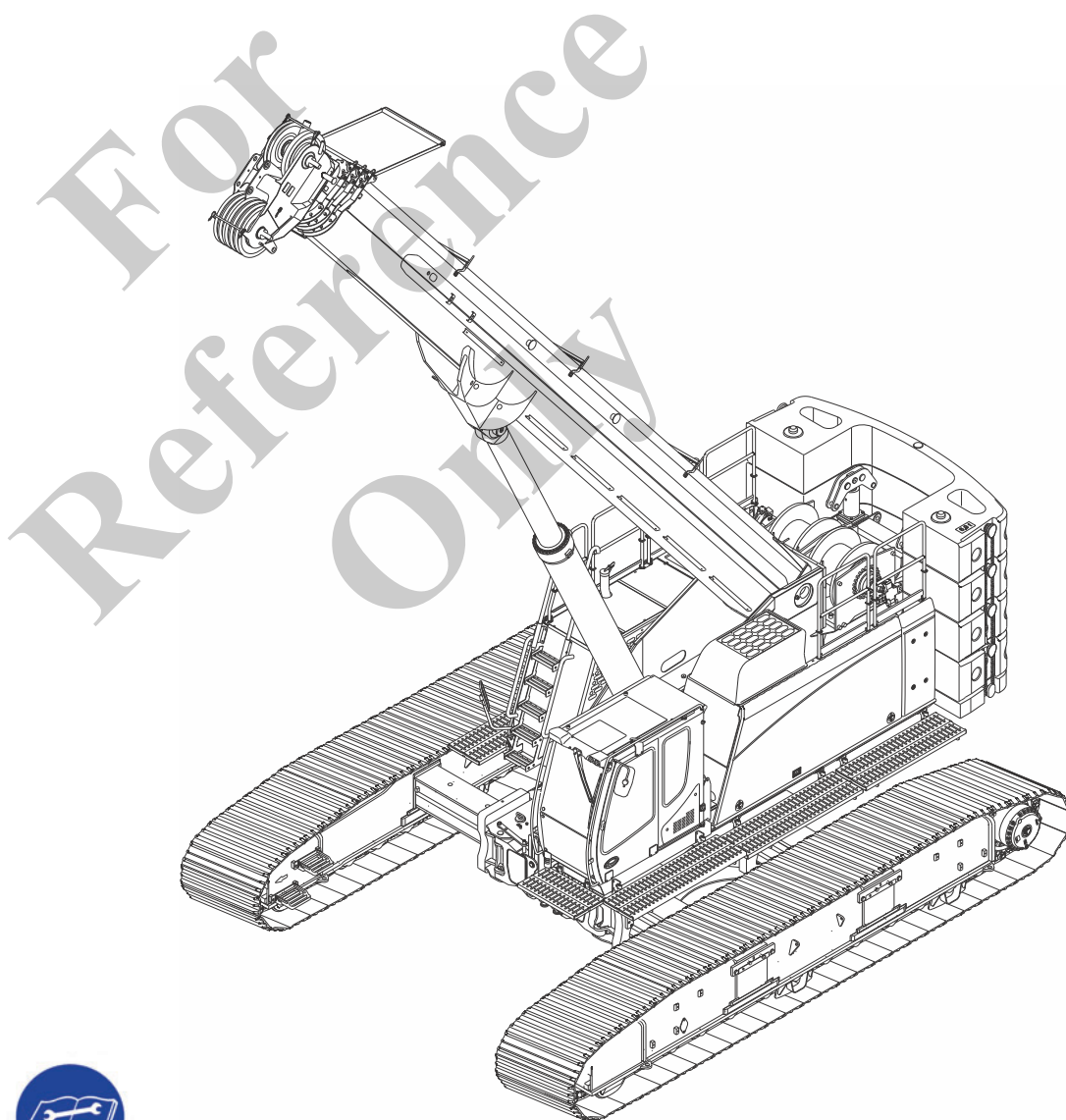


Maintenance manual

GHC 130



Read the manual completely
prior to first operation!



Target group

The machine has been developed for demanding tasks. Persons who work on or with the machine must be trained or instructed for these tasks.

Maintenance must only be carried out by trained specialists.

Instructions concerning the manual

Read through the operating manual thoroughly, in particular Chapter 1 SAFETY, before starting work with the machine.

Keep the manual in a safe place for future use.



- Only work with the machine after you have read and completely understood this manual.
- Refrain from operating or maintaining the machine in an unsafe manner.
- Do not operate machine if a fault has been detected.
- The owner is responsible for the qualifications and training of personnel.
- This manual is a component of the machine. Keep the manual in the cab at all times.
Recommended storage location: Storage compartment behind the driver seat.
In the event of sale, hand-over or lease, the manual must accompany the machine!
- Contact MANITOWOC immediately if there is anything in the manual that you do not understand!
Your comments will help us to make the manual even more user-friendly.

For reasons of clarity, the specified protective devices are not shown in some of the illustrations. Operation with protective devices removed is not permitted!

**Information**

Protective device must be in place when working with the machine.

Presentation methods

This manual contains safety notices that make you aware of dangerous working practices. These safety notices are marked with a safety alert symbol and a signal word.

Notes that make the work easier or contribute to better understanding when operating the machine are presented in the following manner:

**Information**

Indicates notes that draw your attention to special features.

**Information**

Indicates a cross reference to other documents.

Handling instructions are presented in tabular form as follows:

1	Press switch (1).
2	Activate control lever (2).
3	Unfasten bolt (3).

- Listings are marked with bullet points.
 - Sub-points in listings or procedures are marked with dashes.

**Current
when going to press**

Ongoing development guarantees the advanced technology and the high quality of our machines. This may result in variations between this manual and your machine. Also, errors cannot be excluded. Please understand that no legal claims can be derived from the specifications, illustrations, and descriptions in this manual.

For
Reference
Only

1	Safety	1-1
1.1	Presentation of safety information	1-1
1.2	Danger sources	1-2
1.3	National and international regulations	1-2
1.4	General safety instructions	1-3
2	Maintenance schedule, lubrication schedule	2-1
2.1	Maintenance schedule	2-1
2.2	Lubrication points	2-6
2.3	Fill quantities	2-8
3	General instructions	3-1
3.1	Oils and lubricants	3-4
3.1.1	Disposal of lubricants and operating fluids	3-5
3.2	Coolant – drive engine	3-6
3.2.1	Coolant – general	3-6
3.3	Welding	3-8
4	Diesel engine	4-1
4.1	Engine oil	4-1
4.2	Air filter	4-4
4.2.1	Combination cooler	4-7
4.2.2	Diesel prefilter	4-9
4.2.3	Diesel fine filter	4-12
4.2.4	Air intake system	4-12
4.2.5	Belt drives	4-12
5	Hydraulic system	5-1
5.1	Hydraulic hose lines	5-3
5.2	Checking the oil level	5-4
5.3	Changing the hydraulic oil	5-5
5.4	Changing the return filter element	5-8
5.5	Replacing the leak oil filter element	5-9
5.6	Replacing the aeration filter	5-11
5.7	Replacing the HydroClean micro-filter element ..	5-12
5.8	Checking the pre-load of the pressure accumulator	5-14
5.9	Checking and cleaning the hydraulic oil cooler ..	5-15

6	Crane winch	6-1
6.1	General maintenance instructions	6-1
6.2	Checking the winch gearbox oil level	6-3
6.3	Changing the winch gearbox oil	6-3
6.4	Maintaining the brake	6-4
7	Undercarriage	7-1
7.1	Cleaning the frame and track frames	7-1
7.2	Maintaining the crawler track	7-2
7.2.1	Spring tensioning fixture - adjusting track tension	7-3
7.2.2	Checking the tightening torque of base plate bolts	7-5
7.2.3	Checking the travel drive oil level	7-6
7.2.4	Changing the travel drive oil	7-7
8	Rotary connection	8-1
8.1	Lubricating the slewing ring raceway manually	8-2
8.2	Lubricating the slewing ring gearing	8-3
8.2.1	Gear spray	8-3
8.2.2	Slewing ring lubrication	8-4
8.2.3	Tightening the slewing ring bolts	8-6
9	Telescopic boom	9-1
9.1	Lubricating the telescopic boom	9-1
9.2	Inspection of the telescopic boom	9-2
10	Ballast elements - checking the safety chains	10-1
11	Automatic climate control	11-1
11.1	Cleaning the recirculating air filter	11-1
11.2	Cleaning the fresh air filter	11-3
12	Electrical system	12-1
12.1	Servicing battery connections	12-1
13	Structural steelwork and static load-bearing parts	13-1
13.1	Checking static load-bearing parts and steel components for damage	13-1

1 Safety

1.1 Presentation of safety information

This operating manual contains warnings to alert you to hazardous situations.

Safety alert symbol



This is the safety alert symbol. It alerts the user of potential hazards of personal injury. To avoid injury and death, all safety instructions following this symbol must be observed.

Signal word

The signal word indicates the severity and the probability of occurrence of the danger if the instruction is not complied with.



DANGER, this signal words indicates a hazardous situation that will cause severe injury or death if not avoided.



WARNING, this signal words indicates a hazardous situation that may cause severe injury or death if not avoided.



CAUTION, this signal words indicates a hazardous situation that may cause light or medium injury if not avoided.



NOTICE, this signal word indicates important but not safety-relevant information (e.g. risk of property damage).

Warnings in this operating manual



WARNING

Warnings indicating a hazardous situation that could result in injury are always introduced with the safety alert symbol and the signal word.

NOTICE

Warnings indicating a hazardous situation that could result in property damage are introduced by the signal word.

1.2 Danger sources

The machine has been built in accordance with the state of the technology and the recognized safety regulations. Nevertheless, there may be dangers during its use to personnel, machines and other material assets, if...

- the machine is not used as intended,
- the machine is not operated or maintained by trained personnel,
- the safety instructions are not complied with,
- the machine has defects,
- the attached tools do not comply with the relevant safety regulations,
- the attached tools have defects.

1.3 National and international regulations

National and international regulations apply in addition to the safety instructions in this manual.

For example, in the Federal Republic of Germany:

- Winches, Lifting and Pulling Equipment (BGV D8)
- Cranes (BGV D6)
- Crane Inspections (BGG 905)

Information

If national regulations in the country of operation deviate from our recommendations, the more stringent procedure should be followed.

1.4 General safety instructions

The maintenance tasks listed must only be carried out by trained and instructed specialists.

Sudden motion or unintentional starting can result in serious injury or death for anyone on or near the machine. Therefore, observe the following:

- Park machine on a firm substrate. If necessary, move the machine back from the edge of the excavation site.
- Lower attached loads and boom to the ground.
- Apply the brake.
- Switch off machine and safeguard it against unauthorized restart.
- In addition, use chocks to safeguard the machine from rolling off.
- Comply with statutory accident prevention and safety regulations.
- Lower attached loads and boom to the ground.
- Pull back the safety lever.
- Switch off the machine and safeguard it against unauthorized restart before beginning maintenance work.
- Attach warning sign on the operating elements.
- Smoking and handling of open flame are prohibited.
- When working near batteries, cover them with insulating material; do not place tools on batteries.
- Use safety-compliant access ladders or work platforms.
- Maintain a safe distance from rotating and moving parts.
- Discharge pressure before working on the hydraulic system.
- Wear protective gloves when working with steel wire ropes.
- Use only original MANITOWOC spare parts.
- If necessary, switch off the optional battery disconnect switch to interrupt the power supply.
- Do not lift heavy components manually. Use lifting equipment.
- Reinstall all protective devices on completion of maintenance tasks.
- Keep the cab clean and orderly.
- Execute a function check to ensure faultless operation.
- Only the crane owner or his representative may release the machine following maintenance tasks.
- Use only oils and lubricants listed in the lubricant table.



Walkways**DANGER**

Danger of falling!

The max. load permitted on walkways is 200 kg (440 lb) per grating segment. Overload can damage the construction and result in severe personal injuries.

Check walkways every 3 months for cracks or general damage and repair immediately.

- The maintenance tasks listed must only be carried out by trained and instructed specialists.
- Wear personal protective equipment (e.g. hard hat, hearing protection, protective gloves, safety footwear).
- Comply with statutory accident prevention and safety regulations.
- Lower attached loads and boom to the ground.
- Pull the left-hand safety lever back.
- Switch off the machine and safeguard it against unauthorized restart before beginning maintenance work.
- Attach warning sign on the operating elements.
- Smoking and handling of open flame are prohibited.
- Use safety-compliant access ladders or work platforms.
- Maintain a safe distance from rotating and moving parts.
- Depressurize hydraulic system before starting maintenance tasks.
- Only trained MANITOWOC service personnel are allowed to adjust the hydraulic valves.
- Dispose of hydraulic oil as prescribed.
- Wear protective gloves when working with steel wire ropes.
- Use only original MANITOWOC spare parts.
- Use only oils and lubricants listed in the lubricant table.
- Do not lift heavy components manually. Use lifting equipment.
- Keep the cab clean and orderly.
- If necessary, switch off the optional battery disconnect switch to interrupt the power supply.
- When working near batteries, cover them with insulating material; do not place tools on batteries.
- Reinstall all protective devices on completion of maintenance tasks.
- Execute a function check to ensure faultless operation.



- Only the crane owner or his representative may release the machine for operation, after maintenance tasks.
- Tasks on the machine's electrical equipment must only be executed by a qualified electrician.
- Work on undercarriage, braking and steering systems must only be executed by specialists trained for these tasks.
- Work on hydraulic devices must only be carried out by personnel with specific knowledge and experience in the area of hydraulic systems.
- No welding tasks whatsoever may be carried out on the device without consultation with the manufacturer.

For
Reference
Only

For
Reference
Only

This Page Blank

2 Maintenance schedule, lubrication schedule

2.1 Maintenance schedule

Activities that must be performed on the individual assemblies are specified in the maintenance schedule.

The maintenance intervals are specified in operating hours (OH).

Safety instructions

- The maintenance tasks listed must only be carried out by trained and instructed specialists.
- Wear personal protective equipment (for example, hard hat, hearing protection, protective gloves, safety footwear).
- Only mix oils, lubricants and operating fluids that are of the same type, or identical (same specifications) from one manufacturer.
- Only use oils, lubricants and operational fluids that are approved by MANITOWOC.



Information

- Under extreme operating conditions, for example at high ambient temperatures, shorter intervals can be necessary.
- Observe the instructions in the supplemental manuals, if required.
- Observe the instructions provided by the manufacturer of the assemblies, e.g. ENGINE DOCUMENTATION.



Activity	Every 10 OH / daily	Every 50 OH / weekly	Once after 250 OH / 6 weeks	Every 500 OH / 3 months	Every 1000 OH / yearly	Every 2000 OH / 2 years
– Execute visual inspection and function check in accordance with the operating manual.	X	X	X	X	X	X
– Cab - cab suspension: Check bolts and threaded unions.	X	X	X	X	X	X
– All detachable connections: (bolts, split pins, etc.) check for firm seat.	X	X	X	X	X	X
– Visual inspection of all ropes: Fastening, lubrication, and wear	X	X	X	X	X	X

Activity	Every 10 OH / daily	Every 50 OH / weekly	Once after 250 OH / 6 weeks	Every 500 OH / 3 months	Every 1000 OH / yearly	Every 2000 OH / 2 years
– Ropes: Completely unroll and then roll up under adequate pre-tension ¹⁾		x ¹⁾				
¹⁾ After 100 OH, thereafter every 100 OH						
– Visual inspection of all straps and diagonal ties.	x	x	x	x	x	x
– Check engine oil level. Comply with intervals as specified in the manual provided by the engine manufacturer.	x	x	x	x	x	x
– HydroClean micro-filter (option): Check contamination indicator at SENCOR.	x	x	x	x	x	x
– Hydraulic system: Check oil level.	x	x	x	x	x	x
– Lubricate slewing ring gearing.	x	x	x	x	x	x
– Lubricate the rotary connection.		x	x	x	x	x
– Central lubrication system: Check fill level (option).		x	x	x	x	x
– Slewing ring pinion lubrication: Check fill level of the lubricant tank.		x	x	x	x	x
– Check and clean engine cooler.		x	x	x	x	x
– Check coolant level.		x	x	x	x	x
– Water separator: Check filter		x	x	x	x	x
– Slewing gear: Check oil level, top up oil if necessary ²⁾ .		x ²⁾	x ²⁾			
²⁾ After 50-100 OH; thereafter every 50-100 OH / monthly						
– Slewing gear: Clean oil filter ³⁾ .		x ³⁾	x ³⁾			
³⁾ After 250 OH / 6 weeks; thereafter monthly						
– Slewing gear: Lubrication ⁴⁾ .		x ⁴⁾	x ⁴⁾			
⁴⁾ After 250 OH / 6 weeks; thereafter every 150-200 OH / weekly						

Activity	Every 10 OH / daily	Every 50 OH / weekly	Once after 250 OH / 6 weeks	Every 500 OH / 3 months	Every 1000 OH / yearly	Every 2000 OH / 2 years
– Check and clean hydraulic oil cooler.		X	X	X	X	X
– Check and clean combination cooler.		X	X	X	X	X
– Check heating system filter.		X	X	X	X	X
– Clean hydraulic cylinders and check for leaks.		X	X	X	X	X
– Lift winches: Check oil level and check for leaks.		X	X	X	X	X
– Rotary connection: Visually check all connection elements for damage and corrosion.		X	X	X	X	X
– Batteries: Check cable connections and fuses.		X	X	X	X	X
– Lubricate machine.		X	X	X	X	X
– Rope clamps: Retighten screws.		X	X	X	X	X
– AC compressor: Check V-belt status and tension.		X	X	X	X	X
– AC compressor: Check compressor threaded union for firm seat. ⁵⁾			X ⁵⁾	X ⁵⁾	X ⁵⁾	X ⁵⁾
⁵⁾ Every 250 OH						
– Check heating system filter.			X	X	X	X
– Shut-off flap - hydraulic tank (option): Visual inspection for leaks			X	X	X	X
– Check antifreeze.			X	X	X	X
– All winches: Lubricate bearing bushes.			X	X	X	X
– Both crawler travel drives: Check oil level and check for leaks.			X	X	X	X
– Crawler track: Check chain tension.			X	X	X	X

Activity	Every 10 OH / daily	Every 50 OH / weekly	Once after 250 OH / 6 weeks	Every 500 OH / 3 months	Every 1000 OH / yearly	Every 2000 OH / 2 years
– Sprocket: Use suitable methods to check screws for firm seat.			X	X	X	X
– Base plates: Use suitable methods to check screws for firm seat.			X	X	X	X
– Check slewing ring bolts for firm seat with suitable methods.			X	X	X	X
– Structural steelwork Use suitable agents for cleaning and care.		X		X	X	X
– Structural steelwork Use suitable methods to check for structural damage, (e.g. deformation, damage, corrosion, cracks).			X	X	X	X
– Counterweight Check for secure fastening of the counterweight elements with required torque.				X	X	X
– Preload pressure - have hydraulic accumulator checked by specialized hydraulic company. ⁶⁾			x ⁶⁾	x ⁶⁾	x ⁶⁾	x ⁶⁾
⁶⁾ After 250 OH / 6 weeks and after 500 OH / 3 months; thereafter every 1000 OH / yearly						
– Slewing gear: Change oil. ⁷⁾			x ⁷⁾		x ⁷⁾	x ⁷⁾
– Slewing gear: Clean the magnetic closure of the oil drain. ⁸⁾			x ⁷⁾		x ⁷⁾	x ⁷⁾
– Return filter: Replace filter element. ⁷⁾			x ⁷⁾		x ⁷⁾	x ⁷⁾
– Leak oil filter Replace filter element. ⁷⁾			x ⁷⁾		x ⁷⁾	x ⁷⁾
– Aeration filter: Replace filter element. ⁷⁾			x ⁷⁾		x ⁷⁾	x ⁷⁾
– Hoisting winches: Change oil. ⁷⁾			x ⁷⁾		x ⁷⁾	x ⁷⁾

Activity	Every 10 OH / daily	Every 50 OH / weekly	Once after 250 OH / 6 weeks	Every 500 OH / 3 months	Every 1000 OH / yearly	Every 2000 OH / 2 years
– Both travel gears: Change oil. ⁷⁾			x ⁷⁾		x ⁷⁾	x ⁷⁾
⁷⁾ After 250 OH / 6 weeks; thereafter every 2000 OH or yearly						
– Check gallery for cracks or general damage and repair immediately.				x	x	x
– Heating/air conditioning system (option): Have checked by an authorized workshop.					x	x
– Air filter: Replace replacement cartridge and safety cartridge.					x	x
– DEF (AdBlue) tank filter: Replace ¹⁰⁾ .						
– Filter of DEF (AdBlue) supply module: Replace. ¹⁰⁾						
– Change coolant.						x
– Hydraulic system: Change oil. ⁸⁾						x ⁸⁾
⁸⁾ Certain hydraulic oils do not have to be changed as often depending on the results of regularly performed hydraulic oil analyses. The machine must be equipped with MANITOWOC HydroClean. The hydraulic oils approved for extended use are included in the list of operating fluids located in the Appendix. The sampling intervals can be found in Section SAMPLING INTERVALS.						
– Check or replace slewing ring bolts. ⁹⁾						x ⁹⁾
⁹⁾ Every 5000 OH / every 5 years						
¹⁰⁾ Every 4500 OH						
– Clean or replace diesel particulate fil- ter ¹¹⁾ (US EPA Tier 4f / EU Stage V engine only)						
¹¹⁾ After 6,500 OH						



Information

Testing the slew ring bolts must be performed by an expert from an independent specialist company or institute. Unrestricted further use of the slewing ring bolts must be verified with a certificate.

Otherwise, replace the slewing ring screws. Section 2.1.1

2.1.1 Hydraulic oil analysis

Every MANITOWOC machine is filled with Shell hydraulic oil at the factory. Performing regular hydraulic oil analyses allows this hydraulic oil to be used for extended periods.

These hydraulic oil analyses can detect critical states in the hydraulic system early and prevent damage.

However, the machine must be equipped with a MANITOWOC HydroClean filter in order to be able to extend the change intervals.

When performing the hydraulic oil analyses, samples of the hydraulic oil must be sent to a MANITOWOC authorized laboratory at fixed intervals.

Sampling intervals

The hydraulic oil analysis must be performed at the following intervals:

- A MANITOWOC service technician will take the first hydraulic oil sample after 250 operating hours.
- The owner must take the second hydraulic oil sample after 1,000 operating hours.
- The third hydraulic oil sample is taken by the owner after around 1,900 operating hours so the results are available to Service after 2,000 operating hours.
- After 2,000 operating hours, the owner must take a hydraulic oil sample every 500 operating hours.

Sampling point The sampling point is designated by the sticker in Fig. 1.

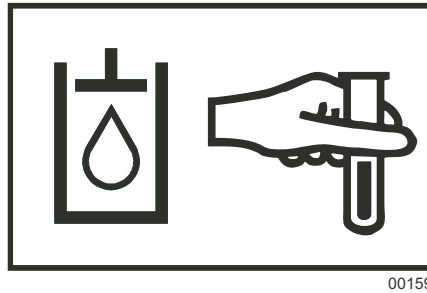


Fig. 1 Sampling point sticker

Take the sample from the measurement connection (1) in Fig. 2 on the HydroClean filter.

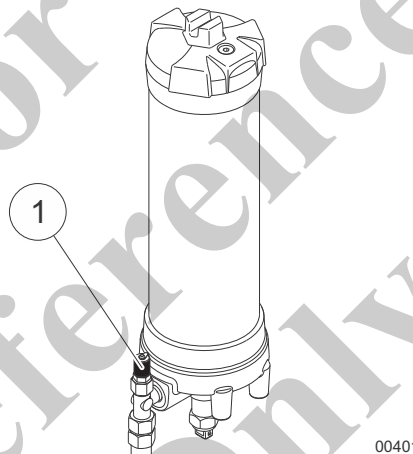


Fig. 2 Sampling point on HydroClean filter

Sampling

NOTICE**Risk of machine damage due to incorrect hydraulic oil analysis.**

The hydraulic system could be damaged if the results of the analysis are distorted due to an unclean hydraulic oil sample.

- Ensure absolute cleanliness when sampling.
- Only use new and unused sample containers.

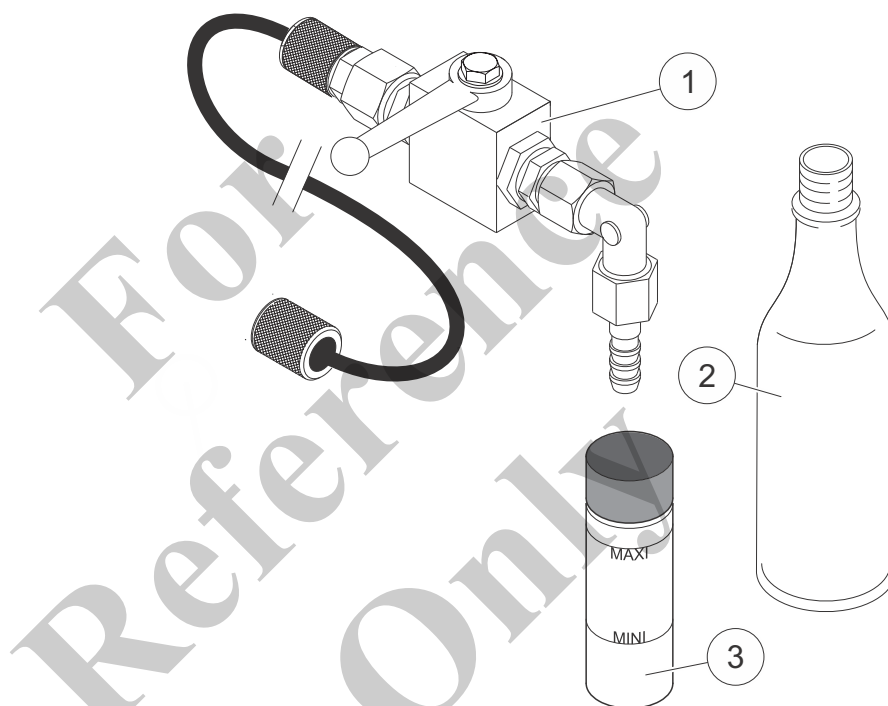


Fig. 3 Hydraulic oil sampling materials

1	Device for removing hydraulic oil samples
2	Container for flushing oil
3	Sample container

WARNING

Risk of severe burns from hot parts and hydraulic oil.

Contact with hot hydraulic system parts or hot hydraulic oil can cause severe burns.

- Avoid contact with hot parts.
- Wear protective clothing and protective gloves.

WARNING

Risk of serious injury from pressurized hydraulic oil.

Opening the hydraulic system can cause pressurized hydraulic oil to eject and result in serious injury.

- Wear protective clothing and protective gloves.

- | | |
|---|--|
| 1 | Start the machine and let it run for at least 15 minutes. |
| 2 | Set the tool on the floor and let the machine run to idle. |
| 3 | Thoroughly clean the area around the sampling point. |
| 4 | Remove the protective cap from the measurement connection (1) in Fig. 4. |

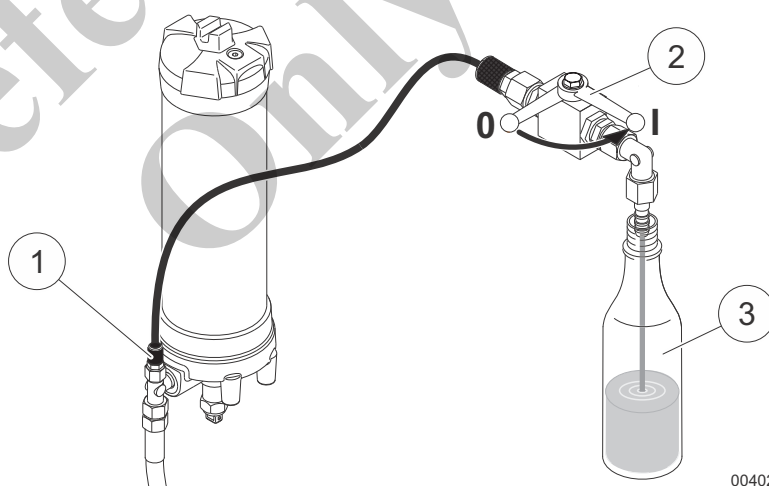


Fig. 4 Draining flushing oil

- | | |
|---|--|
| 5 | Connect the device for removing hydraulic oil samples (2) in Fig. 4 to the measurement connection (1) in Fig. 4 and drain around 0.25 l hydraulic oil into an empty container (3) in Fig. 4. |
| 6 | Dispose of the drained hydraulic oil in accordance with regulations. |

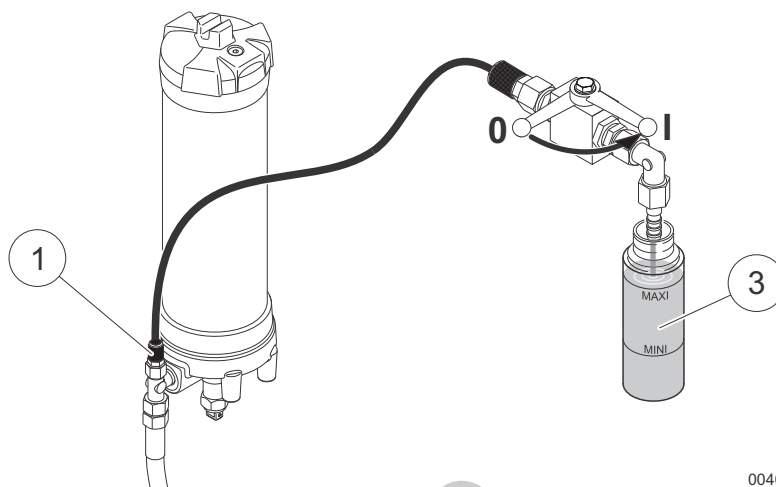


Fig. 5 Taking hydraulic oil sample

00403

- | | |
|----|--|
| 7 | Open a new, clean sample container (3) in Fig. 5 and fill it to the MAX mark with hydraulic oil. Make sure the sample container or closure do not become contaminated. |
| 8 | Carefully close the sample container. |
| 9 | Remove the device for taking hydraulic oil samples from the sampling point and clean it. |
| 10 | Cover the measurement connection (1) in Fig. 5 with the protective cap. |
| 11 | Send the sample container to the laboratory. |

2.2 Lubrication points

Safety notice

- Only mix oils, lubricants and operating fluids that are of the same type, or identical (same specifications) from one manufacturer.



Information

Lubrication intervals and suitable lubricants are specified in the lubricants list in the appendix.

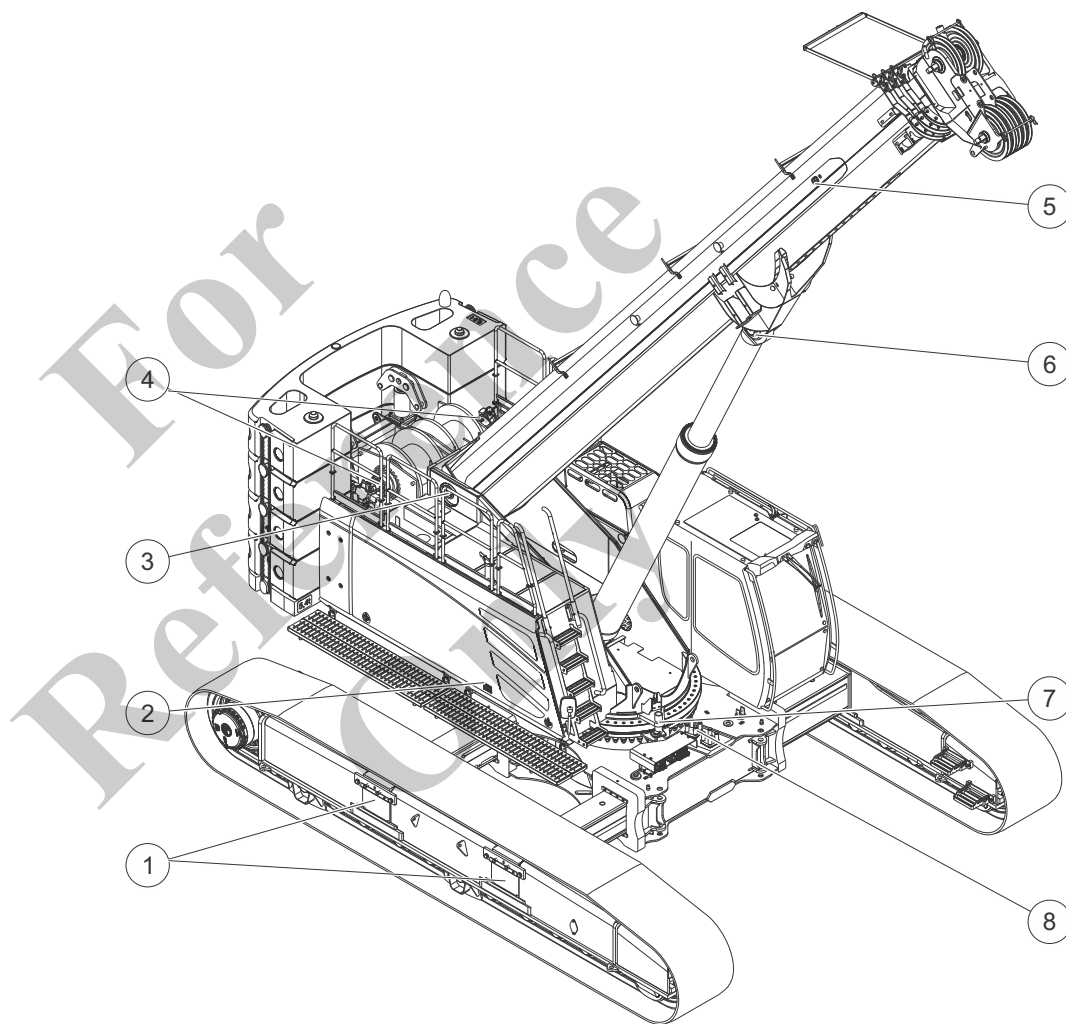


Fig. 6 Lubrication points at the machine

1	Terminal keys	5	Telescopic boom
2	Central lubricating strip	6	Luffing cylinder
3	Boom pivot point	7	Uppercarriage locking mechanism

4	Winch gear	8	Cross member
---	------------	---	--------------

Lubricating the ropes

Steel wire ropes are lubricated during manufacture. This lubrication suffices for storage and for initial operation.

Lubrication intervals for ropes depend on the operating conditions (type of cable, weather conditions, types of use) and cannot therefore be defined exactly by MANITOWOC.

MANITOWOC ensures that cable lengths are chosen according to customer specifications and that they correspond to the load lift chart. To keep wear and damage that could be caused by corrosion to a minimum, ensure that:

- steel wire ropes are always lubricated sufficiently during daily operation,
- steel wire ropes are always **completely** unreeled at intervals of 100 operating hours, checked for damage, adequately lubricated, and reeled up again under adequate tension.

This prevents loosening of the rope layers and potential risk of damage. This applies in particular if the entire length of the wire rope is not used and remains coiled up on the drum.



Information

Observe the supplemental documentation HANDLING, MOUNTING AND MAINTENANCE OF WIRE ROPES.

2.3 Fill quantities

Safety notice



- Only mix oils, lubricants and operating fluids that are of the same type, or identical (same specifications) from one manufacturer.

The following values are guide values. The fill level shown on the respective part is authoritative.

Component	Quantity
Drive engine	16.7 l / 4.4 US gal
Radiator	11.5 l / 3.0 US gal
Fuel tank (combination tank)	approx. 500 l / 132.1 US gal
Hydraulic tank (combination tank)	approx. 765 l / 202.1 US gal
DEF (AdBlue) tank (Tier 4f engine)	approx. 45 l / 11.89 US gal
Crane winch	approx. 3 l / 0.8 US gal
Slewing ring raceway	As needed
Slewing gear	Approx. 3.5 l / 0.92 US gal in the gearbox, approx. 1.0 l / 0.26 US gal in the container
Lubrication points (see Lubrication schedule)	As needed
Grease tank (for slewing ring gearing/pinion lubrication)	approx. 1.0 l / 0.26 US gal
Telescopic boom - slide surfaces	As needed
Bolts - uppercarriage locking mechanism	As needed
Lubricant tank - Lincoln central lubrication system (option)	approx. 2.0 l / 0.52 US gal
Travel gear	approx. 6.0 l / 1.59 US gal

This Page Blank

3 General instructions

Clean the machine monthly, particularly prior to maintenance and repair work. Shorten the cleaning intervals depending on operating conditions and contamination.

WARNING

Danger of injury due to falling.

Danger of falling when performing work above body height.

- Place the machine in park position, lower equipment to the ground.
- Only perform work from a safe standing surfaces.
- Use work platforms.
- Do not use machine parts as climbing aids if they are not intended for this purpose.

WARNING

Danger of injury due to unintentional machine movements.

Danger of crushing and falling due to unintentional machine movements.

- Switch off the machine and safeguard it against being switched on again.
- Attach a sign in the cab that alerts to the fact that service tasks are being executed.

Dry cleaning

If there is minor dust contamination, dry-clean with compressed air (max. 2 bar / 29 psi) and a soft brush.

Wet cleaning



Information

Observe environmental protection regulations

Environmental hazard due to improper handling of environmentally harmful substances.

If the machine is wet-cleaned, there is a risk that environmentally harmful cleaning agents and operating fluids can get into the environment.

- Only wet-clean on a surface that is equipped with oil separators.



Information

Danger of material damage due to improper cleaning.

In a dusty environment, e.g. with fine dust or paper dust, wet-cleaning

the radiators or coolers may cause concrete-like clumping.

- Remove all foreign objects with compressed air prior to wet-cleaning.

Lubricate all bearing points to prevent water ingress.

Seal all openings into which water must not penetrate:

- Exhaust pipe
- Air filter
- Ambient air filters of heating and air conditioning system

Protect all components that must not be cleaned with water from the direct water jet:

- Electrical and electronic assemblies and components
- Exhaust aftertreatment system
- Rotary connection
- Bolt bearing points

Cleaning



Information

Danger of material damage due to improper cleaning.

Only use neutral or slightly alkaline cleaning agents.

Only use clean sponges, brushes and cloths.

When using a high-pressure cleaner, excessive pressure and excessive temperature can cause paint damage.

- If the first three months after commissioning or after repainting:
 - Use cold water with a low dose of a neutral cleaning agent.
 - Operating pressure: max. 60 bar / 870 psi.
 - Spray distance: min. 30 cm / 1 ft
 - Spray angle: 30° to 60°
- After three months:
 - Water temperature max. 60 °C / 140 °F
 - Operating pressure: max. 100 bar / 1 450 psi
 - Spray distance: min. 30 cm / 1 ft
 - Spray angle: 30° to 60°

1	Apply water with cleaning agent and let it soak in.
2	Remove firmly adhering contamination with a sponge or brush.
3	Rinse off the machine with clean water.
4	Clean cab windows and mirrors using a commercially available cleaning agent.

After cleaning

- Remove all coverings that were attached for cleaning.
- Grease all bearing points and rotary connection.
- Warm up the engine so that water residue can evaporate.
- Check all machine functions.
- Check all lines for damage and leaks.
- Treat rubber seals with commercially available rubber care agent.
- Check warning signs and instruction signs for completeness and legibility. Replace missing or damaged signs.
- Check paint finish for visible damage. Repair paint damage immediately, pay attention to the corrosiveness class of the paint structure.
- Check preservation (corrosion protection), repair or replace, if necessary.



Information

Repair paint damage as specified in the MANITOWOC Repair Manual for Paint Damage.

Apply corrosion protection as specified in the MANITOWOC instructions for preservation.

The manuals are available from the MANITOWOC CraneCare Sales and Service Partners.

3.1 Oils and lubricants

NOTICE

Machine components can be damaged by different types of lubricants and operating fluids!

Mixing of different types of oils, lubricants or operating fluids damages machine components.

- Only use the same type of oils, lubricants, and operating fluids.
- Only use oils, lubricants and operational fluids that are approved by MANITOWOC.
- Only mix oils, lubricants and operating fluids that are of the same type, or identical (same specifications) from one manufacturer.

**Information**

Only use oils and lubricants approved by MANITOWOC. These are listed in the lubricants table. The ambient temperature for operating the machine must be between 20 °C (- 4 °F) and + 40 °C (+ 104 °F). If the temperature at the site is outside these values, consult with MANITOWOC CraneCare Customer Service before starting operation.

Oil diagnosis

The oil diagnosis is executed by a qualified laboratory. Regular oil diagnosis helps to avoid unnecessary costs. A series of tests will determine the following:

- Oil condition
- Amount of abraded metal particles in the sample
- Wear rate of components

Recommended for: Hydraulic system, drive engine and winch.

Biodegradable oils and lubricants

The use of such substances is expressly required where the leakage of mineral-based oils and lubricants poses a hazard to the environment. The use of environmentally-friendly lubricants is mandatory, particularly in water conservation or nature conservation areas. Only synthetic, ester-based biological oils may be used.

3.1.1 Disposal of lubricants and operating fluids

NOTICE

Risk of environmental pollution due to improper disposal of solvents!

Improper disposal of lubricants and solvents contaminates the ground water.

- Observe the applicable environmental protection regulations.
- Properly handle and dispose of solvents and lubricants.

Excerpt from the *Disposal Directive 75/439/EEC*:

- "It is prohibited to mix spent oil with other waste."
- "Spent oils must not be mixed together."
- "Used oil filters must be collected, kept, transported and disposed of separately from other waste."



Information

Lubricants and other operating fluids must be disposed of at suitable collection points.

- In addition, any national environmental regulations applicable at the site of operation must be observed.

Batteries

Observe the safety instructions and protective measures when handling batteries.



Information

Do not dispose of batteries with domestic waste!

Dispose of defective batteries at a collection point for old batteries.

- In addition, any national environmental regulations applicable at the site of operation must be observed.

3.2 Coolant – drive engine

3.2.1 Coolant – general

NOTICE

Risk of engine damage due to overheating of the engine!

Adding unsuitable coolants and coolant additives results in damage to the radiator and causes the engine to overheat.

- Only fill suitable coolant of the same type.
- Only fill suitable coolant additives.

NOTICE

Risk of engine damage when filling coolant into an overheated engine!

If coolant is filled into a hot engine, this will result in engine damage.

- Allow the engine to cool before filling coolant.

Depending on the type of engine installed, the engine is filled at the factory with the coolant specified in Section 3.2. The antifreeze is sufficient to -37 °C (-34 °F).

**Information**

Observe the instructions on the coolant sticker in the radiator area.

If the ambient temperature at the site of operation is below this value (-37 °C (-34 °F)), observe the instructions in the operating manual provided by the engine manufacturer, or consult with the MANITOWOC Crane Care customer service organization before start-up.

**Information**

If only a small amount (up to max. 5 l) is required to top up the cooling circuit and no suitable coolant is available, you can provisionally add clean drinking water.

However, the concentration must be checked at the next opportunity, or at the latest before ambient temperatures fall below freezing. Appropriate anti-freeze agent must be added to ensure the required frost protection.

The mixture of water and anti-freeze agent not only ensures frost protection, it is also important for corrosion protection. This is also why the right concentration must be checked regularly and adjusted if necessary.

**Information**

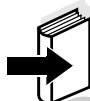
- Use clean, neutral, filtered, fairly soft fresh tap water. MANITOWOC recommends distilled water as the best variant.
- Note that Cummins specifies distilled water.
- Do not use ditch water, industrial drain water, salt water, sea water or rain water.
- Always fill using a water-coolant mixture. Observe the mixing ratio. Mix before filling.

Ensure that the water has the following characteristics:

pH value	7 – 8
Chloride content	max. 100 ppm
Sulfate content	max. 100 ppm
Water hardness	3-12°dGH

**Information**

Observe the recommended mixing ratio (see manufacturer's specifications). If the content of anti-freeze agent is too high, the cooling and frost protection properties will be adversely affected. Observe the specifications of the anti-freeze manufacturer.



Observe the coolant manufacturer's guidelines and/or instructions for use.

Use of other coolants

If any other coolant than those specified above are used, the following must be **considered** or **expressly observed**:

MANITOWOC will accept no responsibility and will provide no warranty or make any guarantees for the use of any coolants other than those specified above.

 CAUTION**Danger of scalding due to evaporating coolant!**

Hot coolant vaporizes when the coolant tank is opened. Personnel in the vicinity suffer scalding injuries.

- Allow the engine to cool down before draining coolant.
- Collect the coolant in a suitable container when draining and dispose of it in accordance with regulations.

Changing coolant

- Completely drain the cooling system before filling.
- Flush the cooling system several times with clean water.
- Fill the cooling system.
- Check the fill level after a short waiting period.
- Start the engine and check the coolant level.

Safety notice

- If at regular checks of the coolant level any lubricating oil is evident in the coolant or if there is conspicuous turbidity, then the coolant must be replaced.

Change intervals

For information about changing the coolant and change intervals refer to the operating manual provided by the engine manufacturer.

3.3 Welding

Safety instructions

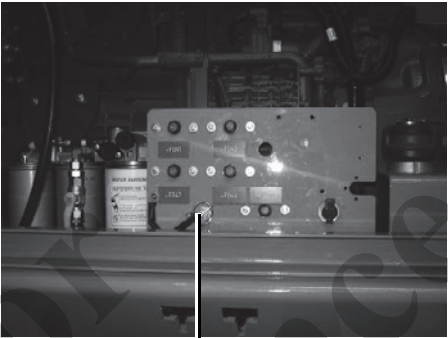
- Welding must only be carried out by an authorized and qualified welding specialist.
- Drilling or welding are prohibited on
 - Boom sections
 - Load-bearing frame parts
 - Engine
 - Hydraulic tank
 - Fuel tank
 - Cab
 - Components supplying fuel and oil
- Cover vulnerable components with fireproof material.

Preliminary work

Before welding, carry out the following preliminary work:



- | | |
|---|---|
| 1 | Press the battery disconnect switch (1) in Fig. 7 to disconnect the power supply. |
| 2 | Clamp the ground terminal of the welding device directly to the component to be welded. |



1

Fig. 7 Position of the battery disconnect switch

For
Reference
Only

This Page Blank

4 Diesel engine

WARNING

Danger of injury due to rotating parts or hot engine parts!

Persons will be injured due to moving parts or hot parts of the running engine.

- Only execute maintenance work when the drive engine is shut down and the cooling system has cooled down.

Safety instructions

- Only carry out maintenance or repair work when the engine is shut off and cooled down. Safeguard the machine against unauthorized restart before starting maintenance work.
- Waste oil must not seep into the ground or waterways. Dispose of oil and oil filters in accordance with statutory regulations.
- Coolant must not seep into the ground or into waterways. Dispose of coolant in accordance with statutory regulations.



Information

Observe the instructions and recommendations in the operating instructions of the engine manufacturer.

4.1 Engine oil

Safety instructions

- Proceed with utmost caution when draining hot oil.
- Waste oil must not seep into the ground or waterways. Dispose of oil and oil filters in accordance with statutory regulations.
- Observe the instructions in the operating manual provided by the engine manufacturer.
- Only mix oils, lubricants and operating fluids that are of the same type, or identical (same specifications) from one manufacturer.

Checking the engine oil level

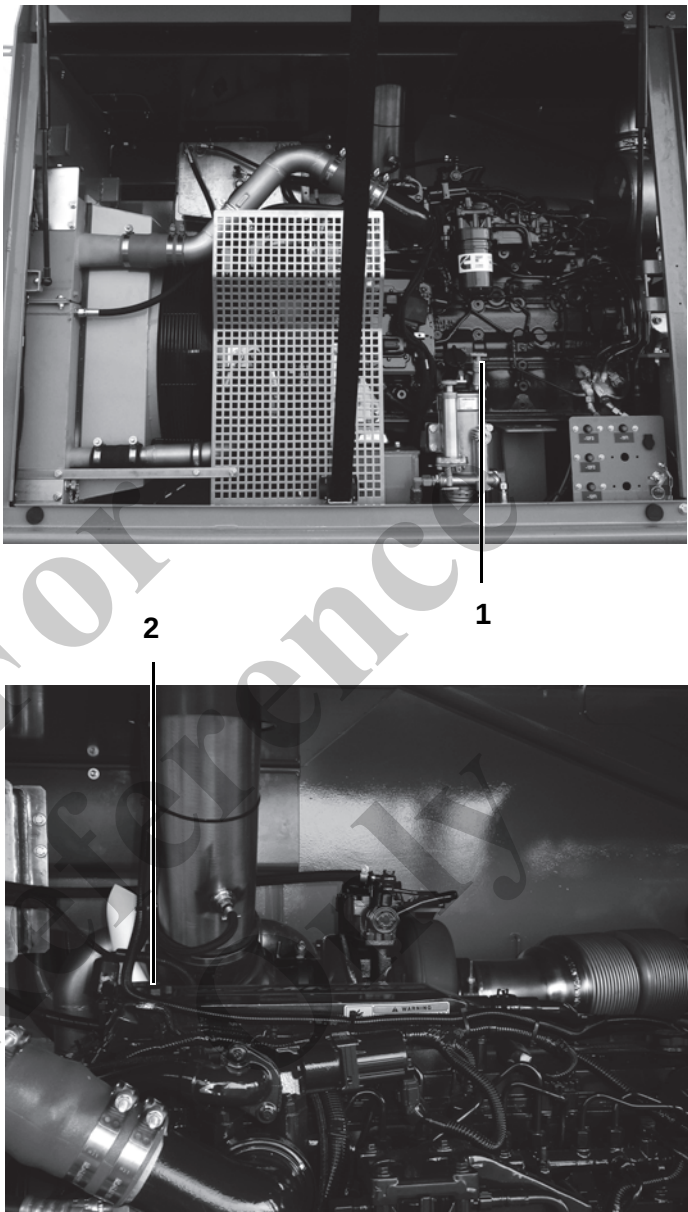


Fig. 8 Oil dipstick and filler neck

- | | | | |
|---|----------|---|-----------------|
| 1 | Dipstick | 2 | Oil filler neck |
|---|----------|---|-----------------|

1	Place the machine in a horizontal position.
2	Run engine for approximately 2 minutes until the system is filled with oil.
3	Shut down the drive engine.
4	Open the service door on the right.

5	Remove oil dipstick (1) in Fig. 8 and wipe it off with a clean, lint-free cloth.
6	Insert oil dipstick to the stop and pull it out again.
7	Check oil level: The oil level must be between the lower marking (MIN) and the upper marking (MAX).
8	If necessary, top up engine oil via the filler neck (2) in Fig. 8 as specified in the operating manual provided by the engine manufacturer.

Changing the engine oil and oil filter

1	Warm up the engine.
2	Place the machine in a horizontal position.
3	Open the service door on the right. Remove lower cover.
4	Change engine oil and oil filter in accordance with the instructions in the engine manufacturer's operating manual.
5	Check oil level: The oil level must be between the lower marking (MIN) and the upper marking (MAX).
6	If necessary top up engine oil as specified in the operating manual provided by the engine manufacturer.

4.2 Air filter

WARNING

Danger of burn injuries due to unsuitable cleaning agents!

Persons suffer burn injuries when cleaning the air filter with hot or flammable cleaning agents.

- Never use gasoline, soap or hot liquids to clean the air filter.
- Only clean the air filter when the engine is shut off and cooled down.

NOTICE

Engine damage due to cleaning with compressed air!

When cleaning the interior of the housing with compressed air, contaminants get into the engine.

- Never use compressed air to clean the interior of the housing.

Air filter indicator light



The condition of the air filter is monitored by a sensor.

The degree of contamination is determined by measuring the resistance to air flow through the filter. If the maximum permissible flow resistance is reached, the *air filter* indicator light lights up on the SENCON.

A warning tone also sounds. Check and clean the air filter immediately.

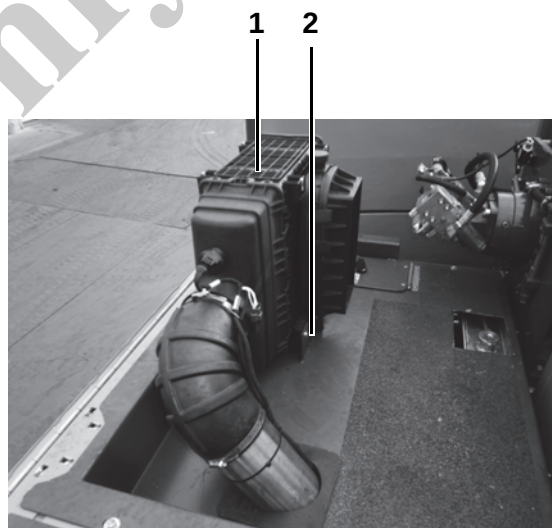


Fig. 9 Position and elements of the air filter

1	Air filter cover	2	Dust discharge valve
---	------------------	---	----------------------

Replacing the air filter - Tier 4f

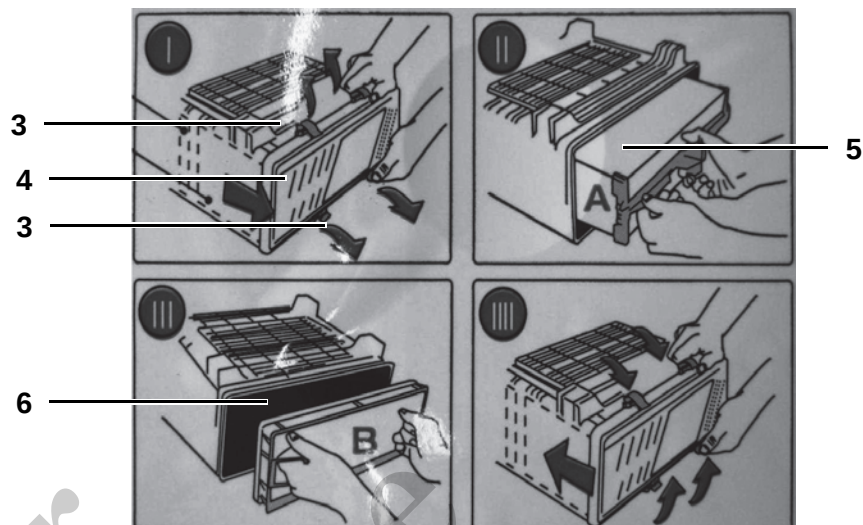


Fig. 10 Replacing the air filter

1	Set down loads and turn off the engine.
2	Climb up to the uppercarriage via the ladder.
3	Open the four locking clamps (3) in Fig. 10 of the air filter cover and remove the air filter cover.
4	Pull out the main element, Primary (5) in Fig. 10, and the safety element, Secondary (6) in Fig. 10, and dispose of them properly.
5	Insert the new main element, Primary (5) in Fig. 10, and safety element, Secondary (6) in Fig. 10.
6	Fasten the air filter cover (4) in Fig. 10 using the locking clamps (3) in Fig. 10.



Information

Replace the main element and safety element, do not clean them!
Danger of engine damage!

**Cleaning the air filter
pre-separator - Tier 4f****Information**

If dust escapes when pressing the dust discharge valve, the pre-separator of the air filter must be cleaned.

1	Set down loads and turn off the engine.
2	Climb up to the uppercarriage via the ladder.
3	Open the locking clamps of the pre-separator cover (7) in Fig. 11.
4	Carefully clean the pre-separator of the air filter using compressed air.
5	Attach the pre-separator cover (7) in Fig. 11 using the locking clamps.
6	Close the service door.

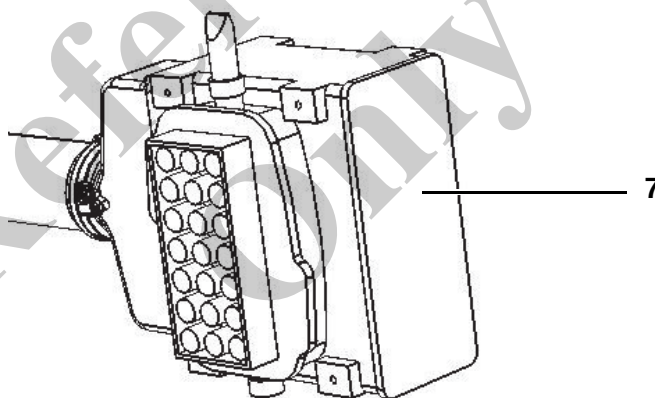


Fig. 11 Air filter pre-separator

Air filter replacement - Tier 3a

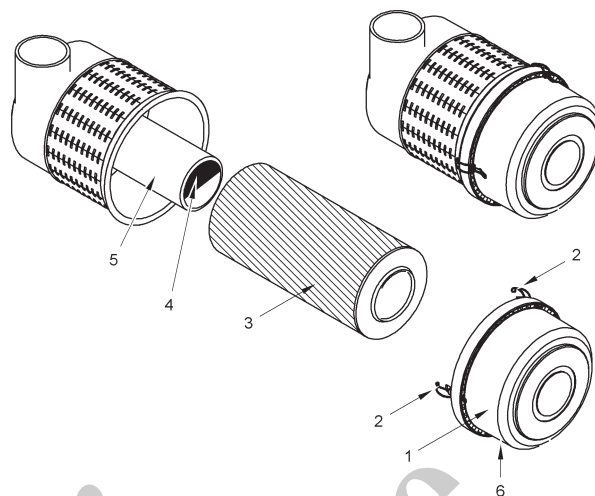


Fig. 12 Structure air filter

1 Air filter cover	4 Handle
2 Locking clamps (3 pc.)	5 Safety cartridge
3 Replacement cartridge	6 Tab

1	Open the locking clamps (2) in Fig. 12 of the air filter cover (1) and remove the air filter cover.
2	Remove replacement cartridge (3).
3	Clean the replacement cartridge: – Blow out from inside to outside using dry compressed air (max. 2 bar/29 psi). – Only knock out in case of emergency!
4	Check replacement cartridge for damage to the filter paper and the seals. Exchange if necessary.
5	Exchange safety cartridge (5) after 5 filter service intervals (at least every 2 years): – Remove the safety cartridge by the handle (4). – Never clean the safety cartridge! – Insert new safety cartridge.
6	Insert new or cleaned replacement cartridge (3).
7	Fit on the air filter cover (1) in such a manner that the tab (6) points downward, the "TOP" marking must be on top.
8	Reattach the air filter cover (1) using the locking clamps (2).

4.2.1 Combination cooler



Danger of injury due to rotating parts or hot engine parts!

Persons will be injured due to moving parts or hot parts of the running engine.

➤ Only execute maintenance work when the drive engine is shut down and the cooling system has cooled down.

Safety instructions

- Coolant must not seep into the ground or into waterways. Dispose of coolant in accordance with statutory regulations.
- Only mix oils, lubricants and operating fluids that are of the same type, or identical (same specifications) from one manufacturer.

Checking and cleaning the radiator

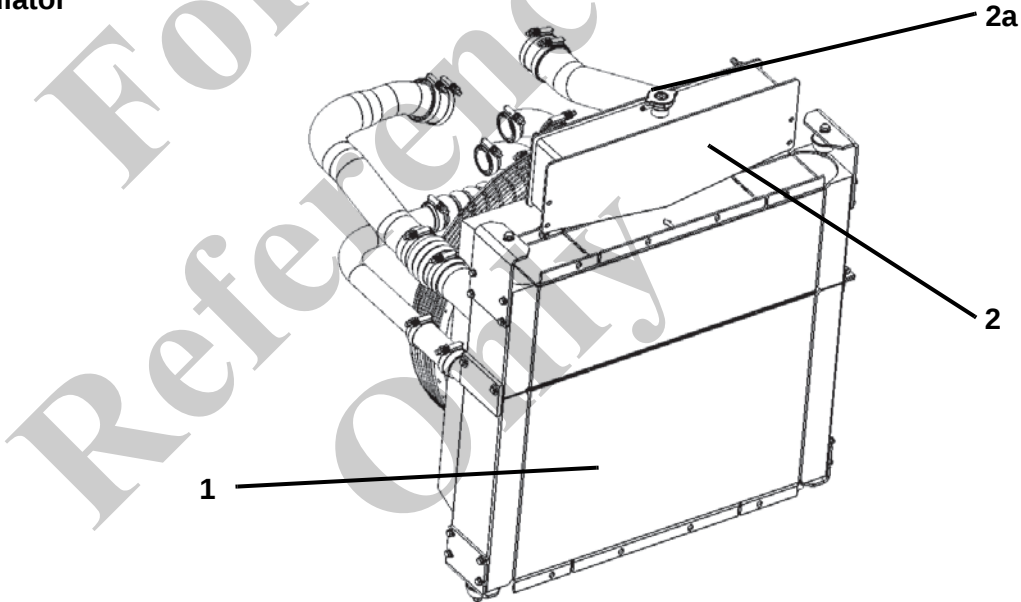


Fig. 13 Combination cooler

1	Let diesel engine and radiator (1) in Fig. 13 cool down.
	⚠ WARNING Danger of burn injuries due to hot engine parts! ● Only open the expansion tank when the engine is cold.
2	Carefully open sealing cap (2a) in Fig. 13 of expansion tank (2) in Fig. 13 to relief the pressure.

3	Check the antifreeze and coolant level, top up if necessary. The coolant must contain at least 50% antifreeze throughout the year.
4	Close the sealing cap (2a) in Fig. 13 of the expansion tank.
5	Blow off cooling fins from the exhaust air side with dry, filtered compressed air (maximum 2 bar). If contaminated with grease and oil, clean the cooling fins using cold-cleaning agent and a steam cleaner.
6	Check radiator for leaks and damaged cooling fins.

**Information**

- To change the coolant, observe the instructions in the operating manual provided by the engine manufacturer.
- MANITOWOC recommends a change interval of 2000 operating hours or maximum 24 months. Whichever comes first.

For Reference Only

4.2.2 Diesel prefilter

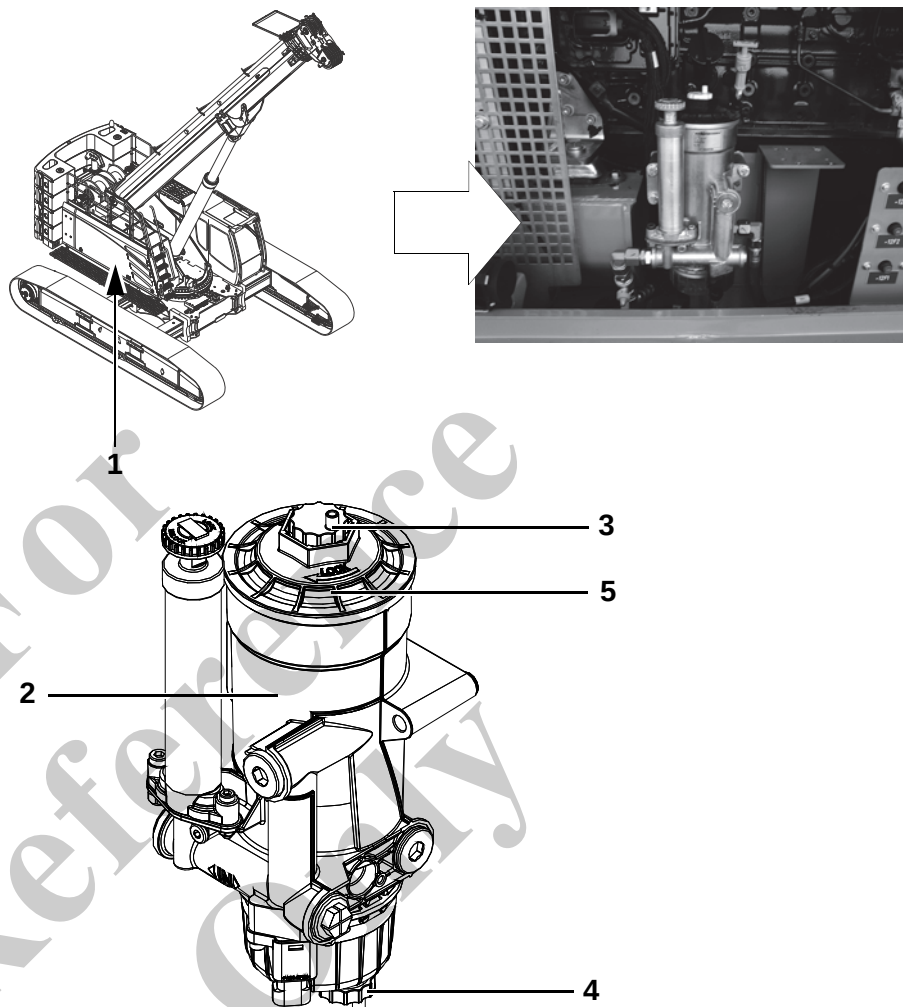


Fig. 14 Position and overview of the diesel prefilter

- | | |
|---|-----------------------------|
| 1 | Service door |
| 2 | Housing of filter cartridge |
| 3 | Vent screw |
| 4 | Drain valve |
| 5 | Screw cap |

Dewatering the diesel prefilter



WARNING

Danger of injury due to rotating parts or hot engine parts!

Persons will be injured due to moving parts or hot parts of the running engine.

➤ Only execute maintenance work when the drive engine is shut down and the cooling system has cooled down.

1	Open the service door (1) in Fig. 14.
2	Place a suitable collecting vessel under the drain valve (4) in Fig. 14 drain valve (5).
3	Open the drain valve (4) Fig. 14.
4	Drain water and contamination from the water container until fuel flows out.
5	Close the drain valve (4) in Fig. 14.
6	Close the service door (1) in Fig. 14.

Changing the filter cartridge



Information

- After dismantling the filter, clean all parts, check for damage or wear and replace parts if necessary.
- Ensure utmost cleanliness when replacing the filter element. In addition, pay attention to the description printed on the filter cartridge.

1	Open the service door (1) in Fig. 14.
2	Place a suitable collecting vessel under the drain valve (5) in Fig. 14 drain valve (5).
3	Open the drain valve (4) Fig. 14.
4	Drain water and contamination from the water container until fuel flows out.
5	Close the drain valve (4) in Fig. 14.

- 6 Unscrew the screw cap (5) in Fig. 14 from the housing (2) in Fig. 14 and pull out the filter element attached to it



- 7 — Unclip the filter element from the screw cap.



- Replace the O-ring of the screw cap (new O-ring is provided with the spare filter element).
- Slightly coat the O-rings on the filter element and on the screw cap with fuel.
- Clip a new filter element into the screw cap.

8	Screw the screw cap (5) in Fig. 14 with the new filter element into the housing (2) in Fig. 14 to the stop. Ensure a tightening torque of 50 Nm.
9	Dispose of old filter element and O-rings.
10	Close the service door (1) in Fig. 14.

4.2.3 Diesel fine filter

Replacement



Information

See the engine manufacturer's operating manual for information on replacing the fuel filter.

4.2.4 Air intake system

Safety instructions

- Check the air intake system regularly.
 - Check the suction hoses for leaks.
 - Check the suction hoses for correct position.
 - Check the hose clips for firm seat.
- Service the dry air filter and the air intake system regularly.



Information

To check the intake system and for replacement of the dry air filter, observe the instructions in the operating manual provided by the engine manufacturer.

4.2.5 Belt drives

Safety instructions

- Only carry out maintenance work when the drive engine is shut down and at a standstill.
- Switch off the machine and safeguard it against unauthorized restart before starting any work.
- Reinstall the protective covering after maintenance work.



Information

To check, tension and change the belt drives, refer to the directions in the operating instructions of the engine manufacturer.

For
Reference
Only

This Page Blank

5 Hydraulic system

WARNING

Danger of injury due to loose hydraulic connection and hot hydraulic oil system!

Escaping hydraulic oil injures persons in the danger zone.

- In the event of injury due to hydraulic oil contact a doctor immediately.
- Ensure that the hydraulic system is de-pressurized before working on it.
- De-pressurize the hydraulic system before starting maintenance any maintenance work.
- Depressurize the pressure accumulator.
- Only open hydraulic lines and threaded unions in de-pressurized status.
- Only have maintenance tasks executed after the hydraulic oil system has cooled down.

Safety instructions



- Work on the hydraulic system may only be carried out by trained personnel with special knowledge and experience in hydraulics.
- Only trained MANITOWOC service personnel are allowed to adjust the hydraulic valves.
- Wear personal protective equipment (for example, hard hat, hearing protection, protective gloves, safety footwear).
- Only execute maintenance tasks when the engine is shut down and the fan wheel is at a standstill. The possibility of automatic start-up must be excluded.
- Before resuming operation, ensure that:
 - there are no objects (e.g. tools) in the area of the fan wheels or that no objects can fall into this area, e.g. due to vibration,
 - the protective devices have been installed.

Cylinder

Pressure cylinders are subject to slight leakage. Remove excess leak oil with a cloth. Dispose of the oil-soaked cloth as hazardous waste. The sliding surfaces of the piston rods are chrome-plated. Heavier leakage indicates damaged sliding surfaces or defective seals.

Clean hydraulic cylinders:

- Do not use sharp edged tools, corrosive fluids or abrasives.
- Wash down piston rods regularly with high-pressure cleaner.
- Apply preservative to extended piston rods after cleaning. This protects the surface from the effects of the environment and weather.

Threaded unions

Check hydraulic threaded unions and couplings regularly for leaks. Seal leak points and remove oil spots. Escaping hydraulic oil is harmful to the environment and poses a hazard due to danger of slipping.

Always seal opened threaded unions immediately with stoppers on both sides.

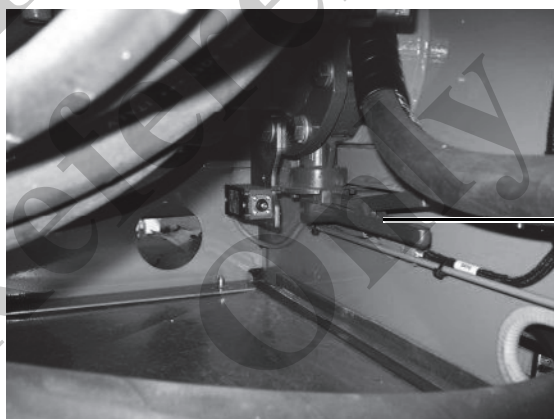
Shut-off flap

Fig. 15 Shut-off flap

The shut-off flap (1) in Fig. 15 must be closed in the following cases:

- When working on the pump regulators.
- When replacing pumps.
- For repair or maintenance tasks.

This prevents larger amounts of hydraulic oil from escaping.

Safety notice

Hydraulic oil must not seep into the ground or waterways.

5.1 Hydraulic hose lines

Storage and service life

Even with proper storage and use at permissible loads, hoses and hose lines are subject to natural aging. This means that their service life is limited.

The owner is responsible for ensuring that hose lines are replaced at suitable intervals, even if safety defects cannot be detected on the hose line.

Hose lines must be replaced at least every six years, including a possible storage period of two years, maximum.

Check

Hose lines should be inspected by an expert at least once a year to ensure that they are safe for further use.

Rectify any defects discovered immediately.

Defects

Replace hose lines in the following cases:

- Outer layer damaged down to the reinforcement (e.g. abrasion points, cuts, cracks)
- Outer layer embrittlement (cracks appearing in hose material)
- Deformations that do not conform to the natural shape of the hose or hose line, either in pressurized status or de-pressurized status, or when bent (e.g. layer separation, blistering)
- Leaks
- Damaged or deformed hose fittings (sealing function impaired)
- Hose has separated from fittings
- Corrosion of fittings that reduces function and strength
- Failure to comply with Installation requirements;
- Storage times and/or service life exceeded

5.2 Checking the oil level

Safety instructions

- Only mix oils, lubricants and operating fluids that are of the same type, or identical (same specifications) from one manufacturer.

1	Lower attached loads and the boom to the ground.
2	Place the machine in a horizontal position.
3	Telescope the undercarriage outward.
4	Retract ballasting cylinders.
5	Completely retract the telescopic boom and lower it.
6	Switch off the diesel engine.

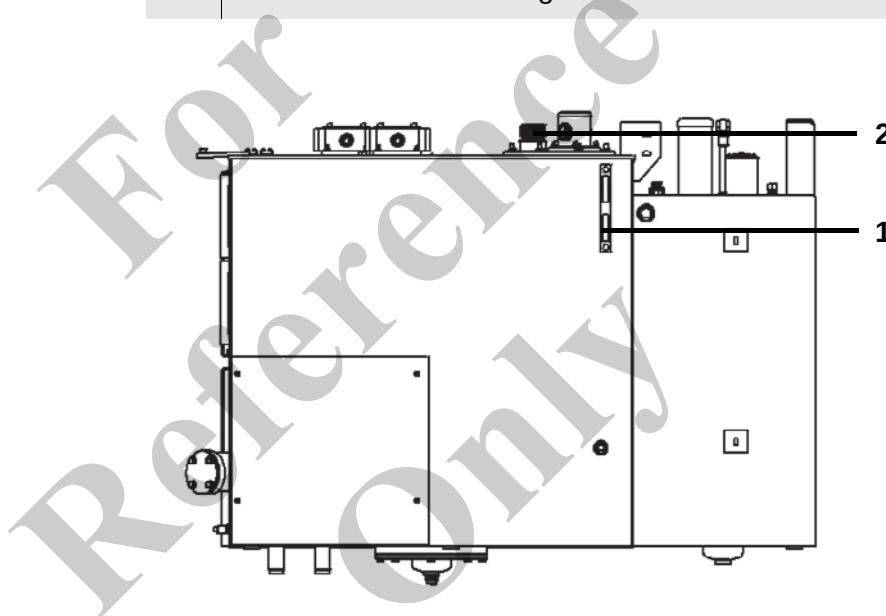


Fig. 16 Oil level indicator and filler neck on combination tank

7	Open front left service door.
8	Check the oil level on the oil level indicator (1) in Fig. 16: The oil level must reach the middle of the sight glass.
9	Top up hydraulic oil if necessary: - Open the cover or remove the cover of the additional tank opening. - Unscrew the cap (2) in Fig. 16 of the oil filler neck. - Top up hydraulic oil and re-check. - Reinstall the screw cap. - Fit the lid or reinstall the cover.

5.3 Changing the hydraulic oil

WARNING

Danger of injury due to loose hydraulic connections!

Escaping hydraulic oil injures persons in the danger zone.

- Only carry out work when the hydraulic system is de-pressurized.
- Work on the hydraulic system may only be carried out by trained personnel with special knowledge and experience in hydraulics.

Safety instructions

- Only mix oils, lubricants and operating fluids that are of the same type, or identical (same specifications) from one manufacturer.
- Ensure that the container is large enough to hold the oil quantity.
- Hydraulic oil must not seep into the ground or waterways. Dispose of waste oil and oil filters in accordance with statutory regulations.



Information

The work can be made easier by pumping out as much oil as possible. Use the return filter openings for this.

1	Lower attached loads and the boom to the ground.
2	Place the machine in a horizontal position.
3	Completely retract all hydraulic cylinders.
4	Depressurizing the hydraulic system.
5	Change the filter element of the return filter.
6	Place a suitable container under the drainage opening of the tank.

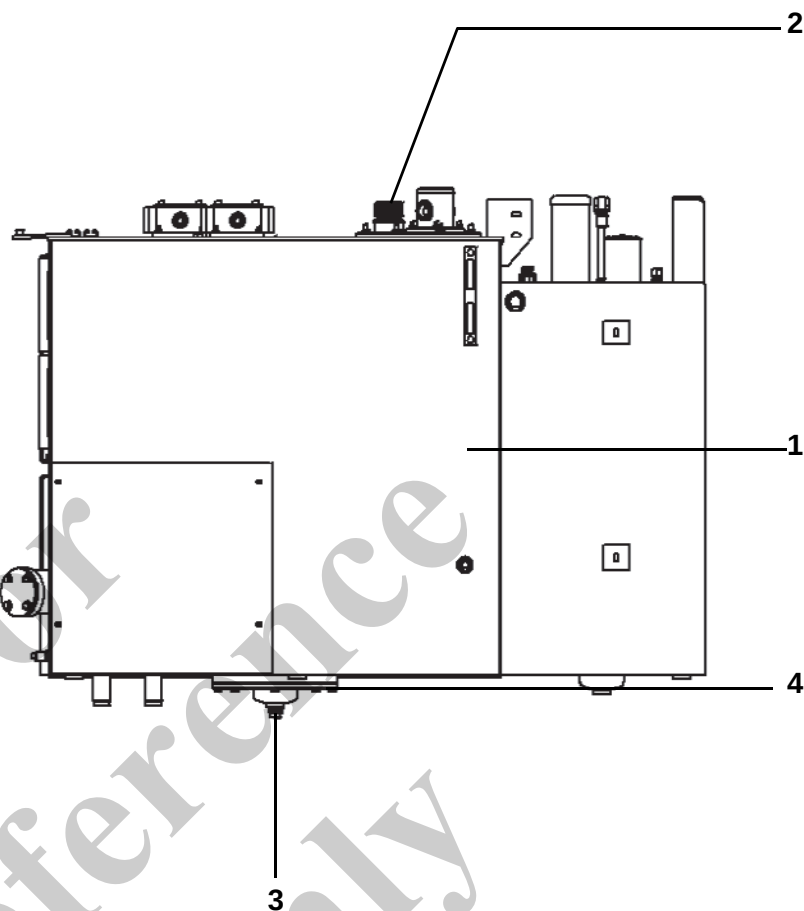


Fig. 17 Hydraulic oil tank

7	Unscrew the drain plug (3) in Fig. 17 on the underside of the tank and collect the used oil in the container.
8	Unscrew the 8 socket head bolts (4) in Fig. 17 and remove the cover.
9	Clean the cover, drain plug and the inside of the hydraulic tank (1) in Fig. 17.
10	Secure the cover and seal using the 4 socket head bolts (4) in Fig. 17.
11	Screw in the drain plug (3) in Fig. 17 and seal.
12	Unscrew the cap (2) in Fig. 17 of the oil filler neck.
13	Fill with new hydraulic oil via the filler neck.

	NOTICE! Machine will be damaged if it is not vented (bled)! ● Bleed pumps after every hydraulic oil change, before starting up again.
14	Bleed the hydraulic pumps: – Clean housing. – Loosen the vent screw on the pump. Do not unscrew completely; hold in place by applying slight pressure with your thumb. – Wait several seconds until the air has escaped. – Tighten the vent screw.

For
Reference
Only

5.4 Changing the return filter element

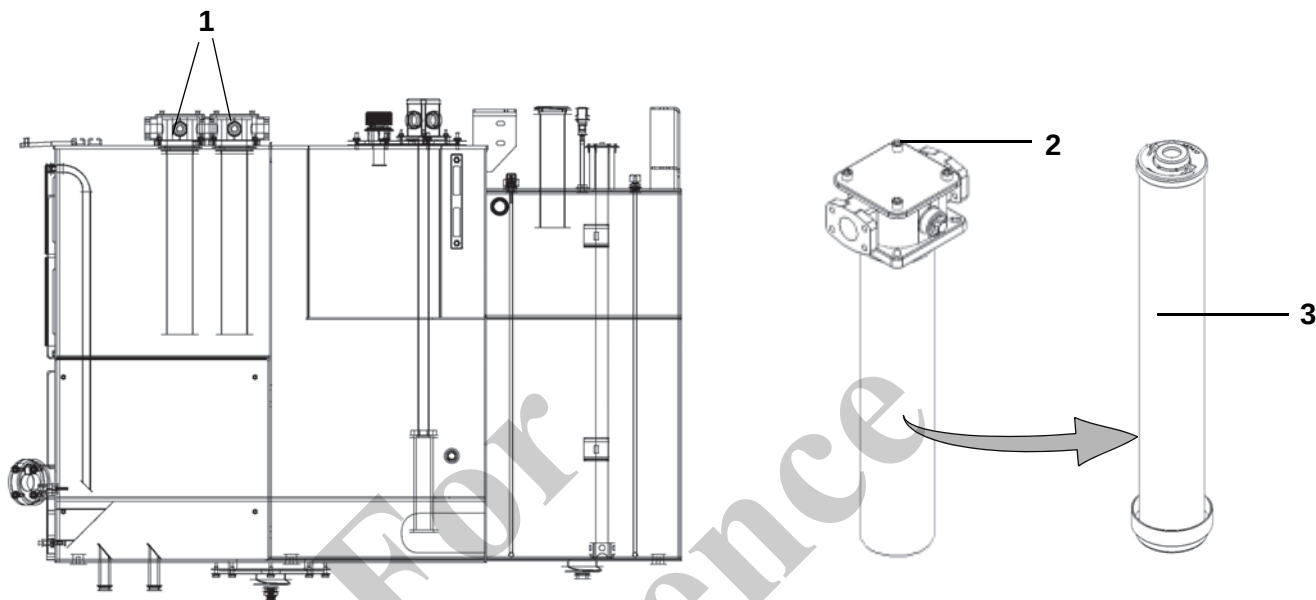


Fig. 18 Return filter

- | | |
|---|---|
| 1 | Unscrew 4 nuts (2) in Fig. 18 at each of the two return filters (1) in Fig. 18. |
| 2 | Pull out the return filters (1) in Fig. 18. |
| 3 | Remove the filter element (3) in Fig. 18 and dispose of it as hazardous waste. |
| 4 | Clean the components, check seal and replace if necessary. |
| 5 | Insert a new filter element. |
| 6 | Insert the return filter (1) in Fig. 18 into the tank and tighten it. |

5.5 Replacing the leak oil filter element

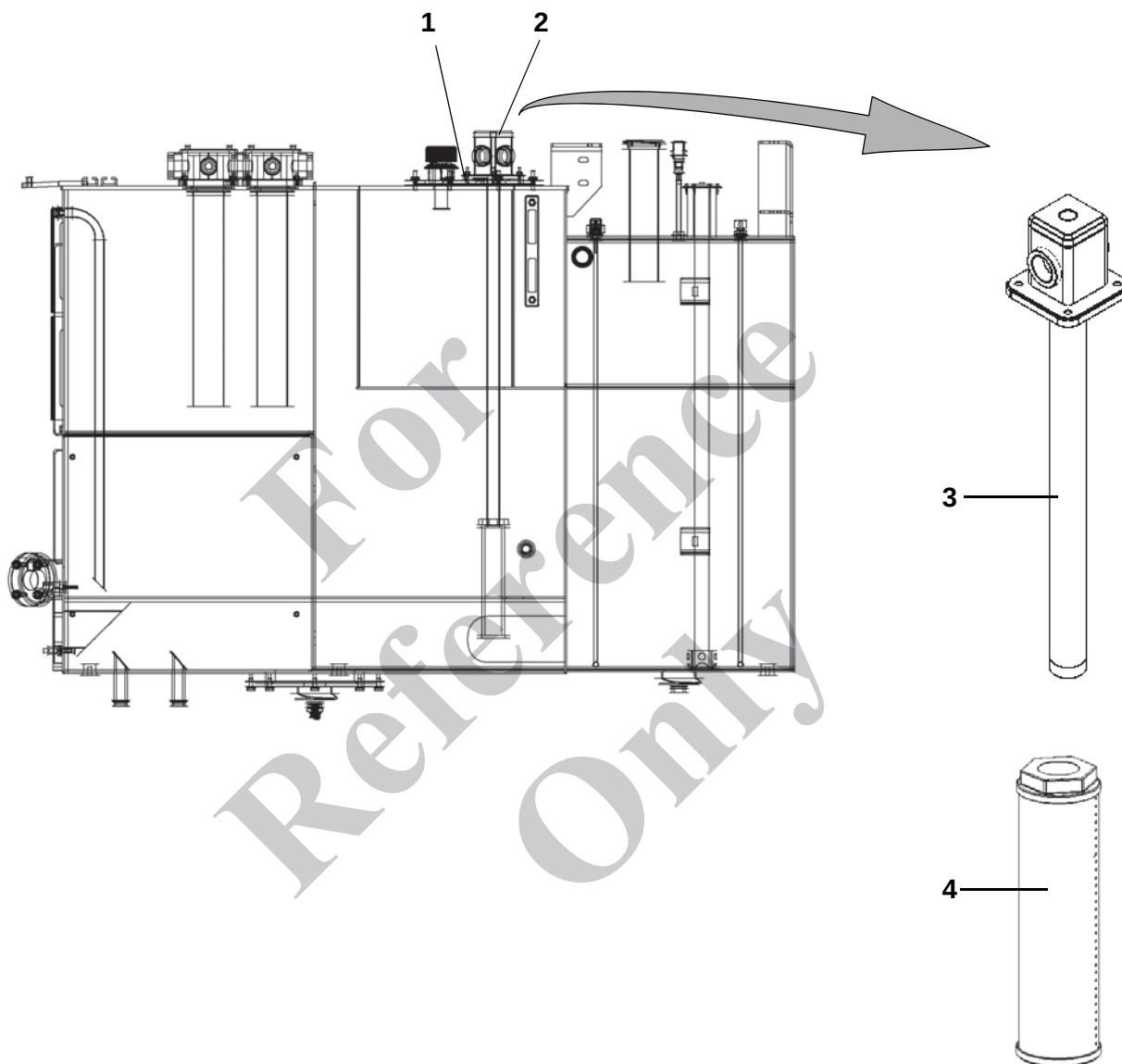


Fig. 19 Leakage oil filter

1	Unscrew the hex nuts (1) in Fig. 19.
2	Pull out the leak oil filter (2) in Fig. 19.
3	Unscrew the filter element (4) in Fig. 19 from the return pipe (3) in Fig. 19.

4	Screw a new filter element (4) in Fig. 19 onto the return pipe (3) in Fig. 19.
5	Insert the leak oil filter (2) in Fig. 19 into the tank.
6	Tighten the leak oil filter (2) in Fig. 19 using the hex nuts (1) in Fig. 19.

For
Reference
Only

5.6 Replacing the aeration filter

Clogged aeration filters allow unfiltered dust and dirt into the hydraulic system. This can cause damage to the hydraulic system (for example to the pumps) and increased hydraulic oil wear.

The aeration filter is located in the screw cap (1) of the filler neck. The aeration filter limits the positive pressure and vacuum in the hydraulic system that occurs during hydraulic work movements. To replace the aeration filter, the tank cover must be removed.

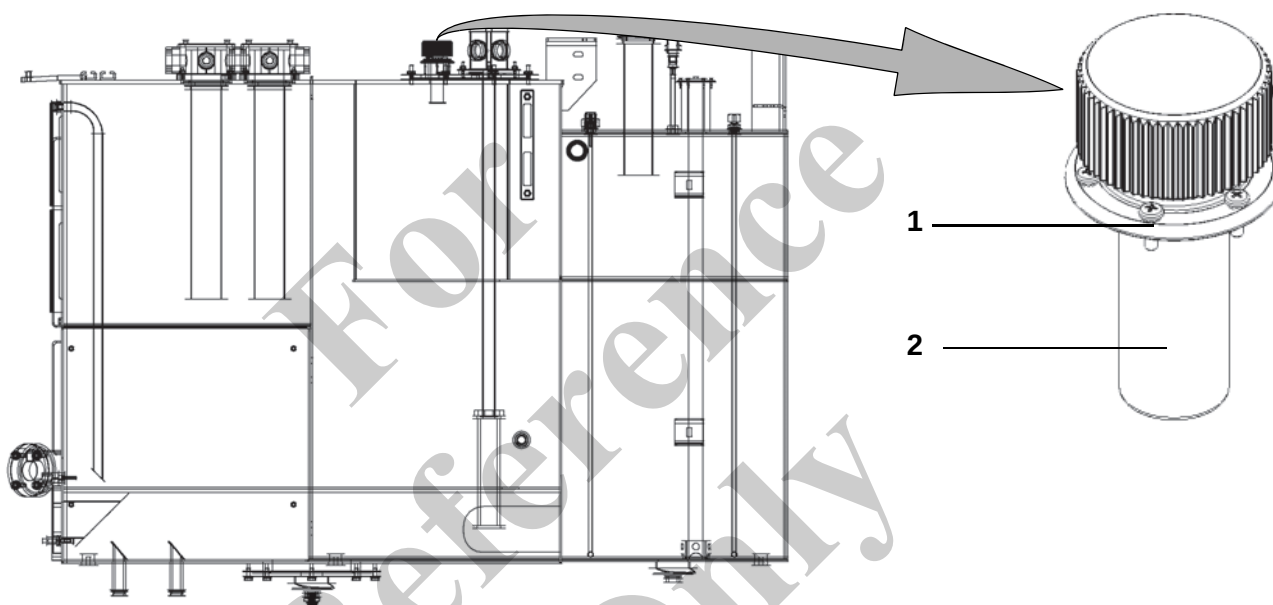


Fig. 20 Position of the aeration filter

- | | |
|---|----------------|
| 1 | Bolts |
| 2 | Filter element |

1	Unscrew the bolts (1) in Fig. 20 of the aeration filter.
2	Pull out the aeration filter (2) in Fig. 20 and dispose of it as hazardous waste.
3	Insert a new aeration filter (2) in Fig. 20.
4	Screw on the bolts (1) in Fig. 20.

5.7 Replacing the HydroClean micro-filter element

WARNING

Danger of injury due to hot engine parts!

Persons will be injured due to hot parts of the running engine.

➤ Only execute maintenance work when the drive engine is shut down and the cooling system has cooled down.



Information

Before changing the filter element, for space reasons the oil filter must first be removed, and then the filter cartridge of the water separator must be removed.



Information

The contamination of the HydroClean filter element is monitored by the SENCON. The filter element must be changed when the corresponding warning light lights up.

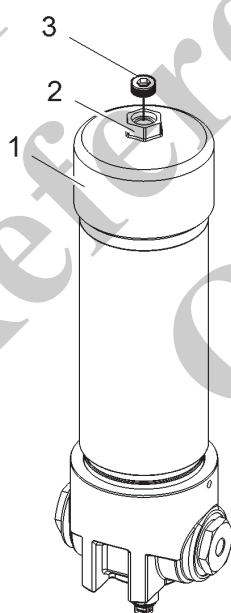


Fig. 21 HydroClean

1	Open the right service door.
2	Depressurizing the hydraulic system.
3	Unscrew the cover (1) in Fig. 21 using the integrated hexagon head (2) in Fig. 21.
4	Pull out the filter element.

5	Dispose of filter element as hazardous waste.
6	Clean the components, check seal and replace if necessary.
7	Insert a new filter element.
8	Reinstall the cover (1) in Fig. 21.
9	Start the drive engine.
10	Unscrew the socket head screw (3) in Fig. 21 slightly until the vent opening is exposed.
11	Close the socket head screw (3) in Fig. 21 as soon as oil escapes.
12	Switch off the diesel engine and check the filter for leaks.

For
Reference
Only

5.8 Checking the pre-load of the pressure accumulator

Safety notice

Every 10 years/20,000 operating hours, arrange for a pressure test and an internal inspection by a specialist.



Information

The preload pressure is checked using the pressure accumulator for the pilot control circuit.

1	Lower attached loads and the boom to the ground.
2	Connect a pressure gauge to the PV connection of the test strip.
3	Switch off the engine and return ignition key immediately to position "1".
4	Move both control levers in the driver's cab in all directions several times.
5	Observe the pressure gauge. As soon as the preload pressure is reached, the valve in the pressure accumulator closes. The pressure gauge pointer drops suddenly to "0". The value displayed just prior to the pressure drop corresponds to the preload pressure of the pressure accumulator.
6	Compare the indicated value with the tolerance specification on the pressure accumulator. If the preload pressure is outside tolerance, replace the pressure accumulator or have it refilled with nitrogen.
7	Disconnect the pressure gauge.

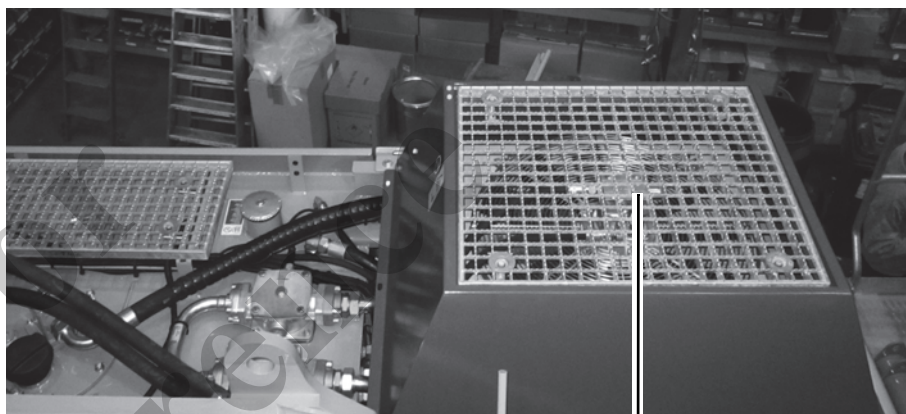
5.9 Checking and cleaning the hydraulic oil cooler

WARNING

Danger of injury due to rotating parts or hot engine parts!

Persons will be injured due to moving parts or hot parts of the running engine.

➤ Only execute maintenance work when the drive engine is shut down and the cooling system has cooled down.



1

Fig. 22 Position of the hydraulic cooling system

1	Wear protective goggles.
2	Blow out the cooling fins with dry, filtered compressed air. Ensure that the cooling fins are not damaged.
3	Remove grease and oil using cold-cleaning agent. Collect cleaning fluid and dispose of it as hazardous waste.
4	Check cooler for leaks and bent or damaged cooling fins.

This Page Blank

6 Crane winch

6.1 General maintenance instructions

WARNING

Danger of injury due to high spring tension!

The winch brakes are under extreme spring tension and if opened can cause injury.

- Do not dismantle the winch brakes.
- Only perform work on the winch and its supplementary devices when the machine is shut down and in a load-free state.
- Before starting any work on the winch, safeguard its drive and supplementary devices against being switched on unintentionally.
- Ensure that the hydraulic and pneumatic supply lines are depressurized.

WARNING

Danger of injury due to rotating parts or hot parts!

Persons will be injured due to moving parts or hot parts of the running engine.

- Only carry out maintenance work when the drive engine is switched off and the winch is at a standstill.
- Wear protective gloves and protective clothing.

Safety instructions

- Oil must not seep into the ground or waterways. Dispose of old oil in accordance with statutory regulations.
- Drain the oil when the gearbox is warm.
- After longer periods of continuous use and in the case of frequent use at maximum load, check the bolts in the load flow for firm seat.
- Do not dismantle winch brakes. Always replace brakes in complete units. Warranty is invalidated if winch brakes are dismantled.
- Check the oil in accordance with the following instructions.
- Once every year, remove the engine and brakes and check the drive-side involute spline connections. There must not be any plastic deformation or abrasive wear (tooth edges partially worn, tooth edges uneven in the tooth base area). If damage can be seen on the involute spline connections, the affected parts must be replaced immediately.
- For the residual service life, and at the latest, every 10 years a general overhaul of the crane winch is strictly prescribed.

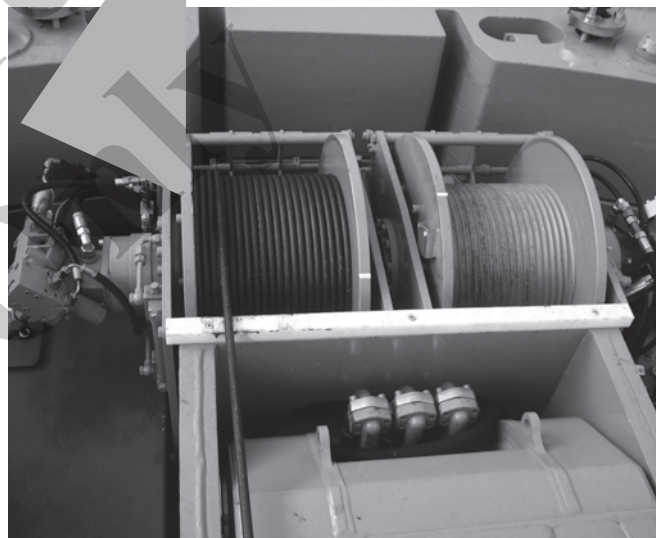
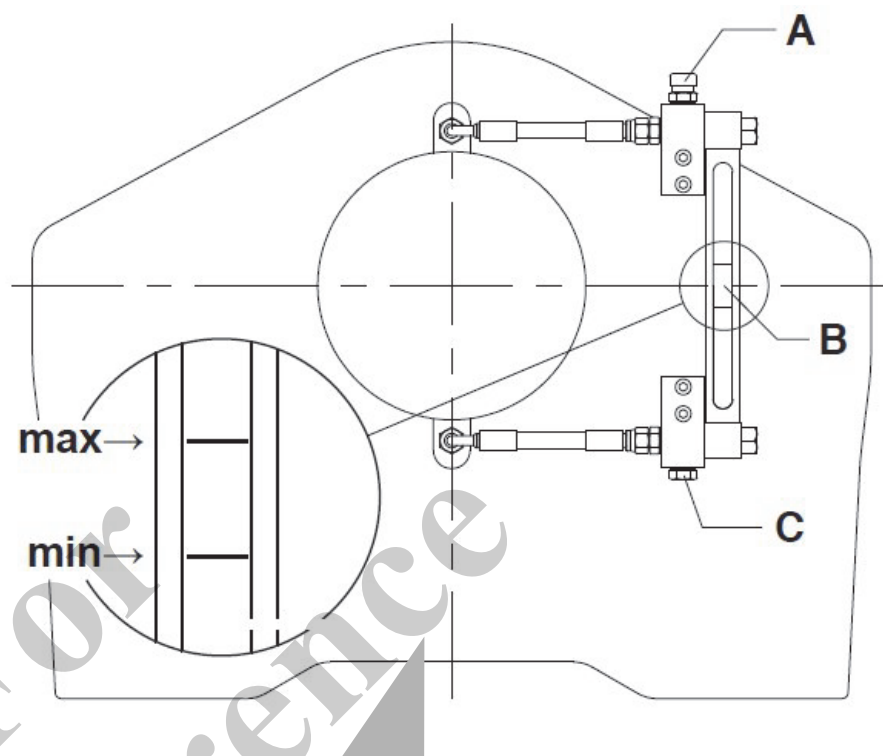


Fig. 23 Winch

A	Oil filler neck – gearbox
B	Oil level indicator
C	Oil drain – gearbox

6.2 Checking the winch gearbox oil level

Safety notice

- Only mix oils, lubricants and operating fluids that are of the same type, or identical (same specifications) from one manufacturer.

1	Place the machine in a horizontal position.
2	Shut down the drive engine.
3	Check the oil level at the oil level indicator (B) in Fig. 23: The oil level must be between the lower marking (MIN) and the upper marking (MAX).
4	Top up gearbox oil, if necessary.
5	Remove the cap of the oil filler neck (A) in Fig. 23.
6	Add fresh gear oil until the oil level (B) in Fig. 23 is between the MIN and MAX markings.
7	Reinstall the cap to the oil filler neck (A) in Fig. 23.

6.3 Changing the winch gearbox oil

Safety notice

- Only mix oils, lubricants and operating fluids that are of the same type, or identical (same specifications) from one manufacturer.

1	Place the machine in a horizontal position.
2	Shut down the drive engine.
3	Place a suitable collecting vessel under the oil drain (C) in Fig. 23.
4	Remove the oil drain plug (C) in Fig. 23.
5	Allow the old oil to drain completely.
6	Clean the components, check seals and replace, if necessary.
7	Reinstall the oil drain plug (C) in Fig. 23.
8	Remove the cap of the oil filler neck (A) in Fig. 23.
9	Add fresh gear oil until the oil level (B) in Fig. 23 is between the MIN and MAX markings.
10	Reinstall the cap to the oil filler neck (A) in Fig. 23.
11	Operate the winch.
12	Check the oil level again.

6.4 Maintaining the brake

Safety instructions

- Do not dismantle the winch brakes. Always replace the brakes in complete units. Warranty is invalidated if winch brakes are dismantled.
- When replacing a seal, always replace all seals.

The brake adjusts itself automatically. At higher pressures and higher activation frequency, small amounts of leak oil on the pistons are unavoidable.

For
Reference
Only

7 Undercarriage

7.1 Cleaning the frame and track frames

Safety instructions

- Do not use gasoline or flammable solvents to clean the undercarriage. Only commercially available solvents are permissible.
- Regularly clean and lubricate all pull-out elements (A).

1	Widen the track width to its maximum setting.
2	Remove accumulated contamination and old grease from all sides of the cross member (A) in Fig. 24 and the center frame (B) in Fig. 24. Clean surfaces with solvent!
3	Grease surfaces: Apply a thin coating of lubricating grease (C) in Fig. 24 using a brush.
4	Also grease the lubrication points on the middle bridge.

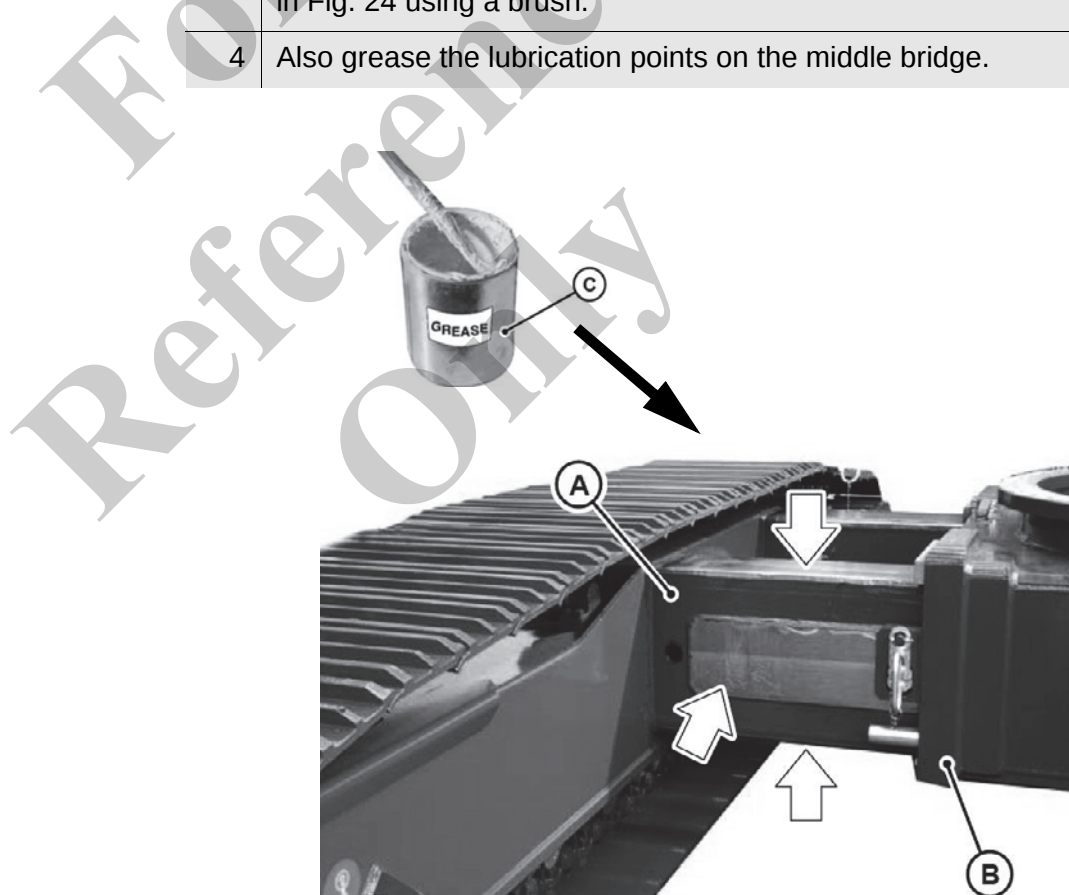


Fig. 24 Cleaning and lubricating the pull-out elements (A) and the center frame (B)

5	Thereafter, reduce and widen the track width so that the lubricating grease is optimally distributed.
---	---

7.2 Maintaining the crawler track

Checking track tension

The correct tension of crawler track **A** is of fundamental significance for the movement of the machine. If the right and left crawler tracks are tensioned differently, driving in a straight line is impossible. Consequently, the tension on both crawler tracks must be checked regularly to exclude the possibility of disruption of operation. The sag value for the chain tension is 50 mm. The sag for the chain tension is 50 mm.

1	Position the machine on level and solid ground.
2	Place a straight edge (B) in Fig. 25 on crawler track A.
3	Measure the distance (C) in Fig. 25 (sag) between track roller and chain link.

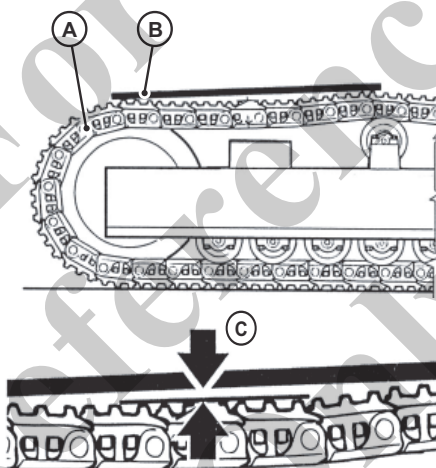


Fig. 25 Determining crawler track tension

4	If the sag is excessive, tension the chain with the spring tensioning fixture (D) in Fig. 26 provided. If the sag is too small, release track tension.
---	--

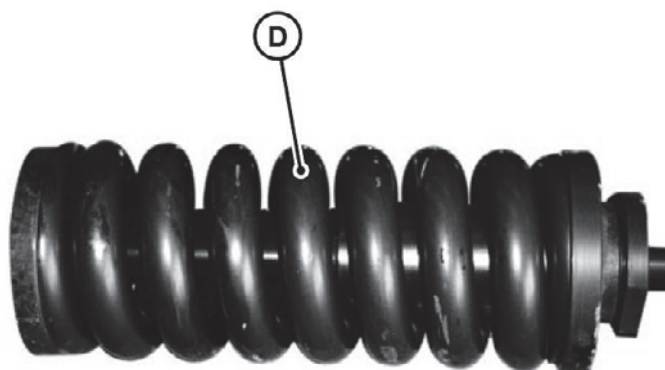


Fig. 26 Spring tensioning fixture

7.2.1 Spring tensioning fixture - adjusting track tension

**Danger to life due to escaping lubricating grease!**

Without lubricating nipples or valve in place, lubricating grease sprays out under high pressure and the valve will be ejected from the machine. Persons will be injured or killed.

- Never take the valve or the grease nipples completely off.
- Always use a suitable extension for the grease gun in order to work at a necessary safety distance from the service door.

**Information**

Constant correct tension of the crawler tracks increases the service life of the components of the undercarriage.

In addition, the tension of the crawler tracks must be adjusted depending on the machine's operating conditions. If the ground is extremely compacted, the crawler tracks must be tensioned as loosely as possible.

1	Position the machine on level and solid ground.
2	Prepare the grease gun (1) in Fig. 27.
3	Remove screws and covers (2) in Fig. 27.
4	Feed connection hose (3) in Fig. 27 into the lubricating valve.
5	Inject lubricating grease. Interrupt the process from time to time to verify the sag.
6	If the track is tensioned too tightly, open valve F slightly so that the excess lubricating grease escapes via the vent opening, thereby relieving the track.
7	Install covers and bolts.
8	Repeat the procedure on the opposite crawler track.

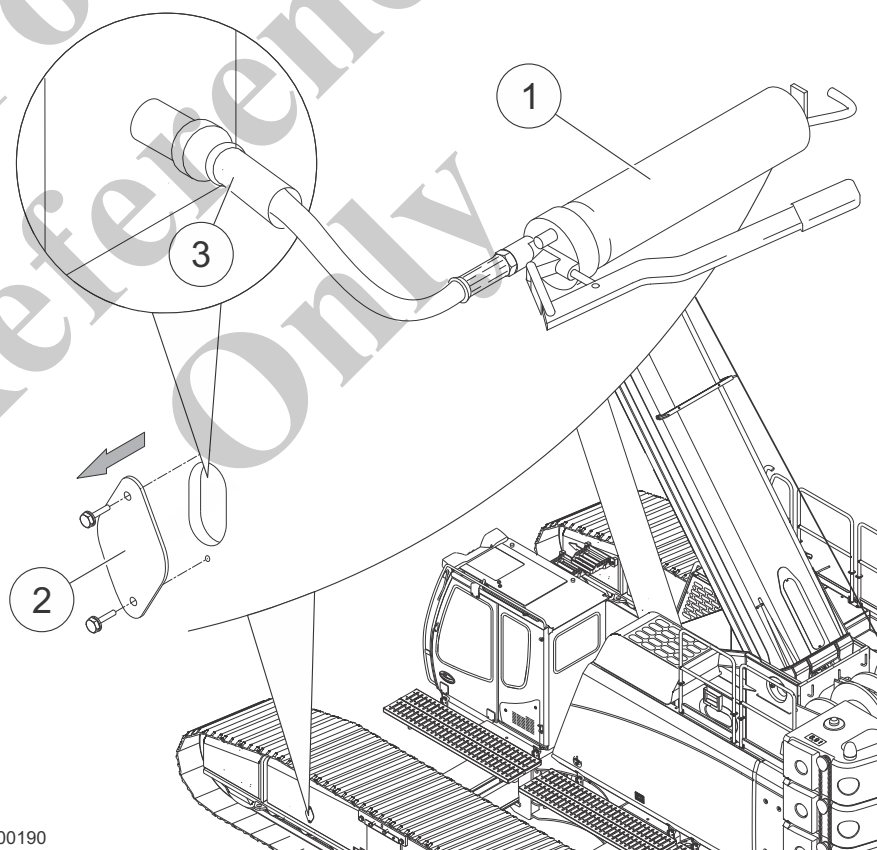


Fig. 27 Adjusting track tension

7.2.2 Checking the tightening torque of base plate bolts

The tightening torque for the base plate bolts must show a value of 747 Nm to 877 Nm. Check the tightening torque using a torque wrench. If one or more base plates (B) in Fig. 28 must be replaced together with the corresponding bolts (C) and (D) in Fig. 28, then the screws must be thoroughly lubricated and tightened to the values stated in column "lubricated"

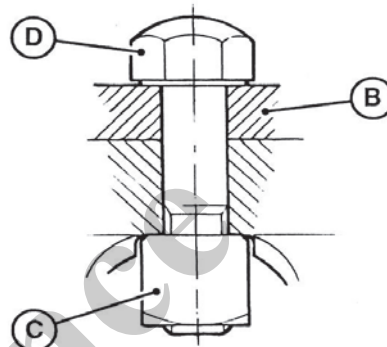


Fig. 28 Cross section of the base plate bolt

7.2.3 Checking the travel drive oil level

WARNING

Danger of scalding due to hot oil!

Persons will be injured due to escaping hot oil.

➤ Only drain the oil when the gearbox is warm.



Information

Mixing different types of oils, lubricants and operating fluids is prohibited.

Only mix the same type of or identical (same specification) oils, lubricants and operating fluids from the same manufacturer.

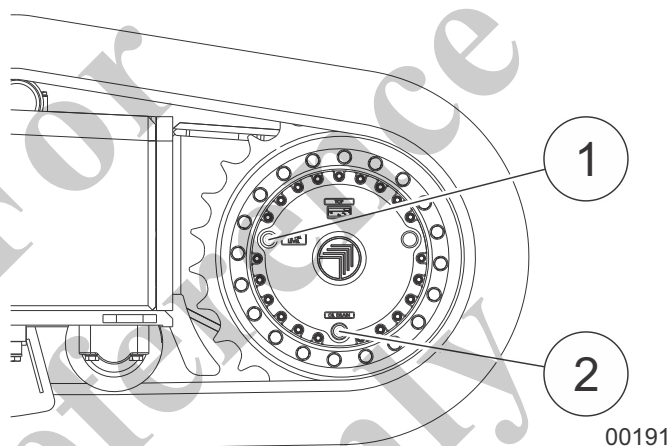


Fig. 29 Lubricating points (1) and (2) of the travel drive

1	Position the machine on level and solid ground. Position lubricating points (1) in Fig. 29 and (2) in Fig. 29 as shown.
2	Switch off the diesel engine.
3	Place a suitable collecting vessel under closure 1.
4	Slowly unscrew closure of lubricating point (1) in Fig. 29 until oil escapes via the tapped bore. If too much oil escapes, tighten the closure.
5	If no oil escapes, topping up is strictly required.
6	To do this, completely take off the closure (1) in Fig. 29. Fill in new oil via the tapped bore until it escapes via this bore.
7	Tighten the closure (1) in Fig. 29.

7.2.4 Changing the travel drive oil

WARNING

Danger of injury due to skin contact with oil!

Contact with oil causes severe skin disorders and other severe injuries.

- Use gloves and safety goggles with side protection.
- Avoid skin contact with used oil.
- After skin contact, thoroughly wash off the affected area.
- Do not inhale or swallow oil.

Information

Mixing different types of oils, lubricants and operating fluids is prohibited.

Only mix the same type of or identical (same specification) oils, lubricants and operating fluids from the same manufacturer.

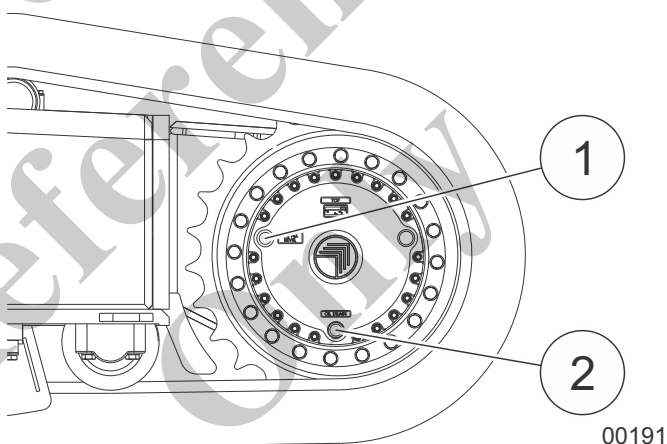


Fig. 30 Lubricating points (1) and (2) of the travel drive

1	Park the machine on an even and hard surface so the lubricating points (1) and (2) are as shown in Fig. 30.
2	Switch off the diesel engine.
3	Place a collecting vessel under the closure for lubricating point (1) and lubricating point (2).
4	Loosen the closure for lubricating point (1) so the oil can flow out better.
5	Loosen and remove the closure for lubricating point (2).
6	Let the used oil drain completely.

7	Tighten the closure of the lubricating point (2).
8	Add fresh oil through the threaded hole of the closure for lubricating point (1) until it overflows.
9	Retighten the closures for lubricating point (1) and lubricating point (2).
10	Check the oil level after two operating hours.

**Information**

Make sure the oil is warm so it can drain more easily. Keep the work area free and clean. Carefully clean the fill plug and drain plug before screwing them back in.

For
Reference
Only

8 Rotary connection

The following components of the rotary connection must always be well-lubricated:

- Bearing race (1):
 - via lubricating nipple.
- Gearing (2):
 - with gear spray or
 - by slewing ring lubrication

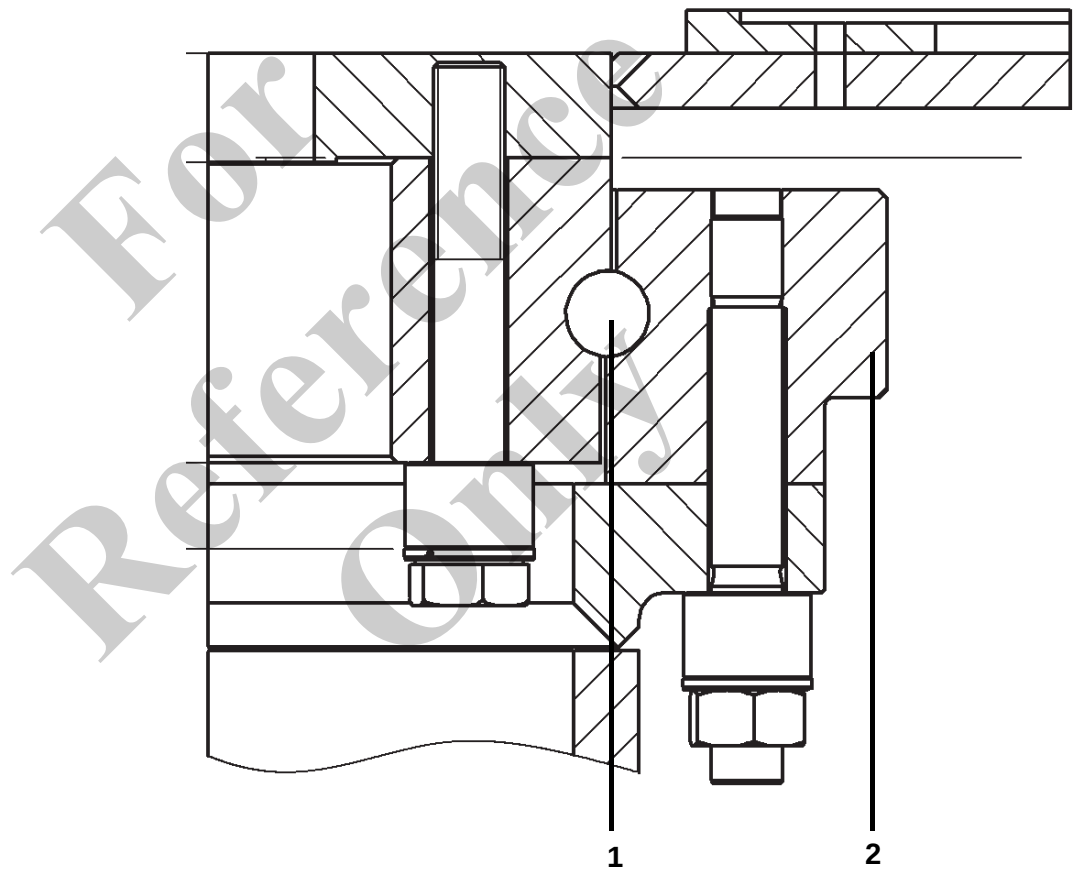


Fig. 31 Rotary connection components

1	Bearing race
2	Gearing

8.1 Lubricating the slewing ring raceway manually

Safety notice

- Only mix oils, lubricants and operating fluids that are of the same type, or identical (same specifications) from one manufacturer.



Information

The specified lubrication intervals must be shortened:

- in the case of high humidity,
- if there are high levels of dust and contamination,
- if there are significant fluctuations in temperature and numerous slewing movements.

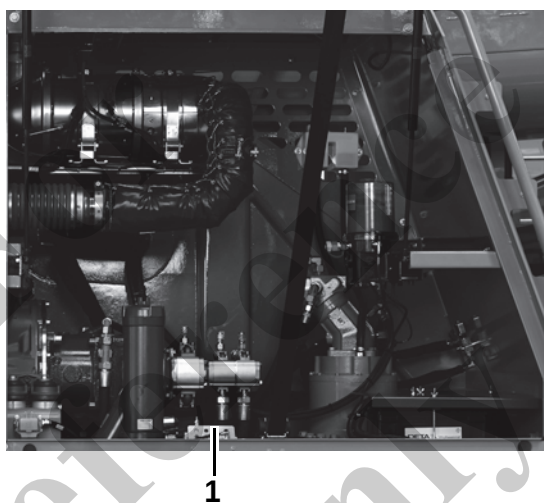


Fig. 32 Position of the slewing ring lubricating nipple

1	Shut down the drive engine.
2	Open the right front service door.
3	Lubricate lubricating nipples (1) in Fig. 32 until grease emerges at the sealing lips.
4	Rotate uppercarriage in both directions several times to distribute the grease.
5	Repeat the process until the rotary connection is completely filled with grease.

Item	Assembly / lubrication point	Number of lubricating nipples
1	Rotary connection	1

8.2 Lubricating the slewing ring gearing

Lubricate the slewing ring gearing with the MANITOWOC gear spray, or via the optional *slewing ring lubrication* feature.

8.2.1 Gear spray

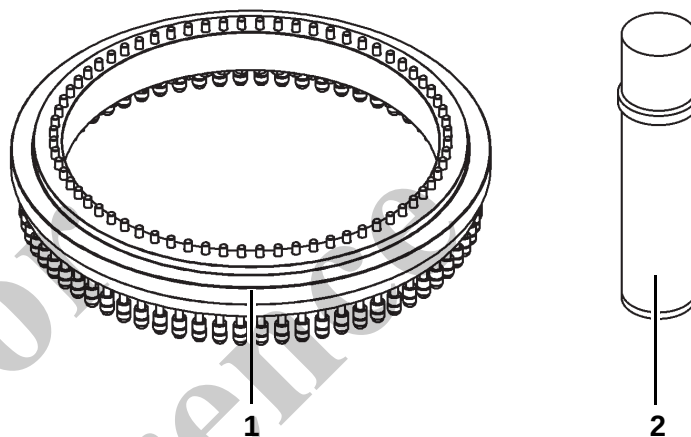


Fig. 33 Lubricate slewing ring.

1	Shut down the drive engine and safeguard it from being restarted.
2	Thoroughly clean gearing (1) in Fig. 33.
3	Check gearing of slewing ring and slewing ring pinion for wear and replace if necessary.
4	Spray gearing from an approximately 30 cm distance with MANITOWOC gear spray (2) in Fig. 33.
5	Slew the uppercarriage a number of times so that the lubricant is distributed uniformly over the gearing.

8.2.2 Slewing ring lubrication

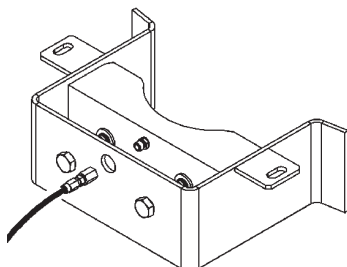


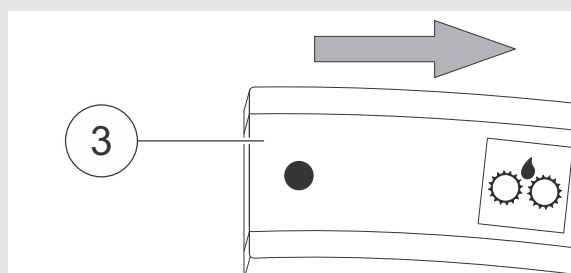
Fig. 34 Plastic skid on the pinion lubrication



Information

Clean the lubrication point thoroughly down to the bare metal before the first application of lubricant!

- | | |
|---|--|
| 1 | Shut down the drive engine and safeguard it from being restarted. |
| 2 | Thoroughly clean the gearing. |
| 3 | Check gearing of slewing ring and slewing ring pinion for wear and replace if necessary. |
| 4 | Start the drive engine. |
| 5 | Actuate the trigger the slewing gear lubrication system: <ul style="list-style-type: none"> – Press the push button (3) for slewing ring lubrication on the right of the control panel and keep it depressed. – Slew the uppercarriage 360° with the control lever to the left and to the right to distribute the lubricant evenly over the gearing. |
| 6 | Release the push button. |
| 7 | Check whether an uninterrupted film of lubricant is present. Repeat the lubrication process if necessary. |





Information

Lubricate slewing ring every 10 operating hours or daily (depending on operating conditions).
Check the lubricant tank weekly and top up lubricant if necessary.

Checking the plastic sliding wear pad

NOTICE

Machine damage due to worn plastic sliding wear pad!

Considerable machine damage occurs if the plastic sliding wear pad is worn.

- Check the plastic sliding wear pad (2) in Fig. 35 in the lubrication device (1) in Fig. 35 for wear every three months.
- Replace the plastic sliding wear pad (2) in Fig. 35 as soon as the wear limit is reached.

Safety instructions

Before checking the plastic sliding wear pad (2) in Fig. 35:

- Lower attached loads and boom to the ground.
- Pull the left-hand safety lever back.
- Switch off the machine and safeguard it against unauthorized restart before beginning maintenance work.
- Attach warning sign on the operating elements.

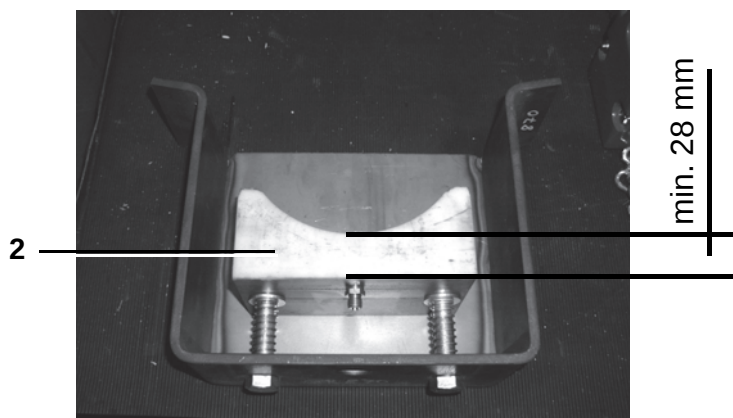


Fig. 35 Plastic sliding wear pad of slewing ring lubrication

1	Remove the lubrication device (1) in Fig. 35.
2	Check the plastic sliding wear pad (2) in Fig. 35 for wear (min. 28 mm).
3	Replace the plastic wear pad if necessary.

Topping up grease



Fig. 36 Lubricant tank of slewing ring lubrication

4	Open cover (1) in Fig. 36
5	Add lubricant.
6	Close the cap.

8.2.3 Tightening the slewing ring bolts

WARNING

Danger to life due to defective slewing ring bolts!

If slewing rings bolts are defective, the uppercarriage tips and persons can be severely injured.

- Check the slewing ring bolts every 5000 operating hours or every 5 years.
- Replace the slewing ring bolts if necessary.

Safety notice

- Have the slewing ring bolts tested by an expert from an independent specialist company or an independent institute.
- Unrestricted further use of the slewing ring bolts must be verified with a certificate. Otherwise, replace the slewing ring bolts.
- Replace corroded bolts immediately.
- Do not tighten loose bolts but renew them immediately.

- Retighten slewing ring bolts weekly using a torque wrench.
- Strictly observe the correct number and diameter of bolts.
- Only use original MANITOWOC spare parts.
- If you suspect damage to the bolt connections, have MANITOWOC Crane Care Customer Service execute a check.
- Contact MANITOWOC CraneCare Customer Service if you have any other questions. The telephone number of MANITOWOC CraneCare Customer Service is stated in the introduction at the beginning of this document.

Retightening the outer race

1	Shut down the drive engine.
2	Go to the area of the slewing ring in the undercarriage.
3	Use a torque wrench to tighten slewing ring screws of the outer race from above in a criss-cross pattern.
4	Turn the uppercarriage to gain access to all bolts.

Tightening the inner race

1	Shut down the drive engine.
2	Go to the area of the middle bridge in the undercarriage. This is the only access to the bolts of the inner race.
3	Use a torque wrench to tighten slewing ring screws of the inner race in a criss-cross pattern as shown in the drawing.
4	Use an extension for the torque wrench. If necessary drive over a pit.
5	Turn the uppercarriage to gain access to all bolts.



Information

The torque of the bolt first tightened will be influenced by the tightening of the other bolts. It is therefore necessary to make at least two rounds tightening all bolts. Bolts should preferably be tightened with a hydraulic socket wrench.

This Page Blank

9 Telescopic boom

9.1 Lubricating the telescopic boom

1	Attach the maximum counterweight.
2	Slew the uppercarriage into the direction of travel.
3	Telescope the undercarriage to maximum track width.
4	Enter the cab.
5	Start the diesel engine and push the safety lever forward.
6	Select operating mode Setup2 on the SENCON.
7	Lower the boom completely.
8	Unreeve the bottom hook block.
9	Extend the telescopic boom to 21.9 m – The lubricating opening (1) in Fig. 37 at the basic body must align with the opening of the telescopic section below it.

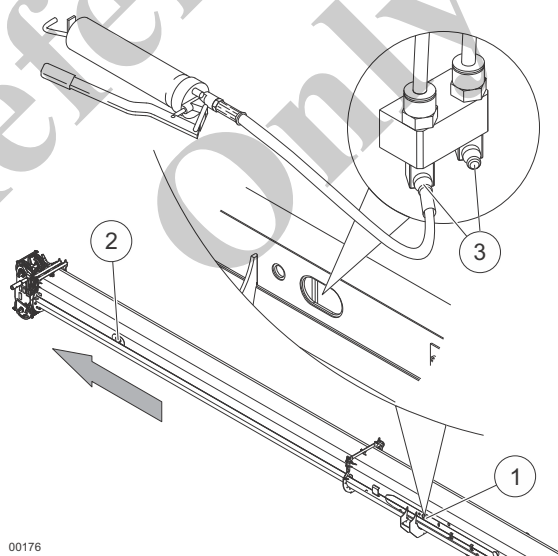


Fig. 37 Lubricating the telescopic boom

10	Lubricate the lubrication points (3) in Fig. 37 by five strokes of the grease gun.
----	--

11	Repeat the procedure at a boom extension of 40 m and at lubrication opening (1) in Fig. 37 to lubricate the third telescope section.
12	Repeat the procedure at a boom extension of 39.5 m and at lubrication opening (2) in Fig. 37 to lubricate the second telescope section.

9.2 Inspection of the telescopic boom

After an operating time of 10,000 h or 10 years, the telescopic boom must be dismantled in such a manner that an examination of the bearings, sheaves, and the telescopic cylinders can be easily executed.

The following parts of the telescopic boom must be checked yearly:

- Bearings
- Telescopic cylinder
- Rope sheaves



Information

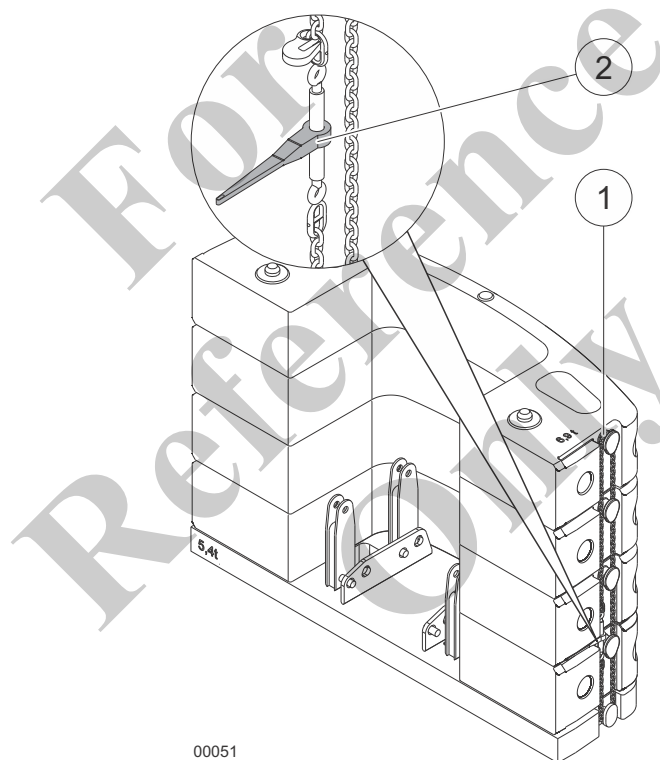
If damage such as cracks, dents, warpage or deformation is suspected, contact MANITOWOC CraneCare Customer Service.

10 Ballast elements - checking the safety chains

Safety instructions

Observe the safety instructions in chapter 1 before starting work!

1	Switch off the diesel engine.
2	Thoroughly clean the machine.
3	Check the tension of the safety chain (1) in Fig. 38.
4	Eliminate chain slack using the tensioner (2) in Fig. 38.



00051

Fig. 38 Position of the ballast rods with hex nuts

For
Reference
Only

11 Automatic climate control

Safety instructions

Maintenance and repairs may only be performed by trained and authorized professionals.



Information

Check the following components monthly:

- Wiring
- Condition of the heating and cooling lines
- Flow of condensed water
- Filter for visible damage
- Plug for proper seating and soiling

11.1 Cleaning the recirculating air filter



Information

The recirculating air filter for the air conditioning system is located in the cab behind the driver seat.

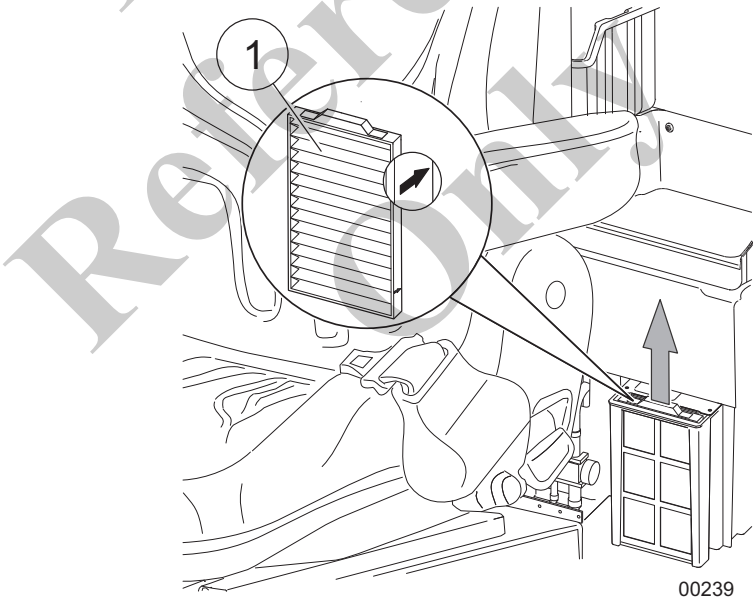


Fig. 39 Recirculating air filter

1	Use the handle to pull the filter element (1) in Fig. 39 out of the filter cartridge.
2	Beat out the filter element or carefully clean it with compressed air.

3	Replace the filter element if it has been damaged or it is too dirty.
4	Insert the cleaned filter element or a new filter element into the filter cartridge.

**Information**

The arrows on the filter element must point toward the back of the cab.

For
Reference
Only

11.2 Cleaning the fresh air filter

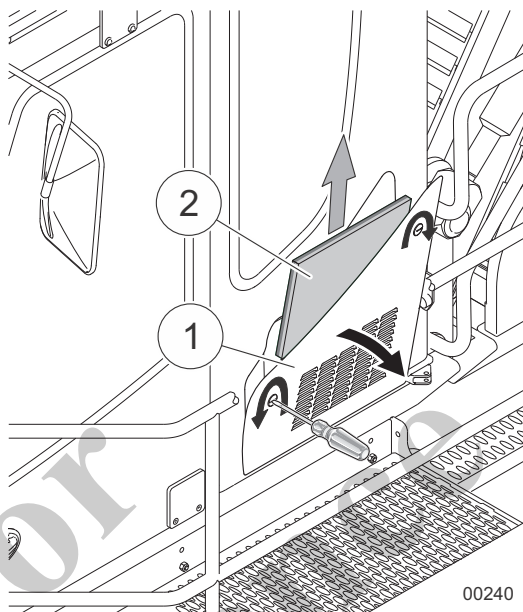


Fig. 40 Fresh air filter

1	Open the cover closures (1) in Fig. 40 with a screwdriver. – Turn the front closure to the left to open it. – Turn the rear closure to the right to open it.
2	Open the cover.
3	Pull the filter element (2) in Fig. 40 up and out.
4	Beat out the filter element or carefully clean it with compressed air.
5	Replace the filter element if it has been damaged or it is too dirty.
6	Insert the cleaned filter element or a new filter element. – The colored side of the filter element must point toward the interior of the cab.
7	Close the cover.
8	Close the cover closures with a screwdriver.

This Page Blank

12 Electrical system

Safety instructions

- Work on the electrical system must be executed by trained, qualified electricians only.

12.1 Servicing battery connections

WARNING

Explosion hazard after warming!

The battery explodes if overheated.
This can cause personal injury.

- Smoking and working with open flame is prohibited.
- Avoid sparks in the vicinity of the battery.

WARNING

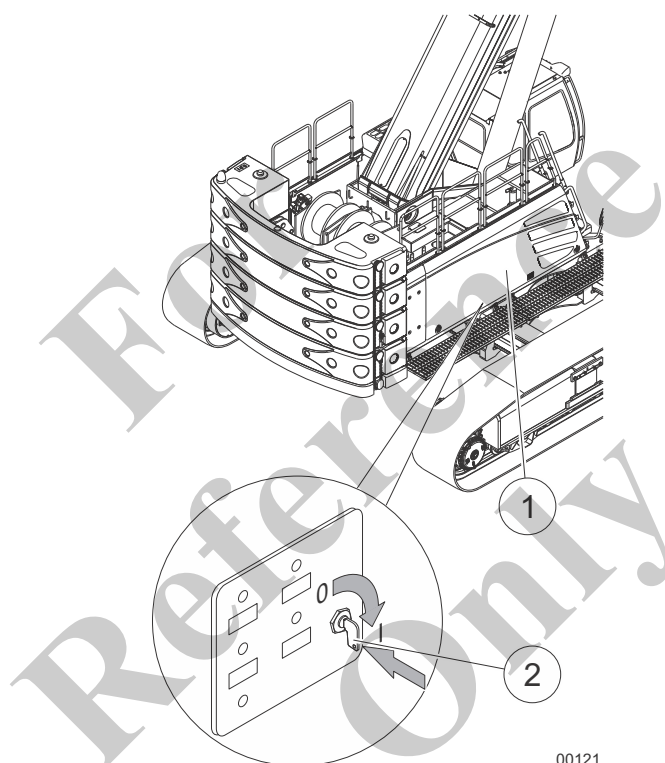
Danger of acid burns due to battery acid!

Escaping battery acid causes burns to skin or eyes.

- Wear safety goggles and protective gloves when working on the battery.
- Do not tilt the battery.
- Do not place tools on the battery.
- Disconnect the batteries before starting any welding.
- Do not confuse the battery connections.
- Dispose of old batteries as hazardous waste.

Check terminals and cable connections of batteries:

1	Open the right service door (1) in Fig. 41.
2	Press the battery disconnect switch (2) in Fig. 41 and turn it to the right.
3	Clean terminals and cable connections of batteries. Check for firm seat, and grease with terminal grease.
4	Return battery disconnect switch to its initial position.



00121

Fig. 41 Switching on the battery disconnect switch

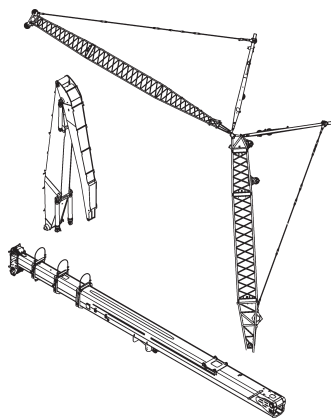
13 Structural steelwork and static load-bearing parts

Safety instructions

- Have load-bearing parts such as the undercarriage, mast, uppercarriage frame, boom and stick thoroughly examined for damage and crack formation at least every six months.
- MANITOWOC recommends that this inspection be carried out by an expert once a year as a precautionary measure to ensure that any serious damage is detected.

For
Reference
Only

13.0.1 Checking static load-bearing parts and steel components for damage



- | | |
|---|--|
| 1 | Thoroughly clean the components. |
| 2 | Visually inspect the components. |
| 3 | If damage is detected, check the components for structural damage by carrying out a dye penetrant test or magnetic particle test.
Involve a specialist for the examination, if necessary. |
| 4 | Only trained and qualified specialists are authorized to execute a repair. |

For
Reference
Only

14 Appendix

14.1 Handling, Installation, and Maintenance of Steel Wire Ropes

14.2 Driver Seat

14.3 Camera System

14.4 Radio Remote Control

14.5 Cleaning the Cooling System

14.6 Winch Life

14.7 Install Large Roller Bearings, Slew Gears and Flange Connections

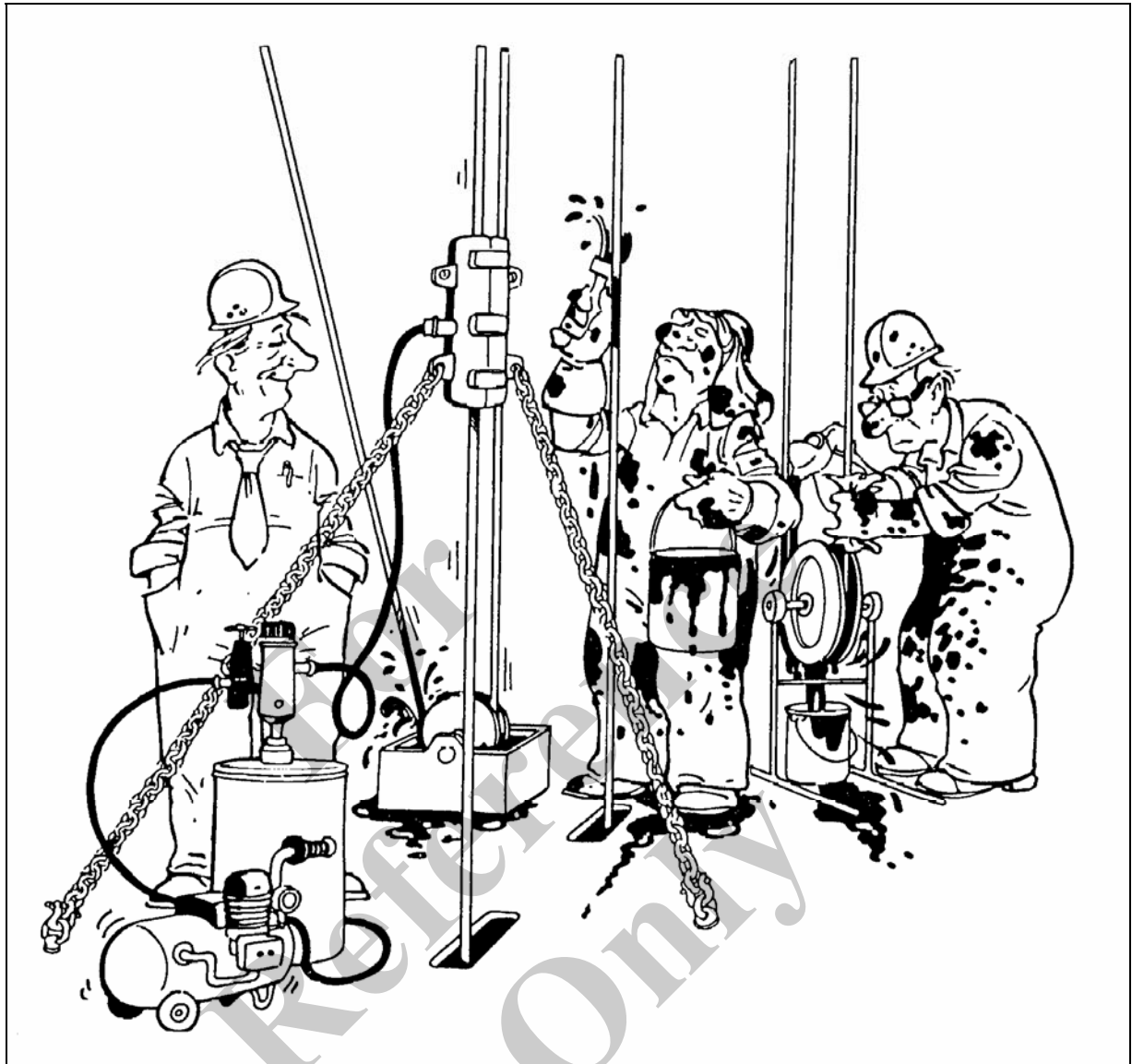
14.8 PFEIFER Pouch Socket System

14.9 Operating Fluids and Lubricants

14.10 Personnel Basket

For
Reference
Only

This Page Blank



Handhabung, Montage und Wartung von Drahtseilen /

*Handling, assembly and
maintenance of wire ropes*

Inhaltsverzeichnis / List of contents

1	HANDHABUNG, MONTAGE UND WARTUNG VON DRAHTSEILEN / HANDLING, ASSEMBLY AND MAINTENANCE OF WIRE ROPES	1
1.1	Die Seilauswahl / Rope selection	1
1.2	Wie sollten Drahtseile entladen werden? / How should wire ropes be unloaded?	1
1.3	Wie sollten Drahtseile gelagert werden? / How should wire ropes be stored?	2
2	DIE MONTAGE VON DRAHTSEILEN / ASSEMBLY OF WIRE ROPES	3
2.1	Das Abwickeln vom Ring / Unwinding from the coil	3
2.2	Das Abwickeln vom Haspel / Unwinding from the reel	3
2.3	Der Montagevorgang / Assembly	5
2.4	Das Umspulen vom Haspel auf die Seiltrommel / Rewinding from the reel to the rope drum	5
2.5	Das Einziehen des neuen Seiles mit Hilfe des alten Seiles oder eines Vorseiles / Drawing in the new rope with the aid of the old rope or a leader rope	6
2.6	Das Auftrommeln unter Last / Winding on to drums under load	7
2.7	Das Einfahren des Drahtseiles / „Running in” the wire rope	8
2.8	Das Ablängen von Drahtseilen / Cutting wire ropes to length	9
3	DIE WARTUNG VON DRAHTSEILEN / MAINTENANCE OF WIRE ROPES	11
3.1	Die Nachschmierung von Drahtseilen / Relubrication of wire ropes	11
3.2	Das Reinigen von Drahtseilen / Cleaning of wire ropes	12
3.3	Das Entfernen von gebrochenen Drähten / Removal of broken wires	13

3.4	Das Kürzen oder Rücken von Drahtseilen / Shortening or relocation of wire ropes	13
3.5	Das Wenden von Drahtseilen / Reversal of wire ropes	14
4	DIE INSPEKTION VON DRAHTSEILEN / INSPECTION OF WIRE ROPES	15
4.1	Warum muß ein Drahtseil inspiziert werden? / Why must a wire rope be inspected?	15
4.2	Wann muß ein Drahtseil inspiziert werden? / When must a wire rope be inspected?	15
4.3	Übersicht über die Ablege Kriterien / Survey of discard criteria	16
4.4	Wo muß das Drahtseil inspiziert werden? / Where must a wire rope be inspected?	19
4.5	Die Ablegedrahtbruchzahl / Number of wire breaks for discard	20
4.6	Wie muß ein Drahtseil inspiziert werden? / How must a wire rope be inspected?	22
4.6.1	Hilfsmittel / Aids	22
4.6.2	Ermittlung der Drahtbruchzahlen / Determination of the numbers of wire breaks	23
4.6.3	Ermittlung des Seildurchmessers / Determination of the rope diameter	24
4.6.4	Messung der Seilschlaglänge / Measurement of the rope lay length	25
4.6.5	Überprüfung der Festigkeit des Drahtseilgefüges / Checking the strength of the wire rope structure	26
4.6.6	Überprüfung auf Strukturveränderungen / Checking for structural changes	27
4.6.7	Überprüfung von Seilrollen und Seiltrommeln / Checking rope pulleys and rope drums	27
5	SCHLUßBEMERKUNG / CONCLUDING REMARKS	31

For
Reference
Only

1 Handhabung, Montage und Wartung von Drahtseilen / *Handling, assembly and maintenance of wire ropes*

1.1 Die Seilauswahl / *Rope selection*

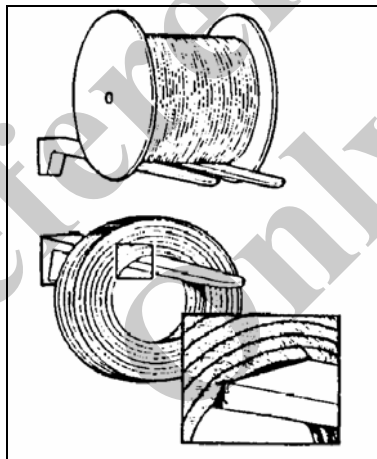
Die Fa. Grove liefert ihre Krane und Bagger in der Erstbeseilung mit hochwertigen Drahtseilen aus. Bei Erreichen der Ablegereife sollte die Beseilung durch neue Drahtseile der gleichen Machart, des gleichen Nenndurchmessers, der gleichen Drahtfestigkeit sowie der gleichen Schlagart und Schlagrichtung ersetzt werden. Diese für die Bestellung der Seile erforderlichen Angaben finden sich im Kranbuch Ihres Gerätes.

Im Umgang mit Drahtseilen sollten die folgenden Punkte beachtet werden:

Grove cranes and excavators are already fitted with high-quality wire ropes on delivery. When ropes are ready for discarding they should be replaced by new wire ropes of the same type, with the same nominal diameter, identical wire strength and the same type and direction of lay. These details required for ordering the ropes can be found in the crane manual.

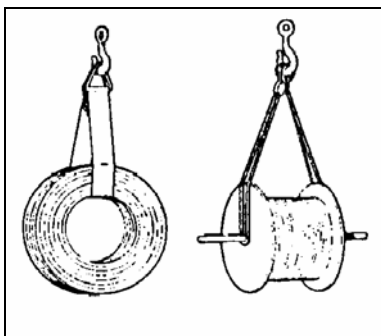
The following points should be noted when handling wire ropes:

1.2 Wie sollten Drahtseile entladen werden? / *How should wire ropes be unloaded?*

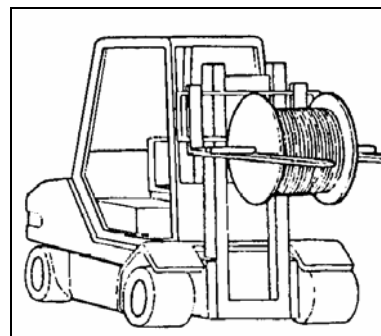


Die ersten Probleme im Umgang mit Drahtseilen treten häufig bereits bei der Anlieferung auf: die Gabel des Staplers fährt unter den Haspel oder in den Seilring hinein und beschädigt die Drahtseiloberfläche.

The first problems when handling wire ropes often already occur on delivery: the fork of the fork-lift truck passes under the reel or into the coil and damages the wire rope surface.



Der Schaden wird vielleicht erst erheblich später entdeckt und eventuell sogar dem Drahtseilhersteller angelastet.



The damage may not be discovered until considerably later and possibly even blamed on the manufacturer. Wire rope supplied as coils or on reels should prefe-

Das auf Ringen oder Haspeln angelieferte Drahtseil sollte nach Möglichkeit überhaupt nicht direkt mit einem Lasthaken oder der Gabel eines Staplers in Berührung kommen, sondern beispielsweise mit Hilfe von breiten textilen Hebebändern angehoben werden.

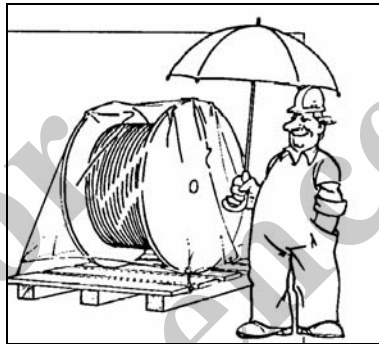
Ein Haspel wird zweckmäßigerweise an einer durch seine Achsbohrung gesteckten Stange angehoben. Wenn die Gabel des Staplers länger ist als die Haspelbreite, kann der Haspel auch an den Flanschen angehoben werden.

rably not come into direct contact with a load hook or the fork of a fork-lift truck, but should be lifted e.g. by wide textile lifting slings.

A practical way to lift a reel is with the aid of a bar pushed through its hole. If the fork of the fork-lift truck is longer than the reel width, the reel can also be lifted at the flanges.

1.3 Wie sollten Drahtseile gelagert werden? /

How should wire ropes be stored?



Drahtseile sollten sauber, kühl und trocken überdacht gelagert werden. Ein Bodenkontakt ist zu vermeiden, beispielsweise durch Lagerung auf Paletten.

Wenn eine Lagerung im Freien unumgänglich ist, müssen die Seile so abgedeckt werden, daß sie mit Regenwasser nicht in Kontakt kommen. Diese Abdeckung schützt zwar gegen Regenwasser, jedoch nicht vor Kondenswasser, welches nicht entweichen kann und das Drahtseil eventuell nachhaltig schädigt. Abhilfe schafft hier beispielsweise eine Zwischenablage aus Sackleinen.

Bei der Lagerung einer größeren Zahl von Ersatzseilen sollte der Grundsatz gelten: first in - first out. Dies bedeutet, daß die Drahtseile in der Reihenfolge ihrer Anlieferung aufgelegt werden sollten. Auf diese Weise wird vermieden, daß einzelne Drahtseile erst nach vielen Jahren Lagerzeit zum Einsatz kommen.

Es versteht sich von selbst, daß bei Verwechslungsgefahr (zum Beispiel bei gleichen Drahtseilen unterschiedlicher Drahtfestigkeiten) die verschiedenen Lagerpositionen deutlich gekennzeichnet werden müssen. Außerdem muß eine ordentliche Dokumentation geführt werden, die anhand von Lagernummern, Spezifikation, Auftrag- und Lieferdatum für jedes der gelagerten und aufgelegten Drahtseile eine Rückverfolgung bis zum Lieferanten ermöglicht.

Wire ropes should be stored under cover in clean, cool and dry conditions. Contact with the ground should be avoided, e.g. by storing on pallets.

If storage outdoors is unavoidable, the ropes must be covered in such a way that they do not come into contact with water. Such a cover gives protection against rain, but condensation, which is unable to escape and possibly causes permanent damage to the wire rope, may form underneath. An intermediate layer of sacking, for example, provides a remedy in this case.

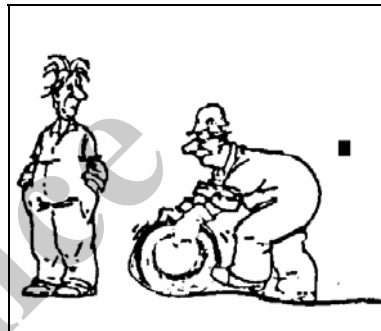
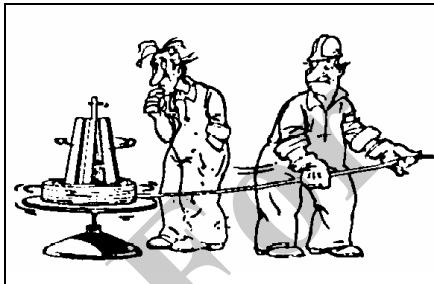
If a large number of spare ropes is stored, the following principle should apply: first in - first out. This means that the wire ropes should be used in the order of their delivery. In this way the use of individual wire ropes after many years of storage is ruled out. It goes without saying that when there is a risk of confusion (e.g. wire ropes which look identical but have different wire strengths) the various storage positions must be clearly marked. It is also essential to keep proper documentation that enables each of the stored and used wire ropes to be traced back to the supplier on the basis of the stock number, specification, order and delivery date.

2 Die Montage von Drahtseilen / *Assembly of wire ropes*

Bei der Montage von Drahtseilen ist generell darauf zu achten, daß die Seile ohne Verdrehung und ohne äußere Beschädigung vom Ring oder Haspel abgewickelt und auf die Anlage aufgelegt werden.

When assembling wire ropes it should generally be ensured that the ropes are unwound from the coil or reel and installed in the plant without twisting and without external damage.

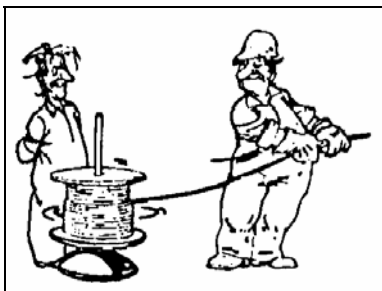
2.1 Das Abwickeln vom Ring / *Unwinding from the coil*



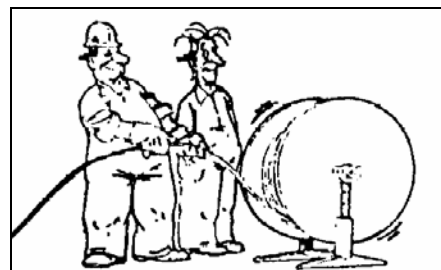
Ein auf einem Ring angeliefertes Drahtseil wird entweder von einem Drehteller abgewickelt oder am Boden ausgerollt. In letzterem Fall sollte der Boden möglichst sauber sein, da beispielsweise Sand, der am Schmiermittel des Drahtseiles haften bliebe, auf der Anlage zwischen Drahtseil und Seilrolle zu Drahtbeschädigungen führen könnte.

*A wire rope supplied on a coil unwound by turntable or on the ground.
In the latter case the ground should be as possible, because sand adhering to the wire rope lubricant, for example, could lead to wire damage between the wire rope and pulley in the plant.*

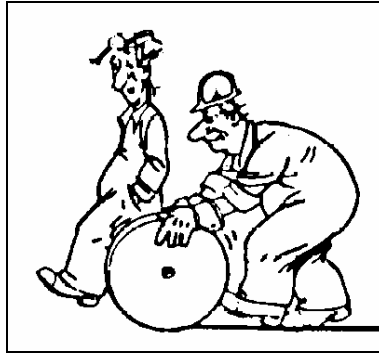
2.2 Das Abwickeln vom Haspel / *Unwinding from the reel*



Ein auf einem Haspel aufgewickeltes Drahtseil wird ebenfalls vorzugsweise von einem Drehteller oder aber von einem Bock abgewickelt.

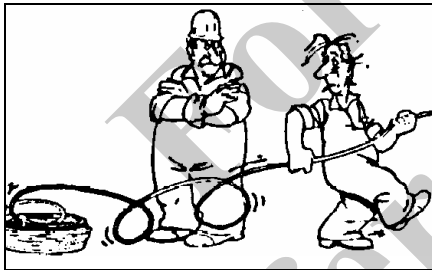


A wire rope wound on a reel is likewise preferably unwound by a turntable or a payoff stand.



Ein Ausrollen am Boden, welches in der einschlägigen Literatur immer wieder empfohlen wird, funktioniert in der Praxis nicht sehr gut, da hierbei der Haspel immer weniger Drahtseil abwickelt als die Wegstrecke, die er zurücklegt, so daß man bei diesem Vorgehen das Drahtseil hinter sich herziehen muß.

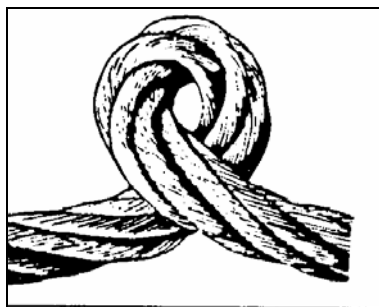
Unreeing on the ground, which is repeatedly recommended in the pertinent literature, is not very satisfactory in practice because the reel unwinds an increasingly smaller amount of rope than the distance it covers, i.e. with this approach you are forced to pull the wire rope along behind you.



In keinem Fall aber darf das Drahtseil seitlich vom Ring oder Haspel abgezogen werden, da auf diese Weise für jede abgezogene Windung eine Torsion in das Drahtseil eingebracht wird. Jede Seilverdrehung aber verändert die Schlaglängen von Litzen und Drahtseil, damit auch die Längenverhältnisse der Seilelemente zueinander und somit letztendlich die Lastverteilungen im Seil.



Under no circumstances, however, is the wire rope to be pulled sideways from the coil or reel, because torsion is introduced into the wire rope for each turn pulled off. Each twisting of the rope changes the lay lengths of strands and wire rope and thus also the length ratios of the rope elements in relation to each other and ultimately the load distributions in the rope.



Ein seitlich vom Ring oder Haspel abgezogenes Drahtseil sperrt sich gegen die aufgezwungene Verdrehung und legt sich in Schlaufen. Bei Belastung eines solchen Seiles ziehen sich die Schlaufen zusammen und erzeugen eine Klenke, eine irreparable Verformung.

A wire rope pulled sideways off the coil or reel resists the twisting and forms loops. If a rope of this type is loaded, the loops contract and produce a kink, an irreparable deformation.

Drahtseile mit Klankenbildung sind nicht mehr betriebssicher und müssen abgelegt werden.

Wire ropes with kink formation are no longer reliable and must be discarded.

2.3 Der Montagevorgang / Assembly

Die vorteilhafteste Art der Drahtseilmontage ist von Anlage zu Anlage verschieden. In jedem Fall ist die Art zu wählen, die bei vertretbarem Aufwand die geringste Gefahr der Seilverdrehung und der Beschädigung des Drahtseiles durch Kontakt mit Konstruktionsteilen gewährleistet.

Bei einigen Geräten kann es empfehlenswert sein, zuerst das alte Drahtseil abzulegen und dann das neue Seil zu montieren, bei anderen, insbesondere größeren Geräten empfiehlt es sich, das neue Drahtseil mit dem alten Seil einzuziehen. Eine weitere Möglichkeit, insbesondere bei der Erstbeseilung, ist die Verwendung eines dünneren Vorseiles, mit dessen Hilfe dann das eigentliche Drahtseil eingezogen wird.

In allen Fällen ist abzuwägen, ob das Drahtseil durch die gesamte Seileinscherung eingezogen werden soll oder zunächst direkt vom Ring oder Haspel auf die Seiltrommel umgespult und anschließend von Hand oder mittels Hilfsseil eingesichert werden soll.

Wenn ein Seilende mit einer nicht lösbaren Seilendverbindung versehen ist, bleibt immer nur die Möglichkeit, das freie Seilende durch die gesamte Einscherung zu ziehen.

The most advantageous type of wire rope assembly varies from plant to plant. The type which ensures the lowest risk of rope twisting and damage to the wire rope by contact with structural parts at acceptable cost should always be selected.

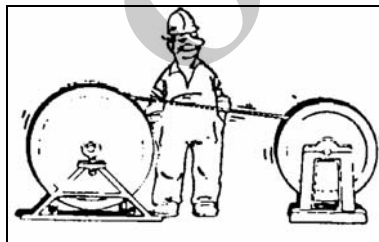
With some equipment it may be advisable first to discard the old wire rope and then assemble the new one; with other equipment, in particular larger units, it is advisable to draw in the new wire rope with the old one.

A further possibility, in particular for the initial ropes, is to use a thinner leader rope for drawing in the actual wire rope.

In all cases it should be considered whether the wire rope is to be drawn through the entire rope reeving system or first rewound directly from the coil or reel on to the rope drum and subsequently reeved by hand or with an auxiliary rope.

If a rope end is provided with an undetachable rope termination, the only option is to draw the free end through the entire reeving system.

2.4 Das Umspulen vom Haspel auf die Seiltrommel / Rewinding from the reel to the rope drum

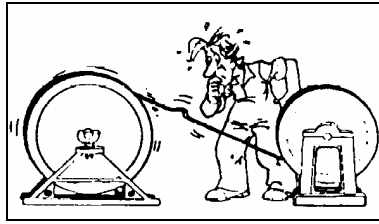


Jedes Drahtseil erhält schon bei der Fertigung, wo es mittels Abzugscheiben aus dem Verseilkorb gezogen wird, eine bevorzugte Biegerichtung. In dieser Richtung gebogen wird es beim Kunden ausgeliefert. Beim Umspulen vom Haspel auf die Seiltrommel ist darauf zu achten, daß das Seil diese bevorzugte Biegerichtung beibehält.

Wenn der Seilstrang unterhalb der Seiltrommel aufläuft, sollte der Montagehaspel so aufgestellt werden, daß der von ihm ablaufende Seilstrang, ebenfalls unterhalb des Haspels abläuft, und umgekehrt.

Each wire rope already acquires a preferred bending direction during production, where it is drawn by take-off pulleys from the stranding cage. It is supplied to the customer already bent in this direction. When rewinding from the reel to the rope drum it should be ensured that the rope retains this preferred bending direction.

If the rope runs under the rope drum, the assembly reel should be installed in such a way that the rope running off it is likewise paid off under the reel and vice versa.



Beim Umspulen entgegengesetzt zur bevorzugten Biegerichtung des Drahtseiles wird dieses entweder versuchen, sich auf der Strecke zwischen Haspel und Seiltrommel zu verdrehen oder später im Einsatz durch Verdrehen die bevorzugte Lage einzunehmen. In beiden Fällen können Strukturveränderungen des Drahtseiles auftreten.

When rewinding against the preferred bending direction of the wire rope, the latter will attempt to twist between the reel and rope drum or subsequently to assume the preferred position by twisting during use. In both cases structural changes may occur in the wire.

2.5 Das Einziehen des neuen Seiles mit Hilfe des alten Seiles oder eines Vorseiles/ Drawing in the new rope with the aid of the old rope or a leader rope

Wenn das neue Drahtseil durch das abzulegende Seil oder ein Vorseil eingezogen wird, ist auf eine sichere Verbindung dieser Seile zu achten. Weiterhin muß gewährleistet sein, daß das Vorseil nicht verdrehen kann. Als Vorseil empfehlen sich zum Beispiel drehungsfreie Drahtseilmacharten oder dreilitzige Faserseile. Bei Verwendung konventioneller Drahtseile ist darauf zu achten, daß sie zumindest die gleiche Schlagrichtung wie das einzuziehende Drahtseil haben.

Wenn das neue Drahtseil mit Hilfe des alten Seiles eingezogen wird, werden die beiden Seilenden oft stumpf gegeneinander geschweißt. Eine derartige Verbindung kann den im Seiltrieb aufgebauten Drall vom alten auf das neue Seil übertragen und dieses schon bei der Montage extrem vorschädigen.

Dieses Verfahren ist aber auch aus anderen Gründen sehr problematisch: Die Schweißverbindung erzielt zwar bei Verwendung spezieller Elektroden im Zerreißversuch im geraden Strang zufriedenstellende Werte, kann aber dennoch wegen der großen Länge der starren Verbindungszone infolge der Biegebeanspruchung beim Lauf über Rollen brechen.

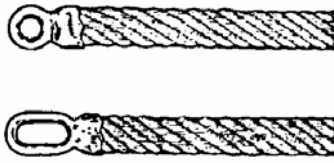
Wenn diese Verbindung Anwendung findet, sollte sie zusätzlich durch einen Seilstrumpf gesichert werden.

If the new wire rope is drawn in by the rope to be discarded or a leader rope, secure joining of these ropes should be ensured. Furthermore, it must be ensured that the leader rope cannot twist. Twist-free wire rope types or three-strand fibre ropes, for example, are recommendable as leader ropes. When conventional wire ropes are used it should be ensured that they at least have the same lay direction as the wire rope to be drawn in.

If the new wire rope is drawn in with the aid of the old rope, the two rope ends are often butt-welded to each other. A joint of this type can transmit the twist built up in the rope drive from the old rope to the new one and already severely damage the latter during assembly.

This procedure is also highly problematical for other reasons: when special electrodes are used, the welded joint may well achieve satisfactory results as a straight strand in the tensile test, but because of the considerable length of the rigid joint zone there is a possibility of it breaking due to bending stresses when running over pulleys.

If this joint is used, it should be secured in addition by a rope stocking.



Unproblematischer ist die Verbindung der Drahtseile durch zwei an den Enden angeschweißte Ringe oder Kettenstücke, die mittels Litzen oder dünnen Seilen verbunden werden. Diese Verbindung besitzt eine zufriedenstellende Tragkraft, ist biegsam und verhindert die Übertragung von Drall vom alten zum neuen Seil. Bei Verwendung von zwei Litzen kann anhand der Zahl der Verdrehungen nach der Montage festgestellt werden, ob das alte Seil auf der Anlage stark verdreht worden ist.

Eine weitere Möglichkeit stellt die Verbindung mittels Seilstrümpfen dar. Seilstrümpfe sind Geflechte aus Litzen, die über die Seilenden geschoben und an den Enden mit Klebeband gesichert werden. Bei Belastung ziehen sich die Seilstrümpfe zusammen und halten die Seilenden mittels Reibung.

Beim Einziehen eines Gleichschlagseils ist zu beachten, daß die Seilstrümpfe sich trotz der Schnürspannungen wie eine Mutter auf einer Schraube auf dem Seil abdrehen können. Hier schafft ein vorheriges Umwickeln der Seilstrecken, die von den Seilstrümpfen gehalten werden sollen, mit einem starken Klebeband Abhilfe.

2.6 Das Auftrommeln unter Last / Winding on to drums under load

Für ein einwandfreies Spulen des Drahtseiles auf der Trommel ist es im Falle von Mehrlagenspülung, und hier besonders bei Verwendung der sogenannten Lebussspülung, von großer Wichtigkeit, daß die Drahtseile unter Vorspannung auf die Trommel gebracht werden.

Wenn die unteren Lagen zu locker sind, können sich die höheren Lagen unter Last zwischen tieferliegende Seilstränge einziehen. Dies kann zu gravierenden Seilschäden führen.

Da der ablaufende Seilstrang an dieser Stelle vielleicht sogar festgeklemmt wird, kann dies beim Abtrommeln des Seiles plötzlich zu einer Spulrichtungs-umkehr und somit zu einem schlagartigen Anheben der abwärts bewegten Last führen.

Die Vorspannung sollte in der Größenordnung von etwa 1 bis 2 % der Mindestbruchkraft der Drahtseile liegen.

The joining of the wire ropes by two rings or chains welded to the ends, which are connected by stranded wires or thin ropes, is less problematical.

This joint has a satisfactory load capacity, is flexible and prevents the transmission of twist from the old rope to the new one. When two stranded wires are used it can be established on the basis of the number of twists after assembly whether the old rope had been heavily twisted on the plant.

A further possibility is joining by rope stockings. Rope stockings are meshes consisting of stranded wires, which are pushed over the rope ends and secured at the ends by adhesive tape. The rope stockings contract under load and hold the rope ends by friction.

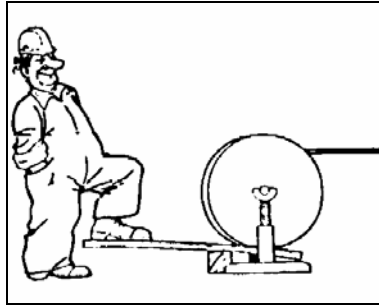
When drawing in a Lang lay rope it should be noted that despite the tying stresses the rope stockings may turn on the rope like a nut on screw. A remedy is provided by previously wrapping strong adhesive tape around the rope sections to be held by the rope stockings.

To ensure that the wire rope is wound properly on the drum it is highly important in the case of multi-layer winding and in particular when using the so-called Lebus winding technique that the wire ropes are brought on to the drum under pre-tension.

If the lower layers are too loose, the higher ones may be drawn in between lower rope sections under load. This may lead to serious rope damage.

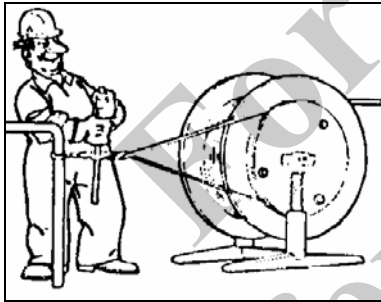
As the rope running off may even become jammed at this point, this may suddenly lead to reversal of the winding direction when unwinding the rope and thus to sudden lifting of the descending load.

The pre-tension should be in the order of magnitude of about 1 to 2 % of the minimum breaking force of the wire ropes.



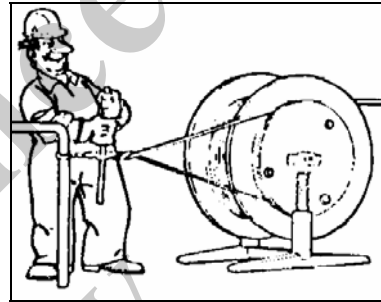
Während es in vielen Fällen ausreicht, das Drahtseil normal aufzulegen, um es dann abzutrommeln und mit Hilfe einer äußeren Last wieder aufzutrommeln, ist dies in anderen Fällen, zum Beispiel im Falle eines Turmdrehkranes, der seine höchste Kletterhöhe noch nicht erreicht hat, nicht möglich. In diesen Fällen muß die Vorspannung bereits bei der Montage aufgebracht werden.

Whereas it is often adequate to mount the wire rope normally and then unwind it and rewind it with the aid of an external load, this is not possible in other cases, e.g. in the case of a slewing tower crane, which has not yet reached its maximum climbing height. In these cases the pre-tension must already be supplied during assembly.



Dies kann beispielsweise durch ein Abbremsen des Haspelflansches mit Hilfe eines Brettes erfolgen oder durch eine am Haspel angebrachte Bremsscheibe. Die Bremsschnüre (Hanfseile mit Stahlkern) liefert der Drahtseilhersteller.

In keinem Fall sollte man versuchen, die Vorspannung durch Klemmkraft, zum Beispiel durch Einklemmen des Drahtseiles zwischen zwei Holzbohlen, zu erzeugen. Das Seil würde durch Strukturveränderungen irreparabel verformt.



This can be done e.g. by braking the reel flange with the aid of a board or by a brake disk mounted on the reel. The brake cords (hemp ropes with a steel core) are supplied by the wire rope manufacturer.

You should never attempt to produce the pre-tension by clamping forces, e.g. by clamping the wire rope between two wooden planks. The rope would be irreparably deformed by structural changes.

2.7 Das Einfahren des Drahtseiles / „Running in” the wire rope

Bevor ein Drahtseil nach seiner Montage die eigentliche Arbeit übernimmt, sollte es eine gewisse Zahl von Lastspielen mit geringen Teillasten durchführen. Es sollte „eingefahren“ werden, damit sich die Seilelemente setzen und der neuen Umgebung anpassen können. Leider wird in der Praxis genau das Gegenteil dieser Empfehlung getan: nach der Seilmontage erfolgt oft zunächst einmal die Überlastprüfung mit Lasten oberhalb der zulässigen Tragkraft der Anlage.

Before a wire rope takes over the actual work after its assembly, it should perform a certain number of load cycles with small partial loads. It should be "run in", so that the rope elements settle and can adapt to the new environment. Unfortunately exactly the opposite of this recommendation is done in practice: rope assembly is often followed first by the overload test with loads above the permissible load capacity of the plant.

2.8 Das Ablängen von Drahtseilen / Cutting wire ropes to length

Oft müssen Drahtseile vom Anwender selbst abgelängt oder gekürzt werden. Das Durchtrennen der Seile kann auf verschiedene Arten erfolgen. Bis zu einem Durchmesser von etwa 8 mm kann eine Drahtseilschere benutzt werden, mechanische oder hydraulische Cutter werden auch für größere Seildurchmesser angeboten. Wenn allerdings eine entsprechende Energiequelle in der Nähe ist, empfiehlt sich immer die Benutzung eines druckluftbetriebenen oder elektrischen Winkelschleifers.

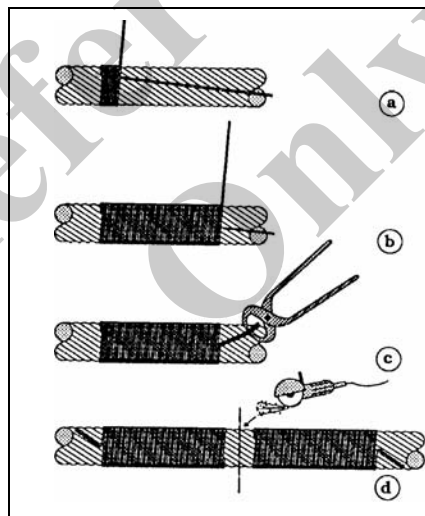
In allen Fällen müssen die Drahtseile neben der Trennstelle sorgfältig abgebunden werden, um ein Aufspringen der Seilenden oder eine Veränderung der Seil- und Litzenschlaglängen zu verhindern. Dies gilt ganz besonders beim Ablängen von drehungsarmen oder drehungsfreien Drahtseilen, deren Litzen oft bewußt vom Seilhersteller nicht vorgeformt worden sind.

Das Abbinden muß mit Eisendraht erfolgen, Isolierbänder können Strukturveränderungen der Drahtseile nicht verhindern.

Wire ropes often have to be cut to length or shortened by the user himself. The ropes can be cut in various ways. Up to a diameter of about 8 mm wire rope shears can be used; mechanical or hydraulic cutters are also offered for larger rope diameters. If a suitable power source is available in the vicinity, however, it is always advisable to use a pneumatically operated or electrical angle grinder.

In all cases the wire ropes must be carefully tied next to the cutting point to prevent the ends springing open or a change in the rope and stranded wire lay lengths. This applies in particular when cutting low-twist or twist-free wire ropes, the stranded wires of which have often intentionally not been preformed by the rope manufacturer.

Iron wire must be used for tying purposes. Insulating tape cannot prevent structural changes in the wire ropes.



Zunächst wird die Trennstelle mit Kreide oder Isolierband markiert. Dann legt man das eine Ende des Bindedrahtes auf einer Länge von etwa 4 mal dem Seildurchmesser längs auf das Seil und beginnt, das Drahtseil und dieses Drahtstück von der Trennstelle wegführend zu umwickeln. Das Seil wird nun auf einer Länge von etwa 3 mal dem Seildurchmesser stramm umwickelt. Dann wird das überwickelte Drahtstück mit Hilfe einer Zange strammgezogen und gemeinsam mit dem zweiten Drahtende verdreht.

First mark the cutting point with chalk or insulating tape. Then lay one end of the tying wire over a length of about 4 times the rope diameter on the rope and start to wrap the wire rope and this piece of wire away from the cutting point. The rope is now wrapped tightly over a length of about 3 times the rope diameter. Then tighten the wrapped piece of wire with pincers and twist together with the second wire end.

Handhabung, Montage und Wartung von Drahtseilen /
Handling, assembly and maintenance of wire ropes

Die Länge der umeinander verdrehten Drahtenden wird mit der Zange auf etwa einen Seildurchmesser gekürzt. Die Drahtenden werden dann mit leichten Schlägen in ein Tal zwischen zwei Außenlitzen des Drahtseiles geschlagen, um der Gefahr einer Verletzung vorzubeugen.

Nach entsprechender Vorbereitung der anderen Seite der Trennstelle kann das Drahtseil nun durchgetrennt werden.

Anstelle eines langen Abbundes können auch auf jeder Seite der Trennstelle drei Abbunde von etwa einem Seildurchmesser Breite angebracht werden.

Shorten the length of the wire ends twisted around each other to about one rope diameter with the pincers. Then lightly tap the wire ends into a recess between two outer stranded wires of the wire rope to prevent the risk of injury.

After similar preparation of the other side of the cutting point the wire rope can now be cut.

Instead of one long tying it is possible to provide each side of the cutting point with three tyings, each with a width of about one rope diameter.

For
Reference
Only

3 Die Wartung von Drahtseilen / Maintenance of wire ropes

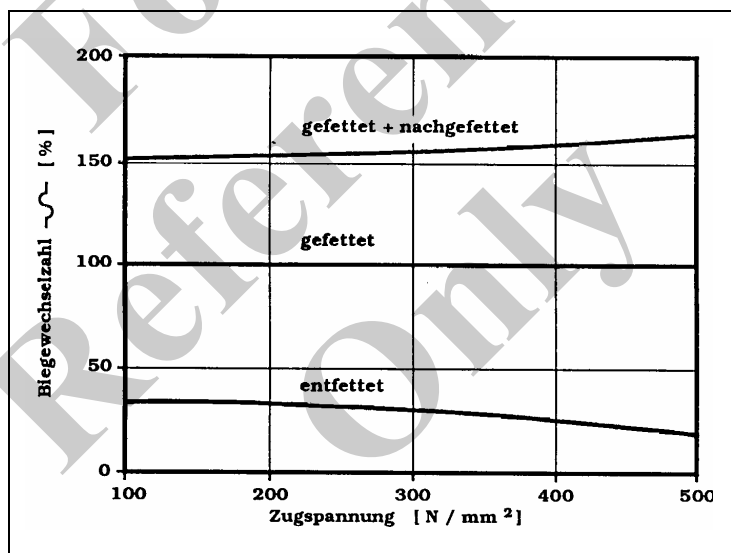
Drahtseile müssen nach DIN 15020 „regelmäßig gewartet werden, wobei die auszuführenden Arbeiten abhängen von der Art des Hebezeuges, dessen Benutzung und der Seilart.“ Durch eine regelmäßige Wartung kann die Lebensdauer eines Drahtseiles erheblich vergrößert werden.

According to DIN 15020 wire ropes must be "regularly serviced", with the work to be carried out depending on the type of hoist, its use and the type of rope". The life of a wire rope can be significantly prolonged by regular maintenance.

3.1 Die Nachschmierung von Drahtseilen / Relubrication of wire ropes

Während seiner Herstellung erhält ein Drahtseil eine intensive Schmierung, die einen Schutz gegen Korrosion und eine Verbesserung der Reibwerte zwischen den Seilelementen untereinander sowie zwischen Drahtseil und Seilrolle oder Trommel erreichen soll. Dieser Vorrat reicht jedoch nur für eine begrenzte Zeit und sollte regelmäßig ergänzt werden.

During its manufacture a wire rope is intensively lubricated to provide protection against corrosion and improvement of the coefficients of friction between the rope elements and between the wire rope and pulley or drum. However, this lubrication lasts only for a limited time and should be regularly supplemented.



Die DIN 15020 schreibt: „Drahtseile müssen in regelmäßigen Abständen, die von den Betriebsverhältnissen abhängen, nachgeschmiert werden, insbesondere im Bereich der Biegezone.“ Weiter heißt es: „Wenn aus betrieblichen Gründen das Nachschmieren des Seiles unterbleiben muß, ist mit einer kürzeren Aufliegezeit zu rechnen und die Überwachung entsprechend einzurichten.“ Der Einfluß von Schmierung und Nachschmierung auf die Seillebensdauer wird im vorigen Bild gezeigt.

According to DIN 15020: "Wire ropes must be re-lubricated at regular intervals which depend on the operating conditions, in particular in the bending zone". It also states: "If relubrication of the rope must be discontinued for operating reasons, a shorter life should be anticipated and the monitoring suitably adapted." The effect of lubrication and relubrication on rope life is shown in.

Bei der Wahl des Nachschmiermittels ist darauf zu achten, daß es mit dem Fabrikat des Drahtseilherstellers verträglich ist. Drahtseilwerk Saar gibt hierüber gerne Auskunft.

When selecting the lubricant, you must ensure that it is compatible with the product of the wire rope manufacturer. Drahtseilwerk Saar will be pleased to supply information in this respect.

Schmierstoffempfehlung

- **Fett:** Aral Aralub LFZ 1

Lubricant recommendation

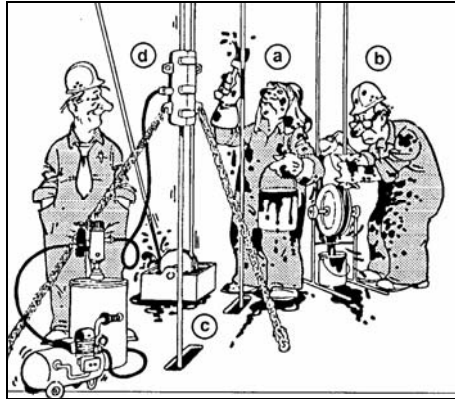
- **grease:** Aral Aralub LFZ 1

• **Haftschmierstoff (Sprühdose):**

Seilfett F 315 L

• **adhesive lubricant (spray):**

Seilfett F 315 L



Das Aufbringen des Schmiermittels kann auf verschiedene Art erfolgen:

Die wohl gebräuchlichsten Methoden sind das Aufbringen mittels Pinsel oder Handschuh.

Auch das Aufbringen von Schmiermittel im Bereich einer Seilrolle wird häufig praktiziert.

Manchmal wird das Schmiermittel kontinuierlich an einer Seilrolle als Tropfschmierung aufgebracht. Bei geringerem Schmiermittelbedarf finden häufig Sprühdosen Anwendung.

Verschiedene Anlagen erlauben das Durchlaufen einer Schmiermittelwanne.

Ein vollständiges Eindringen des Schmiermittels in alle Hohlräume des Drahtseiles garantiert allerdings nur eine Hochdruckschmierung mittels Druckmanschette. Hierbei werden die mit Gummidichtungen versehenen Halbschalen um das Drahtseil geklappt und verschraubt. Während das Drahtseil die Manschette durchläuft, wird mit Drücken um 30 bar Schmiermittel in die Manschette gepreßt. Wichtig bei jeder Drahtseilnachschiemung ist, daß sie von Anfang an regelmäßig erfolgt und nicht erst aufgenommen wird, wenn bereits die ersten Schäden festgestellt wurden.

The lubricant can be applied in various ways:

The most common methods are probably application by brush or glove.

Lubricant is also often applied in the area of a rope pulley.

Sometimes the lubricant is applied continuously as drip-feed lubrication at a cable pulley. Spray tins are often used in the case of smaller lubricant requirements.

Various plants allow the rope to run through a lubricant tank.

However, only high-pressure lubrication by a pressure sleeve ensures complete penetration of the lubricant into all cavities of the wire rope. The half shells with rubber seals are folded around the wire rope and screwed together. As the wire rope passes through, the sleeve lubricant is forced into the sleeve at pressures of around 30 bar. Whichever form of wire rope relubrication is used, the important thing is that it takes place regularly from the outset and is not started only when the first damage has already been detected.

3.2 Das Reinigen von Drahtseilen / Cleaning of wire ropes

Die DIN 15020 schreibt: „Sehr stark verschmutzte Drahtseile sollten von Zeit zu Zeit äußerlich gereinigt werden.“ Dies gilt besonders für Drahtseile, die in stark abrasiver Umgebung arbeiten oder aber im Betrieb chemisch wirksame Stoffe anlagern.

Eine wirksame Reinigung ist allerdings ohne die richtigen Hilfsmittel sehr mühsam. Das kanadische Rigging Manual empfiehlt zur Seilreinigung eine Vorrichtung mit drei rotierenden Bürsten und nachgeschalteter Druckluft. Ein amerikanischer

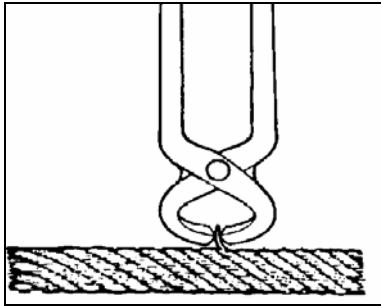
According to DIN 15020: "Extremely dirty wire ropes should be cleaned externally from time to time." This applies in particular to wire ropes which operate in highly abrasive environments or when chemically active substances deposit during operation.

Effective cleaning is extremely troublesome, however, without the correct aids. The Canadian Rigging Manual, recommends a device with three rotating brushes followed by compressed-air for cleaning ropes. An American manufacturer offers a "spiked rope cleaner",

Hersteller bietet einen „Seiligel“ an, eine mit Bürsten versehene rotierende Manschette, die über das Drahtseil gezogen wird.

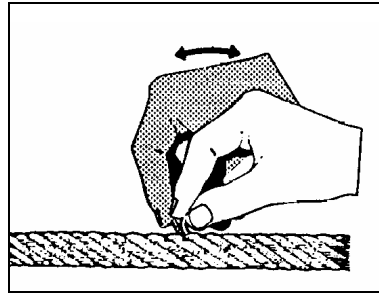
a rotating sleeve with brushes, which is pulled over the wire rope.

3.3 Das Entfernen von gebrochenen Drähten / *Removal of broken wires*



Wenn bei einer Drahtseilinspektion Drahtbrüchen gefunden werden, die sich möglicherweise über benachbarte Drähte legen und diese dann bei Lauf über Rollen ebenfalls zerstören könnten, müssen diese Brüchenden entfernt werden. Auf keinen Fall sollten die Drähte mit einer Zange abgekniffen werden. Die beste Methode ist, die Drähte solange hin- und herzubiegen, bis sie an der letzten Stelle, an der sie in Litzenverband gehalten werden, brechen.

Bei einem dickeren Draht empfiehlt es sich hier, ein Werkzeug hin und her über das Seil zu bewegen und so den Draht zu biegen, bis er bricht.



Any ends of wire breaks found during a wire rope inspection must be removed because they are likely to settle over adjacent wires and cause them to be destroyed as well when running over pulleys. The wires should never be nipped off with pincers. The best method is to bend the wires to and fro until they break at the last point, at which they are held in the stranded wire assembly.

With a thicker wire it is advisable to move a tool to and fro over the rope and thus bend the wire until it breaks.

3.4 Das Kürzen oder Rücken von Drahtseilen / *Shortening or relocation of wire ropes*

Sehr häufig müssen Drahtseile abgelegt werden, weil kurze Seilzonen, beispielsweise das Seilstück, welches auf der Trommel von der ersten in die zweite Lage klettern muß, stark beschädigt sind, während die restliche Seillänge noch in einwandfreiem Zustand ist.

In derartigen Fällen kann die Aufliegezeit von Drahtseilen zum Teil dadurch drastisch erhöht werden, daß die Seile am Festpunkt um eine Strecke gedrückt oder gekürzt werden, die das am stärksten beanspruchte Seilstück aus der Hauptbeanspruchungszone herausführt. Nach diesem Vorgang wird nun eine benachbarte Zone den stärkeren Beanspruchungen ausgesetzt sein.

Eine weitere typische lokale Beschädigung tritt auf der Seiltrommel an den Stellen auf, wo der Seilstrang gegen die benachbarte Windung läuft (crossover point) und zur Seite abgelenkt werden muß. Wenn die hier entstehenden Beschädigungen die Hauptursache für das Ablegen des Drahtseiles darstellen, kann durch mehrfaches Rücken des Seiles und Verschieben der Beanspruchungszone die Seillebensdauer eventuell vervielfacht werden.

Wire ropes often have to be discarded because short rope zones, e.g. the rope section that must climb from the first to the second layer on the drum, are extensively damaged whereas the remaining rope length is still in satisfactory condition.

In such cases the life of wire ropes can sometimes be greatly prolonged by shifting or shortening the ropes at their fixed point by a specific length that moves the most heavily stressed rope section out of the main stress zone. After this process an adjacent zone will now be exposed to the heavier stresses.

Further typical local damage occurs on the rope drum at those points where the rope runs against the adjacent turn (crossover point) and must be diverted sideways. If the damage resulting in this case is the main reason for discarding the wire rope, the rope life can possibly be increased by a multiple by repeated relocation of the rope and displacement of the stress zones.

3.5 Das Wenden von Drahtseilen / Reversal of wire ropes

Auf einigen Anlagen werden die Drahtseile auf verschiedenen Zonen völlig unterschiedlichen Beanspruchungen ausgesetzt. So wird zum Beispiel das Zugseil eines Schürfkübelbaggers (dragline) am Trommelende im wesentlichen auf Biegewechsel beansprucht, das Kübelende wird durch den Boden gezogen und starkem Verschleiß ausgesetzt.

Hier ist es, besonders im Ausland, eine gängige Praxis, das Drahtseil nach einer gewissen Laufzeit zu wenden (end-for-ending), so daß nun das in der Regel noch besser erhaltene Trommelende dem starken Verschleiß ausgesetzt werden kann.

Der Erfolg derartiger Maßnahmen ist allerdings umstritten. In jedem Fall kann sich der Aufwand nur dort lohnen, wo der Seilwert ein Vielfaches der Montagekosten darstellt.

In some plants the wire ropes are exposed to completely different stresses in various zones. For example, the hauling line of a dragline excavator is subjected essentially to alternate bending stresses at the drum end; the bucket end is pulled through the ground and exposed to heavy wear.

It is common practice, particularly abroad, to reverse the wire rope after a certain running time (end-for-ending), so that the drum end usually in better condition can now be exposed to the heavy wear.

However, the success of such measures is disputed. In any case the expenditure is only worthwhile where the rope value is a multiple of the assembly costs.

4 Die Inspektion von Drahtseilen / Inspection of wire ropes

4.1 Warum muß ein Drahtseil inspiziert werden? / Why must a wire rope be inspected?

Ein Drahtseil ist ein Gebrauchsartikel mit einer begrenzten Lebensdauer. Viele Eigenschaften eines Drahtseiles verändern sich im Laufe seiner Einsatzzeit. So steigt beispielsweise seine Bruchkraft zunächst mit zunehmender Laufzeit leicht an, um dann aber nach Überschreiten eines Maximums rapide abzufallen.

Dieser Bruchkraftabfall erklärt sich durch einen zunehmenden Verlust an Metallquerschnitt infolge von Abrieb und Korrosion, durch das Auftreten von Drahtbrücken und durch Strukturveränderungen des Drahtseiles. Die Zahl der Drahtbrüche nimmt in der Regel stetig zu.

Eines der Ziele der Drahtseilinspektion ist es, diesen natürlichen Verlauf zu überwachen, damit das Drahtseil rechtzeitig vor Erreichen eines unsicheren Betriebszustandes abgelegt werden kann.

Ein weiteres Ziel der Inspektion ist es, außergewöhnliche Seilbeschädigungen zu erkennen, die in der Regel durch äußere Einflüsse erzeugt werden. Hierdurch wird einerseits ein rechtzeitiges Ablegen der Drahtseile ermöglicht, andererseits hilft das Erkennen von Schwachstellen im Seiltrieb, Maßnahmen zu ergreifen, die ein wiederholtes Auftreten derartiger Beschädigungen zu vermeiden helfen.

A wire rope is an article of daily use with a limited life. Many properties of a wire rope vary during its period of use. Its breaking force, for example, increases slightly during its initial period of use, but then deteriorates rapidly after reaching a maximum.

This decline in the breaking force is explained by an increasing loss of metal cross-section as a result of wear and corrosion, the occurrence of wire breaks and structural changes in the wire rope. The number of wire breaks usually increases continuously.

One of the aims of wire rope inspection is to monitor this natural wear, so that the rope can be discarded in good time before an unsafe operating condition is attained.

A further aim of inspection is to identify unusual rope damage, which is usually caused by external effects. On the one hand this enables the wire rope to be discarded in good time, on the other hand it can reveal weak points in the rope drive as a first step to introducing measures that can help to prevent repeated occurrence of such damage.

4.2 Wann muß ein Drahtseil inspiziert werden? / When must a wire rope be inspected?

Die DIN 15020, Blatt 2, empfiehlt in Punkt 3.4 „Überwachung“ eine tägliche Sichtprüfung von Drahtseilen und Seilendbefestigungen auf etwaige Schäden.

15020 Part 2 recommends in point 3.4 "Monitoring" a daily visual inspection of wire ropes and rope end fastenings for any damage DIN.

In regelmäßigen Zeitabständen sollen ferner die Drahtseile durch ausgebildetes Fachpersonal auf ihren betriebssicheren Zustand hin untersucht werden. Der zeitliche Abstand der Prüfungen ist nach DIN so festzulegen, „daß Schäden rechtzeitig erkannt werden. Deswegen sind die Abstände in den ersten Wochen nach dem Auflegen eines neuen Drahtseiles und nach dem Auftreten der ersten Drahtbrüche kürzer zu wählen als während der übrigen Aufliegezeit des Drahtseiles. Nach außergewöhnlichen Belastungen oder bei vermuteten nicht sichtbaren Schäden ist der zeitliche Abstand entsprechend zu kürzen (ggf. auf Stunden). Außerdem ist eine solche Prüfung durchzuführen bei der Inbetriebnahme nach längeren Stillstandszeiten, bei zum Ortswechsel demontierten Hebezeugen vor jeder Inbetriebnahme an einer neuen Arbeitsstelle und nach jedem Unfall oder Schadensfall, der in Zusammenhang mit dem Seiltrieb aufgetreten ist.

Seilrollen, Seiltrommeln und Ausgleichsrollen sind nach DIN 15020 „bei Bedarf, jedoch mindestens einmal jährlich und bei jedem Auflegen eines neuen Drahtseiles“ zu überprüfen.

Regelmäßige Inspektionen des Seiltriebes dienen der Sicherheit des Betreibers in zweifacher Hinsicht; Zunächst einmal wird das Unfallrisiko vermindert. Sollte aber durch einen unglücklichen Zufall dennoch einmal ein Schaden eintreten, helfen lückenlose Dokumente regelmäßiger Überwachungen, einen Vorwurf der Fahrlässigkeit zurückzuweisen.

4.3 Übersicht über die Ablegekriterien / Survey of discard criteria

Nach DIN 15020 muß ein Drahtseil abgelegt werden, wenn eines oder mehrere der folgenden Kriterien erfüllt sind:

1) Drahtbrüche. Ein Drahtseil muß abgelegt werden, wenn die zulässige Drahtbruchzahl gemäß DIN 15020 erreicht oder überschritten wurde (siehe Kapitel 5). Bei Auftreten von Drahtbruchnestern ist das Drahtseil ebenfalls abzulegen.

2) Durchmesser verringering. Ein Drahtseil muß abgelegt werden, wenn es seinen Durchmesser durch Strukturveränderungen auf längere Strecken um 15% oder mehr gegenüber dem Nennmaß verkleinert hat.

3) Korrosion. Ein Drahtseil muß abgelegt werden, wenn seine Tragkraft oder seine Betriebsfestigkeit durch Korrosion übermäßig herabgesetzt wurde. Hier muß das Drahtseil bei einer Durchmesser verringering von 10% gegenüber dem Nennmaß abgelegt werden, auch wenn keine Drahtbrüche festgestellt werden.

The wire ropes should also be checked at regular intervals by trained technicians to ensure that they are in operationally reliable condition. According to DIN the intervals between the checks should be laid down in such a way that "damage is recognized in good time. Hence the intervals in the first few weeks after a new wire rope is mounted and after occurrence of the first wire breaks should be shorter than during the remaining life of the wire rope. After unusual loads or in the case of suspected, invisible damage the interval should be shortened accordingly (if necessary to hours). Such an inspection should also be carried out when starting up after prolonged stoppages, in the case of hoists dismantled for relocation before each start-up at a new workplace, and after each accident or case of damage which occurs in connection with the rope drive."

According to DIN 15020, rope pulleys, rope drums and compensating pulleys "should be checked as required, but at least once yearly and whenever a new wire rope is mounted".

Regular inspections of the rope drive help to improve the safety of the operator in two respects: firstly the accident risk is reduced and secondly, if an accident occurs by misfortune, complete documentation of regular monitoring helps to reject a charge of negligence.

According to DIN 15020, a wire rope must be discarded if one or more of the following criteria are satisfied:

1) Wire breaks. A wire rope must be discarded if the permissible number of wire breaks according to DIN 15020 has been achieved or exceeded (see Section 5). If clusters of wire breaks occur, the wire rope should likewise be discarded.

2) Reduction of diameter. A wire rope must be discarded if its diameter has been reduced by structural changes on long sections by 15 % or more compared to the nominal dimension.

3) Corrosion. A wire rope must be discarded if its load capacity or operating strength has been unduly reduced by corrosion. In this case the wire rope must be discarded if its diameter has been reduced by 10 % compared to the nominal dimension, even if no wire breaks are detected.

4) Abtrieb. Ein Drahtseil muß abgelegt werden, wenn seine statische Bruchkraft oder seine Betriebsfestigkeit durch metallischen Abtrieb übermäßig herabgesetzt wurde. Hier muß das Drahtseil bei einer Durchmesser verringering von 10 % gegenüber dem Nennmaß abgelegt werden, auch wenn keine Drahtbrücke festgestellt werden.

4) Wear. A wire rope must be discarded if its static breaking force or operating strength has been unduly reduced by metallic wear. The wire rope must be discarded in the case of a 10% reduction in diameter compared to the nominal dimension, even if no wire breaks are detected.

5) Seilverformungen
Rope deformations



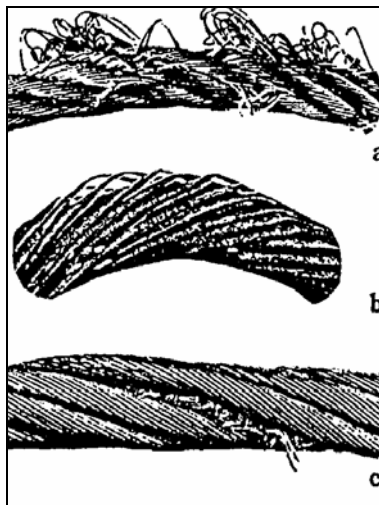
a) Korkenzieherartige Verformungen. Ein Drahtseil muß abgelegt werden, wenn eine korkenzieherartige Verformung eine Wellenhöhe von 1/3 des Seildurchmessers erreicht.

a) Corkscrew-type deformations. A wire rope must be discarded if a corkscrew-type deformation achieves an undulation height of one third of the rope diameter.



b) Korbbildungen. Bei Auftreten einer Korbbildung muß ein Drahtseil abgelegt werden.

b) Basket formations. If a basket formation occurs, a wire rope must be discarded.



c) Schlaufenbildungen. Bei erheblicher Veränderung des Seilverbandes durch Schlaufenbildungen von Drähten muß ein Drahtseil abgelegt werden.

c) Loop formations. In the event of a significant change in the rope assembly as a result of loop formations of wires, a wire rope must be discarded.

Handhabung, Montage und Wartung von Drahtseilen /
Handling, assembly and maintenance of wire ropes

d) Drahtlockerungen. Bei durch Rost oder Abrieb verursachten Drahtlockerungen muß ein Drahtseil abgelegt werden. Bei anderer Ursache sind die Folgeschäden für das Ablegen entscheidend.

e) Knotenbildungen. Bei starker Knotenbildung (Bildung von lokalen Verdickungen im Seil) muß ein Drahtseil abgelegt werden.

f) Einschnürungen. Drahtseile mit starken Einschnürungen sind abzulegen.

g) Lockenartige Verformungen. Drahtseile, die bleibende Verformungen erlitten haben, weil sie über eine Kante gezogen wurden, sind abzulegen.

h) Klanken. Drahtseile mit Klanken (zugezogene Seilschlinge) sind abzulegen.

i) Knicke. Drahtseile, die durch gewaltsame äußere Einwirkung Knicke erhalten haben sind abzulegen.

d) Wire loosening. In the event of wire loosening caused by rust or wear, a wire rope must be discarded. In the event of other causes the consequential damage is determinative for discard of the rope.

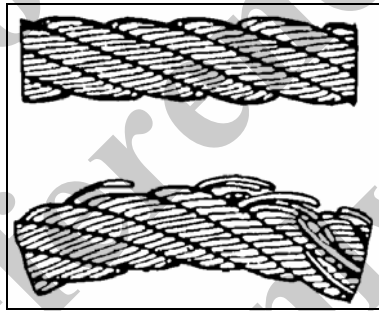
e) Knot formations. In the case of prominent knot formation (local thickening in the rope) a wire rope must be discarded.

f) Constrictions. Wire ropes with prominent constrictions must be discarded.

g) Curl-type deformations. Wire ropes, which have sustained permanent deformations, because they were drawn over an edge, must be discarded.

h) Kinks. Wire ropes with kinks (rope loops drawn together, must be discarded.

i) Bends. Wire ropes which have been bent by external force must be discarded.



j) Hitzeinwirkung. Drahtseile, die übermäßiger Hitzeinwirkung ausgesetzt waren, sind abzulegen. Eine Erwärmung von Seildrähten auf Temperaturen über etwa 300 Grad Celsius führen zu einem starken Abfall der Drahtfestigkeit

j) Heat effect. Wire ropes, which have been exposed to excessive heat, must be discarded. Heating of rope wires to temperatures over about 300°C leads to a sharp reduction of the wire strength.

4.4 **Wo muß das Drahtseil inspiziert werden? /** **Where must a wire rope be inspected?**

Eine optische Begutachtung hat generell auf der gesamten Seillänge zu erfolgen, wobei kritischen Stellen natürlich eine erhöhte Aufmerksamkeit gezollt werden sollte. Kritische Stellen sind:

a) die Seilzonen, die die größte Zahl von Biege-
wechseln ausführen. Hier ist mit erhöhtem Abtrieb
und Drahtbrüchen zu rechnen.

b) die Lastaufnahmepunkte. Wenn ein Hebezeug
bevorzugt an einer Stelle eine Last aufnimmt oder
abgibt, sind alle Seilzonen, die in dieser Stellung
auf Seilrollen liegen oder auf die Trommel auf-
oder von ihr ablaufen, besonderen Beanspru-
chungen unterworfen.

c) die Seilendbefestigungen. An den Seilendbefes-
tigungen ist das Drahtseil in seiner Elastizität be-
einträchtigt, die Seilgeometrie ist hier eingefroren.
Die Befestigung übt oft zusätzliche Pressungen
auf das Drahtseil aus, die Übergangszonen sind
häufig zusätzlichen Spannungen durch Seil-
schwingungen ausgesetzt. Oft kann sich in den
Endbefestigungen Feuchtigkeit festsetzen. Daher
ist hier mit Drahtbrüchen und Korrosion zu rech-
nen.

d) Seilzonen auf Ausgleichsrollen. Im Gegensatz
zu einer Einschätzung nach DIN 15020, die für
Ausgleichsrollen kleinere Durchmesser gestattet
als für die übrigen Rollen im Seiltrieb, sind die
Seilzonen auf Ausgleichsrollen durch Schwingun-
gen der Last oder ungleichmäßiges Spulen zweier
Seiltrommeln z. T. sehr hohen Biegewechselzah-
len unterworfen.
Oft kann sich hier auch Feuchtigkeit zwischen Seil
und Rolle festsetzen und örtlich verstärkte Korro-
sion bewirken.

e) Seilzonen auf Seiltrommeln. Lastaufnahme-
punkte und Überkreuzungsstellen auf Seiltrom-
meln sind verstärktem Verschleiß unterworfen und
daher besonders auf Abtrieb, Drahtbrüche und
Strukturveränderung zu prüfen. Bei Mehrlagen-
spulung können sich die unteren Lagen lockern
und zu Hindernissen für die auflaufenden Seil-
stränge werden, auch können sich höhere Lagen
in lockere untenliegende Lagen hineinziehen.
Berührungsstellen mit den Trommelflanschen und
Steigungszonen sind außerdem besonders zu
begutachten, da sie starkem Verschleiß ausge-
setzt sein können.

*A visual inspection must generally be carried out on
the full rope length, whereby greater attention should,
of course, be paid to critical points. Critical points are
as follows:*

*a) the rope zones which perform the largest number of
alternate bends. Increased wear and wire breaks
should be anticipated in this case.*

b) the load pick-up points.

*If a hoist predominantly picks up or sets down a load at
a specific point, all the rope zones lying on the rope
pulleys or running on to or off the drum in this position
are subjected to special stresses.*

*c) the rope end fastenings. The elasticity of the wire
rope is reduced at the rope end fastenings; the rope
geometry is "frozen" at this point.*

*The fastening often exerts additional pressures on the
wire rope and the transition zones are frequently expo-
sed to additional stresses by rope vibrations. Moisture
may often deposit in the end fastenings. Hence wire
breaks and corrosion are to be anticipated here.*

*d) Rope zones on compensating pulleys. Contrary to
an estimation according to DIN 15020, which permits
smaller diameters for compensating pulleys than for
the other pulleys in the rope drive, the rope zones on
compensating pulleys are sometimes exposed to very
high alternate bending stresses as a result of vibrations
of the load or non-uniform winding of two rope drums.
Moisture may also deposit between rope and pulley and
cause locally increased corrosion.*

*e) Rope zones on rope drums. Load pick-up points and
crossover points on rope drums are exposed to heavier
wear and should therefore be inspected in particular
for wear, wire breaks and structural changes. In the
case of multi-layer winding the lower layers may loo-
sen and become obstacles for the ropes running on to
the drum; higher layers may also be drawn into loose
lower layers. Contact points with the drum flanges and
gradient zones should also be specially evaluated be-
cause they may be exposed to heavy wear.*

f) Seilscheiben. Seilscheiben sind, sofern dies möglich ist, auf ihre Gängigkeit hin zu prüfen. Der Rillengrund der Scheiben, der im Durchmesser etwa Seilnennndurchmesser plus 6% bis plus 8% betragen sollte, ist mit Hilfe einer Lehre zu überprüfen.

Eine zu enge Seilrille führt zu einem starkem Abfall der Seillebensdauer infolge von Strukturveränderungen. Eine zu weite Rille bewirkt wegen der ungenügenden Unterstützung des Drahtseiles einen Abfall der Seillebensdauer infolge vorzeitiger Seilermüdung.

Die verbleibende Wandstärke von Rollen sollte gemessen werden, eventuell vorgefundenes seitliches Einarbeiten ist zu vermerken. Rollen mit Negativabdrücken der Seiloberfläche im Rillengrund sollten ausgetauscht werden.

g) Seilzonen, die aggressiven Medien oder Hitze ausgesetzt sind. Chemikalieneinfluß oder Hitze können die Tragkraft von Drahtseilen deutlich herabsetzen. Dauertemperaturen von etwa 200 Grad Celsius sind für das Drahtmaterial noch unkritisch, jedoch können bereits Temperaturen von 250 Grad Celsius zum vollständigen Schmiermittelverlust des Drahtseiles und somit zu einer deutlichen Verschlechterung der Arbeitsbedingungen führen.

f) Rope pulleys. Insofar as possible, rope pulleys should be checked for easy movement. The groove base in the pulleys, the diameter of which should be about rope nominal diameter plus 6 % to 8 %, should be checked with a gauge.

A rope groove that is too narrow leads to a sharp drop in the rope life as a result of structural changes. A groove that is too wide causes reduction of the rope life as a result of premature rope fatigue because of the inadequate support of the wire rope.

The remaining wall thickness of pulleys should be measured; any lateral working in should be noted. Pulleys with negative impressions of the rope surface in the groove base should be changed.

g) Rope zones, which are exposed to corrosive media or heat. The effect of chemicals or heat may clearly reduce the load capacity of wire ropes. Continuous temperatures of about 200°C are still uncritical for the wire material, but temperatures of 250°C may already lead to complete lubricant loss of the wire rope and thus to a notable deterioration of the operating conditions.

4.5 Die Ablegedrahtbruchzahl / Number of wire breaks for discard

Die Ablegedrahtbruchzahl stellt das wichtigste Ablegekriterium dar. Als Ablegedrahtbruchzahl gilt die größte Zahl der auf einer Länge von 6 x Seildurchmesser oder 30 x Seildurchmesser gefundenen äußeren, oder wenn diese zugänglich sind, auch inneren Drahtbrüche.

Die Ablegebruchzahl ist in DIN 12050 Blatt 2, Seite 3, in Abhängigkeit von der Zahl der tragenden Drähte in den Außenlitzen des Drahtseiles und der Triebwerksgruppe des Seiltriebes dargestellt. Die Tabelle unterscheidet ferner zwischen Kreuzschlag- und Gleichschlagseilen.

Die Ablegedrahtbruchzahl von Kreuzschlagseilen ist im Mittel doppelt so hoch wie die Ablegedrahtbruchzahl von Gleichschlagseilen.

Mit größer werdender Zahl der tragenden Drähte steigt die Ablegedrahtbruchzahl. In den Triebwerksgruppen 2 m, 3 m 4 m und 5 m ist die Ablegedrahtbruchzahl doppelt so hoch wie in den hochbelasteten Triebwerksgruppen 1 Em bis 1 Am.

The number of wire breaks for discard is the most important discard criterion. The highest number of external or, if accessible, also inner wire breaks found on a length of 6 x rope diameter or 30 x rope diameter applies as number of wire breaks for discard.

The number of breaks for discard is shown in DIN 125020, Part 2, page 3 as a function of the number of supporting wires in the outer strands of the wire rope and the drive unit group of the rope drive. The table also distinguishes between cross-lay and Lang lay ropes.

The number of wire breaks for discard in the case of cross-lay ropes is on average twice as high as the number for Lang lay ropes.

As the number of supporting wires increases the number of wire breaks for discard also rises. In the drive unit groups 2 m, 3 m, 4 m and 5 m the number of wire breaks for discard is twice as high as in the heavily loaded groups 1 Em to 1 Am.

Die Angabe von Ablegedrahtbruchzahlen für eine Länge von 6 x Seildurchmesser (ungefähr eine Seilschlaglänge) und für eine Länge von 30 x Seildurchmesser (ungefähr 5 Seilschlaglängen) berücksichtigt das mögliche Auftreten von lokal begrenzten Beschädigungen oder Drahtbruchnesten: Selbst wenn die Ablegedrahtbruchzahl für eine Länge von 30 x Seildurchmesser noch nicht erreicht ist, kann das Drahtseil infolge einer lokalen Beschädigung bereits nicht mehr betriebssicher sein. Es muß dann wegen des Erreichens der Ablegedrahtbruchzahl für 6 x Seildurchmesser abgelegt werden.

Specification of numbers of wire breaks for discard for a length of 6 x rope diameter (approx. one rope lay length) and for a length of 30 x rope diameter (approx. 5 rope lay lengths) takes into account the possible occurrence of locally limited damage or clusters of wire breaks. Even if the number of wire breaks for discard for a length of 30 x rope diameter is not yet achieved, the wire rope may no longer be reliable as a result of local damage. It must then be discarded because the number of wire breaks for discard for 6 x rope diameter is achieved.

For
Reference
Only

4.6 Wie muß ein Drahtseil inspiziert werden? / How must a wire rope be inspected?

4.6.1 Hilfsmittel / Aids

Bei einer fachmännischen Inspektion des Drahtseiles und des Seiltriebes sollten folgende Hilfsmittel zur Verfügung stehen:

- eine Schieblehre (evtl. mit Meßflächen)
- ein Bandmaß
- ein Stück weiße Kreide, ein Stück schwarze Wachskreide
- eine Endlosrolle Papierstreifen
- ein Schraubendreher
- eine Lupe (evtl. Meßlupe, Fadenzähler)
- zwei Satz Rillenlehren
- ein Putzlappen
- ein Notizblock oder ein Inspektionsformular
- die Protokolle der vorausgegangenen Inspektionen
- ein Kugelschreiber o. ä.
- eine Übersicht über die Ablegekriterien

The following aids should be available for a competent inspection of the wire rope and the rope drive:

- *a sliding gauge (possibly with measuring surfaces)*
- *a tape measure*
- *a piece of white chalk, a piece of black wax chalk*
- *an endless roll of paper tape a screwdriver*
- *a magnifier (possibly measuring magnifier, thread counter)*
- *two sets of groove gauges*
- *a cleaning rag*
- *a notepad or inspection form*
- *the records of the previous inspections*
- *a ball-point pen or the like*
- *a list of the discard criteria*

4.6.2 Ermittlung der Drahtbruchzahlen / Determination of the numbers of wire breaks

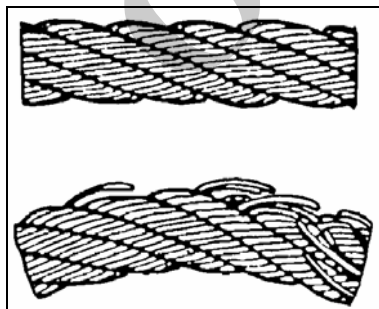
Die Ermittlung der Drahtbruchzahlen muß durch eine äußere visuelle Begutachtung erfolgen. Zunächst muß hierbei durch eine Überprüfung möglichst der gesamten Seillänge die Seilzone mit der größten Drahtbruchhäufung ermittelt werden. Auf den schlechtesten Seilzonen werden mit Hilfe eines Bandmaßes Strecken der Länge 30 x Seildurchmesser abgemessen und mit Kreide markiert. Bei Auftreten von Drahtbruchnestern oder lokalen Beschädigungen des Drahtseiles wird außerdem eine Strecke von 6 x Seildurchmesser (ungefähr eine Seilschlaglänge), die die Schäden beinhaltet, markiert. Auf diesen Strecken werden nun sorgfältig alle Drahtbrüche durch Sichtkontrolle und Abtasten des Seiles auf dem Umfang gezählt. Zur besseren optischen Kontrolle kann es hierbei erforderlich sein, die Seiloberfläche mit Hilfe eines Putzlappens und die Täler zwischen den Litzen mit einem Schaber von Schmiermittel und Schmutz zu befreien.

Das Abtasten des Seiles ist bei der Ermittlung der Drahtbruchzahl ebenso wichtig wie die optische Kontrolle, da sich häufig, besonders bei gut vorgeformten Seilen, die Drahtbruchenden nicht aus dem Seilverband herausheben. Außerdem ist häufig der schmale Spalt zwischen den Bruchenden mit Schmiermittel zugesetzt und daher optisch selbst bei gesäuberten Seilen kaum wahrnehmbar. Wer bei der Seilkontrolle keine schmutzigen Finger bekommt, arbeitet nicht gründlich genug!

The numbers of wire breaks must be determined by an external visual inspection. The rope zone with the largest accumulation of wire breaks must first be determined preferably by checking the full length of the rope.

Sections with a length 30 x rope diameter are measured with a tape measure on the worst rope zones and marked with chalk. If clusters of wire breaks or local damage to the wire ropes occur, a length of 6 x rope diameter (approx. one rope lay length), which includes the damage, is also marked. All wire breaks on these sections are now carefully counted by visual inspection and feeling the rope on its circumference. For better visual inspection it may be necessary to clean the rope surface with a rag and remove lubricant and dirt from the recesses between the stranded wires with a scraper.

When determining the number of wire breaks the feeling of the rope is just as important as the visual inspection, because the wire break ends often do not project from the rope, particularly in well preformed ropes. In addition the narrow gap between the break ends is often clogged with lubricant and therefore barely discernible to the eye even on cleaned ropes. Anyone not getting their fingers dirty when inspecting ropes is not working thoroughly enough!



Drahtbrüche von Außendrähten, die nicht auf den Litzenkuppen, sondern an den Berührungsstellen zweier benachbarter Drähte oder sogar an der Litzenunterseite auftreten, sind sehr schwer zu erkennen. Bei dünnen Seilen, die vollständig entlastet werden können, lassen sich derartige Drahtbrüche durch starkes Biegen des Seiles sichtbar machen.

Die ermittelten Drahtbruchwerte werden notiert und mit den nach DIN 15020 zulässigen Drahtbruchzahlen verglichen. Bei Überschreiten der zulässigen Drahtbruchzahlen muß das Drahtseil abgelegt werden.

Outer wire breaks, which do not occur on the top of the stranded wires but at the contact points between adjacent strands or even on the underside are extremely difficult to recognize. In the case of thin ropes, which can be fully relieved, such wire breaks can be made visible by bending the rope.

The numbers of wire breaks determined are noted and compared with the numbers permissible according to DIN 15020. If the permissible numbers are exceeded, the wire rope must be discarded.

4.6.3 Ermittlung des Seildurchmessers / Determination of the rope diameter

Die Messung des Seildurchmessers sollte bereits am fabrikneu angelieferten Seil mehrfach durchgeführt werden. Zum einen kann durch diese Messung festgelegt werden, ob das neue Seil innerhalb der von den Normen vorgeschriebenen Toleranz von Seilnennndurchmesser + 0% bis Seilnennndurchmesser + 5% liegt (bei Verwendung spezieller Spulsysteme kann der zulässige Durchmesserbereich für das Drahtseil weiter eingengt sein). Zum anderen kann der Mittelwert der gemessenen Durchmesser im Neuzustand als Vergleichswert für alle folgenden Messungen dienen.

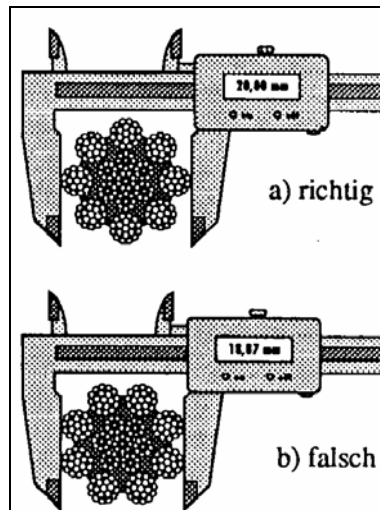
Durch Messungen des Seildurchmessers während der weiteren Betriebszeit des Seiles soll gewährleistet werden, daß abnormal schnelle Verringerungen des Seildurchmessers (zum Beispiel durch Bruch der Stahleinlage) schnell erkannt werden. Weiterhin sollen die Messungen sicherstellen, daß das Seil bei Erreichen der von den Normen vorgeschriebenen maximalen Durchmesserverringerung abgelegt wird. Bei einer Abnahme des Seildurchmessers auf 90% seines Nennwertes muß nach DIN 15020 ein Drahtseil abgelegt werden.

Zur exakten Bestimmung des Seildurchmessers an verschiedenen charakteristischen oder auch außergewöhnlichen Zonen des Drahtseiles bedienen wir uns einer Schieblehre. Die Schieblehre sollte nach Möglichkeit zwei plane Meßflächen aufweisen, eine Digitalanzeige ist vorteilhaft.

The rope diameter should be measured several times on the brand-new rope. Firstly, it can be established by this measurement whether the new rope is within the tolerance of rope nominal diameter + 0 % to rope nominal diameter + 5 % specified in the standards (if special winding systems are used the permissible diameter range for the wire rope may be narrower). Secondly, the mean value of the measured diameter in the brand-new condition can serve as a comparison value for all subsequent measurements.

It should be ensured by measurement of the rope diameter during further operation of the rope that abnormally rapid reductions of the rope diameter (e.g. as a result of fracture of the steel insert) are quickly detected. Furthermore, the measurements should ensure that the rope is discarded when the maximum diameter reduction specified in the standards is achieved. With reduction of the rope diameter to 90 % of its nominal value a wire rope must be discarded according to DIN 15020.

A sliding gauge is used for accurate determination of the rope diameter in various characteristic or unusual zones of the wire rope. The sliding gauge should preferably have two flat measuring surfaces; a digital display is advantageous.



Der Seildurchmesser ist definiert als der Durchmesser des Hüllkreises der Außenlitzen. Die Messung muß also die höchsten Stellen der Außenlitzen erfassen, eine Messung über den Tälern ergäbe einen zu kleinen Wert.

An jeder Meßstelle sollten zwei senkrecht zueinander stehende Seildurchmesser gemessen werden, um auch eventuelle Unrundheiten des Seiles erkennen zu können

Die Eintragung in das Prüfprotokoll könnte heißen: „Seildurchmesser 20.4/20.5 mm“.

The rope diameter is defined as the diameter of the enveloping circle of the outer stranded wires. Hence the measurement must cover the highest points of the outer stranded wires ; measurement over the troughs would produce too small a value. Two rope diameters at right angles to each other should be measured at each measuring point to enable detection of any out-of-roundness.

The entry in the test report could read as follows: "Rope diameter 20.4/20.5 mm".

4.6.4 Messung der Seilschlaglänge / Measurement of the rope lay length

Zur Messung der Seilschlaglänge benötigen wir Bandmaß und Kreide. Um den Fehler bei der Messung möglichst gering zu halten, messen wir über drei oder mehr Schlaglängen und dividieren anschließend die gemessene Länge durch das gewählte Vielfache.

Hierzu markieren wir im interessierenden Bereich eine beliebige Litze auf der Kuppe mit einem Kreidepunkt (Kuppe Null), und auf der weiteren Seillänge jede Kuppe an der Stelle, wo dieselbe Litze nach einer Umrundung des Seiles wieder auftaucht. Bei einem achtlitzigen Seil zum Beispiel markieren wir die achte, sechzehnte, vierundzwanzigste und zweiunddreißigste Kuppe.

Die Strecke von unserer ersten Markierung (Kuppe Null) bis zur letzten schließt nun genau vier Seilschlaglängen ein.

Wir messen die Strecke, dividieren den erhaltenen Wert durch vier und erhalten so mit relativ geringem Meßfehler die Seilschlaglänge in dieser Zone.

A tape measure and chalk are required for measurement of the rope lay length. To minimize the measuring error, the measurement is made over three or more lay lengths and the measured length subsequently divided by the selected multiple.

For this purpose the top side of any strand in the range of interest is marked with chalk (top side zero) and each top side on the further rope length at the point where the same strand reappears after passing round the rope. On an eight-strand rope, for example, the eighth, sixteenth, twenty-fourth and thirty-second top sides are marked.

The distance from the first mark (top side zero) to the last one now includes exactly four rope lay lengths.

The distance is measured, the value obtained divided by four and the rope lay length in this zone obtained with a relatively small measuring error.

Wie der Durchmesser soll auch die Seilschlaglänge beim fabrikneu angelieferten Seil durch mehrere Messungen ermittelt und schriftlich festgehalten werden, auch hier kann der Mittelwert als Vergleichswert für alle folgenden Messungen dienen. In der Regel kann die Seilschlaglänge im Anlieferungszustand des Seiles jedoch auch später noch auf den Totwindungen auf der Trommel gemessen werden.

Die Größe der Schlaglänge allein besitzt für den Seilbetreiber keine Aussagekraft, deutliche Veränderungen der Seilschlaglänge sind jedoch ein Alarmsignal, welches darauf hinweist, daß irgend etwas nicht in Ordnung ist.

Eine andere Möglichkeit, die Seilschlaglänge zu messen, die gleichzeitig noch ein archivierbares Dokument liefert, ist der Abdruck der Seiloberfläche auf einem langen Papierstreifen. Der Abdruck wird folgendermaßen hergestellt: Zunächst wird das freie Ende des aufgerollten Papierstreifens auf dem Seil mittels Klebeband befestigt. Dann entrollt man den Streifen über der Seillänge und fährt gleichzeitig mit einem Stück Wachskreide über das Papier. Über den Litzenkuppen entsteht so ein sauberer Abdruck der Außendrähte des Seiles. Der Papierstreifen wird für die spätere Auswertung beschriftet.

Vor Ort kann durch Übereinanderlegen eines Abdrucks der toten Trommelwindung und der untersuchten Zone und Betrachtung gegen das Licht bereits grob festgestellt werden, ob sich Veränderungen ergeben haben.

Like the diameter, the rope lay length should also be determined by several measurements on the brand-new rope and recorded in writing. The mean value can again serve as comparison value for all subsequent measurements. However, the rope lay length on the new rope can usually also be measured subsequently on the dead turns on the drum.

The lay length is not in itself informative for the rope operator; however, clear changes in the rope lay length are an alarm signal which indicates that something is not in order.

Another possibility of measuring the rope lay length, which also supplies a hard-copy document, is the impression of the rope surface on a long paper strip.

The impression is made as follows: the free end of the rolled-up strip is first secured on the rope by adhesive tape. The strip is then unrolled over the rope length and a piece of wax chalk moved over the paper at the same time. A clear impression of the outer wires of the rope is thus obtained via the top sides of the strands. The paper strip is labelled for subsequent evaluation.

By laying impressions of the dead drum turns and the investigated zone over each other and viewing them against the light it can be roughly ascertained in situ whether changes have occurred.

4.6.5 Überprüfung der Festigkeit des Drahtseilgefüges / Checking the strength of the wire rope structure

Die Festigkeit des Drahtseilgefüges ermitteln wir, indem wir einen Schraubendreher zwischen zwei Decklitzen stecken und ohne große Gewaltanwendung versuchen, durch Drehen des Handgriffs einen Spalt zu erzeugen. Wenn das Drahtseil dieser Verdrehung keinen großen Widerstand entgegensetzt, uns eventuell sogar ein Durchstecken des Schraubendrehers unter zwei benachbarte Litzen erlaubt, liegen Lockerungen des Seilgefüges vor.

In gleicher Weise überprüfen wir, ob sich die Außendrähte des Seiles im Litzenverband gelockert haben.

Ein gewaltsames Abheben der Decklitzen mit Hilfe eines Schraubers oder eines Spleißnagels, wie es verschiedentlich praktiziert wird, um den Zustand des Herzseiles zu begutachten, sollte nach Möglichkeit vermieden werden. Nur zu oft trägt hier das Drahtseil bleibende Beschädigungen davon.

The strength of the wire rope structure is determined by inserting a screwdriver between two top strands and an attempt made to produce a gap by turning the handle without applying too much force. If the wire rope does not offer too much resistance to this turning, and it is even possible to insert the screwdriver under two adjacent strands, the rope structure is loose.

In the same way you can check whether the outer wires of the rope have worked loose in the strand assembly.

Lifting the top strands by force with the aid of a screwdriver or splicing nail, as is occasionally practised to evaluate the condition of the rope core, is best avoided. All too often the wire rope suffers permanent damage in this case.

4.6.6 Überprüfung auf Strukturveränderungen / Checking for structural changes

Im Hauptarbeitsbereich laufender Drahtseile, d. h. in den Seilzonen, die die größte Zahl von Biege- wechselln ausführen, erwartet man im Normalfall die ersten Seilschäden. Seilverformungen wie Korkenzieher, Korbbildungen oder Schlaufenbil- dungen finden sich aber sehr häufig außerhalb des Hauptarbeitsbereiches der Seile, da die Seil- rollen die verursachenden Litzen- oder Drahtüber- längen aus dem Überrollungsbereich herausmas- sieren. Auch vor der Seiltrommel oder aber vor den Endbefestigungen können sich derartige Seil- schäden ausbilden. Diese Bereiche sind daher mit der gleichen Sorgfalt zu untersuchen.

Während der Untersuchung sind die Seile auch einmal zu bewegen, um auch momentan nicht zugängliche Seilzonen begutachten zu können.

Schleifspuren an Konstruktionsteilen können wert- volle Hinweise auf einen nicht einwandfreien Seil- trieb und mögliche Seilschäden sein.

Störungen des Seilverbandes sind die am schwie- rigsten zu beurteilenden Ablegekrterien. Wenn auch nur die geringsten Zweifel an der Betriebssi- cherheit des Drahtseiles vorliegen, sollte das Seil abgelegt werden.

The first rope damage can usually be expected to occur in the main operating range of wire ropes, i.e. in the rope zones performing the largest number of alternate bends. However, rope deformations such as corksc- rews, basket formations or loop formations frequently occur outside the main operating range of the ropes, because excess strand or rope lengths are "massaged" out of the roll-over section by the pulleys. Such rope damage may also occur in front of the rope drum or end fastenings. Hence these areas should be inspected with the same care.

During the inspection the ropes should also be moved to enable evaluation of any rope zones that are tempo- rarily inaccessible.

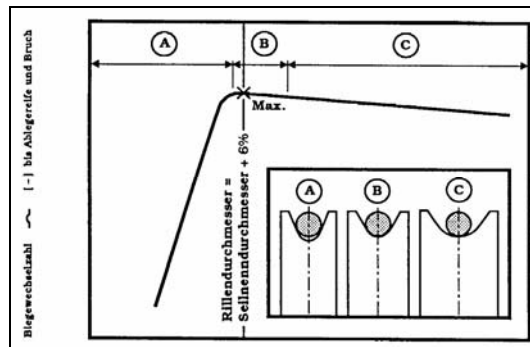
Abrasion marks on structural parts may be useful indi- cations of an unsatisfactory rope drive and possible rope damage.

Faults in the rope assembly are the most difficult dis- card criteria to evaluate. The rope should be discarded even if only the slightest doubt exists with regard to its reliability.

4.6.7 Überprüfung von Seilrollen und Seiltrommeln / Checking rope pulleys and rope drums

Neben dem Drahtseil selbst verdienen auch alle Teile der Anlage, mit denen das Seil in Berührung kommt, unsere Aufmerksamkeit. Die im folgenden für die Seilrollen gemachten Aussagen gelten in analoger Form auch für die Seiltrommeln.

In addition to the wire rope itself, all parts of the plant with which the rope comes into contact merit attention. The following comments on the rope pulleys also apply where appropriate to the rope drums.



Die Rillen der Rollen sollten glatt sein und einen Durchmesser aufweisen, der geringfügig größer ist als der Effektivdurchmesser des Seiles. DIN 15020 empfiehlt einen Rillendurchmesser von mindestens 1,05 mal dem Seilnennendurchmesser. Der optimale Durchmesser im Rillengrund liegt bei etwa 1,06 bis 1,08 mal Seilnennendurchmesser. Durch eine zu enge Rille wird das Drahtseil starken Pressungen in radialer Richtung ausgesetzt. Diese Beanspruchung führt frühzeitig zu Drahtbrüchen oder zu Strukturveränderungen des Seiles.

Eine zu weite Rille hingegen bietet dem Drahtseil zu wenig Auflagefläche und seitliche Unterstützung. Die erhöhten Pressungen im Rillengrund und die Zusatzspannungen durch die verstärkte Seilverformung (Ovalisierung des Seiles) führen ebenfalls zu einem Abfall der Seillebensdauer. Die Überprüfung der Rillen erfolgt mittels Rillenlehren. Derartige Lehren sind zwar im Handel erhältlich, am besten sind jedoch auf der Drehbank hergestellte kreisrund Schablonen.

Zweckmäßigerweise fertigt man sich für den jeweils zu prüfenden Seiltrieb eine kreisförmige Rillenlehre, die im Durchmesser exakt um die gewünschten sechs Prozent größer ist als der Seilnennendurchmesser, sowie für vergleichende Messungen Lehren mit etwas kleineren und größeren Durchmessern.

Zur Überprüfung des Rillenmaßes legen wir die Rillenlehre, die nach obigen Ausführungen am besten passen sollte, in die Rille und überprüfen die Auflageverhältnisse. Liegt die Schablone über einem großen Teil des Umfangs gut auf, ist das Rillenmaß in Ordnung. Liegt die Schablone nur an den Flanken auf, ist die Rille zu eng, liegt sie nur auf einem kleinen Teil des Umfangs auf, ist sie zu weit. In beiden Fällen benutzen wir unsere weiteren Schablonen, um festzustellen, wie groß die Abweichung vom Sollwert ist.

The pulley grooves should be smooth and have a diameter slightly larger than the effective diameter of the rope. DIN 15020 recommends a groove diameter of at least 1.05 times the rope nominal diameter. The optimum diameter in the groove base is about 1.06 to 1.08 times the rope nominal diameter.

If the groove is too narrow the wire rope is exposed to heavy compression in the radial direction. This stress soon leads to wire breaks or structural changes in the rope.

By contrast, if a groove is too wide it offers the wire rope an insufficient contact area and lateral support. The increased pressure in the groove base and the additional stresses resulting from the greater rope deformation (ovalization of the rope) likewise lead to reduction of the rope life.

The grooves are checked by groove gauges. Although these gauges are commercially available, circular templates made on a lathe are the best method.

It is advisable to manufacture a circular groove gauge with a diameter larger by exactly the required 6 % than the rope nominal diameter for the rope drive to be tested as well as gauges with slightly smaller and larger diameters for comparative measurements.

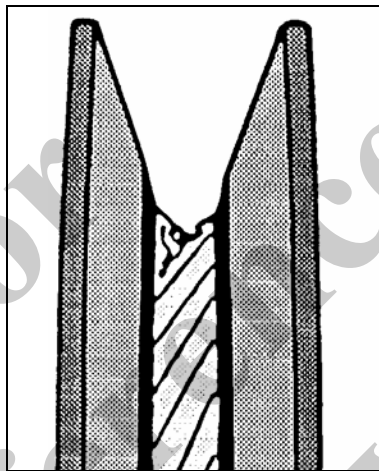
To check the groove dimension the groove gauge most suitable according to the above comments is placed in the groove and the support checked. If the template fits well over a large portion of the circumference, the groove dimension is in order. If the template rests only on the flanks, the groove is too narrow; if it rests only on a small portion of the circumference, it is too wide. In both cases the other templates are used to establish the deviation from the required value.

Die beengten Platzverhältnisse auf vielen Anlagen erschweren oft die Begutachtung. Wenn keine Möglichkeit besteht, die Ansmiegung der Schablone von der Seite her zu kontrollieren, kann man die Schablone durch die Rille ziehen und die Beurteilung anhand der Gleitspuren im Schmiermittel vornehmen.

Eine schmale Spur in der Mitte bedeutet: Die Rille ist größer als die Schablone. Eine breite Spur im gesamten Rillengrund bedeutet: Die Rille und die Schablone sind gleich groß. Zwei schmale Spuren an den Flanken zeigen an, daß die Schablone größer ist als die Rille

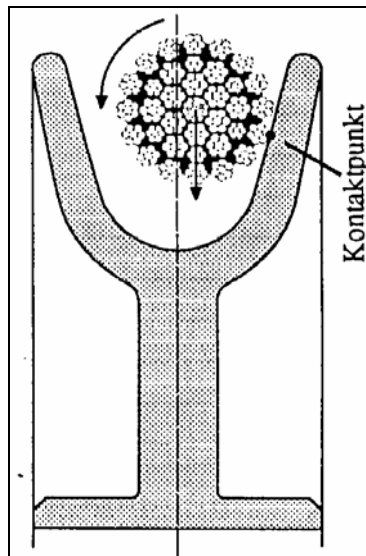
The confined space in many plants often makes evaluation difficult. If it is not possible to check the snug fit of the templates from the side, the templates can be pulled through the groove and the evaluation made on the basis of the sliding marks in the lubricant.

A narrow mark in the centre means: the groove is larger than the template. A wide mark in the entire groove base means: the groove and template are the same size. Two narrow marks on the flanks indicate that the template is larger than the groove.



Während der Messung der Rille überprüfen wir gleichzeitig die Tiefe des Rillengrundes und seine Oberflächenbeschaffenheit. Eingrabungen und andere Oberflächenveränderungen setzen die Seillebensdauer oft stark herab. Wenn sich im Rillengrund ein Negativprofil des aufliegenden Drahtseiles herausgebildet hat, so kann dieses Profil für das jeweilig aufliegende Seil zwar optimal Auflageverhältnisse bieten, spätestens aber das beim nächsten Seilwechsel aufgelegte Seil würde nicht mehr in diese Kontur hineinpassen und sehr schnell zerstört werden. Rollen mit derartigen Eingrabungen müssen bei einem Seilwechsel ebenfalls ausgetauscht werden.

During measurement of the groove the depth of the groove base and its surface quality are also checked. Furrows and other surface changes often significantly shorten the rope life. If a negative profile of the wire rope has formed in the groove base, this profile can offer optimum support for the rope resting on the pulley, but at the latest the rope installed in the next rope change would no longer fit in this contour and would quickly be damaged. Pulleys with such furrows must likewise be changed at the same time as a rope.



Auch die Flanken der Seilrollen sollten regelmäßig überprüft werden. Radial zum Rillengrund weisen die Schleifspuren zeigen uns, daß das Seil beim Lauf über die Rolle zunächst auf die Flanke aufläuft, und dann erst bei weiterer Drehung der Rolle in den Grund hinabrutscht. Hierbei besteht zum einen die Gefahr einer gewaltsamen Seilverdrehung, die zu Strukturveränderungen führt, andererseits die Gefahr eines Hausspringens des Seiles aus der Rolle

Die Ursache für ein Auflaufen des Seiles auf den Flanken liegt häufig in einem unzulässig hohen Ablenkwinkel des Seiles zur Rollenebene. Die DIN 15020 empfiehlt mit Recht, Ablenkwinkel von 4 Grad für nicht drehungsfreie Seile und von 1,5 Grad für drehungsfreie Seile nicht zu überschreiten. 4 Grad entsprechen einer Ablenkung von etwa 1 m auf 15 m, 1,5 Grad entsprechen einer Ablenkung von etwa 1 m auf 40 m.

Wenn bei entlastetem Seil die Möglichkeit besteht, sollten die Seilrollen auch durch Drehen auf Gängigkeit der Lager und ihrer Rundheit hin überprüft werden.

The flanks of the rope pulleys should also be checked regularly. Abrasion marks pointing radially to the groove base show that the rope first contacts the flank when running over the pulley and then slides down into the groove only on further rotation of the pulley. In this case there is a risk of twisting of the rope by force, which leads to structural changes, and also the risk that the rope will jump out of the pulley. The cause of the rope running against the flanks is often an inadmissibly high deflection angle of the rope to the pulley plane. DIN 15020 rightly recommends that deflection angles of 4° for ropes, which are not twist-free, and 1.5° for twist-free ropes should not be exceeded. 4° corresponds to a deflection of about 1 m over 15 m, 1.5° to a deflection of about 1 m over 40 m.

If it is possible when the rope is not under load, the rope pulleys should be checked for easy movement of the bearings and their concentricity by turning.

5 **Schlußbemerkung /** ***Concluding remarks***

Durch die Konzeption der Geräte und die Auswahl der in der Erstbeseilung aufliegenden Drahtseile hat die Firma Grove die Voraussetzungen für zufriedenstellende Seilstandzeiten gelegt. Durch Beachtung der hier angesprochenen Empfehlungen für die Handhabung, Montage, Wartung und Inspektion von Drahtseilen können Sie einen zusätzlichen Betrag zur Wirtschaftlichkeit und Sicherheit ihres Gerätes leisten.

Zu speziellen Fragen nehmen die Firma Grove und der Autor dieser Schrift, Dipl.-Ing. Roland Verreet, gerne Stellung.

Ingenieurbüro für Fördertechnik
Dipl.-Ing. Roland Verreet
Grünenthaler-Str. 40a
D-5100 Aachen
Tel. 0241-173147
Fax: 0241-12982

Copyright: PR GmbH
Grünenthaler-Str. 40a
D-5100 Aachen
Nachdruck nur mit Genehmigung.

By the special design of its equipment and selection of the initially used wire ropes, Grove has created the prerequisites for satisfactory rope life. You can make an additional contribution to the economical operation and safety of your equipment by following the above recommendations for the handling, assembly, maintenance and inspection of wire ropes.

The Grove company and the author of this publication, Dipl.-Ing. Roland Verreet, will be pleased to comment on specific questions.

*Ingenieurbüro für Fördertechnik
Dipl.-Ing. Roland Verreet
Grünenthaler Str. 40a
D-5100 Aachen
Phone +49-241-173147
Fax +49-241-12982*

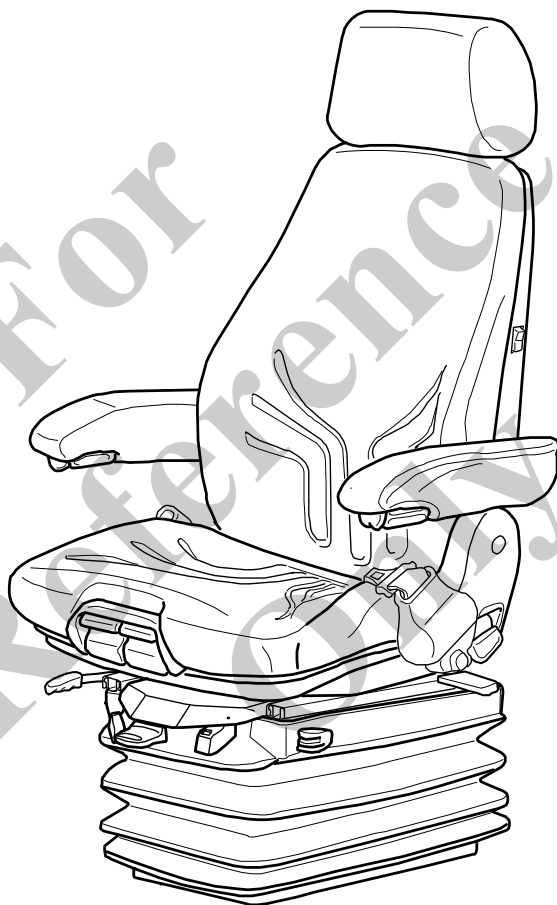
*Copyright: PR GmbH.
Grünenthaler Str. 40a
D-5100 Aachen
Reproduction only with consent.*

For
Reference
Only

MSG95G(L) / 722

MSG95G(L) / 732

MSG95G(L) / 742



GRAMMER

D	3
GB	17
F	31

For
Reference
Only

GRAMMER AG: *Sitz-Komfort für hohe Ansprüche!*

*Sie haben einen **GRAMMER** Sitz erworben. Gratulation!*

Nehmen Sie bitte Platz und erleben Sie Sitz-Komfort und Sicherheit. Freuen Sie sich auf einen Fahrersitz, der sich durch einfache Bedienung und hohe Anpassungsfähigkeit auszeichnet.

Mit Ihrem neuen Fahrersitz fördern Sie nicht nur Ihre Gesundheit, sondern auch Ihre Leistungsfähigkeit.

Gute Fahrt wünscht Ihnen

*Ihr **GRAMMER**-Team*

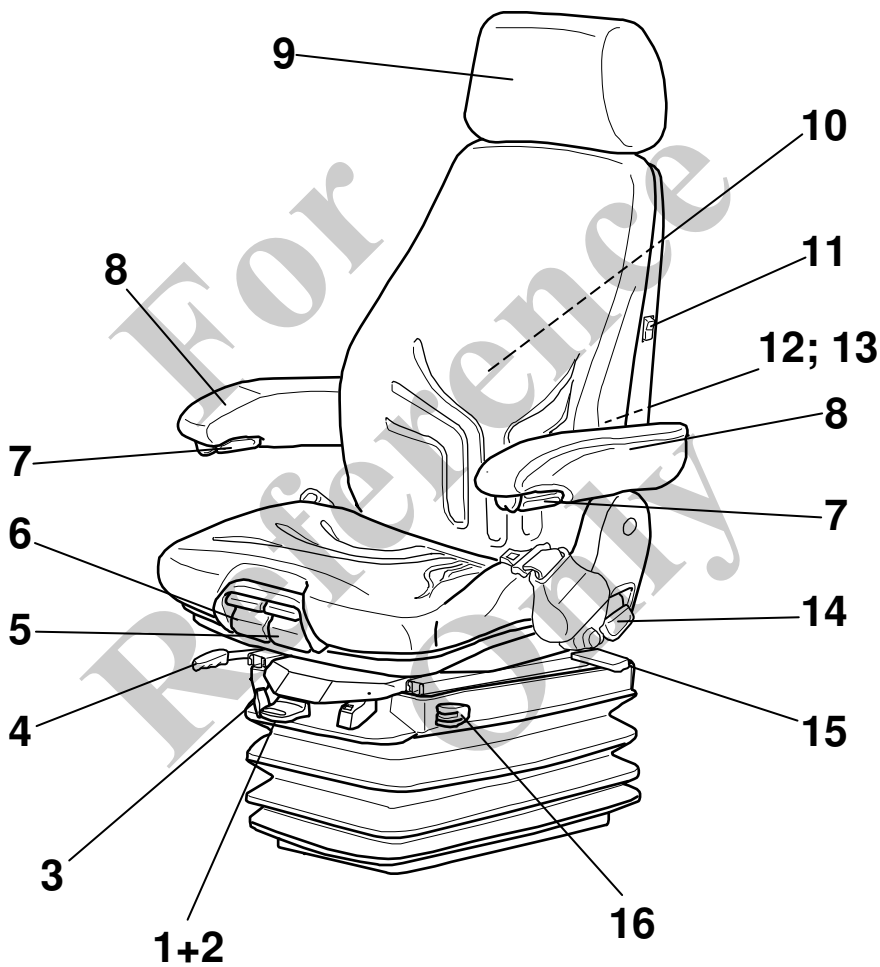
Impressum

Copyright © **GRAMMER** AG

GRAMMER AG
Postfach 1454
D-92204 Amberg

Nachdruck, Vervielfältigung oder Übersetzung,
auch auszugsweise, ist ohne schriftliche
Genehmigung durch die **GRAMMER** AG nicht erlaubt.

Amberg, 10/2010



Inhaltsverzeichnis

Hinweise	6
Sicherheitshinweise	6
Anschlussdaten	8
Gewährleistung und Haftung	8
Sitzfunktionen und Bedienung	9
1 Gewichtseinstellung	9
2 Höheneinstellung	9
3 Stoßdämpfung *	9
4 Längseinstellung	10
5 Sitzneigungseinstellung *	10
6 Sitztiefeinstellung *	10
7 Armlehnenneigung *	11
8 Armlehnen * ***	11
9 Kopfstütze * ***	11
10 Ablage tasche *	12
11 Sitzheizung *	12
12 Lendenwirbelstütze * **	12
13 Lendenwirbelstütze * **	13
14 Rückenlehneinstellung	13
15 Seitenhorizontalfederung *	13
16 Horizontalfederung *	14
Pflege	15

* falls vorhanden ** je nach Ausführung *** nachrüstbar

Hinweise

- Die Bedienungsanleitung muss vor Inbetriebnahme vollständig gelesen werden.
- Die Bedienungsanleitung muss im Fahrzeug mitgeführt werden und dem Fahrzeugführer jederzeit zugänglich sein.
- Der Fahrersitz darf nur von Fachpersonal montiert, gewartet und repariert werden. Jeweilige länderspezifische Vorschriften und Einbauvorschriften des Fahrzeugherstellers sind dabei zu berücksichtigen.
Die jeweiligen länderspezifischen Einbauvorschriften sind bei der **GRAMMER AG** und deren Vertretungen oder beim Fahrzeughersteller zu erhalten.
- Verschleißteile wie Rollen, Stoßdämpfer und die Befestigung sind von Zeit zu Zeit zu prüfen.
- Für den Erhalt Ihrer Gesundheit ist ein stets funktionierender und individuell eingestellter Fahrersitz Voraussetzung. Erhalten Sie die Funktionsfähigkeit Ihres Fahrersitzes durch Pflege und regelmäßige Funktionsüberprüfungen.



Die Funktionsprüfungen sind mindestens den Wartungsintervallen des Fahrzeuges anzupassen (siehe Wartungsplan des Fahrzeuges).

- Die Bedienungsanleitung ist zusammen mit dem Fahrersitz aufzuheben. Falls der Fahrersitz an Dritte weitergegeben wird, ist auch die Bedienungsanleitung weiterzugeben.
- Änderungen, die dem technischen Fortschritt dienen und daraus resultierende Abweichungen zum Seriensitz vorbehalten.



Sicherheitshinweise

- Falsch eingestellte Fahrersitze haben einen geringeren Schwingbereich.
Zur Vermeidung von Personenschäden muss **vor jeder Inbetriebnahme** des Fahrzeuges und **bei jedem Fahrerwechsel** die Gewichtseinstellung auf das individuelle Gewicht des Fahrers erfolgt sein.
- Um Verletzungen zu vermeiden, dürfen **keine Gegenstände im Schwingbereich** des Fahrersitzes gelagert werden.
- **Vor Inbetriebnahme** des Fahrersitzes müssen eventuell vorhandene **Verpackungsmaterialien** von den Sitz- und Rückenpolstern entfernt werden.
- Um Unfallgefahren zu vermeiden, muss **vor Inbetriebnahme** des Fahrzeuges geprüft werden, ob alle Einstellvorrichtungen richtig eingerastet sind.
- Die Einstellvorrichtungen des Fahrersitzes dürfen **während des Betriebes** nicht betätigt werden.
- Hebel der Einstellvorrichtung für die Längseinstellung bei Betätigung nur vorn an der dafür vorgesehenen Stelle fassen.
– QUETSCHGEFAHR –
- Bei **entferntem Rückenpolster** darf die Rückenlehneneinstellung nur betätigt werden, wenn die Rückenplatte z.B. mit der Hand abgestützt wird. Bei Nichtbeachtung besteht **erhöhte Verletzungsgefahr** durch Vorschnellen der Rückenplatte.

- **Jede Veränderung des Serienzustandes** des Fahrersitzes (z.B. durch Nachrüsten von nicht original Nachrüst- und Ersatzteilen der **GRAMMER AG**) kann den geprüften Zustand des Fahrersitzes aufheben. Es können **Funktionen des Fahrersitzes beeinträchtigt werden**, die Ihre **Sicherheit** gefährden. Aus diesem Grund muss **jede bauliche Veränderung** des Fahrersitzes durch die **GRAMMER AG** freigegeben werden.
- Beim Aus- und Einbau des Fahrersitzes sind unbedingt die Angaben des Fahrzeugherstellers zu beachten.
- Fahrersitz nicht an den Abdeckungen anheben. Bei Nichtbeachtung besteht **erhöhte Unfallgefahr durch Lösen oder Brechen** der Abdeckungen.
- Vor dem Ausbau des Fahrersitzes sind sämtliche Steckverbindungen zwischen Fahrersitz und Bordnetz zu trennen. Bei Wiederherstellen der Steckverbindungen muss auf Dichtigkeit (Staub, Wasser) geachtet werden.
- Rückhaltegurte sind am Fahrersitz vorhanden oder nachrüstbar. Das **Nachrüsten** mit Rückhaltegurten ist wegen erhöhter Belastung der Fahrersitzbefestigung **nur nach Genehmigung des Fahrzeugherstellers zulässig**. Die Nachrüstung muss unter Beachtung der jeweiligen länderspezifischen Vorschriften und Richtlinien erfolgen und muss von der **GRAMMER AG** freigegeben werden.
- Rückhaltegurte müssen **vor Inbetriebnahme** des Fahrzeuges angelegt werden. Nach einem Unfall **müssen die Rückhaltegurte ausgetauscht werden**. Bei am Fahrersitz montierten Rückhaltegurten müssen nach einem Unfall **zusätzlich der Fahrersitz** und die **Fahrersitzbefestigung** durch Fachpersonal überprüft werden.
- Schraubverbindungen müssen regelmäßig auf **festen Sitz geprüft** werden. Ein Wackeln des Fahrersitzes kann auf lose Schraubverbindungen oder sonstige Defekte hinweisen.
- Bei Feststellung von Unregelmäßigkeiten in den Funktionen (z.B. defekte Federung des Fahrersitzes, unsachgemäße Vorwölbung der Lendenwirbelstütze usw.) und bei Beschädigungen (z.B. beschädigter Faltenbalg usw.) des Fahrersitzes **umgehend eine Fachwerkstatt** zur Behebung der Ursache aufsuchen. Bei Nichtbeachtung besteht Gefahr für Ihre Gesundheit und **erhöhte Unfallgefahr**.
- Vor Inbetriebnahme des Fahrzeuges sind eventuell im Fahrersitz vorhandene Schalter in der Sitzfläche (zur Stilllegung von Aggregaten beim Verlassen des Fahrersitzes oder Fahrzeuges) auf ihre **Funktionsfähigkeit** zu prüfen. Bei Funktionsstörungen darf das Fahrzeug nicht in Betrieb genommen werden.
– **ERHÖHTE UNFALLGEFAHR** –
- Fahrersitze mit eingebautem Schalter dürfen außer normaler Benutzung **nicht mit Gegenständen auf der Sitzfläche** belastet werden, da sich das Fahrzeug sonst führerlos in Bewegung setzen kann.
– **ERHÖHTE UNFALLGEFAHR** –
Das Entlasten der Sitzfläche während der Fahrt führt zum Fahrzeugstillstand.
- Während des Betriebs – bei belastetem Fahrersitz – Faltenbalg nicht nach innen drücken.
– **QUETSCHGEFAHR** –
- Es ist darauf zu achten, dass **keine Gegenstände** oder **Flüssigkeiten** in das **Innere des Fahrersitzes** gelangen.

Sicherheitshinweise

- Der Fahrersitz ist **nicht wasserdicht** und ist vor Spritzwasser zu schützen!
- Umbau oder Nachrüstarbeiten an Fahrersitzen der **GRAMMER AG** dürfen nur von **autorisierten Fachwerkstätten, geschultem Personal** beziehungsweise entsprechend **ausgebildeten Personen** unter Berücksichtigung der anwendbaren Bedienungs-, Wartungs- und Einbauvorschriften sowie der länderspezifischen Vorschriften durchgeführt werden.
- Bei **unsachgemäßer Montage** besteht die Gefahr von **Verletzungen** sowie **Sachbeschädigungen** und die Funktion des Fahrersitzes oder der angebauten Teile kann nicht garantiert werden.
- **Vor Fahrtbeginn** muss geprüft werden, ob mit allen gewählten Sitzeinstellungen eine **sichere Bedienung** des Fahrzeuges gewährleistet ist.

Anschlussdaten

- Bei notwendigen elektrischen Anschlüssen an das Bordnetz ist folgendes unbedingt zu beachten:

Vor Anschluss eines im Fahrersitz vorhandenen **elektrischen Verbrauchers** (z.B. Sitzheizung oder Klimatisierung) müssen entsprechende auf das Fahrzeug bezogene elektrische Daten bezüglich Spannung, Absicherung und Art der Anschlussverbindung beim Fahrzeughersteller, bei der **GRAMMER AG** oder deren Vertretungen erfragt werden. Aus Sicherheitsgründen muss der Einbau und Anschluss an das Bordnetz von autorisiertem Fachpersonal durchgeführt werden.

Die Sitzanschlüsse sind unabhängig von anderen Fahrzeugbauteilen separat abzusichern.

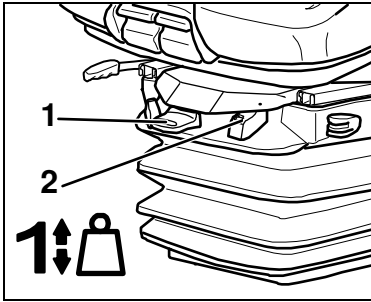
DC	Kompressor	Sitzheizung	Sitzheizung Kompressor
12V	10A	10A	20A
24V	5A	4A	10A

Bei Herstellung des elektrischen Anschlusses ist ein Stromkreis zu wählen, mit dem **durch Abschalten der Zündung** die elektrischen Verbraucher des Fahrersitzes vom stromführenden Netz getrennt werden.

Gewährleistung und Haftung

- Die **GRAMMER AG** übernimmt bei unsachgemäßer Montage, Verwendung, Benutzung und Reparatur keine Gewährleistung oder Haftung für daraus folgende Schäden.
- Einzelheiten über die von der **GRAMMER AG** gewährten Ansprüche finden sich in Ihren vertraglichen Unterlagen (siehe Rechnung oder Lieferschein). Andere als dort beschriebene Ansprüche können gegenüber der **GRAMMER AG** nicht geltend gemacht werden.

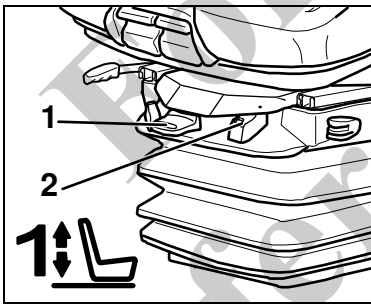
Sitzfunktionen und Bedienung



Gewichtseinstellung

Das jeweilige Fahrergewicht muss bei belastetem Fahrersitz eingestellt werden. Die Einstellung erfolgt durch Ziehen oder Drücken des Betätigungshebels (1), bis die grüne Markierung in der Gewichts- und Höhenanzeige (2) sichtbar ist.

☞ Um Gesundheitsschäden zu vermeiden, muss vor Inbetriebnahme des Fahrzeuges die individuelle Fahrergewichtseinstellung kontrolliert und eingestellt werden.

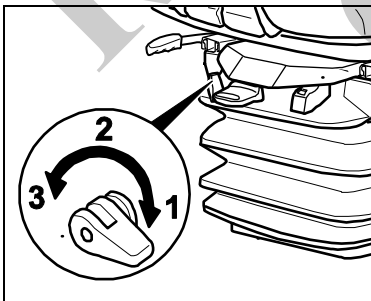


Höheneinstellung

Durch vollständiges Ziehen oder Drücken des Betätigungshebels (1) kann die Sitzhöhe verändert werden.

☞ Die grüne Markierung in der Gewichts- und Höhenanzeige (2) muss sichtbar sein.

☞ Um Beschädigungen zu vermeiden den Kompressor max. 1 min. betätigen.



Stoßdämpfung *

Die Dämpfung des Sitzes kann den Fahrbahn- bzw. Geländebeschaffenheiten angepaßt werden. Der Federungskomfort ist daher individuell einstellbar.

Hebel bis zur gewünschten Einstellung drehen und loslassen.

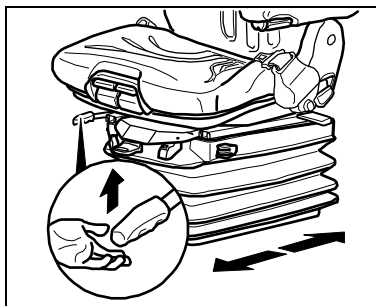
- | | |
|---|--------|
| 1 | weich |
| 2 | mittel |
| 3 | hart |

* falls vorhanden

** je nach Ausführung

*** nachrüstbar

Sitzfunktionen und Bedienung



Längseinstellung

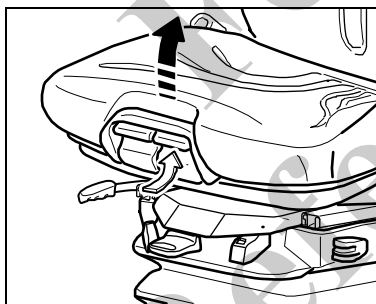
Durch Betätigen des Verriegelungshebels nach oben wird die Längseinstellung freigegeben.



Vorsicht Unfallgefahr!
Verriegelungshebel nicht während der Fahrt betätigen.

☞ Nach der Einstellung muss der Verriegelungshebel in der gewünschten Position hörbar einrasten. Nach dem Verriegeln darf sich der Fahrersitz nicht mehr in eine andere Position verschieben lassen.

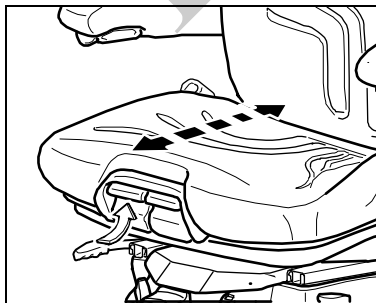
☞ Verriegelungshebel nicht mit Bein oder Wade anheben.



Sitzneigungseinstellung *

Die Längsneigung der Sitzfläche kann individuell angepasst werden.

Zum Einstellen der Sitzneigung den linken Griff nach oben ziehen. Durch gleichzeitiges Be- oder Entlasten der vorderen oder hinteren Sitzfläche neigt sich diese in die gewünschte Lage.



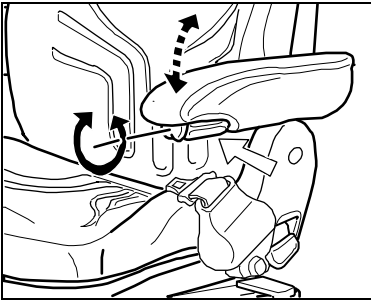
Sitztiefeinstellung *

Die Sitztiefe kann individuell angepasst werden.

Zum Einstellen der Sitztiefe den rechten Griff nach oben ziehen. Durch gleichzeitiges nach vorn oder hinten Schieben der Sitzfläche wird die gewünschte Position erreicht.

* falls vorhanden ** je nach Ausführung *** nachrüstbar

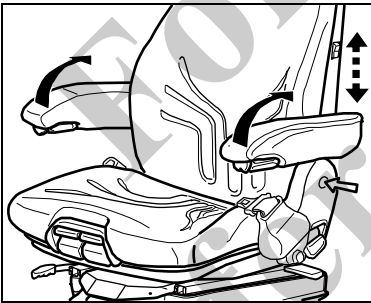
Sitzfunktionen und Bedienung



Armlehnenneigung *

Die Längsneigung der Armlehne kann durch Drehen des Handrads verändert werden.

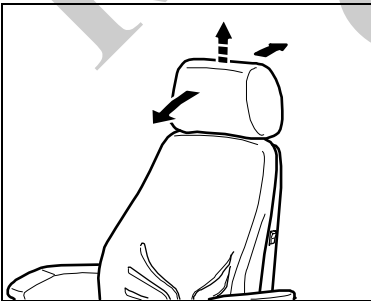
Bei Drehung nach außen wird die Armlehne vorn angehoben, bei Drehung nach innen wird sie vorn abgesenkt.



Armlehnen * ***

Die Armlehnen können bei Bedarf nach hinten geklappt und in der Höhe individuell angepasst werden.

Zur Verstellung der Armlehnenhöhe wird die runde Kappe (Pfeil) aus der Abdeckung herausgehoben und die dahinter liegende Sechskantmutter (Schlüsselweite 13 mm) gelöst. Armlehnen in die gewünschte Stellung bringen (5-stufiges Raster) und Sechskantmutter festziehen (**25Nm**). Die Abdeckkappe wieder auf die Mutter drücken.



Kopfstütze * ***

Die Kopfstütze kann in der Höhe durch Herausziehen über spürbare Rasterungen bis zu einem Endanschlag individuell angepaßt werden.

Die Neigung der Kopfstütze kann ebenfalls durch nach vorne oder hinten Drücken individuell angepaßt werden.

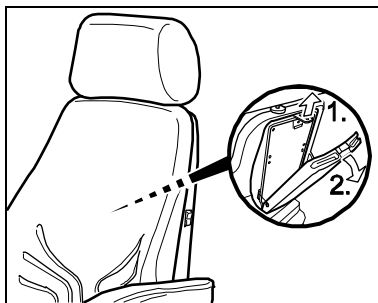
Zum Entfernen der Kopfstütze wird der Endanschlag mit einem Ruck überwunden.

* falls vorhanden

** je nach Ausführung

*** nachrüstbar

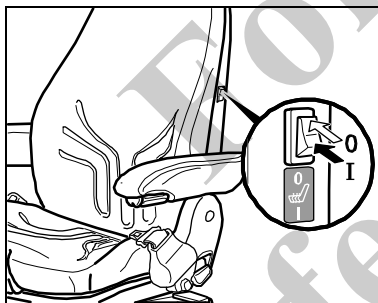
Sitzfunktionen und Bedienung



Ablagetasche *

Die Ablagetasche ist oben an der Rückseite der Rückenlehne angebracht.

Zum Öffnen der Ablagetasche die Lasche zuerst nach oben ziehen (1.) und dann den Deckel der Ablagetasche nach hinten aufklappen (2.).

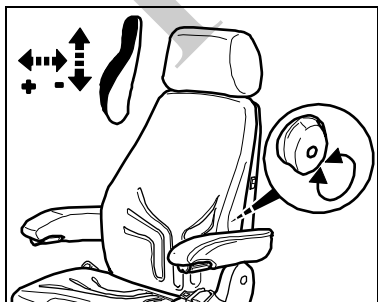


Sitzheizung *

Die Sitzheizung wird durch Betätigung des Schalters ein- bzw. ausgeschaltet.

0 = Sitzheizung AUS

1 = Sitzheizung EIN



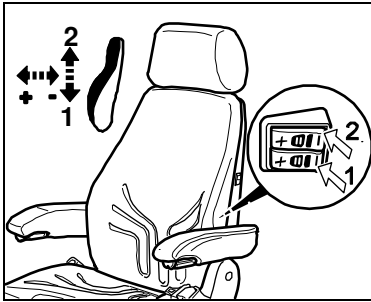
Lendenwirbelstütze * **

Durch Drehen des Handrades nach links oder rechts kann sowohl die Höhe als auch die Stärke der Vorwölbung im Rückenpolster individuell angepaßt werden.

Dadurch kann sowohl der Sitzkomfort erhöht, als auch die Leistungsfähigkeit des Fahrers erhalten werden.

* falls vorhanden ** je nach Ausführung *** nachrüstbar

Sitzfunktionen und Bedienung



Lendenwirbelstütze * **

Durch Betätigung des oberen und unteren Schalters kann die Stärke der Vorwölbung im oberen und unteren Bereich des Rückenpolsters individuell angepasst werden.

Dadurch kann sowohl der Sitzkomfort erhöht als auch die Leistungsfähigkeit des Fahrers erhalten werden.

Die Vorwölbung der Lendenwirbelstütze wird durch Drücken des jeweiligen Schalters auf "+" vergrößert und auf "-" verkleinert.

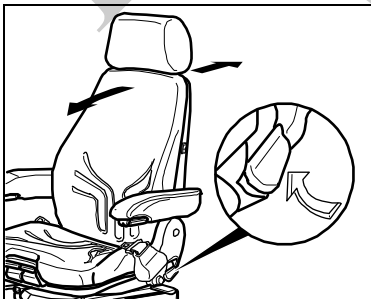
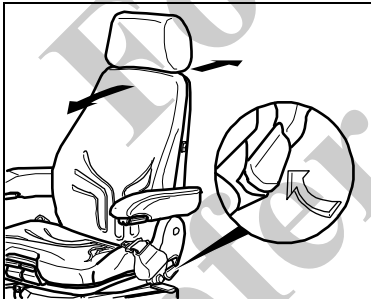
Ändert sich die Wölbung des Rückenpolsters bei Betätigen des Schalters auf "+" nicht mehr, so ist die max. Vorwölbung des Rückenpolsters erreicht und der Schalter ist wieder loszulassen.

Rückenlehneneinstellung

Zum Entrasten der Rückenlehne den Verriegelungshebel nach oben ziehen. Die Rückenlehne beim Entrasten nicht durch dagegen Drücken belasten.

Durch gleichzeitiges Be- und Entlasten der Rückenlehne wird die gewünschte Position erreicht. Zum Verriegeln Hebel wieder loslassen.

☞ Nach dem Verriegeln darf sich die Rückenlehne in keine andere Position bewegen lassen.



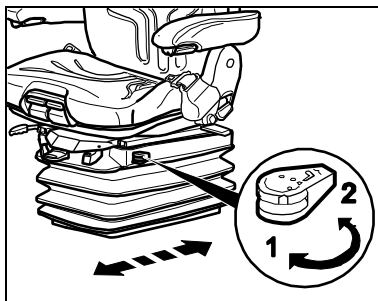
Seitenhorizontalfederung *

Unter bestimmten Betriebsbedingungen ist es vorteilhaft, die Horizontalfederung einzuschalten. Dadurch können seitliche Stoßbelastungen durch den Fahrersitz besser abgefangen werden.

Position 1 = Horizontalfederung Ein
Position 2 = Horizontalfederung Aus

* falls vorhanden ** je nach Ausführung *** nachrüstbar

Sitzfunktionen und Bedienung



Horizontalfederung *

Unter bestimmten Betriebsbedingungen (z.B. Fahren mit Hänger) ist es vorteilhaft, die Horizontalfederung einzuschalten. Dadurch können Stoßbelastungen in Fahrtrichtung durch den Fahrersitz besser abgefangen werden.

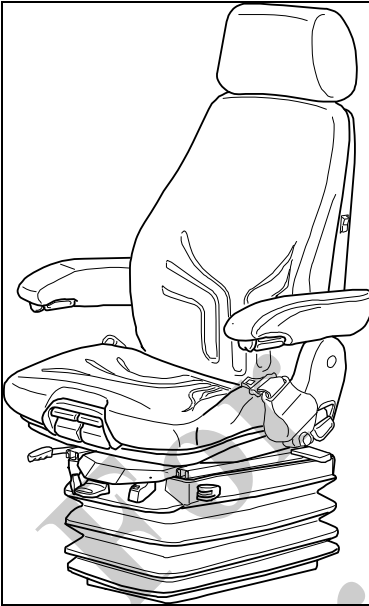
Position 1 = Horizontalfederung Aus

Position 2 = Horizontalfederung Ein

☞ Nach Einstellung von Position **1** muss der Verriegelungshebel in der gewünschten Position einrasten. Hierzu ist der Sitz bis zum hörbaren Einrasten nach hinten zu drücken.

☞ Nach dem Verriegeln darf sich die Horizontalfederung in keine andere Position bewegen lassen.

* falls vorhanden ** je nach Ausführung *** nachrüstbar



Schmutz kann die Funktion des Fahrersitzes beeinträchtigen.

Halten Sie deshalb Ihren Fahrersitz sauber!

Polster müssen zur Pflege nicht vom Sitzgestell gelöst und abgenommen werden.



Vorsicht Verletzungsgefahr durch Vorschnellen der Rückenlehne!

Beim Reinigen des Rückenlehnenpolsters muss bei Betätigung der Rückenlehneinstellung die Rückenlehne mit der Hand abgestützt werden.

ACHTUNG: Fahrersitz nicht mit Hochdruckreiniger reinigen!

Bei der Reinigung der Polsterflächen muss ein Durchfeuchten der Polster vermieden werden..

Handelsübliche **Polster-** oder **Kunststoff-**reiniger erst an verdeckter, kleinerer Fläche auf **Verträglichkeit prüfen**.

For
Reference
Only

GRAMMER AG: Seating comfort for high demands!

*You have acquired a **GRAMMER** seat. Congratulations!*

Take your seat please, and enjoy the ultimate in seating comfort and safety. You will be enjoying a driver's seat characterized by user-friendliness and a high degree of adaptability.

With your new seat you are not only preserving your health; you are improving your performance and efficiency as well.

*Have a good trip, with best wishes from
your **GRAMMER** Team*

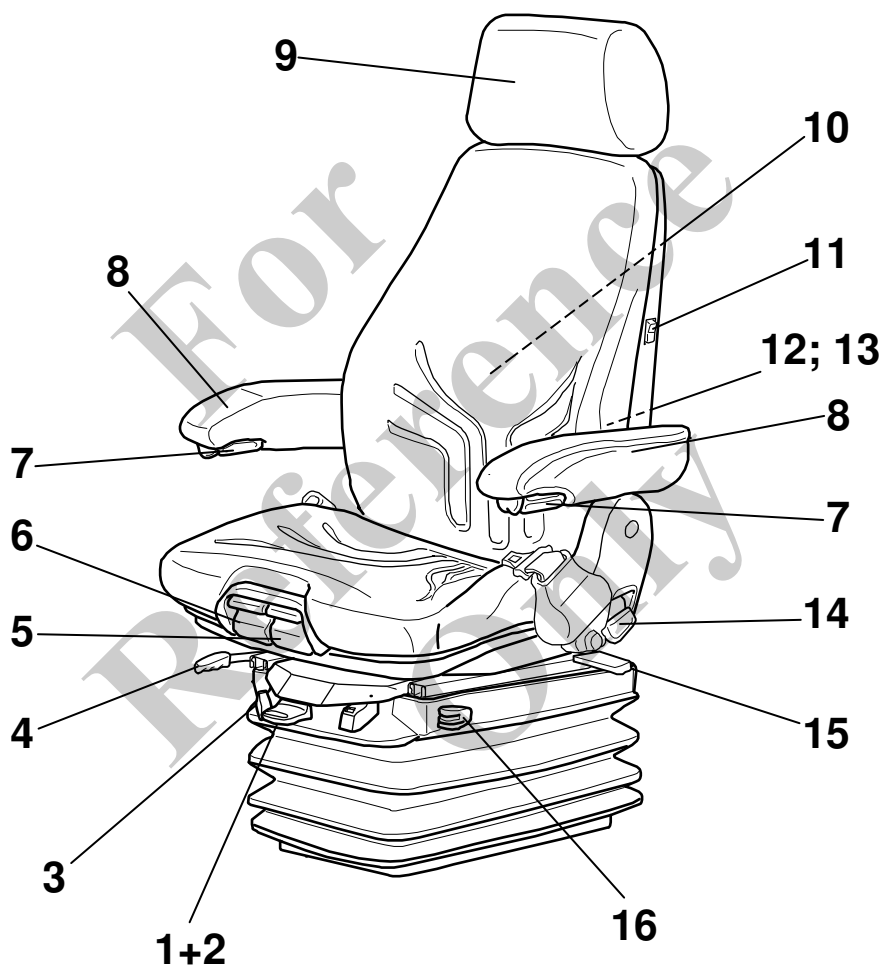
Imprint

Copyright © **GRAMMER** AG

GRAMMER AG
Postfach 1454
D-92204 Amberg

Reprinting, reproduction or translation,
in whole or in part, requires the written
permission of the **GRAMMER** AG

Amberg, 10/2010



Contents

General instructions	20
Safety instructions	20
Connecting data	22
Guarantee and liability	22
Seat functions and operation	23
1 Weight adjustment	23
2 Height adjustment	23
3 Absorber *	23
4 Fore/aft adjustment	24
5 Seat pan angle adjustment *	24
6 Seat depth adjustment *	24
7 Armrest adjustment *	25
8 Armrests * ***	25
9 Headrest * ***	25
10 Storage box *	26
11 Seat heater *	26
12 Lumbar support * **	26
13 Lumbar support * **	27
14 Backrest adjustment	27
15 Lateral isolator *	27
16 Fore/aft isolator *	28
Maintenance	29

* if fitted ** depending on model *** optional extra

General instructions

- The operating instructions must be read in full before use.
- The operating instructions must be kept in the vehicle and always be at hand.
- The driver's seat may only be fitted, serviced and repaired by specialist personnel. The respective national regulations and the vehicle manufacturer's fitting instructions must be observed.
The national fitting regulations can be obtained from **GRAMMER** AG or from agencies of the company, or from the vehicle manufacturer.
- Worn parts such as rollers, shock absorbers and the fixation must be checked from time to time.
- A correctly functioning and individually adjusted driver's seat is essential to your health. Take adequate care of your seat and have it serviced regularly to ensure that it functions correctly.



The functional checks are to be carried out at least as regularly as vehicle services (see maintenance plan for vehicle).

- These operating instructions should always be kept with the driver's seat. If the seat is passed on to a third party, it must be accompanied by the relevant operating instructions.
- Subject to modifications serving engineering progress and deviations compared to the standard type seat arising therefrom.



Safety instructions

- Driver's seats that have been adjusted incorrectly have a smaller moving area. In order to prevent any personal injury, the seat must be adjusted for the driver's weight **before use** and **before every change of driver**.
- To prevent injury, **no objects should be placed within the moving area** of the driver's seat.
- **Before commissioning** of the driver's seat, possible **packaging material** has to be removed from the seat cushion and the backrest upholstery.
- To eliminate any risk of accident, the settings must be checked to ensure they are correctly engaged **before the vehicle is driven**.
- Adjustments must **not** be made **while driving**.
- Only touch the handle for setting the fore/aft adjustment at the indented grip provided for that purpose.
– **RISK OF CRUSHING** –
- **After removal of the backrest upholstery**, the backrest frame must be supported, for example held in place, before the backrest adjuster is operated. If you fail to do so, there is a danger that the backrest frame may jerk forward and **cause injury**.

Safety instructions

- **Any changes to the series standard of the seat** (for example fitting parts which are not original **GRAMMER AG** parts) may impair the safety standard to which it has been tested. **Functions may be impaired**, threatening your **safety**. For this reason, **any change in design of the seat** must be approved by **GRAMMER AG**.
- During the removal and installation of the driver's seat, the corresponding instructions by the specific vehicle manufacturer must be strictly observed!
- Do not hold onto the covers for lifting the driver's seats. If you do so anyway, there is an **increased risk of injury due to loosening or breaking covers**.
- Before you remove the driver's seat, disconnect all plug-in connections between the seat and the vehicle supply network. When you replace the plug-in connectors, make sure they are tight (dust, water).
- Seatbelts are fitted or can be retrofitted to the driver's seat. Seatbelts **may only be fitted on the approval of the vehicle manufacturer**, as they increase the load in the seat mounting area.
Seatbelts must be fitted in accordance with specific national regulations and guidelines, and must be approved by **GRAMMER AG**.
- Seatbelts must be fastened **before driving**.
The seatbelts must be replaced after an accident.
Where seatbelts are fitted to the driver's seat, the **seat** and **seat mounting** must be checked **additionally** by specialist personnel after an accident has occurred.
- Fasteners must be **checked regularly for tight seat**. If the seat wobbles, there may be loose bolts or other faults.
- If you find that the seat does not function correctly (for example a defective suspension of the driver's seat; improper curvature of the lumbar support, etc.) or is damaged (e.g. damaged bellows etc.) **contact a specialist workshop immediately** to arrange for repairs to be carried out.
If you fail to do so, your health may be affected and the **risk of accident increased**.
- Before the vehicle is used, switches that might be in the seat (for shutting down mechanical equipment when the driver leaves his/her seat) must be checked for **proper function**.
If malfunctions are detected, the vehicle must not be driven.
– **INCREASED RISK OF ACCIDENT** –
- **Loads must not be placed on seats** (e.g. with a built-in switch) except for the driver's weight during normal use, as the vehicle may otherwise start to move by itself.
– **INCREASED RISK OF ACCIDENT** –
If you take off the weight from the seat while driving, this will cause the vehicle to stop.
- Do not indent the bellows while there is load on the driver's seat.
– **RISK OF CRUSHING** –
- Make sure that the **interior of the driver's seat** remains free of **foreign particles or liquids**.

Safety instructions

- The driver's seat is **not watertight** and must be protected against splashes of water!
- Any conversion or refitting work on a **GRAMMER AG** driver's seat must be performed exclusively in **authorized workshops** by **trained** or **suitably qualified personnel** and in adherence with the applicable operating, maintenance and installation instructions and in compliance with all relevant national regulations.
- **Improper installation and assembly** bear the risk of **bodily injury** or **property damage** and the proper function of the driver's seat or mounted parts can no longer be guaranteed.
- **Before driving**, you must check if all seat settings selected guarantee a **safe operation** of the vehicle.

Connecting data

- If you need to connect cables to the vehicle supply network, strictly observe the following instructions:

Before you connect an **electrical consumer** fitted in the driver's seat (e. g. the seat heater or the seat ventilation), you must obtain the relevant electrical data for the respective vehicle with reference to voltage, protection and the kind of connections from the manufacturer, from **GRAMMER AG** or the company's agencies.
For safety reasons, the installation and connection to the vehicle supply network must be carried out by authorized specialist personnel only.
The seat connections must be protected independently of other vehicle components.

DC	Compressor	Seat heater	Seat heater compressor
12V	10A	10A	20A
24V	5A	4A	10A

For building an electric connection, select an electric circuit by means of which the electric consumers of the driver's seat are separated from the live network when **the ignition is switched off**.

Guarantee and liability

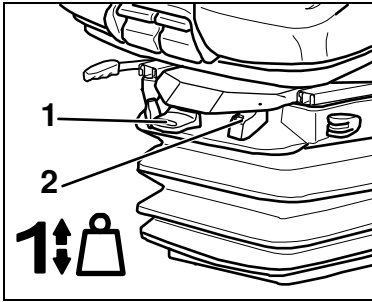
- GRAMMER AG does not disclaim any guarantee or liability for damage resulting from incorrect assembly, use or repair of the seats.
- Further details on the guarantee granted by GRAMMER AG are stated in your contractual documents (see invoice or delivery note). Guarantee claims against **GRAMMER AG** beyond the guarantee obligations described there are excluded.

Seat functions and operation

Weight adjustment

The seat must be adjusted for the driver's weight with the driver sitting on the seat. The adjustment is made by pulling out or pushing in the actuator lever (1) until the green marking is visible in the weight-and-height indicator (2).

☞ To prevent damage to the health, the setting for the driver's weight must be checked and adjusted as necessary before the vehicle is driven.

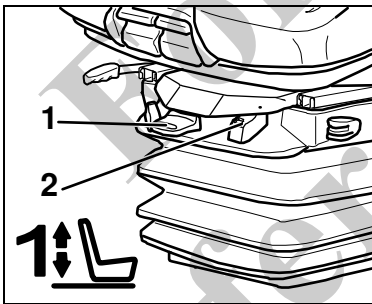


Height adjustment

The seat height can be altered by pulling or pushing the adjustment lever fully up or down (1).

☞ The green marking in the weight-and-height indicator (2) must be visible.

☞ In order to avoid damage, do not operate compressor for more than 1 minute.

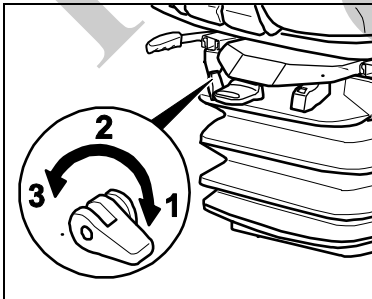


Absorber *

The absorber setting of the seat can be varied to suit the on and off-road driving conditions. The cushioning effect can be individually adjusted for this purpose.

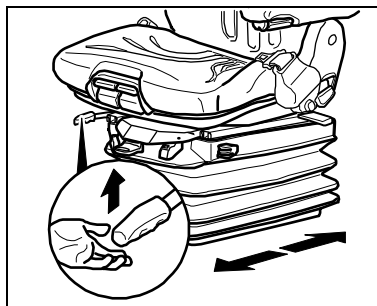
Turn the lever to the desired position and release

- | | |
|---|--------|
| 1 | soft |
| 2 | medium |
| 3 | hard |



* if fitted ** depending on model *** optional extra

Seat functions and operation



Fore/aft adjustment

The fore/aft adjustment is released by lifting the locking lever.



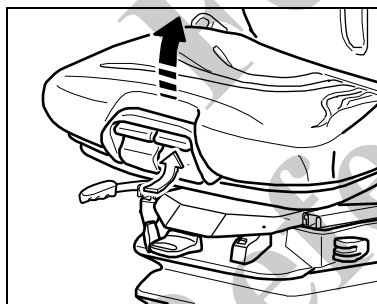
WARNING. Risk of accident!
Do not operate the locking lever while driving.



After the adjustment, the locking lever must latch into the desired position with an audible click. It should not be possible to move the driver's seat into another position when it is locked.



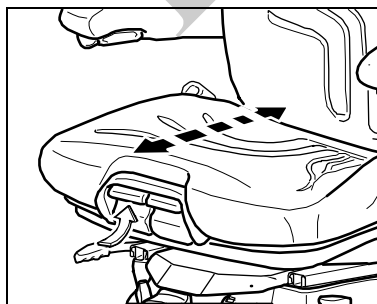
Do not lift the locking lever with your leg or calf.



Seat pan angle adjustment *

The angle of the seat pan can be individually adjusted.

To adjust the angle of the seat pan, pull the left handle upwards. By exerting pressure on or off the front or rear part of the seat pan it can be moved to the desired position.



Seat depth adjustment *

The depth of the seat pan can be individually adjusted.

To adjust the depth of the seat cushion, pull the right handle upwards. By moving the seat cushion backwards or forwards the desired seating position can be reached.

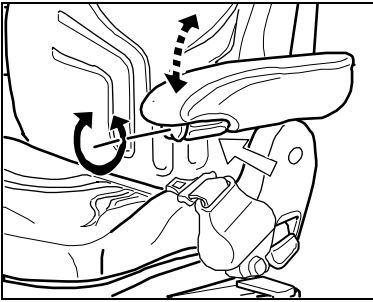
* if fitted ** depending on model *** optional extra

Seat functions and operation

Armrest adjustment *

The inclination of the armrests can be modified by turning the adjustment knob.

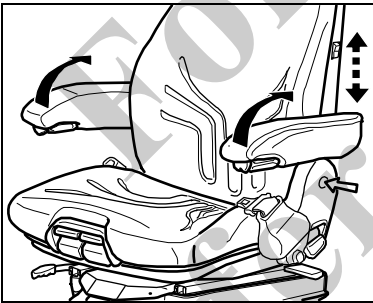
When turning the knob to the outside the front part of the armrest will be lifted, when turning the knob to inside it will be lowered.



Armrests * ***

The armrests can be folded up if required and the height individually adjusted.

To adjust the armrests for height, separate the round cap (see arrow) from the cover, loosen the hexagon nut (size 13 mm) behind it and adjust the armrests to the desired position (5-steps) and tighten the nut again (25Nm). Replace the cap onto the nut.

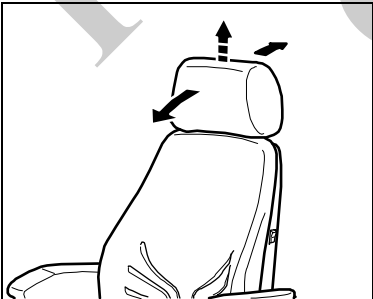


Headrest * ***

The headrest can be individually adjusted for height by pulling it upward over the various increments up the end stop.

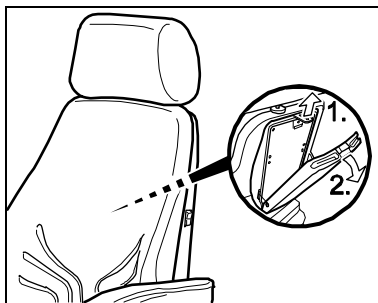
By pushing forward or rearward the angle of the headrest can be adjusted individually.

To remove the headrest, pull it over the end stop.



* if fitted ** depending on model *** optional extra

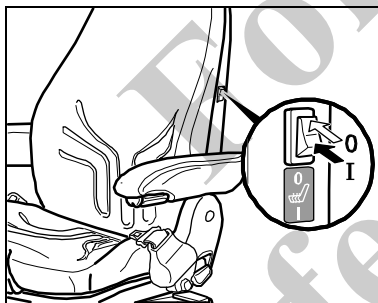
Seat functions and operation



Storage box *

The storage box is placed on the rear upper side of the backrest.

To open the storage box, first pull the fixing lug upwards (1.) and then, fold the cover of the storage box backwards (2.).

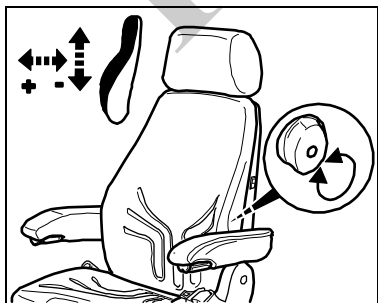


Seat heater *

The seat heater can be turned on/off by pressing the switch.

0 = seat heater OFF

1 = seat heater ON



Lumbar support * **

By turning the adjustment knob to the left or right, both the height and curvature of the backrest cushion can be individually adjusted.

This increases both the seating comfort and the performance of the driver.

* if fitted ** depending on model *** optional extra

Seat functions and operation

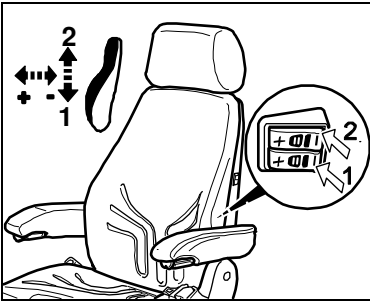
Lumbar support * **

With the upper and lower switch the curvature in the upper and lower area of the backrest upholstery can be individually adjusted.

This increases both the seating comfort and the performance of the driver.

The lumbar support curvature can be increased pressing "+" or reduced by pressing "-" on the relevant switch.

When the backrest upholstery does no longer react to pressing "+", the maximum curvature has been reached and the switch should be released.

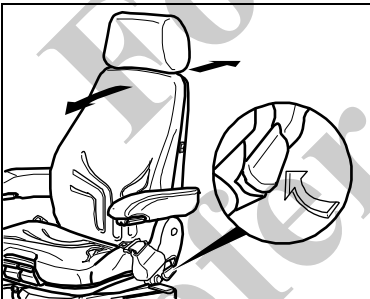


Backrest adjustment

Pull up the locking lever to release the backrest catch. When releasing the backrest catch, do not apply load to the backrest by pressing against it.

By exerting pressure on or off the front or rear part of the seat pan it can be moved to the desired position. Release the locking lever to lock the backrest.

 It should not be possible to move the backrest into another position after it has been locked.

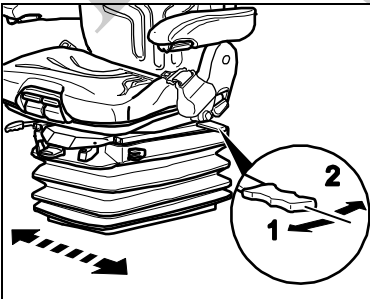


Lateral isolator *

Under certain driving conditions, it is useful to activate the lateral isolator. This means that lateral shock impacts can be better absorbed by the driver's seat.

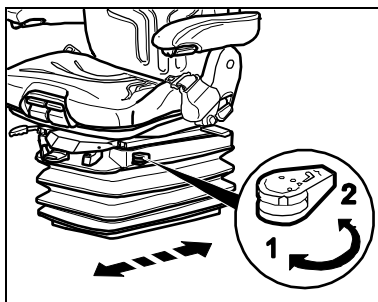
Position 1 = lateral isolator on

Position 2 = lateral isolator off



* if fitted ** depending on model *** optional extra

Seat functions and operation



Fore/aft isolator *

Under certain driving conditions (for example with a trailer attached), it is useful to activate the fore/aft isolator. This means that shock impacts in the driving direction can be better absorbed by the driver seat.

Position 1 = fore/aft isolator off

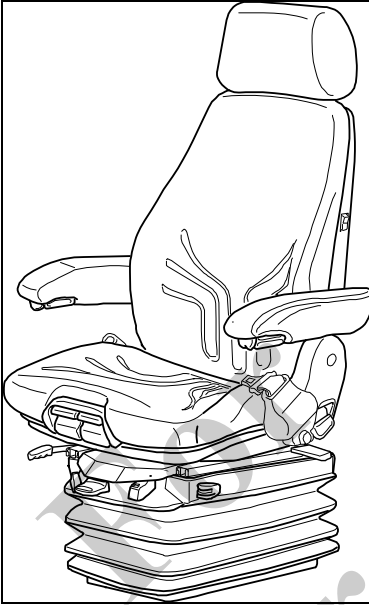
Position 2 = fore/aft isolator on

☞ After the adjustment of position 1, the locking lever must latch into the desired position.

For that, the seat must be pressed backwards until it latches with an audible click.

☞ It should not be possible to move the fore/aft isolator into another position when it is locked.

* if fitted ** depending on model *** optional extra



Dirt can impair the function of the seat,
So make sure you keep your seat clean.

Upholstery does not need to be removed from
the seat frame for cleaning.



**Caution: take care with the
backrest - it may jerk forward and
cause injury!**

**When cleaning the backrest
cushion, the backrest must be
held in place when operating the
backrest lever.**

ATTENTION: Do not clean the seat with a
pressure washer!

When cleaning the upholstery, make sure the
upholstery is not soaked.

Use standard commercially available
**upholstery or plastics cleaning agent. Test
first for compatibility** on a small, concealed
area.

For
Reference
Only

GRAMMER AG : *Siège confort répondant aux exigences les plus élevées !*

*Vous avez acheté un siège **GRAMMER**. Félicitations !*

Veillez prendre place et profiter ainsi du confort de l'assise et de la sécurité.

Sachez apprécier ce siège de conducteur qui se distingue par sa facilité d'utilisation et sa grande souplesse.

A l'aide de ce nouveau siège de conducteur, non seulement vous préservez votre santé, mais vous augmentez aussi vos capacités physiques.

*Votre équipe **GRAMMER***

vous souhaite bonne route !

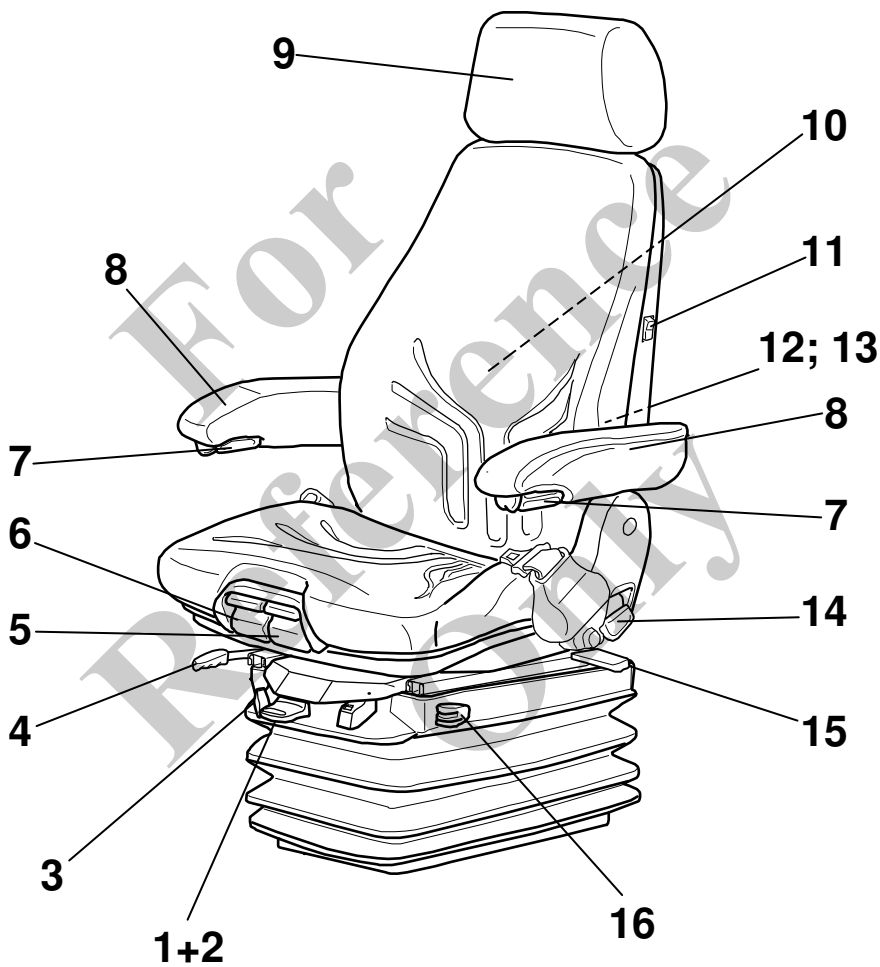
Impression

Copyright © **GRAMMER AG**

GRAMMER AG
Postfach 1454
D-92204 Amberg

Tous droits de reproduction, de traduction,
même partielle, exclus sans l'accord écrit préalable
de **GRAMMER AG**.

Amberg, 10/2010



Sommaire

Instructions	34
Instructions de sécurité.....	34
Données de raccordement	36
Garantie et responsabilité.....	36
Fonctions et utilisation du siège.....	37
1 Réglage du poids	37
2 Réglage en hauteur de l'assise	37
3 Amortissement *.....	37
4 Réglage longitudinal.....	38
5 Réglage en inclinaison de l'assise *.....	38
6 Réglage en profondeur de l'assise *.....	38
7 Inclinaison des accoudoirs *.....	39
8 Accoudoirs * ***	39
9 Appuie-tête * ***	39
10 Poche de rangement *.....	40
11 Chauffage du siège *.....	40
12 Réglage lombaire * **	40
13 Réglage lombaire * **	41
14 Réglage de l'inclinaison du dossier.....	41
15 Amortisseur horizontal latéral *.....	41
16 Amortisseur horizontal *.....	42
Entretien.....	43

* si disponible ** selon le modèle *** en option

Instructions

- Lisez complètement le mode d'emploi avant la mise en service du produit.
- Conservez le mode d'emploi dans le véhicule pour qu'il soit à tout moment à portée de main du conducteur.
- Seul un personnel qualifié est autorisé à monter, à vérifier et à réparer le siège de conducteur.
Les dispositions légales en vigueur dans le pays d'utilisation et les instructions de montage du constructeur automobile doivent être respectées.
Les instructions de montage du pays d'utilisation peuvent être fournies sur demande par **GRAMMER AG**, ses concessionnaires ou par le constructeur automobile.
- Les pièces d'usure, comme par ex. les rouleaux, les amortisseurs de chocs et les pièces de fixation, doivent être contrôlées de temps en temps.
- Un siège fonctionnant correctement et adapté à la stature du conducteur est une condition préalable pour préserver votre santé. Gardez votre siège de conducteur en bon état de fonctionnement en effectuant des entretiens et des contrôles réguliers.
 Les contrôles de fonctionnement doivent être effectués en même temps que les travaux d'entretien du véhicule (voir aussi le plan d'entretien du véhicule).
- Conservez le mode d'emploi à proximité du siège de conducteur. Au cas où le siège serait remis à une tierce personne, le mode d'emploi doit être joint à celui-ci.
- Modifications du siège série servant au progrès technique réservées ainsi que les divergences qui en résultent.



Instructions de sécurité

- Un siège de conducteur mal ajusté ne dispose que d'une zone d'oscillation réduite. Afin de prévenir tout dommage corporel, il faut, **avant chaque utilisation** du véhicule et à **chaque changement de conducteur**, effectuer un nouveau réglage du poids en fonction du poids du conducteur.
- Afin d'éviter les blessures, il est interdit de déposer **des objets dans la zone d'oscillation** du siège de conducteur.
- **Avant la mise en service** du siège de conducteur, il faut enlever **les emballages** des rembourrages du siège et du dossier.
- Afin d'éviter tout risque d'accident, il faut vérifier **avant la mise en marche du véhicule** que tous les dispositifs de réglage sont bien enclenchés.
- Il est interdit d'activer les dispositifs de réglage du siège **pendant que le véhicule roule**.
- Pour effectuer le réglage longitudinal, ne saisissez la manette du dispositif de réglage que par le creux à l'avant de celle-ci.
– **RISQUE D'ECRASEMENT** –
- **Si le dossier rembourré a été enlevé**, le réglage du dossier de siège ne doit être actionné que si la plaque dorsale est retenue, par ex. avec la main. Sinon, **vous risquez de vous blesser** car la plaque dorsale pourrait jaillir vers l'avant.

- **Toute transformation apportée au modèle de série** (p. ex. pièces de rééquipement ou de rechange non originales au lieu de pièces d'origine de **GRAMMER AG**) peut causer l'annulation de l'état de conformité certifié du siège de conducteur. Ceci pourrait avoir pour conséquence **la restriction de certaines fonctions du siège de conducteur** qui pourraient mettre en danger **votre sécurité**. Pour cette raison, **toute transformation** du siège doit impérativement être homologuée par **GRAMMER AG**.
- Lors du montage et du démontage d'un siège de conducteur, il faut impérativement tenir compte des instructions du constructeur automobile.
- Ne soulevez pas le siège en le prenant par les couvercles. Sinon, il y a **grand risque d'accident car les couvercles pourraient se détacher ou se briser**.
- Avant le démontage du siège de conducteur, il faut déconnecter tous les raccordements par fiche entre le siège et le réseau d'alimentation de bord. Lorsque vous reconnectez le siège, il faut s'assurer de l'étanchéité (poussière, eau) des raccordements.
- Le siège est équipé de ceintures de sécurité ou peut être équipé ultérieurement de celles-ci. **L'équipement ultérieur** en ceintures n'est autorisé que si **le constructeur automobile a donné son accord préalable**, car la fixation du siège doit alors supporter une charge plus élevée.
Cet équipement ultérieur devra être effectué conformément aux dispositions et aux directives du pays d'utilisation correspondant et être approuvé par **GRAMMER AG**.
- Les ceintures de sécurité doivent impérativement être mises **avant la mise en marche du véhicule**.
Il est impératif de changer les ceintures de sécurité après chaque accident.
Si un siège est équipé de ceintures de sécurité, **le siège et sa fixation** doivent également, après un accident, être soumis à un contrôle par du personnel qualifié.
- Il faut s'assurer régulièrement que les assemblages par vis sont **bien serrés**. Si le siège bouge, cela peut indiquer que des vis sont débloquées ou qu'il y a un défaut.
- Si vous constatez des irrégularités dans le fonctionnement (p. ex. une suspension défectueuse du siège de conducteur, une déformation du support lombaire, etc.) ou des endommagements du siège de conducteur (p. ex. un soufflet endommagé, etc.), **consultez immédiatement un atelier spécialisé** pour en chercher la cause.
Le non-respect de cette règle constitue un danger pour votre santé et **augmente le risque d'accident**.
- Avant la mise en service du véhicule, vérifiez le **bon fonctionnement** des interrupteurs intégrés à l'assise du siège conducteur (permettant d'arrêter des appareils quand vous quittez le siège ou le véhicule).
En cas de dysfonctionnements, le véhicule ne doit pas être mis en service.
– **GRAND RISQUE D'ACCIDENT** –
- **Ne déposez pas d'objets sur l'assise d'un siège** avec interrupteur intégré (par ex. pour la détection d'occupation), sinon le véhicule pourrait se mettre en marche sans chauffeur en dehors d'une utilisation normale.
– **GRAND RISQUE D'ACCIDENT** –
Descendre du siège pendant que le véhicule roule provoque son arrêt.
- Pendant la circulation - siège occupé - ne pressez pas le soufflet vers l'intérieur.
– **RISQUE D'ECRASEMENT** –

Instructions de sécurité

- Veillez à ce **qu'aucun objet ni liquide** ne pénètre à l'intérieur du siège.
- Le siège de conducteur **n'est pas étanche à l'eau** et doit être protégé contre les éclaboussures !
- Des modifications ou équipements ultérieurs des sièges conducteur de **GRAMMER AG** ne doivent être effectués que par un **atelier autorisé, par du personnel qualifié et spécialisé** tout en respectant les prescriptions d'utilisation, d'entretien et de montage ainsi que les dispositions en vigueur dans le pays d'utilisation correspondant.
- Un **montage incorrect** risque de causer des **lésions corporelles** ainsi que des **dommages matériels**, et le fonctionnement correct du siège de conducteur ou des pièces rapportées ne peut pas être assuré.
- **Avant de démarrer** le véhicule, il faut vérifier si les réglages du siège effectués assurent une **utilisation en toute sécurité**.

Données de raccordement

- Lorsque vous effectuez des raccordements électriques au réseau d'alimentation de bord, respectez impérativement les instructions suivantes :

Avant de raccorder un consommateur électrique intégré au siège du conducteur (par ex. un chauffage de siège ou une climatisation), veuillez vous informer de toutes les données techniques électriques relatives au véhicule, à savoir la tension, la protection par fusibles et le type de raccordement, auprès du constructeur automobile, de **GRAMMER AG** ou auprès de ses concessionnaires.

Pour des raisons de sécurité, le montage et le raccordement au réseau d'alimentation de bord ne doivent être effectués que par du personnel qualifié autorisé.

Les raccordements du siège doivent être protégés par fusibles indépendamment des autres composants du véhicule.

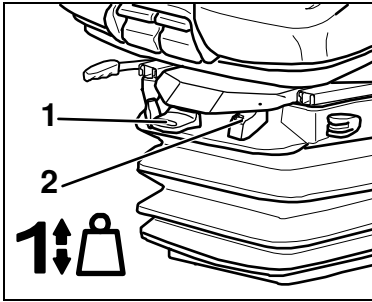
DC	Compresseur	Chauffage du siège	Chauffage du siège Compresseur
12V	10A	10A	20A
24V	5A	4A	10A

Lors du raccordement électrique, il faut choisir un circuit qui déconnecte les consommateurs électriques du siège conducteur du secteur courant **lorsque le contact est coupé**.

Garantie et responsabilité

- **GRAMMER AG** décline toute responsabilité pour les dommages consécutifs dus à un montage et un maniement incorrect ou une réparation incorrecte du siège.
- Vous trouverez plus de détails sur les droits accordés par **GRAMMER AG** dans les documents contractuels (voir la facture ou le bon de livraison). Tout droit autre que ceux stipulés dans ces documents sera refusée par **GRAMMER AG**.

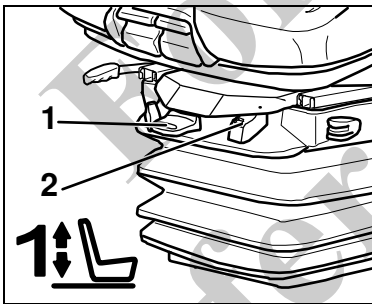
Fonctions et utilisation du siège



Réglage du poids

Le poids du conducteur doit être réglé lorsque celui-ci est assis sur le siège. Le réglage se fait en tirant ou en appuyant sur la manette de réglage (1) jusqu'à ce que le repère vert soit lisible dans l'affichage du poids et de la hauteur (2).

✎ Afin d'éviter des dommages corporels, il faut contrôler et ajuster le réglage individuel du poids du conducteur avant de mettre le véhicule en marche.

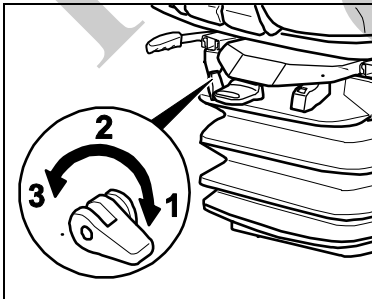


Réglage en hauteur de l'assise

Montez ou descendez le siège en tirant ou en appuyant bien sur la manette de réglage (1).

✎ Le repère vert doit être lisible dans l'affichage du poids et de la hauteur (2).

✎ Pour éviter d'endommager le compresseur, ne l'actionnez pas pendant plus d'une minute.



Amortissement *

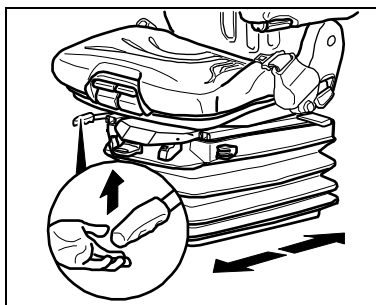
L'amortissement du siège peut être adapté à la configuration de la chaussée ou du terrain. Le confort d'assise est donc réglable en fonction des besoins individuels.

Tourner la manette en position de réglage souhaitée puis lâcher à nouveau.

- | | |
|---|-------|
| 1 | mou |
| 2 | moyen |
| 3 | dur |

* si disponible ** selon le modèle *** en option

Fonctions et utilisation du siège



Réglage longitudinal

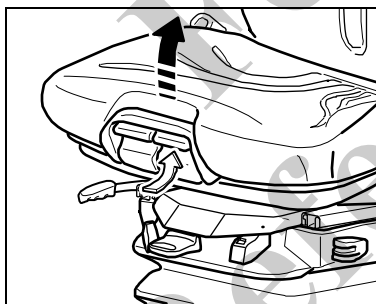
Actionner la manette de blocage, soit vers le haut soit de côté pour libérer le réglage longitudinal.



**Attention ! Risque d'accident !
N'actionnez pas la manette de blocage pendant la conduite.**

➡ Après avoir effectué le réglage, la manette de blocage doit s'enclencher dans la position souhaitée. Celle-ci bloquée, vous ne pouvez plus déplacer le siège de conducteur dans une autre position.

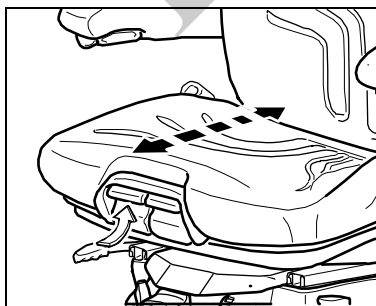
➡ Ne soulevez pas la manette de blocage avec la jambe ou le mollet.



Réglage en inclinaison de l'assise *

L'inclinaison de l'assise peut être réglée individuellement.

Pour régler l'inclinaison de l'assise, tirer la poignée gauche vers le haut tout en appuyant sur l'assise ou en relâchant la pression sur l'assise pour trouver une position confortable.



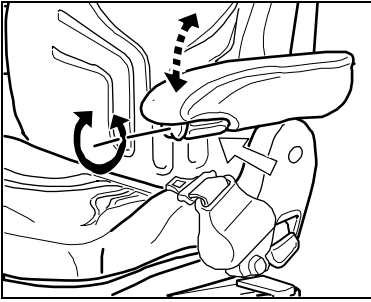
Réglage en profondeur de l'assise *

L'assise peut être réglée individuellement en profondeur.

Pour régler la profondeur de l'assise, tirer la poignée droite vers le haut tout en avançant ou en reculant l'assise pour trouver la position souhaitée.

* si disponible ** selon le modèle *** en option

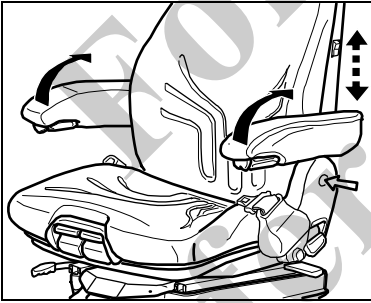
Fonctions et utilisation du siège



Inclinaison des accoudoirs *

Vous pouvez modifier l'inclinaison des accoudoirs en tournant la roue à la main.

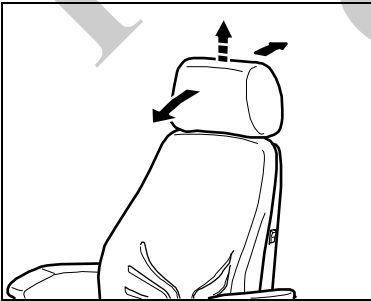
En tournant la roue vers l'extérieur, la partie avant de l'accoudoir sera levée ; tourner la roue à la main vers l'intérieur permet d'abaisser l'accoudoir.



Accoudoirs * ***

Vous pouvez, au besoin, faire basculer les accoudoirs vers l'arrière ou régler leur hauteur.

Le réglage de la hauteur des accoudoirs s'effectue en ôtant le capuchon sur le côté du siège (flèche) et en dévissant l'écrou hexagonal (clé de 13 mm) qui se trouve derrière le capuchon. Ajustez la hauteur souhaitée des accoudoirs (5 pas) et resserrez l'écrou hexagonal (**25Nm**). Ensuite, remettez en place le capuchon.



Appui-tête * ***

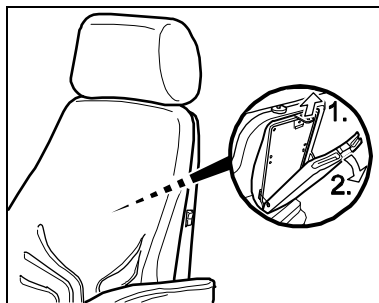
L'appui-tête peut être ajusté en hauteur par différents crans jusqu'à la butée.

L'inclinaison est ajustable en avant ou en arrière par une simple pression sur le haut de l'appui-tête.

L'appui-tête peut être déposé en le tirant au-delà de la butée.

* si disponible ** selon le modèle *** en option

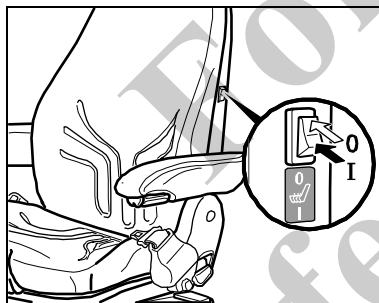
Fonctions et utilisation du siège



Poche de rangement *

La poche de rangement se trouve en haut au dos du dossier.

Pour ouvrir la poche de rangement, tirer d'abord la languette (1) vers le haut, puis ouvrez le couvercle de la poche en le pliant vers l'arrière (2).

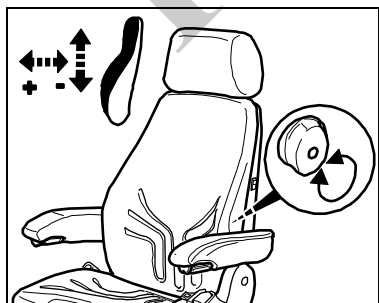


Chauffage du siège *

Actionnez l'interrupteur pour activer ou désactiver le chauffage du siège.

0 = Chauffage du siège NON ACTIVE

1 = Chauffage du siège ACTIVE



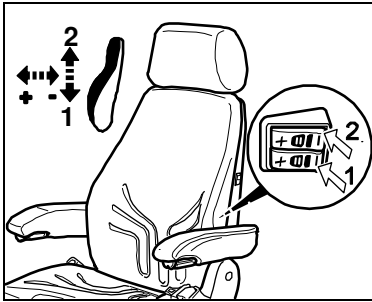
Réglage lombaire * **

Tourner la poignée indifféremment vers la gauche ou vers la droite pour régler le soutien lombaire en hauteur et en profondeur.

Ceci permet d'augmenter aussi bien le confort de l'assise que la liberté de mouvement du conducteur.

* si disponible ** selon le modèle *** en option

Fonctions et utilisation du siège



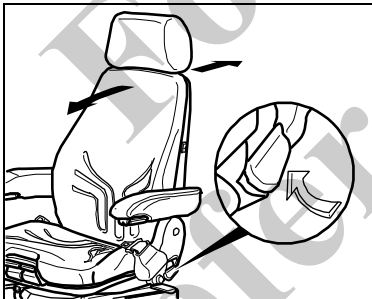
Réglage lombaire * **

En actionnant le commutateur supérieur ou inférieur, le support lombaire peut être ajusté individuellement dans la partie supérieure ou inférieure du dossier.

Ceci permet d'augmenter aussi bien le confort de l'assise que la liberté de mouvement du conducteur.

La cambrure du réglage lombaire est réglée en appuyant sur "+" ou sur "-" du commutateur correspondant.

Arrêtez d'appuyer sur "+" et relâchez le commutateur lorsque la cambrure maximale du dossier est atteinte.

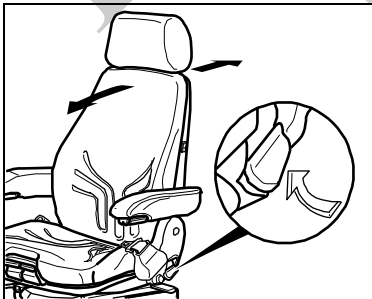


Réglage de l'inclinaison du dossier

Tirez la manette de blocage vers le haut pour déverrouiller le dossier. Lors du déverrouillage du dossier ne pas s'appuyer contre celui-ci.

Régler la position souhaitée en augmentant et en réduisant la pression sur le dossier. Relâcher la manette pour verrouiller.

☞ Celle-ci bloquée, vous ne pouvez plus déplacer le dossier dans une autre position.



Amortisseur horizontal latéral *

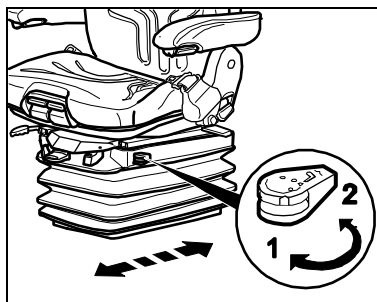
Sous certaines conditions d'utilisation, il est avantageux de mettre en circuit l'amortisseur horizontal. Par son intermédiaire, les chocs latéraux peuvent être mieux repris par le siège du conducteur.

Position 1 = amortisseur horizontal mis

Position 2 = amortisseur horizontal enlevé

* si disponible ** selon le modèle *** en option

Fonctions et utilisation du siège



Amortisseur horizontal *

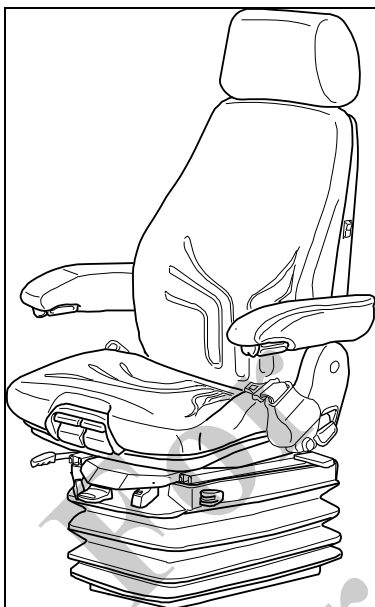
Dans certaines conditions (p. ex. conduite avec une remorque) il est conseillé d'utiliser l'amortisseur horizontal. Le siège du conducteur peut ainsi mieux amortir les à-coups dans le sens de la marche.

Position 1 = amortisseur horizontal enlevé

Position 2 = amortisseur horizontal mis

➡ Après avoir réglé la position 1 souhaitée, la manette de verrouillage doit s'emboîter dans cette position. Poussez pour cela le siège vers l'arrière jusqu'à ce qu'il s'encliquette.

➡ Celle-ci bloquée, vous ne pouvez plus déplacer la position du amortisseur horizontal.



La saleté peut nuire au bon fonctionnement du siège de conducteur.
C'est pourquoi, veuillez à ce que votre siège soit toujours propre !

Il n'est pas nécessaire de sortir les coussins de la carcasse du siège pour les nettoyer.



Attention ! Il y a risque de blessure lorsque le dossier bascule subitement vers l'avant !
Lors du nettoyage des coussins du dossier, il faut régler l'inclinaison du dossier en retenant le dossier avec la main

ATTENTION : Ne pas nettoyer le siège de conducteur avec un appareil de nettoyage à haute pression !

Évitez d'imprégner le rembourrage lorsque vous nettoyez le tissu des coussins.

Vérifiez d'abord sur une petite surface cachée **la résistance du tissu** avant d'utiliser les **nettoyants courants pour tissus et matières plastiques**.

For
Reference
Only



MD3072B

Art.-no. 401 0040 000

MD3072B-Quad

Art.-no. 401 0041 000



BEDIENUNGS- UND MONTAGEANLEITUNG	D
INSTALLATION AND OPERATING INSTRUCTIONS	GB
INSTRUCTIONS DE SERVICE ET DE MONTAGE	F
BEDIENINGS- EN MONTAGEHANDLEIDING	NL
ISTRUZIONI D'USO E DI MONTAGGIO	I
MANUAL DE OPERACIÓN Y DE MONTAJE	E
MANUAL DE MONTAGEM E OPERAÇÃO	P
BETJENINGS- OG MONTERINGSANVISNING	N
MONTERINGS- OCH BRUKSANVISNING	S
KÄYTTÖ JA ASENNUSOHJE	FIN
BETJENINGS OG MONTERINGSVEJLEDNING	DK
INSTRUKCJA OBSŁUGI I MONTAŻU	PL
NÁVOD K OBSLUZE A MONTÁŽI	CZ
KEZELÉSI ÉS SZERELÉSI ÚTMUTATÓ	H
РУКОВОДСТВО ПО МОНТАЖУ И ЭКСПЛУАТАЦИИ	RUS
KULLANMA VE MONTAJ TALIMATI	TUR



Contents

GB

1.0	Product Description	10
1.1	Important notes on the product	10
1.2	Declaration of conformity	11
1.3	Technical data	11
1.4	Optional accessories.....	12
2.0	Safety Instructions	12
2.1	Product Safety	12
2.2	Potential Dangers	12
3.0	Operating and Display Elements.....	13
4.0	Commissioning.....	14
4.1	Operating Modes.....	14
4.2	Malfunctions	16
5.0	Maintenance	16
5.1	Service Information	16
6.0	Environmental Protection	16

General information about this manual

Thank you for buying Motec products. As part of our continuous attempts to improve customer satisfaction, Motec offers latest product information at <http://www.motecgmbh.de>.

Make sure to keep this document available for reference at any time.

Please read this document carefully before starting to use our product. Since all our products are subject to continuous advancement, Motec GmbH reserves the right to modify this product without prior notification.

1.0 Product Description

The TFT Monitor MD3072B/MD3072B-Quad shall be used to display up to 4 video images at vehicles and / or mobile machines. Using the connected camera, the driver/operator is able to monitor areas outside his direct visibility.

1.1 Important notes on the product

Make sure that the data indicated on the rating plate of the TFT display MD3072B/MD3072B-Quad correspond to this user manual. Please see the camera and control box manuals for further instructions.

1.2 Declaration of conformity

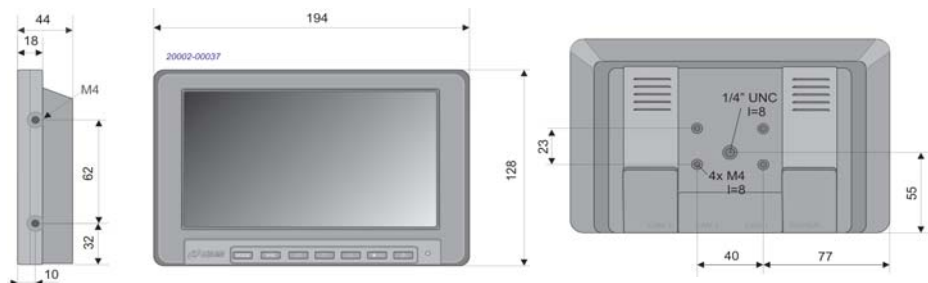
GB

As the initial vendor within Europe, we have conducted an evaluation of conformity for our products in accordance with EU directives and legal provisions based on the requirements of the relevant „harmonised standards“.

You will find the CE marking on the product and also on the accompanying product documentation. We will be happy to provide you with a separate EC Declaration of Conformity upon request. If modifications are made to the device, compliance with the requirements of conformity is no longer ensured and the warranty becomes void. In case of use outside the EU, the user is required to comply with relevant national requirements.

1.3 Technical data

Power supply	12V DC / 24V DC
Storage temperature	-35 °C ... +85 °C
Operating temperature	-30 °C ... +80 °C
Weight	600g
Display housing	Aluminium / impact resistant plastic
Protection class	IP 30
Shock resistance	20g
Display dimensions (mm)	194 x 128 x 44
Mounting thread	1/4" UNC or M4x1.5
Type of installation	Any
Access	Connector
Diagonal screen size	17,8 cm (7", 16:9)
Resolution in pixel	800 x 480
Backlight	300 cd/m ²
Contrast	350:1
Viewing angle	left/right 60 °
Viewing angle	top 35 °
Viewing angle	below 50 °
Video signal	FBAS/CVBS
Video system	PAL & NTSC (automatically adapted)
Signal input	1 Vpp (30% Sync. neg.) / 75 Ohm
Lines	625 / 525
Vertical frequency	50 Hz / 60 Hz
Horizontal frequency	15625 Hz / 15750 Hz
POC	12V DC / 24V DC
SEL1 / SEL2 / SEL3 / SEL4	12V DC / 24V DC
Protection devices	Reverse voltage protection



1.4 Optional accessories

GB

Match code	Part number	Description
MD-KG	406 0089 007	Progressively adjustable joint mount (406 0089 022 is required)
KG24-V50	406 0089 008	Extension 50mm for MDKG- ball joint
MD-V	406 0089 023	Anti-vibrations unit for display mount

2.0 Safety Instructions

WARNING!

The electrical connection and commissioning of this system may only be performed by qualified personnel, in accordance with this document!

The device may only be operated if the user is fully aware of all risks and dangers that may result from the operation of the device.

Do not operate the device if damaged. Do not connect to 230 V DC supply.

2.1 Product Safety

This product is state-of-the-art and corresponds to generally acknowledged safety requirements. You may only operate the product in flawless condition, complying to this document.

2.2 Potential Dangers

Check the system for visible defects before starting operation, and keep monitoring during operation. Do not start operating, or continue operating, the system in case any defects have been detected that may affect the safety of the system. Any such defects affecting the safety must be removed before continuing to operate the system.

Dangers resulting from the use of special operating supplies and accessories which have not been approved or examined cannot be monitored. As it is also not possible to monitor the assembly, installation and operation of the device, the correct usage of the product is under the sole responsibility of the user. Observe the information provided by the machine/vehicle manufacturer when installation the system components. Observe all safety instructions provided for the machine/vehicle. Additional dangers may arise when connecting this product to other products:

- Do not install cables in the vicinity of engines or other sources of heat.
- Protect the cables against damage by means of cable ducts or protective hoses..
- Make sure not to drill the cables.
- Cables must not be painted or get in contact with solvents.
- Loop the cable in case it is too long.



Display on / off



Menus are activated and toggled in the order:

Brightness	Brightness - 0(MIN) ... 60(MAX)
Contrast	Contrast - 0(MIN) ... 60(MAX)
Color	Color saturation - 0(MIN) ... 60(MAX)
Standard	Reset to factory settings
Volume	Volume - 0(MIN) ... 10(MAX)
Language	Language - English, French, German, Spanish, Italian, Portuguese, polish
Mirroring	The camera image is mirrored. Select the „Entry“ menu item to return to the main menu. Select “Exit“ to terminate the menu.
Video	PAL, NTSC, Auto
Poc	OFF/ON. Monitor is activated via ignition
Timer	OFF/ON. Activates the timer mode
Timer Setup	Selection of camera(s) to be displayed in timer mode and setting of display activation time (OFF/ON 5-30 sec.)
Exit	Exits the menu



Select key “Plus“



Select key “Minus“



Day / Night Selection



This key can be used to toggle to camera 1, camera 2, camera 3 and camera 4 in single camera mode.

In split screen mode you can toggle to cameras 1/2, 2/3, 3/4, 4/1, 1/3 and 2/4.

In timer mode this key can be used as Play/Pause function.

In three or four camera operation mode, this button has no function.

Camera selection is only possible if no control line is busy.



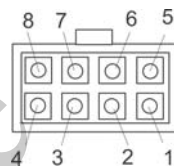
Press the Mode key to toggle to the individual display modes (single image, split screen (2), split screen (3), split screen (4) and timer mode.

4.0 Commissioning

GB

1. Fasten the display mount inside the driver cabin such that the driver can easily see the TFT display. Make sure that no display instruments are hidden and that the driver's front view is not obstructed.
2. Connect the supply cable MD3072B-AK according to the following table.

Pin	Name	Function	Colour
1	+12 / +24V DC	On-board supply pos. term.	Red
2	GND	On-board supply neg. term.	Black
3	POC	Control line	Yellow
4	-	-	White
5	SEL4	Selection camera 4 (MD3072B-Quad)	Red/black
6	SEL3	Selection camera 3 (MD3072B-Quad)	Red/brown
7	SEL2	Selection camera 2 (MD3072B-Quad)	Red/blue
8	SEL1	Selection camera 1 (MD3072B-Quad)	Red/green

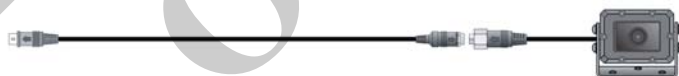


3. Attach the display to the display mount.
4. Adjust the TFT display in an angle providing convenient, optimal view to the driver.

4.1 Operating Modes

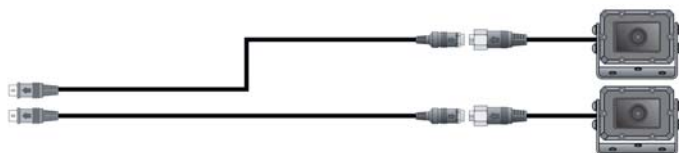
4.1.1 Single Camera Operation

A single camera is connected to C1 in this operating mode.



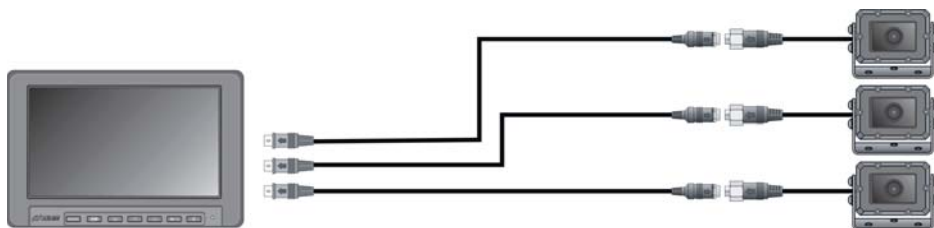
4.1.2 Twin Camera Operation

Two cameras are connected in this operating mode. Camera 1 has the highest priority, i.e. images of camera 1 will be displayed on the screen if both cameras have been selected simultaneously.



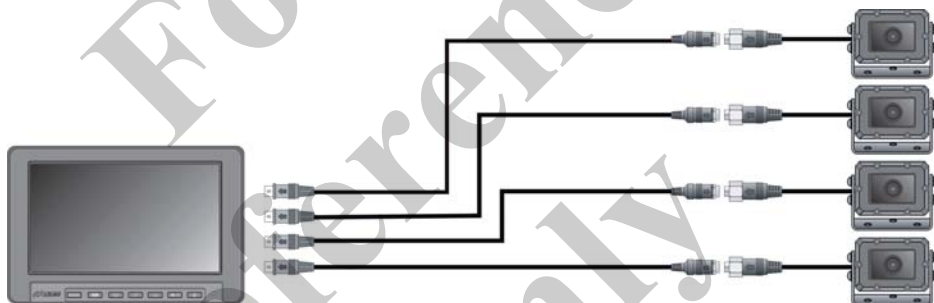
4.1.3 Three Camera Operation

Three cameras are connected in this operating mode. Camera 1 has the highest priority, i.e. images of camera 1 will be displayed on the screen if other cameras have been selected simultaneously. Camera 2 has a higher priority than camera 3.



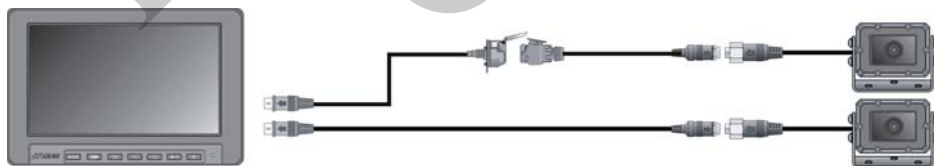
4.1.4 Four Camera Operation

Two or more cameras are connected in this operating mode. Camera 1 has the highest priority, i.e. images of camera 1 will be displayed on the screen if other cameras have been selected simultaneously. Camera 2 has a higher priority than camera 3 and camera 4. Camera 3 has a higher priority than camera 4.



4.1.5 Operation with Two or More Cameras in Trailer Mode

Two or more cameras are connected in this operating mode. Images of the trailer camera (camera 2) will automatically be displayed if the trailer camera is connected to C2 (possible only using control cable such as e.g. MK295.xx).



4.2 Malfunctions

GB

If the unit does not work properly, or if you detect any malfunction, check the external wiring first (fuses, supply voltage, cabling, monitor etc.). If the problem or malfunction can definitely be related to the TFT display MD3072B/MD3072B-Quad, it should be returned to the manufacturer together with a brief description of the fault or problem.

5.0 Maintenance

The TFT monitor is maintenance-free. Clean the monitor cover using only a soft, slightly moistened cloth. The ventilation slots of the color display should occasionally be freed from dust using a cloth or a brush. Motec products have been designed to operate error-free and with minimum maintenance for a long time. You can extend the system life time by regularly cleaning the product and by treating it in a careful and professional manner.

Do not remove the labels which identify the product. In some cases legal provisions apply. In any case the information identifying the product with a precise designation and serial number is relevant for tracking products and in the event of claims under the warranty.

5.1 Service Information

MOTEC Gesellschaft für
mobiltechnische Electronic mbH
- Service -
Oberweyerer Str. 21
65589 Hadamar-Steinbach
GERMANY

E-mail: service@motecgmbh.de
Internet: <http://www.motecgmbh.de>

Tel.: +49 (0) 6433 91 45 88
Fax: +49 (0) 6433 91 45 77

6.0 Environmental Protection

Recyclable material has been used as packaging material to a large extend. Take the opportunity to protect your environment by recycling the packaging material. Unused devices can be delivered to your nearest recycling facility or returned to the manufacturer for recycling.



For
Reference
Only

For
Reference
Only



Motec
Gesellschaft für mobil-
technische Electronic mbH
Oberweyerer Str. 21
65589 Hadamar-Steinbach
GERMANY

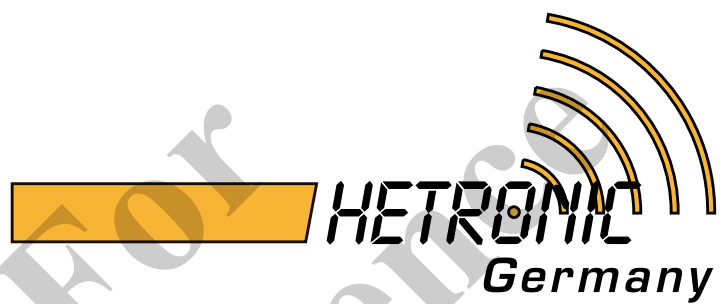
Phone +49 (64 33) 91 45 0
Fax +49 (64 33) 91 45 45

info@motecgmbh.de
www.motecgmbh.de

Betriebsanleitung Allgemein General Operating Manual Radio Remote Control



HETRONIC Germany GmbH
Adalbert-Stifter-Straße 2
84085 Langquaid
Tel.: +49 (0) 9452 189-0
Fax.: +49 (0) 9452 189-201



HETRONIC Germany GmbH
Adalbert-Stifter-Straße 2
D-84085 Langquaid
Tel. : +49 (0)9452/189-0
Fax. : +49 (0)9452/189-201
Web Site: <http://www.hetronic.de>
E-Mail: info@hetronic.de

Betriebsanleitung Deutsch / General Operating Manual German



Betriebsanleitung Englisch / General Operating Manual English



CE Konformitätserklärung / EC Declaration of Conformity



HF Konformitätserklärung / HF Declaration of Conformity



Garantiebedingungen / Guarantee Conditions



Originalbetriebsanleitung Version 2

Technische Änderungen vorbehalten

Original Operating Manual Version 2

Subject to technical changes without prior notice

Verfasser / Author: HETRONIC Germany GmbH

	Seite		Seite
1. Einleitung	5	8. Ladegerät- und Akkuhandhabung	12
1.1 Die Betriebsanleitung		8.1 Wechseln und Aufladen der Akkus	
1.2 Wie die Anleitung anzuwenden ist		8.2 Anzeigen und Fehlermeldungen des Ladegerätes	
1.3 Produktions- und Systemnummern			
1.4 Copyright		9. Batteriehandhabung	13
2. Sicherheitsmaßnahmen	6	9.1 Wechseln der Alkali-Batterien (Größe AA – Mignon)	
2.1 Sicherheit dieser Funkfernsteuerung		9.2 Batteriewechsel beim Modell Pocket	
2.2 Sicherheitshinweise		9.3 Batteriewechsel beim Modell Hand Held	
2.3 Autorisierte Bediener		9.4 HETRONIC Batteriefach	
2.4 Gefahrenquellen			
2.5 Sicherheitsmaßnahmen und Vorkehrungen im Arbeitsbereich		10. Diagnose	14
2.6 Schutzeinrichtungen			
2.7 Verhalten im Notfall		11. Technische Daten Allgemein	16
3. Sicherheitseinrichtung	7	11.1 System	
3.1 Sender		11.2 Sender	
3.2 Empfänger		11.3 Empfänger	
3.3 System		11.4 Akkus und Ladegeräte	
		11.5 Technische Datenblätter	
4. Installation	8	11.6 Allgemein	
4.1 Positionieren der Empfangseinheit		12. Wartung, Garantie, Entsorgung	17
4.2 Installation der Ausgangsverdrahtung		12.1 Wartung	
4.3 Korrekte Montage der Empfangseinheit		12.2 Garantie und Gewährleistung	
		12.3 Entsorgung	
5. Kontrolle vor der Inbetriebnahme	9	12.4 Hinweis für Reklamationsbericht	
5.1 Hinweis zur Bedienung		12.5 Befähigte Personen nach Betriebssicherheitsverordnung	
5.2 Sichtkontrollen			
5.3 Vor der Inbetriebnahme		13. Reklamationsbericht	18
5.4 Funktionstest der Stopptaste bei <u>Sendern mit Schlüsselschalter</u>			
6. Inbetriebnahme	10	14. Abkürzungen und Begriffserklärung	19
6.1 Einschaltvorgang für <u>Sender ohne Schlüsselschalter</u>		14.1 Abkürzungen	
6.2 Einschaltvorgang für <u>Sender mit Schlüsselschalter</u>		14.2 Begriffserklärung	
6.3 Statusanzeige im Empfänger		15. Erklärung zu Einbau- und Sicherheitstest	20
7. Bedienung der MFS und HL Systeme	11		
7.1 MFS Übertragungstechnologie			
7.2 H-Link			

Wir gratulieren Ihnen zum Kauf dieser hochwertigen HETRONIC Sicherheitsfunkfernsteuerung. Sie haben sich damit für ein Qualitätsprodukt von einem der führenden Hersteller von Sicherheitsfunkfernsteuerungen entschieden. Sie können somit sicher sein, ein Produkt nach dem aktuellsten Stand der Technik zu nutzen.

1.1 Die Betriebsanleitung

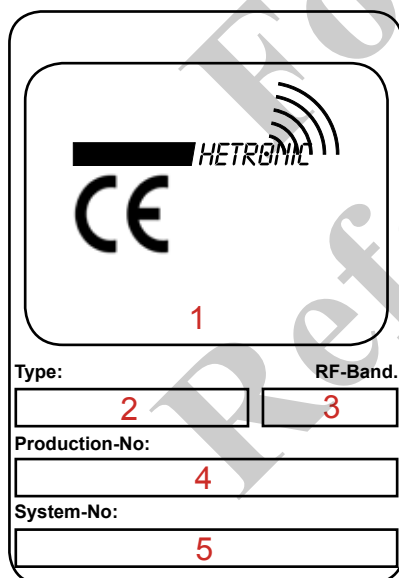
Lesen Sie die Betriebsanleitungen aller Systembestandteile sorgfältig und vollständig durch, bevor Sie die Anlage betreiben. Der Inhalt wird Sie mit den Sicherheitsanweisungen und den Bedienelementen während des normalen Betriebes und der Wartung vertraut machen. Die Betriebsanleitung ist so aufzubewahren, dass der Benutzer sie immer einsehen kann.

1.2 Wie die Anleitung anzuwenden ist

- Die Anleitung ist als Teil des Produktes zu betrachten.
- Die Anleitung ist so lange zu behalten, wie die Anlage in Betrieb ist.
- Die Anleitung ist an jeden nachfolgenden Besitzer oder Benutzer des Produktes weiterzugeben.
- Stellen Sie sicher, dass jede erhaltene Ergänzung der Anleitung beigelegt wird.

1.3 Produktions- und Systemnummern

Wenn Sie sich mit Ihrem Händler oder HETRONIC Germany GmbH wegen Reparaturen, Wartungsarbeiten oder Ersatzteilen in Verbindung setzen, sollten Sie die Systemnummern des Senders und Empfängers bereit halten. Die Nummern finden Sie auf dem Typenschild, welches sich außen auf Sender und Empfänger befindet.



Typenschild - Felder und Bedeutung

1. Zulassungen
2. Sender- bzw. Empfängertyp
3. Frequenz und HF- Ausführung
4. Produktionsnummer
5. Systemnummer

Erklärung zu 5. Systemnummer

Jede Systemnummer setzt sich aus 11 Ziffern zusammen.
Die Bedeutung der einzelnen Ziffern von links nach rechts:

10509178000

- | | |
|--------|-------------------|
| 1. | Länderkennzeichen |
| 05 | Produktionsmonat |
| 09 | Produktionsjahr |
| 178000 | Systemnummer |

1.4 Copyright

Alle Rechte sind vorbehalten. Das Kopieren, Umschreiben, Einstellen in Datenabfragesysteme oder Übersetzen in andere Sprachen in jeglicher Art und Weise ist ausschließlich mit der schriftlichen Genehmigung der Firma HETRONIC Germany GmbH zulässig.

Technische Änderungen sind vorbehalten.

Die Firma HETRONIC Germany GmbH behält sich das Recht vor, ihre Produkte jederzeit, ohne öffentliche Bekanntmachung oder Verpflichtung zu ändern, zu verbessern oder aus dem Sortiment zu entfernen. HETRONIC Germany GmbH lehnt alle Haftungsansprüche für Sachschäden, Körperverletzung oder Tod ab, die durch die Verwendung von nicht zugelassenen Ersatzteilen oder unbefugten Service entstehen.

Bitte beachten Sie die Pläne im Anhang!
Die Pläne zeigen Ihnen die genaue Ausführung Ihrer Funkfernsteuerung.

2.1 Sicherheit dieser Funkfernsteuerung

Diese Funkfernsteuerung verfügt über elektronische und mechanische Sicherheitsvorrichtungen. Es ist nicht möglich, Steuerbefehle, die von anderen Sendern stammen, zu verarbeiten, da alle Informationen von Sender und Empfänger verschlüsselt sind.

2.2 Sicherheitshinweise

Die Benutzung einer Funkfernsteuerung ermöglicht dem Bediener in seinem Arbeitsbereich große Bewegungsfreiheit und eine erhöhte Bedienungsgenauigkeit. Dennoch müssen der Bediener und das mit der Wartung anvertraute Personal stets aufmerksam sein, um alle Vorteile nutzen zu können. Eine korrekte und sichere Benutzung der Funkfernsteuerung zwingt den Bediener dazu, den Lauf der gesteuerten Maschine stets zu beobachten.

2.3 Autorisierte Bediener müssen gemäß Betriebssicherheitsverordnung geschult sein!

Prüfen Sie stets die Arbeitsanweisungen Ihrer Maschine, um eventuell weitere wichtige Informationen zu erhalten!

Der Bediener muss sich davon überzeugen, dass **nicht autorisierte Personen** den Sender nicht bedienen können. Hierzu muss er das Gerät am Schlüsselschalter ausschalten, den Schlüssel abziehen oder die Batterien aus dem Gehäuse entfernen und das Gerät an einem sicheren Ort verschließen. Nur so können wirksam rechtswidrige Handlungen durch nicht autorisierte dritte Personen verhindert werden. Der Benutzer muss Zugang zu allen Arbeitsanweisungen haben, die zu einem korrekten Funktionieren der zu steuernden Maschine nötig sind. Wenn das Gerät nicht vom Käufer selber benutzt wird, verliehen, vermietet oder verkauft wurde, stellen Sie diese Anleitung und die notwendige Sicherheitseinweisung vor dem Betrieb zur Verfügung.

Vor Benutzung der Funksteuerung muss der Bediener die Anweisungen jedes Kapitels in diesem Handbuch gelesen haben und sicher sein, diese genau verstanden zu haben.

2.4 Gefahrenquellen

Das System ermöglicht die Steuerung von Maschinen über Funk. Die Übertragung von Steuerkommandos erfolgt jedoch auch außerhalb der Sichtweite!

Darum:

- Wenn der Sender nicht benutzt wird, schalten Sie ihn aus und ziehen Sie den Schlüsselschalter ab.
- Falls Ihr Sender keinen Schlüsselschalter besitzt, entfernen Sie den Akku.
- Die Sicherheitseinrichtungen dürfen **nicht** entfernt oder verändert werden.

2.5 Sicherheitsmaßnahmen und Vorkehrungen im Arbeitsbereich

Stellen Sie sicher, dass im Arbeitsbereich, in dem die Funkfernsteuerung verwendet wird, keine Gefahr für den Bediener besteht. Überzeugen Sie sich z. B. davon, dass im Arbeitsbereich keine Hindernisse stehen oder gefährliche Situationen entstehen können, die die Arbeitssicherheit beeinträchtigen könnten.

Sorgen Sie für einen rutschsicheren Stand. Vergewissern Sie sich vor jeder Inbetriebnahme der Funkfernsteuerung, dass sich niemand im Arbeits- oder Schwenkbereich Ihrer Last befindet. Falls für Ihren Sender eine Tragehilfe vorgesehen ist, so ist diese auch zu benutzen.

2.6 Schutzeinrichtungen

Alle industriellen HETRONIC Funkfernsteuerungen sind mit einer Stopptaste ausgerüstet, die sich auf der Sendereinheit befindet.

Das Funksystem verfügt über Schutzeinrichtungen, die in folgenden Fällen automatisch eingreifen:

- Störfunk im Arbeitsbereich, der auf den Frequenzbereich der HETRONIC Funksteuerung einwirkt.
- Übertretung des Aktionsradius der Sendereinheit.

In diesen Fällen versetzt sich die Funkfernsteuerung sofort in den Nothaltstatus und unterbricht jedes Ausgangssignal der Empfangseinheit.

2.7 Verhalten im Notfall

- 1 Drücken Sie den roten Stopptaster.
- 2 Drehen Sie den Schlüsselschalter auf „OFF“
- 3 Warten Sie, bis die Maschine stillsteht.
- 4 Verhalten Sie sich, wie es in der Anleitung der Maschine steht.



Drehentriegelbarer
Stopp



Druck-Zug-
Stopp



Tastender
Stopp

3.1 Sender

Schlüsselschalter:

Unsere Sender sind zum größten Teil mit einem Schlüsselschalter ausgestattet. Dieser Schlüssel ermöglicht es dem Bediener den Sender abzuschalten, wenn er nicht benutzt wird. Außerdem schützt er vor Missbrauch durch Unbefugte und im Fall von Wartungsarbeiten an der Maschine.

Selbsttest:

Nach Einschalten des Senders mittels Schlüsselschalter führt das System einen Selbsttest durch. Ein positives Testergebnis wird durch zwei akustische Signale bestätigt. Die grüne LED bestätigt die Startbereitschaft des Senders durch Blinken.

Taster „Start/Hupe“ – Nullstellungszwang :

Nach dem Selbsttest muss der Sender durch Drücken des Tasters „Start/Hupe“ gestartet werden. Dadurch wird der Empfänger in Betrieb gesetzt. Alle Steuerfunktionen müssen in Nullstellung sein, damit das System gestartet werden kann. Wenn eine der Steuerfunktionen aktiviert ist, kann das System nicht in Betrieb genommen werden. Diese Sicherheitseinrichtung gewährleistet, dass keine Maschinenbewegung versehentlich ausgelöst werden kann. Der Startknopf kann nicht durch Zerstörung oder außer Kraft setzen übergangen werden. Wenn der Startknopf während des Selbsttests gedrückt wird, wird das System nicht gestartet.

Stopptaster:

Unsere Sender sind mit einem überlistsicheren Stopptaster ausgestattet. Das Stoppsignal wird als redundantes Signal gesendet. Außerdem wird der Stoppzustand während des Selbsttests bei der Inbetriebnahme überwacht. Wenn der Stopptaster während der Inbetriebnahme gedrückt wird, wird das System nicht gestartet. Der Stopptaster ist die wichtigste Sicherheitseinrichtung der Fernsteuerung. Er gewährleistet, dass der Bediener die Maschine während des Betriebes unverzüglich stoppen kann.

Akku-Überwachung:

Der Batteriestatus wird laufend von der Senderelektronik überwacht. Sollte die Batterie eine Unterspannung erreichen, so wird der Bediener optisch oder akustisch für ca. 30 Sekunden gewarnt. Im Anschluss gibt der Sender einen Befehl aus, wodurch die Maschine in einen sicheren Zustand gebracht wird. Bitte beachten Sie, dass eine frühzeitige Unterspannungserkennung (ca. 10 Minuten) erhältlich ist.

Mechanischer Aufbau:

Ein mechanischer Schutz rund um den Sender schützt die Schalter und Bedienhebel vor Stößen und Herabfallen. Das leichte, faserverstärkte PC-Sendergehäuse hält den Anforderungen des täglichen Betriebes stand.

3.2 Empfänger

Selbsttest:

Nachdem der Empfänger mit Strom versorgt wurde, führt die Software einen Selbsttest durch. Wenn während des Selbsttests ein Fehler auftritt, wird sich der Empfänger nicht einschalten und im sicheren Zustand bleiben.

Nothaltstromkreis:

Im Empfänger ist ein spezieller Sicherheitsstromkreis eingebaut. Durch einen redundanten Aufbau funktioniert dieser selbstüberwachend.

STOPP:

Sobald der Empfänger das Nothaltssignal vom Sender empfängt

- wird die interne Stromversorgung zu den Ausgangsmodulen abgeschaltet.
- wird ein störungssicheres, selbstüberwachendes Nothaltausgangsrelais aktiviert.
- Die Reaktionszeit für Stopp beträgt 450 ms.

Spannungsversorgung:

Der Empfänger hat seine eigene elektronische Spannungsversorgung, die alle Empfängermodule mit Strom versorgt.

3.3 System

Systemnummer:

Jeder Funkfernsteuerung wird aus Sicherheitsgründen ihre eigene Adresse zugeordnet. Sie stellt sicher, dass nur der vorgesehene Empfänger vom dazugehörigen Sender aktiviert werden kann.

Funkstörung:

Im Fall von einer Funkstörung schaltet das System in einen sicheren Zustand ab.

Software:

Die Software des Systems führt nach dem Einschalten einen Systemcheck durch, bei dem alle Sicherheitseinrichtungen überprüft werden. Das System schaltet in einen sicheren Zustand, falls eine Störung auftritt.

4.1 Positionieren der Empfangseinheit

Damit die Funksteuerung funktioniert, muss die Empfangseinheit so installiert werden, dass die Antenne einen maximalen Empfang von Rundfunkwellen hat. Metallteile der zu steuernden Maschine in der Umgebung der Empfangseinheit bilden eine Barriere, die einen guten Empfang verhindert. Wenn der Empfänger in einem metallisch geschlossenen Gehäuse oder in einem abgeschirmten Raum montiert wird, muss eine entsprechende Verlängerung und eine dazu passende Antenne eingesetzt werden, um eine entsprechende Reichweite zu erzielen. Von HETRONIC können hierzu ausführliche Informationen bezogen werden.

Die Empfangseinheit sollte weiterhin an einem sicheren und gut zugänglichen Ort angebracht werden, um spätere Installations- und Wartungsarbeiten zu erleichtern. Installieren Sie die Empfangseinheit so, dass die Kabelverbindung nach unten gerichtet ist.

Bei Installationen an fahrbaren Maschinen oder Fahrzeugen müssen Gummidämpfer angebracht werden, die verhindern, dass starke Vibrationen von der Maschine auf die Empfangseinheit übertragen werden. Falls diese nicht bereits als Serienartikel zu Ihrer Funksteuerung mitgeliefert werden, können die Gummidämpfer bei Ihrem HETRONIC Händler direkt bestellt werden.

ACHTUNG!

- Nur eine befähigte Person, die sowohl den Stromkreis der Maschine als auch die technischen Eigenschaften der Funkfernsteuerung kennt, darf die Empfangseinheit einer Funksteuerung an das elektrische System der Maschine anschließen.
- Während aller Installationsarbeiten müssen sowohl Sender als auch Empfänger stromlos sein.
- Alle Vorschriften, die die Gesundheit der im Umkreis der Installation anwesenden Personen betreffen, alle geltenden örtlichen Bestimmungen und Brandschutzbestimmungen sind strikt einzuhalten.
- HETRONIC übernimmt keine Haftung oder Garantie für Personen- oder Sachschäden, die durch unsachgemäßen oder fahrlässigen Gebrauch der Funkfernsteuerung oder auf Grund eines Nichtbeachtens der Vorschriften oder Arbeitsanweisungen verursacht wurden.

4.2 Installation der Ausgangsverdrahtung

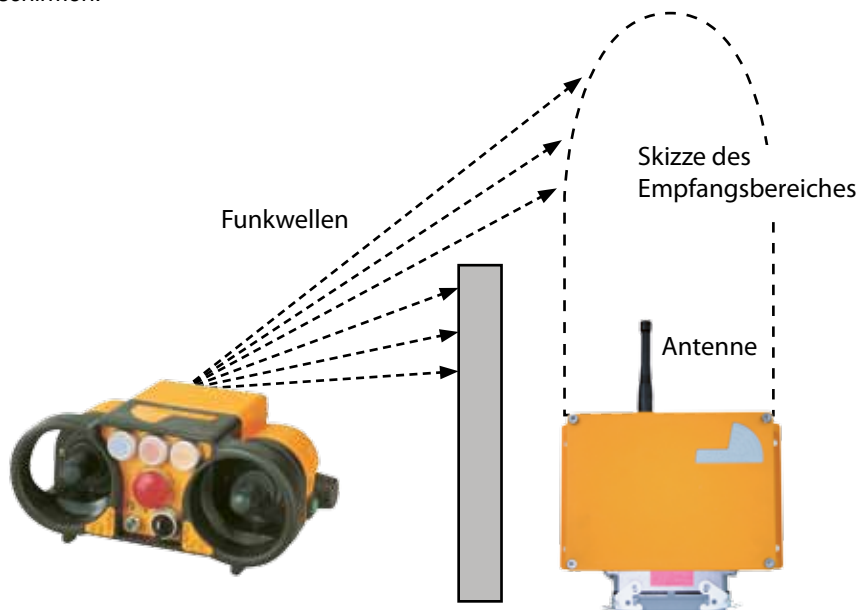
Schalten Sie die zu steuernde Maschine stromlos, bevor Sie die Spannungsversorgung des Empfängers anschließen.

Beauftragen Sie einen qualifizierten Techniker mit der Verdrahtung. Unsachgemäße Verdrahtung kann ernsthafte Systemschäden verursachen und zum Verlust der Garantie führen. Die Ausgangsverdrahtung muss nach dem Schaltplan der Maschine und der Funkfernsteuerung installiert werden. Verwenden Sie nur Kontakte von guter Qualität, um einen einwandfreien elektrischen Kontakt sicherzustellen. Detaillierte Informationen bezüglich der Empfänger-Verdrahtung finden Sie innerhalb der Abdeckung des Empfängers.

Die Stromversorgung und das Erdungskabel sind äußerst wichtig. Sie müssen an betriebssichere Stromanschlüsse angeschlossen werden.

4.3 Korrekte Montage der Empfangseinheit (Siehe Modellzeichnung unten)

Achten Sie beim Positionieren der Empfangseinheit darauf, dass keine großen metallischen Flächen die Außenantenne abschirmen.



5.1 Hinweis zur Bedienung

Haben Sie die Bedienungsanleitung, insbesondere Kapitel 2 „Sicherheitsmaßnahmen“ und Kapitel 3 „Sicherheitseinrichtung“, gelesen und verstanden? Sie dürfen das Gerät vorher **nicht** bedienen!

5.2 Sichtkontrollen

ACHTUNG!

Kontrollieren Sie vor jedem Arbeitseinsatz, ob der Sender Schäden aufweist!

- Befinden sich alle Sicherheitseinrichtungen am richtigen Platz und sind diese funktionstüchtig?
- Sind eventuell Teile beschädigt?
- Ist jeder Gummischutz und jede Abdeckung intakt? (**Sender**)
- Sind alle Verbindungsstecker und Kabel in Ordnung? (**Empfänger**)

ACHTUNG!

Arbeiten Sie nie mit einer Funksteuerung, die Mängel aufweist! Vor Arbeitsbeginn müssen alle Mängel von einem fachlich kompetenten Techniker behoben werden!

5.3 Vor der Inbetriebnahme

- Stellen Sie sicher, dass das System vollständig montiert wurde.
- Machen Sie sich mit sämtlichen Sicherheitsvorkehrungen in der Bedienungsanleitung vertraut.
- Beachten Sie alle Sicherheitsvorkehrungen in der Bedienungsanleitung und überprüfen Sie die Steuerfunktionen und den Betrieb von Maschine und Funkfernsteuerung.
- Wenn der Sender nicht in Benutzung ist, schalten Sie ihn aus und verwahren Sie ihn an einem sicheren Ort. Der Betrieb muss unbefugten Personen unzugänglich gemacht werden.
- Vergewissern Sie sich **immer**, dass die **Stoppfunktion** von Maschine und Funkfernsteuerung einwandfrei funktioniert.
- Wenn die Maschine nicht richtig anspricht, stoppen Sie den Betrieb umgehend. Schalten Sie den Sender aus und entfernen Sie die Batterie. Bitte suchen Sie sofort einen kompetenten Ansprechpartner auf.
- Vor Wartungsarbeiten entnehmen Sie bitte die Batterie des Senders und unterbrechen die Stromzufuhr des Empfängers.
- Bei Transistorempfängern, müssen Entstörglieder (RC) eingebaut werden.
- Wenn Sie Akkus verwenden, stellen Sie sicher, dass sich ein Akku immer im Ladegerät befindet und das Ladegerät immer an einer festen Stromversorgung angeschlossen ist.
- Montage, Einrichtung und Kundendienst dürfen nur von autorisierten Technikern durchgeführt werden.
- Verwenden Sie ausschließlich HETRONIC Ersatzteile.

ACHTUNG!

Schalten Sie die Maschine sofort aus, falls sich ein Problem zeigt. Betreiben Sie eine Maschine niemals, wenn der Nothalt nicht einwandfrei funktioniert. Bei Nichtbeachtung dieser Vorschrift besteht Gefahr für Personen und Sachwerte. Das Ausführen von Arbeitsschritten, die dieser Betriebsvorschrift nicht entsprechen, kann zum Entzug der Betriebserlaubnis und zum Verfall Ihrer Garantie führen!

5.4 Funktionstest des Stopptasters bei Sendern mit Schlüsselschalter

ACHTUNG!

Vor der täglichen Inbetriebnahme der Funkfernsteuerung muss die Kontrolle des Stopptasters durchgeführt werden!

- Stellen Sie sicher, dass der Sender nur mit vollständig geladenen HETRONIC Akkus bzw. Alkali - Batterien betrieben wird.
- Stecken Sie den Schlüssel in den Schlüsselschalter am Sender.
- Drehen Sie den Schlüssel von Position „0“ auf „1“. Warten Sie, bis die grüne LED regelmäßig zu blinken beginnt.
- Überprüfen Sie jetzt, ob der Stopptaster einwandfrei funktioniert. Gehen Sie hierzu wie folgt vor:
 - (1) Drücken Sie den Stopptaster auf dem Sender.
 - (2) Beobachten Sie die Blinkfrequenz der grünen LED
 - (3) Bei gedrücktem Stopptaster = schnelle Blinkfrequenz
 - (4) Bei entriegeltem Stopptaster = normale Blinkfrequenz
- Funktioniert die Stopptaste, können Sie die Anlage starten
- Funktioniert die Stopptaste nicht, müssen Sie für eine Überprüfung durch eine befähigte Person sorgen.
- Jetzt ist Ihre Funksteuerung einsatzbereit. Führen Sie nun eine beliebige Funktion mit dem Sender aus und kontrollieren Sie so, ob die Maschine bei Unterbrechung der Funktion ihre Arbeit sofort einstellt.

6.1 Einschaltvorgang für Sender ohne Schlüsselschalter

1. Akku oder Batterien einlegen
2. Der Sender wird mit einer Funktionstaste gestartet
3. Die grüne LED muss blinken
4. Wenn die Taste nicht mehr betätigt ist, wird die Bewegung gestoppt
5. Bei rot blinkender LED muss die Batterie bzw. der Akku gewechselt werden (Unterspannungstest ist optional)



Pocket



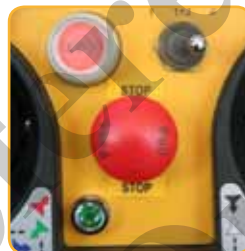
Hand Held

6.2 Einschaltvorgang für Sender mit Schlüsselschalter

1. Mit dem Schlüsselschalter wird der Sender in Betrieb genommen
2. Nach dem Einschaltvorgang müssen 2 kurze Signaltöne zu hören sein (Ausnahme ERGO)
3. Nach der Selbstkontrolle blinkt die grüne LED auf dem Sender
4. Zur täglichen Kontrolle gehört der Test des Stopptasters (wie in Punkt 5.4 beschrieben).
5. Zum Starten der Funkfernsteuerung müssen Sie die grüne Starttaste betätigen. Die Ausführung des Senders kann sich zur Abbildung unterscheiden. Bitte im Plan nachlesen, welche Funktion die Taster haben!
6. Achtung: Steuerfunktionen, welche sich nicht in Nullstellung befinden, verhindern den Startvorgang!



Grüne Starttaste und Schlüsselschalter



Roter Stopptaster

6.3 Statusanzeige im Empfänger

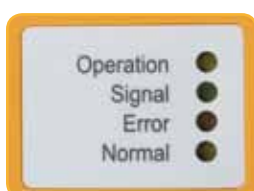
1. Kompakte Ausführung mit Sichtfenster
Das LED Fenster befindet sich auf der rechten Seite des Gehäuses.
2. Kompakte Ausführung ohne Sichtfenster
Die LEDs sind nur im geöffneten Zustand sichtbar
3. Modulare Ausführung
Auf Decoder und **Notstopp**-Decoder befinden sich je 3 LEDs

LED Erklärung

Gelb	=	Betrieb
Grün	=	Funkverbindung
Rot	=	Störung
Gelb	=	Normal (Stoppzustand)

3

1



2



7. Bedienung der MFS und HL Systeme

7.1 MFS Übertragungstechnologie (Multi Frequency Sharing)

Bei den Ausführungen Pocket, Hand Held und Ergo wird das MFSHL System verwendet. MFS-Technologie ermöglicht es, dass mehrere Systeme mit derselben Frequenz im selben Umfeld bedient werden können.

Sender: ERGO-MFS-HL

Pocket-MFS-HL

HandHeld-MFS-HL



Empfänger: RX/AC 8 und 16 MFS-HL

RX/DC 8 und 16 MFS-HL



Sender	Rote LED	Grüne LED
Unterspannung	An	Blinkend
Sender Fehler	An	An
Sender Normal	Aus	Blinkend
Nothalt Sender	Blinkend	Aus

Empfänger	Rote LED	Grüne LED	Buzzer
Fehler Hauptkontakt	An	Aus	Aus
Empfänger aktiv	Aus	Aus	Pfeift
empfängt	Aus	Blinkend	Aus

7.2 H-Link

H-Link ist eine Technologie, die dem Bediener den Zugriff auf die Konfiguration von HETRONIC Funkfernsteuerungen ermöglicht, ohne dass diese geöffnet werden müssen! Die Verdrahtung und Belegung wird durch drahtlosen Datenaustausch zwischen HETRONIC Geräten und einem H-Link Konfigurator ersetzt.

Mittels H-Link können Funktionen wie z. B. Systemadressen, Senderfrequenzkanäle, automatische Abschaltung, Verriegelung, Ausgangseinstellung und vieles mehr eingestellt werden. In der Anleitung ERGO F finden Sie hierzu weitere Informationen. Nach der Erstprogrammierung durch HETRONIC kann beim Sendertyp ERGO F der Frequenzkanal ohne die Verwendung von H-Link eingestellt werden.



8.1 Wechseln und Aufladen der Akkus

Die Akkus müssen vor Inbetriebnahme vollständig geladen werden!

Das Ladegerät muss an einem sauberen und trockenen Ort platziert werden. Schließen Sie das Ladegerät, entsprechend der Ausführung, an eine unterbrechungsfreie Stromversorgung an.

Geben Sie den leeren Akku in das Ladegerät. Der Ladevorgang wird hierdurch gestartet.

Unter Punkt 8.2 wird die Anzeige des Ladegeräts genau beschrieben!

Die Ladezeit beträgt ca. 2 – 4 Stunden (je nach Akku). Ready: (grüne) LED muss leuchten.

Ladegeräte von HETRONIC verfügen über eine Ladezustandserkennung. Das Ladegerät schaltet nach Beendigung des Ladevorgangs automatisch auf Erhaltungsladung um.

TIPP!

Um Ausfallzeiten zu vermeiden, empfiehlt es sich, stets einen geladenen Akku bereitzuhalten.

Bei **Hand Held Systemen**, die ein Ladegerät des Typs **VersaPak** (Bild 1) benutzen, darf die Batterie auf keinen Fall länger als 24 Stunden geladen werden, um etwaige Schäden an VersaPak-Akkus und Ladegeräten zu vermeiden. Dies gilt ausschließlich für VersaPak-Akkus.

Beauftragen Sie ein Fachunternehmen mit der Verwertung und Entsorgung!

8.2 Anzeigen und Fehlermeldungen des Ladegerätes (Bild 2 und Bild 3)

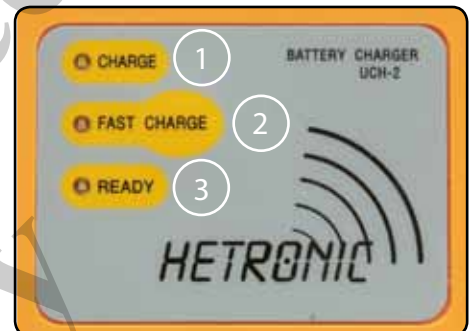
LED-Anzeigen des Ladegerätes

- Ladevorgang läuft: gelbe LED [1] leuchtet
- Schnellladen: gelbe [1] und rote [2] LED leuchten, nach Betätigung der Schnellladetaste [2]
- Ladevorgang abgeschlossen: grüne LED [3] leuchtet, Erhaltungsladung läuft

Fehlermeldungen des Ladegerätes

- Keine LED leuchtet: der Akku ist defekt
- Gelbe LED [1] blinkt: Kurzschluss im Akkublock

In beiden Fällen darf der Akku nicht mehr verwendet werden



ACHTUNG!

Verwenden Sie **ausschließlich** HETRONIC Akkus! Andernfalls besteht Explosionsgefahr. Austretende chemische Substanzen oder sich lösende Teile können irreparable Schäden verursachen.

HINWEIS!

Akkublocke gelten als Sondermüll und sind ordnungsgemäß zu entsorgen.

Defekte Akku-Packs können auch direkt über HETRONIC entsorgt werden.

Ausführungsarten der Ladegeräte:



Bild 1
Versa Pak
Ladegerät



Bild 2
HETRONIC
Ladegerät
mit Akku 3,6V



Bild 3
HETRONIC
Ladegerät
mit Akku 9,6V

9.1 Wechseln der Alkali-Batterien (Größe AA – Mignon)

- Die Batteriespannung wird stets vom Sender überwacht. Wenn die Spannung zu gering ist, leuchtet die LED am Sender rot auf und je nach Ausführung ertönt ein Signal. Bitte tauschen Sie die Batterien umgehend aus. Dazu verfahren Sie wie folgt:
- Bringen Sie den Kran oder die Maschine schnellstmöglich in eine sichere Position.
- Drücken Sie den Stoptaster des Senders.
- Entfernen Sie die leeren Batterien wie in den folgenden Abbildungen gezeigt.
- Befolgen Sie die Anleitung zur Inbetriebnahme, um das System wieder zu starten.

9.2 Batteriewechsel beim Modell Pocket (Abb. 1 und 2)

- Schieben Sie den Deckel des Batteriefachs auf der Unterseite des Senders heraus (siehe Abbildung 1).
- Entnehmen Sie die drei leeren Batterien.
- Legen Sie 3 neue 1,5V Mignonzellen in das gekennzeichnete Fach. (siehe Abbildung 2)
- Schieben Sie den Deckel wieder auf das Batteriefach.



Abb. 1



Abb. 2

9.3 Batteriewechsel beim Modell Hand Held (Abb. 3 – 6)

- Drücken Sie den Hebel am Ende des Batteriefachs, um das Batterierohr oder den Akku zu entfernen. (Abb. 3 – 5)
- Entnehmen Sie die 2 leeren Batterien (Abb. 6).
- Legen Sie 2 neue 1,5V Mignonzellen in das gekennzeichnete Batteriefach (Abb. 6).
- Legen Sie das Batterierohr mit der offenen Seite voran in das Batteriefach des Senders.
- Schieben Sie das Batterierohr in das Batteriefach bis es einrastet.



Abb. 3



Abb. 4



Abb. 5



Abb. 6

9.4 HETRONIC Batteriefach (Abb. 7)

- Um das Batteriefach zu entnehmen, verfahren Sie wie beim Akkuwechsel.
- Bitte achten Sie auf die Polarität der Batterien +/-.



Abb. 7

ACHTUNG!

Verwenden Sie ausschließlich Alkalische Batterien!

Alkalische Batterien dürfen nicht im Ladegerät geladen werden!

Problem	Mögliche Ursachen	Problemlösung
Der Sender zeigt beim Einschalten keine Reaktion.	Die Batterie ist leer.	Laden Sie die Batterie oder ersetzen Sie die alkalische Batterie.
	Die Sicherung ist defekt.	Die Sicherung muss durch einen Fachmann erneuert werden.
	Der Schlüsselschalter ist defekt.	Der Schlüsselschalter muss durch einen Fachmann erneuert werden.
Die Batterien sind geladen, doch der Sender zeigt keine Reaktion	Die Batteriekontakte sind verschmutzt.	Bitte reinigen Sie die Batteriekontakte mit einem Tuch.
	Die Federkontakte im Batteriefach sind defekt.	Lassen Sie die Federkontakte von einem Fachmann erneuern.
Kommunikationsstörung zwischen Sender und Empfänger.	Die Reichweite wurde überschritten.	Gehen Sie in Richtung des Empfängers.
	Eine Funksteuerung mit der gleichen Frequenz arbeitet in der unmittelbaren Nähe.	Die HF-Einstellung muss durch einen Fachmann angepasst werden.
	Ein Objekt befindet sich zwischen Sender und Empfänger.	Bitte ändern Sie die Position des Senders oder verändern Sie die Antennenposition mittels einer Verlängerung.
Die Betriebszeit ist zu kurz.	Die Batterie ist leer.	Geben Sie die Batterie in das Ladegerät und legen Sie eine geladene Batterie in den Sender ein.

Haben Sie noch Fragen?

Bitte nehmen Sie Kontakt mit Ihrem Händler oder mit dem HETRONIC Service-Team auf. Wir helfen Ihnen gerne weiter.
Tel. 09452/189-0

Problem	Mögliche Ursachen	Problemlösung
Das Funksignal ist gut, aber einige vom Sender ausgeführte Funktionen laufen nicht.	Die Verbindung zwischen der Maschine und dem Empfänger ist unterbrochen.	Möglicherweise haben sich Kabel gelöst. Überprüfen Sie die Verkabelung des Empfängers an der betreffenden Funktion.
	Das Ausgangsmodul im Empfänger ist defekt.	Prüfen Sie, ob auf dem Ausgangsmodul im Empfänger eine LED leuchtet, wenn die entsprechende Funktion aktiviert wird.
Nach normaler Inbetriebnahme lässt sich das System nicht starten.	Der Stopptaster ist gedrückt oder defekt.	Lösen Sie den Stopptaster. Betätigen Sie die Start/Hupe Taste.
	Der Meisterschalter befindet sich nicht in Mittelstellung.	Versichern Sie sich, dass sich alle Meisterschalter in Mittelstellung befinden.
	Der Akku oder die Batterie des Senders ist leer.	Überprüfen und wechseln Sie gegebenenfalls den Akku oder die Batterien.
	Der Empfänger ist stromlos.	Die gelbe LED (Diagnosefenster) muss blinken. Überprüfen Sie die Sicherungen.
	Der Starttaster ist defekt.	Erneuern Sie den Starttaster.

Haben Sie noch Fragen?

Bitte nehmen Sie Kontakt mit Ihrem Händler oder mit dem HETRONIC Service-Team auf. Wir helfen Ihnen gerne weiter.
Tel. 09452/189-0

11.1 System

Frequenzbereich:	400 – 470 MHz, Europa 433/434 MHz und 869 MHz
HF-Synthesizer:	Mikroprozessor gesteuerter PLL Synthesizer mit 32 wählbaren Frequenzen
HF-Leistung:	< 10 mW Standard, höhere Sendeleistung auf Anfrage erhältlich, HF-Zulassungen für genehmigungspflichtige und freie Frequenzbereiche für über 40 Staaten.
Modulation:	FM – schmale Bandbreite
Bandbreite:	12,5 kHz / 25 kHz, je nach Ausführung
Reichweite:	ca. 100 Meter mit Standardantenne, ca. 200 Meter mit Spezialantenne
Adressierung:	20 Bit (1 Million einzelne Möglichkeiten)
Temperaturbereich:	-25°C bis +70°C (-18°F bis 160°F)
Feuchtigkeitsresistenz:	0-97% Maximum (gilt nicht für Kondensation)
Ansprechungsdauer:	ca. 450 ms
Baudrate:	2400/4800/9600 bps
Diagnose:	Statusanzeige für HF-Kommunikation, Betriebsspannungsanzeigen für Sender und Empfänger, Unterspannungsanzeige
Zertifikate:	CE, TÜV, ISO 9001 u. v. a.
Steuerfunktion:	bis Performance Level »c« nach EN ISO 13849-1:2006 (Abhängig von der technischen Ausführung)
Stoppfunktion:	bis Performance Level »d« nach EN ISO 13849-1:2006 (Abhängig von der technischen Ausführung)

11.2 Sender

Art:	Ergonomisch geformtes Gehäuse
Gehäusematerial:	Auf Fiberglas basierendes Polyamid mit Glasfaseranteil, je nach Sendervariante, andere Materialien auf Anfrage
Schutzklasse:	IP65
Antenne:	Innenliegend
Batteriegehäuse:	Elektrisch getrennt mit vergoldeten, selbstreinigenden Kontakten
Betriebsdauer:	Standardmäßig 14 – 20 Stunden, je nach Ausführung unterschiedlich
Drucktaster:	Ein- oder zweistufig
Meisterschalter:	Alle Meisterschalter mit automatischer Rückstellung, mehrstufig und proportional, optional mit Totmann, feuchtigkeitsabweisend und ergonomisch im Design

11.3 Empfänger

Gehäusematerial:	Auf Fiberglas basierendes Polyamid mit 30 % Glasfaseranteil, je nach Empfängervariante, andere Materialien auf Anfrage
Anschlussverbindung:	Durch feuchtigkeitsabweisenden Anschlussstecker
Schutzklasse:	IP65
Betriebsspannung:	12/24 VDC, 48/115/230 VAC
Stromaufnahme:	<0,8 A, je nach Bauart
Antenne:	Außenantenne, mit feuchtigkeitsabweisender Verbindung, zum Teil innenliegend
Digitale Ausgänge:	Fehlersicherer und selbstüberwachender Nothaltkreis. Alle Relaisausgänge 275 VAC / 8 A
Prop. Auflösung:	8 Bit (256 Stufen pro Funktion), eingebaute Rampenfunktion wählbar
Prop. Ausgänge:	PWM-Signal mit wählbarer Dither-Frequenz und Strombereich, lineare Ausgangsspannung, Einstellung der prop. Funktionen über den Sender mit Quick-Set-Eigenschaften oder über Potentiometer, mehrere Geschwindigkeitsbereiche wählbar, alle prop. Funktionen einstellbar mit Anfangs- und Endgeschwindigkeit
Serielle Schnittstellen:	RS232/485, CAN-Open, Profi-Bus-DP
Absicherung gegen	Die Absicherung der proportionalen Ausgänge wird standardmäßig im Kabel eingebaut.
Rückspeisung:	Wird das Kabel durch den Kunden angefertigt, muss er für diese Absicherung Sorge tragen

11.4 Akkus und Ladegeräte

Betriebsspannung:	10 - 30 VDC oder 90-270 VAC
Ladezeit:	<4 Stunden
Lebensdauer:	ca. 900 Ladungen
Art:	NiMH
Kapazität:	1200 mAh
Kontakte:	Vergoldete, selbstreinigende Kontakte

11.5 Technische Datenblätter

Technische Datenblätter mit weiteren Informationen stehen Ihnen auf der HETRONIC Web Site zum Download zur Verfügung.

11.6 Allgemein

Die mit CE gekennzeichneten Funkfernsteuerungen sind in folgenden Ländern zugelassen und notifiziert: Deutschland, Österreich, Schweiz, Luxemburg, Belgien, Norwegen, Niederlande, Dänemark, Finnland, Frankreich, Griechenland, Irland, Italien, Portugal, Spanien, Schweden, Großbritannien, Island, Estland.



ACHTUNG!

Der Einsatz des HF-Teils CS434 ist anmelde- und gebührenfrei. Der Sender darf niemals ohne Antenne betrieben werden, da das HF-Modul zerstört werden kann. Die Einstellung der Frequenz wird von HETRONIC werksseitig vorgegeben. Wenn Sie Probleme mit der Funkverbindung Ihres Systems haben, benachrichtigen Sie bitte Ihren Händler oder den HETRONIC Kundendienst. Die Telefonnummer finden Sie auf dem Deckblatt dieser Anleitung.

12.1 Wartung

Bitte beachten Sie folgende Hinweise, um stets eine sichere Funkfernsteuerung zu haben:

Jede Funksteuerung muss mindestens einmal im Jahr kontrolliert werden. Das mit der Wartung beauftragte Personal muss sicherstellen, dass die Sender- und die Empfangseinheit während der Kontroll- und Inspektionsarbeiten stromlos geschaltet sind. Eine regelmäßige Wartung durch den Benutzer verlängert die Lebensdauer der Funkfernsteuerung.

Einbau, Einrichtung und Kundendienst dürfen nur von befähigten Personen durchgeführt werden.

Eventuelle Reparaturen dürfen nur in anerkannten Reparaturwerkstätten, in von HETRONIC empfohlenen Werkstätten oder direkt in den technischen Kundendienst- und Ersatzteilzentren von HETRONIC vorgenommen werden.

Eine eventuelle Benutzung von nicht Original Ersatzteilen oder von nicht autorisiertem Personal ausgeführte Arbeiten führen zu sofortigem Erlöschen der Garantie.

ACHTUNG!

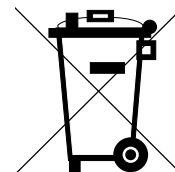
Sind eventuell elektrische Kontakte oxidiert, so verwenden Sie kein Anti-Oxidationsmittel oder ähnliches! Wenden Sie sich in diesem Fall zur sofortigen Auswechslung der betroffenen Teile an Ihren HETRONIC Händler. Die Benutzung von chemischen Mitteln in der Funkfernsteuerung verursacht Schäden an den inneren Bauteilen.

12.2 Garantie und Gewährleistung

Die Garantiebedingungen entnehmen Sie bitte unseren Allgemeinen Geschäftsbedingungen.

12.3 Entsorgung

Vermeiden Sie Umweltverschmutzung! Elektronische Geräte und Teile davon sind Problem Müll! Dies gilt besonders für aufladbare Akkupacks! Beauftragen Sie ein Fachunternehmen mit der Verwertung und Entsorgung! Defekte Akkupacks können auch direkt über HETRONIC entsorgt werden!



12.4 Hinweis für Reklamationsbericht (Seite 18)

ACHTUNG!

Um Ihre Reklamation korrekt bearbeiten zu können, sind die mit „Kunde/ Customer“ gekennzeichneten Felder vollständig auszufüllen! Es ist darauf zu achten, dass die Rechnungsnummer bzw. die Lieferscheinnummer eingetragen ist, damit eine Bearbeitung erfolgen kann.

12.5 Befähigte Personen nach Betriebssicherheitsverordnung

Bitte beachten Sie, dass nur befähigte Personen im Sinne der Betriebssicherheitsverordnung mit der richtigen Berufsausbildung, Berufserfahrung und zeitnaher beruflicher Tätigkeit Arbeiten mit der Funkfernbedienung, Wartungsarbeiten und Reparaturen durchführen dürfen.

13. Reklamationsbericht

Reklamationsbericht/ Complaints report									
Kunde/ Customer									
Kunde/ Customer		Bearb.-Nr./LS-Nr./Re-Nr. Hetronic/ Treatment No./Delivery No./ Invoice No. Hetr.		Datum/ Date		Sachbearbeiter/ Contact			
HETRONIC Germany Eingangsnummer/ In Kn.-Nr./ Cu-No Datum/ Date Sachbearbeiter/ Contact									
Legende/ Legend Grund der Rücklieferung/ reason of delivery Kundenwunsch/ Customer request									
A Falschlieferung/ wrong delivery		1 Reparatur/ repair		blau/ blue		Kunde/ Customer			
B Falsche Bestellung/ order mistake		2 Ersatz/ Replacement		weiß/ white		HETRONIC Germany			
C Teil defekt/ Part defective		3 Gutschrift/ Credite Note							
D Leihanlage/ Rented equipment		4 Funktionskontrolle/ function control							
				(nur gegen BEARBEITUNGSGEBÜHR von 59,50€) (only against HANDLING CHARGE of 59.50 €)					
Kunde/ Customer System-Nr./ Artikel-Nr./ SAP-Nr./ SAP No. Grund der Rücklieferung / Kundenwunsch/ System No. Item No. Component/ Description of failure reason of return delivery Customer request									
1									
2									
3									
4									
HETRONIC Germany Befund/ Datum / Entscheid 1/ Entscheid 2/ report Date result 1 result 2									
1									☐ Garantief. Kulanz Warranty
2									☐ keine Garantie möglich no warranty
3									☐ Reparatur ohne Berechnung repair free of charge
4									☐ Funktionsfähig, kostenlos zurück functional, return free of charge
Sachbearbeiter/ Contact		Datum/ Date		Unterschrift/ Signature		Datum/ Date		Unterschrift/ Signature	
H-D-QS-04-08-Reklamationsbericht-06									

14.1 Abkürzungen

AK	Analog channel / Analogkanal
DK	Digital channel / Digitalkanal
EPROM	Electrical programmable read-only memory / Elektrisch programmierbarer Festwertspeicher
FM	Frequency modulation / Frequenzmodulation
GND	Ground / Bezugspotential
HF	High frequency / Hochfrequenz (HF)
KHz	Kilohertz
LED	Light emitting diode / Leuchtdiode
mAH	Milliampere hours / Milliamperestunden
mA	Milliampere / Milliampere
msec	Millisecond / Millisekunden
MHz	Megahertz
mW	Milliwatt
NiMH	Nickel Metal Hydrite / Nickel-Metal-Hydrid
PWM	Pulse width modulation / Pulsweitenmodulation
RF	Radio frequency / Funkfrequenz
Rx	Receiver / Empfänger
SMD	Surface mounted device / Stark minimierte Dimension von Bauteilen
TTL	Transistor logic / Transistorenlogik
Tx	Transmitter / Sender
Ub	Operating power / Betriebsspannung
VAC	Volts alternating current / Wechselstrom
VDC	Volts direct current / Gleichstrom

14.2 Begriffserklärung

Akustisches Signal	Summer oder anderer Klang, als Warnsignal
Analoges Signal	Proportional stufenlose Steuerung
Coder	Wandelt Eingangssignale in serielle Datennachrichten um
Decoder	Wandelt serielle Datennachrichten in Ausgangssignale um
Digitalsignal	An/aus Funktion
Rastende Funktion	Die Funktion ist aktiviert, wenn der Schalter in Position „On“ ist. Die Funktion ist nicht mehr aktiviert, wenn der Schalter in Position „Off“ ist
Tastende Funktion	Die Funktion ist solange aktiv, wie der Taster gedrückt bleibt
Proportionale Steuerung	Eine stufenlose Ansteuerung mit verschiedenen Geschwindigkeiten

15. Erklärung zu Einbau - und Sicherheitstest



Dieses Formular ist unbedingt durch den für den Einbau Verantwortlichen zu ergänzen und zu unterzeichnen.

HETRONIC kann keine Gewährleistung für die korrekte Installation der Funkfernsteuerung übernehmen. Der Bediener muss sich davon überzeugen, dass Funkfernsteuerung und Maschine aufeinander angepasst und geprüft wurden und die Sicherheitsbestimmungen eingehalten werden. Der Bediener muss alle Sicherheitsvorkehrungen dieser und anderer maßgeblicher Anleitungen befolgen.

Daten der Kundenmaschine

Hersteller

Modellnummer

Seriennummer

Produktionsjahr

Daten der Funkfernsteuerung

Hersteller

Modell

Typ

HETRONIC Germany GmbH

Systemnummer

Ich/ Wir habe(n) den Einbau, die Inbetriebnahme und die Sicherheitsprüfung der Funkfernsteuerung an der oben genannten Maschine durchgeführt. Die geltenden Vorschriften und Gesetze für die Maschinenart wurden dabei erfüllt.

Ort, Datum

Firma (Anschrift)/ Stempel

Name des Verantwortlichen

Unterschrift

	Page		Page
1. Introduction	22	8. Battery charger and rechargeable batteries	29
1.1 The operating manual		8.1 Replacing and charging rechargeable batteries	
1.2 How to use this manual		8.2 Display and error messages of the battery	
1.3 Production and system numbers			
1.4 Copyright			
2. Safety precautions	23	9. Battery handling	30
2.1 Safety of this radio remote control system		9.1 Replacing alkaline batteries (Size AA – round cell)	
2.2 Safety information		9.2 Battery replacement for type Pocket	
2.3 Authorized operators		9.3 Battery replacement for type Hand Held	
2.4 Sources of risk		9.4 HETRONIC battery compartment	
2.5 Safety precautions in the working area			
2.6 Protection devices			
2.7 What to do in an emergency			
3. Protection devices	24	10. Diagnostics	31
3.1 Transmitter		11. Special Technical Data	33
3.2 Receiver		11.1 System	
3.3 System		11.2 Transmitter	
		11.3 Receiver	
		11.4 Rechargeable batteries and battery charger	
		11.5 Technical data sheets	
		11.6 General	
4. Installation	25	12. Maintenance, Guarantee, Disposal	34
4.1 Positioning of the receiver unit		12.1 Maintenance	
4.2 Installation of the output wiring		12.2 Guarantee and warranty	
4.3 Correct installation of the receiver unit		12.3 Disposal	
		12.4 Information about complaints report	
		12.5 Qualified persons according to the Ordinance on Industrial Safety and Health	
5. Checkup before operation	26	13. Complaints report	35
5.1 Notice for operation		14. Abbreviations and Definitions	36
5.2 Visual checkup		14.1 Abbreviations	
5.3 Before operation		14.2 Definitions	
5.4 Functional test of the stop button for <u>transmitters with key switch</u>			
6. Startup procedure	27	15. Installation and safety test declaration	37
6.1 Startup procedure for <u>transmitters without key switch</u>			
6.2 Startup procedure for <u>transmitters with key switch</u>			
6.3 Receiver status display			
7. Operation of MFS and HL systems	28		
7.1 MFS transmission technology (Multi Frequency Sharing)			
7.2 H-Link			

1.1 The operating manual

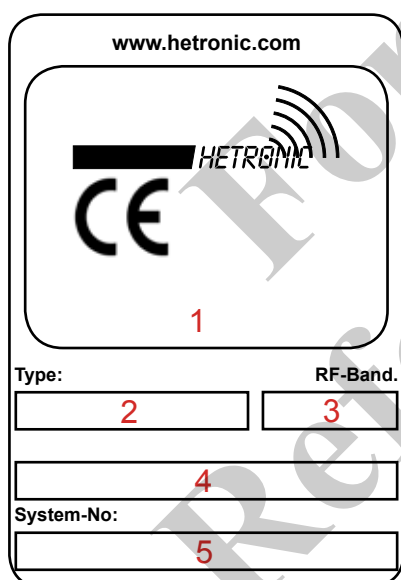
Read the manual of all system components carefully and completely before operating the system. The content will make yourself familiar with the safety instructions and the controls during standard operation and maintenance. Keep the manual in a place where the operator can access it at any time.

1.2 How to use this manual

- This manual is part of the product.
- This manual has to be retained as long as the system is operated.
- This manual has to be passed on to every future owner or user of the system.
- Please assure, that each available appendix is attached to the manual.

1.3 Production and system numbers

When you contact your dealer or HETRONIC for repair work, maintenance or spare parts, please keep the system numbers of the transmitter and the receiver ready. You will find the numbers on the type label on the outside of the transmitter and receiver housing.



Type plate – Labeling and meaning

1. Approvals
2. Transmitter and receiver type
3. Frequency and RF type
4. Production number
5. System number

Explanation for item 5. system number

Each system number is made up of 11 digits. Below you will find the meaning of the particular digits from left to right:

10509178000

- | | |
|--------|---------------------|
| 1. | Country indicator |
| 05 | Month of production |
| 09 | Year of production |
| 178000 | System number |

1.4 Copyright

All rights are reserved. Copying, reshaping, recording on electronic media and translating into other languages is only allowed with the written permission of HETRONIC Germany GmbH.

Subject to technical change without prior notice.

HETRONIC Germany GmbH reserves the right to change, improve or phase out the products anytime without public notice or obligation. HETRONIC Germany does not accept liability claims for material damage, personal injury or death, which result from the use of unlicensed spare parts or unauthorized service.

Please notice the attached drawings!

The drawings will show the specific version of your radio remote control.

2.1 Safety of this radio remote control system

This radio remote control system is equipped with both, electronic and mechanical protection devices. Control commands from other transmitters cannot be processed, as all information from the transmitter and the receiver is encoded.

2.2 Safety information

Using a radio remote control system allows the operator for more mobility in his working area and increased precision. However, the user and the maintenance staff always have to be attentive, in order to access all these advantages. The operator always has to keep an eye on the machine running, as this is necessary to assure a proper and safe operation of the radio remote control system.

2.3 Authorized operators have to be instructed according to the industrial safety regulations!

Always check the operating instructions of your machine, to receive more important information! **The operator** has to assure that unauthorized persons cannot operate the transmitter. For this, he has to turn off the key switch, remove the key or the rechargeable battery and store the transmitter in a lockable location. This is the only way to prevent undesired use or misuse by unauthorized persons. The operator must have access to all operating instructions, which are necessary for the proper operation of the machine to be controlled. If the system is not used by the buyer himself, if it was lent, rented or sold, please provide this operating manual and the required safety instructions before operation.

Before operating this radio remote control, the operator has to read and completely understand all instructions of every chapter of this manual.

2.4 Sources of risk

The system is designed for permitting machines to be controlled by radio remote control. However, control commands are also transmitted outside your range of vision and through or around obstacles.

Therefore:

- Switch the transmitter off and pull the key from the key switch, if it is not in use.
- Remove the rechargeable battery, if your transmitter does not have a key switch.
- The protection devices may not be modified or removed.

2.5 Safety precautions in the working area

Make sure, that there are no risks for the operator within the working area of the radio remote control. Ensure, that there are no obstacles in the working area and that dangerous situations, affecting the operational safety, are avoided. Make sure, you position yourself securely. Before each use of the radio remote control system, ensure, that nobody is within the working area or the swiveling range of your load. If a carrying strap is provided for your transmitter, this has to be used.

2.6 Protection devices

All industrial HETRONIC radio remote control systems are equipped with an emergency stop button, located on the control panel of the transmitter.

The radio remote control system is provided with protection devices, which are activated automatically in the following cases:

- Radio interference within the working area, affecting the frequency range of the HETRONIC radio remote control.
- Exceeding the range of the transmitter.

In these cases, the radio remote control will be stopped immediately and the output signals of the receiver are interrupted.

2.7 What to do in an emergency

- 1 Press the red stop button.
- 2 Turn the key switch to position „OFF“.
- 3 Wait until the machine has stopped.
- 4 Proceed as instructed in the operating manual for your machine.



Unlock stop button by turning clockwise



Push-pull-stop



Momentary stop

3.1 Transmitter

Key switch:

Almost all of the transmitters are equipped with a key switch. This key enables the operator to switch off the transmitter, when it is not operated. Furthermore, the key switch prevents undesired use or misuse by third parties and is a helpful device in case of maintenance work on the machine.

Self test:

After turning the key switch, the system performs a self test. 2 accoustic signals will confirm a positive test result. When the green LED is flashing the transmitter is ready for operation.

Button „start/horn“ – Neutral position :

After the self test, the transmitter has to be started by pushing the start/horn button. This will activate the receiver. All control functions have to be in neutral position, in order to start the system. If one of the control functions is activated, the system cannot be started. This protective measurement ensures that machine motions cannot be activated accidentally. You cannot skip the start button by destructing it or shutting it down. If the start button is pushed during the self test, the system will not start.

Stop button:

The transmitters are equipped with a tamper-proof stop button. The stop signal is transmitted as a normally open contact and a normally closed contact at the same time. Furthermore the stop button status is monitored during the self test when the system is started. If the stop button is activated during the startup procedure, the system will not operate. The stop button is the most important protection device of the radio remote control. It ensures that the operator can immediately stop the machine during operation.

Battery monitoring:

The transmitter's electronics permanently monitors the battery state. If the battery voltage is low, an optical or accoustical signal will alert the operator for about 30 seconds. Afterwards the transmitter automatically sends out a stop signal and brings the machine into a safe state. Please note that an advanced low voltage recognition (approx. 10 minutes) is also available.

Mechanical construction:

A mechanical guard on the transmitter protects the buttons and joysticks from shocks and dropping. The lightweight, fiber-reinforced PC transmitter housing meets the requirements of daily operation.

3.2 Receiver

Self test:

The software runs a self test after the receiver is energized. If the self test is negative, the receiver will not start and remain in a safe state.

Emergency stop circuit:

The receiver includes a specific emergency stop circuit. Due to the redundant design it functions self-monitoring.

STOP:

When the receiver receives the emergency stop signal from the transmitter:

- the internal power supply to the output modules will shut down.
- a fail-safe, self-monitoring emergency stop output relay will be activated.
- the response time is 450 ms.

Power supply:

The receiver has its own electronic power supply, which energizes all receiver modules.

3.3 System

System number:

Each radio remote control has its own address. It ensures that only the designated transmitter can activate the corresponding receiver.

Radio interference:

In case of radio interference, the system will switch into a safe mode.

Software:

After the turn-on procedure, the software of the system performs a system test, where all safety devices are checked.

4.1 Positioning of the receiver unit

When mounting the receiver, ensure that the antenna has maximum radio reception, in order to have a radio remote control that functions properly. Metal parts of the machine to be controlled in the immediate vicinity of the receiver unit avoid a proper radio reception. If the receiver is to be installed inside a metal housing or in a shielded area, an appropriate extension and an adequate antenna have to be used in order to achieve a suitable operating range. Contact HETRONIC to get more detailed information.

Furthermore the receiver has to be mounted in a safe and easily accessible place, in order to facilitate future installation and maintenance work. Install the receiver unit with the cable connections downwards.

If the receiver is to be installed on a vehicle or on a mobile machine, you should equip the receiver with rubber buffers, which prevent the transmission of heavy vibrations from the machine to the receiver. If these rubber buffers are not standard part of your radio remote control system, you may obtain them from your HETRONIC dealer directly.

ATTENTION!

- The installation of the receiver unit on the electric system of the machine may only be performed by a qualified person, familiar with the electrical circuitry of the machine and the technical features of the radio remote control.
- Both, the transmitter and the receiver have to be powered down during installation work.
- All instructions, concerning the health of persons within the immediate vicinity of installation, all valid local regulations and fire regulations have to be observed strictly.
- HETRONIC will not accept liability or provide a guarantee in the event of personal injury or damage to property, resulting from improper or negligent use of the radio remote control or non-compliance with the regulations or instructions.

4.2 Installation of the output wiring

Switch the power supply of the machine off before attaching the voltage supply of the receiver.

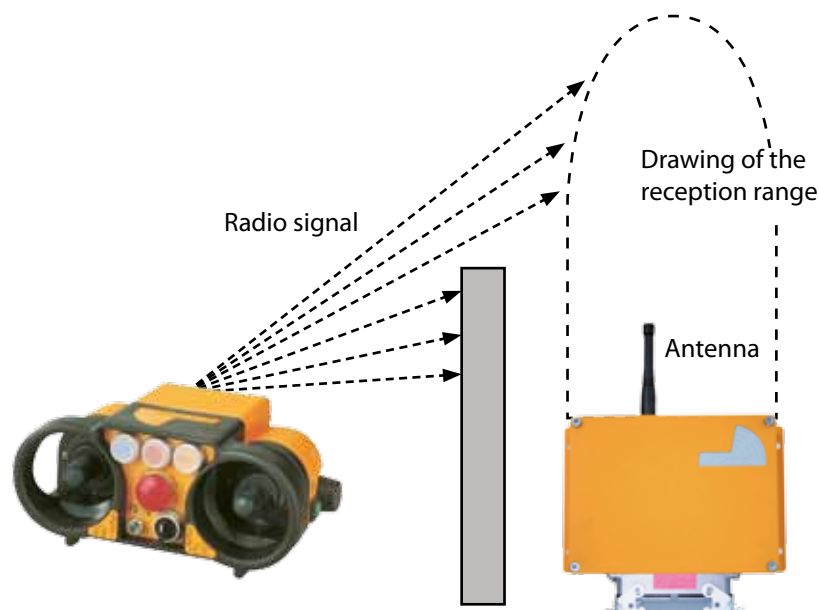
Charge a qualified technician with the wiring. Improper wiring may cause serious system damage and may void your guarantee. The output wiring has to be installed according to the connection diagram of the machine and the radio remote control. Only use contacts of good quality, to ensure a proper electric contact. You will find detailed information about the receiver wiring inside the front covering of the receiver.

The power supply and the ground wire are extremely important. They have to be connected to fail-safe electrical connections.

4.3 Correct installation of the receiver unit

(See drawings below)

When mounting the receiver unit ensure that no big metal surfaces shield the external antenna.



5.1 Notice for operation

Have you read and understood the operating manual, in particular section 2 „Safety precautions“ and section 3 „Protection device“? Please do not use the device until you have done so!

5.2 Visual checkup

ATTENTION!

Always check the transmitter for damages each time before use!

- Are all protection devices present and fully functional?
- Are there any broken parts?
- Are the rubber sleeves and the pushbutton caps in good order? **(transmitter)**
- Are all connectors and cables in good order? **(receiver)**

ATTENTION!

Never operate a radio remote control, that shows any kind of defects! All defects have to be repaired by a qualified technician before operation is started!

5.3 Before operation

- Make sure, the system has been installed completely.
- Make yourself familiar with all safety precautions of the operating manual.
- Notice all safety precautions of the operating manual and check the control functions and the operation of machine and radio remote control.
- If the transmitter is not operated, turn it off and store it in a safe place, inaccessible for unauthorized persons.
- Always check that the stop function of the machine and the radio remote control work perfectly.
- If the machine does not respond correctly, immediately stop operation. Turn off the transmitter and remove the batteries. Immediately contact a qualified person.
- Remove the batteries of the transmitter and disconnect the power supply of the receiver before any maintenance work is done.
- For transistor receivers you have to install suppressor elements.
- If you are using rechargeable batteries, make sure that there is always one battery in the charger, and that the charger is always connected to a permanent power supply.
- Installation, adjustment and maintenance may only be performed by authorized technicians.
- Only use genuine Hetronic spare parts.

ATTENTION!

In case of problems, turn off the machine immediately. Never operate a machine if the emergency stop does not operate properly. In case of disregarding this rule there is risk of personal injury or collateral damage. Performing work steps not complying with this operating manual may lead to the loss of your operating license and result in the expiration of your guarantee!

5.4 Functional test of the stop button for transmitters with key switch

ATTENTION!

Check the emergency stop button each time before operating the radio remote control system!

- Make sure, that the transmitter is either operated with completely charged Hetronic batteries or alkaline batteries.
- Put the key into the key switch on the transmitter.
- Turn the key from position „0“ to „1“. Wait until the green LED starts flashing continuously.
- Now check if the stop button is working properly. Proceed as follows:
 - (1) Push the stop button on the transmitter.
 - (2) Watch the flashing of the green LED.
 - (3) If stop button is activated = fast flashing
 - (4) If stop button is released = standard flashing
- If the stop button works properly – you may start the system.
- If the stop button does not work properly, the system has to be checked by a qualified person.
- Now your radio remote control is ready for operation. Activate any of the functions using the transmitter and check if the machine operation immediately stops if the function is released.

6. Startup procedure

6.1 Startup procedure for transmitters without key switch

1. Insert a battery or rechargeable battery
2. The transmitter will be started by activating one of the function buttons
3. The green LED has to flash
4. If the function button is released, the motion will be stopped
5. If the red LED is flashing, the battery or the rechargeable battery has to be changed (Low voltage test optionally).



Pocket



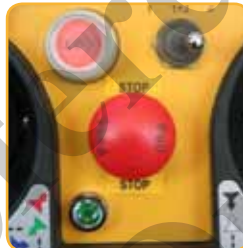
Hand Held

6.2 Startup procedure for transmitters with key switch

1. The key switch is used to start the transmitter
2. After the startup procedure, you should hear 2 short acoustic signals (exception ERGO)
3. After this self test, the green LED on the transmitter starts flashing
4. The stop button has to be checked every day (see section 5.4.)
5. Press the green start button in order to start the system. The layout of your transmitter may differ from the pictures below. Please refer to your drawings for information about the function of the buttons.
6. Attention: Control functions which are not in neutral position prevent the startup!



Green start button
and key switch



Red stop button

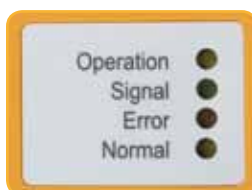
6.3 Receiver status display

1. Compact version with vision panel
The LED Display is on the right side of the housing.
2. Compact version without vision panel
The LEDs are only visible when receiver lid opened.
3. Modular Version
There are 3 LEDs on both the decoder and the emergency stop decoder

LED explanation

Yellow	=	Operation
Green	=	Radio link
Red	=	Failure
Yellow	=	Normal (stop condition)

1



2



3



7. Operation of MFS and HL systems

7.1 MFS transmission technology (Multi Frequency Sharing)

Pocket, Hand Held and Ergo are also available as MFSHL versions. MFS technology allows the operation of several systems with the same frequency in the immediate vicinity.

Transmitter: ERGO-MFS-HL

Pocket-MFS-HL

HandHeld-MFS-HL



Receiver: RX/AC 8 und 16 MFS-HL

RX/DC 8 und 16 MFS-HL



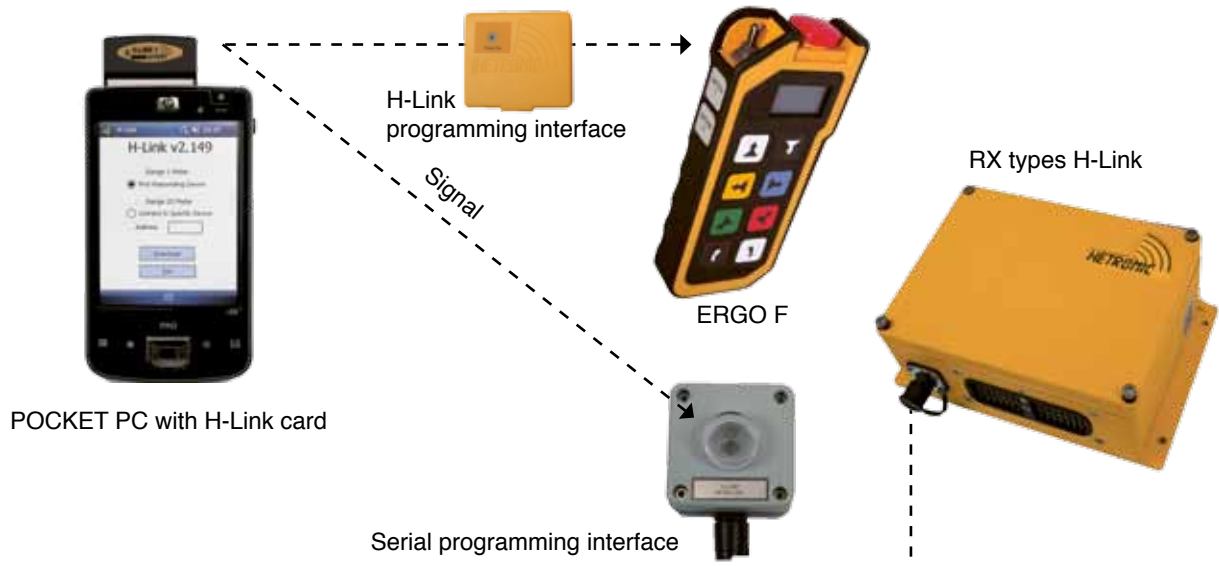
Transmitter	Red LED	Green LED
Low voltage	On	flashing
Transmitter failure	On	On
Transmitter normal	On	flashing
Emergency stop transmitter	flashing	On

Receiver	Red LED	Green LED	Buzzer
Failure main contact	On	Off	Off
Receiver activated	Off	Off	Sounding
Receiving	Off	flashing	Off

7.2 H-Link

H-Link is a technology, which enables the operator to access the configuration of a HETRONIC radio remote control system, without opening it! The wiring and assignment is replaced by a wireless data exchange between HETRONIC systems and an H-Link configurator.

Via H-Link you may set functions as system address, transmitter frequency channel, automatic shutdown, interlocking, output adjustment and many more. Refer to the Ergo F operating manual to get more information. After the initial programming by HETRONIC, you can set the frequency channel for transmitter type ERGO F without using H-Link.



8.1 Replacing and charging rechargeable batteries

The batteries have to be fully charged before startup!

Place the charger in a clean and dry location. Connect the charger, depending on the type, to a permanent power supply. Insert the empty battery into the charger and the charging process will start automatically.

The display of the charger is described in section 8.2!

The charging time is approx. 2 – 4 hours (depending on battery type). Ready: (green) LED has to flash.

Battery chargers of HETRONIC are equipped with a charging state recognition. When the batteries are completely charged, the battery charger automatically switches over to conservation charging.

TIP!

In order to avoid down times, we recommend to always have a fully charged battery pack ready.

With **Hand Held systems**, using a charger of the type **VersaPak** (fig 1), the battery may not be charged longer than 24 hours, in order to avoid damages to the VersaPak batteries and the charger. This applies only for VersaPak batteries. Assign a specialist disposal company with the recycling and disposal!

8.2 Display and error messages of the battery charger (Picture 2 and Picture 3)

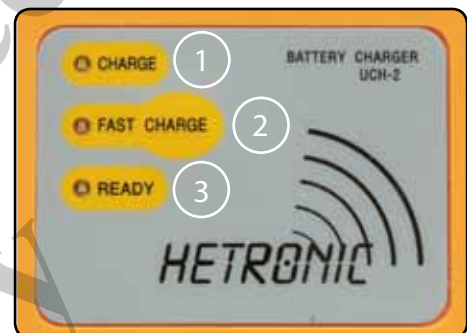
LED-Display of the battery charger

- Charging process is running: yellow LED[1] flashing
- Fast charging: yellow [1] and red [2] LED flashing, after activation of the fast charge button [2]
- Charging process completed: green LED flashing [3], conservation charging is running

Error messages of the battery charger

- No LED is flashing: rechargeable battery is damaged
- Yellow LED [1] is blinking: short circuit in the battery block

In both cases the battery may no longer be used!



ATTENTION!

Only use **genuine HETRONIC batteries!** Not doing so introduces the risk of explosion. Emitted chemicals and flying parts may cause irreparable damages.

HINT!

Rechargeable battery packs are to be treated as hazardous waste and have to be disposed of properly.

Defective rechargeable battery packs can also be disposed of directly through HETRONIC.

Battery charger types:



Picture 1
Versa Pak
Charger



Picture 2
HETRONIC
charger
with battery 3,6V



Picture 3
HETRONIC
charger
with battery 9,6V

9.1 Replacing alkaline batteries (Size AA – round cell)

- The battery voltage is constantly monitored by the transmitter. If the voltage is low, the red LED on the transmitter starts flashing and according to the type you will also hear an acoustic signal. Replace the batteries immediately. Proceed as follows:
- Bring the crane or the machine to a safe state as quickly as possible.
- Push the stop button on the transmitter.
- Remove the empty batteries as shown on the following pictures.
- Follow the instructions in section 6 „Startup procedure“ to restart the system.

9.2 Battery replacement for type Pocket (Pict. 1 and 2)

- Open the battery compartment on the lower side of the transmitter by pulling the cover off (see picture 1).
- Remove the 3 empty batteries.
- Insert 3 new 1,5V round cells into the marked compartment. (see picture 2)
- Close the battery compartment with the cover.



Pict. 1



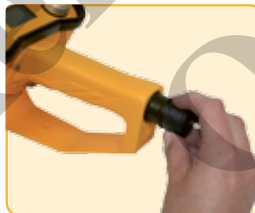
Pict. 2

9.3 Battery replacement for type Hand Held (Pict. 3 – 6)

- Push the lever at the end of the battery compartment, until the battery tube or the rechargeable battery releases (pict. 3 – 5).
- Remove the 2 empty batteries (pict. 6).
- Insert 2 new 1,5V round cells into the battery tube. (pict. 6).
- Insert the battery tube with the open side forwards into the battery compartment of the transmitter.
- Press the battery tube into the compartment until it fully locks into place.



Pict. 3



Pict. 4



Pict. 5



Pict. 6

9.4 HETRONIC battery compartment (Pict. 7)

- Proceed as described in section 8 „Battery charger and rechargeable batteries“, to remove the battery compartment.
- Please note the polarity of the batteries +/-.



Pict. 7

ATTENTION!

Only use alkaline batteries!

Alkaline batteries may not be charged in the battery charger!

Problem	Possible Cause	Solution
The transmitter does not respond when it is switched on.	The battery is empty.	Charge the batteries or replace the alkaline batteries.
	The fuse is blown.	The fuse has to be replaced by an authorized expert.
	The key switch is broken.	The key switch has to be replaced by an authorized expert.
The batteries are fully charged but the transmitter does not respond.	The battery contacts are soiled.	Please clean the battery contacts using a cloth.
	The spring contacts of the battery compartment are broken.	The spring contacts have to be replaced by an authorized expert.
Communication failure between transmitter and receiver.	The range has been exceeded.	Move towards the receiver.
	A radio remote control with the same frequency is operated in close proximity.	The RF settings have to be adjusted by an authorized expert.
	There is an object between transmitter and receiver.	Please change the position of the transmitter or modify the antenna position by using an antenna extension.
The operation time is short.	The battery is empty.	Charge the battery and insert a fully charged battery into the transmitter.

Do you have any questions?

Please contact your dealer or our HETRONIC service team. We are pleased to help you.
Tel. 09452/189-0

Problem	Possible cause	Solution
The radio signal is good, but some of the activated functions do not work.	The connection between the machine and the receiver is broken.	Perhaps there are some cables loose. Check the receiver wiring on the respective function for loose wires.
	The output module of the receiver defective.	Check if there is a LED flashing on the receiver output module when the respective function is activated.
The system does not start after standard startup.	The stop button is engaged or broken.	Release the stop button. Activate the start/horn switch.
	A joystick is not in neutral position.	Ensure that all joysticks are in neutral position.
	The battery of the transmitter is empty.	Check the batteries and replace if necessary.
	The receiver is currentless.	The yellow LED (diagnostic display) has to flash. Check the fuses.
	The start button is broken.	Replace the start switch.

Do you have any questions?

Please contact your dealer or our HETRONIC service team. We are pleased to help you.
Tel. 09452/189-0

11.1 System

Frequency range:	400 – 470 MHz, Europe 433/434 MHz and 869 MHz
RF synthesizer:	Microprocessor-controlled PLL synthesizer with 32 selectable frequencies
RF-output:	<10mW standard, increased transmitting power available on demand, certified for frequency ranges subject to approval and freely assignable frequency ranges in over 40 states.
Modulation:	FM – narrow bandwidth
Bandwidth:	12,5kHz / 25kHz, according to the system
Range:	approx. 100 meters with standard antenna, approx. 200 meters with special antenna
Addressing:	20-bit (more than 1 million different possibilities)
Temperature range:	-25°C up to +70°C (-18°F up to 160°F)
Resistance to moisture:	0-97% max. (non-condensing)
Response time:	approx. 450 ms
Baud rate:	2400/4800/9600 bps
Diagnosis:	Status displays for RF communication, operating voltage displays for transmitter and receiver, low battery indication
Certificates:	CE, TÜV, ISO 9001 and many more
Control function:	Performance Level »c« according to EN ISO 13849-1:2006 (depending on the technical version)
Stop function:	Performance Level »d« according to EN ISO 13849-1:2006 (depending on the technical version)

11.2 Transmitter

Type:	Ergonomically designed housing
Housing material:	Fiberglass reinforced polyamid with glass fibre rate, according to the transmitter type, other materials available on demand
Protection type:	IP65
Antenna:	Internal
Battery housing:	Electrically separated, with gold-plated, self-cleaning contacts
Operating time:	14 – 20 hours standard, depending on the system
Pushbuttons:	single or double stage
Joysticks:	All joysticks with automatic reset function, multiple-steps and proportional, deadman button optional, moisture repellent and ergonomically designed

11.3 Receiver

Housing material:	Fiberglass reinforced polyamid with 30 % glass fibre rate, according to receiver type, other materials available on demand
Connection:	Via moisture repellent connecting plug
Protection type:	IP65
Operating voltage:	12/24 VDC, 48/115/230 VAC
Current consumption:	<0,8 A, type dependant
Antenna:	external antenna, with moisture repellent connection, partly internal
Digital outputs:	Fail-safe and self-monitoring emergency stop circuit, all relay outputs 275VAC/8A
Prop. resolution:	8 Bit (256 steps per function), built-in ramp function selectable
Prop. outputs:	PWM signal with selectable dither frequency and current range, linear output voltage, setting of proportional functions via the transmitter (Quick set) or via potentiometer, multiple speed ranges selectable, all proportional functions may be set with initial and final speeds
Serial interfaces:	RS232/485, CAN-Open, Profi-Bus-DP
Protection against energy recovery:	The protection of the proportional outputs is included in the cable by default. If the cable is made by the customer himself, he has to assure that this protection is available.

11.4 Rechargeable batteries and battery charger

Operating voltage:	10 - 30 VDC or 90-270 VAC
Charging time:	approx. <4 hours
Service life:	approx. 900 charges
Type:	NiMH
Capacity:	1200mAh
Contacts:	Gold-plated, self-cleaning contacts

11.5 Technical data sheets

Technical data sheets with further information are available on the HETRONIC web site.

11.6 General

Radio remote controls, labeled with the CE sign are approved and notified in the following countries: Germany, Austria, Switzerland, Luxembourg, Belgium, Norway, Netherlands, Denmark, Finland, France, Greece, Ireland, Italy, Portugal, Spain, Sweden, Great Britain, Iceland, Estonia.



ATTENTION!

The use of the CS434 RF module is not subject to registration or payment of a fee. Never operate the transmitter without an antenna, as this may destroy the RF module. The frequency is preset by Hetronic in the factory. In case of radio link problems with your system, please contact your dealer or the HETRONIC after sales service. You will find the telephone number on the cover page of this operating manual.

12.1 Maintenance

In order to always have a safe radio remote control please note the following information:

Each radio remote control has to be inspected on a regular basis, at least once a year. The maintenance staff has to ensure that power to the transmitter and the receiver is shut off during maintenance and inspection work. A preventive maintenance by the operator on a regular basis will make for an extended service life.

Installation, adjustment and service work may only be performed by qualified personnel.

Possible repairs may only be performed in service stations that are authorized or recommended by HETRONIC or directly in HETRONIC's service and spare parts department.

The use of non original spare parts or the assignment of unauthorized personnel will immediately void your guarantee.

ATTENTION!

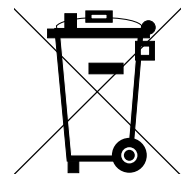
In case of oxidized electric contacts, do not use antioxidant or similar! Please contact your HETRONIC dealer for the immediate replacement of the affected parts. The use of chemical agents will cause damage on the internal components of the radio remote control.

12.2 Guarantee and warranty

You will find the terms of guarantee in our general terms and conditions.

12.3 Disposal

Avoid the pollution of the environment! Electronic devices and their components are hazardous waste! This applies particularly to rechargeable battery packs! Charge a specialist disposal company with the recycling and disposal! Defective rechargeable battery packs may also be disposed of directly through HETRONIC!



12.4 Information about complaints report (page 35)

ATTENTION!

In order to handle your complaint correctly, the fields, marked with "Kunde/ customer", have to be filled in completely. Please specify the invoice or the delivery note number, so that your complaint can be handled as quickly as possible.

12.5 Qualified Persons according to the Ordinance on Industrial Safety and Health

Please note that operation, maintenance and repair work may only be performed by qualified persons according to the ordinance on industrial safety and health, with an adequate professional education, work experience and contemporary occupational activity.

13. Complaint form

Reklamationsbericht/ Complaints report									
Kunde/ Customer									
Kunde/ Customer		Bearb.-Nr./LS-Nr./Re-Nr. Hetronic/ Treatment No./Delivery No./ Invoice No. Hetr.		Datum/ Date		Sachbearbeiter/ Contact			
HETRONIC Germany									
Eingangsnummer/ In		Kn.-Nr./ Cu-No		Datum/ Date		Sachbearbeiter/ Contact			
Legende/ Legend									
Grund der Rücklieferung/ reason of delivery				Kundenwunsch/ Customer request					
A	Falschlieferung/ wrong delivery	1		Reparatur/ repair		blau/ blue		Kunde/ Customer	
B	Falsche Bestellung/ order mistake	2		Ersatz/ Replacement		weiß/ white		HETRONIC Germany	
C	Teil defekt/ Part defective	3		Gutschrift/ Credite Note					
D	Leihanlage/ Rented equipment	4		Funktionskontrolle/ function control					
				(nur gegen BEARBEITUNGSGEBÜHR von 59,50€) (only against HANDLING CHARGE of 59.50 €)					
Kunde/ Customer									
System-Nr./ System No.	Artikel-Nr./ Item No.	SAP-Nr./ SAP No.	Anzahl/ Quantity	Bauteilbezeichnung/ Fehlerbeschreibung Component/ Description of failure	Grund der Rücklieferung / reason of return delivery		Kundenwunsch/ Customer request		
1									
2									
3									
4									
HETRONIC Germany									
Befund/ report	Datum / Date		Entscheid 1/ result 1		Entscheid 2/ result 2				
1					☐ Garantief. Kulanz Warranty				
2					☐ keine Garantie möglich no warranty				
3					☐ Reparatur ohne Berechnung repair free of charge				
4					☐ Funktionsfähig, kostenlos zurück functional, return free of charge				
Sachbearbeiter/ Contact	Datum/ Date		Unterschrift/ Signature		Datum/ Date				
H-D-QS-04-08-Reklamationsbericht-06									



HETRONIC Germany GmbH

Adalbert-Stifter-Str. 2
D-84085 Langquaid

www.hetronic.de

Tel.: +49(0)9452/189-701, 711 or 531

Fax.: +49(0)9452/189-281

Hinweis! Laut den Lieferungs- und Zahlungsbedingungen vom Mai 2010 werden keine Garantieabwicklungen ohne System-Nr., Lieferschein-Nr. und Rechnungs-Nr. bearbeitet.
Versandkosten werden erhoben!

According to our terms and conditions dated May 2010, warranty cases cannot be handled unless the system No., delivery No. and invoice No. is stated. Shipping costs will be charged!

14.1 Abbreviations

AK	Analog channel
DK	Digital channel
EPROM	Electrical programmable read-only memory
FM	Frequency modulation
GND	Ground
HF	High frequency
KHz	Kilohertz
LED	Light emitting diode
mAh	Milliampere hours
mA	Milliampere
msec	Millisecond
MHz	Megahertz
mW	Milliwatt
NiMH	Nickel Metal Hydride
PWM	Pulse width modulation
RF	Radio frequency
Rx	Receiver
SMD	Surface mounted device
TTL	Transistor logic
Tx	Transmitter
Ub	Operating power
VAC	Volts alternating current
VDC	Volts direct current

14.2 Definitions

Acoustic signal	Buzzer or other sound, warning signal
Analog signal	Proportional stepless control
Coder	Converts input signals into serial data.
Decoder	Converts serial data into output signals.
Digital signal	On/off function
Maintained control	The function is activated, if the control is in position „on“. If the control is released, it goes back to position „off“ and the function stops.
Momentary control	The function is activated as long as the button is pushed.
Proportional control	A functional control with multiple speed, stepless activation.

15. Installation and safety test declaration

This form must be completed and signed by the person responsible for the installation of the system.

HETRONIC will not accept liability for the correctness of the installation of the radio remote control system. The operator has to assure, that the radio remote control and the machine have been adapted and tested, and that all relevant safety precautions are maintained. The operator has to follow all safety precautions of this manual and other relevant instructions.

Machine data

Data of the radio remote control

Manufacturer

Manufacturer

Type number

Model

Serial number

Type

HETRONIC Germany GmbH

Production year

System number

I/We have carried out the installation, startup and safety checks for the radio remote control system on the above mentioned machine. In doing so, the latest standards and regulations, applicable to this type of machine, have been maintained.

Location, date

Company (address)/ stamp

Name of responsible person

Signature

Hiermit bestätigen wir, dass die nachfolgend aufgeführten Maschinenbauteile für den Einbau in Maschinen oder andere Geräte, die für Maschinen bestimmt sind oder nicht, gemäß folgender EU-Richtlinien mit Änderungen und Fortschreibungen geeignet sind:

Maschinenrichtlinie	2006/42/EG
Niederspannungsrichtlinie	2006/95/EG
EMV-Richtlinie	2004/108/EG
R&TTE Richtlinie	1999/5/EG

Der Unterzeichner: HETRONIC Germany GmbH
Adalbert-Stifter-Str. 2
84085 Langquaid

Gegenstand der Erklärung: **Funkfernsteuerung**

Sender Typ: **EURO..., GL..., GR..., NOVA..., ERGO...,
ERGO-F..., HH..., MINI..., POCKET..., FE...**

Empfänger Typ: **RX..., RX BMS..., RX MFS..., RX 14b...**

Der Gegenstand der oben beschriebenen Erklärung entspricht den Anforderungen der folgenden Dokumente:

EN ISO 13849-1*	2008	EN 60950-1	2006
EN 62061*	2005	EN 61000-6-2	2005
EN 13557	2008	EN 61000-6-4	2007
EN 14492	2009	EN 300 220	2007
EN 60204-32	2008	EN 301 489	2002
EN 60529	1991		

* Sicherheitskategorie, Performance Level und SIL Level siehe Deckblatt



Langquaid, 01.08.2010

We hereby declare that the components of the equipment, specified below, are suitable for the installation on machinery or other devices, designed for machinery or not, according to the following EU Directives with revisions and subsequent amendments:

Machinery Directive	2006/42/EC
Low Voltage Directive	2006/95/EC
EMC-Directive	2004/108/EC
R&TTE Directive	1999/5/EC

Signed by: HETRONIC Germany GmbH
Adalbert-Stifter-Str. 2
84085 Langquaid

Object of declaration: **Radio Remote Control**

Transmitter Type: **EURO..., GL..., GR..., NOVA..., ERGO...,
ERGO-F..., HH..., MINI..., POCKET..., FE...**

Receiver Type: **RX..., RX BMS..., RX MFS..., RX 14b...**

The object declaration described above is in conformity with the requirements of the following documents:

EN ISO 13849-1	2008	EN 60950-1	2006
EN 62061	2005	EN 61000-6-2	2005
EN 13557	2008	EN 61000-6-4	2007
EN 14492	2009	EN 300 220	2007
EN 60204-32	2008	EN 301 489	2002
EN 60529	1991		

* Safety Category, Performance Level and SIL Level see Cover Sheet



Langquaid, 01.08.2010

HF-Teil Konformität Europa

HF-Part Conformity Europe



Konformitätserklärung gemäß dem Gesetz über Funkanlagen und Telekommunikationsendeinrichtungen (FTEG) und der Richtlinie 1999/5/EG (R&TTE)
Declaration of Conformity in accordance with the Radio and Telecommunications Terminal Equipment Act (FTEG) and Directive 1999/5/EC (R&TTE Directive)

Hersteller / Verantwortliche Person Manufacturer / responsible person	HETRONIC-Germany GmbH Adalbert-Stifter-Str. 2 84085 Langquaid Deutschland
erklärt, dass das Produkt <i>declares that the product</i>	RF-Modul
Type (ggf. Anlagenkonfiguration mit Angabe der Module): <i>Type (if applicable, configuration including the modules)</i>	CS 434 TXN/RXN
☐ Telekommunikations(Tk-)endeinrichtung <i>Telecommunications terminal equipment</i>	☒ Funkanlage <i>Radio equipment</i>
Verwendungszweck / <i>Intended purpose</i>	Transmitter/Receiver
Gerätekategorie / <i>Equipment class</i>	2
bei bestimmungsgemäßer Verwendung den grundlegenden Anforderungen des § 3 und den übrigen einschlägigen Bestimmungen des FTEG (Artikel 3 der R&TTE) entspricht. <i>complies with the essential requirements of §3 and the other relevant provisions of the FTEG (Article 3 of the R&TTE Directive), when used for its intended purpose.</i>	
Gesundheit und Sicherheit gemäß § 3 (1) 1. (Artikel 3 (1) a)) <i>Health and safety requirements pursuant to § 3 (1) 1. (Article 3(1) a))</i>	
angewendete harmonisierte Normen <i>Harmonised Standards applied</i>	EN 60950:2000
Einhaltung der grundlegenden Anforderungen auf andere Art und Weise(hierzu verwendete Standards/ Spezifikationen) <i>Other means of proving conformity with the essential requirements (standards/specifications used)</i>	BMPT Decree No. 306/97
Schutzanforderungen in Bezug auf die elektromagnetische Verträglichkeit (§ 3 (1) 2, Artikel 3 (1) b) <i>Protection requirements concerning electromagnetic compatibility § 3(1)(2), (Article 3(1)(b))</i>	
angewendete harmonisierte Normen <i>Harmonised Standards applied</i>	EN 301 489-1 V1.8.1 (2008-04) EN 301 489-3 V1.4.1 (2002-08)
Einhaltung der grundlegenden Anforderungen auf andere Art und Weise(hierzu verwendete Standards / Spezifikationen) <i>Other means of proving conformity with the essential requirements (standards/specifications used)</i>	

HF-Teil Konformität Europa

HF-Part Conformity Europe



Maßnahmen zur effizienten Nutzung des Funkfrequenzspektrums <i>Measures for the efficient use of the radio frequency spectrum</i>	
☒ Luftschnittstelle bei Funkanlagen gemäß § 3(2) (Artikel 3(2)) <i>Air interface of the radio systems pursuant to § 3(2) (Article 3(2))</i>	
Angewendete harmonisierte Normen <i>Harmonised standards applied</i>	EN 300 220-1 V2.1.1 (2006-04) EN 300 220-2 V2.1.2 (2007-06)
Einhaltung der grundlegenden Anforderungen auf andere Art und Weise (hierzu verwendete Standards/Schnittstellenbeschreibungen) <i>Other means of proving conformity with the essential requirements (standards/interface specifications used)</i>	

Anschrift / Address	HETRONIC-Germany GmbH Adalbert-Stifter-Str. 2 84085 Langquaid Deutschland
Telefon, Fax, Email/ Phone, fax, email:	Tel.: +49 (0) 9452 189 610 Fax: +49 (0) 9452 189 201

Langquaid, 01.08.10

Ort, Datum
Place, date of issue

Name und Unterschrift
Signature

HF-Teil Konformität Europa

HF-Part Conformity Europe



Konformitätserklärung gemäß dem Gesetz über Funkanlagen und Telekommunikationsendeinrichtungen (FTEG) und der Richtlinie 1999/5/EG (R&TTE)
Declaration of Conformity in accordance with the Radio and Telecommunications Terminal Equipment Act (FTEG) and Directive 1999/5/FC (R&TTE Directive)

Hersteller / Verantwortliche Person Manufacturer / responsible person	HETRONIC-Germany GmbH Adalbert-Stifter-Str. 2 84085 Langquaid Deutschland
erklärt, dass das Produkt <i>declares that the product</i>	RF-Modul
Type (ggf. Anlagenkonfiguration mit Angabe der Module): <i>Type (if applicable, configuration including the modules)</i>	CS 434 TRT/TRR
☐ Telekommunikations(Tk-)endeinrichtung <i>Telecommunications terminal equipment</i>	☒ Funkanlage <i>Radio equipment</i>
Verwendungszweck / <i>Intended purpose</i>	Transceiver
Geräteklasse / <i>Equipment class</i>	2
bei bestimmungsgemäßer Verwendung den grundlegenden Anforderungen des § 3 und den übrigen einschlägigen Bestimmungen des FTEG (Artikel 3 der R&TTE) entspricht. <i>complies with the essential requirements of §3 and the other relevant provisions of the FTEG (Article 3 of the R&TTE Directive), when used for its intended purpose.</i>	
Gesundheit und Sicherheit gemäß § 3 (1) 1. (Artikel 3 (1) a)) <i>Health and safety requirements pursuant to § 3 (1) 1. (Article 3(1) a))</i>	
angewendete harmonisierte Normen <i>Harmonised Standards applied</i>	EN 60950:2000
Einhaltung der grundlegenden Anforderungen auf andere Art und Weise(hierzu verwendete Standards/ Spezifikationen) <i>Other means of proving conformity with the essential requirements (standards/specifications used)</i>	BMPT Decree No. 306/97
Schutzanforderungen in Bezug auf die elektromagnetische Verträglichkeit (§ 3 (1) 2, Artikel 3 (1) b) <i>Protection requirements concerning electromagnetic compatibility § 3(1)(2), (Article 3(1)(b))</i>	
angewendete harmonisierte Normen <i>Harmonised Standards applied</i>	EN 301 489-1 V1.8.1 (2008-04) EN 301 489-3 V1.4.1 (2002-08)
Einhaltung der grundlegenden Anforderungen auf andere Art und Weise(hierzu verwendete Standards / Spezifikationen) <i>Other means of proving conformity with the essential requirements (standards/specifications used)</i>	

HF-Teil Konformität Europa

HF-Part Conformity Europe



Maßnahmen zur effizienten Nutzung des Funkfrequenzspektrums <i>Measures for the efficient use of the radio frequency spectrum</i>	
☒ Luftschnittstelle bei Funkanlagen gemäß § 3(2) (Artikel 3(2)) <i>Air interface of the radio systems pursuant to § 3(2) (Article 3(2))</i>	
Angewendete harmonisierte Normen <i>Harmonised standards applied</i>	EN 300 220-1 V2.1.1 (2006-04) EN 300 220-2 V2.1.2 (2007-06)
Einhaltung der grundlegenden Anforderungen auf andere Art und Weise (hierzu verwendete Standards/Schnittstellenbeschreibungen) <i>Other means of proving conformity with the essential requirements (standards/interface specifications used)</i>	

Anschrift / Address	HETRONIC-Germany GmbH Adalbert-Stifter-Str. 2 84085 Langquaid Deutschland
Telefon, Fax, Email/ Phone, fax, email:	Tel.: +49 (0) 9452 189 610 Fax: +49 (0) 9452 189 201

Langquaid, 01.08.10

Ort, Datum
Place, date of issue

Name und Unterschrift
Signature

HF-Teil Konformität Europa

HF-Part Conformity Europe



Konformitätserklärung gemäß dem Gesetz über Funkanlagen und Telekommunikationsendeinrichtungen (FTEG) und der Richtlinie 1999/5/EG (R&TTE)
Declaration of Conformity in accordance with the Radio and Telecommunications Terminal Equipment Act (FTEG) and Directive 1999/5/EC (R&TTE Directive)

Hersteller / Verantwortliche Person Manufacturer / responsible person	HETRONIC-Germany GmbH Adalbert-Stifter-Str. 2 84085 Langquaid Deutschland
erklärt, dass das Produkt <i>declares that the product</i>	RF-Modul
Type (ggf. Anlagenkonfiguration mit Angabe der Module): <i>Type (if applicable, configuration including the modules)</i>	CS 869 TRT/TRR
☐ Telekommunikations(Tk-)endeinrichtung <i>Telecommunications terminal equipment</i>	☒ Funkanlage <i>Radio equipment</i>
Verwendungszweck / <i>Intended purpose</i>	Transceiver
Gerätekategorie / <i>Equipment class</i>	2
bei bestimmungsgemäßer Verwendung den grundlegenden Anforderungen des § 3 und den übrigen einschlägigen Bestimmungen des FTEG (Artikel 3 der R&TTE) entspricht. <i>complies with the essential requirements of §3 and the other relevant provisions of the FTEG (Article 3 of the R&TTE Directive), when used for its intended purpose.</i>	
Gesundheit und Sicherheit gemäß § 3 (1) 1. (Artikel 3 (1) a)) <i>Health and safety requirements pursuant to § 3 (1) 1. (Article 3(1) a))</i>	
angewendete harmonisierte Normen <i>Harmonised Standards applied</i>	EN 60950:2000
Einhaltung der grundlegenden Anforderungen auf andere Art und Weise(hierzu verwendete Standards/ Spezifikationen) <i>Other means of proving conformity with the essential requirements (standards/specifications used)</i>	BMPT Decree No. 306/97
Schutzanforderungen in Bezug auf die elektromagnetische Verträglichkeit (§ 3 (1) 2, Artikel 3 (1) b) <i>Protection requirements concerning electromagnetic compatibility § 3(1)(2), (Article 3(1)(b))</i>	
angewendete harmonisierte Normen <i>Harmonised Standards applied</i>	EN 301 489-1 V1.8.1 (2008-04) EN 301 489-3 V1.4.1 (2002-08)
Einhaltung der grundlegenden Anforderungen auf andere Art und Weise(hierzu verwendete Standards / Spezifikationen) <i>Other means of proving conformity with the essential requirements (standards/specifications used)</i>	

HF-Teil Konformität Europa

HF-Part Conformity Europe



Maßnahmen zur effizienten Nutzung des Funkfrequenzspektrums <i>Measures for the efficient use of the radio frequency spectrum</i>	
☒ Luftschnittstelle bei Funkanlagen gemäß § 3(2) (Artikel 3(2)) <i>Air interface of the radio systems pursuant to § 3(2) (Article 3(2))</i>	
Angewendete harmonisierte Normen <i>Harmonised standards applied</i>	EN 300 220-1 V2.1.1 (2006-04) EN 300 220-2 V2.1.2 (2007-06)
Einhaltung der grundlegenden Anforderungen auf andere Art und Weise (hierzu verwendete Standards/Schnittstellenbeschreibungen) <i>Other means of proving conformity with the essential requirements (standards/interface specifications used)</i>	

Anschrift / Address	HETRONIC-Germany GmbH Adalbert-Stifter-Str. 2 84085 Langquaid Deutschland
Telefon, Fax, Email/ Phone, fax, email:	Tel.: +49 (0) 9452 189 610 Fax: +49 (0) 9452 189 201

Langquaid, 01.08.10

Ort, Datum
Place, date of issue

Name und Unterschrift
Signature

HF-Teil Konformität Europa

HF-Part Conformity Europe



Konformitätserklärung gemäß dem Gesetz über Funkanlagen und Telekommunikationsendeinrichtungen (FTEG) und der Richtlinie 1999/5/EG (R&TTE)
Declaration of Conformity in accordance with the Radio and Telecommunications Terminal Equipment Act (FTEG) and Directive 1999/5/EC (R&TTE Directive)

Hersteller / Verantwortliche Person Manufacturer / responsible person	HETRONIC-Germany GmbH Adalbert-Stifter-Str. 2 84085 Langquaid Deutschland
erklärt, dass das Produkt <i>declares that the product</i>	RF-Modul
Type (ggf. Anlagenkonfiguration mit Angabe der Module): <i>Type (if applicable, configuration including the modules)</i>	FBTX/FBRX
☐ Telekommunikations(Tk-)endeinrichtung <i>Telecommunications terminal equipment</i>	☒ Funkanlage <i>Radio equipment</i>
Verwendungszweck / <i>Intended purpose</i>	Transmitter/Receiver
Gerätekategorie / <i>Equipment class</i>	2
bei bestimmungsgemäßer Verwendung den grundlegenden Anforderungen des § 3 und den übrigen einschlägigen Bestimmungen des FTEG (Artikel 3 der R&TTE) entspricht. <i>complies with the essential requirements of §3 and the other relevant provisions of the FTEG (Article 3 of the R&TTE Directive), when used for its intended purpose.</i>	
Gesundheit und Sicherheit gemäß § 3 (1) 1. (Artikel 3 (1) a)) <i>Health and safety requirements pursuant to § 3 (1) 1. (Article 3(1) a))</i>	
angewendete harmonisierte Normen <i>Harmonised Standards applied</i>	EN 60950:2000
Einhaltung der grundlegenden Anforderungen auf andere Art und Weise(hierzu verwendete Standards/ Spezifikationen) <i>Other means of proving conformity with the essential requirements (standards/specifications used)</i>	BMPT Decree No. 306/97
Schutzanforderungen in Bezug auf die elektromagnetische Verträglichkeit (§ 3 (1) 2, Artikel 3 (1) b) <i>Protection requirements concerning electromagnetic compatibility § 3(1)(2), (Article 3(1)(b))</i>	
angewendete harmonisierte Normen <i>Harmonised Standards applied</i>	EN 301 489-1 V1.8.1 (2008-04) EN 301 489-3 V1.4.1 (2002-08)
Einhaltung der grundlegenden Anforderungen auf andere Art und Weise(hierzu verwendete Standards / Spezifikationen) <i>Other means of proving conformity with the essential requirements (standards/specifications used)</i>	

HF-Teil Konformität Europa

HF-Part Conformity Europe



Maßnahmen zur effizienten Nutzung des Funkfrequenzspektrums <i>Measures for the efficient use of the radio frequency spectrum</i>	
☒ Luftschnittstelle bei Funkanlagen gemäß § 3(2) (Artikel 3(2)) <i>Air interface of the radio systems pursuant to § 3(2) (Article 3(2))</i>	
Angewendete harmonisierte Normen <i>Harmonised standards applied</i>	EN 300 220-1 V2.1.1 (2006-04) EN 300 220-2 V2.1.2 (2007-06)
Einhaltung der grundlegenden Anforderungen auf andere Art und Weise (hierzu verwendete Standards/Schnittstellenbeschreibungen) <i>Other means of proving conformity with the essential requirements (standards/interface specifications used)</i>	

Anschrift / Address	HETRONIC-Germany GmbH Adalbert-Stifter-Str. 2 84085 Langquaid Deutschland
Telefon, Fax, Email/ Phone, fax, email:	Tel.: +49 (0) 9452 189 610 Fax: +49 (0) 9452 189 201

Langquaid, 01.08.10

Ort, Datum
Place, date of issue

Name und Unterschrift
Signature

Antennen-Montage für Rückmeldeanlagen Mounting Antennas for Feedback-Systems



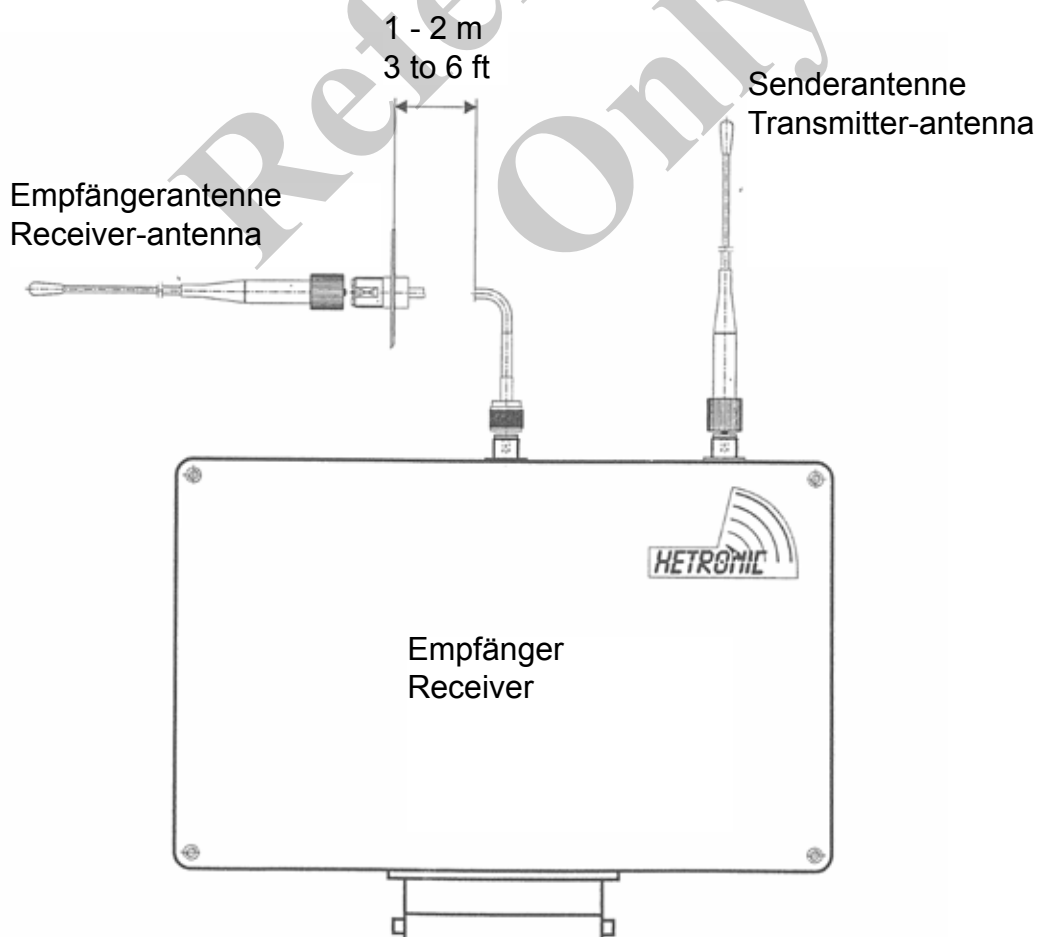
Wichtig!

Um störungsfreien Betrieb zu gewährleisten,
folgen Sie dieser Antennen-Montageanweisung!

Important!

To guarantee a troublefree operation, follow the
instructions given below to mount the antennas.

- Abstand zwischen der Sender- und der Empfängerantenne von mindestens 1 -2 m einhalten.
- Keep a minimum in distance of 3 to 6 ft. between the receiver-antenna and the transmitter-antenna.
- Empfängerantenne waagrecht montieren, Senderantenne senkrecht.
- Mount the receiver-antenna horizontal, the transmitter-antenna vertical.

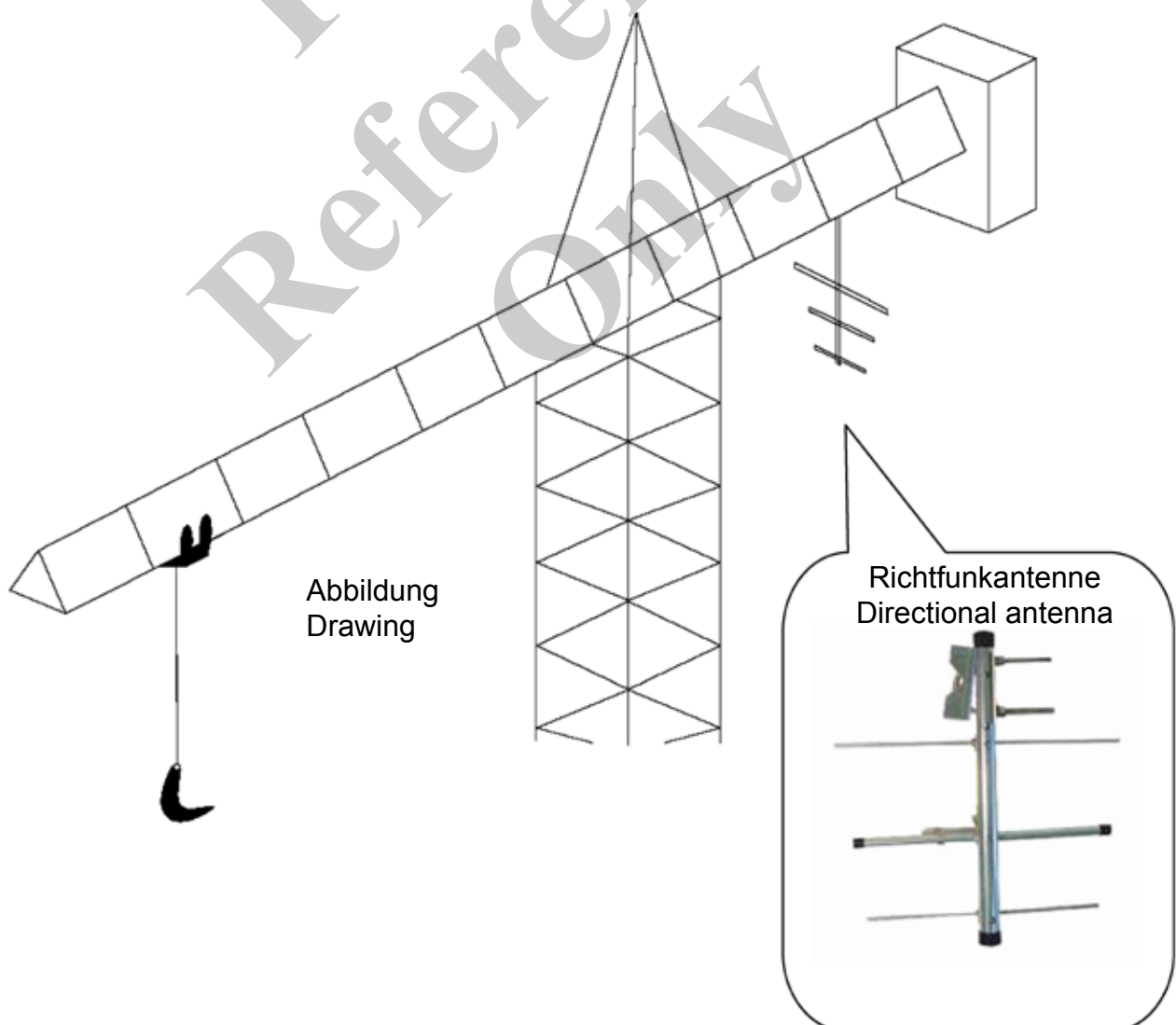


Montagehinweis für Richtfunkantennen am Obendreherkran

Mounting instruction for directional antenna on top slewing cranes

Die Befestigung der Richtfunkantenne ist am Gegenausleger des Kranes vorzunehmen. Der Einbauort sollte offen zugänglich sein und nicht durch Teile des Krans verdeckt werden. Die Antenne muss stets nach unten zeigend (Halterungsbügel oben) montiert werden und die 3 parallel angeordneten Strahlenelemente müssen einen 90° Winkel mit dem Ausleger bilden (siehe Abbildung).

The mounting of the directional antenna has to be done on the counter-boom of the crane. The mounting position should be easily accessible from all sides and not be hidden by any components. The antenna has always to be mounted pointing downwards (mounting clip on top) and the radiation elements (3 parallel pieces) have to show a 90° angle to the boom.



Adalbert-Stifter-Straße 2, D-84085 Langquaid

Stand: Mai 2010

Die Firma HETRONIC Germany GmbH (im Folgenden HETRONIC genannt) gewährt als Hersteller auf den Vertragsgegenstand eine Garantie nach Maßgabe der folgenden Bestimmungen. Die Garantie beginnt ab dem Tag der Lieferung an den Kunden. Die Garantiedauer bestimmt sich nach dem in der Auftragsbestätigung genannten Zeitraum.

Die Garantie erstreckt sich nur auf den in der Auftragsbestätigung der HETRONIC genannten Käufer. Voraussetzung für eine Inanspruchnahme aus der Garantie ist, dass auftretende Mängel HETRONIC unverzüglich, spätestens innerhalb von 14 Tagen nach Entdeckung des Mangels durch den Käufer bzw. nach dem Zeitpunkt, an dem der Mangel für den Käufer bei normaler Verwendung des Gegenstandes ohne nähere Untersuchung erkennbar war, gegenüber HETRONIC in beweisbarer Form nachgewiesen wird. Der Mängelanzeige hat der Käufer die entsprechenden Nachweise (Fotografien, Skizzen, Schadensbeschreibungen etc.) beizufügen.

HETRONIC ist im Garantiefall berechtigt, den Liefergegenstand insgesamt dreimal wegen desselben Mangels nachzubessern. Erst nach einem Fehlschlagen dieser Nachbesserung durch den Hersteller hat der Käufer Anspruch auf Ersatzlieferung eines gleichwertigen Liefergegenstandes. Im Falle einer Ersatzlieferung ist der Hersteller berechtigt, dem Käufer einen nach Art und Güte gleichwertigen Ersatzgegenstand zu liefern.

Ausgenommen von der Garantie sind Verschleißteile. Ein Anspruch auf eine Garantieleistung entfällt, wenn ohne Zustimmung des Herstellers Eingriffe oder Änderungen an den gelieferten Erzeugnissen durch den Käufer vorgenommen wurden. Werden Teile eingebaut, die keine HETRONIC Original Ersatzteile sind (Fremdbauteile), erlischt der Anspruch auf eine Garantieleistung. Dies gilt auch und insbesondere bei der Verwendung von Akkus, die keine Original HETRONIC Produkte sind.

Ebenso entfällt der Anspruch des Käufers aus der Garantie bei unsachgemäßer Behandlung, natürlichem Verschleiß, Verstoß gegen Betriebs-, Montage- und Wartungsvorschriften sowie bei Einsatz unsachgemäßer und ungeeigneter Betriebsmittel. Die Kosten und die Garantieleistung von HETRONIC erstrecken sich nur auf die Nachbesserung bzw. Ersatzlieferung im vorstehenden Sinne. Sämtliche weitere Kosten (Transportkosten, Verpackungskosten etc.) trägt ausschließlich der Käufer. HETRONIC übernimmt keinerlei weitere Folgekosten. Garantieerfüllungsort ist Langquaid.

Adalbert-Stifter-Straße 2, D-84085 Langquaid, Germany
As of May 2010

HETRONIC Germany GmbH (henceforth referred to as HETRONIC) as constructor allows a guarantee to the contractual item under the following conditions. The guarantee is valid from the day of delivery to the customer. The duration of the guarantee is determined by the amount of time stated in the confirmation of order.

The guarantee is only valid to the buyer mentioned in the confirmation of order. To make use of the guarantee, the buyer has to clearly prove to HETRONIC any defects immediately, but latest within 14 days after discovery of the defects or after the point of time at which the defect was noticeable to the buyer without any closer inspection, considering normal usage. Along with the fault notice, the buyer has to deliver any proofs (photographs, drawings, fault descriptions etc.).

In case of a guarantee condition HETRONIC has the right to reimprove the same item three times because of the same fault. Only should the manufacturer fail to reimprove the item does the buyer have a right to demand a replacement delivery of an identical item. In case of a replacement delivery the manufacturer has the right to deliver the buyer a replacement part of equal kind and value.

Exempt from the guarantee are wear and tear parts. Should the buyer in any way alter or change a delivered item without the explicit agreement of the manufacturer, any claim to the guarantee expires. Should the buyer build any foreign parts into the delivered items that are not original HETRONIC replacement parts, any claims to the guarantee also expire. This is especially the case when accumulators are used that are also not original HETRONIC products.

The claim to the guarantee expires as well if the buyer treats the delivered items improperly, in case of natural wear and tear, in case of nonregard of usage, construction and maintenance instructions and in case of the use of improper and inappropriate equipment along with the delivered items. The costs and the guarantee are only covered by HETRONIC in case of later improvement and replacement delivery as stated above. Any further costs (transportation, packaging, etc.) are covered by the buyer. HETRONIC is not responsible for any further costs after the acquisition of the products by the buyer. Location of guarantee delivery is Langquaid.

These guarantee conditions are a mere translation of the German version. Should arise any differences between the two versions, the German version is valid.

German law is valid. Place of jurisdiction is Regensburg.



www.hetronic.de

Alle Rechte vorbehalten. Das Kopieren, Umschreiben, Einstellen in Datenabfragesysteme oder Übersetzen in andere Sprachen in jeglicher Art und Weise ist ausschließlich mit der schriftlichen Genehmigung von HETRONIC Germany zulässig.

Technische Änderungen vorbehalten.

HETRONIC behält sich das Recht vor, ihre Produkte jederzeit, ohne öffentliche Bekanntmachung oder Verpflichtung, zu ändern, zu verbessern oder aus dem Sortiment zu entfernen. HETRONIC lehnt alle Haftungsansprüche für Sachschäden, Körperverletzung oder Tod ab, die durch die Verwendung von nicht zugelassenen Ersatzteilen oder unbefugten Service entstehen.

All rights reserved. Copying, reshaping, recording on electronic media and translating into other languages is only allowed with the written permission of HETRONIC Germany GmbH.

Subject to technical change without notice.

HETRONIC Germany GmbH reserves the right to change, improve or phase out the products anytime without publication or commitment. HETRONIC Germany does not accept liability claims for material damage, personal injury or death, which result from the use of unlicensed spare parts or unauthorized service.

©2010 HETRONIC Germany GmbH

Additional documentation

Cleaning the cooling system

For
Reference
Only

Cleaning the cooling system

The cooling system of a machine comprises a coolant cooler, an oil cooler and a charge-air cooler and additional coolers, depending on the design.

The cooling system ensures that the machine runs at a constant operating temperature. The cooling system has an important impact on the function and service life of the machine.

The cooler is adapted for each respective engine. The cooler must be kept fully operational in order to prevent damage to the drive system, e.g. owing to overheating. You should therefore check the cooler regularly and clean it if necessary.

Dirt can build up on both the outside (e.g. dust) and the inside (e.g. deposits) of the cooler.

Note



This section provides you with general notes on cleaning the cooler. Please also observe the specifications found in the user guide and maintenance instructions for your machine and in the operating instructions provided by the engine manufacturer.

Safety instructions



Warning

- Before beginning cleaning:
 - Dismantle the equipment safely
 - Switch off machine
 - Ensure that the machine cannot be restarted
 - For machines with an electric motor, also switch off the battery isolator switch
 - Allow machine to cool off.
- If the cooler is damaged, contact Grove Customer Service before starting on any repair work.
- Repair work on the cooling system should only be carried out by specialists.
- Do not touch the guard grill on the fan. Rotating fan blades may cause serious injury. Objects coming into contact with the fan blades may be catapulted into the air.
- Always wear face protection or protective glasses when working on the cooling system.

Risk of burns!

- Place a cloth over the sealing cap and open the cap slowly to allow the cooling system to cool down. Always relieve the pressure in the cooling system before starting any repair work.
- Do not use cleaning agents that may damage the cooler materials or the paint on the machine.
- Please observe the manufacturer's specifications when handling coolant or cleaning agents.

**Note**

Damaged cooling fins result in reduced cooling performance. Overheating in any form damages the machine, increases wear and reduces the efficiency of the machine. This results, for example, in increased diesel consumption.

The condition of the cooling fins must therefore be checked daily as part of the visual check.

If the cooler is operated in an environment in which the air contains particles of dust or oil, Grove recommends that it is checked and cleaned several times daily.

For Reference Only

Coolant cooler

External cleaning

Dirt and cleaning procedure

Dust, insects, foliage or leaves	– Compressed air (max. 3.5 bar)
Oily and greasy deposits	– Steam jet



Caution

Ensure that the cooling fins are not damaged.

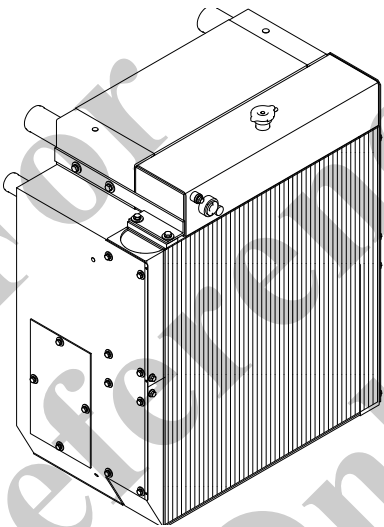


Figure 1 Combination cooler, figure similar

Procedure

- | | |
|---|---|
| 1 | Direct the cleaning jet parallel to the longitudinal direction of the cooling fins.
Make sure that the cooling fins are not damaged. |
| 2 | Allow the cooling system to dry before starting it up again. |

Internal cleaning

It is necessary to clean the interior of the cooling system if

- The engine is constantly overheating even though the V-belt, thermostat and water pump are functioning properly.
- Green sludge (chromium hydroxide) is present on the underside of the sealing cap.
- The coolant is very cloudy.
- Lubricant incursion has occurred.

Procedure

1	Please observe the safety instructions.
2	Drain the coolant into suitable containers and dispose of it in accordance with regulations.
3	Add a mixture of standard cooling system cleaner and water.



Caution

Please note the mixing ratio and ensure that the cooling system cleaner is used properly.

4	Start the engine and allow it to run for approx. 1.5 hours.
5	Drain the mixture into suitable containers and dispose of it in accordance with regulations.
6	Flush the cooling system thoroughly with clean water; repeat this process several times.



Caution

Always fill using a water-refrigerant mixture. Observe mixing ratios. Mix before filling!

7	Fill the cooling system using a water-refrigerant mixture approved by Grove.
---	--



Note

Thorough cleaning is only possible if the cooler is removed. Contact Grove Customer Service before uninstalling the cooler.

Tips for preventive maintenance

This section provides you with a few tips on how to prevent dirt from building up in the cooling system again.



Note

Please also observe the specifications found in the operating instructions of the engine manufacturer.

Water

- Use clean, neutral, filtered fresh water. Grove recommends distilled water.
- Please note that only distilled water must be used on Caterpillar engines.
- Do not use ditch water, industrial drain water, salt water, sea water or rain water.
- Use the same antifreeze. Observe mixing ratios. Mix before filling!

Ensure that the water has the following characteristics:

pH value	7 - 8
Chloride content	max. 100 ppm
Sulphate content	max. 100 ppm
Water hardness	3-12 °dGH

Coolant



Note

Only use antifreeze approved by Grove.

Adapt the mixing ratio of the antifreeze to the operating temperature of the machine.

- Grove recommends changing the coolant every 2000 operating hours or max. 24 months. Whichever occurs first.



Note

To change the coolant, follow the guidelines in the engine manufacturer's operating instructions.

Charge-air cooler

External cleaning

Dirt and cleaning procedure

Dust, insects, foliage or leaves	– Compressed air (max. 3.5 bar)
Oily and greasy deposits	– Steam jet



Caution

Ensure that the cooling fins are not damaged.

Oil cooler

External cleaning

Dirt and cleaning procedure

Dust, insects, foliage or leaves	– Compressed air (max. 3.5 bar)
Oily and greasy deposits	– Steam jet



Caution

Ensure that the cooling fins are not damaged.

Internal cleaning

If dirt is present, rinse out oil channels using a suitable cleaning material intended for this operation. Rinse for as long as required depending on the amount of dirt present. Blow out rinse-aid residue using compressed air once rinsing is complete.

For
Reference
Only

1. Residual length of useful life of winches

1.1 Steps required to ensure safe periods of operation

1.1.1 General

Under the German accident prevention regulations covering winches, lifting and pulling equipment (VBG 8), the owner of the crane is obliged to perform a crane inspection at least once a year (see also ISO 9927-1).

Among other checks, the inspection requires the **spent share of the theoretical length of useful life of the winches** to be determined. Where necessary, the owner of the crane must commission an expert person to do this.

ATTENTION: This is a legally binding requirement within the scope of application of the accident prevention regulations of the German statutory accident insurance. Outside the scope of application, the crane manufacturer recommends to also follow the procedure specified below.

2.1 Periodic inspection of cranes

2.2 Steps required to monitor the winches

2.2.1 Theoretical length of useful life

When calculating and dimensioning the winches of your crane, the design engineers have assumed particular operating conditions and a theoretical total running time, from which results a theoretical length of useful life.

In accordance with DIN-Fachbericht 1, ISO 4301/1, or FEM 9.511, respectively, the winches of your crane have been classified as follows:

Driving gear group:	M.....
Duty cycle:	Q..... (L.....)
Factor of duty cycle:	$k_m = \dots\dots\dots$

From this results a **theoretical length of useful life D**.

Note: For the data applicable in the individual case refer to the table „Monitoring of the Winches“ in the crane inspection and test log book.

ATTENTION: The „theoretical length of useful life“ must not be treated as equivalent to the real (effective) length of useful life of a winch!
In case the crane is used in a manner which differs from that provided for, the owner has to perform the calculations himself!

The effective length of useful life of a winch is subject in addition to a great number of external influences, such as:

1. Instances of overloading due to misuse of the crane
2. Inadequate maintenance: Failure to perform oil change in due time
3. Incorrect operation: Extreme acceleration or deceleration of the load
Load is allowed to drop into the ropes
4. Improper maintenance: Use of the wrong oil
Incorrect filling level
Contamination during oil change

5. Fitting errors made during repair and maintenance
6. Failure to attend to leakages
7. Improperly adjusted safety features
8. Hidden damage ensuing from accidents
9. Extreme ambient conditions:
 - Low or high temperatures
 - Aggressive atmosphere
 - Dust and dirt

2.2.2 Spent share of the theoretical length of useful life

The owner of the crane is obliged to perform a crane inspection at least once a year (ISO 9927-1 and VBG 8).

Among other checks, the inspection requires the spent share of the theoretical length of useful life to be determined. Where necessary, the owner of the crane must commission an expert person to do this.

Determination of the spent share of the theoretical length of useful life requires the effective operating conditions (duty cycle) and the service hours of the hoist mechanisms to be established for any inspection interval. The owner is responsible for the documentation in the crane inspection and test log book.

2.2.2.1 Establishing the operating conditions (duty cycle)

The duty cycle of the crane falls into one of several categories; see also DIN-Fachbericht 1, ISO 4301/1, or FEM 9.511, respectively.

On the basis of the knowledge of the effective operating conditions, one of the duty cycles specified below must be selected and be entered in the crane inspection and test log book for the inspection interval concerned.

Note: To be normally assumed for carrier-mounted cranes in erection service is the duty cycle L1 (Q1) with the duty cycle factor of $k_m = 0.125$

Duty Cycle Class	Definition	Breakdown of Running Time	Factor of duty cycle	Graphical Representation
light Q 1 L 1	Driving gears or parts thereof which are subject to maximum stress in exceptional cases only, but which are regularly subject to very low stress only	10% of running time with maximum load (dead load+1/1 working load) 40% of running time with dead load+1/3 working load 50% of running time with dead load only	$k_m=0.125$	

Duty Cycle Class	Definition	Breakdown of Running Time	Factor of duty cycle	Graphical Representation										
medium Q 2 L 2	Driving gears or parts thereof which are subject to maximum stress rather frequently, which are regularly subject to low stress however	1/6 of running time with maximum load (dead load+1/1 working load) 1/6 of running time with dead load+2/3 working load 1/6 of running time with dead load+1/3 working load 50% of running time with dead load only	$k_m = 0.25$	The graph shows a step-like distribution of load over running time. The y-axis is 'Load %' from 0 to 100. The x-axis is 'Running time %' from 0 to 100. The load starts at 100% for the first 16.67% of running time, drops to 73% for the next 16.67%, then to 47% for the next 16.67%, and finally drops to 20% for the remaining 50% of running time. <table><thead><tr><th>Running time %</th><th>Load %</th></tr></thead><tbody><tr><td>0 - 16.67</td><td>100</td></tr><tr><td>16.67 - 33.33</td><td>73</td></tr><tr><td>33.33 - 50</td><td>47</td></tr><tr><td>50 - 100</td><td>20</td></tr></tbody></table>	Running time %	Load %	0 - 16.67	100	16.67 - 33.33	73	33.33 - 50	47	50 - 100	20
Running time %	Load %													
0 - 16.67	100													
16.67 - 33.33	73													
33.33 - 50	47													
50 - 100	20													
heavy Q 3 L 3	Driving gears or parts thereof which are frequently subject to maximum stress and regularly subject to medium stress	50% of running time with maximum load (dead load+1/1 working load) 50% of running time with dead load only	$k_m = 0.5$	The graph shows a step-like distribution of load over running time. The y-axis is 'Load %' from 0 to 100. The x-axis is 'Running time %' from 0 to 100. The load is at 100% for the first 50% of running time and drops to 40% for the remaining 50%. <table><thead><tr><th>Running time %</th><th>Load %</th></tr></thead><tbody><tr><td>0 - 50</td><td>100</td></tr><tr><td>50 - 100</td><td>40</td></tr></tbody></table>	Running time %	Load %	0 - 50	100	50 - 100	40				
Running time %	Load %													
0 - 50	100													
50 - 100	40													
very heavy Q 4 L 4	Driving gears or parts thereof which are regularly subject to stress adjacent to the maximum stress	90% of running time with maximum load (dead load+1/1 working load) 10% of running time with dead load only	$k_m = 1$	The graph shows a step-like distribution of load over running time. The y-axis is 'Load %' from 0 to 100. The x-axis is 'Running time %' from 0 to 100. The load is at 100% for the first 90% of running time and drops to 20% for the remaining 10%. <table><thead><tr><th>Running time %</th><th>Load %</th></tr></thead><tbody><tr><td>0 - 90</td><td>100</td></tr><tr><td>90 - 100</td><td>20</td></tr></tbody></table>	Running time %	Load %	0 - 90	100	90 - 100	20				
Running time %	Load %													
0 - 90	100													
90 - 100	20													

2.2.2.2 Establishing the effective service hours T_i

The effective service hours established as outlined below must be entered in the crane inspection and test log book for the inspection interval concerned.

There are the following four distinct cases:

2.2.2.2.1 Service hour meter available on each winch

When your crane has been equipped with a service hour meter on each winch, the number of effective service hours T_i for any inspection interval can be read directly.

2.2.2.2.2 Service hour meter available for the entire crane drive system

The share of winch hours in the total number of service hours of the upper structure is to be estimated.

Note: In the case of carrier-mounted cranes in erection service, it can normally be assumed for hoisting winches that the share of the winches in the service hours is 20 % referred to the overall service hours of the upper structure.

2.2.2.2.3 Service hour meter available jointly for the travel and crane drive systems

The share of winch hours in the total number of service hours of the crane is to be estimated.

Note: In the case of carrier-mounted cranes in erection service, the share of upper structure operation can normally be assumed to be 60 %, referred to the total number of service hours of the crane. If the hoisting winch is assumed to have a share of 20%, referred to the upper structure service hours (see para. 2.2.2.2.2), the resulting share, referred to the total number of service hours of the crane, is 12%.

2.2.2.2.4 No service hour meter available

In this case, the effective number of service hours of the winch must be estimated and documented by the owner.

Note: The percentages shown are guiding values normally applicable to main hoisting winches. In the case of auxiliary hoisting winches or boom hoist winches, the shares in the total number of service hours may be significantly smaller and must therefore be estimated by the owner.

2.2.2.3 Determining the spent share of the theoretical length of useful life

For an inspection interval i (not to exceed 1 year, according to ISO 9927-1 or VBG 8), the spent share S_i of the theoretical length of useful life is calculated by the equation:

$$S_i = \frac{k_{mi}}{k_m} \times T_i$$

where:

k_m = Factor of duty cycle taken as a basis in the design calculation of the winch.
For this factor refer to the Operating Manual.

k_{mi} = Factor of duty cycle in the inspection interval i , according to section 2.2.2.1

T_i = Effective service hours in the inspection interval i , according to section 2.2.2.2

After each inspection interval, the spent share is deducted from the residual theoretical length of useful life D_i (refer to example below).

Whenever a theoretical length of useful life is left which is expected to be inadequate for the subsequent period of operation, a general overhaul of the winch must be carried out.

When the theoretical length of useful life D has been attained (see section 2.2.1), continued operation of the winch is not allowed until after a general overhaul.

A general overhaul must be carried out not later than 10 years after commissioning of the crane at any rate.

The owner has to arrange for the general overhaul which must then be performed by the manufacturer, or else by any persons duly authorized by the manufacturer, and must be documented in the inspection and test log book.

On completion of the general overhaul, a new theoretical length of useful life D will be specified by the manufacturer, or by any persons duly authorized by the manufacturer.

At any rate, the maximum period of time to the next general overhaul will not exceed 10 years.

2.2.3 Example

A carrier-mounted crane fitted with a separate service hour meter for travel drive and crane drive has been classified as follows by the manufacturer, according to the Operating Manual:

Driving gear group:	M3
Duty cycle:	light L1, $k_m = 0.125$
Theoretical length of useful life:	$D = 3200 \text{ h}$

The spent share S of the theoretical length of useful life is calculated over the individual inspection intervals as follows:

Inspection No. 1 (first year)

In the past year, the crane has been used for erection work:
Duty cycle: L1, that is, $k_{m1} = 0.125$.

The reading taken on the upper structure service hour meter is 800 h, of which period the winch has been in operation for about 20 %, that is, $T_1 = 160 \text{ h}$.

So at the first inspection the spent share S of the theoretical length of useful life is:

$$S_1 = \frac{0.125}{0.125} \times 160 \text{ h} = 160 \text{ h}$$

Residual theoretical length of useful life:
 $D_1 = 3200 \text{ h} - 160 \text{ h} = 3040 \text{ h}$

The above values are entered in the table in the crane inspection and test log book (see section 2.2.4).

Inspection No. 2 (second year)

The crane has been used for unloading work in the harbour:

Duty cycle: L3, that is, $k_{m2} = 0.5$

The reading taken on the upper structure service hour meter is 2000 h, that is, during the period concerned: $2000 \text{ h} - 800 \text{ h} = 1200 \text{ h}$ (800 h were used in the first year of operation).

Of this the winch has been in operation for about 40 %, that is, $T_2 = 480 \text{ h}$.

So the spent share S_2 of the theoretical length of useful life in the second inspection interval is:

$$S_2 = \frac{0.5}{0.125} \times 480 \text{ h} = 1920 \text{ h}$$

Residual theoretical length of useful life:

$$D_2 = 3040 \text{ h} - 1920 \text{ h} = 1120 \text{ h}$$

Inspection No. 3 (third year)

The crane has been used for erection work and occasionally for unloading work in the harbour:

Duty cycle: L2, that is, $k_{m3} = 0.25$

The reading taken on the upper structure service hour meter is 3000 h, that is, during the period concerned: $3000 \text{ h} - 2000 \text{ h} = 1000 \text{ h}$ (2000 h were used in the first two years of operation).

Of this the winch has been in operation for about 30 %, that is, $T_3 = 300 \text{ h}$.

So the spent share S_3 of the theoretical length of useful life in the third inspection interval is:

$$S_3 = \frac{0.25}{0.125} \times 300 \text{ h} = 600 \text{ h}$$

Residual theoretical length of useful life:

$$D_3 = 1120 \text{ h} - 600 \text{ h} = 520 \text{ h}$$

The entries to be made in the table in the crane inspection and test log book are as follows: see Table 1.

2.2.4 Annex

An example is shown in Table 1.

The residual theoretical length of useful life is to be documented by means of the enclosed Table 2.

For
Reference
Only

Table to Determine the Residual Theoretical Length of Useful Life on Winch No. 1 (Main Hoist Winch) EXAMPLE

Crane model: S 613

Factory number: 613.0. ...

Initial commissioning: 12345

Winch serial number - refer to identification plate: 0815

Last general overhaul performed on:

Winch design data (refer to Operating Manual):

Power unit group: M 3

Duty cycle: Q 1 (L1)

Duty cycle factor k_{mi} : 0.125

Theoretical length of useful life D: 3200 h

S_i

=

Share of the theoretical length of useful life spent since the last inspection

D_i

=

Residual theoretical length of useful life

D_{i-1}

=

Residual theoretical length of useful life after the preceding inspection

k_m

=

Duty cycle factor taken as a basis in the design calculation of the winch

=

For this factor refer to the Operating Manual

k_{mi}

=

Duty cycle factor in the inspection interval i, according to section 2.2.2.1

T_i

=

Effective service hours in the inspection interval i, according to section 2.2.2.2

Inspection No.	Date of initial commissioning Date of inspection	Operating conditions in the period since the last inspection (duty cycle)	Factor of the duty cycle	Service hours of the crane as a whole	Service hours of the upper structure	Service hours of the upper structure since the period since the last inspection	Service hours of the winch	Service hours of the winch in the period since the last inspection T_i	Spent share of the theoretical length of useful life D	Residual theoretical length of useful life	Name of inspector	Signature	Notes
i			k_{mi}	[h]	[h]	[h]	[h]	[h]	$S_i = \frac{k_{mi}}{k_m} \times T_i$	$D_i = D_{i-1} - S_i$			
0	20.11.94	-	-	-	0				0	3200			
1	15.11.95	L1	0.125	-	800	800	-	160 (20 % of 800)	160	3040	Müller		
2	17.11.96	L3	0.5	-	2000	1200	-	480 (40 % of 1200)	1920	1120	Huber		
3	23.11.97	L2	0.25	-	3000	1000	-	300 (30 % of 1000)	600	520	Meier		

A T T E N T I O N: A general overhaul must be performed at least every 10 years.

General overhaul performed on:

Table to Determine the Residual Theoretical Length of Useful Life on Winch No.

Crane model:
Factory number:
Initial commissioning:
Winch serial number - refer to identification plate:
Last general overhaul performed on:
Winch design data (refer to Operating Manual):
Power unit group: M
Duty cycle: Q (L.....)
Duty cycle factor k_{mi} :
Theoretical length of useful life D: T_i =
Share of the theoretical length of useful life spent since the last inspection S_i =
Residual theoretical length of useful life D_i =
Residual theoretical length of useful life after the preceding inspection D_{i-1} =
Duty cycle factor taken as a basis in the design calculation of the winch k_m =
For this factor refer to the Operating Manual
Duty cycle factor in the inspection interval i, according to section 2.2.2.1 k_{mi} =
Effective service hours in the inspection interval i, according to section 2.2.2.2 T_i =

Inspection No.	Date of initial commissioning Date of inspection	Operating conditions in the period since the last inspection (duty cycle)	Factor of the duty cycle	Service hours of the crane as a whole	Service hours of the upper structure	Service hours of the upper structure since the period since the last inspection	Service hours of the winch	Service hours of the winch in the period since the last inspection T_i	Spent share of the theoretical length of useful life D $S_i = \frac{k_{mi}}{k_m} \times T_i$	Residual theoretical length of useful life $D_i = D_{i-1} - S_i$	Name of inspector	Signature	Notes
i			k_{mi}	[h]	[h]	[h]	[h]	[h]	[h]	[h]			

ATTENTION: A general overhaul must be performed at least every 10 years.

General overhaul performed on:

For
Reference
Only

Additional documentation

Installing large roller bearings, slewing gears and flange connections

For
Reference
Only

**Current when going to
press**

Ongoing development ensures the advanced technology and the high level of quality in our machines. This may result in deviations between these Instructions and your machine. Errors can also not be ruled out. Please understand that no legal claims can be derived from the specifications, illustrations and descriptions within these instructions.

For
Reference
Only

1 Installing large roller bearings, slewing gear and flange connections

1.1 General

This supplementary information applies to the installation of large roller bearings and flange connections (FV). This concerns e.g.:

- z Flange connection between the upper structure and the slewing gear
- z Flange connection between the upper structure and the slewing ring
- z Flange connection between the slewing ring and the lower assembly
- z Flange connection between the slewing ring and intermediate ring and the lower assembly
- z Flange connection between the slewing ring and the pylon and intermediate ring and the lower assembly
- z Flange connection between the pylon and pylon



DANGER

- z Make sure that there is no-one within the hazardous area before starting the installation!
- z Pay attention to dimensions and weight according to the operating instructions.
- z Observe general safety information for the installation according to the operating instructions.

1.2 Preparatory measures

In order to guarantee a secure connection between the individual components, several important preparations are required:

- z The flange surfaces on the slewing ring are to be kept free of corrosion.
- z Make absolutely sure that all surfaces including holes, e.g. the lower assembly flange are free of grease. If there is grease in the holes, there is a danger of pushing the grease into the threads in the slewing ring with the bolts.
This additional grease in the threads can greatly decrease the required friction under certain circumstances. The bolt can be damaged without your recognising it or it could even break eventually.
- z No additional oil or grease is to be used for bolted connections e.g. "lower assembly flange-slewing ring, pylon-slewing ring". The bolts and pins are to be installed as delivered.

1.3 Assembly



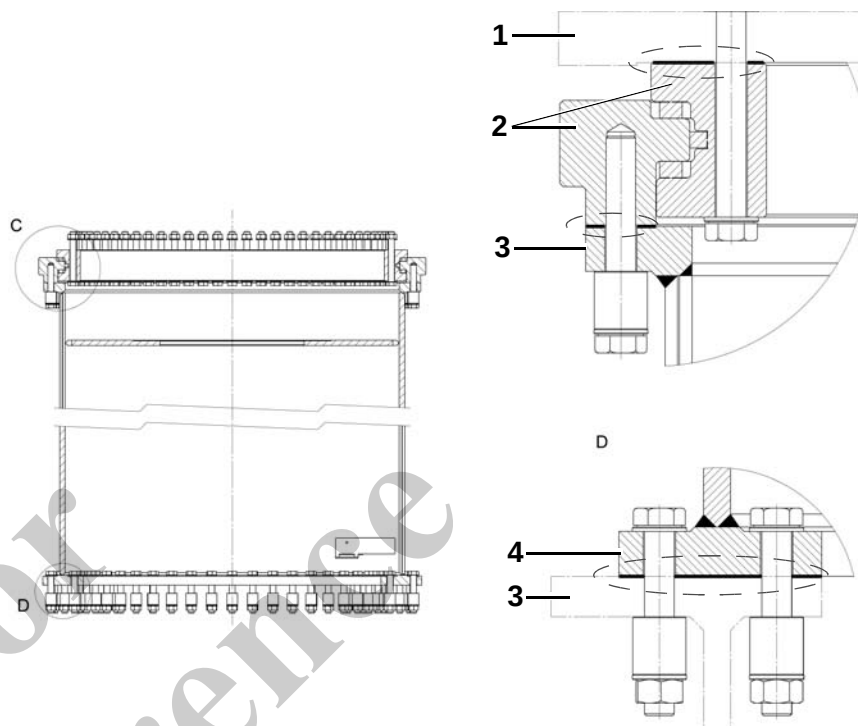
There are a few important points to observe for the installation:

- z Clean all contact surfaces of the flange connections of any oil and grease.
- z Galvanized or coated surfaces must be treated beforehand with AKTIVATOR T 747 because a thread lock compound (such as Gluetec or Loctite) must only be applied on activated surfaces.
- z Apply the thread lock compound with a brush on a surface.
- z Centering elements must not come into contact with the thread lock compound, because later dismounting involves difficulties
--> coat centering elements with wax or grease!
- z Tighten fastening screws according to the torque specifications in a cross pattern. The thread lock compound starts to set after approx. 2 hours. Full strength is achieved after 12 - 24 hours.

- 1) Upper structure
- 2) Slewing ring
- 3) Pylon or lower assembly
- 4) Pylon



Flange connection with Loctite



1.4 Tightening torques for bolts



Note

For certain fixing bolts on the undercarriage, values differing from those listed in this table may apply. Please observe notes in the respective sections.

Strength class 8.8

Coarse thread		Fine thread	
Bolt	Tightening torque M_A [Nm]	Bolt	Tightening torque M_A [Nm]
M4	2,7	M8x1	24
M5	5,4	M10x1	50
M6	9,3	M10x1.25	47
M8	23	M12x1.25	84
M10	45	M12x1.5	81
M12	77	M14x1.5	135
M14	125	M16x1.5	205
M16	190	M18x1.5	305
M18	275	M20x1.5	430

Coarse thread		Fine thread	
M20	385	M22x1.5	580
M22	530	M24x2	720
M24	660	M27x2	1050
M27	980	M30x2	1450
M30	1350		
M33	1850		
M36	2350		

For
Reference
Only

Strength class 10.9

Coarse thread		Fine thread	
Bolt	Tightening torque M_A [Nm]	Bolt	Tightening torque M_A [Nm]
M4	4,0	M8x1	36
M5	7,9	M10x1	73
M6	14	M10x1.25	69
M8	33	M12x1.25	125
M10	66	M12x1.5	120
M12	115	M14x1.5	195
M14	180	M16x1.5	300
M16	280	M18x1.5	435
M18	390	M20x1.5	610
M20	550	M22x1.5	830
M22	750	M24x2	1050
M24	950	M27x2	1500
M27	1400	M30x2	2100
M30	1900		
M33	2600		
M36	3300		

Strength class 12.9

Coarse thread		Fine thread	
Bolt	Tightening torque M_A [Nm]	Bolt	Tightening torque M_A [Nm]
M4	4,7	M8x1	42
M5	9,2	M10x1	86
M6	16	M10x1.25	81
M8	39	M12x1.25	145
M10	77	M12x1.5	140
M12	135	M14x1.5	230
M14	210	M16x1.5	350
M16	330	M18x1.5	510
M18	455	M20x1.5	710
M20	640	M22x1.5	960
M22	880	M24x2	1200
M24	1100	M27x2	1750
M27	1650	M30x2	2450
M30	2200		
M33	3000		
M36	3900		



**Originalbetriebsanleitung
PFEIFER
Taschenschloss-System**

DE

**Translation of the
Original Operating Manual
PFEIFER
Pouch Socket System**

EN

02/2010

**PFEIFER
SEIL- UND HEBETECHNIK
GMBH**

DR.-KARL-LENZ-STRASSE 66
D-87700 MEMMINGEN

TELEFON +49 (0) 83 31-937-267

TELEFAX +49 (0) 83 31-937-341

E-MAIL technik-gbseile@pfeifer.de

INTERNET www.pfeifer.de

Inhaltsverzeichnis

1. Vorwort	Seite 2
2. Zeichenerklärung	Seite 2
3. Einsatzgebiet und Bestimmungsgemäße Verwendung	Seite 2
4. Allgemeine Hinweise	Seite 3
5. Installation und Montage	Seite 4
6. Wichtige Sicherheitshinweise	Seite 5
7. Betrieb	Seite 5
8. Zubehör und Ersatzteile	Seite 6
9. Wartung und Reparatur	Seite 7
10. Traglasttabelle	Seite 7

1. Vorwort

Die Gebrauchsanweisung muss vor Verwendung des PFEIFER Taschenschloss-Systems sorgfältig gelesen und verstanden werden. Die Gebrauchsanweisung muss bei der Verwendung des PFEIFER Taschenschloss-Systems eingehalten werden.

Die Sicherheit des PFEIFER Taschenschloss-Systems ist nur dann gewährleistet, wenn das Taschenschloss so bedient, installiert und gewartet wird, wie in dieser Anleitung beschrieben. Zusätzlich sind alle sicherheitstechnischen Weisungen des Maschinenherstellers und der Betreiberfirma zu beachten.

2. Zeichenerklärung



ACHTUNG

Weist auf schwerwiegende Verletzungsgefahr und Tod hin.



VORSICHT

Weist auf Verletzungsgefahr und das Risiko von Sachschäden hin.



Allgemeiner Hinweis



Schutzhelm benutzen



Fußschutz benutzen



Handschutz benutzen

3. Einsatzgebiet und Bestimmungsgemäße Verwendung



Das PFEIFER Taschenschloss-System dient als lösbare Endverbindung eines Hub-oder Verstellseiles und dem entsprechend ausgebildeten Anschluss eines Kranes.



VORSICHT

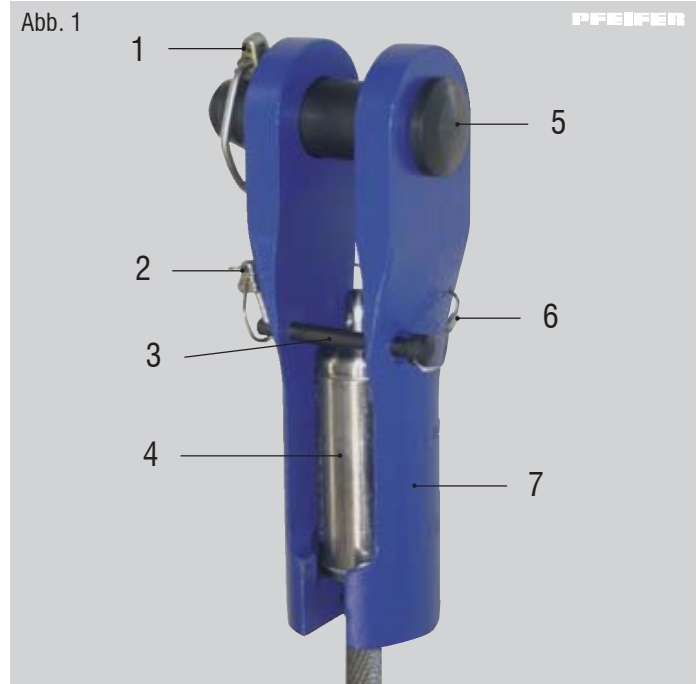
Eine anderweitige Verwendung des PFEIFER Taschenschloss-Systems, außer der hier beschriebenen, ist untersagt!

4. Allgemeine Hinweise

Die **Taschenschlösser Typ 22A** des PFEIFER Taschen-schloss-Systems bestehen aus den Bauteilen (siehe Abb. 1): Gehäuse, Bundbolzen mit Sicherheitsklapp-stecker A und Sicherungsbolzen mit Seil und Sicherheitsklappstecker B.

- 1 Sicherheitsklappstecker A
- 2 Sicherheitsklappstecker B
- 3 Sicherungsbolzen
- 4 Schlossklemme bzw. Schlossverguss-hülse mit Seil
- 5 Bundbolzen
- 6 Sicherungsseil
- 7 Gehäuse

Abb. 1



Als **Seilendverbinding** dienen die PFEIFER Schloss-klemmen Typ 11A (Abb. 2) und 12A (Abb. 3) sowie die PFEIFER Schlossverguss-hülsen Typ 13A und 14A.

Abb. 2



PFEIFER Schlossklemme Typ 11A

PFEIFER Schlossverguss-hülse Typ 13A

Geprüft nach den Vorgaben der EN13411

Anwendungsgebiet:
Äußerst drehungsarme Rundlitzen-seile

Merkmal:
Ohne Drehsicherung am Seilaustritt

Abb. 3



PFEIFER Schlossklemme drehgesichert Typ 12A

PFEIFER Schlossverguss-hülse drehgesichert Typ 14A

Geprüft nach den Vorgaben der EN13411

Anwendungsgebiet:
Nicht drehungsfreie und drehungsarme Rundlitzen-seile

Merkmale:
Drehsicherung (Nase) am Seilaustritt

Abb. 4



Einziehhöse zur Befestigung eines Hilfseinscherseiles an der Seilendverbinding.

Abb. 5



Drehsicherung (Nase) am Seilaustritt des Seilendbeschlages zur Sicherung der nicht drehungsfreien Rundlitzen-seile gegen Aufdrehen.



ACHTUNG

Maximal zulässige Zugkraft der Einziehhöse beachten.



ACHTUNG

Ein Aufdrehen der Seile führt zum Seilversagen und dem Lösen der Last.

5. Installation und Montage



Vor der Montage sind das Gehäuse, die Bolzen und die Seilendverbindungen auf sichtbare Beschädigungen z. B. Risse, Korrosion, Verformungen usw. zu überprüfen.



VORSICHT

Bauteile die Risse, Verformungen oder andere Beschädigungen aufweisen, dürfen nicht eingebaut und verwendet werden.



Das PFEIFER Taschenschloss-System und insbesondere das Gehäuse und die dazugehörigen Seilendverbindungen müssen auf den jeweiligen Seildurchmesser abgestimmt sein und die auf den Komponenten angegebenen Nenngößen müssen zueinander passen.



VORSICHT

Die Verwendung anderer Bauteile, als die zum PFEIFER Taschenschloss-System gehörenden Originalkomponenten und -bauteile ist untersagt. Ebenfalls ist die Verwendung veränderter und/oder modifizierter Bauteile verboten.

- Das Taschenschloss Gehäuse mit Hilfe des Bundbolzens am Kran befestigen.
- Den Bundbolzen durch den dazugehörigen Sicherungsklappstecker A sichern (Abb. 6). Dabei muss der Sicherungsbügel in die dafür vorgesehene Nut des Klappsteckers einrasten (Abb. 7).
- Für den Betrieb die dauerhaft am Seil befestigte Seilendverbindung (Schlossklemme bzw. Schlossvergusschülse) in das Taschenschloss einfügen und mit Hilfe des Sicherungsbolzens sichern (Abb. 8). Dabei muss der Sicherungsbolzen vor dem Seilendbeschlag verbolzt werden und darf nicht in die Einziehöse gesteckt werden (Abb. 9).
- Den Sicherungsbolzen durch den beiliegenden Sicherungsklappstecker B sichern (Abb. 8). Dabei muss der Sicherungsbügel in die dafür vorgesehene Nut einrasten (Abb. 7).



Nach der sachgerechten Montage des PFEIFER Taschenschloss-Systems sind alle Bolzen sowie die Sicherungsklappstecker auf richtigen Sitz zu überprüfen und die Funktionssicherheit des Sicherungsbolzens zu testen (Abb. 10).

Abb. 6



Abb. 7



Abb. 8



Abb. 9



Abb. 10



6. Wichtige Sicherheitshinweise



ACHTUNG

Insbesondere besteht bei unbeabsichtigtem Lösen der Last oder bei Lösen der Last durch Versagen des PFEIFER Taschenschloss-Systems direkte oder indirekte Gefahr für die Sicherheit oder die Gesundheit von Personen innerhalb der Gefahrenzone.



ACHTUNG

Nicht drehungsfreie und drehungsarme Seile dürfen nicht mit drehbarem Festpunkt eingesetzt werden (z.B. Wirbel, Hydraulikzylinder usw.). Bei Nichtbeachtung kann dies zu beachtlichen Seilschäden, Seilriss und dem Lösen der Last führen.



Durch die Seilendverbindung mittels einer verpressten Schlossklemme (Typ 11A und 12A) wird die Mindestbruchkraft des Drahtseiles auf 90% herab gesetzt.



Der Einsatztemperaturbereich von -40°C bis $+80^{\circ}\text{C}$ darf nicht verlassen werden.



Während den gesamten Arbeiten mit dem PFEIFER Taschenschloss-System sind besondere Schutzmaßnahmen zu ergreifen. Schutzhelm benutzen.



Während den gesamten Arbeiten mit dem PFEIFER Taschenschloss-System sind besondere Schutzmaßnahmen zu ergreifen. Fußschutz benutzen.



Während den gesamten Arbeiten mit dem PFEIFER Taschenschloss-System sind besondere Schutzmaßnahmen zu ergreifen. Handschuhe benutzen.

7. Betrieb



VORSICHT

Fallende Lasten, Schockbelastungen oder das Überschreiten der maximal zulässigen Tragkraft sind zu vermeiden und führen zum Ausschluss jeglicher Gewährleistungs- und Produkthaftungsansprüche.



VORSICHT

Das PFEIFER Taschenschloss-System ist auf Beschädigungen zu kontrollieren. Beschädigte Bauteile und Komponenten sind sofort auszutauschen und dürfen nicht weiter verwendet werden.



Während des Betriebs ist auf den korrekten Sitz der Bolzen und Sicherheitsklappstecker, sowie der Seilendverbindung (Schlossklemme und Schlossvergusschülse) im Taschenschloss zu achten.



Während des Betriebs ist eine seitliche Belastung des Gehäuses, sowie Schrägzug zu vermeiden.

8. Zubehör und Ersatzteile

Hilfseinscherausrüstung zum Einziehen des Drahtseiles in den Seiltrieb bestehend aus zwei Verbindungsgliedern und einem Drallfänger (Abb. 11).



VORSICHT

Maximal zulässige Zugkraft der Einziehöse der Seilendverbindung beachten. Die Hilfseinscherausrüstung ist nicht zum Heben von Lasten geeignet.



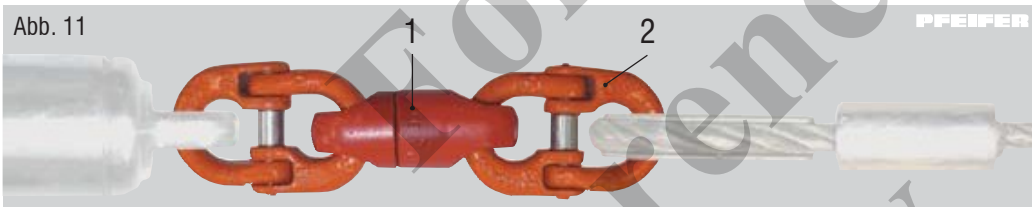
Zum Einziehen des Drahtseiles in den Seiltrieb ein drehungsarmes Hilfseinscherseil verwenden.



Ersatzteile

Reparaturen von Komponenten des gesamten PFEIFER Taschenschloss-Systems dürfen grundsätzlich nur von dafür ausgebildetem und von der Firma PFEIFER Seil- und Hebetechnik GmbH autorisiertem Fachpersonal durchgeführt werden.

Nenngröße NG	Teile-Nummer	Maximal zulässige Zugkraft
16, 19, 22, 26, 29, 32, 36	233596	10 kN
40, 44, 48	233597	20 kN
52	233598	30 kN



- 1 Drallfänger
- 2 Verbindungsglied

NG	Bundbolzen	Sicherheitsklappstecker A	Sicherungsbolzen	Sicherheitsklappstecker B
16	214275	112121	228505	212842
19	214556	112112	228514	212842
22	214561	112112	228551	212842
26	214204	112123	228556	212842
29	213240	112123	228589	212842
32	212770	112123	558590	212842
36	214042	230723	228591	212842
40	230835	230723	230887	112121
44	230836	230723	230888	112121
48	230837	230723	230889	112121
52	230838	230723	230890	112121

9. Wartung und Reparatur



Das gesamte Taschenschloss ist in regelmäßigen Abständen und nach unvorhergesehenen Ereignissen (Fallende Lasten, Schockbelastung etc.), mindestens jedoch immer einmal nach 12 Monaten auf sichtbare Beschädigungen zu kontrollieren.



VORSICHT

Bauteile die Risse, starke Korrosion, Verformungen oder andere Beschädigungen aufweisen, dürfen nicht verwendet und belastet werden.



Diese Gebrauchsanweisung befasst sich nicht mit der Ablegereife des Drahtseiles selbst. Informationen hierzu finden Sie in der gültigen Ausgabe der Norm ISO 4309.



Reparaturen von Komponenten des gesamten PFEIFER Taschenschloss-Systems dürfen grundsätzlich nur von dafür ausgebildetem und von der Firma PFEIFER Seil- und Hebetechnik GmbH autorisiertem Fachpersonal durchgeführt werden.

PFEIFER SEIL- UND HEBE TECHNIK GMBH PRÜFSERVICE

DR.-KARL-LENZ-STRASSE 66
D-87700 MEMMINGEN
TELEFON +49 (0) 8331-937-325
TELEFAX +49 (0) 8331-937-198
E-MAIL prüfservice-azs@pfeifer.de
INTERNET www.pfeifer.de

10. Traglasttabelle



VORSICHT

Fallende Lasten, Schockbelastungen oder das Überschreiten der maximal zulässigen Tragkraft sind zu vermeiden und führen zum Ausschluss jeglicher Gewährleistungs- und Produkthaftungsansprüche.

NG	Bestellnummer	Maximale Traglast	Gewicht
16	03 22A 016	85 kN	2,8 kg
19	03 22A 019	120 kN	4,7 kg
22	03 22A 022	160 kN	7,0 kg
26	03 22A 026	220 kN	10,8 kg
29	03 22A 029	275 kN	15,6 kg
32	03 22A 032	335 kN	21,8 kg
36	03 22A 036	425 kN	29,7 kg
40	03 22A 040	500 kN	42,3 kg
44	03 22A 044	610 kN	55,9 kg
48	03 22A 048	730 kN	71,4 kg
52	03 22A 052	850 kN	90,1 kg

For
Reference
Only



Originalbetriebsanleitung
PFEIFER
Taschenschloss-System

DE

Translation of the
Original Operating Manual
PFEIFER
Pouch Socket System

EN

02/2010

**PFEIFER
SEIL- UND HEBETECHNIK
GMBH**

DR.-KARL-LENZ-STRASSE 66
D-87700 MEMMINGEN
TELEPHONE +49 (0) 83 31-937-267
TELEFAX +49 (0) 83 31-937-341
E-MAIL technik-gbseile@pfeifer.de
INTERNET www.pfeifer.de

Table of Contents

1. Preamble	Page 2
2. Signs and Symbols	Page 2
3. Application Area and Intended Use	Page 2
4. General Informations	Page 3
5. Installation and Assembling	Page 4
6. Important Security Informations	Page 5
7. Operation	Page 5
8. Accessories and Spare Parts	Page 6
9. Maintenance and Repair	Page 7
10. Lifting Capacity Table	Page 7

1. Preamble

The instruction manual has to be read and understood carefully before using the PFEIFER Pouch Socket System. The instruction manual must be adhered to while using the PFEIFER Pouch Socket System.

The safety of the PFEIFER Pouch Socket System is only guaranteed if the pouch socket will be used, installed and maintained as described in this instruction manual. In addition, all safety instructions of the machine manufacturer and the operating company has to be considered.

2. Signs and Symbols



Indicates a serious risk of injury and death.

WARNING



Indicates danger of injury and the risk of property damage.

CAUTION



General information



Wear a helmet



Wear safety shoes



Wear protective gloves

3. Application Area and Intended Use



The PFEIFER Pouch Socket System is a removal end connection for hoist and luffing ropes and the appropriate designed connection to a crane.



Any other use of the PFEIFER Pouch Socket System than those described hereunder is prohibited!

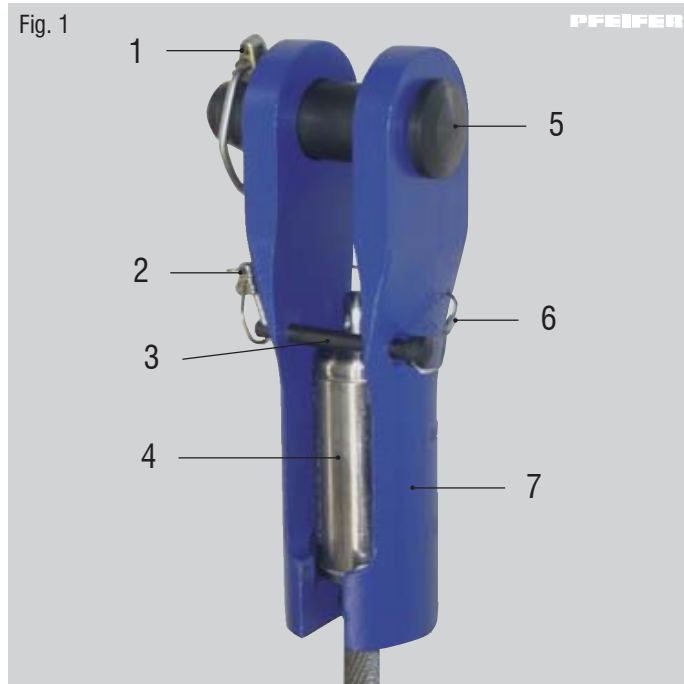
CAUTION

4. General Informations

The **pouch sockets type 22A** of the PFEIFER Pouch Socket System consist of following parts (see Fig. 1): Pouch socket, bolt with safety clip pin A and safety pin with arresting cable and safety clip pin B.

- 1 Safety clip pin A
- 2 Safety clip pin B
- 3 Safety pin
- 4 Swaged sleeve alternatively resin socket with rope
- 5 Bolt
- 6 Arresting cable
- 7 Pouch socket

Fig. 1



PFEIFER swaged steel sleeves type 11A (Fig. 2) and 12A (Fig. 3) and PFEIFER resin sockets Type 13A and 14A are used for rope end terminations.

Fig. 2



PFEIFER swaged sleeve Type 11A

PFEIFER resin socket Type 13A

Tested according to EN13411

Field of application:
High performance rotation resistant ropes

Characteristic:
Without rotary locking device at the tail

Fig. 3



PFEIFER swaged sleeve rotary locked Type 12A

PFEIFER resin socket rotary locked Type 14A

Tested according to EN13411

Field of application:
Non rotation resistant and rotation resistant ropes

Characteristics:
Rotary locking device (nose) at the tail

Abb. 4



Reeving eye for mounting of a reeving-rope on the end termination.



CAUTION

Never exceed the working load limit of the reeving eye.



Abb. 5

Rotary locking device (nose) at the tail of the end termination to secure the nonrotation resistant and rotation resistant ropes against twisting.



WARNING

Twisting of the rope can substantially reduce its breaking force and result in rope failure.

5. Installation and Assembling



Before assembling, the pouch socket, the bolts and the end terminations has to be proofed for visible damages e. g. cracks, corrosion, deformations etc.



CAUTION



The PFEIFER Pouch Socket System particularly the pouch socket itself and the corresponding end terminations have to match to the rope diameter. The nominal sizes on the used components have to match one another.



CAUTION

The usage of parts other than the original components and parts of the PFEIFER Pouch Socket System is forbidden. The usage of modified parts is also forbidden.

- Fit the pouch socket by using the bolt at the fixed-point of the crane.
- Secure the bolt with the corresponding safety clip pin A (Fig. 6). The safety bracket must lock in the intended slot (Fig. 7).
- For usage take the permanent end termination of the rope (swaged steel sleeve or resin socket) in the pouch socket and secure it with the safety pin (Fig. 8). The safety pin has to be fitted in front of the end termination and must not be inserted in the reeving eye (Fig. 9).
- Secure the safety pin with the corresponding safety clip pin B (Fig. 8). The safety bracket must lock in the intended slot (Fig. 7).



After appropriate assembly of the PFEIFER Pouch Socket System, the bolt, the safety pin and the safety clip pins have to be checked for tight fit and the function of the safety pin must be tested (Fig. 10).

Fig. 6



Fig. 7



wrong



right

Fig. 8



Fig. 9



wrong



right

Fig. 10



6. Important Security Informations



WARNING

Accidental releasing of the load or releasing the load as a result of failure of the PFEIFER Pouch Socket System, poses direct or indirect danger to the health and safety of persons within the danger zone.



WARNING

Non rotation resistant ropes and rotation resistant ropes must not be used with a rotating fixed-point (e.g. swivel, hydraulic cylinder etc.). Noncompliance will result in considerable rope damage, rope break and releasing of the load.



By using a swaged steel sleeve for rope end termination (Type 11A and 12A) the minimum breaking load of the rope will be reduced to 90 %.



Never use in conditions below -40°C or exceeding $+80^{\circ}\text{C}$



While working with the PFEIFER Pouch Socket System special protective measures must be taken. Wear a helmet.



While working with the PFEIFER Pouch Socket System special protective measures must be taken. Wear safety shoes.



While working with the PFEIFER Pouch Socket System special protective measures must be taken. Wear protective gloves.

7. Operation



CAUTION

Falling loads, shock loads or to exceed the working load limit are forbidden and will result in the exclusion of warranty and product liability.



CAUTION

The PFEIFER Pouch Socket System has to be checked for damages. Damaged parts and components have to be replaced and may not be used.



During the operation pay attention to the correct fit of the bolt, the safety pin, the safety clip pins, and the end terminations (swaged sleeve and resin socket) in the pouch socket.



During the operation avoid side-loading of the pouch socket and oblique pull.

8. Accessories and Spare Parts

Auxiliary reeving device to pull the rope into the reeving system consists of two connecting links and one swivel (Fig. 11).



CAUTION

Do not exceed the working load limit of the reeving eye of the end termination. The auxiliary reeving device is not designed for lifting of loads.



To pull the rope into the reeving system use a rotation resistant auxiliary reeving rope.

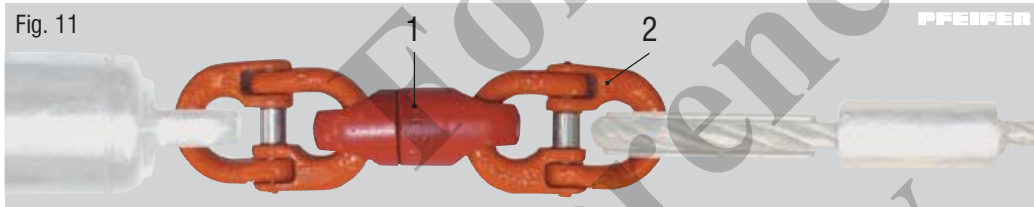


Spare Parts

Repairs of components of the whole PFEIFER Pouch Socket System may only be carried out by trained and approved technicians and by the company PFEIFER Seil- und Hebetchnik GmbH authorized service personnel.

Nominal Size NG	Part Number	Working Load Limit
16, 19, 22, 26, 29, 32, 36	233596	10 kN
40, 44, 48	233597	20 kN
52	233598	30 kN

Fig. 11



- 1 Swivel
- 2 Connecting link

NG	Bolt	Safety Clip Pin A	Safety Pin	Safety Clip Pin B
16	214275	112121	228505	212842
19	214556	112112	228514	212842
22	214561	112112	228551	212842
26	214204	112123	228556	212842
29	213240	112123	228589	212842
32	212770	112123	558590	212842
36	214042	230723	228591	212842
40	230835	230723	230887	112121
44	230836	230723	230888	112121
48	230837	230723	230889	112121
52	230838	230723	230890	112121

--	--	--	--

9. Maintenance and Repair



The whole pouch socket has to be checked for visible damages in periodic intervals and after unexpected incidents (falling loads, shock loads etc.), but at least one time after 12 months.



CAUTION

Parts with cracks, heavy corrosion, deformations and other damages, may not be used and loaded.



This instruction manual does not deal with discard criterias of wire ropes. You will find information about discard criterias in the available issue of the standard ISO 4309.



Repairs of components of the whole PFEIFER Pouch Socket System may only be carried out by trained and approved technicians and by the company PFEIFER Seil- und Hebetechnik GmbH authorized service personnel.

PFEIFER SEIL- UND HEBE-TECHNIK GMBH PRÜFSERVICE

DR.-KARL-LENZ-STRASSE 66
D-87700 MEMMINGEN
TELEPHONE +49 (0) 83 31-937-325
TELEFAX +49 (0) 83 31-937-198
E-MAIL prüfservice-azs@pfeifer.de
INTERNET www.pfeifer.de

10. Lifting Capacity Table



CAUTION

Falling Loads, shock loads or exceeding the working load limit is forbidden and will result in the exclusion of warranty and product liability.

NG	Order Number	Working Load Limit	Weight
16	03 22A 016	85 kN	2,8 kg
19	03 22A 019	120 kN	4,7 kg
22	03 22A 022	160 kN	7,0 kg
26	03 22A 026	220 kN	10,8 kg
29	03 22A 029	275 kN	15,6 kg
32	03 22A 032	335 kN	21,8 kg
36	03 22A 036	425kN	29,7 kg
40	03 22A 040	500kN	42,3 kg
44	03 22A 044	610kN	55,9 kg
48	03 22A 048	730kN	71,4 kg
52	03 22A 052	850kN	90,1 kg

For
Reference
Only

List of operating fluids and lubricants

For
Reference
Only

For
Reference
Only

Introductory remarks

This list contains the operating fluids and lubricants used and recommended by Grove for the **United States of America** and **Canada**.

Hazardous substances

Operating fluids and lubricants for machines are in many cases hazardous substances, therefore certain guidelines must be observed in the handling, storage, transport, labeling and disposal of the substances. These guidelines are based on the legal and technical regulations for hazardous substances, which apply in the respective country and are found in the safety information sheets from the operating fluid and lubricant manufacturer. The user of the operating fluids and lubricants list is therefore obliged to inform himself about the nationally applicable laws and regulations. The Grove assumes no liability for improper or illegal use of their approved operating fluids and lubricants.

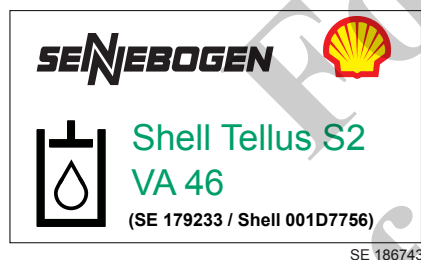


Fig. 1: Sticker hydraulic oil

The factory filling of each Grovemachine is marked with a sticker at the corresponding filling points.

▲ If, for one application, several supplies, e.g. Cryogenic, high temperature or rapidly biodegradable operating fluid are specified, the fuel of the factory filling for the standard temperature range is marked by a black triangle.

The ambient temperature that can be expected at the work site is an important criterion for selection of an operating fluid or lubricant. Consequently, in this list the temperature ranges are assigned to the respective operating fluid or lubricant.

For the low-temperature range and the high-temperature range, various equipment and packages are available, which in addition to the special operating fluids and lubricants contain further measures and modified components.

For operating temperature ranges outside the temperature ranges specified in this list of operating fluids and lubricants, please contact a Groveservice partner.

The machine's operating conditions are another important factor. This implies the amount of dust in the machine's environment and the number of tool changes. These factors significantly affect the service life of the operating fluids and lubricants.

Introductory remarks

When topping up operating fluids and lubricants, only use products of the same brand and type to ensure that technical performance parameters are not impaired. Do not mix operating fluids and lubricants with the same specifications or of the same type from different manufacturers. Do not mix operating fluids and lubricants from the same manufacturer with different specifications or of different types. Through such mixing, significant component damage and malfunction can occur. When changing the operating fluid or lubricant to another grade, type or manufacturer, please contact a Groveservice partner.



WARNING!

Health risks from operating fluids and lubricants.

Care must be taken when handling operating fluids and lubricants, skin, eye contact, ingestion or inhalation can result in serious damage to health.

- Observe the safety information sheet of the operating fluid and lubricant manufacturer.
- Wear protective goggles, protective clothing and protective gloves.
- Avoid contact with eyes and skin.
- Do not inhale operating fluid or lubricant fumes.
- Do not swallow operating fluids or lubricants.

First aid measures:

- **General**
 - Take off contaminated clothing, wash it or dispose of it in an environmentally sound manner.
- **Skin contact**
 - Rinse the operating fluid and lubricant off with water and wash affected skin areas with soap.
 - If skin irritation persists, consult a doctor.
- **Eye contact**
 - immediately rinse the eye with clean water.
 - if irritation persists consult an ophthalmologist.
- **Inhalation**
 - provide fresh air supply.
 - If respiratory arrest occurs , perform artificial respiration.
 - consult a doctor if breathing problems persist.
- **Ingested**
 - Consult a doctor.

Table of contents

1	Hydraulic systems.....	8
1.1	Hydraulic oils for material handlers.....	8
1.1.1	Hydraulic oils with extended change interval.....	8
1.1.2	Hydraulic oils without an extended change interval.....	10
1.2	Hydraulic oils for duty cycle cranes with free-fall winches.....	10
1.2.1	Hydraulic oils with extended change interval.....	10
1.3	Hydraulic oils for crawler cranes, telescopic cranes, harbor cranes, duty cycle cranes without free-fall winches.....	11
1.3.1	Hydraulic oils with extended change interval.....	11
1.3.2	Hydraulic oils without an extended change interval.....	13
1.4	Hydraulic oils for Multihandler 305, 310.....	14
1.4.1	Hydraulic oils without an extended change interval.....	14
1.5	Hydraulic oils for telehandlers.....	15
1.5.1	Hydraulic oils with extended change interval.....	15
1.5.2	Hydraulic oils without an extended change interval.....	16
1.6	Hydraulic oils for Powerpacks.....	16
2	Diesel engines.....	17
2.1	Engine oil.....	17
2.1.1	Caterpillar.....	17
2.1.2	Cummins.....	19
2.1.3	FPT.....	23
2.1.4	Deutz.....	25
2.1.5	Scania.....	27
2.1.6	Diesel emergency generator.....	28
2.2	Coolant.....	29
2.2.1	Caterpillar.....	29
2.2.2	Cummins.....	29
2.2.3	FPT.....	30
2.2.4	Scania.....	30
2.3	Fuels.....	31
2.3.1	Emissions Stage US EPA Tier 2 / EU Tier II and US EPA Tier 3 / EU Tier IIIa.....	31
2.3.2	Emissions Stage US EPA Tier 4 interim / EU Tier IIIb	31
2.3.3	Emissions Stage US EPA Tier 4 final / EU Tier IV / EU Tier V.....	31
2.4	Diesel flow improvers.....	32
2.5	DEF, diesel exhaust fluid for US EPA Tier 4 final / EU Tier IV diesel engines.....	32

Table of contents

3	Electric motors	33
3.1	Lubrication	33
3.2	Coolant - heating circuit	33
4	Gearbox	34
4.1	Slewing gear box	34
4.1.1	Gear oil	34
4.1.2	Lubricating grease - roller bearings	34
4.2	Pump distributor gearbox	35
4.2.1	Gear oil	35
4.3	Winch gear	35
4.3.1	Gear oil	35
4.3.2	Refilling	36
4.4	Powershift transmission	37
4.4.1	Gear oil	37
4.4.2	Refilling	37
4.5	Travel gear Multihandler 305, 310	38
4.5.1	Gear oil	38
4.6	Telehandler travel gears	38
4.6.1	Gear oil	38
4.7	Axles	38
4.7.1	Wheel hub transmission	38
4.7.2	Axle differential transmission	39
4.7.3	Countershaft transmission	39
4.8	Axle distribution gearbox 817E, MP17	39
4.8.1	Gear oil	39
4.9	Crawler travel drive	40
4.9.1	Gear oil	40
4.10	Rail drive	40
4.10.1	Gear oil	40
5	Lubricating grease	41
5.1	Central lubrication system	41
5.2	Slewing ring, roller bearings	41
5.3	Slewing ring, inner gearing	42
5.4	Slewing ring, outer gearing	43
5.5	Manual lubricating points	43
5.6	Undercarriage telescoping	44
5.7	Telescopic boom	45
5.7.1	Telescopic crane	45
5.7.2	Multihandler 305, 310	45
5.7.3	Telehandler	46
5.8	Wire ropes	46
6	Air conditioning systems and switchgear cabinet air conditioning	47
6.1	Air conditioning systems	47
6.1.1	Refrigerant	47

Table of contents

6.1.2	Refrigerant oil.....	47
6.2	Switchgear cabinet air conditioning.....	47
6.2.1	Antifreeze.....	47
7	Windshield washer systems.....	48
7.1	Antifreeze.....	48
8	Starter batteries.....	49
8.1	Battery terminal grease.....	49
8.2	Battery terminal spray.....	49

For
Reference
Only

Hydraulic systems

Hydraulic oils for material handlers > Hydraulic oils with extended change interval

1 Hydraulic systems

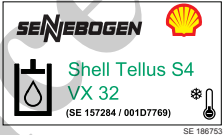
1.1 Hydraulic oils for material handlers

1.1.1 Hydraulic oils with extended change interval

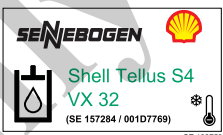
Using the following hydraulic oils can extend change intervals depending on the results of regularly conducted hydraulic oil analyses (Shell LubeAnalyst).

To extend the change interval, the machine must be equipped with SENNEBOGEN HydroClean.

Shell Tellus S4 VX 32 (for A-Series to D-Series)

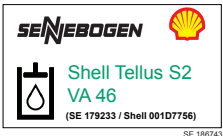
Order number	Specification	Temperature range	Sticker	Alternative
SE: 157284 Shell: 001D7769	DIN 51524-3 HVLP (ISO VG 32)	-30 to +30 °C -22 to +86 °F		Avia Syntofluid PEB 30

Shell Tellus S4 VX 32 (for E-Series)

Order number	Specification	Temperature range	Sticker	Alternative
SE: 157284 Shell: 001D7769	DIN 51524-3 HVLP (ISO VG 32)	-30 to +40 °C -22 to +104 °F		Avia Syntofluid PEB 30

Shell Tellus S2 VA 46

Factory filling - standard temperature range

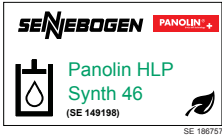
Order number	Specification	Temperature range	Sticker	Alternative
SE: 179233 Shell: 001D7756	DIN 51524 -3 HVLP -D ISO VG 46	-20 to +50 °C -4 to +122 °F		

Hydraulic systems

Hydraulic oils for material handlers > Hydraulic oils with extended change interval

Panolin HLP Synth 46

Rapidly biodegradable

Order number	Specification	Temperature range	Sticker	Alternative
SE: 149198	- ISO 15380 HEES saturated - OECD 301B	-15 to +50 °C +5 to +122 °F		Avia Syntofluid PEB 50

Avia Syntofluid PEB 30 (for A-Series to D-Series)

- Rapidly biodegradable
- Low temperature range

Order number	Specification	Temperature range	Sticker	Alternative
SE: 149199	- ISO 15380 HEPR - DIN 51524-3 HVLP-D - CEC-L-33-A-93	-30 to +30 °C -22 to +86 °F		

Avia Syntofluid PEB 30 (for E-Series)

- Rapidly biodegradable
- Low temperature range

Order number	Specification	Temperature range	Sticker	Alternative
SE: 149199	- ISO 15380 HEPR - DIN 51524-3 HVLP-D - CEC-L-33-A-93	-30 to +40 °C -22 to +104 °F		

Avia Syntofluid PEB 50

- Rapidly biodegradable
- Low temperature range

Order number	Specification	Temperature range	Sticker	Alternative
SE: 149200	- ISO 15380 HEPR - DIN 51524-3 HVLP-D - CEC-L-33-A-93	-25 to +50 °C -13 to +122 °F		

Hydraulic systems

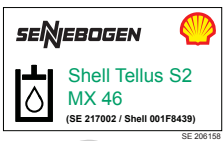
Hydraulic oils for duty cycle cranes with free-fall winches > Hydraulic oils with extended change interval

1.1.2 Hydraulic oils without an extended change interval

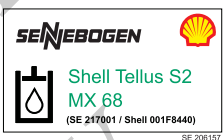
The hydraulic oils cited below can be used if there is no hydraulic oil with an extended change interval available.

When using these hydraulic oils the change interval of 2000 operating hours must be complied with.

Shell Tellus S2 MX 46

Order number	Specification	Temperature range	Sticker	Alternative
SE: 217002 Shell: 001F8439	- DIN 51524-2 HLP/ HLPD - ISO VG 46	-10 to +40 °C +14 to +104 °F		- Agip OSO-D46 - Shell Tellus S2 M 46

Shell Tellus S2 MX 68

Order number	Specification	Temperature range	Sticker	Alternative
SE: 217001 Shell: 001F8440	- DIN 51524-2 HLP/ HLPD - ISO VG 68	-5 to +50 °C +23 to +122 °F		- Agip OSO-D68 - Shell Tellus S2 M 68

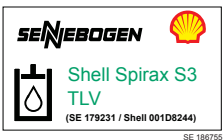
1.2 Hydraulic oils for duty cycle cranes with free-fall winches

1.2.1 Hydraulic oils with extended change interval

Using the following hydraulic oils can extend change intervals depending on the results of regularly conducted hydraulic oil analyses (Shell LubeAnalyst).

To extend the change interval, the machine must be equipped with SENNEBOGEN HydroClean.

Shell Spirax S3 TLV

Order number	Specification	Temperature range	Sticker	Alternative
SE: 179231 Shell: 001D8244	Oil-specific suitability test	-20 to +40 °C -4 to +104 °F		

Hydraulic systems

Hydraulic oils for crawler cranes, telescopic cranes, harbor cranes, duty cycle cranes without free-fall winches > Hydraulic oils with extended change interval

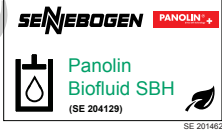
Shell Spirax S4 TXM

Factory filling - standard temperature range

Order number	Specification	Temperature range	Sticker	Alternative
SE: 179232 Shell: 001D8246	Oil-specific suitability test	-10 to +50 °C +14 to +122 °F		■ OMV Austromatic HGN ¹⁾ ■ Castrol Agri Trans Plus 80W ¹⁾
¹⁾ When using these hydraulic oils, the change interval of 2000 operating hours must be complied with.				

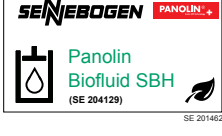
Panolin Biofluid SBH 68

Rapidly biodegradable

Order number	Specification	Temperature range	Sticker	Alternative
SE: 204129	■ ISO 15380 HEES saturated ■ Oil-specific suitability test ■ OECD 301B	-15 to +50 °C +5 to +122 °F		

Panolin Biofluid SBH 46

Rapidly biodegradable

Order number	Specification	Temperature range	Sticker	Alternative
SE: 204129	■ ISO 15380 HEES saturated ■ Oil-specific suitability test ■ OECD 301B	-20 to +40 °C -4 to +104 °F		

1.3 Hydraulic oils for crawler cranes, telescopic cranes, harbor cranes, duty cycle cranes without free-fall winches

1.3.1 Hydraulic oils with extended change interval

Using the following hydraulic oils can extend change intervals depending on the results of regularly conducted hydraulic oil analyses (Shell LubeAnalyst).

To extend the change interval, the machine must be equipped with SENNEBOGEN HydroClean.

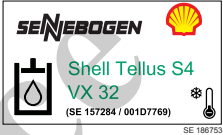
Hydraulic systems

Hydraulic oils for crawler cranes, telescopic cranes, harbor cranes, duty cycle cranes without free-fall winches > Hydraulic oils with extended change interval

Shell Tellus S4 VX 32 (for A-Series to D-Series)

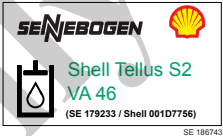
Order number	Specification	Temperature range	Sticker	Alternative
SE: 157284 Shell: 001D7769	DIN 51524-3 HVLP (ISO VG 32)	-30 to +30 °C -22 to +86 °F	 The sticker features the SENNEBOGEN logo, a Shell logo, and a drop icon. Text includes 'Shell Tellus S4 VX 32', '(SE 157284 / 001D7769)', and 'SE 186753'.	Avia Syntofluid PEB 30

Shell Tellus S4 VX 32 (for E-Series)

Order number	Specification	Temperature range	Sticker	Alternative
SE: 157284 Shell: 001D7769	DIN 51524-3 HVLP (ISO VG 32)	-30 to +40 °C -22 to +104 °F	 The sticker features the SENNEBOGEN logo, a Shell logo, and a drop icon. Text includes 'Shell Tellus S4 VX 32', '(SE 157284 / 001D7769)', and 'SE 186753'.	Avia Syntofluid PEB 30

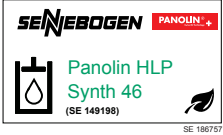
Shell Tellus S2 VA 46

Factory filling - standard temperature range

Order number	Specification	Temperature range	Sticker	Alternative
SE: 179233 Shell: 001D7756	DIN 51524 -3 HVLP -D ISO VG 46	-20 to +50 °C -4 to +122 °F	 The sticker features the SENNEBOGEN logo, a Shell logo, and a drop icon. Text includes 'Shell Tellus S2 VA 46', '(SE 179233 / Shell 001D7756)', and 'SE 186743'.	

Panolin HLP Synth 46

Rapidly biodegradable

Order number	Specification	Temperature range	Sticker	Alternative
SE: 149198	- ISO 15380 HEES saturated - OECD 301B	-15 to +50 °C +5 to +122 °F	 The sticker features the SENNEBOGEN logo, a PANOLIN logo, and a drop icon. Text includes 'Panolin HLP Synth 46', '(SE 149198)', and 'SE 186757'.	Avia Syntofluid PEB 50

Hydraulic systems

Hydraulic oils for crawler cranes, telescopic cranes, harbor cranes, duty cycle cranes without free-fall winches > Hydraulic oils without an extended change interval

Avia Syntofluid PEB 30 (for A-Series to D-Series)

- Rapidly biodegradable
- Low temperature range

Order number	Specification	Temperature range	Sticker	Alternative
SE: 149199	■ ISO 15380 HEPR ■ DIN 51524-3 HVLP-D ■ CEC-L-33-A-93	-30 to +35 °C -22 to +95 °F		

Avia Syntofluid PEB 30 (for E-Series)

- Rapidly biodegradable
- Low temperature range

Order number	Specification	Temperature range	Sticker	Alternative
SE: 149199	■ ISO 15380 HEPR ■ DIN 51524-3 HVLP-D ■ CEC-L-33-A-93	-30 to +40 °C -22 to +104 °F		

Avia Syntofluid PEB 50

- Rapidly biodegradable
- Low temperature range

Order number	Specification	Temperature range	Sticker	Alternative
SE: 149200	■ ISO 15380 HEPR ■ DIN 51524-3 HVLP-D ■ CEC-L-33-A-93	-25 to +50 °C -13 to +122 °F		

1.3.2 Hydraulic oils without an extended change interval

The hydraulic oils cited below can be used if there is no hydraulic oil with an extended change interval available.

When using these hydraulic oils the change interval of 2000 operating hours must be complied with.

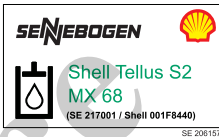
Hydraulic systems

Hydraulic oils for Multihandler 305, 310 > Hydraulic oils without an extended change interval

Shell Tellus S2 MX 46

Order number	Specification	Temperature range	Sticker	Alternative
SE: 217002 Shell: 001F8439	- DIN 51524-2 HLP/ HLPD - ISO VG 46	-10 to +40 °C +14 to +104 °F		- Agip OSO-D46 - Shell Tellus S2 M 46

Shell Tellus S2 MX 68

Order number	Specification	Temperature range	Sticker	Alternative
SE: 217001 Shell: 001F8440	- DIN 51524-2 HLP/ HLPD - ISO VG 68	-5 to +50 °C +23 to +122 °F		- Agip OSO-D68 - Shell Tellus S2 M 68

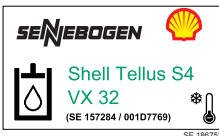
1.4 Hydraulic oils for Multihandler 305, 310

1.4.1 Hydraulic oils without an extended change interval

The hydraulic oils cited below can be used if there is no hydraulic oil with an extended change interval available.

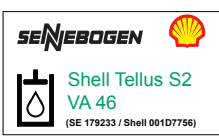
When using these hydraulic oils the change interval of 2000 operating hours must be complied with.

Shell Tellus S4 VX 32

Order number	Specification	Temperature range	Sticker	Alternative
SE: 157284 Shell: 001D7769	DIN 51524-3 HVLP (ISO VG 32)	-30 to +30 °C -22 to +86 °F		

Shell Tellus S2 VA 46

Factory filling - standard temperature range

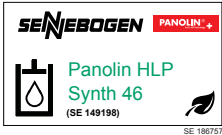
Order number	Specification	Temperature range	Sticker	Alternative
SE: 179233 Shell: 001D7756	DIN 51524 -3 HVLP -D ISO VG 46	-20 to +40 °C -4 to +104 °F		Agrip Precis HVLP-D

Hydraulic systems

Hydraulic oils for telehandlers > Hydraulic oils with extended change interval

Panolin HLP Synth 46

Rapidly biodegradable

Order number	Specification	Temperature range	Sticker	Alternative
SE: 149198	- ISO 15380 HEES saturated - OECD 301B	-15 to +40 °C +5 to +104 °F		Avia Syntofluid PEB 30

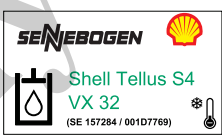
1.5 Hydraulic oils for telehandlers

1.5.1 Hydraulic oils with extended change interval

Using the following hydraulic oils can extend change intervals depending on the results of regularly conducted hydraulic oil analyses (Shell LubeAnalyst).

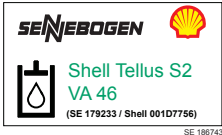
To extend the change interval, the machine must be equipped with SENNEBOGEN HydroClean.

Shell Tellus S4 VX 32

Order number	Specification	Temperature range	Sticker	Alternative
SE: 157284 Shell: 001D7769	DIN 51524-3 HVLP (ISO VG 32)	-30 to +30 °C -22 to +86 °F		Avia Syntofluid PEB 30

Shell Tellus S2 VA 46

Factory filling - standard temperature range

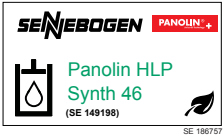
Order number	Specification	Temperature range	Sticker	Alternative
SE: 179233 Shell: 001D7756	DIN 51524 -3 HVLP -D ISO VG 46	-20 to +50 °C -4 to +122 °F		

Hydraulic systems

Hydraulic oils for Powerpacks

Panolin HLP Synth 46

Rapidly biodegradable

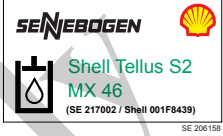
Order number	Specification	Temperature range	Sticker	Alternative
SE: 149198	- ISO 15380 HEES saturated - OECD 301B	-15 to +50 °C +5 to +122 °F		Avia Syntofluid PEB 50

1.5.2 Hydraulic oils without an extended change interval

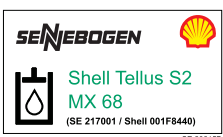
The hydraulic oils cited below can be used if there is no hydraulic oil with an extended change interval available.

When using these hydraulic oils the change interval of 2000 operating hours must be complied with.

Shell Tellus S2 MX 46

Order number	Specification	Temperature range	Sticker	Alternative
SE: 217002 Shell: 001F8439	- DIN 51524-2 HLP/HLPD - ISO VG 46	-10 to +40 °C +14 to +104 °F		- Agip OSO-D46 - Shell Tellus S2 M 46

Shell Tellus S2 MX 68

Order number	Specification	Temperature range	Sticker	Alternative
SE: 217001 Shell: 001F8440	- DIN 51524-2 HLP/HLPD - ISO VG 68	-5 to +50 °C +23 to +122 °F		- Agip OSO-D68 - Shell Tellus S2 M 68

1.6 Hydraulic oils for Powerpacks

Fill Powerpacks with the same hydraulic oil that is used in the machine's hydraulic system.

2 Diesel engines

2.1 Engine oil

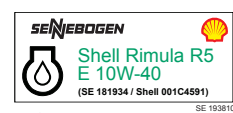
2.1.1 Caterpillar

2.1.1.1 Emissions Stage US EPA Tier 2 / EU Tier II and US EPA Tier 3 / EU Tier IIIa

Shell Rimula Ultra 5W-30¹⁾

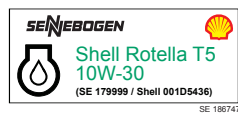
Order number	Specification	Temperature range	Sticker	Alternative
SE: 215956 Shell: 001F4540	- API CJ-4 - CAT ECF-3	-30 to +30 °C -22 to +86 °F		OMV Supertruck 5W-30
¹⁾ Comply with the fuel restrictions specified in the operating manual provided by the manufacturer of the diesel engine.				

Shell Rimula R5 E 10W-40

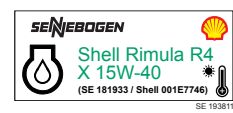
Order number	Specification	Temperature range	Sticker	Alternative
SE: 181934 Shell: 001C4591	API CI-4	-20 to +50 °C -4 to +122 °F		

Shell Rotella T5 10W-30¹⁾

Factory filling - standard temperature range

Order number	Specification	Temperature range	Sticker	Alternative
SE: 179999 Shell: 001D5436	- API CK-4 - CAT ECF-3	-20 to +50 °C -4 to +122 °F		
¹⁾ Comply with the fuel restrictions specified in the operating manual provided by the manufacturer of the diesel engine.				

Shell Rimula R4 X 15W-40

Order number	Specification	Temperature range	Sticker	Alternative
SE: 181933 Shell: 001E7746	- API CI-4 - CAT ECF-2	-10 to +50 °C +14 to +122 °F		

Diesel engines

Engine oil > Caterpillar

Panolin Ecomot 5W-30¹⁾

Rapidly biodegradable

Order number	Specification	Temperature range	Sticker	Alternative
SE: 214838	- API CJ-4 - CAT ECF-3 - OECD 302C	-30 to +50 °C -22 to +122 °F		

¹⁾ Comply with the fuel restrictions specified in the operating manual provided by the manufacturer of the diesel engine.

2.1.1.2 Emissions Stage US EPA Tier 4 interim / EU Tier IIIb

Shell Rimula Ultra 5W-30¹⁾

Order number	Specification	Temperature range	Sticker	Alternative
SE: 215956 Shell: 001F4540	- API CJ-4 - CAT ECF-3	-30 to +50 °C -22 to +122 °F		- Shell Rotella T6 5W-40 - Motorex Nexus FE 5W-30 - Eni i-Sigma top MS 5W-30

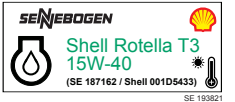
¹⁾ Comply with the fuel restrictions specified in the operating manual provided by the manufacturer of the diesel engine.

Shell Rotella T5 10W-30

Factory filling - standard temperature range

Order number	Specification	Temperature range	Sticker	Alternative
SE: 179999 Shell: 001D5436	- API CK-4 - CAT ECF-3	-20 to +50 °C -4 to +122 °F		

Shell Rotella T3 15W-40

Order number	Specification	Temperature range	Sticker	Alternative
SE: 187162 Shell: 001D5433	- API CJ-4 - CAT ECF-3	-10 to +50 °C +14 to +122 °F		

Panolin Ecomot 5W-30

Rapidly biodegradable

Order number	Specification	Temperature range	Sticker	Alternative
SE: 214838	- API CJ-4 - CAT ECF-3 - OECD 302C	-30 to +50 °C -22 to +122 °F		

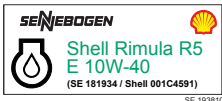
2.1.2 Cummins

2.1.2.1 Emissions Stage US EPA Tier 2 / EU Tier II and US EPA Tier 3 / EU Tier IIIa

Shell Rimula Ultra 5W-30¹⁾

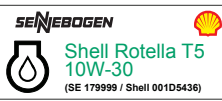
Order number	Specification	Temperature range	Sticker	Alternative
SE: 215956 Shell: 001F4540	- API CJ-4 - Cummins CES 20081	-30 to +30 °C -22 to +86 °F		OMV Supertruck 5W-30
¹⁾ Comply with the fuel restrictions specified in the operating manual provided by the manufacturer of the diesel engine.				

Shell Rimula R5 E 10W-40

Order number	Specification	Temperature range	Sticker	Alternative
SE: 181934 Shell: 001C4591	- API CI-4 - Cummins CES 20078	-20 to +50 °C -4 to +122 °F		

Shell Rotella T5 10W-30¹⁾

Factory filling - standard temperature range

Order number	Specification	Temperature range	Sticker	Alternative
SE: 179999 Shell: 001D5436	- API CJ-4 - API CK-4 - Cummins CES 20086	-20 to +50 °C -4 to +122 °F		
¹⁾ Comply with the fuel restrictions specified in the operating manual provided by the manufacturer of the diesel engine.				

Diesel engines

Engine oil > Cummins

Shell Rimula R4 X 15W-40

Order number	Specification	Temperature range	Sticker	Alternative
SE: 181933 Shell: 001E7746	- API CI-4 - Cummins CES 20078	-10 to +50 °C +14 to +122 °F		

Panolin Ecomot 5W-30¹⁾

Rapidly biodegradable

Order number	Specification	Temperature range	Sticker	Alternative
SE: 214838	- API CJ-4 - OECD 302C - Performance level Cummins CES 20081	-30 to +50 °C -22 to +122 °F		
¹⁾ Comply with the fuel restrictions specified in the operating manual provided by the manufacturer of the diesel engine.				

2.1.2.2 Emissions Stage US EPA Tier 4 interim / EU Tier IIIb

Shell Rimula Ultra 5W-30

Order number	Specification	Temperature range	Sticker	Alternative
SE: 215956 Shell: 001F4540	- API CJ-4 - Cummins CES 20081	-30 to +50 °C -22 to +122 °F		- Shell Rotella T6 5W-40 - Motorex Nexus FE 5W-30

Shell Rotella T5 10W-30

Factory filling - standard temperature range

Order number	Specification	Temperature range	Sticker	Alternative
SE: 179999 Shell: 001D5436	- API CK-4 - Cummins CES 20086	-20 to +50 °C -4 to +122 °F		

Shell Rotella T3 15W-40

Order number	Specification	Temperature range	Sticker	Alternative
SE: 187162 Shell: 001D5433	- API CK-4 - Cummins CES 20086	-10 to +50 °C +14 to +122 °F		

Diesel engines

Engine oil > Cummins

Panolin Ecomot 5W-30

Rapidly biodegradable

Order number	Specification	Temperature range	Sticker	Alternative
SE: 214838	- API CJ-4 - OECD 302C - Performance level Cummins CES 20081	-30 to +50 °C -22 to +122 °F		

2.1.2.3 Emissions Stage US EPA Tier 4 final / EU Tier V

Shell Rimula Ultra 5W-30

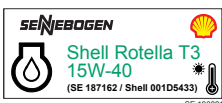
Order number	Specification	Temperature range	Sticker	Alternative
SE: 215956 Shell: 001F4540	- API CJ-4 - Cummins CES 20081	-30 to +50 °C -22 to +122 °F		Shell Rotella T6 5W-40

Shell Rotella T5 10W-30

Factory filling - standard temperature range

Order number	Specification	Temperature range	Sticker	Alternative
SE: 179999 Shell: 001D5436	- API CK-4 - Cummins CES 20086	-20 to +50 °C -4 to +122 °F		

Shell Rotella T3 15W-40

Order number	Specification	Temperature range	Sticker	Alternative
SE: 187162 Shell: 001D5433	- API CK-4 - Cummins CES 20086	-10 to +50 °C +14 to +122 °F		

Panolin Ecomot 5W-30

Rapidly biodegradable

Order number	Specification	Temperature range	Sticker	Alternative
SE: 214838	- API CJ-4 - OECD 302C - Performance level Cummins CES 20081	-30 to +50 °C -22 to +122 °F		

Diesel engines

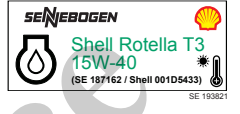
Engine oil > Cummins

2.1.2.4 Emissions Stage US EPA Tier 4 final / EU Tier IV with extended oil change interval

Shell Rimula Ultra 5W-30

Order number	Specification	Temperature range	Sticker	Alternative
SE: 215956 Shell: 001F4540	- API CJ-4 - Cummins CES 20081	-30 to +50 °C -22 to +122 °F		- Shell Rotella T6 5W-40 - Motorex Nexus FE 5W-30

Shell Rotella T3 15W-40¹⁾

Order number	Specification	Temperature range	Sticker	Alternative
SE: 187162 Shell: 001D5433	- API CK-4 - Cummins CES 20086	-10 to +50 °C +14 to +122 °F		

¹⁾ Observe the instructions in the operating manual.

Shell Rotella T5 10W-30¹⁾

Factory filling - standard temperature range

Order number	Specification	Temperature range	Sticker	Alternative
SE: 179999 Shell: 001D5436	- API CK-4 - Cummins CES 20086	-20 to +50 °C -4 to +122 °F		

¹⁾ Observe the instructions in the operating manual.

Panolin Ecomot 5W-30

Rapidly biodegradable

Order number	Specification	Temperature range	Sticker	Alternative
SE: 214838	- API CJ-4 - OECD 302C - Performance level Cummins CES 20081	-30 to +50 °C -22 to +122 °F		

2.1.2.5 Emissions Stage US EPA Tier 4 final / EU Tier V with extended oil change interval

Shell Rimula Ultra 5W-30

Order number	Specification	Temperature range	Sticker	Alternative
SE: 215956 Shell: 001F4540	- API CJ-4 - Cummins CES 20081	-30 to +50 °C -22 to +122 °F		Shell Rotella T6 5W-40

Diesel engines

Engine oil > FPT

Shell Rotella T3 15W-40¹⁾

Order number	Specification	Temperature range	Sticker	Alternative
SE: 187162 Shell: 001D5433	- API CK-4 - Cummins CES 20086	-10 to +50 °C +14 to +122 °F		
¹⁾ Observe the instructions in the operating manual.				

Shell Rotella T5 10W-30¹⁾

Factory filling - standard temperature range

Order number	Specification	Temperature range	Sticker	Alternative
SE: 179999 Shell: 001D5436	- API CK-4 - Cummins CES 20086	-20 to +50 °C -4 to +122 °F		
¹⁾ Observe the instructions in the operating manual.				

Panolin Ecomot 5W-30

Rapidly biodegradable

Order number	Specification	Temperature range	Sticker	Alternative
SE: 214838	- API CJ-4 - OECD 302C - Performance level Cummins CES 20081	-30 to +50 °C -22 to +122 °F		

2.1.3 FPT

2.1.3.1 Emissions Stage US EPA Tier 3 / EU Tier IIIa

Shell Rimula Ultra 5W-30¹⁾

Order number	Specification	Temperature range	Sticker	Alternative
SE: 215956 Shell: 001F4540	API CJ-4	-30 to +30 °C -22 to +86 °F		OMV Supertruck 5W-30
¹⁾ Comply with the fuel restrictions specified in the operating manual provided by the manufacturer of the diesel engine.				

Diesel engines

Engine oil > FPT

Shell Rimula R5 E 10W-40

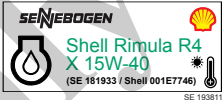
Order number	Specification	Temperature range	Sticker	Alternative
SE: 181934 Shell: 001C4591	■ API CI-4	-20 to +50 °C -4 to +122 °F		

Shell Rotella T5 10W-30¹⁾

Factory filling - standard temperature range

Order number	Specification	Temperature range	Sticker	Alternative
SE: 179999 Shell: 001D5436	■ API CK-4	-20 to +50 °C -4 to +122 °F		
¹⁾ Comply with the fuel restrictions specified in the operating manual provided by the manufacturer of the diesel engine.				

Shell Rimula R4 X 15W-40

Order number	Specification	Temperature range	Sticker	Alternative
SE: 181933 Shell: 001E7746	■ API CI-4	-10 to +50 °C +14 to +122 °F		

Panolin Ecomot 5W-30¹⁾

Rapidly biodegradable

Order number	Specification	Temperature range	Sticker	Alternative
SE: 214838	■ API CJ-4 ■ OECD 302C	-30 to +50 °C -22 to +122 °F		
¹⁾ Comply with the fuel restrictions specified in the operating manual provided by the manufacturer of the diesel engine.				

Diesel engines

Engine oil > Deutz

2.1.3.2 Emissions Stage US EPA Tier 4 final / EU Tier IV / EU Tier V

Shell Rimula Ultra 5W-30

Order number	Specification	Temperature range	Sticker	Alternative
SE: 215956 Shell: 001F4540	- API CJ-4 - ACEA E9	-30 to +50 °C -22 to +122 °F		- Shell Rotella T6 5W-40 - Motorex Nexus FE 5W-30

Shell Rotella T5 10W-30

Factory filling - standard temperature range

Order number	Specification	Temperature range	Sticker	Alternative
SE: 179999 Shell: 001D5436	- API CJ-4 - API CK-4 - ACEA E9	-20 to +50 °C -4 to +122 °F		

Shell Rotella T3 15W-40

Order number	Specification	Temperature range	Sticker	Alternative
SE: 187162 Shell: 001D5433	- API CJ-4 - ACEA E9	-10 to +50 °C +14 to +122 °F		

Panolin Ecomot 5W-30

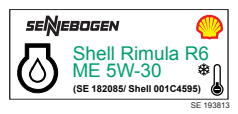
Rapidly biodegradable

Order number	Specification	Temperature range	Sticker	Alternative
SE: 214838	- API CJ-4 - OECD 302C	-30 to +50 °C -22 to +122 °F		

2.1.4 Deutz

2.1.4.1 Emissions Stage US EPA Tier 2 / EU Tier II and US EPA Tier 3 / EU Tier IIIa

Shell Rimula R6 ME 5W-30

Order number	Specification	Temperature range	Sticker	Alternative
SE: 182085 Shell: 001C4595	Deutz DQC IV-10	-30 to +30 °C -22 to +86 °F		OMV Supertruck SAE 5W-30

Diesel engines

Engine oil > Deutz

Shell Rimula R6 MS 10W-40

Order number	Specification	Temperature range	Sticker	Alternative
SE: 181936 Shell: 001E7457	- Deutz DQC IV-10 - ACEA E7	-20 to +50 °C -4 to +122 °F		OMV Supertruck SAE 10W-40

Shell Rotella T5 10W-30¹⁾

Factory filling - standard temperature range

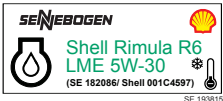
Order number	Specification	Temperature range	Sticker	Alternative
SE: 179999 Shell: 001D5436	- API CK-4 - Deutz DQC III-10 LA	-20 to +50 °C -4 to +122 °F		
¹⁾ Comply with the fuel restrictions specified in the operating manual provided by the manufacturer of the diesel engine.				

Shell Rimula R4 X 15W-40

Order number	Specification	Temperature range	Sticker	Alternative
SE: 181933 Shell: 001E7746	- API CI-4 - Deutz DQC III-10	-10 to +50 °C +14 to +122 °F		

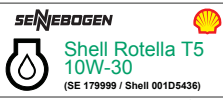
2.1.4.2 Emissions Stage US EPA Tier 4 interim / EU Tier IIIb

Shell Rimula R6 LME 5W-30

Order number	Specification	Temperature range	Sticker	Alternative
SE: 182086 Shell: 001C4597	- ACEA E7 - Deutz DQC IV-10 LA	-30 to +30 °C -22 to +86 °F		Motorex Nexus FE 5W-30 Eni i-Sigma top MS 5W-30

Shell Rotella T5 10W-30

Factory filling - standard temperature range

Order number	Specification	Temperature range	Sticker	Alternative
SE: 179999 Shell: 001D5436	- API CK-4 - Deutz DQC III-10 LA	-20 to +50 °C -4 to +122 °F		

Diesel engines

Engine oil > Scania

Shell Rimula R6 MS 10W-40

Order number	Specification	Temperature range	Sticker	Alternative
SE: 181936 Shell: 001E7457	- Deutz DQC IV-10 - ACEA E7	-20 to +50 °C -4 to +122 °F		OMV Supertruck SAE 10W-40

Shell Rotella T3 15W-40

Order number	Specification	Temperature range	Sticker	Alternative
SE: 187162 Shell: 001D5433	- API CJ-4 - Deutz DQC III-10 LA	-10 to +50 °C +14 to +122 °F		

2.1.5 Scania

2.1.5.1 Emissions Stage US EPA Tier 3 / EU Tier IIIa

OMV Super Truck SAE 5W-30

Order number	Specification	Temperature range	Sticker	Alternative
SE: 124846	- API CI-4 - ACEA E7 - Scania LDF	-30 to +30 °C -22 to +86 °F		

Shell Rimula R6 MS 10W-40

Factory filling - standard temperature range

Order number	Specification	Temperature range	Sticker	Alternative
SE: 181936 Shell: 001E7457	- ACEA E7 - Scania LDF-3	-20 to +50 °C -4 to +122 °F		OMV Supertruck SAE 10W-40

2.1.5.2 Emissions Stage US EPA Tier 4 interim / EU Tier IIlb

Shell Rimula R6 LME 5W-30

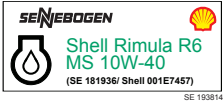
Order number	Specification	Temperature range	Sticker	Alternative
SE: 182086 Shell: 001C4597	- ACEA E7 - Scania LA	-30 to +30 °C -22 to +86 °F		

Diesel engines

Engine oil > Diesel emergency generator

Shell Rimula R6 MS 10W-40

Factory filling - standard temperature range

Order number	Specification	Temperature range	Sticker	Alternative
SE: 181936 Shell: 001E7457	■ ACEA E7 ■ Scania LDF-3	-20 to +50 °C -4 to +122 °F		OMV Supertruck SAE 10W-40

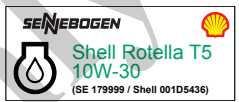
2.1.5.3 Emissions Stage US EPA Tier 4 final / EU Tier V

Shell Rimula Ultra 5W-30

Order number	Specification	Temperature range	Sticker	Alternative
SE: 215956 Shell: 001F4540	■ API CJ-4 ■ ACEA E9 ■ Scania LDF-4	-30 to +50 °C -22 to +122 °F		

Shell Rotella T5 10W-30

Factory filling - standard temperature range

Order number	Specification	Temperature range	Sticker	Alternative
SE: 179999 Shell: 001D5436	■ API CK-4 ■ Scania LDF-4	-20 to +50 °C -4 to +122 °F		

2.1.6 Diesel emergency generator

All diesel engine oils in this list are compatible.

🔗 Chapter 2.1 "Engine oil" on page 17

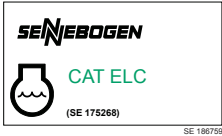


Observe the respective temperature range when using engine oil.

2.2 Coolant

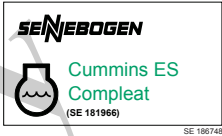
2.2.1 Caterpillar

CAT ELC

Order number	Specification	Temperature range	Sticker	Alternative
SE: 175268	CAT ELC	Mixing ratio for coolant concentrate/water 50/50: Up to -37 °C (-34 °F) 60/40: Up to -52 °C (-61 °F)		
Use a coolant with a mixing ratio of at least 50/50 all year round. Do not exceed a mixing ratio of 60/40.				

2.2.2 Cummins

Cummins ES Compleat

Order number	Specification	Temperature range	Sticker	Alternative
SE: 181966	Cummins CES 14603	Mixing ratio Coolant concentrate/water 50/50: Up to -37 °C (-34 °F) 60/40: Up to -52 °C (-61 °F)		Cummins CES 14603
Use a coolant with a mixing ratio of at least 50/50 all year round. Do not exceed a mixing ratio of 60/40.				

Senprotect

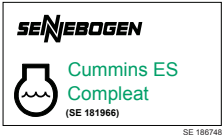
Order number	Specification	Temperature range	Sticker	Alternative
SE: 187301	Cummins CES 14603	Mixing ratio Coolant concentrate/water 50/50: Up to -37 °C (-34 °F) 60/40: Up to -52 °C (-61 °F)	--	Cummins CES 14603
Use a coolant with a mixing ratio of at least 50/50 all year round. Do not exceed a mixing ratio of 60/40.				

Diesel engines

Coolant > Scania

2.2.3 FPT

Cummins ES Compleat

Order number	Specification	Temperature range	Sticker	Alternative
SE: 181966	Cummins CES 14603	Mixing ratio Coolant concentrate/water 50/50: Up to -37 °C (-34 °F) 60/40: Up to -52 °C (-61 °F)		Cummins CES 14603
Use a coolant with a mixing ratio of at least 50/50 all year round. Do not exceed a mixing ratio of 60/40.				

Senprotect

Order number	Specification	Temperature range	Sticker	Alternative
SE: 187301	Cummins CES 14603	Mixing ratio Coolant concentrate/water 50/50: Up to -37 °C (-34 °F) 60/40: Up to -52 °C (-61 °F)	--	Cummins CES 14603
Use a coolant with a mixing ratio of at least 50/50 all year round. Do not exceed a mixing ratio of 60/40.				

2.2.4 Scania

Scania (Ready Mix)

Order number	Specification	Temperature range	Sticker	Alternative
SE: 182087	Scania	Mixing ratio for coolant concentrate/water 50/50: Up to -37 °C (-34 °F) 60/40: Up to -52 °C (-61 °F)		
Use a coolant with a mixing ratio of at least 50/50 all year round. Do not exceed a mixing ratio of 60/40.				

2.3 Fuels

2.3.1 Emissions Stage US EPA Tier 2 / EU Tier II and US EPA Tier 3 / EU Tier IIIa

Diesel fuel with high sulfur content

Order number	Specification	Temperature range	Sulfur content
-	■ Diesel fuel DIN EN 590 ■ ASTM D975 LSD 1D, 2D	-	≤ 500 mg/kg
Comply with the instructions concerning fuel in the operating manuals provided by the manufacturers of the diesel engines.			

2.3.2 Emissions Stage US EPA Tier 4 interim / EU Tier IIIb

Diesel fuel with low sulfur content

Order number	Specification	Temperature range	Sulfur content
-	■ Diesel fuel DIN EN 590 ■ ASTM D975 ULSD 1D, 2D	-	≤ 15 mg/kg
Comply with the instructions concerning fuel in the operating manuals provided by the manufacturers of the diesel engines.			

2.3.3 Emissions Stage US EPA Tier 4 final / EU Tier IV / EU Tier V

Diesel fuel with low sulfur content

Order number	Specification	Temperature range	Sulfur content
-	■ Diesel fuel DIN EN 590 ■ ASTM D975 ULSD 1D, 2D	-	≤ 15 mg/kg
Comply with the instructions concerning fuel in the operating manuals provided by the manufacturers of the diesel engines.			

Diesel engines

DEF, diesel exhaust fluid for US EPA Tier 4 final / EU Tier IV diesel engines

2.4 Diesel flow improvers

Fuchs Maintain Winterfit

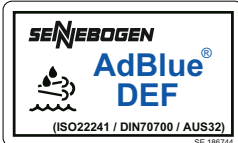
Order number	Specification	Temperature range	Mixing ratio			Alternative
SE: 180464	MB 137.1 BMW BG 13	-31 to -10 °C -23.8 to +14 °F	Summer			
			1:1000	-10 °C	14 °F	
			2:1000	-18 °C	0 °F	
			3:1000	-23 °C	-10 °F	
			4:1000	-25 °C	-13 °F	
			Winter			
			1:1000	-25 °C	-13 °F	
			2:1000	-28 °C	-18 °F	
			3:1000	-31 °C	-24 °F	

AUTOL TP 10

Order number	Specification	Temperature range	Sticker	Alternative
SE: 182173	■ MB 137.1 ■ BMW BG 13		—	

2.5 DEF, diesel exhaust fluid for US EPA Tier 4 final / EU Tier IV diesel engines

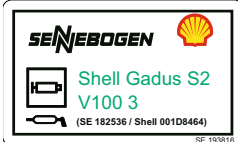
DEF

Order number	Specification	Temperature range	Sticker	Alternative
SE: 149060	■ ISO 22241 ■ DIN 70070 ■ AUS 32	-10 to +30 °C -14 to +86 °F		

3 Electric motors

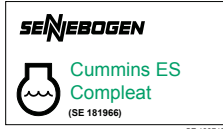
3.1 Lubrication

Shell Gadus S2 V100 3

Order number	Specification	Temperature range	Sticker	Alternative
SE: 182536 Shell: 001D8464	■ DIN 51825 K3K-30 ■ NLGI 3	-30 to +50 °C -22 to +122 °F		■ Esso UNIREX N3

3.2 Coolant - heating circuit

Cummins ES Compleat

Order number	Specification	Temperature range	Sticker	Alternative
SE: 181966	Cummins CES 14603	Mixing ratio Coolant concentrate/water ■ 50/50: Up to -37 °C (-34 °F) ■ 60/40: Up to -52 °C (-61 °F)		Cummins CES 14603
Use a coolant with a mixing ratio of at least 50/50 all year round. Do not exceed a mixing ratio of 60/40.				

Senprotect

Order number	Specification	Temperature range	Sticker	Alternative
SE: 187301	Cummins CES 14603	Mixing ratio Coolant concentrate/water ■ 50/50: Up to -37 °C (-34 °F) ■ 60/40: Up to -52 °C (-61 °F)	--	Cummins CES 14603
Use a coolant with a mixing ratio of at least 50/50 all year round. Do not exceed a mixing ratio of 60/40.				

Gearbox

Slewing gear box > Lubricating grease - roller bearings

4 Gearbox

4.1 Slewing gear box

4.1.1 Gear oil

Shell Omala S4 GXV 220

Order number	Specification	Temperature range	Sticker	Alternative
SE: 179227 Shell: 001F8458	- CLP HC (PAO) 220 - DIN 51517 T3	-30 to +50 °C -22 to +122 °F		- OMV gear oil SHG 220 - Castrol Alphasyn EP 220

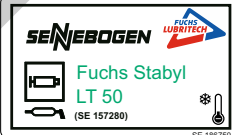
Panolin EP Gear Synth 220

Rapidly biodegradable

Order number	Specification	Temperature range	Sticker	Alternative
SE: 214837	- CLP - DIN 51517 - OECD 301B	-30 to +50 °C -22 to +122 °F	-	

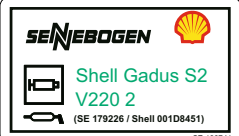
4.1.2 Lubricating grease - roller bearings

Fuchs Stabyl LT 50

Order number	Specification	Temperature range	Sticker	Alternative
SE: 157280	- DIN 51502 - KPHC2N-50 - NLGI 2	-30 to +50 °C -22 to +122 °F		Avia Grease PE Polar

Shell Gadus S2 V220 2

Factory filling - standard temperature range

Order number	Specification	Temperature range	Sticker	Alternative
SE: 179226 Shell: 001D8451	- DIN 51502 - KP2K-20 - NLGI 2	-20 to +50 °C -4 to +122 °F		- OMV Signum CX 2 - AUTOL TOP 2000 - Castrol Olit 2 EP

Panolin Biogrease EP2

Rapidly biodegradable

Order number	Specification	Temperature range	Sticker	Alternative
SE: 214840	- DIN 51502 KPE2K-30 - NLGI 2 - OECD 301B	-25 to +50 °C -13 to +122 °F		- Avia Syntogrease 2 - BP Biogrease EP 2 - OMV Signum BD 2

4.2 Pump distributor gearbox

4.2.1 Gear oil

Shell Omala S4 GXV 220

Order number	Specification	Temperature range	Sticker	Alternative
SE: 179227 Shell: 001F8458	- CLP HC (PAO) 220 - DIN 51517 T3	-30 to +50 °C -22 to +122 °F		- OMV gear oil SHG 220 - Castrol Alphasyn EP 220

Panolin EP Gear Synth 220

Rapidly biodegradable

Order number	Specification	Temperature range	Sticker	Alternative
SE: 214837	- CLP - DIN 51517 - OECD 301B	-30 to +50 °C -22 to +122 °F	-	

4.3 Winch gear

4.3.1 Gear oil

Shell Omala S4 GXV 220

Order number	Specification	Temperature range	Sticker	Alternative
SE: 179227 Shell: 001F8458	- CLP HC (PAO) 220 - DIN 51517 T3	-30 to +50 °C -22 to +122 °F		- OMV gear oil SHG 220 - Castrol Alphasyn EP 220

Gearbox

Winch gear > Refilling

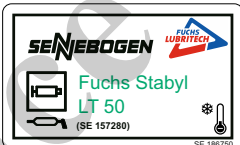
Panolin EP Gear Synth 220

Rapidly biodegradable

Order number	Specification	Temperature range	Sticker	Alternative
SE: 214837	- CLP - DIN 51517 - OECD 301B	-30 to +50 °C -22 to +122 °F	-	

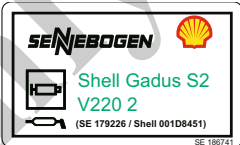
4.3.2 Refilling

Fuchs Stabyl LT 50

Order number	Specification	Temperature range	Sticker	Alternative
SE: 157280	- DIN 51502 - KPHC2N-50 - NLGI 2	-30 to +50 °C -22 to +122 °F		Avia Grease PE Polar

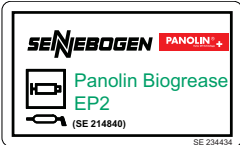
Shell Gadus S2 V220 2

Factory filling - standard temperature range

Order number	Specification	Temperature range	Sticker	Alternative
SE: 179226 Shell: 001D8451	- DIN 51502 - KP2K-20 - NLGI 2	-20 to +50 °C -4 to +122 °F		- OMV Signum CX 2 - AUTOL TOP 2000 - Castrol Olii 2 EP

Panolin Biogrease EP2

Rapidly biodegradable

Order number	Specification	Temperature range	Sticker	Alternative
SE: 214840	- DIN 51502 KPE2K-30 - NLGI 2 - OECD 301B	-25 to +50 °C -13 to +122 °F		- Avia Syntogrease 2 - BP Biogrease EP 2 - OMV Signum BD 2

4.4 Powershift transmission

4.4.1 Gear oil

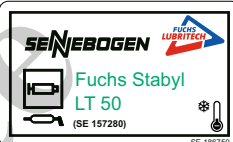
Fill power shift transmission with diesel engine oil.

☞ Chapter 2.1 "Engine oil" on page 17

They do not apply to axle distribution gearboxes 817E, MP17.

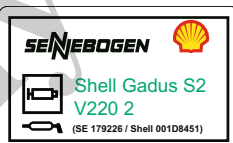
4.4.2 Refilling

Fuchs Stabyl LT 50

Order number	Specification	Temperature range	Sticker	Alternative
SE: 157280	- DIN 51502 - KPHC2N-50 - NLGI 2	-30 to +50 °C -22 to +122 °F		Avia Grease PE Polar

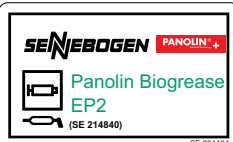
Shell Gadus S2 V220 2

Factory filling - standard temperature range

Order number	Specification	Temperature range	Sticker	Alternative
SE: 179226 Shell: 001D8451	- DIN 51502 - KP2K-20 - NLGI 2	-20 to +50 °C -4 to +122 °F		- OMV Signum CX 2 - AUTOL TOP 2000 - Castrol Olit 2 EP

Panolin Biogrease EP2

Rapidly biodegradable

Order number	Specification	Temperature range	Sticker	Alternative
SE: 214840	- DIN 51502 KPE2K-30 - NLGI 2 - OECD 301B	-25 to +50 °C -13 to +122 °F		- Avia Syntogrease 2 - BP Biogrease EP 2 - OMV Signum BD 2

Gearbox

Axles > Wheel hub transmission

4.5 Travel gear Multihandler 305, 310

4.5.1 Gear oil

Shell Spirax S3 ALS 80W-90

Order number	Specification	Temperature range	Sticker	Alternative
SE: 179230 Shell: 001D8843	■ API GL5 LS ■ ZF-TE ML-05 C¹⁾	-30 to +40 °C -22 to +104 °F		■ Eni ROTRA MP/S 85W-90 ■ Castrol Axle Z Limited Slip 85W-90 ■ OMV gear oil LS SAE 85W-90

¹ In addition, the gear oils of the lubricant classes F, G, H of the ZF-TE ML-05 can be used.

4.6 Telehandler travel gears

4.6.1 Gear oil

Shell Spirax S3 ALS 80W-90

Order number	Specification	Temperature range	Sticker	Alternative
SE: 179230 Shell: 001D8843	■ API GL5 LS ■ ZF-TE ML-05 C¹⁾	-30 to +40 °C -22 to +104 °F		■ Eni ROTRA MP/S 85W-90 ■ Castrol Axle Z Limited Slip 85W-90 ■ OMV gear oil LS SAE 85W-90

¹ In addition, the gear oils of the lubricant classes F, G, H of the ZF-TE ML-05 can be used.

4.7 Axles

4.7.1 Wheel hub transmission

4.7.1.1 Gear oil

Shell Spirax S3 ALS 80W-90

Order number	Specification	Temperature range	Sticker	Alternative
SE: 179230 Shell: 001D8843	■ API GL5 LS ■ ZF-TE ML-05 C¹⁾	-30 to +50 °C -22 to +122 °F		■ Eni ROTRA MP/S 85W-90 ■ Castrol Axle Z Limited Slip 85W-90 ■ OMV gear oil LS SAE 85W-90

¹⁾ In addition, the gear oils of the lubricant classes F, G, H of the ZF-TE ML-05 can be used.

4.7.2 Axle differential transmission

4.7.2.1 Gear oil

Shell Spirax S3 ALS 80W-90

Order number	Specification	Temperature range	Sticker	Alternative
SE: 179230 Shell: 001D8843	- API GL5 LS - ZF-TE ML-05 C¹⁾	-30 to +50 °C -22 to +122 °F		- Eni ROTRA MP/S 85W-90 - Castrol Axle Z Limited Slip 85W-90 - OMV gear oil LS SAE 85W-90

¹⁾ In addition, the gear oils of the lubricant classes F, G, H of the ZF-TE ML-05 can be used.

4.7.3 Countershaft transmission

4.7.3.1 Gear oil

Shell Spirax S3 ALS 80W-90

Order number	Specification	Temperature range	Sticker	Alternative
SE: 179230 Shell: 001D8843	- API GL5 LS - ZF-TE ML-05 C¹⁾	-30 to +50 °C -22 to +122 °F		- Eni ROTRA MP/S 85W-90 - Castrol Axle Z Limited Slip 85W-90 - OMV gear oil LS SAE 85W-90

¹⁾ In addition, the gear oils of the lubricant classes F, G, H of the ZF-TE ML-05 can be used.

4.7.3.2 Hydraulic oil - parking brake

Fill parking brake with the same hydraulic oil that is used in the machine's hydraulic system.

🔗 Chapter 1 "Hydraulic systems" on page 8

4.8 Axle distribution gearbox 817E, MP17

4.8.1 Gear oil

Shell Spirax S3 ALS 80W-90

Order number	Specification	Temperature range	Sticker	Alternative
SE: 179230 Shell: 001D8843	- API GL5 LS - ZF-TE ML-05 C¹⁾	-30 to +50 °C -22 to +122 °F		- Eni ROTRA MP/S 85W-90 - Castrol Axle Z Limited Slip 85W-90 - OMV gear oil LS SAE 85W-90

¹⁾ In addition, the gear oils of the lubricant classes F, G, H of the ZF-TE ML-05 can be used.

Gearbox

Rail drive > Gear oil

4.9 Crawler travel drive

4.9.1 Gear oil

Shell Omala S4 GXV 220

Order number	Specification	Temperature range	Sticker	Alternative
SE: 179227 Shell: 001F8458	- CLP HC (PAO) 220 - DIN 51517 T3	-30 to +50 °C -22 to +122 °F		- OMV gear oil SHG 220 - Castrol Alphasyn EP 220

Panolin EP Gear Synth 220

Rapidly biodegradable

Order number	Specification	Temperature range	Sticker	Alternative
SE: 214837	- CLP - DIN 51517 - OECD 301B	-30 to +50 °C -22 to +122 °F	-	

4.10 Rail drive

4.10.1 Gear oil

Shell Omala S4 GXV 220

Order number	Specification	Temperature range	Sticker	Alternative
SE: 179227 Shell: 001F8458	- CLP HC (PAO) 220 - DIN 51517 T3	-30 to +50 °C -22 to +122 °F		- OMV gear oil SHG 220 - Castrol Alphasyn EP 220

Panolin EP Gear Synth 220

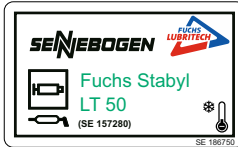
Rapidly biodegradable

Order number	Specification	Temperature range	Sticker	Alternative
SE: 214837	- CLP - DIN 51517 - OECD 301B	-30 to +50 °C -22 to +122 °F	-	

5 Lubricating grease

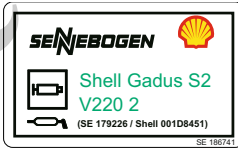
5.1 Central lubrication system

Fuchs Stabyl LT 50

Order number	Specification	Temperature range	Sticker	Alternative
SE: 157280	- DIN 51502 - KPHC2N-50 - NLGI 2	-30 to +50 °C -22 to +122 °F		Avia Grease PE Polar

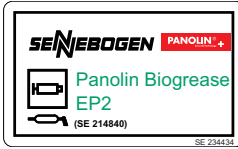
Shell Gadus S2 V220 2

Factory filling - standard temperature range

Order number	Specification	Temperature range	Sticker	Alternative
SE: 179226 Shell: 001D8451	- DIN 51502 - KP2K-20 - NLGI 2	-20 to +50 °C -4 to +122 °F		- OMV Signum CX 2 - AUTOL TOP 2000 - Castrol Oliit 2 EP

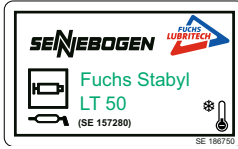
Panolin Biogrease EP2

Rapidly biodegradable

Order number	Specification	Temperature range	Sticker	Alternative
SE: 214840	- DIN 51502 KPE2K-30 - NLGI 2 - OECD 301B	-25 to +50 °C -13 to +122 °F		- Avia Syntogrease 2 - BP Biogrease EP 2 - OMV Signum BD 2

5.2 Slewing ring, roller bearings

Fuchs Stabyl LT 50

Order number	Specification	Temperature range	Sticker	Alternative
SE: 157280	- DIN 51502 - KPHC2N-50 - NLGI 2	-30 to +50 °C -22 to +122 °F		Avia Grease PE Polar

Lubricating grease

Slewing ring, inner gearing

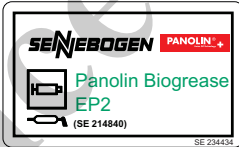
Shell Gadus S2 V220 2

Factory filling - standard temperature range

Order number	Specification	Temperature range	Sticker	Alternative
SE: 179226 Shell: 001D8451	- DIN 51502 - KP2K-20 - NLGI 2	-20 to +50 °C -4 to +122 °F		- OMV Signum CX 2 - AUTOL TOP 2000 - Castrol Olit 2 EP

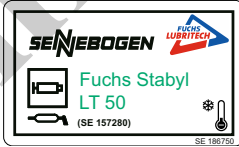
Panolin Biogrease EP2

Rapidly biodegradable

Order number	Specification	Temperature range	Sticker	Alternative
SE: 214840	- DIN 51502 KPE2K-30 - NLGI 2 - OECD 301B	-25 to +50 °C -13 to +122 °F		- Avia Syntogrease 2 - BP Biogrease EP 2 - OMV Signum BD 2

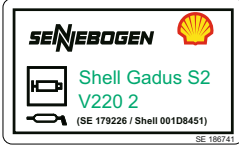
5.3 Slewing ring, inner gearing

Fuchs Stabyl LT 50

Order number	Specification	Temperature range	Sticker	Alternative
SE: 157280	- DIN 51502 - KPHC2N-50 - NLGI 2	-30 to +50 °C -22 to +122 °F		Avia Grease PE Polar

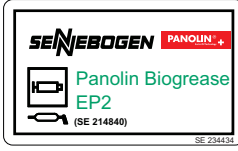
Shell Gadus S2 V220 2

Factory filling - standard temperature range

Order number	Specification	Temperature range	Sticker	Alternative
SE: 179226 Shell: 001D8451	- DIN 51502 - KP2K-20 - NLGI 2	-20 to +50 °C -4 to +122 °F		- OMV Signum CX 2 - AUTOL TOP 2000 - Castrol Olit 2 EP

Panolin Biogrease EP2

Rapidly biodegradable

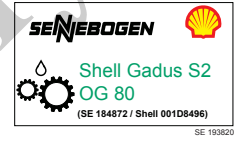
Order number	Specification	Temperature range	Sticker	Alternative
SE: 214840	- DIN 51502 KPE2K-30 - NLGI 2 - OECD 301B	-25 to +50 °C -13 to +122 °F		- Avia Syntogrease 2 - BP Biogrease EP 2 - OMV Signum BD 2

5.4 Slewing ring, outer gearing

Fuchs Ceplattyn KG 10 HMF - LT

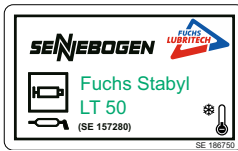
Order number	Specification	Temperature range	Sticker	Alternative
SE: 156982	- DIN 51502 - OGPF00N-50 - NLGI 00	-30 to +50 °C -22 to +122 °F		

Shell Gadus S2 OG 80

Order number	Specification	Temperature range	Sticker	Alternative
SE: 184872 Shell: 001D8496	- DIN 51502-OGPF0S-30 - NLGI 0	-20 to +50 °C -4 to +122 °F		OKS 490

5.5 Manual lubricating points

Fuchs Stabyl LT 50

Order number	Specification	Temperature range	Sticker	Alternative
SE: 157280	- DIN 51502 - KPHC2N-50 - NLGI 2	-30 to +50 °C -22 to +122 °F		Avia Grease PE Polar

Lubricating grease

Undercarriage telescoping

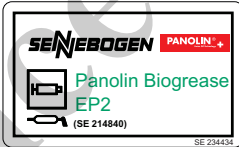
Shell Gadus S2 V220 2

Factory filling - standard temperature range

Order number	Specification	Temperature range	Sticker	Alternative
SE: 179226 Shell: 001D8451	- DIN 51502 - KP2K-20 - NLGI 2	-20 to +50 °C -4 to +122 °F		- OMV Signum CX 2 - AUTOL TOP 2000 - Castrol Olit 2 EP

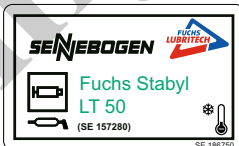
Panolin Biogrease EP2

Rapidly biodegradable

Order number	Specification	Temperature range	Sticker	Alternative
SE: 214840	- DIN 51502 KPE2K-30 - NLGI 2 - OECD 301B	-25 to +50 °C -13 to +122 °F		- Avia Syntogrease 2 - BP Biogrease EP 2 - OMV Signum BD 2

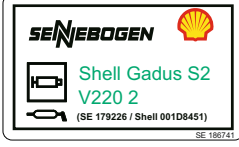
5.6 Undercarriage telescoping

Fuchs Stabyl LT 50

Order number	Specification	Temperature range	Sticker	Alternative
SE: 157280	- DIN 51502 - KPHC2N-50 - NLGI 2	-30 to +50 °C -22 to +122 °F		Avia Grease PE Polar

Shell Gadus S2 V220 2

Factory filling - standard temperature range

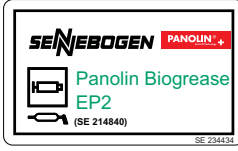
Order number	Specification	Temperature range	Sticker	Alternative
SE: 179226 Shell: 001D8451	- DIN 51502 - KP2K-20 - NLGI 2	-20 to +50 °C -4 to +122 °F		- OMV Signum CX 2 - AUTOL TOP 2000 - Castrol Olit 2 EP

Lubricating grease

Telescopic boom > Multihandler 305, 310

Panolin Biogrease EP2

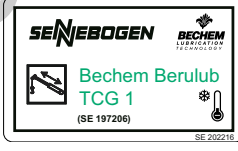
Rapidly biodegradable

Order number	Specification	Temperature range	Sticker	Alternative
SE: 214840	■ DIN 51502 KPE2K-30 ■ NLGI 2 ■ OECD 301B	-25 to +50 °C -13 to +122 °F		■ Avia Syntogrease 2 ■ BP Biogrease EP 2 ■ OMV Signum BD 2

5.7 Telescopic boom

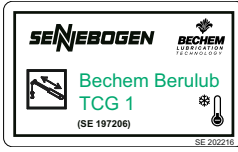
5.7.1 Telescopic crane

Berulub TCG 1 V¹⁾

Order number	Specification	Temperature range	Sticker	Alternative
SE: 197206	■ NLGI 1 ■ PTFE ■ Oil-specific suitability test	-30 to +50 °C -22 to +122 °F		
¹⁾ Sprayable version (with diluent) from Berulub TCG 1				

5.7.2 Multihandler 305, 310

Berulub TCG 1 V¹⁾

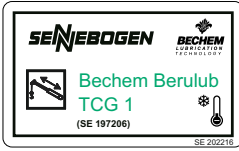
Order number	Specification	Temperature range	Sticker	Alternative
SE: 197206	■ NLGI 1 ■ PTFE ■ Oil-specific suitability test	-30 to +50 °C -22 to +122 °F		
¹⁾ Sprayable version (with diluent) from Berulub TCG 1				

Lubricating grease

Wire ropes

5.7.3 Telehandler

Berulub TCG 1 V¹⁾

Order number	Specification	Temperature range	Sticker	Alternative
SE: 197206	■ NLGI 1 ■ PTFE ■ Oil-specific suitability test	-30 to +50 °C -22 to +122 °F		
¹⁾ Sprayable version (with diluent) from Berulub TCG 1				

5.8 Wire ropes

Pfeifer RL-S

Order number	Specification	Temperature range	Sticker	Alternative
SE: 185735	Rope spray	-30 to +50 °C -22 to +122 °F	-	Rope grease F 315 L (adhering lubricating spray in the spray can)

Pfeifer RL-B

Order number	Specification	Temperature range	Sticker	Alternative
SE: 185736	Rope oil	-30 to +50 °C -22 to +122 °F	-	

6 Air conditioning systems and switchgear cabinet air conditioning

6.1 Air conditioning systems

6.1.1 Refrigerant

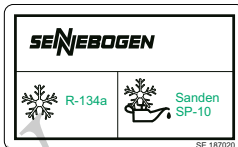
KLEA 134a

Order number	Specification	Temperature range	Sticker	Alternative
SE: 185737	R134a	-30 to +50 °C -22 to +122 °F	—	

6.1.2 Refrigerant oil

6.1.2.1 Sanden compressor

Sanden SP-10

Order number	Specification	Temperature range	Sticker	Alternative
SE: 185732		-30 to +50 °C -22 to +122 °F		Sanden SP-15

6.1.2.2 Bitzer compressor

Bitzer BSE32

Order number	Specification	Temperature range	Sticker	Alternative
SE: 193700		-30 to +50 °C -22 to +122 °F	—	

6.2 Switchgear cabinet air conditioning

6.2.1 Antifreeze

Tyfocor L

Order number	Specification	Temperature range	Sticker	Alternative
SE: 185731		-30 to +50 °C -22 to +122 °C	—	

Windshield washer systems

Antifreeze

7 Windshield washer systems

7.1 Antifreeze

Windshield washer system anti-freeze

Order number	Specification	Temperature range	Sticker	Alternative
SE: 185734	Fresh water with a proportion of at last 50% antifreeze	-30 to +50 °C -22 to +122 °F	–	

For
Reference
Only

8 Starter batteries

8.1 Battery terminal grease

Battery terminal grease

Order number	Specification	Temperature range	Sticker	Alternative
SE: 071706			–	

8.2 Battery terminal spray

Battery terminal spray

Order number	Specification	Temperature range	Sticker	Alternative
SE: 113732			–	

For
Reference
Only

For
Reference
Only

OPERATOR MANUAL

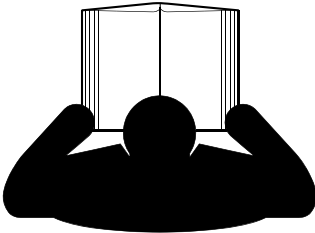
This manual has been prepared for and is considered part of the

Personnel Basket Option

NOTICE

The basket serial number is the only method your distributor or the factory has of providing you with correct parts and service information.

Always furnish crane serial number when ordering parts or communicating service problems with your distributor or the factory.

	 WARNING To prevent death or serious injury: • Avoid unsafe operation and maintenance. • This basket must be operated and maintained by trained and experienced personnel. Manitowoc is not responsible for qualifying these personnel. • Do not operate or work on this basket without first reading and understanding this Operator Manual the crane Operator Manual and Rating Plate supplied with crane. • Store Operator Manual in holder provided. • If the Operator Manual is missing from cab, contact your distributor for new ones.
---	---

For
Reference
Only

This Page Blank

TABLE OF CONTENTS

Safety. 1-1

 General Safety Requirements. 1-1

 Equipment Operator 1-2

 Ground Crew. 1-3

 Platform Occupants 1-3

 Communications. 1-4

 Lifting Personnel Near Power Lines 1-5

Inspection and Testing. 1-6

 Inspection 1-6

 Lift Testing 1-9

 Basket Type and Test Weights. 1-10

 Yoke Basket 1-14

 Safety harnesses 1-14

Basket Installation 1-14

 Basket Yoke to Main Boom Installation 1-15

 Basket Yoke to Jib Boom Installation 1-15

 Yoke Basket Adjustment. 1-15

 Before Making the Lift. 1-16

 Yoke Basket Operation. 1-16

For
Reference
Only

This Page Blank

PERSONNEL BASKET

SAFETY

The following safety rules apply specifically to basket operation and are to be used in conjunction with and supplemental to the safety information in the Safety and Operation sections in the front of the Operator Manual.

General Safety Requirements

1. Verify that there are no less hazardous alternatives to performing the work, or providing access to the area.
2. Lift controls and basket shall be tested and inspected each day prior to use to determine the system is in safe working condition.
3. Only authorized persons shall operate the crane and personnel platform.
4. Belting off to an adjacent pole, structure, or equipment while working from a personnel lift shall not be permitted.
5. Occupants shall always stand firmly on the floor of the basket, and shall not sit or climb on the edge of the basket or use planks, ladders, or other devices for a work position.
6. A body harness shall be worn and a lanyard attached to the designated tie-off anchor at all times when working from a personnel platform, unless special work requirements dictate otherwise.
7. Boom and basket load limits specified shall not be exceeded.
8. The crane shall not be moved when the boom is elevated, or the platform is occupied.
9. Climbers shall not be worn while performing work from a personnel platform.
10. Do not operate near power line or other electrical hazards. This device is not insulated. Remain a minimum of 6 meters (20 feet) away from any electrical component. Consult minimum clearance table or Electrocution Hazard decal for additional clearance information (Figure 1-1). Hoisting personnel within 20 feet of a power line that is up to 350kV, and hoisting personnel within 50 feet of a power line that is over 350kV, is prohibited (Figure 1-1). You must use a signal person on the ground to guide the operator.
11. No modifications or additions which affect the mechanical, hydraulic, or electrical integrity or the safe operation of the crane or personnel platform shall be made without the written approval of the manufacturer or an equivalent entity. See 29CFR1926.1412(a) and 29CFR1926.1434
12. Do not use the load line to lift or handle loads while personnel are in the basket. Load block must be removed from load line.
13. Safety harness and lanyards shall be used only for employee safeguarding. Any safety harness or lanyard actually subjected to an in-service loading shall be immediately removed from service and discarded or destroyed.
14. A personnel lift plan containing at least the information shown in "Personnel Platform Lift Planning and Authorization Form" shall be prepared.
15. Do not allow personnel lifts in winds in excess of 32 km/hr (20 mph) at the raised platform height, or during electric storms, snow, ice, sleet, or other adverse weather conditions that could affect the safety of personnel. Terminate personnel lifting operations if hazardous conditions develop during the lift.
16. Conduct a Pre-lift briefing attended by the equipment operator, platform occupants and ground crew.
17. Appropriately brief any individuals that are changed during a series of personnel lifts.
18. The contents of the Pre-Lift briefings shall cover, as a minimum:
 - a. The proper use of all equipment involved.
 - b. Assignment and responsibilities of each person involved in the lift operation.
 - c. The procedures to be followed.
 - d. Guidance on general and specific safety precautions.
 - e. Special signals for the operation.
 - f. Unique considerations of the lift.
 - g. Work to be accomplished during lift.
 - h. If applicable, the responsibilities and assignments of a signal person when lifting personnel near electrical power lines.
19. Allow personnel platforms to be only used for personnel, their tools, and sufficient material to do their work. Make sure the weight of the personnel and tools do not overload the personnel platform. Never use personnel platforms to transport bulk materials.
20. Have a qualified person evaluate the safety issues of the operational environment and verify the platform and hoisting equipment are suitable for use.
21. Determine if special work circumstances require further precautions.

22. Precautions such as but not limited to the following shall be taken:

- a. When welding is to be accomplished from the personnel platform, suitable electrode holders shall be provided to protect them from contact with any conducting components of the platform.
- b. When personnel lifts are conducted over water, personal flotation devices shall be provided and required to be worn. Personal fall protection devices with quick release features shall be provided, and required to be worn. The fall protection device shall be appropriately attached while personnel are lifted over land and detached while personnel are lifted over water.
- c. A boat with appropriate rescue personnel shall be available at all times during a personnel lift over water.
- d. Appropriate personnel protective equipment shall be provided and required to be used around toxic, flammable or hazardous substances or fumes.

23. Review any concentrated loading of the platform to preclude the over stressing of any component or the impairing of the platform stability.

Equipment Operator

Equipment Operator shall:

1. Comply with any applicable qualification criteria. As a minimum the qualification requirements shall include, but not be limited to:
 - a. Qualification to operate the specific type hoisting equipment used in the personnel lift.
 - b. Successfully meeting the physical qualification criteria as established in the applicable hoisting equipment ASME B30 volume. Additionally, the operator shall have been tested for substance abuse. Testing shall be in accordance with applicable government regulations and the policies of the employer.
 - c. Successfully meeting the training and qualification criteria established in the applicable hoisting equipment ASME B30.5 volume for telescoping cranes.
2. Be qualified to operate the platform controls of a platform with controls.
3. Not engage in a personnel lift when physically or mentally unfit. The operator has the right to refuse any personnel lift under the following circumstances:
 - a. The operator does not feel physically or mentally fit to perform the operation.
 - b. The operator has been working for more than ten hours prior to the start of the lift or the lift will not be completed before the operator has been working for twelve hours.
 - c. The operator did not have at least eight hours off immediately prior to the work shift containing the personnel lift operation.
4. Not engage in any practice that will divert their attention while actually engaged in operating the hoisting equipment.
5. Only respond to signals from the Personnel Lift Supervisor or a designated signal person. The operator shall obey a stop signal at any time, no matter who gives it.
6. Consult with the Personnel Lift Supervisor before commencing or continuing the lift whenever the operator has any doubt as to the safety of the lift.
7. When involved with a boom mounted platform without controls, remain at the hoisting equipment controls whenever personnel are in the platform.
8. When involved with a boom mounted platform with boom motion controls and a means of lowering, retracting and rotating in the event the primary power source becomes inoperative, be free not to remain at the hoisting equipment controls.
9. Consult the Safety and Operation sections in the Operator Manual for specific instruction on the equipment operation.
10. Inspect the hoist equipment setup area before the personnel lift and report his observations to the Personnel Lift Supervisor. The operator shall inspect the area for potential hazards such as, but not limited to:
 - a. Excessive load or radius.
 - b. Overhead obstructions and electrical transmission lines.
 - c. Hazardous locations.
 - d. Inadequate surface and support to withstand all forces imposed.
 - e. Wind, weather and other unstable conditions.
 - f. Any potentially hazardous conditions.
11. Inspect the hoist equipment immediately prior to starting a personnel lift operation. The criteria for a frequent inspection as specified in the appropriate hoisting equipment ASME B30 volume shall be used.
12. Operate hoisting equipment with tracks at full extension and pinned and crane equipped with full counterweight configuration. Handling of personnel is not permitted with mid span or zero span positions.

13. Verify that the hoisting equipment is set up and maintained within one percent of grade level ($\pm 0.30^\circ$).
14. For hoisting equipment with a boom attached platform, verify that the platform is attached as specified in the basket installation section.
15. Not allow the total weight of the lifted load including rigging, platform, personnel, tools and material to exceed 50 percent of the hoisting equipment's rated load, under the planned conditions of operation. (Except during testing as outlined in Inspection Section.)
16. Not allow the platform's rating or the hoisting equipment's reduced rated load, to be exceeded when loads are transferred to the hoisted platform.
17. Perform a trial lift prior to lifting personnel with the platform on each shift and after any change of set up location, hoist equipment configuration or operator. These lifts shall be used to ascertain that hoist equipment set up and configuration is correct, load capacities are adequate, that no hazardous interferences exist, and to further demonstrate the operator's operational competence.
18. Verify that during the trial lift, the platform is loaded to at least the weight expected during the actual lift.
19. Not knowingly allow the platform load to exceed the platform rating. (Except during testing as out- lined in inspection section).
20. Not travel the hoisting equipment with personnel in the personnel platform.
21. Perform all movements of the platform under the direction of a designated signal person and in a slow, controlled manner to minimize sudden movements of the platform.
22. Remain at the hoisting equipment controls at all times when the platform is occupied.
23. Set all brakes and locks on the hoisting equipment after positioning of the personnel platform and before personnel perform any work.
24. Not move platforms over, under or in the vicinity of power lines unless the requirements of the minimum clearance shown in the required clearance table and on the Electrocution Hazard decal are met (Figure 1-1).
25. Not lift any other loads, on any other load lines, while conducting a personnel lift. See "General Safety Requirements" on page 1.(Step 12). When the hoisting equipment has a boom attached platform without controls it shall not be used for other lifting service.
26. Not disable, or allow to be disabled, any hoist equipment safety device during a personnel lift.

27. Not operate a platform with motion controls without the platform operation manual available in the platform.
28. Avoid the simultaneous operation of more than one of the hoisting equipment motion controls, unless such practice increases the safety of the lift operation.

Ground Crew

Ground Crew shall:

1. Visually inspect the personnel lifting platform, and its associated rigging, for hazardous conditions, prior to and during any operation.
2. Assist in the entrance and exit of personnel occupants at ground level.
3. Verify the personnel platform is securely attached to the hoisting equipment and in a manner specified by the platform manufacturer and that all attachments and the platform are secure.
4. Verify that boom attached personnel platforms are only attached using the pins and fittings specified by the hoist equipment manufacturer or a qualified person.
5. Keep people from passing under the raised personnel platform.
6. Not use a suspension system for lifting personnel that has been used for lifting loads other than the personnel platform.
7. Maintain continuous and positive communication between the personnel platform occupants and the operator, if signal persons are part of the ground crew.
8. Not engage in any practice or have any other duties that will reduce the safety of the personnel lift operation.
9. Observe the weight test and report any deformation or hazardous conditions to the Personnel Lift Supervisor.
10. Verify the platform is evenly loaded, material secured, and the total platform weight does not exceed the platform rating or the reduced hoisting equipment lift capacity.
11. Not allow an occupied platform over, under or in the vicinity of power lines unless the requirements minimum clearance distances are met as shown in the required clearance table and on the Electrocution Hazard decal (Figure 1-1).

Platform Occupants

Personnel Platform Occupants shall:

1. Maintain a stable and even loading on the platform.
2. Keep all parts of their body inside the platform during raising, lowering and positioning, except when performing duties as a designated signal person.

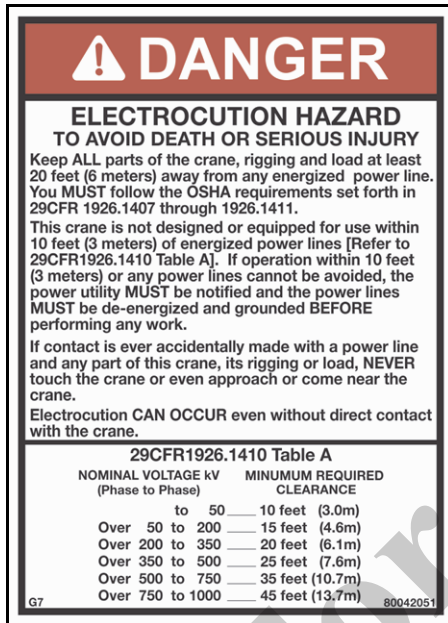
3. Not interfere with the platform operator or the designated signal person in the platform except to give an emergency stop signal.
4. Keep their personnel fall protection device lanyard fastened to the provided anchorage points at all times, while occupying the platform, unless special circumstance work requirements dictate otherwise.
5. Be familiar with the hand signals posted in the platform. All occupants shall know the emergency stop signal.
6. Conduct their work in a manner to help maintain the platform stability, and the safety of the personnel lift operation.
7. Remain in continuous sight or in communication with the operator, and in sight and communication of a signal person.
8. Use personal protective equipment such as hard hats, safety glasses, hearing protection and gloves in conditions where a hazard of injury exists.
9. Wear personal fall protection devices with lanyards attached to a specific anchorage point(s), unless Special Circumstance Work requirements dictate otherwise.
10. Limit their number commensurate with the work being performed, the platform design and hoisting equipment limitations.
11. Evenly distributing and securing materials and equipment while the platform is lifted.
12. Not stand, sit on, or work from the top rail, intermediate rail, toe board or use any other device to enhance their vertical height working capability
13. Not pull the platform out of plumb with the hoisting equipment.
14. Not enter or exit a suspended platform while it is raised unless the platform has an installed gate and the platform is physically secured to the structure to which they are entering or exiting and to which they have attached their safety harness lanyard.
15. Not enter or exit a platform that does not have an installed gate, while it is suspended or raised.

16. Keep entrance gate closed and pinned in the horizontal position, except when entering or exiting the platform.

Communications

1. A communication system shall be used that effectively addresses the unique lift constraints, environmental issues and communication security necessary for a safe operation.
2. All communications shall be discernible to the operator. No response to a signal shall be made unless the signal is clearly understood.
3. If communications between operator and platform occupants are disrupted, all operations shall be stopped until communication is re-established.
4. Communication systems to be used during the lift shall be verified as functioning and effective prior to commencing each lift.
5. Hand signals to the operator shall be in accordance with the hoisting equipment ASME B30 Volume, unless voice communication (telephone, radio, or equivalent) is utilized.
 - a. A pictorial representation of the hand signals shall be posted conspicuously at the following locations:
 - As required by the hoisting equipment ASME B30 volume.
 - Inside the personnel platform.
 - At any platform motion control locations.
 - b. Some operations may require additions to, or modifications of, standard hand signals.
 - Any special signals shall be agreed upon and understood by the signal persons and the hoisting equipment operator.
 - Special signals shall not conflict with the hoisting equipment standard signals.
6. Radios or other electronic means of communications, if used, should operate on a secure channel.
7. Audible and visual alert devices should be provided in the platform for use in an emergency (i.e. air horns or strobe lights).

Lifting Personnel Near Power Lines



8466

FIGURE 1-1

Required Clearance for Lifting Personnel Near High Voltage Power Lines	
Kilovolts (kV)	Minimum Radial Distance ft (m)
to 50	10 (3)
over 50 to 200	15 (4.6)
over 200 to 350	20 (6.1)
over 350 to 500	25 (7.6)
over 500 to 750	35 (10.7)
over 750 to 1000	45 (13.7)

Lifting personnel where the crane equipment or platform can become electrified from electric power lines is an extremely hazardous practice. It is advisable to perform the lift so there is no possibility of any of the crane equipment, load line or personnel platform becoming a conductive path. This hoisting equipment shall not be used to lift personnel under, beside, or over electric power lines if any combination of boom, personnel platform, load line and machine component will enter the prohibited zone as specified in the required clearance table or the Electrocutation Hazard decal (Figure 1-1). Lifting personnel near electric power lines is not allowed unless there is no less hazardous way to do the job. However, under no circumstance are the required clearance distances be to violated.

Situations to consider when lifting personnel near electric power lines are:

- Power lines are de-energized and grounded to ground and between phases. (This is the preferred condition.)
- Power lines are energized with the hoisting equipment outside the prohibited zone but there is a potential for the hoisting equipment or platform being energized.
- Power lines are energized with the hoisting equipment inside the prohibited zone and there is a possibility that the hoisting equipment or platform can become energized. **(Lifting personnel in this condition is prohibited)**
- Hoisting equipment is in transit with the boom lowered and no personnel in the platform.

Condition A

This is the preferred condition under which a personnel lift can be performed. The hazard of injury or death due to electrocution has been removed. The following steps shall be taken when lifting personnel in a Condition A situation:

- The power company or owner of the power lines shall de-energize the lines.
- The power lines shall be visibly grounded to ground and between the phases to avoid the possibility of electrical feedback.
- A qualified representative of the owner of the power lines or a designated representative of the electric utility shall be on the site to verify that step (1) and (2) of this section have been completed and that the power lines are not energized.
- Durable signs shall be installed at the operator station, and on the outside of the crane, warning that electrocution or serious bodily injury may occur unless the minimum clearance shown in the required clearance table and on the Electrocutation Hazard decal is maintained between the hoisting equipment and platform and power lines. These signs shall be posted at the hoist equipment operating station, on the outside of the hoist equipment, and inside the personnel platform.
- If proximity warning devices, insulated links or boom cages are used, by choice or legal mandate, they shall not be a substitute for any of the requirements of this section. If these devices are used, the hoist equipment operator, ground crew and platform occupants shall be instructed by management on the limitations of the devices, operating condition requirements of the devices and the devices' testing requirements prescribed by the device manufacturer.

Condition B

The following steps shall be taken when lifting personnel in a Condition B situation:

1. A meeting, on the job site, between the job site management and either a qualified representative of the owner of the power lines or the electric utility shall take place. Procedures to safely complete the lift shall be established.
2. The clearance specified in the Required Clearance Table or in the Electrocution Hazard decal (Figure 1-1) shall be maintained between the hoisting equipment, load line and personnel platform at all times. Hoisting personnel within 20 feet of a power line that is up to 350kV, and hoisting personnel within 50 feet of a power line that is over 350kV, is prohibited (Figure 1-1).
3. Power line movement, horizontal and vertical, due to wind shall be added to the distances specified. A qualified representative of the power line owner or a designated representative of the electric utility shall be consulted for the movement distances.
4. The required clearances to the power lines shall be continuously monitored by a dedicated and qualified signal person in constant communication with the hoist equipment operator.
5. Personnel platform movement restraint, when required, shall be done through electrically non-conductive tag lines.
6. No person outside the personnel platform shall be permitted to touch the hoist equipment, load line or platform unless the signal person identified in (Step 4) above indicates it is safe.
7. Operation of the boom or the personnel platform over power lines shall not be permitted.
8. Power line visibility enhancing devices, such as ribbons or balls, should be attached to the power lines to aid in the location of the prohibited zone established in (Step 2) and (Step 3) above.
9. Durable signs shall be posted warning that electrocution or serious bodily injury may occur unless the minimum clearance is maintained between the hoisting equipment and platform and power lines. These signs shall be posted at the hoist equipment operating station, on the outside of the hoist equipment, and inside the personnel platform.
10. If proximity warning devices, insulated links or boom cages are used, by choice or legal mandate, they shall not be substituted for any of the requirements of this section. If these devices are used, the hoist equipment operator, ground crew and platform occupants shall be instructed by management on the limitations of the devices, operating condition requirements of the devices

and the devices testing requirements prescribed by the device manufacturer.

Condition C

Lifting personnel under this condition is prohibited.

Condition D

The following steps shall be taken when transiting to a personnel lifting location in a Condition D situation:

1. While in transit and with no occupants in the platform, the clearance to power lines shall be as specified in 29CFR1926.1411 and ASME B30.23 volume applicable to the hoisting equipment.
2. When planning the transit of the hoisting equipment the effect of transit speed and transit surface on the hoisting equipment movement shall be considered.

INSPECTION AND TESTING

The following instructions are for Inspection and Weight Testing of the Yoke Basket Assemblies.

The purpose of inspecting and testing the basket platform is to comply with ASME B30.23.

 DANGER

Falling hazard. Do not operate the basket without the proper pins in place. Inspect the pins each time the basket is used.

Inspection**Initial Inspection**

Prior to initial use and at each new job site, the basket platform and all attachment points shall be inspected by a qualified person for damage or excessive wear, and inspected using the "Personnel Lift Platform Pre-Lift Inspection" form on page 7.

Regular Inspection

Frequent Inspection - The platform, suspension system, attachment points, and any platform motion controls shall be inspected at least once each day, before use and by a designated person. The inspection is to identify conditions that could create hazardous operating conditions. Inspect for damage or excessive wear, and inspect using the "Personnel Lift Platform Pre-Lift Inspection" form on page 7.

Periodic Inspection - At least once every 12 months inspect, the basket platform. Basket platforms that have been out of service for 12 or more consecutive months shall be inspected prior to use.

PERSONNEL LIFT PLATFORM PRE-LIFT INSPECTING		
Inspector	Date	Platform ID
	Satisfactory	Unsatisfactory
1. Markings		
Platform decals and placecards (all information legible)		
Suspension system decals and placards		
2. Structure		
Load supporting welds/bolts		
Load supporting members		
Barrier from toe board to intermediate rail		
Hand Rail		
Fall protection device anchor points		
Gate locking mechanisms		
Platform flooring		
Suspension attachment points		
3. Attachment mechanisms		
Pins/Ears/Bolt-ups/Eyes (circle)		
Basket mounting bracket		
Basket pivot bearings		
4. Special purpose items		
Hand brake operation		
Safety harness and lanyards		
Floor cleanliness		
5. General comments:		
Name	Signature	Date

PERSONNEL PLATFORM LIFT PLANNING AND AUTHORIZATION FORM		
1. Location		Date
2. Purpose of Lift _____ _____ _____		
3. Hoisting Equipment Mfg.	Model#	Serial #
4. Expected radius	(max)	(at work location)
5. (A) Rated load at radius	(B) Maximum lift load (50% of 5A)	
6. Platform ID		
7. Platform Weight		
8. (A) Number of platform occupants	(B) Approximate weight with equipment.	
9. Total Lift Weight		
10. Personnel Lift Supervisor		
11. What are the alternatives to this personnel lift? _____ _____ _____ _____		
12. Why are they not being used? _____ _____ _____ _____		
13. Prelift briefing held		AM/PM
Attendees		
14. Anticipated hazards (wind, weather visibility, power lines)		
15. Lift accomplished date		Time
16. Remarks _____ _____ _____ _____		
Name		Signature
		Date

Lift Testing

All equipment used in lifting of personnel should be tested and inspected to protect against failure during lifting operations. Trial Lift and Proof Lift are the two test lifts that must be used for the Yoke Basket Platforms. Perform these test lifts using the following information and criteria.

Contact Crane Care with any questions concerning Basket Test Failure, Inspection, Trial or Proof Lift, Basket Repairs or any other questions concerning this procedure.

Proof Lift

At each new job site, prior to hoisting people in the basket platform, the basket and rigging shall be proof tested to 125% of the basket platform's rating.

- The test load shall be evenly distributed.
- The weight used for the Proof Lift is identified in the *Basket Type and Test Weights* table in apprentices ().
- The platform shall be lifted and held in a raised position for not less than five minutes.
- After the Proof Lift test is completed, a qualified person shall inspect the platform and fill out the *Personnel Lift Platform Pre-Lift Inspection* form on page 7. Any damage revealed by the inspection shall be corrected and another test conducted before using the basket.

The most recent record of the test shall be maintained at the job site.

- The Proof Lift test is considered successful if during inspection the Basket Platform (and basket connection points) show no signs of damage or excessive wear and all inspection categories on the *Personnel Lift Platform Pre-Lift Inspection* form (on page 7) are checked as Satisfactory. Any *Unsatisfactory* checks or damage to the basket platform qualifies as a failed Proof Lift.
- If the basket platform fails the *proof* test inspection and structural repairs or modification are necessary; a Proof Lift Retest to 150% of the platforms rated capacity must be made after the repairs are completed.
- Retest by following Performing The Lift Test steps. Step 3 will be a 150% Proof Test only.

- **Never** use a basket that fails the Proof Lift.

Trial Lift

Perform a trial lift prior to lifting personnel on each shift the basket is used and after any change of setup location, hoist equipment configuration or operator.

This lift shall be used to ascertain that hoisting equipment setup and configuration is correct, load capacities are adequate and no hazardous interferences exist (electric wiring) and to further demonstrate the operator's competence.

- The weight used for the Trial Lift is identified in the *Basket Type and Test Weights* table in parentheses ().

Performing The Lift Test

Use the Basket Parts List, Figure 1-2, Figure 1-3 and the *Basket Type and Test Weights* table to determine which basket type and weight combinations to use for each different test lift.

1. Install two bracket assemblies (1, Figure 1-2, Figure 1-3).
2. Install two web sling shackles and two slings to the basket, Figure 1-2.
3. Determine the Basket Type and the amount of weight for each lift using the *Basket Type and Test Weights* table.
4. Position the weight on the floor and lower the basket assembly onto the weight. Connect the weight to the basket with the two slings (Figure 1-2, Figure 1-3).
5. Raise the basket into the air.

For a Proof Lift, a minimum of 5 minutes.

For a Trial Lift, be sure the basket clears any hazards or interference/objects.

6. Lower the basket and perform the after test inspection.

If the Proof Lift was performed fill out the *Personnel Platform Lift Planning and Authorization Form*. If the lift is successful remove brackets, weights, shackles and slings.

Basket Type and Test Weights

Basket Type	Jib Trial Lift (Item No. (lb.) **	Jib Proof Lift (125%) (Item No. (lb.) **	Boom Trial Lift (Item No. (lb.) **	Boom Proof Lift (125%) (Item No. (lb.) **
Yoke (2 person)	4 (500 lb.)	4,5 (625 lb.)	4,5,6 (1200 lb.)	4,5,6,7 (1500 lb.)

** Item No. = Basket Assembly Parts List Item Number

** lb. = The total pounds of all weights and the Bracket Assy (if used).

BSAY Yoke Basket Assembly Parts List (Figure 1-2)

Item No.	Description	Qty
1	Basket Assembly, 2 Person	1
2	Web Sling Shackle	2
3	Sling	2
4	500 lb. Weight Assy	1
5	125 lb. Weight Assy	1
6	575 lb. Weight Assy	1
7	300 lb. Weight Assy	1
8	Adapter-Yoke (Main Boom Use Only)	1
9	Yoke	1
10	Pin	4
11	Lock Pin	4
12	Pin	2
13	Lift Cylinder	1
14	Leveling Valve - Pump	1
15	Gate	1
16	Adapter-Yoke (GHC55 Jib Only)	1

BSAY-2 YOKE BASKET TEST WEIGHT ASSEMBLIES - TWO PERSON

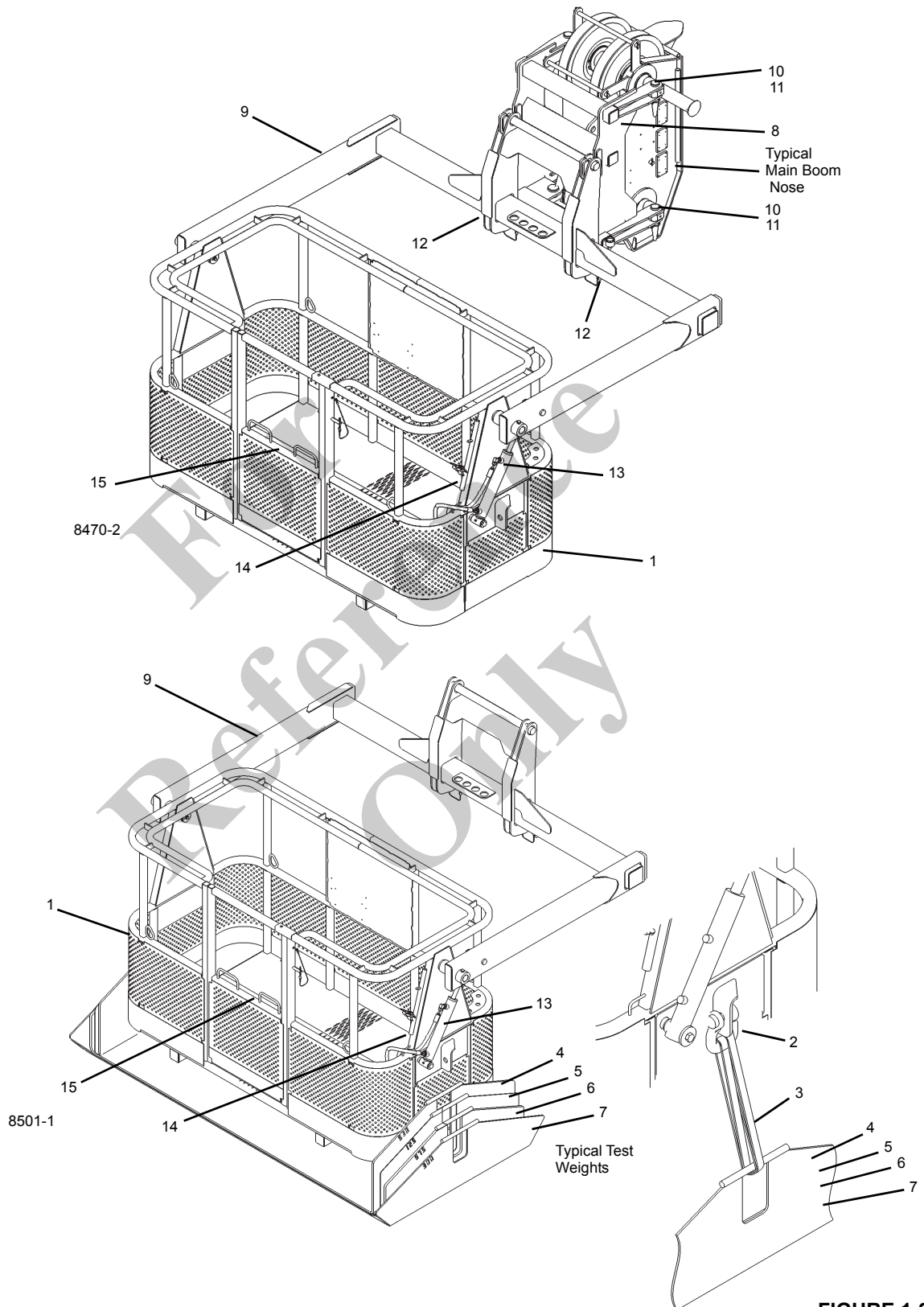


FIGURE 1-2

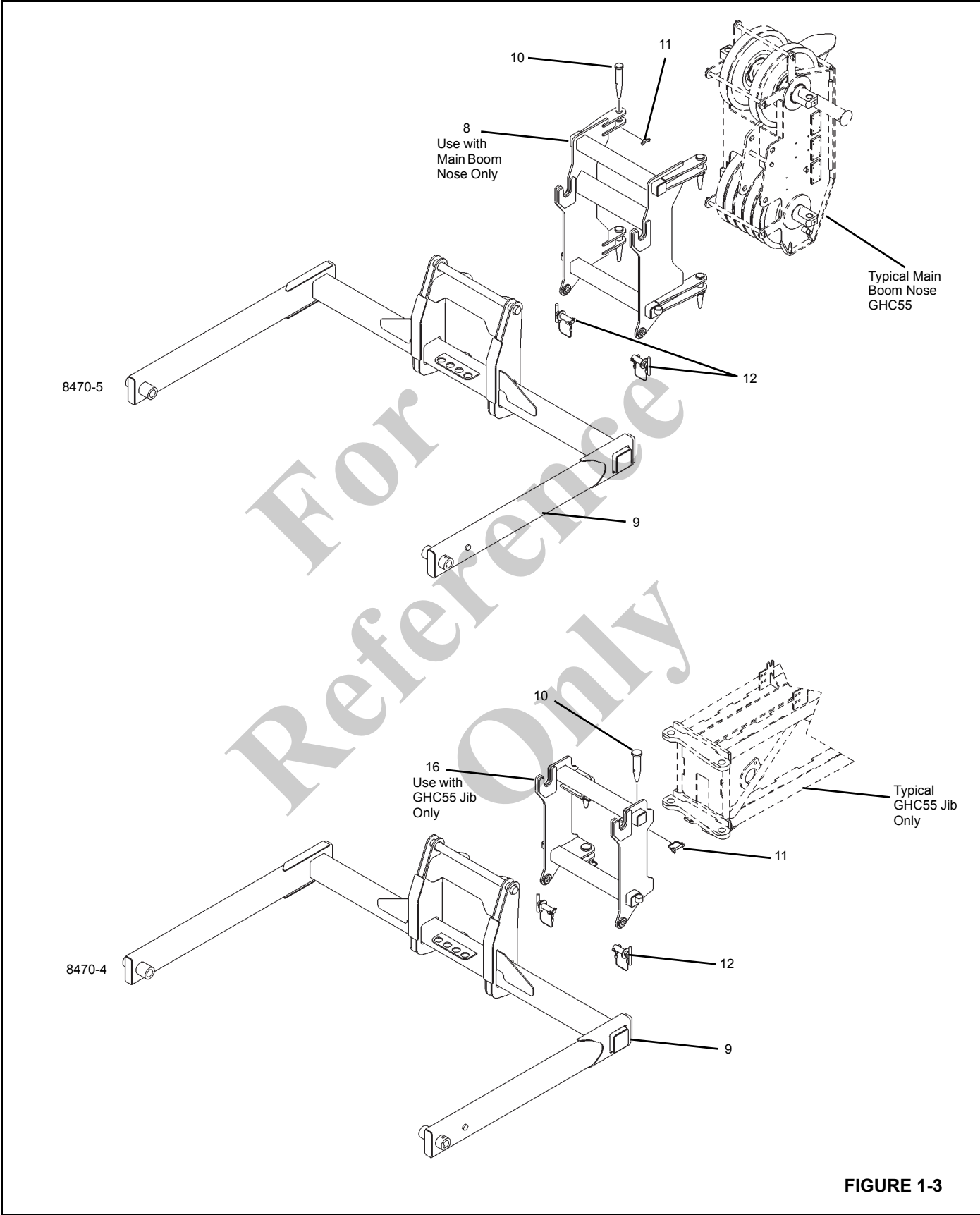


FIGURE 1-3

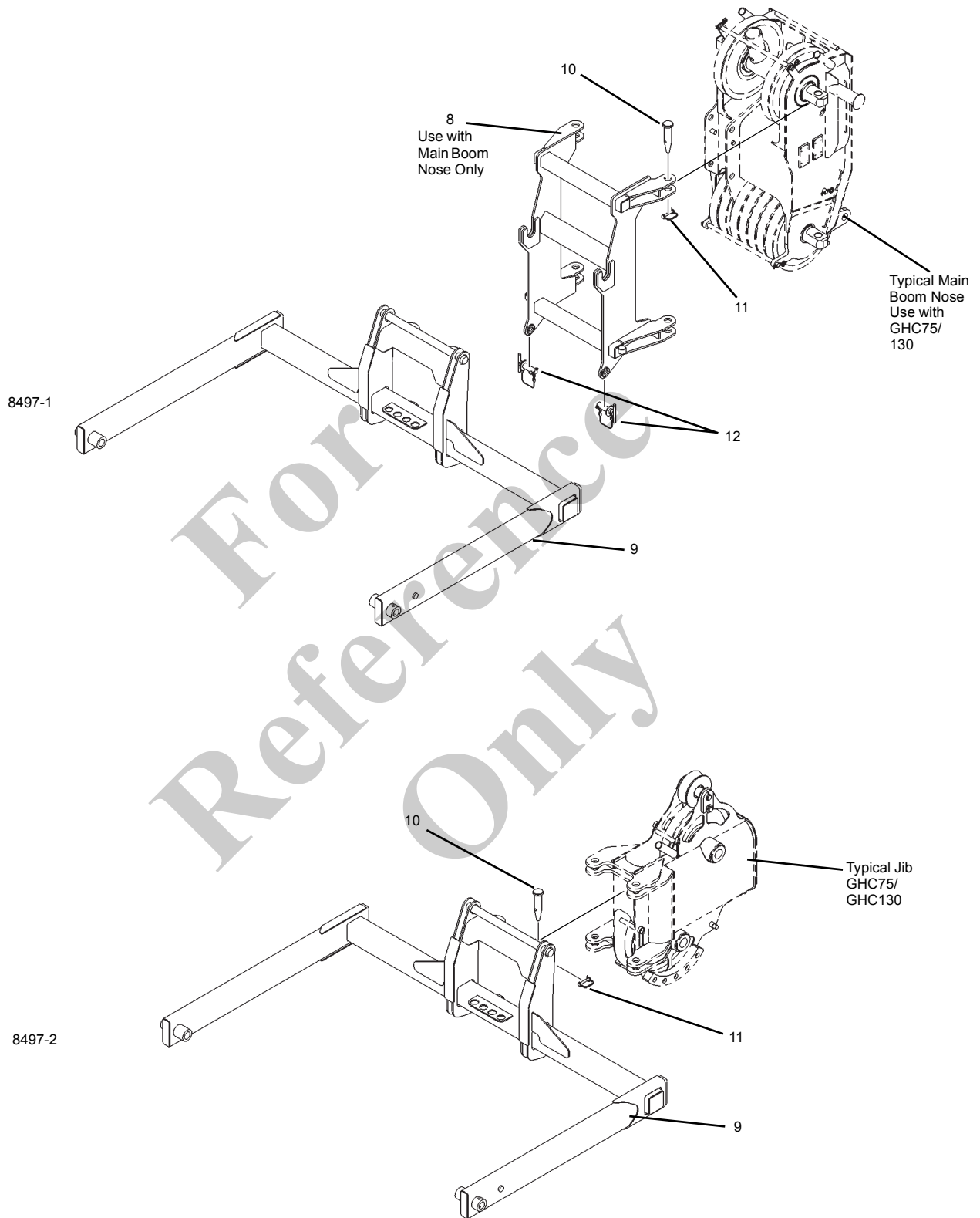


FIGURE 1-4

Yoke Basket

The basket can be attached to either the tip of the boom or the tip of the jib for the purpose of lifting personnel and their work equipment to elevated working heights.

DANGER

Boom tip attachment can contact jib in stowed position when boom is fully retracted causing damage to boom. Boom attachments must be removed for retracted boom lifting operations.

The maximum capacity of the basket is 1200 pounds when attached to the tip of the boom and 500 pounds when attached to the tip of the jib. The maximum occupancy rating in all cases is two people.

NOTE: Refer to the crane Rated Capacity Charts. Verify capacity chart matches crane model and boom length.

DANGER

Overloading basket or crane will result in death or serious injury.

Where no capacity ratings are shown on the rated charts, for example: at below 0° boom angle, operation is allowable with the boom fully retracted. All work with a personnel basket must be done on firm level ground ($\pm 0.30^\circ$), with the tracks fully extended and pinned, and crane equipped with full counterweight configuration.

The basket is equipped with a manually applied brake to keep basket from swinging when the basket is being loaded or after the desired work position is reached. The brake is intended to be disengaged when the basket is raised to the work position so that the basket hangs freely within 10 degrees of level until the work position is reached.

Safety harnesses

Safety harnesses are provided for basket occupants and should be secured to the harness attachment links located near the basket corners See (Figure 1-5).

DANGER

Falling hazard!

Working at elevated heights without using proper fall protection can result in severe injury or death. Always use proper fall protection as required by local, state or federal regulations.

A gate is located at the front center of the basket. The gate is to be used for ease of entrance and exit to the basket and must be latched in the closed position when the basket is occupied.

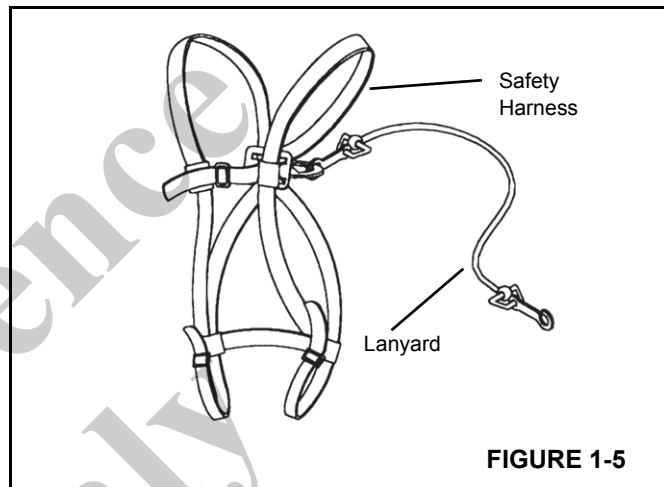


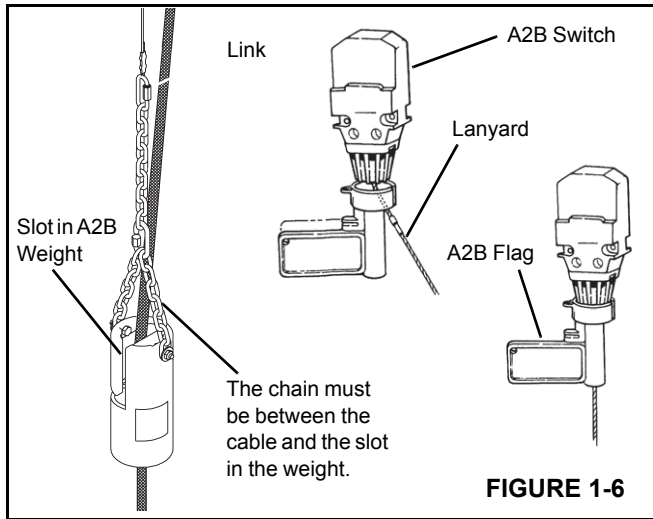
FIGURE 1-5

BASKET INSTALLATION

The baskets use the quick attaching system to attach the basket to the tip of the boom or jib. See (Figure 1-2) and (Figure 1-3) and (Figure 1-4) for yoke basket attachment.

To install the attaching hardware do the following:

1. Remove the anti-two-block (A2B) weight and override the A2B system with the A2B flag (Figure 1-6).
 - a. Loosen the link on the lanyard and remove the A2B weight and chain.
 - b. With the lanyard in the slot of the A2B flag, push the flag up on the bottom of the switch.
 - c. Pull the lanyard down into the catch in the flag so that the switch is in the open position.



2. Remove the hook block from the load line and stow the wedge socket and the pin and clip.

Basket Yoke to Main Boom Installation

1. For a main boom attachment, remove the jib deployment pin from the shafts on the boom.
2. Position the adapter (8) to the tip of the main boom nose using attaching hardware (10) & (11) see (Figure 1-3) and (Figure 1-4).
3. Position the yoke (9) to the adapter (8) using attaching pin (12) see (Figure 1-3) and (Figure 1-4).

Basket Yoke to Jib Boom Installation

1. Remove adapter (8) from the boom nose to allow for jib deployment. Stow away adapter for future use.
2. Properly deploy the jib to the main boom nose (Refer to Crane Operator Manual).
3. On Model GHC55 only, position the adapter (16) to the tip of the jib using attaching hardware (10) & (11). See (Figure 1-2) and (Figure 1-3).
4. Position the yoke (9) to the adapter (16) using attaching pins (10, 11 and 12) see (Figure 1-3).
5. On Model GHC75 and GHC130, position the yoke (9) directly to the jib using attaching pins (10 and 11) see (Figure 1-4).

NOTE: Step 4 is not required on Model GHC75 or GHC130 since the yoke (9) attaches directly to the jib.

Yoke Basket Adjustment

To install the yoke basket follow Basket Installation. The following instructions are additional installation instructions that apply only to the yoke basket.

1. If the basket yoke is raised higher than required during installation; it can be lowered by *SLOWLY* pulling up on the float selector (1, Figure 1-9). Use caution when lowering the yoke in this manner. Pulling the float selector (1) out to fast and to far will lower the yoke at a very fast rate.
2. If the basket yoke needs to be raised; return the float selector to the down position and use the hand pump to raise the yoke to the desired position.

NOTE: See "Yoke Basket Operation" on page 16. to attach the yoke basket to the main boom or jib.

Before Making the Lift

- Set the tracks at the full extended position and with the full counterweight configuration.

NOTE: Refer to the crane Rated Capacity Charts. All work with a personnel basket must be done on firm level ground ($\pm 0.30^\circ$), with the tracks fully extended and pinned, and crane equipped with full counterweight configuration.

- Program the RCL as specified in the RCL Operator Manual which is located in the document case.
- Check all controls for proper operation. If any abnormal operations are detected, the condition must be corrected before continuing.
- Check the work area for electric power lines. If power lines are present, See "Lifting Personnel Near Power Lines" on page 5.

Hoist Cable

The hoist cable must be disconnected from the hook block and properly secured to the stowing point when using the basket assemblies.

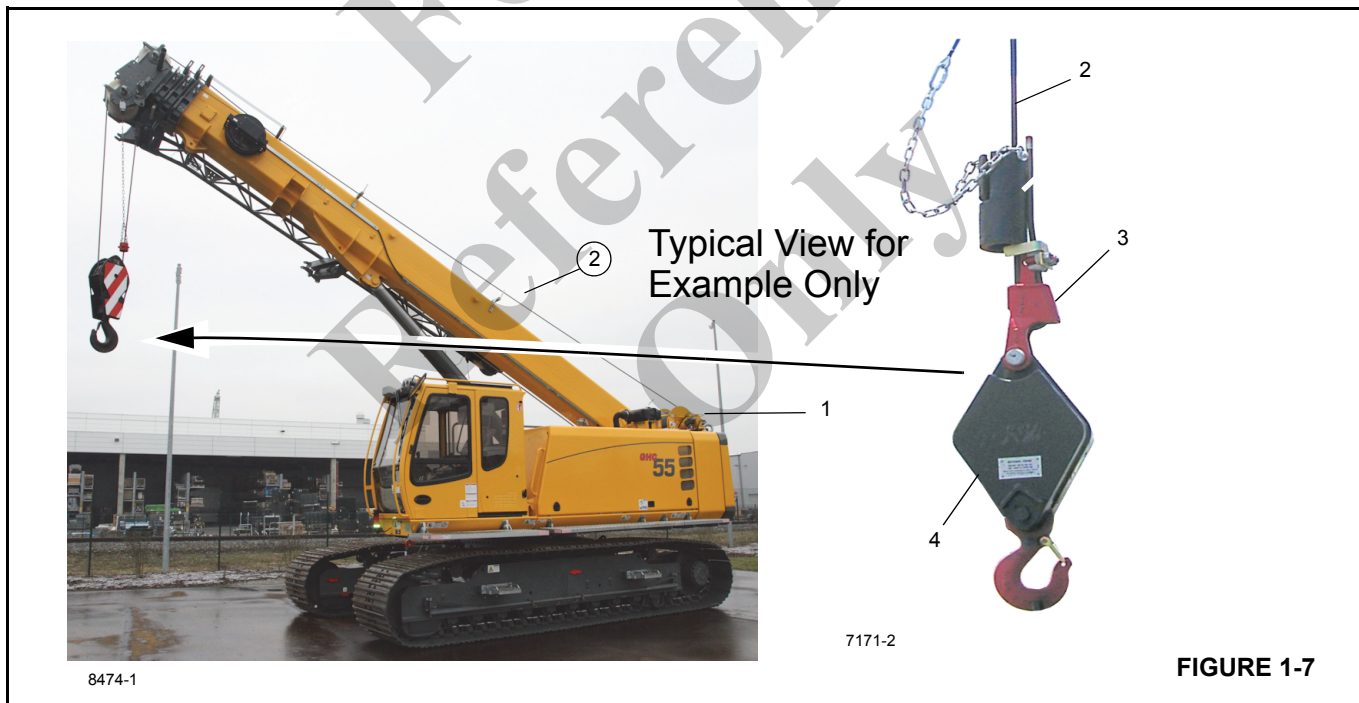
If your crane has the hoist mounted to the turret (as shown in Figure 1-7) - DO NOT connect the hoist cable to any place on the boom.

CAUTION

DO NOT connect the hoist cable to any place on the boom. When the hoist is mounted to the turret; connecting the hoist cable to the boom while operating the basket assembly will cause extensive damage to the machine.

Hoist Cable Tie Down - Turret Mounted Hoist

- Remove the hook block (4) from the wedge socket (3, Figure 1-7) and feed the cable back through the boom nose until the wedge socket (3) has cleared the boom nose. Note that a typical single reeved hook block (4) is shown in Figure 1-7, your machine may appear to be reeved differently.
- Slowly re-wind the hoist cable until the wedge socket (3) is within several feet of the stowing point.
- Slowly rewind the hoist cable (2) until any remaining slack is removed and the cable is snug.



Yoke Basket Operation

The following operating instructions are for the two man yoke basket option. These instructions will explain how to raise the yoke basket assembly to the level necessary to attach the basket adapter to the boom nose.

Perform the Installation instructions beginning on page 14 before starting these operating instructions.

- To enter the basket, remove the gate locking pin (1, Figure 1-8), pull up on the grab handle (2) and swing the gate (3) open.

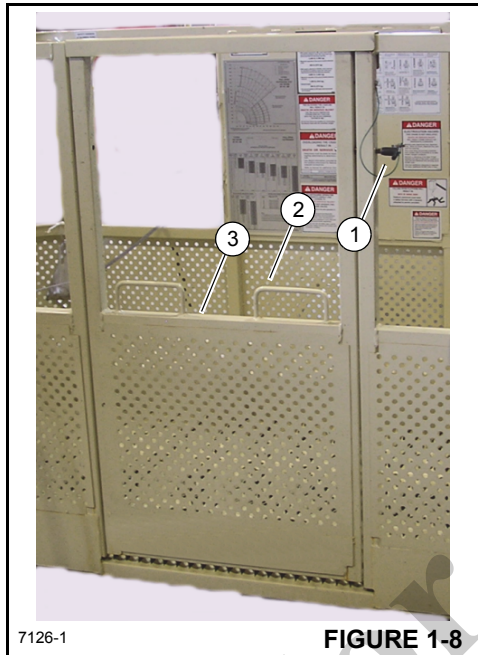


FIGURE 1-8

2. Connect the safety harness. Close the basket gate (3, Figure 1-8) by lifting up on the gate grab handle (2) and move the gate to the closed position, reinstall the safety pin (1).
3. Make sure the float selector (1, Figure 1-9) is turned to the up position and the brake selector (2) is in the CW (clockwise) position. This allows the basket to swing freely as the basket is raised to the work location.

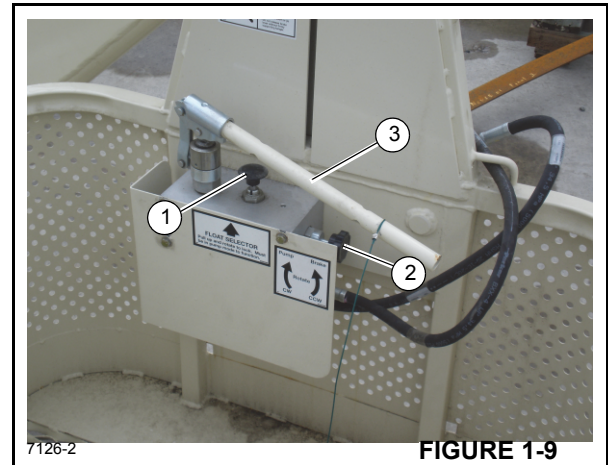


FIGURE 1-9

4. After the basket platform is raised to the working position; rotate the brake selector (2) to the CCW (counterclockwise) position to lock the brake.

This locks the yoke assembly into position and prevents free-swing when the basket platform is attached to the boom nose.

CAUTION

Rotate the brake selector (2, Figure 1-9) to the CCW (counterclockwise) brake position **immediately** after raising the yoke assembly to the proper height (step 4 above). The brake selector must be in the lock position before continuing or using the basket during normal operation.

NOTE: The Yoke Basket hand pump (3, Figure 1-9) should not be used when the crane is operating. The hand pump is to be used *only* when installing the yoke to the crane.

For
Reference
Only

This Page Blank

Alphabetical Index

Basket Installation 1-14
Inspection and Testing..... 1-6
Personnel Basket..... 1-1
Safety..... 1-1
TABLE OF CONTENTS..... 1-1

For
Reference
Only

For
Reference
Only

This Page Blank