Instruction- and Maintenance Manual
Trolley system

Document Number:
ED.03884.00.001.ENG
rev02

Status:
Final

Original instructions

ETR50
ETR100

50 tons
100 tons

ENERPAC
HEAVY LIFTING TECHNOLOGY

www.enerpac.com

Revisions

Revision	Description	Date	Author	Checked	Approved by
Rev. 00	Initial version	12 May 2021	D. Rosier	M. Schreur	R. Broenink
Rev. 01	Added Cube jack lifting requirements	1 June 2021	M. Schreur	F. Schiphorst	R. Broenink
Rev. 02	Added Track alignment requirement	8 June 2021	M. Schreur	H. Frankema	R. Broenink

Preface

Dear customer,

This is the manual for assembling, using and maintaining of the trolley systems ETR50 and ETR100.
The trolley systems do have a lot in common; the differences are indicated clearly.
In this manual, the trolley systems are 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.

NB: 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 situation existing at the **time of publication**.
- 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.
- Even though the fact that this manual has been drafted with great care, we **cannot guarantee** that it does not contain any errors.
- The use interpretation and use of all information in this document and possible consequences through improper use of the system are wholly the **responsibility of the user**. Enerpac shall under no circumstances accept any responsibility for such improper use.

Pictures and illustrations in this manual may differ from reality.
Within this document use is made of structured text. The following conventions are applied:

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

Example:

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

We are interested in improving our documentation, and we welcome your comments and suggestions. If you have any difficulties using this manual, discover an error, or just want to provide some feedback, contact us. Please include the handbook code as shown at the front page.

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

Enerpac.

Contents

1. Introduction

1.1. Manufacturer address

Enerpac Heavy Lifting Technology B.V.
Zuidelijke Havenweg 3,
7554 RR Hengelo (Ov)
The Netherlands
Tel. +31 74 242 20 45
Fax. +31 74 243 03 38
Email: info.hengelo@enerpac.com
Website: www.enerpac.com

1.2. Declaration

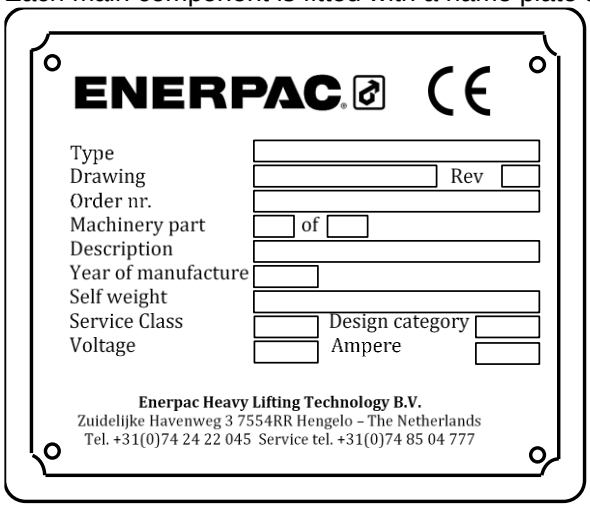
Declaration of Conformity according to Machine Directive 2006/42/EC.
For the EC Declaration of Conformity reference is made to ref [5] “EC Declaration of conformity” which is part of the product delivery.

1.3. Referenced documents

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.	Remote Control unit	LIA08E00-04	Autec
5.	Cube jack system	ED.03783.00.001 latest revision	Enerpac

1.4. Identification

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



NB: 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 with 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 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, in particular listed in section 3.1. “General”.
- 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.

The System is intended for moving a load which is put on top of the trolleys.
Do not use the System for any other purpose.

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 should meet the technical specifications given by Enerpac.
Apply **original spare parts** as these parts are made according to the technical specification of Enerpac.
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 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 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 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.

1.8.1. The owner of the system

The responsibilities of the owner of the system are:
a) to make sure the system meets the requirements as given in this manual as well as specific job requirements defined by the user,
b) to make sure the system and all necessary components, specified by the manufacturer, meet the user's requested configuration and capacity,
c) to provide the applicable capacity charts to the user,
d) to provide this manual to the user to enable correct assembly, disassembly, operation and maintenance information,
e) to make sure all inspections and maintenance activities are performed,
f) to designate personnel for maintenance, repair, transport, assembly, and disassembly,
g) and to designate 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) to comply with the requirements of this manual and all regulations applicable at the work site,
b) to use supervisors for activities,
c) to ensure that the system is in proper operating condition, prior to initial use at the worksite by
    a. verifying that the Owner has provided this manual,
    b. and verifying that a frequent inspection has been performed,
d) to verify that the system has the necessary capacity to perform the proposed operations in the planned configuration,
e) to ensure the assigned operators have been notified of adjustments or repairs that have not yet been completed, prior to commencing operations,
f) to designate personnel for inspections as required in the applicable chapter,
g) to designate personnel for maintenance, repair, transport, assembly, and disassembly,
h) to ensure that all personnel involved in maintenance, repair, transport, assembly, disassembly, and inspection are aware of their responsibilities, assigned duties, and the associated hazards,
i) and to ensure 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:
1. ensuring that the system meets the requirements prior to initial site usage.
2. determining if additional regulations or requirements are applicable.
3. ensuring that a qualified person is designated as the system director.
4. ensuring that the operations are coordinated with other jobsite activities that will be affected by or will affect the operations.

5. ensuring that the area for the system is adequately prepared. The preparation includes, but is not limited to, the following:
    a. access for the system and associated equipment.
    b. sufficient room to assemble and disassemble the system.
    c. 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.
    d. traffic control as necessary to restrict unauthorized access to the system's working area.
    e. ensuring that work involving the assembly and disassembly of system is supervised by a qualified person.
    f. ensuring that operators meet the physical, knowledge, and skill requirements as described in this manual.
    g. 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 wind
        - weather conditions
        - extreme temperatures
        - inadequate lighting
        - operating surface conditions
        - excessive noise proximity to energized sources (e.g., power 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
    - informing the system operator of the weight and planned movement of the loads to be handled.
    - obtaining the system operator's verification that this weight does not exceed the system's rated load.
    - ensuring that load rigging personnel have been designated for the system.
    - ensuring that the load is properly rigged and stable.

1.8.5. The operators

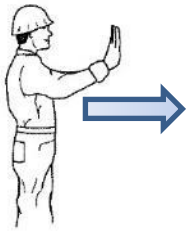
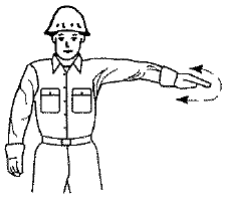
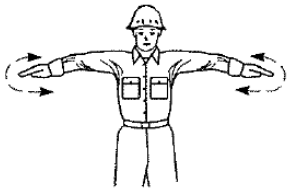
The system Operator shall be responsible for the following listed items.
The system Operator shall not be responsible for hazards or conditions that are not under his direct control and that adversely affect the system operations.
Whenever the system Operator has doubt as to the safety of operation, 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 of rigging and basic rigging procedures. Ensuring that the load is properly secured and will be lifted safely.
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 may be applied when using the system:

TRAVEL. Arm extended forward, hand open and slightly raised, make pushing motion in direction of travel.		STOP. Arm extended, palm down, move arm back and forth horizontally.	
END EVERYTHING. Clasp hands in front of body.		INDIVIDUAL TROLLEYS Hold up: one finger for trolley marked: "1," Two fingers for trolley marked "2", etc. Regular signals follow.	
EMERGENCY STOP. Both arms extended, palms down, move arms back and forth horizontally.			

1.10. Lifetime

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

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

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 indicate the most common used labels in industrial documents.

NB: to highlight important **work activities** and for **additional information**

Caution: if failure to heed the given instructions may result in **damage to the system.**

Attention: a general warning to the operator of potential damage to **equipment** and the **environment.**

Hazard: to indicate potential **hazards to personnel** if work instructions are not followed precisely.

2. General safety aspects

This chapter contains general safety aspects.
Specific safety directions are mentioned in other chapters.

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 jewellery**. 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 it surroundings.
- Keep the 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 **concentration** 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 shows the most common used warning symbols in industrial environments.

Danger of contact with moving machine parts

Danger of lethal voltage in the control panels

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

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

Danger do not step up

The table below shows the most common symbols of **mandatory signs** in industrial environments:

Read the instruction manual.

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

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

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

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

NB:

- 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 signs applied to the machine.

2.4. Welding work

- Welding, cutting and grinding work on the System is only permitted with the **prior written consent** of 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
  - 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 sure that no ports have been **switched** during re-installation work.
- All parts and the length and quality of hoses meet the requirements of Ref 3 “General rules and safety requirements for systems and their components”.

2.7. Fire

The course of action in the event of an emergency is determined by the rules and regulations applicable on the worksite. Every company has its own special rules. So make 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 rendezvous point.

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

2.8. Working with hazardous substances

It is thought that special first aid procedures are required in cases of accidents with chemicals.

But in cases of small quantities, standard measures suffice:
- rinse thoroughly with water
- wash with soap
- provide fresh air
- remove any contaminated clothing

In common the following rules are applicable:
- Contact with skin:
  - rinse thoroughly with water
  - remove any contaminated clothing
  - wash the relevant body parts with soap.
- Contact with eyes:
  - rinse thoroughly with water (10 till 15 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 (TREMCARD 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 D "Hydraulic fluid safety information" of this manual.

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

Symbol	General hazard indication	Possible precautionary measures
	May cause an allergic reaction on the skin.	Contaminated work clothing must not leave the workspace.
	Harmful to aquatic organisms, with long term effects	Do not discharge into the environment.
	Causes serious eye injury and/or damage to the skin.	Wear eye protection and skin protection (such as protective gloves).

[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
	Fire hazard when heated and/or in presence of sparks.	Keep away from heat, sparks, open flames and/or hot surfaces. No smoking!
	May cause fire (oxidising agent).	Take the necessary precautionary measures to prevent mixture with flammable substances.
	Toxic in cases of ingestion and/or skin penetration	Do not eat, drink or smoke when using this product.
	May cause hypersensitivity of the airways or heritable mutations in male reproductive cells, is a potential carcinogen and/or is toxic to human reproduction	Apply a strict hygiene/health policy and wear suitable personal protection equipment.
	Explosion hazard when heated and/or in presence of sparks	Keep away from heat, sparks, open flames and/or hot surfaces. No smoking!
	Contains a gas under pressure. May explode if heated	Keep out of sunlight. Store in a well-ventilated space.

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.
- 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 connections when the System has to be moved, even if it is for only a short distance.
- To avoid damage during transport, **use timbers**, gummies and plastic packaging to prevent this.

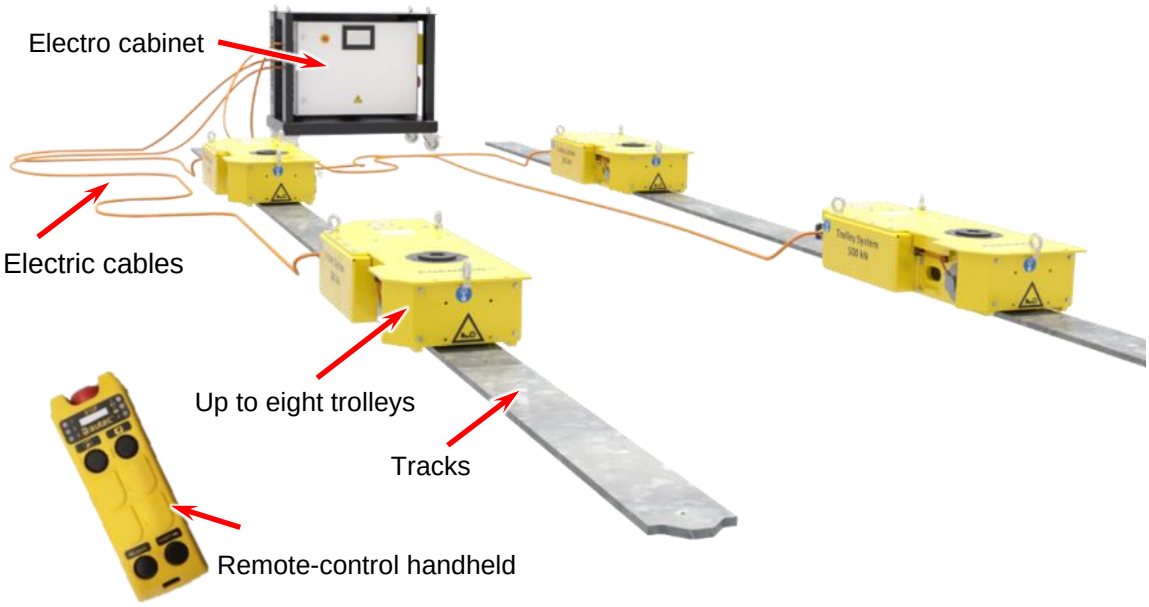
- **Containers** may be used for transport, since they provide rigid protection against and avoid weather influences. Make sure that all parts are secured against sliding around.

3. System Overview

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

3.1. General

The system consists of one electro cabinet and up to eight trolleys.



The system can move a heavy load:

- In **longitudinal direction** by travelling along the tracks.
- In **vertical direction**:
  - Over a few centimetres, by applying an internal hydraulic cylinder.
  - Over a long distance by positioning a cube jack system (see ref 5 “Cube jack system”) on top of the trolleys.

Some more technical properties:

- The movements of the trolleys are **synchronised** automatically.
- The **electro cabinet** contains all electrics to control the electromotors of all trolleys. It is provided with a screen on the front panel.
- Each trolley is connected to the electro cabinet by one **cable**, which provides both power and control signals.
- For moving in longitudinal direction use is made of the **remote-control handheld**, which is **wireless** connected to the Electro cabinet. The system can also be controlled locally by the controls on the electro cabinet, which is useful in case the remote-control fails, and for maintenance purposes.
- The ETR50 trolleys run on single set of tracks.
  The ETR100 trolleys run on double set of tracks.

ETR50

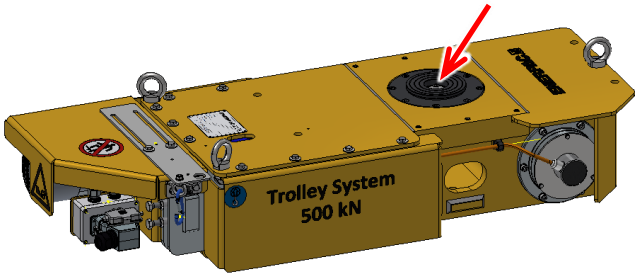
ETR100

3.2. Configuration kits

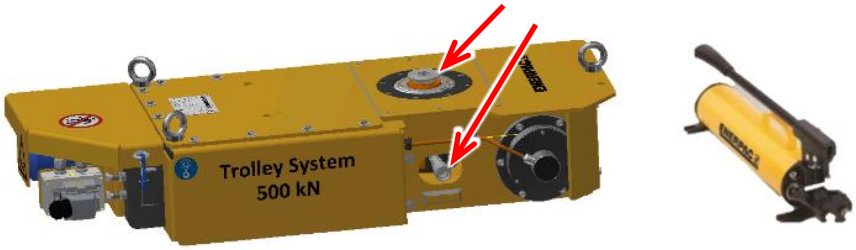
The trolleys can be provided with configuration kits. The Various kits and article numbers are listed in Appendix Z.

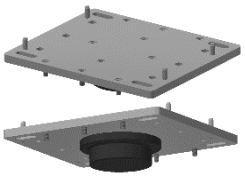
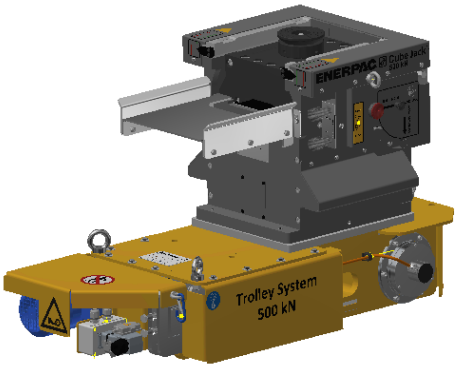
Two axes swivel kit	The swivel can move in two directions (2D). To be used when header beams are put on top of the trolleys	

Three-axes swivel kit	The swivel can move in three directions (3D). To be used when the load is put directly on top of the trolleys	



Hydraulic kit	Mounted inside the trolley. To be used to lift a load over a few centimetres. Use is made of your own hydraulic power means, for instance a hydraulic handpump.	



cube jack mounting kit	Mounted on top of the trolley. To be used to enable mounting a cube jack system. See ref 5 “Cube jack system”.	
		

3.3. Transport frames

Transport frames are available for the ETR50 and the ETR100 types.

- Transport frames for the ETR50 can contain two trolleys.
- Transport frames for the ETR100 can contain one trolley.

The frames can be piled.

ETR50 transport frame

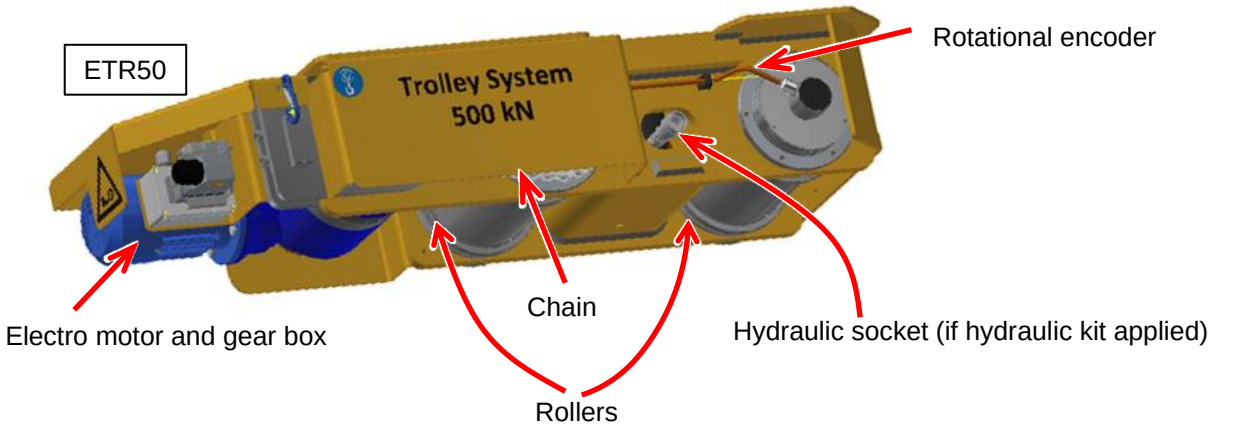
ETR50 piled

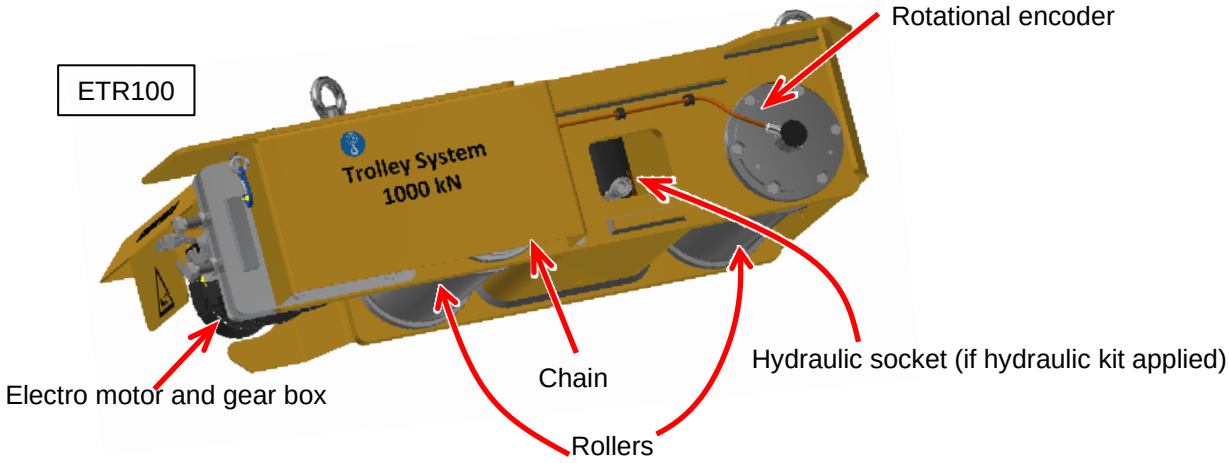
- Transport frames for the track plates.
  A frame can contain 20 short track plates or 20 long track plates.

3.4. Main parts

3.4.1. The trolley

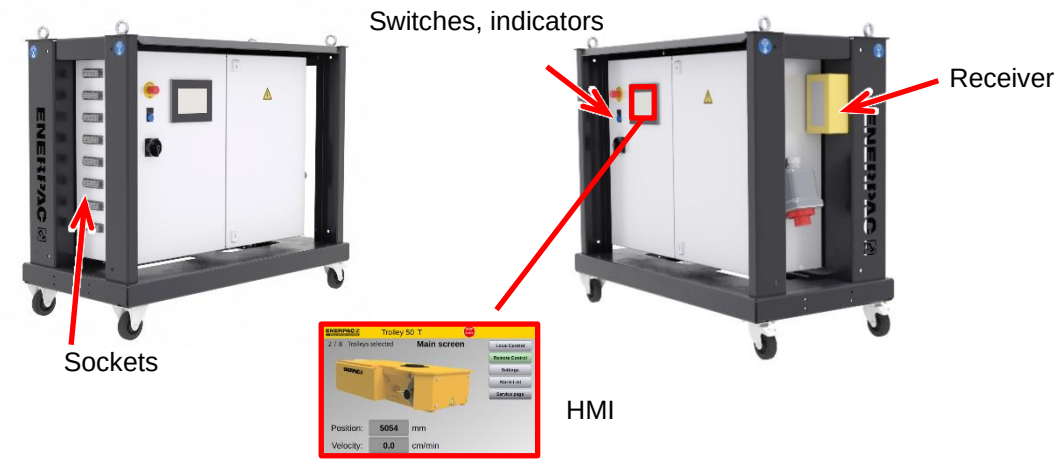
The pictures below indicate the main parts of the ETR50 trolley and the ETR100 trolley.





The trolley runs on the track by two **rollers**. The rollers are provided with rims to keep track.
The **electro motor** propels the front rollers by the **gear box** and the **chain**.
The **rotational encoder** measures the **travelled distance**. This is used to keep the positions of all trolleys synchronised automatically.

3.4.2. The electro cabinet



The **electro cabinet** contains the electrics to control the electro motors of the trolleys.
There are **sockets** for eight trolleys.
On the front side of the cabinet **switches** and **indicators**, as well as the **HMI screen.**
The **receiver** performs the wireless communication with the remote-control handheld.

3.4.3. The remote-control handheld

The remote-control handheld enables controlling of moving in horizontal direction of the trolleys.
The device is wireless connected to the electro cabinet.
The battery is charged with the charger.

The remote-control handheld is provided with a key, which must be mounted before operation.
The key is stowed behind the battery.

3.4.4. Tracks

Two types of tracks are available:

- Short type
  Length 1495 mm

- Long type
  Length 2995 mm

3.5. System specifications

3.5.1. Main Specifications

Specification of the power source				
Voltage	380 to 480 V AC/ 3-phase The units feature automatic phase detection according to the rotation direction of the electric.			
Frequency	50-60 Hz			
Plug	5 pins			
Current per trolley	3 A			
Fuse	32 A			
Power per trolley	ETR50	0,55 kW		
	ETR100	0,75 kW		
Temperatures				
Operating	System incl Remote-control handheld	Min	-10°C **NB:** Below 0^0 the battery of remote-control has half capacity	
		Max	+50°C	
	Hydraulic oil	Min	start up	-20°C
		Min	operation	+10°C
		Max	operation	+70°C
Storage	System	Min	-25°C	
		Max	+60°C	
	Remote-control handheld	Min	-25°C	
		Max	+45°C	
Remote-control handheld				
Operating time	40 hours at 20^0C			
Hydraulic oil (only for hydraulic kit)				
Type	Enerpac Shell Tellus S4VE46			
Minimum requirement	The purity of the medium is in accordance with: - class 10 of NAS 1638 - class 21/19/16 of ISO DIS 4406			
Volume	ETR50 with hydraulic kit	0,393 l		
	ETR100 with hydraulic kit	1,430 l		
Noise pressure				
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)*		72 dB(A)		

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

3.5.2. Functional specifications

The table shows the operational specifications of the system.

3.5.2.1. ETR50

Moving directions of the load		
Horizontally	By moving along the tracks	
Vertically	ETR50 with hydraulic kit	By extending the cylinders
	ETR50 with cube jack	See ref 5 "Cube jack system"
Velocities		
Travelling speed	High speed	≈100 meter/hour
	Nominal speed	≈ 50 meter/hour
	Low speed	≈ 25 meter/hour
Lifting capacity		
ETR50 ETR50 with hydraulic kit ETR50 with cube jack	500 kN	
Lifting height		
ETR50 with hydraulic kit		0 mm – 50 mm
ETR50 with cube jack when driving		Maximum height 2 cribbing block + top block
ETR50 with cube jack when stand still		Maximum height 5 cribbing block + top block

NB: the stability of the cube jack system is highly influenced by the trolley. It is prohibited to drive the trolley when more than 2 cribbing blocks have been entered.

Attention: A maximum height when driving is allowed with the cube jack configuration.

3.5.2.2. ETR100

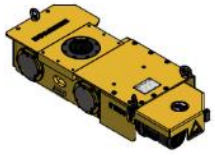
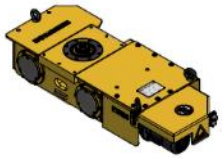
Moving directions of the load		
Horizontally	By moving along the tracks	
Vertically	ETR100 with hydraulic kit	By extending the cylinders
	ETR100 with cube jack	See ref 5 "Cube jack system"
Velocities		
Travelling speed	High speed	≈100 meter/hour
	Nominal speed	≈ 50 meter/hour
	Low speed	≈ 25 meter/hour
Lifting capacity		
ETR100 ETR100 with hydraulic kit ETR100 with cube jack		1000 kN
Lifting height		
ETR100 with hydraulic kit		0 mm – 100 mm
ETR100 with cube jack when driving		Maximum height 3 cribbing block + top block
ETR100 with cube jack when stand still		Maximum height 8 cribbing block + top block

NB: the stability of the cube jack system is highly influenced by the trolley. It is prohibited to drive the trolley when more than 3 cribbing blocks have been entered.

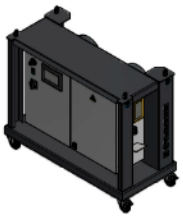
Attention: A maximum height when driving is allowed with the cube jack configuration.

3.6. Dimensions

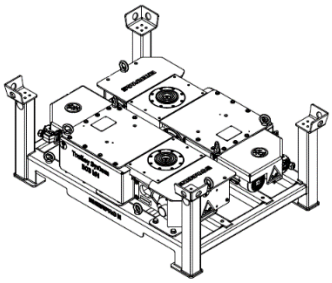
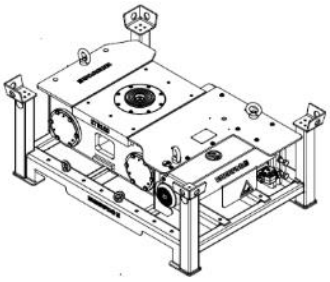
The dimensions of the trolleys are given below.

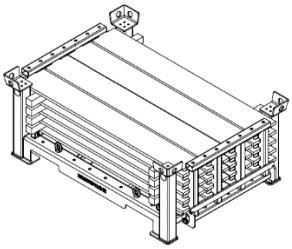
	ETR50	ETR50 with hydraulic kit
Trolleys ETR50		
	Length: 1245 mm Width: 494 mm Height: 245 mm Weight: 310 kg	Length: 1245 mm Width: 494 mm Height: 257 mm Weight: 320 kg

	ETR100	ETR100 with hydraulic kit
Trolleys ETR100		
	Length: 1415 mm Width: 821 mm Height: 345 mm Weight: 850 kg	Length: 1415 mm Width: 821 mm Height: 349 mm Weight: 860 kg

Electro Cabinet		Length: 1290 mm Width: 600 mm Height: 1098 mm
		Weight: 250 kg

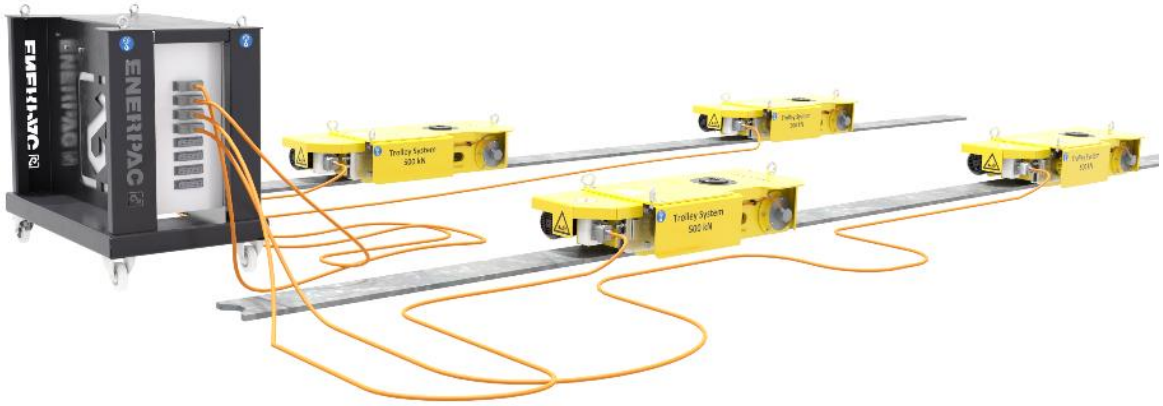
	Short type	Long type
		
Tracks	Length: 1495 mm Width: 200 mm Height: 20 mm Weight: 46 kg	Length: 2995 mm Width: 200 mm Height: 20 mm Weight: 92 kg

	For ETR50	For ETR100
Storage frame for trolleys		
	Length: 1481 mm Width: 1091 mm Height: 617 mm Weight: 122 kg empty 743 kg ETR50 763 kg ETR50 with hydraulic kit	Length: 1481 mm Width: 1091 mm Height: 617 mm Weight: 115 kg empty 965 kg ETR100 975 kg ETR100 with hydraulic kit
	Capacity: 2 trolleys	Capacity: 1 trolley

Storage frame for tracks		Length: 1592 mm Width: 1091 mm Height: 617 mm Weight: 152 kg
		Capacity: 20 short tracks(tot weight 1077 kg) or 20 long tracks(tot weight 2037 kg)

3.7. System configurations

You as a user can decide in which configuration you apply the system.
An example of a configuration with four trolleys is shown below.



NB:

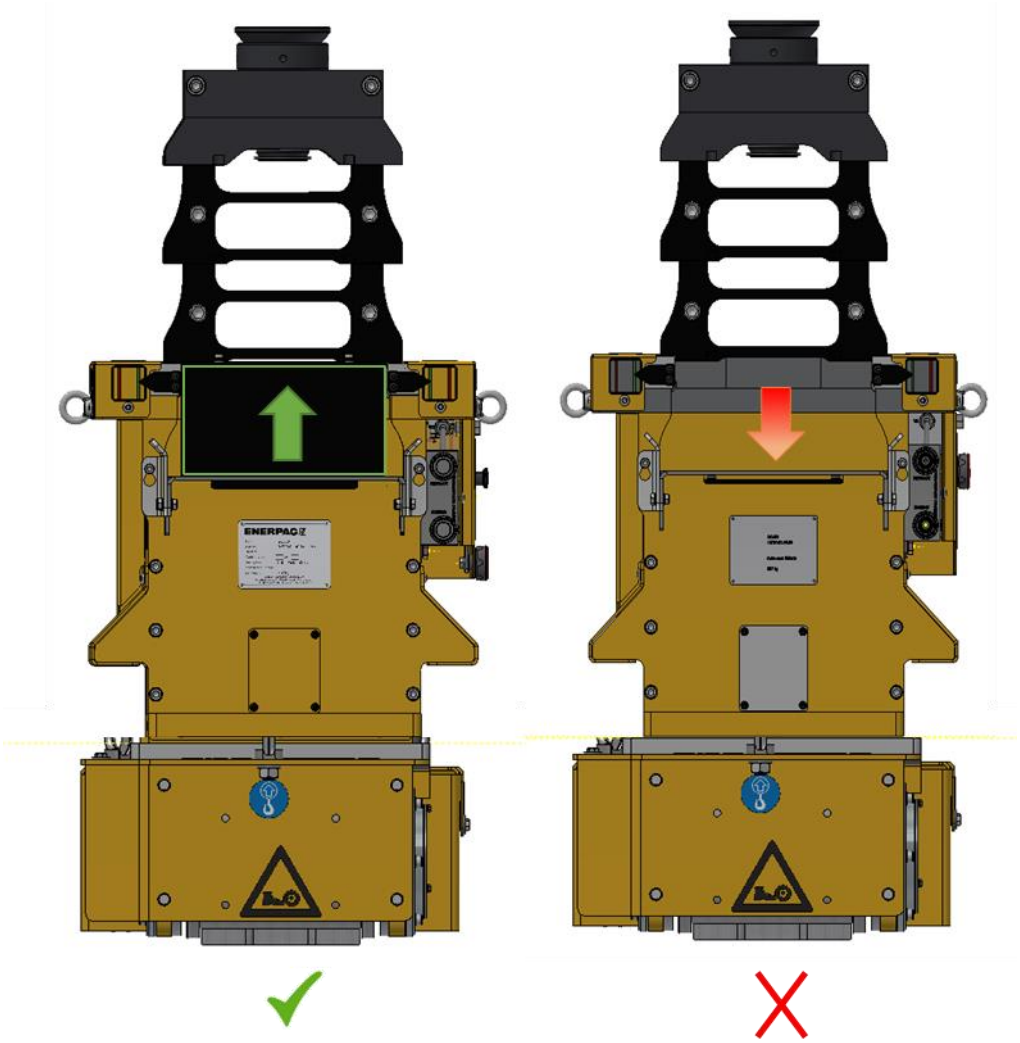
- Whatever configuration you apply, make sure the correct preparations and planning activities are made. See section 4. “Plan a moving operation”. Enerpac may advise.
- The use of other components than purchased by Enerpac is possible if those components are used in accordance with their own specifications.

3.8. Cube jack configuration

In addition to the cube jack configuration, this subchapter explains how to drive safely with this configuration. As stated in chapter 3.5.2 height limitations are set for the cube jack configuration in combination with the trolley. This is set because the driving forces of the trolley can introduce additional sideloads to the cube Jack tower.

Attention: A maximum height when driving is allowed with the cube jack configuration.

Next to the height limit it is necessary to have all cube jacks in lifting mode and to extend the cylinders of each cube jack against the Cribbing block. Do not lift the towers from the locks. This is necessary to make sure cribbing blocks will be aligned with the cylinder lifting block after driving with the trolley. Below the correct and incorrect positions of the cube jacks when driving is illustrated.



3.9. Service conditions

- The system is intended for moving a load which is put on top of the trolleys.
  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.

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

4. Plan a moving operation

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

1. Record the preparation in the checklist given in Appendix A “Checklist for planning”.

2. Evaluate the information about the **load**:
   - Mass of the load.
   - Centre of gravity of the load.
   - Dimensions of the load.
   - The position of the load’s centre of gravity with respect to the position of the trolleys
   - The side load does not exceed the limit.

3. Evaluate the information about the **system**:
   - Sufficient electric power available?
   - Bearing capacity of the most heavily loaded trolley.
   - Moving distance in longitudinal direction
   - What type of configuration are you going to apply:
     - If vertical moving required: hydraulic cylinder or cube jack?
     - Two-axes or three-axes swivel?

4. Subsoil
   - Allowable pressure on the subsoil before subsidence happens.
   - Is foundation underneath the tracks necessary?

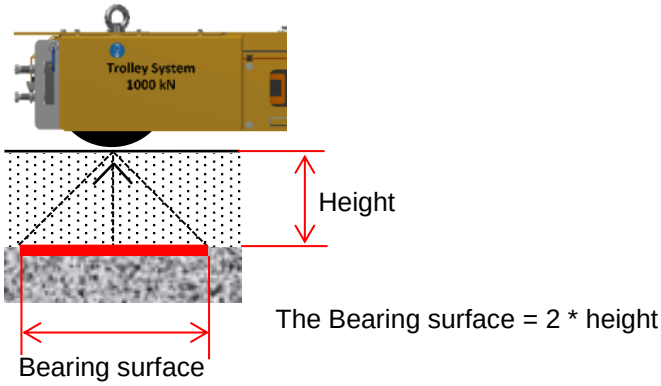
NB: It is of the utmost importance to read this whole chapter carefully before starting the operation.

Hazard: Failure to prepare an operation correctly may result in loss of System stability during use.

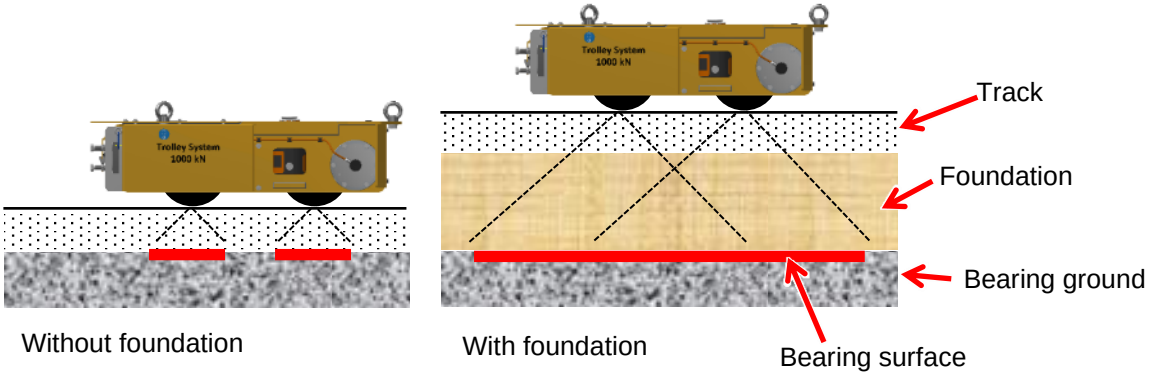
4.1. Bearing ground pressure calculation

The track can be put on the ground:

- without foundation, if the bearing capacity of the subsoils is sufficient.
- on a foundation:
  - to compensate unevenness in the subsoil
  - to reduce the bearing pressure on the subsoil.
    Use is made of the effect that pressure spreads down in an angle of 45^0 as shown below.



Additional foundation extends the bearing surface substantially.
This is made visible in the figure below.



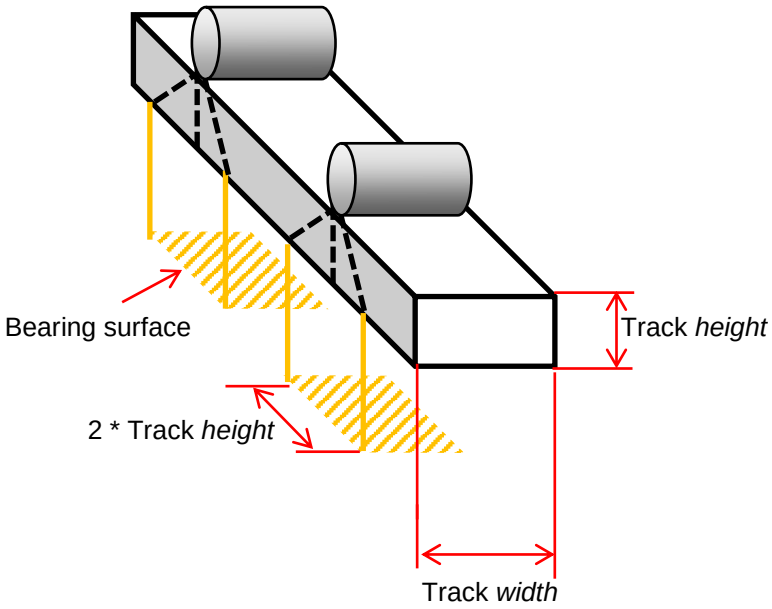
NB: The pressure on the subsoil is inverse proportional with the height of the supporting material, as can be seen in the next sections.

NB: Complete the checklist in appendix A “Checklist for planning” with the calculated bearing pressure.

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

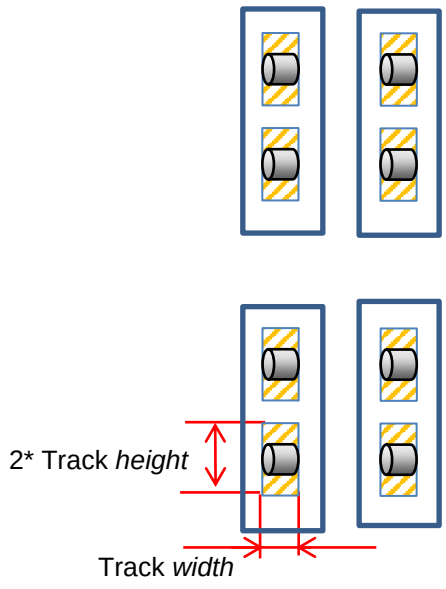
4.1.1. No foundation applied

The tracks are put directly on the ground, not on a foundation.
The dimensions of the bearing surface are as follows:



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

Parameter		**Abbrev**	**Value**
Track	Height	Track *height*	0.02 m
	Width	Track *width*	0.20 m
Own mass of one trolley		Trolley *mass*	See 3.6. "Dimensions"
Safety factor		S	1.7
Maximum force on **one trolley** which can occur during the operation [kN]		F	

1.	Bearing surface, including the spreading effect in length direction for all (four, in this case) trolleys	 Bearing_surface per trolley = 2 * (2 * Track *height* * Track *width*)
2.	Pressure on the ground [metric tonnes / m^2]	$\sigma = \frac{F + Trolley\_mass}{Bearing\_surface} * S$

Example:

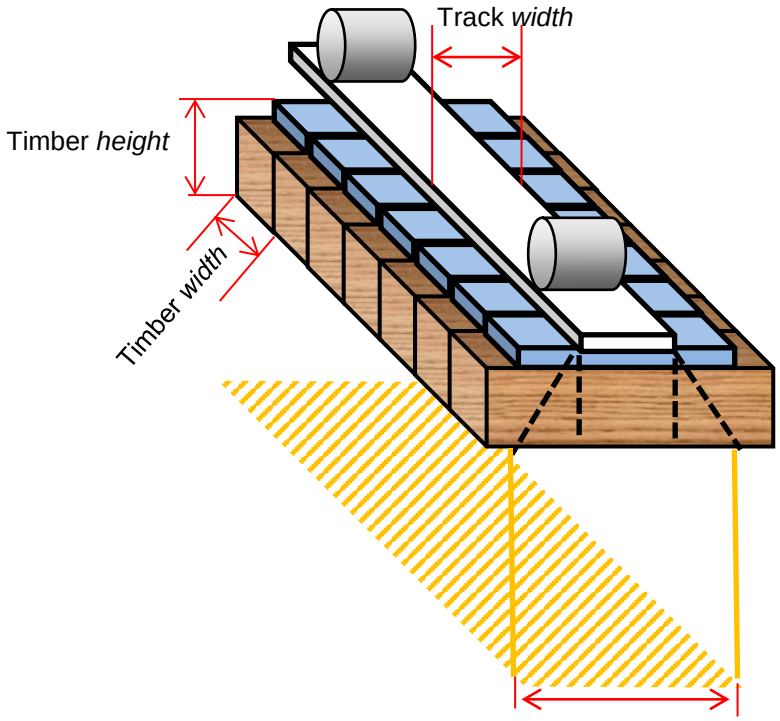
Load on one trolley	50 short tons
Bearing surface of one trolley	2 * (2 * 0,02 * 0.0) = 0.016 m^2
Ground pressure	$\sigma = \frac{50+0.385}{0.016} * 1.7$= **3149** *tons / m^2*

4.1.2. Foundation applied

The tracks are put on a foundation. Timbers of hard wood can be used as supporting material.
Put the timbers close to each other without gaps. Put steel plates between the timbers and the tracks.
NB: The steel plates must be adjacent. Do not leave space between them.

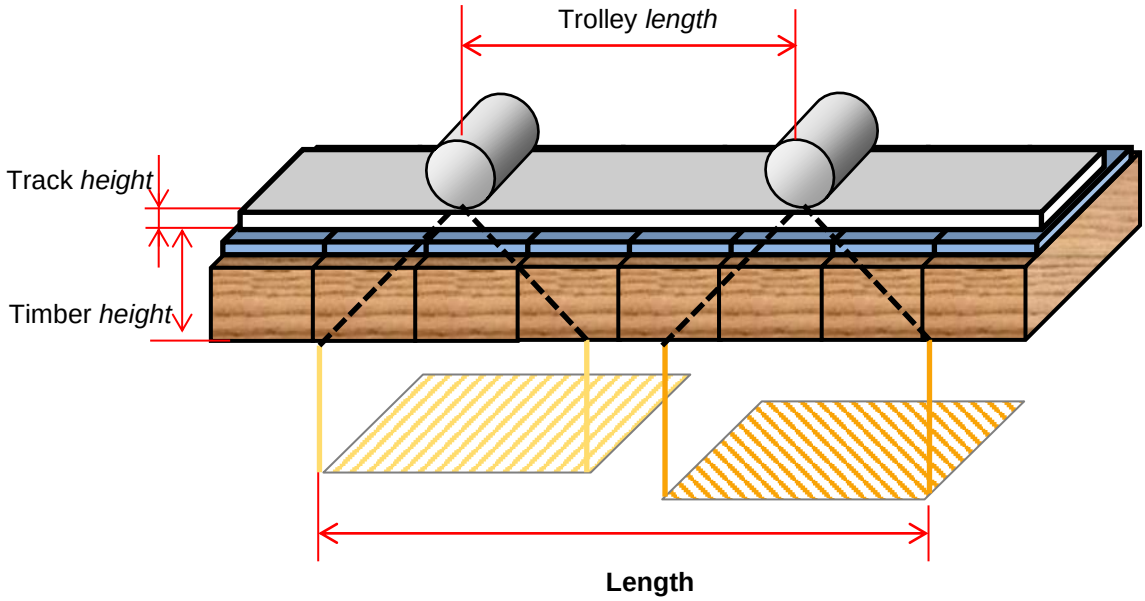
The dimensions of the bearing surface are calculated as follows:

- The **width** of the footprint of one trolley:



Width = Track *width* + 2 * Timber *height*

- The **length** of the footprint of one trolley:



Length

For Timber *height* < 210 mm:
The areas do not overlap. The **Length** = 2 (rollers) * 2 * (Track *height* + Timber *height*)
For Timber *height* >210 mm:
The areas overlap. The **Length** = Trolley *length* * 2 (Track *height* + Timber *height*)
.

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

Parameter		Abbrev	Value
Track	Height	Track *height*	0,02 m
	Width	Track *width*	0.20 m
Trolley	Own mass	Trolley *mass*	See 3.6. "Dimensions"
	Length	Trolley *length*	0.420 m (ETR50) 0.600 m (ETR100)
Timbers	Width	Timber *width*	t.b.s.
	Height	Timber *height*	t.b.s.
Safety factor		S	1.7
Maximum force on **one trolley** which can occur during the operation [kN]		F	

1.	Surface of one footprint = width * length	(Track *width* + 2 * Timber *height*) * (Trolley *length* + 2 * (Track *height* + Timber *height*))
2.	Pressure on the ground [metric tonnes / m^2]	$\sigma = \frac{F + Trolley\_mass}{Bearing\_Surface} * S$

Example:

Load on one trolley		50 metric tonnes
Timbers:	Width	0.10
	Height	0.10
Length of the trolley		0.42

Measure of one footprint

Width: Track *width* + 2 * Timber *height* = 0.2 + 2 * 0.1 = 0.40 m

Length: Trolley *length* + 2*(Track *height*+ Timber *height*) = 0.42 + 2 * (0.02 + 0.1) = 0,84

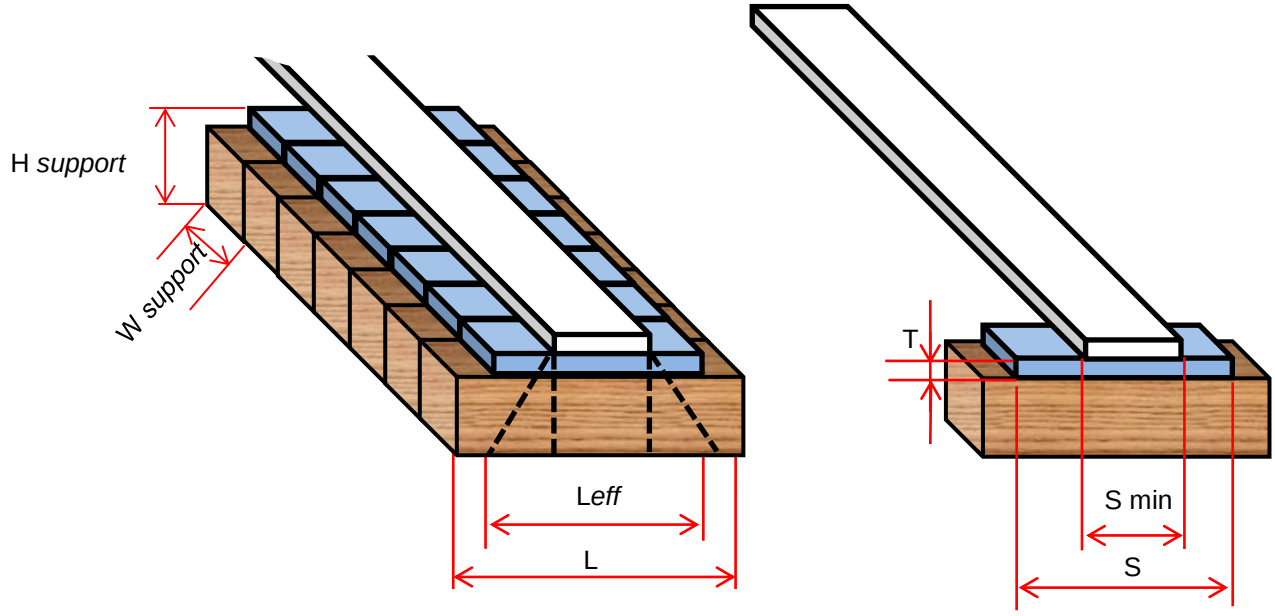
Surface of one footprint:

L * W: 0.40 * 0.84 = 0.34 m^2

Ground pressure per trolley $\sigma = \frac{50+0.385}{0.34} * 1.7$= **251 metric tonnes / m^2**

4.1.3. Requirements for supporting material

The supporting material has to meet the following requirements:



Parameter		Requirement
Timbers	Length	L >= Leff
	Width	Wsupport >= Hsupport
Steel plates	Width	S >= Smin
	Thickness	T >= 15 mm

- The timbers shall have a mechanical compressive strength of at least 25 N/mm² without occurrence of deflection. However, Enerpac strongly recommends adhering to 30N/mm², preferably Azobé.
- The steel plates shall be properly secured.
- The steel plates shall have a mechanical compressive strength of at least 30 N/mm² without occurrence of deflection.

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

NB:

- 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 bear in mind that suitable wood may not always be available immediately.

4.2. Check the bearing capacity of the system

The following parameters may influence the stability of the system in a negative way:

- Bad founded tracks
- Unequal soil, or soil with too little bearing capacity
- Inclination of the bearing ground

In case of any doubt, please contact Enerpac.

NB: The System integrity can only be guaranteed when exclusively Enerpac products are used.

Caution: Though all limits for the capacity, skew, wind and environmental influences are either calculated or tested by the Enerpac consciously, during moving operations these parameters may interfere with each other in a negative way. Test situations differ from real life situations!

4.3. Side load

Side load may endanger the stability of the System.
Side load can be caused by

- wind
- bearing ground not level
- system not mounted plumb.

Attention: A maximum side load of 1.5 % is allowed.
During activities in the open air, wind exerts may put force on the lifted object.
Therefore, for *every* operation the maximum permissible side load has to be calculated.

NB

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

Hazard

- When moving, always assume a worst-case scenario.
  Wind is unpredictable and may quickly change speed and direction. Do not take any risks: if the wind is too strong, that means it's a 'no go'!

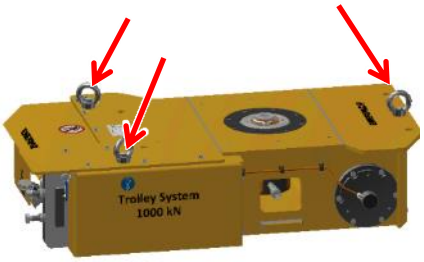
5. Install the System

This chapter describes how to install the System as well as the preparations which have to be made for the working location.
Record all activities in Appendix B “Checklist for installing the system”.

NB: The System integrity can only be guaranteed when exclusively Enerpac products are used.

5.1. How to hoist

- Use slings to hoist the trolleys.



- Use all four lifting eyes of the electro cabinet to hoist.
  Make sure all cables are disconnected.

5.2. Place the supporting material

In order to ensure its stability, the tracks have to be put level on the ground.
When the subsoil is not flat, it must be graded to create a good solid foundation on which the system can work safely.

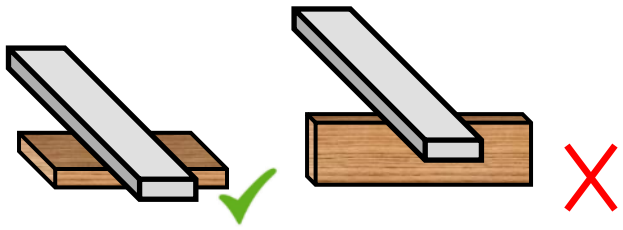
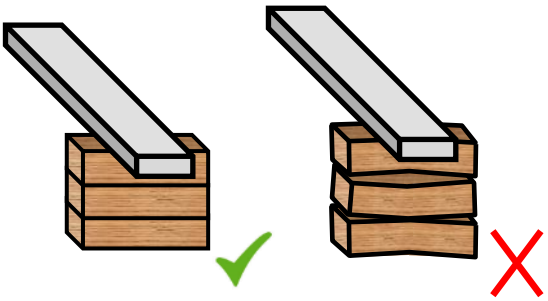
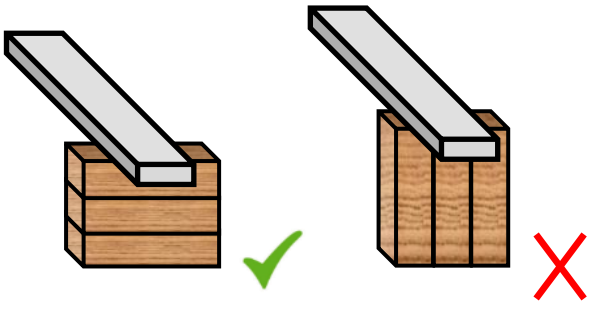
Attention: Creating a proper foundation must be handled with the utmost of care, as it is the system's primary safety issue.

5.2.1. Requirements for the supporting material

The applied support for the tracks has to fulfil all requirements with regard to sufficient strength, minimized compressibility and maximum stability.
The foundation of the tracks is the exclusive responsibility of the user.

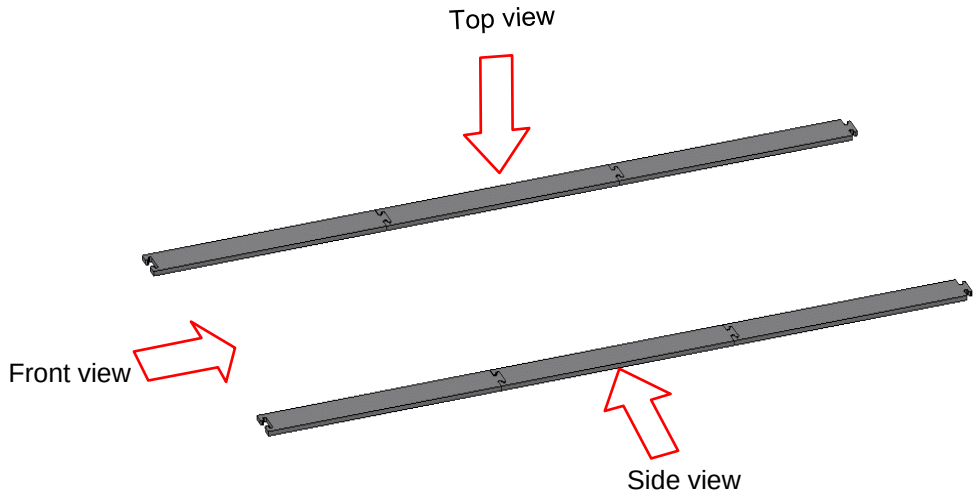
5.2.2. Place the supporting material

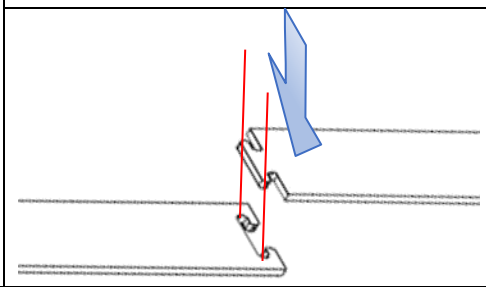
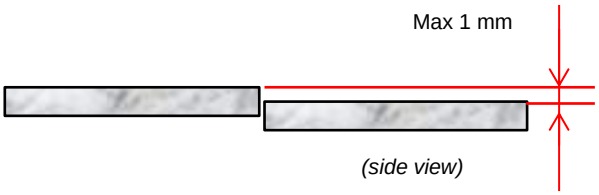
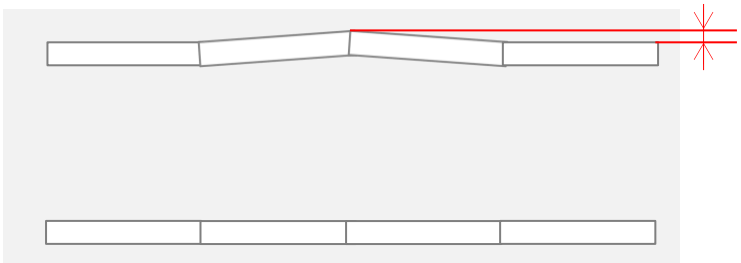
Observe the following while positioning the supporting material:

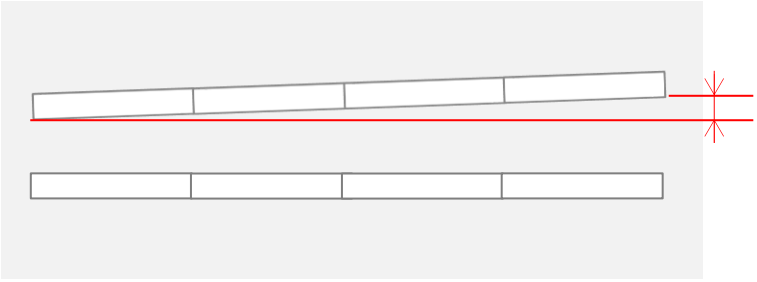
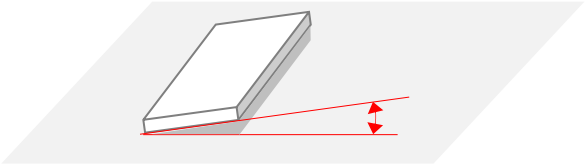
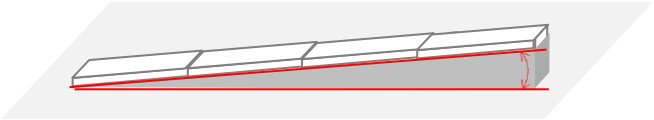
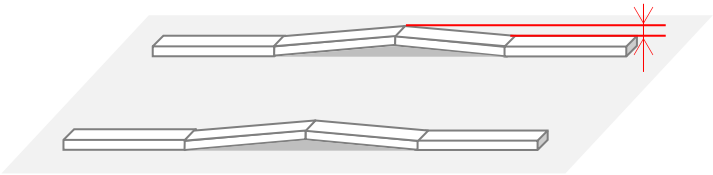
If the diameter of the timbers is not square, then put them in flat position	
If you stack timbers then leave no slack in between, to avoid risk of spring	
Put the timbers horizontally, not vertically	
Track couplings must always be fully supported.	

5.3. Put the tracks in place

Align the tracks according to the following requirements:



Nr	Alignment requirement	Tolerance
1	Position the tracks on the floor or on top of the supporting material. Hook the track plates together. • For the ETR50, make a track of one track plate wide. • For the ETR100, make a track of two track plates wide.	N/A
		
2	Verify that the connections are flat.	1 mm
	 *(side view)*	
2	The tracks shall be in parallel	3 mm
	 *(top view)*	
3	The tracks shall be aligned from the start to the end	5 mm

	 *(top view)*	
4	The tracks shall have no skew more than …	0.2°
	 *(front view of one track)*	
5	The tracks shall not incline	0.2°
	 *(side view of one track)*	
6	The tracks shall be flat.	3 mm over 2 meter
	 *(side view of track)*	

5.4. Put the trolleys on top of the tracks

To put the trolleys on the tracks, proceed as follows:

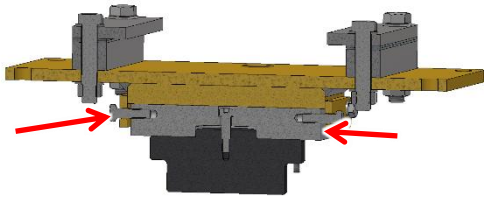
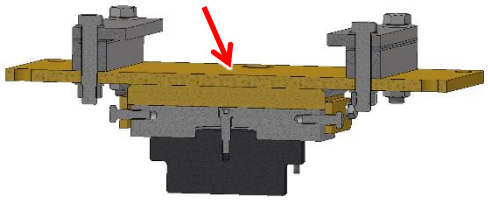
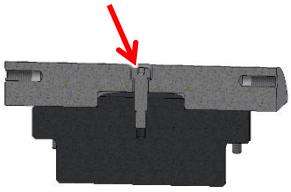
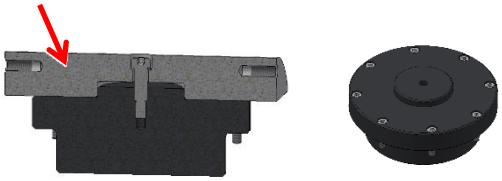
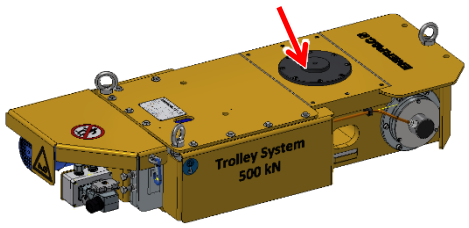
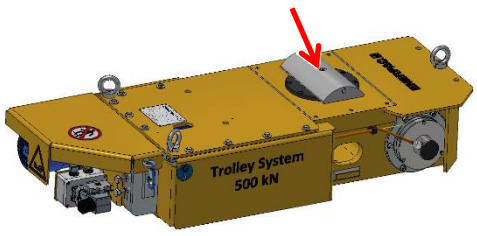
1.	Hoist the trolleys out of the transport frames. **Caution:** Do not put the trolleys on the floor; the rims of the rollers may be damaged.	
2.	Hoist the trolleys.	
3.	Put the trolleys on the track: • the ETR50 on a single track, • the ETR100 on a double track. Make sure the rims of the rollers enclose the track. **Caution:** Pay attention to the rotational encoder and its cable since they are vulnerable.	
4.	Move the trolley firmly to the left and the right by hand, to ensure that the rims of the rollers enclose the track. Do such both for the front side of the trolley and the read side.	
5.	Position the other trolleys similarly according to the configuration of your choice.	

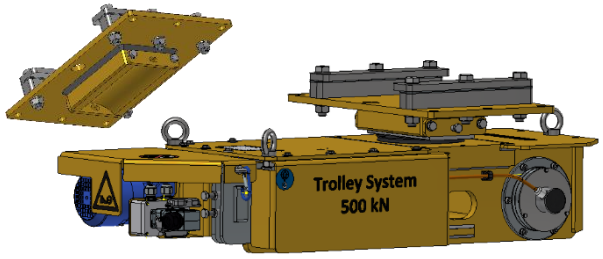
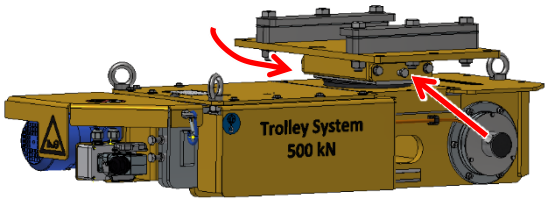
5.5. Mount the configuration kits

This section gives instructions for mounting the configuration kits. The Various kits and article numbers are listed in Appendix Z.
Only one configuration kit can be mounted on a trolley at a time.
Observe the torque settings as given in Appendix C “Torque settings”.

5.5.1. Mount the two-axes beam swivel kit

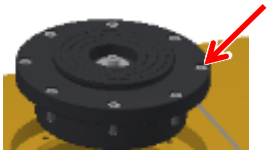
To mount the two-axes swivel on the trolley, proceed as follows:

1.	Unscrew the bolts	
2.	Remove the yellow part	
3.	Unscrew the bolt.	
4.	Remove the half moon.	
5.	Put the black disk on top of the trolley. Tighten the eight bolts.	
6.	Put the half moon on top of the black disk and tighten the bolt.	

7.	Put the yellow part on top.	
8.	Fasten the two bolts.	

5.5.2. Mount the three-axes beam swivel kit

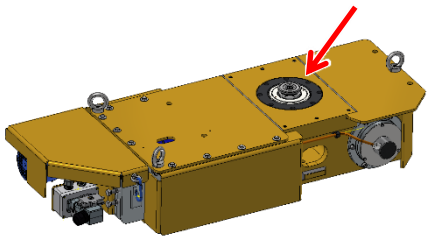
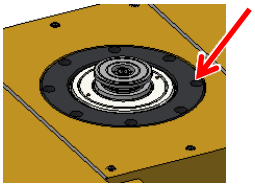
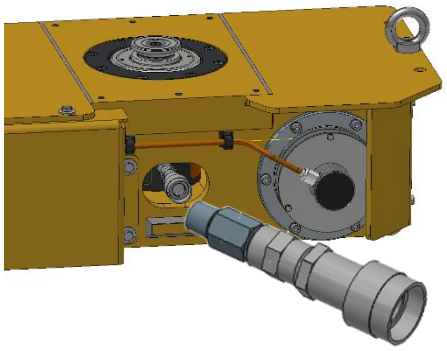
To mount the three-axes swivel on the trolley, proceed as follows:

1.	Put the three-axes beam swivel kit in the trolley.	
2.	Fasten the eight bolts.	

5.5.3. Mount the hydraulic kit

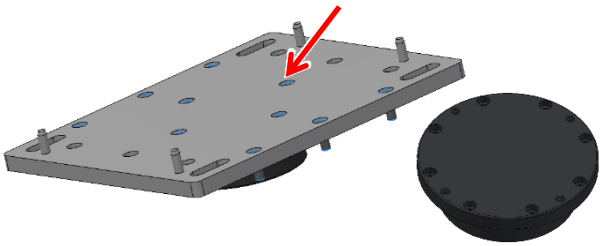
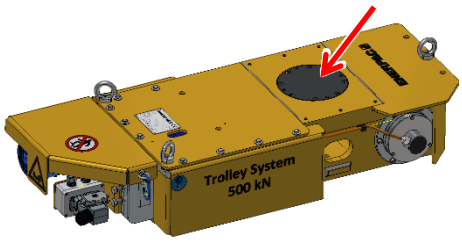
To mount the hydraulic kit on the trolley, proceed as follows:

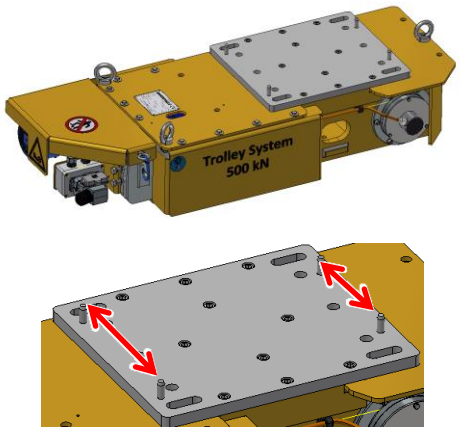
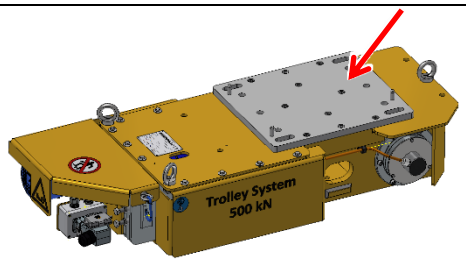
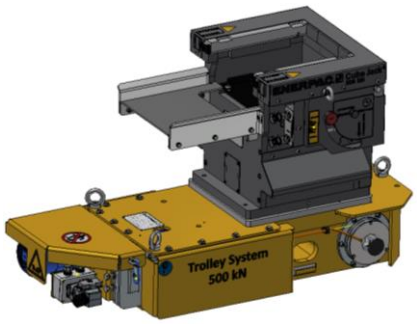
1.	Put the ring on the cylinder and rotate it to fix.	

2.	Put the cylinder in the trolley.	
3.	Fasten the eight bolts.	
4.	Mount the three parts of the socket in one go.	

5.5.4. Mount the cube jack kit and the cube jack

To mount the cube jack kit and the cube jack on the trolley, proceed as follows.
For handling the cube jacks reference is made to ref 5 “Cube jack system”.
Proceed as follows:

1.	Unscrew the bolts.	
2.	Put the disk on the trolley and fasten the eight bolts.	

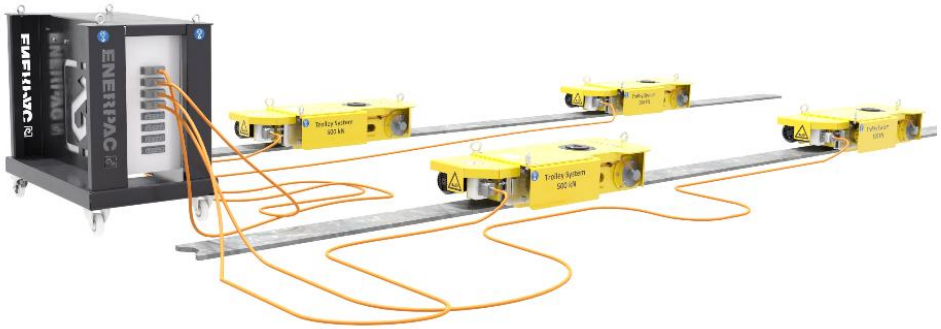
3.	Put the plate on top of the trolley, according to the direction in which you want to position the cube jack. The distances between the pins differ. In the position shown on the picture, the tray of the cube jack will point to the motor.	
4.	Fasten the ten bolts.	
5.	Put the cube jack on top of the plate. The cube jack has to fit on the pins of the plate.	

NB: the stability of the cube jack system is highly influenced by the trolley. Maximum lifting heights are stated in chapter 3.5.2.

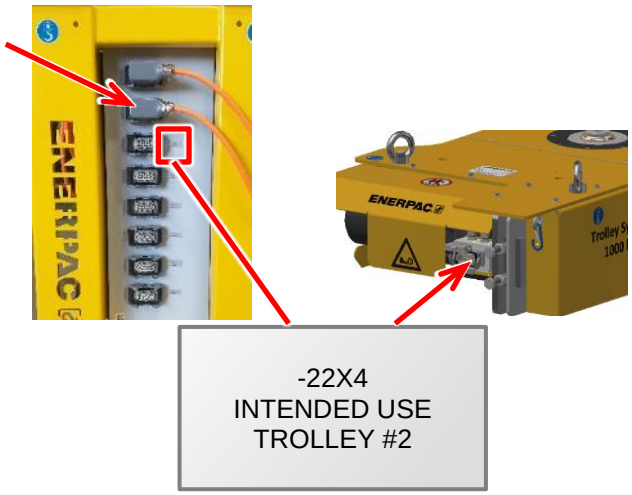
Attention: A maximum height when driving is allowed with the cube jack configuration.

5.6. Connect the electrics

Create the electric circuit as shown below. Up to eight trolleys can be connected.



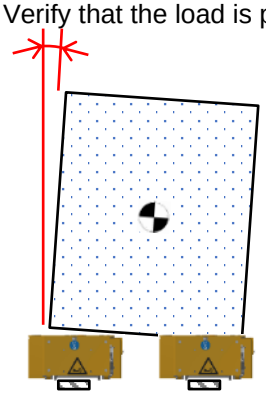
Proceed as follows:

1.	Connect the trolleys electrically to the Electro cabinet on the Cabinet cart. Observe the number plates next to the sockets. Those numbers match with the numbers shown on the HMI. Connect trolley 1 to socket 1, and so on. **NB:** The numbers on the trolleys are for indicative purposes only; technically all trolleys are equal. **NB:** If on the HMI a trolley is selected but no trolley is connected to the respective socket then an error is reported.	
2.	Connect the Electro cabinet to main power.	
3.	Mount the key on the remote-control handheld.	
4.	Test the configuration: • Switch the system to on. • Move the trolleys. Verify the correct operation. Verify the correct moving direction.	See section 6.4. “Start the system”. See section 6.5. “The HMI”.

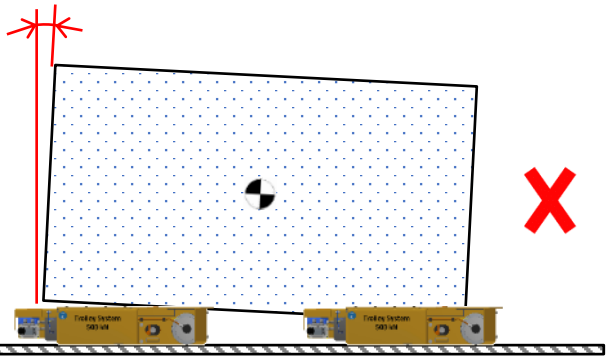
5.7. Put the load on top of the trolleys

To put the load on top of the trolleys
Observe the following:

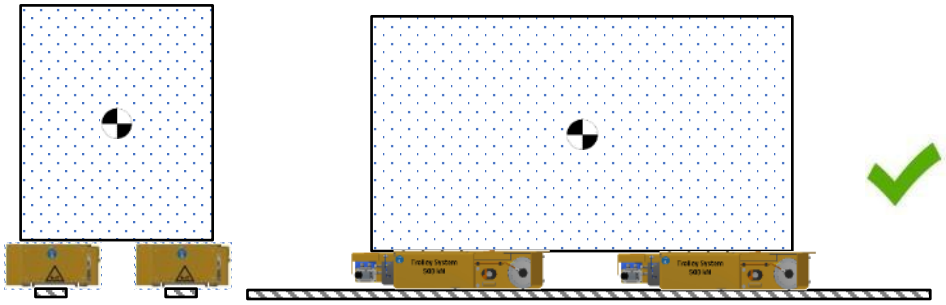
1. Verify that the load is plumb positioned both in longitudinal and transverse direction.



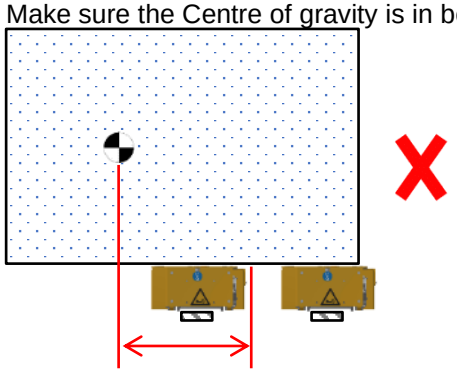
(front view)



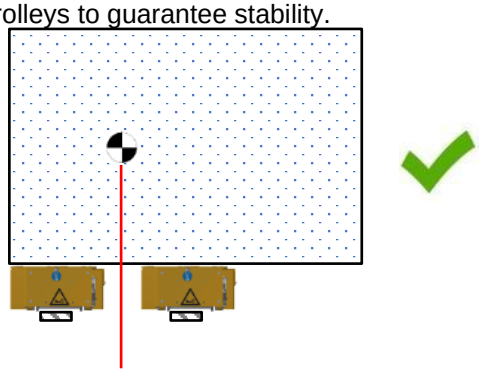
(side view)



2. Make sure the Centre of gravity is in between of the trolleys to guarantee stability.



(front view)



6. Control the system

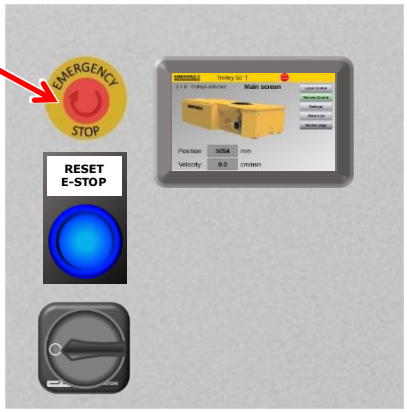
This section describes the functions of all controls and indicators or the system.

6.1. Emergency buttons

The system can be stopped immediately by pressing an emergency button.

Two emergency buttons are provided:

- On the electro cabinet:

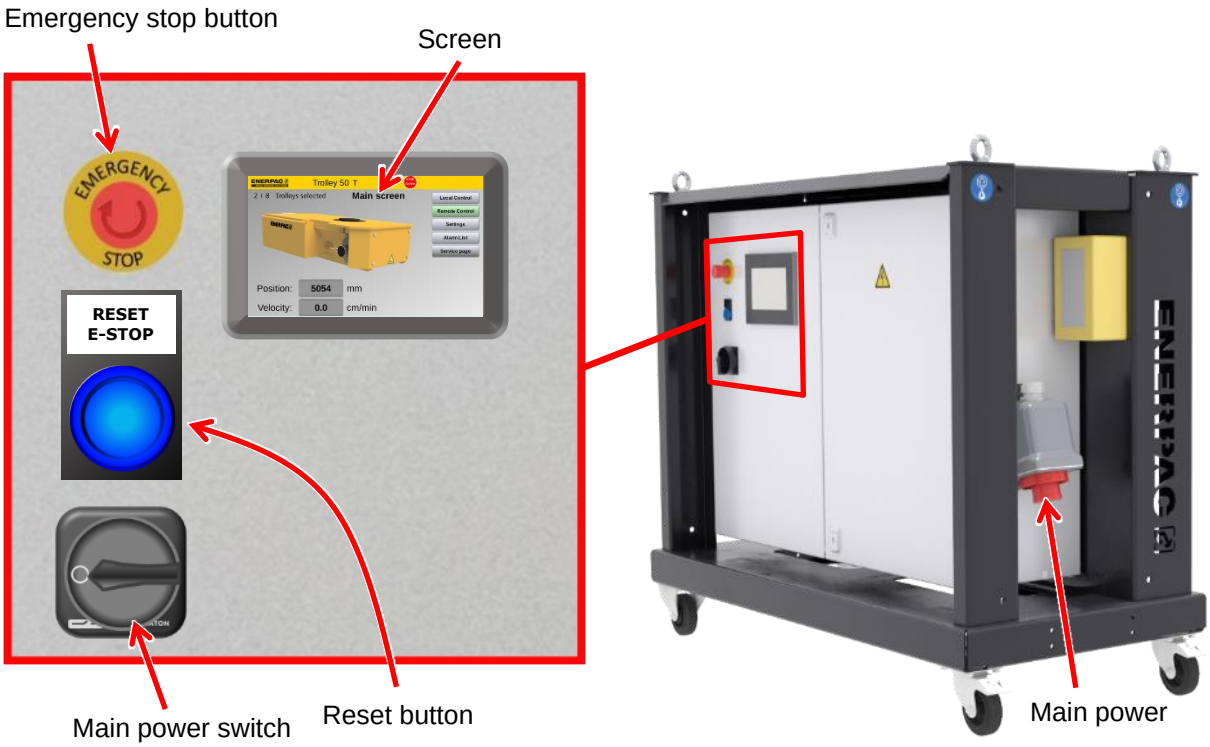


1. The emergency button is pressed.
   The system stops moving.
   The blue button lights up.
2. Investigate the reason why the button was pressed and solve the situation.
2. Turn the Emergency button clockwise.
   The blue Reset E-stop button starts blinking.
3. Press the Reset E-stop button on the Electro Cabinet.
   NB: It may take 30 seconds before the system is ready to operate.

- On the remote-control handheld:

1. The emergency button is pressed.
   The system stops moving.
   The blue button on the electro cabinet lights up.
2. Investigate the reason why the button was pressed and solve the situation.
3. Press the Start button on the remote-control handheld
4. Press the Reset E-stop button on the Electro Cabinet or on the remote-control handheld.
   NB: It may take 30 seconds before the system is ready to operate.
5. Press the Start button on the remote-control handheld, to start the remote-control handheld.

6.2. The electro cabinet



Main switch	Switch	To switch the system to on. The switch is provided with a lock.
Emergency active	Indicator / push button	It lit when any emergency button was pressed. See section 6.1. “ Emergency buttons”.
Emergency stop	Button	To stop the system in case of an emergency.
Sockets for trolleys	Socket	Up to eight trolleys can be connected to the sockets.

6.3. The remote-control handheld

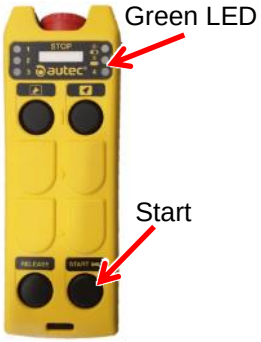
The remote-control handheld enables the user to control the travelling of the trolleys.
Two different speeds in both directions are possible.

OFF, EMERGENCY	• To initiate an emergency stop. • To switch the remote-control handheld to off.	
START	• When pressed, the wireless connection with the propelled trolley is set up. See also section 6.4. “Start the system”. • To reset the system when the emergency button was pressed. Reset is not possible when the emergency button on the cabinet is in pressed state.	
FORWARD	To move the trolleys in forward direction. Which direction is defined as ‘Forward’, can be set in the Local control screen; see section 6.5.4 “Local control screen”. • When pressed softly, the system moves at low speed. • When pressed fiercer, the system moves at normal speed.	
BACKWARD	• When pressed softly, the system moves at low speed in backward direction. • When pressed fiercer, high speed is chosen.	
ZERO	To reset the synchronisation of the movement of the trolleys.	
Green LED	OFF	The transmitting unit is switched off
	Steady ON	The transmitting and receiving unit do not communicate.
	Blinks once per sec	It is possible to send commands
	Blinks fast	The transmitting and receiving unit communicate. It is possible to initiate remote controlling by pressing START.
Red LED	Off	The transmitting unit works correctly
	Steady On	At start-up, the STOP pushbutton is pressed or damaged.
	Is steady on for 2 sec	The transmitting unit does not work correctly.
	Blinks once per sec	The battery has a run time of approximately 4 hours.
	Blinks twice per sec	At start up, a pushbutton is pressed or damaged.
	Blinks three times per sec	The unit is discharged at start up.
	Blinks fast	The battery has a 10min run time.
LEDs	• LED 1: on when all selected trolleys are online. • LED 2: on when there are no errors. • LED 3: - continue: all trolleys are within position tolerance. - 1Hz flashing: one or more trolleys exceed 2 * the position tolerance. - 2Hz flashing: one or more trolleys exceeds 4 * the position tolerance.	

NB: When not operated, the remote-control handheld switches off after three minutes.

6.4. Start the system

To start the system, proceed as follows:

1.	Make sure the emergency button is released. Try to rotate it clockwise.	
2.	Set the main switch on the electro cabinet to on. *After a few minutes, the initial window appears on the screen.*	
3.	• If you want to control the system by the HMI then press Local control. *The system is now ready.* • If you want to use the remote-control handheld then set on the main screen the system to Remote control. **NB**: The remote control handheld can be used in all screens except the local control screen.	
4.	Rotate the emergency button of the remote-control handheld, to ensure that the button is released.	
5.	Press Start for two seconds, to switch the remote-control handheld to on. *The green LED starts flashing fast.* Press Start again. *The green LED starts flashing slowly.* *The system can be controlled by the remote-control handheld.*	

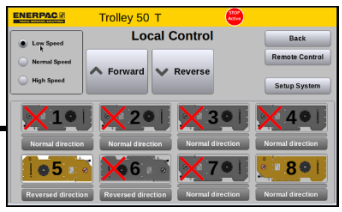
6.5. The HMI

The system is controlled using the Human Machine Interface, implemented as windows on the screen.

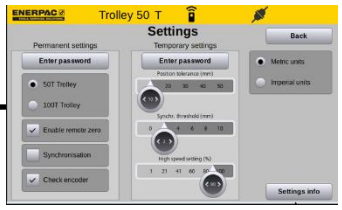
6.5.1. The menu structure

Main screen

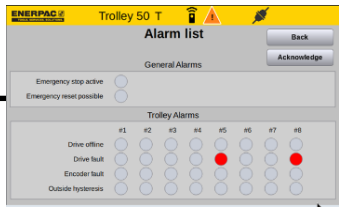
Remote control



Local control



Settings

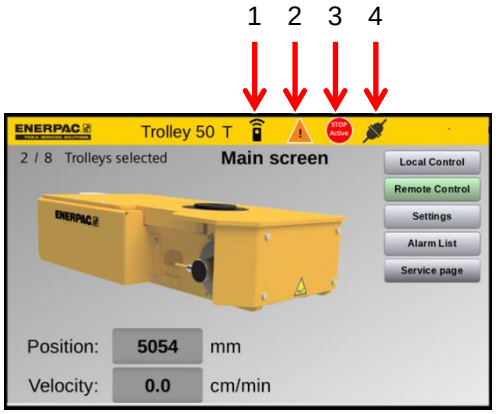


Alarms screen

Service page

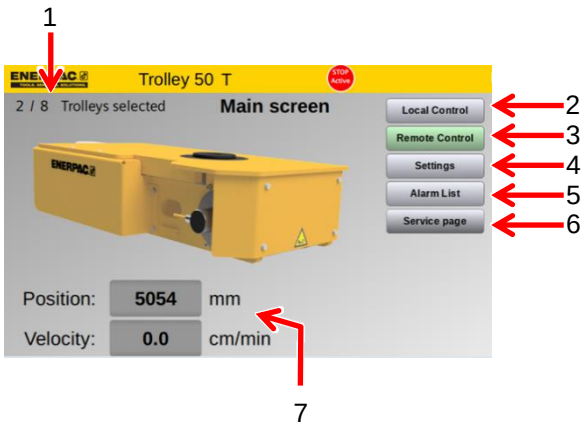
6.5.2. Common elements

On all screens the following icons can be visible.



1.	The remote-control handheld is connected and working.
2.	There is an alarm. Check the alarms list. See section 6.5.8 “Alarms list screen”.
3.	One of the Emergency buttons was pressed.
4.	All selected trolleys are connected.

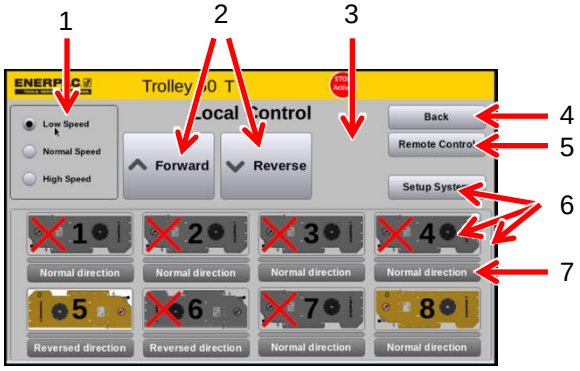
6.5.3. Main screen

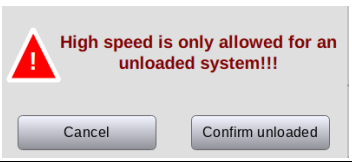


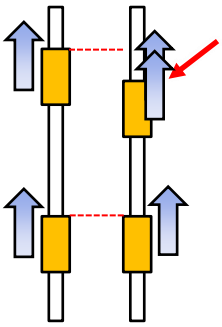
1.	The number of selected trolleys
2.	Set the system to local control. The trolleys are controlled by the buttons on the HMI. The remote-control handheld cannot be used, though the emergency button on it can stil be used.
3.	Set the system to be controlled by the remote-control handheld. This is only possible if low speed or normal speedis selected on the local control screen; not for high speed. See section 6.5.4 “Local control screen”. The system cannot be controlled by the HMI. The button is green if remote control is selected. 
4.	Go to the Settings screen.
5.	Go to the Alarms list screen.
6.	Go to the Service page.
7.	The (average) moved distance of all trolleys since the ‘zero’ button was pressed. The distance can be shown in inches and in millimeters. This can be set on the Settings screen; see section 6.5.6 “Settings screen”.

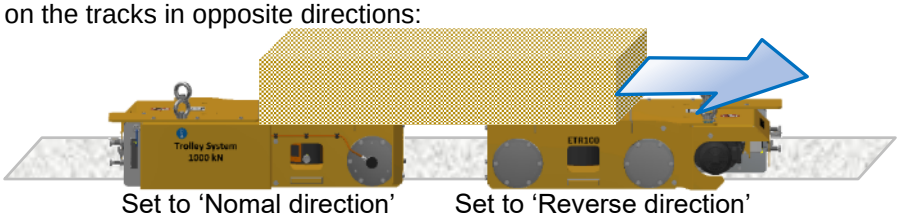
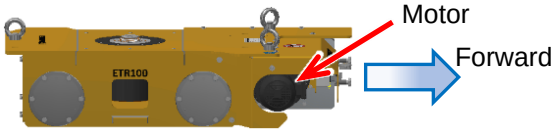
6.5.4. Local control screen

Using the local control screen enables the operator to move the trolleys.



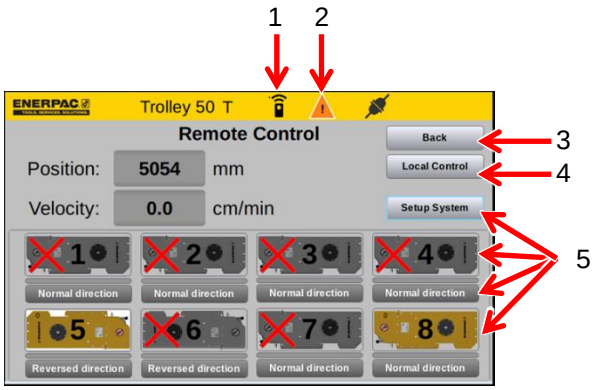
1.	To select the moving speed of the trolleys. High speed is only selectable when no load on the trolleys. **Caution:** Selecting high speed while the system is loaded may cause severe damage to the system. 

2.	Keep pressed to move all selected trolleys forward and reverse. For a definition of forward and reverse, see step [8]. *The positions of the trolleys with respect to each other are kept constant automatically.* *When a trolley is moving, the motor is shown in the icon.* 
3.	The zero button is used to set the measurered position deviations to zero.  Increased speed of lagging trolley **NB:** The zero button is only visible after the settings are confirmed; see step [6]. *When the trolleys move, the synchronisation mechanism keeps the distances between them constant. The speed of lagging trolleys is increased, while the speed of trolleys ahead is decreased.* When you press the zero button, the measured position deviations are set to zero. *The distances of the trolleys will be kept as they were when the zero button was pressed.* *The amber bar in each icon indicates the actual position deviation.* *If the deviation exceeds the position tolerance, the system stops.* *If so, investigate the system. Are there blockades?* *Ccheck the Alarms screen; see section 6.5.8 "Alarms list screen".* 
4.	Go to the main screen.
5.	Set the system to be controlled by the remote-control handheld. This will only be successful if the remote-control handheld is already switched on and connected, which is made visible by the icon in the top row of the screen.  *The remote-controll screen becomes visible.*
6.	Use this button to select the trolleys you want to move. Unselected trolleys will not move. Proceed as follows: 1. Press the Set up button.  *A green outline becomes visible. Selection of trolleys is possible.*  2. Click on all trolleys you want to select. *The red crosses disappears.* *The pictures becomes coloured.* To de-select, click again.  3. Click Confirm. *A green outline becomes visible, which indicates that the selected trolleys can move.* 

7.	Setting the moving direction enables synchronised running of trolleys while they are positioned on the tracks in opposite directions:  Set to 'Nomal direction' Set to 'Reverse direction' • 'Normal direction' (forward): the trolley moves in the direction in which the rotational encoder is located.  Reverse • 'Reversed direction': the trolley moves into the direction where the motor is located.  Motor Forward

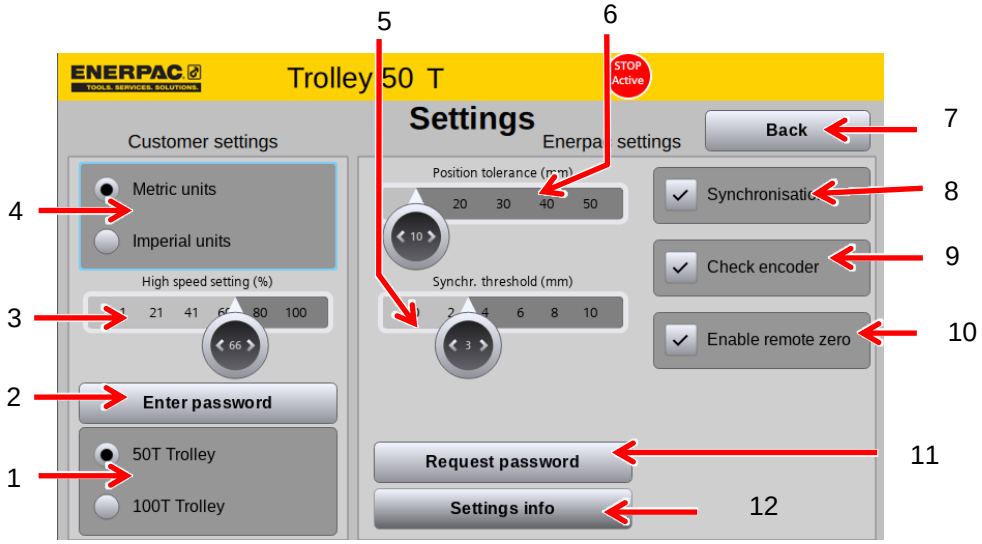
6.5.5. Remote-control screen

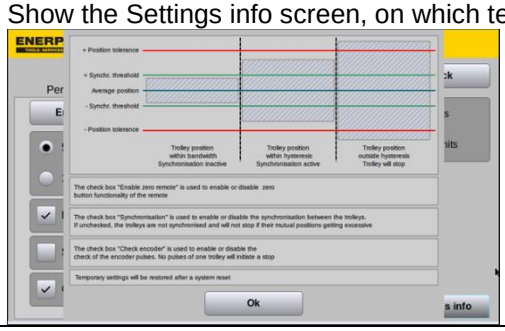
The picture below shows all possible symbols on the remote-control screen.
(Not all shown symbols are visible at the same time.)



1.	If shown, the system can be operated by the RC-handheld. If not, switch the RC-handheld to on. See section 6.3. "The remote-control handheld".
2.	If shown, not all selected trolleys are online. After about one minute the problem will be solved automatically. If not, check the Alarms list; see section 6.5.8 "Alarms list screen".
3.	Go to the screen where you came from. If greyed out, the first press local control to leave the screen.
4.	Disable control by the remote-control handheld and set local control. The emergency-button of the remote-control handheld will still be active.
5.	See section 6.5.4 "Local control screen".

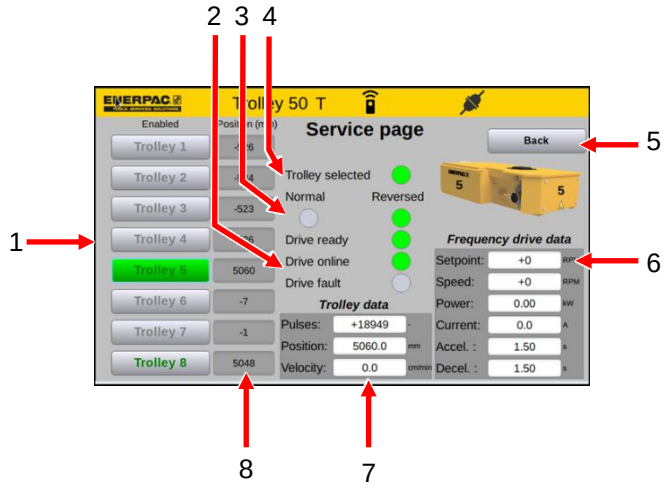
6.5.6. Settings screen



1.	To select the type of system.
2.	If the password is entered, the settings will be kept after a reset of the system. The password is “1234”. 
3.	Maximum speed of the trolleys when High speed is chosen.
4.	To set the unit (inches or millimetres) of the displayed positions and speeds.
5.	The limit under which the synchronisation is not active. This may be required when the system is under load.
6.	To set the maximum allowed error in position of the trolleys. When the error is exceeded, the trolley stops while the other trolleys keep running. In this way, the positions are kept synchronised.
7.	To return to the previous page
8.	If checked, the trolleys move synchronised. Disabling synchronisation may be required when during an operation a defect in the synchronisation mechanism appears, or if the trolleys are fixated to each other by the load. In that case, the system can continue moving, but synchronisation is no longer active. Monitor visually the positions of the trolleys.
9.	If checked, the system verifies whether sufficient information is received from the sensors of the trolleys. If this is not the case, the system will stop. If during an operation a fault appears, you may uncheck. In that case, the system can continue moving, but synchronisation is no longer active. Monitor visually the positions of the trolleys.
10.	To enable ‘zero’ the system using the RC-handheld.
11.	To enable to change standard Enerpac settings of machine, These settings are only changed with permission of Enerpac
12.	Show the Settings info screen, on which technical information is shown. 

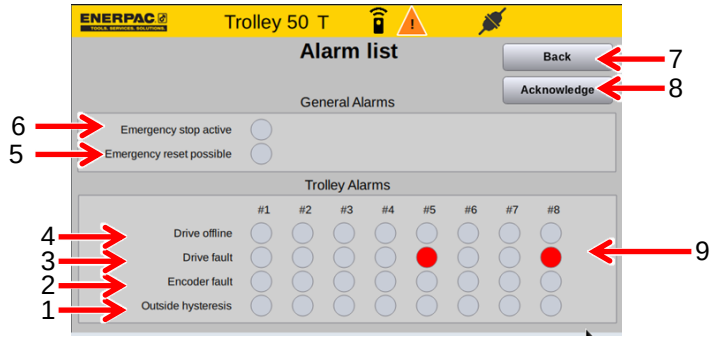
6.5.7. Service page

The data on the Service page are valid during Remote control.



1.	To select the trolley from which you want to see technical information. • The trolley from which the data is shown, is indicated with a green field. • The selected trolleys are indicated with green text. 
2.	• Drive ready: The trolley can operator normal. • Drive online: The data connection with the trolley is operational. Commands can be given. • Drive fault: There is an error. Check the Alarms screen.
3.	Indicates whether the trolley runs forward or reverse
4.	Indicates whether the trolley is selected, either in local or reverse mode.
5.	Return to the screen where you came from
6.	Technical information of the trolley. Use this information when communicating with Enerpac in case of technical issues.
7.	
8.	Positions of the trolleys as measured by the moving sensors.

6.5.8. Alarms list screen



1.	• Amber: the position of the trolley is outside the position tolerance. • Grey: the position is ok.
2.	No pulses were received from the moving sensor. The system will stop. This check can be reset by the “check encoder” checkbox in the Settings screen.
3.	• Red: error in the electronics of a trolley. • Amber: the error in the electronics of a trolley is solved. Press Acknowledge. The indicator will turn grey. • Grey: ok
4.	The data connection with the trolley is not operational. No commands can begiven.

5.	Is on if one of the emergency buttons was pressed or if the RC-handheld is off.
6.	The emergency stop is active, regardless of whether it was pressed or not.
7.	Return to the previous screen
8.	To reset the indications in the “Trolley alarms” field.
9.	Indicators of all faults of all trolleys. • Grey: no fault • Amber: - warning, or - the fault has disappeared. The indicator turns grey after pressing Acknowledge. • Red: Severe fault.

7. Execute a transportation operation

7.1. Safety directions

Record all activities in the checklist as given in Appendix A “Recording a moving operation”.

How to execute a transportation operation is not within the scope of this manual.

Nevertheless, pay attention to the risks and warnings, since correct operation of the system is essential for safety:

Hazard

- **Improper use** of the machine or failure to take the changes indicated in this manual into consideration 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.
- Adhere to the **checklists** during all work activities: during preparation for the operation, system construction, and for moving the load.
  Failure to adhere to the checklists may result in serious injury to the user, possibly even death.

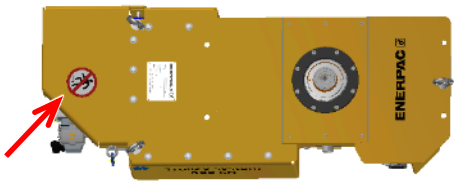
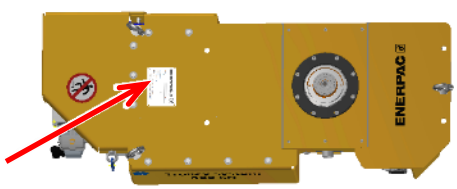
Caution

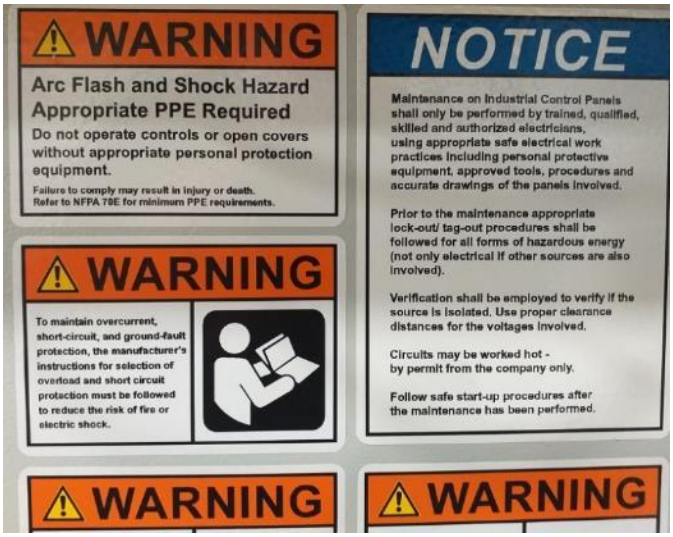
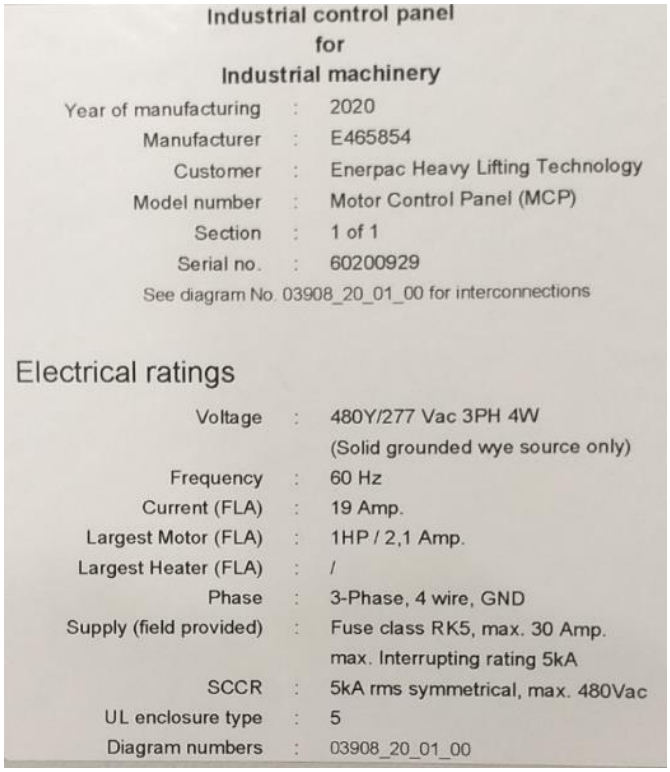
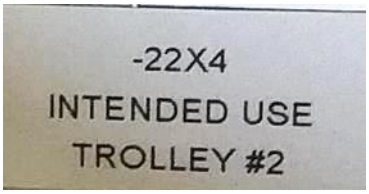
- It is of the utmost importance to **read this manual** carefully before setting up the machine. Failure to prepare correctly for an operation may result in total loss of machine stability during use.
- When moving, always assume a **worst-case scenario**. Wind can be unpredictable, quickly changing speed and direction. Do not take chances: if the wind is strong, that means it's a 'no go'!
- While travelling and side-shifting, make sure there are no obstacles.

NB: Follow the instructions on labels applied to the system, without question.

7.2. Warning signs and texts on the system

The following warning signs are applied to the system.
See section 2.3. “Symbols applied to the System”.

	
500 kN, 1000kN (at left hand side and right-hand side of the trolley)	
	
Identification plate	

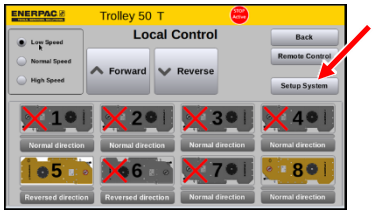
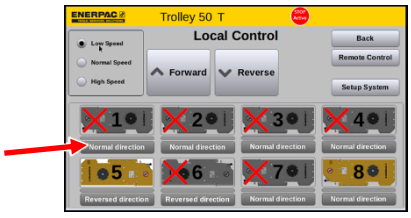
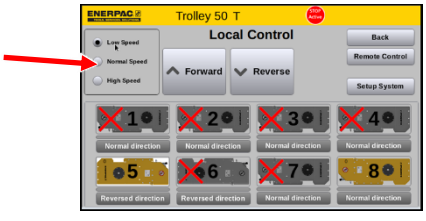
On the electro cabinet	  

7.3. Move the trolleys by local control

This mode is useful:

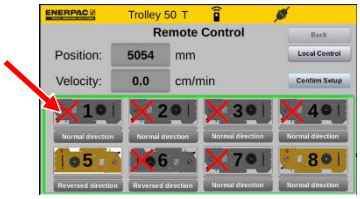
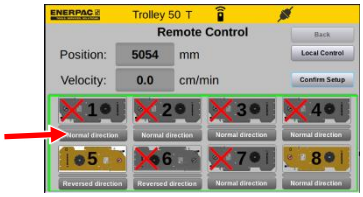
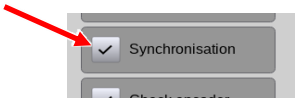
- for maintenance,
- for testing,
- in case remote control fails.

To move trolleys by local control, proceed as follows:

1.	Switch the system to on. See section 6.4. “Start the system”.	
2.	Set the system to local control. See section 6.5.3 “Main screen”	
3.	Press the Setup system button.	
4.	Select the trolleys you want to move. See section 6.5.4 “Local control screen”	
5.	Set the moving direction of the trolleys.	
6.	Select the speed of the trolleys.	
7.	Use the buttons on the screen to move the trolleys.	

7.4. Move the trolleys by the remote-control handheld

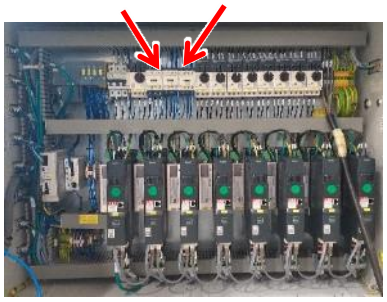
This mode is the main method of operating the system.

1.	Switch the system to on. See section 6.4. “Start the system”.	
2.	Set the system to remote control. See section 6.5.3 “Main screen”	
3.	Press the Setup system button.	
4.	Select the trolleys you want to move. See section 6.5.5 “Remote-control screen”.	
5.	Set the moving direction of the trolleys.	
6.	• Switch synchronisation to off if the load fixates the trolleys to each other. • Switch synchronisation to on if the load is flexible. See section 6.5.6 “Settings screen”.	
7.	Use the buttons on the remote-control handheld to move the trolleys. See section 6.3. “The remote-control handheld”.	

8. Solve problems

This chapter describes localization and solving of problems.

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…
The trolleys do not move.	Obstruction?	Remove the obstruction
	Is power available?	Check the power
	Chain blocked?	Check the chain
	Electro motor overheated	Check the ventilation of the motor
	The difference in height of two adjacent tracks exceeds 1 mm.	Correct the tracks.
The trolleys stopped	One or more trolleys exceeded the position tolerance.	Check the trolleys and the tracks. Are there obstructions? Can all trolleys run freely? Check section 6.5.8 “Alarms list screen”.
The system does not respond to the commands of the remote-control handheld.	The remote-control handheld was not operated more than 3 minutes.	Switch the remote-control handheld on. See section 6.3. “The remote-control handheld”.
	Moving capability blocked due to dirt or rust?	Make clean
	Battery empty	Charge the battery.
	Radio contact obstructed	Move to another place, in sight of the receiver of the electro cabinet.
	Wireless connection defect	Continue with local control. See section 6.5.4 “Local control screen”
Motor failure	Electro motor overheated	Wait a while.
	Fuses tripped.	Open the door of the electro cabinet and check the fuses. 
	Other problems	Check the error reports: see section 6.5.8 “Alarms list screen” see section 6.5.7 “Service page”.

NB: The list 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 trolleys 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.

Pay special attention to the electrical parts (electro motor, stroke meter, electric cabinet), which are sensitive to moisture.

10. Maintenance

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

This chapter describes:

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

The time intervals may be varied based on experience gained on the service life of systems used in similar circumstances.
If the system was idle for at least 6 months, all inspections as listed in the following section with a prescribed frequency of at least 6 months have to be performed.

NB: Any maintenance procedures not detailed in this section can only be performed by or in consultation with Enerpac.

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

10.1. Rules to be observed for maintenance

Observe the following rules for maintenance:

1. If the system was idle for at least 12 months, all inspections as listed in the following section with a prescribed frequency of at least 12 months have to be performed.
2. Prior to use, all new, altered, modified, or repaired hydraulic components shall be inspected to verify compliance with the applicable provisions of this section. Written records are not required.
3. Only perform maintenance if the system is not under load.
4. Any maintenance procedures not detailed in this section can only be performed by or in consultation with Enerpac.
5. Only apply spare parts provided by Enerpac. If parts of foreign make are applied, all guarantees will be void.
6. The warranty shall void if any modifications are made to the system without the consent of the manufacturer.
7. Follow all safety instructions in this manual.
8. When working with flammable liquids, take the applicable safety¬ regulations into account.
9. Only perform maintenance work after the system has been shut down. Before starting maintenance, make sure the system is secured against unauthorized use. Put up warning signs.
10. Make certain that the hydraulic system is not under pressure.
11. If maintenance has to be executed while the system is running then a person has to be present to supervise, and to stop the machine if needed. This also applies for work on the electrical system if the system needs to be powered.
12. Do not spill any oil and similar fluids. Be mindful of the environment and the costs of cleaning up.
13. Make certain that you apply personal protection equipment (PPE) and take any other safety precautions required by the working conditions.
14. Make sure that you know the location of fire alarms, firefighting facilities and fire extinguishers.
15. Only use suitable work equipment. Prevent damage due to use of unsuitable equipment.
16. Without the express consent of the manufacturer, you are not allowed to make any changes, additions or adjustments to the system which affect the safety of the machine. This also applies to installation and adjustment of safety devices, covers and valves and to welding work on load-bearing parts.

17. Make certain that the system is made ready for operation after the maintenance work was completed. Inform the operator.

10.2. Responsibilities

Observe the following rules for responsibilities.

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

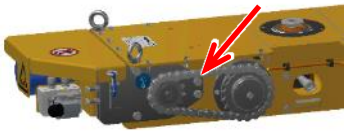
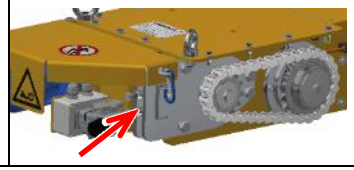
Contact the manufacturer for the following maintenance work:

- Adjusting the electrical system and repairs to the control system.
- Replacing parts.

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

10.3. Mechanical

Maintenance jobs to be executed.
Record all activities in Appendix B “Checklist for maintenance”

Subject	Action	Person O (owner) EE (Enerpac expert)	First 40 hours	Before use	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 of trolleys and Cabinet cart	Visual check of all welding	O		x					
	Visual check painting	O		x		x			
	Visual check on corrosion and damages	O		x	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.	O				x			
2. Chain									
2.1. Grease	 Grease the chain. Use Kroon Oil Multi Purpose Grease 3.	O				x			
2.2. Tension	 Test the tension of the chain. There should be no slack. If so, contact Enerpac or use the indicated bolts to tension.	O				x			

10.4. Hydraulics

This section lists all maintenance jobs for the hydraulics.
For hydraulic fluid safety information sheet, see Appendix D “Hydraulic fluid safety information”.

Regard the following:

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

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

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

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

1 Maintenance jobs to be executed.
2 Record all activities in Appendix B “Checklist for maintenance”.
3

Subject		Action	Person O (Owner) EE (Enerpac expert)	First 40 hours	Before use	40 hours / Weekly	500 hours / yearly	2000 hours / 2 years	10000 hours / 10 years	Remarks
1. Hydraulic connections										
1.1.	Pipes and hoses	Check on oil leakage and damages	O		x					
		Check if the couplings are tightened well.	O	x			x			
		Replace all hoses	O					x		
2. Cylinders										
2.1.	Common	Check on leakages and damages	O		x					

4
5
6

10.5. Electrics

Maintenance jobs to be executed.
Record all activities in Appendix B “Checklist for maintenance”.

Subject		Action	Person O (owner) EE (Enerpac expert)	First 40 hours	Before use	40 hours / Weekly	Each 500 hours / Each year	2000 hours / Every 2 years	10000 hours / Every 10 year	Remarks
1. Electro motor										
1.1.	General	Check on damages	O		x					
		Wipe it clean and free from dust	O	x			x			
2. Cables and connectors										
2.1.	General	Check on damages	O		x					
3. Devices										
3.1.	Main switch	Replace the main switch of the Electric cabinet	EE						x	
3.2.	Remote-control handheld	Replace the battery	O					x		

11. Dismantling the system

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

- Drain the hydraulic oil.
- Dismount rubber and plastic components.
- Dismount the metal components.

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

12. Index

Appendices

A.Checklist for planning

1. Project

Project	
Date	
Description	
Weight	

2. The load

☐	Mass of the load	
☐	Centre of gravity of the load	
☐	Dimensions of the load	Length: … Width: … Height: …
☐	The position of the load's centre of gravity with respect to the position of the trolleys	
☐	The side load does not exceed the limit	

3. The system

☐	Sufficient electric power available?	
☐	Bearing capacity of the most heavily loaded trolley	
☐	Moving distance in longitudinal direction	… mm
☐	Type of configuration: two-axes swivel, three-axes swivel, hydraulic cylinder, cube jack	
☐	If the hydraulic cylinder is applied, is a hydraulic pump available?	

4. The subsoil

☐	Allowable pressure on the subsoil before subsidence happens. (σ *toe*)	…. Tonne/_m²
☐	foundation underneath the tracks necessary	yes/no

5. Commitment

Preparations by: Date:

Signature:

Approved by: Date:

Signature:

B.Checklist for installing the system

1. Project

Project	
Date	
Description	
Weight	

2. Mechanical

☐	Checklist A “Checklist for planning” completed and signed off
☐	Foundation installed, as determined during Planning?
☐	Tracks positioned with flatness better than 3mm over 2 m.
☐	Trolleys put on the track.
☐	If applicable, the cube jacks correctly positioned on top of the trolleys
☐	If applicable, are the cube jacks not exceeding the maximum height limitation as stated in chapter 3.5.2.
☐	If applicable, are the cube jacks cylinders extended before operating the trolleys. Check if configuration is in accordance with chapter 3.8. before operating the trolley.

3. Electrical

☐	All trolleys electrically connected to the Electro cabinet.
☐	Electro cabinet connected to main power.
☐	Verify all trolleys drive in the same direction.
☐	Synchronised moving of the trolleys has been tested
☐	The battery of the remote-control handheld is fully charged

4. Commitment

Installations by: Date:

Signature:

Approved by: Date:

Signature:

A.Recording a moving operation

1. Project

Project	
Date	
Description	
Weight	

2. Recording of activities

	Activity	Time
☐	The checklist in Appendix A “Checklist for planning” has been completed and signed off.	
☐	The checklist in Appendix B “Checklist for installing the system” 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:

B.Checklist for maintenance

Mechanical

Subject	Action	Date	Remark
1. Main construction			
1.1. Main construction of trolleys and cabinet cart	Visual check of all welding		
	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.		
2. Chain			
2.1. Grease	Grease the chain		
2.2. Tension	Test the tension of the chain.		

Hydraulics

Subject	Action	Date	Remark
1. Hydraulic connections			
1.1. Pipes and hoses	Check on oil leakage and damages		
	Check if the couplings are tightened well.		
	Replace all hoses		
2. **Cylinders**			
2.1. Common	Check on leakages and damages		

Electrics

Subject	Action	Date	Remark
1. Electro motor			
1.1. General	Check on damages		
	Wipe it clean and free from dust		
2. Cables and connectors			
2.1. General	Check on damages		
3. Devices			
3.1. Main switch	Replace the main switch		
3.2. Remote-control handheld	Replace the battery		

C.Torque settings

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

Nominal size	Strength class	Course pitch [Nm] (Copper-grease) 0.08	Fine pitch [Nm] (Copper-grease) 0.08
M4	8.8	2.2	
	10.9	3.2	
	12.9	3.8	
M5	8.8	4.3	
	10.9	6.3	
	12.9	7.4	
M6	8.8	7.4	
	10.9	10.9	
	12.9	12.5	
M7	8.8	12.0	
	10.9	17.5	
	12.9	20.5	
M8	8.8	18	19
	10.9	26	28
	12.9	31	32
M10	8.8	36	37
	10.9	52	55
	12.9	61	64
M12	8.8	61	63
	10.9	90	93
	12.9	105	109
M14	8.8	97	103
	10.9	145	150
	12.9	165	175
M16	8.8	145	155
	10.9	215	225
	12.9	250	270
M18	8.8	210	230
	10.9	300	330
	12.9	350	380
M20	8.8	300	320
	10.9	420	460
	12.9	500	530

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

D.Hydraulic fluid safety information

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

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

1.1. Product identifier

Trade name	Shell Tellus S4 VE 46
Product code	001F8443

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

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

1.3. Details of the supplier of the safety data sheet

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

1.4. Emergency telephone number

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

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

2.1. Classification of the substance or mixture

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

2.2. Label elements

Labelling (REGULATION (EC) No 1272/2008)

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

Safety data sheet available on request

Sensitising components	Contains triazole derivatives. May produce an allergic reaction

2.3. Other hazards

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

3. Composition/information on ingredients

3.1. Mixtures

Chemical nature: Blend of polyolefins and additives

Hazardous components

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

4. First aid measures

4.1. Description of first aid measures

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

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

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

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

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

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

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

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

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

5. Firefighting measures

5.1. Extinguishing media

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

Unsuitable extinguishing media: Do not use water in a jet

5.2. Special hazards arising from the substance or mixture

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

5.3. Advice for firefighters

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

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

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

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

6.2. Environmental precautions

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

6.3. Methods and materials for containment and cleaning up

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

6.4. Reference to other sections

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

7. Handling and storage

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

7.1. Precautions for safe handling

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

7.2. Conditions for safe storage, including any incompatibilities

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

7.3. Specific end use(s)

Specific use(s)	Not applicable

8. Exposure controls/personal protection

8.1. Control parameters

Occupational Exposure Limits

Biological occupational exposure limits

No biological limit allocated.

Monitoring Methods

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

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

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

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

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

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

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

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

8.2. Exposure controls

Engineering measures

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

General Information:

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

8.3. Personal protective equipment

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

Eye protection	If material is handled such that it could be splashed into eyes,protective eyewear is recommended. Approved to EU Standard EN166.

Hand protection	Where hand contact with the product may occur the use of gloves approved to relevant standards (e.g. Europe: EN374, US: F739) made from the following materials may provide suitable chemical protection.
Remarks	PVC, neoprene or nitrile rubber gloves Suitability and durability of a glove is dependent on usage, e.g. frequency and duration of contact, chemical resistance of glove material, dexterity. Always seek advice from glove suppliers. Contaminated gloves should be replaced. Personal hygiene is a key element of effective hand care. Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturizer is recommended. For continuous contact we recommend gloves with breakthrough time of more than 240 minutes with preference for > 480 minutes where suitable gloves can be identified. For short-term/splash protection we recommend the same but recognize that suitable gloves offering this level of protection may not be available and in this case a lower breakthrough time maybe acceptable so long as appropriate maintenance and replacement regimes are followed. Glove thickness is not a good predictor of glove resistance to a chemical as it is dependent on the exact composition of the glove material. Glove thickness should be typically greater than 0.35 mm depending on the glove make and model.
Respiratory protection	No respiratory protection is ordinarily required under normal conditions of use. In accordance with good industrial hygiene practices, precautions should be taken to avoid breathing of material. If engineering controls do not maintain airborne concentrations to a level which is adequate to protect worker health, select respiratory protection equipment suitable for the specific conditions of use and meeting relevant legislation. Check with respiratory protective equipment suppliers. Where air-filtering respirators are suitable, select an appropriate combination of mask and filter. Select a filter suitable for combined particulate/organic gases and vapours [Type A/Type P boiling point > 65°C (149°F)] meeting EN14387 and EN143.
Thermal hazards	Not applicable

8.4. Environmental exposure controls

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

9. Physical and chemical properties

9.1. Information on basic physical and chemical properties

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

9.2. Other information

Conductivity	This material is not expected to be a static accumulator

10. Stability and reactivity

10.1. Reactivity	The product does not pose any further reactivity hazards in addition to those listed in the following sub-paragraph
10.2. Chemical stability	Stable. No hazardous reaction is expected when handled and stored according to provisions
10.3. Possibility of hazardous reactions	
Hazardous reactions	Reacts with strong oxidising agents.
10.4. Conditions to avoid	
Conditions to avoid	Extremes of temperature and direct sunlight

10.5. Incompatible materials

Materials to avoid	Strong oxidising agents

10.6. Hazardous decomposition products

Hazardous decomposition products	No decomposition if stored and applied as directed

11. Toxicological information

11.1. Information on toxicological effects

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

12. Ecological information

12.1. Toxicity

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

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

13. Disposal considerations

13.1. Waste treatment methods

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

14. Transport information

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

ADN	Not regulated as a dangerous good
ADR	Not regulated as a dangerous good
RID	Not regulated as a dangerous good
IMDG	Not regulated as a dangerous good

14.6. Special precautions for user

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

14.7. Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code
Not applicable for product as supplied. MARPOL Annex 1 rules apply for bulk shipments by sea.

15. Regulatory information

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

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

The components of this product are reported in the following inventories

EINECS	All components listed or polymer exempt
TSC	All components listed

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

16. Other information

16.1. Full text of H-Statements

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

16.2. Full text of other abbreviations

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

16.3. Abbreviations and Acronyms

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

IC50	Inhibitory Concentration fifty
IL50	Inhibitory Level fifty
IMDG	International Maritime Dangerous Goods
INV	Chinese Chemicals Inventory
IP346	Institute of Petroleum test method N° 346 for the determination of polycyclic aromatics DMSO-extractables KECI = Korea Existing Chemicals Inventory LC50 = Lethal concentration fifty
LD50	Lethal Dose fifty per cent.
LL/EL/IL	Lethal Loading/Effective Loading/Inhibitory loading LL50 = Lethal Loading fifty
MARPOL	International Convention for the Prevention of Pollution From Ships
NOEC/NOEL	No Observed Effect Concentration / No Observed Effect Level
OE_HPV	Occupational Exposure - High Production Volume PBT = Persistent, Bioaccumulative and Toxic
PICCS	Philippine Inventory of Chemicals and Chemical Substances
PNEC	Predicted No Effect Concentration
REACH	Registration Evaluation And Authorisation Of Chemicals
RID	Regulations Relating to International Carriage of Dangerous Goods by uail
SKIN_DES	Skin Designation
STEL	Short term exposure limit
TRA	Targeted Risk Assessment
TSCA	US Toxic Substances Control Act
TWA	Time-Weighted Average
vPvB	very Persistent and very Bioaccumulative

16.4. Further information

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

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

Z. Compatibility of system parts

1. Specification of system parts

a. Driving units

Driving unit	Article number	GA Drawing	Track width [mm]	Max capacity [kN]
ETR50	03908.01.06.00	03908.50.06.00	200	500
ETR50-H	03908.01.07.00	03908.50.07.00	200	500
ETR100	03909.01.06.00	03909.50.06.00	400	1000
ETR100-H	03909.01.07.00	03909.50.07.00	400	1000

b. Control units

Control Unit	Article number	GA Drawing	Control capacity	Voltage
ETR-CPJ-8	03908.01.08.00	03908.50.08.00	1-8 units	460-480
ETR-CPW-8	03908.01.08.00	03908.50.08.00	1-8 units	380-400

c. Track units

Track Plates	Article number	GA Drawing
ETR-TP-015	03908.01.09.00-01	03908.50.09.01
ETR-TP-030	03908.01.09.00-02	03908.50.09.02

d. Optional units

Swivel Beam Kit	Article number	GA Drawing	Max capacity [kN]
ETR50-BMK	03908.01.02.00	03908.50.02.00	500
ETR100-BMK	03909.01.02.00	03909.50.02.00	1000

Spherical bearing Kit	Article number	GA Drawing	Max capacity [kN]
ETR50-MK	03908.01.03.00	03908.50.03.00	500
ETR100-MK	03909.01.03.00	03909.50.03.00	1000

Cylinder Kit	Article number	GA Drawing	Max capacity [kN]
ETR50-HMK	03908.01.04.00	03908.50.04.00	500
ETR100-HMK	03909.01.04.00	03909.50.04.00	1000

SCJ Mounting Kit	Article number	GA Drawing	Max capacity [kN]
ETR50-SMK	03908.01.05.00	03908.50.05.00	500
ETR100-SMK	03909.01.05.00	03909.50.05.00	1000

SCJ	Article number	GA Drawing	Max capacity [kN]
SCJ-50	03793.01.00.00	03793.50.00.00	500
SCJ-100	03883.01.00.00	03883.50.00.00	1000

2. Compatibility of the system parts

Compatible	Not Compatible

a. Trolleys and Control panel

All trolleys and control panels are compatible to each other.

b. Trolleys and Track Plates

All trolleys and track plates are compatible to each other.

c. Trolleys and Optional Units

Optional Units		Trolley			
		ETR50	ETR50-H	ETR100	ETR100-H
		03908.01.06.00	03908.01.07.00	03909.01.06.00	03909.01.07.00
ETR50-BMK	03908.01.02.00	C	C	NC	NC
ETR100-BMK	03909.01.02.00	NC	NC	C	C
ETR50-MK	03908.01.03.00	C	C	NC	NC
ETR100-MK	03909.01.03.00	NC	NC	C	C
ETR50-HMK	03908.01.04.00	C	C	NC	NC
ETR100-HMK	03909.01.04.00	NC	NC	C	C
ETR50-SMK	03908.01.04.00	C	C	NC	NC
ETR100-SMK	03909.01.04.00	NC	NC	C	C
SCJ-50	03793.01.00.00	C	C	NC	NC
SCJ-100	03883.01.00.00	NC	NC	C	C