

## OPERATIONS MANUAL POWER PACK P-460 D



Serial no. 2.1.0460.DXX

This powerpack is filled with hydraulic oil of  
**TOTAL Equivis ZS 46**

### IMPORTANT ENGINE INFORMATION

## **VOLVOPENTA**

AB Volvo Penta, Sweden

ENGINE FAMILY: 5VPXL12.1ACB -DISPLACEMENT 12.1 -VALVE LASH INT 0.20mm  
ENGINE MODEL: TAD 1241GE EXHAUST EMISSION EXH 0.50mm  
CONT SYST EM. TC. CAC CONSTANT SPEED ONLY Y

ENGINE CODE	POWER kW/rpm	FUEL RATE mm3/stroke	STATIC TIMING deg bef T.D.C.
III ; IV	363/1500 402/1800	EC 324 ; 305 US	

**USA** THIS ENGINE CONFORMS TO 2005 US EPA REGULATIONS LARGE NON ROAD COMPRESSION-  
IGNITION ENGINES THIS ENGINE IS CERTIFIED TO OPERATE ON DIESEL FUEL ONLY.

**CALIFORNIA** THIS ENGINE CONFORMS TO 2005 CALIFORNIA REGULATIONS FOR HEAVY-DUTY  
OFF-ROAD DIESEL CYCLE ENGINES AS APPLICABLE. THIS ENGINE IS  
CERTIFIED TO OPERATE ON DIESEL FUEL ONLY.

VP 3819556  
FEL NOX g/kWh

P-460 2.1.0460.D28 ENGINE TAG.bmp

## PREFACE

This user's manual contains the procedures for safe operation and preventive maintenance of the hydraulic **POWER PACK P-460-D46** by qualified personnel.

References to other documentation, figures etc. are indicated in *italics*

## Intended use

The **POWER PACK P-460-D46** is solely intended for use as hydraulic power source for driving steel or concrete piles with hydraulic piling hammers **in non hazardous areas**.

Only qualified personnel may operate or maintain the machine.

A qualified person is one who is familiar with this equipment and with possible hazards involved.

During first commissioning, the user(s) will be instructed accordingly by PILECO HYDROHAMMER B.V.

This manual must be used in combination with the user's manual of the selected Hydrohammer® and control equipment.

If problems occur for which no solution can be found in this manual, or **for major maintenance or repair**, please contact PILECO HYDROHAMMER B.V.

## GUARANTEE/LIABILITY

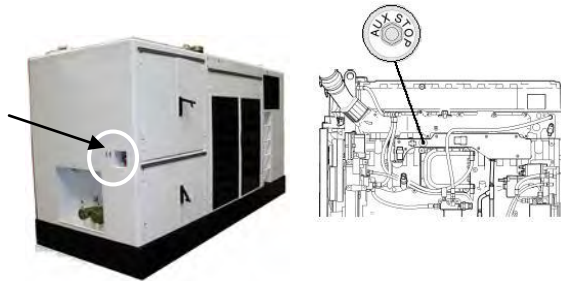
The terms for guarantee and liability as specified in the general conditions of PILECO (October 1991) shall apply, unless mentioned otherwise in this manual or agreed between PILECO and the customer in writing. PILECO HYDROHAMMER B.V. therefore, denies any claim which should arise from failure to execute the necessary safety precautions as specified below, or negligence to the (local) safety rules.

## SAFETY PRECAUTIONS

### Emergency stop buttons

There are two **emergency buttons**: one external, above the hose connections (see arrow) and one on the engine at the alternator side.

The remote system control box C-34 also has an emergency stop. The C-34 is normally stored next to the Engine panel A-35.



The following headers are used in this manual:

**WARNING:** where failure to observe the instruction could result in injury to the operator or exposed persons.

**CAUTION:** where failure to observe the instruction could result in damage to the equipment. PILECO HYDROHAMMER B.V. points out that the execution of the safety precautions as specified below and abidance with the (local) safety rules can only be the full responsibility of the user.

- Use only **approved** lifting equipment when moving the power pack.
- Dirt and sand are enemy no. 1 to hydraulic systems. Clean the parts if necessary with engine fuel.
- Avoid injury by using, where necessary, personal protection material like safety-goggles, safety-gloves, safety-shoes, etc.
- Pile driving should be stopped immediately to prevent possible (further) damage:
  - after trouble or an irregularity has been observed,
  - in case of fire in the direct vicinity of the power pack or hammer.

Use the emergency button in emergency cases only, such as a fire in the power pack.








**It is the responsibility of the user to have fire extinguishers available at site!**

- Welding on the container walls is not allowed (integral hydraulic reservoir and fuel tank).
- Do not grind or weld in the direct vicinity of disassembled or open hydraulic components (during maintenance).
- Do not (dis)connect the hydraulic hoses while engine is running.
- Do not remove the engine radiator filler cap when engine is still hot.
- Do not smoke when filling the fuel tank.
- Wipe spilled fuel carefully and discard the means used for this task.
- The engine should not be running when carrying out maintenance.
- Switch off the battery main switch before commencing to service the electrical installation.
- Keep loose hair and loose clothing away from running parts.
- Keep all the doors closed (except the ones of operating panels as required) when the power pack is in operation.
- Use **ONLY** the wall mounted hand pump for filling. The pump is directly connected to the cavity of the return filter. Do not use the manhole or any other connection on the hydraulic oil reservoir, to prevent dirt entrainment.

## APPLIED STICKERS

Replace stickers as soon as they are damaged or have become illegible.  
Thoroughly clean the surface with a grease solvent, before applying the new sticker.  
New stickers can be ordered from PILECO HYDROHAMMER.

The following stickers haven been applied at appropriate places on the power pack.

		Location
Full	To indicate which eye in the lifting plate has to be used, depending on the amount of hydraulic oil and fuel in the tanks	
Empty		
	Presence of flammable liquids, in this case diesel fuel in the base of power pack container	Bottom of long container wall
	Danger, battery! When topping up the batteries wear the protective clothing gloves and face protection. Do not short-circuit the poles. Always disconnect the "min (-)" pool from the battery first, (the one connected to the foundation of the diesel engine) if ever this has to be removed.	At hinged lid of battery compartment
	Watch out, hot surface	Long container wall, near engine exhaust.
	Trip danger When using the integrated stairs of the power pack.	Front side, right above stairs
	Danger: Electricity, Electrical hazard	Batteries; inside engine panel A-35
	Warning: hand entanglement/rotating rollers	Fan's of radiators

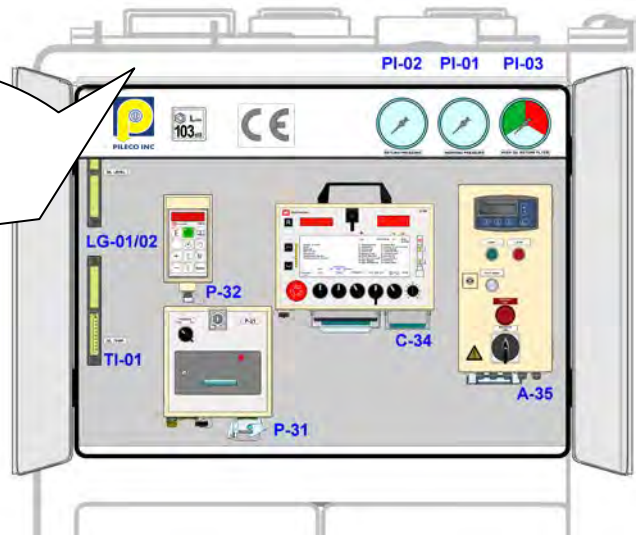
	<b>page</b>
Preface / Intended use / Guarantee/Liability / Safety precautions .....	II
CONTENTS .....	III
<b>USER'S MANUAL</b> .....	<b>1</b>
<b>FOR</b> .....	<b>1</b>
<b>HYDRAULIC POWER PACK P-460</b> .....	<b>1</b>
1. INTRODUCTION .....	1
1.1. General (see page IV).....	2
1.2. Technical specifications and data.....	3
2. DESCRIPTION OF THE SYSTEM AND MAIN COMPONENTS.....	4
2.1. Pump driver (Diesel engine) and auxiliaries .....	4
2.2. Hydraulic system.....	5
2.2.1. Main hydraulic circuit (see fig. 4).....	5
2.2.2. Hydraulic manifold block HM-01 .....	6
2.3. Electrical system .....	7
2.4. Fuel system.....	8
3. PREPARATIONS PRIOR TO OPERATION .....	9
4. OPERATION.....	10
4.1. Checks before starting .....	10
4.2. Starting.....	10
4.3. Preheating of the hydraulic oil .....	12
4.4. Normal stop .....	12
4.5. Emergency stop .....	12
4.6. Depressurizing the hydraulic system .....	12
5. TROUBLE SHOOTING.....	13
5.1. Specific powerpack malfunctions.....	13
6. MAINTENANCE AND REPAIRS .....	14
6.1. General cleaning.....	14
6.2. Fuels and lubricants.....	14
6.3. Preventive maintenance .....	15
6.3.1. Daily inspection .....	15
6.3.2. Regular inspections.....	15
6.3.3. Replacement of the return filter element.....	16
6.4. Spare parts .....	17
7. STORAGE AND TRANSPORT .....	18
7.1. Storage .....	18
7.2. Preservation.....	18
8. DRAWINGS AND DIAGRAMS .....	19

### List of Figures

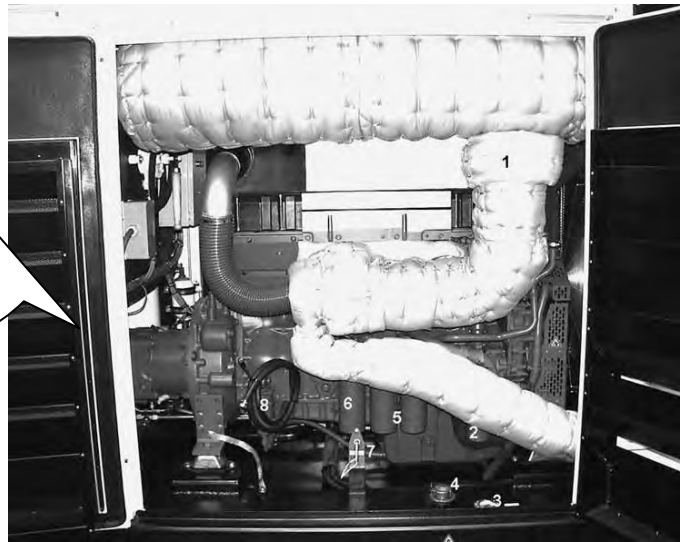
Fig. 1: Location of main components with item numbers .....	2
Fig. 2 Engine view, main switch side .....	4
Fig. 3 Engine view, PTO side .....	4
Fig. 4: P&I diagram hydraulic system .....	5
Fig. 5: Hydraulic manifoldHM-01 .....	6
Fig. 6: Outside quick connectors .....	6
Fig. 7: Hydraulic manifold diagram .....	6
Fig. 8: Location of batteries .....	7
Fig. 9 Location of X-56 .....	7
Fig. 10 Electronic components in X-56.....	7
Fig. 11 P & I-diagram Fuel system .....	8
Fig. 12: Hose connections.....	9
Fig. 13: Layout gauge panel and control equipment .....	10
Fig. 14: Layout engine control panel A-35.....	11
Fig. 15 Return filter.....	16
Fig. 16 Location of identification plate, CE-sticker and sound power level sticker .....	17
Table 1 Trouble shooting P-460 .....	12



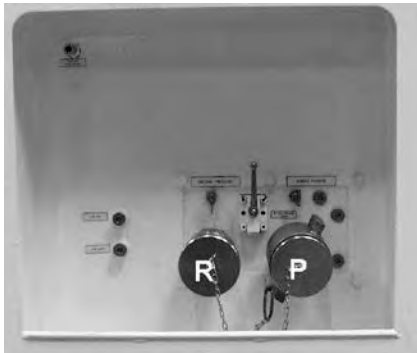
## 1. INTRODUCTION



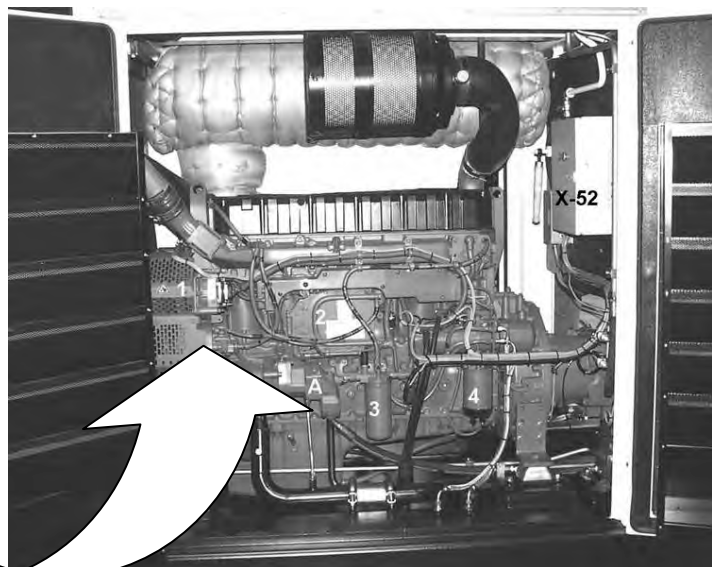
**Gauge panel & Engine panel A-35 and Instruments of hydraulic tank**



**Engine view, main switch side**



**Quick connectors**



**Engine view, PTO side**

## INTRODUCTION (continued)

### 1.1. General (see page IV)

The Power pack P-460 is built inside a container-type housing and supplies high pressure oil to the **Hydrohammer®**. The engine is accessible via double doors at both long sides of the container.

The gauge panel (6), the A-35 engine panel (5) and instruments for the hydraulic oil reservoir are grouped together and accessible behind the double upper doors.

The C-34 system control box and P-31/32 printer set (if supplied) can be placed next to the A-35.

The radiator block for the engine coolant **E-01** (17) is air cooled by the fan (direct driven by the diesel engine) and has an expansion tank on top of it.

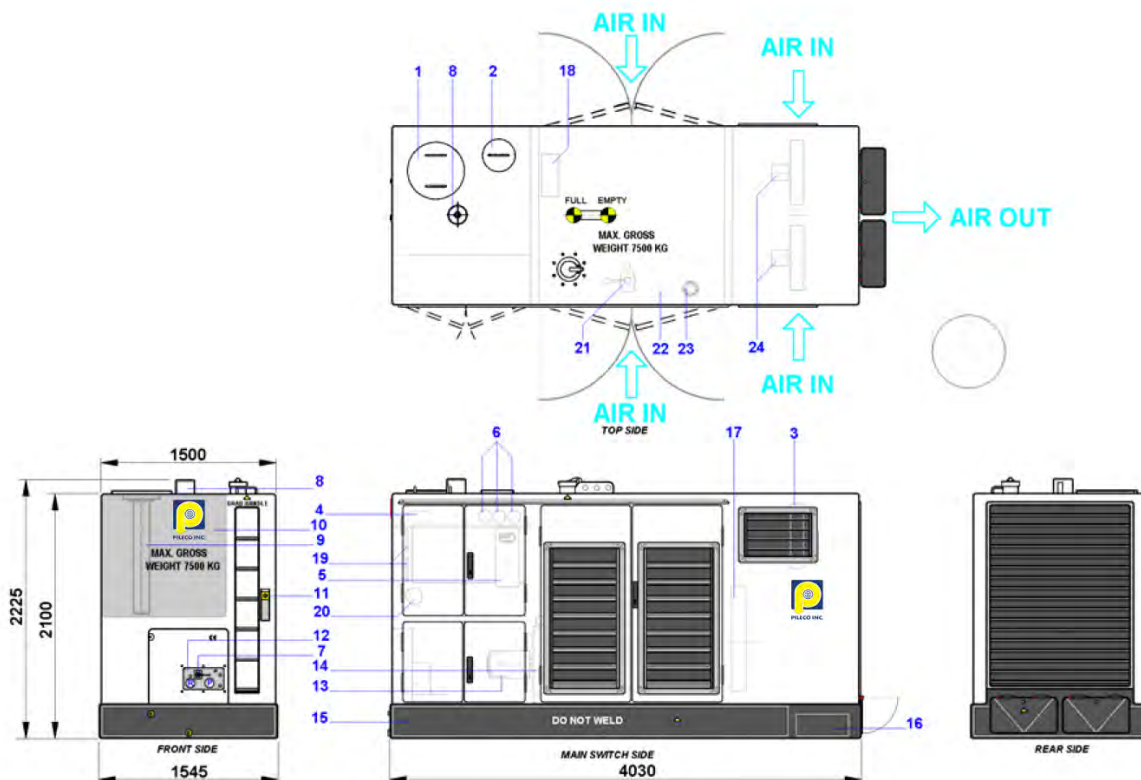
The radiator block for the hydraulic oil consists of two sections in series **E-02A/B** and is cooled by two separate fans driven by hydraulic motors.

The ambient cooling air is sucked via the louvers in the doors (for the engine) and two louvered windows (for the hydraulic oil) and then blown through their respective radiators. All the air leaves the power pack via the louvers in the rear wall of the housing.

The fuel tank **TK-02** is formed by the bottom section of the container and is equipped with a level indicator.

The hydraulic manifold **HM-01** (12) is located under the hydraulic oil reservoir **TK-01** (10) and is accessible via the lower doors. The hydraulic hose connections to the hammer and for draining the hammer are located on the partly recessed rear wall of the container.

The emergency stop button (11) is located right and above the hose connections, in an open recessed box, which also has an opening for the entry of the control cable.



**Fig. 1: Location of main components with item numbers**

- |   |  |  |
|---|--|--|
| 1 Manhole cover (hydraulic oil tank)            | 8 Breather filter (hydraulic oil tank) | 15 Fuel tank <b>TK-02</b>              |
| 2 Hand hole cover for return filter             | 9 Return filter <b>FIL-01</b>          | 16 Battery                             |
| 3 Hydraulic oil radiators (2 x) <b>E-02 A/B</b> | 10 Hydraulic oil tank <b>TK-01</b>     | 17 Engine coolant radiator <b>E-01</b> |
| 4 Identification plate                          | 11 Emergency stop button               | 18 Connection box X-56 (not shown)     |
| 5 Engine panel A35                              | 12 Hydraulic manifold <b>HM-01</b>     | <b>Hydraulic hoses:</b>                |
| 6 Gauge panel                                   | 13 Hydraulic pump <b>P-01</b>          | One set 2" quick connectors            |
| 7 By-pass valve (system depress.)               | 14 Diesel engine <b>PDM-01</b>         | P Supply to hammer                     |
|   |  | R Return from hammer                   |

## 1.2. Technical specifications and data

### Ambient conditions

Max ambient air temperature  
Noise **power** level at full load

operational between -10 and + 45 °C  
103 dB(A) ref 1 pW



### Container type housing

Net weight (empty)  
Weight incl. fuel and oil  
Dimensions l x w x h  
Capacity / fill fuel tank  
Capacity / fill hydraulic oil tank

### Shop order no. **H-20070128**

approx. 5 400 kg  
max. 7 400 kg  
4030 x 1545 x 2225 mm  
1100 / 1050 litres  
1300 / 1200 litres

### Diesel engine and auxiliaries



Model/Serial number  
Engine serial No.  
Make/ type

**TAD 1241GE / 868836**  
**2012631841**

### Engine data set xxx

Certification  
Engine output, 15 kW fan losses incl.  
Sense of rotation  
Engine management system  
Exhaust silencer, nominal size  
Lube oil system

Volvo / 6 cyl.in-line, water cooled, turbocharged with intercooler  
EPA / CARB Tier 2, ..... see sticker  
344 kW at 1800 rpm (ISO 3046 / BS 5524 / DIN 6271)  
CCW facing coupling end  
EDC III / E.C.V including diagnostic functions (in Control box X-56)  
8 " fully welded, outlet through roof, with rain cap  
direct driven lube oil pump (in sump), Filters: 2 full flow, 1 bypass, cooler

Starting system  
Main coupling  
Cooling system  
- Coolant radiator h x w x d  
Dissipated heat  
Pressure drop water side  
- Fan  
Diameter  
absorbed power  
air capacity

24 V battery system (2 batteries, total 170 Ah)  
Centaflex, CF-K150D-40-SAE 14  
closed loop coolant, air cooled by radiator  
890 x 980 x 75 mm (excl. expansion tank on top)  
143 kW  
1120 Pa at 21.600 l/h  
Diesel engine driven, ratio 1.01  
890 mm  
15 kW ( at 1800 rpm)  
6 m<sup>3</sup>/s (at 1800 rpm)

### Hydraulic oil system

#### • Hydr. Pump Make / type

Model:  
Control  
Pump capacity range  
Internal safety setting

Mannesmann Rexroth /variable capacity, pos. displacement (axial plunger) with booster (Pump s/n. 22445410)  
A11VL0260EP2D/11R-NZD12K01  
**electr./hydr.**  
50 – 460 l/m  
390bar

#### • Hydraulic manifold HM-01 With safety valves settings

IHC No. 86.40.40.72 (fully assembled)  
380 / 90 bar

#### • Hydr. oil radiators (2x)

Dissipated heat  
Hydromotors (2x) type (fan drive)

air cooled, with hydraulically driven fans  
Flow control by speed adjustment ( max 3350 rpm)  
2 x 25 kW  
Parker, type PGM 511 B0160

### Hydraulic pumps (PTO driven)

NOTE: Double vane pump with common suction.

**Denison**, double vane type, T67CB 031 B10 5R11 A1M1 (one section for cooling circuit, one section for drive of fan hydr. motors).

- Suction filter, make & type 2 x UFI, 77201-450-M090, 90 micron
- Return filter (FIL-01), make & type Parker Arlon IN AGB4-2000 TXW14, **10 micron**, mounted in separate section of reservoir, with internal bypass (set at 1.5 bar)

NOTE: See also additional data in par 6.5 Spare parts



## 2. DESCRIPTION OF THE SYSTEM AND MAIN COMPONENTS

### 2.1. Pump driver (Diesel engine) and auxiliaries

The turbo charged diesel engine PDM-01 is electrically started from the A-35 engine control panel. The engine is running at constant speed (1800 rpm) and drives one in-line variable flow pump.

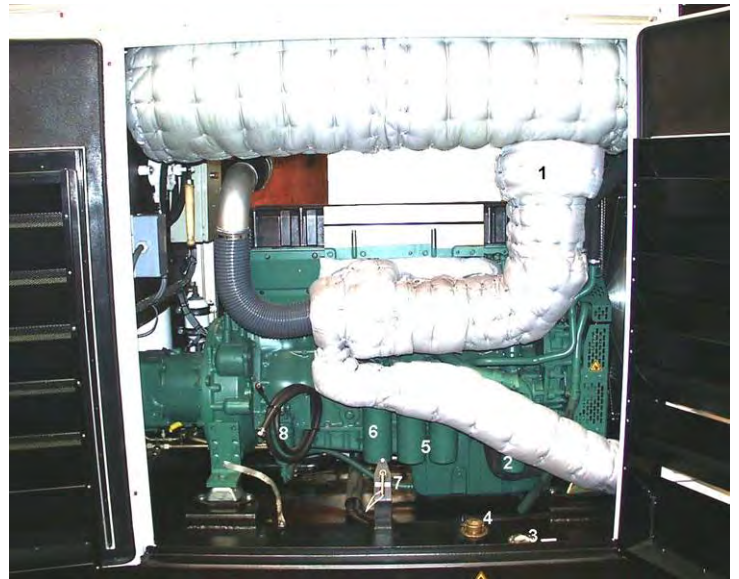
Flow adjustments can be made from the C-34 control box (FLOW - 0 +) or A-35.



The engine is cooled by a coolant in closed loop. The coolant in its turn is air cooled in the coolant radiator by the engine driven fan.

The engine is equipped with a hand pump to drain the motor sump when the lube oil filters and the motor oil have to be changed.

The fuel is forced through the pre-filter with water sensor (fig. 3/5) and the fuel filter (fig. 3 /4) and finally injected into the cylinders by the fuel injection pump. (See for further details par.2.4)



**Fig. 2 Engine view, main switch side**

#### Engine management system

The engine is equipped with an electronic motor management system EDC III (Electronic Diesel Control, including diagnostic functions) that cooperates with the power pack's monitor and control system (in power pack Control box X-56).

If a disturbance is detected, a diagnostic indicator inside the X-56 starts blinking. The OEM-engine documentation will provide the operator with an error code to assist in locating the problem.



**Fig. 3 Engine view, PTO side**



## 2.2. Hydraulic system

### 2.2.1. Main hydraulic circuit (see fig. 4)

Filtered hydraulic oil from the suction filters **FIL-02A/B** is drawn from the reservoir **TK-01** via the suction valve (with limit switch **GS-02**) to the main pump **P-01**. This variable flow pump is used for the hammer. A double vane pump in tandem arrangement with common suction is PTO-driven. **P-02A** provides the oil flow of the cooling circuit and **P-02B** drives the hydraulic motors of the fans.

Via the set 2" quick connectors **P** and **R**, the oil runs to and from the hammer. The working pressure (**PI-01**), the return pressure (**PI-02**) and diff. pressure return filter (**PI-03**) are indicated on the gauge panel.

From connection **T1** on the manifold **HM-01**, the oil enters the return filter **FIL-01**, located in a separate compartment in the reservoir.

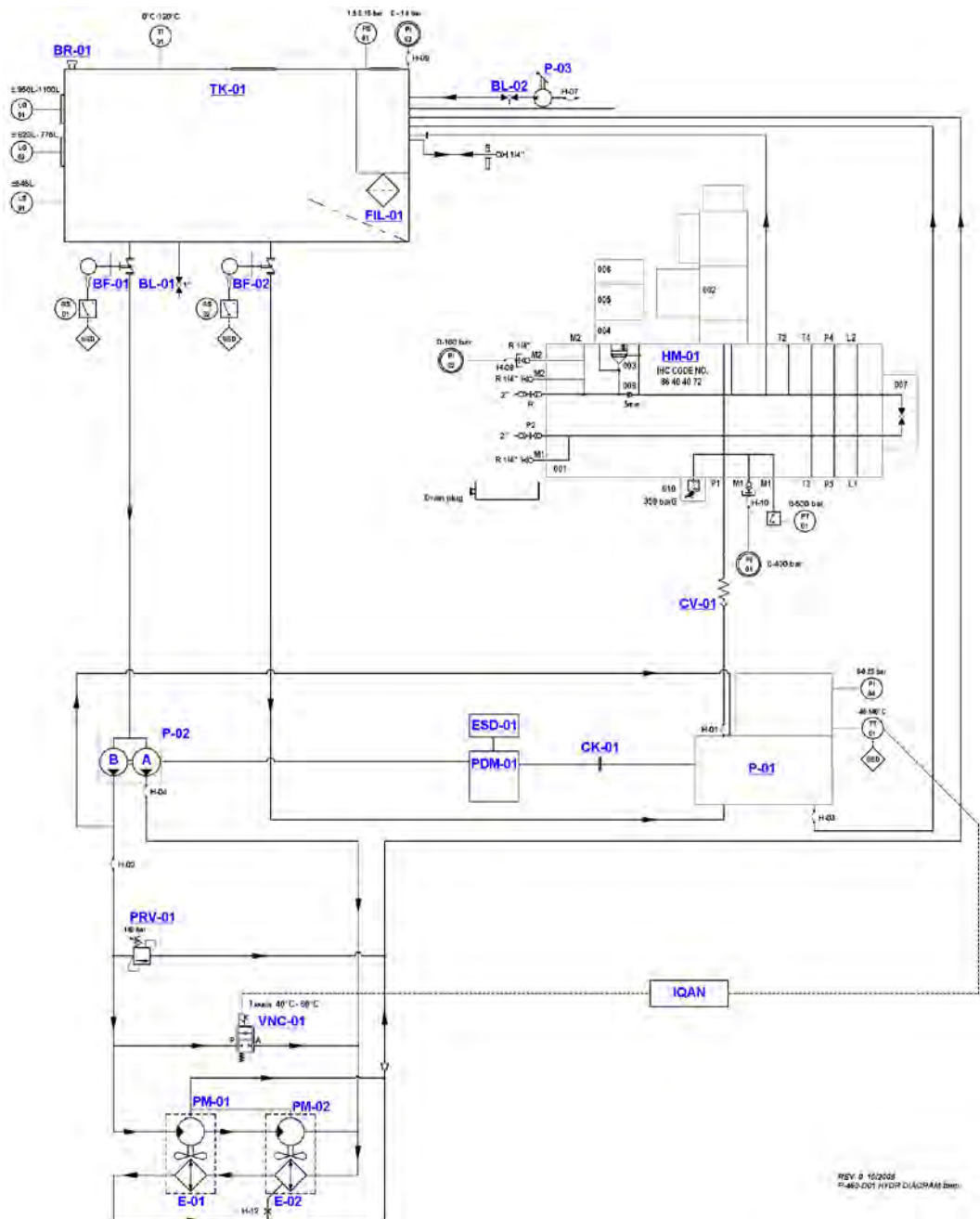
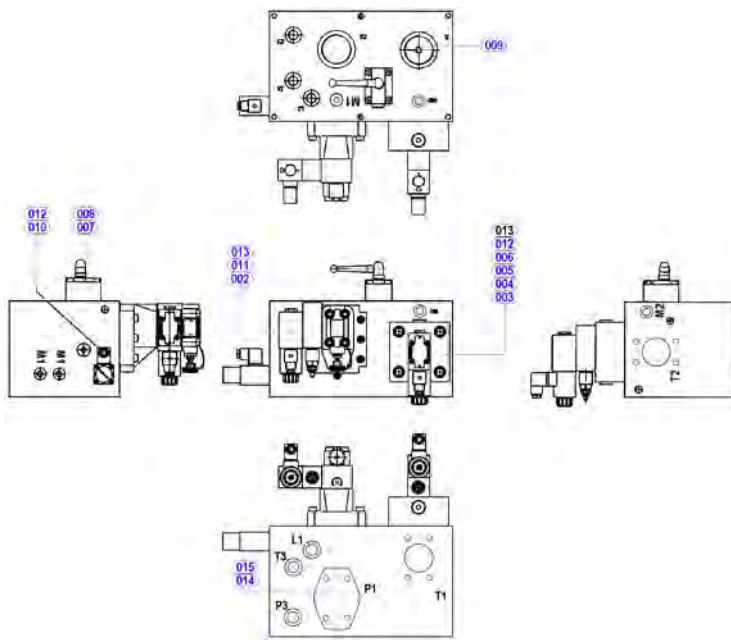
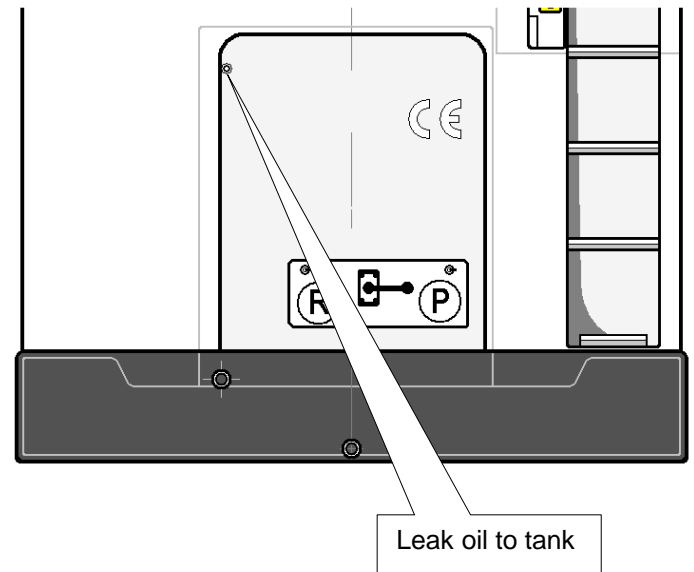


Fig. 4: P&I diagram hydraulic system

## 2.2.2. Hydraulic manifold block HM-01



**Fig. 5: Hydraulic manifold HM-01**



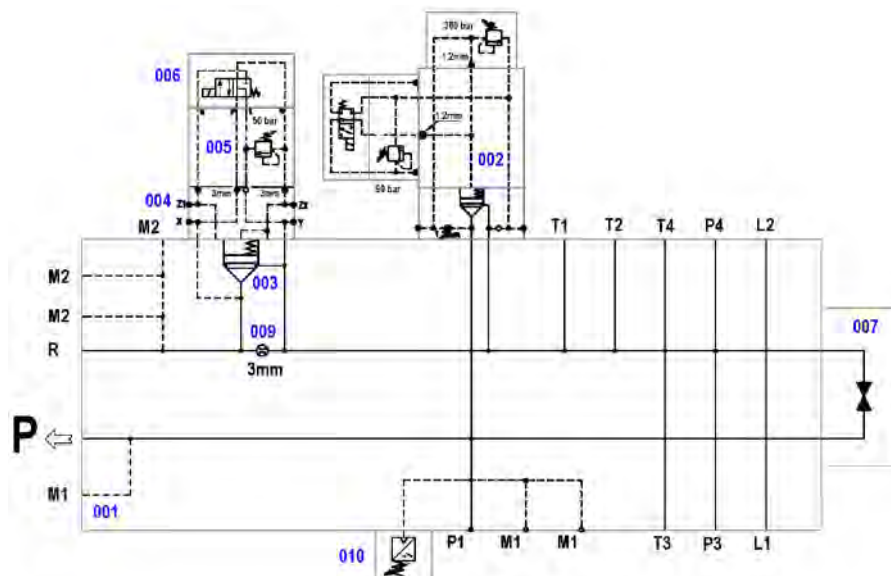
**Fig. 6: Outside quick connectors**

The working pressure is limited at two levels as determined by the two safety valves 2 and 3 which are integrated with their pilot valves in the so-called A-valve (as referred to in the electrical wiring diagrams).

- If both pilot valves of safety valves 2 and 3 are de-energised, the system pressure is zero.
- If pilot valves of safety valves 2 and 3 are energised, the system is protected against overpressure during pile driving to 380 bar,
- If only pilot valve of 2 is energised, the system pressure is limited to 90 bar during idle operation (the hammer has not yet been started or piling is stopped). This pressure allows the ram to come down slowly to its rest position.

Safety valve 1 is set @ 50 bar and protects the back pressure level of the system. It is integrated with its pilot valve in the so-called "Td"-valve assembly (as referred to in the electrical wiring diagrams).

The ball valve, mounted on the manifold and accessible from outside, is used to make the system pressureless (for emptying or disconnecting hoses) or for idle running of engine during service checks.



**Fig. 7: Hydraulic manifold diagram**

### 2.3. Electrical system

There are no customer power connections required.

#### Batteries

All electrical equipment is fed from the 24 Vdc battery system (also used for engine starting). The batteries are installed in a separate compartment in the base of the container, accessible via a hinged cover as shown below:



**Fig. 8: Location of batteries**

Internal connections within the power pack are grouped together to the terminal boxes X18 and 19. Both boxes are connected to the terminal box X-52 and signals are led from there-on to the terminal strip X1 in the engine panel A-35.

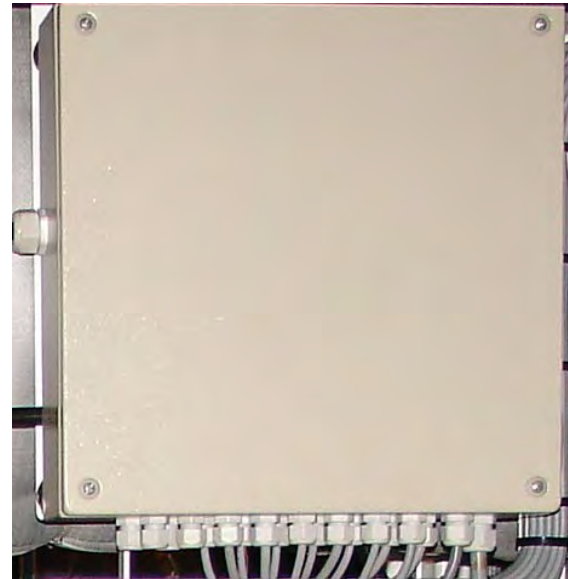
#### Power pack control box X-56

The main components in X-56 are:

- XT-2 Expansion power 2<sup>nd</sup> gen. IQAN module for engine communication (J1939 CAN bus protocol and physical I/O)
- XP-2 Expansion signal IQAN module  
Several I/O functions
- Programmable transmitter.  
Converting input signal 0-5Vdc to an output signal 4-20mA.  
It allows flow read out on the C-34.

Note: IQAN is an electronically monitoring and controlling system for the power pack.

Internal connections within the power pack are grouped together into the X-56. Signals are led from there-on to the terminal strip in the engine control panel A-35.



**Fig. 9 Location of X-56**



XT-2 IQAN module (left)  
XP-2 IQAN module (right)  
Programmable transmitter (middle)

**Fig. 10 Electronic components in X-56**

## 2.4. Fuel system

The electronically controlled fuel injection system is a part of the power management system EDC III / E.C.V.

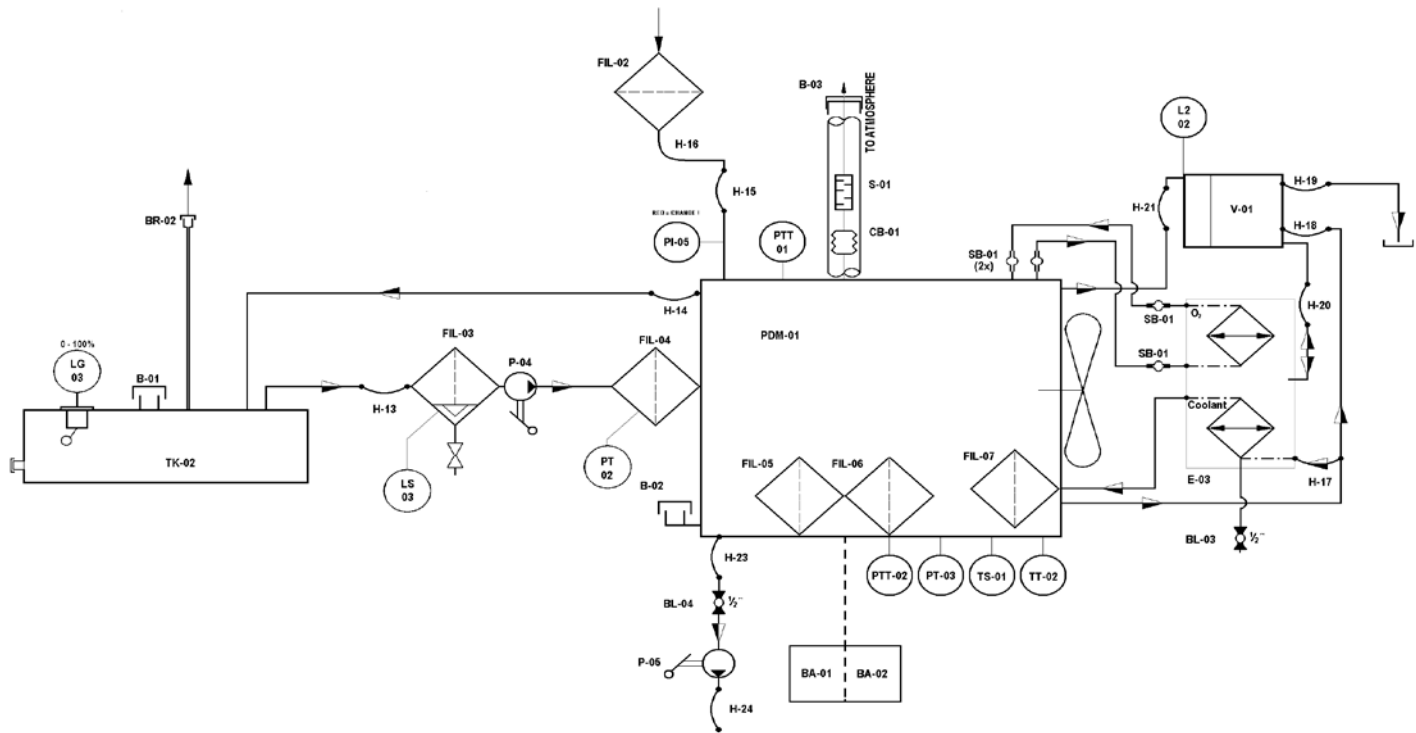


Fig. 11 P & I-diagram Fuel system



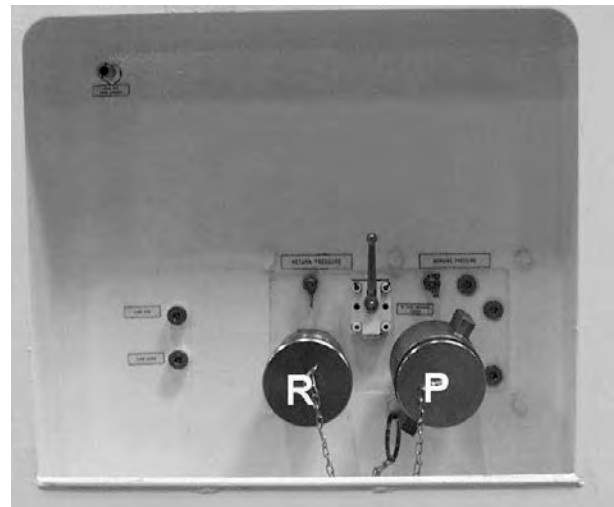
### 3. PREPARATIONS PRIOR TO OPERATION

#### 3.1 Site installation

Lift the complete container at one of the grouped lifting eyes on the container roof (depending on the amount of hydr. oil and fuel in the tanks).  
Use only approved hoist materials.  
Put the container down carefully at the desired location.

#### 3.2 Hoses and cables

- Put ball valve (*fig. 12*) in the open position to make sure that the hydraulic system becomes pressureless.
- Check the pressure gauges (*fig. 13/ PI-1/2*) to ensure that the hydraulic system is indeed pressureless.
- Connect the hydr. oil hoses from the Hydrohammer® to the selected P&R set of quick connector.
- Close the by-pass valve.
- Insert hammer control cable through the opening at the emergency stop and connect it to the A-35 engine control panel.



Quick connectors, 2 "  
P Supply hose connection (to hammer)  
R Return hose connection (from hammer)  
By-pass valve to depressurize hydraulic system

**Fig. 12: Hose connections**

#### 3.3 Fuel and hydraulic oil filling

See paragraph 6.2 of this manual for the specification of fuel and hydraulic oil.

- Fill the fuel tank. The filler cap and the level indicator are located next to each other.
- Fill the hydraulic oil reservoir with the hand pump on the wall:
  - put the suction hose (included in the supply) of the hand pump in the drum containing the correct hydraulic oil,
  - fill at least until the oil level is visible in the upper gauge glass (*see fig. 13 LG-01A*), take into account the oil volume in the hydraulic hoses.

#### **CAUTION:**

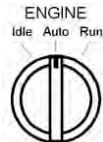
Use **ONLY** the wall mounted hand pump for filling. The pump is directly connected to the cavity of the return filter. Do not use the manhole or any other connection on the hydraulic oil reservoir, to prevent dirt entrainment.

## 4. OPERATION

### 4.1. Checks before starting

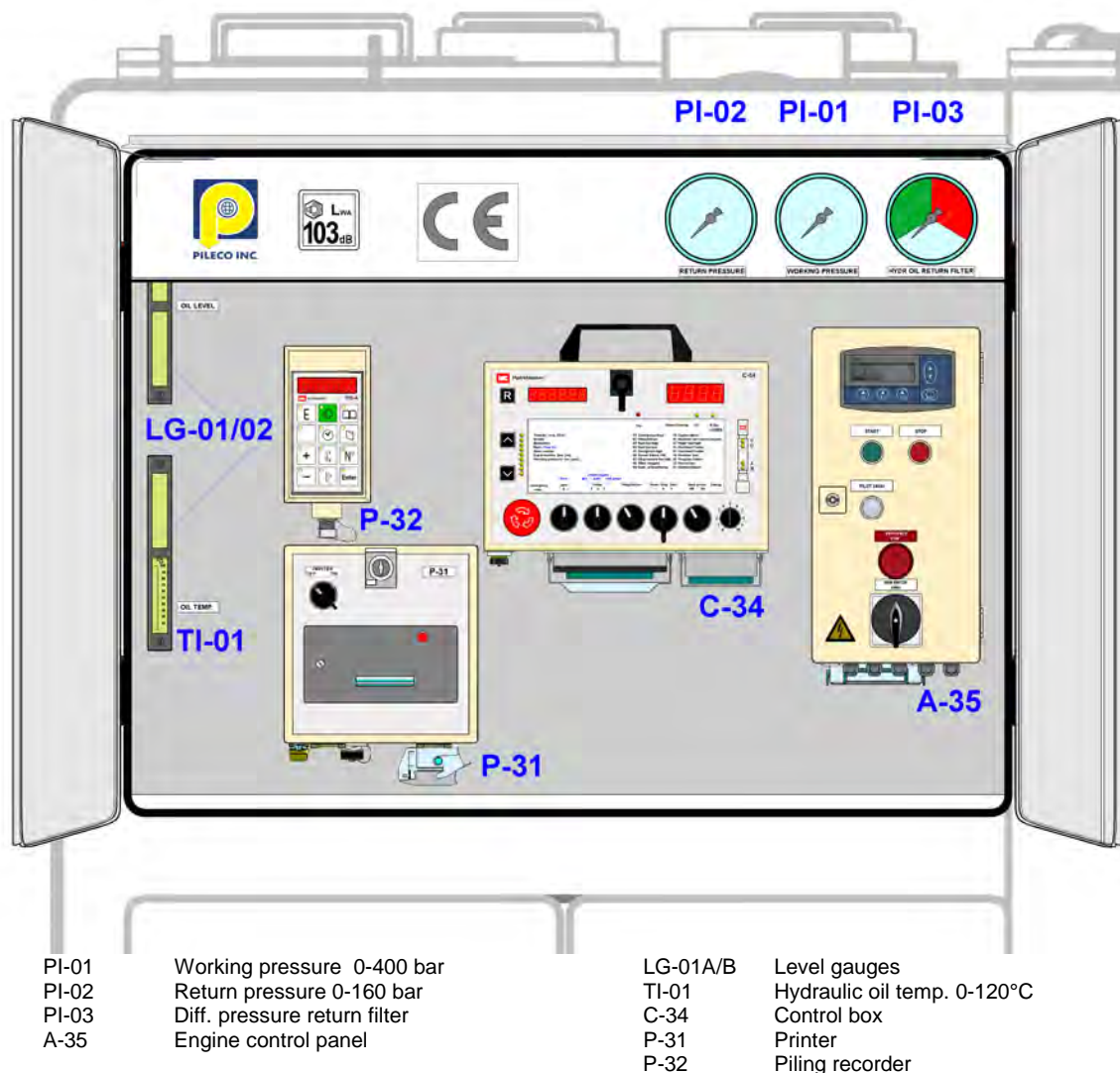
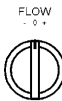
Check:

- Fuel level at level indicator.
- Level in engine oil sump with oil stick.
- Coolant in radiator, top up if necessary.
- Level in hydraulic oil reservoir.
- Hydraulic suction valve open BF-02.
- Put battery main switch ON.
- Put mains switch (S1) on A-35 in pos. I (ON).
- Put engine switch on C-34 in position Idle

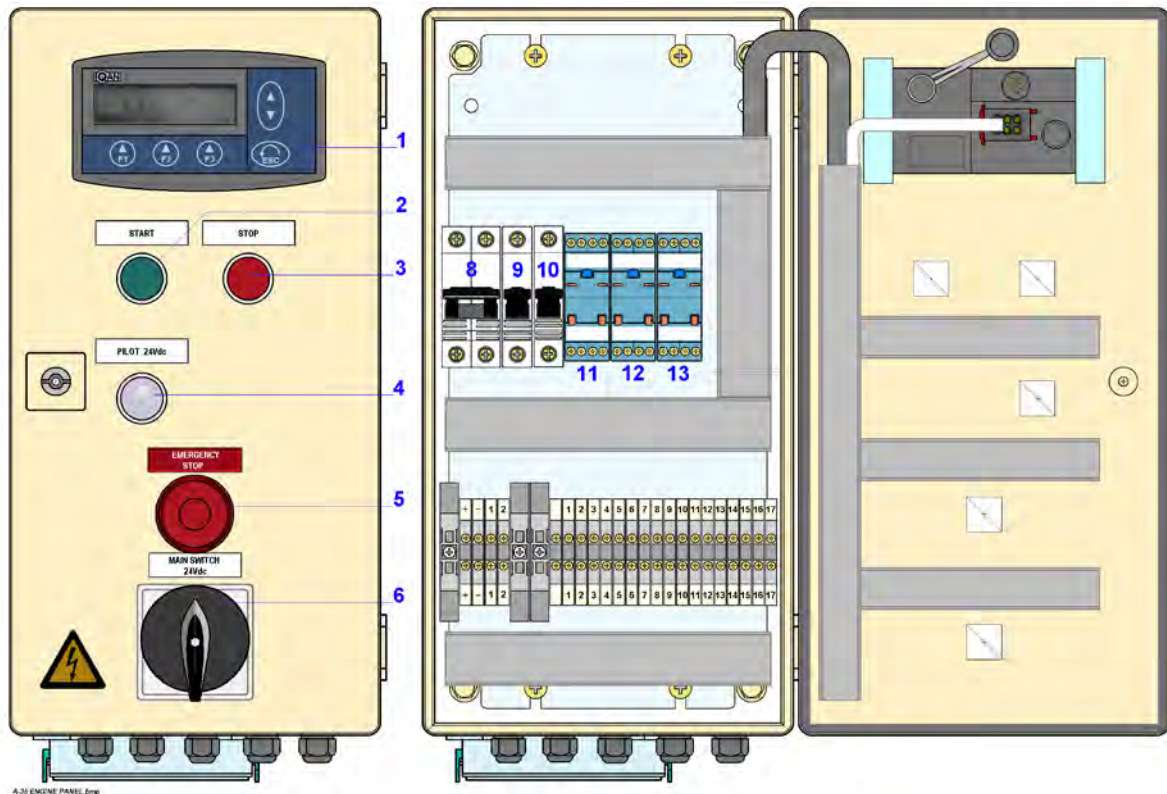


### 4.2. Starting

- Start the diesel engine with the start switch on the A-
- Let the engine idle run (800 rpm) for about 5 minutes to warm up.
- Check the temperature of the hydraulic oil, if less than 10 °C, preheating is required as described in paragraph 4.3.
- Ensure that the by-pass valve (*on manifold*) is closed (handle horizontal) and allow the hydraulic hoses and the rest of the hydraulic system in the hammer to be filled.
- Check the hydraulic oil level again and top up if necessary.
- Put ENGINE switch on C-34 in position Auto or RUN.
- Increase pump FLOW as required using the switch on C-34.



**Fig. 13: Layout gauge panel and control equipment**



#### A-35 Engine control panel

- 1 IQAN display
- 2 Start button (green)
- 3 Stop button (red)
- 4 Indicating lamp POWER 24 Vdc (white)
- 5 Emergency stop button (turn and pull to reset)
- 6 Power supply switch (0=off, I=on)

#### Cable connectors

- 7 Plug 24 pole, hammer to control box

#### Inside box

- 8 Fuse 25 A; Main power supply 24 Vdc
- 9 Fuse 10 A; Power supply 24 Vdc to C\_34
- 10 Fuse 16 A; Power supply 24 Vdc to A-35
- 11 Relay Emergency stop
- 12 Relay Emergency stop back-up
- 13 Relay Emergency stop by-pass

**Fig. 14: Layout engine control panel A-35**

### 4.3. Preheating of the hydraulic oil

To ensure smooth operation of the Hydrohammer®, the temperature of the hydraulic oil should be at least 10 °C. The TI-1 thermometer is located on the reservoir wall under the level gauges. If the temperature is lower, preheating of the hydraulic oil is required. This can be done in two ways:

- by disconnecting the quick connectors of the hydraulic hoses from the hammer to the powerpack or
- by closing the back pressure on the hydraulic manifold

Both ways cause the hydraulic oil to return to the reservoir across a relief valve, converting the pumping energy into heat.

The more oil is circulated (higher oil flow S2 on C-34) the faster the hydraulic oil will reach the required temperature.

The procedure for preheating is as follows:

#### By disconnecting the quick connectors

- o Check that the bypass ball valve is closed (handle horizontal).
- o Disconnect both quick connectors on the hydraulic manifold (P and R) of the hoses to the hammer
- o Start the engine, the pressure will be built up to 90 bar (relief valve setting of the main valve fig. 3/3) and the oil will return via this relief valve on the hydraulic manifold back to the reservoir.
- o Stop the engine when the hydraulic oil has reached the correct temperature (10-15°C).
- o Open the ball valve to depressurize the manifold and close the ball valve when both pressure gauges (fig. 15 /PI 01 and 02) indicate zero.
- o Connect both hydraulic hoses of the hammer with the quick connectors to the hydraulic manifold.



#### By closing the back pressure valve.

#### **WARNING:**

Use this method only when hammer is on pile, to prevent uncontrolled movement of the ram weight.

- o Check that the by-pass valve is closed (handle horizontal).
- o Turn the back pressure switch S6 on the control box C-34 in position 'OFF' to open the back pressure valve on the manifold.
- o Start the engine, then **close** the back pressure valve with switch S6 on the control box C-34: the pressure will be built up to 50 bar (relief valve setting) and the oil will return via the back pressure valve to the reservoir.
- o Stop the engine when the hydraulic oil has reached the correct temperature 10-15°C. Turn switch S6 in position OFF.

The power pack is now ready for use.

### 4.4. Normal stop

The normal stop procedure is as follows:

(assumed is that piling operation has been stopped by switch S5 on C-34.

- reduce engine speed to 900 rpm and let it run for a short while to allow cooling-down of the turbo,
- stop engine after cooling-down by pushing the stop switch on engine control panel A-35.

At day's end:

- put power switch S1 of A-35 in OFF position (O)
- put battery main switch on engine in OFF position,

### 4.5. Emergency stop

#### **CAUTION**

Use the emergency stop button on the Power pack or on the C-34 control box **for emergency cases only.**

Such as in case of a fire in the power pack:

- press the emergency button immediately,
- close all doors and hatches.

### 4.6. Depressurizing the hydraulic system

Turn the handle of the bypass ball valve to the open position to depressurize the system.



## 5. TROUBLE SHOOTING

### 5.1. Specific powerpack malfunctions

Generally, malfunctions in the power pack will have an effect on the Hydrohammer®. Here, only the specific power pack malfunctions will be discussed.

Possible cause	Remedy
<b>1. Engine does not start</b>	
a Battery Main switch (fig.2 pos. 7) or power switch on A34 in position OFF (0)	a Turn switch to position ON.
b Battery supply voltage is too low.	b Check battery and its connections. Replace flat battery
c EMERGENCY STOP on powerpack or on control box C-32 has been pressed (trip code 01 on C-32 display).	c Make quarter turn <i>to the right</i> to unlock and reset.
d Suction valve not fully open (limit switch)	d Fully open suction valve at bottom of hydr. oil reservoir
<b>2. Malfunctions in hydraulic oil circuit</b>	
a Hydraulic hoses P and R are crossed at initial start.	a Read working pressure on gauge panel, while circulating the hydr. oil (hammer not in operation). If reading is 90 bar, correct hose connections.
b System pressure remains 90 bar.	b Check circuitry of main valve "A"
c Air in hydraulic oil (hydrohammer strikes irregularly).	c Deaerate hydr. pump housing.
d Trip code 08: filter clogged, too high a pressure drop.	d Replace clogged filter element in return filter.
e Trip code 09: hydraulic oil level too low or temp. above trip setting of °C.	e Top up hydraulic oil in reservoir, if OK, cool down at reduced engine speed (1500 rpm) with all pump heads in operation.
f Trip code 07: pressure too high.	f Reduce oil flow or increase blow energy.
<b>3. Hydraulic oil supply to hammer too low.</b>	
a Engine does not reach operational rpm with full throttle.	a1 Blocked fuel filter (paraffin condensation), water contamination a2 Air in the fuel system a3 Malfunctioning of injectors a4 Malfunctioning of turbocharger a5 Excessive coolant temperature a6 Blocked intercooler a7 High backpressure in the exhaust system
b Ball valve on hydraulic manifold not fully closed.	b Close valve, handle horizontal.
<b>4. Engine malfunctions during running, trip code 10</b>	
Warning lights on engine panel (see fig. 19):	
a Alarm light (yellow), (B5): Charging failure of battery.	a Check the belt tension of the dynamo, the condition of the battery and the dynamo (alternator).
b Trip light (red), (B2): engine lube oil pressure.	b Check lube oil level, if OK, check lube oil filters.
c Trip light (red), (B1): engine coolant water temp.	c Check level in radiator, top up as necessary.

**Table 1 Trouble shooting P-460**

## 6. MAINTENANCE AND REPAIRS

The container walls are equipped with doors for better access during inspection or maintenance.

### 6.1. General cleaning

Keep the powerpack clean, inside as well as outside.

### 6.2. Fuels and lubricants

#### For diesel engine

- Lube oil  
Sump capacity: ..... 38 liters  
The system is factory-filled with ELF Multi performance 4D, viscosity: SAE 15 W 40  
Equivalent lube oils are:  
TEXACO Ursa super TD (CCMC D2)  
SHELL Rimula TX 15W40  
ESSO Super diesel oil TD (CCMC D3)

- Fuel  
The use of ASTM-D975-No.2 fuel is recommended for optimum engine performance.  
At operating temperatures below 0 °C, acceptable performance can be obtained by using blends of No. 2D and No. 1D.  
The use of lighter fuels can reduce fuel economy.

The fuel's viscosity must be kept above 1.3 cSt to provide adequate lubrication.

- Coolant.  
The closed loop cooling system is factory filled with TOTAL coolant, in 100% concentration, providing protection to -32 °C.  
Total contents  
(including expansion tank): ..... 53 liters

#### For hydraulic oil system

Hydraulic oil (mineral)  
**TOTAL Equivis ZS 46** or equivalent:  
SHELL TELLUS T 46  
TEXACO RANDO OIL HD  
  
or bio-grade oils:  
TOTALFINAELF BIO HYDRAN TMP 46  
SHELL NATURELLE HF-E 46  
BP BIO HYD SE 46  
TEXACO RANDO BIO HE 32 or 46

### 6.3. Preventive maintenance

**WARNING:** The engine should not be running when carrying out maintenance.

#### 6.3.1. Daily inspection

A daily inspection comprises the following:

- **Engine and auxiliaries**

- Level of engine oil
- Level of coolant
- Clogging indicator engine air inlet filters, replace elements when indicator is completely red,
- Fuel level ..... Fuel level indicator and filling cap
- Water separator in fuel line, drain water if present

- **Hydraulic system**

- Level of the hydraulic oil in the reservoir
- Clogging indicator of return filter, located on the gauge panel (PI-03 on fig. 6), should be in green field. When indicator enters the orange field, the filter should be changed at earliest convenience, since the piling operation will be stopped when the indicator enters the red field.
- Check the circuit for leakage.



#### 6.3.2. Regular inspections

- **Engine and auxiliaries**

	Interval
1 Check that there is no leakage of coolant, lube oil or fuel Filling point of expansion tank is accessible behind the hatch as shown ----->	Weekly
2 Check the V-belts on engine for wear, damage and tension	Every 200 hours
3 Renewal of engine oil	Every 200 hours
4 Level of electrolyte in battery (weekly if ambient temp. is above 25 °C at day light)	Every 200 hours
5 Replacement of the oil filters	Every 400 hours
6 Check the air lines and lube lines to the turbo-compressor for leakage	Every 400 hours
6A Lubricate the belt tensioner	Every 400 hours
7 Replacement of the fuel fine filters	Every 800 hours
8 Remove water and dirt from the fuel tank	Every 800 hours
9 Checking and cleaning of the cooling system	Every 1200 hours
10 Check the starter motor and the AC-generator	Every 1200 hours
11 Check the valve clearance *	Every 1200 hours
12 Check the turbo-compressor *	Every 2400 hours
13 Check the injectors *	Every 2400 hours
14 General inspection of engine and accessories *	very 2400 hours

\* These items are only to be carried out by authorised personnel, at least once every other year, independent of the number of running hours.

- **Hydraulic system**

- 1 Perform laboratory tests on the hydraulic oil on a regular basis (especially water content).  
Replace the hydraulic oil as necessary at least once per year
- 2 Replace the return filter element.  
Replace element when indicator is in orange field (more than 0.8 bar).
- 3 Check the connectors, condition and insulation of the electrical wiring.  
Every 200 running hours.

### 6.3.3. Replacement of the return filter element

The return filter is equipped with a magnetic core (providing full flow magnetic pre-filtration upstream of the filter element) and an integral bypass.

The hydraulic oil passes the filter from inside to outside, thus collecting all the particles inside the cartridge.

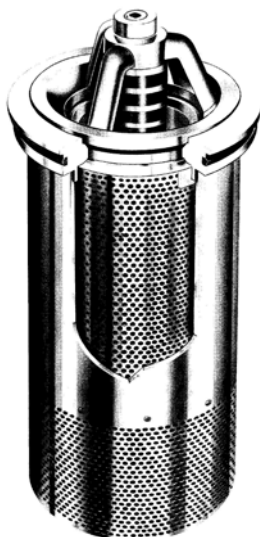
Replace element when indicator is in orange field (more than 0.8 bar).

Trip setting is 1.2 bar

The procedure for replacement of the filter element is as follows (see fig. 21):

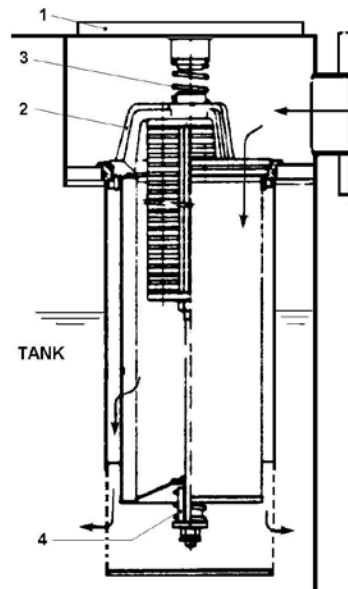


- Remove the hand hole cover (see arrow) on the roof of the container, tagged with Hydr. Oil Return filter.
- Take off the top spring (3) from the filter bridge (2).
- Pull out the filter bridge, complete with filter cartridge.



REMARK: Temporarily close the hand hole opening to prevent possible dirt entrance during the filter cleaning.

- Unscrew the bottom nut and remove the bypass-assembly
- Remove the fibre glass filter element
- Clean the centre stud, magnet core and the metal gauze filter with compressed air.
- Insert the new 10 micron fibre glass filter element and install the various parts in place.
- Install the top spring and close the hand hole cover on the roof.
- Fully open the suction valve to the main pump.
- Vent the pump on its casing.



- 1 Hand hole cover
- 2 Bridge
- 3 Top spring
- 4 Bypass-assembly

**Fig. 15 Return filter**

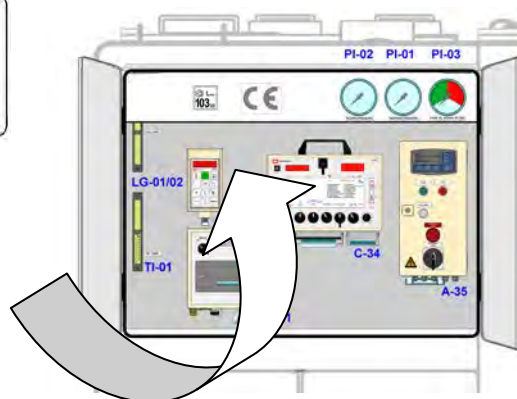


## 6.4. Spare parts

### Ordering spare parts

Always state the following details on your spare parts orders:

- Type and serial number of the powerpack, as shown on the identification plate, see below
- PILECO part number and description of part or assembly.
- The required quantity.



**Fig. 16 Location of identification plate, CE-sticker and sound power level sticker**

IHC standard **recommended** spare parts package (IHC article code 86 40 89 19).

## 7. STORAGE AND TRANSPORT

In case of extended time between uses the engine should be run until warm **at least once every 14 days**. This prevents corrosion of the engine.

### 7.1. Storage

Storage of the power pack is recommended after completion of each piling job (At least the control box should be stored in a dry atmosphere with a max. rel. humidity of 60 %) or when it will not be used for a period of two months and longer.

The following preparations should be carried out for storage of the power pack:

- Open the by-pass valve (fig. 1/7) to depressurize the hydraulic system. When pressure gauges (fig. 13/PI-01/02) indicate zero, close again the ball valve on the hydraulic manifold.
- Disconnect the hydraulic hoses from the manifold and put the dust caps on the quick connectors.
- Disconnect the cap air hose and put protection covers on the connections
- Ensure that the power switch S1 of A-34 is in OFF position (O).
- Ensure that the battery main switch (fig. 2) is in position OFF.
- Check if the frost protection of the coolant is adequate.
- Ensure that all container doors are closed.

In case of overseas transport:

- carry out the same preparations as described in par. 7.1.
- empty the fuel tank
- disconnect the battery cables.

### 7.2. Preservation

If the engine will not be used for more than two months, preservation should be performed.

#### **For periods of storage up to 8 months:**

Change the engine oil and oil filter and then run until warm.

#### **For periods of storage longer than 8 months:**

Preserve the lubrication and fuel systems with preservation oil as follows:

- Drain the oil from the engine and fill it with **preserving oil\*** to just over the MIN marking on the dipstick.
- Connect the suction and return fuel lines to a container filled with 1/3 **preservation oil** and 2/3 diesel fuel.
- Bleed the fuel system.
- Start the engine and operate at a high idle speed until approximately two liters have been used. Shut off the engine and connect the normal fuel lines.
- Empty the preservation oil from the engine.
- Make sure that the coolant's freeze protection is sufficient. Supplement as needed. As an alternative the coolant can be drained (drain also the coolant filter).
- Drain off any water and contamination from the fuel filter and the fuel tank. Fill the tank completely full with fuel to avoid building of condensation.
- Disconnect the battery cables and clean and charge the batteries. Maintenance charge the batteries periodically during the storage period.  
**A poorly charged battery can freeze and break.**
- Clean the engine externally. Do not use high pressure spray when cleaning the engine. Touchup paint damage using Volvo Penta original paint.
- Spray the electrical system's components with a water displacing spray.
- Check and treat control cables using rust preventative.
- Affix a note on the engine showing the date, type of preservation and type of preservation oil is provided.

## **8. DRAWINGS AND DIAGRAMS**

### **ELECTRICAL**

The attached electrical drawings are for diagnostic purposes by qualified persons only.