PALFINGER Installation Guideline
Hydraulic Loader Crane

Installation Guideline

Hydraulic Loader Crane

Original Installation Guideline

DA-105

Version: 2023/03

English

PALFINGER AG
Lamprechtshausener Bundesstraße 8
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www.palfinger.com

Contents

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Chapter 1

General remarks and information

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Contents

1.1 Introduction and handling of installation guideline

The PALFINGER installation guideline is the guidance for mounting a crane. The precise mounting of the crane, e.g., selection of the correct chassis, secondary drive, pump, calculation verifications, and so forth, should be considered at the time the crane is sold. These instructions contain technical instructions, remarks and standards which must be observed during the mounting of the crane. In addition, they have useful remarks regarding the proper mounting of the crane.

This mounting instruction is written for certified vehicle and crane body builders. For general appreciation of the document context a certain expert knowledge is necessary.

You get the latest version of these installation guidelines and other technical documentation from your PALFINGER general agency or on the PALFINGER PALDESK. The necessary registration must be done on PALDESK online. The main dealer is responsible to hand over this document to the company which is working in the crane body builder business.

PALFINGER keeps its rights to change or upgrade this document at any time. It is possible for special crane installations to create a new document which can be deviant in the context..

1.2 Applicability

This mounting instruction is applicable to PALFINGER knuckle boom cranes, telescopic cranes, PW cranes and PC cranes and to EPSILON timber handling cranes, recycling cranes, off road cranes and to Railway Basic Line cranes. It is not applicable to marine cranes.

Contact the PALFINGER general representative or the PALFINGER Customer Service for special models or special body buildings.

1.3 Symbols in this document

The following symbols and signal words are mentioned in this document:

DANGER

Situation that leads to death or serious injury.

WARNING

Situation that can lead to death or serious injury.

CAUTION

Situation that can lead to minor injuries.

ATTENTION

Situation that can lead to damage.

INFORMATION

Information for the user.

1.4 Accident control

During the body building process of the crane, all valid laws and provisions regarding safety has to be taken in account. Every technical support to avoid accidents must be used.

The country specific regulations must be achieved! The liability and observation of these laws and provisions must be fulfilled by the body building company!

GEFAHR

Before starting the bodybuilding work read the chapters in the user manual and mounting instruction of the crane, vehicle and additional equipment.

If this safety advice will be ignored, some danger can't be distinguished. Acute mortal danger is possible.

1.5 Modification to the crane

Modifications to the crane without consultation and written approval by PALFINGER are not permitted for reasons of safety, product liability and PALFINGER guarantee.

The exchange of accessories (cable winch, working basket, etc.) are excepted from this regulation (see chapter 11 "Mounting auxiliary devices")

If modifications are made to the crane, that go beyond the scope of the chapter 11 "Mounting auxiliary devices", a PALFINGER Customer Service must be consulted in advance and written approval from PALFINGER must be obtained. This is especially important if the load-bearing crane components are welded, drilled or worked on in any other way which could adversely affect the statics. Modifications of this nature may be made only in authorized workshops approved by PALFINGER.

1.6 Intended use

The crane may be used only in the scope of its classification – see technical data sheet (e.g., HC1 HD4B3 according EN12999). PALFINGER Customer Service must be consulted before using the crane in any other way.

INFORMATION

See at user operating manual chapter 7 – „Use for intended use".

1.7 Quality assurance

In view of international product liability legislation, continuous quality monitoring during the performance of conversions and the manufacture or mounting of body buildings is required.

PALFINGER recommends that the body builders set up a quality management system in conformity with general requirements and generally accepted principles (e.g., in accordance with DIN EN ISO 9000).

1.8 Pre-inspection by PALFINGER

A pre-inspection by PALFINGER is not required if the crane mounting or modifications are carried out in accordance with these mounting instructions.

If PALFINGER performs a pre-inspection for a crane mounting, it will cover only the basic compatibility with the chassis used in this case and the interfaces to the superstructure (e.g., dimensions and securing of the subframe). The pre-inspection is a service offered by PALFINGER and does not release the mounting company from its obligation to verify the compatibility itself once again. The mounting company bears sole and exclusive responsibility for the compatibility; PALFINGER does not assume any liability for the compatibility.

PALFINGER reserves the right to refuse to issue approval of the crane mounting or modifications even if a comparable approval had been granted earlier. Technical progress does not allow similar situations to be treated the same without question.

INFORMATION

In case of deviation to the mounting instruction respectively harmonized standards the body building company must evaluate the risk and if necessary issue a new declaration of conformity.

1.9 Excerpt from standards

STANDARD NR.	DESIGNATION
MR 2006/42/EN	Machinery Directive
ISO 9000	Quality Management Systems
EN 12999	Cranes – Loader Cranes
EN 280	Transportable Lifting Workman Baskets
ISO 9606-1	Testing of Welders
EN 292-1 EN 292-2	Machine Safety – Basic Terms Machine Safety – Technical Guidelines
EN 14175	Welding Additives – Shield Gases for Arc Welding and Cutting
EN 440	Welding Additives – Wire Electrodes and Weld Metal for Metal-Gas-shielded Welding of Unalloyed Steels and Fine-grained Steels – Classification
EN 499	Welding Additives – Encased Rod Electrodes for Arc Manual Welding of Unalloyed Steels and Fine-grained Steels – Classification
EN 757/1997	Welding Additives - Encased Rod Electrodes for Arc Manual Welding of high strength steel - Classification.

EN 719	Welding Supervision – Tasks and Responsibilities
EN 729-1	Welding Quality Requirements – Arc Welding of Metallic Materials, Part 1
EN ISO 16834/2007	Welding consumables - Wire electrodes, wires, rods and deposits for gas shielded metal arc welding of high strength steels - Classification.
EN 22553/1994	Welded, brazed and soldered joints - Symbolic representation on drawings.
EN 1050	Machine Safety – Guidelines for Risk Assessment
EN 10025	Hot-rolled Products Made of Unalloyed Structural Steels, Technical Terms and Conditions of Delivery
EN 10149-2/1995	Hot-rolled Products Made of Fine-grain Structural Steels Suitable for Welding.
EN 10113-1 EN 10113-2	Hot-rolled Products Made of Fine-grain Structural Steels Suitable for Welding
EN 10204	Metal Products – Types of Inspection Certificates
DIN 15018 DIN 15018-1 DIN 15018-2 DIN 15018-3	Cranes – Basic Principles for Steel Girders – Calculation – Principles for Construction Design and Execution – Calculation of Motor Vehicle Cranes
DIN 15019	Cranes, Stability
DIN 18800-1	Steel Constructions – Measurement and Design
DIN 18800-1/A1	Steel Constructions – Measurement and Design – Amendment A1
EN ISO 5817	Arc Welded Connections on Steel – Guidelines for the Evaluation Groups of Irregularities
EN ISO9692-1/04-05	Arc Manual Welding, Gas-shielded Welding and Gas Welding, Welding Seam Preparation for Steel
SEW088/1993	Fine grain structure steels suitable for welding. Processing guidelines in particular for fusion-welding.
EN ISO 12100-2	Safety of machinery. Basic concepts, general principles for design. Technical principles
ISO 14122-1 to 4	Safety of machinery. Permanent means of access to machinery. Stairways, stepladders and guard-rails

1.10 PAC Online codes for PALFINGER cranes and accessories

Crane Model Code

P K	36001	L	E	XXX	
I	I	I	I	I	I
I	I	I	I	I	Code for additional crane equipment
I	I	I	I	Code for the number of hydraulic telescoping extensions	
I	I	I	Main boom model		
I	I	Number of linkage systems			
I	Lift moment code				
Crane designation					

Model Codes for Second Knuckle System (Fly-Jib)

P J	101	A	XXX
I	I	I	I
I	I	I	Code for additional crane equipment
I	I	Code for the number of hydraulic telescoping extensions	
I	Lift moment code		
Code for second knuckle system			

Crane designation

PC	PALFINGER compact crane
PK	PALFINGER crane
PKK	PALFINGER crane with short knuckle boom
PW	PALFINGER wallboard crane
PKB	PALFINGER crane Brazil
PJ	Second knuckle system

Main boom model

()	Standard model
L	Long main boom
EL	Extra-long main boom
T	Telescoping main boom

Code for the number of hydraulic telescoping extensions

()	1 extension
A	2 extensions

B	3 extensions
C	4 extensions
D	5 extensions
E	6 extensions
F	7 extensions
G	8 extensions
H	9 extensions

Codes for additional crane equipment (extract of the prevalent codes)

-12V	12-Volt model
-24V	24-Volt model
2	Hose equipment for one accessory / pan
4	Hose equipment for two accessories / pan
6	Hose equipment for three accessories / pan
T2	Reel equipment for one accessory / pan
T4	Reel equipment for two accessories / pan
F (FL)	Controls – ground
H	Controls – high seat
HKONS	High seat console with storage space for remote control panel
I	Controls – raised stand
J	Controls – cab
RRC	Remote control
AOS	Active Oscillation Suppression
STEIL	Geometry supervision
STU	Hour counter
BEL	Lighting package
PU002	Preparation for continuous pump
PU003	Preparation for LS-pump
NK	Emergency controls – crane column
R0	Outriggers extendable on one side
R1(X)	Outriggers extendable on both sides (hydraulically)
R2(X)	Lengthened outriggers extendable on both sides (hydraulically)
R3(X)	Telescoping outriggers (hydraulically)
R4(X)	Telescoping outriggers extra-long (hydraulically)
STZS	Supporting cylinders – rigid
STZY	Supporting cylinders – automatic slew able
STT	Stabilizer plates

EGG	Combination crane base
TKKR	Oil tank mounted on crane base
OT	No tank on crane base
TL100	Tank 100l
OLK	Oil cooler
SENS	Temperature and fill level sensor
OEL	Oil for crane testing
SHB	Lifting power limitation dependent on slewing angle
SH	Winch mounted on main boom
SK	Winch mounted on knuckle boom
TOQU	Dead center above crossbeam
TOWI	Dead center above rocker
TRAN2	Transport position monitoring main boom horizontal
AUSW	Stabilizer monitoring outrigger
AUSVW	Stabilizer monitoring outrigger locking
ABSTW	Outrigger and stabilizer cylinder monitoring
OSK	Overload protection – hydraulic
V..	Mechanical extension (number)
W	Counterweight
1GETR	1 slewing gearbox
2GETR	2 slewing gearboxes
LH	Load hook
RAL	Color
ISC	Integrated stability control (ISC, ISC-L, ISC-S)
HPSC	continuously variable High Performance Stability Control
KRANK	Crane preservation
EKAT	Spare Parts Catalogue
KONF	Conformity acc. MD/2006/42/EC (CE)
HE	Declaration of incorporation MD/2006/42 or PALFINGER certificate

PALFINGER Installation Guideline
Hydraulic Loader Crane

Chapter 2

Regulations and statute

Original Installation Guideline

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2.1 Responsibility

For the avoidance of doubt: The responsibility for the proper design, manufacture, body building and the modification of chassis is always borne exclusively and in full by the company that manufactures or carries out the body building and modification, respectively.

Body buildings and / or executions of modifications approved in writing by PALFINGER do not release the body builder from its responsibility.

If the company carrying out the work notices any foreseeable mistakes / critical issues at the planning stage or in the intentions of the customer, the user, its own personnel or the vehicle manufacturer, it must point this out to the affected party without delay in verifiable form.

The company is responsible for ensuring that the operational and traffic safety, the servicing opportunities and the driving properties do not have any adverse characteristics.

With a view to ensuring operational and traffic safety, the company must base itself when it comes to designs, static calculations, superstructure manufacture, operating instructions and manuals on the latest technological advances, the legal statutes of the country concerned, the standards and the acknowledged rules of the specialist field. Any more difficult conditions of operation must be considered separately.

The companies mounting the cranes are furthermore liable for damage which is a consequence of inadequate functional and operational safety or incorrect operating instructions. PALFINGER therefore demands from the body builder:

- Greatest possible safety in accordance with the latest technological advances
- Understandable and adequate operating instructions
- Easily visible and permanently mounted signs warning of danger areas for operators
- and/or third persons
- Observance of the necessary protective measures in order to prevent risks in
- accordance with EN12100 (e.g., crushing, shearing, squirting out of liquids, etc.)
- Adherence to the currently applicable Machinery Directive as per MR 2006/42/EG.

2.2 Warranty

2.2.1 Warranty claims

Warranty claims may be asserted solely on the basis of the purchase contract between the buyer and the seller. Consequently, the warranty obligation is solely the responsibility of the seller of the delivered object in each case.

No right to make any guarantee or warranty claims against PALFINGER exists if the mounting instructions have not been followed or if the machine has been used improperly. Furthermore, no right to make any guarantee or warranty claims against PALFINGER exists if an unsuitable chassis or an unsuitable body building with respect to the intended use of the crane is chosen, or if the damage to the crane is caused by the body building or the type and execution of the mounting, or by improper operation.

2.2.2 Rights and claims

Contrary to Art. 932 of the Austrian General Civil Code (ABGB), the rights of the ordering party are limited to the right to demand rectification. In the event of the issue failing to be rectified, the ordering party expressly retains the right to reduce the payment made or, if it so chooses, to instead cancel the contract.

The ordering party must notify PALFINGER without delay of any defect that has been identified.

PALFINGER shall bear no liability if the defect is immaterial to the interests of the ordering party or results from a circumstance for which PALFINGER is not responsible.

Contrary to Art. 933 of the Austrian General Civil Code (ABGB), the ordering party's rights to make any claim due to deficiencies in the assembly work lapse after one year.

In the event of any modifications or maintenance work improperly performed without PALFINGER's prior consent by the ordering party or any third party, PALFINGER shall bear no liability for the consequences. The ordering party has the right to rectify deficiencies itself, or to have them rectified by a third party, and to demand reimbursement of the necessary expenses from PALFINGER only in urgent cases of endangerment of operational safety or to stave off disproportionately high losses, in which event PALFINGER must be notified immediately, or if after expiry of a reasonable deadline set by the ordering party for rectification of the deficiency PALFINGER is in default with carrying out said work.

Any guarantee or warranty claims are to be handled in accordance with the PALFINGER guarantee and warranty conditions.

2.3 Liability

2.3.1 Defects

If any defects on the PALFINGER product are identified by the body builder, PALFINGER is to be informed at once and after consultation with PALFINGER they are, if necessary, to be rectified.

2.3.2 Damage

PALFINGER shall not be liable for any damage arising other than on the PALFINGER product itself; in particular PALFINGER shall not be liable for any lost profits or any other financial losses of the body builder / customer. Insofar as our contractual liability is ruled out or limited, this shall apply also to the personal liability of any employees, representatives or agents. The above limitation of liability shall not apply if the cause of any loss or damage is wilful intent or gross negligence, there is any personal injury or a claim to compensation exists pursuant to the Product Liability Act. The same shall apply if PALFINGER has provided a guarantee for the quality of the contractually agreed work that conflicts with the limitation of liability. If PALFINGER is negligently in breach of a contractually material obligation, the duty to pay compensation for the damage shall be limited to the level of loss typically arising.

The company carrying out the body building must indemnify PALFINGER from any claims from its customers or other third parties if any damage that has occurred is a consequence of the company’s failure to adhere to these assembly guidelines.

2.4 CE marking

In the EU and in certain other countries, the Machinery Directive 2006/42/EC as currently applicable and supplemented by harmonized standards must be taken into account during the mounting of the crane. As a motor vehicle with a mounted crane is deemed to be a single machine according to the EU Machinery Directive, this combination (vehicle + crane + any ancillary equipment) must be furnished by the superstructure manufacturer with the CE mark and a declaration of conformity.

Since pursuant to the Machinery Directive the loader crane is an interchangeable piece of equipment, the crane is delivered ex works PALFINGER with the CE mark and a declaration of conformity. The crane's conformity declaration must be supplemented by the conformity declaration of the body builder.

If a crane is delivered without the components required for CE (e.g., supports), PALFINGER will issue a manufacturer's declaration and the crane will be delivered without a conformity declaration or CE mark. In this case, the superstructure manufacturer is responsible for the conformity procedure in accordance with the aforementioned Machinery Directive. PALFINGER original accessories correspond to CE requirements, i.e., the conformity procedure for the delivered component has already been carried out by PALFINGER. The body builder must therefore provide verification only for the complete body building.

During the mounting, the superstructure manufacturer must work in accordance with the aforementioned Machinery Directive and issue the required verifications such as hazard analysis, risk assessment and description of the remaining risk in its appendix to the operating instructions.

The Machinery Directive prescribes a type test by an authorized agency for any machines intended for lifting people. Any such type test is to be organized by the body builder.

INFORMATION

In the event of any deviations from the installation guidelines and/or harmonized standards, the body builder must assess the risk and, where applicable, issue a new declaration of conformity.

When the body builder makes conversions or additions to either the crane or its accessory (PALFINGER additional stabilizers, PALFINGER equipment, etc.) he must observe all applicable standards. The superstructure manufacturer must also issue the new declaration of conformity which will as a consequence be required for crane and accessory.

When converting or installing safety-relevant components (such as encoders, odometers, limit switches, pressure gauges and the like) original PALFINGER components must be used (refer to chapter 9, "Electric system on the crane").

PALFINGER Installation Guideline
Hydraulic Loader Crane

Chapter 3

Mounting Preparation

Original Installation Guideline
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Contents

3.1 General

The relevant requirements in body building are in particular:

- EN12999 loader cranes
- EN280 mobile aerial work platforms – calculation – stability – construction – safety – tests
- Directive 2006/42/EC machinery directive
- ISO4413 hydraulic fluid power – general rules and safety
- requirements for hydraulic systems and their components
- EV Directive 2007/46/EC road traffic and homologation requirements
- EN12100 safety of machinery – general design principles –
- risk assessment and risk reduction
- Country-specific requirements and guidelines
- Vehicle manufacturer-specific regulations
-

In particular, the following evidence is indispensable:

- Calculation of the maximum dimensions (e.g., height calculation for vehicle body, stabilizers, overhangs)
- Axle load or foundation calculation
- Stability calculation
- Stress detection on the chassis frame and subframe or foundation
- Unit design: engine / power take-off dimensioning
- Pumps and line design
- If available - proof of the max. supporting force of the additional stabilizers
- Risk assessment of the construction project.
-

When planning body building, provision shall be made in particular for:

- Transport protection against unintentional swinging out in road operation
- Status display of the transport position monitoring in the driver's cab
- Avoidance of the risk of crushing of moving parts by creating sufficient free space
- Identification of sources of danger
- Consideration of the visibility of the hazardous area
- Protection against interference from hot surfaces or exhaust gases
- Proper ascent aids and fall protection devices
- Protection against improper use / loading
- Risks and sources of danger that cannot be avoided by constructive measures must be documented in operating instructions.
- Acceptances prescribed by the authorities or by the customer

3.2 Information portal - PALFINGER PALDESK

On the PALFINGER PALDESK you can find technical documentation about design and calculation of the structure.

Every crane type is available in all various designs in a daily update on PALFINGER PALDESK. Comprehensive technical data sheets are provided where you can find all important information such as dimensions, dead weights, lifting torques, load capacities, hydraulic plans, electrical circuit diagrams, assembly data sheets and the like.

If your recommended data is not available, please contact the customer service or product management.

3.2.1 3D data of crane components

On request, order-specific 3D data from cranes can also be provided for detailed checks of the body building situation and possible collisions with the vehicle.

The inquiries are accepted by the respective general agency and forwarded to the responsible department at PALFINGER headquarters for processing.

3.2.2 Requests regarding PALFINGER software

- PAC Online: Program for calculating axle loads, stability, HPSC and load capacities and for showing load capacity curves and load capacity analyses
- PALDESK: Information portal for visualization and download of technical information, spare part catalog, mounting instructions, electrical wiring diagrams, service information and training documents
- PALDIAG.NET: Program for diagnostic and configuration of PALTRONIC and remote control
- PAF: Program for calculating subframes
- PALREMOTE: Program for connecting computers online
- PALCHART: Documentation of adjusting the crane
-

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3.3 Crane positions on the chassis

There are three different types of mounting, depending on the way the crane will be used:

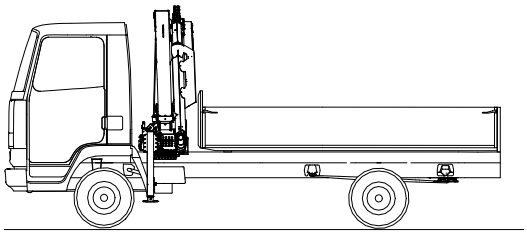
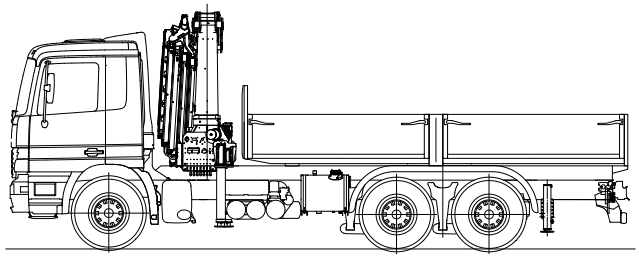
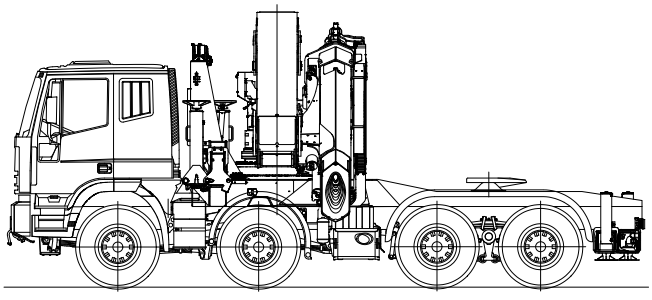
- Front mounting: crane is mounted behind the driver cab.
- Rear mounting: crane is mounted at the end of the chassis frame.
- Special mounting: crane is mounted in the middle of the chassis frame, for example.

The comments below will describe the advantages and disadvantages of each of the mountings mentioned above. The best possible mounting for the customer's intended use should be selected during the project planning.

WARNING

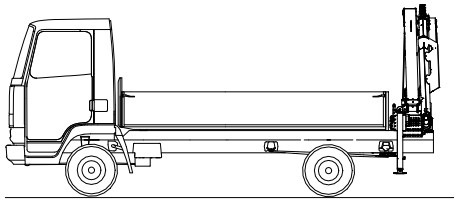
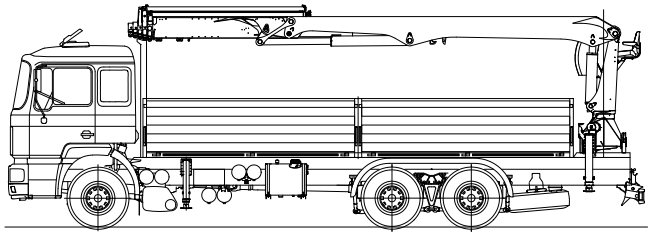
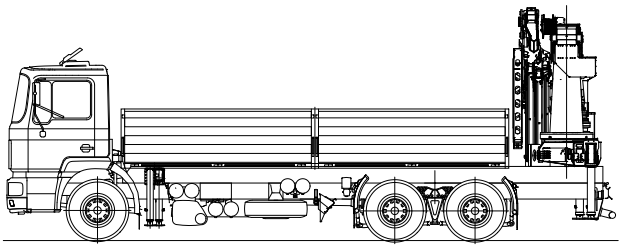
The mounting examples below do not give specific indications of the possible mountings of the various crane models. It is always necessary to perform axle load and stability calculations.

3.3.1 Front mounting

 *Illustration 03-00 1; Front mounting light series 4x2*	Front mounting of a loader crane from the light and medium crane series on a double-axle chassis (4x2) with a loading bridge and without additional stabilizers.
 *Illustration 03-00 2; Front mounting medium series 6x4*	Front mounting of a loader crane from the medium crane series with a loading bridge and an additional stabilizer at the rear on a triple-axle chassis (6x4).
 *Illustration 03-00 3; Front mounting heavy series 8x4*	Front mounting of a loader crane with combination crane base from the crane series for heavy loads on a four-axle tractor (8x4) and with additional stabilizer at the rear.

Advantages	Disadvantages
• Good stability towards the back (good working area towards the back – 180°) • This type of mounting is suitable for tractors, models with loading bridges or container platforms • Relatively light load on the rear axle • Relatively inexpensive sub frame design • Long load can be transported well (load can protrude over the rear)	• Poor stability towards the front • Heavy load on front axle. Depending on the crane's dead weight, an increase in the permissible front axle load or a double-axle at the front may be required • Loss of reach towards the rear

3.3.2 Rear mounting

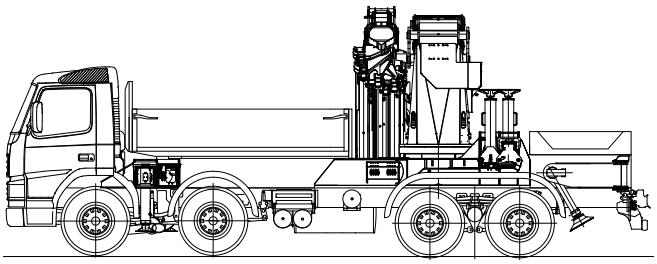
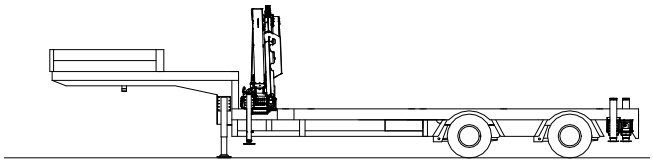
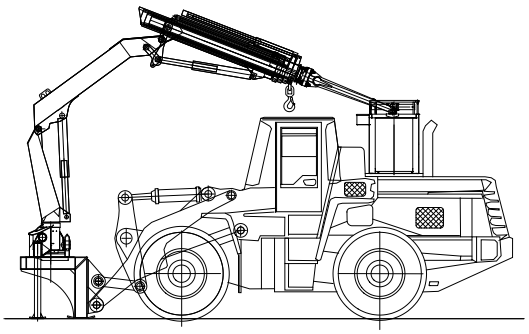
 *Illustration 03-00 4; Rear mounting light series 4x2*	Rear mounting of a loader crane from the light and medium crane series on a double-axle chassis (4x2) with a loading bridge and without additional stabilizers.
 *Illustration 03-00 5; Rear mounting long-boom crane 6x4*	Rear mounting of a long-boom crane on a triple-axle chassis (6x4) with loading bridge and an additional stabilizer in the front area.
 *Illustration 03-00 6; Rear mounting medium series 6x4*	Rear mounting of a loader crane with second knuckle system from the crane series for heavy loads on a triple-axle chassis (6x4) with loading bridge and an additional stabilizer in the front area.

Advantages	Disadvantages
• Good stability towards the front • This mounting type is suitable only for loading bridges and similar equipment • Relief for front axle (but can have adverse effects on steering properties) • No loss of reach towards the rear • Simple loading and unloading of a trailer are possible when the crane is mounted at the rear • Good working area – 360°	• Difficult to transport long loads • Heavy load on the rear axle • A second additional stabilizer is often required for lift performance > 48 mt • Since higher torsion moments may occur when using rear mounting, a torsion-resistant sub frame or greater stability factors are required

INFORMATION

A straightforward rear mounting is as a rule not possible, or possible only under special conditions, for a crane lift moment of 800 kNm or greater.

3.3.3 Special mounting

 *Illustration 03-00 7; Crane central installation*	Mounting of a loader crane from the series for heavy loads on a four-axle truck chassis (short wheelbase). Two additional stabilizers have been mounted to achieve adequate stability, whereby the additional stabilizer at the rear can be slewed towards the back.
 *Illustration 03-00 8; Crane mounted on semitrailer*	Crane mounted on a double-axle semitrailer with an additional stabilizer at the rear.
 *Illustration 03-00 9; Crane mounted on a wheel loader*	Mounting of a loader crane on a wheel loader.

Advantages	Disadvantages
• Customer-specific mounting – special requirements of the customer can be taken into account during the planning. The optimization of the mounting allows a maximum of performance requirements to be achieved	• The specific requirements of the customer generally lead to increased design and mounting expenditures – mounting usually expensive

3.4 Total height of the vehicle

A height calculation verifies that the total height of the vehicle remains within the defined limits (legal provisions or restrictions due to intended use).

- Influencing factors:
- Vehicle mounting height incl. subframe
- Crane height:
-
- Folded
- Over loading surface
- Second knuckle system

ATTENTION

Before beginning the mounting, measure the frame height of the chassis and the height of the crane and compare the measurements with the height calculation

3.4.1 Crane with conventional crane basic frame

The chassis frame must be reinforced with a subframe. The following formula can be used to calculate the overall height of the vehicle:

$$H_{GES} = H_{FG} + H_{HR} + H_K$$

H_{GES} Total height

H_{FG} Chassis height

H_{HR} Subframe height

H_K Total crane height (see technical data sheets)

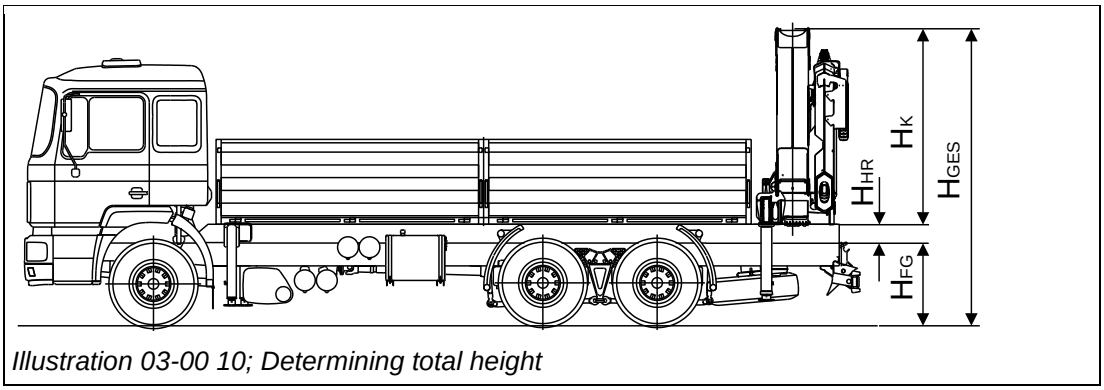


Illustration 03-00 10; Determining total height

3.4.2 Crane with combination basic frame

The crane is placed directly on the chassis frame, so the total height can be calculated according to the following formula:

$$H_{GES} = H_{FG} + H_K$$

H_{GES}	Total height
H_{FG}	Chassis height
H_K	Total crane height (see technical data sheets)

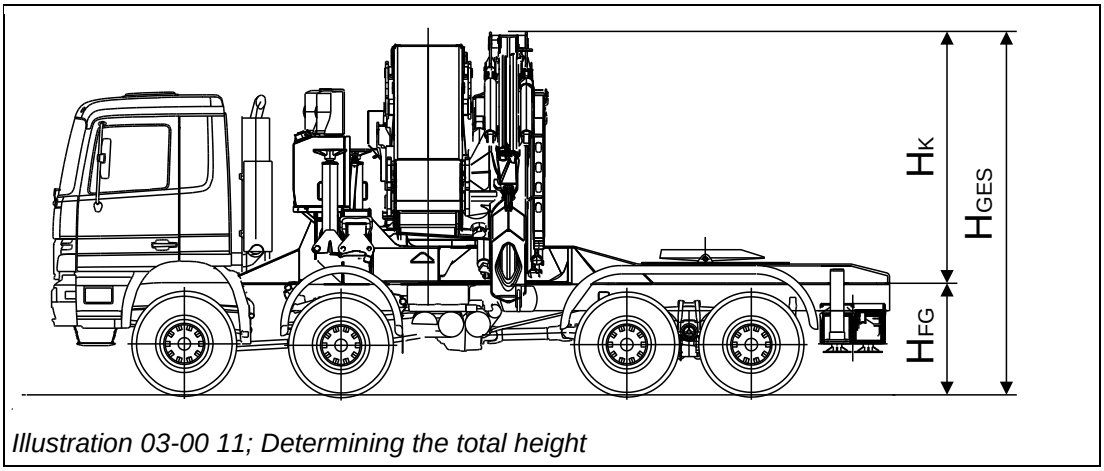


Illustration 03-00 11; Determining the total height

3.5 Axle load stability calculation

The determination of the axle load and the calculation of the stability factor against tipping over are essential for vehicle optimization and correct mounting design.

The mounting must be designed so that a lateral weight difference does not cause any tilting of the vehicle. Permissible limits may be obtained from the truck manufacturer.

INFORMATION

The calculation program 'PAC Online' can be used as an aid to calculate the axle load and stability factors easily. PALFINGER Customer Service and all general representatives will be glad to give you more information about this program.

You will also find further information about calculating the axle load in most mounting guidelines of the respective truck manufacturers.

All of the weights of the mounted components (crane, sub frame, tank, etc.) must be distributed between the front and rear axles in accordance with the moment rate, whereby the reaction forces should always be related to the theoretical middle of the front or rear axle.

The front axle(s) of the vehicle must always be loaded with a minimum share of the total weight of the vehicle in order to avoid negative steering characteristics. Precise information is obtainable from the truck manufacturer.

3.5.1 Theoretical wheelbase

The theoretical wheelbase is a theoretical value used in calculating the axle loads. The definition is shown in the following illustrations.

INFORMATION

The wheelbase effective for turning used in calculating the turning tracks is not always identical with the theoretical wheelbase required for calculating the axle load.

3.5.1.1 Determining the theoretical wheelbase l_{th} for a double-axle chassis

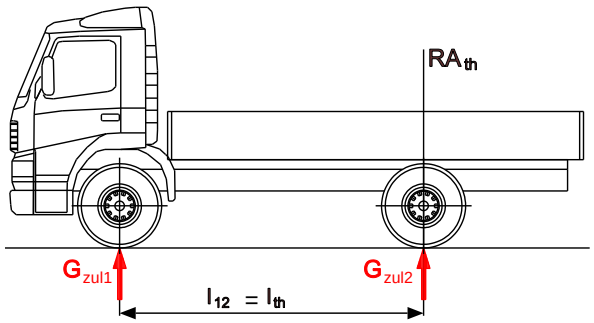


Illustration 03-00 12; Determining the theoretical wheelbase l_{th} for double-axle chassis

RA_{th}	Theor. rear axle middle
G_{zul1}	Perm. axle load of the 1st axle
G_{zul2}	Perm. axle load of the 2nd axle
l_{12}	Wheelbase from 1st to 2nd axle
l_{th}	Theoretical wheelbase

3.5.1.2 Determining the theoretical wheelbase lth for a four-axle chassis with two front and two rear axles for any axle loads

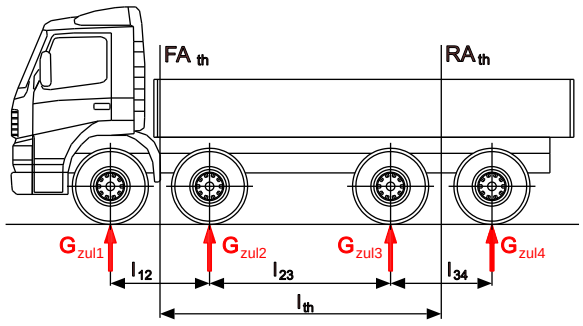


Illustration 03-00 13; Determining theoretical wheelbase l_{th} for four-axle chassis

R_{Ath}	Theor. rear axle middle
FA_{th}	Theor. front axle middle
G_{zul1}	Perm. axle load of the 1st axle
G_{zul2}	Perm. axle load of the 2nd axle
G_{zul3}	Perm. axle load of the 3rd axle
G_{zul4}	Perm. axle load of the 4th axle
l_{12}	Wheelbase from 1st to 2nd axle
l_{23}	Wheelbase from 2nd to 3rd axle
l_{34}	Wheelbase from 3rd to 4th axle
l_{th}	Theoretical wheelbase

$$I_{th} = I_{23} + \frac{G_{zul} * I_{12}}{G_{zul1} + G_{zul2}} + \frac{G_{zul4} * I_{34}}{G_{zul3} + G_{zul4}}$$

3.6 Stability calculation

The vehicle must be stable throughout the entire working area. This can be achieved by using the following systems:

- Adequate stabilizer width
- Additional stabilizers
- Slewing limitation
- Lift moment restriction in certain slewing areas (SHB)
- Extra ballast weight in the carrier vehicle

The safety factor against tipping over is the ratio of the total of all stabilizing moments to the total of all tip moments.

$$S = \frac{\Sigma M_S}{\Sigma M_K}$$

S	Safety factor against tipping over
Sum MS	Total of all stabilizing moments
Sum MK	Total of all tipping moments

The safety factor against tipping over, also called the stability factor (S), must be observed in accordance with EN12999 or the regulations specific to the country.

An alternative help for the calculation is given with the PALFINGER special program PAC Online.

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3.7 Selection and calculation of an additional stabilizer

3.7.1 Preselection of an Additional Stabilizer

WARNING

The diagrams below may be used only for the preselection of an additional stabilizer. They do not replace the stability calculation or the static and rigidity verification.

Front assembly:

For a quick pre-selection of additional stabilizers, the diagram below can be used for front-mounted cranes. It takes into account compliance with the permissible supporting forces at maximum support width of the available PALFINGER additional stabilizers.

Procedure:

- For the defined crane, the dynamic crane moment M_{dyn} can be found out in PALDESK.
- The position of the crane and additional stabilizers must be selected considering the vehicle conditions and desired stability results and defined in the construction drawing
- Starting from Mdyn of the crane on the X-axis, a vertical line shall be drawn upwards
- Starting from the choice of the distance from the center of the crane column to the center of the BS on the Y-axis, a horizontal line shall be drawn
- From the intersection of these two lines, follow the vertical line downwards to the intersection with the next "BS line"
- This specific additional stabilizer allows the maximum supporting forces that occur

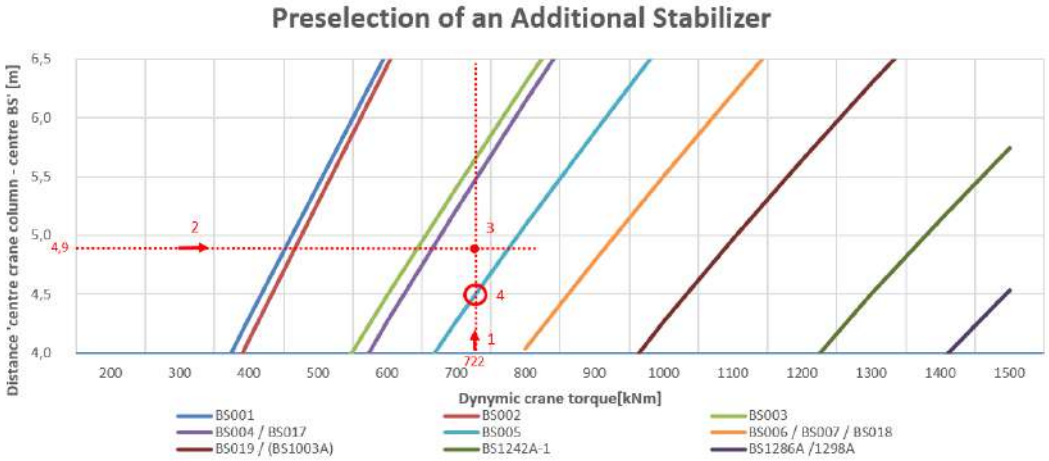


Illustration 03-00 14; Diagram for preselection of additional stabilizer front assembly

Example: PK 65002-SH: M_{dyn} 722 kNm (1); Distance from center crane column to center BS 4.9m (2). Intersection of the two lines (3) and downwards, the intersection point (4) with the next additional stabilizer below – thus the preselection is BS005.

Rear assembly:

For a quick pre-selection of additional stabilizers, the diagram below can be used for rear-mounted cranes. It considers compliance with the permissible supporting forces at maximum support width of the available PALFINGER additional stabilizers.

Procedure:

- For the defined crane, the dynamic crane moment Mdyn can be found out in Paldesk
- Starting from Mdyn of the crane on the X-axis, a vertical line shall be drawn upwards
- Starting from maximum permissible total weight of the truck on the Y-axis, a horizontal line shall be drawn
- From the intersection of these two lines, follow the vertical line downwards to the intersection with the next "BS line"
- This specific additional stabilizer allows the maximum supporting forces that occur

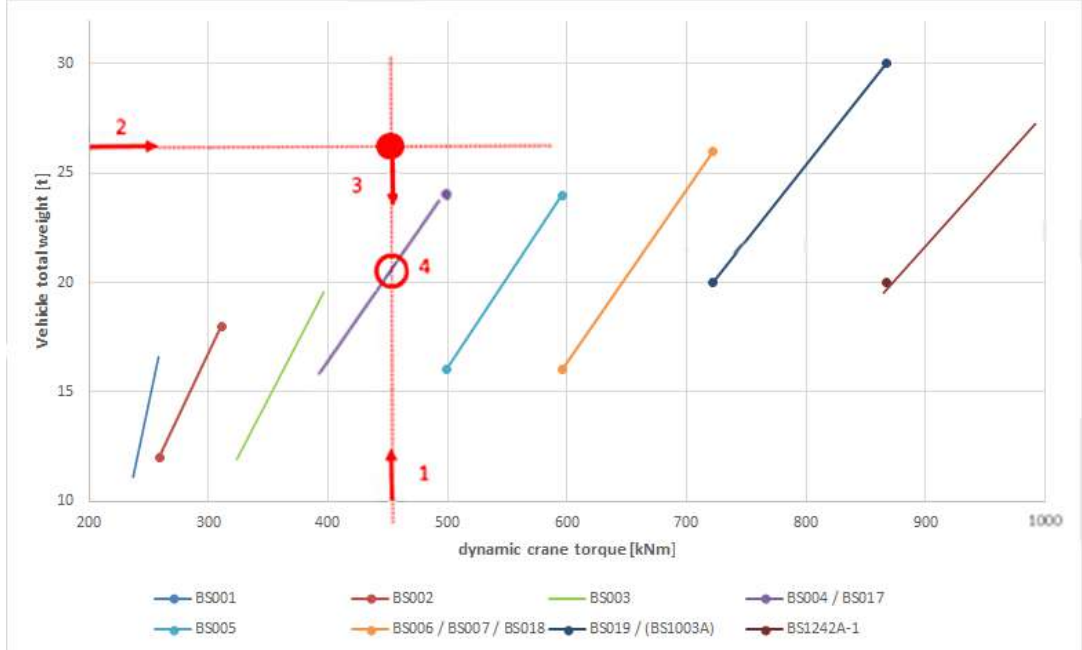


Illustration 03-00 15; Diagram for preselection of additional stabilizer rear assembly

Example rear-mounted: PK 34002-SH: M_{dyn} 450 kNm (1); Maximum permissible total weight of the truck: 26 t (2). Intersection of the two lines (3) and downwards, the intersection point (4) with the next additional stabilizer below - thus the preselection is BS004 / BS017.

3.7.2 Max. supporting force F_{ST} on the additional stabilizer

The calculation is described for a front-mounted loader crane. It can also be used analogously for a rear-mounted loader crane.

The max. dynamic crane moment Mdyn is decisive for the calculation of the max. supporting force.

Definition of M_{dyn}: Total dynamic crane moment, load combination A1, corresponding with crane classification EN12999, no safety coefficients.

3.7.2.1 Determining the max. dynamic crane moment M_{dyn}

INFORMATION

The maximum dynamic crane moment M_{dyn} can be obtained online in the technical information sheets (TIB) via PALDESK.PALFINGER.com.

3.7.2.2 Determining the max. supporting force F_{ST} of the additional stabilizer

The calculation is described for a front-mounted loader crane. It can also be used analogously for a rear-mounted crane.

For the calculation of the stabilizer force (F_{ST}) on the stabilizer cylinder of the additional stabilizer you can use following procedure.

$$F_{ST} = \frac{M_d}{L_{st}}$$

F_{ST}	Max. stabilizer force in kN
M_d	Max. dyn. crane lift moment in kNm
L_{ST}	Shortest distance crane column middle to stabilizer cylinder of the additional stabilizer in m

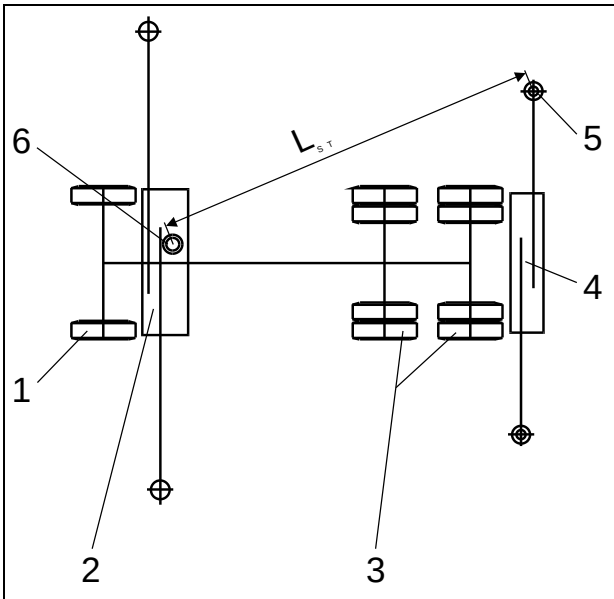


Illustration 03-00 16; Determining max. stabilizer force FST

1	Truck front axle
2	Loader crane
3	Truck rear axle
4	Additional stabilizer
5	Stabilizer cylinder additional stabilizer
6	Crane column middle

INFORMATION

Further information on additional stabilizers and their fastening can be obtained online in Chapter 7 'Mounting additional stabilizers' via PALDESK.PALFINGER.com.

3.7.3 Additional stabilizer(s) in front of the cab

If it is supposed to be possible to make full use of the crane moment even above the driver's cab, this can be achieved by mounting one or two stabilizer cylinder(s) (1) in front of the driver's cab.

The size and design of the additional support cylinders must be individually adapted to the truck. PALFINGER's recommendation is to set up a support cylinder in front of the cab. In the following, the advantages and disadvantages of the two variants are compared.

One support cylinder in front of the cab	
Advantages	**Disadvantages**
• Statically better design • Centric application of force • Better crane performance when working above the cab • Cheaper body building variant	• Slightly more space required in the longitudinal direction of the vehicle (more massive version of the cylinder) • Front towing coupling can only be achieved with effort

Two support cylinders in front of the cab	
Advantages	**Disadvantages**
• Higher supporting forces can be achieved when using 2 support cylinders (only with the corresponding design of the chassis frame) • Slightly more compact design in the longitudinal direction of the vehicle is possible • Front towing coupling feasible	• Potential restriction when slewing above the cab due to overloading of one of the two front stabilizers

In order to be able to mount support cylinders in front of the cab, the vehicle must be equipped with a reinforced chassis frame in the front area.

Some truck manufacturers offer so-called snow plough attachments or towing attachments as special equipment. As a rule, this special equipment is well-suited for the mounting of stabilizer cylinders.

The max. permissible support forces of the support cylinders depend on the design of the front chassis frame and must therefore be coordinated with the respective truck manufacturer.

The max. permissible supporting forces must be secured by suitable measures (e.g., pressure sensors, etc.). These signals must be integrated into the crane overload system.

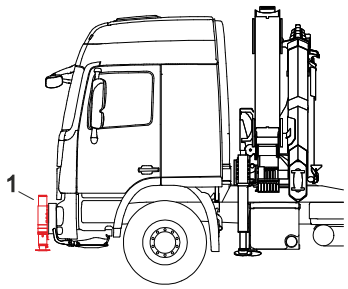


Illustration 03-00 17; Front stabilizer

1	Additional stabilizer in front of the cab

INFORMATION

Enough clearance for tipping of the driver's cab must be considered when using front stabilizer (see mounting guideline and mounting drawing of the respective truck manufacturer).

3.7.4 Additional stabilizers from PALFINGER

PALFINGER offers different variants of additional stabilizers depending on the supporting force.

Advantages:

- Development and production by PALFINGER
- Simple and ideal integration into the stability system of the crane "Plug & Play"
- Low dead weight = Higher payload
- High max. permissible support forces up to 240 kN
- All support cylinders are equipped with slewing supporting disks (compliant with EN12999)
- Fully variable support position available
- Protected internal hoses and electronics
- Low-maintenance boom system
- High working speed thanks to integrated return oil utilization
- High corrosion resistance due to high-quality KTL coating

INFORMATION

Link to the overview list in PALDESK: https://static.palfinger.com/static-palipedia-docs/uploads/Bid-Specification/bs000_2016-04-00000014CX/BS000_2016-04.pdf

3.7.4.1 Front stabilizers from PALFINGER

INFORMATION

PALFINGER offers truck manufacturer-specific front stabilizer kits. These are coordinated with the truck manufacturers and contain information on truck order codes. These can be obtained online in the 'Mounting Accessories Catalog' via PALDESK. PALFINGER.com.

3.8 Selection and calculation of a subframe

The subframe has to be dimensioned according to the currently valid technical regulations or standards.

The main purposes of the subframe are as follows:

- Increase of the bending and torsional rigidity of the overall system
- Application of the forces into the chassis frame and the additional stabilizers
- Fastening of body components such as crane, additional stabilizers, hookloader, platforms, trough-tipper system, fifth wheel plate or special constructions

The type of design and its connection to the chassis frame is essentially dependent on:

- The type and height of the force application – e.g., in the case of the loader crane, the dynamic crane moment
- The basic vehicle and the application
- The available mounting space
- Regulation of the truck manufacturers
- The desired properties (payload, stability, loading height)
- The available materials

3.8.1 Selection of the subframe

The design of subframes is basically divided into open or closed types or the combination of the both.

The selection and dimensioning of the subframe type are influenced in particular by the following factors:

Factor	Examples
Application and type of body building	Loader crane (front-, middle-, rear-mounted), base frame – type (chassis frame or integral base frame), additional stabilizers, combination crane / hookloader, semi-trailer vehicle, container vehicle, swap platform, etc.
stress and application of forces	Dynamic crane moment, forces of the hook loader, the type of connection between subframe and chassis frame as well as additional stabilizers, e.g., shear-yielding and shear-resistant connections
Basic vehicle	Vehicle type (axle type and number, off-road capability, etc.), vehicle weight, as well as chassis frame design (single or double C-beam)
Intended flied of application and customer requirements	Permissible total height, loading height, permissible total weight, stability requirements, field of application (soil conditions)
Subframe manufacturing or procurement costs	Availability and cost of materials and prefabricated profiles, availability of equipment (lasers, chamfer devices, etc.)

INFORMATION

With the help of the calculation program "PAF" (PALFINGER Frame), the stresses in the chassis and subframe as well as the support forces on the additional stabilizers can be determined. Further information on this software can be obtained from PALFINGER Customer Service and all national representatives.

INFORMATION

Further information on the designs of the subframes can be obtained online in Chapter 5 'Subframes' via PALDESK.PALFINGER.com.

3.8.2 Intermediate layer

In some cases, an intermediate layer must be installed between the chassis frame and the subframe. It must be made of a permanently dimensionally stable material (e.g., mild steel or plastic) and must extend over the entire length of the subframe.

Examples:

- Galvanic isolation of steel chassis and aluminum subframe.
- Geometric requirements such as loading height or collisions with vehicle components.

3.9 Connecting elements

3.9.1 Selection of connecting elements

Mechanical connecting elements are used to attach the body components to the chassis frame.

The crane and the additional stabilizers must be connected to the chassis frame in a shear-resistant manner to transmit the forces. This is usually done by connecting elements that are welded to the subframe and screwed to the chassis frame.

In between, depending on the crane size and/or design, continuous shear-resistant elements are used to connect the subframe to the chassis frame or, in the case of cranes with a lower lifting moment, shear-yielding or shear-resistant elements at short, specified intervals.

INFORMATION

Some truck manufacturers already offer suitable crane plates and base shear plates in their body building platforms, which can be pre-assembled on request.

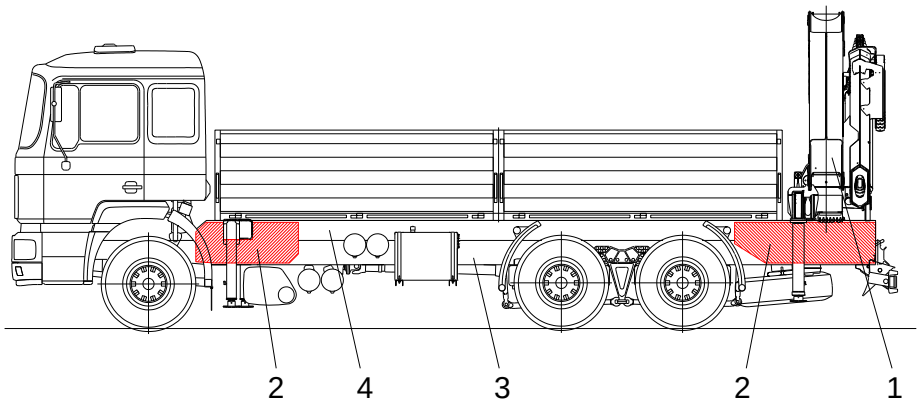


Illustration 03-00 18; Base shear plate

1	Loader crane	3	Chassis frame
2	Base shear plate	4	Subframe

INFORMATION

Further information on the design of the connecting elements on the subframe can be obtained online in Chapter 5 'Subframes' via PALDESK.PALFINGER.com.

INFORMATION

Further information can be obtained online in Chapter 6 'Crane Fastening' via PALDESK.PALFINGER.com.

3.9.2 Type of connecting elements

3.9.2.1 Crane plates / Mounting plates

These connecting elements are required for static or strength reasons in the areas below the loader crane as well as in the area of the additional stabilizers and are referred to here as "crane plate" or "mounting plate".

These base shear plates have the task of creating a rigid and a shear-resistant connection between the chassis frame and the subframe. They are also included in the cross-sectional calculation via PAF.

3.9.2.2 Fastening angels

Shear-yielding connecting elements are used for gradual mechanical decoupling of the subframe from the chassis frame. Thus, the force transfer is gradually transferred to the chassis frame via all shear-yielding elements in order to create a "soft" transition.

If these connecting elements were designed as shear-resistant, there would be a hard or abrupt transfer of force from the subframe to the chassis frame, resulting in a much higher load on the chassis frame.

Flexible mounting also ensures limited horizontal movement between the chassis frame and subframe and can be considered as the parallel interaction of two separate beams. The cross-sectional areas of the chassis frame and the subframe are each exposed to a portion of the total bending moment, according to their respective moments of inertia.

The flexibility of this connection also improves the driver comfort of the truck, because the chassis frame reacts much more flexibly to potential horizontal movements. Thus, vibrations coming from the rear of the vehicle are damped and diverted in the direction of the driver's cab. Examples of shear-yielding connecting elements.

INFORMATION

The number and design of the connecting elements influences the driving behavior and must be selected according to the currently valid body building guidelines of the respective truck manufacturer.

3.9.2.3 Continuous side plates

For superstructures on a vehicle with a short wheelbase, it makes sense to complete the web push plates (2) as far as possible continuously.

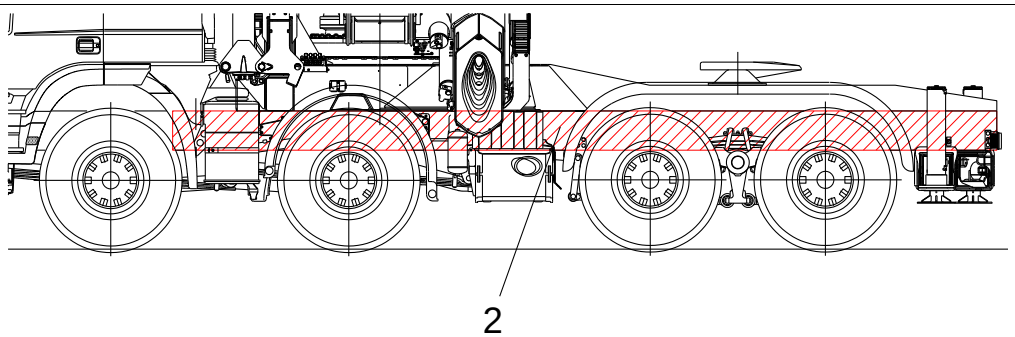


Illustration 03-00 19; Continuous side plates

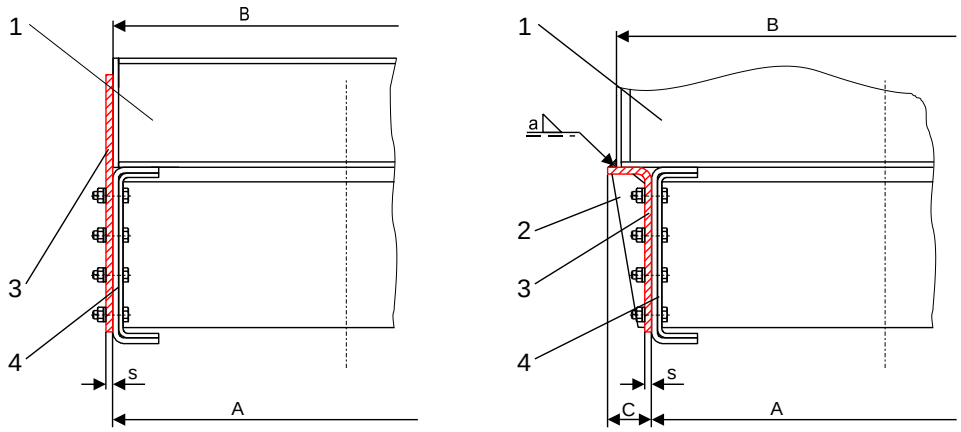


Illustration 03-00 20; Fastening side plates

1	Combination crane base / subframe	A	Width of chassis frames
2	Reinforcement angle	B	Width of chassis frames / combination crane base
3	Base shear plate	C	Width of base shear plate
4	Chassis frame	s	Thickness of base shear plate

The base shear plate (3) is bolted to the chassis frame (4) and welded to the subframe (1). If the subframe is the same width as the chassis frame, the base shear plate is attached flush (see left-hand illustration). If the subframe or the combination crane base is wider than the chassis frame, the width is equalized using the base shear plate (see right-hand illustration).

Select the width of the base shear plate (C) so that a fillet weld of the thickness a = 0.8 * s can be placed without obstruction. Weld on reinforcement angles (2) at intervals of about 800 to 1000 mm on the sides of the base shear plates.

3.9.3 Flexible- and torsion-resistant crane mounting

3.9.3.1 Flexible crane mounting

A flexible crane mounting is a mounting which has low resistance to twisting. In this type of mounting, the mounting follows the movements of the chassis frame when the vehicle is driving over uneven surfaces, subjecting the mounting and the chassis to strong twisting motions.

Advantages	Disadvantages
• Usually low-cost mounting. • Good driving properties on uneven terrain. • Low tensions from torsion in the mounting.	• Only low torsion moments can be transferred to the mounting. • Wide spring fluctuations during crane operation • Suitable only for cranes up to about 25 mt.

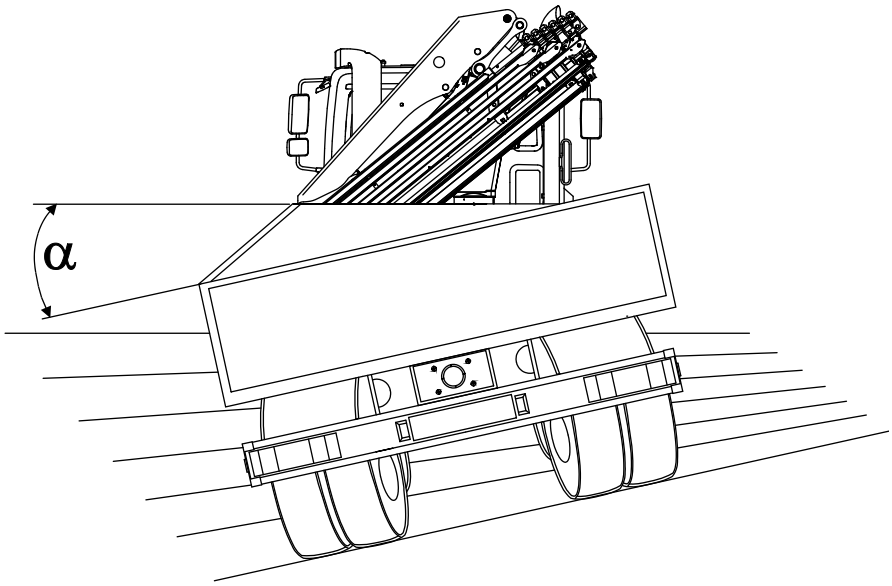


Illustration 03-00 21; Frame system of a torsion-flexible crane mounting

INFORMATION

Since flexible crane mountings can transfer only low torsion moments, they are only suitable for crane mountings without additional stabilizer.

More information on torsion-flexible subframe designs can be obtained online in Chapter 5 'Subframes' via PALDESK.PALFINGER.com

3.9.3.2 Torsion-resistant crane mounting

A torsion-resistance crane mounting is a mounting which has high resistance to twisting. Since this mounting's own rigidity permits little torsion in the chassis, the driving properties are worse on uneven terrain.

Advantages	Disadvantages
• High torsion moments in the mounting can be transferred • Little spring fluctuation during crane operation • Suitable for cranes with high lift moment (> 25 mt) and for rear-mounted cranes	• Usually, expensive mounting • Poorer driving properties on uneven terrain (all-wheel drive often required) • High tensions from torsion in the mounting

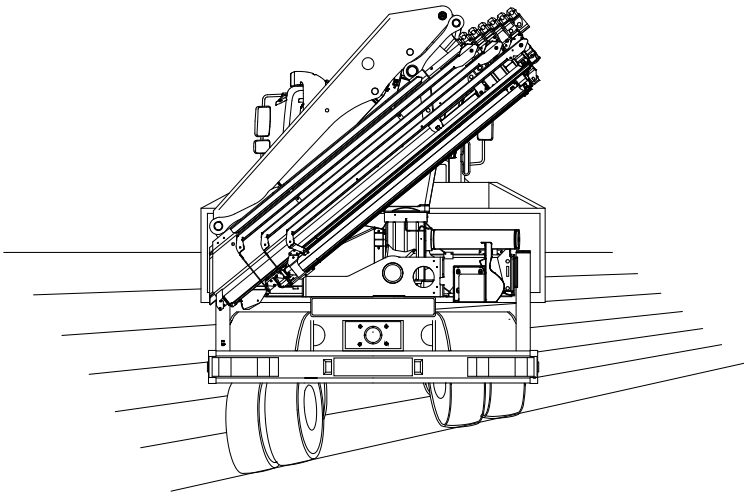


Illustration 03-00 22; Frame system of a torsion-resistant crane mounting

INFORMATION

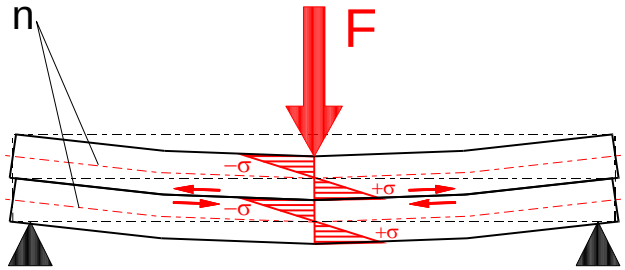
Since torsion-resistance mountings can transfer high torsion moments, they are well-suited for crane mountings with additional stabilizer and for rear-mounted cranes.

More information on torsion-resistant subframe designs can be obtained online in Chapter 5 'Subframes' via PALDESK.PALFINGER.com

3.9.4 Shear-yielding and shear-resistant frame connections

3.9.4.1 Shear-yielding frame connections

There is a shear-yielding frame connection if the frame systems allow a longitudinal shift as a consequence of a bending stress on the contact surfaces. The vertical force F causes both bars to bend, leading to a maximum tension on the outer fibers of the individual frame systems. The tension is zero in the neutral fibers "n".



F	vertical force
N	neutral fibers
-σ	compressive stress
+σ	tensile stress

Illustration 03-00 23; Shear-yielding frame connection

All of the mountings or sub frames which are bolted to the chassis with fastening angles or similar devices are to be regarded as shear-yielding connections. Relative motion between the chassis frame and the subframe is possible to a limited extent. Shear-yielding fastenings should always be selected as long as they are adequate for the task.

More information on torsion-resistant subframe designs can be obtained online in Chapter 5 'Subframes' via PALDESK.PALFINGER.com

3.9.4.2 Shear-resistant frame connections

There is a shear-resistant frame connection when a longitudinal shift of the two frame systems is no longer possible (see bar model). This can be assured, for example, by mounting shear-resistant connecting elements such as base shear plates on the ends of the frame systems. The max. tensions now occur only in the outer fibers of the complete frame system.

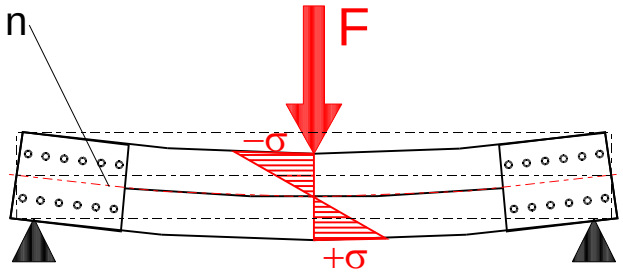


Illustration 03-00 24; *Shear-resistant frame connections*

F	vertical force
N	neutral fibers
-σ	compressive stress
+σ	tensile stress

Relative motion between the frame and the sub frame are no longer possible when shear-resistant connections are used. They should be used when shear-yielding fastenings are no longer adequate, or if the sub frame would have unreasonably large cross-section dimensions if a shear-yielding connection were used.

The shear-resistant connection must be designed according to the mounting instructions of the truck manufacturer. You will find more information on shear-resistant connecting elements in Chapter 5 'Subframe".

3.9.4.3 Combined frame connection

The connection types shear-yielding and shear-resistant can also be combined. This means that the shear-resistant connection is used only in the area requiring this type of connection. Otherwise, the shear-yielding connection is used.

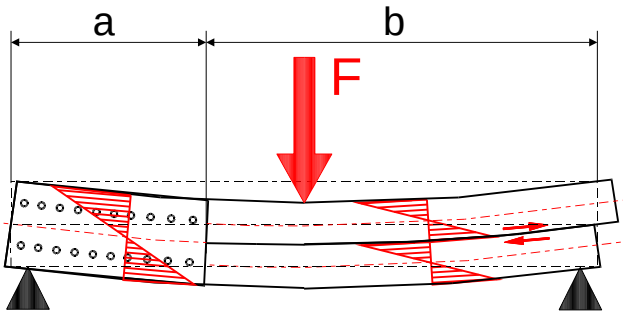


Illustration 03-00 25; Combined frame connections

F	vertical force
a	Area of shear-resistant connection
b	Area of shear-yielding connection

For example, a shear-resistant connection can be selected in the crane area, then there can be a changeover to the shear-yielding connections for the rest of the frame, if permitted by rigidity and stability values.

WARNING

Before beginning the mounting, the chassis and the crane must be weighed and compared with the results of the axle load and stability calculation. In cases of greater deviation, the calculation or the crane arrangement must be corrected.

A practical stability test according to EN12999 or another standard specific to the country must be carried out after completion of the mounting.

3.10 Defining of PTO and hydraulic pump

3.10.1 Hydraulic drive

The purpose of this calculation is to determine the correct dimensioning of the hydraulic drive for the loader crane.

Determining the required data such as conveyance quantity and max. operating pressure according to the technical data sheets of the crane.

The following points must be considered to determine the correct design:

- Permissible output and torque
- Consideration of the total efficiency factor
- Selection of the correct gear transmission ratio with ideal motor rotational speed
- Correct selection of the rotational direction
- Critical rotational speed
- Useful life
- Maximum length and bend angles of the drive shaft (if required)
- Cooling (no heat build-up)
- Mounting and accessibility

3.10.1.1 Hydraulic pump calculation

PALFINGER recommends the use of the technical specification 'Pump design hydraulics – loader crane'. This can be obtained online via PALDESK.PALFINGER.com.

INFORMATION

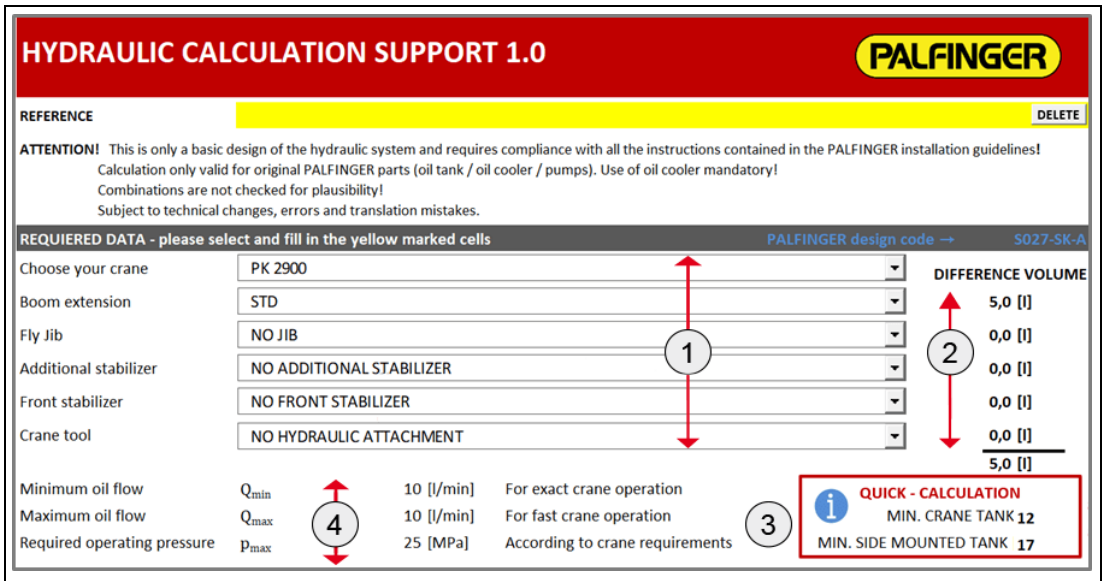
This is only a basic design of the hydraulic system. All instructions in the PALFINGER mounting guideline must be followed! The design is only valid for PALFINGER knuckle boom cranes in combination with original PALFINGER hydraulic components (pump, oil cooler, tank, etc.)

INFORMATION

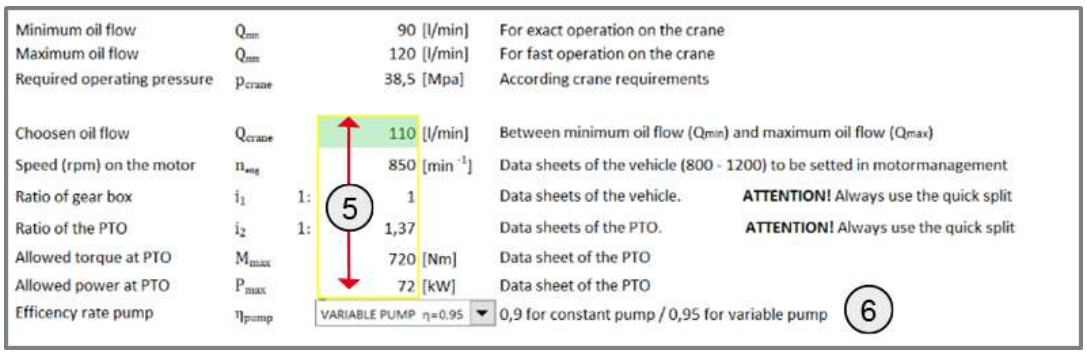
In the case of dual-circuit cranes, both circuits must be calculated separately!

INFORMATION

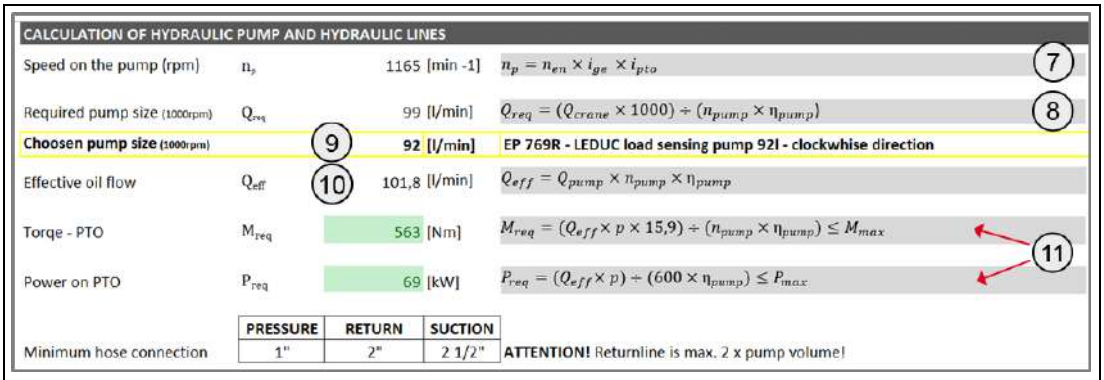
Depending on the field of application, fixed displacement or variable displacement pumps can be used.



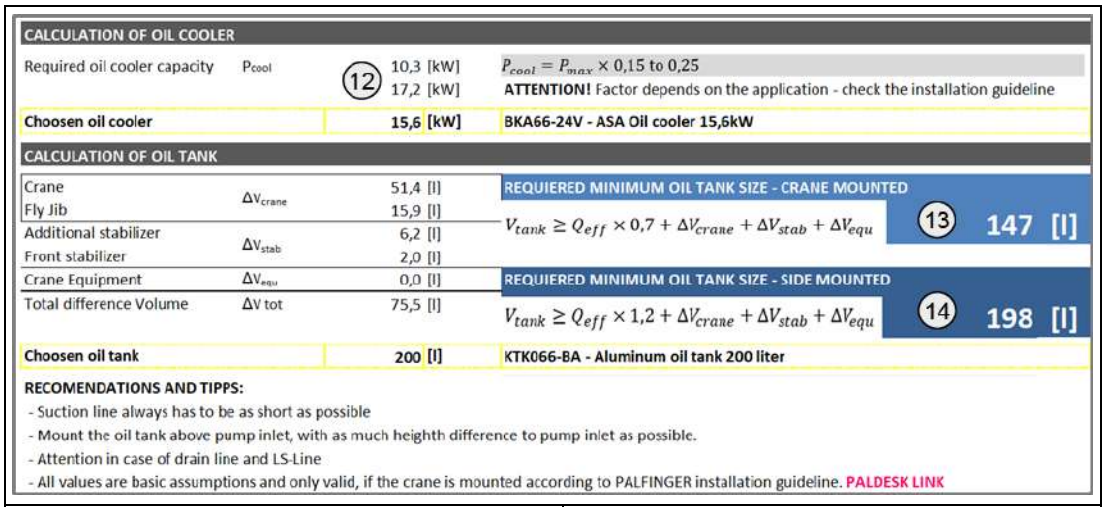
1	Selection crane / fly jib / stabilizer / equipment	3	Quick calculation volume flow
2	Difference volume of crane / jib / additional stabilizer / equipment	4	Information about oil flow



5	Vehicle PTO specification	6	Selection pump type



7	Pump speed	10	Effective oil flow
8	Required pump size	11	Max. torque / power
9	Chosen pump size		



CALCULATION OF OIL COOLER

Required oil cooler capacity	P_{cool}	(12) 10,3 [kW] / 17,2 [kW]	$P_{cool} = P_{max} \times 0{,}15$ to $0{,}25$ **ATTENTION!** Factor depends on the application - check the installation guideline
Choosen oil cooler		**15,6 [kW]**	**BKA66-24V - ASA Oil cooler 15,6kW**

CALCULATION OF OIL TANK

Crane	ΔV_{crane}	51,4 [l]	REQUIERED MINIMUM OIL TANK SIZE - CRANE MOUNTED
Fly Jib		15,9 [l]	$V_{tank} \geq Q_{eff} \times 0{,}7 + \Delta V_{crane} + \Delta V_{stab} + \Delta V_{equ}$ (13) **147 [l]**
Additional stabilizer	ΔV_{stab}	6,2 [l]	
Front stabilizer		2,0 [l]	
Crane Equipment	ΔV_{equ}	0,0 [l]	REQUIERED MINIMUM OIL TANK SIZE - SIDE MOUNTED
Total difference Volume	ΔV tot	75,5 [l]	$V_{tank} \geq Q_{eff} \times 1{,}2 + \Delta V_{crane} + \Delta V_{stab} + \Delta V_{equ}$ (14) **198 [l]**
Choosen oil tank		**200 [l]**	**KTK066-BA - Aluminum oil tank 200 liter**

RECOMENDATIONS AND TIPPS:
- Suction line always has to be as short as possible
- Mount the oil tank above pump inlet, with as much heighth difference to pump inlet as possible.
- Attention in case of drain line and LS-Line
- All values are basic assumptions and only valid, if the crane is mounted according to PALFINGER installation guideline. PALDESK LINK

12 Required oil cooler capacity 13 Min. oil tank size (crane mounted)	14 Min. oil tank size (side mounted)

ACHTUNG

If only one transmission ration is available, use 1 for i_{ge}. Q_{crane} must be between Q_{min} and Q_{max}.

Pump speed

$n_{pump} = n_{en} \bullet i_{ge} \bullet i_{pto}$

n_{pump}	Pump speed [min^{-1}]
n_{en}	Engine speed [min^{-1}]
i_{ge}	Gear transmission ratio
i_{pto}	PTO transmission ratio

In combustion engines the speed must comply with the recommendations of the engine manufacturer.

Transmission ratios can be found in the appropriate technical datasheets of the gearbox manufacturer.

ATTENTION

The hydraulic pump must not be operated above the permitted rotational speed under any circumstances. The pump should always operate in the optimal rotational speed range (see data sheet of the hydraulic pump) to achieve a high efficiency factor and operational quietness.

Required nominal pump volume

$Q_{req} = Q_{crane} \bullet 1000 / (n_{pump} \bullet \eta_{pump})$

Q_{req}	Required nominal pump volume at 1000 rpm	
Q_{crane}	Required crane volume flow [l/min]	
n_{pump}	Pump speed [rpm]	
η_{pump}	Pump efficiency	
	Continuous displacement pump	0.9
	Variable displacement pump	0,95

The required crane volume flow can be found in the appropriate technical datasheets on PALDESK.

Pump parameters can be found in the appropriate technical datasheets of the respective pump manufacturer.

Effective pump capacity

$$Q_{eff} = Q_{pump} \bullet n_{pump} \bullet \eta_{pump}$$

Q_{eff}	Effective pump volume [l/min]	
Q_{pump}	Volume flow of selected pump at 1000 rpm [l/min]	
n_{pump}	Pump speed [rpm]	
η_{pump}	Pump efficiency	
	Continuous displacement pump	0.9
	Variable displacement pump	0,95

Pump parameters can be found in the appropriate technical datasheets of the respective pump manufacturer.

3.10.1.2 Calculation of required driving power

Required engine torque

$$M_{treq} = (Q_{eff} \bullet p \bullet 159) / (n_{pump} \bullet \eta_{pump}) \leq M_{tmax}$$

M_{treq}	Required torque [Nm]	
Q_{eff}	Actual pump volume [l/min] with variable discharge pumps it is necessary select the maximum volume flow.	
n_{pump}	Pump speed [rpm]	
η_{pump}	Pump efficiency	
	Continuous displacement pump	0.9
	Variable displacement pump	0,95
M_{tmax}	Maximum engine torque	

Pump parameters and the maximum motor torque can be found in the appropriate technical datasheets of the respective pump manufacturer.

Required PTO power output

Cardan shafts can reduce efficiency and hence increase the required driving power. Each power take-off and each cardan shaft have a maximum permissible torque and a maximum permissible driving power under specific operating conditions, which must be checked during project planning.

$P_{req} = (Q_{eff} \bullet p) / (60 \bullet \eta_{pump}) \leq P_{max}$

P_{req}	Required PTO power output [kW]	
Q_{eff}	Actual pump volume [l/min] with variable discharge pumps it is necessary select the maximum volume flow.	
p	Operating pressure [MPa] (1 MPa = 10 bar)	
η_{pump}	Pump efficiency	
	Continuous displacement pump	0.9
	Variable displacement pump	0,95
P_{max}	Maximum driving power [kW]	

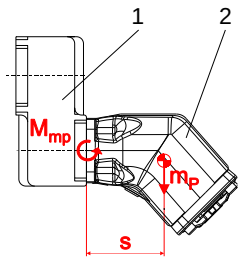
The operating pressure of the crane can be found in the appropriate technical datasheets on PALDESK. Maximum driving power can be found in the appropriate technical datasheets of the truck manufacturer.

3.10.1.3 Calculating the max. weight moment of hydraulic pumps for direct mounting

When a hydraulic pump is mounted directly on a gear box (e.g., auxiliary drive), the weight moment of the pump must be checked. The purpose of this calculation is to verify that the weight moment of the pump does not put excessive strain on the gear box housing. The permissible value can be found in the technical data sheets from the gear box manufacturer.

If the weight moment of the hydraulic pump is not shown in the technical data sheets, this value can be calculated according to the formula below.

$$M_{mp} = \frac{m_P * 9{,}81 * s}{1000}$$



1	Gear box / PTO	2	Hydraulic pump

M_{mp}	Weight moment of the pump [Nm]
m_P	Dead weight of the pump [kg]
s	Distance from mounting flange to center of gravity of the pump [mm]

ATTENTION

Always observe the guidelines issued by the manufacturers of the pump, motor and gearbox.

3.11 Oil tank and oil cooler design

The oil tank shall provide oil volume for the hydraulic cylinders and calm the oil to prevent air from being sucked in by the pump. However, the oil tank has only a minor influence on the cooling behavior of the hydraulic oil.

For the oil tank design, the periodically varying oil volume of the hydraulic system is taken into account. This is the difference in volume between retracted and extended cylinder positions.

The oil cooler is the most important component for keeping the hydraulic oil in an optimum temperature range. PALFINGER recommends the general use of oil coolers.

Only during very shorts operating times (depending on intensity maximum 15 - 30 min) with longer cooling times (> 2 h) you can work without an oil cooler. In such a case, an oil tank larger than the one described below may be necessary.

At very low temperatures ensure that the oil reaches its operating temperature. Smaller oil tanks are advantageous in this respect, where appropriate provide for an oil preheating system.

Answers to specific questions regarding hydraulic system design can be obtained from PALFINGER customer service.

INFORMATION

Detailed design instructions can be obtained online in the PAC Online software and the training documents via PALDESK.PALFINGER.com.

3.11.1 ORIGINAL PALFINGER hydraulic tanks

All ORIGINAL PALFINGER hydraulic tanks (crane tanks and extra tanks) are optimized in their fluid dynamics and can, therefore, be designed according to the below specified formulas.

PALFINGER recommends the use of an electrical temperature and fill level sensor, which is optionally available for various models. It serves as an additional information system and thus prevents consequential damage in case of excessive oil temperature.

INDEX	Designation	Source
V_{tank}	minimum required oil volume at maximum oil level [l]	TIB / catalog
Q_{eff}	effective delivery rate of hydraulic pump or pumps [l/min]	calculated
Q_{min}	recommended minimum delivery rate of hydraulic pump or pumps [l/min]	TIB
ΔV_{crane}	periodically varying oil volume of crane including PJ [l]	PAC Online
ΔV_{stab}	periodically varying oil volume of additional stabilizers [l]	PAC Online
ΔV_{equ}	periodically varying oil volume of ancillary equipment [l]	PAC Online

3.11.1.1 Design of ORIGINAL PALFINGER crane tank

$$V_{tank} \geq Q_{eff} \bullet 0,7 + \Delta V_{crane} + \Delta V_{stab} + \Delta V_{equ}$$

Additional condition: $Q_{eff} \geq Q_{min}$

INFORMATION

The effective delivery rate Q_{eff} used in the calculation must not be less than the relevant crane type's minimum delivery volume recommended in the technical data.

Influence of smaller ancillary equipment can be neglected (e.g., clamshell bucket etc.).

3.11.1.2 Design of ORIGINAL PALFINGER extra tank

$V_{tank} \geq Q_{eff} \bullet 1,2 + \Delta V_{crane} + \Delta V_{stab} + \Delta V_{equ}$

Additional condition: $Q_{eff} \geq Q_{min}$

INFORMATION

Because of its different suction height and geometry an extra tank requires a higher factor.

The effective delivery rate Qeff used in the calculation must not be less than the relevant crane type's minimum delivery volume recommended in the technical data.

Influence of smaller ancillary equipment can be neglected (e.g., clamshell bucket, etc.).

3.11.1.3 Parameters

- The presented formulas are only applicable to cranes with oil cooler.
- Use of ORIGINAL PALFINGER hydraulic oil is recommended to achieve optimal air separation.
- ORIGINAL PALFINGER hydraulic tanks are delivered cleaned and closed. Pay particular attention to component cleanliness of the hydraulic tank. Check component cleanliness before filling the tank.

ATTENTION

Other products that are also supplied by the hydraulic system are not considered in this design and may have varying requirements!

Every hydraulic system has its particularities that must be considered.

In order to limit oil heating, use sufficiently designed oil coolers.

3.11.2 Hydraulic tanks and combination tanks manufactured by other companies

3.11.2.1 Design of tanks manufactured by other companies

- For hydraulic tanks manufactured by other companies make sure that, after deducting the periodically varying oil volume, the hydraulic fluid in the tank is sufficient to reliably supply the suction port even at maximum vehicle tilt.
- Also, with this base design the use of oil coolers is recommended.

ATTENTION

Other products that are also supplied by the hydraulic system are not considered in this design and may have varying requirements!

Every hydraulic system has its particularities that must be considered.

In order to limit oil heating, use sufficiently designed oil coolers.

3.11.3 General hydraulic tank installation guidelines

- Do not place the oil tank near the exhaust (exhaust pipe or outlet).
- To prevent the hydraulic oil from heating up unintentionally and hence fire hazard
- Place the oil tank above pump level (reduced risk of cavitation)
- Place the oil tank as near as possible to the pump (reduced risk of cavitation)
- Lead suction line as straight as possible to the pump (reduced risk of cavitation)
- In case of rear mounting always use a separately mounted oil tank. With an integrated tank the suction line on the crane would be too long.
- Install a stopcock right downstream the suction nozzle in the suction line, this facilitates work on lower hydraulic components without having to empty the oil tank.
- PALFINGER points out that the PAC Online hydraulic system calculation module is available for designing hydraulic systems.

DANGER

Risk of fire!

Do not place the oil filler neck near the exhaust.

3.11.4 Oil cooler design

Every hydraulic system has its particularities that must be considered. In order to limit oil heating, use sufficiently designed oil coolers.

Adjust the oil cooler's output capacity as per crane size and use.

The hydraulic fluid's permissible temperature range with PALFINGER is:

30 - 60 °C ideal working range

80 °C maximum value

How to select a suitable hydraulic fluid is described in chapter 8.

INDEX	Designation	Source
Q_{eff}	effective delivery rate of hydraulic pump or pumps [l/min]	calculated
p	crane's operating pressure [bar]	TIB
P_{cool}	oil cooler's capacity [kW]	TIB / calculated

3.11.4.1 Oil cooler basic design

$$P_{cool} \geq (Q_{eff} \cdot p) / 600 \cdot k$$

k factor 0,15 – 0,25 for 1- circuit systems

k factor 0,23 – 0,38 for 2- circuit systems

INFORMATION

The cooling capacity P_{cool} depends on the difference between oil temperature and air temperature.

For the basic design, the capacity is specified with a temperature difference of 40 °C and an effective hydraulic pump delivery rate of 100 l/min.

3.11.4.2 Parameters and oil cooler installation guidelines

- With increased hydraulic performance and adverse ambient factors use a more powerful oil cooler, including:
- Use in regions with ambient temperature
- Permanent use
- Grab operation and intensive operation of ancillary equipment
- Intensive rope winch operation
- Use at great altitudes (> 1500 m above sea level)
- Insufficient heat removal of cooler (confined space of installation, engine heat, etc.)
- All hydraulic lines must be designed as per chapter 8, in order to reduce additional fluid heating.
- Maintain distances to adjacent components as per oil cooler installation guidelines.
- Monitor the oil temperature when in use.
- Use of Original PALFINGER hydraulic oil is recommended.

ATTENTION

This formula is an empirical formula; it does not consider all ambient factors!

To prevent fluid overheating adjust the oil cooler's capacity to the actual conditions.

Other products that are also supplied by the hydraulic system are not considered in this design and may have varying requirements!

The oil cooler's installation guidelines are supplied with every separate oil cooler. Alternatively, they can be obtained online via PALDESK.PALFINGER.com. Always observe these guidelines!

3.12 Equipment recommendations for the vehicle

Only careful planning of the bodybuilder and a proper definition of the relevant truck order codes together with specialists from the truck manufacturers enables the full use of the properties of PALFINGER components.

INFORMATION

A checklist for body building configuration as well as a selection of relevant truck order codes can be obtained online via PALDESK. PALFINGER.com.

3.12.1 Space requirements for crane and mounting

It must be determined in the preliminary stage whether transmission components which protrude beyond the chassis frame or other components of the truck (shock absorbers, springs, hydraulic pump, auxiliary drive, air reservoir etc.) may lead to collision problems with the sub frame or the crane. It must also be determined if there is adequate space for the spring travel of the axles.

3.12.2 Parking brake

It is a sensible idea to equip the front axle(s) with a parking brake to achieve better stability during crane operation.

3.12.3 Spring brake

The installed spring brakes must be fail-safe, so, the brake lining is pressed onto the brake disk or drum purely mechanically via spring force and thus ensures the full braking effect even in case of brake control failure.

3.12.4 Chassis

When engaging the PTO at vehicles with air suspension it must be secured that the air bellows will be de-aerated. This means that the vehicle be lowered down to the mechanical axle stops.

The automatically ride height control system of the air suspension must be deactivated when the PTO is engaged.

DANGER

Once the stability system has been adjusted, any modifications to the air suspension parameters in crane operation may cause the vehicle to tip over.

3.12.5 Selection of the length for the rear overhang (L)

The rear overhang (L) must be adjusted to the loading bridge length, or, based on the standard length of the rear overhang, the achievable loading bridge length must be determined for a front mounting of the crane.

In case of a trailer truck with additional stabilizer in the rear, the rear overhang must be defined in a length that the additional stabilizer could be mounted professionally.

The rear overhang must be selected in accordance with the space requirements of the crane when the crane is mounted at the rear.

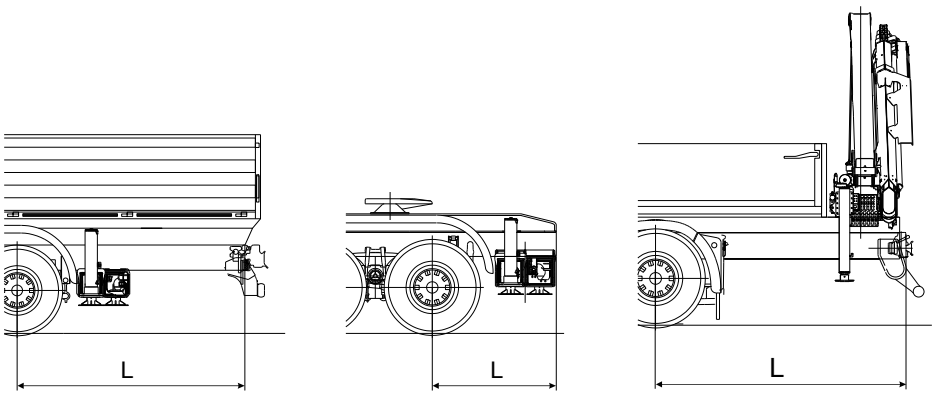


Illustration 03-00 26; Different lengths of the rear overhang L

INFORMATION

Legal and national provisions must be observed in allowing for the overhang at the rear!

INFORMATION

The appropriate length of the chassis frame must already be observed when ordering the truck!

3.12.6 Front frame reinforcement for mounting stabilizers in front of the cab

If it is supposed to be possible to make full use of the crane moment even above the driver’s cab, this can be achieved by mounting one or two stabilizer cylinders (1) in front of the driver’s cab.

For this purpose, it is necessary that the chassis frame under the driver's cab up to the front bumper is in an adequately rigid design.

Which permissible bending moment may be applied to the chassis frame or which support forces may be applied to the front support cylinders must be clarified by the bodybuilder with the respective truck manufacturer.

Some truck manufacturers offer so-called snow plough attachments or towing attachments as special equipment. As a rule, this special equipment is well-suited for the mounting of stabilizer cylinders.

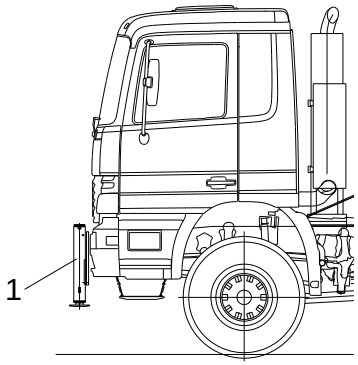


Illustration 03-00 27; Front frame reinforcement for front stabilizers

1	Stabilizer in front of the cab

INFORMATION

When mounting front stabilizers, care must be taken to ensure sufficient space for tilting the driver's cab (see mounting guidelines or construction drawings of the respective truck manufacturer).

INFORMATION

Some truck manufacturers offer factory front frame reinforcements that can help to improve the performance of the crane in front of the truck.

3.12.7 Preparation of the vehicle chassis frame with base shear plates

Base shear plates are those sheets or sheet metal moulded parts that are screwed to the side of the chassis frame and welded upwards to the subframe or to the combination crane base of the crane.

These connecting elements are required for static or strength reasons in the areas below the loader crane as well as in the area of the additional stabilizers.

These base shear plates have the task of creating a rigid and a shear-resistant connection between the chassis frame and the subframe. They are also included in the cross-sectional calculation via PAF.

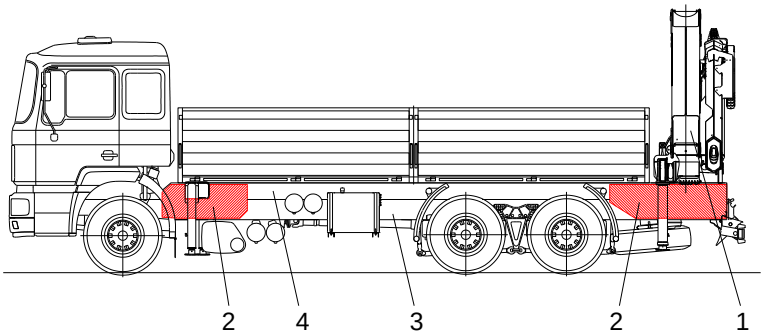


Illustration 03-00 28; Base shear plates

1	Loader crane	3	Chassis frame
2	Crane plate	4	Subframe

INFORMATION

Some truck manufacturers already offer suitable base shear plates, which can be pre-assembled on request. It is a quality- assuring measure and usually also an economic advantage if these plates are already considered when ordering the truck. The bodybuilder can thus be spared the complex and time-consuming work of assembling the base shear.

INFORMATION

Further information on the design, dimensioning and material quality of the base shear plates can be obtained online in Chapter 5 "Connecting elements on the subframe" via PALDESK.PALFINGER.com.

PALFINGER Installation Guideline
Hydraulic Loader Crane

Chapter 4

Welding on bodywork and crane

Original Installation Guideline

DA-105

Version: 2021/09

English

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Contents

4.1 General principles

This document provides essential guidance for the performance welding work in body building.

INFORMATION

Due to the diversity of country-specific legislation and standard requirements, not every task can be addressed and defined.

INFORMATION

All work must be carried out in compliance with the relevant, country-specific standards, rules and regulations!

This applies in particular to welding work on crane components made of high-strength fine-grained steels!

4.2 Requirements

4.2.1 Certification of the welding company

Minimum requirement in CE-area	EN ISO 3834-3
Ideal requirement in the CE-region	EN ISO 3834-2
Ideal requirement in the non-CE-area	CE-Requirements
Minimum requirement in the non-CE- area	Analog standards and guidelines

4.2.2 Welding equipment and equipment

INFORMATION

MAG welding is only permitted in the CE-area with infinitely adjustable welding apparatus!

The apparatus:

- Are well maintained and serviced
- Hose packages and ground cables are in good condition
- Have a sticker with information about the last and next maintenance
- A gas flow device is available on the welding apparatus
- Personal protective equipment according to the current state of the art is available.
- Annual calibration takes place
- A contact thermometer for measuring the interpass temperature or flame straightening temperature is available

4.2.3 Base materials

When procuring steel materials in the CE area, the order text requires the delivery of a 3.1 material certificate according to EN ISO 10204. This also includes the chemical composition and mechanical-technological characteristics.

A random check of completeness is carried out.

The base materials used are clearly labelled and can be assigned to a material quality. Ideally, the labelling is visible until cutting and is also used for residual sheets.

4.2.3.1 Welding filler materials and auxiliary materials

The filler material/welding consumable need to be chosen based on the deposited metals properties, to guarantee a weld joint which fulfils the giving specifications.

In case that PALFINGER components should be welded to the subframe (e.g., additional stabilizer), PALFINGER recommends using filler material quality Z2. This is valid for frame material ≤ S 690.

For welding operations which should be done at crane components you need to have knowledge about the material quality of the welding materials (see chapter 4 "selection of filler material").

INFORMATION

If this is not known, this information must be requested from PALFINGER!

In the interest of cold crack safety, only filler materials are to be used which do not result in unnecessarily high strength and a sufficiently low hydrogen content compared to the base material. In manual arc welding, the best prerequisite for cold crack-proof welding is the use of basic electrodes.

INFORMATION

Only welding filler materials may be used which have approvals or suitability tests from external certification centers (e.g., TÜV, DB, German Lloyd, etc.) Furthermore, it is necessary to use only filler materials with an acceptance test certificate according to 3.1B (EN 10204).

4.2.3.2 Storage and drying

Welding filler materials must be protected against:

- Atmospheric influence
- Humidity
- Pollution
- Corrosion

INFORMATION

If necessary, basic electrodes must be re-dried according to the manufacturer's specifications in order to ensure the required low hydrogen content.

Welding filler materials must be assignable to a supplier, a type and a charge at all times.

4.2.3.3 Recommendation for basic material groups

Basic material group	≤ S460	S690	S890
≤ S460	Z1	Z1	Z1
S690	Z1	Z2	Z2
S890	Z1	Z2	Z3

Z1 This combination of basic materials can be welded with auxiliary material Z1.

Z2 This combination of basic materials can be welded with auxiliary material Z2.

Z3 This combination of basic materials can be welded with auxiliary material Z3.

4.2.3.4 Filler materials and auxiliary materials (minimum requirement)

Code	Type	Standard specification of the filler	Standard No.	PALFINGER ID no.
Z1	E	E 42 4 xx B x x H5	EN 499	1,2mm: W10007241 1,0mm: W10007243
	M	G 42 4 M G4Si1	EN 440	
	M	ER70S-6	AWS A5.18-93	
Z2	E	E69 4 xx B x x H5	EN 757	1,2mm: W10006119 1,0mm: W10007363
	M	G69 4 M xx	EN 12534	
	M	ER100S-G	AWS A5.28-96	
Z3	E	E 89 4 xx B x x H5	EN 757	1,2mm: W10006121 1,0mm: W10007347
	M	G 89 4 M xx	EN 12534	
	M	ER 120S-G	AWS A5.28-96	

E E-Rod electrodes for arc manual welding

M Solid wire electrode for gas-shielded welding

Xx Placeholder for variable values

INFORMATION

For MAG - M welding, shielding gas M20 according to EN 14175 has to be used.

4.2.4 Welding supervision

The executing company must appoint a preferably internal, responsible welding supervisor.

The welding supervisor must have a:

- Minimum qualification according to EN 14731 as IWS (master welder)
- Ideal qualification according to qualification level IWE (welding technology)

The welding supervisor performs the supervisory tasks in accordance with EN ISO 3834 and regularly monitors welding work. Presence is required when carrying out welding work on the integral base frame.

Ideally, the welding supervisor keeps an up-to-date list with:

- Welders
- Welder's stamps
- Approvals & Validity
- Required date for the renewal examination of admission

In addition, the welding supervision ensures via appropriate training programs, that the welders also have the necessary manual skills to meet the required seam quality during welding work.

4.2.5 Welding qualification

Welders may only perform work for which they are certifiably qualified in accordance with EN ISO 9606-1 or local requirements. The minimum requirements for welding tasks in body building are the following valid welder-qualifications according to EN ISO 9606-1*:

Fillet weld	PF, PD (PB recommended)
Butt seam	PF (PA recommended)
Number of layers	multi-layer welding in each case
Material group	FM2 (Re > 500 MPa)
Welding process	135 MAG

INFORMATION

***If there are workshop-related, comprehensible restrictions on the required qualifications, these must be taken into account.**

Example: If only materials ≤ S460 are used, the qualification for the material group FM1 is sufficient. With appropriate prefabrication, the qualification for "butt seam PF" can be omitted.

Certified welders:

- Have a personal welder's stamp
- Fulfill the required welding quality for body building in constrained positions
- Know permissible weld seam irregularities according to EN ISO 5817 or production-relevant standard extracts
- Are aware of relevant prohibitions in body building (e.g., prohibition of welding the chassis frame)
- Know which welding filler material to use

4.2.6 Welding method

The selection of the welding procedure is primarily dependent on the material and the production process. The following processes are recommended for welding:

- MAG M (135)
- Manual electrode (111)

For root welding you may also use TIG (141).

INFORMATION

In the CE area, a qualification of the applied welding processes in the form of a working sample according to EN ISO 15613 is recommended.

INFORMATION

In the non-CE area, at least one valid fracture sample of fillet and butt seam must be performed.

Ideally, the following valid welding procedure qualification according to EN ISO 15613 / EN ISO 15614 are available:

- Butt seam without weld pool protection; Uphill position; S690, sheet thickness ≥ 8mm
- Fillet seam uphill position; S690, sheet thickness ≥ 8mm
- Mounting straps connection (EN ISO 15613)

4.2.7 Welding drawing

Welding seam symbols and dimensions of welding seams are specified in this mounting guideline according to EN 22553.

For fillet welds, the weld thickness "a" is generally indicated.

- a: Height of the largest isosceles triangle that can be entered in the sectional view
- z: The leg length z is the leg length of the largest isosceles triangle which can be drawn in the cross-section drawing

$a = z / \sqrt{2}$; $(a = 0{,}7 \cdot z)$

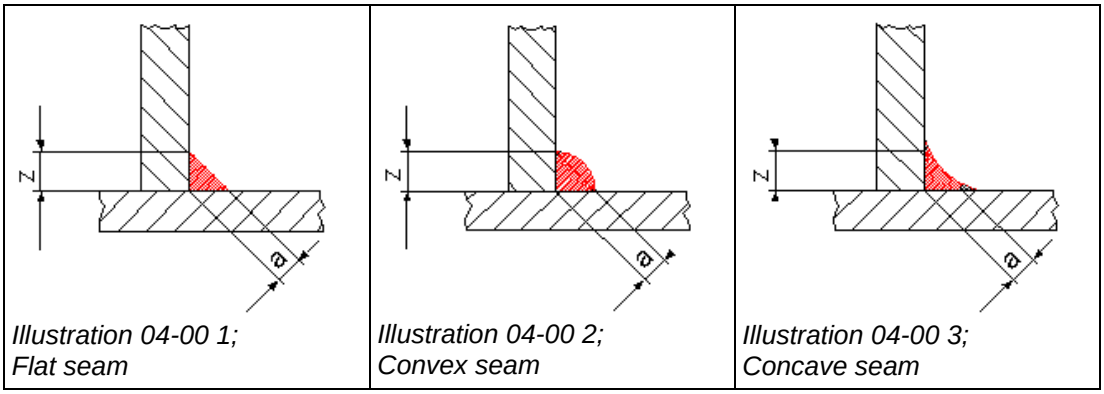

Illustration 04-00 1; Flat seam

Illustration 04-00 2; Convex seam

Illustration 04-00 3; Concave seam

The dimensioning of the seam thicknesses is the responsibility of the respective design department. As a guideline for the minimum seam thicknesses, the following rules have proven themselves in practice:

Sheet Thickness [mm] Doubling	**Seam Thickness [a_{min}] T-Joints**	**Seam Thickness [z] Doubling**
3 – 12	$a = t_{min}$	$z = t_1$
15 – 30	$a = 0.8 * t_{min}$	$z = 0.8 * t_{min}$

t_{min} Sheet thickness of the thinner sheet plate, which gets welded

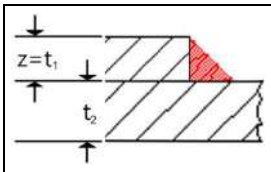

Illustration 04-00 4;
Doubling 5 mm to 8 mm
z = 5

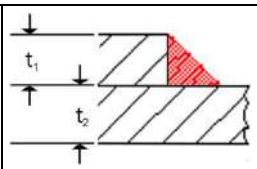

Illustration 04-00 5;
Doubling 12 mm to 15 mm
z = 10

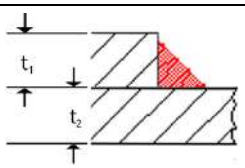

Illustration 04-00 6;
Doubling 15 mm to 15 mm
z = 12

Ideally, welding drawings are available for each body building project (if included in the project):

- Subframe
- Integration of the subframe
- Integration of additional stabilizers
- Integration of the integral base frame

The welding drawing contains directly visible for the welder:

- Quality of the base material (in the individual drawing)
- Welding filler material
- Welding seam symbol according to EN 2553
- Required seam thickness
- Required quality level for permissible irregularities according to EN ISO 5817
- Required scope of testing

4.2.8 Welding instructions

For standard applications, the welder shall at least be provided with a structured list for the layer structure and associated parameters of the common execution of the welding seam.

In the CE area, it is recommended that the welding supervisor provide the welders with valid welding instructions in accordance with EN ISO 15609 for all welding work.

Ideally, the following valid welding instructions according to EN ISO 15609 are available on site for inspection by the welder as a minimum requirement.

Fillet weld	PF, PD (PB recommended)
Butt seam	PF (PA recommended)
Wall thickness range	8 – 12 mm
Number of layers	Multi-layer welding in each case
Material group	W2 (for S460) and W3 (for S690)
Welding process	135 MAG

INFORMATION

If there are workshop-related, comprehensible restrictions, these must be taken into account!

4.2.9 Testing personnel - non-destructive testing

In the CE area, qualified inspection personnel must perform inspection activities in accordance with EN ISO 9712.

Minimum qualification: VT inspector (visual inspection) with proof of qualification in the form of training on permissible seam irregularities according to EN ISO 5817 conducted by an IWE.

Ideally, the non-destructive VT inspector has the level 2 qualification according to EN ISO 9712.

INFORMATION

In exceptional cases, the existence of analogous, relevant experience may also be sufficient.

4.3 Performance

Essential standard work for body buildings is:

- Production of the subframe
- Connection of base shear plates and their connection to the subframe
- Connection of the mounting straps for crane fastening
- Connection of the anti-twist protection of the crane
- Integration of additional stabilizers
- Integration of the integral base frame
- Adaptation- and repair work on crane components

For these welding connections, the quality requirements of the evaluation group "B" are required and must be observed.

4.3.1 Practical hints for welding

The ground wire must always be attached to the component to be welded and as close as possible to the welding area. Never lead the current over the bearings because this would destroy the bearings.

In order to protect the Crane's electronic parts, disconnect the electric power supply of the crane. The radio remote control has to be disconnected. For the truck follow the manufacturer's guidelines for the vehicle. Cover or disassemble all heat sensitive parts (e.g., plastic hoses, wiring, leaf springs, air bellows, etc.).

The thickness of the welded parts should be as low as possible in relation to the base plate in order to avoid a critical change in stiffness.

The welding seams must always be made in the longitudinal direction of the component, the ends of the welded brackets should be tapered in the longitudinal direction of the component and must be ground notch-free. – see sketch "Design welded parts / notch-mild runouts of welding seam".

Tack welded auxiliary constructions must not be knocked off. They must be separated with angle grinder without weakening the base material.

No cross seams may be welded on crane components.

4.3.2 Pre-welding tasks

4.3.2.1 Preparatory tasks

- Where necessary, vehicle attachments are dismantled to ensure sufficient accessibility to enable the required welding quality.
- Welding work is preferably carried out in the PA or PB position.
- All hazardous areas of the vehicle or body components are covered prior to welding. building components are covered prior to welding.

4.3.2.2 Weld preparation and weld cleaning

- The weld preparation procedure must be in according with guideline EN ISO 9692. Processing can be achieved through oxy-fuel cutting, hand grinding or mechanical processing.
- The processing can be carried out by autogenic flame cutting, hand grinding or by mechanical processing. The flame cutting surfaces shall be sanded.

- In particular, edge offset and welding gaps are checked in accordance with EN ISO 5817 before welding begins. Welding gaps for butt joints are between 1,5 and 4 mm
- The entire area of the weld must be free of any grease, oil, rust flakes, paint, rust, dirt and humidity. Discolouration, caused by cutting, is allowed and can be left.
- Welding on the chassis frame is not permitted. In the frame area (e.g., connection of base shear plates) bath supports made of copper are used to protect the frame profiles.

4.3.2.3 Control and procedure in case of deviations

- The responsible welding supervisor is responsible for checking compliance with the specifications.
- In the event of impermissible deviations (from EN ISO 5817 - evaluation group B), the responsible welding supervisor shall define measures to correct them.
- The implementation of the corrective measures is checked.
- Ideally, measures for the sustainable prevention of failures are documented

4.3.3 Preheating

INFORMATION

If the work piece temperature is below +10 °C, preheating to 50 or 80 °C is always required.

Acetylene must be used as fuel gas (because of the low hydrogen content). The oxyacetylene flame should have a setting which is as neutral as possible.

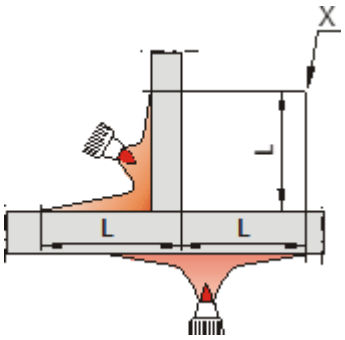

Illustration 04-00 7; Preheating of a part

L	100 mm / 3,94"
X	Measure the temperature here

INFORMATION

Preheating temperatures should be checked using an infrared thermometer or temperature chalk.

4.3.4 Tasks during welding

The following points must be checked regularly during welding:

- Welding parameters
- Condition of the gas nozzle
- escaping volume flow

4.3.4.1 Tack welds

For tack welds which become part of the weld connection use fillers which are adjusted to the basic material. Make the tacking spots a flat weld, approx. 50 mm long, with a minimum of 20 mm and in distances of 200 - 300 mm.

4.3.4.2 Root position

Immediately before welding the root layers, the stitching seams are checked for cracks, sanded out if necessary and renewed.

4.3.4.3 Filling and top layer

In the case of multilayer welding, the seam construction should always be started on the flanks, so that the heat of the following caterpillar also favorably influences the heat-affected zone. This is particularly important for the top layers.

The filling and top layers are to be manufactured according to multi-layer technology, in which the individual welding beads are designed as flat as possible. This also applies to the position PF (climbing seam). A caterpillar width of 20 mm should not be exceeded.

4.3.5 Tasks after welding

The following points must be observed after welding:

- Visual inspection according to drawing requirements and the permissible welding seam deviations according to EN ISO 5817
- Slag and weld spatter are properly removed without any residues
- Ideally, stamping of the welding work by the welder (confirmation of proper execution and 100 % visual inspection)
- If an additional inspection is performed by qualified NDT inspectors or the welding supervisor, these inspections are also documented
- Control of the fillet seams with a suitable welding seam gauge
- Control of the permissible welding distortion during frame production
- If flame straightening work is carried out to maintain tolerances, maximum temperatures and exposure times adapted to base materials are specified for this purpose

4.4 Repair welding

INFORMATION

Repairing welds on main components may only be carried out after consultation with the PALFINGER Service Department.

INFORMATION

Further information can be obtained online in the repair instructions RA9-15 "Repair load attachments" via PALDESK.PALFINGER.com.

Typically, it is not permitted to perform welding repairs on:

- Cylinder end caps
- Nowhere on cylinders of EPSILON cranes
- Longitudinal welds on hexagon extension booms

If doubler plates are attached, the thickness should be as small as possible in relation to the base plate in order to avoid a critical change in stiffness.

The welding seams must always be made in the longitudinal direction of the component, the ends of the welded brackets should be tapered in the longitudinal direction of the component and must be ground notch-free. – see sketch "Design welded parts / notch-mild runouts of welding seam".

INFORMATION

No cross seams may be welded on crane components.

INFORMATION

The crack area must be ground out completely and thus the crack in depth as well as length must be completely removed. This must be checked by means of surface inspection.

INFORMATION

After each repair welding on main crane components, the crane must be subjected to a new acceptance test in accordance with the applicable national regulations!

4.5 Designs of notch-mild runouts

The following designs of notch-mild (K) or ground (KS) run-outs are permissible:

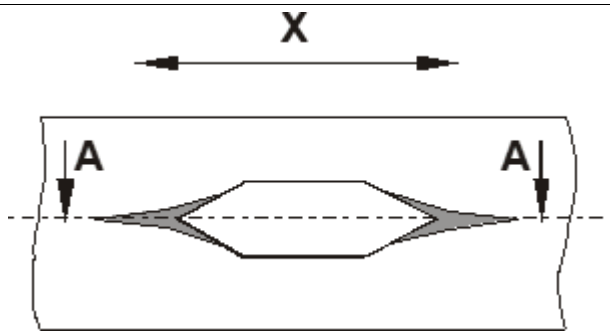

Illustration 04-00 8; Execution notch-mild runout

X	Longitudinal direction

Maximal permitted form of a runout notch-mild (K):

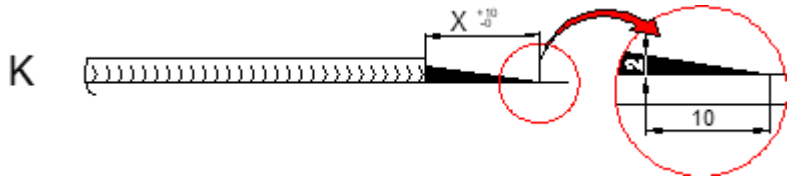

Illustration 04-00 9; Cut A - A notch-mild (K)

INFORMATION

The change-over of welding seam to steel plate must be performed notch-free!

At a 10 mm distance from the peak of the welding seam run-out, the seam must not exceed a height of 2 mm.

Proceed as follows:

1. Design runouts as flat as possible
2. Pre-grinding under use of roughing disc (preferably in the longitudinal direction)
3. Under use of sandpaper-disc notch-free grinding

INFORMATION

Any other form of the welding seam runout is not permitted.

Illustration 04-00 10; Permitted form of a runout

INFORMATION

During grinding attention must be paid to avoid any grinding-in deeper than 0,5 mm to the base plate. Cross-rills are not permitted!

Respect the demand for notch-freeness!

4.6 Areas where welding is permitted

The component drawings of the following pages define the areas where it is permitted to add some additional parts

Exceptions to this are original PALFINGER consoles according to technical documentation such as:

- Main boom – rope winch console
- Knuckle boom – rope winch console
- Crane column - console for raised seat

INFORMATION

The welding of additional load tackles or the repair welding of load tackles at telescopic boom or knuckle boom is not permitted.

INFORMATION

Welding at EPSILON cranes is only permitted after a written approval of EPSILON and in consideration of this welding instruction!

Legend for the component drawings	
	In these areas it is possible to weld on supports or consoles up to a load-bearing capacity of 50kg, in doing so always keep a minimum distance of 60mm to the component edges.
	In these areas welding is not permitted. Should welding need to be done in these areas, it must be approved by PALFINGER in a written form.

4.6.1 Component drawing crane base

INFORMATION

Welding is only allowed on the reinforcement sheets!

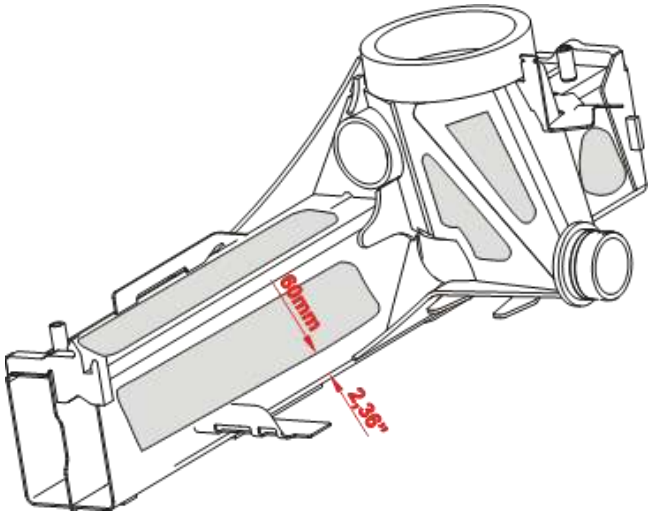

Illustration 04-00 11; Crane base slewing cylinder topview

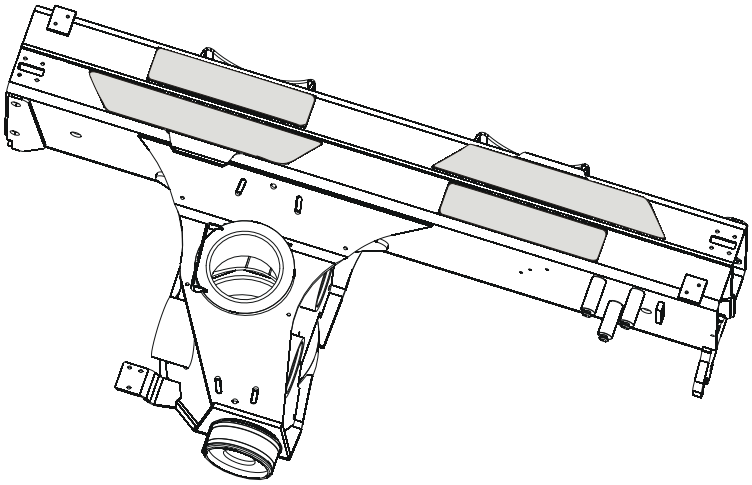

Illustration 04-00 12; Crane base slewing cylinder bottomview

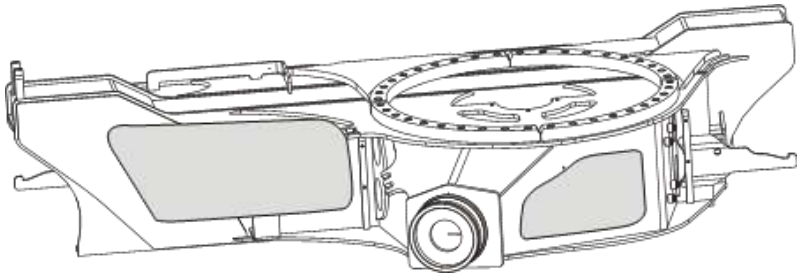

Illustration 04-00 13; Endless slewing crane base topview

4.6.2 Component drawing crane column

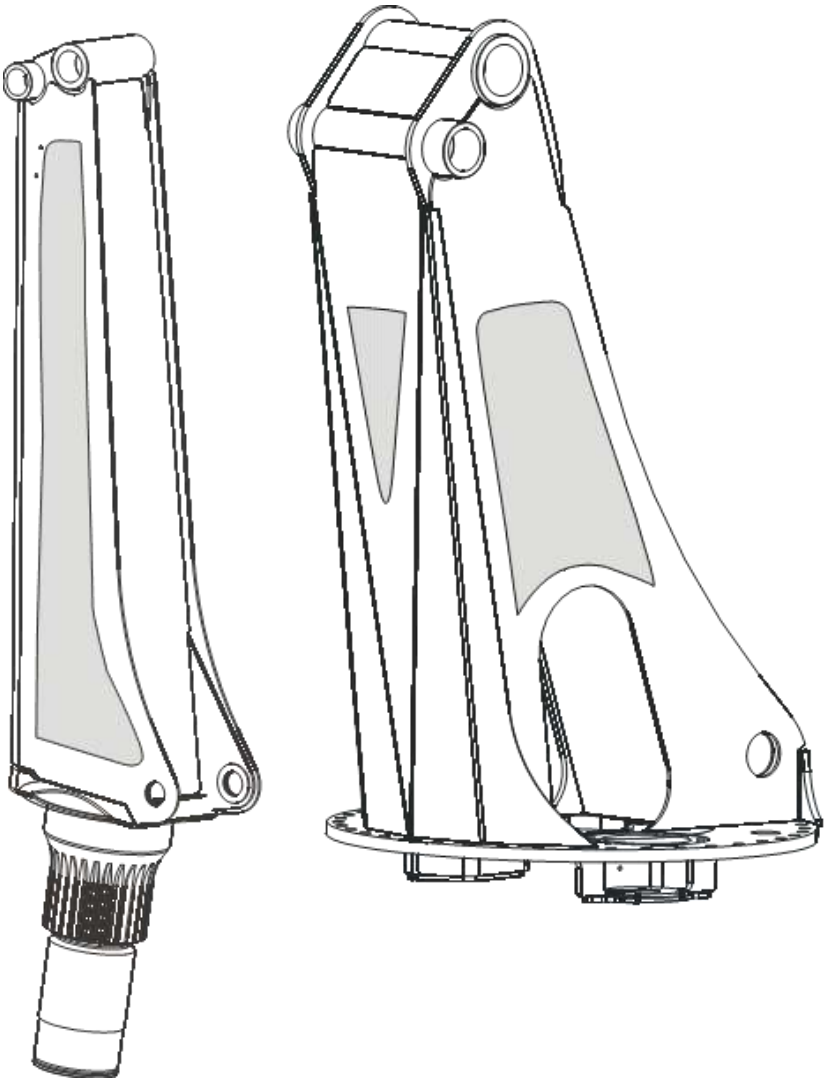

Illustration 04-00 14; Crane column for cranes with slewing cylinder and for endless slewing cranes

4.6.3 Component drawing main boom

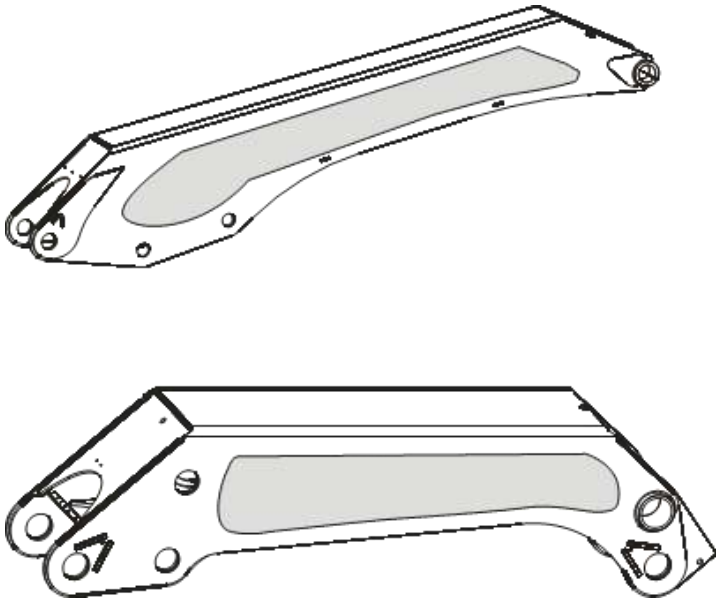

Illustration 04-00 15; Main booms for medium and heavy crane series

4.6.4 Component drawing knuckle boom

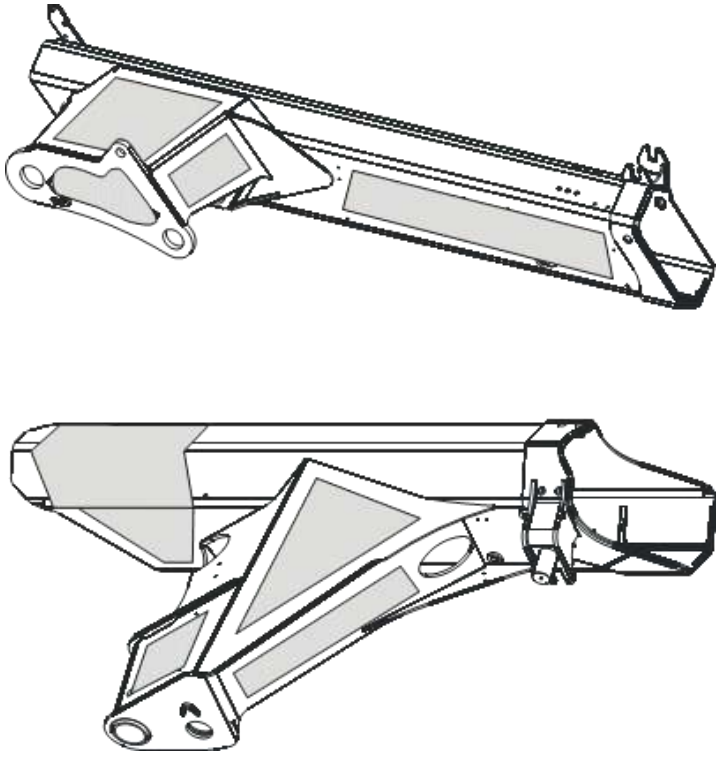

Illustration 04-00 16; Knuckle booms for medium and heavy crane series

4.6.5 Component drawing integral base frame

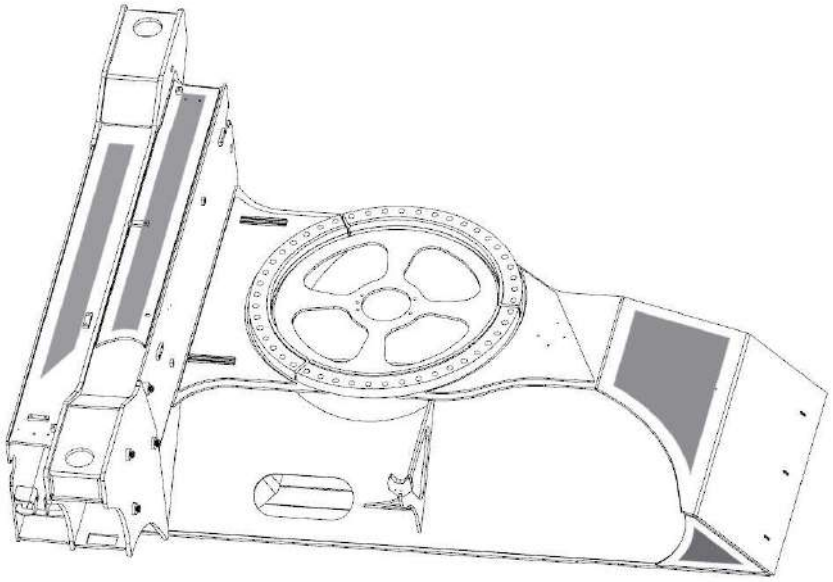

Illustration 04-00 17; Left side of the integral base frame

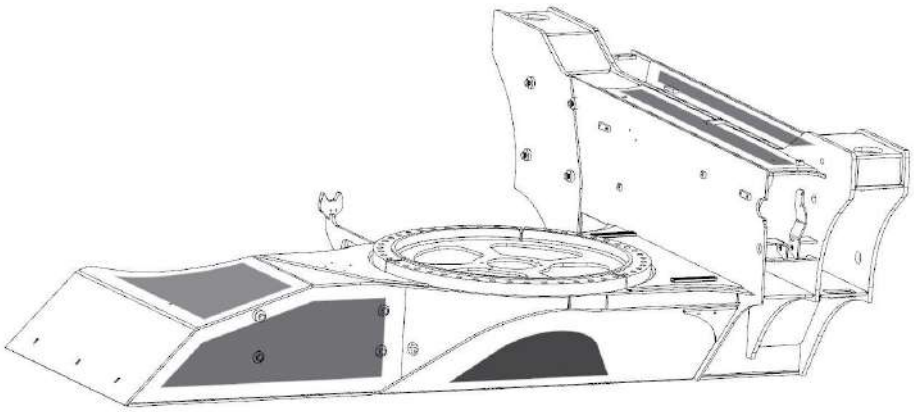

Illustration 04-00 18; Right side of the integral base frame

PALFINGER Installation Guideline
Hydraulic Loader Crane

Chapter 5

Subframe

Original Installation Guideline

DA-105

Version: 2023/03

English

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Contents

5.1 Remarks on working on the chassis frame

5.1.1 Aligning the chassis before beginning the mounting

Before beginning work on the mounting, the chassis frame must be aligned completely level in order to ensure irreproachable overall quality and a long useful life of the mounted vehicle. The main chassis beams must be lying parallel, and the frame must not be entangled.

A minimum of three adjustable supports must be used to align a chassis with pneumatic suspension. These supports must not be removed during the mounting.

ATTENTION

The chassis must be aligned again any time the vehicle has been driven.

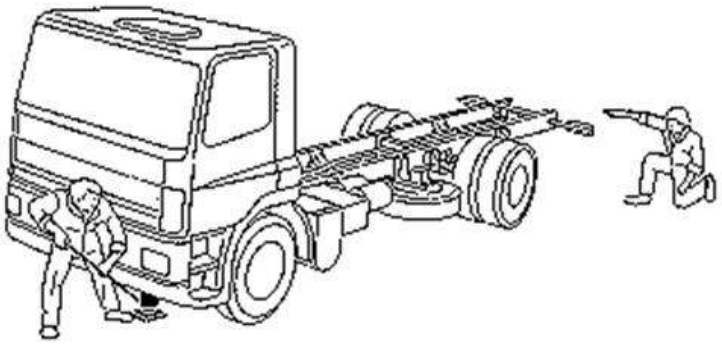


Illustration 05-00 1; Chassis alignment

5.1.2 Drilling on the chassis frame

All of the fastenings must be fixed with bolts to the web of the main chassis beams.

It is absolutely forbidden to drill or otherwise make holes in the flanges of the chassis frame as they cause a high concentration of tension. The only exception is the drilling of holes in the frame overhang which are required to mount the finishing crossbeam.

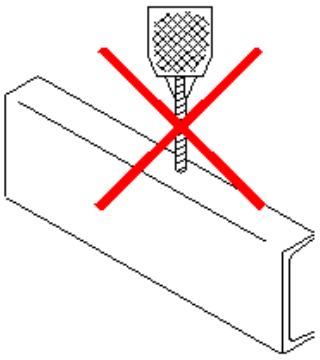


Illustration 05-00 2; Drilling on the chassis

The pre-drilled master gage for holes should primarily be used for mounting the subframe and other components to the chassis. If more holes are required, they should be drilled according to the guidelines of the truck manufacturer.

5.1.3 Modifications to the chassis frame

Modifications such as welding, drilling or relocating vehicle components must be carried out according to the mounting guidelines of the respective truck manufacturer.

For more information, see Chapter 4 "Welding on Bodywork and Crane"

5.1.4 Mounting heavy components

Heavy components such as battery casings, fuel tanks, spare tyres, oil tanks, etc., put significant stress on the chassis frame. Whenever heavy components are moved or mounted, observe the following points:

Mount the component as close as possible to a crossbeam. Attaching an inner and/or outer reinforcement plate can distribute the torque stress so that the stress on the frame is reduced.

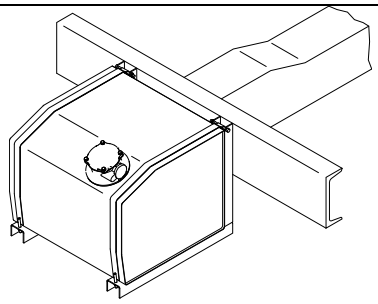


Illustration 05-00 3; Mounting heavy components, e.g., oil tank

- Washers must be placed on the inner side of the chassis frame for the mounting bolts (min. 200 HB).
- We recommend using "driven bolt connections" for large components (see chapter 5 "Connecting Elements to Sub-frame").
- A sufficient number of bolts and a large clamping surface should be used so that there is little stress on the frame. Whenever possible, use the existing holes. If additional holes must be drilled, observe the notes of the vehicle manufacture.

5.2 Subframe design

The subframe is the connecting link between the loader crane and the motor vehicle. When the crane is in operation, the subframe, together with the chassis frame, must withstand all of the external stresses (bending stress, torsion stress, etc.). In addition to the constructive design, it is extremely important to select the correct material and the appropriate welding procedure for the subframe to prevent failure of the component.

ATTENTION

The subframe must be produced according to state-of-the-art technology and acknowledged rules of production.

5.2.1 PALFINGER subframe modules

The subframe modules are available either with or without loose attachments, but also with already welded base shear plates and support bars, which have already integrated the new anti-twist protection in the new TEC cranes.

With this preparation, the assembly time is significantly reduced, as the crane only has to be positioned on the frame and screwed in place.

Subframe without additional stabilizer	Subframe with additional stabilizer
	
Illustration 05-00 4; Subframe without additional stabilizer	*Illustration 05-00 5; Subframe with additional stabilizer*

INFORMATION

Further information on the PALFINGER subframe modules (preparation of additional support, container locks, fifth wheel coupling, etc.) can be obtained online in the respective product information via PALDESK. PALFINGER.com.

INFORMATION

Further assembly information and welding instructions can be found in chapter 4 "Welding on the Bodywork and Crane" and chapter 6 "Crane Installation".

5.2.1.1 Subframe for small cranes (5 - 20 mt)

Frame type: Open frame construction (without BS)

No priority consideration of the torsional rigidity, the stability is basically sufficient without additional stabilizer.

Moulded tube frame:

Illustration 05-00 6; Moulded tube frame

In the case of an open subframe construction, it is essential to ensure a sufficient contact surface (moulded tube width) if a closed subframe module is not used at least at the crane mounting area.

Otherwise, this can lead to positioning problems of the support bars (anti-twist protection version 2) with the new TEC cranes. In this case, the design C of the anti-twist protection version 1 must be selected, see chapter 6 "Crane Model Features – anti-twist protection for crane, version 1")

Screwed frame kit:

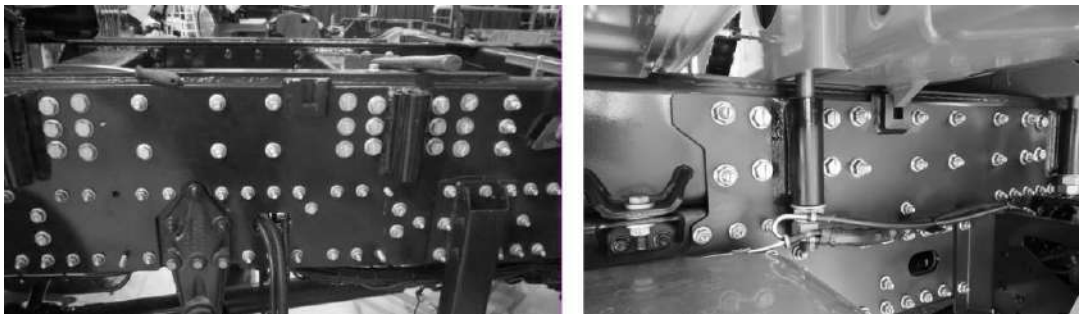


Illustration 05-00 7; Screwed frame kit

5.2.1.2 Subframe for construction vehicles (15 - 30 mt)

Frame type: Semi-open frame construction (without BS)

Torsional rigidity: This design provides torsion-resistant properties in the area of the crane and torsionally flexible properties in the area of the platform.

Illustration 05-00 8; Semi-open frame construction

Frame type: Closed frame construction (without BS)

Torsional rigidity: The stability is significantly improved compared to the open (or semi-open) subframe design. With high torsional rigidity, the weight is still kept low.

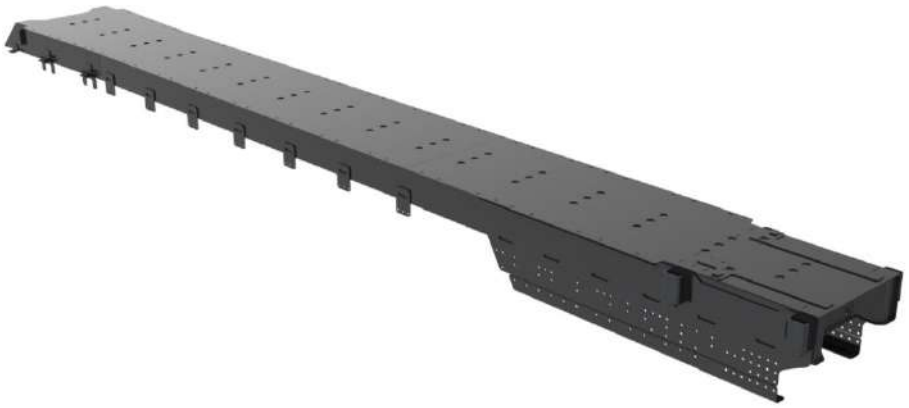


Illustration 05-00 9; Closed frame construction (without BS)

5.2.1.3 Subframe for medium large cranes with vehicle base frame (> 30 mt)

Frame type: Closed frame construction is indispensable (with BS)

Torsional strength: Due to stability, additional stabilizers are usually used and thus a high torsional rigidity is ensured.

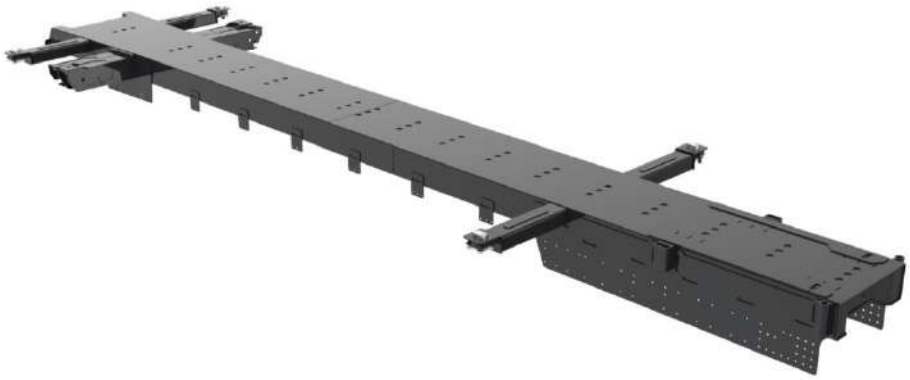


Illustration 05-00 10; Closed frame construction (with BS)

5.2.1.4 Subframe for medium large cranes with integral base frame (> 65 mt)

Frame type: Closed frame construction is indispensable (with BS)

Torsional rigidity: Due to stability, additional stabilizers are always used and thus a high torsional rigidity is ensured.

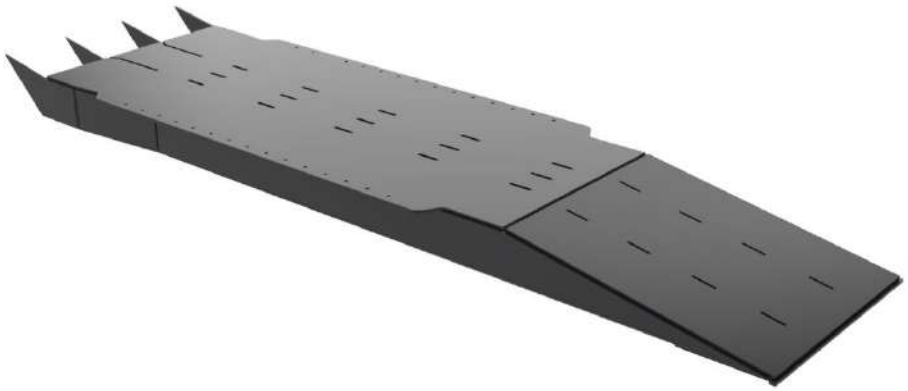


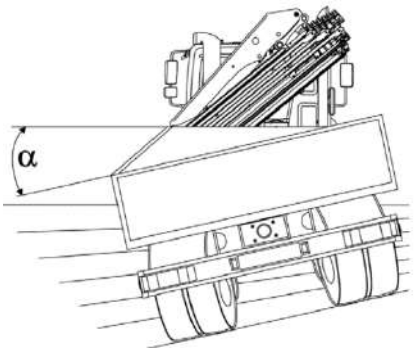
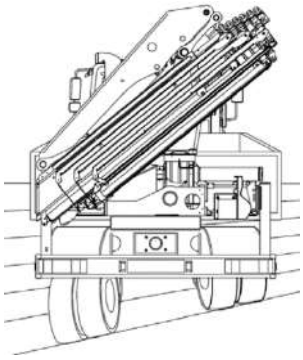
Illustration 05-00 11; Closed frame construction integral base frame

5.2.2 Flexible vs. torsion-Resistant Subframe

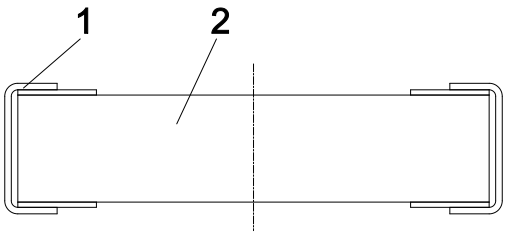
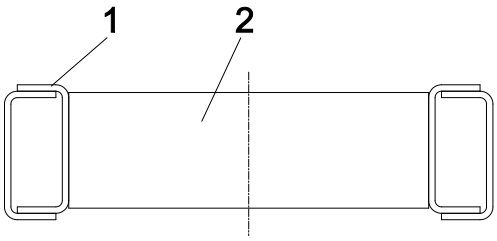
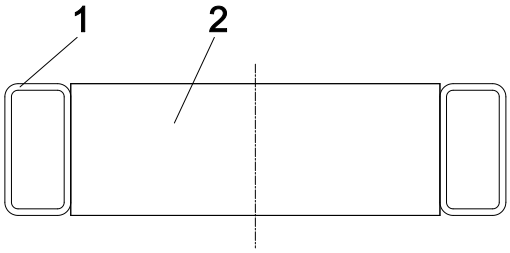
The following subframe models can be used for a flexible crane mounting. Since all of these subframes are made of standard steel profiles, production is relatively low in cost.

The subframe must be made torsion-resistant in the area of the crane through the use of additional crossbeams, longitudinal member or belt sheets. Open profiles must be closed to form a box profile.

Since flexible subframes can transfer only low torsion moments, they are only suitable for crane mountings without auxiliary support.

Flexible subframe	Torsion-resistant subframe
• Weight advantages compared to a closed frame • More flexibility of the vehicle through higher torsion → Better off-road capability • For cranes < 30 mt	• Offers very good stability behavior due to torsion-resistant properties • For cranes > 30 mt
	

5.2.2.1 Models of flexible subframes

 *Illustration 05-00 12; C-Profile subframe*	Subframes made of C profiles: Subframes of this design are especially flexible and are therefore only used for mounting cranes with a low lift moment.
 *Illustration 05-00 13; Nested C-Profile subframe*	Subframes made of nested C profile: Due to the doubling of the upper and lower belt, a substantially higher bending moment can be applied to a nested C profile. The torsion resistance is comparable to that of a rectangular hollow profile.
 *Illustration 05-00 14; Rectangular hollow profile*	Subframe made of rectangular hollow profile: Rectangular profiles can absorb relatively high bending moments with good torsion resistance.
1 Longitudinal member	2 Crossbeams

Rear end of the subframe:

When using a torsionally flexible subframe, it is often necessary to make the rear overhang torsional-resistant. This is particularly important in order to achieve high stability, for example tippers, hook lifts or vehicles with swap bodies and, above all, vehicles with a rear-mounted crane. Drawbar equipped vehicles may also require a high rigidity of the subframe.

Front end of the subframe:

To counteract frame vibrations, the subframe must be located as close as possible to the front axle.

In order to achieve the highest possible friction between the subframe and the chassis frame, the subframe must be placed firmly and able to follow any cranked run (1) of the vehicle frame.

If a straight subframe (2) is used, adapter plates (3) must be installed.

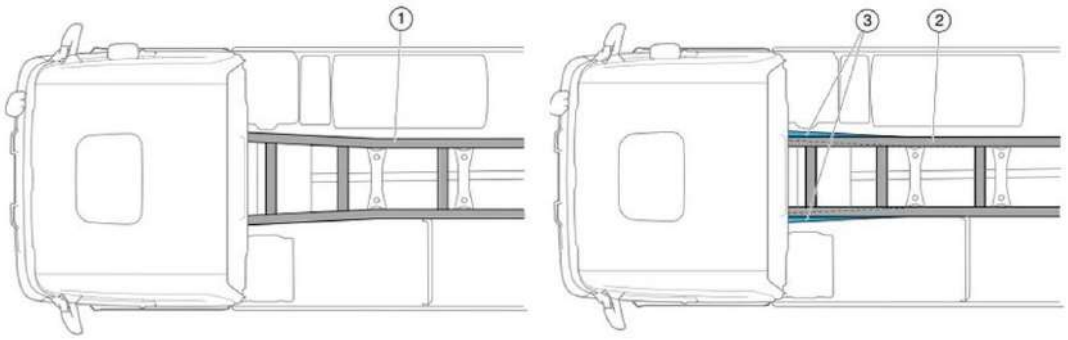


Illustration 05-00 15; Front part of the subframe

1	Cranked subframe	3	Adapter plates
2	Straight subframe		

The front end of the subframe must be to ensure a gradual increase in flexural strength. The figure below shows examples of different frontal end designs. A simple straight cut at the front end is not allowed!

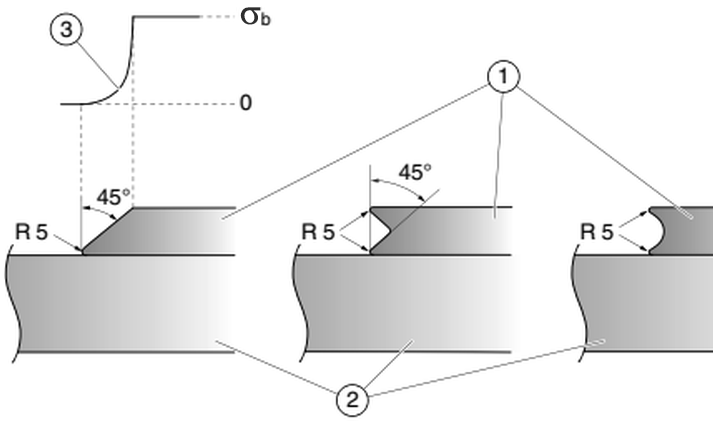


Illustration 05-00 16; Execution of the front end of the subframe

1	Subframe	3	Gradual increase in bending stress ($\sigma_{b)}$
2	Chassis frame		

To prevent wear of the chassis frame at the upper flange, the subframe must be rounded at the lower edge at the front end, see illustration. Wear damage can lead to fractures over time.

5.2.3 Torsion-resistant subframes

The following subframe models can be used for a torsion-resistant crane mounting. These examples can be individually modified according to production possibilities.

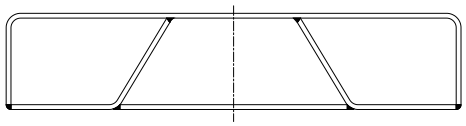
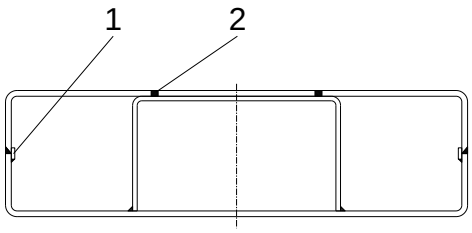
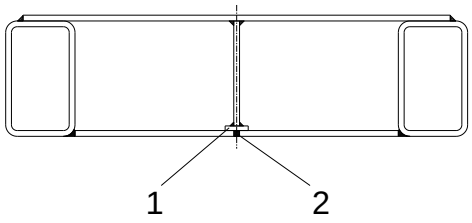
These subframes are resistant to bending and torsion due to their closed construction. Because they are more complex to produce, these subframes are generally more expensive than the flexible subframes and should be used only in situations where they are necessary.

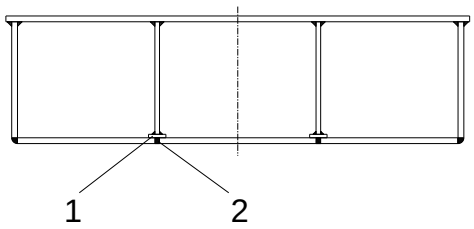
Since torsion-resistant crane mountings can transmit high bending and torsion moments, they are well-suited to crane mountings with auxiliary support.

ATTENTION

Tension certifications are absolutely essential for the chassis frame and the subframe!

5.2.3.1 Models of torsion-resistant subframes

 *Illustration 05-00 17;Subframe made of canted sheet moulded parts*	**Subframe made of canted sheet moulded parts:** For this subframe, a steel sheet is bent into a C profile and welded to other bent sheet moulded parts into a box profile. Advantage: few welding seams, little distortion, no complicated welding seam preparation required. Disadvantage: Connection to integral base frame very complex
 *Illustration 05-00 18; Subframe with upper and lower shell*	**Subframe with upper and lower shell:** For this subframe, steel sheets are bent into shells and welded bluntly into a box profile. As a reinforcement for rigidity, either two or three web plates or another C profile are welded in. Advantage: Easy connection to integral base frame, little welding seams, little danger of welding distortion Disadvantage: production problems with thick steel sheet, complicated welding seam preparation
 *Illustration 05-00 19; Subframe made of rectangular hollow profile*	**Subframe made of rectangular hollow profile:** For this subframe, rectangular hollow profiles and steel sheets are welded together into a closed box profile. One or two web plates can be welded in as reinforcements for rigidity. Advantage: simple to manufacture. Disadvantage: availability of rectangular hollow profiles made of high-strength fine-grained construction steel; only hot-rolled hollow profiles may be used.

 *Illustration 05-00 20; Subframe made of straight steel sheets*	**Subframe made of straight steel sheets:** The subframe is welded with straight steel sheets into a closed box profile. The thickness of the sheet and number of belt sheets is selected according to the required rigidity and construction height. Advantages: Connection to integral base frame very easy. It is also possible to use thick sheets, high bending and torsion resistance. Disadvantages: many welding seams, danger of welding distortion, complicated production.
1 Welding puddle protection	2 Plug welding seam

5.2.3.2 Increase in Rigidity

Basically, the rigidity of a frame system can be changed by modifying the material thickness and material geometry.

Subframe	Chassis frame
• Closed box profile • > height of subframes • Increase material thickness	• Installation of additional struts, reinforcements (e.g., lower belt) • Double C-Profile • Vehicle manufacturer optimized frame reinforcements

5.3 Selection of material and welding procedure

5.3.1 Selection of subframe material

The material for the auxiliary frame module should be selected on the basis of the following considerations:

- The material quality (strength) should be as low as possible or only as high as necessary (reason: weldability decreases as strength increases).
- The material should have a fine-grained structure (fine-grained construction steel).
- The material must be well-suited for welding using the selected welding procedure.
- The material should have adequate notch impact work and tenacity.
- The material should be unsusceptible to cold cracking.
- Further mechanical and technological properties must be suitable for the production process (e.g.: good cold formability, etc.).

Example of materials:

Material designation	Type	Nominal thickness	Yield stress (R_{eH}) in N/mm²	Standard No.
S355J0	unalloyed construction steel	≤ 16 mm	355	EN 10025 (March 1994)
S460MC	Fine-grained construction steel	≤ 50 mm	460	EN 10149-2 (Nov. 1995)
S500QL	Fine-grained construction steel	≤ 50 mm	500	EN 10137-2 (Nov. 1995)
S700MC	Fine-grained construction steel	≤ 50 mm	700	EN 10149-2 (Nov. 1995)

ATTENTION

As the sheet thickness and strength increase, so does the risk of a cold crack during welding.

5.4 Connecting elements on the subframe

The connections between subframe and chassis frame have to be shear-yielding or shear-resistant. The number and type of mounting elements are selected in accordance with the mounting guidelines from the truck manufacturer.

5.4.1 Shear-yielding connecting elements

Shear-yielding connecting elements are used for gradual mechanical decoupling of the subframe from the chassis frame. Thus, the force transfer is gradually transferred to the chassis frame via all shear-yielding elements in order to create a "soft" transition.

If these connecting elements were designed as shear-resistant, there would be a hard or abrupt transfer of force from the subframe to the chassis frame, resulting in a much higher load on the chassis frame.

Flexible mounting also ensures limited horizontal movement between the chassis frame and subframe and can be considered as the parallel interaction of two separate beams. The cross-sectional areas of the chassis frame and the subframe are each exposed to a portion of the total bending moment, according to their respective moments of inertia.

The flexibility of this connection also improves the driver comfort of the truck, because the chassis frame reacts much more flexibly to potential horizontal movements. Thus, vibrations coming from the rear of the vehicle are damped and diverted in the direction of the driver's cab.

Examples of shear-yielding connecting elements:

A) Fastening angels	**B) Fastening angles in combination with disk spring**

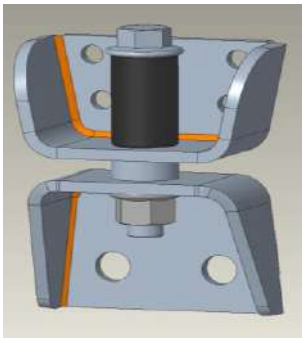
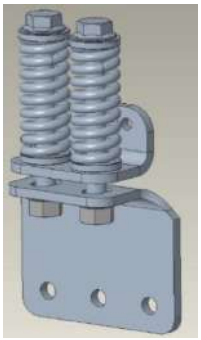

	

Illustration 05-00 21; Mounting brackets	*Illustration 05-00 22; Springs*
C) Fastening angles with spacers	D) Fastening with mounting bolts

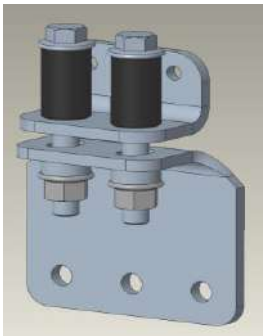
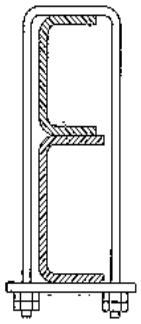

	

Illustration 05-00 23; Spacers	*Illustration 05-00 24; Mounting bolts*

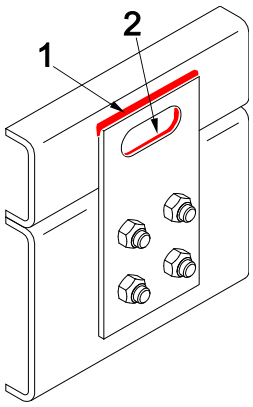
5.4.2 Shear-resistant connecting elements

From a structural point of view, a shear-resistant or shear-stiff connection is necessary wherever the overall cross-section (chassis frame + subframe) has to function as a single beam.

The focus here is on increasing the flexural rigidity of the entire steel beam structure, consisting of truck frame and subframe longitudinal member.

5.4.2.1 Mounting sheets

The mounting sheets must be welded on to the subframe as shown below.

The welding seam 1 must be drawn across the entire width of the mounting sheet. The welding must go around the corners of the sheet. Weld completely around the opening in the mounting sheet (welding seam 2).	 *Illustration 05-00 25; Mounting sheets*

5.4.2.2 Base shear plates

The plates or moulded parts which are bolted to the side of the vehicle frame and then welded at the top to the subframe or the combination base of the crane are known as lateral base shear plates.

A generous number of base shear plates is necessary for static or rigidity reasons in the area underneath the loader crane and in the area of the auxiliary support.

These base shear plates are used to create a bending-resistant and a shear-resistant connection between the vehicle frame and the crane or subframe. They are also included in the cross-section calculation.

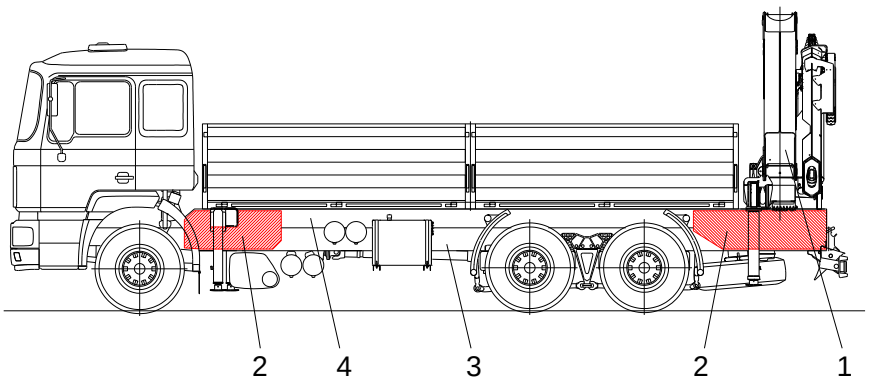


Illustration 05-00 26; Base shear plates

1	Loader crane	3	Chassis frame
2	Base shear plate	4	Subframe

Further information on base shear plates can be found in Chapter 3 "Equipment Recommendations".

When mounting on a vehicle with a short wheelbase, it makes good sense to prepare the base shear plates (2) to be as continuous as possible.

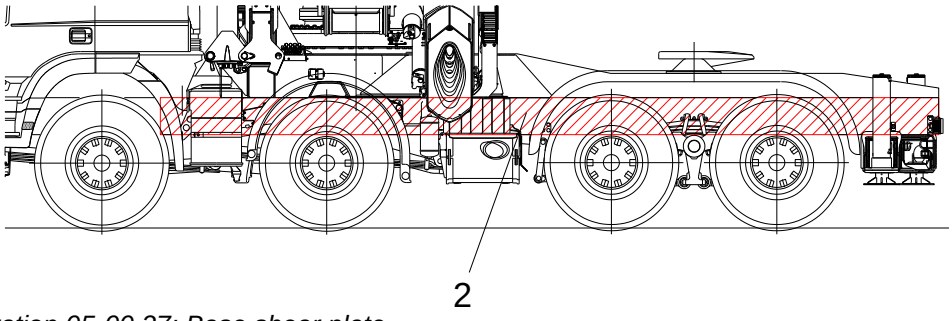


Illustration 05-00 27; Base shear plate

5.4.2.3 Dimension and material of base shear plates

The base shear plates should always be of the same grade of steel as the chassis frame (but with a minimum yield stress ReH ≤ 420 N/mm2). Moreover, the material for the base shear plate should have the following quality features:

- Fine-grained structure (fine-grained construction steel)
- Good weldability
- Adequate notch impact work and tenacity

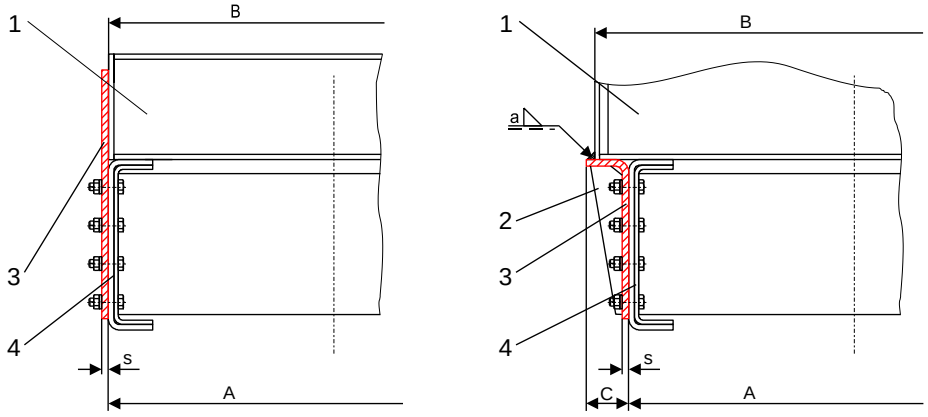


Illustration 05-00 28; Base shear plates

A	Width of chassis frames	1	Combination crane base / subframe
B	Width of chassis frames / combination crane base	2	Reinforcement angle
C	Width of base shear plate	3	Base shear plate
s	Thickness of base shear plate	4	Chassis frame

The base shear plate is bolted to the chassis frame and welded to the subframe. If the subframe is the same width as the chassis frame, the base shear plate is attached flush (see left-hand illustration). If the subframe or the combination crane base is wider than the chassis frame, the width is equalized using the base shear plate (see right-hand illustration). Select the width of the base shear plate (C) so that a fillet weld of the thickness a = 0.8*s can

be placed without obstruction. Weld on reinforcement angles at intervals of about 800 mm to 1000 mm on the sides of the base shear plates.

Recommended sheet thickness "s" of the base shear plates, dependent on the crane lift moment

Max. crane lift moment in kNm	Sheet thickness "s" in mm
≤ 200	6
201 bis 350	8
351 bis 750	10
> 750	12

The mounting possibilities for base shear plates shown below are available for the various mounting variations and differing frame cross-sections so that a technically correct solution can be found for every mounting

5.4.2.4 Mounting forms for base shear plates when the subframe is the same width as the chassis frame

Example 1

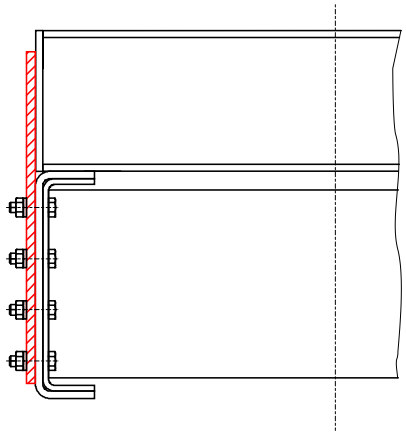


Illustration 05-00 29; Base shear plate

A straight steel sheet is bolted to the side of the chassis frame and welded to the subframe. This variant is suitable only for relatively strong chassis frames (double frames).

Advantages:
Fast, relatively simple and economical production.

Disadvantages:
Often not suitable for thin-walled chassis frames (single frames).

Example 2

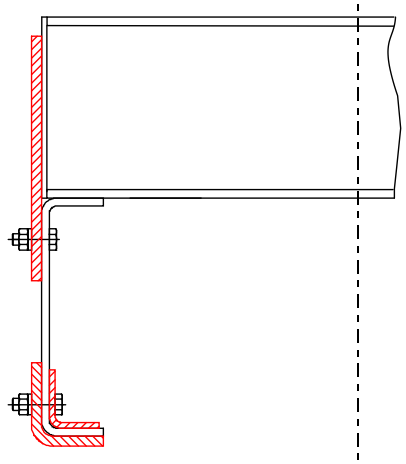
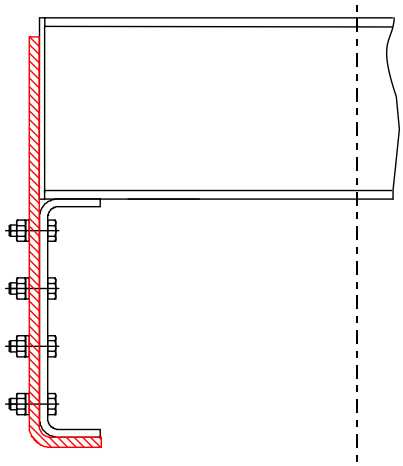
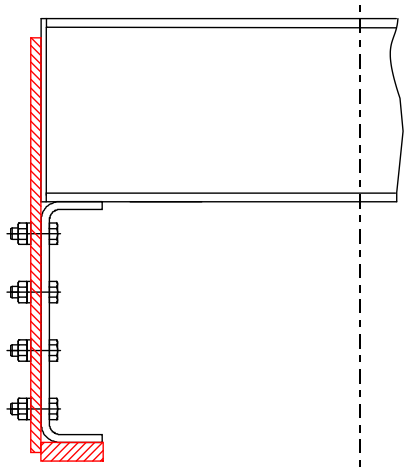


Illustration 05-00 30; Base shear plate

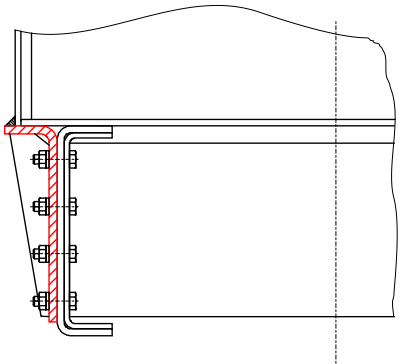
For this variant, the base shear plate is divided into three parts. The chassis frame is reinforced by the two angles.

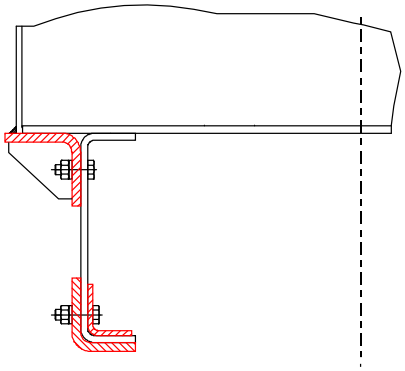
Advantages:
Fast, relatively simple and economical production. Also suitable for single chassis frames.

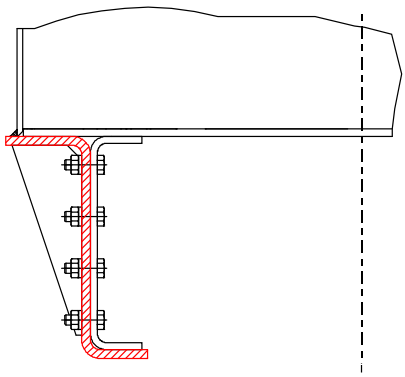
Example 3  *Illustration 05-00 31; Base shear plate*	One-piece angled base shear plate. This mounting form also results in a reinforcement of the chassis frame. Advantages: Also suitable for single chassis frames. Disadvantage: Mounting is somewhat more complicated.

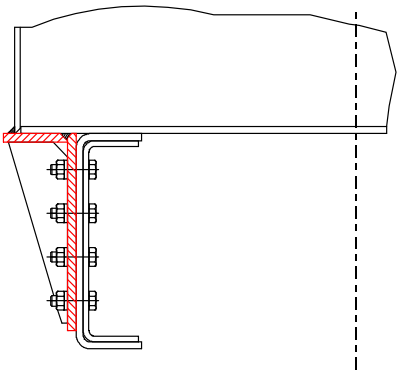
Example 4  *Illustration 05-00 32; Base shear plate*	Two-piece base shear plate which is welded together with a fillet weld. The greater the thickness of the lower steel plate, the more the chassis frame can be reinforced. Advantages: Also suitable for single chassis frames. Disadvantage: Mounting is more complicated.

5.4.2.5 Mounting forms for base shear plates when the auxiliary fame or the combination crane base is wider than the chassis frame

Example 1  *Illustration 05-00 33; Base shear plate*	In this variant, the base shear plate is canted once and bolted laterally to the chassis frame (torsion-resistant connection). This variant is suitable only for relatively strong chassis frames (double frames). Advantages: Fast, relatively simple and economical production. Disadvantages: Often not suitable for thin-walled chassis frames (single frames).

Example 2  *Illustration 05-00 34; Base shear plate*	Construction type "Mercedes Benz" – the base shear plate is divided into two pieces (2 angles) with an interior frame reinforcement. Advantages: Fast, relatively simple and economical production. Also suitable for single chassis frames.

Example 3  *Illustration 05-00 35; Base shear plate*	For relatively thin-walled or single chassis frames, it may be advantageous or even necessary to design the base shear plate in a Z shape. Advantage: Single chassis frames can be reinforced with the plates into bending-resistant frames. Disadvantage: Difficult mounting of the base shear plate

Example 4  *Illustration 05-00 36; Base shear plate*	Using the two-piece base shear plate can equalize any distortion in the subframe module by later mounting the upper part of the base shear plate. Advantage: Possible to equalize heights. Internal tensions can be prevented for the most part. Disadvantage: High production expenditures.

5.4.3 Combining shear-yielding and shear-resistant connecting elements

It is also possible to combine the shear-yielding and shear-resistant connection types. This means that the shear-resistant connection is used only in the area requiring this type of connection. Otherwise, the shear-yielding connection is used. For example, a shear-resistant connection can be selected in the crane area, then there can be a changeover to the shear-yielding connections for the rest of the frame, if permitted by rigidity and stability values.

5.5 PAF – PALFINGER Frame

The PAF (PALFINGER Frame) software was specially developed for calculating chassis frames and subframes for loader crane body building. In this process, the cross-sections of the chassis frame are drawn by using parametric basic shapes and templates.

The bending and torsional moments acting on them are automatically calculated by the program by using a PAC Online body building project.

INFORMATION

PAF determines the stresses on the subframe according to the generally valid rules of strength theory.

The crane column center will be idealized as the point of initiation or application of the crane moment. The closer the total center of gravity to the center of the crane column is, the more valid the values of the PAF / PAC online calculation are, since an idealized rigid body system is assumed.

However, subframe systems for loader cranes are statically undefined, when 4+ additional stabilizers are used. Therefore, it is assumed, that the crane and possible additional stabilizers are extended and in full contact with the ground.

The following points must be considered separately:

- Statements regarding frame dimensioning must not be made across the board.
- Front- and rear-mounted cranes must be evaluated strictly separately, especially because of the distance between the total center of gravity and the center of the crane column.
- A rigid body system doesn't consider deformations and therefore also not the overall vehicle rigidity.
- An accurate stress analysis can only be realized with the help of FE calculation methods. PAF provides good results without much calculational effort, but the evaluation of the raw data must always be considered in a conservative and critical way.
- Bending stress "σb" occurs when force is applied vertically to the beam axis (normal stress).
- Torsion "τ" occurs when external forces generate a torque. Torsion can only be calculated with a closed subframe system and must be examined separately, especially when additional frame stabilizers are used.
- For the frequent case of simultaneous bending and torsional stresses, the equivalent stress "σv" can be calculated with $\sigma_v = \sqrt{\sigma_b^2 + 3\,\tau^2} \leq \sigma_{zul}$

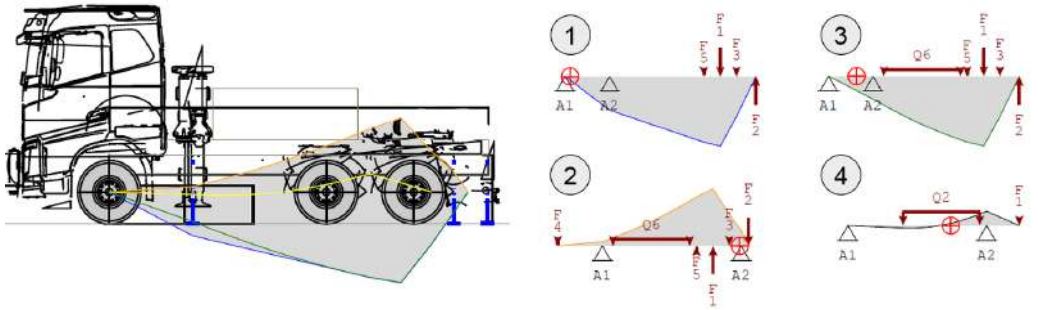


Illustration 05-00 37; PAF calculation of the maximum bending moment in different load cases

1	Crane to the front, truck unloaded	3	Crane to the front, truck loaded
2	Crane to the rear, truck loaded	4	Driving condition with payload

Cross-sections at which the bending moment changes or critical values can be reached are considered separately. This includes, among other things, the impression edge of the crane column (cross spar and rocker), the axle carriers or spring holder and the supports.

5.6 Frame connections of sheet metal and profiles

5.6.1 Types of joints of sheets and moulded tubes

It is recommended that the subframe be prefabricated to such an extent that it need only be connected to the chassis frame on the vehicle; this will prevent stress on the chassis frame.

If metal sheets or moulded tubes must be extended, they should be joined either offset (x ~ subframe height) or at an angle (α ~ 30° to 45°) to one another.

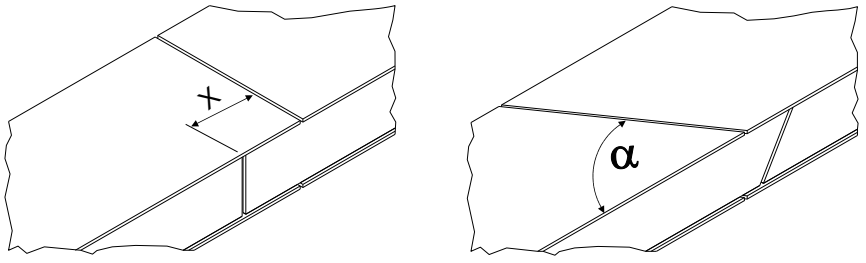


Illustration 05-00 38; Type of joint

Choose a welding order which will prevent distortion almost entirely.

5.6.2 Bolt connections for the mounting

5.6.2.1 Materials and dimensions

Bolts and locknuts for fastening the mountings must be strength category 10.9 as a minimum. Washers must have a hardness of at least 200 HB.

Mountings are normally fastened to the chassis frame with M14 bolts. Under certain circumstances, M16 bolts are also used.

5.6.2.2 Bolt connection with friction connection

A force transmission with a friction connection can function only if the bolt is very tight. If the bolts used are too short, the bolt connection will become loose due to so-called "subsidence". The bolts must be retightened if the connection is to function properly.

Using spacers allows you to achieve the correct bolt length, thus creating a permanent bolt connection.

Area of application: bolt connections which need not withstand high shear forces (e.g., for the mounting of supplementary tanks or for shear-yielding mountings).

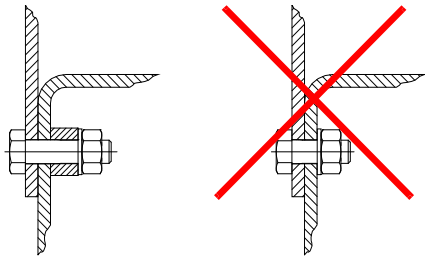


Illustration 05-00 39; Bolt connection

5.6.2.3 Shear-resistant bolt connection

Only positive-fit connecting elements are shear-resistant. Shear-resistant bolt connections are "driven bolt connections" (fitted bolts) or bolt connection if the hole play is ≤ 0,2 mm, full-shaft bolts with a minimum quality of 10.9 are used and the minimum bolt length is assured.

Area of application: fastening of base shear plates, as substitute for rivets, fastening of crossbeams, etc.

ATTENTION

A shear-resistant bolt connection may be tightened only at the nut. Take care of torque moments!

The thread of the screws should end before the connected parts. If the shaft is longer than the connecting parts use a washer underneath the nut!

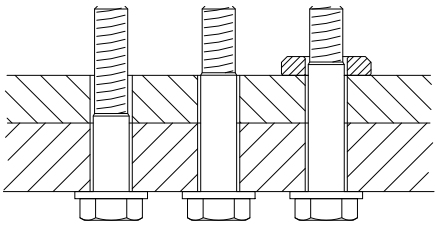


Illustration 05-00 40; Bolt connection

5.6.2.4 Shear-resistant rivet connection

Can be used as a replacement for bolt connections or welded joints.

Screw connections are often difficult to implement when subframes are closed because there is no access to the inside of the frame profile to fasten and tighten a screw by using a nut. The use of threads in the longitudinal frame member is not always possible.

Rivet joints are often the most efficient choice, as welding preparation and follow-up are omitted.

Field of application: Galvanized subframe for rear-mounted loader cranes up to approx. 26 mt.

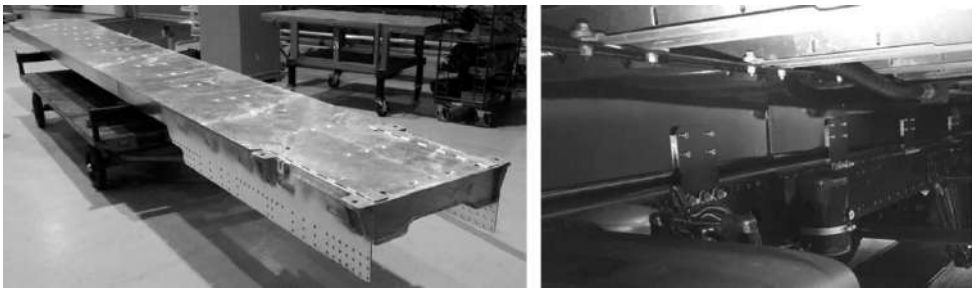


Illustration 05-00 41; Rivet connection of a galvanized subframe

PALFINGER Installation Guideline
Hydraulic Loader Crane

Chapter 6

Crane Installation

Original Installation Guideline

DA-105

Version: 2023/03

English

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Contents

6.1 Guideline for crane installation

For planning and assembling of a crane on a vehicle it is important to proceed in the following order:

Planning	1.	**Installation planning of the crane** • Define crane position on the vehicle • Calculate the height of the vehicle • Axle load calculation • Stability calculation • Selection of additional stabilizer (if necessary) • Dimensioning of PTO and hydraulic pump • Dimensioning of tank volume and oil cooler (if necessary) • Definition of dead point for cranes without continuous rotation	**Chapter 3**
	2.	**Selection and calculation of a subframe** • Flexible / torsion-resistant subframe • Shear-yielding / shear-resistant frame connection • Strength calculation of subframe •	**Chapter 5**
Assembly	3.A	**Crane installation with truck standard crane base** • Manufacturing and assembling to the chassis of subframe including wear plates and base shear plates • Positioning of the crane on the subframe by means of proper lifting accessories • Positioning and tack welding of mounting bushes and mechanical crane stops • Remove crane from subframe • Welding of mounting bushes and mechanical crane stops • Paint subframe, base shear plates, bolt sleeves and anti-twist protection of crane • Positioning of crane on subframe and fixing with mounting bolts	**Chapter 6**
	3.B	**Crane installation with combination crane base** • Fixing of base shear plates on the chassis frame • Positioning of crane and additional stabilizer on the chassis and tack welding to the base shear plates • Pre manufacturing of subframe modules • Positioning of subframe modules on the chassis • Welding of the subframe modules, the crane base and the base shear plates • Painting of subframe modules	**Chapter 6**

Assembly	4.	**Connecting of crane hydraulic** • Assembly of hydraulic pump • Connecting of oil pipes and hoses • Filling of hydraulic tank with hydraulic oil • 	**Chapter 8**
	5.	**Connecting of crane electric** • Connecting of main line to the crane • Matching of stabilizer positions of crane and additional stabilizer (if existing) according to current installation • Establishing of vehicle interfaces (motor start / stop, motor speed adjustment, transport position monitoring) • 	**Chapter 9**
Start up	6.	**Start-up of crane** • Functional check • Setting of pressures • Setting loading limits and safety systems • 	**Chapter 12**
	7.	**Handover to the end customer** • Handover to the end customer according PALFINGER handover guidelines	**Chapter 12**

6.2 Safe crane handling

6.2.1 Transport

When transporting the crane make sure that lashing points and fasteners will not damage any components during transportation from manufacturing company to customer. All crane accessories are delivered in wooden crates and/or card boxes. These must not be damaged or removed prior to start of assembly.

When transporting the crane make sure that lashing points and fasteners will not damage any components during transportation from manufacturing company to customer. All crane accessories are delivered in wooden crates and/or card boxes. These must not be damaged or removed prior to start of assembly.

6.2.2 Transport locks

In some crane models additional transport locks are mounted (for instance in Epsilon AS85), these must be dismounted by the bodybuilder after the crane has been installed on the truck.

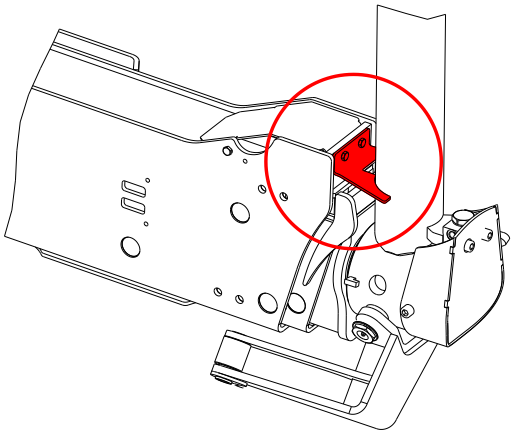


Illustration 06-00 1; Transport lock

6.2.3 Next Epsolution Epsilon crane series

In case of Epsilon timber and recycling cranes with the following equipment code:

Equipment code	Description
AS45	45˚ stabilizer cylinder in transport position folding up via mechanical link guide
AS85	85˚ stabilizer cylinder in transport position folding up via mechanical link guide

The cranes are palletized and delivered with the stabilizer cylinders folded vertically up-wards. During set-up the two stabilizer cylinders must be folded down in the same way as they were folded up. The direction is indicated by a label on the link of the stabilizer cylinder and can be viewed in the below illustration.

INFORMATION

Observe the specified swivel direction (arrow on label, see illustration 06-00 2).

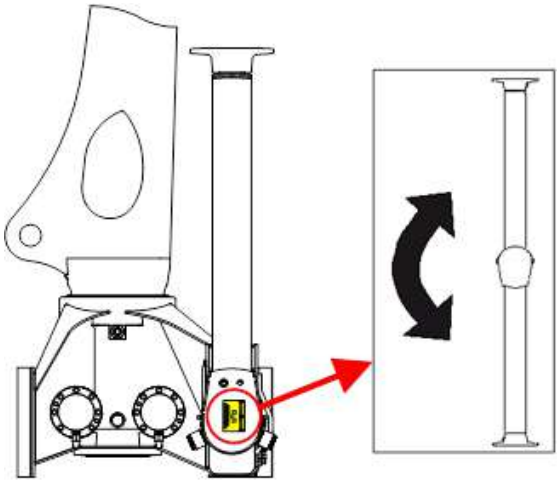


Illustration 06-00 2; Slew stabilizer cylinder

WARNING

When you fold the stabilizers down in the wrong direction the hydraulic hoses will get twisted and damaged!

6.2.4 Unloading and bodybuilding process

During the unloading process through the bodybuilder or a third party consider of all safety rules and accident controls. Unload the crane and all its accessories safely and don't throw boxes, etc. from the platform of the transporting vehicle.

When the parts are unloaded, check the parts for damages and completeness. If there are damages, note it on the shipping documents. Never pull or push the crane and it´s accessories on the floor. The using of chains and cables is just allowed if there is no direct con-tact between the crane parts and the lifting equipment.

While handling the crane with the forklift the crane must be fastened to the original transport pallet. The forklift must be suitable for lifting the crane to be transported (lifting capacity, forks, etc.).

Consult the technical data sheets to find the dead weight of the crane. Be sure to take into account any accessories that have been installed

GEFAHR

During crane handling there is danger of tipping over and hence risk to life!

GEFAHR

For a safe crane handling always use sufficient dimensioned devices (belts, chains). Best is to use original PALFINGER handling systems!

During the crane handling danger of squeezing is given. Always be in a safety distance!

Cranes may only be transported as being packed for loading in factory without any additional accessories attached to such as fly-jib, subframe, etc.

INFORMATION

Before lifting the transport pallet check that the loader crane is free and any screws, belts and the like are removed.

Introduction of our new system of crane lifting accessories which have been especially designed for the handling of PALFINGER cranes for shipment, installations and repair jobs.

The following points have been checked very carefully to ensure a trouble-free use of the equipment:

- Safety
- Protection of the crane painting
- Universal for different crane types
- Fast and quick handling

Following crane lifting accessories are available in the PALFINGER tool catalog at the moment.

INFORMATION

The PALFINGER tools catalog can be obtained online in the service documents via PALDESK.PALFINGER.com

6.2.5 Lifting accessories for small and medium cranes models

Cranes with a bracket on the main boom can be transported on this bracket directly (see illustration 06-00 3).

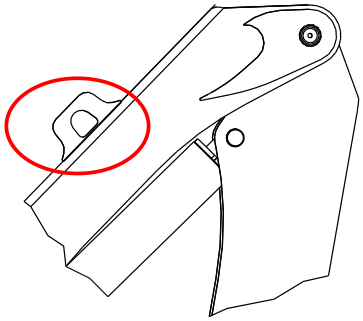


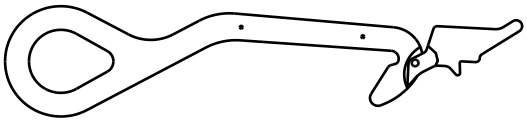
Illustration 06-00 3; Bracket on main boom

INFORMATION

Further information on the transport hangers can be obtained online in Service Information C07/2008 and C03/2012 "Crane transport hangers" via PALDESK. PALFINGER.com.

6.2.5.1 Performance crane series (cranes with Ø 90mm transport hole on main boom)

Performance crane series (cranes with Ø 90mm transport hole on main boom) → HXE2262

HXE2262 (max. load 4000kg)	PK 10000 - PK 29002	 *Illustration 06-00 4; HXE2262*

DANGER

When handling the crane with the load handling attachments (HXE2262) the hook must be hooked into the lateral 90mm borehole on the main boom and the safety latch must snap in to prevent the load handling attachment from getting loose uncontrollably!

6.2.5.2 Further crane series

Cranes of the High-Performance range as well as SLD and TEC series are all delivered with shackle on the main boom. It can also be used for transportation.

The shackle must be removed after placing and mounting the crane.

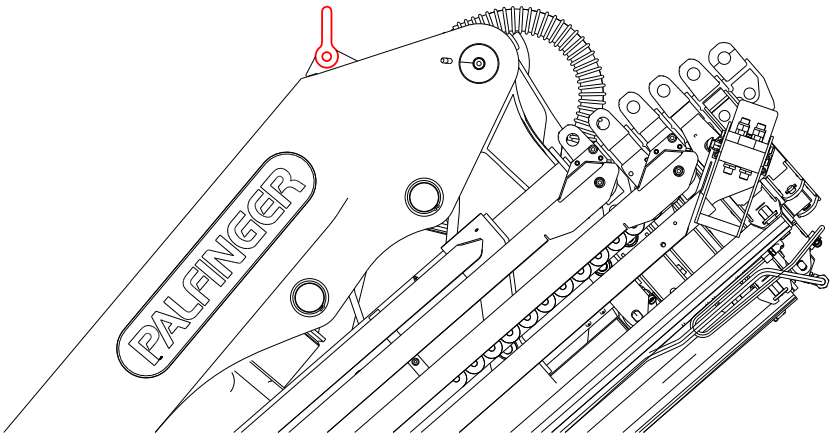


Illustration 06-00 5; Shackle High-Performance-Series

In case of cranes with the power link plus system up to approx. 20 mt, the shackle is not mounted in the center of gravity axis in some crane models, therefore the crane will tilt somewhat to the side. This may be prevented by using the described load handling attachments.

For these cranes, the EKD105 / EKD107 load handling attachments are intended for crane assembly and are more suitable. The bracket on the main arm serves as the fastening position using bolts HI042 and securing device EQ042.

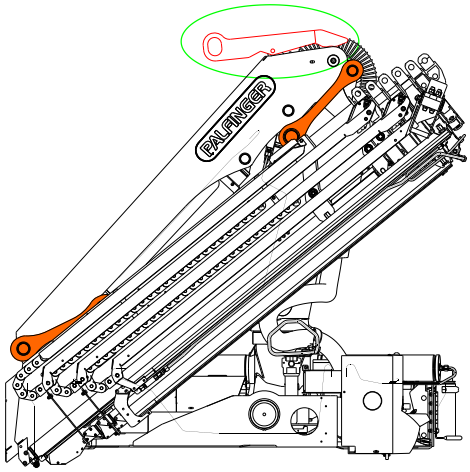
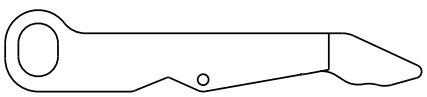
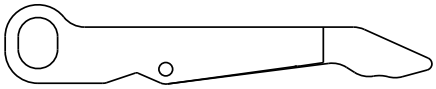


Illustration 06-00 6; Load handling attachments

EKD105 +HI 273 +EQ 042 (max. load 3000kg)	PK 8502 HP – PK 12502 SH	 *Illustration 06-00 7; EKD105*

EKD107 +HI 042 +EQ 042 (max. load 3000kg)	PK 13002 HP – 18502 HP	 Illustration 06-00 8; EKD107

INFORMATION

In the High-Performance crane series with power link system on both the lifting cylinder and the knuckle cylinder it is recommended to use the lifting gear (EKD105 and EKD107) for placing the crane onto the carrier vehicle.

DANGER

Do not exceed the maximum load of 3000 kg when using the lifting gear (EKD105 and EKD107)!

INFORMATION

In order to prevent the crane from damage you must dismount the load handling attachment before taking the loader crane into operation!

6.2.5.3 SOLID crane series

Cranes of the SOLID series are all delivered with shackle on the main boom. It may be used to transport and place the unit onto the carrier vehicle.

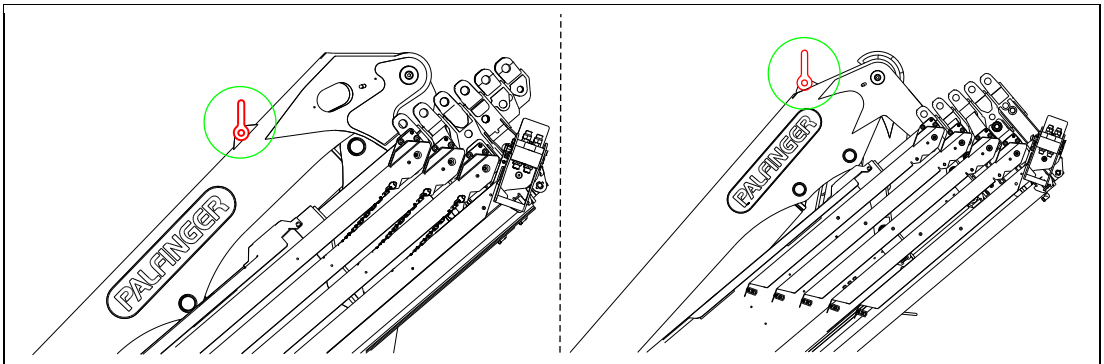


Illustration 06-00 9; Shackle of SOLID crane series

INFORMATION

In order to prevent the crane from damage you must dismount the load handling attachment before taking the loader crane into operation!

6.2.6 Lifting gear for long boom crane series

6.2.6.1 Long boom crane series

Cranes of the L and EL series are delivered with screwed on lifting gear. The lifting gear can be used to transport the loader crane (see illustration 06-00 10).

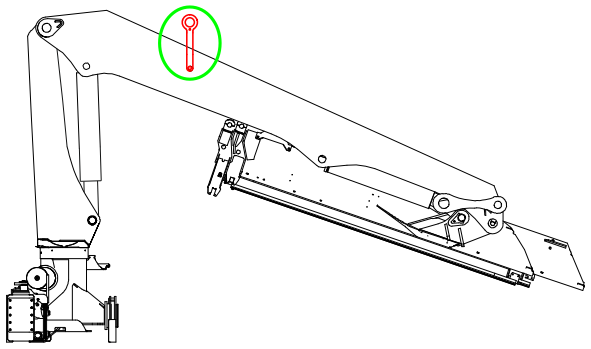


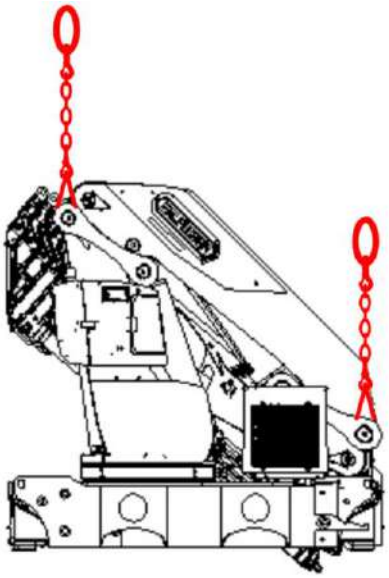
Illustration 06-00 10; Load handling attachments

INFORMATION

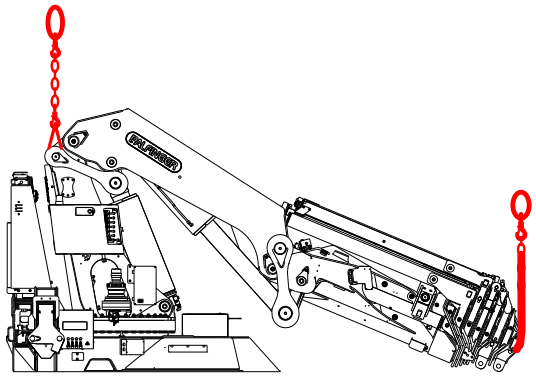
In order to avoid damage to the crane it is necessary that the lifting gear and the optionally mounted transportation equipment such as pins are dismounted before starting up the loader crane.

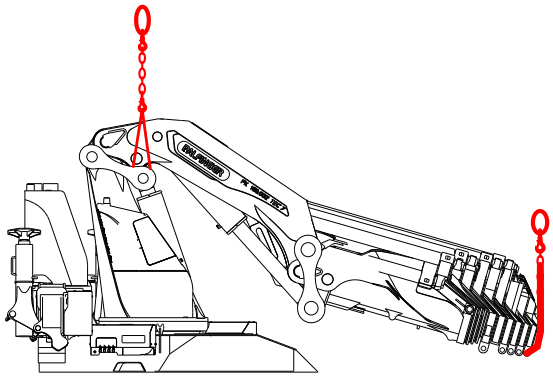
6.2.7 Load handling attachments for loader cranes of the middle-sized and large series

Lifting accessories for 40 – 105 mt → EKD188

EKD188	Cranes with truck standard base, M24, 10.6 t	
EKD188-01	PK135.002 TEC7 with truck standard base, M36, 17 t	*Illustration 06-00 11; EKD188 / 188-01*

Lifting accessories for 60 – 165 mt → EKD106

EKD106	High Performance crane series, Integral base frame	 *Illustration 06-00 12; EKD106*

EKD106	TEC / SLD crane series, Integral base frame	 *Illustration 06-00 13; EKD106*

The following documents are included with each EKD-106 and EKD-108U accessory:

- Conformity declaration
- General operating manual for lifting accessories from the supplier
- PALFINGER specific operator manual about the proper using of the accessories

INFORMATION

The operating instructions on how to lift a PALFINGER crane can be obtained online via PALDESK.PALFINGER.com.

For using the lifting accessories EKD-106 and EKD-108U, the lifting height of the over-head crane shall be at least 4.7 to 5 m (including a truck frame height of approx.1,5 m).

6.2.8 Load handling attachments for small and PC cranes

The small cranes PK 2900 to PK 4200 and the PC cranes can be transported with the shackles mounted.

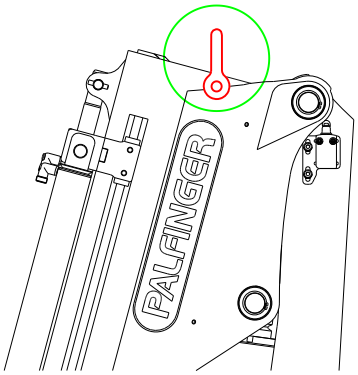


Illustration 06-00 14; Shackle PC crane

INFORMATION

In order to prevent the crane from damage you must dismount the shackle before taking the loader crane into operation!

6.2.9 Lifting accessories for EPSILON cranes

6.2.9.1 Epsolution

Depending on crane model, EPSILON cranes have two lugs or two eyes to hook the sling chain's hook in. The lugs or eyes are located near the center of gravity. So, the crane can be lifted straight up from the pallet.

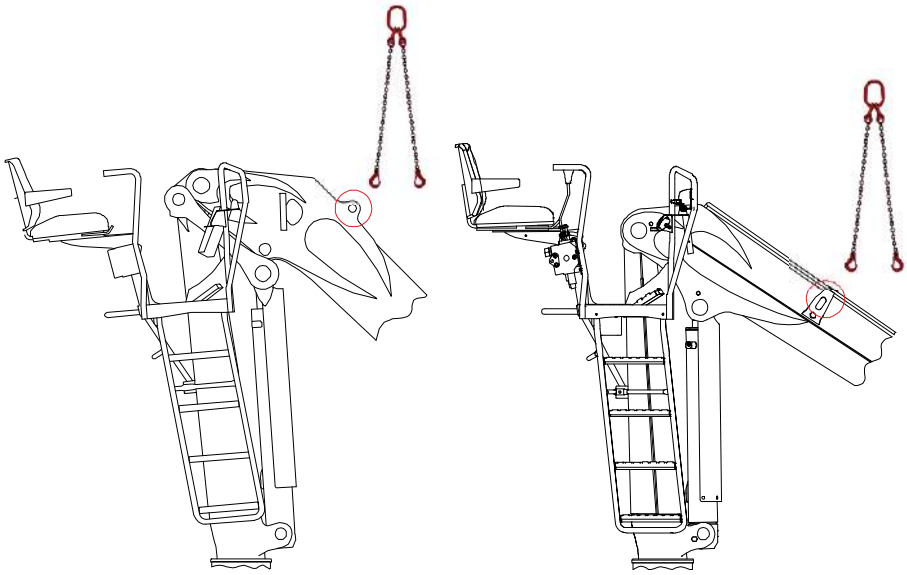


Illustration 06-00 15; Transport shackle respectively -eyes of EPSILON cranes

At EPSILON Z-cranes with telescopable main boom there are no shackles respectively eyes to hook on the lifting device. In this case a hoisting sling for lifting the crane must be used.

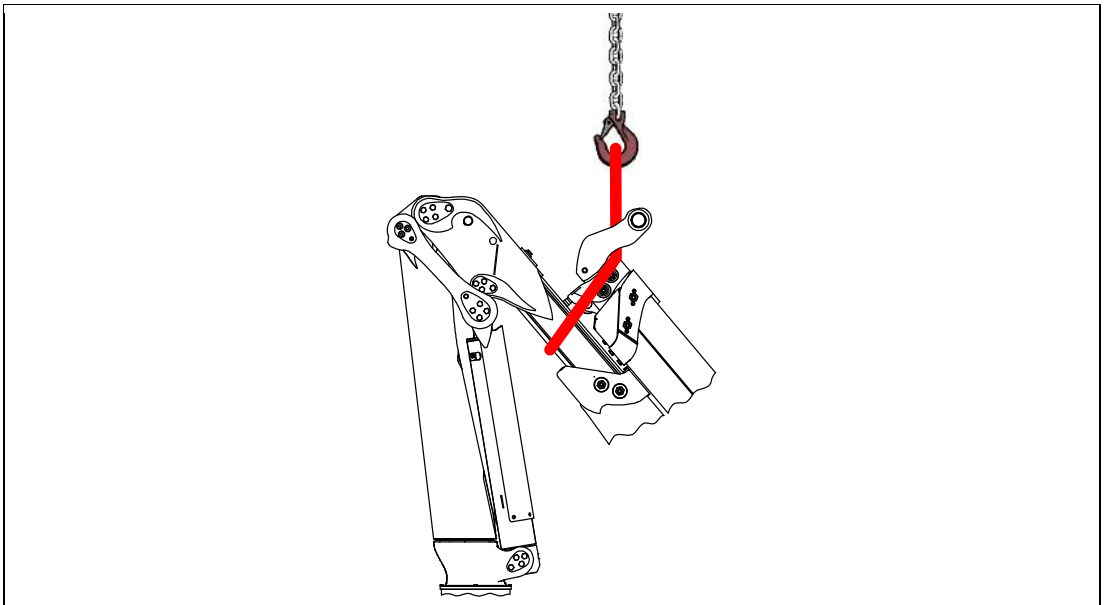


Illustration 06-00 16; Hook on with hoisting sling at EPSILON Z-crane

6.2.9.2 Next Epsolution

Epsilon cranes of the Next Epsolution series have a borehole near the crane's center of gravity. The lifting rod from the BK 240 assembly kit gets fixed in this borehole. The sling chain can be hooked in the two lugs. So, the crane can be lifted safely from the pallet. The offered assembly kit BK 240 includes the lifting rod, lug, distance piece and lynch pin.

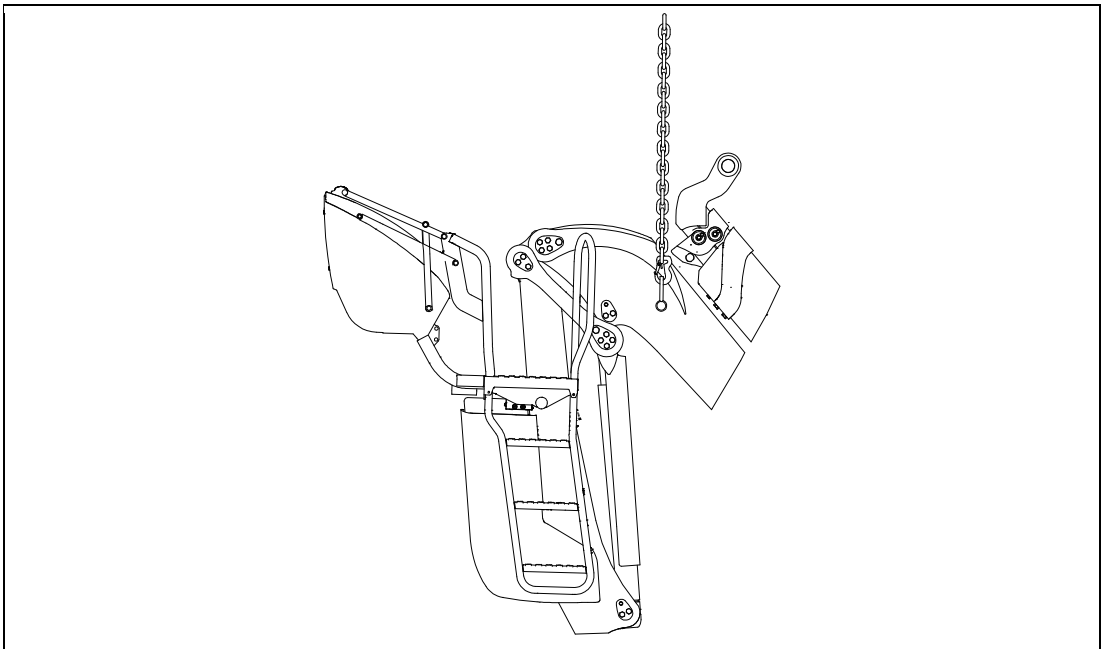


Illustration 06-00 17; Attaching the crane with lifting rod from kit BK240 for Next Epsolution cranes

At EPSILON L-cranes out of the S-class there are no shackles respectively eyes to hook on the lifting device. In this case a hoisting sling for lifting the crane must be used.

The following points must be observed:

- Due to the sharpness an edge protection below the main boom must be used to avoid damaging of the hoisting sling.
- The hoisting sling has to be put like a loop around the main boom.

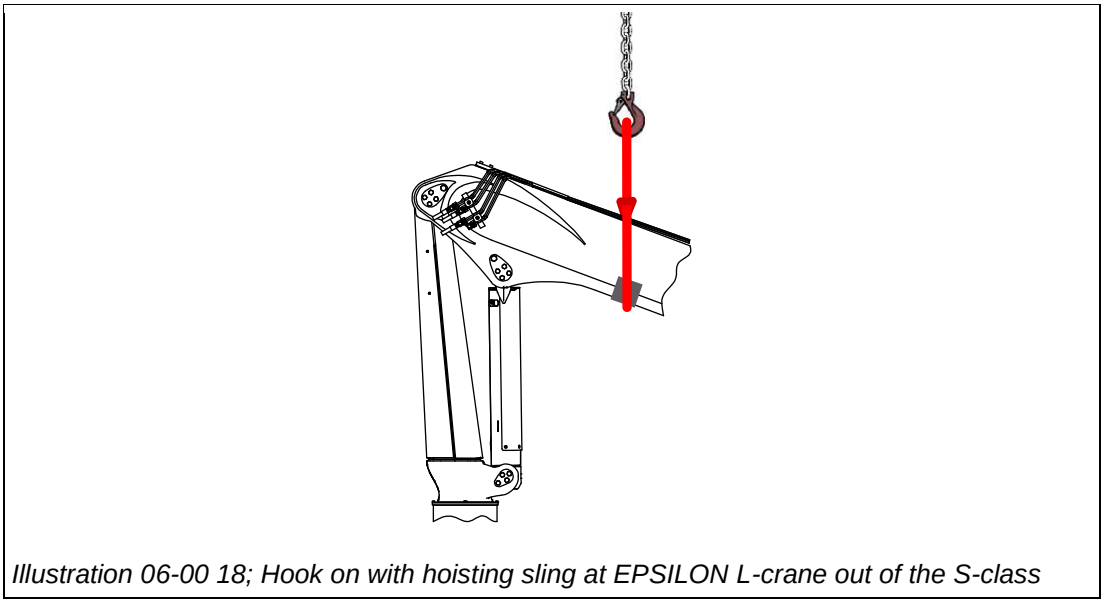


Illustration 06-00 18; Hook on with hoisting sling at EPSILON L-crane out of the S-class

6.2.10 Common security advice for using crane lifting accessories

The crane must to be secured during the working process until the fixation on the truck or on a residential place is done by mounting bolts or welding angles.

6.2.11 Demounting of the crane

INFORMATION

Before dismounting the crane depressurize the system and disconnect it from mains.

Before loosening the screws of the crane, the crane must be secured. If necessary, cut off the welding connections of the integral base frame.

Afterwards the hydraulic- and electric lines can be demounted.

For further transport place and fasten the crane to the original PALFINGER pallet.

GEFAHR

During crane handling there is danger of tipping over and hence risk to life!

The stability of the crane has to be guaranteed in each step of the working process.

6.3 Crane model features

6.3.1 Component designation

6.3.1.1 Crane with continuous rotation system

The crane shown in following illustration is an example and shows crane components which may be optional on your crane, depending on design and crane type.

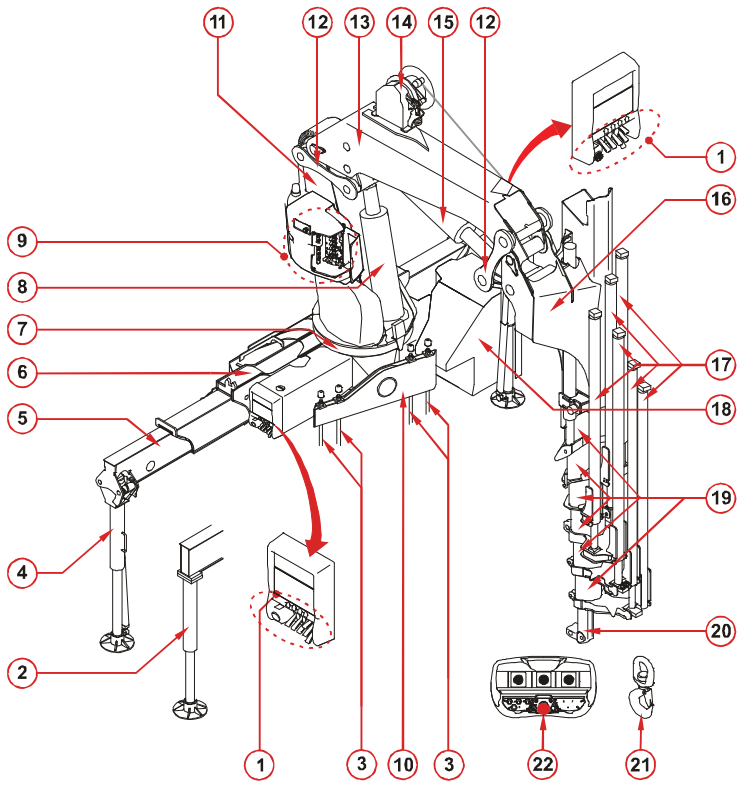


Illustration 06-00 19; Main components of a crane with continuous rotation system

1	Ground control – control valve side, opposite side
2	Rigid stabilizer cylinder
3	Crane mounting bolts
4	Tiltable stabilizer cylinder
5	Telescopic outrigger beams
6	Base
7	Continuous rotation system with gear rim
8	Lift cylinder
9	Emergency control stand on the crane column
10	Balance
11	Crane column
12	Linkage system
13	Main boom
14	Rope winch
15	Outer boom lift cylinder
16	Outer boom
17	Extension cylinder for hydraulic extension booms
18	Hydraulic oil tank with oil level indicator
19	Extension booms
20	Mechanical extension booms
21	Load hook
22	Remote control handset

6.3.1.2 Crane without continuous rotation system

The crane in the drawing below is an example and shows crane components which may be found on the crane as options, depending on the exact design and crane model.

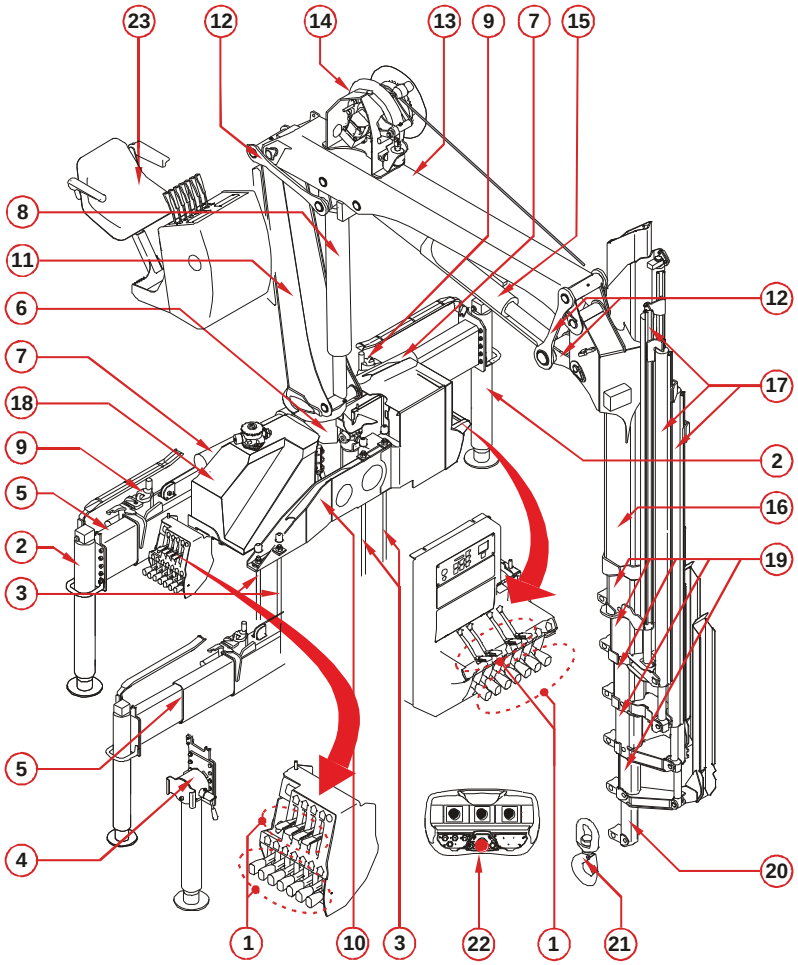


Illustration 06-00 20; Main components of a crane without continuous rotation system

1	Ground control – control valve side, opposite side	13	Main boom
2	Rigid stabilizer cylinder	14	Rope winch
3	Crane mounting bolts	15	Outer boom lift cylinder
4	Tiltable stabilizer cylinder	16	Outer boom
5	Telescopic outrigger beams	17	Extension cylinder for hydraulic extension booms
6	Base	18	Hydraulic oil tank with oil level indicator
7	Slewing system	19	Extension booms
8	Lift cylinder	20	Mechanical extension booms
9	Manual outrigger interlock system	21	Load hook
10	Balance	22	Remote control handset
11	Crane column	23	Top seat
12	Linkage system		

6.3.2 General mounting instructions

Generally, the loader crane gets put on the subframe and fastened with mounting bolts.

INFORMATION

Find the number of mounting bolts and the fastening points in the appropriate technical datasheets.

It is permissible to combine the mounting points of BRI-4 and BRI-8 shown in the technical datasheets (mounting points I to IV, see illustration 06-00 21). So, at identical superstructures there may be different designs of mounting points (connection between crane and subframe).

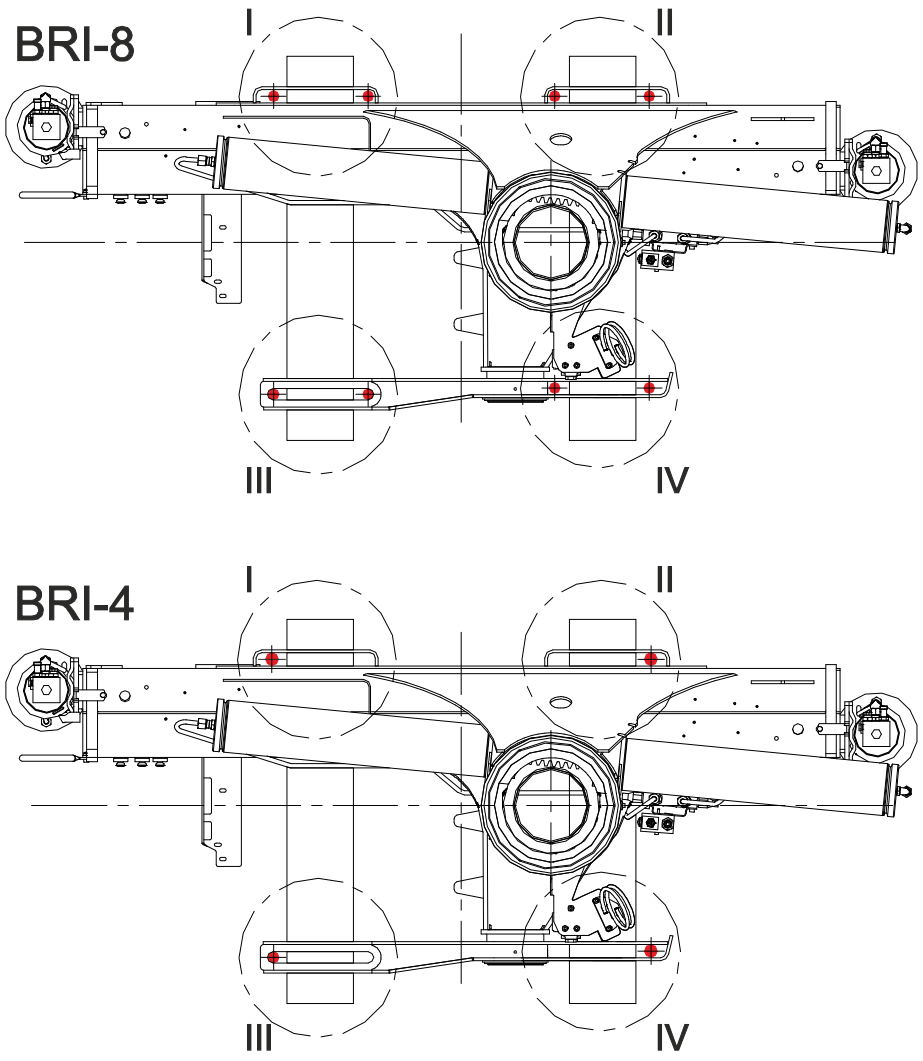


Illustration 06-00 21; Mounting bolts - mounting points on crane

I-IV	Mounting points to connect crane and subframe

ATTENTION

Cranes with conventional crane base (assembled with mounting bolts) must never be put directly onto the chassis frame.

6.3.2.1 Crane connection including anti-twist protection, version 1 (up to crane series 2010 or SLD)

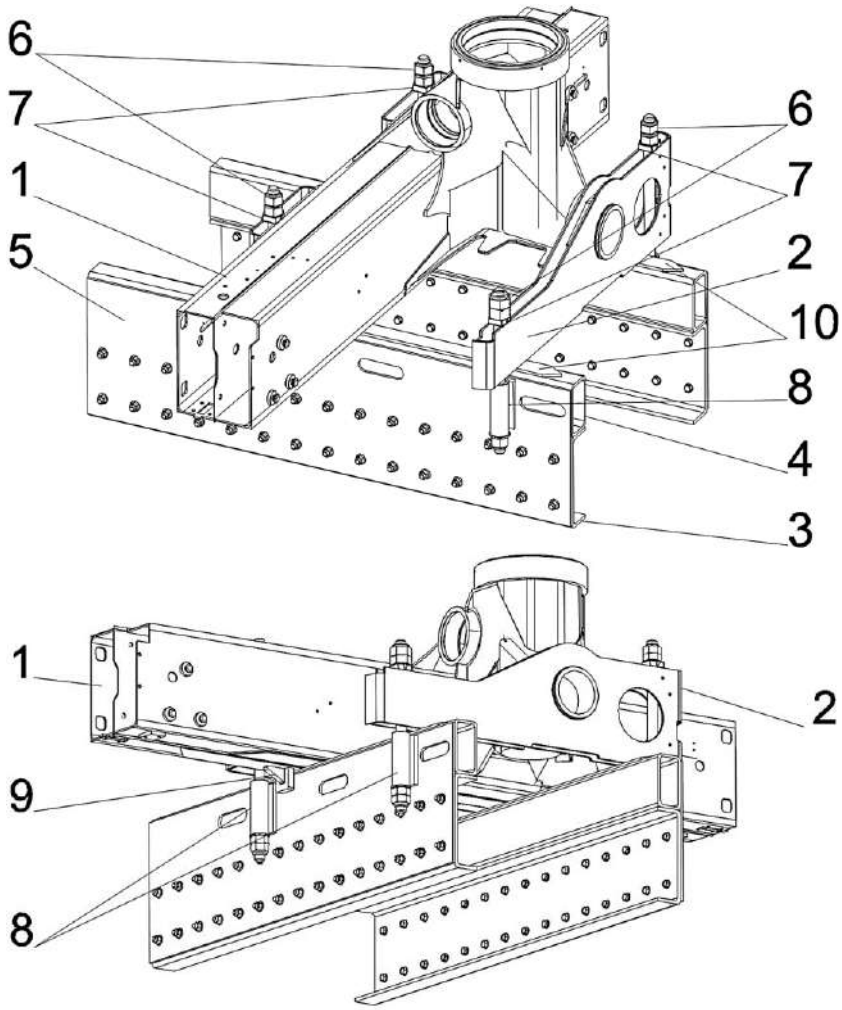


Illustration 06-00 22; Overview of crane installation with mounting bolts

1	Crane base	6	Mounting bolts
2	Crane rocker	7	Mounting washers
3	Vehicle frame	8	Mounting brackets
4	Subframe	9	Anti-twist protection for crane
5	Base shear plate	10	Support plate for subframe

Add square mounting washers (7) between mounting straps and mounting nuts. The mounting bolts (6) must be generally tightened with two mounting nuts at both ends. If, for reasons of space, only one nut can be installed, a self-locking nut must be used and tightened using a torque spanner. In case of doubt, contact PALFINGER customer service.

6.3.2.2 Crane connection including anti-twist protection, version 2 (TEC crane series)

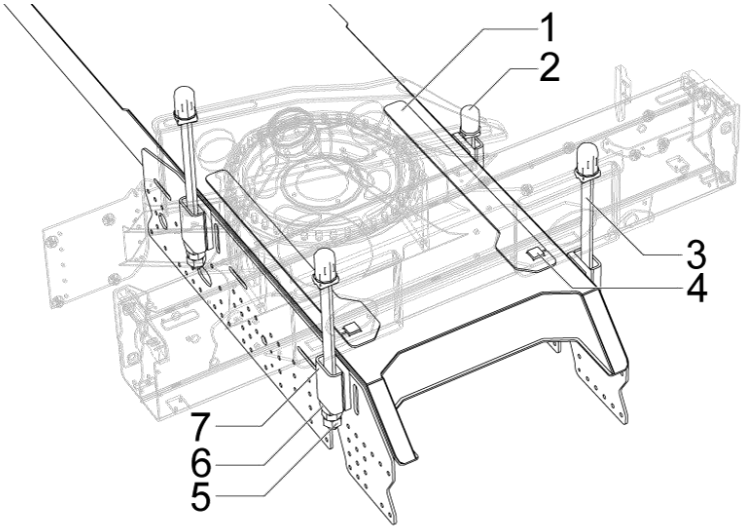


Illustration 06-00 23; Overview of crane installation with mounting bolts

1	Support bars	5	Mounting nuts
2	Caps	6	Mounting washers
3	Mounting bolt	7	Mounting pockets
4	Anti-twist stop blocks		

6.3.2.3 Tightening torque for mounting bolts

The below specified tightening torque is defined for mounting bolts as delivered.

- Uncoated mounting bolts: lightly oiled
- Coated mounting bolts: not oiled

The tolerance range of tightening torques is +/- 10% of the default values.

Strength classes or material			
	8.8	C40	42CrMo4V
Thread diameter	Tightening torques [Nm]		
M16 x 1,5	120		
M20 x 1,5		140	210
M24 x 1,5			450
M30 x 1,5			900
M33 x 1,5 (only EPSILON)			1220
M36 x 1,5			1550
M42 x 1,5			2500
M48 x 1,5			3700

WARNING

The projection of the second nut (counter-nut) or, in exceptional cases, the self-locking nut, must be at least three full turns of the thread (3 x thread pitch).

It must be ensured that the crossbeam of the crane base rests flat on the subframe (component 4, illustration 06-00 24). If there is a gap, fill it by welding steel plates onto the subframe. Where the crane is attached the subframe must be produced torsion-resistant and rigid (see chapter 5 "Subframe").

6.3.2.4 Tightening sequence of mounting bolts

When fitting the mounting bolts, the steps must be carried out in the following order:

1. In order to avoid any mechanical stress when mounting the base, all mounting bolts must be pre-fitted.
2. Pre-tension applying 50 % of the tightening torque, however, maximum 200 Nm (diagonal, see illustration 06-00 25).
3. Tighten them with torque wrench until the specified tightening torque is reached.

If the mounting bolt cannot be fitted because of the load arm, follow the below instruction:

1. Fit mounting bolts to minimum 3 mounting points.
2. Pre-tension applying 50 % of the tightening torque, however, maximum 200 Nm (diagonal, see illustration 06-00 25).
3. Lift the outer boom and fit bolts to 4th mounting point.
4. Tighten them with torque wrench until the specified tightening torque is reached.

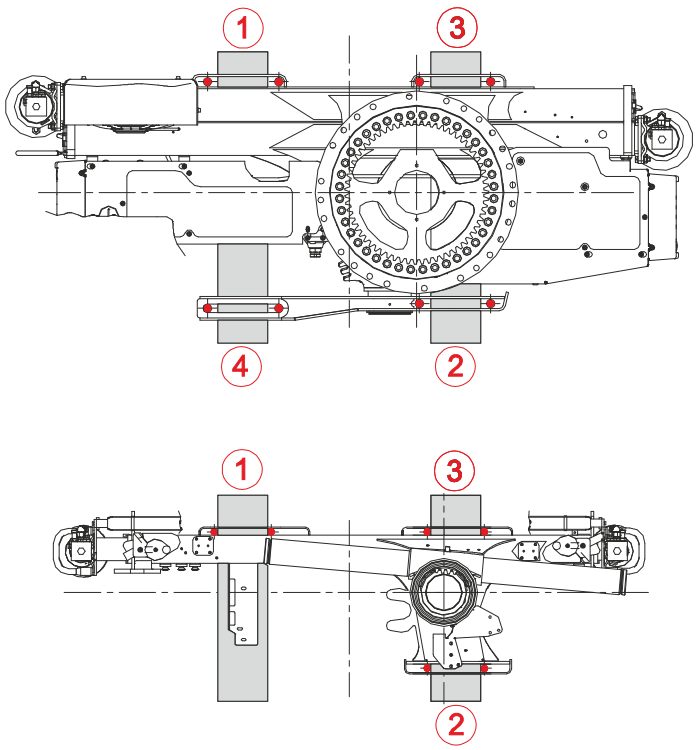


Illustration 06-00 24; Tightening sequence of mounting bolts

INFORMATION

Find the number of mounting bolts and the fastening points in the appropriate technical datasheets.

DANGER

Always tighten mounting bolts diagonally by applying the correct torque!

DANGER

Only original PALFINGER mounting bolts may be used. These can be bought from the PALFINGER Equipment Center.

DANGER

The mounting bolts delivered with the crane (component 6, illustration 06-00 23) are made of high-tensile material and must not be deformed, neither hot nor cold. The threads of the mounting bolts must never be recut.

DANGER

When replacing the crane by a new one, the entire crane mounting must be replaced, too!

6.3.2.5 Support plate at subframe, version 1

In order to protect the subframe's cross-section from being weakened due to wear and settling effects, support plates need to be fitted near the crane's support points.

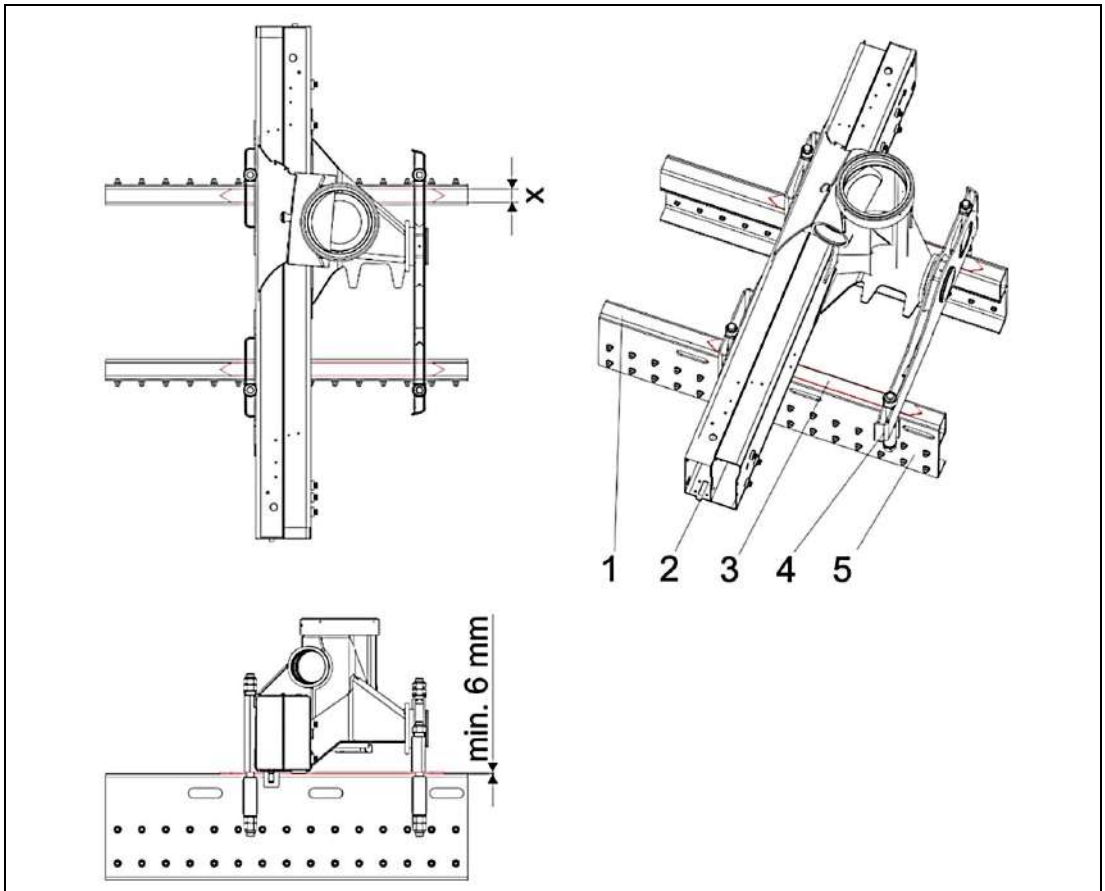


Illustration 06-00 25; Support plate

1	Subframe	4	Crane rocker
2	Crane base	5	Side boards
3	Support plate	X	Use up maximum possible width to support (max. 100 mm)

Unless differently prescribed in the vehicle manufacturer's installation instructions, fit the mounting bolts in the vehicle frame from inside the frame. Screw on the nut from the outside of the vehicle frame. Tighten the bolted connection with the nut. The head of the bolt is used only for countering.

DANGER

Loose, damaged or over-tightened bolts can break under load. There is risk of fatal injury.

DANGER

When replacing the crane inspect the support plates for settling effects and replace them if necessary!

INFORMATION

In order to avoid tension on the crane's base frame it is necessary to place the support plates at the smallest possible distance to the mounting bolts (X), refer to illustration 06-00 25 and 06-00 26!

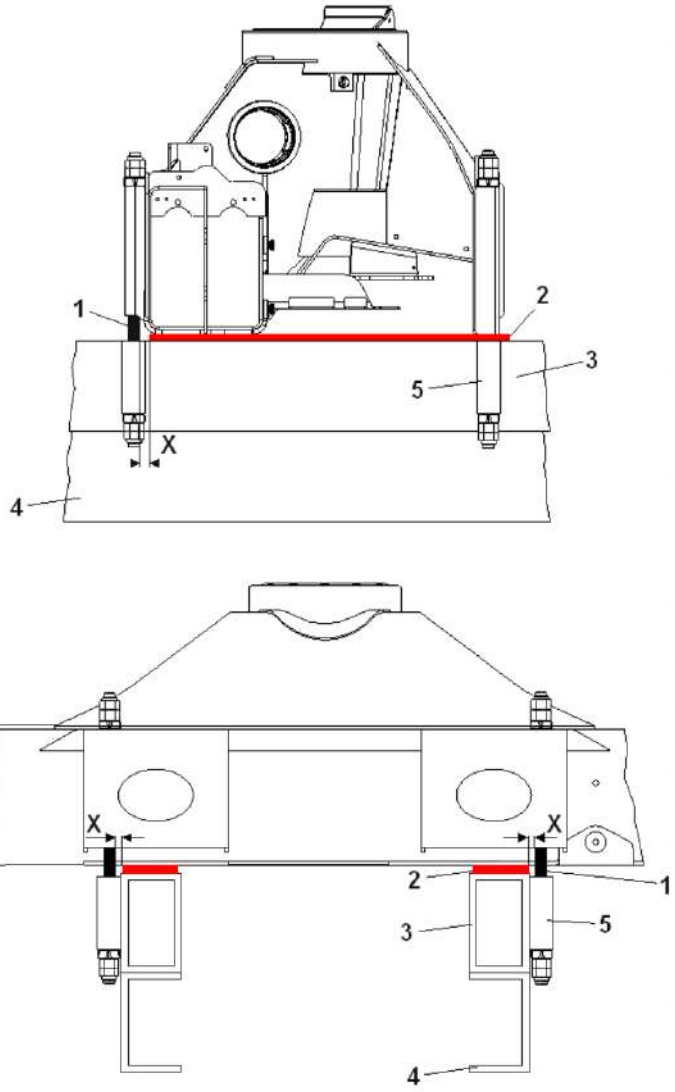


Illustration 06-00 26; Distance between mounting bolts and support plates

1	Mounting bolts	4	Chassis frame
2	Support plate	5	Mounting brackets
3	Subframe		

6.3.2.6 Anti-twist protection for crane between crane and subframe, version 1

Mounting bolts must not transmit any moment of force from the crane to the subframe. Therefore, it is necessary to install an anti-twist protection device for the crane. The anti-twist protection device prevents the crane from shifting on the subframe in longitudinal or transverse direction.

Every PALFINGER mounting kit includes a suitable anti-twist protection device for the crane, adjusted to the crane size.

INFORMATION

Areas grinded down to bare metal for welding work must be protected against corrosion again once the welding work is done.

The following table defines the prescribed anti-twist protection device for the crane and the weld thicknesses depending on the crane's torsional moment.

Crane's torsional moment (dynamical) M_t [kNm]	**≤ 5,0**	**≤ 16,0**	**≤ 27,0**	**≤ 42,0**	**≤ 55,0**	**≤ 85,0**	**≤ 105,0**	**EPSILON**
Design	A	B	B	B	C	C	C	B
Component no.	HT10348 HT10349	HT7940 HT7941	HT7940 HT7941	HT7940 HT7941	HT11012 HT11013	HT11012 HT11013	HT11012 HT11013	HT7940 HT7941
Thickness of connection plate [mm]	≥ 6	≥ 8	≥ 8	≥ 10	≥ 10	≥ 12	≥ 12	≥ 8
Quality of connecting plate material	≥ S355							
Welding additive	Z1; See chapter 4, "Welding on Crane and Attachment"							
Assessment group	B DIN EN ISO 5817							
Preheating	See chapter 4, "Welding on Crane and Attachment"							
Min. weld joint thickness a [mm]	3	4	5	6	6	7	8	8

WARNING

Welding may be done only by people in possession of a valid welder's certificate in accordance with ISO 9606-1 or with an equivalent national welder's certificate. The area to which the welding certificate applies must cover the full scope of the work to be done (see chapter 4 "Welding on Crane and Attachment").

Regarding definitions for weld seam design and lengths find the appropriate drawings on the following pages.

Anti-twist protection for crane, version 1, design A:

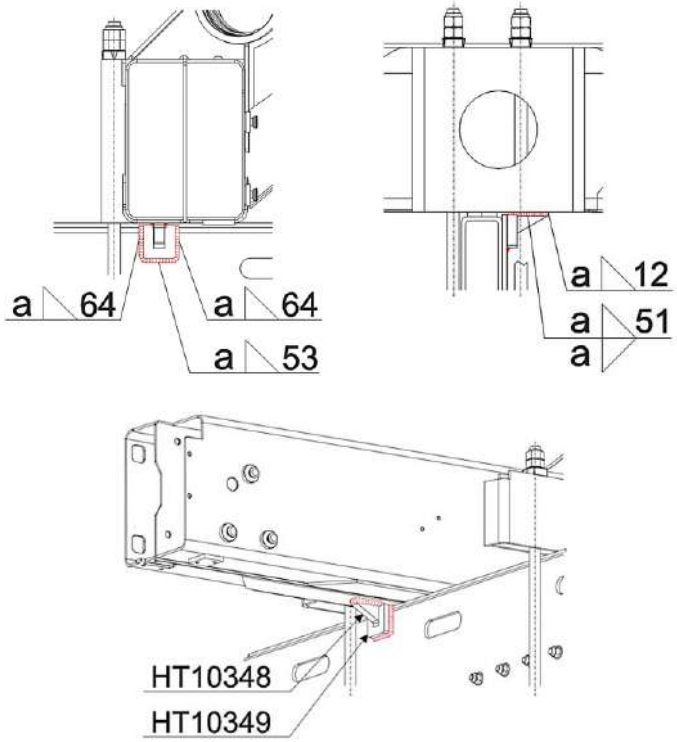


Illustration 06-00 27; Anti-twist protection for crane, version 1, design A

Anti-twist protection for crane, version 1, design B:

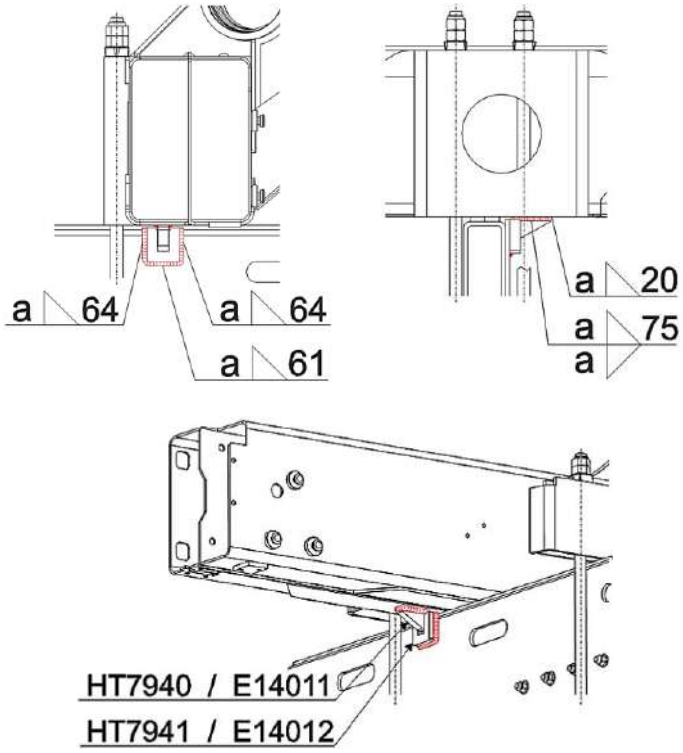


Illustration 06-00 28; Anti-twist protection for crane, version 1, design B for PALFINGER loader cranes or EPSILON cranes

Anti-twist protection for crane, version 1, design C:

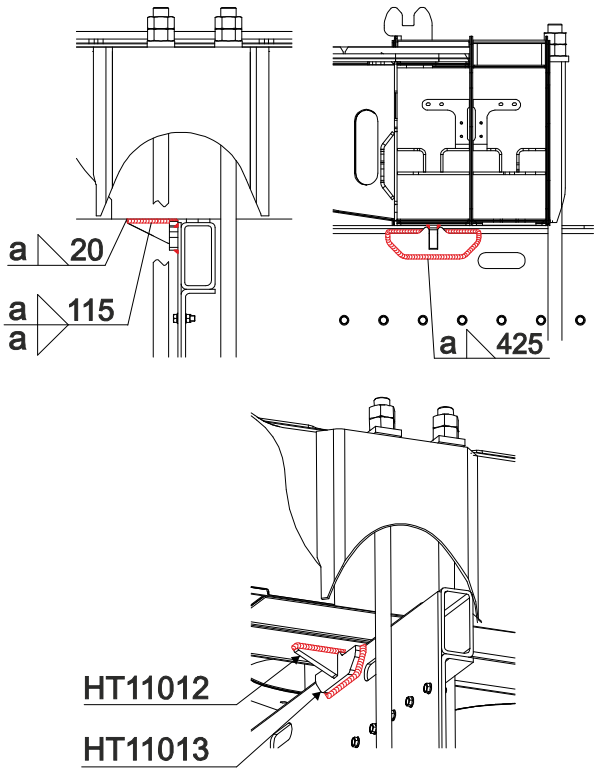


Illustration 06-00 29; Anti-twist protection for crane, version 1, design C

6.3.2.7 Anti-twist protection for crane between crane and subframe, version 2

Mounting bolts must not transmit any moment of force from the crane to the subframe. Therefore, it is necessary to install an anti-twist protection device for the crane. The anti-twist protection device prevents the crane from shifting on the subframe in longitudinal or transverse direction.

Every PALFINGER mounting kit includes a suitable anti-twist protection device for the crane plus support bars, adjusted to the crane size.

INFORMATION

From the first quarter 2020, information regarding the operation of the EKD-161 setup gage for this crane installation can be obtained online via PALDESK.PALFINGER.com.

INFORMATION

Areas grinded down to bare metal for welding work must be protected against corrosion again once the welding work is done.

ATTENTION

Welding may be done only by people in possession of a valid welder's certificate in accordance with ISO 9606-1 or with an equivalent national welder's certificate. The area to which the welding certificate applies must cover the full scope of the work to be done (see chapter 4 "Welding on Crane and Attachment").

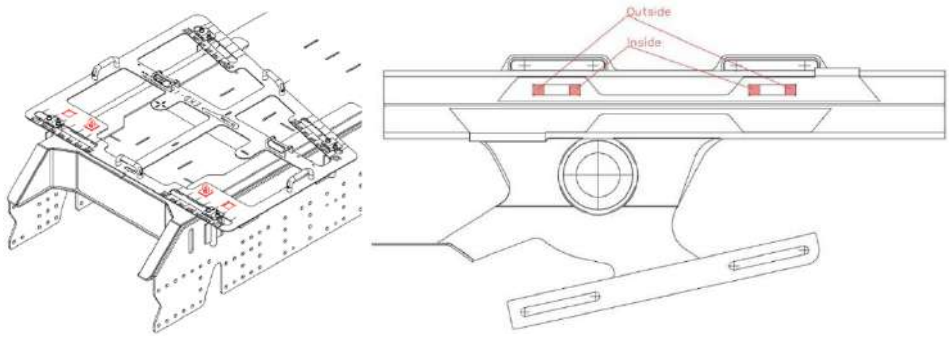


Illustration 06-00 30; View of the base frame with possible positions of the anti-twist stop blocks

INFORMATION

Position the support bars as far as possible to the edge. Recesses must be directed to the edge to allow visual check of the anti-twist stop blocks. When positioning the sup-port bars, either the outer or the inner position must be selected for both bars.

Anti-twist protection for crane, version 2, design:

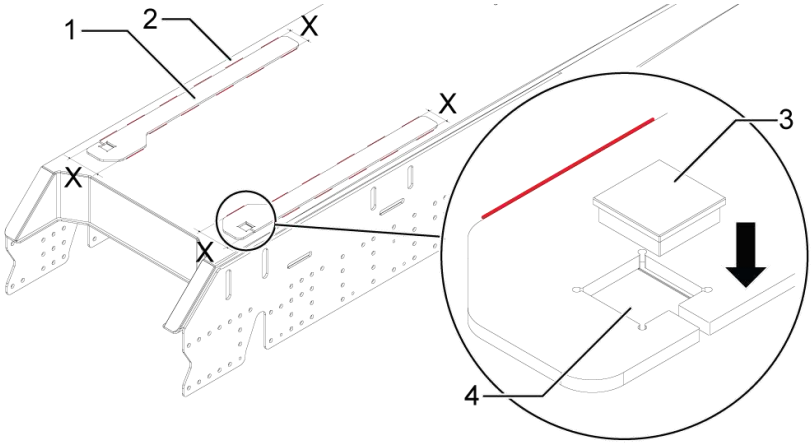


Illustration 06-00 31; Overview of anti-twist protection, version 2

1	Support bars	3	Anti-twist stop block
2	Make offset weld (protect free spots against corrosion).	4	Recess for form closure

Protect free spots against corrosion during a separate weld seam.

ATTENTION

Do not weld in the areas marked with X.

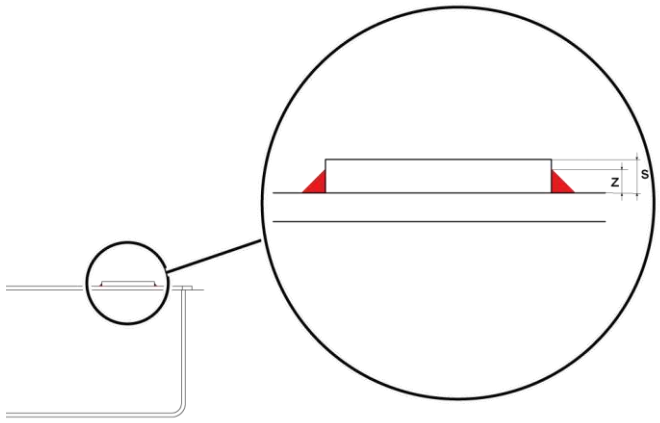


Illustration 06-00 32; Detailed picture of design

s	Hight of support plate	z	Welding height ≥ 0,7 • s

INFORMATION

Those areas that are ground metallically blank for welding work must be protected against corrosion again after welding.

6.3.2.8 Sheet metal stoppers

INFORMATION

Using sheet metal stoppers on PALFINGER loader cranes is no longer permissible, because missing protection against the crane slipping sideways (see illustration 06-00 33).

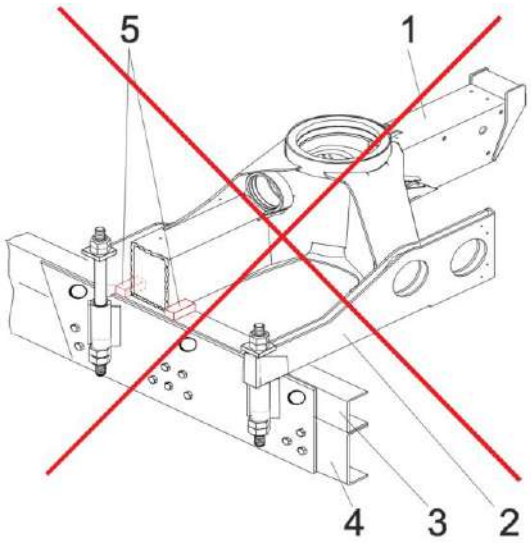


Illustration 06-00 33; Sheet metal stoppers

1	Crane base	4	Chassis frame
2	Crane balance	5	Sheet metal stoppers
3	Subframe		

Conventional stoppers (sheet metal stoppers) are installed only at an EPSILON L-crane (timber) without crossbeam.

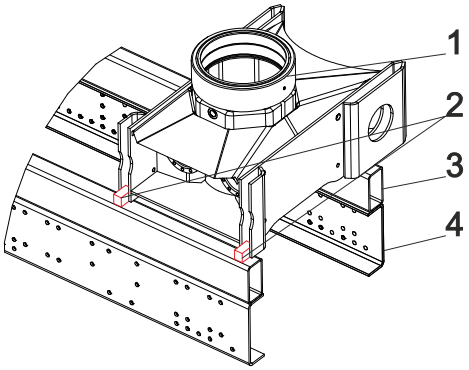


Illustration 06-00 34; EPSILON L-crane base with sheet metal stoppers as anti-twist protection for the crane

1	EPSILON crane base on L-crane
2	Sheet metal stoppers
3	Subframe
4	Chassis frame

6.3.2.9 Mounting washers with anti-twist protection

PALFINGER offers 7 types of mounting washers with anti-twist protection (diameters M24, M30, M36 and M42). The matching mounting washers are included in the mounting accessory.

The following picture illustrates an example of a mounting washer with anti-twist protection:

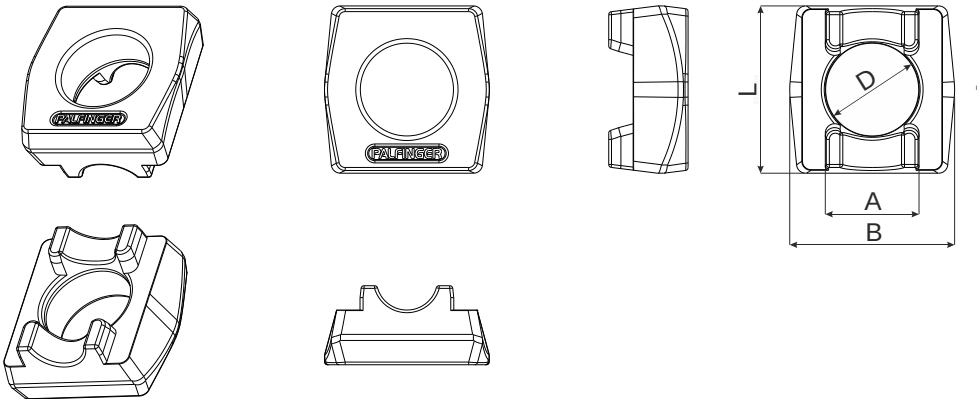


Illustration 06-00 35; Mounting washer with anti-twist protection

A	Width of anti-twist protection	L	Lengths of mounting washer
B	Width of mounting washer	D	Borehole for mounting bolt

In EPSILON cranes this type of mounting washers are only used for M30 mounting bolts.

The anti-twist protection will only work properly if the mounting washer has been correctly mounted onto the crane base!

Insert the mounting washer's anti-twist protection of matching width into the mounting straps. Clearance between the mounting strap on the crane base and the mounting washer may be maximum 1,5 mm. When tightening the mounting bolt connection make sure you fix the mounting washer to prevent it from twisting. After having it tightened, check if the mounting washer is aligned parallel to the mounting strap. If necessary, correct its position.

DANGER

When fitting the mounting washers always ensure correct seating! The gap between mounting washer and mounting strap at the crane base may be maximum 1,5 mm. Failure to observe this will cause danger of the mounting washer being pulled through the mounting strap under load. There is risk of fatal injury!

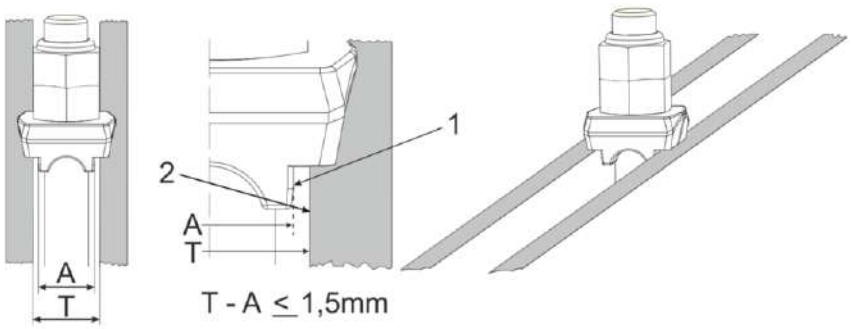


Illustration 06-00 36; Maximum distance between mounting washers with anti-twist protection and mounting strap

A	Width of anti-twist protection	1	Outer edge of anti-twist protection
T	Width of mounting strap	2	Inner edge of mounting strap

When using mounting washers with anti-twist protection it is no longer necessary to weld the washers to the crane base after assembly! Due to the coating of the anti-twist mounting washers, it is not necessary to paint them after assembly!

If narrow space or special superstructures do not allow to check the maximum distance of 1.5 mm between mounting washer and mounting strap, you must weld on the mounting washer. It is permitted to weld on the mounting washer. A welded mounting washer must be protected by paint!

INFORMATION

If mounting washers get welded, it is absolutely required to observe and comply with the welding guidelines given in chapter 4 of the assembly instructions "Welding on crane and attachment"!

INFORMATION

Using old mounting washers (HTR1140, HX 077, HTR1051 and HTR3382) is still permissible (see point 3.2.5), however do not use different mounting washers on one crane.

6.3.2.10 Mounting washers without anti-twist protection

For mounting bolts with diameters M20 and M48 mounting washers with anti-twist protection are not available. A steel plate with fitting borehole is included for these mounting washers. In order to protect the mounting washer from twisting and slipping, it must be welded to the crane base after assembly. The weld must be minimum 20 mm in order to avoid hardening in the weld seam area (see chapter 4, "Welding on crane and attachment").

These types of mounting washers are still used on EPSILON cranes with mounting bolt diameters M24 and M33.

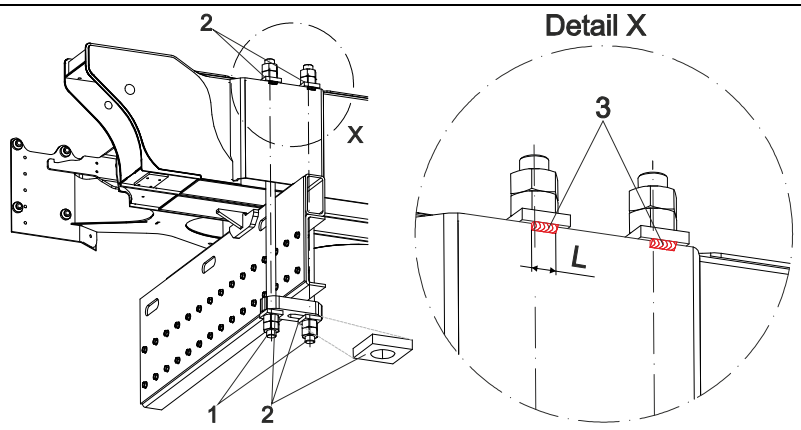


Illustration 06-00 37; Mounting washers without anti-twist protection

1	Mounting bolt	3	Weld seam for mounting washer protection
2	Mounting washer without anti-twist protection	L	Length of weld seam (min. 20 mm)

Mounting washers without anti-twist protection for diameters M24, M30, M36 and M42 must also still be used on PALFINGER cranes ordered before 01.07.2011 (e.g., when retrofitting or as replacement part). This is because of changed tolerances for the width of mounting straps on the crane base.

Areas grinded down to bare metal for welding work must be protected against corrosion again once the welding work is done.

INFORMATION

Uncoated mounting bolts must be preserved against corrosion after assembly!

6.3.2.11 Mounting protective caps

Once the installation is finished, the mounting bolts must be fitted with protective caps which are series included in the mounting kits.

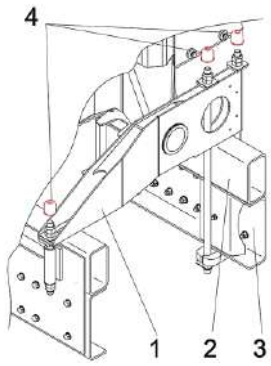


Illustration 06-00 38; Mounting protective caps

1	Crane rocker
2	Subframe
3	Chassis frame
4	Mounting protective caps

6.3.3 Single mounting (BRI-4), version 1

The mounting brackets are welded to the base shear plate. PALFINGER provide prefabricated welding kits for the mounting brackets.

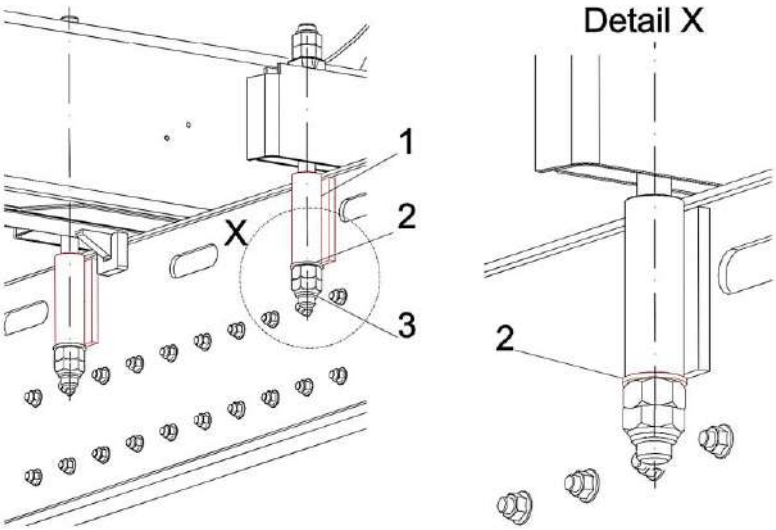


Illustration 06-00 39; Crane mounting BRI-4

1	Mounting bracket	3	Mounting bolt
2	Hardened washer (HV300)		

Hardened washers HV300 (component 2) are put between mounting brackets and mounting nuts at the subframe's side. They are included in the mounting kit.

All types of loader cranes may be mounted in this way.

When positioning the mounting brackets, provide for a gap of minimum 5 mm between upper edge of mounting bracket and lower edge of crane base. This way it is ensured, that the crane base rests flat on the subframe.

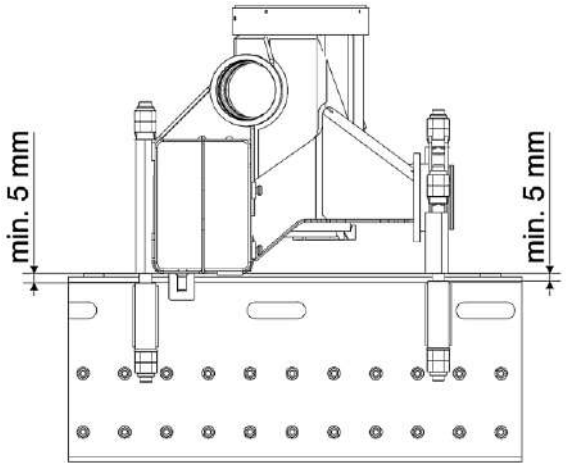


Illustration 06-00 40; Gap between crane base and mounting brackets

6.3.3.1 Connecting the mounting bracket to the subframe (standard design mounting bracket)

The below table shows the kits for various mounting bolts developed by PALFINGER including the prescribed welds. For the mounting bolts' diameters of the respective crane model refer to the technical datasheets.

Mounting bolt	M20x1,5	M24x1,5	M30x1,5	M36x1,5	M42x1,5	M48x1,5
Max. mounting force F_{Br} [kN]	85	125	200	290	400	530
Matching mounting bracket spare part no.	HXE-4534	HXE-3144	HXE-3145	HXE-9084	HXE-2527	HXE-4514
Sleeve length [mm]	≥ 120	≥ 160	≥ 160	≥ 214	≥ 214	≥ 310
Thickness of connecting plate [mm]	≥ 6	≥ 8	≥ 8	≥ 10	≥ 12	≥ 12
Quality of connecting plate material	≥ S355					
Welding additive	Z1; See chapter 4, "Welding on Crane and Attachment"					
Assessment group	B DIN EN ISO 5817					
Preheating	See chapter 4, "Welding on Crane and Attachment"					
Min. weld joint thickness a_W [mm]	4.5	6	7	8	10	10

ATTENTION

Welding may be done only by people in possession of a valid welder's certificate in accordance with ISO 9606-1 or with an equivalent national welder's certificate (see chapter 4, "Welding on crane and attachment").

The following illustrations 06-00 41 and 06-00 42 are to supplement the previous table:

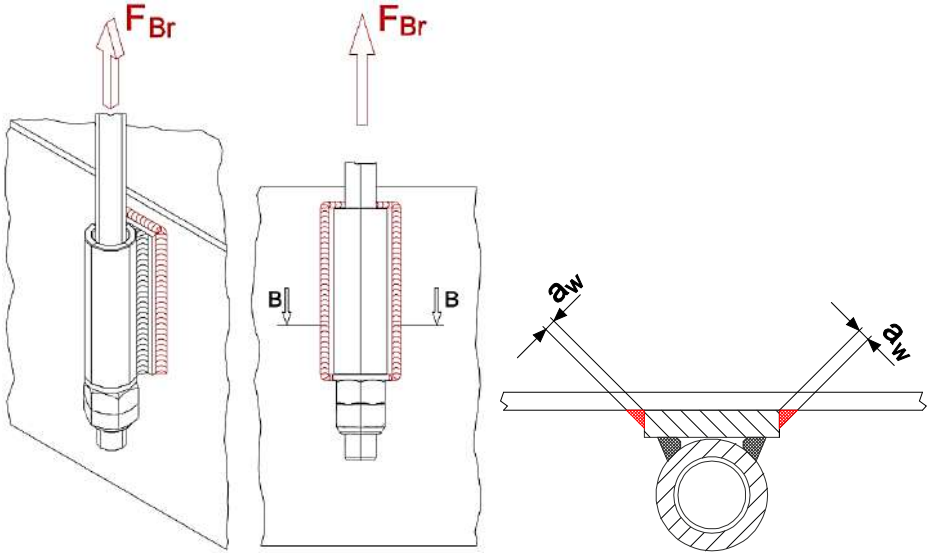


Illustration 06-00 41; Connection of mounting brackets, standard design mounting bracket for M20, M24, M30 and M36

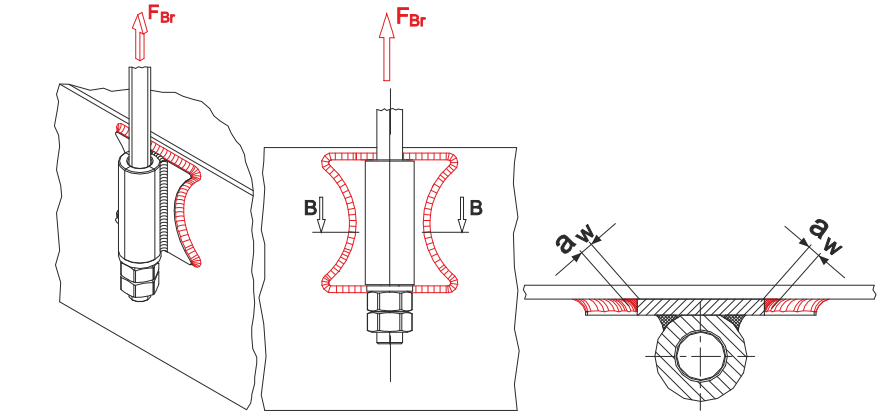


Illustration 06-00 42; Connection of mounting brackets, standard design mounting bracket for M42 and M48

6.3.3.2 Connecting the mounting bracket to the subframe (standard design mounting bracket, cut)

If necessary standard mounting brackets may be cut as per below table. The prescribed gusset plates and weld joints are also specified in the table.

Mounting bolt	M20x1,5	M24x1,5	M30x1,5	M36x1,5	M42x1,5	M48x1,5
Max. mounting force F_{Br} [kN]	85	125	200	290	400	530
Bracket length L [mm]	≥ 58	≥ 78	≥ 78	≥ 120		Approval from PALFINGER required
Matching mounting bracket spare part no.	HXE-4534	HXE-3144	HXE-3145	HXE-9084		
Special mounting brackets shortened	x	x	HXE-6700 L = 110	HXE-5694 L = 130	HXE-5390 L = 130	
Thickness of connecting plate [mm]	≥ 6	≥ 8	≥ 8	≥ 10		
Thickness of gusset plate s [mm]	6± 1	8± 1	8± 1	8± 1		
Quality of connecting plate material	≥S355					
Welding additive	Z1 See chapter 4, "Welding on Crane and Attachment"					
Assessment group	B DIN EN ISO 5817					
Preheating	See chapter 4, "Welding on Crane and Attachment"					
Min. weld joint thickness a_{w1} [mm]	5	6	8	8	10	
Min. weld joint thickness a_{w2} [mm]	4	5	7	7		

ATTENTION

Welding may be done only by people in possession of a valid welder's certificate in accordance with ISO 9606-1 or with an equivalent national welder's certificate (see chapter 4, "Welding on crane and attachment").

The following illustration 06-00 43 is used as addition to the previous mounting brackets HXE-4534, HXE-3144, HXE-3145 and HXE-9084 from the table above.

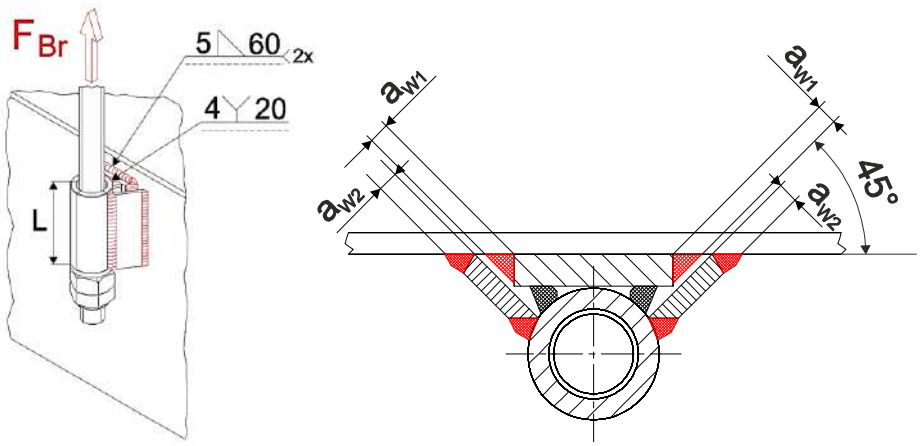


Illustration 06-00 43; Connection of mounting brackets, standard design cut for M20, M24, M30 and M36

6.3.4 Single mounting (BRI-4), version 2

The mounting pockets are welded to the base shear plate. PALFINGER provide prefabricated welding kits for the mounting pockets.

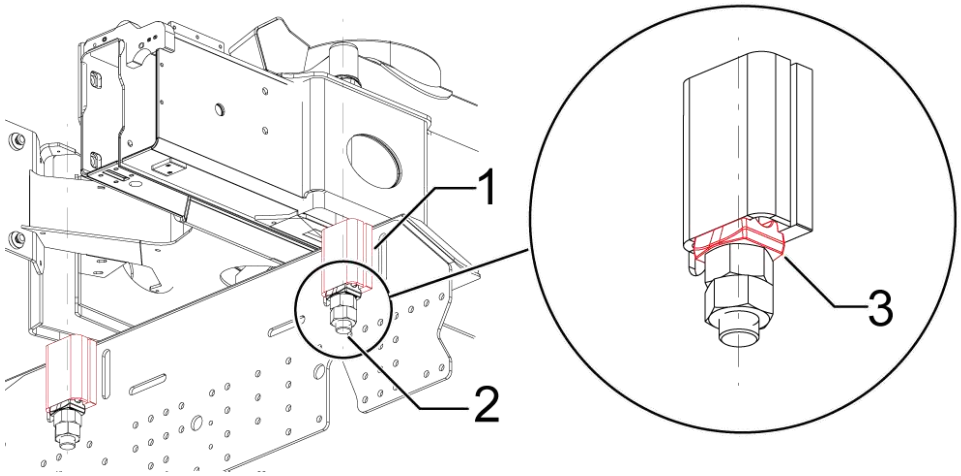


Illustration 06-00 44; Crane mounting BRI-4

1	Mounting pocket	3	Mounting washer
2	Mounting bolt		

Mounting washers (component 3) are put between mounting pockets and mounting nuts at the subframe's side. They are included in the mounting kit.

All types of loader cranes may be mounted in this way.

When positioning the mounting pockets, provide for a gap of minimum 5 mm between upper edge of mounting pocket and lower edge of crane base. This way it is ensured, that the crane base rests flat on the subframe.

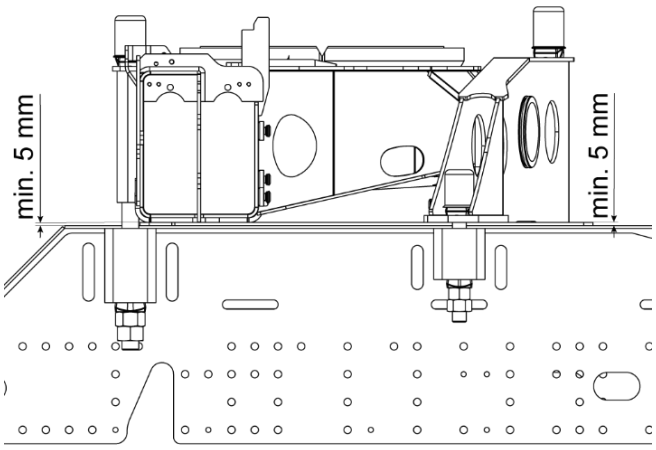


Illustration 06-00 45; Gap between crane base and mounting pockets

6.3.4.1 Connecting the mounting pocket to the subframe (standard design mounting pocket)

The below table shows the kits for various mounting bolts developed by PALFINGER including the prescribed welds. For the mounting bolts' diameters of the respective crane model refer to the technical datasheets.

Mounting bolt	**x**	**M30x1,5**	**M36x1,5**	**x**
matching mounting pocket spare part no.	x	HXE-6816	HXE-6514	x
Pocket length [mm]	x	= 110	= 160	x
Quality of connecting plate material	≥ S460			
Welding additive	Z1; See chapter 4, "Welding on Crane and Attachment"			
Assessment group	B DIN EN ISO 5817			
Preheating	See chapter 4, "Welding on Crane and Attachment"			
Min. weld joint thickness a [mm]	x	7	8	x

ATTENTION

Welding may be done only by people in possession of a valid welder's certificate in accordance with ISO 9606-1 or with an equivalent national welder's certificate (see chapter 4, "Welding on crane and attachment").

The following illustration 06-00 46 is an addition to the table above.

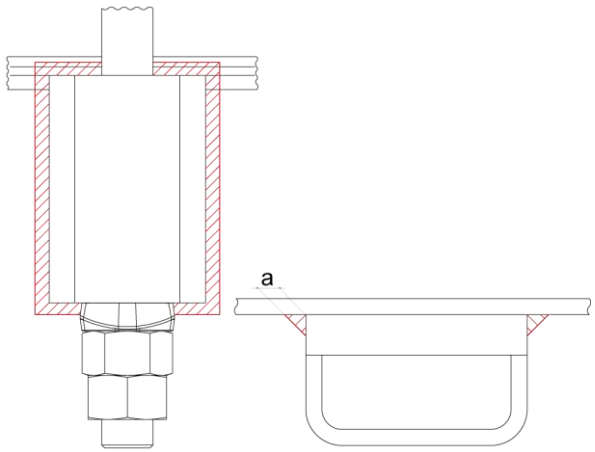


Illustration 06-00 46; Connection of mounting pockets, version 2

ATTENTION

The mounting pockets must be welded on all sides.

6.3.5 Double mounting (BRI-8), version 1

6.3.5.1 Variant with mounting plate

For double mounting (version 1) with mounting plates a steel plate is put under the chassis frame and screwed together with two mounting bolts. In this variant the chassis frame needs to be protected against being compressed (see component 3, illustration 06-00 47). The support profile has to be protected against slipping and dropping off by using a bolt that penetrates the chassis frame (see component 4, illustration 06-00 47).

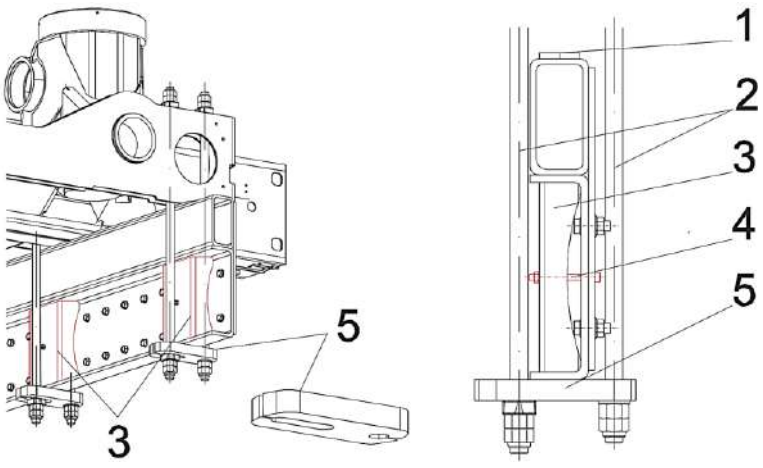


Illustration 06-00 47; Double mounting BRI-8

1	Crane body level	4	Mounting of support profiled sheet
2	Mounting bolts	5	Mounting plate
3	Support profile		

When fitting them mounting plate a hardened washer HV300 is added at the borehole (see component 1, illustration 06-00 48). At the elongated hole the mounting washer with anti-twist protection is added (see component 3, illustration 06-00 48). When mounting the mounting washer with anti-twist protection the same provisions apply as described under 3.2.4! All components are included in the mounting kit.

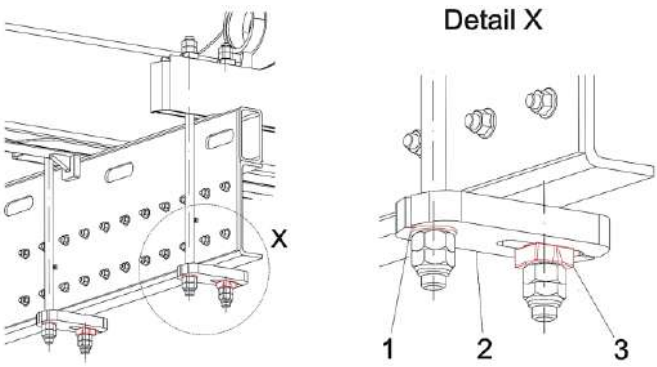


Illustration 06-00 48; Crane mounting BRI-8

1	Hardened washer (HV300)	3	Mounting washer with anti-twist protection
2	Mounting plate		

When fitting the mounting plate, make sure the item number which is punched in the mounting plate is on the side opposite the mounting washer (on top).

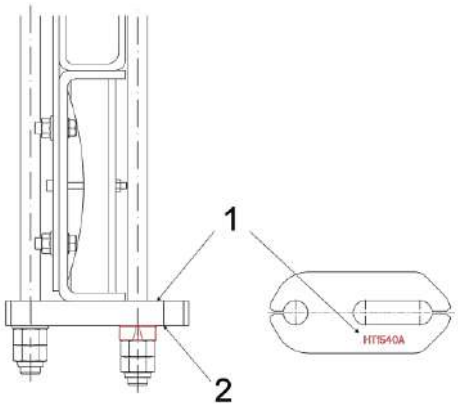


Illustration 06-00 49; Mounting plate installation BRI-8

1	Position of item number when assembling the mounting plate	2	Position of mounting washer with anti-twist protection during assembly

6.3.5.2 Variant with mounting sleeve

When mounting the unit in this way, the first sleeve is welded from outside to the base shear plate and the second sleeve into the subframe. Fit the mounting sleeves in a position where the mounting bolts may be tightened easily.

All types of cranes may be mounted in this way.

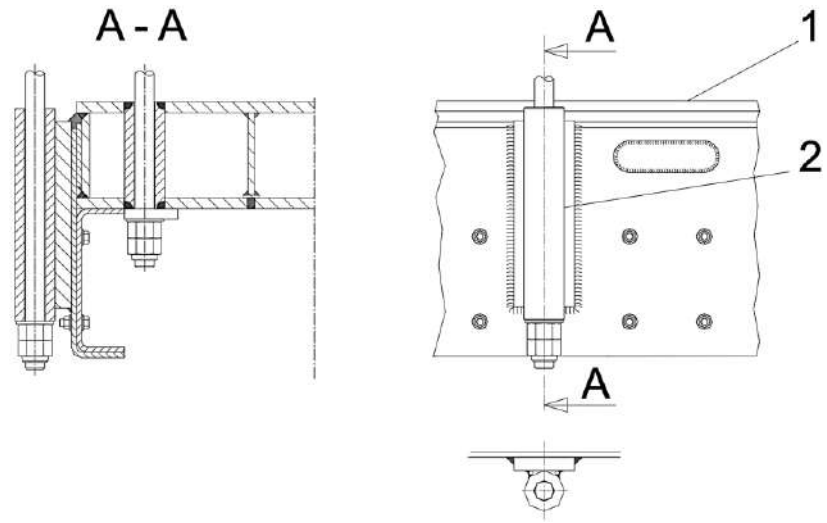


Illustration 06-00 50; Assembly with mounting sleeves BRI-8

1	Crane body level	2	Mounting bracket

6.3.6 Double mounting (BRI-8), version 2

With double-mounting (version 2), mounting pockets are also attached to the inside of the subframe.

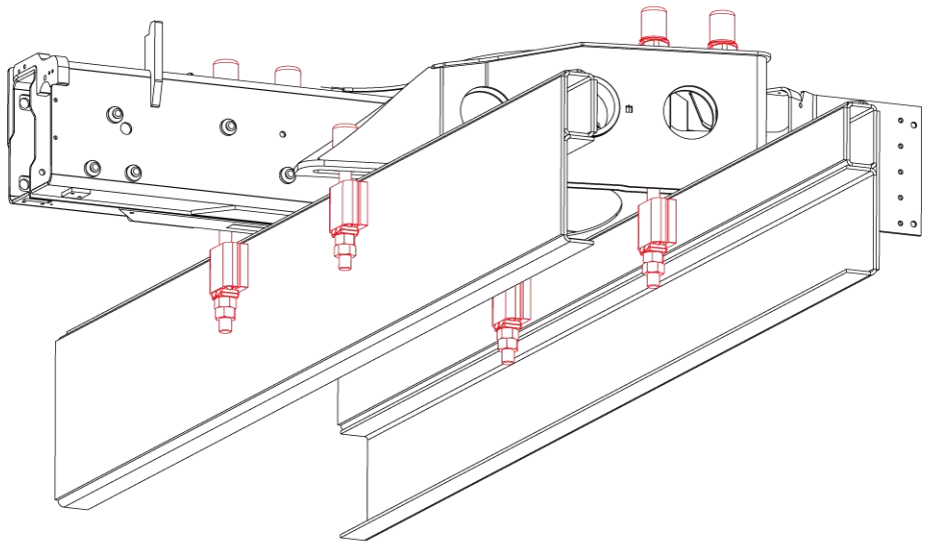


Illustration 06-00 51; Double mounting BRI-8 diagonal view

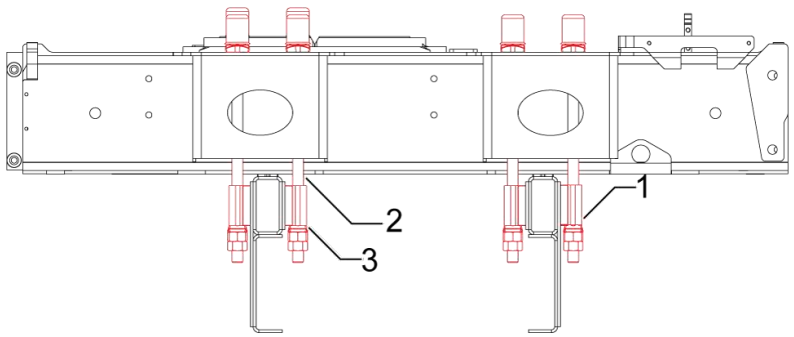


Illustration 06-00 52; Double mounting BRI-8 side view

1	Mounting pocket	3	Mounting washer
2	Mounting bolt		

6.3.7 Fitting the stabilizer cylinders to the crane extension arms

When fitting the stabilizer cylinders to the extension arms the following points need to be taken into account:

- Clean flange surfaces on both sides of any dirt and foreign bodies. The surface protection must not be removed
- The fixing screws must be tightened with the required tightening torque and secured with screw-locking adhesive. Before applying the adhesive, the thread must be cleaned and degreased. To avoid cold shock effects, it has to be guaranteed that the environment and the glued parts will have the requested minimum temperature required by the screw-locking adhesive. Following adhesives are approved by PALFINGER (the specification of the adhesive supplier must be considered during processing):

- LOCTITE 243 (alternative LOCTITE 245)
- VARY BOND 12-43 (alternative VARY BOND 12-45)
- WIKO 02K43 (alternative WIKO 02K45)

INFORMATION

See available PALFINGER tool catalog on the PALDESK.PALFINGER.com.

- The stabilizer cylinder must always be secured to the stabilizer outrigger using the fastening bolts provided (A).

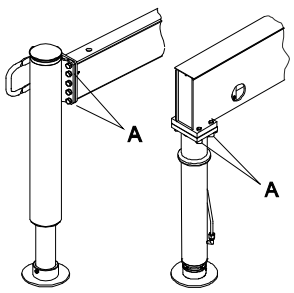


Illustration 06-00 53; Bolting the stabilizer cylinder to the extension arm

Stabilizer plate extensions may only be used in accordance with technical information sheets. No other stabilizer plate extensions are permitted without separate approval from PALFINGER!

No modification of the flange plates on the stabilizer outrigger or stabilizer cylinder (e.g., extension by one row of holes) is permitted without separate approval from PALFINGER!

DANGER

No bolts other than those specified may be used to fix the stabilizer cylinders to the extension arms!

DANGER

Loose, damaged or excessively tightened bolts are susceptible to break under load. This creates an acute risk of fatality to the operator and others.

Tightening torque ISO-screws in Nm: (not oiled and not lubricated)	
Screw thread:	Screw strength: 10.9
M 12	108
M 14	172
M 16	264
M 18	369
M 20	517
M 22	704
M 24	890

6.3.8 Crane installation of EPSILON crane base without crossbeam

The EPSILON crane base for long log vehicles is delivered without integrated crossbeam. Therefore, an additional stabilizer is assembled together with the crane base.

Following additional stabilizer options are distinct.

- EPSILON crane base with flapdown stabilizers
- EPSILON crane base with additional stabilizers
- EPSILON off-road crane and communal crane mounting

6.3.8.1 EPSILON crane base with flapdown-stabilizer

Crossbeam, flapdown stabilizer and balancing rod are delivered separately. After installation of the crossbeam on the subframe the flapdown stabilizer are welded to the crossbeam. Afterwards the balancing rod is mounted to the flapdown stabilizer.

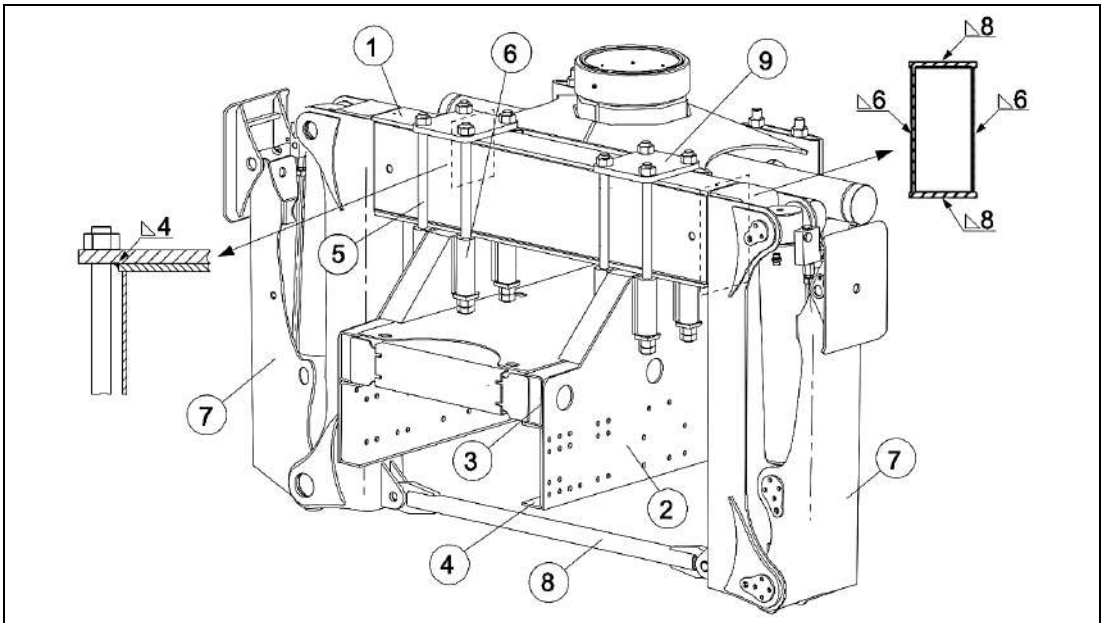


Illustration 06-00 54; EPSILON L-crane base with flapdown stabilizers

1	Crossbeam	6	Mounting bushes
2	Base shear plates	7	Flapdown stabilizer
3	Subframe	8	Balancing rod
4	Chassis frame	9	Connection plate
5	Mounting bolts		

If the crane's base and the crossbeam of the stabilizer are not on the same level, a steel plate must be put between connecting plate and crossbeam and welded to the connecting plate.

INFORMATION

As described in point 3.2.3, the crossbeam must be secured against shifting by using stops!

6.3.8.2 EPSILON crane base with additional stabilizer

In this case an EPSILON additional stabilizer is mounted together with the crane base.

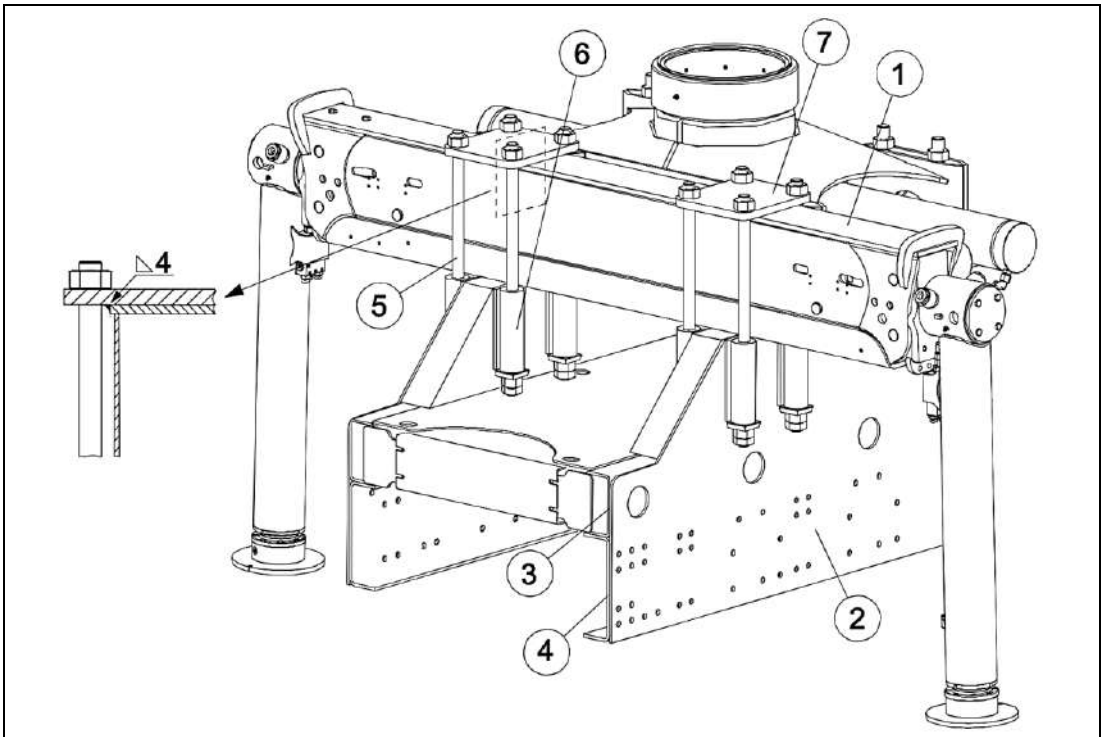


Illustration 06-00 55; EPSILON L-Crane base with EPSILON additional stabilizer

1	Crossbeam of additional stabilizer	5	Mounting bolts
2	Base shear plates	6	Mounting bushes
3	Subframe	7	Connection plate
4	Chassis frame		

If crane base and crossbeam of the additional stabilizer do not have the same level it is necessary to put a steel plate between crossbeam and connection plate to get the same level. This additional steel plate has to be welded to the connection plate.

INFORMATION

As described in point 3.2.3, the crossbeam must be secured against shifting by using stops!

6.3.8.3 EPSILON Off-Road-Crane and Communal-crane installation

The crane is installed directly on the mounting frame and has to be fixed with screws (see table below).

The mounting frame can be realized with through-holes (see option A, illustration 06-00 56) or with threaded-holes (see option B, illustration 06-00 56). For option A, a self-locking nut has to be used.

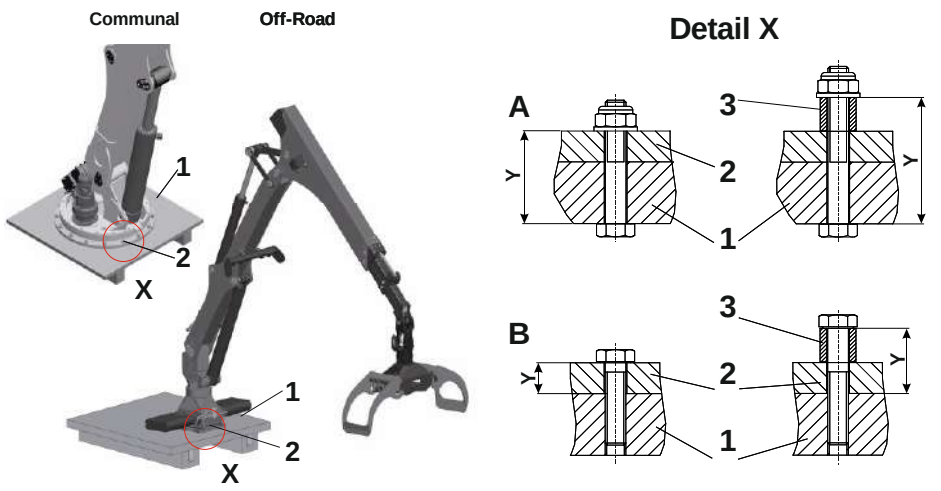


Illustration 06-00 56; EPSILON Off-Road-Crane and Communal-Crane installation

1	Mounting frame / Chassis frame	3	Distance bush
2	Crane base	Y	Clamping length

Communal		OFF-ROAD			
Crane class	C	C	M	S	X
Screw (ISO4014)	M16	M24	M24	M24	M24
Self-locking nut (DIN 931)	M16	M24	M24	M24	M24
Strength class	10.9	12.9	12.9	12.9	12.9
Quantity	16	8	8	10	14
Clamping length Y [mm]	60	70	70	70	70

The required clamping length "Y" of the screws (see table above) has to be observed. In order to fulfill this requirement, it is allowed to use distance bushes (see illustration 06-00 56 part 3).

As corrosion protection the lower side of the crane base is only primed by EPSILON. Before mounting of the crane, the primer has to be grinded down. Also, the mounting area at the frame has to be free of any coating (steel to steel connection between crane and mounting frame)

INFORMATION

Take care in steel-to-steel connection between crane and mounting frame. If there is no steel-to-steel connection a loosening of the mounting screws is possible.

6.4 Mounting of cranes with combination crane base

6.4.1 Component designation

The crane in the drawing below is an example and shows crane components which may be found on the crane as options, depending on the exact design and crane model.

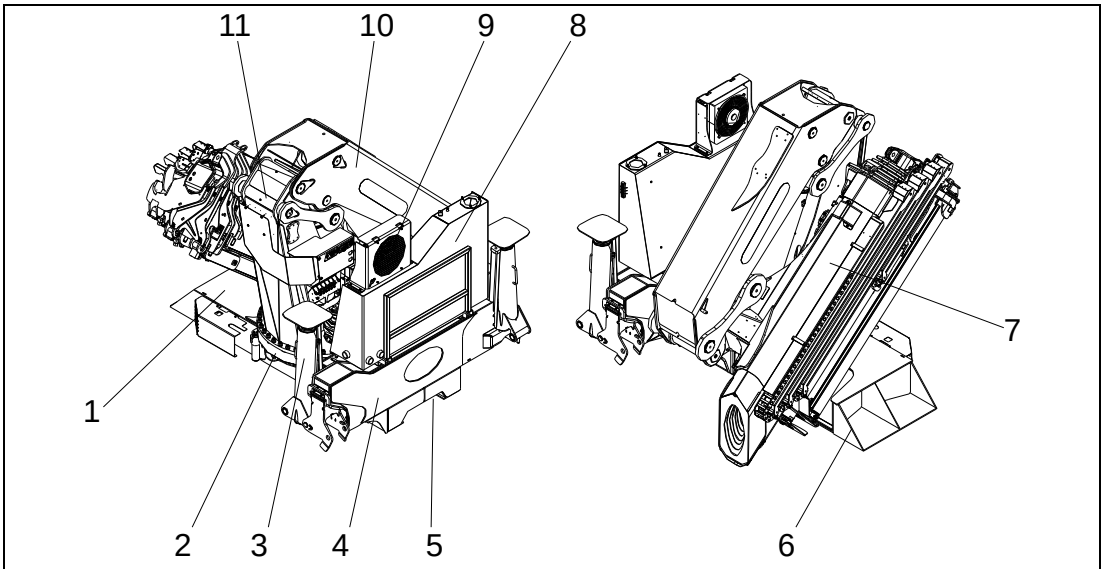


Illustration 06-00 57; Component designation of a crane with combination crane base

1	Combination crane base	7	Load booms
2	Bearing ring mount	8	Oil tank
3	Support cylinder	9	Oil cooler
4	Crane support (cross-beam)	10	Main boom
5	Welding connection point	11	Crane column with control valve
6	Welding connection point		

6.4.2 Integral base frame

In this section the integral base frame is on the one hand the crane base and on the other a complete replacement for a subframe. Depending on set-up variant, the subframe modules get welded directly to the weld end connections (parts 1 and 6).

The integral base frame is on the one hand the crane base and on the other a complete replacement for a subframe in this section.

There is no crane base balance on this combination crane base. The crane is designed to be secured to the base shear plates on the truck chassis by welded connections. The mounting bolt connection otherwise used is therefore unnecessary.

The crane support must be positioned in front of the bearing ring mount to achieve better stability and to realize the maximum length of the boom system with a low crane height. This type of construction design makes it possible to keep the construction heights very low even with maximum equipment on the crane and the chassis.

There is a free space (7) for truck components which are above the chassis frame (e.g., transmission parts, etc.) in the front lower area of the combination crane base. This will prevent virtually all collisions with these components.

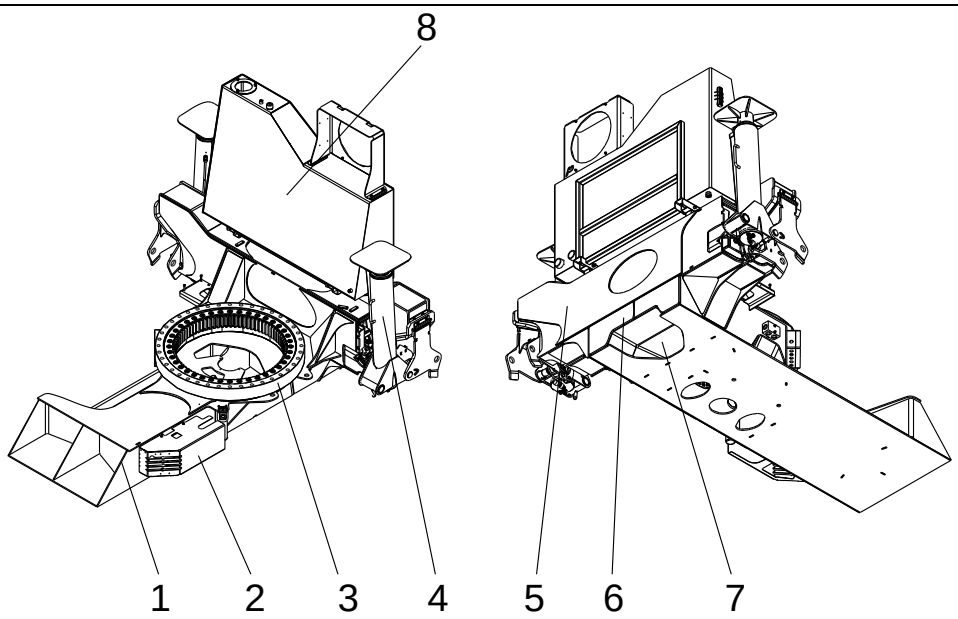


Illustration 06-00 58; Combination crane base

1	Welding connection point	6	Welding connection point
2	Control panel support	7	Free space for protruding components of the truck chassis (transmission, etc.)
3	Bearing ring mount		
4	Support cylinder		
5	Crane support (cross-beam)	8	Oil tank and oil cooler

6.4.3 System description for the mounting

As already mentioned in chapter 5 Subframe, the crane is positioned directly on the chassis frame and connected to the base shear plates (see chapter Subframe) shear resistant and torsion resistant by welding. The combination crane base has been dimensioned so that a subframe is not necessary in this area. The other subframe modules are welded to the connection points of the combination crane base at the front and back.

In this chapter, the mounting on a tractor is described as an example. Subframe modules with loading bridge, bed or container platform need to be mounted in the same way. Only the height and length of the subframe are different.

Contact PALFINGER for all other special mounting variants (mounting in the middle, etc.).

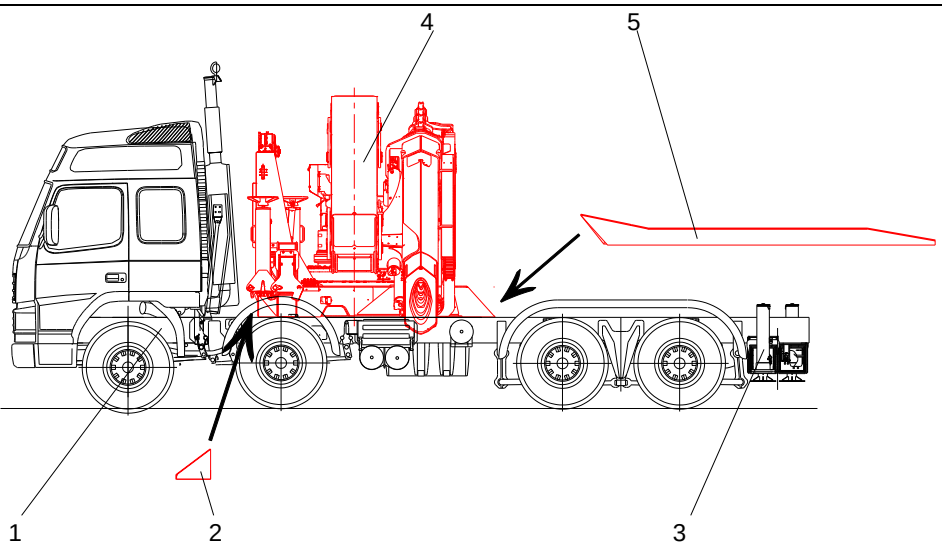


Illustration 06-00 59; System description for installation with combination crane base

1	Truck chassis	4	Crane
2	Front subframe module (frame end)	5	Rear subframe module
3	Auxiliary support		

The following chronological work steps described below are recommended for carrying out the complete mounting:

- Preparation of the truck chassis (see chapter 3 "Equipment recommendations for the vehicle").
- Position and tack the crane and auxiliary support to the chassis (the position of the crane and the auxiliary support is determined based on the axle load calculation).
- Prefabricate the subframe modules (see chapter 6 "Prefabrication of the rear subframe module").
- Placement of the subframe modules on the chassis.
- Welding the subframe modules to the crane or the base shear plates.

6.4.4 Prefabrication of the rear subframe module

The following descriptions of the subframe module are intended for informational purposes only.

The design of the subframe modules is essentially dependent on the following factors

- Available raw material (sheet metal, moulded tubes, etc.)
- Required sheet thickness and grade of steel
- Production process (available canting press, welding procedure, etc.)
- and can deviate accordingly from the following description.

An opening must be provided in the front part of the subframe module so that the middle cross-piece and the base plate of the combination crane base can be welded to the subframe module; this opening is then welded closed with a closing plate (1) to complete the mounting of the subframe.

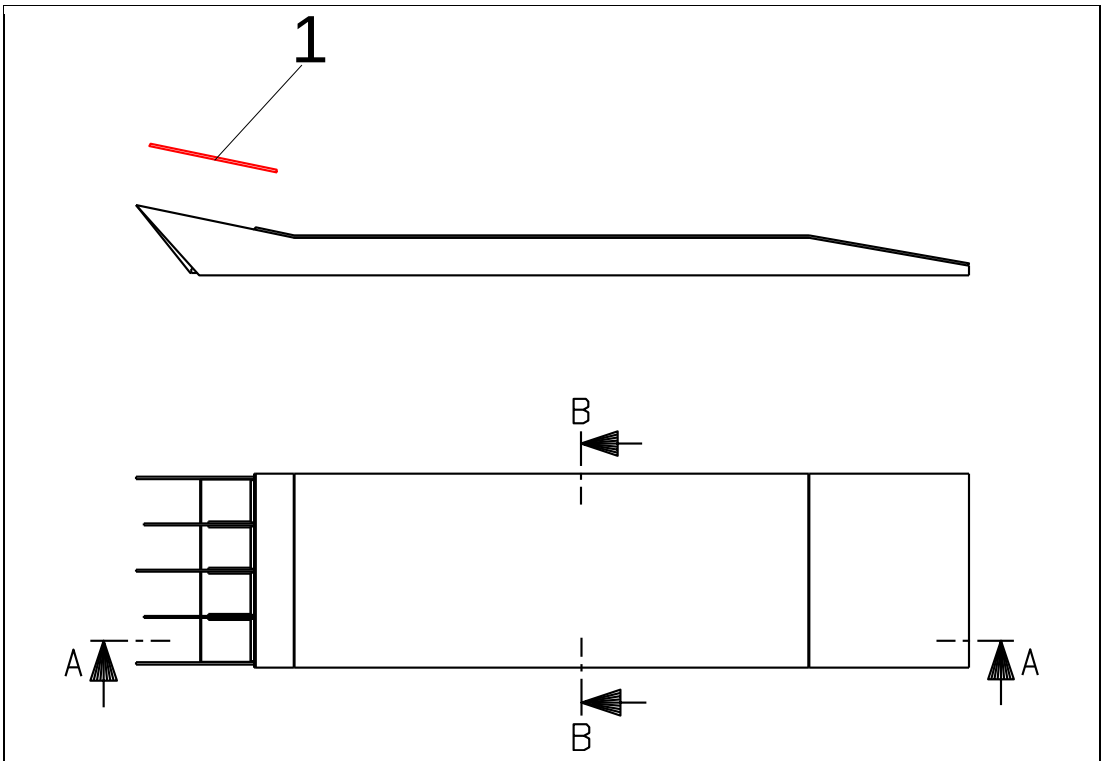


Illustration 06-00 60; Design rear subframe module

Cut A-A:

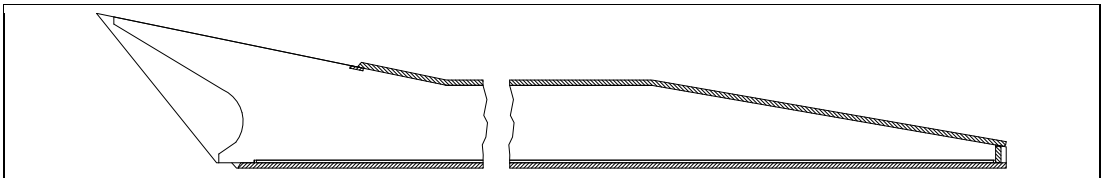


Illustration 06-00 61; Design rear subframe module section A-A

Cut B-B:

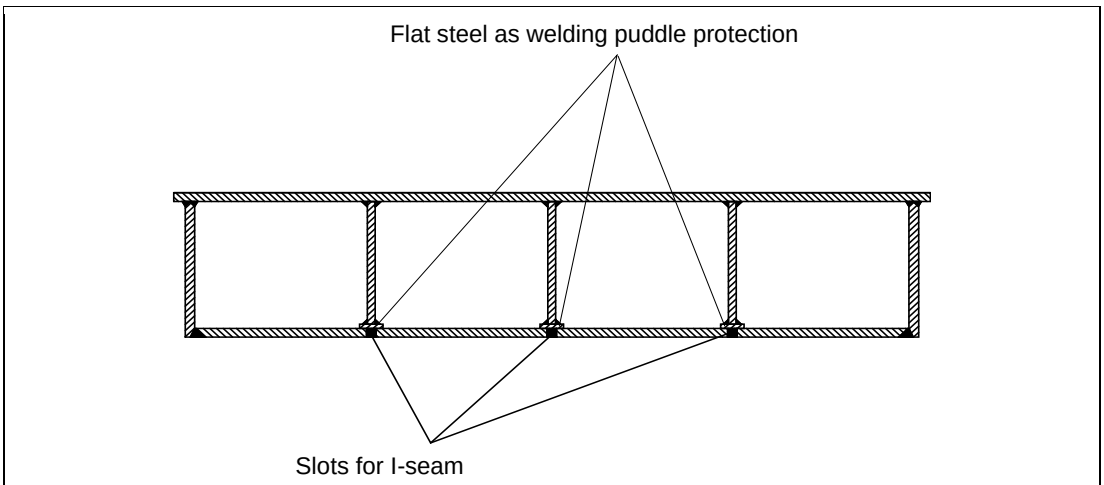


Illustration 06-00 62; Design rear subframe module section B-B

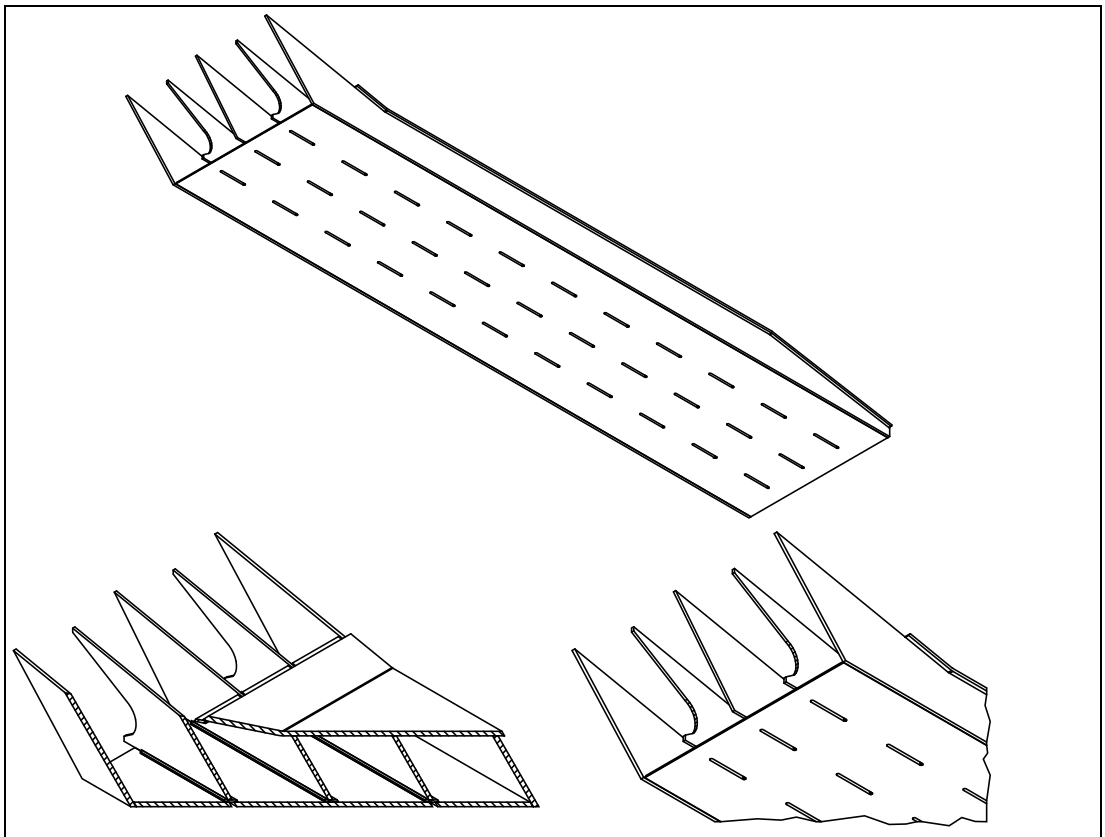


Illustration 06-00 63; Design rear subframe module

6.4.5 Mounting of the rear subframe module (EH and SH cranes)

Park the vehicle on a level surface and check the parallelism of the frame.

Before mounting the rear subframe module, the surface of the welding area must be thoroughly stripped and cleaned of any residual paint and dirt.

The subframe module must be placed so that it rests solidly on the chassis frame or on the base shear plates.

Once the subframe module has been aligned and tacked, the welding work must progress in such a manner that any distortion can be kept to a minimum or virtually eliminated (e.g., by having two welders opposite one another, etc.).

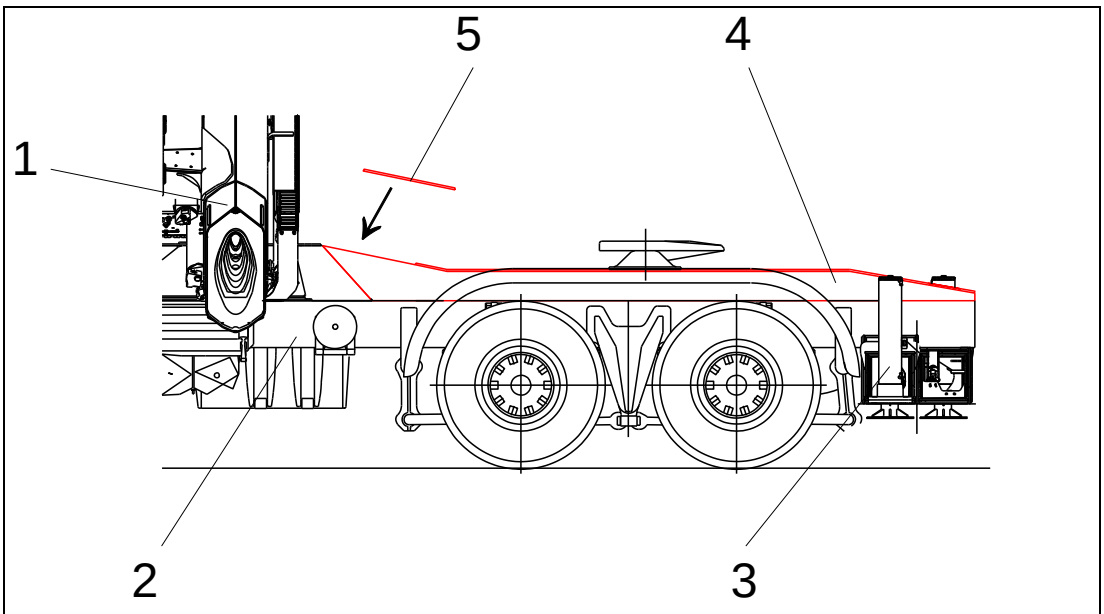


Illustration 06-00 64; Mounting of rear subframe module

1	Crane	4	Rear subframe module
2	Chassis frame or base shear plate	5	Closing plate
3	Additional stabilizer		

For integral base frames of the EH and SH cranes the connection area to the subframe is open.

The rear subframe module must be welded to the crane or the base shear plate in the following areas:

1. Connection – combination crane base and the bending area of the subframe module with the base shear plate.
2. Connection – rear area of the subframe module with the base shear plate.
3. Connection – combination crane base with the subframe module.

Once the center bar and the base plate of the integral base frame have been welded to the subframe module, close the opening in this area with a cover plate. Do this with fully connected V-weld over the entire sheet thickness and to the side with maximum possible fillet weld thickness.

Once the center bar and the base plate of the integral base frame have been welded to the subframe module, close the opening in this area with a cover plate.

6.4.6 Installing the rear subframe module (TEC series)

6.4.6.1 Connecting the integral base frame with the subframe

The integral base frame (IBF) is equipped with a cover plate in the section that connects it to the subframe of PALFINGER loader cranes of the TEC series with integral base frame (up to PK135.002). The position of the gusset plates underneath is shown in illustration 06-00 65.

When connecting the subframe to the new IBF, remember that only the plates 1 are allowed to be used for connection as shown below.

Connection to the 2 internal plates must be made from the center of each plate at +/- 15 mm including weld seam.

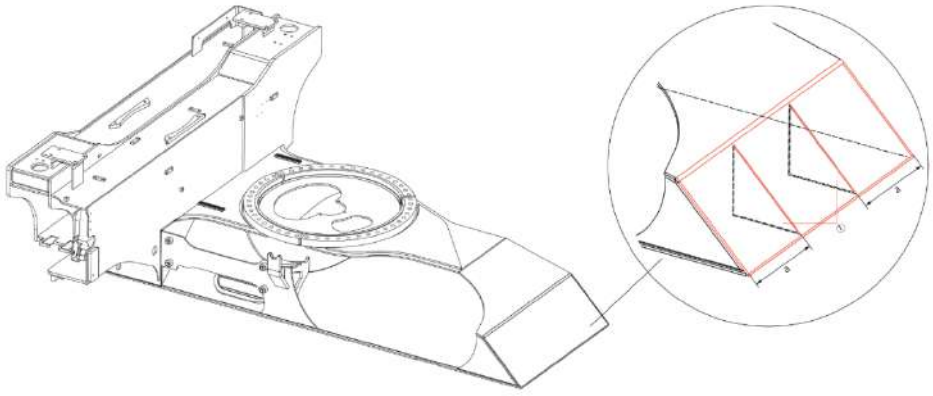


Illustration 06-00 65; Connecting the new IBF

1	Inside web-plates of the IBF	a	Distance from outer edge to center of web-plate

Crane model	Dimension a
PK 135.002	310 mm

6.4.6.2 Connecting the lower edge

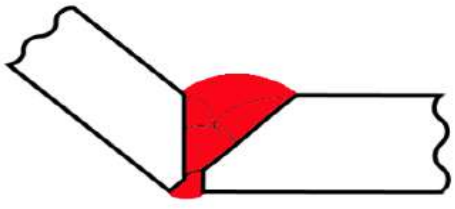


Illustration 06-00 66; Min. single-bevel groove weld at lower connecting point

DANGER

When welding at the lower edge, the subframe must be connected by a single-bevel groove weld.

6.4.6.3 Connecting the web-plates

If the connecting plates are not part of the pre-manufactured subframe, make sure to produce the full connection completely with the help of the web-plate. The connection is made at an angle of α < 30°. Also, the section "x" for connection must be observed, see illustration 06-00 67.

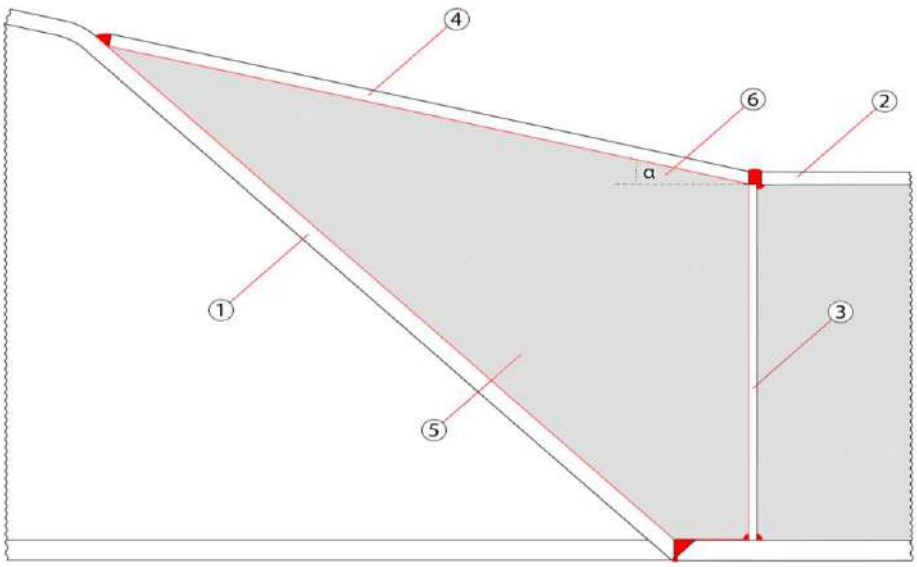


Illustration 06-00 67; Connection via web-plate

1	Integral base frame	4	Cover plate
2	Subframe	5	Web-plate (min. 2 outside and 2 inside)
3	Recommended additional cross-web	6	Connecting angle α < 30°

INFORMATION

In the seams the cover plate gets completely connected crosswise to the axle direction, in longitudinal direction fillet welds at the outer edges are sufficient. See illustration 06-00 67.

INFORMATION

A suitable weld type can be selected for the other connections that must correspond with a complete connection.

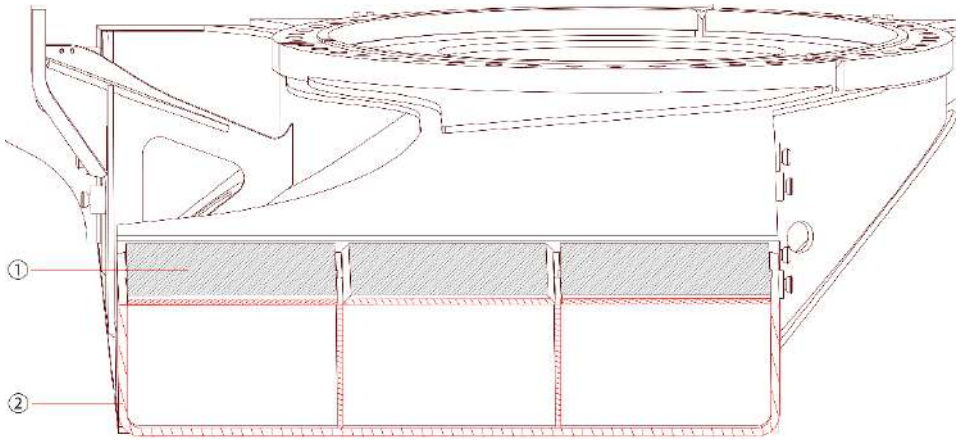


Illustration 06-00 68; Classic example for IBF connection

1	Cover plate	2	Connection points

6.4.6.4 Connecting the cover plate to upper IBF edge

The cover plate 1 of a high subframe must be connected to the upper edge of the IBF only in section x as shown in illustration 06-00 69. This corresponds with half the bending former and must be maintained including the weld. If the subframe is lower, the power-flow must be as linear as possible at the transition. In both cases make sure the cover plate 1 to be connected is completely connected.

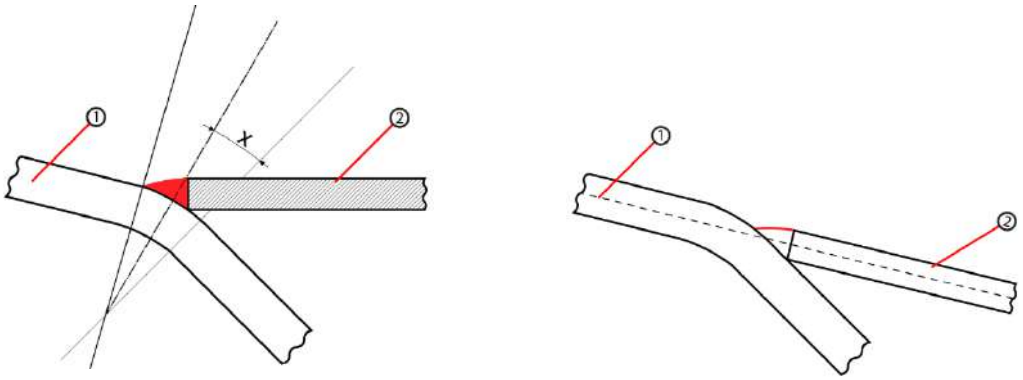


Illustration 06-00 69; Complete upper connection with subframe at same height and lower subframe

1	IBF	2	Subframe (cover plate)

INFORMATION

If the subframe is lower than the IBF, make sure to connect the cover plate in a way that the power flows perfectly into the integral base frame. (One line from integral base frame into the subframe.)

DANGER

With this type of connection, a complete connection must be ensured.

6.4.7 Production and installation of front subframe module (frame end)

In order to be able to gently transfer the bending forces into the chassis frame, a suitable frame end needs to be produced in the front section. It is welded to the front of the integral base frame.

The frame end needs to be adjusted to the space available in this section. Provide for necessary clearance for maintenance work to the gear, etc.

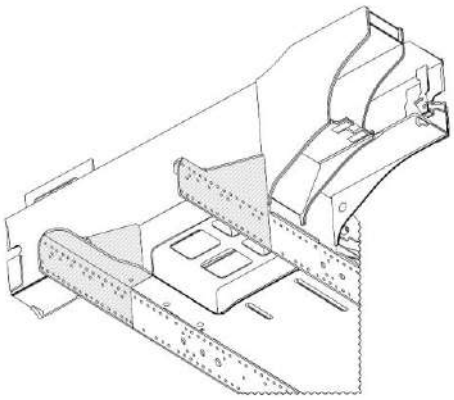


Illustration 06-00 70; Design of front subframe module

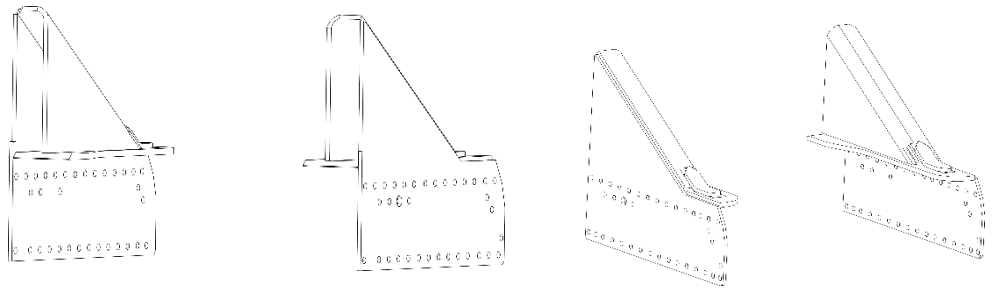


Illustration 06-00 71; Illustration of front subframe module (for information only)

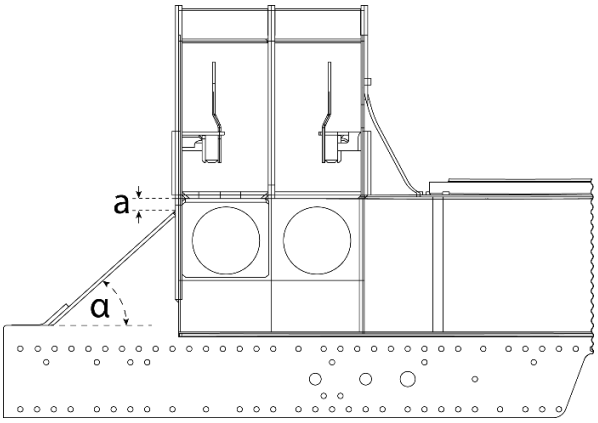


Illustration 06-00 72; Side view of front subframe module

INFORMATION

Angle α must be less than or equal to 45°.
Distance a must be less than or equal to 50 mm.

6.4.8 Welding work at integral base frame

For such work you must observe the installation guide's welding instructions (see chapter 4).

INFORMATION

To prevent the electronical parts on both the crane and the vehicle from damage, these components must be disconnected from mains before welding (see also set-up guide or operating manuals of the respective truck manufacturer).

The entire area of the weld has to be free of any grease, oil, rust flakes, paint, rust, dirt and humidity. Ensure that the grinding work does not grind off too much material from the crane base (do not reduce the thickness of the metal)!

ATTENTION

The selection of the protective gas and the welding additive as well as the form of the welding seam and its thickness is to be made by a qualified welding supervisor.

Welding may be done only by people in possession of a valid welder's certificate in accordance with ISO 9606-1 or with an equivalent national welder's certificate. The area to which the welding certificate applies must cover the full scope of the work to be done (see chapter 4 "Welding on Crane and Attachment").

Permissible areas for welding on the combination crane base:

Key to the component sketches:	
	The combination crane base is welded to the subframe modules and base shear plates.
	In the areas shown on the component sketches it is possible to weld on brackets of a capacity up to 50 kg. In doing so always observe the minimum distance to the components' edges of 60 mm. If in doubt, obtain PALFINGER approval before welding within these areas.
	Welding work is not allowed in these areas.

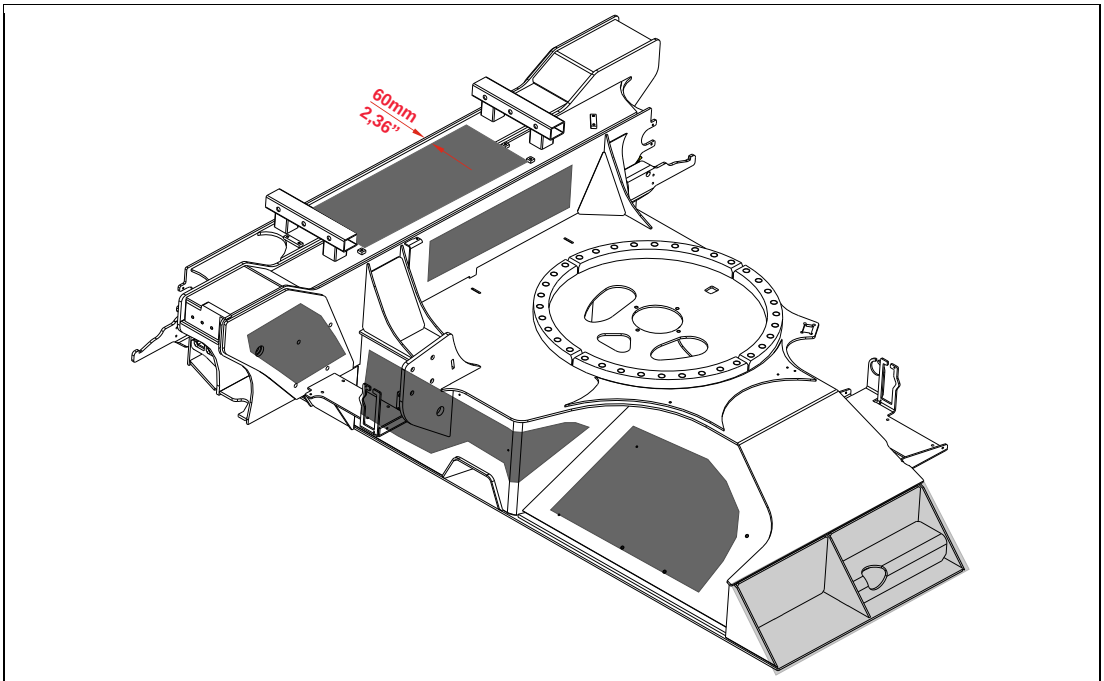


Illustration 06-00 73; Welding areas on the combination crane base

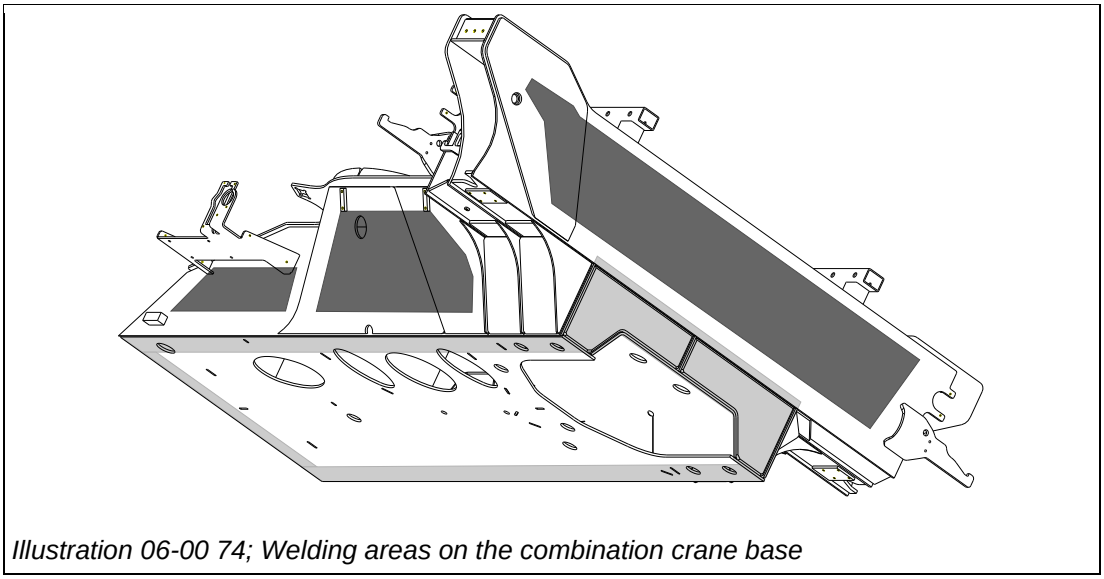


Illustration 06-00 74; Welding areas on the combination crane base

6.5 Crane installation on removable mounting console

If you want the dismounting of the crane to be simple, a removable mounting console is usually the best solution.

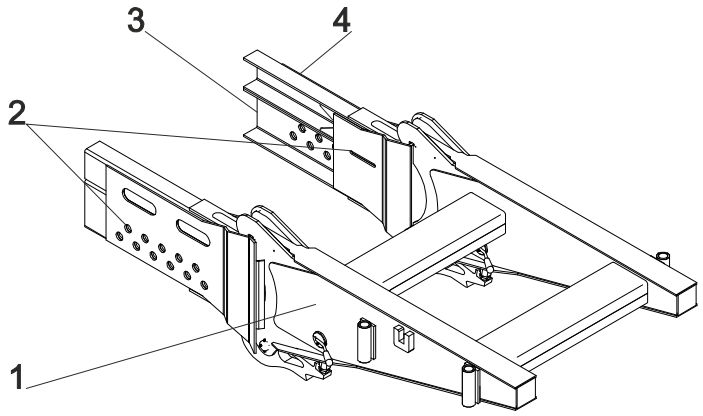


Illustration 06-00 75; Installation on removable mounting console

1	Mounting console	3	Chassis frame
2	Mounting parts of removable mounting console at the chassis frame	4	Subframe

The mounting console is mounted on the rear of the vehicle by using holding plates. The holding plates are mounted according to their own separate mounting instruction. The installation guide for setting up the demountable bracket can be obtained online via PALDESK.PALFINGER.com.

The mounting bracket is connected to the rear console in the same way as in 3.3.1 "Connecting the mounting bracket to the subframe". A reinforcing plate in the form of a doubling plate must be welded under the front mounting bracket to prevent the beam from bulging.

When positioning the mounting bracket, a gap of 30 - 50 mm must be provided between the upper and the lower edge of the crane base frame.

The original PALFINGER cross beams HOK004 must be used.

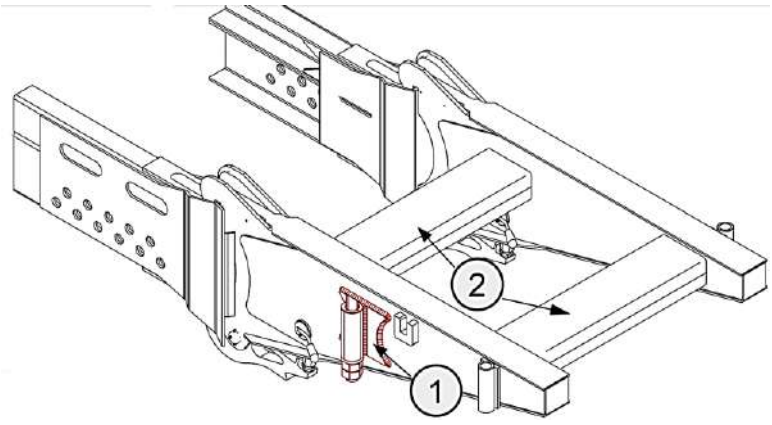


Illustration 06-00 76; Connecting mounting bracket with reinforcing plate

1	Reinforcing plate	2	Cross beam HOK004

6.6 Crane installation with trailer frame

When mounting cranes with a trailer frame, the frame is mounted laterally on the subframe. The connection to the subframe is done with the bearing plates designed for this purpose.

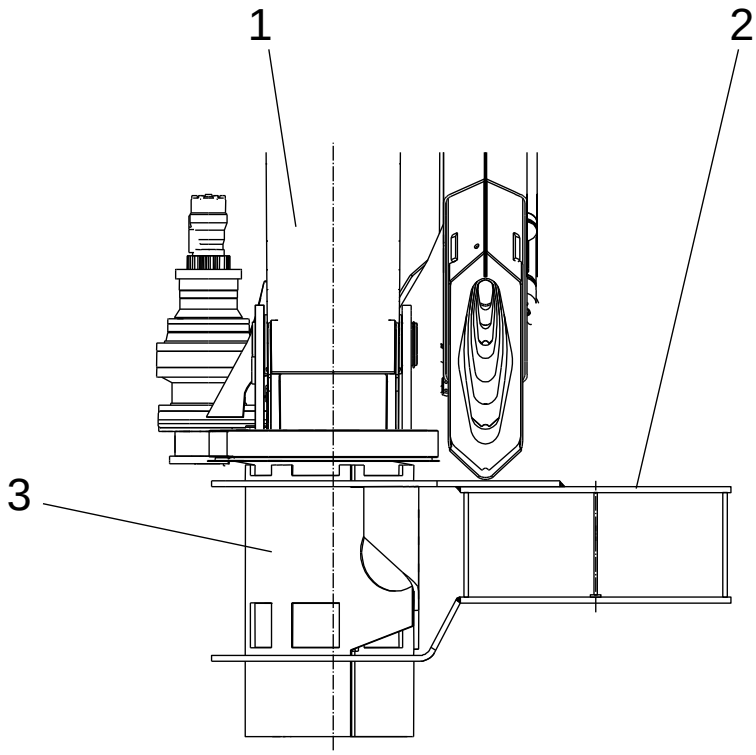


Illustration 06-00 77; Crane installation with trailer frame

1	Crane	3	Trailer frame
2	Subframe		

6.7 Crane installation with tube base

If the crane is equipped with a ball bearing slewing ring at the slewing system, it is possible to integrate the crane base into the subframe completely.

Instead of the crane support, one or more auxiliary supports are installed.

WARNING

After having welded the tube base, absolutely check the flange plate for welding distortions and compensate for them appropriately in case the tolerances have been exceeded.

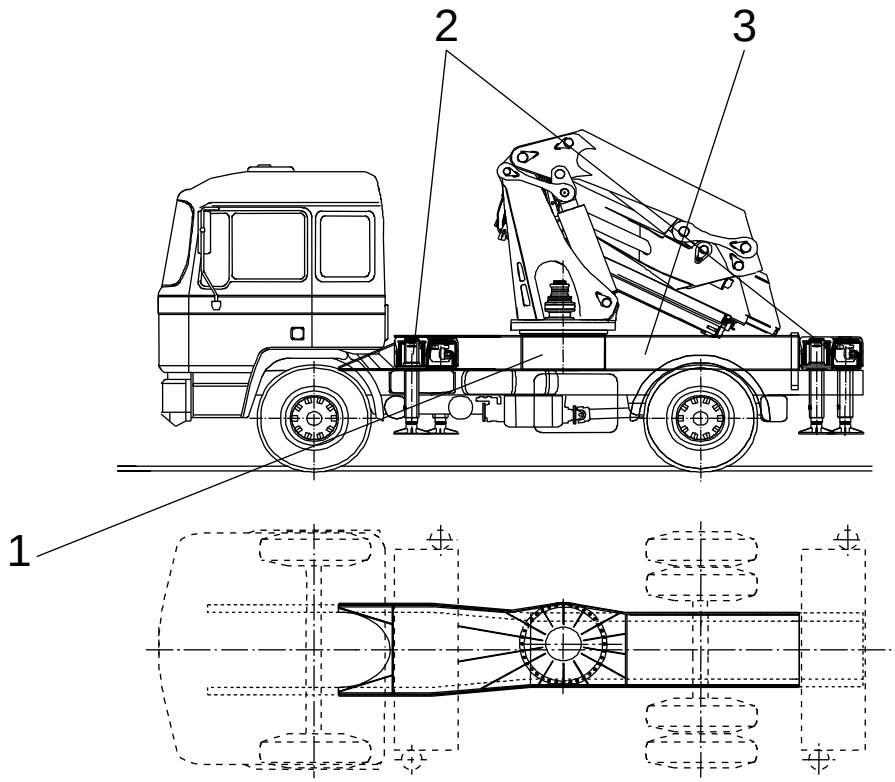


Illustration 06-00 78; Crane mounting with tube base

1	Tube base	3	Subframe
2	Additional stabilizers		

6.8 Stationary mounted loader crane

Stationary mounted cranes are cranes installed on a rigid substructure (e.g., concrete foundation). As stationary mounting of cranes does not correspond with any series, it must be planned in detail in advance.

In order to reduce the impact load on the crane - which is higher on a rigid substructure - suitable measures need to be taken by the body builder to protect the crane components and the substructure, such as:

- Classification of stationary mounted loader cranes in lift class HC2 corresponding EN12999:2011 (truck mounted cranes are assigned to HC1). As a result, the crane's load capacity gets reduced. The reduction depends on the maximum vertical hook speed or grab speed and can be determined as follows (dynamic coefficients in formula according to EN12999:2011) and is valid for all not SH cranes.

INFORMATION

In case of cranes with standard truck base frame observe the separate details given in the technical information sheets. If these details are missing for a crane, it must not be installed as a stationary unit.

$$p_{max} = \frac{1{,}05 + 0{,}17 \cdot \frac{v_h}{2}}{1{,}10 + 0{,}34 \cdot \frac{v_h}{2}} \cdot 100 \qquad [\%]$$

Alternatively, it is possible to read the graph in illustration 06-00 78 to determine the working pressure.

INFORMATION

The graphic is meant as help for cranes of pre-SH series. Use it only, if the type of lifting gear and mode of operation do not match HD5 according to EN 12999.

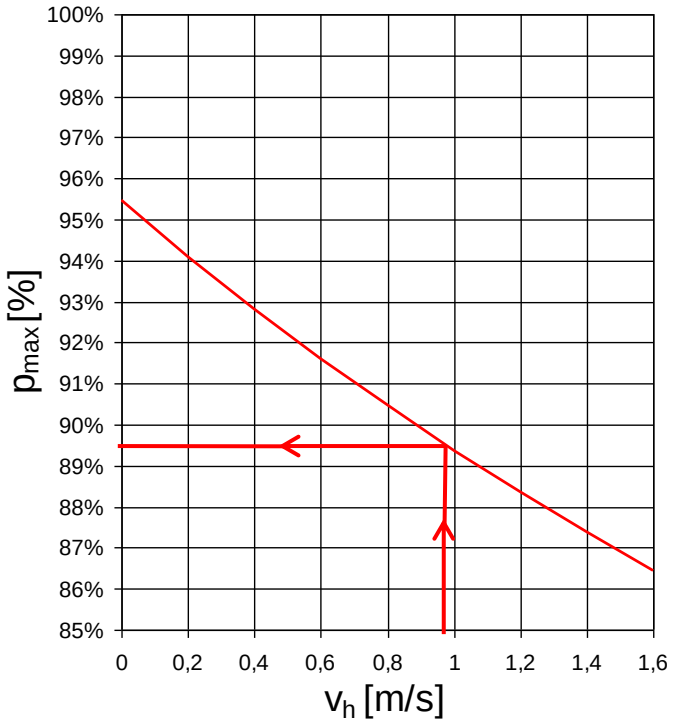


Illustration 06-00 79; Reduction of the work pressure in dependence of the maximum vertical hook speed or grab speed

V_h	maximum vertical hook speed or grab speed [m/s]
p_{max}	crane reduction (in HC2) referred to maximum working pressure in case of truck mounting crane (HC1)

INFORMATION

The lifting speed can be obtained from PALFINGER.

After working pressure reduction, the body builder must attach new load capacity charts on the crane and in the operator manual!

INFORMATION

For cranes with HD4 lifting gear the working pressure for stationary installation must be reduced according to table above (Illustration 06-00 77).
Cranes with HD5 lifting gear no working pressure reduction is needed.

INFORMATION

For EPSILON cranes the working pressure for stationary application must always be reduced to 80 % of the maximum working pressure!

Not all of the EPSILON crane models are suitable for stationary application, therefore contact EPSILON and clarify this question when planning the use of your crane.

- Alternatively, to the reduction of the load capacity you can also install an amply dimensioned pressure accumulator at the lifting cylinder.

Warning: The declaration of conformity for the crane must be reissued by the body builder.

- It needs to be checked if the standard crane base can be used for stationary mounting (see technical datasheets). If stationary crane mounting is not permissible with the standard crane base, you can contact PALFINGER. In combination with suitable arrangements (e.g., pipe bracket) it could be possible to realize stationary installation.

INFORMATION

Stationary crane mounting with combination crane base (integral base frame) is not permitted!

- Additionally, to the capacity reduction also the slewing movement of the crane should be diminished in EPSILON cranes. This can be done via pressure accumulator, electronic damping, brake valve, etc.. In case of Epsilon L-cranes with truck base frame, disc springs must be installed despite pressure reduction during mounting (see illustration 06-00 79).

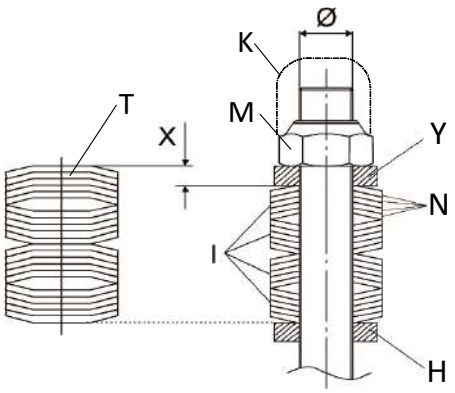


Illustration 06-00 80; Disk springs on EPSILON cranes

Ø	Thread of the high-alloy bolt (M30 x 1.5)
T	Disk springs
N	Number of springs per assembly (8)
I	Number of spring assemblies (4)
X	Preload during assembly (6.4 mm)
H	Mounting plates
Y	Washers
M	Nuts
K	Protective caps

INFORMATION

This kit of disk springs is suited for the Epsilon ranges Onroad and Recycling M, Q, S-crane range with L-boom system, however not suitable for Epsilon cranes with Z-boom system. This kit with the disk springs for M30x1.5 high-alloy bolts can be purchased from Epsilon.

The correct classification of lifting class, hoist types and capacity load group/class S according to EN 12999 or the implementation of suitable measures for impact reduction lies in the responsibility of the body builder. Furthermore**,** the body builder is responsible for the correct design of the substructure and the crane mounting. In case of any uncertainties, contact the acceptance authority or PALFINGER.

INFORMATION

Depending on how intensively cranes are used, they are classified in capacity load groups (e.g., B3) or strain curve classes (S-class, e.g., S2). (See operating instructions "Intended use".)

Check if the planned use as stationary crane corresponds with the classification or use. It might be additionally necessary to reduce load capacity, or the crane might be totally unsuited for the intended use.

WARNING

Improper use for other than the intended purposes can cause the crane components to break.

Examples of stationary mounted cranes:

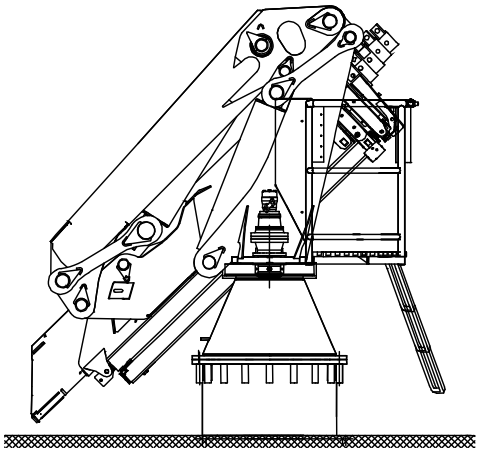


Illustration 06-00 81; Loader crane with Marine base frame stationary mounted on steel pipe bracket

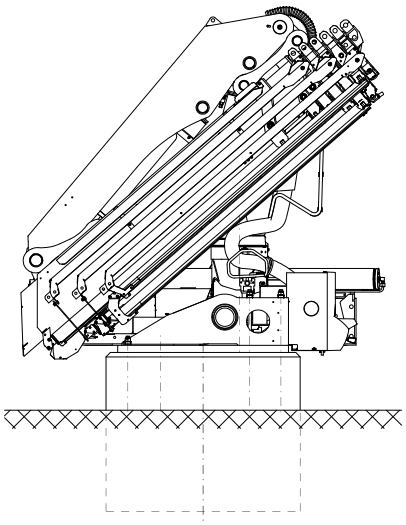


Illustration 06-00 82; Loader crane with standard base frame stationary mounted on reinforced concrete foundation

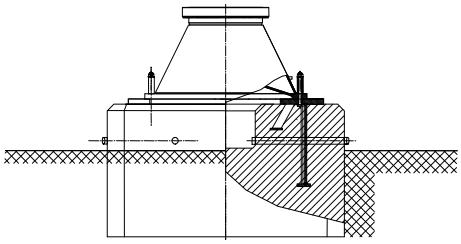


Illustration 06-00 83; Loader crane with Marine base frame stationary mounted on a reinforced concrete foundation

6.9 Installation of PC cranes

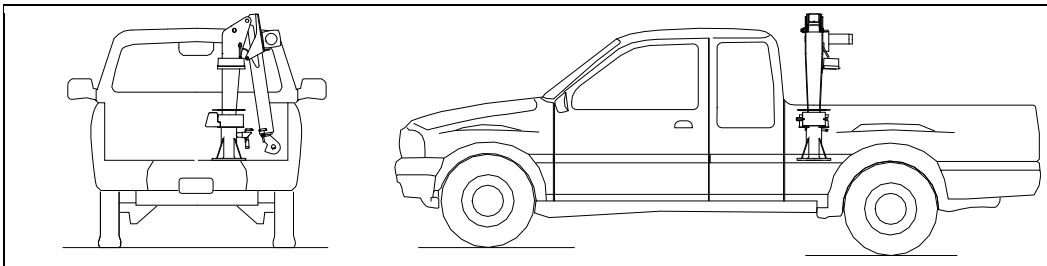


Illustration 06-00 84; PC Crane on a pick-up vehicle

First, the pivotal point or the mounting position of the crane on the vehicle must be determined and marked.

DANGER

When selecting the mounting position, make sure that the control station is not in the vicinity of the vehicle exhaust pipe (emissions).

If possible, dismount the superstructure with subframe from the vehicle. Produce a mounting plate minimum 20 mm thick corresponding to the size of the crane base.

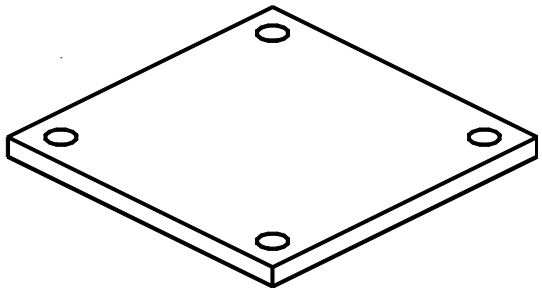


Illustration 06-00 85; Mounting plate for crane base

An appropriate substructure must exist in the chassis area to ensure trouble-free installation and function. If a suitable substructure is not already in place, a suitable subframe construction must be prepared (unless the respective truck manufacturer prescribes or recommends other actions).

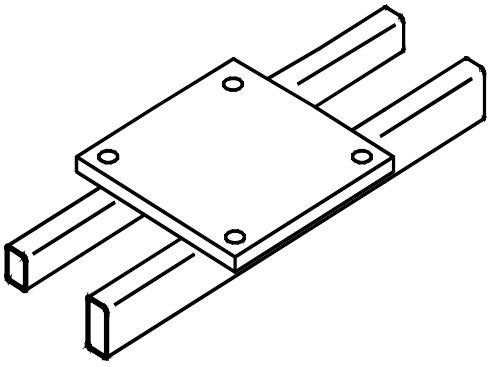


Illustration 06-00 86; Substructure in the vehicle frame area

The subframe can be secured to the vehicle using mounting bolts or other mounting elements.

WARNING

If the subframe is secured using double mounting brackets, the chassis frame must be protected from compression (see chapter 6.3.4, crane installation / double mounting bolt installation).

During the assembly of the crane on the mounting plate it is necessary to put 4 distance washers at the fixing points with a thickness of 3 mm and an outer diameter of 50 mm between the crane base and the mounting plate (PALFINGER order number HT9430).

(See also technical information sheets (TIB), PALDESK.PALFINGER.com.)

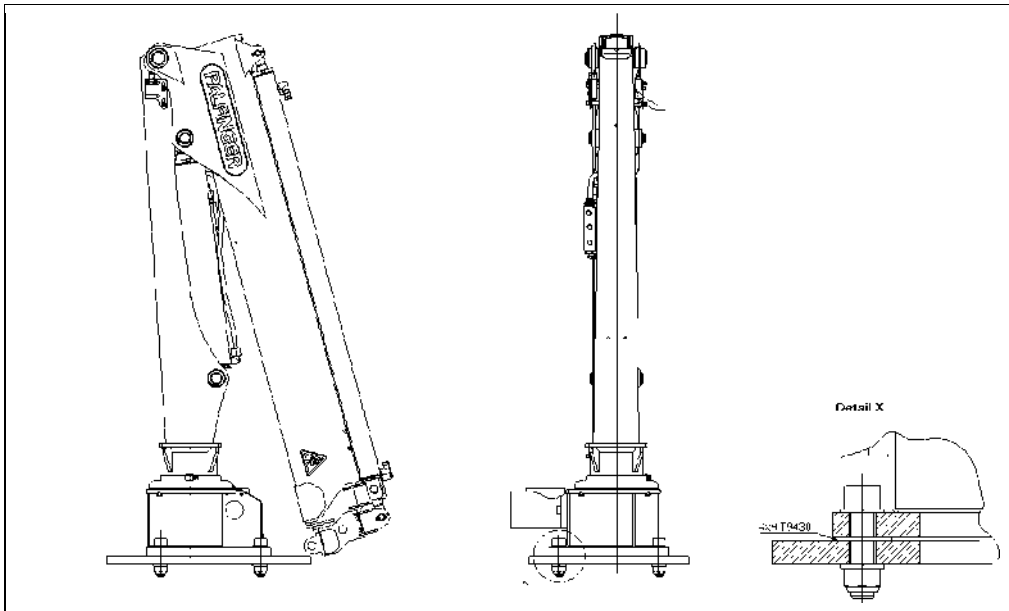


Illustration 06-00 87; Distance washer between the base frame and mounting pallet

6.10 Completing the crane base

In some crane models like for instance in PK 200002L several attachment parts such as control terminals, spirit levels etc. are provisionally mounted to the combination crane base or delivered in a separate pack. To complete the operator stations the body manufacturer must observe and carry out the following points when mounting these parts.

6.10.1 Protection against exhaust

The operator station must be positioned in compliance with EN12999 or national provisions.

INFORMATION

Select the operator station's position in a place where the operator is not endangered by exhaust gases.

6.10.2 Control terminals

Illustration 06-00 88; Control terminal

- The control terminals must be mounted in a clearly visible and accessible place.
- The control terminals must never be installed in the movement range (danger zone) of the stabilizers or other movable components.

WARNING

The control terminals must be placed and mounted to the truck superstructure outside the danger zone and in compliance with standards. When controlling the crane or stabilizers, for instance when extending the outriggers, the operator must never be in the danger zone!

6.10.3 Level glasses

Mount and adjust a level glass (level indicator) clearly visible immediately next to the operator stations for the stabilizers.

6.10.4 Load capacity charts

The load capacity chart must be attached clearly visibly on the operator stations for the crane control.

An emergency cut-off button must be installed on the operator stations for the crane control, and it must snap in when being pushed and stop the crane completely. In case of PK 200002L for instance the emergency cut-off buttons are integrated into the control terminals.

6.11 Transport locks on the vehicle

INFORMATION

The below advice on how to secure the load arm for transportation is only a recommendation. On every body building with standard attachment to vehicle or crane, the body builder must secure the load arm for transportation against side movement during transport!

6.11.1 Crane put-down on the truck-bed

If the loader crane is not in its transport position during travel, but instead put down on the truck-bed with stretched out boom, the crane must be secured against side movement during transport with suitable and sufficiently sized clamping fixtures (see illustration 06-00 88).

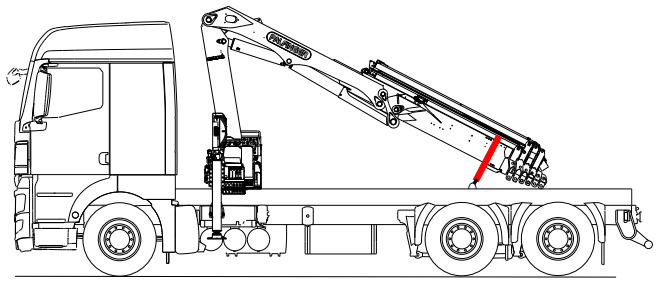


Illustration 06-00 89; Clamping fixture for securing the load arm

6.11.2 Crane put down on the front wall

If the loader crane is stretched out and put down on the vehicle's front wall the superstructure manufacturer must produce sufficiently sized equipment on the front wall where the extension boom can be put down (see illustration 06-00 89).

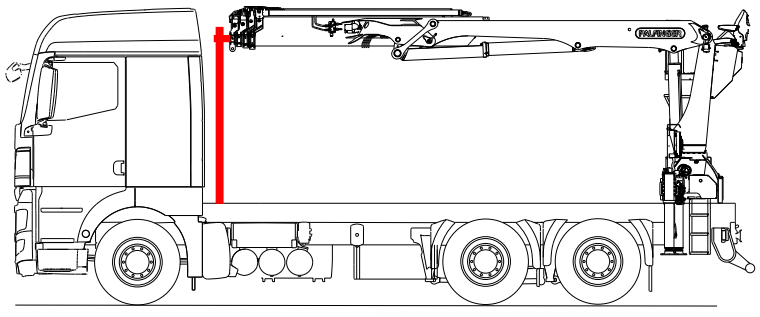


Illustration 06-00 90; Securing the load arm on the front wall

6.11.3 Crane put down above driver's cab

If the loader crane is put down above the driver's cab for instance in case of an EPSILON L-crane (crane for long wood handling), the superstructure manufacturer must attach a support for the boom system (see illustration 06-00 90).

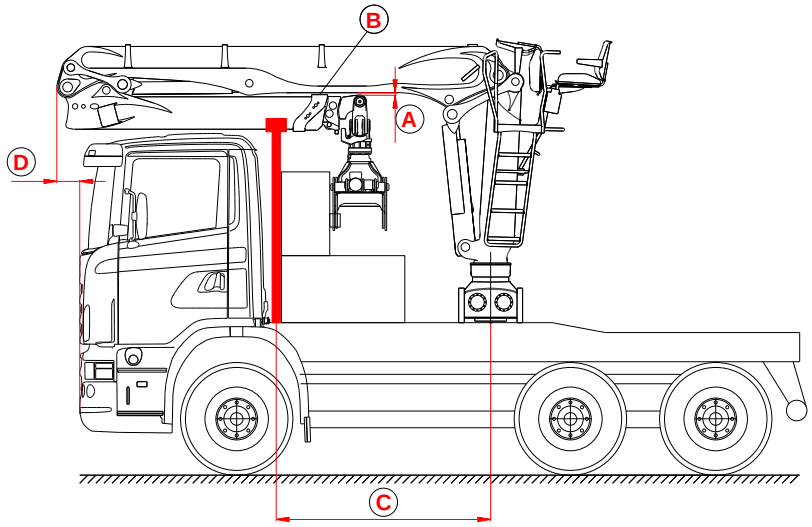


Illustration 06-00 91; Securing the load arm above the driver's cab

INFORMATION

The distance between put-down-position or transport lock and crane's pivot point (C) should be as big as possible (see illustration 06-00 90).

INFORMATION

The distance (A) must not be too small (see illustration 06-00 90). The joint must not touch the main boom during transport. If required, mount a plastic spacer (B, ordering code GUM).

INFORMATION

The grab must be secured against twisting and swinging in the transport position. The grab must not rest on the grab boom.

INFORMATION

The distance (D) the unit projects over the cab (see illustration 06-00 90) must comply with applicable national standards and requirements; also, indication with labels and illumination must comply with national provisions.

PALFINGER Installation Guideline
Hydraulic Loader Crane

Chapter 7

Mounting additional stabilizers

PALFINGER

Original Installation Guideline

DA-105

Version: 2023/03

English

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Contents

7.1 Guidelines for installation additional stabilizers

When planning and assembly additional stabilizers for a vehicle it is important to proceed in the following order:

Planning	**1.**	**Additional stabilizer mounting preparations** • Selection and calculation of additional stabilizer • Defining stabilizer control valve: ○ Order stabilizer control valve with crane ○ Positioning of stabilizer control valve by bodybuilder ⇩	**Chapter 3**
	2.	**Defining the mounting position of the additional stabilizer** • Installation above or below the chassis frame • Checking ground clearance and angle of slope ⇩	**Chapter 7**
	3.	**Subframe** • Selection and calculation of subframe • Defining elements to link chassis frame to subframe ⇩	**Chapter 5**
Assembly	**4.**	**Mechanical installation** • Defining connection to subframe ⇩	**Chapter 7**
	5.	**Hydraulic installation** • Sizing and laying hydraulic lines ⇩	**Chapter 7**
	6.	**Electrical installation** • Sizing and laying power lines • Connecting according wiring diagrams ⇩	**Chapter 7**
	7.	**Finishing** • Preserving / painting the bodywork upon completion	**Chapter 7**

7.2 General mounting remarks

The position of the additional stabilizer must not impair the functioning of the vehicle components or any maintenance work on the vehicle. If necessary, spacers must be placed between the additional stabilizer and the chassis frame.

The clearance of the drive shaft and the spring travel of the axles must be guaranteed without restriction.

The positioning of the controls for the additional stabilizers must be selected such that the operator can see the stabilizers' full area of movement.

It must be possible to extend the additional stabilizers individually on either side.

Sufficient ground clearance must be assured (take the angle of slope α into account!). PALFINGER recommends ground clearance of at least 200 mm. Moreover, there must be adequate extension length "H" of the stabilizer cylinder (take into consideration during project planning).

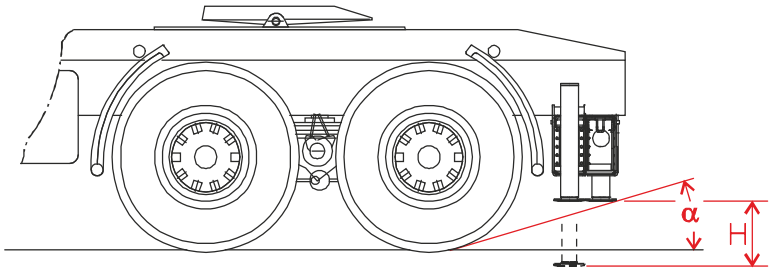

Illustration 07-00 1; Angle of slope and stabilizer cylinder extension length

INFORMATION

The subframe must be produced torsion-resistant (see chapter 5 "Subframe") so that torsion moments can be transferred to the additional stabilizer.

INFORMATION

Supporting forces are absorbed by the stabilizers and applied via the static structure (subframe + vehicle frame). In any case, attention must be paid not to exceed the maximum permissible supporting forces and not to overload the static structure and, if necessary, to limit the supporting force by reducing the lifting force.

7.3 Additional stabilizer mounting options

7.3.1 Additional stabilizer above the chassis frame:

As a rule, additional stabilizers are installed over the chassis frame (superstructure mounting) if the crane is mounted at the rear. The additional stabilizer is then integrated into the front area of the subframe.

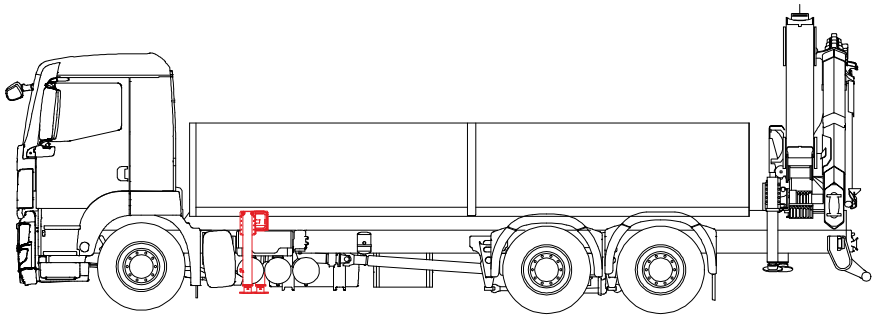

Illustration 07-00 2; Additional stabilizer front-mounted over chassis frame

Where the crane is mounted at the front, the additional stabilizers can also be fitted above the chassis frame at the back.

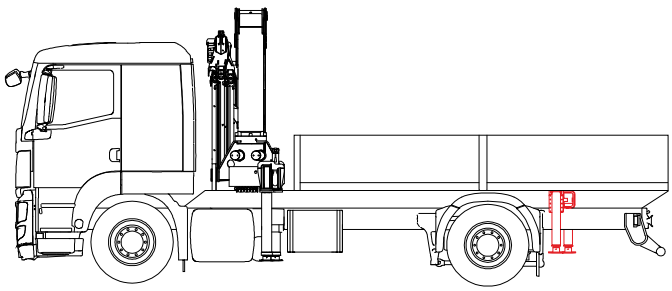

Illustration 07-00 3; Additional stabilizer rear-mounted over chassis frame

7.3.2 Additional stabilizer below the chassis frame:

Additional stabilizers below the chassis frame (substructure mounting) are usually used for front-mounted loader cranes. The additional stabilizer is installed in the rear area under the chassis frame.

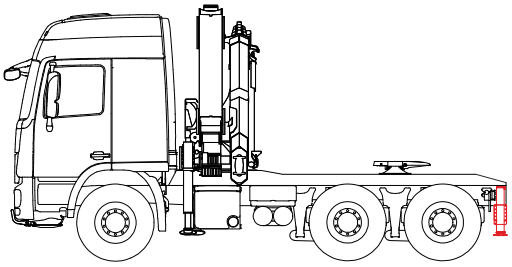

Illustration 07-00 4; Additional stabilizer mounted under chassis frame on a tractor unit

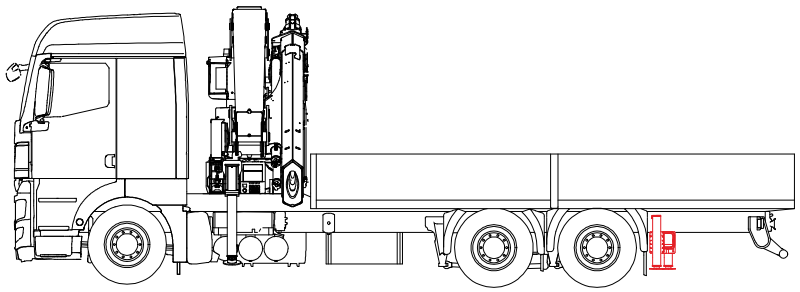

Illustration 07-00 5; Additional stabilizer mounted under chassis frame on a vehicle with a long overhang

When installing the additional stabilizer below the chassis frame, the following must be observed:

- Slope angle
- Lack of space during air suspension lowering (Engagement of the PTO leads to lowering of the chassis because of the simultaneous air suspension activation)
- Risk of collision (drive train, exhaust, gearbox, etc.)

7.3.3 Additional stabilizer cylinder(s) in front of the driver's cab:

When loader cranes are mounted at the front, the driver's cab is usually not completely stable. The stability in this area can be substantially improved by installing one or two stabilizer cylinders (1) in front of the driver's cab. The size and design of the additional stabilizer cylinders need to be customized for the vehicle. PALFINGER's recommendation is to fit one stabilizer cylinder in front of the driver's cab. The advantages and disadvantages of the two fitting options are compared below.

One stabilizer cylinder in front of the driver's cab	
Advantages	Disadvantages
• Statically a better design • Centric exertion of force • Better crane performance when working above the driver's cab • Cheaper installation option	• Slightly more space needed in the vehicle's lengthways direction (more solid cylinder design) • Tow coupling at the front not easily possible

Two stabilizer cylinders in front of the driver's cab	
Advantages	Disadvantages
• Greater supporting force can be achieved using 2 stabilizer cylinders (only if chassis frame is of appropriate design) • Can be built somewhat more compactly in the vehicle's lengthways direction • Tow coupling at the front possible	• Possible limitations to pivoting above the driver's cab due to overloading one of the two cylinders

The vehicle must be equipped with a reinforced chassis frame in the front area before stabilizer cylinders can be mounted in front of the driver's cab. Truck manufacturers offer appropriate options for this that are generally suitable for fitting these stabilizer cylinders (1).

The maximum permissible supporting forces of the stabilizer cylinders depend on the design of the front chassis frame and must therefore be discussed in every case with the relevant truck manufacturer. Suitable measures (e.g., pressure sensors, etc.) must be used to ensure that the maximum permissible supporting forces are not exceeded. These signals must then be incorporated into the crane overload system.

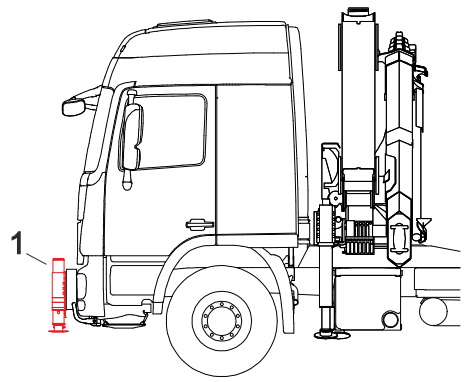

Illustration 07-00 6; Front stabilizer

INFORMATION

Enough clearance for tipping of the driver's cab must be considered when using front stabilizer (see mounting instruction and mounting drawing of the truck supplier).

7.4 Mechanical installation of additional stabilizers

INFORMATION

The details in this chapter should be regarded merely as recommendations. The bodybuilder must assess each individual installation and make the weld joints in accordance with the static and dynamic requirements.

7.4.1 Dimension and material of the base shear plates

The base shear plates should always be of the same grade of steel as the chassis frame (minimum yield stress Re ≥ 355 N/mm2). Moreover, the material for the base shear plate should have the following quality features:

- Fine-grained structure (fine-grained construction steel)
- Good weldability
- Adequate notch impact work and tenacity

Max. stabilizer width	Sheet thickness
≤ 3.9 m	8 mm
4.0 - 6.9 m	10 mm
7.0 - 8.6 m	12 mm

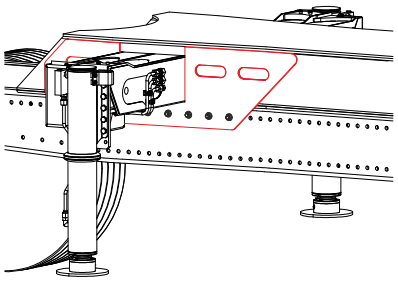

Illustration 07-00 7; Example for base shear plate

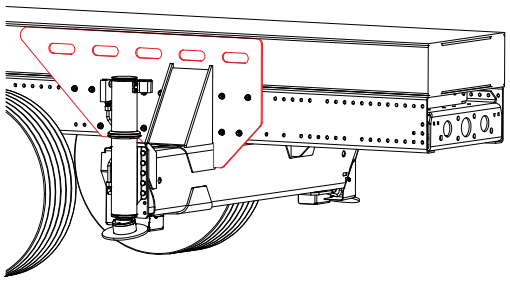

Illustration 07-00 8; Example for base shear plate

Number of screws:

Note: The required number of screws cannot be generalized and must be calculated or designed by the bodybuilder.

7.4.2 Installing the additional stabilizer above the chassis frame

The following connection variants are possible:

- Connect additional stabilizer in a shear-resistant manner to the chassis frame
- Connect additional stabilizer in a shear-yielding manner to the chassis frame

7.4.2.1 Connect additional stabilizer in a shear-resistant manner to the chassis frame

Variant 1: Additional stabilizer integrated into the subframe

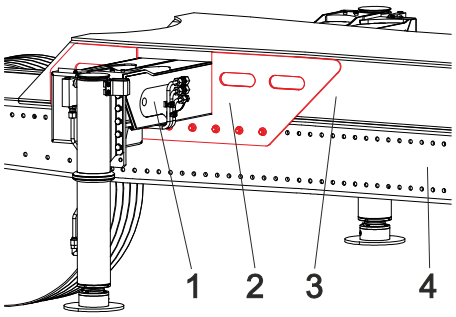

Illustration 07-00 9; Variant 1 - Shear-resistant superstructure mounting, view 1

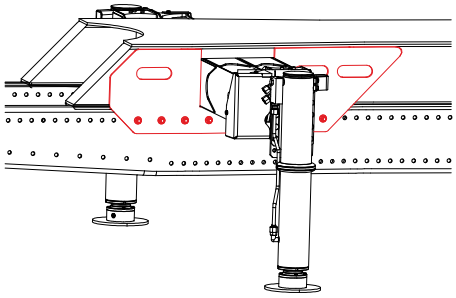

Illustration 07-00 10; Variant 1 - Shear-resistant superstructure mounting, view 2

1	Additional stabilizer
2	Base shear plate
3	Subframe
4	Chassis frame

Variant 2: Top edge of additional stabilizer flush with top edge of subframe, the subframe welded at the front side onto the additional stabilizer

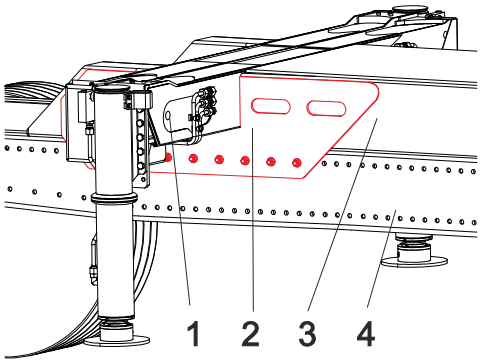

Illustration 07-00 11; Variant 2 - Shear-resistant superstructure mounting, view 1

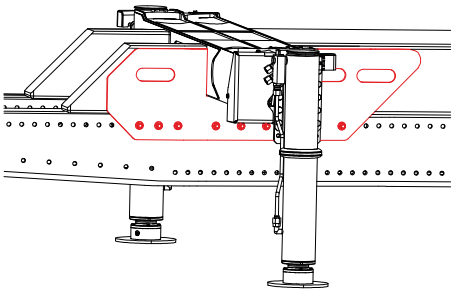

Illustration 07-00 12; Variant 2 - Shear-resistant superstructure mounting, view 2

1	Additional stabilizer
2	Base shear plate
3	Subframe
4	Chassis frame

Variant 3: Additional stabilizer above the subframe.

- More ground clearance (slope angle)
- Higher supporting force with lower weight
  (Comparison supporting force: BS1286A 240 kN - BS1242A 210 kN)

7.4.2.2 Connect additional stabilizer in a shear-yielding manner to the chassis frame

If high torsional forces on the frame are expected, spring elements should be chosen as connecting elements. Springs that can be compressed for more movement, allow higher torsional forces, as necessary for off-road vehicles, for example.

If you choose to make the connection between chassis and subframe in shear-yielding manner (see chapter 5 "Subframe"), the additional stabilizer can be integrated as per the example below.

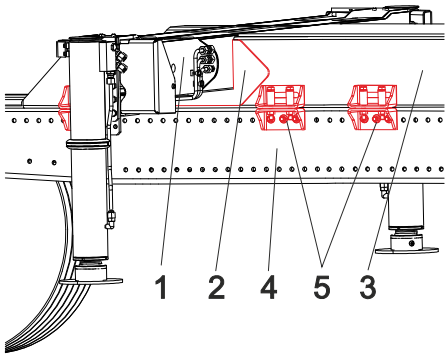

Illustration 07-00 13; Shear-yielding superstructure mounting, view 1

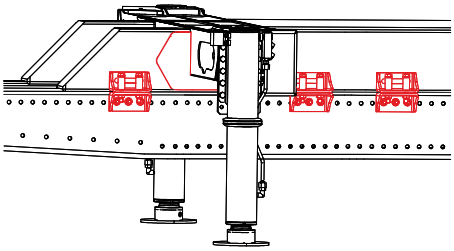

Illustration 07-00 14; Shear-yielding superstructure mounting, view 2

1 Additional stabilizer 2 Stiffening plate 3 Subframe	4 Chassis frame 5 Shear-yielding connecting elements

7.4.3 Installing the additional stabilizer under the chassis frame

The following connection variants are possible:

- Additional stabilizer welded to gusset plates
- Additional stabilizer mounted under the chassis frame using bolt connections

7.4.3.1 Additional Stabilizer BS017 | BS018 | BS01*

These additional stabilizers have been specially designed for mounting under the vehicle frame.

BS017 and BS018 are designed for mounting under the vehicle between the vehicle axles with the focus on very low section height of the crossbeam for maximum ground clearance.

Various support cylinder variants for BS019 enable flexible installation under or above the vehicle frame.

Illustration 07-00 15; New generation of additional stabilizer BS017, BS018 and BS019 (left to right).

*BS = Base Stabilizer

INFORMATION

With the introduction of the new stabilizers, the BS019 replaces the BS1003A.

INFORMATION

Further information on the new additional supports can be obtained online in the product information and technical information sheets via PALDESK.PALFINGER.com.

7.4.3.2 Additional stabilizer welded to gusset plates

The additional stabilizer is placed under the chassis frame and welded to the base shear plate. Customized reinforcement plates should be mounted on both sides to achieve adequate stability.

Two gusset plates should be mounted for this purpose on the outside of the crossbeam. The gusset plates should be mounted over the side plates of the additional stabilizer's crossbeam in order to ensure the optimum exertion of force. A cover plate should be inserted between the gusset plates to strengthen them. The cover plate should then be welded all round to the gusset plates, the base shear plate and the crossbeam. The gusset plates each get weld-joined on the inside and outside to the base shear plate and the crossbeam.

INFORMATION

The dimensioning of the gusset plate and cover plates must correspond at least to the steel quality / material thickness of the base shear plates.

INFORMATION

The accessibility for a proper weld seam design must be given. Welding may only be carried out on permissible component areas (see 5.1 "Permitted areas for welding work on the additional stabilizers").

Sizing the gusset and cover plates:

Stabilizer width	Sheet thickness	Yield strength R_e [N/mm²]	Gusset plate width (B)	Gusset plate height (H)
≤ 3,9 m	8 mm	≥ 355	Additional stabilizer's doubler plate minus 20mm (X)	Chassis frame (H_{FR}) + half subframe height (H_{HR})
4,0 – 6,9 m	10 mm	≥ 355		
7,0 – 8,6 m	12 mm	≥ 355		

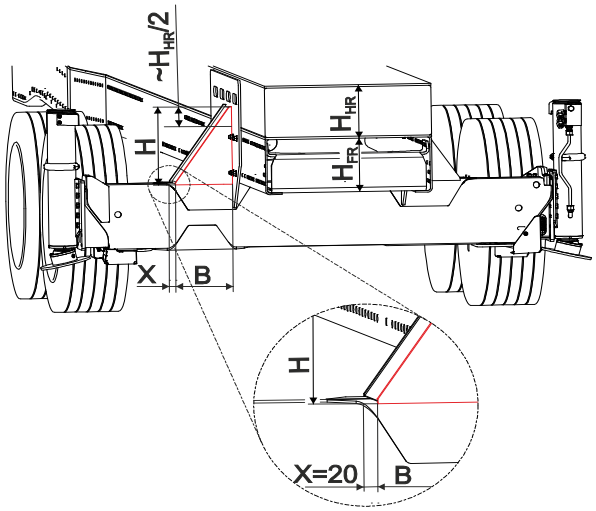

Illustration 07-00 16; Gusset plate sizing

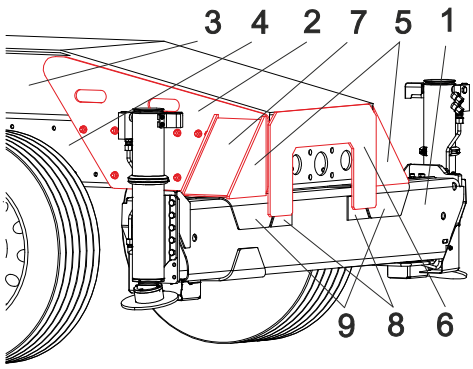

Illustration 07-00 17; Example mounting on tractor unit, view from behind

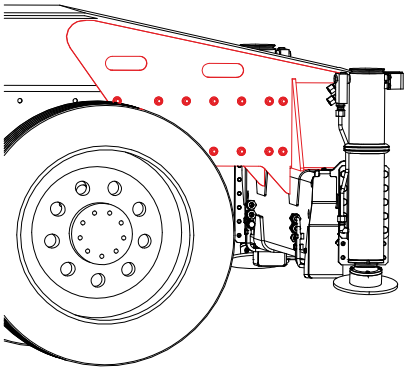

Illustration 07-00 18; Example mounting on tractor unit, view from front

1 Additional stabilizer	7 Cover plate for gusset plates
2 Base shear plate	8 Additional doubler plate for mounting the subframe end plate
3 Subframe	9 Additional stabilizer's doubler plates
4 Chassis frame	
5 Gusset plates	
6 Subframe end plate	

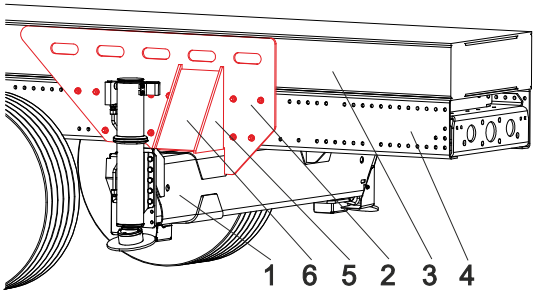

Illustration 07-00 19; Example mounting on vehicle with long overhang, view from behind

1 Additional stabilizer	4 Chassis frame
2 Base shear plate	5 Gusset plates
3 Subframe	6 Cover plate for gusset plates

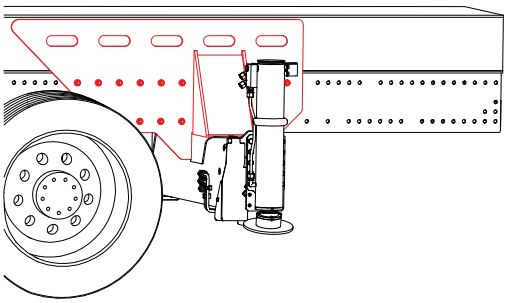

Illustration 07-00 20; Example mounting on vehicle with long overhang, view from front

7.4.3.3 Additional stabilizer mounted under the chassis frame using bolt connections

The additional stabilizer can also be mounted under the chassis frame by means of four mounting bolts. To do this each of the four bolt sleeves needs to be welded to the additional stabilizer's crossbeam and to the base shear plates.

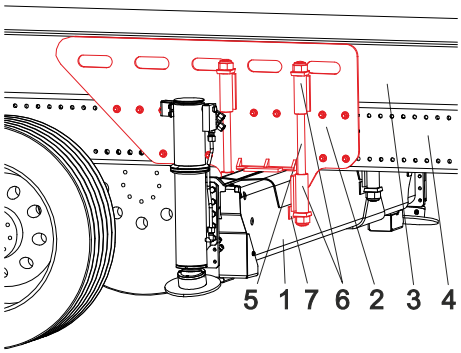

Illustration 07-00 21; Bolt connections, view from behind

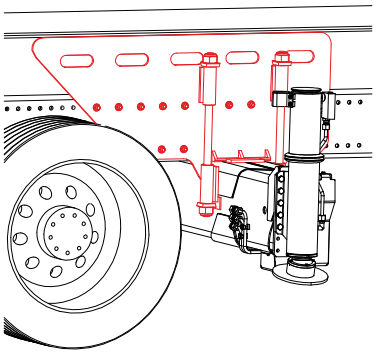

Illustration 07-00 22; Bolt connections, view from front

1 Additional stabilizer	6 Sleeves on base shear plate and additional stabilizer
2 Base shear plate	7 Additional doubler plate for mounting the bolt sleeve
3 Subframe	
4 Chassis frame	
5 Bolt connection	

DANGER

Only Original PALFINGER bolt connections may be used. These can be bought from the PALFINGER equipment center.

To select the right bolt connection, use the following diagram. The stabilizer width W and maximum permitted stabilizer force F_{ST} (see technical information sheets) need to be entered into the diagram. The intersection of the values shows the required bolt connection cross-section. Drawn in as an example is an additional stabilizer with a stabilizer width of 5,2 m and maximum permitted stabilizer force of 140 kN. The bolt connection cross-section required for this example is M30x1.5. For the red area in the diagram an approval must be obtained from PALFINGER.

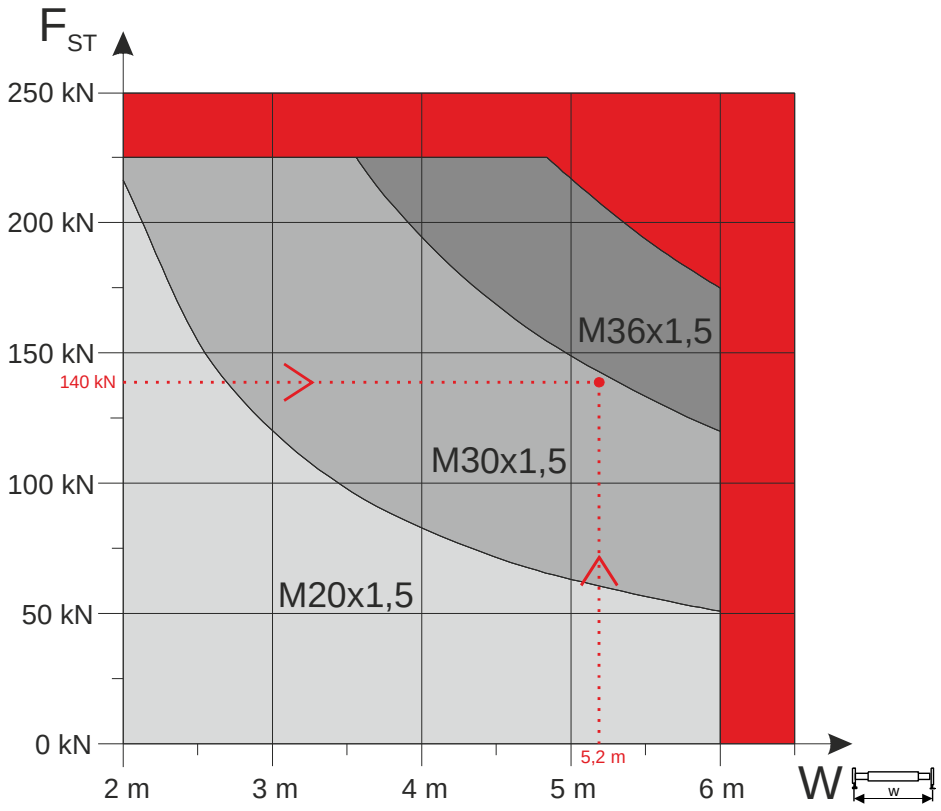

Illustration 07-00 23; Bolt connection selection

Sizing bolt connection elements:

Bolt connection	**M20x1.5**	**M30x1.5**	**M36x1.5**
Matching bolt sleeve [spares no.]	----	HXE-3145	HXE-9084
Sleeve length [mm]	≥ 120	≥ 160	≥ 200
Thickness of connecting plate and bush [mm]	≥ 6	≥ 8	≥ 10
Quality of connecting plate material	Yield strength Re ≥ 355N/mm²		
Welding additive	Z1 chapter 4 "Welding on crane and attachment"		
Evaluation group	B DIN EN ISO 5817		
Min. weld joint thickness a_w [mm]	5	6	7
Bolt connection torque [Nm] (lightly oiled); Material: 42 Cr Mo 4v	140	900	1550

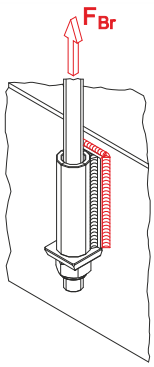

Illustration 07-00 24; Bolt sleeve mounting

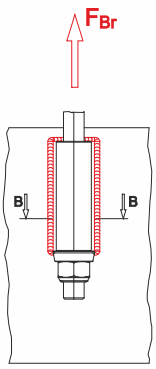

Illustration 07-00 25; Bolt sleeve mounting

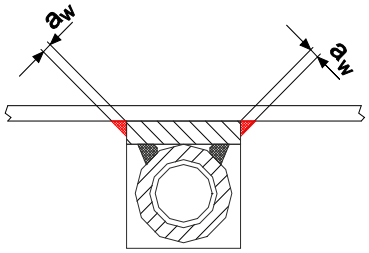

Illustration 07-00 26; Bolt sleeve B-B cross-section

The bolt connections must be secured with a self-locking nut or a counter-nut at both ends and tightened using a torque spanner. The projection of the bolt connection above the self-locking nut / counter-nut must be at least three full turns of the thread (3 x thread pitch).

DANGER

Loose, damaged or excessively tightened bolts are susceptible to break under load. This creates an acute risk of fatality to the operator and others.

DANGER

Never tighten bolt connections with anything other than the prescribed amount of torque.

Due to the high surface pressure, when mounting using bolt connections an additional supporting plate (position 1 in illustration 07-00 27) must be fixed onto the base shear plate.

Supporting plate sizing:

Span [m]	Yield stress R_e [N/mm²]	Supporting plate Position 1			Gusset plate Position 1.1	
		Plate thickness [mm]	Width B1 [mm]	Length L1	Plate thickness [mm]	Cross-section (min. 3) [mm]
≤ 3,9	≥ 355	8	100	= Additional stabilizer width	8	80x80
4,0 – 6,0	≥ 355	10	100		10	80x80
> 6,0	Approval from PALFINGER required					

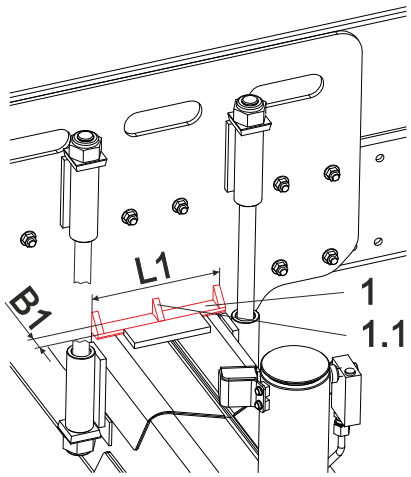

Illustration 07-00 27; Definition of supporting plate on base shear plate

1	Supporting plate	B1	Supporting plate width
1.1	Gusset plate for base shear plate	L1	Supporting plate length

Secure the additional stabilizer from slipping lengthways or sideways by means of stop plates. In order to avoid the additional stabilizer slipping sideways, a stop plate needs to be welded onto it (position 2 in illustration 07-00 27).

Sizing the sideways stop plate:

Stabilizer width	Yield strength R_e [N/mm²]	Plate thick-ness	Width B2	Length L2
≤ 3,9 m	≥ 355	10 mm	20 mm	100 mm
4,0 – 6,9 m	≥ 355	12 mm	30 mm	100 mm
7,0 – 8,6 m	≥ 355	15 mm	30 mm	100 mm

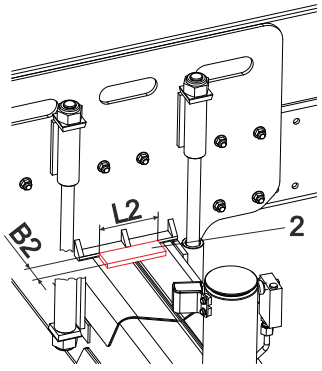

Illustration 07-00 28; Definition of sideways stop plate on the additional stabilizer

2	Sideways stop plate for additional stabilizer
B2	Sideways stop plate width
L2	Sideways stop plate length

The sideways stop plate (2) must be welded around 3 edges (not the stop edge) to the additional stabilizer's crossbeam!

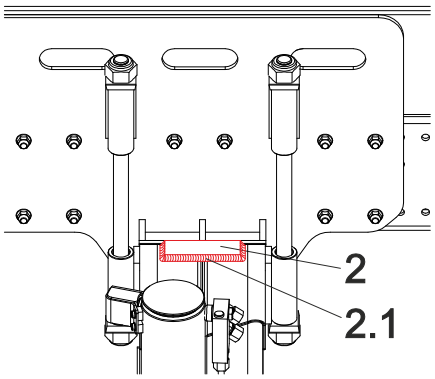

Illustration 07-00 29; Definition of welding of the sideways stop plate to the additional stabilizer

2	Sideways stop plate
2.1	Welding seam for sideways stop plate (on 3 edges)

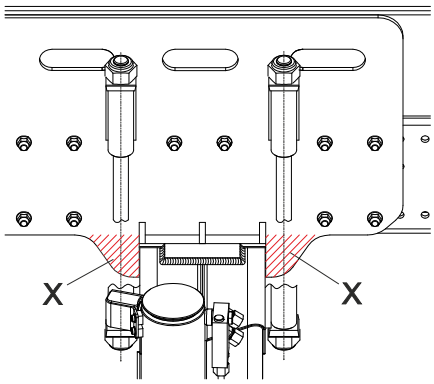

Illustration 07-00 30; Definition of lengthways stop plate

X	Lengthways stop plate integrated into the base shear plate (bolts partially erased)

ATTENTION

The selection of the protective gas and the welding additive as well as the form of the welding seam and its thickness is to be made by a qualified welding supervisor.

Welding may be done only by people in possession of a valid welder's certificate in accordance with ISO 9606-1 or with an equivalent national welder's certificate. The area to which the welding certificate applies must cover the full scope of the work to be done (see chapter 4 "Welding on crane and attachment").

7.4.4 Fitting the stabilizer cylinders to the additional stabilizer's extension arms

When fitting the stabilizer cylinders to the extension arms the following points need to be considered:

- Clean flange surfaces on both sides of any dirt and foreign bodies. The surface protection must not be removed.
- The fixing screws must be tightened with the required tightening torque and secured with screw-locking adhesive. Before applying the adhesive, the thread must be cleaned and degreased. To avoid cold shock effects, it must be guaranteed that the environment and the glued parts will have the requested minimum temperature

required by the screw-locking adhesive. Following adhesives are approved by PALFINGER (the specification of the adhesive supplier must be considered during processing):

- LOCTITE 243 (alternative LOCTITE 245)
- VARY BOND 12-43 (alternative VARY BOND 12-45)
- WIKO 02K43 (alternative WIKO 02K45)

INFORMATION

More information on the PALFINGER tool catalog can be obtained online via PALDESK.PALFINGER.com.

- The stabilizer cylinder must always be secured to the stabilizer outrigger using the fastening bolts provided (A).

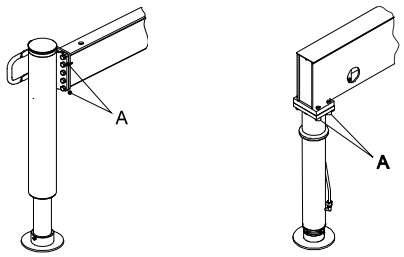

Illustration 07-00 31; Bolting the stabilizer cylinder to the extension arm

Stabilizer plate extensions may only be used in accordance with technical information sheets. No other stabilizer plate extensions are permitted without separate approval from PALFINGER!

No modification of the flange plates on the stabilizer outrigger or stabilizer cylinder (e.g., extension by one row of holes, etc.) is permitted without separate approval from PALFINGER!

DANGER

No bolts other than those specified may be used to fix the stabilizer cylinders to the extension arms!

DANGER

Loose, damaged or excessively tightened bolts are susceptible to break under load. This creates an acute risk of fatality to the operator and others.

Tightening torque ISO-screws in Nm (not oiled and not lubricated)	
Bolts: ISO 4762, ISO 4014 Nuts: ISO 4032 Washers: ISO 7090	
Bolt thread:	Stability: 10.9
M12	100 Nm
M14	165 Nm
M16	245 Nm

The label EB-4039 must be glued to all support cylinders. Fill in the maximum permissible support force of the respective support cylinder in kN on the label.

Illustration 07-00 32; Shield EB-4039

7.5 Welding work on the additional stabilizers

For such work you must observe the installation guide's welding instructions (see chapter 4).

INFORMATION

To prevent the electronic parts on both the crane and the vehicle from damage, these components must be disconnected from mains before welding (see also bodybuilder guideline and operating manuals of the respective truck manufacturer).

Extra preparations for welding on additional stabilizers:

- Dismount outriggers including pipelines, hydraulic hoses and electric lines.
- Dismount sensors such as measuring wires and magnetostrictive sensors
- Observe the supplied assembly instructions for the additional stabilizers.

The entire area of the weld must be free of any grease, oil, rust flakes, paint, rust, dirt and humidity. Ensure that the grinding work does not grind off too much material from the additional stabilizers (do not reduce the thickness of the metal!).

WARNING

The selection of the protective gas and the welding additive as well as the form of the welding seam and its thickness is to be made by a qualified welding supervisor.

Welding may be done only by people in possession of a valid welder's certificate in accordance with ISO 9606-1 or with an equivalent national welder's certificate. The area to which the welding certificate applies must cover the full scope of the work to be done (see chapter 4 "Welding on crane and attachment").

7.5.1 Permitted areas for welding work on the additional stabilizers

Key to the component sketches:	
	Attachments may be welded on in these areas. The metal is of a quality with yield strength of R_e von 690 N/mm².
	Attachments may be welded on in this area if doubler plates in the thickness of the light grey areas have first been welded on. The metal is of a quality with yield strength of Re von 890 N/mm². However, unless absolutely necessary, welding in these areas should be avoided.
	Welding work is not allowed in these areas.

Crossbeam sketch - Low construction:

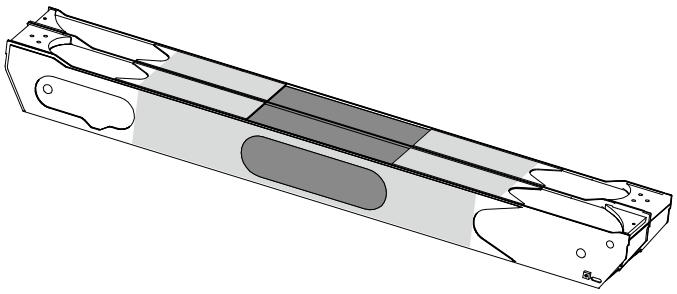

Illustration 07-00 33; Low construction crossbeam – Top view

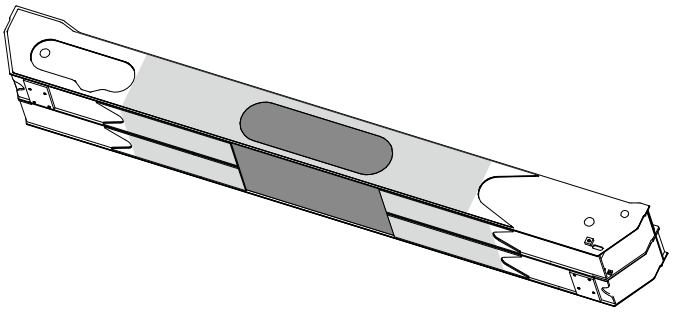

Illustration 07-00 34; Low construction crossbeam – Bottom view

Crossbeam sketch - High construction:

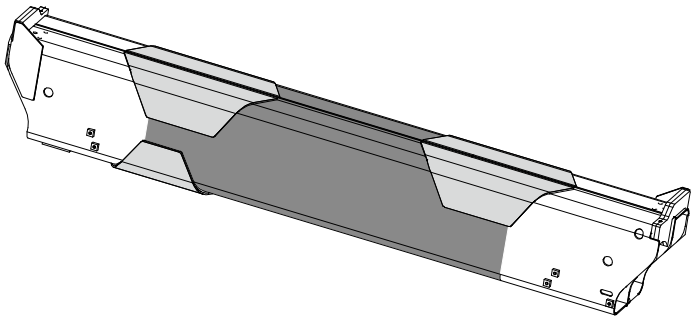

Illustration 07-00 35; High construction crossbeam – Top view

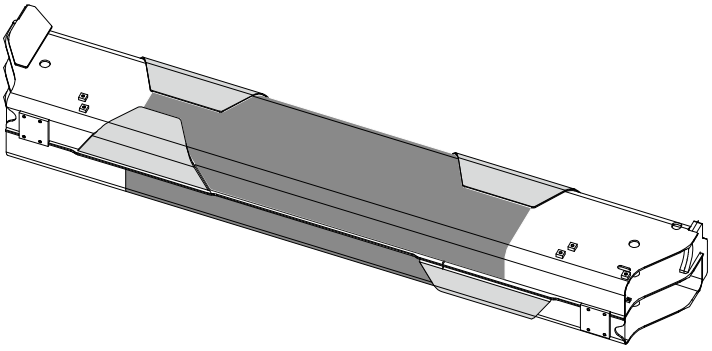

Illustration 07-00 36; High construction crossbeam – Bottom view

7.5.2 Retrofitting of brackets at the BS013-SA-A Stabilizers:

With the additional stabilizer (BS013-SA-A) it is possible to refit brackets for its fastening to the vehicle. For the exact bracket position, please refer to the technical information sheets of the BS013-SA-A, which are provided for download from PALDESK.PALFINGER.com.

The sheet metal parts (BS013G0106 and BS013G0107) to be welded onto the crossbeams are made of quality S690 fine-grained steel. The crossbeam's material quality is S355.

Any welding is not allowed in the area (A) marked in red in the illustration, because otherwise it will be impossible to mount the large washers properly (see illustration 07-00 37).

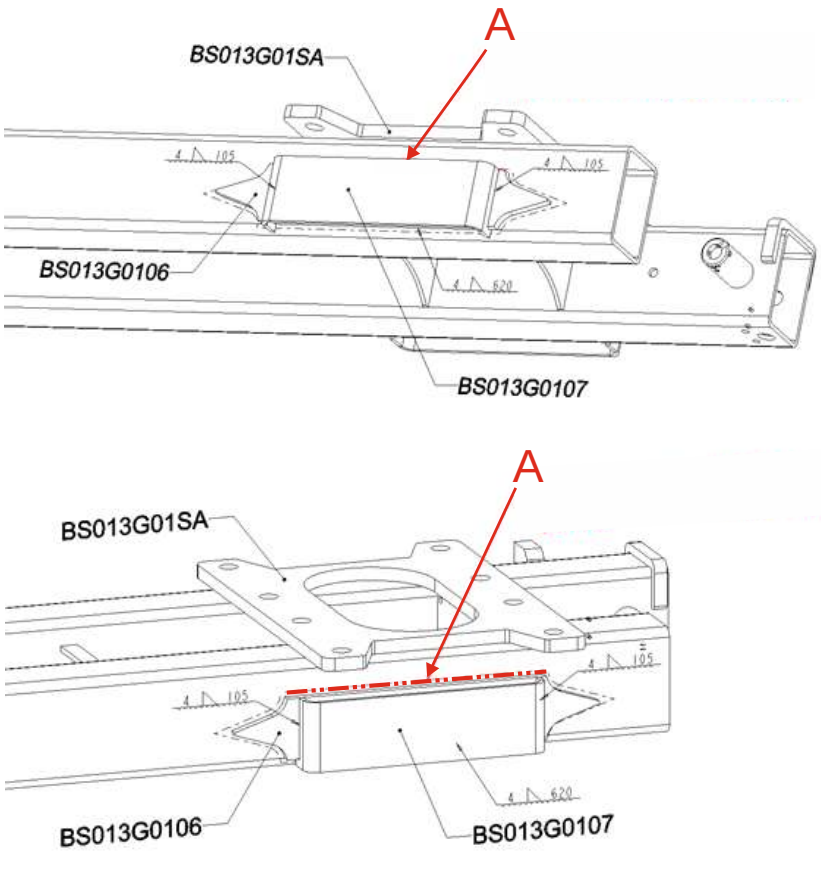

Illustration 07-00 37; Bracket position

7.6 Hydraulic installation of the additional stabilizers

It is necessary for the operation of the additional stabilizers to integrate them into the crane's hydraulic circuit. This can be done by connecting the additional stabilizer system to the crane's control slides or it can be operated via control slides installed separately.

INFORMATION

With the FFST order option, the stabilizers are controlled via radio remote control. If the control valve for stabilizer operation is provided loose, it must be properly installed by the body builder.

To check the function of the main control valve for crane operation, a pretension valve is therefore installed. This valve must be replaced by a pressure transmission plug (HPCO) when connecting these two control valves together.

The hydraulic diagrams can be obtained online via PALDESK.PALFINGER.com.

7.6.1 General installation information

- The connecting lines between loader crane and additional stabilizers must be secured by clamps to the subframe or chassis frame. The number of clamps will be based in each instance on the way in which the supports are fitted. Any damage to the lines through vibration must be avoided.
  PALFINGER recommends using clamps with rubber collars.
- Angled threaded joints should not be used in the construction of the pipelines. The hydraulic pipes should always be bent using a pipe-bending device (radius of curvature should be at least three times the pipe diameter; observe any additional manufacturer's instructions). Be absolutely certain to avoid any cross-section strictures at the bends.
- Hydraulic pipes or hoses can be used for the link between loader crane and additional stabilizer system. PALFINGER recommends using pipes for any relatively long sections of line. Only the connecting pieces or moving joints should be linked via hoses.
- When installing hydraulic lines pay attention to cleanliness! Pipelines must be cleaned before fitting!

INFORMATION

When carrying out the hydraulic installation of the additional stabilizers take note of chapter 8 "Mounting remarks for the crane hydraulics"!

7.6.2 Notes on BS1003A, BS019, BS1242A, BS1286A, BS1298A

With the BS1003A or BS019, pressure relief valves are installed on the piston side of the cylinder. In order to ensure proper function, the leak oil- or tank line must have at least the same dimension as the supply line – dimensioning recommendations according to the hydraulic chapter.

Additional stabilizers are designed for different supply pressures and must be protected against too high forces.

Therefore, as can be seen in the hydraulic diagrams, pressure relief valves are installed on the piston side of the BS1242A-, BS1286A- and BS1298A stabilizer cylinders. These can lead to insufficient support pressures in combination with certain control valves.

For the following combinations marked with "x", the piston-side pressure relief valves on of the cylinders must be removed.

PK-type	Crane type	Frame type*	BS1242A		BS1286A		BS1298A	
			floor	radio	floor	radio	floor	radio
55002 TEC-5	S435-SK-A	Truck	x	x	x	x	x	x
58002 TEC-7								
56002-HP	S507-SK-E	truck		x		x		x
62002-EH								
63002-EH	S509-SK-D	truck		x		x		x
65002-SH				x		x		x
65002-SH	S509-SK-D	IBF	x	x	x	x	x	x
76002-EH	S510-SK-D	truck		x		x		x
78002-SH				x		x		x
76002-EH	S510-SK-D	IBF	x	x	x	x	x	x
78002-SH			x	x	x	x	x	x
88002-EH	S511-SK-D	truck		x		x		x
92002-SH				x		x		x
88002-EH	S511-SK-D	IBF	x	x	x	x	x	x
92002-SH			x	x	x	x	x	x
110002-SH	S512-SK-D	truck	x	x	x	x	x	x
110002-SH	S512-SK-D	IBF	x	x	x	x	x	x
135002 TEC-7	S531-SK-A	truck	x	x	x	x	x	x
		IBF						
165002 TEC-7	S533-SK-A	IBF	x	x	x	x	x	x

* IBF = Integral Base Frame

INFORMATION

This applies to cranes with conventional crane base and floor control, equipped with the Salami VDM07 control valve (200 bar). For cranes < 56 mt, the pretension valves must always be removed.

7.6.3 Dimensioning of hydraulic piping

The recommended flow rate for the additional supports is 30 – 40 l/min.

Line type	Line dimension
Extension line	16S
Retraction line	12S

INFORMATION

The number of lines depends on the configuration of the additional support. Due to the respective crane configuration, it may be useful to dimension pipes larger in order to minimize the accumulating dynamic pressure.

7.6.4 Connections options between crane and additional stabilizer

As the hydraulic connection is always on the opposite side from the movement, the run of the line between crane and additional stabilizer has to be crossed over the chassis frame (see illustration 07-00 38).

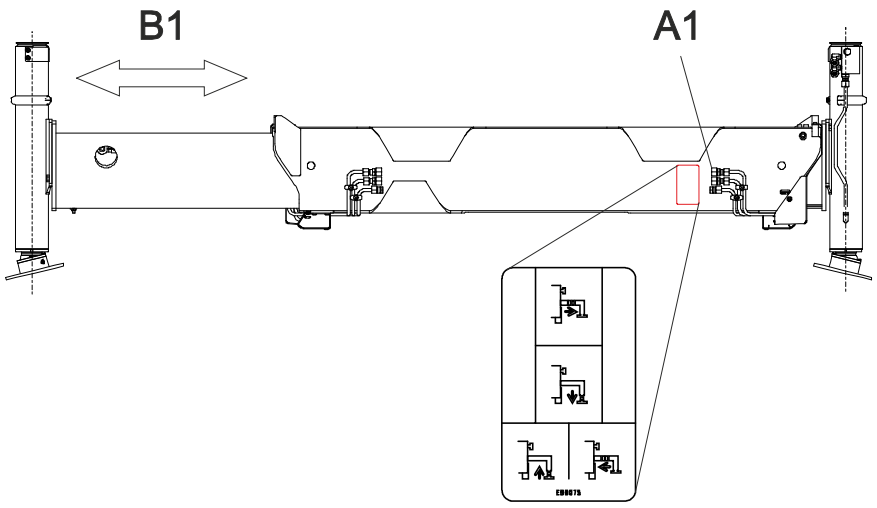

Illustration 07-00 38; Connection side and movement side of an additional stabilizer

A1	Connection side 1	B1	Movement side 1

For clear labelling of the connections to the additional stabilizers with three connecting lines, there is a sticker showing the directions of movement stuck on the stabilizer's crossbeam (see illustration 07-00 38).

7.6.4.1 8 control valve connections and 8 (10*) additional stabilizer connections

Some original PALFINGER additional stabilizers (e.g., BS019) are protected from mechanical overload by a pressure relief valve. These pressure relief valves have a leakage oil connection, which is symbolically visible in the hydraulic diagrams. The return of the leak oil of the pressure relief valve to the hydraulic tank must be carried out using a T-connection piece into the nearest tank line.

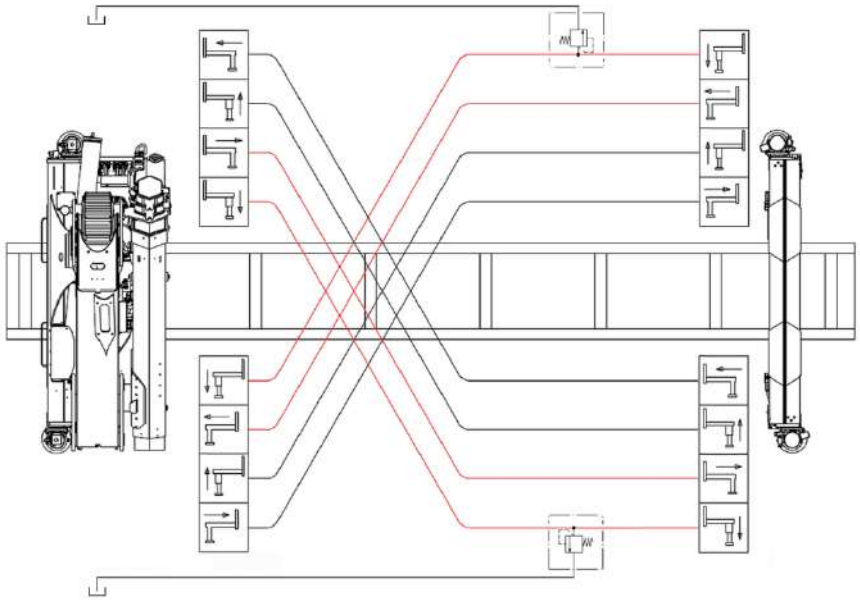

Illustration 07-00 39; 8 control valve connections and 8 additional stabilizer connections

4 (5*) lines:

- Extend arm (red) 16S
- Extend stabilizer cylinder (red) 16S
- Retract arm (black) 12S
- Retract stabilizer cylinder (black) 12S
- Leak oil line PRV * (black) 12L

7.6.4.2 6 control valve connections and 6 additional stabilizer connections

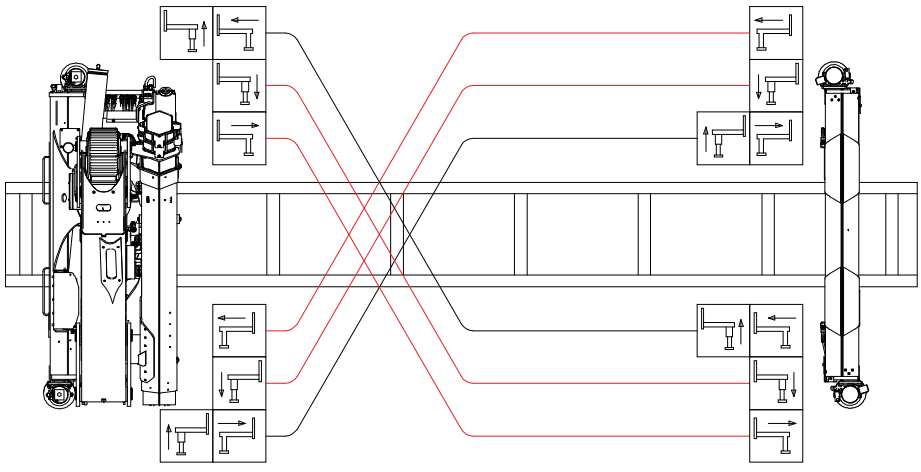

Illustration 07-00 40; 6 control valve connections and 6 additional stabilizer connections

3 lines:

- Extend arm (red) 16S
- Extend stabilizer cylinder (red) 16S
- Retract arm and stabilizer cylinder (black) 12S

7.6.4.3 8 control valve connections and 6 additional stabilizer connections

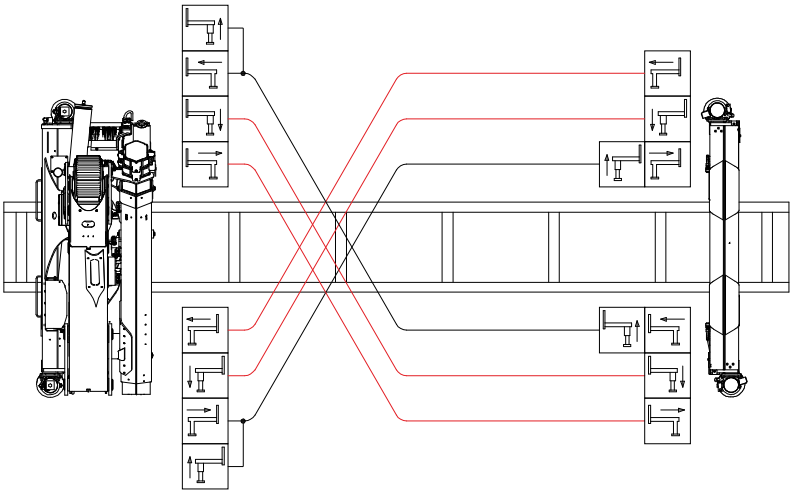

Illustration 07-00 41; 8 control valve connections and 6 additional stabilizer connections

3 lines:

- Extend arm (red) 16S
- Extend stabilizer cylinder (red) 16S
- Retract arm and stabilizer cylinder (black) 12S

7.6.4.4 6 control valve connections and 8 (10*) additional stabilizer connections

Some original PALFINGER additional stabilizers (e.g., BS019) are protected from mechanical overload by a pressure relief valve. These pressure relief valves have a leakage oil connection, which is symbolically visible in the hydraulic diagrams. The return of the leak oil of the pressure relief valve to the hydraulic tank must be carried out using a T-connection piece into the nearest tank line.

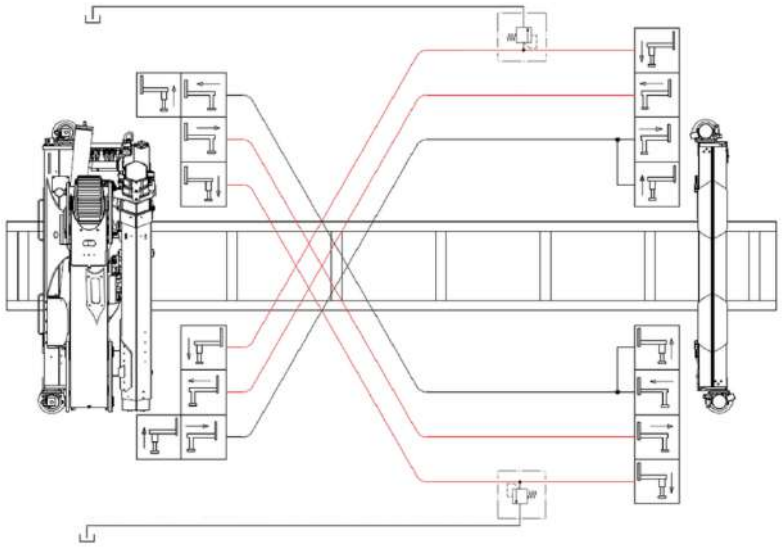

Illustration 07-00 42; 6 control valve connections and 8 additional stabilizer connections

3 (4*) lines:

- Extend arm (red) 16S
- Extend stabilizer cylinder (red) 16S
- Retract arm and stabilizer cylinder (black) 12S
- Leak oil line PRV * (black) 12L

7.6.4.5 Radio remote controlled stabilizers in front of the cab via lose control valve

Requirements:

- Radio remote control Palcom P7
- Radio remote controlled stabilizers for crane and auxiliary stabilizers

Option:

- Radio remote controlled frame stabilizer FFSt8+2

INFORMATION

When connecting the control valve with the stabilizers, the levers of the control valve and those of the radio remote control must point into the direction of movement of the stabilizer cylinders!

INFORMATION

When installing a double control valve, sufficient accessibility must be ensured. In emergency mode, the valves must be able to be operated manually by hand. Hand levers must be protected against accidental actuation or damage. This applies in particular to areas that could also be used as a climbing aid or treads.

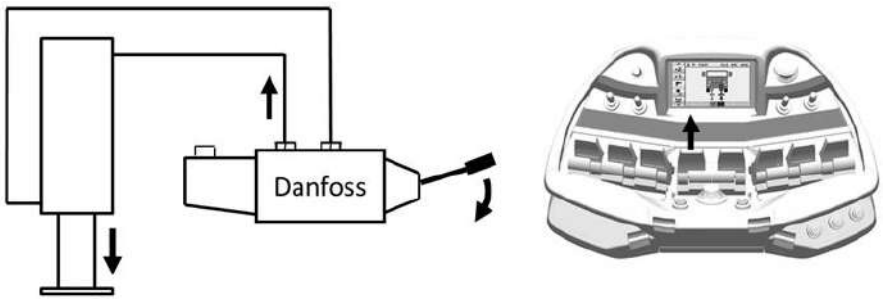

Illustration 07-00 43; Connection of radio remote controlled front stabilizer via loose control valve

7.6.5 Retraction and extension speeds of the outriggers

Do not exceed the maximum outrigger retraction and extension speed of 0.35 m/s (± 25 %).

INFORMATION

When the outrigger speed is exceeded, it is necessary to adjust the speed via check valve or lift stop on the control valve!

7.7 Electrical installation of the additional stabilizers

7.7.1 Electrical options on an additional stabilizer

A differentiation can be made on an additional stabilizer between the following four signal categories:

- Transport position monitor
- Stabilizer monitor
- Stability control
- Additional electrics

7.7.1.1 Transport position monitor

The transport position monitor checks that when the vehicle is in driving mode the extension arms are completely retracted. The fact that the arms are fully retracted is indicated in the driver's cab by an audible and a visual signal.

The following options are available:

AUSW	Checks by means of a limit switch whether the extension arm is fully retracted. The fact that the arms are fully retracted is indicated in the driver's cab by an audible and a visual signal.
ABSTW	The fully retracted position of the stabilizer cylinder and the stabilizer extension arm is monitored on the additional stabilizers by means of limit switches. The fact that the arms and cylinders are fully retracted is indicated in the driver's cab by an audible and a visual signal.
AUSVW	Checks by means of a limit switch whether the manual extension arm has been fully pushed in and locked in place. The fact that the arms are fully retracted is indicated in the driver's cab by an audible and a visual signal.

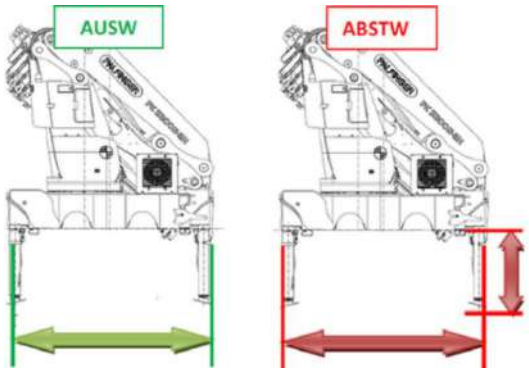

Illustration 07-00 44; Outrigger monitoring (left), stabilizer monitoring (right)

To be CE compliant either AUSW respectively AUSVW option is required.

INFORMATION

For cranes with S-IQ, the optical and acoustical warning signal (driver's cab) of all transport position monitoring systems is connected to the S-IQ system and output as a digital signal.

7.7.1.2 Stabilizer monitor

The stabilizer monitor checks the status of the crane stabilizer in crane operation mode. The stabilizer monitor is integrated into the crane overload system.

The following options are available:

AUS	The fully extended position of the stabilizer cylinder and the stabilizer extension arm is monitored on the additional stabilizers by integrated limit switches. The system is enabled through the crane's overload safeguard system.
ISC	Sensors on the additional stabilizers monitor whether the extension arms are retracted or semi or fully extended and whether the stabilizer cylinder is supported. The crane's ISC system regulates the levels of lifting power accordingly.

To be CE compliant the ISC option is required.

7.7.1.3 Stability control

The stability control unit calculates the vehicle's stability during crane operation. Stability is being recalculated for each crane position in real time.

	ISC-S	HPSC-E*	HPSC-L	HPSC
Only the position of fully extended outrigger gets captured	●		●	
Variable capture of outrigger position		●		●
Indication of support situation		●	●	●
Capture of slewing angle		●	●	●
Optional capture of boom angle via rotary encoder			●	●
Optional capture of lengths of extension booms for TEC 7 cranes				●
Expandable with additional stabilizer		● (only BS1)		●
Expandable with frame stabilizer				●
Expandable by supporting force measurement unit (FSTAB)				●
Expandable with load detection		●		●

*HPSC-E Only in combination with P40

HPSC-L = HPSC Light, HPSC-E = HPSC Economy, HPSC, HPSCP = HPSC-Plus with the options GEOM (geometry), FSTAB (stabilizer force) and LOAD.

7.7.1.4 Additional electrics

The following options are available:

BEL	Illumination of the stabilizer cylinder using LEDs. The lighting is configured on the stabilizer cylinder as the cabling is done internally.

7.7.2 General installation information

There is a printout of the electrical circuit diagrams in the connection box on the additional stabilizer. These can be obtained online via PALDESK.PALFINGER.com.

7.7.2.1 Connection box on the additional stabilizer

In order to enable installation to be done as flexibly as possible, the connection box is provided loose. The manufacturer of the superstructure must mount the box in a position suitable for the stabilizer in question. The connection must be terminated in accordance with the electrical circuit diagrams!

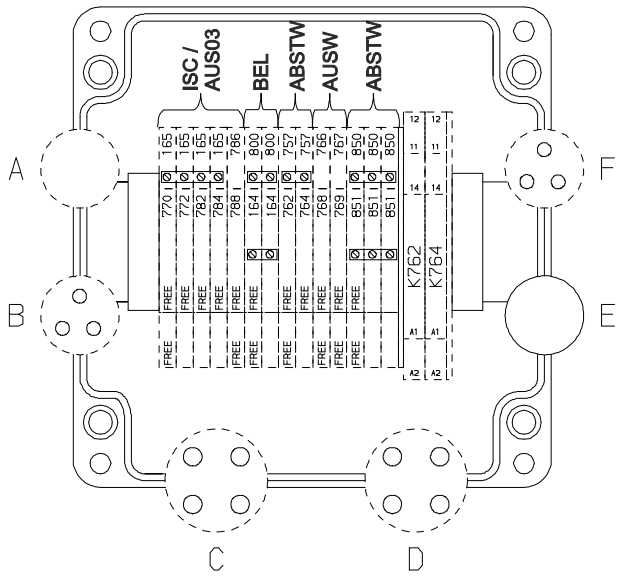

Illustration 07-00 45; Connection box from additional stabilizer

7.7.2.2 Nominal cable cross-sections

Line	24 V cable cross-section	12 V cable cross-section
Power supply (+ / -)	1,0 mm²	2,0 mm²
Signal lines	1,0 mm²	1,0 mm²

Multiple individual wires of a multi-pole cable (e.g., 18 x 1mm²) can also be connected for the power supply.

7.7.2.3 Handling of draw wire sensors on additional stabilizers

ACHTUNG

To prevent the additional stabilizers from being damaged in transit to the body builder company, observe the advice given on the transport pallet!

When mounting the additional stabilizers make sure not to damage the electronic components such as draw wire sensors which are installed on the additional stabilizers. If necessary, dismount the sensors before mounting the additional stabilizers.

INFORMATION

Generally, only professionally trained and accordingly authorized persons are allowed to dismount, mount or maintain the sensors!

When dismounting / mounting the draw wire sensors observe the following points:

- Sensor (draw wire sensor) must be disconnected from mains
- Pull only at the stepped rubber, never pull the wire directly
- Never let the wire return with a snap
- Avoid sharp edges and kinks
- The maximum length of wire extension must not be exceeded
- Do not pull out completely and wind up the wire using your hands
- Never bend or crush the wire
- The wire's pull-out angle must not be greater than 3°

For attaching / detaching the wire use the mounting bracket EKD-1003.

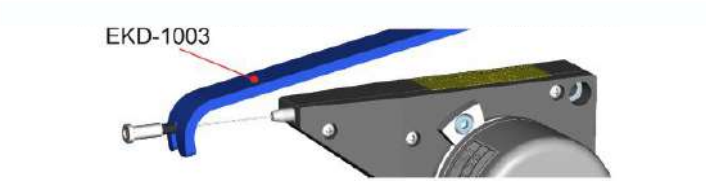

Illustration 07-00 46; Draw wire sensor

INFORMATION

Never directly wash electronic parts on the vehicle or crane with high-pressure cleaner (refer to operating instructions, section Cleaning)!

ACHTUNG

After any work being done on the sensors, they must be re-calibrated and tested for proper function!

7.7.3 ISC cabling

A detailed description of the ISC cabling can be obtained online in the Service Information C-01/2011 via PALDESK.PALFINGER.com.

Additional information on hard wiring, function and logic of ISC stability control can be obtained online in the training document "Paltronic 50 V5.4" via PALDESK.PALFINGER.com.

7.7.3.1 Example of ISC cabling on Paltronic 50 V4.6 and V5.4

To be CE compliant the additional stabilizer must be configured at least with options ISC and AUSW.

Any combination of an additional stabilizer with ISC-S or ISC-L is not possible.

In order to ensure that the ISC works perfectly, all the additional stabilizer's extension arms and stabilizer cylinders must be connected to the vehicle in the correct relation to their position.

As this depends on the superstructure (front-mounted or rear-mounted), the superstructure manufacturer must attach this as per the legend (see below) to the add-on board provided for this purpose.

The positions relate to the extension arms' actual position on the vehicle!

Connector right front (J01)
1. Arm right front half extended
2. Arm right front fully extended
3. Stabilizer right front fully supported

Connector left front (J02)
4. Arm left front half extended
5. Arm left front fully extended
6. Stabilizer left front fully supported

Connector right rear (J03)
7. Arm right rear half extended
8. Arm right rear fully extended
9. Stabilizer right rear fully supported

Connector left rear (J04)
10. Arm left rear half extended
11. Arm left rear fully extended
12. Stabilizer left rear fully supported

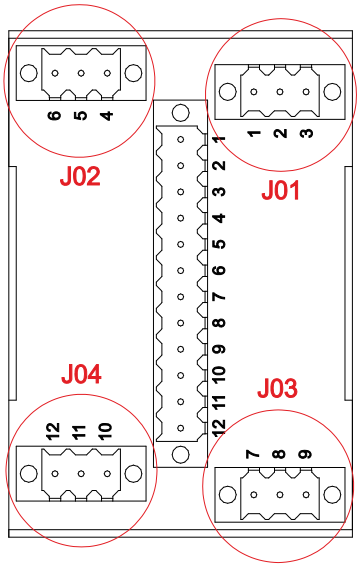

Illustration 07-00 47; Add-on board

INFORMATION

If the crane has no additional stabilizer, the corresponding male connectors are not used. The unused connectors must not be bridged. The factory setting may need to be corrected in accordance with the actual bodywork (see chapter 9 "Electric system on the crane").

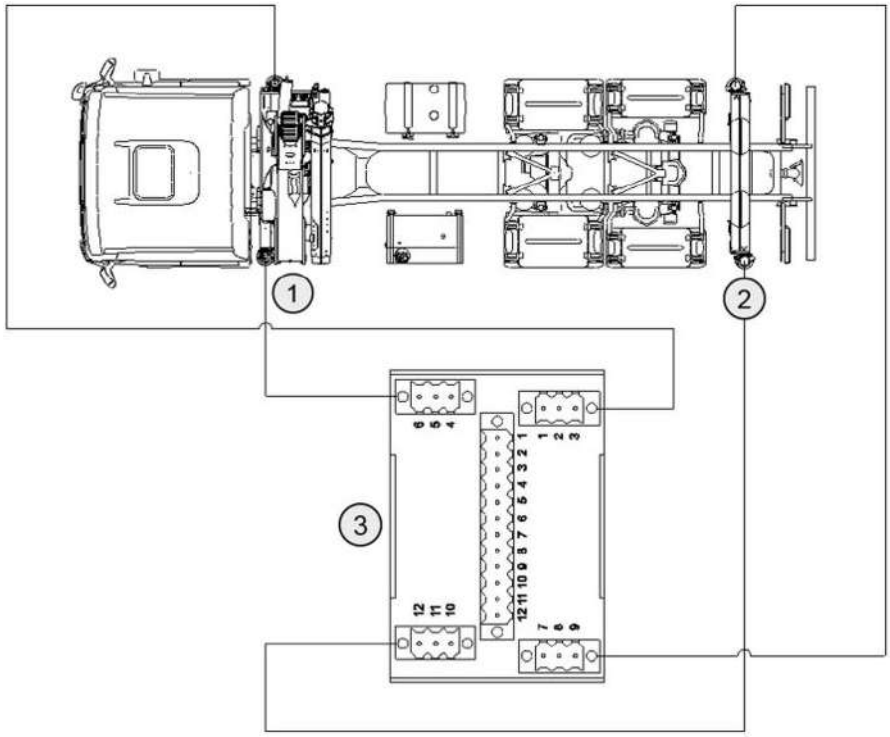

Illustration 07-00 48; Example of front-mounted crane; balance facing backward; additional stabilizer rear-mounted

1	Crane stabilizer	3	ISC extension board
2	Additional stabilizer		

If a crane with ISC-S or ISC-L is to be retrofitted with an additional stabilizer, the FLEZUS (four relays) function and a (*) jumper each (see wiring diagram below) have to be retrospectively fitted in the electrical slider box. On cranes with additional stabilizers and ISC the FLEZUS function and the (*) jumpers are fitted as standard.

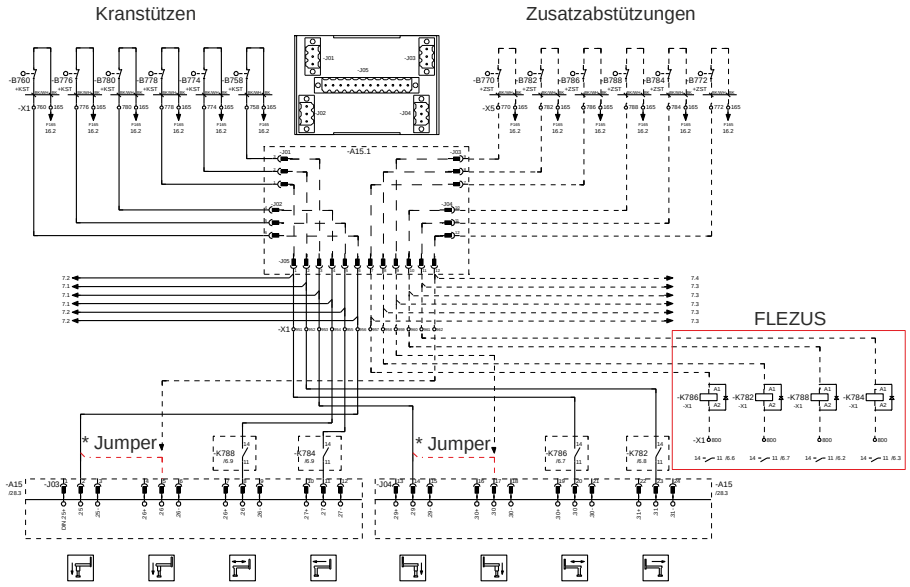

Illustration 07-00 49; Example ISC slider box (excerpt from crane electrical circuit diagram)

7.7.4 Wiring additional stabilizers Pal40 with BS001 (without SI-Q)

INFORMATION

It is not possible to retrofit the wiring for additional stabilizer. The complete electrical kit must be replaced.

7.7.4.1 Connection / Connection plan

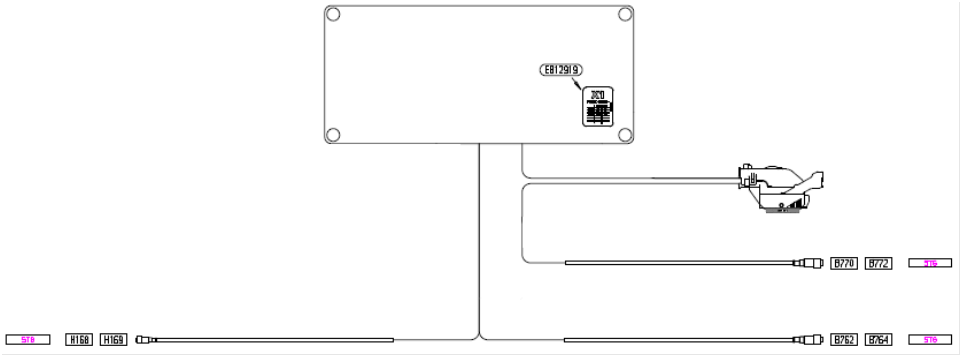

Illustration 07-00 50; Overview Plug

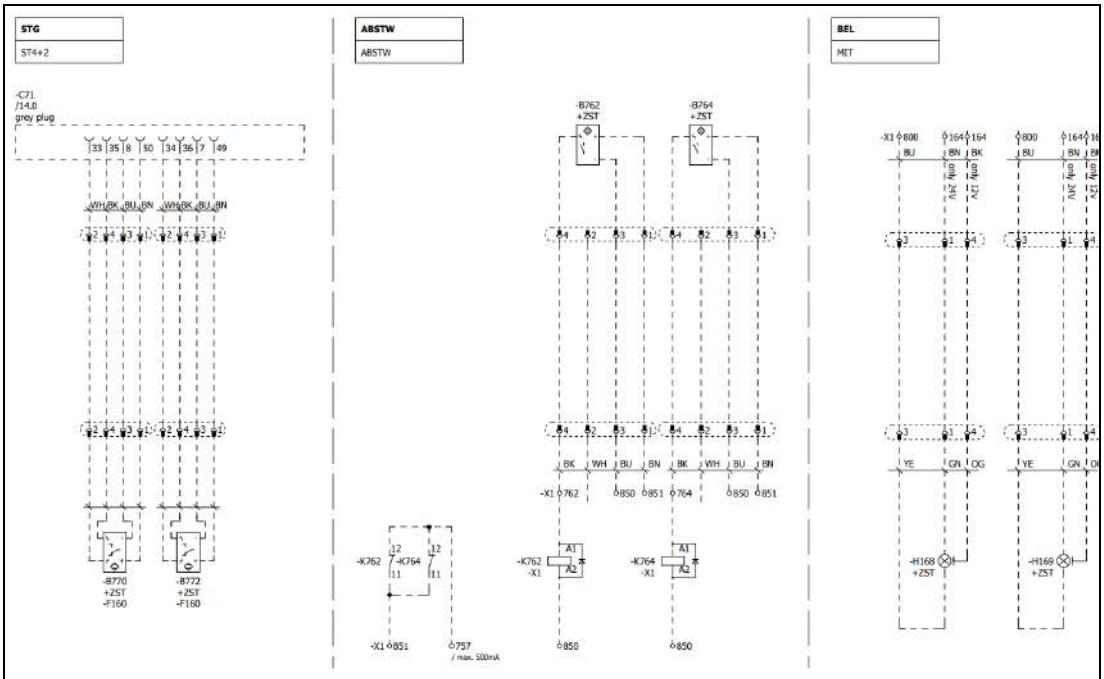

Illustration 07-00 51; Example junction box / plug (excerpt from crane electrical wiring diagram)

7.8 Wiring diagram S-IQ

7.8.1 General overview

System requirements:

- Paltronic 150
- SH / TEC crane

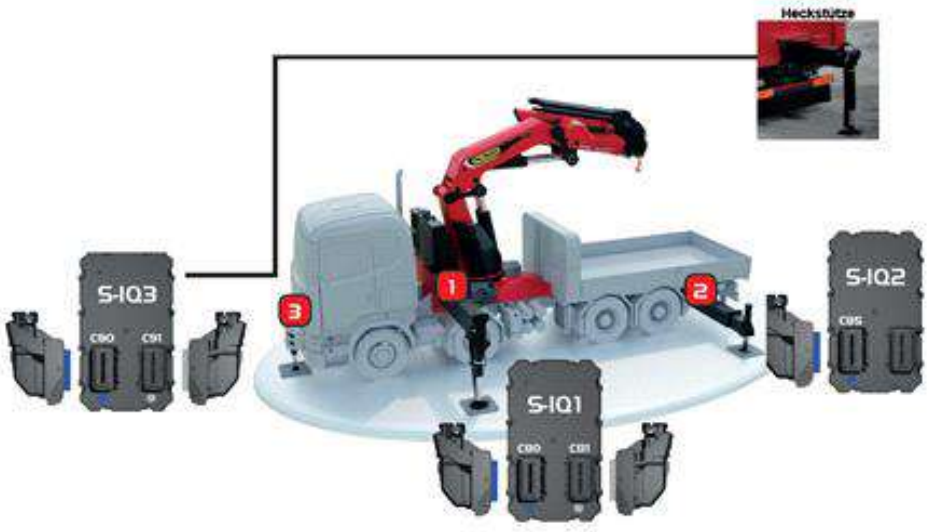

Illustration 07-00 52; Overview S-IQ

1	S-IQ1 crane support (directly connected to X5-box)	3	S-IQ3 frame support (directly connected to X5-box)
2	S-IQ2 additional support (connected to S-IQ1 via CAN-bus)		

The S-IQ systems are assigned to supports and labelled with S-IQ1, S-IQ2 und S-IQ3 as shown. S-IQ1 is connected to PALTRONIC 150 via CAN sensor bus.

The support signals are processed in an electronic control unit S-IQ and communicate with the crane electronics by means of a CAN bus signal. A separate electronic control unit is included per stabilizers pair. This unit can be mounted on the standard position on the outrigger box or individually on the vehicle.

S-IQ1:

The crane stabilizers are wired, factory connected and tested. The version of the S-IQ1 cable harness depends on the crane equipment.

The digital input of the ballast weight LCA03 is located at the grey connector (C81) on S-IQ1 electronic box of the crane stabilizers.

S-IQ2:

The S-IQ2 electronic box may basically be mounted individually (also on the truck frame) with threaded holes on both side of the cross beam for the fixation).

S-IQ3:

The S-IQ3 electronic box has 2 connections. The second plug (grey) is prepared to take pressure transducer signals.

The digital inputs for ballast weight LCA05 and LCA06 are also included in the S-IQ3 electronic (Connector C90 blue).

INFORMATION

The S-IQ1 and S-IQ3 electronics are interchangeable. Thanks to the plug & play solution mentioned above, installation reliability and the necessary assembly time (connection of the additional stabilizers, etc.) have been considerably simplified.

INFORMATION

PALFINGER cranes with PAL50 control are not S-IQ capable, so the additional stabilizers must be hard-wired.

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PALFINGER cranes with PAL50 control are not S-IQ capable, so the additional stabilizers must be hard-wired.

INFORMATION

The currently applicable wiring diagrams can be obtained online via PALDESK.PALFINGER.com

7.8.1.1 S-IQ conversion of front and additional stabilizers

Due to market inquiries and consideration of the cost-effectiveness of a new crane exchange without changing the vehicle, additional stabilizer with "old steel construction" can be rebuild with S-IQ conversion kits.

However. for a conversion to the S-IQ system it is required, that the additional stabilizers are already equipped for HPSC (full version).

INFORMATION

More information can be obtained online in the document "S-IQ conversion of front and additional support" via PALDESK.PALFINGER.com.

7.8.1.2 Wiring diagram S-IQ1 / S-IQ2 / S-IQ3

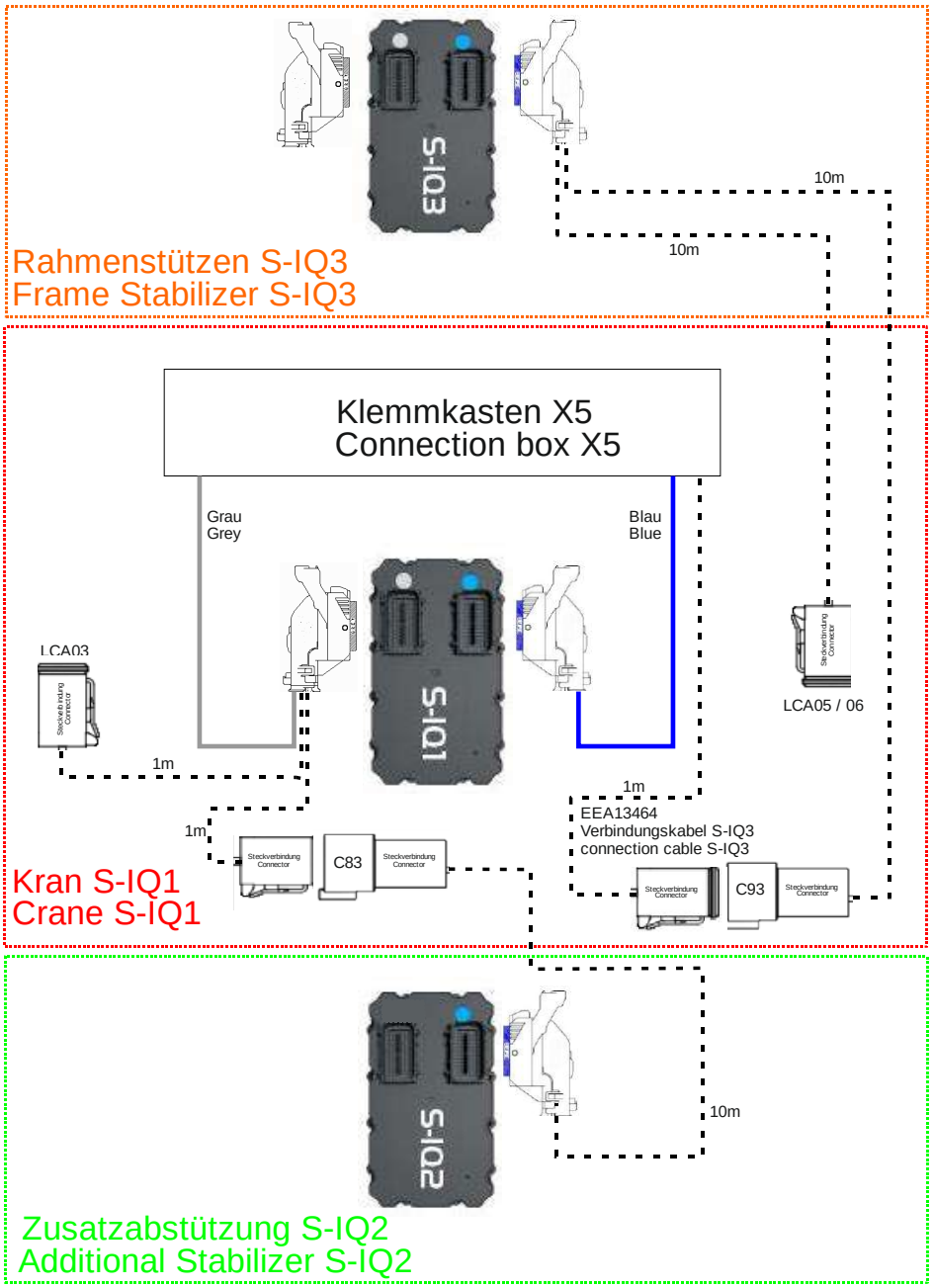

Illustration 07-00 53; Wiring diagram S-IQ1, S-IQ2, S-IQ3

7.8.1.3 Wiring diagram S-IQ1 / S-IQ2

- S-IQ1 Crane stabilizer
- S-IQ2 Additional stabilizer

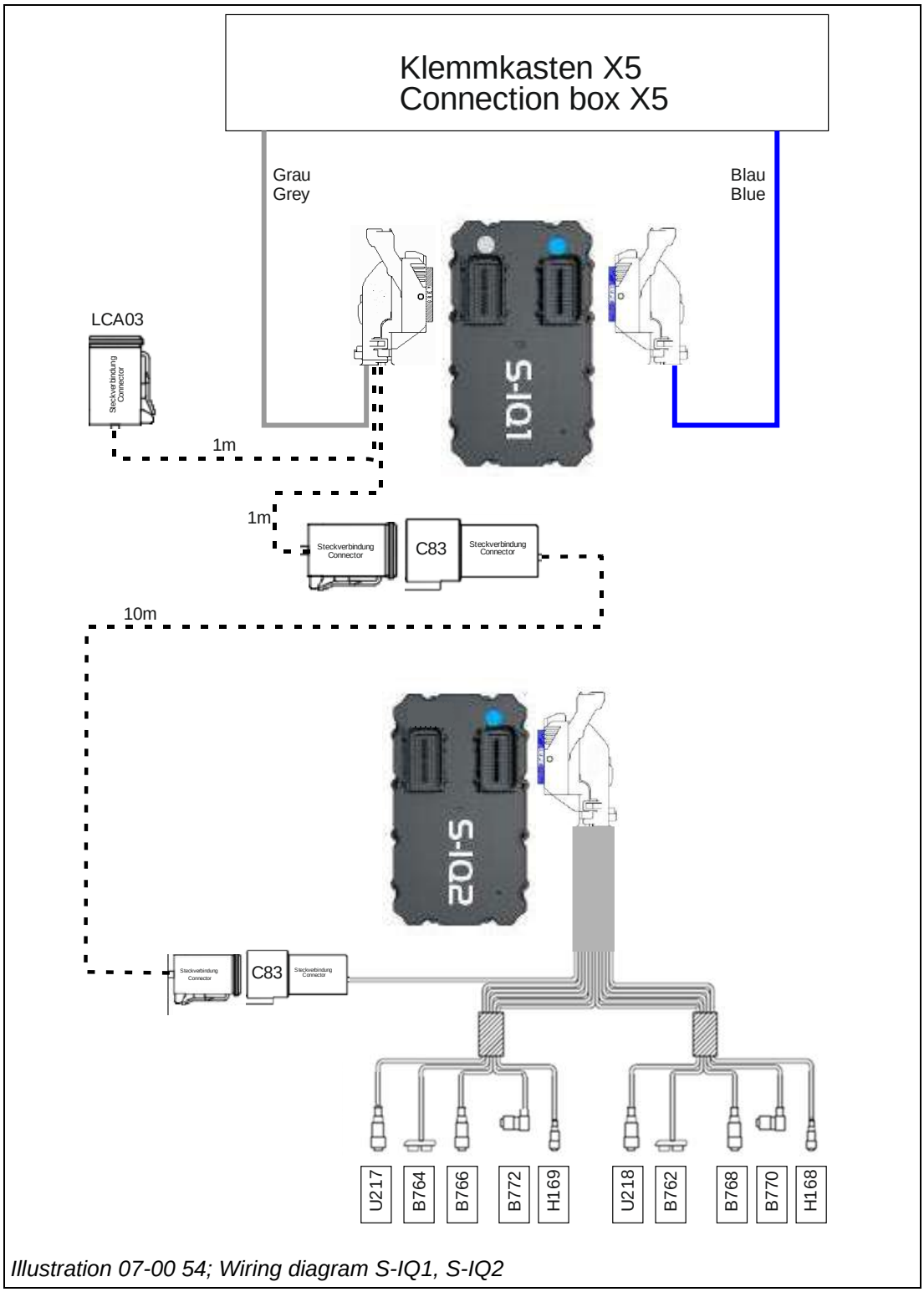

Illustration 07-00 54; Wiring diagram S-IQ1, S-IQ2

7.8.1.4 Wiring diagram S-IQ1 / S-IQ3

- S-IQ1 Crane stabilizer
- S-IQ3 frame stabilizer (figure: one front stabilizers)

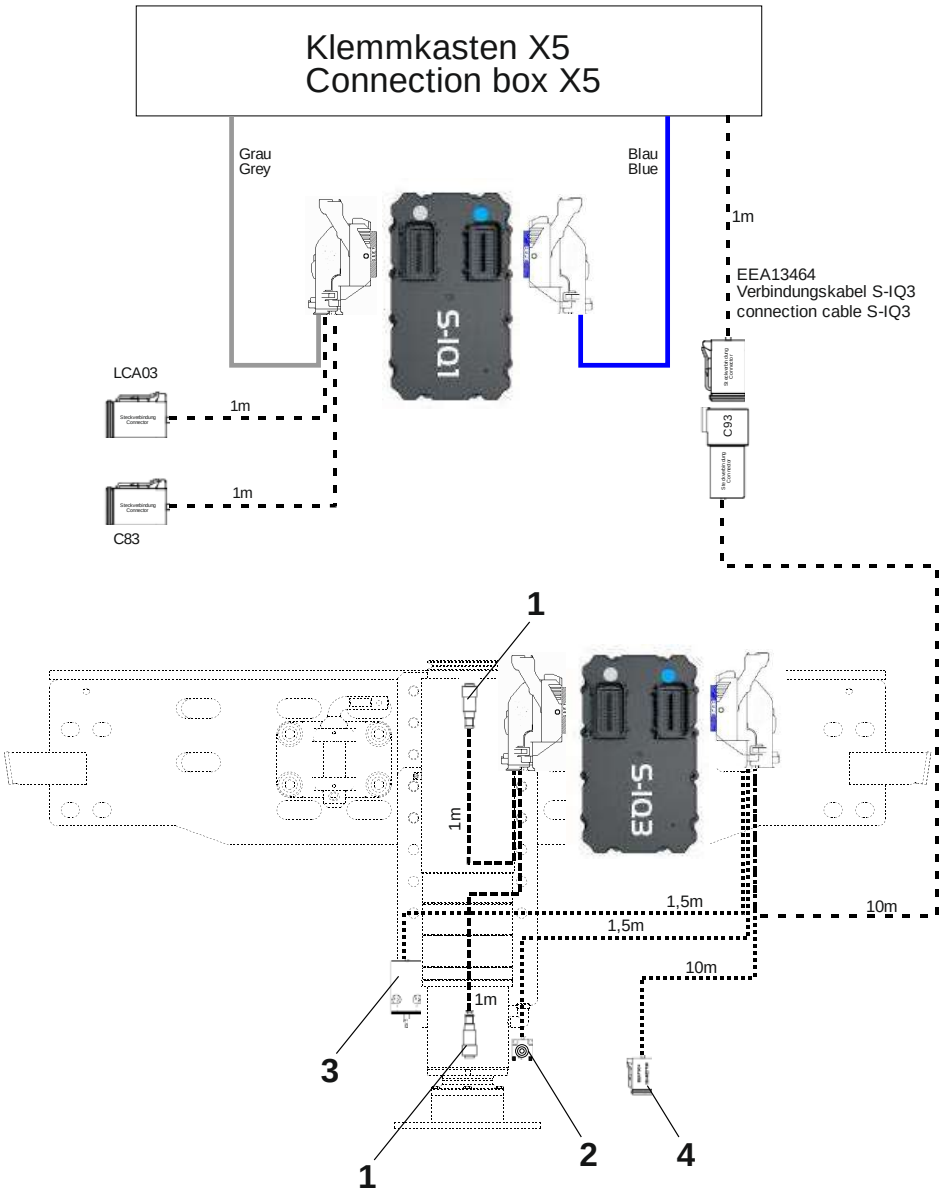

Illustration 07-00 55; Connection plan S-IQ1, S-IQ3

1	Pressure transducer (frame overload) 2 pieces	3	Frame stabilizer (supported) 1 piece
2	ABSTW (frame stabilizer) 1 piece	4	Connection (LCA05 / 06)

7.8.1.5 Connection plan S-IQ1 / S-IQ3

- S-IQ1 Crane stabilizer
- S-IQ3 frame stabilizer (figure: two front stabilizer)

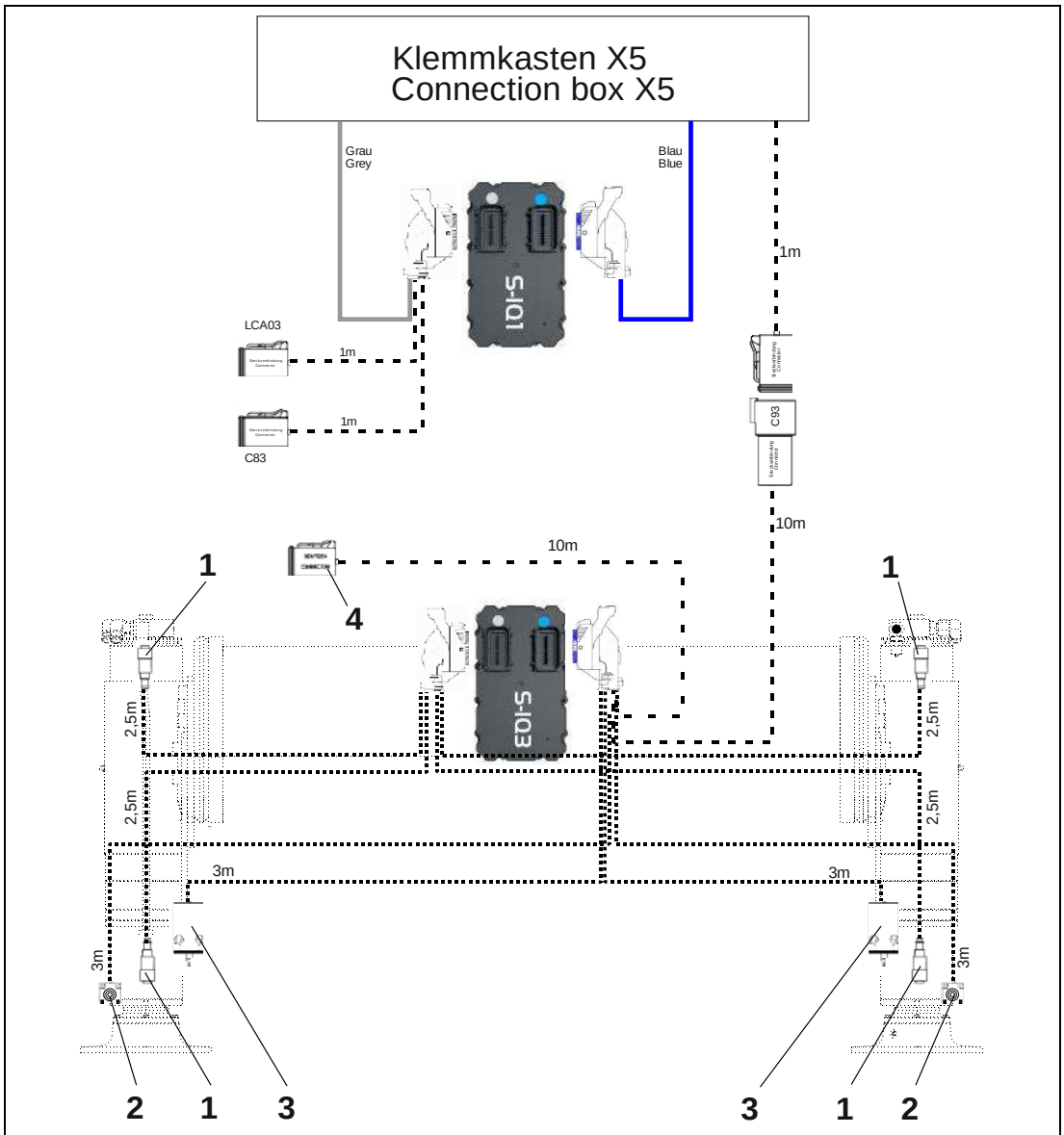

Illustration 07-00 56; Connection plan S-IQ1, S-IQ3

1	Pressure transducer (frame overload) 4 pieces	3	Frame stabilizer (supported) 2 pieces
2	ABSTW (frame stabilizer) 2 pieces	4	Connection (LCA05 / 06)

7.9 Preserving / Painting the additional stabilizers

The additional stabilizers are shipped KTL-coated. Areas grinded down to bare metal for welding work must be protected against corrosion again once the welding work is done.

You can paint straight onto KTL-coated surfaces. Just make sure that the surfaces are free of any fat, oil, rust or dirt and are dry.

If the subframe is going to be sandblasted with the additional stabilizer welded on, all add-on parts and the extension arms with the stabilizer cylinders must be taken off.

ATTENTION

Hot galvanizing may not to be used as corrosion protection for the additional stabilizers or any of its parts!

PALFINGER Installation Guideline
Hydraulic Loader Crane

Chapter 8

Mounting remarks for the crane hydraulics

Original Installation Guideline

DA-105

Version: 2023/03

English

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Contents

8.1 General

Flawless work with the hydraulic loader crane requires that the hydraulic connection has been established correctly.

When mounting a loader crane, the mounting company will normally have to install all the lines and components described below, with the exception of the high-pressure filter.

Many crane models have the option of ordering the oil tank and oil cooler pre-mounted. So, only hydraulic pump, suction line plus pressure line and, if any, leakage and LS lines must be mounted.

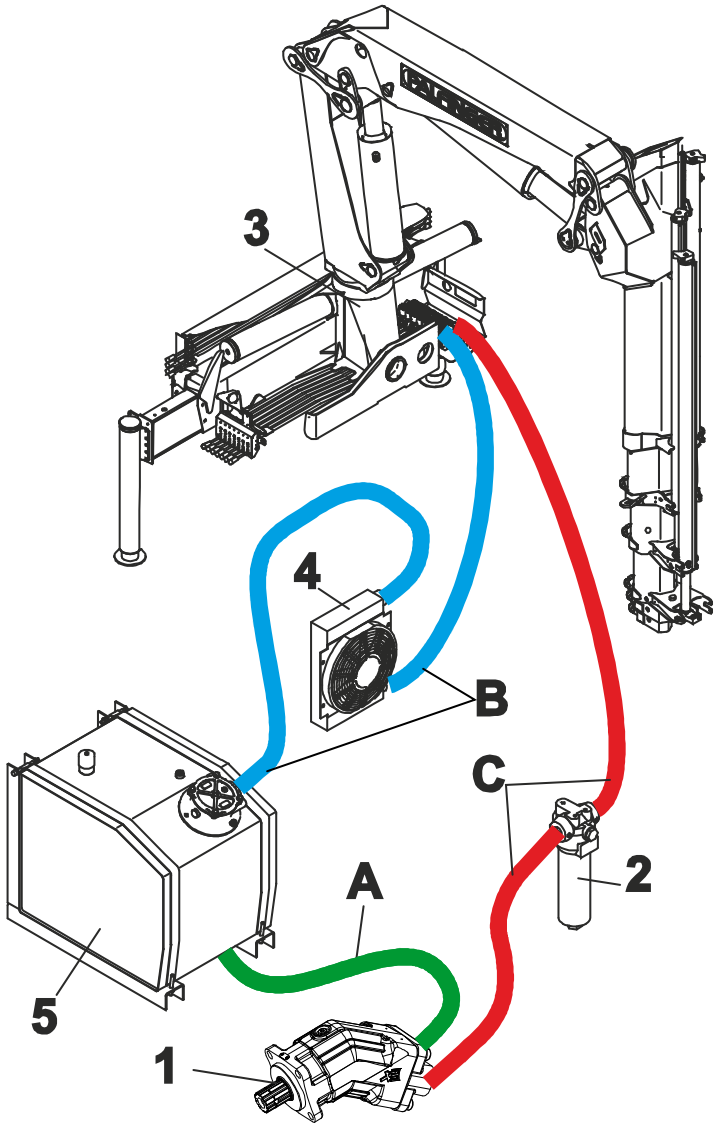


Illustration 08-00 1; Schematic sketch of a hydraulical crane installation

1	Hydraulic pump	A	Suction line
2	High-pressure filter	B	Return line
3	Loader crane	C	High-pressure line
4	Oil cooler		
5	Oil tank with return and ventilation filter		

8.2 Oil lines on the loader crane and mounting

8.2.1 Pipes

Usually, hydraulic pipes are used in places where the connection points are not subject to relative movements.

While producing and mounting the unit observe the following points:

- Avoid using elbow unions
- For producing bending radii always use pipe bending equipment
- Select bending radii that comply with the manufacturer's specifications (usually the bending radius is greater than or equal to three times the pipe diameter)
- Deburr and rinse the pipe ends, and until installation store them in a closed place to prevent them from contamination
- Always install the parts when not under tension
- Use elastic clamps for fastening
- Use only ORIGINAL PALFINGER hydraulic lines when replacing PALFINGER hydraulic lines

ATTENTION

Cotton waste and other fibrous material must not be used to clean hydraulic components.
Dirty or otherwise corroded pipes must not be installed.

8.2.2 Hoses

Hose lines are used in hydraulics to join connections which move relative to one another. In addition, hose lines have a damping effect on transmission of structure-borne sound.

Hoses may not be mounted so that they are taut or twisted under any circumstances.

Observe installation regulations and manufacturer’s technical information regarding laying and use precisely.

8.2.2.1 Shut-off valve

Mount a shut-off valve at the suction nozzle to allow the line or pump to be replaced without emptying the tank.

Use high quality Teflon tape or hemp for the installation. When mounting, make sure that the valve can be fully opened and closed again. An additional use of mounting clips counteracts vibrations and oscillation in the suction line.

8.2.3 Bursting strength

Burst protection is used to avoid serious accidents or injuries to liquid jets as well as fatal accidents, which is why a burst protection must be installed on every high-pressure hose (e.g., LS hose).

Burst protection hose requirements:

- Protection against abrasion and damage
- High tensile strength

Invert the end of the burst protection hose and secure it with cable ties in the area of the hose compression.

Illustration 08-00 2; Burst protection hose

Make sure that the pipes, hoses and connecting elements are adequately burst-proof.

Pipes	Hoses
Safety factor 2.5 against bursting	Safety factor 4 against bursting

To protect persons, the hoses near the operator stations have to be protected by covers.

If the connection pump-crane can be uncoupled, the line must be secured with a pressure control valve (see chapter 6, Crane Installation on removable Mounting Console).

8.2.4 Laying rules

Attach pressure lines (hose / pipe) to the frame with clamps to counteract vibrations or movements of the pressure line.

Pipes and hoses can also be attached together. Attach them to the vehicle frame or subframe with suitable brackets.

- Since it is not always possible to fasten the hoses with suitable brackets, cable ties may also be used for secure attachment, according to the vehicle manufacturers.
- Only attach to other lines or original vehicle lines if potential resulting forces and relative movements (e.g., in the case of pressure pulses) can also be absorbed.

INFORMATION

Suitable hose brackets or hose clamps are available in the PALFINGER commodity spare parts catalogue.

- Keep distance to rotating vehicle parts
- Keep distance to the exhaust and exhaust attachment parts. If unavoidable, use heat protection hoses.

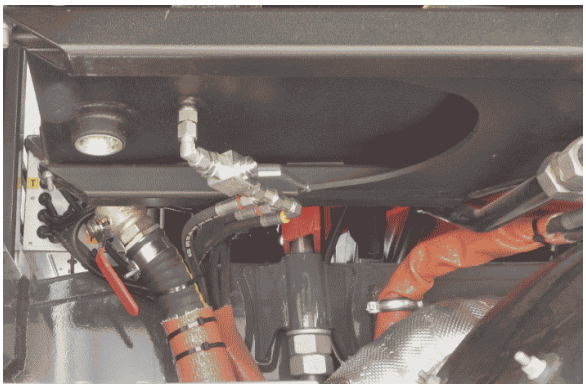


Illustration 08-00 3; Heat protection hoses (red)

8.2.5 Pressure lines

The supply lines to the crane and the crane's working lines are called pressure lines.

Characteristics are:

- Oil speed relatively great: v = (3), 5 - 7 m/s
- Pressure very high: pmax = 385 bar
- Maximum flow corresponds with maximum pump flow rate at adjusted engine speed. Qmax = QPump
- Relatively small line diameter

By nature, the greatest line friction is caused in the pressure lines due to the installation of valves and the relatively small diameters. Therefore, they should be laid with as few hydraulic resistors as possible (no unnecessary angles, etc.).

8.2.6 Return line

The return line is the connection between the control block and the tank for the oil flowing back.

If it is required, the oil cooler is built into the return line.

Their typical characteristics are:

- Large diameter so that dynamic pressure stays low
- No pressure (except dyn. pressure): p = 0 - about 15 bar
- Oil speed low: v = 1 - 3 m/s
- Discharge high Q_{max} = about 1,6 x Q_{Pump}

INFORMATION

If the return lines in dual-circuit systems must be connected to build one line, the two volume flows must be summed up for dimensioning of downstream elements! This concerns in particular the line cross-sections and the return filter.

8.2.7 Suction line

The suction line is the connection between the tank and the pump; it should be as large and as short as possible.

Their typical characteristics are:

- Very large diameter
- Oil speed minimal: v = 0.5 -1 m/s

In order to prevent cavitation any hydraulic components except the shut-off valve must not be installed between tank and pump.

The line cross-section should be selected so that the pressure at the suction connection does not fall below 0.8 bar (abs.) and does not exceed 2 bar (abs.).

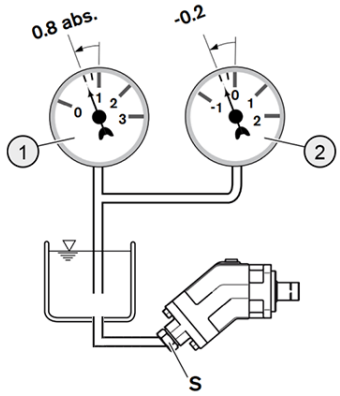


Illustration 08-00 4; Pressure measurement suction connection

1	Absolute pressure gauge	2	2 Standard pressure gauge

Make sure that the connections are airtight.

Use only hoses that are suitable for vacuum (e.g., plastic hoses with spiral).

ATTENTION

If the suction line is too long there is danger of cavitation forming on the hydraulic pump. In order to avoid it, an integrated crane tank must not be used for rear mounting.

8.2.8 Leak oil lines

Leak oil from the hydraulic motors must be returned without pressure to the tank, above all for cranes with an endless slewing system and / or with a rope winch.

The leak oil line must therefore lead to a separate leak oil connection on the tank, standard on PALFINGER tanks.

8.2.8.1 Leak oil lines of the crane

The leak oil line is always led through the rotary distributor, even if it is not used, on cranes with infinite slewing gear. This simplifies the later addition of a winch if this should be required.

Especially with cranes with endless slewing system and / or rope winch, the leak oil of the hydraulic motors must be led into the tank without pressure.

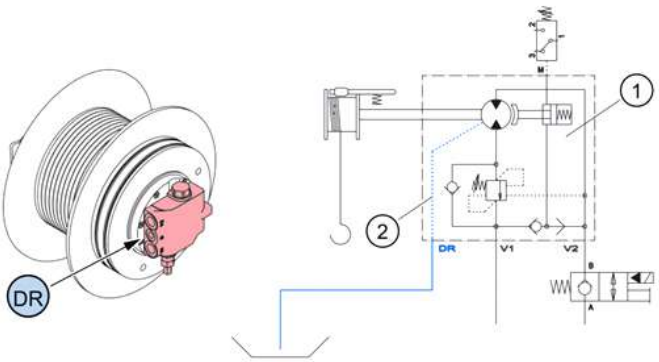


Illustration 08-00 5; Leak oil hydraulic motor rope winch

1	Lowering brake valve	2	Leak oil (DR)

Under no circumstances may the leak oil line be combined with the return line of the crane as the dynamic pressure of the system would otherwise build up in the leak oil line.

8.2.8.2 Leak oil line of hydraulic pump

If hydraulic pumps with their own leak oil line are used, the line must also lead back to the tank without pressure.

It is important that this line is led under the oil level in the tank to prevent air from being "sucked in" by this line. In addition, the line must be laid in such a way that the housing of the hydraulic pump is always filled with oil and that air is prevented from entering at the radial seal, even during longer idle times.

Whether this line is necessary or not depends on the pump model (see pump manufacturer's documentation). Observe strictly any mounting instructions from the manufacturer.

The leak oil line can also be connected to the bottom of the tank. Make sure to install an additional shut-off valve.

Illustration 08-00 6; Leak oil line with an additional shut-off valve

8.2.9 Load sensing line of the variable displacement pump

If a variable displacement pump is used, the load-sensing line must be connected between the LS connection on the proportional distributor valve and the signal input on the variable discharge pump.

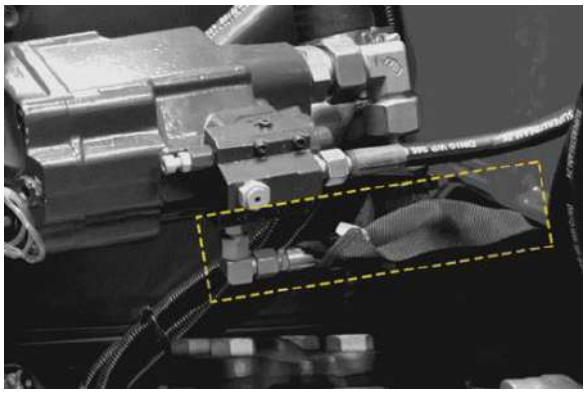


Illustration 08-00 7; Connection of the LS line to a variable displacement pump always with burst protection

The LS line is always led through the rotary distributor, even if this is not used, on cranes with endless slewing systems. This simplifies a later conversion to variable discharge pump which may be desired.

INFORMATION

LS lines are only required for pressure-flow-regulators with load sensing. Electric control systems (proportional adjustment) are controlled by solenoid valves (currently not in use at PALFINGER).

8.3 Selection of the hydraulic line cross-section

8.3.1 General dimensioning recommendations

The PALFINGER software PAC Online (calculation of installation on vehicle) includes the function "hydraulic system".

It calculates the pipe diameters specifically required for each installation, based on guidelines that are prescribed for the selection of suitable minimum diameters at hydraulic connections. They are explained in the next section.

Based on the defined volume flows at the pump (nominal volume flow of crane) PALFINGER recommends the use of the nomogram (Illustration 08-00 8) for calculations of line cross-sections.

For rear-mounted cranes or for longer lines, the lower limits of the flow velocity must be used. If in doubt, use the next larger nominal size.

8.3.2 Determining suitable dimensions:

The selection of the line cross-section is extremely important so that frictional loss in the pressure area is kept as small as possible and the oil flow in the suction area is not disrupted.

The table below shows the recommended flow speeds:

- Suction line [S]: 0,5 - 1 m/s
- Return line [R]: 1 - 3 m/s
- Pressure line from pump to control valve [P]: 3 - 5 m/s
- Work lines at the crane: 5 - 7 m/s

The longer the line, the larger the cross-section that should be selected!

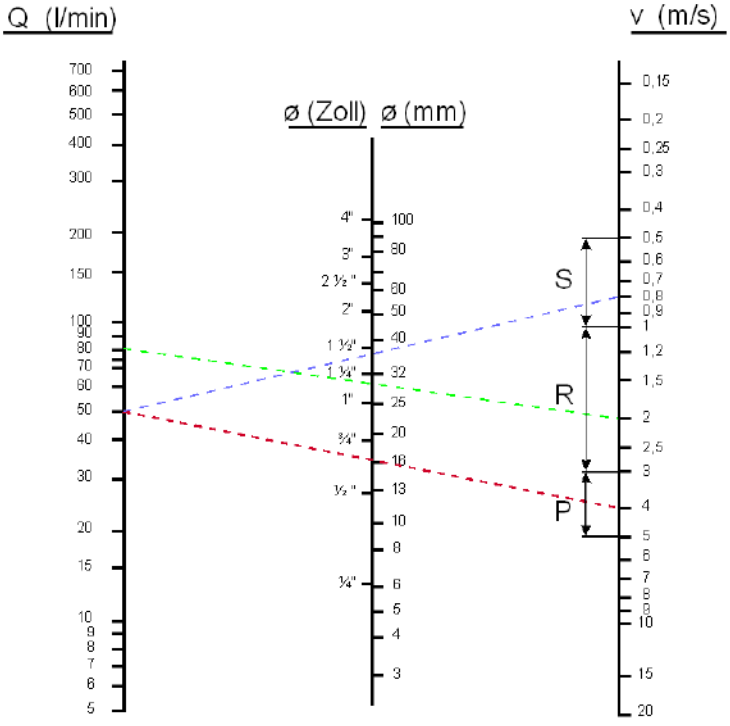


Illustration 08-00 8; Nomogram for calculation of line cross-section

By combining the two factors volume flow [l/min] and flow speed [m/s], the above table will give you the optimum line cross-section.

Note: Here you must use the volume flow in the pipe, not the pump flow (especially return line ➔ Qmax = about 1,6 • Qpump)

The result of the graphical dimensioning has to be rounded up to the next line nominal diameter.

ATTENTION

Pay careful attention to the correct dimensioning of the lines and hoses.

If the lines are dimensioned too small, there will be excessive dynamic pressure in the lines, leading to excessive heating of the oil.

8.4 Hydraulic oil filtration

8.4.1 Description

Filters ensure oil purity of the device and thus protects the hydraulic components from damage and malfunction.

In normal situations, a high-pressure filter and a return filter are installed on the crane. Moreover, a ventilation filter is used on the tank. Suction filters are not recommended due to the risk of cavitation.

Filters must be designed for the system (oil flow); damage results if the flow rate is too great.

Every hydraulic filter has an integrated bypass which responds when the overpressure has been reached and allows the oil flow to pass through unfiltered.

The following are used:

High-pressure filter	With a fineness of 5µm absolute, with bypass function
Return filter	With a fineness of 10µm absolute, with bypass function. Here you must use the volume flow in the pipe, not the pump flow (especially return line ➔ Qmax = about 1,6 • QPump). If at dual circuit systems the summarized volume flow exceeds the maximum liter input of the filter you are not allowed to combine the two return lines to one pipe. The two return lines have to be connected to the tank separately
Ventilation filter	With a fineness of 3 µm absolute

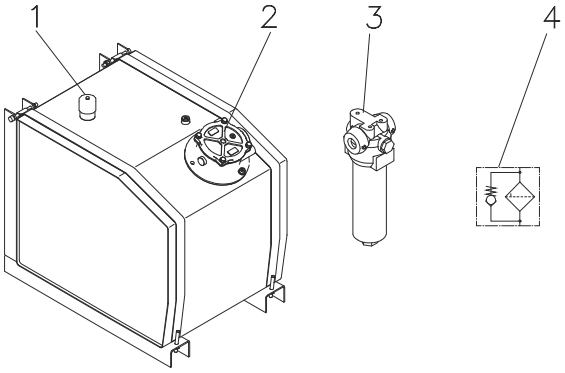


Illustration 08-00 9; Filters on the crane

1 Ventilation filter
2 Return filter
3 High-pressure filter
4 Hydraulic symbol filter + bypass

8.4.2 Filter installation and maintenance

Optimal accessibility is especially important so that maintenance work can be performed quickly and carefully.

The purity of the hydraulic oil and the useful life of the hydraulic system are directly related to one another.

A change of all filter elements (even of the tank ventilation filters) after initial start-up has proved effective.

All other maintenance has to be executed in the intervals given in the operating instructions.

As a rule, all filter elements should be replaced in the course of the PDI check – before the handover to the customer, after the HPSC check.

INFORMATION

All PALFINGER cranes are equipped ex works with a high-pressure filter matched to the crane type.

INFORMATION

For cranes with a factory delivery date of 01 May 2021 or later, the pre-delivery inspection with filter change is mandatory and must be documented accordingly.

Further information on this can be obtained online in Service Information I-GG-2102 via PALDESK.PALFINGER.com.

ATTENTION

Due to the risk of cavitation, suction filters are not used at PALFINGER.

ATTENTION

Only original PALFINGER filter elements may be used.
If parts from other companies are used, the warranty and guarantee claims are void

8.5 Oil tank

8.5.1 General

- Do not position the oil tank in the exhaust area (exhaust pipe or exhaust opening) to avoid heating of the hydraulic oil and risk of fire.
- Position the oil tank above pump level (reduced risk of cavitation).
- Position the oil tank as close as possible to the pump (reduced risk of cavitation).
- Lead the suction line as straight as possible to the pump (reduced risk of cavitation).
- For rear mounting always use a separately mounted oil tank. With an integrated oil tank, the suction line is too long.
- Install a shut-off valve next to the suction connection to ensure work on low-lying hydraulic components without emptying the oil tank.
- PALFINGER refers to the PAC-Online hydraulic calculation module for the design of the hydraulic system.

WARNING

Risk of fire! Do not position the oil filler neck near the exhaust.

8.5.2 Description

In the hydraulic system, the tank serves as an equalizing tank for the volume difference of the differential cylinders; in addition, its large exterior surface has a considerable cooling effect.

Besides the return and ventilation filters and the required connections, an oil tank must also be equipped with steadying plates (baffles) to prevent flow turbulence in the tank.

Every tank consists of the following components.

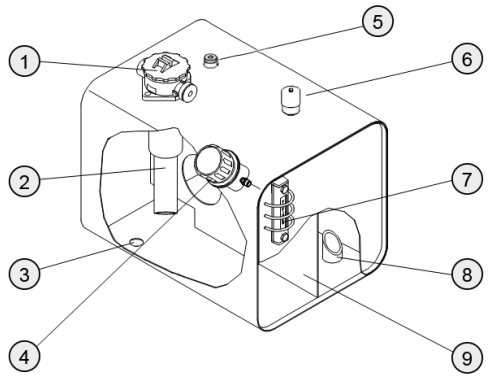


Illustration 08-00 10; Components of an oil tank

1	Return flow filter	6	Vent filter
2	Return connection	7	Fill level indicator
3	Drain plug	8	Suction connection
4	Filling port	9	Baffle
5	Leak oil connection		

On most of the tanks, a thermometer which shows the oil temperature has been integrated into the fill level gauge.

8.5.3 Mounting of oil tanks

For reasons of space or technical reasons, the tank can also be mounted on the chassis frame. Crane variants with an already integrated tank are also available.

Advantages of integrated tanks on the crane base:

- Pre-installation reduces installation time
- Reduced risk of cavitation
- Short hydraulic lines
- Space-saving due to compact design
- No relocation or adaption work
- Good accessibility

INFORMATION

For many crane models there is an option to order the oil tank pre-assembled.

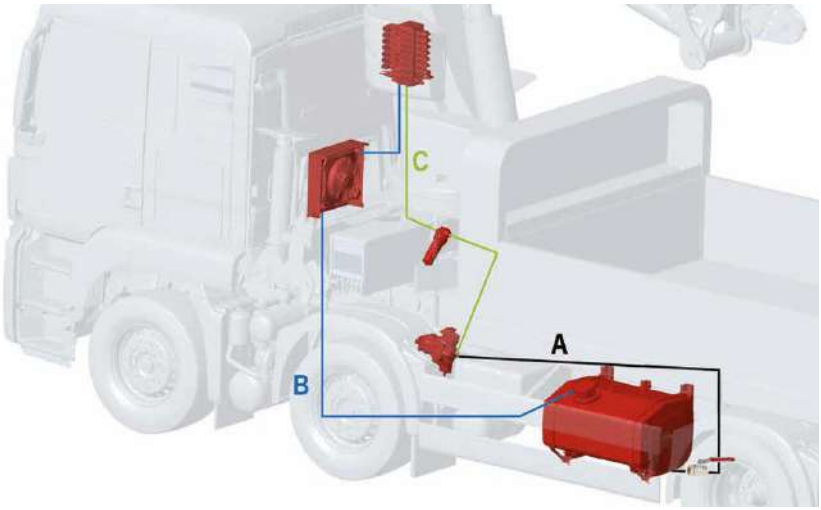


Illustration 08-00 11; Oil tank mounted on the chassis frame

A	Suction line
B	Return line
C	Pressure line

- When mounting the tank (selecting the mounting position), make sure that
  - The tank can be filled without any trouble
  - Servicing work (changing filters) is not obstructed
  - All of the connections are easily accessible
  - The fill level indicator is easily visible
- A shut-off valve must be installed in the suction line immediately after the intake sockets so that the leads or the pump can be changed without emptying the tank.
- Emissions from the engine may not be led to the outside in the vicinity of the oil tank.
- Before mounting the oil tank, check to see that the inside is clean and clean carefully if needed. When modifications have been made to the tank by drilling, etc., the tank must be cleaned thoroughly.

WARNING

The tanks' filling nozzles must be arranged so that they prevent any fire being caused by hydraulic oil escaping or spilling on hot parts (e.g., exhaust system).

ATTENTION

In the case of rear mounting, do not use an integrated crane tank to avoid too long suction lines. This poses the risk of cavitation at the hydraulic pump.

8.5.3.1 External hydraulic tanks

Stress on the shell plate, caused by the weight of the oil, must be kept as low as possible. Therefore, care should be taken in future to ensure that a cross beam (stabilizer) is welded into the tank support (see sketch).

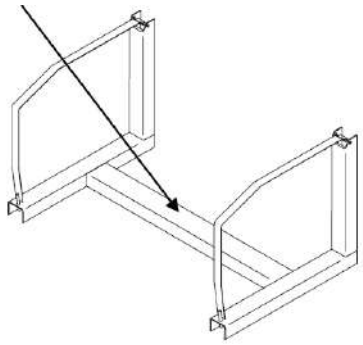


Illustration 08-00 12; Cross beam welded into the tank support

8.5.4 Tank filling

Tanks may only be filled when they are cold and with the crane in transport position. Fill the tank only to the mean value shown on the fill indicator.

INFORMATION

Since oil expands due to heat, the tank must never be completely filled. Oil expands when it gets warm (~ 0.7 % per 10 °C) – When 100 l of oil is heated from 40 to 60 °C, the expansion is about 1.4 l.

In the case of expanded oil, the tank may only be filled up to the mark of the maximum level.

The tank must be filled through a suitable filter, yet when delivered the oil is usually not in the purity class required for the operating status.

INFORMATION

The RA9-3 "Ensuring purity in hydraulic systems" must be observed and can be obtained online via PALDESK.PALFINGER.com.

When the oil is changed, the tank must be cleaned and any contamination residues which have been deposited removed.

The PALFINGER lubricants label (EB 15982) indicates the PALFINGER hydraulic oil used to fill the crane in the factory.

Position the label on the crane tank (if present) otherwise near the hydraulic filter. If, when filling the crane, a different PALFINGER hydraulic oil is used as indicated on the existing label, the label must be replaced and the oil type and the corresponding viscosity must be stamped onto it.

If no original PALFINGER hydraulic oil is used, the lubricants label EB 15982 must be removed and the oil information on the maintenance instruction label must be filled in as indicated below.

Illustration 08-00 13; EB15982 PALFINGER lubricant sticker

Attach the supplied maintenance instruction label (EB12023 or EB12024) to the crane tank. If there is no crane tank, attach it to the hydraulic filter. Enter the date of filling, oil type, operating hours and service interval on the label plus information on the hydraulic filter's maintenance interval.

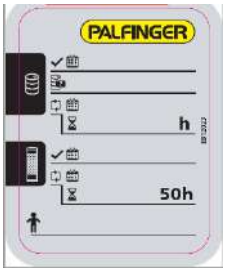


Illustration 08-00 14; EB12023 – Initial servicing

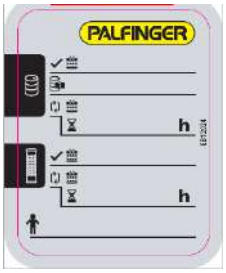


Illustration 08-00 15; EB12024 – Subsequent service

8.6 Oil cooler

The oil cooler is the most important component to keep the hydraulic oil in an optimal temperature range. It is therefore important to know the operating conditions and the average operating time already during the project planning stage. PALFINGER generally recommends the use of an oil cooler.

The oil cooler's dimension must ensure that the maximum hydraulic oil temperatures of 60 °C (in exceptional cases 80 °C) cannot be exceeded in crane operation at the planned ambient temperatures.

Only in the case of very short operating times (intensity-dependent max. 15 - 30 min.) with long cooling phases (> 2 h) may make the use of an oil cooler dispensable. In this case, a larger oil tank may be necessary, as shown in the diagram below (Illustration 08-00 15).

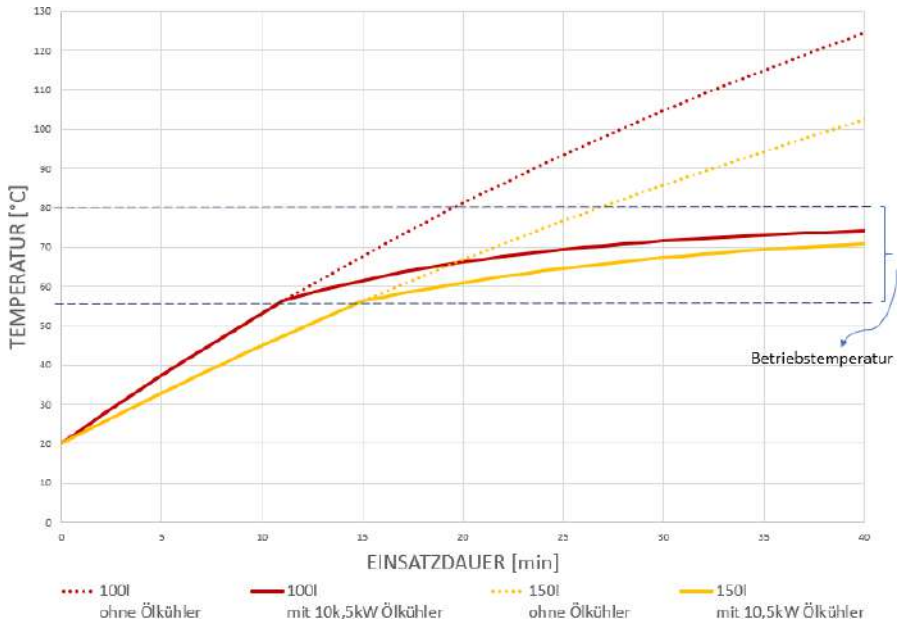


Illustration 08-00 16; Diagram of temperature rise with and without oil cooler

8.6.1 Calculation formula for the oil cooler

Oil coolers are designed according to their cooling capacity, which is calculated in relation to the maximum hydraulic power of the system

In order to limit oil heating, sufficiently designed oil coolers must be used. Depending on the use and size of the crane, the performance capacity of the oil cooler must be adjusted.

The permissible temperature range of the hydraulic oil according to PALFINGER is:

30 – 60 °C Ideal working range

80 °C Maximum value

Symbol	Unit	Description	Source
Qeff	[l/min]	Effective flow rate of the hydraulic pump(s)	Calculated
p	[bar]	Maximal hydraulic power of the crane	Calculated
Pcool	[kW]	Cooling power of the oil cooler	Price List/ Catalogue

$$P_{cool} \geq \left(\frac{Q_{eff} \times p}{600}\right) \times 0{,}3\ k$$

factor k 0,15 – 0,25	for single-circuit systems
factor k 0,23 – 0,38	for dual-circuit systems

ATTENTION

This formula is a rule of thumb that does not take into account all of the environmental factors!

In order to prevent overheating of the oil, the cooling capacity of the oil cooler must be adapted to the actual conditions.

Other products that are also supplied by the hydraulic system are not taken into account in this design and may have different requirements!

INFORMATION

The installation guidelines of the oil coolers are attached to each loose oil cooler and must be followed. These can also be obtained online via PALDESK.PALFINGER.com.

INFORMATION

Incorrect dimensioning of the oil cooler can cause serious consequences such as the loss of required properties of the hydraulic oil due to overheating.

INFORMATION

The cooling capacity Pcool depends on the temperature difference between oil temperature and air temperature.

For the basic design, the power is specified at 40°C temperature difference and 100 l/min effective flow rate of the hydraulic pump.

INFORMATION

For more information regarding the design of the hydraulic system contact the PALFINGER Factory Customer Service.

8.6.2 Building types

As a rule, only air coolers can be used on loader cranes.

They are installed in the return line of the crane and are turned on and off by a thermostat.

In order to ensure the intended cooling capacity, sufficient distances to adjacent components must be ensured during assembly.

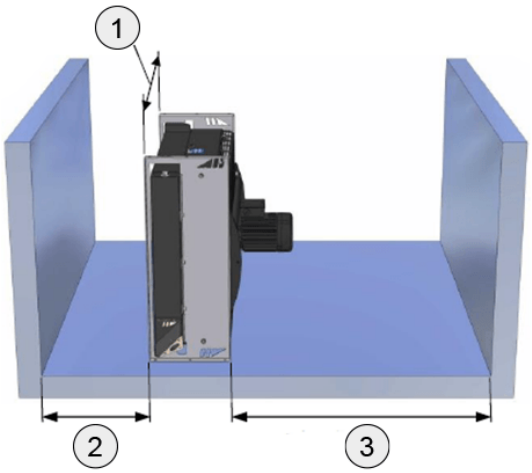


Illustration 08-00 17; Minimum clearance oil cooler

1 Oil cooler width
2 At least half the width of the oil cooler
3 At least the width of the oil cooler

It must be ensured that the cooling air can flow in and out unhindered. Recirculation of the warm exhaust air must be avoided.

PALFINGER offers models with varying cooling performance; selection of the cooler depends on the crane size.

As a rule, the oil cooler suggested in the crane's price list is selected; in cases of extreme use (e.g., continuous grab operation), the next-largest cooler (also shown in the crane's price list) must be used.

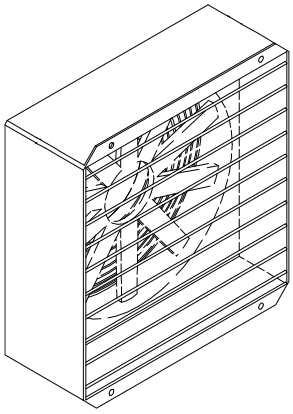


Illustration 08-00 18; Design of an oil cooler

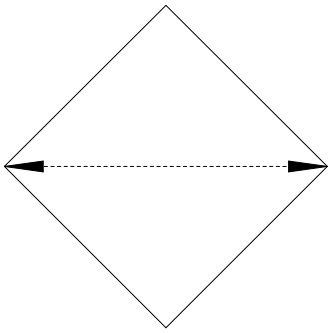


Illustration 08-00 19; Hydraulic symbol

8.6.3 General condition and installation guideline oil cooler

In case of increased hydraulic power and unfavorable environmental conditions, a more powerful oil cooler must be installed. These would be:

- Use in areas with high ambient temperature
- Continuous use
- Grapple operation and intensive operation of auxiliary equipment
- Intensive rope winch operation
- Use at high altitudes (> 1500 m)
- Insufficient heat dissipation of the cooler (limited installation space, engine waste heat, etc.)

All hydraulic lines must be designed in accordance with this chapter in order to reduce additional heating of the oil as far as possible.

Distances to adjacent components must be maintained in accordance with the installation guidelines for the oil cooler.

During operation, the oil temperature must be monitored.

The use of ORIGINAL PALFINGER hydraulic oils is recommended.

8.6.4 Connection of oil coolers

The oil cooler must be connected hydraulically to the return line of the crane.

The oil cooler must be mounted on the vehicle when removable consoles are used. (See also chapter 6 "Securing of crane /Crane mounting on removable mounting console").

Adjustment above 45 °C is useless, as the effective cooling time still available to the cooler will be too short.

PALFINGER oil coolers have an automatically controlled thermostat that starts at an oil temperature of 35 °C and reaches its full cooling performance at 45 °C.

Oil coolers always have separate electric connections; as a rule, connect them with the auxiliary drive.

See the description chapter 9 "Electric System on the Crane".

8.7 Installation and commissioning of the hydraulic pump

INFORMATION

The following explanations regarding the pump installation are exemplary and do not claim to be generally valid. Detailed information can be found in manufacturer's currently valid bodybuilder guidelines and technical data sheets.

8.7.1 Design of power take-off (PTO) and hydraulic pump

8.7.1.1 Hydraulic Drive

The aim of the design calculations is to find the correct dimensioning of the hydraulic drive for the loader crane.

Required data such as flow rate and max. operating pressure can be taken from the crane's technical data sheets.

For a correct dimensioning, the following points have to be considered:

- Permissible power and torque
- Consideration of the overall efficiency
- Selection of the correct gear ratio at optimum motor speed
- Correct choice of direction of rotation
- Critical speed
- Service life
- Maximum length and deflection angle of the cardan shaft (if required)
- Cooling (no heat accumulation)
- Mounting and accessibility

8.7.1.2 Calculation of the hydraulic pump - crane

PALFINGER recommends the use of the technical specification "Pump design hydraulic - loader crane". This document can be obtained online via PALDESK.PALFINGER.com.

INFORMATION

This gives a basic design of the hydraulic system. All instructions in the PALFINGER installation guideline must be followed!

The design is exclusively valid for PALFINGER knuckle boom cranes in combination with ORIGINAL PALFINGER hydraulic components (pump, oil cooler, tank, etc.).

INFORMATION

For dual-circuit cranes, both circuits must be calculated separately!

8.7.2 Installation of the hydraulic pump

Usually, the pump may be installed in the place the manufacturer specifies. However, the pump housing must always be filled with hydraulic oil and must not run dry even in longer downtime.

- Make absolutely sure that the rotation direction of the hydraulic pump is correct.
- It is recommended to install a speed controller for keeping a constant engine speed.

- When using drive shafts, observe the manufacturer's guidelines (cover guards for rotating shafts and measures to reduce the noise).
- Information about the required line connections can be found in this chapter.
- Information about the selection and dimensioning of the hydraulic pump can be found in chapter 3 "Mounting preparation".
- Observe manufacturer's installation instructions.
- When installing the pump, pay attention to the presence and correct fit of the seal.

INFORMATION

Even smallest dirt particles can cause damage to the hydraulic system. If hydraulic piping is carried out later, the unconnected inlet and outlet fitting of the hydraulic pump must be taped off.

The RA9-3 "Ensuring purity in hydraulic systems" must be observed and can be obtained online via PALDESK.PALFINGER.com.

INFORMATION

If a hydraulic pump should be installed to an unsealed PTO, this will be sealed exclusively by the pump.

INFORMATION

Pre-installed, easily accessible measurement connections simplify pressure measurements during commissioning and when looking for the possible cause of malfunctions!

8.7.3 Commissioning of the hydraulic pump

After opening the shut-off valve, start the pump at slow speed or with several start/stop operations.

Run the pump for 1 - 2 minutes and make sure that a steady flow rate and smooth running is established.

During commissioning, attention must be taken to vibrations and running noise.

Possible causes of mechanical noise are:

- Cavitation
- Leaking suction line
- Incorrect alignment of the pump

INFORMATION

After several hours of operation, check the mounting screws of the pump and tighten them firmly by using a torque wrench.

8.7.4 Fixed displacement pump

Fixed displacement pumps offer a simple and cost-effective drive variant. Depending on the requirements, PALFINGER offers a variety of inclined axis or swash plate pumps. Here, too, PALFINGER works exclusively with renowned and long-standing partners to ensure the highest quality requirements.

Application:

- Hooklift
- Compact cranes
- Epsilon (largely)

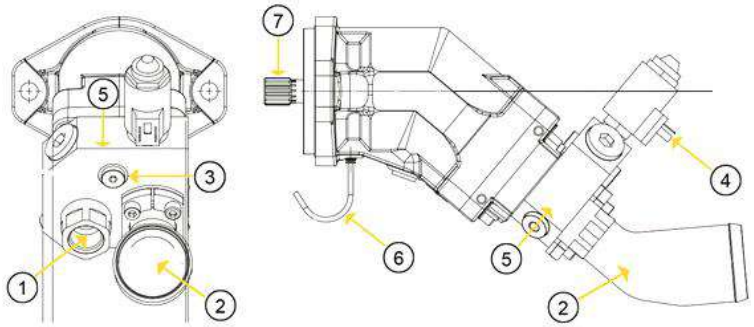


Illustration 08-00 20; Schematic illustration fixed displacement pump

1	Pressure connection	5	Bypass-valve
2	Suction connection	6	Leak oil line
3	Leak oil connection	7	Splined shaft
4	Electric connection of the bypass-valve		

INFORMATION

Depending on the manufacturer, the design, position and arrangement of the connections may vary.

General characteristics:

- Special features and dimensions for use in commercial vehicles
- Flow rate proportional to engine speed
- Self-priming, for open center systems
- Flange and shaft for direct mounting on the PTO
- No leak oil line required (except a bypass-valve is needed)
- A pressure relief valve must be provided in the hydraulic system

Advantages (compared to variable displacement pumps):

- Compact design
- Low weight
- Easy mounting
- Cost effective
- Automatic adjustment of the direction of rotation for pumps (with dual direction of rotation)
- Noise optimized

8.7.4.1 Bypass-valve

For fixed displacement pump applications, where the pump is driven by a continuously running PTO (PTO cannot be switched off or flywheel-side PTO), a bypass-valve must be installed. This allows continuous operation of the fixed displacement pump:

- No heat generation in the hydraulic circuit
- No negative impact on pump service life

- Easy installation: Bypass-valves are usually symmetrically designed and can be rotated 180° so that collisions with chassis parts can be avoided.

Bypass-valves are usually solenoid valves. When not activated, the pump outlet can be connected to the pump inlet fitting. When activated, the pump operates normally (volume flow is conveyed).

Operating principle of a bypass-valve with a circulation line (T)

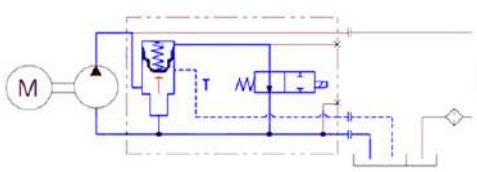


Illustration 08-00 21; Bypass-valve not active

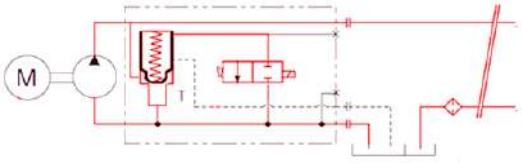


Illustration 08-00 22; Bypass-valve active

To ensure a cooling flow through the hydraulic circuit, the leakage oil connection (circulation line T) must be connected and led directly to the tank.

8.7.4.2 Leak oil line

Fixed displacement pumps can also be internally drained. If a leak oil line is provided, it must be returned without pressure to the tank. The internal leakage does not ensure sufficient lubrication during commissioning, why at least half of the pump housing must be filled with oil before.

8.7.4.3 Protective hose

As a rule, modern hydraulic pumps are equipped with two reinforced radial seals.

The protective hose is a special safeguard, consisting of a transparent plastic pipe, which is inserted into the relief bore. It effectively prevents the ingress of dirt or high-pressure water and thus avoids damage to the seals and at the same time allows air circulation in the chamber between the shaft seals.

Installation:

- Lay the protective hose in such a way that the ingress of road dirt, water or steam, which occurs during cleaning with high-pressure devices, is avoided
- The end of the hose must be moved facing down in order to quickly detect possible leakage
- The hose can be fastened by cable ties

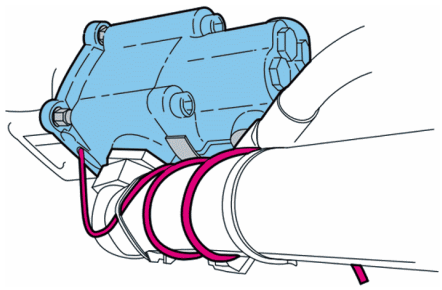


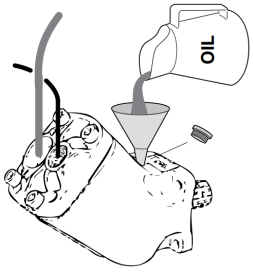
Illustration 08-00 23; Installation position protective hose

8.7.4.4 Installation notes

INFORMATION

The following installation notes are exemplary and do not claim to be generally valid. Detailed information can be found in manufacturer's currently valid installation guidelines and technical data sheets.

Initial filling:



Before commissioning, the pump must be filled through the upper drain port. Flush carefully to bleed the pump completely.

Pump positioning:

If the pump is mounted above the oil tank, the suction connection should always be above the pressure connection. Best operational lifetime is achieved by pump installations as shown in Fig. 3. The shortest results from pump installations as shown in Fig. 1.

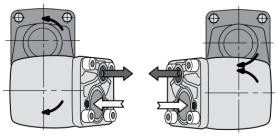


Fig.1

Fig.2

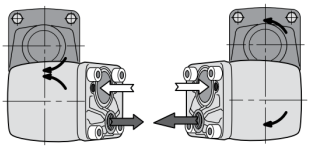


Fig.3

The pump can be mounted either on the gearbox-side PTO or on the flywheel-side PTO (with bypass valve).

Drive shaft installation:

For reasons of space (dual-circuit system) or excessive weight moment, the pump can be moved by drive shafts. Observe that every auxiliary drive and drive shaft has its maximum permissible torque.

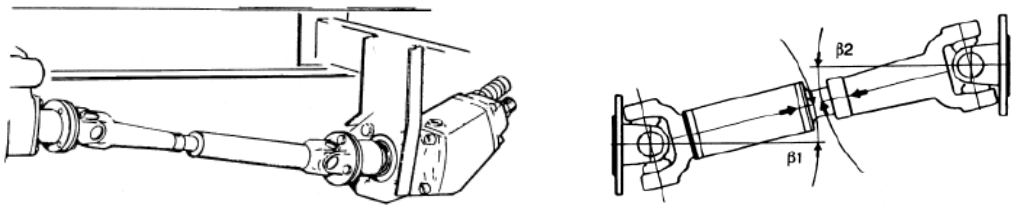


Illustration 08-00 24; Permitted joint angle when installing a drive shaft

To ensure the longest possible lifetime, the joint angle should be kept between 0.5 and 4° (the joint angle must not be more than 8°). The angles β1 and β2 should be equal.

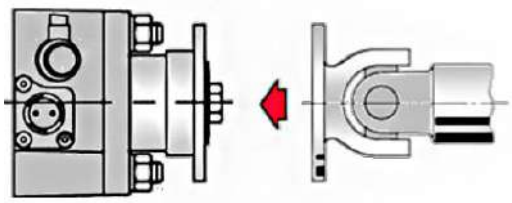
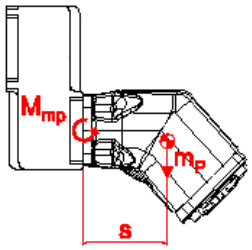


Illustration 08-00 25; Connection cardan shaft drive. Flange according to DIN ISO 7646

When moving pumps by drive shafts, special attention must be taken to a possible pump support.

- Principle: If a pump support is required, it must be attached to the same component as the pump. When using a drive shaft, the support can also be attached to the chassis / body.



The maximum torsional – and bending moments of the PTO (due to the pump weight) must not be exceeded. The approximate center of gravity of the various pumps is shown in the technical drawings of the pump manufacturer.

INFORMATION

Hydraulic pumps sold by PALFINGER require an adapter for spline shaft profile 8-32-36. Adaptions to drive shafts are done by using the number of holes and the diameter.

INFORMATION

The permissible axial force load of the drive shaft, the permissible torsional vibrations, the optimal direction of the load force as well as the limit speeds can be obtained from the technical data sheet of the manufacturer.

Radial forces on the drive shaft are not permitted!

Direction of rotation:

The direction of the pump rotation can be changed with most modern constant pumps by rotating the end cover by 180°.

Before installing, check the direction of rotation of the pump and the PTO. An arrow on the PTO indicates its rotation direction.

The direction of rotation of the PTO is decisive for the direction in which the pump should rotate. The PTO and the pump are counter-rotating, which means: - A clockwise PTO requires a counter-clockwise pump, and vice versa.

INFORMATION

For clear determination: Many pump manufacturers attached an arrow to the housing, which indicate the direction of rotation and thus the oil flow.

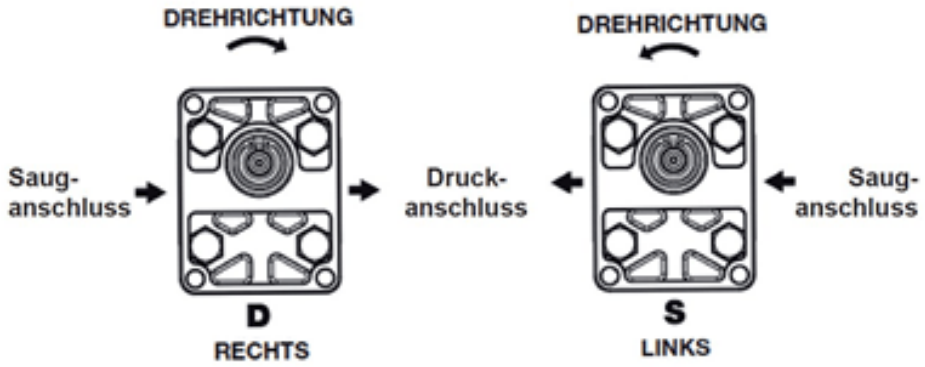


Illustration 08-00 26; Direction of rotation determination by top view

INFORMATION

If the direction of rotation of the PTO is unknown, install the pump and start the engine for a few seconds. By pressing the hands on both pump connections, the inlet (suction side) and outlet (pressure side) can be determined.

Direction of rotation change steps:

To change the direction of rotation, convert the pressure connection from one to the other port., In order to do so, dismantle the fittings and the parts of the split flange. These must then be reinstalled depending on the direction of rotation. The fittings must be sealed and strictly tightened.

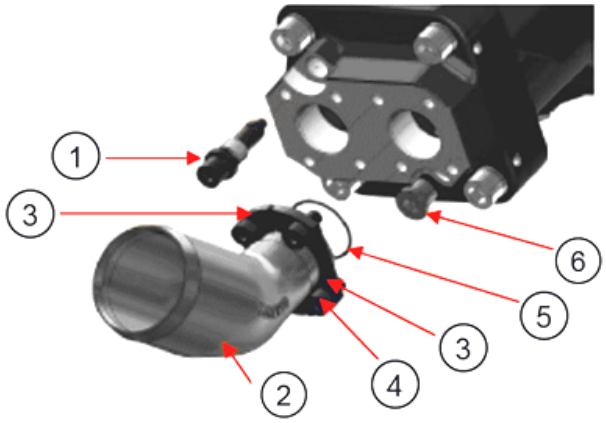


Illustration 08-00 27; Disassembly of an inlet fitting (here exemplary on a Leduc XPi)

1	Adjusting screw	4	Screw
2	Inlet fitting	5	Gasket
3	Split flange	6	Blind screw

INFORMATION

Tightening torques for pump components can be obtained from the manufacturer's website.

Before assembly, completely empty the axial piston unit to avoid mixing with the hydraulic oil used in the system.

- No pump rotation without adjustment screw or during adjustment work
- Clamp the pump only in the designated area
- Observe markings on the gear (if available)

8.7.4.5 PTO configurations

Clutch-independent PTO:

When the clutch is disengaged at a flywheel-side (engine side) PTO, the PTO remains active and can therefore be used both when the vehicle is moving and in parking position (e.g., hooklift operation).

Clutch-dependent PTO:

Clutch-dependent PTO (gearbox-side) are not active when the clutch is disengaged and therefore normally used when the vehicle is in parking position (e.g., loader crane).

Schematic overview of different PTO:

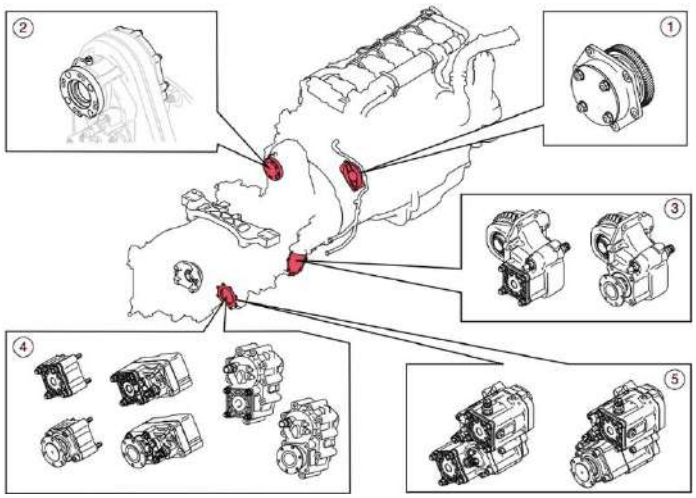


Illustration 08-00 28; Schematic overview of PTO drives

1	Engine-side PTO	4	Rear PTO on the gearbox
2	Flywheel-side PTO	5	Double PTO at the rear of the gearbox
3	PTO on the side of the gearbox		

INFORMATION

The following explanations regarding the pump assembly are exemplary and do not claim to be generally valid. Detailed information can be found in the manufacturer's currently valid installation guidelines and technical data sheets.

ATTENTION

Use special tools to mount couplings, pinions, sleeves and gears on the pump shaft.

Pump mounting to the PTO with separate pinion and outer locking ring or screw with disc:

- An inner retaining ring (1) must be mounted

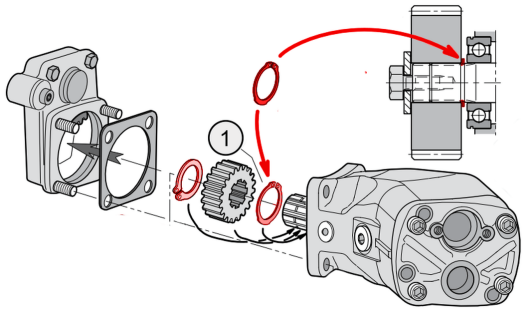


Illustration 08-00 29; Pump mounting to the PTO with separate pinion

Pump mounting on the PTO with a sliding sleeve that can be pushed on and off the pump shaft in the axial direction:

- An inner retaining ring (1) must be mounted!

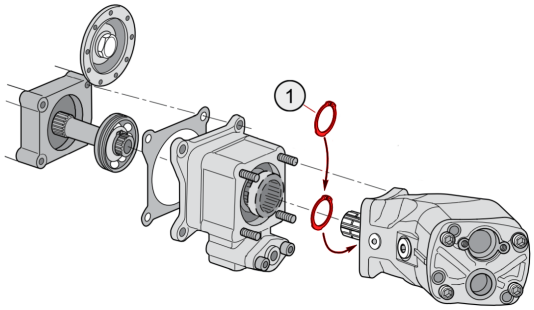


Illustration 08-00 30; Pump mounting to the PTO with sliding sleeve

Pump mounting to the PTO with integrated pinion:

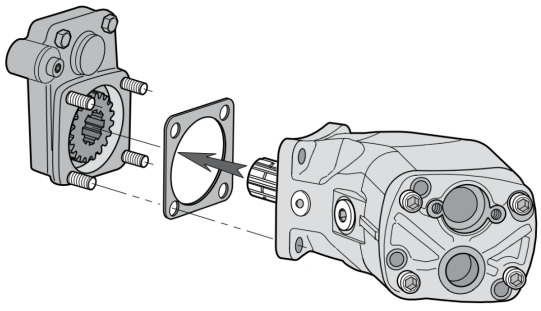


Illustration 08-00 31; Pump mounting to the PTO with integrated pinion

If the PTO has a sealed output sleeve (see figure), the multi-wedge shaft of the gear pump must be lubricated with a heat-resistant grease (at least once a year) before commissioning.

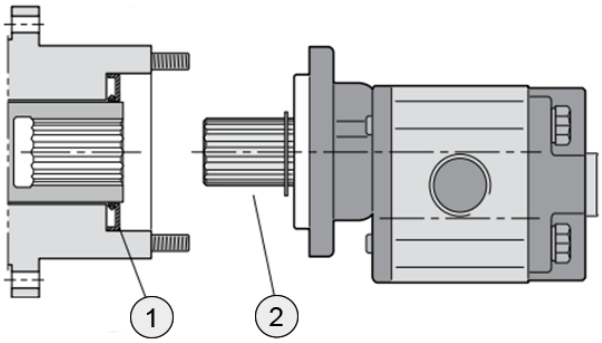


Illustration 08-00 32; PTO with sealed output sleeve

1	Gasket	2	Grease

8.7.4.6 Settings on the hydraulic pump

No adjustment required at continuous pump:

Maximum pressure (p) in (MPa)

In continuous pump systems the crane's maximum pressure (main pressure) is adjusted at the pressure relief valve of the control valve. (Adjustment made on test stand.)

8.7.5 Variable displacement pump

The bent axis system is very often used on trucks because of its very narrow design. The pump is available in different sizes and must be chosen according to the demand of the hydraulic system.

Applications:

- Cranes of the SH and TEC series
- Cranes with proportional control valves and preparation for LS

Advantages (compared to constant pumps):

- Low oil wear
- Low oil heating
- High energy efficiency
- Low operating noise
- Extended operational lifetime of hydraulic components

As an example, for a variable displacement pump, the below figure shows a Bosch-Rexroth bent axis axial piston pump with variable flow, type KVA.

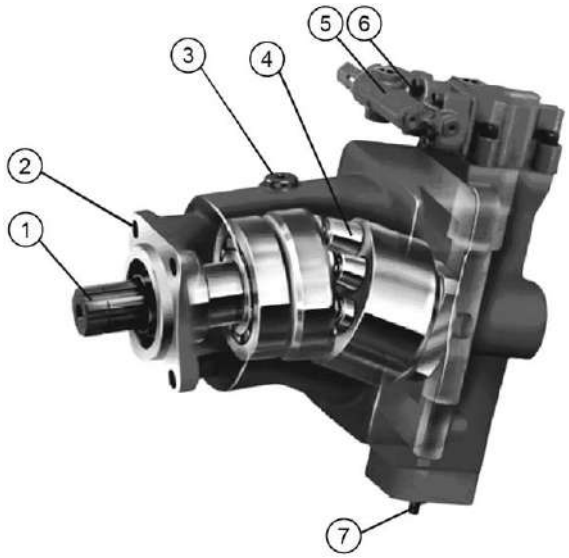


Illustration 08-00 33; Schematic representation of a single-digit pump

1	Drive shaft	5	Standby-pressure setting on P/F controller
2	Flange for direct connection to PTO	6	Maximum pressure setting on P/F controller
3	Air bleeding screw	7	Maximum flow adjustment
4	Pistons		

The maximum 40° angle of the pump creates a volume flow on the pistons, depending on the current angle, on the size of the pumps and on the revolutions.

The angle is controlled by the P/F controller, which therefore needs a LS-signal from the control valve. The pump creates no flow if the pistons are horizontal.

The operating direction usually cannot be changed on variable pumps.

Direction of rotation:

With some positive adjustment pumps (Hydro Leduc TXV, etc.) the direction of rotation can be adjusted.

Illustration 08-00 34; Change of the direction of rotation (here as an example of a Leduc TXV)

- Replace both flange halves (1) with inlet (suction) fitting (2)
- Replace adjustment screw (4) with locking screw (3)

INFORMATION

Positive variable displacement pumps are usually only suitable for one direction of rotation. Therefore, check the direction of rotation of the pump and PTO before assembly. Overserve the currently valid technical data sheets or assembly instructions of the manufacturers.

8.7.5.1 Load sensing

Variable displacement pumps have a variable volume flow with a pressure-flow-regulator, the so-called load sensing.

INFORMATION

PALFINGER recommends the LOAD Sensing System (closed-center system) especially for cranes with high operating pressures and relatively variable oil flow rates (e.g., TEC5/7 cranes).

A pressure-flow-regulator is used to control the maximum volume flow and maximum pressure.

The P/F-controller defines the required amount of oil, which must be conveyed by the pump due to the LS-signal from the proportional control valve.

The system is self-regulating and therefore automatically adjusts the volume flow depending on slow or fast movements.

- Volume flow and pressure are always based on the requirements of the system, so a signal coming from the control valve (load sensing line) is required.
- Minimum flow at maximum pressure to perform slow and precise movements.
- In order to perform fast hydraulic functions, the response time of the pump must be very short.

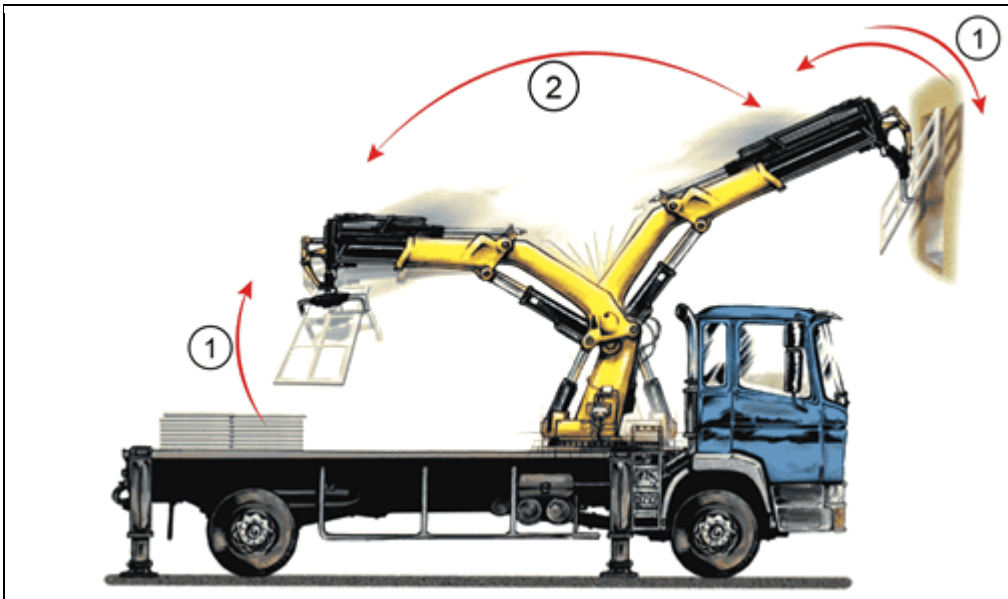


Illustration 08-00 35; Movements on the loader crane determine volume flow

1	Slow and precise movements	2	Fast movements

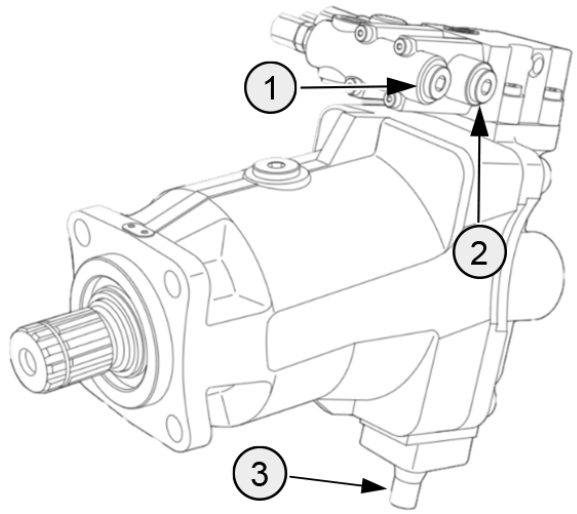
INFORMATION

Applications designed for constant volume flow or with a simple throttle control valve usually require a simulated LS signal.

8.7.5.2 Adjustment work on the adjustable pump

The following settings are required on the injection pump:

- Standby-pressure (p) in (MPa)
- Maximum pressure (p) in (MPa)
- Volume flow (Q) in l/min



1 Adjustment screw standby-pressure
2 Adjustment screw main relief valve (maximum pressure)
3 Adjustment screw volume flow

Illustration 08-00 36; Adjustment screws on a variable displacement pump (here as an example on a Bosch Rexroth)

With adjustment screws (3), the volume flow can be adapted to the requirements of the crane.

INFORMATION

The standby-pressure (also called LS pressure) as well as the maximum system pressure can be set at the pump with screws. Depending on the manufacturer, the design, position and arrangement of the adjustment screws may vary.

PALFINGER recommends the following measuring tools:

Mobile hydraulic hand-held instrument	EKD 060, EKD 061, EKD 068 EKD 069
Pressure transducer	EKD 063
Temperature transducer	EKD 064

Together with the respective pump manufacturers, PALFINGER has defined a uniform pressure presetting for all load-sensing pumps.

Previous factory pressure settings:

	BOSCH REXROTH	HYDRO LEDUC	HAWE INLINE
Pressure regulator	385 bar	100 bar	360 bar
LS-controller	30 bar	30 bar	27 bar
Seal	Yellow seal cap	-	-

New factory pressure settings

	BOSCH REXROTH	HYDRO LEDUC	HAWE INLINE
Pressure regulator	200 bar	200 bar	200 bar
LS-controller	30 bar	30 bar	30 bar
Seal	Yellow seal cap	-	-

8.7.5.3 Standby-pressure

The standby pressure affects the responsiveness (reaction behavior) of the crane.

The stand-by pressure gets measured at the measuring port of the control valve (in the suction line) in no-load operation (no function actuated). Ideally, the stand-by pressure is measured in use (after crane installation in the test run) and re-adjusted for ideal response behavior.

Increasing the standby pressures makes the load-sensing signal “harder”, causing the crane to respond more quickly to required movements, but also increasing the energy loss in the hydraulic system.

Depending on the mounting position of the crane, either front- or rear-mounted, the standby-pressure is set between 3,4 and 3,7 MPa.

If a significantly higher standby-pressure is required to achieve the desired responsiveness of the crane, check the general bodybuilding- or line dimensioning if necessary.

INFORMATION

From delivery November 2020, all listed pumps will be delivered with a uniform standby pressure setting (3 Mpa).

8.7.5.4 Working pressure

In the case of load-sensing systems, the pressure control on the pressure relief valve of the variable displacement pump must be adjusted to the operating pressure required for the crane according to technical data sheets.

The pressure is measured at the test connection of the product (usually on the main control block).

If the "retract extension boom" function is not limited by a section valve (see the hydraulic diagram of the product), the "retract extension boom" function should be used.

The adjustment shall be made when the lever of the "retract extension boom" function is deflected and the function is driven against the end stop of the movement.

If the "retract extension boom" function is limited by a section valve, the setting with the "lift knuckle boom" function must be carried out as an alternative.

In this case, the electronically available soft stop must be deactivated for a short time using PALDIAG. Otherwise, the setting is not possible.

In any case, the value must be set to the specified operating pressure according to the hydraulic diagram (-0 / +1 MPa).

After adjustment has been made, the setting with test load in point position (according to payload diagram, usually 20°/20°) must be verified with the "lift main boom" function. The test load must be lifted slowly (visibly moved upwards).

The exact setting values of the hydraulic system can be found in the pertinent technical data sheets.

After completing the settings on the hydraulic pump, the setting screws must be sealed with lead seals.

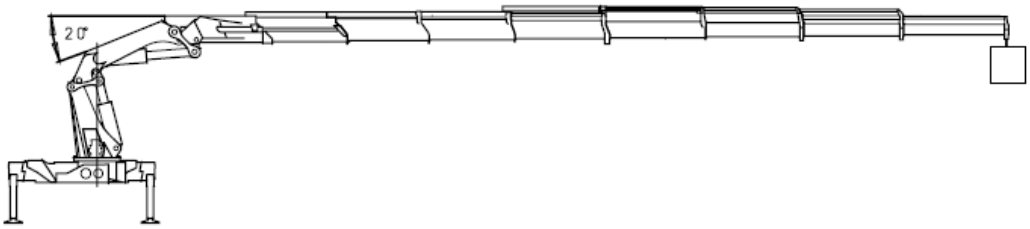


Illustration 08-00 37; Testing position 20°/20°

If the desired settings, even after slight adjustments, cannot be achieved, the PALFIGNER customer service must be contacted.

ATTENTION

In the case of cranes with additional hose equipment, rope winch, hose reels, etc., the crane might not lift the test load with the maximum permissible main overpressure.

Here, the main overpressure must be set in a manner that the lifting cylinder can lift the test load "just not yet" (by no means higher than the maximum main overpressure!), but the load capacity according to the load capacity diagram must be lifted without any problems.

Maximum permissible deviation from the default value according to the technical information sheet is ± 15 bar.

SLD and TEC cranes ± 10 bar (weight of additional hose equipment is taken into account in the load capacity diagram)

Definition test load: load capacity crane or JIB in testing position + coefficient [%]

Test load table:

Device		E.g., Crane types	Type of lifting gear*	Coefficient [%]
Crane	without HPLS < 12 mt	SLD/TEC 1/3	HD4	5
	without HPLS ≥ 12 mt	SLD/TEC 1/3	HD4	7
	M-, E-, A-, SHPLS	EH, SLD 5, TEC 5, TEC 7	HD4	5
	SHPLS	SH, TEC 7	HD5	3
Jib	Without HPLS		HD4	5
	EHPLS, SHPLS	EH, TEC 5	HD4	5
	SHPLS	SH, TEC 7	HD5	3

*HD4/HD5 according to crane classification from technical data sheet or load capacity diagram. In the case of cranes without a type of lifting gear specification, HD4 applies.

INFORMATION

From delivery November 2020, all pumps will be supplied with a uniform operating pressure setting (20 MPa).

WARNING

Variable displacement pumps are factory-adjusted; however, the pressure is only a basic value to make device movements possible after installation.

Therefore, after installation variable displacement pumps must ALWAYS be adjusted to the actually required operating pressure as per technical product data.

If this is neglected, there is a risk of accident because of incorrectly adjusted forces, pressures and speeds.

8.7.5.5 Main pressure relief valve

INFORMATION

The main pressure relief valves are arranged differently on the respective control valves. Depending on the manufacturer, the design, position and arrangement of the adjustment screws may vary.

INFORMATION

Further information can be obtained online in the training documents (control valves) via PALDESK.PALFINGER.com.

8.7.5.6 Sealing

INFORMATION

After adjustment and commissioning, the two settings (standby- pressure, operating pressure of the pump) must be secured by appropriate seals (according to pump manufacturer).

For Bosch Rexroth LS pumps there is a uniform sealing cap (orange) which is available under the spare part number EK-715A.

Illustration 08-00 38; Orange seal cap of Bosch Rexroth LS-pumps

For Leduc and Hawe pumps sealing wax has to be used, as no sealing cap is provided by these manufacturers.

- A sealing wax can be ordered from the spare parts center (EKD-180).
- The adjustment screws (maximum pressure and standby-pressure) must be sealed with sealing wax as shown in the figure below.

Illustration 08-00 39; Blue sealing wax for Leduc and Hawe LS-pumps

8.8 Hydraulic oil

Hydraulic oil is first of all used to transfer energy inside the hydraulic system.

Furthermore, it shall lubricate the movable parts of hydraulic components, protect them against corrosion, remove dirt particles and dissipate heat.

The correct design of tank and cooling systems is the precondition for ensuring optimum operating temperatures of the hydraulic system. Normally, a crane is operated at system temperatures between 30 and 60 °C. The maximum oil temperature of 80 °C must not be exceeded.

Proper functioning essentially depends on selecting the matching hydraulic oil. This is in the bodybuilder's responsibility.

The specifications from the present installation guidelines as well as conditions of application and customer requests have to be taken into account.

8.8.1 PALFINGER hydraulic oils

PALFINGER offer their own hydraulic liquids for their products in the following classes:

PREMIUM	HV multi-grade oil based on mineral oil
EXTREME	HV multi-grade oil for use at low temperatures
BIO	HEES biodegradable multi-grade oil with a synthetic base

As of October 2019, the PALFINGER plants use the products in viscosity class 32 for initial filling.

Besides their very good viscosity properties, PALFINGER oils have significant advantages regarding filterability, useful life, wear protection, air release property and biodegradability.

Depending on application and customer requirement, these oils are available to the bodybuilder in the following viscosity classes and container sizes:

Type	Viscosity class	Approx. ambient temperature	PALFINGER- part number*
PREMIUM	22	-25 °C to 15 °C	FL000005
	32	-20 °C to 25 °C	FL000006
	46	-15 °C to 35 °C	FL000007
	68	-15 °C to 40 °C	FL000008
EXTREME	32	-40 °C to 30 °C	FL000009
BIO	15	-40 °C to 15 °C	FL000010
	32	-25 °C to 25 °C	FL000011
	46	-20 °C to 35 °C	FL000012
	68	-15 °C to 45 °C	FL000013

* +00020 for 20l; +00209 for 209l barrel; +01000 for 1000l

INFORMATION

The PALFINGER hydraulic oil EXTREME 32 has been designed as a low-temperature oil and is only limited useable at high temperatures.

8.8.2 Selection of the base oil

Generally, the following base oils are available for use:

Mineral oil

Is well suited for use with loader cranes and can be procured anywhere with uniform criteria. As a rule, PALFINGER cranes are tested with mineral oil.

Synthetic-based oils

Synthetic ester oils in particular are often used in lieu of mineral oil. They are biologically degradable and have outstanding values for a wide range of requirements. Be sure in this case as well that the selected oil meets the specific requirements.

Oils with special properties

If special properties are required (e.g., non-flammable, etc.), special oils may be used (e.g., glycol base for offshore use). The manufacturer must always be consulted in these cases.

8.8.3 General requirements:

The hydraulic oil must meet the following general requirements:

- Purity class 17/15/12 (acc. to ISO 4406) in crane operation
- Good protection from corrosion and oxidation (type HLP, HVLP)
- Gut lubrication
- Good air separation capability
- Low foam production
- Neutrality with regard to seals and hydraulic hoses
- For ensuring this purity class it is necessary to filter the oil with first fill.

8.8.4 Selection of viscosity classification:

The viscosity class is a key indicator of the tenacity of a (hydraulic) oil and is also known as the tensile strength.

It is dependent on the temperature of the medium and is shown in [mm2/s] or [cSt].

As the temperature rises, the viscosity falls and the oil becomes more viscous [sic] or vice-versa.

The viscosity must be selected according to the ambient temperature, while making sure that the limits are not exceeded during operation.

The limits are:

High temperature range (continuous operation)	10 cSt	normal 12 cSt
Low temperature range (cold start)	1000 cSt	normal 200 cSt

The viscosity-temperature diagram enables you to select the viscosity classification in general:

The name of the hydraulic oil (e.g., HLP 68) relates to a temperature of 40 °C. It means that an oil named HLP 46 has a viscosity of 46 cSt at 40 °C.

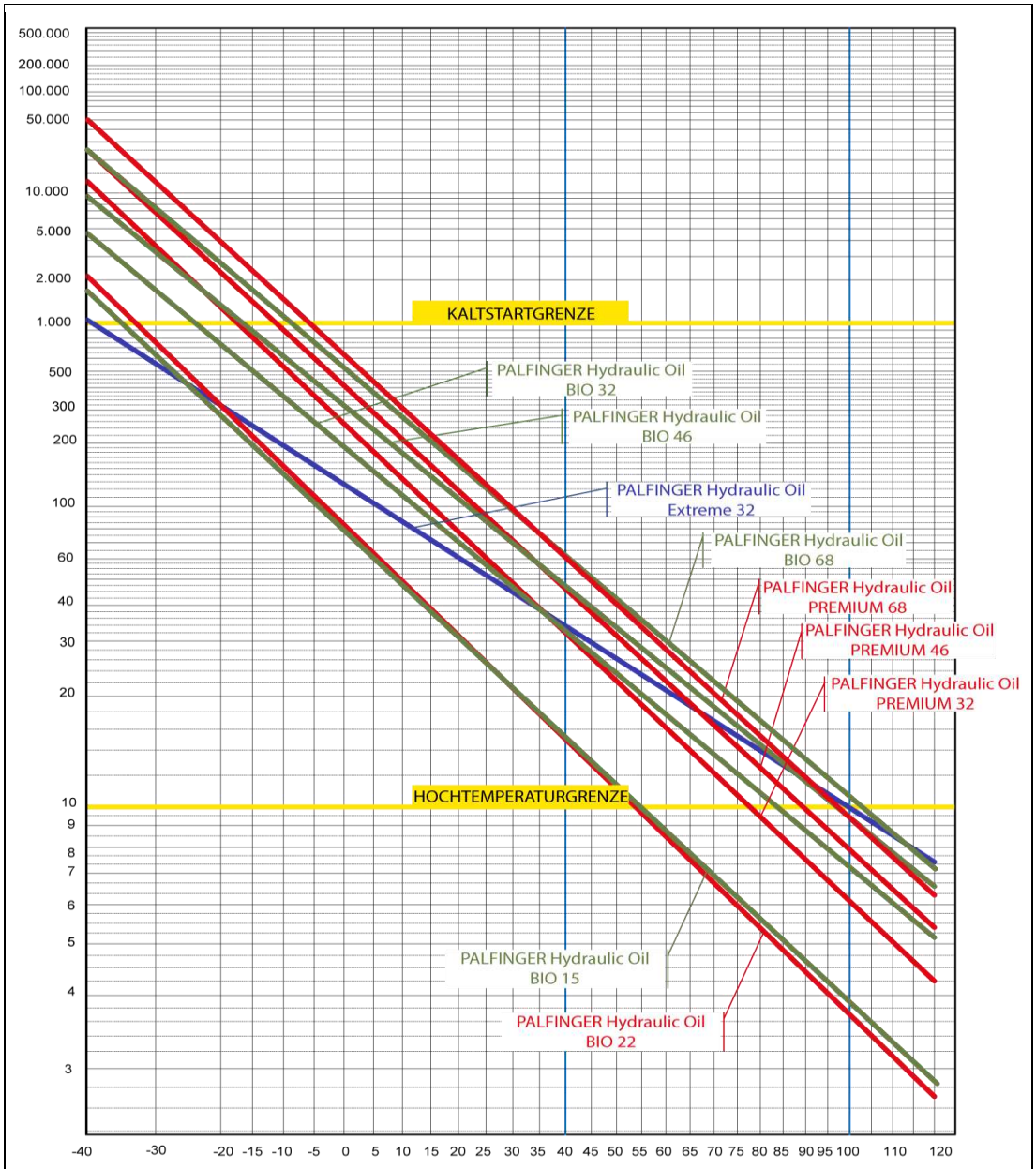


Illustration 08-00 40; Selection of the hydraulic oil in dependency of the reference temperature

8.8.5 Multigrade oils

Multi-grade oils are more expensive than conventional hydraulic oils because their viscosity is less dependent on the temperature. So, they cover a larger temperature range.

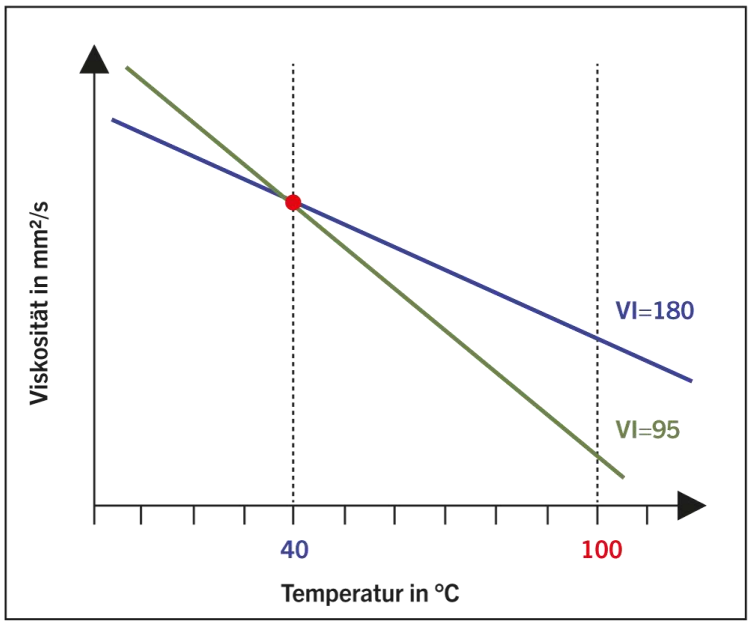


Illustration 08-00 41; Properties of multigrade oils

8.8.6 Compressibility and expansion:

Although hydraulic oil is regarded as "incompressible," the compressibility of oil is actually 0.7 Vol % for a pressure difference of 100 bar.

100 bar → - 0,7 Vol%

Oil expands greatly when heated, which is why tanks must never be filled completely.

10 °C → + 0,7 Vol %

8.8.7 Oil maintenance

In operation and depending on their service life, hydraulic oil loses continuously parts of its properties.

In practice two ways of maintenance are used. Interval maintenance with fix periods and Oil monitoring with flexible maintenance intervals based on measuring results of regular inspections.

8.8.7.1 Interval maintenance

As a rule, hydraulic oil is changed after approx. 1000 operating hours. This occurs roughly once every year together with the filter change.

If oil is maintained accordingly, especially filtered very well, this interval can be prolonged (see also the oil manufacturer's documents).

High temperature has a particular worsening effect on the service life.

ATTENTION

If the temperature in a system is increased, it is absolutely necessary to install an oil cooler or reduce the volume flow.

8.8.7.2 PALFINGER oil check

After commissioning of vehicle (after HPSC adjustment) a zero or initial sample is taken and analyzed, that forms the basis for future reference. When the crane is being serviced once every year, further oil analyses are planned, so the oil quality is monitored.

Based on the oil check results and depending on the quality of the oil sample it may be possible to postpone the up to now normal and required change of hydraulic oil after 1000 hours to a later date.

8.9 Hydraulic crane connection

The hydraulic crane connection has to be done according to the current PALFINGER hydraulic diagrams. These diagrams can be obtained online via PALDESK.PALFINGER.com.

8.9.1 Combination of a LS system with a constant flow system

Sometimes it might be necessary to combine a LS system with a constant flow system. For instance, a crane with separate control valve for the additional stabilizer or a combination of a crane and a tipper on the same truck.

This can be realized with following modifications:

- By means of a 3/2-way valve, the operator can choose between the two different systems (switching-over).
- Using an adjustable throttle in the pressure line to the constant flow system allows adjusting a certain oil flow to this system (open the throttle means increasing the speed). Constant throttle vales are not recommended because of difficult speed setting.
- In order to receive an LS signal when operating the second valve, the pressure of the second supply line (downstream of the restrictor!) is led to the pressure-flow-regulator via change valve.

With this system it is theoretically possible to combine more than two systems together; practically this is limited by the higher friction in the system. The standby setting increases to an unacceptable limit. Three systems are a realistic maximum.

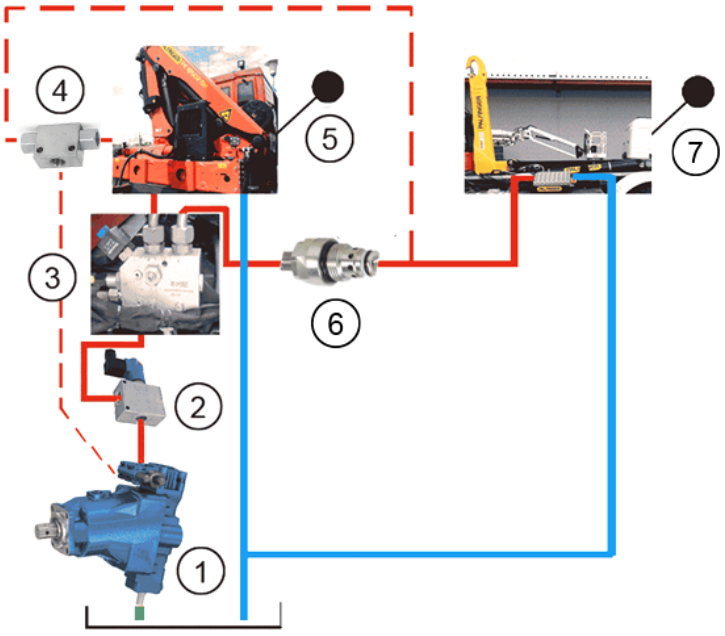


Illustration 08-00 42; Schematic sketch of a combination of a LS system with a constant flow system

1	LS pump	5	LS control valve
2	Emergency cut off valve	6	Throttle valve (adjustable)
3	Changeover valve	7	Constant flow control valve
4	Shuttle valve		

8.9.1.1 Necessary settings

Following Settings has to be done at this system:

- Maximum working pressure at pressure-flow-regulator of pump
- Set the main relief valve on the control valve 10 % above the maximum working pressure.
- The pressure of the second hydraulic system has to be set on the second control valve (if this pressure is lower than the LS-System).
- The adjustment on the throttle defines the constant flow at the second system.

8.9.1.2 Return line

When linking an LS system with a constant flow system, PALFINGER recommends the installation of a check valve in the return line of the crane, as in the case of a combination with a hook loader for example. This ensures that the oil coming from the hook loader always flows directly into the tank and thus through the return filter.

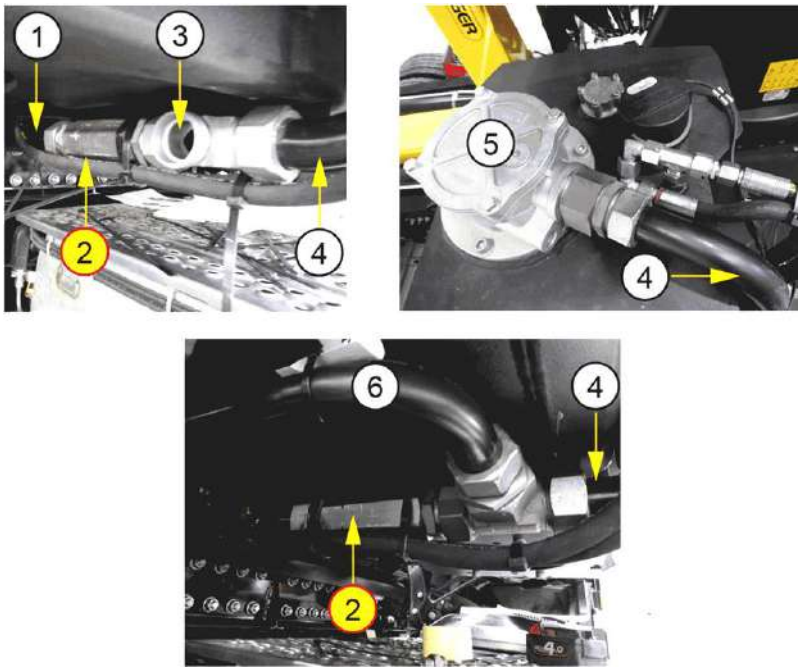


Illustration 08-00 43; Return valve in the return line during combination construction

1	Return line from the control valve crane	4	Return line to the tank
2	Check valve	5	Return flow filter
3	Tee connector	6	Return line from the control valve hook loader

The return lines as well as the leak oil lines coming from the crane and hook loader are connected together.

Use reducer and angle pieces.

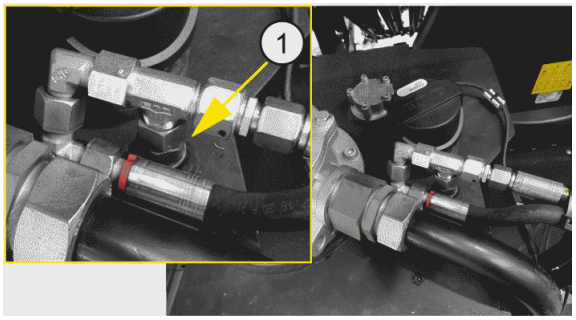


Illustration 08-00 44; Connection of leak oil lines via reducers and angle pieces

1	Connection leak oil tank

ATTENTION

Under no circumstances may the leakage oil line be combined with the return line of the crane, as otherwise the back pressure of the system will be applied to the leak oil line.

8.9.2 Detachable cranes

Usually, detachable cranes are rear mounted. So, when the crane is disconnected the crane's oil cooler and tank remain on the vehicle.

In the closed hydraulic systems of the disconnected crane temperature differences e.g., between day and night cause significant pressure fluctuations that may damage system components.

To prevent damage, we recommend installing a compensation tank with hydraulic couplers. It must have a venting and outlet device.

By connecting the coupler to the compensation tank possibly occurring impact pressures are depressurized.

WARNING

In constant current systems it must be ensured on the vehicle side that any system pressure does not occur when connecting the crane.

This may be prevented by appropriate safety measures (installation of a pressure relief valve).

8.10 Flow sharing configuration

The pump flow rate (liters) maximum available with RPM+ has to be added in the

PALDIAG software in the provided flow sharing configuration screen.

INFORMATION

To ensure maximum performance, the default setting in PALDIAG must be replaced by the precisely measured value of the volume flow.

INFORMATION

Further information can be obtained online in the Service information I-GG-1903 via PALDESK.PALFINGER.com.

8.10.1 Measurement of volume flow

In order to measure the volume flow of the system, a volume flow transducer is installed in the pressure line.

Disconnect the pressure hose from the high-pressure filter and connect it to the transducer. An auxiliary hose can be used to connect the transducer with the filter.

Set the engine speed to RPM+ or RPM-auto and heat up the hydraulic oil to optimal operating temperature (approx. 30 °C).

The maximum volume flow can be achieved, among others, by fully deflecting all main functions simultaneously.

ACHTUNG

Pay attention to the flow direction of the transducer!

PALFINGER recommends the following measuring tools:

Mobile hydraulic hand-held instrument	EKD 060, EKD 061, EKD 068 EKD 069
Volume flow transducer	EKD 062

ACHTUNG

The volume flow must be measured before starting inspection and the data received must added in the flow sharing configuration screen.

INFORMATION

In case of a dual-circuit system this needs to be done for both circuits!

INFORMATION

RPM+ (= AUTO RPM) is the truck's maximum engine speed in crane operation.

8.11 Customer functions

It is possible to include special hydraulic functions in the PALFINGER radio remote control

PALCOM. This requires ordering the option CFUNC.

Examples for special hydraulic functions on the truck superstructure are clamping functions, recovery winch, platform expansions and the like.

Special PALFINGER customized-function valves are available with 2, 4 or 6 functions from the Spare Parts Centre.

The hydraulic connection is usually established in front of the main valve parallel to the main valve.

The line is dimensioned analogously to the previous chapters.

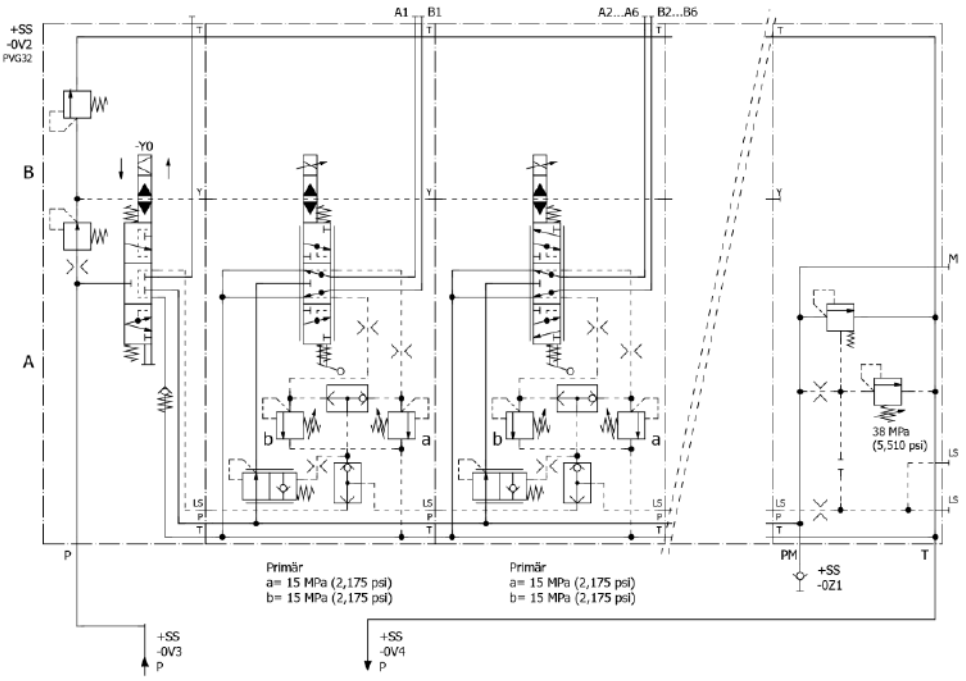


Illustration 08-00 45; Inclusion CFUNC

WARNING

For special hydraulic functions on the vehicle superstructure a risk analysis must be carried out to identify and avoid any potential dangers.

Operation, function and warnings have to be described in operating instructions.

WARNING

The bodybuilder must ensure that the function and moving direction by deflecting a lever are clearly indicated on the radio remote control and the main control valve.

PALFINGER Installation Guideline
Hydraulic Loader Crane

Chapter 9

Electric system on the crane

Original Installation Guideline

DA-105

Version: 2023/03

English

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Lamprechtshausener Bundesstraße 8
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Contents

9.1 General

Almost all crane models today require an electrical connection because of the diverse safety features.

INFORMATION

The bodybuilder guidelines of the respective truck manufacturer must be complied with at all times.

All of the cranes are delivered pre-wired. When the crane is being mounted the electric system must be properly connected to the truck as per crane configuration.

Depending on the equipment on the crane, several power lines and signal lines may be required.

Care should always be taken that the right equipment is provided when the crane is ordered.

A distinction is made between:

- 12 V system
- 24 V system

INFORMATION

Starting the engine must not be possible with a gear engaged.

9.1.1 Electromagnetic compatibility

9.1.1.1 Immunity:

Regarding electromagnetic compatibility the electric system must comply with EN 61000-6-2.

9.1.1.2 Emission:

Regarding electromagnetic compatibility the electric system must comply with EN 61000-6-4.

Provided that the installing company uses certified components on a loader crane (for all additional parts in the electric systems) which comply with the requirements of the above-mentioned standards, and provided that these parts are installed as per the supplier's recommendations then it will not be necessary to inspect the entire electric system for electromagnetic compatibility.

After the installation of such components and/or systems, the bodybuilder remains responsible for ensuring that the truck continues to comply with the applicable legal requirements. No feedback between the body-side electrics / electronics and the truck is allowed, in particular if body-side disturbances can impair the operation of on-board devices for the recording of road tolls, telematics devices, telecommunications systems or other devices, by accessories that are installed in the truck.

9.1.1.3 Static Discharge

The bodybuilder must ensure that electrostatic discharge is avoided by retrofitting appropriate equipment or by taking appropriate measures.

9.1.1.4 Protection against Overvoltage

When deactivating solenoid valves and other solenoid coils, they can generate voltage peaks. These can damage the electrical system components or cause system malfunctions. To avoid this problem, solenoid valves with overvoltage protection should always be used.

9.1.1.5 Truck Manufacturer-specific Documents

Detailed information and technical data sheets concerning additional electrical consumers can be obtained from the currently valid manufacturer's bodybuilding guideline.

9.2 Electrical supply

9.2.1 Voltage supply

The voltage supplied to the crane must be within certain tolerances, depending on the system, if trouble-free electrical operation is to be assured.

The target values shown below apply:

- 12 V system 11 – 14 V at the terminals of the crane control box
- 24 V system 22 – 28 V at the terminals of the crane control box

While mounting / wiring the crane, make sure that all wires are laid and connected properly.

ATTENTION

In all trucks, the batteries may be disconnected at the earliest 5 min after the engine has been switched off, as the regeneration can still be active.

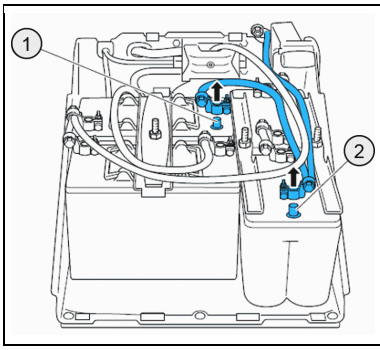
- The current consumption for 12 V devices may only take place via a voltage converter.
- Current drain from only one battery is not permitted, as unequal charges lead to overcharging and damage to the other battery. Under certain circumstances, e.g., for devices with high power requirements or under extreme climatic conditions, batteries with higher capacity are required.
- Minus and plus wires must have the same minimum cross-section.
- Simultaneous power supply for the oil cooler relay K1165 and the working light relay K1166 (recommendation).

9.2.1.1 Precautions when working on the electrical system:

- Before starting work on the on-board electrical system, the connection to the negative pole of the battery must be disconnected.
- If the truck is equipped with a dual battery system, it is sufficient to disconnect the negative terminal of the service battery.

9.2.1.2 Precautions before welding:

- The negative terminal of the battery must be disconnected.
- If the truck is equipped with a dual battery system, the negative terminals of the service and start batteries shall be disconnected.



1 Disconnect the negative pole of the service battery.
2 Disconnect the negative terminal of the starting battery.

If a power supply is required during work, the respective consumers must be connected to the battery in conjunction with a 10 A fuse, to prevent accidents and a short circuit.

ATTENTION

If batteries with higher amperage are installed by the bod builder, the cross-sections of the battery wires must be adapted to the new power consumption.

9.2.2 Current consumption

The electric lines from truck to crane must be fuse protected professionally according to the electrical current consumption.

ATTENTION

Ex works the crane is NOT supplied with a safety fuse in the supply line.

Several systems mounted on the crane are internally equipped with fuses ex works:

Radio remote control SCANRECO	10 A in the receiver housing
Radio remote control HETRONIC	7,5 A in the receiver housing
Radio remote control PALCOM	10 A in the receiver housing
PALTRONIC 40	2 x 5 A /1 x 1 A in X1 distribution box
PALTRONIC 50	5 A in the main device
PALTRONIC 150	3 x 3 A and 1 x 10 A main device
PALTRONIC 150_TTC (No fuses)	Main unit closed casing

The fuses are located in the cab and X1 connection box.

Sensor system at column, main and knuckle boom	1 A (F165)
Fuse CAN-control valve	5 A (F166)
Sensor system for HPSC (rope transducer)	1 A (F167)
Sensor system at crane base, Digi HPSC	1 A (F168)
Fuse Fly-Jib	1 A (F169)
Fuse CAN-control valve	5 A (F172)
Fuse CAN-control valve	5 A (F174)
S-IQ	5 A (F175)
Telematic	1A 24V / 3A 12V (F900)

Fuse protection depending on the system:

Electrical fuse protection of the electronic systems installed in the crane depends on the crane configuration and consequently on the number of connected electric consumers.

For the technical data of the individual fuses refer to the crane’s specific circuit diagram.

INFORMATION

The currently valid wiring diagrams can be obtained online via PALDESK.PALFINGER.com.

9.2.3 Additional consumers

In principle, the connection of additional consumers is possible. When retrofitting additional consumers, the following points must be considered:

- Additional fuses can be installed either in the central electrical system of the truck or in a prepared joint box next to the central electrical system.
- Do not interfere with existing truck circuits.
- Do not connect additional consumers to already occupied fuses.
- Each circuit added must be sufficiently designed and protected by its own fuse. The rated current of the fuse should ensure the protection of the wiring and not the system connected to it.
- Electrical installations must ensure protection against all possible disturbances without affecting the electrical system of the truck itself.

ATTENTION

Attention must be paid to use the right fuses, as a fuse with a higher release current can cause damage or fire.

ATTENTION

Wire cross-sections, wire lengths and ambient temperatures influence the maximum possible continuous current consumption.

ATTENTION

With continuous load, the current through the fuse should not exceed 70% of the rated current of the fuse.

ATTENTION

When connecting additional electrical consumers, the electrical interfaces as described in the respective manufacturer's bodybuilder guidelines must be used.

9.2.3.1 Electrical wires

Additional wires and harnesses must be installed correctly.

ATTENTION

Subsequent connection to existing electrical wires by means of insulation displacement termination, simple twisting or soldering is not permitted.

Connections must be carried out properly and professionally by means of suitable plug connections.

Dimensioning:

- Taking into account the fuse protection, current and temperature, the correct wire dimensions must be used.
- By using the right wire lengths, risks or damage can be avoided. Excess lengths increase the risk of chafing, while wires that are too short can be torn apart due to movements between the powertrain, chassis and cab.

Placement:

- Wires must be clamped to existing wire harnesses in order to avoid damage caused by chafing. For fixing, at least 8 mm wide cable ties must be installed at a distance of
- 200 -400 mm.
- Do not clamp wires to hot surfaces (above 100 °C, e.g., fuel lines, compressed air and servo lines) as well as to rough edges (e.g., sheet metal edges, screws, nuts).
- Wires must not be laid in places where they could become entangled or where they could chafe on moving parts.
- No feedback must be guaranteed in any case. When choosing the wire cross-section size, the voltage drop and the heating of the conductor must be taken into account. Cross-sections below 0,75 mm² should be avoided as their mechanical strength is not sufficient. The bodybuilder is responsible for the dimensioning.

Protection:

- For wires outside the cab, protective sheathing must be installed to protect against heat.
- To protect the wires from mechanical damage, edge protection must be installed on all wire feedthroughs in metal parts.

	AdBlue is dangerous for open electrical connectors and spreads quickly in wires. If AdBlue is spilled on a plug, the part of the wire that was exposed to the urea solution must be replaced immediately.

	Before opening the urea quick couplings, make sure that they are not under pressure. First, the power supply of the AdBlue system must be switched off and after a waiting time of at least two minutes, the pressure should be relieved and the couplings can be opened. As long as there is a risk of liquid leakage, the wires must not be disconnected. If electrical connectors are removed, they must be closed and protected with a cover, e.g., plastic bags.

9.2.3.2 Installation and connection regulations

Wires that are too long should be folded and fixed as shown in the figure below. Due to this loop formation, the excess wire remains available and can be used if necessary.

Illustration 09-00 1; Loop formation with excess cable length

When attaching to solenoid valves and wire connections, a loop should be formed. The loop allows the solenoid valves to be replaced and prevents water from entering through the wire, as shown in the figure. Ensure that the cable tie is located on the protective sheathing of the wire. Excluded from this are wires with corrugated hoses.

Illustration 09-00 2; Attaching wires to solenoid valves

Attach corrugated wires as shown in the figure below.

Illustration 09-00 3; Attaching corrugated wires

When adding wires for bodybuilding, attention must be paid to ensure that the wires are sufficiently fused and chafing is avoided. The following should be taken into account:

- Wiring for bodybuilding should be clamped outside the respective manufacturer specific wiring and not affect its position.
- The cable ties must be positioned in such a way that no relative movement can occur between wires and surrounding components.
- When adding new wires to existing, new cable ties must be positioned in the place of the original cable ties. The original cable ties must be disposed of.
- The wire section in the area of the tilting mechanism of the cab must never be clamped (dashed line in the figure). This section of the wiring must be able to move together with the cab.

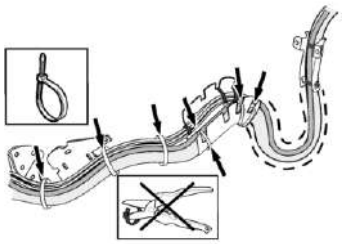


Illustration 09-00 4; Wire section in the area of the tilting mechanism

9.2.3.3 Wire feedthroughs

In the case of additional wire feedthroughs at the cab interface, attention must be paid to ensure that the feedthroughs are sealed. This can be done via various accessories such as reducers, seal plugs or corrugated hoses.

Illustration 09-00 5; Wire feedthroughs at the cab interface

This principle must be followed for all sealed wire feedthroughs. With insufficient sealing, moisture might pass along the wiring through capillary effects into the control units and destroy them.

9.2.3.4 Connection of ground wires

The total cross-section of the ground wires of all electrical consumers must be equal to the sum of all plus-sided connection wires.

This can be done either via a single ground wire or via several individual wires, which reflects the total cross-section as a whole.

The latter is recommended, since devices with high power consumption (crane, oil cooler, working lights, etc.) are wired separately in the crane junction box.

ATTENTION

Ground wires must be connected to central grounding points of the truck! In most cases there are defined grounding connection points by the truck manufacturers.

For this purpose, the respective truck manufacturer's bodybuilder guidelines must be observed.

In principle, the original grounding connections of the truck may not be changed. If these connections need to be moved or additional grounding points have to be installed, existing holes or studs on the frame must be used.

	The connection of more than 3 wires to a grounding point is not permitted. The grounding connection with the largest cross-section must be attached to the lowest point. The angle must be at least 60°.

Correct design of grounding connections:

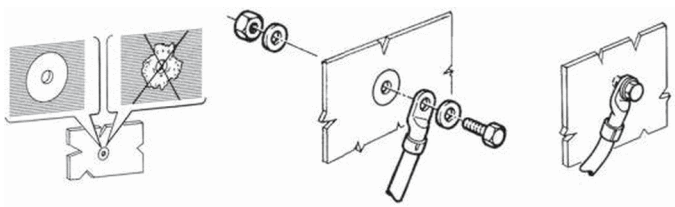


Illustration 09-00 6; Correct design of grounding connections

- It is important to remove the paint from both sides of the frame to ensure good contact. Suitable materials such as sandpaper must be used to produce a smooth and bare surface.
- A suitable and well-conductive paint must be applied between the wire lug and the metal surface.
- Connect the wire within 5 minutes after applying the conductive paint.

Original grounding points for the engine and chassis must not be used at any time for grounding connections at signal level (e.g., sensors or devices with low power consumption).

ATTENTION

Additional signal masses must not be connected to power masses.

INFORMATION

When relocating the battery, ensure that the grounding connection is on the same side of the frame to which the negative terminal of the battery is connected.

Grounding connections on the other side of the frame cause a voltage drop.

9.2.4 PC power pack

When using the PC power pack make sure to calculate and use wire diameters in dependence of the applied power. See training documents!

9.3 Crane connectors

9.3.1 Connecting the main electrical supply line

The crane and other consumers must be protected with fuses in the truck's fuse box. In case of damage the fuse can thus be replaced immediately and effortlessly and the supply line to the crane remains protected. The fuse rating required is for instance 7,5 to 15 A for the crane current, 15 to 30 A for the oil cooler.

In accordance with electrical fuse protection (Ampere) select the wire cross-section so that, in case of an electrical short circuit, the installed fuse protects the wire network against being damaged by wire fire.

The electrical fuse protection of the individual consumers on the crane is ensured via distribution to several fuses in the crane's electric system.

INFORMATION

Refer to the respective manufacturer's bodybuilder guidelines regarding electrical interfaces, deduction of electrical power and prescribed cabling positions.

ATTENTION

The crane must be turned on using an external switch or together with the PTO switch (relay switch). Never use the ignition or steady plus!! This would inevitably cause damage from overheating to the magnetic valves.
For cranes with a Pal150_TTC or Pal180 control, terminal 851 must be supplied separately via ignition so that the control is activated. Terminals 801 and 800 are connected via PTO as before.

9.3.1.1 Universal electric diagram of connectors of PALFINGER cranes

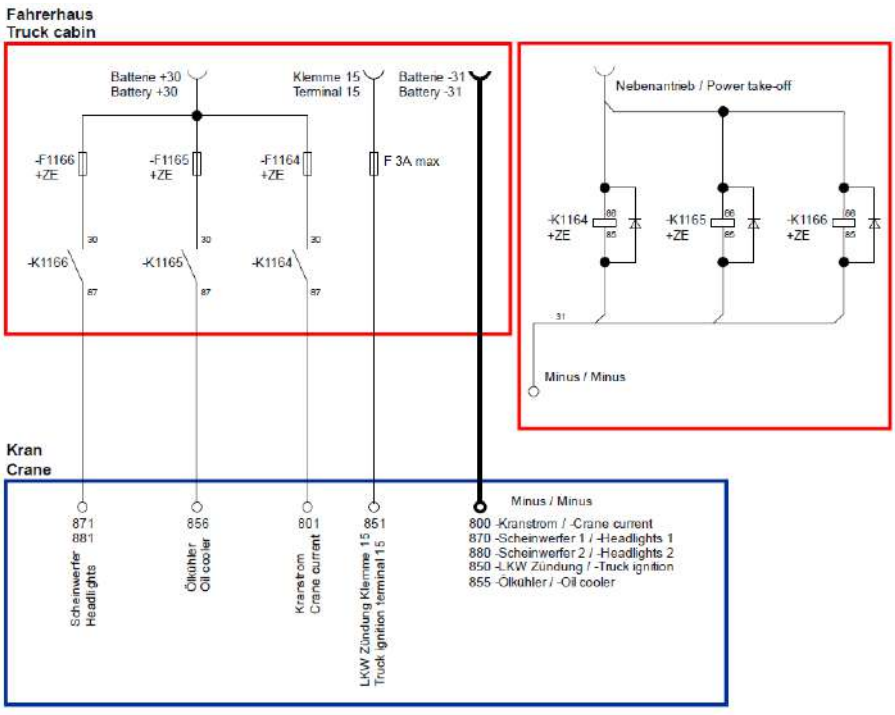


Illustration 09-00 7; Universal electric diagram of crane connectors

Voltage supply:

Fuse	Voltage	Current
F1164	12 V	20 A
F1164	24 V	10 A
F1164	12 V (RRC)	15 A
F1164	24 V (RRC)	7,5 A
F1166	12 V	15 A
F1166	24 V	10 A
F1165	12 V	20 A
F1165	24 V	15 A
(F terminal 15)*	24 V	3 A

* Essential for PALTRONIC 150_TTC (control activation)

Relay	Voltage	Switching current *
K1164	12 V / 24 V	20 A
K1165	12 V / 24 V	30 A
K1166	12 V / 24 V	20 A

* Recommended relay rated switching current for continuous load

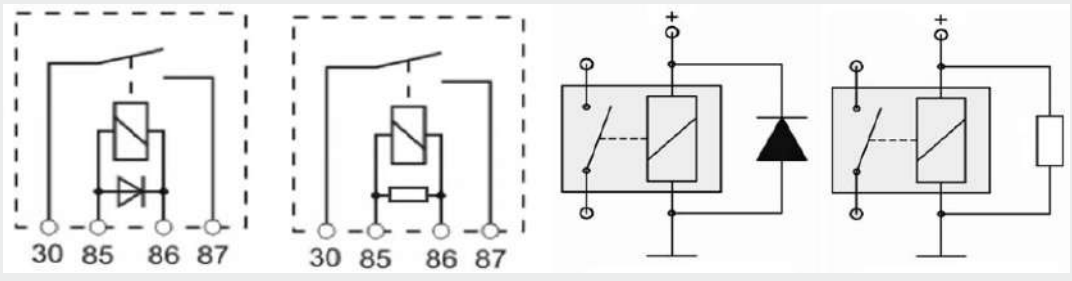
Terminal	Voltage	Current
851	12 V / 24 V	1 A (without S-IQ)
851	12 V / 24 V	3 A (with S-IQ)
850	12 V / 24 V	Minus

INFORMATION

All electrical parts used later on the crane or during installation, that are electrically operated via inductive load (relay, contactor, electrical magnetic valves, etc.) must be equipped with a protective circuit (freewheeling diode) because self-induction of the components may occur and result in errors.

Example: Relay with freewheeling diode.

Solenoids with a freewheeling diode.



9.3.1.2 S-IQ voltage supply / Transport position monitoring

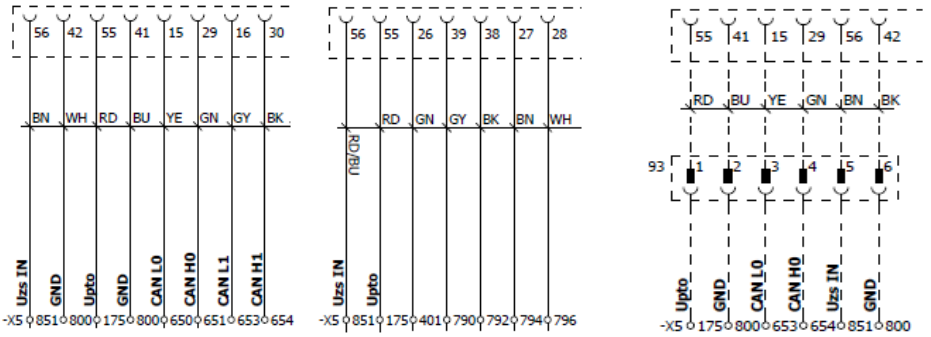


Illustration 09-00 8; SIQ voltage supply

Terminals / description:

Terminal:	Name:	Technical description:
851	Uzs IN	Plus via truck ignition ON (terminal 15) bodybuilder interface Activation of the PALTRONIC 150_TTC (CPU)
800	GND	Truck minus terminal 31 (bodybuilder interface)
175	Upto	Truck PTO ON (bodybuilder interface)
650	CAN LO	CAN connection from S-IQ1 to Paltronic
651	CAN HO	CAN connection from S-IQ1 to Paltronic
653	CAN L1	CAN connection from S-IQ1 to S-IQ3
654	CAN H1	CAN connection from S-IQ1 to S-IQ3
401	Trans2	Main boom digital input
790	DI input	Digital input signal of parking brake
792	DI input	Digital input signal of acknowledgement key
794	DI OUT	Digital signal, acoustic output max. 1 A
796	DI OUT	Digital signal, visual output max. 1 A

9.3.1.3 Circuit diagram of EPSILON crane connectors

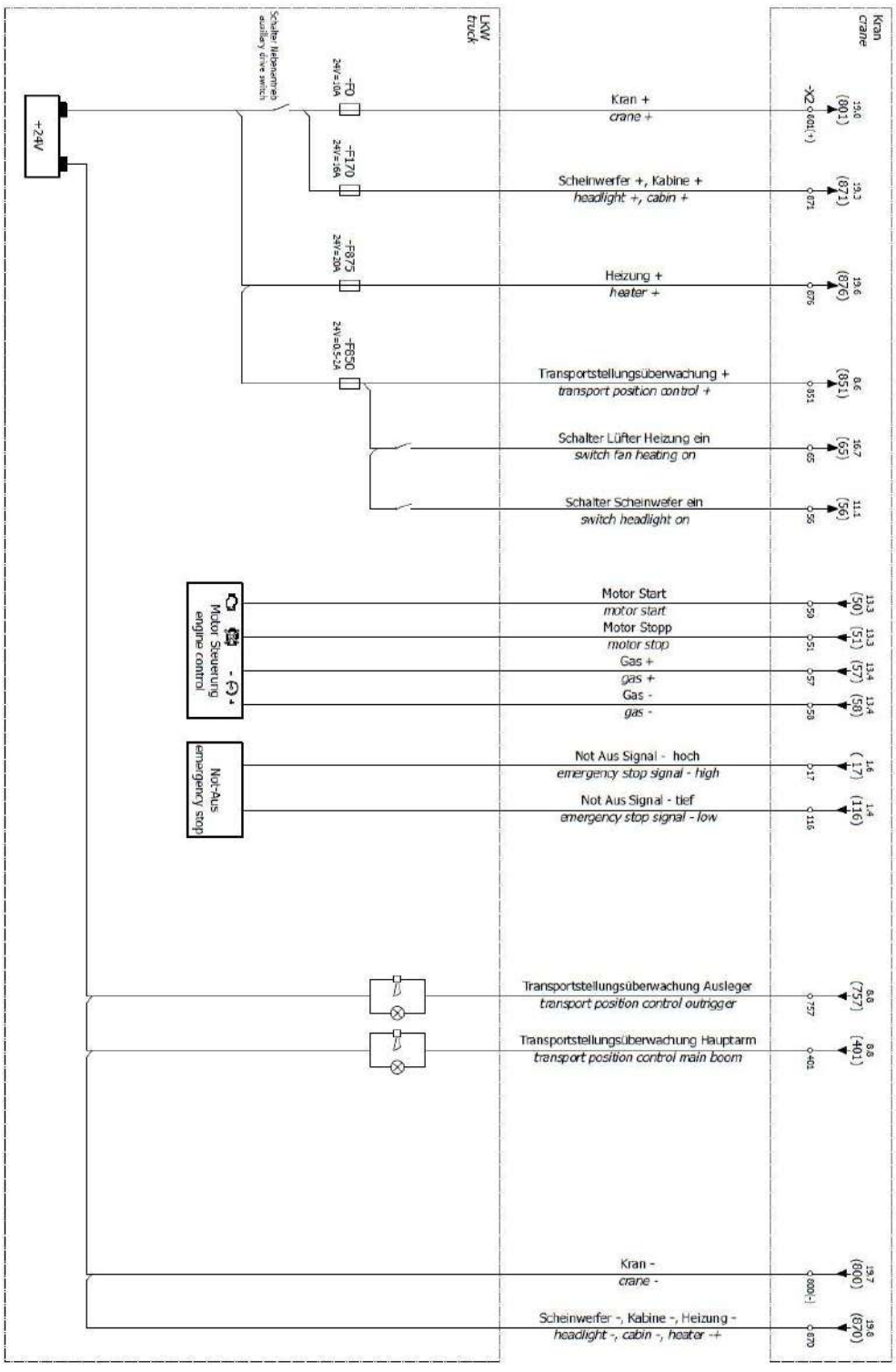


Illustration 09-00 9; Circuit diagram of EPSILON crane connectors

9.3.1.4 Additional fuses on EPSILON cranes

Name	Ampere	Description	Installed in
F1	3 A	Supply of MD3 display	CAE
F2	3 A	Supply of joysticks	CAE
F16	10 A (8 A)	Main supply	CAE; CAH; CAM
F56	3 A	Working lights current impulse relay	CAE; CAM
F163	10 A	Wiper, windscreen wash water, rotary light, internal light	CAE; CAH
F164	10 A	Working lights current impulse relay, engine controls, seat heater	CAM
F168	10 A	Seat heater, compressor	CAE; CAH
F170.1	10 A	Cabin light	CAE; CAH; CAM
F170.2	10 A	Working light on knuckle boom	CAE; CAH; CAM
F175	2 A	Supply of 12 V DC voltage converter	CAE; CAH; CAM
F180	10 A	Heating	CAE
F690	10 A	Wiper, windscreen wash water, rotary light, internal light	CAM
F695	10 A	Fan	CAE

9.3.1.5 Nominal cross sections:

Depending on the equipment, PALFINGER cranes are produced with 1,5 mm² or 2,5 mm² lines.

Wires with a length of 5 m and over (e.g., rear mounting or mounting to semi-trailer) need to be in the next larger size of nominal cross section to minimize potentially occurring voltage drops.

INFORMATION

It is recommended to equip the crane power supply line, the oil cooler line and the supply line to working lights with a wire cross section of minimum 2,5 mm².

The cross sections of all consumers' negative lines (earthing) must be equal to the total of cross sections of all positively supplied consumers.

It is important that the earthing has the same electric potential. In other words, all negative lines (if multi-wired) must be connected to the same ground pin.

What is tapped from power supply and negative line must be retrieved from the respective truck manufacturer's bodybuilder guidelines.

9.3.2 24 V crane and 12 V truck electrical system

In the case of a 24 V crane on a truck with 12 V system voltage, a charging converter must be installed which transforms the supply voltage from 12 V (truck) to 24 V (crane).

INFORMATION

In case of system failure because of undervoltage Paltronic always switches to the safe status.

9.3.2.1 Charging converter 12 V to 24 V

PALFINGER offers two power variants of the charging converter.

EEA12086 → 10 A

EEA16341 → 20 A

INFORMATION

Power supply lines for oil cooler and working lights are not connected via charging converter but via relay circuit (see 3.2.6 wiring diagram).

9.3.2.2 Charging Converters - Technical Data

Designation	Specifications
nominal voltage	12 V
Input	8 to 16 V
Output current max.	10 / 20 A
output voltage	26,4 – 29,4 V
Power / Efficiency (η)	250 W / 500 W 95 %
ambient temperature	- 20 °C to + 50 °C

9.3.2.3 Electrical connections

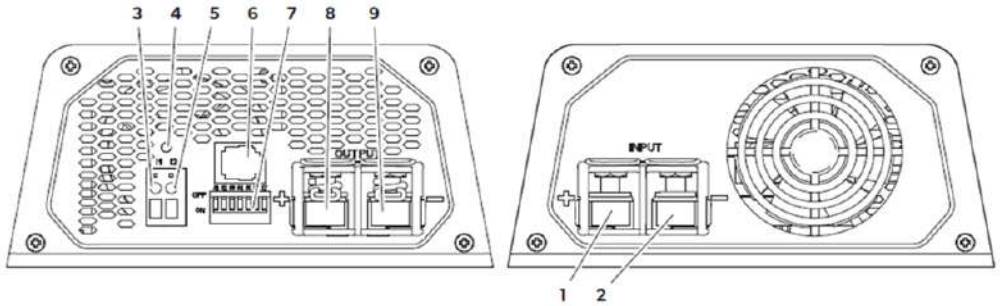


Illustration 09-00 10; Example of charging converter connectors

No.	Designation	Technical remark
1	Positive input terminal	Manufacturer’s bodybuilder guidelines (wire cross-section)
2	Negative input terminal	Manufacturer’s bodybuilder guidelines (wire cross-section)
3	Control line (activation)	PTO
4	LED display	Functional indicators
5	Accessories	Manufacturer’s bodybuilder guidelines
6	Accessories	Manufacturer’s bodybuilder guidelines
7	Coding switch	Manufacturer’s bodybuilder guidelines
8	Positive output terminal	Manufacturer’s bodybuilder guidelines (wire cross-section)
9	Negative output terminal	Manufacturer’s bodybuilder guidelines (wire cross-section)

9.3.2.4 Assembly location

INFORMATION

Strictly observe the respective truck manufacturer's bodybuilder guidelines regarding electrical connection points inside and outside the cab and where electrical signals and electrical power can be fed in or tapped.

9.3.2.5 Electrical fuse protection

- Voltage supply must be ensured (length and cross-section of wire, max. fuse performance), in order to achieve maximum electrical output power of the charging converter. Pay attention to the respective manufacturer's bodybuilder guidelines.
- The fuse must be installed in a way that its function cannot be impaired by external effects (spray, dirt, etc.).
- Soldered wire connections (corrosion).
- Protect the fuse unit against external effects by applying protective wax.

9.3.2.6 Wiring diagram

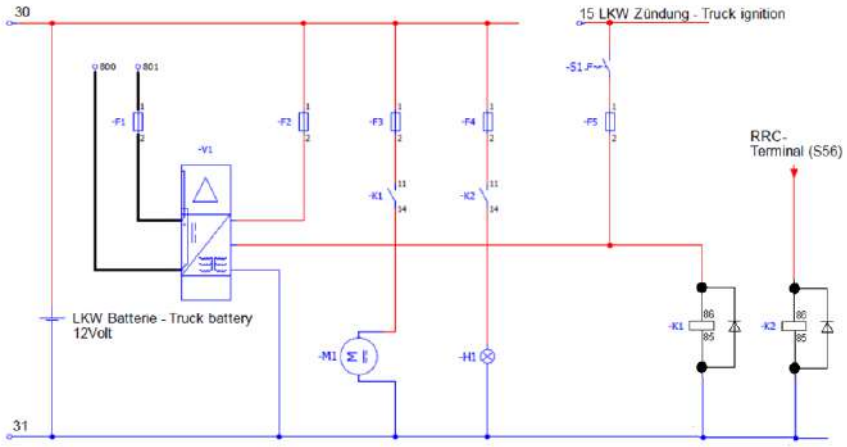


Illustration 09-00 11; Circuit diagram of charging converter

Terminal	Terminal designation
V1	Charging converter
M1	Oil cooler
H1	Working lights
K1	Relay of oil cooler 12 V / 20 A / 30 A (with freewheeling diode)
K2	Relay of working lights 12 V / 20 A / 30 A (with freewheeling diode)
F1	Fuse of crane load current
F2	Fuse of charging converter load current
F3	Fuse of oil cooler 12 V / 30 A
F4	Fuse of working lights (dependent on manufacturer)
F5	Fuse of charging converter control current max. 5 A Relay K1 - oil cooler via PTO
F6	Supply terminal 851 activation of the PALTRONIC 150_TTC Transport position monitoring

9.3.3 12 V Electrical system of crane and truck

In the case of a 12 V crane on a truck with 12 V system voltage occurrence of undervoltage is more probable than on a truck with 24 V system. The supply voltage for the crane electrical system must be constant above 9 V.

Undervoltage may have various causes:

- Contact issues (e.g., corrosion, incorrect installation, etc.).
- Wire cross-section
- Electrical load too high for a short time
- During engine start
- Battery capacity
- Grounding

INFORMATION

In case of system failure because of undervoltage PALTRONIC always switches to the safe status.

9.3.3.1 Charging converter

The charging converter transforms the onboard voltage of the truck from min. 8 V to an output voltage of max. 14.7 V.

INFORMATION

If an oil cooler and / or working lights are installed during bodybuilding, they must be connected via a separate charging converter.

9.3.3.2 Charging converter technical data

PALFINGER recommends a charging converter with 10 A or 20 A output power. When using a more powerful product, adjust the wire cross-sections, electrical fuse protection, etc. accordingly.

Designation	Technical data	Technical data
Nominal voltage	12 V	12 V
Input voltage range	8 to 16 V	8 to 16 V
Maximum output current	10 A	20 A
Output voltage	13,2 – 14,7 V	13,2 – 14,7 V
Power / Efficiency (η)	c. 250 W / (η) 90 %	c. 500 W / (η) 95 %
Ambient temperature	- 20 to + 50 °C	- 20 to + 50 °C

9.4 Transport position

9.4.1 Safety-related Functions

For a CE-conform design the following signals have to be indicated by an optical and acoustical alarm in the driver's cab.

- Transport position monitoring of the boom-system (e.g., TRAN1, TRAN2)
  The transport position monitoring checks if the boom-system of the crane is in transport position or in the arm support during travel. The improper position of the boom-system is indicated by visual and audible signals in the driver's cab.
- Transport position monitoring of the outrigger (e.g., AUSW, AUSVW, ABSTW)
  The transport position monitoring checks that - when the truck is in driving mode - the outriggers are completely retracted. If this is not the case, visual and audible warnings will be given in the cab.
- On cranes with S-IQ the visual and audible warnings of all transport position monitoring units are interconnected accordingly in the S-IQ electronics and get output as digital signals. Furthermore, the signals permitted in the loader crane standard EN 12999 can be interlinked for suppressing the audible warning:

Signal number	Meaning	Description
790	Parking brake engaged	Digital input on crane: A High signal in this line means that the parking brake of the truck is engaged and the audible warning can be suppressed.
792	Acknowledge button in the driver's cab	Digital input on crane: A High signal in this line suppresses the audible warning until the status changes the next time (acknowledge the audible warning).
794	Audible warning max. 1 Ampere	Digital output on crane socket: The audible warning in the cab is connected to this output (can be acknowledged and suppressed by parking brake).
796	Visual warning max. 1 Ampere	Digital output on crane socket: The visual warning in the cab is connected to this output. This signal cannot be suppressed.

Possible wrong indications of audible and visual warnings of transport position in the cab can be prevented by controlling a relay via the digital output signals (794/796). The relay in turn will control the audible or visual warning via load contact.

INFORMATION

The wires in the truck's cab must be laid in compliance with the respective truck manufacturer's bodybuilder guidelines.

9.5 Truck-specific functions

9.5.1 Truck parameterization

Usually, the truck parameters get assigned by a service partner of the truck manufacturer.

During parameterization various functions can be activated under certain conditions.

Example of parameterization under various conditions:

- Crane power supply via PTO in combination with neutral gear
- Crane power supply via PTO in combination with neutral gear and engaged parking brake
- Engine start / stop in combination with neutral gear
- Engine start / stop in combination with neutral gear and engaged parking brake
- Engine stop when temperature of engine too high
- Engine stop when fuel tank reached reserve fuel level
- Engine start via truck ignition lock impossible, if crane or stabilizers are not in transport position
- Switch off / deactivate truck level control during crane operation.
- Use visual controls in the truck dashboard (e.g., transport position of stabilizers, outrigger, crane boom position)
- Different speed ranges e.g., for crane / dumper trucks, depending on the currently selected function

9.5.2 Body builder interfaces

No signals from the CAN-bus may be tapped. The only exception is the CAN-bus interface for the bodybuilder, if existing.

Interventions in the on-board electrical system are only permitted via the interfaces provided by the respective truck manufacturer.

Interfaces are used for:

- Engine start / stop
- Engine speed control (RPM+)
- Tapping into parking brake signal
- Control of air suspension
- Power supply for additional consumers
- Tapping into reversing signal

ATTENTION

This chapter cannot sufficiently provide all information on all questions relating to electrical interfaces of modern commercial trucks. Further information on individual systems can be obtained from the corresponding bodybuilder guidelines and additional wiring diagrams of the respective truck manufacturer.

It is the responsibility of the bodybuilder to ensure that the right documents are used corresponding to the truck's equipment and model and series, respectively.

ATTENTION

Depending on the truck's configuration and electrical preparations, the function of individual pins may vary. The respective manufacturer's wiring diagrams must be observed!

9.5.3 Power supply

ATTENTION

No electrical consumers shall be connected to the power supply of the electronic control units.

ATTENTION

Installations on the electrical system must be short-circuit protected.

ATTENTION

The wire cross-section must be sufficiently dimensioned for the connected consumer.

ATTENTION

Retrofitted consumers must be protected by sufficiently dimensioned fuses. Don't connect additional electric consumers to fuses used by the truck electrical system.

Battery

Direct tapping into the battery cable is not permitted by cutting open or by means of commercially available power distributors.

When removing the terminal from batteries, always disconnect the minus terminals first, then the plus terminals. When connecting the terminals, always connect the plus terminal first, then the minus terminals.

When moving the battery, the battery cables must not be extended. A new cable has to be used. The maximum length listed below must not be exceeded.

Cable cross-section	Maximum length
50 mm^2	3550 mm
70 mm^2	6000 mm
95 mm^2	6700 mm

Central electrics

The central electrical system is often located in the driver's cab, behind the footwell fairing on the passenger side or under the instrument panel and supplies the vehicle equipment with power. In the central electrical system, there are usually grounding connections, electrical interfaces, fuse strips and relay sockets.

Grounding connections

All grounding connections must be connected to the prepared grounding points in the cab / vehicle frame to ensure proper functioning. Grounding connections in other places can cause damage to the truck's electrical system.

- All grounding connections for bodybuilder functions on the chassis frame must be connected to the frame side where the negative terminal of the battery is also connected. A grounding connection to the other frame causes a voltage drop.

Fuse / relay socket:

After proper installation, all fuses must be labeled on the fuse cover, depending on the variant.

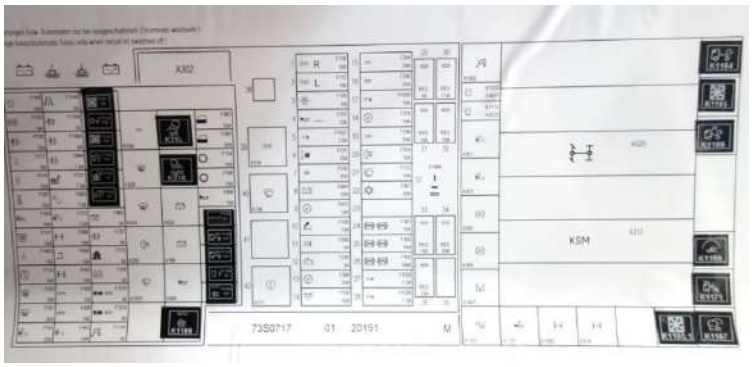


Illustration 09-00 12; Labeling on the fuse / relay cover

9.5.4 Requirement PTO

A PTO is required to drive the hydraulic pump. It is important to design an optimal hydraulic system and specify the correct pump size to provide sufficient oil flow and prevent the PTO from overloading.

INFORMATION

In order to ensure an equal torque distribution from a PTO, power must not be drawn off at low idle speeds of the engine.

If the power is required, an increased engine speed (RPM+) must be requested.

INFORMATION

If there is a risk of overloading the PTO due to excessive power consumption, the engine torque can be limited by parameterization.

INFORMATION

The engine's response to the PTO load is limited to avoid exhaust emissions. For example, a hydraulic system can increase the torque requirement so quickly that the engine cannot react that fast enough, especially at low engine speeds.

ATTENTION

When working with the PTO there is a risk that dust and dirt will get into the transmission and engine. Therefore, always clean the entire area around the PTO.

9.5.5 Engine speed (working speed)

Depending on the bodybuilding and intended operation of the truck, a minimum, constant or maximum speed is required from the PTO and thus also from the engine.

Different control types are often selected for the engine speed, e.g.:

- Speed Control Switch
- Fixed parameterizable value
- Analog control element
- External CAN-Bus

A fixed engine speed is used, for example, for the operation of cranes. Interventions by the bodybuilder / truck manufacturer service partner are carried out via manufacturer-specific interfaces in the central electrical system.

9.5.6 Engine start / stop

This function is used to start and stop the engine remotely. The associated relays for engine start / stop are K50 (start) and K51 (stop). They are installed in a junction box located on the crane.

9.5.7 Signal parking brake engaged

The signal "parking brake engaged" is required for:

- Remote control release
- Alert signals in the cab

9.5.8 Signal reverse gear engaged

The signal "reverse gear engaged" is required for:

- Additional reversing lights
- Activation of working lights when the reversing gear is engaged (see automatic mode 3-way switch).
- Activation Camera

9.5.9 Lowering air suspension

In some cases, bodybuildings require additional stabilizers to ensure enough stability. Example of such bodies are loader crane or access platforms. In stabilizer mode with ground contact of the wheels, the air suspension must be lowered to the air bellows in order to increase the stability. The air suspension control must remain deactivated throughout the whole crane operation.

INFORMATION

PALFINGER recommends automatic air suspension lowering as soon as the PTO is engaged. The crane functions may only be activated after complete lowering. If manually lowering is used , only the stabilizer functions may be available after the PTO is engaged.

ATTENTION

To protect the air bellows in the lowered state, depending on the respective truck manufacturer, care must be taken to determine whether a residual pressure must be present. Observe the respective manufacturer's bodybuilder guideline.

9.6 Connecting electrical auxiliary devices

9.6.1 Connecting the oil cooler

Oil coolers are connected separately on all models (even when they are mounted as standard).

Therefore, each oil cooler has its own input line, that needs to be protected with 15 A at 24 V and with 30 A at 12 V.

Normally, the oil cooler should always be supplied with power when the crane's electric power supply is established.

INFORMATION

This feature is controlled by the thermo sensor and the soft-start module. Direct connection via terminal 15 (truck ignition) or terminal 30 (battery +) is not permitted.

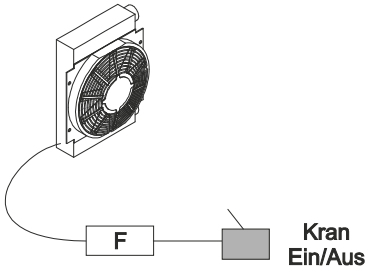


Illustration 09-00 13; Example of oil cooler connection

9.6.2 Connecting the working lights

The working light(s) on the crane are power supplied together via the PTO or separate switch, however separate from the crane current.

The wires must be shortened to the correct length and protected with a corrugated hose. Additional working lights must be wired from the cab to the clamping box (X43).

Illustration 09-00 14: Wiring preparation for additional lights

1	Labeling
2	Wires feedthrough on the cab / chassis interface
3	Junction box X43 on the body

The working lights should be switched via a relay (K1160). The cross-sectional determination must be adjusted to the respective power consumption of the lights (halogen / LED). The respective switch (S1160) is supplied with ignition plus.

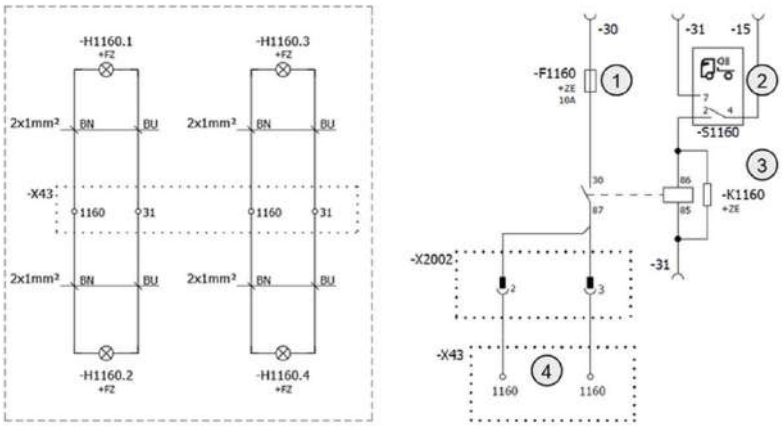


Illustration 09-00 15; Schematic wiring diagram additional working lights

1	Fuse working lights (F1160)	3	Relay Working lights (K1160)
2	Switch working lights (S1160)	4	Junction box X43 for additional working lights

9.6.2.1 3-way switch

The additional working lights are activated via the switch (S1160). Due to a ground switch control (S31), different switching positions are possible:

- Additional working lights only left
- Additional working lights left and right
- Additional working lights only right

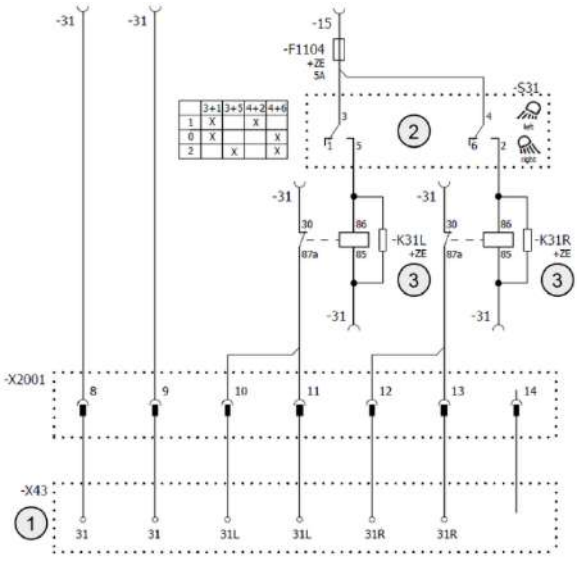


Illustration 09-00 16; Schematic 3-way wiring diagram of additional working lights (manufacturer-specific, here MAN)

1	Junction box X43 for additional working lights
2	3-way switch for additional working lights
3	Relay for switching right or left

INFORMATION

Some truck manufacturers offer wiring preparations ex work, which can be used by the bodybuilder.

9.6.3 Reversing lights

No working- or fog lights may be used as reversing lights, although they might look similar. The respective switch (S1189) is supplied with ignition plus.

9.6.3.1 3-way switch

Due to a 3-way switch (S1189), different switching positions are possible:

- On (used as additional working lights)
- Activation together with the reversing light (automatic mode)
- Off

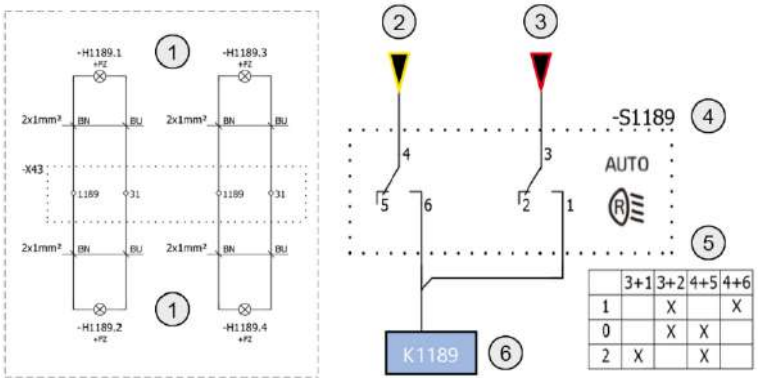


Illustration 09-00 17; Schematic 3-way wiring diagram of reversing lights (truck-specific, here Mercedes)

1	Reversing lights / working lights (H1189)	4	Automatic Reversing Switch
2	Signal "reverse gear engaged"	5	Switching matrix
3	Ignition plus terminal 15	6	Relay "reversing lights"

9.6.4 Connecting the workman basket

The installation instructions for connecting the workman basket can be obtained online via PALDESK.PALFINGER.com.

9.7 S-IQ

9.7.1 General overview

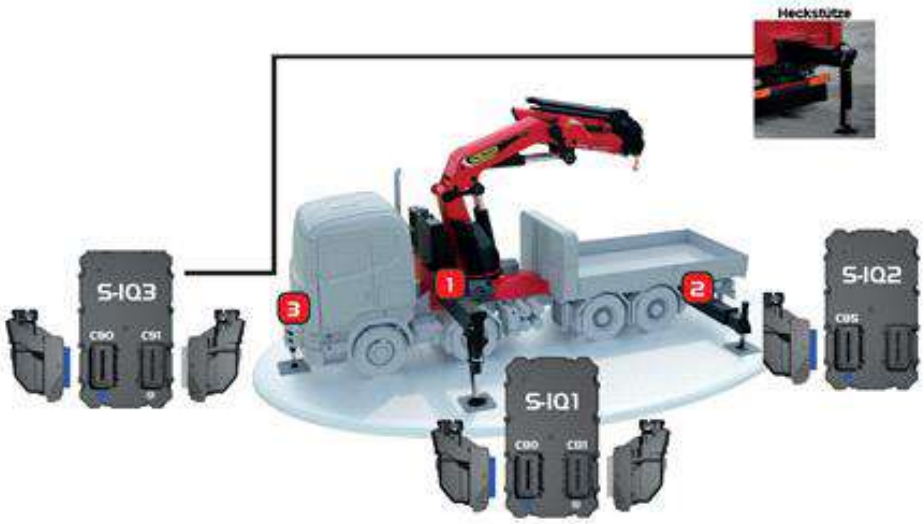


Illustration 09-00 18; General overview of S-IQ

9.7.2 Wiring diagrams

9.7.2.1 Wiring diagram S-IQ1 / S-IQ2

- S-IQ1 crane stabilizer
- S-IQ2 additional stabilizers
- S-IQ1 LCA03

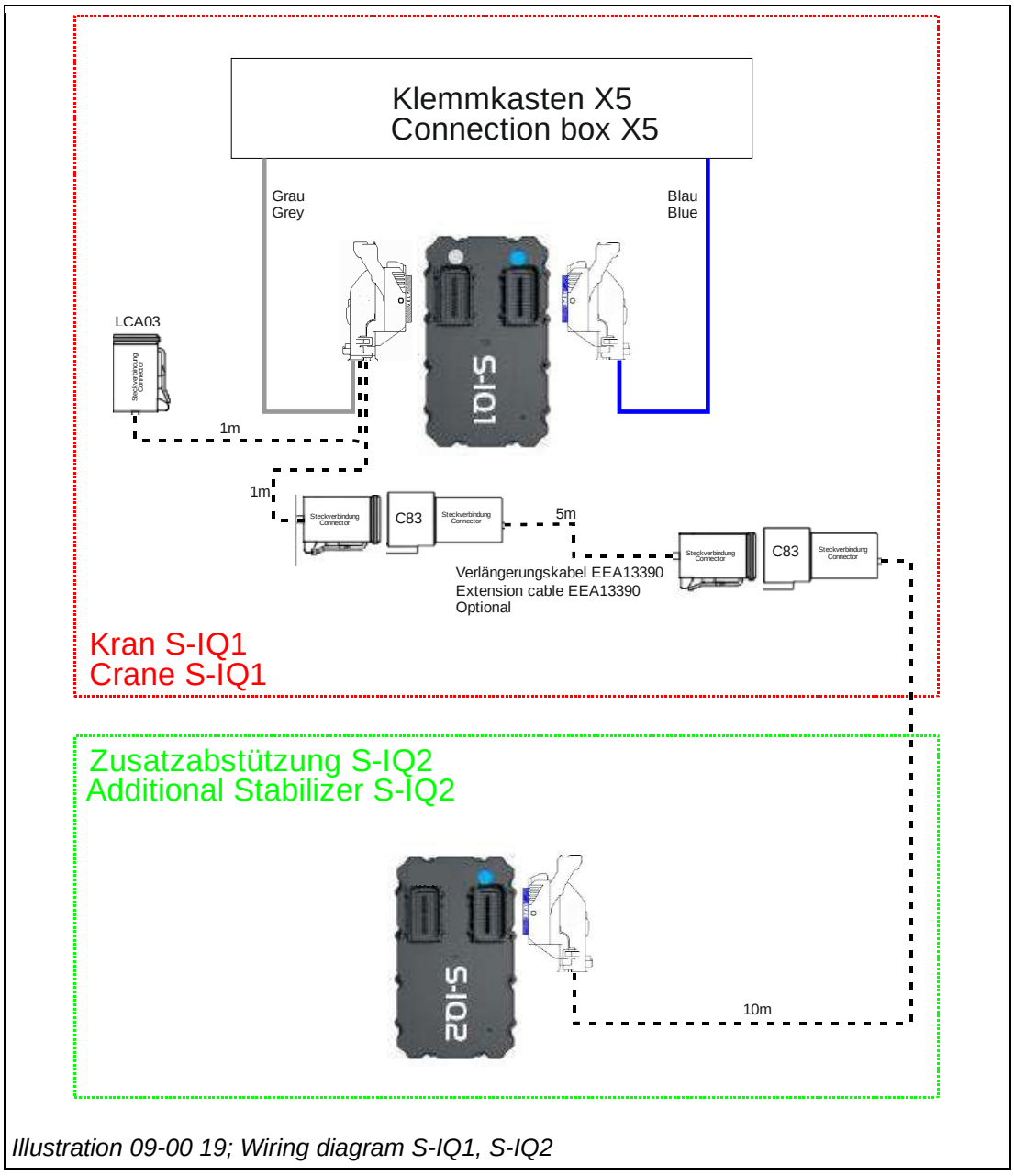


Illustration 09-00 19; Wiring diagram S-IQ1, S-IQ2

9.7.2.2 Wiring diagram S-IQ1 / S-IQ2 / S-IQ3

- S-IQ1 crane stabilizer
- S-IQ1 LCA03
- S-IQ3 frame stabilizer
- S-IQ3 LCA05 / 06
- S-IQ2 additional stabilizers

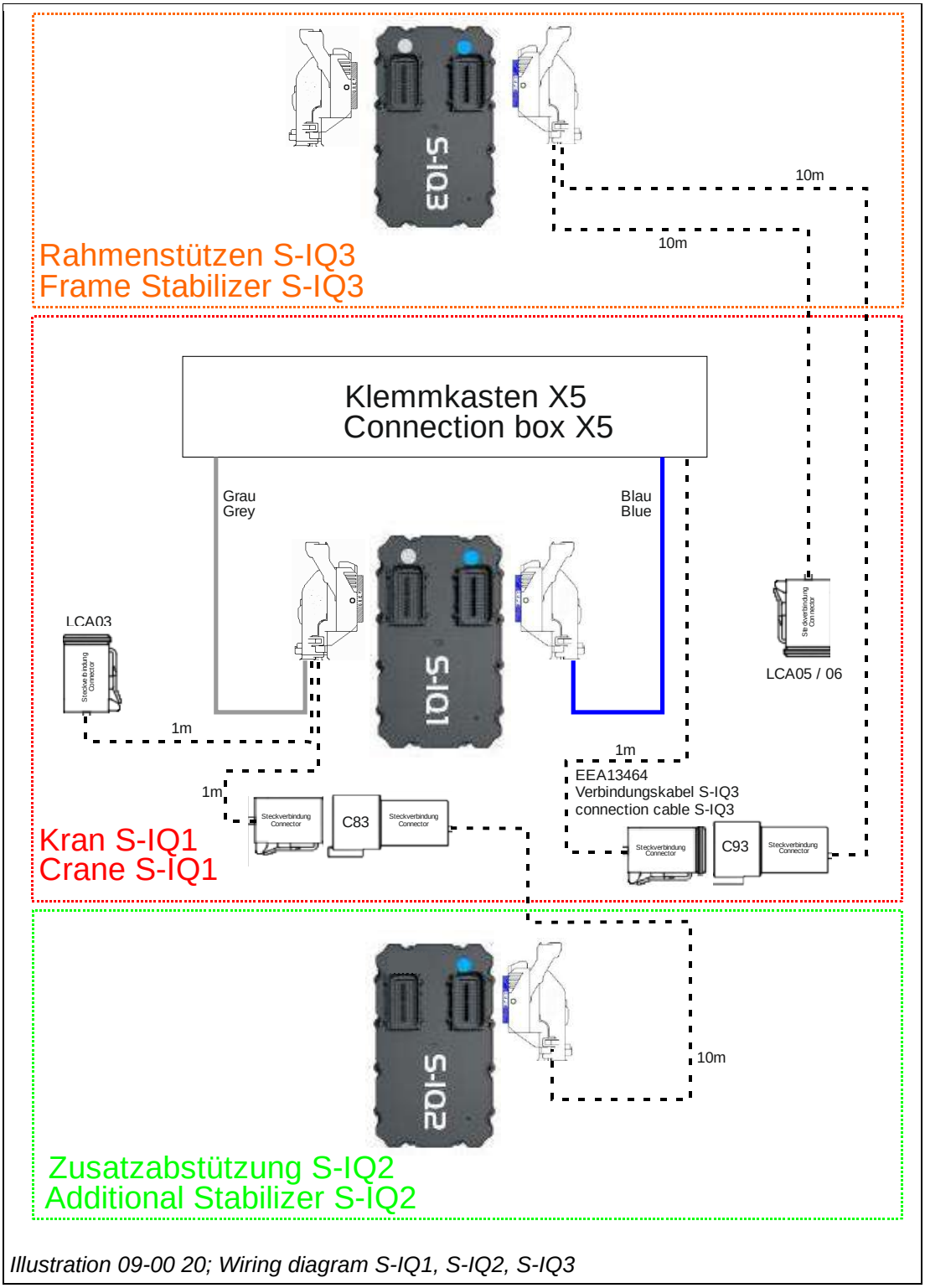


Illustration 09-00 20; Wiring diagram S-IQ1, S-IQ2, S-IQ3

9.7.2.3 Wiring diagram S-IQ1 / S-IQ3

- S-IQ1 crane stabilizer
- S-IQ3 LCA03 / 05 / 06

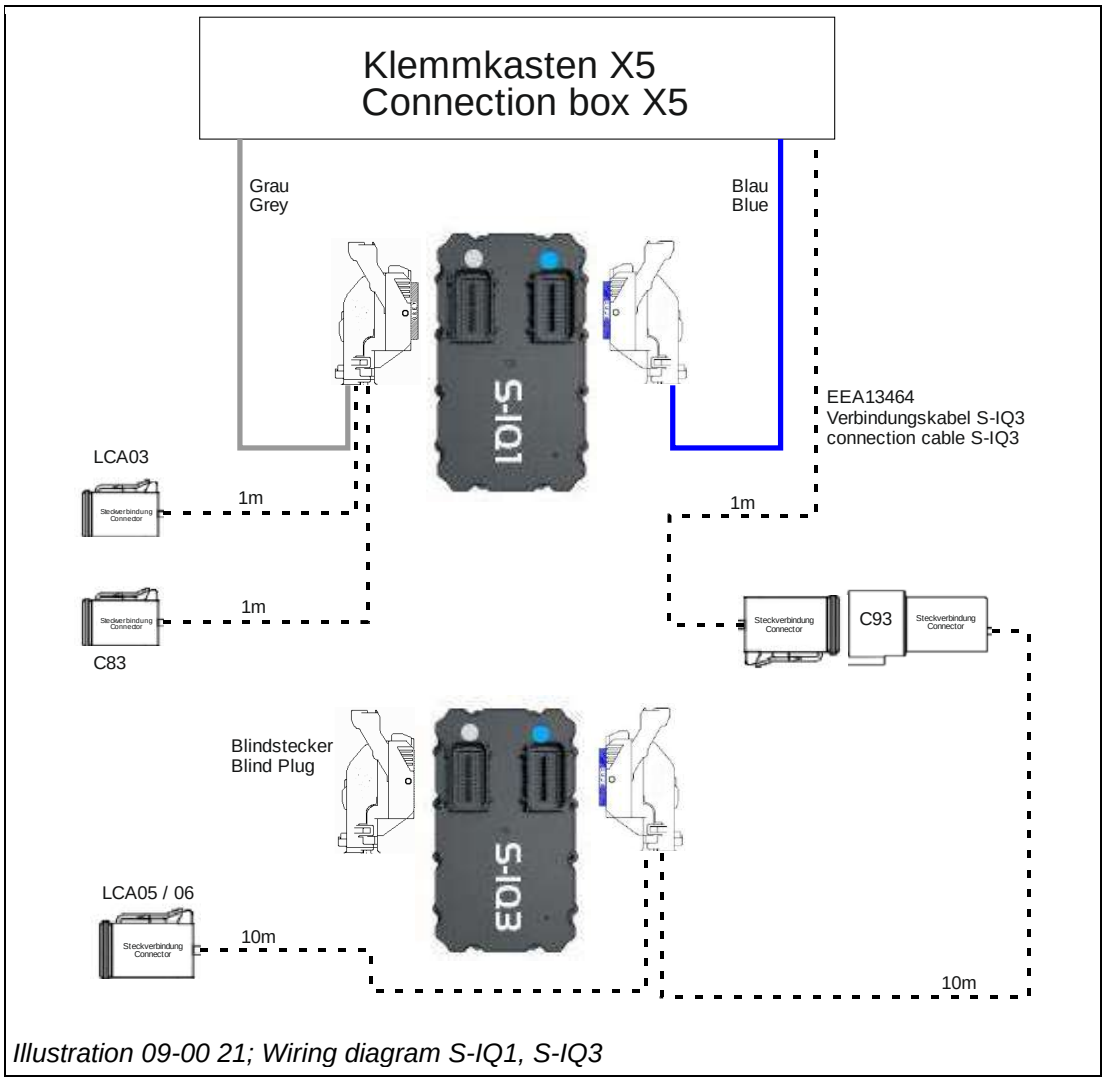


Illustration 09-00 21; Wiring diagram S-IQ1, S-IQ3

INFORMATION

The mating 4-pin or 6-pin connectors are included as per crane configuration!

INFORMATION

The currently valid wiring diagrams can be obtained online via PALDESK.PALFINGER.com.

9.8 Radio remote control

9.8.1 Connecting the charger of the radio remote control

Mount the charger of the radio remote control in the driver's cab. Connect the supplied wire via 3 A fuse.

After charging is completed the charger still trickle-charges the battery.

This has to be taken into account when connecting it to the truck's electric system.

Name	Current consumption
Charging process	840 mA
Trickle charging	200 mA
Standby (without battery)	130 mA

INFORMATION

In particular, pay attention to the current drain during trickle-charging or in standby.

The bodybuilder guideline mentions the current drain from the electrical system when the truck is parked (at night, on weekends, etc.).

If the respective truck manufacturer doesn't provide any regulation, PALFINGER recommends to always control the charger via terminal 15 (ignition on).

- Mount the charger in horizontal or vertical position. Make sure the air circulation is sufficient for venting (min. 30 mm on the back).

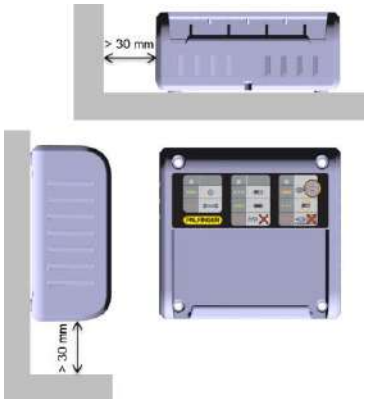


Illustration 09-00 22; Radio remote control charger

- Mount the charger in a cool, shady place in the driver's cab.
- Higher ambient temperatures and direct sun radiation increase the charger's temperature and prolong the charging time!
- Mount the charger in a place where it is protected against spray!

Illustration 09-00 23; Spray, sun radiation

INFORMATION

This applies to all types of remote controls and chargers.

9.8.1.1 Frequency release for PALCOM radio remote control

In some countries outside the EU, it is necessary to specify the telecommunication approval number for the respective country on the device.

The countries and their approval numbers are specified on the enclosed sticker.

Stick it into the battery slot on the radio transmitter as shown in the picture.

Inside the EU the sticker is not necessary.

Illustration 09-00 24; Position of approval number

9.8.1.2 Antenna for radio remote control of crane

In order to ensure perfect radio connection, place the antenna as high and exposed as possible.

This is certainly different for every crane and in most of the cases it is put on a truck part.

The antenna's base is magnetic, so any mounting material is not required.

INFORMATION

Place the antenna in a safe position outside the crane's movement range, for instance on the oil cooler's mounting frame!

9.8.1.3 Connecting the cab heating (Epsilon)

In order to be able to switch on the cab heating while driving, the heating's switch-on-signal must be connected with a switch in the driver's cab. For power supplying the cab-heating during heater operation (the Diesel fuel heating even in follow-up operation) it must be connected at continuous plus (terminal 30).

INFORMATION

The power supply must not be switched off with the PTO.

9.9 Modification and installation of safety-relevant components

Original PALFINGER components must be used when modifying or installing safety-relevant components (such as encoders, odometers, limit switches, pressure gauges, etc.). When installing such safety-relevant components, the PALFINGER repair instructions RA 9-10 "Guidelines on gluing safety-relevant components" must be applied. They can be obtained online via PALDESK.PALFINGER.com.

INFORMATION

If bolted connections of safety-relevant components are loosened or added later on the crane or its accessory, they must be carried out in accordance with the PALFINGER repair instructions RA 9-10 "Guidelines on gluing safety-relevant components"!

It must therefore be ensured that safety-relevant switches and sensors are installed in compliance with safety procedures.

INFORMATION

Safety-relevant switches or sensors must be installed and protected against manipulation in compliance with safety procedures.

Safe status:	Switch / sensor actuated	→ OFF signal (break contact)
Dangerous status:	Switch / sensor not actuated	→ ON signal (break contact)

This circuit guarantees that when using a positive breaking contact (with corresponding mechanical link) the system changes into the safe status when the switch/sensor is being actuated. At the same time any wire break will start a safe status → OFF signal.

Assembly and wiring must comply with the basic and reliable safety principles of EN ISO 13849-2. When making the wiring, prevent any short circuit between any two conductors or any conductor and an unprotected live part (see EN ISO 13849-2, table D.4 and IEC 60204-1).

9.10 Electric crane connection with hybrid power pack

Together with Bosch Rexroth, PALFINGER has redesigned the standard for hybrid power packs. See 10.3 for detailed description and features relevant for bodybuilding.

9.10.1 Hybrid power unit types

PALFINGER provides 4 new hybrid power packs. The new hybrid power packs differ significantly from the previous models. The distinguishing features are described under point 10.3.

- KEB014441 – 15 KW
- KEB014442 – 30 KW
- KEB014443 – 2 x 15 KW
- KEB014444 – 2 x 30 KW

WARNING

The control box houses the low-voltage distribution (24 V DC) and the 400 V three-phase AC power.

For the electrical connection of the crane in the control box to the 24 V power network, the 400 V three-phase power supply must be disconnected from the outside on the network side.

Work on the 400 V three-phase power supply is only allowed to country-specific trained technicians!

WARNING

The outdoor socket(s) for the 400 V three-phase power supply is included loose.

As mentioned above, all work connected with this power supply may only be carried out by trained technicians.

9.10.2 Description of the terminal strip

The example shows a terminal strip in the control box. The view is shown as an example and differs according to the above-mentioned power pack types (KEB14441 - KEB14444).

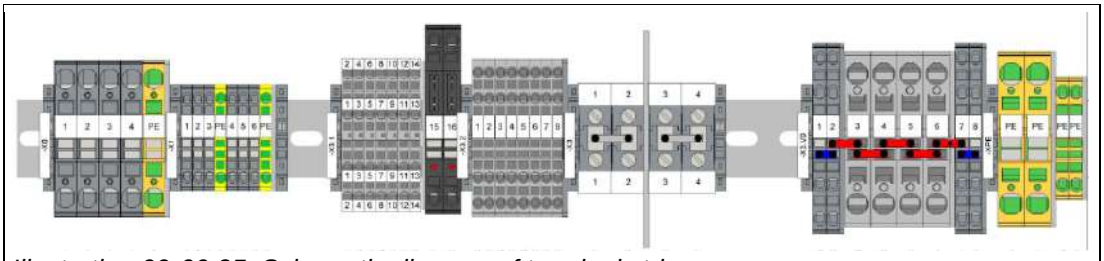


Illustration 09-00 25; Schematic diagram of terminal strip

The electrical connection terminals relevant for the electrical crane connection (24) are mounted on the terminal strip.

X3 Interface Main power supply, operating selector switch truck 24 V

X3.1 Interface additional functions, special functions

X3.2 Interface power supply crane, working lights, oil cooler etc. 24 V

X3.V0 Interface ground supply crane, working lights, oil cooler etc. 24 V

9.10.3 Modifications

The hybrid units have been upgraded in terms of electrical- and connection technology to meet today's standards. All new hybrid units were converted from star/delta switching for the electric motor to the current standard with a soft start module. In addition to the already known connection options, the following innovations were implemented.

9.10.3.1 Terminals

The terminals for the ground supply (X3.V0/1-8) and the power supply X3.2/1-4) for the crane are duplicated.

9.10.3.2 Truck control 400 voltage supply

If the control cabinet is connected to 400 V three-phase alternating voltage, a 24 V signal is output via the power supply T1/relay contact 13/14. This 24 V signal can be tapped at terminal X3.1/7 and indicates the external 400 V three-phase power supply as a visual signal device in the driver's cab.

Important: It is the external power supply and not the mechanical connection of the 400 V plug that is monitored.

9.10.3.3 Enabling hybrid operation

If trucks are equipped with air suspension, a defined lowering of the air suspension (stability) must be ensured before crane operation.

For this purpose, the voltage supply of the crane can be controlled via the terminals X3.1/13 and X3.1/14 in such a way that, after the air suspension has been lowered, the two terminals X3.1/11 and X3.1/12 are bridged by a release signal controlled by the bodybuilding.

As a result, the crane / Paltronic is supplied with voltage via K1, S1, K8 and K9 after the release signal of the level lowering of the air suspension.

9.10.3.4 Safety interlock

This safety interlock is necessary to ensure the lowering of the air suspension for stability. If there is voltage at terminal X3.1/13 in the control cabinet, the unit cannot be started in mains operation (400 V). The relay K1 opens the internal circuit to the start button S3.

In the event that lowering is not necessary for bodybuilding reasons (no air suspension installed), the system can be deactivated by bridging the two relay contacts 22 and 21 at terminals X3.1/15 and X3.1/16.

9.10.3.5 Workman basket emergency operation

If the hybrid power pack fails in workman basket operation, emergency operation can be performed with the emergency lowering of the workman basket using the external hydraulic power packs and the PALFINGER emergency power pack control.

For the emergency operation of the workman basket in connection with the hybrid power pack, the workman basket is supplied with electrical voltage via switch S253 of the PALFINGER emergency power pack control and with oil via the external hydraulic power packs. The following electrical connections must be made for this purpose:

- Connect the S253 signal to terminal X3.1/8. This activates the relay K2.
- Connect the connections 811 and 812 (+24 V) of the PALFINGER emergency unit control to the terminals X3.2/7 and X3.2/8.
- The relay K2 switches the external power supply of the PALFINGER emergency unit control to the work basket via the terminals X3.2/5 and X3.2/6.

9.10.3.6 Additional functions

The known additional functions motor start and motor stop can be found in the respective wiring diagrams.

9.10.3.7 Transport monitoring

The voltage supply of the transport monitoring is connected to terminal X3.1/9. The display in the driver's cab is connected to the terminals provided for this purpose on the crane.

9.10.3.8 Wiring diagrams, spare parts

The wiring diagrams of the Bosch Rexroth hybrid power packs are listed in the PALDESK under Equipment:

- Mounting Accessories
- Hydraulic Power Packs
- PALFINGER Hybrid

INFORMATION

On the rear pages of the circuit diagram, the electrical parts installed in the control box are listed with PALFINGER spare part numbers.

PALFINGER Installation Guideline
Hydraulic Loader Crane

Chapter 10

Additional work before and during the crane installation

PALFINGER

Original Installation Guideline

DA-105

Version: 2023/03

English

PALFINGER AG
Lamprechtshausener Bundesstraße 8
5101 Bergheim | Austria
www.palfinger.com

Contents

10.1 Adjust dead point

When mounting cranes which do not have an infinite slewing gear, it is important to note the position of the dead point before placing the crane. This point is marked by the factory on the crane base with the following symbol.

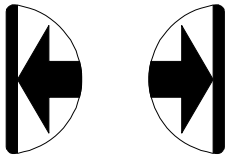


Illustration 10-00 1; Symbol "dead point"

10.2 Crane specific works

10.2.1 Removing lifting gear

Mounted lifting gear, such as eyes or shackles, need to be dismounted after assembly.

Illustration 10-00 2; Mounted lifting gear

10.2.2 Removing transport protection equipment

Depending on crane type, transport protection equipment may be fitted. It needs to be removed after crane installation for visual and safety reasons. Example:

Steel bracket at top edge of knuckle boom	Edge protection at lashing point
	

Illustration 10-00 3; Examples of transport protection equipment

10.2.3 Removing transport locks

10.2.3.1 Removing knuckle boom transport locks

The transport locks of the knuckle boom need to be removed after having mounted the crane

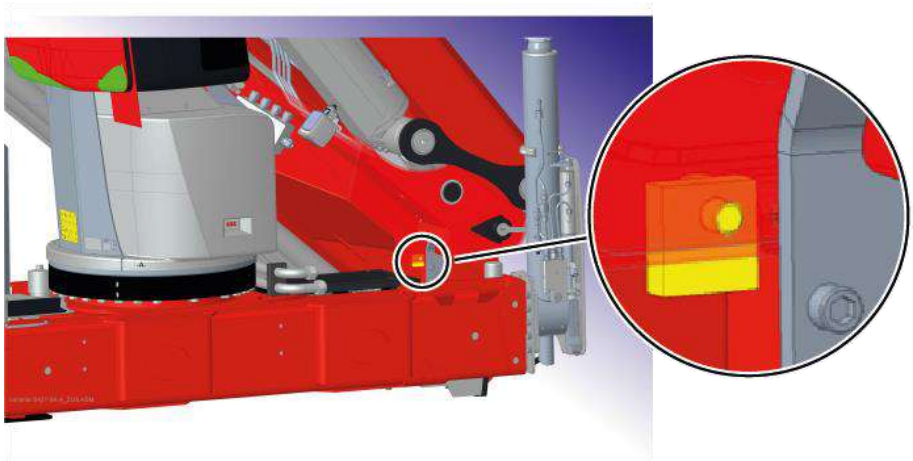


Illustration 10-00 4; Knuckle boom transport lock

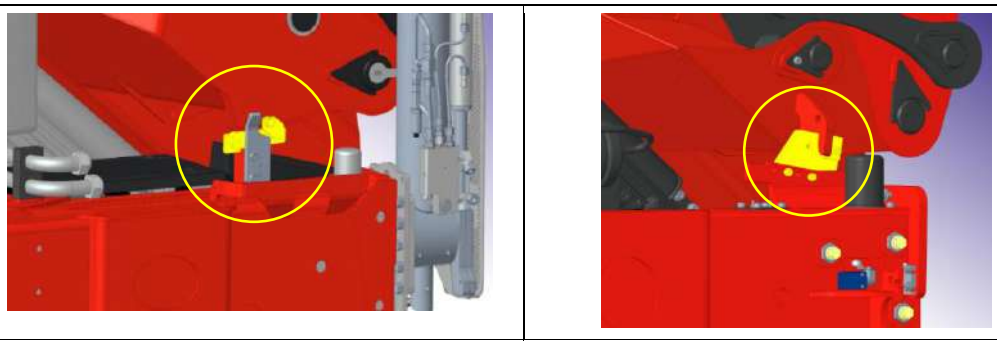


Illustration 10-00 5; Knuckle boom transport lock

10.2.3.2 Balance transport lock

The screws on the balance are used for fastening during crane manipulation. After having put down the crane, loosen this screw to avoid noise caused by torsion of the vehicle.

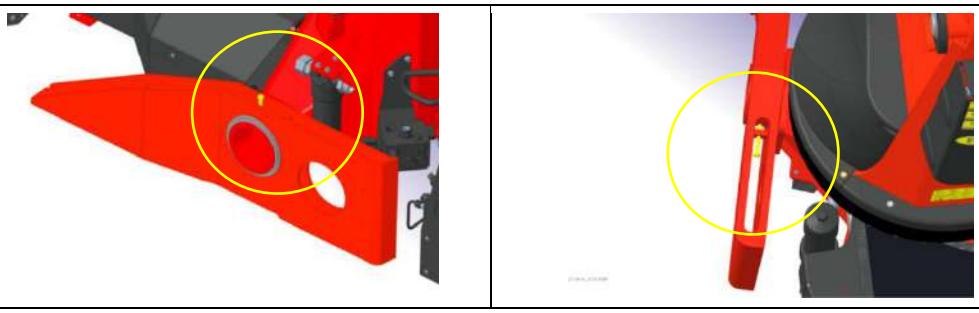


Illustration 10-00 6; Balance transport lock

10.2.4 Mounting supplied material

Accessories specific for the crane are supplied together with the crane in a transport box and need to be mounted. For example, the safety-relevant protection bracket for the control panels' levers is not mounted ex works in order to reduce transport dimensions.

Illustration 10-00 7; Crane controls protective bracket

Illustration 10-00 8; Stabilizer controls protective bracket

10.2.4.1 Design lables on TEC cranes with PAL 180

The new PALFINGER logo (design facelift) is fitted as standard to TEC cranes with PAL 180 as a haptic lable on the left and right of the main boom.

Appropriate washers, spacers and screws (M6) must be provided on the main boom or on the plate. The screw positions may vary depending on the main boom design.

Illustration 10-00 9; New PALFINGER logo as standard on TEC cranes with PAL 180

Illustration 10-00 10; Powder-coated plates on cranes with main boom winch

For cranes with a main boom winch, only a powder-coated plate (2 mm) is fitted directly to the main boom on the winch side instead of the haptic design lable.

Appropriate washers, spacers and screws (M6) must be provided on the main boom or on the plate. The screw positions may vary depending on the main boom design.

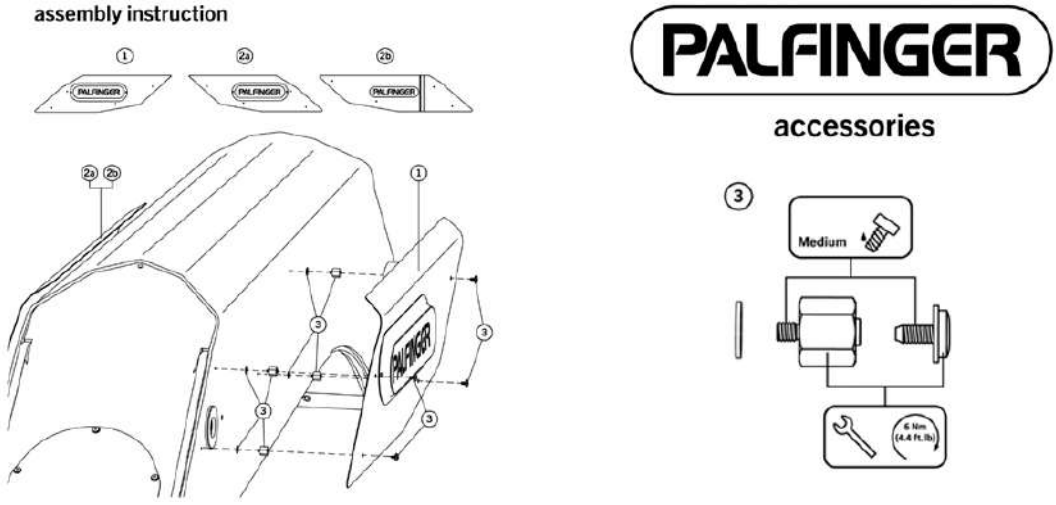


Illustration 10-00 11; Assembly instructions for PALFINGER TEC design plate with PAL 180

The lables are delivered in a wooden box, which also contains the insert EB17517 (Illustration 10-00 11). This contains relevant mounting instructions for the new design plates.

Materials to be used are:

- Washers and spacers
- M6 screws (6 Nm)
- Medium-strength screw adhesive

10.2.4.2 Assembly of EPSILON remote - terminals (RCE)

With EPSILON cranes with radio remote control the operating panels for outriggers and stabilizers are delivered separately and must be installed on the truck body. For safety reasons, a minimum distance to the stabilizer cylinders should be maintained when mounting the panels.

If it is impossible for space reasons, a risk assessment is obligatory, at least warning signs must be attached as per EN 12999.

The control panel for the right outrigger must be mounted on the right side. The control panel for the left outrigger must be mounted on the left side. The appropriate outrigger must be in view of the operator during operation.

The minimum distance between panel and stabilizer cylinder depends on the slewing direction.

WARNING

Not maintaining the minimum distance may lead to severe personal injury and material damage.

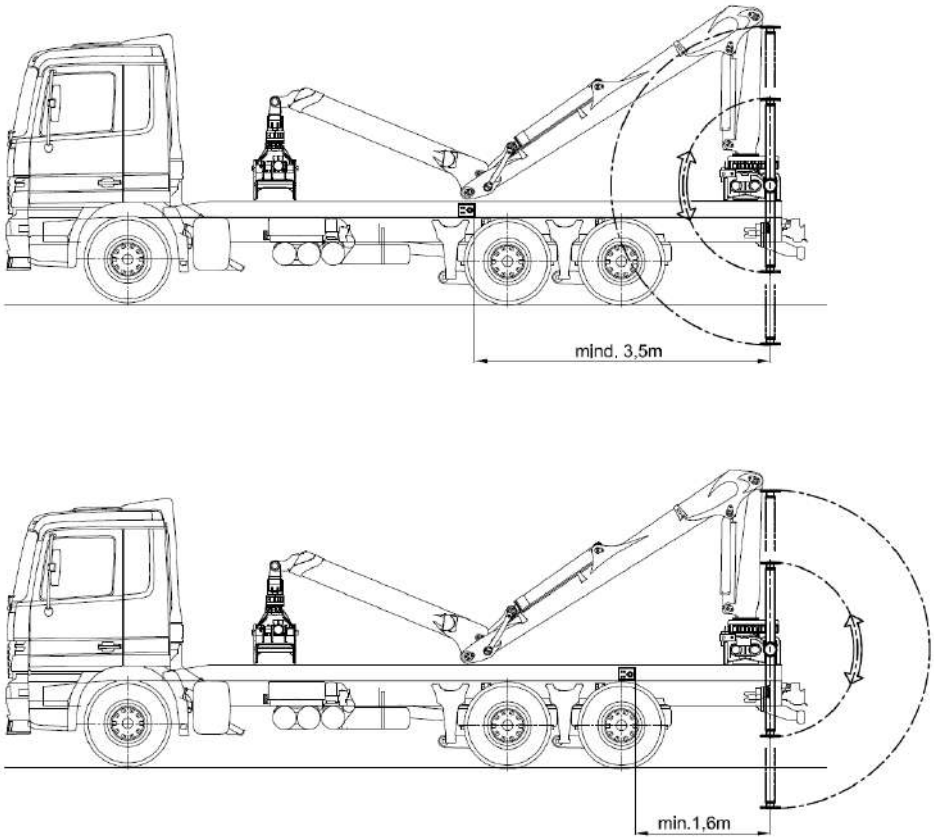


Illustration 10-00 12; Position of EPSILON radio terminal

10.3 Pre-loading prior to initial activation

- All crane functions have to be pre-loaded hydraulically before unfolding in order to avoid injuries or damages to the vehicle caused by unintended movements of crane components. This applies in particular to:
- Lower outer boom
- Lower fly jib
- Retract extension booms

DANGER

If this is ignored, there is risk of injury caused by components that suddenly lower or move out unintentionally.

10.4 Adapt crane support

10.4.1 Installing the stabilizer cylinders

When mounting cranes on which the factory did not mount the support cylinders for transport reasons, the following points must be observed during mounting:

- Clean flange areas.
- Mount the handle for mechanically extendable support.
- Tighten the fastening screws of the support cylinders with a torque spanner (see user manual Chapter 11, Service).

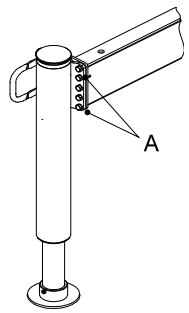


Illustration 10-00 13; Fastening screws (A) of the support outrigger

WARNING

The support cylinder must always be secured with all of the fastening screws (A) to the support outrigger.

- The lock function of the mechanical support outriggers when retracted must be guaranteed. PALFINGER recommends a warning light in the driver's cab as a check of the support lock for safety reasons.
- Support outriggers and support cylinders must be visible during extension and retraction. If this is not possible for both sides, operation must be restricted to the visible side. This can be done by removing the hand lever or disconnecting the opposite control.
- Contact surfaces of mechanical support outriggers should not be lubricated (cleanliness in the operating area).
- If support plates were supplied with the crane, a transport base should be provided in the vicinity of the supports.

10.4.2 Retraction limiter of hydraulic outriggers

In case retraction limiters are required for the outriggers, they should only be implemented via lift stop equipment on the piston rod of the extension cylinder.

It is not permitted to mount a mechanical stop on the cylinder's outside, because this may have a negative effect on the system.

The part of the chrome-plated piston rod which is exposed to the environment due to adjustment should be protected against corrosion (e.g., by paint or preservation) for a better visual appearance.

The sensor's position for transport position monitoring needs to be adjusted.

10.5 Note on risk of slipping, tripping and falling

Climbing aids and platforms, which must be climbed or stepped on for crane operation, need to be installed in compliance with legal provisions. In addition to national requirements on component design, also appendix L of EN 12999 and EN ISO 12100 need to be considered.

10.5.1 Relevant contents of EN ISO 12100-2010:

Chapter 6.3.5.6 of the standard: 'Actions for safe access to machinery'

This section describes that operation and all routine works need to be carried out from the ground. If this is impossible, actions for the avoidance of danger are specified. These include:

- Provision of access aids
- Non-slip design of steps and walkways
- Avoidance of falling and tripping hazard
- Installation of guardrails and points for fastening personal protective equipment
- Control stands must not be affected

10.5.2 Extract of EN 12999 appendix L

10.5.2.1 Handrails and handholds

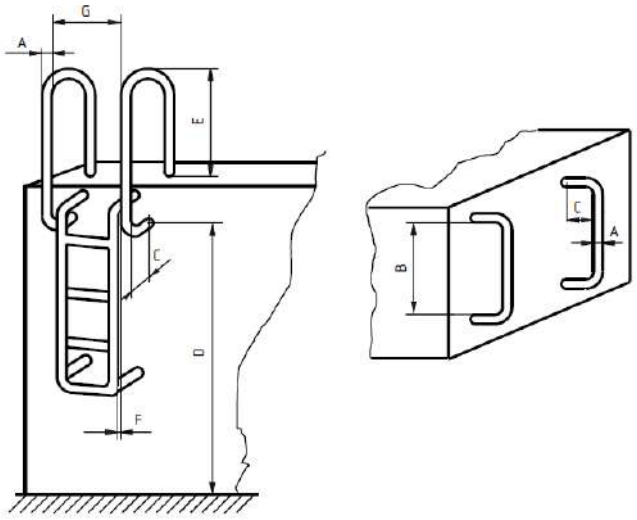


Illustration 10-00 14; Handrails and handholds

Dimensions of handrails and handholds:

Symbol	Descriptions	min. [mm]	max. [mm]
A	Width (diameter or across flats)	16	40
B	Length between bend radii for support legs of handholds	150	-
C	Hand clearance to mounting surface	75	-
D	Distance above standing surface	-	1.600
E	Vertical distance of handrail continuation above step, platform, stairway or ramp	850	-
F	Offset distance of handrail or handhold from edge of step	75	200
G	Width between parallel handrails	450	-

Note: Handrail extension can be an integral part of or separate from ladder.

10.5.2.2 Steps, ladders and stairways

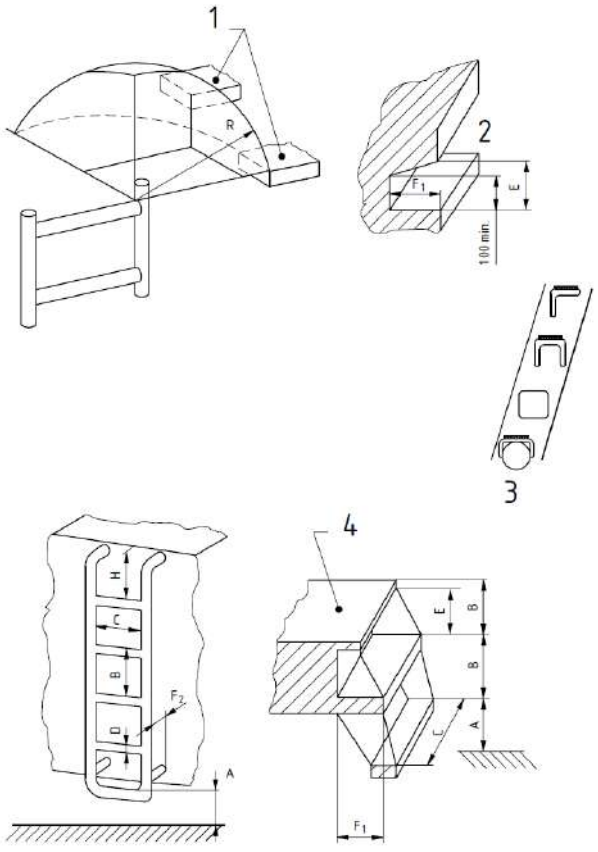


Illustration 10-00 15; Steps, ladders and stairways

1	Platform	3	Typical profiles for ladder rungs
2	Instep clearance	4	Platform level

Dimensions of Steps, ladders and stairways:

Symbol	Descriptions	min. [mm]	max. [mm]
A	Height of first step above ground or platform	-	600
B	Riser height	220	300
C	Step width –Rung ladders (for one foot)	300 (150)	-
D	Rung tread - Width	19	40
E	Instep clearance	150	-
F_1	Tread depth for steps (stepped ladders, stairways, etc.)	240*	400
F_2	Toe clearance (free space behind rungs)	150	-
H	Distance from top rung of ladder to platform	-	150
R	Step placement from ladder	-	300

* Can be reduced to 130 mm when free space for toe clearance is provided.

10.6 Raised control positions

Supplied PALFINGER top seat components shall be fitted as per original installation guidelines. They can be obtained online via PALDESK.PALFINGER.com.

On cranes with top seat and high stand the bodybuilder shall mount climbing aids (non-slip steps, handles) and fall protection equipment confirming to standards and applicable national regulations. The crane operator must be able to safely access and stay on the appropriate operator station. It must be ensured that platforms are designed to prevent control levers from being actuated unintentionally or used as handgrips. They should not impair operability of the unit.

At raised control position a safety rail must be added in conformity with standards and regulations of the pertinent country.

Note the additional space requirement for a high seat (risk of being crushed!).

10.7 Protective devices on the vehicle

- Protection from emissions
- Protection from rotary movements (drive shaft)
- Lateral restriction for the crane outrigger stored on the loading area: Measures must be taken to ensure that the crane (and / or accessories are fastened to it) do not protrude over the width of the vehicle during transport.

INFORMATION

In case that the control position is beside the exhaust pipe, it is necessary to add following advice.

Attention, exhaust fume! Use control position only for unfolding and folding of the crane!

10.8 Warning devices

- Acoustical warning for people about to enter a hazardous area. Requirement for reach of 12 m or more according to EN12999 5.6.7 → connect to vehicle horn or the horn which can be obtained from PALFINGER (EMV certified).
- Transport position monitoring of main boom: Required, when stored above loading area – according to EN12999 5.6.1.3.
- Support outriggers retracted respectively locked according EN12999
- Optional: Support cylinders retracted.

10.9 HPSC options for ballast LCA03 / LCA05 / LCA06

In order to increase the crane's stability on a vehicle, the options LCA03 and LCA05 facilitate the integration of two ballast weights into the stability system. The respective weights and center of gravity coordinates must be stored in PALTRONIC via PALDIAG.

For semi-trailer vehicles the trailer weight at the kingpin may optionally be included via LCA06 function. So, the semi-trailer's specific effect on stability behavior can be considered. However, configuration in PACWEB and an additional specific adjustment process are required.

DANGER

If the ballast weights are positioned on the vehicle in a way that does not match the settings in PALTRONIC there is danger of tipping and therefore risk of fatal injury!

The ballast weights LCA03 or/and LCA05 get activated via digital inputs in PALTRONIC. The digital inputs are set through coded connectors that are inseparably connected with the ballast weight. Only in this way, safe crane operation can be guaranteed. Once the ballast weight is properly placed and the connector plugged into the crane controls, the crane controls automatically calculate the extended working range.

PALFINGER recommends the bodybuilder to consider the following points when installing this additional function:

- The connectors' coding must be non-confusable and tamper-proof. This applies to both the coding between LCA03 and LCA05 and the coding between these two and the other connectors on the crane or vehicle.
- The coded connectors must always be inseparably connected with the ballast weight.
- Wiring to controls and connectors must be installed in a way that excludes any short circuit between any two conductors (compare with EN ISO 13849-2:2012, table D.4 - Faults and fault exclusions - conductors / cables). Furthermore, basic and proven principles must be applied with the electric system (see EN ISO 13849-2, Appendix D).

INFORMATION

Examples for fault exclusions of short circuits between any two conductors (see EN ISO 13849-2):

- **Permanently (firmly) installed conductors, secured against external damage (e.g., by cable duct, armored conduit).**
- **Installation in two different metal conductors.**
- **Conductors within one electric installation space.**
- **Conductors individually protected through ground connection.**
- **Both the conductors and the installation space must meet the requirements of IEC 60204-1.**
- **Non-confusable attachment points and installation positions for the ballast weights (see illustrations 10-00 15 to 10-00 17).**

PALDIAG LCA03 / LCA05 input window:

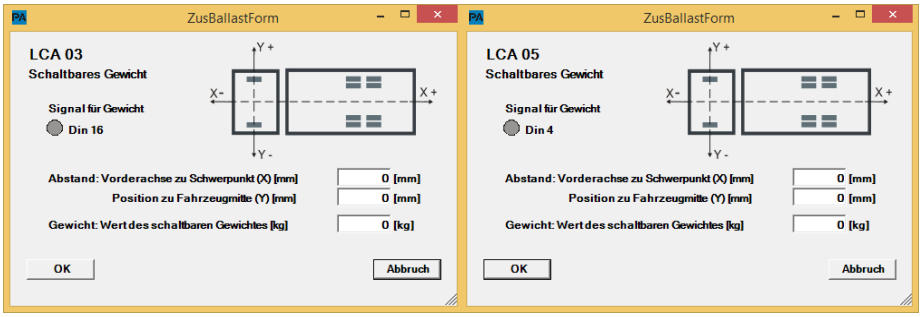


Illustration 10-00 16; PALDIAG input window

Ballast weight LCA 03:

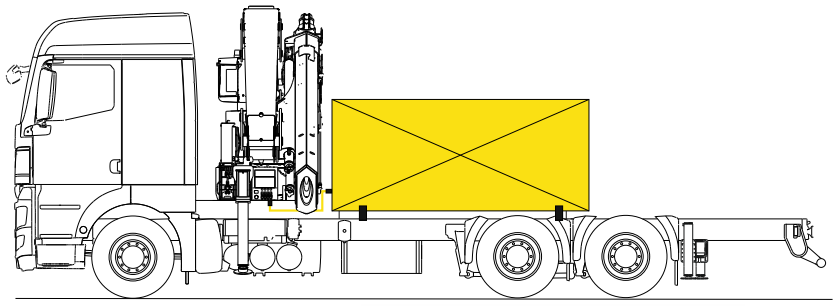


Illustration 10-00 17; Ballast weight LCA 03

Ballast weight LCA 05 - mode 1:

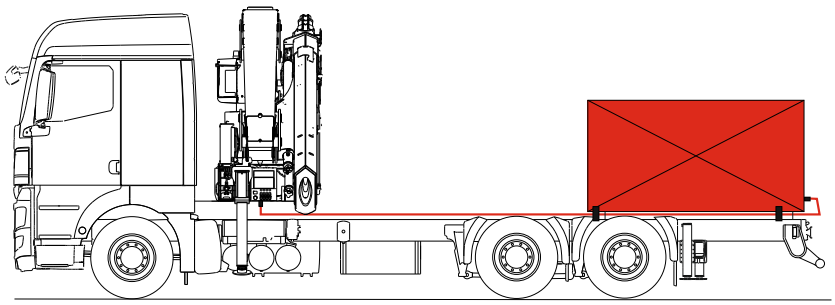


Illustration 10-00 18; Ballast weight LCA 05 mode 1

Ballast weight LCA 05 - mode 2:

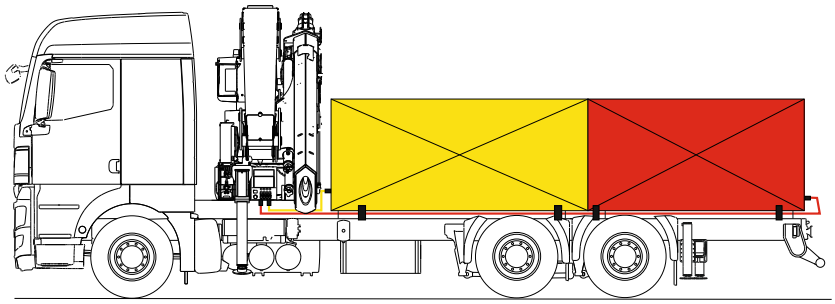


Illustration 10-00 19; Ballast weight LCA 05 mode 2

Ballast LCA06:

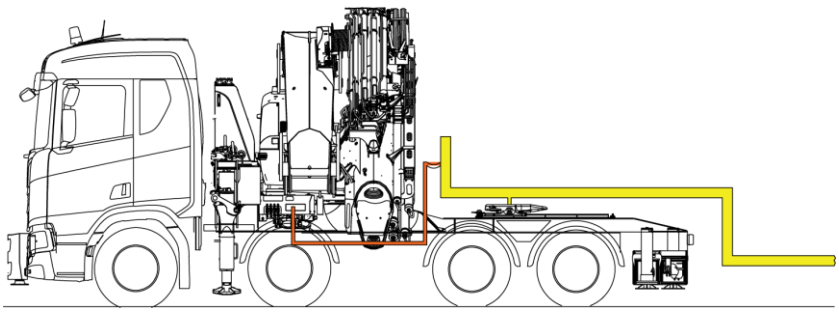


Illustration 10-00 20; Ballast weight LCA 06

PALFINGER Installation Guideline
Hydraulic Loader Crane

Chapter 11

Mounting auxiliary devices

Original Installation Guideline

DA-105

Version: 2018/03

English

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Contents

11.1 Prerequisites for the installation of auxiliary devices

PALFINGER cranes can be operated with several different auxiliary devices. In the EEA and some countries, auxiliary devices must bear their own CE certification (see the relevant operating instructions as well for the specific crane).

Observe the following points when mounting any auxiliary devices:

- The auxiliary device must be suitable for the crane in terms of size and lifting capacity.
- When mounting the device on the crane, the bodybuilder guidelines of the respective manufacturer for the device and, to the extent applicable, any regulations specific to the country must be observed.
- Check for the existence of laws specific to the country which regulate the use or operation of auxiliary devices.
- Make sure there is a type plate on the auxiliary device with the following information:
  - Manufacturer
  - Type designation
  - Serial number
  - Dead weight
  - Operating pressure
  - Capacity
  - Max. permissible lifting weight
  - Year built
- Some of these auxiliary devices must be attached to the crane using the PALFINGER special suspension gear. Mount the PALFINGER special suspension gear according to the sketch below.

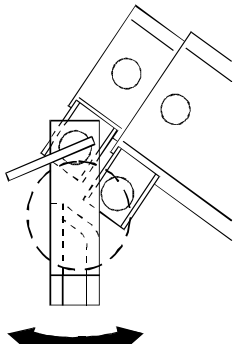


Illustration 11-00 1; PALFINGER special suspension gear

ATTENTION

If the PALFINGER special suspension gear is not used for these devices, the load-bearing boom may be damaged (Loss of guarantee).

If a hydraulically driven auxiliary device is used, the crane must also be equipped with the appropriate control valve and additional piping on the load-bearing boom. Exact data can be found in the hydraulic circuit diagrams of the specific crane or auxiliary device.

The scope of application, the preparatory work and the mounting of PALFINGER auxiliary devices is explained in the following.

11.2 PALFINGER Fly Jib

The PALFINGER Fly Jib is a second knuckle boom system and serves to extend reach and broaden the range of possible uses.

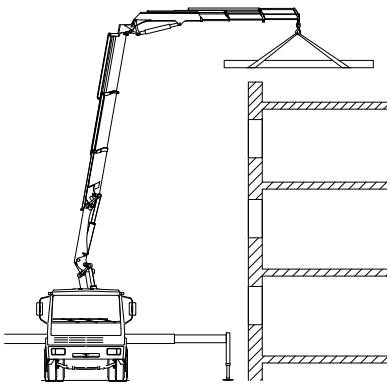


Illustration 11-00 2; PALFINGER Fly Jib

See the technical sheets of the crane to find out which type of fly jib matches which crane.

11.2.1 Adapt the insert

Weld the appropriate spacer plates to the insert. Then grind down the spacer plates, if necessary, far enough so that the fly jib fits firmly in the crane's telescoping boom but can nevertheless be easily attached and removed. If the insert has too much play in the telescoping boom, oscillation during operation may lead to damage to the fly jib or the telescoping boom.

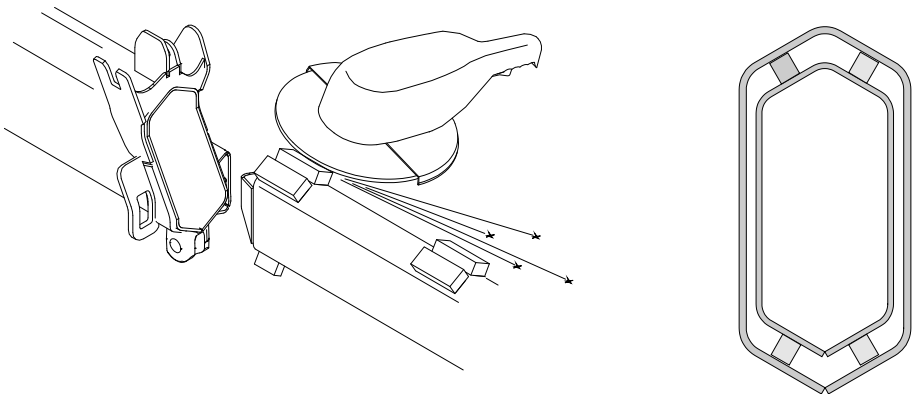


Illustration 11-00 3; Grinding of the spacer plates

Then a stop must be welded to the insert. Position it so that the connecting pin can be easily pushed through the connecting hole without applying pressure.

ATTENTION

The selection of the protective gas and the welding additive as well as the form of the welding seam and its thickness is the responsibility of the welding supervisor.

The welding must be done only by people in possession of a valid welder's certificate in accordance with ISO 9606-1 or with an equivalent national welder's certificate. The scope of the welder's certificate must cover the entire range of the executed range (see chapter 4)

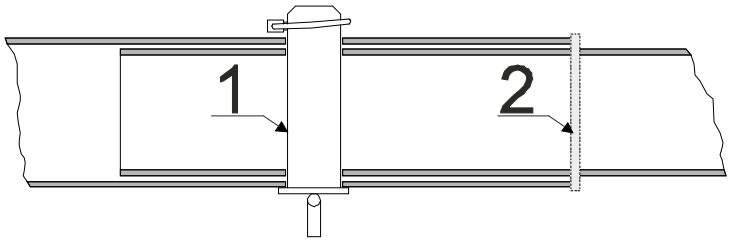


Illustration 11-00 4; Securing of the connection pin

1 Connection pin	2 Limit stop

If the fly jib is mounted on the crane, the connecting pin must be secured properly with the appropriate safety materials.

11.3 Rotator, grab, stone-stacking gripper, pallet fork, etc.

Rotators are used in combination with auxiliary devices which must be slewable (gripper, pallet fork, etc.). Depending on the use, you can choose between two attachment variants (rotator on the auxiliary device).

11.3.1 Mounting of the auxiliary device (grab, stone-stacking gripper, pallet fork, etc.)

- The auxiliary device may be mounted and dismounted only by trained personnel.
- The permissible total weight of the vehicle (vehicle registration certificate) must be observed.
- The auxiliary device may be attached only to suitable device carriers.

ATTENTION

Paint must be removed from all of the contact surfaces before the auxiliary device is mounted on the rotator.

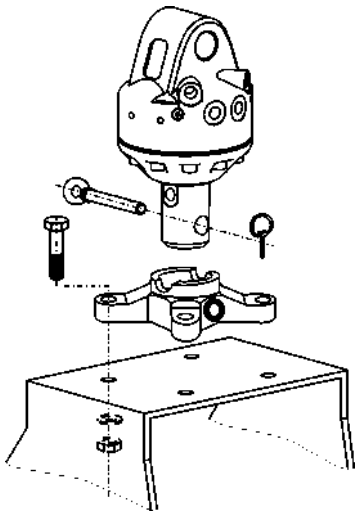


Illustration 11-00 5; Rotator type G

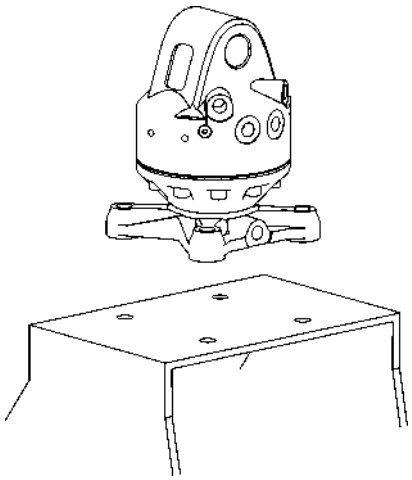


Illustration 11-00 6; Rotator type GF

The selection of the type of rotator depends on the frequency with which the auxiliary device will be changed. If several auxiliary devices are used, choose Rotator Type G. If one auxiliary device is being used, use Rotator Type GF.

PALFINGER rotators must be mounted with the appropriate upper suspension on the load suspension gear of the crane's telescoping boom. The bolt, which is used to pin the rotator, must be properly secured with the appropriate safety materials.

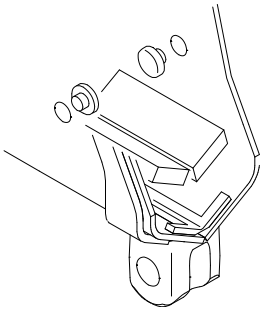
11.4 Mechanical extensions

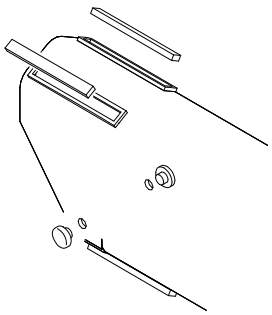
Mechanical extensions are used to increase the reach. You can find the appropriate mechanical extensions for your crane in the mounting sheet DA069.

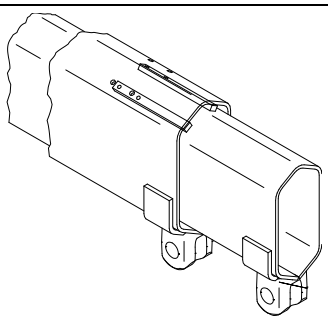
INFORMATION

In more recent crane models the load capacities for mechanical extensions are shown in the technical datasheets, which can be obtained online via PALDESK.PALFINGER.com.

11.4.1 Adaption of mechanical extensions

 *Illustration 11-00 7; Placing of the sliders and lateral guides*	Place the sliders and lateral guides in the last telescoping boom/extension.

 *Illustration 11-00 8; Positioning of the sliders and guides*	Position the guides and the sliders for the mechanical extension at the designated places.

 *Illustration 11-00 9; Screwing of the stops*	Slide the mechanical extension into the last telescoping boom. Screw the stops on the upper side of the last telescoping boom so tightly, that the connecting pins of the extension and the telescoping boom are flush.

Adjust the distances with the sliders and guides, so that the extension fits firmly but is still easy to slide in and out.

11.4.2 Labeling of mechanical extensions

WARNUNG

If a crane is retrofitted with mechanical extensions, the installer must specify the maximum load capacity for the respective extension in yellow paint (RAL1023 - refer to technical datasheet DA 069 online at PALDESK.PALFINGER.com). The nameplate such as BV237-0001 must be fitted as shown below, the year must be hole-punched and stuck on the mechanical extension.

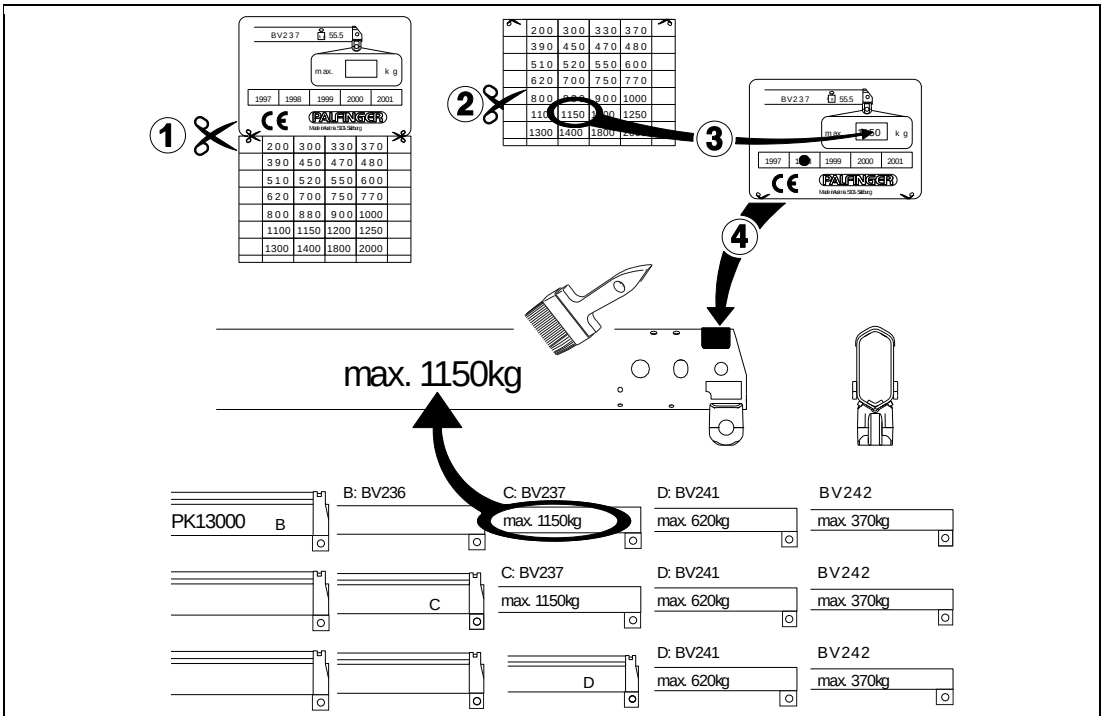


Illustration 11-00 10; Labeling of mechanical extensions

INFORMATION

In more recent crane models the load capacities for mechanical extensions are shown in the technical datasheets, which can be obtained online via PALDESK.PALFINGER.com.

ACHTUNG

By using of mechanical extensions, the points 5.4.2 ff. from EN12999 must be considered!

11.5 Winch

When mounting the winch, a distinction is made between a winch on the main boom and a winch on the knuckle boom.

11.5.1 Mounting on the main boom

The winch is mounted on the main boom by positioning it and then bolting it tightly into place at the designated drill holes using mounting rails. See the technical information sheet 'Winch mounting' for the specific crane.

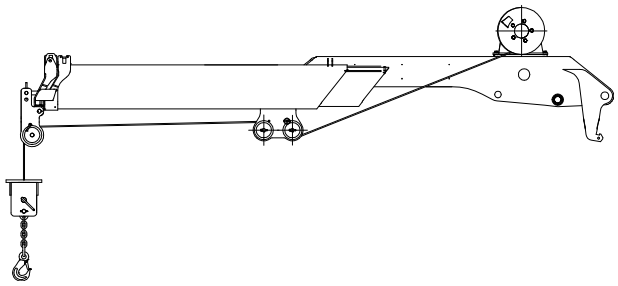


Illustration 11-00 11; Winch mounting on the main boom

11.5.2 Mounting on the knuckle boom

A console which is used to fasten the winch must be welded to the knuckle boom. See the technical information sheet 'Winch mounting' for the specific crane.

WARNING

The selection of the protective gas and the welding additive as well as the form of the welding seam and its thickness is the responsibility of the welding supervisor.

The welding must be done only by people in possession of a valid welder's certificate in accordance with ISO 9606-1 or with an equivalent national welder's certificate. The scope of the welder's certificate must cover the entire range of the executed range (see chapter 4)

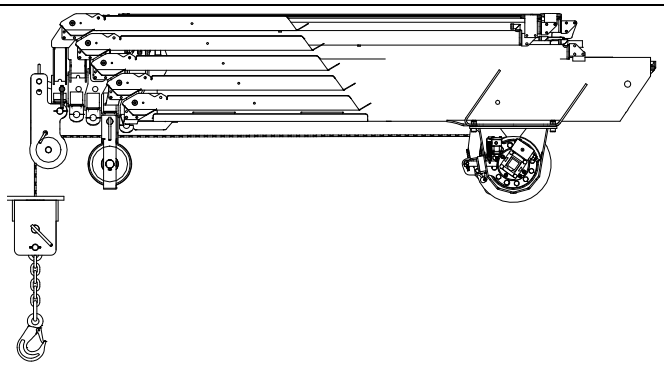


Illustration 11-00 12; Winch mounting on the knuckle boom

Deflection pulleys, trolley heads and intermediate pulleys must be mounted in accordance with the instructions in the technical information sheets.

11.5.3 Hydraulics

There must be an additional section on the control valve. Make sure that this section is equipped with a slide bar with an open zero setting. Otherwise, it must be replaced. Leak oil from the hydraulic motors must be returned without pressure to the tank.

11.6 Workman basket

The PALFINGER workman baskets BB040, BB041 and BB042 have been developed to be used with PALFINGER loader cranes of types SH or TEC7 to transport people for working at heights. The workman basket is equipped with remote control and thus a full-featured lifting platform.

WARNING

Please bear in mind that lifting platform operation may be subject to national health and safety provisions. Therefore, enquire about the national applicable laws.

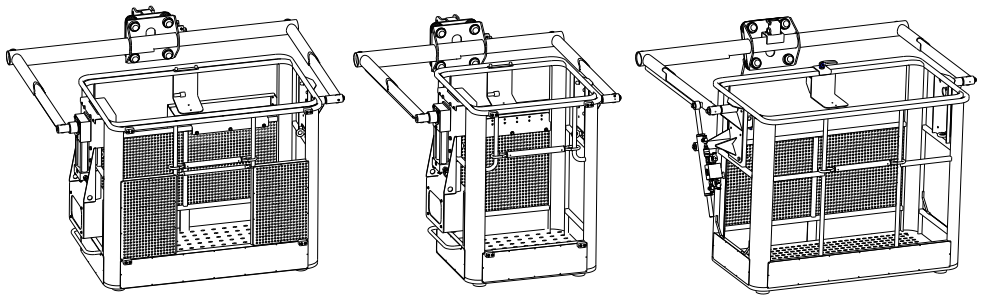


Illustration 11-00 13; Workman baskets BB040, BB041, BB042

The crane used must lift a minimum load of (basket dead weight + insert piece + basket load capacity) • 1,5 throughout its entire working range.

The crane must be equipped with a PALFINGER remote control system (RC operation).

The crane may be operated only by using the remote control system while the workman basket is in use. All the other control panels must be locked during this period.

The workman basket must comply with the currently valid standards.

11.6.1 Adaption of the insert

Fasten the appropriate spacer plates to the insert. Then grind down the spacer plates, if necessary, far enough so that the insert of the workman basket fits firmly in the crane's telescoping boom but can nevertheless be easily attached and removed. If the insert piece has too big a gap in the extension boom, the workman basket may start to swing and thus tilt improperly during operation.

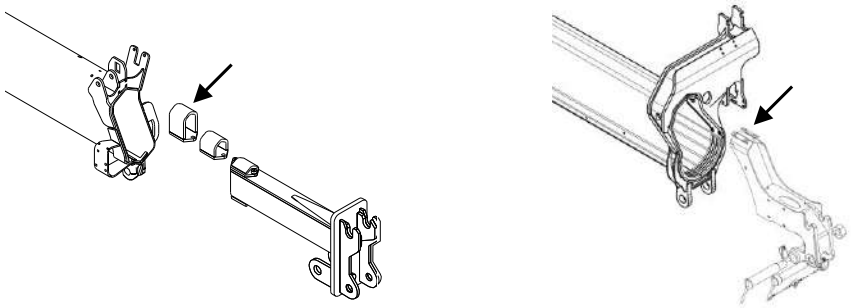


Illustration 11-00 14; Insert piece of workman basket

11.6.2 Loader crane and workman basket ex works

If a PALFINGER SH or TEC7 loader crane is delivered ex works with a BB040, BB041 or BB042 workman basket, PALFINGER will issue an EC Declaration of conformity for it. Loader crane and workman basket get factory inspected and setup together.

To this aim the superstructure manufacturer must take the following actions:	execute	inspect
All stabilizer cylinders must be integrated into the HPSC stability system!	O	
HPSC must be correctly adjusted and activated.	O	O
For emergency control, the PALFINGER emergency power unit or an at least equivalent hydraulic power unit must be mounted. Connect the emergency power unit to the provided switch and make a function check. After this seal the locking flap of the switch.	O	O
The superstructure manufacturer provides the operator with a description of the emergency control's functionality.	O	
The label EB12120 must be attached to every operator station from where the stabilizers can be controlled (see illustration 11-00 15).	O	
The label EB-4039 must be attached to all stabilizer cylinders (see illustration 11-00 16). The supporting force determined by the superstructure manufacturer must be added on this label.	O	O
The present operating instructions of the workman basket must always remain with the basket and delivered to the operating company.		O
According to the Machinery Directive 2006/42/EC (article 12, paragraph 4) the superstructure manufacturer must arrange for a type examination of the entire machine, e.g., crane, workman basket and superstructure on the vehicle, according to Appendix 9 of the Machinery Directive. It needs to be carried out by a certified body.	O	

11.6.3 Loader crane with prepared fixture for workman basket

If the PALFINGER SH or TEC7 loader crane is equipped with a workman basket fixture, it may get EC conformity with any available or purchased PALFINGER workman basket of types BB040, BB041 or BB042.

To this aim the superstructure manufacturer must take the following actions:	execute	inspect
All stabilizer cylinders must be integrated into the HPSC stability system!	O	
HPSC must be correctly adjusted and activated.	O	O
The correct type of workman basket must be activated in PALDIAG.	O	O
If the remote control handset is connected to the crane, crane operation must not be possible from the ground / emergency operator station on the column.		O
When the workman basket is connected to the crane, the remote control handset may control the crane only after it has been connected to the workman basket.		O
Check the emergency cut-off button in the workman basket and at the radio remote control.		O
When crane, workman basket and remote control handset are connected, the workman basket must not tilt by more than 5° towards the horizontal. In case of BB040 and BB041 the workman basket approaches the horizontal position by itself. In case of BB042 the workman basket prevents any tilt greater than 5°.		O
When the electric systems of workman basket and crane are connected, the crane speed reduces automatically to maximum 0,7 m/s (slewing) or 0,4 m/s (all other movements).		O
Semi-automatic movements (e.g. AOS, FOLD, etc.) need to be deactivated in workman basket mode of operation.		O
If the crane is equipped with radio controlled stabilizers they must not be operable in workman basket mode of operation.		O
The crane is equipped with a levelling button for emergency basket operation. It activates basket levelling, when the crane is operated via hand levers in emergency mode.		O
For emergency control, the PALFINGER emergency power unit or an at least equivalent hydraulic power unit must be mounted. Connect the emergency power unit to the provided switch and make a function check. After this seal the locking flap of the switch.	O	O
The superstructure manufacturer provides the operator with a description of the emergency control's functionality.	O	
The label EB12120 must be attached to every operator station from where the stabilizers can be controlled (see illustration 11-00 15).	O	

	execute	inspect
The label EB-4039 must be attached to all stabilizer cylinders (see illustration 11-00 16). The supporting force determined by the superstructure manufacturer must be added on this label.	O	O
The present operating instructions of the workman basket must always remain with the basket and delivered to the operating company.		O
According to the Machinery Directive 2006/42/EC (article 12, paragraph 4) the superstructure manufacturer must arrange for a type examination of the entire machine, e.g. crane, workman basket and superstructure on the vehicle, according to Appendix 9 of the Machinery Directive. It needs to be carried out by a certified body.	O	
Static test of workman basket: Load the workman basket with a weight 1,5 times its load capacity and lift it off the ground with the crane.	O	

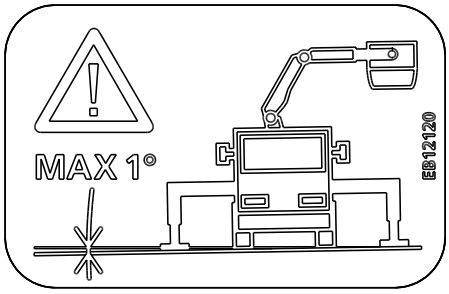


Illustration 11-00 15; EB-12120

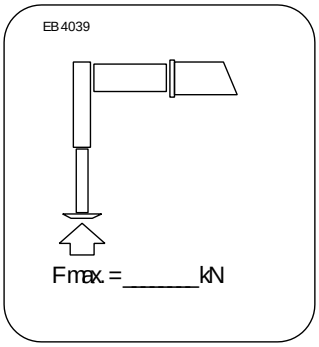


Illustration 11-00 16; EB-4039

11.6.4 Emergency control

After failure of the truck's hydraulic system, it must be possible to lower the crane and bring it in transport position via emergency control. To this aim the crane must be equipped with a PALFINGER emergency power unit or an at least equivalent hydraulic power unit.

11.6.5 Hydraulic circuit diagrams

11.6.5.1 Crane with continuous pump

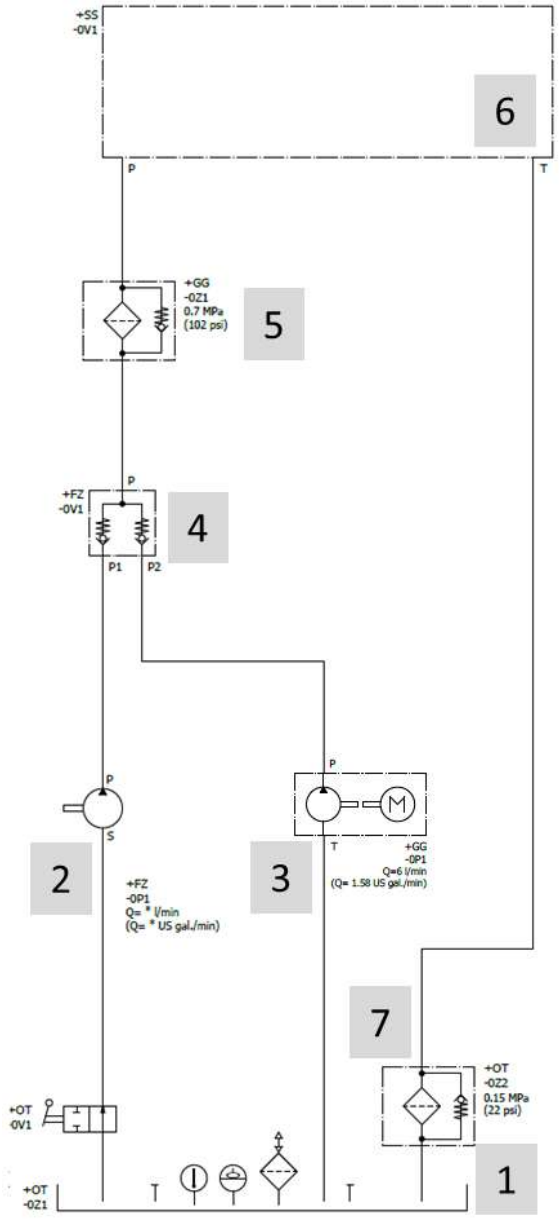


Illustration 11-00 17; Hydraulic connecting diagram - continuous pump

1	Oil tank	5	High pressure filter
2	Hydraulic Pump	6	Crane control valve
3	Emergency unit	7	Return filter
4	Shuttle valve		

11.6.5.2 Crane with LS pump

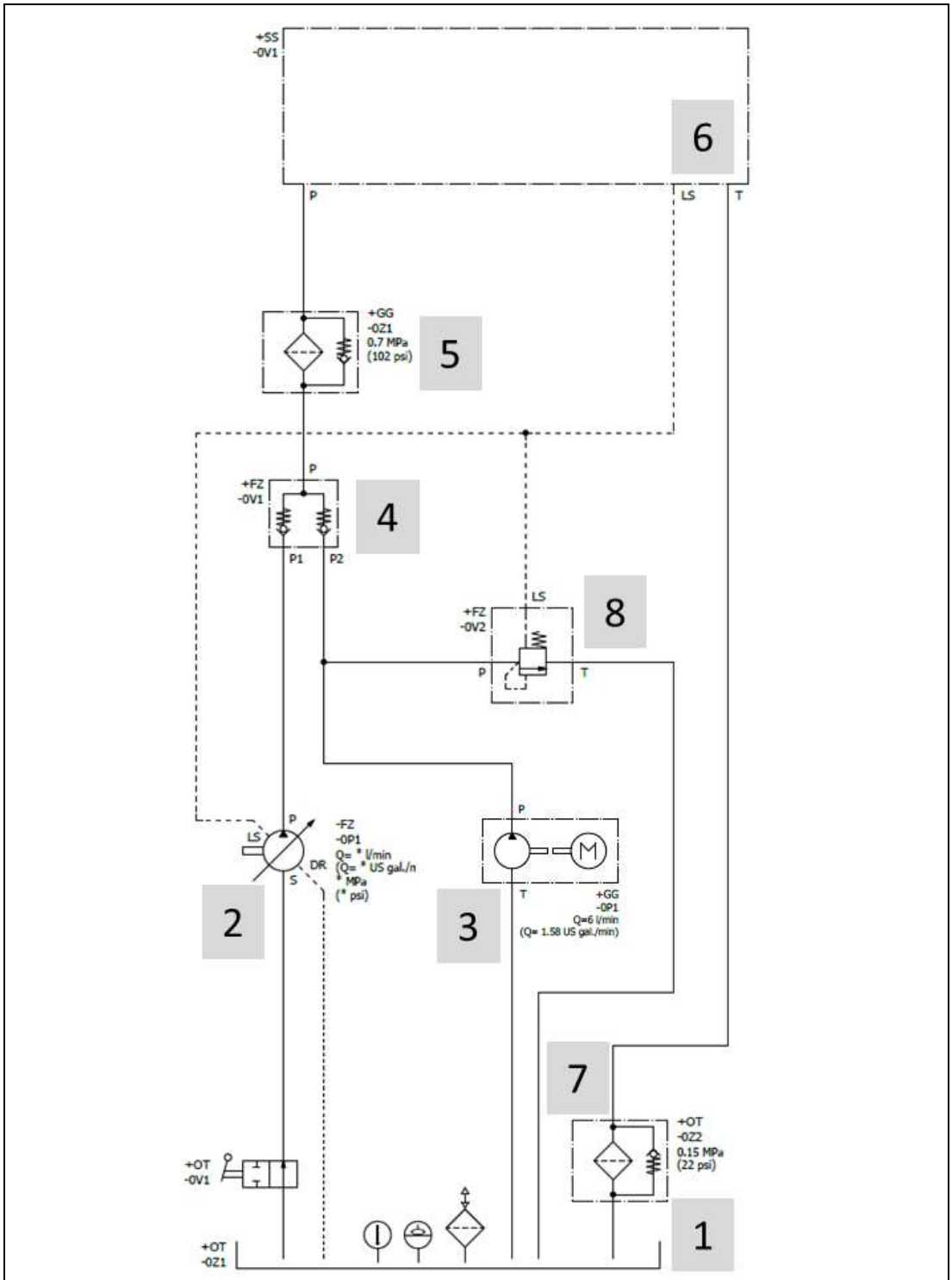


Illustration 11-00 18; Hydraulic connecting diagram - crane with LS pump

1	Oil tank	5	High pressure filter
2	Hydraulic Pump	6	Crane control valve
3	Emergency unit	7	Return filter
4	Shuttle valve	8	Pressure compensator

11.6.5.3 Crane with dual-circuit control and LS pumps

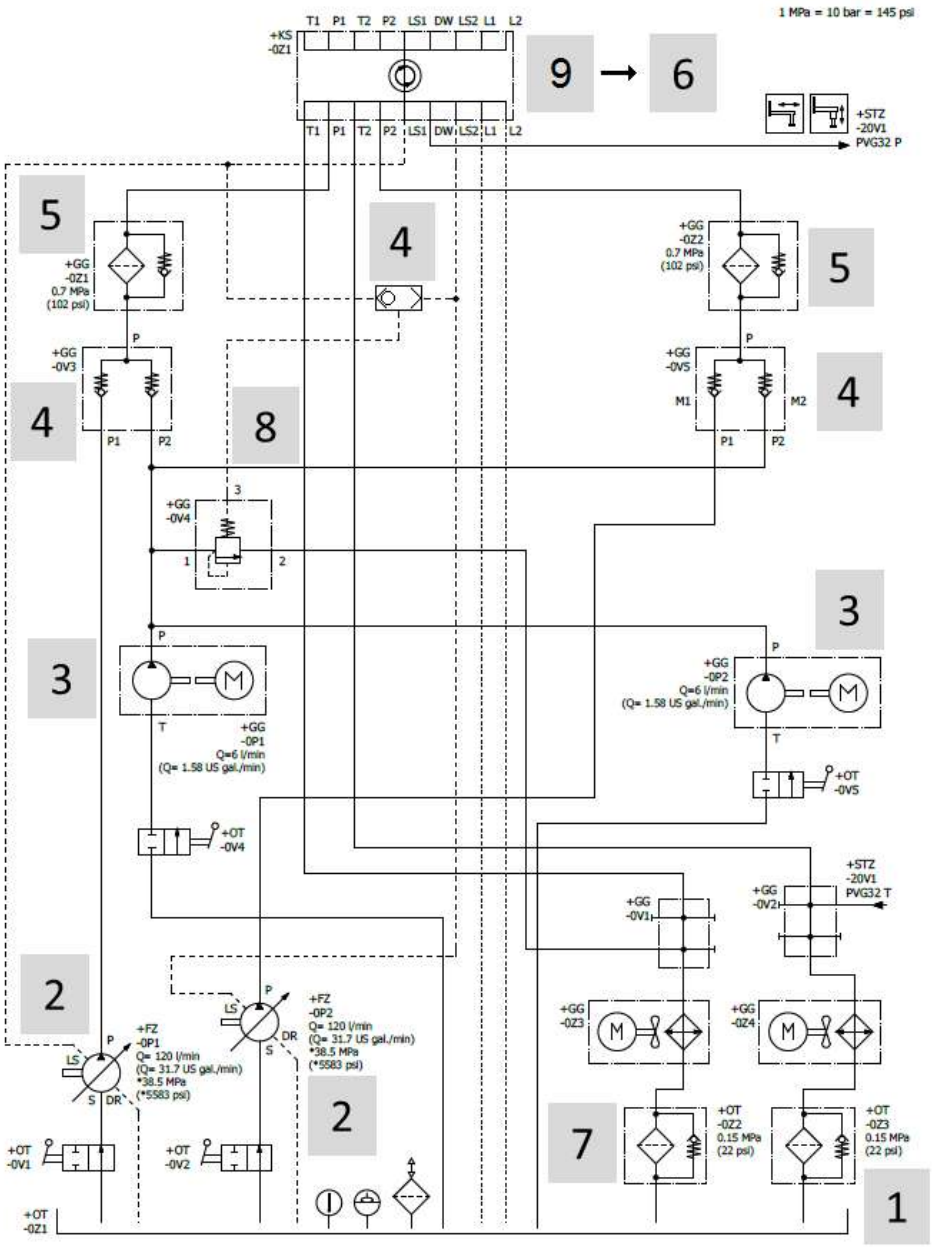


Illustration 11-00 19; Hydraulic connecting diagram - crane with dual-circuit control and LS pumps

1	Oil tank	6	Crane control valve
2	Hydraulic Pump	7	Return filter
3	Emergency unit	8	Pressure compensator
4	Shuttle valve	9	Hydraulic rotary union
5	High pressure filter		

11.6.6 Electric circuit diagram of emergency unit

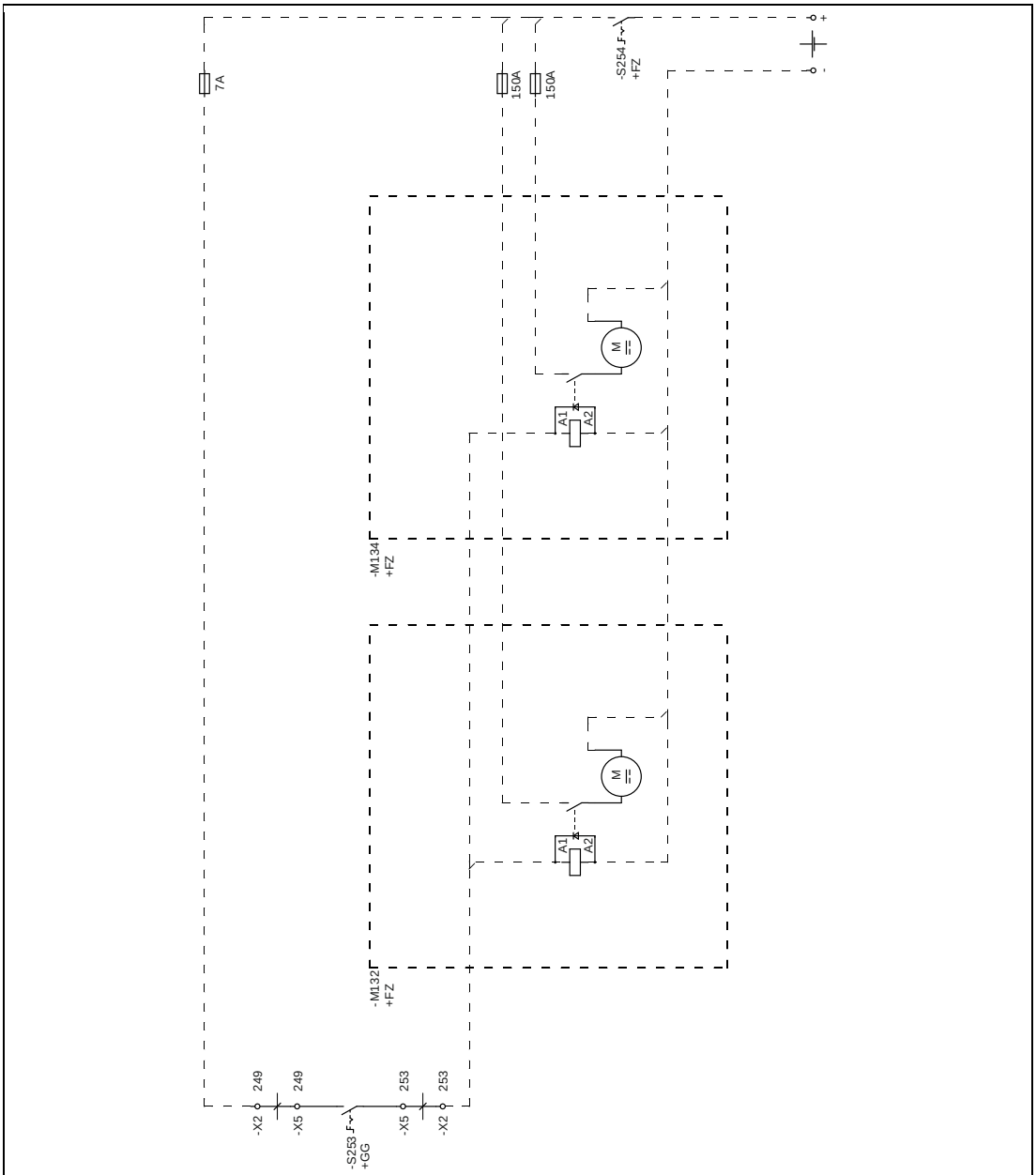


Illustration 11-00 20; Electric circuit diagram of emergency unit

Operating levers / Designation:

Operating levers:	Designation:	Technical description:
S253	Activation of emergency unit	
S254	Battery main switch	24V min. 350A
M132	Emergency unit 1	24V 3kw max. 270bar
M134	Emergency unit 2	24V 3kw max. 270bar

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Hydraulic Loader Crane

Chapter 12

Delivery of the crane

Original Installation Guideline

DA-105

Version: 2019/12

English

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Contents

12.1 Adjusting limiting systems

12.1.1 Factory settings

The basic safety systems for limiting the loader crane (maximum lifting power, load torque limitation and load holding valves) are preset and tested by the factory. Therefore, they do not need any further adjustment.

In the course of doing the functional or safety checks you should, however, make sure that these systems are working correctly.

12.1.2 Setting reducing systems and other safety systems

If the crane is fitted with systems that have an influence on the lifting power in certain working areas, jacked situations or set-up situations, then after the crane has been fitted these systems must be set.

- These systems may be:
- Lifting power limiters dependent on slewing angle (SHB)
- Integrated stability control systems such as ISC, ISC-L or ISC-S
- High Performance Stability Control HPSC, HPSC-L, HPSC-M or HPSC+LOAD
- High stand rotation limiters (IS)
- Cab protection systems (CPS)
- Completely blocked work areas
- All other forms of shut-off or reducer systems that affect the lifting power or the area of movement. Especially those that were made by the body builder.

Having, in particular, those systems that affect the truck's stability (such as HPSC, SHB and ISC) positioned correctly is of enormous importance. It is therefore vital that these systems are correctly set and adequately tested (verified).

See also the available PALFINGER training documents.

12.1.3 Fall Protection Mode

When the FPM extra function (fall protection mode) has been ordered, the system's blocked area needs to be default adjusted by the adjuster. This is done after having completed the HPSC basic settings. The configuration documentation is contained in document I-EC-1601 and in the crane's operating instructions, which can be obtained online via PALDESK.PALFINGER.com

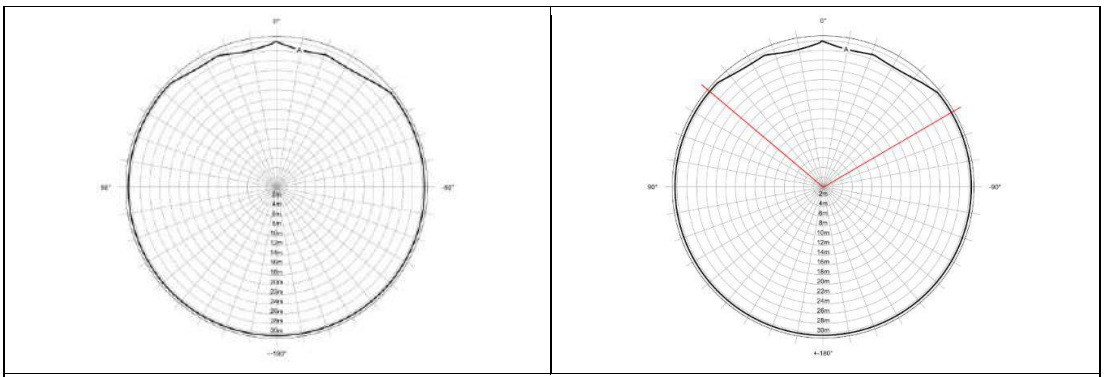

Illustration 12-00 1; Example blocked area of FPM

INFORMATION

The maximum applicable load capacity is 600 kg.

12.1.4 Adjusting stability systems

Available stability systems need to be adjusted as per applicable training documents. They can be retrieved from the PALDESK and from training literature.

Reduced load range (HPSC, SHB, ISC, etc.) settings must be documented accordingly.

The PALCHART online tool can be used for this (see PALFINGER training chapter M3-5 HPSC and M2-9 ISC).

12.2 Liability

In all materials respects PALFINGER accepts no liability for any of the following:

Maximum crane settings that have been altered by the bodybuilder or by anyone else (main excess pressure valve, crane overload limit, emergency shut-off valve, load holding valves, etc.). These settings may in principle not be changed, except if a reduction of the lifting power is necessary.

Settings that need to be set by the bodybuilder and can therefore only be roughly preset at the factory (e.g., all reduced load limits, angle settings, vehicle dependent switch signals, etc.).

Safety systems and shut-off mechanisms that no longer have any original seals (modified load holding valves, overwritten crane nominal / HPLS limits).

INFORMATION

The person liable for any setting is in general the person who made it.

Proceeding carefully and understanding the systems are therefore prerequisites for making safe and correct settings.

12.3 Pre-delivery inspection

Prior to crane delivery inspections are required that verify correct installation and function as well as proper adjustment of all safety systems.

The body builder and/or the PALFINGER partner responsible for its sale must perform these inspections. It is essentially the responsibility of the sales partner that has sold the crane to the end customer to ensure that the required inspections are carried out.

They must always comply with the applicable national regulations. The specifications of the Machinery Directive apply for bringing this equipment on the market in the EC. EN 12999.

From the PALFINGER perspective they are interpreted in the following points.

12.3.1 Functional check

Reference EN 12999 Point 6.2.2

The functional check of the crane required by the standard will as a rule be carried out in the factory. After bodybuilding it is nevertheless necessary to inspect the entire unit.

This ensures that all safety equipment and controls work properly, and the machine is able to move in all ranges intended.

Requirements for inspection

- The crane is completely installed mechanically, electrically and hydraulically.
- The oil tank has been filled with hydraulic oil suitable for the intended use (corresponding with the oil level indicator, in folded position).
- All limiting system have been adjusted.

Inspection

- Starting the machine - Checking that the machine's hydraulic and electrical circuits are functioning.
- Running through all of the movements to check the controls for these and to check that the machine moves properly.
- It is particularly important to make sure that the machine can be put into and taken out of the transport position without any problem (i.e., checking the space, correct operation and the support's transport position).
- Checking that the hoses are laid correctly, especially if the dead point has been moved.
- Checking that all indicators and controls are working and correct.
- Checking the emergency shut-off function.
- Checking the machine's entire hydraulics for any leaks.
- Where remote controls are being used, checking where the charger is fitted and that it is working properly.
- Checking the crane's maximum lifting power: Attaching a load that may overload the crane (e.g., 1.25 x load capacity at full outreach). It must be possible to lift the load with full stability in the corresponding radius. This point is a pure check, the relevant adjustment comes from the factory.
- Checking the crane's normal load torque limitation: Now push out the load further. Within the corresponding tolerance (maximum 7 %) the crane must switch off and block all movements that increase the load torque. This point is a pure check, the relevant adjustment comes from the factory.

INFORMATION

Any defects found must be remedied by the body builder.

12.3.2 Static test

Reference: EN 12999 point 6.2.3

Type examination

- The type examination (see point EN 12999, 6.2.3.1) is done in the factory. No further steps needed by the assembler.

Inspecting the installed unit

The installed crane is inspected with 1.25 times its load capacity in the positions to be tested (specified lifting force x 1.25).

a) (Reference: point 6.2.3.2 a): This point applies only to cranes with manual extensions. If present, proceed as follows:

- Attach the test load (1.25 x the specified maximum load capacity of the manual insert extensions). Fully extend the crane Slew the crane in the areas with full stability over the entire radius.
- Should the load-holding valve open (which might occur), use a forklift to attach the load and make a point-by-point inspection in intervals of 30°.

b) (Reference: point 6.2.3.2 b): The inspection at maximum hydraulic outreach is carried out together with the stability inspection (6.2.5). No steps to be taken.

c) (Reference: point 6.2.3.2 c): If the radius inspection with maximum load capacity cannot be executed practically because it required movements close to the crane column with very heavy loads, EN 12999 it is recommended to inspect it at a practicable outreach as close as possible to the crane column: e.g., main boom at 20°, all extension booms retracted, outer boom with required test load c. 1.0 m above ground) The load can be slewed with the crane or attached via forklift in intervals of 30°.

12.3.3 Dynamic test

Reference: EN 12999, point 6.2.4

The "temporary overriding" of safety systems proposed in the standard is prohibited by PALFINGER.

Instead PALFINGER recommend the following inspection method:

- Attach a test load with 1.1 times the load capacity (or similar) and move it repeatedly into overload – with full stabilization in 100 % stable slewing positions. The load peaks corresponding to the standard specifications will be reached.
- As this procedure is also part of HPSC verification, any further steps are not necessary. This is covered by verification.

12.3.4 Stability testing

After the crane has been mounted, a stability test must always be conducted.

It should generally be done after checking the crane's functionality and any adjustment of additional safety systems, such as HPSC, SHB or ISC.

We would expressly urge you at this point not to carry out this check during the crane handover or in the presence of an end customer.

The stability test must be carried out in accordance with the prevailing laws at the given time in the market and country in question.

- CE countries: to be conducted as per EN 12999, point 6.2.5. The test load stipulated there and to be used for the test is available from PALFINGER under the heading "Static Test Loads" on the PALDESK and in the training literature.
- Non-CE countries: to be conducted according to national laws regarding stability.
- For non-CE countries without their own legislation PALFINGER recommend the test load to be used to be at least 125 % of the crane's maximum lifting power.

In every case the following apply:

- The stability test must be performed across the crane's complete pivot range.

- It must (unless prescribed otherwise in the relevant national legislation) be carried out under the least favorable operating conditions permitted by PALFINGER. That means with the vehicle unloaded and in static conditions. The load gets attached slowly by using a forklift.
- The tilt must be within the permissible limits specified in the operating instructions.
- Stability testing must also be done in reduced load ranges (HPSC, SHB, ISC etc.) in accordance with the limits and shut-off points previously set there. Reduce the test load accordingly, the extension system should be as far as possible out during the test.
- Reduced load range (HPSC, SHB, ISC, etc.) settings must be documented accordingly.
- The PALCHART online tool can used for this (see PALFINGER training chapter M3-5 HPSC and M2-9 ISC).

Stability test

Reference EN12999, point 6.2.5

Already when the stability system is being adjusted, the values for the not fully supported status get verified. In the HPSC system it is called Verification. In other systems such as ISC and SHB it must be ensured that the adjusted values have been verified by dynamically approaching the applicable limit.

The stability test at maximum radius is called 100%-test in the HPSC system. The test load gets attached at maximum outreach and slewed through the fully stable range.

- Attach the test load (specifically calculated load at full outreach, HPSC proposes this value). Fully extend the crane. Slew the crane in the areas with full stability over the entire radius.
- Should the load-holding valve open (which might occur), use a forklift to attach the load and make a point-by-point inspection in intervals of 30°.
- In areas where the crane is not fully stable even with full stabilization (recognizable by dips in the HPSC PALCHART) it is necessary to reduce the outreach accordingly.

On cranes without HPSC (even when other stability systems such as ISC are being used) the test must be carried out accordingly in the range of the adjusted load limits.

12.4 Documentation

Any addenda and/or amendments that arise through setting up the entire machine must be documented as additions to the documentation and appended to the operating instructions and (if applicable, e.g., in the case of circuit diagram modifications) to the technical documents.

Responsibility for the work and modifications made always rests with the superstructure manufacturer.

The following additionally applies to CE countries:

- The body builder must issue a CE declaration of conformity for the entire machine (crane and vehicle or substructure).
- The CE declaration of conformity supplied by PALFINGER ex-works with the crane can be used for this. It already has a pre-printed section for the body builder's component.
- The CE declaration of conformity must always be kept on the vehicle with the crane documentation.

12.4.1 Note on maximum floor load

From 2019 the standard EN 12999 requires a note regarding the maximum floor load that occurs. For the crane stabilizers use the values from PALCHART, and for PALFINGER additional stabilizers the forces shown in the technical sheets in PALDESK. Alternatively, it is possible to enter measured forces.

In case of front stabilizers, the determined maximum force must be attached with a sticker.

Depending on frame thickness, it may be less than the maximum possible load of the front stabilizer.

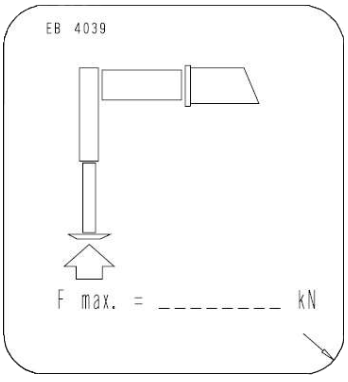

Illustration 12-00 2; Example sticker for maximum floor load

12.5 Delivery to the end customer

Delivery to the end customer is a guided process, described in the service manual (chapter "Handover to the end customer").

Handover needs to be prepared well and consists of two essential steps.

12.5.1 Training and handover

The handover to the end customer must include a training session for the operating company, which must be documented.

The section "Handover to the end customer" needs to be completed in the service manual and uploaded to PALDESK together with the product registration.

12.5.2 Registration of start of warranty period

The machine's guarantee and warranty period begin upon shipment of the crane to the end customer.

The start of warranty period including all necessary data (vehicle data, customer data, etc.) must be reported to the manufacturer via PALDESK.

PALFINGER Installation Guideline
Hydraulic Loader Crane

Chapter 13

Additional documentation for Railway Basic Line

Original Installation Guideline

DA-105

Version: 2021/09

English

PALFINGER AG
Lamprechtshausener Bundesstraße 8
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Contents

13.1 General

13.1.1 Aim

The hydraulic loader crane installation guidelines for PL cranes can mostly be used for Basic Line cranes.

Missing contents for Basic Line devices are covered by the present document.

13.1.2 References / Further applicable documents

The user is hereby explicitly advised that the present document shall be valid only in connection with the existing hydraulic loader crane installation guideline (PALDESK - Products - Service - EMEA Loader crane - Service information - Installation guidelines – "Complete installation guidelines").

13.1.3 Symbols

The below symbols have been taken from the installation guidelines.

DANGER

Situation that leads to death or serious injury.

WARNING

Situation that can lead to death or serious injury.

CAUTION

Situation that can lead to minor injuries.

ATTENTION

Situation that can lead to damage.

INFORMATION

Information for the user.

13.2 Operator station

13.2.1 Hydraulic crane connection

The port between crane and vehicle is at the back of the operator station.

Ports must have the following dimensions:

Designation in H-diagram and control block	Dimension PK 8502 RW - PK 12502 RW	Dimension PK 14502 RW	Dimension PK 18502 RW - PK 34002 RW	Function
F1	20S	20S	25S	P - Pump
D1	12S	12S	12S	P2 - Hand pump
B1	22L	28L	28L	T - Tank
E1	8S	8S	8S	LS – Load sensing
DR	10L	10L	10L	DR - leak oil

Table 1: Port sizes between vehicle and operator station

In illustration 13-00 1 the position of the hydraulic port between vehicle and operator station for the hydraulic connection of the crane is encircled.

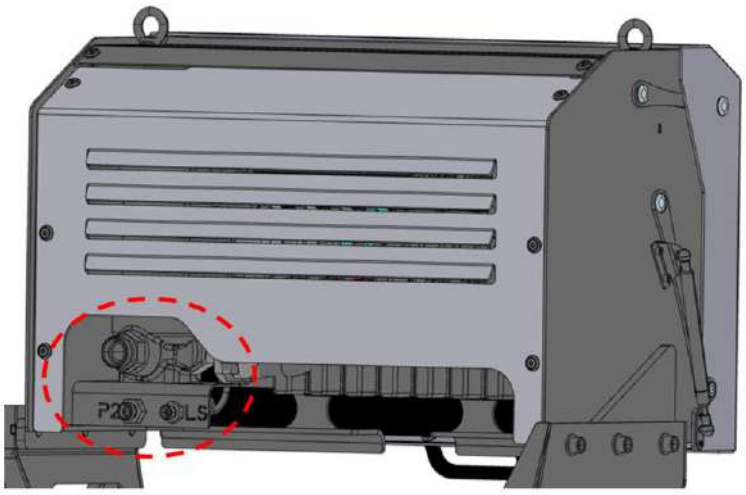

Illustration 13-00 1; Position of hydraulic port between vehicle and operator station

13.2.2 Mechanical port on operator station

The operator station will be supplied including transport brackets. Their position at the vehicle has to be adjusted accordingly by the assembler. The following might have to be considered:

- Use of bolts with minimum grade of 8.8
- Safety when working range is limited to the side (adjacent track limitation)
- Electrical distance to overhead line
- Crushing points
- Danger of falling
- Ergonomic aspects
- Clear view

WARNUNG

The transport brackets are not designed for stresses on rail vehicles. The operator station must be fitted to the vehicle by the body builder.

For dimensions of the operator station, please, refer to the Technical information sheets.

13.2.3 Adjusting the line length between operator station and crane

The lines between operator station and crane are 3 m long ex works.

13.2.3.1 Hydraulic port between operator station and crane

If necessary, it is possible to extend the hydraulic hoses between operator station and crane (pipe fittings according to EN ISO 8434-1).

The port sizes are given below:

Dimension PK 8502 RW - PK 12502 RW	Dimension PK 18502 RW - PK 14502 RW	Dimension PK 23002 RW - PK 34002 RW	Function
12S / NW10	12S / NW10	12S / NW10	A – Slew to the right
12S / NW10	12S / NW10	12S / NW10	B – Slew to the left
12S / NW10	12S / NW10	16S / NW12	A – Lower main boom
12S / NW10	12S / NW10	16S / NW12	B – Raise main boom
12S / NW10	12S / NW10	16S / NW12	A – Lower outer boom
12S / NW10	12S / NW10	16S / NW12	B – Raise outer boom
12S / NW10	16S / NW12	16S / NW12	A – Extend extension boom
12S / NW10	16S / NW12	16S / NW12	B – Retract extension boom
12S / NW10	12S / NW10	12S / NW10	A – Raise rope winch
12S / NW10	12S / NW10	12S / NW10	B – Lower rope winch
10L / NW08	10L / NW08	10L / NW08	Leakage oil – rope winch
12S / NW10	12S / NW10	12S / NW10	A – Rotator right
12S / NW10	12S / NW10	12S / NW10	B – Rotator left
12S / NW10	12S / NW10	12S / NW10	A – Open grab
12S / NW10	12S / NW10	12S / NW10	B – Close grab
16S / NW12	16S / NW12	16S / NW12	HPCO - stabilizers
18L / NW16	18L / NW16	18L / NW16	Tank - stabilizers

Table 2: Anschlussgrößen Bedienstand ↔ Kran

In illustration 13-00 2 the position of the bracket for the hydraulic port between crane and operator station is encircled.

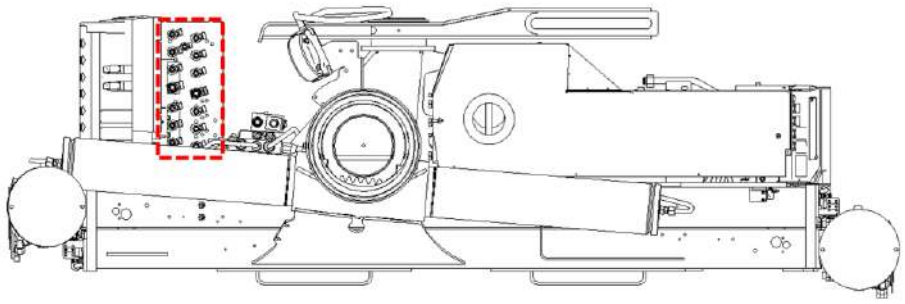

Illustration 13-00 2; Position of hydraulic port between operator station and crane

13.2.3.2 Position of electrical port between operator station and crane

If necessary, the cable connecting operator station and crane may be disconnected at the terminal box on the operator station and extended using terminal box and cable.

Illustration 13-00 3 shows the position of the terminal box on the operator station.

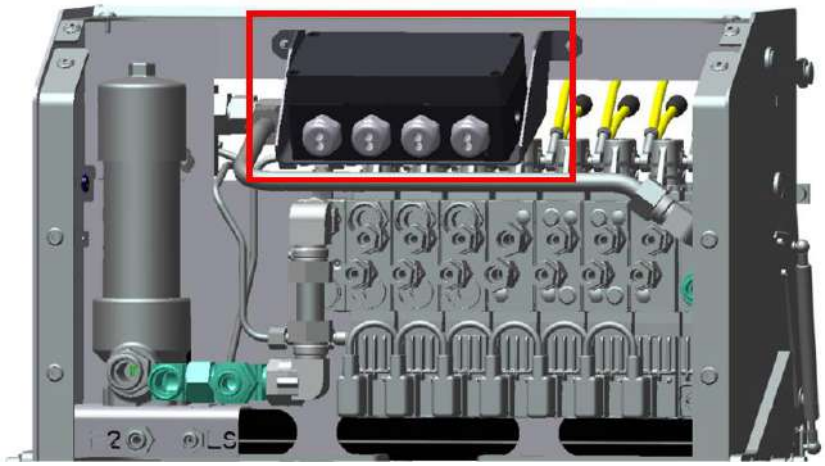

Illustration 13-00 3; Position of the terminal box on the operator station

13.3 Emergency stop

13.3.1 Extract from circuit diagram

Terminal	Signal type	Technical description
820 - 821 (via relay K10)	Loop	Emergency stop crane to vehicle, channel 1
822 - 823 (via relay K11)	Loop	Emergency stop crane to vehicle, channel 2
805	DIN	Emergency stop vehicle to crane, channel 1
806	DIN	Emergency stop vehicle to crane, channel 2

Table 3: Klemmenübersicht Not-Halt

Illustration 13-00 4 and illustration 13-00 5 show extracts from the Basic Line circuit diagram.

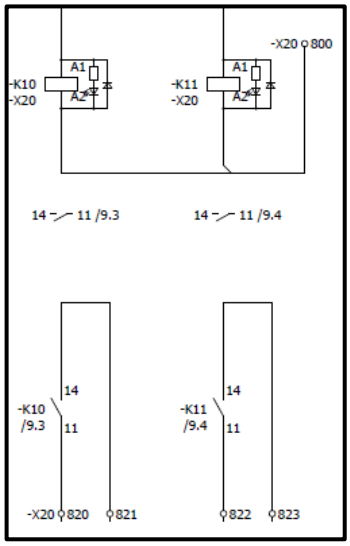

Illustration 13-00 4; Emergency stop circuit diagram from crane to vehicle

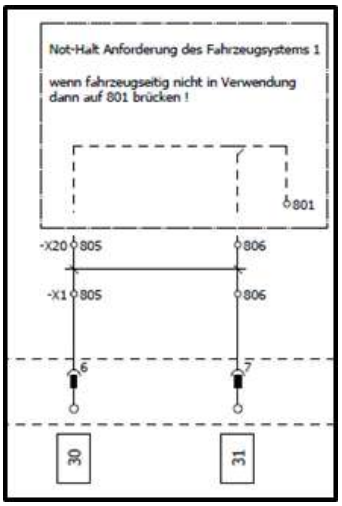

Illustration 13-00 5; Emergency stop circuit diagram from vehicle to crane

13.3.2 Permissible statuses of emergency stop

13.3.2.1 Crane to vehicle

- Crane controls transmit a closed emergency stop loop at the crane to the vehicle via zero-potential. It is closed via two relay outputs. The conditions that must be met include:
- Emergency stop button on crane NOT pressed
- Emergency stop button on remote control handset NOT pressed
- Emergency stop button in the workman basket NOT pressed
- All conditions required by the (crane) system for a closed emergency stop loop are met. These include:
    - Lever comparison
    - Emergency cut-off return (of control valve)
    - Device inclination less than 15°

The below table 4 illustrates the status of the closed emergency stop loop on the crane.

Emergency stop from crane to vehicle			
Terminal	Signal type	Technical description	Status
820 - 821 (via relay K10)	Loop	Emergency stop crane to vehicle, channel 1	Closed
822 - 823 (via relay K11)	Loop	Emergency stop crane to vehicle, channel 2	Closed

Table 4: Permissible statuses of emergency stop from crane to vehicle

Any other status than that shown in table 4 must be categorized by the vehicle as an interruption of the emergency stop loop at the crane.

INFORMATION

The outputs

- **"Emergency stop crane to vehicle, channel 1" and**
- **"Emergency stop crane to vehicle, channel 2" can alternatively, remain under power, if the emergency stop loop (from) vehicle**
- **"Emergency stop vehicle to crane, channel 1" and**
- **"Emergency stop vehicle to crane, channel 2" is interrupted.**

The loop to the vehicle (crane to vehicle) and the signals from the vehicle (vehicle to crane) are not interdependent.

INFORMATION

When changing the mode of operation (manual/radio/stabilizer) the emergency stop loop gets briefly interrupted. The outputs

- **"Emergency stop crane to vehicle, channel 1" and**
- **"Emergency stop crane to vehicle, channel 2" are not energized.**

It is recommended, not to stop the vehicle motor, because it is an emergency stop function, not an emergency cut-off function!

13.3.2.2 Vehicle to crane

Crane controls analyze the emergency stop loop at the vehicle's side via two digital inputs. In order to signalize a closed emergency stop loop of the vehicle to the crane the following status is required.

- At the vehicle the emergency stop loop is NOT interrupted

The below table 5 illustrates the status of the closed emergency stop loop on the vehicle.

Emergency stop from vehicle to crane			
Terminal	Signal type	Technical description	Status
805	DIN	Emergency stop vehicle to crane, channel 1	1
806	DIN	Emergency stop vehicle to crane, channel 2	1

Table 5: Permissible statuses of emergency stop from vehicle to crane

Any other status than that shown in table 5 must be categorized by the crane as an interruption of the emergency stop loop at the vehicle.

If the crane is not integrated in the vehicle, the loop must be bridged electrically.

13.4 Travel drive

13.4.1 General

- Travel drive controls must only be used for rail vehicles. Using the unit on two-way vehicles on roads or trucks is prohibited!
- As soon as the crane is out of its transport position the vehicle may be relocated only via radio remote control!

13.4.2 Extract from circuit diagram

The electric port is in the crane terminal box.

Terminals from circuit diagram:

Terminal	Signal type	Technical description
828	DOUT	Lever for travel drive direction 1 deflected
829	DOUT	Lever for travel drive direction 2 deflected
826	DOUT	Driving mode signal active
827	DOUT	Lever for travel drive not in the neutral position

Table 6: Overview of travel drive terminals

Illustrations 13-00 6 and illustration 13-00 7 show extracts from the Basic Line circuit diagram.

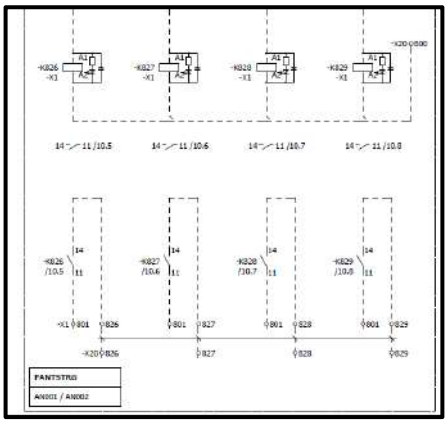

Illustration 13-00 6; Travel drive DOUT - extract from circuit diagram

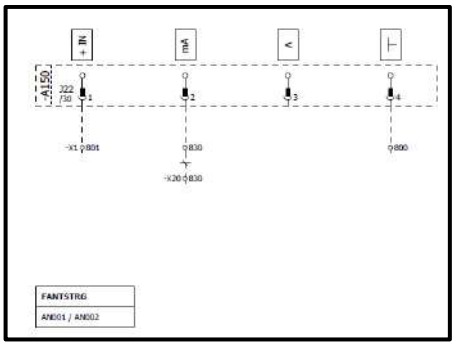

Illustration 13-00 7; Travel drive AOUT - extract from circuit diagram

13.4.3 Permissible statuses of travel drive

The following signal is provided for signaling the changeover from crane operation to driving mode.

Travel drive			
Terminal	Signal type	Technical description	Status
826	DOUT	Driving mode signal active	1

Table 7: Permissible statuses of travel drive in genera

INFORMATION

CE-conform connection of travel drive controls to the assembled system (vehicle) requires that changeover to driving mode is signalized via this output on the vehicle side!

13.4.3.1 Option: 20-4-20 mA

This option is activated, if the crane has been ordered with the following characteristic:

- FANSTRG = AN001

The below table 8 shows the permissible statuses for relocating the vehicle in directions 1 or 2 via crane radio remote control.

All statuses that differ from those shown in table 8 must be categorized as errors by the vehicle and the vehicle must neither be relocated in direction 1 nor in direction 2!

Standstill - option: 20-4-20 mA			
Terminal	Signal type	Technical description	Status
820 - 821 (via relay K10)	Loop	Emergency stop crane to vehicle, channel 1	Closed
822 - 823 (via relay K11)	Loop	Emergency stop crane to vehicle, channel 2	Closed
828	DOUT	Lever for travel drive direction 1 used	0
829	DOUT	Lever for travel drive direction 2 used	0
827	DOUT	Lever for travel drive not in the neutral position	0
830	AOUT	Driving signal	4 mA

DIRECTION 1 - option: 20-4-20 mA			
Terminal	Signal type	Technical description	Status
820 - 821 (via relay K10)	Loop	Emergency stop crane to vehicle, channel 1	Closed
820 - 821 (via relay K10)	Loop	Emergency stop crane to vehicle, channel 2	Closed
828	DOUT	Lever for travel drive direction 1 used	1
829	DOUT	Lever for travel drive direction 2 used	0
827	DOUT	Lever for travel drive not in the neutral position	1
830	AOUT	Driving signal	4-20 mA

DIRECTION 2 - option: 20-4-20 mA			
Terminal	Signal type	Technical description	Status
820 - 821 (via relay K10)	Loop	Emergency stop crane to vehicle, channel 1	Closed
820 - 821 (via relay K10)	Loop	Emergency stop crane to vehicle, channel 2	Closed
828	DOUT	Lever for travel drive direction 1 used	0
829	DOUT	Lever for travel drive direction 2 used	1
827	DOUT	Lever for travel drive not in the neutral position	1
830	AOUT	Driving signal	4-20 mA

Table 8: Permissible statuses of travel drive option 20-4-20 mA

13.4.3.2 Option: 4-12-20 mA

This option is activated, if the crane has been ordered with the following characteristic:

- FANSTRG = AN002

The below table 9 shows the permissible statuses for relocating the vehicle in directions 1 or 2 via crane radio remote control.

All statuses that differ from those shown in table 9 must be categorized as errors by the vehicle and the vehicle must neither be relocated in direction 1 nor in direction 2!

Standstill - option: 4-12-20 mA			
Terminal	Signal type	Technical description	Status
820 - 821 (via relay K10)	Loop	Emergency stop crane to vehicle, channel 1	Closed
820 - 821 (via relay K10)	Loop	Emergency stop crane to vehicle, channel 2	Closed
828	D OUT	Lever for travel drive direction 1 used	0
829	D OUT	Lever for travel drive direction 2 used	0
827	DOUT	Lever for travel drive not in the neutral position	0
830	AOUT	Driving signal	12 mA

DIRECTION 1 - option: 4-12-20 mA			
Terminal	Signal type	Technical description	Status
820 - 821 (via relay K10)	Loop	Emergency stop crane to vehicle, channel 1	Closed
820 - 821 (via relay K10)	Loop	Emergency stop crane to vehicle, channel 2	Closed
828	D OUT	Lever for travel drive direction 1 used	1
829	D OUT	Lever for travel drive direction 2 used	0
827	DOUT	Lever for travel drive not in the neutral position	1
830	AOUT	Driving signal	4-12 mA

DIRECTION 2 - option: 4-12-20 mA			
Terminal	Signal type	Technical description	Status
820 - 821 (via relay K10)	Loop	Emergency stop crane to vehicle, channel 1	Closed
820 - 821 (via relay K10)	Loop	Emergency stop crane to vehicle, channel 2	Closed
828	D OUT	Lever for travel drive direction 1 used	0
829	D OUT	Lever for travel drive direction 2 used	1
827	DOUT	Lever for travel drive not in the neutral position	1
830	AOUT	Driving signal	12-20 mA

Table 9: Permissible statuses of travel drive 4-12-20 mA

13.5 Transport position

With Basic Line cranes, the transport position of the crane and support is monitored with the help of the S-IQ-Box.

13.5.1 S-IQ

This section summarizes content from the S-IQ training documents. The complete training document is available via PALDKESK.

The S-IQ electronics in Basic Line cranes include the following functions:

- Digital input for parking brake
- Digital input for acknowledgment signal via a button - the acoustic warning can be suppressed using a button according to product standard EN12999.
- Safe inductive proximity switches (SIL2) are used for the digital signals.
- Transport position monitoring (two digital outputs for optical and acoustic warning devices)

Logic:

The digital output of the optical warning device is always active as long as monitoring of the transport position (crane or supports) is active. The digital output of the acoustic warning device is active as long as monitoring of the transport position (crane or supports) is active and the parking brake is released. For this purpose, the S-IQ1 electronics on the crane have a separate power supply input, independent of the crane supply. The truck's ignition signal (Kleme15) should be used. In most cases this signal is available at the truck-side electrical interface. The digital outputs can be loaded with a maximum of 1 A.

INFORMATION

A signal for an acoustic warning and a signal for a visual warning are provided in the crane connection box.
It should be noted that the individual transport position monitoring systems (support and crane) are linked with the signals provided.
Separate provision of the signals is not possible.

INFORMATION

Further information can be obtained online in the training document C-63 "S-IQ stabilizer intelligence" via PALDESK.PALFINGER.com.

13.5.2 Signal transport position crane

The following options exist:

Check of crane transport position for EN12999 cranes	
TRAN2	Check of transport position • Position crane boom above the platform Limit switch on crane column or main boom for monitoring the transport position Wired up to an electric joint box With output for optical and acoustical signal for indication of transport position

TRAN5	Check of transport position • Crane boom positioned above the platform • Crane folded to vehicle width Limit switch on crane column or main boom for monitoring the transport position Wired up to an electric joint box With output for optical and acoustical signal for indication of transport position

Table 10: Transport position check crane

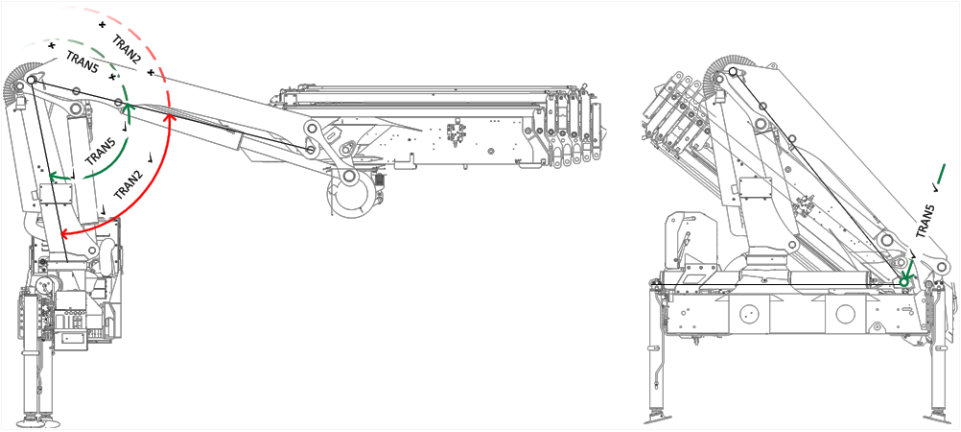

Illustration 13-00 8; TRAN2 and TRAN5

Notes on the options TRAN2 and TRAN5:

TRAN2

- Standard scope of delivery for all Basic Line cranes.
- Only the main arm position below the horizontal is monitored. The slewing mechanism, knuckle boom and extension boom are not monitored!

TRAN5

- Option
- In addition to TRAN2, a signal is supplied via a proximity switch when the main arm is in the armrest on the base frame. This means that the slewing mechanism is also monitored indirectly. Knuckle boom and extension boom are not monitored.

The proximity switches are read in via the SIQ-Box and output to the crane connection box. The SIQ Box is supplied with the ignition signal.

During the project planning, the installation company / vehicle manufacturer must determine whether the signals supplied (TRAN2, TRAN5) are sufficient to ensure that the crane is in the transport position.

WARNING

The installation company / vehicle manufacturer must ensure that the crane is adequately monitored in the transport position. If the signals supplied (TRAN2, TRAN5) are not sufficient, monitoring must be set up on the vehicle side. This is not included in the PALFINGER scope of delivery.

13.5.3 Transport position signal crane stabilizers

The following options exist:

Check of outrigger transport position for EN12999 cranes	
AUSW	Check of hydraulic outriggers in retracted position Wired up to an electric joint box at the crane column With output for optical and acoustical signal
ABSTW	Check of hydraulic outriggers (AUSW) and stabilizer arms in retracted position Wired up to an electric joint box at the crane column With output for optical and acoustical signal (not for STZY)

Table 11: Transport position check stabilizers

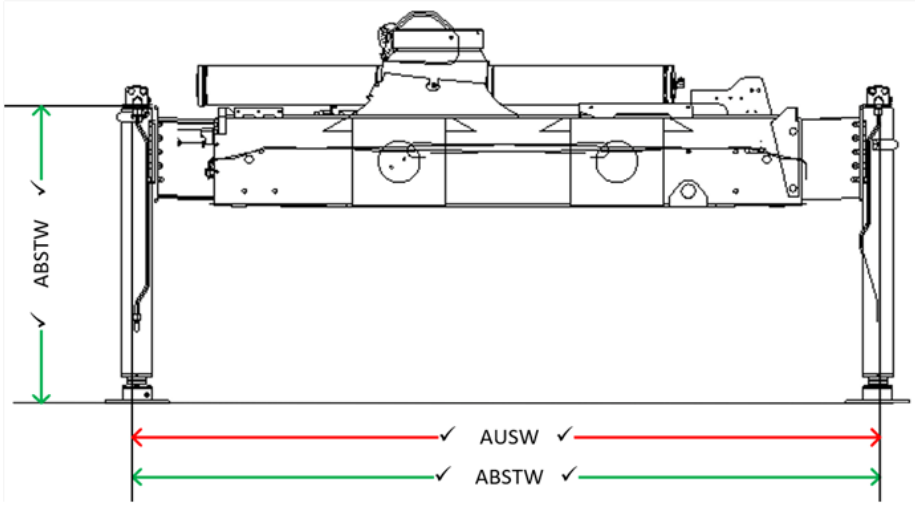

Illustration 13-00 9; AUSW and ABSTW

Notes on the options AUSW and ABSTW:

AUSW

- Standard scope of delivery for all Basic Line cranes.
- Only the outriggers are monitored.
  The support cylinders (feet) are not monitored!

ABSTW

- Optionally selectable

In addition to AUSW, a signal is supplied via a proximity switch when the support cylinders (feet) are in the retracted position.

The proximity switches are read in via the S-IQ box and output at the crane connection box The S-IQ box is supplied with the ignition signal.

WARNUNG

The body builder must ensure that the stabilizers are adequately monitored in the transport position.

13.5.4 Transport position locking mechanism

If it is necessary to additionally secure crane components in the transport position, this security must be installed on the vehicle. This kind of protection is not included in the PALFINGER scope of delivery.

WARNING

The installation company, vehicle manufacturer or distributor must ensure that all movable crane components, including supports (stabilizers), are adequately secured in the transport position.

If a mechanical support entry limitation (see chapter 6) is mounted on the outriggers, locking of the outriggers in the transport position for all vehicle types (including 2-way- vehicles and trucks) is prescribed by PALFINGER!

Illustration 13-00 10; Example stabilizer outrigger locking mechanism

13.6 Entry limitation of outriggers (stabilizers)

Due to a vehicle width of rail vehicles > 2550 mm, it may be necessary (to prevent collisions between the outriggers and the vehicle) to limit the reach of the outriggers.

With the help of a device feature (probably "ABSTEINBEGR") - "Support entry limitation", a kit is provided in the accessory box to limit the entry width of the crane outrigger.

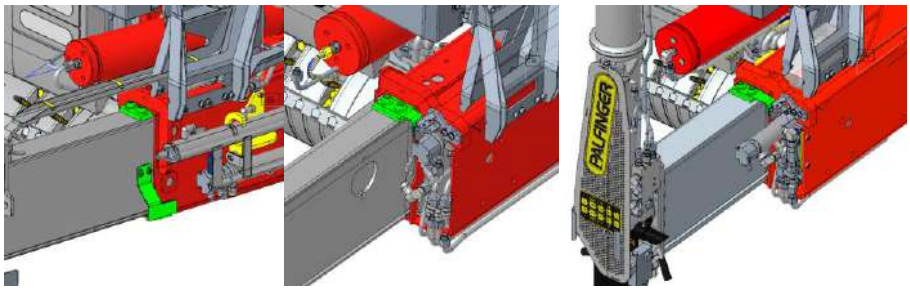

Illustration 13-00 11; Entry limitation for S105, S205 and S407

The kit consists of:

- A stop attachment to limit the extension distance (always on top of the outrigger)
- An actuation flag for the transport position switch (AUSW)
- Mounting material

13.6.1 Mounting of entry limitation

The entry restriction must be matched to the carrier vehicle and must therefore take place after the crane has been installed on the vehicle.

The installation of the entry restriction must be carried out according to the following guidelines.

13.6.1.1 Positioning

The permissible entry limitation is max. 375 mm.

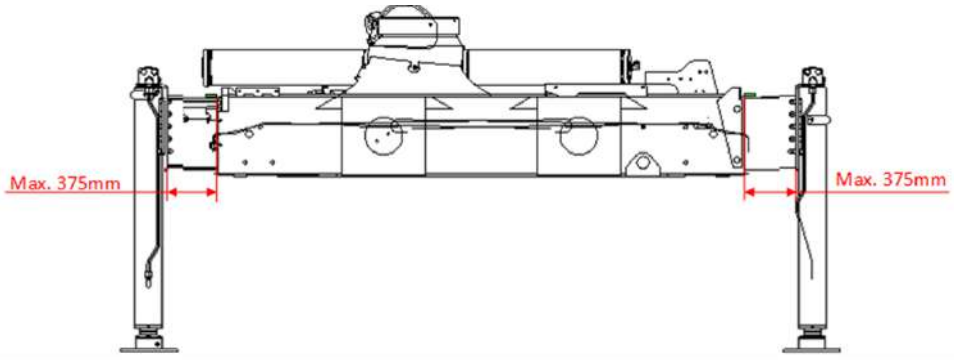

Illustration 13-00 12; Maximum permissible entry limitation

Note: An entry limitation of 375 mm is statically uncritical and corresponds approximately to the difference between the width of typical trucks and the max. width of railroad vehicles (broad gauge Russia).

13.6.1.2 Threaded holes in the outrigger brackets

The limitations differ depending on the crane model (see illustration 13-00 13). Therefore, different positions for the drilling holes are necessary.

- PK 8502 RW, PK 10002 RW and PK 12502 RW

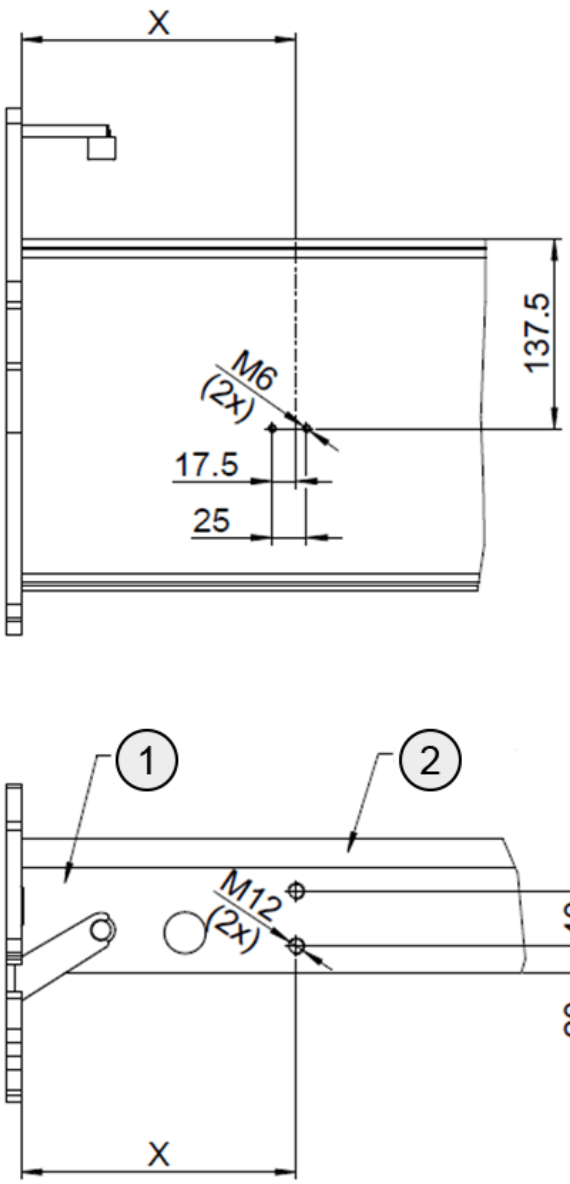

Illustration 13-00 13; Drilling wholes entry limitation outriggers (PK8502, 10002, 12502RW)

1	Outrigger	2	Edging

Distance X depends on situation on the vehicle. Material KMG11298A is included in the accessory box.

In the figure above, the mounting of the switching flag with 2x M6 is shown above (side view) and the entry limitation attachment (with 2x M12, top view) below.

- PK 14502 RW and PK 18502 RW (entry limitation)

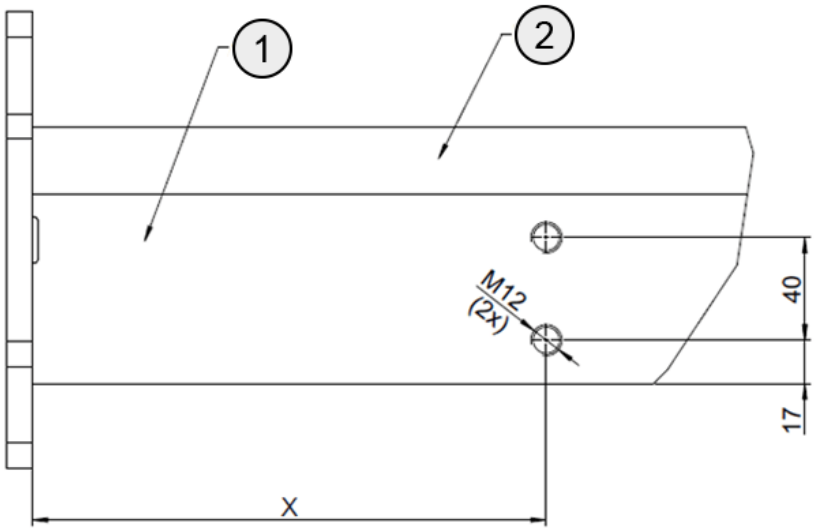

Illustration 13-00 14; Drilling pattern for entry limitation PK 14502RW/18502RW

1 Outrigger	2 Edging

Distance X depends on situation on the vehicle. Material KMG11300A is included in the accessory box.

- PK 23002 RW, PK 27002 RW and PK 34002 RW (entry limitation)

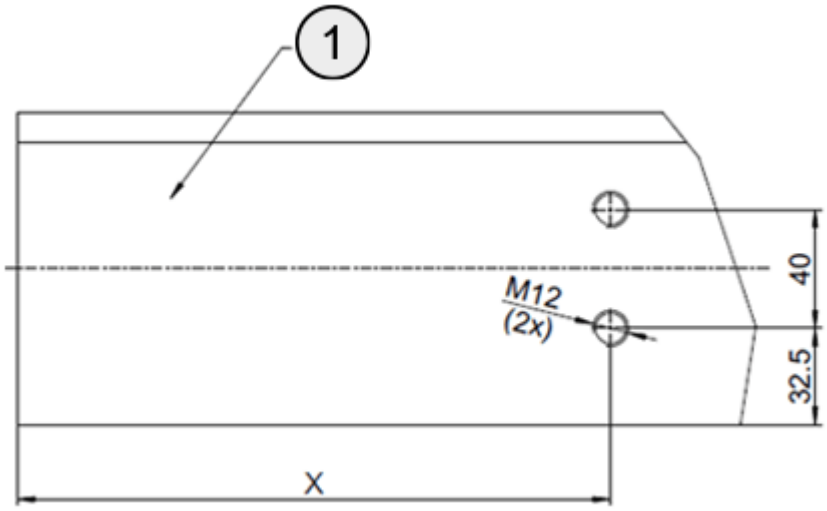

Illustration 13-00 15; Drilling pattern for entry limitation PK23002RW, 27002RW, 34002RW

1 Ausleger

Distance X depends on situation on the vehicle. Material KMG11299A is included in the accessory box.

13.6.1.3 Tightening torque

The stop for the entry limitation must be tightened with M12 screws (see illustration 13-00 15, illustration 13-00 16 and illustration 13-00 17) of grade 10.9 with 108 Nm.

13.6.1.4 Proximity switch

It must be ensured that the AUSW switch is actuated in the fully retracted position.

13.6.1.5 PACWEB

Before setting the HPSC, the changed position in PACWEB must be considered.

13.6.1.6 Transport lock of the support

WARNING

The installation company, vehicle manufacturer or distributor must ensure that all moving crane components including supports are adequately secured in the transport position.

13.7 Working range limitation to the side

As early as in design phase, various data about vehicle and track must be obtained in order to prepare adjustment specifications that comply with standards and regulations.

For compliance with applicable standards and regulations the factory set working range limitation to the side must be adjusted.

INFORMATION

Adjust the working range limitation to the side as per adjustment instruction!

WARNING

As the setting is based on vehicle and track data, the data must be made available to the operator including the resulting slewing range of the crane!

Depending on place of operator station installation the key-operated switch must be wired accordingly and checked for proper function!

DANGER

The key switch position must be unmistakably assignable to the crane's blocked area! If this is not the case there is risk of fatal or personal injury!

13.8 Working range limitation to the top

As early as in design phase, various data about vehicle and track must be obtained in order to prepare adjustment specifications that comply with standards and regulations.

For compliance with applicable standards and regulations the factory set working range limitation to the top must be adjusted.

INFORMATION

Adjust the working range limitation to the top as per adjustment instruction!

WARNING

As the setting is based on vehicle and track data, the data must be made available to the operator including the resulting working height of the crane!

13.9 Grounding cables

For connecting the crane to the equipotential bonding between crane and vehicle or rail earth a port is provided on the base. Illustration 13-00 16 shows the position of the port on the base:

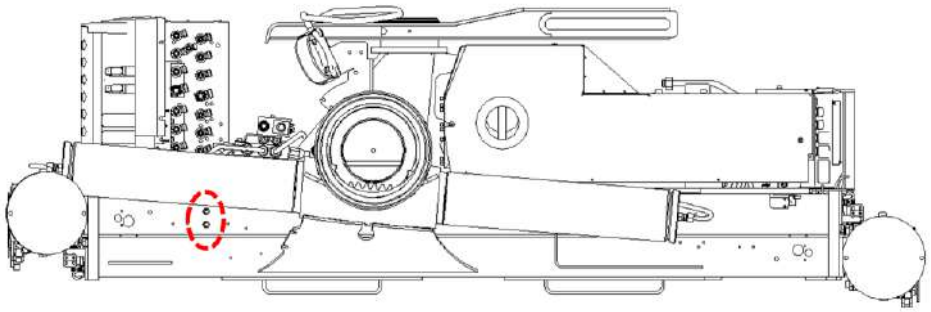

Illustration 13-00 16; Grounding port

For correct connection attention must be paid to the following:

- The nuts must be tightened at a torque of 31 Nm.
- Nuts must not be glued in.
- Maximum 3 earthing brackets may be connected via one bolt.
- On the fitted nut at least 2 turns of thread must protrude.

13.10 Project development

13.10.1 Components that jut out at the bottom

When developing the project, please note, that components jut out at the bottom below installation level. This is shown in illustration 13-00 17.

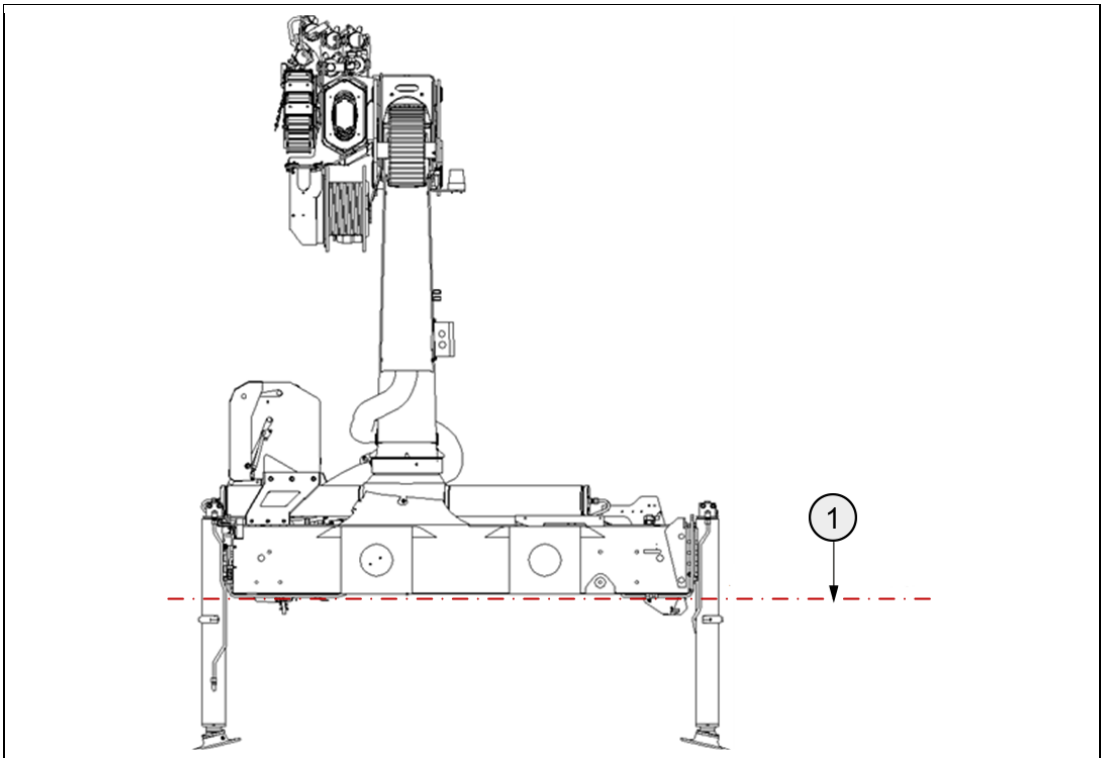

Illustration 13-00 17; Components that just out at the bottom

1	Mounting level

For exact dimensions refer to the technical information sheets of the appropriate crane model.

13.10.2 Two-way (road-rail) vehicles

WARNING

As a general principle, Basic Line crane controls are NOT able to DISTINGUISH road from rail operation on two-way vehicles.

For Basic Line cranes on two-way vehicles the following has to be observed in particular.

This results in the following limitations:

- Stability
  - Stability calculation is not different for rail and road operation.
  - The lowest common tilting edge and the highest installation height of rail and road operations get parameterized. Every case needs to be verified both in plane and in superelevation.

- Consequently, this doubles the verification volume in comparison with a pure rail vehicle or road vehicle

- Travel drive
  - Travel drive controls must only be used for rail vehicles. Using the unit on two-way vehicles on roads or trucks is prohibited!

- Working range limitation to the side and top (adjacent track limitation and height limitation)
  - The altered vehicle geometry must be taken into account in adjustment specifications. The most restrictive values must be adjusted.

13.10.3 Vehicles with several working / lifting units

Mounting other machinery like cranes, working platforms or other lifting / positioning devices on the same vehicle together with a Railway Basic Line crane causes new topics that must be considered for the overall vehicle concept:

- RW Basic Line units cannot consider other working units for the stability control calculation.
  That is why those units must be brought to the least favorable position when stability control (HPSC) is adjusted for the Basic Line unit.
- PALFINGER recommends allowing crane mode only if all other units are in transport position. To set up this logic, the following points must be considered:
  - The signal for transport position (TRANS2, TRANS5 acc. chapter 5) is a one-channel signal only. Such a signal is normally not enough to realize safety related functions that are required for stability control mechanisms. PALFINGER recommends implementing an additional surveillance of the transport position of the crane on the vehicle.
  - To create an interdependency of the crane release and the position of other units on the vehicle, the corresponding signals / states can be related to the emergency stop loop of the vehicle (chapter 3, "emergency stop"). So the release of the crane can be controlled accordingly.

DANGER

The realization and safety of the overall logic for working units on a vehicle is under control and responsibility of the installation company / vehicle manufacturer.