Instruction- and Maintenance Manual
Strand jack system

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Volume 2:
Hydraulic Power Units

2.2 kW
7.5 kW
15 kW
18.5 kW
30 kW

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Revisions

Rev	Description	Date	Author	Checked	Approved
12	First release Integrated manual for all strand jack HPUs. Since this is volume 2 of the document set, the numbering starts at 11.	20 July 2020	D. Rosier	R. Broenink	R. Broenink
13	- 7.5 KW added - class 10 of NAS 1638	25 Aug 2020	D. Rosier	R. Broenink	R. Broenink
14	The 19 kW HPU removed	15 June 2021	D. Rosier	R. Broenink	R. Broenink

Preface

Dear customer,

This manual is volume 2 of the manual for the Strand jack, and it describes the Hydraulic Power Units.

For the preface reference is made to volume 1.

Contents

1 Introduction

1.1 Manufacturer address

For the manufacturer address reference is made to section 1 of ref 7 “Strand jack manual”.

1.2 Declaration

For the Declaration of Conformity reference is made to section 1 of ref 7 “Strand jack manual”.

1.3 Referenced documents

The following documents are referred to in this manual:

Ref	Name	Identification	Manufacturer
1.	Operation of electrical installations - Low voltage	N 3140	NEN
2.	Operation of electrical installations	NEN-EN 50110-1	NEN
3.	General rules and safety requirements for systems and their components	NEN-EN-ISO 4413	NEN
4.	Technical handbook		Enerpac
5.	EC Declaration of conformity		Enerpac
6.	ASME B30.1-2015	Jacks, Industrial Rollers, Air Casters, and Hydraulic Gantries. (Safety Standard for Cableways, Cranes, Derricks, Hoists, Hooks, Jacks and Slings)	American Society of Mechanical Engineers
7.	Strand jack manual Volume 1	ED.03237,00,001	Enerpac
8.	Manual for the cooling fan	Installation, operation and service manual D/E/F/I/SP 5.813.B4/06.15	HYDAC International

1.4 Identification, liability and modifications

For identicifation, liability and modifications reference is made to section 1 of ref 7 “Strand jack manual”.

1.5 Intended use

For intended use reference is made to section 1 of ref 7 “Strand jack manual”.
The intended use of the System is provide hydraulic pressure for strand jacks.

1.6 Personnel and responsibilities

For Personnel and responsibilities reference is made to section 1 of ref 7 “Strand jack manual”.

1.7 Hand signals

For hand signals reference is made to section 1 of ref 7 “Strand jack manual”.

1.8 Lifetime

For Lifetime reference is made to section 1 of ref 7 “Strand jack manual”.

1.9 Warning symbols used within this document

For warning symbols reference is made to section 1 of ref 7 “Strand jack manual”.

2 General safety aspects

For general safety aspects reference is made to section 1 of ref 7 “Strand jack manual”.

3 System Overview

This section describes the properties and the control aspects of the HPUs.

3.1 The 2.2 kW electric HPU

3.1.1 Main properties

One HPU provides one strandjack with hydraulic power and controls the movements of that strand jack.

Properties of the HPU's:

- The hydraulic power is generated by the electromotor.
- The hydraulic hoses of the strand jack are connected to the HPU:
  - main jack
  - bottom anchor
  - upper anchor
- The electro cabinet contains:
  - Electronics and fuses
  - At its front door:
    - Sockets for the data cables
    - Sockets for the power cables
    - Buttons and indicators
- Brackets on top of the HPU enable piling of powerpacks which is useful for transportation and storage.
- The level of the hydraulic oil can be checked by the oil level indicator.

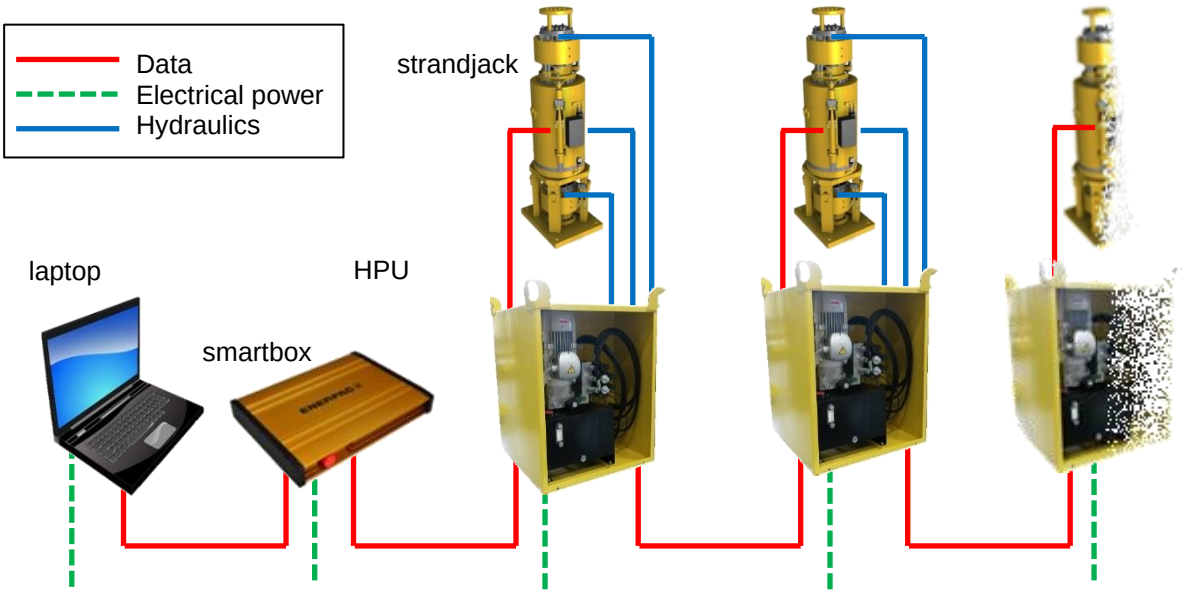
Rear side

Front side

3.1.2 Control

The HPU can be controlled either…

- … by **computer** (the laptop together with the smartbox). **Up to 60** powerpacks / strandjacks can be operated simultaneously.
  This is the operational mode.



A dedicated application runs on the laptop. For that application reference is made to ref 7 “Strand jack manual”. The Smartbox provides interfacing between the laptop and the powerpacks.
The application enables:

- A number of powerpacks can be operated simultaneously.
- The movements of all strandjacks are synchronised
- The strokes of the main jacks of the strand jacks are kept equal. *(“hysteresis”)*.

- … or by the **local control handheld**.

The local control handheld can only control **one** HPU / strandjack.
This mode is intended to be used during setting to work and maintenance.

The following functions are available:

- Main jack: up, down
- Lower anchor: open, close
- Upper anchor: open, close

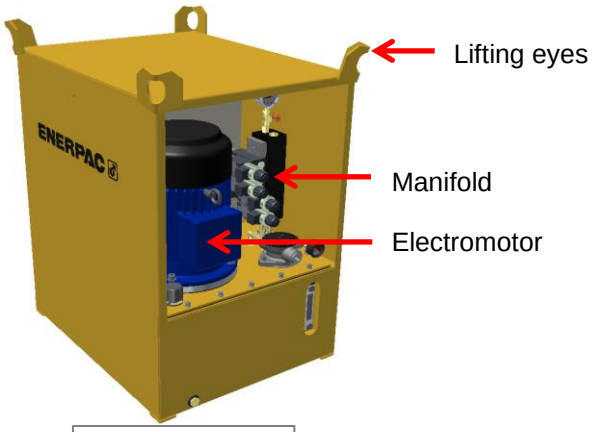
Caution: When applying the local control handheld there is no safeguarding: both anchors can be opened at the same time.

Hazard: When both anchors are opened at the same time, an attached load will drop.

3.2 The 7.5 kW electric HPU

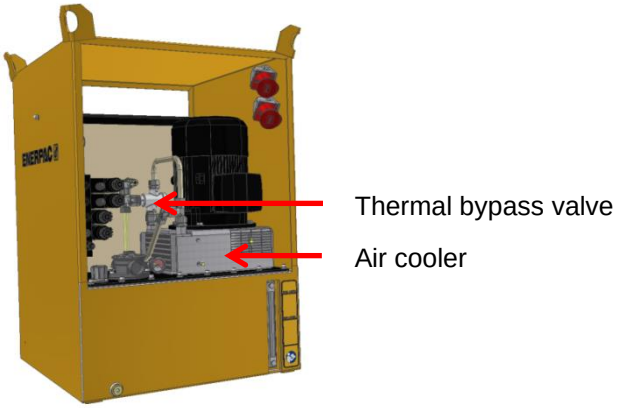
3.2.1 Main properties

One power pack provides one strand jack with hydraulic power and controls the movements of that strand jack.



Rear side

Front side



Optional
HPU with air cooler
Rear side

Properties of the power pack:

- The hydraulic power is generated by the electromotor.
- The hydraulic hoses of the strand jack are connected to the manifold:
  - main jack
  - bottom anchor
  - upper anchor
- The electro cabinet contains:
  - Electronics and fuses
  - Sockets for the data cables
  - Sockets for the power cables
- Control panel
  - Lifting eyes on top of the power pack enable piling which is useful for transportation.

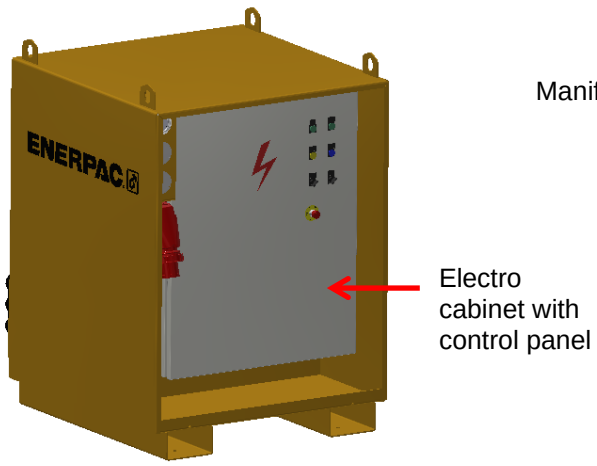
3.2.2 Control

Control is similar to the 2.2 kW type; see section 3.1.2 “Control”.

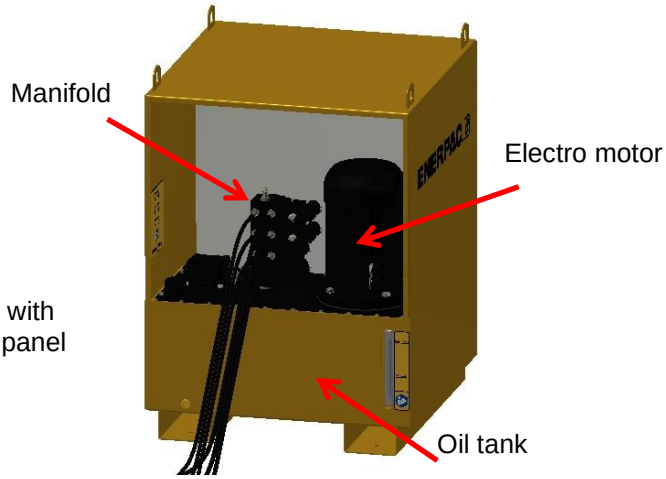
3.3 The 15 kW electric HPU

3.3.1 Main properties

One power pack provides one strand jack with hydraulic power and controls the movements of that strand jack.



Front side



Rear side

Properties of the power pack:

- The hydraulic power is generated by the electromotor.
- The hydraulic hoses of the strand jack are connected to the manifold:
  - main jack
  - bottom anchor
  - upper anchor
- The electro cabinet contains:
  - Electronics and fuses
  - Sockets for the data cables
  - Sockets for the power cables
  - Control panel

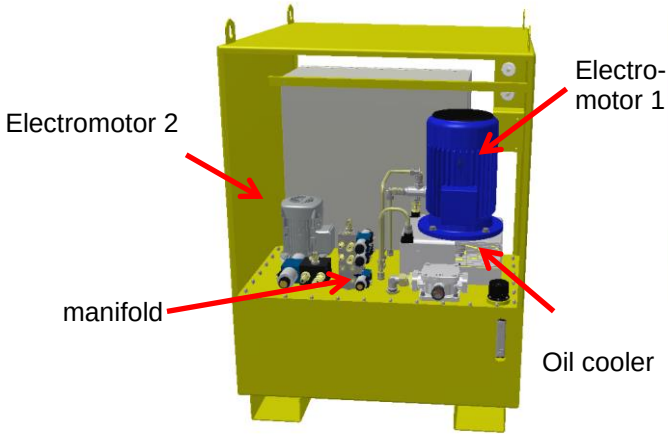
3.3.2 Control

Control is similar to the 2.2 kW type; see section 3.1.2 “Control”.

3.4 The 18.5 kW Electric HPU

3.4.1 Main properties

One HPU provides one strandjack with hydraulic power and controls the movements of that strand jack. It can operate indoors and outdoors.



Rear side

Front side

Properties of the HPU:

- The hydraulic power is generated by two electro motors:
  - The power for the main jack is produced by electromotor 1
  - The power for the top- and the bottom anchor is produced by electromotor 2
- The hydraulic hoses of the strand jack are connected to the manifold:
  - main jack
  - bottom anchor
  - upper anchor
- The hydraulic oil is cooled by an oil cooler
- The electro cabinet contains:
  - Electronics and fuses
  - Sockets for the data cables
  - Sockets for the power cables
  - Control panel
- Brackets on top of the HPU enable piling which is useful for transportation.

3.4.2 Control

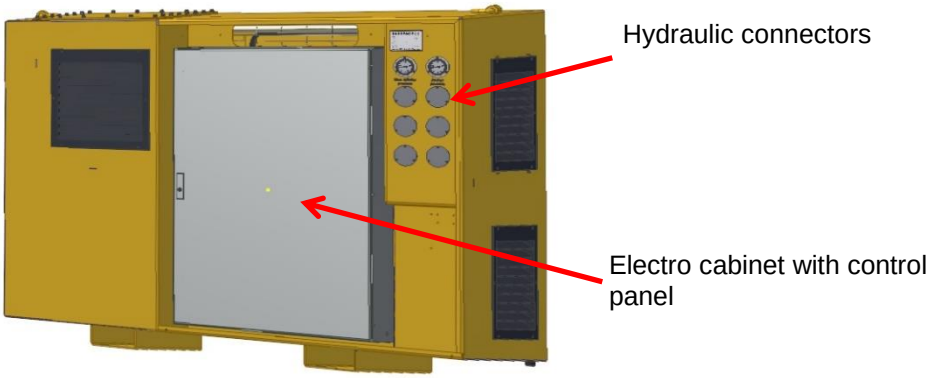
Control is similar to the 2.2 kW type; see section 3.1.2 “Control”.

The local control handheld is different and is as follows:

3.5 The 30 kW electric HPU

3.5.1 Main properties

One HPU provides one strandjack with hydraulic power and controls the movements of that strand jack.



Properties of the HPU:

- The hydraulic power is generated by two electro motors:
  - The main electro motor serves the main jack of the strand jack
  - The secondary electromotor serves the jacks of the top- and bottom anchor
- The hydraulic hoses of the strand jack are connected to the connections of the HPU:
  - main jack
  - bottom anchor
  - upper anchor
- The electro cabinet contains:
  - Electronics and fuses
  - Sockets for the data cables
  - Sockets for the power cables
  - Control panel

3.5.2 Control

Control is similar to the 2.2 kW type; see section 3.1.2 “Control”.

3.6 System specifications

3.6.1 Main specifications

		2.2 kW	7.5 kW	15 kW	18.5 kW	30 kW
IP rating		IP54				
Voltage		360 to 480 V AC/ 3-phase				
Frequency		50-60 Hz				
Current per unit		5A	15 A	30 A	32 A	60 A
Power	Pump 1	2.2 kW	7.5 kW	15 kW	18.5kW	30 kW
	Pump 2	-	-	-	1.5 kW	1.1 kW

Temperatures			
Operating temperature of the machine	Min		-10°C
	Max		+50°C
Temperature of the hydraulic oil	Min	at start up	-20°C
	Min	in operation	+10°C
	Max in operation		+60°C
Storage temperature of the machine	Min		-40°C
	Max		+60°C

Type					
Minimum requirement					
	2.2 kW	**7,5 kW**	**15 kW**	**18.5 kW**	**30 kW**
Volume (liters)		60	150	175	350
Filter type	none	Hydac 0165 R 010 BN4HC		Hydac 0330 R 010 BN4HC	Hydac 0165 R 010 BN4HC
Maximum operating pressure (bars)	230	230 / 350		Main 1:230 Sec 2: 50	Main:350 Sec: 60
Volume (liters)	-	-		-	-
72 dB(A)					

Caution: There is a risk of ice accretion at temperatures below 0ºC.
If ice has accreted on machine components, they cannot be used since they may lock up.

NB: Consult Enerpac if you want to apply the system by other temperatures.

3.6.2 Functional specifications

For compatibility and theoretical lifting speeds reference is made to Appendix Z Compatibility in ref 7 “Strand jack manual Volume 1”

Number of strand jacks to be controlled	
HPU type	**Number of strand jacks**
2.2 kW	1 .. 60
7.5 kW	
15 kW	
18.5 kW	
30 kW	

3.6.3 Dimensions

HPU type	length x width x depth	Weight (excl oil)	Picture
2.2 kW	750 x 600 x 832	269	
7.7 kW	750 x 600 x 959	260	
15 kW	1000 x 1000 x 1389	439 kg (600 kg incl oil)	
18.5 kW	1100 x 1100 x 1540	1050	
30 kW	1905 x 850 x 1455	1550 kg (incl oil)	

3.7 Service conditions

:

- The HPU is intended to provide hydraulic power to a strand jack system which is attached to it, and to control that strand jack system.
- Do not use the HPU for any other purpose.
- No alterations may be made to the HPU.
- Only use the HPU as it was delivered.

NB: The System is explicitly **not intended** for hoisting people.

Hazard: using the HPU for other purposes than the intended use may cause hazards to personnel and may cause damage to the equipment.

4 Plan an operation

Make sure the capacities of the HPU and the capacities of the strandjack to be attached to the HPU match. Use the table as given in section 3.6.2 “Functional specifications”.

Observe the following:

- The HPU matches the capacity of the applied strand jack.
  Reference is made to Appendix Z of ref 7 “Strand jack manual Volume 1”
- The system has to be positioned on a flat and stable subsoil.
- Verify that you have a unobstructed view on the operation from the spot where you control the HPU using the local control handheld.

☞ **NB:** It is of the utmost importance to read this whole chapter carefully before start the lifting operation.

5 Install the System

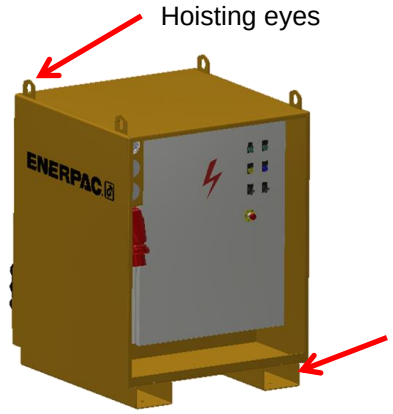
Attention:
Though some components of the HPU may look robust, all components of the system are delicate.

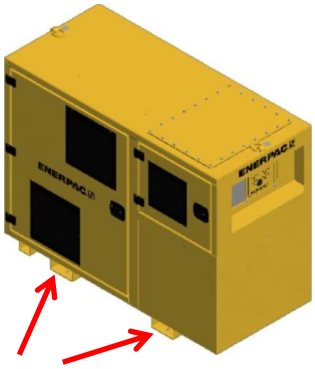
- Do not expose them onto heavy impact.
- Don't use excessive force when mounting or dismounting.
- Handle the hydraulic hoses and the electric cables with great care.

Fully complete the checklist as given in B "Checklist for installing the System".

5.1 How to hoist

For hoisting the HPU use all four lifting eyes or use a forklift





Attention

- Verify that the lifting capacity of you crane is sufficient.
- Disconnect all cables and hoses when the HPU has to be moved, even over a short distance.
- Always use all four hoisting eyes when hoisting the unit.
- The system can be lifted by a forklift. Use the openings for forklift as shown below.
  Make sure the system does not touch the ground when moved by a forklift.

5.2 Mechanical

Put the HPU on a stable ground or on a stable support surface.
The HPU shall be positioned with a skew less than 50, to prevent oil flowing out of the oil cap or the breather.

5.3 Hydraulics

NB: Observe the directions as given in section 2.11 “Dealing with hoses” as given in Ref 7 “Strand jack manual Volume 1”.

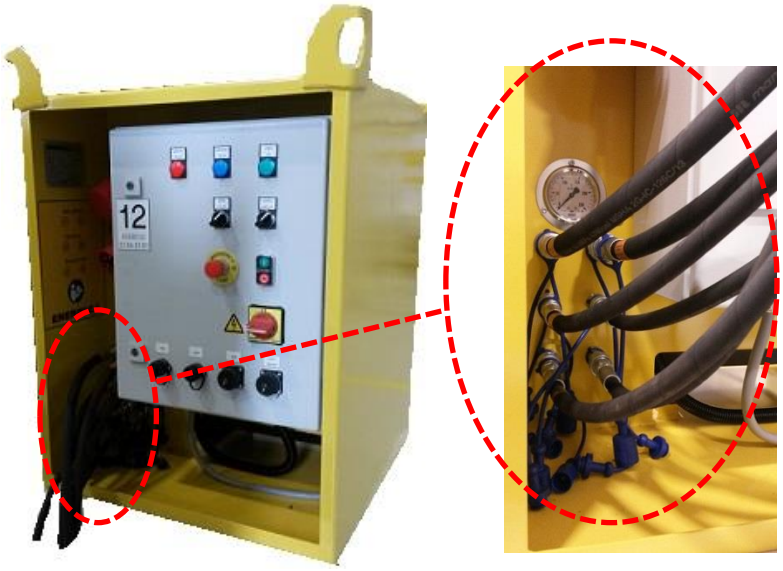
Hazard: When the couplings have not been tightened to the end, overpressure may occur which could damage the system.

Caution

- Dirt may damage the hydraulic system
- Applying the parameters up to the limits (temperatures, impulse frequencies and use in continuous operation) may reduce the service life of hoses.

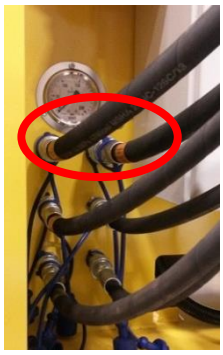
5.3.1 The 2.2 kW HPU

The HPU has to be connected hydraulically with the strand jack. The hoses are connected to the couplings on the manifold inside the HPU:



To connect the hoses proceed as follows.
NB: Don’t bother the direction of the oil flow (feed, retour), due to the application of male / female sockets.

1.	Make sure there is no pressure left in the system. Use the manometer. Make sure its valve is open.	

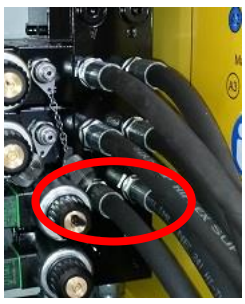
2.	Connect the main cylinder. Use the upper sockets of the manifold	 
3.	Connect the bottom anchor. Use the bottom sockets of the manifold.	 
4.	Connect the top anchor. Use the middle couplings of the manifold.	 

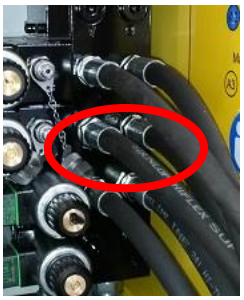
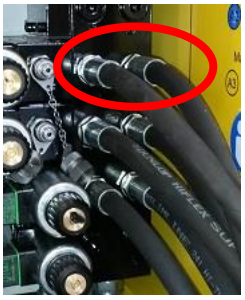
5.3.2 The 7.5 kW

The power pack has to be connected hydraulically with the strand jack. The hoses are connected to the couplings on the manifold inside the power pack:

To connect the hoses proceed as follows.

NB: Don't bother the direction of the oil flow (feed, retour), due to the application of male / female sockets.

1.	Make sure there is no pressure left in the system. Use the manometer. Make sure its valve is open.	
2.	Connect the main cylinder. Use the bottom couplings on the manifold.	 

3.	Connect the bottom anchor. Use the middle couplings of the manifold.	 
4.	Connect the top anchor. Use the top couplings of the manifold.	 

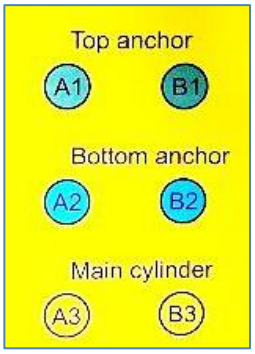
5.3.3 The 15 kW HPU

The power pack has to be connected hydraulically with the strand jack. The hoses are connected to the couplings on the manifold inside the power pack:

To connect the hoses proceed as follows.

NB: Don't bother the direction of the oil flow (feed, retour), due to the application of male / female sockets.

NB: Observe the directions as given in section 2.11 "Dealing with hoses" as given in Ref 7 "Strand jack manual Volume 1".

1.	Read the instructions on the sign inside the HPU.	
2.	Make sure there is no pressure left in the system. Use the manometer.	

3.	Connect the main cylinder. Use the bottom couplings on the manifold.	 
4.	Connect the bottom anchor. Use the middle couplings of the manifold.	 
5.	Connect the top anchor. Use the top couplings of the manifold.	 

5.3.4 The 18.5 kW HPU

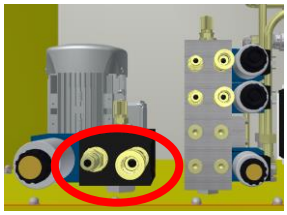
The HPU has to be connected hydraulically with the strand jack. The hoses are connected to the couplings on the manifold inside the HPU:

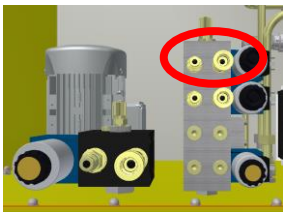
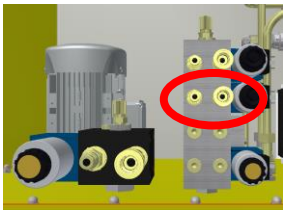
manifold

To connect the hoses, proceed as follows.

NB:

- Don't bother the direction of the oil flow (feed, retour), due to the application of male / female sockets.
- Observe the directions as given in section 2.11 "Dealing with hoses" as given in Ref 7 "Strand jack manual Volume 1".

1.	Make sure there is no pressure left in the system. Read the manometer. Make sure its valve is open.	
2.	Connect the main cylinder. Use the bottom couplings on the manifold.	 

3.	Connect the bottom anchor. Use the middle couplings of the manifold.	 
4.	Connect the top anchor. Use the top couplings of the manifold.	 

5.3.5 The 30 kW HPU

The HPU has to be connected hydraulically with the strand jack. The hoses are connected to the couplings on front side of the HPU:

To connect the hoses, proceed as follows.

NB: Don't bother the direction of the oil flow (feed, retour), due to the application of male / female sockets.

1.	Make sure there is no pressure left in the system. Use the manometers.	
2.	Connect the main cylinder. Use the bottom couplings.	 
3.	Connect the bottom anchor. Use the middle couplings	 

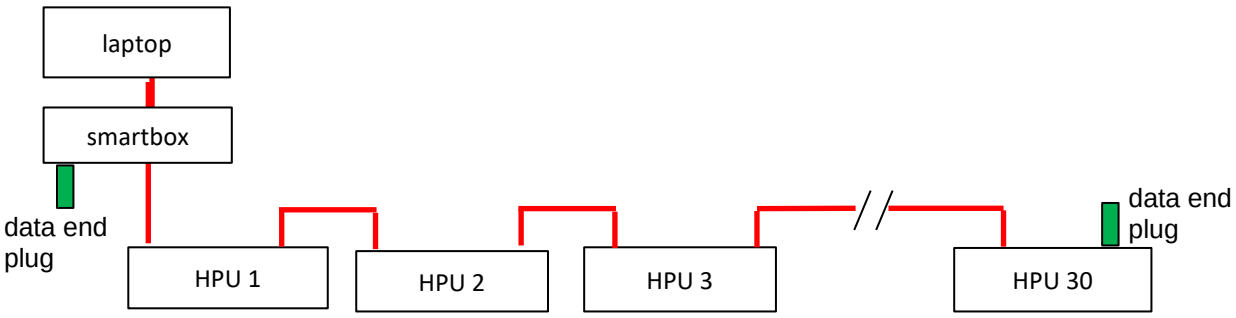
4.	Connect the top anchor. Use the top couplings.	 

5.4 Electrical

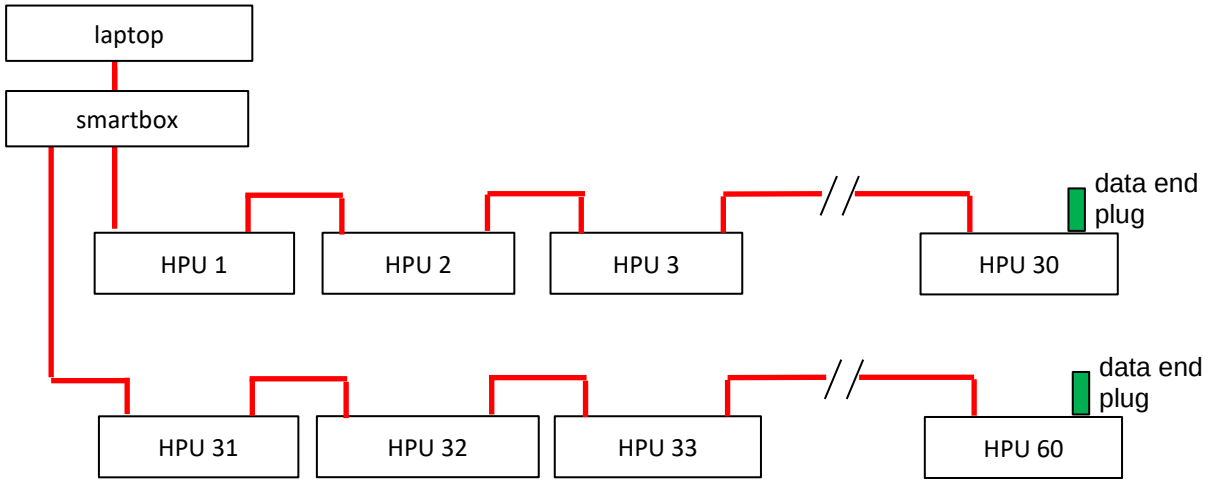
5.4.1 The 2.2 kW HPU

5.4.1.1 Data cables

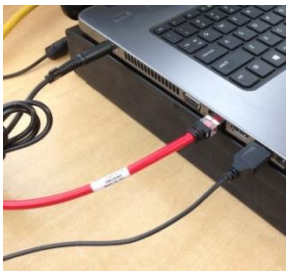
- The following scheme has to be realised for a configuration of 1 to max 30 powerpacks:

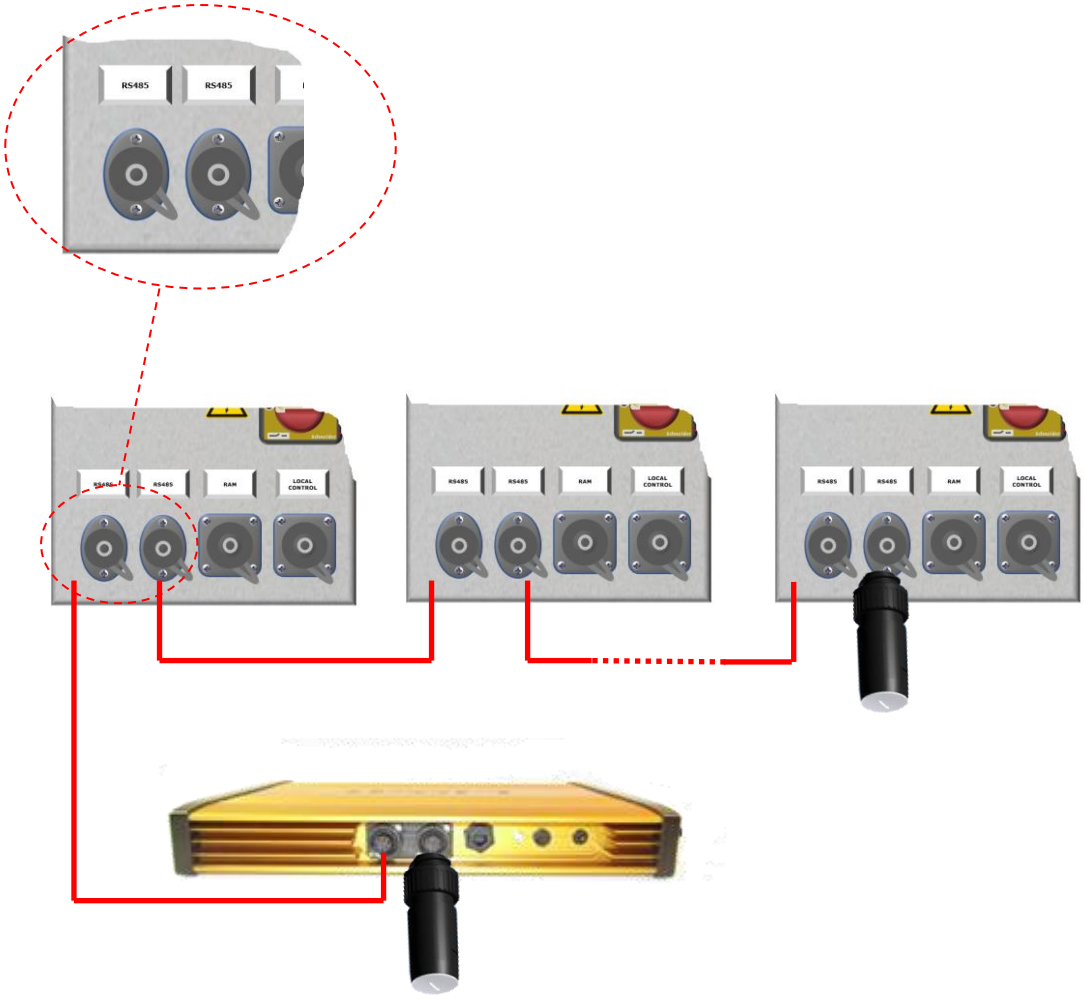


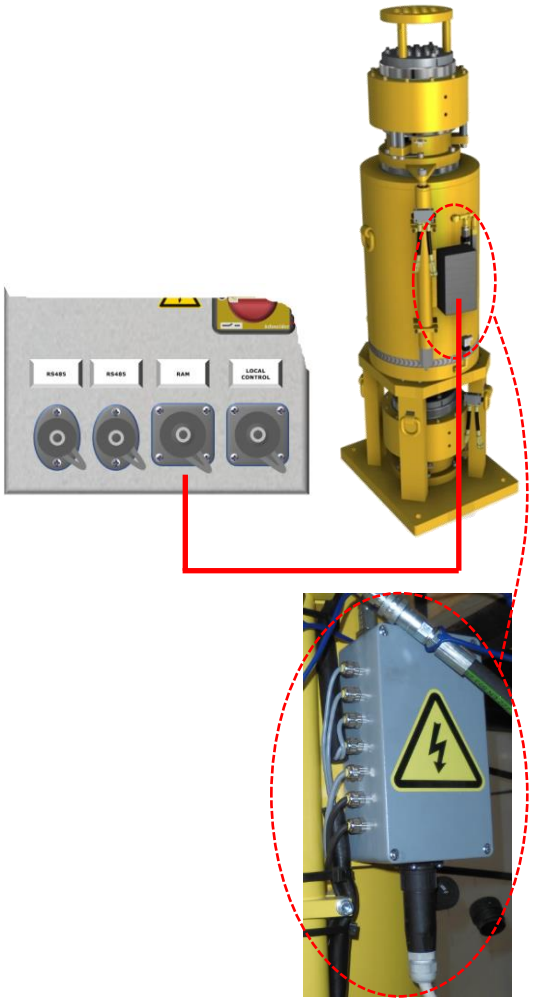
- The following scheme has to be realised for a configuration of more than 30 and up to 60 powerpacks:



To connect the cables, proceed as follows:

1.	Connect the smartbox with the laptop using the red Ethernet cable	 
2.	Connect the smartbox with the powerpacks according to the scheme. Use the RS485 data cables. **NB:** The sequence of connecting the powerpacks is at random; the powerpacks will identify themselves electronically.	

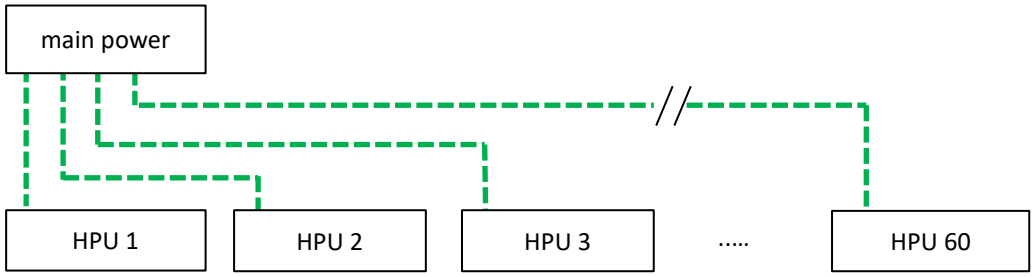


3.	Mount the data end plugs: • The last HPU in a row • The smartbox if 30 or less powerpacks were connected. **Attention**: if the data end plugs are not mounted then the system won't work.	
4.	Connect each the HPU to its own strand jack. Use the socket marked with "RAM".	

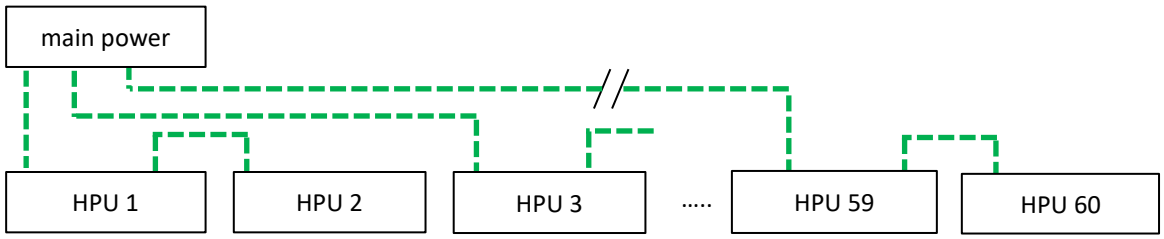
5.4.1.2 Power cables

The powerpacks can be connected in two ways:

- Each HPU is connected individually to the main power



- Powerpacks are connected the main power two-by-two; they are interconnected.
  This configuration enables the use of less meters of power cable, depending on the locations of the powerpacks with reference to each other.



Attention:

- Check the capacities of the fuses of your power source.
- Do not interconnect more than two powerpacks.

To connect the cables, proceed as follows:

1.	Connect the power cables to the laptop and the smartbox	
2.	Connect the power supply cable to one of the powerpacks. Use the indicated sockets of the HPU.	
3.	Connect the next powerpacks, according to the scheme of your preference. If you choose to interconnect then connect the outbound socket of the one with the inbound socket of the other HPU.	

5.4.2 The 7.5 kW HPU

5.4.2.1 Data cables

See section 5.4.1.1 “Data cables”.

5.4.2.2 Power cables

For the scheme see section 5.4.1.2 “Power cables”.

Proceed as follows:

	Connect the power cables to the laptop and the smartbox	
	Connect the power supply cable to one of the power packs. Use the indicated sockets of the power pack.	
	Connect the next power packs, according to the scheme of your preference. If you choose to interconnect then connect the outbound socket of the one with the inbound socket of the other power pack.	

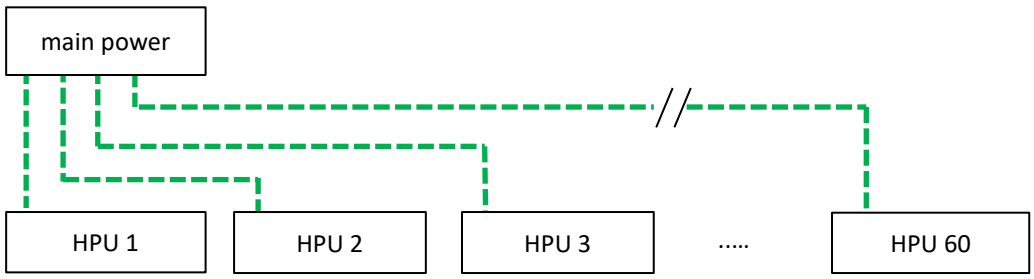
5.4.3 The 15 kW HPU

5.4.3.1 Data cables

See section 5.4.1.1 “Data cables”.

5.4.3.2 Power cables

Each power pack is connected individually to the main power



Attention: Check the capacities of the fuses of your power source.

Proceed as follows:

1.	Connect the power cables to the laptop and the smartbox	
2.	Connect the power supply cables to all power packs.	

5.4.4 The 18.5 kW HPU

5.4.4.1 Data cables

See section 5.4.1.1 “Data cables”.

5.4.4.2 Power cables

See section 5.4.1.2 “Power cables”.

To connect the cables, proceed as follows:

1.	Connect the power cables to the laptop and the smartbox	
2.	Connect the power supply cable to one of the powerpacks. Use the indicated sockets of the HPU.	
3.	Connect the next powerpacks, according to the scheme of your preference. If you choose to interconnect then connect the outbound socket of the one with the inbound socket of the other HPU.	

5.4.5 The 30 kW HPU

5.4.5.1 Data cables

See section 5.4.1.1 “Data cables”.

5.4.5.2 Power cables

Connect the power cable to the socket.

6 How to control the System

6.1 How to use the emergency buttons

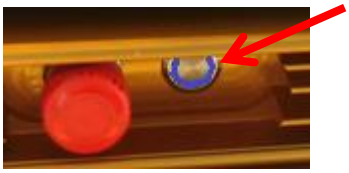
6.1.1 The 2.2 kW, 7.5 kW, 15 kW, 18kW, 30kW HPUs

Emergency stop buttons are provided:

Button		When the button is pressed then…
The HMI, running on the laptop		• The powerpacks of all Strandjack units stop. • all vertical movements are stopped
Smartbox		
Powerpacks of the strandjack units		• The HPU on which the button was pressed stops. All movements are stopped • If the HPU is set to Remote then other powerpacks which are set to Remote stop as well.

To resolve the Emergency situation:

1. Solve the reason why the button was pressed
2. Turn the Emergency stop button which was pressed to release it
3. If the HPU was in Remote then the Reset button on the Smartbox is on.
   Press that button to reset the Smartbox



4. Restart the System

6.2 How to control the HPU

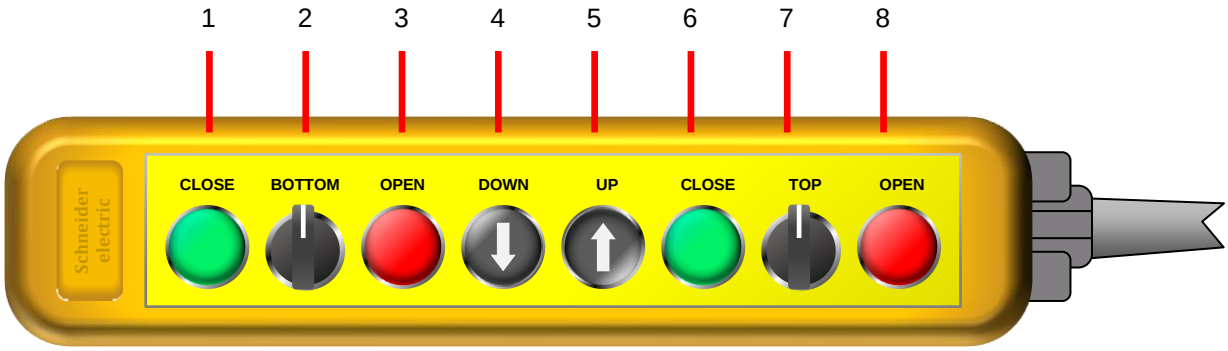
6.2.1 The 2.2 kW HPU

6.2.1.1 Local control

Caution: When applying the local control handheld there is no safeguarding: both anchors can be opened at the same time. Therefore, local control is intended to be used for installation- and maintenance purposes **only.**

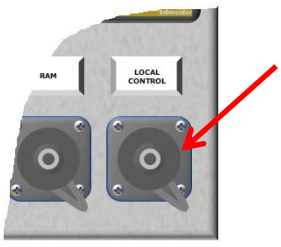
Hazard: When both anchors are opened at the same time, an attached load will drop.

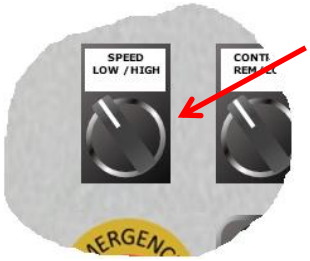
One single strand jack unit can be controlled by the local control handheld.



Nr	type	name	description
1.	indicator	Close	Is on when bottom anchor clamps the strand: “close”
2.	switch	Bottom	Turn to the left to open the bottom anchor Turn to the right to close the bottom anchor
3.	indicator	Open	Is on when bottom anchor does not clamp the strand: “open”
4.	push button	Down	To retract the main jack
5.		Up	To extend main jack
6.	indicator	Close	Is on when the top anchor clamps the strand
7.	switch	Top	Turn to the left to open the top anchor Turn to the right to close the top anchor
8.	indicator	Open	Is on when top anchor head does not clamp the strand

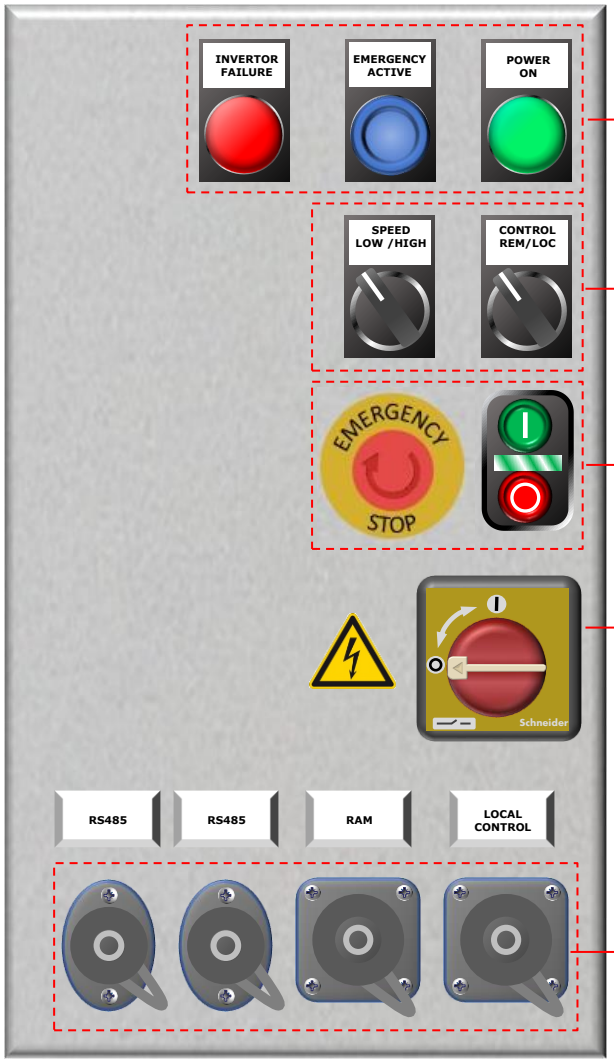
To control the strand jack using the local control handheld proceed as follows:

1.	Connect the local control to the socket on the HPU	

2.	Set the switch on the HPU control panel to “Loc”.	
3.	Select low speed or high speed lifting or lowering.	
4.	Use the buttons and switches on the local control to control the strand jack.	

6.2.1.2 The control panel

This section describes how to control the HPU:



1 Failure of the electronics of the electromotor
2 The emergency button was pressed
3 The power is switched on (main switch)

4 Setting of the moving speed of the strand jack
5 Set the HPU to be controlled by computer (REM) of local control unit (LOC)

6 Emergency button.
If pressed then the strand jack stops moving.
7 Switch the electromotor on or off

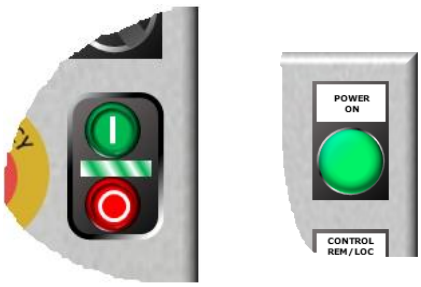
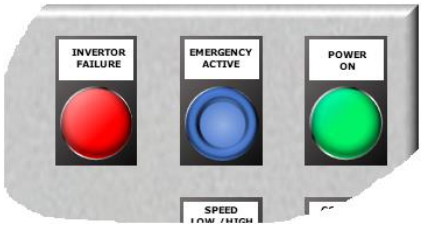
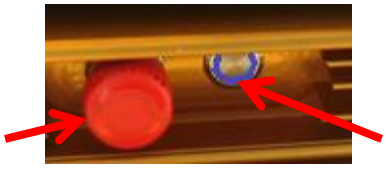
8 Main power switch

9 Connector for the local control unit
10 Connector for the electronics of the strand jack
11,12 Two identical RS485 in/out sockets for the data cables

6.2.1.3 Swith the system on and off

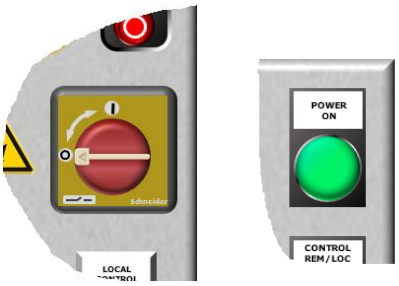
To switch the system on proceed as follows:

1.	Turn the main switch of one HPU to '1'	
2.	Verify that the emergency button is in OK position. Turn clockwise to ensure that it is not engaged.	

3.	Turn the control switch to 'REM' (remote). ('LOC'= local)	
4.	Press the on button *The power on indicator is on* *The pumps start running*	
5.	Verify: • the Power ON indicator is on • the invertor failure indicator is off • the emergency active indicator is off	
6.	Repeat steps 2 to 4 for all other powerpacks	
7.	Connect the power supplies of the Smartbox and the laptop. Start the application on the laptop.	
8.	Press the reset button on the Smartbox. *The blue light dims*	
9.	Use computer or the local control handheld to verify the functionality: • Lifting, lowering • Open, close of the top anchor • Open, close of the bottom anchor *All movements have to be performed smoothly and in accordance with the selected direction.*	

To switch the system off, proceed as follows:

1.	Press the off button *The pumps stop running*	

2.	Turn the main switch of one HPU to ‘0’ *The power indicator is off*	

6.2.1.4 Computer control

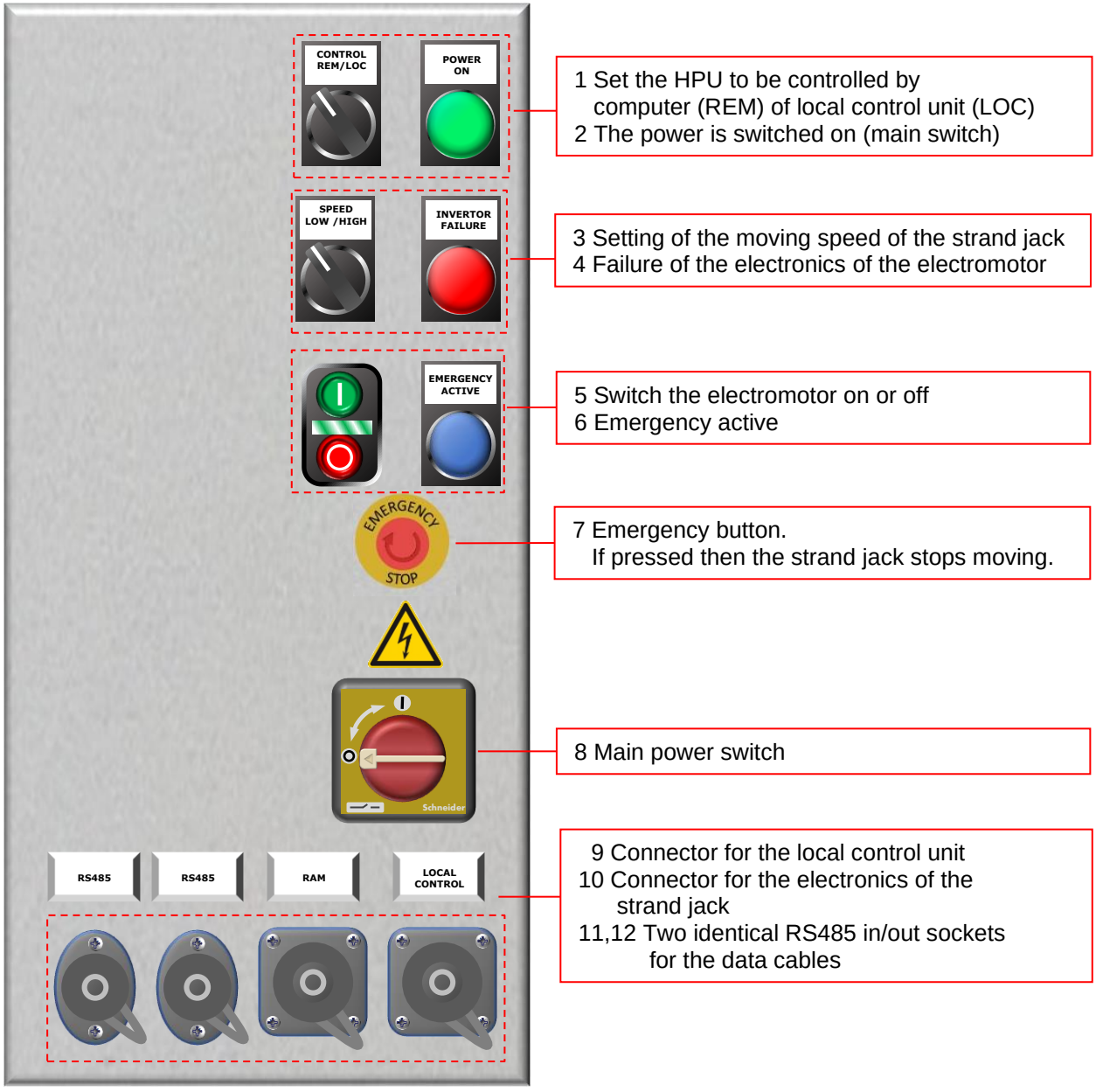
For controlling the system using the laptop and the local control handheld, reference is made ref 7 “Strand jack manual”.

6.2.2 The 7.5 kW HPU

6.2.2.1 Local control

See section 6.2.1.1 “Local control”.

6.2.2.2 The control panel



1.	switch	Control REM/LOC	• REM (remote): The system is computer controller • LOC (local): The system is controlled by the remote control panel
2.	indicator	Power on	Is on when the power is switched on by [8]
3.	switch	Speed low/high	The lifting / lowering speed, both for local control and remote control.
4.	indicator	Inverter failure	Is lit when the electronics fail

5.	buttons	On/Off	To switch the electro motor on/off. Only effective when the main switch [8] is set to on
6.	indicator	Emergency active	Is on when the Emergency stop button [7] was pressed
7.	button	Emergency stop	To switches the system off immediately. The cylinder will not move anymore.
8.	switch	Main power switch	To switches the main power. The electronics are active and communication with the SCC runs.
9.	socket	RS485	Two sockets for connecting data cables. The sockets have equal functionality; both of them can be used for input and output
10.			
11.		RAM connector	Socket for connecting with the electronic cabinet of the strand jack.
12.		Remote Control	Socket to connect the local control unit (if delivered). Is intended for installation- and maintenance use only. When applied, [1] has to be set to Local.

6.2.2.3 Switch the system to on and off

See section 6.2.1.3 “Swith the system on and off”.

6.2.2.4 Computer control

For controlling the system using the laptop and the local control handheld, reference is made ref 7 “Strand jack manual”.

6.2.3 The 15kW HPU

6.2.3.1 Local control

See section 6.2.1.1 “Local control”.

6.2.3.2 The control panel

This section describes how to control the HPU.

1 Failure of the electronics of the electromotor
2 The emergency button was pressed
3 The power is switched on (main switch)

4 Strand Jack ID

5 Setting of the moving speed of the strand jack
6 Set the HPU to be controlled by computer (REM) of local control unit (LOC)

7 Emergency button.
If pressed then the strand jack stops moving.
8 Switch the electromotor on or off

9 Hour counter

10 Connector for the local control unit
11 Connector for the electronics of the strand jack
12,13 Two identical RS485 in/out sockets for the data cables

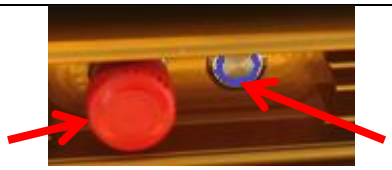
14 Main switch
(located at the side of the cabinet)

1.	indicator	Inverter failure	Is on when the electronics fail
2.	indicator	Emergency active	Is on when the Emergency stop button [7] was pressed
3.	indicator	Power on	Is on when the power is switched on by [8]
4.	Indication	-	Shows the number of the connected strand jack and the IMAC address of the HPU.
5.	switch	Speed low/high	The lifting / lowering speed, both for local control and remote control.
6.	switch	Control REM/LOC	• REM (remote): The system is computer controller • LOC (local): The system is controlled by the local control handheld

7.	button	Emergency stop	To switches the system off immediately. The cylinder will not move anymore.
8.	buttons	On/Off	To switch the electro motor on/off. Only effective when the main switch [14] is set to on
9.	Indicator	Hour counter	Shows the number of hours the HPU has been switched on
10.	socket	RS485	Two sockets for connecting data cables. The sockets have equal functionality; both of them can be used for input and output
11.			
12.		RAM connector	Socket for connecting with the electronic cabinet of the strand jack.
13.		Local Control	Socket to connect the local control handheld (if delivered). Is intended for installation- and maintenance use only. When applied, [6] has to be set to Local.
14.	switch	Main power switch	To switches the main power. The electronics are active and communication with the SCC runs.

6.2.3.3 Switch the system to on and off

1.	Turn the main switch of one power pack to '1'	
2.	Turn the control switch to 'REM' (remote). ('LOC'= local)	
3.	Verify that the Power ON indicator is on	
4.	Verify that the emergency button is in OK position. Turn clockwise to ensure that it is not engaged.	
5.	Repeat steps 2 to 5 for all other HPU's	
6.	Connect the power supplies of the Smartbox and the laptop. Start the application on the laptop.	

7.	Press the reset button on the Smartbox. *The blue light dims*	
8.	Use computer or the local control handheld to verify the functionality: • Lifting, lowering • Open, close of the top anchor • Open, close of the bottom anchor *All movements have to be performed smoothly and in accordance with the selected direction.*	

6.2.3.4 Computer control

For controlling the system using the laptop and the local control handheld, reference is made ref 7 “Strand jack manual”.

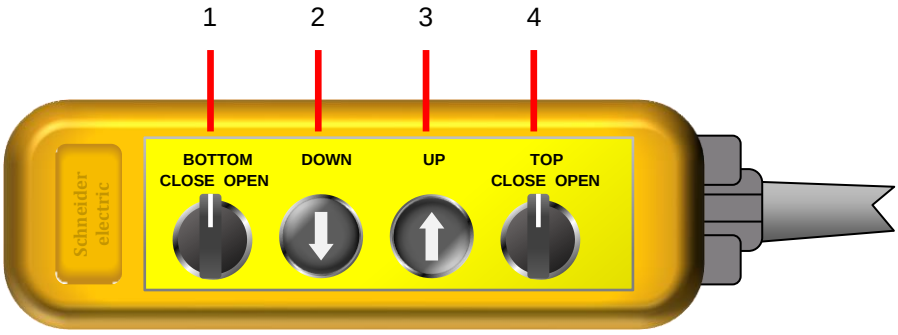
6.2.4 The 18.5 kW HPU

6.2.4.1 Local control

Caution: When applying the local control handheld there is no safeguarding: both anchors can be opened at the same time. Therefore, local control is intended to be used for installation- and maintenance purposes **only.**

Hazard: When both anchors are opened at the same time, an attached load will drop.

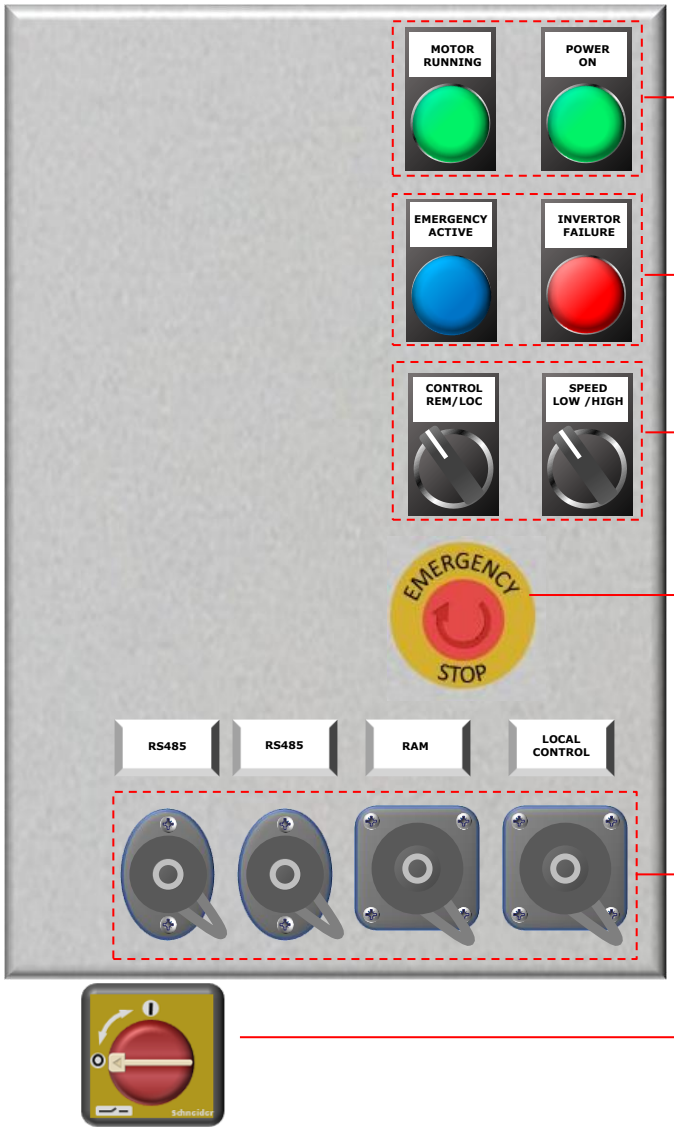
One single strand jack unit can be controlled by the local control handheld.



Nr	type	name	description
1.	switch	Bottom close open	To close and open the bottom anchor
2.	button	Down	To lower the main jack
3.		Up	To extend the main jack
4.	switch	Top close open	To close and open the top anchor

6.2.4.2 The control panel

This section describes how to control the HPU.



1 Motor running
2 Power on

3 Emergency active
4 Invertor failure

5 Control remote or local
6 Speed low or high

7 Emergency button

8,9 Two identical RS485 in/out sockets for the data cables
10 Connector for the electronics of the strand jack
11 Connector for the local control unit

12 Main switch
(located at the side of the cabinet)

1.	indicator	Motor running	Is lon when the electromotor runs
2.		Power on	Is on when the power is switched on by [12]
3.		Emergency active	Is on when the Emergency stop button [7] was pressed
4.		Motor failure	Is on when the electronics of the motor fails
5.	switch	Control REM/LOC	• REM (remote): The system is computer controller • LOC (local): The system is controlled by the local control handheld.
6.		Speed low/high	The lifting / lowering speed, both for local control and remote control.
7.	button	Emergency stop	To switches the system off immediately. The cylinder will not move anymore.
8.	socket	RS485	Two sockets for connecting data cables. The sockets have equal functionality; both of them can be used for input and output
9.			
10.		RAM connector	Socket for connecting with the electronic cabinet of the strandjack.

11.		Local Control	Socket to connect the local control handheld (if delivered). Is intended for installation- and maintenance use only. When applied, [1] has to be set to Local.
12.	switch	On/off	To switch the HPU on. The button is mounted aside of the electro cabinet.

6.2.4.3 Switch the system on and off

See section 6.2.1.3 “Swith the system on and off”.

6.2.4.4 Computer control

For controlling the system using the laptop and the local control handheld, reference is ref 7 “Strand jack manual”.

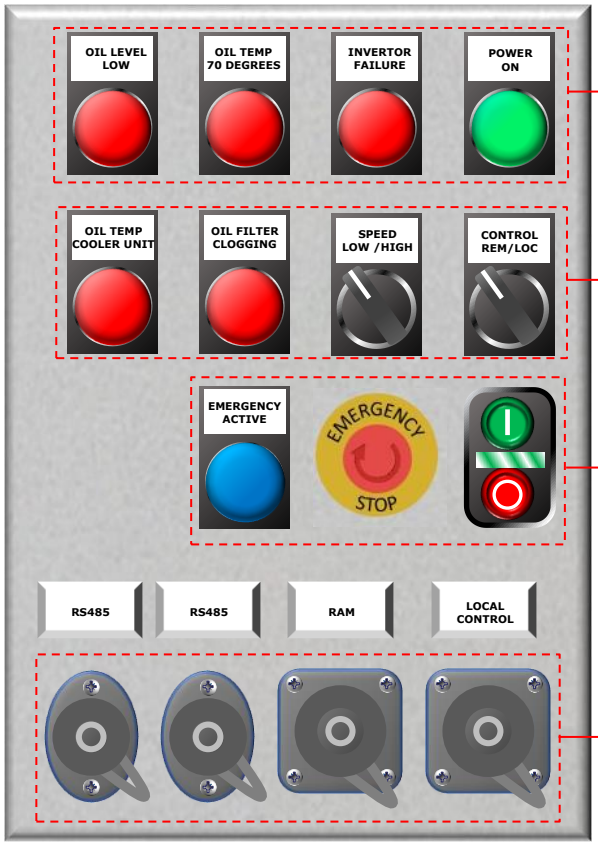
6.2.5 The 30 kW HPU

6.2.5.1 Local control

See section 6.2.1.1 “Local control”.

6.2.5.2 The control panel

This section describes how to control the HPU’s:



1 Oil level low
2 Oil temperatura 70 degrees
3 Invertor failure
4 Power on

5 Oil temeprature cooler unit
6 Oil filter clogging
7 Speed Low / high
8 Control Remote / local

9 Emergency active
10 Emergency button
11 Switch the electromotors on or off

12,13 Two identical RS485 in/out sockets for the data cables
14 Connector for the electronics of the strand jack
15 Connector for the local control unit

16 Main switch
(located a the side of the cabinet)

1.	indicator	Oil level low	Is on when the oil level is low. The machine stops.
2.		Oil temperature 70 degrees	Is on when the oil temperature exceeds 70 degrees Celsius. The machine stops.
3.		Inverter failure	Is on when the electronics fail
4.		Power on	Is on when main switch [16] is switched on.
5.		Oil temperature cooler unit	Is on when the oil temperature as measured in the cooler is too high.
6.		Oil filter clogging	Is on when the oil filter is clogged. Replace the oil filter.
7.	switch	Speed low/high	Switch to set the moving speeds of the jacks of the top anchor, the bottom anchor and the main jack
8.		Control rem/loc	Switch to set the system to • Controlled by computer (REM) • Controlled by the local control handheld (LOC)
9.	indicator	Emergency active	Is on when the emergency button has been pressed

10.	Button	Emergency	To switch of the HPU off in case of an emergency. All movements of the strand jack are stopped. Turn the switch to lift the emergency situation.
11.	button	On/off	To switch both electro motors on and off.
12.	sockets	RS485	Two sockets for connecting data cables. The sockets have equal functionality; both of them can be used for input and output
13.			
14.		RAM connector	Socket for connecting with the electronic cabinet of the strandjack.
15.		Local Control	Socket to connect the local control handheld (if delivered). Is intended for installation- and maintenance use only. When applied, [1] has to be set to Local.

6.2.5.3 Switch the system on and off

See section 6.2.1.3 “Swith the system on and off”.

6.2.5.4 Computer control

For controlling the system using the laptop and the local control handheld, reference is made ref 7 “Strand jack manual”.

6.3 Limiting devices

6.3.1 The 2.2kW, 7.5 kW, 15kW, 18.5 kW HPU

The produced pressure of the HPU is limited. The limit is a factory setting and depends on the properties of the connected strand jack system but will never exceed the pressure as stated in section 3.6.1 “Main specifications”.

7 Execute an operation

This section describes how to use the system.
Precondition is, that the system has been set to work completely, and that you are familiar with the operation if the system.

☞ **NB:** Operating the HPU is only permitted if you are certified by Enerpac as an authorised operator.

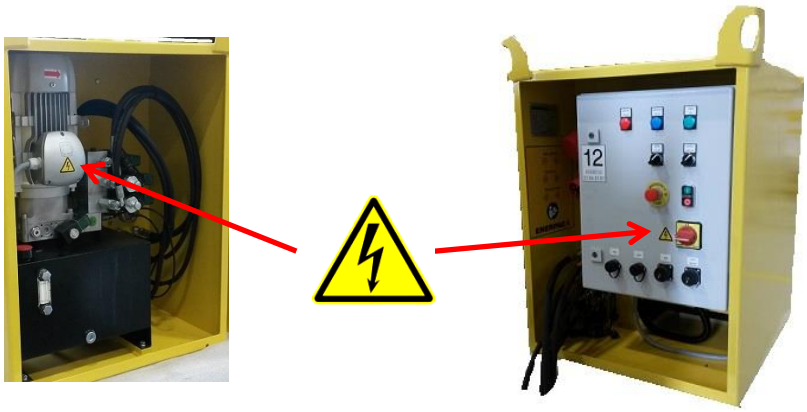
7.1 Risks and Warnings

For risks and warnings reference is made to section 7 of ref 7 “Strand jack manual Volume 1”.

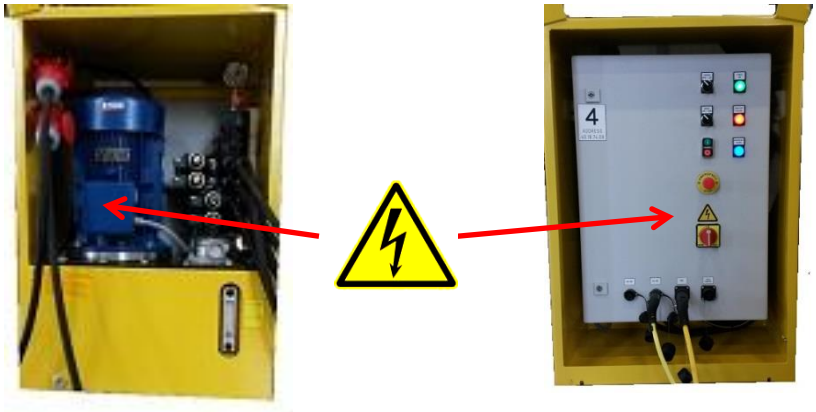
7.2 Warning signs on the System

The following labels and signs are applied on the HPU.
Find the legend in section 2.3. “Symbols applied to the System” of Ref 7 “Strand jack manual Volume 1”.

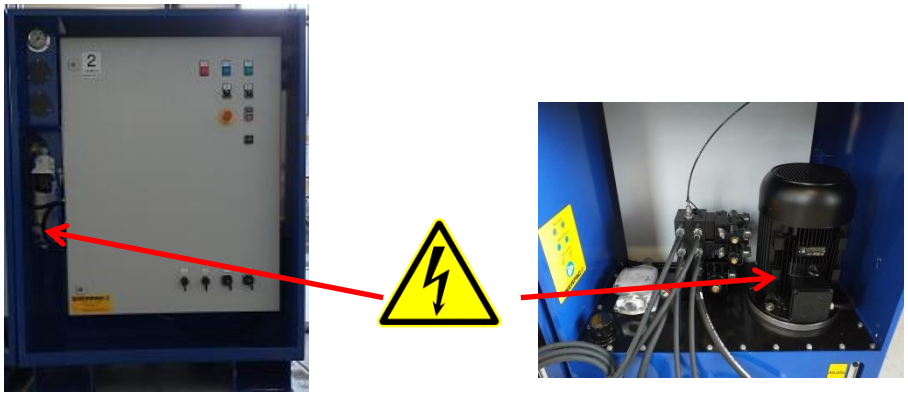
7.2.1 The 2.2 kW HPU

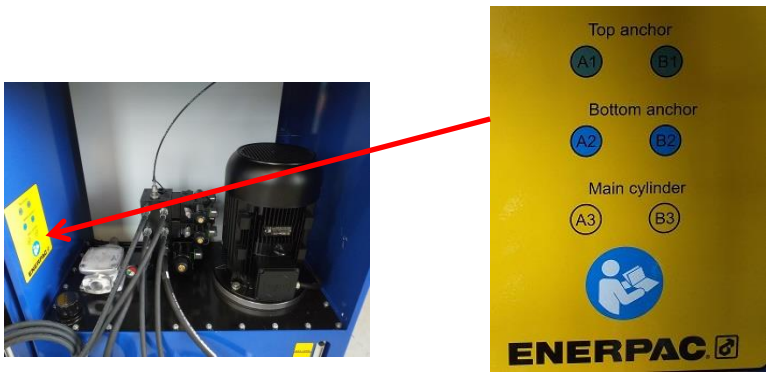


7.2.2 The 7.5 kW

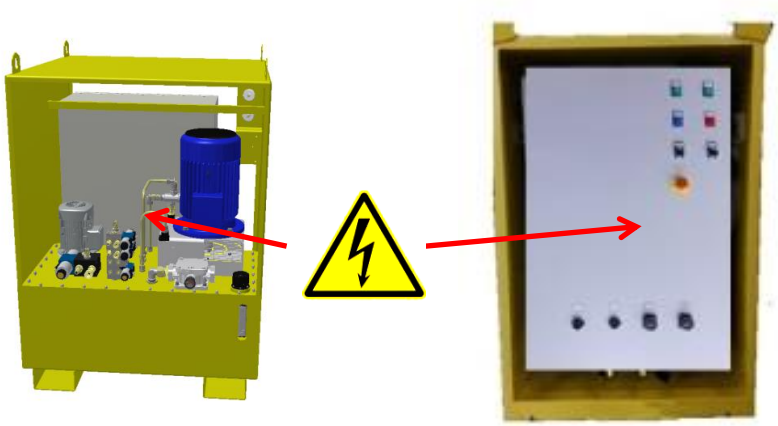


7.2.3 The 15 kW HPU

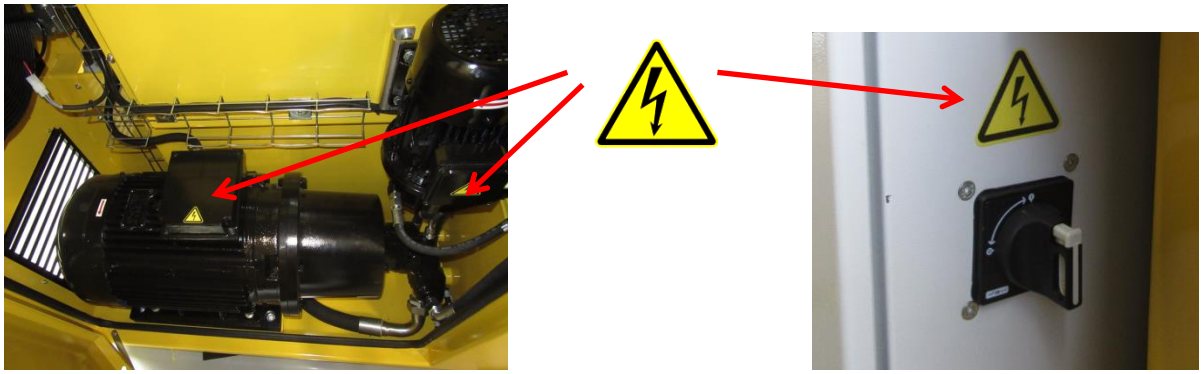




7.2.4 The 18.5 kW HPU



7.2.5 The 30 kW HPU



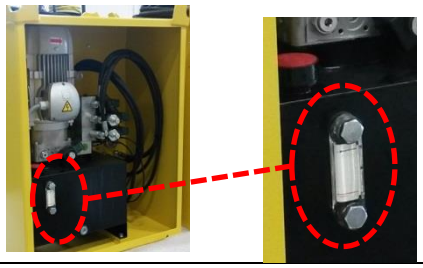

Upper head cylinder
A1
B1
Lower head cylinder
A2
B2
Main cylinder
A3
ENERPAC

7.3 Execute the operation

7.3.1 The 2.2 kW HPU

For lifting a load reference is made to ref 7 “Strand jack manual”.

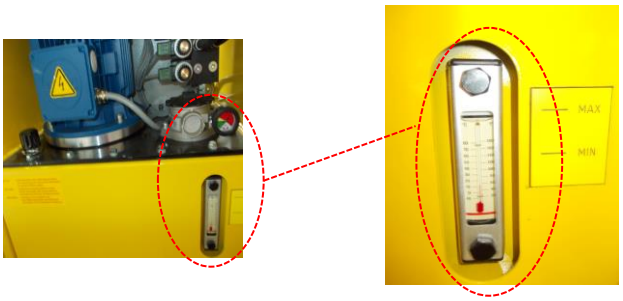
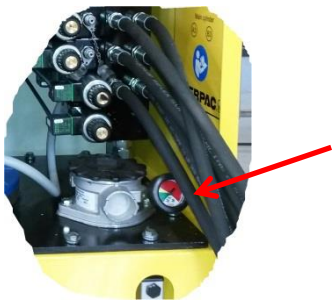
While executing an operation monitor the following:

The oil level shall never get lower than the indicated minimum.	
Oil pressure. When one of the jacks is operated the HPU produces hydraulic pressure. That pressure can be read from the manometer. (The maximum pressure is a factory setting.)	

7.3.2 The 7.5 kW

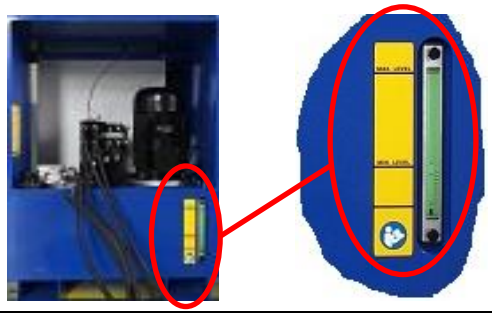
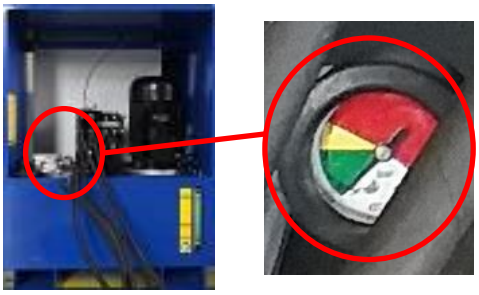
For lifting a load reference is made to ref 7 “Strand jack manual”.

While executing an operation monitor the following:

The **oil level** shall never get lower than the indicated minimum. The **oil temperature** shall never get outside the limits as listed in section 3.6.1 “Main specifications”.	
If the **clogging indicator** gets into the red zone, the oil filter had to be replaced immediately. See section 3.6.1 “Main specifications”.	
Oil pressure. When one of the jacks is operated the power pack produces hydraulic pressure. That pressure can be read from the manometer. Make sure the crane is open. The maximum pressure is a factory setting.	

7.3.3 The 15 kW HPU

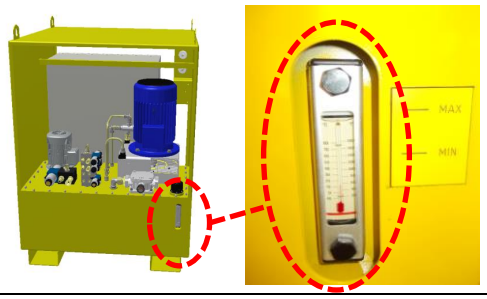
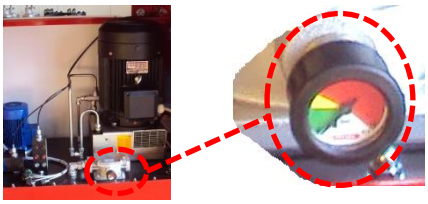
For lifting a load reference is made to ref 7 “Strand jack manual”.
While executing an operation monitor the following:

The **oil level** shall never get lower than the indicated minimum. The **oil temperature** shall never get outside the limits as in section 3.6.1 “Main specifications”.	
If the **clogging indicator** gets into the red zone, the oil filter had to be replaced immediately. See section 10.4.2 “Replace the filter element”.	
Oil pressure. When one of the jacks is operated the power pack produces hydraulic pressure. That pressure can be read from the manometer. The maximum pressure is a factory setting.	

7.3.4 The 18.5 kW HPU

For lifting a load reference is made to ref 7 “Strand jack manual”.

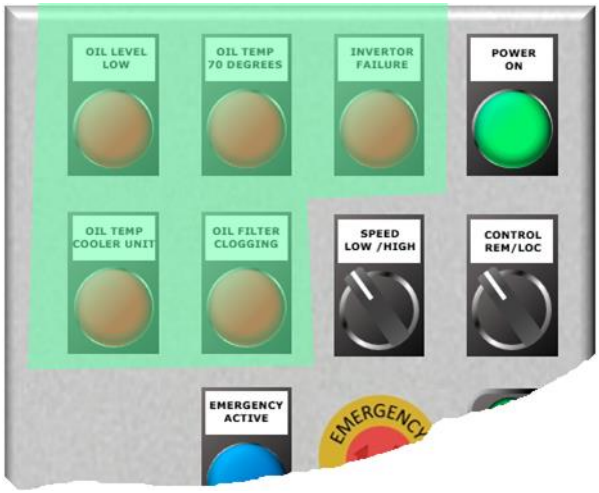
While executing an operation monitor the following:

The **oil level** shall never get lower than the indicated minimum. The **oil temperature** shall never get outside the limits as listed in section 3.6.1 “Main specifications”.	
If the **clogging indicator** gets into the red zone, the oil filter had to be replaced immediately. See section 10.4.2 “Replace the filter element”.	
Oil pressure. When one of the jacks is operated the HPU produces hydraulic pressure. Read the pressure from the manometer. Make sure the crane is open. The maximum pressure is a factory setting.	

7.3.5 The 30kW HPU

For lifting a load reference is made to ref 7 “Strand jack manual”.

While executing an operation monitor the following:

The oil level shall never get lower than the indicated minimum.	
None of the indicated indicators should be on	
Oil pressure. When the main jack or on of the anchors is operated, the HPU produces hydraulic pressure. That pressure is shown on the manometers. ☞ **NB:** The maximum pressure is a factory setting	

8 Solve problems

This chapter describes localization and solving of problems.

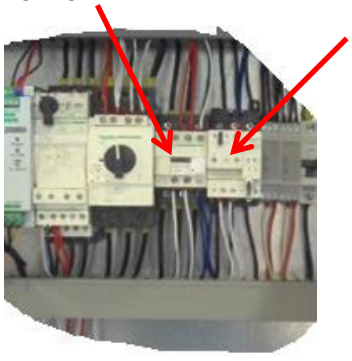
- A main problem localization procedure is given.
- A list of possible problems is given, together with causes and possible solutions.

8.1 Main problem localization procedure

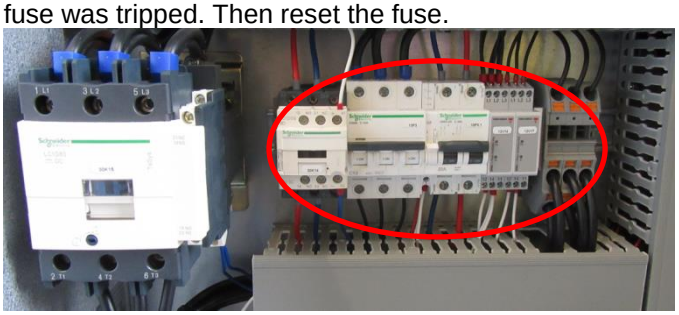
Hazard
Performing repairs on the System may cause dangerous effects when not executed by well-skilled personnel.

Contact Enerpac if you need assistance.

8.1.1 The 2.2 kW, 7.5kW, 15 kW, 18.5 kW

<table>
<tr><th colspan="2">Symptom</th><th>Possible cause and solution</th></tr>
<tr><td rowspan="5">1.</td><td rowspan="5">The HPU does not start</td><td>Emergency stop button pressed.
Find out why the button was pressed.
Then reset the emergency circuit; see section 6.1 “How to use the emergency buttons”.</td></tr>
<tr><td>Data end plugs not mounted.</td></tr>
<tr><td>Is any error message visible on the laptop?
Solve the problem accordingly</td></tr>
<tr><td>Is any error indicator on one of the control panels on?</td></tr>
<tr><td>Check the data cables and sockets.</td></tr>
<tr><td>2.</td><td>The synchronization of the height of the load (“hysteresis” does not work properly</td><td>Calibrate the height sensors; see ref 7 “Strand jack manual”.
Hydraulic leakage?</td></tr>
<tr><td>3.</td><td>Communication problems with the laptop or smartbox</td><td>Check the data cables and sockets.</td></tr>
<tr><td>4.</td><td>The HPU stopped unexpectedly</td><td>• Was the Emergency button pressed?
• Is any fuse tripped?
Check the fuses inside the electro cabinets Check why the fuse was tripped.
Then reset the fuse.
For 2.2 kW:
  
For 15 kW:
 
 
To get out of an emergency situation:
• Perform all checks [1] .. [3]
• apply “Installation mode”; see ref 7 “Strand jack manual” or apply the local control handheld, in order to control the system manually.</td></tr>
</table>

8.1.2 The 30 kW HPU

	Symptom	Possible cause and solution
1.	The HPU does not start	Emergency stop button pressed. Find out why the button was pressed. Then reset the emergency circuit; see section 6.1 “How to use the emergency buttons”.
		Data end plugs not mounted.
		Is any error message visible on the laptop? Solve the problem accordingly
		Is any error indicator on one of the control panels on?
		Check the data cables and sockets.
2.	Though an electromotor runs, the pump does not	The coupling between the electric motor and the pump can be defective. Check the coupling. Replace the coupling if defective.
3.	Leakage of hydraulic coupling	Defective coupling. Replace it.
4.	Indicator “Oil temp 70 degrees” is lit	The oil temp is too high. • Check the oil cooler. • Power-off the HPU to cool down the hydraulic oil.
5.	Indicator “Oil level low” is on	The level of the hydraulic oil is too low. Top up the oil. See section 10.4.1 “Replace the hydraulic oil”
6.	Indicator “Oil filter clogging” is on	Mount a new oil filter; see section 10.4.2 “Replace the filter element”.
7.	Indicator “Invertor failure” is on	There might be a failure with frequency control.
8.	The synchronization of the height of the load (“hysteresis” does not work properly	Calibrate the height sensors; see ref 7 “Strand jack manual”.
		Hydraulic leakage?
9.	Communication problems with the laptop or smartbox	• Check the data cables and sockets. • Eventually switch the laptop and the smartbox off and on.
10.	The HPU stopped unexpectedly	• Was the Emergency button pressed? • Is any fuse tripped? • Check the fuses inside the electro cabinets Check why the fuse was tripped. Then reset the fuse.  **To get out of an emergency situation**: • Perform all checks [1] .. [3] • apply “Installation mode”; see ref 7 “Strand jack manual” or apply the local control handheld, in order to control the system manually.
11.	Phoenix electronic circuit breaker trips	The protection of an electromotor has tripped due to: • Defective electric component within the circuit • A short-circuit. To solve the problem: • Check if all indicators on the electronic fuse block are green and not flashing. • After solving the problem, press on the green leds to restore the circuit.

9 Storage

9.1 System

When the system is stored then retract all jacks.

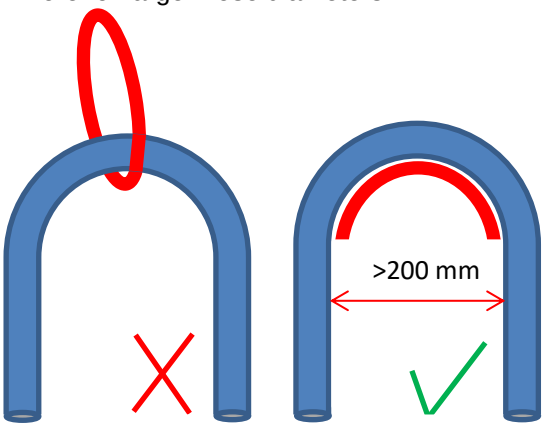
- Short term storage:
  Cover the units with a tarpaulin in order to keep electrical and other moisture-sensitive components dry, especially when stored in open air.
- Long term storage:
  Enerpac recommends a dry and closed space.

For storage temperature of the system reference is made to 3.6.1 “Main specifications”.

☞ **NB:** During storage in the open air, cover the units with a tarpaulin in order keep electrical and other moisture-sensitive components dry.
The tarpaulin is not included in the delivery but can be added as an option.

9.2 Hydraulic hoses

- Store hoses in a **frost-free**, cool, dry space with medium air humidity (condensation free).
- Keep hoses out of direct **sunlight** (UV radiation).
- Keep hoses out of the outlet flow of ventilators (drying effect).
- Protect hoses against exposure to **ozone** (released during welding work).
- Ozone causes accelerated ageing of hoses (splitting due to dryness).
- Protect hoses against dirt and **moisture**.
- Preferably store hoses in a **horizontal** position.
  When you store the hoses in **vertical** position use hose brackets with a bend **radius** of at least 200 mm, or more for larger hose diameters.



9.3 Local control handheld

Store the local control handheld with a maximum charged battery in case of storage for more than one month.
After six months of storage the battery will still be charged for approximately 40% in case of an ambient temperature of 25°C.

Attention: Do not store in open air

10 Maintenance

Keep the machine in good condition to obtain optimum performance from your machine and to guarantee the safety of the users.

This chapter describes

- the maintenance jobs to be carried out
- the required skills for the maintenance jobs
- the time-intervals the jobs have to be performed in.
  The time intervals are given for regular frequency of use and normal severity of service conditions.
  The time intervals have to be taken proportionally shorter when
  - the system is applied more often than regular, which is once per month.
  - the system is used in exceptional service conditions, like wet or salty environments
  - the system is applied to the limits of its capacity
  - the system is applied for special service. The time interval has to be discussed with Enerpac.

The time intervals may be varied based on experience gained on the service life of systems used in similar circumstances.

- If the system was idle for at least 6 months, all inspections as listed in the following section with a prescribed frequency of at least 6 months have to be performed.
- Prior to use, all new, altered, modified, or repaired hydraulic gantry systems shall be inspected to verify compliance with the applicable provisions of this section. Written records are not required.

☞ **NB:**

- Only perform maintenance on the units if they are not under load
- Only perform maintenance on the units if the header beams have been removed.
- Any maintenance procedures not detailed in this section can only be performed by or in consultation with Enerpac.
- Only apply spare parts provided by Enerpac. If non-Enerpac parts of are applied, all guarantees will be void.

☞ **NB**: If the system has been idle for more than 12 months than it shall be inspected prior to use completely.

10.1 Rules to be observed for maintenance

Due to the regulations as stated in Ref 6 “ASME B30.1-2015” observe the following rules for maintenance:

1. If the system was **idle** for at least 12 months, all inspections as listed in the following section with a prescribed frequency of at least 12 months have to be performed.
2. Prior to use, all **new, altered, modified, or repaired** hydraulic components shall be inspected to verify compliance with the applicable provisions of this section. Written records are not required.
3. Only perform maintenance if the system is **not under load**.
4. Any maintenance procedures **not detailed** in this section can only be performed by or in consultation with Enerpac.
5. Only apply **spare parts** provided by Enerpac. If parts of foreign make are applied, all guarantees will be void.
6. The warranty shall void if any **modifications** are made to the HPU without the consent of the manufacturer.
7. Make certain that you are **familiar** with the HPU and its use. Read the user manual carefully and in full and request instructions from the operator where needed.
8. Only perform maintenance work if you are **qualified** to do so. Unauthorized personnel may not open the Power pack.
9. Follow all instructions given on the **warning symbols** on the HPU.
10. Follow all **safety instructions** in this manual.

11. When working with **flammable liquids**, take the applicable safety regulations into account.
12. Only perform maintenance work after the HPU has been **shut down**. Before starting maintenance, make sure the HPU is secured against unauthorized use. Put up warning signs.
13. Make certain that the hydraulic system is **not under pressure**. Use the manometer.
14. If maintenance has to be executed while the system is **running** then a person has to be present to supervise, and to stop the machine if needed. This also applies for work on the electrical system if the system needs to be powered.
15. Do not **spill** any oil and similar fluids. Be mindful of the environment and the costs of cleaning up.
16. Make certain that you apply personal protection equipment (**PPE**) and take any other safety precautions required by the working conditions.
17. Make sure that you know the location of **fire alarms**, firefighting facilities and fire extinguishers.
18. Only use suitable work **equipment**. Prevent damage due to use of unsuitable equipment.
19. Without the express consent of the manufacturer, you are not allowed to make any **changes**, additions or adjustments to the HPU which affect the safety of the machine. This also applies to installation and adjustment of safety devices, covers and valves and to welding work on load-bearing parts.
20. Make certain that the HPU is made **ready for operation** after the maintenance work was been completed. Inform the operator.

10.2 Responsibilities

Due to the regulations as stated in Ref 6 “ASME B30.1-2015” observe the following rules for responsibilities.

The maintenance tables indicate for each maintenance job whether it has to be performed either by the owner or by the manufacturer.

Contact the manufacturer for the following maintenance work:

- Adjusting the pressure in the hydraulic system.
- Adjusting and repairing hydraulic pumps and setting up hydraulic pumps.
- Adjusting and repairing control valves for all main functions.
- Adjusting the electrical system and repairs to the control system.
- Replacing parts.

In these cases, the maintenance work for the owner is limited to identification of a fault.

10.3 Mechanical

- The maintenance intervals given in the table below are based on regular use of the HPU; which is approximately one operation per month. When the HPU is intensively or less intensively used, the maintenance intervals will change accordingly.
- Perform all inspections up to yearly if the system has been idle for at least 12 months.
- Record all activities in Appendix C.2 “Mechanical”.
- For greasing use Kroon Oil multi-purpose grease 3.

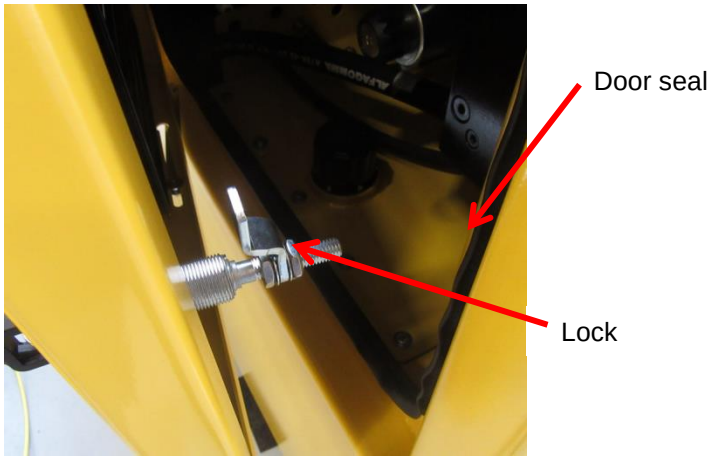
Maintenance job to be executed:

Subject	Action	Person O (owner) EE (Enerpac expert)	First 40 hours	8 hours Daily	40 hours Weekly	500 hours Each year	2000 hours Every 2 years	10000 hours Every 10 year	Remarks
1. Main construction									
1.1. Main construction	Visual check of all welding	O				X			
	Visual check painting	O				X			
	Visual check on corrosion and damages	O			X				
	Check if all bolts are still tightened	O				X			
	Visual check of the hoisting lugs	O				X			
	Inspect the readability of the warning signs. Clean if obscured by dirt. Restore if damaged or no longer present	O				X			
	For the 30 kW HPU: Replace all seals, door seals and inspection hatches. See section 10.3.2 “Seals and hatches”.	EE						X	
	For the 30 kW HPU: Replace engine feet	EE						X	
	Grease the hinges and locks	O				X			

10.3.1 Cooling fan

10.3.2 Seals and hatches

Examples of which types of seals and hatches are meant, are given below.



10.4 Hydraulics

This section lists all maintenance jobs for the hydraulics.
Record all activities in Appendix C “Logging Maintenance”.
For hydraulic fluid safety information sheet, see Appendix D “Hydraulic fluid safety information”.

Observe the following:

- Before starting maintenance, make sure no pressure is present in the hydraulic system.
- All inspections up to yearly have to be performed if the system has been idle for at least 12 months. The system shall only be returned to service when approved by a qualified person as described that section.
- All replacement parts including the ram, hoses, couplings, seals, valves, and caps shall meet or exceed the original equipment manufacturer's specifications.

Due to the regulations as given in Ref 6 “ASME B30.1-2015” hydraulic parts shall be removed from service if damage such as the following is present:

a) excessively **worn**, scored, cracked, bent, or broken ram
b) **cracked** or broken jack housing or cylinder
c) internal or external hydraulic **fluid leak**
d) damaged **seals** or valves
e) excessive **pitting** or corrosion
f) excessive **nicks** or gouges
g) missing or illegible **identification**
h) indications of **structural damage** due to heat, or evidence of unauthorized welding
i) **improperly functioning** or damaged load cap or integral auxiliary load point
j) loose structural **bolts** or rivets
k) worn or damaged **load-bearing** threads
l) damaged or improperly assembled **accessory** equipment
m) missing **relief valve** for double-acting jack
n) damaged or severely worn **hoses** or couplings
o) **contaminated** hydraulic fluid
p) other conditions including **visible damage** that cause doubt as to the continued use of the hydraulic jack

The system shall only be returned to service when approved by a qualified person as described in that section.

NB: Enerpac strongly advises to apply parts as bought from Enerpac.

Attention: All replacement parts including the ram, hoses, couplings, seals, valves, and caps shall meet or exceed the original equipment manufacturer's specifications.

Hazard: Applying parts which to not apply to the specifications may cause hazards to personnel and the system Before removing a component of the hydraulic system, check if there is no hydraulic pressure left within the hydraulic system

Hazard: High pressured hydraulic oil spray can cause physical injuries, fire or death of personnel

- The maintenance intervals given in the table below are based on regular use of the HPU; which is approximately one operation per month. When the HPU is intensively or less intensively used, the maintenance intervals will change accordingly.
- Perform all inspections up to yearly if the system has been idle for at least 12 months.
- Record all activities in Appendix C.2 “Mechanical”

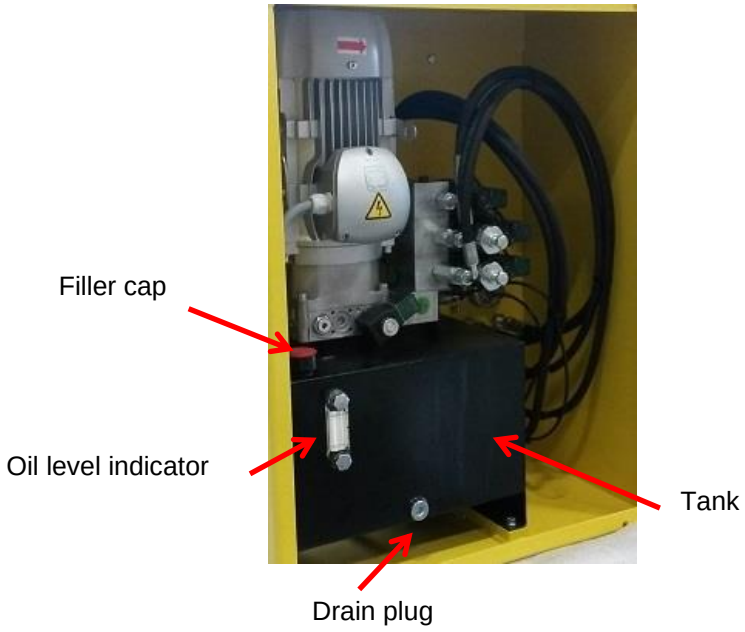
Subject	Action	Person O (Owner) EE (Enerpac expert)	First 40 hours	8 hours Daily	40 hours Weekly	500 hours yearly	2000 hours 2 years	10000 hours 10 years	Remarks
1. Hydraulic pump and tank									
1.1. Pump	Check on oil leakage, damages and paint work	O		x					
	Check if the bolts are still tightened	O	x			x			
1.2. Hydraulic tank	Check on oil leakage, damages and paint work	O		x					
	Check if the bolts are still tightened For 30 kW HPU: See section 10.4.3.1 “Bolts of pumps and manifolds”.	O	x			x			
	Replace all seals	EE						x	
	Replace the level gauges	EE						x	
	Drain the tank (water and sludge)	EE					x		
1.3. Valves	Check on oil leakage and damages	O		x					
	Check if the bolts are still tightened	O	x			x			
	Replace all seals For 30kW HPU: See section 10.4.3.2 “Valves and seals”	EE						x	
	Check all valve settings	O					x		
1.4. Manifolds	Check on oil leakage and damages	O		x					
	Check if the bolts are still tightened. For 30kW HPU: See section 10.4.3.1 “Bolts of pumps and manifolds”	O				x			
1.5. Oil	Take an oil sample to analyze	EE					x		Change oil if necessary
	Replace the hydraulic oil See section 10.4.1 “Replace the hydraulic oil”.	EE					x		Or after 2000 running hours
	Check the oil level	O		x					
1.6. Hydraulic filter	Replace the filter element See section 3.6.1 “Main specifications”.	EE				x		X	And if clogged

	Replace the seals of the filter housing	EE						x	
1.7. Breathers	Replace the breather	EE				x			
1.8. Bellhousing	For 18.5 kW HPU: Check on damages	O	x				x		
	For 18.5 kW HPU: Check if the bolts are still tightened	O						x	
	For 18.5 kW HPU: Replace motor pump coupling For 30 kW HPU: see section 10.4.3.3 “Bellhousing”	EE						x	
1.9. Oil cooler	For 30 kW HPU: Wipe it clean and free from dust. See section 10.4.3.4 “Oil cooler”.								
2. Hydraulic connections									
2.1. Pipes, hoses and brackets	Check on oil leakage and damages. For 30kW HPU see section 10.4.3.5 “Couplings and hoses”	O		x					
	Check if the couplings are tightened well.	O	x			x			
	Replace all seals within the piping (Walform)	EE						x	
	Replace all hoses	EE					x		
	Replace all plastic brackets	EE					x		
2.2. Couplings and quick-screw couplings	Check on oil leakage and damages	O		x					
	Check if the couplings are tightened well.	O		x		x			
	Replace all seals of the couplings	EE						x	
	Replace fast couplings and screw couplings	EE					x		
2.3. Gauges, measurement sensors	Check on damages. For 30kW Hpu see section 10.4.3.6 “Sensors”	O		x					
	Check the tightening bolts, nuts and components	O		x		x			
	Replace all seals	EE						x	
	Replace all gauges	EE						x	
3. Housing									
3.1. Common	Check on damages and paint	O		x					
	Check if the bolts are still tightened	O	x			x			
	Replace all seals, door seals and inspection hatches	EE						x	
	Grease the hinges and locks	O				x			
	Replace engine feet	EE						x	

10.4.1 Replace the hydraulic oil

10.4.1.1 The 2.2 kW HPU

The oil in the sump has either to be refreshed or a purity test has to be performed.



Proceed as follows:

1.	Ensure that the HPU is switched off
2.	Open the filler cap
3.	Drain the oil using the drain plug
4.	Close the drain plug
5.	Fill the tank. Monitor the oil level indicator. Apply the oil type as indicated in section 3.6.1 “Main specifications”. Oil from new drums may be contaminated and may contain water due to condensation. Therefore: • When pouring out the oil, the plug should not be located at the lowest point. • Do not empty the drum to the end. • Put the remaining oil into a clean container and check on presence of water and dirt before using it. Caution: do not fill the tank over the maximum.
6.	Let the pump run for 10 minutes to get the oil free of air.
7.	Check the correct functioning of the main jack, the bottom anchor and top anchor.
8.	**Attention**: dispose the oil responsibly

10.4.1.2 The 7.5 kW

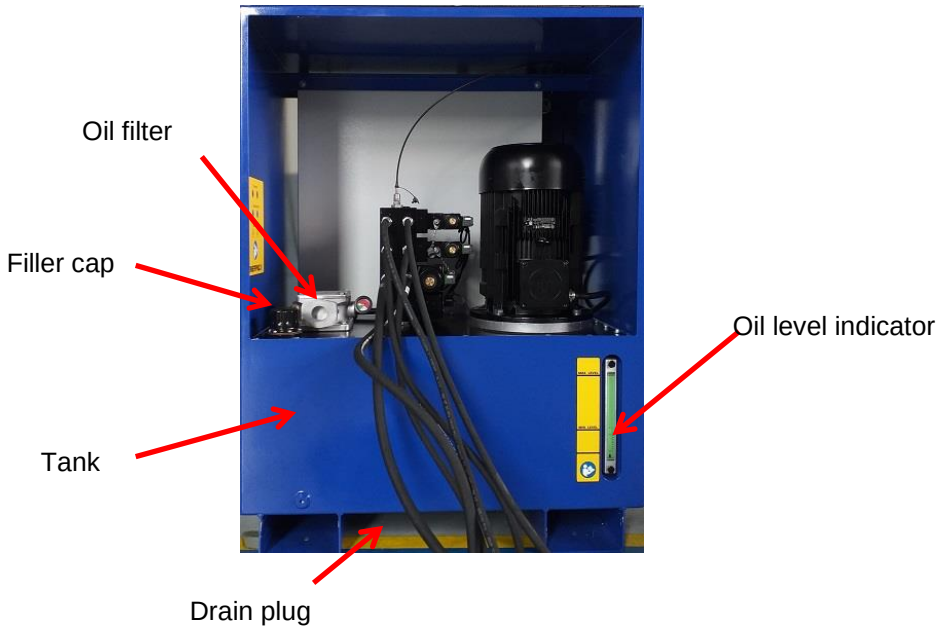
The oil in the sump has either to be refreshed or a purity test has to be performed.

Proceed as follows:

9.	Ensure that the power pack is switched off
10.	Open the filter cap
11.	Drain the oil using the drain plug
12.	Close the drain plug
13.	Fill the tank. Monitor the oil level indicator. Apply the oil type as indicated in section 3.3.1 “Main properties”. Oil from new drums may be contaminated and may contain water due to condensation. Therefore: • When pouring out the oil, the plug should not be located at the lowest point. • Do not empty the drum to the end. • Put the remaining oil into a clean container and check on presence of water and dirt before using it. Caution: do not fill the tank over the maximum.
14.	Replace the filter element, as described in section 10.4.2.2 “The 7.5 kW”
15.	Let the pump run for 10 minutes to get the oil free of air.
16.	Check the correct functioning of the main jack, the bottom anchor and top anchor.
17.	**Attention**: dispose the oil responsibly

10.4.1.3 The 15 kW HPU

The oil in the sump has either to be refreshed or a purity test has to be performed.

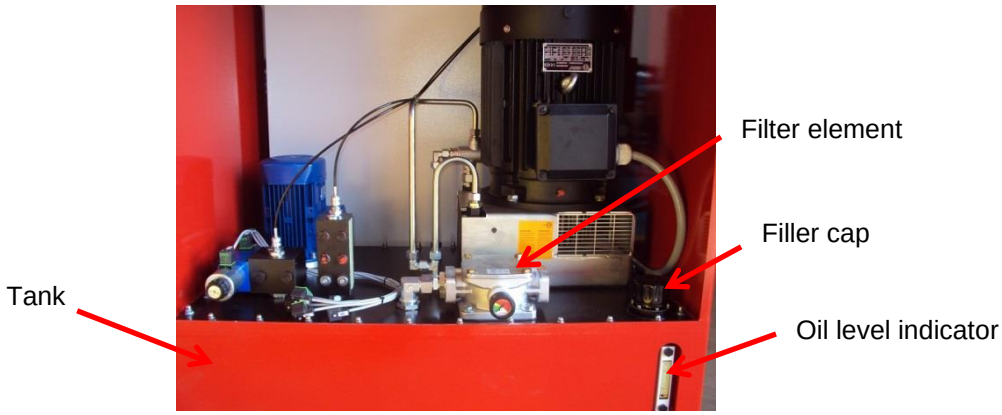


Proceed as follows:

1.	Ensure that the power pack is switched off
2.	Open the filter cap
3.	Drain the oil using the drain plug
4.	Close the drain plug
5.	Fill the tank. Monitor the oil level indicator. Apply the oil type as indicated in section 3.6.1 “Main specifications”. Oil from new drums may be contaminated and may contain water due to condensation. Therefore: • When pouring out the oil, the plug should not be located at the lowest point. • Do not empty the drum to the end. • Put the remaining oil into a clean container and check on presence of water and dirt before using it. Caution: do not fill the tank over the maximum.
6.	Replace the filter element; see section 10.4.2 “Replace the filter element”
7.	Let the pump run for 10 minutes to get the oil free of air.
8.	Check the correct functioning of the main jack, the bottom anchor and top anchor.
9.	**Attention**: dispose the oil responsibly

10.4.1.4 The 18.5 kW HPU

The oil in the sump has either to be refreshed or a purity test has to be performed.



Proceed as follows:

1.	Ensure that the HPU is switched off
2.	Open the filter cap
3.	Drain the oil
4.	Close the drain plug
5.	Fill the tank. Monitor the oil level indicator. Apply the oil type with the type specified in section 3.6.1 “Main specifications”. Oil from new drums may be contaminated and may contain water due to condensation. Therefore: • When pouring out the oil, the plug should not be located at the lowest point. • Do not empty the drum to the end. • Put the remaining oil into a clean container and check on presence of water and dirt before using it. Caution: do not fill the tank over the maximum.
6.	Replace the filter element; see section 10.4.2 “Replace the filter element”.
7.	Let the pump run for 10 minutes to get the oil free of air.
8.	Check the correct functioning of the main jack, the bottom anchor and top anchor.
9.	**Attention**: dispose the oil responsibly

10.4.1.5 The 30 kW HPU

The oil in the tank has either to be refreshed or a purity test has to be performed.

The tank is provided with a gauge at its front side.

The filler cap has a breather function.

Underneath the tank is a drain plug.

Proceed as follows:

1.	Ensure that the HPU is switched off
2.	Open the filter cap
3.	Drain the oil using the drain plug
4.	Close the drain plug
5.	Fill the tank. Monitor the oil level indicator. Apply the oil type as indicated in section 3.6.1 “Main specifications”. Oil from new drums may be contaminated and may contain water due to condensation. Therefore: • When pouring out the oil, the plug should not be located at the lowest point. • Do not empty the drum to the end. • Put the remaining oil into a clean container and check on presence of water and dirt before using it. Caution: do not fill the tank over the maximum.
6.	Replace the filter element, as described in section 10.4.2 “Replace the filter element”.

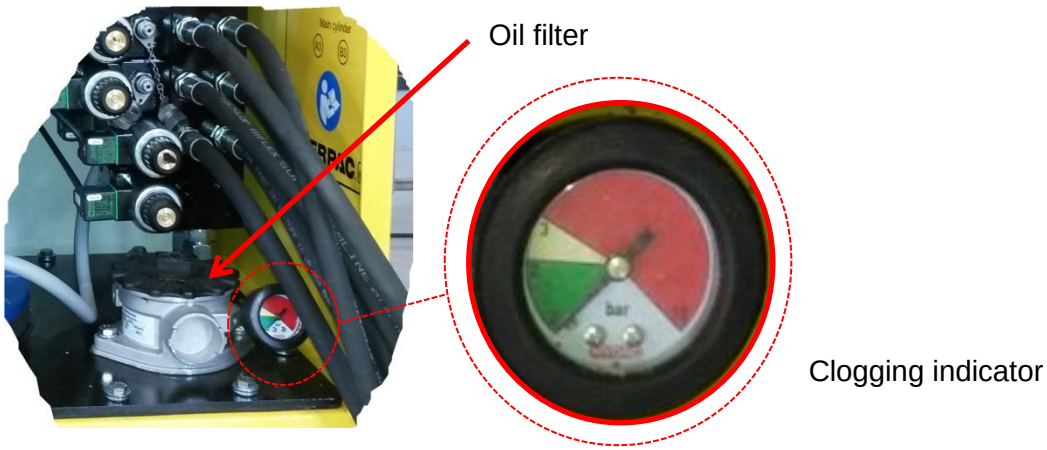
7.	Let the pump run for 10 minutes to get the oil free of air.
8.	Check the correct functioning of the main jack, the bottom anchor and top anchor.
9.	Attention: dispose the oil responsibly

10.4.2 Replace the filter element

10.4.2.1 The 2.2 kW HPU

Not applicable

10.4.2.2 The 7.5 kW



The oil filter cleans the oil that flows back into the tank.

Due to contamination of the oil, the permeability of the filter will decrease, which causes a raise of the pressure of the return flow of the oil. The pressure is shown on the clogging indicator:

- Green: the pressure is 0 .. 2 bar
  The filter is fine.
- Yellow: the pressure is 2..3 bar
  The filter is still working, but has to be replaced as soon as possible.
- Red: the pressure is over 3 bar.
  Oil is no longer filtered.
  Replace the filter element immediately.

The filter element has to be replaced

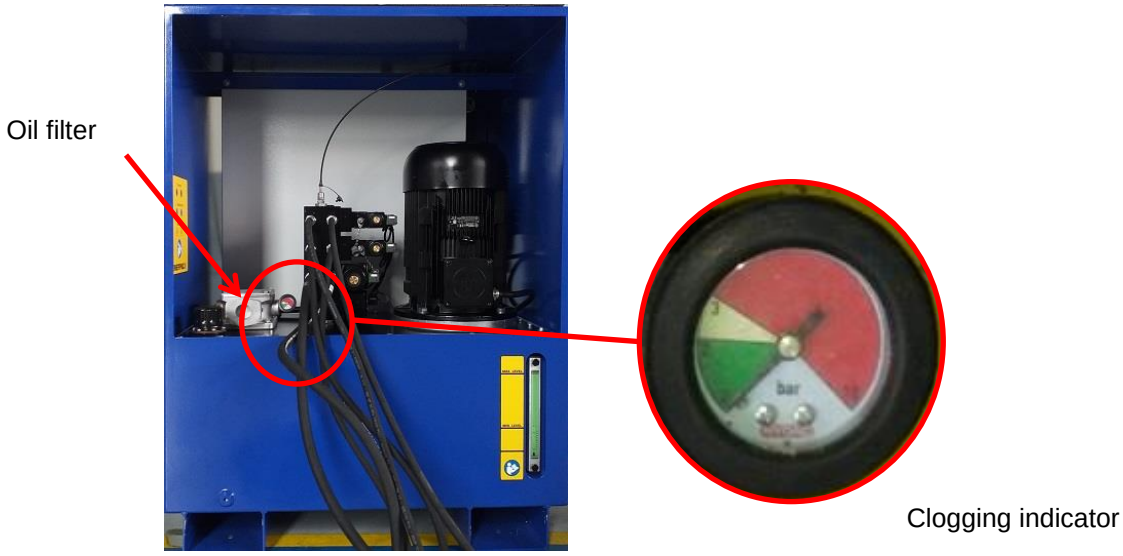
- when the oil is refreshed
- when the clogging indicator shows yellow or red
- according to the maintenance scheme

To replace the filter element, proceed as follows:

1.	Make sure the power pack is switched off
2.	Unscrew the return filter cap
3.	Remove the internal filter element

4.	Put a new filter element, as specified in section 3.2.1 “Main properties” **Attention:** to ensure correct operation, only replace with an element with equal brand and type.

10.4.2.3 The 15 kW HPU



The oil filter cleans the oil that flows back into the tank.

Due to contamination of the oil, the permeability of the filter will decrease, which causes a raise of the pressure of the return flow of the oil. The pressure is shown on the clogging indicator:

- Green: the pressure is 0 .. 2 bar
  The filter is fine.
- Yellow: the pressure is 2..3 bar
  The filter is still working, but has to be replaced as soon as possible.
- Red: the pressure is over 3 bar.
  Oil is no longer filtered.
  Replace the filter element immediately.

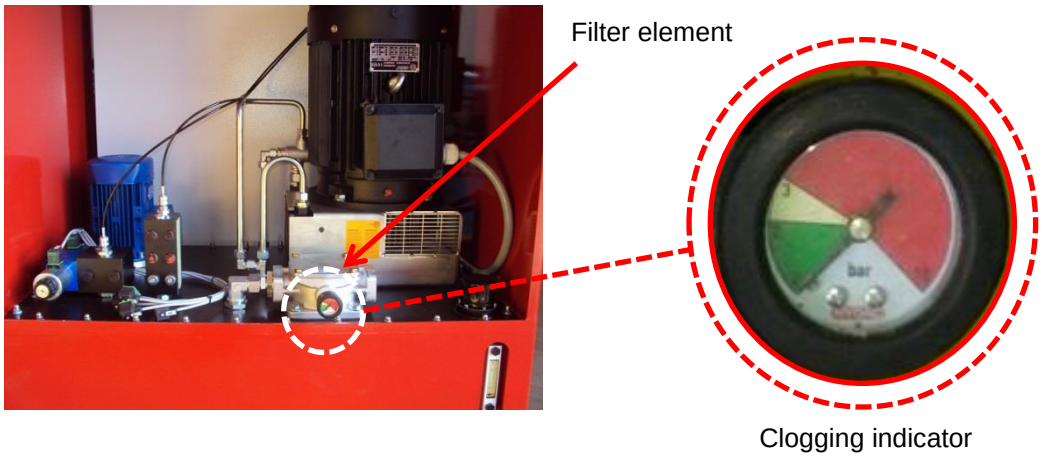
The filter element has to be replaced
- when the oil is refreshed
- when the clogging indicator shows yellow or red
- according to the maintenance scheme

To replace the filter element, proceed as follows:

5.	Make sure the power pack is switched off
6.	Unscrew the return filter cap
7.	Remove the internal filter element
8.	Put a new filter element, as specified in section 3.6.1 “Main specifications”.

	Attention: to ensure correct operation, only replace with an element with equal brand and type.

10.4.2.4 The 18.5 kW HPU



The oil filter cleans the oil that flows back into the tank.

Due to contamination of the oil, the permeability of the filter will decrease, which causes a raise of the pressure of the return flow of the oil. The pressure is shown on the clogging indicator:

- Green: the pressure is 0 .. 2 bar
  The filter is fine.
- Yellow: the pressure is 2..3 bar
  The filter is still working, but has to be replaced as soon as possible.
- Red: the pressure is over 3 bar.
  Oil is no longer filtered.
  Replace the filter element immediately.

The filter element has to be replaced

- when the oil is refreshed
- when the clogging indicator shows yellow or red
- according to the maintenance scheme

To replace the filter element, proceed as follows:

1.	Make sure the HPU is switched off
2.	Unscrew the filter cap
3.	Remove the internal filter element
4.	Put a new filter element, as specified in section 3.6.1 “Main specifications”.
	Attention: to ensure correct operation, only replace with an element with equal brand and type.

10.4.2.5 The 30kW HPU

The oil filter cleans the oil that flows back into the tank.

Due to contamination of the oil, the permeability of the filter will decrease, which causes a raise of the pressure of the return flow of the oil. If the indicator in the control panel is on, the oil filter has to be replaced.

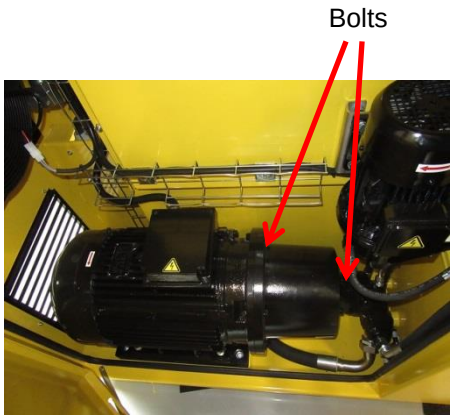
To replace the filter element, proceed as follows:

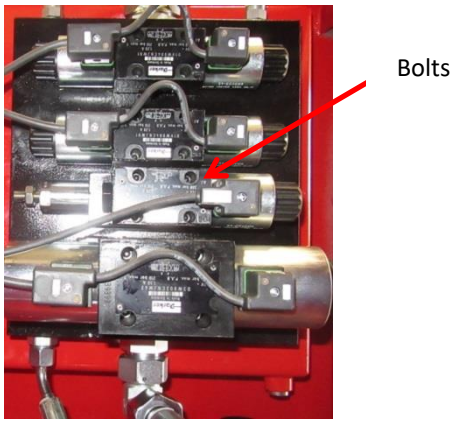
1.	Make sure the HPU is switched off
2.	Unscrew the return filter cap
3.	Remove the internal filter element
4.	Put a new filter element, as specified in section 3.6.1 “Main specifications”. **Attention:** to ensure correct operation, only replace with an element with equal brand and type.

10.4.3 The 30kW HPU specific procedures

10.4.3.1 Bolts of pumps and manifolds

Examples of which types of bolts are meant, are given below.

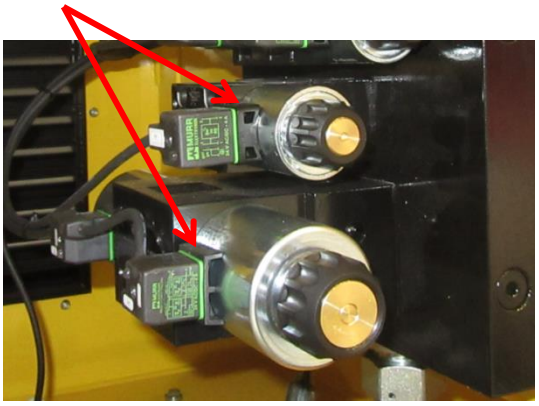




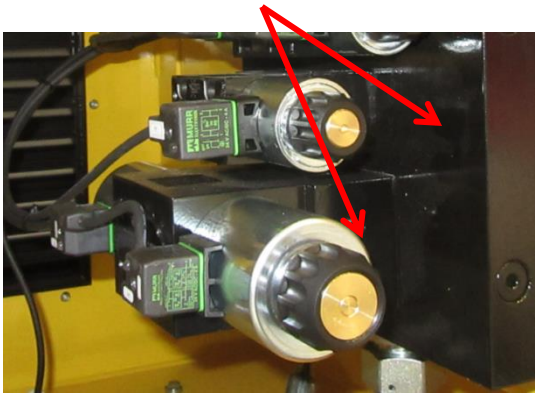
10.4.3.2 Valves and seals

Examples of which types of valves and seals are meant, are given below

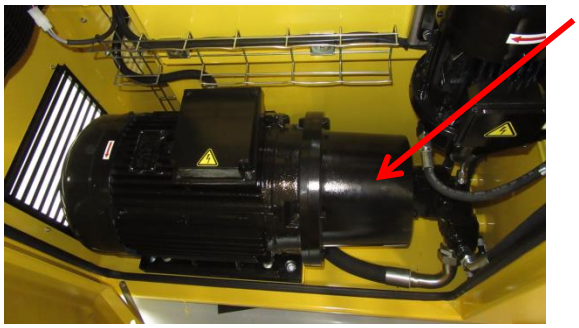
Seals of valves



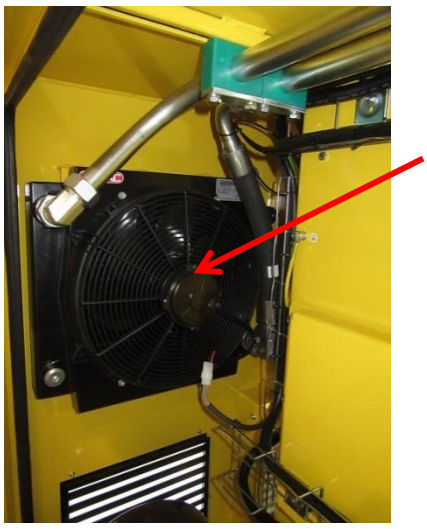
Seals of manifolds



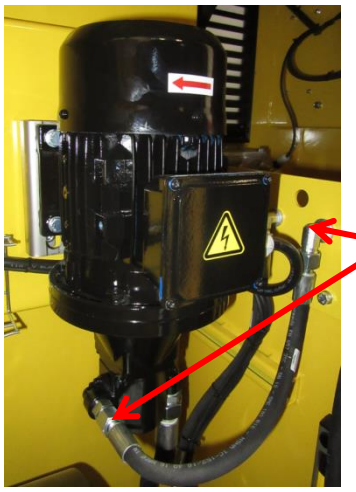
10.4.3.3 Bellhousing



10.4.3.4 Oil cooler

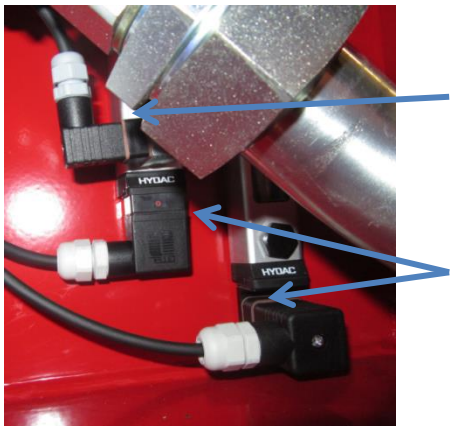


10.4.3.5 Couplings and hoses



10.4.3.6 Sensors

Examples of which types of sensors are meant, are given below.



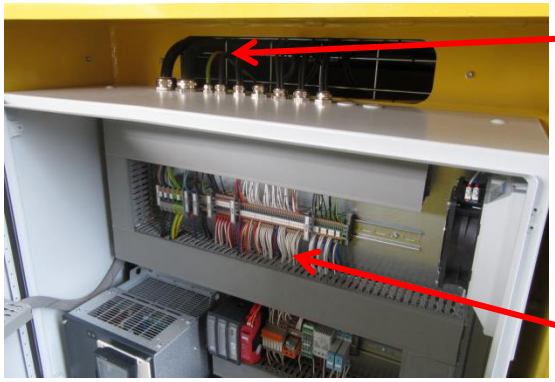
10.5 Electrics

- The maintenance intervals given in the table below are based on regular use of the HPU; which is approximately one operation per month. When the HPU is intensively or less intensively used, the maintenance intervals will change accordingly.
- Perform all inspections up to yearly if the system has been idle for at least 12 months.
- Record all activities in Appendix C.2 “Mechanical”.

Subject	Action	Person O (owner) EE (Enerpac expert)	First 40 hours	8 hours Daily	40 hours Weekly	Each 500 hours Each year	2000 hours Every 2 years	10000 hours Every 10 year	Remarks
1. Electro motor For 18.5 kW HPU: valid for electro motors 1 and 2									
1.1. General	Check on damages	O		X					
	Wipe it clean and free from dust	O	X			X			
2. Cables and connectors									
2.1. General	Check on damages. See section 10.5.1 “Cables, wiring and connectors”	O		X					
	Grease the battery connection points	EE				X			
3. Devices									
3.1. General	Check the local control handheld on damages	O		X					
3.2. Main switch	Replace the main switch. See section 10.5.2 “Main switch”.	EE						X	
3.3. Emergency switch	Check the correct functioning of the emergency button	O				X			

10.5.1 Cables, wiring and connectors

Examples of what cables, wirings and connectors are meant. are given below.



10.5.2 Main switch

11 Quality

-

12 Dismantling the system

To dismantle the system at the end of its lifetime, proceed as follows:

- Drain the fluids like:
  - hydraulic oil,
  - lubricating oil,
  - coolant,
  - and fuel.
- Remove the batteries.
- Dismount the electric components and electric wiring.
- Dismount rubber and plastic components.
- Dismount the metal components.

Collect all material, sort it and let it be recycled by a specialized company.

Attention: Dispose of all material in a responsible manner.

13 Index

Appendices

A. Checklist for planning

A.1 Project

Project	
Customer	
Location	
Date	

A.2 The HPU

☐	The HPU matches the capacity of the strand jack
☐	The HPU can be positioned on a flat and stable subsoil
☐	The operator can have an unobstructed view botj on the operation and the HPU

A.3 Commitment

Preparations by: Date:

Signature:

Approved by: Date:

Signature:

B. Checklist for installing the System

B.1 Project

Project	
Customer	
Location	
Date	

B.2 Mechanics

☐	Checklist A “Checklist for planning” completed and signed off
☐	The power pack is installed with a skew less than 5^0.

B.3 Hydraulics

☐	All couplings are free of dirt and undamaged
☐	The main jack has been connected to the power pack
☐	The bottom anchor has been connected to the power pack
☐	The top anchor has been connected to the power pack

B.4 Electrics

☐	The data cables have been connected
☐	The data end plugs have been mounted
☐	The power cables have been mounted
☐	Proper functioning of main jack has been proved
☐	Proper functioning of the bottom anchor has been proved
☐	Proper functioning of top anchor has been proved

B.5 Commitment

Installations by: Date:

Signature:

Approved by: Date:

Signature:

C. Logging Maintenance

C.1 Hydraulics

Subject	Action	Date	Remark
1. Hydraulic pump and tank			
1.1. Pump	Check on oil leakage and paint work		
	Check if the bolts are still tightened		
1.2. Hydraulic tank	Check on oil leakage, damages and paint work		
	Check if the bolts are still tightened		
	Replace all seals		
	Replace the level gauges		
	Drain the tank (water and sludge)		
1.3. Valves	Check on oil leakage and damages		
	Check if the bolts are still tightened		
	Replace all seals		
	Check on oil leakage and damages		
	Check if the bolts are still tightened.		
1.4. Manifolds	Check on oil leakage and damages		
	Check if the bolts are still tightened		
1.5. Oil	Take an oil sample to analyze		
	Replace the hydraulic oil		
	Check the oil level		
1.6. Hydraulic filter	Replace the filter element		
	Replace the seals of the filter housing		
1.7. Breathers	Replace the breather		
1.8. Bellhousing	For 18.5 kW HPU: Check on damages		
	For 18.5 kW HPU: Check if the bolts are still tightened		
	For 18.5 kW HPU: Replace motor pump coupling For 30 kW HPU: see section 10.4.3.3 “Bellhousing”		
1.9. Oil cooler	For 30 kW HPU: Wipe it clean and free from dust.		
2. Hydraulic connections			
2.1. Pipes, hoses and brackets	Check on oil leakage and damages		
	Check if the couplings are tightened well.		
	Replace all seals within the piping (Walform)		
	Replace all hoses		
	Replace all plastic brackets		
2.2. Couplings and quick-screw couplings	Check on oil leakage and damages		
	Check if the couplings are tightened well.		
	Replace all seals of the couplings		
	Replace fast couplings and screw couplings		
2.3. Gauges, measurements sensors	Check on damages.		
	Replace all seals		
	Replace all gauges		

Subject	Action	Date	Remark
3. **Housing**			
3.1. Common	Check on leakages		
	Check if the bolts are still tightened		
	Replace all seals, door seals and inspection hatches		
	Grease the hinges and locks		
	Replace engine feet		

C.2 **Mechanical**

Subject	Action	Date	Remark
1. Main construction			
1.1. Main construction	Visual check of all welding		
	Visual check painting		
	Visual check on corrosion and damages		
	Check if all bolts are still tightened.		
	Visual check of the hoisting lugs		
	Inspect the readability of the warning signs.		
	For the 30 kW HPU: Replace all seals, door seals and inspection hatches.		
	For the 30 kW HPU: Replace engine feet		
	Grease the hinges and locks.		

C.3 **Electrics**

Subject	Action	Date	Remark
1. Electro motor			
1.1. General	Check on damages		
	Wipe it clean and free from dust		
2. Cables and connectors			
2.1. General	Check on damages		
	Grease the battery connection points		
3. Devices			
3.1. General	Check the local control handheld on damages		
3.2. Main switch	Replace the main switch		
3.3. Emergency switch	Check the correct functioning of the emergency button		

D. Hydraulic fluid safety information S4 VE 46

SAFETY DATA SHEET
According to EC No 1907/2006 as amended as at the date of this SDS
Shell Tellus S4 VE 46
Version 1.2 Revision Date 02.01.2020 Print Date 03.01.2020

1. Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Trade name	Shell Tellus S4 VE 46
Product code	001F8443

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the Substance/Mixture	Hydraulic oil
Uses advised against	This product must not be used in applications other than those listed in Section 1 without first seeking the advice of the supplier.

1.3. Details of the supplier of the safety data sheet

Manufacturer/Supplier	Shell Nederland Verkoopmaatschappij B.V. Weena 70 3012 CM Rotterdam Netherlands
Telephone	(+31) 0900 202 2710
Telefax	-
Email Contact for Safety Data sheet	If you have any enquiries about the content of this SDS please email lubricantSDS@shell.com

1.4. Emergency telephone number: National Poison Information Centre (NVIC): Tel. nr. +31 30 - 2748888 (24 hrs a day and 7 days a week). Only for the purpose of informing medical personnel in cases of accidental intoxications.
+31 (0)10 4313233
National Poison Information Centre (NVIC): Tel. nr. +31 30 - 2748888 (24 hrs a day and 7 days a week). Only for the purpose of informing medical personnel in cases of accidental intoxications.
+31 (0)10 4313233

2. Identification of the substance/mixture and of the company/undertaking

2.1. Classification of the substance or mixture
Classification (REGULATION (EC) No 1272/2008
Based on available data this substance / mixture does not meet the classification criteria.

2.2. Label elements
Labelling (REGULATION (EC) No 1272/2008)

Hazard pictograms	No Hazard Symbol required	
Signal word	No signal word	
Hazard statements	PHYSICAL HAZARDS: Not classified as a physical hazard according to CLP criteria. HEALTH HAZARDS: Not classified as a health hazard under CLP criteria. ENVIRONMENTAL HAZARDS: Not classified as environmental hazard according to CLP criteria.	
Precautionary statements	Prevention Response Storage Disposal	No precautionary phrases

Safety data sheet available on request

Sensitising components	Contains triazole derivatives. May produce an allergic reaction

2.3. Other hazards: This mixture does not contain any REACH registered substances that are assessed to be a PBT or a vPvB. Prolonged or repeated skin contact without proper cleaning can clog the pores of the skin resulting in disorders such as oil acne/folliculitis. Used oil may contain harmful impurities. High-pressure injection under the skin may cause serious damage including local necrosis. Not classified as flammable but will burn

3. Composition/information on ingredients

3.1. Mixtures

Chemical nature: Blend of polyolefins and additives

Hazardous components

Chemical name	CAS-No. EC-No. Registration number	Classification (REGULATION (EC) No 1272/2008)	Concentration [%]
Distillates (Fischer - Tropsch), heavy, C18-50 – branched, cyclic and linear	848301-69-9 482-220-0 01-0000020163-82	Asp. Tox.1; H304	85- 95
Triazole derivative	91273-04-0 401-280-0	Skin Corr.1B; H314 Skin Sens.1A; H317 Aquatic Chronic1; H410	0,01 - 0,05

4. First aid measures

4.1. Description of first aid measures

Protection of first-aiders: When administering first aid, ensure that you are wearing the appropriate personal protective equipment according to the incident, injury and surroundings.

If inhaled: No treatment necessary under normal conditions of use. If symptoms persist, obtain medical advice.

In case of skin contact: Remove contaminated clothing. Flush exposed area with water and follow by washing with soap if available. If persistent irritation occurs, obtain medical attention. When using high pressure equipment, injection of product under the skin can occur. If high pressure injuries occur, the casualty should be sent immediately to a hospital. Do not wait for symptoms to develop. Obtain medical attention even in the absence of apparent wounds.

In case of eye contact: Flush eye with copious quantities of water. Remove contact lenses, if present and easy to do. Continue rinsing. If persistent irritation occurs, obtain medical attention.

If swallowed: In general no treatment is necessary unless large quantities are swallowed, however, get medical advice.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms: Oil acne/folliculitis signs and symptoms may include formation of black pustules and spots on the skin of exposed areas. Ingestion may result in nausea, vomiting and/or diarrhoea. Local necrosis is evidenced by delayed onset of pain and tissue damage a few hours following injection.

4.3. Indication of any immediate medical attention and special treatment needed

4.4. Treatment: Notes to doctor/physician:
Treat symptomatically.
High pressure injection injuries require prompt surgical intervention and possibly steroid therapy, to minimise tissue damage and loss of function. Because entry wounds are small and do not reflect the seriousness of the underlying damage, surgical exploration to determine the extent of involvement may be necessary. Local anaesthetics or hot soaks should be avoided because they can contribute to swelling, vasospasm and ischaemia. Prompt surgical decompression, debridement and evacuation of foreign material should be performed under general anaesthetics, and wide exploration is essential.

5. Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media: Foam, water spray or fog. Dry chemical powder, carbon dioxide, sand or earth may be used for small fires only.

Unsuitable extinguishing media: Do not use water in a jet

5.2. Special hazards arising from the substance or mixture

Specific hazards during firefighting: Hazardous combustion products may include: A complex mixture of airborne solid and liquid particulates and gases (smoke). Carbon monoxide may be evolved if incomplete combustion occurs. Unidentified organic and inorganic compounds

5.3. Advice for firefighters

Special protective equipment for firefighters: Proper protective equipment including chemical resistant gloves are to be worn; chemical resistant suit is indicated if large contact with spilled product is expected. Self-Contained Breathing Apparatus must be worn when approaching a fire in a confined space. Select fire fighter's clothing approved to relevant Standards (e.g. Europe: EN469).

Specific extinguishing methods: Use extinguishing measures that are appropriate to local circumstances and the surrounding environment

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Personal precautions:
6.1.1 For non emergency personnel: Avoid contact with skin and eyes.
6.1.2 For emergency responders: Avoid contact with skin and eyes

6.2. Environmental precautions

Environmental precautions: Use appropriate containment to avoid environmental contamination. Prevent from spreading or entering drains, ditches or rivers by using sand, earth, or other appropriate barriers. Local authorities should be advised if significant spillages cannot be contained

6.3. Methods and materials for containment and cleaning up

Methods for cleaning up	Slippery when spilt. Avoid accidents, clean up immediately. Prevent from spreading by making a barrier with sand, earth or other containment material. Reclaim liquid directly or in an absorbent. Soak up residue with an absorbent such as clay, sand or other suitable material and dispose of properly

6.4. Reference to other sections

For guidance on selection of personal protective equipment see Chapter 8 of this Safety Data Sheet., For guidance on disposal of spilled material see Chapter 13 of this Safety Data Sheet

7. Handling and storage

General Precautions	Use local exhaust ventilation if there is risk of inhalation of vapours, mists or aerosols. Use the information in this data sheet as input to a risk assessment of local circumstances to help determine appropriate controls for safe handling, storage and disposal of this material.

7.1. Precautions for safe handling

Advice on safe handling	Avoid prolonged or repeated contact with skin. Avoid inhaling vapour and/or mists. When handling product in drums, safety footwear should be worn and proper handling equipment should be used. Properly dispose of any contaminated rags or cleaning materials in order to prevent fires.

7.2. Conditions for safe storage, including any incompatibilities

Other data	Keep container tightly closed and in a cool, well-ventilated place. Use properly labeled and closable containers. Store at ambient temperature. Refer to section 15 for any additional specific legislation covering the packaging and storage of this product.
Packaging material	Suitable material: For containers or container linings, use mild steel or high density polyethylene. Unsuitable material: PVC.
Container Advice	Polyethylene containers should not be exposed to high temperatures because of possible risk of distortion.

7.3. Specific end use(s)

Specific use(s)	Not applicable

8. Exposure controls/personal protection

8.1. Control parameters

Occupational Exposure Limits

Biological occupational exposure limits

No biological limit allocated.

Monitoring Methods

Monitoring of the concentration of substances in the breathing zone of workers or in the general workplace may be required to confirm compliance with an OEL and adequacy of exposure controls. For some substances biological monitoring may also be appropriate.

Validated exposure measurement methods should be applied by a competent person and samples analysed by an accredited laboratory.

Examples of sources of recommended exposure measurement methods are given below or contact the supplier. Further national methods may be available.

National Institute of Occupational Safety and Health (NIOSH), USA: Manual of Analytical Methods http://www.cdc.gov/niosh/

Occupational Safety and Health Administration (OSHA), USA: Sampling and Analytical Methods http://www.osha.gov/

Health and Safety Executive (HSE), UK: Methods for the Determination of Hazardous Substances http://www.hse.gov.uk/

Institut für Arbeitsschutz Deutschen Gesetzlichen Unfallversicherung (IFA) , Germany http://www.dguv.de/inhalt/index.jsp

L'Institut National de Recherche et de Securité, (INRS), France http://www.inrs.fr/accueil

8.2. Exposure controls

Engineering measures

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Select controls based on a risk assessment of local circumstances. Appropriate measures include Adequate ventilation to control airborne concentrations. Where material is heated, sprayed or mist formed, there is greater potential for airborne concentrations to be generated.

General Information:

Define procedures for safe handling and maintenance of controls. Educate and train workers in the hazards and control measures relevant to normal activities associated with this product. Ensure appropriate selection, testing and maintenance of equipment used to control exposure, e.g. personal protective equipment, local exhaust ventilation. Drain down system prior to equipment break-in or maintenance. Retain drain downs in sealed storage pending disposal or subsequent recycle. Always observe good personal hygiene measures, such as washing hands after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping.

8.3. Personal protective equipment

The provided information is made in consideration of the PPE directive (Council Directive 89/686/EEC) and the CEN European Committee for Standardisation (CEN) standards.Personal protective equipment (PPE) should meet recommended national standards. Check with PPE suppliers.

Eye protection	If material is handled such that it could be splashed into eyes,protective eyewear is recommended. Approved to EU Standard EN166.
Hand protection	Where hand contact with the product may occur the use of gloves approved to relevant standards (e.g. Europe: EN374, US: F739) made from the following materials may provide suitable chemical protection.
Remarks	PVC, neoprene or nitrile rubber gloves Suitability and durability of a glove is dependent on usage, e.g. frequency and duration of contact, chemical resistance of glove material, dexterity. Always seek advice

from glove suppliers. Contaminated gloves should be replaced. Personal hygiene is a key element of effective hand care. Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturizer is recommended. For continuous contact we recommend gloves with breakthrough time of more than 240 minutes with preference for > 480 minutes where suitable gloves can be identified. For short-term/splash protection we recommend the same but recognize that suitable gloves offering this level of protection may not be available and in this case a lower breakthrough time maybe acceptable so long as appropriate maintenance and replacement regimes are followed. Glove thickness is not a good predictor of glove resistance to a chemical as it is dependent on the exact composition of the glove material. Glove thickness should be typically greater than 0.35 mm depending on the glove make and model.

Respiratory protection: No respiratory protection is ordinarily required under normal conditions of use. In accordance with good industrial hygiene practices, precautions should be taken to avoid breathing of material. If engineering controls do not maintain airborne concentrations to a level which is adequate to protect worker health, select respiratory protection equipment suitable for the specific conditions of use and meeting relevant legislation. Check with respiratory protective equipment suppliers. Where air-filtering respirators are suitable, select an appropriate combination of mask and filter. Select a filter suitable for combined particulate/organic gases and vapours [Type A/Type P boiling point > 65°C (149°F)] meeting EN14387 and EN143.

Thermal hazards: Not applicable

8.4. Environmental exposure controls

General advice: Take appropriate measures to fulfill the requirements of relevant environmental protection legislation. Avoid contamination of the environment by following advice given in Section 6. If necessary, prevent undissolved material from being discharged to wastewater. Wastewater should be treated in a municipal or industrial wastewater treatment plant before discharge to surface water. Local guidelines on emission limits for volatile substances must be observed for the discharge of exhaust air containing vapour.

9. Physical and chemical properties

9.1. Information on basic physical and chemical properties

Appearance	Liquid
Colour	Colourless
Odour	Slight hydrocarbon
Odour Threshold	Data not available
pH	Not applicable
pour point	: -48 °CMethod: ISO 3016
Initial boiling point and boiling range	> 280 °Cestimated value(s)
Flash point	260 °C, Method: ASTM D92 (COC)
Evaporation rate	Data not available
Flammability (solid, gas)	Data not available
Upper explosion limit	Typical 10 %(V)
Lower explosion limit	Typical 1 %(V)
Vapour pressure	< 0,5 Pa (20 °C) estimated value(s)
Relative vapour density	> 1estimated value(s)
Relative density	0,832 (15,0 °C)
Density	: 832 kg/m3 (15,0 °C) Method: ISO 12185
Solubility(ies)	
Water solubility	negligible
Solubility in other solvents	Data not available
Partition coefficient: n- octanol/water	log Pow: > 6(based on information on similar products)
Auto-ignition temperature	> 320 °C
Decomposition temperature	Data not available
Viscosity	
Viscosity, dynamic	Data not available
Viscosity, kinematic	46 mm2/s (40,0 °C), Method: ISO 3104 8,7 mm2/s (100 °C), Method: ISO 3104
Explosive properties	Not classified
Oxidizing properties	Data not available

9.2. Other information

Conductivity: This material is not expected to be a static accumulator

10. Stability and reactivity

10.1. Reactivity: The product does not pose any further reactivity hazards in addition to those listed in the following sub-paragraph

10.2. Chemical stability: Stable. No hazardous reaction is expected when handled and stored according to provisions

10.3. Possibility of hazardous reactions

Hazardous reactions: Reacts with strong oxidising agents.

10.4. Conditions to avoid

Conditions to avoid: Extremes of temperature and direct sunlight

10.5. Incompatible materials

Materials to avoid: Strong oxidising agents

10.6. Hazardous decomposition products

Hazardous decomposition products: No decomposition if stored and applied as directed

11. Toxicological information

11.1. Information on toxicological effects

Basis for assessment	Information given is based on data on the components and the toxicology of similar products. Unless indicated otherwise, the data presented is representative of the product as a whole, rather than for individual component(s).
Information on likely routes of exposure	Skin and eye contact are the primary routes of exposure although exposure may occur following accidental ingestion
Acute oral toxicity	
Product	LD50 rat: > 5.000 mg/kg Remarks: Low toxicity: Based on available data, the classification criteria are not met.
Acute inhalation toxicity	Remarks: Based on available data, the classification criteria are not met.
Acute dermal toxicity	LD50 Rabbit: > 5.000 mg/kg Remarks: Low toxicity: Based on available data, the classification criteria are not met.
Skin corrosion/irritation	
Product	Remarks: Slightly irritating to skin., Prolonged or repeated skin contact without proper cleaning can clog the pores of the skin resulting in disorders such as oil acne/folliculitis., Based on available data, the classification criteria are not met.
Serious eye damage/eye irritation	
Product	Remarks: Slightly irritating to the eye., Based on available data, the classification criteria are not met.
Respiratory or skin sensitisation	
Product	Remarks: For respiratory and skin sensitisation; Not a sensitiser. Based on available data, the classification criteria are not met.
Components	Triazole derivative: Remarks: May cause an allergic skin reaction in sensitive individuals.
Germ cell mutagenicity	
Product	Remarks: Non mutagenic, based on available data, the classification criteria are not met.
Reproductive toxicity	
Product	Remarks: Not a developmental toxicant., Does not impair fertility. Based on available data, the classification criteria are not met.
STOT - single exposure	
Product	Remarks: Based on available data, the classification criteria are not met.
STOT - repeated exposure	
Product	Remarks: Based on available data, the classification criteria are not met.
Aspiration toxicity	
Product	Not an aspiration hazard.
Further information	
Product	Remarks: Used oils may contain harmful impurities that have accumulated during use. The concentration of such impurities will depend on use and they may present risks to health and the environment on disposal., ALL used oil should be handled with caution and skin contact avoided as far as possible. Remarks: High pressure injection of product into the skin may lead to local necrosis if the product is not surgically removed. Remarks: Slightly irritating to respiratory system. Remarks: Classifications by other authorities under varying regulatory frameworks may exist.
Summary on evaluation of the CMR properties	
Germ cell mutagenicity-Assessment	This product does not meet the criteria for classification in categories 1A/1B.
Carcinogenicity-Assessment	This product does not meet the criteria for classification in categories 1A/1B.
Reproductive toxicity - Assessment	This product does not meet the criteria for classification in categories 1A/1B.

12. Ecological information

12.1. Toxicity

Basis for assessment	Ecotoxicological data have not been determined specifically for this product. Information given is based on a knowledge of the components and the ecotoxicology of similar products. Unless indicated otherwise, the data presented is representative of the product as a whole, rather than for individual component(s).(LL/EL/IL50 expressed as the nominal amount of product required to prepare aqueous test extract).
Product:	
Toxicity to fish (Acute toxicity)	Remarks: LL/EL/IL50 > 100 mg/l Practically non toxic: Based on available data, the classification criteria are not met.
Toxicity to crustacean (Acute toxicity)	Remarks: LL/EL/IL50 > 100 mg/l Practically non toxic: Based on available data, the classification criteria are not met.
Toxicity to algae/aquatic plants (Acute toxicity)	Remarks: LL/EL/IL50 > 100 mg/l Practically non toxic: Based on available data, the classification criteria are not met.
Toxicity to fish (Chronic toxicity)	Remarks: Data not available
Toxicity to crustacean (Chronic toxicity)	Remarks: Data not available
Toxicity to microorganisms	Remarks: Data not available

	(Acute toxicity)	
	Components:	Triazole derivative
	M-Factor (Short-term (acute) aquatic hazard)	1
12.2.	Persistence and degradability	
	Product: Biodegradability	Remarks: Not readily biodegradable., Major constituents are inherently biodegradable, but contains components that may persist in the environment.
12.3.	Bioaccumulative potential	
	Product: Bioaccumulation	Remarks: Contains components with the potential to bioaccumulate.
	Partition coefficient: n-octanol/water	log Pow: > 6Remarks: (based on information on similar products)
12.4.	Mobility in soil	
	Product: Mobility	Remarks: Liquid under most environmental conditions. If it enters soil, it will adsorb to soil particles and will not be mobile. Remarks: Floats on water.
12.5.	Results of PBT and vPvB assessment	
	Product: assessment	This mixture does not contain any REACH registered substances that are assessed to be a PBT or a vPvB.
12.6.	Other adverse effects	
	Product: Additional ecological information	Does not have ozone depletion potential, photochemical ozone creation potential or global warming potential., Product is a mixture of non-volatile components, which will not be released to air in any significant quantities under normal conditions of use. Poorly soluble mixture. Causes physical fouling of aquatic orgasms

13. Disposal considerations

13.1.	Waste treatment methods	
	Product	Recover or recycle if possible. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste classification and disposal methods in compliance with applicable regulations. Do not dispose into the environment, in drains or in water courses. Waste product should not be allowed to contaminate soil or ground water, or be disposed of into the environment. Waste, spills or used product is dangerous waste.
	Contaminated packaging	Dispose in accordance with prevailing regulations, preferably to a recognized collector or contractor. The competence of the collector or contractor should be established beforehand. Disposal should be in accordance with applicable regional, national, and local laws and regulations.
	Local legislation	
	Waste catalogue	EU Waste Disposal Code (EWC):
	Waste Code	13 01 11*
	Remarks	Disposal should be in accordance with applicable regional, national, and local laws and regulations. Classification of waste is always the responsibility of the end user.

14. Transport information

14.1.	UN	
	ADN	Not regulated as a dangerous good
	ADR	Not regulated as a dangerous good
	RID	Not regulated as a dangerous good
	IMDG	Not regulated as a dangerous good
	IATA	Not regulated as a dangerous good
14.2.	Proper shipping name	
	ADN	Not regulated as a dangerous good
	ADR	Not regulated as a dangerous good
	RID	Not regulated as a dangerous good
	IMDG	Not regulated as a dangerous good
	IATA	Not regulated as a dangerous good
14.3.	Transport hazard class	
	ADN	Not regulated as a dangerous good
	ADR	Not regulated as a dangerous good
	RID	Not regulated as a dangerous good
	IMDG	Not regulated as a dangerous good
	IATA	Not regulated as a dangerous good
14.4.	Packing group	
	ADN	Not regulated as a dangerous good
	CDNI Inland Water Waste Agreement	NST 3411 Mineral Lubricating Oils
	ADR	Not regulated as a dangerous good
	RID	Not regulated as a dangerous good
	IMDG	Not regulated as a dangerous good
	IATA	Not regulated as a dangerous good
14.5.	Environmental hazards	
	ADN	Not regulated as a dangerous good
	ADR	Not regulated as a dangerous good
	RID	Not regulated as a dangerous good
	IMDG	Not regulated as a dangerous good

14.6. Special precautions for user

Remarks	Special Precautions: Refer to Section 7, Handling & Storage, for special precautions which a user needs to be aware of or needs to comply with in connection with transport.

14.7. Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable for product as supplied. MARPOL Annex 1 rules apply for bulk shipments by sea.

15. Regulatory information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

REACH - List of substances subject to authorisation (Annex XIV)	Product is not subject to Authorisation under REACH
Volatile organic compounds	0 %
Other regulations	The regulatory information is not intended to be comprehensive. Other regulations may apply to this material. Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), annex XIV. Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), annex XVII. Directive 2004/37/EC on the protection of workers from the risks related to exposure to carcinogens or mutagens at work and its amendments. Directive 1994/33/EC on the protection of young people at work and its amendments. Council Directive 92/85/EEC on the introduction of measures to encourage improvements in the safety and health at work of pregnant workers and workers who have recently given birth or are breastfeeding and its amendments.

The components of this product are reported in the following inventories

EINECS	All components listed or polymer exempt
TSC	All components listed

15.2. Chemical safety assessment

No Chemical Safety Assessment has been carried out for this substance/mixture by the supplier.

16. Other information

16.1. Full text of H-Statements

H304	May be fatal if swallowed and enters airways
H314	Causes severe skin burns and eye damage
H317	May cause an allergic skin reaction
H410	Very toxic to aquatic life with long lasting effects

16.2. Full text of other abbreviations

Aquatic Chronic	Long-term (chronic) aquatic hazard
Asp. Tox.	Aspiration hazard
Skin Corr.	Skin corrosion
Skin Sens.	Skin sensitisation

16.3. Abbreviations and Acronyms

ACGIH	American Conference of Governmental Industrial Hygienists
ADR	European Agreement concerning the International Carriage of Dangerous Goods by Road
AICS	Australian Inventory of Chemical Substances
ASTM	American Society for Testing and Materials
BEL	Biological exposure limits
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes
CAS	Chemical Abstracts Service
CEFIC	European Chemical Industry Council
CLP	Classification Packaging and Labelling
COC	Cleveland Open-Cup
DIN	Deutsches Institut fur Normung
DMEL	Derived Minimal Effect Level
DNEL	Derived No Effect Level
DSL	Canada Domestic Substance List
EC	European Commission
EC50	Effective Concentration fifty
ECETOC	European Center on Ecotoxicology and Toxicology Of Chemicals
ECHA	European Chemicals Agency
EINECS	The European Inventory of Existing Commercial Chemical Substances
EL50	Effective Loading fifty
ENCS	Japanese Existing and New Chemical Substances Inventory
EWC	European Waste Code
GHS	Globally Harmonised System of Classification and Labelling of Chemicals
IARC	International Agency for Research on Cancer
IATA	International Air Transport Association
IC50	Inhibitory Concentration fifty
IL50	Inhibitory Level fifty
IMDG	International Maritime Dangerous Goods
INV	Chinese Chemicals Inventory

IP346	Institute of Petroleum test method N° 346 for the determination of polycyclic aromatics DMSO-extractables KECI = Korea Existing Chemicals Inventory LC50 = Lethal concentration fifty
LD50	Lethal Dose fifty per cent.
LL/EL/IL	Lethal Loading/Effective Loading/Inhibitory loading LL50 = Lethal Loading fifty
MARPOL	International Convention for the Prevention of Pollution From Ships
NOEC/NOEL	No Observed Effect Concentration / No Observed Effect Level
OE_HPV	Occupational Exposure - High Production Volume PBT = Persistent, Bioaccumulative and Toxic
PICCS	Philippine Inventory of Chemicals and Chemical Substances
PNEC	Predicted No Effect Concentration
REACH	Registration Evaluation And Authorisation Of Chemicals
RID	Regulations Relating to International Carriage of Dangerous Goods by uail
SKIN_DES	Skin Designation
STEL	Short term exposure limit
TRA	Targeted Risk Assessment
TSCA	US Toxic Substances Control Act
TWA	Time-Weighted Average
vPvB	very Persistent and very Bioaccumulative

16.4. Further information

Training advice	Provide adequate information, instruction and training for operators
Other information	No Exposure Scenario annex is attached to this safety data sheet as it is a non-classified mixture containing no hazardous substances. Under Article 31 of REACH, a SDS is not required for this product. Therefore, this SDS has been created on a voluntary basis to pass on potentially relevant information required under Article 32. A vertical bar (|) in the left margin indicates an amendment from the previous version
Sources of key data used to compile the Safety Data Sheet	The quoted data are from, but not limited to, one or more sources of information (e.g. toxicological data from Shell Health Services, material suppliers' data, CONCAWE, EU IUCLID date base, EC 1272 regulation, etc).

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.

E. Torque settings

Inspect all bolt joints which may pose a hazard to people and machines at fixed intervals and check their torque.
Apply the torque values unless indicated otherwise on the drawing.

Nominal size	Strength class	Course pitch [Nm] (Copper-grease) 0.08	Fine pitch [Nm] (Copper-grease) 0.08
M4	8.8	2.2	
	10.9	3.2	
	12.9	3.8	
M5	8.8	4.3	
	10.9	6.3	
	12.9	7.4	
M6	8.8	7.4	
	10.9	10.9	
	12.9	12.5	
M7	8.8	12.0	
	10.9	17.5	
	12.9	20.5	
M8	8.8	18	19
	10.9	26	28
	12.9	31	32
M10	8.8	36	37
	10.9	52	55
	12.9	61	64
M12	8.8	61	63
	10.9	90	93
	12.9	105	109
M14	8.8	97	103
	10.9	145	150
	12.9	165	175
M16	8.8	145	155
	10.9	215	225
	12.9	250	270
M18	8.8	210	230
	10.9	300	330
	12.9	350	380
M20	8.8	300	320
	10.9	420	460

Nominal size	Strength class	Course pitch [Nm] (Copper-grease) 0.08	Fine pitch [Nm] (Copper-grease) 0.08
	12.9	500	530
M22	**8.8**	400	430
	10.9	570	610
	12.9	670	710
M24	**8.8**	510	640
	10.9	730	900
	12.9	850	1060
M27	**8.8**	750	920
	10.9	1070	1310
	12.9	1250	1530
M30	**8.8**	1000	1280
	10.9	1450	1820
	12.9	1700	2130
M33	**8.8**	1400	1700
	10.9	1950	2430
	12.9	2300	2840
M36	**8.8**	1750	2230
	10.9	2500	3170
	12.9	3000	3710
M39	**8.8**	2300	2850
	10.9	3300	4050
	12.9	3800	4740