

# PPC Hydraulic Power Packs Compact series

Assembling advices for qualified staff  
HANDBOOK

We thank you for your choice of Hydronit advanced range; you have purchased a superior product made out of the best quality materials and technology available.

For a proper use of our components, we invite you to carefully follow the instructions and the advices stated in this handbook.

This handbook is addressed to trained and qualified staff that however cannot replace a professional and competent installer. The qualified staff have got a sufficient knowledge of Hydronit range of products thanks to technical train and experience. The qualified staff is liable for the application, security and directions requested by the rules in force.

The user is liable for the product and accessories choice. Therefore it is important for the user to analyse its own application and the problems involved, making adequate analysis and tests.

Hydronit Srl is not liable for damages to persons and things due to a bad or incorrect installation of PPC power units.

Hydronit Srl is making a continuous research and development of its products with the consequent right to modify all necessary technical specifications at any time without notice.

Hydronit management team

### 1: General instructions

Please read carefully the PPC Use and Maintenance Handbook for safety instructions end general instructions, before operating on the power units and on its parts. Remember to:

- use accident prevention protections;
- work in very good cleaning conditions;
- work in maximum security conditions;
- use suitable and clean instruments, tools and benches.

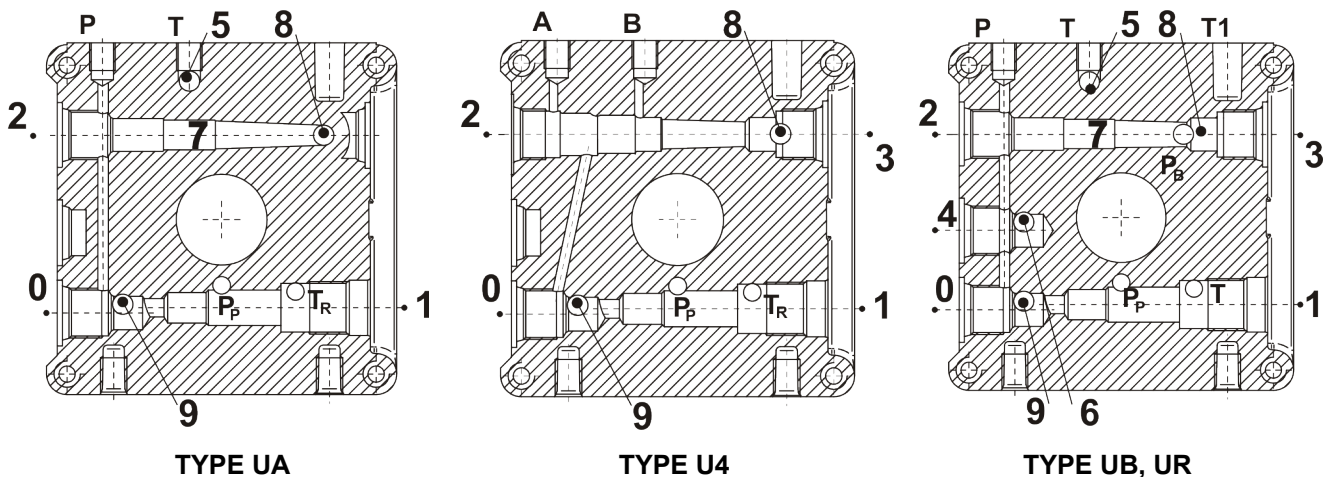
**Warning:** during the operations of commissioning, normal service, maintenance, installation breathing and flushing, adjustment of valves and control devices, there could be hydraulic fluid outlet with sudden splashes at such high temperature that could cause skin burns.

The hydraulic fluid can be dangerous for health as its contact with eyes and skin can cause serious damages. Carefully follow the security rules stated by the fluid manufacturers on the technical and toxicity specifications card of the product.

The hydraulic fluid is a polluting product. Therefore it is better to avoid fluid leakages using gathering tanks and accidental fluid leakages using absorbent products.

### 2: Universal central manifolds

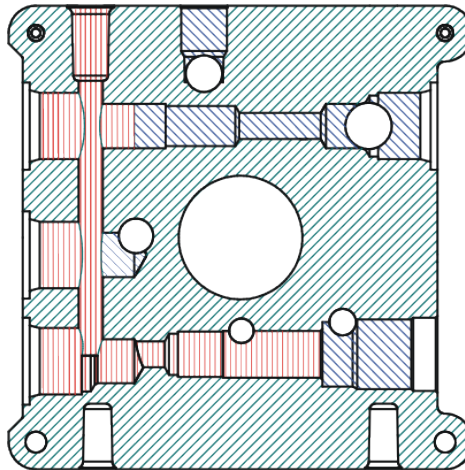
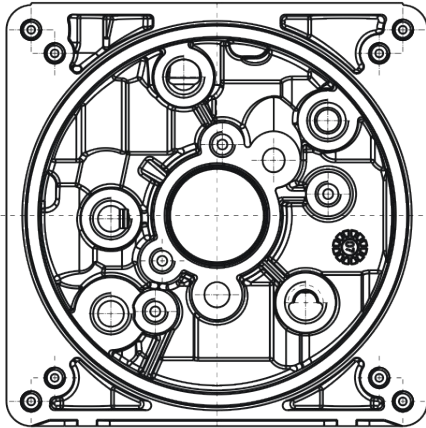
They are supplied pre-tested at 270 bar against leakage and porosity and are available in four different executions: type UA, type U4, type UB and UR. Their cavities for integral valves are normally recognized by a number as per below scheme:



You can easily recognize type **U4** from the fact it has one additional machined lateral cavity: cavity 3. You can easily recognize type **UB** and **UR** from the fact they have two additional machined lateral cavities: cavity 3 and cavity 4. The **UR** body, as difference with the UB, has the cavity 5 connected with the cavity 7 and the extra  $P_B$  port for the second reversible pump outlet port.

TYPE UA cavities:	TYPE U4 cavities:	TYPE UB and UR cavities:
1: 1/4"BSPP and M20x1,5 0, 2: 3/4-16 UNF 2B 5, 8, 9: 1/4" BSPP 7: Ø12,7 - not threaded	1: 1/4"BSPP and M20x1,5 2: 4-way valve cavity 0, 3: 3/4-16 UNF 2B 8, 9: 1/4" BSPP	1: 1/4"BSPP and M20x1,5 0, 2, 3, 4: 3/4-16 UNF 2B 5, 6, 8, 9: 1/4" BSPP 7: Ø12,7 - not threaded

Below picture is given as general indication of the pressure (red vertical grid) / return to tank (blue 45° grid) line passages within the manifold in typical applications. The flexibility of the PPC central manifold permits to realize applications with different distribution of pressure / return line passages, so take this scheme just as reference.



Before mounting valves and components inside the manifold block, check the presence of dust and dirt and properly clean and flush it. The presence of hydraulic oil is normal and due to the in-factory testing procedure.

## 2: Integral valves

Proper assembly and installation are very important for a good long time service for an hydraulic system. Dust and dirt are the worst enemies for hydraulic systems. During the installation take care of cleaning, making the principal connecting operations in clean and dust free rooms.

Mounting sequence:

Valve	Cavity	Instructions	Tools
VUC20	0	Please check if VUC20 main check valve is already mounted within cavity n° 0 (3/4" BSP). If not, screw the valve in the central manifold. The cartridge have flow inlet from the edge and outlet from the cartridge side. Recommended screwing torque is from 20 to 40 Nm.	Allen wrench 3
VMDC35	1	Locate the annealed copper ring supplied with the valve in the groove at the bottom of the M20x1,5 cavity. Screw in the relief valve. Recommended torque is 45 Nm.	Hex. key 24
1/4" BSP VSC01 valves	5, 6, 8	Screw the valve in required port. Teflon or liquid sealing (Loctite or similar) are not required.	Straight screw-driver

Valve	Cavity	Instructions	Tools
SUV (Start Up Valve)	9	<p>Cavity 9 must be firstly threaded 1/4"BSPP and the bottom drilled opened with a 6mm hole, possibly out of center towards the relief valve.</p> <p>The SUV valve gap F must be regulated in a way to have its closing at a flow at least 30% lower than the nominal one of the pump, according to the following diagram. The SUV valve is not suggested for flows lower than 4-5 l/min.</p> <p>Screw the valve in the cavity 9 with the closing disk orientated towards the bottom of the cavity, taking care not to screw it too much, what would keep the valve always closed. A threads sealing liquid (Loctite,...) is suggested to keep the valve in place.</p>	<p>F (mm)</p> <p>Q (l/min)</p>
Ø 12,7 VSC04 valves	7	<p>Fit the valve in cavity 7, below cavity 2, taking care the direction as per below drawing is respected. Comparing to VSC01 (1/4"BSPP), this execution, functionally interchangeable with the above, has the advantage of an easiest mounting/unmounting during new systems first commissioning. It is normal in these cases to try different flow settings to suit the specific application requirements. VSC04 can be changed just unscrewing the 3/4-16UNF valve in cavity 2.</p>	-
3/4-16 UNF valves and plugs	2, 3, 4	<p>Firstly check that the valve can operate with the peculiar flow direction of the cavity in which we are going to fit it. Cavities 2 and 4 have flow inlet on the cartridge side and outlet from the edge. Cavity 3 works in the other way (inlet from the edge and outlet from the cartridge side).</p> <p>Screw-in each valve with recommended torque from 15 to 40Nm (see each valve technical table in PPC catalogue).</p>	Hex. key 22 or 24
PMC02 hand pump & CM04 lever valves	2,4	<p>Screw-in the cartridge with recommended torque of 20Nm. Due to dimensional constraints, the tightening nut height is limited. Do not over-torque to avoid damage on the nut hexagon.</p> <p>Mount the die-cast aluminium cover taking care that the lever termination inside the cover fits inside the hinge point of the cartridge.</p> <p>Fix the cover with two M5x45 bolts, with proper washers. Recommended torque from 5Nm. Do not over torque.</p> <p>Fix the hand lever in required position.</p> <p>In case of the PMC02 hand pump, proper 1/4"BSPP suction piping must be fitted in cavity 6 or 8, checking it does not present fractures which could let air in. Remember to commission the pump by acting a few times on the lever until the air bubbles come out of the cartridge.</p>	Hex. key 22

### 3: tank pipes and filters

Return line pipes should be normally mounted before the gear pump is assembled. Use only 1/4" BSP pipes made in steel or oil resistant polymer (such as PP or PVC). Pipes supplied by Hydronit are generally in polyethylene. With horizontal mounting tanks, proper elbows should be forecast.

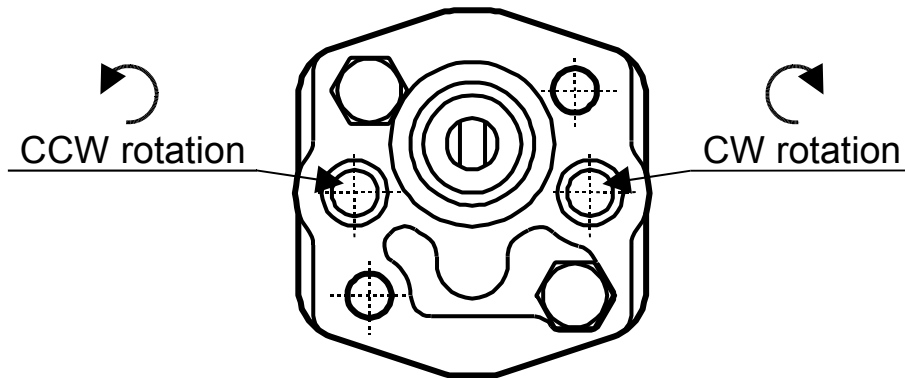
In all cases respect following advices:

- the return pipes terminals should be below the minimum fluid level to avoid foam generation during the power pack functioning. We suggest to cut the terminal of the return pipe at 45° and turn it towards the tank wall.
- return pipes should be placed as far as possible from the inlet pipes
- with small flow (below 4 l/min) return pipes could be substituted by diffusers plugged directly in the 1/4" BSP return port in the central manifold. Ask our technical office for more details.
- inlet (suction) pipes are 3/8" BSP pipes in steel or oil resistant polymer. They must be fitted in the suction port on the back of the gear pump. With horizontal mounting tanks, proper elbows should be forecast.
- the suction pipes terminals should be well below the minimum fluid level to avoid air suction, thus pump cavitation, during the power pack functioning.
- at the suction terminal a strainer filter is normally fitted. For flows greater of 6-7 l/min round net filters Ø80mm are suggested. For lower flows, Ø63mm round net filters are appropriate. Screw the filter by hand completely, at end stroke lightly force the threading making the filter thread penetrate the plastic pipe, in order to grant a mechanical and hydraulic sealing.

Filters, diffusers and pipes must be regularly checked, after the first power pack flushing and commissioning and -during the power pack normal operation- in occasion of each hydraulic fluid filling or replacement, in order to prevent the presence of impurities which could clog the system and cause pump cavitation and valves malfunctioning. See PPC use and maintenance handbook.

### 4: gear pump

The sense of rotation of the gear pump can be clockwise (CW) or counter-clockwise (CCW - the sense of rotation is given looking the pump having the shaft in front of you). Check the presence of a direction sticker or mark on the pump body. In most common cases, supplied pumps are with clockwise rotation. Below picture shows the pump from shaft side: arrows show open the port for clockwise or counter-clockwise rotation. Reversible pumps have both ports open plus a third drain port which must be kept open.



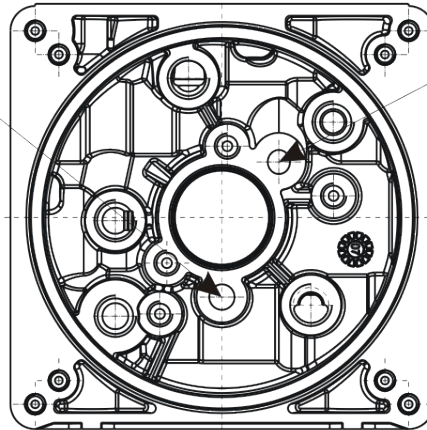
Remove the protection plastic caps from the pump inlet and outlet ports. Check the o-ring on the outlet port is properly in position.

Fit the pump in the central manifold centering housing (Ø32mm), taking care the outlet port is in coincidence with the relevant P port on the central manifold.

In case of gr.0 pumps, needs the use of the adapter flange, to fix at the central manifold with two M8x20 bolts with short head. Fix the pump at the flange with two M5 bolts.



Standard P port



2<sup>nd</sup> P port for reversible pump

In some cases, particularly with reversible pumps, you will have a double outlet port. In this case an additional P port must be forecast on the central manifold.

Fix the pump with two M8 bolts (8.8 class steel bolts required) provided with elastic washers. The bolts length should be longer enough so that the threaded part protrusion to fix the pump to the PPC central manifold is at least 12mm. Recommended torque is 25Nm. Do not over torque. We suggest the use of a proper torque limiter key for this operation.

On the inlet port of the pump connect a pipe 3/8"-3/8" with the length adequately to the tank and an inlet filter.

For the gr.0 pump the suction pipe must be 1/4"-1/4".

In case of reversible pump gr.0 the two check valves are integrated on the pumps, so the assembling is the same of the single rotation pump. On the gr.1 reversible pumps a second inlet pipe 1/4"-1/4" with filter on cavity 6 and an in-line check valve on the inlet port of the pump must be mounted. A relevant technical table is available on request.

#### 5: Electric motors

We suggest to assemble heavy motors on the central manifold first, then fit the relevant coupling and, as third step, mount the gear pump. In this way the operator's work during assembling is facilitated.

With small motors, up to 5 kg, the gear pump can be mounted first, then the coupling and the motor.

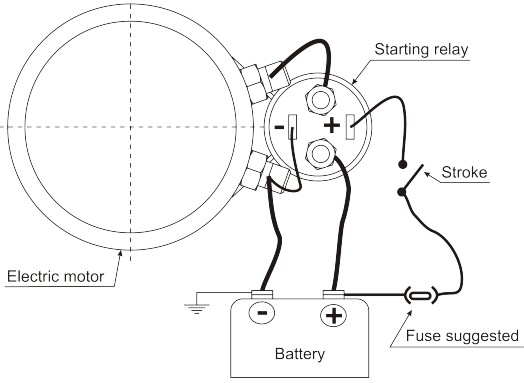
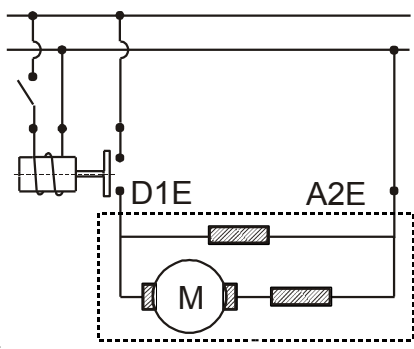
For a proper motor choice check the relevant technical tables on PPC Power Pack Compact series catalogue and eventually contact our technical department.

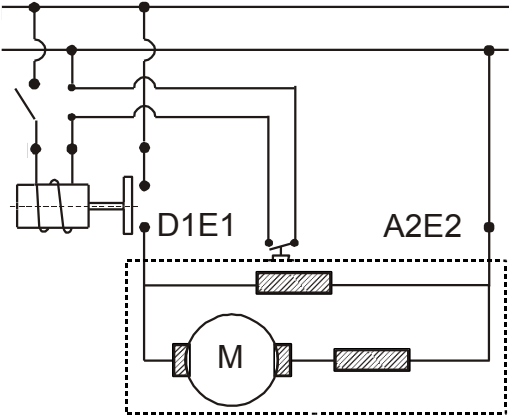
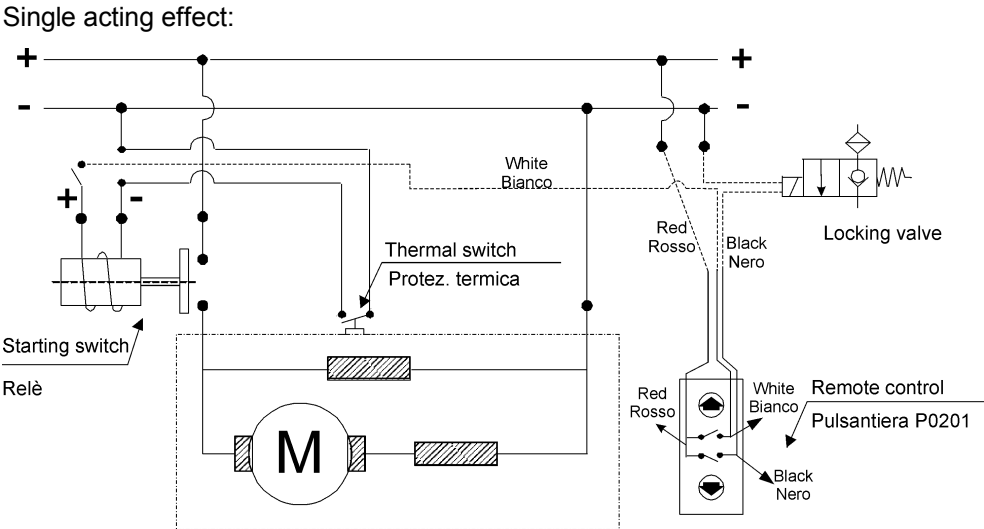
#### DC motors:

<b>Motor</b>	<b>Mounting kit</b>	<b>Instructions</b>	<b>Tools</b>
0,5kW DC 0,8kW DC Ø80	E36200006 coupling for gr.0 pump  E36200002 coupling for gr.1 pump  2 M6x16 bolts	After mounting the gear pump, fit the coupling in its position, after greasing its two milled edges. Then position the motor taking care that the motor shaft slot properly fits on the coupling. Turn the motor in order to have the fixing holes in coincidence of the threaded holes on the central manifolds. Fix the motor with two M6x16 bolts with a tightening torque of 8-19 Nm.	Allen wrench 5
1,6kW 12DC 2,1kW 12DC 2,2kW 24DC Ø112	E36200001 coupling  2 M6x160 bolts	We suggest to mount the motor before the gear pump.  Keep off the plastic protection cap on the shaft side of the motor. Keep in position the motor rotor by hands to prevent it to move and slip out (this would cause the motor brushes and springs also to come out of their holder).  Put the motor on a stable horizontal surface with shaft upward. Gently slip the central manifold on the motor bearing until it comes to the bottom. Turn the central manifold in order to have the fixing holes in coincidence of the threaded bolts which will fix the motor. Fit two M6x160 bolts with appropriate elastic washers from the rear of the motor and fix it with a tightening torque of 8-19 Nm.  After the motor is properly fixed, you can mount the coupling	Allen wrench 5

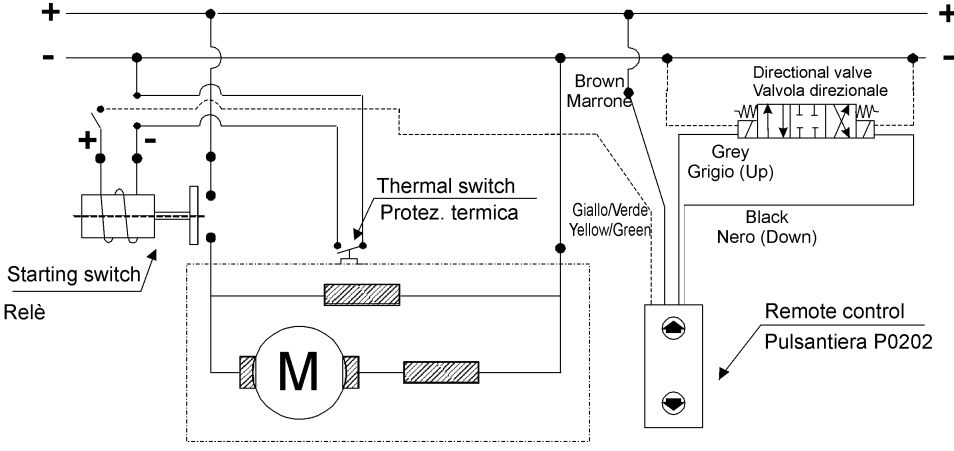
<b>Motor</b>	<b>Mounting kit</b>	<b>Instructions</b>	<b>Tools</b>
		and the pump.	
2,4kW 12DC 3,0kW 24DC Ø125	E36200001 coupling 4 M6x260 bolts	<p>We suggest to mount the motor before the gear pump.</p> <p>Keep off the plastic protection cap on the shaft side of the motor. Keep in position the motor rotor by hands to prevent it to move and slip out (this would cause the motor brushes and springs also to come out of their holder).</p> <p>Put the motor on a stable horizontal surface with shaft upward. Gently slip the central manifold on the motor bearing until it comes to the bottom. Turn the central manifold in order to have the fixing holes in coincidence of the threaded bolts which will fix the motor. Fit four M6x260 bolts with appropriate elastic washers from the rear of the motor and fix it with a tightening torque of 8-19 Nm.</p> <p>After the motor is properly fixed, you can mount the coupling and the pump.</p>	Press system, Allen wrench 5
2,5kW 12CC 3,0kW 24CC 4,0kW 24CC Ø151		See B14 AC motors mounting instructions	-

**DC motor accessories**

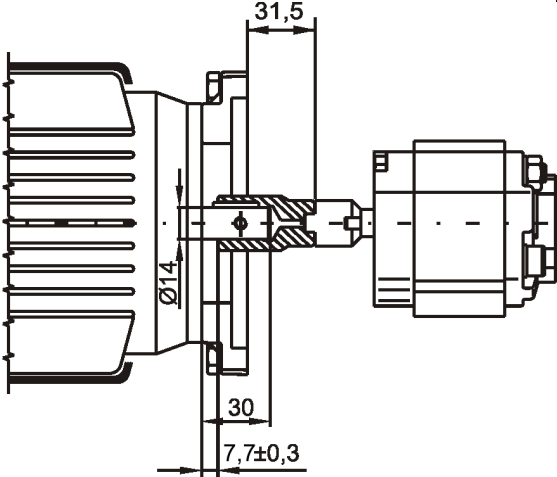
<b>Accessory</b>	<b>Instructions</b>	<b>Tools</b>
Starter solenoid switch	<p>Attention! To connect the + pole of the starter switch to the DC motor use copper band wire of proper section, depending on the load current. This can be as high as 500A or more. On ø112 motors you can fix the starter directly to the motor with two M5 bolts.</p>  	Allen wrench 4

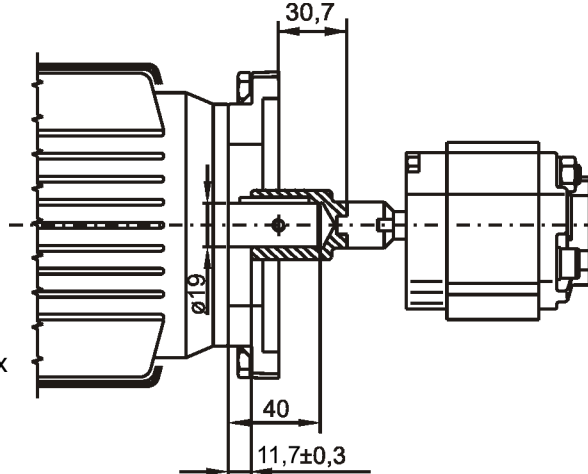
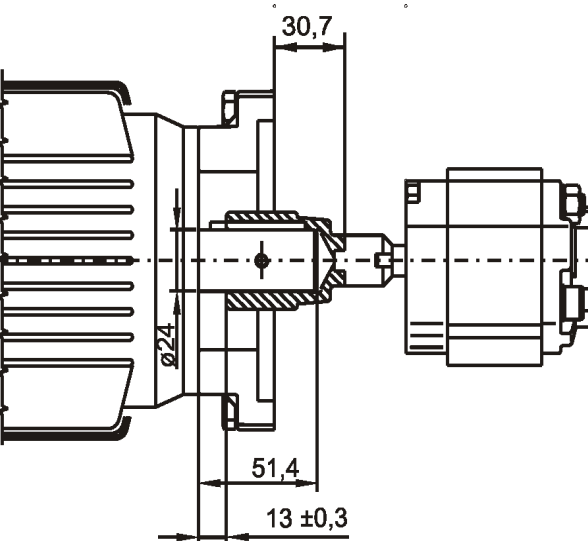
Accessory	Instructions	Tools
<p>Thermal protection switch</p>	<p>This is normally supplied already integrated within the motor. In the Ø125 and Ø151motors is always present.</p> <p>In case of 1,6kW 12DC / 2,2kW 24DC Ø114 motors, the thermal protection switch has the form of a wired plug to be mounted in the relevant cavity on the back cover of the motors. Supplied thermal switches are designed to sustain the current absorbed by the starter solenoid switch and have a sufficient temperature hysteresis, so that can be used as direct automatic motor protection when connected as follows:</p> 	
<p>Protection cover</p>	<p>Just fix it using one or two prolonged threaded bar M6 in place of the M6x160 bolts normally used to fix the motor to the central manifold. Use fixing M6 nuts below and above the cover to keep it in proper position.</p>	<p>Hex. key 10</p>
<p>Remote pendant controller</p>	<p>The connection of remote controller is to effect as the scheme, depending by the system to control, with single or double acting effect cylinder.</p> <p>Single acting effect:</p> 	

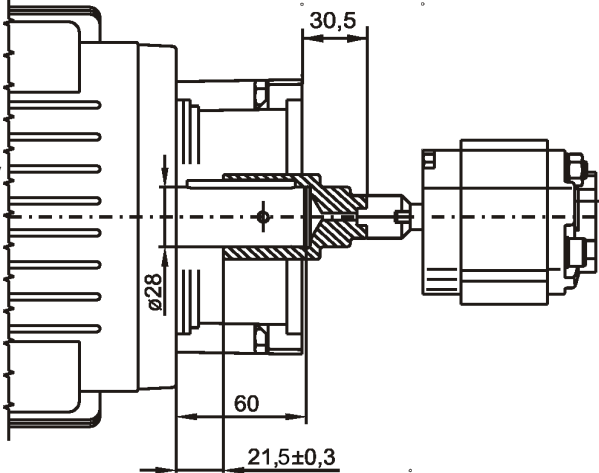


Accessory	Instructions	Tools
	<p>Double acting effect:</p> 	

**Ac motors**

Motor	Mounting kit	Instructions	Tools
frame 71/80/90 integral motors	E36100000 coupling four M8x25 bolts + elastic washers	<p>Integral motors of all available frame size offer an easy mounting, since do not require flanges or adaptors, and share one single coupling type for all powers and types.</p> <p>While keeping the motor vertically with shaft towards the top on a stable horizontal surface, fit in position the E36100000 coupling on motor shaft slot lightly greased. You can then add the central manifold already fitted with all valves and components and fix it with four M8x25 bolts with relevant elastic washers.</p> <p>Fit the gear pump. (see point 4)</p>	Hex. key 13
frame 71/80 B14 motors	XB14-71 flange +coupling kit four M6 and four M8x25 bolts	<p>Fit the square flange (cod F27010001) on B14 motor flange and fix it with four M6 bolts of proper length. Fit the motor side semi-coupling (cod. E36100001) on B14 motor shaft and fix it with the lateral nut screw, taking care that below quote is respected. <i>Attention! The semi-coupling on the motor side should not be pushed to the end; the clearing is necessary to compensate the wide variations in motor shaft lengths of the different producers.</i></p> <p>While keeping the motor vertically with shaft towards the top on a stable horizontal surface, fit in position the E36100000 coupling on the motor semi-coupling slot lightly greased. You can then add the central manifold already fitted with all valves and components and fix it with four M8x25 bolts</p> 	Hex. key 10 and 13

Motor	Mounting kit	Instructions	Tools
		<p>with relevant elastic washers. Fit the gear pump. (see point 4)</p>	
<p>frame 80 B14 motors</p>	<p>XB14-80 flange +coupling kit four M6 and four M8x25 bolts</p>	<p>Fit the square flange (cod F27010002) on B14 motor flange and fix it with four M6 bolts of proper length. Fit the motor side semi-coupling (cod. E36100002) on B14 motor shaft and fix it with the lateral nut screw, taking care that below quote is respected. <i>Attention! The semi-coupling on the motor side should not be pushed to the end; the clearing is necessary to compensate the wide variations in motor shaft lengths of the different producers.</i></p> <p>While keeping the motor vertically with shaft towards the top on a stable horizontal surface, fit in position the E36100000 coupling on the motor semi-coupling slot lightly greased. You can then add the central manifold already fitted with all valves and components and fix it with four M8x25 bolts with relevant elastic washers.</p>  <p>Fit the gear pump. (see point 4)</p>	<p>Hex. key 10 and 13</p>
<p>frame 90 B14 motors</p>	<p>XB14-90 flange +coupling kit eight M8x25 bolts</p>	<p>Fit the square flange (cod F27010003) on B14 motor flange and fix it with four M8 bolts of proper length. Fit the motor side semi-coupling (cod. E36100003) on B14 motor shaft and fix it with the lateral nut screw, taking care that below quote is respected. <i>Attention! The semi-coupling on the motor side should not be pushed to the end; the clearing is necessary to compensate the wide variations in motor shaft lengths of the different producers.</i></p> <p>While keeping the motor vertically with shaft towards the top on a stable horizontal surface, fit in position the E36100000 coupling on the motor semi-coupling slot lightly greased. You can then add the central manifold already fitted with all valves and components and fix it with four M8x25 bolts with relevant elastic washers.</p>  <p>Fit the gear pump.</p>	<p>Hex. key 13</p>

Motor	Mounting kit	Instructions	Tools
		(see point 4)	
frame 100/112 B14 motors	XB14-100 flange +coupling kit eight M8x25 bolts	<p>Fit the square flange (cod F27010004) on B14 motor flange and fix it with four M8 bolts of proper length. Fit the motor side semi-coupling (cod. E36100004) on B14 motor shaft and fix it with the lateral nut screw, taking care that below quote is respected. <i>Attention! The semi-coupling on the motor side should not be pushed to the end; the clearing is necessary to compensate the wide variations in motor shaft lengths of the different producers.</i></p> <p>While keeping the motor vertically with shaft towards the top on a stable horizontal surface, fit in position the E36100000 coupling on the motor semi-coupling slot lightly greased. You can then add the central manifold already fitted with all valves and components and fix it with four M8x25 bolts with relevant elastic washers.</p>  <p>Fit the gear pump. (see point 4)</p>	Hex. key 13

## 6: Tanks

Assembly of the reservoir: to assemble the reservoir it is necessary to put the power unit in such a way to facilitate the operator's work.

Prior of assembling:

- check the reservoir cleaning
- check the clamp to be smooth, without burrs, welding slags, scoring, etc.
- check the o-ring and its seat are clean
- grease the clamp and the o-ring
- insert the reservoir with a firm hand pressure
- eventually slightly rotate the tank to have the fixing holes in coincidence with the threaded holes on the central manifold.

### Steel reservoirs

- fit four M6x16 screws in their seats and tighten them by hand
- tighten the screws uniformly with a tightening torque of 8-19 Nm

### Plastic reservoirs

- fit the clamp band around the tank neck
- (L type only): fit two or four washers M6 (thickness 3mm) below clamp brackets code E60513022. Four clamp brackets are suggested for the 2,5 and 3,5 l tanks.
- fit four M6x16 screws in their seats and tighten them by hand
- tighten the screws uniformly with a tightening torque of 8-19 Nm
- tighten the clamp band

Disassembly of the reservoir: no particular attention has to be paid in the reservoir disassembly operation, just empty it from the hydraulic fluid; the disjunction from the power unit (and vice-versa) must be done by hand with a light swinging of one of the two components.

This operation must be done with great care as disjunction may occur suddenly, causing the eventual exit of remaining hot fluid. Using levers or screwdrivers may cause dents or scoring that could jeopardize the power unit.

#### 7: External manifolds

The range of Hydronit external manifolds is designed for the maximum mounting flexibility, in order to have the best adaptability to the room available on modern machines.

The manifolds are modular, i.e. can be stacked one upon the other, with passing-through P and T ports. The fixing bolts length should be long enough so that the threaded part protrusion to fix the manifolds to the PPC central manifold is at least 12mm (M8 bolts) or 9mm (M6 bolts). Take care that the two o-rings (OR 13.94x2.62 NBR 90 - OR3056) on P and T ports are in place before mounting. the blocks.

<b>Manifold</b>	<b>Mounting bolts</b>	<b>Instructions</b>	<b>Tools</b>
E60403004	2xM8 8.8 class	Spacing element. Generally required with all AC motors with frame 80 and over, underneath the cetop 3 manifold blocks, in order to have sufficient room to mount the cetop 3 valves.	Allen wrench 6
E60403001	2xM8 8.8 class	Cetop 3 parallel circuit with rear A-B ports. Generally used with smaller tanks.	Allen wrench 6
E60403010	2xM8 8.8 class	Cetop 3 parallel circuit with lateral A-B ports. Generally used with bigger tanks to ease the pipe fittings mounting.	Allen wrench 6
E60403003	2xM8 8.8 class	Cetop 3 serial circuit with rear A-B ports. Generally used with smaller tanks. The T port of one manifold is connected to the P port of the following manifold in the stack.	Allen wrench 6
E60403011	2xM8 8.8 class	Cetop 3 serial circuit with lateral A-B ports. Generally used with bigger tanks to ease the pipe fittings mounting. The T port of one manifold is connected to the P port of the following manifold in the stack.	Allen wrench 6
E60403005	2xM8 8.8 class	90° rotation manifold. Used with three or more cetop 3 manifolds, it lets mounting of the additional cetop 3 manifolds parallel to the motor, in order to reduce the lateral dimensions of the power pack	Allen wrench 6
E60413001 /2/3	2xM8 8.8 class	Cetop 3 parallel circuit with integral piloted check valves and lateral A-B ports.	Allen wrench 6
E60403030 E60403031	4xM6 8.8 class	Modular manifold for ¾-165UNF cartridge valves. Please note that this kind of manifold is not stackable but cannot be mixed with stackable ones for cetop 3 due to the different bolts sets.	Allen wrench 5

#### 8: Cetop 3 valves

Place the SD03 cetop valve on the manifold taking care that P-T-A-B ports are properly corresponding to the relevant ports on the block. Due to the asymmetric fixation of Cetop3 standard (A port on the side of the two M5 bolts with distance 31mm) this operation should be quite easy.

Fit the plug connector on the coil and the coil on the valve solenoid, fixing it with provided closing ring. The coil can be rotated in any position on solenoid tube. The coil connector cable entry can be rotated with 90° intervals by opening and reassembling the contacts holder inside the plug housing.

Fix the valve with four bolts M5x30 of steel class 10,9 or higher. Recommended torque 5 Nm.

#### 9: Accessories

Foot mounting support: fix it to the central manifold with two M10x18 bolts and appropriate washers. The foot mounting support can be fixed to the machine frame by four M8 bolts.

**10: Installation and commissioning**

The sense of rotation of the motor can be clockwise or counter-clockwise (the sense of rotation is given looking the motors having the shaft in front of you). Check the presence of a direction sticker or mark on the motor body. In most common cases, supplied motors are with counter-clockwise rotation.

Electrically connect the motor as per following connection schemes. This operation is to be carried out only by qualified people. Never operate on electric parts of the motor with the power line connected!

Attention! During operation motors can reach high temperatures, often exceeding the “threshold of burn” (as defined in UNI EN 563 standards). As the “reduction of the surface temperature” cannot be treated as a technical solution (UNI EN 563 appendix C), the operator must use protections such as screens or barriers, warning signals and personal protections (gloves).

<b>Motor type</b>	<b>Instructions</b>	<b>Connection scheme</b>
Three phase 230/400V	Connect the pins inside the electric terminal box as per side connection scheme. Connect the three phases L1, L2 and L3. To inverse rotation, just switch two of the three phases. Most commonly used pumps are with CW rotation, so you should connect the motors for CCW rotation (looking from shaft side).	
Single phase 230V	Connect the pins inside the electric terminal box as per relevant connection scheme. Most commonly used pumps are with CW rotation, so you should connect the motors for CCW rotation (looking from shaft side). Connect the N and L lines.  <i>Attention!</i> Never touch the capacitor pins U2 and W1. Capacitors remain charged even when the power line is disconnected.	

**Check list of controls:** check the right working of all controls.

- Relief valve: the relief valve is a security component, therefore it must not be unduly operated, for example: replacement of the adjustment screw. The security standards state that the relief valve of the power unit has to be leaded to avoid any unduly operation.
- Air breathing: during the first commissioning, it is necessary to make an air breathing of the hydraulic system to avoid foam in the reservoir and eventual uncontrolled movements of cylinders. At the same time, check again the fluid level and, if necessary, fill-up to the proper level. After some working hours, check the eventual presence of leakages in all the system, check again the fluid level and eventual presence of foam.

**11: Maintenance**

An hydraulic system where the operation of installation, assembly and commissioning have been duly done will have a long life without troubles and will not need particular maintenance.

It is necessary to often check the quality and the state of the fluid transmitting the power and to be sure there are no impurities inside the circuit; the reliability of any hydraulic machine is tied to this: it is now scientifically stated that the principal cause of troubles in hydraulic systems is due to the wear and aging of the hydraulic fluid with consequent loss of its chemical-physic performances and to the presence of particles and micro-particles continuously running inside the fluid and to, causing wear and damage. These particles free to run inside the circuit, act as an abrasive mixture scratching the surfaces they contact and dragging further contamination in circulation; of course the more sophisticated are the installations the worst incidence have these damages.

Since the installation starting-up, the maintenance is made by small operations that must be done regularly to be really effective. It is extremely important to program the maintenance operations and report them on

machines or installation cards; these cards must always follow each power units or each part of the installation.

Appendix A: general conditions of use

- ISO6743/4 (DIN 51519) mineral base hydraulic fluid
- Hydraulic fluids viscosity must be according to ISO 3448 standards:
- min. viscosity: 22 mm<sup>2</sup>/S
- max. viscosity: 100 mm<sup>2</sup>/S
- advised viscosity: 46 mm<sup>2</sup>/S
- The contamination degree must not be higher than 18/14 ISO 4406 class
- Minimum temperature of the hydraulic fluid: -15°C
- Maximum temperature of the hydraulic fluid: +70°C
- Optimal temperature of the hydraulic fluid: +30°C ~ +50°C
- Minimum environment temperature: -15°C
- Maximum environment temperature: +50°C
- Use new and filtered hydraulic fluid (25 μ or better)
- Never mix hydraulic fluids of different manufacturers as they can cause dangerous mud and sediments.