

Instruction- and Maintenance Manual SUPER LIFT

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Super Lift

SL100 and SL200
100 or 200 ton hydraulic portal lift system



ENERPAC 
HEAVY LIFTING TECHNOLOGY 

www.enerpac.com

Revisions

Rev	Description	Date	Author	Checked	Approved by
00	Initial version	29 November '18	S. Jansen	R. Rosier	R. Broenink
01	Removed GA drawings, added compatible accessories, Freewheel function release bolts	27 March 2019	S. Jansen	T. Westerhof	R. Broenink
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Preface

Dear customer,

This is the manual for assembling, operating and maintaining your SL100 and SL200 system. In the rest of this manual, this machine is referred to by the term “**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 button
The indicator turns green
2. Click on the square icon
The system starts moving
3. Select one of the following options:
 - Click the red icon for lifting
 - Click the green icon for lowering
 - Click the blue icon for ending the operation

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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

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Email: info.hengelo@enerpac.com
Website: www.enerpac.com

1.2. Declaration

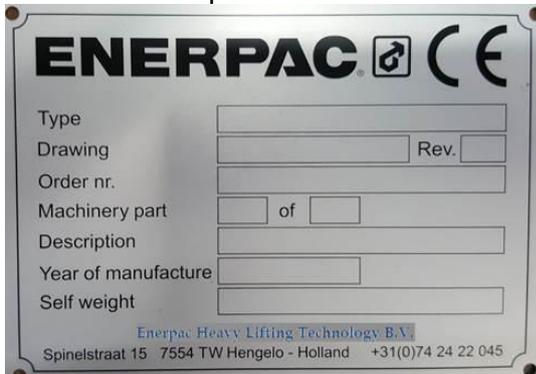
Declaration of Conformity according to machine Directive 2006/42/EC.

1.3. Referenced documents

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.	USB stick with wind calculations		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

1.4. Identification

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



The 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 the manufacturer.
- 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.

1.6. Intended use

The System is intended to move a load in vertical, longitudinal and transverse direction.

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. The manufacturer 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 recognised 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 the manufacturer. This also applies to the installation and adjustment of safety devices and valves and welding work on the System.

Spare parts must always meet the technical specifications given by Enerpac in the construction file and the component construction lists for the machine. It is recommended to use original spare parts. In cases of doubt, please contact Enerpac.

1.8. Personnel and obligations

- Only **qualified personnel** are allowed to **operate** the System. Qualified personnel are those who have followed the official Gantry training of Enerpac and have obtained the Certificate.
- 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.
- **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 and 1.8.2 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 has 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 or 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.

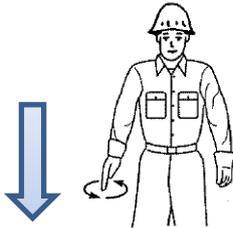
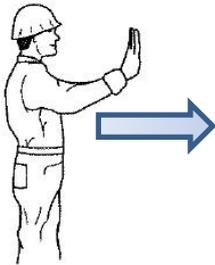
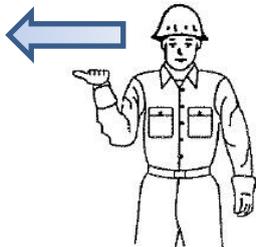
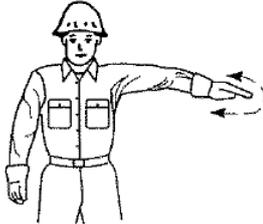
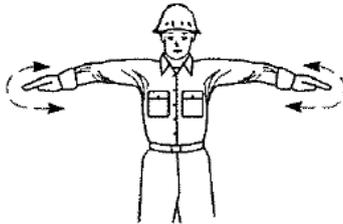
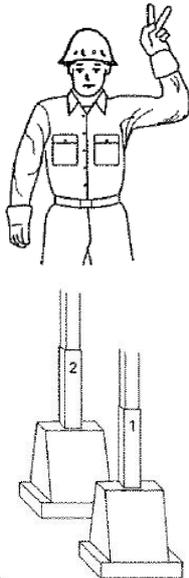
The system Operator's responsibilities shall include the following:

- 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:

<p>RAISE.</p> <p>With forearm vertical, forefinger pointing up, move hand in small horizontal circle.</p>		<p>LOWER.</p> <p>With arm extended downward, forefinger pointing down, move hand in small horizontal circle.</p>	
<p>GANTRY TRAVEL.</p> <p>Arm extended forward, hand open and slightly raised, make pushing motion in direction of travel.</p>		<p>SIDE SHIFT.</p> <p>Palm up, fingers closed, thumb pointing in direction of motion, jerk hand horizontally.</p>	
<p>STOP.</p> <p>Arm extended, palm down, move arm back and forth horizontally.</p>		<p>EMERGENCY STOP.</p> <p>Both arms extended, palms down, move arms back and forth horizontally.</p>	
<p>END EVERYTHING.</p> <p>Clasp hands in front of body.</p>		<p>INDIVIDUAL CYLINDERS.</p> <p>Hold up: one finger for cylinder marked: "1," two fingers for cylinder marked "2".</p> <p>Regular signals follow.</p>	

1.10. Lifetime

The safe and effective lifetime of the System strongly depends on

- the intensity of the use
- the quality of the maintenance

1.11. Warning symbols used within this document

This manual uses warnings and symbols to draw your attention to important safety information. The table below shows the applied warnings and symbols.



NB

'NB' is used to highlight important **work activities** and for **additional information**



Caution

'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 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 jewelry**. Long hair must be tied back.

- **Tools** and equipment, necessary for (dis-)assembly of the System, as well as for maintenance has 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.

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

2.3. Symbols applied to the System

The System is labelled with

- warning symbols
- symbols with mandatory directions.

The tables below explain the most common used **warning symbols**:



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 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 instructions/instruction manual before operation.



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 and to keep them in fully legible condition.

2.4. Welding work

- Welding, cutting and grinding work on the System is only permitted with the **prior written consent** of the manufacturer.
- 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.

**NB**

Welding, cutting or grinding work on the System is not permitted without the manufacturer'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 device 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 certain that the relevant parts are no longer receiving power. If necessary, connect the machine to earth. Insulate any adjacent components that are still receiving power.
- 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 receiving **power**, 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 certain that no ports have been **switched**.

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 certain 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.
- **Switch off** the electrical power supply.
- **Extinguish** the fire if it is still in its early stage, using the extinguishing means available onsite.
- **Leave the scene** of the emergency situation and report to the rendez-vous point.



Hazard

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:

- rinse thoroughly with water
- wash with soap
- provide fresh air
- 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 F “Enerpac HF95 Hydraulic fluid safety ” 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.

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).

Symbol	General hazard indication	Possible precautionary measures
	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.

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 personnel which is trained and qualified for the job. Use checklist B “Checklist for installing the System”.
- 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, these are less reliable and will cause leaks over time.
- 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 hydraulic power units when there is load on the System
- Preferably store the System in lowest position



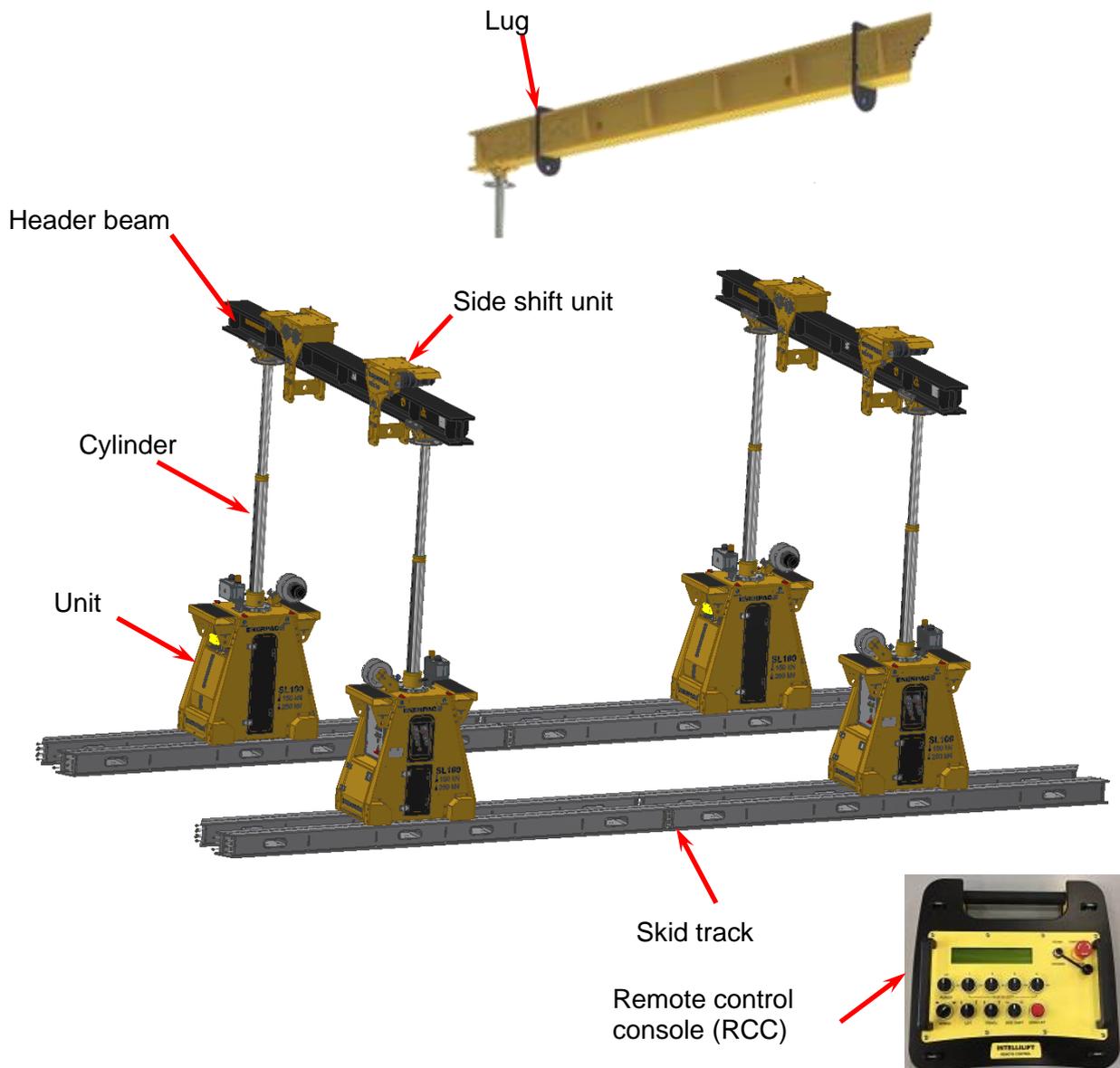
Hazard

Careless handling of hydraulics can cause serious injuries

3. System Overview

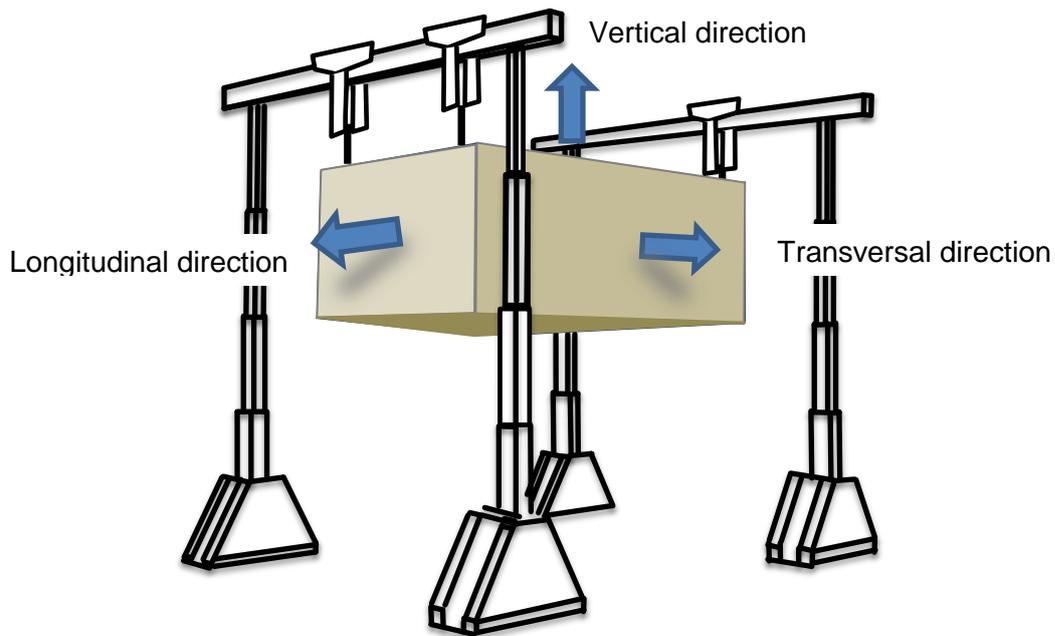
This chapter describes the main functions and components of the System.

3.1. General



The System is a four point lifting system which can move a heavy load in three directions:

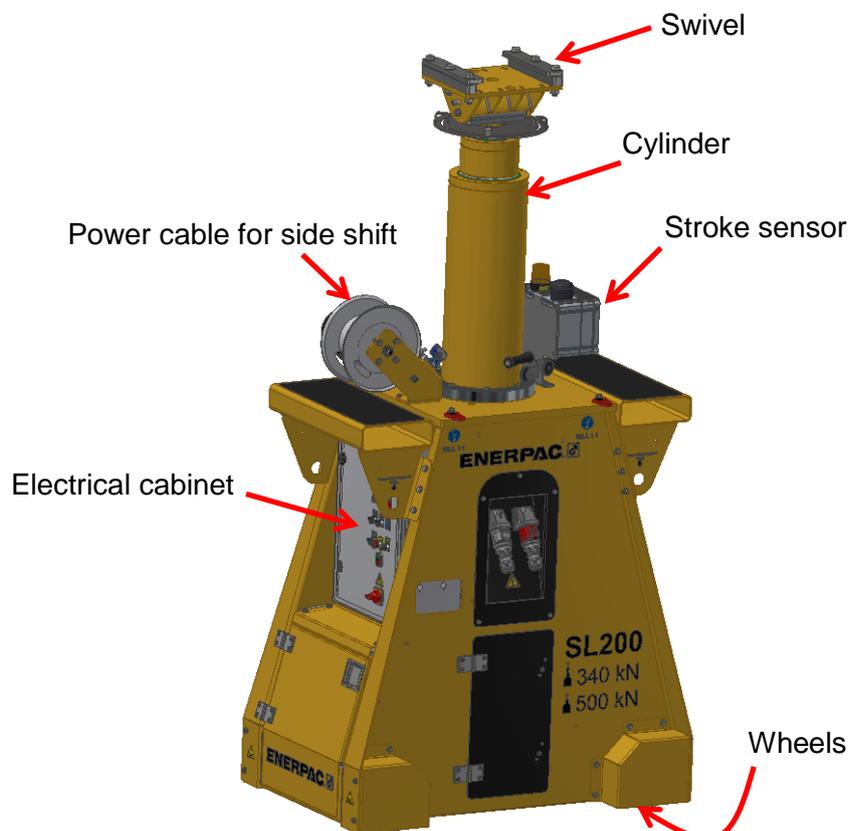
- Vertical direction, by extending the cylinders
- In longitudinal direction, by moving the units along skid tracks
- In transversal direction, by moving side shift units along the header beams



Some more properties:

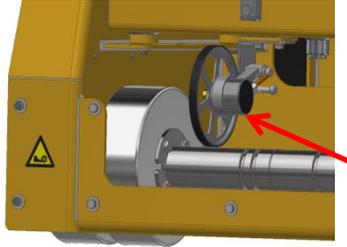
- The System can be controlled remotely by a handheld console.
- The System is provided with on-board hydraulic power, both driving and lifting. Therefore, no hydraulic hoses have to be used on the working scene. Connecting electric power is sufficient.

3.1.1. The units



- The cylinder consists of a telescopic cylinder system, extending in two stages.
- The units have to be provided with electrical power

- Each unit is provided with an electro motor which drives the hydro pump. This pump powers the lifting cylinder and wheel drives.
- Control of the units:
 - One unit can be controlled by the buttons and switches on its electrical cabinet
 - All units can be remotely controlled simultaneously by the remote control console.
- The units are provided with a sensor which measures the travelling distance:



- In order to synchronise the lifting heights of all units, each units is provided with a stroke sensor, which is connected by a line with the top of the cylinder:

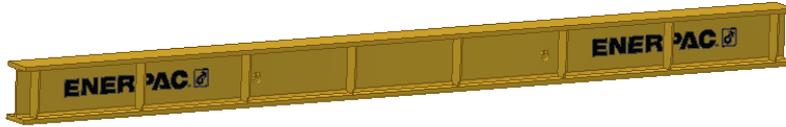


- While extending, the cylinder may turn around its length axis. You can turn the swivel in the right position by hand.
- The side shift, if applied, is provided with power by the power cable.
- Each unit is provided with a control panel, by which the unit can be controlled. Other units cannot be controlled by the control panel.



3.1.2. The header beam

The Header beams across the top of the Units create a portal. They can be composed out of more sections.



Header beams of various lengths and capacities can be applied; reference is made to Appendix Z. The header beams have to be applied in accordance with the capacity charts of the specific header beam.

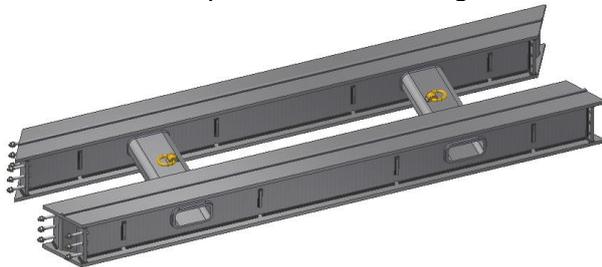
Header beams of foreign make may be applied if

- the material properties are the same,
- made from similar web, and
- flange dimensions match with the Enerpac beams

Header beams of foreign make can be applied if their capacity is sufficient, but Enerpac will not take any responsibility for it.

3.1.3. The skid tracks

The Skid tracks form a railway on which the System can travel. Skid tracks are provided with a longitudinal ridge to guide the Units while travelling.



Skid tracks of foreign make can be applied if their capacity is sufficient, but Enerpac will not take any responsibility for it.

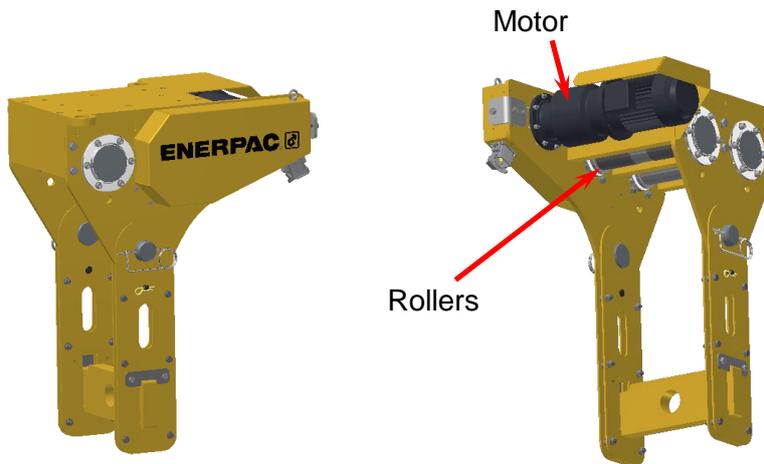
3.1.4. The side shift units

The load can be affixed to the Header beam by means of side shift units. The side shift units enable the load to be moved in transverse direction. Each side shift is provided with an electrical drive which propels rollers. The rollers run on the header beams. The drive has a single speed.

The side shift units can be controlled by the RCC and by the control panel on the electrical cabinet.

Two types of side shift units can be applied. Their principles are equal; just the construction and the capacities differ.

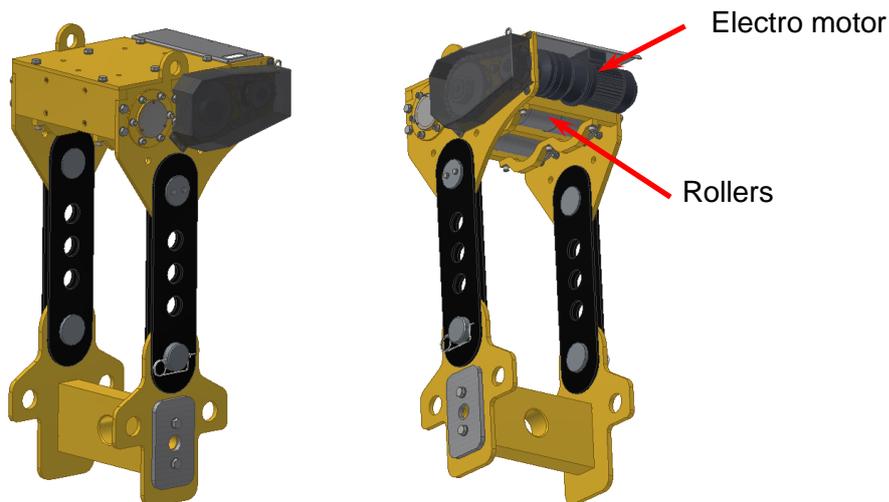
3.1.4.1. Type HBS1250 MK3



Optionally a transporting frame can be delivered for transport and storage of the side shift units:

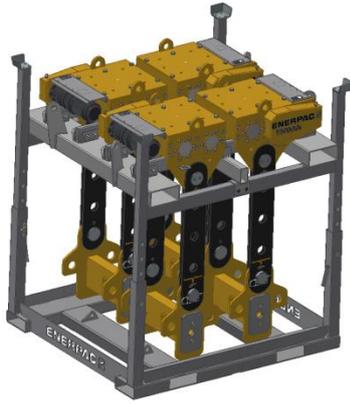


3.1.4.2. Type HBS3000



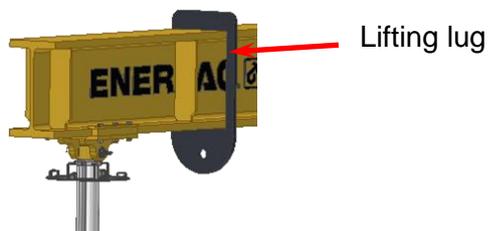
Optionally a transporting frame can be delivered for transport and storage for this type of side

shift units:



3.1.5. The lifting lugs

Instead of side shift units, simple lifting lugs can be applied to affix the load to the header beam.



Lifting lugs of foreign make can be applied if their capacity is sufficient, but Enerpac will not take any responsibility for it.

3.1.6. The remote control console (RCC)

The RCC enables the operator to control the complete System (all four units simultaneously) on a safe distance. Connection with the System can be made by a radio link or by wire.



3.2. System specifications

3.2.1. Main specifications

Power source			
Voltage		360 to 480 V AC/ 3-phase <i>The units feature automatic phase detection.</i>	
Current		16 A per unit	
Frequency		50-60 Hz	
Power		7.5 kW per unit	
Fuse		32A (if two units are interlooped) 16 A (if all units are connected individually to the main power)	
Plug		5 pins	
Temperatures			
Operating temperature		min	-10°C <i>The battery of the RCC will only have half capacity</i>
		max	50°C
Storage temperature	Machine	min	-25°C
		max	60°C
	Remote control console	min	<ul style="list-style-type: none"> • 20°C • 0°C <i>While charging the battery</i>
		max	<ul style="list-style-type: none"> • 60°C • 45°C <i>While charging the battery</i>
Noise pressure			
<i>Measured at ear height at nominal loading one metre away from any unit's electric motor. (The C-weighted instantaneous sound pressure of 130 dB is never exceeded)</i>		77 dB(A)	



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

3.2.2. Operational specifications

Moving directions of the load			
Horizontally	Lateral direction	By using side shifts	
	Longitudinal direction	By moving along the skid tracks	
Vertically	By extending the cylinders		
Velocities (approx.)			
SL100 unit	Travelling speed	31 meter/hour	
	Lifting speed	Low speed	13 minutes
		High speed	6 minutes
SL200 unit	Travelling speed	31 meter/hour	
	Lifting speed	Low speed	29 minutes
		High speed	18 minutes
Side shift	HBS1250MK3	51.5 cm / minute	
	HBS3000	90.0 cm / minute	
Capacities units and side shifts			
SL100 unit	Stage 1	250 kN	2050 mm – 3400 mm
	Stage 2	150 kN	3400 mm – 4750 mm
SL200 unit	Stage 1	500 kN	2731 mm – 4715,5 mm
	Stage 2	340 kN	4715,5 mm – 6700 mm
Side shift	HBS1250MK3	312.2 kN	
	HBS3000	1500.0 kN	

3.2.3. Dimensions

The following information if the main parts of the system is available in the respective GA drawings:

- Capacities
- Dimensions
- Weights

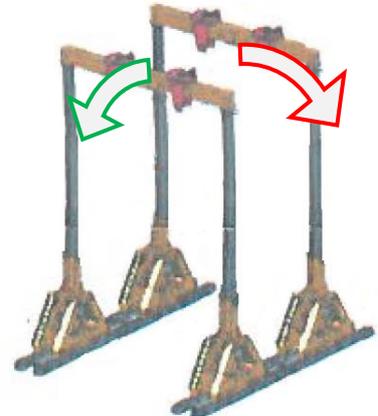
The correct drawing numbers are given in Appendix Z “Compatible accessories”

3.3. System configurations

3.3.1. Header beam configurations

Proposed configurations of the System are:

- Classic configuration.
Two headerbeams, each of them connecting two units. **Lateral** stability is provided by the beams, and the Units contribute to the **longitudinal** stability.



- Configuration with a single longitudinal beam.:



- Configuration with double longitudinal beams:

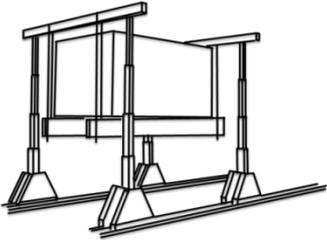
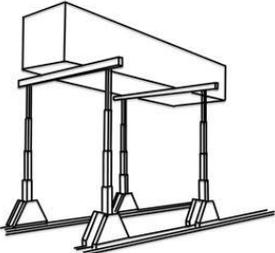
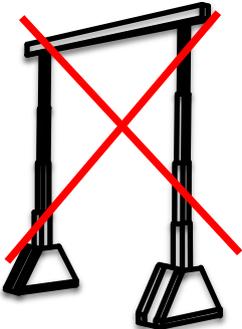


- The use of other components than purchased by Enerpac is possible as long as those components are used in accordance with their own specifications.
- When you deviate from the configurations as proposed, make sure the correct calculations are made. Enerpac may advise.
- Enerpac cannot be held responsible for the use of other configurations than the proposed.
- Contact Enerpac if you want to use other configurations than the depicted
- A configuration, in which foreign lifting equipment such as strand-jacks and skidding systems is applied, is allowed as long as all static requirements w.r.t. strength, deflections and stability are fulfilled.

3.3.2. Side shift units and header beams

- All header beams can be applied to the SL100 AND SL200 system
- Both side shift types can be applied to the SL100 AND SL200 system

3.4. Position of the load

	<ul style="list-style-type: none"> • The System can lift loads while the load is suspended from the Header beams:
	<ul style="list-style-type: none"> • The System can tilt a load
	<ul style="list-style-type: none"> • If you want to put the load on top of the Header beams, contact Enerpac.
	 <ul style="list-style-type: none"> • The system is exclusively suitable for four-leg lifting.



Enerpac can advise you when you want to use the System in other configurations than the proposed ones.

3.5. Service conditions

- The System is intended for hoisting loads.
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.



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



Attention: lifting operations with **less than four units** is **strictly prohibited**



Hazard: lifting a load **with only two units** is a high risk operation, hazardous and therefore prohibited:

The System with its load can tip-over completely, due to

- out of centre of gravity
- swinging of the load
- large sling angles.

Such an operation may lead to an accident which causes damage to the

- machine itself
- objects and goods in its vicinity or mounted to the machine

People in the immediate area may get severely injured.

4. Plan a lifting operation

In this chapter, the planning activities for a lifting operation are described.

1. Record the preparation in the checklist given in Appendix A “Checklist for planning a lifting operation”.
2. Make sure the following information is available:
 - Mass of the load.
 - Centre of gravity of the load.
 - Dimensions of the load.
 - Allowable pressure on the subsoil before subsidence happens.
3. Determine the position of the load’s centre of gravity within the units
4. Determine the lifting height
5. Consider the following subjects:
 - Lifting capacity of the most heavily loaded unit.
 - Capacity of the side shift.
 - Capacity of the header beams.
 - Bearing capacity of the subsoil.
Is additional supporting material under the skid tracks necessary?
 - The wind load



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

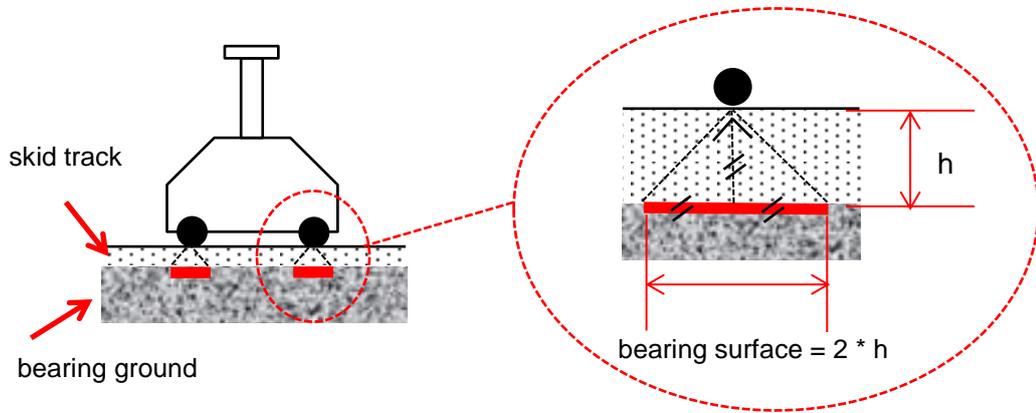


Hazard: failure to prepare a lifting operation correctly may result in loss of System stability.

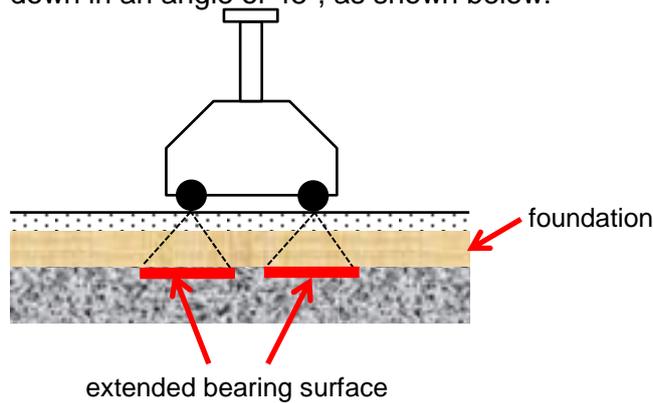
4.1. Bearing ground pressure calculation

The skid tracks can be put

- directly on the subsoil, if the bearing capacity of the subsoils is sufficient.



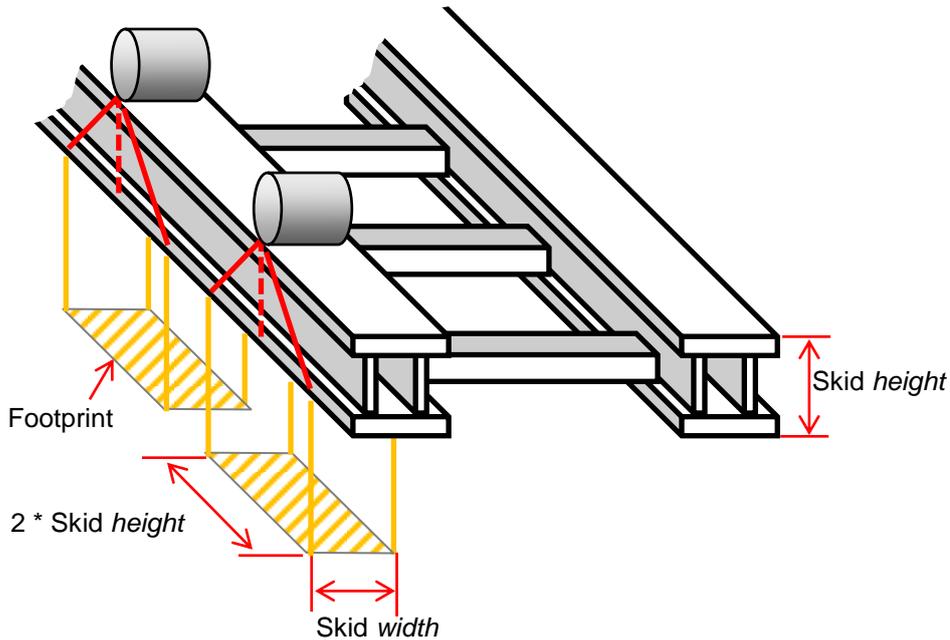
- on a foundation:
 - to compensate unevenness in the subsoil
 - to reduce the bearing pressure. Use is made of the effect that pressure spreads down in an angle of 45° , as shown below:



The pressure on the subsoil is inverse proportional with the height of the foundation.

4.1.1. No foundation applied

The dimensions of the bearing surface are as follows:



To calculate the bearing pressure, you *might* use the following procedure:

Parameter		Abbreviations	Value
Skid track	height	Skid <i>height</i>	0.2 [m]
	width	Skid <i>width</i>	0.2 [m]
Own mass of one unit		Unit <i>mass</i>	2.2 metric ton (see section 3.2.3)
Mass of auxiliary material (beams, shackles etc)		Aux <i>mass</i>	15
Safety factor		S	1.7
Maximum force on one unit which can occur during the operation [kN]		F	Depends on the operation

1.	Bearing surface, including the spreading effect in length direction, of one unit	<p>4 wheels * 0.2 * 0.4 = 0.32</p>
2.	Pressure on the ground [metric tonnes / m ²]	$\sigma = \frac{F + Weight_{unit} + \frac{Weight_{aux_material}}{4}}{Bearing\ Surface} \cdot Safety\ factor$

Example:
 Load to be lifted 45 metric tons
 Ground pressure $\sigma = \frac{45/4 + 2.2 + 15/4}{0.32} * 1.1 = 91.4$ metric tons / m²



Complete the checklist in appendix A “Checklist for planning a lifting operation” with the calculated bearing pressure.

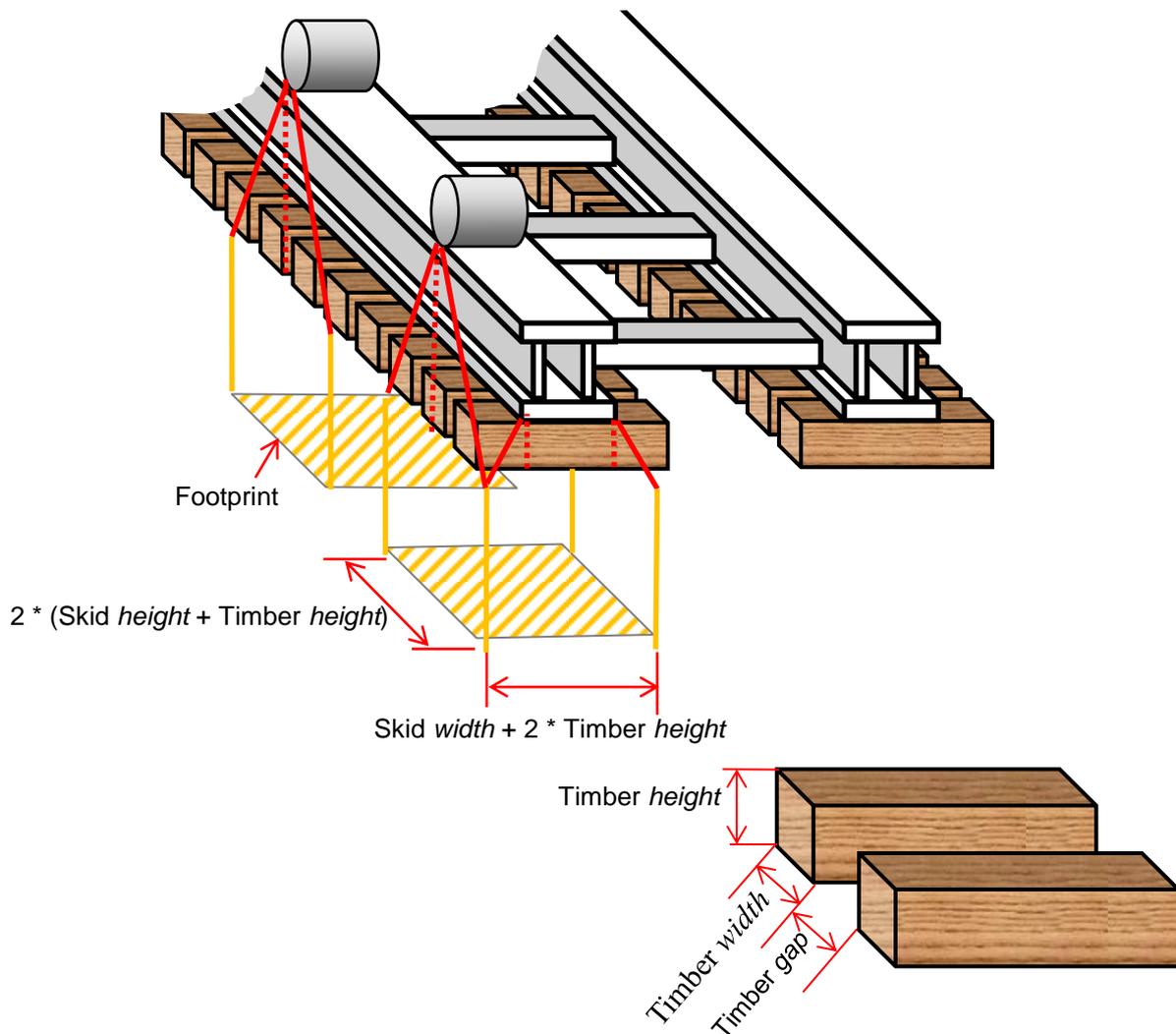


Attention: the exerted ground pressure may never exceed the bearing capacity of the subsoil.

4.1.2. Foundation applied

In order to reduce the bearing ground pressure, timbers of hard wood can be applied as foundation material.

The dimensions of the bearing surface are as follows:



To calculate the bearing pressure, you *might* use the following procedure:

Parameter		Abbreviations	Value
Skid track	height	Skid <i>height</i>	0.2 [m]
	width	Skid <i>width</i>	0.2 [m]
Timber	height	Timber <i>height</i>	Depends on the operation
	width	Timber <i>width</i>	
	gap	Timber <i>gap</i>	
Own mass of one Unit		Unit <i>mass</i>	2.2 [metric tons] (see section 3.2.3)
Mass of auxiliary material (beams, shackles etc)		Aux <i>mass</i>	15 [metric tons]
Safety factor		S	1.7
Maximum force on one Unit which can occur during the operation [kN]		F	Depends on the operation

1.	Surface of one footprint = width * length	$(Skid\ width + 2 * Timber\ height) * [2 * (Skid\ height + Timber\ height)]$
2.	The bearing surface of one Unit is formed by four footprints	
3.	Support ratio, to correct for the gaps between the timbers	$Support_Ratio = Timber\ width / (Timber\ width + Timber\ gap)$
4.	Pressure on the ground [metric tonnes / m ²]	$\sigma = \frac{F + Unit_mass + Aux_mass / 4}{Bearing_surface * Support_Ratio} * S$

Example:

Load to be lifted		45 metric tons
Timbers:	Width	0.10 m
	Height	0.10 m
	Gap	0.05 m

Measures of one footprint:

$$\text{Width: Skid width} + 2 * \text{Timber height} = 0.2 + 2 * 0.1 = 0.4 \text{ m}$$

$$\text{Length: } 2 * (\text{Skid height} + \text{Timber height}) = 2 * (0.2 + 0.1) = 0.6 \text{ m}$$

$$\text{Surface: } 0.4 * 0.6 = 0.24 \text{ m}^2$$

$$\text{Four footprints } 4 * 0.16 = 0.96 \text{ m}^2$$

$$\text{Support ratio } 0.10 / (0.10 + 0.05) = 0.67$$

$$\text{Ground pressure } \sigma = \frac{45/4 + 2.2 + 15/4}{0.96 * 0.67} * 1.7 = 45.5 \text{ metric tons / m}^2$$



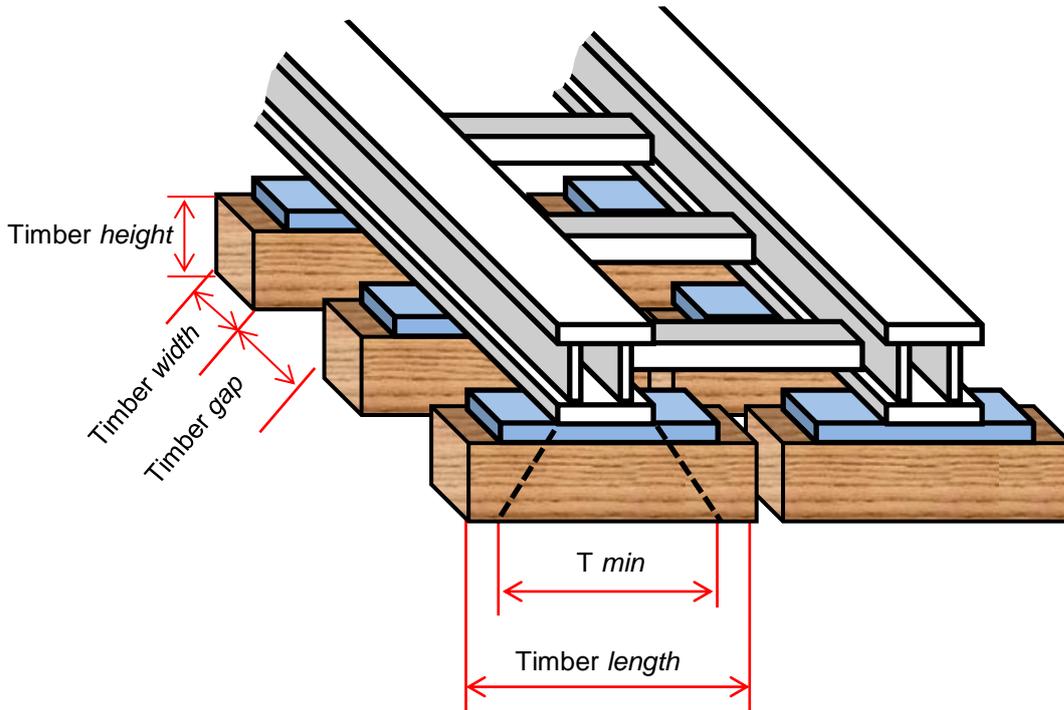
Complete the checklist in appendix A “Checklist for planning a lifting operation” with the calculated bearing pressure.



Attention: the exerted ground pressure may never exceed the bearing capacity of the subsoil.

4.1.3. Requirements for foundation material

The supporting material has to meet the following requirements:



Parameter		Requirement
Timbers	Timber length	> T_{min} < 612mm
	Timber width	> Timber height
	Timber gap	Depends on ground pressure < 300 mm
	mechanical compressive strength	> 8 N/mm ² without occurrence of deflection  Enerpac strongly recommends adhering to 13 N/mm ²
Steel shim plates	mechanical compressive strength	> 30 N/mm ² without occurrence of deflection

Steel shims can be used to level the skid track, or filling openings under the floor and the skid track due to thickness tolerances in the timber and flatness of the floor and track. The entire contact surface between the skid track and the floor, or the skid track and the timbers must be filled.



- Wood is a natural product: its quality is not assured. In order to guarantee quality, test the timbers on 125% of the expected load.
- For your planning keep in mind that suitable wood may not always be available immediately.



Attention: use of other wood types such as plywood, multiply, pine and compressed wood is **explicitly prohibited**.

4.2. Check the lifting capacity of the System

This chapter describes how to determine the lifting capacity of the system.

The lifting height influences the lifting capacity.

4.2.1. Maximum load

The bearing capacity of the System depends on the degree of extension of the Cylinders: the more extension, the less bearing capacity.



Stage 1

Stage 2

Complete the checklist in Appendix A “Checklist for planning a lifting operation”, under “Stage of Extension”.

The maximum load per Unit

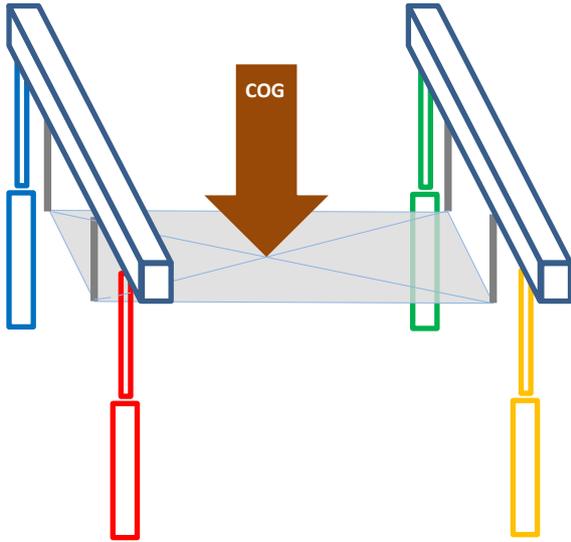
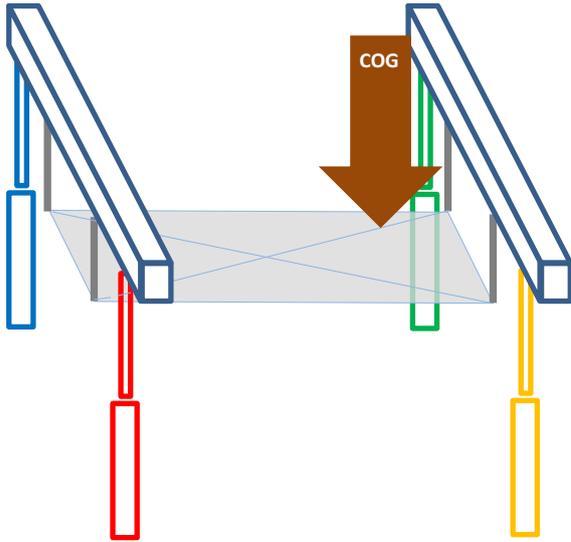
The bearing capacity per stage and per unit is given in the table of section 3.2.2 “Operational specifications” at page 30.



The capacity of a System is four times the maximum load on one Unit.

The effect of eccentricity of the Centre of Gravity on the capacity of the System

When the Centre of Gravity (COG) is not in the centre of the System, the capacity of the System will decrease. The figures below give the principle of it. The numbers are fictitious.

Assume <ul style="list-style-type: none"> • a load of 400 kN • a bearing capacity per unit of 100 kN • stage 2 used 	
Centre of Gravity in the centre	Centre of Gravity eccentric
	
The load is spread equally over the units: All Units bear $400 / 4 = 100$ kN	The load is spread unequally over the units. The load on the 'green' unit has increased significantly and exceeds 100 kN
The system is loaded to its limits, but none of the units is overloaded.	The green unit is overloaded! The system cannot lift the 400 kN anymore but less, to avoid overload in the green unit. <i>The capacity of the system has decreased due to eccentricity of the load.</i>

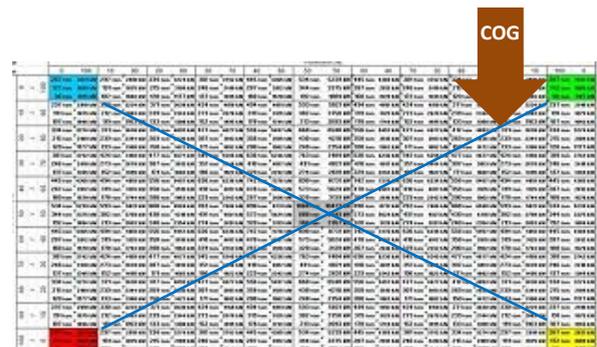


The more the COG of the load deviates from the centre of the System, the less the capacity will be.

The capacity chart referred to in Appendix Z “Compatible accessories” shows the bearing capacity of the system in relation to the position of the load. The **coloured** cells in that **capacity chart** correspond with the **units** in the figure above.

Use the capacity chart as follows for your **side shift operations**:

- Locate the position of the COG in the capacity chart, as shown at the right →
- The data on that spot shows the total capacity (4 units) of the system.



4.2.2. Minimum load

When the load is only little, the motion of the first and the second section may not be exactly smooth, due to friction in the hydraulic cylinders.

To ensure a smooth motion, the units have to bear a minimum load of 50 kN.
In most cases, the weight of the Header Beams is sufficient.

Enter the minimum load in the checklist given in Appendix A “Checklist for planning a lifting operation”. Do such for the unit which is bearing the lightest load only.

4.3. Side Shift units or Lugs

4.3.1. Side shift units

When you want to move the load in transverse direction then apply the side shift units.
Verify their bearing capacity and dimensions according the GA drawings. The correct drawing numbers are given in Appendix Z “Compatible accessories”.



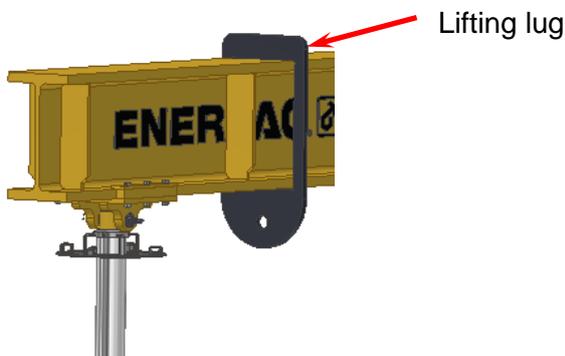
Always determine the force on the Side Shift, even for relatively light loads.
In case of any doubt, consult Enerpac.



Caution: the force on the side shift units shall never exceed their bearing capacity.

4.3.2. Lugs

If there is no need to move the load in transverse direction then the Lugs can be applied, rather than the more complicated Side Shift units.
Check the capacity of the Lugs. Use the information in the GA drawings. The correct drawing numbers are given in Appendix Z “Compatible accessories”
Enter the load in the checklist given in Appendix A “Checklist for planning a lifting operation”.



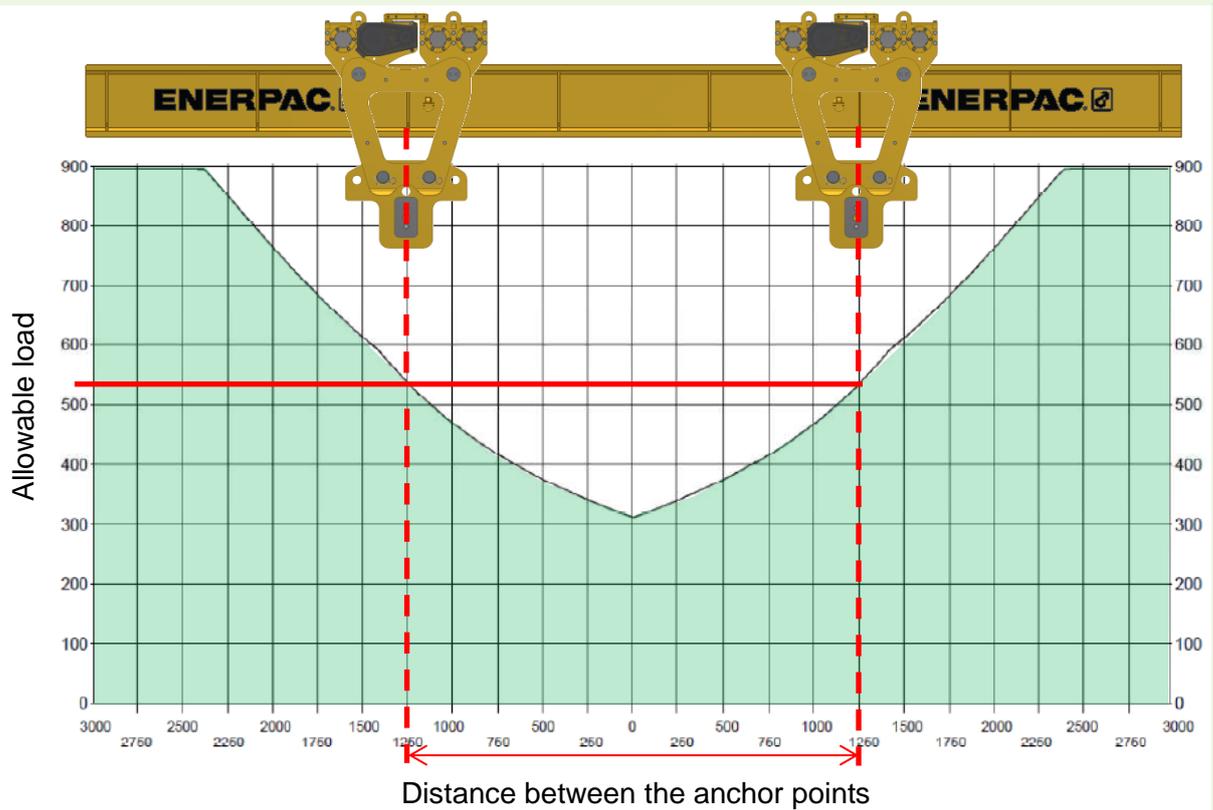
Lifting lugs of foreign make can be applied if their capacity is sufficient, but Enerpac will not take any responsibility for it.

4.4. The bearing capacity of the Header beam

The bearing capacity of the main header beams depends on position of the load: the closer to the centre, the less the capacity of the header beam.

The capacities of the header beams in relation to the position of the load are given in the capacity charts in the load charts. The correct document numbers are given in Appendix Z “Compatible accessories”

Example how to determine the bearing capacity of the header beam for two anchor points. Loads within the green area are allowed.



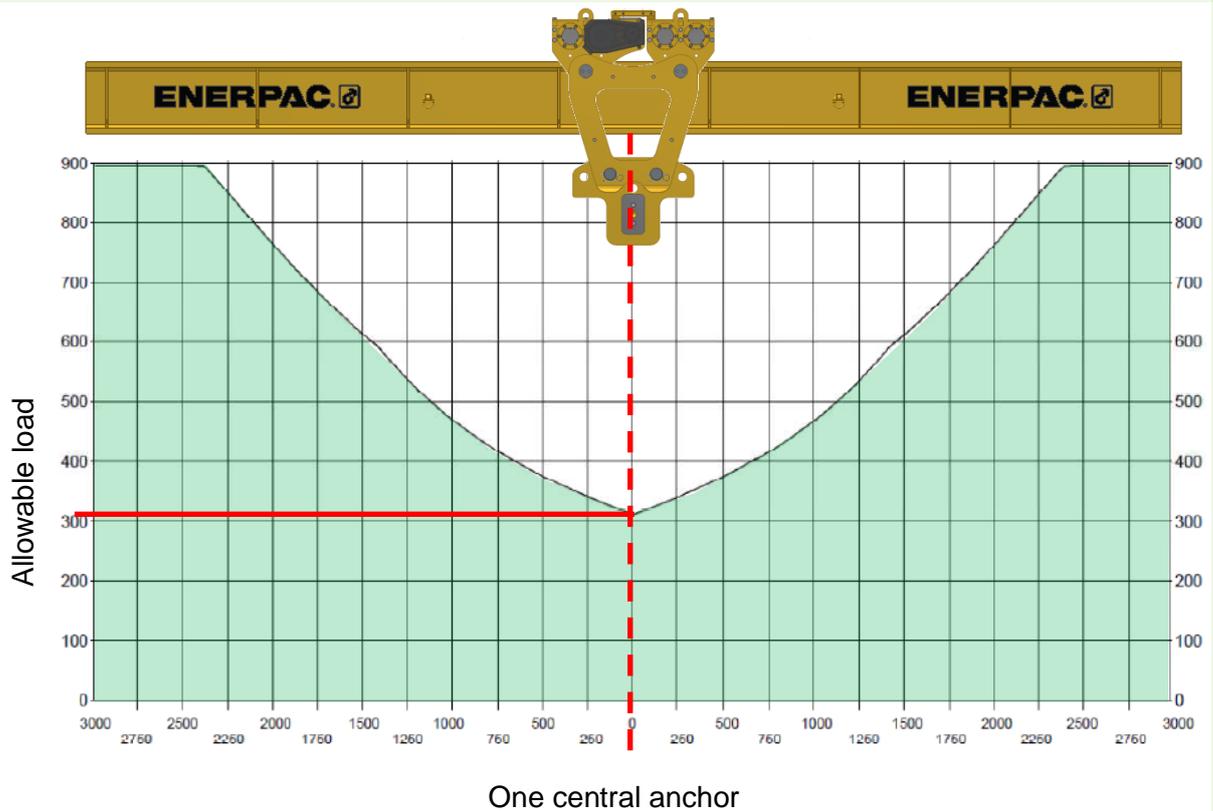
The distance between the anchor points is (1250 + 1250) mm, so the maximum allowable load is 520 kN per anchor point.

The bearing capacity of the beam is twice the indicated capacity if

- only one anchor point is used and
- the anchor point is located in the centre of the beam.

This is depicted below:

Example how to determine the bearing capacity of the header beam for one anchor point. Loads within the green area are allowed.



In this example the total allowed load is $2 \times 300 = 600$.

Enter the beam load in the checklist given in Appendix A “Checklist for planning a lifting operation”.



Caution

The force on each anchor point shall not increase the capacity of the header beam.



- Earlier purchased Enerpac / Hydrosplex Header Beams may be applied if their capacity is sufficient.
- Header beams of foreign make can be applied if their capacity is sufficient, but Enerpac will not take any responsibility for it.

4.5. Side load

Side load may endanger the stability of the System.

Side load can be caused by

- wind
- bearing ground not levelled out
- system not mounted plumb
- slings or shackles which are not mounted plumb between the side shift units (or lugs) and the load.

During activities in the open air, wind may exert force on the lifted object.

Therefore, for every lifting operation the expected side load has to be calculated.

The permitted side-load on the System is **1.5%** of the actual load.

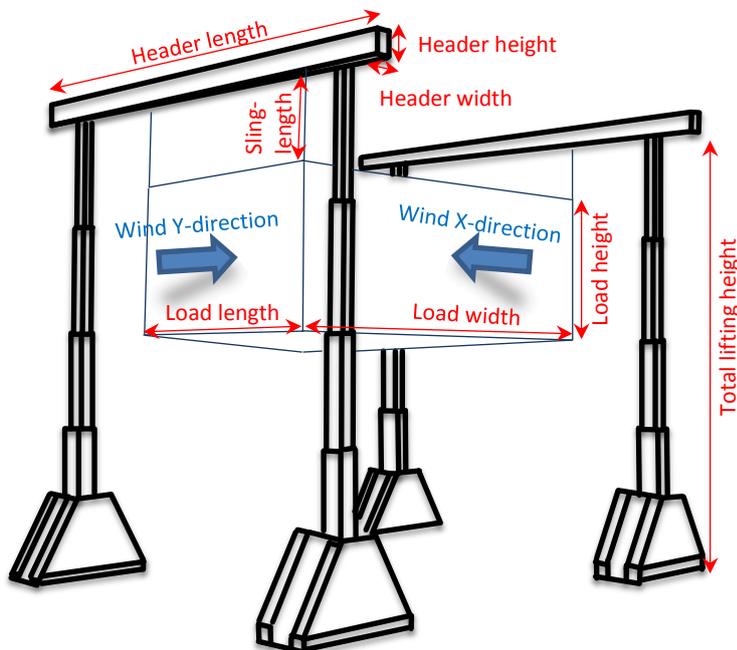
Enter the max expected side-load Appendix A “Checklist for planning a lifting operation”.

The side load caused by wind depends on

- the size of the object
- the wind speed
- the height of the top beams (lifting height).

To calculate the permissible wind speed, you might use the form on the supplied USB stick; see Ref 4 “USB stick with wind calculations”.

The form gives the permissible wind speeds in both directions under different circumstances. The used parameters are indicated in the illustration below.



Example of a completed form:

Load Properties		
Load width	4	<i>m</i>
Load length	5	<i>m</i>
Load height	3	<i>m</i>
Load weight	1250	<i>kN</i>

Operational parameters		
Total lifting height	7.0	<i>m</i>
Sling length	0.5	<i>m</i>

Header geometry		
Header width	0.33	<i>m</i>
Header length	6.00	<i>m</i>
Header height	0.40	<i>m</i>

Cross Beam parameters		
Beam width	0.33	<i>m</i>
Beam length	6.00	<i>m</i>
Beam height	0.40	<i>m</i>

Wind parameters		
Max. wind velocity X-direction	17.8	<i>m/sec</i>
Max. wind velocity Y-direction	15.6	<i>m/sec</i>

The calculation program takes the dimensions of the foot of the System in account. Those dimensions are implemented as fixed parameters and cannot be altered.



- Always assume the most adverse situation
- Populate the checklist in Appendix A “Checklist for planning a lifting operation” with the maximum permissible wind speed.



Hazard:

- Under no circumstances whatsoever may lifting operations be carried out when the wind speed is greater than the permissible values
- When lifting, always assume a worst-case scenario. Wind is unpredictable and may quickly change speed and direction.

5. Install the System

This chapter describes how to install the System as well as the preparations which have to be made for the working location.

Fully complete the checklist as given in A “Checklist for planning a lifting operation”.



- Verify the lifting capacity of your lifting means with reference to the weight of the parts to be hoisted. The weights are stated on the GA drawings. The correct drawing numbers are given in Appendix Z “Compatible accessories” For torque settings reference is made to Appendix G “Torque settings”.

5.1. How to hoist parts of the System

5.1.1. Hoisting the units

Pre-conditions for moving a units:

- the cylinder is in fully retracted position
- no beams are mounted
- no load is mounted

The units can be moved in two ways:

- A. Using a **forklift** truck.
Use the fork holes of the unit.



In order to prevent damage to the wheels of the units:

- the bottom of the unit should be kept at a height of at least 300 mm
- the unit should not lean back

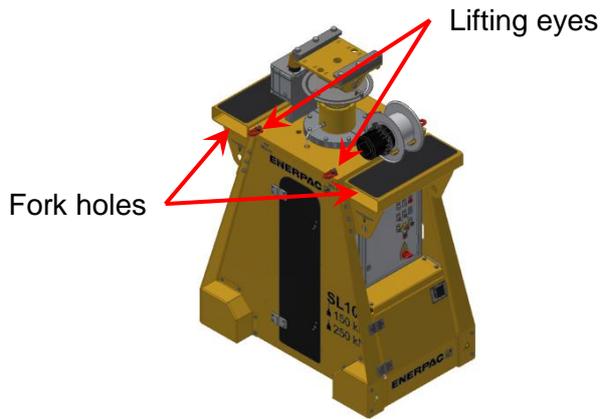


- B. Using a **crane**.
Use the lifting eyes of the unit.



Attention: always use four lifting eyes

The lifting eyes and the forklift openings are shown below:

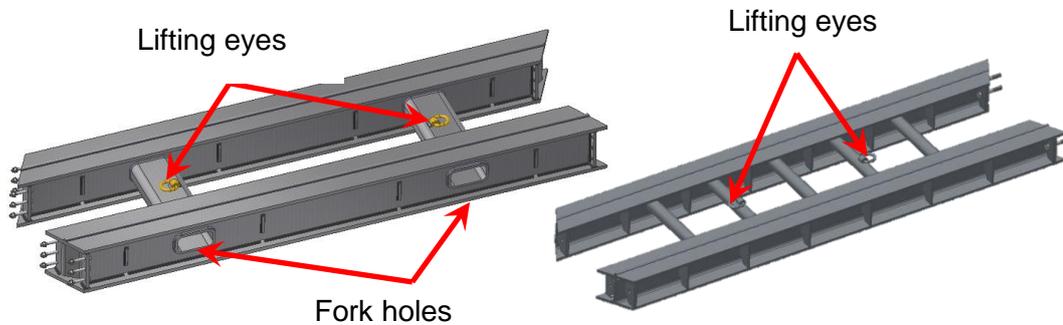


 Always keep the unit in vertical position

5.1.2. Hoisting the skid tracks

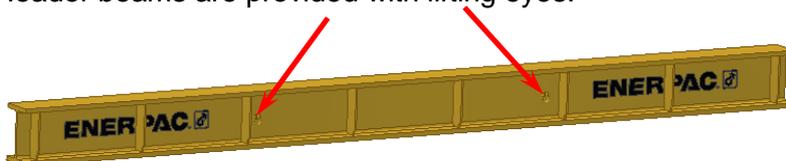
The skid tracks may be moved in two ways:

- With a forklift truck.
For this, the skid tracks are fitted with fork holes
- Using a crane.
For this, the skid tracks are fitted with 2 lifting eyes.



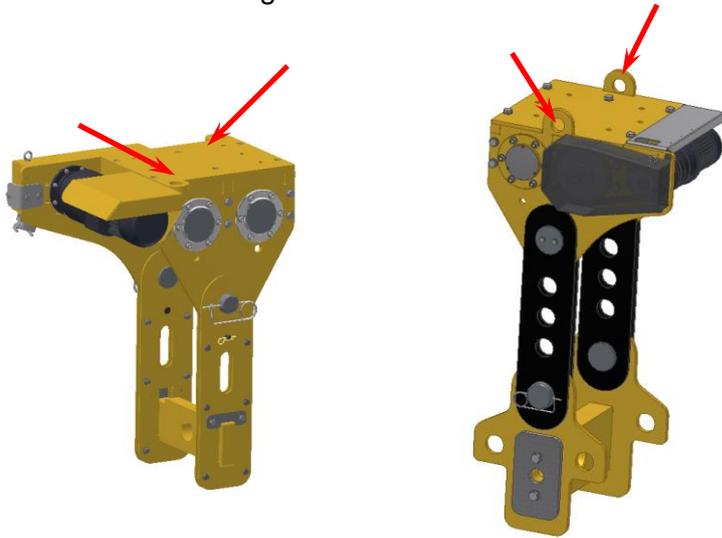
5.1.3. Hoisting the header beams

Header beams are provided with lifting eyes.

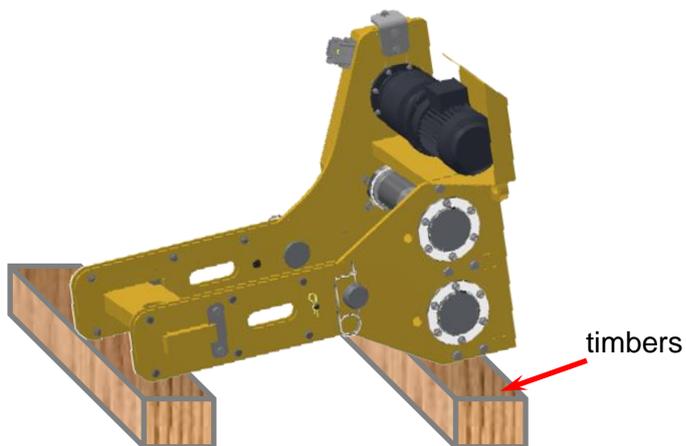


5.1.4. Hoisting the side shift unit

The side shift unit shall only be moved using the lifting eyes. Attach chains or slings to the indicated locations.

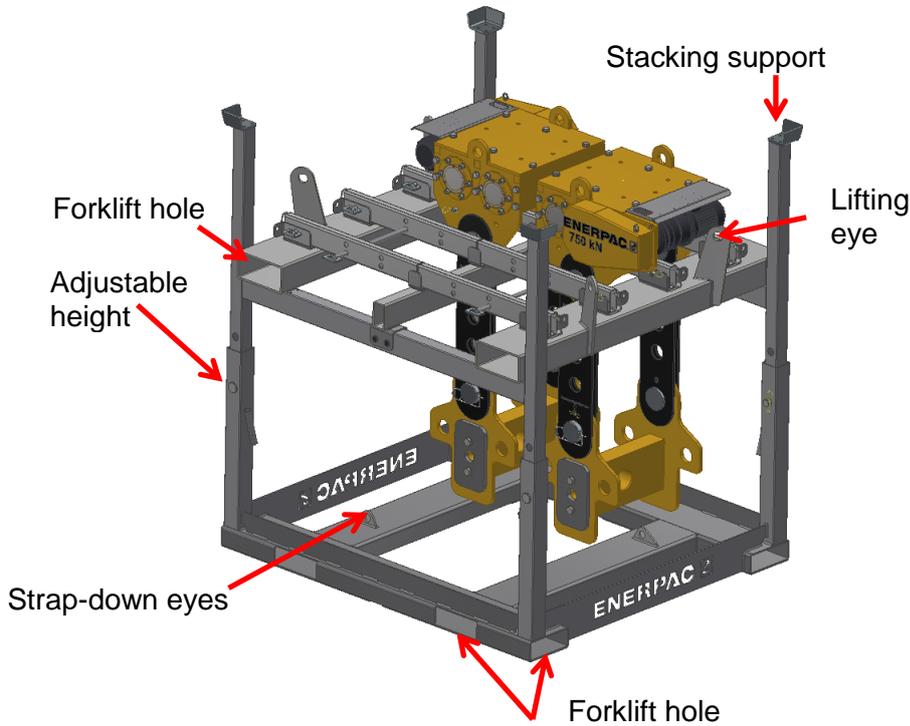


When not in use then put the side shift unit down horizontally. Use timbers to prevent damage.

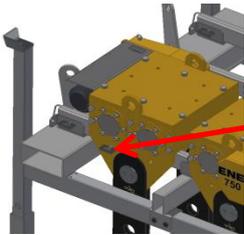


Optionally, transportation frames may be delivered for transporting and storing the side shift units:

5.1.4.1. HBS3000



To get the side shift unit out of the transportation frame proceed as follows:

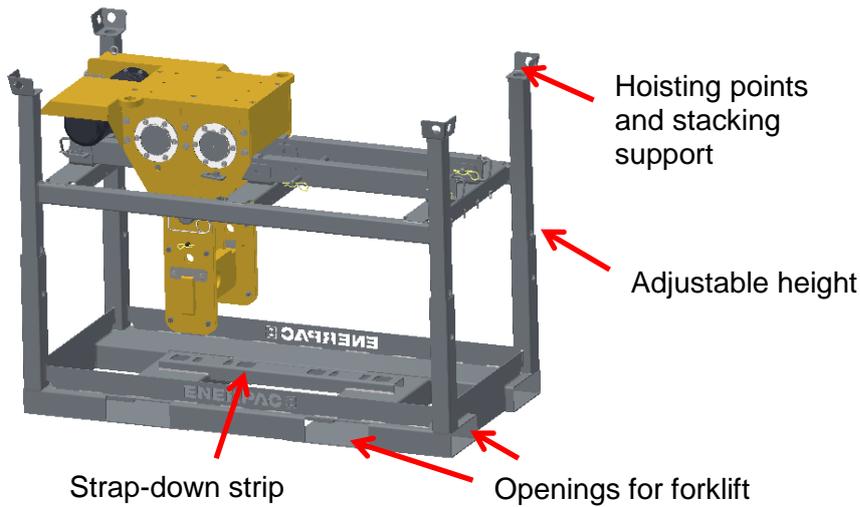
1.	Put the transportation frame next to the gantry. Use a forklift or a crane.	
2.	At delivery, the side shift units are strapped to the strap-down eyes. Remove those straps.	
3.	Remove the locking pin	 <p>Locking pin</p>
4.	Store the locking pin in one of the pipes	
5.	Hoist the side shift unit out of the transportation frame. Use the lifting eyes.	

For storing the side shift units in the transportation units, proceed in reverse order.

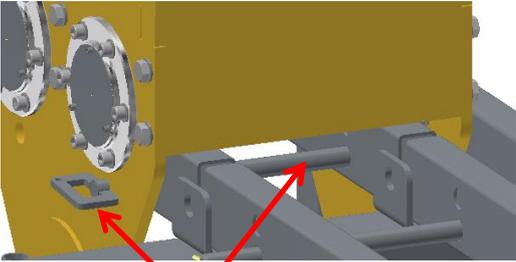
Pay attention to the following:

- The height of the transportation frame is adjustable. Make sure the height is set in such a way that the side shift units cannot touch the ground.
- Strap the side shift units to the strap-down eyes.

5.1.4.2. HBS1250MK3



To get the side shift unit out of the transportation frame proceed as follows:

1.	Put the transportation frame next to the gantry. Use a forklift or a crane.	
2.	At delivery, the side shift units were strapped down. Remove the straps.	
3.	Remove the locking pin	 <p>A close-up diagram of the yellow side shift unit's locking mechanism. A red arrow points to a 'Locking pin' that is inserted into a slot on the side of the unit.</p>
4.	Hoist the side shift unit out of the transportation frame. Use the lifting eyes.	

For storing the side shift units in the transportation units, proceed in reverse order.

Pay attention to the following:

- The height of the transportation frame is adjustable. Make sure the height is set in such a way that the side shift units cannot touch the ground.
- Strap the side shift units to the strap-down eyes.

5.2. Place the Skid Tracks

In order to ensure its stability, the System it has to be put level on the ground. When the subsoil is not flat then grade it, to create a solid foundation on which the system can operate safely.



Attention: creating a proper foundation has to be performed with utmost care, as it is the system's primary safety issue. The foundation of the Skid tracks is the exclusive responsibility of the user.

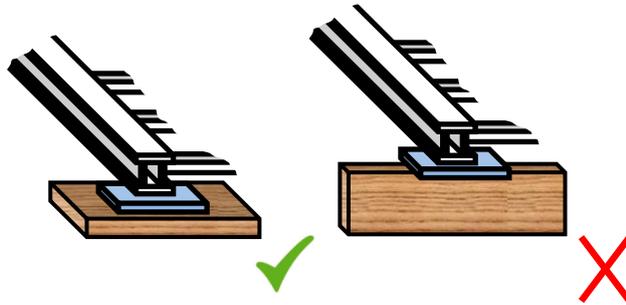
5.2.1. Build the foundation

For building the foundation, proceed as follows:

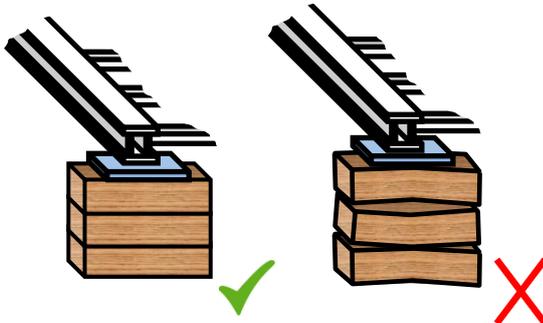
Install the foundation material as you determined; see section 4.1. "Bearing ground pressure calculation".

Regard the following aspects:

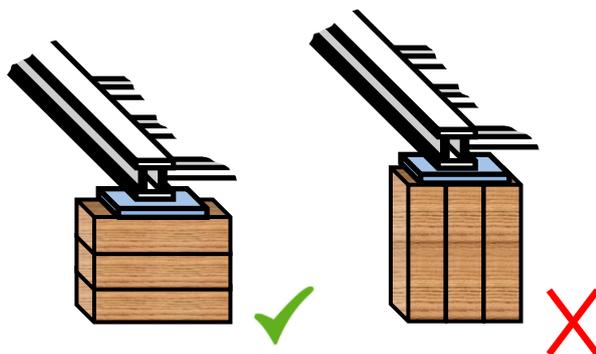
- If the section profile of the timbers is not square then put them in flat position:



- If you stack timbers then leave no slack in between, to avoid risk of spring:



- Put the timbers horizontally, not vertically:



5.2.2. Put the skid tracks in place

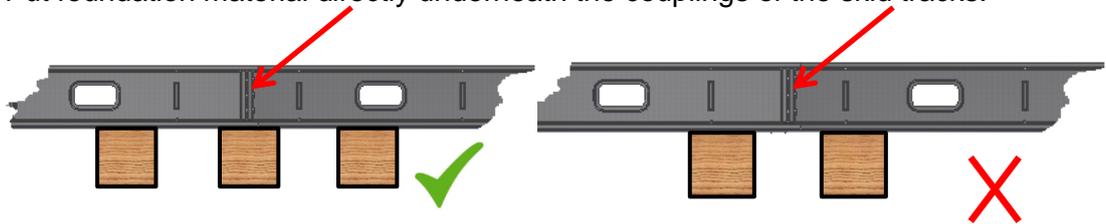
For putting the skid tracks in place, proceed as follows:

Put the skid tracks on the foundation and mount them together.
Regard the following aspects:

- Make sure no clearance is left between the foundation and the skid tracks. Eventually use shims.

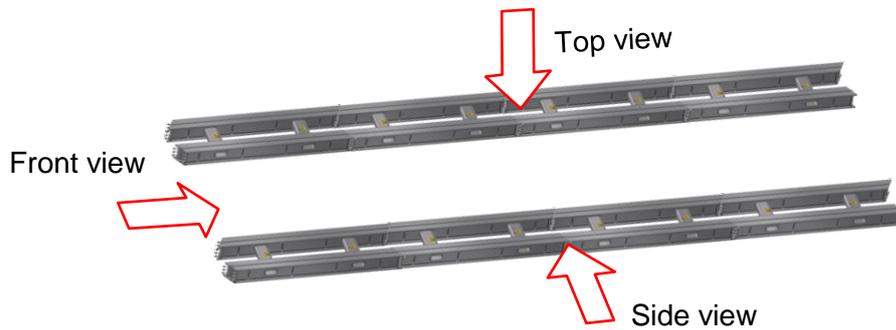


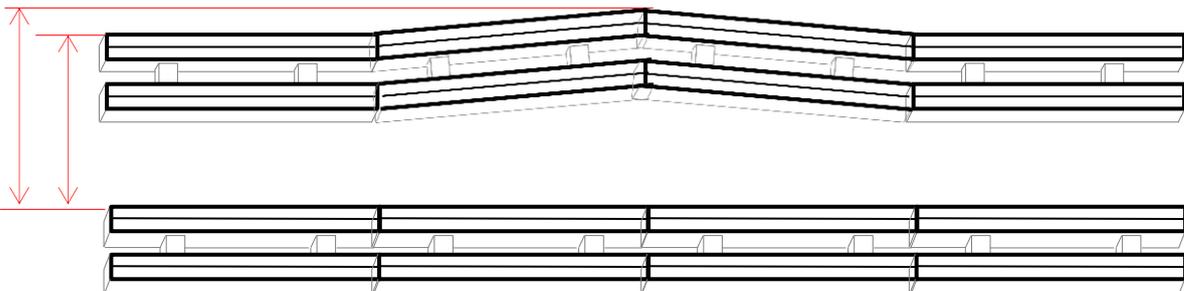
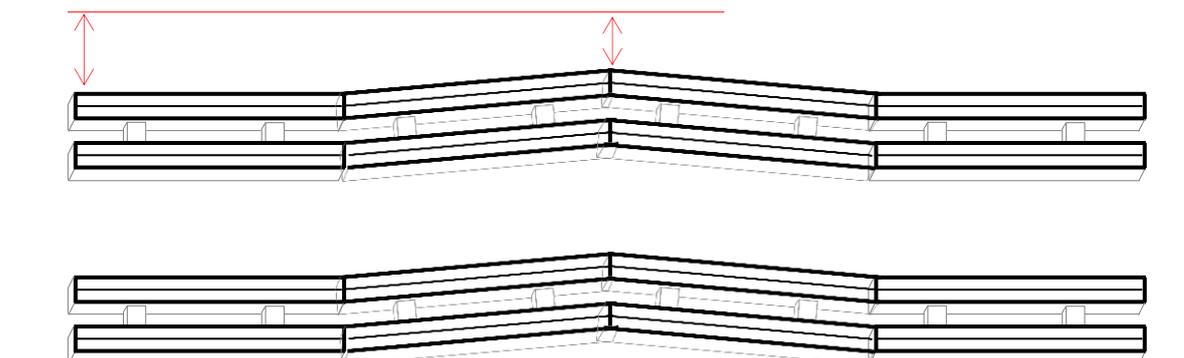
- Put foundation material directly underneath the couplings of the skid tracks:

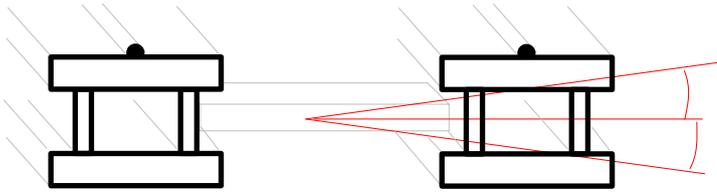
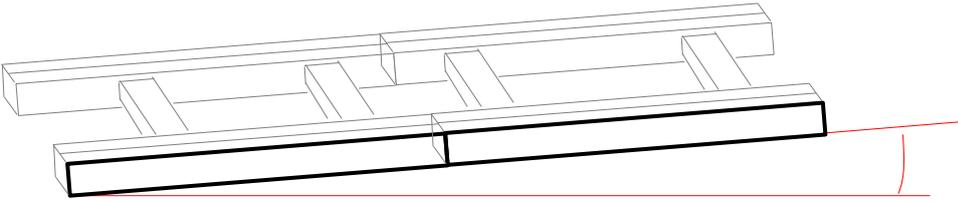
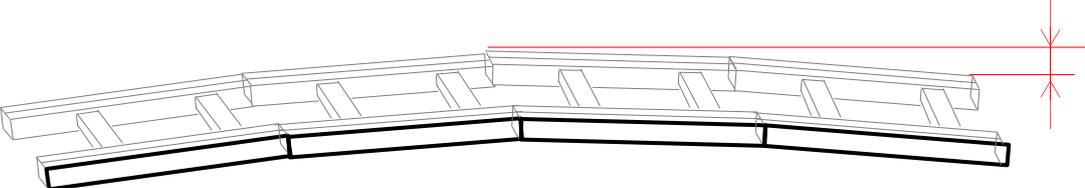
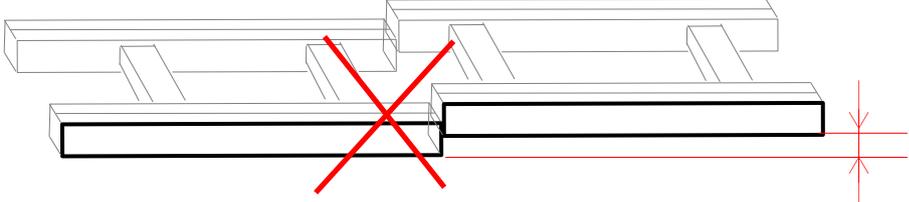


5.2.3. Align the skid tracks

Align the Skid tracks according to the following requirements:

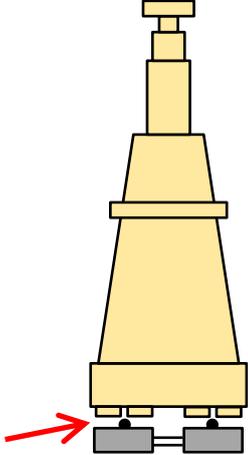
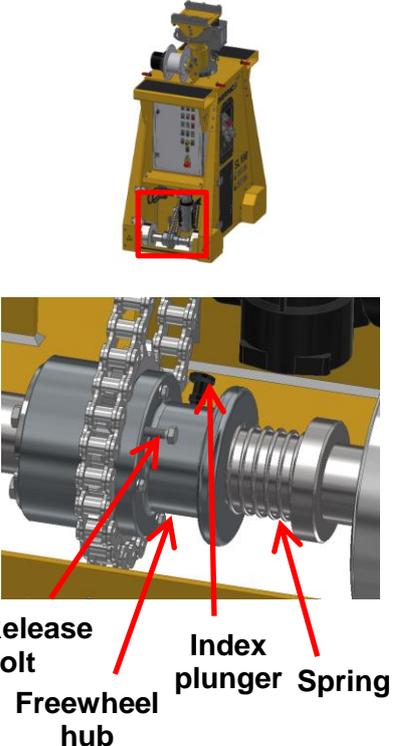


Nr	Alignment requirement	Tolerance
1	The Skid tracks shall be in parallel  (top view)	12 mm
2	The Skid tracks shall be aligned from the start to the end  (top view)	12 mm
3	The skew of the Skid tracks shall be	0.2°

	 <p>(front view of one skid track)</p>	
4	The inclination of the Skid tracks shall be zero	0.2°
	 <p>(side view)</p>	
5	The Skid tracks shall be flat	5 mm over 3 meter
	 <p>(side view)</p>	
6	The surfaces of the segments of the Skid tracks shall be well aligned. Use shims if necessary	-
	 <p>(side view)</p>	

5.3. Put the Units on top of the Skid tracks

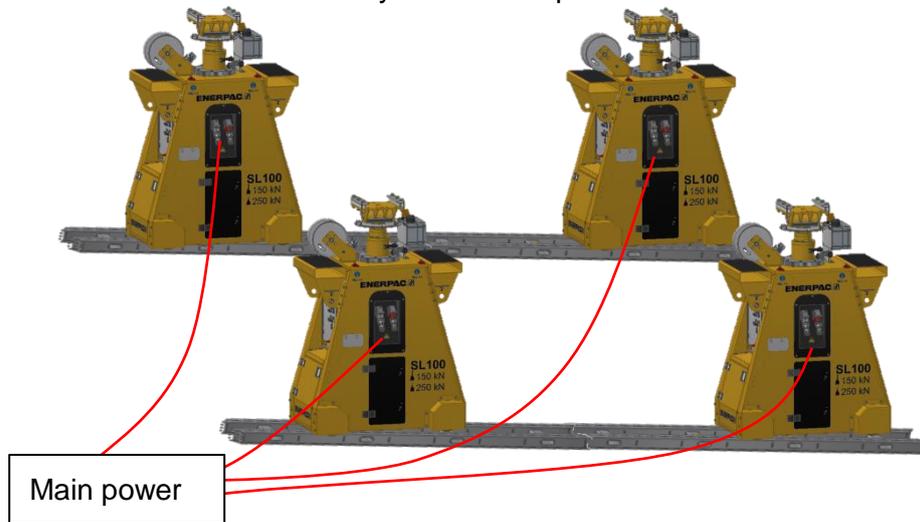
To put the Units on the skid tracks proceed as follows:

<p>1.</p>	<p>Put the Units on the Skid tracks</p> <ul style="list-style-type: none"> • Regard the hoisting instructions as given in paragraph 5.1.1 “ Hoisting the units”. • The grooves between the wheels have to correspond with the ridges on the Skid tracks. 	
<p>2.</p>	<p>Set the positive travel direction. (Do such after the power has been connected.)</p>	
<p>3.</p>	<p>Push the units to their required location by manpower:</p> <ol style="list-style-type: none"> 1. Decouple the driving mechanism on the chain drive by pulling the index plunger out and move the freewheel hub backwards. The Units are now freewheel position. (if the coupling will not come loose, tighten the two release bolts to decouple the driving mechanism) 2. Push the units to the required position 3. Couple the driving mechanism by pulling the index plunger. <p>The spring will push the freewheel hub back to its original position. The pins of the freewheel hub must align with the holes of the bushing on the shaft, to deactivate the freewheel mode. By using the travel buttons on the electrical cabinet in local control mode, the pins will align with the holes automatically. Make sure that the hub is locked again with the index plunger.</p>	

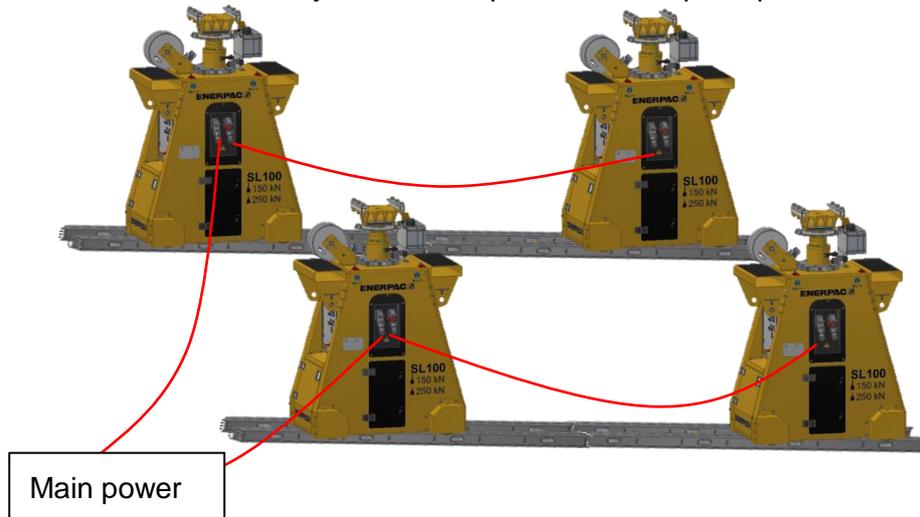
5.4. Connect the power cables

Connect the power cables to each of the units' power connections. There are two options how to connect:

- connect each unit individually to the main power:



- connect one unit directly to the main power, and loop the power forward to one other unit:



Don't bother the phase of the power since the units feature automatic phase detection. This assures the correct rotation direction of the electro motors.

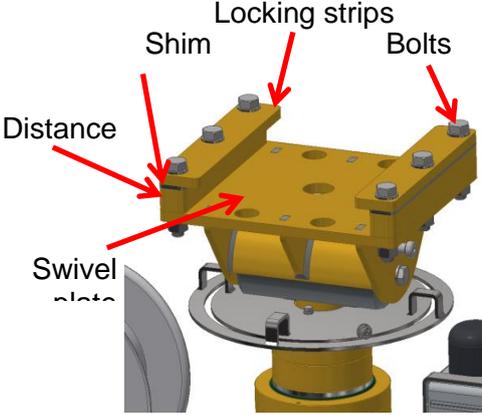


Attention: do not interconnect more than two units.

5.5. Mount the Header Beams

5.5.1. Mount the header beam on top of the cylinder

To mount the Header Beams on top of the Units proceed as follows:

1.	Remove the six bolts at the top of the swivel plate	
2.	Remove the locking strips.	
3.	Put the header beam on top of the swivel.	
4.	<p>Clamp the header beam to the swivel using the distance strips and the locking strips.</p> <p>With the shim plates, the tolerance of the plate thickness of the beam can be compensated for.</p>	
5.	Level the beam. Use the buttons of the electrical cabinet (see page 70) or use the RCC (see page 72).	
6.	Tighten the bolts according to the table in Appendix W "Torque settings".	



- Make sure the beam is level and that all bolts are tightened properly.
- Always apply all bolts

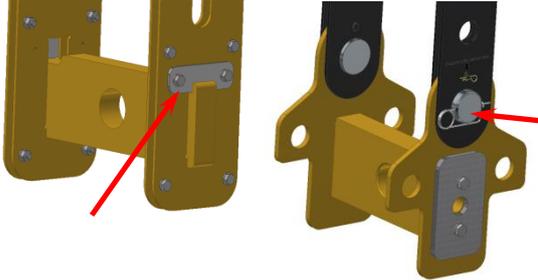
5.5.2. Mount longitudinal beams

When you apply longitudinal beams (see section 3.3.1 “Header beam configurations”), make sure that those longitudinal beams are securely fastened to the header beams. Enerpac provides a solution for mounting the longitudinal beams. Contact Enerpac if you are going to use longitudinal beams.

5.6. Mount the side shifts on the header beams

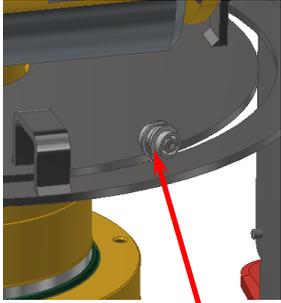
To mount the side shifts to the header beams, proceed as follows:

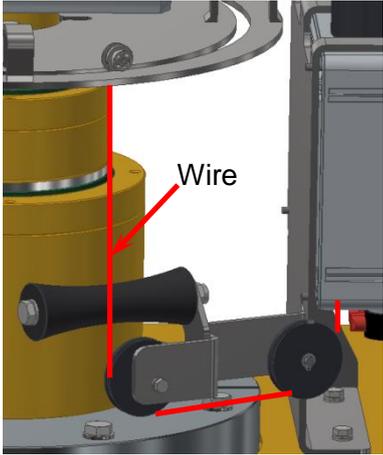
<p>1.</p>	<p>Mount the cable-guiding wheel at the Header beam. Do this at the same side where the cable reel is mounted on the base of the unit. Otherwise the cable could get pinched.</p>	
<p>2.</p>	<p>Put the side shift over the header beam.</p>	

<p>3.</p>	<p>Place the anchor</p>	
<p>4.</p>	<p>Lock the anchor with the locking strips or locking pins.</p>	
<p>5.</p>	<p>Connect the cable on the cable reel with the side shift</p> <p> Attention: ensure that the cable is mounted in such a way that it cannot get pinched.</p>	
<p>6.</p>	<p>Mount the other side shift units similarly.</p>	

5.7. Mount the wire of the stroke encoder

To mount the stroke encoder, proceed as follows:

<p>1.</p>	<p>Check whether the plate is clean and the runner can move light and freely.</p>	 <p>Runner</p>
-----------	---	--

<p>2. Pull the wire out of the encoder box. Lead the wire around the guiding wheels.</p> <p>Attach the end of the wire on the runner on the plate.</p> <p> Attention: Do not let go of the wire. If it shoots at high-speed into the encoder, the stroke encoder sensor is broken.</p>	
---	--

5.8. Install the remote control console (RCC)

The RCC provides wireless communication with the Units, though wired communication is possible as well.

5.8.1. Wireless communication

The RCC enables wireless on a radio frequency of 2.4 GHz. No cables have to be connected.

BUT:

The wireless communication may be disturbed.

If so, a report is given on the LCD per Unit: ***** Communication-time-out *****

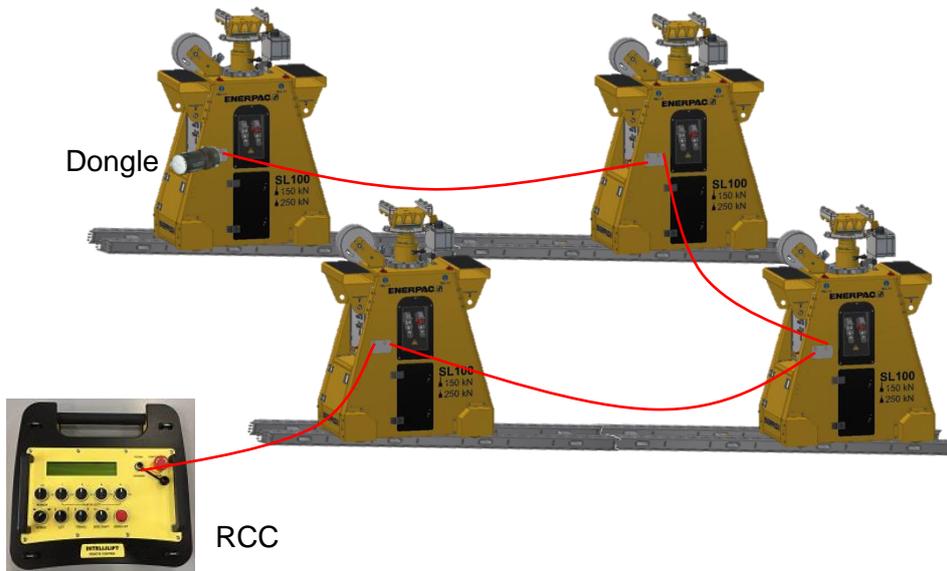
The disturbance may be caused by radio reflections or 'dead' area's. Walking to another position may help

Connection-fail measures:

- If the communication fails for 2 seconds then all movements of the units and the side shifts are stopped.
- If the communication fails for 10 seconds then the system makes an Emergency stop. For recovering from this situation reference is made to section 6.1. "The Emergency buttons".

5.8.2. Wired communication

To enable wired communication the following set up has to be realised:



To build the set-up proceed as follows:

1.	Switch the RCC off	
2.	Switch all units off. Use the main switch.	
3.	Connect the data cable with the RCC. Use the RS-485 connection	
4.	Connect the data cable to one of the units.	
5.	Interconnect all units with data cables. The sequence is at random since the units will identify themselves automatically.	
6.	Provide the last unit with the Dongle	

5.8.3. Set up the communication

To set up the communication between the RCC and the four Units to work, proceed as follows.

Reference is made to

- The controls on the RCC as “RCC[x]”.
The layout of the RCC is given on page 72.
- The Control Panels of the units as “UNIT[x]”.
The layout of the control panel is given on page 70.

1.	Connect data cables or do not so. The system will automatically detect their presence.	
2.	Ensure that the “Emergency stop” button on the RCC is in the non-activated position.	
3.	Switch the main power switches on the control panels of all units to “on”. <i>The “power on” indicator on the control panel of the Units will be lit.</i>	
4.	Make sure that the “Emergency stop” buttons on all units’ are in the non-activated position. The blue indicator should be dimmed.	
5.	Switch the unit to Remote	

6.	<p>Select the Units you want to operate with. <i>The RCC can now detect the units.</i> <i>If the connection with a unit is fine than the "emergency active" indicator on the control panel of that unit is dimmed.</i></p>	
7.	<p>Switch the same switches to off again</p>	
8.	<p>Switch the RCC off and on <i>As soon as the communication is established:</i></p> <ul style="list-style-type: none"> • <i>the text "Engine still" is displayed</i> • <i>an asterisk is displayed</i> <p><i>If the RCC detected data cables then the wireless means are switched off.</i></p> <p><i>Now it is possible to control the units.</i></p>	

5.8.4. Reprogram the communication

Each RCC is provided with a unique code. This code is known by the receivers of the units, so they can recognize their Master's Voice.

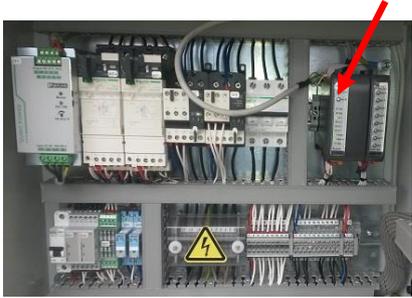


Enerpac has set this communication configuration initially.
The setting is persistent and remains after switching off the power.
Only when the RCC or one of the units was replaced, reprogramming is required.

Reprogramming is performed for each unit separately.

Proceed as follows:

1.	Make sure the battery of the RCC is charged	
2.	Switch the units off.	
3.	Deselect all units	
4.	Switch the unit which has to be programmed on.	
5.	Select the concerned unit	

<p>6.</p>	<p>Open the electrical cabinet of the unit. Look for the receiver.</p>	
<p>7.</p>	<p>Press “LEARN” for two seconds</p> <p><i>When the tekst “NO ANSWER” disappears from the display of the RCC, the RCC and the unit are connected.</i></p>	
<p>8.</p>	<p>Eventually repeat [2] .. [7] for the other units</p>	
<p>9.</p>	<p>Verify that the number on the RCC match with the numbers on the units, by travelling with the units individually.</p>	

5.9. Perform an all-over visual inspection of the System

Inspect the System visually.

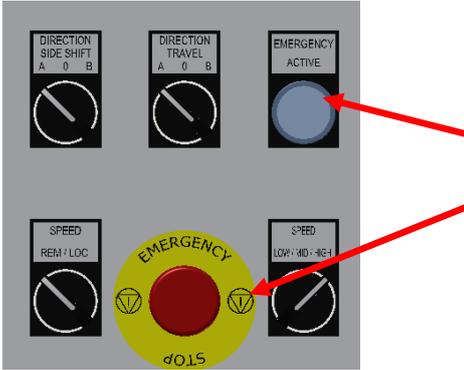
Enter the result of the inspection in the checklist given in Appendix B “Checklist for installing the System”.

6. How to control the System

6.1. The Emergency buttons

The system is provided with emergency buttons.

- On the control panels of all four units:



When the button is pressed:

- the unit is switched off
- the blue button “Emergency active” is lit
- when the unit is in Remote Control, other units in Remote Control are switched off as well.

To recover the system from an Emergency situation:

- investigate why the button was pressed
- pull the button
- press the blue button

- On the RCC:



When the button is pressed:

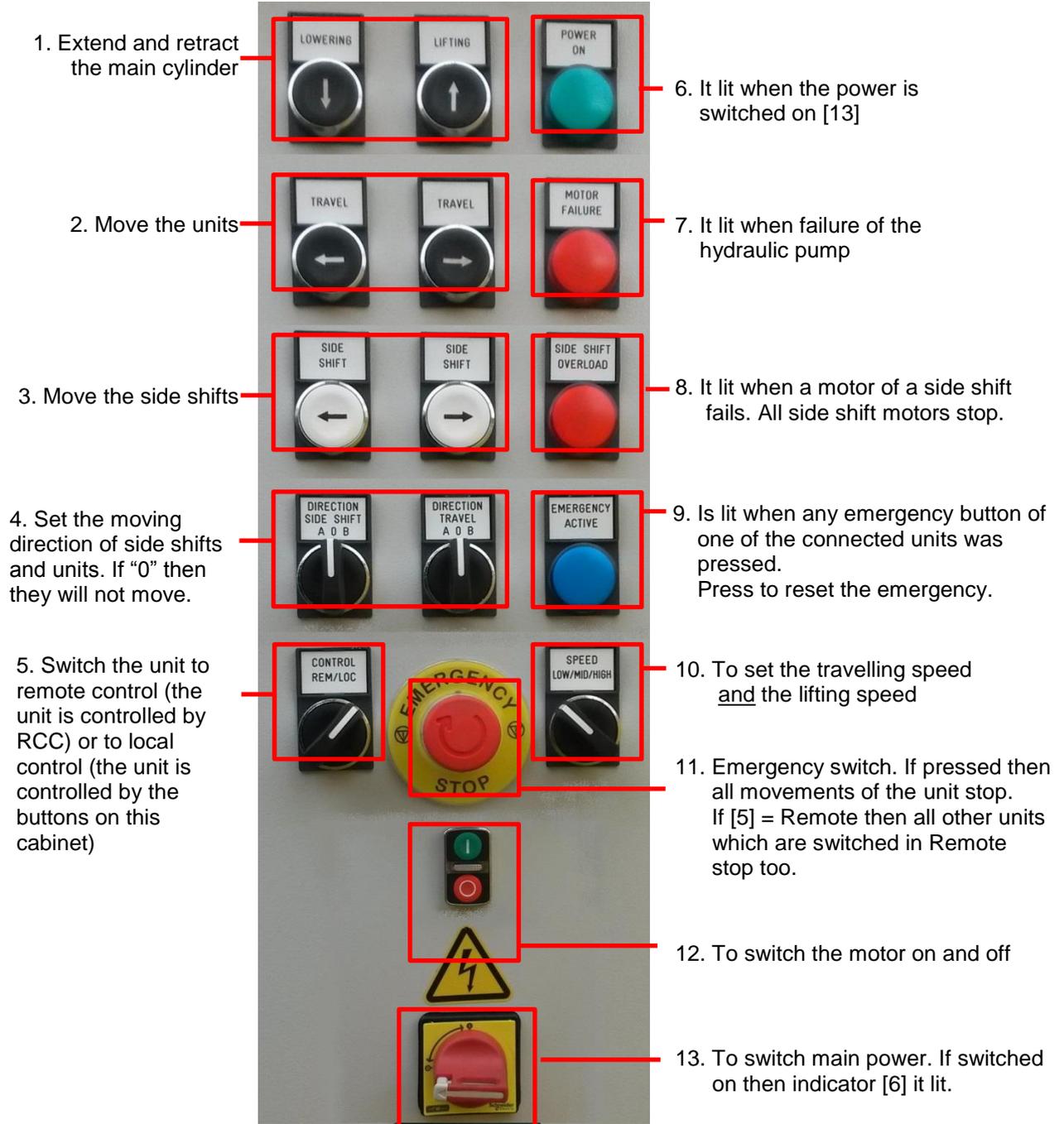
- all units which are in remote control are switched off

To recover the system from an Emergency situation:

- investigate why the button was pressed
- switch off the main power of all units for at least 20 seconds
- restart the system

6.2. The Control Panel of the Unit

6.2.1. The switches and indicators



6.2.2. Local control mode

The control panel of a unit enables the operator to control the unit on which it is mounted. Other units cannot be controlled.

Let's call this mode "Local Control".

Local control is meant to be used during assembly phase of the System:

- to manoeuvre the Units into the correct position
- to manoeuvre the Side Shifts into position
- to set the positive running directions of the Unit and the Side Shift.

For Local Control proceed as follows:

<p>1.</p>	<p>Switch the Unit on; use [13] and [12]. Verify that [6] is lit, and [7] and [8] are dimmed</p> <p>(see page 70)</p>	
<p>2.</p>	<p>Use [5] to enable Local Control</p>	

In local control the following operations can be done:

- Set the positive running direction of the Unit; use [5]
- Set the positive running direction of the Side Shift; use [8]
- Extend or retract the cylinder; use [1]
- Travel the units forward and backward; use [2]
- Move the side shift towards the left or the right; [use [3]



Never use local control when header beams are mounted, since:

- that requires synchronous action of the units.
- In local control no load detection is performed.

6.3. The remote control console (RCC)

This chapter describes the properties and the use of the RCC.
The RCC enables the operator to execute a lifting operation on a safe distance.

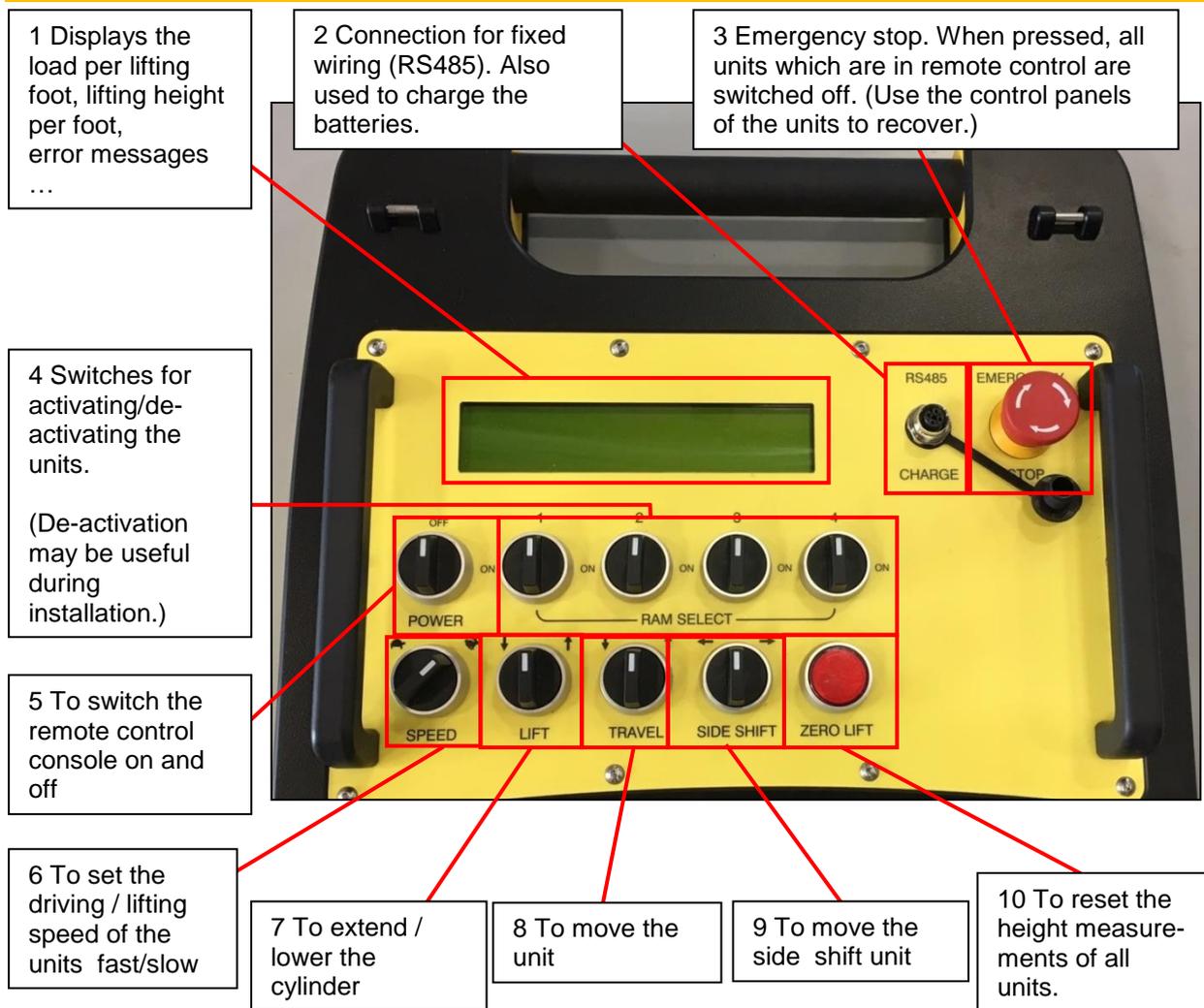
The RCC provides:

- synchronized moving of the units (tolerance of 15 mm)
- synchronised lifting (tolerance 24 mm).



The system starts faster when the RCC is switched on before the units

6.3.1. The controls



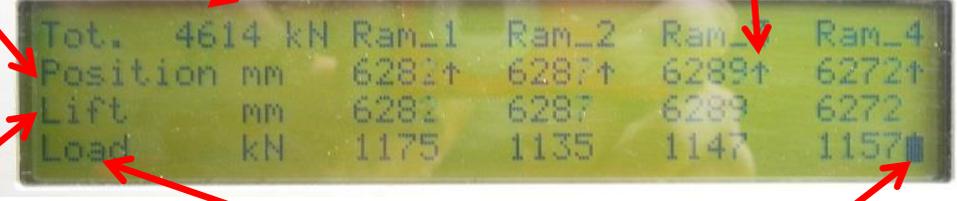
ad [6]:

The system can operate in “fast” (which is valid for lifting,/lowering and travelling) when

- The load on each unit is less than 10% of its Working Load Limit
- The cylinders are not extended in stage 2

Otherwise the system automatically operates in “Slow”

6.3.2. The display



A. Absolute height of the cylinders

B. Total load on the System

C. Direction of the arrow
 Direction of arrow within the remote control display:
 Up: Lifting
 Down: Lowering
 Right or Left: Travelling direction
 Diagonal: Side shifting

Tot.	4614 kN	Ram_1	Ram_2	Ram_3	Ram_4
Position	mm	6281↑	6287↑	6289↑	6272↑
Lift	mm	6281	6287	6289	6272
Load	kN	1175	1135	1147	1157

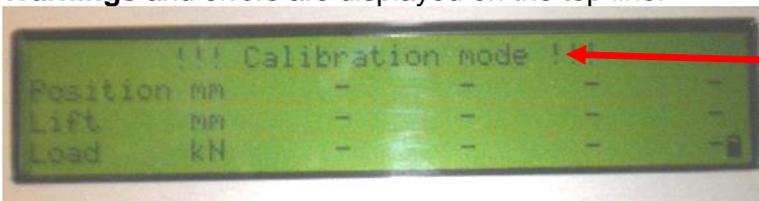
D. Height of the cylinders w.r.t. "zero lift").

E. The load per cylinder

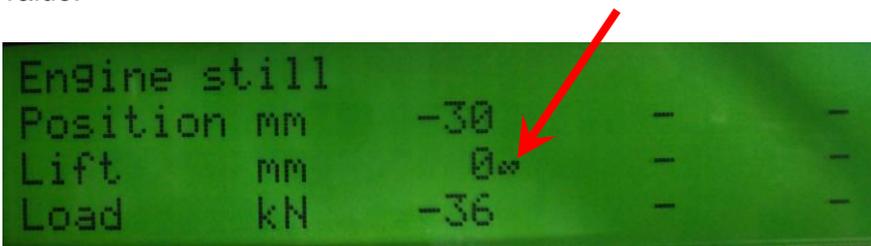
F. Power status of the battery

The following values are displayed on the screen:

- **Tot.**
The total load on the selected units
- **Position**
The height per cylinder
- **Lift**
The height with reference to the zero lift position
- **Load**
The load per cylinder
 - The load is a calculated value, based on the position.
Changes in the indicated position may cause a jump in the load indication.
 - The values indicated for the non-selected cylinders are invalid.
- **Warnings and errors** are displayed on the top line:



A list of possible errors and warnings is given in Paragraph 8.2. "List of problems and solutions" under "Reports on the display of the RCC".
 When wired communication with the Units is OK, a "∞" symbol is shown behind the Lift value.



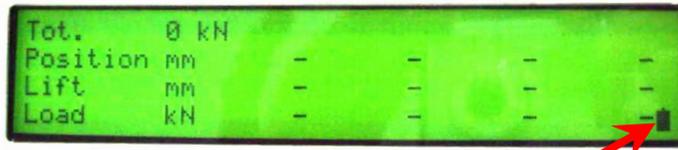
- The display is provided with **background lighting**. In order to extend the battery life, the background lighting is switched off if no changes are detected for a period of 15 seconds.

- **Emergency pressed**

The report “***Emergency pressed***” is shown:

- When the emergency button on the remote control console was pressed
- When the emergency button on a unit was pressed, but only when that unit was on Remote control. Reference is made to section 6.1. “The Emergency buttons”.

- **Battery level**



The display shows the power level of the battery.
The console can operate approximately 8 hours on a fully charged battery.
Switch the console off after use and connect it with the 12V loader.



Only apply the delivered loader.

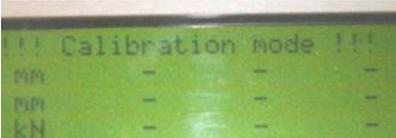
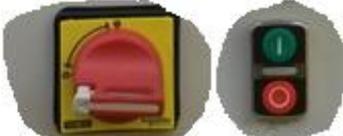
6.3.3. Calibrate the stroke sensor

This paragraph describes how to calibrate the stroke sensors, which measure the height of the cylinders. For calibrating use the RCC; see page 72.



Calibration has to be performed when a stroke sensor or the RCC is changed, so calibration is **not part** of the daily routine.

Proceed as follows:

1.	Preconditions: <ul style="list-style-type: none"> • RCC switched off • Units switched off. 	
2.	Set “Speed” on the RCC to the ‘hare’ (high speed)	
3.	Press “Zero lift” and keep it pressed while you switch the console on. Keep “Zero lift” pressed until the message “System not ready” is shown	
4.	Release the “Zero lift” button. <i>The RCC is now in calibration mode. The “Calibration mode” message appears on the display.</i>	
5.	Switch the unit which you want to calibrate on and start its motor.	

6.	Select the unit on the RCC	
7.	Retract the cylinders to the very minimum position	
8.	Extend the cylinders to the very maximum position	
9.	Deselect the unit <i>The stroke sensor has been calibrated. The message "Calibration succeeded" is shown.</i>	
10.	Switch the RCC off.	
11.	Switch the RCC on.	
12.	Verify the displayed position. It should be the maximum position.	
13.	Retract the cylinder to the very minimum position.	
14.	Verify the displayed position. It should be approx. zero.	

7. Execute a lifting operation

This chapter describes how to perform a lift operation.

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'!
- Never attempt to **extend or retract masts** to which something is attached or which are fitted with a buffer beam. The extension cylinders are not designed to bear additional weight.
- Do not extend masts when a **person is close** to the masts.

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.
- Local **control** is only permitted if there is no beam attached to the unit.
- A unit is only part of the central emergency stop system if the control selector switch is in the **remote position**.
- Ensure that the load avoids contact with a gantry leg or any obstructions while lifting, side shifting, or traveling.
- Ensure that the gantry legs, header beams, and other components of the gantry system avoid contact with any obstructions while traveling.
- The operator should have an unobstructed view of 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 Appendix F “Enerpac HF95 Hydraulic fluid safety”.



Hazard

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

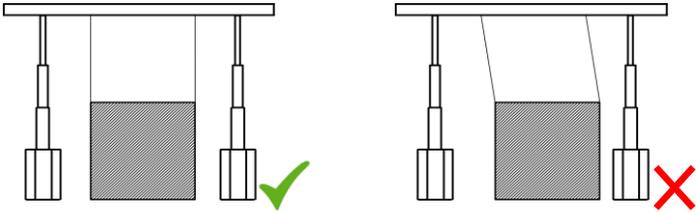
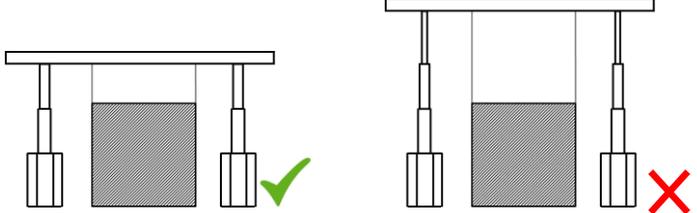
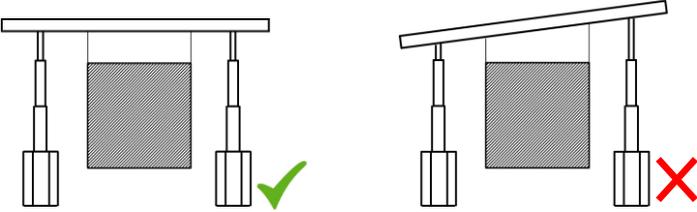
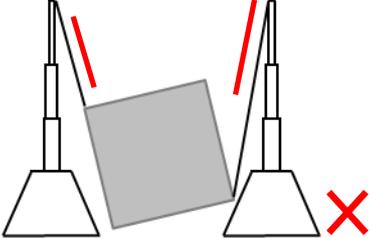
The following signs are applied to the system:



(The symbols are explained in section 2.3. “Symbols applied to the System”).

7.2. Suspend the load

To suspend the load regard the following rules:

<p>1. The anchors on the header beam have to be in line with the hoisting points of the load.</p> <p> <i>If the anchors are not in line with the hoisting points, the load will sway as soon as it gets free from the ground. The resulting lateral force may endanger the stability of the System.</i></p>	 <p>(front view)</p>
<p>2. Keep the lifting straps as short as possible.</p> <p> <i>Long slings may enable swinging of the load, causing dangerous lateral forces.</i></p>	 <p>(front view)</p>
<p>3. The header beam has to be kept level at any time, with a tolerance of 0.2°.</p> <p><i>Mount the header beam level at installation time. During operation the header beam is kept level automatically.</i></p>	 <p>(front view)</p>
<p>4. Lifting slings have to be plumb within a tolerance of 0.2°. This is especially applicable for tilting operations; see section 7.6. "Tilt the load".</p> <p> <i>Exceeding the limit of 0.2° will cause dangerous lateral forces.</i></p>	 <p>(side view)</p>

7.3. Lift the load

This chapter describes the steps you have to follow for lifting a load.

Apply the RCC, since only then the automatic safety measures are active..



Hazard: lifting a load while applying local control can cause severe accidents since safety measures are not active in local control.

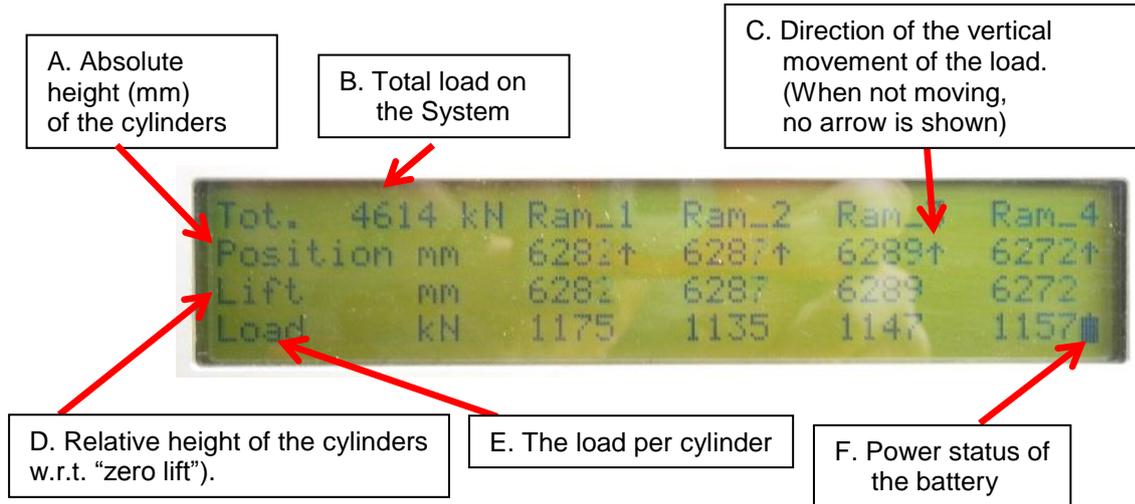
In the steps reference is made to

- the controls on the RCC; see page 72.
- the Control Panels of the Units; see page 70.

Proceed as follows:

1.	Record all activities during the operation using the form given in Appendix D “Recording a lifting operation”	
2.	Verify that the checklists given in: <ul style="list-style-type: none"> a. Appendix A “Checklist for planning a lifting operation” and b. Appendix B “Checklist for installing the System”. c. Appendix C “Final checks” are completed and signed off.	
3.	Switch the RCC on. <i>The RCC starts up.</i> <i>The software version number is displayed</i>	
4.	Verify the battery of the RCC is fully charged <i>The battery status is shown at the display.</i> <i>A full battery has a capacity of approximately 8 hours.</i>	
5.	Switch all four Units on. <i>Indicator UNIT [6] is lit .</i> <i>Indicators UNIT [7] and UNIT[8] should bedimmed</i>	
6.	Activate all four units.	

7.	Switch the units to Remote	
8.	<p>Reset the measured heights of all units by pressing “zero lift”.</p> <p><i>The current heights of the cylinders will be taken as the new reference points.</i></p> <p><i>The height counters [D] on the display will start counting from zero.</i></p>	
9.	<p>Select the travelling speed.</p> <p>Select “low” if the system is carrying a load.</p> <p><i>If the system detects a load or the units are extended for more than the first stage then “Low” is selected automatically.</i></p>	
10.	<p>Lift the load using RCC[7].</p> <p>While lifting, monitor the display (shown below).</p> <ul style="list-style-type: none"> • Monitor the lifting heights. <ul style="list-style-type: none"> The heights of the cylinders are measured continuously; see [A]. The RCC automatically levels the heights of the four cylinders within a bandwidth of 24 mm. <ul style="list-style-type: none"> ○ <i>When the height of one cylinder differs more than 12 mm from the others, its lifting speed (or the lifting speeds of the other units) is slowed down until all heights are within a bandwidth of 6 mm.</i> ○ <i>When the difference of height exceeds 24 mm then system stops moving the load. Technical investigations of the problem have to be made. Follow the main problem solving procedure as described in 8.1. “Main problem localization procedure” on page 87.</i> • Monitor the individual loads on the units [E] • Monitor the total load on the system [B] • Monitor the direction of vertical movement [C] • Monitor the power status of the battery [F] 	
11.	Switch the unit off	
12.	Switch the RCC off	



7.4. Move the load in longitudinal direction

Moving the load in longitudinal direction is done by travelling of the units.

- For travelling all four units simultaneously and synchronised, apply the RCC. See section 6.3.1 “The controls”.
- To move one single unit individually, you can either use the RCC or you can apply local control; see section 6.2.1 “The switches and indicators”.

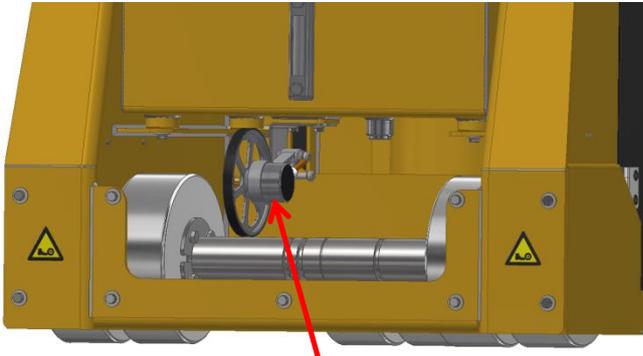
7.4.1. Move the units

To move all units synchronously, proceed as follows:

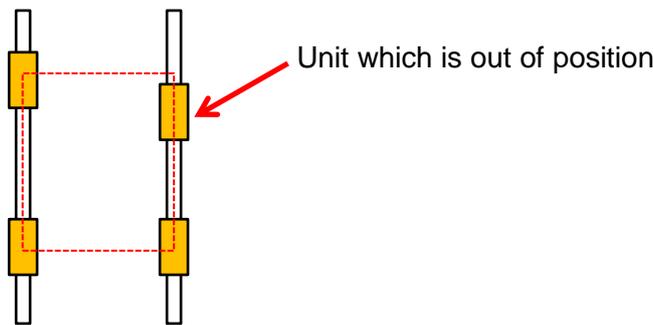
1.	Apply the RCC	
2.	Verify that all checklists have been completed and signed off: <ul style="list-style-type: none"> • Appendix A “Checklist for planning a lifting operation” • Appendix B “Checklist for installing the System” • Appendix C “Final checks”. 	
3.	Verify the power status of the battery of the RCC	
4.	Select the travelling speed [6]. Select “tortoise” if the system is carrying a load. <i>If the system detects a load or the cylinders are extended for more than the first stage, tortoise is selected automatically.</i>	
5.	Enable all units; use the buttons [4] “Ram select”.	
6.	Use “Travel” to move the units  Attention: when you have stopped the system four times then you have to synchronize the positions of the units. Synchronisation is described in the next section.	

7.4.2. Synchronize the positions of the units

The system keeps the relative positions of the units lined-up automatically. Use is made of a travelling distance measuring device which is implemented as a pulse counter:



The measuring starts counting at zero every start. Due to the limited resolution of the measuring device, the positions of the units may get out of rectangular formation when the system has stopped moving several times:



The following procedure can be applied to synchronise the positions of the units:

<p>1.</p>	<p>The units are in rectangular formation if</p> <ul style="list-style-type: none"> • $B1 = B2$ • $A1 = A2$. <p>To measure the positions of the units you might apply</p> <ul style="list-style-type: none"> • a tape-measure • optical measuring means, if you want to stay away from the System while it is bearing a load <p>Feel free to apply your own measuring methods.</p>	
<p>2.</p>	<p>If you detect misalignment then move the concerned unit (or units) to restore the rectangular formation. Apply local control or remote control to move the unit.</p> <p> Attention: To prevent worsening the situation:</p> <ul style="list-style-type: none"> • make sure you move the correct Unit(s) • make sure you move it in the correct direction <p>The stability of the system is at stake!</p>	

7.5. Move the load in transversal direction

For moving the load in transversal direction the moving capability of the side shift is applied.

To operate the side shifts simultaneously, proceed as follows:

1.	Apply the RCC	
2.	Verify that all checklists have been completed and signed off: <ul style="list-style-type: none"> • Appendix A "Checklist for planning a lifting operation" • Appendix B "Checklist for installing the System" • Appendix C "Final checks". 	
3.	Verify the power status of the battery [F]; see the figure below.	
4.	Enable all units; use the buttons [4] "Ram select".	
5.	Use [9] "side shift" to move the selected side shift units simultaneously.	

7.6. Tilt the load

It is possible to perform tilt operations with the System.



Note the following aspects:

- Unlike the normal lifting operations, here the **slings** should be kept as **long** as possible, to minimize lateral forces.
- Always apply **four units**.
- Only move **two units at a time**.
The other two units are kept passive.
In the illustration above the red Unit is the active one: it moves towards the blue unit.
The blue unit is passive and stands still.



Hazard

- This operation has an increased risk of dangerous lateral forces.
- Do not use the freewheel function during any lifting operation including tilting operations. The load can swing if those units are moving suddenly after overcoming the friction forces.

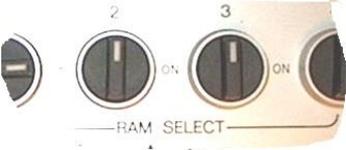


If you want to perform a tilting operation, first contact Enerpac.

An illustrative video of a tilting operation is available on

<https://www.youtube.com/watch?v=rC1toW6ECfU>.

To tilt a load, proceed as follows.

1.	Apply the RCC
2.	Record all activities during the operation using the form given in Appendix D "Recording a lifting operation"
3.	Verify that all checklists have been completed and signed off: <ul style="list-style-type: none"> • Appendix A "Checklist for planning a lifting operation" • Appendix B "Checklist for installing the System" • Appendix C "Final checks".
4.	Select the two 'passive' units on the RCC 
5.	Manoeuvre the header beam of the units attached to the (future) bottom of the load right above the load.
6.	Attach the bottom of the load to the header beam.
7.	De-select the passive units on the RCC
8.	Select the two 'active' units on the RCC
9.	Manoeuvre the header beam of the active units right upon the (future) top of the load.
10.	Attach the header beam to the load.
11.	Extend the cylinder for 5 cm.
12.	Let the units travel towards the passive units in such a way that the lifting eyes of the load are once again directly underneath the header beam.
13.	Verify that the lifting eyes are straight underneath the header beam with in tolerance of 0.2°. Use a plumb line, a laser or a theodolite.
14.	Repeat the steps 11 .. 13 until the load has been tilted completely.

8. Solve problems

This chapter describes localization and solving of problems.

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

8.1. Main problem localization procedure

When during lifting or other use of the System problems occur, follow the steps below to solve the problem.

1. Verify that no **Emergency buttons** is activated
2. Is there an **overload** problem?
Check the displayed Loads on the RCC [E] (see page 73).
Check the heights displayed on the RCC [A], [D] (see page 73)
3. Is there a **technical problem** in one of the Units?
Check the Control Panel of all Units (see page 70):
 - is indicator [6] lit? (power on)
 - is indicator [7] dimmed? (Motor failure)
 - is indicator [8] dimmed? (Side shift overload)
 - is indicator [9] dimmer? (Emergency active)
4. Are hydraulic **leakages** visible?
5. Are there any mechanical **obstructions**?

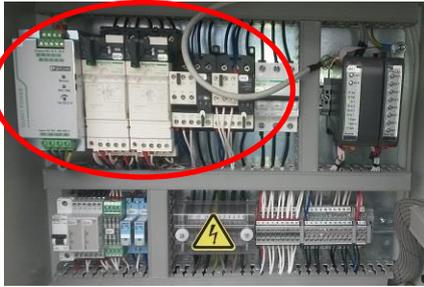
Solve the problem accordingly.

Call Enerpac if you need assistance.

8.2. List of problems and solutions

The table below lists a number of errors and problems which may appear during the use of the System, together with possible causes and solutions.

Symptom	Possible cause	What to do...
Main problems		
Load value “-300” displayed <i>(large negative)</i>	Faulty or loose wiring	Check the wiring Call Enerpac
All units selected, but none moves up	Cylinder at end position?	-
	One of the hydraulic motors stopped	Press the START button [10] on the Control Panel to restart
	Emergency pressed?	Reset the Emergency
All units selected, but only one moves up	Height measurement was not zeroed.	Zero the height measurements using [10] of the RCC.
After switching on the Control Panel of a Unit, the error “communication timeout” is displayed on the RCC	This is normal behaviour due to time needed by the starting-up processes.	Wait for approximately 30 seconds
No display indication after switching on the RCC	Battery is low	Charge the battery for at least 4 hours
Reports on the display of the RCC		
“Emergency pressed”	An Emergency button was pressed, either on one of the Unit or on the RCC.	Reset the emergency
“Communication timeout”	Radio disturbed	Use cable connection
“**” visible behind the RAMs”	No problem	Appears when the cable connection is used
“System not ready”	Initiation message	Wait 20 seconds
“Stroke measurement out of range”	Measurement counter defect	Replace the device
	Wiring fault	Repair the wiring
	Height measurement cable snapped	Check the cable
“Load measurements out of range”	Sensor defect	Replace the sensor or contact Enerpac.
	Fault in the wiring	Check the wiring
“Drive sensor error” <i>(All Units stop driving)</i>	One of the pulse counter defect	Change the sensor or contact Enerpac.  <i>If you do not have a spare sensor, you might remove all driving sensors of all Units. The System will be operational again, BUT WITHOUT DRIVING SAFETY! IT's ON YOUR OWN RISK.</i>
		Too long misalignment between the Units
		One of the Units is obstructed
“Engine still”	Hydraulic pump of the indicated Unit is not running	Push [4] on the Control Panel of the Unit

Symptom	Possible cause	What to do...
"Overload"	Too much weight on one of the cylinders	If on one cylinder: the load is not divided properly over the System Else: reconsider your lifting operation w.r.t. the weight of the Load
Mechanical and electrical problems		
The System does not travel	The two Bolts of the driving motors of the Units are loose	Fasten the bolts
	One of the hydraulic valves is defect	Repair the valve; Contact Enerpac.
The System does not lift	Hydraulic valve defect	Call Enerpac
	Unit is switched off	Use [4] to switch the Unit on
The cylinders raise unequally	Problem with oil flow or leakage.	Contact Enerpac
The System cannot lower the load	Problem with oil flow or leakage.	Contact Enerpac
The Side Shift does not move	Side shift not connected	Connect the Side Shift
	One of the safety relays tripped	Open the Electrical Cabinet and reset the relays indicated with 10QF2. See the picture below. If not successful then Contact Enerpac.
Indicator "Invertor Failure" on the Electrical Cabinet is lit		Try to start the motor, use [4] If not successful the open the Electrical Cabinet and reset the relays indicated with 11QF2; see the figure below. If not successful then Contact Enerpac.
Indicator "Side Shift Overload" on the Electrical Cabinet is lit		Try to start the motor, use [4] If not successful the open the Electrical Cabinet and reset the relays indicated with 10QF2; see the figure below. If not successful then Contact Enerpac.



The table is meant as a first aid kit. Contact Enerpac if you need assistance.



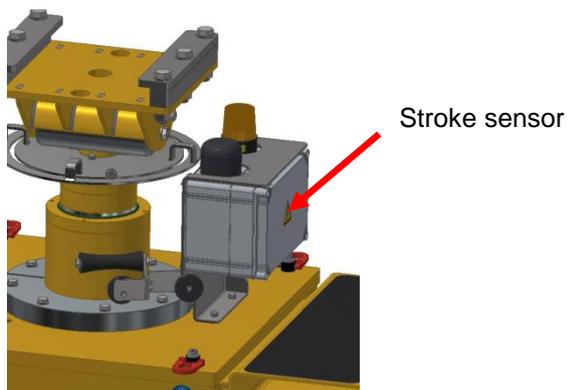
Hazard : Performing repairs on the System may cause dangerous effects when not executed by well-skilled personnel.

9. Storage

Requirements for storage of the System:

- During short-term storage, especially 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.
- Long-term storage:
For long-term storage a dry and closed space is recommended.

Make sure to keep the electronics dry.
Pay special attention to the stroke sensor.



10. Maintenance

Keep the machine in good condition

- to obtain optimum performance from your machine.
- to guarantee the safety of the users, it is important to.

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 intervals are based on **regular use** of the System; which is approximately one lifting operation per month. When the System is intensively or less intensively used, the maintenance intervals will change accordingly.



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

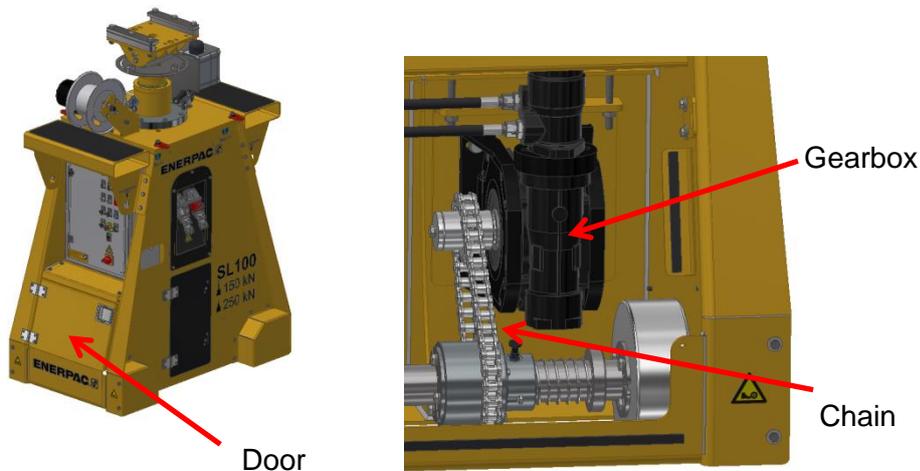
10.1. Mechanical

Perform maintenance on the mechanical part according to the list as shown below.
Record all activities in Appendix E “ Checklist for 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. Main construction									
1.1. Main construction	Visual check of all weldings	O				X			
	Visual check painting	O				X			
	Visual check on corrosion and damages	O			X				
	Check all bolts.	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					
2. Chain of the units									
2.1. Lubricate the chain	Lubricate the chain;					X			
2.2. Tension the chain	Tension the chain;					X			
3. Side shift unit									
3.1. Lubricate the chain	Lubricate the chain;								

10.1.1. Lubricate the chain

A chain connects the gearbox with the drive shaft:

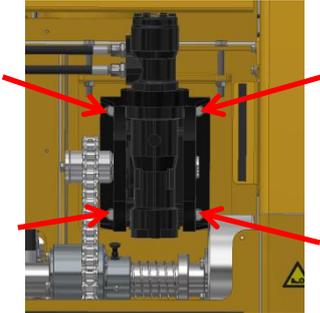


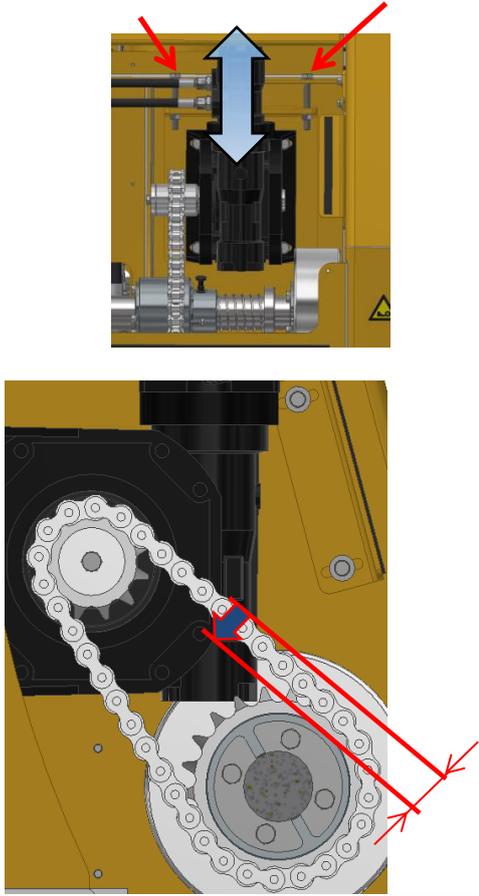
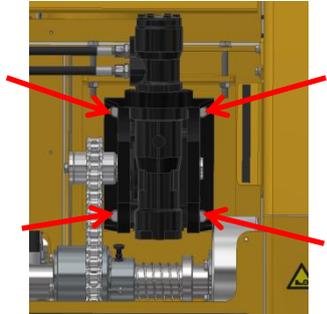
To maintain the drive chain proceed as follows:

1.	Make sure the power supply has been switched of
2.	Open the front door
3.	Visually inspect the chains and the gears
4.	Lubricate the chain with Kroon Oil multi-purpose grease 3
5.	Close the front door

10.1.2. Tension the chain

To tension the drive-chain, proceed as follows:

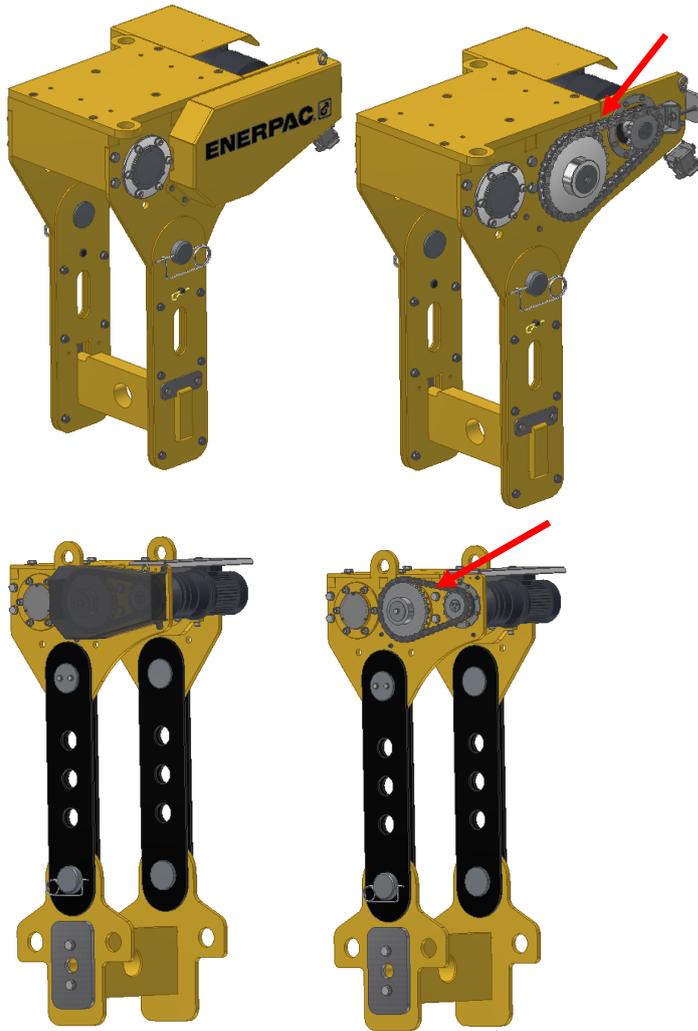
1.	Make sure the power supply has been switched of	
2.	Open the front door	
3.	Loosen the four bolts of the gearbox	

<p>4.</p>	<p>Tension the chain by turning the tensioning bolts.</p> <ul style="list-style-type: none"> • Keep the gearbox level. • The tension is fine when there is 10 mm slack at its mid-point. Use handpower. 	
<p>5.</p>	<p>Tighten the four bolts of the gearbox according to Appendix W "Torque settings"</p>	
<p>6.</p>	<p>Close the front door</p>	

10.1.3. Lubricate the side shift units

The side shift units are provided with chains, which have to be lubricated. Use "Kroon Oil multi-purpose grease 3".

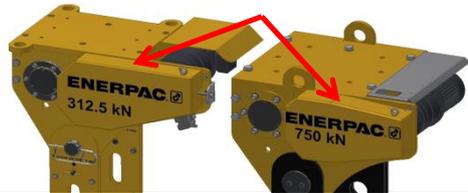
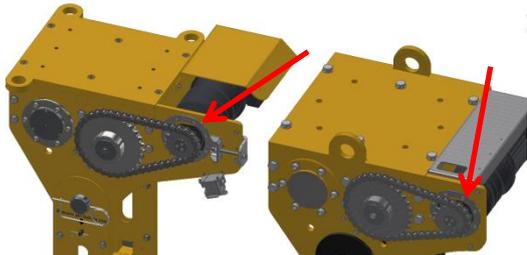
Both types of side shift units are shown below:

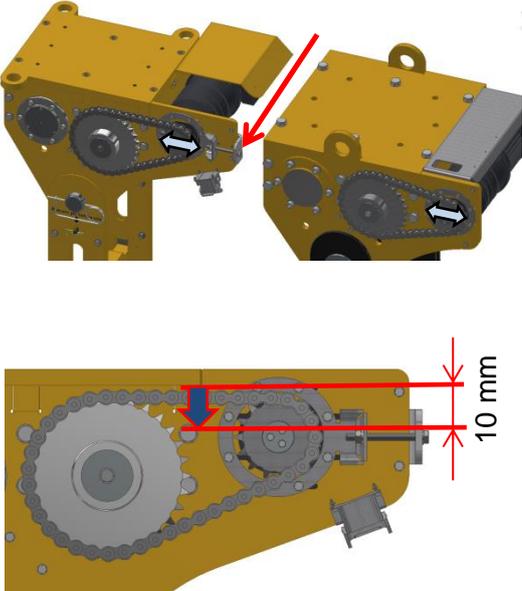
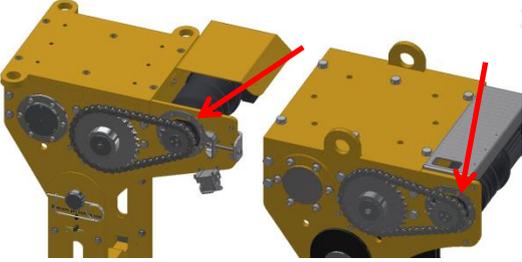


(The bearings of the side shift units were greased for lifetime.)

10.1.4. Tension the chain of the side shift units

To tension the drive-chain, proceed as follows:

1.	Make sure the power supply has been switched of	
2.	Remove the chain cover	
3.	Loosen the bolts of the gearbox and clamping ring	

<p>4.</p>	<p>Tension the chain by turning the tensioning bolts or moving the gearbox backwards.</p> <ul style="list-style-type: none"> • Keep the gearbox level. • The tension is fine when there is 10 mm slack at its mid-point. Use handpower. 	
<p>5.</p>	<p>Tighten the bolts of the gearbox and clamping ring according to Appendix W "Torque settings"</p>	
<p>6.</p>	<p>Mount the chain cover</p>	

10.2. Hydraulic

Perform maintenance on the mechanical part according to the list as shown below.

Record all activities in Appendix E “Checklist for Maintenance”.

For hydraulic fluid safety information sheet, see Appendix F “Enerpac HF95 Hydraulic fluid safety”.

Subject	Action	Person O (Owner) EE (Enerpac expert)	First	8 hours	40 hours	500 hours	2000 hours	10000 hours	Remarks
			40 hours	Daily	Weekly	yearly	2 years	10 years	
1. Hydraulic pump, tank and cooler									
1.1. Pump	Check on oil leakage	O		x					
	Check if the bolts are still tightened	O	x			x			
	Check on damages. Check the paintwork.			x					
	Wipe it clean and free from dust			x					
1.2. Hydraulic tank	Check on oil leakage, damages and paint work	O		x					
	Check if the bolts are still tightened	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	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	O				x			
1.5. Oil	Take an oil sample to analyze	EE					x		Change oil if necessary
	Replace the hydraulic oil. See section 10.2.1 “Drain the oil” and Section 10.2.2 “Filling the tank”.	EE						x	
	Check the oil level	O		x					

1.6. Hydraulic filter	Replace the filter element. See section 10.2.3 "Replace the filter element".	EE				x		x	And if indicated
	Replace the seals of the filter housing	EE						x	
1.7. Breathers	Replace the breather	EE				x			
1.8. Bellhousing	Check on damages	O					x		
	Check if the bolts are still tightened	O	x					x	
	Replace motor pump coupling	EE						x	
1.9. Cooler	Check on oil leakage and damages	O		x					
	Check if the bolts are still tightened	O	x			x			
	Clean the cooler	O				x			
	Measure pressure difference "delta p" at the cooler	EE						x	
2. Hydraulic connections									
2.1. Pipes, hoses and brackets	Check on oil leakage and damages	O		x					
	Check if the couplings are tightened well.	O	x			x			
	Replace all seals within the piping (Walform)	EE						x	
	Replace all hoses	EE					x		
	Replace all plastic brackets	EE					x		
2.2. Couplings and quick-screw couplings	Check on oil leakage and damages	O		x					
	Check if the couplings are tightened well.	O		x		x			
	Replace all seals of the couplings	EE						x	
	Replace fast couplings and screw couplings	EE					x		
2.3. Gauges, measurement sensors	Check on damages	O		x					
	Check the tightening bolts, nuts and components	O		x		x			
	Replace all seals	EE						x	
	Replace all gauges	EE						x	
3. Housing									
3.1. Common	Check on damages and paint	O		x					
	Check if the bolts are still tightened	O	x			x			
	Replace all seals, door seals and inspection hatches	EE						x	
	Grease the hinges and locks	O				x			
	Replace engine feet	EE						x	

4. Cylinders

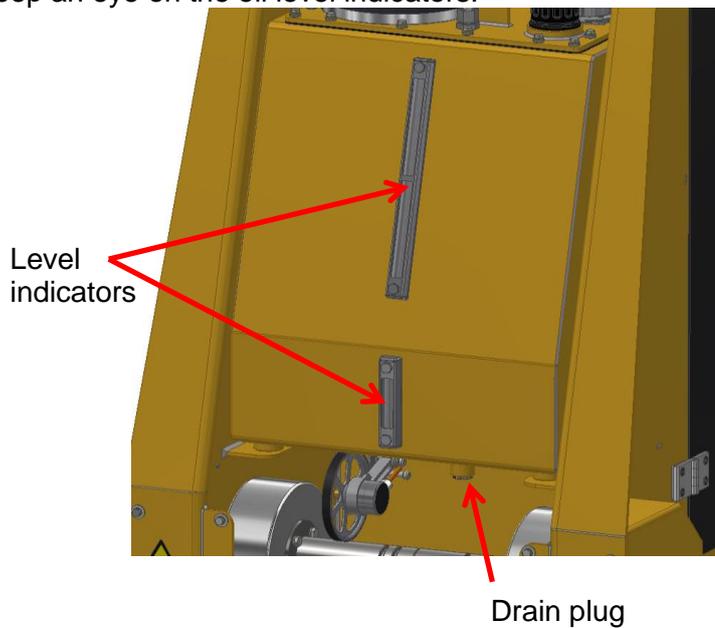
4.1. Common	Check on leakages	O		x				
	Check if the bolts are still tightened	O	x			x		
	Replace all seals	EE					x	
	Grease the bearings	EE			x			

10.2.1. Drain the oil

The oil in the tank has either to be refreshed or a purity test has to be performed. The minimum requirement is that the purity of the medium is in accordance with class 7 of NAS 1638.

Proceed as follows:

1. Ensure that the cylinder is completely retracted
2. Drain the oil from the tank. Use the plug at the downside of the tank. While draining, keep an eye on the oil level indicators.

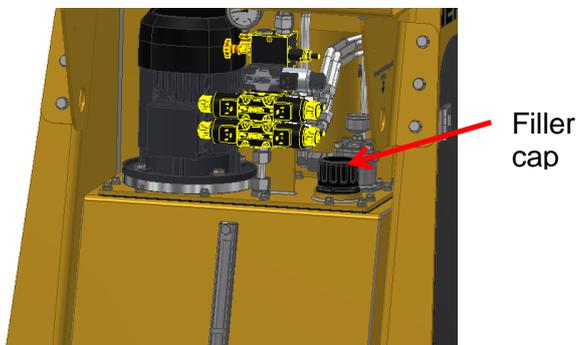


Dispose the oil responsibly

10.2.2. Filling the tank

To fill the tank, proceed as follows:

1. Make sure the Cylinder of the Unit is fully retracted
2. Use the fill/bleed opening to fill the tank with oil.
Use oil type Enerpac HF95



3. Make sure that the oil is free of air by circulating the oil through the system by starting the System and let it run for 10 minutes.

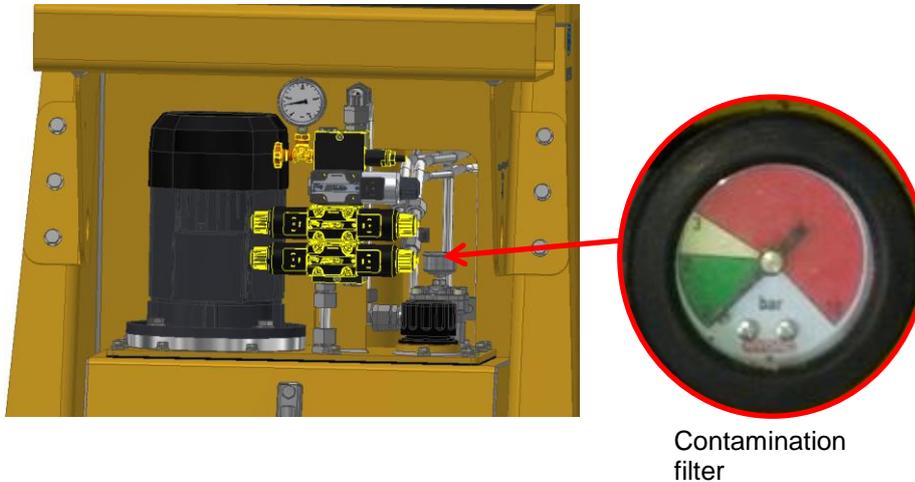


Do not fill the tank over the maximum.

10.2.3. Replace the filter element

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

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



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

The filter element has to be changed:

- When the oil is changed
- When the indicator shows yellow or red
- Once per year

To replace the filter, proceed as follows:

1. Unscrew the return filter cap.
2. Remove the internal filter element
3. Put a new filter element.

To ensure correct operation, only replace with an element with equal brand and type.
Use *Hydac* return filters.

The exact type is listed on the parts list of the machine.

10.3. Electrical

Perform maintenance on the electrics of the system according to the list below.
Record all activities in Appendix E “ Checklist for 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. Cables and connectors									
1.1. General	Check on damages	O		x					
2. Devices and cabinets									
2.1. General	Check on leakages and damages	O		x					
	Check if the bolts and nuts are still tightened	O	x			x			
	Replace all seals	EE						x	
2.2. Main switch	Replace the main switch	EE						x	
2.3. Remote Control devices	Replace the battery	EE					x		

11. Quality

Not applicable

12. Dismantling the system

For dismantling the system at the end of its lifetime regard the following subjects:

- Drain the motor oil and the hydraulic oil
- Dismount the batteries.
- Dismount the electronic and electric components
- Dismount the main metal frame of the system.
Collect the material sort by sort.



Attention: dispose all material in a responsive way.

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Appendices

A. Checklist for planning a lifting operation

1. Project

Project	
Customer	
Location	
Date	

2. Operation type

<input type="checkbox"/>	Lift / lower
<input type="checkbox"/>	Move in longitudinal direction
<input type="checkbox"/>	Move in transversal direction

3. Ground bearing pressure

<input type="checkbox"/>	Allowable pressure on the subsoil. (σ_{toe}) Tonne/_m ²
--------------------------	---	-----------------------------

4. Capacity

<input type="checkbox"/>	Mass of the load	
<input type="checkbox"/>	Lifting height mm
<input type="checkbox"/>	Stage of Extension	1 / 2
<input type="checkbox"/>	Capacity in highest stage kN
	Allowable load: kN
<input type="checkbox"/>	The mass of the load does not exceed the allowable load	
<input type="checkbox"/>	Minimum force per unit is sufficient kN
<input type="checkbox"/>	Maximum force per anchor point does not exceed the capacity of the side shift (<i>if applicable</i>) kN
<input type="checkbox"/>	The force on the applied header beam does not exceed the limits	
	Maximum permissible wind speed	X-direction Y-direction
	 m/sec m/sec
<input type="checkbox"/>	The side load does not exceed 1.5 % of the vertical load	

5. Commitment

Planning by:

Date:

Signature:

Approved by:

Date:

Signature:

B. Checklist for installing the System

1. Project

Project	
Customer	
Location	
Date	

2. Planning

<input type="checkbox"/>	Checklist A "Checklist for planning a lifting operation" completed and signed off
--------------------------	---

3. Foundation

<input type="checkbox"/>	Foundation underneath skid tracks has been put in accordance with the instructions in this manual. <i>If foundation is applied</i>
--------------------------	--

4. Skid tracks

<input type="checkbox"/>	Skid tracks placed according to instructions in manual
<input type="checkbox"/>	Skid tracks aligned according to instructions in manual.
<input type="checkbox"/>	Skid tracks connected according to instructions in manual.

5. Units

<input type="checkbox"/>	Move all units forwards and backwards over a short distance using the RCC, to ensure you have set the positive driving direction correctly.
<input type="checkbox"/>	Slide all cylinders in and out over a short distance. <i>(This assures the communication functions properly.)</i>
<input type="checkbox"/>	Check the status of the battery of the RCC
<input type="checkbox"/>	The stroke sensors are undamaged

6. Header beam

<input type="checkbox"/>	Bolts on the swivel tightened to torque in accordance with instructions in manual
<input type="checkbox"/>	Beam is horizontal (level) on the two units

7. Side shifts

<input type="checkbox"/>	Side shift mounted in accordance with instructions in manual <i>(If applicable)</i>
<input type="checkbox"/>	Move the Side Shifts to the right and the left over a short distance, to assure the correct positive driving direction

8. Visual inspection

<input type="checkbox"/>	Visual inspection: no excessive rust.
<input type="checkbox"/>	No parts of the system are damaged
<input type="checkbox"/>	Visual inspection of the hydraulic components: no oil leakages
<input type="checkbox"/>	Running surfaces of the skid tracks are clean. <i>(Dirt may cause the units to slip)</i>
<input type="checkbox"/>	The units can run freely and are not obstructed.
<input type="checkbox"/>	Inspection of the electrics: electrical cables are undamaged electrical cables cannot be pinched

9. Other equipment

<i>What</i>	<i>Length</i>	<i>Capacity</i>	<i>Mass</i>
Lifting straps			
Chains			
Other			

10. Commitment

Installed by:

Date:

Signature:

Approved by:

Date:

Signature:

C.Final checks

1. Project

Project	
Customer	
Location	
Date	

2. Installation

<input type="checkbox"/>	Checklist B "Checklist for installing the System" has been completed and signed off
--------------------------	---

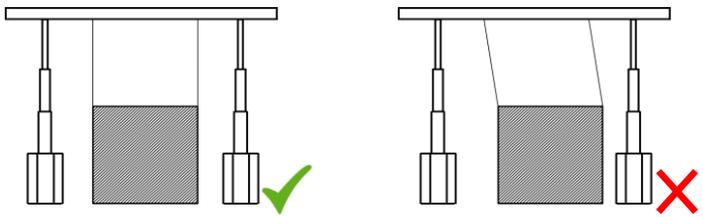
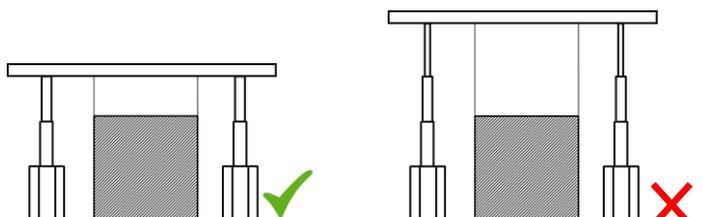
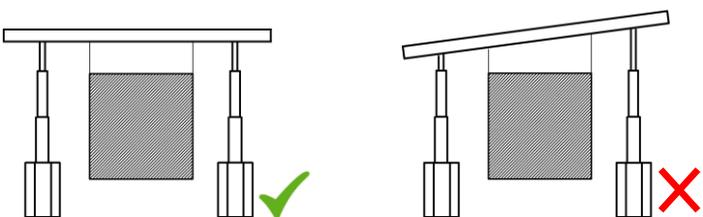
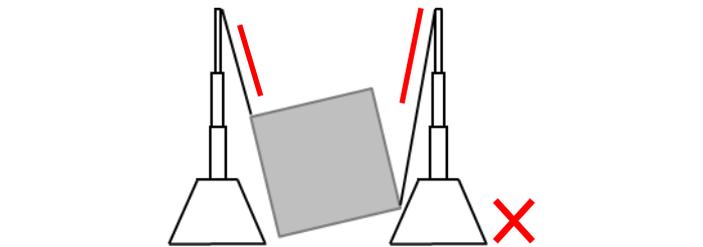
3. Inspect the System

<input type="checkbox"/>	No parts of the portal lift are damaged
<input type="checkbox"/>	No leakages of the hydraulic components
<input type="checkbox"/>	Drop-zone is cordoned off. No people are inside the unsafe zone. Barriers and tape is used.
<input type="checkbox"/>	Running surfaces of the skid tracks are clean.
<input type="checkbox"/>	The units can run freely and are not obstructed.
<input type="checkbox"/>	The weight of the load is indicated on the RCC correctly.
<input type="checkbox"/>	The side-load does not exceed 1.5 % of the vertical load

Part 1/2

Part 2/2

4. Check the load suspension

<input type="checkbox"/>	<p>The anchors on the header beam are in line with the hoisting points of the load.</p>	 <p>(front view)</p>
<input type="checkbox"/>	<p>The lifting straps are short.</p>	 <p>(front view)</p>
<input type="checkbox"/>	<p>The header beams are level</p>	 <p>(front view)</p>
<input type="checkbox"/>	<p>Lifting slings are plumb.</p>	 <p>(side view)</p>

5. Commitment

Inspected by:

Date:

Signature:

Approved by:

Date:

Signature:

D. Recording a lifting operation

1. Project

Project	
Customer	
Location	
Date	

2. Recording of activities

Activity		Time
<input type="checkbox"/>	The checklist in Appendix C “Final checks” has been completed and signed off	
1		
2		
3		
4		
5		
6		
7		
8		

Part 2/3

	Activity	Time
9		
10		
11		
12		
13		
15		
16		
17		
18		

3. Commitment

Executed by:

Date:

Signature:

Approved by:

Date:

Signature:

E. Checklist for Maintenance

1. Recording of activities

Record the executed maintenance in the tables below:

a. Mechanical:

Subject	Action	Person	Date
1. Main construction			
1.1. Main construction	Visual check of all weldings		
	Visual check painting		
	Visual check on corrosion and damages		
	Check all bolts.		
	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		
2. Chain of the units			
2.1. Lubricate the chain	Lubricate the chain		
2.2. Tension the chain	Tension the chain		
3. Side shift unit			
3.1. Lubricate the chain	Lubricate the chain;		
3.2. Tension the chain	Tension the chain		

b. Hydraulical:

Subject	Action	Person	Date
1. Hydraulic pump, tank and cooler			
1.1. Pump	Check on oil leakage, damages and paint work		
	Check if the bolts are still tightened		
	Check on damages		
	Wipe it clean and free from dust		
1.2. Hydraulic tank	Check on oil leakage, damages and paint work		
	Check if the bolts are still tightened		
	Replace all seals		
	Replace the level gauges Drain the tank (water and sludge)		
1.3. Valves	Check on oil leakage and damages		
	Check if the bolts are still tightened		
	Replace all seals Check all valve settings		
1.4. Manifolds	Check on oil leakage and damages		
	Check if the bolts are still tightened		
1.5. Oil	Take an oil sample to analyze		
	Replace the hydraulic oil.		
	Check the oil level		
1.6. Hydraulic filter	Replace the filter element.		
	Replace the seals of the filter housing		
1.7. Breathers	Replace the breather		
1.8. Bellhousing	Check on damages		
	Check if the bolts are still tightened		
	Replace motor pump coupling		
1.9. Cooler	Check on oil leakage and damages		
	Check if the bolts are still tightened		
	Clean the cooler		
	Measure pressure difference “delta p” at the cooler		
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 (Waldform)		
	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. Housing			
3.1. Common	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		
	Replace engine feet		
4. Cylinders			
4.1. Common	Check on leakages		
	Check if the bolts are still tightened		
	Replace all seals		
	Grease the bearings		

c. Electric:

Subject	Action	Person	Date
1. Cables and connectors			
1.1. General	Check on damages		
2. Devices and cabinets			
2.1. General	Check on leakages and damages		
	Check if the bolts and nuts are still tightened		
	Replace all seals		
2.2. Main switch	Replace the main switch		
2.3. Remote Control devices	Replace the battery		

F. Enerpac HF95 Hydraulic fluid safety data sheet

HF-95 Hydraulic oil

Safety Data Sheet

according to Regulation (EC) No. 453/2010

Date of issue: 02/03/2004

Revision date: 10/02/2015

Supersedes: 24/02/2012

Version: 4.0

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product form	:	Mixture
Product name.	:	HF-95 Hydraulic Oil
Product group	:	Blend

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

1.2.1. Relevant identified uses

Main use category	:	Industrial use, Professional use, Consumer use
Industrial/Professional use spec.	:	Non-dispersive use Used in closed systems
Function or use category	:	Lubricants and additives

1.2.2. Uses advised against

No additional information available

1.3. Details of the supplier of the safety data sheet

Enerpac B.V.
 P.O. Box 8097, 6710 AB EDE
 THE NETHERLANDS
 Tel: +31(0)318 535911

1.4. Emergency telephone number

Emergency number	:	0032 (70) 245 245
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SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP]
 Not classified

Classification according to Directive 67/548/EEC or 1999/45/EC
 Not classified

Adverse physicochemical, human health and environmental effects
 No additional information available

2.2. Label elements

Labelling according to Regulation (EC) No. 1272/2008 [CLP] EUH phrases	:	EUH210 - Safety data sheet available on request
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2.3. Other hazards

No additional information available

SECTION 3: Composition/information on ingredients
3.1. Substances

Not applicable

3.2. Mixture

Name	Product identifier	%	Classification according to Directive 67/548/EEC
Baseoil - unspecified	(CAS No) 64742-55-8 (EC no) 265-158-7	1 - 25	Not classified
Zinkalkyldithiophosphate	(CAS No) 68649-42-3 (EC no) 272-028-3 (REACH-no) 01-2119493635-27	0,1 - 0,5	Xi; R41 Xi; R38 N; R51/53
2,6-Di-tert-butylphenol	(CAS No) 128-39-2 (EC no) 204-884-0	0,1 - 0,25	Xi; R38 N; R50/53

Name	Product identifier	%	Classification according to Regulation (EC) No. 1272/2008 [CLP]
Baseoil - unspecified	(CAS No) 64742-55-8 (EC no) 265-158-7	1 - 25	Asp. Tox. 1, H304
Zinkalkyldithiophosphate	(CAS No) 68649-42-3 (EC no) 272-028-3 (REACH-no) 01-2119493635-27	0,1 - 0,5	Eye Dam. 1, H318 Aquatic Chronic 2, H411
2,6-Di-tert-butylphenol	(CAS No) 128-39-2 (EC no) 204-884-0	0,1 - 0,25	Skin Irrit. 2, H315 Aquatic Acute 1, H400 Aquatic Chronic 1, H410

Full text of R-, H- and EUH-phrases: see section 16

SECTION 4: First aid measures
4.1. Description of first aid measures

First-aid measures after inhalation	:	Not expected to require first aid measures.
First-aid measures after skin contact	:	Wash skin with mild soap and water.
First-aid measures after eye contact	:	In case of eye contact, immediately rinse with clean water for 10-15 minutes.
First-aid measures after ingestion	:	Do not induce vomiting. Rinse mouth. Get immediate medical advice/attention.

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

Symptoms/injuries after inhalation	:	Not expected to present a significant inhalation hazard under anticipated conditions of normal use.
Symptoms/injuries after skin contact	:	Not expected to present a significant skin hazard under anticipated conditions of normal use.
Symptoms/injuries after eye contact	:	Not expected to present a significant eye contact hazard under anticipated conditions of normal use.
Symptoms/injuries after ingestion	:	Not expected to present a significant ingestion hazard under anticipated conditions of normal use.

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

No additional information available

SECTION 5: Firefighting measures
5.1. Extinguishing media

Suitable extinguishing media	:	Water fog. Foam. Powder. Dry chemical product.
Unsuitable extinguishing media	:	Do not use a heavy water stream.

5.2. Special hazards arising from the substance or mixture

No additional information available

5.3. Advice for firefighters

Precautionary measures fire	:	Exercise caution when fighting any chemical fire.
Firefighting instructions	:	Use water spray or fog for cooling exposed containers.
Protection during firefighting	:	Do not enter fire area without proper protective equipment, including respiratory protection.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel		
Protective equipment	:	Wear suitable protective clothing and gloves.

6.1.2. For emergency responders

Protective equipment	:	Wear suitable protective clothing and gloves.
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6.2. Environmental precautions

Prevent entry to sewers and public waters. Notify authorities if product enters sewers or public waters.

6.3. Methods and material for containment and cleaning up

For containment	:	Impound and recover large spill by mixing it with inert granular solids.
Methods for cleaning up	:	Detergent. Take up liquid spill into absorbent material sand, saw dust, kieselguhr.
Other information	:	Spill area may be slippery. Use suitable disposal containers.

6.4. Reference to other sections

No additional information available

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Precautions for safe handling	:	Avoid all unnecessary exposure. Both local exhaust and general room ventilation are usually required.
Handling temperature	:	< 40 °C
Hygiene measures	:	Wash hands and other exposed areas with mild soap and water before eat, drink or smoke and when leaving work.

7.2. Conditions for safe storage, including any incompatibilities

Storage temperature	:	< 40 °C
Storage area	:	Store in dry, cool, well-ventilated area.

7.3. Specific end use(s)

No additional information available

SECTION 8: Exposure controls/personal

8.1. Control parameters

	:	5 mg/m ³ for oil mists (TWA, 8h-workday) recommended, based upon the ACGIH TLV (Analysis according to US NIOSH Method 5026, NIOSH Manual of Analytical Methods, 3rd Edition).
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8.2. Exposure controls

Personal protective equipment	:	Safety glasses. Gloves.
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Hand protection	:	Wear suitable gloves resistant to chemical penetration.
Skin and body protection	:	No special clothing/skin protection equipment is recommended under normal conditions of use.
Respiratory protection	:	No special respiratory protection equipment is recommended under normal conditions of use with adequate ventilation.

SECTION 9: Physical and chemical properties
9.1. Information on basic physical and chemical properties

Physical state	:	Liquid
Appearance	:	Oily liquid.
Colour	:	Blue
Odour	:	Characteristic.
Odour threshold	:	No data available
pH	:	No data available
Relative evaporation rate (butylacetate=1)	:	No data available
Melting point	:	No data available
Freezing point	:	No data available
Boiling point	:	No data available
Flash point	:	> 180 °C @ ASTM D92
Self ignition temperature	:	No data available
Decomposition temperature	:	No data available
Flammability (solid, gas)	:	No data available
Vapour pressure	:	No data available
Relative vapour density at 20 °C	:	No data available
Relative density	:	No data available
Density	:	872 kg/m ³ @ 15°C
Solubility	:	Slightly soluble, the product remains on the water surface.
Log Pow	:	No data available
Viscosity, kinematic	:	32 mm ² /s @ 40°C
Viscosity, dynamic	:	No data available
Explosive properties	:	No data available
Oxidising properties	:	No data available
Explosive limits	:	No data available

9.2. Other information

No additional information available

SECTION 10: Stability and reactivity
10.1. Reactivity

None under normal conditions.

10.2. Chemical stability

Stable under normal conditions.

G. 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
	10.9	420	460
	12.9	500	530
M22	8.8	400	430

Nominal size	Strength class	Course pitch [Nm]	Fine pitch [Nm]
		(Copper-grease)	(Copper-grease)
M22		0.08	0.08
	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

Z. Compatible accessories

Gantry	Load chart	GA Drawing	Name	Gauge [mm]	Max height [mm]	Max capacity [kN]
03730.01.00.00	ED.03730.70.001	03730.50.00.00	SL100	610	4750	250
03731.01.00.00	ED.03731.70.001	03646.50.00.00	SL200	610	6700	500

Headerbeams	Load chart	GA Drawing	Name	Length [m]	Height [mm]	Width [mm]
03645.01.00.00	ED.03645.70.001	03645.50.00.00	HBSL 125-6	6	432	307
03646.01.00.00	ED.03646.70.001	03646.50.00.00	HBSL 125-8	8	524	306
03817.01.00.00	ED.03817.70.001	03817.50.00.00	HBSL 200-8	8	572	306
03647.01.00.00	ED.03647.70.001	03647.50.00.00	HBSL 125-10	10	668	305
03648.01.00.00	ED.03648.70.001	03648.50.00.00	HBSL 125-12	12	716	305
02939.01.00.00	ED.02939.70.001	02939.50.00.00	HBSBL -6	6	600	480
02843.01.00.00	ED.02843.70.001	02843.50.00.00	HBSBL -8	8	600	480
02940.01.00.00	ED.02940.70.001	02940.50.00.00	HBSBL -10	10	600	480
03302.01.00.00	ED.03302.70.001	03302.50.01.00	HBSBL -12	12	950	480

Beam skidding units	GA Drawing	Name	Capacity per anchor [kN]
03697.01.00.00	03697.50.00.00	BSSL125	312.5
03697.01.04.00	03697.50.04.00	Top Swivel BSSL125	312.5
03636.01.00.00	03636.50.00.00	BSSBL300	750
03636.01.11.00	03636.50.11.00	Sling Tool BSSBL300	750
03636.01.10.00	03636.50.10.00	Top Swivel BSSBL300	750
03636.01.12.00	03636.50.12.00	Rotation Anchor BSSBL300	750
03530.01.00.00	03530.50.00.00	BSSBL600	1500

Lifting Lugs	GA Drawing	Name	Hole height [mm]	Hole width [mm]	Capacity per anchor [kN]
03817.01.00.00-03	03817.50.00.00-03	LLSL200-8	582	320	500
03647.01.00.00-03	03647.50.00.00-03	LLSL125-10	678	320	312.5
03648.01.00.00-03	03648.50.00.00-03	LLSL125-12	730	320	312.5
02940.01.02.00	02940.50.02.00	LLSBL250	1100	490	2500
02940.01.02.00-01	02940.50.02.00-01	LLSBL125	1100	490	1250

Skid tracks	GA Drawing	Name	Gauge [mm]	Length [mm]	Gantry Type
02913.01.01.01	02913.50.01.01	STSL125-6	612	6000	SL100
02913.01.01.02	02913.50.01.02	STSL125-3	612	3000	SL100

03818.01.01.00	03818.50.01.00	STSL200-6	610	5900	SL100 / SL200 / SL300
03818.01.02.00	03818.50.02.00	STSL200-3	610	3000	SL100 / SL200 / SL300