User Manual

921NG



AMCO VEBA

LIFTING BEYOND HORIZONS

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ORIGINAL INSTRUCTIONS

USER MANUAL
921NG
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A WARNINGS

A.1 PERSONAL PROTECTIVE EQUIPMENT

During normal crane operations the users must wear:
- helmet
- safety gloves
- industrial footwear
- overalls secured using buttons and without loose or baggy parts
- high visibility clothing

IN ADDITION
+ oil-proof gloves and safety goggles during maintenance tasks.
+ ear protection if the noise level in the operating position exceeds 80 dB(A).
+ a dust mask in the presence of dusts.
+ a suitable mask in the presence of toxic fumes or poison gas.

Protective equipment

Standard protective equipment during any crane operation	
Additional protective equipment during crane maintenance	
Additional protective equipment if the noise level exceeds 80 dB(A)	
Additional protective equipment in the presence of dusts	
Additional protective equipment in the presence of toxic fumes or poison gas	

A.2 MECHANICAL HAZARDS

The most common mechanical hazards due to a failure to follow the instructions in this user manual are listed below.

A.2.1 STRUCTURAL RESISTANCE

The structural resistance may be impaired by the following adverse working conditions:

ENVIRONMENTAL TEMPERATURE
- Weakening of the crane structure
- Hydraulic oil viscosity too low/high
- Hydraulic oil overheating
- Weakening of plastic components
- Degradation of flexible hoses (-40°C ÷ 100°C)

INCLINATION OF THE CRANE'S BASE
- Crane rotation not possible
- Overpressure in slewing cylinders
- Overstress in rack - pinion wheel or thrust block - motor coupling
- Overstress in crane structure
- Loss of stability

INCLINATION OF THE CRANE'S BOOMS

When the crane works with the booms in a near-vertical alignment (lifting moment is near zero), the load limiting device could operate without the expected accuracy due to:
- oscillations / accelerations of the booms
- inclination of the vehicle
- wind
- joint clearances, frictions

This could cause:
- Overstress in crane structure
- Loss of stability

OIL FLOW RATE TO MAIN CONTROL VALVE
- Overstress in crane's structure caused by excessive speed of movement
- Excessive oil temperature

WIND SPEED
- Overstress in crane structure
- Excessive oscillation of the load
- Loss of stability

PRECIPITATION
- Lightening, electric shock
- General malfunctioning of the electric system

USE IN EXPLOSIVE ENVIRONMENTS
- Flammable hydraulic fluid and plastic components

INSTALLATION ON RIGID BASE
- Excessive forces of inertia

USE IN MARINE ENVIRONMENT
- Corrosion of structural components: cylinder rods, pins, winch rope (offshore cranes)
- Excessive forces due to oscillation/inclination (ship-mounted cranes)

LIFTING COMPONENT
- Excessive forces if lifting components other than hook are used

IP PROTECTION LEVEL
- Electric system faults (safety and controls)

WARNINGS
- Do NOT use the crane if the operating conditions are incompatible with the instructions given in this manual. Specifically, the user must contact the crane manufacturer if the environmental temperature is outside the range given in this manual.



- Handling of loads at heights requires full risk assessment: strictly adhere to the load charts and always fully extend the stabilizers.
- Suspended loads must not be left unsupervised: put the load on a stable place before leaving the control station.
- Do not slew the crane at max. speed up to the end of stroke (dead point), but approach slowly.
- Clear any snow or ice from the crane booms to prevent excessive stress caused by the extra weight and to ensure that movement of telescopic components is not affected.
- Contact an authorised assistance centre before using or transporting the crane in a marine environment.
- The lifting component to which the diagrams refer in this manual is the crane hook. If other lifting components are used, the user must contact an authorised assistance centre to obtain a dedicated load chart.
- Maintenance on the machine which requires welding or grinding is forbidden. Refer to an authorised assistance centre if repairs or modifications to metalwork are required.





A.2.2 CRUSHING HAZARD

Crushing hazards derive from moving components on the crane:

- body crushing between the crane and vehicle
- upper limb crushing between base and crane booms
- body crushing between stabilisers and a stationary object during stabilizer opening
- limb crushing when stabiliser legs are retracted
- lower limb crushing under the stabiliser feet
- limb crushing in openings

WARNINGS

- Cordon off the working area using barriers and warning signs before starting any operations with the crane. Use special signals to warn others when crane movement is about to start. Avoid hazardous situations in which the user or other personnel may be crushed by the crane, stabilizers or the load.





- Do NOT climb on to the crane base when the vehicle's engine is running.





- When handling the crane, avoid grasping the control levers: operate them only with the fingers.




- Keep all personnel away from the hydraulic stabiliser extensions during opening.



- Do NOT place limbs under the stabiliser feet.



- Do NOT place lower limbs between the stabiliser legs and the vehicle. Do NOT place hands near the stabiliser extensions during retraction.



- Do NOT perform maintenance when the crane is moving or when the power take-off is enabled. Do NOT touch the crane when it is moving.



- Abide by safety distances indicated in EN 349 and make sure all others do the same.

A.2.3 CUTTING HAZARD

Residual hazard associated with movement of booms and connecting rods. A residual cutting hazard exists for the upper limbs between moving parts associated with the booms, base and telescopic components.

WARNINGS

- When the crane is working, do NOT place upper limbs between the boom joints, near connecting rods or in the area where the stabiliser extensions are retracted into the base. Do NOT insert fingers, feet or limbs inside openings on moving parts.



- Do NOT stand between the base and booms during crane folding.



A.2.4 IMPACT HAZARD

Residual hazard associated with:

- impact with the crane boom during unfolding/folding
- impact with the moving load
- impact with the stabilisers
- impact caused by an accidental release of the load

WARNINGS

- Take care not to bump against moving parts on the crane. Specifically, do NOT bang your head on the boom during working operations.
-



- Take great care not to bump against the suspended load. The load must always be moved under safe conditions away from potential hazards and obstacles, as specified in this manual.



- Always check that the load lifting components (hook, shackle, slings, chains) are in perfect condition. Do NOT exceed the maximum load indicated on the plate. Check that the load is properly secured to prevent accidental falling. Do NOT stand under the load.
- If the crane is equipped with turning stabilizers, take care to prevent impact with things and persons during rotation.



A.2.5 OIL LEAK HAZARD

Hydraulic fluid leaks can cause burns, irritation to the skin and eyes and can even penetrate under the skin.
These hazards are associated with incorrect tightening of fittings, rubbing of hoses against metal parts, excessive bending of hoses, incorrect disconnection of hoses during maintenance, incorrect repairs, ageing, etc.




WARNINGS

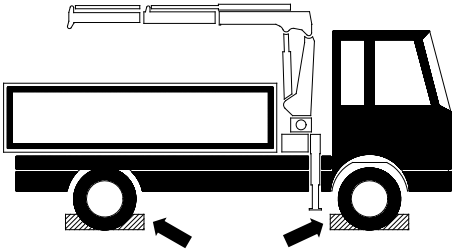
- When the crane is new and used for the first time, small oil leaks from the fittings may occur due to the heat expansion. Tighten the fittings using the torques given in this manual. Couplings may be damaged if they are too tight.
- The crane is designed in such a way to prevent rubbing of hoses against moving parts. However the installation configuration may cause hoses to come into contact with other moving parts. If this happens use additional sheaths to protect the hoses.
- If a hose is damaged, immediately switch OFF the machine and identify the damaged area using a piece of cardboard or wood. Spurts of fluid from a very small hole are powerful enough to penetrate the skin.
- Precautions shall be taken when disconnecting hydraulic tubing and hoses to ensure that no hydraulic pressure is retained in the line when the power supply to the system is switched OFF.
- When using blowtorches and other welding equipment for repairs (at an authorised assistance centres only) switch OFF the pressure to the hydraulic system and work away from hoses and steel lines.

A.2.6 LOSS OF STABILITY

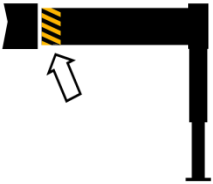
Loss of stability can cause serious damage to property and injury to persons. Carefully follow the stabilizing procedure specified in this user manual. Do NOT tamper with safety devices. Stabilize the crane on firm ground.

WARNINGS

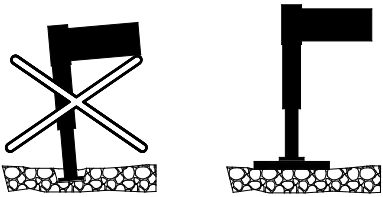
- Check that the parking brake is ON and the wheels are secured by using chocks.



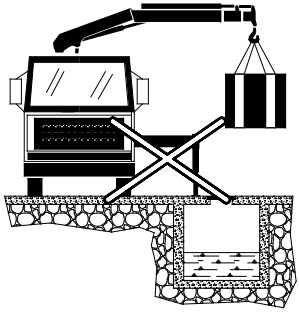
- Check that the stabiliser extensions are fully open (NO CE)



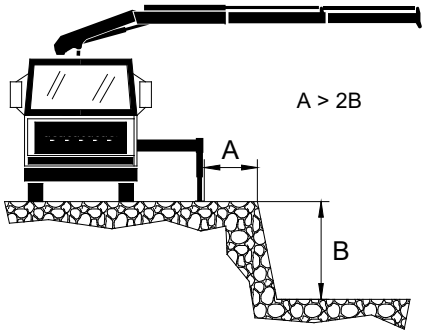
- Make sure that the stabilizer feet are correctly deployed and the ground can support their max. pressure (see D.1). If it does not, retract the hydraulic extensions immediately, place the load on the ground and increase the support area using larger support pads.



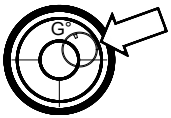
- Do NOT place the stabilizer feet near drains, manholes, wells, electric conduits and in general on any surface unable to support the maximum stabilizer force.



- When working on bridges the stabilizer feet must be placed at least one metre from the edge. Make sure that the stabilizers are at a safe distance from ditches and steep slopes. As a general rule the distance A between a stabilizer leg and the edge must be at least 2 times the depth B of the ditch.



- Check that the crane is not inclined at an angle greater than the maximum permitted value G (see B.6.3).



- Do NOT tamper with electrical, electronic and hydraulic safety devices on the machine. Check that all safety and protection devices are installed and functioning correctly before using the crane.



- When a load is lifted for the first time proceed slowly and carefully to ensure that the area of stability for the machine has been identified correctly. Inform the supervisor immediately of any loss of stability.
- Routinely check correct functioning of the stabiliser legs. Stop work immediately in the event of any faults and refer to an authorised assistance centre.

A.2.7 SLIPPING AND FALLS

This hazard exists where the ground is slippery (e.g. due to oil, water or other material), bumpy, broken, etc.

- Fall hazard due to slippery or broken ground, etc.



WARNINGS

- Do NOT use the crane on unstable ground. The user shall NOT work on broken, slippery or uneven ground. Unexpected stops during movement or unwanted enabling of controls may cause serious damage to property and injury to persons.

A.3 ELECTRIC SHOCK HAZARD

A.3.1 CONTACT WITH LIVE COMPONENTS

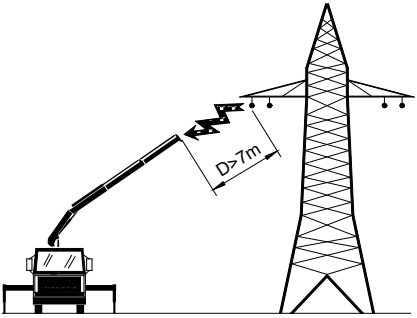
There is an electric shock hazard for the user under the following conditions:

- if the crane comes into contact with electrical power lines
- if the crane is struck by lightning



WARNINGS

- The crane should only be operated at a distance D of at least 7 m from electrical power lines. The crane can be used closer to power lines if, following notification to the electricity supply company, suitable protection is adopted to prevent any accidental contact. The minimum operating distance must be calculated taking into account the maximum crane outreach towards the lines and the maximum displacement of the lines.



- The crane should only be used near live power lines if:

- Safety distances are adhered to
- Live parts are covered or surrounded by proper guards
- Overhead power lines are switched OFF for the entire duration of work



WHAT TO DO IN CASE OF CONTACT WITH POWER LINES

1) Keep calm
2) Do NOT leave the control position
3) Do NOT touch any metal parts on the machine
4) Warn people nearby not to approach the crane, vehicle, load or the person in the control position
5) Switch OFF the power line.
6) Do NOT leave the driving cabin. If you must abandon your position, do NOT touch the crane and the ground at the same time, but leave your position by jumping to the ground.

A.3.2 STATIC ELECTRICITY

The crane can accumulate static electricity. This generally occurs when the material placed between the stabiliser feet and the ground is an insulator e.g. wood, the crane is used near radio transmitters or high frequency switching systems and when a storm is approaching.

- Static electricity can affect correct functioning of pacemakers.

WARNINGS

- Accumulation of static electricity is prevented by connecting the vehicle's chassis to earth using a proper conductive device.
- People with pacemakers are forbidden from approaching or using the crane.



A.4 HEAT HAZARDS

A.4.1 BURNS

These hazards are caused by:

- Contact with hot hoses, hot tanks and damage to hoses resulting in spurts of hot oil.
- Use in explosive environments

WARNINGS

- Do NOT touch any part of the hydraulic system when the temperature exceeds 50°C.



- Routinely check that the thermometer is functioning correctly. Refer to an authorised assistance centre in the event of a fault.
- Environmental temperature can affect crane control capacity. Do NOT use the crane under extreme environmental conditions (very hot, very cold, very high relative humidity).
- Do NOT use the machine in explosive environments.

A.5 NOISE HAZARDS

There are no significant noise hazards in that the crane does not include the power source.

WARNINGS

- Wear ear protection equipment if the noise level in the operating position exceeds 80 dB(A) as a result of other machinery or equipment in use.



A.6 VIBRATION HAZARDS

There are no significant vibration hazards in that a loader crane is used for short periods and therefore there is no significant effect on the operator.

A.7 HAZARDS DUE TO TOXIC SUBSTANCES

These hazards are associated with:
- Inhalation of exhaust fumes or toxic substances caused by the working environment and/or the substances moved.
- Incorrect handling or disposal of hydraulic oil.
- Incorrect handling or disposal of grease.
- Fire caused by highly flammable hydraulic fluid.

WARNINGS FOR TOXIC FUMES AND SUBSTANCES
Control positions must be located so that operators are not exposed to inhalation of exhaust fumes and toxic substances caused by the working environment and/or the substances moved.
If the operator is exposed to exhaust fumes move the exhaust pipe outlet point further away from the working position (e.g. using removable flexible hosing).
Wear a mask if the crane is used in environments with toxic fumes or substances.



WARNINGS FOR HYDRAULIC OIL AND INDUSTRIAL GREASE
These substances must be handled with care in a ventilated environment. Wear protective gloves and goggles. They must be stored and moved in sealed containers to prevent leaks and accidental contact with skin and eyes.



Store used oil and grease in sealed containers at a temperature less than 65°C. Contact an authorised waste management company to dispose of them.
These substances are flammable. Keep all naked flames well away.

IN THE EVENT OF FIRE...
do NOT use water to extinguish fires. Use foam or CO_2. Wear a gas mask.
IN THE EVENT OF ACCIDENTAL SPILLAGE...
- of hydraulic oil, use sand or sawdust to contain the fluid. Then place it in a container suitable for disposal. If the spillage occurs in water contact the relevant authorities.
- of grease, wait for the grease to solidify. Then use a spade to scrape up the material and place it in a container suitable for disposal.

FIRST AID IN CASE OF...
- contact with the skin: wash using soap and water.
- contact with the eyes: remove contact lenses and rinse using water.
- swallowing fluid: call a doctor, do NOT induce vomiting.

A.8 ERGONOMIC HAZARDS

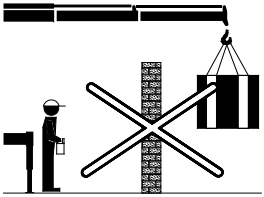
A.8.1 MANUAL OPERATIONS

WARNINGS
- Do not place the body under excessive strain when operating the crane. If manual operations are required (e.g. pivoting stabilizer legs, lifting manual extensions or other components) or the load must be moved by hand, do NOT lift a weight of more than 25 kg (20 kg for women).



A.8.2 VISIBILITY

WARNINGS
- When using the crane the operator shall have a perfect view of the working zone, of the controls and of emergency and safety devices of machine.



- An additional lighting system conforming to EN 1837 must be installed if the crane is used at night.
- A qualified assistant must help the operator if the latter does not have a clear view of the entire working range of machine.

A.8.3 HUMAN ERROR

WARNINGS
- Users must be able to read and understand the crane's documents and manuals.
- Users must be able to apply the prescriptions given in this manual.
- Users must receive adequate training (in accordance with ISO 9926-1) from the installer before the crane is put into service. Use by other personnel is forbidden.
- People using the vehicle on public roads must have the relevant authorisation and be aware of local driving legislation.
- Users and assistants must not be temporary staff. They must be at least 18 years old and able to perform all tasks. In addition, the following aspects must be taken into consideration:
  - physical: sight and hearing; no fear of heights; not under the effects of alcohol, drugs or prescription medicines;
  - psychological: conduct in stressful situations; mental balance; sense of responsibility.

A.9 UNEXPECTED START-UP AND SWITCH-OFF

Impact, crushing, load loss and stability loss hazards exist as a result of accidental crane start-up and switch-off.

WARNINGS
- Before using the crane check that there is enough fuel and the battery is in good condition.
- The user must be in full control of the machine with control and stop devices in easy reach from the moment of start-up.
- Control and maintenance operations must be performed with the machine and engine switched OFF, the brake ON and wheels blocked using special chocks.



A.10 FAULTS IN SAFETY DEVICES

- Tampering with safety devices can cause excessive stress on the crane, loss of stability, impact, falling loads, sudden release of the lifting components and manual extensions, accidents when moving the vehicle, etc.
- Incorrect folding of the crane can cause serious damage due to impact of protruding components against various objects (bridges, garages, other vehicles, etc.) when moving the vehicle.
- Failure to apply decals to the machine may cause the user not to take into consideration hazards associated with normal crane use.

WARNINGS
- Do NOT remove, modify or disable safety devices whether mechanical (guards, locks, etc.) or hydraulic (valves, seals). Failure to abide by this regulation shall cause the warranty to be declared null and void.

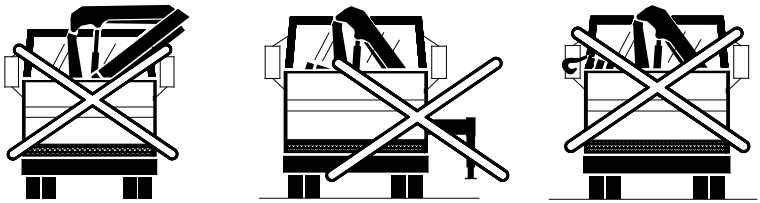


- Make sure lifting components are not supporting a load and are resting on a suitable support surface before disconnecting them.
- Do NOT tamper with or remove warning stickers. Do NOT clean the stickers with solvents. Do NOT use water or steam under pressure to clean the machine.



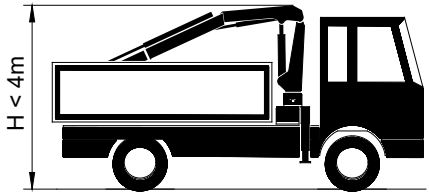
- Before moving the vehicle always check that:

- The crane is folded correctly in transport position (1).
- The stabilizer extensions are fully retracted and locked (2). If the extensions are locked using a pin, this must be inserted perfectly in the extension.
- No crane components or accessories are protruding outside the profile of the vehicle, (e.g. prevent the hook from protruding, 3).
- The LED warning light in cabin is green (if present, see B.6.5).



1 2 3

- In addition, if the intended transport position is different from the standard folded configuration (e.g. boom stowed on the truck body), the user must check that:
  - the rotation of boom system is locked by a suitable locking device.
  - the boom's height in transport position is less than the maximum value permitted by the road safety regulations (e.g. height < 4m, see B.6.5).



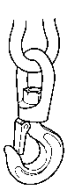
A.11 COUPLING FAULTS

There is a serious risk of damage to property and injury to persons in the event of incorrect coupling of mechanical and hydraulic components between the crane and the vehicle, between the crane and the lifting components and between the lifting components themselves.

WARNINGS
The following checks should always be made before using the crane:
- Visually check that the hydraulic system is functioning correctly and that there are no fluid leaks between hoses and couplings.
- Visually check the integrity of the machine structure and hoses.
- Check that the load capacity of the lifting components is adequate.
- Check the integrity of the seals on safety devices and valves.
- Check the efficiency of the safety devices.



- Check that hooks, shackles, slings, ropes, chains and relevant safety devices are in perfect condition.

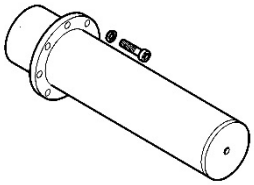




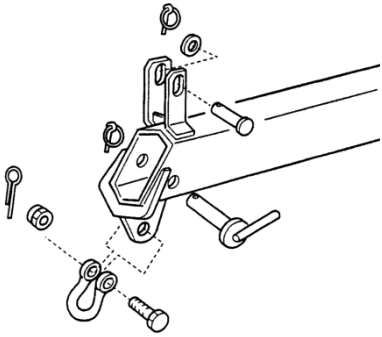
- Check that the mounting bolts are secured and tightened properly and that the crane is in the correct position relative to the frame of the vehicle.



- Visually check that the screws of the slewing cylinders, all nuts and bolts in general are tightened properly.



- Check that pins and screws used on the extensions and on other lifting tools are assembled and secured correctly.



A.12 HAZARDS DUE TO INCORRECT LIFTING OPERATIONS

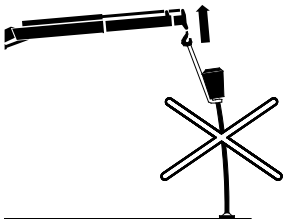
Residual hazards exist as a result of incorrect lifting operations:

- Loss of stability
- Uncontrollable load, overload, exceeding the overturning limit
- Uncontrollable speed of movements, oscillation of the load
- Unexpected or accidental movement of loads
- Unsuitable, worn or unsafe lifting devices/accessories
- Lifting of people
- Use during high winds
- Risk of damaging load support surfaces

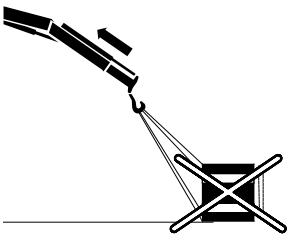
WARNINGS

The following movements and operations with the crane are strictly forbidden:

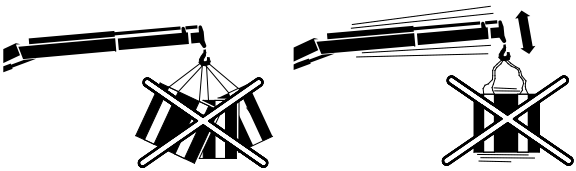
- Using the crane to drag, extract, remove, push or crush fixed or stuck objects.



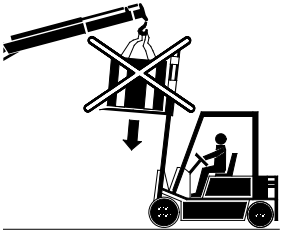
- Dragging of loads on the ground, on guides, resting against a wall, etc.

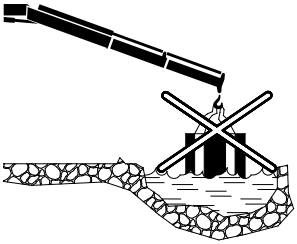


- Brisk movements (sudden slewing, raising, lowering) causing significant load oscillation or abnormal vibrations on crane structure.

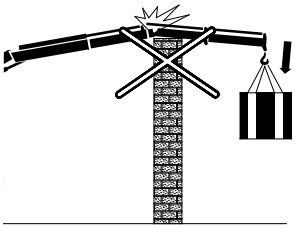


- Lifting of loads not placed on rigid and fixed supports unless the user knows the weight of the load being moved: e.g. lift truck releasing an excessive load on the hook; lifting a floating load, etc.

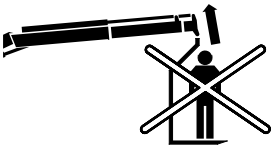




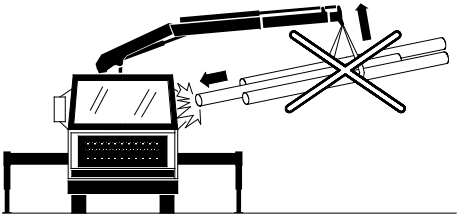
- Movements very close to fixed (walls, trees, etc.) and mobile (cranes, forklift trucks, gantry cranes, etc.) objects.



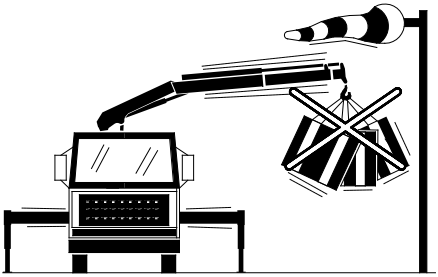
- Lifting of people.



- Using lifting components which are worn, not suitable for the load or without safety devices. Risk of accidental loss/fall, slipping, excessive rotation or tipping of the load and uncontrollable movements.



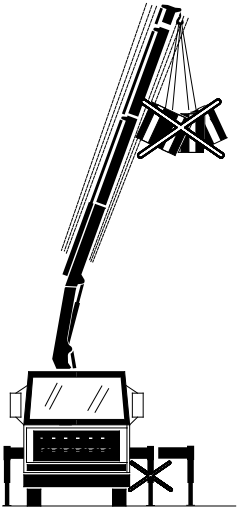
- Using the machine under adverse weather conditions (e.g. high winds).

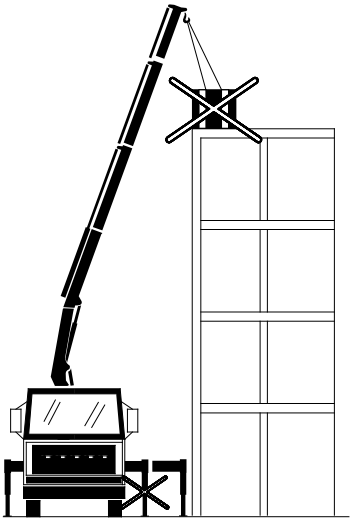


- Placing the load on surfaces with unsuitable strength, area or inclination.



- Handling of loads at heights is strongly unrecommended: the load could bump against the booms and oscillations of load and booms could cause a sudden increase of the lifting/tipping moment. If this operation is anyhow needed, fully extend the stabilizers and reduce the working speed.





A.13 HOW TO TRANSPORT THE CRANE

Before installation, the crane must be moved safely, in order to avoid falls and impacts with objects and persons. During transport of the crane, the carrier must follow the instructions below:

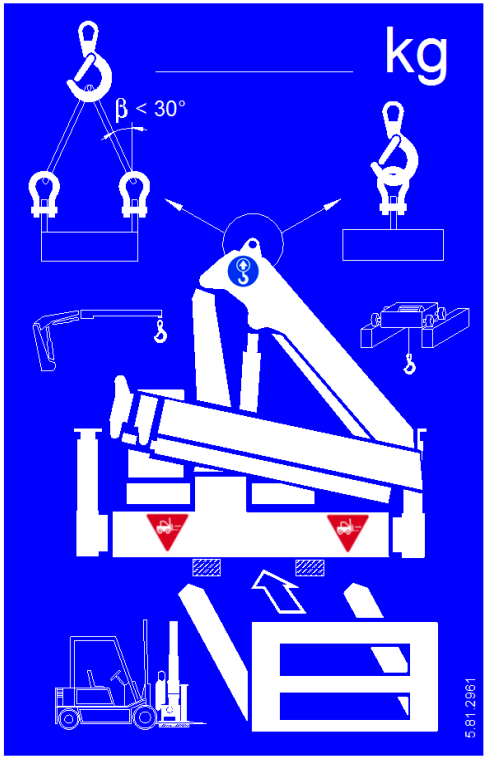
- The carrier is responsible for the crane and he must be qualified and authorized.
- Use means of transport and lifting equipment and tools with adequate capacity.
- Lift the crane using a lift truck, a crane or a bridge crane.
- During transport by land and sea, fix the crane or its container to the mean of transport (body, container, hold, etc.). Protect the crane from atmospheric agents. Never unpack the crane.
- During transport the swivel bridge must be locked with the suitable swivel lock (see E.6).

LIFTING WITH A LIFT TRUCK

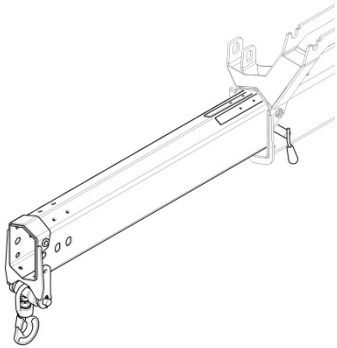
Ensure that the 2.boom of the crane is facing the lift truck.
Insert the forks under the base in correspondence to the indicated arrows (see figure).
Secure the crane to the forks.

LIFTING WITH A CRANE

Insert a shackle in each suitable lifting eye on the 1.boom (see figure) and connect properly to a hook. Make sure to limit the load oscillations.



A.14 WARNINGS FOR USE WITH MANUAL EXTENSIONS

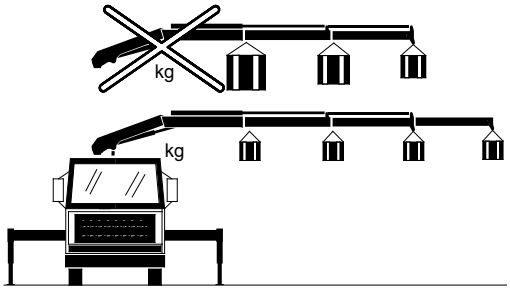


There are additional specific hazards for cranes with manual extensions as listed below:

- Hazards resulting from structural failure of a manual extension
- Crushing and cutting hazard for fingers during mounting, extraction, retraction.
- Impact hazard during extraction and retraction of extension.
- Hazard from putting the body under excessive strain when lifting manual extensions

WARNINGS

- The rated capacity of a manual extension remains constant when varying the working radius and the boom inclination: the rated capacity is indicated in the load chart, in the plate applied on the extension and given in the user manual.
  Never lift loads exceeding the rated capacity of the extension.
  The operator can use only manual extensions supplied by the crane manufacturer.

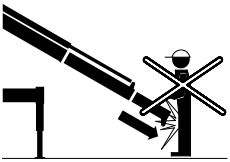


- Do NOT insert fingers inside free housings of securing components (in particular housings for locking pins of manual extensions).



- Avoid boom positions causing the unpinned extension to move at high speeds. Keep away from the extension's trajectory.

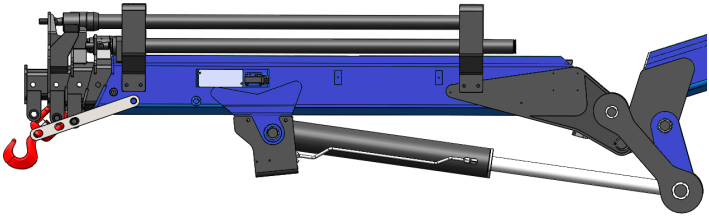




- The user can manually lift the extension by himself only if its weight is less than the maximum value provided by safety standards (see A.8.1), otherwise he must request another person for help or use a suitable lifting equipment.



A.15 WARNINGS FOR USE WITH JIB



There are additional specific hazards for cranes equipped with a jib, as listed below:

- Crushing and cutting hazard for upper limbs between moving parts of the jib.
- Impact hazard with property and people during opening and closing of jib.
- Hazards during fitting/removing the jib

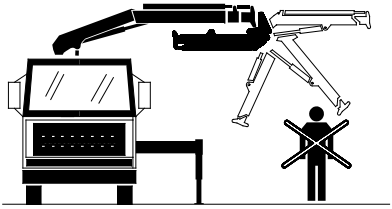
WARNINGS

- When the crane is working do NOT approach or place upper limbs between the jib boom joints and connecting rods. Do NOT insert fingers, feet or limbs inside openings on moving parts.



- Take care not to bump into moving parts on the jib boom particularly during folding and unfolding.





- It's necessary to check for stable positioning and safe fitting of the jib extension during mounting, taking off and stocking.

A.16 WARNINGS FOR USE WITH BUCKET - GRAPPLE



There are additional specific hazards for cranes equipped with bucket as listed below:

- Crushing and cutting hazard for upper and lower limbs in the bucket and moving parts.
- Entanglement hazard in the bucket and rotor parts.
- Impact hazard for people and property due to uncontrolled release of the load or to accidental disconnection of the lifting component.
- Impact hazard for equipment against objects.
- Structural damage hazard when pressing the load by lowering the crane boom.
- Hazards due to maintenance performed under unsafe conditions.

WARNINGS

- Cordon off the working area using barriers to prevent people from approaching nearer than 20 m to the crane and equipment. If in specific cases the equipment requires a greater safe distance, then this must be adhered to.

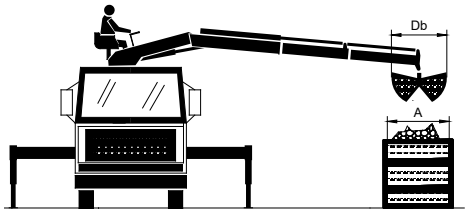




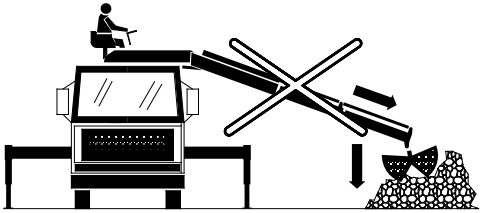
- Do NOT use these tools to move forbidden loads as specified in the user and maintenance manual for the equipment.
- Do NOT insert limbs between the clamshells.



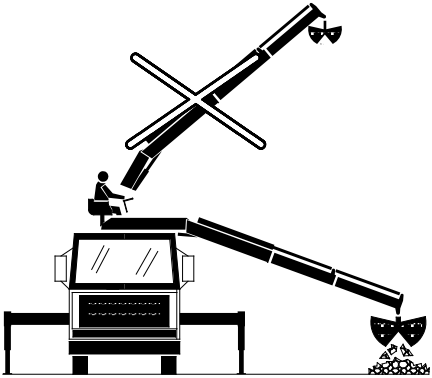
- The working area must be big enough to contain the tool when operating at the maximum opening (Db < A).



- Only use the crane to lift free loads. Do NOT press objects or material with the tool.



- Release the load as close to the ground or container as possible. Do NOT overload the tool.



- Take care that the load does not fall accidentally. Do NOT operate the tool over areas where accidental fall of the load may cause damage to property and injury to persons.
- Before performing maintenance rest the equipment on the ground, switch OFF the machine, disconnect the control panel from the power supply and wait for the oil to cool for at least 2 hours.

A.17 WARNINGS FOR USE WITH DRILL



There are additional specific hazards for cranes equipped with a drill as listed below:

- Entrapment, crushing and cutting hazard for upper and lower limbs on the drill body.
- Flying loose material hazard caused by drill operation.
- Impact and cutting hazard during drill operation.
- Structural damage and tipping hazard if the drill penetrates the ground but is unable to expel material.

WARNINGS

- Keep away from the area in which the drill is operating.





- Correct functioning of the drill occurs when material is released from the excavation. If the drill tends to penetrate the ground without material being released, stop work immediately and remove the drill from the ground by rotating it in an anti-clockwise direction.

B USER MANUAL

B.1 PREMISE

Dear Customer,

Thank you for buying our product.
We have done everything we can to supply you with an excellent and safe product.
Please follow the instructions given below to ensure that your crane operates safely:

- Follow the warnings as well user and maintenance instructions.
- Perform routine maintenance to keep your crane efficient and safe.
- Keep the crane clean. Dirt increases wear of the cylinders and pins.
  Leaks of oil and other fluids are the main cause of accidents.
- Follow the instructions in this manual.
- Keep this manual in a safe place with the crane so that it is accessible to the user at all times.
- If the crane is sold the new owner must request an updated version of this manual.
- Refer to an authorised assistance centre in the event of damage to, even partial, or loss of this manual.

This User Manual is for the crane only and does not refer to the vehicle. The manual for the complete installation is released by the installer who is responsible for applying the CE mark to the assembly.

Yours sincerely

B.2 IDENTIFICATION

MANUFACTURER
H.C.E. s.r.l. Unico Socio
Via Einstein 4,
42028 POVIGLIO (RE) ITALY

CRANE TYPE: 921NG

NO CE CONTROLS
☐ NO RDC (without radio remote control)
☐ RDC (with NO CE radio remote control)
☐ TOP (with Basic/Graphic radio remote control)
CE CONTROLS
☐ NO RDC 3XL (without radio remote control, with 3XL-2displays)
☐ RDC 3XL (with Basic/Graphic/Scanreco radio remote control, with 3XL-1display)
☐ RDC 4XL (with Basic/Graphic/Scanreco radio remote control, with 4XL+TOP)
STABILIZERS
☐ ST-M : stabilizers with standard spread and manually operated extensions
☐ EX-H : stabilizers with extra spread and hydraulically operated extensions
☐ SE-H : stabilizers with super spread and hydraulically operated extensions
☐ SC : fixed stabilizer legs
☐ GI : manual turning stabilizer legs
☐ GIAUT : automatic turning stabilizer legs

Serial number: _____

CLASSIFICATION
Design according to: EN 12999 - EN 13001

Lifting components	Hoisting class	Hoist drive	Stress history class
☐ Hook ☐ Winch ☐ Forks, pole	HC1	HD4	S2
☐ Bucket, grapple ☐ Drill	HC1	HD4	S1

EXPECTED OPERATING LIFE FOR DUTY CLASSES S2 AND S1
Working cycles by day : 85
Working days by year : 235

Load capacity %	Expected working cycles No.		Operating life years	
	S2	S1	S2	S1
50%	500.000	250.000	25	12.5
66%	200.000	100.000	10	5
75%	150.000	75.000	7.5	3.75
90%	87.000	43.500	4.3	2.15
100%	64.000	32.000	3.2	1.6

B.3 DESCRIPTION AND DOCUMENTATION

B.3.1 ENCLOSED DOCUMENTATION

Assembly must be performed by an authorised assistance centre in accordance with the instructions in the installer manual released by the manufacturer and the vehicle setup specifications.
The installer must provide training for operators concerning all aspects of crane functioning at the moment of machine delivery in accordance with ISO 9926-1.
The installer must give the final customer the following crane documents, completed and signed as necessary:

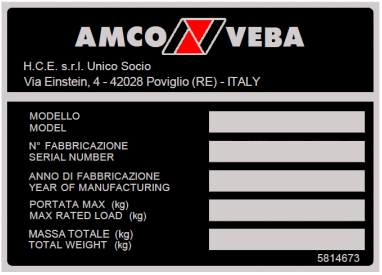
- Declaration of EC conformity (only for EC countries)
- Certificate of origin
- Certificate of warranty
- User manual
- Spare parts catalogue

The owner of the crane is responsible for the routine inspections required by law.

B.3.2 MARK

The crane is fitted with an indelible plate containing the following information:

- CE mark (only for EC countries)
- name and address of manufacturer
- crane model
- serial number
- year of manufacture
- maximum load
- crane weight



NO CE



CE

The plate is riveted to the column.
The serial number is also engraved on the crane base.
For commercial reasons the crane type may not correspond to the mark applied on the boom.
On customer request the plate may not indicate the crane weight and the maximum load.

B.3.3 SERVICE CONDITIONS

The machine is designed to operate under the following conditions:

Service conditions

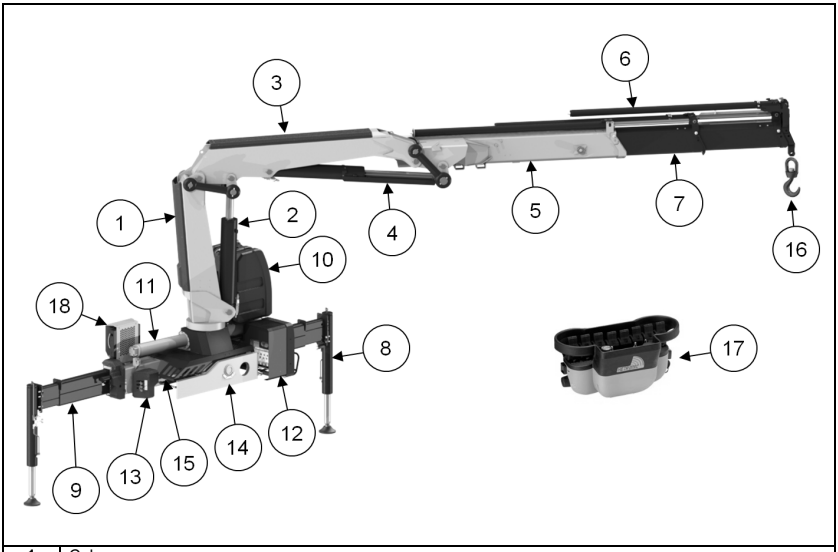
STOP DESCRIPTION	RANGE
Environmental temperature	-10°C ÷ 40°C
In-service wind (see B.8.4 for special conditions)	Wind state: Light (EN 13001-2) Max. mean wind speed: 34 km/h
Weather conditions to avoid	Storm Sand storm
Hydraulic oil temperature	-10°C ÷ 80°C
Max. base inclination with respect to the horizontal	4° for duty S2 3° for duty S1
Bearing capacity of the ground supporting the stabilizer legs	> max stabilizer pressure on the ground
Min. distance D between crane and electric power lines	7 m
Forbidden work environments	Marine environments Explosive environments Underwater
IP protection class	IP 65

⚠ If any of these conditions is not fulfilled, stop work immediately.

B.3.4 MAIN COMPONENTS

A list of the main crane components is given below in accordance with EN 12999:

MAIN COMPONENTS

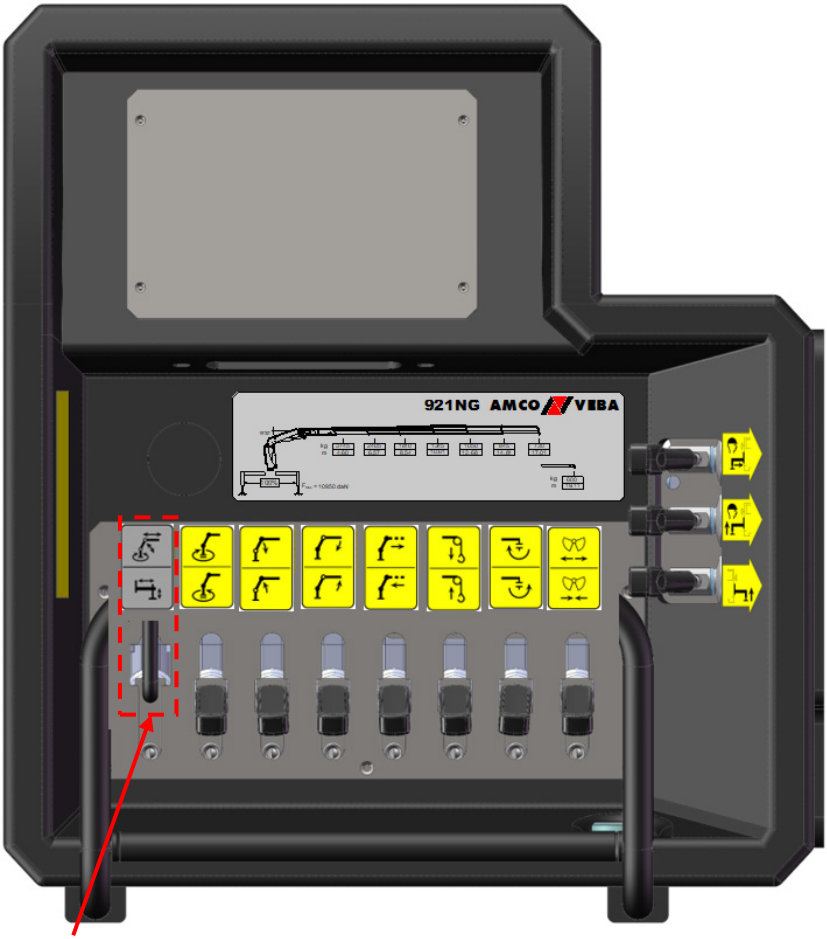


1	Column
2	1st boom cylinder
3	1st boom
4	2nd boom cylinder
5	2nd boom
6	Extension cylinders
7	Hydraulic extensions
8	Stabilizer cylinder
9	Stabilizer extension
10	Oil tank
11	Slewing cylinder
12	Controls, at control valve side
13	Controls, at opposite control valve side
14	Swivel bridge
15	Base
16	Hook
17	Radio remote control (option)
18	Oil cooler (option)

B.4 CONTROLS

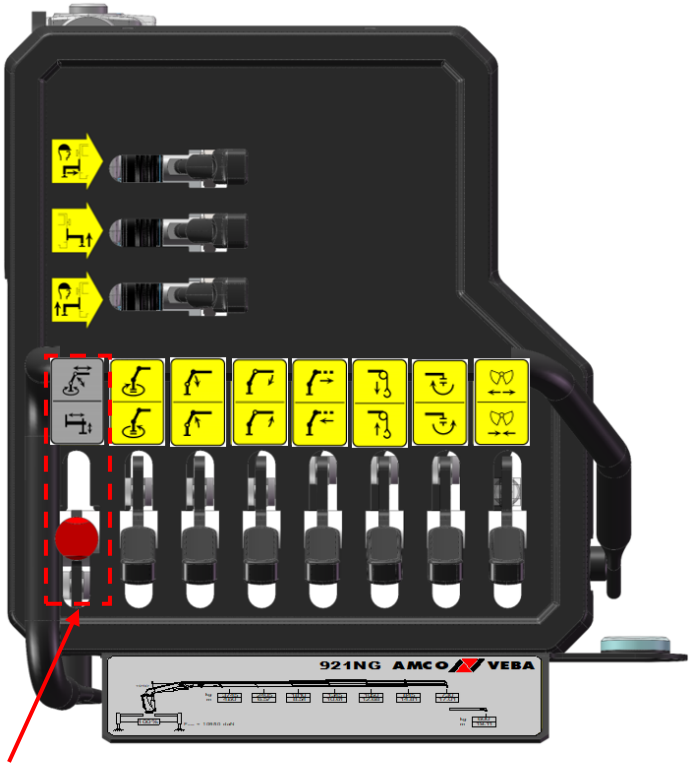
B.4.1 CONTROL STATIONS

NO RDC-CRANE
On main control valve side



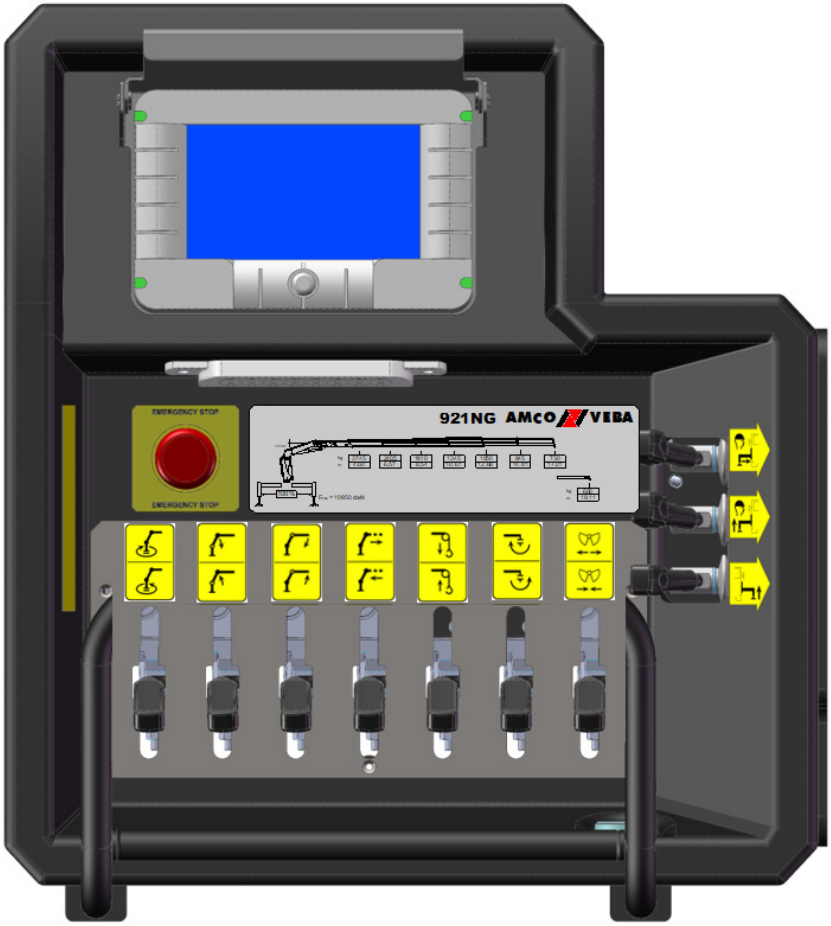
For NO CE only.

NO RDC-CRANE
On the opposite control valve side

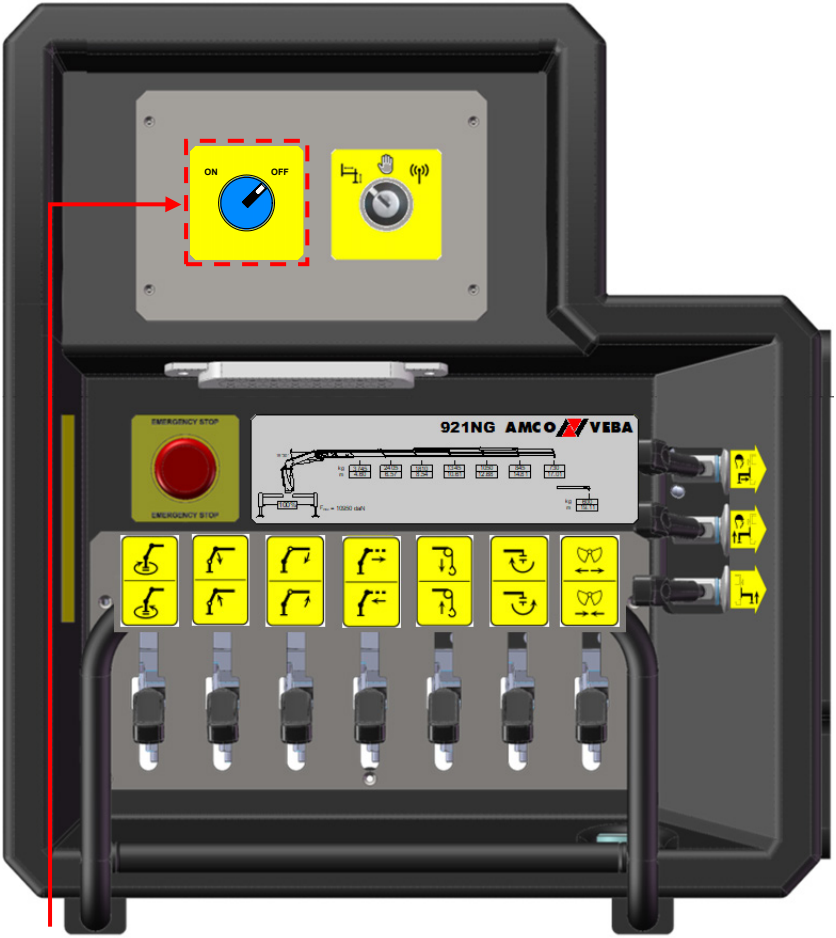


For NO CE only.

RDC-CRANE
EMERGENCY CONTROLS WITH DISPLAY
On the main control valve side



RDC-CRANE
EMERGENCY CONTROLS WITHOUT DISPLAY
On the main control valve side



In case of work lights only.

RDC-CRANE
EMERGENCY CONTROLS
On the opposite main control valve side



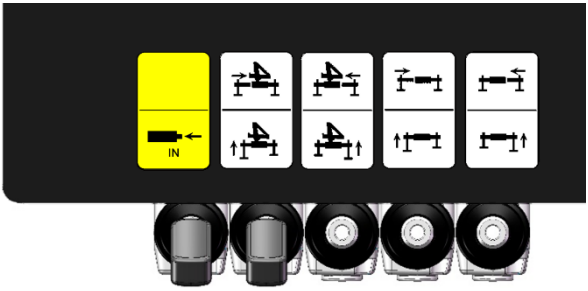
RDC-CRANE WITH RADIO-CONTROLLED STABILIZERS
BUTTONS FOR ACTIVATING THE STABILIZER CONTROLS VIA RADIO
On both sides of the crane, close to the stabilizer controls.

BS



Activation of radio stabilizer controls

RDC-CRANE WITH RADIO-CONTROLLED STABILIZERS
EMERGENCY RADIO STABILIZER CONTROLS
On the opposite main control valve side, under the cover.

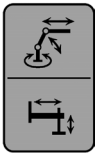


⚠ The serigraphs shown above are for explanations only: they are not applied on the cover.

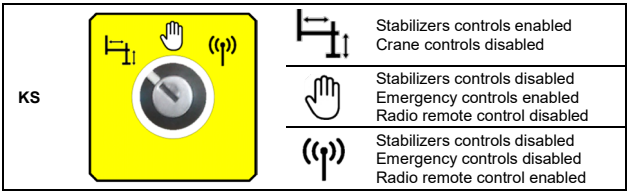
B.4.2 DESCRIPTION OF CONTROLS

FLOW DEVIATION LEVER (NO CE, NO RDC)

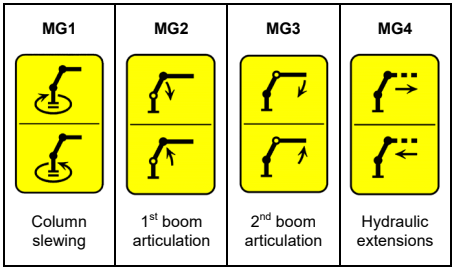
- **Lever UP**: crane enabled, stabilizers disabled
- **Lever DOWN**: crane disabled, stabilizers enabled



KEY SWITCH SELECTOR (RDC, NO TOP)

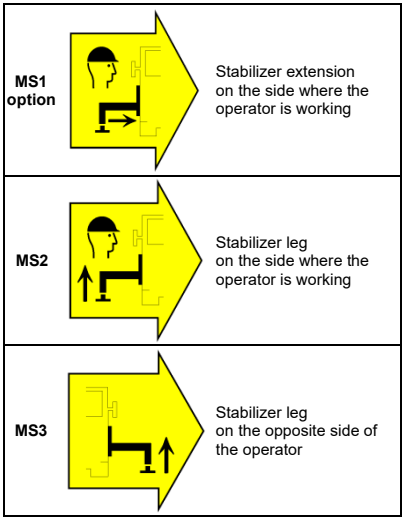


STANDARD CRANE CONTROLS

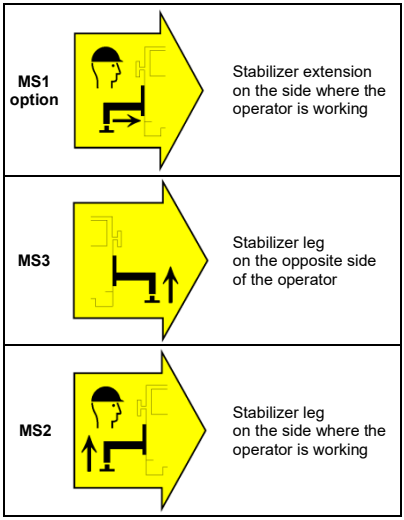


STABILIZERS CONTROLS

ON THE MAIN CONTROL VALVE SIDE



ON THE OPPOSITE MAIN CONTROL VALVE SIDE



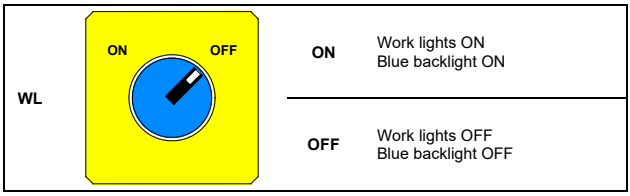
The MS1 lever is present only if the stabilizer extensions are hydraulically operated.

⚠ It is forbidden to place the stabilizer feet on the ground and to lift them off the ground by operating the lever MS3: this lever can be operated only if all stabilizer feet are already on the ground, only to correct slightly the inclination of the vehicle or to balance the suspensions' load.

B.4.3 OUTRIGGERS CONTROLS (OPTIONAL)

Outriggers supplied by crane's manufacturer are operated by additional controls having the same functions as the crane's stabilizer controls (see UM for outriggers for further information).

B.4.4 WORK LIGHTS CONTROL SWITCH (NO CE, NO TOP)

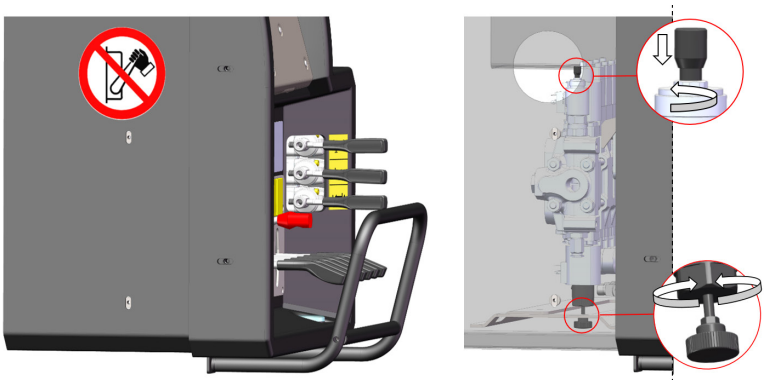


B.4.5 EMERGENCY CONTROLS

In case of failure, the operator can pass manually from the crane controls to the stabilizer controls and vice versa following the procedures below.

CE, NO RDC CRANE

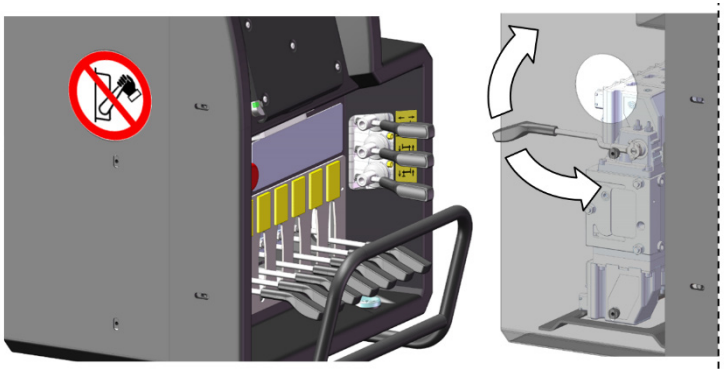
Break the seal sticker, push and turn the manual actuator. Then screw the knurled knob under the main control valve (see figure below).



- **Knob fully screwed:** crane enabled, stabilizers disabled
- **Knob fully unscrewed:** crane disabled, stabilizers enabled

RDC CRANE

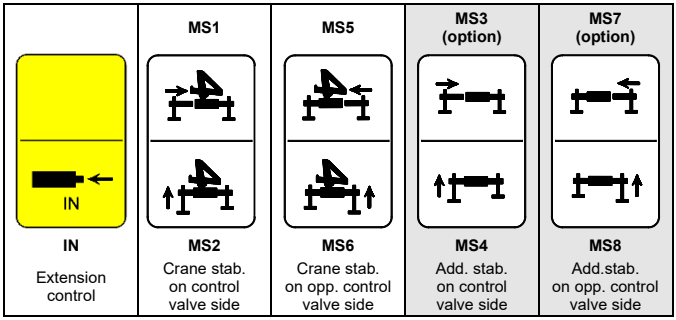
Break the seal sticker (see figure below) and turn the flow deviation lever under the cover.



- **Knob pulled (lever turned clockwise):** crane enabled, stabilizers disabled
- **Knob pushed (lever turned counterclockwise):** crane disabled, stabilizers enabled

In addition, in case of stabilizers controlled by radio, activate the emergency stabilizers controls following this procedure:

- mount (by screwing) on stabilizer control valve the two suitable levers supplied demounted: the first one on “IN” element; the second one on “MS” element corresponding to the cylinder to move.



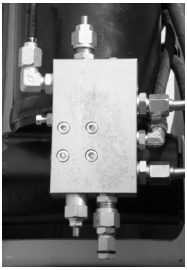
- operate the lever “MS”, keeping it UP/DOWN
- slowly operate the “IN” lever
- after the cylinder is closed, unscrew the “MS” lever, then screw again the lever on another MS element and repeat the procedure.

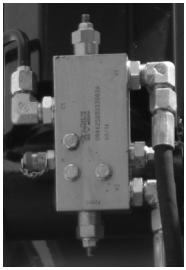
Emergency controls for RDC crane must be operated by two operators: in case of absence of the second operator, the flow deviation lever must be kept turned by means of a cable tie. After the crane is brought into transport position, remove all the levers previously mounted and the cable tie (if used). Take care to prevent impacts during emergency operations (see A.2.2, A.2.4).

B.5 SAFETY DEVICES

B.5.1 OVERCENTER VALVES

The overcenter valves are fitted on the 1st boom cylinder and on the 2nd boom cylinder. Their purpose is to lower or block the load if the pressure into the cylinders reaches the setting value. So the crane structure is made safe.

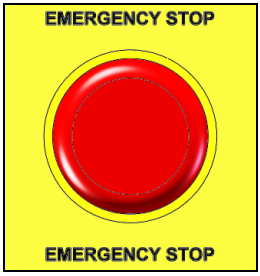




When the valve opens, the operator must retract the hydraulic extensions immediately, to stop the descent of the load.

B.5.2 EMERGENCY STOP BUTTON

The emergency stop buttons are installed at the control positions of EC cranes.
In case of danger or emergency, the crane's movements can be blocked immediately by pressing one of the stop buttons.
To restore the normal operating conditions, turn the head of the button until the release is engaged and the button returns to its normal position.

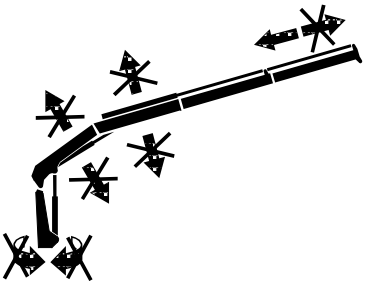


Before restoring the normal operating conditions, always check that the emergency situation no longer exists and that the safety is guaranteed again.

B.5.3 MOMENT LIMITER

The purpose of the moment limiter is to protect the crane's structure from overload and ensure machine stability. It constantly detects the pressure in the 1st boom cylinder and intervenes when the lifting moment exceeds the setting value.
When a overload condition is reached, the crane movements are blocked according to the figure below.

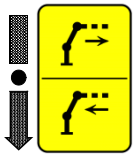
NO CE MOMENT LIMITER



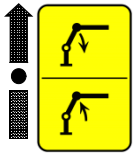
To remove the overload condition, it is necessary to retract the hydraulic extensions until the lifting moment falls below the setting value.

When the 1st boom cylinder is fully extended, the moment limiter could intervene even if the crane is not loaded. To unblock the crane proceed as follows:

1) Push three/four times repeatedly the lever operating the hydraulic extensions.



2) Close the 1st boom cylinder slowly.

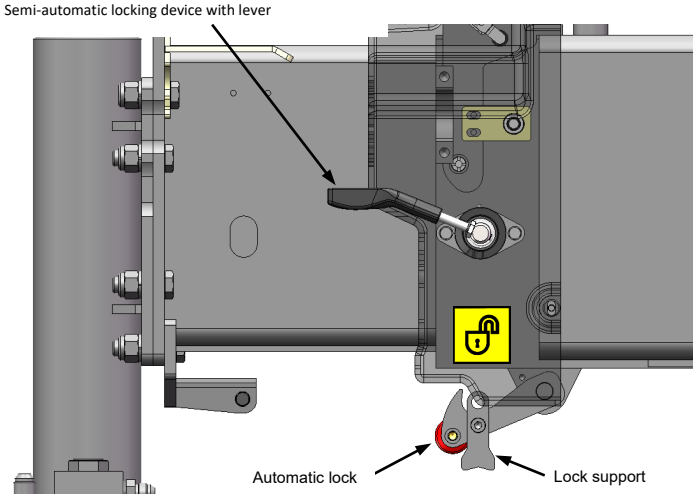


See UM of 3XL and 4XL for information about CE moment limiters.

B.5.4 LOCKING DEVICES FOR STABILIZER EXTENSIONS

FOR ALL CRANE VERSIONS
On both sides of the base an automatic lock is installed.
Its purpose is to lock automatically the stabilizer extension in its fully closed position. To release the extension and pull it out, it's necessary to pull the automatic lock and pull out the extension with the correspondent control. To make this operation easier, a support was designed to keep raised the automatic lock and so allows to extend the outriggers.

FOR CRANES WITH MANUALLY OPERATED STABILIZER EXTENSIONS
On both sides of the base two locking devices are installed: an automatic lock and a semi-automatic locking device with lever.
The purpose of the locking device with lever is to lock the stabilizer extension in its fully retracted and fully extended, when engaged.



The following sign means that you have to turn the lever downwards in order to disengage the locking device.

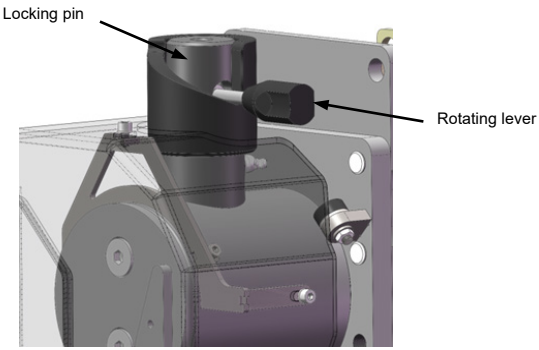


⚠ Failure to lock the stabilizer extensions correctly when transporting the machine may cause damage to property and injury to people.

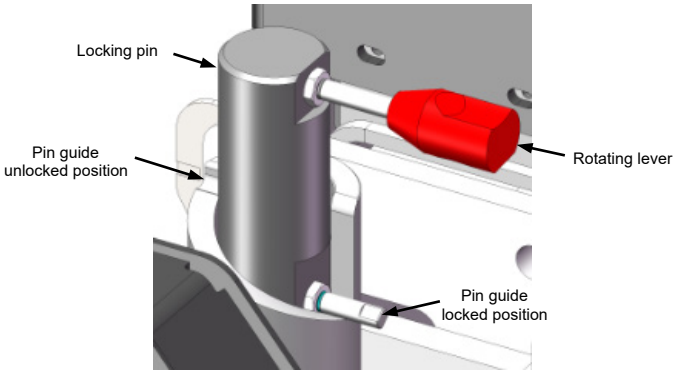
B.5.5 LOCKING DEVICE FOR TURNING STABILIZER LEGS

Their purpose is to lock the rotation of the stabilizer legs in working and transport position.

LOCKING DEVICE WITH LEVER FOR MANUAL TURNING STABILIZERS



LOCKING DEVICE WITH LEVER FOR AUTOMATIC TURNING STABILIZERS



⚠ Failure to lock the stabilizer legs correctly when transporting the machine may cause damage to property and injury to people.

B.5.6 SLEWING LIMITERS

The NO CE crane can be equipped with slewing limiter: its purpose is to block the crane rotation toward the prohibited working zone (for example in front of the truck cab).

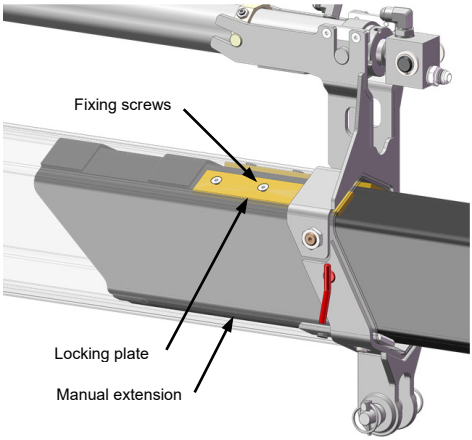
⚠ The installation of the slewing limiter after the crane sale must be made at an authorized assistance center.

MECHANICAL LIMITER (OPTIONAL FOR NO CE CRANE)

The device consists of two plastic spacers inserted inside the rotation cylinders so as to limit the stroke of the pistons.

B.5.7 LOCKING DEVICE FOR MANUAL EXTENSIONS

Two locking plates are mounted at the end of the last hydraulic extension to prevent the accidental removal of the manual extension.



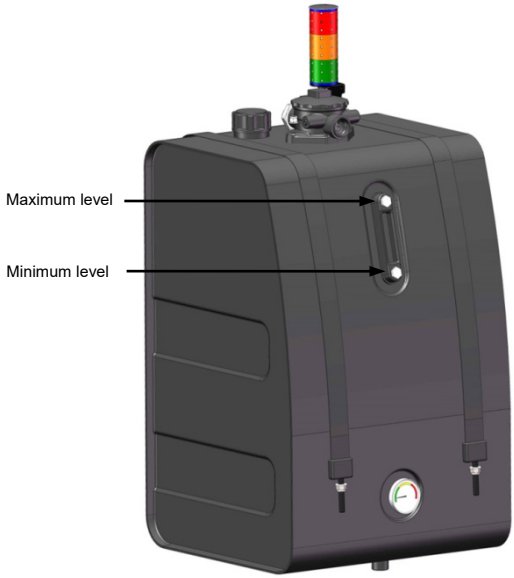
The plates allow the manual extension to slide freely between the fully retracted and fully extended position. In order to remove a manual extension, first unscrew the fixing screws and remove the plates.

⚠ During the extraction of the manual extension it's necessary to avoid the residual risks due to this operation (see A.14).

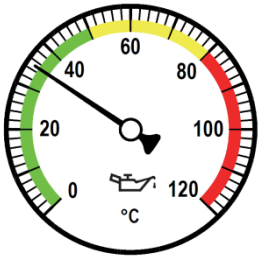
B.6 GAUGES AND INDICATORS

B.6.1 GAUGES ON OIL TANK

OIL LEVEL INDICATORS
The oil tank is fitted with two visual level indicators in order to check the amount of oil in the tank.



THERMOMETER
CE cranes are fitted with a thermometer that shows the current oil temperature in degrees Celsius:
- **Yellow sector (T > 50°C):** it is dangerous to touch hydraulic elements due to high temperature.
- **Red sector (T > 80°C):** the user must suspend work until the temperature falls below 80°C.

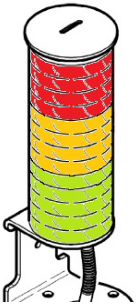


CLOGGING INDICATOR
The CE tank filter and the high pressure filter (option) have clogging indicators that indicate when the filter cartridge has to be replaced (pressure gauge on red).
RDC-cranes are always equipped with high pressure filter and clogging indicators.



B.6.2 LOAD INDICATORS

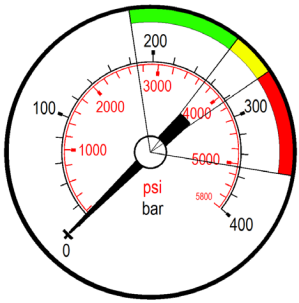
SIGNAL LIGHT TOWER (STANDARD FOR CE/RDC CRANES)
The signal tower provides visual and audible warning signals to indicate the load level of crane:
- **Flashing green light, no audible signal**: 90% of lifting capacity is not reached
- **Fixed orange light, intermittent audible signal**: 90% of lifting capacity is reached
- **Fixed red light, continuous audible signal**: 100% of lifting capacity is reached



3XL/4XL DASHBOARDS
See UM for the stability control system installed.

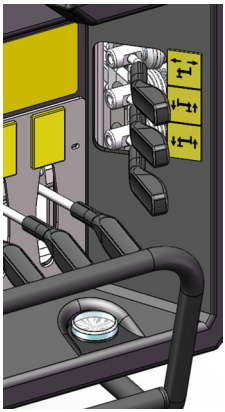
PRESSURE GAUGES (OPTION FOR NO CE)
The pressure gauges indicate the pressure of the 1.boom cylinder.

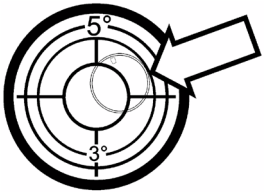
- **Green sector**: 90% of lifting capacity is not reached
- **Yellow sector**: 90% of lifting capacity is reached
- **Red sector**: 100% of lifting capacity is reached



B.6.3 LEVEL INDICATOR

Near the stabilizers controls there are level indicators that show the inclination of the base.
The figure below shows an inclination of 3°.





B.6.4 OPERATING HOURS COUNTER (NO CE, NO TOP)

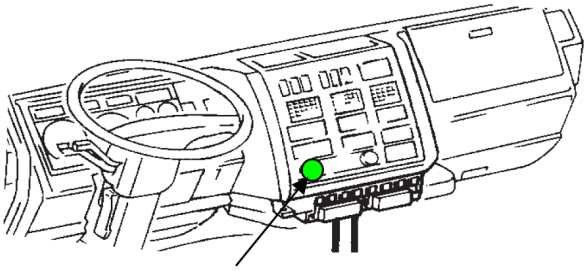
The hours counter is installed at the control station on the main control valve side.
Purpose of the counter is to indicate the total operating hours of the crane: the user shall perform the planned maintenance at the intervals shown in the Maintenance Record (see C.3).



B.6.5 VISUAL-AUDIBLE WARNING DEVICE IN CABIN

The Road Safety Regulations set out the maximum dimensions of motor vehicles.
For this reason in CE area a visual-audible warning device is installed in cabin: this gives the driver permission to move the vehicle under safety conditions. The device gives the following signals:

- **Green light, no audible signal**: all stabilizer extensions are correctly closed, the crane's boom is in transport position.
- **Red light, intermittent audible signal**: one or more stabilizer extensions are not closed correctly and/or the crane's boom is not in transport position.



⚠ It is prohibited to move the vehicle when the warning LED light is red.

B.7 OPERATING THE CRANE

B.7.1 PRELIMINARY CHECKS BEFORE OPERATION

Before using the crane check that
- crane's structure, safety devices and safety signs are intact.
- there are no parts on the equipment which have not been checked or are not permitted.
- hydraulic system, couplings, valves, safety devices and indicators are efficient.
- there are no oil leaks.
- status of maintenance, coupling and tightness of hooks, shackles, cables, chains, fixing screws, screws, nuts, bolts, pins and lifting equipment is perfect.
- oil filters are not clogged.
- oil level in the tank is above the minimum level.
- there is enough fuel in the tank of vehicle.
- vehicle is blocked with parking brake and wheel chocks
- all unauthorised personnel are outside the crane's working area.
- lifting component is suitable and intact.
- stability control system is functioning (only for CE cranes): check that the leds of proximities mounted on crane base and on additional stabilizers are ON when the crane is correctly stabilized.
- ground can support the maximum pressure of stabilizer feet (see D.1).
- all safety measures are properly executed (see A)
- service conditions are fulfilled (see B.3.3)

 If any of the above conditions is not fulfilled, stop work immediately, perform the necessary maintenance and if necessary contact an authorised assistance centre.

B.7.2 START-UP OPERATION

The operator must follow this procedure:
- Take the engine to the speed recommended by the installer for the crane. Push the clutch and engage the power take-off; release the clutch gradually.

 Never accelerate over the speed recommended with the power take-off engaged because the power take-off might break and the operational speed of the crane would exceed the speed considered for the structural test on the machine.
Operating the crane at a speed exceeding the rated one might cause a serious accident and the risk of breakage due to fatigue is higher.

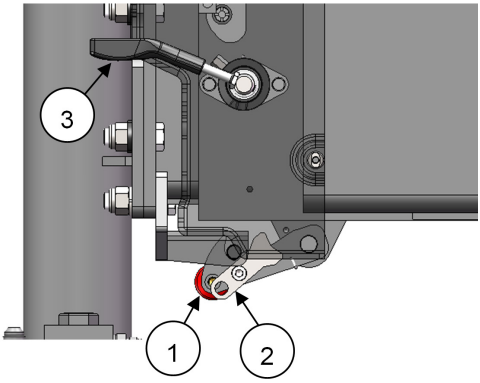
Moreover for CE cranes
- Turn on the electric power supply of the crane.

Moreover for RDC cranes
- Activate the radio transmitter.

The crane is now ready for operation.

B.7.3 HOW TO DEPLOY THE STABILIZERS WITH MANUALLY OPERATED EXTENSIONS

LOCKING DEVICES OF STABILIZER EXTENSIONS

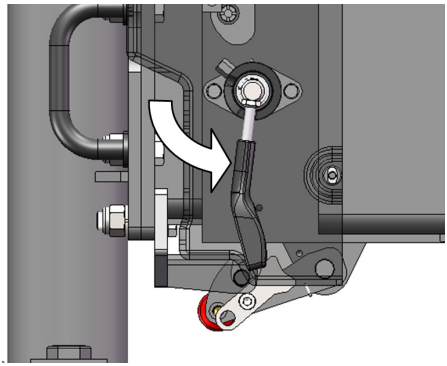


1	Automatic lock
2	Lock support
3	Semi-automatic locking device
Lever 3 up: the locking device 1 is engaged or ready to get engaged Lever 3 down: the locking device 1 in disengaged	

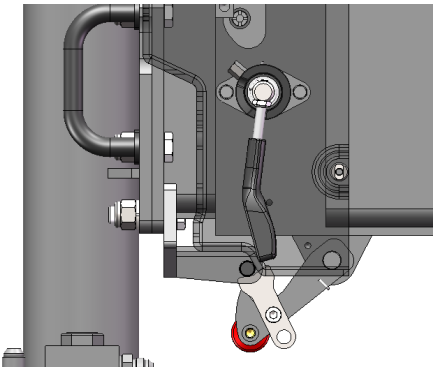
Operating the crane is allowed only when the stabilizers are deployed correctly.
Always use the controls on the side on which you are operating the crane.

Execute the following procedure on the control valve side:

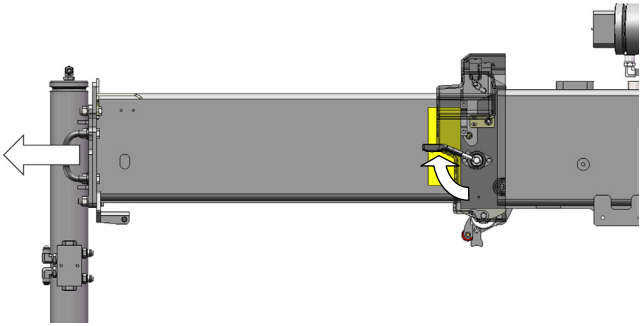
1) Turn the lever 3 downwards up to its vertical locking position: the locking device is disengaged.



2) Lower the automatic lock 1, rotate and lay the lock support 2 on the pin.

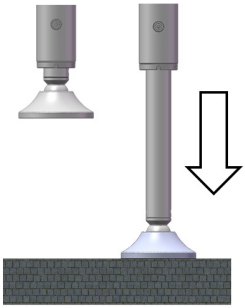


3) Pull the suitable handle and extract completely the stabilizer extension till the semi-automatic locking device 3 does stop the beam extension, then shake it to be sure the locking device 3 is fully engaged. The yellow warning sign on extension appears.



4) If the crane is fitted with turning stabilizer legs, rotate downwards the leg up to the vertical position (see B.7.5)

5) Extend the cylinder till to place the foot on the ground, without fully discharging the vehicle's suspension.

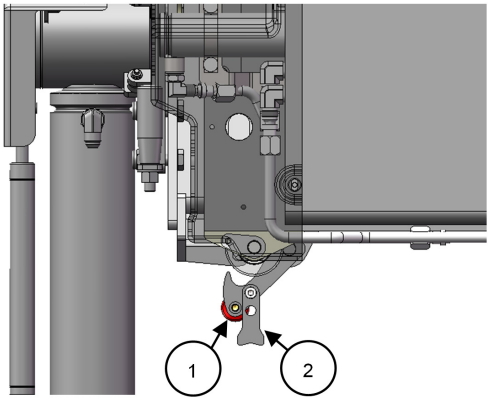




6) Execute the same procedure at opposite control valve side.

B.7.4 HOW TO DEPLOY THE STABILIZERS WITH HYDRAULICALLY OPERATED EXTENSIONS

LOCKING DEVICE OF STABILIZER EXTENSIONS

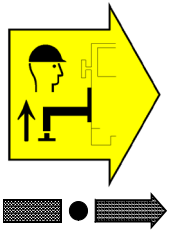


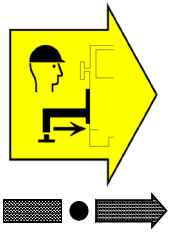
1	Automatic lock
2	Lock support

Operating the crane is allowed only when the stabilizers are deployed correctly. Always use the controls on the side on which you are operating the crane.

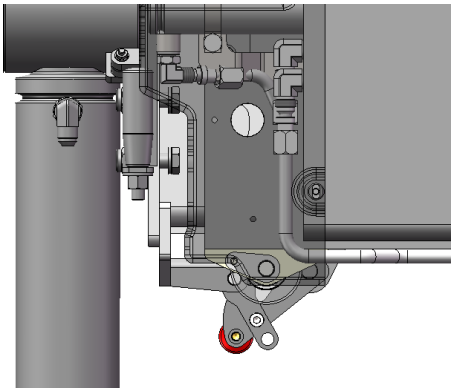
Execute the following procedure on the control valve side:

1) Retract fully the stabilizer cylinder and then the stabilizer extension.

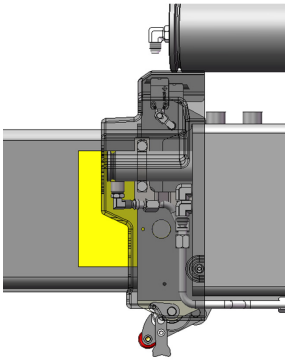




2) Lower the automatic lock 1, rotate and lay the lock support 2 on the pin.



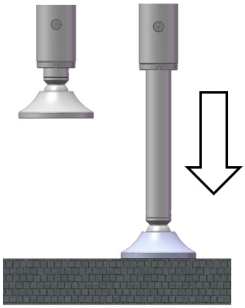
3) By using the control lever below extract the stabilizer extension.
The yellow warning sign on extension appears, if the extension is fully extracted.





4) If the crane is fitted with turning stabilizer legs, rotate downwards the leg up to the vertical position (see B.7.5)

5) Extend the cylinder till to place the foot on the ground, without fully discharging the vehicle's suspension.

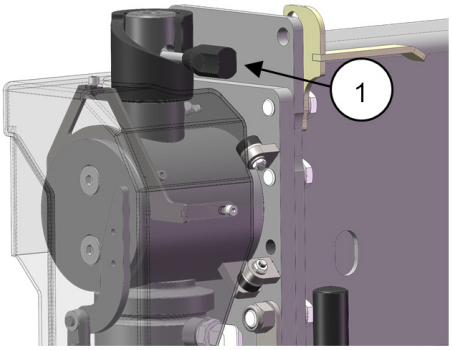




6) Execute the same procedure at opposite control valve side.

B.7.5 HOW TO ROTATE DOWNWARDS THE MANUAL TURNING STABILIZER LEGS

LOCKING DEVICE OF TURNING LEGS



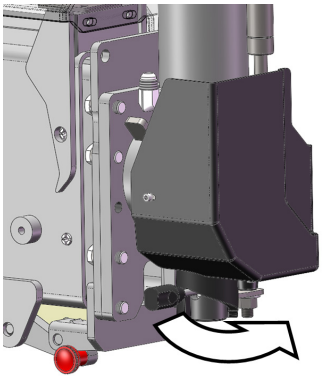
1	Locking device with lever

Lever 1 perpendicular to extension axis (down): the locking device is engaged
Lever 1 parallel to extension axis (up): the locking device is disengaged

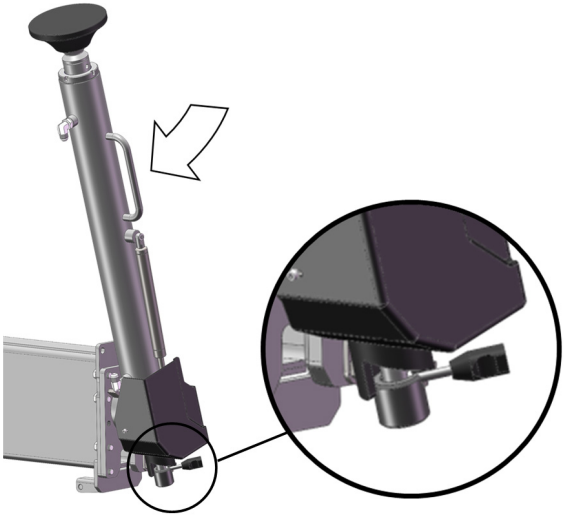
Execute the following procedure:

1) Grasp the handle and turn counter-clockwise the lever (the locking device is disengaged). If the lever is locked, shake lightly the leg till the lever can be easily operated.

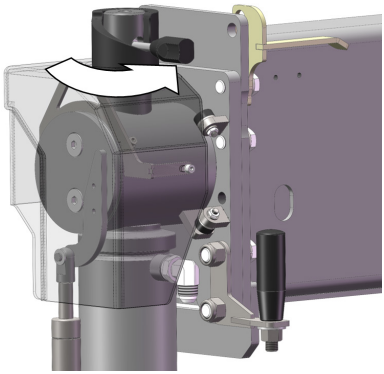




2) Rotate slightly the leg, holding the locking device 1 in disengaged state.



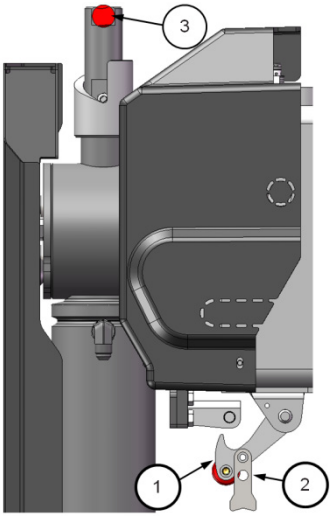
3) Then release the locking lever and rotate fully the leg downwards up to the vertical position: the locking device engages automatically (the lever turns clockwise and goes down). If the locking device doesn't engage, shake lightly the leg. Now the stabilizer leg is locked.



⚠ Before opening the stabilizer cylinder, be sure the locking lever is fully engaged and the stabilizer leg is locked correctly.

B.7.6 HOW TO DEPLOY THE AUTOMATIC TURNING STABILIZERS

LOCKING DEVICES OF STABILIZER EXTENSIONS

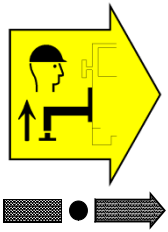


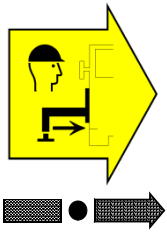
1	Automatic lock of stabilizer extension
2	Lock support
3	Locking device of stabilizer leg

Operating the crane is allowed only when the stabilizers are deployed correctly. Always use the controls on the side on which you are operating the crane.

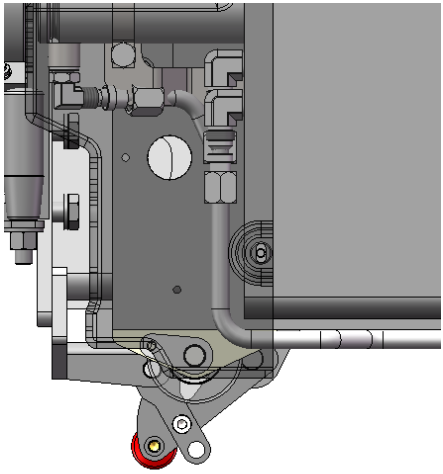
Perform the following procedure on the control valve side:

1) Retract fully the stabilizer cylinder and then the stabilizer extension.

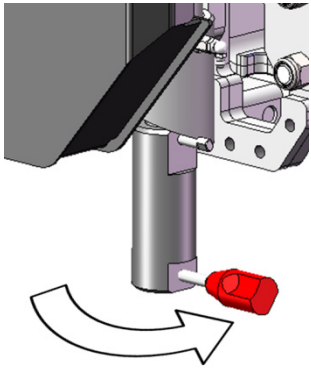




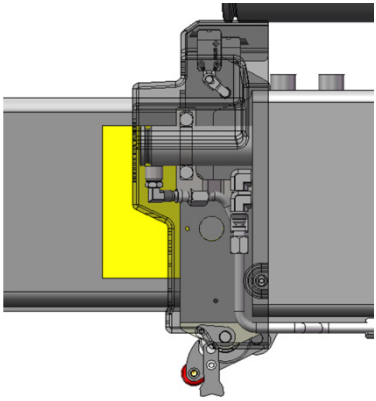
2) Lower the automatic lock 1, rotate and lay the lock support 2 on the pin.



3) Unlock the pin by rotating counterclockwise the lever until the pin guide reaches the unlocked position (see B.5.5).



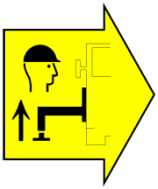
4) Operate the control lever for extracting the stabilizer extension.
The yellow warning sign on extension appears, if the extension is fully extracted.



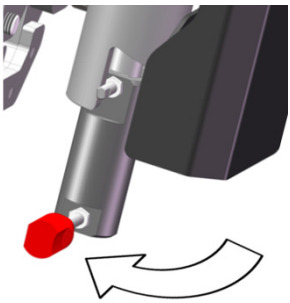


5) Operate the lever for extending the cylinder leg and rotate it slightly by only a few degrees.

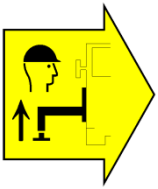


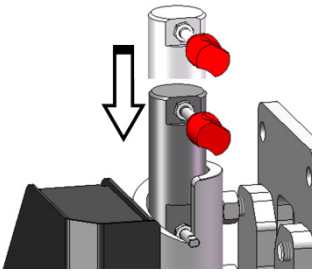


6) Then release the pin by rotating the lever clockwise completely.

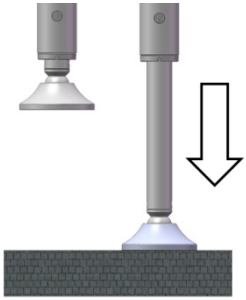


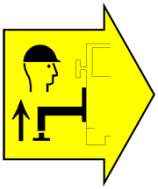
7) Fully rotate the leg downwards to the vertical position: the locking device engages automatically (the pin guide reaches the locked position). If the locking device is not engaged, shake lightly the leg until you obtain the engagement.





8) Extend the cylinder till to place the foot on the ground, without fully discharging the suspensions.

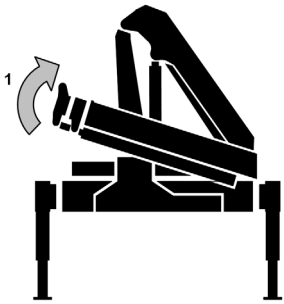


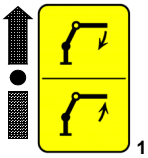


9) Perform the same procedure at opposite control valve side.

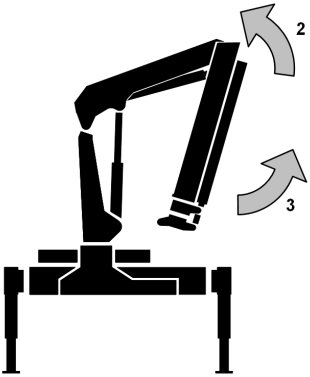
B.7.7 OPENING PROCEDURE

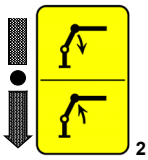
1) If the crane is in folded position, fully retract the 2nd boom cylinder (articulation cylinder).

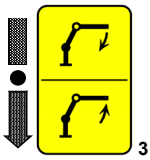




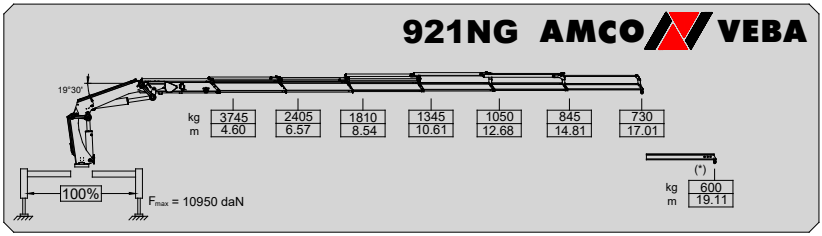
2) Lift the 1st boom so that the 2nd boom can rotate freely.
3) Move the 2nd boom to the horizontal position.







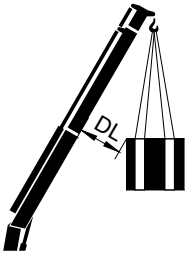
B.7.8 HOW TO READ THE LOAD CHART



The load chart shows the rated loads (kg) that the crane can lift depending on working radius (m).
The load chart applied on the crane shows the rated loads for the crane with horizontal booms; the chart showing the whole working range is given in the Technical Sheet.
The manual extensions (*) are shown separated from the hydraulic extensions.
The winch load chart shows the rated loads that can be hoisted by winch only.
100% indicates that the rated loads can be lifted only if the stabilizers are fully extended.
F_{max} is the maximum force that the stabilizer can impose on the ground.

B.7.9 LIFTING OPERATIONS

Before beginning the lifting operations it is necessary to make sure that:
- lifting accessories (shackles, hooks, ropes, chains, bands, etc.) have a lifting capacity greater than the load to be lifted.
- apply hoisting cables, ropes, chains, bands to the hook so that their safety is not compromised.
- lift the loads from their center of gravity and make sure that they cannot move, slide and rotate.
- avoid sudden movements, operate the control levers gently and gradually. Do not swing the load.
- do NOT interrupt the movements suddenly, mostly when lowering and rotating the loads.
- never take loads or the crane boom above the control position.
- fully retract all hydraulic extensions before every lifting operation.
- prevent the load from colliding with the crane structure, the vehicle or obstacles nearby. It is necessary to hold the load at safety distance DL > 1 m from the crane structure and obstacles.



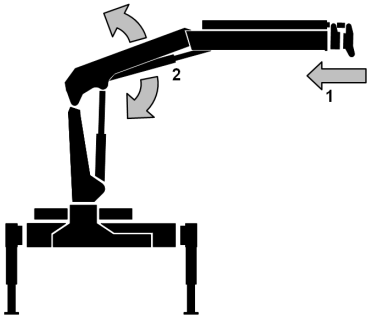
COMBINED MOVEMENTS

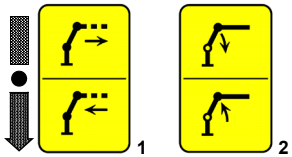
The crane controls can carry out some movements at the same time by moving two levers simultaneously. The speed of each movement decreases/increases when using two functions at the same time. In case of proportional main valve and variable displacement pump the speed of each movement is constant when using two functions at the same time.
Most attention must be paid when releasing/operating a control because the speed of the other function could increase/decrease suddenly: it is recommended to not use more than one lever at the same time.

B.7.10 CLOSING PROCEDURE

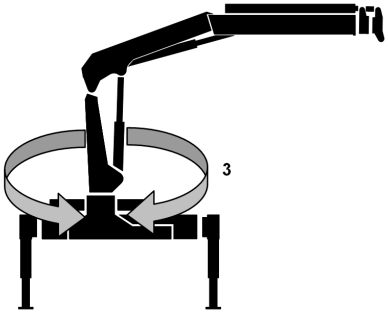
The operator should close the crane from the column side to avoid collisions with moving parts of the crane.

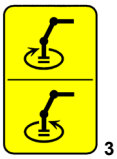
1) Close the hydraulic extensions of the crane
2) Move the 1st boom so that the 2nd boom can rotate freely.



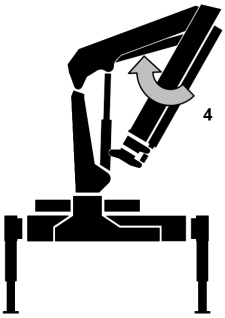


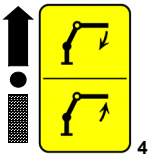
3) Rotate the crane column toward the recovery direction.



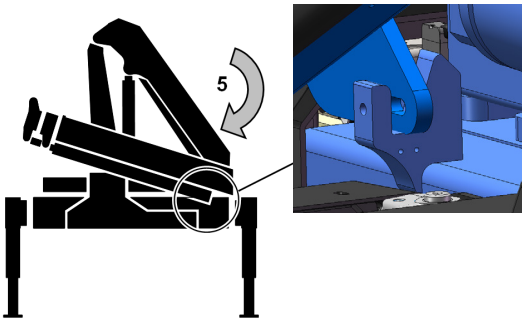


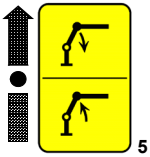
4) Close the 2nd boom completely, operating the control lever of the articulation cylinder.





5) Lower the 1st boom until the recovery locks are in their seats. Block the crane.

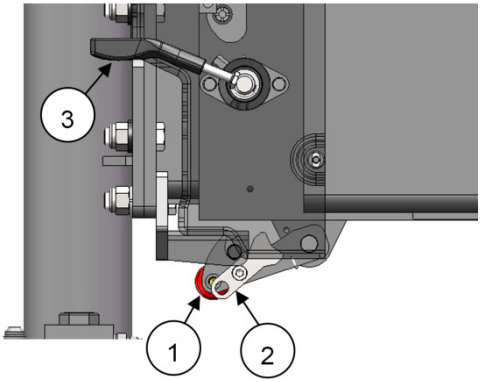




If, for transport, the crane is closed with the boom on the vehicle body, make sure that the crane cannot move.

B.7.11 HOW TO FOLD THE STABILIZERS WITH MANUALLY OPERATED EXTENSIONS

LOCKING DEVICES OF STABILIZER EXTENSIONS

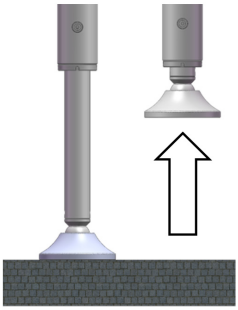


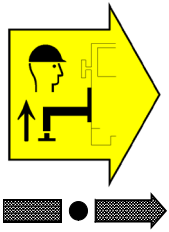
1	Automatic lock
2	Lock support
3	Semi-automatic locking device
Lever 3 up: the locking device 1 is engaged or ready to get engaged Lever 3 down: the locking device 1 in disengaged	

The stabilizers can be closed exclusively after the booms are closed in transport position. Always use the controls on the side on which you are operating the crane.

Execute the following procedure on the control valve side:

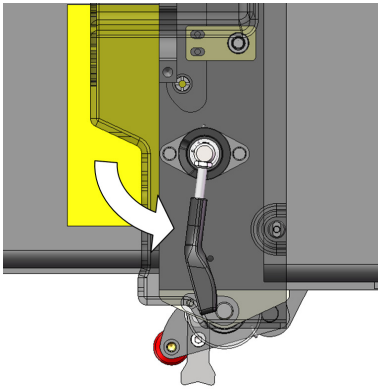
1) Retract fully the stabilizer leg.



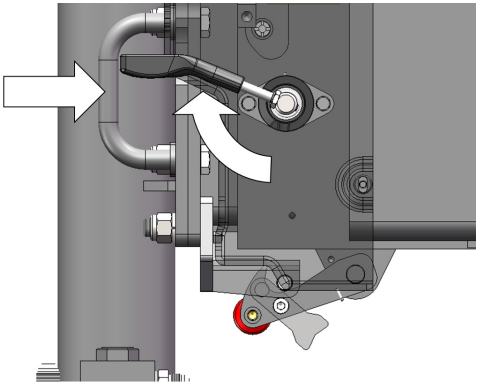


2) If the crane is fitted with turning stabilizer legs, rotate the leg up to its transport position (see B.7.13)

3) Turn the lever 3 downwards up to its vertical locking position: the locking device is disengaged.

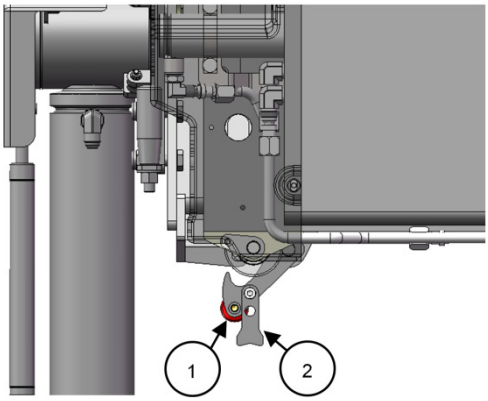


4) Retract fully the stabilizer extension. The automatic lock 1 and the locking device 3 engage automatically. Shake lightly the extension to be sure the locking device 3 is completely engaged.



B.7.12 HOW TO FOLD THE STABILIZERS WITH HYDRAULICALLY OPERATED EXTENSIONS

LOCKING DEVICE OF STABILIZER EXTENSIONS

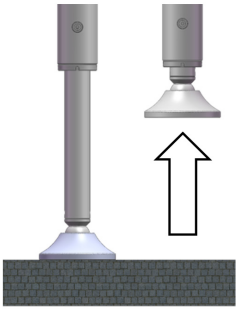


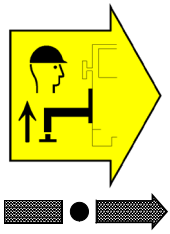
1	Automatic lock
2	Lock support

The stabilizers can be closed exclusively after the booms are closed in transport position. Always use the controls on the side on which you are operating the crane.

Execute the following procedure on the control valve side:

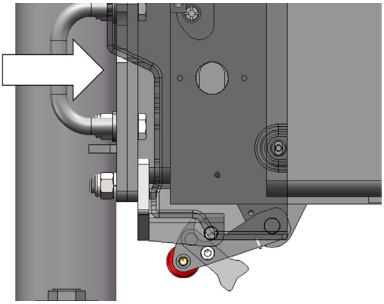
1) Retract fully the stabilizer leg.

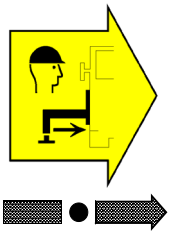




2) If the crane is fitted with turning stabilizer legs, rotate the leg up to its transport position (see B.7.13)

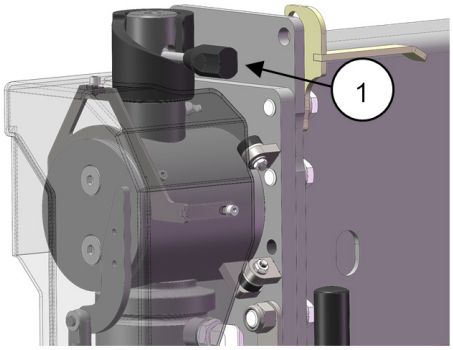
3) Retract fully the stabilizer extension. The automatic lock 1 engages automatically.





B.7.13 HOW TO ROTATE UPWARDS THE MANUAL TURNING STABILIZER LEGS

LOCKING DEVICE OF TURNING LEGS



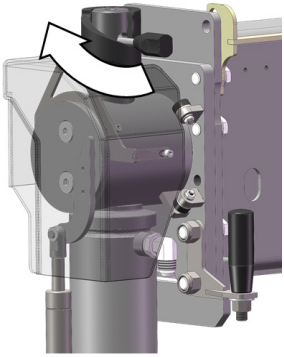
1	Locking device with lever

Lever 1 perpendicular to extension axis (down): the locking device is engaged
Lever 1 parallel to extension axis (up): the locking device is disengaged

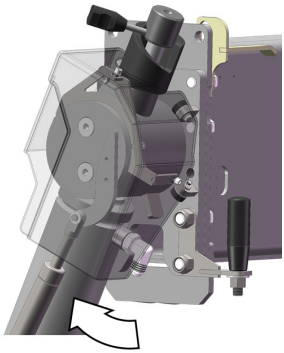
Execute the following procedure:

1) Grasp the handle and turn clockwise the lever (the locking device is disengaged). If the lever is locked, shake lightly the leg till the lever can be easily operated.

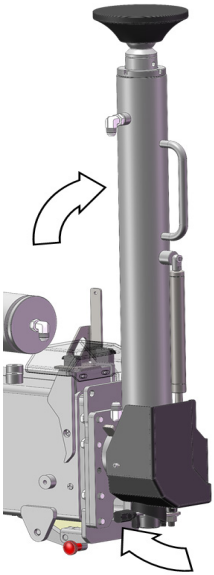




2) Rotate slightly the leg, holding the locking device 1 in disengaged state.



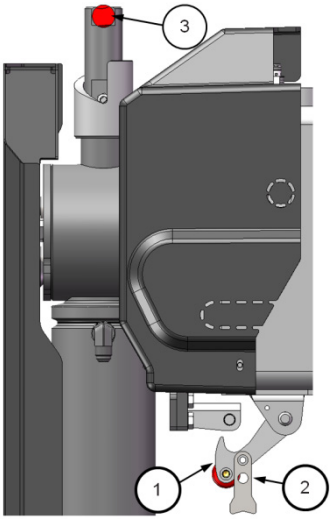
3) Then release the locking lever and rotate fully the leg upwards up to the vertical position: the locking device engages automatically (the lever turns clockwise and goes down). If the locking device doesn't engage, shake lightly the leg. Now the stabilizer leg is locked.



⚠ Before leaving the stabilizer cylinder, be sure the locking lever is fully engaged and the stabilizer leg is locked correctly.

B.7.14 HOW TO FOLD THE AUTOMATIC TURNING STABILIZERS

LOCKING DEVICES OF STABILIZER EXTENSIONS

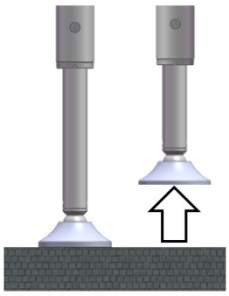


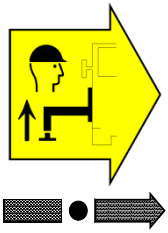
1	Automatic lock of stab. extension
2	Lock support
3	Locking device of stab. leg

The stabilizers can be closed exclusively after the booms are folded in transport position. Always use the controls on the side on which you are operating the crane.

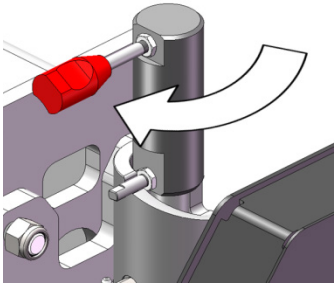
Perform the following procedure on the control valve side:

1) Lift the stabilizer leg off the ground without fully retracting the rod.

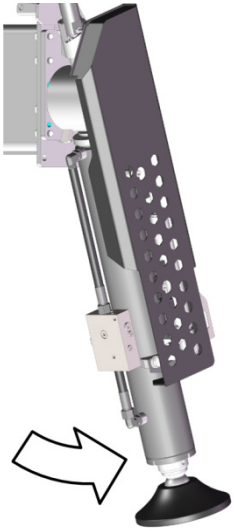


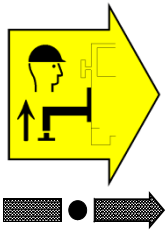


2) Unlock the pin by rotating clockwise the lever until the pin guide reaches the unlocked position (see B.5.5).

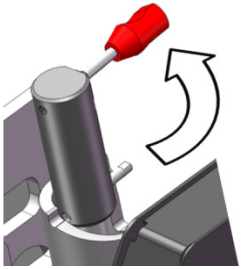


3) Operate the lever for retracting the cylinder leg: fully retract the rod and rotate slightly the leg by only a few degrees.

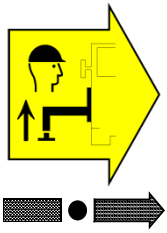


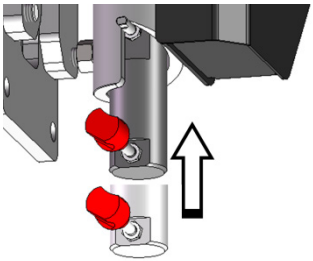


4) Then release the pin by rotating the lever clockwise completely.

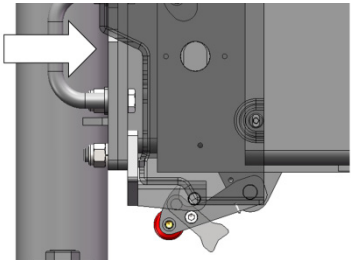


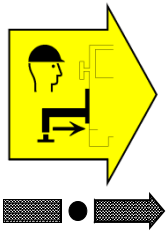
5) Fully rotate the leg upwards to the vertical position: the locking device engages automatically (the pin guide reaches the locked position). If the locking device is not engaged, shake lightly the leg until you obtain the engagement.





6) Fully retract the stabilizer extension. The automatic lock 1 engages automatically.





7) Execute the same procedure at opposite control valve side.

⚠ Before leaving the stabilizer cylinder, be sure the locking pin is fully engaged and the stabilizer leg is locked correctly.

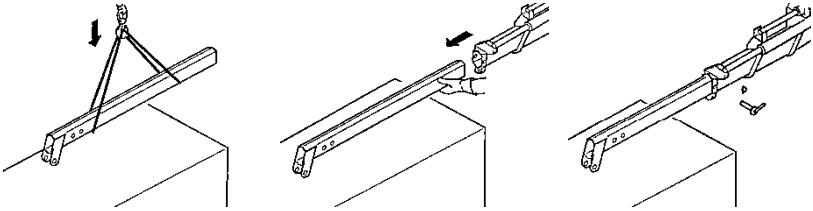
B.7.15 USE WITH MANUAL EXTENSIONS

The manual extensions can be used only with the hook to increase the crane's outreach.
The maximum capacity of each manual extension is constant (see A.14), indicated in the load chart and marked on a plate applied on the extension itself.
The manual extensions must be removed when not in use, otherwise the rated capacities shall be reduced by their weights (see D.1).
In CE area, the safe use of manual extensions is ensured by the moment limiter (see UM for RLC and 3XL/4XL).

INSTALLATION OF A MANUAL EXTENSION

The procedure for a correct installation of a manual extension is the following:

1) Put the extension onto a stable surface by means of a suitable lifting tool.
2) Slowly move the crane boom so that the extension enters it; check that the pin holes are aligned.
3) Lock the manual extension with the pin and secure with the safety lock.

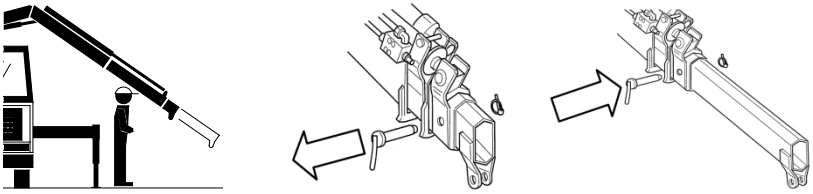


1 2 3

EXTRACTION OF A MANUAL EXTENSION

If a manual extension has to be extracted from the crane boom, operate as follows:

1) Position the crane with the boom directed towards the ground:
2) Remove the safety lock and the lock pin.
3) Extract the extension until the pin holes are aligned; insert the lock pin and secure with the safety lock.

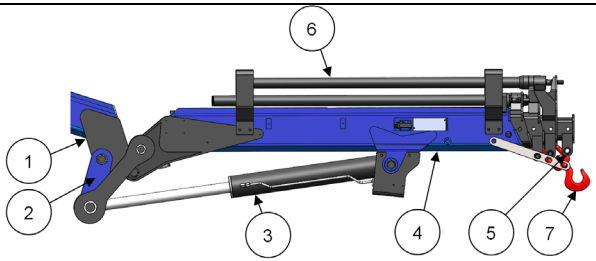


1 2 3

B.7.16 USE WITH JIB

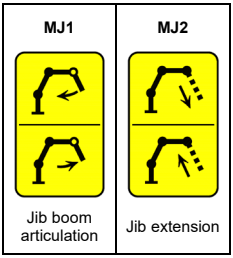
The jib is an optional accessory which does not modify the intended use of the crane on which it is fitted. A list of the main jib components is given below:

MAIN COMPONENTS



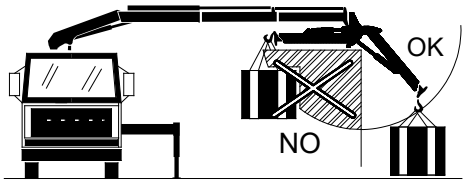
1	Jib attachment
2	Jib connecting rods
3	Jib articulation cylinder
4	Jib boom
5	Jib hydraulic extensions
6	Jib extension cylinders
7	Jib hook

JIB CONTROLS



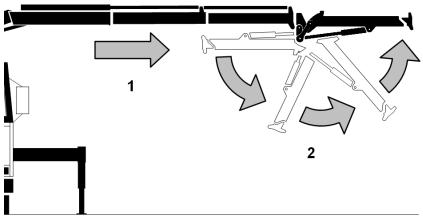
WORKING RANGE

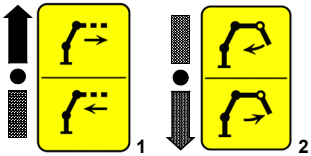
The jib must not lift loads secured to the hook if the boom is closed beyond the vertical.



If loads greater than the jib max. capacity have to be lifted, it is necessary to remove the jib boom and work with the basic crane.

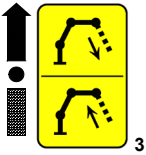
UNFOLDING PROCEDURE
1) After having fully extended the extensions of basic crane, rotate the jib boom (2).





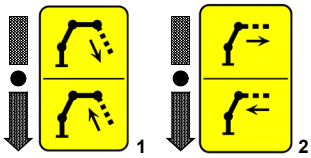
3) Extend hydraulic jib extensions until the hook reach the vertical line of the load to be lifted.



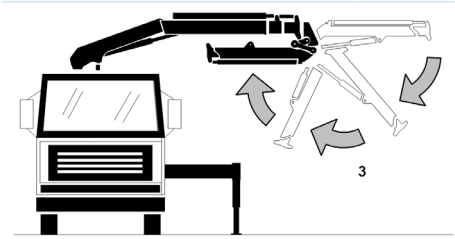


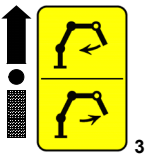
FOLDING PROCEDURE
1) Fully retract the jib extensions, then retract the basic crane extensions (2).





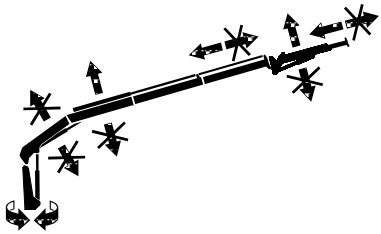
3) Fold completely the jib boom.



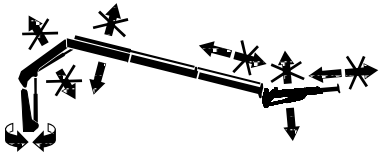


MOMENT LIMITER FOR JIB
It constantly detects the pressures in the 1st boom cylinder and in the jib articulaton cylinder.
When a overload condition is reached, the crane movements are blocked according to the figure below.

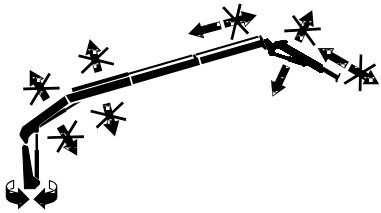
Maximum setting pressure reached in the 1st boom cylinder



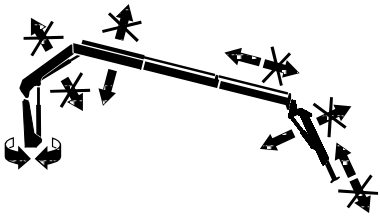
2.boom and jib over the horizontal



2.boom under the horizontal and jib over the horizontal



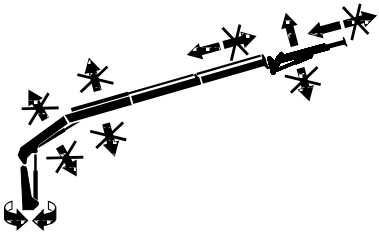
2.boom over the horizontal and jib under the horizontal



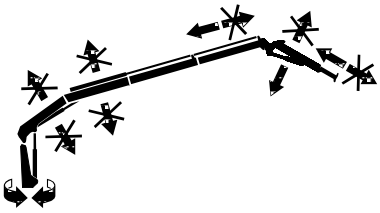
2.boom and jib under the horizontal

If the crane is not radio controlled, all movements are blocked except retraction of hydraulic extensions and crane slewing.

Maximum setting pressure reached in the jib articulation cylinder



Jib over the horizontal

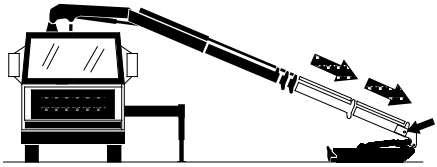


Jib under the horizontal

It could happen that retraction of the extensions of basic crane is not sufficient to reset normal crane functioning. In this case the jib extensions have to be retracted as indicated in figure.
If the crane is not radio controlled, all movements are blocked except retraction of hydraulic extensions and crane slewing.

HOW TO ASSEMBLE THE JIB

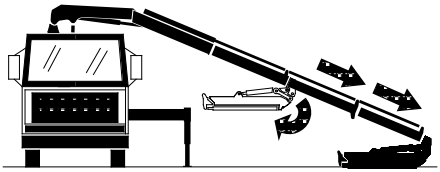
1) Let align the boom extensions of the basic crane towards the jib attachment.
2) Slowly open the basis crane extensions until the pin holes are aligned (see figure).



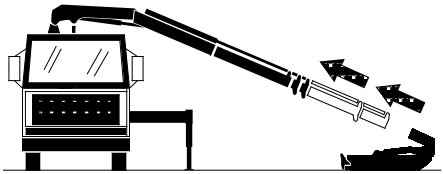
3) Insert the locking pin and the split pin.
4) Connect all fittings and quick couplings to the respective colour in order to avoid a dangerous inversion of the power circuit lines.

HOW TO REMOVE THE JIB

1) Let position the jib boom with all extensions retracted parallel to the loading floor.
2) Open the extensions of the basis crane until the back of the jib is resting on the loading floor. Do NOT push jib to make easier the extraction of the locking pin.



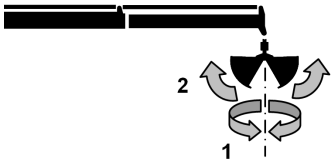
3) Pull the coupling sleeve to disconnect the quick couplings.
4) Disconnect the electric connectors.
5) Remove the split pin and the pin of the jib attachment.
6) Retract the extensions of basis crane up to the complete extraction of the jib attachment.

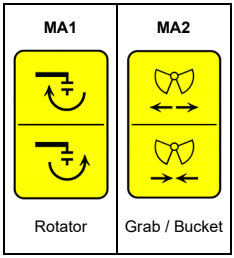


B.7.17 USE WITH BUCKET-GRAB

The bucket can only be operated when the crane opening procedure is complete.
The control is used to open and close the bucket thus allowing to lift and release the load.
The bucket is often secured to a hydraulic rotor that allows to rotate on its own axis. There is a separate control for this.

CONTROLS





CONDITIONS FOR SAFE USE

Use of the equipment is forbidden before the crane is declared conform to the Machinery Directive.
The bucket-grab shall be connected to the last hydraulic extension with a special attachment and/or with a rotator according to essential safety requirements.

⚠ If the crane is equipped with an additional lifting tool intended to push to the ground (bucket-grab-drill), the rated capacities are not derated but the stress history class becomes irreversibly S1 (see B.2), even if the equipment is removed later on.

For further information see D.17 and refer to the User Manual for the tool.

B.7.18 COMPULSORY CHECKS BEFORE LEAVING THE WORK PLACE

Before leaving the work place check that:
- control panel of the crane is not powered.
- power take-off is disengaged.
- (for cranes with stabilizers) the stabilizers legs are fully retracted and all stabilizer extensions are blocked with the stabilizer lock devices.
- crane is placed in transport position and there are no crane components or accessories protruding outside the profile of the vehicle.
- (for CE cranes with stabilizers) the warning LED light in cab is green (see B.6.5).

B.8 USE UNDER SPECIAL SERVICE CONDITIONS

Exceptionally, the crane can be operated even if the service conditions are not met, i.e when:
- the stabilizers feet are deployed on a soft surface
- the crane is operated in low-temperature environments
- the inclination angle of the crane's base exceeds the max. permitted value
- the crane is operated in-service wind

In these events the entity of the unfavourable condition shall be estimated by skilled technicians.
If more conditions should be present at the same time, all the respective derating factors shall be taken into account.

B.8.1 STABILIZERS ON SOFT SURFACE

It could happen that the stabilizers must be deployed on a soft or unstable surface. In this event, if the user has not suitable support pads at disposal, a derating factor shall be applied to the max. working pressure, as follows:

$$p_r = \kappa_s \cdot p_{max} \qquad \text{with} \qquad \kappa_s = \frac{p_{sur}}{p_{stab}}$$

where:
κ_s is the derating factor to apply if the support surface has insufficient bearing capacity
p_r is the reduced pressure
p_{max} is the max. working pressure under standard conditions
p_{sur} is the effective bearing capacity of the surface supporting the stabilizers
p_{stab} is the max. stabilizer pressure on the ground (see D.1)

The following table shows typical values of bearing capacity (p_{sur}) for different soil types: these values are only indicative and can change depending on material, humidity, granulometry, hardness, inclination and other soil properties and conditions.

 SOIL TYPE	BEARING CAPACITY MPa
Natural, clearly virgin soils (mud, peat, marsh soil)	0
Fill soil, not compacted	0.0 ÷ 0.1
Not coherent, but compact soils (fine and medium sand)	0.15
Coarse sand and gravel	0.20
Coherent soils:	
- doughy	0
- soft	0.04
- rigid	0.1
- half-solid	0.2
- solid	0.4
- rock	1.5
- solid rock	3.0

B.8.2 LOW-TEMPERATURE ENVIRONMENTS

The crane is designed to withstand the maximum stresses when the environmental temperature is within the range given in B.3.3. When the environmental temperature is below the allowable range, then a derating factor shall be applied to the max. working pressure, as follows:

$p_r = \kappa_T \cdot p_{max}$

where:
κ_T is the derating factor to apply when working in low-temperatures environments
p_r is the reduced pressure
p_{max} is the max. working pressure under standard conditions

The table below shows the value of κ_T as the environmental temperature changes.

Environmental temperature (°C)	Derating factor κ_T
$-20 \leq T_{env} < -10$	0.75
$-30 \leq T_{env} < -20$	0.50
$-40 \leq T_{env} < -30$	0.25

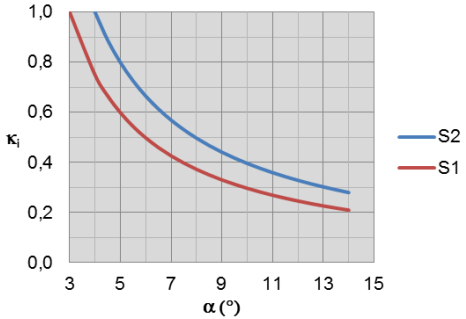
B.8.3 HIGH BASE INCLINATION

The crane can slew freely and safely the rated loads when the base inclination is below the max. permitted value given in B.3.3 and D.1. If the base inclination is higher than the maximum permitted, then a derating factor shall be applied to the max. working pressure, as follows:

$p_r = \kappa_i \cdot p_{max}$

where:
κ_i is the derating factor to apply if the base inclination is higher than the maximum permitted
p_r is the reduced pressure
p_{max} is the max. working pressure under standard conditions

The graphic below shows the trend of κ_i as the inclination changes, for history classes S2 and S1 (see B.2).



B.8.4 IN-SERVICE WIND

The crane is designed to withstand occasionals loads due to the wind effects.
According to EN 13001-2, the crane can be safely operated under the following wind state:

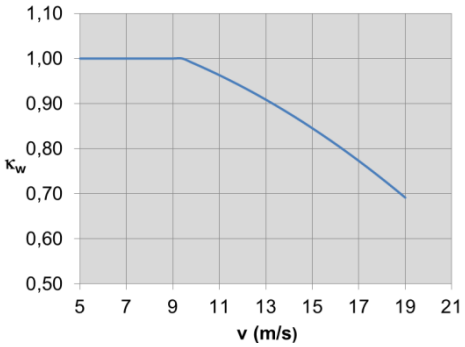
- Wind state: Light
- Max. mean wind speed: v = 9.4 m/s (34 km/h, 5 Beaufort)

If the wind speed should exceed the limit above, then a derating factor shall be applied to the max. working pressure, as follows:

$p_r = \kappa_w \cdot p_{max}$

where:
κ_w is the derating factor to apply at mean wind speed of over 9.4 m/s
p_r is the reduced pressure
p_{max} is the max. working pressure under standard conditions

The graphic below shows the trend of κ_w as the wind speed (v) changes.



It is recommended to not operate the crane when the wind speed exceeds 18.9 m/s (68 km/h, 8 Beaufort).

The table below shows the derating factors for normal and heavy wind state:

Wind state	v (m/s)	Derating factor κ_w
Light	9.4 (5 Beaufort)	1.00
Normal	13.3 (6 Beaufort)	0.90
Heavy	18.9 (8 Beaufort)	0.70

The following table shows the Beafort scale and its wind speed ranges.

BEAUFORT SCALE

Wind	Symbol	Wind speed		Beaufort force	Effect
		m/s	km/h		
Calm		0 - 0.2	0 - 1	0	Smoke rises vertically
Light air		0.3 - 1.5	1 - 5	1	Smoke drifts slightly
Light breeze		1.6 - 3.3	6 - 11	2	Leaves rustle Wind vane moves
Gentle breeze		3.4 - 5.4	12 - 19	3	Leaves-constant motion Light flag extended
Moderate breeze		5.5 - 7.9	20 - 28	4	Raises dust and papers Small branches stir
Fresh breeze		8.0 - 10.7	29 - 38	5	Small trees sway
Strong breeze		10.8 - 13.8	39 - 49	6	Large branches move Use of umbrella difficult
Moderate gale		13.9 - 17.1	50 - 61	7	Whole trees in motion
Fresh gale		17.2 - 20.7	62 - 74	8	Twigs broken off trees Difficult to drive a car
Strong gale		20.8 - 24.4	75 - 88	9	Slight structure damage occurs
Whole gale		24.5 - 28.4	89 - 102	10	Trees uprooted Severe structural damage

The following table shows the Beafort scale and its wind speed ranges.

BEAUFORT SCALE

Wind	Symbol	Wind speed m/s	Wind speed km/h	Beaufort force	Effect
Calm		0 - 0.2	0 - 1	0	Smoke rises vertically
Light air		0.3 - 1.5	1 - 5	1	Smoke drifts slightly
Light breeze		1.6 - 3.3	6 - 11	2	Leaves rustle Wind vane moves
Gentle breeze		3.4 - 5.4	12 - 19	3	Leaves-constant motion Light flag extended
Moderate breeze		5.5 - 7.9	20 - 28	4	Raises dust and papers Small branches stir
Fresh breeze		8.0 - 10.7	29 - 38	5	Small trees sway
Strong breeze		10.8 - 13.8	39 - 49	6	Large branches move Use of umbrella difficult
Moderate gale		13.9 - 17.1	50 - 61	7	Whole trees in motion
Fresh gale		17.2 - 20.7	62 - 74	8	Twigs broken off trees Difficult to drive a car
Strong gale		20.8 - 24.4	75 - 88	9	Slight structure damage occurs
Whole gale		24.5 - 28.4	89 - 102	10	Trees uprooted Severe structural damage

C MAINTENANCE

C.1 WARRANTY TERMS

The manufacturer declines all responsibility for damage to the crane caused by failed maintenance or lubrication. Preventive routine maintenance refers to machine use in non-abrasive and non-corrosive environments. Failure to abide by this stipulation shall result in all guarantees for faults being declared null and void.

All repairs, modifications and maintenance (excluding routine) must be performed by an authorised assistance centre. All repair reports drafted by authorised assistance centres following routine and extraordinary maintenance must be recorded and archived by the owner of the crane.

C.2 ORDINARY MAINTENANCE

The following routine maintenance shall be performed by the operator to ensure machine efficiency:
- greasing
- filling up the oil tank
- crane cleaning
- wire rope inspection (if present)

Check the following before performing any maintenance operation:
- The vehicle must be switched OFF and the brake applied
- The power supply to the crane must be switched OFF

C.2.1 GREASING

Grease the machine at regular intervals to improve crane functioning and avoid unnecessary extraordinary maintenance. Greasing occurs in two different ways:
- manual
- under pressure

MANUAL GREASING

Remove grease from telescopic extensions using a soft spatula (plastic or wood). Use a brush to spread a new layer of grease on the contact surface.
Use a type of grease compatible with that indicated in the following table.

Recommended grease (NLGI 0 - DIN 51818)

TOTAL
CERAN CA

PRESSURE GREASING

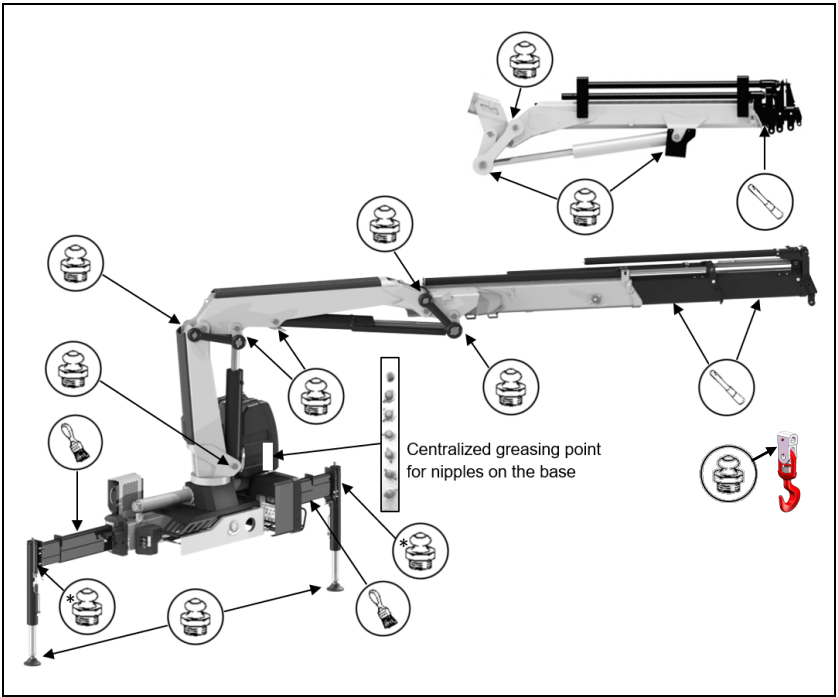
Carefully clean the grease nipple. Insert new grease until the grease is coming out of the joints to ensure that all the old grease is replaced by new grease. Carefully remove any excess grease.
Use a type of grease compatible with that indicated in the following table.

Recommended greases (NLGI 2 - DIN 51818)

TOTAL	MOBIL	ESSO	AGIP	IP
MULTIS EP2	MOBIL GREASE MP	BEACON EP2	GR MU EP2	ATHESIA EP2

Do NOT use greases containing Molybdenum Disulfide.

GREASING CHART



	Manual greasing of boom extensions' sliding surfaces Frequency of greasing: 200 working hours / 180 days
	Manual greasing of stabilizer extensions' sliding surfaces Frequency of greasing: 100 working hours / 90 days
	Greasing under pressure of nipples Frequency of greasing: 50 working hours / 40 days (*) Greasing points in case of turning stabilizers only

⚠ Not all greasing points can be reached from the ground. Therefore, get a ladder or another suitable means. Do not climb on the crane.

C.2.2 FILLING UP THE OIL TANK

Before using the crane, check the oil level in the tank: the level with horizontal crane at rest, must always be between the minimum and maximum level. If the level is under the minimum, fill up the tank. The oil contamination level must be lower than the indicated value, or else we suggest a prefiltering with efficiency $ß_{6\text{-}10(c)} \geq 75$ (ISO 16889).

FILLING UP THE TANK

1) Take the crane to in rest and horizontal position, switch off.
2) Check that the oil temperature is low enough to prevent burns from contact with oil tank.
3) Unscrew the oil filling plug located at the top of the tank.
4) Fill the tank up to the max. level indicated with suitable oil.
5) On completing the operation check that the plug is perfectly closed.

Recommended hydraulic oils

Environmental Temperature	Viscosity grade (ISO 3448)	Min. Viscosity index (ISO 2909)	Cleanliness level (ISO 4406)	Recommended oils
-10°C ÷ 10°C	VG 32	98	18/16/13	**BIOHYDRAULIC TMP FR 32** **AGIP OSO 32** **ESSO NUTO H 32** **IP HYDRUS 32** **TOTAL AZOLLA ZS 32**
10°C ÷ 35°C	VG 46	98	18/16/13	**BIOHYDRAULIC TMP FR 46** **AGIP OSO 46** **ESSO NUTO H 46** **IP HYDRUS 46** **TOTAL AZOLLA ZS 46**
35°C ÷ 40°C	VG 68	98	18/16/13	**BIOHYDRAULIC TMP FR 68** **AGIP OSO 68** **ESSO NUTO H 68** **IP HYDRUS 68** **TOTAL AZOLLA ZS 68**

See E.5 for more information about oil selection.

C.2.3 CLEANING THE CRANE

In order to protect the corrosion-resistant layers of the machine, do NOT use cleaning agents under pressure with a temperature higher than 60°C. Use always biodegradable cleaning agents.
To avoid oxidation of chrome-plated parts, only use PH neutral cleaning agents.
In any case it is forbidden to direct pressurized jets close to the electric components.



C.2.4 SPECIAL PRECAUTIONS FOR CHROME-PLATED SURFACES

If the crane is exposed to corrosive, abrasive or chemical substances, precautions should be taken to protect the chrome-plated surfaces concerned. Particular attention must be paid when the crane boom is stowed on the truck body as transport position and the cylinder rods come into contact with salt water, sand or abrasive dust: in this case it is recommended to keep clean and protect all rods concerned with a proper biodegradable lubricant (see table below).

Recommended lubricant

INTERFLON
FIN LUBE EP PLUS

C.3 PLANNED AND EXTRAORDINARY MAINTENANCE

The owner of the crane is responsible for contacting an authorised assistance centre to perform the following maintenance activities:

- planned maintenance
- maintenance after inactivity
- extraordinary maintenance

All maintenance activities are scheduled and must be registered in the Maintenance Record: the maintenance schedule must be signed by the authorised assistance centre.

C.4 TAKING THE CRANE OUT OF SERVICE

At the end of its working life or for other reasons, it may be necessary to take the crane out of service. You must contact an authorised assistance centre to put the crane out of service.

C.4.1 DISASSEMBLY

Follow this procedure in case of disassembly of a crane:

1) Prepare a site suitable for disassembly and a lifting device with proper load capacity.
2) After positioning the vehicle and applying the parking brake, fold the crane into transport position.
3) Disconnect the electrical connections from the electrical system of vehicle.
4) Disconnect the hydraulic connections to pump and tank. Beware of escaping oil.
5) Connect the crane to a lifting device, remove the crane mounting bolts.
6) Lift the crane and place it in a flat and stable position on the ground.
7) Remove pump, PTO and cardan shaft and replace the original covers on the gearbox take-off of the vehicle.
8) Protect all disassembled crane parts from atmospheric agents.

All disassembled elements (plastics, batteries, hydraulic oil, hoses, etc.) must be collected and eventually disposed of in compliance with legislative requirements.

C.4.2 STORAGE

The crane must be stored with the following precautions:
- Close the crane in transport position, on a flat and stable ground.
- Cut off the hydraulic and electric circuits.
- Secure the crane properly in order to avoid falls due to accidental impacts.
- Carry out all precautions in order to avoid leakage of polluting materials and substances of the crane (oil, grease, plastic, hoses, etc.)
- Protect the crane from atmospheric agents (water, humidity, marine environment, etc.) with suitable package.

C.4.3 DISPOSAL

The crane and all components must be disposed of by an authorised waste management company in accordance with current legislation. Verify that all components cannot be re-used.

D TECHNICAL SHEET



D.1 CRANE'S TECHNICAL DATA

Versions				2S	3S	4S	5S	6S	3SJ3	4SJ3	5SJ2
Max. net lifting moment			*t m* *kNm*	19.8 194	18.7 184	18.2 178	17.6 173	17.2 169	15.0 147	14.9 146	9.1 89
Max. dynamic moment			*daNm* *kNm*	24960 249.6					24690 246.9		24590 245.9
Capacity at min. hydraulic outreach Max rated capacity	hook [S2]		*kg*	4555	4310	4100	3900	3745	2050	2035	1000
	grab [S1]		*kg*	4555	4310	4100	3900	3745	N/A	N/A	N/A
	min.outreach		*m*	4.35	4.35	4.43	4.51	4.60	7.35	7.35	7.20
Capacity at max. hydraulic outreach	hook [S2]		*kg*	2325	1670	1255	945	730	465	410	380
	grab [S1]		*kg*	2325	1670	1255	945	730	N/A	N/A	N/A
	max.outreach		*m*	8.29	10.36	12.51	14.72	17.01	18.56	20.11	20.27
Capacity of 1st man. extension	capacity		*kg*	N/A	1115	940	725	600	390	355	275
	max.outreach		*m*	N/A	12.51	14.72	17.01	19.11	20.43	21.77	21.83
Max. load height above the base for the last extension	hydraulic		*m*	10.6	12.7	14.8	17.0	19.3	20.9	22.4	22.6
	manual		*m*	N/A	19.3	21.4	21.4	21.4	24.6	25.8	24.1
Weight of crane without stabilizers			*kg*	2210	2360	2510	2630	2725	3020	3000	2905
Weight of stabilizers		ST-M	*kg*	265							
		EX-H	*kg*	370							
		SE-H	*kg*	500							
Weight of 1st man. extension			*kg*	N/A	90	67	48	41	35	30	22
Max. working pressure			*bar*	320		310			N/A		N/A
Max. oil flow rate			*ℓ/min*	45							
			ℓ/min	70							
Max. power needed			*kW*	31.2		30.2			N/A		N/A
			kW	48.5		47.0			N/A		N/A
Oil tank capacity			*ℓ*	130							
Slewing angle			°	415°							
Gross slewing torque			*daNm* *kNm*	2600 26.0					N/A		N/A
Max. base inclination			°	4°					3°		
			°	3°					N/A		
Max boom inclination for use with CE winch			°	75°							
Max. stabilizer force on the ground with stabilizers fully extended		ST	*daN*	10950					10830		10785
		EX	*daN*	9600					9500		9460
		SE	*daN*	7015					6935		6910
Max. stabilizer pressure on the ground with stabilizers fully extended		ST	*MPa*	2.88					2.85		2.84
		EX	*MPa*	2.53					2.50		2.49
		SE	*MPa*	1.84					1.82		1.82
Lifting coversion factor, k			*kgm/bar*	75.66							
Distribution factor of dyn. moment on base, β			-	0.70							
Position of standard dead point (see D.6)											

D.2 WINCH SETTINGS

TI1 - SINGLE LINE PULL

Versions	2S	3S	4S	5S	6S	3SJ3	4SJ3	5SJ2
Max line pull *kg*	N/A	N/A	N/A	N/A	N/A	1000	1000	900
Start angle - pull% Final angle - pull%	-	-	-		-	-	-	-

TI2 - SINGLE LINE PULL

Versions	2S	3S	4S	5S	6S	3SJ3	4SJ3	5SJ2
Max line pull *kg*	2000	2000	2000	2000 (*)	2000 (*)	N/A	N/A	N/A
Start angle - pull% Final angle - pull%	-	-	-	60°-89% 75°-85%	51°-59% 75°-53%	-	-	-

N/A: configuration not available
(*): configuration requiring pull derating: available only for CE/TOP cranes (PCS)
Pull%: pull derating percentage

When the crane is equipped with winch, the max. working pressure and the limiter setting pressure are increased by 10 bar with respect to the standard ones.

D.3 TOTAL WEIGHTS

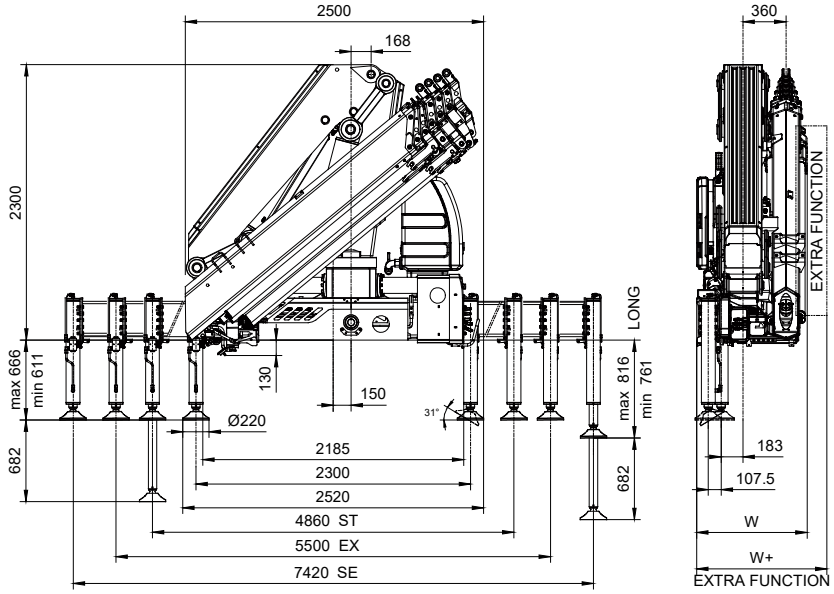
The table shows the total weights including oil inside the cylinders (fully retracted) and considering oil tank empty.

kg	Crane version							
Type of stabilizers	**2S**	**3S**	**4S**	**5S**	**6S**	**3SJ3**	**4SJ3**	**5SJ2**
ST-M	2475	2625	2775	2895	2990	3285	3265	3170
EX-H	2580	2730	2880	3000	3095	3390	3370	3275
SE-H	2710	2860	3010	3130	3225	3520	3500	3405

The weights may vary by ± 3%
Additional weight for TI1 winch: 95 kg
Additional weight for TI2 winch: 150 kg
Additional weight of 1st extra function activated with slides: 8 kg pro hydraulic extension
Additional weight of 2nd extra function activated with slides: 2 kg pro hydraulic extension
Additional weight of 1st extra function activated with hose reel: 20 kg
Additional weight of 2nd extra function activated with hose reel: 10 kg

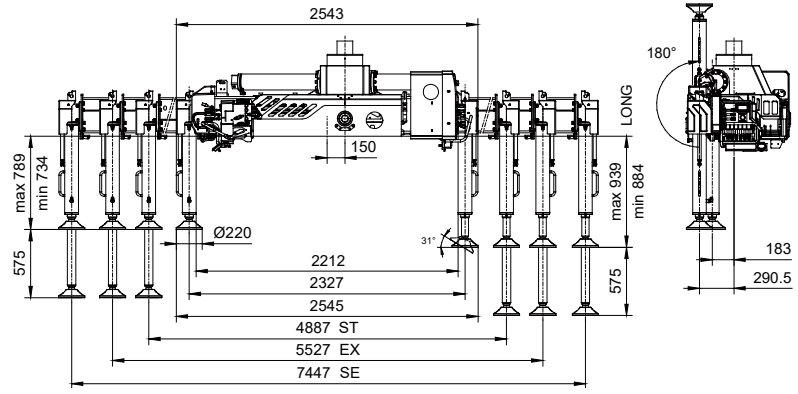
D.4 OVERALL DIMENSIONS

FIXED STABILIZERS LEGS



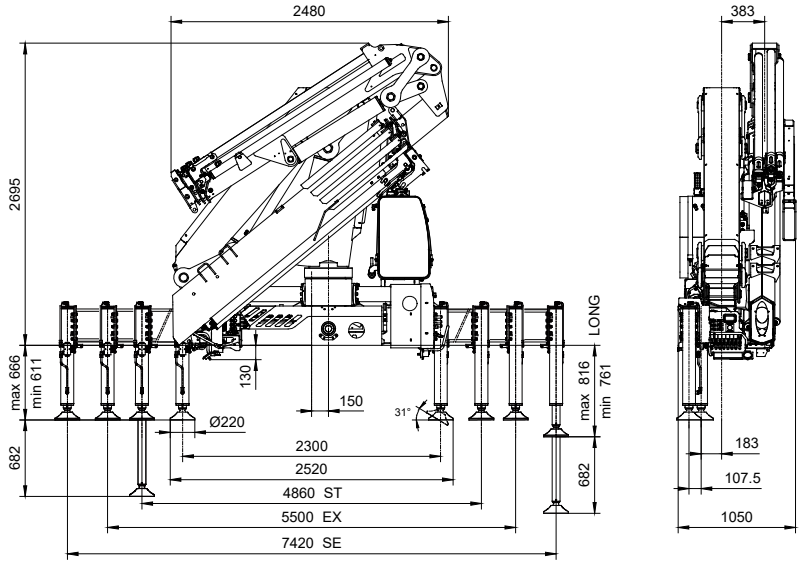
		2S	3S	4S	5S	6S
W (mm)		930	930	930	930	930
W+ (mm)	slides	1050	1050	1050	1050	1050
	hose reel	N/A	N/A	N/A	1120	1120

TURNING STABILIZERS LEGS

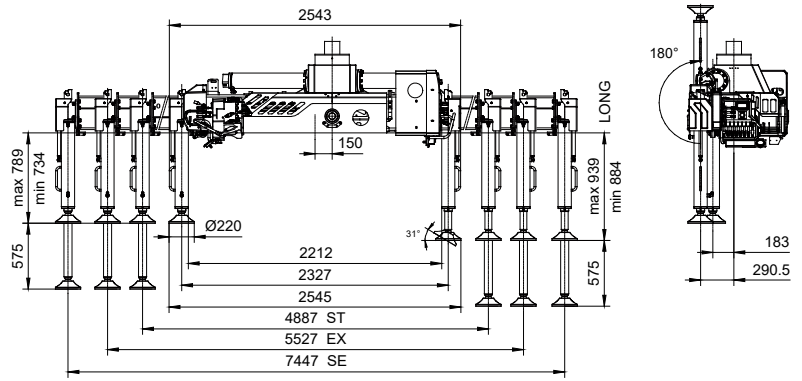


OVERALL DIMENSIONS
3SJ3

FIXED STABILIZERS LEGS

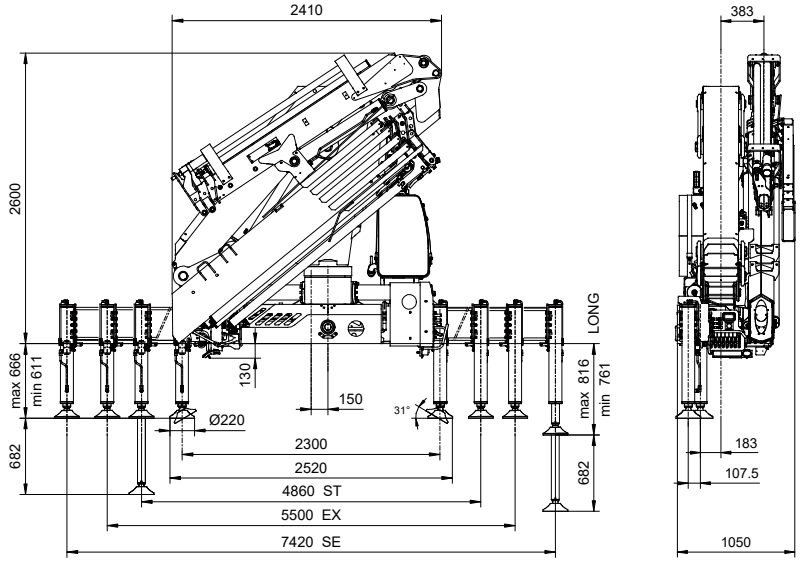


TURNING STABILIZERS LEGS

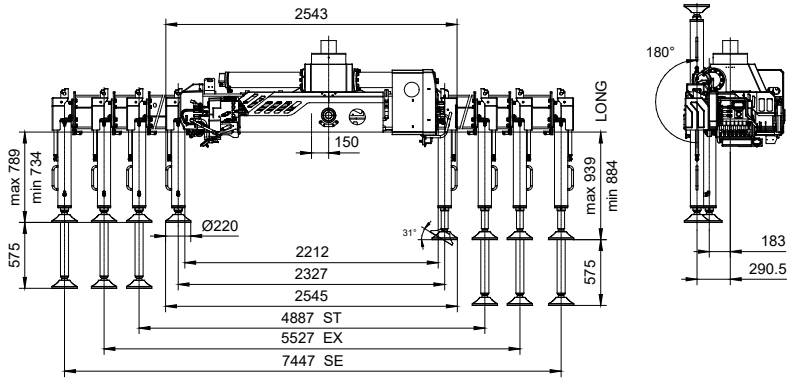


OVERALL DIMENSIONS
4SJ3

FIXED STABILIZERS LEGS

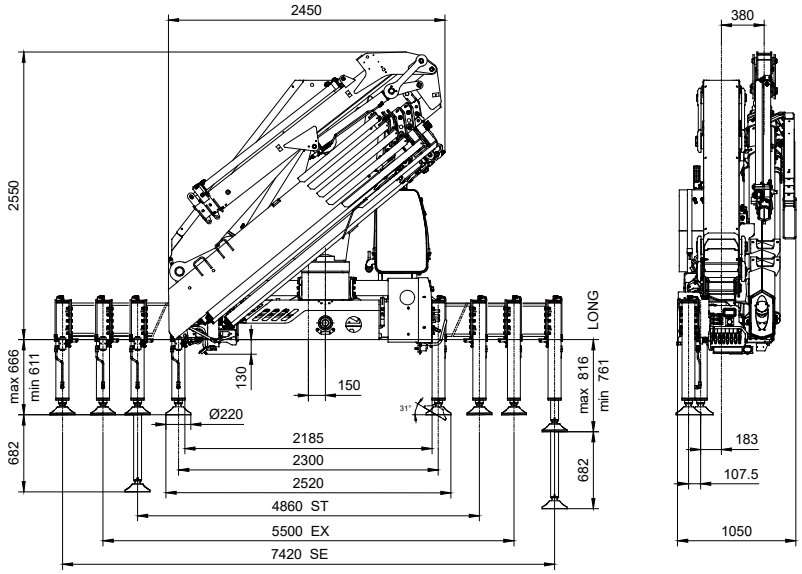


TURNING STABILIZERS LEGS

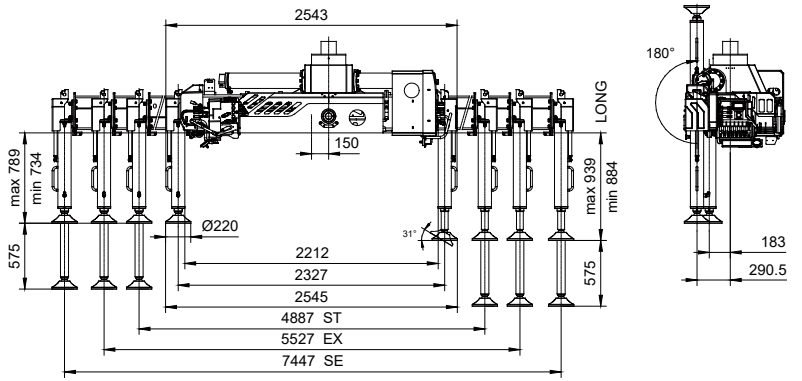


OVERALL DIMENSIONS
5SJ2

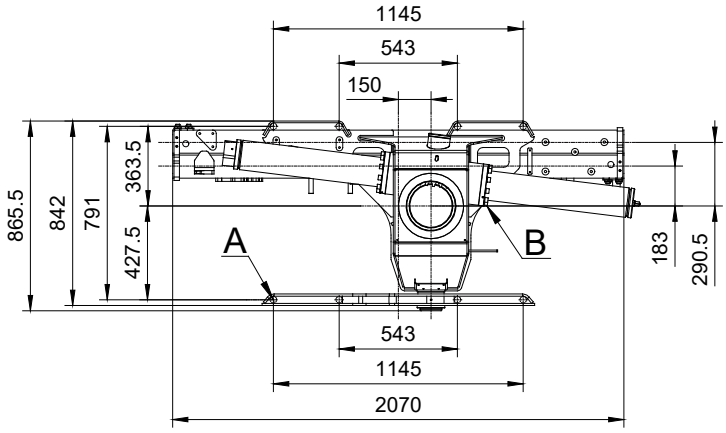
FIXED STABILIZERS LEGS



TURNING STABILIZERS LEGS



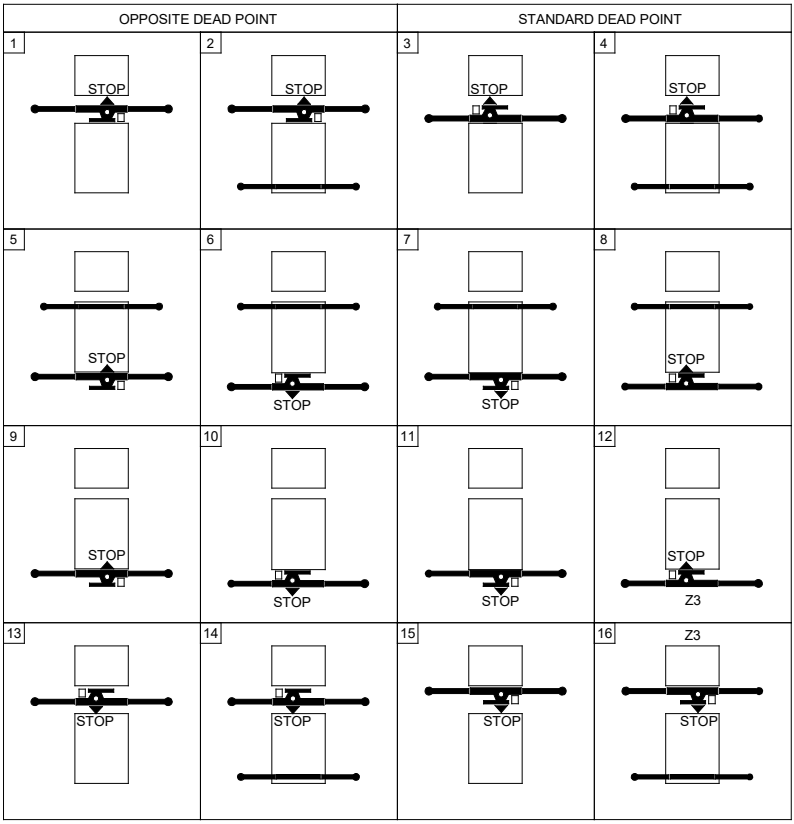
D.5 BASE DIMENSIONS AND MOUNTING BOLTS



Ref.	Description	Q.ty	Material Grade	Size (Q.ty)	Tightening torque
A	Kit with 8 crane mounting bolts	8	42CrMo4+QT EN 10083-3	M24x2 L=1100 (4) L=1015 (4)	400 Nm
	Kit with 4 crane mounting bolts	4	42CrMo4+QT EN 10083-3	M30x2 L=1000 (2) L=1100 (2)	700 Nm
B	Fixing bolts for each slewing cylinder	10	8.8	M14x2 L=75	80 Nm

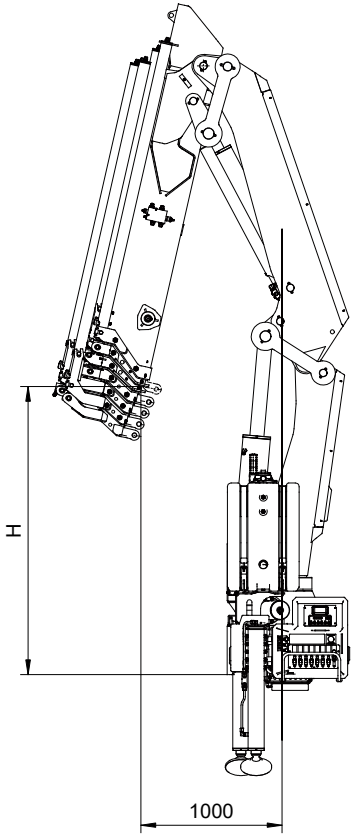
D.6 INSTALLATION TYPE NUMBER

Installation types numbers (ITN) for cranes with standard dead point (STOP) toward swivel bridge.



Legend:
▲ : position of dead point (STOP)
□ : position of main manual controls (on column side)

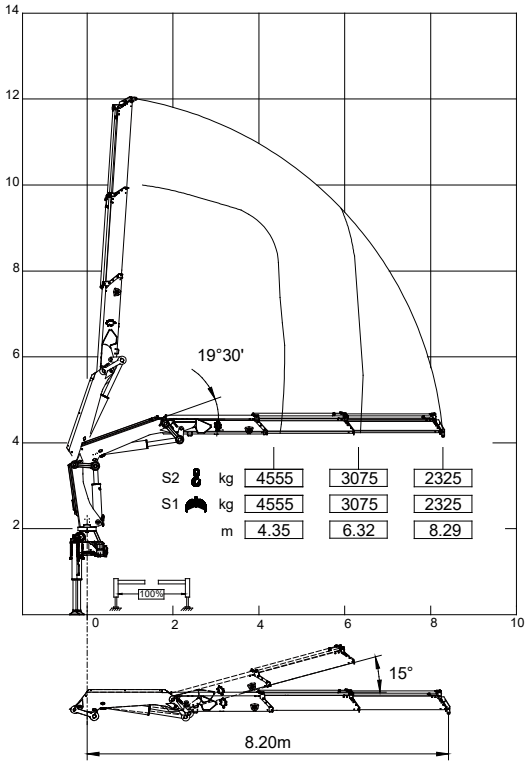
D.7 LIFTING HEIGHT CLOSE TO THE COLUMN



Version	H mm
2S	2189
3S	1946
4S	1861
5S	1777
6S	1700

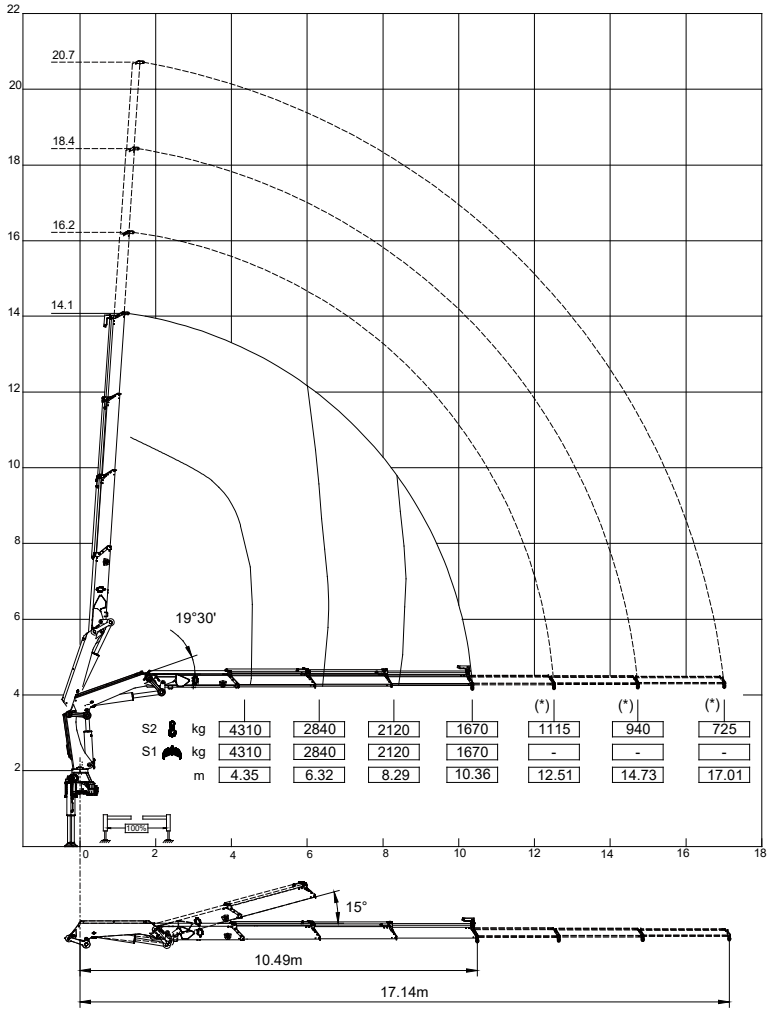
D.8 LOAD CHARTS FOR USE WITH HOOK/TOOL

921NG 2S



If an additional lifting tool is mounted, the rated capacities shall be reduced by the tool's weight

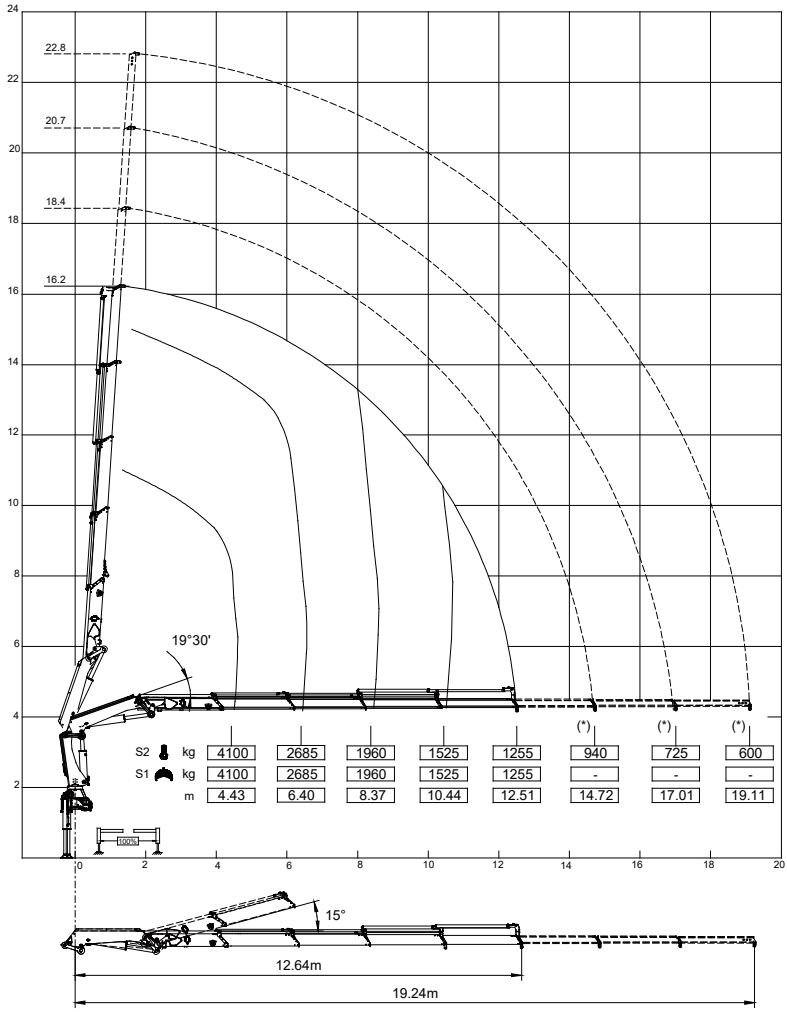
LOAD CHART FOR USE WITH HOOK/TOOL
921NG 3S



						(*)	(*)	(*)
S2	kg	4310	2840	2120	1670	1115	940	725
S1	kg	4310	2840	2120	1670	-	-	-
	m	4.35	6.32	8.29	10.36	12.51	14.73	17.01

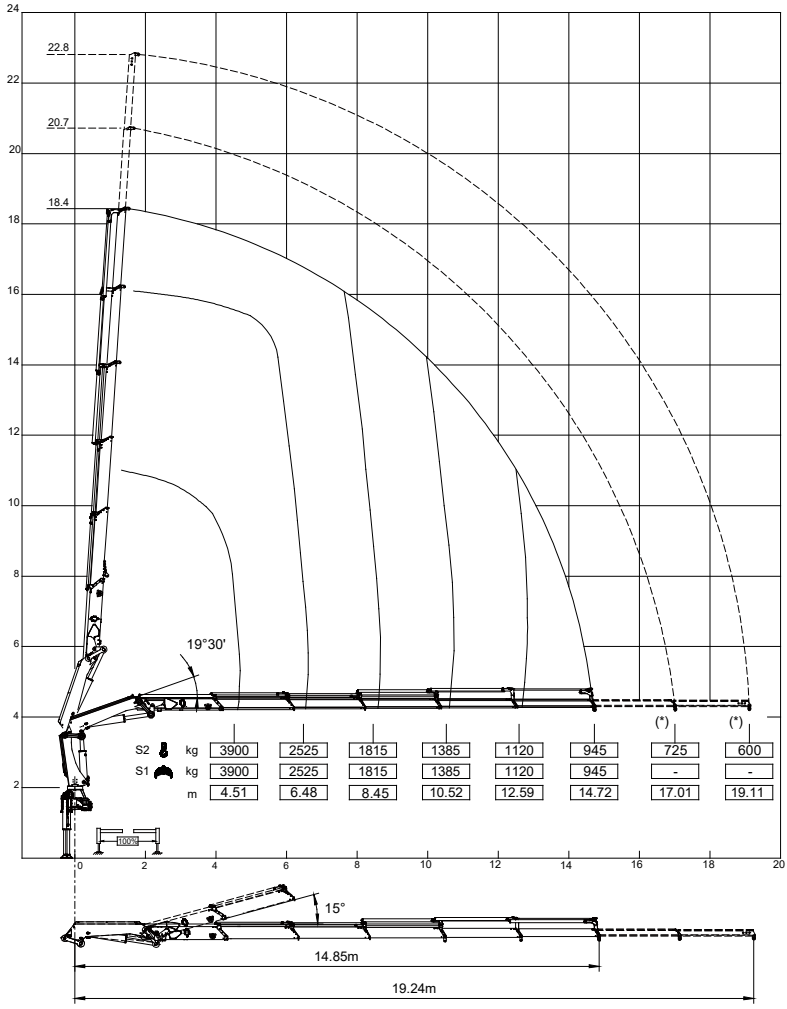
(*) Manual extensions (optional): these cannot lift additional hydraulic tools
If an additional lifting tool is mounted, the rated capacities shall be reduced by the tool's weight

LOAD CHART FOR USE WITH HOOK/TOOL
921NG 4S



(*) Manual extensions (optional): these cannot lift additional hydraulic tools
If an additional lifting tool is mounted, the rated capacities shall be reduced by the tool's weight

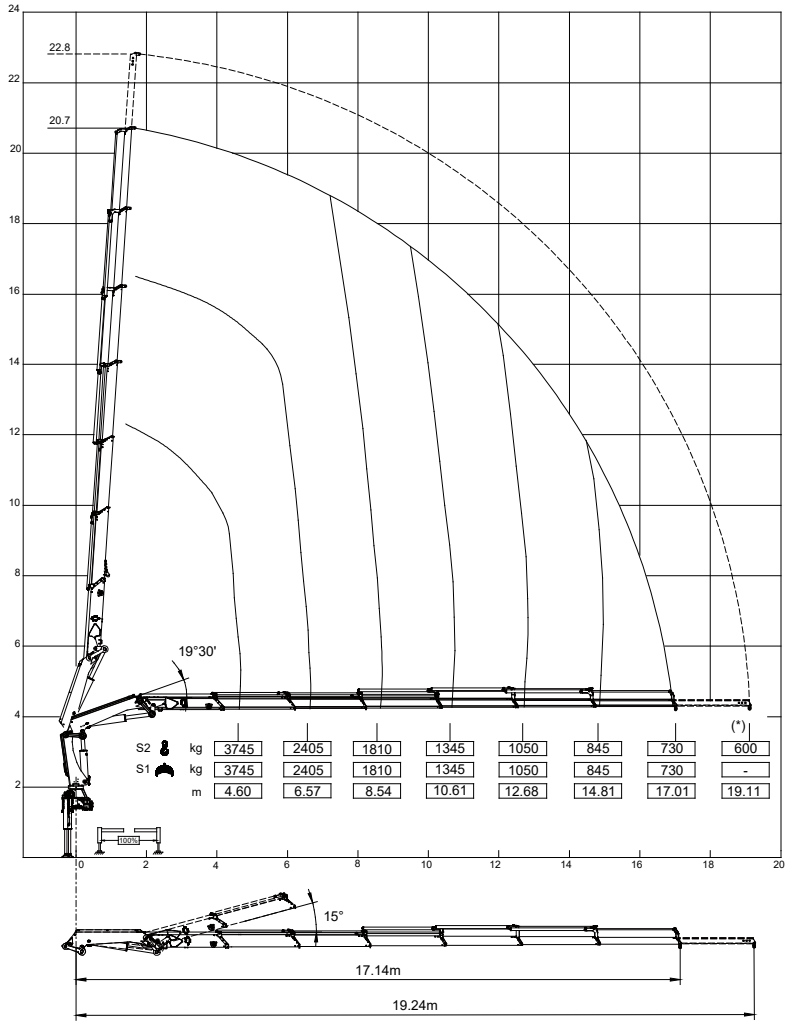
LOAD CHART FOR USE WITH HOOK/TOOL
921NG 5S



S2	kg	3900	2525	1815	1385	1120	945	725	600
S1	kg	3900	2525	1815	1385	1120	945	-	-
	m	4.51	6.48	8.45	10.52	12.59	14.72	17.01	19.11

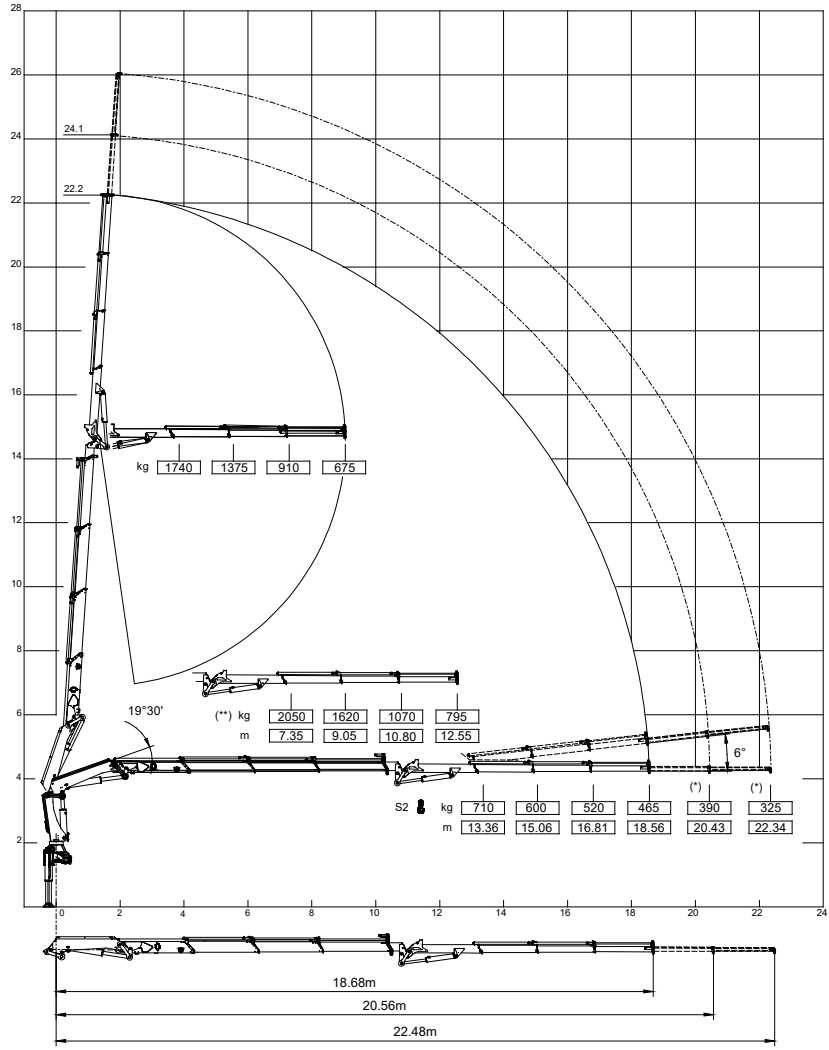
(*) Manual extensions (optional): these cannot lift additional hydraulic tools
If an additional lifting tool is mounted, the rated capacities shall be reduced by the tool's weight

LOAD CHART FOR USE WITH HOOK/TOOL
921NG 6S



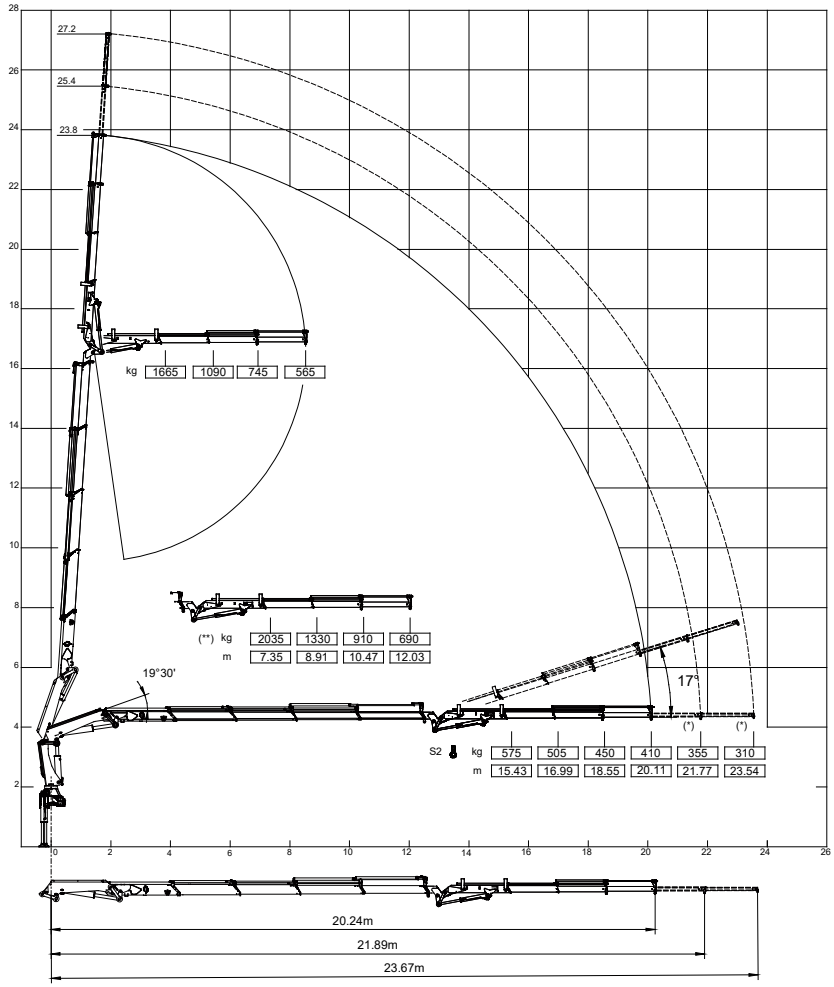
(*) Manual extension (optional): this cannot lift additional hydraulic tools
If an additional lifting tool is mounted, the rated capacities shall be reduced by the tool's weight

LOAD CHART FOR USE WITH HOOK
921NG 3SJ3



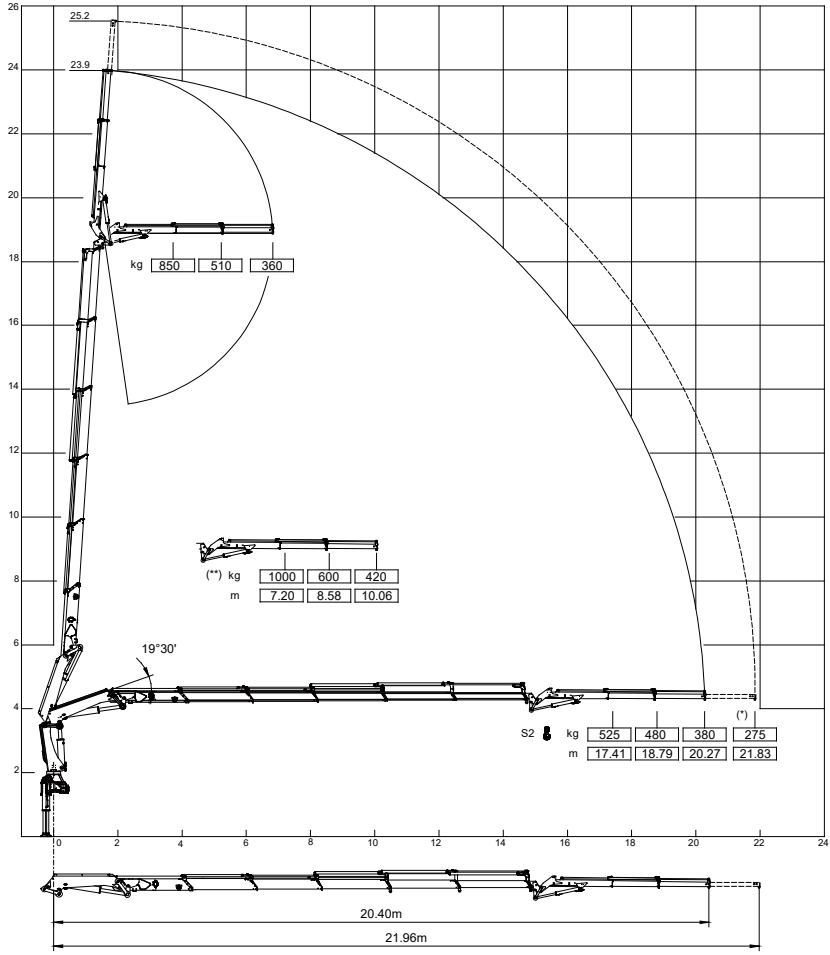
(*) Manual extension (optional): this cannot lift additional hydraulic tools
(**) Max. lifting capacity of jib
The given rated capacities can be moved only by operating the jib.

LOAD CHART FOR USE WITH HOOK
921NG 4SJ3



(*) Manual extension (optional): this cannot lift additional hydraulic tools
(**) Max. lifting capacity of jib
The given rated capacities can be moved only by operating the jib.

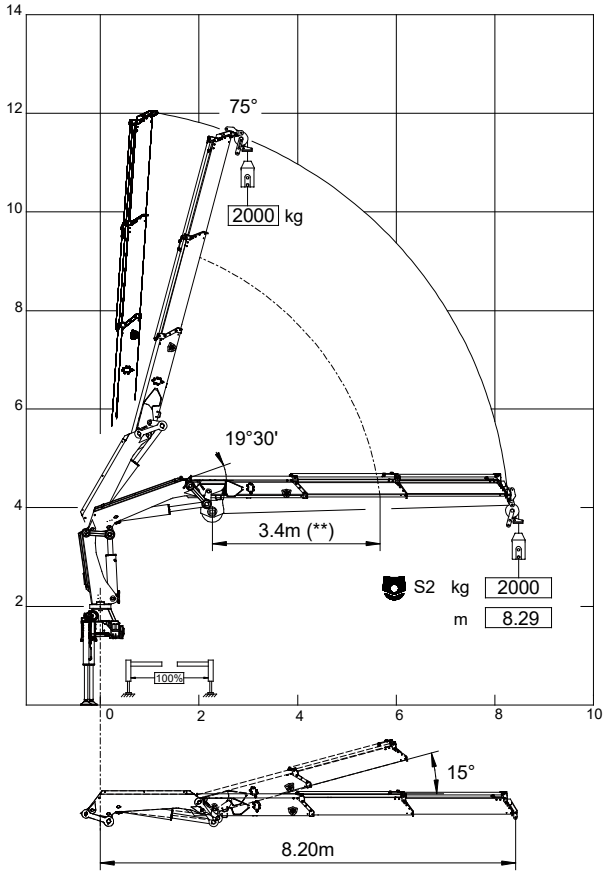
LOAD CHART FOR USE WITH HOOK
921NG 5SJ2



(*) Manual extension (optional): this cannot lift additional hydraulic tools
(**) Max. lifting capacity of jib
The given rated capacities can be moved only by operating the jib.

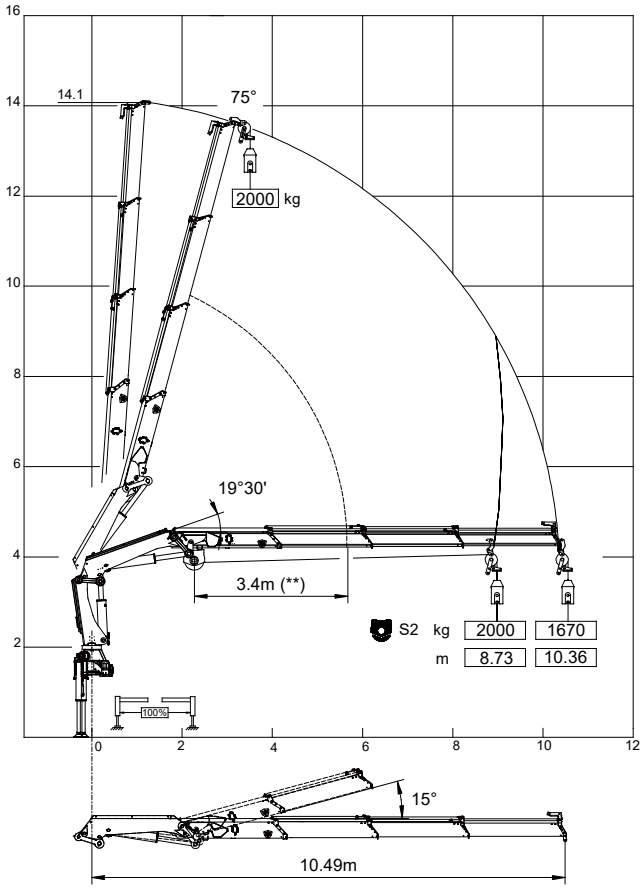
D.9 LOAD CHARTS FOR TI2 WINCH IN SINGLE LINE

921NG 2S + TI2 SINGLE LINE



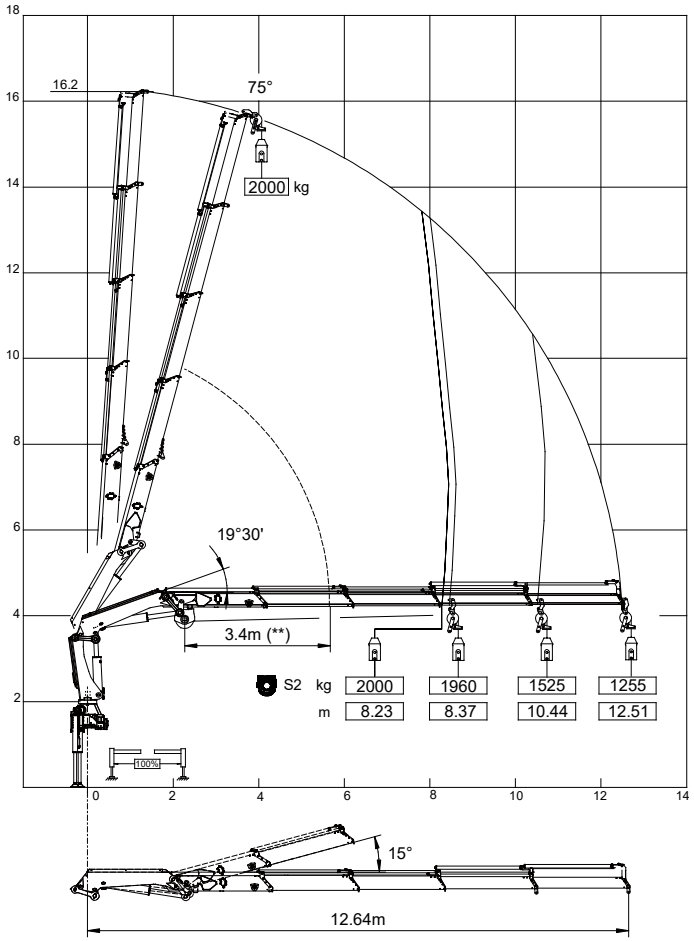
(**) Minimum distance winch - pulley
Winch max. pull: 2000 kg

LOAD CHART FOR WINCH TI2 IN SINGLE LINE
921NG 3S + TI2 SINGLE LINE



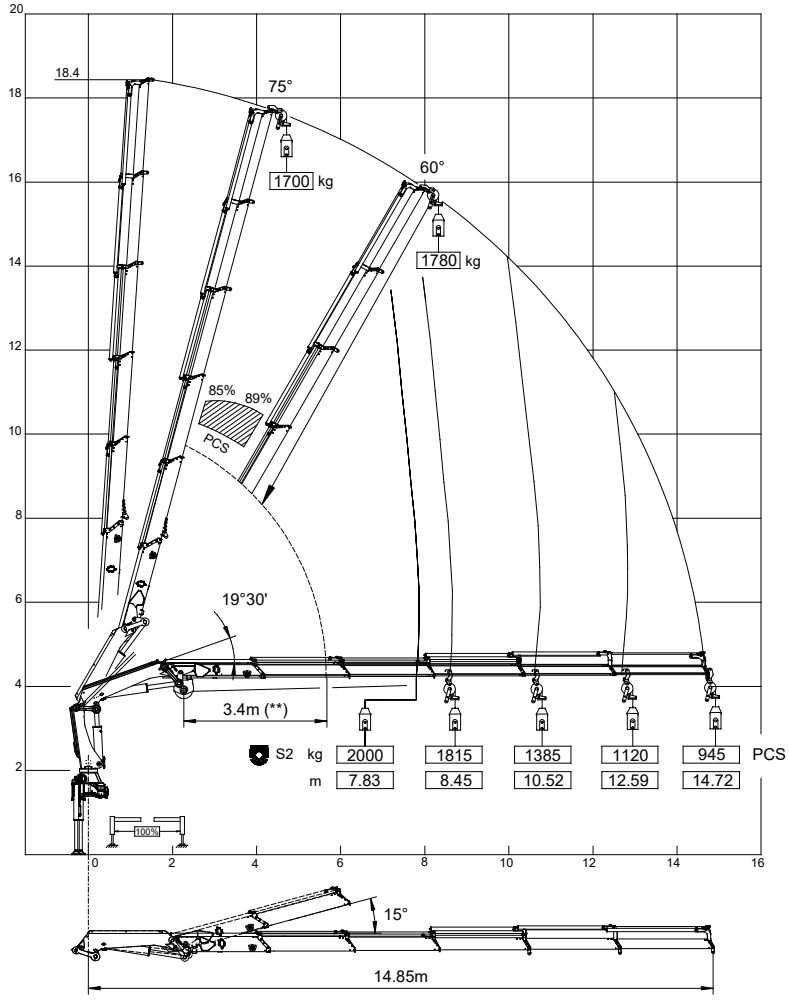
(**) Minimum distance winch - pulley
Winch max. pull: 2000 kg

LOAD CHART FOR WINCH TI2 IN SINGLE LINE
921NG 4S + TI2 SINGLE LINE



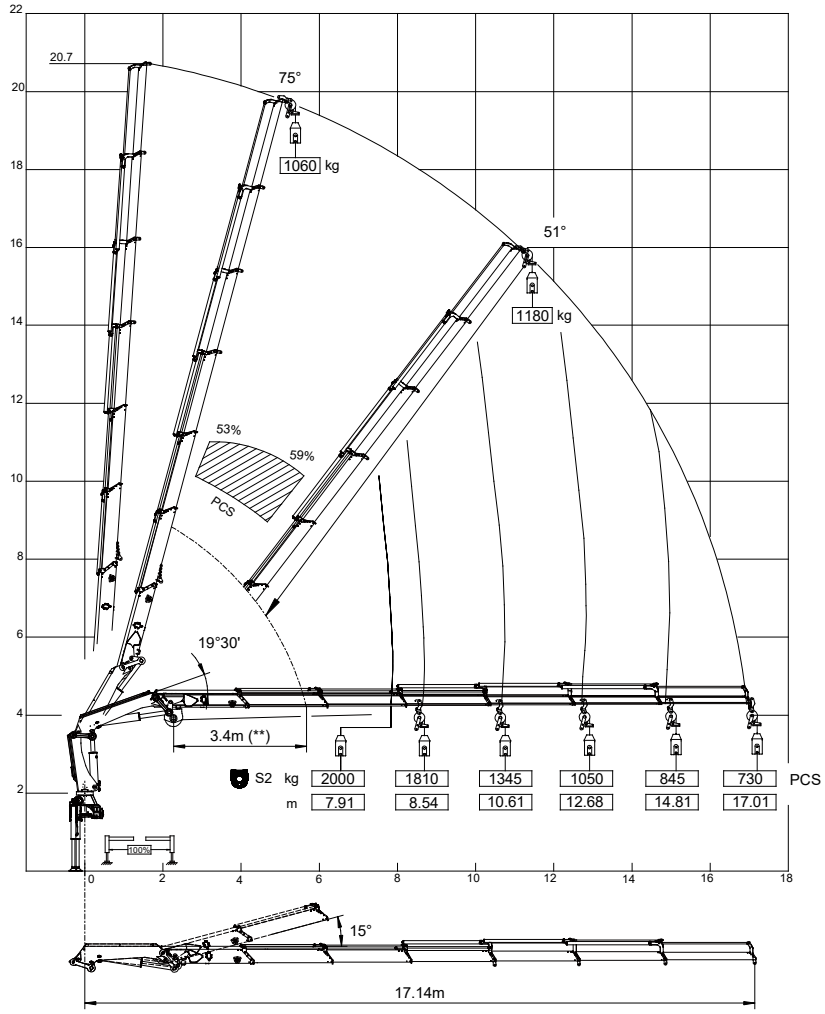
(**) Minimum distance winch - pulley
Winch max. pull: 2000 kg

LOAD CHART FOR WINCH TI2 IN SINGLE LINE
921NG 5S + TI2 SINGLE LINE



(**) Minimum distance winch - pulley
Winch max. pull: 2000 kg

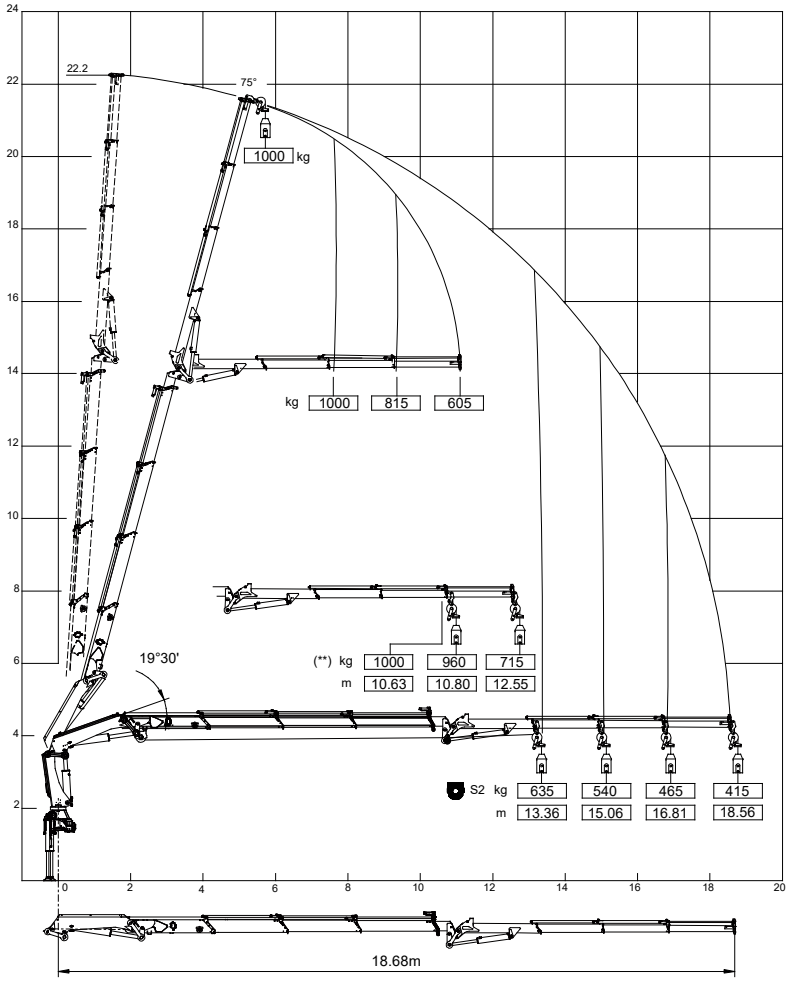
LOAD CHART FOR WINCH TI2 IN SINGLE LINE
921NG 6S + TI2 SINGLE LINE



(**) Minimum distance winch - pulley
Winch max. pull: 2000 kg

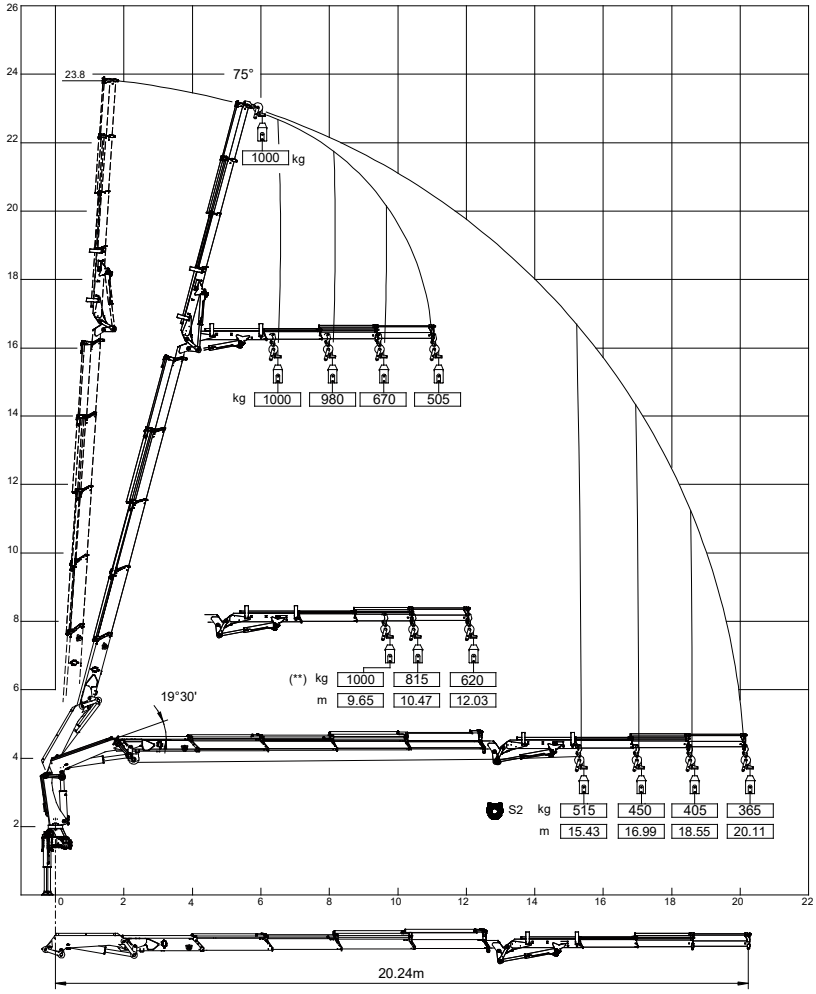
D.10 LOAD CHARTS FOR TI1 WINCH IN SINGLE LINE

921NG 3SJ3 + TI1 SINGLE LINE



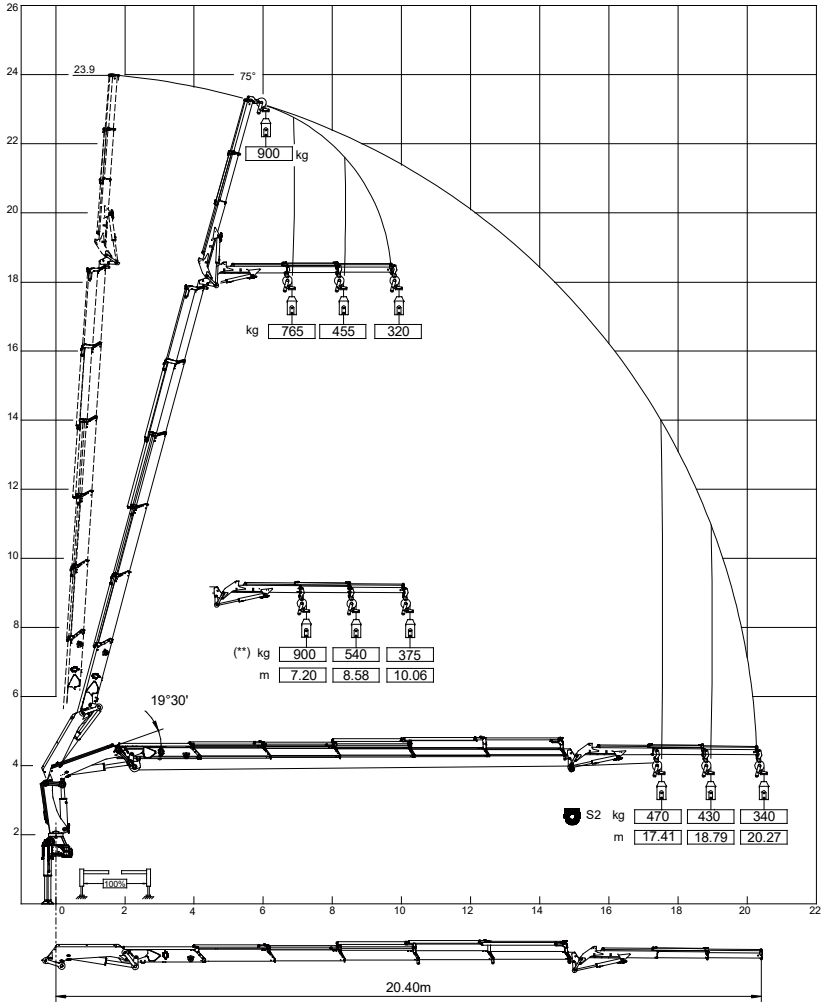
(**) Max. lifting capacity of jib
Winch max. pull: 1000 kg

LOAD CHART FOR WINCH TI1 IN SINGLE LINE
921NG 4SJ3 + TI1 SINGLE LINE



(**) Max. lifting capacity of jib
Winch max. pull: 1000 kg

LOAD CHART FOR WINCH TI1 IN SINGLE LINE
921NG 5SJ2 + TI1 SINGLE LINE

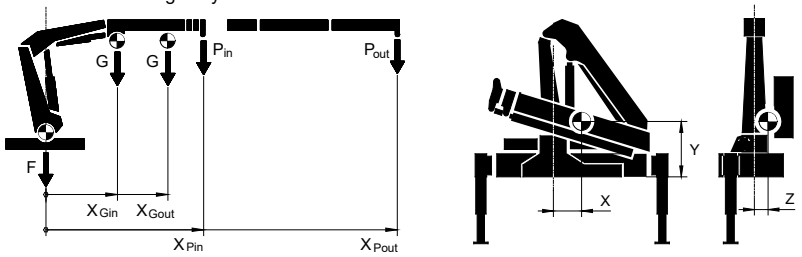


(**) Max. lifting capacity of jib
Winch max. pull: 900 kg

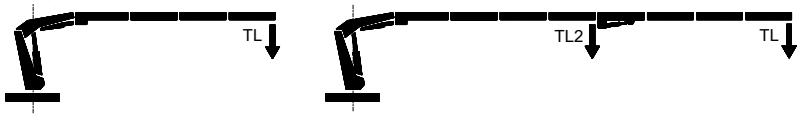
D.11 CENTERS OF GRAVITY AND TEST LOADS

This annex contains the data needed for the stability test in accordance with EN 12999.

Loads and centers of gravity



Hooking point for the test load



Key:
F = weight of fixed parts (stabilizers, base, column, 1st boom cylinder)
G = weight of booms
X_G = distance between G and column axis
P = rated capacity
X_P = distance between P and column axis
TL = test load, to be hooked to the last hydraulic extension
TL2 - #S = additional test load, to be hooked to the hydraulic extension indicated in the table below
X, Y, Z = coordinates of center of gravity for whole crane folded in transport position (EX-H version)
in = configuration with all hydraulic extensions fully retracted
out = configuration with all hydraulic extensions fully extracted

WEIGHTS AND CENTERS OF GRAVITY

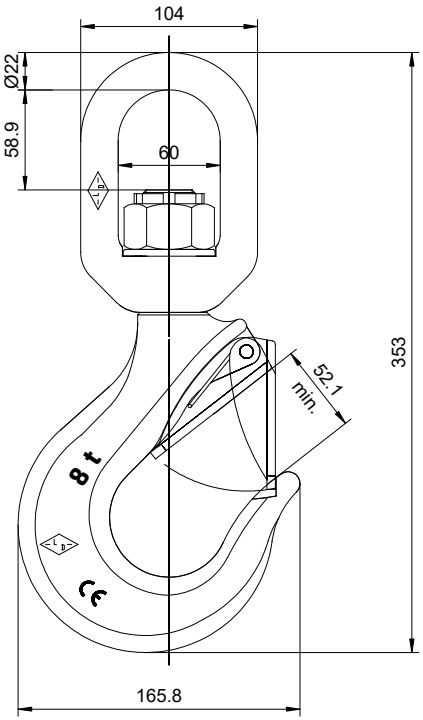
921NG	F kg	G kg	X_G in / out m	P in / out kg	X_P in / out m	TL (TL2 - #S) kg	X	Y	Z
							mm		
2S	ST-M : 1425 EX-H : 1530 SE-H : 1660	1050	2.12 3.01	4555 2325	4.35 8.29	2906	223	724	18
3S		1200	2.26 3.79	4310 1670	4.35 10.36	2092	219	741	39
4S		1350	2.37 4.61	4100 1255	4.43 12.51	1605	209	757	58
5S		1470	2.46 5.36	3900 945	4.51 14.72	1241	198	772	70
6S		1565	2.51 5.97	3745 730	4.60 17.01	986	190	782	77
3SJ3		1860	3.45 7.04	710 465	13.36 18.56	581 (211 - 3S)	170	1035	110
4SJ3		1840	3.27 7.43	575 410	15.43 20.11	513 (186 - 4S)	183	1007	114
5SJ2		1745	2.95 7.12	525 380	17.41 20.27	475 (143 - 5S)	168	928	102

The data are relating to crane configuration with horizontal booms.
For the jib version, the "in" data are relating to standard crane's extensions always fully extracted.

D.12 HOOK DATA

HOOK MOUNTED ON STANDARD BOOM
VERSIONS: 2S, 3S, 4S, 5S, 6S

DIMENSIONS

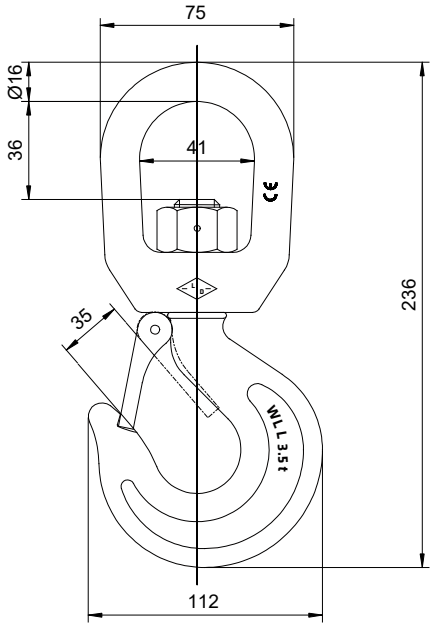


TECHNICAL PROPERTIES
Working load limit (WLL) : 8000 kg
Material: alloy steel
Weight: 6.2 kg
Swivel hook
Reference standard: DIN 15401

HOOK DATA

HOOK MOUNTED ON JIB BOOM
VERSION: 3SJ3, 4SJ3, 5SJ2

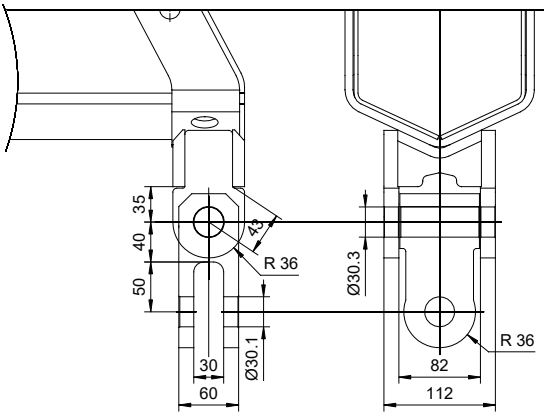
DIMENSIONS

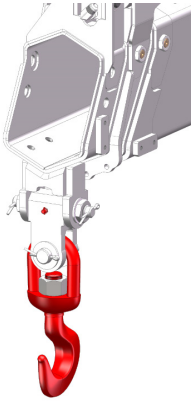


TECHNICAL PROPERTIES
Working load limit (WLL) : 3500 kg
Material: alloy steel
Weight: 1.2 kg
Swivel hook
Reference standard: DIN 15401

D.13 LOAD ATTACHMENT

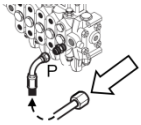
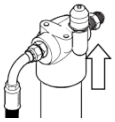
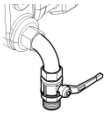
ATTACHMENT FOR HOOK AND LIFTING TOOL





D.14 HYDRAULIC SYSTEM

FITTINGS FOR CONNECTION TO PUMP

921NG	NO RDC		RDC	
Control valve pressure line		M 7/8"-14 JIC		M 3/4"-16 GAS
Tank suction line		M 1"1/2 BSP		M 1" 1/2 BSP

EXTENSION TIMES OF HYDRAULIC CYLINDERS

921NG	Extension time s	Retraction time s
Slewing (180°)	20	20
1.boom cylinder	18	26
2.boom cylinder	25	16
boom extension 1S (SGS active)	N\A	N\A
boom extension 2S (SGS active)	N\A	N\A
boom extension 3S (SGS active)	N\A	N\A
boom extension 4S (SGS active)	N\A	N\A
boom extension 5S (SGS active)	N\A	N\A
boom extension 6S (SGS active)	44	44
jib articulation cylinder	N\A	N\A
jib extension 2S	N\A	N\A
jib extension 3S	N\A	N\A

Times are indicative and referring to the following operating conditions:
- unloaded crane operated with a single control lever
- oil flow rate recommended for NO RDC crane
- ISO VG 46 oil at a temperature of 50°C

MAX. ALLOWABLE SINK RATE FOR THE LOAD

The sink rate is the uncontrolled descent of the load in a given time interval due to internal leakage of hydraulic components. The table below shows the maximum permitted descent of the rated load, at the max. hydraulic outreach and in the given time interval.

921NG	Time interval min.	Max. load descent mm
2S	10	415
3S	10	518
4S	10	250
5S	10	294
6S	10	340
3SJ3	10	371
4SJ3	10	402
5SJ2	10	405

CAPACITY OF HYDRAULIC SYSTEM

921NG	Cylinders extended ℓ	Cylinders retracted ℓ
2S	70	46
3S	78	50
4S	86	55
5S	94	60
6S	102	67
3SJ3	102	66
4SJ3	102	65
5SJ2	103	66

Capacities do not include the oil tank.

ADDITIONAL CAPACITY FOR HYDRAULICALLY OPERATED STABILIZER EXTENSIONS

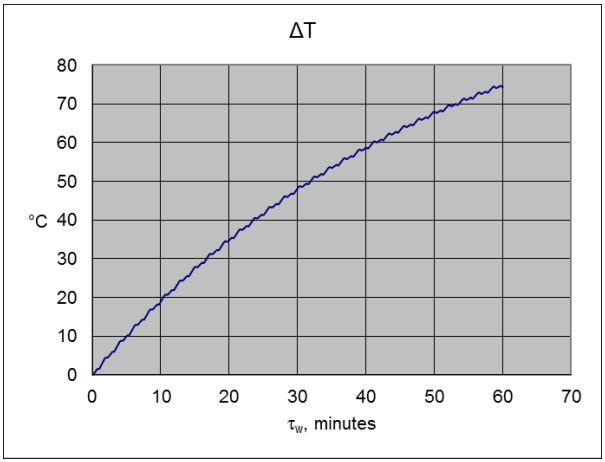
EX-H	+4.0	+2.5
SE-H	+6.5	+3.5

D.15 OIL COOLER



TECHNICAL SPECIFICATIONS
Heat transfer coefficient: 235 W/K (oil flow rate of 40 ℓ/min)
Activation temperature: 48 °C
Weight: 13.5 kg
Capacity: 4 ℓ

For a crane without oil cooler performing a sequence of standard work cycles, the difference in temperature between the oil and the environment is shown in the graph below.



The oil cooler is recommended when

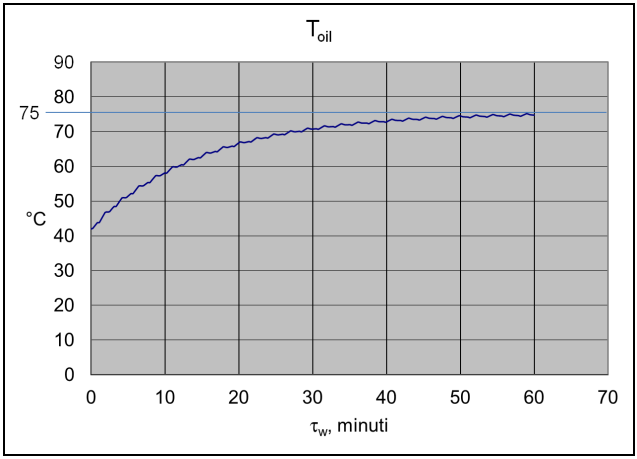
$$T_{env} + \tau_w > 57$$

where:
T_{env} : temperature of the environment (°C)
ΔT : difference in temperature between the oil and the environment (°C)
τ_w : working time (minutes)

However, when a crane equipped with oil cooler carries out a sequence of standard work cycles, the oil temperature exceeds 75 °C after the following working times:

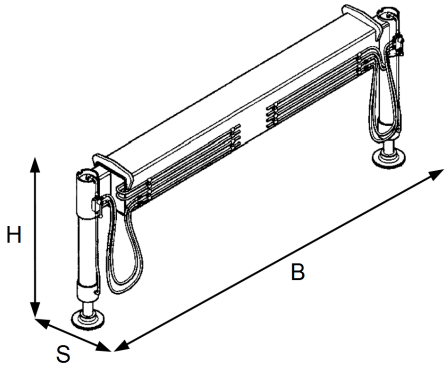
T_{env} (°C)	τ_w to exceed 75 °C (minutes)
42	no limit
45	35
48	25
50	21
52	18
54	15

The graph below shows the temperature trend (T_{oil}) with oil cooler when T_{env} = 45 °C.



Notes:
The max recommended oil temperature is 75°C (at 80°C you must stop working)
The calculation of the oil temperature is purely indicative and depending on several variables (e.g. working cycle, wind, humidity, weather, etc.)

D.16 ADDITIONAL STABILIZERS

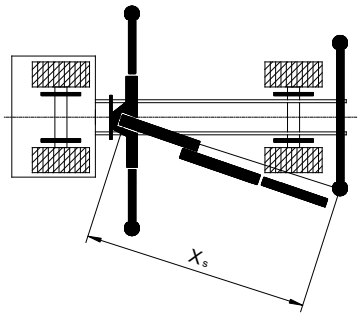


Additional stabilizers must be chosen so that:
- the installation is stable (see Installer Manual)
- the max. force acting on the additional stabilizers, F_s, is lower than the max. load allowed by the stabilizers itself, R_{max}.

$$F_s = M_{dyn} / X_s \qquad F_s \geq 0.6\ F_{sg}$$

where:
M_{dyn}: max. dynamic moment of the crane
X_s: distance between column axis - stab. cylinder
F_{sg}: max force on stabilizer leg

Check that: $F_s \leq R_{max}$
R_{max} is given in the technical specifications of the additional stabilizers.



- In addition, CE additional stabilizer must be equipped with safety devices integrated with the crane's stability control system. Therefore we recommend to install the following models designed by crane's manufacturer.

Code	Spread (m)	Weight (kg)	R_{max} (kg)	Overall dimensions BxHxS (mm)
7850088	2.00	155	6250	2160x770x190
7850086	3.32	220	6250	2285x780x240
7850087	3.32	235	6250	2285x780x240

For further information see the User Manual for additional stabilizers.

D.17 RECOMMENDED ADDITIONAL LIFTING TOOLS

CLAMSHELL BUCKET



Crane version	Gross load kg (1)	Data of recommended tool				Payload kg (3)	Load ratio	
		HYVA model	weight kg	volume dm^3	capacity kg (2)		crane (4)	tool (5)
2S	2325	H605-650	410	650	975	**1915**	60%	100%
3S	1670	H605-650	410	650	975	**1260**	83%	100%
4S	1255	H605-450	340	450	675	**915**	81%	100%
5S	945	H604-325	235	325	487,5	**710**	76%	100%
6S	730	H604-200	195	200	300	**535**	68%	100%

Notes
(1) The gross load is the load capacity of crane at maximum hydraulic outreach
(2) The tool's load capacity is calculated multiplying the volume by a density of 1.5 kg/dm^3
(3) The payload is the gross load of crane minus the tool's weight
(4) The crane's load ratio is the percentage value of the liftable load with respect to the gross load
(5) The tool's load ratio is the percentage value of the liftable load with respect to tool's capacity

Stress history class: S1

RECOMMENDED ADDITIONAL LIFTING TOOLS
ORANGE PEEL GRAPPLE



Crane version	Gross load kg (1)	Data of recommended tool				Payload kg (3)	Load ratio	
		HYVA model	weight kg	volume dm^3	capacity kg (2)		crane (4)	tool (5)
2S	2325	H653-4 large	435	500	750	**1890**	51%	100%
3S	1670	H653-4 large	435	500	750	**1235**	71%	100%
4S	1255	H653-4 large	395	350	525	**860**	73%	100%
5S	945	H653-4 small	250	240	360	**695**	65%	100%
6S	730	H653-4 small	235	180	270	**495**	69%	100%

Notes
(1) The gross load is the load capacity of crane at maximum hydraulic outreach
(2) The tool's load capacity is calculated multiplying the volume by a density of 1.5 kg/dm^3
(3) The payload is the crane's gross load minus the tool's weight
(4) The crane's load ratio is the percentage value of the liftable load with respect to the gross load
(5) The tool's load ratio is the percentage value of the liftable load with respect to tool's capacity

Stress history class: S1

RECOMMENDED ADDITIONAL LIFTING TOOLS
LOGGING GRAPPLE



Crane version	Gross load kg [1]	Data of recommended tool			Payload kg [2]	Load ratio	
		HYVA model	weight kg	capacity kg		crane [3]	tool [4]
2S	2325	H634-0,25	170	4000	**2155**	100%	54%
3S	1670	H634-0,25	170	4000	**1500**	100%	38%
4S	1255	H634-0,25	170	4000	**1085**	100%	27%
5S	945	H634-0,25	170	4000	**775**	100%	19%
6S	730	H634-0,25	170	4000	**560**	100%	14%

Notes
[1] The gross load is the load capacity of crane at maximum hydraulic outreach
[2] The payload is the gross load of crane minus the tool's weight
[3] The crane's load ratio is the percentage value of the liftable load with respect to the gross load
[4] The tool's load ratio is the percentage value of the liftable load with respect to tool's capacity

Stress history class: S1

RECOMMENDED ADDITIONAL LIFTING TOOLS
BRICK STACK GRAPPLE



Crane version	Gross load kg (1)	Data of recommended tool			Payload kg (2)	Load ratio	
		HYVA model	weight kg	capacity kg		crane (3)	tool (4)
2S	2325	H332-850	245	2200	**2080**	79%	100%
3S	1670	H332-850	245	2200	**1425**	100%	89%
4S	1255	H332-850	245	2200	**1010**	100%	63%
5S	945	H332-850	245	2200	**700**	100%	32%
6S	730	H332-850	245	2200	**485**	100%	22%

Notes
(1) The gross load is the load capacity of crane at maximum hydraulic outreach
(2) The payload is the gross load of crane minus the tool's weight
(3) The crane's load ratio is the percentage value of the liftable load with respect to the gross load
(4) The tool's load ratio is the percentage value of the liftable load with respect to tool's capacity

Stress history class: S2

RECOMMENDED ADDITIONAL LIFTING TOOLS
PALLET FORK



Crane version	Gross load kg (1)	Data of recommended tool			Payload kg (2)	Load ratio	
		HYVA model	weight kg	capacity kg		crane (3)	tool (4)
2S	2325	H415 2000-500	155	2000	**2170**	93%	100%
3S	1670	H415 1500-500	135	1500	**1535**	98%	100%
4S	1255	H415 1500-500	135	1500	**1120**	100%	75%
5S	945	H415 1500-500	135	1500	**810**	100%	54%
6S	730	H415 1500-500	135	1500	**595**	100%	40%

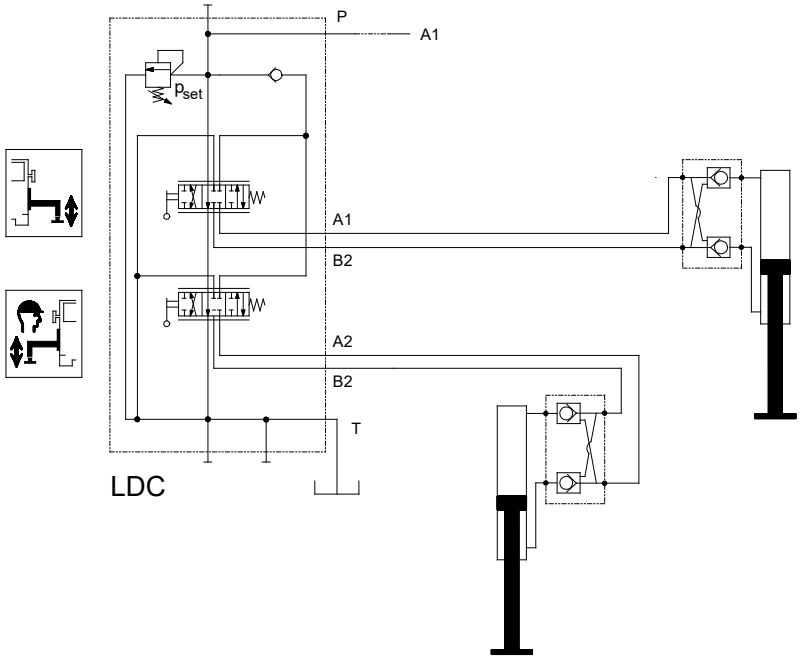
Notes
(1) The gross load is the load capacity of crane at maximum hydraulic outreach
(2) The payload is the gross load of crane minus the tool's weight
(3) The crane's load ratio is the percentage value of the liftable load with respect to the gross load
(4) The tool's load ratio is the percentage value of the liftable load with respect to tool's capacity

Stress history class: S2

E ANNEXES

E.1 HYDRAULIC SCHEMATICS

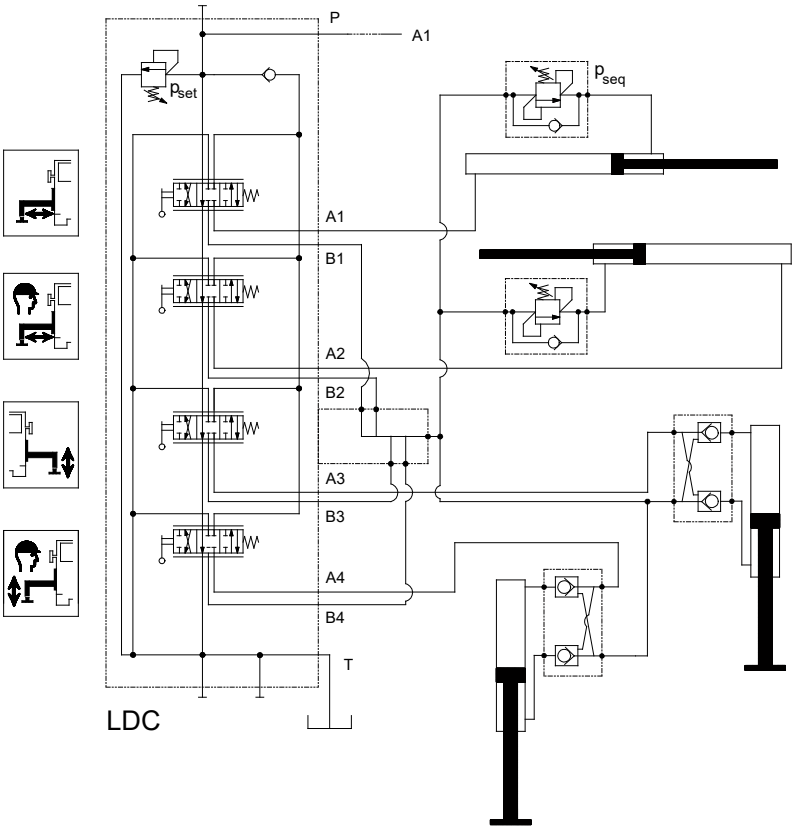
STABILIZERS
MANUALLY OPERATED EXTENSIONS



1040041

Settings
p_{set} = 130 bar

HYDRAULIC SCHEMATICS
STABILIZERS
HYDRAULICALLY OPERATED EXTENSIONS
FIXED OR MANUALLY TURNING STABILIZER LEGS

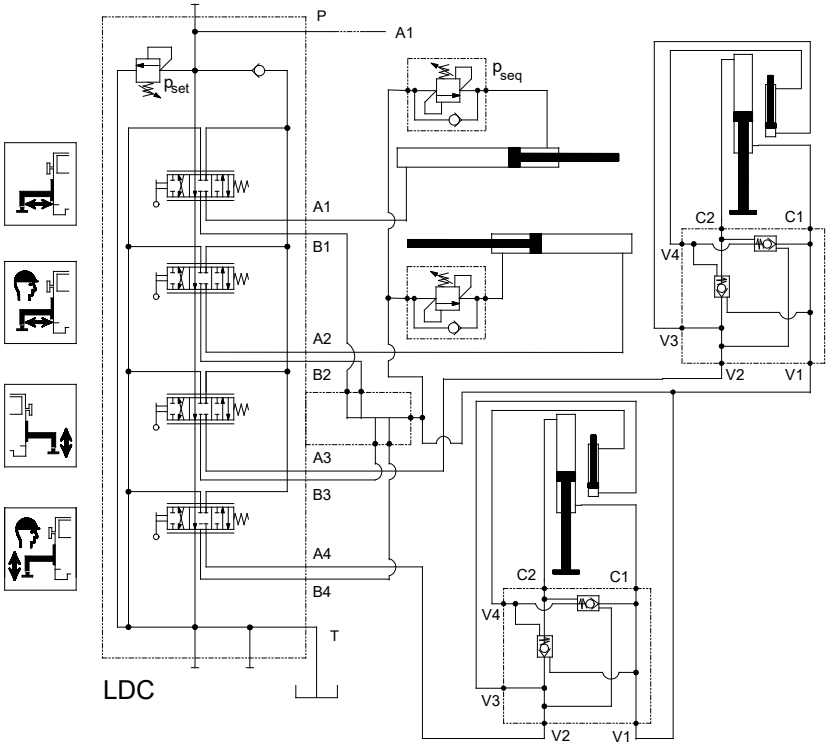


1040042

Settings

p_{set} = 130 bar
p_{seq} = 80 bar

HYDRAULIC SCHEMATICS
STABILIZERS
HYDRAULICALLY OPERATED EXTENSIONS
AUTOMATIC TURNING STABILIZER LEGS

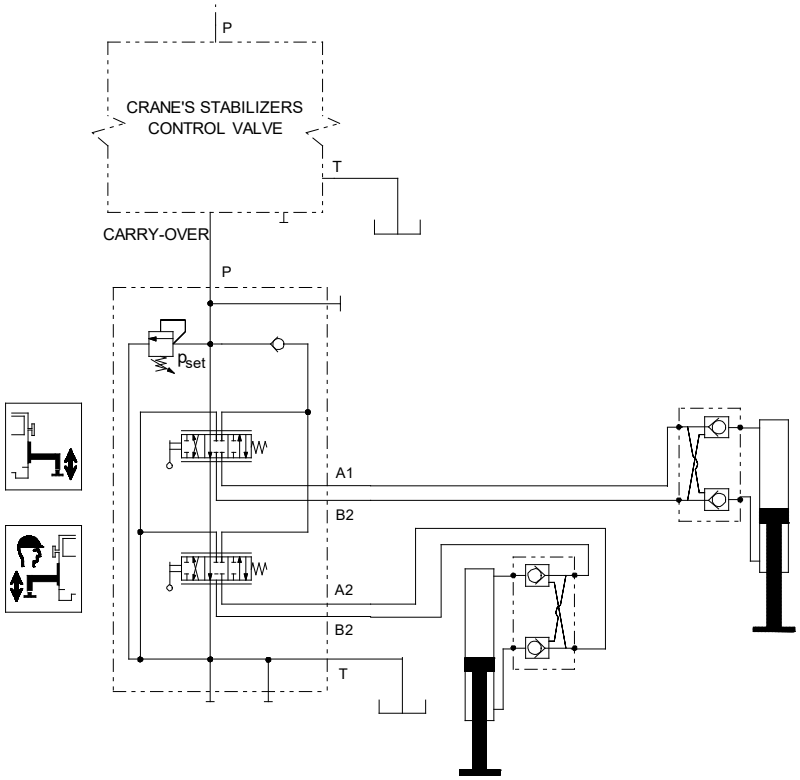


1040049

Settings

p_{set} = 140 bar
p_{seq} = 80 bar

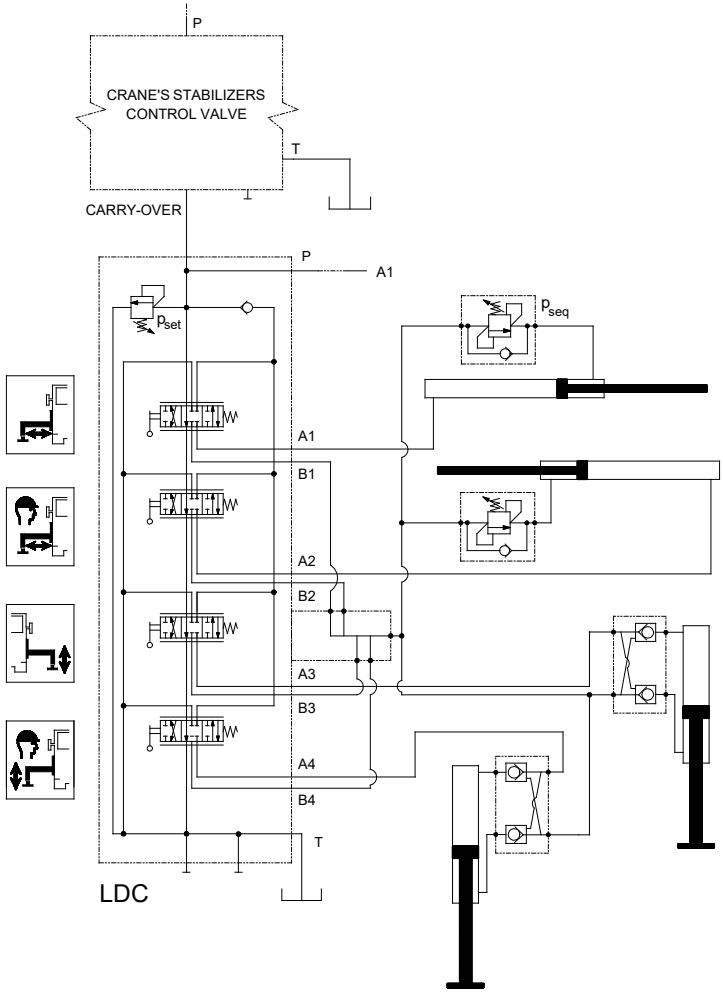
HYDRAULIC SCHEMATICS
ADDITIONAL STABILIZERS
MANUALLY OPERATED EXTENSIONS



1040043

Settings
p_{set} = 130 bar

HYDRAULIC SCHEMATICS
ADDITIONAL STABILIZERS
HYDRAULICALLY OPERATED EXTENSIONS

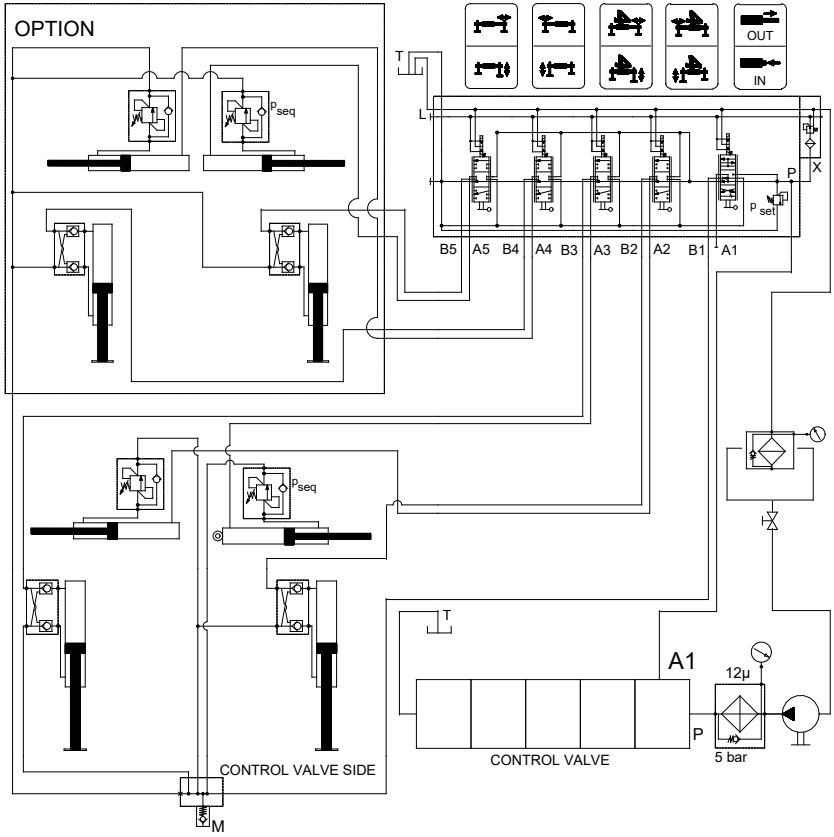


1040044

Settings

p_{set} = 130 bar
p_{seq} = 80 bar

HYDRAULIC SCHEMATICS
RADIO CONTROLLED STABILIZERS (OPTIONAL)

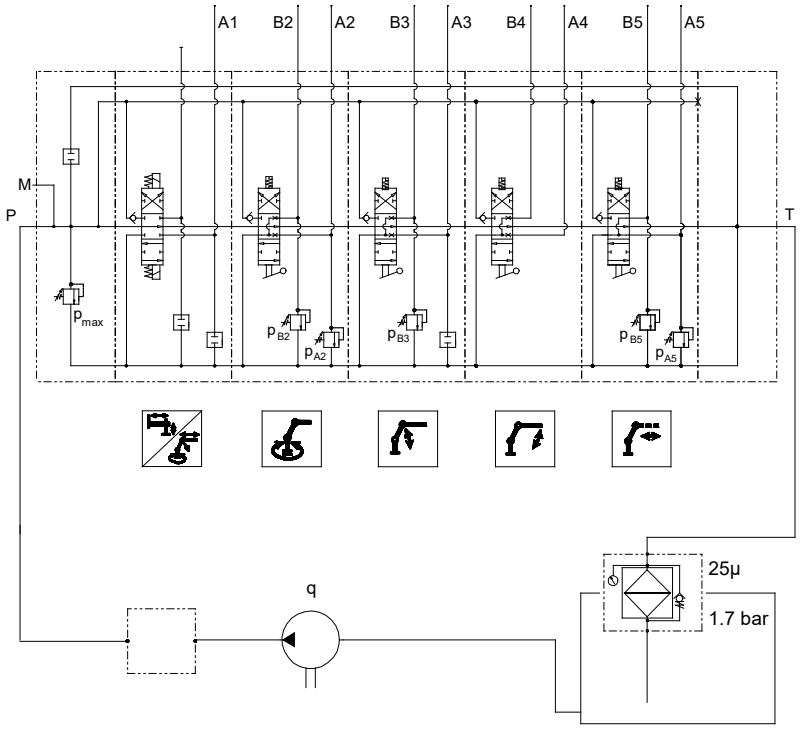


1050110

Settings

p_{set} = 150 bar
p_{seq} = 80 bar

HYDRAULIC SCHEMATICS
CONTROL VALVES
NO RDC - NO CE

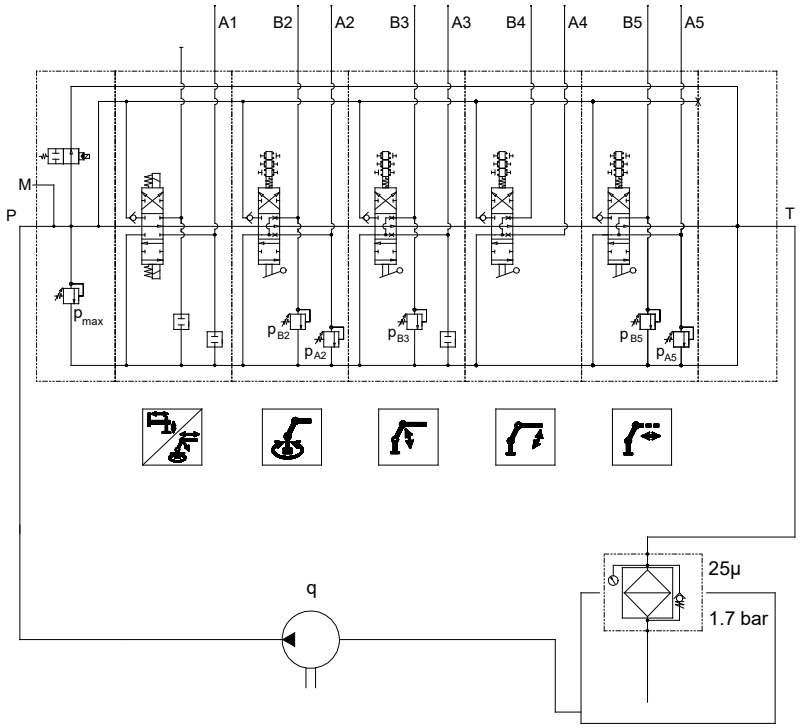


1030192

Settings

q = 45 ℓ/min		
p_{max} = 320 bar		for 2S - 3S
p_{max} = 310 bar		for 4S - 5S - 6S
p_{max} = - bar		for 3SJ3 - 4SJ3 - 5SJ2
p_{A2} = 230 bar	p_{B2} = 230 bar	
p_{A3} = p_{max}	p_{B3} = 80 bar	
p_{A4} = p_{max}	p_{B4} = 200 bar	for 2S - 3S - 4S - 5S - 6S
p_{A4} = - bar	p_{B4} = - bar	for 3SJ3 - 4SJ3 - 5SJ2
p_{A5} = 300 bar	p_{B5} = 300 bar	

HYDRAULIC SCHEMATICS
CONTROL VALVES
NO RDC - CE

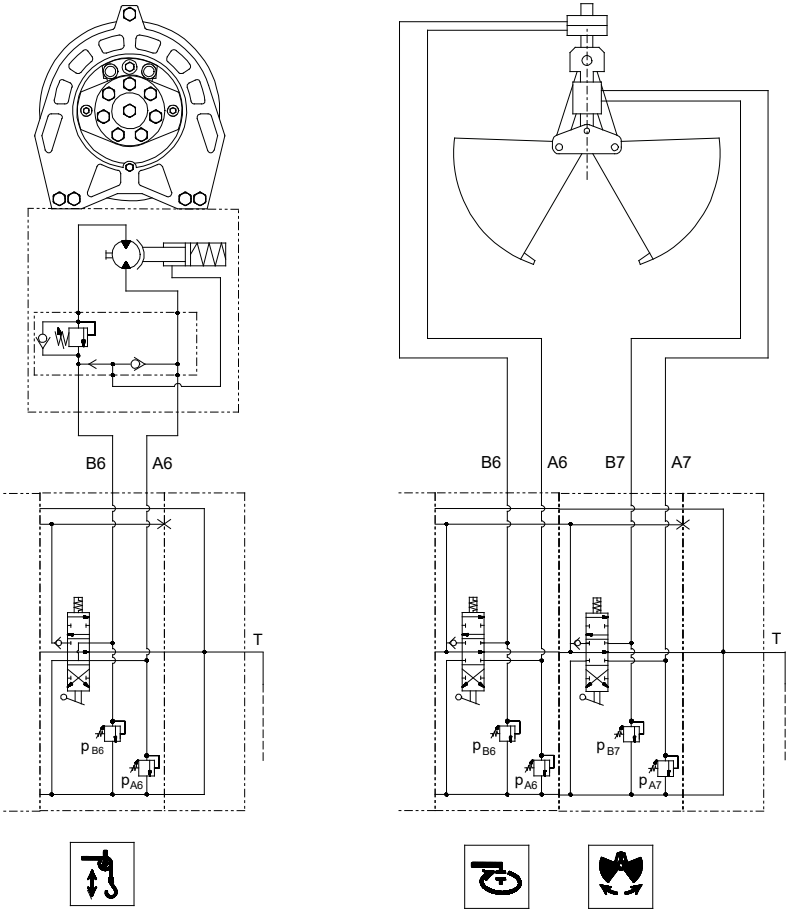


1030193

Settings

q = 45 ℓ/min		
p_{max} = 320 bar	for 2S - 3S	
p_{max} = 310 bar	for 4S - 5S - 6S	
p_{max} = - bar	for 3SJ3 - 4SJ3 - 5SJ2	
p_{A2} = 230 bar	p_{B2} = 230 bar	
p_{A3} = p_{max}	p_{B3} = 80 bar	
p_{A4} = p_{max}	p_{B4} = 200 bar	for 2S - 3S - 4S - 5S - 6S
p_{A4} = - bar	p_{B4} = - bar	for 3SJ3 - 4SJ3 - 5SJ2
p_{A5} = 300 bar	p_{B5} = 300 bar	

HYDRAULIC SCHEMATICS
SUPPLEMENTARY ACTIVATION ELEMENTS
NO RDC



1030194

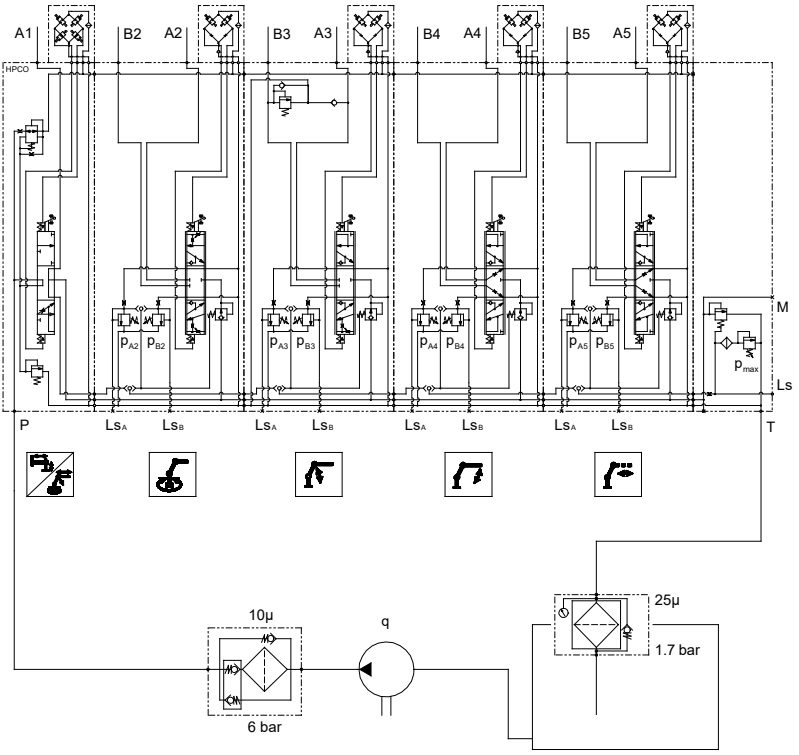
Settings for winch

p_{A6} = 200 bar	p_{B6} = 200 bar

Settings for rotor und bucket/grab

p_{A6} = 200 bar	p_{B6} = 200 bar
p_{A7} = 200 bar	p_{B7} = 200 bar

HYDRAULIC SCHEMATICS
CONTROL VALVE
RDC - NO CE

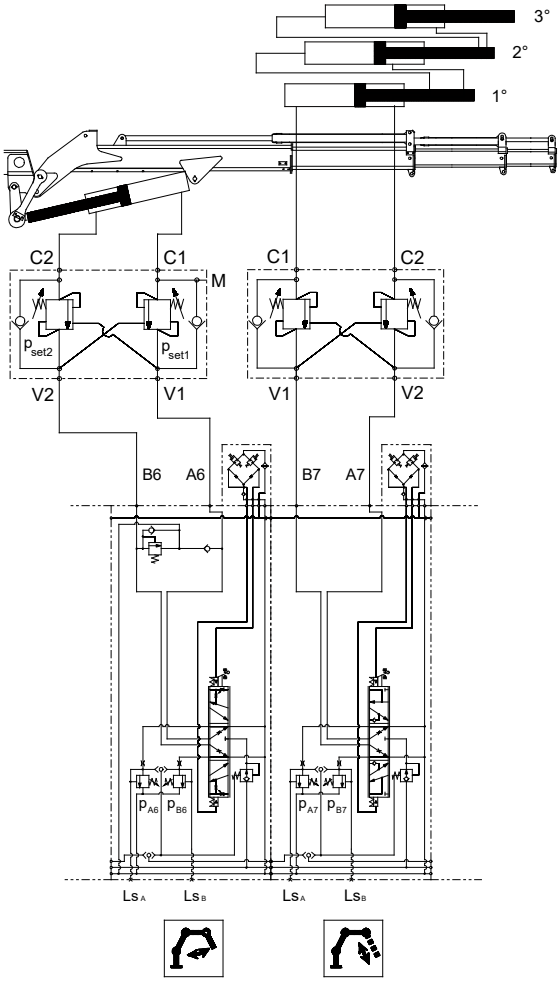


1030198

Settings

q = 70 ℓ/min		
p_{max} = 320 bar	for 2S - 3S	
p_{max} = 310 bar	for 4S - 5S - 6S	
p_{max} = - bar	for 3SJ3 - 4SJ3 - 5SJ2	
p_{A2} = 230 bar	p_{B2} = 230 bar	
p_{A3} = p_{max}	p_{B3} = 80 bar	
p_{A4} = p_{max}	p_{B4} = 200 bar	for 2S - 3S - 4S - 5S - 6S
p_{A4} = - bar	p_{B4} = - bar	for 3SJ3 - 4SJ3 - 5SJ2
p_{A5} = 300 bar	p_{B5} = 300 bar	

HYDRAULIC SCHEMATICS
CONTROL VALVE ELEMENTS AND OVERCENTER VALVES OF JIB
RDC - NO CE

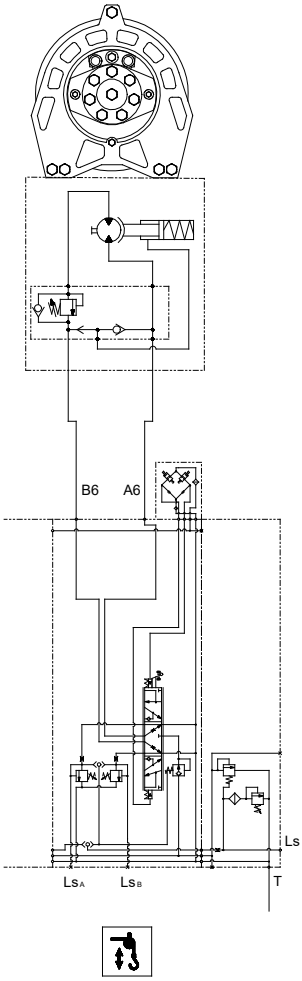


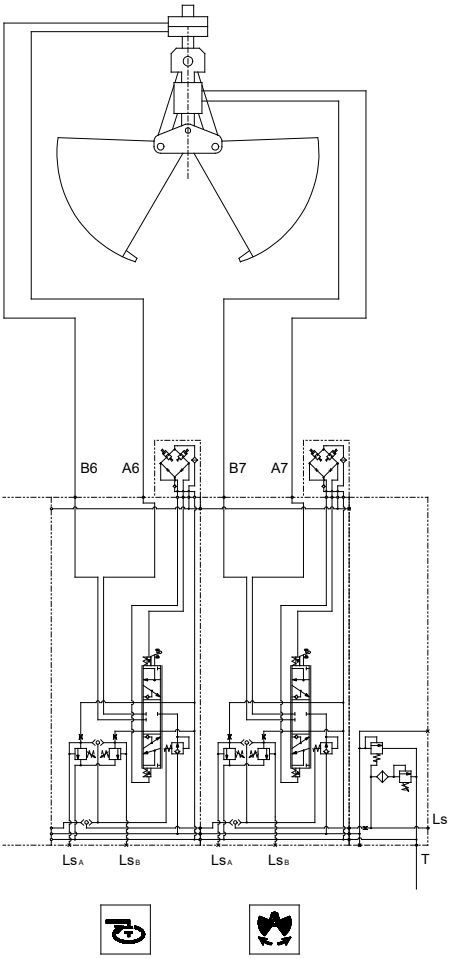
1030222

Settings

p_{A6} = - bar	p_{B6} = - bar
p_{B7} = - bar	p_{B7} = - bar
p_{set1} = - bar	p_{set2} = - bar

HYDRAULIC SCHEMATICS
SUPPLEMENTARY ACTIVATION ELEMENTS
RDC - NO CE





1030199

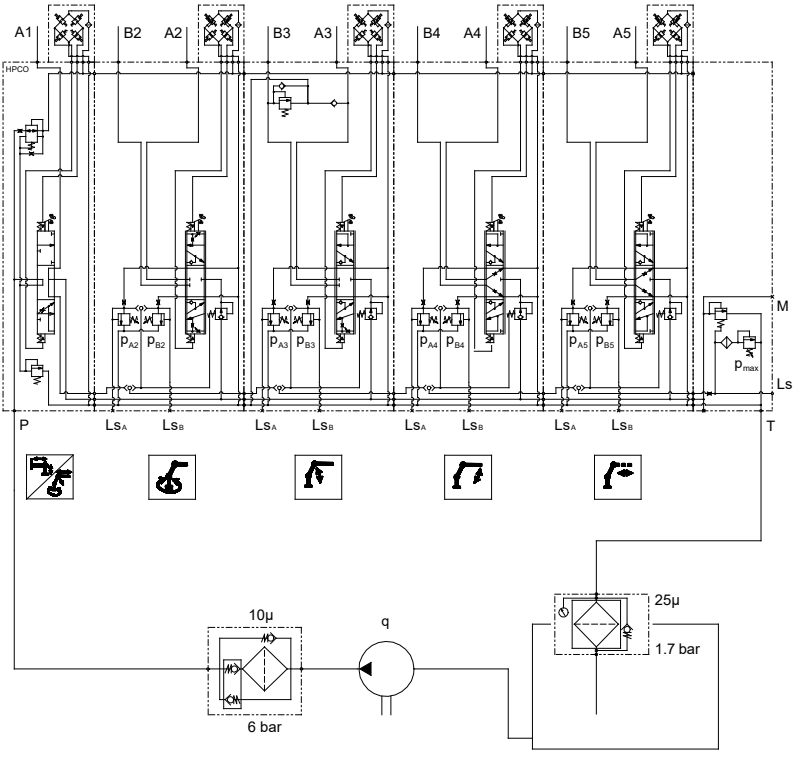
Settings for winch

p_{A6} = 200 bar	p_{B6} = 200 bar

Settings for rotor und bucket/grab

p_{A6} = 200 bar	p_{B6} = 200 bar
p_{A7} = 200 bar	p_{B7} = 200 bar

HYDRAULIC SCHEMATICS
CONTROL VALVE
RDC - CE

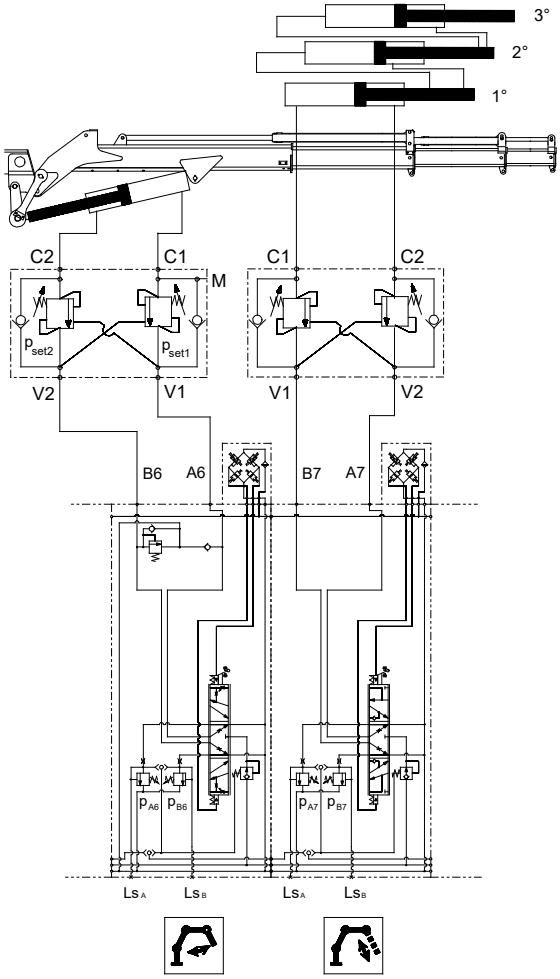


1030196

Settings

q = 70 ℓ/min		
p_{max} = 320 bar	for 2S - 3S	
p_{max} = 310 bar	for 4S - 5S - 6S	
p_{max} = - bar	for 3SJ3 - 4SJ3 - 5SJ2	
p_{A2} = 230 bar	p_{B2} = 230 bar	
p_{A3} = p_{max}	p_{B3} = 80 bar	
p_{A4} = p_{max}	p_{B4} = 200 bar	for 2S - 3S - 4S - 5S - 6S
p_{A4} = - bar	p_{B4} = - bar	for 3SJ3 - 4SJ3 - 5SJ2
p_{A5} = 300 bar	p_{B5} = 300 bar	

HYDRAULIC SCHEMATICS
CONTROL VALVE ELEMENTS AND OVERCENTER VALVES OF JIB
RDC - CE

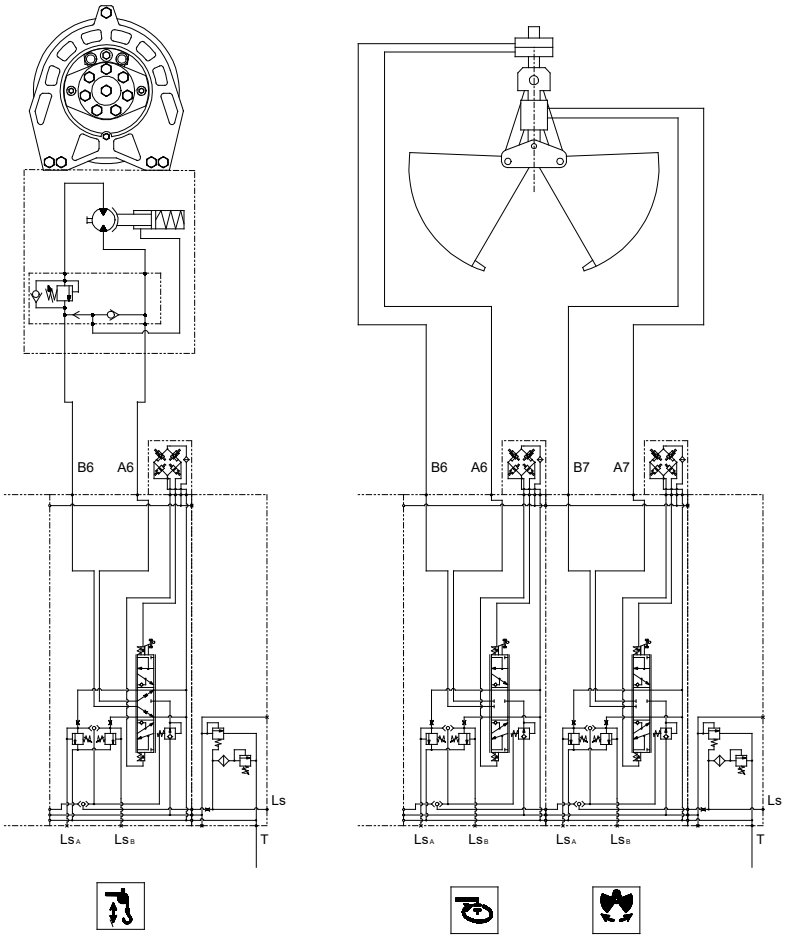


1030223

Settings

p_{A6} = - bar	p_{B6} = - bar
p_{B7} = - bar	p_{B7} = - bar
p_{set1} = - bar	p_{set2} = - bar

HYDRAULIC SCHEMATICS
SUPPLEMENTARY ACTIVATION ELEMENTS
RDC - CE



1030197

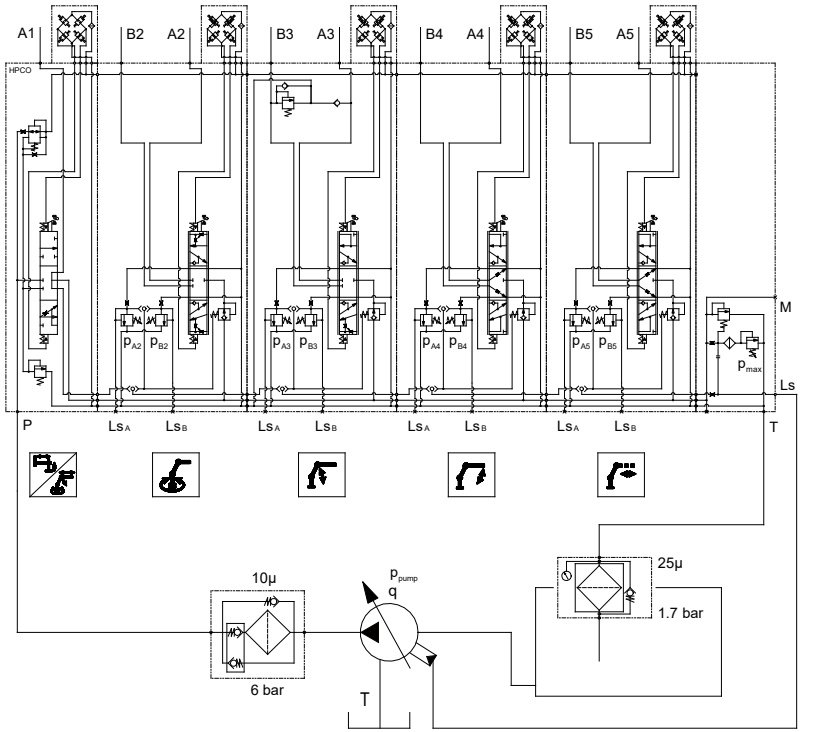
Settings for winch

p_{A6} = 200 bar	p_{B6} = 200 bar

Settings for rotor und bucket/grab

p_{A6} = 200 bar	p_{B6} = 200 bar
p_{A7} = 200 bar	p_{B7} = 200 bar

HYDRAULIC SCHEMATICS
CONTROL VALVE FOR LS VARIABLE DISPLACEMENT PUMP
RDC - CE

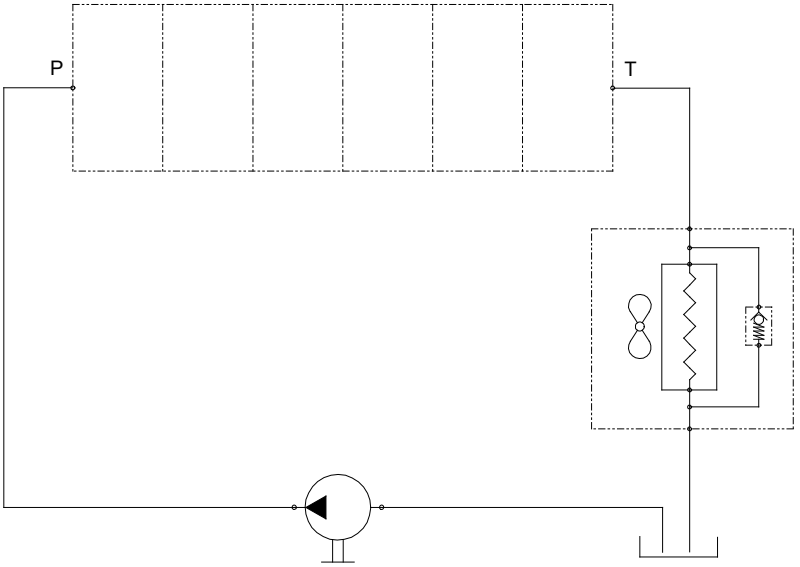


1030238

Special settings

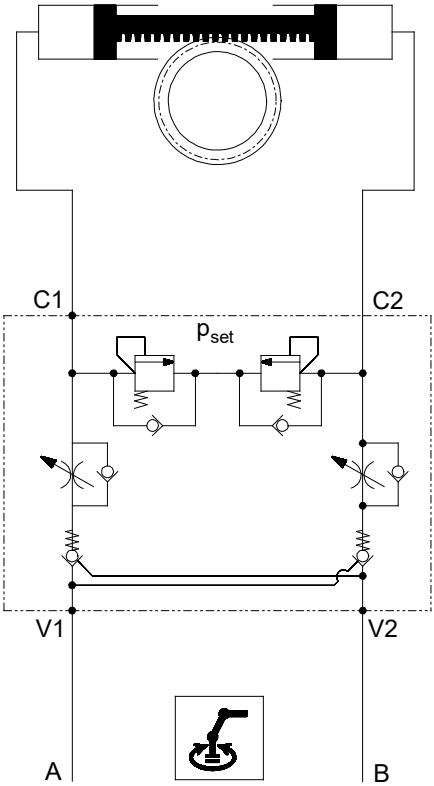
q : variable	
p_{max} = 350 bar	for 2S - 3S
p_{max} = 340 bar	for 4S - 5S - 6S
p_{max} = - bar	for 3SJ3 - 4SJ3 - 5SJ2
p_{pump} = 320 bar	for 2S - 3S
p_{pump} = 310 bar	for 4S - 5S - 6S
p_{pump} = - bar	for 3SJ3 - 4SJ3 - 5SJ2

HYDRAULIC SCHEMATICS
OIL COOLER (OPTION)



1030250

HYDRAULIC SCHEMATICS
SLEWING SYSTEM

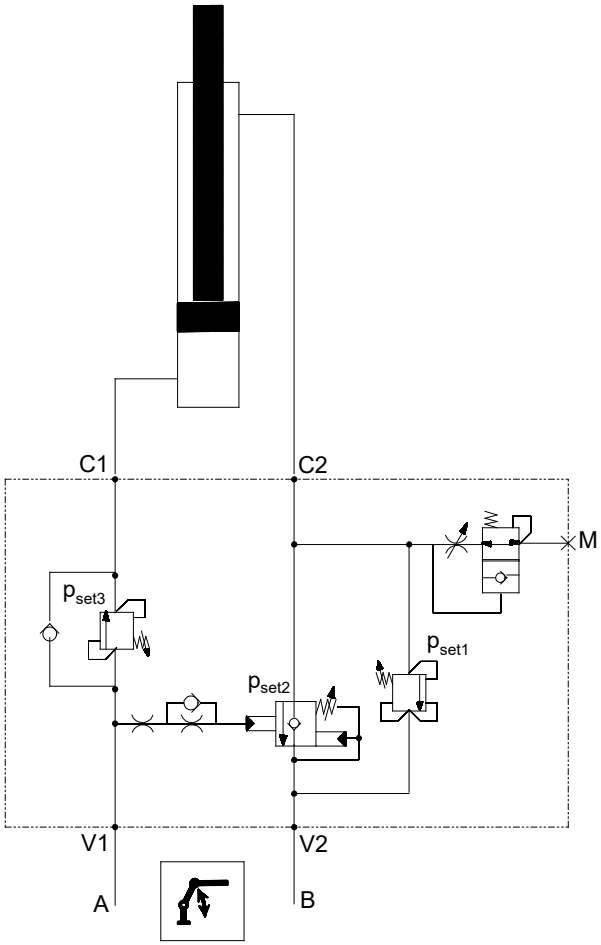


1050102

Rack stroke: 725 mm

Settings
p_{set} = 190 bar

HYDRAULIC SCHEMATICS
1ST BOOM CYLINDER

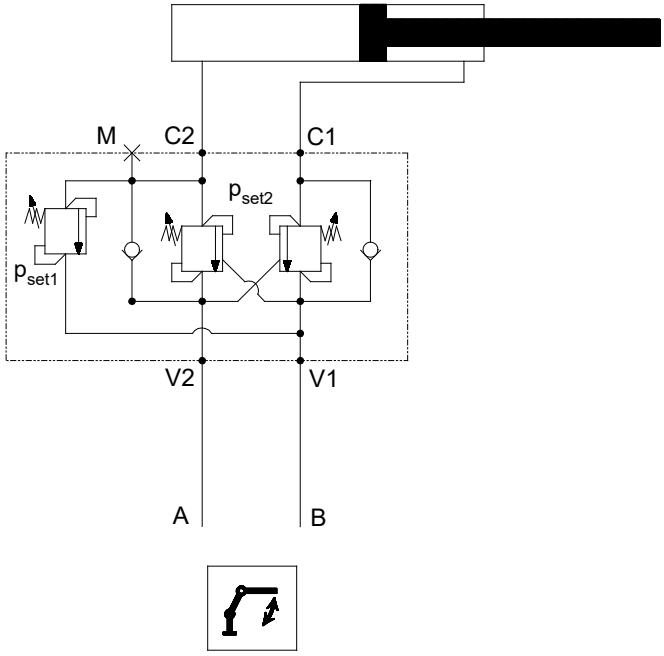


1050093

Settings

p_{set1} = 355 bar	for 2S
p_{set1} = 340 bar	for 3S - 4S
p_{set1} = 335 bar	for 5S - 6S
p_{set2} = 32 bar	
p_{set3} = 40 bar	

HYDRAULIC SCHEMATICS
2ST BOOM CYLINDER

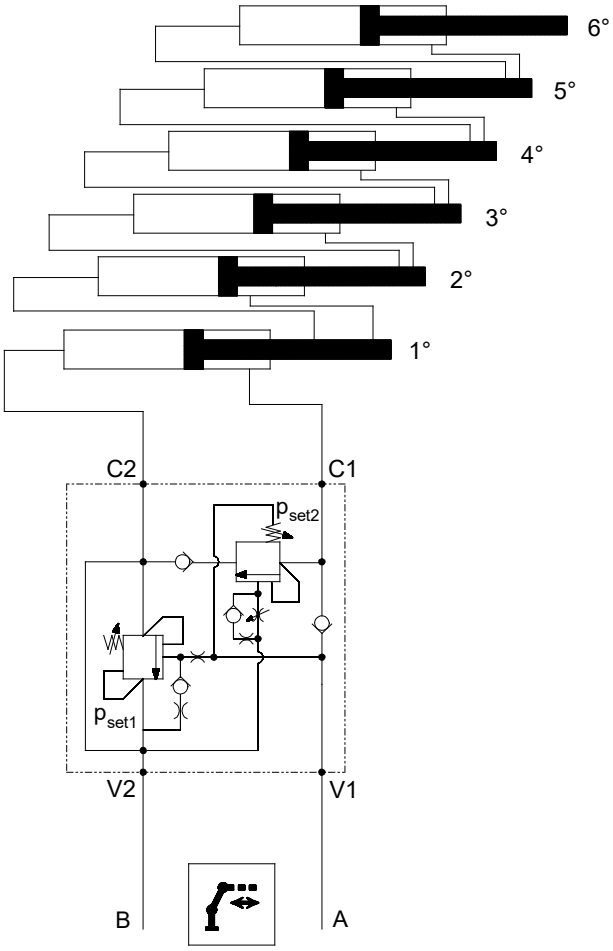


1050119

Settings

p_{set1} = 335 bar	for 2S
p_{set1} = 340 bar	for 3S - 4S - 5S - 6S
p_{set2} = 315 bar	

HYDRAULIC SCHEMATICS
EXTENSION CYLINDERS

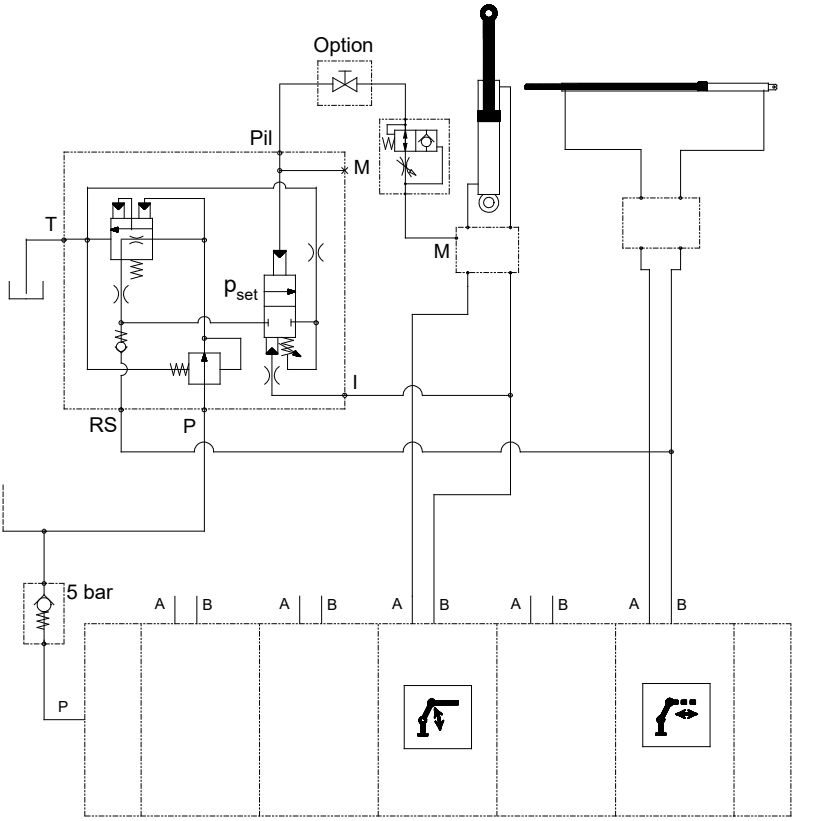


1050103

Settings

p_{set1} = 210 bar
p_{set2} = 430 bar

HYDRAULIC SCHEMATICS
MOMENT LIMITER, NO RDC - NO CE



1060093

Settings

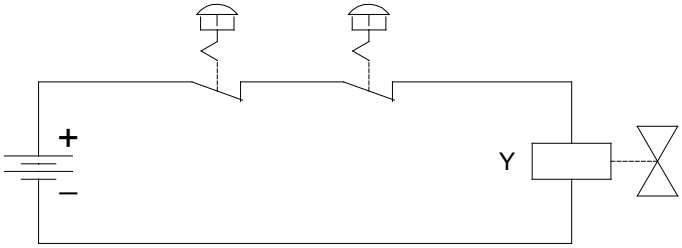
p_{set} = 320 bar	for 2S
p_{set} = 310 bar	for 3S - 4S - 5S - 6S
p_{set} = - bar	for 3SJ3 - 4SJ3 - 5SJ2

E.2 ELECTRIC SCHEMATICS

TECHNICAL DATA

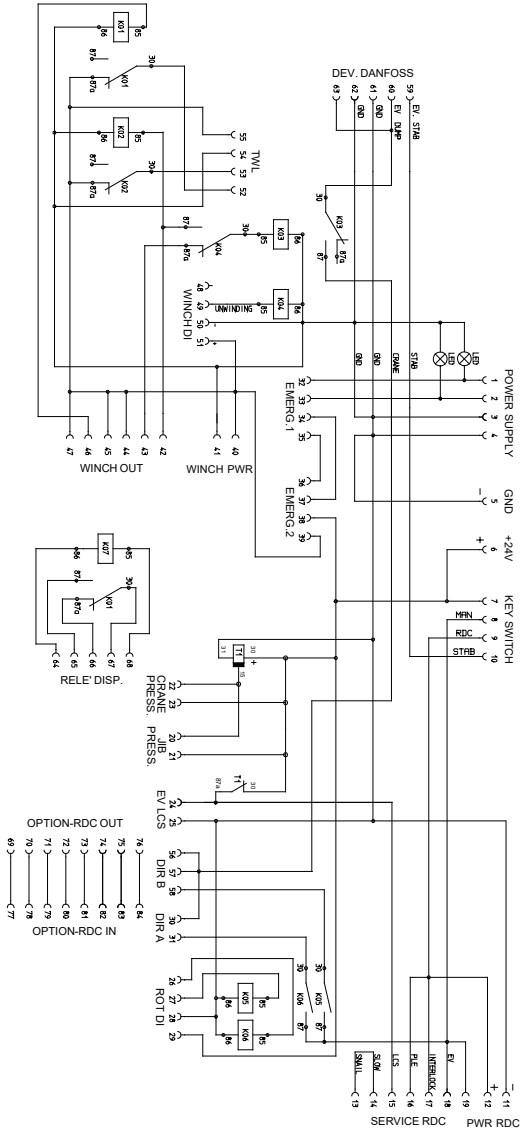
Supply voltage	12V - 24V
Max. current absorbed by the electric system	10A
Max. current absorbed by the electric system with radio-controlled stabilizers	15A
Environment working temperature	-35°C ÷ 85°C
IP protection class	IP 66

ELECTRIC SCHEMATICS
EMERGENCY STOP BUTTONS
NO RDC - NO CE (OPTION)



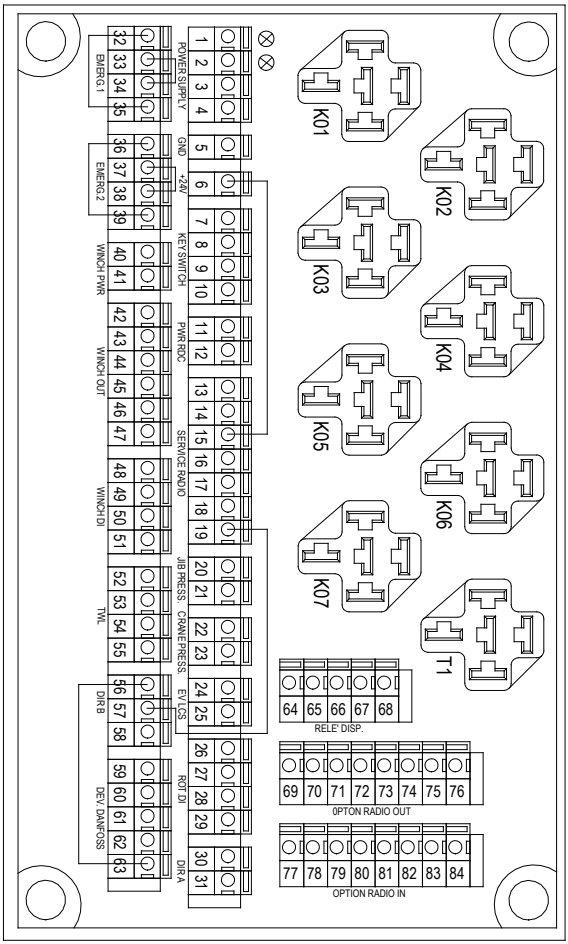
1010225

ELECTRIC SCHEMATICS
TERMINAL BOX - ELECTRIC SCHEMATIC



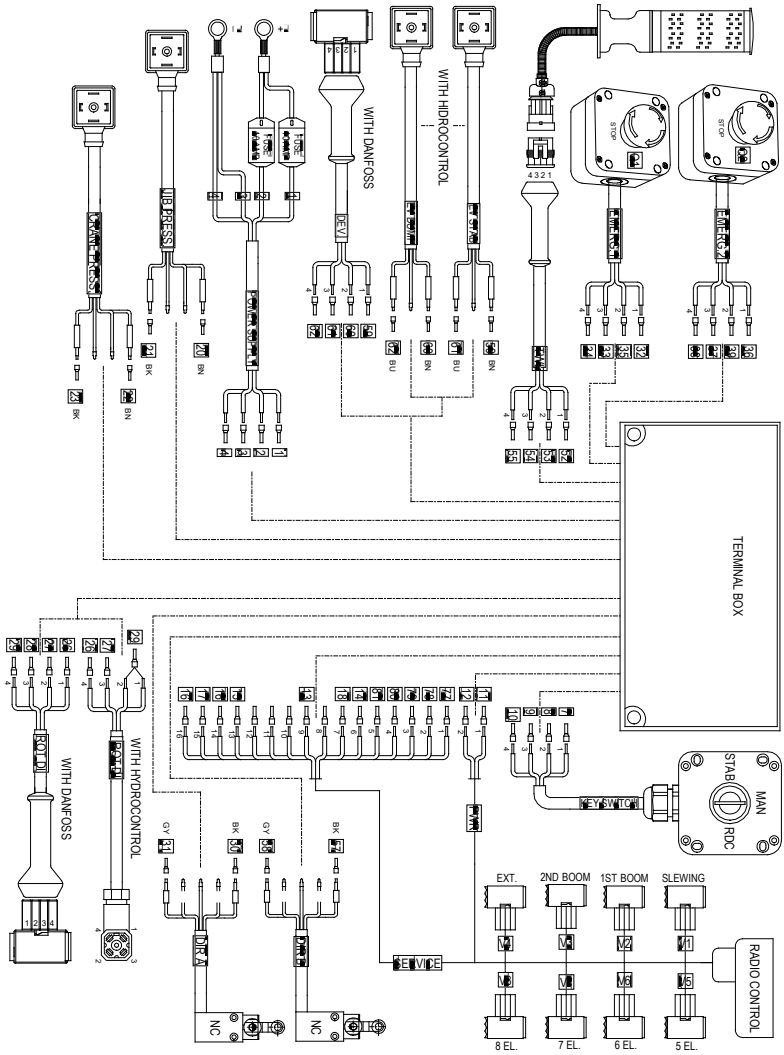
1010244-P1

ELECTRIC SCHEMATICS
TERMINAL BOX - CONNECTIONS



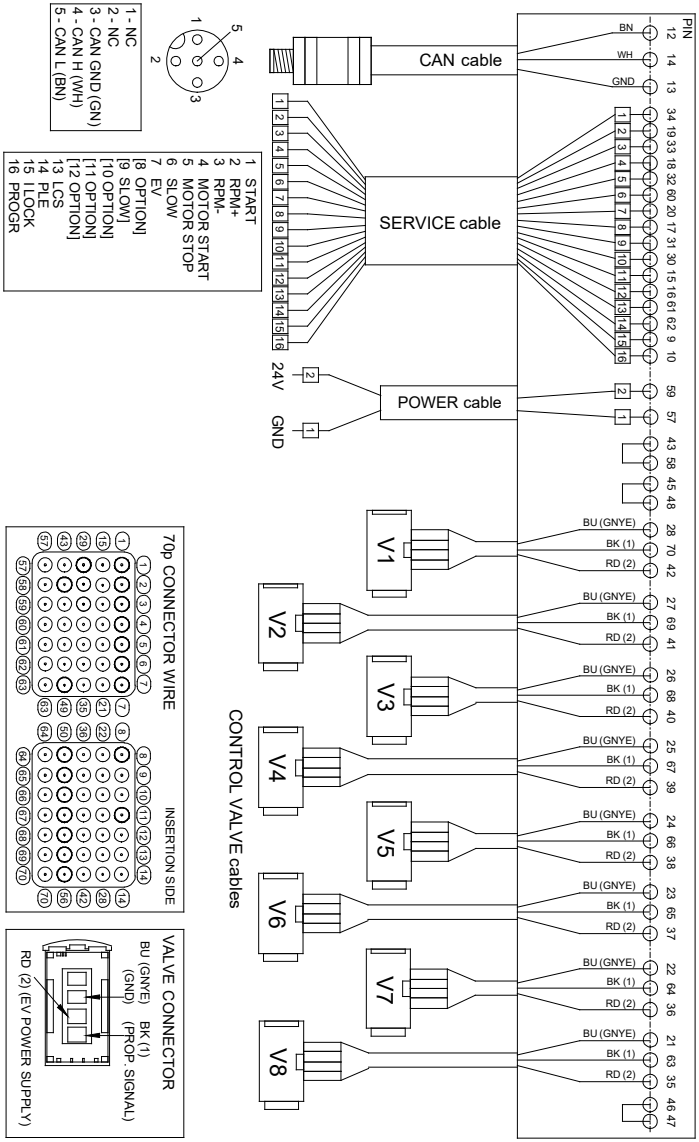
1010244-P2

ELECTRIC SCHEMATICS
NO CE - FULL OPTIONAL



1010244-P3

ELECTRIC SCHEMATICS
NO CE - RADIO CONTROL WIRING LAY-OUT



3312008

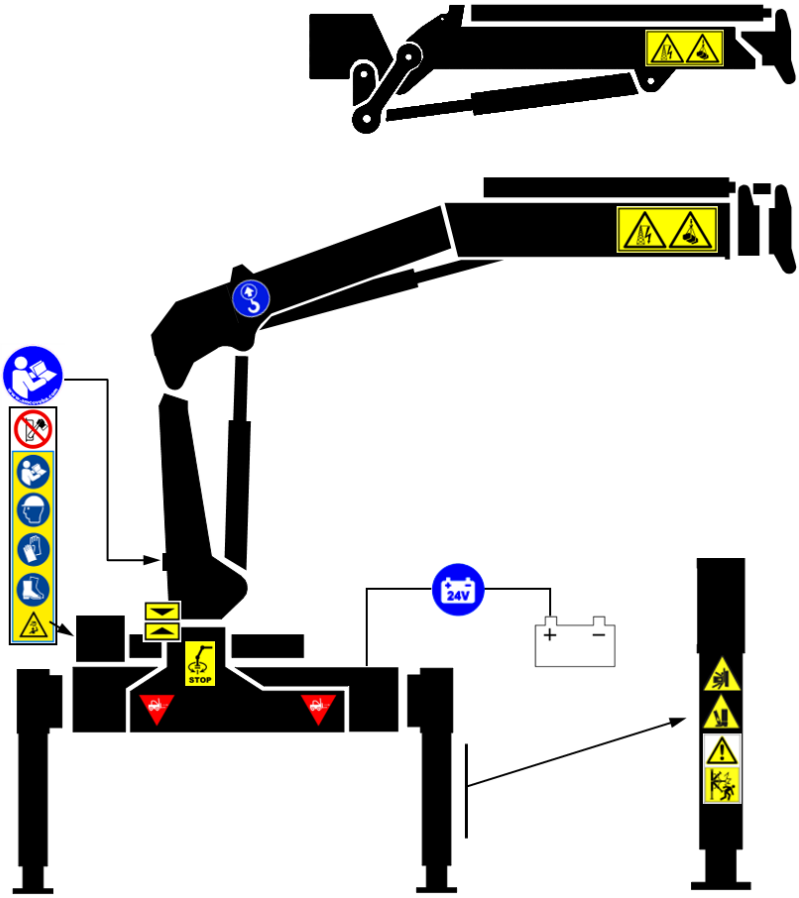
E.3 SAFETY SIGNS

Sign	Position	Description
	On stabilizer legs	Do NOT bang against the stabilisers during the stabilization of the crane
	On stabilizer legs	Do not position lower limbs under stabiliser legs during the stabilization of the crane
	On turning stabilizer legs	Do NOT bang against the turning stabiliser legs during the stabilization of the crane
	On stabilizer legs NO CE	Before starting any lifting operations, it's necessary to stabilize the crane correctly: fully extend the beams and deploy the stabilizer feet on the ground
	On base	Position of crane's dead point
	On base On column	Alignment point for the column when the crane is folded correctly

SAFETY SIGNS

Sign	Position	Description
	At controls	Read the user manual Wear helmet, gloves, industrial footwear Warning: do NOT bang on the booms during opening and folding of the crane
	At RDC controls	Seal sticker Do NOT use emergency controls under normal work conditions
	On column	Read the operator's manual; It's possible to download it from the indicated website
	On last boom On the jib	Power line electric shock hazard Suspended load movement hazard Do NOT stay in the crane's working area

LOCATION OF SAFETY SIGNS



E.4 TIGHTENING TORQUES

SCREWS - BOLTS

THREAD DIAMETER (mm)	TIGHTENING TORQUE Nm Property class 8.8	10.9	12.9
M 6 x 1	9.5	14	16.4
M 8 x 1.25	23	34	40
M 10 x 1.5	46	67	79
M 12 x 1.75	79	116	136
M 14 x 2	127	187	219
M 16 x 2	198	291	341
M 18 x 2.5	283	402	471
M 20 x 2.5	402	570	667
M 22 x 2.5	552	783	917
M 24 x 3	691	981	1148
M 27 x 3	1022	1452	1700
M 30 x 3.5	1387	1969	2305

Notes:
- in case of connection between **Geomet bolt - Untreated support** (or nut), multiply the tabulated values by **0.85**
- in case of connection between **Geomet bolt - Geomet nut**, multiply the tabulated values by **0.70**
- crane mounting bolts and slewing cylinders bolts shall be tightened with the torque given in D.5

FITTINGS JIC 37° SAE J514

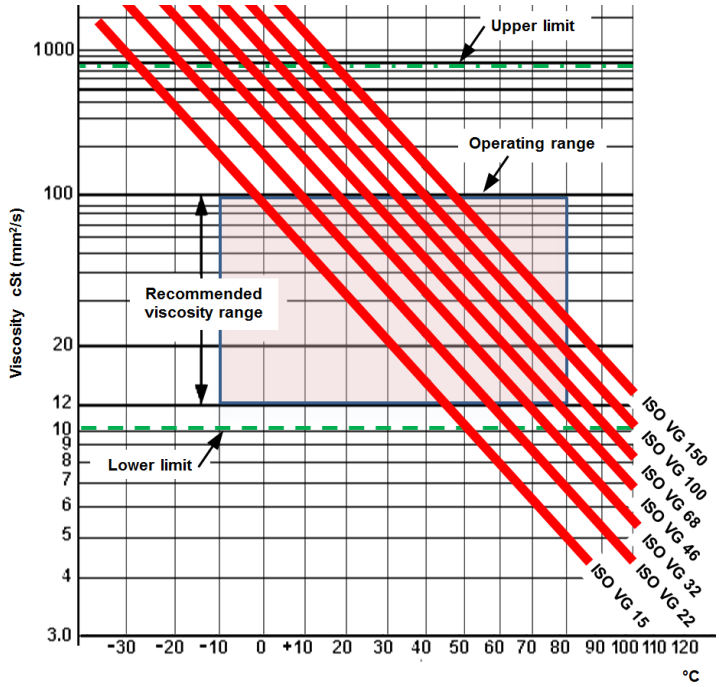
TUBE OUTER DIAMETER (mm - in)	TIGHTENING TORQUE Nm
6 - 1/4"	15
8 - 5/16"	25
10 - 3/8"	31
12 - 1/2"	52
16 - 5/8"	72
20 - 4/5"	100

FITTINGS DIN 2353

TUBE OUTER DIAMETER - GAS THREAD (mm - in)	TIGHTENING TORQUE Nm
6 - G 1/8"	20
8 - G 1/4"	40
10 - G 1/4"	40
12 - G 3/8"	80
15 - G 1/2"	100
18 - G 1/2"	100
22 - G 3/4"	200
28 - G 1"	380
35 - G 1" 1/4	500
42 - G 1" 1/2	600

E.5 SELECTION OF HYDRAULIC OIL

Viscosity is one of the most important properties of hydraulic oils because it affects the hydraulic sealing and the functionality of the safety valves. Therefore the oil temperature is very important because even small changes in temperature affect viscosity: as the temperature increases, viscosity decreases. The following table shows the effect of temperature on oil viscosity.



STARTING AND OPERATING VISCOSITY RANGE

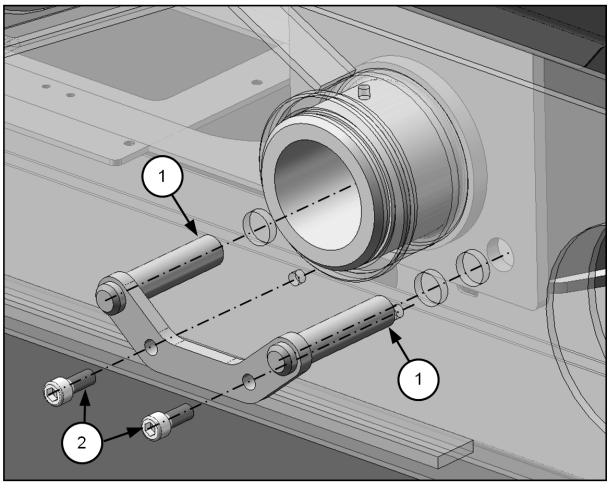
Max allowable viscosity at startup	1000 cSt
Min allowable viscosity during crane operations	10 cSt
Recommended operating viscosity	12 to 100 cSt

STARTING AND OPERATING TEMPERATURE RANGE

	Min starting oil temperature (environmental temp.) T_{env}	Operating oil temperature range T_{oil}
ISO VG 32	-10 °C	17 to 67 °C
ISO VG 46	-5 °C	25 to 77 °C
ISO VG 68	3 °C	32 to 80 °C

E.6 LOCKING DEVICE FOR SWIVEL BRIDGE

When selling the crane, the swivel bridge is locked by means of a rotation locking device.
The swivel lock consists of a device equipped with locking pins that prevent the bridge rotation with respect to the base. The swivel lock is screwed to swivel bridge.



Legend
1: Locking pins of the swivel lock
2: Fixing screws

The swivel lock must be removed after crane installation (see sticker below).



E.7 TROUBLESHOOTING

Trouble	Possible causes	Troubleshooting
The crane decreases in efficiency, the oil temperature increases, it is necessary to increase the speed of the engine to obtain the required speed.	Pump wear	Check the pressure on the pump delivery. If it's necessary to replace it, go to an authorized assistance center
The crane fails to lift the required load with all movements.	1) General overpressure valve worn, no more seal or dirty 2) Oil leakage at some part of the circuit	1-2) Go to an authorized assistance center
The crane moves slowly.	1) Crushed or dented suction hose 2) Air suction	1) Replace the suction hose 2) Check the tightness of the fittings on suction hose
The crane does not complete its movements.	Low oil level.	Restore the oil level in the tank
Operating the control levers produces no movement of the crane.	1) No motive power 2) Emergency stop button on 3) Safety solenoid valve damaged	1) Check there is motive power 2) Disengage the emergency push-button after checking there are no dangerous conditions 3) Go to an authorized assistance center
Crane lifts, but does not hold the load.	1) Wrong boom valve setting 2) Worn cylinder seals.	1) Set the valves 2) Replace the seals
Control levers of 1.boom and hydraulic extensions cylinders blocked in one direction.	Load limiting device on	Go to an authorized assistance center.
Oil leakage from the cylinders, lowering of the load with stationary pump, loss of power.	Cylinders seals wear.	Go to an authorized assistance center.
The slewing movement is not regular.	1) Vehicle beyond the max permitted inclination. 2) Slewing flow regulator valve and/or anti-shock valve on distributor element incorrectly set or dirty. 3) Worn slewing cylinder seals.	1) Return the vehicle to within permitted range 2) Set or clean the valves 3) Replace the seals
Rotation blocked in one direction	Slewing limiting device triggered	Go to an authorized assistance center.

TROUBLESHOOTING

Trouble	Possible causes	Troubleshooting
The stabilizer leg closes during the crane work.	1) The block valve on the stabilizer leg worn, no more seal. 2) Internal seals wear.	1-2) Go to an authorized assistance center.
Vibrations in the crane cylinders, boom extension cylinders jerk during the initial manoeuvres.	Hydraulic oil temperature too low	Perform manoeuvres without load for several minutes in order to warm up the oil
Vibrations in all movements when the oil is warm.	1) Insufficient oil in the tank 2) Air inside hydraulic circuit	1) Add hydraulic oil 2) Operate the controls to fully extend and fully retract the cylinders several times
The load limiting device comes into operation beyond its tolerance limits.	Incorrect setting of the load limiting device	Go to an authorized assistance center.
Metal particles found in the oil filters.	Some parts of the hydraulic circuit may be in a state of deterioration.	Go to an authorized assistance center.
Squeaking on articulation points or slewing unit bushing.	Lack of lubrication	Grease articulation points or bushings

E.8 EC DECLARATION OF CONFORMITY

AMCO VEBA

"ORIGINALE" Dichiarazione CE di conformità di una macchina

N..... Data.....

Fabbricante: H.C.E. s.r.l. Unico Socio. Indirizzo: via Einstein n°4 – 42028 Poviglio (RE) ITALIA.
Persona autorizzata a costituire il fascicolo tecnico: F. Marinelli, via Einstein n°4 – 42028 Poviglio (RE) ITALIA .
SI DICHIARA CHE LA GRU:
Mod. H.C.E....., N°. di serie .....dotata dei seguenti accessori:

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è conforme alle disposizioni pertinenti della Direttiva Macchine (2006/42/CE)
è conforme alle disposizioni della direttiva EMC 2014/30/UE
Tale dichiarazione riguarda esclusivamente la macchina nello stato in cui è stata immessa sul mercato, escludendo i componenti aggiunti e/o le operazioni effettuate successivamente dall'utente finale.
É vietata la messa in servizio se l'installazione non è stata eseguita nel rispetto delle indicazioni fornite da H.C.E. s.r.l. Unico Socio e dal costruttore dell'autocarro.

"ORIGINAL" EC Declaration of conformity for machinery

N..... Dated.....

Manufacturer: H.C.E. s.r.l. Unico Socio. Address: via Einstein n°4 – 42028 Poviglio (RE) ITALIA.
Person authorized to compile the technical file: F. Marinelli, via Einstein n°4 – 42028 Poviglio (RE) ITALIA.
HEREWITH WE DECLARE THAT THE CRANE:
Mod. H.C.E....., serial number ..... equipped with the following accessories:

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is in conformity with the relevant provisions of the Machinery Directive (2006/42/EC)
is in conformity with the provisions of EMC-Directive 2014/30/EU
This declaration relates exclusively to the crane in the state in which it was placed on the market, and excludes components which are added and/or operations carried out subsequently by the final user.
It is forbidden to put the crane into service should the installation not be carried out according to the instructions provided by H.C.E. s.r.l. Unico Socio and the truck's producer.

Jacob Biemond
R&D Director Hyva Group

FACSIMILE