

L.... Rev. 06/06

Index:

English: 1-11

Repair Parts Sheets for this product are available from the Enerpac web site at www.enerpac.com, or from your nearest Authorized Enerpac Service Center or Enerpac Sales office.

1.0 IMPORTANT RECEIVING INSTRUCTIONS

Visually inspect all components for shipping damage. Shipping damage is **not** covered by warranty. If shipping damage is found, notify carrier at once. The carrier is responsible for all repair and replacement costs resulting from damage in shipment.

SAFETY FIRST

2.0 SAFETY ISSUES



Read all instructions, warnings and cautions carefully. Follow all safety precautions to avoid personal injury or property damage during system operation. Enerpac cannot be responsible for damage or injury resulting from unsafe product use, lack of maintenance or incorrect product and/or system operation. Contact Enerpac when in doubt as to the safety precautions and operations. If you have never been trained on high-pressure hydraulic safety, consult your distribution or service center for a free Enerpac Hydraulic safety course.

Failure to comply with the following cautions and warnings could cause equipment damage and personal injury.

A **CAUTION** is used to indicate correct operating or maintenance procedures and practices to prevent damage to, or destruction of equipment or other property.

A **WARNING** indicates a potential danger that requires correct procedures or practices to avoid personal injury.

A **DANGER** is only used when your action or lack of action may cause serious injury or even death.



WARNING: Wear proper personal protective gear when operating hydraulic equipment.



WARNING: Stay clear of loads supported by hydraulics.

A cylinder, when used as a load lifting device, should never be used as a load holding device. After the load has been raised or lowered, it must always be blocked mechanically.



WARNING: USE ONLY RIGID PIECES TO HOLD LOADS.

Carefully select steel or wood blocks that are capable of supporting the load. Never use a hydraulic cylinder as a shim or spacer in any lifting or pressing application.



DANGER: To avoid personal injury keep hands and feet away from cylinder and workpiece during operation.



WARNING: Do not exceed equipment ratings. Never attempt to lift a load weighing more than the capacity of the cylinder. Overloading causes equipment failure and possible personal injury. The cylinders are designed for a max. pressure of 10,000 psi (350 bar). Do not connect a jack or cylinder to a pump with a higher pressure rating.



Never set the relief valve to a higher pressure than the maximum rated pressure of the pump. Higher settings may result in equipment damage and/or personal injury.



WARNING: The system operating pressure must not exceed the pressure rating of the lowest rated component in the system. Install pressure gauges in the system to monitor operating pressure. It is your window to what is happening in the system.



CAUTION: Avoid damaging hydraulic hose. Avoid sharp bends and kinks when routing hydraulic hoses. Using a bent or kinked hose will cause severe back-pressure. Sharp bends and kinks will internally damage the hose leading to premature hose failure.



Do not drop heavy objects on hose. A sharp impact may cause internal damage to hose wire strands. Applying pressure to a damaged hose may cause it to rupture.



IMPORTANT: Do not lift hydraulic equipment by the hoses or swivel couplers. Use the carrying handle or other means of safe transport.



CAUTION: Keep hydraulic equipment away from flames and heat. Excessive heat will soften packings and seals, resulting in fluid leaks. Heat also weakens hose materials and packings. For optimum performance do not expose equipment to temperatures of 150 °F (65 °C) or higher. Protect hoses and cylinders from weld spatter.

DANGER: Do not handle pressurized hoses. Escaping oil under pressure can penetrate the skin, causing serious injury. If oil is injected under the skin, see a doctor immediately.

WARNING: Only use hydraulic cylinders in a coupled system. Never use a cylinder with unconnected couplers. If the cylinder becomes extremely overloaded, components can fail catastrophically causing severe personal injury.

WARNING: BE SURE SETUP IS STABLE BEFORE LIFTING LOAD. Cylinders should be placed on a flat surface that can support the load. Where applicable, use a cylinder base for added stability. Do not weld or otherwise modify the cylinder to attach a base or other support.

Avoid situations where loads are not directly centered on the cylinder plunger. Off-center loads produce considerable strain on cylinders and plungers. In addition, the load may slip or fall, causing potentially dangerous results.

Distribute the load evenly across the entire saddle surface. Always use a saddle to protect the plunger.

IMPORTANT: Hydraulic equipment must only be serviced by a qualified hydraulic technician. For repair service, contact the Authorized ENERPAC Service Center in your area. To protect your warranty, use only ENERPAC oil.

WARNING: Immediately replace worn or damaged parts by genuine ENERPAC parts. Standard grade parts will break causing personal injury and property damage. ENERPAC parts are designed to fit properly and withstand high loads.

WARNING: Do not use electric pumps in an explosive atmosphere. Adhere to all local and national electrical codes. A qualified electrician must do installation and modification.

WARNING: Start the pump with the valve in the neutral position to prevent accidental cylinder operation. Keep hands clear of moving parts and pressurized hoses.

WARNING: These pumps have internal factory adjusted relief valves, which must not be repaired or adjusted except by an Authorized Enerpac Service Center.

CAUTION: To prevent damage to pump electric motor, check specifications. Use of incorrect power source will damage the motor.

3.0 SPECIFICATIONS

3.1 Performance Chart (see Performance Chart below)

3.2 Flow Charts (see Figure 1)

4.0 INSTALLATION

Install or position the pump to ensure that air flow around the motor and pump is unobstructed. Keep the motor clean to ensure maximum cooling during operation.

4.1 Reservoir Breather Cap (See Figure 2)

For shipping purposes, a shipping plug (A) is installed in the breather port on the top of the reservoir. Before using replace the shipping plug with the breather cap (B). NOTE: The breather port (B) is separate from the oil fill port (C). Oil fill port (C) uses a SAE #10 plug.

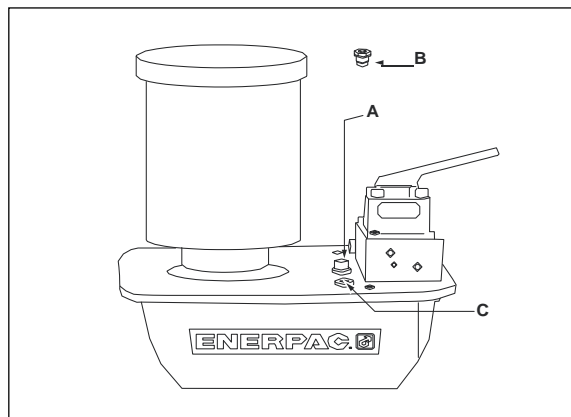
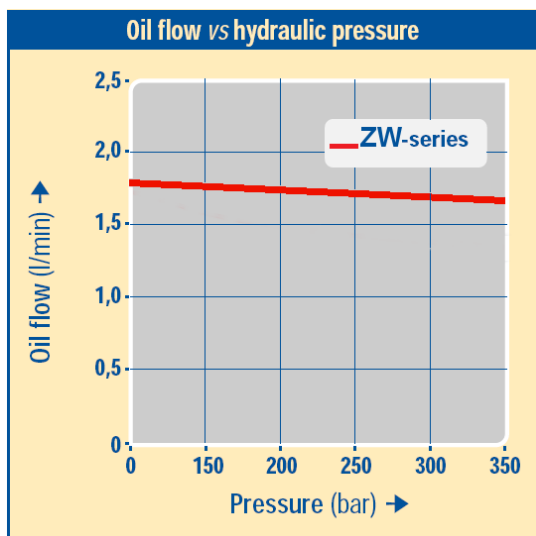


Figure 2, ZE & ZW Breather Installation

Pump Series	Operation	Output Flow (L/min) @ 350 bar	Motor	Relief Valve Adjustment range (bar)	Sound level (dBA)
ZW5...E100	Single-stage	1,64	1,1 kW	70 - 350	75

4.2 Pump Mounting

Refer to Figure 3 for mounting dimensions to secure the pump to a fixed surface.

	1, 2 Gal. (4-8 L) in. (mm)	2.5 Gal. (10 L) in. (mm)	5 Gal. (20 L) in. (mm)	10 Gal. (40 L) in. (mm)
A	9.46 (240)	12.0 (305)	16.6 (421)	19.9 (505)
B	3.75 (95)	11.0 (279)	15.6 (396)	18.9 (480)
C	16.28 (414)	17.6 (446)	17.6 (446)	17.6 (446)
D	9.00 (229)	12.0 (305)	12.0 (305)	12.0 (305)
E	2.86 (73)	0.5 (13)	0.5 (13)	0.5 (13)
F	3.64 (92)	2.8 (71)	2.8 (71)	2.8 (71)
G	M8 x 1.25	Ø .34 (8.6) diameter through hole 0.25 (6) deep		

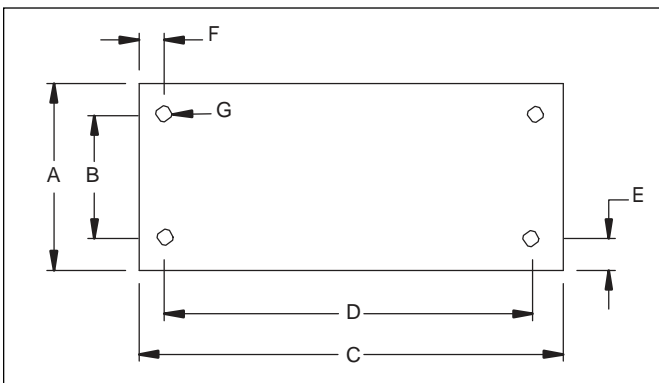


Figure 3

4.3 Electrical Connections

THE PUMP IS FACTORY EQUIPPED WITH THE COMMON ELECTRICAL PLUG FOR A GIVEN VOLTAGE, ALTERING THE PLUG TYPE SHOULD ONLY BE DONE BY A QUALIFIED ELECTRICIAN, ADHERING TO ALL APPLICABLE LOCAL AND NATIONAL CODES.

1. The disconnect and line circuit protection to be provided by customer.
Line circuit protection to be 115% of motor full load current at maximum pressure of application (see Figure 1).
2. For more information, refer to pump name plate for power rating.

4.4 Fluid Level

Check the oil level of the pump prior to start-up, if necessary add oil by removing the SAE #10 plug from the cover plate (see Fig. 2). The reservoir is full when the oil level reaches the top of the sight glass. (Fig. 4).

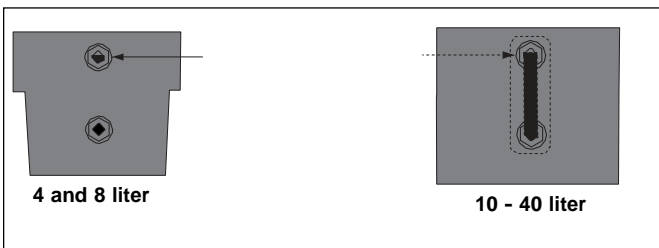


Figure 4

IMPORTANT: Add oil only when all system components are fully retracted, or the system will contain more oil than the reservoir can hold.

4.5 Hydraulic Connections

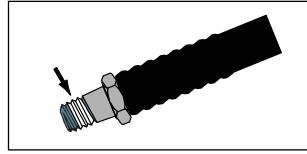


Figure 5

Apply 1-1/2 wraps of Teflon tape or other suitable sealant to the hydraulic hose fitting, leaving the first complete thread free of tape or sealant as shown in Figure 5.

Thread hose(s) into outlet port(s) of the valve (see valve body for port identification).

Extend hose to valve port "A"

Retract hose to valve port "B" (if applicable).

Gauge to valve port "GA, GB, or GP".

("GA" measures "A" port pressure, "GB" measures "B" port pressure, "GP" measures pump pressure down stream of system check).



photo 1: complete unit with VP valves and electric switch box.

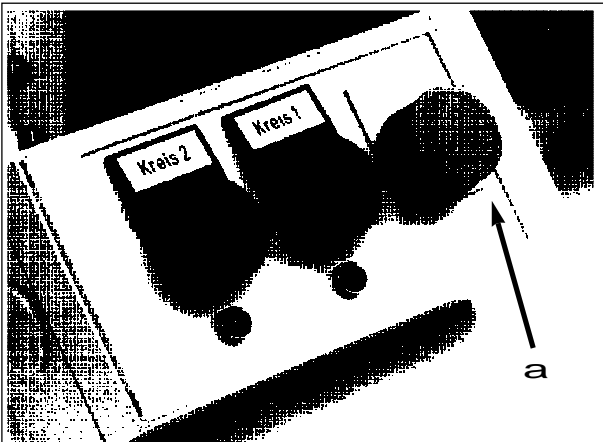


photo 2: nr. a = emergency button on manual remote control.



photo 3: electrical connectors for isolating valve pump's pressure switch 100 - 350 bar,

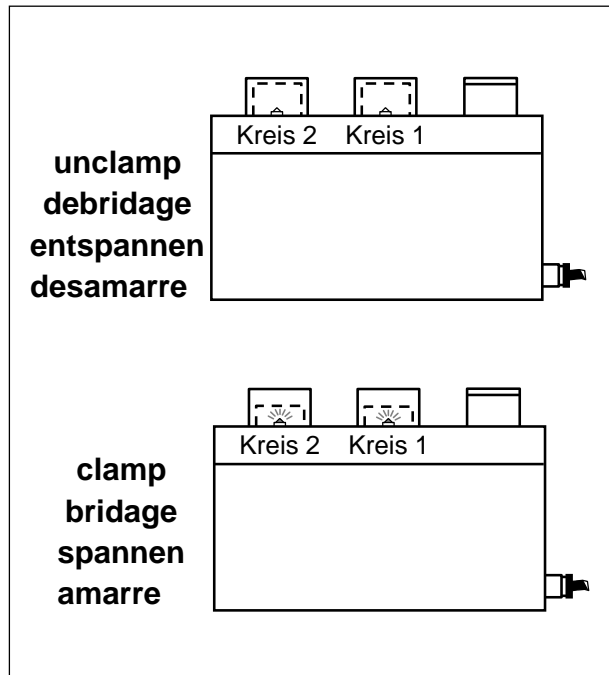


illustration 1: manual remote control

5.0 OPERATION

5.1.2 The power supply cable has to be fitted with a suitable electrical connector to connect the pump to the available power source.

5.1.3 Ensure that the voltage indicated on the unit's identification plate corresponds with the available voltage.

5.1.4 Position the pump on a level surface and replace the red plug on the reservoir cover plate with the black filter/vent plug

5.1.5 Check the hydraulic oil level in the reservoir by observing the upper sight glass at the front side of the reservoir. If required add hydraulic oil.

5.2 Taking into operation

Standard versions without options for single-acting circuits and double-acting circuits. Follow the next steps:



IMPORTANT: Ensure all clamping elements are able to withstand a operating pressure of 350 bar.

1. Actuate (push) emergency button on the manual remote control. Connect a suitable electrical connector to the power supply cable. Connect the pump to the main power supply. The emergency button cuts off the pump. The solenoids of the valves are energized.

2A. FOR SINGLE ACTING CIRCUITS ONLY (3/2-VALVES): All valves have to be de-energized. The buttons (illustration 1), are in and do not equal the outside surface (P connected with A).

De-actuate the emergency button on the manual remote control by turning the button clockwise. The motor starts and the pump will pressurize the circuit. The pump stops when the factory-set pressure switch is actuated (set at 350 bar).



WARNING: The hydraulic circuits are pressurized.

Go to step 3.

2B. FOR DOUBLE ACTING CIRCUITS ONLY (4/3-VALVES): The solenoids for the cross valve position have to be energized (P connected with B). The buttons (illustration 1 + photo 2) are out and equal the outside surface. De-actuate the emergency button on the manual remote control by turning the button

clockwise. The motor starts and the pump will pressurize the circuits via oilconnection B; all cylinders will make the unclamp stroke. The pump stops when the factory-set pressure switch (set at 350 bar), (photo 3 on top of manifold) is actuated.



WARNING: The hydraulic circuits are pressurized!

Go to step 3.

3. Ensure that the installed hydraulic circuits equals the circuits on the manual remote control.

4. OPERATING PRESSURE ADJUSTMENT: The pump pressure switch is factory set at 350 bar. For lower operating pressure, turn the external adjustable pressure relief valve counter clockwise until the required pressure is reached. Read the pressure on the pressure gauge.

Reset the pump pressure switch until it signals the required pressure as set by the pressure relief valve. Illustration 2 (page 4) specifies the switch pressure as function of the adjustment screw distance. Always check with the pressure gauge. Repeat this to ensure that the pressure switch is set to the right pressure.

For more accurate pressure settings, use the pressure gauge until the required pressure switch point has been reached.

IMPORTANT: The external adjustable pressure relief valve should be set approximately 5 to 10% higher than the pressure switch.



WARNING: Never change the setting of the pump pressure switch without resetting the external adjustable pressure relief valve.

5. For safety reasons and to ensure proper operation, the hydraulic system has to be deaerated. After the deaeration, check the oil level and refill oil when necessary.

6. Pump is ready for operation. Use the buttons on the remote control to actuate the hydraulic circuits.

6.0 STANDARD OPTIONS

6.1 Pressure switches for machine tool interlock

These pressure switches on the valve block can be recognized because they are not electrical connected.

Illustration 2+3 (page 6) shows the switch diagram of the pressure switch. The pressure switch for machine tool interlock is adjustable from 100 to 350 bar.

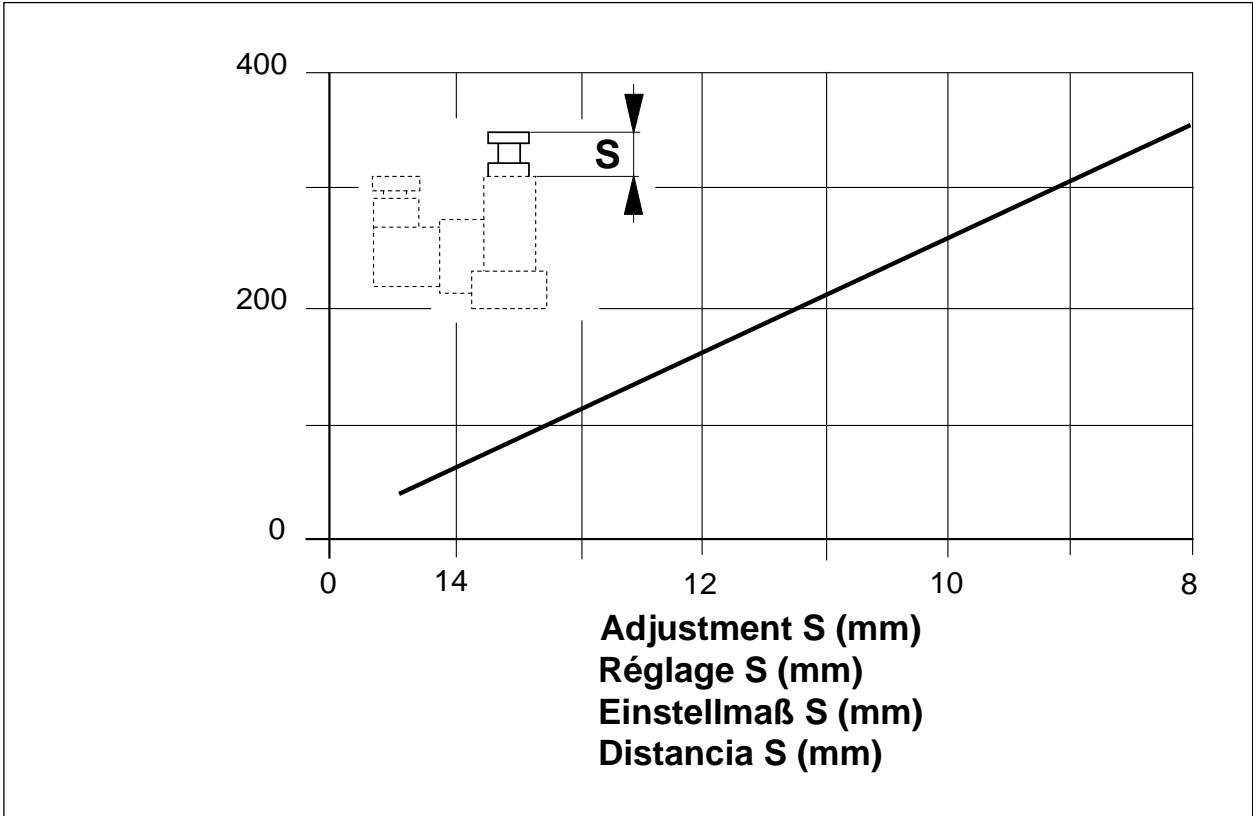


illustration 2: Switch pressure diagram for adjustment screw distance.

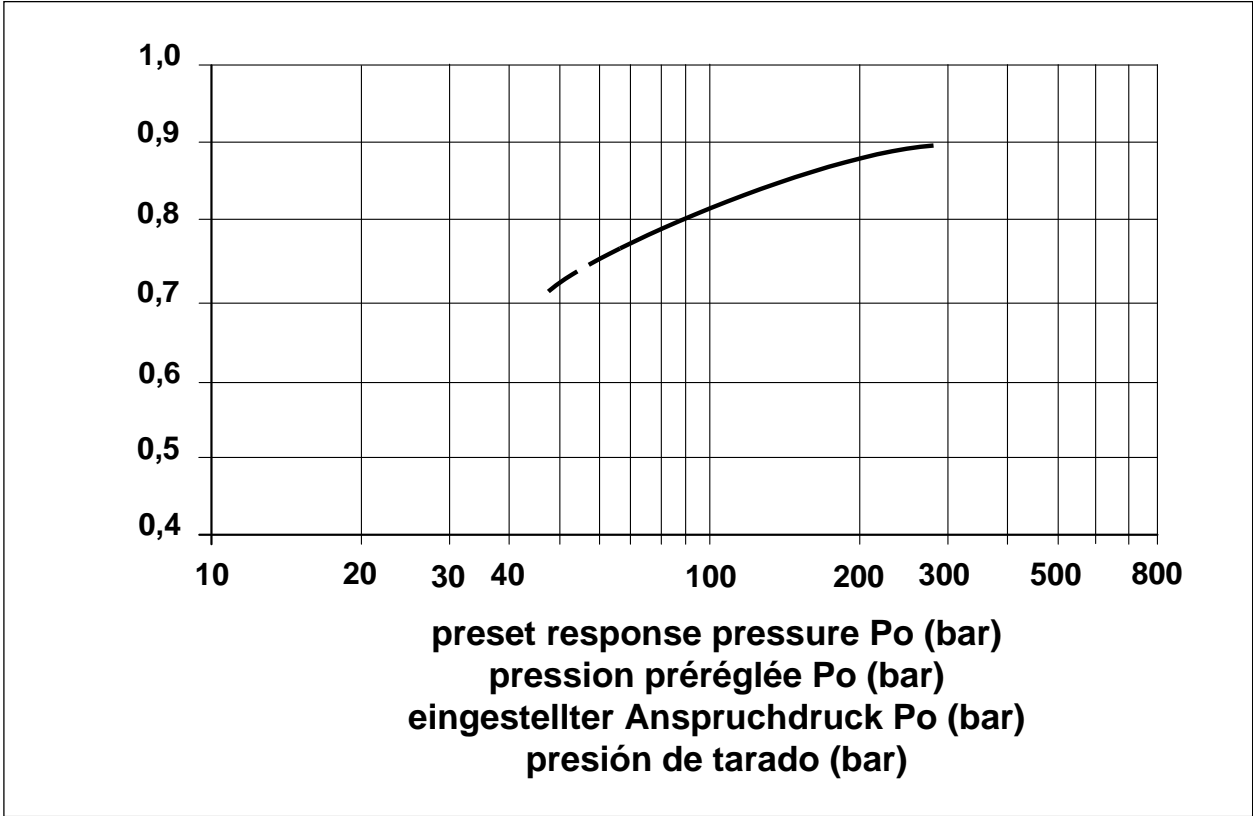


illustration 3: Switch pressure diagram of pressure switch

Illustration 3: Switching pressures

The pressure P_u (bar), at which the pressure switch (electrical switching contact) drops back into its original position (neutral setting) in the event of a pressure drop, is represented as a guideline value $P_u \approx k \times P_o$.

Example: Pressure switch set to 100 bar drops back into its neutral position at $0,82 \times 100 \text{ bar} = 82 \text{ bar}$ (approximate value).

6.1.1 Adjustment

The pressure switch can be adjusted with the pump external adjustable pressure relief valve. DO NOT adjust the pump pressure switch. Illustration 2 on page 4 specifies the switch pressure as function of the adjustment screw distance. Check with the pressure gauge.

Check if the pressure switch has made contact by using the electro-contacts 1, 2 and 3 on the pressure switch. Use a universal electro test tool and check according to illustration 2.

IMPORTANT: Pressure of machine tool interlock pressure switch < pressure of pump pressure switch.

6.2 Pressure switches as isolating valve

These pressure switches on the valve block (photo 3) can be recognized because they are electrical connected to the main electric switch box (photo 1).

The pressure switch as isolating valve is adjustable from 100 to 350 bar. It controls a 3/3-valve for single-acting circuits and a 4/3-valve for double-acting circuits.

6.2.1 Adjustment

Connect a pressure gauge to the hydraulic line which has to be isolated and set the switch at the required pressure. The diagram in illustration 2 can be used.

6.3 Pressure switches for machine tool interlock and as isolating valve

Two separate pressure switches, which can be recognized as described in paragraph 5.1 and 5.2.

1st: set the pressure switch as isolating valve.

2nd: set the pressure switch for machine tool interlock.

IMPORTANT: Pressure of machine tool interlock pressure switch < pressure of isolating valve pressure switch.

6.4 Oil temperature gauge

Oil temperature gauge is assembled in the reservoir but is not electrical connected. The switch signals

when the maximum oil temperature is reached (N.O.-switch), which is 60°C. See specifications in table A on page 7.

6.5 Oil level switch

Oil level switch is assembled in the pump cover plate but is not electrical connected. The switch signals when the minimum allowable oil level in the reservoir (N.C.-switch) is reached. See specifications in table B on page 7.

7.0 MAINTENANCE AND SERVICE

All hydraulic Enerpac products, including pumps, use Enerpac HF-95 hydraulic oil. It is available from you Enerpac distributor. Enerpac productnumbers: HF-95X.....1 litre hydraulic oil; HF-95Y.....5 litre hydraulic oil; HF-95Z.....60 litre hydraulic oil.

7.1 Hydraulic oil change

Use clean, high quality oil in your hydraulic system. Contaminated oil causes premature wear to moving parts and seals. The frequency of changing oil depends on operating conditions and filters within your system, but you should follow a regular maintenance schedule. Dispose of used oil properly! Follow the steps below:

1. To change hydraulic oil, place the pump over an oil sump and unscrew the reservoir's lower sight glass. After the oil has been drained completely, replace the sight glass.

2. Unscrew the bolts holding the black reservoir cover and lift the pump unit off the reservoir. Be careful: do not damage the gasket.

3. Clean the reservoir with kerosine or a similar cleaning agent and make sure all dirt has been removed.

4. Remove the oil filter screen and suction tube. Clean with kerosine or a similar cleaning agent. Place the suction tube and oil filter screen after cleaning.

5. Make sure the gasket between pump cover and reservoir is not damaged. Replace if necessary and reinstall the pump unit. Fill the reservoir with new hydraulic oil HF-95 until the oil level is visible in the upper sight glass of the reservoir.

7.2 Service

- Regularly inspect all components to detect any problem requiring maintenance and service. Replace worn or damaged parts.
- Do not exceed oil temperature of 60°C.

Enerpac offers ready-to-use spare parts kits for repair and/or replacements. Repair part sheets are available with parts drawing and parts list. Contact Enerpac.

CIRCUIT ALTERNATIVES & VALVING OPTIONS

See paragraph 8 and 9 with illustrations 7 to 16.

8.0 TROUBLESHOOTING

PROBLEM	SOLUTION
1. Pump does not switch off.	A. Switch pressure of the pump pressure switch is higher than pump relief valve. Reset pressure switch to a lower value than the pump relief valve.
2. Pump does not reach maximum pressure.	A. Check hydraulic connections on leakage. B. Check hydraulic cylinders on leakage. C. Deaerate hydraulic system. D. Dirt in valves. Poppet valve doesn't close. Clean valve or call Enerpac.
3. Pressure in circuit drops too quickly. Too frequent restart of pump.	A. Check hydraulic connections on leakage. B. Check hydraulic cylinders on leakage. C. Pump pressure switch equals pressure relief valve. Reset pressure switch to a lower value than pump relief valve. D. Deaerate hydraulic system. E. Dirt in valves. Poppet valve doesn't close. Clean valve or call Enerpac.
4. No oil delivery.	A. Oil level in reservoir too low. Refill oil reservoir. B. Dirt in oil suction. See paragraph 6.2.

Table A - Oil temperature gauge

The gauge continuously checks the oil temperature. It signals when the oil temperature rises above 60°C. The oil temperature gauge is not electrically connected and it is assembled to the side of the reservoir.

Specifications

Electric connector:	DIN 43650
Switch temperature:	60°C
Current:	2A
Voltage:	230V
Protection:	IP 65
Switch type:	N.O.

Table B - Oil level switch

The oil level indicator continuously checks the oil level in the reservoir and signals when the oil level is getting too low. The oil level indicator is not electrically connected. It is assembled in the reservoir cover plate.

Specifications

Electric wire length:	1m (2 x 0,25 mm ²)
Current:	0,5A
Voltage:	230V
Protection:	IP 54
Switch type:	N.C.

Table C - Pump unit

Max. operating pressure:	350 bar
Min. operating pressure:	100 bar
Effective oil capacity of reservoir *:	10 liter
Max. hydraulic output flow:	1,64 l/min
Pump type:	6 radial pistons
Noise level:	max. 75 dB(A)
Ambient temperature:	0 - 60°C
Hydraulic connections:	G1/4"
Oil type:	HLP-32 ISO V632 DIN 52529
Valve type options:	3/2 poppet; 3/3 or 3/4 poppet valve with or without isolating valve function.
Pump pressure switch adjustment range:	100 - 350 bar.

* Depending on reservoir ordered.

Table D - Electric characteristics

Operating voltage *:	230V/1ph 50 Hz 400V/3ph 50 Hz
Power:	1,1 kW
Rotations:	1425 RPM
Current:	1,9A/400V; 3,3A/230V
Rotation direction:	both
Protection:	IP 54
Max. time in operation:	50%
Cable length:	3 mete-r

* Depending on model ordered.

Electric connector to the main power supply is not included with delivery.

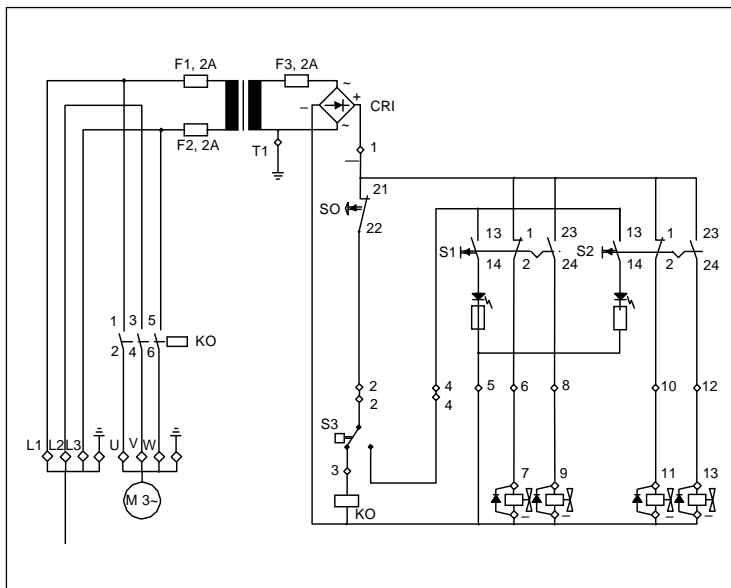


illustration 5: Scheme of basic pump unit with two double-acting circuits.

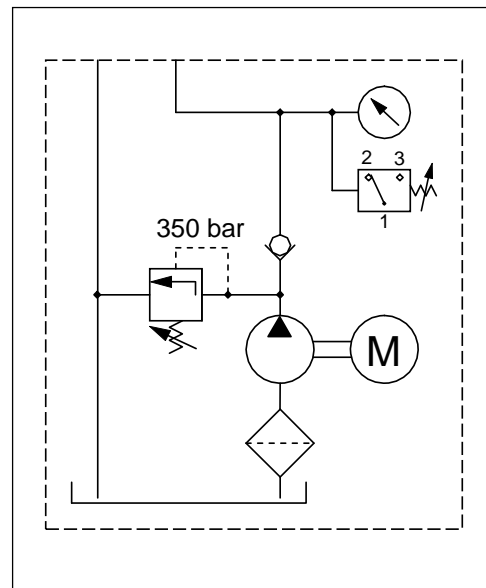


illustration 6: hydraulic scheme of basic pump unit.

9.0 CIRCUIT ALTERNATIVES

9.1 Using single-acting cylinders

Illustration 8: VP-41

To control one or two independent circuits with single acting, spring return cylinders.

9.2 Using double-acting cylinders

Illustration 9: VP-11

To control one circuit with single-acting, spring return cylinders and double-acting cylinders, or with double-acting cylinders only.

Illustration 10: To control two independent circuits with single- and double-acting cylinders.

10.0 VALVING OPTIONS

10.1 Machine tool interlock

Pressure switches, which can be connected to the hydraulic lines of each independent circuit. The switch has to be electrically connected to the machine tool control. Machining can only start if the switch pressure has been reached. The machine tool will be cut of if the pressure drops approximately 15%. The switch can be installed in the A-lines or in the A and B hydraulic lines.

Illustration 11: For one single-acting circuit.

Illustration 12: For one double-acting circuit.

10.2 Isolating valve

For some particular applications, i.e. when a workpiece has to be positioned and clamped with different forces, it is recommended to have different operating pressures in independent circuits.

A pressure switch in the hydraulic line to the cylinder actuates a valve with a closed center position and isolates the circuit when the pre-set pressure has been reached. In case of pressure drop, the switch opens the valve to compensate.

In single-acting circuits, the isolating valve is a 3/3-valve with closed center.

In double-acting circuits, the isolating valve is the standard 4/3 valve. The pressure switch is, via the central control box, connected to the valve. The isolating valve is ready for operation.

Illustration 13: For one single-acting circuit.

Illustration 14: For one double-acting circuit.

10.3 Machine tool interlock and isolating valve

The pressure switches can be installed in the A or in the A and B hydraulic lines.

Illustration 15: For one single-acting circuit.

Illustration 16: For one double-acting circuit.

Illustration 11: For one single-acting circuit.

Illustration 12: For one double-acting circuit.

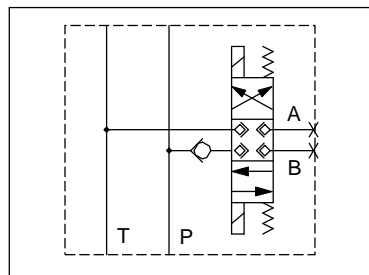


illustration 9

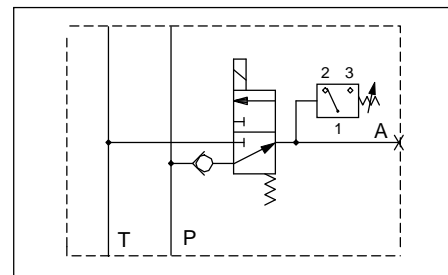


illustration 11

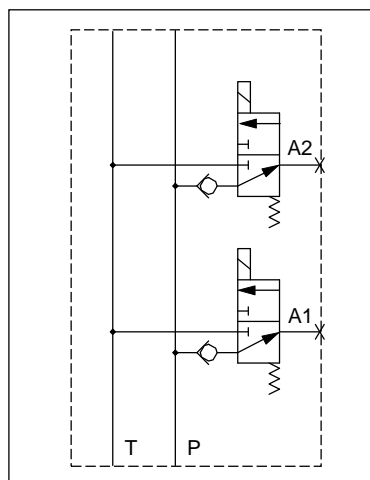


illustration 8

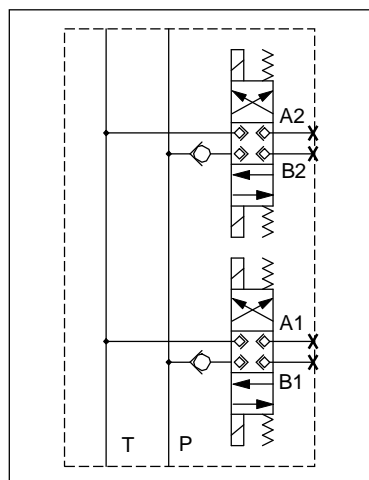


illustration 10

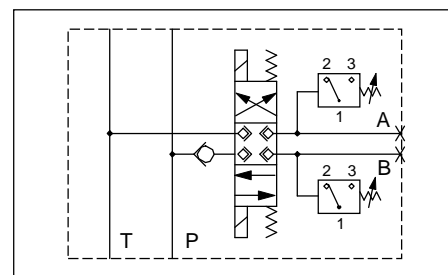


illustration 12

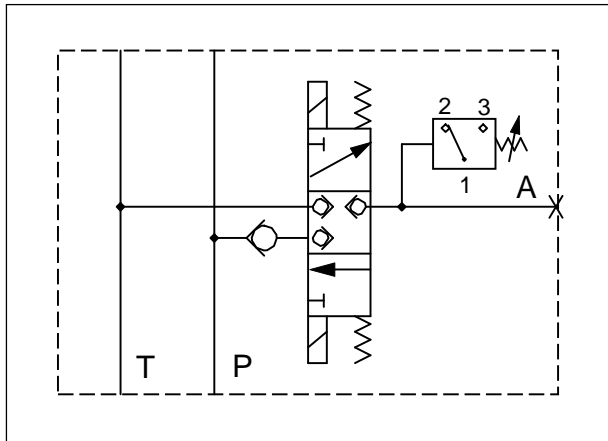


illustration 13

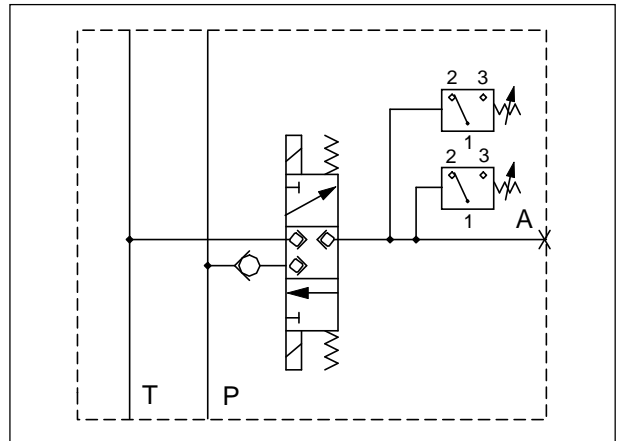


illustration 15

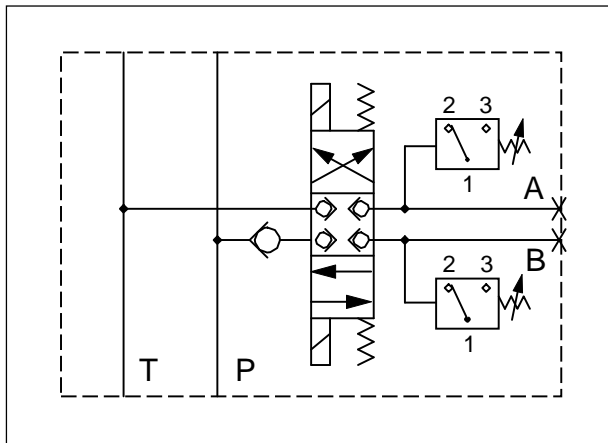


illustration 14

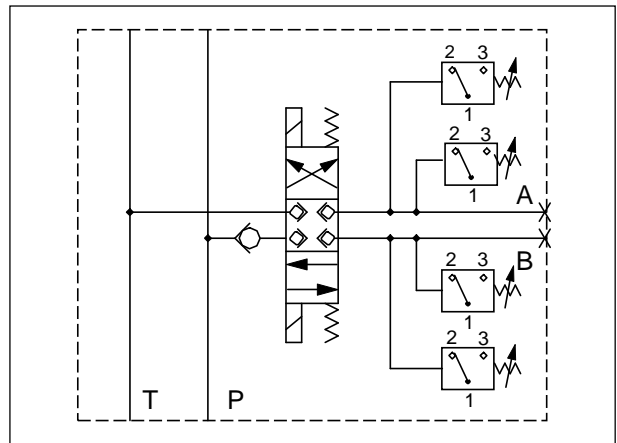


illustration 16