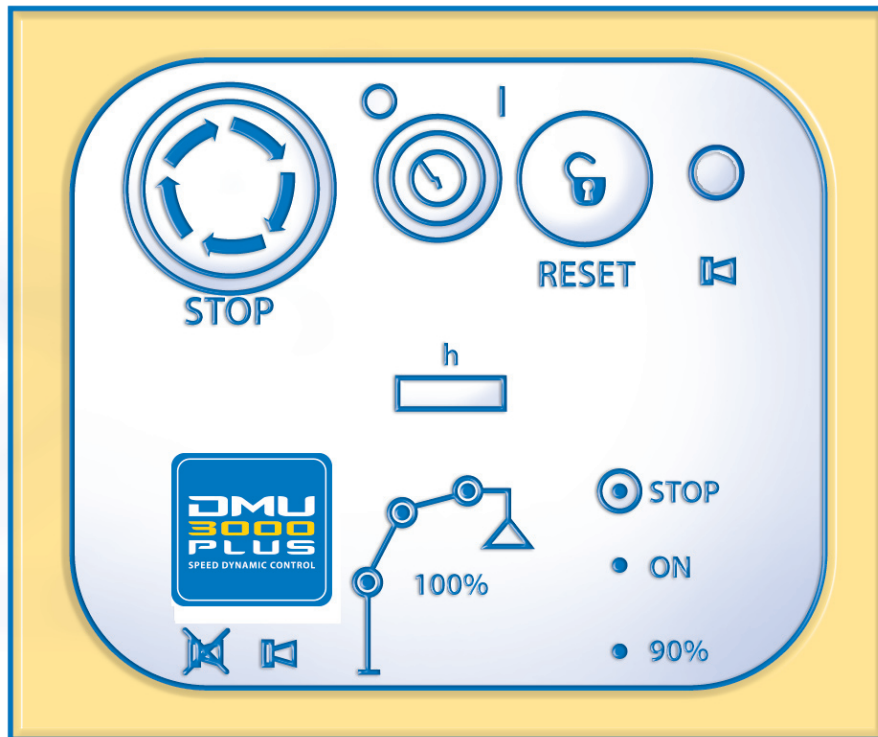




THE POWER OF PERFORMANCE

DATA MONITOR UNIT 3000 PLUS



OPERATOR'S MANUAL



Code: MO00021GB 0 - 10/01/09

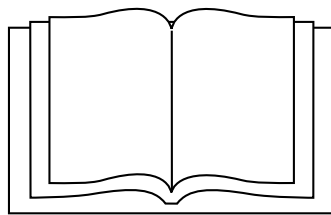
<https://cranemanuals.com>

Foreword

The contents in this technical manual concern the electronic over-load safety device (EOP) named DMU3000 PLUS installed on the crane.

The information of this booklet are to be considered as additional specifications to the rules already set forth in the Crane User Manual.

The reading of this manual is essential to learn how the DMU3000 PLUS system works. It also helps to operate with the crane under safe conditions, at maximum performances.



Sol.Ge All rights reserved

No part of this may be published without prior written permission.

Index

| | |
|--|-----------|
| 1 - START OF FUNCTIONING | 4 |
| 2 - DESCRIPTION OF CONTROL PANEL FUNCTION MODES | 6 |
| 2.1 Main panel | 6 |
| 2.2 Secondary panel | 6 |
| 2.3 Optional panels | 7 |
| 3 - STARTING THE DMU3000 PLUS DEVICE..... | 8 |
| 3.1 Device functioning check..... | 10 |
| 4 - MOVING THE CRANE | 11 |
| 4.1 Opening the crane in safety | 11 |
| 4.2 Operating with the crane | 12 |
| 4.3 Stand-by function | 15 |
| 5 - WINCH AND ROTOR/BUCKET ADDITIONAL HYDRAULIC JOINT CONNECTION ... | 16 |
| 5.1 Additional hydraulic joint | 16 |
| 5.2 Winch | 16 |
| 5.3 Use of equipment | 17 |
| 6 - ADDITIONAL INSTRUCTIONS | 18 |
| 6.1 "SCANRECO" type radio control use | 18 |
| 6.2 "HETRONIC-QUES" type radio control use | 18 |
| 6.3 "AUTOMATIC SLOWING DOWN" functioning mode | 19 |
| 6.4 "MAXIMUM Boom ELEVATION" control (inclination) | 27 |
| 7 - ADDITIONAL/OPTIONAL FUNCTIONS | 28 |
| 7.1 Processing in the front area, automatic performance downgrade | 28 |
| 7.2 Stopping of operations that use the winch | 28 |
| 7.3 Indications relative to filter clogging | 29 |
| 8 - PIN CODE | 30 |
| 8.1 - Memorisation of the PIN code | 30 |
| 8.2 - Practical use of the PIN code..... | 31 |
| 8.3 - Deleting the PIN code | 31 |
| 8.4 - Changing the PIN code..... | 32 |
| 9 - ANOMALIES/SOLUTIONS | 33 |
| 10 - "CROSS – STAB" OUTRIGGERS | 43 |
| 11 - INSTRUCTIONS FOR EXCLUDING THE DEVICE IN EMERGENCY CONDITIONS... | 50 |
| 12 - DISPLAYING DATA ON THE RADIO CONTROL DISPLAY | 51 |
| 12.1 Normal functioning | 51 |
| 12.2 Anomaly messages | 54 |
| 12.3 Displaying additional parts | 59 |
| 13 - MAINTENANCE..... | 65 |

1 - Work principles

The **DMU3000 PLUS** is an electronic load (EOP) limiter that allows safe working of the crane, avoids overloading of the crane structure and automatically limits maximum speed in certain operational conditions.

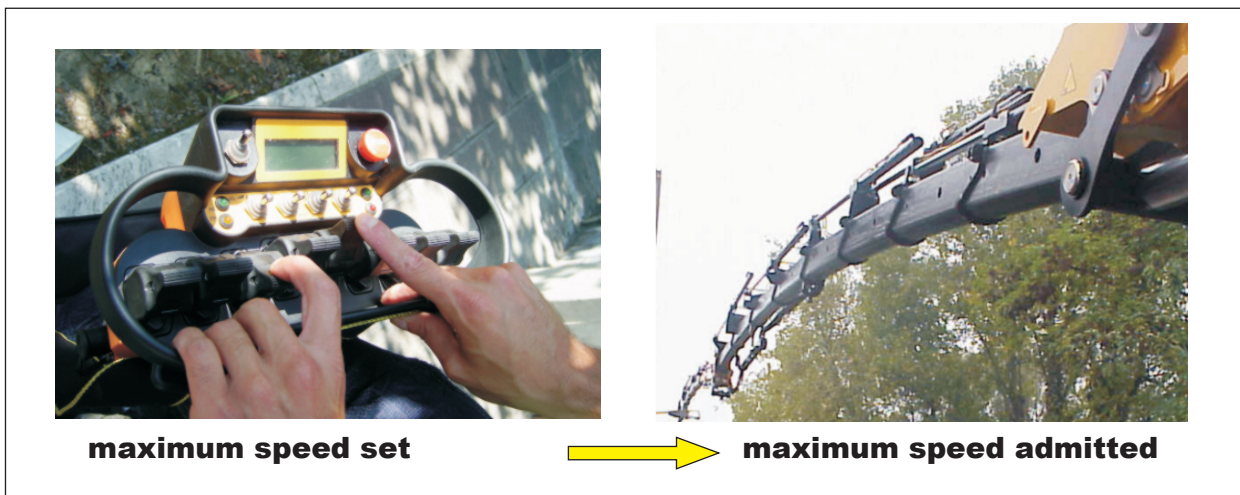
IT IS ESSENTIAL TO ACTIVATE THE DEVICE BY MEANS OF THE RELEVANT CONTROLS, IN ORDER TO OPERATE WITH THE CRANE.

Whilst working, the DMU 3000 PLUS receives the pressure values present inside various lifting cylinders and those relative to the positioning of crane arms.

Through the "CAN-BUS" communication system, the DMU 3000 PLUS load control system is in constant contact with the RADIO CONTROL, automatically setting limits to the maximum operational speeds admitted to the crane. These speed limits derive from two factors:

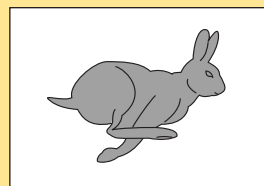
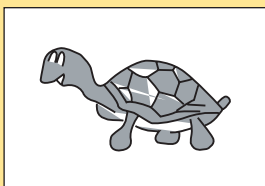
- 1) **geometric configuration of the crane**
- 2) **load applied to the hook**

working with a DMU 3000 PLUS is, without doubt, extremely safe as well as enjoyable!



CAUTION

There can also be automatic increases in the cranes movement speed: we emphasize that these happen in a much more progressive manner, compared to slowing down, in order to let the operator manage crane movement safely.

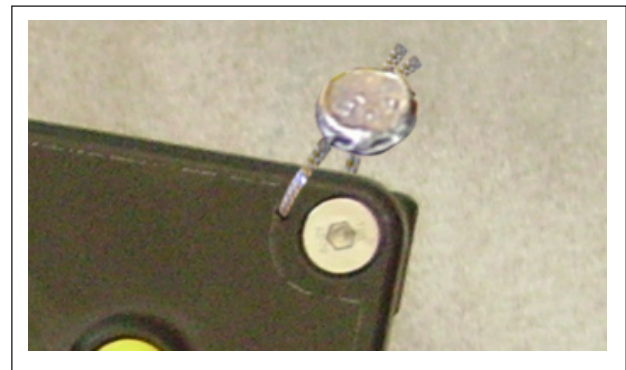


When the 100% crane maximum performance is reached, some movements are automatically blocked, and only load approaching to the crane column is allowed.

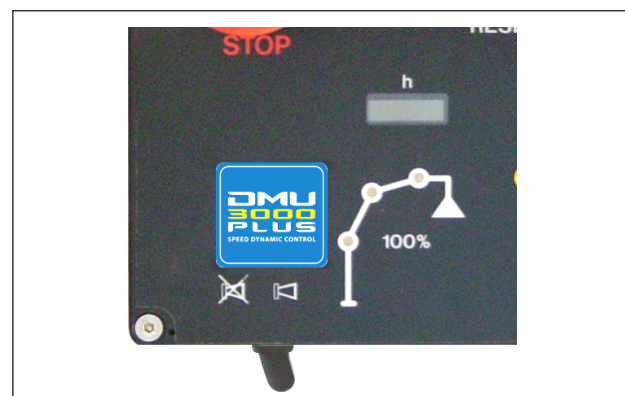
On the control panels located next to crane manual controls, the cylinder which activated the stop of some manoeuvres is pointed out. This helpful indication enables to use the crane at maximum performances of all structural components. The device engagement does not permit the operator to make those movements with the crane, which could bring away the load from the crane base. This particular manoeuvre would subsequently increase the crane load at the base.



Note *The electronic parts of the overload limiter are located in the rear side of the main control panel: an applied seal with the EFFER mark must be visible on a panel side, otherwise the product warranty is void.*



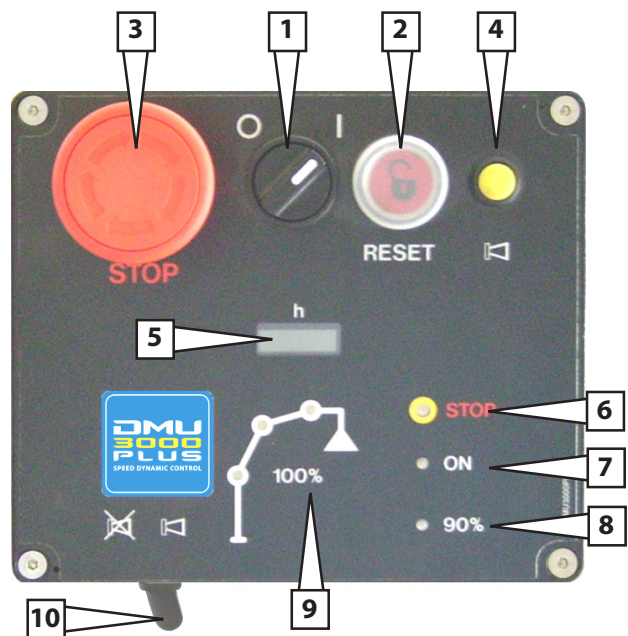
Note *On the lower part of the DMU electrical box there is a switch that can be used to limit the acoustic alarm functioning time to 5 seconds. We emphasise that this CAN NOT be used whilst using crane with the radio control.*



2 - Description of control panel functions

2.1 Main panel

- 1 - main switch
- 2 - reset push-button
- 3 - emergency stop push-button
- 4 - acoustic alarm
- 5 - hours-counter
- 6 - warning lamp to indicate "pushed emergency stop"
- 7 - warning lamp to indicate "device turned on"
- 8 - warning lamp to indicate reaching of "90% max. performance"
- 9 - warning lamps to indicate "lifting cylinder at max. performances (100%)"
- 10 - on/off acoustic switch

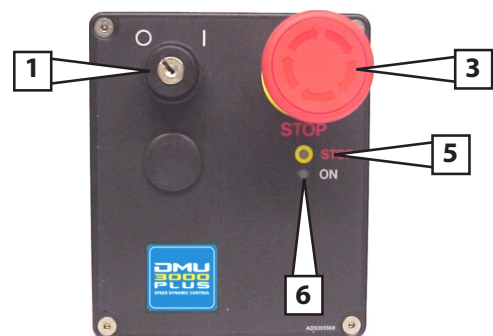
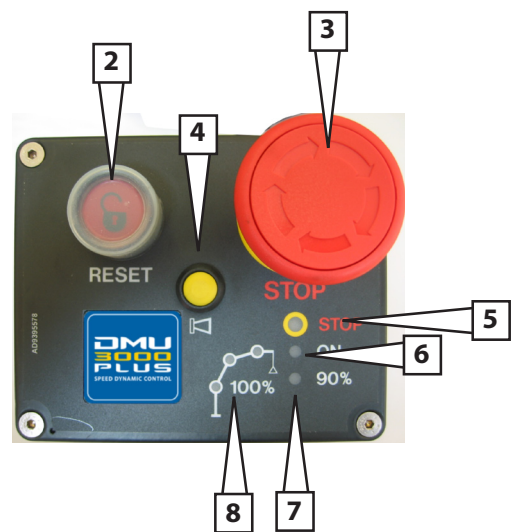


2.2 Additional panel

Based on the crane version, the available additional control panel may be one of the two types shown here below.

The description of the single function is available here below:

- 1 - main switch
- 2 - reset push-button
- 3 - emergency stop push-button
- 4 - acoustic alarm
- 5 - warning lamp to indicate "pushed emergency stop"
- 6 - warning lamp to indicate "device turned on"
- 7 - warning lamp to indicate reaching of "90% max. performance"
- 8 - warning lamps to indicate "lifting cylinder at max. performances (100%)"

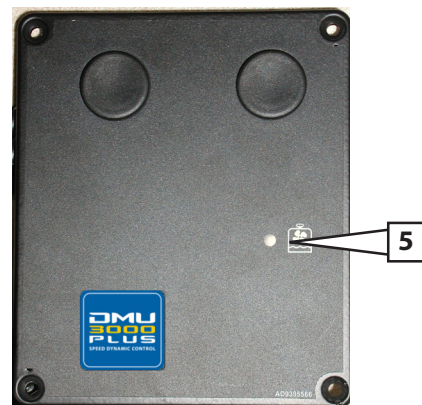
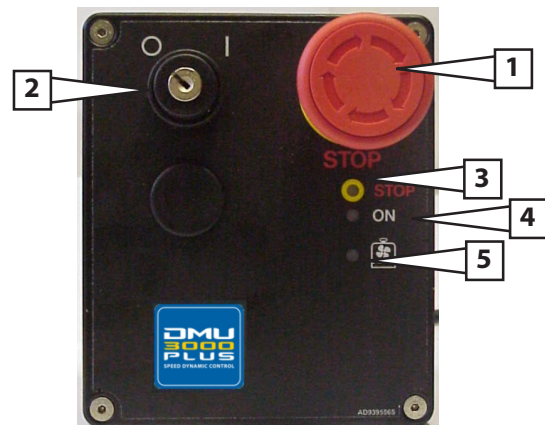


2.3 Optional panels

Other panels may be available on the crane, according to the technical requirements of the different crane models, and to the type of required accessories. They are named: optional panels.

The single functions are shortly described as follows:

- 1 - emergency stop push-button
- 2 - main switch
- 3 - warning lamp to indicate "pushed emergency stop"
- 4 - warning lamp to indicate "device turned on"
- 5- warning lamp to indicate "activated oil cooler"

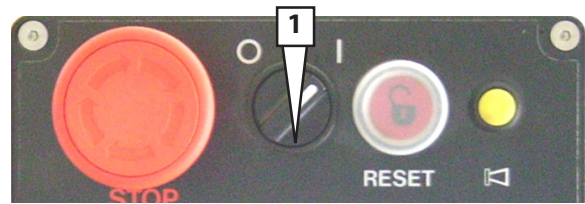


3 - Start of DMU3000 PLUS device

After setting up the lorry as shown in the crane user manual, in order to start the device you must:

- ▶ TURN THE MAIN SWITCH

by moving the switch (1) into "I" position, the device is electrically engaged



- ▶ CHECK THAT THE "STOP" WARNING LAMP SHALL NOT TURNED ON

if the warning lamp (6) is on, one or more emergency stop push-buttons (3) is/are pushed to release it, turn the push-button clockwise.

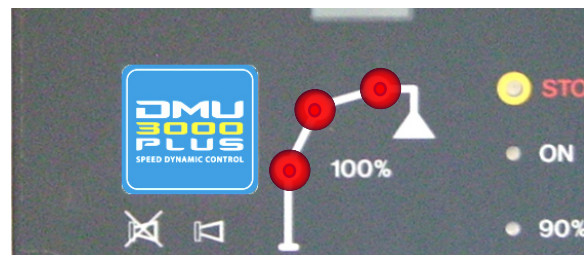


THE DEVICE IS UNDER AUTO-DIAGNOSTIC PHASE

Once control is finished, the warning lamps at side and the acoustic alarm operate for one second, in case of positive result

- ▶ CHECK THAT THE GREEN "ON" WARNING LAMP IS LIGHTING

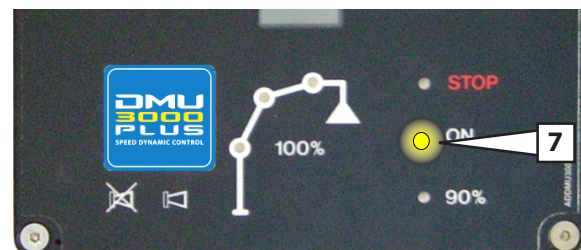
if the warning lamp (7) is lighting, the first start phase gave a positive result. Otherwise, re-check all above stated points or a fault is present.



Start-up for using the crane via the distributor lever:

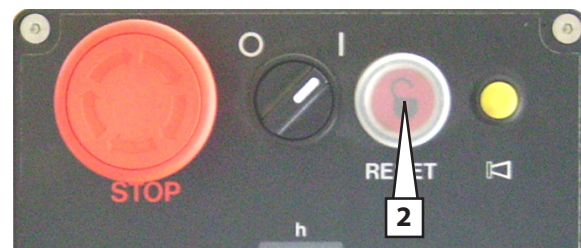
- ▶ PUSH THE "RESET" PUSH-BUTTON WHILE FLASHING

after a few seconds of fix light, the push-button (2) starts to flash slowly. Then, after pushing, it switches off to show that the start phase is over.



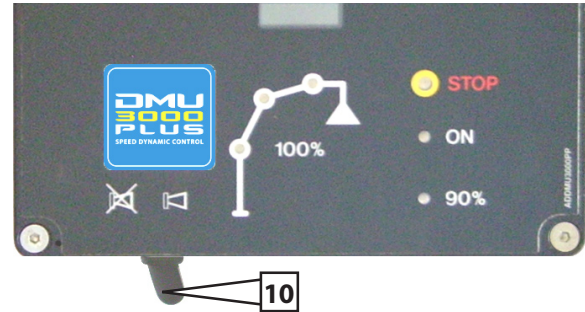
Start-up for using the crane via the radio control:

- ▶ PRESS THE RESET BUTTON ON THE PUSH-BUTTON PANEL: the DMU will emit a brief sound that indicates that the start-up phase is complete. This operation must be carried out after electronically activating the radio control and the transmitter.



CHOICE OF ACOUSTIC ALARM

▶ USING THE SWITCH (10) allows you to select an acoustic alarm signal that can either be continuous (will only stop once the alarm situation is over) or timed (stops after 5 seconds after the beginning of the alarm situation). Selecting the type of acoustic signal is carried out by using the selector switch placed in the lower part of the main panel.



CAUTION

In case crane drive is achieved by a remote control, the selected acoustic alarm shall be continuous only (EN 12999 A1-A2 standard).

Note *Whilst working a safety function is automatically active, an acoustic signal intervenes as usual and the light, which corresponds with safety function that intervened, will switch on.*

3.1 Device functioning check

The standard rule ref. UNI EN 12999 A1-A2, according to the standard ref. UNI EN 12644-1 states that the operator is compelled to check the correct condition and operation of the safety devices before EACH WORK CYCLE.



At each work cycle, before starting the crane, perform the following checks:

HOW TO CARRY OUT CHECKS

A → Limiter and load indicator of standard crane and jib:

With the crane without load, make the 1st boom cylinder reach the up limit stop. The control bank lever must be activated, and acoustic alarms and warning lamps must operate before reaching the 90% of crane max. lifting capacity and then, the 100% of crane max. lifting capacity.

With the jib without load, moves the 2nd boom below the horizontal line, switch on and off the DMU, push the RESET button, and within 60 seconds since have pressed the RESET button and activated the crane, perform an opening manoeuvre of the jib up to the limit stop. On reaching 100%, outgoing movement of the basic crane and additional joint (if present) extensions, must not be allowed.

B → Load limiter in derated area:

with the crane without load, set in no-derated work area, make the 1st boom cylinder reach slowly the up limit stop. After activation of acoustic alarms and warning lamps because the 100% crane max. lifting capacity was reached, the crane must not be able to enter the derated area.

C → Position limiter (joint and second boom inclination):

Make sure that an acoustic signal (beep) is emitted when the joint aligns with the second boom.

Make sure that a double acoustic signal (beep-beep) is emitted when the second boom exceeds the 30°-angle over the horizontal line.

D → With the crane without load, perform a rise manoeuvre of the jib boom up to the limit stop position, then perform a rise manoeuvre of the 1st boom or of the 2nd boom. The position limiter device shall block the crane as soon as the supplementary fly-jib reaches a 50° angle respect to the horizontal line.

Whilst keeping all extensions withdrawn, align the first boom, second boom and crane joint, and carry out an ascending manoeuvre with the first boom. The position limiter device must block the crane in a way that almost forms an 85° angle of the aligned arms and the horizontal.

E → Emergency devices: press one mushroom shaped emergency button at a time from each control placement. The crane should not move if any of the mushroom-shaped emergency buttons are pressed (active).

F → Winch safety devices (winch optional):

With the crane empty, carry out a winch cable ascent limit stop manoeuvre. The winch ascent movement needs to be blocked prior to any kind of collision between the hook and pulley.

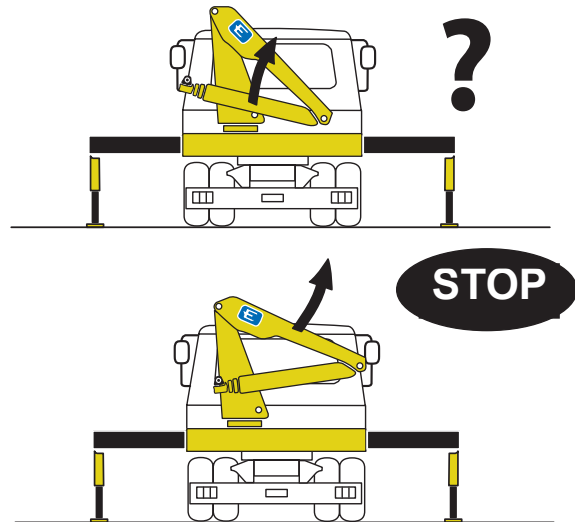
With the crane without load, perform a downward manoeuvre. The downward movement must stop at least with three winded rope turns.

Note *The standard rules above mentioned require to carry out the checks A, B, C, E, before each working cycle.*

4 - Moving the crane

4.1 Crane opening in safety

As described in the User Manual, a correct manoeuvre to open the crane shall start with a closure manoeuvre performed by the 2nd boom cylinder: in that way, the hydraulic oil in the front side of the cylinder will reach the correct pressure, allowing the 2nd boom to rest firmly in its position after its removal from the support on the column. It can be easily foreseen that a sudden movement of the 2nd boom unit downwards, during crane opening, will damage the crane seriously.



On some crane models supplied with pressure transducer fitted also on the 2nd boom hydraulic cylinder, a function provided by the DMU3000 PLUS device allows to stop crane movements when crane opening started without a closure manoeuvre of the 2nd boom cylinder.

In order to restore crane movements stopped by the intervention of this working block, select a closure manoeuvre of the 2nd boom cylinder.

Note **All cranes are delivered with this function OFF. In order to activate this function, contact EFFER service center, in order to set the DMU3000 PLUS by the proper software.**

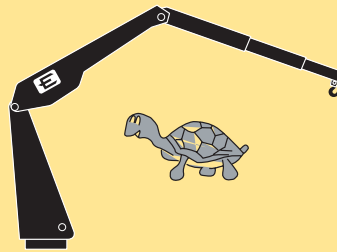
4.2 Crane operation

The **DMU3000 PLUS** overload limiter, at its start, automatically blocks the crane movements that move the load away from the crane column. Therefore, before moving loads, see the crane load diagram in order to avoid interrupting the required manoeuvres.

The following operative conditions may be faced:

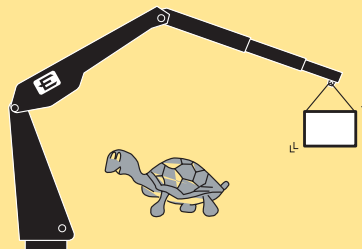
➔ even if there is no load applied on the hook, the crane will slow down a number of movements:

- ▶ The crane has a geometric configuration, therefore, automatic slowing down functions have been applied
- See the chapter relative to "start of functioning" in order to understand automatic slowing down of crane movements.



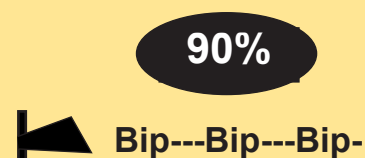
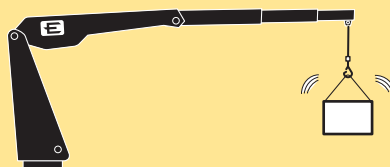
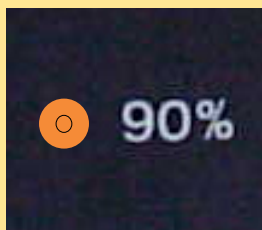
➔ with a load applied to the hook, the crane slows down a number of movements

- ▶ Movement of the load applied to the hook requires a pressure value that slightly exceeds the maximum allowed pressure for working the crane, therefore, automatic slowing down function mode takes place.
- See the chapter relative to "start of functioning" in order to understand automatic slowing down of crane movements.



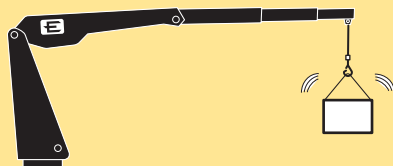
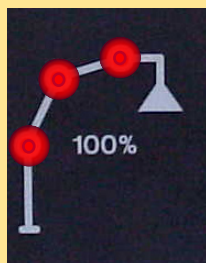
➔ 90% of max. lifting capacity is reached

- ▶ the yellow warning lamp is on, and an acoustic slow intermittent signal is audible: however, the crane may be operated.



➔ 100% of max. cylinder capacity is reached

- the red warning lamp relevant to the cylinder reaching the max. capacity is on, an acoustic quick intermittent signal is audible. The load may be only brought near to crane base.



CAUTION

A) it is always possible to bring the load close to crane base: the pressure inside the cylinders goes down and all movements are automatically restored.

CAUTION

B) it is possible to lower both crane arms when the 2nd boom is positioned under horizontal and, in some cases, even when it is over the horizontal but within an angle of 30°. (The latter movement is only possible if the 100% applied maximum load peak is exceeded by a small amount).

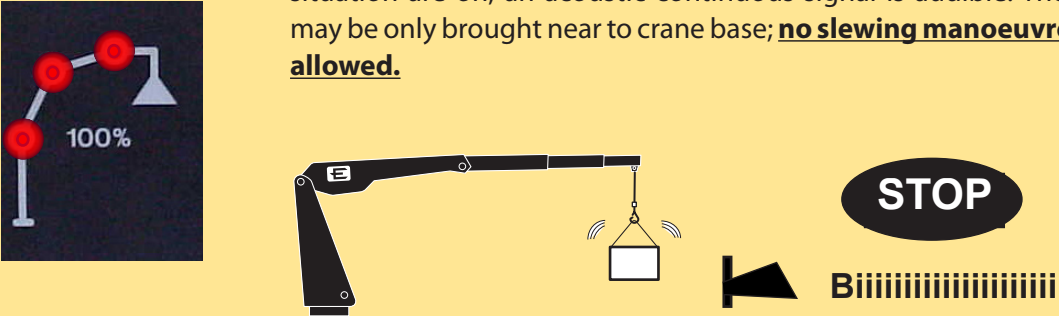
CAUTION

C) it is still possible to carry out rotation manoeuvres, as long as you do not wish to enter in a downgraded performance area with the crane rotation.

CAUTION

D) the intervention of the safety device DMU3000 PLUS (especially with the crane in horizontal configuration) can be affected by load oscillations and operating speeds: an improper operation can be easily reset executing a fast manoeuvre with the lever corresponding to standard machine extension, in the direction of re-enter. The erasure of an eventual improper operation depends on the shifts of the lever in the correct direction: no movements of hydraulic extensions are necessary. This procedure can be repeated 5 times at the most.

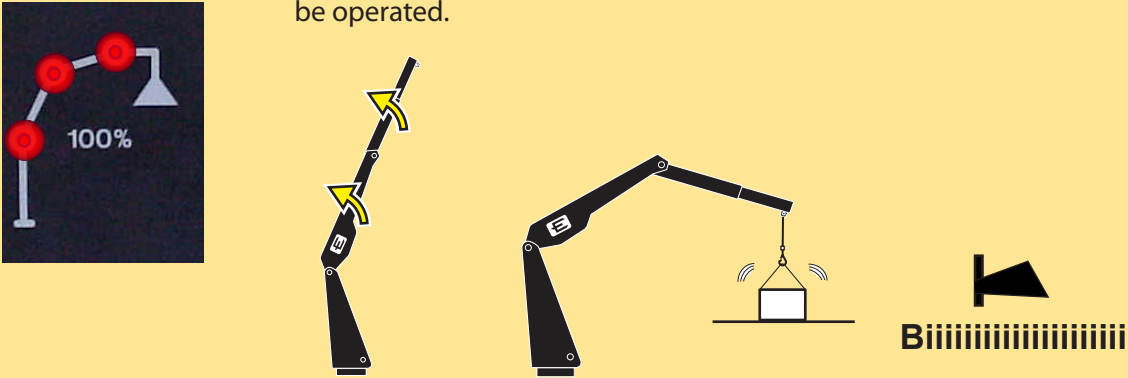
➔ The max. emergency limit is reached because of sudden operative stops or big load oscillations.



The red warning lamps relevant to cylinders showing dangerous situation are on, an acoustic continuous signal is audible. The load may be only brought near to crane base; **no slewing manoeuvres are allowed.**

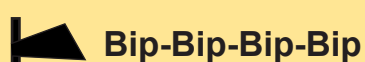
➔ The max. emergency limit is reached because of:

- sharp end stroke opening of cylinder (even without any load hanged on the hook);
- weight higher than crane capacity hanged on the hook and trial of lifting it quickly.



The red warning lamps relevant to cylinders showing dangerous situation are on, an acoustic continuous signal is audible. The crane can not be operated.

Pressing the "RESET" button on the DMU 3000 PLUS panel or on the radio control transmitter, will make the "RESET" button on the DMU flash for 10 seconds, within which it is possible to carry out a brief descent movement in order to free the crane from the stop position (except for extension outgoing manoeuvres). The amount of time allowed for the manoeuvre depends on the position of the second boom: three seconds if the boom is positioned with an angle that is less than 30° and two seconds if the angle is greater than 30°. This operation can be carried out a maximum of 5 times, or until the maximum allowed limit is reached. You must wait for 30 seconds between one manoeuvre and another. Even though the acoustic block signal stops it may not be possible to note that the boom has lowered.



Note *When the load limiter starts to work, it is recommended to carry out a "check pressure" operation by moving the lever of the extension on the re-entry side, with a series of quick movements (the device reacts to a maximum of 5 movements). In this way, possible memorization of incorrect pressure is deleted.*

4.3 Stand-by

If, during the job, no controlbank lever has been operated for over 30 minutes, the DMU3000 is in STAND-BY position and the warning lamp shown in the picture starts to flash (two flashes alternated by a pause).

To start manoeuvring the crane, two different procedures are available, depending on the use:

- use of the crane in manual mode, by the controlbank levers: a whole start-up procedure shall be launched, by switching on the main switch.
- use of the crane via radio control: press the emergency stop button on the radio control transmitter, then release the button and connect the radio signal to the receiver, by pushing the RESET button.



5 - Connection of supplementary fly-jib, winch and rotator/grab

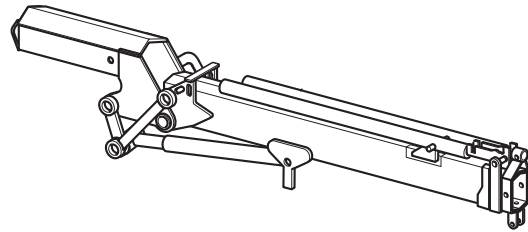
5.1 Hydraulic supplementary fly-jib

The following notes are helpful to fly-jib use on those crane models, where the DMU3000 PLUS electronic device is available.

- fly-jib work is assimilable to the one of crane 2nd boom.

- fly-jib is hydraulically activated through connection of four quick couplings.

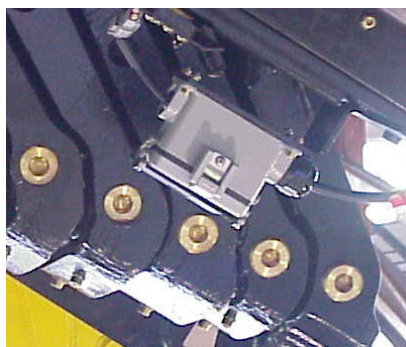
- an electric connector is located close to the hydraulic quick couplings. The electric activation of the fly-jib occurs when such connector is fitted.



Note *Without any electric connection, the fly-jib may not be operated.*

Electric connection:

The electric connection is carried out by connecting the plug present where the basic machine and additional joint join together.



5.2 Winch

The electric cable of the winch rope limit switch must be connected to the cable indicated by the arrow, if the return pulley is applied to the last hydraulic extension of the standard crane.

In case the winch rope limit switch is applied to the supplementary jib tip, instead of the plug with electric by-pass function - **INDISPENSABLE TO OPERATE THE STANDARD CRANE** - a simple cap protecting the electric contact must be fitted.



Note *If the articulation is not used, the mobile metal connector must be fixed to an attachment arranged on the articulation itself, so as to protect the electric connections.*

5.3 Use of equipment

► Rotor / Bucket

A piece of equipment where a rotor/bucket can be applied to the crane (this match must previously be certified by an EFFER authorised centre) or to the edge of the basic crane as an alternative to using the additional hydraulic joint. It can also be joined to the edge of the basic crane if it is equipped with two opportunely pre-prepared additional controls.



► Use as an alternative to the additional joint

The pipes relative for working the hydraulic rotor and bucket need to be connected to the two hydraulic controls relative for working the additional joint jack and the additional extension. On the edge of the last extension of the basic crane there is an electric connector for electric connecting the additional joint. A "by-pass key", indispensable for hydraulic activation of the two function modes, needs to be applied to this connector.

► Use via two controls

Piping relative to hydraulic rotor and bucket functioning, needs to be connected to the two opportunely pre-prepared hydraulic controls.

► Hydraulic activation

In both cases, as well as what is described above, the ROTOR/BUCKET function mode needs to be activated, as it automatically downgrades crane performance to the equivalent of 12%. This downgrade is set by EFFER in order to limit the mechanical stresses on the crane, caused by working with the bucket. This is done through a pre-established sequence of movements of the lever dedicated to the bucket function (lever that originally operates the supplementary extension). The lever is to be pushed up twice and pushed down once within 2 seconds. This sequence is denominated "bucket PIN". When the sequence has been completed, you will hear an acoustic indication to confirm that the bucket is enabled.



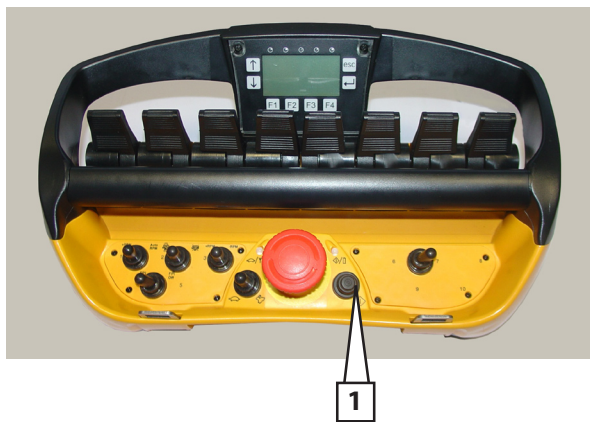
Such enabling can be performed by radiocontrol too, and it is necessary to repeat the sequence at each **DMU3000 PLUS** start.

6 - Additional instructions

The following additional instructions respect to the operator's manual are useful to understand better the operation of the crane.

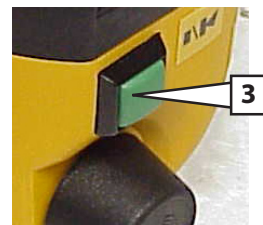
6.1 Use of Radio remote type "SCANRECO"

Push button "1" of the push button control panel of the radio controller acts as the acoustic indicator of the **DMU3000 PLUS** device and, simultaneously, as the RESET function.



6.2 Use of Radio remote type "HETRONIC-QUES"

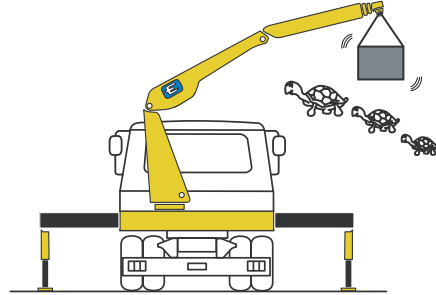
On the transmitter, the push-button "3" serves like acoustic alarm for **DMU3000 PLUS** device and, at the same time, like RESET function.



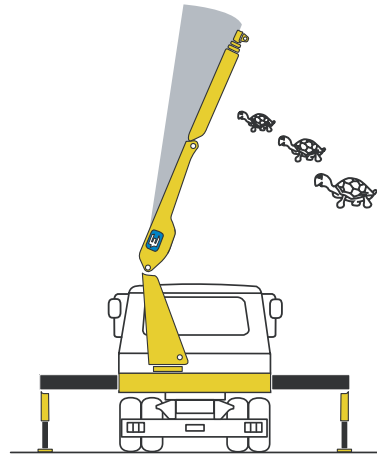
6.3 AUTOMATIC SLOW DOWN

We feel it is useful to expand further on crane "automatic slowing down".

This function automatically slows down the crane movements if certain geometric configurations are reached and if the load applied to the hook creates a certain pressure inside the movement cylinders. This pressure is relatively close to the pressure value that starts to work the load limiter.



Without doubt, working a crane that has "automatic slowing down" is certainly easier to use for the operator. When it starts to work, even moving the crane with various movements at the same time leads to a hook speed that does not correspond to the mathematical sums of each movement, but it has a maximum level set by EFFER, a level we feel, after many years of research, is the correct compromise between crane performance and operational safety.



Working out data relative to "automatic slowing

down" is carried out by the **DMU 3000 PLUS**: the DMU electronic program is in constant contact with the radio control thanks to the use of a CAN-BUS system, and this allows the operator to move the crane within the determined maximum performance speed values.

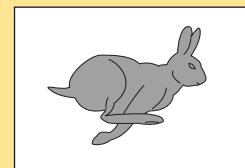
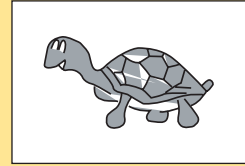
CAUTION

The crane automatically increases speed when the conditions that set-off the "automatic slowing down" cease.

6.3.1 AUTOMATIC SLOWING DOWN: geometric configuration of the crane

Now follows some working conditions for which maximum attention is required by the operator:

- when the boom of a crane is completely vertical, an increase of the hook speed, caused by varying the hubs, is normal: the operator must intervene progressively reducing the setting of the speed to avoid structural jolts caused by having reached maximum vertical position or, even worst, violent interferences between the load and the crane structure.
- starting from maximum verticality and then carrying out a fast descent is dangerous: the load may have large jolts compromising the stability or, even worst, the fastening of the hook of the crane.
- needless to say that, even a fast crane rotation manoeuvre, carried out with the whole structure extended vertically, will cause lateral disorientation of the hook or, even worst, of the load, difficult to control.
- with the whole crane structure vertically extended, even the slightest movement of the extensions is a manoeuvre which requires careful attention by the operator, as at most times the hook is at a considerable distance from the ground.



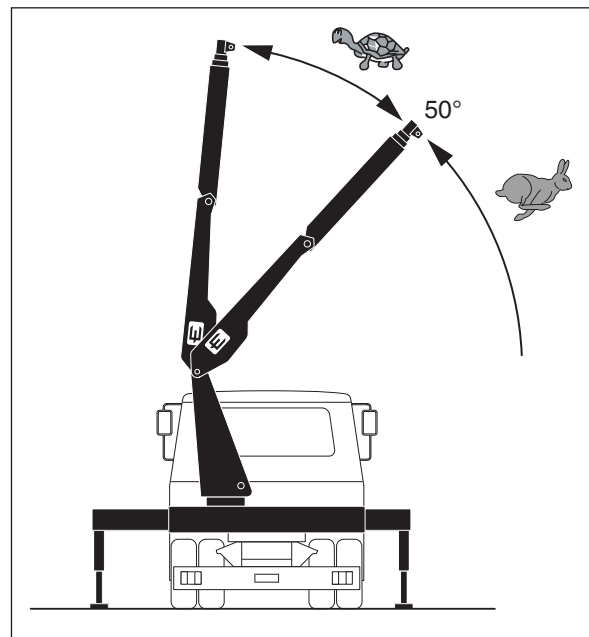
The DMU 3000 PLUS, in automatic, limits the maximum speed admitted according to the geometric configuration of the crane, by distinguishing the ascent and descent movements, and also depending on the presence of an eventual supplementary joint.

► WORKING ONLY WITH THE BASIC CRANE:

The basic crane has a maximum operational speed until it reaches a vertical angle of the second boom of about 50°.

- From 50° to the maximum verticality, there are 4 progressive speed reduction STEPS, which correspond with the reaching of determined vertical angles of the second boom. Operative speed reduction intervenes for the following movements:

- Boom ascent
- Boom descent
- Crane rotation
- Extension return (only once the 4th step has been reached)



Here is some data that could help perceive the slowing down of the crane:

SECTION A: maximum rotation speed has a small limit

SECTION B: small limit to the maximum speed of the following movements:

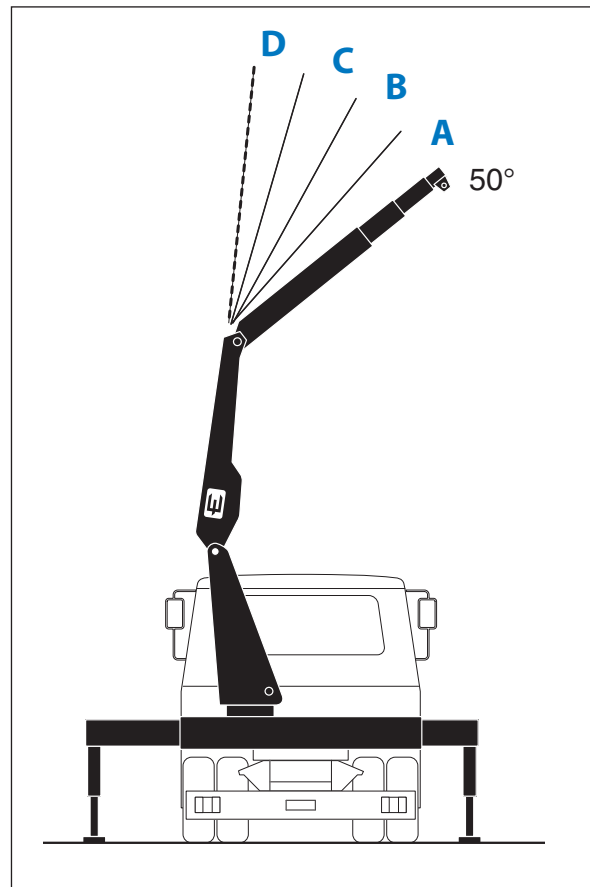
- first ascending boom
- second ascending boom
- rotation (further small limit to the maximum speed)

SECTION C: small limit to the maximum speed of the following movements:

- ascent of first boom
- descent of first boom
- ascent of second boom
- descent of second boom
- rotation (further small limit to the maximum speed)

SECTION D: another limit to the maximum speed of the following movements:

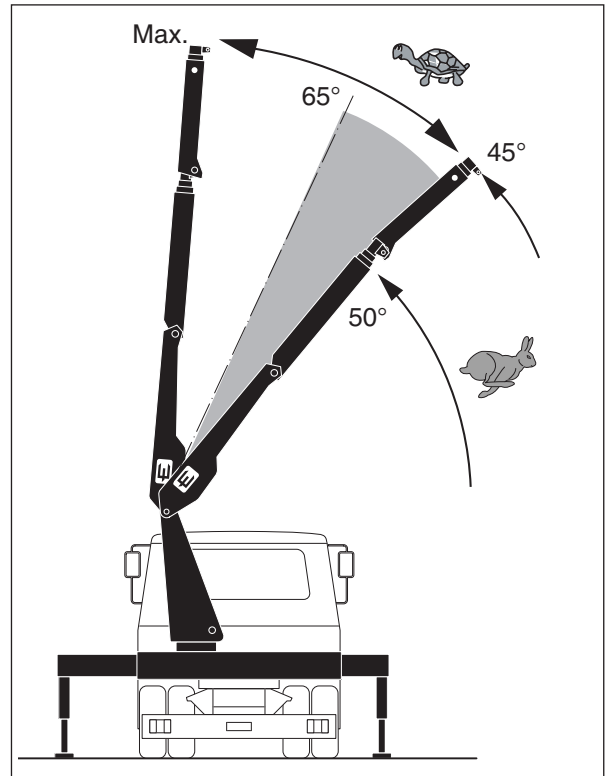
- ascent of first boom
- descent of first boom
- ascent of second boom
- descent of second boom
- rotation (further small limit to the maximum speed)
- Extension return



Note *On varying the various operative sections, the hydraulic distributor lever, automatically and progressively / proportionally, changes position. The speed of the crane point remains almost unchanged, as the slowing down compensates the increase of speed that derives from the reduction of the geometric hubs. As a result, the crane movement unquestionably results as being safer.*

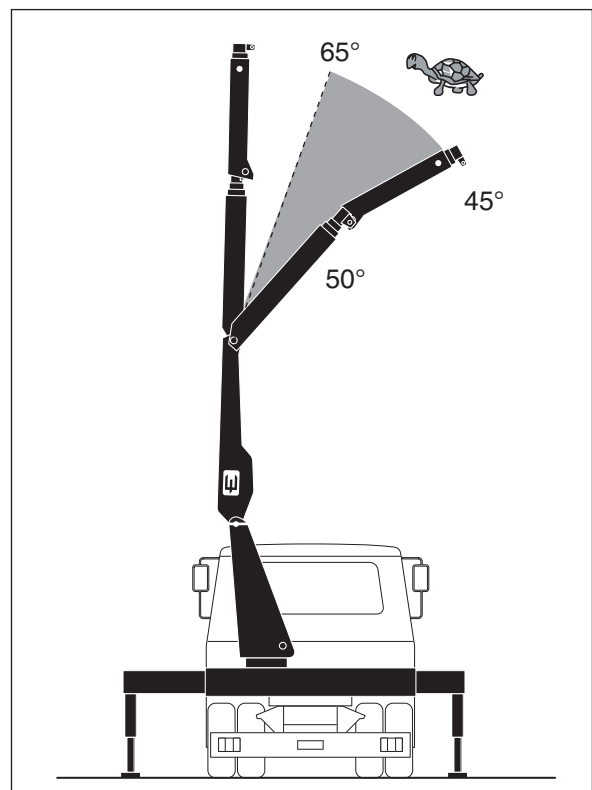
▶ WORKING WITH THE ADDITIONAL JOINT:

- the basic crane and the additional joint have a maximum operational speed if the second boom of the basic crane is in a position where it does not exceed the vertical angle by about 50° , and the additional joint does not exceed the vertical angle by about 45° .



- Positioning the arms of the crane over the above described operational area, obtains a progressive reduction of the maximum operational speed, as shown below:

- a small reduction of the maximum speed of the joint movement, when the second crane boom is positioned vertically between 50° and 65° , and the additional joint is positioned at an vertical angle greater than 45°

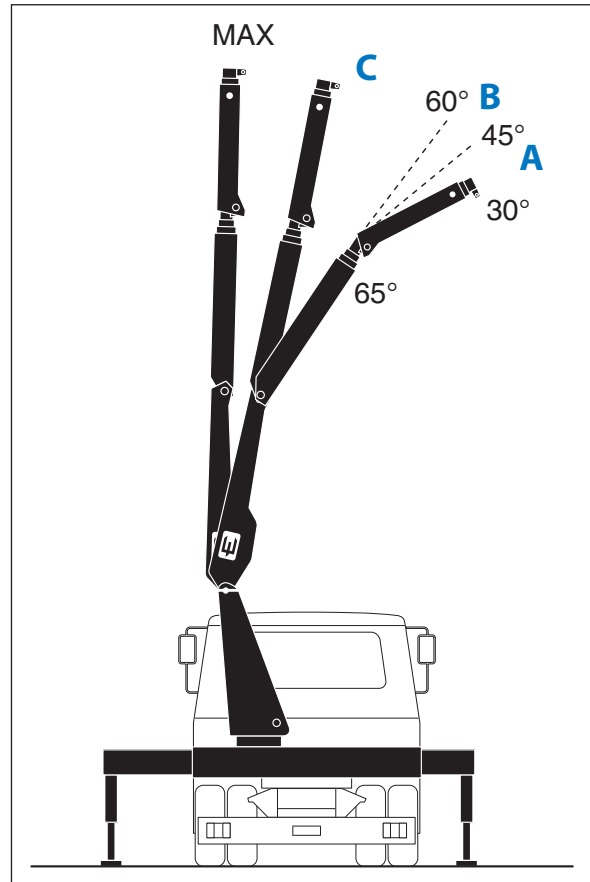


- **WITH THE SECOND Boom OF THE CRANE POSITIONED MORE THAN 65°:**

SECTION A: a further limit to the joint movement speed, in ascent, and to the crane rotation speed

SECTION B: a further limit to the joint movement speed, both for ascent and descent, and to the crane rotation speed.

SECTION C: a further limit to the joint movement speed, both for ascent and descent, and to the crane rotation speed.



Note

On varying the various operative sections, the hydraulic distributor lever, automatically and progressively / proportionally, changes position.

The speed of the crane point, remains almost uniform as the slowing down compensates the increase of speed that derives from the reduction of the geometric hubs.

As a result, the crane movement unquestionably results as being safer.

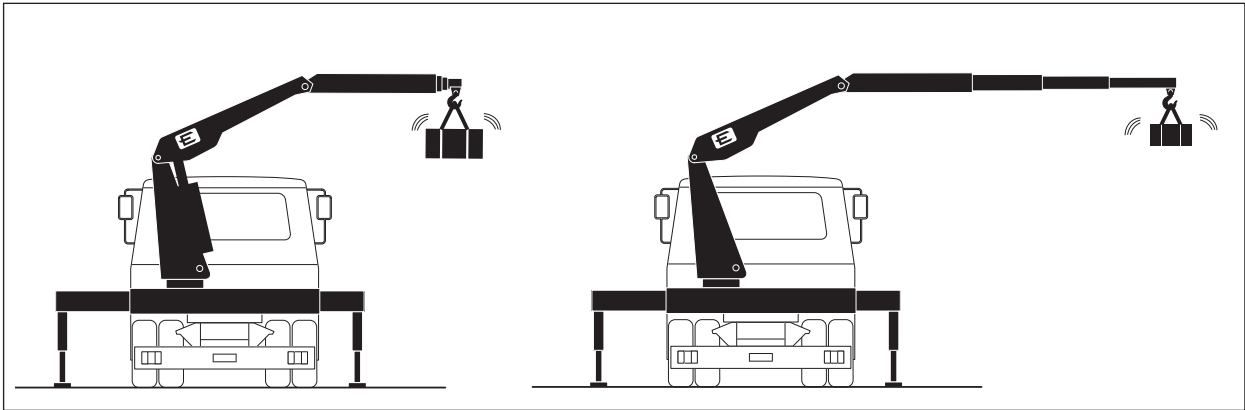
Note

The slowing down values, relative to working with the additional joint, are added to those specific to the basic crane.

6.3.2 AUTOMATIC SLOWING DOWN: load applied to the hook

When a load is applied to the hook of a crane, pressure increases inside the hydraulic cylinders that move the arms:

- the more the load has a weight close to the maximum lifting capacity of the crane, the more the pressure value is close to the maximum pressure value admitted (value corresponds to the intervention of the load limiter).



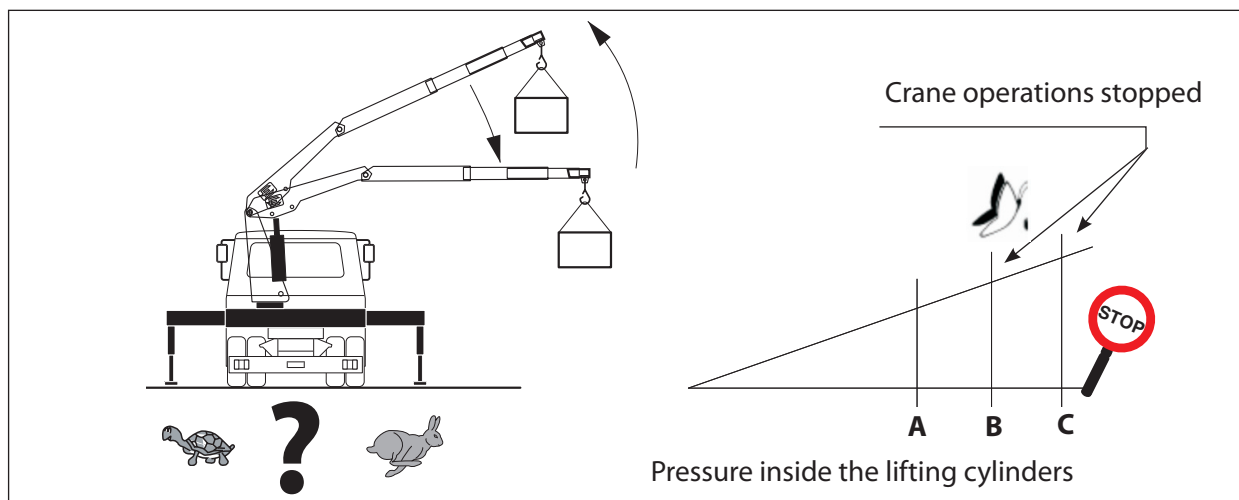
- the more the lifted load is moved away from the column, the more the pressure value nears the maximum admitted pressure value (value corresponds to the intervention of the load limiter).

Swinging the load, just like the crane movement speed, causes temporary increases in the pressure value, that is, subjecting the crane structure to brief (but damaging) temporary increases of stresses, also creating the conditions that trigger the load limiter.

In order to make the most of the crane structure, in terms of moving large loads, it is indispensable to reduce this phenomenon to a minimum.

Therefore, the **DMU 3000 PLUS** has the task of reducing the operational speed when the crane performances almost reach the maximum admitted values.

Note *The DMU 3000 PLUS, when in automatic, limits the maximum allowed speeds for both the boom movements and crane rotation manoeuvring once certain crane load conditions are reached. This automatism of the speed variation differs depending on whether an ascent or descent the load is being carried out.*



Crane with F.P.I. system

- A = 80% pressure STARTS TO SLOW DOWN
- B = 90% pressure SLOWING DOWN IS QUICKER
- C = 100% pressure CRANE OPERATIONS STOPPED

Crane without F.P.I. system

- A = 90% pressure STARTS TO SLOW DOWN
- B = 100% pressure CRANE OPERATIONS STOPPED

On cranes that do not have the F.P.I. device, the progressive reduction of speed starts to reach the pressure value equal to 90% of the maximum allowed pressure, and there are 7 progressive speed reduction steps.

On cranes that have the F.P.I. device, the progressive reduction of speed starts to reach the pressure value equal to 80% of the maximum allowed pressure, and there are 11 progressive speed reduction steps.

1st Note Reaching both 90% and 100% of the maximum allowed pressure value, sets-off acoustic and visual indications.

2nd Note When the last speed step starts to function, the crane has a maximum possible speed of approx. 20% of the maximum movement speed that is not subjected to slowing down.

Conclusion

From what is described in points 1 and 2, the crane, whilst working, has an automatic progressive reduction of speed when the arms of the crane are positioned in a number of geometric configurations, which are considered critical in order for the operator to control the crane. Another progressive automatic reduction of the speed is obtained when, whilst working, the value of the pressure inside the lifting cylinders reaches a determined value.

Please note that the slowing down of a higher value prevails over the slowing down of a lower value.

IF THE OPERATOR SETS A SPEED VALUE, GREATER THAN WHAT IS ALLOWED BY THE DMU 3000 PLUS, ON THE RADIO CONTROL MANIPULATOR, DEPENDING ON THE DATA DETECTED BY THE SYSTEM, this will lead to progressive increase of the operational speeds, when:

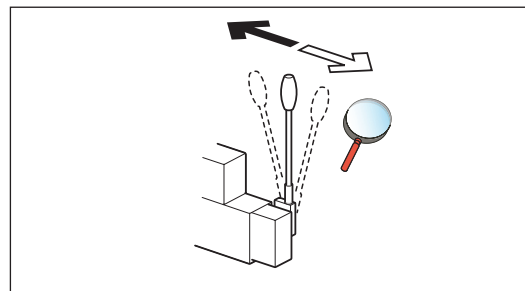
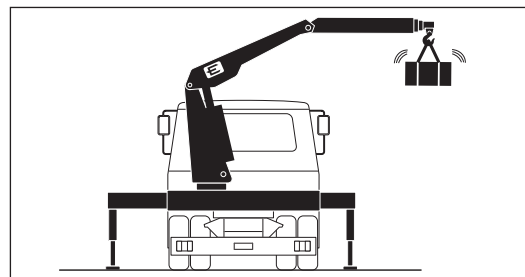
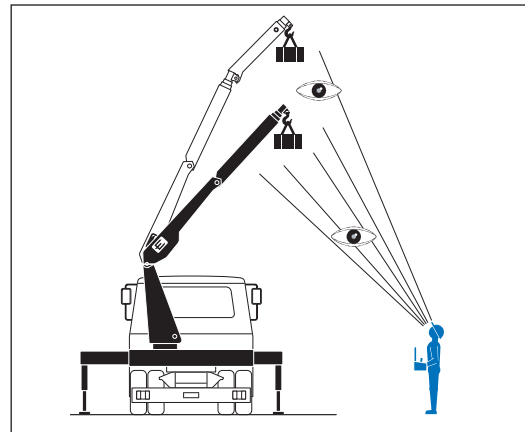
- critical areas are left whilst working
- conditions are created that allow the pressure value inside the lifting cylinders to decrease.

CAUTION

In order to operate safely, it is indispensable to visually check the speed of the hook.

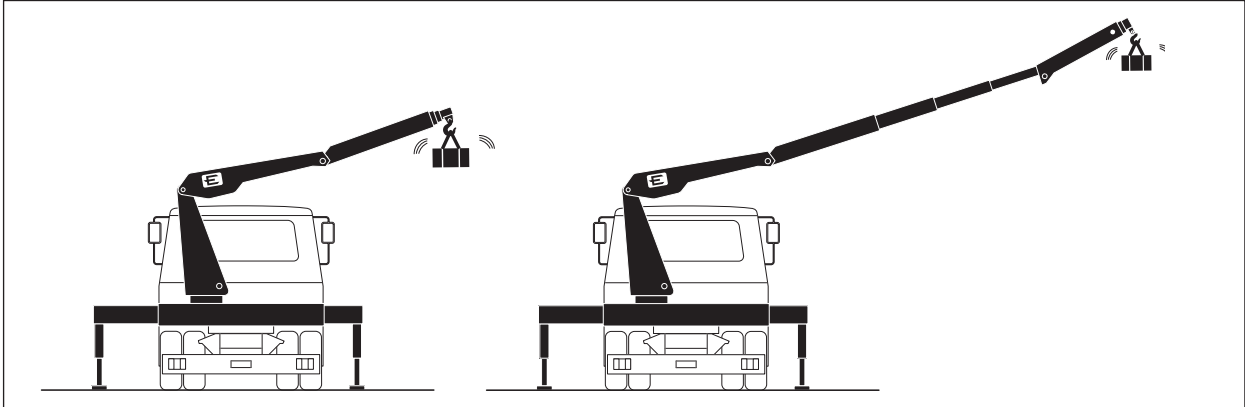
Note *The indications relative to the speed variations are sent from the DMU to the RADIO CONTROL through a CAN-BUS communication. The latter controls/modifies the lever position of the hydraulic distributor, varying the oil quantity that feeds the hydraulic cylinders. Varying the distributor lever position varies the crane operational speed.*

Note *When one or more crane boom movements are carried out at the same time in the same direction, the DMU 3000 PLUS, automatically, elaborates the parameters set by the operator to contain the speed increase of the hook. Otherwise, there would be an increase in the hook speed, which reduces operational safety.*



6.4 "MAXIMUM Boom ELEVATION" control (inclination)

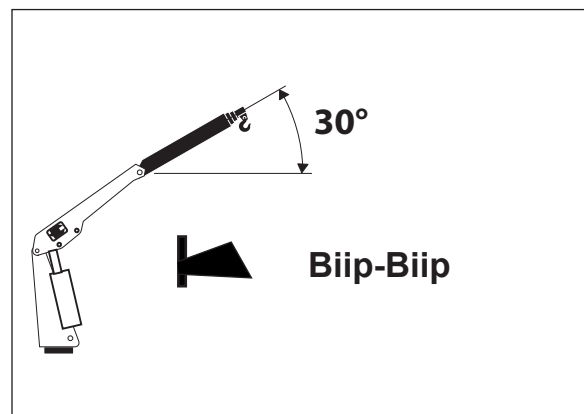
As a feature, recently designed cranes, have second boom and additional joint hydraulic movement that allows you to exceed the horizontal alignment.



► Second boom inclination control

The second boom can incline like the first boom. The movement of the second boom from a 30° angle is signalled by 2 fast BEEPS; we remind you that manoeuvres prevented by the intervention of the load limiter, vary according to the angle of the second boom.

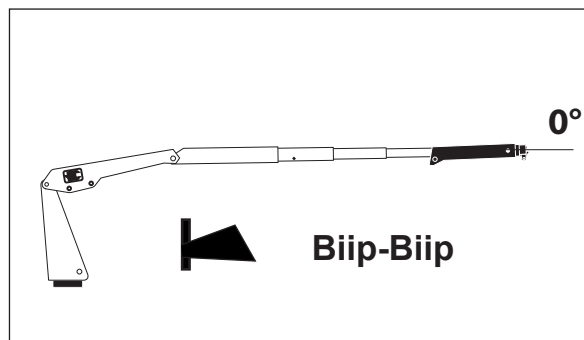
If the second inclined boom is used to carry out maximum opening movement of the first boom, the electronic system blocks the ascending movement once the second boom reaches a verticality of 85° (maximum verticality)



► Joint inclination control

The additional joint can incline like the second boom. The movement of the boom joint when beginning in-line with the second boom is signalled by 1 BEEP, for both opening and closing movements.

If the inclined additional joint is used to carry out the maximum vertical movement with the basic crane arms, the electronic system blocks the ascending movements once the additional joint reaches the verticality of 50° (maximum allowed verticality in configuration with the inclined joint).



ascending movements once the additional joint reaches the verticality of 50° (maximum allowed verticality in configuration with the inclined joint).

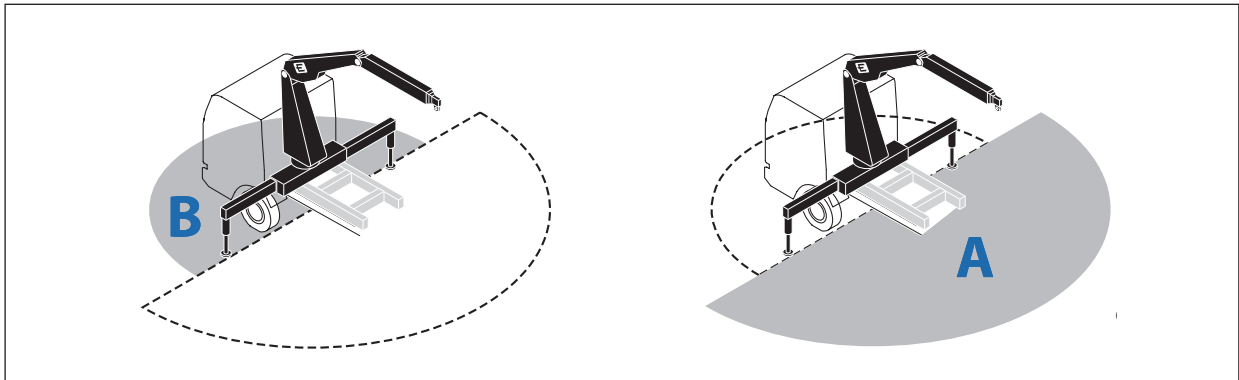
Note *The configuration of the basic crane when it is completely vertical is only possible if the the additional joint is not in inclined configuration.*

7 - Additional functions/optional

The **DMU3000 PLUS** device offers additional safety indications, as described in the following chapters.

7.1 Work in front area, automatic decreasing of crane performances

When working with the crane in front area, the device automatically decreases crane performances to guarantee truck stability, according to specific load chart.



Passing from work area A to work area B, or viceversa, the DMU PLUS emits a BIP for two seconds.

7.2 Work stops with winch use

When using the winch, an acoustic alarm can be heard, indicating that some operations conditions have been reached.

► **fast intermittent acoustic signal:**

- when the maximum load admitted is detected on the winch (100% of the load admitted). This alarm stops all crane movements, with the exception of the lowering movement of the cable and retracting movement of the extensions of the base machine and supplementary articulation.
- when the cable lifting limit switch trips. This alarm stops all crane movements with the exception of the cable lowering movement and retracting movement of the extensions of the base machine and supplementary articulation.
- when the cable lowering limit switch trips. This alarm only stops the lowering movement of the cable.



► Slow intermittent acoustic signal

This signal triggers when 90% of the maximum load admitted on the winch is detected. This alarm does not stop any crane movement.

7.3 Clogged filter indication

The crane is equipped with a device indicating that filter cartridge applied on the piping that sends the oil of the pump to the hydraulic system of the crane, is clogged. If the filter cartridge is clog, after 30 working minutes (considered as "time of lever acting"), an acoustic alarm consisting of repeated series of four Bip, sounds for two minutes.

This acoust signal occurs is given each time the **DMU3000 PLUS** is turned on.



◀ **Biip-Biip-Biip**

◀ **Bip-Bip-Bip-Bip
Bip-Bip-Bip-Bip
Bip-Bip-Bip-Bip**



Note *The alarm resets after replacing the filter cartridge, but only after 30 minutes of crane work (considered as "time of lever acting"), with the filter cartridge not clogged.*

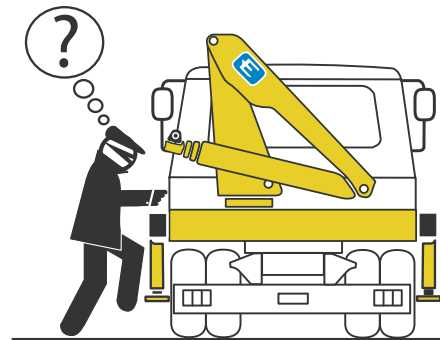
Note *Eventual alarms for crane operativity or for device anomalies have priority on this function.*

Note *Time passed with alarm switched on is stored by DMU3000 PLUS, to prove an incorrect crane use.*

8 - PIN Codenumber

The **DMU3000 PLUS** device offers the chance of inserting a personalized start codenumber. Thus, an antitheft system comes in force: should the right PIN codenumber not be digitated, the crane may not be operated. At each crane start, insert the PIN codenumber, by shifting the controlbank levers or by means of the remote control (if installed on the crane).

The personalized codenumber shall be inserted by installer or by user. The following instructions will be helpful in case of PIN codenumber store, delete and change.



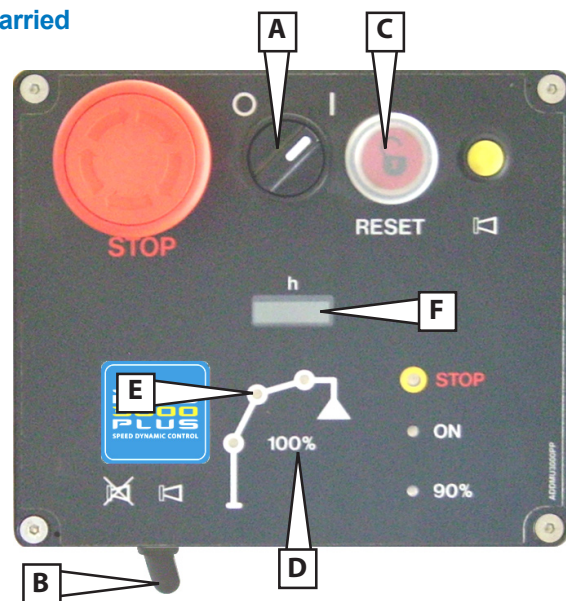
8.1 How to store PIN codenumber (to be carried out starting from crane completely switched off)

PIN codenumber **111** can not be used.

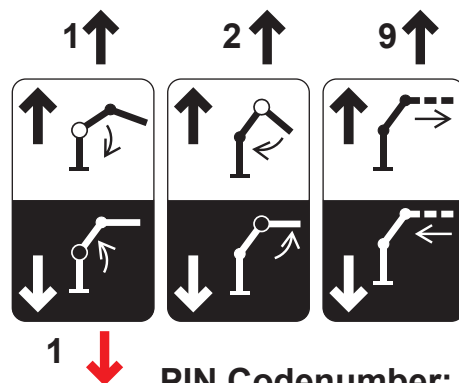
A lever not shifted means **ZERO**.

Example: how to store the PIN 129 codenumber.

- 1- operate the main switch **A** (key switch)
- 2- operate the switch **B** to cut out the acoustic signal a few times quickly. A short sound is audible and the red led **D** relevant to 1st boom block is lighting
- 3- push the "RESET" push-button **C** once: the three red leds are lighting
- 4- to insert the codenumber operate:
 - once** the 1st boom lever (simulating lower)
 - twice** the 2nd boom lever (simulating lower)
- 5- operate the 1st boom lever in upwards direction, to confirm the inserted codenumber
- 6- the red led **E** relevant to 2nd boom block is lighting
- 7- repeat codenumber input
- 8- the red led **F** relevant to fly-jib block is lighting and a sound is audible for 3 seconds.
- 9- turn off the key main switch **A**.



Example: No of times



PIN Codenumber: 129

From this moment, the crane may be operated only after inserting the pin codenumber.

Note In case of error, the red led D relevant to 1st boom block is lighting and 2 short sounds are audible. Push the "RESET" push-button C and repeat the procedure.

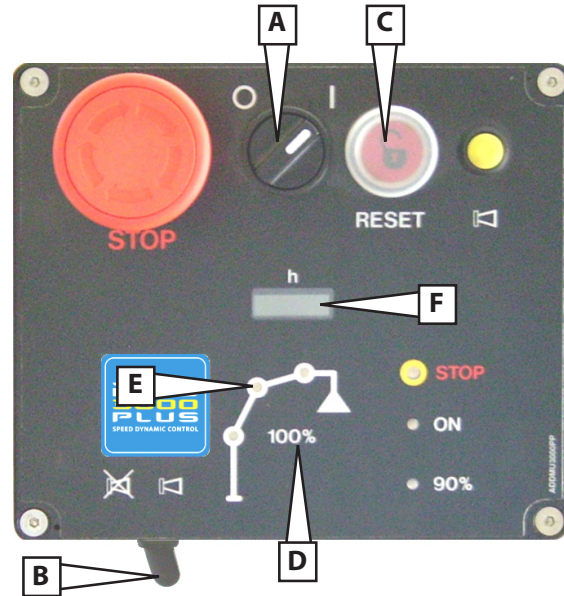
8.2 How to use the PIN codenumber

With a PIN codenumber already stored, operate the main switch **A**: three red leds (**D,E,F**) on the control panel will start flashing in the sequence to indicate that the PIN codenumber must be inserted.

Before shifting the controlbank levers, push the "RESET" push-button: the three red leds light up and the PIN codenumber must be inserted in the **DMU3000 PLUS** device.

Operate the controlbank levers once simulating lower of 1st boom, 2nd boom and basic crane extension and operate the 1st boom lever in upwards direction, to confirm.

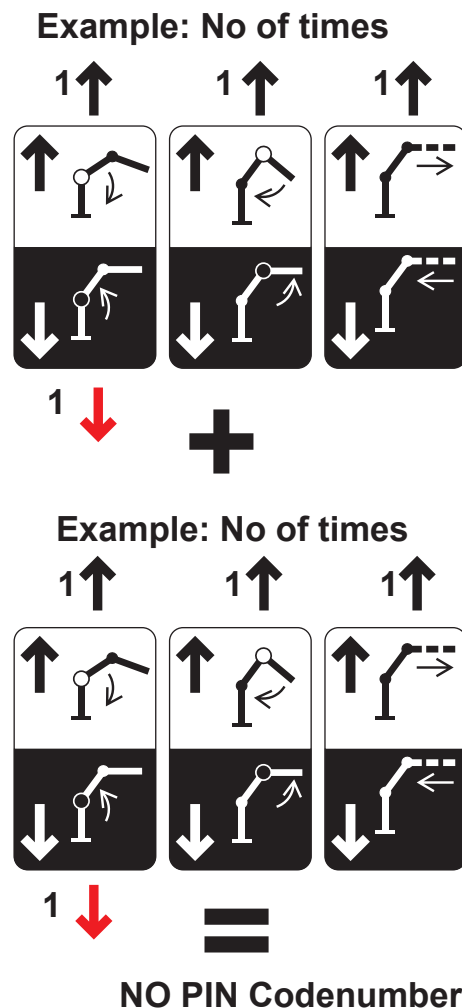
The insertion of a wrong PIN codenumber is signalled by three flashing red leds: push the "RESET" push-button and repeat the procedure of PIN codenumber insertion.



8.3 How to delete PIN codenumber (to be carried out starting from crane completely switched off)

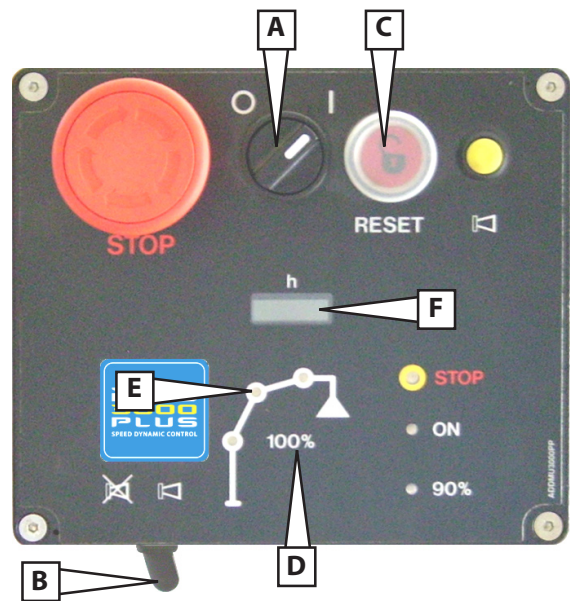
- 1- operate the main switch **A** (key switch)
- 2- operate the switch **B** to cut out the acoustic signal a few times quickly. A short sound is audible
- 3- push the "RESET" push-button **C** once and insert the current **PIN** codenumber (Ex.: 129). The red light **D** relevant to 1st boom block is lighting. In case of error, repeat the procedure and push again the "RESET" push-button each time
- 4- push the "RESET" push-button **C** again: the three leds are lighting
- 5- operate the controlbank levers once simulating lower of 1st boom, 2nd boom and extensions outlet
- 6- operate the 1st boom lever once simulating upwards of 1st boom: the red led **E** relevant to 2nd boom is lighting
- 7- operate the controlbank levers once simulating lower of 1st boom, 2nd boom and extensions outlet
- 8- operate the 1st boom lever simulating upwards movement. The red led **F** relevant to fly-jib is lighting and a sound is audible for 3 seconds
- 9- turn off the key main switch **A**.

From this moment, the crane has no PIN codenumber.

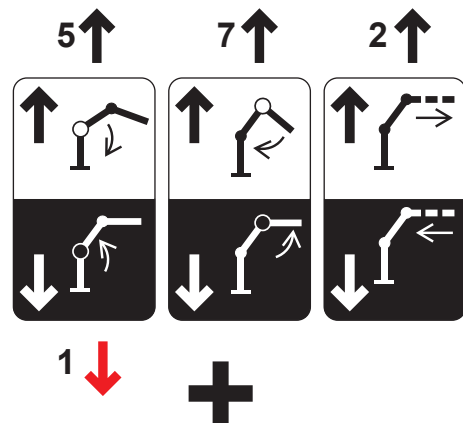


8.4 How to change PIN codenumber (to be carried out starting from crane completely switched off)

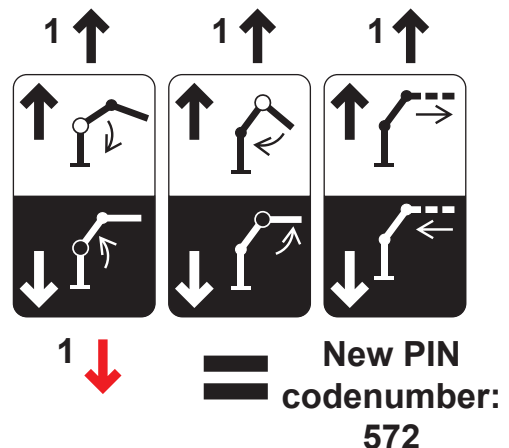
- 1- Operate the main switch **A** (key switch)
- 2- operate the switch **B** to cut out the acoustic signal a few times quickly. A short sound is audible.
- 3- push the "RESET" push-button **C** once and insert the current PIN codenumber (Ex.: 129). The red light **D** relevant to 1st boom block is lighting. In case of error, repeat the procedure and push again the "RESET" push-button each time.
- 4- push the "RESET" push-button **C** again
- 5- operate the three above mentioned controlbank levers for the desired number of times. The new PIN codenumber is set up.
- 6- operate the 1st boom lever in upwards direction, to confirm the inserted codenumber (EX.572)
- 7- the red led **E** relevant to 2nd boom block is lighting
- 8- repeat codenumber input
- 9- the red led **F** relevant to fly-jib block is lighting and a sound is audible for 3 seconds
- 10- turn off the key main switch **A**.



Example: No of times



Example: No of times



Note In case of error, the red led **D** relevant to 1st boom block is lighting and 2 short sounds are audible. Push the "RESET" push-button **C** and repeat the procedure from point 5.

From this moment, the crane may be operated only after inserting the new PIN code number"

Note Should the PIN codenumber be "forgotten", it is necessary to go to an authorized workshop which may intervene on DMU3000 PLUS software, in order to work again with the crane.

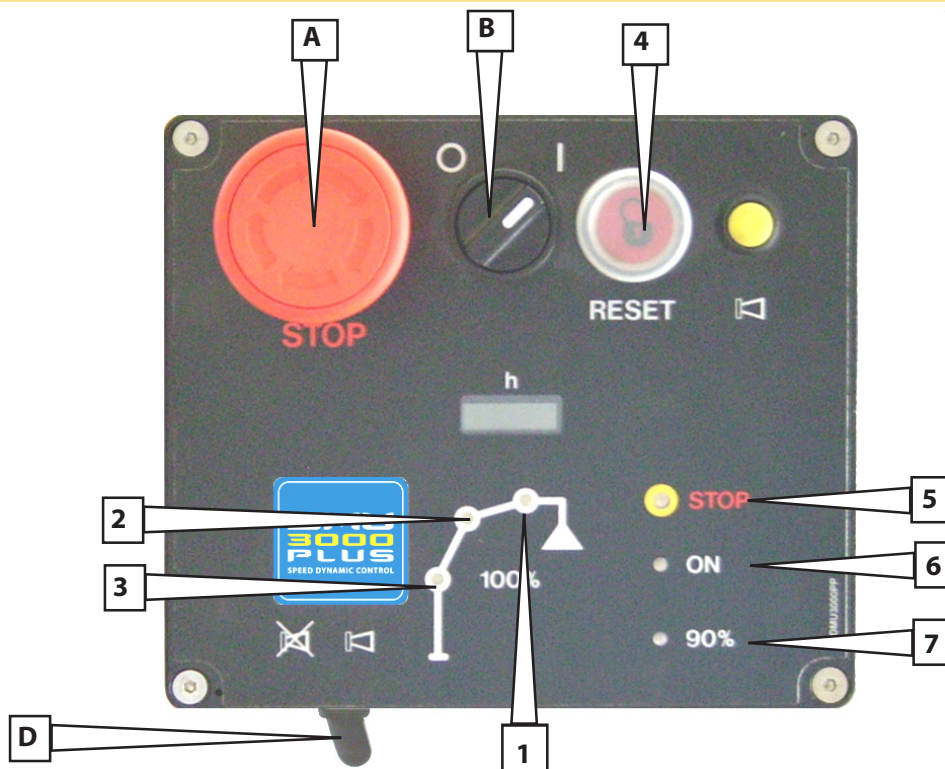
9 - Trouble shooting

In case of defect, the DMU3000 PLUS emits a continuous or intermittent acoustic alarm. Some warning lamps are displayed on the control panel, to give advice and to find out the kind of anomaly occurred.

The following notes concern DMU3000 PLUS main indications relating to an operative block or a fault, and their available and possible solutions to finish a job and go to the nearest EFFER authorized workshop.

Foreword

Note *During the diagnostic work it is important that the acoustic alarm is not disabled to have an indication on the exact type of sound.*



Note *The LED light that flashes on the DMU main panel shows the position of crane boom where the failure is.*

LIST:

| | |
|--|-----------------------------------|
| | FLASHING SLOWLY |
| | FLASHING QUICKLY |
| | LIGHTED UP PERMANENTLY |
| | CONTINUOUS ACOUSTIC ALARM |
| | INTERMITTENT QUICK ACOUSTIC ALARM |

A) When starting the DMU, the warning lights 1, 2, 3, 4, and 7 are flashing slowly and a continuous acoustic alarm is emitted



CAUSE

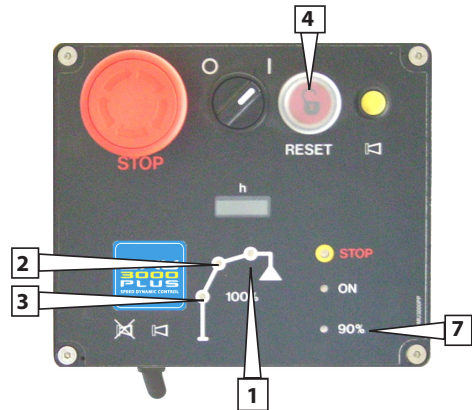
The DMU receives the indication that a lever of the crane control bank is not in the central position: a microswitch fitted behind a control bank lever is operated in one direction.

CHECK

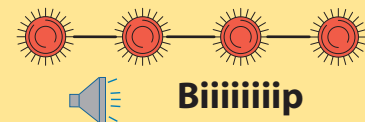
Bring all levers back to central position and repeat the start procedure.

SOLUTION

If problem still persists, get in touch with an EFFER authorized workshop immediately.



B) When starting the DMU, the warning lights 1, 2, 3, 4, and 7 are flashing quickly and a continuous acoustic alarm is emitted



CAUSE

The DMU receives the indication that a lever of the crane control bank is not in the central position: a microswitch fitted behind a control bank lever is operated in both directions.

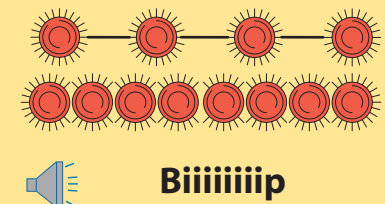
CHECK

Bring all levers back to central position and repeat the start procedure.

SOLUTION

If problem still persists, get in touch with an EFFER authorized workshop immediately.

C) When starting the DMU, the warning light 3 flashes quickly, the warning lights 1, 2, 4, and 7 are lighted permanently and a continuous acoustic alarm is emitted



CAUSE

The DMU does not receive any pressure value relating to first boom cylinder.

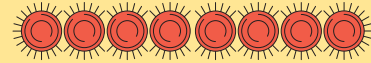
CHECK

Check electric cable integrity of pressure transducer.

SOLUTION

If fault can not be found out, get in touch with an EFFER authorized workshop immediately.

C1) After switching on the unit, during the first slewing, the warning light 3 flashes, the warning lights 1, 2, 4, and 7 lighted permanently, and a continuous acoustic alarm is emitted



Biiiiiiiip

CAUSE

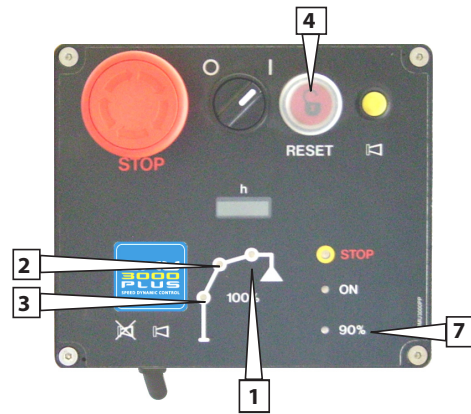
The rotary sensor reads an incorrect value (out of range).

CHECK

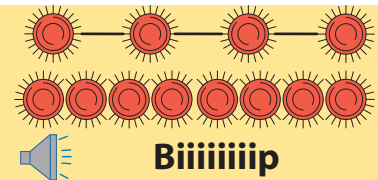
Check electric cable integrity of the rotary sensor.

SOLUTION

If fault can not be found out, get in touch with an EFFER authorized workshop immediately.



D) The warning light 2 flashes quickly, the warning lights 1, 3, 4 and 7 are lighted up permanently and a continuous acoustic alarm is emitted



CAUSE

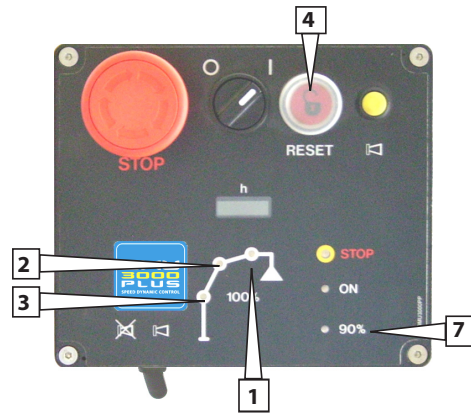
The DMU does not receive any pressure value relating to second boom cylinder.

CHECK

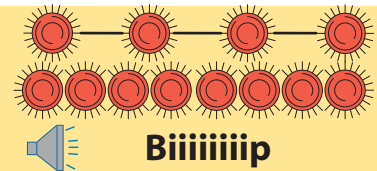
Check electric cable integrity of pressure transducer.

SOLUTION

If fault can not be found out, get in touch with an EFFER authorized workshop immediately.



E) The warning light 2 flashes quickly, the warning lights 1, 3, 4 and 7 are lighted up permanently, and a continuous acoustic alarm is emitted



CAUSE

The DMU does not receive any angle value relating to second boom cylinder.

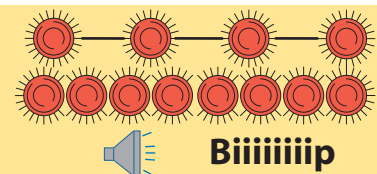
CHECK

Check electric cable integrity of pressure angular sensor.

SOLUTION

If fault can not be found out, get in touch with an EFFER authorized workshop immediately.

F) The warning light 1 flashes quickly, the warning lights 2, 3, 4, and 7 are lighted up permanently and a continuous acoustic alarm is emitted



CAUSE

The DMU receives a not allowed, anomalous pressure value relating to jib cylinder.

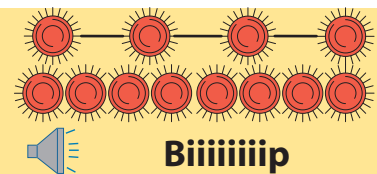
CHECK

Check electric cable integrity of pressure transducers.

SOLUTION

If fault can not be found out, get in touch with an EFFER authorized workshop immediately.

G) The warning light 1 flashes quickly, the warning lights 2, 3, 4, and 7 are lighted up permanently and a continuous acoustic alarm is emitted



CAUSE

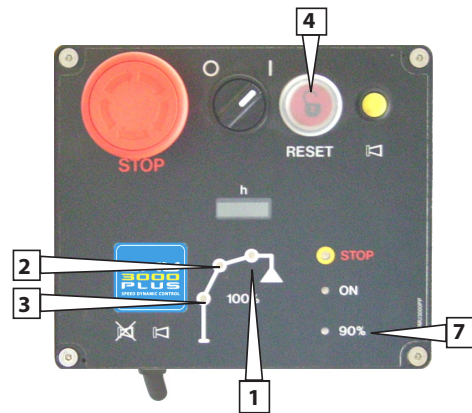
The DMU does not receive any angle value relating to jib.

CHECK

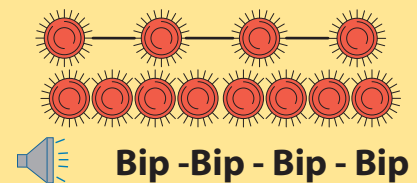
Check electric cable integrity of pressure angular sensor.

SOLUTION

If fault can not be found out, get in touch with an EFFER authorized workshop immediately.



H) Though the additional jib is not fitted to crane: the warning light 1 flashes quickly, the warning lights 2, 3, 4, and 7 are lighted permanently and an intermittent quick acoustic alarm is emitted



CAUSE

The DMU still receives a pressure value relating to jib cylinder.

CHECK

Check electric integrity of cable connecting DMU to the electric plug on crane tip.

SOLUTION

If fault can not be found out, get in touch with an EFFER authorized workshop immediately.

I) The jib load limiting device comes into operation though a jib load lower than the load allowed by the load diagram is applied. The DMU comes into operation and stops jib extensions from exiting though the load is lower by 30-40% than data on sheet.

CAUSE

The DMU receives an anomalous pressure value relating to jib cylinder which is higher than the value resulting from the load applied.

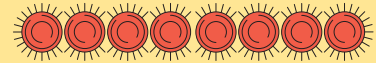
CHECK

Check electric connections between crane and jib.

SOLUTION

If fault can not be found out, get in touch with an EFFER authorized workshop immediately.

L) At startup (or suddenly during normal work operations) the warning lights 1, 2, 3, 4, 7 are lighted up permanently and no acoustic alarm is emitted.



CAUSE

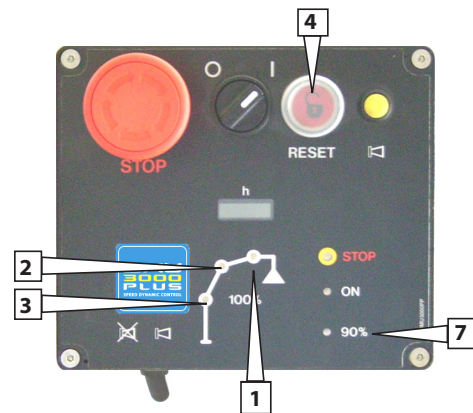
There is a short circuit in the electric system.

CHECK

Check solenoid valve electric connections and their electric cable.

SOLUTION

If fault can not be found out, get in touch with an EFFER authorized workshop immediately.



M) If a slewing manoeuvre is carried out and downgraded work area is entered – this area is controlled by two proximity switches – a quick intermittent sound is emitted (one acoustic sound every second) (No lightening indication appears on the DMU panel.)



Bip -Bip - Bip - Bip

CAUSE

There is a short circuit in the electrical wiring controlling the downgraded work area: with this fault, the rear work area on truck – area of maximum performance – has a higher operating angle: the truck risks overturning.

CHECK

A lighted led is placed on each proximity switch: if you keep the crane boom positioned within the work angle of the crane maximum capacity (proximity switches not covered by cam), the LED lights must be on.

- Note** *This type of alarm is operated as a result of a slewing manoeuvre, while entering the downgraded work area.*
- Note** *After the DMU is electrically disabled, when it is restarted no sound is emitted for the presence of the fault, although the fault is still there.*

SOLUTION

With the crane in the max. load area, if just one luminous LED is OFF, get in touch with an EFFER authorized workshop immediately.

N) If a slewing manoeuvre is carried out and downgraded work area is entered – this area is controlled by three proximity switches – a quick intermittent sound is emitted (an acoustic sound every second)



Bip-Bip-Bip-Bip-...

Or you have an intermittent sound with descending tone of three beeps, repeated every minute.



Bip-Bip-Bip-... Bip-Bip-Bip-...

No lightening indication appears on the DMU panel.

CAUSE

There is a short circuit in the electrical wiring controlling the downgraded work area: with this fault, the rear work area on truck – area of maximum performance – has a higher operating angle: the truck risks overturning.

CHECK

A lighted led is placed on each proximity switch: if you keep the crane boom positioned within the work angle of the crane maximum capacity (proximity switches not covered by cam), the lighted LEDs must be switched on. A quick intermittent sound indicates a failure on two proximity switches, a descending sound indicates a failure on only one of the two proximity switches.

Note *This type of alarm is operated as a result of a slewing manoeuvre, while entering the downgraded work area.*

Note *After the DMU is electrically disabled, when it is restarted no sound is emitted for the presence of any fault, although the fault is still there.*

SOLUTION

With the crane in the max. load area, if just one luminous LED is OFF, get in touch with an EFFER authorized workshop immediately.

Note *If this alarm can also be heard after repairing the failure, this is an indication that the two outer proximity switches have been applied in an inverted position.*

O) The hook for load attachment to winch cable, is electronic, and it transmits the value of the load applied (optional)

The warning lights 1, 2, 3, and 7 flashes in sequence, and an intermittent quick acoustic alarm is emitted



Bip -Bip - Bip - Bip

CAUSE

- 1) Pin battery low
- 2) Error of communication between DMU and pin
- 3) Error of radio communication between pin and its receiver.

CHECK

Check for pin switching ON, and check cables connecting DMU and pin (CAN-bus).

SOLUTION

Load the pin battery by the suitable cable or replace battery. If fault can not be found out, get in touch with an EFFER authorized workshop immediately.

P) The warning light 3 flashes and no acoustic alarm is emitted.

CAUSE

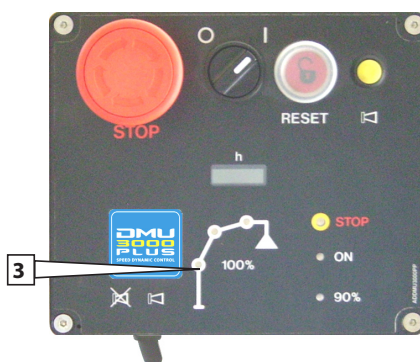
Faulty encoder for crane slewing.

CHECK

Check electric connections between rotary controlbank and DMU.

SOLUTION

If fault can not be found out, get in touch with an EFFER authorized workshop immediately.



CRANE BLOCKED BY AN OPERATIONAL ERROR

1) The warning lights 1, 2, 3, 4, and 7 are lighted up permanently and a continuous acoustic alarm is emitted



The manoeuvre for starting after switching off was too quick.

SOLUTION 1) turn off the DMU and restart it electrically after at least three seconds.

2) The warning lights 1, 2, 3 are flashing in succession and no acoustic alarm is emitted

The **CAUSE** is the inclusion of the PIN code (see user manual)

SOLUTION 1) enter the PIN code to have the crane operating

SOLUTION 2) if you do not know the PIN code, you can cancel it with the computer (see chapter 13 of this manual)

3) When the DMU is turned on only, the warning light 5 is lighted, and the crane is not operational

An emergency stop button is pressed.

SOLUTION identify the pressed emergency stop button and release it.

4) The warning light 4 is blinking, no acoustic alarm is emitted

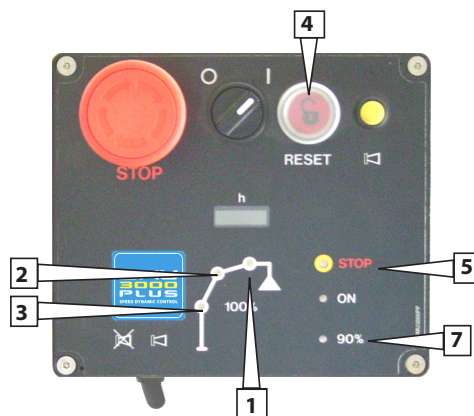
The DMU is waiting for the start signal.

SOLUTION press the DMU start button, either on its panel, or its remote control – if fitted –

5) The warning light 7 is turned on with series of two flashes

The DMU entered Stand-By mode (30 minutes have passed since the crane has been moved for the last time) –

SOLUTION press the emergency stop button, release it or press the reset button either on its panel or on the DMU panel, or on its remote control push-button panel – if fitted –




6) The warning light 7 is turned on intermittently, and it has an acoustic alarm of the intermittent/slow type  **Bip...Bip...Bip....**

A pressure value equal to 90% of the maximum pressure value has been reached in a cylinder related to boom lifting

SOLUTION the crane can operate with the speed reductions provided for the specific project.

7) One or several warning lights 1, 2, 3, is turned on intermittently, and an acoustic alarm of the intermittent/quick type is emitted.

 **Bip -Bip - Bip - Bip - Bip**

In the boom lifting cylinder related to the warning light which is turned on, the maximum allowed pressure value for the project has been reached.

SOLUTION the crane can operate with the restrictions due to the load limiting device operation.


8) One or several warning lights 1, 2, 3 is turned on permanently and a continuous acoustic alarm is emitted.

 **Biiiiiiip**

A sharp load manoeuvre has created a pressure value higher than the maximum allowed pressure value for the project within the boom lifting cylinder related to the warning light which is turned on.

SOLUTION the crane can operate only while carrying out the hydraulic extension retraction manoeuvres.

9) After 30 minutes of work – time measured since a control bank lever is operated – for a time of two minutes a sound made up of a series of four beeps is emitted.

 **Bip-Bip-Bip-Bip / Bip-Bip-Bip-Bip / Bip-Bip-Bip-Bip-.....**

This type of alarm appears each time you turn on the DMU, with the procedures described above.

CAUSE

The DMU has received the indication of the oil filter delivery clogging.

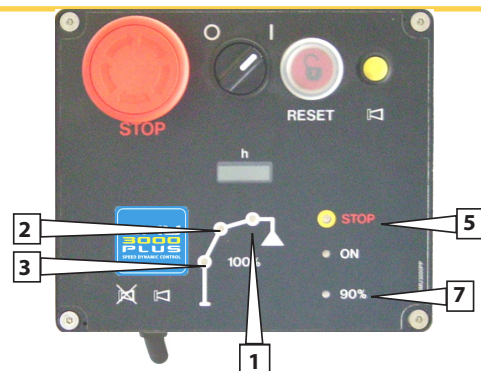
CHECK

You can check on the clogging indicator on the filter: when an acoustic alarm is emitted if you see a red band inside the clogging indicator, the filter cartridge is certainly clogged.

SOLUTION

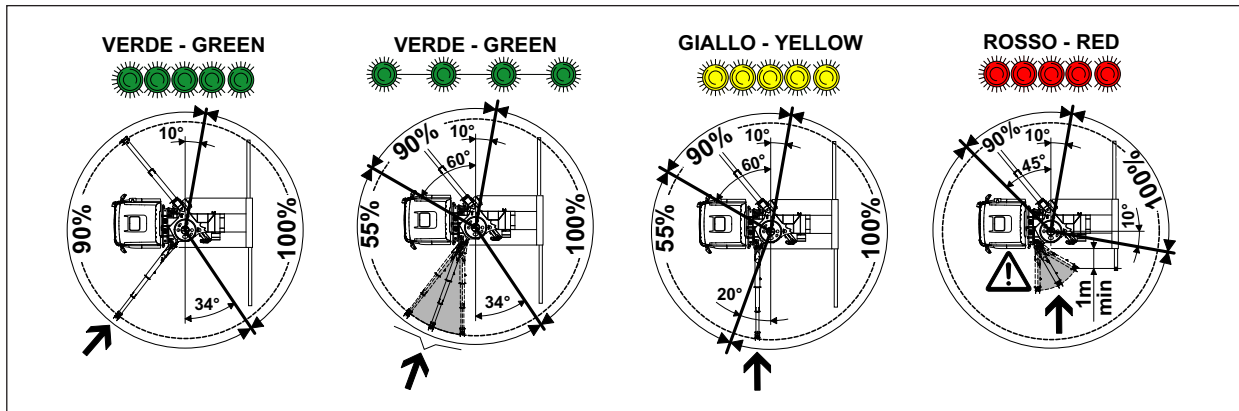
Replace the filter cartridge as soon as possible.

Note *following application of a new filter cartridge, the indication of filter clogged filter remains for a time of 30 minutes of work, measured since a crane control bank lever is operated.*



10 - " CROSS – STAB " outriggers

THIS TYPE OF OUTRIGGER IS PRESENT (OPTIONAL) ON A FEW LARGE-CAPACITY LIFTING CRANES.



Note Note that the values shown in a percentage are purely indicative

The operational advantage of the CROSS STAB. (the outrigger on the left side of the crane is a revolving/swinging type) is that the lifting capacity in the front working area (area in front of the lorry cabin) is undoubtedly greater compared to a traditional crane. The special stabilising system allows you to work with the crane in the front working area using up to 90% of the maximum lifting pressure (information refers to the 1355 crane model installed on a 4 axes lorry; the reference operative load diagrams are those inserted in the operator manual **SEE NOTE** *) and lifting capacity reduction is very limited when compared to the maximum lifting capacity of the crane.

An electronic device is PRESENT on the CROSS-STAB outriggers that constantly interacts with the DMU3000 PLUS, sending it all information relative to the positioning of the adjustable / revolving outriggers.

The crane in question is equipped with the electronic "tipping-over-prevention" device, both on the outriggers of the basic crane and on the additional outriggers.



It should be made clear that a perfect lorry stabilizing manoeuvre does not start the "tipping-over-prevention" device, which should still be considered as an extra safety device.

WE WILL NOW POINT OUT THE CRANE OPERATIONAL SECTIONS THAT POSITION THE REVOLVING / ADJUSTABLE OUTRIGGERS, WITH THE RELATIVE DOWNGRADED PERFORMANCES.

Note *Near the rotating / adjustable outrigger, a luminous signal is applied to indicate to the operator which section the outrigger is positioned in: section that automatically identifies different crane performances, as explained below.*

The luminous signal comes on in different ways:

- 1) FIRST POSITION FIXED GREEN**
- 2) SECOND POSITION FLASHING GREEN**
- 3) THIRD POSITION FIXED YELLOW**
- 4) FORTH POSITION FIXED RED**

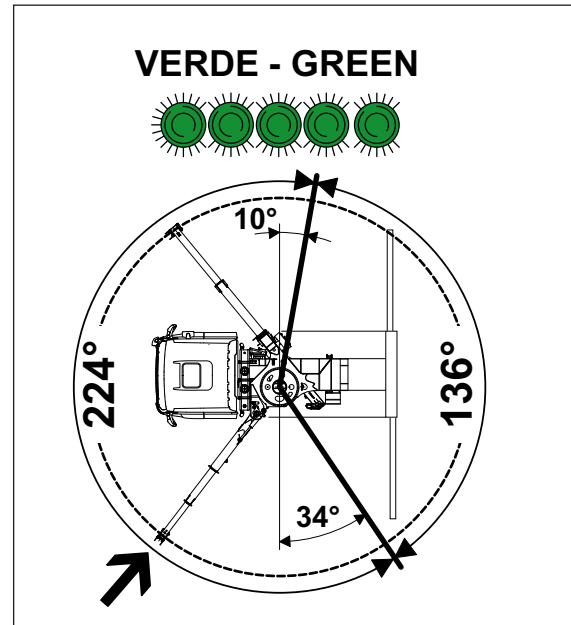
► 1) First positioning

LIGHT SWITCHED ON IN FIXED GREEN MODE

OUTRIGGER POSITIONED IN MAXIMUM OPENING POSITION

There are two different operational areas:

- 136° rear: the crane has maximum working performance
- 224° front: the crane has a slightly limited lifting performance.



Note

Remember that the intervention of the DMU 3000 PLUS load limiter in the front work area (224°) stems from a lorry stability problem. In the downgraded area the following functioning is obtained:

- **Crane slewing** (note that if the load limiter has intervened after attempting to enter a downgraded operational area, it is always possible to automatically carry out the manoeuvre in reverse order. If the load limiter has intervened whilst working the crane boom already within the downgraded working area, it is only possible to carry out the slewing manoeuvre if the calibration threshold has been exceeded by a small percentage. If not, slewing is completely blocked).
- **Boom descent** (Note that the movement of the second boom is admitted if the second boom is positioned underneath the horizontal, and the calibration threshold relating to the intervention of the load limiter has been exceeded by a small percentage)
- **Boom ascent** if the second boom is positioned at an angle higher than 30°

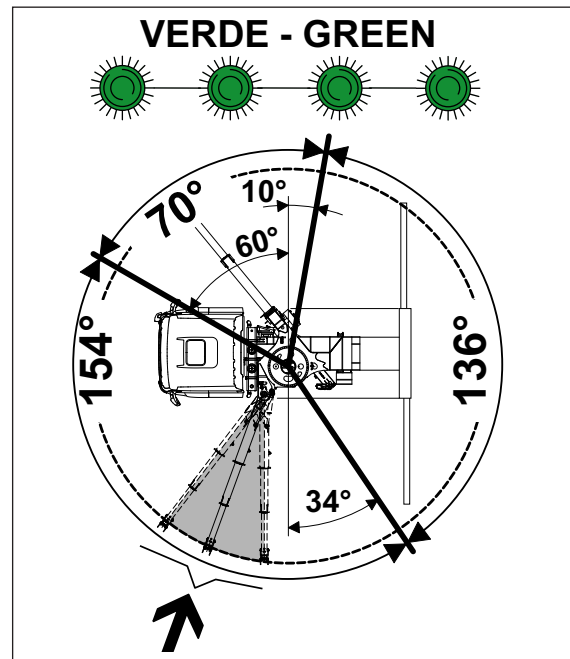
► 2) Second positioning

LIGHT SWITCHED ON IN FLASHING GREEN MODE

OUTRIGGER POSITIONED WITHIN THE INDICATED AREA

There are three different operational areas:

- 136° rear: the crane has maximum working performance
- 70° in the right area of the lorry: the crane has a slightly limited lifting performance.
- 154° front/left: the crane has a slightly limited lifting performance.



Note Remember that the intervention of the DMU 3000 PLUS load limiter in the two downgraded working areas stems from a lorry stability problem. In the rear work area corresponding to 136°, the load limiter has a standard functioning. In the other two areas, the following functioning is obtained:

- **Crane rotation** (note that if the load limiter has intervened after attempting to enter a downgraded operational area, it is always possible to automatically carry out the manoeuvre in reverse order. If the load limiter has intervened whilst working the crane boom already within the downgraded working area, it is only possible to carry out the rotating manoeuvre if the calibration threshold has been exceeded by a few percentage points: if not, the rotation is completely blocked).
- **Boom descent** (Note that the movement of the second boom is admitted if the second boom is positioned underneath the horizontal, and the calibration threshold relating to the intervention of the load limiter has been exceeded by a number of percentage points)
- **Boom ascent** if the second boom is positioned at an angle higher than 30°

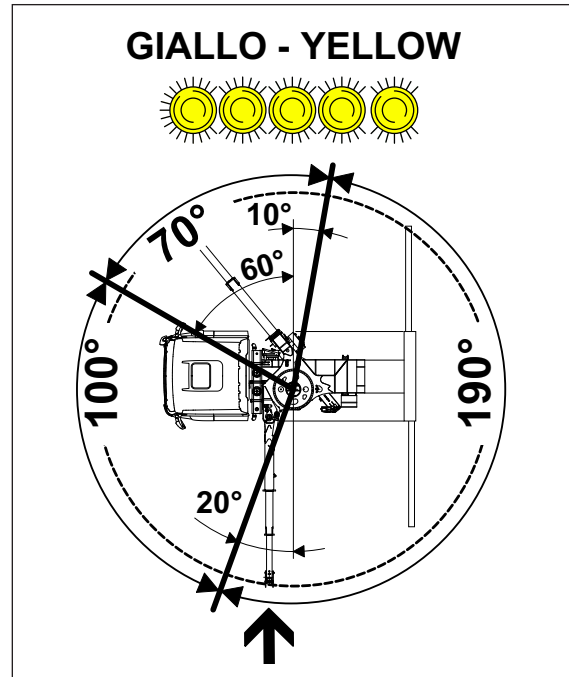
► 3) Third positioning

LIGHT SWITCHED ON IN FIXED YELLOW MODE

OUTRIGGER POSITIONED PERFECTLY PERPENDICULAR WITH THE LORRY AXIS

There are three different operational areas:

- 190° rear: the crane has maximum working performance
- 70° in the right area of the lorry: the crane has a slightly limited lifting performance.
- 100° front: the crane has a limited lifting performance.



Note

Remember that the intervention of the DMU 3000 PLUS load limiter in the two downgraded working areas stems from a lorry stability problem. In the rear work area corresponding to 190°, the load limiter has a standard functioning. In the other two areas, the following functioning is obtained:

- **Crane rotation** (note that if the load limiter has intervened after attempting to enter a downgraded operational area, it is always possible to automatically carry out the manoeuvre in reverse order. If the load limiter has intervened whilst working the crane boom already within the downgraded working area, it is only possible to carry out the rotating manoeuvre if the calibration threshold has been exceeded by a few percentage points: if not, the rotation is completely blocked).
- **Boom descent** (Note that the movement of the second boom is admitted if the second boom is positioned underneath the horizontal, and the calibration threshold relating to the intervention of the load limiter has been exceeded by a number of percentage points)
- **Boom ascent** if the second boom is positioned at an angle higher than 30°

► 4) Forth positioning

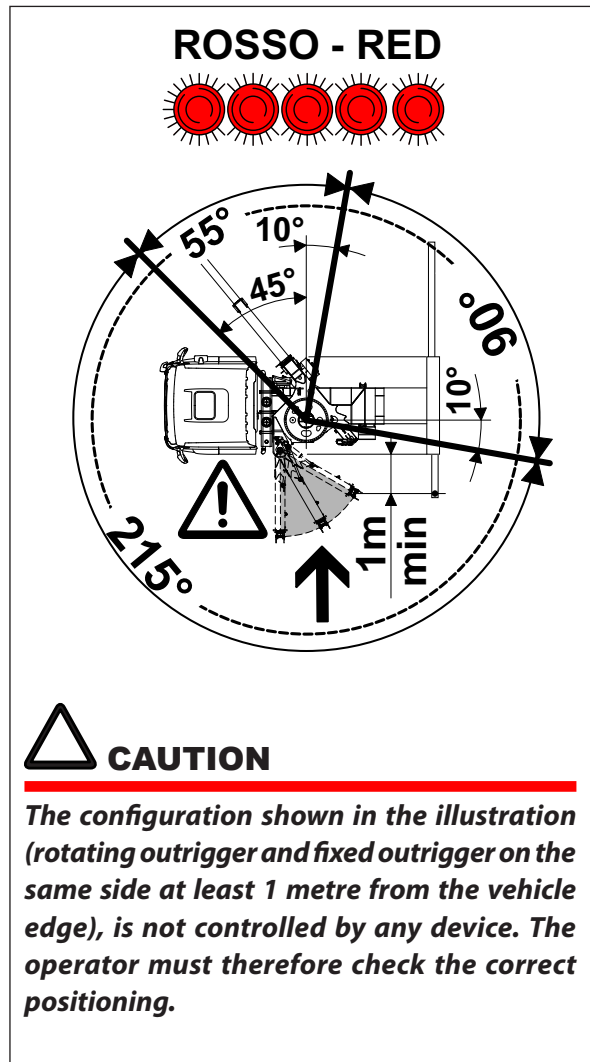
LIGHT SWITCHED ON IN FIXED RED MODE

OUTRIGGER POSITIONED WITHIN THE OUTLINED AREA, with the horizontal extension retracted and both foot jacks positioned at a minimum distance of 1 metre from the encumbrance space of the lorry.

There are two different operational areas, and an area where it is possible to move the crane without the load.

- 90° rear: the crane has maximum working performance
- 55° in the right / front area of the lorry: the crane has a slightly limited lifting performance.
- 215° front and left: the crane in this area IS NOT OPERATIONAL. The force limiting device DMU3000 PLUS allows the rotation of the crane without any load applied to the lifting hook, and with the extensions only partially extended. This type of operating has been planned only to speed the passage from one operational area to another.

Note Remember that the intervention of the DMU 3000 PLUS load limiter in the two downgraded working areas stems from a lorry stability problem. Forbidden operational manoeuvres are within the 55° angle on the right-hand-side area of the lorry. If the load limiter intervenes, it reflects standard functioning.



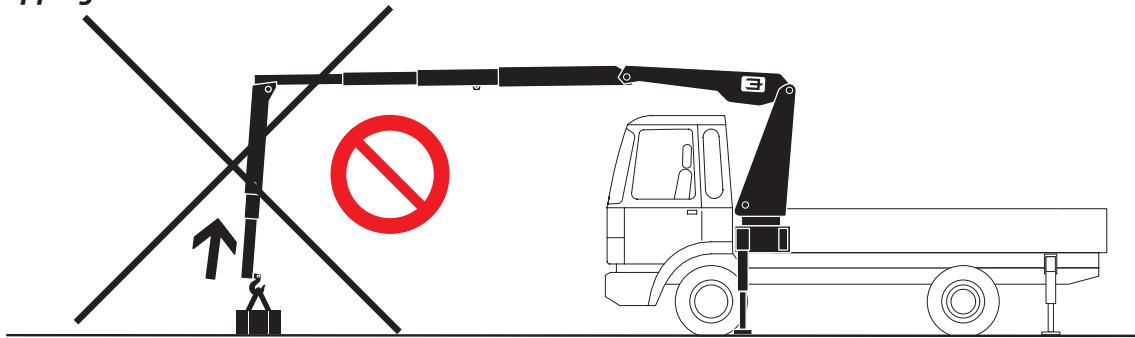
WE WISH TO EMPHASISE THAT IT IS UP TO THE INSTALLERS TO CARRY OUT THE CHECKS REQUESTED BY THE EUROPEAN DIRECTIVE 96/37/EC (load and overloading test) BEFORE STARTING TO WORK THE CRANE.

Note The lifting features shown on the load diagrams show that the crane outriggers (both for basic and additional cranes) are completely spread out to the side and the lorry pneumatics adhere only to the ground, this way providing a braking contribution whilst working. Also, the lorry wheels are blocked with four wedges. All this conforms to standards that regulate the use of oil-pressure cranes for lorries.

RESIDUAL RISKS

CAUTION

In the downgraded working area with the joint positioned beneath the horizontal, it is absolutely forbidden to move loads using the return extension manoeuvres. Danger of the lorry tipping over.



CAUTION

Side extension of the rear outrigger IS NOT MONITORED by the DMU3000PLUS system. Therefore, it is solely the operators' responsibility to correctly position it.

CAUTION

The intervention of the load limiter DOES NOT HINDER extension return manoeuvre. It is therefore forbidden (especially if the crane is placed in a working area with limited performances due to stability problems) to lift a load from the ground by activating the extension return manoeuvre. This manoeuvre could lead to the lorry tipping over.

11 - Instructions to disconnect the device in case of emergency



EV1

- A) Take away the seal put at end;
- B) Mechanically block the spool inside the solenoid valve, by unloosing the ring nut; pay attention that the small piston is not lost, because it is essential to work;
- C) Invert the small piston indicated by the arrow. Insert it inside the cover for better convenience;
- D) Then screw the ring nut again.

EV2

- A) Take away the seal put at end;
- B) Push the spool inside the solenoid valve;
- C) Turn the spool clockwise until it is locked.

After cutting out the solenoid valve, lay the load without increasing the outreach, bring the crane in transport position according to User Manual instructions and go to an EFFER authorized workshop.

EV3

- A) Take away the seal put at end;
- B) Push the spool inside the solenoid valve;
- C) Turn the spool clockwise until it is locked

After cutting out the solenoid valve, lay the load without increasing the outreach, bring the crane in transport position according to User Manual instructions and go to an EFFER authorized workshop.



With the crane in emergency condition, all safety devices are disconnected. Do not operate the crane with loads hanged on, to avoid severe personal injuries or to run the risk of life danger to crane operator. The by-pass system is useful to fold the crane in the correct position for transport configuration: therefore, it is necessary to go to an EFFER authorized workshop.

12 - Displaying data on the radio control display

When both the radio control and the DMU3000 PLUS are electrically activated, messages for the operator appear on the display present on the radio control transmitter:

Note that a correct interpretation of these messages leads to various operational advantages that stem from knowing loading conditions the crane is subjected to.



Another advantage that comes from the display is being able to carry out a quick diagnostics when there is an anomaly on the crane.



12.1 Normal functioning

During normal crane functioning, a screen appears on the display, as shown in the example below:

| SIST OK | | | |
|---------|------|------|----|
| P1 | P2 | P3 | W |
| 154b | 205b | 160b | |
| 55% | 70% | 55% | 0% |

Note *the pressure and percentage values are relative to the instant crane situation that stems from the loading conditions. Therefore, these values are values that vary when the loading conditions are varied.*

Description of data displayed on the screen "SIST OK"

SIST OK: indicates that the transmitter is radio connected to the receiver. The crane is operative and there is no kind of anomaly present.

| | | | |
|---------|------|------|----|
| SIST OK | | | |
| P1 | P2 | P3 | W |
| 154b | 205b | 160b | |
| 55% | 70% | 55% | 0% |

If the crane is equipped with a device called "radio pin" to view the load applied on the radio control display, or to limit the maximum applicable load. The device is provided with a battery, the graphical method to display the battery status is the following:

Charged battery

| | | | |
|---------|------|------|-----|
| SIST OK | | | ### |
| P1 | P2 | P3 | W |
| 154b | 205b | 160b | |
| 55% | 70% | 55% | 0% |

Average charged battery

| | | | |
|---------|------|------|----|
| SIST OK | | | ## |
| P1 | P2 | P3 | W |
| 154b | 205b | 160b | |
| 55% | 70% | 55% | 0% |

Battery with low charge

| | | | |
|---------|------|------|----|
| SIST OK | | | # |
| P1 | P2 | P3 | W |
| 154b | 205b | 160b | |
| 55% | 70% | 55% | 0% |

Low battery

| | | | |
|---------|------|------|----|
| SIST OK | | | |
| P1 | P2 | P3 | W |
| 154b | 205b | 160b | |
| 55% | 70% | 55% | 0% |

P1: the first value below the P1 indication is relative to the pressure value present inside the cylinder / cylinders that move the first boom of the crane.

The other value, shown underneath, indicates the pressure percentage inside the cylinder / cylinders, referring to the maximum value that is the value that causes the load limiter to start.

P2: the first value below the P2 indication is relative to the pressure value present inside the cylinder / cylinders that move the second boom of the crane.

The other value, shown underneath, indicates the pressure percentage inside the cylinder / cylinders, referring to the maximum value that is the value that causes the load limiter to start.

P3: the first value below the P3 indication is relative to the pressure value present inside the cylinder / cylinders that move the additional joint, on the side of the circuit that lifts the load.

The other value, shown underneath, indicates the pressure percentage inside the cylinder / cylinders, referring to the maximum value that is the value that causes the load limiter to start.

Note *if the crane is not equipped with an additional joint, below the P3 wording the values are shown as zero;*
If the crane is not equipped with an additional joint, but is working without the aid of one, below the P3 wording, the values are shown as zero.

W: if the crane is supplied with standard winch, the values beneath this indication are only shown if and when there is a winch installed on the crane, otherwise nothing is shown. Whilst working, 90% appears on the screen when the entity of the load applied to the winch cable reaches and exceeds 90% of the maximum applicable load. 100% will appear when ascending cable automatic limit stop intervention occurs, or when 100% of the maximum winch performance is reached.

If during the work the cable end-of-stroke in descent comes into operation, the indication **FCI** will appear with the pertaining indication of its load (90% or 100%) if there are the conditions for this indication.

Examples:

1. the FCI signal (lower limit stop) is received and the next signal is displayed

| | | | | |
|---------|------|------|------|--|
| SIST OK | | | | |
| P1 | P2 | P3 | W | |
| 154b | 205b | 160b | FCI | |
| 55% | 70% | 55% | 100% | |

2. the pre-alarm signal is received, and the next signal is displayed

| | | | | |
|---------|------|------|-----|--|
| SIST OK | | | | |
| P1 | P2 | P3 | W | |
| 154b | 205b | 160b | 90% | |
| 55% | 70% | 55% | 90% | |

3. the winch load alarm signal or the FCS signal (upper limit stop) is received and the next signal is displayed

| | | | | |
|---------|------|------|------|--|
| SIST OK | | | | |
| P1 | P2 | P3 | W | |
| 154b | 205b | 160b | 100% | |
| 55% | 70% | 55% | 100% | |

If the crane is provided with a device for the display of the load applied to the winch cable (pin radio, proportional load cell), under W you find the value of the load being handled, both in absolute value and in percentage of the maximum load which can be moved. When the cable rise end-of-stroke (FCS) or cable descent end-of-stroke (FCI) are operated the initials relating to the device which came into operation appear instead of the load value.

| | | | | |
|---------|------|------|------|--|
| SIST OK | | | | |
| P1 | P2 | P3 | W | |
| 154b | 205b | 160b | FCI | |
| 55% | 70% | 55% | ...% | |

| | | | | |
|---------|------|------|------|--|
| SIST OK | | | | |
| P1 | P2 | P3 | W | |
| 154b | 205b | 160b | FCS | |
| 55% | 70% | 55% | ...% | |

12.2 Anomaly messages

If there is an anomaly, the main screen is automatically displayed for 5 seconds and “SIST OK” is replaced with “SIST FAULT”. Then for a further 5 seconds a screen will show a list of encountered anomalies.

A maximum of 4 anomalies fit on the screen. Therefore, if the number of anomalies is equal to or less than 4 the system only uses one screen to display them. If, however, there are more than 4, the anomalies are organised into groups of 4 and each group is displayed for 5 seconds.

Each displayed anomaly is characterised by its own “error code”.

Note *When an inconvenience occurs on the crane, it is very important to give the error code to the EFFER after-sales assistance centre. Depending on the kind of anomaly, it is possible to be given instructions on how to continue operating anyway, even with a few limitations on performance.*

For example:

- main screen with the anomaly indication present

| | | | |
|------------|------|------|----|
| SIST FAULT | | | |
| P1 | P2 | P3 | W |
| 154b | 205b | 160b | |
| 55% | 70% | 55% | 0% |

- screen with a number of “error codes”

(U3, 00, D0)

| | |
|----|------------|
| U3 | UnderRange |
| 00 | OverRange |
| D0 | Cat2Fault |

Over the next few pages we will show how to interpret anomaly messages.

*

a) TYPE OF MESSAGES: "UnderRange" (U)

U3 UnderRange

- U0 UnderRange:** the pressure sensor applied to the jack that moves the first boom does not read any pressure data.
- U1 UnderRange:** the pressure sensor applied to the jack that moves the second boom does not read any pressure data.
- U2 UnderRange:** the extension positioning sensor (only present on certain crane versions) does not send any signals to the DMU3000 PLUS.
- U3 UnderRange:** there is a problem with the position sensor relative to the second boom of the crane.*
- U4 UnderRange:** the pressure sensor applied to the jack that moves the additional joint (ascending side), does not read any pressure data.
- U5 UnderRange:** the pressure sensor applied to the jack that moves the additional joint (descending side), does not read any pressure data.
- U6 UnderRange:** there is a problem with the position sensor relative to the additional joint of the crane.
- U7 UnderRange:** there is a problem with the sensor relative to the position of the crane boom in relation with the lorry, or with the sensor that detects the position of the first boom in relation with the horizontal (if present).

*

b) TYPE OF MESSAGES: "OverRange" (O)

O0 OverRange

- O0 OverRange:** the pressure sensor applied to the jack that moves the first boom does not read any pressure data that exceeds the range allowed by the sensor itself. *
- O1 OverRange:** the pressure sensor applied to the jack that moves the second boom does not read any pressure data that exceeds the range allowed by the sensor itself.
- O2 OverRange:** the extension positioning sensor detects a value that exceeds the range allowed by the sensor itself.
- O3 OverRange:** the corner sensor on the second crane boom detects a value that exceeds the range allowed by the sensor itself.
- O4 OverRange:** the pressure sensor on the bottom side of the jack of the additional joint is reading a pressure that exceeds the range allowed by the sensor itself.
- O5 OverRange:** the pressure sensor on the rod-side of the jack of the additional joint is reading a pressure that exceeds the range allowed by the sensor itself.
- O6 OverRange:** the corner sensor on the boom of the crane joint detects a value that exceeds the range allowed by the sensor itself.
- O7 OverRange:** the corner sensor present on the rotation column (only on certain crane versions) detects the angle values not included within the allowed range.



c) MESSAGES RELATIVE TO:

D0 Cat2Fault

“INCONVENIENCES INSIDE THE ELECTRIC CIRCUIT BOARDS (D):

- D0 Cat2Fault:** there is an error inside the DMU3000 PLUS electronic logic, therefore it is necessary to contact an authorised EFFER centre.. *
- D1 FeedBack:** there is an error inside the DMU3000 PLUS electronic logic, therefore it is necessary to contact an authorised EFFER centre.
- D2 InjFault:** there is an error inside the DMU3000 PLUS electronic logic, therefore it is necessary to contact an authorised EFFER centre.
- D3 PICFeedBack:** there is an error inside the DMU3000 PLUS electronic logic, therefore it is necessary to contact an authorised EFFER centre.
- D4 PICTimeOut:** there is an error inside the DMU3000 PLUS electronic logic, therefore it is necessary to contact an authorised EFFER centre.



d) TYPE OF MESSAGE: A COMPONENT IS IN “E” TYPE

E1 JibFault

BREAKDOWN

- E0 StartFault:** a lever of the distributor results as not being in neutral position the moment the DMU3000 PLUS is switched on.
- E1 JibFault:** a lever has been activated that is relative to the additional joint, even though the joint is not installed on the crane.. *
- E2 CRCFault:** there is a fault with the electrical part of the DMU3000 PLUS.
- E3 LeveFault:** there is a breakdown of the distributor lever positioning sensor; it is sending indications that the lever has been activated in two directions at the same time.
- E4 AD_SC_Fault:** there is a short circuit in the electrical plant.
- E6 II Fault:** the corner sensor on the second boom of the crane has a range error.
- E7 Joint Fault:** the corner sensor on the boom of the crane joint has a range error.
- E8 lbyPass:** a pressure sensor is reading a pressure value that is lower than the minimum safety peak.
- E10 BucketFault:** a lever relative for using the bucket has been activated, without having inserted the bucket pin.
- E11 WinchFault:** the winch has been disassembled from the crane; a winch lever has been activated.
- E12 CANError:** there is an error with CAN-BUS communication between the various crane electric components.
- E13 Extention Fault:** there is a fault with the electronic part that detects how much the extension has extended (only present in certain crane versions).

E14 Check PN: an error occurred during the automatic check of rotation sensor functioning (only present on certain crane models).

E15 TimeOut CANW: a communication error occurred between the winch loading cell (system that weighs the applied load, present only on certain versions of cranes) and the DMU3000 PLUS.

E16 TimeOut Radio W: a communication error occurred between the receiver and transmitter of the winch loading cell (system that weighs the applied load, present only on certain versions of cranes).

e) TYPE OF MESSAGE:

*

BLOCK CAUSED BY A MANOEUVRE THAT IS NOT ALLOWED "L"

L3NoUp1, 2, 3, Ver

Another series of messages can appear on display to indicate that **a certain number of manoeuvres are not allowed**, and these stem from the crane geometric configuration.

This indication disappears the moment that the crane geometric configuration is modified with opportune correct manoeuvres.

Even in this case the main screen wording "**SIST OK**", is replaced by the wording "**SIST ALARM**" every 5 seconds and afterwards a screen with the list of incorrect geometric conditions is displayed.

A maximum of 4 signals fit on the screen, therefore, if the number of signals is equal to or less than 4, the system only uses one screen to display them. If, however, there are more than 4, the signals are organised into groups of 4 and each group is displayed for 5 seconds.

Each displayed signal is characterised by its own "error code".

L0 No Up 3: there is winch installed on the additional joint: the geometric configuration impedes the additional joint ascent manoeuvre.

L1 No Dw 1, 2, 3: there is winch installed on the additional joint: the geometric configuration impedes descent manoeuvres of all the crane arms.

L2 No Mov: during crane use in PLE function mode, the non-permitted work zone can be entered by rotating. it is possible to restore the crane movements only after rotating the crane back into the permitted work zone.

L3 No Up 1, 2, 3, Ver: when using the crane within the front working zone, due to safety reasons, the DMU3000 PLUS load limiter begins to work with the arms positioned in a such a manner that does not make it possible to perform ascending movements. *

L4 No Mov 1: the crane geometric configuration has created a pressure value below the minimum safety level inside the hydraulic cylinder that moves the second boom: it is not possible to carry out rotation, first boom movement or second boom ascent manoeuvres.

L6 No Up 3: whilst using the crane, the additional joint has reached a configuration that does not make it possible to continue the ascent manoeuvre with the joint itself.

L7 No Up 3: the second crane boom is positioned over 50°, the additional joint is perfectly aligned with the second boom and the indication communicates that it is not possible to perform the ascent manoeuvre with the additional joint.

L8 No Up 1, 2, 3: the crane boom geometric configuration no longer makes it possible to perform ascent manoeuvres with any of the arms.

L9 No Up 1, 2: the crane boom geometric configuration no longer makes it possible to perform ascent manoeuvres with any of the basic crane arms.

L10 No Up 2, 3: the crane boom geometric configuration no longer makes it possible to perform ascent manoeuvres with the second basic crane boom or with the additional joint.

L11 By-pass FC Sno: when there is an additional joint installed on the crane, and, when switched on, if the second boom is lower than 30°, for 1 minute the opening electric limit stop of the joint jack is not active. This allows you to check that the joint load limiter functions correctly, and the limiter should intervene by carrying out a complete opening manoeuvre.

L12 Antitilting Alarm: it shows the anti-tilting control operation, which inhibits all movements of the crane except extension retraction both with the machine base and jib.

L13 Winch stand-by: when the crane is fitted with a radio pin to detect load applied to the winch cable, it shows that the pin radio battery is low.

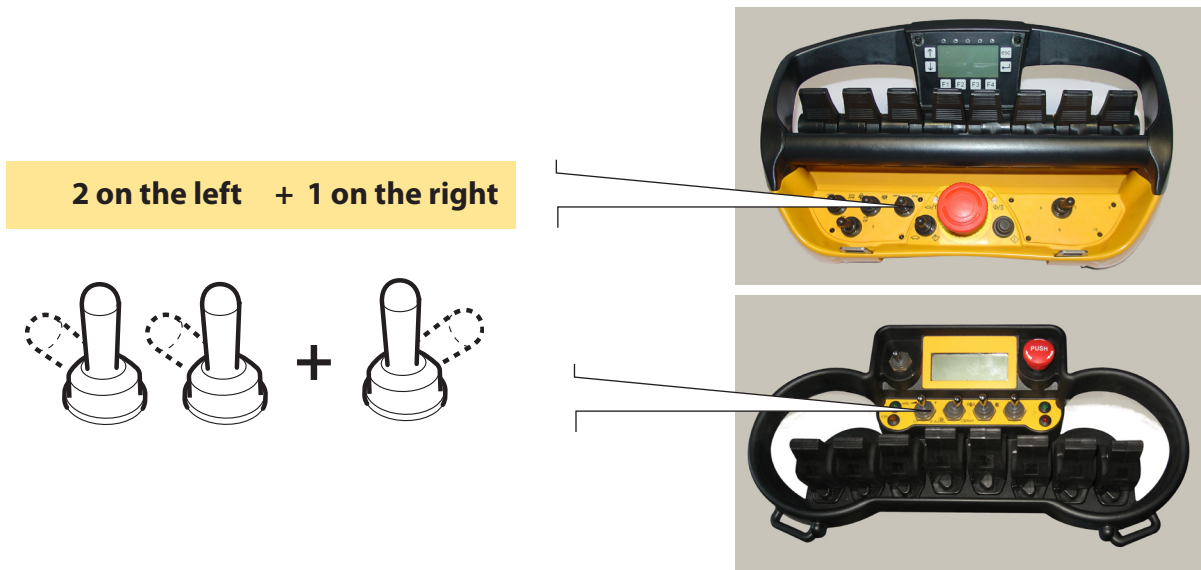
Note *This message causes the winch manoeuvre to be locked and the crane booms to rise.*

12.3 Displaying additional parts

It is possible to access further displays by following the instructions indicated below:

- electrically activate the crane and the radio control
- with the RESET button, activate the radio communication between the transmitter and receiver
- the display will be activated, and the standard screen will appear with the wording **"SIST OK"**.

Using the button on the transmitter, relative to "GAS+, GAS-" (RPM- RPM+) function, carry out a quick sequence of movements:



You can have access to first display relating to "SERVICE". By turning the same button to the right 9 screens appear on the display in sequence. Turn the button to the right for a number of times equal to the screen you want to use.

- 1- **" WINCH TYPE "** - one screen only
- 2- **" SERVICE BQ LEVERS "** - one screen only
- 3- **"SERVICE ANGLES"** - one screen only
- 4- **" SERVICE MOV"** - (only active on cranes with DYNAMIC CAN), there are two screens.
- 5- **" SERVICE ANAGOL INPUT"** -there are two screens
- 6- **" SERVICE DIGITAL INPUT"** - there are three screens
- 7- **" SERVICE DIGITAL OUTPUT"** - one screen only
- 8- **"SERVICE STATUS"** - there are six screens
- 9- **" ANALOG INPUT 8 "** - (active only on cranes where the winch loading cell transmits the applied load value to the cable hook), one screen only

1 - Screen "WINCH TYPE"

Here are a few examples of the possible values of "WINCH TYPE"

WINCH TYPE : 0

it occurs when the load limiting device of the winch uses a torque limiter for the assessment of load applied to the winch.

N.B: - the values of the lines below are the values to be communicated to EFFER in case of operating failures of the winch.

```
SERVICE
WINCH TYPE 0
0CBA9876543210 kg
00000000000010 1345
```

WINCH TYPE : 1

it occurs when the load limiting device of the winch uses an extended load cell for the assessment of load applied to the winch.

It is possible to see two values that indicate the load applied to the winch expressed in kilograms. The indication (f) shows that this is a filtered value, therefore an average value, in the other case it is an instantaneous unfiltered value.

```
SERVICE
WINCH TYPE 1
3210 (f) kg/ kg AN8
0000 11 12 123
```

Note You cannot have a crane with an extended load cell device and at the same time the device called the "radio pin". The load cell already supplies an analogue signal that shows the actual load applied to the winch.

WINCH TYPE : 2

It occurs when the winch load limiting device uses a radio pin for the assessment of load applied to the winch.

```
SERVICE
WINCH TYPE 2
3210 (f) kg/ kg AN8
0000 11 12 123
```

WINCH TYPE : 0+2

It occurs when the winch load limiting device uses a torque limiter for the assessment of load applied to the winch, but at the same time a pin radio used only for the display of the load applied to the crane hook, is also fitted.

```
SERVICE
WINCH TYPE 0+2
3210 (f) kg/ kg AN8
0000 11 12 123
```

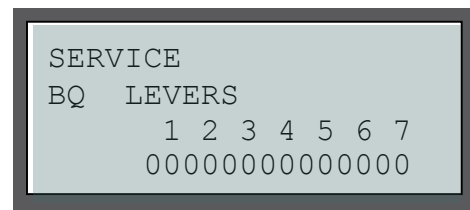
Note The torque limiter is a device that supplies a digital signal to DMU. Whereas, the load cell supplies an analogue signal.

2 - "SERVICE BQ LEVERS" Screen

Example:

The numbers from 1 to 7 indicate the hydraulic distributor levers.

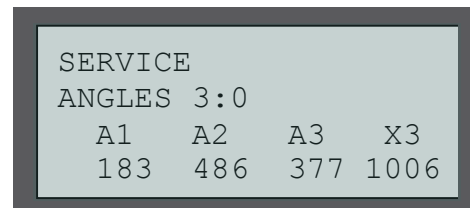
When a distributor lever is activated via radio control, the number 1 appears to indicate the movement of the spool inside the distributor, to the right or left depending on the direction set.



3 - "SERVICE ANGLES" Screen

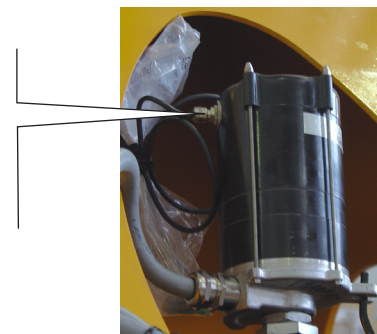
For example:

N.B: the meaning of index 3:0 means that there are a total of four values



- the numerical values must be divided by 10, in order to change them to angle values (e.g. $183 = 18.3^\circ$ $486 = 48.6^\circ$)

A1: if a rotation sensor (ENCODER) is present in the middle of the rotation thrust block used for communicating the position of the arms in comparison with the lorry longitudinal axis to the DMU3000 PLUS (this presence is indispensable for crane versions where lorry stabilising is realised by using CROSS STAB type outriggers, or on particularly accessorised crane models), the value that appears underneath, indicates the angle of the boom direction compared to the lorry longitudinal axis.



When the crane boom is positioned in the middle of the front working zone, the angle value is equal to zero.

If the above described variant is not present on the crane then 0 value appears.

A2: indicates the angle of the second boom in comparison to the horizontal

A3: if this crane is working with the additional joint, the angle of the joint boom in comparison to the horizontal is matched to this value.

If this same crane is working without using the additional joint, due to it being removed, then zero value will appear on display.

0 value will also appear on cranes where the use of the additional joint is not envisioned.

X3: shows the angle value present between the joint boom and the second boom. When the joint boom is in an "inclined" position, compared to the second boom, the values relative to this indication are preceded by minus symbol (e.g. - 120 or rather the joint boom is inclined by 12°)

4 - "SERVICE MOV" screen

These two screens allow you to realise the speed of crane movements whilst working, (independent or operator desired speed), that corresponds to partial activation of the radio control manipulator, or by an automatic slowing down of movement intervention. This automatic slowing down can intervene due to the crane geometric position or due to a medium-high load situation.

The values that appear on the screen marked by the letter A, are relative to the boom descent movements as well as the anticlockwise rotation movement: eight values, hypothesizing eight crane hydraulic functions.

The values that appear on the screen marked by the letter B, are relative to the boom ascent movements as well as the clockwise rotation movement: eight values, hypothesizing eight crane hydraulic functions.

The displayed values indicate the % of movement set at the distributor lever. These values vary between 0 and 100, this means that:

0 = 0% distributor lever has not been moved

100 = 100% distributor lever has been moved as far as possible

Example of the 2 screens:

| | | | | |
|---------|-------|---|-------|--|
| SERVICE | | | | |
| MOV %: | 1A-4A | / | 5A-8A | |
| 0 | 0 | 0 | 0 | |
| 0 | 0 | 0 | 0 | |

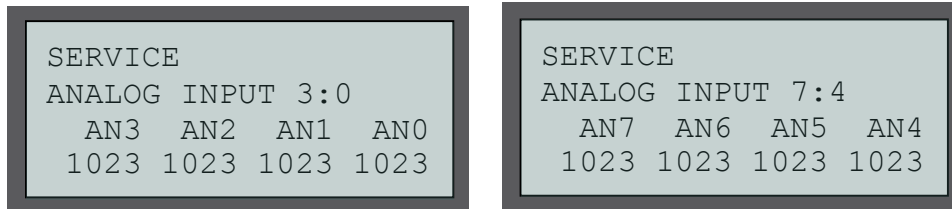
| | | | | |
|---------|-------|---|-------|--|
| SERVICE | | | | |
| MOV %: | 1B-4B | / | 5B-8B | |
| 0 | 0 | 0 | 0 | |
| 0 | 0 | 0 | 0 | |

The examples shown indicate that the distributor levers are all in neutral position.

5- "SERVICE ANAGOL INPUT" screen

These values are useful for an EFFER sales assistance centre if the origin of an anomaly needs to be determined. This data is not useful for the operator during normal use of the crane.

Example: of the 2 possible screens:

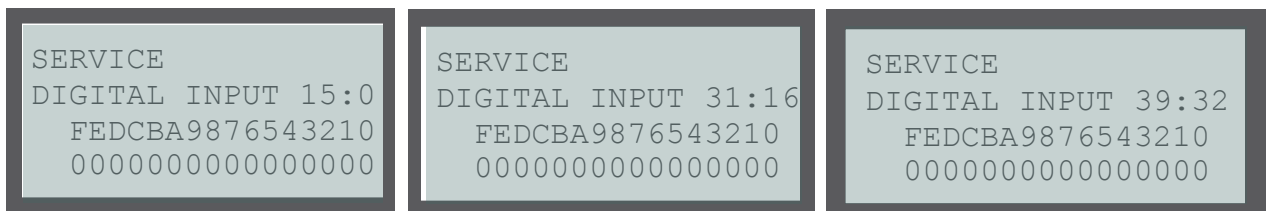


6- "SERVICE DIGITAL INPUT" screen

It is possible for the operator to access the other three screens, therefore, he is able to examine a total of 39 values that can have the number 1 or 0.

These are values that are useful for an EFFER sales assistance centre if the origin of an anomaly needs to be determined. This data is not useful for the operator during normal use of the crane.

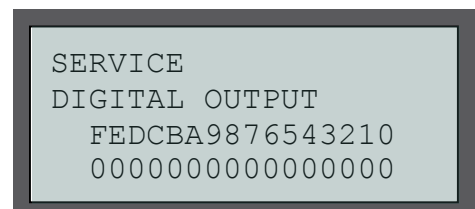
Example: of the 3 possible screens:



7- "SERVICE DIGITAL OUTPUT" screen

A further screen that the operator can access is shown below: values appear that can have the number 1 or 0.

These are values that are useful for an EFFER sales assistance centre if the origin of an anomaly needs to be determined. This data is not useful for the operator during normal use of the crane.

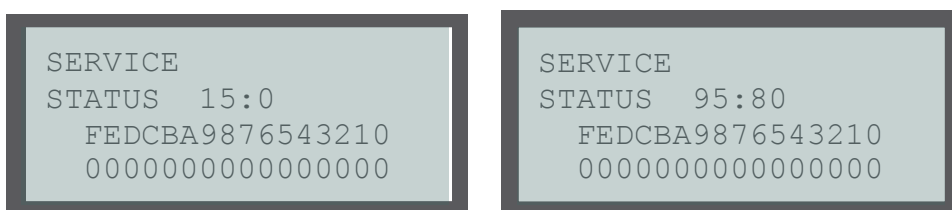


8 "SERVICE STATUS" screen

Six screens that the operator can access that show values relative to the functioning status of the crane in that precise moment. The values can have the number 1 or 0.

These are values that are useful for an EFFER sales assistance centre if the origin of an anomaly needs to be determined. This data is not useful for the operator during normal use of the crane.

Here is an example of the first and sixth screen:



9 - "ANALOG INPUT 8" screen

If a "Torque Limiter" is installed on the crane this page is not displayed as there would be no data to display.

When a winch (enlarged loading cell) is installed on the crane or a radio pin, indications relative to the winch load limiter status appear on this screen.

| | | | |
|----------------|---------|------|-----|
| SERVICE | | | |
| ANALOG INPUT 8 | | | |
| 3210 | (f) KG/ | KG | AN8 |
| 0000 | 1611 | 1112 | 284 |

Below are the various interpretations to be made of the above shown screen, whilst working with the winch:

Value '3210': value shown underneath the number 3 is "1" if the loading cell present on the crane is registering a loading value that exceeds the maximum range allowed by the sensor itself, otherwise the value is "0".

Value shown underneath the number 2 is "1" if the loading cell in the crane is not registering any data, otherwise the value is "0".

Value shown underneath the number 1 is "1" if the value of the load applied to the winch cable has set off the pre-alarm, or rather the signal relative to 90% of maximum applicable load, otherwise the value is "0".

Value shown underneath the number 0 is "1" if the value of the load applied to the winch cable has set off the alarm, or rather the signal relative to 100% of maximum applicable load, otherwise the value is "0".

Value ' (f) kg ': this is the load on the winch, that is to say the kilograms read by the loading cell. This value is filtered.

Value ' kg ': this is the load on the winch, that is to say the kilograms read by the loading cell.

Value ' AN8 ': if the crane has an enlarged loading cell, this value represents the A/D conversion of the energized signal sent to the DMU by the loading cell. If the crane has a radio pin then this value is equal to 1023 as nothing is connected to the analogical input.

13 - Maintenance

The electronic load limiter device does not require maintenance as careful design choices of components is such that the device can also be used in adverse environmental conditions (temperature range = -30°C + 70°C).

Functioning is guaranteed even if the lorry batteries have a voltage value that moves away from the normal 20%

Obviously, checking the voltage present on the batteries is part of occasional checks carried out on the lorry.

When cleaning with hydro cleaners it is advisable to avoid aiming the water jet at electrical components. This recommendation is valid for all components present on the lorry as well

CAUTION

Whenever it is necessary to carry out welding on the lorry, crane or even the lorry body, remove the positive wire from the lorry batteries in order to disconnect the electrical power supply of the device



THE POWER OF PERFORMANCE

Sol.Ge. S.p.A.
Via Bonazzi, 12/14
40013 Castel Maggiore (BO) - I
tel. +39 051 4181211
fax +39 051 701492
web: www.effer.it
e-mail: info@effer.it