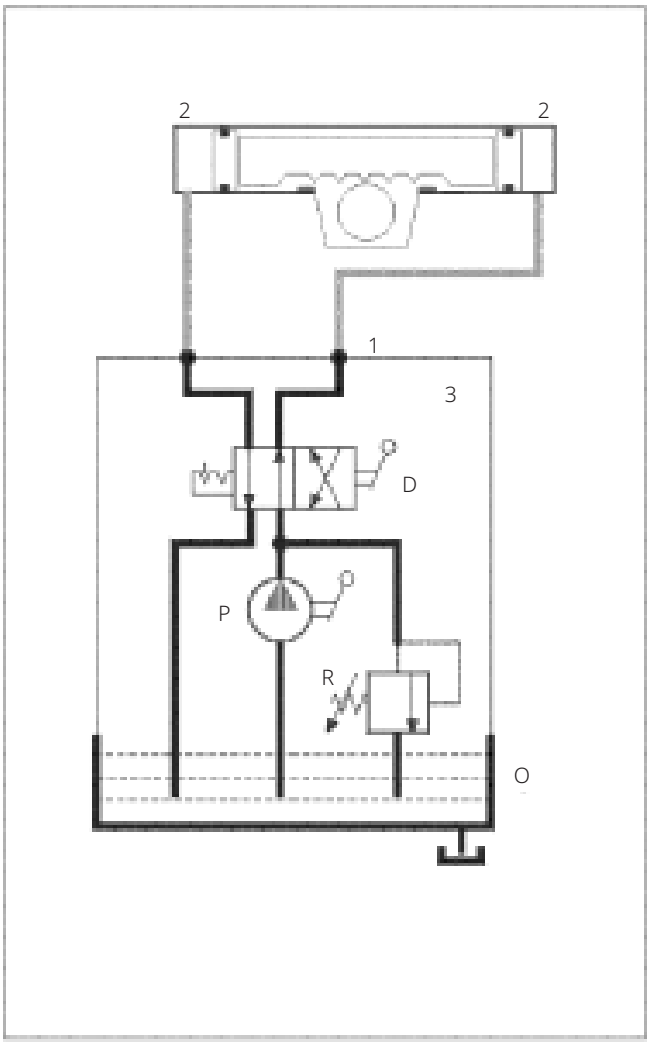
Typical schematics for various applications that follow are attached for information only; in these schematic, actuator operation in local is performed by the optional hydraulic manual override (Figure 5 and Figure 6). Actuator operation in remote shall be performed operating the hydraulic manual selector (Figure 5 and Figure 7) by control signal from control room.

Figure 5.



The power and control systems are supplied on specific customer demand (refer to specific documentation furnished).

Figure 6. Local Control Only for Double-Acting Actuators



Parts:

1. Rack and pinion mechanism
2. Hydraulic cylinder
3. Hydraulic manual override

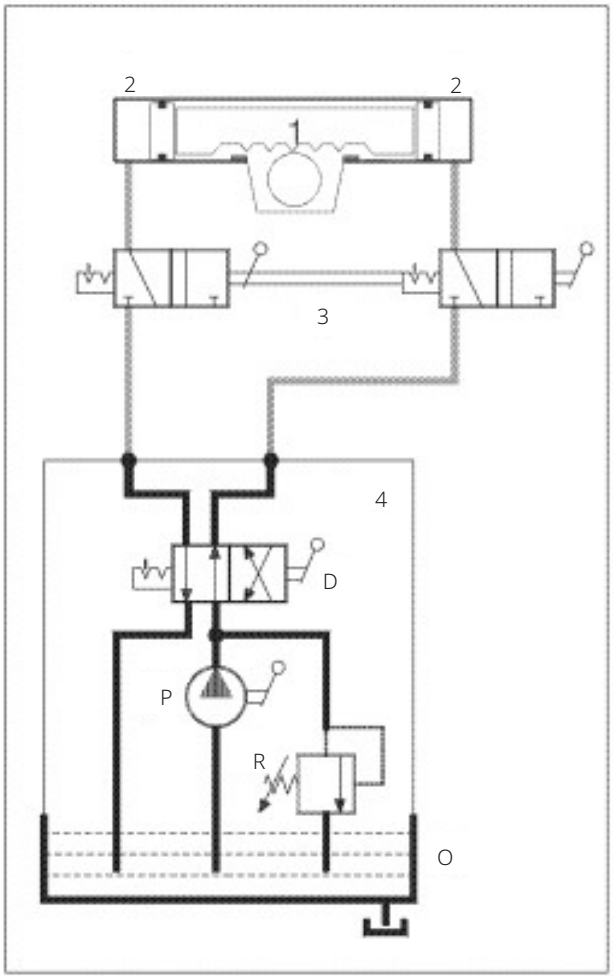
D. Directional control valve

P = Hand pump

R = Relief valve

O = Oil tank

Figure 7. Local Control Suitable Also for Remote Oil Supply for Double-Acting Actuators



Parts:

1. Rack and pinion mechanism
2. Hydraulic cylinder
3. Hydraulic manual selector
4. Hydraulic manual override

D. Directional control valve

P = Hand pump

R = Relief valve

O = Oil tank

3.2 Residual Risks

⚠ WARNING

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

The operations are carried out sending the proper signal through the control system in compliance with customer specifications.

Please refer to the functional diagram and specific documentation supplied.

3.4 Calibration of the Angular Stroke

Two mechanical stoppers are available for external stroke adjustment between 80 and 100° rotation.

It is important that the mechanical stops of the actuator (and not those of the valve) stop the angular stroke at both extreme valve position (fully open and fully closed), except when this is required by the valve operation (e.g., metal seated butterfly valves).

The setting of the open valve position is performed by adjusting the travel stop screw, which is on the left side of the actuator (screwed into the end flange of the hydraulic cylinder).

For the adjustment of the travel stop screw in the end flange of the hydraulic cylinder, proceed as follows:

1. Unscrew the plug from the cylinder end flange.
2. If the actuator angular stroke is stopped before reaching the end position (fully open or closed), unscrew the stop screw by turning it counterclockwise with an Allen wrench until the valve reaches the correct position.
3. If the actuator angular stroke is stopped beyond the end position (fully open or closed valve), screw the stop screw by turning it clockwise until the valve reaches the correct position.
4. Screw the plug into the cylinder end flange.

Figure 8.

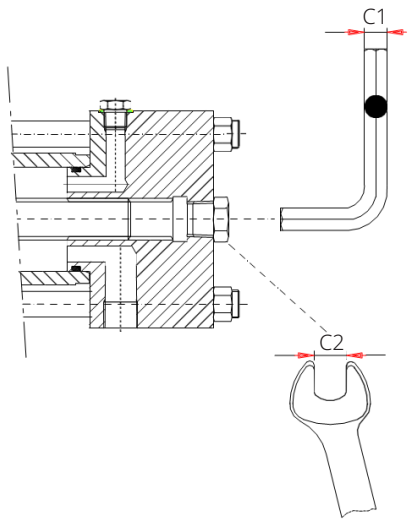


Table 3.

Hydraulic Cylinder Diameter	Wrench C1 (mm)	Wrench C2 (mm)
From 28 to 40	8	22
From 45 to 60	12	27
From 70 to 175	14	36
From 200 to 235	22	36

3.5 Calibration of Microswitches (If Foreseen)

NOTICE

Operate only the microswitches corresponding to the direction of operation being carried out, as clearly reported on the microswitch.

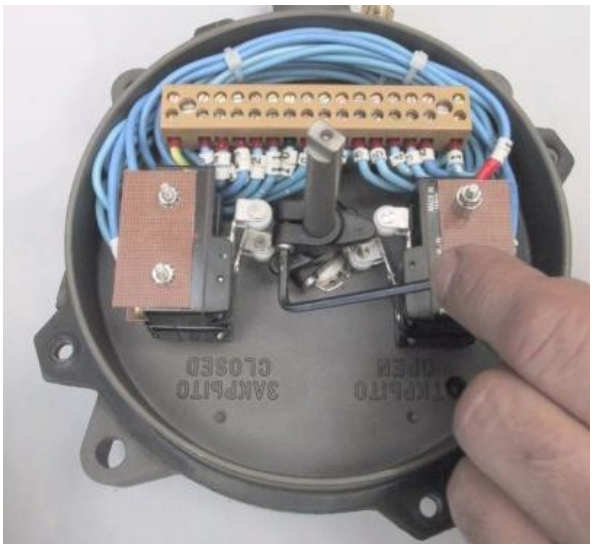
Microswitches are placed inside a special box, see Figure 9.

For microswitches calibration, please refer to the relative wiring diagram and follow these steps:

1. Unscrew the fastening screws of the cover (Figure 9).
2. Remove the cover paying attention not to deteriorate the gasket and the cylindrical and flat coupling surfaces.
3. Operate the actuator (in opening or closing) with local pneumatic or hydraulic operation (Section 3.3).
4. Unscrew the screw of the operating cam relative to the microswitch to calibrate and adjust it according to the settings (Figure 10).
5. Tighten the screw.
6. Operate the actuator and adjust any other microswitch with the procedure already described.
7. Position the cover making sure the cam-carrier shaft grips with the index dragging shaft.
8. Check that the cover and the index show the proper position of the valve (Figure 11).
9. Tighten the screws.

Figure 9. Microswitches box

Figure 10. Cam Adjustment



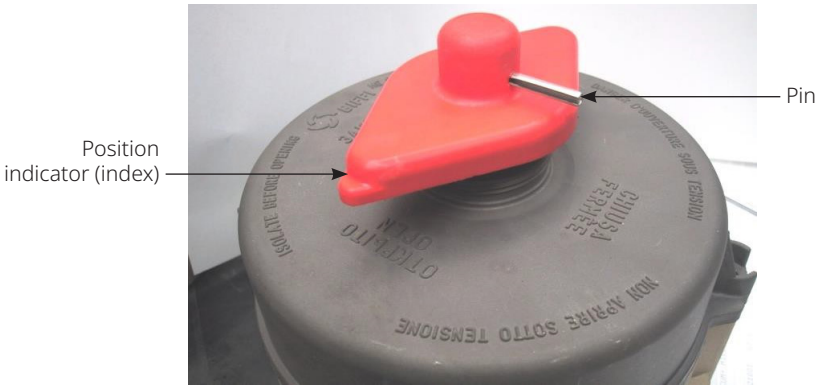
If the index (Figure 11), does not signal the proper position of the valve but is turned by 90°:

- 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.

NOTICE

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

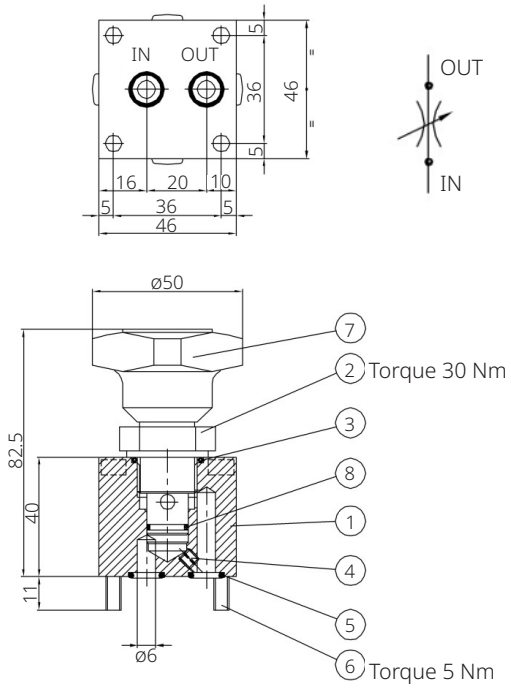
Figure 11. Position Indicator and Pin for Microswitches Box



3.6 Calibration of the Operation Time

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, its possible to modify or reset the operating time through two flow regulation valves placed on inlets of hydraulic cylinder (Figure 12).

Figure 12. Adjustment of Operating Time By Flow-Regulator Valve (Please Refer to Specific Operating Diagram, Item 526-530)



Technical Features	
Maximum Adjusted flow (l/min.)	10
Maximum working pressure (bar)	250
Fluid viscosity range (cSt)	5 to 750
Fluid temperature range (°C)	-45 to +60
Mass (kg)	0.70
Hydraulic Fluid: mineral oils	
Recommended filtration: 19/15 ISO 4466 (25 µ abs.)	
Seals in MFQ (Fluorosilicone)	

Table 4. Parts List

Item	Quantity	Denomination	Material	Type or Drawing
8	1	OR+2BK 8 (INCLUDED IN CARTRIDGE POSITION 2)	MFQ-70Sh+PTFE	OR2-013 + 2BK
7	1	HANDWHEEL	11S (2011)	29.102.378
6	4	SCREW	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 POSITION 2)	MFQ-70Sh	OR 2-116
2	1	CARTRIDGE	AISI 316	FT 2267/2-14-FQSV
1	1	BODY	AISI 316	49.144.031

To carry out the adjustment, operate the handwheel (turn clockwise the handwheel to increase the operating time or turn the handwheel counterclockwise to decrease the operation time).

Section 4: Operational Tests and Inspections

NOTICE

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.

Section 5: Maintenance

NOTICE

Before executing any maintenance operation, it is necessary to close the hydraulic supply line and discharge pressure from the cylinder of the actuator and from the control unit (if foreseen).

⚠ WARNING

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

5.1 Periodic Maintenance

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

NOTICE

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

NOTICE

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 all the paint-coat of the actuator. If some areas are damaged, repair the paint-coat according to the applicable specification.
- Check if there are no hydraulic leakages. If necessary, tighten the nuts of the pipe-fittings.
- Check if the actuators did not undergo accidental damage with oil leakages found on site (Section 5.2).
- 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.
- Check oil level into the hydraulic manual override (see specific customer documentation furnished with actuators).

NOTICE

For refill, use oil of the same brand as the one in the actuator. The cleanliness level for the actuator without a control system is NAS 8 minimum. The minimum cleanliness level is driven by the single component requirements for actuators with the control system. Refer to the technical actuator data sheet.

Table 5. Hydraulic Oil List by Biffi Italia s.r.l. for Refilling in Different Working Conditions

Standard temperature conditions (-30 °C to +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:	Use an equivalent or better product in compliance with the oil proposed in the actual scope of supply by Biffi Fiorenzuola. Your oil supplier can verify and propose an alternative product at your responsibility.
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 (or equivalent)	0.87 Kg/dm^3
Low temperature conditions (until -60 °C)	
Manufactured	SYNTESIS *
Name	SYNTRASS-CS 500 *
Viscosity at -60 °C	580 cST
Viscosity at -30 °C	39 cST
Viscosity at 20 °C	5.8 cST
Viscosity at 50 °C	2.1 cST
Flash point	152 °C
Pour point	-68 °C
Specific weight (or equivalent)	0.897 kg/dm^3

NOTE:
* Refer to Fiorenzuola plant to receive a quotation for this oil

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

5.2.1 Replacement of Cylinder Seals

NOTICE

Before executing 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 for the safety of maintenance staff.

⚠ WARNING

Installation, commissioning, and maintenance and repair works should be carried out by qualified staff. Before carrying out any operation, cut power off from the electrical line.

1. Unscrew the plug (14-15) from the cylinder end flange.
2. Measure the distance from the stop screw (27) to the end flange (12) 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 (27) by turning it counterclockwise with an Allen wrench until the screw is completely withdrawn inside the end flange threaded hole.
4. Unscrew the nuts (13) from the tie rods (11): they must be gradually unscrewed all at the same time, to recover the spring pre-setting.
5. Slide of the end flange (12) and the tube (7).
6. Remove the piston (8) from the tube (7).

5.2.1.1 Seals Replacement

If the O-rings/seals must be replaced, remove the existing one from its groove, clean the groove carefully, and lubricate it with a protective oil film (ARNICA 22 or the oil used in the hydraulic cylinder). Assemble the new O-ring/seals into its groove and lubricate it with a protective oil film. Replace the O-ring (18) of the end flange (12).

To replace the piston seal ring (10) proceed as follows:

1. Remove the existing Polytetrafluoroethylene (PTFE) seal ring (10) with its O-ring from their groove.
2. Clean the groove carefully and lubricate it with a protective oil film.
3. Assemble the new O-ring into its groove and lubricate it with a protective oil film.
4. Assemble the new PTFE seal ring (10) 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 PTFE the seal ring is made out of allows the ring to shrink back to its previous dimension after a short time.

5.2.1.2 Reassemble

Prior to reassemble, 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 recommended grease.

1. Carefully clean the inside of the tube (7) and check that the entire surface, particularly that of the bevels, is not damaged. Lubricate with a protective oil film the tube internal surface and the bevels at the ends. Slide the tube onto the piston taking care not to damaged the PTFE seal ring (10): the tube bevel has to smoothly compress the seal ring; take care also not to damage the end flange O-ring (18).
2. Assemble the end flange by centring it on the inside diameter of the tube, taking care not to damage the O-ring (18).
3. Assemble the nuts (13) onto the tie rod (11). Tighten the nuts to the recommended torque alternating between opposite corners.
4. Restore a generous coating of grease on the contact surfaces of the rack and pinion.
5. Assemble the new O-rings (17-20) after cleaning the surfaces of the housing (1) and cover (4)
6. Lubricate with protective oil the O-rings (17-20).
7. Assemble the cover (4) and the screw (5). Tighten the screws to the recommended torque.
8. Screw the stop screw (27) by turning it clockwise with an Allen wrench until it reaches its original position (the same distance with reference to the end flange surface).
9. Screw the plug (15) into the cylinder end flange.

NOTICE

Carry out a few operations (Sections 2.5 and 2.7) to check that there are no leakages from the gaskets.

Figure 13. RPHD Double-Acting Hydraulic Actuator

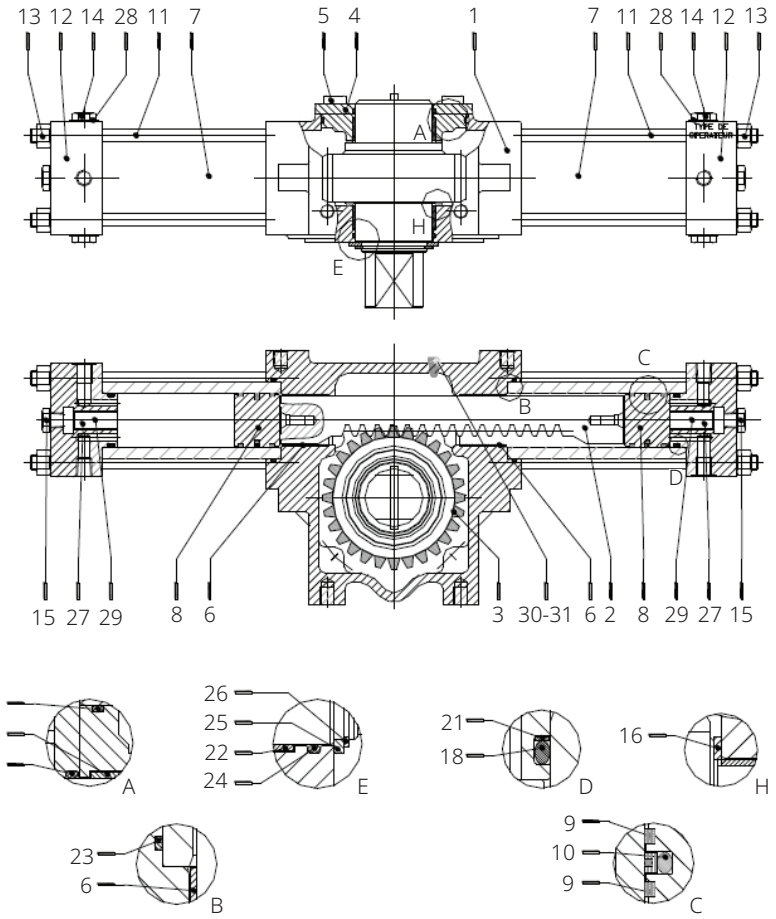


Table 6. Parts List

Item	Description	Item	Description
1	Housing	17	O-ring
2	Rack	18	O-ring
3	Pinion	19	Bushing
4	Cover	20	O-ring
5	Screw	21	Back-up ring
6	Bushing	22	Bushing
7	Cylinder tube	23	O-ring
8	Piston	24	O-ring
9	Guide sliding piston ring	25	Spigot ring
10	Piston seal ring	26	Retainer ring
11	Tie rod	27	Stop setting screw
12	End flange	28	Washer
13	Nut	29	Friction bar
14	Plug	30	Vent valve
15	Plug	31	Vasher
16	Shoulder washer		

5.3 Dismantling and Demolition

⚠ WARNING

Before starting the disassembly, a large area should be created around the actuator 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 Section 2.2.

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

⚠ WARNING

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 (e.g., metallic and plastic materials, fluids, etc.) and send them to differentiate waste collection sites, as provided for by the laws and provisions in force.

Section 6: Troubleshooting

6.1 Failure or Breakdown Research

Table 7.

Event	Possible cause	Remedy
Actuator does not work	Lack of power supply	Restore it
	Lack of hydraulic supply	Open line interception valve
	Blocked valve	Repair or replace
	Wrong position of the distributor of the manual hydraulic group	Restore correct position
	Failure of the control group	Call Biffi Italia s.r.l. Customer Service
	Low supply pressure	Restore (Section 1.4)
Actuator too slow	Low supply pressure	Restore (Section 1.4)
	Wrong calibration of flow regulator valves	Restore (Section 3.6)
	Wear of the valve	Replace
Actuator too fast	High supply pressure	Restore (Section 1.4)
	Wrong calibration of flow regulator valves	Restore (Section 3.6)
Leakages on hydraulic circuits	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 (Section 3.4)
	Wrong warning of microswitches	Restore (Section 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

Section 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 (Section 1.2) for any specific spare part for a specific actuator model.

Please send every spare parts request to:

Biffi Italia s.r.l. - Spare parts and after-sales department

Tel.: +39 0523-944523

Fax: +39 0523-941885

E-mail: Biffispares@Emerson.com

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 Replacement Procedure

Figure 14. RPHD Hydraulic Actuator

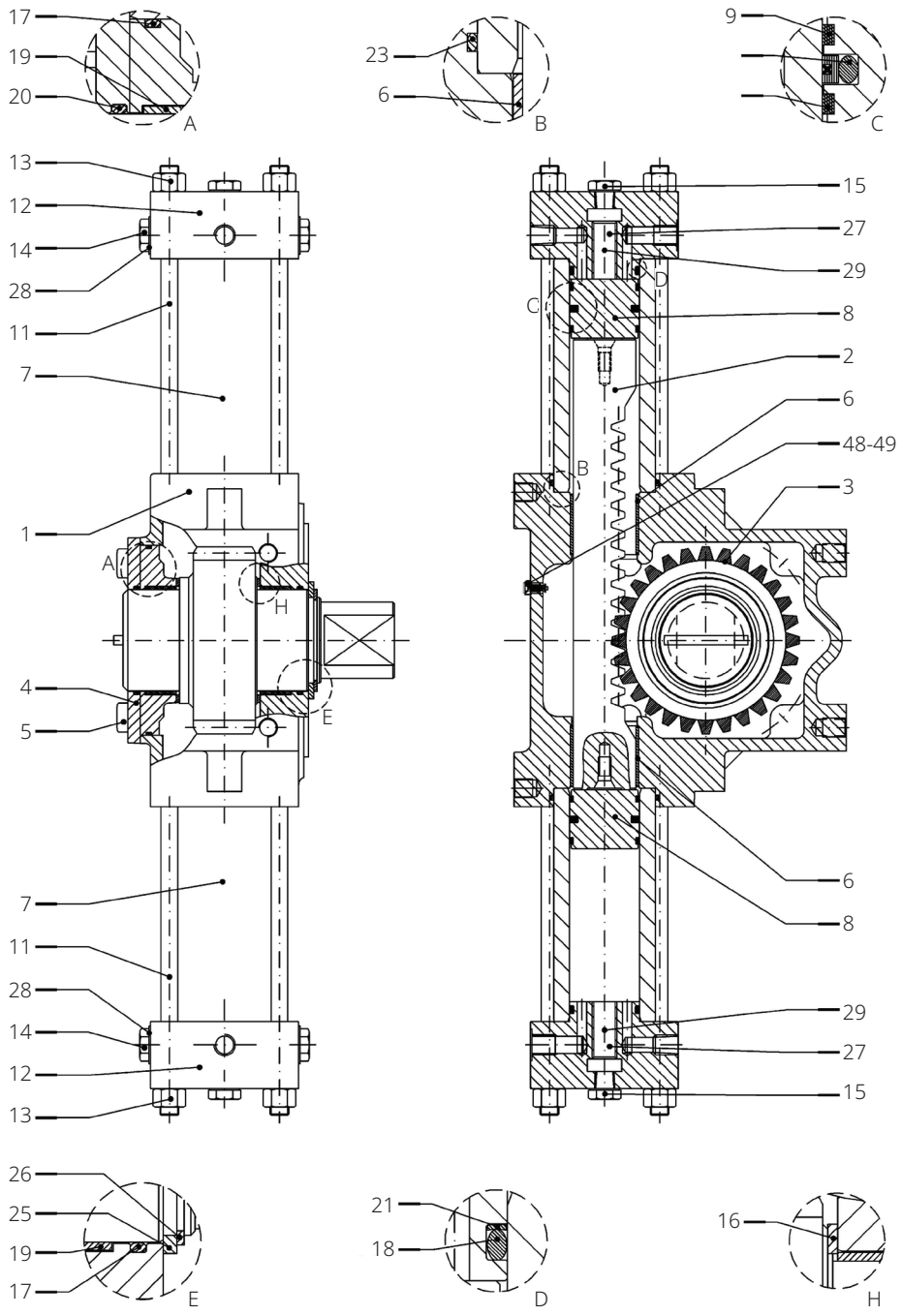


Table 8. Parts List

Item	Quantity	Description	Material
1	1	Housing	Nodular cast iron
2	1	Rack	Alloy steel
3	1	Pinion	Alloy steel
4	1	Cover	Carbon steel
5	4	Screw	Alloy steel
6	2	Bushing	Fe + Bz + PTFE
7	2	Cylinder tube	Nickel-plated carbon steel
8	2	Piston	Carbon steel
9	4	Guide sliding piston ring	* PTFE + Graphite
10	2	Piston seal ring	* PTFE + graphite + NBR
11	8	Tie rod	Alloy steel
12	2	End flange	Carbon steel
13	8	Nut	Carbon steel
14	4	Plug	Stainless steel
15	2	Plug	Stainless steel
16	2	Shoulder washer	* Ertacetal
17	2	O-ring	* NBR
18	2	O-ring	* NBR
19	2	Bushing	Fe + Bz + PTFE
20	1	O-ring	* NBR
21	2	Back-up ring	* NBR
23	2	O-ring	* NBR
25	1	Spigot ring	Nylon
26	1	Retainer ring	* Stainless steel
27	2	Stop setting screw	Carbon steel
28	4	Washer	Copper
29	2	Friction bar	Nylon
48	1	Vent valve	Stainless steel
49	1	Washer	PVC

NOTE:
* Recommended spare parts

Section 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).....

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