

USE AND MAINTENANCE MANUAL

CRAWLER WITH CRANE

M 250



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Translation of original instructions

USE AND MAINTENANCE MANUAL VEHICLE MODEL

MODEL	M250
COMMAND EXECUTION	Electro-hydraulic
SERIAL NUMBER	M305200112
DECLARATION NO.	M305200112
YEAR OF MANUFACTURE	2020
CARRIER VEHICLE	CRAWLER
MAINTENANCE	100744

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specifications are subject to change

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1 INTRODUCTION

Adequate work safety is essential to prevent serious damage to yourself and to other people.

Therefore, it is essential to follow the WARNINGS and to carefully read this manual presenting accurate and fundamental instructions on routine and periodic maintenance procedures.

1.1 Purpose and limits of this instruction manual

This instruction manual addresses, in particular, the owner of the CRAWLER and, in general, all those who are involved in any capacity in its transfer by road or elsewhere, use, monitoring and maintenance, until its final dismantling.

The purpose of this instruction manual is to:

- describe the use of the crawler based on its design;
- Illustrate the principal technical characteristics of the machine;
- provide the characteristic data for completion of the "TEST LOG" by the responsible Department;
- provide instructions for positioning and operating the machine;
- Describe the safety devices;
- Provide routine maintenance and repair instructions;
- Form the basis for a support structure for training personnel;
- Provide instructions for completing the inspection register.

The present manual, however, cannot in any way be a substitute for adequate previous experience of personnel on similar machines or experience gained on this machine under the supervision of personnel trained in accordance with the chapters which follow.

In addition to observing the instructions contained in instruction manual, the operation of the crawler is subject to the observance of all safety regulations provided for by the specific legislation of the country in which the machine is used.

1.2 Where and how to store the instruction manual

The instruction manual is to be considered as a part of the machine and must, therefore, always be stored for consultation or reference on board the machine, in a protected and dry place away from direct sunlight.

In the event that the instruction manual is accidentally damaged, request another copy from **BRENNERO GRU**.

1.3 Modifications and integrations to the instruction manual

The manual reflects the state of technology at the time of marketing the machine; therefore, it cannot be considered inadequate or incomplete due to subsequent modifications or integrations being introduced due to new laws, updated harmonised standards and/or newly acquired know-how.

BRENNERO GRU reserves the right to update its production and relative instruction manuals on the basis of developments in technology, newly acquired know-how and/or changes in laws, without being obliged to act on the machines sold previously and on their manuals.

Nevertheless, **BRENNERO GRU** will be entitled to modify and/or integrate the instruction and maintenance manuals of the products sold previously if it deems this is appropriate for justified reasons.

In this case, updated or amended documents will be transmitted to the original owners of the machines. These documents must be considered as an integral part of the instruction manual and carefully stored together with the present manual or transmitted to the new owners in the event that the crawler has been sold.

1.4 Exclusion of liability

As the manufacturer, **BRENNERO GRU** does not accept any liability arising from damage due to:

- improper use of the machine;
- use by untrained personnel;
- use in contravention of the safety regulations specified by European Community and/or national regulations in force;
- inadequate ground characteristics;
- total or partial failure to observe the provisions of the manual;
- failure to observe the maintenance instructions provided in the manual;
- modifications or repairs not authorised by the manufacturer;
- use of non original spare parts;
- exceptional environmental events.

ATTENTION: READ AND KEEP THIS MANUAL!



- | |
|---|
| <ul style="list-style-type: none">• Study the operating instructions. |
| <ul style="list-style-type: none">• The operator shall be trained on the use of the machine, he/she should be aware of its lifting capacity and operating limits, and should be aware of and follow safety standards carefully. |
| <ul style="list-style-type: none">• The instruction manual is a fundamental element for the proper use and maintenance of the equipment. |

For repair and overhaul assistance please call the company, which has highly skilled workers and suitable equipment available.

The TECHNICAL ASSISTANCE SERVICE is at your disposal for explanations, advice and for interventions with its own workers, if necessary.

Proper operation and durability is only ensured by using original spare parts.



<p>At the end of this manual, there are some sheets on which every intervention, update and change made over time must be recorded. By doing this, you and we will always have an updated statistical memorandum of the machine.</p>
--

<p>THE INSTRUCTIONS IN THIS MANUAL DO NOT TAKE THE PLACE OF, BUT RATHER COMPLETE THE OBLIGATIONS ON SAFETY AND ACCIDENT LEGISLATION IN FORCE</p>

2 NOTES FOR USING THE CRAWLER

ATTENTION:

EXCEEDING THE LOAD VALUE INDICATED BY THE WORKING AREA CAN LEAD TO STRUCTURAL DAMAGE AND TO THE EQUIPMENT OVERTURNING



**THIS MANUAL IS INTEGRATED WITH THE FOLLOWING
MANUALS THAT MUST BE READ AND UNDERSTOOD IN THEIR
ENTIRETY BY THE OPERATORS IN CHARGE:**

- TRACK USE AND MAINTENANCE MANUAL – TRACK ONE
- DIESEL ENGINE USE AND MAINTENANCE MANUAL – YANMAR
- REMOTE CONTROL MANUAL - SCANRECO
- WINCH MANUAL - ROTZLER
- INSPECTION REGISTER



3 PRELIMINARY INFORMATION

3.1 Revisions to this document

3.1.1 Validity

This manual reflects the state of the art at the time of the machine's release into the market. It is an integral part of the machine and is in compliance with all regulations, laws and directives binding at that time; this manual cannot be considered inadequate if subsequently updated because of more recent experiences.

Any changes, adjustments, etc. made at a later date on machines that have been sold do not oblige the manufacturer to modify the equipment supplied beforehand nor to consider it and the relevant manual insufficient and unsuited.

Any possible supplement to this manual that the manufacturer judges important to send to the user should be kept together with the manual to which is an integral part.

3.2 Reference regulations

BRENNERO GRU crawlers are manufactured in compliance with the following Directives.

DIRECTIVES:

- 2006/42/EC (Machinery Directive).
- 2004/108/EC (electromagnetic compatibility).
- 2000/14/EC (acoustic emission)
- 2006/95/EC (low-voltage directive)

3.3 Enforced harmonised regulations

- EN 12100:2010,
- EN 13000:2010,
- EN 60204-1:2006+A1:2009+ AC:2010,
- EN 4413:2010

3.4 Use and storage conditions

BRENNERO GRU crawlers are built to operate in the following environmental conditions:

- operating temperature min. -4°F max. +104°F
- humidity 30% - 95% without condensate
- storage temperature -22°F max. +140°F.

When the machine is to be used under environmental conditions other than the standard ones, special devices are available on request.

IMPORTANT: never use the machine under unfavourable air conditions (i.e.: many working hours in a marine area).

3.5 Forbidden use

IT IS FORBIDDEN to use the machine in an atmosphere where there is possibility of fire or explosion.

IT IS FORBIDDEN to use the machine as a rescue vehicle for towing vehicles

IT IS FORBIDDEN to use the machine to transport materials or people

IT IS FORBIDDEN to use the machine with people on board

IT IS FORBIDDEN to drag or pushing loads

Any use not expressly provided in this manual IS FORBIDDEN

Any movement of the machine with the crane not in operating conditions IS FORBIDDEN

3.6 Identification data

All the information for the identification of the machine is etched on a plate on the rotating turret.

N.B. For every demand specify type and serial number.



3.7 Static test and dynamic test

The machine HAS SUCCESSFULLY PASSED the performance tests carried out according to the static test (maximum static load test 1.25 times the rated load) and the dynamic test (maximum dynamic load test 1.1 times the rated load) in compliance with the conditions set out by EN 13000 and Machinery Directive 2006/42/EC.

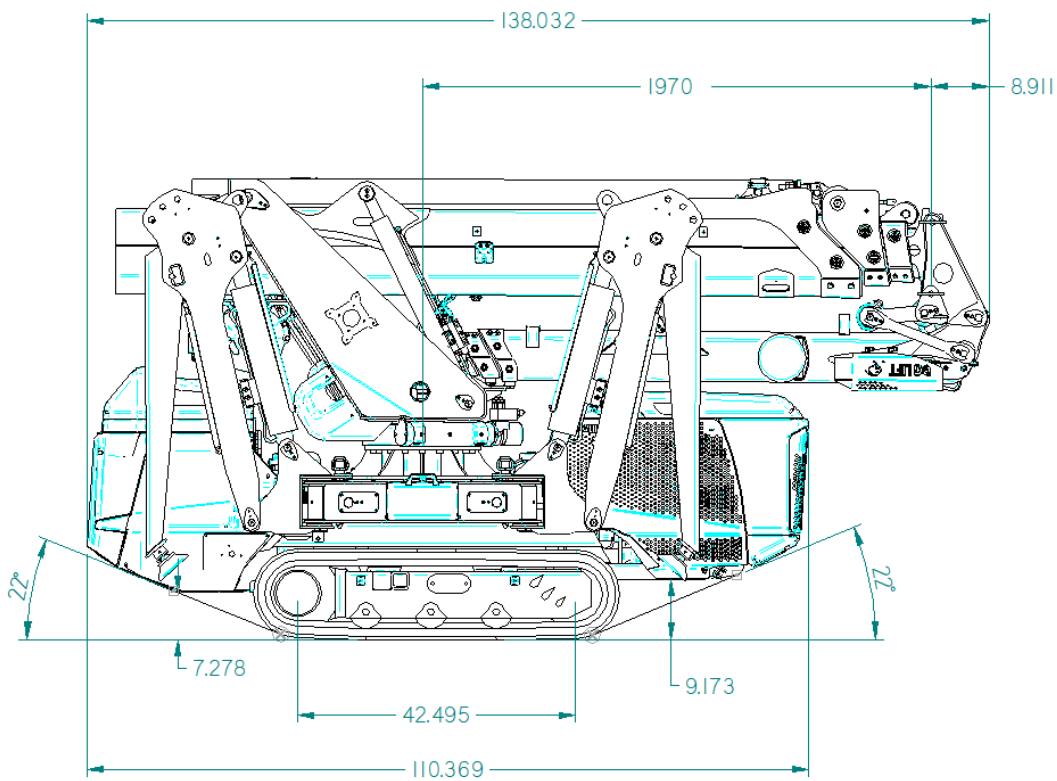
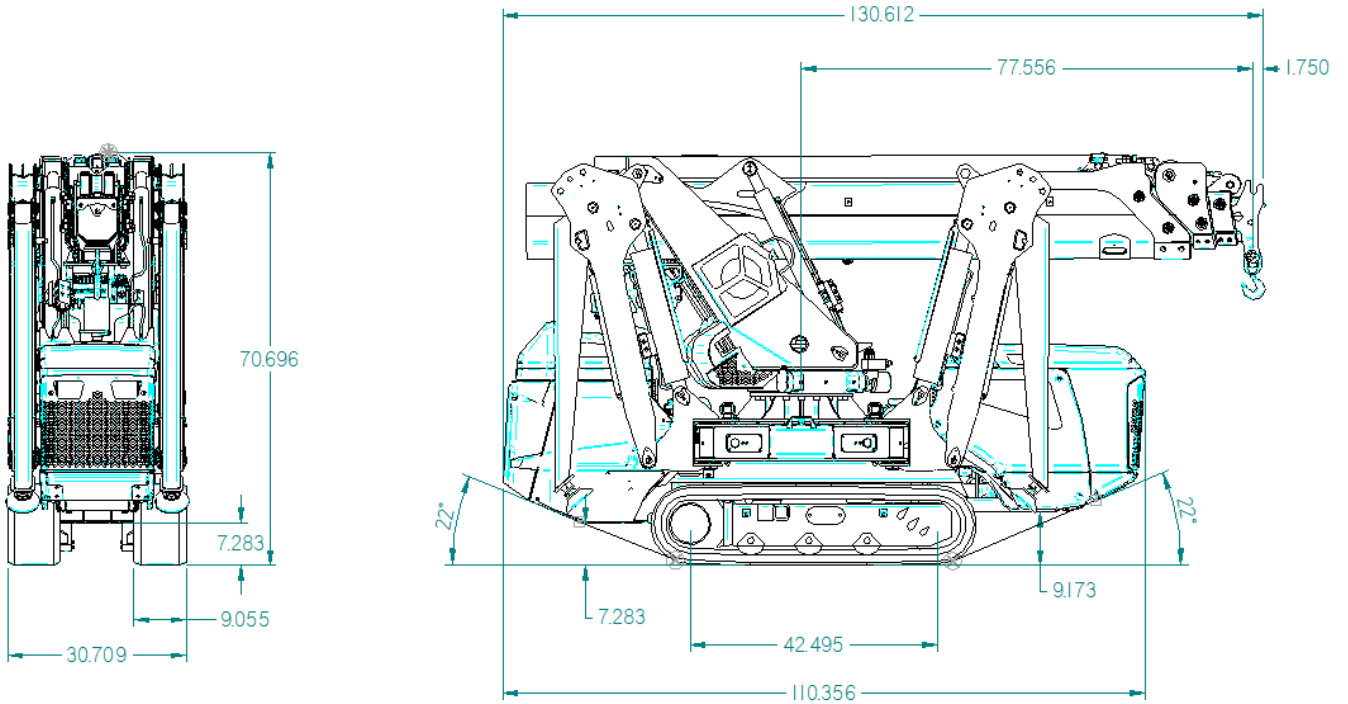
4 TECHNICAL SPECIFICATIONS

4.1 Vehicle in operating position

The forward direction of travel is that shown in the picture:



4.2 OVERALL DIMENSIONS AND WEIGHT



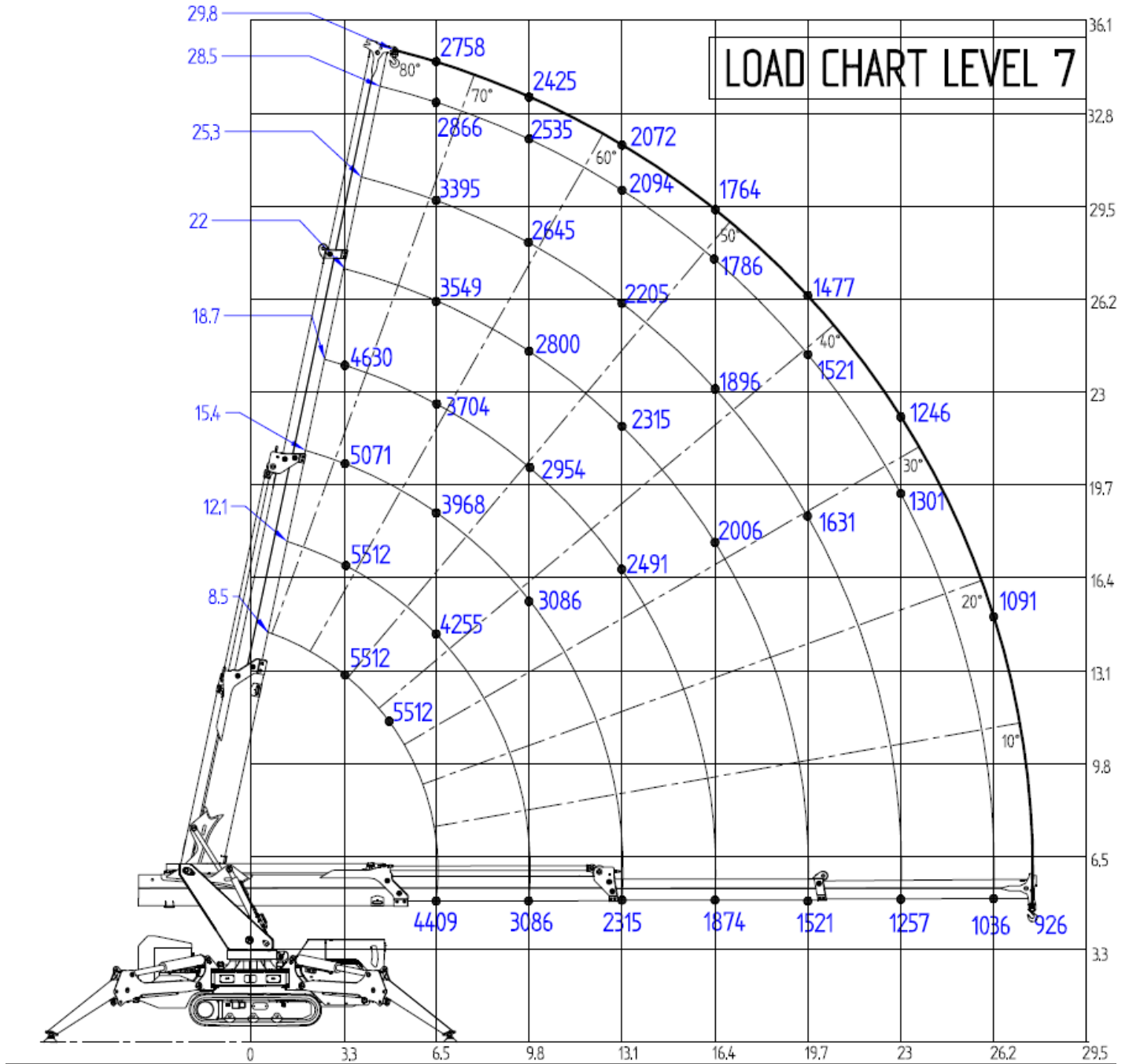
Weights

Standard Crane	4960 lb
Hydraulic Jib	462 lb
Electric engine	88 lb
Winch	146 lb

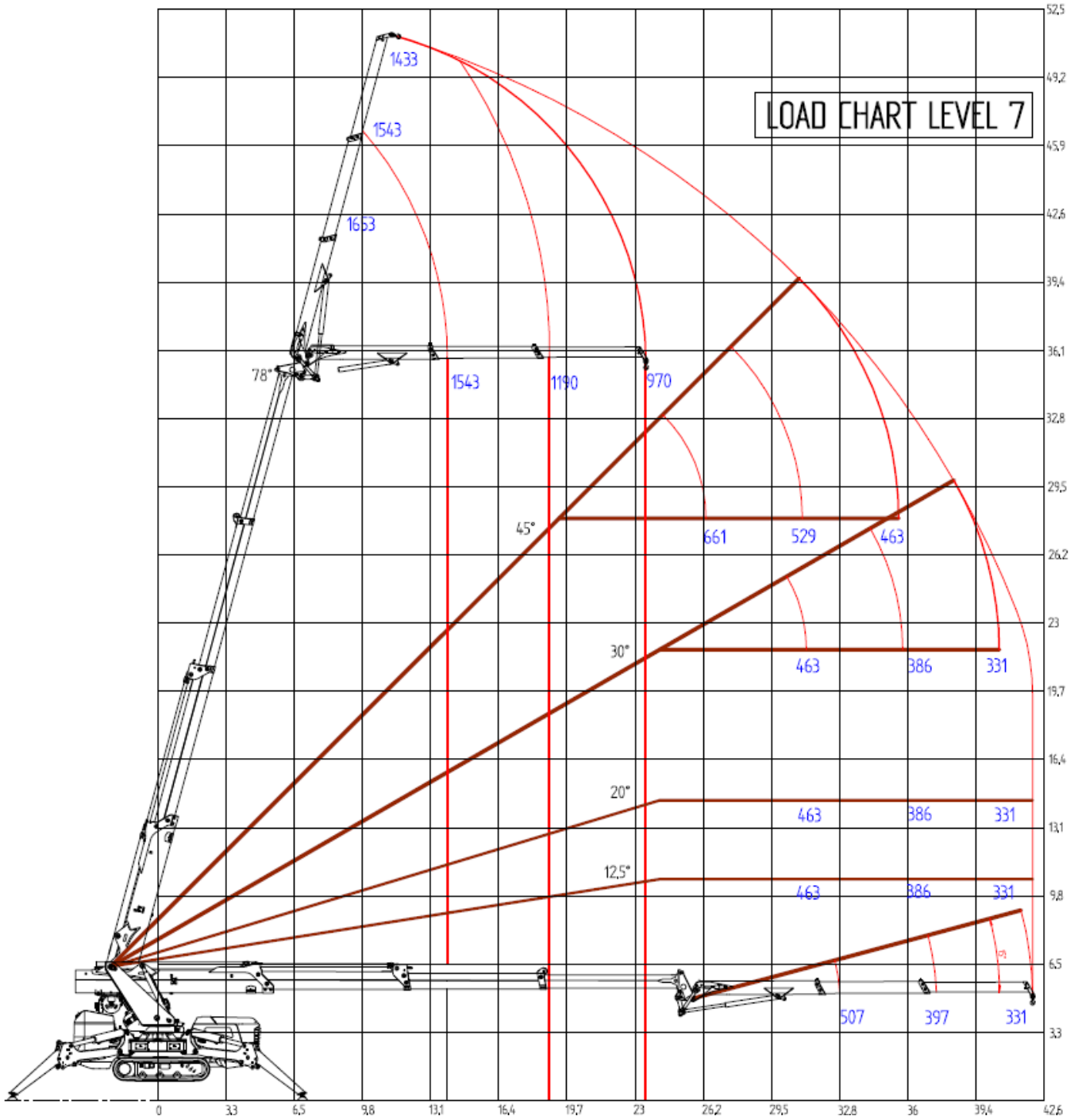
5 OPERATING AREA DIAGRAMS

The tables given below indicate the crane capacities (standard or with jib). They only relate to the M250 machine and are applied to both sides of the crawler.

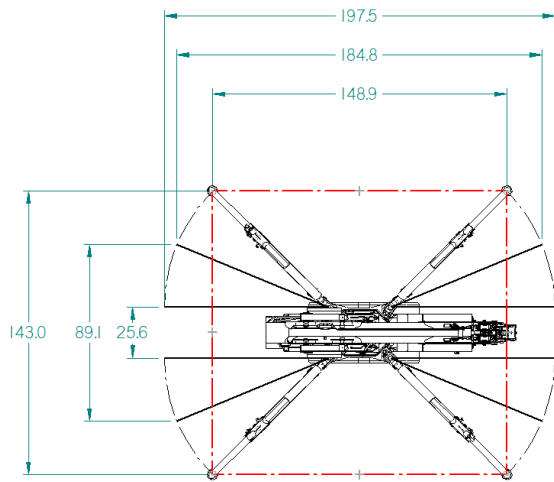
Standard Crane



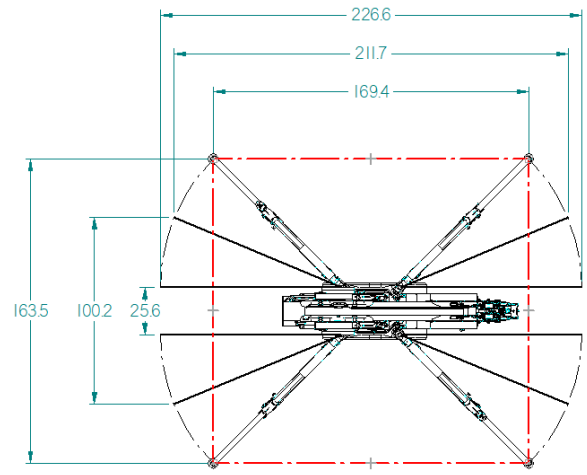
Crane with mobile Jib



6 STABILISATION



MIN EXTENDED



MAX EXTENDED

7 TECHNICAL FEATURES

CRAWLER	CRAWLER M250
ENDOTHERMIC ENGINE	YANMAR
SERVICE PUMP	Gear pump with one suction
ELECTRIC SERVICE PUMP 400V. a.c.	2.2 Kw
CONTROLS	Electro-hydraulic
MAX OPERATING PRESSURE	3625 psi
ELECTRICAL SYSTEM	12V Powered by the batteries of the crawler
REACTION ON THE OUTRIGGER	6182,24 lb
MAX PRESSURE ON THE GROUND CRAWLER	7,462 psi
WEIGHT :	5985 lb

8 CONSUMABLES

PART WITH CONSUMABLE	QUANTITY	BRAND
Hydraulic oil tank	17 gals	ENI ARNICA 32
Parts lubricated with grease outrigger legs	As needed	Grease type EP2
Track gear unit lubrication	Refer to track manual	Refer to track manual

9 OPERATING INSTRUCTIONS SAFETY STANDARDS

NOTE: In order to use the crawler, the operators must:

- be in perfect psycho-physical conditions
- be trained on how to use the crane
- have read and fully understood all the instructions and information in this manual and on the machine

The operator must not wear:

- rings
- wristwatches
- jewellery
- dangling clothing and anything that may become dangerous near moving parts

IMPORTANT WARNINGS

ALL THE PROVISIONS ON USE AND MAINTENANCE CONTAINED IN THIS MANUAL ARE UNBREAKABLE, THEREFORE WE RECOMMEND TO CAREFULLY AND FREQUENTLY READ THEM AND TO ALWAYS PUT THEM INTO PRACTICE.

WITHOUT PREJUDICE TO THE FACT THAT BRENNERO GRU S.R.L. WILL NOT BE HELD LIABLE BEYOND THE GRANTED WARRANTY, AFTER TESTING AND DELIVERING THE MACHINE, IT RECOMMENDS TO CAREFULLY AND REGULARLY COMPLY WITH ALL THE PROVISIONS CONTAINED IN THIS MANUAL AND TO APPLY THE REGULATIONS IN FORCE. FAILURE TO ENFORCE THE ABOVE IS ANOTHER REASON OF NON-LIABILITY FOR DAMAGE TO THE MACHINE, PROPERTY, PERSONS AND THIRD PARTIES.

IN THE ABOVE INDICATED CASES THE 12-MONTHS WARRANTY IS NOT EFFECTIVE. TECHNICAL DATA CONTAINED IN THIS MANUAL CAN UNDERGO CHANGES DUE TO THE DIFFERENT TYPES OF TRUCKS, TO TECHNICAL CHANGES, OR TO THE ENTERING INTO FORCE OF MODIFIED REGULATIONS. THEREFORE, THE USER SHOULD CAREFULLY STUDY THE ABOVE MENTIONED TECHNICAL DATA. FOR SPECIAL WORKING CONDITIONS NOT COVERED IN THIS DOCUMENT, PLEASE CONTACT THE MANUFACTURER TO REQUEST WRITTEN APPROVAL.

FOR SAFETY PURPOSES, IT IS ABSOLUTELY ESSENTIAL TO ALWAYS CARRY OUT THE FOLLOWING OPERATIONS:

- a. Carefully follow the operating instructions (in chronological order).
 - b. It is strictly forbidden to use the equipment with excessive weights exceeding and in ways other than those indicated on the machine and in this document.
 - c. Read the content of all the plates affixed to the equipment and the relevant component use and maintenance manuals.
 - d. The machine must be operated by at least two people, one of them being a skilled worker with perfect knowledge of how to use the machine.
 - e. Before operation, the equipment must be stabilised using the outrigger with the increased plates installed, which must necessarily rest on solid ground. If necessary, use boards to arrange the thrusts on an area large enough compared to the characteristics of the ground. These boards must be of suitable material and thickness for the outriggers' thrust, always tested before use with the machine at the maximum outreach, near the ground, and with a weight equal to the maximum allowed capacity.
 - f. In case of sloping ground, stabilise the machine, paying special attention to the following:
The maximum deviation of the thrust bearing plane compared to the horizon must not exceed 1°.
- Make sure there are no electric lines.
 - If the machine is used on busy roads, it is compulsory to signal its presence using appropriate ground signals and the flashing light and to comply with the highway code in force.
 - When envisioned in the Safety Operational Plan or by the Risks Analysis, all workers should wear the safety helmet, in accordance with law.
 - It is absolutely forbidden to insert tools, hands, fingers, etc. within the holes on the telescopic arms and in places where there are dangers arising from interference, cutting and crushing, etc.

9.1 While moving

- Check whether the chosen road is suitable to the overall dimensions of the equipment.
- Do not apply the ballast while travelling to prevent overloading the tracks.
- When driving on public roads, request permission from competent authorities and block traffic so as to eliminate any type of danger.
- Check that the cross slope of the chosen road is not such to risk the vehicle tipping over (max 7%) (see figure)



Do not turn quickly or suddenly when you are on a slope, risk of overturning.
While moving always remain in the rear position and at a distance of at least 6,5 foot
The visibility of the operator must be such as to prevent any type of collision
There must be no people present except for the operator near the crawler while it is moving
The maximum slope in the direction of travel should not exceed 30%

9.2 At the end of work

Make sure that the structure is in the correct rest position and that the outriggers are fully retracted.

9.3 anchoring for transport

The crawler must be lifted using the appropriate anchors (Nr 4)



10 SAFETY STANDARDS

Basically the machine is used to lift, lower and position loads, therefore, the procedure recommended for performing a typical lifting is described below:

- a) Determine the weight of the load to be lifted by adding the weight of the block, sling belts, chains and any other mechanism used.
The weight should be marked on the load, otherwise, consult someone who knows it. Do not attempt to lift a load whose weight is unknown.
- b) Consult the table of maximum crane loads to know the maximum outreach (minimum angle of the boom) so as to be able to lift the load safely.
When using the table of maximum loads always remember that:
exceeding maximum loads means overloading the crane, with the risk of rope breakage or damage to the crane itself.
- c) Lift the boom and position the hook over the load
- d) Lower the hook above the weight to be lifted. If the angle of the arm is less than that indicated in the table of maximum loads for the corresponding weight, the load must be brought closer to the crane or divided into smaller loads
- e) Secure the load on the hook. The following points must be respected before lifting the load:
 - 1) the head of the boom must be positioned directly above the load and not exceed the maximum outreach indicated in the capacity table. The lifting devices have been designed to lift and must not be used to drag a load laterally or even inwards or outwards.
 - 2) Never exceed the maximum loads listed on the load diagram.
 - 3) When the loads to be lifted are at the limit of the maximum load of the crane or rope, it must do so to prevent the lifting rope from being suddenly loaded or unloaded. Approach the load with "delicacy".
- f) Lift the load up to the desired height. Raise or lower the various elements so as to bring the load to the lowering position. Be careful when lowering the boom or rotating with load: the centrifugal force could increase the reach with a consequent reduction in the flow rate. When lowering the boom, with load, the maximum outreach shown in the table of maximum loads for the corresponding weight must not be exceeded.

10.1 GENERAL SAFETY STANDARDS

- 1) Read this instruction manual carefully. It contains extremely useful information
- 2) Every time an operator leaves the crane for any reason, it is necessary
 - a) lower the load and place it on a firm surface
 - b) switch off all the engines
 - c) never hold a load suspended by relying only on the seal of the piston seals, valves and brake of the winch, unless the operator is at the command position and is ready to check the load. Loosening the brake, leaking gaskets or valves, vandalism or mechanical defects could cause the load to fall if it is suspended in the air without being checked.
- 3) During the operation of the crane the operator must not eat, read or be distracted in any way. Remember that operating the crane is a full-time job
- 4) Suspended loads must not be moved over persons or even cause danger. All non-service personnel must leave the work area during crane operation.

- 5) Make sure that the work area is clear and that it is possible to clearly observe the boom and the load. Before swinging, raising or lowering the arm, always check that there are no people in the working range. If the crane operator's field of view is incomplete, make eye contact with a person who can observe each work area. Stick to its various signals. Make sure these signals are understood by both people
- 6) The crane must be inspected daily. Do not operate a damaged or maintenance-free crane. Pay particular attention to lifting elements and wire ropes. Damaged or worn components must be replaced before using the crane. Remember that a piece costs less than one person. According to the directives of the OSHA (Occupational Safety and Health Act), "all ropes must be inspected thoroughly once a month, and the complete report on rope conditions must be written, dated, signed and kept on hand". Replace worn or damaged ropes immediately. Pay particular attention to the ropes for lifting the arm and to the extension ropes with hook. Check that the connection points (plugs, sockets, welds, etc.) are not worn or damaged.
- 7) Avoid that the oscillating load does not collide with the arm and that the arm does not rest or touch other objects. Danger of dents or damage to the arm! If the damage is serious, the arm could break. Pylons and broken or damaged diagonal anchors must be replaced. If only bent, tighten them again. For more detailed information on arm repair contact an authorized distributor.
Some parts of the arm are made of special steel, which could be damaged by improper repair. The longitudinally bent or damaged side members, even in the slightest wear, must not be used even repaired. The longitudinal members are so important for the strength of the arm that it is not worth trying to repair them.
If the arm is hit or damaged by anything, stop it immediately. Arm loading increases as it is lowered; a damaged arm or arm suspension system could break during lowering. In the event of a damaged arm, use an auxiliary crane to assist the lowering operation.
- 8) Don't just trust the winch brake, brake, gaskets or valves to hold the arm in place. Wear phenomena and other factors could adversely affect the ability to hold the boom firmly.
- 9) Never climb or descend on the moving crane. Use both hands when climbing the crane
- 10) Keep the crane clean and in good condition; oil or grease residues on the platform can cause falls. Incorrect adjustment can cause damage to the crane, load drop or other anomalies.
- 11) Always keep a dry or carbon dioxide extinguisher in the immediate vicinity of the crane. All persons involved in the service and maintenance of the crane must know how to use it. Periodically check that the fire extinguisher is correctly loaded and working.
- 12) Do not tamper with the safety devices in any way. They must always be in good condition and properly registered. They have been installed on the machine for your safety
- 13) Smoking is prohibited near the batteries and the fuel tank during control operations.
- 14) Before performing repairs or adjustments, the arm must be lowered to rest position.

- 15) Always remove the barriers and protection panels before using the crane. Do not wear loose clothing that could get caught in moving mechanisms. Always wear hard helmets, safety glasses, steel-tipped shoes and all the equipment prescribed by national labor standards.
- 16) Always switch off the panel before performing maintenance operations on the hydraulic system and disconnect the batteries before performing maintenance operations on the electrical system.
- 17) Never approach your driving pulleys, drums or ropes with your fingers, feet or clothes unless the crane is out of order and the rest of the staff know what you are doing. Never place your hands on the ropes when climbing on the tip of the crane. A sudden movement could activate the drum or drive pulleys.
- 18) Use extreme caution when removing the drain plugs, the grease nipples, the plugs of the hydraulic pressure system, etc. They can be expelled violently and hit the operator or hot oil, water or steam could cause serious burns.
- 19) Always wear safety glasses when drilling, sanding or hammering metal objects, to prevent metal splinters from striking your eyes.
- 20) The operator, supervisor or person in charge must observe that:
 - a) the loads are well fixed before being lifted.

Make sure that the load cannot slip off the anchoring system. Make sure that the load is slung so that it does not fall.
 - b) The sling chains and straps must be of a suitable size for the load, in good condition and not twisted together. A test certificate must exist for each element of the lifting system.
 - c) The load must not be obstructed in any way during lifting or rotation. Make sure that the movements of the load, ropes and all other elements of the crane are not hindered in any way.
 - d) Avoid sudden starts and stops. Carefully lift, rotate evenly, lower and lower the load carefully. Possible load shocks, sudden crane rotations and rapid load lowering can cause impulsive loads and excessive lateral stresses on the arm. Rough use could also cause the crane to break. An excessively "violent" drive is typical of beginners. Be professional instead.
 - e) Never wind the lifting rope around the load. Never use old, worn or damaged ropes for slinging the load. They could break and drop the load.
- 21) The lifting rope must always be vertical when lifting is started, otherwise the load starts to oscillate in various directions as soon as it is lifted from the ground.

When a very heavy load is lifted, the crane tends to lean towards the arm. This is due to the elasticity of the crane and the arm. This inclination increases the outreach, and consequently the load will move towards the outside as soon as it is raised from the ground. This movement is dangerous for everything on the load path and also because the increased reach can overload the crane.

To overcome this problem, the arm must be raised as soon as the load is off the ground, so that the rope remains in a vertical position. When laying the load, lower the arm after it has touched the ground, to prevent the hook from starting to swing just released from loading
- 22) A service person must be in charge of carrying out the signals by hand, and the crane operator must only follow his hand signals, and the crane operator must only follow his signals. A stop signal must always be respected, regardless of the person giving it.

23) The crane operator must be aware of the load to be lifted. Do not attempt to fix the load. Use a socket, a certified weight, a weighing system for the hook or a load display system. Don't forget - the weight to be lifted includes the weight of all the lifting mechanisms and belts, the hook lock and the load suspended on the hook. The total weight must never exceed the maximum load of the crane shown in the corresponding table, as regards position, arm length, reach, number of ropes and service conditions. Remember; the data shown in the table of maximum loads are based on ideal conditions:

- a) no lateral stress or oscillation by load
- b) good view
- c) machinery in perfect condition and equipped as supplied by the Manufacturer.

If these conditions are missing, the load must be reduced to compensate for the missing requirements. The extent to which the load must be reduced depends on the current working conditions.

It is a question of sensitivity and experience. Below are listed some factors that may make it necessary to reduce the load:

- a) Wind
- b) unfavorable environmental conditions
- c) inexperienced personnel
- d) poor visibility
- e) fragile load
- f) cranes in poor conditions

If in doubt, do not risk. Reduce the values more than you think is necessary.

Avoid working with the crane when strong winds are blowing. If it is not possible to avoid it, reduce the maximum loads much more than prescribed in the table of maximum loads. Wind blowing in the opposite direction to the load and the arm causes a lateral load on the arm and reduces its maximum load.

When lifting large loads, such as panels for prefabricated houses, in the presence of strong winds, the movement of the load can be a source of danger for the staff or for the surrounding buildings. An oscillation of the load towards the outside increases the outreach and can overload the crane. This could cause the arm to break or damage the crane.

24) Do not work with arms and arm lengths not permitted by the maximum loads table. Do not use longer arms or extensions than prescribed. Both situations can cause the arm and / or extension to break.

25) Keep the ropes for the load as short as possible so as to avoid excessive swinging of the ropes.

26) The outreach must be known. Don't try to guess it. The reach, angles and condition of the machine can be shown on the crane display. Remember: the outreach is the horizontal distance between the crane rotation axis and the center of gravity of the freely suspended load.

27) The length of the boom must also be known. Don't try to guess it. Using a boom that is not permitted in length can cause serious injury..

28) To lift the load at least the number of parts of the lifting rope specified in the table of maximum loads must be used. The respective national regulations could require a different safety coefficient for the ropes and therefore of their number. Consult these standards and apply them, if possible.

Pay particular attention when moving loads with a single rope, with a reduced reach.

29) Check the operation of the winch brake and the seal from the gaskets and valves by lifting the load a few centimeters and leaving it in that position. It should stay in position without any problem.

- 30) Do not pull sideways with the boom, even to a small extent, the load must be lifted vertically. Lifting a load by pulling the lifting rope sideways could cause the arm to bend.
- 31) Do not alter any part of the crane. Modifications or changes to any part of the equipment could create unforeseen stresses during the construction of the crane. Such modifications can seriously alter the applicable maximum loads and render the entire table of maximum loads useless. They can also overload or stress critical elements causing disastrous failures.
- 32) Do not lift more than one load individually harnessed at a time, even if both combined loads do not exceed the maximum load of the crane. The crane operator may not be able to concentrate simultaneously on two loads, and this would cause a dangerous situation.
- 33) Act with caution when lifting the boom to the minimum outreach, being ready to quickly stop the stroke of the arm. Failure of the limiting device to function could damage the boom and cause injury to service personnel.
- 34) Make sure that the block is not raised until it hits the head of the arm. This could damage the rope or pulleys or cause the block to tip over with consequent damage to the entire crane. If the crane is equipped with a device capable of disengaging the block lifting before it hits the head of the boom, it is necessary to check its correct operation before each use of the crane. Never trust, however, too much of the "safety" devices, which will never replace the judgment ability and the prudence of the crane operator.
- 35) During the operation of the crane equipped with any load indication mechanism, overload limiting system or automatic safety device, it must not be forgotten that these devices do not release the crane operator from his duty of care and his ability. For example, these devices cannot signal if too little rope has been used to lift a load, or make corrections according to the wind, or signal that the device is incorrectly adjusted, or correct any lateral stresses on the arm or signal many other conditions that can occur and cause dangerous situations. All the skill, experience, common sense and responsibility of a crane operator is required to achieve completely safe operation. Many safety devices can assist the crane operator in carrying out his duties, but they can exempt him from his duties of absolute safety and reliability. Make sure that the hook is secured with its pins and its safety pins, and that it works properly.

When lifting submerged loads, you do not have to pull them sideways which could cause the arm to break. If possible, sling the load so that it can be lifted from one end only. The load must not be pulled violently. When a submerged load reaches the surface, do not try to lift it from the water in one go. It could be saturated with water and probably weigh more than you can imagine. Lifting it slowly you have the possibility to let it empty. Be patient, as drainage can last a long time. A load removed from the water, even if completely emptied, will have an effective weight much greater than that of what it had under water, due to the hydrostatic thrust.

10.2 INTENDED USE

The crane should be used to lift, move free, supported and non-restrained loads and deposit them; as prescribed by the manufacturer in the appropriate capacity tables.

The load must be aligned with the hook and the head of the arm and must never be pulled transversely on a support.

To carry out this work, only the equipment supplied directly by the manufacturer with the machine (swigaway, jib, heads, etc.) may be used.

In particular, the lifting of people is allowed only if expressly authorized in a written way by the manufacturer and with the appropriate equipment supplied by the same, usable only on the single machine for which it was requested by the owner of the truck crane.

Any other auxiliary equipment must be fitted only after authorization and written approval from the manufacturer.

This equipment excludes simple gripping devices such as tie rods, sling bars, hooks, shackles, bells, eyebolts, chains and slings provided they are adequate for the load to be lifted and applied correctly, according to the instructions of the manufacturer of these organs, bearing in mind the necessary safety factors required by the regulations in force in the place where the machine operates.

The lifting work must be carried out under the conditions, modalities, configurations and with loads not exceeding those indicated in the capacity tables and relative warnings, in addition to what is prescribed by this manual or other manuals supplied with the machine.

Regarding the use of the machine on public roads, the use must strictly comply with the provisions of the law concerning road traffic in the country where the machine is used.

Avoid translation and use of the crane in dusty places and with puddles.

FOR SAFETY PURPOSES, IT IS ESSENTIAL TO NEVER USE THE MACHINE UNDER THE FOLLOWING CONDITIONS:

- With loads and conditions other than those for which it was designed, tested and delivered, indicated on the machine and crane user manual;
- On soft, unstable or cluttered ground;
- With wind speed exceeding 41,01 ft/s;
- Near power lines (the machine is not insulated);
- In areas at risk of explosion;
- If there are cracks, flaws, hydraulic leaks, cut wires or any other anomaly during operation;
- At temperatures below -4°F;
- With safety devices out of order or not inspected;
- Under dangerous weather conditions (poor visibility, thunderstorms, lightning, etc.);
- With posters, banners, etc. hanging from the booms or other parts of the machine.

IMPORTANT

It is absolutely forbidden to insert tools, hands, fingers, etc. into the holes on telescopic arms, cable pulleys and on joints.

DURING WASHING WITH HIGH-PRESSURE JET, DO NOT AIM AT BOXES, CABINETS AND ELECTRIC COMPONENTS. WASH WITH DETERGENTS, AGGRESSIVE CHEMICALS, PETROL OR SIMILAR SUBSTANCES, WHICH CAN DAMAGE RUBBER PARTS, PLASTIC COMPONENTS AND PAINT.

ATTENTION!!! PAUSES/WORKING BREAKS

Never leave the machine unattended without first turning off the engine, locking the control panel on the ground.

It is mandatory, in the event of breaks or stops, to always bring the machine to the ground (in transport position).

It is strictly forbidden to leave the machine open, for long periods, without checking the seal of the various components (valves, outriggers, levelling, etc...) on a daily basis.

ATTENTION!!! WORKING NEAR ELECTRIC LINES

Operating with a crawler near power lines is always very dangerous because of the mobility of the machine structure.

Please note that there can be electric discharges even without contact between the two parts, even if they are not at the minimum safety distance (refer to the regulations in force in the country of destination of the machine).

The standards in force in Italy (Italian Presidential Decree no.164 art.11), for example, require a minimum distance of 16,40 foot. This value is to be considered the minimum distance and the operator must make sure that, during the various manoeuvres with the self-propelling vehicle, none of its parts exceed the safety distance. In any case it is recommended to request the interruption of the power supply for the period in which work will be carried out with the self-propelling vehicle.

10.3 Residual risk and appropriate precautions

- Violent handling of control levers: risk of shocks and oscillations.
RESPECT THE CONTROLS TO CONTROL SPEED AND ACCELERATION
- Overloading and horizontal or inclined thrusts: risk of overturning.
DO NOT EXCEED THE ALLOWED SERVICE LOADS
- Ground collapsing: risk of overturning
CHECK GROUND PRESSURE AND GROUND SOLIDITY
(see ground pressure under outriggers) (pay attention to winter thawing).
- Wind gusts: risk of overturning.
DO NOT WORK UNDER DANGEROUS WEATHER CONDITIONS
- Impact against obstacle on ground or in air: risk of collision or overturning.
BE EXTREMELY CAREFUL DURING OPERATION
- Impact against a power line: electrical risk.
KEEP AT A SAFE DISTANCE FROM ELECTRIC LINES
- Work on hard shoulders, pavements etc.: risk of overturning.
PAY PARTICULAR ATTENTION TO THE GROUND AND THE POSITIONING OF THE OUTRIGGERS
- Work in explosive environment: risk of explosion.
MAKE YOURSELF AWARE OF THE PRESENCE OF EXPLOSIVE OR FIRE RISKS IN THE WORK AREA
- Persons within machine range of action: risk of crushing.
CLOSE OFF THE WORK AREA AND PROHIBIT ACCESS OF NON AUTHORISED PERSONNEL. DURING WORK, CHECK THAT THE PROHIBITION IS UPHELD
- Thermal engine + exhaust: risk of burns and intoxication.
DO NOT STAND NEAR EXHAUST FLUES. WHEN WORKING INDOORS, DIRECT EXHAUST OUTSIDE.

- Beware of overloads from above or caused by contact with other structures.

BEFORE ANY JOB, EVALUATE THE CONDITIONS OF THE WORK AREA WELL, THE GROUND, THE DIMENSIONS PRESENT, THE LIGHTING AND NOISE CONDITIONS, AND THE PREPARATION OF THE PERSONNEL ABOUT TO USE THE EQUIPMENT.

- Toxic materials

IN THE SYSTEM THERE ARE TOXIC AND POISONOUS SUBSTANCES (MERCURY, OILS, PLASTICS, ETC.) IF SWALLOWED OR INHALED THE MAINTENANCE AND REPAIR OF THE SYSTEM MUST ONLY BE CARRIED OUT BY TRAINED AND EXPERT PERSONNEL.

NB. IF THE MACHINE IS EQUIPPED WITH HOSES FOR EXHAUST GAS DEVIATION IT IS COMPULSORY TO USE THEM.

10.4 Operating limit

DO NOT USE THE MACHINE:

- With a load exceeding maximum capacity.
- On ground which is not resistant to the pressure and load under the outriggers.
- With wind exceeding 41,04 ft/s.
- In cold rooms.
- In explosive environments and in environments with aggressive atmospheres.
- During a thunderstorm.
- With poor visibility.
- In a poorly ventilated area. (Toxic exhaust gas of thermal engines).

10.5 Information about wind speed

WIND FORCE	WIND SPEED	DESIGNATION	FEATURE
Beaufort	Ft/s		
0	0.0 - 0.65	Calm	Calm winds, the smoke rises vertically or almost vertically.
1 2	0.98 – 4.92 5.24 – 10.82	Light breeze	Wind direction differs from smoke direction, as you can feel wind on your face, leaves start moving, the deflector starts moving.
3 4	11.15 – 17.71 18.04 – 25.91	Moderate breeze	Leaves and branches move continuously. Small branches start moving. Dust and paper are moved on the ground.
5	26.24 – 35.10	Quite strong gale	Small branches with leaves move; waves form on canals and on lakes.
6	35.43 – 45.27	Strong wind	Big branches swing, wind whistles when passing through the electric line cables; it is difficult to walk with the umbrella opened.
7	45.60 – 56.10	Very strong wind	Trees swing; it is difficult to walk.
8	56.43 – 67.91	Stormy wind	Branches are broken; it is hard to walk.
9	68.24 – 80.05	Storm	Causes damage to houses (aerials and roof tiles fly away).

WARNING

WIND SPEED IS MEASURED ON AVERAGE FOR APPROXIMATELY 10 MINUTES AT A 32,08-FOOT HEIGHT ON A LEVEL GROUND

10.6 Summary of most important warnings

MOVEMENT POSITION

Make sure of the complete non-working condition



MOVEMENT



Pay attention to the overall dimensions of the machine.

OUTRIGGING

Pay attention to ground solidity.



OUTRIGGING

Maximum ground inclination.



LEVELLING

Check maximum allowed inclination.



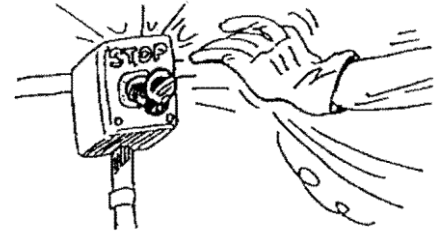
WORK AREA

Put barriers around working area.



EMERGENCY STOP

If there is any anomaly, stop the machine.
BEFORE SWITCHING ON THE
MACHINE CHECK THAT THE DANGEROUS CONDITIONS
ARE OVER



OBSTACLES AND ELECTRIC LINES

Make sure that there are no electric lines and general
obstacles.



BLOWS AND THRUSTING AGAINST OBSTACLES

Impact and/or thrusting against an
obstacle
(extension/retraction and/or lifting/lowering) may cause
structural damage to the machine and serious risks of
the equipment overturning. Before and during
movement always visually check the overall
dimensions of the machine structure in all directions.



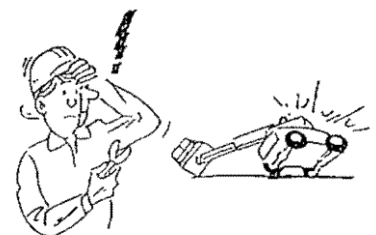
PROTECTIONS

When performing special works,
safeguard yourself and the machine.



REPAIRS AND MODIFICATIONS

Do not carry out any repair or modifications unless at
authorised repair shops



10.7 Consistency of the ground

During the manoeuvres of installation of the outriggers pay special attention to the ground where you will put the outrigger plates. Always verify the consistency and the solidity of the ground and, if necessary, interpose increased baseplates to obtain a better load distribution transmitted to the ground (if in doubt, ask the worksite manager or a civil engineer experienced on the ground consistency for information). For the load values transmitted to the ground by the machine outriggers, see chapter 7 “Technical features”, while for the ground consistency values, below is a purely indicative table featuring the allowable pressures of certain types of ground.

For the calculation of the specific pressure loaded on the ground from the outriggers use this formula:

$$P = F/A$$

where:

P= specific pressure loaded on the ground by the outrigger (psi)

F= maximum load of the outriggers (lb - see chap. 7)

A= area/bearing surface of the outrigger (in²)

Example:

for crawler with F = 7054 lb and support plates with surface

A = 62 in² (size 7,87x7,87 inch)

P = 7054/62 = 116 psi

With the addition of the increased support plate with surface

A' = 248 in² (size 15,74x15,74 inch)

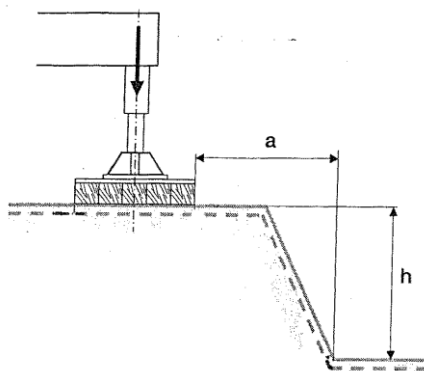
P' = 7054 / 248 = 29 psi

Chart with the values of the ground consistency

Type of ground	Specific allowable pressure (psi)
Shifted grounds, not compact	14,50 – 29,00
Compact and granular grounds (sand)	29,00 – 87,02
Compact grounds (sand+gravel)	58,01 – 145,03
Rocks of medium thickness (limestone - sandstone) - road suitable for heavy vehicle transit	145,03 – 217,55
Rocks with high consistency (strong limestone -	217,55 – 435,11
Compact rocks (porphyry - basalt - granite)	435,11 – 725,18

10.8 Safety distances from ditches/slopes

During the installation of the outriggers, always stay at a sufficient safety distance from ditches and slopes. This distance is a consequence of the kind of ditch/slope (propped and not propped) and of the kind of ground (we advise you to ask information to the yard manager or to a civil engineer experienced of the ground consistency). We give you below the scheme/theoretical rule:



- In case of crumbling or loose terrain - $a = 2 \times h$
- In case of compact terrain, not crumbling or loose - $a = 1 \times h$

10.9 General safety standards for using the crawler

The following safety standards must be complied with when using the machine:

1. The crawler may only be used by authorised personnel
2. the machine has been designed to operate in the following environmental conditions:

temperature	-4°F + 104°F
humidity	30÷95% without condensate
3. The instructions relating to "activating the machine" and "return to travel position" must be followed scrupulously and in chronological order.
4. the machine must be placed on firm ground and with the base positioned horizontally.
5. Should you need to operate on poorly consistent ground, incapable of withstanding the specific pressure exerted by the outrigger with the standard plate, appropriate boards must be set up capable of dividing the load in reference to the specific pressure indicated on the plates near each outrigger.

NOTE: BEFORE ACTIVATING THE CRANE, MAKE SURE THAT THE MACHINE HAS BEEN STABILISED BY MEANS OF THE OUTRIGGERS AND THAT THE TRACKS ARE LIFTED FROM THE GROUND BY AT LEAST 39,37 inch.

6. Never exceed the maximum allowed load indicated on the capacity plates.
7. When working near aerial electric lines, it is mandatory to remain at least 16,40 foot away from them, to operate with care and attention and in any case to connect the chassis of the vehicle to earth.
8. the machine has been built to perform vertical loading manoeuvres. Therefore its use to perform horizontal thrusts or pulls is forbidden.
9. It is forbidden to increase wind speed by applying signs, guards or structures.
10. the machine must never lean on other structures, whether fixed or mobile.
11. All operations to reach the working spot must be carried out by the operator.
12. Check for the presence of fixed or movable obstacles in the work area which could cause dangerous situations during the work phases.
13. While manoeuvring, always look in the machine's direction of movement.

14. It is forbidden to stand near the chassis of the vehicle while the machine is manoeuvring; always make sure that no one is present before starting to operate with the equipment.
15. Approach the work spot by means of short movements on the control levers.
16. Do not perform abrupt reverse manoeuvres to avoid creating backlashes on the structure involving dangerous situations for operators.
17. Always manoeuvre cautiously and slowly. Quick manoeuvres can cause accidents.
18. It is forbidden to tamper with the hydraulic block valve on the cylinders and the maximum pressure valve.
19. It is forbidden to tamper with or modify any safety device.
20. Check the efficiency of the work area limiting device daily.
21. Check the level of the hydraulic oil in the tank daily.
22. Perform the prescribed periodical maintenance.
23. Check the warning lights fitted on the machine on a daily basis.
24. It is forbidden to use the crawler with wind speed exceeding 27,96 mph (41,01 ft/s).
25. Should the machine be used along roads open to traffic, it is mandatory to signal its presence with appropriate signs on the ground.
26. Use the machine in sufficiently illuminated areas.

11 ROAD SIGNS

Operative area delimitations

Before working with the crane check environmental conditions and visibility that can occur

Outline the working area with appropriate warning system.

- **Barriers;**
- **tapes;**
- **signage (of prohibition, warning, danger, etc);**
- **Delimitation area signage (light signals, cones, etc.).**

Note material is not supplied to the crane..



12 OPERATIONAL PRECAUTIONS (RESIDUAL RISKS)

12.1 Electric power lines

safe distance from power lines
user requirements.

It is forbidden work with the crane (parts and load) at a distance from overhead power lines and underground, less than the minimum allowed by current regulations in the country of use.

Un (kv) Minimum distance (d) (foot)

< 1 9,84 ft

1 < Un < 30 11,48 ft

30 < Un < 132 16,40 ft

> 132 22,96 ft

If the evolving field of machine is crossed by power lines, always keep a safe distance, as prescribed by national regulations (in the according table to 2004/40 / CE and Italian Legislative Decree 81/2008).

CAUTION

If you do not know the nominal voltage of the power line, always maintain a minimum distance of 22,96 foot. It still recommended to increase this to 65,61 foot minimum distance because of the difficulty of real evaluation, for possible deformations and the crane movements at work and possible sudden gusts of wind.

The described warnings, related to the dangers of electric nature, are also valid for power lines of trains, trams, trolley buses, cableways, etc ..

13 GENERAL FEATURES

The equipment in question consists essentially of a track-driven crawler, to which a crane is applied.

The chassis is made of electro-welded sheet metal and constrained in four hydraulically driven independent outriggers.

The outriggers are kept in the desired position by moving the levers on the remote control.

The chassis is fitted with a column, via a slewing ring, which ensures continuous rotation

The boom unit is composed of a lifting boom inside of which telescopic extensions slide by means of a hydraulic cylinder system. A telescopic jib is articulated at the end of the extension and driven by a joint fitted with a hydraulic cylinder.

The machine is equipped with a remote control to move the machine, the crane and outrigger feet.

The controls are proportionally driven to make it possible to adjust movement speed as needed.

A red button stops all the machine functions if it is operated.

A limiting device automatically delimits the allowed working areas.

14 DESCRIPTION OF THE MACHINE

14.1 Intended use of the machine

The crawler is designed and built for lifting and moving material.

The machine works with the outriggers pressed to the ground, the chassis levelled and the track detached from the ground.

15 MAIN COMPONENTS

A - Remote control

Use for moving the machine.

B - Column

C - First boom

D - Second boom

E - Oil tank

It is the tank that contains the oil for powering the machine's hydraulic plant, complete with level indicator. The oil tank is an integral part of the machine chassis.

F - Outriggers

With individual descent, they are fastened to the chassis.

G - Chassis

This is the steel bearing structure.

H - Emergency hand pump

Hydraulic hand pump for emergency descents.

I - Emergency controls

For directing the movements of the machine during descent in emergency conditions.

L- Track unit

Moves the crawler thanks to 2 hydraulic motors which drive the tracks. The tracks can have 3 positions (optional): the first one is low to simplify access to narrow spaces, while the second one is high to ensure better stability and a better approach angle while moving.

16 HYDRAULIC PLANT POWER SUPPLY

Supply with pump coupled to a YANMAR silenced thermal engine or alternatively, electric pump coupled to a 230V electric motor.

17 DESCRIPTION, CONTROLS, FEATURES, PERFORMANCES, EMERGENCY AND OPERATING PROCEDURE

17.1 Description of machine's general display



Main screens:



Crane

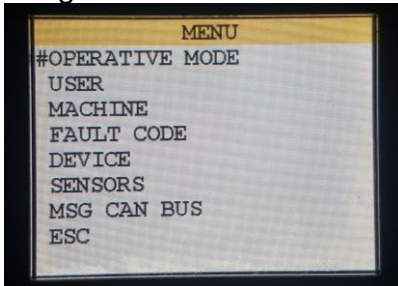
Chassis tilt

stabilizer

Engine Rmp

For scrool the 4 main pages , use button P1

For get into the advanced menu hold down button P3



To move inside the advanced menu:

P1= Scroll rows downward

P2= Scroll rows upwards

P3= Select

17.2 Operating the crawler

Description of controls and indicators:

1. Battery isolator: interrupts all the connections to the batteries of the self-propelling vehicle. When it is in the OFF position, no functions can be activated except for the electric motor.
2. Main panel
3. Main ON/OFF selector: when it is in the ON position, the panel display switches on and all crane functions can be activated
4. Main display panel: switching on the display preceded by sound mean that the system is operative
5. Endothermic engine control panel (refer to the YANMAR manual for the description and operating instructions)
6. Main emergency button: when it is pressed, it cuts the power to the endothermic engine (if it is switched on, it turns it off) and to the electric motor (if it is switched on, it turns it off)
7. Electric motor power supply selector switch: when you are on the Rpm page of the general main panel, press P1 button to enable the electric engine function. Turn on the electric engine from remote control, switch S2.
8. Electric socket for electric motor: when plugged and powered, allow the general panel to work in electric mode
9. Main Electric panel ON/OFF

BEFORE SWITCHING ANY OF THE MOTORS ON, MAKE SURE THAT THE OIL TANK CONTAINS ENOUGH OIL AND THAT THE INTAKE VALVE IS OPEN. OTHERWISE THE HYDRAULIC PUMPS MAY BE DAMAGED PERMANENTLY.



1



2



3



4



5



6



7



8



9

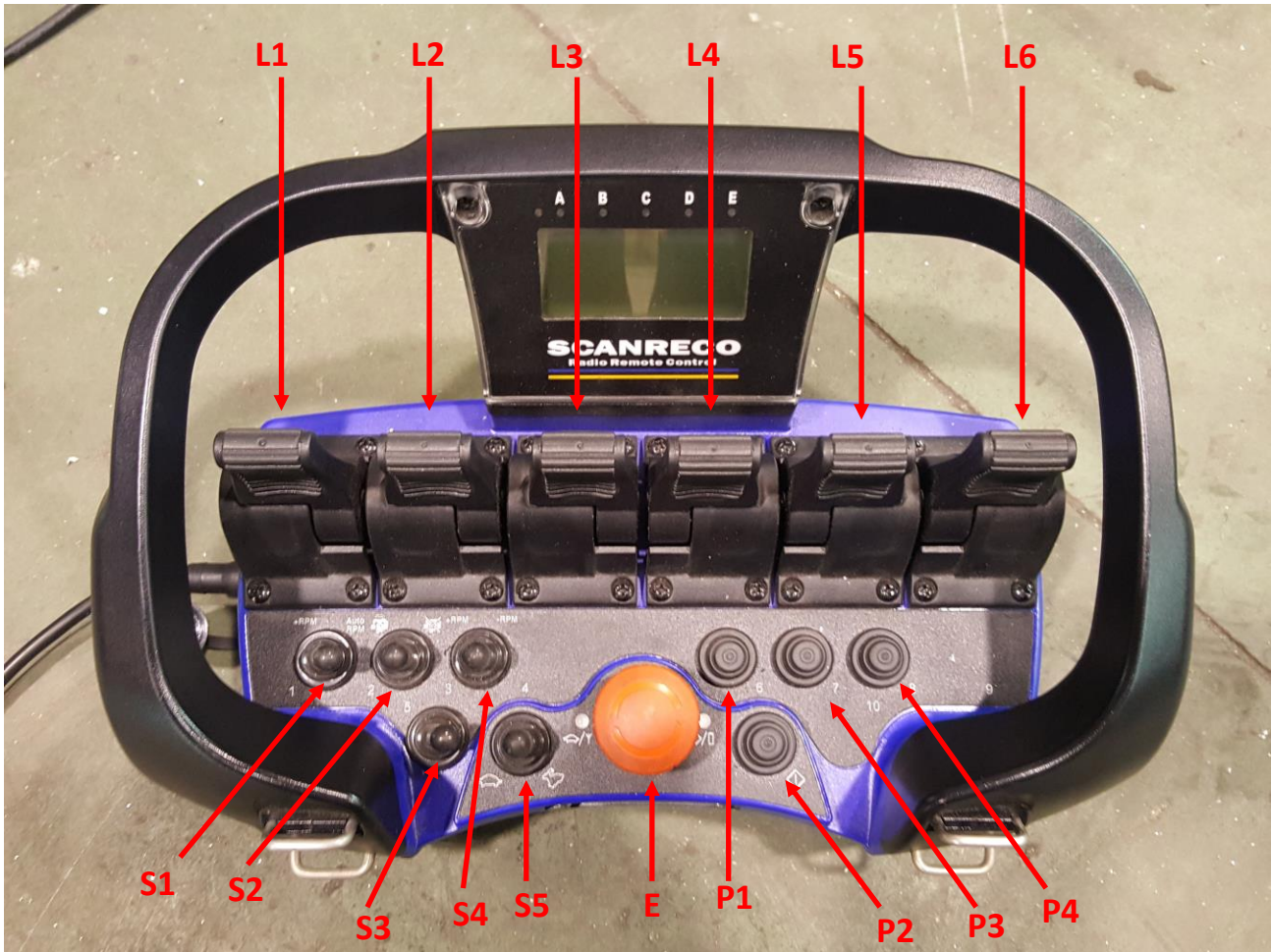
Starting the endothermic engine:

1. Make sure that the battery isolator is in the ON position
2. Make sure that there is fuel in the tank
3. Turn the key (Step 3) in ON position, hold to the left the engine remote control lever for 7 seconds (refer to the YANMAR diesel engine manual for the description and operating instructions)

Starting the electric motor:

1. Make sure that the power socket (step 8) is engaged and powered
2. Make sure that the main electric panel ON/OFF is ON (step 9)
3. Move on Rpm diesel engine page of the main panel, press P1 button (step 7).
In the case that the diesel engine is still active will turn off
Move to the left the engine power lever located on the remote control (S 2)

17.3 Description of the remote control functions and display:



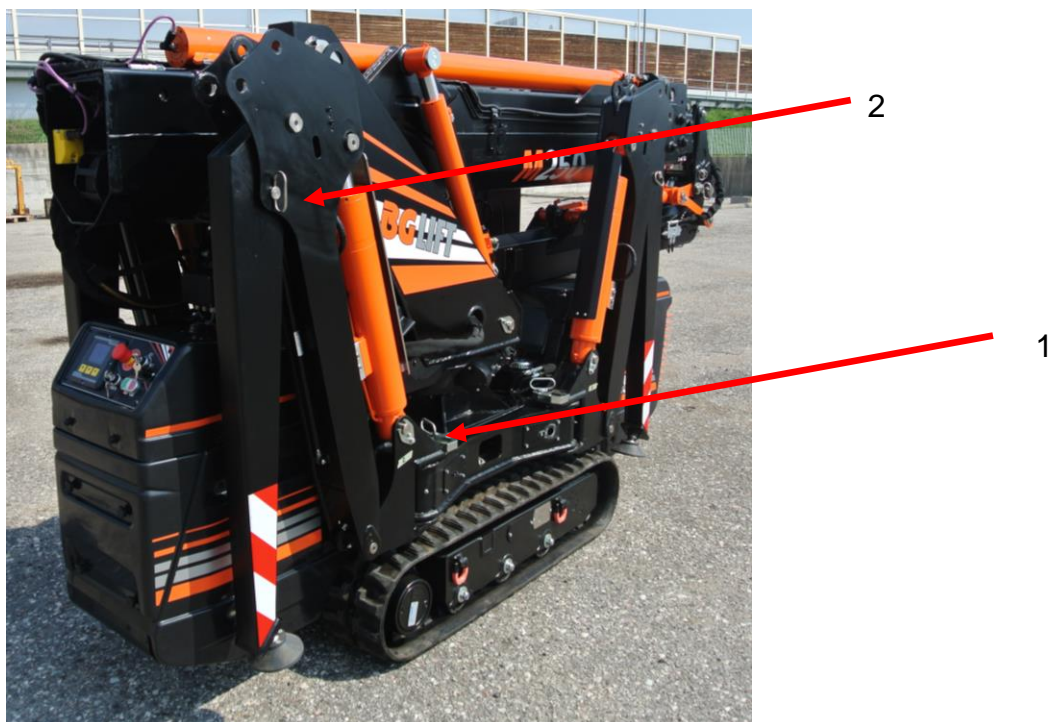
Consider that movements with the operator in front of the main display panel:
Caption:

T= crawler operative mode selected
S= stabilizer operative mode selected
C= crane operative mode selected

- S1. 3 position operative mode selector:
 - 1. Left – Crane
 - 2. Middle – Crawler
 - 3. Right – Stabilizer
- S2. Engine ON/OFF
- S3. Crawler Led Lamp ON/OFF
- S4. Diesel Engine Rpm regulator
- S5. Speed selector:
 - C= N° 4 crane speed reductions
- E. Emergency button
- P1. C= moving left – 110% mode. T=Slow/Fast
- P2. Remote control ON/OFF button Remote control RESET
- P3. Destabilization button for all stabilizer simultaneously
- P4. Automatic stabilization button

- L1. lever:
 - T: Movement lever for left crawler
 - Push upward the crawler moves forward
 - Push downward the crawler moves backward
 - C: Column rotation lever
 - Push upward clockwise rotation
 - Push downward counterclockwise rotation
- L2. lever:
 - C: UP/DOWN Main boom
 - Push upward main boom go DOWN
 - Push downward main boom go UP
 - S: Stabilizer N° 4 UP/DOWN
 - Push upward stabilizer N°4 go UP
 - Push downward stabilizer N°4 go DOWN
- L3. lever:
 - C: IN/OUT Main boom
 - Push upward main boom go OUT
 - Push downward main boom go IN
 - S: Stabilizer N° 3 UP/DOWN
 - Push upward stabilizer N°3 go UP
 - Push downward stabilizer N°3 go DOWN
- L4. lever:
 - C: UP/DOWN Hydraulic Jib
 - Push upward Hydraulic Jib go DOWN
 - Push downward Hydraulic Jib go UP
 - S: Stabilizer N° 2 UP/DOWN
 - Push upward stabilizer N°2 go UP
 - Push downward stabilizer N°2 go DOWN
- L5. lever:
 - C: IN/OUT Hydraulic Jib
 - Push upward Hydraulic Jib go OUT
 - Push downward Hydraulic Jib go IN
 - S: Stabilizer N° 1 UP/DOWN
 - Push upward stabilizer N°1 go UP
 - Push downward stabilizer N°1 go DOWN
- L6. lever:
 - T: Movement lever for right crawler
 - Push upward the crawler moves forward
 - Push downward the crawler moves backward
 - C: Winch lever
 - Push upward rope go OUT
 - Push downward rope go IN

17.4 Crawler stabilisation description



Below are some key steps for operating and stabilising the machine:

- Place the selector S1 of the remote control to the right on outriggers;
- To proceed with the automatic stabilization, press and hold the button N°10 of the key manual (button N° 8 on the remote control). The machine stops automatically when the chassis planarity level placed on the machine is close to 0°. If after the first stabilization step, the height to the ground is not enough. Press again the button pressed before.
- To proceed with the manual stabilization, it is enough move the level corresponding to the stabilizer that you want to move.
- Repeat the previous steps for the other stabilizers (is possible to move more than one stabilizer at the same time)
- When the desired stabilisation leg has been extended, press and hold the lever relating to the required leg and press lever No. 13 to extend the stabilisation cylinder that will lift the machine.

The system are able to understand automatically the positions of the pins and limit the stability of the machine respect to the stability area generated. This position are showed on the main display panel / stabilization page.

17.5 Crawler Translation

To perform traversing manoeuvres, act as follows:

- a) Make sure the outriggers are all lifted (not pressed to the ground)
- b) Using selector switch S3, activate the track operation control. Levers L1 and L6 control the forward and backward movement of the tracks when used simultaneously.



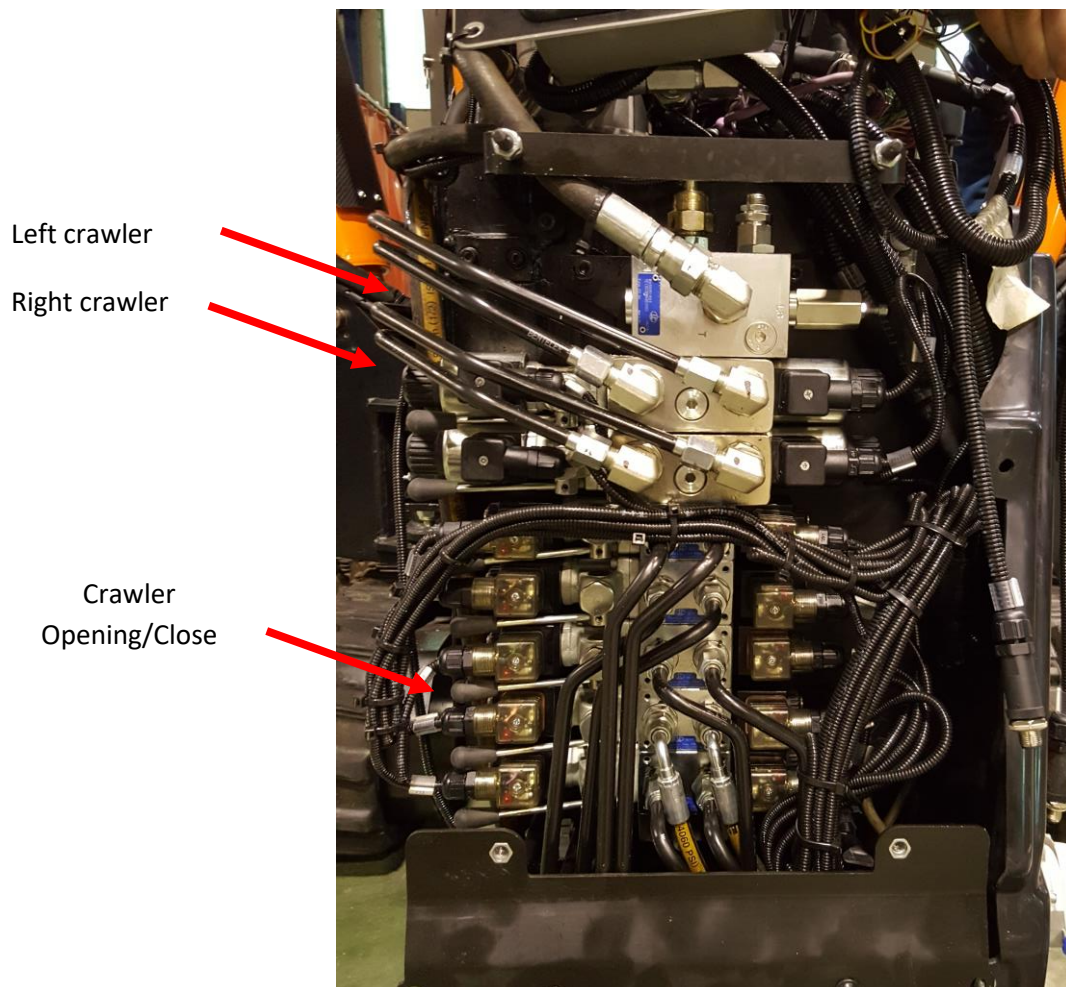
- **ATTENTION:** The presence of the tipping hazard signal does not exempt the operator in any way from controlling stability of the vehicle while traversing, because in some particular cases and/or in the event of control failures, the machine could still overturn.
- During traversing manoeuvres, the operator should stay outside of the machine operating range.



WARNING: FOR TURN YOU MUST NOT OPERATE WITH THE CRAWLERS OPPOSED BECAUSE THE FRICTION ON THE GROUND MAY COMPROMISE THE MOVEMENTS AND BRING TO STOPPING THE ENGINE

17.5.1 Outriggers distributor (Manual Mode)

the manual track distributor is located inside the carter located under the general display and must only be used in the event of a system failure.



17.6 Crane part



After having provided to stabilize, the machine is able to operate with the crane. To enable this mode, you must have stabilized the machine, the tracks must be lifted from the ground at least 100 mm, the chassis planarity level must be approximately 0 ° and all four stabilizers must be pressed to the ground.

When stabilized (will be displayed on the main display on the stability page the word "stab Ok"), by moving the operating mode selector (switch S1) to the left, will be able to use the crane

NOTE: in case the stabilization has not been done in the correct way (on the main display panel will show "Crane lock") if you move the operating mode selector S1 to the crane mode , the crane will be locked.

In case that the crane is enabled (stabilizations ok)

Once you move the switch S1 in crane , will required the operating mode:

Using the buttons P1 and P2 (located under the main display panel) choose and select with P3 button the operating mode that reflect the crane configuration.

P1= items scroll downwards

P2= items scroll upwards

For move up to the Crane rest position proceed moving up the main boom (lever L2 downwards), referring to the remote control lever, make the crane movements that you need

17.7 Returning to the operating position

To return to the operating position, fully close the aerial part of the machine, making sure that the main boom rests on its support. Being careful to avoid any possible collisions against the frame.

For put the crane in rest position:

- Rotate the boom in the correct position (on the main display panel, crane page, the value named "rot" has to be at -180° painted by green)
- Go back with the Jib extensions and close the Jib
- Go back with main boom extensions and close it until that is not in the rest position (on the main display panel, crane page, the values named boom angle and boon extension has to be painted by green)

In the moment when, on the main display panel, all three values are painted by green, the control system allow the machine to the destablization (selector S1 Operative mode to the right/ push the button N°7 of the remote control)

- a. Make all the outriggers retract to the transport position (maximum elevation).
- b. Remove the support from all four outriggers.
- c. To move the outriggers individually, select the outrigger/s to be moved by pressing the corresponding levers, then move in the direction of the desired movement.

18 CLOSING THE MACHINE IN EMERGENCY CONDITIONS (MANUAL EMERGENCY CONTROLS)

In the event of a failure or interruption of the hydraulic or electric power supply, during use the operator can close the machine by performing the manual emergency manoeuvres. If the manual emergency controls are required.

18.1 Type of breakdown

18.1.1 Main hydraulic force failure

This type of fault occurs in the event there is a fault in the machine electric circuit

You can proceed in two ways:

- Remote control line working:



- turn to the right the bypass key positioned under the general panel ON/OFF key

- Make all the necessary manoeuvres to put the machine in rest position

NOTE: the bypass, since its insertion, has a duration of 10 seconds to re-use it is necessary to disable it and wait 60 seconds before you re-enable it again

- Remote control line damage:



Put the emergency remote control jumper in to cable "X7.C" connected to the remote control transmitter

Remove the carter behind the crane column for access to the crane distributor

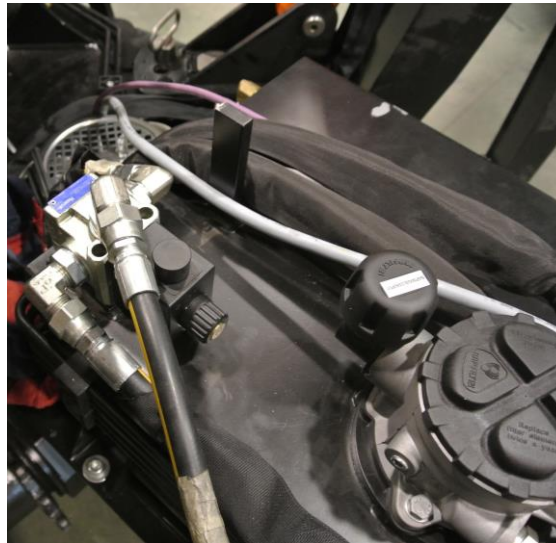


Insert the lever in the distributor peice corresponding to the movement that do you want do:
Distributor movements indicator, starting from the left to the right

- IN/OUT Jib extension
- UP/DOWN Jib
- Winch
- IN/OUT main boom extensions
- UP/DOWN main boom
- Column rotations

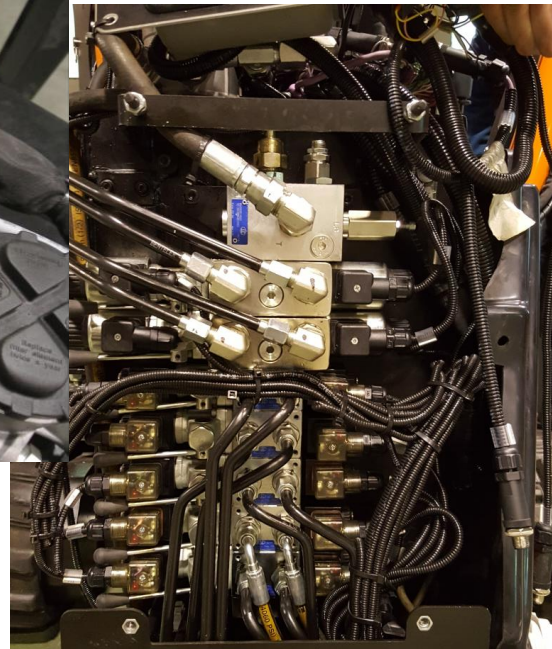
When the crane is in rest position, remove the carter of main display panel and the carter below for enter to the stabilizer/crawler distributor:

- Hold press the Crane/Stabilizer
And crawler Exchange valve
(figura 1)



Picture .1

- Move the Crawler/Stabilizer
distributor lever corresponding
to the required manoeuvre
(Picture 2)



Picture .2

Draw corresponding to movements
Chapter 17.5.1

18.1.2 Electrical system failure

This type of fault occurs in the event of a 12VCC electric power failure (possible breakage of control unit and/or wires of system logic)



Contact an authorised BRENNERO GRU workshop for assistance.



A - Emergency stop buttons

They are located on the engine and remote control emergency controls. They stop any machine function in the event of an emergency.

B – Hand pump for emergency descent

Allows to direct the movements of the machine and to resume operation in the event of a breakdown.

C – Hydraulic emergency controls

They are located on the rotary turret and are used to direct the movements of the crane in emergency conditions and without electric power.

G - Endothermic engine

Diesel engine that enables all the movements of the crawler.

H - Electric pump

400 VAC electric pump that enables all the movements of the crawler.

I – Flanged block valves on all cylinders

Cylinder movement is stopped if a hydraulic pipe breaks or there is a pressure drop.

L – Protections on electric and hydraulic plant

All flexible hoses and cables are equipped with wear-proof and burst-proof protections.

M – Maximum pressure valves

They prevent the maximum pressure in the hydraulic plant, at which the self-propelling vehicle is calibrated, from being exceeded.

19.1 Control panel display alarms key

NAME	Code	Description
FAULT CODE Params Error	111	Saved parameter "CRC" error – MPC113
FAULT CODE DataExchange Error	112	Internal Data Exchange MPC113 Fail
FAULT CODE TP BOOM L inLow	121	Cylinder side pressure sensor boom reading too low range
FAULT CODE TP BOOM L inHigh	122	Cylinder side pressure sensor boom reading too high range
FAULT CODE TP BOOM L outLow	123	Cylinder side pressure sensor boom actual pressure measurement too low range
FAULT CODE TP BOOM L outHigh	124	Cylinder side pressure sensor boom actual pressure measurement too high range
FAULT CODE TP BOOM H inLow	131	Piston side pressure sensor boom reading too low range
FAULT CODE TP BOOM H inHigh	132	Piston side pressure sensor boom reading too high range
FAULT CODE TP BOOM H outLow	133	Piston side pressure sensor boom actual pressure measurement too low range
FAULT CODE TP BOOM H outHigh	134	Piston side pressure sensor boom actual pressure measurement too high range
FAULT CODE TP JIB L inLow	141	Cylinder side pressure sensor jib reading too low range
FAULT CODE TP JIB L inHigh	142	Cylinder side pressure sensor jib reading too high range
FAULT CODE TP JIB L outLow	143	Cylinder side pressure sensor jib actual pressure measurement too low range
FAULT CODE TP JIB L outHigh	144	Cylinder side pressure sensor jib actual pressure measurement too high range
FAULT CODE TP JIB H inLow	151	Piston side pressure sensor jib reading too low range
FAULT CODE TP JIB H inHigh	152	Piston side pressure sensor jib reading too high range
FAULT CODE TP JIB H outLow	153	Piston side pressure sensor jib actual pressure measurement too low range
FAULT CODE TP JIB H outHigh	154	Piston side pressure sensor jib actual pressure measurement too high range

FAULT CODE CHASSIS ANGLE X1 outLow	201	Chassis X angle sensor channel 1 actual angle measurement out to low range
FAULT CODE CHASSIS ANGLE X1 outHigh	202	Chassis X angle sensor channel 1 actual angle measurement out to high range
FAULT CODE CHASSIS ANGLE Y1 outLow	203	Chassis Y angle sensor channel 1 actual angle measurement out to low range
FAULT CODE CHASSIS ANGLE Y1 outHigh	204	Chassis Y angle sensor channel 1 actual angle measurement out to high range
FAULT CODE CHASSIS ANGLE X2 outLow	205	Chassis X angle sensor channel 2 actual angle measurement out to low range
FAULT CODE CHASSIS ANGLE X2 outHigh	206	Chassis X angle sensor channel 2 actual angle measurement out to high range
FAULT CODE CHASSIS ANGLE Y2 outLow	207	Chassis Y angle sensor channel 2 actual angle measurement out to low range
FAULT CODE CHASSIS ANGLE Y2 outHigh	208	Chassis Y angle sensor channel 2 actual angle measurement out to high range
FAULT CODE BOOM ANGLE1 outLow	211	Boom angle sensor channel 1 actual angle measurement out to low range
FAULT CODE BOOM ANGLE1 outHigh	212	Boom angle sensor channel 1 actual angle measurement out to high range
FAULT CODE BOOM ANGLE2 outLow	213	Boom angle sensor channel 2 actual angle measurement out to low range
FAULT CODE BOOM ANGLE2 outHigh	214	Boom angle sensor channel 2 actual angle measurement out to high range
FAULT CODE JIB ANGLE1 outLow	221	Jib angle sensor channel 1 actual angle measurement out to low range
FAULT CODE JIB ANGLE1 outHigh	222	Jib angle sensor channel 1 actual angle measurement out to high range
FAULT CODE JIB ANGLE2 outLow	223	Jib angle sensor channel 2 actual angle measurement out to low range
FAULT CODE JIB ANGLE2 outHigh	224	Jib angle sensor channel 2 actual angle measurement out to high range
FAULT CODE BOOM LENGTH1 inLow	231	Boom length sensor channel 1 actual angle reading too low range
FAULT CODE BOOM LENGTH1 inHigh	232	Boom length sensor channel 1 actual angle reading too high range
FAULT CODE BOOM LENGTH1 outLow	233	Boom length sensor channel 1 actual angle measurement out to low range
FAULT CODE BOOM LENGTH1 outHigh	234	Boom length sensor channel 1 actual angle measurement out to high range

FAULT CODE BOOM_LENGTH2_inLow	235	Boom length sensor channel 2 actual angle reading too low range
FAULT CODE BOOM_LENGTH2_inHigh	236	Boom length sensor channel 2 actual angle reading too high range
FAULT CODE BOOM_LENGTH2_outLow	237	Boom length sensor channel 2 actual angle measurement out to low range
FAULT CODE BOOM_LENGTH2_outHigh	238	Boom length sensor channel 2 actual angle measurement out to high range
FAULT CODE JIB_LENGTH1_inLow	241	Jib length sensor channel 1 actual angle reading too low range
FAULT CODE JIB_LENGTH1_inHigh	242	Jib length sensor channel 1 actual angle reading too high range
FAULT CODE JIB_LENGTH1_outLow	243	Jib length sensor channel 1 actual angle measurement out to low range
FAULT CODE JIB_LENGTH1_outHigh	244	Jib length sensor channel 1 actual angle measurement out to high range
FAULT CODE JIB_LENGTH2_inLow	245	Jib length sensor channel 2 actual angle reading too low range
FAULT CODE JIB_LENGTH2_inHigh	246	Jib length sensor channel 2 actual angle reading too high range
FAULT CODE JIB_LENGTH2_outLow	247	Jib length sensor channel 2 actual angle measurement out to low range
FAULT CODE JIB_LENGTH2_outHigh	248	Jib length sensor channel 2 actual angle measurement out to high range
FAULT CODE ROT_ANGLE1_outLow	253	Rot angle sensor channel 1 actual angle measurement out to low range
FAULT CODE ROT_ANGLE1_outHigh	254	Rot angle sensor channel 1 actual angle measurement out to high range
FAULT CODE ROT_ANGLE2_outLow	257	Rot angle sensor channel 2 actual angle measurement out to low range
FAULT CODE ROT_ANGLE2_outHigh	258	Rot angle sensor channel 2 actual angle measurement out to high range
FAULT CODE CONGRUENCE_BoomAngle	521	Too high actual measurement difference between boom angle sensors
FAULT CODE CONGRUENCE_BoomAngle_1A_1B	522	Too high actual measurement difference between boom angle sensors, by CpuA_Ch1 and CpuB_Ch1
FAULT CODE CONGRUENCE_BoomAngle_2A_2B	523	Too high actual measurement difference between boom angle sensors, by CpuA_Ch2 and CpuB_Ch2

FAULT CODE CONGRUENCE BoomLength	531	Too high actual measurement difference between boom length sensors
FAULT CODE CONGRUENCE BoomLength 1A 1B	532	Too high actual measurement difference between boom length sensors, by CpuA_Ch1 and CpuB_Ch1
FAULT CODE CONGRUENCE BoomLength 2A 2B	533	Too high actual measurement difference between boom length sensors, by CpuA_Ch2 and CpuB_Ch2
FAULT CODE CONGRUENCE JibAngle	541	Too high actual measurement difference between Jib angle sensors
FAULT CODE CONGRUENCE JibAngle 1A 1B	542	Too high actual measurement difference between Jib angle sensors, by CpuA_Ch1 and CpuB_Ch1
FAULT CODE CONGRUENCE LMI JibActLimit A B	545	Congruence error between computed ActualLimit of LMI load between the 2 channel
FAULT CODE CONGRUENCE LMI JibActSwl A B	546	Congruence error between computed percentage of LMI load between the 2 channel
FAULT CODE CONGRUENCE JibLength	551	Too high actual measurement difference between Jib length sensors
FAULT CODE CONGRUENCE JibLength 1A 1B	552	Too high actual measurement difference between Jib length sensors, by CpuA_Ch1 and CpuB_Ch1
FAULT CODE CONGRUENCE ChassisXAngle	561	Too high actual measurement difference between chassis X angle sensors
FAULT CODE CONGRUENCE ChassisXAngle 1A 1B	562	Too high actual measurement difference between chassis X angle sensors by CpuA_Ch1 and CpuB_Ch1
FAULT CODE CONGRUENCE ChassisXAngle 2A 2B	563	Too high actual measurement difference between chassis X angle sensors by CpuA_Ch2 and CpuB_Ch2
FAULT CODE CONGRUENCE ChassisYAngle	571	Too high actual measurement difference between chassis Y angle sensors
FAULT CODE CONGRUENCE ChassisYAngle 1A 1B	572	Too high actual measurement difference between chassis Y angle sensors by CpuA_Ch1 and CpuB_Ch1
FAULT CODE CONGRUENCE ChassisYAngle 2A 2B	573	Too high actual measurement difference between chassis Y angle sensors by CpuA_Ch2 and CpuB_Ch2
FAULT CODE CONGRUENCE RotAngle	581	Too high actual measurement difference between rotation angle sensors
FAULT CODE CONGRUENCE RotAngle 1A 1B	582	Too high actual measurement difference between rotation angle sensors by CpuA_Ch1 and CpuB_Ch1
FAULT CODE CONGRUENCE RotAngle 2A 2B	583	Too high actual measurement difference between rotation angle sensors by CpuA_Ch2 and CpuB_Ch2
FAULT CODE CONGRUENCE PDIFFBoom A B	591	Too high actual measurement difference between computed differential pressure Boom to CpuA and CpuB
FAULT CODE CONGRUENCE PDIFFiib A B	592	Too high actual measurement difference between computed differential pressure Jib to CpuA and CpuB

FAULT CODE CAN BUS BoomAngleMsgCh1	601	Can Bus messages receive fail from boom angle sensor channel 1
FAULT CODE CAN BUS BoomAngleMsgCh2	602	Can Bus messages receive fail from boom angle sensor channel 2
FAULT CODE CAN BUS BoomLengthMsgCh1	605	Can Bus messages receive fail from boom length sensor channel 1
FAULT CODE CAN BUS BoomLengthMsgCh2	606	Can Bus messages receive fail from boom length sensor channel 2
FAULT CODE CAN BUS JibSensorPdo1	611	Can Bus messages receive fail from Jib sensor PDO 1
FAULT CODE CAN BUS JibSensorPdo2	612	Can Bus messages receive fail from Jib sensor PDO 2
FAULT CODE CAN BUS EV RotMsgCh1	641	Can Bus messages receive fail from Hawe EV Rot
FAULT CODE CAN BUS EV BoomMsgCh1	642	Can Bus messages receive fail from Hawe EV boom
FAULT CODE CAN BUS EV BoomTeleMsgCh1	643	Can Bus messages receive fail from Hawe EV tele
FAULT CODE CAN BUS EV JibMsgCh1	644	Can Bus messages receive fail from Hawe EV jib
FAULT CODE CAN BUS EV JibTeleMsgCh1	645	Can Bus messages receive fail from Hawe EV telejib
FAULT CODE CAN BUS EV WinchMsgCh1	646	Can Bus messages receive fail from Hawe EV winch
FAULT CODE CAN BUS EncoderMsg_CHA	651	Can Bus messages receive fail from rot angle sensor channel 1
FAULT CODE CAN BUS EncoderMsg_CHB	652	Can Bus messages receive fail from rot angle sensor channel 2
FAULT CODE CAN BUS MSC113_1_CHA_PDO1	661	Can Bus messages receive fail from MSC113_1 ChA PDO 1
FAULT CODE CAN BUS MSC113_1_CHA_PDO2	662	Can Bus messages receive fail from MSC113_1 ChA PDO 2
FAULT CODE CAN BUS MSC113_1_CHB_PDO1	663	Can Bus messages receive fail from MSC113_1 ChB PDO 1
FAULT CODE CAN BUS MSC113_1_CHB_PDO2	664	Can Bus messages receive fail from MSC113_1 ChB PDO 2

FAULT CODE CAN BUS MSC113 2 CHA PDO1	671	Can Bus messages receive fail from MSC113 2 ChA PDO 1
FAULT CODE CAN BUS MSC113 2 CHA PDO2	672	Can Bus messages receive fail from MSC113 2 ChA PDO 2
FAULT CODE CAN BUS MSC113 2 CHB PDO1	673	Can Bus messages receive fail from MSC113 2 ChB PDO 1
FAULT CODE CAN BUS MSC113 2 CHB PDO2	674	Can Bus messages receive fail from MSC113 2 ChB PDO 2
FAULT CODE CAN BUS MSC113 3 CHA PDO1	681	Can Bus messages receive fail from MSC113 3 ChA PDO 1
FAULT CODE CAN BUS MSC113 3 CHA PDO2	682	Can Bus messages receive fail from MSC113 3 ChA PDO 2
FAULT CODE CAN BUS MSC113 3 CHB PDO1	683	Can Bus messages receive fail from MSC113 3 ChB PDO 1
FAULT CODE CAN BUS MSC113 3 CHB PDO2	684	Can Bus messages receive fail from MSC113 3 ChB PDO 2
FAULT CODE CAN BUS ChassisAngleMseCh1	691	Can Bus messages receive fail from chassis angle sensor channel 1
FAULT CODE CAN BUS ChassisAngleMseCh2	692	Can Bus messages receive fail from chassis angle sensor channel 2
FAULT CODE MSC113 1 CRC A	811	Saved parameter "CRC" error – MSC113
FAULT CODE MSC113 1 PDO Rx A	812	Can Bus messages receive fail from MPC113
FAULT CODE MSC113 1 OchRxFail A	813	Can Bus messages receive fail from MPC113 Other Channel
FAULT CODE MSC113 1 ExchangeFail A	814	Internal Data Exchange MSC113 Fail
FAULT CODE MSC113 1 OchCouRunFail A	815	Other Channel run Fail
FAULT CODE MSC113 1 CRC B	821	Saved parameter "CRC" error – MSC113
FAULT CODE MSC113 1 PDO Rx B	822	Can Bus messages receive fail from MPC113
FAULT CODE MSC113 1 OchRxFail B	823	Can Bus messages receive fail from MPC113 Other Channel
FAULT CODE MSC113 1 ExchangeFail B	824	Internal Data Exchange MSC113 Fail
FAULT CODE MSC113 1 OchCouRunFail B	825	Other Channel run Fail

FAULT CODE MSC113 2 CRC A	831	Saved parameter "CRC" error – MSC113
FAULT CODE MSC113 2 PDO Rx A	832	Can Bus messages receive fail from MPC113
FAULT CODE MSC113 2 OchRxFail A	833	Can Bus messages receive fail from MPC113 Other Channel
FAULT CODE MSC113 2 ExchangeFail A	834	Internal Data Exchange MSC113 Fail
FAULT CODE MSC113 2 OchCouRunFail A	835	Other Channel run Fail
FAULT CODE MSC113 2 CRC B	841	Saved parameter "CRC" error – MSC113
FAULT CODE MSC113 2 PDO Rx B	842	Can Bus messages receive fail from MPC113
FAULT CODE MSC113 2 OchRxFail B	843	Can Bus messages receive fail from MPC113 Other Channel
FAULT CODE MSC113 2 ExchangeFail B	844	Internal Data Exchange MSC113 Fail
FAULT CODE MSC113 2 OchCouRunFail B	845	Other Channel run Fail
FAULT CODE MSC113 3 CRC A	851	Saved parameter "CRC" error – MSC113
FAULT CODE MSC113 3 PDO Rx A	852	Can Bus messages receive fail from MPC113
FAULT CODE MSC113 3 OchRxFail A	853	Can Bus messages receive fail from MPC113 Other Channel
FAULT CODE MSC113 3 ExchangeFail A	854	Internal Data Exchange MSC113 Fail
FAULT CODE MSC113 3 OchCouRunFail A	855	Other Channel run Fail
FAULT CODE MSC113 3 CRC B	861	Saved parameter "CRC" error – MSC113
FAULT CODE MSC113 3 PDO Rx B	862	Can Bus messages receive fail from MPC113
FAULT CODE MSC113 3 OchRxFail B	863	Can Bus messages receive fail from MPC113 Other Channel
FAULT CODE MSC113 3 ExchangeFail B	864	Internal Data Exchange MSC113 Fail
FAULT CODE MSC113 3 OchCouRunFail B	865	Other Channel run Fail
FAULT CODE FBK EV AEREAL	701	Error Feedback EV Aereal
FAULT CODE FBK EV STAB	702	Error Feedback EV Stabilization

FAULT CODE CONGRUENCE EV ROT	710	Check a difference status between Jovstick and EV Hawe
FAULT CODE CONGRUENCE EV BOOM	711	Check a difference status between Jovstick and EV Hawe
FAULT CODE CONGRUENCE EV BOOMTELE	712	Check a difference status between Jovstick and EV Hawe
FAULT CODE CONGRUENCE EV JIB	713	Check a difference status between Jovstick and EV Hawe
FAULT CODE CONGRUENCE EV JIBTELE	714	Check a difference status between Jovstick and EV Hawe
FAULT CODE CONGRUENCE EV WINCH	715	Check a difference status between Jovstick and EV Hawe
FAULT CODE OUT StatusOut0 A	901	Output MPC113 Error
FAULT CODE OUT StatusOut1 A	902	Output MPC113 Error
FAULT CODE OUT StatusOut2 A	903	Output MPC113 Error
FAULT CODE OUT StatusOut3 A	904	Output MPC113 Error
FAULT CODE OUT StatusOut4 A	905	Output MPC113 Error
FAULT CODE OUT StatusOut5 A	906	Output MPC113 Error
FAULT CODE OUT StatusOut6 A	907	Output MPC113 Error
FAULT CODE OUT StatusOut0 B	911	Output MPC113 Error
FAULT CODE OUT StatusOut1 B	912	Output MPC113 Error
FAULT CODE OUT StatusOut2 B	913	Output MPC113 Error
FAULT CODE OUT StatusOut3 B	914	Output MPC113 Error
FAULT CODE OUT StatusOut4 B	915	Output MPC113 Error
FAULT CODE OUT StatusOut5 B	916	Output MPC113 Error
FAULT CODE OUT StatusOut6 B	917	Output MPC113 Error
FAULT CODE RX LOOP 10	991	Internal Loop 10ms MPC113 Error
FAULT CODE RX LOOP 50	992	Internal Loop 50ms MPC113 Error
FAULT CODE RX LOOP 100	993	Internal Loop 100ms MPC113 Error

ATTENTION!!! WELDING/RESTORATION

Different parts of the machine are made with high elastic limit steel; never make welding or restorations without the authorization and the preventive instructions of the manufacturer.

1. INTRODUCTION
2. PRODUCTS TO USE
3. MAINTENANCE PROGRAMME
4. HYDRAULIC OIL LEVEL VERIFICATION
5. DELIVERY FILTER CARTRIDGE REPLACEMENT
6. CONTROL THE SEAL ON THE CYLINDER CHECK VALVES
7. FITTINGS AND FLEXIBLE/RIGID PIPES INSPECTION
8. ELECTRIC SYSTEMS/COMPONENTS
9. STRUCTURE INSPECTION
10. BOLT AND NUT TORQUE CHECK
11. EMPTYING THE SYSTEM AND FILLING THE TANK
12. PROCEDURE TO BE FOLLOWED IN THE EVENT OF A PUMP BREAKDOWN
13. GREASING THE HINGED PINS
14. GREASING THE SLIDING BLOCKS
15. CONTROL/ADJUSTMENT OF THE SLIDING BLOCKS ON THE TELESCOPIC BOOMS
16. CONTROLS
17. PROBLEMS – CAUSES – SOLUTIONS RELATING TO OPERATING ANOMALIES
18. PARTS
19. TROUBLESHOOTING

20.1 Introduction

It is of the utmost importance that this equipment is washed with a pressure washer to remove all polluting elements, which can damage materials and impair proper functioning.

After washing, lubricate all components to properly restore sliding conditions and check if there are elements out of shape or which show wear. If so, it is compulsory to contact an authorised service shop to replace these elements.

For lubricating material refer to what indicated in this manual.

It is essential to take into account that even safety devices are subject to wear and that you must always check that they are clean,

lubricated and intact. Under normal working conditions cleaning and lubricating operations as described above can be carried out once a month. This interval

must be reduced in the event of heavy duty use or harsh environmental conditions.

It is impossible to describe all these situations, therefore, below are some examples.

- Resuming machine operation after a long period of inactivity.
- Extremely high or extremely low environmental temperatures with subsequent fast lubricant deterioration or extreme hardening.
- Sanding and painting work where the material may frequently fall into the sliding mechanisms, mixing with grease and forming a compound that instead of lubricating turns into an abrasive substance, wearing out the components quickly until seizing up the sliding mechanisms.

We rely on your conscientiousness in tracing down, in relation to the ways in which the machine is used, when and how to perform control and maintenance absolutely necessary for the perfect functioning and good state of preservation of safety devices and of the machine in general.

WARNING

FOR THE SAFETY OF THE MACHINE AND OF OPERATORS IT IS MANDATORY TO USE ORIGINAL SPARE PARTS.

WHILE WASHING WITH A HIGH-PRESSURE JET, DO NOT AIM DIRECTLY AT ELECTRIC BOXES AND CABINETS. DO NOT USE DETERGENTS, HARSH CHEMICALS, PETROL OR SIMILAR SUBSTANCES, WHICH CAN DAMAGE RUBBER PARTS, PLASTIC COMPONENTS AND THE PAINTWORK.

DO NOT PERFORM MAINTENANCE ON THE MACHINE WHEN THIS IS MOVING. TURN ALL THE ENGINES OFF AND REMOVE THE KEYS FROM THE CONTROL PANEL AND FROM THE DASHBOARD OF THE VEHICLE. FOR BALL JOINTS WE RECOMMEND REPEATING THE LUBRICATION PROCEDURE IN VARIOUS AREAS OF THE MACHINE.

HOWEVER, MAINTENANCE HAS TO BE CARRIED OUT WHEN THE MACHINE IS TURNED OFF AND AFTER THE KEYS HAVE BEEN REMOVED FROM THE CONTROL PANELS

Inspection, maintenance and other intervention on the machine are to be carried out according to specific skills. As far as maintenance programme is concerned, what follows is a list of workers in charge for each operation:

- a. Machine operator and service workshop of the company that owns the machine
- b. Workshop

Before carrying out any modifications you must to be authorised by the manufacturer.

Note: After any type of inspection/maintenance, report the results and the operations carried out on the relevant inspection register - see chap.24

IN THE EVENT OF A LONG PERIOD OF MACHINE INACTIVITY Store it in a dry and ventilated place.

Remove starting keys from the machine.

Clean filter and electric system.

Protect contacts and remote control switches with special antioxidising products.

- Lubricate the sliding guides, chains and surfaces that are not protected by paint.
- Do not cover the machine with plastic sheets since it would create harmful condensate.
- With regard to the crawler, follow the manufacturer instructions.

Before putting the machine into operation again, carry out inspection and maintenance procedures at intervals requested every day....., every 50 hours....., once a month.

DISMANTLING AND SCRAPPING

In case of scrapping, it is necessary to dismantle the machine and broke it down into uniform parts which should be sent to the relevant storage centres. These types of materials are present on the machine:

- Ferrous materials: structural steelwork and mechanical components.
- Plastic materials: gaskets, belts, guards.
- Electric materials: windings, controls, solenoid valves and similar components.
- Oils and lubricants: hydraulic oil, reduction gear lubricants, lubricating grease.
- With regard to the crawler, follow the manufacturer instructions

20.2 Products to be used

- λ NILS NILEX EP2 grease or equivalent for pins and lubricators
- σ NILS NILEX EP2 grease for the boom extensions and the outrigger supporting beams

ENI ARNICA 32 hydraulic system oil - Hydraulic system capacity 17 gals

**IT IS ABSOLUTELY FORBIDDEN TO INTRODUCE TOOLS, HANDS, FINGERS,
ETC., IN THE HOLES OF THE TELESCOPIC BOOM.**

**ALL THE MAINTENANCE OPERATIONS HAVE TO BE MADE WITH ORDINARY
TOOLS ACCORDING TO THE SAFETY RULES**

20.3 Maintenance programme

Important:: After carrying out any kind of inspection/maintenance, before putting the machine back into service, perform the inspection and maintenance operations listed in the “every day” section.

INTERVALS	OPERATION	NOTES	BY
Every day before putting into service	<p>Check through repeated tests, that all safety and emergency devices work properly; in particular, pay special attention to the following:</p> <ul style="list-style-type: none"> - - emergency stop buttons - outrigger/boom interlock systems - controls and warning lights - battery charge - hydraulic oil and fuel tank levels <p>MOREOVER, MAKE SURE THAT:</p> <ul style="list-style-type: none"> - the pin locking systems (plugs, ring nuts, etc.) must be fully efficient and in good conditions - the instruction and safety plates must be fully legible - there must be no hydraulic leaks, loose electric connections, signs of collision, friction, etc. 		A machine operator
Every 50 hours of work	<p>Check oil level in the motors.</p> <p>Make sure that the following components are sufficiently clean:</p> <ul style="list-style-type: none"> - of the diesel pre-filter - of the motor air filter - of the machine (in particular, inspect tightness of connections and hoses); also inspect the condition of rubber pads, cables, all accessories and equipment. <p>Check hydraulic oil filter saturation.</p>		A machine operator
Every month (~ 120 hours)	<p>Perform a complete cycle of cleaning and greasing as indicated in the INTRODUCTION to this MAINTENANCE paragraph.</p> <p>Perform inspection and lubrication as indicated in the attached figure 050.</p> <p>Check the lubrication conditions of the extension chains/ cables of the booms and proceed with greasing the chains/ cables transmission rollers (if any).</p>	<p>After the first 150 hours replace the hydraulic system oil filter cartridges</p>	A machine operator

CHECK FOR ANY RUSTY SPOTS THAT
MAY POINT OUT KNOCKS, CRACKS OR
OTHER
PHENOMENON REQUIRING INTERVENTION



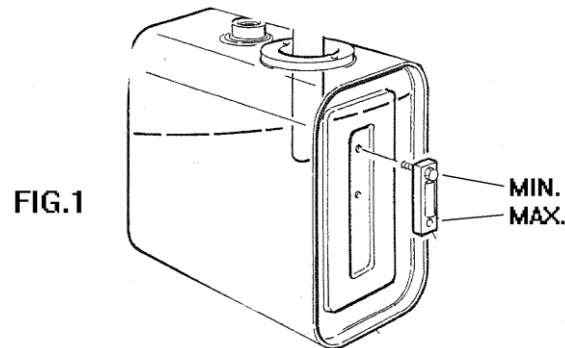
Check and if necessary adjust
play of side guide slide blocks.

Important: After carrying out any kind of inspection/maintenance, before putting the machine back into service, perform the inspection and maintenance operations listed in the “every day” section.

INTERVALS	OPERATIONS	NOTES	BY
Every 3 months (~ 360 hours)	<p>Inspect main fixing tightening parts: slewing ring bolts and nuts reduction gear bolts and nuts chassis nuts and bolts ring nuts on pins.</p> <p>Check the wear of the extension/retraction chains.</p> <p>Perform inspection and lubrication as indicated in Figure 051. Replace hydraulic system oil filter cartridges and inspect locking valves. N.B. If tightening of slewing ring screws is not correct, it is necessary to replace the screws at our authorised service shops</p>	<p>In this regard, see fastening torques in chapter 3</p> <p>See paragraph 25.11</p> <p>In this regard see “INSTRUCTIONS FOR HYDRAULIC SYSTEM MAINTENANCE”</p>	A machine operator and/or owner company safety manager + BRENNERO GRU workshop
Every 6 months (~ 750 hours)	Perform a full machine inspection and write down the results on the special sheets attached in the “INSPECTION REGISTER”.		A machine operator + Owner company safety manager
Every year (~ 1500 hours)	Replace all the oil in the hydraulic system.	In this regard see “INSTRUCTIONS FOR HYDRAULIC SYSTEM MAINTENANCE”	A machine operator + owner company safety manager + BRENNERO GRU workshop
Every 1-3 years (1500-4500 hours)	COMPLETE INSPECTION		BRENNERO GRU workshop
(~ 15000 hours) or ten years	COMPLETE OVERHAUL		BRENNERO GRU workshop

20.4 Hydraulic oil level verification

Refer to the "Maintenance" section, chapter 9, of the EFFER operator manual attached.



20.5 Delivery oil filter cartridge replacement

The flow filter cartridge is placed under the cover next to the machine general control display



20.6 Cylinder block valve seal inspection

Every three months check the seal of the blocking valves on the cylinders in this way:

Functioning control of outrigger driven block valves

- 1) Press outriggers to the ground
- 3) Leave the machine turned on so as to maintain the controls power supply active.
- 4) Act on the lifting control levers and make sure that the outriggers do not move.
- 5) Switch the machine off, wait a few minutes and mark the outrigger extension position
- 6) Check after 10 minutes that there was no yielding (retraction of the outriggers).
- 7) Perform the same test/inspection for the seal of the fully retracted outriggers

Control of the blocking valves on the cylinders of the superstructure

NOTE: If there is any yielding, contact an authorised workshop immediately to perform additional inspections and solve the problem.

20.7 Checking the fittings and flexible/rigid pipes

During normal maintenance, you must check all the pipe-fittings and the different hydraulic connections of the machine to find irregularities.

With regard to fittings in general, the inspection involves checking that there are no oil leaks and checking that they are clamped properly (if the fitting features a gasket, replace it if necessary). With regard to the hoses, thoroughly check the pipe/pressed pipe-fitting joint and the general condition of the hose (it must show no signs of early ageing, cracks, swellings or abrasions that can compromise the seal).

For the replacement of any pipes follow these instructions:

1. Turn engine off.
2. Operate, many times, control levers (motor turned off) in order to eliminate pressure within the circuits.
3. If the hose is below the tank, there may be an exhaust suction issue; therefore, if necessary, disconnect hoses connected to return filters.
4. If you have to replace an induction pipe from the tank, you have to stop the oil from draining out of the tank.
5. Always proceed very carefully while removing the part to be replaced.
6. Use always original pipes/spares

After having replaced the required parts, eliminate air that has entered into the circuit by moving the various end run jacks.

ATTENTION!!! PIPES-ELECTRIC CABLES

The flexible pipes and the electric cables that cross the cable holder chains are components that can be subject to wear and must be checked frequently to prevent damage, resulting in machine downtime.

You must therefore check that they are fastened properly at the ends of the cable holder chain, their external wear condition, their correct position and tension (the inside of the cable holder chain must show no signs of wear or protruding pipes and cables).

Note: If the cable holder chain is inside the boom, a visual inspection can be performed with a portable torch, from the rear boom opening (remove the casing and pay attention to the cable holder chain during the extension of the boom).

20.8 Electric systems/components

Periodically check (every 100 hours / a month of work) the state and conservation of the components and electrical cabling (scrupulously check the cables and the various plugs and inputs of connection). Check that the cables do not show signs of crushing/chafing or superficial wear and tear and they are correctly fixed in their original position.

You must also check the integrity of the different electric boxes and verify the correct water tightness of the covers and of the pipe-fittings for the entry of the electric cables (to avoid dangerous water infiltrations).

20.9 Structure inspection

The complete crawler structure inspection must be carried out at least every 1500/2000 working hours, by the expert personnel authorised by the manufacturer, to check the general condition of the machine.

To do this control follow these instructions:

- thoroughly wash/clean the entire machine
- visually inspect the entire machine structure with particular attention to the welding and to rust/oxidation spots, to find any signs of weakening
- if you find flaws/cracks or if in doubt, contact an authorised workshop immediately for more in-depth checks

20.10 Slewing ring bolts tightening check

The tightness of the bolts and nuts used on the crawler must be checked at least every 300/600 working hours, by expert personnel to find yielding or loosening.

You have to control the clamping of all the bolts and nuts that are on the machine (through dynamometric key with the aid of the values clamping chart below). Give attention to the follow critical points:

- clamping to the vehicle frame
- flanged valve clamping on cylinders
- thrust bearing/turret/frame clamping
- outrigger clamping

ATTENTION!!!

During the controls/new clamping do not use the screws that are already at a yield/extended because they do not guarantee the correct seal characteristics. Therefore, especially in critical clamping points, if you find a loose fastening, replace the screw (only use original spare parts supplied by the manufacturer).

BOLT TIGHTENING TORQUE TABLE Nm

RATED DIAMETER (mm)	BOLT CLASS		
	8.8	10.9	12.9
5	5	7	8
6	8	12	14
8	20	29	35
10	40	60	70
12	70	100	120
14	110	160	190
16	170	250	300
18	240	350	410
20	340	500	580
22	460	680	800
24	580	860	1000
27	860	1270	1490
30	1170	1720	2010
33	1590	2340	2740
36	2040	3000	3520
39	2660	3900	4570

Tightening accuracy $C_{\mu} = 0.15$ Standard E25-030 Afnor 84162 (10Nm \cong 1 Kgm)

TABLE OF PIPE FITTING/PIPE TIGHTENING TORQUE

FITTINGS/PIPES 24° - DIN3861

FITTINGS/PIPES 60°-BSP

T Ø EXT PIPE		THREAD	TIGHTENING TORQUE
SERIE S	TH		N.m
LIGHT (L)	6	12 x 1.5	13 - 15
	8	14 x 1.5	15 - 18
	10	16 x 1.5	25 - 28
	12	18 x 1.5	27 - 30
	15	22 x 1.5	50 - 60
	18	26 x 1.5	60 - 75
	22	30 x 2	85 - 105
	28	36 x 2	120 - 140
HEAVY (S)	6	14 x 1.5	14 - 16
	8	16 x 1.5	25 - 28
	10	18 x 1.5	27 - 30
	12	20 x 1.5	43 - 54
	14	22 x 1.5	50 - 62
	16	24 x 1.5	60 - 75
	20	30 x 2	90 - 110
	25	36 x 2	125 - 145

T Ø EXT PIPE		THREAD	TIGHTENING TORQUE
mm	IN.		N.m
5	3/16	1/8	12 - 14
6	¼	1/4	14 - 16
10	3/8	3/8	25 - 28
12	½	1/2	45 - 60
16	5/8	5/8	55 - 70
20	¾	¾	90 - 110
25	1"	1"	120 - 140
32	1"1/4	1"1/4	170 - 190
38	1"1/2	1"1/2	200 - 245

20.11 Emptying the system and filling the tank

If it is necessary to empty the equipment, you have to completely remove used oil as not to mix it with new oil. Intake must be carried out starting from the equipment's lowest part; intake should be carried out when oil is hot.

The oil for refilling the equipment should be poured into the tank through a 25 micron filter. Oil must be clean and devoid of any foreign substance, which could cause anomalies and early wear to the equipment; moreover, the oil must correspond to the specifications indicated.

20.12 Procedure to be followed in case of a pump breakdown/seizure

Under these conditions there is a risk of polluting the whole system. As a matter of fact, a breakdown in this equipment is always characterised by quite abrasive dust, which can cause serious damages to the remaining equipment. Oil must be drained from the tank and valves, utilities, pipes and the tank washed and cleaned.

Moreover, it is necessary to check if cylinders show wear.

Replace all the filters and fit provisional 25 micron filters on each return hose. Let the equipment work for 40/50 hours approx. before removing provisional filters and refilling tank with new oil.

20.13 Greasing the hinged pins

The hinged pins must be lubricated. For the kind of grease see paragraph 2-Products to use.

20.14 Greasing the sliding blocks

To lubricate the sliding blocks you have to strew the sliding parts of the different booms with a right lubricator/grease (see paragraph 20.2 –Products to use) in the contact zone of the sliding blocks.

Make some operations of extension/without operator after having finished the clamping operation, so you can obtain the correct lubrication distribution on the sliding parts.

20.15 Control/adjustment of telescopic boom sliding blocks

Regularly check the wear condition (and make adjustments when necessary) of the sliding blocks of the outrigger booms.

The lateral sliding blocks are generally adjustable from the outside through a system with screw/adjustment register.

The correct adjustment can't be very narrow (to avoid an early damage) and not very slow (to avoid a side clearance). We advise you to maintain a maximum allowance between sliding block and boom of 0,019 inch.

The upper and lower sliding blocks are not adjustable from the outside. To control the wear condition and a new adjustment you have to go to an authorized workshop because it's necessary to remove the parts.

In any case you can check their wear controlling the thickness. The head of the screws or of the backstops can't protrude from the upper surface of the sliding block. We advise you to maintain a minimum projection of the sliding block of 0,11 inch compared to the clamping systems.

20.16 Controls

Check the correct functioning of all controls (hydraulic, electric and electronic), the correct return to zero of the lever, the gradualism of the manoeuvres and the operative speed. The functioning is faulty, go as soon as possible to an authorised assistance point.

20.17 Problems- causes - solutions of operating anomalies

Problems	Possible causes	Hypothesis for intervention
<p>INSUFFICIENT PRESSURE or pressure drop in comparison to the level required in the circuit</p>	<ol style="list-style-type: none"> 1. max pressure valve half-open 2. pump defect 3. extreme inner leaks 4. extreme pressure drops 	<ol style="list-style-type: none"> 1. a) due to excessively low calibration pressure b) due to seal seat wear c) due to impurities under the seats d) due to spring breakage 2. see points 5 ÷ 11 3. a) seals worn in the cylinders or in the hydraulic motors b) valve and distributor wear c) oil viscosity too low 4. a) oil viscosity too high b) insufficient oil passage size c) oil passages partially obstructed
<p>PUMP DEFECT for lack of power or for power extremely below normal values</p>	<ol style="list-style-type: none"> 5. throttled intake 6. air inlet 7. hermetically sealed tank 8. defective working 9. oil excessively viscous 10. inner breakdowns in the pump 11. pump excessively worn 	<ol style="list-style-type: none"> 5. a) intake filter small or clogged b) intake pipe clogged c) intake pipe small or winding 6. a) in the tank intake socket b) in the intake fittings c) in seal on pump shaft d) due to intake of foamy oil 7. air bleed in the obstructed tank 8. a) check coupling b) oil speed too high or too low 9. see indications for the pump 10.a) internal gaskets broken b) blades, plates or pistons stuck c) pump head not clamped d) internal broken parts to be replaced 11. pump to be replaced
<p>EXCEEDINGLY NOISY PUMP (for instance some gear pump are always a little noisy)</p>	<ol style="list-style-type: none"> 12. cavitation 13. air inlet 14. internal wear 15. system vibrations 	<ol style="list-style-type: none"> 12. a) choked intake: b) high viscosity 13. excessive clearance in supports and plates 14. defective installation, resonance, etc.

Problems	Possible causes	Hypothesis for intervention
<p>OVERHEATING i.e. oil temperature beyond prudential limit of 60°-70°</p>	<p>16. too high maximum pressure 17. power is uselessly engaged 18. excessive inner leaks 19. excessive pressure drops 20. insufficient oil capacity 21. insufficient cooling 22. excessive friction</p>	<p>15 excessive valve calibration 16. a) shut-off valve inefficient b) short circuit at end of cycle c) hydraulic circuit to be modified 17. increase oil tank capacity 18. a) addition of artificial cooling b) any refrigerant inefficient 19. a) faulty internal pump assembly b) no lubrication where required c) use of non-lubricating oil</p>
<p>INCORRECT MOVEMENTS of hydraulically operated elements with respect to the required cycle</p>	<p>23. air in the circuit 24. valves locked 25. cylinder locked 26. excessive pressure drops 27. varying accumulator pressure</p>	<p>20. a) bleed air bubbles at high points b) eliminate air inlets: see point 6 21. a) valves locked, while closing, by rubber or other b) valves half-open due to dirt 22. a) faulty internal cylinder assembly b) inadmissible normal axis loads c) seizure of connection pins 23. a) accumulator capacity insufficient b) greater circuit request due to internal leaks</p>
<p>EXCESSIVE WEAR i.e. excessively fast compared to effective operating time and service</p>	<p>28. oil containing abrasives 29. insufficient lubrication 30. high operating pressure 31. faulty couplings</p>	<p>24. a) oil too old b) filters inefficient 25. a) poor oil quality b) oil too fluid at operating temperature 26. in comparison to the allowed max. pressure for pump and valves 27. abnormal strain on shafts and stems</p>

20.18 Components

Parts/breakdown	Cause	Remedia I
Noisy power take off	Driving with power take off applied. Working wearing.	Overhaul or total replacing.
Free power take off	Air switch breakage or air lack in the truck.	Replacement
Noisy truck pump	No oil or breakage of the key or socket connection joint	Oil refilling or replacing
Stab. insufficient oil pressure	Make sure that the arm is in non-working position and that micro-switch is depressed. Exchanger valve not excited No voltage Parking brake not engaged Lorry pump broken Emergency pressed Check valve open Dirty max. exchanger valve, outrigging distributor.	Check every single part. Clean or replace, if necessary.
Turret controls out of order	Outrigging has not occurred. Exchange heart-basket control not switch (See electric system manual)	Inspection of 4 stabilisation micro switches
Basket controls out of order	(See electric system manual)	
Insufficient oil pressure turret distributor	Max. distrib. valve dirty Exchanger valve not excited Boom support micro switch faulty	Turret panel fuse inspection Replacement of components (see electrical system manual)
Insufficient oil pressure pump	Broken pump or dirty non-return truck pump valve	Clean and/or replace
Emergency stoppage for Edi System	Lack of current Coil burnt out	Check cable from frame to truck cabin Replacement
Pantograph lowering oscillation	Turret accumulator	Replacement
Potentiometer lever: does not go back to normal position	Wearing of the spring	Replacement
Excessive rotation with machine stationary	Loosened fixing screws	Adjust fixing plate of the gearbox and tighten screws

20.19 TROUBLESHOOTING

- b. The outriggers do not work:
 - Check the correct position of the outrigger/boom selector key
 - Check that the crane is closed properly

- c. Booms do not work:
 - Check that the stabilised machine enabling indicator light is on
 - If the indicator light is not on, make sure the outriggers are correctly placed on the ground and the tracks lifted
 - Check the correct position of the outrigger/boom selector key
 - Check whether the handwheel on the proportional distributor is fully tightened

- d. Motorised pump unit does not work:
 - Check the mains power supply and that the plug is connected
 - Make sure the circuit breaker switch is engaged
 - Check the efficiency of all fuses on the general electric control board

- e. The manual emergency pump boom controls do not work:
 - Check whether the handwheel on the proportional distributor is fully tightened

21 ELECTRIC DRAW

4

23 MARKING

THE PLATES FEATURED IN THIS CHAPTER AND ON THE CRAWLER RELATE TO MACHINE IDENTIFICATION, SAFETY AND USER INSTRUCTIONS. SAID PLATES ARE OBLIGATORY AND MUST BE CHECKED FOR PERFECT LEGIBILITY. Following updates, some drawings, colours or text expressions could be modified; however, message meanings remain unchanged.



REFERENCE REGULATIONS

This control register is issued by the BRENNERO GRU to the machine user, in accordance with Directive 2006/42/EC.

PRESERVATION INSTRUCTIONS

This register is to be considered an integral part of the machine and should accompany the equipment during its whole working life up to final scrapping.

ATTENTION!!!!!!

Under Directive 2006/42/EC, they must be kept together in this register also the certificates of the replaced components (motor, mechanisms, structural elements, security devices and their components) and tests relating to the repair of a certain entity.

COMPILATION INSTRUCTIONS

The following instructions are given according to provisions known at the time of putting the machine on the market. New provisions could modify the user's obligations.

IMP.: THE FREQUENCY AND EXTENT OF THE TESTS MAY ALSO DEPEND ON NATIONAL REGULATIONS.

This register has been conceived to write down, according to proposed charts, the following events related to the useful life of the machine:

- periodic inspections (every six months) to be carried out by the machine owner company safety manager
- transfer of ownership
- substitution of the motor, mechanisms, structural elements, safety devices and relative components
- significant breakdowns and appropriate repairs

24.1 Periodic inspections

Inspection date	Date of next inspection	Name of inspector	Comments	Signature



DELIVERY OF TO THE FIRST OWNER

The machine, serial number....., year of manufacture.....
referred to in this inspection register was delivered by BRENNERO GRU on (date)
..... to:

.....
according to the conditions set forth by the agreement, with technical, dimensional and
functional specifications indicated in the instruction manual and in the summary contained in
this Register.

MESSRS.

SUBSEQUENT TRANSFERS OF TITLE

On ownership of the machine in question is transferred to:
.....
.....

We certify that, on the above-mentioned date, technical, dimensional and functional
specifications of the machine in question are compliant with the original specifications and that
changes, if any, have been noted in this Register.

The seller

The buyer

.....

.....

SUBSEQUENT TRANSFERS OF TITLE

Dated ownership of the machine in question is transferred to:
.....
.....

We certify that, on the above-mentioned date, technical, dimensional and functional
specifications of the machine in question are compliant with the original specifications and
that changes, if any,
have been noted in this Register.

The seller

The buyer

.....

.....



REPLACEMENT OF STRUCTURAL COMPONENTS

Date:

component description

.....
manufacturer: supplied by:

reason for the replacement:

.....
.....
.....

Person in charge of the replacement

The user

.....

REPLACEMENT OF STRUCTURAL COMPONENTS

Date:

component description

.....
manufacturer: supplied by:

reason for the replacement:

.....
.....
.....

Person in charge of the replacement

The user

.....

REPLACEMENT OF STRUCTURAL COMPONENTS

Date:

component description

.....
manufacturer: supplied by:

.....
.....
.....

Person in charge of the replacement

The user

.....

REPLACEMENT OF MECHANISMS

Date:
component description

.....
manufacturer: supplied by:
reason for the replacement:

.....
.....
.....

Person in charge of the replacement The user
.....

REPLACEMENT OF MECHANISMS

Date:
component description

.....
manufacturer: supplied by:
reason for the replacement:

.....
.....
.....

Person in charge of the replacement The user
.....

REPLACEMENT OF MECHANISMS

Date:
component description

.....
manufacturer: supplied by:
reason for the replacement:

.....
.....
.....

Person in charge of the replacement The user
.....

REPLACEMENT OF SAFETY DEVICES AND RELEVANT COMPONENTS

Date:

component description

.....

manufacturer: supplied by:

reason for the replacement:

.....

.....

.....

Person in charge of the replacement

The user

.....

.....

REPLACEMENT OF SAFETY DEVICES AND RELEVANT COMPONENTS

Date:

component description

.....

manufacturer: supplied by:

reason for the replacement:

.....

.....

.....

Person in charge of the replacement

The user

.....

.....

REPLACEMENT OF SAFETY DEVICES AND RELEVANT COMPONENTS

Date:

component description

.....

manufacturer: supplied by:

reason for the replacement:

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Person in charge of the replacement

The user

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