Guideline
Inspection Loader Crane

Inspection instructions

Guideline for inspection steps and tolerances

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0 General

0.1 Introduction and handling of this document

This PALFINGER document is a technical manual for the inspection procedures listed in the „INSPECTION-HANDOVER-MAINTENANCE--SERVICE“.

The inspection-steps mentioned in the test protocol are described here in detail, and more in-depth measurements, tolerances and testing procedures are explained.

This document does not contain any information on the correct operation of a loader crane. Information regarding normal crane operation can be found in the operating instructions.

0.1.1 Validity and maintenance intervals

The guideline “Inspection loader crane“ is valid for all PALFINGER loader cranes and is made to support the regular maintenance during the operating life of the crane.

Maintenance must only be conducted by authorized PALFINGER shop personnel, that has the necessary training from PALFINGER University.

Dependent on the maintenance intervals and operating hours, pay special attention to wear and tolerances.

This guide is generally valid for all inspections, and covers amongst others:

- Inspection before delivery / Handover
- 50 hour inspection
- All reoccurring inspections (1000 hour inspection / yearly inspection)
- Other inspections (e.g. after accidents, overloads, …)
- Inspection after major changes of the unit
- Country specific inspections (e.g. accident prevention regulations)
- Inspection for change of ownership

0.1.2 Definitions

Operator:	Owner, Leaser, renter of the unit; uses the unit, operates the unit or assigns an operator
Operation:	Start the unit, independent on the reason (work, maintenance, service, etc.)
Assistant:	Helps, but does not operate the unit
Installer:	Mounts the unit on the vehicle
Service partner:	Someone endorsed by PALFINGER
Qualified person:	Someone who, because of his knowledge of the topic is competent in the area of loader cranes, and who knows all applicable laws and regulations, that enable him to assess the reliable and safe operational state of the unit.
Properly:	is he who observes all duties and responsibilities imposed by his job.
Negligent:	is he who does not observe the duties and responsibilities imposed by his job.
Reckless:	is he who does not adhere to rules that should be obvious to anyone
Load moment:	The moment that is exerted by the load on the hook, additional equipment, lifting means etc.
Own moment:	The moment that is exerted by the arm system itself
Total moment:	Combines the load moment and the own moment
Overload situation:	When the max. allowed moment for the current working position is reached
Working area:	The area that is needed to perform the task
Working position:	Position of the crane
Area of movement:	The area where the crane can move
Load area:	The area where the specific crane can work with load
Load track:	The pathway taken by the moving load
Load hold:	Holding the load, supervised by the operator, while the safety systems of the crane are in operation
Set-up:	The crane, prepared for the work at hand
EU:	European Union
CE marking:	Marking of the unit, corresponding to the regulations of the EU
Emergency operation:	An operational mode that is not intended for normal crane operation. This is used to get the crane into transport position if and when the electronics or safety systems are faulty

0.1.3 Symbols and hints

These symbols and hints point out important tips, possible dangers and mortal dangers

Caution!

Symbol and special word will be used for imminent danger.
If the safety instructions will be ignored, acute danger for life exists for the operator and others.

Attention!

Symbol and special word will be used for imminent danger.
If the safety instructions will be ignored, acute danger for life exists for the operator and others.

Note!

Symbol and special word will be used for a very important note which makes it easier to operate the machine.

0.2 The inspector

Inspections must only be conducted by qualified shop personnel with training for inspections on loader cranes by PALFINGER University.

0.2.1 Qualification

Qualification criteria for inspectors are:

- In-depth knowledge of country specific rules, regulations, standards and laws for the operation and inspection of loader cranes and all additional equipment
- All relevant PALFINGER training courses offered by PALFINGER University
- Knowledge of safety relevant notices and certifications
- Ability to concentrate, responsibility and reliability
- Trained to be a qualified person
- Legal age (dependent on the country)

0.2.2 Safety equipment

Appropriate safety equipment has to be worn at any time, especially when:

- Cleaning or performing maintenance
- Changing equipment
- Inspecting and operating the loader crane
- Servicing or repairing

Safety equipment consists of:

- Protective clothing and work gloves
- Safety helmet
- Safety shoes

When repairing or performing maintenance:

- Ear protection and safety goggles

0.2.3 Handling hydraulic fluids, cooling fluids, gear oil and lubricants

WARNING **Attention!**

All fluids mentioned can be under pressure. Because of the operating temperature of a unit, there is also risk of scalding!

WARNING **Attention!**

All fluids mentioned are harmful. Handling these fluids requires special care.

0.2.4 Evaluating the condition of the unit

The inspector has to evaluate the condition of the unit. It is the inspectors responsibility to assess all problems and if needed stop further operation.

Evaluation of the unit can lead to the following assessments:

- No problems: The unit does not have any faults.
- Minor flaws: The unit has minor flaws. Normal operation can continue for a limited time, repairing of these flaws has to be scheduled.
- Considerable flaws: The unit has considerable flaws. Further use of the unit cannot be allowed. The machine must be repaired before normal operation can continue.

0.2.5 Tools and gear

The gear listed below, in conjunction with the proper tools, is mandatory for proper inspection of the unit.

All instruments have to be calibrated and checked for accuracy regularly.

All components and their order codes can be found in the PALFINGER tools catalogue.

- Test weights: The test weights have to correspond to the load limits of the crane. PALFINGER offers a modular system that can be adjusted using different weights and is stable without the need for belts etc.
- Measuring tape and calipers: To measure tolerances and lengths
- Lifting tools: Chains and belts to fix test loads
- Stopwatch: To measure speeds and sink rates
- Steel rule: To measure warpage and deflection
- Feeler gauge: To measure clearances, ranging from 0.05mm to 4mm
- Measuring stick: To measure warpage
- Digital bubble level: To measure angles and positions
- Inspection spray for cracks: Inspections for cracks using dye penetrant testing are only conducted if there is a suspicion of hidden crack formation. The inspector must have a certificate of proficiency for this method

Attention!

This method must only be conducted by a certified inspector, because it can cover (hide) cracks if not conducted properly.

- Steam cleaner: To clean components and uncover damages.
- Pressure gauge: To check the pressure settings. One low pressure (5 MPa) gauge and one high pressure (40 MPa) gauge are needed.
- Dial gauge and magnet: To measure radial and axial clearances.
- Multimeter: To find faults in the electrical system.

0.3 Procedures for inspections

0.3.1 General

Crane components age over time because of load, environmental influences etc. therefore they have to be checked regularly. This interval can be found in the operating manual of the machine, and is generally yearly or every 1000 operating hours, whichever comes first.

There are country specific laws which supersede the PALFINGER rules, if they are stricter.

Every regular inspection has to be conducted according to the “INSPECTION-HANDOVER-MAINTENANCE-SERVICE” and has to be documented there.

Because of the complex preparation (full disassembly, removal of varnish, etc.) X-Ray only has to be done after accidents or when the machine is refurbished and is regulated in the country-specific rules and regulations

In case of doubt, a certified inspector can use dye penetrant testing to find cracks and faults.

Normally the following inspection methods are used:

- Visual inspection (see 0.3.3)
- Functional inspection (see 0.3.4)
- Pressure inspection (see 0.3.5)
- Inspection of additional equipment (see 0.3.6)
- Measurements are described in every inspection step

It is recommended to work through the steps in the order given in the inspection protocol.

0.3.2 Preparing the unit

Before starting the inspection, the unit has to be checked visually, and the general condition (as provided by the operator) has to be evaluated.

Take special notice of:

- General condition (allows conclusions for maintenance and service)
- Completeness of documentation in the Inspection guideline (entries)
- Liquids mandatory for operation (oils, fuel)
- Increased dirt on certain components (allows conclusions towards leakages of the hydraulic system)
- Varnish repairs and rust
- Added (welded on) or changed parts
- Anything else noticeable

Clean the unit using a steam cleaner and proper cleaning agent (see operating instructions)

Use the unit after allowing it to dry for a while, and get it up to operating temperature (hydraulic oil between 40°C and 60°C)

0.3.3 Visual inspection

A visual inspection is the evaluation of the current state of an item using the human eye. The current state is compared against the expected nominal condition. With the specific professional knowledge, the condition of parts can be evaluated.

This includes evaluation of:

- Completeness and general condition
- Correct mounting (screws, weld seam, etc.)
- Damages (deformation, cracks, etc.)
- Varnish, corrosion, hydraulic leakages, bare cables, general condition
- Completeness, quantity of oils, lubricants, frost protection, etc.
- Completeness of safety features, fixtures, bails, covers
- Original parts, undamaged seals, safety features
- Good maintenance (lubrication, cleaning, etc.)

0.3.4 Functional inspection

A “functional inspection” is an inspection to check the working condition of a part by actuating it as it was designed.

This includes:

- Correct function and completeness of control elements and signs
- Performs the correct function/movement as intended
- Safety features and stop-mechanics trigger correctly
- Warning functions (optical, acoustic, mechanical) work as intended
- Suspicious sounds (squeaking, creaking etc.)
- Noticeable tolerances
- Correct action when reaching max. loads
- Deformation, cracks, damages occurring under max .load
- Check start/stop of functions, and max speeds

0.3.5 Pressure inspection

The pressure test or pressure inspection is an inspection of parts (pump, control valve, cylinder, etc.) that are intended to store or carry fluids, to check for leakages.

This is usually done by:

- Actuating the whole range of motion of the function
- Move the function against the mechanical end stop. If the end stop is not mechanic, gently move against an obstacle to create a proper resistance
- Evaluate the general condition of hydraulic components (Leakage, ageing, damages, warpage)

0.3.6 Inspection of Additional Equipment

An „Inspection of Additional Equipment “ is an inspection that checks the completeness of a part, system or accessory

This is done by:

- Checking the completeness of components or systems, according to the operating instructions, spare part catalogue and other documentation
- Checking for obviously missing parts of a system, like displays, safety features, mounting points etc.

1 Informational- and warning signs

1.1 Type plate

1.1.1 To inspect

- Check readability
- Check for validity (e.g. correct type plate)

1.1.2 Guidelines, tolerances

None

1.1.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Inspection of additional equipment (see chapter 0.3.6)

1.1.4 Description of inspection method

- Visual inspection of the type plate, Compare the type plate to the crane data
- The type plate must be readable

1.1.5 Additional valid documents

Operating instructions “Device and Functions”

1.1.6 Actions for negative inspection results

- Renew the type plate
- Register the loss of the original in the inspection booklet

1.2 Load diagram

1.2.1 To inspect

Check readability of the data. Load diagrams have to be mounted visibly near all stationary operating stands.

1.2.2 Guidelines, tolerances

None

1.2.3 Inspection method

Visual inspection (see chapter 0.3.3)

1.2.4 Description of inspection method

Check the diagram on all operating stands for readability.

1.2.5 Additional valid documents

- The valid load diagram is shown in the spare part catalogue of the crane.
- The valid load diagram for the specific crane is displayed in the spare part catalogue or in the technical info sheets of the operating instructions
- Diagrams for use in reduced support situations can be created online with the PALCHART tool.

1.2.6 Actions for negative inspection results

- If the load diagram is lost or illegible, replace it.
- If needed print out the reduced load diagram via PALCHART.

1.3 Warning signs, mandatory signs and prohibition signs

1.3.1 To inspect

Check all warning-, mandatory- and prohibition signs on the crane

1.3.2 Guidelines, tolerances

An overview of all signs can be found in the spare part catalogue and in the operating instructions

1.3.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Inspection of additional equipment (see chapter 0.3.6)

1.3.4 Description of inspection method

Check all appropriate signs for readability.

These are signs with the following information:

- Do not walk under hanging load (has to be on both sides of the crane)
- Crushing hazard (has to be at every operating stand)
- Do not step on! and Slippery!
- A manual on how to fold and unfold the crane
- Notice for pivoting supports
- Notice for remote control supports
- Emergency cut-off labelling
- Reflecting signs
- Do not lubricate! Signs for maintenance free extension systems
- Yellow/black marking

1.3.5 Additional valid documents

An overview of all mandatory and prohibition signs can be found:

- In the corresponding spare part catalogue
- In the operating instructions

1.3.6 Actions for negative inspection results

Renew the missing signs

1.4 Function related signs and symbols

1.4.1 To inspect

Readability and accuracy of all symbols and moving parts

1.4.2 Guidelines, tolerances

All relevant stickers and covers are present

1.4.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Inspection of additional equipment (see chapter 0.3.6)

1.4.4 Description of inspection method

Check all appropriate signs for readability.

1.4.5 Additional valid documents

An overview of all symbols and signs can be found

- In the corresponding spare part catalogue
- In the operating instructions

1.4.6 Actions for negative inspection results

Renew signs where needed

2 Documentation

2.1 Inspection booklet

2.1.1 To inspect

Check for completeness and readability.

2.1.2 Guidelines, tolerances

- The inspection booklet has to be carried on the unit
- The inspection booklet should be in the same language as the operating instructions.

2.1.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Inspection of additional equipment (see chapter 0.3.6)

2.1.4 Description of inspection method

Check if the inspection booklet is present

2.1.5 Additional valid documents

None

2.1.6 Actions for negative inspection results

Amend the existing inspection booklet or order a new one. Use the serial number for ordering a new manual.

2.2 Operating instructions

2.2.1 To inspect

Check for completeness and readability.

2.2.2 Guidelines, tolerances

- The operating instructions has to be carried on the unit
- The EU requires the operating instructions to be in the language of the country, as well as in the language of the producer (German).

2.2.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Inspection of additional equipment (see chapter 0.3.6)

2.2.4 Description of inspection method

- Check if operating instructions is available
- Check if all necessary languages are available

2.2.5 Additional valid documents

None

2.2.6 Actions for negative inspection results

Amend the existing operating instructions or order a new one. Use the serial number for ordering a new manual.

2.3 Declaration of conformity, manufacturer's declaration

2.3.1 To inspect

Check if latest version is present

2.3.2 Guidelines, tolerances

None

2.3.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Inspection of additional equipment (see chapter 0.3.6)

2.3.4 Description of inspection method

Check if any major changes/additions which would require additional evaluation or approval have been carried out on the equipment.

2.3.5 Additional valid documents

Inspection guideline

2.3.6 Actions for negative inspection results

- Check crane data
- Order a new document from the manufacturer using the serial number
- Note down in inspection guideline
- Conduct a new acceptance test if necessary

2.4 Inspection protocol of the last reoccurring inspection

2.4.1 To inspect

Check if last inspection was carried out

2.4.2 Guidelines, tolerances

The inspection protocol of the last reoccurring inspection has to be available on the unit. The original template is available in the “INSPECTION-HANDOVER-MAINTENANCE-SERVICE” guideline, and can be copied from there ore ordered from PALFINGER.

2.4.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Inspection of additional equipment (see chapter 0.3.6)

2.4.4 Description of inspection method

Check if protocol is present

2.4.5 Additional valid documents

None

2.4.6 Actions for negative inspection results

None, but inform the operator that the latest inspection protocol has to be kept on the unit.

2.5 Spare part catalogue

2.5.1 To inspect

If available, check for completeness and readability.

2.5.2 Guidelines, tolerances

The spare part catalogue is an optional document that does not have to be on the unit by law. It can be present though, and if so, has to be correct.

2.5.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Inspection of additional equipment (see chapter 0.3.6)

2.5.4 Description of inspection method

Check if spare part catalogue is present

2.5.5 Additional valid documents

None

2.5.6 Actions for negative inspection results

- None
- Should the operator wish so, a new spare part catalogue can be printed. There is also an online version of it.

2.6 Suspension element supplementary sheet

2.6.1 To inspect

Check for completeness and readability.

2.6.2 Guidelines, tolerances

None

2.6.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Inspection of additional equipment (see chapter 0.3.6)

2.6.4 Description of inspection method

Check if supplementary sheet is present

2.6.5 Additional valid documents

- EN 12999
- Country specific regulations
- Inspection guideline

2.6.6 Actions for negative inspection results

If necessary, print the missing sheet from PALFINGER Online, and include in crane documentation

3 Crane fastening

3.1 Fastening

3.1.1 To inspect

Condition of all components related to crane fastening

3.1.2 Guidelines, tolerances

- The mounting instructions for loader cranes are a basic guideline for proper mounting of a crane.
- Tolerances for the clearance at the balance is 2mm (see 10.7)

3.1.3 Description of inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)
  - Area where the crane rests on the sub frame; wear plates
  - Good seat of mounting bolts, brackets, safeguards and self-locking nuts
  - Check fitting plate and spacers for damage to varnish and cracks
  - Check balance for tolerances (see 9.5 and 10.7)
  - Check good seat of sub frame / web plates for welded frame

3.1.4 Additional valid documents

Mounting instructions for loader cranes

3.1.5 Actions for negative inspection results

Immediately stop crane operation and repair

3.2 Tightening torque for mounting bolts

3.2.1 To inspect

Tightening torque of mounting bolts

3.2.2 Guidelines, tolerances

WARNING

Attention!

Only use original PALFINGER mounting bolts. Mounting bolts use high-strength materials and must not be formed neither hot nor cold. Never rethread mounting bolts under any circumstances!

Tightening torque of mounting bolts:

	Strength category	**Material**	**Material**
	8.8	C40	42CrMo4V
Thread diameter	**Torque (Nm)**		
M16x1,5	120		
M20x1,5		140	210
M24x1,5			450
M30x1,5			900
M33x1,5 (only Epsilon)			1220
M36x1,5			1550
M42x1,5			2500
M48x1,5			3700

3.2.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

3.2.4 Description of inspection method

Tighten and check the torque of mounting bolts (See mounting instructions for detailed instructions)

Procedure:

- Get the crane into a safe position without any load (ideally the transport position)
- Tighten (retighten) the mounting bolts using the proper torque

3.2.5 Additional valid documents

- Loader crane mounting instructions
- Technical information sheets for the specific crane (information about the mounting bolts used)

3.2.6 Actions for negative inspection results

Immediately stop crane operation and repair

3.3 Rotation prevention

3.3.1 To inspect

Check condition and functionality of the rotation prevention

3.3.2 Guidelines, tolerances

The crane has to be secured against unintended movements in all directions

3.3.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

3.3.4 Description of inspection method

- Visual check if the mounting corresponds with the mounting instructions
- Check for cracks at the stop buffers
- Check the function by slewing with load attached and abruptly stopping the motion

3.3.5 Additional valid documents

- Mounting instructions for loader cranes
- Technical information sheets

3.3.6 Actions for negative inspection results

Immediately stop crane operation and repair

3.4 Subframe

3.4.1 To inspect

Check the function and condition of the subframe

3.4.2 Guidelines, tolerances

Mounting instructions for loader cranes

3.4.3 Inspection method

Visual inspection (see chapter 0.3.3)

3.4.4 Description of inspection method

To inspect:

- Visual check if the subframe and the mounting of the subframe correspond to the mounting instructions
- Check angle holders and mounting screws
- Check subframe components for deformation and cracks
- Check subframe for removed varnish and rust
- Also check the crane base if it is welded

3.4.5 Additional valid documents

Mounting instructions for loader cranes

3.4.6 Actions for negative inspection results

Immediately stop crane operation and repair

3.5 Demountable bracket

3.5.1 To inspect

Check the crane mounting and mounting material on the attachments

3.5.2 Guidelines, tolerances

Mounting instructions for loader cranes

3.5.3 Inspection method

Visual inspection (see chapter 0.3.3)

3.5.4 Description of inspection method

Visual inspection for functionality and safety of mechanical, hydraulic and electrical connections between the truck and the crane.

- Check for cracks, deformations and corrosion of mechanical parts
- Check bolts, plugs and safety devices
- Check hydraulic connections, especially check if there is a safety valve against connecting the wrong way
- Check if hydraulic and electric connections are working (especially the vehicle illumination)
- Check for proper cable routing, there must not be any hanging connections etc.

3.5.5 Additional valid documents

Mounting instructions for loader cranes

3.5.6 Actions for negative inspection results

Immediately stop crane operation and repair

4 Climbing aids, steps and elevated control stations

4.1 Ladders and climbing aids

4.1.1 To inspect

Visual check of all climbing aids and steps

4.1.2 Guidelines, tolerances

- CE rules and regulations
- Country specific rules and regulations, if they are stricter than CE rules and regulations

4.1.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

4.1.4 Description of inspection method

Visually inspect climbing aids

Especially look for any dangers to the operator (crushing, falling hazards etc.)

- Check for damage and deformation
- Check for proper fastening
- Check for sharp edges or other dangerous areas
- Good mounting of handles
- Crushing hazard areas while operating the crane
- Step security (slip hazards)
- Warning signs, anti-slip mats etc. are present
  (crushing hazard, falling hazard, etc.)

4.1.5 Additional valid documents

Country specific rules and regulations

4.1.6 Actions for negative inspection results

Immediately stop crane operation and repair

4.2 Cabin protection

4.2.1 To inspect

Functionality of the cabin protection (Electrical system to prevent a collision of the crane and the truck cabin)

4.2.2 Guidelines, tolerances

Country specific rules and regulations

4.2.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

4.2.4 Description of inspection method

Attention!

Cabin protection is optional and not available on all units. Make sure cabin protection is enabled and activated before inspecting its functionality. Also make sure that the overload protection system (Paltronic) is not bypassed, otherwise the system is without function and there is acute risk of accidents!

Check the proper function according the activated system (use PALDIAG.NET to see which one is active)

- With IS001: Paltronic locks a freely programmable slewing area, independent on the main boom or knuckle boom position
- With IS002: Paltronic locks a freely programmable slewing area if the main boom is below a programmable angle
- With IS003: Paltronic locks a freely programmable slewing area if the main boom and the knuckle boom are below a programmable angle

Functional test by driving the crane into that locked area.

The system has to reliably stop the crane even when moving at full speed

4.2.5 Additional valid documents

- Paltronic 50 training documents (v4.0 and higher)
- Paltronic 150 training documents

4.2.6 Actions for negative inspection results

Immediately stop crane operation

4.3 High stand, high seat

4.3.1 To inspect

Check functionality and condition of safety devices

4.3.2 Guidelines, tolerances

Country specific rules and regulations

4.3.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

4.3.4 Description of inspection method

Check all control stations

- Check if control station (high seat, high stand) is mounted securely
- Check mounts for cracks, deformation and corrosion
- Check if foldable parts (seat, hand rail, etc.) snap in properly
- Check high seat control switch (see 4.4)
- Check seat heater if available
- Check function and secure fastening of covers
- Check if seat and armrest are mounted securely
- Check if hold-to-run control elements go back to neutral position and are smooth and easy to operate

Check electrical safety functions: locked area “highstand”

WARNING

Attention!

The electrical system “high stand” prevents crane operation in the high stand area, when the crane is operated from this high stand.
Make sure that the overload protection system (Paltronic) is not bypassed, otherwise the system is without function and there is acute risk of accidents!

Check the proper function according the activated system (use PALDIAG.NET to see which one is active)

- IS001, IS002 and IS003 are functionally identical to the cabin protection (see 4.2) but are only active if the crane is operated from the high stand.

Perform a functional test of the system by slewing into the high stand area.

This HAS TO be done from the high stand.

4.3.5 Additional valid documents

- Paltronic 50 training documents
- Paltronic 150 training documents

4.3.6 Actions for negative inspection results

For safety relevant faults: Immediately stop crane operation, then repair or re-program the function

4.4 High seat control switch

4.4.1 To inspect

Functionality of the system

4.4.2 Guidelines, tolerances

This control switch makes sure that operation from the high stand is only possible when the operator is seated or when any other monitored system is engaged (high stand gate closed)

This is to secure the crane against unintended movements when entering or exiting the high stand area.

4.4.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

4.4.4 Description of inspection method

Visual inspection:

- Cable installation, plugs, contacts and switch positions

Functional inspection:

- Operating the crane from the high seat while sitting has to be possible
- Standing up must deactivate the control stand. Operation is not possible
- Trigger switches that are mounted differently (at the safety bar) work as intended

4.4.5 Additional valid documents

Training documents for loader cranes

4.4.6 Actions for negative inspection results

Immediately stop crane operation and repair the system

4.5 Crane cabin

4.5.1 To inspect

General condition and functionality

4.5.2 Guidelines, tolerances

None

4.5.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

4.5.4 Description of inspection method

Inspect the suitability for daily use:

- General condition of the cabin
- Mounting of the cabin frame
- Check for damage, deformation and cracks
- Check protection grid of the roof window (falling loads)
- Check latch of door and window
- Check safety belt and other safety devices
- Check control elements by operating the crane from the cabin
- Check comfort functions (seat heater, radio, AC etc)

4.5.5 Additional valid documents

Operating instructions of the cabin (especially also for 3rd party cabins)

4.5.6 Actions for negative inspection results

- For safety relevant faults: Immediately stop crane operation, then repair or re-program the function
- inform the operator if non-safety relevant
- Repair the system

5 Pump and PTO

5.1 Hoses and mounting

5.1.1 To inspect

- General condition of the hoses
- Proper hose placement

5.1.2 Guidelines, tolerances

Recommendation:

- Replace hoses every 6 years (see 22.2)

5.1.3 Inspection method

Visual inspection (see chapter 0.3.3)

5.1.4 Description of inspection method

Hoses

- Rub- and scrub free mounting, general condition of hoses
- Proper fit of mounting clamps
- All hoses present

Valve between tank and pump

- Check if valve is present
- Check the valve for function
- Check safety seal

Pump

- Crane speed is OK (subjective assessment)
- Check if pressure setting is sealed on variable pumps

5.1.5 Additional valid documents

none

5.1.6 Actions for negative inspection results

- If hoses are broken or old -> replace them
- If seals are broken – set the correct pressures and re-seal
- If crane speed is off, measure the volume flow

5.2 PTO switch, warning devices and locks

5.2.1 To inspect

- Functional check
- Instruments

5.2.2 Guidelines, tolerances

Country specific rules and regulations

5.2.3 Inspection method

Functional inspection (see chapter 0.3.4)

5.2.4 Description of inspection method

Turn crane mode on and off using the switch in the truck cabin

- Check if the pump engages and disengages as intended
- Check if the electrical supply for the crane switches on
- If intended so, switch on the electrical supply separately

There might be other systems and displays combined with the PTO switch, check the function of these as well

- Engine speed-control
  - Might not exist
  - Can put the truck engine into working speed automatically
  - Can be fully manual, semi-automatic or controllable via the crane controls
  - Can be combined with the trucks cruise control
- Check if the engine immobilizer works as intended. (Can engage when releasing the park break or when attempting to engage a gear
- Check if the air suspension lowers automatically (this differs between truck manufacturers)
- Optical and acoustic displays and warning devices for crane height control (TRAN)
- Additional systems depending on the truck and unit, that might need to engage/disengage with the PTO

5.2.5 Additional valid documents

None

5.2.6 Actions for negative inspection results

- For safety relevant faults: Immediately stop crane operation and repair
- For non-safety-relevant faults: inform the operator and repair as soon as possible

6 Hydraulic tank, oil cooler, filters

6.1 Damage, leakage, filling quantity, oil change

6.1.1 To inspect

Check for oil leakage, mounting, fittings and filling quantity

6.1.2 Guidelines, tolerances

- Oil change or oil analysis every 1000 operating hours
- Special fluids may have other requirements (e.g. oil analysis, maintenance by 3rd party)

6.1.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

6.1.4 Description of inspection method

- Check tank for damages, general condition and leakages
- Check filling level indicator for readability and leakage
- Check filling level of hydraulic oil

Note!

To check the filling level, all cylinders must be retracted as much as possible (crane in transport position). Also note that hydraulic oil expands approx. 1% for every 10°C

- Check oil cooler for leakages, plugging and dirt
- Check all filters and hydraulic connections for leakages
- Check electronic filling level indicator (P150, tank sensor)
- Check electronic temperature indicator (P150, tank sensor)

6.1.5 Additional valid documents

- Operating instructions
- Training documents
- Mounting instructions for loader cranes

6.1.6 Actions for negative inspection results

- top up missing fluids
- repair leakages, remove plugging and dirt
- repair faulty parts

6.2 Mounting and band clamps

6.2.1 To inspect

- Check mounting of oil cooler and tank
- Check condition of band clamps
- Look for damages

6.2.2 Guidelines, tolerances

None

6.2.3 Inspection method

Visual inspection (see chapter 0.3.3)

6.2.4 Description of inspection method

- Check tank mounts (rubber buffers, dampening elements, bands, rubber protection etc.) for condition and secure mounting
- Check if oil cooler mount is secure, solid and in good condition

6.2.5 Additional valid documents

- Operating instructions
- Training documents
- Mounting instructions for loader cranes

6.2.6 Actions for negative inspection results

- Correct all faults
- Replace various rubber parts (dampening systems, protections, etc) if needed

6.3 Filters

6.3.1 To inspect

Condition and Service interval of filters

6.3.2 Guidelines, tolerances

- Service intervals according to the operating instructions
- All hydraulic filter elements have to be changed at the first service (50 operating hours) and then every 1000 operating hours

6.3.3 Inspection method

Visual inspection (see chapter 0.3.3)

6.3.4 Description of inspection method

At a normal service

- Check the operating hours of the unit at the operating hour counter
- Change the filter according to the intervals (high pressure filter, return oil filter, air filter)
- Reset the service warning on the operating hour counter

After hydraulic components get damaged, especially if there could be dust from abrasion in the hydraulic oil (pump damage, damage to hydraulic motors etc.)

- Take a sample of the oil and have it analyzed

6.3.5 Additional valid documents

- Operating instructions
- Training documents

6.3.6 Actions for negative inspection results

- Change the filter according to service intervals
- Reset the hour counter
- If needed perform an oil analysis (Analysis of hydraulic oil can only be performed at specialized laboratories

6.4 Hydraulic oil cooler

6.4.1 To inspect

- Condition of the cooler and all components
- Proper function of the fan
- Dirt on the cooler (in the grills)

6.4.2 Guidelines, tolerances

The fan has to engage according to its model

6.4.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

6.4.4 Description of inspection method

The function of the oil cooler can only be tested by heating the hydraulic oil circuit (through usage). When reaching the designated temperature, the fan has to engage according to it's model.

PALFINGER uses two different models on the market:

- The older system engages the fan full-speed when the temperature is reached – until the oil temperature is back to nominal values
- The newer system starts cooling with reduced speed at 35°C and increases the speed until it reaches full speed at 45°C

The electrical supply of the oil cooler is connected to the PTO. Permanent supply or supply using the truck ignition key are not valid

Note!

The simplest method of testing the oil cooler function is to watch it over the whole inspection period. Because of the length and the workload oil temperature rises and the fan has to engage

- Check cooler mounting (rubber parts) for condition and secure fit

6.4.5 Additional valid documents

- Operating instructions
- Training documents

6.4.6 Actions for negative inspection results

- Clean off dirt
- If the fan does not engage as intended – repair or replace!
- Renew rubber elements

7 Control valves for working and stabilizing hydraulics

7.1 Check for leakages

7.1.1 To inspect

- Leakages of the control valve
- Leakages and laying of pipes and hoses on the control valve

7.1.2 Guidelines, tolerances

None

7.1.3 Inspection method

Visual inspection (see chapter 0.3.3)

7.1.4 Description of inspection method

Visual inspection for dirt and leakages of the control valves

- Extraordinarily dirty regions in isolated areas may indicate leakages
- Especially also check the areas below the control valve to assess leakages
- Check if oil leaks between the elements of a sandwich style control valve
- Check if all attached hoses and joints are leakage-free and move freely

7.1.5 Additional valid documents

None

7.1.6 Actions for negative inspection results

- Clean dirt
- Repair leakages

7.2 Check settings and seals of the main pressure relief valve

7.2.1 To inspect

- Intact original seal (factory settings, original PALFINGER seal)
- Proper pressure setting for the unit

7.2.2 Guidelines, tolerances

- Main pressure relief valve needs to be sealed
- Settings according to hydraulic diagram for the unit with a tolerance of +- 1MPa

7.2.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Pressure inspection (see chapter 0.3.5)

7.2.4 Description of inspection method

Visual inspection of the seal on the control valve

Note!

Warranty claims can only ever be accepted if the seal is intact.
Despite a seal pressure settings can vary over time (fatigue of the spring, etc). A pressure measurement is always necessary.

Check pressure settings for stabilizer control valve

- Check the pressure setting of the main pressure relief valve of the stabilizer control valve by actuating a non-reduced function to its mechanical end point (e.g. retract stabilizers) – compare against hydraulic diagram

Note!

On cranes with restrictor control valves (Nordhydraulik RSQ etc.) a precise measurement can only be achieved by adding a T-piece in the supply pipe of the control valve, or by mounting a measurement connection to the control valve. This is however only necessary if the results differ considerably from the target.

Check the pressure settings of the main control valve

- Check by lifting the maximum load. (Warning: Crane must be loaded with it's max load, not limited by reduced load limits or inadequate stabilization.
- Or check using a pressure gauge by actuating a non-restricted function to its mechanical end point (e.g. retract extensions).
- Cranes with variable flow pumps have to be adjusted at the pump.

7.2.5 Additional valid documents

Hydraulic diagram

7.2.6 Actions for negative inspection results

Correct the settings and re-seal the main pressure relief valve

7.3 Smooth running of control elements, signage

7.3.1 To inspect

- Smooth operating of control levers
- Hold-to-run elements return to neutral automatically

7.3.2 Guidelines, tolerances

None

7.3.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

7.3.4 Description of inspection method

Visual inspection:

- Check that all hand levers are parallel when in neutral position (can be adjusted for mechanic control rods
- Check bolts and safeguards for proper mounting and completeness

Functional inspection:

- Actuate levers and let go. Look for immediate automatic reset to neutral position
- Check for proper mounting of hand levers

7.3.5 Additional valid documents

None

7.3.6 Actions for negative inspection results

- Immediately stop crane operation and repair the System.
- Adjust non-parallel levers to make them parallel again.

7.4 Check operating signs

7.4.1 To inspect

- Check signage for functions at the control stations for readability, correctness.
- Check if all signs are there.

7.4.2 Guidelines, tolerances

None

7.4.3 Inspection method

Visual inspection (see chapter 0.3.3)

7.4.4 Description of inspection method

Check signage for functions at the control stations for readability, correctness and presence.

7.4.5 Additional valid documents

- Spare part catalogue and operating instructions for symbol explanation and overview
- Country specific rules and regulations

7.4.6 Actions for negative inspection results

- Replace missing signage
- Replace indecipherable signage

8 Outriggers and stabilizers

8.1 Outrigger interlock

Note!

A mechanical interlock is only available for manual outriggers on the crane and/or manual additional supports.

8.1.1 To inspect

Functionality

8.1.2 Guidelines, tolerances

The interlock must engage automatically when reaching the mechanical endstop of the outrigger (retracted and extended)

8.1.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

8.1.4 Description of inspection method

Visual inspection

- Check for damage, deformation and completeness

Functional inspection

- Unlock outriggers, extend manually and push back in
- When reaching transport position the interlock must engage automatically
- The bracket to secure the transport position must close smoothly
- If transport position is electrically monitored, the corresponding light in the truck cabin has to switch off when all outriggers (and other included signals) are in transport position and locked.

8.1.5 Additional valid documents

Operating instructions, Country specific rules and regulations

8.1.6 Actions for negative inspection results

Immediately stop crane operation and repair the system

8.2 Outrigger tolerances, smooth operation and signage

8.2.1 To inspect

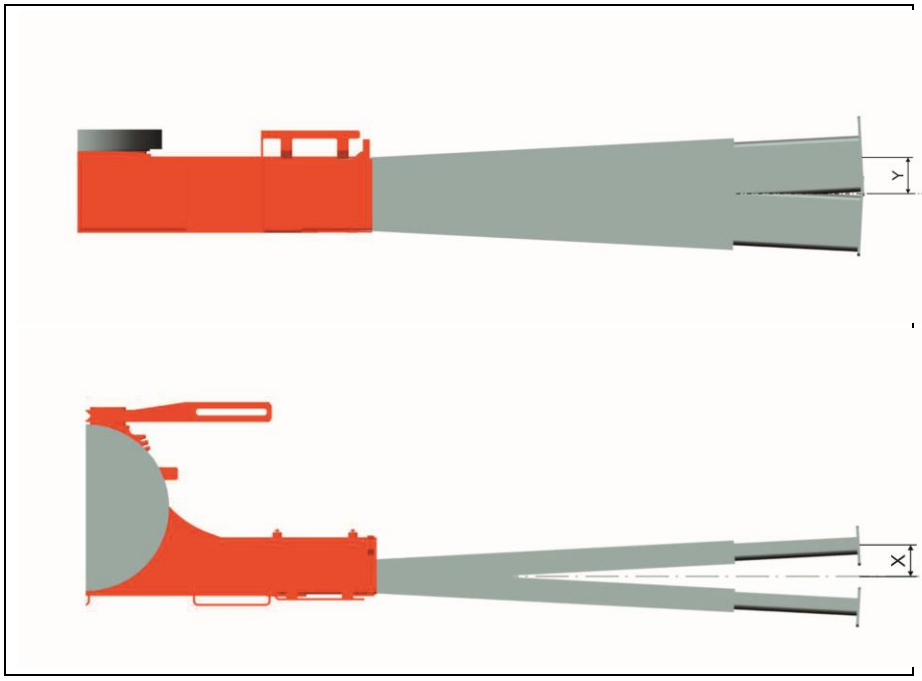
- Proper maintenance of outriggers
- Smooth operation of manual outriggers
- Lateral and vertical tolerances of outriggers
- Proper marking of the “fully extended” position

8.2.2 Guidelines, tolerances

Note!

Tolerances listed here always relate to the middle position, and show half the allowed tolerance (from endpoint to endpoint)

- Tolerances lateral and vertical



Crane type	< 40 mt				> 40 mt			
Outrigger distance [m]	1	2	3	≥ 4	1	2	3	≥ 4
max. lateral tolerance "**X**" [mm]	20	30	40	50	30	60	90	120
max. vertical tolerance "**Y**" [mm]	20 (35)	40 (70)	120	160	50	100	150	180

The values in brackets are for the inner outrigger in single-outrigger-box systems (R2(X) and R3(X)).

- Outrigger tolerances (responsible for stabilizer tilt)

Condition	a_{max} [mm]	Angle [°]
retracted	15	1,00

8.2.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

8.2.4 Description of inspection method

Visual inspection:

- Fully extend outriggers (pull out) and check for damage, deformation, poor maintenance (missing lubrication)
- Check signage: All outriggers have to have signs (EB4636) for the fully-extended position. All mounting holes have to be covered with warning sticker EB5190

Functional inspection:

- Fully extend manual outriggers, and push them back in. Check if they are smooth to operate. Then pull them out again. Max. force when starting to pull 350N, when continuing to pull: 300N)
- Fully extend hydraulic outriggers
- Check the vertical tolerance Y by extending the supports
- Check the lateral tolerance X by manually pulling and pushing the outriggers (max force 250N)
- Check "a_{max}" by manually pushing and pulling the support plate when the support is retracted. Max force: 100N.

8.2.5 Additional valid documents

Operating instructions

8.2.6 Actions for negative inspection results

If the outrigger is difficult to move:

- Clean the outrigger
- Lubricate the proper surfaces (if intended on the specific model)

If signage is missing, dirty or damaged

- Renew the signs for the „fully extended“ position and any warning signs

If vertical tolerances are too high:

- Adjust roll bearings (clean, adjust)
- Replace guide blocks if necessary

If lateral tolerances are too high

- Adjust the lateral guide blocks (if present). If necessary replace them

If angular tolerances are too high (stabilizer tilt)

- Adjust the lateral guide blocks (if present). If necessary replace them
- Replace all guide blocks if necessary

8.3 Stabilizer ram mounting, condition and function

8.3.1 To inspect

Condition, leakages, deformation and mounting

8.3.2 Guidelines, tolerances

Torque for screws

Strength class	10.9
Dimension	Moment [Nm]
M10	60
M12	100
M14	165
M16	245
M18	345
M20	480

8.3.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

8.3.4 Description of inspection method

Visual inspection:

- Check if all mounting screws of the supports are present and tightened properly
- Check if used screws are class 10.9
- Check for leakages
- Check for damage to the piston rod
- Check for damage and deformation – especially the pipes on the outside

Functional inspection:

- Check if support cylinders extend and retract properly. Cylinders have to retract fully and with proper speed.
- Extend the support cylinders and check if there are internal leakages.

8.3.5 Additional valid documents

Operating instructions

8.3.6 Actions for negative inspection results

- Immediately stop crane operation and repair
- Tighten the mounting screws of the support cylinders

8.4 Stabilizer plate, stabilizer extensions

8.4.1 To inspect

- Check mounting of the stabilizer plate
- Check mounting of stabilizer extensions

8.4.2 Guidelines, tolerances

None

8.4.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

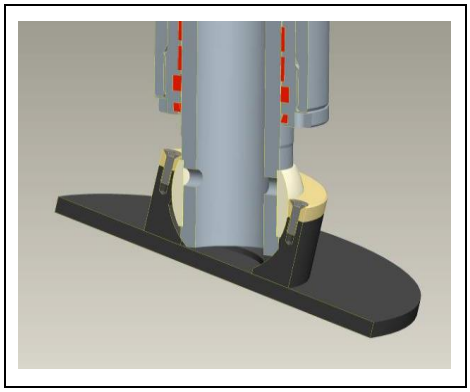
8.4.4 Description of inspection method

Visual inspection:

- Visual check if stabilizer plate and extensions (if available) are mounted properly and all screws are tight
- Check for damages

Functional inspection:

- Check if the support plate is tilt-able 10° all around
- If necessary (tight joint) support in skewed position (e.g. partly on a wooden block) to check this



8.4.5 Additional valid documents

None

8.4.6 Actions for negative inspection results

Immediately stop crane operation and repair

8.5 Tiltable support bearing, and lock

8.5.1 To inspect

Function and condition of tiltable supports and lock

8.5.2 Guidelines, tolerances

Manually tiltable supports must be lockable at 0°, 60° and 120 °.

8.5.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

8.5.4 Description of inspection method

Bearing spigot

- Check for radial tolerances
- Check lubrication and smooth operation
- Check mounting of spigot

Lock

- Get manual tiltable stabilizers into working position and transport position. The lock must engage automatically
- Condition and securing of the plastic handle. Handle must not disengage itself, designed locking positions must lock completely
- If the pin bore is too worn (stabilizer moves more than +/- 1°) it has to be repaired.

Lubrication

- Lubricate using all grease nipples until the old lubricant is pressed out.

Arrestor hook, mechanical safety

- Check the arrestor hook in retracted position. The cylinder must be secured properly in retracted position by the arrestor hook.
- If the cylinder is held by the hook, the outrigger must not be able to extend!
- If the cylinder is retracted fully, it must not lie on the arrestor hook. It may only lie on the arrestor hook when it is extended a little bit (a few mm).

Hydraulic

- Check condition and laying of hoses. Also check during slewing (that hoses are not crushed)
- Check all functions for leakages

8.5.5 Additional valid documents

Operating instructions

8.5.6 Actions for negative inspection results

Immediately stop crane operation and repair

8.6 Tiltable stabilizer – auxiliary cylinder, chain and operation, gears

8.6.1 To inspect

Leakages, damage, proper function and movements, chain tension and wear, mechanical functions

8.6.2 Guidelines, tolerances

Extension speed should be approx. 4 seconds for 1 way

8.6.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

8.6.4 Description of inspection method

System „Kette“ (chain)

Functional check of the tilt function and sequence

- Tilt every tilt-able stabilizer up and down. Check for proper function and speed

Check chain for tension and wear

- If the chain is adjusted properly, the locking bolt locks automatically at each end stop

Check unwinding of the chain

- The chain must unwind parallel to the cylinder. (if necessary loosen and straighten the chain)

Leakages and mounting of tilting cylinder

- Check valves and pressure addition valves must not leak and all components must be mounted properly

System „Getriebe“ (gear)

Functional check of the tilt function and sequence

- Tilt every tilt-able stabilizer up and down. Check for proper function and speed

Leakages and mounting of tilting cylinder

- Check valves and pressure addition valves must not leak and all components must be mounted properly

8.6.5 Additional valid documents

Operating instructions

8.6.6 Actions for negative inspection results

Immediately stop crane operation and repair

8.7 Stabilizer and outrigger signal

8.7.1 To inspect

- Proper function of outrigger position signals
- Proper function of support signals

8.7.2 Guidelines, tolerances

All cranes with ISC or HPSC must recognize the support situation correctly

8.7.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

8.7.4 Description of inspection method

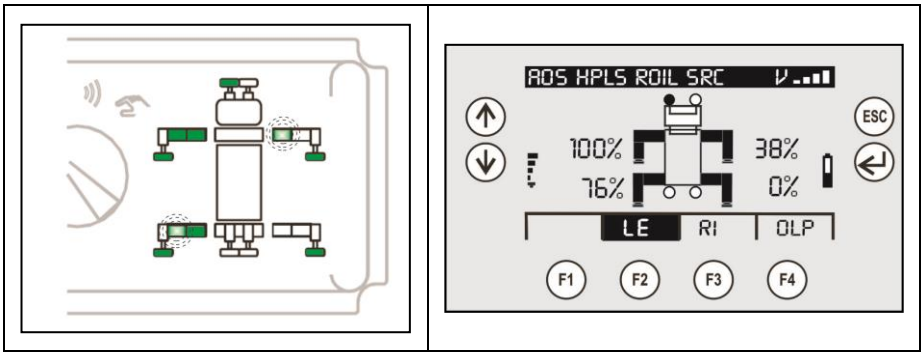
Check function and position recognition of outriggers

- Switch crane to stabilizer mode and move outriggers to different positions
- The electronics on the crane (Paltronic 50 or 150) and the connected remote control (if available) must show the position of the outriggers as intended

Check support situation recognition

- The electronics on the crane (Paltronic 50 or 150) and the connected remote control (if available) must recognize which supports are supported – this includes all additional supports mounted by the installer.

  Example P50 and P150:



8.7.5 Additional valid documents

Operating instructions

8.7.6 Actions for negative inspection results

DANGER

Danger!

If stabilizer or outrigger signals are not recognized correctly or are bypassed, none of the stability control systems can work correctly. There is severe danger of accidents, and immediate danger to the life of the operator and others.

Immediately stop crane operation and repair

8.8 Outrigger positional lights

8.8.1 To inspect

Functionality and cable routing

8.8.2 Guidelines, tolerances

Positional lights must be alight during crane operation

8.8.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

8.8.4 Description of inspection method

Check cable laying and mounting

- Cables to positional lights must be properly mounted and laid. There must be no hanging cable hoops, no cable crushing or damages.
- Positional lights must be mounted properly

Functional check

- After turning on crane power, the positional lights must be on all the time.
- Flashing functions are not planned, but might be connected by the Installer. This is OK as long as the cabling is done properly.

8.8.5 Additional valid documents

None

8.8.6 Actions for negative inspection results

Repair

8.9 Transport position monitoring

8.9.1 To inspect

- Proper function of transport position monitor of the outriggers
- Proper function of transport position monitor of the crane
- Proper function of the monitoring of retracted stabilizers (if available)
- Proper function of the interlock monitoring for manual outriggers (if available)

8.9.2 Guidelines, tolerances

As long as the crane is not in the intended transport position, optical and acoustic warning devices must indicate this.

8.9.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

8.9.4 Description of inspection method

Check function "outriggers retracted"

- Check function and connection to the vehicle. Check the cabling and adjustment of the switches. This signal usually is wired in series to the "Stabilizer transport position" and "Crane transport position".

Check function "stabilizers retracted"

- If available, this function is wired in series with the stabilizer extensions. Check the cabling and the adjustment of the switches.

Check function "crane folded"

- Fold the crane to its intended transport position (depending on the crane model this can be folded completely or main boom below horizontal). Check the cabling and adjustment of the switch.

Check lock-monitoring of mechanical outriggers:

- The lock must only be lockable when the outrigger is completely retracted. The included inductive switch must trigger when the lock is engaged. Check the cabling and the function of the switch.

Functional check:

- First check which monitoring systems are in place, and how they communicate with the driver (optical, acoustic, both, influences the trucks driving, influences the break pressure, etc.)
- move all monitored components (outriggers, stabilizers, crane hook) to transport position, and check them all separately.

8.9.5 Additional valid documents

Operating instructions und country specific guidelines and regulations

8.9.6 Actions for negative inspection results

Immediately stop crane operation and repair

9 Crane base (slewing cylinders)

9.1 Steelwork crane base, slewing cylinder leakage

9.1.1 To inspect

Condition of steelwork, varnish, damages

9.1.2 Guidelines, tolerances

none

9.1.3 Inspection method

Visual inspection (see chapter 0.3.3)

9.1.4 Description of inspection method

Steelwork

- Check the crane base for cracks, deformation and damages
- Check for damage to varnish, corrosion
- Check for improperly done additions (welded parts, consoles, fixtures, drilled holes)

Slewing cylinder

- Check for deformation, damage to varnish and corrosion
- Check for proper mounting of slewing cylinder
- Check for leakages, especially at the threads and flanges.

9.1.5 Additional valid documents

Welding guideline (see PALFINGER technical documentation)

9.1.6 Actions for negative inspection results

Repair as soon as possible

9.2 Lubrication of toothed rack and bearings

9.2.1 To inspect

- Maintenance (condition) of the column bearing
- Function of all grease nipples

9.2.2 Guidelines, tolerances

Maintenance intervals (lubrication slewing) according to operating instructions

9.2.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

9.2.4 Description of inspection method

Check for proper maintenance

- Check if all grease nipples and hoses are OK
- Check if crane is maintained regularly (also ask the operator)

Lubricate the slewing drive

- Lift the arm system to enable the crane to slew freely
- Slew the crane to its mechanical end stop in one direction
- Lubricate using all grease nipples for the slewing section. Most models have those grease nipples in one spot

- Slew the crane a bit (5-10°) and repeat lubrication. Repeat until the crane reaches the other end stop

Speed check

- Slew the crane from end stop to end stop in both directions, and measure the time it needs. Both directions should take approx. the same time. This time is not defined by PALFINGER, since it is highly dependent on the model, settings, hydraulics and remote control systems.

9.2.5 Additional valid documents

- Operating instructions
- Operator DVD (shows lubrication procedure)

9.2.6 Actions for negative inspection results

- Repair the system
- Correct settings if needed

9.3 Slewing tolerances

9.3.1 To inspect

The horizontal tolerances of the crane column. This is influenced by various factors, which makes a simple measurement next to impossible.

Factors that influence the tolerance:

- Gear tooth tolerances
- Oil compression in the slewing system
- Air in the slewing cylinders
- (internal) leakages of the slewing control valve

9.3.2 Guidelines, tolerances

The valid tolerance for the first measurement after hydraulic movement is 10mm. Because of the reasons above this is very hard to evaluate though. New bearing rings influence the perceived tolerance greatly.

9.3.3 Inspection method

- Properly support the vehicle. Slew the crane sideways and extend 2-4 extensions. Move the crane approx. 1m above the ground, so it is easily reachable.
- Briefly slew left and right to ensure both slewing cylinders are filled with oil completely
- Press the cranes emergency cut-off, but let the pump continue running.
- Move the crane by hand (250 N) to the left and to the right, measure the tolerance at the column
- The first try counts. Repeating the process can reduce the oil in the cylinders and thus falsify the measurement.

Measure the tolerance with the help of a 2nd person.

It is easiest to draw lines with a non-permanent marker.

The maximum tolerance at the column (as shown in the picture) is 10mm.

9.3.4 Additional valid documents

None

9.3.5 Actions for negative inspection results

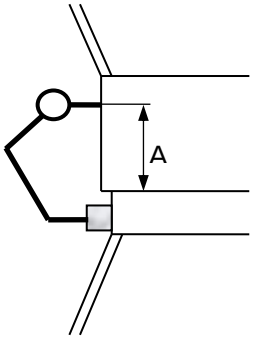
- To repair this, it is needed to know the reason for the higher tolerance. (gear tooth tolerances have a high influence, bad bearing rings make the tolerance worse, or hydraulic leakages in the control valve.
- Repair the system.

9.4 Column tolerance

9.4.1 To inspect

Inspect the radial tolerance between the crane base and the column

9.4.2 Guidelines, tolerances



Measure the tolerance at the crane column

A (mm)	60	70	80
Tolerance (mm)	1,30	1,35	1,40

9.4.3 Inspection method

Use a dial gauge with magnet socket

9.4.4 Description of inspection method

Note!

The crane must not have more axial tolerance than allowed, because this would influence the measurement

Move crane into measurement position

- Fully support the vehicle
- Slew the crane to the side, and move it close to the ground with the arm stretched (approx. 100mm)
- Prepare a wooden block to protect the crane tip

Measurement position

Mount the dial gauge on the crane (PALFINGER special tools catalogue)

	**Attention:** The feeler must not touch any welds

Measure the radial tolerance

- Set the scale to 0
- Mount a pressure gauge to measure main boom lowering pressure to 10MPa
- Actuate main-boom lowering, lowering the crane onto the wooden block for protection. Continue lowering and read the gauge. The pressure should be around 10MPa

9.4.5 Additional valid documents

None

9.4.6 Actions for negative inspection results

- If the tolerances are exceeded, replace the foils when possible
- If the tolerances are exceeded greatly (>+50%) immediately stop crane operation and repair.

9.5 Balance

9.5.1 To inspect

Check the circlip, condition and radial tolerance of the balance.

9.5.2 Guidelines, tolerances

The max. allowed tolerance is 2mm

9.5.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

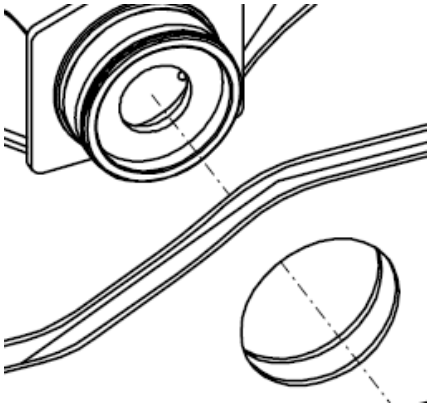
9.5.4 Description of inspection method

Visual inspection

- Check condition and proper seat of circlip
- Check that no “crane stoppers” are mounted on the balance (see mounting instructions for loader cranes)
- Check for deformation or corrosion
- Check the securing screw put in by PALFINGER for delivery was removed after mounting (!!)

Measurement of balance tolerance

- Slew the crane above the cabin
- Attach a dial gauge
- Slew the crane to the rear, and measure the tolerance

	Allowed tolerance is 2mm

9.5.5 Additional valid documents

Mounting instructions for loader cranes

9.5.6 Actions for negative inspection results

Repair the system

10 Crane base (Endless slewing)

10.1 Steelwork of crane base, gear ring, slewing drive

10.1.1 To inspect

Condition of steel components, varnish or damages

10.1.2 Guidelines, tolerances

none

10.1.3 Inspection method

Visual inspection (see chapter 0.3.3)

10.1.4 Description of inspection method

Steel work

- Check the crane base for cracks, deformation, damages
- Check for damage to varnish, corrosion
- Pay special attention to improperly done attachments (welded parts, consoles, mounts, holes)

Slewing drive, gear ring

- Check for damage, damage to varnish, corrosion
- Check for damage of consoles, hydraulic/electric lines
- Check for hydraulic leakages of the drive and the load holding valve

10.1.5 Additional valid documents

Welding guideline (see PALFINGER technical documentation)

10.1.6 Actions for negative inspection results

- Repair
- Replace damaged covers, stickers, etc.

10.2 Lubrication of turntable and bevel

10.2.1 To inspect

Lubrication of slewing components

10.2.2 Guidelines, tolerances

Maintenance intervals (lubrication, turntable, slewing drive) according to operating instructions

10.2.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

10.2.4 Description of inspection method

Check proper maintenance

- Check if all grease points are present and functional
- Check if crane is maintained regularly (also ask the operator)

Lubricate the slewing drive

- Lift the arm system to facilitate free slewing of the crane
- Grease, using all grease nipples at the slewing drive

	The grease nipples are located around the slewing drive, and are labeled. Grease using all nipples, and check their function.

Speed check

- Slew the crane in both directions and measure the time needed. There should be no significant time difference between both directions. This time is not specified by PALFINGER, since it is highly dependent on the model, setup, hydraulics and remote control.

10.2.5 Additional valid documents

Operating instructions chapter maintenance and service

10.2.6 Actions for negative inspection results

- Repair the system
- Adjust the speeds using Paldiag if needed

10.3 Tightening torque of turntable bolts

10.3.1 To inspect

- Condition and tightening torque of turntable bolts
- Proper mounting of slewing motors

10.3.2 Guidelines, tolerances

Tightening torque of turntable bolts

Bolt diameter	Needed torque
M20	480 Nm
M24	900 Nm

Tightening torque

Strength category	5.6	6.8	8.8	10.9
Bolt size	Torque (NM)			
M3	0,7	0,9	1,2	1,5
M4	1,7	2,1	2,8	3,5
M5	3,4	4,3	5,5	7
M6	5,9	7,3	9,5	12
M8			23	30
M10			46	60
M12			79	100
M14			125	165
M16			195	245
M18			280	345

10.3.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

10.3.4 Description of inspection method

- Check all bolts for completeness
- Re-tighten all turntable bolts using a torque wrench
- If bolts need to be re-tightened more than 30°, they are considered “loosened”. These bolts must not be re-used, and have to be replaced.
- Check and re-tighten all bolts of the slewing gear

Note!

Only tighten bolts using a torque wrench. Always use the proper setting (see table).

DANGER

Danger!

This inspection point is very important and is to be observed meticulously. There is acute risk of injury or death, if turntable bolts are loosened or not maintained properly.

10.3.5 Additional valid documents

Operating instructions Chapter Service

10.3.6 Actions for negative inspection results

Immediately stop crane operation and repair

10.4 Slewing tolerance, column tolerance

10.4.1 To inspect

Slewing tolerance

- Tolerance comes from wear of the pinion gear, the turntable or defective pre-tension valves (if mounted)

Column tolerance

- Wear of bearing balls, resulting from high loads and deficient maintenance

10.4.2 Guidelines, tolerances

Slewing tolerance

- 3 mm at the turntable for models with 2 slewing motors
- 5 mm at the turntable for models with 1 slewing motor

Column tolerance

- 2 mm at the turntable

10.4.3 Inspection method

Slewing tolerance

- Functional inspection (see chapter 0.3.4) by measuring using a try square / marker

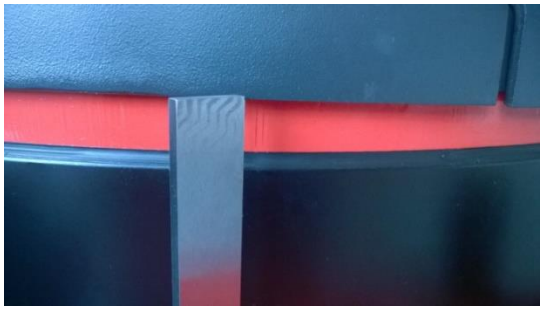
Column tolerance

- Functional inspection (see chapter 0.3.4) by measuring using a dial gauge

10.4.4 Description of Inspection method

Slewing tolerance

- Support the vehicle, slew crane to the side, extend the extensions (approx.. 2-4 extensions) and get it to 1m above the ground (easily reachable)
- Press the crane to the side by hand (250 N) and measure the tolerance at the column
- This is easiest by asking a 2nd person to mark the positions on the crane boom



Measure the column tolerance with the help of a 2nd person.

This is easily done by marking with a whiteboard-pen

Column tolerance

- Support the vehicle
- Move the crane into measurement position – extension system close to the vehicle and as vertical as possible, slightly above the floor
- Set the dial gauge to 0. Move the crane against the floor by lowering the main boom with approx. 10MPa (bolster with a piece of wood)
- Read the value from the gauge
- Repeat 4x – every 90° - around the crane

	Dial gauge in measurement position

10.4.5 Additional valid documents

None

10.4.6 Actions for negative inspection results

- Repair the system
- If slewing tolerance is too high
  - Double slewing drives: check the hydraulic pre-tension valves
  - Single slewing drive: Press the pinion gear against the turntable. Do this by loosening the outer turntable screws, pressing the column and re-tightening the screws
- If column tolerance is too high
  - Replace the turntable

10.5 Rotary distributer, slip ring condition, mounting

10.5.1 To inspect

Proper mounting and general condition, hose and cable placement

10.5.2 Guidelines, tolerances

None

10.5.3 Inspection method

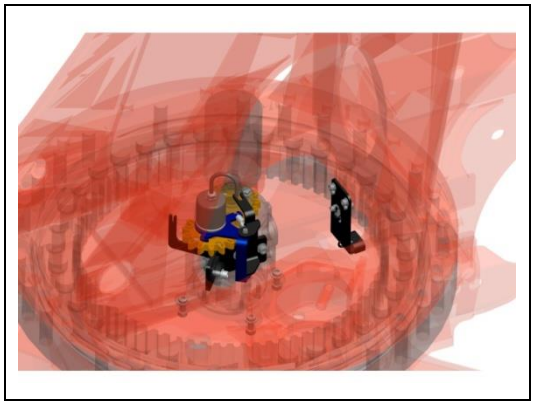
- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

10.5.4 Description of Inspection method

If necessary remove the cover to access the rotary distributer

Slew the crane to both sides to check the movement of the slip ring and the rotary distributer. Both have to be mounted rigidly.

- Check the proper seat of the rotary distributer and the slip ring body, check proper mounting of the mounting brackets, consoles and screws
- Check hydraulic connections for leakages placement and damages
- Check cabling and function of rotary encoder and control switch (slew the crane, there must not be any electronic errors shown)



10.5.5 Additional valid documents

None

10.5.6 Actions for negative inspection results

Cease crane operation and repair immediately

10.6 Slewing gear, gear oil

10.6.1 To inspect

Leakages of the slewing gear, level of gear oil, service interval

10.6.2 Guidelines, tolerances

- Oil change interval
  - First change at 1000 operating hours
  - Next changes at 3000, 6000, 9000 etc. operating hours
- Use ISO VG 150 gear oil

10.6.3 Inspection method

Visual inspection (see chapter 0.3.3)

10.6.4 Description of Inspection method

Check slewing gear

- Check for leakages
- Check fill level using gauge glass or fill level indicator (depending on variant)
- Change the oil if necessary

Note!

Prior to changing the gear oil, warm it up by continuously slewing. This speeds up the flow rate during changing the oil change

Mount a small hose to drain the oil.

Leave the plug open while filling in fresh oil, to wash out contaminants.

After contaminants are out, put the plug in, and continue filling.

10.6.5 Additional valid documents

Operating instructions chapter Maintenance and Service

10.6.6 Actions for negative inspection results

- Repair leakages
- Refill missing oil
- Change the gear oil according to service intervals

10.7 Balance bearing

10.7.1 To inspect

Check securing, condition and radial tolerance of the bearing, and the mounting to the subframe.

10.7.2 Guidelines, tolerances

Tolerance max 2mm at the shaft

10.7.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

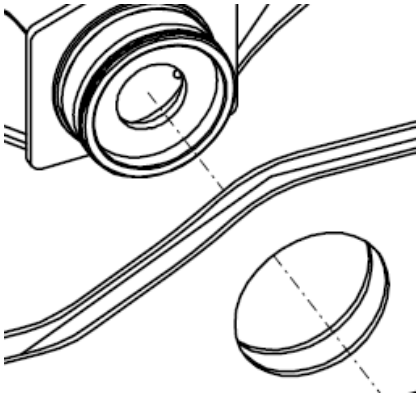
10.7.4 Description of Inspection method

Visual inspection

- Check the condition and proper mounting of the circlip
- Check that no “crane stoppers” are mounted on the balance. (see mounting instructions loader crane)
- Check for deformation and corrosion
- Check that all factory-mounted securing screws were removed during mounting (!!)

Measure the tolerance at the balance

- Slew the crane above the cabin
- Attach a dial gauge
- Slew the crane to the rear of the vehicle
- Measure the tolerance

	Max allowed tolerance: 2mm

10.7.5 Additional valid documents

Mounting instructions loader crane

10.7.6 Actions for negative inspection results

Repair the system

11 Column, main boom, knuckle boom

11.1 Steel construction

11.1.1 To inspect

General condition, damage and corrosion of main components

11.1.2 Guidelines, tolerances

None

11.1.3 Inspection method

Visual inspection (see chapter 0.3.3)

11.1.4 Description of Inspection method

General condition

- Check the main components for corrosion and damage
- Check mounted parts and consoles for condition and mounting
- Check for deformation, especially damage because of collision forces during crane operation
- See if any additionally mounted parts (especially welded ones) were probably mounted by 3rd parties (e.g. additional lights). Especially check if welded parts were mounted according to the PALFINGER welding instructions

Crack test

- A visual crack test has to be performed by a competent person every 50 operating hours
- As part of a general overhaul after 6-10 years or 5000-8000 operating hours, a comprehensive crack test of all components and welds is recommended.
- A comprehensive crack test can only be conducted by specialized workshops and requires specifically trained personnel and special tools.

11.1.5 Additional valid documents

PALFINGER welding guideline

11.1.6 Actions for negative inspection results

- Repair corroded areas
- Deformations can present static problems. In case of doubt, contact PALFINGER.
- Cracks can present a serious danger. In case of doubt, contact PALFINGER.

11.2 Greasing of bushings

11.2.1 To inspect

Check if all grease nipples and grease pipes work properly

11.2.2 Guidelines, tolerances

Greasing plan in the operating instructions chapter Maintenance and Service

11.2.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

11.2.4 Description of Inspection method

Check if all greasing points are maintained regularly and work as intended

- Grease all greasing points, check if grease can be inserted (Bolts between the arms, at the power-link system and the cylinders)
- Clean all greasing points
- On cranes with signage for greasing points: make sure that the signage is readable

11.2.5 Additional valid documents

Operating instructions, chapter maintenance and service

11.2.6 Actions for negative inspection results

- Replace grease nipples and pipes that do not work
- If needed: Instruct the operator how to maintain the unit properly

11.3 Wear and tolerances of pins, bushings

11.3.1 To inspect

All pins and bushings of moveable main components (crane column to knuckle boom). All cylinder pins and pins on the power-link system.

11.3.2 Guidelines, tolerances

No absolute values available

11.3.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

11.3.4 Description of Inspection method

Visually inspect the pin locks

- Inspect for proper function
- Inspect the circlip for completeness and damage
- Check welded brackets for damage or cracks
- Check if any pins shifted

Subjective tests of bushing tolerances at the pins

- Recognize excessive tolerances at the bushings by alternating between positive and negative load (press against the floor)
- If the tolerances are conspicuously high (subjective evaluation) inspect the bushings more precisely. Check for wear by removing the pins

11.3.5 Additional valid documents

None

11.3.6 Actions for negative inspection results

Depending on the damage

- Replace damaged or missing circlips
- Repair damaged pinlocks
- Replace worn down or broken bushings
- Replace worn down pins

11.4 Transport position bracket

11.4.1 To inspect

- Check the function and condition of the arm rests
- Arrow for slewing position of transport position
- Check function and signal for transport position (if available)
- Check that no parts protrude beyond the valid transport height and width

11.4.2 Guidelines, tolerances

None, country specific rules and regulations

11.4.3 Inspection method

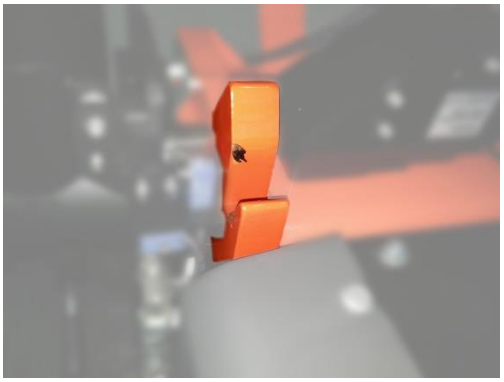
- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

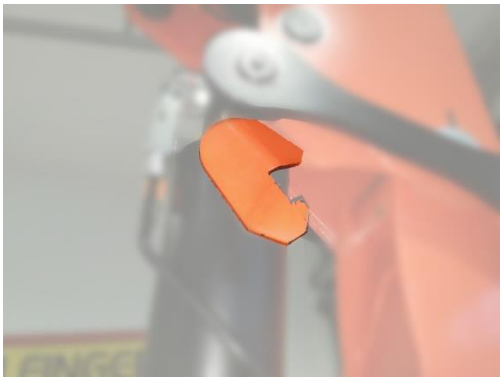
11.4.4 Description of Inspection method

Move crane into transport position (usually: fold it)

- Check the condition of the mechanical arm rests. Check for proper function, damages and smooth operation (grease if necessary)

  The arm rest can be one of the following variants:

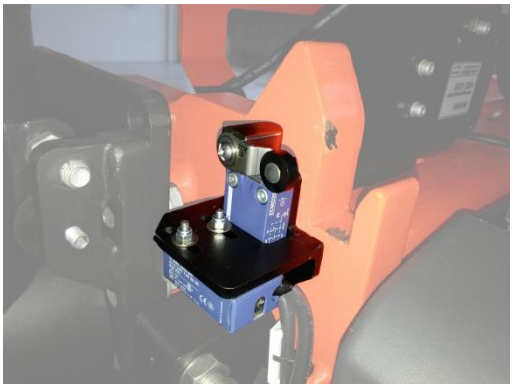
Arm rest on the crane base (if crane is foldable)	
Arm rest on crane column (big cranes and models w/o power-link). Check pins and bushings, should be greased	

Extension rest on main boom (small power-link models)	
Hook for extensions (models without power-link), smooth operation	

- Check if transport position is properly marked (if intended on the model at hand)

The markings (sticker, plastic arrow, groove) have to align perfectly when the crane is in transport position	

- Check condition of the switch and cabling for the transport position signal (see chapter 8.9)

The switch has to actuate as intended in transport position. The display in the cabin has to work as intended.	

Note!
Dependent on the rules and regulations and on the installer, a variety of options are possible.
It has to be inspected that the system, whichever is installed, works as intended and that warnings are given as appropriate.

11.4.5 Additional valid documents

None, Country specific rules and regulations

11.4.6 Actions for negative inspection results

Depending on the damage

- Lubricate mechanical touching points
- restore smooth operation of moving parts (hook)
- properly set the slewing transport-position markings
- repair/set the electrical switch for transport position

11.5 Condition of load holding valves on main and outer boom

11.5.1 To inspect

- General condition of cylinder and related hydraulics
- Sealing of valves

11.5.2 Guidelines, tolerances

Load holding valves are safety relevant, have to be set correctly and must be sealed.

11.5.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)
- Pressure inspection (see chapter 0.3.6)

11.5.4 Description of Inspection method

Visual inspection for leakages and damage

- Check ram and connections for leakages (dirty areas)
- Check pipes and hoses for damage
- Check lifting cylinder for damage and check condition of the piston rod (cracks, deformations, scratches)
- Check for areas of collision or chafing over the whole length of the cylinder and rod

Check sealing of load holding valves on the lifting cylinder and knuckle boom cylinder

- The sealing must not be damaged
- The settings must be correct

11.5.5 Additional valid documents

Training documents for loader cranes (valve settings)

11.5.6 Actions for negative inspection results

- Repair damaged parts, or replace them
- Replace missing seals on load holding valves, and check the correct settings

DANGER

Caution!

System is under pressure because of the load holding valve.
When opening pipes, hoses or valves be careful about locked-in pressure, hydraulic fluids and falling loads.

11.6 Lowering rate of boom system

11.6.1 To inspect

Lowering rate of boom system

11.6.2 Guidelines, tolerances

The lowering rate of the boom system is measured at the tip under nominal load.

Valid values according to EN 12999:

- Loader cranes <12m outreach: 0.5% of the outreach per minute
- Loader cranes >12m outreach: 0.2% of the outreach per minute

Example: crane with 22.5m outreach: Valid lowering rate is: 22500mm*0.002=45mm/min

11.6.3 Inspection method

Functional inspection (see chapter 0.3.4)

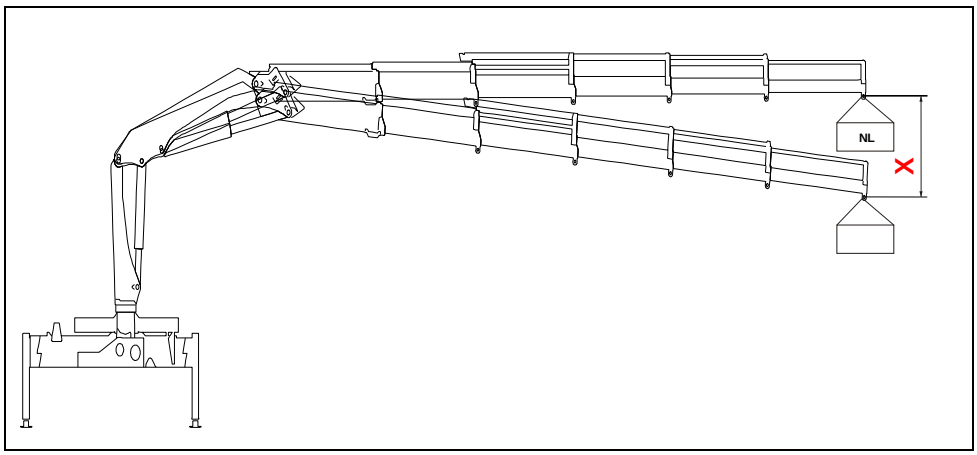
11.6.4 Description of Inspection method

Inspecting the lowering rate

- Warm up the hydraulic system to operating temperature
- Support the unit
- Attach a load matching the crane (Nominal load at max outreach)
- Move the crane arm in it's strongest position (see load diagram, usually 20°/20°)
- Extend to full outreach, the overload protection must not engage (that would mean the load is too high for this test)
- Evaluate the lowering rate using a suitable measuring device over the course of at least one minute

Symbolic depiction

- N_L = Nominal load at full outreach
- X = lowering distance to be measured



Note!
If the lowering rate is too high, repeat the procedure and use markings on the cylinders to find out which one is faulty.

11.6.5 Additional valid documents

EN 12999

11.6.6 Actions for negative inspection results

Find the reason for the fault and repair

- Find out the faulty cylinder by marking the cylinders and repeating the test
- When the cylinder is found, test if it is the cylinder or the LHV, by opening the appropriate lines
- Repair

12 Extension boom system

12.1 Steel construction, lifting lug

12.1.1 To inspect

General condition, damages and corrosion of extensions

12.1.2 Guidelines, tolerances

None

12.1.3 Inspection method

Visual inspection (see chapter 0.3.3)

12.1.4 Description of Inspection method

General condition

- Check the extensions for corrosion and damage
- Especially check the longitudinal welds of the extensions

Note!
Cracks at the extensions, especially on or along the weld, are safety relevant and lead to immediate cease of operations for this crane

- Check the piston mounts for corrosion and damage
- Check for collision-free extending and retracting of the extension system. Check for wear and abrasion on the extensions
- Check for scratches and wear from the guide packets and their mounts
- Check the load attachment points on all extensions that have them, also check the greasing nipple on the load hook attachment point.

Crack test

- A visual inspection for cracks has to be conducted by the operator every 50 operating hours
- PALFINGER recommends a comprehensive crack test including unmounting of all parts and check of welds at the general overhaul (comprehensive service after 6-10 years or 5000-8000 operating hours).
- A comprehensive test can only be conducted by specialized workshops. It requires specialized knowledge and tools.

12.1.5 Additional valid documents

PALFINGER welding guideline

12.1.6 Actions for negative inspection results

- Revamp corroded areas and damages.
- Deformations can lead to stability problems. In case of doubt, contact PALFINGER.
- If questions concerning cracks or deformations arise, contact PALFINGER.

12.2 Vertical boom tolerances, condition of guide pads

12.2.1 To inspect

Vertical tolerances of the extensions

12.2.2 Guidelines, tolerances

Recommended max for each extension at the front negatively loaded: 2.5mm

12.2.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

12.2.4 Description of Inspection method

Subjective evaluation of the tolerances

- Fully extend the extension system and evaluate the drop of each extension subjectively
- Evaluate the general impression, take into account the operating hours of the crane and the usage. (crane with grapples have higher wear because of more time in negative load)

Measure the arm tolerance

- Let the extension system touch the ground, and carefully press it into the floor generating negative load, so that all extensions touch the top, and the tolerances to the bottom are visible
- Measure the tolerance for each arm

12.2.5 Additional valid documents

None

12.2.6 Actions for negative inspection results

Change the lower-front guide pads. If needed, also exchange the upper rear guide pads.

Note!
Changing the front guide pads usually works without unmounting the extensions and the extension cylinders. Therefore in case the tolerances are too high, always the front guide pads should be changed first.

Wear of the rear pads can usually be compensated for by using higher guide pads in the front.
Latest every second guide-pack change calls for changing the rear pads as well.

All guide pad changes have to be noted in the service handbook.

Usually all guide pads are changed during a general overhaul of the unit, no matter their tolerances.

12.3 Horizontal boom tolerances, condition of guide pads

12.3.1 To inspect

Horizontal tolerances of the extensions

12.3.2 Guidelines, tolerances

Recommended max tolerance for each arm (extended) is +/-30mm at the end of the arm

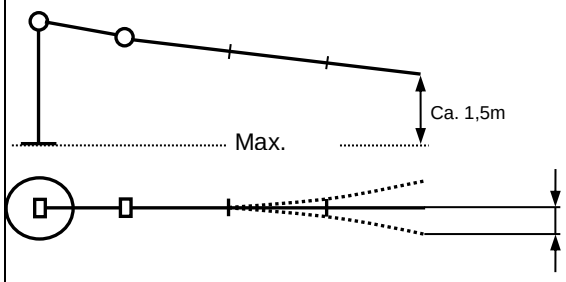
12.3.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

12.3.4 Description of Inspection method

Fully extend the crane, and move the tip of the extensions approx. 1.5m above the floor.

- Check the lateral guide blocks for completeness
- Move the crane to both sides by hand (200N)
- The max. suggested tolerance for each direction is 30mm for each arm

	Lateral guide blocks (in graphic: green) and guide pads “lower front” (in graphic: blue) (The colors of the guide blocks does not correspond to the real colors)
	Visualization of the crane position for this measurement Force is to applied at the tip of the completely extended extension system Slewing tolerances must not be added to this measurement!

12.3.5 Additional valid documents

None

12.3.6 Actions for negative inspection results

- Readjust the lateral guide blocks
- Replace guide pads if necessary

12.4 Lubrication / Maintenance free

12.4.1 To inspect

Check the lubrication of the extensions

12.4.2 Guidelines, tolerances

Lubrication plan in the operating instructions chapter Maintenance and Service

12.4.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

12.4.4 Description of Inspection method

Note!
Make sure that this is indeed a crane WITHOUT maintenance free guide blocks

Check if all extensions are lubricated regularly

- All gliding surfaces have to be lubricated properly
- Other surfaces must NOT be lubricated
- Check if suitable lubricant is used (use the operating instructions as a reference)

12.4.5 Additional valid documents

Operating instructions, chapter maintenance and service

12.4.6 Actions for negative inspection results

- Lubricate the extension system
- Point out the proper maintenance steps to the operator.

12.5 Extension boom cylinder, guidance, bearing

12.5.1 To inspect

- Condition of the extension cylinder, look for damage and corrosion
- Mounting points and slides of the cylinders
- Condition of pipes and hoses

12.5.2 Guidelines, tolerances

None

12.5.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

12.5.4 Description of Inspection method

Visual inspection of the cylinder

- Check for mechanical damage (because of collisions)
- Check the mounting of the cylinder, check that all bolts are mounted
- Check the condition of the guide blocks of guided cylinders
- Check pipes of extension cylinders for chafes

Extending and retracting the extensions

- Check if the system extends and retracts without issues
- Pay attention to smooth operation, chafing of pipes or hydraulic noise

12.5.5 Additional valid documents

Training documents loader crane, “extensions” chapter

12.5.6 Actions for negative inspection results

- Repair any damage
- Replace guide blocks

12.6 Hydraulic function, sequence control

12.6.1 To inspect

- Hydraulic function of extension cylinders, leakages
- Function and settings of sequence control (if available)

12.6.2 Guidelines, tolerances

Sequence valves must open completely, the piston rod must stay visible for 2-4mm

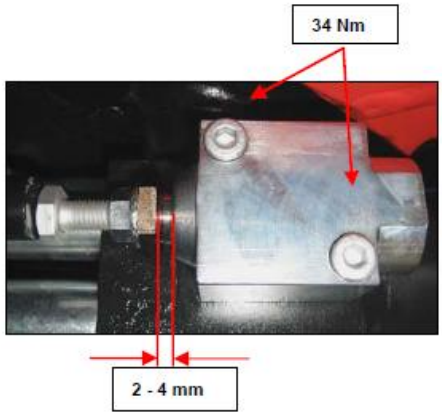
12.6.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

12.6.4 Description of Inspection method

Extend the extensions completely, during that:

- Check for leakages
- Check piston rods and pipes for damage
- If the unit has sequence control:
  - Check for proper sequence
  - Check for leakages and settings of sequence valves
  - Check locknut for proper tightening, retighten if necessary.



Sequence valve has to open fully. When fully opened, the rod of the valve is still visible (2~4mm)

see Service-Bulletin C04/2010

  - Check the sequence controlled valves for internal leakage during retracting. Mind: all locked pistons may move a (noticeable) bit as well.

12.6.5 Additional valid documents

- Service Bulletins C-09/2012, C-04/2010
- Training documents

12.6.6 Actions for negative inspection results

- Repair any damage
- Repair leakages
- Set sequence valves

12.7 Load holding valve, return oil utilization

12.7.1 To inspect

Check condition and sealing of load holding valves

12.7.2 Guidelines, tolerances

None

12.7.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

12.7.4 Description of Inspection method

Visual inspection:

- Leakages
- Damage to sealing caps

Inspection for internal leakages:

- Extend and retract the extension system at full speed and abruptly stop. The extensions must stop immediately, without any further movement. (no slow creeping inward or outward)

If the return oil utilization can be turned on and off:

- Check the function of the return oil utilization by switching it off and on while extending the extensions.

12.7.5 Additional valid documents

- Training documents
- Service Bulletin C08/2006

12.7.6 Actions for negative inspection results

- Repair any damage
- If the system moves by itself, the cause for internal leakage must be found. Reasons can be leakages in the cylinders or the load holding valve.

13 Fly-Jib

13.1 Pull in part, energy supply

13.1.1 To inspect

- Pull in part for mechanical function and damage
- Changeability of the jib
- Electrical connections
- Hydraulic connections

13.1.2 Guidelines, tolerances

None

13.1.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

13.1.4 Description of Inspection method

Mechanical connection

- Check the mounting bolt and the securing pin for condition, function and completeness
- Check the tolerances of the pull in part, the guide blocks (metal top and plastic bottom) Ask the operator if mounting/unmounting the jib poses any problems, change guide blocks if needed

Hydraulic connection

- Screw connections:
  - Check if connections can be released manually, check if dust caps are all present.
- Multifaster:
  - Check the function by opening and closing the multifaster

Electrical connection

- Check if all plugs are clean and work as intended
- Check the condition of all plugs, plug seals and dust caps
- Check the condition and function of blind plugs by using them

13.1.5 Additional valid documents

None

13.1.6 Actions for negative inspection results

- Repair the system
- Replace any broken components

13.2 Steel construction

13.2.1 To inspect

General condition, damage and corrosion of the extensions

13.2.2 Guidelines, tolerances

None

13.2.3 Inspection method

Visual inspection (see chapter 0.3.3)

13.2.4 Description of Inspection method

General condition

- Check the pull in part, the outer boom and the extensions for corrosion and damage
- Especially check the longitudinal weld of the extensions

Note!
Cracks at the extensions, especially at or along the weld, are safety relevant. Immediately stop crane operation if such problems are found.

- Check the cylinder mounting for corrosion and damage
- Check for collision-free extending and retracting of the extension system, also notice wear and chafing of the extensions
- Check for scratching or chafing from guide blocks and mounts
- Check the hook attachment point of all extensions, also check the grease nipple

Crack inspection

- A visual inspection for cracks has to be conducted by the operator every 50 operating hours
- During a general overhaul every 6-10 years or 5000-8000 operating hours, a comprehensive check of all parts and welds is recommended.
- A comprehensive check can only be done in special workshops using special tools.

13.2.5 Additional valid documents

PALFINGER welding guideline

13.2.6 Actions for negative inspection results

- Repair corrosion and damage
- Check for deformation because of external forces, as they can lead to static problems. When in doubt, contact PALFINGER.
- If questions concerning cracks or other static problems occur, contact PALFINGER.

13.3 Greasing of bushes

13.3.1 To inspect

Check the grease nipples and greasing lines for function

13.3.2 Guidelines, tolerances

Greasing plan in the operating instructions chapter “maintenance and service”

13.3.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

13.3.4 Description of Inspection method

Check if all greasing points are maintained regularly, and work

- Grease all greasing points, check if grease enters the system (pins of outer booms, power-links and cylinders)
- Clean all greasing points
- Check if greasing points are signed properly (if applicable)

13.3.5 Additional valid documents

Operating instructions

13.3.6 Actions for negative inspection results

- Replace broken grease nipples or grease lines
- If needed, instruct the operator how to maintain the unit properly.

13.4 Wear and tolerances of pins, bushings

13.4.1 To inspect

All bushing bearings on the jib arm, pins of pistons and links

13.4.2 Guidelines, tolerances

No absolute values available

13.4.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

13.4.4 Description of Inspection method

Visual inspection of pinlocks

- Check if all pinlocks work properly
- Check circlips for completeness
- Check welded brackets to find breaks and cracks
- Check if bolts moved unexpectedly

Check the tolerances of the pins

- Recognize tolerances by alternating between positive and negative load of the extension system (press extensions against the floor)
- If tolerances seem high, check the pin and bushing by removing both from the crane. This is the only way to see if they are worn down.

13.4.5 Additional valid documents

None

13.4.6 Actions for negative inspection results

Depending on the damage:

- Replace missing circlips
- Repair broken pinlocks
- Replace worn down bushings
- Replace worn down pins

13.5 Bracket for transport position

13.5.1 To inspect

- Check the fly-jib arm rest on the arm system
- Check arm rests on the truck (if available)

13.5.2 Guidelines, tolerances

None

13.5.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

13.5.4 Description of Inspection method

Move the fly-jib in transport position

- Check arm rest for proper function (grease slightly if necessary)
- Check the mounting screws of the arm rest and plate
- Check the bracket for storing the jib when not in use
- Check if the jib is within the Height/Width of the vehicle

	Example for arm rest on the outer boom

13.5.5 Additional valid documents

None

13.5.6 Actions for negative inspection results

Depending on the damage

- Slightly grease mechanical contact points
- Repair damage
- Replace damaged components

13.6 Fly-Jib cylinder, leakages, valves

13.6.1 To inspect

General condition of the cylinder and related hydraulics, sealings of valves

13.6.2 Guidelines, tolerances

Load holding valves are safety relevant and have to be set and sealed properly

13.6.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)
- Pressure inspection (see chapter 0.3.6)

13.6.4 Description of Inspection method

Visual inspection for leakages and damage

- Check cylinders and connections for leakages (dirty areas)
- Check lines and hoses for damage
- Check cylinders for damage, check the condition of the piston rods (cracks, deformations)
- Check for collision damage and abrasion

Functional check of hydraulic components

- Move all functions to their mechanic end stops
- Check for damage, unexpected noises and leakages

Check the sealing of load holding valves on all cylinders (jib folding and extensions)

- Seal must be intact
- Settings must be correct

13.6.5 Additional valid documents

Training documents loader crane (settings of valves)

13.6.6 Actions for negative inspection results

- Repair and replace damaged components
- Re-seal load holding valves, check their setting prior to re-sealing

DANGER

Caution!

Because of load holding valves, the system stays under pressure even when the pump is shut down. Be careful of high pressure oils when opening hoses or valves.

13.7 Fly-Jib lowering rate

13.7.1 To inspect

Fly-Jib lowering rate

13.7.2 Guidelines, tolerances

The lowering rate of the fly-jib is measured at the tip during nominal load.

Valid values according to EN 12999:

- Cranes >12m outreach: 0,2% of the outreach per minute

Example: Crane, 22.5m outreach: Valid rate = 22500mm * 0.002 = 45mm/min

13.7.3 Inspection method

Functional inspection (see chapter 0.3.4)

13.7.4 Description of Inspection method

The fly-jib lowering rate is measured together with the crane lowering rate.

- For the lowering rate the whole system has to be viewed. This includes all lifting cylinders.

See chapter 11.6.

13.7.5 Additional valid documents

EN 12999 (valid lowering rates)

13.7.6 Actions for negative inspection results

Find the faulty component and repair/replace

- Find the component (cylinder) by repeatedly marking and testing
- Find out if the cylinder or the LHV are at fault by opening the appropriate lines
- Repair

13.8 Vertical boom tolerance, condition of guide pads

13.8.1 To inspect

Vertical tolerances of the jib boom

13.8.2 Guidelines, tolerances

Suggested max movement for each extension when negatively loaded: 2.5mm

13.8.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

13.8.4 Description of Inspection method

Subjective evaluation of the tolerances

- Fully retract the extension system of the crane
- Fully extend the extension system of the jib and evaluate the drop of each extension subjectively,
- Evaluate the general impression, take into account the operating hours of the crane and the usage. (crane with grapples have higher wear because of more time in negative load)

Measure the arm tolerance

- Let the extension system touch the ground, and carefully press it into the floor generating negative load, so that all extensions touch the top, and the tolerances to the bottom are visible.
- Measure the tolerance for each arm

13.8.5 Additional valid documents

None

13.8.6 Actions for negative inspection results

Change the lower-front guide pads. If needed, also exchange the upper rear guide pads.

Note!
Changing the front guide pads usually works without unmounting the extensions and the extension cylinders. Therefore in case the tolerances are too high, always the front guide pads should be changed first.

Wear of the rear pads can usually be compensated for by using higher guide pads in the front.
Latest every second guide-pack change calls for changing the rear pads as well.

All guide pad changes have to be noted in the service handbook.

Usually all guide pads are changed during a general overhaul of the unit, no matter their tolerances.

13.9 Horizontal boom tolerances, condition of guide pads

13.9.1 To inspect

Horizontal tolerances of the extensions

13.9.2 Guidelines, tolerances

Recommended max tolerance for each arm (extended) is +/-30mm at the end of the arm

13.9.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

13.9.4 Description of Inspection method

- Fully retract the extensions of the crane.
- Fully extend the extensions of the jib, and move the tip of the extensions approx. 1.5m above the floor.
    - Check the lateral guide blocks for completeness
    - Move the crane to both sides by hand (200N)
    - The max. suggested tolerance for each direction is 30mm for each arm

	Lateral guide blocks (in graphic: green) and guide pads “lower front” (in graphic: blue) (The colors of the guide blocks does not correspond to the real colors)

13.9.5 Additional valid documents

None

13.9.6 Actions for negative inspection results

- Readjust the lateral guide blocks
- Replace guide pads if necessary

13.10 Fly-Jib Extension cylinders, guidance

13.10.1 To inspect

- Condition of the extension cylinder, look for damage and corrosion
- Mounting points and slides of the cylinders
- Condition of pipes and hoses

13.10.2 Guidelines, tolerances

None

13.10.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

13.10.4 Description of Inspection method

Visual inspection of the cylinder

- Check for mechanical damage (because of collisions)
- Check the mounting of the cylinder, check that all bolts are mounted
- Check the condition of the guide blocks of guided cylinders
- Check pipes of extension cylinders for chafes

Extending and retracting the extensions

- Check if the system extends and retracts without issues
- Pay attention to smooth operation, chafing of pipes or hydraulic noise

13.10.5 Additional valid documents

Training documents loader crane, chapter “extensions”

13.10.6 Actions for negative inspection results

- Repair any damage
- Replace guide blocks

13.11 Hydraulic function, sequence control

13.11.1 To inspect

- Hydraulic function of extension cylinders, leakages
- Function and settings of sequence control (if available)

13.11.2 Guidelines, tolerances

Sequence valves must open completely, the piston rod must stay visible for 2-4mm

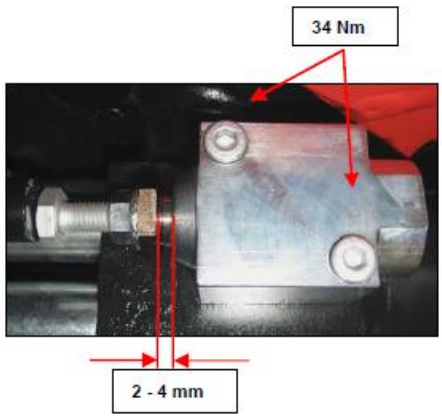
13.11.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

13.11.4 Description of Inspection method

Extend the jib extensions completely, during that:

- Check for leakages
- Check piston rods and pipes for damage
- If the unit has sequence control:
  - Check for proper sequence
  - Check for leakages and settings of sequence valves
  - Check locknut for proper tightening, retighten if necessary.



Sequence valve has to open fully. When fully opened, the rod of the valve is still visible (2~4mm)

see Service-Bulletin C04/2010

  - Check the sequence controlled valves for internal leakage during retracting. Mind: all locked pistons may move a (noticeable) bit as well.

13.11.5 Additional valid documents

- Service Bulletins C-09/2012, C-04/2010
- Training documents

13.11.6 Actions for negative inspection results

- Repair any damage
- Repair leakages
- Set sequence valves

13.12 DPS (Dual Power System)

13.12.1 To inspect

Function of switch, cabling and condition of seal

13.12.2 Guidelines, tolerances

None

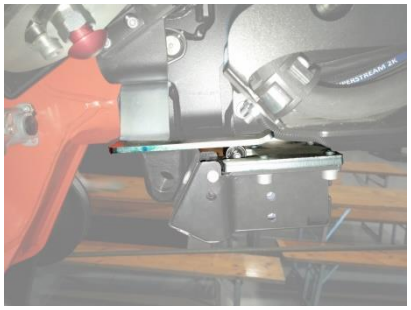
13.12.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

13.12.4 Description of Inspection method

Visual check of the DPS function

- DPS reduces the fly-jib lifting capacity when the switch on the crane is actuated by extending the second-last or last extension.
- Make sure the DPS function works properly, and is mounted correctly (on the crane)
- Make sure the switch is sealed properly



Functional inspection

- Check the function by extending the extensions and watching the switch
- If needed, the function can be checked using Paldiag.NET as well.
- Check if the loads on the load diagram correspond with the crane settings!

13.12.5 Additional valid documents

Training documents

13.12.6 Actions for negative inspection results

- Set the crane properly
- Repair any damage

14 Load handling devices, slingers

14.1 Load hook

14.1.1 To inspect

General condition of the load hook, load hook safety catch, and bearing

14.1.2 Guidelines, tolerances

- EN 12999 and country specific demands
- Regulations by the hook manufacturer
- If no other regulations apply, then the valid values for evaluating the hook wear (replacement state) are:
    - Widening of hook mouth + 10%
    - Wear down of the hook – 5%

14.1.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Measuring the replacement state

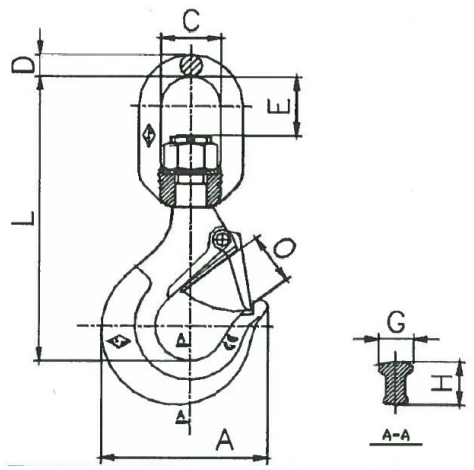
14.1.4 Description of Inspection method

Visual check of the hook

- Check the condition of the hook
- Is the right hook used
- Wear, widening of hook mouth
- Condition of hook safety catch
- Bearing (can the hook be turned)
- Check the locknut for proper seat and damage
- Check the locknut safety pin for proper seat and damage

Measuring replacement state

- The replacement state can be measured by measuring the remaining thickness of the hook (figure H in the picture) and the hook mouth aperture (O in the picture).
- Both values have to be compared to the hook data sheet
- The corresponding hook data sheet can be found either in the crane documentation, or in PALIPEDIA in: → Service → Loader Crane → Certificates → Hook

	Hook outline from a hook data sheet • Measure the mouth aperture “O” • Measure hook size “H” • Compare with date sheet values

If the tolerances are exceeded, the hook is ready to be replaced

14.1.5 Additional valid documents

Hook data sheet

14.1.6 Actions for negative inspection results

Depending on the damage

- Repair the hook safety features (if possible)
- Slightly grease the hook bearing
- Replace the hook if needed

14.2 Slingers, load handling devices

14.2.1 To inspect

Condition and function of all load handling devices, general condition, damage and replacement state

14.2.2 Guidelines, tolerances

- EN12999 (Loader crane)
- EN13155 (loose load handling devices)
- EN1492 (textile load handling devices)
- EN13414 (steel wire rope slings)
- Country specific rules and regulations
- Rules and regulations from the producer of the load handling device, concerning its replacement state

14.2.3 Inspection method

Visual inspection (see chapter 0.3.3)

14.2.4 Description of Inspection method

Load handling devices are

- Lifting straps, textile load handling devices
- Load handling chains and ropes

Mechanical load handling devices

- Pallet hooks
- Other mechanical load handling devices

Visual inspection of existing equipment

- Check plaques of slings, ropes, chains etc.
- Check data for their replacement state
- Check for damage, wear and corrosion
- Check pinlocks and other safety devices
- Check mechanically moving components for function, greasing and smooth operation

14.2.5 Additional valid documents

Manufacturer information and data sheets

14.2.6 Actions for negative inspection results

- Replace all devices that are not safe anymore
- Repair damaged equipment (if possible and allowed)

15 Hose equipment

15.1 Condition hose equipment

15.1.1 To inspect

- Mechanical, hydraulical and electrical (if cables are carried along as well) condition of the hose equipment
- Proper function

15.1.2 Guidelines, tolerances

None

15.1.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

15.1.4 Description of Inspection method

Visual inspection

- Mechanical condition of the hose tray
- Check if all safety pins and winding pins etc.
- Check all mounts and screw connections
- Condition of hoses and leakages on the crane and jib
- Proper unwinding of the hoses, chafes and other damage
- Condition of electrical lines (if any)
- Condition of plugs, covers, seals, and mounting of consoles
- Age of hoses. Hoses have to be changed every 6 years (see 22.2)

Functional inspection

- Extend and retract both the crane and the jib completely and look if all hoses and everything else wind and unwind properly
- Mind any chafing areas, leakages and conspicuous sounds

15.1.5 Additional valid documents

- Hydraulic diagram of the crane
- Data sheets for any additional equipment

15.1.6 Actions for negative inspection results

- Repair the system
- Replace any broken or damaged hoses
- Replace missing screws, mounts and pinlocks

15.2 Quick coupling and dust caps

15.2.1 To inspect

Check condition and function of the coupling

15.2.2 Guidelines, tolerances

None

15.2.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

15.2.4 Description of Inspection method

Visual inspection

- There must be no risk of confusing the lines
- Check if dust caps are present and in order
- Check the general condition and look for leakages

Functional inspection

- Open and close the multifaster
- Check for function and leakages
- Open and close quick couplings
- Check for smooth operation and leakages

15.2.5 Additional valid documents

None

15.2.6 Actions for negative inspection results

- Replace missing dust caps
- Replace couplings that are hard to operate
- Replace missing pinlocks and other safety related equipment
- Repair damage

15.3 Pressure settings

15.3.1 To inspect

Proper pressure setting of the hose equipment

15.3.2 Guidelines, tolerances

None

15.3.3 Inspection method

Pressure inspection (see chapter 0.3.5)

15.3.4 Description of Inspection method

Make sure that the working pressure of additional equipment is set properly

- Close the line
- Attach a pressure gauge
- Actuate the function

Attention!

Appropriate protective clothing and protective goggles have to be worn during any pressure inspection!

Note!

If the pressure gauge is attached to the measuring port on the control valve, the ram pressure in the hoses is shown as well

In case of doubt a measurement port has to be attached at the equipment side of the hose equipment, and the pressure measured there directly

15.3.5 Additional valid documents

- Hydraulic diagram of the crane
- Data from the equipment manufacturer

15.3.6 Actions for negative inspection results

- Repair the system
- Set the proper working pressure on the section valve of the main control valve

16 Additional equipment

16.1 Pins, securing, connections

16.1.1 To inspect

Mounting points, pins, securing pins, greasing

16.1.2 Guidelines, tolerances

None

16.1.3 Inspection method

Visual inspection (see chapter 0.3.3)

16.1.4 Description of Inspection method

Visual inspection

- Check that all pins and corresponding pinlocks are present
- Check rotation locks (if present)
- Check the condition of all pins, check for tolerances
- Check mechanical mounting points for tolerances and corrosion
- Check if all greasing points are greased properly, and maintenance relevant areas are maintained regularly

16.1.5 Additional valid documents

None

16.1.6 Actions for negative inspection results

- Grease at all greasing points
- Replace broken components
- Repair damages

16.2 Rotator

16.2.1 To inspect

Function, leakages, proper speeds

16.2.2 Guidelines, tolerances

None

16.2.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

16.2.4 Description of Inspection method

Visual inspection

- Check the general condition, damage and corrosion
- Check the condition of all hydraulic lines and hoses, look for leakages

Functional inspection

- Turn the rotator in both directions
- Look for proper function, correct turning direction
- Subjectively evaluate the turning speed. (speak to operator about it)

16.2.5 Additional valid documents

None

16.2.6 Actions for negative inspection results

- Repair any damages
- Replace equipment if necessary

16.3 Mechanical function of additional equipment

16.3.1 To inspect

Condition of grapples, joints and mechanical parts of additional equipment

16.3.2 Guidelines, tolerances

According to the producer of the equipment

16.3.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

16.3.4 Description of Inspection method

Inspecting additional equipment

- General condition of the equipment, damage, corrosion
- Inspection of grapples and wear edges for mechanical damage
- Check for cracks (visual)
- Wear of compression areas (e.g. rubber rails of brick stack grapples)
- Check for unhindered movement when opening/closing the grapple
- Check all joints and bearings for mechanical damage
- Check for proper maintenance and greasing
- Actuate all possible movements of the additional equipment to their end stops

16.3.5 Additional valid documents

Documentation of the manufacturer of the additional equipment

16.3.6 Actions for negative inspection results

- Grease all greasing points
- Replace broken or worn down components
- Repair any damage

16.4 Hydraulic and electric function

16.4.1 To inspect

- Electrical and hydraulical function of the equipment
- Special functions

16.4.2 Guidelines, tolerances

None

16.4.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)
- Pressure inspection (see chapter 0.3.5)

16.4.4 Description of Inspection method

Note!

Because of the high amount of additional equipment it is not possible to describe all equipments in detail. However it is prudent that all equipments are checked as applicable.

- Visual check for evident deficiencies.
- Check hydraulics and piston rods etc. for mechanical damage and leakages
- Check for proper hose guidance, check if all protective hoses are present, check for leakages
- Check electrical valves for proper function, cables for proper routing
- Check if the equipment can be operated normally
- Check if all safety features work as intended, that any covers and other safety related devices are in working condition
- Check if the pressure settings are correct and that the pressure settings are sealed
- Check any attached specialized equipment (suction cups, chainsaws, manupulators, special grapples, compressed air systems etc.)

16.4.5 Additional valid documents

Documentation of the manufacturer of the additional equipment

16.4.6 Actions for negative inspection results

- Repair any damage
- Replace broken or work down components
- Replace broken cables or hoses
- Set the correct pressures and re-seal

17 Mechanical extension booms

17.1 Smooth running, locking pin

17.1.1 To inspect

- Condition of pins and pin locks
- Extensions can be inserted and taken out

17.1.2 Guidelines, tolerances

None

17.1.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

17.1.4 Description of Inspection method

- Check pins for completeness, condition, diameter, proper length, original accessory, wear and tear
- Check pin locks for function and completeness
- Check that the extension can be inserted and taken out smoothly

17.1.5 Additional valid documents

None

17.1.6 Actions for negative inspection results

- Replace missing pins and pinlocks
- Replace pins that are worn down too much
- Replace guide blocks and grease to make inserting and extracting a smooth operation

17.2 Steel construction

17.2.1 To inspect

Steel construction

17.2.2 Guidelines, tolerances

None

17.2.3 Inspection method

Visual inspection (see chapter 0.3.3)

17.2.4 Description of Inspection method

General condition

- Check for damage, deformation, wear, scratchmarks
- Especially check the longitudinal welds at the extensions

Note!
Cracks at extensions, especially at or along the longitudinal welds are safety relevant and must lead to immediate cease of crane operation.

Crack inspection

- A visual inspection for cracks has to be conducted by the operator every 50 operating hours
- During a general overhaul every 6-10 years or 5000-8000 operating hours, a comprehensive check of all parts and welds is recommended.
- A comprehensive check can only be done in special workshops using special tools.

Mechanical end stops

- Extensions are secured against falling out completely. This protects the operator. The mechanical end stops must be present.
- Check for completeness and functionality

17.2.5 Additional valid documents

None

17.2.6 Actions for negative inspection results

- Professional repair or replacement of damaged extensions
- Repair or replace missing mechanical end stops

17.3 Marking of maximum capacity

17.3.1 To inspect

Labels are present

17.3.2 Guidelines, tolerances

- Labels for the mechanical extensions must contain the valid load limit and the own weight
- PALFINGER realizes that using a type plate (sticker)

17.3.3 Inspection method

Visual inspection (see chapter 0.3.3)

17.3.4 Description of Inspection method

Check if sticker is present and readable

17.3.5 Additional valid documents

Technical data sheet DA069

17.3.6 Actions for negative inspection results

- Replace missing stickers
- Correct non-readable stickers

17.4 Overload protection system for manual extension

17.4.1 To inspect

Function of overload switch for mechanical extensions

17.4.2 Guidelines, tolerances

EN12999

17.4.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

17.4.4 Description of Inspection method

The overload protection system for mechanical extensions consists of a load measuring device and pressure switch that is mounted between the extension and the load hook. For multiple extensions, different pressure areas can be selected.

Visual inspection of the system

- Check the components and their sealing
- Check the cable routing

Functional inspection of the system

- Make sure that the system is connected properly, and is activated
- Put a scale between hook and load, and lift a too-heavy load.
- When the valid load limit is reached, the overload protection system must engage.

17.4.5 Additional valid documents

EN 12999

17.4.6 Actions for negative inspection results

- Repair damage
- Reset manipulated pressure settings
- Check and correct the programming using Paldiag.NET

18 Rope winch

18.1 Winch bracket, installation, connection

18.1.1 To inspect

Mounting screws

18.1.2 Guidelines, tolerances

Table for torque settings

Class	8.8	10.9
Dimension	Moment [Nm]	Moment [Nm]
M10	46	60
M12	79	100
M14	125	165
M16	195	245
M18	280	345
M20	390	480

18.1.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

18.1.4 Description of Inspection method

General condition of the winch

- Check the winch for apparent deficiencies, damage, corrosion and completeness
- Check the hydraulic connection, condition of hoses and check for leakages
- Check electrical lines, condition and cable routing

Winch mounting

- Check the winch console for proper mounting (welds), cracks and damage
- Check the tightening torque of mounting screws

18.1.5 Additional valid documents

- Technical data sheets for winch mounting
- Table for tightening torque (see above)

18.1.6 Actions for negative inspection results

Cease crane operation and repair the system

18.2 General condition, type plate

18.2.1 To inspect

- Type plate condition
- Leakages in the winch, general condition of the winch

18.2.2 Guidelines, tolerances

None

18.2.3 Inspection method

Visual inspection (see chapter 0.3.3)

18.2.4 Description of Inspection method

- Check if type plate is readable
- Check if the winch leaks
- Check for damage to the drum and to the end-layer roll and switch
- Check the console and any covers
- Check the condition of the disc springs

18.2.5 Additional valid documents

- Training documents chapter for winch
- Operating instructions

18.2.6 Actions for negative inspection results

Cease winch operation and repair

18.3 Rope (condition, maintenance)

18.3.1 To inspect

Check the cable for wear level and damage

18.3.2 Guidelines, tolerances

ISO 4309 (Cranes -- Wire ropes -- Care and maintenance, inspection and discard)

18.3.3 Inspection method

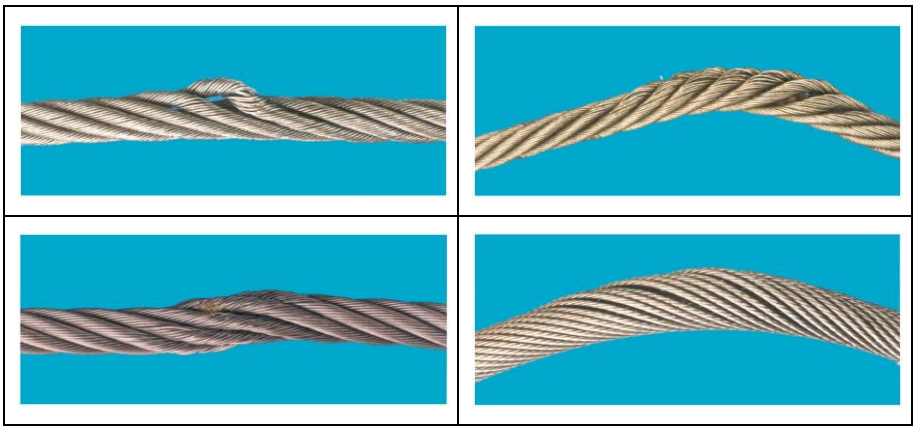
Visual inspection (see chapter 0.3.3)

18.3.4 Description of Inspection method

Unwind the cable

- While doing that check the whole cable length for loosened or broken strands, strands that stick out, kinks and any other damage to the cable
- Slightly oil the cable when rewinding (let it run through an oiled piece of cloth

Examples for damaged areas according to the standard:



Note!
When rewinding, the cable must be under constant tension (e.g. use a forklift) This ensures that the cable is not dragged along the ground and has the proper tension for winding.

18.3.5 Additional valid documents

- ISO 4309
- Training documents, chapter for winches

18.3.6 Actions for negative inspection results

- If the cable does dos not conform to the regulations any more, replace it.
- Detailed information when this is the case can be found in ISO 4309

18.4 Overload protection system

18.4.1 To inspect

Proper function of the overload switch on the winch

18.4.2 Guidelines, tolerances

- The switch should engage at approx. 10% above the nominal load of the winch
- The switch must not engage when the winch is pulled full-power against the extension

18.4.3 Inspection method

Functional inspection (see chapter 0.3.4)

18.4.4 Description of Inspection method

The overload switch can be checked by slowly extending the extensions without unwinding the winch.

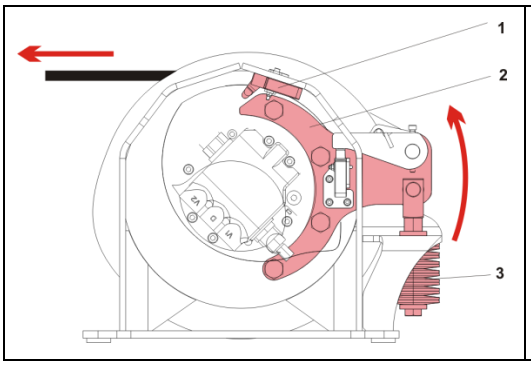
DANGER

Caution!

This inspection requires proper expertise and a correct electrical installation of the winch.
If settings are wrong, or the programming is wrong, the cable can rip
There is severe danger to the life of the operator and others.

Winches that have a B4 overload switch (nearly all models)

- Extend extensions approx. 3-4m
- Use “winch lift” to slowly bring the hook in contact with the extension tip – without load
- Slowly extend the extensions against the hook, the cable tightens
- Slowly extend further (10~15cm) and the disc springs should compress. The switch B4 has to switch and make the winch go into overload.



Overload sequence

- The disc springs (3) compress because of the tension on the rope
- Winch body (2) is turned slightly against the springs
- Switch (1) switches

The overload switch can also be checked using a proper test load. This is very difficult however, because of the load requirement changes according to different remaining layers on the winch

For electronic overload protection systems on the winch

- The test is done in basically the same manner
- Electronic settings are done in Paldiag.NET

18.4.5 Additional valid documents

- Training documents, chapter for winches
- Operating instructions

18.4.6 Actions for negative inspection results

Set up the system properly, repair if needed

18.5 End layer limiting switch

18.5.1 To inspect

Proper function of the end layer switch on the winch

18.5.2 Guidelines, tolerances

The end layer switch must stop unwinding when the winding count on the winch is at 3.

18.5.3 Inspection method

Functional inspection (see chapter 0.3.4)

18.5.4 Description of Inspection method

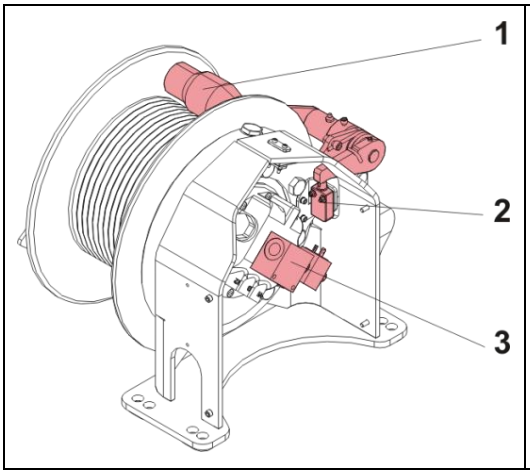
It is best to check proper function by completely unwinding the winch. This has to be done anyway to inspect the cable.

DANGER

Caution!

This inspection requires proper expertise and a correct electrical installation of the winch.
If settings are wrong, the cable detaches from the winch. There is severe danger to the operator and others

- Completely unwind the winch, always keep tension on the cable.
- When there are only 3 layers left, the roll falls onto the drum, and engages the end-layer switch (mechanical or electrical B5)
- Further lowering the winch must be blocked



Shut off sequence

- The roll(1) falls onto the drum, when only 3 layers are left
- Switch (2) is actuated
- Further unwinding is stopped by a magnet valve (3) or by an electronic command (different winch, not depicted)

18.5.5 Additional valid documents

- Training documents, chapter for winches
- Operating instructions

18.5.6 Actions for negative inspection results

Set up the system, repair if needed

18.6 Winch additional equipment, rope guidance

18.6.1 To inspect

Condition, function and completeness as well as proper usage of winch equipment

18.6.2 Guidelines, tolerances

None

18.6.3 Inspection method

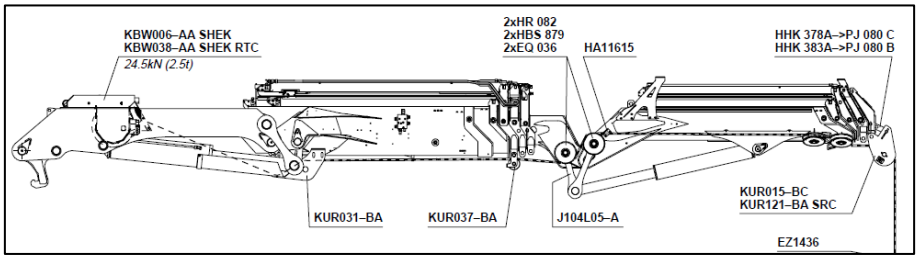
Visual inspection (see chapter 0.3.3)

18.6.4 Description of Inspection method

Check for completeness of winch equipment

- Determine which winch equipment is necessary for the crane-winch combination at hand. Use the technical data sheet.

Example: Equipment and cable routing for a PK 34002-SH D PJ080 SHEK



- Note that a crane can have different versions (with/without jib, multi-strain etc.)
- Check for completeness of the equipment. Especially check that all pins and bolts as well as pinlocks etc. are present and in good condition
- Check pulleys for wear and smooth turning. Pulleys align with the direction of the cable and must not rub anywhere
- Check all pins and pinlocks for condition and function
- Check the general condition of all equipment – is it maintained properly?
- Check all storage-mounting points for the equipment. Can all parts be stored properly during transit?

18.6.5 Additional valid documents

Technical data sheets for the crane/winch combination at hand

18.6.6 Actions for negative inspection results

- Replace missing components
- Replace or repair defective components

18.7 Option: Tiltable winch

18.7.1 To inspect

- Folding mechanism and position recognition of the folding winch
- This function is optional

18.7.2 Guidelines, tolerances

None

18.7.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

18.7.4 Description of Inspection method

Visual inspection of the components

- Re-tighten mounting screws on the flange plate if necessary
- Hose routing and cable routing, condition of protective hose
- Leakages of the switch valve, the connections and the folding piston
- Mounting point of the folding cylinder to the winch – condition and leakages
- Pins and pinlocks
- Check end-layer switch folding mechanism of proper horizontal setting and mounting
- Check end layer dampening folding mechanism for transport position for damage and proper mounting
- Check proper mounting of covers
- Check the switch for position recognition and the electrical cabling for condition

Folding function

- Actuate the folding function according to the operating instructions or the operator DVD
- Make sure the system works properly and can be used as intended

18.7.5 Additional valid documents

- Training documents – chapter for winches
- Operating instructions
- Operator DVD

18.7.6 Actions for negative inspection results

Cease winch operation and repair the system

18.8 Option: RTC (Rope Tension Control system)

18.8.1 To inspect

Proper function of the RTC system (only in connection with Paltronic 150 and Jib)

18.8.2 Guidelines, tolerances

None

18.8.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

18.8.4 Description of Inspection method

Visual inspection of the components

- Make sure the cable is mounted to the bolt on the jib
- Check the main switch on the fly-jib for proper function, damage and good cable routing

	RTC only works when the cable is mounted on the bolt on the jib. A switch tells paltronic that the cable is mounted

Functional inspection of the RTC

- Turn on RTC using the RRC
- Extend- and retract the crane extensions
- The winch must engage together with the extensions and keep the cable under tension
- Turn off RTC
- The winch must not engage by itself any more

18.8.5 Additional valid documents

Training documents for winches and Paltronic 150 - RTC

18.8.6 Actions for negative inspection results

Repair the system

18.9 Option: SRC (Synchronic Rope Control system)

18.9.1 To inspect

Proper function of the SRC system (only in connection with Paltronic 150 and fly-jib)

18.9.2 Guidelines, tolerances

None

18.9.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

18.9.4 Description of Inspection method

Visual inspection of the components

- Make sure that SRC is plugged in
- Check the cabling, plugs and other components for damage

SRC measures the relative movement between the cable and the extensions, and controls the winch correspondingly, to keep the cable length constant.

Functional inspection of the SRC

- Turn on SRC using the RRC while the crane is in winch operation mode
- Extend and retract the extensions
- The winch must operate automatically to keep the cable length constant
- Deactivate SRC on the RRC
- The winch must not move automatically any more

18.9.5 Additional valid documents

Training documents for winches and Paltronic 150, SRC

18.9.6 Actions for negative inspection results

Repair the system

18.10 Winch hour meter, gear oil

18.10.1 To inspect

Age and condition of the gear oil

18.10.2 Guidelines, tolerances

- Gear oil must be changed
  - After the first 20 operating hours of the winch
  - Every 150 operating hours of the winch
- Suitable gear oil: ISO VG 150

18.10.3 Inspection method

Visual inspection (see chapter 0.3.3)

18.10.4 Description of Inspection method

Determine the changing interval

- Read the hour counter of the winch
- If no counter is mounted, read the hours using Paldiag.NET
- If no Paltronic is mounted, change the oil yearly

Change oil if necessary.

18.10.5 Additional valid documents

Training documents chapter for winches

18.10.6 Actions for negative inspection results

- Change the oil
- Note the oil change in the service book of the crane

18.11 Check theoretical remaining life time of the winch

18.11.1 To inspect

Check the remaining life time

18.11.2 Guidelines, tolerances

Germany: BGV D8 (Unfallverhütungsvorschrift Winden, Hub- und Zuggeräte)

18.11.3 Inspection method

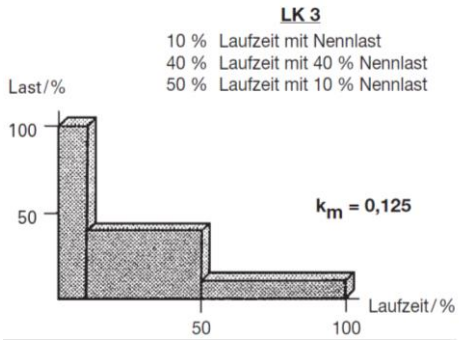
Calculation using the PALFINGER guideline

18.11.4 Description of Inspection method

Calculating the theoretical remaining life time is done according to BGV D8. A simplified explanation follows:

- The winch corresponds to 1 BM (see type plate) – this equals to 400h of life time under nominal load.
- A factor has to be calculated according to the daily use – this has to be done separately for each crane according to the BGV D8
- Generally it can be said that for cranes under heavy use, a low value has to be used.

Example: Excerpt from BGV D8



Example for a carpentry shop

- 10% nominal load (fully loaded winch)
- 40% at 40% load (average value for various loads)
- 50% at 10% load, “going back” after each lift

This results in a factor of k_m = 0,125; If the winch does not have an hour counter, this has to be multiplied by 1,2.

This results in a theoretical total use of the winch:

- 400 h (1 Bm) / 0,125 (calculated factor) = 3200 h

Calculating the remaining life time:

- Deduct the current hour counter value from the total life time of the calculation. For winches without an hour counter, assume an average for each year.

18.11.5 Additional valid documents

- Form to calculate the remaining operating life (PALFINGER Service)
- Country specific rules and regulations (BGV D8 in Germany)

18.11.6 Actions for negative inspection results

When the max life time is reached, the winch has to be evaluated and if necessary replaced. Contact PALFINGER

19 Workman basket

19.1 Steel construction

19.1.1 To inspect

- Condition of the pull-in part and the basket in general.
- Components for completeness (pins, pinlocks, handles)
- Damage, corrosion

19.1.2 Guidelines, tolerances

None

19.1.3 Inspection method

Visual inspection (see chapter 0.3.3)

19.1.4 Description of Inspection method

Visual inspection

- Check the steel construction for corrosion and damage
- Check the mounting pin and the pinlock
- Check the tolerances of the pull-in part (guide blocks)
- Check the function of the blind plug and the condition of the wiring inside as well as the blind plug mount
- Check the condition of the plug pins and seal rings

19.1.5 Additional valid documents

- EN 280
- National guidelines

19.1.6 Actions for negative inspection results

Stop further crane operation with the workman basket and repair

19.2 Quick changing system

19.2.1 To inspect

Check the function and condition of the quick-change

19.2.2 Guidelines, tolerances

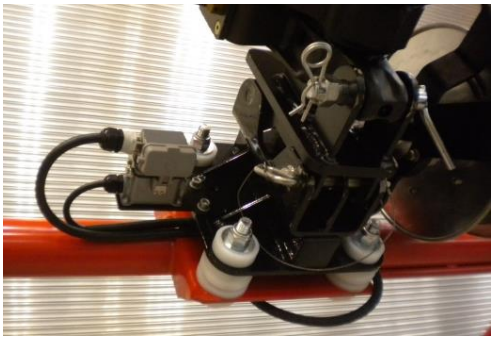
None

19.2.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

19.2.4 Description of Inspection method

- Mount the basket
- Check the quick-change
  - General condition and function, completeness
  - Check for mechanical damage, check the claws and how they grab
  - Check the pull-in part, pin, threads, locknuts, safety pins and gliding surfaces
  - For cranes 2015 onwards also check the monitoring switch at the bolt

	Basket mount with quick change For models 2014 onwards that pull-in part is secured with a crown nut and a splint

19.2.5 Additional valid documents

- Operating instructions for workman basket
- National guidelines

19.2.6 Actions for negative inspection results

- Immediately stop workman basket operation
- Repair the system

19.3 Type plate, warning signs, decals

19.3.1 To inspect

Check the type plate, mandatory signs and warning signs for completeness and readability

19.3.2 Guidelines, tolerances

All signs (type plate, notices, stickers, instructions etc.) have to be readable and mounted at the proper position. An overview of all signs can be found in the spare part catalogue

19.3.3 Inspection method

Visual inspection (see chapter 0.3.3)

19.3.4 Description of Inspection method

Visual inspection of all signs

- Completeness
- Readability
- Correctness

Example: signs on a workman basket

	Type plate • present • readable
	Notices about • How to use • Crushing hazards • Reflector signs • Do not enter, slipping hazard • Crane operation, basket operation • Emergency cut-off • Emergency operation • Instruction manual

19.3.5 Additional valid documents

- Crane operating instructions
- Workman basket operating instructions
- EN 280
- National guidelines

19.3.6 Actions for negative inspection results

Replace missing or illegible signs

19.4 Electric

19.4.1 To inspect

- Plugs from the crane
- Cable routing, cable spools
- Plug for basket control (with RRC)
- All intended safety systems must be in working order

19.4.2 Guidelines, tolerances

EN 280

19.4.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

19.4.4 Description of Inspection method

Mount the basket and prepare basket operation

- Completeness of all pins and pinlocks
- Check the condition and function of plug connections, check for completeness (blind cap)
- Check condition of cabling, cable routing, chafing areas, damage
- Check cable spools for cable condition and cable spooling (check tension)
- Connect the basket control

Turn on the system

- Check all displays
- Check all control elements and switches
- Start the RRC, check for function (cabling, emergency cut-off loop)

Example

- Basket control on an SH crane
- RRC connected

19.4.5 Additional valid documents

- EN 280
- Operating instructions for workman basket and loader crane
- National guidelines

19.4.6 Actions for negative inspection results

- Stop workman basket operation
- Repair the system

19.5 Inclination regulation

19.5.1 To inspect

Condition and proper function

19.5.2 Guidelines, tolerances

For automatic Inclination regulation (EN 280):

- The system must keep the basket within 5° of inclination

19.5.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

19.5.4 Description of Inspection method

Visual inspection

- Check connections (electrical, hydraulical) for completeness and condition
- Mounting of components, screw connections, imperviousness of electrical boxes
- Leakages of the hydraulics, dirt and damage
- Check the oil level of the tank
- Oil change (always together with the oil change of the crane)

	Example of a hydraulic system

19.5.5 Additional valid documents

- EN 280
- Operating and maintenance manual for workman basket
- National guidelines

19.5.6 Actions for negative inspection results

- Stop workman basket operation
- Repair the system

19.6 Function of basket operation

19.6.1 To inspect

- Functional inspection of workman basket operation
- Control functions
- Inclination control

19.6.2 Guidelines, tolerances

EN 280 (the following is a tiny excerpt of the many regulations for workman basket operation)

- Normal basket operation must only be possible with a connected RRC in the basket
- Automatic inclination control must keep the basket within 5° inclination at all times
- Movement speed must not exceed 0,4m/s vertically (extensions) or 0,7m/s (slewing)

19.6.3 Inspection method

Functional inspection (see chapter 0.3.4)

19.6.4 Description of Inspection method

Using the normal basket operation

- Check if the pull-in part is securely mounted to the crane. There must be no “wiggle”.
- Check all basket control functions
- Check all displays
- Check if crane speed is reduced appropriately
- Check inclination control
- Check that all cut-offs work (e.g. that the basket cannot be moved below 90° vertical (if programmed))

19.6.5 Additional valid documents

- EN 280
- Operating and maintenance manual for workman basket
- National guidelines

19.6.6 Actions for negative inspection results

- Stop workman basket operation
- Repair the system

19.7 Function of emergency operation

19.7.1 To inspect

- Check if emergency operation is present
- Check completeness and function

19.7.2 Guidelines, tolerances

- EN 280
- Country specific guidelines

19.7.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

19.7.4 Description of Inspection method

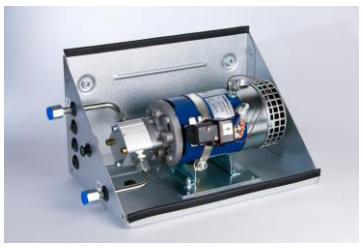
Visual inspection

- Instructions, stickers, warnings are present
- Completeness of control elements (levers, keys)
- Completeness of safety elements (seals, …)

Functional inspection

- Depending on the system its function and condition is to be inspected

Examples for emergency operation units

	Example: hand pump • Function of the hand pump • Completeness of all operating elements • seals
	Example: electrohydraulic unit • Switch to emergency operation • Check all movements, crane movements must still be possible

19.7.5 Additional valid documents

- Operating instructions
- National guidelines

19.7.6 Actions for negative inspection results

- Stop workman basket operation
- Repair the system

20 Remote control system

20.1 Handset

20.1.1 To inspect

Check the portable control for proper function and completeness of any accessories

20.1.2 Guidelines, tolerances

None

20.1.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)
- Inspection of additional equipment (see chapter 0.3.6)

20.1.4 Description of Inspection method

- Visual inspection of the portable control (damage, dirt)
- Check completeness and condition of carrying straps and clasps
- Functional inspection of all control elements (also use the test mode on Scanreco RRCs)
- Functional inspection of the external functions (e.g. motor start)
- Check the battery contacts and battery compartment
- Ask the operator about the working cycles of the battery. Batteries have a life expectancy of 2 years

20.1.5 Additional valid documents

Spare part catalogue

20.1.6 Actions for negative inspection results

- Repair the system
- Replace the battery if needed

20.2 Receiver, cable mode

20.2.1 To inspect

- Receiver mounting
- Condition
- Status codes

20.2.2 Guidelines, tolerances

None

20.2.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)
- Inspection of additional equipment (See chapter 0.3.6)

20.2.4 Description of Inspection method

Visual inspection

- Check the casing for damage, cracks or breaks
- Check the status code display (LED or 7-segment display)
- Check the antenna screw connector and the antenna cable
- Check the mounting position of the magnetic antenna
- Check the mounting of the receiver and the dampeners
- Check the cabling, protective hull and plug

Inspection of additional equipment

- Check the cable for receiver<->remote control

Functional inspection

- Operate the crane in RRC mode
- Operate the crane in cable mode
- Read error codes using Paldiag.NET (this can be done in one go together with the error code readout for Paltronic – see chapter 21.7)

20.2.5 Additional valid documents

None

20.2.6 Actions for negative inspection results

Repair the system

20.3 Battery charger

20.3.1 To inspect

Mounting position and function of the charger

20.3.2 Guidelines, tolerances

None

20.3.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

20.3.4 Description of Inspection method

Check the mounting position of the charger

- The charger normally is mounted in the truck cabin in a spot that is not shone upon by direct sunlight. The charger must not be exposed to direct sunlight.
- Check the condition and function of the charger
- Check the function by changing batteries and watching the LEDs

20.3.5 Additional valid documents

- Operating instructions
- Training documents for RRC

20.3.6 Actions for negative inspection results

- Repair the system
- Replace damaged components
- Replace batteries if needed (normal life cycle is 2-4 years)

21 Electrical functions, load test

21.1 Wiring, junction boxes, electrical components

21.1.1 To inspect

Cable routing, electric boxes, electrical components, displays

21.1.2 Guidelines, tolerances

None

21.1.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

21.1.4 Description of Inspection method

Inspect all electrical components on the crane. Check for damage, cable routing, leakages and general condition

- Supply from the truck
- Condition of the crane connection box and other electrical boxes
  - Open the box, check for water entry
  - Check seals, grease seals with silicone grease and close the box
  - Check the mounting at the PG screws
- Cable routing, naming of cables
- Cable guides
- Slip ring body
- Function and condition of the spotlight
- Function and condition of the horn (90% and 100% warning)
- Function and condition of displays
- Function and condition of switch elements

21.1.5 Additional valid documents

Operating instructions

21.1.6 Actions for negative inspection results

Repair the system

21.2 Emergency cut off system

21.2.1 To inspect

Function and condition of emergency cut-offs

21.2.2 Guidelines, tolerances

EN 12999 (Actuating an emergency cut off must stop the machine/crane.)

21.2.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

21.2.4 Description of Inspection method

Inspect the condition of the cut-off switch

- Emergency cut-off switches must be marked RED and must be freely accessible

Functional inspection

- Start the crane
- Check all emergency cut-off switches, every one of them must stop the crane completely

Attention!

Actuating an emergency cut-off must stop all further crane movements. If this is not the case, there is acute danger for the operator and others

- The mushroom-style switches must latch, and must be releasable again by twist/pulling

21.2.5 Additional valid documents

- EN 12999
- Operating instructions

21.2.6 Actions for negative inspection results

- Cease crane operation immediately and repair the system
- If emergency cut-offs do not work, the system might have been manipulated. This has to be checked thoroughly and must be repaired before the crane is allowed to operate again.

21.3 Overload protection system

21.3.1 To inspect

The function of the load moment limitation system

21.3.2 Guidelines, tolerances

EN 12999

21.3.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)
- Pressure inspection (see chapter 0.3.5) or load test

21.3.4 Description of Inspection method

Visual inspection of all components

- General condition of the components
- Cable routing, cable mounting
- Manipulation of any seals

Most load moment limitation systems can be checked for general function by moving against the upper dead-point of the lifting cylinder (pressure peak)

- Move the crane against the mechanical end-stop and check if the overload protection system engages
- Check if the overload protection can be temporarily disengaged (OLP function)
- Check alarms (horn)

On models that do not move to their mechanical end stops (SH crane series) the function of the load moment limiting system can only be checked using a load test (see chapter 21.5)

21.3.5 Additional valid documents

- EN 12999
- Operating instructions
- Training documents for the load moment limiting system at hand

21.3.6 Actions for negative inspection results

- Cease crane operation
- Properly set the system according to a load test
- Repair the system

21.4 Stability control system

21.4.1 To inspect

Function of the stability control system

21.4.2 Guidelines, tolerances

EN 12999

21.4.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)
- Pressure inspection (see chapter 0.3.5) or load test

21.4.4 Description of Inspection method

Determine which system is in use

- SHB reduces the lifting capacity in a certain slewing area
- ISC reduced capacity areas, monitors outriggers using switches
- HPSC Various versions, monitored outriggers
- Other systems, more load limits, additional programmings

The function of the stability control systems can only be evaluated with a load test (see chapter 21.5)

Generally it can be assumed that settings are correct as long as no seals have been manipulated and no programming has been changed

Both can be checked.

21.4.5 Additional valid documents

- EN 12999
- Operating instructions

21.4.6 Actions for negative inspection results

- Cease crane operation
- Apply corrected settings (after a load test)

21.5 Load test

21.5.1 To inspect

Lifting capacity, load moment limitation system and stability

21.5.2 Guidelines, tolerances

EN 12999

21.5.3 Inspection method

- Pressure inspection (see chapter 0.3.5)
- Load test

21.5.4 Description of Inspection method

Determine which system, if any, is used (load moment limitation and stability control).

Check the max. lifting capacity and load moment limitation

- Crane fully supported
- Lift the test load
- Extend the crane to the appropriate outreach for the test load, to 100% lifting capacity
- Load must still be liftable

Note!

The test load for this test should be approx. 10% above the maximum lifting capacity when the crane is fully extended.
See the load diagram for details

- Extend the crane another 5% - the load moment limitation must engage.
- For HPLS crane models, use the HPLS values for determining the load

Note!

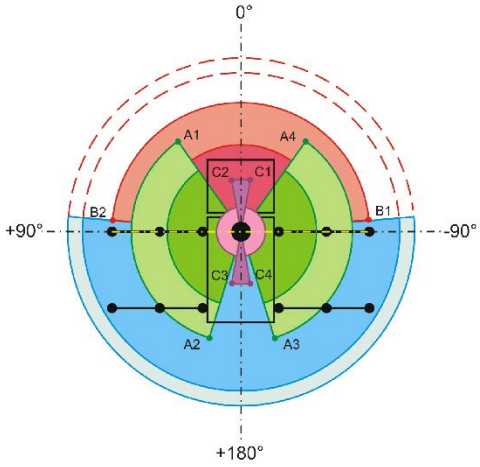
For reoccurring inspections only the engaging of the overload protection system is tested. For this a test load of slightly more than 100% of the nominal load is used.

This enables to test the proper function of the overload protection system

A test using 125% nominal or other loads as high is not necessary and much more complicated.

Checking the Stability control systems SHB and ISC

- Cranes of this category need to be hooked up to Paldiag.NET in order to see the programmed angles, and to test the proper response of the systems.
- Select appropriate test loads according to the PALCHART diagram



Example

Spot test the programmed limits and angles

Checking the HPSC stability control system

- Support the crane according to the Palchart printout “reoccurring inspection”
- Select a random testing position, and inspect.

Note!

The test load should be chosen in order for the Stability control system to only engage at approx. 85% of the crane outreach.
Heavier loads do not deliver useable results
To select an appropriate load, see the Palchart printout and/or technical data sheets.

- Extend the load in the cranes strongest arm position
- The stability control system must stop the crane as soon as the limit is reached (as close as possible when the system is fully supported)
- Cranes with fly-jib can be inspected either with or without the jib attached.

Note!

This test checks the overload protection system as it would act in normal working situations. A test using 125% nominal load or similar is not necessary.

21.5.5 Additional valid documents

- Operating instructions
- Training documents for the systems at hand

21.5.6 Actions for negative inspection results

- Immediately cease crane operation
- Correct the settings (according to the training documents)
- Repair the system

21.6 Additional electrical functions and systems

21.6.1 To inspect

Functional inspection of other systems and options

21.6.2 Guidelines, tolerances

None

21.6.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

21.6.4 Description of Inspection method

Inspect components for damage, cable routing and function

- Cable routing, mounting of components
- Proper function of displays and warning systems

Functional inspection of additional systems, move the crane where necessary

- HPLS High Power Lifting System
- AOS Active Oscillation Suppression
- ROIL Return oil utilization
- P-Fold automatic folding and unfolding of the crane
- RRC check all additional functions
- BEL Lighting package
- LCA Additional load limits (additional stabilizers, load on the trailer, …)
- Spotlights
- Remote controlled stabilizers
- Special functions

21.6.5 Additional valid documents

- Operating instructions
- Training documents

21.6.6 Actions for negative inspection results

Repair the system

21.7 Error memory

21.7.1 To inspect

- Save all data
- Read and delete the error code memory

21.7.2 Guidelines, tolerances

None

21.7.3 Inspection method

Connect with computer (Paldiag.NET) and save all data

21.7.4 Description of Inspection method

Connect with Paldiag.NET

- Save the parameter file
- Read the status codes with Paldiag.NET
- Evaluate the codes, inspect the unit where necessary and repair
- Delete the status code memory
- Upload the file to PALIPEDIA, mention the DATE in the file name (YYYY-MM-TT)

21.7.5 Additional valid documents

- Training documents
- PALCODE

21.7.6 Actions for negative inspection results

- If any unexpected status codes arise, investigate
- Repair the system

21.8 Reset hour meter (service)

21.8.1 To inspect

Reset the hour counter

21.8.2 Guidelines, tolerances

None

21.8.3 Inspection method

Functional inspection (see chapter 0.3.4)

21.8.4 Description of Inspection method

Write down the data

- Read the hour counter data and note it down on the inspection protocol

Reset the counter

- Reset the counter to the new service interval (depending on the system e.g. by connecting clamp 400 with “+”)

Note!

ONLY reset the counter if all necessary service jobs have been done!

21.8.5 Additional valid documents

Training documents

21.8.6 Actions for negative inspection results

Not applicable

22 Miscellaneous

22.1 Protection plates, covers

22.1.1 To inspect

Functionality, completeness and proper mounting of covers and guard plates

22.1.2 Guidelines, tolerances

EN 12999

22.1.3 Inspection method

Visual inspection (see chapter 0.3.3)

22.1.4 Description of Inspection method

Some covers and guard plates are to protect the operator from leaking hydraulic fluid.

- Check general condition, completeness, damage, corrosion and proper mounting of all guard plates and covers.
- Especially check covers, guard plates and cooling plates which are must fulfill this function as well.

22.1.5 Additional valid documents

None

22.1.6 Actions for negative inspection results

- If there is damage within the operating area of the crane, crane operation must be stopped.
- The EN Standard defines the operating area to be 1m around the operator, as long as there can be >5 MPa or 50°C in the hydraulic system.

22.2 Hydraulic hoses

22.2.1 To inspect

General condition and age of hydraulic hoses

22.2.2 Guidelines, tolerances

DIN 20066: Max age of hydraulic hoses is 6 years

22.2.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)
- Pressure inspection (see chapter 0.3.5)

22.2.4 Description of Inspection method

Evaluate the general condition and age of hydraulic components

- Leakages (areas with high amounts of dirt can hint on leakages) of hoses and other components
- Chafing areas, damages
- Ripped or brittle hoses (esp. hoses that are exposed to the sun)

During inspection the crane was moved multiple times and pressure was created in all functions

- Check if any damage or abrasion was caused during the inspection

The suggested maximum usage time for hydraulic hoses is 6 years.

After 6 years all hydraulic hoses should be changed, no matter their condition

Note!

In accordance with DIN 20066 hydraulic hoses have to be changed every 6 years. This also applies to hoses without any visible damage as there may be internal damage.

22.2.5 Additional valid documents

None

22.2.6 Actions for negative inspection results

Replace all hydraulic connections (hoses) every 6 years.

22.3 Protection hoses

22.3.1 To inspect

- Protective hoses
- Splash guard

22.3.2 Guidelines, tolerances

- EN12999
- DIN 20066

22.3.3 Inspection method

Visual inspection (see chapter 0.3.3)

22.3.4 Description of Inspection method

Protective hoses must offer adequate protection from leaking hydraulic fluid for the operator.

- Check all protective hoses for completeness, proper mounting, proper function, damage and general condition

22.3.5 Additional valid documents

EN12999

22.3.6 Actions for negative inspection results

- If protective hoses are damaged within the operating area, cease all crane operation immediately and repair.
- In accordance with the standard, the operating area is defined as an area of 1m around the operator, as long as hydraulic hoses carry 5 MPa or more or fluids of 50°C or more.

Note!

DIN 20066 recommends to replace hoses every 6 years. While changing, the condition of the protective hoses should be evaluated in detail, and they should be changed if deemed necessary.

22.4 Others

22.4.1 To inspect

Check all 3rd party systems that have been mounted on or are otherwise associated with the crane.

22.4.2 Guidelines, tolerances

None

22.4.3 Inspection method

- Visual inspection (see chapter 0.3.3)
- Functional inspection (see chapter 0.3.4)

22.4.4 Description of Inspection method

The installer may have combined the crane with other systems that are powered by the same hydraulics or electrics.

There may also be other consoles, devices or systems that have been mounted on the crane.

- Visually inspect any such things for damage, corrosion and check their intended functionality
- Inspect the device/etc. for its intended functionality

Proper function for the intended use must be ensured.

22.4.5 Additional valid documents

None

22.4.6 Actions for negative inspection results

Repair the system