



GMK 6400 Risk Assessment driving and operating crane

This risk assessment is based upon the information contained within the standard Operator's Manual 2012 for a Grove GMK 6400 all-terrain crane. This document has been prepared by Manitowoc Australia for the use of such crane in Australia.

Although this risk assessment is comprehensive, and all efforts have been made to be as thorough as possible, Manitowoc CraneCARE makes no claim in any way, shape or form to its complete accuracy or that all possible hazards have been identified, or that all associated risks have been identified or priority assessed, or that all possible control measures that could be implemented have been provided.

The information contained within this risk assessment is also based upon the assumption that all personnel involved with the use of the crane, including operators, service personnel, or associated crane crew personnel have received prior instruction and/or appropriate training in all aspects of operating, or servicing and maintaining, or working with this particular model of crane, and that while conducting the previously mentioned tasks, are doing so with the full permission of the crane owner, and are doing so while holding all appropriate qualifications and/or certifications required by applicable legislation in the country, region, state or territory in which the crane is to be operated.

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GENERIC HAZARDS AND INFORMATION

A. General Information

Warnings and Symbols

	Hazard may cause personal injury
	Hazard may cause damage to crane or other objects within the working range
	Hazard may cause electrocution
	Hazard may cause environmental damage, for further information on handling substances that pose a risk to the environment; see Maintenance manual, Chapter Safety and environmental protection.

B. Generic Hazards

Section / Heading	Hazard	Risk	Described Risk & Control Measures
Generic hazards that apply to multiple sections	Slips, trips and falls		<p>Risk of slips, trips and falls due to slippery surfaces.</p> <p>Inspect all walkways, access ladders, steps and grab-rails for damage or presence of oils, greases, mud or slippery substances that could cause a slip. Wipe away or properly clean any substance that will cause a risk. Ensure that walking surfaces are coated with a non-slip coating.</p>
	Cuts and abrasions		<p>Risk of cuts and abrasions due to sharp edges or damaged surfaces.</p> <p>Wear protective gloves when inspecting or cleaning access devices as protection against any sharp edges or chemical contamination. Inspect for any evidence of damage, corrosion, broken welds, loose bolts, metal fatigue or any other factor that may cause a loss of strength to walkways, access ladders, steps and grab-rails.</p>
	Use of OEM ladders		<p>Risk of fall from ladders if used incorrectly or unsafely.</p> <p>Ensure that any OEM removable ladders are positioned correctly and locked into their respective holders before using them for access. Ensure that all OEM ladders are stowed and secured on the vehicle when not in use. Do not jump off the crane structure. Use provided access ladders. Face the ladder when climbing. Use proper hand-holds. Do not use control levers, seats or other non-secured items as hand-holds.</p> <p>Refer to <i>section 4.1.3 of the Operators Manual</i> for more information.</p>
	Use of portable ladders		<p>Risk of fall from ladders if used incorrectly or unsafely.</p> <p>Ensure that any portable ladders are positioned on a firm level base. Ensure step ladders are fully opened and locked. Do not stand any higher than the third step from the top. Ensure standard ladders are elevated to approximately 75° (1:4), and are secured at the base and the top. If this is not possible, have a second person foot and steady the ladder. Maintain three points of contact on the ladder at all times. Do not over-reach. Do not attempt to carry tools up or down the ladder while holding them in your hands.</p> <p>Do not jump off the crane structure. Use provided access ladders. Face the ladder when climbing. Use proper hand-holds. Do not use control levers, seats or other non-secured items as hand-holds.</p>

B. Generic Hazards

Section / Heading	Hazard	Risk	Described Risk & Control Measures
Generic hazards that apply to multiple sections (cont)	Slips, trips and falls		Risk of slips trips and falls due to loose covers and debris. Inspect all covers and guards are secured in place. Remove any debris from ground around the machine, the cabin areas, carrier deck areas and access ways that may create any trip hazards. Dispose of debris correctly and safely.
	Falls from Height		Risk of injury due to falls from heights. Where access ways and edge protection is not provided in certain sections of the superstructure, utilise scaffolding or elevating work platforms to conduct the inspections. Where these control measures are not possible, the use fall prevention, fall restraint, or fall arrest devices and appropriate anchors and systems will be required. Do not attempt to gain access to the crane when it is in motion.
	Pressurised or high temperature fluids		Risk of serious injury due to hot/pressurised fluids. Follow manufacturer's instructions regarding checking of fluid levels. Ensure that wherever possible that pressure is relieved in all reservoirs prior to opening. For engine coolant tank instruction Refer to section 7 & 8 of Maintenance Manual . Ensure that all fluids have had sufficient time to cool down prior to opening the reservoir. Wear protective gloves, protective eyewear and appropriate protective clothing as per manual. Wear long sleeved protective clothing when checking the vehicle engine oil. It is necessary to reach between the back of the drivers cab and the exhaust system to access the engine dipstick. Ensure that you do not touch the hot exhaust system. Refer to section 7 & 8 of Maintenance Manual for procedure. Do not conduct fluid level inspections when the engine is running or if systems are energised. Do not attempt to remove inspection caps or covers when the engine is running or system is energised. If a hydraulic leak is suspected in a hose or pipe, do not use bare hands to locate the leak when the system is energised and pressurised. Be sure to read applicable Material Safety Data Sheets prior to working with fluids and abide by the advice given for appropriate PPE.
	Protruding objects		Risk of head injuries. Where deemed necessary, use protective headwear such as a safety helmet to protect against head bumps on protruding objects such as hook blocks, boom sections and counterweights.

B. Generic Hazards (cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
Generic hazards that apply to multiple sections (cont)	Refuelling, servicing, repair work		<p>Risk of environmental contamination when handling fuels, lubricants and other fluids.</p> <p>Ensure that any oil or fuel spills or leaks are either cleaned up or rectified. Ensure that oil-spill kits are available on-site. Wipe up any fuel spillage and secure fuel caps when refuelling is complete.</p>
	Batteries		<p>Risk of explosions due to batteries emitting vapours.</p> <p>Be aware of hydrogen gases emitted from batteries. Do not allow metal objects to arc across battery terminals. Ensure terminal covers are in place. Do not smoke or use naked flames in the vicinity of batteries. Ensure that any maintenance or checks carried out on batteries are conducted in a well ventilated area.</p>
	Flammable materials		<p>Risk of fire.</p> <p>Do not leave any rags or clean-up materials on the machine that could catch fire due to heat build-up. Switch off the engine, heater and all additional heating devices prior to refuelling.</p> <p>Ensure that the appropriate types and numbers of fire extinguishers are fitted to the crane, or a fire suppression system is fitted. Ensure that all fire extinguishers comply with appropriate standards, and have been tagged and inspected.</p> <p>Ensure that operators and crane crew members have had training in the use of fire extinguishers.</p> <p>Do not smoke or use naked flames in the vicinity of oil or fuel. Extinguish all sources of ignition when handling these types of materials.</p>
	Areas of low light/darkened areas		<p>Risk of incidents due to a lack of available light.</p> <p>Ensure that inspections are carried out in a well lit area where clear vision available to all parts of the crane. In areas where seeing is difficult, utilise lighting plants, spotlights or torches to enable a clear view of the task being performed.</p> <p>Ensure that the light source does not itself create a hazard from generated heat.</p>

B. Generic Hazards (cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
Generic hazards that apply to multiple sections (cont)	Crush zones		Risk of crushing in limited access areas. Ensure that crane is switched off when inspecting items located in crush zones. Place warning tags on operating controls and remove keys and battery isolator switch while performing inspections. Where applicable place "Risk – Crush Zone" warning stickers in appropriate areas.
	Safety labels and signage		Risk of incidents due to lack of visual warning. Ensure that all warning labels and stickers are in appropriate places and legible. Clean warning labels and stickers when obscured with water and mild detergent. Do not use organic solvents to clean labels and stickers. Replace labels or stickers that have become illegible or damaged.
	Statutory signage		Risk of incidents due to lack of appropriate signage. Ensure that all appropriate signage is displayed upon the carrier of the truck crane prior to on-road driving. In this way you will minimise the risk of other road users being uninformed about the truck cranes characteristics. Ensure that "Caution – Left Hand Drive" warning labels are displayed in appropriate positions on the front and/or rear of the vehicle. Ensure that "Oversize" warning labels are displayed in appropriate positions on the front and/or rear of the vehicle. Ensure that "Do not Overtake Turning Vehicle" warning labels are displayed in appropriate positions on the front and/or rear of the vehicle. Ensure that the operator of the crane is the holder of the appropriate driver's licence for on-road operation. Ensure that the operator complies with applicable State or Territory traffic laws when operating the crane on public roads.
	Collision with objects		Risk of incidents due to objects being out of the operator's field of vision. If operating in close proximity to other vehicles or plant, ensure that another person is used to guide the operator while the machine is in motion. In this way you will prevent the truck crane from colliding with objects, other plant or on-site personnel.
	Access and Egress		Risk of falls due to objects being mistaken for hand-holds. Beware not to use the front window support strut or the front panel support bar as hand holds when entering the crane cab. These items look like hand-holds but are not designed as such and may collapse under a person's weight, causing a fall or damage to the component.

B. Generic Hazards (cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
Generic hazards that apply to multiple sections (cont)	Operator Physical Condition		<p>Risk of incidents due to physical condition of operator.</p> <p>Prior to operating the machine, ensure that the operator is not suffering from fatigue or is under the influence of drugs or alcohol. Where required ensure that the operator has undergone a recent medical examination.</p>
	System Unfamiliarity		<p>Risk of incidents due to operator not receiving full instruction.</p> <p>Ensure that the operator has been fully instructed by a suitable competent person on the operational aspects of the crane functions, the ECOS crane control system and the EKS/RCI (Rated Capacity Indicator).</p> <p>Failure to do so may result in damage to the crane and it's systems, or cause an incident that may result in personal injury to the operator or other members of the crane crew, or innocent bystanders.</p>

CARRIER

1. Overview

Section / Heading	Hazard	Risk	Described Risk & Control Measures
<p>1.4.2 How are the operating instructions structured?</p>	<p>Misinterpretation of Instructions</p>		<p>Risk of incidents when only referring to the checklists during operation.</p> <p>The checklists and the step-by-step instructions should always be considered as a single unit for the complete description of a rigging procedure. It is only safe to operate the truck crane by referring to the checklists when you are familiar with all of the Risks that may occur, and are confident in completing the necessary steps as described in the relevant operation instructions. If in doubt, always read the section first which is referred to in the checklist.</p>

2. Basic Safety Instructions for Crane Operators

Section / Heading	Hazard	Risk	Described Risk & Control Measures
<p>Basic safety Instructions</p>	<p>Too may to be listed</p>		<p>This row has only been added for the operator to identify that the safety instructions though generic in nature are important to the use of the crane in any and all types of applications, use and maintenance. It is vital the operators familiarises themselves with the safety instructions.</p>

3. Operating Elements for Driving

Section / Heading	Hazard	Risk	Described Risk & Control Measures
<p>3.2 Short description of the operating elements</p>	<p>System Unfamiliarity</p>		<p>Risk of incidents due to operating error.</p> <p>Section 3.2 is not a complete operating manual. It only provides a general overview of the operating element functions. Before using the operating elements for the first time, read through the following chapters thereafter and the safety instructions listed there.</p>
<p>3.2.16</p>	<p>Windows</p>		<p>Risk of crushing when closing windows.</p> <p>If the window winder encounters resistance, it does not stop but continues with reduced power. Monitor the window and let go of the rocker button as soon as someone reaches into or leans through the window.</p>

4. Starting / Turning Off the Engine for Driving

Section / Heading	Hazard	Risk	Described Risk & Control Measures
4.1.3 Access ladders and ladders	Ladders		<p>Risk posed by ladder falling down.</p> <p>Always secure the ladders before driving. This prevents the ladders from falling down while driving on the road and endangering other vehicles.</p>
4.1.4 Refuelling	Refuelling		<p>Risk of fire due to flammable gases.</p> <p>Switch off the diesel engine, the heater and all additional heating devices before refuelling.</p> <p>Do not smoke while refuelling. Extinguish all naked flames and sources of heat in the immediate area and ensure that an appropriate fire extinguisher is available.</p>
4.1.4 Refuelling	Refuelling		<p>Risk of splash-back while refuelling.</p> <p>As the fuel tank approaches being full, there is a risk that escaping air from the fuel tank may cause a splash-back of fuel. Wear appropriate face/eye protection, and appropriate protective gloves during refuelling.</p>
4.1.4 Refuelling	Refuelling		<p>Risk of incidents if fuel tank is not closed.</p> <p>Always screw the fuel cap back onto the filler neck after refuelling. In this way you prevent following vehicles from being endangered by the fuel cap falling off or fuel escaping.</p>
4.1.5 Checks before starting the engine	Valves on hydraulic tank		<p>Risk of damage to the hydraulic pumps.</p> <p>The diesel engine may only be started if all four shut-off valves in the suction lines of the hydraulic pumps are open. The shut-off valves are open when the handles are parallel to the suction lines.</p>
4.1.6 Switch on the ignition	Transmission		<p>Risk posed by unexpected rolling.</p> <p>When the ignition is switched on, the transmission switches to the neutral position N. Therefore always apply the parking brake or the service brake before you switch on the ignition. This prevents the truck crane from suddenly rolling away.</p>

4. Starting / Turning Off the Engine for Driving (cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
4.1.7 Lamp test / equalisation of the switching states	Lamp test		<p>Risk of incidents due to faulty lamps.</p> <p>The lamps that are used to provide warnings and information during operation go on for control purposes whenever the ignition is switched on. Always perform the lamp tests described in Section 4.1.7 and immediately replace faulty lamps or have them replaced. In this way, you will avoid incidents and damage that occur when malfunctions are not identified in time.</p>
4.1.8 Starting the engine	Without flame start system		<p>Risk of explosions when using starter fuel.</p> <p>The engine may never be started with the aid of starter fuel. The starter fuel sprayed into the suction unit may ignite.</p>
4.1.8 Starting the engine	With flame start system		<p>Risk of explosions when using starter fuel.</p> <p>The engine may never be started with the aid of starter fuel. The starter fuel sprayed into the suction unit may ignite.</p>
4.1.9 Checks after starting the engine	Checking in the main menu		<p>Risk of damage to the engine.</p> <p>Switch off the engine if the <i>Diesel Engine Oil Pressure</i> warning symbol is still displayed about 10 seconds after starting the engine. The engine can be damaged by running it when the oil pressure is too low. Check that the lamps go out when the engine is running. The lamp only goes out when the vehicle starts moving. Refer to section 4.1.9 for the warning lamp diagram.</p>
4.2 Turning off the engine 4.2.1 During normal operation, with the ignition lock / with the hand-held control	Steering system		<p>Risk of incidents due to the fact that the truck crane cannot be steered.</p> <p>Only turn off the engine once the truck crane is at a standstill. If you remove the ignition key, the steering will lock and you will lose control of the moving crane.</p>

5. Driving

Section / Heading	Hazard	Risk	Described Risk & Control Measures
5.1 Before Driving 5.1.2 Checking the condition of the truck crane	vehicle height		<p>Risk of incidents from exceeding the permissible height.</p> <p>Ensure that the boom is fully lowered and locked into the dolly or fully lowered into boom rest otherwise the overall height will also be exceeded at on-road level. Refer to section 5.1.1 for instructions on the boom position before driving.</p> <p>If the boom set down indicator as shown below here is fitted as an option (not in Australia) check that the symbol is shown.</p> 
5.1.2 Checking the condition of the truck crane	Supply Pressure		<p>Risk of incidents due to the truck crane moving unintentionally.</p> <p>Make sure that the parking brake lever is pulled backwards, pointing to the rear and locked into position before building up the supply pressure. In this way you prevent the parking brake from releasing as soon as sufficient pressure is available and the truck crane starting to move unintentionally.</p>
5.1.2 Checking the condition of the truck crane	Parking Brake		<p>Risk of incidents due to the truck crane moving unintentionally.</p> <p>Also press the brake pedal before releasing the parking brake. In this way you prevent the truck crane from starting to roll in an uncontrolled manner when the parking brake is released.</p>
5.1.3 Adjusting the seat and the steering column	Adjusting the steering column		<p>Risk of incidents if the steering column is unlocked.</p> <p>Always stop the truck crane before you unlock the steering column. You can no longer steer safely after unlocking the steering column.</p>
5.1.4 Switching the suspension on / off	Switching off the suspension		<p>Risk of damage to the axle lines.</p> <p>Always switch on the suspension for on-road driving. The axle lines may become damaged and the steering behaviour may change if the suspension is switched off.</p>

5. Driving (cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
5.1.5 Setting the Tachograph	Tachograph drawer		Risk of damage to the Tachograph drawer. Open the Tachograph drawer only to insert or remove diagram sheets and do not use the opened drawer as a shelf or surface (e.g. to mark the diagram sheets). By doing this, you can prevent contamination and damage.
5.1.5 Setting the Tachograph	Inserting incorrect diagram sheets		Risk of malfunctions in the electronics. If a diagram sheet has been damaged by being marked several times, this might cause malfunctions in the electronics. Therefore, always insert the plastic sheet diagram supplied should you need not to use the Tachograph.
5.2 Operating the transmission 5.2.1 Switching on	Starting		Risk posed by unexpected rolling. When the ignition is switched on, the transmission switches to the neutral position N. Therefore always apply the parking brake or the service brake before you switch on the ignition. This prevents the truck crane from suddenly rolling away.
5.2.2 Shifting the transmission to the neutral position	Lack of drive		Risk of incidents when driving in neutral position. Never into neutral position while driving. In the neutral position, you cannot accelerate the truck crane and the engine retarder does not work.
5.2.4 Selecting the driving direction	Gear engagement		Risk of incidents from unexpected movement. If the engine speed is too high when selecting the driving direction, then no gear will be engaged. However, if the engine speed briefly drops low enough, then the gear will be engaged and the truck crane will begin to move, e.g. when you release the accelerator.
5.2.4 Selecting the driving direction	Brakes not applied		Risk of incidents if brakes are not applied. If the brakes are not applied, the truck crane moves immediately once the driving direction has been selected. Therefore, always apply the parking brake or holding brake to secure the truck crane before selecting the driving direction.

5. Driving (cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
5.2.6 Starting	High transmission loads		<p>Risk of damage to the transmission where the load is too high the truck crane cannot move.</p> <p>Release the accelerator after 30 seconds at the latest when the load is too high. This prevents the transmission from being damaged due to overheating. The starting gear is not automatically disengaged. Switch into the neutral position and let the motor run until the gear oil temperature drops below about 93 °C. Select a lower starting gear or driving mode P and start driving again.</p>
5.3 Driving and turning off the truck crane	Steering		<p>Risk of incidents due to the fact that the truck crane cannot be steered.</p> <p>Never switch off the ignition or remove the ignition key while the truck crane is moving. In this way you prevent the steering from locking and do not lose control of the moving truck crane.</p>
5.3.1 Checks while driving	Immediately after you start to move		<p>Risk of incidents if the steering circuits fail.</p> <p>If one or more of the <i>Steering Circuit</i> warning lamps light up, stop the truck crane immediately and switch off the engine. Check whether oil has been lost. Depending on the size of the leak, the oil supply in a steering circuit may be lost within 2 minutes.</p>
	While driving		<p>Risk of damage if warning messages are not observed.</p> <p>Observe all information in the section <i>Warning Submenu</i> and take the appropriate remedial measures if a warning message appears. In this way, you can prevent these malfunctions from causing malfunctions on the truck crane.</p>
5.3.2 Tempomat	Use of tempomat whilst driving		<p>Risk of incidents due to carelessness</p> <p>Always be ready to brake even if the Tempomat is switched on. Only switch the Tempomat on if the traffic situation permits a constant speed.</p>

5. Driving (cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
5.3.4 Driving downhill	Transmission		Risk of incidents when driving in neutral position. Never switch into the neutral position when driving. In neutral position, the truck crane may accelerate and the engine retarder is ineffective,
5.3.4 Driving downhill	Excessive engine speed		Risk of damage due to excessive engine speed exceeding 2000 RPM. Shift to a higher gear or slow the truck crane down when the maximum permissible engine speed has been reached. This prevents the engine or transmission from being damaged or the air intake inhibitor from being triggered.
5.3.4 Driving downhill	driving downhill		Risk of damage from oscillating movements. Always maintain a speed below 85 km/h. Stop the truck crane in good time.
5.3.4 Driving downhill	Acceleration		Risk of incidents due to unexpected acceleration. Maintain sufficient distance when the engine retarder is switched on. The effectiveness of the engine retarder is interrupted during gear shifting. This may cause the truck crane to accelerate briefly.
5.3.5 Driving uphill	Pressure on transmission		Risk of damage to the transmission Release the accelerator after 30 seconds at the latest when the load is too high. This prevents the transmission from being damaged due to overheating. The starting procedure is not automatically cancelled.
5.3.6 Warning messages in driving mode	Ignoring meaning of the symbols		Risk of damage if warning messages are not observed. Observe all information in the section 5.3.6 and take the appropriate remedial measures if a warning message appears. In this way, you can prevent these malfunctions from causing malfunctions on the truck crane.
5.3.6 Warning submenu	Oil pressure too low		Risk of damage to the engine if the oil pressure drops. If the oil pressure warning lamp  lights up and the warning buzzer sounds, turn the engine off as soon as possible and look for the cause. Never restart the engine until you have found the cause and eliminated the problem. Refer to Malfunctions on the Engine for Driving – section 7.6.1 of the Operators Manual for more information.

5. Driving (cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
5.3.6 Warning submenu	Supply pressure in the brake circuit too low		<p>Risk of incidents if one or both brake circuits fail.</p> <p>If the brake pressure warning lamp  lights up on the instrument panel, stop the truck crane immediately and identify the cause. Refer to <i>Malfunctions on the Engine for Driving – section 7.6.3 of the Operators Manual</i> for more information.</p>
5.3.7 Turning off the truck crane	Secure against rolling away		<p>Risk of incidents due to the truck crane moving unintentionally.</p> <p>Secure the truck crane on uphill and downhill roads by using wheel chocks together with the parking brake.</p>
5.3.7 Turning off the truck crane	When stationary for more than 8 hours		<p>Risk due to unauthorised use.</p> <p>Always stow away the hand-held control in the crane cab before leaving the truck crane, and lock the door to the crane cab or the driver's cab. In this way you can prevent unauthorised persons from starting the engine with the hand-held control.</p>
5.3.8 Folding berth	Folding berth		<p>Risk of incidents due to the berth folding down.</p> <p>If the folding berth is fitted check that the locking bar is engaged and put up the back rest of the seats before driving. This prevents the berth from folding down when braking, resulting in uncontrolled manoeuvres due to fright.</p>
5.4 Off-road driving 5.4.2 transfer case on/off road /on road gears	Increased thrust of driven wheels		<p>Risk of the transfer case not functioning properly.</p> <p>Only change the operating mode of the transfer case when the vehicle is stationary and the transmission is in the neutral position N. Never press the <i>On-road</i> and <i>Neutral</i> or <i>Off-road</i> buttons at the same time. This can result in faulty shifting in the transfer case.</p>

5. Driving (cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
5.4.3 longitudinal locks	Operation of longitudinal locks		Risk of damage to the axle lines Leave the longitudinal differential locks switched on only for as long as necessary. Always switch off the longitudinal differential locks before driving on a firm surface.
5.4.4 Operation of the transverse differential locks	Operation of the transverse differential locks		Risk of damage to the transverse differential locks Leave the transverse differential locks switched on only for as long as necessary. Always switch off the transverse differential locks when driving on firm ground and around corners.
5.4.5 Operating the level adjustment system	Blocked suspension		Risk of accidents when the suspension is blocked Check the state of the suspension at the 3rd and 6th axle lines before every level adjustment. Doing this helps you to prevent; <ul style="list-style-type: none"> the tyres being overstrained when the vehicle level is lowered and bursting, either immediately or later when driving. a wheel losing contact with the ground without being noticed, resulting in an impermissible vehicle state after lifting the vehicle level.
5.4.5 Operating the level adjustment system	Changing the vehicle level		Risk of accidents from exceeding the permissible overall height Always bring the truck crane to on-road level before driving on roads after changing the level. If the truck crane is on a higher level, then the specified overall height will be exceeded.
5.4.6 Freeing the truck crane stuck in terrain	Rocking the truck crane free		Risk of damage to the transmission. Release the accelerator after 30 seconds at the latest when the load is too high. This prevents the transmission from being damaged due to overheating. The starting gear is not automatically disengaged.
5.4.6 Freeing the truck crane stuck in terrain	Towing free forwards		Risk of damage to the chassis. Only tow the truck crane free while observing the procedure given for the pulling direction. Jerking the truck crane or pulling it at an angle can cause damage to the chassis. Refer to Operators manual section 5.4.6.
5.4.6 Freeing the truck crane stuck in terrain	Towing free to the rear		Risk of damage to the chassis. Only tow the truck crane free while observing the procedure given for the pulling direction. Otherwise the chassis may be damaged or the towing eyes may be torn off or bend. Refer to Operators manual section 5.4.6.

5. Driving (cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
5.4.7 Separate Steering	Switching to separate steering		Risk of accidents when driving on the road with unlocked steering After driving with separate steering, change over immediately to normal steering. The locking condition for normal steering is only re-established when the lamp has gone out. Refer to section 5.4.6 of operator manual.
5.4.7 Separate Steering	Switching to normal steering		Risk of accidents when driving on the road with unlocked steering Changing over to normal steering is only completed when the lamp has gone out. Otherwise, the steering is not locked on the 6th and 7th axle lines. See 5.4.7.
5.5 Heating and ventilating the driver's cab 5.5.3 Auxiliary heater	Switching on the auxiliary heater		Risk of explosions when operating the auxiliary heater. The auxiliary heater is not allowed to be operated: <ul style="list-style-type: none"> • At service stations and tank farms • At locations where flammable gases and vapours are found or can be formed (e.g. at fuel stations and chemical factories) • At locations where explosive dust is found or can be formed (e.g. coal dust, wood dust, grain dust)
	Switching on the auxiliary heater		Risk of suffocation when operating the auxiliary heater. Do not use the auxiliary heater in closed spaces (e.g. in a garage)
5.5.4 Auxiliary water heater	Switching on the auxiliary water heater		Risk of explosions when operating the auxiliary heater. The auxiliary heater is not allowed to be operated: <ul style="list-style-type: none"> • At service stations and tank farms • At locations where flammable gases and vapours are found or can be formed (e.g. at fuel stations and chemical factories) • At locations where explosive dust is found or can be formed (e.g. coal dust, wood dust, grain dust)
	Switching on the auxiliary water heater		Risk of suffocation when operating the auxiliary heater. Do not use the auxiliary heater in closed spaces (e.g. in a garage)
5.5.5 Auxiliary air heater with timer	Switching on auxiliary air heater		Risk of explosions when operating the auxiliary heater. The auxiliary heater is not allowed to be operated: <ul style="list-style-type: none"> • At service stations and tank farms • At locations where flammable gases and vapours are found or can be formed (e.g. at fuel stations and chemical factories) • At locations where explosive dust is found or can be formed (e.g. coal dust, wood dust, grain dust)
5.5.5 Auxiliary air heater with timer	Switching on auxiliary air heater		Risk of suffocation when operating the heating Do not operate the heater or the heater with the timer in enclosed rooms (e.g. garages).

6. Driving Modes and Rigging for On-Road Driving

Section / Heading	Hazard	Risk	Described Risk & Control Measures
6.1 Driving modes	Heavy loads		<p>Risk of incidents due to increased braking distance.</p> <p>The braking deceleration required by the EU partial-type approval cannot be met when driving with axle loads of over 12 tonne. Please bear in mind that the braking distance of the truck crane will increase as a result.</p>
6.1 Driving modes	Material condition		<p>Risk of damage due to premature wear.</p> <p>Premature wear of parts under particular stress (brake system, steering, tyres, wheels, suspension, and drive shafts) cannot be ruled out even when the axle loads only briefly exceed 12 tonne.</p>
6.1.3 Maximum permitted speeds with an axle load of over 12t.	Overloading		<p>Risk of accidents due to overloading of the tyres</p> <p>Never exceed the maximum permitted speed which is given for the current axle load and tyre size. This prevents the rope tyres from becoming overloaded and rupturing.</p>
6.2 Rigging work for driving with a trailer 6.2.1 Switching on the slewing gear freewheel	Houselock on		<p>Risk of incidents with the houselock switched on.</p> <p>Always switch the houselock off before setting down the main boom on the trailer. Otherwise the superstructure will be unable to slew when driving around corners. Place the boom on the trailer as described in section <i>Switching on boom floating position</i>, see 6 - 8.</p>
6.2.1 Switching on the slewing gear freewheel	Unsecured bolts		<p>Risk of incidents if the bolts are not secured.</p> <p>Always secure the bolts with the lock. This prevents the slewing gear freewheel from being switched off unintentionally while driving.</p>
6.2.2 Switching on boom floating position	Boom floating position switched off.		<p>Risk of incidents when driving with boom floating position switched off.</p> <p>Always switch on the boom floating position when the main boom is on a trailer. This prevents the trailer hanging briefly with its full weight on the main boom on uneven ground, the axle loads from rising suddenly, or the truck crane tipping over when driving around corners.</p>
6.2.2 Switching on boom floating position	Setting the main boom down on the trailer		<p>Risk of incidents due to the main boom falling down.</p> <p>You may only switch on the boom floating position when the boom is already set down on the trailer. In this way you prevent the raised boom from falling down.</p>

6. Driving Modes and Rigging for On-Road Driving (cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
6.3 Rig the outrigger span 7.78 x 8.90 / 1.22 m	Overloading		Risk of damage to the suspension struts and tyres Always support the truck crane with the supplied supports before carrying out the procedures listed. This prevents the suspension struts and tyres from becoming overloaded and damaged. Refer to section 6.3 of operator's manual for further information.
6.3 Rig the outrigger span 7.78 x 8.90 / 1.22 m	Unlevel truckcrane and carrier		Risk of tipping when not horizontally aligned. Ensure that the truck crane and carrier are always level. This prevents the outriggers from slipping off the packing or overloading the truck crane.
6.4 Installing / removing supports	Unsupported truckcrane		Risk of truck crane overturning if not properly supported The lifting of loads is only permitted when the truck crane is supported by all the outriggers. For this reason, always use an auxiliary crane to lift the outrigger beams.
6.4.6 Establishing / disconnecting the electrical connection	Ignition left on.		Risk of malfunctions in the electronic system Always turn off the ignition before you disconnect or establish the electrical connection. In this way you prevent malfunctions and corresponding error messages in the subsequent crane operation.
6.4.10 Pulling out / Inserting the outrigger beam	Outrigger beam		Risk of being crushed by the swinging outrigger beam Secure the outrigger with the guide ropes when pulling it in and out. Keep a suitable distance to avoid injuring yourself or others on the swinging outrigger beam.
6.4.10 Pulling out / Inserting the outrigger beam	Extending/extracting outriggers		Risk of damage to the piston rod When extending and retracting the outrigger beams with the guide ropes, align the beam in such a way that the projecting piston rod is not damaged.
6.4.10 Pulling out / Inserting the outrigger beam	Spacers not screwed in		Risk of damage to the spacers Check that all spacers have been screwed in completely. This prevents the spacers from remaining hanging and becoming damaged.
6.4.10 Pulling out / Inserting the outrigger beam	Pulling out / Inserting the outrigger beam		Risk of damage to the hoses and cables Ensure that the hoses and cables of the hydraulic and electrical connections are not damaged.

6. Driving Modes and Rigging for On-Road Driving (cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
6.4.11 Transporting the outrigger beams	Transporting the outrigger beams		Risk of damage to the outrigger beams and outrigger pads When outrigger pads are mounted, always use a device to set them down. If you lay the outrigger beams onto the side, connections may tilt and become damaged.
6.5 Mounting / dismantling the rear outriggers	Slewing superstructure		Risk of overturning when slewing the superstructure Always stabilize the truck crane with an outrigger span of 7.78 x 8.90 / 1.22 m and enter an appropriate SLI code before you slew the superstructure. Never override the SLI when slewing is switched off; see Crane movements during the installation and removal procedures, p. 6 - 39.
6.5.3 Crane movements during the installation and removal procedures	Slewing superstructure		Risk of overturning when slewing the superstructure Always support the truck crane with an outrigger span of 7.78 x 8.90 / 1.22 m (with packed supports at the rear) and set the corresponding SLI code before slewing the superstructure. Do not override the SLI if slewing is switched off. Ensure procedures in 6.5.3 is followed.
6.5.4 Slings points of the rear outrigger	Slings		Risk of accidents if used improperly Attach the outrigger box only to the designated points and only use lifting gear of sufficient lifting capacity. Weight of the outrigger box as on p. 8 - 5.
6.5.6 Electrical connection, establishing / breaking	Ignition left on		Risk of malfunctions in the carrier electronics Always turn off the ignition before you establish or break the electrical connection. In this way you prevent malfunctions and error messages in the carrier electronics.
6.5.8 Lifting / hanging the outrigger box with the truck crane	Raising rear outriggers		Risk of damage to the suspension struts and tyres You must support the truck crane on the supports before raising the rear outriggers with the truck crane. This prevents the suspension struts and tyres from becoming overloaded and damaged.
6.5.8 Lifting / hanging the outrigger box with the truck crane	Lifting outrigger box		Risk of overturning with the raised outrigger box Always enter an SLI code for the outrigger span 7.78 x 8.90 / 1,22 m with the working position required before lifting the outrigger box with the truck crane and slewing the truck crane. You may not override the SLI even if the SLI goes off at a small working radius. When the working radius increases after SLI shutdown, the stability is no longer guaranteed.

6. Driving Modes and Rigging for On-Road Driving (cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
6.5.8 Lifting / hanging the outrigger box with the truck crane	Attaching and raising outrigger box.		Risk of being crushed when attaching and raising the outrigger box Always guide the outrigger box from the rear with guide ropes when attaching and raising it. This will help prevent you being crushed between the outrigger box and the carrier.
6.5.9 Fixing / Releasing the outrigger pins	Extending and retracting pins		Risk of crushing when extending / retracting the pins The pins on both sides are always moved at the same time from the Rear outrigger / additional axle control unit. Make sure that no-one is in the vicinity of the carrier retainers on the other side of the vehicle when you extend or retract the pins.
6.5.9 Fixing / Releasing the outrigger pins	Securing plugs		Risk of damage to the securing plugs Make sure that the securing plugs with the chains are not pushed inwards through the retainers on the carriage. In this way you can prevent the chains or the securing plugs being severed when the pins are extended or retracted.
6.5.10 Transportation on a separate vehicle	Transportation of outrigger box and pads		Risk of damage to add-on parts on the outrigger box and outrigger pads. Always set down the outrigger box on appropriate mounting equipment for transportation to avoid damage to the add-on parts protruding from under the outrigger box. Always secure the mounting equipment and the outrigger box against slipping and overturning. See 6.5.10 for further details.
6.5.12 Hook block in the lighting carrier	Unsecured hook block		Risk of accidents if hook block is not secured. Always secure the hook block in the stowing position with tightening belts or other suitable fastening equipment. This avoids the hook block from slipping during the journey and damaging parts or from falling down and endangering following traffic.
6.6 Rigging the main boom (OPTIONAL)	Correct equipment		Risk of incidents when removing / installing the main boom without pulling devices. Only remove or install the main boom if the truck crane is equipped with the factory-installed pulling devices and with the necessary accessories. Without these factory-installed pulling devices, the main boom may be removed by CraneCARE only. With the appropriate additional equipment, you have the option of mounting/ removing the main boom in working position 0° to the rear.

6. Driving Modes and Rigging for On-Road Driving (cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
6.6.3 Slinging the main boom	Use of correct equipment		<p>Risk of incidents due to incorrect procedure.</p> <p>Only use the slinging gear included in the delivery. These must be attached only at the 4 slinging points on both sides of the main boom. Align the auxiliary crane in such a way that the main boom can be raised vertically without swinging. See 6.6.3 for details.</p>
6.6.4 Removing / attaching the clamp	Movement of main boom		<p>Risk of hands and arms being crushed.</p> <p>Make sure that the boom pivot pin is bolted before making or removing or attaching the clamp. This means that you avoid a swinging main boom crushing your arms or hands on the turntable.</p>
6.6.5 Switching the pressure relief on / off	Falling main boom		<p>Risk of incidents from falling main boom.</p> <p>Check to see that the main boom is in the boom rest before switching off the pressure relief. In this way, you prevent the raised main boom from falling down.</p>
6.6.6 Retracting / fitting the derricking cylinder head pin	Operation of the lifting device		<p>Risk posed by lifting equipment not working.</p> <p>Have the lifting device serviced in time before the maintenance interval specified on the label expires.</p>
6.6.6 Retracting / fitting the derricking cylinder head pin	Retracting the derricking cylinder head axle		<p>Risk of incidents from falling derricking cylinder.</p> <p>Always take the load off of the derricking cylinder using the lifting device before retracting the head pin. By doing this, you prevent the derricking cylinder from falling down, injuring people or being damaged while retracting the head pin.</p>
6.6.6 Retracting / fitting the derricking cylinder head pin	Fitting the derricking cylinder head axle		<p>Risk of damage to the bearings in the derricking cylinder head.</p> <p>Make sure that the bearings in the derricking cylinder are aligned with the head pin before fitting the head pin. This prevents the head pin from damaging the bearing.</p>
6.6.7 Retracting / extending the boom pivot pin	Retracting / extending the pivot pin		<p>Risk of damage to the main boom.</p> <p>Before retracting, the main boom must be slung and all other sling gear must be tightened. Before extending, the bearing points on the turntable must be aligned with the boom pivot pin.</p>

6. Driving Modes and Rigging for On-Road Driving (cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
6.6.8 Disconnecting the hydraulic / electrical connection	Lifting in front of the turntable		Risk of damage to connection lines and the driver's cab. Lift the main boom far enough to ensure that the pivot point of the derricking cylinder does not damage the driver's cab. Only lift the main boom so far in front of the turntable that the cables and hoses do not tear off.
6.6.8 Disconnecting the hydraulic / electrical connection	Lifting in front of the turntable		Risk of hands and arms being crushed. Lift the main boom only far enough in front of the turntable to ensure that you are not crushed between the turntable and the main boom.
6.6.8 Disconnecting the hydraulic / electrical connection	Disconnecting		Risk of malfunctions in the superstructure electronics. Always turn off the ignition in the crane cab before you establish or separate the electrical connection. In this way you prevent malfunctions in the electronics and corresponding error messages in the subsequent crane operation.
6.6.9 Establishing the hydraulic / electrical connection	Lifting onto the turntable		Risk of damage to the driver's cab. Lift the main boom far enough to ensure that the pivot point of the derricking cylinder does not damage the driver's cab.
6.6.9 Establishing the hydraulic / electrical connection	Lifting onto the turntable		Risk of hands and arms being crushed. Lift the main boom only far enough onto the turntable to ensure that you are not crushed between the turntable and the main boom.
6.6.9 Establishing the hydraulic / electrical connection	Establishing connections		Risk of malfunctions in the superstructure electronics. Always turn off the ignition in the crane cab before you establish or separate the electrical connection. In this way you prevent malfunctions in the electronics and corresponding error messages in the subsequent crane operation.
6.6.10 Aligning the connecting points	Raising main boom onto turntable.		Risk of damage to the turntable and the connection lines. Make sure the connection lines are located within the turntable and that the main boom does not swing when you raise it onto the turntable.

6. Driving Modes and Rigging for On-Road Driving (cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
6.6.11 Securing / releasing the derricking cylinder	Derrick cylinder		Risk of accidents from protruding derricking cylinder The derricking cylinders jutting out to the rear must be specially marked before on-road driving (warning signs, signalling lights etc.). Observe the regulations of the country in which you are working.
6.6.12 Transporting the main boom	Suitable packing		Risk of damage to the main boom. Always place the main boom onto a suitable packing. If you lay the main boom on its side, add-on parts will be damaged.
6.6.13 Inspections after main boom mounting	Condition of equipment		Risk of malfunctions during crane operation. Make absolutely sure you perform the inspections in 6.6.13. This will prevent malfunctions caused by faulty hydraulic or electrical connections.
6.7 Installing / removing the additional axle (Optional if there is an 8 th axle).	Slewing with outrigger removed		Risk of overturning when slewing with the rear outrigger removed Always support the truck crane with an outrigger span of 7.78 x 8.90 / 1.22 m and set the corresponding SLI code before slewing the superstructure with the rear outrigger dismounted. Do not override the SLI when slewing is switched off; as per Crane movements during the installation and removal procedures, see p. 6 - 39.
6.7.3 Slings points on the additional axle	Slings		Risk of accidents if used improperly Sling the additional axle only on the designated points and use only lifting gear with sufficient load bearing capacity. Weight of the additional axle see 8 - 5.
6.7.4 Crane movements during the installation and removal procedures	Slewing		Risk of overturning when slewing the superstructure Always support the truck crane with an outrigger span of 7.78 x 8.90 / 1.22 m and set the corresponding SLI code before slewing the superstructure with the rear outrigger dismounted. Do not override the SLI if slewing is switched off.
6.7.5 Breaking / establishing the hydraulic connections	Breaking / establishing the hydraulic connections		Risk. Body parts could be crushed when establishing a connection for the suspension Only establish a connection for the suspension after – first locking the suspension with the valves and – lowering the truck crane until the wheels of the additional axle lightly touch the ground. This avoids the wheels suddenly being lowered and damaged.

6. Driving Modes and Rigging for On-Road Driving (cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
6.7.8 Attaching / removing the additional axle with the truck crane	Attaching / removing the additional axle with the truck crane		Risk of damage to the suspension struts and tyres You must support the truck crane on the rear supports before raising the additional axle with the truck crane. This prevents the suspension struts and tyres from becoming overloaded and damaged.
6.7.8 Attaching / removing the additional axle with the truck crane	Raised axle		Risk of overturning with raised additional axle Always enter an SLI code for the outrigger span 7.78 x 8.90 / 1.22 m with the working position required before lifting the additional axle with the truck crane and slewing the truck crane. You may not override the SLI even if the SLI goes off at a small working radius. When the working radius increases after SLI shutdown, the stability is no longer guaranteed.
6.7.8 Attaching / removing the additional axle with the truck crane	Attaching and hoisting additional axle.		Risk of crushing when attaching and hoisting the additional axle Always attach and hoist the additional axle from the rear and with guide ropes. This will help prevent you being crushed between the additional axle and the carrier.
6.7.8 Attaching / removing the additional axle with the truck crane	Lifting		Risk of accidents if the additional axle is not secured Always set down the additional axle on a support. This prevents the additional axle from overturning.
6.7.9 Securing / Releasing the additional axle pins	Extending/retracting pins		Risk of crushing when extending / retracting the pins The pins on both sides are always moved at the same time from the Rear outrigger / additional axle control unit. Make sure that no-one is in the vicinity of the carrier retainers on the other side of the vehicle when you extend or retract the pins.
6.7.9 Securing / Releasing the additional axle pins	Securing plugs		Risk of damage to the securing plugs Make sure that the securing plugs with the chains are not pushed inwards through the retainers on the carriage. In this way you can prevent the chains or the securing plugs being severed when the pins are extended or retracted.
6.7.10 Locking / enabling the suspension on the additional axle	Enabling		Risk posed by bursting tyres When the suspension is locked, the suspension on the additional axle remains rigid. For this reason you should only lower the truck crane far enough for the wheels not to be put under strain. This prevents the tyres from being put under strain and puncturing when the vehicle level is lowered.

6. Driving Modes and Rigging for On-Road Driving (cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
6.7.10 Locking / enabling the suspension on the additional axle	Enabling		<p>Risk of damage to the tyres</p> <p>Before lowering the truck crane, check the area under the raised wheels for sharp or pointed objects, and remove these if necessary. By doing so, you can prevent the tyres from bursting or becoming damaged when the truck crane is lowered.</p>
6.7.10 Locking / enabling the suspension on the additional axle	Enabling		<p>Risk of crushing when enabling the suspension</p> <p>When the hand valves are opened, the wheels drop down suddenly. For this reason you should lower the truck crane until the wheels are nearly at ground level before opening the hand valves, and ensure that no-one is in the immediate vicinity of the wheels when you release the suspension.</p>
6.7.11 Raising / lowering 3rd and 6th axle lines	Raising		<p>Risk posed by bursting tyres</p> <p>Always lower the truck crane as far as possible before locking the suspension.</p> <p>When you lock the suspension at a higher level, this level may be undercut later on by lowering. The suspension struts on the locked axle remain rigid and the tyres may come under excessive strain.</p>

7. Malfunctions in Driving Mode

Section / Heading	Hazard	Risk	Described Risk & Control Measures
7.2 What to do when a malfunction occurs in road traffic	Poor Visibility		<p>Risk of incidents due to poor visibility.</p> <p>If possible, do not stop in a tunnel or directly after a curve.</p> <ul style="list-style-type: none"> Secure the vehicle Turn on the hazard warning lights Secure the breakdown area <ul style="list-style-type: none"> Set up a warning triangle Set up a signal lamp or torch <p>Warning triangles, signal lamps and torches must be set up in front of the breakdown area in such a way as to prevent rear end collisions, particularly in curves.</p> <p>If possible, do not stop in a tunnel or directly behind a curve. Keep calm.</p> <ul style="list-style-type: none"> Brake the truck crane. Observe the motorists and cyclists behind you. Stop at a place which is safe for you and for the traffic behind you
7.2 What to do when a malfunction occurs in road traffic	Working in Risk Areas		<p>Risk of incidents during repair work in Risk areas.</p> <p>Even simple repairs can be dangerous in risk areas (e.g. tunnels, crossroads, motorway bridges). In a Risk areas, only carry out repair work required to leave the Risk area.</p>
7.3.1 Towing in the event of engine or transmission damage	Towing long distances		<p>Risk of incidents and damage when towing the truck crane long distances.</p> <p>Tow the truck crane at a maximum speed of 7 km/h and over a distance of max. 300 m. Additional measures must be taken for longer distances. In these cases, contact CraneCARE.</p>
7.3.1 Towing in the event of engine or transmission damage	Parking brake		<p>Risk of incidents in the event of faulty brakes.</p> <p>If damage has occurred to the service brake system, you may only tow the truck crane away from the immediate Risk area after receiving permission to do so from Crane Care.</p>
7.3.1 Towing in the event of engine or transmission damage	Towing the truck crane out of the Risk area		<p>Risk of damage to the chassis.</p> <p>Ensure the towing vehicle only drives off slowly. Starting to tow too quickly or in jolts can damage the chassis. Remember that the steering is sluggish. If the engine fails, only the emergency steering pump will be available, which only supports the steering from a speed of at least 2 km/h.</p>

7. Malfunctions in Driving Mode

Section / Heading	Hazard	Risk	Described Risk & Control Measures
7.3.1 Towing in the event of engine or transmission damage	Towing the truck crane out of the Risk area		Risk of incidents due to sluggish steering. Remember that the steering will be sluggish. If the engine fails, only the emergency steering pump will be available, which only supports the steering from a speed of at least 2 km/h. At speeds less than 2 km/h, the truck crane can hardly be steered.
7.3.1 Towing in the event of engine or transmission damage	Towing the truck crane out of the Risk area		Risk of incidents and damage when towing the truck crane long distances. Risk of accidents and damage when towing the truck crane long distances Tow the truck crane at a maximum speed of 7 km/h and over a distance of max. 300 m. Additional measures must be taken for longer distances. In these cases, contact <i>CraneCARE</i> .
7.4 Wheels and tyres 7.4.1 Wheel change	Wheels leaning against truck crane		Risk of incidents from overturning wheel. If you lean a wheel against the truck crane briefly when changing a wheel, secure it against falling over with a rope. Only move the outriggers if there is no wheel leaning against the truck crane.
7.4.1 Wheel change	Removing a damaged wheel		Risk of incidents from overturning wheel. When unscrewing the last wheel nuts, the wheel can slip off the hub and fall in your direction. Secure the wheel and step back quickly if the wheel threatens to tip.
7.4.1 Wheel change	On the spare wheel holder		Risk of overturning while slewing. Always check before slewing whether slewing is permitted in the truck crane's current rigging mode (counterweight, outrigger span, working radius). Correct the rigging mode if necessary. Refer to <i>Slewing with the Rigged Counterweight</i> – section 13.7.12 of the Operator's Manual for more information.
7.4.1 Wheel change	Mounting a wheel		Risk of incidents. Check the wheel rim, the tyres, the wheel nuts and the wheel studs for damage before mounting the spare wheel. Never mount damaged parts. Mount only the manufacturer's original spare wheel or a permitted wheel of the same size and load bearing capacity.
7.4.2 Filling the tyres yourself	Inflation Pressure		Risk of incidents due to impermissible tyre pressure. If the maximum pressure is above the specified tyre pressure, fill the tyres up to the maximum specified pressure. In this way you prevent the tyres from becoming damaged during driving, and bursting. Refer to <i>Tyres</i> – section 8.1.3 of the Operator's Manual for correct inflation pressure.

7. Malfunctions in Driving Mode (cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
7.4.2 Filling the tyres yourself (cont.)	Remove the filling hose		Risk of damage to the compressed air system. Always close the filler connection with the cap. This prevents damage and contamination in the compressed air system.
7.5 Fuses on the carrier	Information on replacing fuses		Risk of damage when the ignition is switched on. Switch off the ignition whenever a fuse has to be replaced. In this way you can prevent the new fuse from being damaged by the increased starting current immediately after inserting it.
7.5 Fuses on the carrier	Information on replacing fuses		Risk of damage due to overloading. Replace blown fuses only with new fuses of the same amperage. In this way you can prevent parts from being overloaded and damaged or the fuse from being immediately damaged again. Notify Crane Care if a fuse of the same amperage blows again after turning on the ignition.
7.5 Fuses on the carrier	Information on replacing fuses		Risk of fire. Never replace a defective fuse with other electrically conductive materials.
7.5.2 Fuses in the battery box	Lead and lead compounds		Risk due to lead and lead compounds of batteries. Battery poles, clamps, and parts of the battery itself contain lead and lead compounds. Wash your hands thoroughly following work on these parts or in these areas.
7.7 Procedure in the event of malfunction 7.7.1 Switching on emergency operation in the coolant circuit	Running diesel engine/fan wheel turning		Risk of incidents due to turning fan wheel. Always switch off the engine and secure against unauthorized use before switching on emergency operation. This prevents the fan wheel from starting to turn suddenly, and injuring you.
7.7.1 Switching on emergency operation in the coolant circuit	Hot engine parts		Risk of burning yourself when the engine is hot. During operation the engine and add-on parts heat up to a great extent. Wear appropriate protective gloves and be careful not to touch hot parts when you switch on the emergency operation.

8. Technical Information on the Carrier

Section / Heading	Hazard	Risk	Described Risk & Control Measures
N/A	N/A	N/A	N/A

9. Index for Part 1 – Operating Instructions – Carrier Driving

Section / Heading	Hazard	Risk	Described Risk & Control Measures
N/A	N/A	N/A	N/A

SUPERSTRUCTURE

10. Operating Elements for Crane Operation

Section / Heading	Hazard	Risk	Described Risk & Control Measures
10.2 Short description of the operating elements	System familiarity		<p>Risk of incidents due to operating error.</p> <p>Section 10.2 of the Operator’s Manual is not a complete operating manual. It only provides a general overview of the operating element functions. Before using the operating elements for the first time, read through the following chapters and the safety instructions listed there.</p>

11. Starting / turning off the engine – for crane operation

Section / Heading	Hazard	Risk	Described Risk & Control Measures
11.1 Starting the engine from the crane cab 11.1.3 Refuelling	Inflammable gases		Risk of fire due to inflammable gases. Turn off the engine, crane cab heater and all auxiliary heaters before refuelling.
11.1.3 Refuelling	Filler cap		Risk of incidents if the fuel tank is not closed. Screw the cap back onto the filler neck each time after refuelling. In this way you can prevent other vehicles from being endangered by the cap falling off or fuel escaping.
11.1.4 Inspections before starting the engine	Valve on hydraulic tank		Risk of damage to the hydraulic pumps. You may only start the engine when the valves on the hydraulic tank are open.
11.1.6 Lamp test	Lamp test		Risk of incidents due to faulty lamps. The lamps that are used to provide warnings and information during operation light up for control purposes whenever the ignition is switched on. Always perform the lamp tests described in Section 11.1.6 and immediately replace faulty lamps or have them replaced. In this way you can avoid incidents and damage caused by detecting malfunctions too late.
11.1.8 Starting the engine	Without flame start system		Risk of explosions when using starter fuel. The engine may never be started with the aid of starter fuel. The starter fuel sprayed into the suction unit may ignite.
11.1.8 Starting the engine	With flame start system		Risk of explosions when using starter fuel. The engine may never be started with the aid of starter fuel. The starter fuel sprayed into the suction unit may ignite.
11.1.9 Inspections after starting the engine	Low oil pressure		Risk of damage to the engine.  If the lamp does not go out after 10 seconds, the oil pressure is too low. Switch the engine off and look for the cause see section 15.4.1 of the operator's manual.
11.3 Turning off the engine 11.3.1 During normal operation, with the ignition lock / with the hand-held control	Suspended loads		Risk of incidents due to suspended loads. Never turn off the engine with a load suspended. You must have the control levers at hand in order to intervene at any time. Always set down the load before you leave the crane cab.
11.3.2 In emergencies, with the emergency stop switches	Sudden stops		Risk of overloading if used improperly. Use the emergency stop switches only in an emergency, i.e. if the crane functions no longer respond to the control levers. Stopping crane movements suddenly may cause the truck crane to become overloaded under unfavourable conditions.

12. Crane Operation

Section / Heading	Hazard	Risk	Described Risk & Control Measures
12.1 Before crane operation 12.1.2 Checking the condition of the truck crane	Loss of oil		Risk if the crane cannot be unrigged In the event of loss of oil, you may no longer be able to perform crane movements (even in emergency operation).
12.1.2 Checking the condition of the truck crane	Consumables		Risk of environmental damage due to leaking consumables Immediately repair or have repaired oil, fuel and coolant leakages. That way you prevent oil or fuel from seeping into the ground or polluting waters.
12.1.2 Checking the condition of the truck crane	Inspecting turning rope drum		Risk of crushing due to turning rope drum Keep away from the turning rope drum. This will prevent your limbs from being drawn in and getting crushed.
12.1.4 Checking the safety devices	Faulty safety devices		Risk of incidents when working with faulty safety equipment. It is strictly prohibited to operate the crane safety devices that are faulty, overridden or out of service. Have faulty devices repaired immediately by Crane Care .
12.1.4 Checking the safety devices	Seat contact switch		Risk of incidents if the seat contact switch is faulty. Always stand inside the crane cab when you perform this inspection. If you stand next to the crane cab, you can be pushed off the carrier if the superstructure slews as a result of a faulty dead man's switch.
12.1.5 Load, earthing	Static electricity		Risk of incidents due to electric shocks. Always earth the load before operating the crane: <ul style="list-style-type: none"> Near strong transmitters (radio transmitters, radio stations etc.) Near high frequency switching gears If a thunder storm is forecast Use electrically conductive material for earthing: <ul style="list-style-type: none"> Hammer a metal rod (approx. 2.0 m) at least 1.5 m into the ground Moisten the soil around the metal rod for better conductivity Clamp an insulated cable to the metal rod (cross-section at least 16mm²) Clamp the other end of the cable to a metal rod with an insulated grip. Hold the metal rod firmly by the insulated grip To earth, touch the load with the metal rod. See diagram in 12.1.5 for illustration.
12.1.5 Load, earthing	Static electricity		Risk of incidents due to electric shock. Ensure that the connections between the cable and the metal rod are electrically conductive. When earthing, hold the metal rod only by the insulated handle and keep a sufficient distance to the metal rod in the ground.

12. Crane Operation			
Section / Heading	Hazard	Risk	Described Risk & Control Measures
12.1.8 Switching the houselock on / off	Switching on the houselock		Risk of damage during slewing. Always switch off the slewing gear before you operate the houselock. The system will be damaged when slewing the superstructure during the locking procedure.
12.1.8 Switching the houselock on / off	Slewing with blocked lock		Risk of damage due to slewing with blocked lock. Before slewing make sure the symbol  is displayed in red (houselock off). Otherwise the system will be damaged during slewing.
12.1.8 Switching the houselock on / off	Switching off the houselock		Risk of damage from slewing during the locking procedure. Always switch of the slewing gear before you operate the houselock. The system will be damaged when slewing the superstructure during the locking procedure.
12.2 Operation of the safe load indicator (SLI)	Rigging mode		Risk of incidents due to incorrectly set SLI. Before operating the crane, ensure that the current rigging mode is correctly entered. An incorrect input will give you a false sense of security. This results in the truck crane overloading and causing an incident..
12.2 Operation of the safe load indicator (SLI)	Overridden or faulty SLI		Risk of incidents due to overridden or faulty SLI. The SLI should never be overridden. It is prohibited to work with the SLI if it is switched off, overridden, out of service or faulty.
12.2 Operation of the safe load indicator (SLI)	Two-hook operation		Risk of overturning in two-hook operation. The SLI only secures one-hook operations. Two-hook operations are not permitted.
12.2.1 Switching on the SLI	Faulty lamps or buzzer		Risk of incidents if the safety devices are faulty. If the lamps or the buzzer fails, notify <i>Crane Care</i> and have the error rectified. In the meantime, pay particular attention to the lamps in the event of a failure of the buzzer ton or vice versa. Conduct lamp test as per 12.2.1.
12.2.2 Entering the rigging mode	Incorrect rigging mode		Risk of overturning due to incorrectly set rigging mode. Values which have already been set may change when entering individual components. For this reason, you should always compare the displayed rigging mode with the current rigging mode of the truck crane after making the entry. In this way you prevent the SLI calculating with incorrectly set components and the truck crane becoming overloaded or from overturning. See diagrams in 12.2.2.

12. Crane Operation			
Section / Heading	Hazard	Risk	Described Risk & Control Measures
12.2.2 Entering the rigging mode	Incorrect set SLI		Risk of incidents due to incorrectly set SLI. If the current rigging mode varies from the displayed rigging mode, the maximum load displayed by the SLI does not correspond to the actually permissible lifting capacity according to the <i>Lifting Capacity Table</i> . Overloading and incidents will be the result. See diagrams in 12.2.2.
12.2.3 Inspections prior to crane operation	Incorrect SLI		Risk of incidents due to incorrectly set SLI. Check whether the current rigging mode of the truck crane corresponds to the displayed rigging mode. If the current rigging mode varies from the displayed rigging mode, the maximum load displayed by the SLI does not correspond to the actually permissible lifting capacity according to the <i>Lifting Capacity Table</i> . Overloading and incidents will be the result.
12.2.3 Inspections prior to crane operation	Hoists display		Risk of incidents due to incorrectly set SLI. After switching over the hoists, always check whether the displayed reeving value corresponds to the current reeving value of the displayed hoist and, if necessary, enter the current reeving value. In this way, you can prevent the SLI from making calculations based on an incorrect reeving value, and the truck crane becoming overloaded or from overturning.
12.2.8 SLI override	Overridden or faulty SLI		Risk of incidents due to overridden or faulty SLI. It is not permitted to work with an overridden or faulty SLI. Set down the load immediately and stop operating the crane if the SLI is faulty. You may only override the SLI if it becomes absolutely necessary in the event of an emergency. This is to put the truck crane back into a safe condition in the event of a malfunction. In this case, do not perform any movements which increase the load moment. 12.2.8 describes where necessary how to override the SLI.
12.2.8 SLI override	Unintentionally overriding the SLI		Risk of incidents due to unintentional override. The key must not remain in the key operated switch during the crane operation. In this way, you avoid overriding the SLI unintentionally.
12.3 Crane work with the main boom 12.3.1 Checks before crane operation	Unlevel truck crane		Risk of incidents if the truck crane is not level. The SLI calculates the radius from the length and angle of the main boom. The actual working radius changes and there is a Risk of the crane overturning if the truck crane is not level. Ensure the truck crane is levelled.

12. Crane Operation (cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
12.3.1 Checks before crane operation	High wind speed		Risk of incidents due to excessively high wind speeds. If the current wind speed is higher than the maximum permissible wind speed, stop crane operation immediately and restore the current rigging mode. This prevents the truck crane from overturning due to overloading. See further description in 12.3.1.
12.3.3 Main hoist	Unintentional operation of the hoist		Risk of incidents due to incidental operation of a hoist. Always switch off the hoist that is not in use. Never operate the hoist if the hook block is unreeved and the hoist rope is completely wound onto the drum. <ul style="list-style-type: none"> Slack rope forms in the course of the <i>Lower</i> movement. Rope loops form, which can cause the load to slip and destroy the hoist rope. The switch-off point of the lowering limit switch shifts in the course of the <i>Raise</i> movement. The lowering limit switch loses its function as a safety device.
12.3.3 Main hoist	Loads lifted on a slant		Risk of incidents due to loads being lifted at a slant. Loads can bend the main boom, resulting in the hoist rope no longer being aligned vertically. Compensate the deflection by raising the boom in order to lift the load vertically. In this way you prevent the load dragging and injuring helpers. Inform all helpers/spotters about this issue.
12.3.3 Main hoist	Slack rope on main hoist		Risk due to slack rope. Use only hook blocks and lifting gear of the minimum weight prescribed in the <i>Lifting Capacity Tables</i> , depending on the reeving and boom length. This way you will prevent slack rope developing at large heights when lifting without a load. This can result in the load slipping during subsequent lifting operations.
12.3.3 Main hoist	Lifting and lowering		Risk of incidents due to incomplete monitoring. Operation of the main hoist is monitored fully only if: <ul style="list-style-type: none"> The lifting limit switch is correctly rigged – see p13-11 for more information. The lifting limit switch is not overridden – refer to Lifting Limit Switch and Lowering Limit Switch – for more information. The lowering limit switch is correctly set – refer to p12-57 for more information.

12. Crane Operation (cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
12.3.3 Main hoist (cont.)	Lifting and lowering		Risk of incidents due to suspended loads. Never turn off the engine with a load suspended. You must have the control levers at hand in order to intervene at any time. Always set the load down before you leave the crane cab.
12.3.4 Auxiliary hoist	General operation of hoist		Risk of incidents when working with auxiliary hoist. Read and observe all of the safety instructions in the section titled Main Hoist – Page 12-49 before operating the auxiliary hoist. All safety instructions for the operation of the main hoist also apply to the auxiliary hoist, along with the information in section 12.3.4
12.3.4 Auxiliary hoist	Hoist ropes		Risk of incidents from damaged hoist ropes. If you reeve the auxiliary hoist rope in addition to the main hoist rope, ensure that the hoist ropes do not rub against each other and that the auxiliary hoist rope does not touch the rotating flanged wheel of the main hoist during subsequent operation. Raise the main boom to at least 20° before lifting loads. This prevents damage to the hoist ropes, resulting in the ropes tearing. If you run the auxiliary hoist rope over the left head sheave, the current boom length must be at least 21 m before you raise a load. Otherwise, the rope angle would exceed the maximum permissible value.
12.3.4 Auxiliary hoist	Lifting and lowering		Risk of incidents due to incomplete monitoring. Operation of the main hoist is monitored fully only if: – the lifting limit switch is correctly installed; see p13 - 119, – the lifting limit switch is not overridden; – the lowering limit switch is correctly set; see p12 - 57
12.3.4 Auxiliary hoist	Lifting and lowering		Risk of incidents due to suspended loads. Never turn off the engine with a load suspended. You must have the control levers at hand in order to intervene at any time. Always set the load down before you leave the crane cab.

12. Crane Operation (cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
12.3.5 Lifting limit switch and lowering limit switch	Triggering the Lifting limit switch		Risk of incidents due to intentional triggering of the lifting limit switch. Always complete the hoisting operation (and extending) before raising the lifting limit switch weight. If the lifting limit switch is lifted at too great a speed, the hook block may swing into the main boom and damage the head sheaves and the hoist rope.
12.3.5 Lifting limit switch and lowering limit switch	Lifting limit switch override		Risk of incidents if the lifting limit switch is overridden. You may only override the lifting limit switch if this is specified in the operating instructions when carrying out maintenance or rigging work. With the lifting limit switch overridden, you may drive only at the minimum speed and without a load.
12.3.5 Lifting limit switch and lowering limit switch	Lifting limit switch override		Risk of incidents due to incomplete monitoring. If the lifting limit switch is overridden, crane operation is no longer monitored completely. When hoisting the lifting limit switch weight, the crane movement is stopped once. After moving the control lever again, the crane movement is re-enabled and thereafter not disabled again.
12.3.5 Lifting limit switch and lowering limit switch	Lowering limit switch		Risk of incidents due to incorrect setting or intended triggering. Prior to crane operation, ensure that the lowering limit switch is set correctly and always complete the lowering operation before the lowering limit switch is triggered. This prevents the hoist rope from becoming damaged due to complete unreeling or switching off at high speeds, and the load being dropped as a result.
12.3.5 Lifting limit switch and lowering limit switch	Lowering limit switch		Risk of incidents due to adjustments made to the lowering limit switch. Always re-adjust the lowering limit switch if you unreel hoist rope from the stationary rope drum. The lowering limit switch does not record the number of these winds. In this way you avoid the lowering limit switch switching off too late or not at all, the hoist rope being damaged and the load being dropped.

12. Crane Operation (cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
12.3.6 Derricking gear	Raising loads		Risk of overturning while lifting loads. Raising the boom is a movement that reduces the load moment and that is not deactivated by the SLI. However, raising the boom is the movement which can cause the truck crane to overturn if the load lifted is too heavy. It is prohibited to lift loads by raising the boom, since the SLI does not monitor this procedure.
12.3.6 Derricking gear	Raising and lowering		Risk of incidents due to unexpected crane movements. In the case of multiple configurations, check whether the control lever function <i>Derricking</i> is switched on before you move the control lever for derricking. This avoids incidents caused by unexpected crane movements.
12.3.6 Derricking gear	Lowering the main boom to a horizontal position		Risk of overturning with overridden SLI. Do not under any circumstances override the SLI. If the SLI shuts down the lowering procedure, the truck crane is in a condition in which the main boom may not be lowered beyond the working range (e.g. the load or working radius is too large). The truck crane will overturn if you continue to lower the boom with the SLI overridden.
12.3.7 Telescoping mechanism	No inspections prior to starting operation		Risk of damage to the telescoping mechanism. Before the first telescoping, always check whether the ECOS display indicates the current telescoping. This prevents the telescoping mechanism from being damaged when telescoping.
12.3.7 Telescoping mechanism	Unexpected derricking		Risk of incidents due to unexpected crane movements. In the case of multiple configurations, check whether the control lever function <i>Telescoping</i> is switched on before you move the control lever for telescoping. This avoids incidents caused by unexpected derricking.
12.3.7 Telescoping mechanism	Incomplete monitoring		Risk of incidents due to incomplete monitoring. Boom extension is monitored completely only if: – the lifting limit switch is correctly rigged; see p13 - 119, – the lifting limit switch is not overridden; see p12 - 55.
12.3.7 Telescoping mechanism	Hook block		Risk of damage to the hoist rope. The rope can become slack if the hook block touches the ground during retracting operations. Rope loops form, which can cause the load to slip and destroy the hoist rope.
12.3.7 Telescoping mechanism	Unlocking the telescoping cylinder		Risk of damage to the boom system. If extending and retracting several times does not cause unlocking, you must not telescope any further against the stop.

12. Crane Operation (cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
12.3.7 Telescoping mechanism	Unlocking the telescopic section		<p>Risk of damage to the boom system. If extending and retracting several times does not cause unlocking, you must not telescope any further against the stop.</p> <p>If removing the load does not cause unlocking, you must lock the telescopic section see p 12 - 82 and start unlocking anew.</p>
12.3.7 Telescoping mechanism	Locking the telescopic section		<p>Risk of damage to the telescoping cylinder.</p> <p>Move the control lever until the telescopic section is locked and set down</p> <p>– the symbol  must be yellow. In this way, you can prevent the load from exerting pressure on the telescoping cylinder and allow the load to be released for fixed lengths.</p>
12.3.8 High speed mode	Excessive acceleration		<p>Risk of incidents due to sudden acceleration of operations. Reduce the engine speed before starting high-speed mode. This prevents the movements from becoming excessively accelerated, which may result in the truck crane starting to sway and overturn.</p>
12.3.8 High speed mode	Hoists		<p>Risk of incidents due to overloading. Make sure that the lifted load is no more than 50% of the maximum load according to the <i>Lifting Capacity Table</i> (maximum degree of utilisation of 50%), before operating the hoists in high-speed mode.</p>
12.3.8 High speed mode	Light hook block		<p>Risk of slack rope formation with a light hook block. If you switch on high-speed mode at high speeds, a light hook block will not be able to keep the hoist rope taut if it is hoisted up high with a small number of reevings and a large boom length.</p>
12.3.8 High speed mode	Large number of reevings		<p>Risk of slack rope formation with large number of reevings. If you switch on high-speed mode with a large number of reevings and without a load, slack rope may form because the hook block is lowered too slowly due to the high degree of friction.</p>
12.3.9 Slewing gear	Stability of truck crane		<p>Risk of overturning when slewing with a rigged counterweight. Always check before slewing whether slewing is permitted in the current rigging mode of the truck crane (counterweight, outrigger span, working radius). Correct the rigging mode if necessary. Refer to <i>Slewing with the Rigged Counterweight</i> – P13-72. for more information.</p>

12. Crane Operation (cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
12.3.9 Slewing gear	Slewing		<p>Risk of overturning when slewing with an incorrectly set SLI. Always check before slewing whether the SLI code valid for the current rigging mode is displayed.</p> <p>This prevents slewing operations from being released within impermissible ranges and the truck crane from overturning.</p>
12.3.9 Slewing gear	Slewing		<p>Risk of crushing during slewing. Before slewing, actuate the horn and ensure there are no persons in the slewing range of the superstructure.</p> <p>In this way, you prevent persons from getting crushed between the superstructure and the carrier or between the superstructure and other parts.</p>
12.3.9 Slewing gear	Slewing speed		<p>Risk of main boom buckling. Do not accelerate the slewing speed to such a degree that the load starts swinging.</p>
12.3.9 Slewing gear	Slewing of superstructure		<p>Risk of damage to add-on parts Raise the main boom to at least 15° before slewing the superstructure from -160° to +20°. This prevents the main boom from damaging add-on parts of the carrier, e.g. the exhaust system or air filter.</p> <p>You can adjust the sensitivity of the control levers to the operating conditions; as per <i>“Setting the characteristic curve for the control levers”</i> see p. 12 - 100.</p>
12.3.9 Slewing gear	Braking the slewing movement		<p>Risk of main boom buckling. Do not under any circumstances switch off the slewing gear to brake it. Only switch off the slewing gear after the superstructure has stopped turning.</p>
12.3.9 Slewing gear	Switching off the slewing gear		<p>Risk of damage to the main boom. Brake the slewing movement down to a standstill before you switch off the slewing gear. The slewing gear brake is automatically engaged when the slewing gear is switched off. In this way, you can prevent lateral forces from affecting the main boom due to long delays or swinging loads.</p>

12. Crane Operation (cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
12.4 Settings and displays for crane operation 12.4.1 Inclining the crane cab	Tilting of cab		Risk of accidents when entering and leaving the crane cab while it is tilted Always bring the crane cab into the end position to the front before leaving it. This prevents you slipping between the cab and the stepping grid and injuring yourself.
12.4.1 Inclining the crane cab	Loose objects		Risk of incidents due to objects overturning in the crane cab. Close the crane cab door before inclining and remove all loose objects (e.g. bags, bottles etc.) from the crane cab. In this way, you prevent objects from tipping over, the crane cab door opening by itself or unintended operational incidents caused by fright.
12.4.6 Directional spotlights	Position of spotlights		Risk of incidents due to being blinded during on-road driving. When driving on the road, always direct the spotlights in such a way that the reflector points downwards. In this way, you can prevent yourself or other road users from being blinded and causing incidents.
12.4.8 Warning submenu	Ignoring warning messages		Risk of damage if warning messages are not observed. Observe the information contained in section 12.4.8 in good time and take appropriate remedial measures if a warning message appears. In this way, you can prevent these malfunctions from causing malfunctions on the truck crane. All warning messages which relate to the engine apply to the engine for crane operation.
12.4.8 Warning submenu	Oil pressure		Risk of damage to the engine if the oil pressure drops. Turn off the engine as soon as possible and look for the cause if the oil pressure warning lamp  lights up or if the warning buzzer sounds. Never restart the engine before you have found the cause and eliminated the problem. Refer to Malfunctions on the Engine – p 15-15 of the Operator's Manual for more information .
12.4.8 Warning submenu	Oil temperature		Risk of overheating. If the hydraulic oil temperature exceeds 80°C, there is a fault. Set down the load as soon as possible and try to find the cause. Set down the load as soon as possible and turn off the engine if the temperature of the hydraulic oil exceeds 100°C.

12. Crane Operation (cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
12.5 Working range limiter	Obstacles		<p>Risk of incidents arising from situations which cannot be monitored.</p> <p>The working range limiter only serves as an additional safety device. Brake the crane movement in time to avoid the obstacle. Do not knowingly drive into the shutdown area. You, the crane operator, are responsible for supervising the working range at all times, so that you can react accordingly in a situation that cannot be monitored electronically.</p>
12.5 Working range limiter	Clearances		<p>Risk of incidents due to limit values set too low.</p> <p>When entering the limit values, be aware that, even after switching off the engine, movements can occur that would bring the load into the shutdown area (e.g. due to load swing or boom deflection). For this reason, always enter the limit value to the object with sufficient safety distance.</p>
12.5 Working range limiter	Clearances		<p>Risk of incidents if the safe distance is not complied with.</p> <p>Even when the working range limiter is switched on, always observe all safety distances according to the country's legislation, codes of practice and other standards (e.g. concerning electrical overhead cables)</p> <p><i>NOTE: For operation in Australia, refer to the Occupational Health and Safety Regulations or Codes or Practice that apply in your respective state or territory.</i></p> <p><i>Observe all clearances relating to NO GO zones and comply with any legislation regarding the use of observers or spotters.</i></p>
12.5.3 Entering limit values	Incorrect values set		<p>Risk of incidents due to limit values set too low.</p> <p>When entering the limit values, be aware that, even after switching off the engine, movements can occur that would bring the load into the shutdown area (e.g. due to load swing or boom bending). For this reason, always enter the limit value to the object with sufficient safety distance to the object.</p>
12.5.3 Entering limit values	Slewing range		<p>Risk of incidents due to incorrectly set slewing angles.</p> <p>Always slew the main boom to the shutdown point from the right with slewing angle A and from the left with slewing angle B. This prevents slewing into the impermissible range from being released. A and B as noted are described under 12.5.3.</p>

12. Crane Operation (cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
12.5.5 Switching monitoring functions on / off	Limit values		<p>Risk of incidents due to incorrectly set limit values. After switching on the monitoring function, slowly approach all limit values and check that they are switched off in time. If necessary, enter new values with larger safety distances.</p> <p>With monitoring switched on, the speed of all power units is limited to 50%. Limits below 50% continue to be active. Manitowoc recommended limiting the slewing gear speed to between 30% and 50%.</p>
12.5.6 Shutdown by working range limiter	Overriding SLI		<p>Risk of incidents from overriding shutdown procedures. Only override the SLI if absolutely necessary and if you can clearly see the Risk zone. Remember that, because of the boom deflection, the overall height of the truck crane will increase when putting down the load. If you override the SLI, the shutdown is overridden and all movements are enabled.</p>
12.6 Work break 12.6.1 Short work breaks	Suspended loads		<p>Risk of incidents due to suspended loads. Never turn off the engine with a load suspended. You must have the control levers at hand in order to intervene at any time. Always set the load down before you leave the crane cab.</p>
12.6.2 In case of work breaks of more than 8 hours	Unsecured truck crane		<p>Risk due to unauthorised use. Close the hand-held control in the crane cab before leaving the truck crane, remove the ignition key and lock the door to the crane cab.</p>
12.7 Heating and air-conditioning system 12.7.2 Auxiliary water heating system	Switching on		<p>Risk of explosions when operating the auxiliary heater.</p> <p>The auxiliary heater is not allowed to be operated:</p> <ul style="list-style-type: none"> • At service stations and tank farms • At locations where flammable gases and vapours are found or can be formed (e.g. at fuel stations and chemical factories) • At locations where explosive dust is found or can be formed (e.g. coal dust, wood dust, grain dust)
12.7.2 Auxiliary water heating system	Switching on		<p>Risk of suffocation when operating the auxiliary heater. Do not use the auxiliary heater in closed spaces (e.g. a garage)</p>

13. Rigging Work

Section / Heading	Hazard	Risk	Described Risk & Control Measures
13.2 Choosing a suitable site 13.2.1 Determining the required ground bearing area	Ground bearing area		<p>Risk of overturning if the ground bearing area is too small.</p> <p>Ensure that the actual ground bearing area is at least as large as specified in the table. This prevents the ground from giving way and the truck crane from overturning. Refer to section 13.2 of the operators manual for examples</p>
Additional hazards to 13.2.1	Ground/supporting surface conditions		<p>Damage to underground services due to subsidence.</p> <p>Wherever possible, obtain information regarding the location of any underground services such as water, gas, electricity, telephone or sewer lines. Avoid setting the outriggers above these underground services.</p>
Additional hazards to 13.2.1.	Ground/supporting surface conditions		<p>Risk of support surface collapse due to inadequate strength.</p> <p>Do not set up the crane on any suspended concrete slab without an engineering report being conducted by a competent person. Do not move the crane onto the suspended slab until all of the requirements of the engineering report have been completed (such as propping and extra supports) and the crane operator has personally inspected the required improvements and received a written copy of the engineering report and written verification that the requirements of the report have been completed.</p>
Additional hazards to 13.2.1.	Levelling the crane		<p>Risk of overturning when carrier of truck crane is at an angle.</p> <p>Line up the carrier horizontally and align the truck crane horizontally with the outrigger cylinders. In this way you prevent the outrigger pads slipping from the angled carrier, or the truck crane from having an unfavourable centre of gravity owing to an incline and overturning when subject to a load.</p>
Additional hazards to 13.2.1.	Enlarging the outrigger surface area		<p>Risk of incidents by crane overturning due to weak packing.</p> <p>Thin boards or planks made of pine wood or bricks are not made to withstand the resulting pressure and divert it safely to the ground.</p> <p>Ensure that the surface area of the outrigger packing is enlarged as much as possible by using hardwood timber packing with a minimum strength rating of F14 and with minimum dimensions of 200mm wide by 75mm thick, by using steel plates, by using "bog mats" or by using OEM synthetic outrigger mats. Under no circumstances should the crane be set up for lifting without increasing the surface bearing area of the outrigger pads.</p>

13. Rigging Work (cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
Additional hazards to 13.2.1.	Heavy outrigger packing		<p>Risk of manual handling injuries while lifting outrigger packing.</p> <p>Ensure that correct manual handling techniques are used when handling heavy outrigger packers. Wherever possible utilise two person lifting techniques.</p>
Additional hazards to 13.2.1.	Placement of outrigger packing	 	<p>Risk of incidents and machine damage due to incorrectly placed outrigger packing.</p> <p>Ensure that the initial layer of packing has been laid as horizontally as possible. Failure to do this will mean that the packing will not be vertically aligned and this will cause instability of the packing. There is also the risk that the outrigger pads will slide off the packing during levelling.</p> <p>If using hardwood timber packing to increase the surface bearing area of the outriggers, ensure that the bottom layer of packing is laid closely together with no gaps between the timbers. Each subsequent layer of timber packing should be laid at right angles (90°) to the previous layer and arranged so that the packing resembles a gently sloping pyramid. Ensure that the top layer of timber packing is placed at right angles (90°) to the outrigger beams.</p>
13.2.2 Safe distances from slopes and pits	Clearances		<p>Risk of ground subsidence due to crane weight too close to bank or pit.</p> <p>Avoid setting up the crane in the vicinity of trenches, slopes or excavations that may collapse under the combined weight of the crane, lifted load and other imposed forces. For guidance on appropriate distances to maintain, Refer to Safe Distance from slopes and Pits – section 13.2.2 of the Operator's Manual.</p>
13.2.3 Earthing of the truck crane	Electrical		<p>Risk of incidents due to electric shocks.</p> <p>Earth the crane before crane operation:</p> <ul style="list-style-type: none"> Near strong transmitters (radio transmitters, radio stations etc.) Near high frequency switching stations If a thunder storm is forecast
13.2.3 Earthing of the truck crane	Electrical		<p>Risk of incidents due to electric shock.</p> <p>Ensure that the connections between the cable and the clamp are electrically conductive. Do not attach the clamp to parts that are screwed on, such as valves, covers or similar parts. Fasten the terminal to an electrically-conducting position on the main boom or the superstructure.</p>

13. Rigging Work (cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
13.2.4 Safe distance from electrical lines with additional information.	Overhead power lines		<p>Risk of incidents due to electric shocks. This truck crane is not insulated. Contact between overhead powerlines and the boom, the hoist rope, the hook block, the lifting tackle, the load itself or the guide ropes can result in serious, possible fatal injuries.</p> <p>If possible, have the current in the powerlines switched off or keep the truck crane, its equipment, lifting tackle and the load at a minimum safe distance as specified by local regulations for that level of voltage.</p> <p><i>NOTE: For operation in Australia, refer to the Occupational Health and Safety Regulations or Codes or Practice that apply in your respective state or territory.</i> <i>Observe all clearances relating to NO GO zones and comply with any legislation regarding the use of observers or spotters</i></p>
13.3 Connecting / disconnecting the hand-held control	Unauthorised use		<p>Risk due to unauthorised use Always stow the hand-held control in the crane cab before you leave the crane, and lock the doors. That way you can prevent unauthorised persons from starting the engine.</p>
13.4. Rigging for crane operation / driving 13.4.1. Slewing the crane cab	Slewing		<p>Risk of injury due to slewing Ensure that no persons or obstacles are in the slewing range when you slew the crane cab or the crane cab arm.</p>
13.4.1. Slewing the crane cab	Slewing crane cab.		<p>Risk of damage when slewing the crane cab Check that the rear access ladder has been removed. This prevents the ladder from being jammed and damaged.</p>
13.4.2 Tread grid, ladder, railings			<p>Risk of falling when railing is open Always close the railing on the tread grid prior to any crane operation. This avoids them falling from the tread grid when this is no longer above the carrier.</p>
13.4.2 Tread grid, ladder, railings			<p>Risk of falling when railing is not pushed out Slide in the access railings only once you have finished all rigging work where you must stand on the turntable. When the railings are slid in they do not provide you with good support.</p>
13.4.2 Tread grid, ladder, railings			<p>Risk of accidents from exceeding the permissible overall height Always slide in the access railings before driving. When the railing is pushed out, the overall height specified for on-road driving is exceeded.</p>
13.4.2 Tread grid, ladder, railings			<p>Risk of falling from the superstructure Always use the supplied extension ladder when rigging the railings on the turntable. This avoids you falling from the turntable when rigging.</p>

13. Rigging Work (cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
13.4.3 Mirrors	Mirrors		Risk of accidents when exceeding the permissible dimensions Fold the necessary mirrors in for driving. With the mirrors folded out, the specified overall height at on-road level and the specified overall width for driving on roads is exceeded.
13.5 Rigging work after driving with a trailer 13.5.1 Switching off slewing gear freewheel	Movement of boom		Risk of incidents with the slewing gear freewheel switched on. Switch off the slewing gear freewheel before working with the crane. If it is not switched off, the slewing gear brake does not work and you cannot stop slewing movements in time.
13.5.2 Switching off the boom floating position	Boom security		Risk of accidents due to the main boom falling down Always secure the lever with the padlock after switching off the boom floating position. This prevents the raised main boom from falling down when actuating the lever.
13.5.3 Switching off boom pre-tensioning	Valve IV		Risk of hydraulic oil overheating. Always switch valve IV over (lever in horizontal position) before operating the crane. This prevents the pressure in the hydraulic circuit from rising and the hydraulic oil from exceeding the permissible temperature of 80°C.
13.6 Outriggers	Movement of outriggers		Risk of crushing due to extending supports. You may activate the outriggers only if you yourself or a spotter with whom you are in visual contact have an unobstructed view of their and the outrigger movements.
Additional hazards to 13.6	Movement of outriggers		Risk of contact with objects when extending or retracting outrigger beams. Ensure that prior to extending the outrigger beams that there is sufficient clearance to allow full extension of the outrigger beams without collision with surrounding objects. Clear away any obstructions that may cause interference.
Additional hazards to 13.6	Lowering suspension		Risk of crushing when lowering suspension. To allow use of the outrigger controls, the crane suspension must be fully lowered and locked. Ensure that no person is standing in a position where crushing can occur while the crane suspension is being lowered and locked.

13. Rigging Work (cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
13.6.1 CHECKLIST: Extending the outriggers	Crane stability		<p>Risk of truck crane overturning if improperly supported.</p> <p>When working with the crane, always:</p> <ul style="list-style-type: none"> • Extend the outrigger beams only to the permitted spans. • Extend all four outrigger beams to the same span • Enlarge the surface area of the outrigger pad packing • Raise the truck crane until all wheels are off the ground • Align the truck crane horizontally • Refer to checklist for details in section 13.6.1 of operators manual.
13.6.2 CHECKLIST: Retracting the outriggers	Clearances		<p>Risk of incidents during on-road driving.</p> <p>For on-road driving, ensure:</p> <ul style="list-style-type: none"> • All outrigger beams and cylinders have been retracted fully • All outrigger beams have been pinned and secured • All outrigger pads have been pushed in and secured • The outriggers do not protrude beyond the outer limits of the vehicle • Refer to checklist for details in section 13.6.2 of operators manual.
13.6.3 Permissible outrigger spans	Rotating the superstructure		<p>Risk of overturning when slewing the superstructure.</p> <p>Support the truck crane with the required outrigger span. For all outrigger spans, slewing is only permissible with certain counterweight versions and boom positions. See section 13.6.5 of the Operator's Manual for details.</p>
13.6.5 Setting the spans	Outrigger extension		<p>Risk of the truck crane overturning if it is not properly supported.</p> <p>Always extend all four outrigger beams to the required outrigger span, even if you are only working to one side. Otherwise the rear stability of the rigging mode according to the SLI code is no longer guaranteed.</p>
13.6.5 Setting the spans	Outrigger beams moving		<p>Risk of incidents due to supports moving out.</p> <p>Always fully retract all the supports and secure them with the pins. This prevents the supports from swaying out in curves and causing serious incidents.</p>
13.6.6 Extending / retracting outriggers	Vision blocked		<p>Risk of accidents if supporting cylinders cannot be seen</p> <p>Cordon off the area where you intend to extend and retract the outrigger beams. Nobody is allowed to be in this area. Observe the moving outrigger cylinders or have them observed by a spotter who is in visual contact with you.</p>

13. Rigging Work (cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
13.6.6 Extending / retracting outriggers	Crane stability		Risk of overturning if improperly supported Always extend all the outrigger beams, and always extend them to the spans corresponding to the SLI code. This also applies if you are working on one side only, since it ensures that the truck crane is stable at the rear. side only, since it ensures that the truck crane is stable at the rear.
13.6.6 Extending / retracting outriggers	Outriggers		Risk of damage to the outriggers Before extending the outrigger beams, always check whether they have been released.
13.6.8 Enlarging the ground bearing area	Outrigger packing		Risk of incidents if the packing is insufficient. Only use materials of sufficient strength. This will prevent the packing from giving way and causing the truck crane to tilt and overturn.
13.6.8 Enlarging the ground bearing area	Outrigger packing set up		Risk of overturning if the packing or the truck crane is at an angle. Level the packing and the truck crane horizontally. This prevents the outrigger pads from slipping off the inclined packing and causing the truck crane to overturn. Follow 13.6.8 for further instructions.
13.6.9 Extending / retracting supporting cylinders	Ground conditions		Risk of overturning due to insufficient load bearing capacity of the ground. Enlarge the ground bearing area if the ground cannot withstand the resulting outrigger pressure. This prevents the ground under the outrigger pads from giving way and causing the truck crane to tilt and overturn.
13.6.9 Extending / retracting supporting cylinders	Supporting cylinders		Risk of incidents if supporting cylinders cannot be observed. Nobody is allowed to be in the area of the supporting cylinders. Observe the moving supporting cylinders or have them observed by a spotter who is in visual contact with you. Do not extend the supporting cylinders as far as possible. The supporting cylinders must have a remaining stroke of at least 25 mm in order to carry out alignment corrections.
13.6.9 Extending / retracting supporting cylinders	Extending the outrigger cylinders		Risk of damage to the outrigger cylinders. Move the outriggers as uniformly as possible on all four support points. This prevents the outrigger cylinders from being damaged due to one-sided pressure.
13.6.9 Extending / retracting supporting cylinders	Retracting the outrigger cylinders		Risk of damage to the tyres. Before retracting the outrigger cylinders, remove any sharp-edged and pointed materials from under the tyres. This prevents the tyres from being punctured or being damaged when the truck crane is lowered.

13. Rigging Work (cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
13.6.10 Levelling the truck crane on outriggers horizontally	Overloading the Boom		<p>Risk of overloading the main boom.</p> <p>Always slew the superstructure to the 0° or 180° position and set down the load before levelling the truck crane. In other positions, the deformation of the carrier will create incorrect results for the inclination and the truck crane will be at an angle. This could cause the main boom to become overloaded during crane operation.</p>
13.6.10 Levelling the truck crane on outriggers horizontally	Unsupported truck crane		<p>Risk of incidents due to incorrectly supported truck crane.</p> <p>Perform the following checks each time you have levelled the truck crane and correct any misalignments. Otherwise the truck crane may overturn even when lifting a load released by the SLI. Check after you have levelled the truck crane:</p> <ul style="list-style-type: none"> • Whether all the wheels are lifted off the ground • Whether the ground under any of the outrigger pads has given way • Whether the packing is correct for the enlarged ground bearing area.
Additional hazards to 13.6.10	Automatic procedure		<p>Risk of overturning if truck crane is not level.</p> <p>When ECOS ends automatic alignment, the truck crane may not necessarily be horizontally aligned (if for example one outrigger cylinder has been extended as far as possible) Always check the horizontal alignment on the electronic level display after automatic alignment.</p>
13.7 Counterweight 13.7.1 Identification	Interchanged counterweights		<p>Risk if counterweight parts are interchanged.</p> <p>Use only the counterweight sections that belong to your truck crane. The truck crane and the counterweight parts are labelled with the same serial number. Other or additional parts may not be rigged.</p>
13.7.2 Slinging points	Slinging		<p>Risk of incidents if used incorrectly.</p> <p>Attach the various counterweight sections only to the intended slinging points and use lifting gear with sufficient lifting capacity. Only lift the counterweight sections one by one, since the slinging points are not designed for lifting stacked counterweight sections. Before lifting plates which are lying on top of each other, make note of the permitted weights. See 13.7.2 for details.</p>
13.7.2 Slinging points	Slinging		<p>Risk of damage to the mountings of the auxiliary hoists</p> <p>Do not attach the sling gear to the mountings for the auxiliary hoist. This way you prevent these from getting damaged and malfunctions occurring when rigging the auxiliary hoist.</p>

13. Rigging Work (cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
13.7.3 Counterweight combinations	Incorrect counterweight		<p>Risk of overturning due to a counterweight version that is not permitted Combine the counterweights with each other only in the way prescribed in this chapter and in the Lifting capacity table. Other versions are not permitted. If other versions are assembled, the truck crane is no longer protected against overloading by the SLI.</p>
13.7.3 Counterweight combinations	Slewing with rigged counterweight		<p>Risk of overturning when slewing with a rigged counterweight You may only slew the superstructure with a rigged counterweight if an outrigger span of sufficient size is rigged. For the required outrigger span, refer to the table in the section Slewing with rigged counterweight, p. 13 - 72, and support the truck crane accordingly before you slew the superstructure. That way you prevent the truck crane from tipping to the rear when slewing the superstructure.</p> <p>The counterweight parts of the GMK 6400 truck crane can be assembled in six different counterweight versions (in eight different versions with additional equipment).</p>
13.7.4 CHECKLIST: Rigging the counterweight	Slewing		<p>Risk of overturning when slewing with a rigged counterweight Always check before slewing whether slewing is permitted in the truck crane's current rigging mode (counterweight, outrigger span, working radius). Correct the rigging mode if necessary; see slewing with rigged counterweight, p13 - 72.</p> <p>Follow instructions in 13.7.4.</p>
13.7.5 CHECKLIST: Unrigging the counterweight	Crane stability		<p>Risk of injury or damage</p> <p>For this area refer to Section 13.7.5 of the Operator's Manual for more information.</p>
13.7.6 Assembling counterweight combinations - Setting down the 20 t base plate	Slewing in current rigging mode		<p>Risk of overturning when slewing with a rigged counterweight.</p> <p>When a counterweight combination is rigged, check whether slewing is permitted with the current rigging mode (outrigger span, working radius). Correct the rigging mode if necessary. Refer to Slewing with the Rigged Counterweight – Page 13-71 of the Operator's Manual for more information.</p>

13. Rigging Work (cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
13.7.6 Assembling counterweight combinations - Setting down the 20 t base plate	Setting down counterweight sections		Risk of crushing when setting down the counterweight sections. Ensure that helpers maintain sufficient clearances from the counterweight sections with all parts of their bodies during placement. Remove all objects from the counterweight platform that could become jammed or crushed.
13.7.6 Assembling counterweight combinations- Setting down the 20 t base plate	Using access ladder when slewing superstructure		Risk of crushing when slewing the superstructure. The access ladders are located in the slewing range of the superstructure. Ensure that nobody uses the access ladders (e.g. helper) while you lift a plate onto the counterweight platform.
13.7.6 Assembling counterweight combinations - Setting down the 20 t base plate	Slings counterweight sections		Risk of incidents caused by falling counterweight sections. Only attach the counterweight sections to the appropriate slinging points and use lifting gear with sufficient lifting capacity. The counterweight sections should be lifted one at a time. The slinging points are not designed for hoisting stacked counterweight sections. See 13.7.6.
13.7.6 Assembling counterweight combinations - Setting down the 20 t base plate	Slings point folded out		Risk of damage when slings point is folded out Always fold up the shackles. This avoids malfunctions when rigging the auxiliary hoist.
13.7.6 Assembling counterweight combinations - Placing the 10 t plates / blocks	Rigging sequence		Counterweight may overturn if the rigging sequence is incorrect When rigging, always place / raise the 10 t plates and 10 t blocks alternately at the left and right sides. Otherwise the truck crane will be overloaded at one side or the counterweight may fall from the carrier.
13.7.7 Securing / releasing 10 t counterweight blocks	Counterweights		Risk of accidents from falling counterweight blocks Secure the 10 t blocks with the tension rods. This prevents the blocks from slipping or falling down and injuring someone.
13.7.7 Securing / releasing 10 t counterweight blocks	Releasing 10 t counterweight blocks		Risk of accidents due to damage to the lifting gear and the slinging points Release the blocks before lifting. Otherwise the tension rods, the lifting gear or the slinging points may be overloaded and damaged. This can cause the blocks to slip or unexpectedly fall down, through damage that cannot be externally seen.
13.7.9 Electrical connection, establishing / breaking	Electrical connection		Risk of malfunction in the superstructure electronics Always turn off the ignition in the crane cab before you establish or break the electrical connection. In this way you prevent malfunctions and error

			messages in the superstructure electronics.
13. Rigging Work (cont.)			
Section / Heading	Hazard	Risk	Described Risk & Control Measures
13.7.10 Rigging the counterweight	Raising and lowering counterweight		Risk of crushing when raising and lowering Make sure nobody is on the counterweight platform while the counterweight is being lifted or lowered. Before raising and lowering, remove all objects that could become jammed or crushed.
13.7.10 Rigging the counterweight	Counterweight		Risk of accidents from falling counterweight When the counterweight is locked to the turntable, always check that the safety valve is closed before moving the lifting cylinder; as per Counterweight safety valve, p. 13 - 70. This prevents the counterweight from being inadvertently unlocked and falling due to getting the switches mixed up.
13.7.10 Rigging the counterweight	Hand held control		Risk of accidents due to falling counterweight parts Only leave the hand-held control connected as long as it is needed for rigging the counterweight. The counterweight could fall off while the crane is being operated and lead to damage and injuries.
13.7.10 Rigging the counterweight	Rigging the counterweight		Risk of damage when raising the counterweight Always check that the two red lamps O are lit before lifting the counterweight with the lifting cylinder. If the green lamps o are lit then locking cylinders are extended. These would be pressed against the mountings on the turntable and damage them.
13.7.10 Rigging the counterweight	Locking the counterweight		Risk of accidents from falling counterweight Always close the safety valve if the counterweight is locked to the turntable. In this way you can prevent the locking pins, for example, from being unintentionally retracted because a button is erroneously pushed, causing the entire counterweight to fall down.
13.7.10 Rigging the counterweight	Unrigging counterweight		Risk of accidents from falling counterweight Also make sure that the hydraulic cylinders are fully extended into the cylinder mounts on the counterweight platform. In this way you can avoid the counterweight falling when the locking pins are retracted.

13. Rigging Work (cont.)			
Section / Heading	Hazard	Risk	Described Risk & Control Measures
13.7.10 Rigging the counterweight	Opening the safety valve		Risk of accidents when the safety valve is open Always close the safety valve if the counterweight is locked to the turntable. This prevents the counterweight from falling down due to unintentional actuation of the locking pins.
13.7.11- Hoisting and setting down counterweight parts with mounted auxiliary hoist	Hoisting and setting down.		Risk of damaging the railing of the hoist Carry out the hoisting and setting down of the plates with mounted auxiliary hoist only as described in this section. This prevents the railing of the auxiliary hoist being damaged by the hook block or by the lifting gear. Use only lifting gear of sufficient lifting capacity. To lift and place the plates you require three lifting slings with a length of 2 metres.
13.7.12 - Slewing with rigged counterweight	Slewing with incorrect SLI		Risk of overturning when slewing with an incorrectly set SLI Always check before slewing that the SLI code valid for the current rigging mode is displayed. This prevents slewing operations from being released within impermissible ranges, which would cause the truck crane to overturn.
13.7.12 - Slewing with rigged counterweight	Operating hand held control		Risk of overturning when operating with the hand-held control When operating with the hand-held control, there is no monitoring by the SLI. Before slewing, always use the following table to check if slewing is permitted. This prevents the truck crane from overturning while rotating.
13.8.2 - Slings points and transport	Slings points		Risk of accidents if used improperly Only sling the auxiliary hoist onto the slinging points provided. Always use lifting gear with sufficient lifting capacity; à Dimensions and weights of removable parts – Auxiliary hoist, see p. 16 - 3.
13.8.2 - Slings points and transport	Transportation		Risk of damage to the auxiliary hoist Attach the auxiliary hoist on the separate vehicle so that it cannot slip off. Insert the hydraulic hoses and the electric cable into the specially designed shaft.
13.8.2 - Slings points and transport	Transportation		Risk of accidents from damaged auxiliary hoist rope Ensure that the hoist rope is not damaged when loading the auxiliary hoist. This prevents loads from falling during crane work with an auxiliary hoist.

13. Rigging Work (cont.)			
Section / Heading	Hazard	Risk	Described Risk & Control Measures
13.8.9 - Locking / Unlocking the auxiliary hoist	Open safety valve		<p>Risk of accidents when the safety valve is open</p> <p>Always close the safety valve when the auxiliary hoist on the 20 t base plate is locked. This prevents the auxiliary hoist from being unlocked due to unintentional actuation and from being lifted off the base plate.</p>
13.8.12 - Permissible applications for the auxiliary hoist	Two hook operations		<p>Risk of accidents during two-hook operation</p> <p>During alternating operation the load must always hang on only one hook block. If you sling the load on both hook blocks but lift it with only one of the blocks, you are already in the non-permissible two-hook mode which is no longer secured by the SLI.</p> <p>Install both lifting limit switches and the associated lifting limit switch weights; see installing lifting limit switch, p. 13 - 119.</p> <ul style="list-style-type: none"> • Enter the current reeving for both hoists at the SLI; as per entering the reeving, see p. 12 - 28. • Switch on the hoist with which you wish to lift the load; as per hoists display, see p. 12 - 31. • <p>The correct hoist is now set on the SLI and crane operation is secured by the SLI. The maximum loads are reduced by the value of the weight of the second hook block.</p>
13.9 Rigging work on the main boom 13.9.1 - Hook block on the bumper	Picking up the hook block from the bumper		<p>Risk of accidents if the view is obstructed</p> <p>Have a spotter guide you when detaching the hook block from the holding rope since the view of the hook block is obstructed by the driver's cab.</p>
13.9.1 - Hook block on the bumper	Attaching the hook block to the bumper		<p>Risk of accidents if the view is obstructed</p> <p>The reeved rope lines obstruct the view on the road. The number of legally permissible rope lines can vary depending on the country in which you are working. According to EU regulations, the hook block may not be reeved more than four times when driving on the road.</p>
13.9.1 - Hook block on the bumper	Attaching the hook block to the bumper		<p>Risk of accidents due to the hook block swinging unexpectedly</p> <p>The hook block will suddenly swing forwards if the retaining rope for the hook block tears when tightening the hoist rope.</p> <p>Therefore make sure that the spotter or other persons are always at a safe distance to the side of the hook block.</p> <p>Do not attach the rope end clamp to the front towing coupling. The towing coupling must be free for a tow-rod in emergencies.</p>

13. Rigging Work (cont.)			
Section / Heading	Hazard	Risk	Described Risk & Control Measures
13.9.2 Hook block on a separate vehicle	Slewing		Risk of overturning while slewing Before slewing, always check that slewing is permitted in the current rigging mode. Correct the rigging mode if necessary; see slewing with rigged counterweight, p. 13 - 72.
13.9.2 Hook block on a separate vehicle	Overridden SLI		Risk of overturning when slewing with an overridden SLI Do not override the SLI before slewing the superstructure. Enter an SLI code for the 360° working range if the slewing operation is not enabled. In this way you prevent the superstructure from being slewed into impermissible areas and the truck crane tipping over as a result.
13.9.2 Hook block on a separate vehicle	Hook block		Risk of damage to the separate vehicle Only raise the hook block from the separate vehicle if the main boom head is directly above the hook block. This prevents the hook block from swinging and damaging the separate vehicle.
13.9.2 Hook block on a separate vehicle	Slack hoist rope		Risk of damage to the hoist rope To prevent slack rope, do not ease down too much hoist rope when picking up and reeving the hook block. Slack rope causes rope loops on the hoist drum, which can result in the load slipping and the hoist rope being destroyed.
13.9.3 Reeving and unreeving the hoist rope	Reeving		Risk posed by rope slack Only use hook blocks and sling gear of the minimum weight prescribed in the Lifting capacity table, depending on the reeving and boom length. That way you prevent slack rope forming at large heights when lifting without a load. This can result in the load slipping.
13.9.3 Reeving and unreeving the hoist rope	Reeving the hoist rope		Risk of damage to the hoist rope Always guide the hoist rope via the right head sheave in order to keep within the maximum permissible rope angle. If you run the auxiliary hoist rope over the left head sheave, you must extend the main boom to a total length of at least 21 m before lifting a load. In such a way you prevent the hoist rope being damaged and thus reducing the lifting capacity by exceeding the maximum permissible rope angle.

			See instructions in 13.9.3 for diagram and details.
13. Rigging Work (cont.)			
Section / Heading	Hazard	Risk	Described Risk & Control Measures
13.9.3 Reeving and unreeving the hoist rope	Securing the hoist rope		Risk of damage to the hoist rope Follow diagram and instructions in 13.9.3 by inserting the rods (2) and (3) into the rear holes (7). If the rope safety rods are inserted into the front bores, the hoist rope runs in an impermissible angle and could cause damage causing the load to fall.
13.9.5 - Installing / removing the lifting limit switch	Locked lifting limit switch		Risk of damage if the lifting limit switch is locked The lifting limit switch must not be locked. Remove the lock, if necessary. If the lifting limit switch is locked, the hook block could hit the bottom of the main boom head during the lifting procedure, resulting in damage to the hook block, main boom head and hoist rope.
13.9.6 - Locking / Unlocking the lifting limit switch	Locking		Risk of damage if the lifting limit switch is locked The lifting limit switch to which the lifting limit switch weight is attached may under no circumstances be locked when operating the crane. If the lifting limit switch is blocked, release the locking system. This prevents the hook block from hitting the main boom head, causing damage to the hook block, main boom head and hoist rope.
13.9.7 - Anemometer and air traffic control light	Driving on roads with anemometer and air traffic control light.		Risk of damage when driving on roads Always remove the anemometer and air traffic control light before on-road driving. This prevents the specified overall height from being exceeded at on-road level, and the anemometer from being damaged by air currents.

14. Rigged truck crane, driving

Section / Heading	Hazard	Risk	Described Risk & Control Measures
14 Rigged truck crane, driving	Obstructions when driving		Risk of accidents if your view of the truck crane is partially obstructed When driving the truck crane, always stay in visual or radio contact with a spotter who can observe the parts you are unable to see, e.g. the raised boom in 0° to the rear position.
14 Rigged truck crane, driving	Driving with lifted load		Risk of accidents when driving with a lifted load Driving the truck crane with a load lifted is prohibited. Always set down the load prior to driving the truck crane and secure the hook block so it cannot swing.
14 Rigged truck crane, driving	Superstructure slewing		Risk of overturning due to superstructure slewing When driving the rigged crane, the slewing gear must be switched off – slewing gear brake engaged. The turntable must be locked.
14 Rigged truck crane, driving	Driving on public roads		Risk of accidents when driving on public roads Driving on public roads is only permissible if all requirements listed in the CHECKLIST: Inspections before on-road driving are met; see p 5 - 1. Driving on public roads with a rigged truck crane is not permitted.
14.1.- Permissible rigging modes and axle loads	Loads on axles		Risk of damage to the axle lines Bring the superstructure and the main boom into the positions specified only. This prevents excessive strain on the axle lines.
14.1.- Permissible rigging modes and axle loads	Overriding the SLI		Risk of accidents if the SLI is overridden Always enter the SLI code for the current rigging mode. The specified positions are within the monitored working ranges. If the SLI is overridden, the truck crane may overturn even if you approach the positions specified. Bring the superstructure and the main boom into a position that is specified in the table in 14.1 for the respective counterweight rigged. Tie down the hook block so that it cannot swing back and forth.
14.3 Before driving the rigged truck crane 14.3.1 Checking the tyre pressure and the wind speed	Tyre pressure		Risk of damage to the tyres. Only drive the rigged truck crane if the tyres are at the prescribed pressure level. Never reduce the tyre pressure in order to increase the bearing surface of the tyres. Check that the tyres are all at the prescribed pressure levels; see Tyres, p. 8 - 7.
14.3.1 Checking the tyre pressure and the wind speed	Wind speed		Risk of incidents due to excessively high wind speeds. You may not drive the rigged truck crane if the wind speed exceeds the maximum permissible values specified in the <i>Lifting Capacity Tables</i> . In this case, you must bring the truck crane into a safe condition.

14. Rigged truck crane, driving

Section / Heading	Hazard	Risk	Described Risk & Control Measures
14.3.2 Securing the superstructure against slewing	Slewing of the superstructure.		Risk of overturning by slewing the superstructure while driving the truck crane Always lock the superstructure before driving the rigged truck crane to prevent it from slewing. When slewing the superstructure while driving the truck crane, there is an increased risk of overturning.
14.3.3 - Putting the truck crane on the wheels	Retracting of cylinders		Risk of overturning if the outrigger cylinders are retracted unevenly Retract the outrigger cylinders evenly. This prevents the truck crane from overturning when retracting individual outrigger cylinders. Retract the outrigger cylinders until all wheels are just above the ground.
14.3.3 - Putting the truck crane on the wheels	Switching on suspension		Risk of overturning when switching on the suspension You may under no circumstances switch on the suspension as long as the rigged truck crane is on wheels. The suspension struts would be suddenly pressed together and damaged and the truck crane could overturn when switching on the suspension.
14.3.3 - Putting the truck crane on the wheels	Switching on suspension		Risk of overturning if outriggers are retracted Always leave the outriggers extended and the outrigger pads just above the ground to secure the truck crane against overturning.
14.3.4 - Preparing to drive	Switching on separate steering		Risk of damage to the steering linkage Always switch on separate steering before driving the rigged truck crane and steer the truck crane only when it is rolling. The steering linkage can be damaged if separate steering is switched off or if you steer the vehicle while it is stationary.
14.4 - While driving	Operating steering in stationery position		Risk of damage to the steering linkage The steering linkage can be damaged if the steering is operated while the vehicle is stationary.
14.4 - While driving	Switching on the suspension		Risk of overturning when switching on the suspension The suspension must be deactivated (locked) as long as the rigged truck crane is on wheels. When switching on the suspension, the suspension cylinders would suddenly be pressed together and damaged, and the truck crane could overturn. Never align the truck crane with the level adjustment system if the ground is uneven. In this case you must raise the truck crane with the outrigger cylinders, level it and lower it again, as described in the section Putting the truck crane on the wheels; see p. 14 - 7.

15. Malfunctions during Crane Operation

Section / Heading	Hazard	Risk	Described Risk & Control Measures
15.1 Emergency stop switch	Overloading switch		Risk of overloading if used improperly. Only activate the emergency stop switch if it is no longer possible to stop the crane movements with the normal operating elements. The emergency stop switch stops the crane movements suddenly. This may overload the truck crane, e.g. in the event of high working speeds and large working radius.
15.1 Emergency stop switch	Suspended load		Risk of accidents due to suspended loads If a load is suspended from the hook after actuating emergency stop, make sure no-one enters the Risk area under the suspended load. Secure the Risk area in case the error cannot be corrected quickly before you leave the operating site.
15.2 What to do when malfunctions occur during crane operation	Suspended loads		Risk of incidents when carrying out repairs with loads lifted. Repairs must not be carried out as long as a load is lifted. Always try to lower the load before carrying out repairs. Only properly qualified personnel may perform crane movements with the solenoid valves.
15.2 What to do when malfunctions occur during crane operation	Overridden or faulty SLI.		Risk of incidents due to overridden or faulty SLI. You may only override the SLI if it becomes absolutely necessary in the event of an emergency. This is to put the truck crane into a safe condition in the event of a malfunction. In this case, do not perform any movements that would increase the load moment.
15.3 Fuses on the superstructure	Ignition left on with blown fuse		Risk of Damage when the ignition is switched on. Switch off the ignition whenever a fuse has to be replaced. In this way you can prevent the new fuse from being damaged by the increased starting current immediately after inserting it.
15.3 Fuses on the superstructure	Blown fuse		Risk of damage due to overloading. Replace blown fuses only with new fuses of the same amperage. In this way you can prevent parts from being overloaded and damaged or the fuse from being immediately damaged again. Notify CraneCARE if a fuse of the same amperage blows again after turning on the ignition.
15.3 Fuses on the superstructure	Conductive materials		Risk of Fire. Never replace a defective/blown fuse with other electrically conductive materials.
15.3.3 Fuses in the battery box	Lead and lead compounds		Risk due to lead and lead compounds of batteries. Battery poles, battery terminals and parts of the battery itself contain lead and lead compounds. Wash your hands after working on these parts or in these areas.

15. Malfunctions during Crane Operation (cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
15.4.12 Troubleshooting the SLI	Error messages		Risk of incidents. Immediately stop operating the crane if an error message is displayed. The SLI may only be repaired by trained and qualified personnel.
15.4.12 Troubleshooting the SLI	Overridden or Faulty SLI		Risk of incidents in the event of a faulty or overridden SLI. In the event of a defective SLI, first try to eliminate the error using the information in <i>section 15.4 of the Operator's Manual</i> . Only override the SLI if it becomes absolutely necessary in order to lower the load in the event of an emergency. Do not carry out any movements which increase the load moment in the event of a faulty or overridden SLI. If the SLI is overridden, the crane operations are not monitored and no shutdown procedures are initiated when leaving the working range.
15.4.12 Troubleshooting the SLI	Error messages in the monitoring submenu		Risk of incidents. Immediately stop operating the crane if an error message is displayed. The SLI may only be repaired by trained and qualified personnel.
15.4.12 Troubleshooting the SLI	Switching off sensor / tachogenerator		Risk due to failure of SLI. Have the error rectified before the next crane job. By doing this, the crane can then still be unrigged without SLI monitoring if the second sensor/tachogenerator fails.
15.4.12 Troubleshooting the SLI	Switching off sensor / tachogenerator		Risk of incidents due to defective functioning. After switching off the faulty sensor/tachogenerator, only begin crane operations if the remaining sensors/tachogenerators are displayed correctly. In this way you prevent the SLI from not switching off when leaving the working range and the truck crane overturning as a result.
15.5 Emergency operations and programs 15.5.1 Emergency operation for telescoping	Mechanical emergency operation		Risk of incidents due to sudden retraction of a telescopic section. Before unlocking the telescopic section, secure it against automatic retraction. In this way, you can prevent the retracting telescopic section from shearing off any of your limbs or the truck crane from being damaged or being overturned by the telescopic section suddenly retracting. If the telescoping cylinder is positioned at a locking point, the corresponding telescopic section cannot be locked or unlocked manually.

15. Malfunctions during Crane Operation (cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
15.5.1 Emergency operation for telescoping	Unlocking telescopic sections		Risk of incidents due to a mechanically released lock. Under no circumstances may you operate the telescopic cylinder if the lock is mechanically released. Screw all set screws out of the bore holes immediately after finishing the repair work. This prevents damage to the telescoping cylinder and the locking system.
15.5.2 Telescoping emergency program	Undetermined status of telescoping mechanism		Risk of damage to the telescoping mechanism. Ensure you always have an overview of the current status of the telescoping mechanism before you initiate locking or unlocking. In emergency mode, there is no monitoring of prerequisites – the function is performed immediately after pressing the button. See 15.5.2 for more detailed instructions.
15.5.2 Telescoping emergency program	Error indications		Risk of damage to the main boom. Never telescope the main boom if there is an error on the length indicator and on the proximity switch at the same time. It would then not be possible for you to monitor operations, and components in the main boom could be damaged, or a situation could arise in which the main boom can no longer be extended or retracted.
15.5.2 Telescoping emergency program	Sudden retractions of telescopic section.		Risk of incidents from sudden retraction of a telescopic section.  Press the button for unlocking the telescopic section not more than twice . If this does not start the unlocking procedure, contact Crane Care .
15.5.2 Telescoping emergency program	Retracting and locking a telescopic section		Risk of damage to the main boom. If you select <i>Lock</i> during telescoping, the locking pins on the telescopic section are slid out immediately and they can damage or tear the electrical or hydraulic components in the main boom.
15.5.2 Telescoping emergency program	Unlocking the telescopic cylinder		Risk of incidents from sudden retraction of a telescopic section.  Press the button for unlocking the telescopic cylinder not more than twice . If this does not start the unlocking procedure, contact Crane Care .

15. Malfunctions during Crane Operation (cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
15.5.2 Telescoping emergency program (cont.)	Extending and locking the telescoping cylinder		<p>Risk of damage to the main boom.</p> <p>If you select <i>Lock</i> while the telescoping cylinder is moving, the locking pins on the telescopic section are slid out immediately and they can damage or tear the electrical or hydraulic components in the main boom.</p>
15.5.2 Telescoping emergency program	Retracting		<p>Risk of damage if the length specifications are not observed.</p> <p>Extend the telescoping cylinder (without telescopic section) only to the specified length. This prevents the piston rod from becoming damaged if the telescoping cylinder slides out of the telescopic section.</p>
15.5.3 Additional hazards	Entering set values		<p>Risk of damage due to incorrect input.</p> <p>Before working with the crane, check whether ECOS now indicates the correct telescoping and correct an incorrect input, if necessary. Entering incorrect values causes malfunctions and may cause damage to the telescoping mechanism.</p>
15.5.4 Emergency operation with the hand-held control	SLI function		<p>Risk of overturning due to deactivated monitoring function.</p> <p>The SLI is switched off and the crane operations are not monitored when operating with the hand-held control. If you move into a critical range, the truck crane will overturn.</p>
15.5.2 Telescoping emergency program	Operating a power unit		<p>Risk of overturning when driving into the shutdown ranges.</p> <p>Avoid lowering. If you cannot avoid lowering, try to set the load down beforehand, and ensure that the maximum permissible working radius for the rigging mode as specified in the <i>Lifting Capacity Table</i> is not exceeded. Before slewing, always check whether this is permissible in the current rigging mode. Refer to <i>Slewing with a Rigged Counterweight – section 13.7.12</i> of the Operator's Manual for more information.</p>
15.5.2 Telescoping emergency program	Operating a power unit		<p>Risk of incidents when operating the slewing gear.</p> <p>Sit down in the crane cab to operate the slewing gear. This prevents you from being pushed off the carrier or being crushed by the carrier as a result of slewing. Lay the connecting cable of the hand-held control so that it will not catch on anything.</p>

15. Malfunctions during Crane Operation (cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
Additional hazards – hot engine	Hot engine parts		<p>Risk of burning yourself when the engine is hot.</p> <p>During operation, the engine and the add-on parts heat up to a great extent. Wear appropriate protective gloves and be careful not to touch hot parts.</p>
Additional hazards - Connecting / disconnecting hoses	Establishing connections		<p>Risk of damage to the hoses.</p> <p>Lay the hoses in such a manner that they can be moved freely, so as to prevent them from being crushed or torn or getting caught during subsequent crane movements.</p>

16. Technical Information about the Superstructure

Section / Heading	Hazard	Risk	Described Risk & Control Measures
N/A	N/A	N/A	N/A, to this risk assessment however the information is important.

17. Index for Part 2 – Operating Instructions – Superstructure

Section / Heading	Hazard	Risk	Described Risk & Control Measures
	N/A	N/A	N/A



GMK 6400 Risk Assessment Lattice Extension

This risk assessment is based upon the information contained within the standard lattice extension Manual 2012 for a Grove GMK 6400 all-terrain crane. This document has been prepared by Manitowoc Australia for the use of such crane in Australia.

Although this risk assessment is comprehensive, and all efforts have been made to be as thorough as possible, Manitowoc CraneCARE makes no claim in any way, shape or form to its complete accuracy or that all possible hazards have been identified, or that all associated risks have been identified or priority assessed, or that all possible control measures that could be implemented have been provided.

The information contained within this risk assessment is also based upon the assumption that all personnel involved with the use of the crane, including operators, service personnel, or associated crane crew personnel have received prior instruction and/or appropriate training in all aspects of operating, or servicing and maintaining, or working with this particular model of crane, and that while conducting the previously mentioned tasks, are doing so with the full permission of the crane owner, and are doing so while holding all appropriate qualifications and/or certifications required by applicable legislation in the country, region, state or territory in which the crane is to be operated.

This is an uncontrolled copy when printed.

GENERIC HAZARDS AND INFORMATION

General Information

Warnings and Symbols

	Hazard may cause personal injury
	Hazard may cause damage to crane or other objects within the working range
	Hazard may cause electrocution
	Hazard may cause environmental damage, for further information on handling substances that pose a risk to the environment; see Maintenance manual, Chapter Safety and environmental protection.

1. Basic Safety Instructions

Section / Heading	Hazard	Risk	Described Risk & Control Measures
Basic safety Instructions	Too may to be listed	   	This row has only been added for the operator to identify that the safety instructions though generic in nature are important to the use of the crane in any and all types of applications, use and maintenance. It is vital the operators familiarises themselves with the safety instructions.

2. Additional operating and display elements

Section / Heading	Hazard	Risk	Described Risk & Control Measures
N/A	N/A	N/A	N/A, to this risk assessment however the information is vital in this section and must be followed.

3. Transport measurements, weights and allocation of the lattice extension sections

Section / Heading	Hazard	Risk	Described Risk & Control Measures
N/A	N/A	N/A	N/A, to this risk assessment however the information is vital in this section and must be followed.

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4. Boom extension

Section / Heading	Hazard	Risk	Described Risk & Control Measures
4.1 Components and identification	Non modified extension		<p>Risk of incident during operation with non-modified boom extension. Operate the truck crane only with those parts of the boom extension which have the same serial number as the crane. The SLI is only set for this boom extension. This prevents malfunctions and damage. For technical reasons, the truck crane may be adjusted only with one boom extension. If you wish to use the boom extension on more than one GROVE truck crane, the parts of the boom extension must be adjusted for these cranes and labelled with all of the respective serial numbers.</p>
4.1 Components and identification	Incorrect adjustment		<p>Risk of incidents if not adjusted correctly The adjustment of the boom extension may only be carried out by CraneCARE.</p>
4.3 Slings points	Incorrect slinging		<p>Attach the boom sections only to these slinging points as indicated in the lattice manual section 4.3 as they will then automatically have the right centre of gravity. Use only the supplied securing equipment with sufficient lifting capacity;</p>
4.5.2 Truck crane rigging mode during installation of the boom extension	Truck crane rigging mode during installation of the boom extension		<p>Risk of overturning. The boom extension may only be mounted with the span and counterweight indicated in the <i>Lifting capacity table</i>. These values apply both to rigging and operation of the boom extension.</p>
			<p>Risk of incidents. Use only the supplied and permitted securing equipment with sufficient lifting capacity. Use an extendable ladder for mounting the boom extension as well as the mounted ladders and steps. Follow noted safety controls for use of ladders.</p> <ul style="list-style-type: none"> • Retract the truck crane as under GMK 6400 operating instructions – Retracting. The prescribed outrigger span can be found in the Lifting capacity tables. • Rig the counterweight version required for operation with the boom extension to be rigged as under GMK 6400 operating instructions – Counterweight. The required counterweight can be found in the Lifting capacity tables. • Turn the truck crane into the position to rig the boom extension, retract all telescope sections completely and lower the main boom to the horizontal position as under GMK 6400 operating instructions – Telescoping gear. • Unreeve the hook block as under GMK 6400 operating instructions – Reeving and unreeving the hoist cable. Lay the main hoist rope on the deflection sheave of the main boom. • See 4.5.2 for illustration.

4. Boom extension

Section / Heading	Hazard	Risk	Described Risk & Control Measures
4.5.3 Establishing/disconnecting the connections for the hydraulic lock	Establishing/disconnecting the connections for the hydraulic lock.		Risk of damage to the connection lines. Always disconnect the hydraulic and electrical connection immediately after you have locked the foot section. By doing this you prevent the connection lines tearing when telescoping or unrigging the foot section. The connections must always be disconnected immediately after establishing or releasing the hydraulic lock. The connections must always be disconnected immediately after establishing or releasing the hydraulic lock.
4.5.4 Secure/release hydraulic lock	Secure/release hydraulic lock		Risk of incidents if the lock is released. Secure the hydraulic lock immediately after you have locked the foot section. This way you prevent the lock from coming undone during operation, in the event that the pressure in the hydraulic system drops (e.g. if the hydraulic hoses get damaged). There is a mechanism to secure the hydraulic lock in the rear on the foot section. Depending on the version, it is operated in different ways so follow 4.5.4.
4.5.5 Locking the foot section/releasing the lock	Locking the foot section/releasing the lock		Risk of incidents if the lock is released. Secure the hydraulic lock immediately after you have locked the foot section. This way you prevent the lock from coming undone during operation, in the event that the pressure in the hydraulic system drops (e.g. if the hydraulic hoses get damaged). Disconnect the connections for the hydraulic lock; as per page 4.28.
	Locking the foot section/releasing the lock		Risk of damage to the connection lines. Always disconnect the hydraulic and electrical connection immediately after you have locked the foot section. By doing this you prevent the connection hoses tearing when the main boom is telescoped. Remove the lifting gear from the foot section.
	Releasing the lock		Risk of incidents from falling foot section. Always attach the foot section to the provided slinging points with the auxiliary crane before you release the lock. This will prevent the unsecured foot section from falling and causing injury to you or other persons. Follow page 4.28-4.29 for further instructions on attaching the foot.
	Releasing the lock		Risk of damage to the connection lines. Always disconnect the hydraulic and electrical connection immediately after you have released the lock. By doing this you prevent the connection hoses tearing when the foot section is set down. Set the foot section down with the auxiliary crane, e.g. on a separate vehicle. Remove the lifting gear from the foot section.

4. Boom extension

Section / Heading	Hazard	Risk	Described Risk & Control Measures
4.5.7 Installing/removing the boom extension sections	Installing/removing the boom extension sections		<p>Risk of incidents from loads which cannot be detected. Operation of the boom extension is prohibited as long as the tie/rear pendant links are fastened to the intermediate sections or the luffing control arm is fastened to the foot section. The weight of the rear pendant link is not registered by the SLI and therefore punctual SLI shutdown is no longer guaranteed.</p>
4.5.7 Installing/removing the boom extension sections	Undetected loads		<p>Risk of incidents from loads which cannot be detected. Operation of the boom extension is prohibited as long as the tie/rear pendant links are fastened to the intermediate sections or the luffing control arm is fastened to the foot section. The weight of the rear pendant link is not registered by the SLI and therefore punctual SLI shutdown is no longer guaranteed.</p>
4.5.7 Installing/removing the boom extension sections	Installing/removing the boom extension sections		<p>Risk of incidents from falling boom extension. Before you detach the pin connections always unload the boom extension first until the pins move smoothly. In this way you avoid the loaded boom extension folding down when detaching the connection and hurting yourself or others.</p>
4.5.8 Blocking the joint on the foot section	Blocking the joint on the foot section		<p>Risk of incident from folding out foot section. For operation with the boom extension the pins in the foot section's angle section must always be inserted. Before raising the boom extension check if both parts of the foot section are connected with the pins. This prevents the upper section folding down during the raising process.</p>
4.5.9 Removing/installing deflection sheave on the angle piece	Removing/installing deflection sheave on the angle piece		<p>Risk of incidents from damaged hoist rope. Always remove the deflection sheave to the angle piece before you rig the above-mentioned boom extensions. This prevents the hoist rope dragging in an impermissible angle or on the deflection sheave and becoming damaged.</p>
4.5.12 Setting the angle position of the boom extension	Setting the angle position of the boom extension		<p>Risk of incidents because of faulty fall-back guard strut. The pendulums of the fall-back guard strut on both sides of the angle piece have to be freely mobile throughout their entire slewing range. If the pendulum is not able to move freely over the entire slewing range, the boom extension will not be supported to the rear. Furthermore, the fall-back guard strut can be damaged when the boom extension is set down.</p>

4. Boom extension

Section / Heading	Section / Heading	Section / Heading	Section / Heading
4.5.13 Changing the lifting limit switch and anemometer	Changing the lifting limit switch and anemometer		Risk of malfunctions. If you dismantle the lifting limit switch from the head of main boom, always plug the bridging plug into the socket. Otherwise the lifting limit switch on the head section will be without function.
4.5.16 Placing and reeving hoist rope	Placing and reeving hoist rope		Risk of incidents if the deflection sheave was improperly removed. Before placing the hoist rope, check if the deflection sheave on the angle piece is removed, as is required with the rigged boom extension (see page 4 - 40). With these boom extensions, the hoist rope can drag on the mounted deflection sheave or it runs in an impermissible rope angle when it is placed on the deflection sheave. In both situations, the hoist rope is damaged which can lead to the load falling.
4.5.16 Placing and reeving hoist rope	Placing and reeving hoist rope		Risk of incidents if the deflection sheave was in the wrong position. If the deflection sheave on the angle piece must be installed, then check if it is locked in the Boom extension/luffing jib position (see page 4 - 41). This avoids damage to the hoist rope dragging on the structural members and being damaged which can lead to the load falling.
4.5.16 Placing and reeving hoist rope	Placing and reeving hoist rope		Single reeving may cause risk of slack rope formation. When working with 1-ply reeving with long lattice extensions, you must lift a load of at least 450 kg. This means that the weight of the rear hoist rope is compensated and no slack rope develops. The given load corresponds to the weight of the hook tackle delivered by GROVE for the GMK 6400.
4.6 Working with the boom extension	Working with the boom extension		Risk of overturning if wind speeds are too great. If the maximum permissible wind speed according to the Lifting capacity table is reached; you must put down the load. Observe the information in section Effect of wind when operating the boom extension (further on in this chapter) and, if necessary, lower the boom extension.
4.6 Working with the boom extension	Working with the boom extension		The main boom may buckle. Accelerate and brake the crane movements in such a way that the load does not sway.
4.6 Working with the boom extension	Working with the boom extension		Risk of incidents due to overloading. A hook block may not be reeved on the main boom during operation with the boom extension. This hook block or load is not detected by the SLI and the truck crane can become overloaded.
4.6 Working with the boom extension	Working with the boom extension		Single reeving may cause risk of slack rope formation. When working with 1-ply reeving with long lattice extensions, you must lift a load of at least 450 Kg. This means that the weight of the rear hoist rope is compensated and no slack rope develops. The given load corresponds to the weight of the hook tackle delivered by GROVE for the GMK 6400.

4. Boom extension

Section / Heading	Hazard	Risk	Described Risk & Control Measures
4.6.1 Operating the SLI	Operating the SLI		Risk of incidents due to incorrectly set SLI If the current rigging mode varies from the displayed rigging mode, the maximum load displayed by the SLI does not correspond to the actual permissible lifting capacity according to the Lifting capacity table. Overloading and incidents will be the result. Only the display for the current rigging mode of the boom extension is to be in place as displayed in 4.6.1.
4.6.5 Influence of the wind during operating with boom extension	Influence of the wind during operating with boom extension		Risk of incidents due to high wind speeds. If the wind speed exceeds the maximum permitted values according to the Lifting capacity table exceeds the maximum permissible values, crane operation must be stopped and the truck crane must be brought to the rigging mode which the following table prescribes. This also applies when the wind surfaces of the load is smaller than the permissible specific wind surfaces as per GMK 6400 operating instructions – External influences during crane operation- – Permissible wind load.
4.7 Driving with rigged crane and boom extension	Driving with rigged crane and boom extension		Risk of incidents. It is forbidden to move the truck crane with a load on the hook. Put the load down before you move the truck crane. Secure the hook block so that it cannot swing.
4.7 Driving with rigged crane and boom extension	Driving with rigged crane and boom extension		Risk of overturning. Before a rigged crane can be driven, the superstructure must be locked and the slewing gear permanent brake must be engaged.
4.7 Driving with rigged crane and boom extension	Driving with rigged crane and boom extension		Risk of incidents due to not having a complete overview of the truck crane. While driving the equipped truck crane, always stay in visual or radio contact with a spotter who additionally observes the parts which you cannot see (e.g. the raised boom when the superstructure is turned to the back). In this way you prevent incidents resulting from collisions with persons, other construction equipment, ledges of buildings, cables or other objects.
4.7.1 Driving route	Driving on route		Risk of damage to the tyres. Release no air from the tyres. Do not reduce the tyre pressure.
4.7.2 Position of the boom and the axle load	Position of the boom and the axle load		Risk of damage to the axle lines. Always move the main boom into the position prescribed by the table for the rigged boom extension before you move the rigged truck crane. Positions which deviate from the specified position cause impermissible loads on the axle lines. Follow the tables as per 4.7.2 for different boom lengths.

4. Boom extension

Section / Heading	Hazard	Risk	Described Risk & Control Measures
4.7.3 Driving the rigged crane	Retracting the outrigger		Risk of overturning. Make sure that the truck crane does not overturn while the outriggers are being retracted. Retract all the outrigger cylinders as uniformly as possible.
4.7.3 Driving the rigged crane	Switching over the suspension locking system.		Risk of overturning when switching off the suspension locking system. As long as the truck crane is on wheels, you may not turn off the suspension locking system for any reason. The suspension is no longer under pressure and when the suspension locking system is switched off, the suspension legs would be pressed together, damaged and the truck crane could tip over.
4.7.3 Driving the rigged crane			Risk of overturning. To reduce the risk of the crane overturning do not raise the outrigger pads more than 5 to 10 cm off the ground. Leave the outrigger beams extended.
4.7.3 Driving the rigged crane	Driving the rigged crane		Risk of damage to the tyres. Check the pressure in the tyres before moving the rigged truck crane. The truck crane may only be moved if the tyre pressures are at the prescribed levels; as per GMK 6400 operating instructions – Checking the tyres. Do not reduce the tyre pressure.
4.7.3 Driving the rigged crane			Risk of damaging the steering linkage. Steer the truck crane only when the vehicle is moving. The steering linkage can be damaged if the steering is turned while the vehicle is stationary.
4.7.3 Driving the rigged crane	Supporting the truck crane		Risk of overturning The truck crane must be raised until no wheels touch the ground.

5. Luffing Jib

Section / Heading	Hazard	Risk	Described Risk & Control Measures
5.1 Components and identification	Non modified luffing jib		<p>Risk of incident during operation with non-modified luffing jib. Operate the truck crane only with those parts of the luffing jib which have the same serial number as the crane. The SLI is set only for this luffing jib. This prevents malfunctions and damage. The truck crane may be adjusted only with a luffing jib. If you wish to use the luffing jib on several Grove truck cranes, the parts of the luffing jib must be adjusted for these cranes and labelled with all of the respective serial numbers.</p>
5.1 Components and identification	Incorrect adjustment of luffing jib.		<p>Risk of incidents if not adjusted correctly To prevent this the adjustment of the boom extension may only be carried out by CraneCARE.</p>
5.3 Slings points	Slings points		<p>Risk of incidents form incorrect slings points. The slings points of all luffing boom sections can be seen in the following diagram. Attach the boom sections only to these slings points as they will then automatically have the right centre of gravity. Use only the supplied securing equipment with sufficient lifting capacity; As per chapter 3, Transport measurements, weights and allocation of the lattice extension sections.</p>
5.4.2 CHECKLIST: Luffing jib removal	Luff jib removal		<p>Risk of damage to the hoist rope. Ensure that the hoist rope is not damaged while carrying out the removal of the luff jib as described in 5.4.2. If necessary, set down the hook block and reeve the main hoist rope out. See 5.4.2 steps 10 onwards.</p>
5.5.2 Rigging mode of the truck crane when mounting the luffing jib	Mounting the luffing jib		<p>Risk of overturning. The luffing jib may only be mounted with the span and counterweight indicated in the Lifting capacity table. These values apply both to rigging and operation of the luffing jib.</p>
5.5.2 Rigging mode of the truck crane when mounting the luffing jib			<p>Risk of incidents. Use only the supplied and permitted securing equipment with sufficient lifting capacity. Use an extendable ladder for mounting the luffing jib as well as the mounted ladders and steps. Follow notes control measure for general works for ladders. Ensure the preparatory work described in 5.5.2 is followed when mounting or dismantling the luffing jib on the truck crane in order to bring the truck crane into the prescribed rigging mode.</p>

5. Luffing Jib

Section / Heading	Hazard	Risk	Described Risk & Control Measures
5.5.3 Installing/disassembling luffing control arm	Installing/disassembling luffing control arm		Risk of injury due to falling parts. Do not leave the transport brackets hanging in the luffing jib. They may fall down during operation, causing damage or injury.
5.5.3 Installing/disassembling luffing control arm	Creating a connection between the fall-back guard strut and the luffing control arm		Risk of injury from unsecured fall-back guard strut In the assembly procedure, the fall-back guard strut is temporarily not locked with the luffing control arm. The unsecured fall-back guard strut can inadvertently start to move. You can prevent personal injuries or damage to the fall-back guard strut or the add-on parts by securing the fallback guard strut against slipping, e.g. by slinging.
5.5.3 Installing/disassembling luffing control arm	Loosening the connection between the fall-back guard strut and the luffing control arm		Risk of injury from unsecured fall-back guard strut In the assembly procedure, the fall-back guard strut is temporarily not locked with the luffing control arm. The unsecured fall-back guard strut can inadvertently start to move. You can prevent personal injuries or damage to the fall-back guard strut or the add-on parts by securing the fallback guard strut against slipping, e.g. by slinging.
5.5.3 Installing/disassembling luffing control arm	Disconnecting the connection between the foot section and the luffing control arm		Risk of damage to the fall-back guard strut. After lifting the luffing control arm, the piston rod of the fall-back guard strut will protrude above the luffing control arm. Ensure that during lifting, the piston rod does not knock into anything or is bent. Place the luffing control arm in a place where the piston rod and its surface will not be damaged. Lift the luffing control arm from the foot section and place it onto the support.
5.5.4 Establishing/disconnecting the connections for the hydraulic lock	Establishing/disconnecting the connections for the hydraulic lock		Risk of damage to the connection lines. Always disconnect the hydraulic and electrical connection immediately after you have locked the foot section. By doing this you prevent the connection lines tearing when telescoping or unrigging the foot section.
5.5.5 Secure/release hydraulic lock	Unsecured hydraulic lock		Risk of incidents if the lock is released. Secure the hydraulic lock immediately after you have locked the foot section. This way you prevent the lock from coming undone during operation, in the event that the pressure in the hydraulic system drops (e.g. if the hydraulic hoses get damaged).

5. Luffing Jib

Section / Heading	Hazard	Risk	Described Risk & Control Measures
5.5.6 Locking the foot section/releasing the lock	Locking the foot section		<p>Risk of incidents if the lock is released. Secure the hydraulic lock immediately after you have locked the foot section. This way you prevent the lock from coming undone during operation, in the event that the pressure in the hydraulic system drops (e.g. if the hydraulic hoses get damaged). Disconnect the connections for the hydraulic lock; as per page 5 - 40.</p>
5.5.6 Locking the foot section/releasing the lock	Locking the foot section		<p>Risk of damage to the connection lines. Always disconnect the hydraulic and electrical connection immediately after you have locked the foot section. By doing this you prevent the connection hoses tearing when the main boom is telescoped. Remove the lifting gear from the foot section.</p>
5.5.6 Locking the foot section/releasing the lock	Releasing the lock		<p>Risk of incidents from falling foot section. Always attach the foot section to the provided slinging points with the auxiliary crane before you release the lock. This will prevent the unsecured foot section from falling and causing injury to you or other persons. Check whether the connections for the hydraulic lock have been established; as per 5 - 40. Check whether the hydraulic lock is released and release if it is not; As per <i>Secure/release hydraulic lock</i>, page 5 - 41. Follow also 5.5.6.</p>
5.5.6 Locking the foot section/releasing the lock	Releasing the lock		<p>Risk of damage to the connection lines. Always disconnect the hydraulic and electrical connection immediately after you have released the lock. By doing this you prevent the connection hoses tearing when the foot section is set down. Set the foot section down with the auxiliary crane, e.g. on a separate vehicle. Remove the lifting gear from the foot section.</p>
5.5.9 Separating/joining catcher 2 and raising cylinder.	Catcher 2 and the raising cylinder pinned together		<p>Risk of damage to the hydraulic cylinder If catcher 2 and the raising cylinder are pinned together during operation with the luffing jib, the raising cylinder could be damaged. Therefore, always check the pin position when rigging the luffing jib. The pin must be in the holder.</p>
5.5.10 Reeving the auxiliary hoist rope to the upper hook block	Insufficient reeving		<p>Risk of incidents from too little reeving. The auxiliary hoist rope is designed so that it is possible to operate the luffing jib after reeving nine times. Therefore, always reeve the hoist rope between the upper and lower sheaves nine times. This avoids the hoist cable from becoming overloaded with little reeving and breaking during luffing jib operation.</p>

5. Luffing Jib

Section / Heading	Hazard	Risk	Described Risk & Control Measures
5.5.12 Securing the upper hook block on the luffing control arm	Locking the upper hook block		Risk of incidents when raising the upper hook block. If you still need to move the hoists back to lock the upper hook block, make sure that the luffing control arm does not raise when someone is standing on it. See 5.5.12 for securing.
5.5.13 Removing the upper hook block from the luffing control arm	Releasing the locking pin		Risk of falling when releasing the pins on the upper hook block. No persons may be present on the luffing control arm when the hoisting gear has to be moved to release the pins on the upper hook block. When moving the hoisting gear, the luffing control arm can raise suddenly, causing a person to lose their balance and fall from the luffing control arm.
5.5.16 Installing/disassembling boom sections and rear pendant links	Removal		Risk of incidents from descending luffing jib. Always remove the load from the luffing jib first, using an auxiliary crane, before releasing the pin connections. In this way you avoid the boom sections folding down when releasing the connection and hurting yourself or others. Ensure the removal process in 5.5.16 is followed.
5.5.16 Installing/disassembling boom sections and rear pendant links	Release of hinge lock		Risk of incidents with hinge lock released. Always lock the hinge in the foot section first, before dismantling the last boom section. If you dismantle this boom section when the hinge lock is released, the fall-back guard strut bears most of the weight when the luffing control arm is in the wrong position. This means that the fall-back guard strut suddenly pulls the foot section upwards, and you or others may be injured by the boom sections being folded upwards. Ensure you follow the diagram FO305 in 5.5.16
5.5.17 Hinge lock in the foot section	Locking the hinge		Risk of crushing when raising the luffing part. Nobody should be standing near the folding parts (for example, on a ladder) when you lift the luffing part of the foot section to lock the hinge. This prevents anyone getting crushed by the parts which are folding up.
5.5.20 Setting the angle position of the luffing jib	Faulty fall-back guard strut		Risk of incidents because of faulty fall-back guard strut. The pendulums of the fall-back guard strut on both sides of the angle piece have to be freely mobile throughout their entire slewing range. If the pendulums are not able to move freely over the entire slewing range, the luffing jib will not be supported to the rear. Furthermore, the fall-back guard strut may be damaged when the luffing jib is set down.
5.5.21 Changing the lifting limit switch and anemometer	Changing the lifting limit switch		Risk of malfunctions! If you dismantle the lifting limit switch from the head of main boom, always plug the bridging plug into the socket. Otherwise the lifting limit switch on the head will be without function.

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Section / Heading	Hazard	Risk	Described Risk & Control Measures
5.5.24 Placing and reeving hoist rope	Placing and reeving hoist rope		Risk of incidents from damaged hoist rope. The deflection sheave on the angle piece must be locked in Boom extension/luffing jib position so that the hoist rope does not rub against other parts as per page 5 – 73. In this way, you can prevent loads from falling due to a damaged hoist rope.
5.5.24 Placing and reeving hoist rope	Single reeving		Single reeving may cause risk of slack rope formation. When working with 1-ply reeving with long lattice extensions, you must lift a load of at least 450 kg. This means that the weight of the rear hoist rope is compensated and no slack rope develops. The given load corresponds to the weight of the hook tackle delivered by GROVE for the GMK 6400.
5.5.30 Preparing the luffing jib for unrigging	Preparing the luffing jib for unrigging		Risk of damage to the hoist rope. Ensure that the hoist rope is not damaged. During the following procedure, set down the hook block as soon as the boom system is in an appropriate position, and unreeve the main hoist rope.
5.5.30 Preparing the luffing jib for unrigging	Preparing the luffing jib for unrigging		Risk of damage to the fall-back guard strut. During the following procedure, ensure that the head section does not touch the ground before the luffing control arm has reached the steepest position. When the luffing control arm is inclined forwards, the backtop can touch the foot section and be damaged in the worst case scenario (luffing jib has been set down flat on the ground).
5.5.30 Preparing the luffing jib for unrigging	Lowering of main boom		Risk of incidents owing to the main boom being lowered too far. At the most, lower the main boom so that the lock positions for the hinge lock align with one another. This position can be exceeded when lowering the boom to the horizontal position, especially with long luffing jibs. The bendable part of the foot section is pressed against the fixed part; this causes tension. This tension is released when the pins are driven out; the unexpected slippage of the luffing jib can injure you or others. Set the luffing control arm onto the rigging supports. Now the luffing jib is ready for further rigging.
5.6 Operation with the luffing jib	Wind speed		Risk of overturning if wind speeds are too great. If the maximum permissible wind speed according to the Lifting capacity table is reached; you must put down the load. Observe the information in section title "Effect of wind when operating the luffing jib" (in chapter 5) and, if necessary, lower the luffing jib.

5.6 Operation with the luffing jib	Operating		Risk of the main boom buckling. Accelerate and brake the crane movements in such a way that the load does not sway.
5.6 Operation with the luffing jib	Movement of hoist block		Risk of incident from unchecked hoisted hook block. Move at a very low hoist speed if you have only a light hook block or a small load hanging on a long luffing jib. In this way you will prevent the hook block being lifted further uncontrollably by the kinetic energy in the rear main hoist rope while braking the main hoist, which may damage the deflection sheave or the hoist rope.
5.6 Operation with the luffing jib	Single reeving		Single reeving may cause risk of slack rope formation. When working with 1-ply reeving with long lattice extensions, you must lift a load of at least 450 kg. This means that the weight of the rear hoist rope is compensated and no slack rope develops. The given load corresponds to the weight of the hook tackle delivered by GROVE for the GMK 6400.
5.6.1 Operating the SLI	Operating the SLI		Risk of incidents due to incorrectly set SLI If the current rigging mode varies from the displayed rigging mode, the maximum load displayed by the SLI does not correspond to the actual permissible lifting capacity according to the Lifting capacity table. Overloading and incidents will be the result.
5.6.1 Operating the SLI	Accepting the rigging mode		Risk of incidents due to incorrectly set SLI If the current rigging mode varies from the displayed rigging mode, the maximum load displayed by the SLI does not correspond to the actual permissible lifting capacity according to the Lifting capacity table. Overloading and incidents will be the result.
5.6.5 The effect of wind when operating with the luffing jib	Wind		Risk of incidents due to high wind speeds. If the wind speed exceeds the maximum permitted values according to the lifting capacity table, crane operation must be stopped and the truck crane must be brought to the rigging mode which the following table prescribes. This also applies when the wind surface of the load is smaller than the permissible specific wind surfaces as per GMK 6400 operating instructions – External influences during crane operation; and – Permissible wind load. Also see tables in 5.6.5 for procedures according to wind speeds.

5. Luffing Jib

Section / Heading	Hazard	Risk	Described Risk & Control Measures
5.7 Driving with rigged crane and rigged luffing jib	Driving with rigged crane and rigged luffing jib		Risk of incident The truck crane must be raised until no wheels touch the ground. Risk of incidents. It is forbidden to move the truck crane with a load on the hook. Put the load down before you move the truck crane. Secure the hook block so that it cannot swing.
5.7 Driving with rigged crane and rigged luffing jib	Driving with rigged crane and rigged luffing jib		Risk of overturning Before a rigged crane can be driven, the superstructure must be locked and the slewing gear permanent brake must be engaged.
5.7 Driving with rigged crane and rigged luffing jib	Driving with rigged crane and rigged luffing jib		Risk of incidents due to not having a complete overview of the truck crane. While driving the equipped truck crane, always stay in visual or radio contact with a spotter who additionally observes the parts which you cannot see (e.g. the raised boom when the superstructure is turned to the back). In this way you prevent incidents resulting from collisions with persons, other construction equipment, ledges of buildings, cables or other objects.
5.7.1 Driving route	Driving route		Risk of damage to the tyres. Release no air from the tyres. Do not reduce the tyre pressure.
5.7.2 Rigging modes for moving and axle loads	Movement of vehicle		Risk of damage to the axle lines. Always move the truck crane to the prescribed rigging mode before you drive the rigged truck crane. Positions which deviate from the rigging mode cause impermissible loads on the axle lines.
5.7.2 Rigging modes for moving and axle loads	Unrigging counterweights		Risk of overturning in other rigging modes. Always check if the listed prerequisites are fulfilled and enter the SLI rigging code for Telescoping (or Derricking) according to the table, before you unrig the counterweight sections. After unrigging, the truck crane is in a rigging mode that can only be monitored by this rigging code. This rigging code can only be accepted if the listed prerequisites are fulfilled. See 5.7.2.
5.7.2 Rigging modes for moving and axle loads	Main boom telescoping		Risk of incidents due to incorrectly set or overridden SLI. For the rigging modes that are given in the following tables, telescoping is only monitored if the respective SLI rigging code is entered for Telescoping. Do not enter any other SLI code and do not bridge the SLI.

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Section / Heading	Hazard	Risk	Described Risk & Control Measures
5.7.2 Rigging modes for moving and axle loads	Derricking main boom or luffing jib		Risk of incidents due to incorrectly set or overridden SLI. For the rigging modes that are given in the following tables, derricking the main boom is only monitored if the respective SLI rigging code is entered for Derricking. Do not enter any other SLI code and do not bridge the SLI.
5.7.3 Driving the rigged crane	Retracting the outrigger		Risk of overturning Make sure that the truck crane does not overturn while the outriggers are being retracted. Retract all the outrigger cylinders as uniformly as possible.
5.7.3 Driving the rigged crane	Switching off the suspension locking system		Risk of overturning when switching off the suspension locking system. As long as the truck crane is on wheels, you may not turn off the suspension locking system for any reason. The suspension is no longer under pressure and when the suspension locking system is switched off, the suspension legs would be pressed together, damaged and the truck crane could tip over.
5.7.3 Driving the rigged crane	Switching over the suspension locking system		Risk of overturning. To reduce the risk of the crane overturning do not raise the outrigger pads more than 5 to 10 cm off the ground. Leave the outrigger beams extended.
5.7.3 Driving the rigged crane	Driving		Risk of damage to the tyres. Check the pressure in the tyres before moving the rigged truck crane. The truck crane may only be moved if the tyre pressures are at the prescribed levels; as per GMK 6400 operating instructions – Checking the tyres. Do not reduce the tyre pressure.
5.7.3 Driving the rigged crane	Driving		Risk of damaging the steering linkage. Steer the truck crane only when the vehicle is moving. The steering linkage can be damaged if the steering is turned while the vehicle is stationary. Check the wind speed before moving the rigged truck crane. The same maximum permitted wind speeds apply for moving the crane as for working with the crane; as per GMK 6400 operating instructions – Influence of wind on crane operation.
5.7.3 Driving the rigged crane	Supporting the truck crane		Risk of overturning The truck crane must be raised until no wheels touch the ground.

5. Luffing Jib

Section / Heading	Hazard	Risk	Described Risk & Control Measures
5.8.1 Cleaning	Cleaning		<p>Risk of damage to electrical components Never hold the spray of a high pressure cleaner over electrical devices, relays, switch boxes and control units. This will prevent water from entering the components and causing damage, and will prevent faults occurring in the electrical system. The components specified in the following section are to be cleaned with particular care.</p>
5.8.7 Checking the nitrogen pressure and oil pressure in the fall-back guard strut for correct operation	Checking the nitrogen pressure and oil pressure in the fall-back guard strut for correct operation		<p>Risk of incidents Never attempt to dismantle the fall-back guard strut. The fall-back guard strut cylinder is under pressure even when the cylinder is extended completely. Only have repair work carried out by properly qualified personnel.</p>
5.8.7 Checking the nitrogen pressure and oil pressure in the fall-back guard strut for correct operation	Checking the nitrogen pressure and oil pressure in the fall-back guard strut for correct operation		<p>Risk of incidents The gas pressure test must be carried out only by an authorised inspector of pressure tanks or under his supervision or instruction.</p>
5.8.7 Checking the nitrogen pressure and oil pressure in the fall-back guard strut for correct operation	Topping up nitrogen		<p>Risk of explosion. Fill the nitrogen reservoir with nitrogen only. Do not use any other gas.</p>
5.8.7 Checking the nitrogen pressure and oil pressure in the fall-back guard strut for correct operation	Topping up nitrogen		<p>Risk when the pressure of the nitrogen bottle is too high. Install a pressure reducing valve if the pressure in the nitrogen bottle is greater than the permissible operating overpressure in the nitrogen reservoir (see model plate of fall-back guard strut). Screw the pressure reducing valve onto the nitrogen bottle connection.</p>
5.8.7 Checking the nitrogen pressure and oil pressure in the fall-back guard strut for correct operation	Topping up nitrogen		<p>Risk of damage when closing the valve on the test manometer When closing, always turn the valve on the gas filling device lightly with your hand. If the valve is closed too tightly, components in the test manometer can be damaged or torn apart. The screw plug for the test connection is closed using the final tightening torque only after the gas filling device has been removed. See 5.8.7 for further details.</p>
5.8.7 Checking the nitrogen pressure and oil pressure in the fall-back guard strut for correct operation	Oil filling		<p>Risk of malfunction due to air in the oil filling. Always bleed the hose so that when checking and, if necessary, when making a subsequent correction to the oil pressure, no air gets into the oil filling. If air is found in the oil filling, insufficient pressure can occur in the luffing control arm and it will malfunction.</p>
5.8.7 Checking the nitrogen pressure and oil pressure in the fall-back guard strut for correct operation	Oil pressure		<p>Risk of damage when operating pressure too high. Do not exceed the operating overpressure in the nitrogen reservoir. Check the pressure in the nitrogen reservoir before increasing the oil pressure.</p>

5. Luffing Jib

Section / Heading	Hazard	Risk	Described Risk & Control Measures
5.8.8 Required inspections for the fall-back guard strut	Unchecked fall guard back strut		<p>Risk of incidents due to lacking inspections. Always have the following inspections done if the respective time interval has expired. Only have inspections done by the professional staff of CraneCARE or by the manufacturer of the fall-back guard strut. In this way, you will avoid incidents that are due to unrecognized wear and tear.</p> <ul style="list-style-type: none"> • Every 24 months – an external check of the fall-back guard struts by CraneCARE. • Every 60 months – an internal check of the fall-back guard struts by CraneCARE or by the manufacturer of the fall-back guard struts. • Every 120 months – a pressure check by the manufacturer of the fall-back guard struts.

6. Heavy Load Lattice Extension

Section / Heading	Hazard	Risk	Described Risk & Control Measures
6.1 Components and identification	Non-modified heavy load lattice extension		<p>Risk of incident during operation with non-modified heavy load lattice extension.</p> <p>Operate the truck crane only with those parts of the heavy load lattice extension which have the same serial number as the crane. The SLI is set only for this heavy load lattice extension. This prevents malfunctions and damage.</p> <p>For technical reasons, the truck crane may be adjusted only with one heavy load lattice extension. If you wish to use the heavy load lattice extension on more than one GROVE truck crane, the parts of the heavy load lattice extension must be adjusted for these cranes and labelled with all of the respective serial numbers.</p>
6.1 Components and identification	Incorrect adjustment		<p>Risk of incidents if not adjusted correctly</p> <p>The modification of the heavy load lattice extension may only be carried out by CraneCARE.</p>
6.3 Slings points	Slings points		<p>The slinging points of all heavy load lattice extension parts can be seen in Diagram W4948 in 6.3. Attach the boom sections only to these slinging points as they will then automatically have the right centre of gravity. Use only securing equipment with sufficient lifting capacity. See Chapter 3, "Transport measurements, weights and allocation of the lattice extension sections".</p>
6.5.1 Truck crane rigging mode during installation of the heavy load lattice extension	Truck crane rigging mode during installation of the heavy load lattice extension		<p>Risk of overturning</p> <p>The heavy load lattice extension may only be mounted with the span and counterweight indicated in the lifting capacity table. These values apply both to rigging and operating the heavy load lattice extension.</p>
6.5.1 Truck crane rigging mode during installation of the heavy load lattice extension	Truck crane rigging mode during installation of the heavy load lattice extension		<p>Risk of incidents.</p> <p>Use only authorized lifting tackle with sufficient load bearing capacity. Use the supplied extendable ladder when installing the heavy load lattice extension. You must follow the preparatory procedures in 6.5.1 when installing or dismantling the heavy load lattice extension on the truck crane in order to bring the truck crane into the prescribed rigging mode.</p>

6. Heavy Load Lattice Extension

Section / Heading	Hazard	Risk	Described Risk & Control Measures
6.5.2 Establishing/disconnecting the connections for the hydraulic lock	Disconnecting connections		Risk of damage to the connection lines. Always disconnect the hydraulic and electrical connection immediately after you have locked the adapter. By doing this you prevent the connection lines tearing when telescoping or unrigging the adapter. The connections must always be disconnected immediately after establishing or releasing the hydraulic lock.
6.5.3 Secure/release hydraulic lock	Secure/release hydraulic lock		Risk of incidents if the lock is released. Secure the hydraulic lock immediately after you have locked the adapter. This way you prevent the lock from coming undone during operation, in the event that the pressure in the hydraulic system drops (e.g. if the hydraulic hoses get damaged).
6.5.4 Locking the adapter/releasing the lock	Locking the adapter/releasing the lock		Risk of incidents if the lock is released. Secure the hydraulic lock immediately after you have locked the adapter. This way you prevent the lock from coming undone during operation, in the event that the pressure in the hydraulic system drops (e.g. if the hydraulic hoses get damaged). Disconnect the connections for the hydraulic lock; see page 6 - 16.
6.5.4 Locking the adapter/releasing the lock	Locking the adapter		Risk of damage to the connection lines. Always disconnect the hydraulic and electrical connection immediately after you have locked the adapter. By doing this you prevent the connection hoses tearing when the main boom is telescoped. Remove the lifting gear from the adapter.
6.5.4 Locking the adapter/releasing the lock	Releasing the lock		Risk of incidents from falling adapter. Always attach the adapter to the provided slinging points with the auxiliary crane before you release the lock. This will prevent the unsecured adapter from falling and causing injury to you or other persons. Check whether the connections for the hydraulic lock have been established; see page 6 - 16. Check whether the hydraulic lock is released and release if it is not; as per <i>Release pins</i> , page 6 - 17. Also ensure 6.5.4. is followed.
6.5.4 Locking the adapter/releasing the lock	Releasing the lock		Risk of damage to the connection lines. Always disconnect the hydraulic and electrical connection immediately after you have released the lock. By doing this you prevent the connection hoses tearing when the adapter is set down. Set the adapter down with the auxiliary crane, e.g. on a separate vehicle. Remove the lifting gear from the adapter.

6. Heavy Load Lattice Extension

Section / Heading	Hazard	Risk	Described Risk & Control Measures
6.5.9 Setting the angle position of the heavy load lattice extension	Setting the angle position of the heavy load lattice extension		Risk of incidents because of faulty fall-back guard strut. The pendulums of the fall-back guard strut on both sides of the angle piece have to be freely mobile throughout their entire slewing range. If the pendulum is not able to move freely over the entire slewing range, the heavy load lattice extension will not be supported to the rear. Furthermore, the fall-back guard strut can be damaged when the heavy load lattice extension is set down.
6.5.10 Changing the lifting limit switch and anemometer	Changing the lifting limit switch		Risk of malfunctions. If you dismantle the lifting limit switch from the head of main boom, always plug the bridging plug into the socket. Otherwise the lifting limit switch on the head section will be without function.
6.5.12 Placing and reeving hoist rope	Placing and reeving hoist rope		Risk of incidents from damaged hoist rope. The deflection sheave on the angle piece must be locked in Heavy load lattice extension position so that the hoist rope does not rub against other parts as per page 6 - 23. In this way, you can prevent loads from falling due to a damaged hoist rope.
6.6 Operation with the heavy load lattice extension	Operation with the heavy load lattice extension		Risk of overturning if wind speeds are too great. If the maximum permissible wind speed according to the Lifting capacity table is reached, you must put down the load. Observe the information in Effect of wind when operating the heavy load lattice extension (further on in this chapter) and, if necessary, lower the main boom.
6.6 Operation with the heavy load lattice extension	Operation with the heavy load lattice extension		The main boom may buckle. Accelerate and brake the crane movements in such a way that the load does not sway.
6.6.1 Operating the SLI	Rigging mode		Risk of incidents due to incorrectly set SLI If the current rigging mode varies from the displayed rigging mode, the maximum load displayed by the SLI does not correspond to the actual permissible lifting capacity according to the Lifting capacity table. Overloading and incidents will be the result.

6. Heavy Load Lattice Extension

Section / Heading	Hazard	Risk	Described Risk & Control Measures
6.6.1 Operating the SLI	Incorrect SLI		Risk of incidents due to incorrectly set SLI If the current rigging mode varies from the displayed rigging mode, the maximum load displayed by the SLI does not correspond to the actual permissible lifting capacity according to the Lifting capacity table. Overloading and incidents will be the result.
6.6.5 Wind effect when operating the heavy load lattice extension	Wind effect when operating the heavy load lattice extension		Risk of incidents due to high wind speeds. If the wind speed exceeds the maximum permitted values according to the lifting capacity table in 6.6.5, crane operation must be stopped and the truck crane must be brought to the rigging mode which the following table prescribes. This also applies when the wind surface of the load is smaller than the permissible specific wind surfaces as per GMK 6400 operating instructions for – External influences during crane operation; and – Permissible wind load.
6.7 Turning loads with the heavy load lattice extension	Overloading		Risk of incidents due to overloading. Lifting a load with two hooks is permissible only if the following instructions and illustrations are observed. If these instructions are disregarded, incidents can occur due to individual parts of the truck crane being overloaded. The SLI then no longer provides protection. Two-hook operation with the boom extension is not permitted. The load must always be lifted completely with the weakest part (heavy load lattice extension) first.
6.7.1 Prerequisites	Overloading		Risk of incidents due to overloading. The reeving on the main boom must be equal to or greater than that on the lattice extension. The main hoist cable and main hoisting gear will become overloaded if this condition is not taken into account.
6.7.3 Turning a load	Overloading		Risk of incidents due to overloading. Keep the acceleration forces as low as possible during two-hook operation. For this reason, move the load at the lowest possible speed. If the load is on two hooks, there will be slight differences in the <i>Actual load</i> display. However, the differences concerning SLI shutdown are on the safeside. During the entire lifting operation, the rigging mode with the heavy load lattice extension must be entered on the SLI and displayed. Ensure 6.7.3 procedures are followed also.

6. Heavy Load Lattice Extension

Section / Heading	Hazard	Risk	Described Risk & Control Measures
6.8 Driving with rigged crane and rigged heavy load lattice extension	Driving with rigged crane and rigged heavy load lattice extension		Risk of incidents. It is forbidden to move the truck crane with a load on the hook. Put the load down before you move the truck crane. Secure the hook block so that it cannot swing.
6.8 Driving with rigged crane and rigged heavy load lattice extension	Driving with rigged crane and rigged heavy load lattice extension		Risk of overturning Before a rigged crane can be driven, the superstructure must be locked and the slewing gear brake must be engaged.
6.8 Driving with rigged crane and rigged heavy load lattice extension	Driving with rigged crane and rigged heavy load lattice extension		Risk of incidents due to not having a complete overview of the truck crane. While driving the equipped truck crane, always stay in visual or radio contact with a spotter who additionally observes the parts which you cannot see (e.g. the raised boom when the superstructure is turned to the back). In this way you prevent incidents resulting from collisions with persons, other construction equipment, ledges of buildings, cables or other objects.
6.8.1 Driving route	Driving route		Risk of damage to the tyres. Release no air from the tyres. Do not reduce the tyre pressure.
6.8.2 Position of the boom and the axle load	Position of the boom and the axle load		Risk of damage to the axle lines. Always move the main boom into the position prescribed by the table for the rigged heavy load lattice extension before you move the rigged truck crane. Positions which deviate from the specified position cause impermissible loads on the axle lines. See tables in 6.8.2.
6.8.3 Driving the rigged crane	Retracting the outrigger		Risk of overturning Make sure that the truck crane does not overturn while the outriggers are being retracted. Retract all the outrigger cylinders as uniformly as possible.
6.8.3 Driving the rigged crane	Switching over the suspension locking system.		Risk of overturning when switching off the suspension locking system. As long as the truck crane is on wheels, you may not turn off the suspension locking system for any reason. The suspension is no longer under pressure and when the suspension locking system is switched off, the suspension legs would be pressed together, damaged and the truck crane could tip over.
6.8.3 Driving the rigged crane	Switching over the suspension locking system.		Risk of overturning To reduce the risk of the crane overturning do not raise the outrigger pads more than 5 to 10 cm off the ground. Leave the outrigger beams extended.

<p>6.8.3 Driving the rigged crane</p>	<p>Driving the rigged crane</p>		<p>Risk of damage to the tyres. Check the pressure in the tyres before moving the rigged truck crane. The truck crane may only be moved if the tyre pressures are at the prescribed levels; as per GMK 6400 operating instructions – Checking the tyres. Do not reduce the tyre pressure.</p>
<p>6.8.3 Driving the rigged crane</p>	<p>Driving the rigged crane</p>		<p>Risk of damaging the steering linkage. Steer the truck crane only when the vehicle is moving. The steering linkage can be damaged if the steerage is turned while the vehicle is stationary. Check the wind speed before moving the rigged truck crane. The same maximum permitted wind speeds apply for moving the crane as for working with the crane; as per <i>GMK 6400 operating instructions – Influence of wind on crane operation.</i></p>
<p>6.8.3 Driving the rigged crane</p>	<p>Supporting the truck crane</p>		<p>Risk of overturning The truck crane must be raised until no wheels touch the ground.</p>

7. Rigging Winch (additional equipment)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
7.3 Pulling the hoist rope to the head	Connecting the rigging rope and the hoist rope.		<p>The load could drop due to a damaged hoist rope.</p> <p>Only use the provided rope connector to fasten the rigging rope onto the hoist rope. If the rigging rope is fastened in another way, the hoist rope will bend too much directly behind the fixed rope sleeve. The hoist rope will be damaged in this way, which leads to dropping of loads. The same is true for when the hoist rope was shortened and is equipped with a rope end clamp and a rope wedge.</p>
7.3 Pulling the hoist rope to the head	Unreeling the hoist rope		<p>Risk of injury when working with wire cables.</p> <p>There is a risk of crushing, since body parts can be pulled in by the rigging rope. Stay away from the moving rope during operation. Wear suitable protective gloves when working with the rigging rope. Slowly pull the hoist rope with the rigging rope to the head until the rope connector is at least positioned between the deflection sheaves and stop the rigging winch. See 7.3 for further details.</p>
7.3 Pulling the hoist rope to the head	Rolling the rigging rope onto the drum		<p>Risk of damage to the hydraulic oil tank.</p> <p>When the support roller is erected, the maximum clearance is exceeded. When driving under platforms and in spaces with low headroom, the turning support can damage the hydraulic oil tank. It is imperative that you set down the support roller before on-road driving.</p>
7.4 Pulling the hoist rope to the upper hook block	Connecting the rigging rope and the main hoist rope		<p>The load could drop due to a damaged hoist rope.</p> <p>Only use the provided rope connector to fasten the rigging rope onto the hoist rope. If the rigging rope is fastened in another way, the hoist rope will bend too much directly behind the fixed rope sleeve. The hoist rope will be damaged in this way, which leads to dropping of loads. The same is true for when the hoist rope was shortened and is equipped with a rope end clamp and a rope wedge.</p>
7.4 Pulling the hoist rope to the upper hook block	Reeling off the main hoist rope		<p>Risk of injury when working with wire cables.</p> <p>There is a risk of crushing, since body parts can be pulled in by the rigging rope. Stay away from the moving rope during operation. Wear suitable protective gloves when working with the rigging rope.</p> <p>Slowly pull the main hoist rope as far as possible up to the rigging winch. Then stop the rigging winch.</p>

7. Rigging Winch (additional equipment)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
7.4 Pulling the hoist rope to the upper hook block	Separating the rigging rope and the main hoist rope		<p>Falling hazard when hoist rope is under tensile stress.</p> <p>Under no circumstances should you loosen the connection between the rigging rope and the rope connector when the rigging rope is not yet slackened.</p> <p>The hoist rope will snap back with the heavy rope connector. This can make you fall down from the main boom.</p> <p>Only loosen the rope connector when the main hoist rope is on the main boom without any tension.</p> <p>Separate the rigging rope and the hoist rope at the rope connector, see page 7.30.</p>
7.5.1 For operation of the rigging winch	Slack rigging rope		<p>Risk of incidents if rope is slack.</p> <p>A slack rigging rope causes load slipping and knot formation on the cable drum. This could damage the hoist rope.</p> <p>Secure the rigging rope on the winch and onto the winch against independent loosening through vibrations during on-road driving.</p>
7.5.2 Support roller on the turntable	Setting down the support		<p>Risk of damage to the hydraulic oil tank.</p> <p>When the support roller is erected, the maximum clearance is exceeded. When driving under platforms and in spaces with low headroom, the turning support can damage the hydraulic oil tank.</p> <p>It is imperative that you set down the support roller before on-road driving. See 7.5.2.</p>
7.5.8 Rope connector	Rope connector		<p>Risk of incidents due to falling loads.</p> <p>Do not fasten the rigging rope directly onto the hoist rope. When the hoist rope is pulled over the sheaves without a rope connector, the hoist rope bends too much behind the fixed sleeve. The hoist rope will be damaged in this way, which leads to dropping of loads.</p> <p>Only use the provided rope connector to connect the rigging rope with the hoist rope.</p>
7.6 Maintenance of the rigging winch	Rigging winch		<p>Risk of incidents if rigging winch is started automatically.</p> <p>Since it is possible to start the crane engine with the hand-held control and without an ignition key, make sure to secure the hand-held control against unauthorised use when performing maintenance work.</p> <p>Place the hand-held control into the crane cab, pull the ignition key out and lock the crane cab.</p> <p>Maintenance plan is described in 7.6.</p>

7. Rigging Winch (additional equipment)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
7.6.4 Checking the condition of the rigging rope	Condition of the rigging rope		<p>Risk of incidents due to reduced load bearing capacity Remember that other factors may also make it necessary to replace a hoist rope before the number of wire breaks requiring rope replacement has been reached (age of rope, frequency of use or exceptional loading).</p> <ul style="list-style-type: none"> • Do not put the rigging winches out of service. • Connect the hand-held control for operation of the rigging winch. • Reel off the rigging rope on the entire length. • Check for visible wire breaks when reeling off. You can find the maximum number of wire breaks in the table in 7.6.4.
7.6.5 Changing the rigging rope	Changing the rigging rope		<p>Risk of incidents due to ripped wire cable. Only use a replacement wire cable that has the same technical specifications as the defective rope, or use an original replacement rope. Wind up the wire cable completely. Ensure that the rope is not wound up again in the other direction.</p>
7.6.5 Changing the rigging rope	Changing the rigging rope		<p>Risk of incidents due to rotating rope drum. Turn off the crane engine and remove the ignition key so that no unauthorised operation of the rigging winch can occur. Now follow 7.6.5.</p>
7.6.5 Changing the rigging rope	Changing the rigging rope		<p>Risk of damage to the wire cable. Ensure that the rope wedge, rope loop and rope end do not protrude beyond the diameter of the winch drum. This protects the new wire cable from being damaged through kinking or flattening even as it is wound on. Leave the crane engine on. Roll the wire cable slowly onto the drum. The wire cable rope must be held taut when rolling onto the drum.</p>

8. Trouble shooting

Section / Heading	Hazard	Risk	Described Risk & Control Measures
8.1 Notes on troubleshooting	Malfunctions		<p>Risk of incidents during emergency operation. Emergency operation with the hand-held control, the emergency telescoping program or performing crane movements by using manual actuation of solenoid valves may only be carried out by properly qualified personnel. Observe the specifications in the <i>Malfunctions during crane operation</i> chapter in the <i>GMK 6400 operating instructions</i>, depending on whether the load can /be set down or not set down. Pay particular attention to the Safety instructions in that section.</p>



GMK 6400 Risk Assessment Mega Wing Lift

This risk assessment is based upon the information contained within the standard Mega Wing Lift Manual for a Grove GMK 6400 all-terrain crane.

Although this risk assessment is comprehensive, and all efforts have been made to be as thorough as possible, Manitowoc CraneCARE makes no claim in any way, shape or form to its complete accuracy or that all possible hazards have been identified, or that all associated risks have been identified or priority assessed, or that all possible control measures that could be implemented have been provided.

The information contained within this risk assessment is also based upon the assumption that all personnel involved with the use of the crane, including operators, service personnel, or associated crane crew personnel have received prior instruction and/or appropriate training in all aspects of operating, or servicing and maintaining, or working with this particular model of crane, and that while conducting the previously mention tasks, are doing so with the full permission of the crane owner, and are doing so while holding all appropriate qualifications and/or certifications required by applicable legislation in the country, region, state or territory in which the crane is to be operated.

This is an uncontrolled copy when printed.

GENERIC HAZARDS AND INFORMATION

General Information

Warnings and Symbols

	Hazard may cause personal injury
	Hazard may cause damage to crane or other objects within the working range
	Hazard may cause electrocution
	Hazard may cause environmental damage, for further information on handling substances that pose a risk to the environment; see Maintenance manual, Chapter Safety and environmental protection.

1.3 Basic Safety Instructions

Section / Heading	Hazard	Risk	Described Risk & Control Measures
Basic safety Instructions	Too may to be listed		This row has only been added for the operator/personnel to identify that the safety instructions though generic in nature are important to the use of the crane in any and all types of applications, use and maintenance. It is vital the operators familiarises themselves with the safety instructions.

2 Transport dimensions and weights

Section / Heading	Hazard	Risk	Described Risk & Control Measures
N/A	N/A	N/A	N/A, to this risk assessment however the information is vital in this section and must be followed.

3 Scope of delivery and function

Section / Heading	Hazard	Risk	Described Risk & Control Measures
N/A	N/A	N/A	N/A, to this risk assessment however the information is vital in this section and must be followed.

4 Additional operating and display elements

Section / Heading	Hazard	Risk	Described Risk & Control Measures
N/A	N/A	N/A	N/A, to this risk assessment however the information is vital in this section and must be followed.

5 MWL Rigging and Unrigging

Section / Heading	Hazard	Risk	Described Risk & Control Measures
5.1.1 Identification	Incorrect parts		Risk of malfunctions and damage. Only operate the truck crane with those parts of the MWL which have the same serial number as the crane. The SLI is only set for this MWL. This prevents malfunctions and damage.
5.1.1 Identification	Adjustment		Risk of damage The adjustment of the MWL may only be carried out by CraneCARE.
5.1.2 Slings points	Slings points		Risk of incidents if used incorrectly. Only attach the lifting gear at the slinging points intended, and only use the lifting gear supplied. In this way you prevent the MWL from moving out of the necessary inclination (ca. 5°) or from swinging and causing injury.
5.3.4 Installing/removing the lateral head sheaves	Installing/removing the lateral head sheaves		Risk of incidents from falling head sheaves. Secure the head sheave with a guide rope before fastening the cover to the axle. In this way, you prevent being pushed from the ladder by the head sheave slipping down incidentally.
5.3.4 Installing/removing the lateral head sheaves	Removing the lateral head sheaves		Risk of injury from head sheave tilting out unexpectedly. Before removing, always check whether the joint on the bearing block is blocked by the locking pin, and pull the lifting gear lightly taut with the auxiliary crane before loosening the securing pin. In this way you prevent the head sheave from tilting to the side or to the rear when the securing pins are released, and causing injury to yourself or others.
5.3.4 Installing/removing the lateral head sheaves	Removing the lateral head sheaves		Risk of incidents from falling head sheaves. Secure the head sheave with a guide rope before releasing the cover on the axle. In this way, you prevent being pushed from the ladder by the head sheave slipping down incidentally.
5.3.4 Installing/removing the lateral head sheaves	Removing the lateral head sheaves		Risk of incidents due to swinging head sheave. Always align the head sheave to the vertical so that it does not swing when it is pulled from the axle. Stand on the ground slightly to one side at the front of the main boom head and use the guide rope to pull the head sheave from the axle. This means you are out of the danger area should the head sheave swing.
5.3.5 Using the rigging tool	Using the rigging tool		Risk of incidents if used incorrectly. Only use the rigging tool to release the heavy pins, and not to knock them out. In this way you prevent being knocked off balance by the great weight of the pins, and falling from the ladder.

5 MWL Rigging and Unrigging (cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
5.3.6 MWL – Slinging and fastening the guide ropes	Slinging and fastening the guide ropes		Risk of damage if incorrect lifting gear is used. Only use the slinging tackle supplied, since this means that the MWL will automatically be at the inclination required for installation, i.e. an angle of around 5° to the front.
5.3.7 Push the supports in/out	Not pushing the supports in		Risk of damage due to supports not being pushed in. If the supports are not pushed in, the cooling water cooler, the fuel tank and the derricking cylinder will be damaged when the MWL is lowered onto the main boom. Push the supports in when the MWL is raised with the auxiliary crane.
5.3.7 Push the supports in/out	Not pushing the supports out		Risk of injury through improper handling. Always keep a firm hold on the lower part of the support when removing the pin. Otherwise the support could fall off and cause injury.
5.3.8 Establishing/breaking the hydraulic connection between the MWL and the main boom	Releasing the connection		Risk of damage to the MWL unit and main boom. Position the hook block of the auxiliary crane above the longitudinal axis of the MWL. In this way you prevent the MWL from canting in the locking points and damaging them.
5.3.9 MWL – lowering/raising on the main boom	Lowering the main boom		Risk of damage to the rear pendant links. When lowering the MWL, make sure that the rear pendant links thread into the brackets and that the pegs thread into the retainers on the main boom. In this way you prevent damage to the rear pendant links or to the retainers.
5.3.9 MWL – lowering/raising on the main boom	Raising on the main boom		Risk of damage to the raising cylinder and rear pendant links. When lowering the MWL, make sure that the rear pendant links thread into the brackets and that the pegs thread into the retainers on the main boom. In this way you prevent damage to the rear pendant links or to the retainers.
5.3.9 MWL – lowering/raising on the main boom	Raising on the main boom		Risk of damage to electric cables and hydraulic hoses. Before raising, check that the electrical and hydraulic connections have been broken. In this way you prevent damage to the connecting cables and hydraulic hoses when the MWL is raised and thereafter lowered.
5.3.10 Connecting/disconnecting the holding frame and main boom	Unlock the sliding connecting link		Risk of incidents when operating with sliding connecting links unlocked. Unlock the sliding connecting link only when unrigging the MWL with a connection established between the holding frame and the gantry masts. When operated with the sliding connecting link unlocked, the holding frame may be pulled out of the retainers. This will cause damage to the boom system, and the boom may bend due to overload, causing the load to be dropped and the truck crane to overturn.

5 MWL Rigging and Unrigging(cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
5.3.11 Establishing/disconnecting the hydraulic connection	Establishing the hydraulic connection		<p>Risk of damage to the electrical cables. Disconnect the electrical connection cables from the dummy sockets on the MWL before taking the hydraulic hoses out of the holder. In this way you prevent the hydraulic hoses from being caught on the connection cables and damaging them.</p> <p>Check the quick couplings for contamination (e.g. grains of sand) and clean them if necessary before establishing the hydraulic connections. In this way you prevent leaks and malfunctions when the connections are established.</p>
5.3.11 Establishing/disconnecting the hydraulic connection	Disconnecting the hydraulic connection		<p>Risk of damage to the electrical cables. Disconnect the electrical connection first. In this way you prevent the hydraulic hoses from being caught on the connection cables and damaging them.</p>
5.3.12 Establishing/disconnecting the electrical connection	Establishing the electrical connection		<p>Risk of malfunction in the superstructure electronics. Always turn off the ignition on the superstructure before you establish or break the electrical connection. In this way you prevent malfunctions in the superstructure electronics and corresponding error messages in crane operation thereafter.</p>
5.3.12 Establishing/disconnecting the electrical connection	Establishing the electrical connection		<p>Risk of damage to the connecting cable. Make the hydraulic connection first. In this way you prevent the hydraulic hoses from being caught on the connection cables and damaging them.</p>
5.3.12 Establishing/disconnecting the electrical connection	Breaking/disconnecting the electrical connection		<p>Risk of malfunction in the superstructure electronics. Always turn off the ignition on the superstructure before you establish or break the electrical connection. In this way you prevent malfunctions in the superstructure electronics and corresponding error messages in crane operation thereafter.</p>
5.3.13 Connecting/removing the hand-held control	Unauthorised use of the hand-held control		<p>Risk due to unauthorised use. Always stow the hand-held control in the crane cab before you leave the crane, and lock the door. That way you can prevent unauthorised persons from starting the engine.</p>
5.3.14 Connecting/disconnecting the raising cylinder and main boom	Moving the raising cylinder		<p>Risk of damage through incorrect switching position. After locking the raising cylinder, the lever must always be in position B. Otherwise, only the left-hand raising cylinder will move when the MWL is raised and the system will be put under pressure, causing damage.</p>

5 MWL Rigging and Unrigging(cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
5.3.17 Moving the deflection sheaves into the position Operation/Transport	Moving into the position <i>Operation</i>		Risk of damage to the deflection sheave and the main boom. While the left-hand deflection sheave for the auxiliary rope is in the Operation position, you must on no account set down the MWL on the main boom. In this way you prevent the deflection sheave being pressed against the main boom when the MWL is set down, causing damage to both the deflection sheave and the main boom. See diagrams and instructions in section 5.3.17.
5.3.19 Positioning/removing the hoist ropes on/from the deflection sheaves	Positioning/removing the hoist ropes on/from the deflection sheaves		Risk of incidents due to falling parts. Always secure the pins of the rope protection roll with retaining pins. In this way you prevent parts from coming loose, falling off and causing injury; you also prevent the unsafe hoist rope from sliding off the deflection sheave.
5.3.20 MWL – raising/setting down	MWL – raising		Risk of damage through incorrect switching position. Before raising the MWL, check that the lever of the hydraulic circuit of the raising cylinders is in position B. Otherwise, only the left-hand raising cylinder will move when the MWL is raised and the system will be put under pressure, causing damage.
5.3.20 MWL – raising/setting down	MWL – raising		Risk of damage from tension ratchets or turnbuckles which have not been loosened. Make sure that the tension ratchets and the turnbuckles are in the Operation position before you raise the MWL. In this way you prevent the turnbuckles or tension ratchets from counteracting the raising, which could cause damage to these components, to the rear pendant links or to the raising cylinders.
5.3.20 MWL – raising/setting down	MWL – setting down		Risk of damage if the guy ropes are not removed. Make sure that the guy ropes have been removed from the lateral head sheaves before setting down the MWL. In this way you prevent the securing pins from being put under excessive strain, which could also cause damage to the lateral head sheaves when the MWL is set down again.
5.3.20 MWL – raising/setting down	MWL – setting down		Risk of damage to the deflection sheave and the main boom. Always move the left-hand deflection sheave into the Transport position before setting down the MWL on the main boom. In this way you prevent the deflection sheave being pressed against the main boom when the MWL is set down, causing damage to both the deflection sheave and the main boom.

5 MWL Rigging and Unrigging (cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
5.3.21 Positioning/removing the guy ropes	Positioning the guy ropes		Risk of incidents from head sheaves falling down. Do not on any account loosen the joint locks or the securing pins in order to position the guy rope. In this way you prevent the head sheaves from folding out to the side or swinging round and injuring you.
5.3.21 Positioning/removing the guy ropes	Positioning the guy ropes		Risk of damage to the guy rope. When positioning the guy rope, make sure that the rope line which is fastened to the fixed point of the winch is pointing forwards. In this way you prevent the rope lines from crossing when the winch is turned, causing damage to them.
5.3.21 Positioning/removing the guy ropes	Positioning the guy ropes		Risk of slack rope on the winch drum. When unreeling the winches, ensure that the slack rope falls downwards from the holder on the gantry mast. If the slack rope does not fall downwards, pull it upwards onto the head sheave. This prevents the guy rope from being damaged by the slack rope.
5.3.21 Positioning/removing the guy ropes	Removing the guy rope		Risk of damage from swinging guy rope. Always slew the superstructure to the rear or to the side in order to remove the guy ropes. In this way you prevent the swinging guy rope from damaging parts of the superstructure (e.g. the windshield).
5.3.21 Positioning/removing the guy ropes	Removing the guy rope		Risk of incidents from head sheaves falling down. Check whether the lateral head sheaves are secured before you remove the gantry masts. In this way you prevent the head sheaves from folding out to the side or swinging round and injuring you.
5.3.21 Positioning/removing the guy ropes	Removing the guy rope		Risk of incidents from swinging guy rope. After it is released, the guy rope swings to the gantry mast. For this reason, position the ladder as far from the lateral head sheaves as possible. In this way you prevent the guy rope from hitting the ladder.
5.3.22 Securing/releasing the lateral head sheaves	Releasing the lateral head sheaves		Risk of incidents from head sheaves falling down. Make sure that the guy ropes are positioned and slightly tightened before you release the lateral head sheaves. In this way you prevent the head sheaves from folding out to the side or swinging round and injuring you.
5.3.22 Securing/releasing the lateral head sheaves	Releasing the lateral head sheaves		Be careful not to damage the securing pins. When releasing the securing pin, only wind up the winch until the guy rope is slightly taut. If you continue to wind up the winch after this, the securing pin may become subject to excessive load and be damaged.

5 MWL Rigging and Unrigging (cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
5.3.23 Transporting the MWL	Transporting the MWL		Risk of incidents from securing incorrectly. Always secure the MWL for transport by lashing it with suitable belts or chains. In this way you prevent the MWL from slipping during transportation and protruding from the vehicle edges, or falling off.
5.4.1 In the submenu Rigging – MWL	MWL raising		Risk of damage from tension ratchets or turnbuckles which have not been loosened. Make sure that the tension ratchets and the turnbuckles are in the Operation position before you raise the MWL. In this way you prevent the turnbuckles or tension ratchets from counteracting the raising, which could cause damage to these components, to the rear pendant links or to the raising cylinders.
5.4.1 In the submenu Rigging – MWL	MWL setting down		Risk of damage if the guy ropes are not removed. Make sure that the guy ropes have been removed from the lateral head sheaves before setting down the MWL. In this way you prevent the securing pins from being put under excessive strain, which could also cause damage to the lateral head sheaves when the MWL is set down again.
5.4.1 In the submenu Rigging – MWL	MWL setting down		Risk of damage to the deflection sheave and the main boom. Always move the left-hand deflection sheave into the Transport position before setting down the MWL on the main boom. In this way you prevent the deflection sheave being pressed against the main boom when the MWL is set down, causing damage to both the deflection sheave and the main boom. Before setting down, both gantry masts must be folded in completely so that the rear pendant links and the gantry masts fit into the proper rests when set down.
5.4.1 In the submenu Rigging – MWL	MWL setting down		Risk of damage to the deflection sheave and the main boom. Always move the left-hand deflection sheave into the Transport position before setting down the MWL on the main boom. In this way you prevent the deflection sheave being pressed against the main boom when the MWL is set down, causing damage to both the deflection sheave and the main boom.

6 Operation with the main boom and the MWL

Section / Heading	Hazard	Risk	Described Risk & Control Measures
6 Operation with the main boom and the MWL	Ignoring safety warnings		Risk of incidents if the safety information is ignored. When operating the main boom with the MWL, all the warnings given in the GMK 6400 operating instructions apply without exception. This chapter merely supplements the GMK 6400 operating instructions through the addition of information necessary when operating the main boom together with the MWL.
6.1.4 Reeving the hoist rope	Reeving the hoist rope		Risk of damage to the hoist rope. Before operation with the MWL, always check if the upper rope holding rods and are inserted into the front bore hole. If the rope safety rods are inserted into the rear bore holes, the hoist rope runs at an impermissible angle and could cause damage, causing the load to fall. See 6.1.4 for diagrams and instructions.
6.2.5 Telescoping with rigged MWL	Telescoping with rigged MWL		Risk from slack rope. When telescoping, pay attention to the guy ropes. If they sag significantly, there is a malfunction. In this case, interrupt telescoping and wind up the winch until the guy ropes are taut (as per Winding/unwinding the winches, page 5 - 73). In this way you prevent slack rope forming on the winches.
6.3 Operation with MWL set down	Operation with MWL set down		Risk of damage to the hoist rope. When the MWL is set down, only operation with the main hoist is permitted. If the main hoist is led over the right-hand rope sheave on the raising frame, the hoist rope runs at an impermissible angle and could cause damage, causing the load to fall.
6.3.1 Bringing the boom system into the operating condition	Telescoping		Risk of damage to the lateral head sheaves and the guy ropes. Make sure that the guy ropes have been removed from the lateral head sheaves before telescoping the main boom with the MWL set down. In this way you prevent damage to the lateral head sheaves or the guy ropes during telescoping.
6.4.1 Bringing the boom system into the operating condition	Telescoping		Risk from slack rope. When telescoping, pay attention to the guy ropes. If they sag significantly, there is a malfunction. In this case, interrupt telescoping and wind up the winch until the guy ropes are taut (see winding/unwinding the winches, page 5 - 73). In this way you prevent slack rope forming on the winches. When telescoping, proceed exactly as for telescoping with braced boom system; see page 6 - 14.

6 Operation with the main boom and the MWL (cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
6.5 Driving with rigged truck crane and rigged MWL	Moving with load on		Risk of incidents. You must not move the truck crane with a load on the hook. Put the load down before you move the truck crane. Secure the hook block so that it cannot swing.
6.5 Driving with rigged truck crane and rigged MWL	Driving		Risk of overturning. Before a rigged crane can be driven, the superstructure must be locked and the slewing gear brake must be engaged.
6.5 Driving with rigged truck crane and rigged MWL	Vision		Risk of incidents when you cannot see the entire truck crane. When moving the rigged truck crane, keep in contact with a spotter, either by sight or by means of radio, who can observe the parts of which you have no overview e.g. the erected boom when the superstructure is slewed to the rear). This prevents incidents resulting from collisions with persons, other construction equipment, ledges of buildings, cables or other objects.
6.5.1 Driving route	Tyre pressure		Risk of damage to tyres. Check the pressure in the tyres before moving the rigged truck crane. The truck crane may be moved only if tyre pressures are at the prescribed levels; à GMK 6400 operating instructions – Part 1 Driving – Technical data – Tyres. On no account should you reduce the tyre pressure.
6.5.2 Rigging modes for moving and axle loads	Rigging modes for moving and axle loads		Risk of damage to the axle lines. Always move the main boom to the prescribed position before you drive the rigged truck crane. If the boom is not in the prescribed position or the counterweight version is too large, the axle lines will be submitted to loads in excess of those permitted.
6.5.2 Rigging modes for moving and axle loads	Overriding SLI		Risk of incidents when SLI is overridden. Always set the SLI code corresponding to the current rigging mode when you telescope the main boom into the prescribed position. Do not override the SLI; the prescribed positions in the following tables are all within the areas which are permitted according to the Lifting capacity tables. The truck crane operates without overload protection when the SLI is overridden.
6.5.3 Driving the rigged truck crane	Retracting the outriggers		Risk of overturning. Make sure that the truck crane does not overturn while the outrigger cylinders are being retracted. Retract all the outrigger cylinders as uniformly as possible.

6 Operation with the main boom and the MWL (cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
6.5.3 Driving the rigged truck crane	Switching over the suspension locking system		Risk of overturning when switching off the suspension locking system. As long as the truck crane is on wheels, you may not turn off the suspension locking system for any reason. The suspension is no longer under pressure and when the suspension locking system is switched off, the suspension struts would be pressed together, damaged and the truck crane could tip over.
6.5.3 Driving the rigged truck crane	Switching over the suspension locking system		Risk of overturning. To reduce the risk of the crane overturning do not raise the outrigger pads more than 5 to 10 cm off the ground. Leave the outrigger beams extended.
6.5.3 Driving the rigged truck crane	Tyre pressure		Risk of damage to tyres. Check the pressure in the tyres before moving the rigged truck crane. The truck crane may only be moved if the tyre pressures are at the prescribed levels; see Operating instructions GMK 6400 – Checking the tyres. Do not reduce the tyre pressure.
6.5.3 Driving the rigged truck crane	Driving the rigged truck crane		Risk of damaging the steering linkage. Steer the truck crane only when the vehicle is moving. The steering linkage can be damaged if the steering is turned while the vehicle is stationary.
6.5.3 Driving the rigged truck crane	Supporting the truck crane		Risk of overturning. The truck crane must be raised until no wheels touch the ground.

7 Operation with boom extension and MWL

Section / Heading	Hazard	Risk	Described Risk & Control Measures
7 Operation with boom extension and MWL	Ignoring safety warnings		Risk of incidents if the safety information is ignored. For operation with the boom extension and MWL, all warnings given in the GMK 6400 Lattice extension operating instructions also apply. This chapter merely supplements the GMK 6400 lattice extension operating instructions through the addition of information necessary when operating the boom extension together with the MWL.
7.1.5 Extra information on positioning the hoist rope with rigged MWL	Overloading		Risk of incidents due to overloading. When operating the boom extension, there must be no hook block reeved on the main boom, even if the boom system is braced. This hook block or load is not detected by the SLI and the truck crane can become overloaded.
7.1.5 Extra information on positioning the hoist rope with rigged MWL	Rope protection rolls		Be careful not to damage the rope protection rolls. Always secure the hoist rope on the rear deflection sheave of the foot section with the MWL operation support roller. This prevents the rope protection rolls from becoming overloaded and rupturing.
7.3 Operation with MWL set down	Operation with MWL set down		Risk of damage to the hoist rope. When the MWL is set down, only operation with the main hoist is permitted. If the auxiliary hoist rope is led over the right-hand rope sheave on the raising frame, the hoist rope runs at an impermissible angle and could cause damage, causing the load to fall.
7.3.1 Bringing the boom system into the operating condition	Telescoping		Risk of damage to the lateral head sheaves and the guy ropes. Make sure that the guy ropes have been removed from the lateral head sheaves before telescoping the main boom with the MWL set down. In this way you prevent damage to the lateral head sheaves or the guy ropes during telescoping.
7.4 Rigging mode with unbraced boom system and raised MWL	MWL raised and the boom system unbraced		Risk of overturning in an impermissible operating mode when SLI is overridden. Operation with the boom extension is not permitted with the MWL raised and the boom system unbraced. Do not on any account override the SLI in order to raise loads in this mode whose weight exceeds the values of the empty hook curve. This prevents the truck crane from overturning.
7.5 Driving with rigged crane and rigged boom extension with rigged MWL	Driving with rigged crane and rigged boom extension with rigged MWL		Risk of incidents. You must not move the truck crane with a load on the hook. Put the load down before you move the truck crane. Secure the hook block so that it cannot swing.
7.5 Driving with rigged crane and rigged boom extension with rigged MWL	Driving with rigged crane and rigged boom extension with rigged MWL		Risk of overturning. Before a rigged crane can be driven, the superstructure must be locked and the slewing gear brake must be engaged.

7 Operation with boom extension and MWL (cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
7.5 Driving with rigged crane and rigged boom extension with rigged MWL	Vision		Risk of incidents when you cannot see the entire truck crane. While driving the rigged truck crane, always stay in visual or radio contact with a spotter who additionally observes the parts which you cannot see (e.g. the raised boom in cases where the superstructure is turned to the back). This will prevent incidents resulting from collisions with persons, other construction equipment, ledges of buildings, cables or other objects.
7.5.1 Driving route	Tyre pressure		Risk of damage to tyres. Check the pressure in the tyres before moving the rigged truck crane. The truck crane may be moved only if tyre pressures are at the prescribed levels as per GMK 6400 Operating instructions – Part 1 Driving – Technical data – Tyres. On no account should you reduce the tyre pressure.
7.5.2 Rigging modes for moving and axle loads	Rigging modes for moving and axle loads		Risk of damage to the axle lines. Always move the truck crane to the prescribed rigging mode before you drive the rigged truck crane. Positions that deviate from the rigging mode cause impermissible loads on the axle lines. See tables in 7.5.2 for rigging modes.
7.5.3 Driving the rigged crane	Retracting the outriggers		Risk of overturning. Make sure that the truck crane does not overturn while the outrigger cylinders are being retracted. Retract all the outrigger cylinders as uniformly as possible.
7.5.3 Driving the rigged crane	Switching off the suspension locking system		Risk of overturning when switching off the suspension locking system. As long as the truck crane is on wheels, you may not turn off the suspension locking system for any reason. The suspension is no longer under pressure and when the suspension locking system is switched off, the suspension struts would be pressed together, damaged and the truck crane could tip over.
7.5.3 Driving the rigged crane	Raising outriggers		Risk of overturning. To reduce the risk of the crane overturning do not raise the outrigger pads more than 5 to 10 cm off the ground. Leave the outrigger beams extended.
7.5.3 Driving the rigged crane	Driving the rigged crane		Risk of damage to tyres. Check the pressure in the tyres before moving the rigged truck crane. The truck crane may only be moved if the tyre pressures are at the prescribed levels; see Operating instructions GMK 6400 – Checking the tyres. Do not reduce the tyre pressure.
7.5.3 Driving the rigged crane	Driving the rigged crane		Risk of damaging the steering linkage. Steer the truck crane only when the vehicle is moving. The steering linkage can be damaged if the steering is turned while the vehicle is stationary.
7.5.3 Driving the rigged crane	Supporting the truck crane		Risk of overturning. The truck crane must be raised until no wheels touch the ground.

8 Operation with the luffing jib and the MWL

Section / Heading	Hazard	Risk	Described Risk & Control Measures
8 Operation with the luffing jib and the MWL	Ignoring safety warnings		Risk of incidents if the safety information is ignored. For operation of the luffing jib with MWL, all warnings given in the Lattice extension operating instructions GMK 6400 also apply. This chapter merely supplements the Lattice extension operating instructions GMK 6400 through the addition of information necessary when operating the luffing jib together with the MWL.
8.2.5 Extra information on positioning the hoist rope with rigged MWL	Rope holding rollers		Be careful not to damage the rope holding rollers. Always secure the hoist rope on the rear deflection sheave of the foot section with the MWL operation support roller. This prevents the rope holding rollers from becoming overloaded and rupturing.
8.3.2 CHECKLIST: Bringing the boom system into rigging mode	Bringing the boom system into rigging mode		Risk of damage to the hoist rope. Make sure that the hoist rope is not damaged. During the following procedure, set down the hook block as soon as the boom system is in an appropriate position, and un-reeve the main hoist rope.
8.3.2 CHECKLIST: Bringing the boom system into rigging mode	Bringing the boom system into rigging mode		Be careful not to damage the fall-back guard strut. During the following procedure, ensure that the head section does not touch the ground before the luffing control arm has reached the steepest position. When the luffing control arm is inclined forwards, the backtop can touch the foot section and be damaged in the worst case scenario (luffing jib has been set down flat on the ground).
8.3.2 CHECKLIST: Bringing the boom system into rigging mode	Bringing the boom system into rigging mode		Risk of incidents if the main boom is lowered too far. In the next step, only lower the main boom far enough to allow the locking pin positions for the hinge lock to align. This position can be exceeded when lowering the boom to horizontal, especially with long luffing jibs. The inclinable part of the foot section is pressed against the fixed part; this causes tension. This tension is released when the pins are driven out, and the unexpected slippage of the luffing jib which then occurs can injure you or others.
8.4.1 Bringing the boom system into the operating condition	Telescoping		Risk of damage to the lateral head sheaves and guy ropes. Make sure that the guy ropes have been removed from the lateral head sheaves before telescoping the main boom with the MWL set down. In this way you prevent damage to the lateral head sheaves or the guy ropes during telescoping.
8.5 Rigging mode with unbraced boom system and raised MWL	Overriding SLI		Risk of overturning in an impermissible operating mode when SLI is overridden. Operation with the luffing jib is not permitted with the MWL raised and the boom system unbraced. Do not on any account override the SLI in order to raise loads in this mode whose weight exceeds the values of the empty hook curve. This prevents the truck crane from overturning.

8 Operation with the luffing jib and the MWL (cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
8.6 Driving with rigged crane, rigged luffing jib and rigged MWL	Moving truck crane		Risk of incidents. You must not move the truck crane with a load on the hook. Put the load down before you move the truck crane. Secure the hook block so that it cannot swing.
8.6 Driving with rigged crane, rigged luffing jib and rigged MWL	Driving		Risk of overturning Before a rigged crane can be driven, the superstructure must be locked and the slewing gear holding brake must be engaged.
8.6 Driving with rigged crane, rigged luffing jib and rigged MWL	Vision		Risk of incidents when you cannot see the entire truck crane. While driving the rigged truck crane, always stay in visual or radio contact with a spotter who additionally observes the parts which you cannot see (e.g. the raised boom in cases where the superstructure is turned to the back). This will prevent incidents resulting from collisions with persons, other construction equipment, ledges of buildings, cables or other objects.
8.6.1 Driving route	Tyre pressure		Risk of damage to tyres. Check the pressure in the tyres before moving the rigged truck crane. The truck crane may be moved only if tyre pressures are at the prescribed levels see GMK 6400 operating instructions – Part 1 Driving – Technical data - Tyres. On no account should you reduce the tyre pressure.
8.6.2 Rigging modes for moving and axle loads	Rigging modes for moving and axle loads		Risk of damage to the axle lines. Always move the truck crane to the prescribed rigging mode before you drive the rigged truck crane. Positions that deviate from the rigging mode cause impermissible loads on the axle lines.
8.6.2 Rigging modes for moving and axle loads	Rigging modes for moving and axle loads		Risk of overturning in other rigging modes. Always check if the listed prerequisites are fulfilled and enter the SLI rigging code for Telescoping (or Derricking) according to the table in 8.6.2, before you unrig the counterweight sections. After unrigging, the truck crane is in a rigging mode that can only be monitored by this rigging code. This rigging code can only be accepted if the listed prerequisites are fulfilled.
8.6.2 Rigging modes for moving and axle loads	Main boom telescoping		Risk of incidents due to incorrectly set or overridden SLI. For the rigging modes that are given in the following tables in 8.6.2, telescoping is only monitored if the respective SLI rigging code is entered for Telescoping. Do not enter any other SLI code and do not bridge the SLI.

8 Operation with the luffing jib and the MWL (cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
8.6.2 Rigging modes for moving and axle loads	main booms or luffing jibs have to be derricked		<p>Risk of incidents due to incorrectly set or overridden SLI For the rigging modes that are given in the following tables in 8.6.2, derricking the main boom is only monitored if the respective SLI rigging code is entered for <i>Derricking</i>.</p> <p>Do not enter any other SLI code and do not bridge the SLI.</p>
8.6.3 Driving the rigged crane	Outriggers		<p>Risk of overturning. Make sure that the truck crane does not overturn while the outrigger cylinders are being retracted. Retract all the outrigger cylinders as uniformly as possible.</p>
8.6.3 Driving the rigged crane	Switching off the suspension locking system		<p>Risk of overturning when switching off the suspension locking system. As long as the truck crane is on wheels, you may not turn off the suspension locking system for any reason. The suspension is no longer under pressure and when the suspension locking system is switched off, the suspension struts would be pressed together, damaged and the truck crane could tip over.</p>
8.6.3 Driving the rigged crane	Switching off the suspension locking system		<p>Risk of overturning. To reduce the risk of the crane overturning do not raise the outrigger pads more than 5 to 10 cm off the ground. Leave the outrigger beams extended.</p>
8.6.3 Driving the rigged crane	Driving the rigged crane		<p>Risk of damage to tyres. Check the pressure in the tyres before moving the rigged truck crane. The truck crane may only be moved if the tyre pressures are at the prescribed levels; see Operating instructions GMK 6400 – Checking the tyres. Do not reduce the tyre pressure.</p>
8.6.3 Driving the rigged crane	Driving the rigged crane		<p>Risk of damaging the steering linkage. Steer the truck crane only when the vehicle is moving. The steering linkage can be damaged if the steering is turned while the vehicle is stationary.</p> <p>Check the wind speed before moving the rigged truck crane. The same maximum permitted wind speeds apply for moving the truck crane as for working with the crane; see <i>Operating instructions GMK 6400 - Influence of wind on crane operation</i>.</p>
8.6.3 Driving the rigged crane	Supporting the truck crane		<p>Risk of overturning. The truck crane must be raised until no wheels touch the ground.</p>

9 Operation with heavy load lattice extension and MWL

Section / Heading	Hazard	Risk	Described Risk & Control Measures
9 Operation with heavy load lattice extension and MWL	Ignoring safety warnings		Risk of incidents if the safety information is ignored. For operation with the heavy load lattice extension and MWL, all warnings given in the GMK 6400 lattice extension operating instructions also apply. This chapter merely supplements the GMK 6400 lattice extension operating instructions through the addition of information necessary when operating the heavy load lattice extension together with the MWL.
9.1.3 Extra information on positioning the hoist rope with rigged MWL	Reeving auxiliary hoist rope		Risk of damage to the auxiliary hoist rope. Only ever reeve the main hoist rope on the heavy load lattice extension. If the auxiliary hoist rope is reeved on the heavy load lattice extension, the auxiliary hoist rope will be at an impermissible angle and will therefore be damaged.
9.2 Operation with braced boom system	Reeving auxiliary hoist rope		Risk of damage to the auxiliary hoist rope. Only ever reeve the main hoist rope on the heavy load lattice extension. If the auxiliary hoist rope is reeved on the heavy load lattice extension, the auxiliary hoist rope will be at an impermissible angle and will therefore be damaged.
9.3 Operation with MWL set down	Operation with MWL set down		Risk of damage to the hoist rope. When the MWL is set down, only operation with the main hoist is permitted. If the main hoist rope is led over the right-hand rope sheave on the raising frame, the hoist rope runs at an impermissible angle and could cause damage, causing the load to fall.
9.3.1 Bringing the boom system into the operating condition	Telescoping		Risk of damage to the lateral head sheaves and guy ropes. Make sure that the guy ropes have been removed from the lateral head sheaves before telescoping the main boom with the MWL set down. In this way you prevent damage to the lateral head sheaves or the guy ropes during telescoping.
9.4 Rigging mode with unbraced boom system and raised MWL	Rigging mode with unbraced boom system and raised MWL		Risk of overturning in an impermissible operating mode when SLI is overridden. Operation with the heavy load lattice extension is not permitted with the MWL raised and the boom system unbraced. Do not on any account override the SLI in order to raise loads in this mode whose weight exceeds the values of the empty hook curve. This prevents the truck crane from overturning.

9 Operation with heavy load lattice extension and MWL (cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
9.5 Turning loads with the heavy load lattice extension	Turning loads with the heavy load lattice extension		Risk of incidents due to overloading. Lifting a load with two hooks is permissible only if the following instructions and illustrations are observed. If these instructions are disregarded, incidents can occur due to individual parts of the truck crane being overloaded. The SLI then no longer provides protection. Two-hook operation with the boom extension is not permitted.
9.5 Turning loads with the heavy load lattice extension	Turning loads with the heavy load lattice extension		Risk of incidents due to overloading. The load must always be lifted completely with the weakest part (heavy load lattice extension) first.
9.5.1 Prerequisites	Reeving		Risk of damage to the hoist rope. When you reeve the main hoist rope on the main rope and reeve the auxiliary hoist rope on the heavy load lattice extension, the hoist ropes will rub against each other and the auxiliary hoist rope will be at an impermissible angle. This will result in damage to both hoist ropes.
9.5.1 Prerequisites	Reeving		Risk of incidents due to overloading. The reeving on the main boom must be equal to or greater than that on the lattice extension. The auxiliary hoist rope and the auxiliary hoist will become overloaded if this condition is not met.
9.5.3 Turning a load	Turning a load		Risk of incidents due to overloading. Keep the acceleration forces as low as possible during two-hook operation. For this reason, move the load at the lowest possible speed. If the load is on two hooks, there will be slight differences in the <i>Actual load</i> display. However, the differences concerning SLI shutdown are on the safeside. During the entire lifting operation, the rigging mode with the heavy load lattice extension must be entered on the SLI and displayed.

9 Operation with heavy load lattice extension and MWL(cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
9.6 Driving with rigged crane and rigged heavy load lattice extension with rigged MWL	Moving the truck crane		Risk of incidents. You must not move the truck crane with a load on the hook. Put the load down before you move the truck crane. Secure the hook block so that it cannot swing.
9.6 Driving with rigged crane and rigged heavy load lattice extension with rigged MWL	Driving with rigged crane and rigged heavy load lattice extension with rigged MWL		Risk of overturning. Before a rigged crane can be driven, the superstructure must be locked and the slewing gear brake must be engaged.
9.6 Driving with rigged crane and rigged heavy load lattice extension with rigged MWL	Vision		Risk of incidents when you cannot see the entire truck crane. While driving the rigged truck crane, always stay in visual or radio contact with a spotter who additionally observes the parts which you cannot see (e.g. the raised boom in cases where the superstructure is turned to the back). This will prevent incidents resulting from collisions with persons, other construction equipment, ledges of buildings, cables or other objects.
9.6.1 Driving route	Tyre pressure		Risk of damage to tyres. Check the pressure in the tyres before moving the rigged truck crane. The truck crane may be moved only if tyre pressures are at the prescribed levels as per GMK 6400 operating instructions – Part 1 Driving – Technical data - Tyres. On no account should you reduce the tyre pressure.
9.6.2 Rigging modes for moving and axle loads	Rigging modes for moving and axle loads		Risk of damage to the axle lines. Always move the truck crane to the prescribed rigging mode before you drive the rigged truck crane. Positions that deviate from the rigging mode cause impermissible loads on the axle lines. See rigging mode tables in 9.6.2.
9.6.3 Driving the rigged crane	Retracting the outriggers		Risk of overturning. Make sure that the truck crane does not overturn while the outrigger cylinders are being retracted. Retract all the outrigger cylinders as uniformly as possible.
9.6.3 Driving the rigged crane	Switching off the suspension locking system		Risk of overturning when switching off the suspension locking system. As long as the truck crane is on wheels, you may not turn off the suspension locking system for any reason. The suspension is no longer under pressure and when the suspension locking system is switched off, the suspension struts would be pressed together, damaged and the truck crane could tip over.

9 Operation with heavy load lattice extension and MWL (cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
9.6.3 Driving the rigged crane	Raising outriggers		Risk of overturning. To reduce the risk of the crane overturning do not raise the outrigger pads more than 5 to 10 cm off the ground. Leave the outrigger beams extended.
9.6.3 Driving the rigged crane	Tyre pressure		Risk of damage to tyres. Check the pressure in the tyres before moving the rigged truck crane. The truck crane may only be moved if the tyre pressures are at the prescribed levels; see Operating instructions GMK 6400 – Checking the tyres. Do not reduce the tyre pressure.
9.6.3 Driving the rigged crane	Driving the rigged crane		Risk of damaging the steering linkage. Steer the truck crane only when the vehicle is moving. The steering linkage can be damaged if the steering is turned while the vehicle is stationary.
9.6.3 Driving the rigged crane	Supporting the truckcrane		Risk of overturning. The truck crane must be raised until no wheels touch the ground.

10 Malfunctions during operation with the MWL

Section / Heading	Hazard	Risk	Described Risk & Control Measures
10.3.1 Operating the MWL in the emergency program	Switching on the emergency program		Risk of damage when emergency program is switched on. Be sure that all necessary requirements are fulfilled before you perform a function in the emergency program. The crane control is not monitored. All functions are carried out immediately and unconditionally.
10.3.1 Operating the MWL in the emergency program	Switching on the emergency program		Risk of damage to the telescoping mechanism. If there is no malfunction at the telescoping mechanism, then wait until the time is up and the emergency program is ended before you telescope the main boom. In the emergency program the telescoping mechanism is not monitored by the crane control and you can execute functions that would damage the telescoping mechanism.
10.3.2 Telescoping in the emergency program with a rigged MWL	Telescoping in the emergency program with a rigged MWL		Risk of damage when emergency program is switched on. Authoritative for the operation of the telescoping mechanism in the emergency program are all specifications and safety instructions in the supplied operating instructions; à Operating instructions GMK 6400 – Part 2 Crane operation – Chapter Malfunctions during crane operation – Emergency operations and emergency programs. This section only contains additional information that must be observed when the MWL is rigged before telescoping in the emergency program.
10.3.2 Telescoping in the emergency program with a rigged MWL	Retracting		Risk from slack rope. Pay attention that the guy ropes do not slacken to the point where there is slack rope when winding.

11 Maintenance work on the MWL (cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
11.3.1 Check the position of the guy ropes on the winch drum for correct operation	Unintentional rotation of the winch drum		Risk of incidents from unintentional rotation of the winch drum. Shut down the crane engine and secure it against unauthorized use before you start work on the winch drums. The rotating winch drum can inflict serious crushing injuries.
11.3.6 Checking the end fastenings of the guy ropes	Unintentional rotation of the winch drum		Risk of incidents from unintentional rotation of the rope drum. Shut down the crane engine and secure it against unauthorized use before you start work on the winch drums. The rotating winch drum can inflict serious crushing injuries.
11.3.6 Checking the end fastenings of the guy ropes	Slack rope		Risk of damage from slack rope. Remove the guy rope loops from the brackets on the gantry masks before winding in the winches, and always keep the guy ropes lightly taut when winding. In this way you prevent damage to the brackets, or the formation of slack rope.
11.3.8 Checking the condition of the guy ropes	Rotating winches		Risk of incidents from rotating winches. The rotating winches can inflict serious crushing injuries. Make sure that you do not come within range of the rotating winches.
11.3.8 Checking the condition of the guy ropes	Condition of the guy ropes		Risk of incidents due to falling loads. The guy rope must not be shortened. If the rope is shortened, there will no longer be the required number of safety turns on the winch drum when the main boom is fully extended. Without safety turns, the guy rope may slip out of the clamping device on the winch drum during operation. Damage to the boom system and dropping of the load could result. If the rope needs to be changed; see <i>Changing the guy ropes</i> , page 11 - 20.
11.3.9 Lubricate gear rims	Winches operated		Risk of crushing if the winches are operated inadvertently. Shut down the crane engine and secure it against unauthorized use before you lubricate the gear rims. In this way you prevent being crushed by the rotating gear rim or flapping locking element.
11.3.9 Lubricate gear rims	Slack rope		Risk of damage from slack rope. Remove the guy rope loops from the brackets on the gantry masks before winding in the winches, and always keep the guy ropes lightly taut when winding. In this way you prevent damage to the brackets, or the formation of slack rope.
11.3.10 Lubricating the locking units	Winches operated		Risk of crushing if the winches are operated inadvertently. Shut down the crane engine and secure it against unauthorized use before you lubricate the gear locking unit. In this way you prevent being crushed by the rotating gear rim or flapping locking element.

11 Maintenance work on the MWL (cont.)

Section / Heading	Hazard	Risk	Described Risk & Control Measures
11.3.11 Changing the oil at the winch gears	Oil		Risk of damage to the hoist gear. The waste oil must be tested for abrasion particles. This test serves to identify damage at an early stage; see page 11 - 19.
11.3.11 Changing the oil at the winch gears	Leaking consumables		Risk of environmental damage due to leaking consumables. Always let consumables drain into suitable receptacles. Wipe up any consumables that have leaked. Store/dispose of consumables and any soaked equipment properly. Ask about the applicable regulations.
11.3.11 Changing the oil at the winch gears	Oil		Risk of incidents due to the load falling. If this test is not performed, there may be a risk of damage to the winch gear. This can cause the load to fall or the boom to be damaged. See 11.3.11 for further details.
11.3.12 Changing the guy ropes	Changing the guy ropes		Risk of incidents from falling load. Use only a replacement rope that has the same technical specifications as the defective rope, or an original replacement rope.
11.3.12 Changing the guy ropes	Rope drum		Risk of incidents due to rotating rope drum. Turn off the engine and remove the ignition key so that no unauthorised operation of the hoisting gears can occur.
11.3.12 Changing the guy ropes	Rope clamp		Risk of incidents from slipping rope clamp. Always push the guy rope up to the designated clamp length in the clamping device. In this way you prevent the guy rope from slipping out of the clamping device, the main boom becoming overloaded and the load falling.
11.3.12 Changing the guy ropes	Changing the guy ropes		Risk of damage to the guy rope. After you have pushed the guy rope into the clamping device, you should only carry out the movement Wind winch in order to reach all the locking screws. In this way you prevent damage to the guy rope from its becoming clamped between the winch drum and the winch frame.

12 Index

Section / Heading	Hazard	Risk	Described Risk & Control Measures
N/A	N/A	N/A	N/A



GMK 6400 Risk Assessment Rigging Winch

This risk assessment is based upon the information contained within the standard rigging winch Manual for a Grove GMK 6400 all-terrain crane.

Although this risk assessment is comprehensive, and all efforts have been made to be as thorough as possible, Manitowoc CraneCARE makes no claim in any way, shape or form to its complete accuracy or that all possible hazards have been identified, or that all associated risks have been identified or priority assessed, or that all possible control measures that could be implemented have been provided.

The information contained within this risk assessment is also based upon the assumption that all personnel involved with the use of the crane, including operators, service personnel, or associated crane crew personnel have received prior instruction and/or appropriate training in all aspects of operating, or servicing and maintaining, or working with this particular model of crane, and that while conducting the previously mentioned tasks, are doing so with the full permission of the crane owner, and are doing so while holding all appropriate qualifications and/or certifications required by applicable legislation in the country, region, state or territory in which the crane is to be operated.

This is an uncontrolled copy when printed.

GENERIC HAZARDS AND INFORMATION

General Information

Warnings and Symbols

	Hazard may cause personal injury
	Hazard may cause damage to crane or other objects within the working range
	Hazard may cause electrocution
	Hazard may cause environmental damage, for further information on handling substances that pose a risk to the environment; see Maintenance manual, Chapter Safety and environmental protection.

1. Rigging Winch Operating Instructions

Section / Heading	Hazard	Risk	Described Risk & Control Measures
1.3 Pulling the hoist rope to the head	Connect the rigging rope and the hoist rope		The load could drop due to a damaged hoist rope. Only use the provided rope connector to fasten the rigging rope onto the hoist rope. If the rigging rope is fastened in another way, the hoist rope will bend too much directly behind the fixed rope sleeve. The hoist rope will be damaged in this way, which leads to dropping of loads. The same is true for when the hoist rope was shortened and is equipped with a rope end clamp and a rope wedge.
1.3 Pulling the hoist rope to the head	Unreeling the hoist rope		Risk of injury when working with wire cables. There is a risk of crushing, since body parts can be pulled in by the rigging rope. Stay away from the moving rope during operation. Wear suitable protective gloves when working with the rigging rope.
1.3 Pulling the hoist rope to the head	Rolling the rigging rope onto the drum		Risk of damage to the hydraulic oil tank. When the support roller is erected, the maximum clearance is exceeded. When driving under platforms and in spaces with low headroom, the turning support can damage the hydraulic oil tank. It is imperative that you set down the support roller before on-road driving.
1.4 Pulling the hoist rope to the upper hook block	Connecting the rigging rope and the main hoist rope		The load could drop due to a damaged hoist rope. Only use the provided rope connector to fasten the rigging rope onto the hoist rope. If the rigging rope is fastened in another way, the hoist rope will bend too much directly behind the fixed rope sleeve. The hoist rope will be damaged in this way, which leads to dropping of loads. The same is true for when the hoist rope was shortened and is equipped with a rope end clamp and a rope wedge.
1.4 Pulling the hoist rope to the upper hook block	Reeling off the main hoist rope		Risk of injury when working with wire cables. There is a risk of crushing, since body parts can be pulled in by the rigging rope. Stay away from the moving rope during operation. Wear suitable protective gloves when working with the rigging rope.
1.4 Pulling the hoist rope to the upper hook block	Separating the rigging rope and the main hoist rope		Falling hazard when hoist rope is under tensile stress. Under no circumstances should you loosen the connection between the rigging rope and the rope connector when the rigging rope is not yet slackened. The hoist rope will snap back with the heavy rope connector. This can make you fall down from the main boom. Only loosen the rope connector when the main hoist rope is on the main boom without any tension.

1 Rigging Winch Operating Instructions

Section / Heading	Hazard	Risk	Described Risk & Control Measures
1.5.1 For operation of the rigging winch	Slack rope		Risk of incidents if rope is slack. A slack rigging rope causes load slipping and knot formation on the cable drum. This could damage the hoist rope. Secure the rigging rope on the winch and onto the winch against independent loosening through vibrations during on-road driving.
1.5.2 Supporting roller on the turntable	Setting down the support		Risk of damage to the hydraulic oil tank. When the support roller is erected, the maximum clearance is exceeded. When driving under platforms and in spaces with low headroom, the turning support can damage the hydraulic oil tank. It is imperative that you set down the support roller before on-road driving.
1.5.8 Rope connector	Rigging rope		Risk of incidents due to falling loads. Do not fasten the rigging rope directly onto the hoist rope. When the hoist rope is pulled over the sheaves without a rope connector, the hoist rope bends too much behind the fixed sleeve. The hoist rope will be damaged in this way, which leads to dropping of loads. Only use the provided rope connector to connect the rigging rope with the hoist rope.
1.6.2 Description of maintenance work	Rigging winch started		Risk of incidents if rigging winch is started automatically. Since it is possible to start the crane engine with the hand-held control and without an ignition key, make sure to secure the hand-held control against unauthorised use when performing maintenance work. Place the hand-held control into the crane cab, pull the ignition key out and lock the crane cab.
1.6.2 Description of maintenance work	Condition of the rigging rope		Risk of incidents due to reduced load bearing capacity. Remember that other factors may also make it necessary to replace a hoist rope before the number of wire breaks requiring rope replacement has been reached (age of rope, frequency of use or exceptional loading).
1.6.2 Description of maintenance work	Wire cable		Risk of incidents due to ripped wire cable. Only use a replacement hoist rope which has the same technical specifications as the defective rope, or use an original replacement rope.
1.6.2 Description of maintenance work	Rotating rope drum		Risk of incidents due to rotating rope drum. Turn off the crane engine and remove the ignition key so that no unauthorized operation of the rigging winch can occur.
1.6.2 Description of maintenance work	Changing the rigging rope		Risk of damage to the wire cable. Ensure that the rope wedge, rope loop and rope end do not protrude beyond the diameter of the winch drum. This protects the new wire cable from being damaged through kinking or flattening even as it is wound on.