



GLOBAL CRANE TRAINING

AC200-1 OPERATION

Superstructure Safety



Superstructure Safety Content



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Intended Use

The crane is designed for lifting loads.

It is prohibited to transport people with personnel carrying equipment! In many cases, there have been serious injuries when people have been transported using personnel carrying equipment (or even on the hook or on loads). In these cases, they have no control over crane movements and are not protected against bumps or falls. Even the smallest of errors can have fatal consequences.

In exceptional cases (for example, the use of personnel cages which were not supplied by the crane manufacturer), please consult the responsible authorities / agencies concerning relevant permits, fixed special conditions, safety regulations, additional tests and demands on the crane and similar issues. In Germany, the authority / institution concerned in the first place is the Berufsgenossenschaft.

The use of such additional devices is then the responsibility of the crane operator following the valid safety and accident prevention regulations!

Risk of death!

It is expressly forbidden to use the crane for jumps with rubber ropes (bungee jumping)!

Using the crane for such jumps represents a misuse of the crane and entails extreme danger for life and limb!

The crane is designed exclusively for **assembly operation**. Any other type of use which goes beyond the limits specified, for example handling of general cargo or grab operation, are **not classified as intended use**.

The manufacturer shall not be held liable for any damage that results. The operator carries full responsibility for this type of use.

Intended use also includes the observation of all load tables, the operating instructions - in particular with regard to the specified assembly sequence - and the lubrication and maintenance specifications.

If operation of the crane for part-load handling or another type of use is required, please contact the crane manufacturer.

The use of two hoists to raise the load (2-hook operation) is not permitted.

Special load cases are however permitted in consultation with the crane manufacturer.

The crane operator is responsible for the operation of additional equipment which is not included in the manufacturer's scope of supply (e.g. personnel cages), under observation of the applicable safety and accident prevention regulations.



Operating Conditions and Computed Design of the Crane General

The crane has been constructed using state of the art technology and in accordance with recognized safety regulations. Nevertheless, its use can lead to hazards for the life and limb of the operator and third parties, and/or damage to the machine and other objects.

Use the crane only when it is in full working order and only for its intended use, paying attention at all times to safety and potential hazards, and in observance of the operating instructions. In particular have any malfunctions which might impair safety rectified immediately.

The term „operating instructions“ refers to the operating instructions and the lubrication and maintenance instructions.

Classification of the Crane

The crane is classified as follows
(ISO 4301-2 and FEM 1.001):

- Operating class => U2
- Load class => Q2
- Crane group => A1

All important components of the crane are designed and manufactured for normal assembly operation. This assumes that crane operations under full load, crane operations with lower load and operating breaks occur in a ratio that is typical for an assembly crane. More exacting operating conditions necessarily lead to a shorter life expectancy for the crane.

Operating conditions or types of use other than assembly operation require the permission of the manufacturer and normally lead to a reduction in the lifting capacities.

Workplace Ergonomics

The following noise levels can occur near the crane operator's seat in the cab of the superstructure:

- Engine (S.S.) idle speed (610 rpm) < 75 dB(A)
- Max. engine speed (S.S.) without load (2750 rpm) < 85 dB(A)
- Engine speed at maximum engine torque without load (1300 rpm) < 80 dB(A)

Measurements were taken using a noise level measuring unit with the test microphone at the ear position of the crane operator.

The A-assessed equivalent permanent sound level at the operator's seat measured over the shift duration of 8 hours is below 70 dB(A). For this purpose, measurements were taken during operation on construction sites using dosimeters.

The crane operator is protected against mechanical vibrations by means of a tilting seat which can be adjusted to his weight. The crane operator's seat offers infinite adjustment options for the seat height and tilt, backrests and armrests. It is therefore possible to select the optimum working position for every driver.



The weighted effective value of acceleration to which the upper body is exposed is below 2.5 m/s².

The weighted effective value of acceleration to which the lower body is exposed (feet and seat) is below 0.5 m/s².

Both values are therefore below the statutory specifications.

Load and Utilization of the Crane

The maximum permitted load changes in relation to the configuration, boom length and working radius. It is specified by the crane manufacturer in the load capacity tables.

The load capacity tables supplied with the crane specify limit values which must not be exceeded.

The load limit of the winches is effectively reached when the rope force has reached its permitted value. Low loads with a small amount of reeving can place the winch under just as much load.

Required Ambient Conditions

The permitted **temperature range for operating the crane is** -20C to +40C, if the maximum or minimum temperature occurs only a few days a year.

Optional equipment for other operating conditions can be supplied.

The crane can be operated under full load up to a **height of** 1000 m above mean sea level. It is not hazardous to operate the crane up to an operating height of 2000 m above mean sea level.

The crane can also be operated without danger with high / low **relative air moisture**.

Continuous operation in aggressive air (e.g. harbors, chemicals industry, steelworks etc.) combined with high relative air moisture can require an adapter kit / optional equipment.

High levels of dust require the filter to be changed more regularly. Dust concentration levels of up to 35 mg/m³ are permitted for a short period of time.

With an oncoming **wind the crane operator must follow the rules** outlined in the operating instructions, operating rules and instructions in the operating instructions of the superstructure.

The **ground, on which the crane is supported - or driven with** load - must be strong enough to support the load.

Use of the crane in a **potentially explosive atmosphere or in** operating conditions where combustible gas can be drawn in is only permitted following corresponding **conversion**.



Service Life

Classification of the crane is based on a total operating life (service life) of 20 years under the following conditions:

- the crane is operated as an assembly crane.

The load capacity tables that are authorized for the crane are based on assembly operation only. General cargo handling or grab operation can only be permitted following express permission from the manufacturer under suitable conditions.

- the total number of load cycles in this period is less than 32,000 (e. g. 5 -10 lifts / day on 200 days / year).

A „LOAD CYCLE“ encompasses processes which begin when a load is raised and end when the crane is ready to raise the next load.

- the type of load (load collective) of the entire crane shows values no worse than the following:

- for 1/10 of the load cycles the crane is placed under max. load

- for 4/10 of the load cycles with 44 % of the max. load

- for 5/10 of the load cycles with 16 % of the max. load

„Load“ in this context refers to the sum of the load, load-handling devices and lifting tackle (e.g.: load + hook block + sling ropes).

Under these conditions, assuming that maintenance work is carried out properly, the theoretical service life can be more than 20 years.

Harder operating conditions naturally lead to a reduction in the service life.

For the winches, however, the rules for calculating the remaining theoretical service life must be observed, as outlined in Lubrication and Maintenance Instructions.

Some components (e.g. ropes) are not designed for the entire service life of the crane, but must be replaced after a certain amount of time.

Information on this can be found in the lubrication and maintenance instructions for the superstructure.

Standards and Calculation Regulations

The specifications contained in this on service life, loading and utilization of the crane are taken from the European standards ISO 4301-2 and FEM 1.001, FEM 5.004 and ISO 9927-1. The proof of stability for the framework, the components and parts of the crane is based on the standards: FEM 5.004, ISO 4301-1, ISO 4301-2, FEM 1.001 and ISO 4308-2.

The ropes are selected and calculated in accordance with ISO 4308-2. All required proofs of stability (buckling and bending) were carried out in accordance with DIN 18800. The minimum safety factors are taken from FEM 5.004.

The proof of standing stability for the crane is based on ISO 4305.

For countries in which different standards and calculation regulations apply, special calculations or proofs can be carried out.

If required, these calculations must be specially ordered by the crane operator. This does not alter the operating conditions for the crane. If necessary the lifting capacities must be limited.



Safety Regulations

While carrying out power—driven erection and assembly procedures only the crane operator is allowed on the crane (and he must be in the crane operator's cab). Remaining personnel must remain clear of the hazardous area on and around the crane.

The only exception to this rule is when the counterweight is being fitted and when a load is being attached or released with the help of a fitter.

When stacking the counterweight the person attaching the equipment must leave the crane and the slewing area as soon as the erection work is completed. During stacking, the person attaching the equipment must remain outside the hazardous area.

When attaching and disconnecting the load, particular care should be taken as a result of swinging loads or hook blocks. The person attaching the equipment must be proficient in handling hook blocks.

Once the load has been attached or released, the fitter must leave the slewing or hazardous area immediately.

The fitter must be easily recognizable to the crane operator.

The fitter must wear one or more means of identification e.g. jacket, helmet, special collars, armbands, signaling discs.

These means of identification should be in a distinctive color and where possible of an identical design and must be exclusive to the fitter.

Selection and Qualifications of Personnel

In order to operate a crane optimally within its proper parameters, the crane operator and personnel working on maintenance, assembly and dismantling must be properly qualified and trained.

The crane operator / owner is responsible for providing this training.

Use only reliable, trained and/or experienced personnel for work on and with the crane.

Make sure that only authorized personnel are allowed to carry out work .

Pay attention to the minimum working age.

Clearly specify all areas of responsibility:

- for operating, erecting and servicing.
- for the crane driver, also with regard to his responsibilities as a result of road traffic regulations. Allow him to refuse instructions from third parties which contravene safety regulations!

Personnel who are still being trained and instructed in the use of the crane, or who are completing a general apprenticeship, may only be allowed to work on the crane under the constant supervision of an experienced member of staff .



Particular Hazards

Electrical Energy

High voltage

With high voltage lines, any direct contact with the boom or the hoist rope is always dangerous.

With high voltage lines above 1000 V current can be transferred even as the lines are approached.

This hazard should be prevented by the following measures:

- Switch off the power to the lines.
- Cover or cordon off the danger zone.

Both measures may only be carried out by qualified electrical specialists.

If these measures cannot be carried out, a sufficient safety clearance must be maintained between the crane (and hoist rope, lifting tackle, hook block, load) and current-carrying lines.

Risk to life and limb!

Keep a clearance of at least 10 m. If this is not possible, you must obtain information on required minimum safety distances from the electric power company responsible.

With extremely long boom equipment, these safety clearances are very difficult to judge. To be on the safe side, increase the safety clearance to 20 m.

The safety clearance must still be available for unfavorable crane or load positions.

Allow for possible swinging of the load or swinging out of the free line as a result of the wind.

If, however, the crane accidentally comes into contact with high voltage power lines:

- Move the crane out of the danger zone: drive out, swing away, adjust the boom!

If this is not possible:

- Do not leave the crane or driver's cab.
- Warn those outside not to approach or touch the crane.

If the crane operator leaves the crane or if another person approaches and touches the crane, they will receive an electric shock.

Even the ground around the crane is carrying an electric current. Therefore every step on the crane, to the crane or away from the crane is potentially dangerous (step voltage)!

- Arrange for the voltage to be switched off.
- Only leave the crane when you are sure that the touched/damaged line has definitely been disconnected from the power source.



High-frequency radiation / operating in vicinity of transmitters

Charging

It can cause dangerous electrical charging if track-free mobile cranes are used in the vicinity of transmission systems (e.g. radio transmitters).

In this case, the following measures must be taken:

- agreement with the operator of the transmitter (possibly switching off the transmitter).
- grounding (of the track-free mobile crane).

In order to protect the rotating connection the grounding cable must be fastened directly to the superstructure of the crane or to the boom.

Risk of injury!

If the prescribed measures are not taken the persons connecting the charged components to ground will be violently and painfully electrified at touch.

Interference with the crane electrics

At the same time, the crane electrics, especially the **IC-1**, cannot be considered function safe, depending on the strength and frequency of the transmitter.

The danger of the **IC-1 being influenced by high-frequency radiation** has been minimized with up-to-date technology (shields). However, it cannot be fully discounted, especially under extreme circumstances.

This is especially valid if the crane is used in the close vicinity of high-frequency radiation sources (e.g. radar stations, radio transmission stations, radio and television stations).

Lightning

If storms are approaching, if possible lower the crane equipment and leave the crane.

If this is not possible, lower the load from the hook, switch off the engine and leave the crane.

Only remain in the crane operator's cab if you cannot carry out these measures in good time.

Under no circumstances must the crane operator approach the crane or its immediate vicinity during the storm. Warn any other people in the vicinity of the crane.

The general functions of the crane must be checked if it is suspected that it has been struck by lightning. It is especially important that the following is checked:

- general electrics, especially:
- load limit device; if defective, there is a fault message in the display.
- limit switch for function.
- inductive proximity switch for function.
- luffing and outrigger cylinders with a visual inspection for external damage caused by flashover voltages or melting. By retracting and extending the relevant cylinders several times, check if there are suspected internal leaks due to damaged seals.
- hoists, especially for damage to the ball and roller bearings.





Combination of Hazards with Combined Operation of Two or More Cranes

Operating Areas of Several Cranes Overlap

If the operating areas of several cranes overlap, there is a risk of collisions.

The operating company or its representative must:

- specify the working procedure in advance!
- make sure that there is a clear line of communication with the crane operator !

If the crane operator does not have spoken or visual contact, suitable measures must be taken, e.g. use of radios, spotters/banks men etc.

If spotters are used, suitable signals must be agreed between the spotters and the crane operators. In this regard, please refer to "Safety Instructions".

Crane operators must operate the crane in such a way that uncontrolled movements and subsequent collisions are avoided.

They must receive suitable training and instructions to this end.

Combined Raising of a Load by More Than One Crane

If a load is to be raised by more than one crane, the operator of the crane or his representative must first set up a working procedure and appoint a supervisor, in whose presence the operations are carried out.

The most important requirement for this type of operation is, however, careful planning, covering the following points:

- The mass (the weight) and the center of gravity of the load must be known exactly.
- The load must be shaped in such a way as to avoid extra hazards during the lifting procedure.
- The other cranes which are taking part in the operation must have nearly the same lifting capacity.
- Additional dynamic load effects when the load is raised and set down and load effects as a result of environmental influences (e.g. wind) must be allowed for during planning.

The actual danger is during joint lowering of the load. Using the relevant reeving and control, the lowering speeds of both cranes must be as similar as possible, otherwise there is danger of the slow crane becoming overloaded.

The „Accident Prevention Regulations for Cranes“ by the Employer’s Liability Insurance Association (BGV D6) can serve as a helpful guide. It contains regulations and safety instructions for operation with several cranes. It especially emphasizes the importance of sufficient safety reserves for each crane and that the full load value of the load capacity table may never be used.

If there are any doubts concerning the accuracy of the data, e.g. the accuracy of the details with regard to mass and the position of the centre of gravity of the load, the safety reserves must be increased accordingly.

Before carrying out heavy-duty operations, the crane manufacturer should be consulted to see whether the crane can be fitted with any additional safety devices (e.g. limiters) or whether the lifting capacity needs to be restricted additionally for the operation in question.

Avoid pulling a load sideways or at an angle!

Crane Operation

Before Crane Operation

Check the load conditions again before commencing crane operation: Is the mass (the weight) of the load and the operating procedure known and is there sufficient lifting capacity, working radius and lifting height? Compare the values with the load capacity table.

Check whether outside conditions such as wind, snow, poor visibility, unfavorable temperatures etc. could limit crane work. Compare the conditions with the corresponding sections in the operating instructions.

Make sure that the ground has sufficient load-bearing capacity when supporting the crane on outriggers.

For more detailed information, "Working Instructions" in the operating instructions of the superstructure and section "Outriggers" in the operating instructions of the crane chassis.

Before commencing work at the operating site, familiarize yourself with the working environment. The working environment includes, for example, obstructions in the operating and traffic areas, the load-bearing capacity of the ground and the necessary safety precautions required to cordon off the construction site from public traffic areas.

To operate the crane, unhindered sight of the crane, load and load path must be ensured.

Carry out the necessary measures to ensure that the crane is operated in a safe and functional condition.

Before commencing work, check that all crane movements are functioning correctly and safely.

Operate the crane only if all safety guards and equipment are fitted and functional.

Check the correct function of the brakes, signal and lighting equipment, limit switches and overload cut-off device daily, for cranes that are seldom used - every time that they are operated.

Before commencing work with the crane make sure that no-one is in the hazardous area. If necessary give a warning sign (actuate the horn before starting the engine for example!).

As oil can be emitted during maintenance and assembly work, suitable collecting vessels and binding agents must be kept ready.



The weight of the load must be known.

It is difficult to calculate the load weight during dismantling work. If a load that is attached to the crane is released from its previous connection to other parts and is too heavy, the crane will be unavoidably destroyed or will tip over, regardless of the load limit switch.

When dismantling hollow components (pipelines, cement silos etc.) allowance must be made for the weight of possible residues inside these components.

When determining the size of the components that are to be dismantled, never utilize the full values allowed in the load capacity tables of the crane, but allow for a safety buffer.

Select the correct boom length and reeve the hoist rope in accordance with the individual load case.

Select the lifting tackle in accordance with the weight of the load, the type of attachment and the angle of inclination.

Only hook blocks supplied by the crane manufacturer may be used. The use of other hook blocks is only allowed following permission from the crane manufacturer.

Pay attention to the rules and regulations for working with load handling equipment (attachment ropes etc.). Never use lifting tackle if there is any doubt as to its lifting capacity. Check to make sure that the lifting tackle is in perfect condition.

When carrying out power-driven working procedures (raise / lower load) only the crane operator is allowed on the crane (and he must be in the crane operator's cab). Remaining personnel must remain clear of the hazardous area on and around the crane.

The crane operator must give a warning signal when starting the drive motor and before starting crane movements (horn).

Stop work immediately if persons fail to leave the hazardous area in spite of the warning.

The crane operator may only start movements if he has good visibility of the hazardous areas. In case of poor visibility suitable persons must be selected as spotters and must be instructed on the correct signals before commencing work.

This also applies if normal voice communication is not possible as a result of an increased noise level.

Keep the windows of the crane operator's cab clean to maintain good visibility at all times.

In order to allow immediate reaction when the crane is subjected to changing environmental conditions, it is prohibited to switch off the drive of the crane when a load is attached and / or to leave the crane operator's cab.

Exceptions are only permitted in emergency situations.

To avoid hazardous situations, in the final instance the drive source (diesel engine) can be switched off using the emergency off button in the crane operator's cab.

First - where possible - movements that have been started should be completed using the control levers.

Before raising a load, you must always make sure that the hook block is positioned vertically over the load's centre of gravity.



The crane (superstructure) may only be placed in operation when the crane chassis engine is switched off, the driver's cab closed and the control panels of the outriggers locked.

The erected crane without load may only be left without the supervision of a trained crane operator if certain conditions are met (see operating instructions of the crane chassis, "Parking").

The carrying of persons with the load or the load handling equipment is prohibited.

The crane may only be accessed and left following agreement with the crane operator and only when the crane is at a standstill.

Observe all safety and hazard warnings on the crane.

Avoid any actions which may impair safety (e.g. risk to the stability of the crane).

Never slew loads over people.

Only start the crane engine from the driver's seat. Only actuate the control lever from the cab.

Keep the controls lever within reach as long as a load is suspended on the crane or the crane is driven.

To prevent the unintended activation of crane movements, both control levers are equipped with an additional button (dead-man's button).

The crane movement can only be carried out as long as one of these buttons is pressed.

The dead man's switch may only be actuated (pressed and released) and the limit switches in the instrument panel bridged, when the corresponding control lever is in the „O“

position and/or the working movement that is underway has been completed.

RISK OF ACCIDENTS!

Actuation of one of these buttons when the control lever is fully deflected leads to an abrupt activation or braking of the corresponding movement.

For all crane movements, pay particular attention to the load, for unladen operation the load-handling device, and the boom tip !

Watch the slewing radius of the counterweight etc.

Watch out for obstacles (on the crane and on the operating site) which could lead to a collision.

The load must never come into contact with the framework of the crane (boom system, superstructure, crane chassis, outriggers etc.).



Dragging and scraping of the load is prohibited during crane operation.

It is prohibited to pull loads free that have become lodged.

Do not jump from the crane.

Use the ladders and the handrails provided.

Secure the doors with the available locks to prevent them slamming open or closed.

Check the crane at least once a shift to check for any visible signs of damage or faults. Any changes (including to operating behavior) should be reported immediately to the point / person responsible. If necessary, switch off and safeguard the crane.

In case of a malfunction on the crane, switch off the crane immediately and secure it. Have any faults rectified immediately!

Pay attention to the procedures for switching equipment on and off as well as the behavior of the indicator lights as outlined in the operating instructions.

In case of poor visibility and darkness always switch on the outside lighting. The inside lighting should be switched off to enable proper sight of the load and the immediate environment of the crane.

Always keep the operating instructions at the crane operating site in the storage compartments provided. These are located on the superstructure on the back wall of the cab and on the crane chassis on the driver's door.

Be aware of the location and availability of fire warning and fire fighting equipment.

Pay attention to the weight and surface area of the load exposed to the wind.

Loads that are in water are lighter for the crane than those in air (due to buoyancy). When the load leaves the water it becomes heavier. If this results in the crane being overloaded the load limit device would be triggered.

There is a risk to the lifting tackle, however, if this is not measured for the actual load weight.

Set the computer of the IC-1 in accordance with the load capacity tables supplied.

Working in the overload range (load limit switch has shut down) is prohibited.

Observe the permitted wind speeds.

The superstructure may only be slewed when the crane is supported on outriggers. Note that slewing is only permitted for certain crane configurations (e.g. with regard to outrigger support area, counterweight etc.). Always observe the specifications of the load capacity tables.

Slewing of the superstructure in the overload range (load limit device has shut off) is generally prohibited.

In an emergency the wide-opening front window can be used as an exit.



Following Crane Operation

When you leave the crane:

- the load must be detached from the crane hook or set down on the ground.
- the engine must be switched off and all control levers placed in the „O“ position or the „locked“ position.
- the heating must be switched off.
- the parking brake of the crane chassis must be closed.
- the crane must be secured to prevent unauthorized use and unintentional movement.

If the crane is parked on steep ground, the travel gear must be additionally secured with chocks, the slew brake applied and the boom secured.

Close all control panels that are fitted with a lock when they are not being used.

When parking the crane pay attention to the permitted wind speeds (also for the time when the crane is at a standstill). If necessary telescope in and set down the boom.

Power Supply Failure

General

If the power supply fails, all movements are stopped. An unintentional restart is not possible. When the diesel engine comes to a standstill, the driven hydraulic pumps also stop. The oil which is currently in circulation also comes to a standstill.

As soon as the control pressure reaches zero, all actuators return spring-loaded to the zero position, regardless of the position of the pilot control lever.

In the hydraulic circuits which are directly relevant to safety, there is redundant braking of the winches and cylinders as a result of the locked position or additional retaining brake.

Winches and cylinders

The oil column on the lever side of the winch motors and cylinders is safeguarded by means of load-independent brake valves (lowering brake valves). The winches and cylinders can no longer be moved in the event of a failure to the power supply.

The lower brake valves are directly fitted to the winch motors and cylinders (no hose lines).

As the described case is extremely seldom, there is no in-built option for lowering a load on the hook. In this event the customer service department must be informed.

If hoses or pipes should burst, therefore, there will be no dangerous crane movements as a result.

In addition, in the case of a standstill the hydraulically actuated disc brake of the slew gear is applied.



Driving the crane in the erect (configured) condition

When the crane is driven in the configured position, the load rests on the suspension cylinders. These are not equipped with pipe burst valves, in order to guarantee problem-free suspension behavior during driving of the crane. To avoid hazardous situations, the regulations outlined in the operating instructions for the crane chassis, "Driving in the Configured Condition" must be strictly observed.

Hand Signals

If the crane operator cannot oversee the operation and working direction (and/or hazardous areas) from the crane operator's cab (or driver's cab), a spotter must be used.

This also applies if normal spoken communication is not possible as a result of the increased noise level.

Only responsible and reliable persons who know the symbols may be employed as spotters.

The spotter should be in a safe position, from where he can SEE THE LOAD and can himself be clearly SEEN BY THE CRANE OPERATOR.

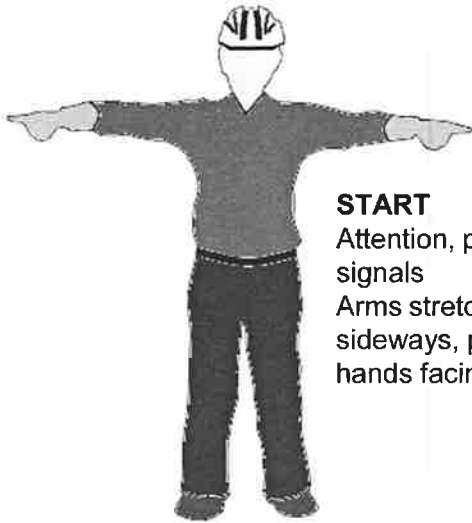
The spotter must be easily recognizable for the crane operator. The spotter should wear one or more suitable means of identification e.g. jacket, helmet, collars, armbands, signaling discs.

These signs of identification must be in a distinctive color and uniform in design and must be worn exclusively by the spotter.

If the load is attached by several people, only one person may give the signals. These must be made known to the crane operator.

If the crane operator does not fully understand a signal, he should not carry out any movement with the crane. Before commencing work the crane operator and spotter must work out a signal for this scenario.

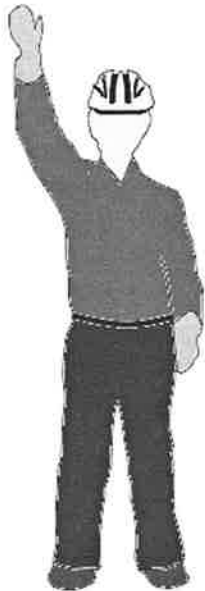


**START**

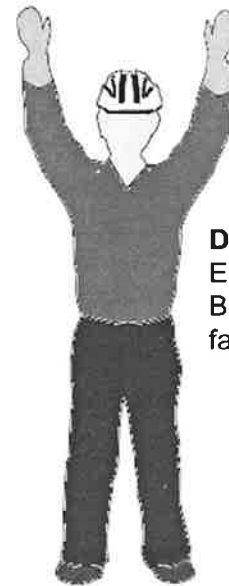
Attention, pay attention to the following signals
Arms stretched out horizontally sideways, palms of the hands facing forwards.

**END**

of a movement
Hands folded at chest height.

**STOP !**

Interruption, end a movement
Right arm raised, palm of the right hand facing forwards.

**DANGER !**

Emergency stop
Both arms raised, palms of the hand facing forwards.



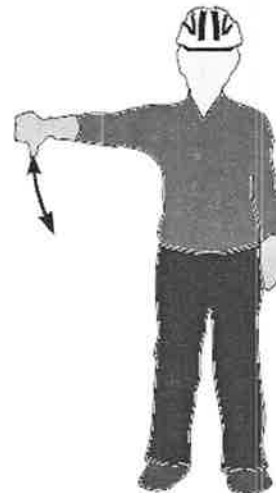
RAISE load
Right arm raised, palm of the right hand facing forward, moving slowly in a circle.



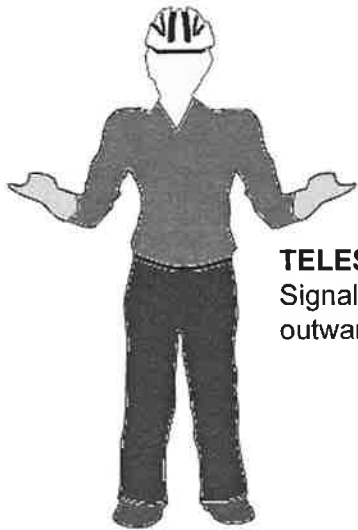
RAISE boom
Signal with one hand. Right arm stretched outwards, thumb pointing upwards.



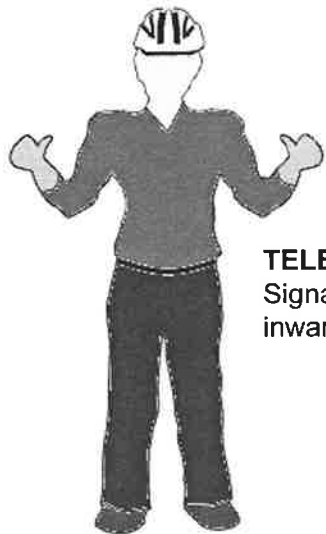
LOWER load
Right arm down, palm of the hand facing inwards, moving slowly in a circle.



LOWER boom
Signal with one hand. Right arm stretched outwards, thumb pointing downwards.



TELESCOPE OUT boom
Signal with both hands. Thumbs pointing outwards.



TELESCOPE IN boom
Signal with both hands. Thumbs pointing inwards.

NOTES;

