

Instruction- and Maintenance Manual POWER PACK

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*30 kW EL
for strand jack*

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Preface

Dear customer,

This is the manual for assembling, operating and maintaining your HPU 30 kW EL system. In the rest of this manual, this machine is referred to by the term “**Powerpack**”. The powerpack will always be part of a strand jack system.

The manual is part of the handbook of the System, and is meant to be used by operators and by maintenance engineers.



It is essential that the user reads this manual completely **before** start working with the System.

- All information, illustrations and technical data in this manual are applicable to the System as it was at the **time of issuing** of this manual.
- We continuously **improve** our products and therefore reserve the right to implement improvements and **changes** whenever it is necessary and possible to do so, without any obligation to apply improvements or changes to models purchased previously. Nevertheless, when the system is improved due to serious **safety issues**, you as a customer will be informed.
- If this manual becomes **unreadable**, in whole or in part, you can order a copy by providing us the number given on the front cover.
- Despite the fact that this manual has been drafted with great care, we **cannot guarantee** that it does not contain any errors.
- The use and interpretation of all information in this manual and the possible consequences through improper use of the system are wholly the **responsibility of the user**. Enerpac shall under no circumstances accept any responsibility for such improper use.

Pictures and illustrations in this manual may differ from reality.

Within this document use is made of **structured text**. The following conventions are applied:

- Procedural steps are numbered. Execute the steps sequentially. Do not skip any step.
- Responses of the system are written on the next line in italic font.
- Choices are indicated with bullets.

Example:

1.	Press the green button. <i>The motor starts running.</i>	
2.	Select one of the options: • Use the red button to stop the motor • Use the blue button to pause the machine.	 

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We hope this manual will help you to use the System properly.

Enerpac.

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1. Introduction

1.1. Manufacturer address

Enerpac Heavy Lifting Technology B.V.
Spinelstraat 15, 7554 TS
Hengelo (Ov)
The Netherlands
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Fax. +31 74 243 03 38
Email: info.hengelo@enerpac.com
Website: www.enerpac.com

1.2. Declaration

Declaration of Conformity according to Machine Directive 2006/42/EC.
For the EC Declaration of Conformity reference is made to ref [5] "EC Declaration of conformity" which is part of the product delivery.

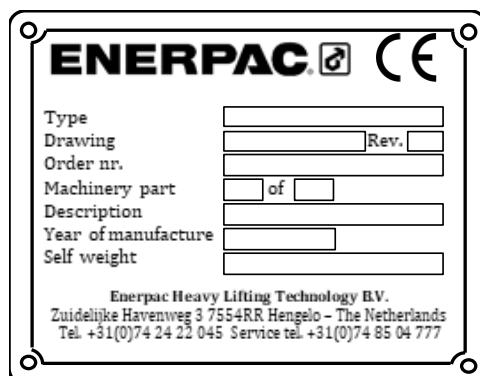
1.3. Referenced documents

The following documents are referred to in this manual:

Ref	Name	Identification	Manufacturer
1.	Operation of electrical installations - Low voltage	NEN 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	As delivered	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	As delivered	Enerpac

1.4. Identification

Each main component is fitted with a name plate as shown below.



The name plate is a rectangular label with a double border. At the top left is the **ENERPAC** logo and a CE mark. Below the logo are several fields for identification: Type, Drawing, Order nr., Machinery part (with a box for 'of'), Description, Year of manufacture, and Self weight. At the bottom, it lists the company name and address: Enerpac Heavy Lifting Technology B.V., Zuidelijke Havenweg 3 7554RR Hengelo - The Netherlands, Tel. +31(0)74 24 22 045, Service tel. +31(0)74 85 04 777.



Name plates are official documents.
It is not permitted to alter them or
render them illegible.

1.5. Liability

- Personnel as well as other people involved in the usage of the System are expected to have read and **understood** this manual.
- In cases of **doubt** about the use or application of this machine, always contact Enerpac for advice and recommendations.
- **Unauthorised alterations** to the machine may have a deleterious effect on the characteristics of the machine and may disrupt the control functions. Unauthorised alterations therefore annul any resultant damage claims against Enerpac.
- The **risk analysis** conducted by Enerpac, intended usage and reasonably foreseeable incorrect usage of the System were assessed. The instructions in this manual were drawn up based on this analysis.
- Unauthorised **modifications** to the machine may adversely affect its properties or disrupt normal functioning. Therefore, Enerpac shall not be liable for any claims resulting from unauthorised modifications.

1.6. Intended use

The powerpack is intended to provide hydraulic power to a strand jack system which is attached to it, and to control that strand jack system. On its turn, the powerpack itself has to be controlled by computer or by the local control device.

The definition of 'intended use' excludes any and all uses which do not meet the descriptions, including use that exceeds the machine's technical limitations. Enerpac shall not accept any liability for damage resulting from use that is not in accordance with the machine's intended use. The user shall bear any and all risks. The definition of 'intended use' also includes strict compliance with the instructions in the user manual and assumes that the equipment is inspected and maintained at the indicated times.

- The System should only be used in the **intended manner** as described in the instructions in this manual.
- The System should only be operated by **operators** with full knowledge of the applicable safety regulations and the hazards which may arise during use.
- The System was developed and built according to the officially recognized safety **regulations**. However, if the machine is not used as intended:
 - This may pose a **risk** to the health and lives of operators and bystanders.
 - The System may not function properly or may create **hazardous** situations.
- The System should only be used if the machine is in perfect technical **condition**.
- Faults which may result in hazardous situations must be **resolved** immediately.
- The machine must not be used in potentially **explosive** environments.

1.7. Modifications

Never make any **modifications** or additions which could have an adverse impact on safety without prior approval from Enerpac. This also applies to the installation and adjustment of safety devices and valves and welding work on the System.

Spare parts have always to meet the technical specifications given by Enerpac.

Preferably apply **original spare parts** as these parts are made according the technical specifications of Enerpac. In cases of doubt, please contact Enerpac.

1.8. Personnel and responsibilities

- Only **qualified personnel** are allowed to **operate** the System.
Qualified personnel are those who have certified skills to operate the System.
They should preferably have received training from Enerpac, or else from the customer.
- Only **qualified personnel** are allowed to **maintain** the System.
Qualified personnel are those who have certified main education for the jobs they have perform, either mechanical, hydraulically or electrical.
They should preferably have received training from Enerpac, or else from the customer.
- **Qualification** of the personnel is a responsibility of the customer.
- Always comply with legal **minimum age** stipulations.
- The System should only be used, maintained and repaired by properly **instructed** and **trained** personnel. Clearly describe the qualifications of the relevant employees with regard to use, commissioning, assembly, disassembly and all maintenance and repair work. If must be performed by third parties, they must receive clear instructions so both the client and the contractor are up-to-date on the agreements reached.
- The supervisor and operator are authorized to refrain from following any instructions from **third parties** that may pose a risk to the machines or bystanders.
- Personnel who have **not been fully trained** and instructed in the use of the machine, or personnel who have only received general training, may only perform work on the System under continuous **supervision** of a qualified person.
- Work on the **electrical** and the **hydraulic systems** must be performed by competent, qualified personnel, or by trained personnel under the direct supervision of qualified personnel, in compliance with all applicable rules and regulations.
- **Assembly and disassembly** may only be performed by trained installers under the supervision of an authorized person who has adequate knowledge of the System.

The responsibilities listed below are in accordance with the standard as referred to in Ref [6] ASME B30.1-2015.

- In some situations, the owner and the user may be the same entity and is therefore accountable for all of the following responsibilities a listed in this chapter.
- In other cases, the user may lease or rent the system from the system without supervisory, operational, maintenance, support personnel, or services from the system owner. In these situations, sections 1.8.1 “The owner of the system” and 1.8.2 “The user of the system” shall apply.

1.8.1. The owner of the system

The responsibilities of the owner of the system are:

- a) make sure the system meets the requirements as given in this manual as well as specific job requirements defined by the user.
- b) make sure the system and all necessary components, specified by the manufacturer, meet the user's requested configuration and capacity.
- c) providing the applicable capacity charts to the user
- d) providing this manual to the user to enable correct assembly, disassembly, operation and maintenance information
- e) make sure all inspections and maintenance activities are performed.
- f) designating personnel for maintenance, repair, transport, assembly, and disassembly.
- g) designating personnel for inspections as required in the applicable chapters.

1.8.2. The user of the system

The responsibilities of the user of the system are:

- a) complying with the requirements of this manual and all regulations applicable at the work site.

- b) using supervisors for activities
- c) ensure that the system is in proper operating condition, prior to initial use at the worksite by
 - verifying that the Owner has provided this manual
 - verifying that a frequent inspection has been performed
- d) verifying that the system has the necessary capacity to perform the proposed operations in the planned configuration
- e) ensuring the assigned operators have been notified of adjustments or repairs that have not yet been completed, prior to commencing operations
- f) designating personnel for inspections as required in the applicable chapter
- g) designating personnel for maintenance, repair, transport, assembly, and disassembly
- h) ensuring that all personnel involved in maintenance, repair, transport, assembly, disassembly, and inspection are aware of their responsibilities, assigned duties, and the associated hazards
- i) ensuring that the inspection, testing, and maintenance programs specified by owner are followed

1.8.3. The site supervisor

In some cases the site supervisor and the system director may be the same person.

The responsibilities of the site supervisor shall include the following:

- j) ensuring that the system meets the requirements prior to initial site usage.
- k) determining if additional regulations or requirements are applicable.
- l) ensuring that a qualified person is designated as the system director.
- m) ensuring that the operations are coordinated with other jobsite activities that will be affected by or will affect the operations.
- n) ensuring that the area for the system is adequately prepared. The preparation includes, but is not limited to, the following:
 - 1. access for the system and associated equipment.
 - 2. sufficient room to assemble and disassemble the system.
 - 3. an operating area that is suitable for the system with respect to levelness, surface conditions, support capability, proximity to power lines, excavations, slopes, underground utilities, subsurface construction, and obstructions to operation.
 - 4. traffic control as necessary to restrict unauthorized access to the system's working area.
 - 5. ensuring that work involving the assembly and disassembly of system is supervised by a qualified person .
 - 6. ensuring that operators meet the physical, knowledge, and skill requirements as described in this manual.
 - 7. ensuring that conditions that may adversely affect the operations are addressed. Such conditions include, but are not limited to, the following:
 - poor soil or support conditions
 - wind velocity or gusting winds
 - weather conditions
 - extreme temperatures
 - inadequate lighting
 - operating surface conditions
 - excessive noise proximity to energized sources (e.g., power lines, pressurized lines)
 - ensuring that work performed by the rigging crew is supervised by a qualified person
 - ensuring that maintenance is performed by a designated person

1.8.4. The system director

The system Director's responsibilities shall include the following:

- a) being present at the job site during the operations.
- b) stopping the operations if alerted to an unsafe condition.
- c) ensuring that the preparation of the area needed to support the operation has been completed before the operation starts.
- d) ensuring necessary traffic controls are in place to restrict unauthorized access to the system's work area.
- e) ensuring that personnel involved in the operations understand their responsibilities, assigned duties, and the associated hazards.
- f) addressing safety concerns raised by the system operator or other personnel and being responsible if he decides to overrule those concerns and directs the operation to continue. In all cases the manufacturer's criteria for safe operation and the requirements of this manual shall be followed.
- g) designating the signal person(s) and conveying that information to the system operator.
- h) evaluating the operation in proximity to energized sources.
- i) ensuring precautions are implemented when hazards associated with special load handling operations are present. Such operations may include, but are not limited to, the following:
 - multiple types of system used simultaneously
 - shifting centre(s) of gravity or lifting below the centre of gravity
 - shifting, inclined, or moving surfaces
 - operating barges
- j) informing the system operator of the weight and planned movement of the loads to be handled.
- k) obtaining the system operator's verification that this weight does not exceed the system's rated load.
- l) ensuring that load rigging personnel have been designated for the system.
- m) ensuring that the load is properly rigged and stable.

1.8.5. The operators

The system Operator shall be responsible for the following listed items.

The system Operator shall not be responsible for hazards or conditions that are not under his direct control and that adversely affect the system operations.

Whenever the system Operator has doubt as to the safety of operation, the system Operator shall stop the system functions in a controlled manner. System operations shall resume only after safety concerns have been addressed and the continuation of the operation is directed by the system Director.

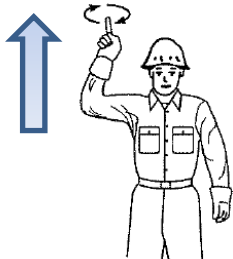
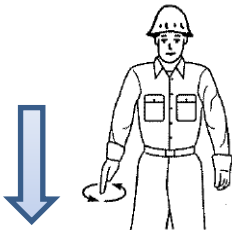
The system Operator's responsibilities shall include the following:

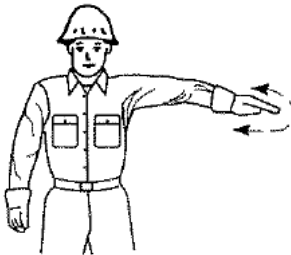
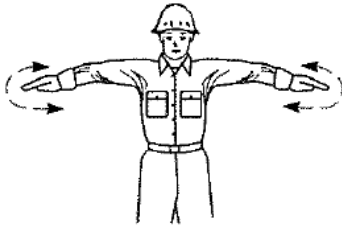
- a) reviewing the requirements for the system with the Director before the operations.
- b) knowing what types of site conditions could adversely affect the operation of the system and consulting with the system Director concerning the possible presence of those conditions.
- c) understanding and applying the information contained in this manual.
- d) understanding the system's functions and limitations as well as its particular operating characteristics.
- e) using the system's load/capacity chart(s) and diagrams and applying all notes and warnings related to the charts to confirm the correct system configuration to suit the load, site, and load handling conditions.
- f) refusing to operate the system when any portion of the load or the system could be adversely affected by proximity to energized sources until evaluated and approved by a qualified person.
- g) performing inspections as specified in the applicable chapter.
- h) promptly reporting the need for any adjustments or repairs.
- i) following applicable lock out/tag out procedures,
- j) not operating the system when physically or mentally unfit.

- k) ensuring that all controls are in the off or neutral position and that all personnel are in the clear before energizing the system.
- l) not engaging in any practice that will divert his attention while actually operating the system controls.
- m) testing the system function controls that will be used and operating the system only if those function controls respond properly.
- n) operating the system's functions, under normal operating conditions, in a smooth and controlled manner.
- o) knowing and following the procedures specified by the system manufacturer or approved by a qualified person for assembly, disassembly, and setting up the system.
- p) knowing how to travel the system, if applicable.
- q) ensuring that the load and rigging weight(s) have been provided.
- r) calculating or determining the rated load for all configurations that will be used and verifying, using the capacity chart(s), that the system has sufficient capacity for the proposed operation.
- s) considering all factors known that might affect the system capacity and informing the system Director of the need to make appropriate adjustments.
- t) knowing the standard and special signals as specified in the applicable chapter and responding to such signals from the signalperson. When a signalperson is not required, the system Operator is then responsible for the movement of the system. However, the system Operator shall obey a stop signal at all times, no matter who gives it.
- u) understanding bask load rigging procedures. For responsibility of rigging the load and ensuring that the load is rigged properly
- v) if power fails during the operations
 - set all locking devices
 - move all power controls to the OFF or neutral position
 - secure and stabilize the load, if practical
- w) before leaving the system unattended
 - secure and stabilize the load
 - set all locking devices
 - put the system controls in the OFF or neutral position
 - turn off the system power source
 - follow the recommendations as given in this manual or given by a qualified person for securing the system

1.9. Hand signals

The following hand signals are applicable when using the system:

RAISE. With forearm vertical, forefinger pointing up, move hand in small horizontal circle.		LOWER. With arm extended downward, forefinger pointing down, move hand in small horizontal circle.	
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STOP. Arm extended, palm down, move arm back and forth horizontally.		EMERGENCY STOP. Both arms extended, palms down, move arms back and forth horizontally.	
END EVERYTHING. Clasp hands in front of body.		INDIVIDUAL STRAND JACKS. Hold up: one finger for the system marked: "1," two fingers for the system marked "2". Regular signals follow.	

1.10. Lifetime

No lifetime of the System is specified, since its safe and effective lifetime strongly depends on

- the intensity of the use
- the quality of the maintenance
- the service conditions the system is exposed to, like wet or salty environments
- the masses of the loads the system is exposed to.

1.11. Warning symbols used within this document

In this manual warnings and symbols are used to draw your attention to important safety information. The table below shows the applied warnings and symbols:

**NB**

Is used to highlight important **work activities** and for **additional information**

**Caution**

Is used if failure to heed the given instructions may result in **damage to the system**.

**Attention**

General warning to the operator of potential damage to **equipment** and the **environment**.

**Hazard**

Draws the user's attention to potential **hazards to personnel** if work instructions are not followed precisely.

2. General safety aspects

Subjects that must be followed are covered not only in this chapter; also in other chapters are specific safety directions that must be read and followed.

2.1. Mandatory protective gear

While using the System ensure that the locally applicable safety regulations are observed

Make sure that all people on the working place observe the following safety regulations:



Always wear • safety goggles
and a safety helmet



Always wear • safety footwear



Wear safety gloves.
But we strongly advise not to wear them when
operating handheld control consoles



Wear a safety harness when working at heights
more than 2 meters

2.2. General safety regulations

Special safety regulations are given in the relevant national legislations or company regulations for accident prevention. Compliance with these rules and regulations is a legal requirement and a condition of employment. In addition to the safety regulations set out under the law, also observe the following points:

- Keep the worksite **clean**.
- Before every start-up, always check that there are no **persons** in an unsafe situation or position with respect to the System. Stop working if, despite warnings, there are still employees in an unsafe situation.
- Only use the System on an adequately stable and robust **subsurface**.
- Keep all equipment out of the area of above-ground **power lines**.
- The **coverings** must be closed (this does not apply to the covering on control panels).
- The operator must switch off the System before leaving it **unattended**.
- Use all required **Personal Protection Equipment (PPE)**.
- Do not wear any loose **clothing or jewellery**. Long hair must be tied back.
- **Tools** and equipment, necessary for (dis-)assembly of the System as well as for maintenance have to be in good condition. Badly maintained equipment can cause time wastage and lead to permanent damage to the equipment and/or its surroundings.
- Keep the hydraulic and moving equipment of the System **clean** to prevent it from jamming or causing damage to itself or other equipment.
- Do not use the System, whether loaded or not, while unauthorized people are in its **vicinity**. The System can be operated remotely.

- Maintain **focus** during the work. Carelessness may result in serious injuries.
- Additional **lifting gear** and accessories such as hawsers, shackles, lugs, slings etc. must comply with the legal requirements imposed in the country of use.
- **Inspect** the condition of the System before every individual start-up, given the fact that the slightest defect may have severe consequences.
- Personnel shall not place any **part of their body** under the load.
- Personnel shall **remain clear** of the system during operation.
- Personnel shall **not ride** on the system while traveling or side shifting.

Enerpac is not liable for improper use of accessories in combination with the System.

2.3. Symbols applied to the System

The System can be labelled with

- warning symbols
- symbols with mandatory directions.

The table below shows the most commonly used **warning symbols** in industrial environments:



Danger of contact with moving machine parts



Danger
Lethal voltage in the control panels



Danger of **parts of hands** getting trapped/caught



Danger of **parts of feet** getting trapped/caught



Danger of **falling**



Danger
Exercise extreme attention and caution when **under moving loads**.



Danger of getting **trapped**/caught between moving parts.

The table below shows the most commonly symbols with **mandatory directions** in industrial environments:



Read the instruction manual.



Wear **gloves** to prevent injury from and/or exposure to chemicals.



Wear safety **glasses** to prevent eye injuries.



Wear safety **shoes** to prevent injuries caused by falling objects and/or feet getting caught in machinery.



Wear **hearing** protection.



Wear a safety **helmet** to prevent injuries caused by falling objects.



Wear a safety **harness**



The stickers on the machine are **official documents** and it is not permitted to alter them or render them illegible.



It is **strictly obligatory** to observe the warning symbols and the mandatory symbols applied to the machine.

2.4. Welding work

- Welding, cutting and grinding work on the System is only permitted with the **prior written consent** of Enerpac.
- Welders must be properly qualified and must have a valid welding certificate.
- If welding work needs to be performed on the System then
 - Switch the machine off
 - Disconnect all power cables and communications cables
 - Connect the system to a direct earth line.



Welding, cutting, grinding or any other structural adjustment work on the System is not permitted without Enerpac's prior written permission.

2.5. Working on the electrical system

- In the event of an electrical fault in the electric control system, you must bring all connected devices into a safe condition. **Switch off** the System.
- Work on the electrical system must be performed by a competent, **qualified electrician** or by trained personnel under the direct supervision of a qualified electrician, in compliance with all applicable rules and regulations such as
 - Ref 1 “Operation of electrical installations - Low voltage”
 - Ref 2 “Operation of electrical installations”.
- **Switch the power** off before inspection, maintenance or repair of the System. Make sure that there is no power on the relevant parts. If necessary, connect the machine to earth. Insulate any adjacent component that is still under voltage.
- Check and inspect the electrical system of the System at **regular intervals**. Problems, such as loose connections and damaged or stuck wiring, must be resolved immediately. Only use original fuses and circuit breakers with the correct current value.
- If work does need to be performed on components which are under **voltage**, then cordon off the work zone and only use certified and properly insulated tools.

2.6. Working on the hydraulic system

- Work on the hydraulics system or other components in a pressurized system must be performed by a **competent, qualified installer** or by trained personnel under the direct supervision of a qualified installer, in compliance with all applicable rules and regulations.
- Check all pipes, hoses, quick-release couplings and screw joints **regularly** for leaks and visible external damage. Repair damage immediately. Pressurized hydraulic fluid leaks may cause serious injury, and it may cause fire and damage to the environment.
- If parts need to be removed from the hydraulic system, the **hydraulic pressure must be released** according to the instructions in this manual before beginning work.
- Expand and install pressurized hydraulic pipes, tubes and lines in accordance with professional standards.
- Make sure that no ports have been **switched** during re-installation work.

All parts and the length and quality of hoses meet the requirements of Ref 3 “General rules and safety requirements for systems and their components”.

2.7. Fire

The course of action in the event of an emergency is determined by the rules and regulations applicable on the worksite. Every company has its own special rules. So make sure you are up-to-date on these rules.

In any case, the following actions are necessary in the event of a fire:

- Keep **calm**.
- **Report** the emergency to the employee responsible for in-house emergency services (IHES).
Tell who you are, where you are located and describe the emergency situation.
(The IHES employee will notify external emergency services.)
- **Warn** your colleagues.
- **Extinguish** the fire if it is still in its early stage, using the extinguishing means available onsite.
- If possible, **switch off** the electrical power supply.

- **Leave the scene** of the emergency situation and report to the rendez-vous point.

**Caution**

Never use water to put out an electrical fire or a fluid fire

2.8. Working with hazardous substances

It is thought that special first aid procedures are required in cases of accidents with chemicals. But in cases of small quantities, standard measures suffice:

1. rinse thoroughly with water
2. wash with soap
3. provide fresh air
4. remove any contaminated clothing

In common the following rules are applicable:

- **Contact with the skin:**
 - rinse thoroughly with water
 - remove any contaminated clothing
 - wash the relevant body parts with soap.
- **Contact with the eyes:**
 - rinse thoroughly with water (5 minutes) using eye wash fountain
 - consult a doctor.
- **Ingestion:**
 - rinse the mouth out with water.
 - If necessary, dilute the substance by drinking water.
 - If a corrosive substance has been ingested, do not induce vomiting. This is to prevent the substance coming into contact with the sensitive oesophagus again.
 - If the victim is unconscious, never attempt to induce vomiting or have the victim drink anything.

Using a 'neutralizing solution' (such as a base for an acid) can actually make the situation **worse**.

In addition to this, it is advisable to consult the safety information (TREM CARD book, safety information sheets and the catalogue) and report everything that is relevant to the accident to a doctor.

When work has to be done in confined spaces:

- Wear personal protection equipment
- ventilate according to the relevant regulations
- Ask a colleague to remain by the entrance in order to provide assistance in the event of an emergency.
- You are legally required to be **familiar with the potential hazards** of the product. The safety information sheets are intended to provide adequate, correct and up-to-date information on all substances used on the worksite.
- Relevant safety information sheets are given in Appendix E Hydraulic fluid safety information of this manual.

During maintenance, you may work with substances fitted with **GHS symbols**. These GHS symbols are explained in the next below.¹

Symbol	General hazard indication	Possible precautionary measures
	May cause an allergic reaction on the skin.	Contaminated work clothing must not leave the workspace.
	Harmful to aquatic organisms, with long term effects	Do not discharge into the environment.
	Causes serious eye injury and/or damage to the skin.	Wear eye protection and skin protection (such as protective gloves).
	Fire hazard when heated and/or in presence of sparks.	Keep away from heat, sparks, open flames and/or hot surfaces. No smoking!
	May cause fire (oxidising agent).	Take the necessary precautionary measures to prevent mixture with flammable substances.
	Toxic in cases of ingestion and/or skin penetration	Do not eat, drink or smoke when using this product.
	May cause hypersensitivity of the airways or heritable mutations in male reproductive cells, is a potential carcinogen and/or is toxic to human reproduction	Apply a strict hygiene/health policy and wear suitable personal protection equipment.
	Explosion hazard when heated and/or in presence of sparks	Keep away from heat, sparks, open flames and/or hot surfaces. No smoking!
	Contains a gas under pressure. May explode if heated	Keep out of sunlight. Store in a well-ventilated space.

¹ CLP is the Regulation on Classification, Labelling and Packaging of substances and mixtures (EC No 1272/2008). This regulation brings European legislation on the classification, labelling and packaging of chemical substances into accordance with the GHS (Global Harmonised System for classification and labelling of chemical substances). The GHS is a United Nations system used to identify chemical substances and inform users of their hazards using standard symbols and phrases on labels, packaging and Safety Information Sheets (SIS).

2.9. Assembly and disassembly

- **Assembly** and disassembly of the System has to be performed by properly trained operators
- Only use **certified lifting** and hoisting equipment.
Check the validity of these certificates and qualifications.
- Only use lifting and hoisting equipment with **suitable capacity** for the loads in question.
- Before commissioning, any parts that were disassembled for transport must be **re-assembled**, re-installed, checked and approved by qualified personnel.
- Make sure that the **instructions in this manual** have been followed precisely before commissioning the System.
- **Lift** loads as described in the user manual (connection points for lifting hooks) and observe the professional standards.



Hazard

Any components that are blocked or stuck in any way (and any parts connected to these components) will be under mechanical tension. If you release these parts, they could change position suddenly and injure you seriously.

2.10. Transport, loading and unloading of the System

- **Loading** and unloading has to be performed by properly trained operators
- Only use lifting and hoisting equipment with **suitable capacity** for the loads in question.
- **Lift loads** as described in the user manual (connection points for lifting hooks) and observe the professional standards.
- Only use **suitable containers** with adequate load-bearing capacity for transport purposes.
- **Secure** the load properly using suitable connection points and twist locks (for the containers). When using twist locks secure them properly and check that the locking mechanism is working correct.
- **Disconnect** all electrical and hydraulic connections when the System has to be moved, even if it is for only a short distance.
- To avoid damage during transport use timbers, rubber pads and plastic for **packaging**.
- **Containers** may be used for transport, since they provide rigid protection against and avoid weather influences. Make sure that all parts are secured against sliding around.

2.11. Dealing with hoses

- Make sure the **maximum** permitted pressure is never exceeded:
 - Do not change any safety setting.
- Ensure that the **accumulators** and by-pass hoses are in good condition.
- Do not **drive** over or stand on the hoses:
 - Standing on and driving over the hoses causes damage to the hose fabric, which causes leaks.
 - A sudden increase in pressure caused by squeezing the hose causes serious damage to other components.
- Do not **pull** on a hose that is connected:

- If pulling forces are exerted on a hydraulic coupling the hose and coupling interface will weaken which may result in the hose bursting out of the coupling.
- Always lift a hose by the hose itself, whilst supporting the coupling.
- Stow hoses in such a way that no forces (gravitational force) are exerted on the coupling.
- While moving the hoses, prevent the couplings **being dragged** over the ground:
 - Prevent excessive wear on the couplings and hoses by transporting them on pallets, if possible.
 - During assembly the hose must be supported by necessary use bend guides to prevent twisting of the hose.
- Protect the hose **sleeve** in places where chafing etc. cannot be avoided:
 - Wear spots can be prevented by sliding protective sleeves over areas where wear is expected or by covering sharp edges.
- Change **worn or damaged hoses** immediately:
 - If a hose is pressurized continuously by more than 20% above working pressure it must be replaced.
- Do not use **dirty** or corroded **couplings**.
 - They are less reliable
 - They will cause leaks over time.
 - They pollute the hydraulic system
- **Disconnecting** hydraulic tubing and hoses shall be done with utmost care.
 - The system is designed in such a way that hydraulic pressure drops to zero when the system is switched off. Nevertheless, pressure can remain due to
 - i. The presence of load on the system
 - ii. Raise of temperature
 - But the hydraulic connections have been designed in such a way that either
 - i. they cannot be uncoupled when they're under pressure, or
 - ii. they can be uncoupled under pressure of only a few bars, but measures have been taken that no oil can come out
 - Always use the manometers of the System to verify that the pressure is zero.



- Preferably do not uncouple the HPU when there is load on the System
- Preferably store the System in lowest position



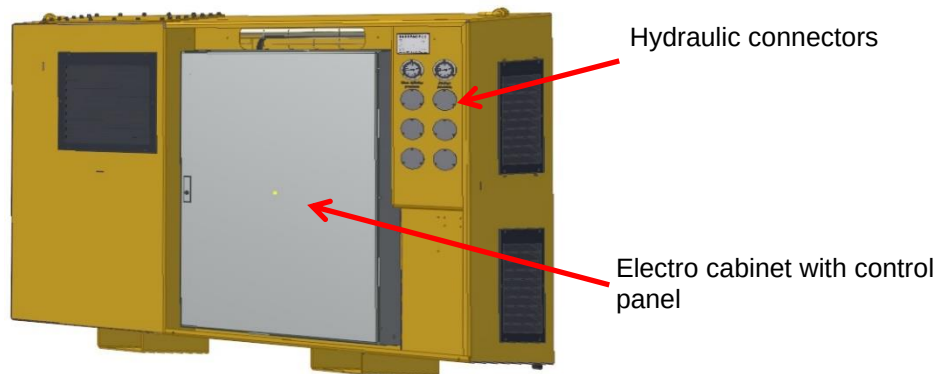
Hazard

Careless handling of hydraulics can cause serious injuries

3. System Overview

3.1. General

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



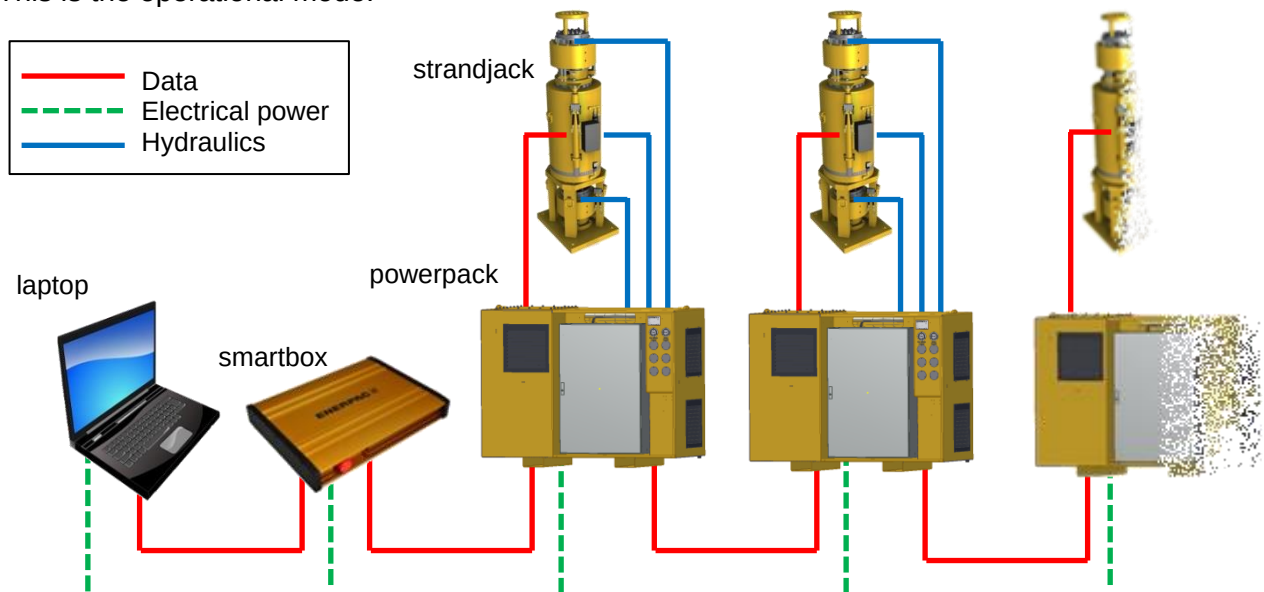
Properties of the powerpack:

- 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 powerpack:
 - 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

3.1.1. Control

The powerpack 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 unit**.



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

The following functions are available:

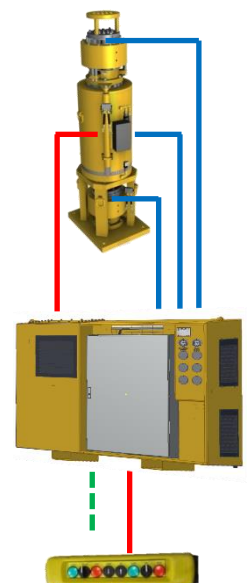
- Main jack: up, down
- Lower anchor: open, close
- Upper anchor: open, close



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



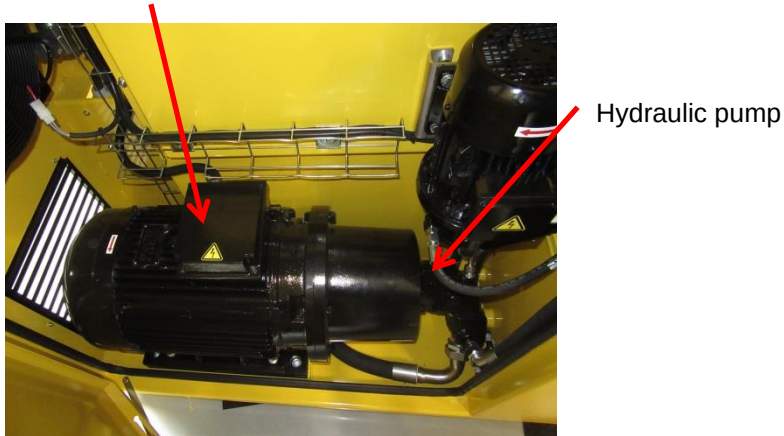
Hazard: When both anchors are opened at the same time, an attached load will drop.



3.1.2. The hydraulics

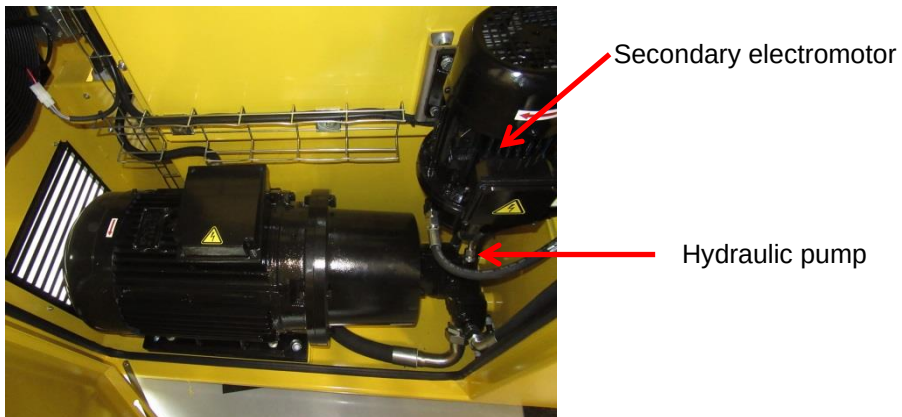
- The main electro motor drives the pump serving the main jack of the strand jack. The motor is connected to the pump by the bell housing.

Main electromotor



Hydraulic pump

- The secondary electro motor drives the pump serving the anchors jacks of the strand jack. The motor is connected to the pump by the bell housing.



Secondary electromotor

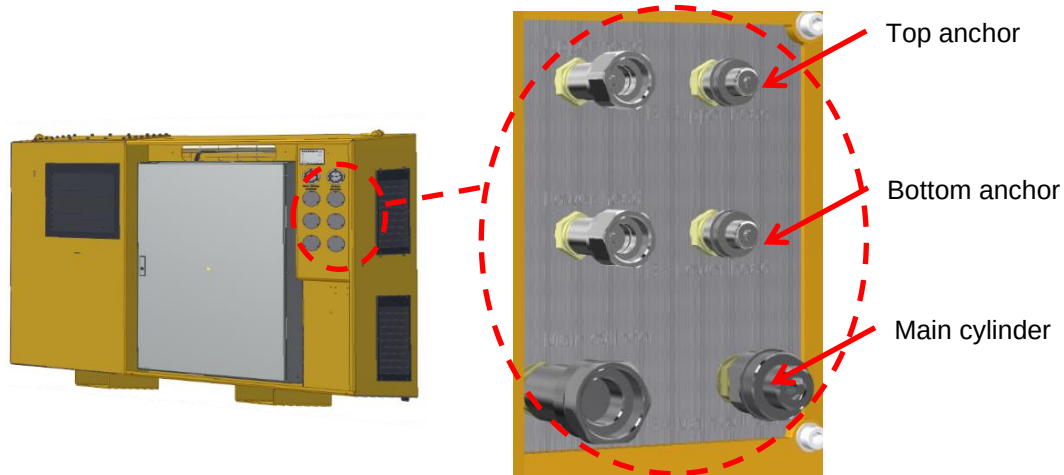
Hydraulic pump

- Oil cooler
The oil cooler cools the hydraulic oil of the system by a radiator and a fan.
The main- and the secondary pumps share the oil. The oil cooler cools the hydraulic oil.

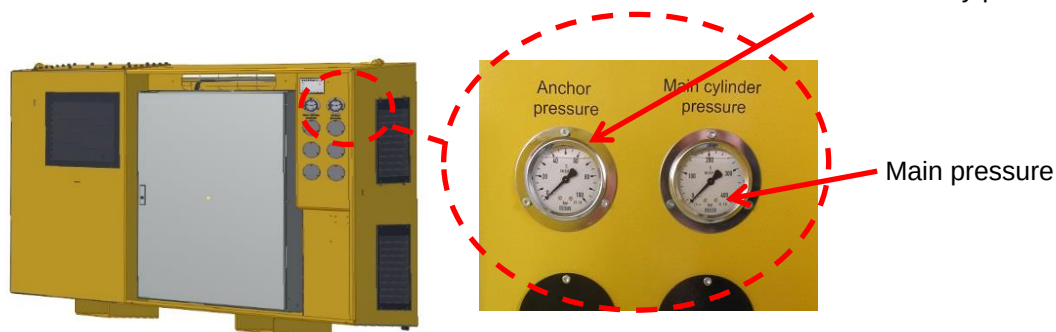


Oil cooler

- Hydraulic connections
The hydraulic connections are at the front side of the powerpack.



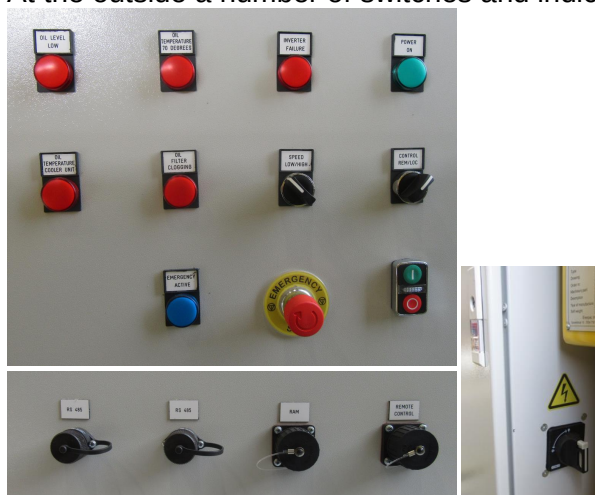
- **Manometers**
The manometers indicate the pressures of the main- and the secondary oil circuits.



3.1.3. The electrical cabinet

The electrical cabinet contains all electric functions of the powerpack.

- At the outside a number of switches and indicators is mounted.



3.1.4. The local control unit

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



Caution: When applying the local control unit there is no safeguarding; both anchors can be opened at the same time. Therefore, manual 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.

3.2. System specifications

3.2.1. Main specifications

Specification of the power source			
Voltage		400 V AC/ 3-phase	
Current		32 A per unit	
Frequency		50-60 Hz	
Power	Main	30.0 kW	
	Secondary	1.1 kW	
Temperatures			
Operating temperature of the machine	Min		-10°C
	Max		+40°C
Temperature of the hydraulic oil	Min	at start up	-20°C
		at operation	+10°C
	Max		+70°C
Storage temperature of the machine	Min		-25°C
	Max		+60°C
Hydraulics			
Oil	Type	Shell Tellus S4 VE 46	
	Purity	class 10 of NAS 1638 class 21/19/16 of ISO DIS 4406	
Oil volume		350 liters	
Filter type		Hydac 0165 R 010 BN4HC	
Pump delivery Q	Main	60.0 l/min @ 1500 rpm	
	Secondary	8.5 l/min @ 1440 rpm	
Maximum operating pressure	Main	350 bar	
	Secondary	60 bar	
Noise pressure			
Measured at ear height at nominal loading one metre away from any Unit's electric motor. <i>The C-weighted instantaneous sound pressure of 130 dB is never exceeded.</i>			72 dB (A)



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



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

3.2.2. Functional specifications

Compatible strand jack types	
Strand jack type	Theoretical lifting speed [m/hr]
HSL 4500	10
HSL 5000	10
HSL 6500	17
Number of strand jacks	
Number of strand jacks to be controlled	1 .. 60

3.2.3. Dimensions

Size	Length	1905 mm
	Width	850 mm
	Height	1455 mm
Weight (including oil)		1550 kg

3.3. Service conditions

- The powerpack 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 System for any other purpose.
- No alterations may be made to the System.
Only use the System as it was delivered.



Hazard: using the powerpack for other purposes than the intended may cause:

- hazards to personnel
- damage to equipment.

4. Plan an operation

Make sure the capacities of the powerpack and the capacities of the strandjack to be attached to the powerpack match. Use the table as given in section 3.2.2 “Functional specifications”.

5. Install the System



Attention

Though some components of the powerpack 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.



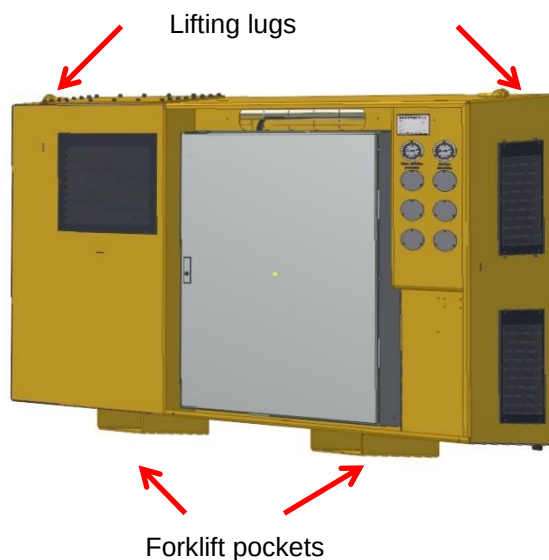
Caution

Though the components of the powerpack appear to be robust, they are fragile. Therefore, the components, especially the hydraulic hoses and the electric cables, have to be handled with great care. No strong forces may be exerted to the components.

5.1. How to hoist

For moving the powerpack

- By a crane.
Use the lifting eyes. Apply 2.5 tons straps.
- By a forklift.
Use the pockets.



Attention

- Verify that the lifting capacity of your crane is sufficient.
- Disconnect all cables and hoses when the powerpack has to be moved, even over a short distance.
- Always use all lifting eyes when hoisting the unit.
- Make sure the doors are closed and locked

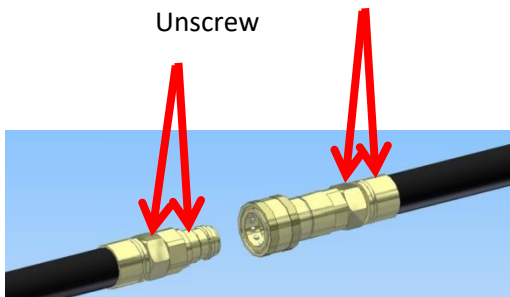
5.2. Mechanical

Put the powerpack on a stable ground or on a stable support surface.

The powerpack shall be positioned with a skew less than ± 25 mm / 1000 mm to prevent oil flowing out of the oil cap or the breather.

5.3. Hydraulics

5.3.1. Main directions for connecting the hydraulic hoses

1.	Inspect the couplings. Are they dirty? Are they damaged?
2.	Clean the inner and outer side of the couplings before they are mounted; dirt might get in the system causing damage. Use degreaser.
3.	Dry the couplings with paper and visually check them for dirt.  <i>Do not use any brake cleaner or other detergents; they might affect the couplings.</i>
4.	Hoses which are not mounted may be under pressure though, due to exposure to warmth. If so, it is hard to connect the couplings. To reduce the pressure in the hose: a) Twist the coupling off the hose. <i>A little until oil will come out</i> b) Turn the coupling tight again. 
5.	Screw the screw-coupling together to the end. <i>While tightening the couplings, the oil passage is opened up</i>
6.	Once a hose has been disconnected, the connection points have to be blanked off with a cap or stopper. Cover the hydraulic components with paper or linen.



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.

5.3.2. Connect the hydraulic hoses

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



To connect the hoses proceed as follows.



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

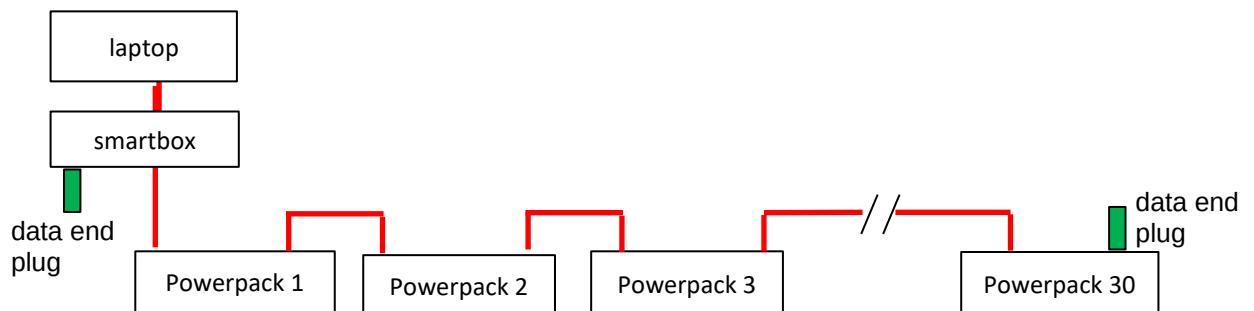
1. Make sure there is no pressure left in the system. Use the manometers.	
2. Connect the main cylinder. Use the bottom couplings.	
3. Connect the bottom anchor. Use the middle couplings	

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

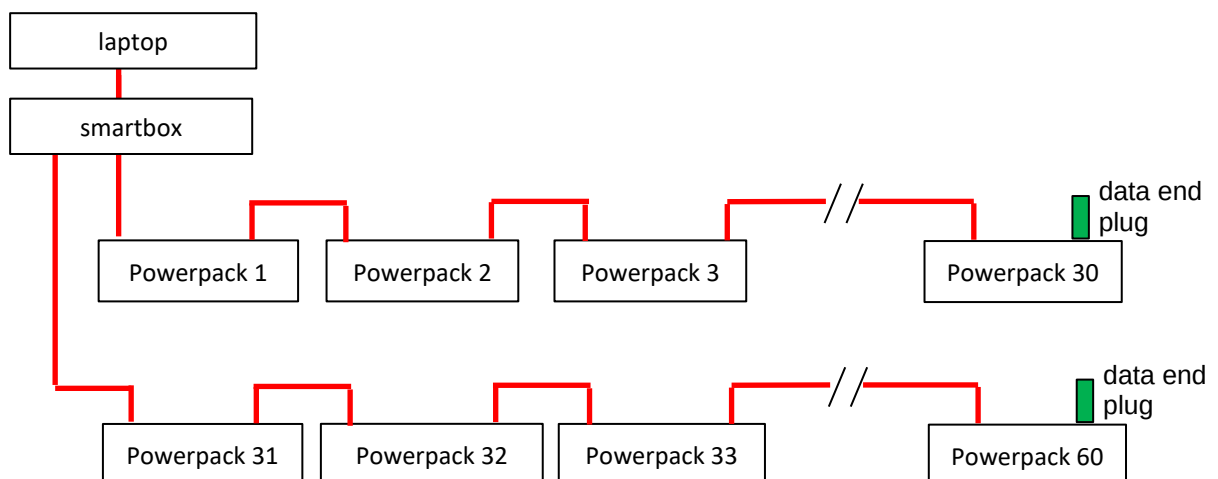
5.4. Electrics

5.4.1. Data cables

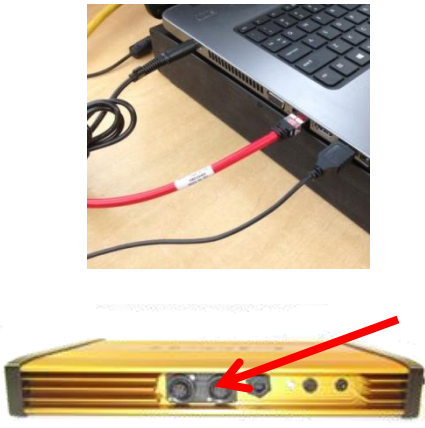
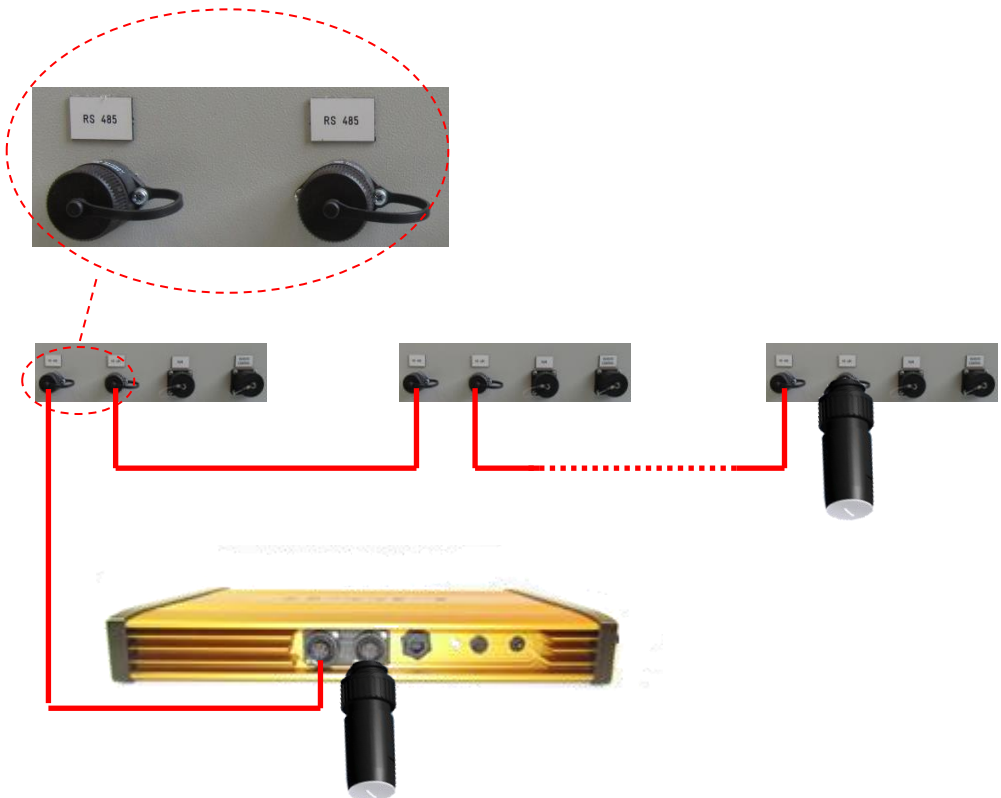
- The following scheme has to be realised for a configuration of 1 to max 30 powerpacks:

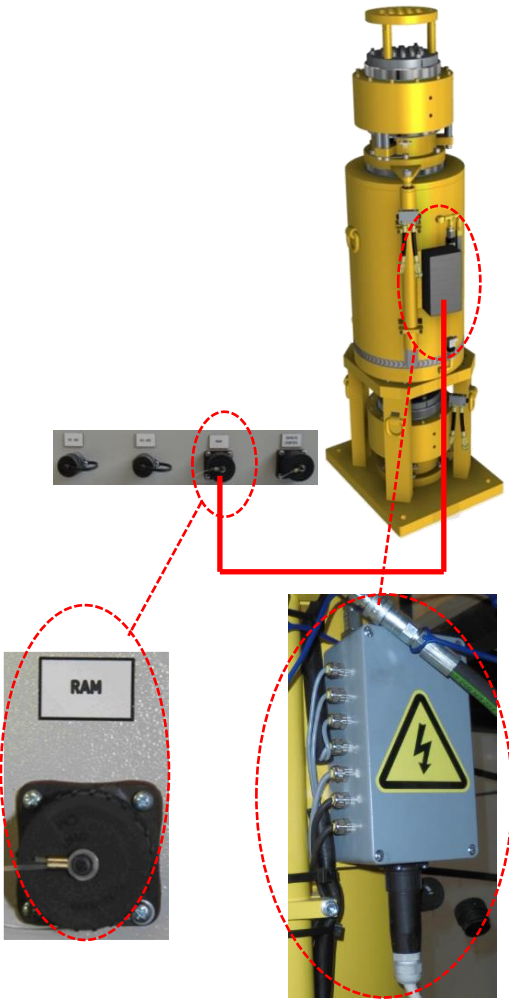


- The following scheme has to be realised for a configuration of more than 30 and up to 60 powerpacks:



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.	The sequence of connecting the powerpacks is at random; the powerpacks will identify themselves electronically.
	

3. Mount the data end plugs: • The last powerpack 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 powerpack to its own strand jack. Use the socket marked with "RAM".	

5.4.2. Power cable

Connect the power cable to the socket.



5.4.3. Uninstall the powerpack

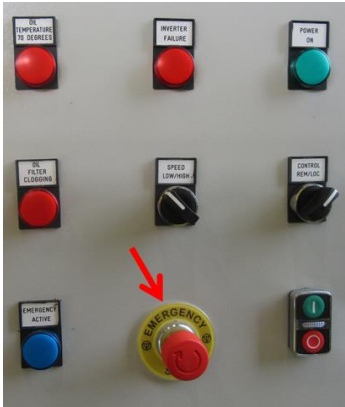
To uninstall the powerpack proceed as follows:

1. Make sure load is off the strand jack
2. Disconnect the power supply of the powerpack.
3. Disconnect the power cables of the powerpack
4. Disconnect the data cables
5. Disconnect hydraulic connectors.
6. Inspect all parts.
7. Store all equipment properly; see section 9. "Storage".

6. How to control the System

6.1. The Emergency buttons

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 powerpack on which the button was pressed stops. All movements are stopped - If the powerpack is set to Remote then other powerpacks which are set to Remote stop as well.

To resolve the Emergency situation:

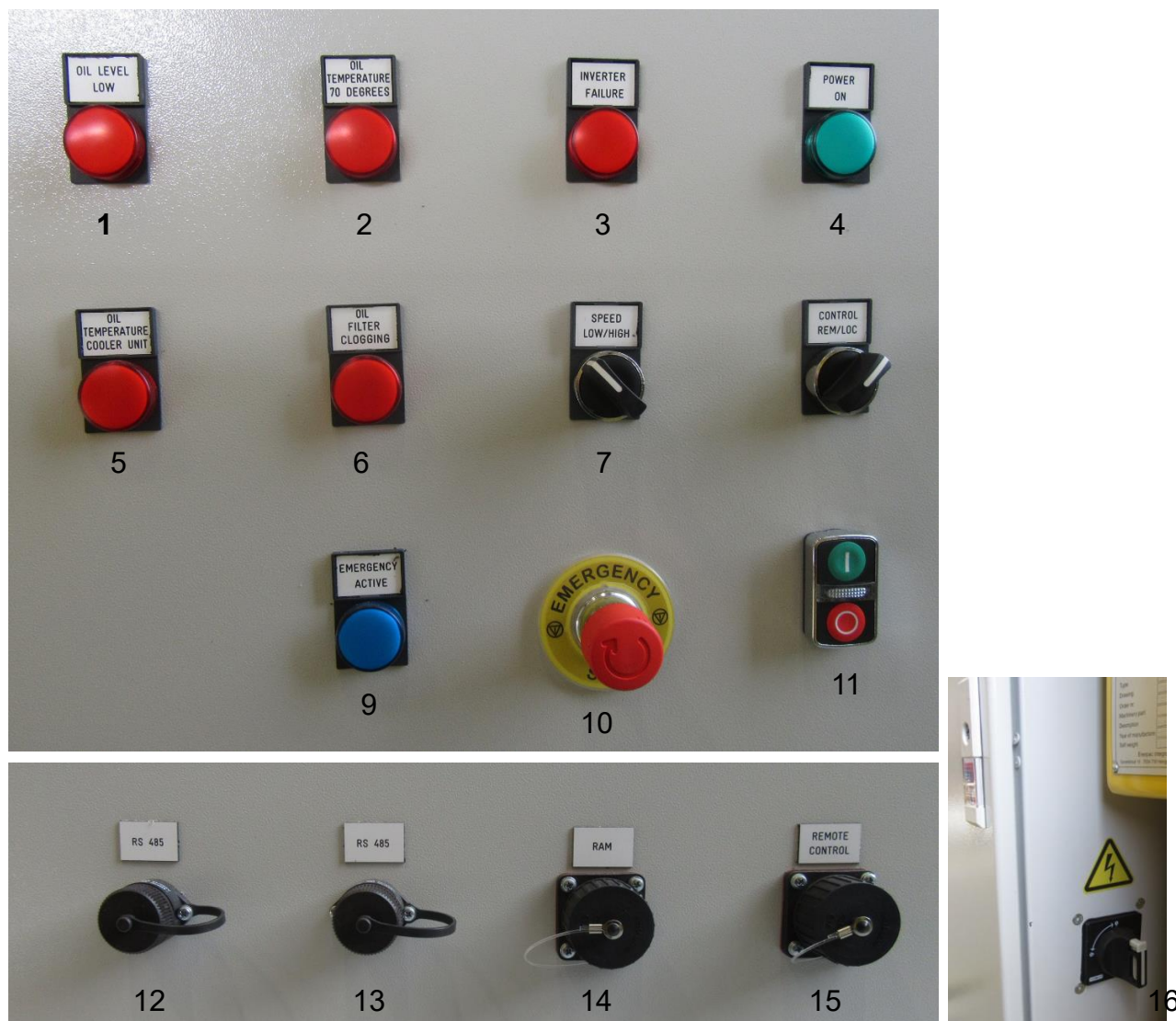
1. Solve the reason why the button was pressed
2. Turn the Emergency stop button which was pressed to release it
3. If the HPU was in Remote then the Reset button on the Smartbox is lit. Press that button to reset the Smartbox



4. Restart the System

6.2. The control panel

This section describes how to control the HPU's:



1.	indicator	Oil level low	Is lit when the oil level is low. The machine stops.
2.		Oil temperature 70 degrees	Is lit when the oil temperature exceeds 70 degrees Celsius. The machine stops.
3.		Inverter failure	Is lit when the electronics fail
4.		Power on	Is lit when main switch [16] is switched on.
5.		Oil temperature cooler unit	Is lit when the oil temperature as measured in the cooler is too high. STOP DE MACHINE?
6.		Oil filter clogging	Is lit 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 unit (LOC)
9.	indicator	Emergency active	Is lit when the emergency button has been pressed

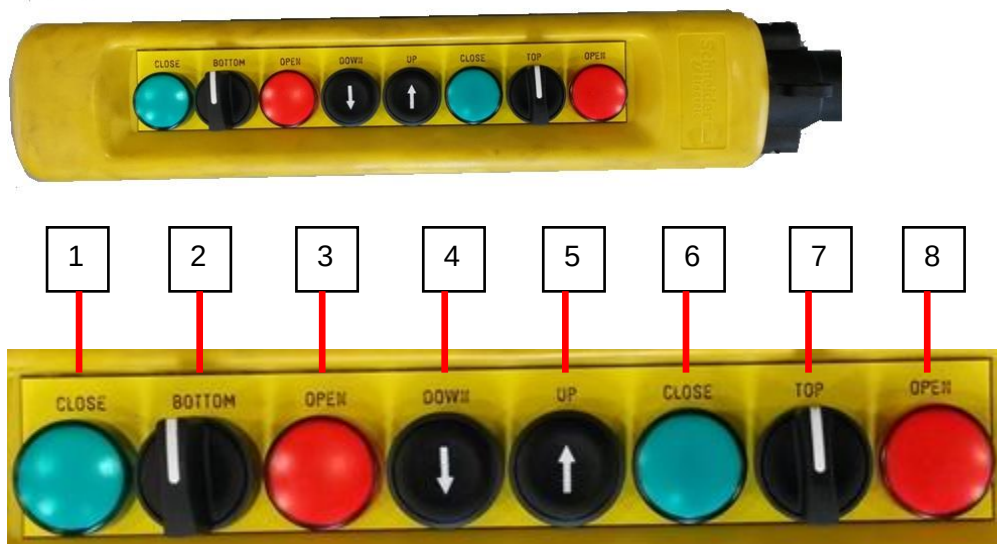
10.	Button	Emergency	To switch of the powerpack off in case of an emergency. All movements of the strand jack are stopped. Turn the switch to lift the emergency situation.
11.	button	On/off	To switch both electro motors on and off.
12.	sockets	RS485	Two sockets for connecting data cables. The sockets 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.		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.

6.3. Computer

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

6.4. Manual control using the local control unit

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



Nr	type	name	description
1.	indicator	Close	Is lit 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 lit 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 lit 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 lit when top anchor head does not clamp the strand



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

To control the strand jack using the local control 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.	

6.5. Start the system

1.	Turn the main switch of one powerpack 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 <i>The power on indicator is lit</i> <i>The pumps start running</i>	 
5.	Repeat steps 2 to 4 for all other powerpacks	
6.	Connect the power supplies of the Smartbox and the laptop. Start the application on the laptop.	

A close-up photograph of the bottom of two bottle caps, one red and one blue, resting on a metallic surface. Two red arrows point to the contact points on the caps.

6.7. Limiting devices

- The main pump delivers pressurized hydraulic oil to the main cylinder of the strand jack. The pressure setting of the safety valve depends on the strand jack operation pressure; reference is made to 7 “Strand jack manual”.
The maximum safety pressure is given in section 3.2.1 “Main specifications”.
- The secondary pump delivers pressurized hydraulic oil to the top anchor and the bottom anchor of the strand jack.
The maximum safety pressure is given in section 3.2.1 “Main specifications”.

7. Execute an operation



Operating the powerpack is only permitted if you are certified by Enerpac as an authorised operator.

7.1. Risks and Warnings

- Proper handling of the System is essential for safety.
- Observe the System while operating.
- Make sure the working area is fenced off.

Address the following subjects:

Hazard



- **Improper use** of the machine may result in accidents causing damage not only to the machine itself, but also to objects and goods in its vicinity or mounted to the machine, as well as injuries to people in the immediate area, and possibly even death.
- Failure to adhere to the **checklists** may result in serious injury to the user, possibly even death.
- Even if all safety measures are taken and the system is operated correctly, there will remain a **residual risk** of tumbling of the system.

Caution



- Failure to **prepare correctly** for a lifting operation may result in total loss of machine stability during use.
- When lifting, always assume a **worst-case scenario**. The wind can be unpredictable, quickly changing speed and direction. Do not take any chances: if the wind is strong, that means it's a 'no go'!

Attention



- It is of the utmost importance to **read this manual** carefully before setting up the machine. Failure to prepare correctly for a lifting operation may result in total loss of machine stability during use.
- Adhere to the **checklists** during all work activities: during preparation for the lifting operation, system construction, and for lifting the load.
- During local **control** no safeguarding is active. Top- and bottom anchors can be opened simultaneously.
- A powerpack is only part of the central emergency stop system if the control selector switch is in the **remote position**.
- The operator should have an **unobstructed view** on the system and load during operation of the system. If this is not possible, a signaller shall be used with an effective means of communication to provide directions to the operator.
- **Communication** among personnel involved in the operation shall be maintained continuously during all movement of the load. If at any time communication is disrupted, the operator shall stop all movements until communication is restored.
- Signals to the operator should be in accordance with the standards prescribed in section 1.9. "Hand signals". If special signals are required, they shall be agreed upon by the operator and support personnel prior to

the lifting operation. Signals shall be discernible or audible at all times. No action shall be taken unless signs are clearly understood.

- **Load handling personnel** shall obey any stop signal.



NB

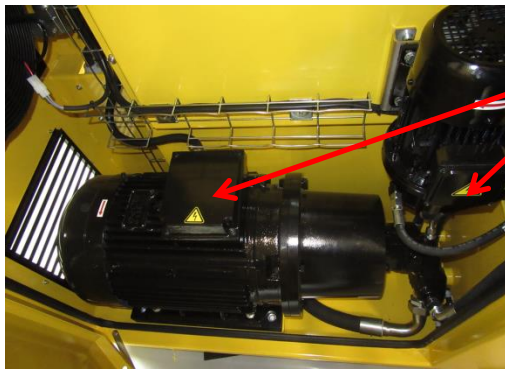
Pay attention to the Hydraulic fluid safety information, as listed in Appendix E



Hazard

Despite all inherent safe design measures, safeguarding and complementary protective measures, there will always be the **residual risk** of tumbling of the system.

The Follow the labels and signs are applied on the powerpack:



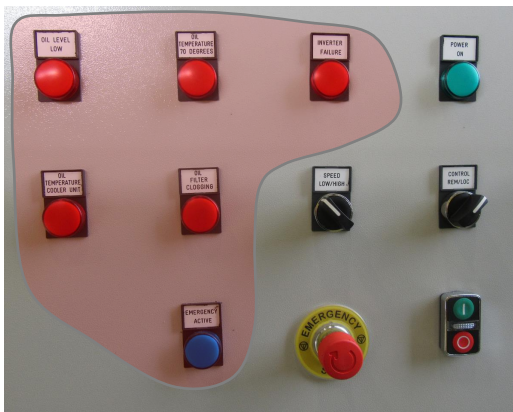
Find the legend in section 2.3. "Symbols applied to the System".

7.2. Lift a load

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

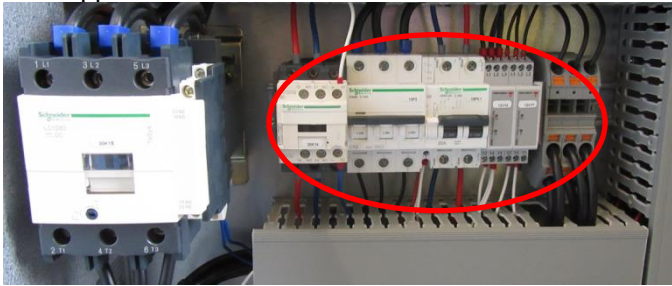
Record all activities. Use the list as given in Appendix D “Logging an operation”.

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 lit	
Oil pressure. When the main jack or on of the anchors is operated, the powerpack produces hydraulic pressure. That pressure is shown on the manometers.  The maximum pressure is a factory setting	

8. Solve problems

In case of anomalies proceed as follows to solve the problem:

Symptom		Possible cause and solution
1.	The powerpack does not start	Emergency stop button pressed. Find out why the button was pressed. Then reset the emergency circuit; see section 6.1. "The Emergency buttons"
		Data end plugs not mounted.
		Is any error message visible on the laptop? Solve the problem accordingly
		Is any error indicator lit on one of the control panels?
		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 lit	The level of the hydraulic oil is too low. Top up the oil. See section 10.3.1 "Replace the hydraulic oil".
6.	Indicator "Oil filter clogging" is lit	Mount a new oil filter; see section 10.3.2 "Replace the filter element"
7.	Indicator "Invertor failure" is lit	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 powerpack 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 unit, 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.

**Hazard**

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



Contact Enerpac if you need assistance.

9. Storage

9.1. System

When the system is stored then retract all jacks.

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

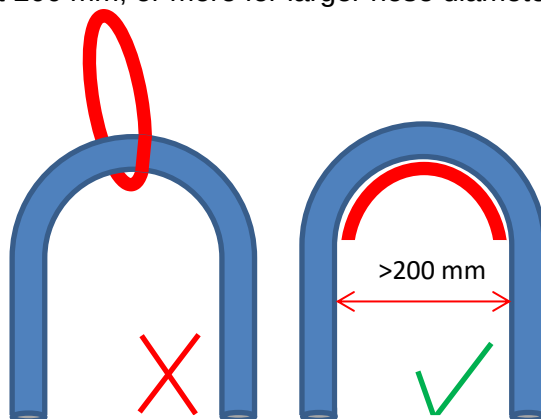
For storage temperature of the system reference is made to 3.3.1 “Main specifications”



NB: when 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.



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.

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

10.1. Rules to be observed for maintenance:

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. For use of **spare parts** reference is made to section 1.7. "Modifications".
6. Make certain that you are **familiar** with the powerpack and its use. Read the user manual carefully and in full and request instructions from the operator where needed.
7. Only perform maintenance work if you are **qualified** to do so. Unauthorized personnel may not open the Power pack.
8. Follow all instructions given on the **warning symbols** on the powerpack.
9. Follow all **safety instructions** in this manual.
10. When working with **flammable liquids**, take the applicable safety regulations into account.
11. Only perform maintenance work after the powerpack has been **shut down**. Before starting maintenance, make sure the powerpack is secured against unauthorized use. Put up warning signs.
12. Make certain that the hydraulic system is **not under pressure**. Use the manometer.
13. 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.
14. Do not **spill** any oil and similar fluids. Be mindful of the environment and the costs of cleaning up.
15. Make certain that you apply personal protection equipment (**PPE**) and take any other safety precautions required by the working conditions.
16. Make sure that you know the location of **fire alarms**, firefighting facilities and fire extinguishers.

17. Only use suitable work **equipment**. Prevent damage due to use of unsuitable equipment.
18. Without the express consent of the manufacturer, you are not allowed to make any **changes**, additions or adjustments to the Powerpack 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.
19. Make certain that the powerpack is made **ready for operation** after the maintenance work was been completed. Inform the operator.

10.2. Responsibilities

The maintenance tables indicate for each maintenance jobs 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. Hydraulics

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

For repairs reference is made to section 2.6. "Working on the hydraulic system".
The system shall only be returned to service when approved by a qualified person as described in that section.



Attention

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

All maintenance jobs together with the required skills and the time intervals are listed in the table below.

- The maintenance intervals given in the table below are based on regular use of the powerpack; which is approximately one operation per month. When the powerpack 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 the list, as given in Appendix C "Logging of maintenance".

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 <i>See section 10.3.3 "Bolts of pumps and manifolds"</i>	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 <i>See section 10.3.4 "Valves and seals"</i>	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 <i>See section 10.3.3 "Bolts of pumps and manifolds"</i>	O				x			
1.5. Oil	Take an oil sample to analyze	EE					x		Change oil if necessary
	Replace the hydraulic oil <i>See section 10.3.1 "Replace the hydraulic oil".</i>	EE					x		Or after 2000 running hours
	Check the oil level	O		x					
1.6. Hydraulic filter	Replace the filter element <i>See section 10.3.2 "Replace the filter element"</i>	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	Check on damages <i>See section 10.3.5 "Bellhousing"</i>	O					x		
	Check if the bolts are still tightened	O	x					x	
	Replace motor pump coupling	EE						x	

1.9. Oil cooler	Wipe it clean and free from dust See section 10.3.6 "Oil cooler"	O	x	x					
2. Hydraulic connections									
2.1. Pipes, hoses and brackets	Check on oil leakage and damages See section 10.3.7 "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 See section 10.3.7 "Couplings and hoses"	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 See section 10.3.8 "Sensors"	O		x					
	Check the tightening bolts, nuts and components	O		x		x			
	Replace all seals	EE						x	
	Replace all gauges	EE						x	
3. Cylinders									
3.1. Common	Check on leakages	O		x					
	Check if the bolts are still tightened	O	x			x			
	Replace all seals	EE						x	
	Grease the bearings	EE			x				

10.3.1. Replace the hydraulic oil

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.



Filler cap

Oil tank



Gauge

The filler cap has a breather function.



Underneath the tank is a drain plug.



Proceed as follows:

1.	Ensure that the powerpack 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 3.2.1 “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 10.3.2 “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

10.3.2. Replace the filter element



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 lit, the oil filter has to be replaced.

To replace the filter element, proceed as follows:

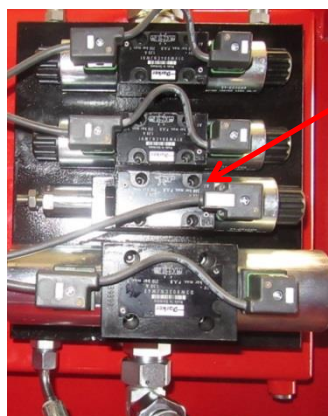
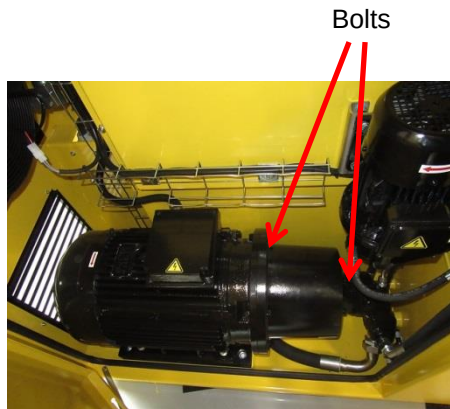
1.	Make sure the powerpack is switched off
2.	Unscrew the return filter cap
3.	Remove the internal filter element
4.	Put a new filter element, as specified in section 3.2.1 “Main specifications”.



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

10.3.3. Bolts of pumps and manifolds

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



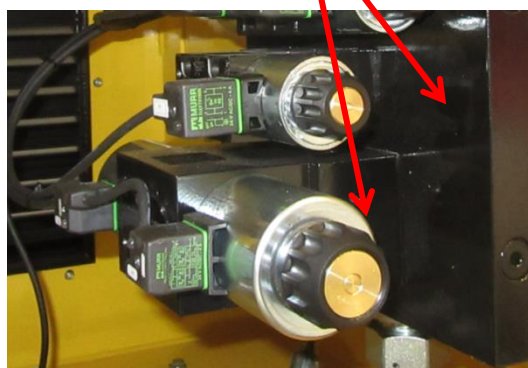
10.3.4. Valves and seals

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

Seals of valves



Seals of manifolds



10.3.5. Bellhousing



10.3.6. Oil cooler



10.3.7. Couplings and hoses

Examples of which types of couplings and hoses are meant, are given below.



Couplings

Hydraulic hoses

Couplings



10.3.8. Sensors

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



Seals of oil temperature switch

Seals of oil level switch

10.4. Mechanical

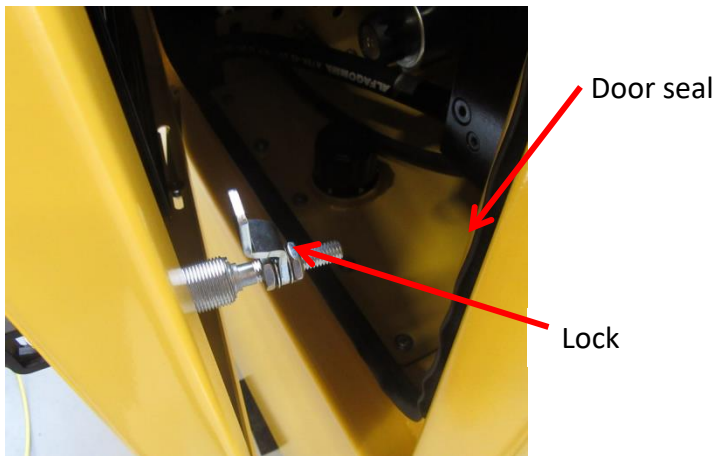
All maintenance jobs together with the required skills and the time intervals are listed in the table below.

- The maintenance intervals given in the table below are based on regular use of the powerpack; which is approximately one operation per month. When the powerpack 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 the list, as given in Appendix C “Logging of maintenance”.

Subject	Action	Person O (owner) EE (Enerpac expert)	First 40 hours	8 hours Daily	40 hours Weekly	Each 500 hours	2000 hours Every 2 years	10000 hours Every 10 year	Remarks
1. Main construction									
1.1. Main construction	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 <i>See section 10.4.1 “Seals and hatches”</i>	EE						x	
	Grease the hinges and locks	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 even no longer present	O				x			
	Replace engine feet	EE						x	

10.4.1. Seals and hatches

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



10.5. Electrics

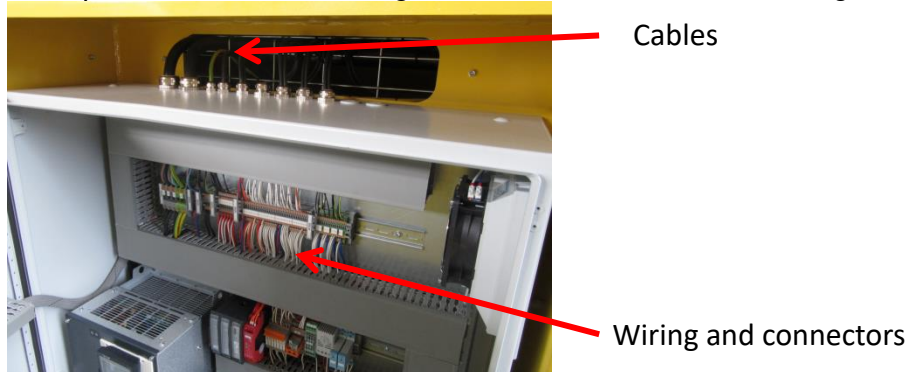
All maintenance jobs together with the required skills and the time intervals are listed in the table below.

- The maintenance intervals given in the table below are based on regular use of the powerpack; which is approximately one operation per month. When the powerpack 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 the list, as given in Appendix C “Logging of maintenance”.

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 motors									
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 <i>See section 10.5.1 “Cables, wiring and connectors”</i>	O		X					
	Grease the battery connection points	EE				X			
3. Devices									
3.1. General	Check the local control unit on damages	O		X					
3.2. Main switch	Replace the main switch <i>See section 10.5.2 “Main switch”</i>	EE						X	
3.3. Emergency switch	Check the correct functioning of the emergency button	O				X			

10.5.1. Cables, wiring and connectors

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



10.5.2. Main switch



11. Quality

Not applicable.

Dismantling

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

- Uninstall the system as described in section 5.4.3 “Uninstall the powerpack”.
- 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 all material in a responsive way.

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Appendices

A. Checklist for planning

1. Project

Project	
Customer	
Location	
Date	

2. Planning

☐	The capacity of the powerpack matches with the applied strand jack
--------------------------	--

3. Commitment

Preparations by:

Date:

Signature:

Approved by:

Date:

Signature:

B. Checklist for installing the System

1. Project

Project	
Customer	
Location	
Date	

2. Mechanics

☐	The lifting capacity of your crane in relation to the weight of the system is sufficient
☐	The powerpack is installed with a skew better than ± 25 mm / 1000 mm

3. Hydraulics

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

4. Electrics

☐	The main switch is in off position
☐	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

5. Commitment

Installations by:

Date:

Signature:

Approved by:

Date:

Signature:

C. Logging of maintenance

Hydraulics:

Subject	Action	Person	Date
1. Hydraulic pump and tank			
1.1. Pump	Check on oil leakage, damages 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		
1.3. Valves	Drain the tank (water and sludge)		
	Check on oil leakage and damages		
	Check if the bolts are still tightened		
	Replace all seals		
1.4. Manifolds	Check all valve settings		
	Check on oil leakage and damages		
1.5. Oil	Check if the bolts are still tightened		
	Take an oil sample to analyze		
1.6. Hydraulic filter	Replace the hydraulic oil		
	Check the oil level		
1.7. Breathers	Replace the filter element		
	Replace the seals of the filter housing		
1.8. Bellhousing	Replace the breather		
	Check on damages		
	Check if the bolts are still tightened		
1.9. Oil cooler	Replace motor pump coupling		
	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, measurement sensors	Check on damages		
	Check the tightening bolts, nuts and components		
	Replace all seals		
	Replace all gauges		
3. Cylinders			
3.1. Common	Check on leakages		

Subject	Action	Person	Date
	Check if the bolts are still tightened		
	Replace all seals		
	Grease the bearings		

Mechanical

Subject	Action	Person	Date
1. Main construction			
1.1. Main construction	Check on damages and paint		
	Check if the bolts are still tightened		
	Replace all seals, door seals and inspection hatches		
	Grease the hinges and locks		
	Visual check of the hoisting lugs		
	Inspect the readability of the warning signs. Clean if obscured by dirt. Restore if damaged or even no longer present		
	Replace engine feet		

Electrics:

Subject	Action	Person	Date
1. Electro motors			
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 unit on damages		
3.2. Main switch	Replace the main switch		
3.3. Emergency switch	Check the correct functioning of the emergency button		

D. Logging an operation

1. Project

Project	
Customer	
Location	
Date	

2. Recording of activities

	Activity	Time
☐ ☐	The checklists have been completed and signed off: Appendix A "Checklist for planning" Appendix B "Checklist for installing the System".	
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		

Activity		Time
12.		
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		
21.		
22.		
23.		
24.		

3. Commitment

Executed by:

Date:

Signature:

Approved by:

Date:

Signature:

E. Hydraulic fluid safety information

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	Hydraulic oil
Substance/Mixture	This product must not be used in applications other than those listed in Section 1 without first seeking the advice of the supplier.
Uses advised against	
- 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
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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.
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- 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
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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. Do not use water in a jet
Unsuitable extinguishing media
- 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 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.
- Precautions
- 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 Sécurité, (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. 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.
Remarks	
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 °C Method: ISO 3016
Initial boiling point and boiling range	> 280 °C estimated 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	> 1 estimated value(s)
Relative density	0,832 (15,0 °C)
Density	: 832 kg/m ³ (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 mm ² /s (40,0 °C), Method: ISO 3104 8,7 mm ² /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
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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
Toxicity to fish (Chronic toxicity)	Practically non toxic: Based on available data, the classification criteria are not met.
Toxicity to crustacean (Chronic toxicity)	Remarks: Data not available
Toxicity to microorganisms (Acute toxicity)	Remarks: Data not available
Components:	Triazole derivative
M-Factor (Short-term (acute) aquatic hazard)	1
12.2. Persistence and degradability	
Product:	Remarks: Not readily biodegradable., Major constituents are inherently biodegradable, but contains components that may persist in the environment.
12.3. Biodegradability	
Bioaccumulative potential	
Product:	Remarks: Contains components with the potential to bioaccumulate.
Bioaccumulation	log Pow: > 6Remarks: (based on information on similar products)
Partition coefficient: n-octanol/water	
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 organisms
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	NST 3411 Mineral Lubricating Oils
Waste Agreement	
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 für 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
EWG	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
Other information

Provide adequate information, instruction and training for operators
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.

F. 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]	Fine pitch [Nm]
		(Copper-grease) 0.08	(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

Nominal size	Strength class	Course pitch [Nm]	Fine pitch [Nm]
		(Copper-grease) 0.08	(Copper-grease) 0.08
	10.9	420	460
	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