F 390SE.24 G.C.
use and maintenance

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FASSI CRANE

F 390SE.24 G.C.
use and maintenance

This instruction manual describes the FASSI CRANE F390SE.24 G.C..

The fitment must be carried out in accordance with the instructions given by the Manufacturer in the manual for hydraulic crane fitting.

The Manufacturer declines all responsibility and guarantee if the fitting is entrusted to workshops without sufficient technical capability to carry out the work in conformity.

As well as the principal safety norms, this manual contains a description of the crane and the instructions for use and maintenance.

The crane must only be operated by responsible persons, previously instructed and authorized.

THANK YOU FOR SELECTING ONE OF OUR CRANES.

SAFETY NORMS

(**!**) This symbol draws your attention on the points concerning safety.
It means: **WARNING! BE CAREFUL!**
IT CONCERNS YOUR SAFETY!

!ATTENTION!

READ THIS MANUAL CAREFULLY *prior to use of the crane or any maintenance. A few minutes spent now could save time and labour later. Be sure that the unit has been installed, inspected and tested in accordance with the local legal requirements.*

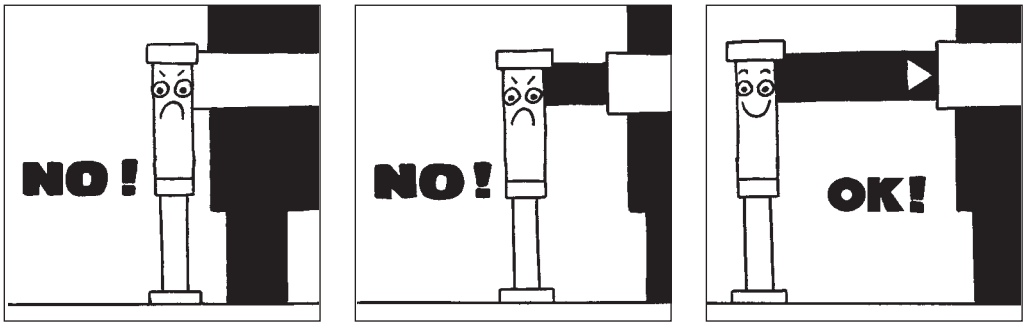
To operate the crane it is necessary to fully understand its working, safety and warranty norms.

Check that protections are in their place and that all safety devices are fitted and active.

Warning plates, as well as instruction and operation plates must be replaced when no longer readable or missing. (See chapters A - B)

Do not run the engine in a indoor area without first making sure there is adequate ventilation. Fit a suitable extension tube to the vehicle exhaust pipe to take the fumes away from the working area.

Stabilize the vehicle checking that they rest on a solid base; if necessary use larger outrigger base plates (available on request) to avoid sinking. If you adopt other means, make sure that they are suitably sized for the load they must bear.



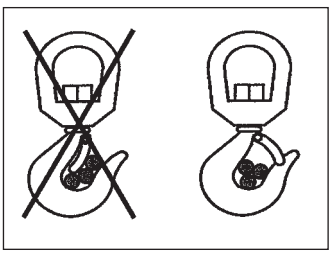
Stabilize the vehicle on a horizontal plane with a maximum tolerance of 1,5 degrees.

Never operate the outriggers when the crane is loaded.

Remember that the stability of the unit (crane-vehicle) is only guaranteed by the fully lateral extension of the outriggers.

Should visibility be insufficient, make sure that control stations are properly lighted so as to ensure safety while operating control functions and allow reading of the plates.

Before manoeuvering a load check that the working area is adequate and properly lighted for your crane.

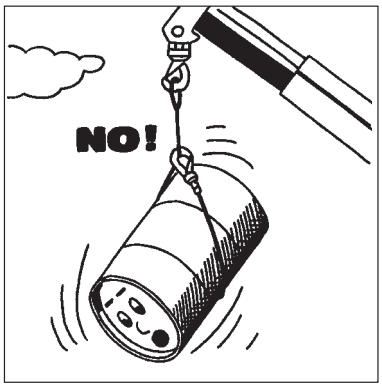


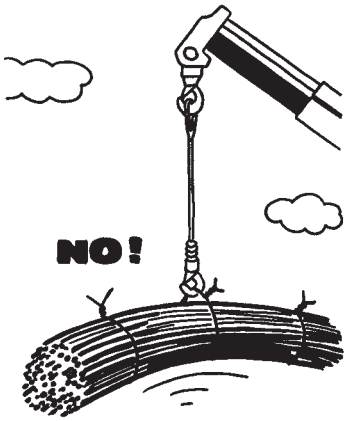
Make sure that the hook is always free to rotate on its pin and that nothing obstructs its vertical positioning.

Check the efficiency of the hook safety catch.

Carefully inspect the load rigging and the condition of ropes or chains.
Make sure that the lifted load is balanced.

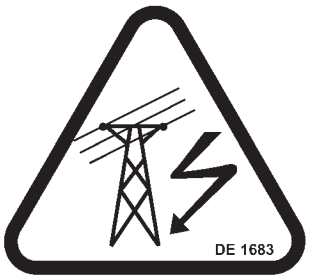
Hook up the load, checking that it does not exceed the capacity indicated on the lifting diagram specific to each load configuration.

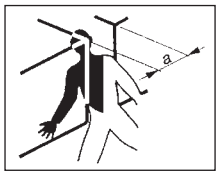
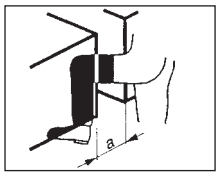
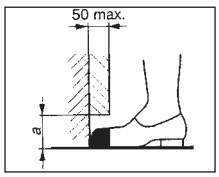
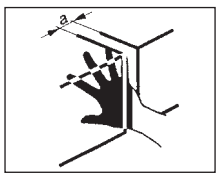


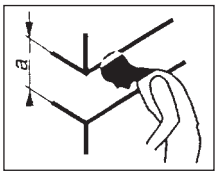
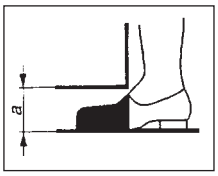
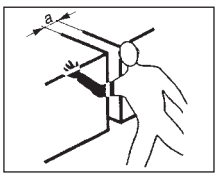
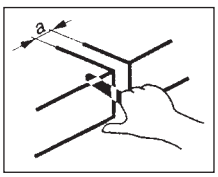


It is absolutely prohibited to walk or stop under a suspended load and for unauthorized persons to be within the working area.
Avoid swinging the load above the control station; any hidden danger situation must be audibly alarmed.

Avoid all those situations which may result in crushing during crane stabilization, movement and load handling.
The table reports the minimum safe working distances to avoid crushing parts of the body.



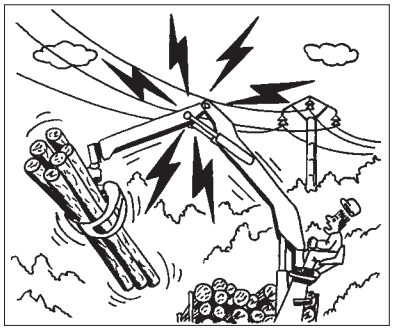
Parts of the Body	Minimum safe working distance inch	Figure
Body	19,68	
Leg	7,09	
Toes	1,97	
Hand Wrist Fist	3,94	

Parts of the Body	Minimum safe working distance inch	Figure
Head	11,81	
Foot	4,72	
Arm	4,72	
Finger	0,98	

In conformity with "EN 349" Standard the minimum safe working distances to avoid crushing parts of the body.

NOTE: Failure to respect the minimum safe distances may result in a deadly risk for the operator and his assistants.

Maintain safe clearances from electrical lines and apparatus. You must allow for boom sway, rock or sag and electrical line and loadline swaying. This lifting device does not provide protection from contact with or proximity to an electrically charged conductor. You must maintain a clearance of at least 10 feet between any part of the crane, loadline or load and any electrical line or apparatus carrying up to 50.000 volts. One foot additional clearance is required for every additional 30.000 volts or less.



NOTE: Failure to respect the minimum safe distances may result in electrical hazards for the operator and his assistants.

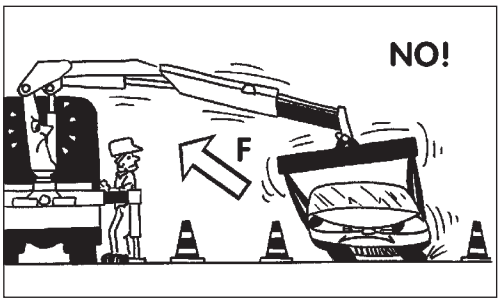
Do not utilize the crane with stormy weather or with wind speed exceeding 12,5 m\s (value 6 of the Beaufort scale).

Indications about wind speed

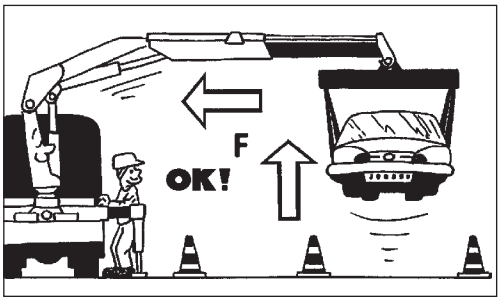
Force of the wind Beaufort scale	Wind speed m/s	Classification	Characteristics
0	0,0 - 0,2	Calm	Calm wind, smoke goes up quite vertically
1 2	0,3 - 1,5 1,6 - 3,3	Light breeze	Smoke reveals the direction of the wind, one can feel the wind blowing, leaves start fluttering.
3 4	3,4 - 5,4 5,5 - 7,9	Moderate breeze	Leaves and branches are in constant motion, small branches start fluttering. Dust and papers dance on the ground.
5	8,0 - 10,7	Fresh breeze	Small green branches bend, the surface of waterways and lakes are wavy.
6	**35,43 - 45,28**	**Near gale**	**Big branches bend, wind whistles through high-tension cables, it's difficult to walk keeping the umbrella open.**
7	13,9 - 17,1	Moderate gale	Trees sway, it's hard to walk.
8	17,2 - 20,7	Storm wind	Branches get broken, it's hard to walk.
9	20,8 - 24,4	Storm	It damages houses (antennas and roof tiles fall down)

For cranes with top seat controls, it is necessary to use a ladder and a cat walk to reach the control station.
When operating from the top seat, stay within its side safety guards.

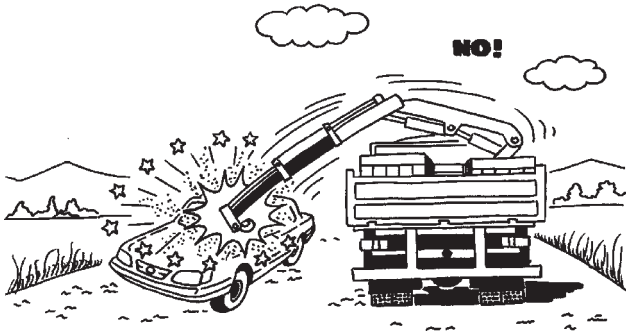
Do not rotate the crane before the load is lifted, do not operate with sudden movements, activate the controls with slow and progressive movements.
Rotate slowly and with care paying attention to the stability of the vehicle.
With vertical lift, on hydraulic and mechanical extension, rotate slowly in order to avoid side-skidding.

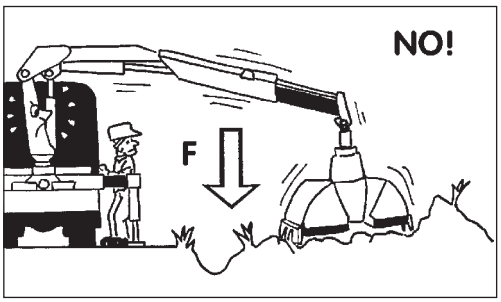


(!) ATTENTION (!)
Do not utilize the crane for pushpull (F), lateral (F) or sideways (F) operations.



Do not move the vehicle if a load is suspended on the crane.



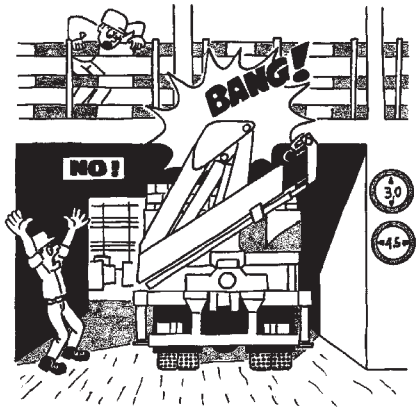


Under no circumstances interfere with the safety and protection devices.

The vehicle\crane must not be left unless the load is on the ground, the booms of the crane are folded and laid on a solid base and the power take-off is disengaged.

At the end of the job and prior to driving the vehicle the crane must be folded.
If the booms are to be laid on the body or on the load, they must be blocked to prevent possible sideways movements.

NOTE Implements can be left mounted on the booms of the crane only if the overall dimensions are respected.



THE FORK MUST BE TIED DOWN AT ALL TIMES DURING TRANSPORT

Make sure that the outrigger rams are lifted and the supports re-entered within the overall width of the truck.

Disengage the power take off.

To avoid hitting bridges or tunnels check and record the overall height of your crane in the folded position or in laid position in the body or on the load. Always respect and pay proper attention to road signs placed in proximity of such obstacles.

INSTRUCTIONS FOR CRANE USE

The use of the crane is reserved to authorized personnel, instructed in advance, who has to strictly conform to the safety norms and instructions contained in the instruction manual supplied with the crane.

1 — Only authorized persons are allowed to operate the crane.

2 — The crane must be used on firm, level ground.

3 — Check that the vehicle hand brake is on and that the wheels are chocked.

4 — Before every operation make sure that:
— no-one is within the working area of the crane;
— the safety devices are in place and operative;
— the minimum safe working distances from power lines are observed;
— the load is correctly slung and hooked.

5 — Stabilize the vehicle by the outrigger rams, making sure that:
— the lateral supports are fully extended;
— the wheels are in contact with the ground and the suspension is not completely unloaded;

6 — Use the crane in accordance with the use and maintenance manual, making sure that:
— the load and radius are within the maximum limits shown on the crane capacity plate;
— the crane is used progressively avoiding sudden load movements;
— swinging or dragging of the load is avoided;
— the load is lifted before rotating.

7 — When using implements protect the crane working area with a barrier.

8 — The vehicle/crane are not left unless the power take off is disengaged and the load is on the ground.

9 — Before driving the vehicle make sure that the outriggers are fully retracted and re-entered, and the crane is in folded position.

fig. 1

FASSI GRU IDRAULICHE

FASSI GRU IDRAULICHE SpA
24021 ALBINO (BG) ITALY - Via dei Carmelitani, 2
Tel. + 39 35 77.64.00 - Fax + 39 35 75.50.20

INSTRUCTIONS FOR SAFE USE OF THE CRANE

DE2676

1 Only authorized persons are permitted to operate the crane.
2 The crane must be used on firm, level ground.
3 Check that the vehicle hand brake is on and that the wheels are chocked.
4 Before operation make sure that:
- no-one is within the working area of the crane;
- the safety devices are in place and operative;
- the minimum safe working distances from power lines are observed;
- the load is correctly slung and hooked.

5 Stabilize the vehicle with the outriggers, making sure that:
- the lateral supports are fully extended;
- the wheels are in contact with the ground and the suspension is not completely unloaded;

6 Use the crane in accordance with the use and maintenance manual, making sure that:
- the load and radius are within the maximum limits shown on the crane capacity plate;
- the crane is used progressively avoiding sudden load movements;
- swinging or dragging of the load is avoided;
- the load is lifted before rotating.

7 When using implements protect the working area with a barrier.
8 The vehicle/crane are not left unless the power take off is disengaged and the load is on the ground.
9 Before driving the vehicle ensure that the outriggers are fully retracted and re-entered and the crane is in the folded position.

THESE INSTRUCTIONS FOR THE USE OF THE CRANE COINCIDE WITH THOSE OF THE PLATE DE2676 (FIG. 1) PLACED NEXT TO THE CRANE.

IDENTIFICATION OF THE CRANE MODEL

The exact **crane model, serial number** and description of **implements** will enable **FASSI Service Department** to give a rapid and efficient response.

Identification data of the crane are marked on the plate DE2141 and fixed on the base.

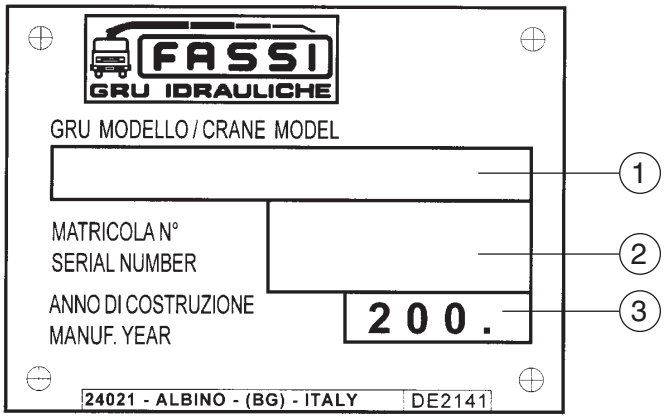


fig. 2

1 — Crane model
2 — Serial Number
3 — Year of manufacturing

(!) UNDER NO CIRCUMSTANCES SHOULD THE DATA MARKED ON THE PLATE BE ALTERED.

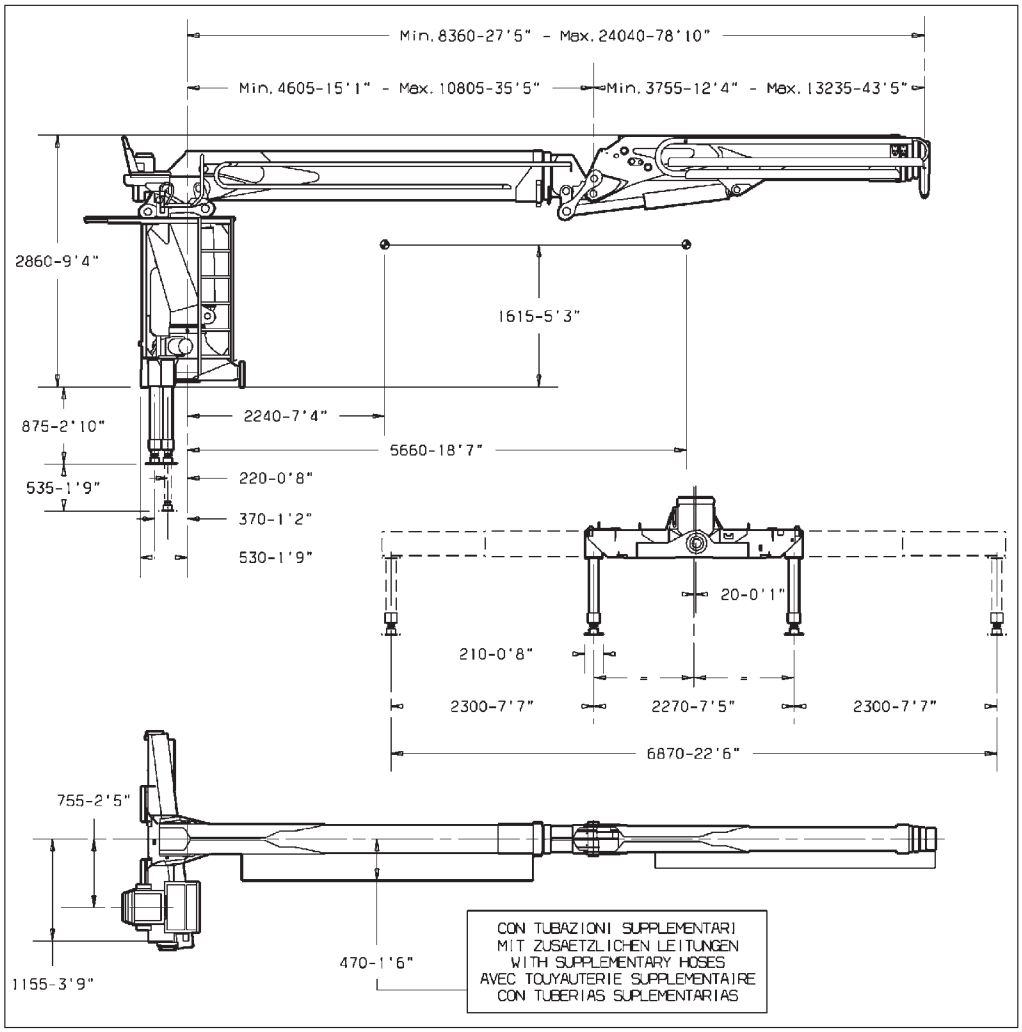
TECHNICAL DATA

The design of this crane has been carried out in respect of **DIN 15018** norms, fatigue test classification **H1B3** .

(!) The crane can operate, intermittently, with lifting devices other than the hook.
The dimensions and the capacity of the implements must be proportioned with crane performances.

F 390SE.24

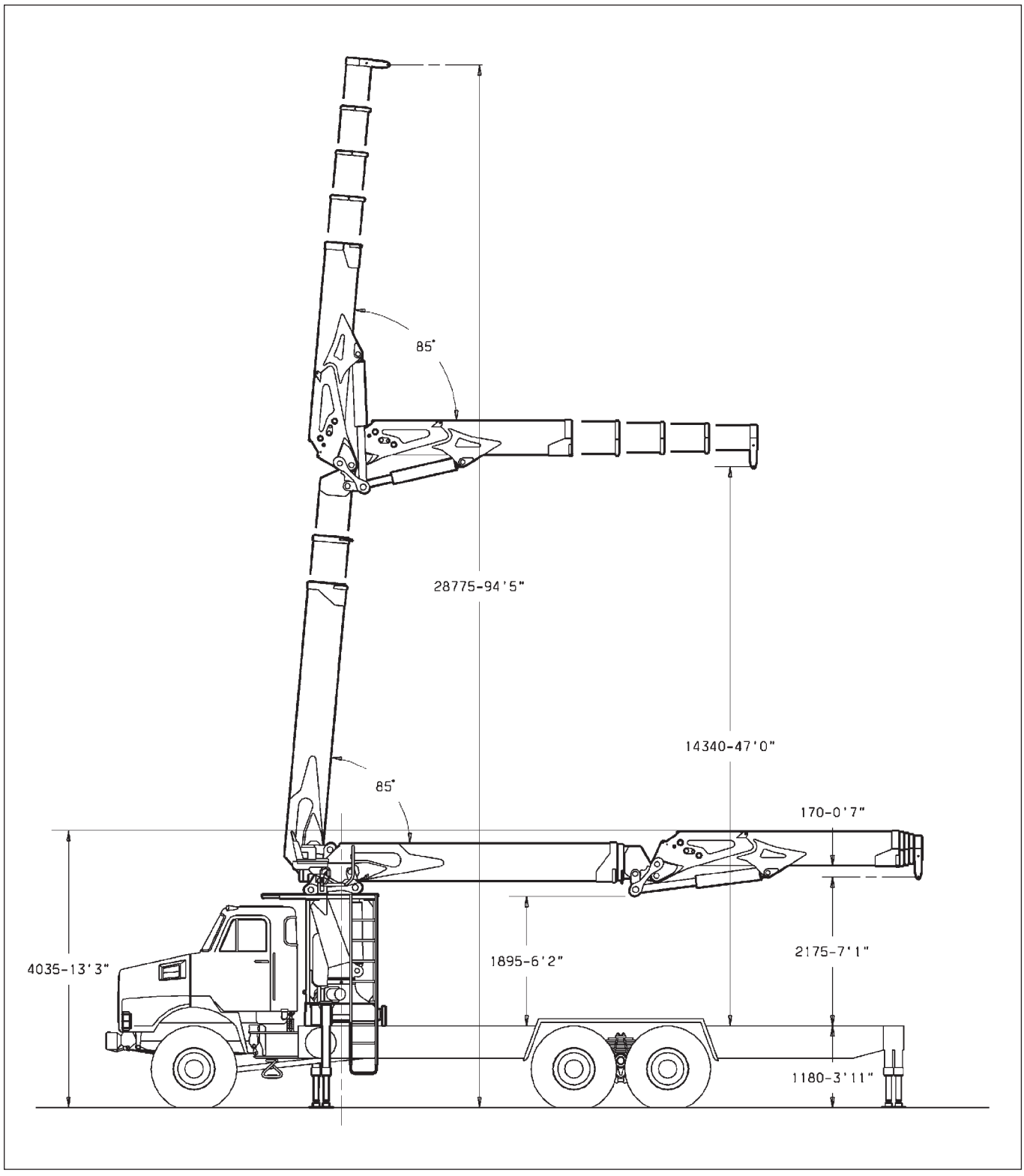
Lifting capacity	Standard reach	Hydraulic extension	Rotation arc	Rotation torque	Working pressure	Pump capacity	Oil tank capacity	Crane weight	Max. working pressure on the outrigger (Φ 500) (Φ 1'8")
28 tm 274,7 kNm	**24,04 m**	**15,68 m**	**430°**	**6,79 tm 66,59 kNm**	**29,0 MPa**	**60 l/min**	**240 l**	**6200 kg**	**9 daN/cm^2**
202524 lbf.ft	**78'10"**	**51'5"**	**430°**	**49117 lbf.ft**	**4206 psi**	**15,85 gal/min**	**63,4 gals**	**13670 lbs**	**130 psi**



PESO GRU CON SERBATOIO NON RIFORNITO, STABILIZZATORI STANDARD	kg 6.200
WEIGHT OF THE CRANE WITH EMPTY TANK, STANDARD STABILIZATION	
POIDS DE LA GRUE AVEC RESERVOIR VIDE, STABILISATION STANDARD	lbs 13.670
KRANGEWICHT MIT LEEREM TANK UND STANDARDABSTUETZUNG	

F 390SE

ST 390



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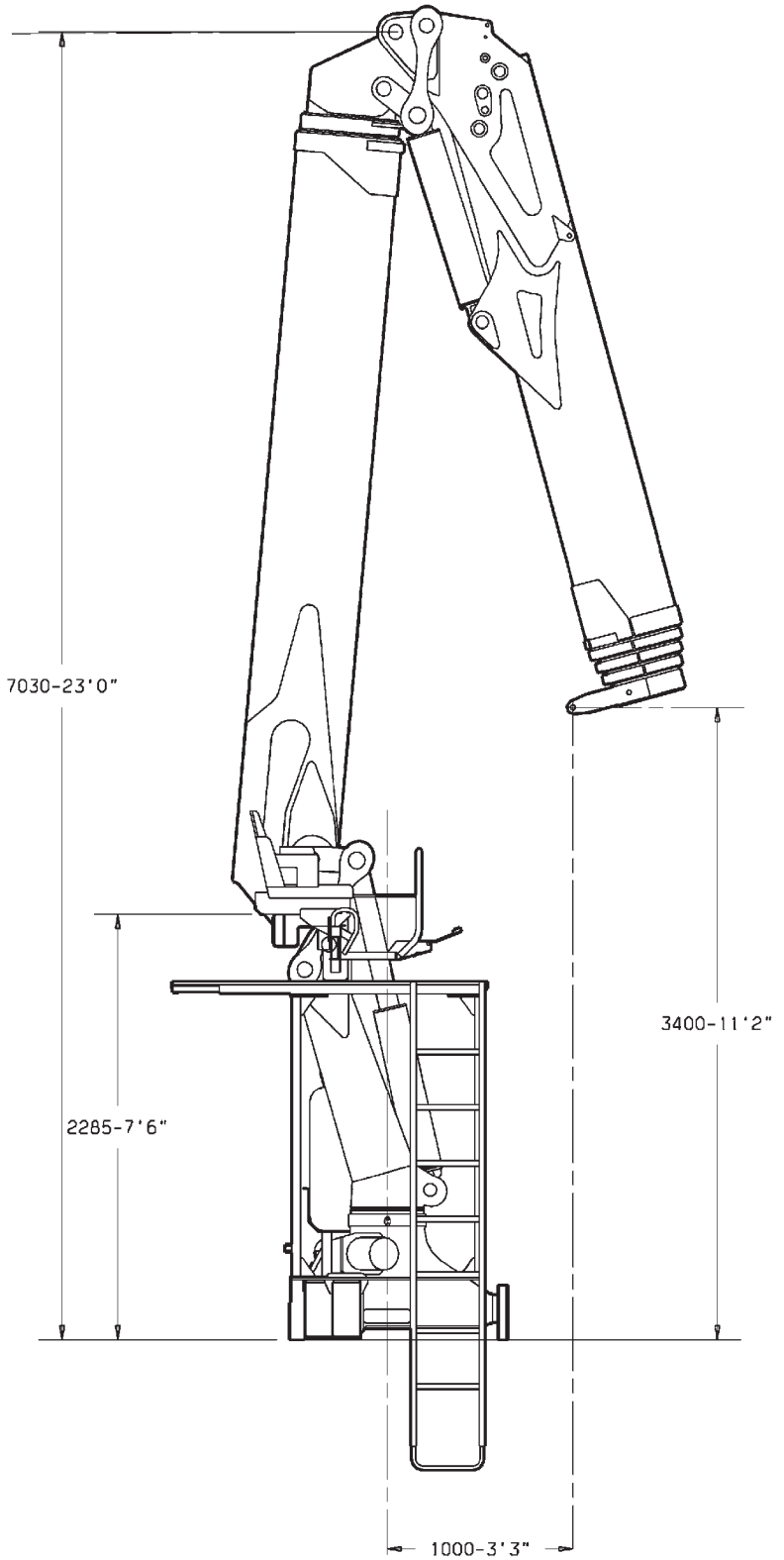


MASSIMA ALTEZZA SOTTOGANCIO.
HAUTEUR MAXIMUM SOUS CROCHET.
MAXIMUM HOOKING POSITION.
MAXIMALHOEHE BIS KRANHAKEN

FASSI GRU IDRAULICHE **ST 390**

CRANE NOMENCLATURE (fig. 3)

Pos.		*Description*
1	-	Outrigger rams
2	-	Outrigger supports
3	-	Base
4	-	Rotation cylinders
5	-	Column
6	-	Inner ram
7	-	Inner boom
8	-	Inner booms extension rams
9	-	Inner extension boom sections
10	-	Outer ram
11	-	Outer boom
12	-	Booms extension rams
13	-	Extension boom sections
14	-	Deviator crane - outriggers
15	-	Outrigger distributors
16	-	Ladder and cat walk
17	-	Seat and control station
18	-	Crane distributors (manual and foot controls)
19	-	Supplementary hoses (hydraulic implements)
20	-	Oil tank

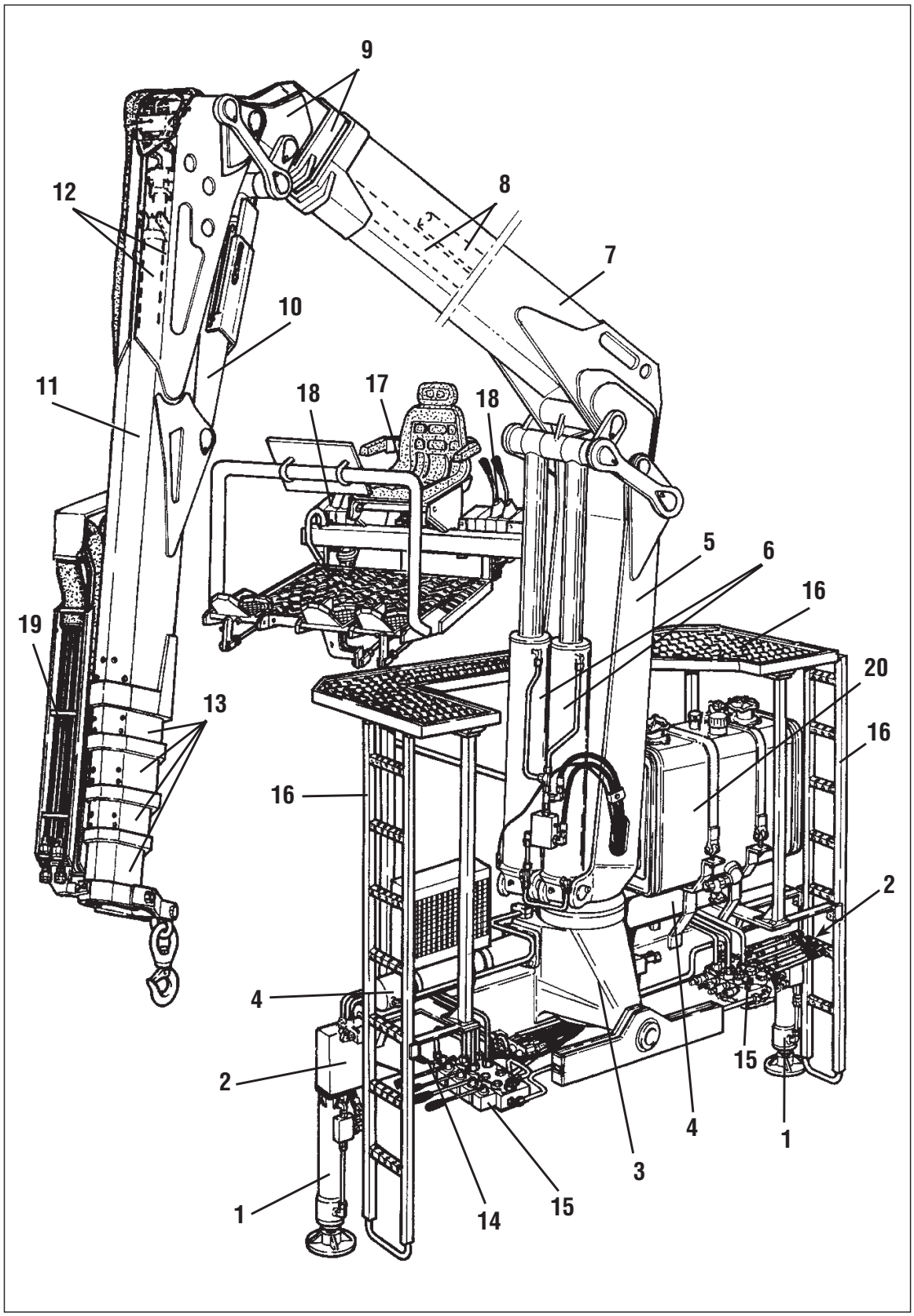


fig. 3

SAFETY AND PROTECTION DEVICES (fig. 4)

Pos.		*Description*
1	-	Check valves for outrigger rams
2	-	Check valve for rotation control
3	-	Check valve for inner ram
4	-	Check valve for inner booms extension rams
5	-	Check valve for outer ram
6	-	Check valve for booms extension ram
7	-	Lifting moment limiting device assembly
8	-	Parachute valves (lifting moment limiting device)
9	-	Main pressure valves (outrigger distributors)
10	-	Main pressure and auxiliary valves (crane distributors)
11	-	Carter for outer ram
12	-	Carter for hose protection devices
13	-	Carter for booms extensions ram check valve
14	-	Handles
15	-	Emrgency tap (lifting moment limiting device)
16	-	Seat with device indicating the operator presence
17	-	Heat exchanger (available on request)

(!) Before crane use check that safety and protection devices are fitted and active.

(!) Under no circumstances interfere with the safety and protection devices.

(!) Interference with the check valves and removal of the lead seals remove the Manufacturer and invalidate the warranty.

(!) For the access to the top seat use a ladder and a cat walk.

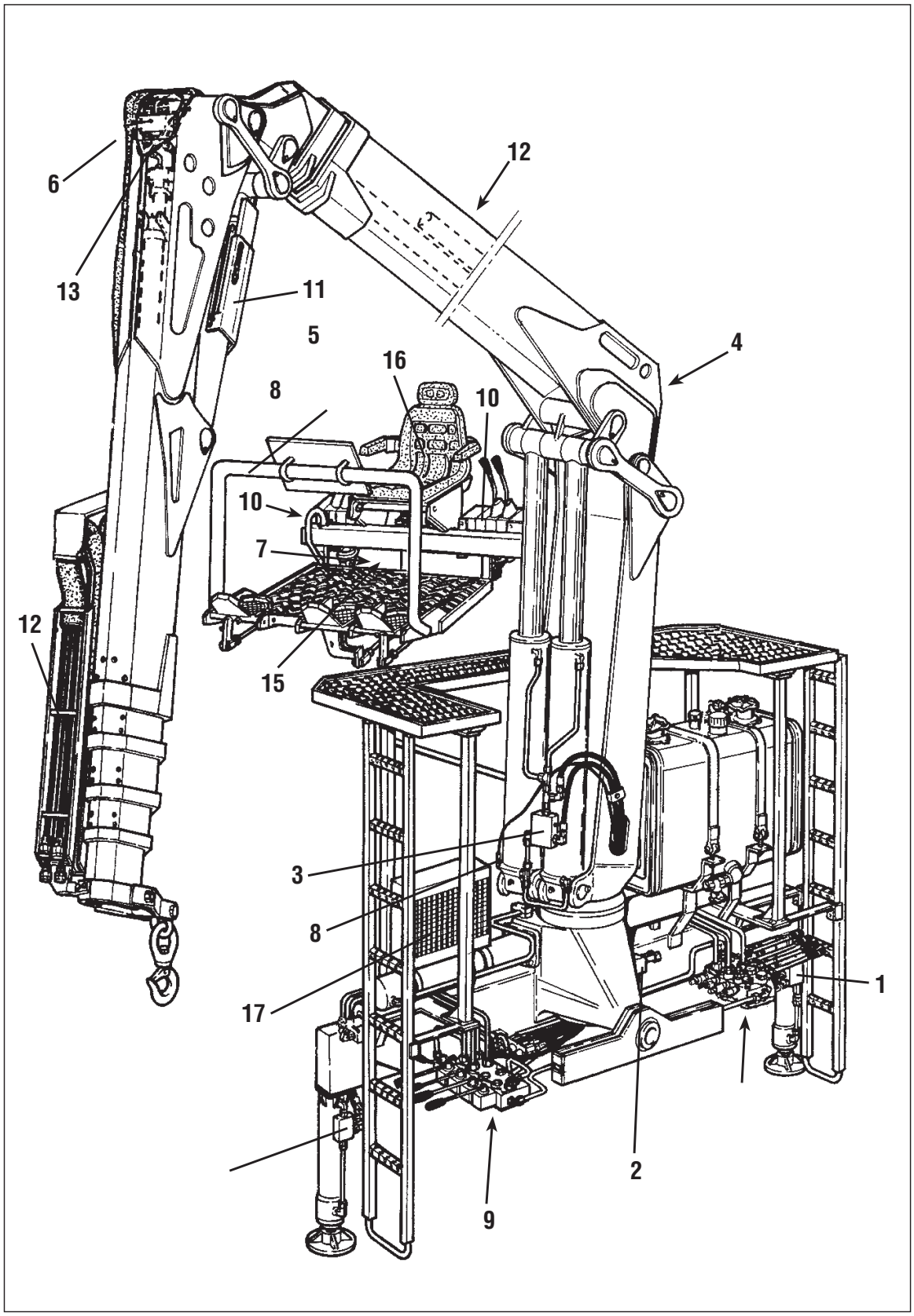


fig. 4

LIFTING MOMENT LIMITING DEVICE

A characteristic which permits the classification of cranes is their lifting capacity or maximum lifting moment. The moment is defined by the value obtained from the product of the load to be lifted (in lbs) by its distance (in ft) from the centerline of the crane rotation.

The device called “lifting moment limiting device” preserves the crane structure from overloads, as it prevents any movement which increases the value of the moment up to the maximum established value.

Lifting moment limiting device “INTELLIGENT TYPE”
This device is fitted close to the distributor, whose specific functions it uses. It utilises an electrohydraulic technology, preventing any movement which causes an increase in the pressure induced by the load in the inner and outer rams of the crane, up to the “critical values” which have been established in the structural test. These values, which are non-exceedable, determine the intervention levels and provide the data for setting the device. The condition of intervention is operated by the position, in connection with the horizontal position, of the crane outer boom, on which the electronic signal position (mercury level switch) is read by a special electrovalve. This determines the controls of the locking or unlocking (resetting) of the controls concerned.

(!) CAUTION DANGER (!)
On the outer boom there is a mercury capsule (mercury level switch) duly protected and provided with the following warning stickers.

MERCURY IS EXTREMELY TOXIC. IN CASE OF REPLACEMENT AND/OR SCRAPPING, DISPOSE OF OR RECYCLE THE CAPSULE CONTAINING MERCURY WITH MAXIMUM CARE, AND IN ACCORDANCE WITH THE NATIONAL REGULATIONS IN FORCE.

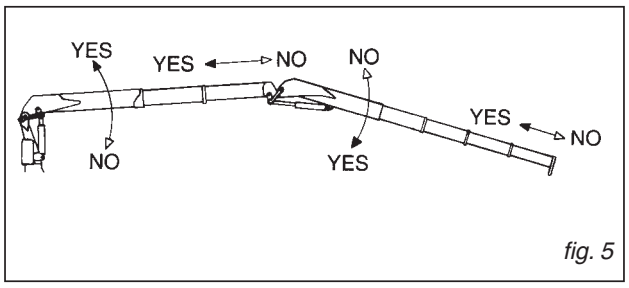


fig. 5

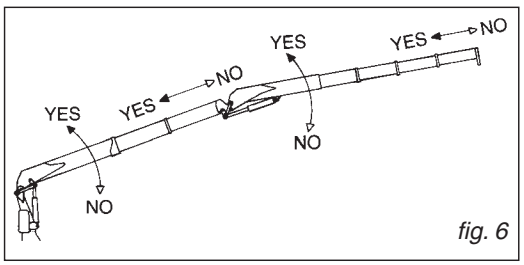


fig. 6

The lifting moment limiting device prevents the following manoeuvres:

- Inner boom descent; the inner boom lift is controlled by the general main pressure valve of the distributor.
- Extension of the inner extension boom sections.
- Outer boom lift.
- Outer boom descent.
- Extension of extension boom sections.

The crane configurations (fig. 5-6) indicate the manoeuvres which are allowed and not allowed by the device, in connection with the horizontal position of the crane and extension outer booms. When the moment is reduced, it resets automatically (the manoeuvres blocked by the device are released).
N.B.: There is a delay of **four** (**4**) seconds after the moment reduction before the reset can occur in order to safeguard the stability of the device.

(!) In the absence of electric power all crane functions will be desactivated.

MANOEUVRES OF THE CRANE LOADS

Generality

(!) Before manoeuvering the load, verify that the working area is suitable for your crane.

The lifting curves of the capacity plate indicate the maximum load that the crane can lift at a certain radius and at a certain height. To utilize the maximum capacity of the crane, it is necessary to position the inner boom as indicated on the capacity plate. During load handling, do not exceed the reach limits given, or the load indicated on the above mentioned charts. If the limits are exceeded, the limiting device, allowing all manoeuvres, which reduce the lifted load within the permitted reach limits and forbid all other manoeuvres, will be immediately activated.

Lifting moment limiting device
A characteristic which permits the classification of cranes is their lifting capacity or maximum lifting moment. The moment is defined by the value obtained from the weight of the load to be lifted (**kg**) by its distance (**meters**) from the centerline of the crane rotation.
The device called “lifting moment limiting device” preserves the crane structure from overloads, as it prevents any movement which increases the value of the moment up to the maximum established value.

"Electronic" lifting moment limiting device

This device utilises an electro-hydraulic system managed by an electronic logic that prevents any operation tending to cause an increase in the pressure induced by the load in the lifting rams (inner, outer rams of the crane and of the hydraulic extension, if fitted), up to the critical values. These values, which are not exceedable, determine the intervention levels and provide the data for setting the device.

The pressure values detected in the lifting rams are turned into electric signals by the transducers, and sent to the electronic logic of the device which determines the locking or unlocking of the controls concerned, according to the horizontal position of the crane outer boom (mercury level switch); only the controls allowing a reduction of the overload are enabled, while those increasing it are disabled.

The device features an electro-hydraulic control that does not allow the set value to be exceed, by deactivating the controls (levers in neutral position) commanded by the limiting device. When the controls are released (levers in neutral position) it's this electronic logic that handles which manoeuvres are disabled, according to the position of the crane outer boom and in overload condition, by sending electric signals to special micro-switches placed on the elements of the distributor.

(!) ATTENTION (!)
The presence of the lifting moment limiting device does not release the user from the obligation to respect what is indicated on capacity plates and lifting curves.

Control panels

Layout of the control panel (fig. 17), placed next to the distributor of the crane

A - green, yellow and red led band signalling the load percentage as compared to the capacity plate

Green light	load between 0 and 90%
Yellow light	load between 90 and 100%
Red light	load higher than 100%

B - Display
C - Control buttons (4 control buttons)
D - "STOP" button
E - Audible alarm push button (danger)
F - Green warning light (electric on)
G - Control button for XP
H - Control button for the temporary exclusion of the lifting moment limiting device

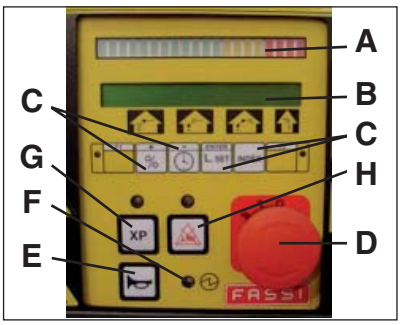


fig. 17

Layout of the control panel (fig. 18) placed on the double control side and on top seat (version with hand-cable controls)

D - "STOP" button
E - Audible alarm push button (danger)
F - Green warning light (electric on)
G - Control button for XP
H - Control button for the temporary exclusion of the lifting moment limiting device

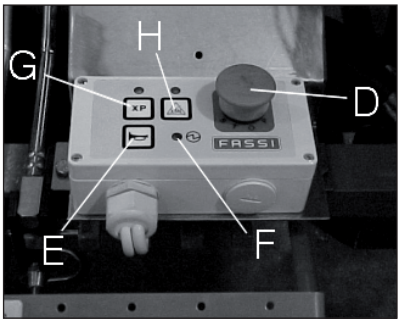


fig. 18

If the **green warning light F** comes on, it confirms that the electric circuit is active.

!NOTE! **In the absence of electric power all crane functions will be desactivated.**

If the **yellow led A** comes on during load handling, 90% of the capacity (lifting moment) has been reached.

If during operation the **red led B** comes on, the activation value of the lifting moment limiting device has been reached.

Any hidden danger situation for persons must be audibly alarmed by pressing the push button **E**.

When there are serious, imminent and dangerous conditions for persons and things during load handling, operate on the **STOP** button, which isolates all crane functions.

Display on the control panel

When the electric feeding has been activated (after the version's number of the software) the pressure in the inner, outer ram and the jib and the percentage of load on the winch are displayed.

In relation to the view chosen like standard, when you start the radio remote control the pressure values are displayed in:
- "bar" if on the display, on the left of the values, no symbol is present.
- "daPsi" if on the display, on the left of the values, the symbol * is present.

- By pushing the button [+/%] the percentage values of pressure in the inner, outer ram and the jib and the percentage of load on the winch are displayed. By pushing a second time the button [+/%] the pressure values in the inner, outer and jib rams movement in the measurement unit non standard and the percentage of load on the winch are displayed. By pushing again the button [+/%] you return to the initial display.
- For the use of the control button [−/⏱] see Par. 22.2.
- By pushing the button [INDEX] one or more times you return to the initial display (view of the pressure values).
- For the meaning of other messages see Par. 16.7.1 "Diagnostic"

Crane without load applied and activated limiting device
The limiting device may intervene also during loadless crane operation following a pressure peak provoked by the attainment of the stroke end of the lifting ram at high speed. In this condition, reactivation of the crane commands by performing one of the manoeuvres is allowed by the system. If the limiting device intervenes when both the lifting rams are open and at stroke end, and the crane extension booms are fully folded, it is not possible to reactivate the commands, since the permitted manoeuvres (arm lifting and extension fully retracted) cannot be carried out, because of the actual configuration of the crane (outer boom above the horizontal). The device, in this case, allows the descent manoeuvres since it verifies the it was a peak pressure inside the lifting rams; the crane being loadless, thus these manoeuvres will be allowed.

Temporised exclusion device of the lifting moment limiting device
The activation of the exclusion device is permitted when the limiting device is activated and only in the case when it is impossible to carry out any of the allowed manoeuvres. This generally occurs when handling heavy and bulky loads, with the outer boom above the horizontal and the extension boom sections almost retracted.

(!) ATTENTION (!)
The activation of the exclusion system for the lifting moment limiting device can ONLY be operated when the extension booms of the crane and of the hydraulic jib (when fitted) are fully retracted.

The activation button of the excluding device, **only in the case of the crane,** are to be activated as follows:
- retracted the crane extension booms until stroke end and momentarily pressurise;
- maintain the command for the extensions boom until the red led of the button LMI placed on the control panel begins to flash;
- continue to keep the command for the extensions boom and press the exclusion device button, the flashing red light becomes fixed;
- release the lever commanding the extensions booms.

The permitted manoeuvre is the descent of the outer boom in order to bring it under the horizontal; remember that you have at your disposal **five (5)** seconds from the command operation to carry out the descent. After such period of time, wait at least **one (1)** minute in order to be allowed to carry out the manoeuvre once again.

The activation button of the excluding device, **only in the case of the hydraulic jib,** are to be activated as follows:
- retracted the extensions booms of the hydraulic jib until stroke end and momentarily pressurise;
- maintain the command for the extensions of the hydraulic jib boom until the red led of the button LMI placed on the control panel begins to flash;
- release the lever commanding the extensions booms of the hydraulic jib;
- within 3 seconds from releasing the lever commanding the extensions booms of the jib, retracted the extensions booms of the hydraulic jib until stroke end and momentarily pressurise (the red led turns off as soon as the re-entry begins);
- maintain the command for the extensions boom until the red led of the button LMI placed on the control panel begins to flash;
- continous to keep the command for the crane extensions boom press the exclusion device button, the flashing red light becomes fixed;
- release the lever commanding the crane extensions booms.

The permitted manoeuvre is the descent of the outer boom in order to bring it under the horizontal; remember that you have at your disposal **five (5)** seconds from the command operation to carry out the descent. After such period of time, wait at least **one (1)** minute in order to be allowed to carry out the manoeuvre once again.

(!) ATTENTION (!)
Activation of the exclusion device of the lifting moment limiting device.

When the operator uses this device, it means that he wishes to override the lifting moment lifting device in order to make some manoeuvres (which would be impossible with the device active) that bring the moment to within the maximum level, but involve an overload condition. In such an emergency condition (where the lifting moment limiting device has been disabled),

the operator, who is the main responsible for the machine safety, must:
- **carefully consider the manoeuvres required to return to normal working conditions;**
- **calmly and carefully assess the type and scale of the hazards arising from these manoeuvres and the possible reaction of the crane (tipping over, frame overload, uncontrolled fall of the load due to a hydraulic system overload etc.);**
- **make all movements as slowly as possible to reduce the dynamic overload to the minimum.**

Lifting moment limiting device for two working sectors

In case of one sector of the working area with reduced stability of the vehicle (e.g. sector in front of vehicle cab) the limiting device can be provided with a special function which allows to operate with a reduction of the intervention level. The reduction of the intervention level reduces the crane capacity values and this reduction value is defined in the vehicle stability calculation. Consequently the working area is divided in one sector (e.g. body side) where the crane works according to the capacity plate values and another sector (e.g. cab side) where it works with reduced capacity values. The device has consequently two intervention levels which are activated in relation to the sector of the crane working area always securing the vehicle stability.

(!) ATTENTION (!)

If the rotation stops by going through the working zone where the crane can operate according to the capacity plate values to the one where it can operate according to the reduced values, it means that one of the following conditions is reached:
- rotation of a load bigger than the one admitted in the reduced sector defined in the vehicle stability calculation;
- rotation without load applied but with (at least) one of the inner, outer rams of the crane or the jib (if fitted) extended and pressurised at the stroke end.

The following manoeuvres are allowed:
- the opposite rotation
- the manoeuvres allowed by the limiting device in relation to the position of the outer boom (positioned over or under the horizontal line).

Rotation limiting device

When a sector of the working area exists in which the stability is insufficient (for example in the area in front of the cab) the permitted arc of rotation is limited by means of an adjustable electro-hydraulic device which only allows operation within the safe area. (Warning: persist in the operation!)
When exceeding the “safe area” the rotation limiting device only allowing:
- the opposite rotation
- the manoeuvres allowed by the limiting device in relation to the position of the outer boom (positioned over or under the horizontal line).

If a reduction of capacity is necessary because of insufficient stability of the complete unit, new capacity plates must be fixed giving the derated capacity in accordance with the final stability test.

(!) ATTENTION (!)

Always check carefully that the vehicle is perfectly stable, paying special attention to the area immediately in front of the driver’s cabin as this is usually less stable.

In the case of the appearance of the signal “ALARM” on the display of the control panel or of the radioremote control or in case of an electrical failure.

In these cases, because of a fault, shown in the system, the crane is not functional any more. The checks that the operator can effect to reactivate the crane functions are the following:
- in case of an electrical failure check the connection of the feeding cables to the battery;

- in case of the appearance of the signal “ALARM” on the display of the push-button panel see Par. 15.7.1 and check if the fault can be resolved by the operator.

If the fault cannot be resolved, you must immediately go to a FASSI **authorised Center** after bringing the crane to its the rest position in relation to the conditions explained in the paragraphes 15.7.2, 15.7.3.

Diagnostic (Alarms/Input/Output) LME vers. 4-5 UC 01-7

It is possible to install on the machine some operation improvements of the limiting device not yet described here. For this purpose compare the released version of the software installed on the machine (you can read it on the display when switching on) with the one in this paragraph's heading. For further explanations please refer to Fassi service network.

All the eventual problems that the electronic device can have are shown on the display of the control panel and they create the stop of all crane functions. The visualisation of the alrm must be reset pushing the button l.m.l.d. exclusion on the main box control panel, which bring again the display in the original screen showing the pressures only if the problem has been solved. As consequence of this, when appear an alarm signal it is necessary to solve the problem because only in this case will be possible to reset the display and reactivate the crane working.

ALARM CODES:

01 - electronic card alarm
02 - inner ram transducer alarm
04 - outer ram transducer alarm
06 - jib articulating ram transducer alarm
08 - proximity sensor alarm (central one off)
09 - proximity (lateral one off)
10 - mercury sensor level alarm (connector disconnected)
11 - mercury sensor level alarm (sensor defect)
12 - winch alarm
14 - microswitch on the inner ram distributor segment alarm
15 - microswitch on the outer ram distributor segment alarm
16 - microswitch on the jib articulating ram distributor segment alarm
17 - microswitch on the extension rams distributor segment alarm
18 - microswitch on the jib extension rams distributor segment alarm
19 - microswitch on the winch distributor segment alarm
20 - microswitch on the rotation distributor segment alarm
21 - 10A fuse alarm (fuse inside the main control panel protecting the emergency circuit)
22 - winch stroke end device alarm

Only for crane with slew ring:

30 - inconsistency of the rotation lever movement alarm
31 - inconsistency of the inner ram lever movement alarm
32 - inconsistency of the outer ram lever movement alarm
33 - inconsistency of the crane extension ram lever movement alarm
34 - inconsistency of the jib articulating ram lever movement alarm
35 - inconsistency of the jib extension ram lever movement alarm
36 - inconsistency of the winch lever movement alarm
40 - CAN-BUS reading alarm on unit FX003
41 - CAN-BUS reading alarm on unit FX004
42 - CAN-BUS reading alarm on radio remote receiver unit

MESSAGES	**EXPLANATION**
"WINCH OFF"	- information for the activation of the winch up or down.
"WINCH CAL.ERROR"	- flashing warning (10 seconds each minute); it appears when the maximum detection of the winch adjustment with load is exceeded.
"STOP BOOM OUT"	- warning for the interruption of the extension boom exit because of a sudden variation of the cable tension.
"STOP JIB 25°"	- warning of not permitted activation of the lifting functions because of the activation of the maximum vertical operativity of the jib when it is complete with the 25° angle increasing.
"PLE"	- activation of the speed reduction for the use of the access platform.

What to do in case of alarm

CODE	REMEDY
01	Take off the tension to the system and take on again the tension. If the problem remains, take off the tension to the system again, take on the tension and wait 12 minutes (12 minutes waiting time is a compulsory condition and needs to be checked with a watch), take off the tension to the system again, take on again the tension. If the problem remains, you must immediately go to a FASSI **authorised Center**.
02	Check the connector of the pressure transducer. If the problem remains, you must immediately go to a FASSI **authorised Center**.
04	See code 02.
06	See code 02.
08	Check if the red light on the proximity sensor is off and verify if the metallic band is rightly positioned.
09	See code 08.
10	Check that the connector of the mercury sensor level is not damage. If the problem remains, you must immediately go to a FASSI **authorised Center**.
11	You must immediately go to a FASSI **authorised Center**.
12	See code 11.
14	See code 11.
15	See code 11.
16	See code 11.
17	See code 11.
18	See code 11.
19	See code 11.
20	See code 11.
21	Replace the 10A fuse at the nearest workshop after removing the carter and the cover of the main panel FX000. (See electric schematic Par. 5)
22	See code 11.

Only for crane with slew ring:

30	See code 11.
31	See code 11.
32	See code 11.
33	See code 11.
34	See code 11.
35	See code 11.
36	See code 11.
40	See code 11.
41	See code 11.
42	See code 11.

MESSAGES	REMEDY
"WINCH OFF"	Place the distributor bank lever controlling the winch in neutral position.
"WINCH CAL.ERROR"	See code 11.
"STOP BOOM OUT"	Place the distributor bank lever controlling the extension booms in neutral position. If the warning appears when the winch cable lifting stroke end is not reached, place in any case the lever in neutral position and then restart to operate.
"STOP BOOM UP"	Lifting functions not available; are authorized only descent functions.

To verify the right working of the differents input it is possible to use the display in the "INPUT" menu.

EMERGENCY tap lever fig. 7

Each device is fitted with an emergency tap lever to be used in the event of a black-out, electrical or hydraulic malfunctions or whenever the lifting moment limiting device makes it impossible to use any controls when handling a load (this may occur when the extension booms are fully folded and the load is particularly heavy and bulky).

(!) WARNING (!)

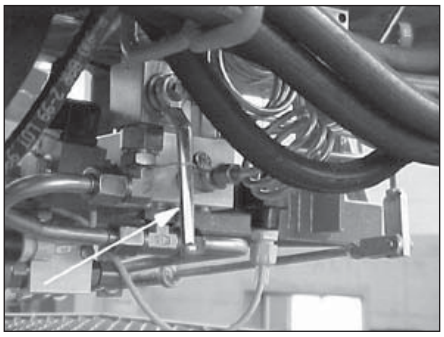


fig. 7

When the operator uses this device, it means that he wishes to override the lifting moment limiting device in order to make some manoeuvres (which would be impossible with the device active) that bring the moment to within the maximum level, but involve an overload condition. In such an emergency condition (where the lifting moment limiting device has been disabled), the operator must:

- carefully consider the manoeuvres required to return to normal working conditions;
- calmly and carefully assess the type and scale of the hazards arising from these manoeuvres and the possible reaction of the crane (tipping over, frame overload, uncontrolled fall of the load due to a hydraulic system overload etc.);
- make all movements as slowly as possible to reduce the dynamic overload to the minimum.

Only in these situations it is permitted to remove the lead seals placed on the tap lever and place it in the closed position.

After such emergency operations and prior to re-use of the crane, you must immediately go to FASSI authorised Center for testing the structure and re-sealing of the device.

(!) Interferences with the valves or removal of the lead seals release the Manufacturer from any responsibility and invalidate the warranty.

(!) ATTENTION (!)

The presence of the lifting moment limiting device does not release the user from the obligation to respect what is indicated on capacity plates and lifting curves.

(!) ATTENTION (!)

Do not walk on the electric control panels (plate DE1679)
Do not use water to estinguish fire! (plate DE1680)

DE1679

DE1680

CONTROLS TO STABILIZE THE VEHICLE

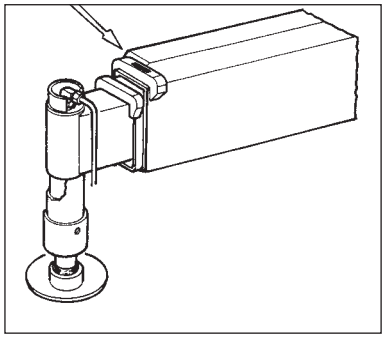
The outriggers rams prevent harmful stresses both to the frame and to the vehicle suspensions on which the crane is mounted and assure the stability of the unit during load handling.

Supplementary beams
Supplementary beams (supplementary outriggers) are used in conjunction with the crane outriggers to ensure the vehicle stability during load handling.

Supplementary beam code	outrigger ram stroke	extension max. interaxis
390B054	520 mm	4984 mm hydraulic extension

Identification data of the supplementary beam are punched on the beam (fig. 8) in the following sequence:

fig. 8



Example ***390B054*0001**

serial no.

identification code

(!) ATTENTION (!)
Be very careful during vehicle stabilization operation; make sure that no one is or transits in close proximity of the working area of the outriggers.

(!) ATTENTION (!)
The crane stability is only guaranteed by the maximum lateral extension of the outrigger supports and by the solidity of the base underneath the plates of the outrigger rams. To check the maximum working pressure see Chapter V “Technical data”

When stabilization is complete the wheels of the vehicle must still be in contact with the ground and the suspensions must not be fully unloaded.

Stabilize the crane so as to operate on a horizontal plane with a maximum tolerance of 1,5 degrees.

Description of the controls to stabilize the vehicle

The controls to stabilize the vehicle are activated only on ground level and are placed on the crane base; they are in conformity with the safety directives and enable the operator to activate the lateral extension of the outriggers (outrigger supports and rams) only from the side where he can visually check the operation.

Lever function (oil-diverter side) Fig. 9

- **D** Deviator crane/outriggers control (- **E/S**)
- **E2** Outrigger extension control **E2** crane
- **S2** Outrigger ram control **S2** crane
- **E3** Outrigger extension control **E3** supplementary outriggers
- **S3** Outrigger ram control **S3** supplementary outriggers

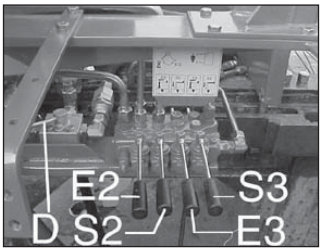


fig. 9

Lever function (oil tank side) Fig. 10

- **E1** Outrigger extension control **E1** crane
- **S1** Outrigger ram control **S1** crane
- **E4** Outrigger extension control **E4** supplementary outriggers
- **S4** Outrigger ram control **S4** supplementary outriggers

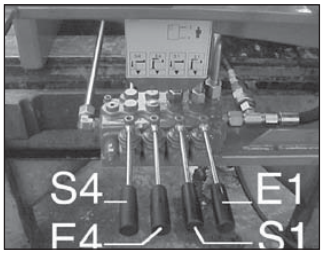


fig. 10

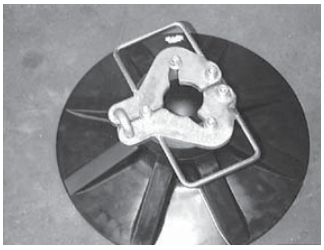
The extension and re-entering of the support and outrigger rams indicated on the fig. 9-10 coincide with what indicated on the plates **DE3771** and **DE3772** placed next to the control station.

The symbols and the graphics of the plates define the side of the vehicle from which we operate and indicate the operating levers in relation to their movement.

Controls for positioning the hydraulic outriggers of the crane and of the supplementary beam.

Special base plates (detachable)

The outrigger rams of the crane and of the supplementary outriggers they are supplied with base plates which can be fastened to the ram stems through jaw securing devices.



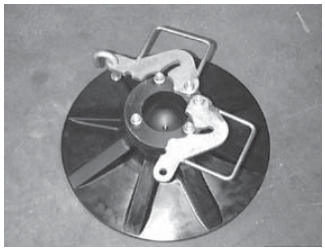


fig. 11a

Fastening of the base plate
- Place the base plate underneath the ram, remove the check pin and open the anchor jaws. (fig. 11-11a)
- Operate the corresponding lever **S** to control the descent of the ram until the ball joint touches the seat cut in the base plate; closethe jaws and secure them in their seat with the check pin. (fig. 11b-11c)

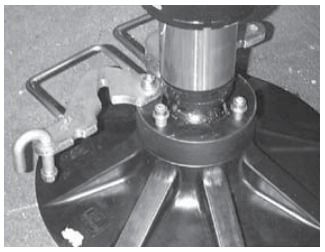


fig. 11b

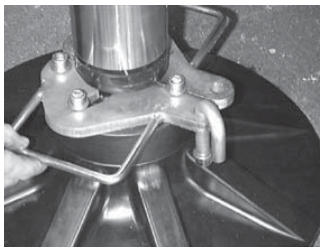


fig. 11c

Removal of the base plate
- Release the check pin and open the anchor jaws.
- Operate the corresponding lever **S** to control the re-entry of the ram.
- Close the jaws, secure them with the check pin and remove the base plate.

(!) For the safety and for the encumbrances we recommend to remove the plates before putting the rams to the rest position; special handles are featured for the plates handling and the opening and closing of the securing device (jaws).

fig. 14

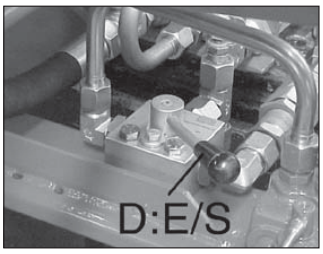
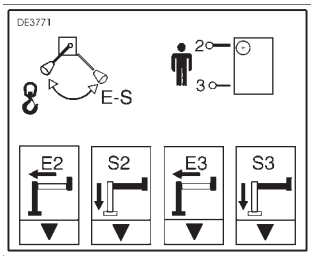


fig. 13



(!) WARNING (!)
Keep clean the ball joint heads of the outrigger rams and the seats cut in the base plates to avoid their deterioration.

Controls workable from the oil-diverter side fig.11-13 **DE3771**

Position lever **D** of oil diverter (-**E/S**) on **E/S**. fig. 14

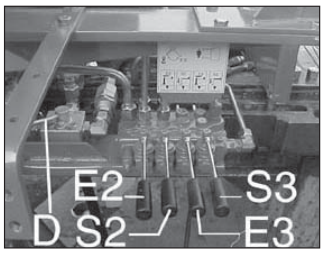
Extension of the outrigger support **E2** ( )
- Operate the lever **E2** to extend the outrigger support.

Descent of the outrigger ram **S2** ( ) and fastening of the base plate (see par. "Special base plates").
- Operate the lever **S2** to lower the outrigger ram.

Extension of the outrigger support **E3** (supplementary outriggers).
- Operate the lever **E3** to extend the support.

Descent of the outrigger ram **S3** (supplementary outriggers) and fastening of the base plate (see par. "Special base plates").
- Operate the lever **S3** to lower the ram.

fig. 11



Controls workable from the oil tank side fig. 12-15 **DE3772**

The lever **D** of oil diverter (-**E/S**) must be positioned on **E/S**; if it's the case re-position it.

fig. 12

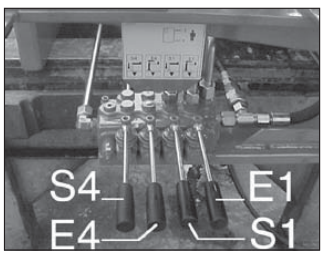
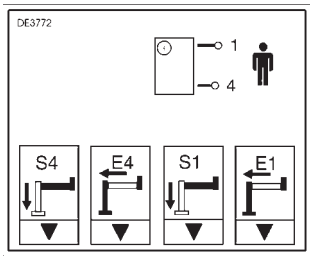


fig. 15



Extension of the outrigger support **E1** ( ).
- Operate the lever **E1** to extend the outrigger support.

Descent of the outrigger ram **S1** ( ) and fastening of the base plate (see par. "Special base plates").
- Operate the lever **S1** to lower the ram.

Extension of the outrigger support **E4** (supplementary outriggers)
- Operate the lever **E4** to extend the support.

Descent of the outrigger ram **S4** (supplementary outriggers) and fastening of the base plate (see par. "Special base plates").
- Operate the lever **S4** to lower the outrigger ram.

(!) ATTENTION (!)

The complete extension of the outrigger supports is visually indicated by the yellow triangles which are found at the end of the beam and the first outrigger support. (Note: the pictures are related to the oil-diverter side) (fig. 16-16a)

The stabilization has to be carried out with care and gradually keeping the vehicle in horizontal levelled condition to prevent springs overloads and chassis torsions.

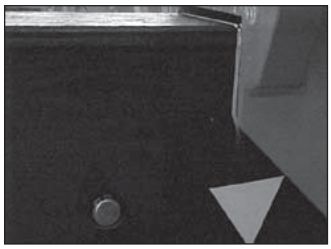


fig. 16

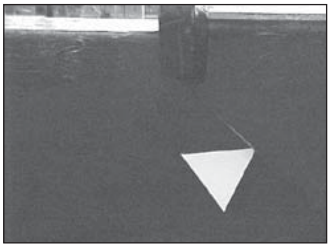


fig. 16a

(!) ATTENTION (!)

During the stabilisation operations, for each outrigger ram, it is recommended to DESCENT the outrigger as last manoeuvre.

Enable the crane by taking lever **D** controlling the crane/outriggers oil-diverter (- **E/S**) to position . fig. 14a **DE3771**

Manoeuvres for re-entry of the crane outriggers and supplementary outriggers within the overall vehicle width after crane use.

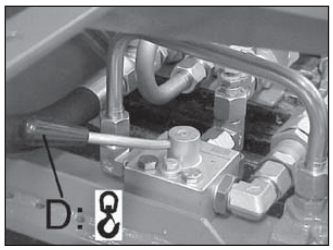


fig. 14a

Controls workable from the oil-diverter side fig. 11-13 **DE3771**

Position lever **D** of oil diverter (**- E/S**) on **E/S**

Re-entry of the outrigger ram **S2** ( ) and removal of the base plate (see par. "Special base plates").
- Operate the lever **S2** to control the re-entry (at stroke end) of the outrigger ram.
Re-entry of the outrigger support **E2** ( ).
- Operate the lever **E2** to control the re-entry of the outrigger support.
Re-entry of the outrigger ram **S3** (supplementary outriggers) and removal of the base plate (see par. "Special base plates").
- Operate the lever **S3** to control the re-entry (at stroke end) of the outrigger ram.
Re-entry of the outrigger support **E3** (supplementary outriggers).
- Operate the lever **E3** to control the re-entry of the support.

Controls workable from the oil tank side fig. 12-15 **DE3772**

The lever **D** of oil diverter (- **E/S**) must be positioned on **E/S**; if it's the case re-position it.

Re-entry of the outrigger ram **S1** ( ) and removal of the base plate (see par. "Special base plates").
- Operate the lever **S1** to control the re-entry (at stroke end) of the outrigger ram.
Re-entry of the outrigger support **E1** ( ).
- Operate the lever **E1** to control the re-entry of the outrigger support.
Re-entry of the outrigger ram **S4** (supplementary outriggers) and removal of the base plate (see par. "Special base plates").
- Operate the lever **S4** to control the re-entry (at stroke end) of the outrigger ram.
Re-entry of the outrigger support **E4** (supplementary outriggers).
- Operate the lever **E4** to control the re-entry of the support.

(!) WARNING (!)

Due to the particular characteristic of the hydraulic circuit (double circuit with two pumps), the distributor placed on the right of the top seat (extension booms, outer boom and pallet-fork) is alimented by one pump also with the oil-diverter - E/S on E/S.
The distributor controls are disacticated by a device indicating the operator presence which prevents the control activation before the operator sits down at the control station.

(!) Under no circumstances interfere with the device indicating the operator presence which is fitted on the seat of the control station.

CONTROLS TO OPERATE THE CRANE

(!) WARNING (!)
Before operating the crane it is compulsory to set the outriggers

This coincides with that indicated on the plate **DE6723** placed on the outriggers. (fig. 17)

fig. 17

(!) **Operate the levers smoothly and gradually.**
When carrying out simultaneous movements of two or more functions, also related to pump flow and lever travel, it is possible that on reaching the stroke end of a particular function, an increase in speed of the other functions will occur.

The control station is on the top seat, the crane and the hydraulic implements are controlled from the distributors placed on the left and on the right side of the operator and are activated by means levers (manually) and foot controls.

(!) The device indicating the operator presence which is fitted on the seat of the control station prevents the activation of the hydraulic working of the two distributors before the operator sits down at the control station.

The left distributor, respect to the operator, controls four functions (left to right):
- Pallett-fork rotator
- Inner ram
- Rotation-of the crane
- Extension of the inner booms

The right distributor, respect to the operator, controls three functions (left to right):
- Exit of the extension boom sections
- Outer boom
- Pallett-fork

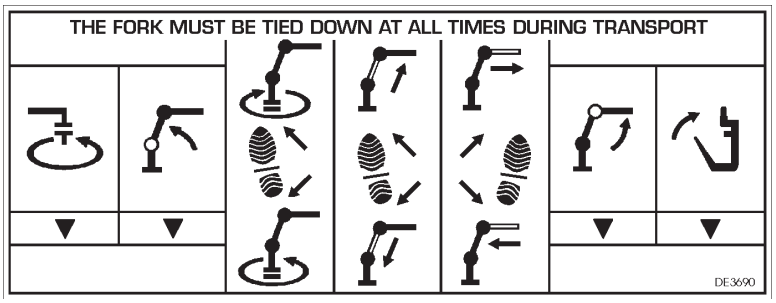


fig. 18a

The symbols on the plate **DE3690**, placed on the support handle in front of the operator, identify the left and right side of the control station, define the lever function and foot controls in relation to the movement to be effected. fig. 18-18a

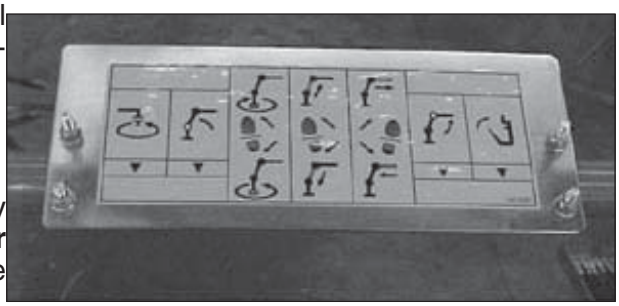


fig. 18

Left side of the control station

Respect to the operator (left to right) we activate, by means of levers, the pallet-fork **rotator** and the **inner boom** and, by means of foot controls, the **rotation** of the crane and the **extension** of the inner booms.

The first lever controls the mouvement of the pallet-fork **rotator**
forwards: clockwise rotation
towards: counterclockwise rotation.

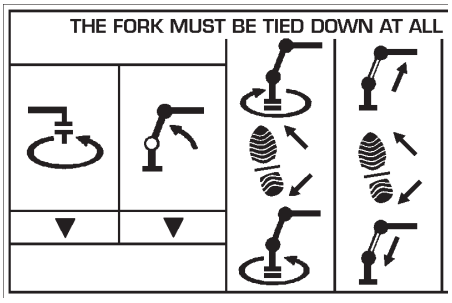


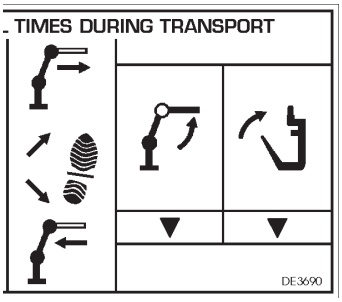
fig. 18b

The second lever controls the mouvement of the **inner boom**
forwards, controlling the descent
towards, controlling the ascent

The left foot control activates the **rotation** of the crane
Pushing with the foot tip: clockwise rotation
Pushing with the heel: counterclockwise rotation.

The center foot control activates the **extension** of the inner booms
Pushing with the foot tip, we control the **exit** of the inner booms
Pushing with the heel, we control the **re-entry** of the inner booms

fig. 18c



Right side of the control station

Respect to the operator (left to right) we activate, by means of foot controls, the **exit** of the extension boom sections and, by means of levers, the **outer boom** and the **pallet-fork**.

The right foot control activates the **exit** of the extension boom sections
Pushing with the foot tip, we control the **exit** of the extension boom sections
Pushing with the heel, we control the **re-entry** of the extension boom sections.

The first lever controls the mouvement of the **outer boom**
forwards, controlling the descent
towards, controlling the ascent.

The lever controls the mouvement of the **pallet-fork**
forwards, controlling the **closure**
towards, controlling the **opening**.

Manoeuvres to unfold the crane into a working condition

- Engage the power take off.
- Stabilize the vehicle as described on page 16.
- Before lifting the inner boom, be sure that the outer ram is open.
- Lift the inner boom over the horizontal line, close the outer boom and eventually extend the booms of the crane.
- Operate on the crane rotation to position the fork on the vertical line above the load, operate on the pallet-fork rotation control for the correct orientation of the fork.

Manoeuvres to fold the crane into the rest condition

- Open the outer boom to its stroke end.
- Re-enter the extension boom sections.
- Operate the rotation control of the crane and fold the inner boom, paying attention to the crane boom position on the body. It is necessary during this operation to orientate the pallet-fork position to avoid obstacles on the body or the load.
- Lift and re-enter the outriggers as previously described.
- Disengage the power take off.

(!) THE FORK MUST BE TIED DOWN AT ALL TIMES DURING TRASPORT.

Load manoeuvres

(!) Before manoeuvering the load, verify that the working area is suitable for your crane.

The lifting curves of the capacity chart indicate the maximum load that the crane can lift at a certain radius and at a certain height.

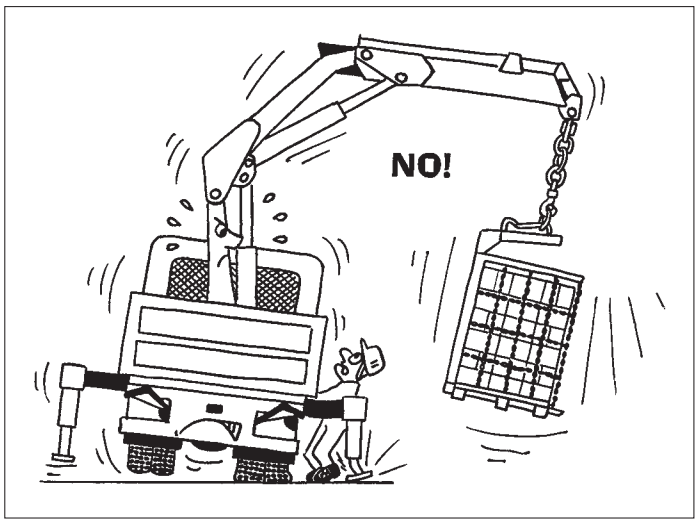
(!) Always remember that when operating with implements, their tare weight must be deducted from the capacity of the crane.

During load handling do not exceed the reach limits given, or the load indicated on the above mentioned charts. If the limits are exceeded, the lifting moment limiting device, allowing all manoeuvres, which reduce the lifted load within the permitted reach limits and forbid all other manoeuvres, will be immediately activated.

(!) The presence of the lifting moment limiting device does not release the user from the observance of the capacity chart.

(!) ACTION OF INNER BOOM TELESCOPE EXTENSIONS CAN ALWAYS BE ACTIVATED WHEN INNER BOOM IS ABOVE 45°, ON THE CONTRARY, BELOW 45° IT CAN BE ACTIVATED ONLY IF THE PRESSURE OF THE INNER RAMS IS LESS THAN 200 BAR.

To increase the hydraulic available reach always activate first the extension sections of the inner boom (ONLY WHEN ABOVE 45 DEGREES) and afterward those of the outer boom: follow the inverted sequence to reduce the hydraulic reach (ALWAYS KEEPING IN MIND THAT THE "Inner Boom Telescope" MUST ONLY BE OPERATED ABOVE 45 DEGREES).



USE OF IMPLEMENTS

OIL COOLER (HEAT EXCHANGER)

The crane is equipped with an oil cooler (air-oil heat exchanger) to prevent damage caused by an excessive increase of the oil temperature.

NOTE
When working in a low temperature climate, we recommend to bring the hydraulic oil up to working temperature prior to starting work, This is best done by operating the crane thru all its functions ram stroke end.

(!) WARNING (!)
The heat exchanger openings must be kept clear and clean. At no time should it be covered.

HYDRAULIC ACCESSORIES

The crane can be provided with implements such as:

- Fork rotator
- Pallet-fork

(!) When using an implement it is always necessary to check that its weight, dimension and capacity is matched to the crane performances.

(!) Warning and norms for crane use also apply for hydraulic implement use.

(!) Always remember that when operating with implements, their tare weight must be deducted from the capacity of the crane.

Hydraulic connections between implements and hoses fitted on the extension boom section of the crane.

(!) In case of hoses connection to implements through coupling unions it is necessary to verify that there is no trace of soil, curt etc. on the unions and inside the seats so as to avoid the oil contamination and consequently wear the tightening " surface of unions.

(!) WARNING (!)
To ensure that the control corresponds to the implement movement, hydraulic connections are symmetrically fitted with coupling unions. Never invert such positions: movements inversion as well as operating difficulties could occur.

MAINTENANCE INSTRUCTIONS

To assure a long life to the crane, it is necessary to meticulously follow the instructions.

General lubrication and small repairs can be carried out by the user; repairs of a more complicated nature must be carried out by authorized service personnel.

Spare parts must be original.

At least once a year you must take the crane to a **Fassi Service Center** for a check.

Good maintenance and proper use are imperative to maintain efficient use and guarantee the safety of the crane.

(!) Before disconnecting any hydraulic hoses, ensure that there is no pressure in the hydraulic circuit.

After removing hoses always mark them and their respective ports on the crane. Faulty replacement can cause damage to the rams and to the hydraulic circuit.

Respect the information supplied for maintenance and technical assistance.

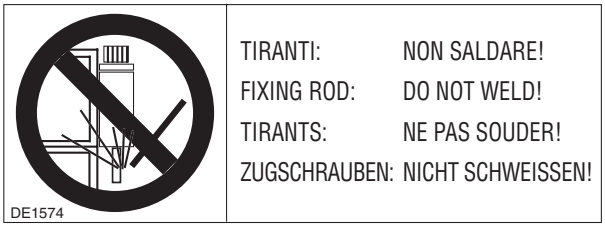
Any maintenance operation must be carried out with the crane power source turned off. (in case of fixed mounting with hydraulic power pack, the electric motor has to be turned off).

fig. 19

Do not place limbs, fingers or any other parts of anatomy into areas of the crane, which present possibilities of shearing, without having blocked such parts of the crane.

Do not weld, drill or grind any part of the crane without the Manufacturer's authorisation.

Do not weld the fixing rods of the crane (DE1574 fig. 19).



When repairs to, or checks of, the hydraulic circuit and of the rams are carried out, it is very important not to use, or be in the proximity of, materials which can damage the circuit or contaminate the hydraulic oil eg. metal shavings, sand or dust.

Do not use high pressure washers on the controls (deviators, distributors, double controls, hand cable controls), on the electronic components (boxes, control panels), on the oil cooler (if fitted), on the tank.

Never use detergents, petrolsol or inflammable liquids, always use non flammable or non toxic liquids.

When cleaning the exchanger (if fitted) direct the jet of water or air parallely to the fins in order not to damage them; protect the electric motor adequately. Where needed use a cleaning product which does not eat into the alluminium of the radiant group.

To avoid down time, it is recommended to periodically carry out the following checks.

After every 8 working hours or at the end of every working day

Check that all safety devices are efficient.

Check the level of the hydraulic oil in the tank.

Check the hoses fittings and all the components of the hydraulic circuit for possible leaks.

Check that the oil-diverter - **E/S** lever can be moved easily.

Check that the crane controls (levers and foot) and the outrigger controls (levers) can be moved easily and return freely to neutral position.

Check the condition of shackles, hooks, wire ropes and every eventually used equipment.

After every 40 working hours or after every working week

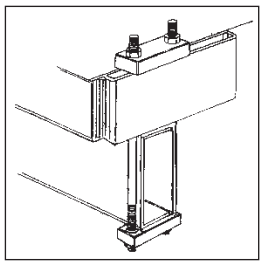


fig. 20

Check the tightening torque of the fixing rods of the crane.
(fig. 20)

Tightening torque for the rods M33x2 = 1200 Nm

Clean the oil filter placed in the oil tank of the crane and if any, on the pump section and pressure hoses.

NOTE The filters of fibre or paper can not be cleaned, they must be replaced.

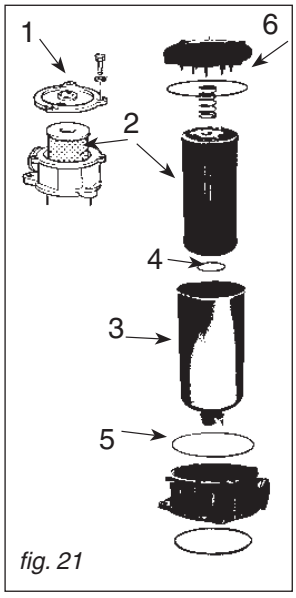


fig. 21

Cleaning of the wire mesh filter on the tank (oil return to the oil-tank) fig. 21
- Unscrew the security bolts of the filter cover 1 and remove it.
- Extract the cartridge, clean by flushing with a non flammable and non toxic solvent (gas oil or other).Thoroughly dry the filter inside and out (do not use compressed air).
- Check if the cartridge has collapsed; if so, replace it!
- Remove the filter body 3 and clean it
- Re-assemble the filter body and the cartridge: check the sealing of the 'O' ring 4-5-6; in case, replace it!

NOTE Take care that no contaminated material passes into the tank.

Replacement of the filter on the delivery line (before the distributor) fig. 22
When the visual indicator becomes red, replace the cartridge.
- Unscrew with a suitable spanner the filter body (1) from the head (2).
- Remove the cartridge (3) and clean inside the filter body (1).
- Insert a new cartridge and re-assemble the filter body into the head (check the sealing (4)).

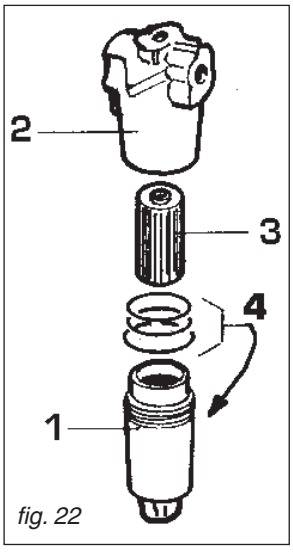


fig. 22

Check the oil level in the tank with the crane in the folded position and with the outriggers (crane and supplementary) fully re-entered. The oil level must not exceed the maximum or be lower than the minimum (fig. 23).

Top up using hydraulic oil with the same characteristics as those indicated in the table at page 33.

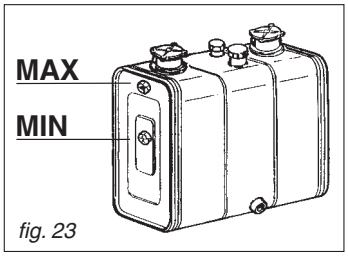


fig. 23

Note! The following lubricators have been centralized and gathered in a case positioned on the base (crane distributor side):
- rack guide shoe - rotation;
- upper and lower bush of the column - column support;
- rack group - column gear;
- column support group - pendulum beam.

(!) WARNING (!)
At low temperatures, the grease shall not crystallize or, to be more precise, shall not change its characteristics.

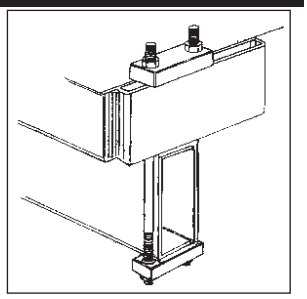
At the effective operative temperature, the grease we recommend shall have a fluidity at least equal to rating **NLGI 0** or max. 1.

(!) WARNING (!)
Centralized lubrication shall not be used when room temperature is below -10°C / -20°C.

For the sliding sections of the outrigger supports and of the extension booms guide shoes made from a special material have been fitted: to ease their movement it is recommended to smear a light film of grease on them, taking care that the surfaces of the outrigger supports and inner and extension booms are free from impurities such as sand etc. For the sliding sections of the carter of the outer ram and ease their movement it is recommended to smear a light film of grease on the guide-shoes.

Use a grease with the same characteristics indicated in the table at page 33.

After every 500 working hours



Check the tightening torque
- of the fixing rods of the crane; consult the following table in order to find it's value according to the bolt diameter

Table of the tightening torques of the fixing rods of the crane on the vehicle From "C0404 Kit for crane fixing"

D. Fixing rods	Tightening torque = Nm
M22x1,5	300
M24x2,0	400
M27x2,0	600
M30x2,0	471
M33x2,0	1200
M39x3,0	1800

- of the securing bolts for the ram pins and of all the other bolts and screws, where the tightening torque is not expressly indicated, consult the following table in order to find it's value according to the bolt diameter and class.

Table of the bolts tightening torque with average friction value (0,15) and average-good tightening accuracy (C).

Bolt Diameter = D	Class 8.8 Torque = Nm	Class 10.9 Torque = Nm	Class 12.9 Torque = Nm
3	1,06	1,56	1,83
4	2,44	3,58	4,19
5	4,83	7,10	8,30
6	8,30	12,30	14,30
8	20	29	35
10	40	59	69
12	69	102	119
14	111	163	191
16	173	255	298
18	239	352	412

Bolt Diameter = D	Class 8.8 Torque = Nm	Class 10.9 Torque = Nm	Class 12.9 Torque = Nm
20	339	499	584
22	466	685	802
24	584	858	1004
27	865	1271	1487
30	1173	1723	2016
33	1594	2342	2740
36	2046	3006	3517
39	2658	3905	4570

From "ELEMENTS DE FIXATION - ASSEMBLAGES VISSES" E 25-030 AGOSTO 1984

Check the guide shoe wear as it affects the sliding section tolerances; if the clearances are considerable, damage to the rams and the structure may occur.

Clean the air filter placed in the top of the oil tank filter cap.

Completely replace the hydraulic oil and the filter cartridges.

(!) The waste oil and the filter cartridges must be disposed of by authorized persons.

(!) CAUTION DANGER (!)

On the outer boom there is a mercury capsule (mercury level switch) duly protected and provided with the following warning stickers.

MERCURY IS EXTREMELY TOXIC. IN CASE OF REPLACEMENT AND/OR SCRAPPING, DISPOSE OF OR RECYCLE THE CAPSULE CONTAINING MERCURY WITH MAXIMUM CARE, AND IN ACCORDANCE WITH THE NATIONAL REGULATIONS IN FORCE.

After every 1000 working hours or after every working year

Perform: Washing, Function Testing, Testing according to the capacity plates
Check: Identification plates, Capacity plates

Checklist in accordance with ISO 9927-1

Element	**Checks to be carried out:**
Subframe Structure and fixing rods	Tightening torque of the fixing rods, wear and any deformation, actions
Base Rack group, compensator	Lubrication, tightening torque of the rods, wear and any deformation, actions
Outriggers Supports, rams, base plates safety catches, hoses	Greasing of extension supports, oil-leaks, wear, actions, inspection of hoses
Rotation cylinders Cylinders, pistons, seals,	Oil-leaks, chromium plating, any deformation, inspection of hoses
Column Inner boom connection, outrigger connection, pins, bushes	Lubrication, wear and any deformation, actions
Inner boom Pins, outrigger connections	Lubrication, wear and any deformation, actions
Inner ram Cylinder, rod, piston, seals, hoses	Oil-leaks, chromium plating, any deformation, inspection of hoses
Outer boom Pins, outrigger connections	Lubrication, wear and any deformation, actions
Outer ram Cylinder, rod, piston, seals, hoses	Oil-leaks, chromium plating, strains, inspection of hoses
Extension booms Guide shoes, pins, outrigger connections	Lubrication, wear and any deformation, actions
Extension rams Cylinder, rod, piston, seals, hoses	Oil-leaks, chromium plating, any deformation, inspection of hoses
Hydraulic jib Booms, pins, outrigger connections	Lubrication, wear and any deformation, actions
Rams (hydraulic jib): Cylinder, rod, piston, seals, hoses	Oil-leaks, chromium plating, any deformation, inspection of hoses
Winch Torque limiter, brake, rope slide guide, cable, stroke end, pulleis	Lubrication, wear and any deformation, actions

Distributors, deviators, valves Control levers, forks, joints, fixing screws, lead seals	Checking of the pressure, oil-leaks, wear and any deformation, actions,
Lifting moment limiting device Valves, pressure switches, electrovalves	Checking of the pressure, oil-leaks
Power take-off, pump, oil-tank Filters, hoses	Pump capacity, checking of the pressure, oil change, replacement of filters, inspection of hoses
Oil-pressure system Hoses, hose protection devices	Checking of the pressure, oil-leaks, inspection of hoses
Implements for lifting Hooks, chains, cables, slings	Safety check, wear and any deformation, actions,
Implements Wallboard forks, buckets, rotators	Oil-leaks, wear and any deformation, actions, inspection of hoses
Seat, third control station Frame, fixing screws	Access inspection, wear and any deformation, strains
Tele(radio)remote control	Test

Complete overhaul of the crane is required when 10.000 working hours or 10 years' life are reached - i.e.:

When one of the limits indicated hereunder is reached:

10.000 working hours, (i.e.: 10 years, 50 weeks a year, 20 hours a week, or 5 years, 50 weeks a year, 40 hours a week)

or

10 years' life of the crane,

a complete overhaul with in-depth structural inspection of the crane must be carried out by the Manufacturer or by an authorised service centre.

POSSIBLE FAULTS

Many years experience of our product has allowed us to identify and classify the most common faults which occur. In most cases it requires accurate hydraulic and electric troubleshooting and simple rectification. In the following table we report the most frequent inconveniences and our suggested remedies.

(!) Checking and adjustment of oil pressures of valve settings must be carried out by an authorized service agent, under penalty of warranty forfeiture.

Operations which can be carried out by the user.

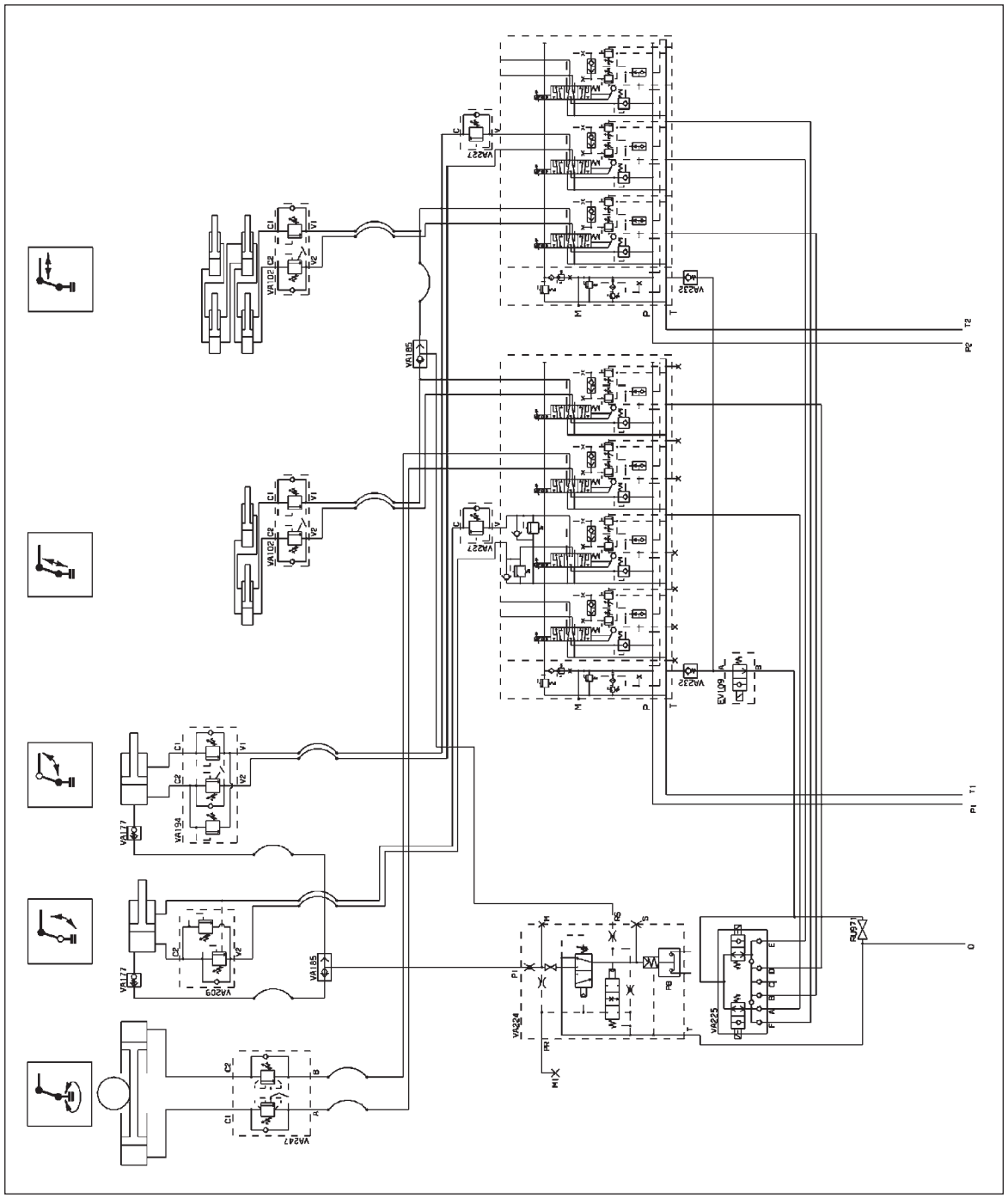
Faults	***Cause***	**Remedies**
The crane does not rotate properly	*Vehicle non in level position* *Lack of lubrication*	Stabilize the vehicle Grease the rotation group
The extension booms do not completely extend or work jerkily	*Lack of lubrication of the guide shoes*	Grease the guide shoes
Crane controls are not active with the operator at the control station	*Lack of electric energy* *The device indicating the operator presence on the top seat is activated*	Check the fuse, the battery and electric circuit Check the circuit of the device indicating the operator presence on the top seat
Vibrations in crane operations	*Shortage of oil* *Obstructed filters*	Check the level and top up if necessary Clean or replace the filter cartridge
Noteable decrease in movement speed	*Obstructed filters*	Clean or replace the filter cartridge

Operations to be carried out by a service center.

Faults	***Cause***	**Remedies**
The crane does not lift the loads indicated on the capacity plate	*Non efficiency of the pump* *(main pressure or auxiliary) valves not properly adjusted, or worn* *Ram seals are not properly fitted*	Replace the pump Check the pressure, adjust the valves or replace them Replace the seals
A boom of the crane does not hold up the load and visually lowers	*The safety check valve of the ram is open* *Oil leaks inside the ram*	Replace the valve Defective seals, replace them
The crane does not rotate properly	*Valves controlling the rotation not adjusted* *Wear of the seals of the rotation cylinder*	Adjust the valves Replace the seals
The extension booms do not completely extend or work jerkily	*Wear of guide shoes*	Check the guide shoes wear, replace if necessary
Vibrations in crane operations	*Non efficient pump*	Check the pump
Noteable decrease in movement speed	*Non efficient pump*	Check the pump

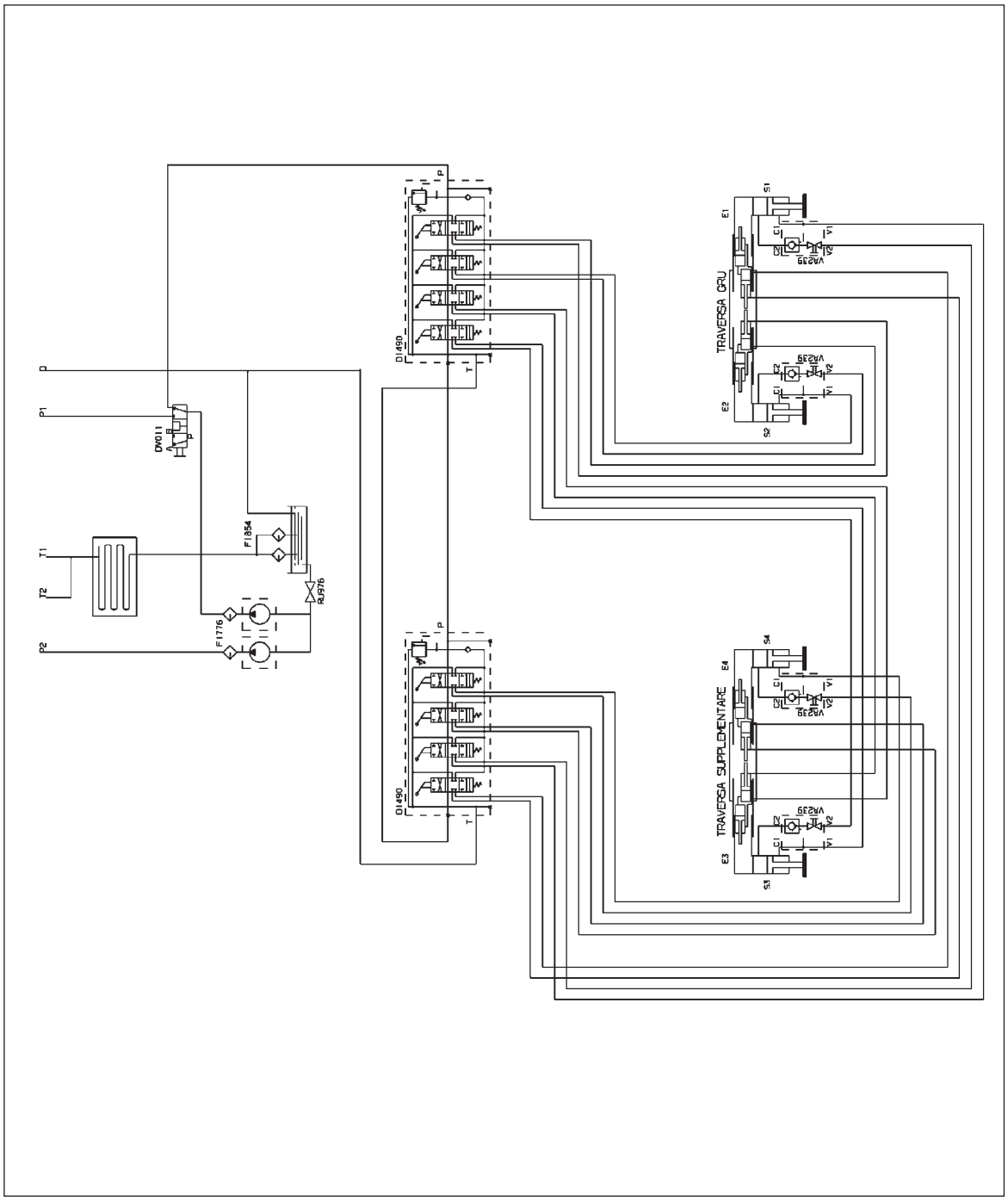
HYDRAULIC AND ELECTRIC SCHEMATICS

Hydraulic schematic for crane - two Danfoss distributors - lifting moment limiting device “intelligent” type

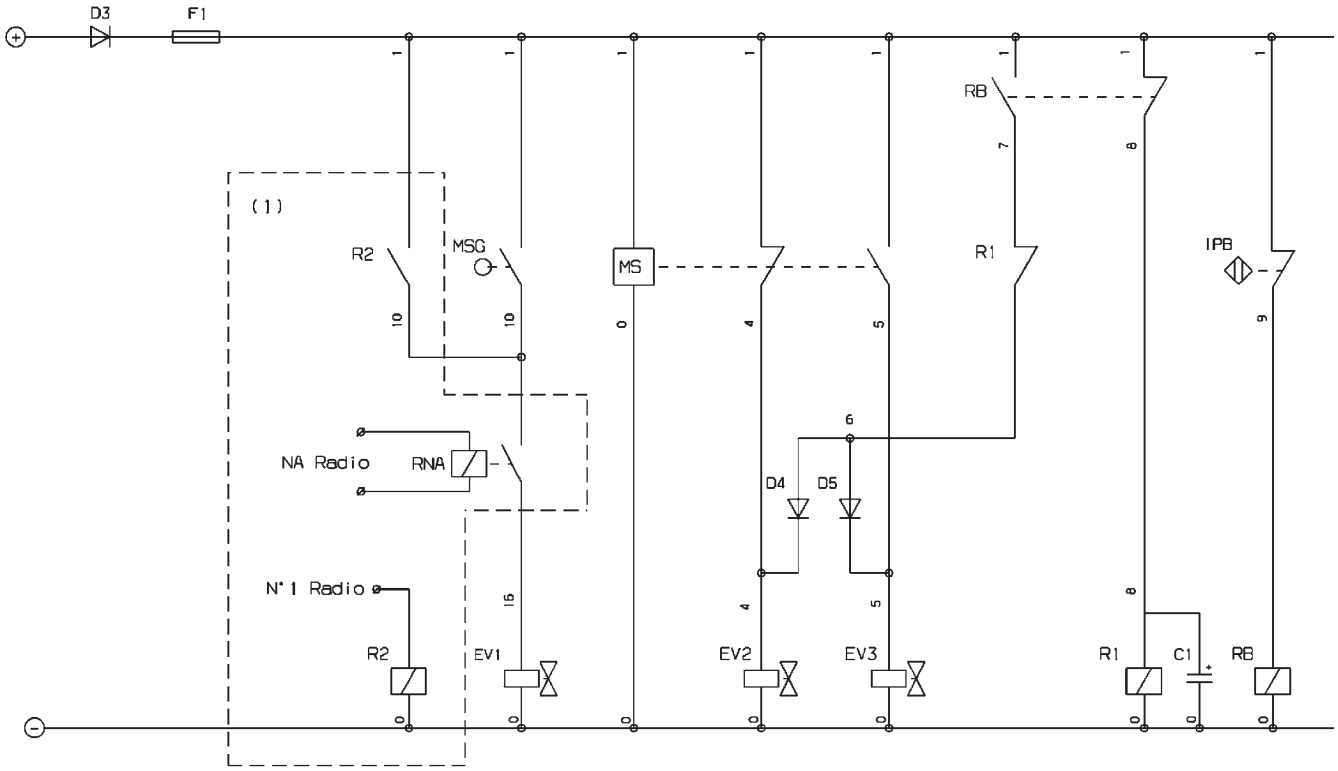


CODE	DESCRIPTION	CODE	DESCRIPTION
EV109	ELECTROVALVE	VA209	SIMPLE EFFECT BLOCK VALVE
M1/M	GAUGE QUICK CONNECTION	VA224	LIFTING MOMENT LIMITING DEVICE VALVE
RU971	FAUCET	VA225	LEVEL SENSOR VALVE
VA102	DOUBLE EFFECT BLOCK VALVE	VA227	SEQUENCE VALVE
VA177	ANTIBURST VALVE FOR LIFTING RAMS	VA232	UNIDIRECTIONAL VALVE
VA185	SELECTOR VALVE	VA247	DOUBLE EFFECT BLOCK VALVE
VA194	DOUBLE EFFECT BLOCK VALVE		

Hydraulic schematic for crane - outriggers and outrigger extensions



CODE	DESCRIPTION
DI490	DISTRIBUTOR
DV011	DEVIATOR
FI776	FILTER
FI854	FILTER
RU976	FAUCET
VA239	SIMPLE EFFECT BLOCK VALVE



(1) WITH RADIO REMOTE CONTROL ONLY

CODE	*DESCRIPTION*
ALIM	FEED MAIN CONTROL PANEL
C1	CONDENSOR FOR BLOCK DELAY
D3	POLARITY PROTECTION DIODE
D4	LIMITING DEVICE DIODE
D5	LIMITING DEVICE DIODE
EV1	EMERGENCY ELECTROVALVE
EV2	ELECTROVALVE FOR LIFTING BLOCK
EV3	ELECTROVALVE FOR DESCENT BLOCK
F1	PROTECTION FUSE 5A
IPB	PROXIMITY SENSOR VALVE
MS	MERCURY LEVEL SENSOR ON THE OUTER BOOM
MSG	MICROSWITCH FOR OPERATOR PRESENCE ON TOP-SEAT
R1	RELAY FOR BLOCK DELAY
R2	RELAY FOR OPERATOR PRESENCE ON TOP-SEAT
RB	STOP SIGNAL RELAY
RNA	EMERGENCY RADIO REMOTE CONTROL RELAY

TABLE OF HYDRAULIC OIL AND LUBRICANTS CHARACTERISTICS

HYDRAULIC OIL WITH HIGH VISCOSITY: ISO-L-HV		
Minimal external temperature:	maximal oil temperature:	Gradation
-35°C	+45°C	ISO VG 32
-20°C	+75°C	ISO VG 46

HYDRAULIC OIL WEAR RESISTANT: ISO-L-HM		
Minimal external temperature:	maximal oil temperature:	Gradation
-10°C	+60°C	ISO VG 32
+ 0°C	+75°C	ISO VG 46
+ 5°C	+85°C	ISO VG 68
+10°C	+90°C	ISO VG 100

GREASE (for centralized system)
Use only GREASE NILEX EP1 of the firm NILS. NOTE: Do not ABSOLUTELY mix different types of grease.

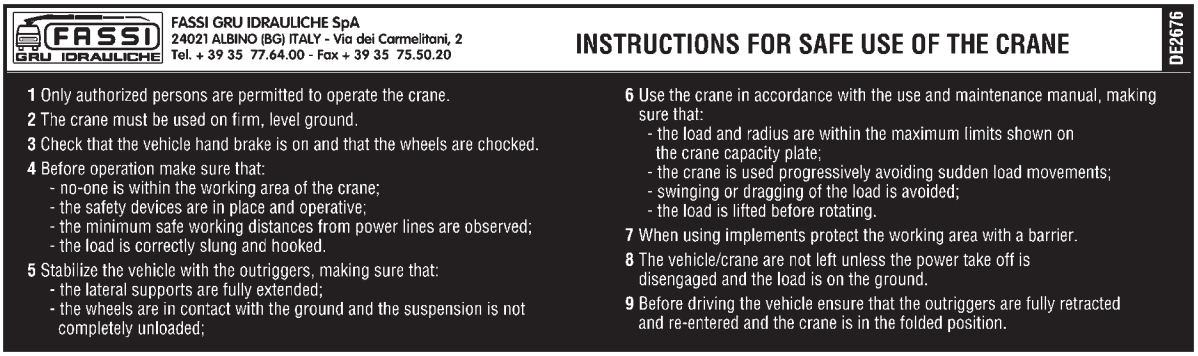
GREASE (for slew ring, extension booms, outrigger supports...)
-30°C up to +130°C EP1 Gradation (cold climate) EP2 Gradation (warm climate) All grease used must be free from acid and resin, not hygroscopic and long-life such as BP GREASE LTX-EP1\EP2 or ELF EPEXA 1\2 ESSO BEACON EP1\EP2 or TEXACO EP1\EP2 MOBIL EP1\EP2 or SIMILAR.

HYDRAULIC OIL FOR MOTOREDUCER
Classification ISO-L-CC Gradation EP ISO-VG 150

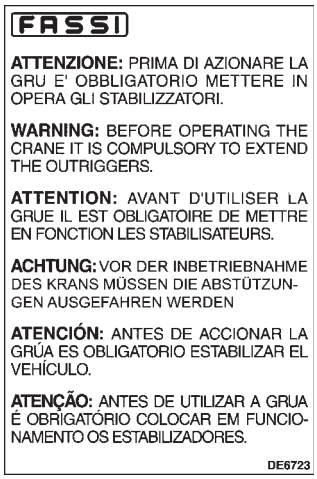
LUBRICATING OIL (for winch cable)
The most suitable here is a general-purpose lubricating oil with about SAE 30° viscosity. A lubricating oil containing non-stick additives is recommended if the cables are expected to move quickly through the pulleys. BRILUBE 50 (BRITISH ROPES - BRINDON)

(!) WARNING (!)
Don't use greases with solid particles as "Bisulphide of Molybdenum" (not compatible with eventual teflon bushes).

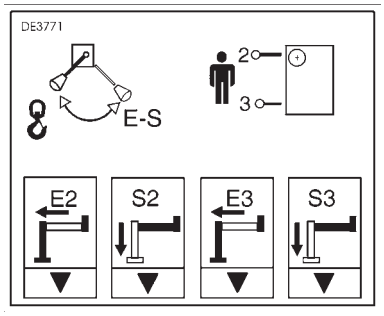
INSTRUCTION AND WARNING PLATES



DE 2676
Instruction plate and safety norms

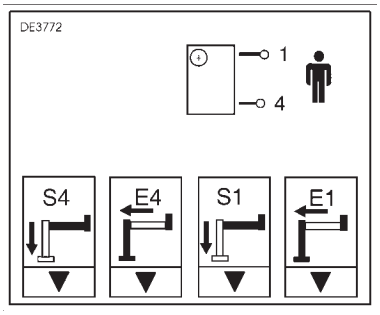


DE 6723
Warning plate to stabilize the vehicle before using the crane

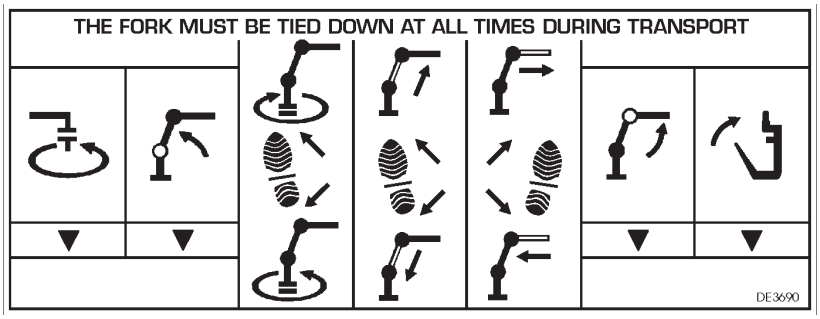


DE 3771

Instruction plates to stabilize the vehicle



DE 3772

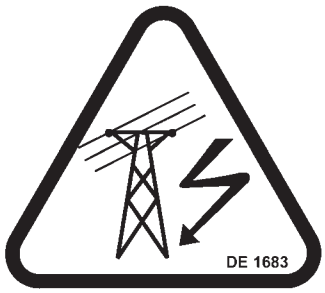


DE 3690

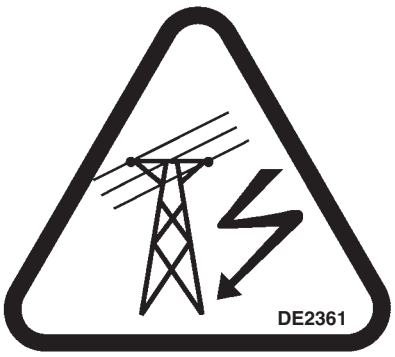
Crane controls plate

DE 1067
Do not walk or stay under a suspended load and for unauthorized persons to be within the working area.

DE 1686
Do not walk or stop under a suspended load



DE 1683
Do not operate in proximity of electric high-tension lines



DE 2361
Do not operate in proximity of electric high-tension lines

DE 2100
Danger plate for crushing of lower limbs

DE 1679
Do not walk on...

DE 1680
Do not use water to estinguish fire

DE 1681
Greasing points with brush

DE 1682
Greasing points at pressure

TIRANTI: NON SALDARE!
FIXING ROD: DO NOT WELD!
TIRANTS: NE PAS SOUDER!
ZUGSCHRAUBEN: NICHT SCHWEISSEN

DE 1574

Do not weld the fixing rods

CAPACITY PLATES

For cranes and manual extensions.

The represented plates refer to the nominal design capacities.

! WARNING !

If the capacities are downgraded or partially reduced (e.g. sector in front of vehicle cab) capacity plates must be applied in line with the final test figures.