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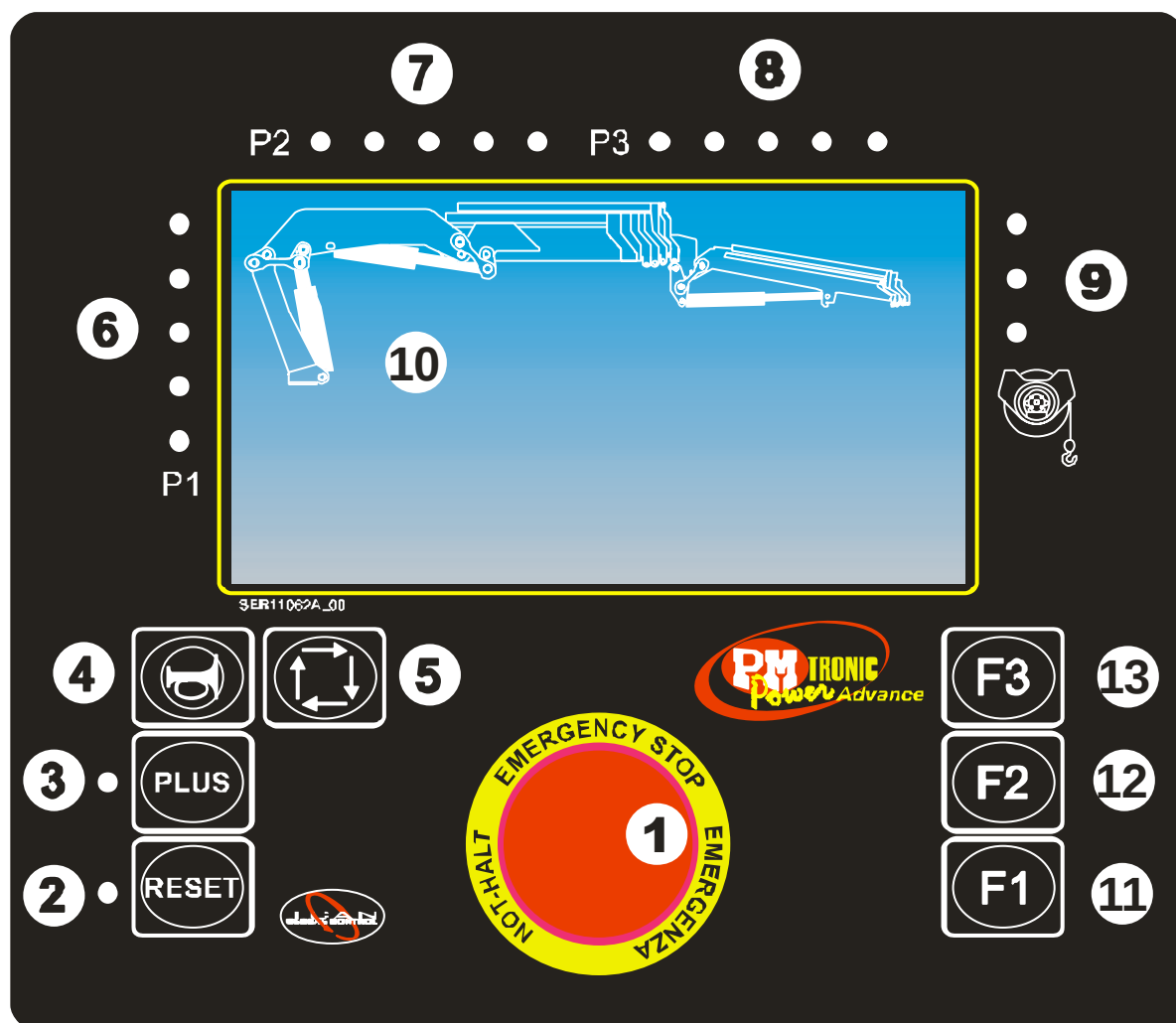
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|                                              |           |
|----------------------------------------------|-----------|
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PM GROUP SPA reserves the right to make technical modifications without giving prior notice.  
For further information concerning installation, please contact our Technical Service Department (SAT).

# 1 Description

## 1.1 Main Panel



### LEGEND

1. Emergency Stop
2. RESET Key + LED
3. PLUS Key + LED
4. Key of the Horn Truck
5. TEST/SCROLL key
6. Column cylinder LED Bar
7. Main boom cylinder LED bar
8. Jib cylinder LED bar
9. Winch LED bar
10. Display
11. FUNCTION key
12. FUNCTION key
13. FUNCTION key



## 1.2 Satellite

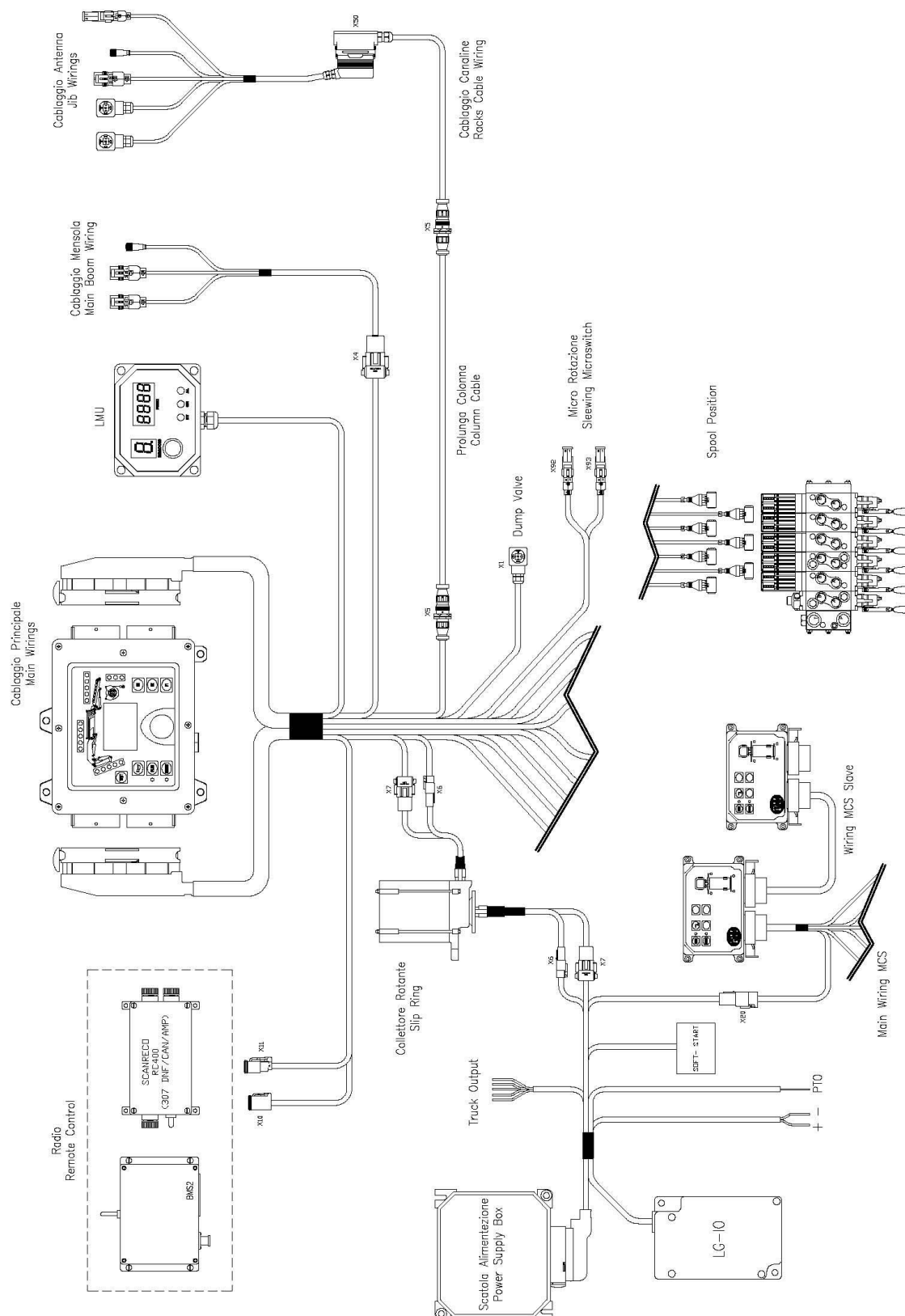
This unit replicates all the functions of the main panel.





## 2 The System Components

### Layout





## **2.1 Analogue Sensors**

This type of sensor provides a proportional output.

### **2.1.1 Pressure transducers**

Pressure transducers detect pressure given by the load in the lifting cylinders and produce an electrical signal related to the pressure.

Unlike pressure switches that provide an on-off signal, pressure transducers produce a proportional output signal. In particular, transducers for the new electronic system provide a signal with the following ratio:

0 ÷ 400 BAR

4 ÷ 20 mA

In this way, the component is constantly checked since the electronic control unit will provide an error message every time it receives a signal not within the specified range.

For instance, if the connection cable is interrupted, the control unit will no longer receive the minimum 4mA signal and will therefore signal a connection failure or improper operation of the transducer.

### **2.1.2 Angle Sensors**

The angle sensors incorporated into the new system are also innovative with respect to the sensors used in older systems.

Like pressure sensors, new angle sensors do not provide an on-off signal but a proportional signal relating to the angle detected. The output signal is always power signal, with the following ratio:

-105° ÷ +105°

4 ÷ 20 mA

By using these sensors, the faults are monitored and the crane management is much more accurate, since the electronic control unit can always count on exact information about the crane position, thus enabling performance to be optimised and improved freedom of movement in blocking conditions.

### **2.1.3 Oil Temperature Sensor**

This sensor measures the oil temperature in the hydraulic circuit in the discharge section. The sensor is resistive and has the following operating range:

-40° ÷ +150°



## **2.2 Digital Sensors**

This category includes sensors providing an on/off output signal.

### **2.2.1 Spool Position Sensors on Control Valve Block (D.I.)**

These sensors detect digitally (on/off) the activation of A or B inlet of the control valve block and therefore control the crane movements.

As far as the Danfoss control valve blocks are concerned, the spool position are built into the Radio module, whereas in all other control valve blocks, the sensors are in a separate module.

The control is active (NC) with levers in the idle position. In other words, the D.I. module provides two high output signals. Consequently, the electronic control unit will only accept one single direction given and therefore will signal an error if both manoeuvres are activated at the same time (e.g. rightward/leftward rotation).

Furthermore, when the system is turned on, the control unit will check the status of the levers and signal if a manoeuvre is already activated.

### **2.2.2 Rotation Proximity/MICROSWITCH Sensors**

These sensors check the crane rotation and detect whether the downgraded area has been reached (e.g. area in front of the cabin) or whether the rotation is disabled.

Proximity sensors are PNP NC (proximity switches with a normally closed, positive output). This means that if the connection cable is accidentally interrupted, the control unit will automatically switch to a downgraded operation or will disable rotation.

## **2.3 Sensori CAN-Bus**

This sensors are connected with the main unit with a CAN-Bus connection.

### **2.3.1 Outrigger Encoder**

These sensors are used with the interlock type 5 system and they detect the length of each stabilizer. In this way the main unit is able to check the stability level and calculate the overload pressure.

### **2.3.2 Slewing Encoder**

This sensor detect the rotation angle of the column with an accuracy of 1 degree.

PM standard angles are:

- 0° front area (crane over the cab)
- 90° right side area
- 180° rear area (crane over the body of the truck)
- 270° left side area



## 3 Operation

### 3.1 Start-Up

The Power Tronic system made a check control of all the components at the start-up, in order to check possible problems and further the position of the spools in order to verify the neutral position of the levers. Whenever the system finds one or more levers in an activated position, the error icon is displayed with the number of the item concerned. The crane remains locked until the error is solved.

To restart the system, disengage and then restart the PTO. As an alternative, you can do a quick reset of the system.

If the system does not detect any problems on sensors and connections, the start-up of the crane is allowed.

### 3.2 Use Selection

After the check control of the system, the operator is requested to select a crane mode. There are 3 different modes that be can be selected by means of the function keys, which are both on the Power Tronic unit and on remote control keyboard (when available) :

- **F1** Key Crane Use
- **F2** Key Supplementary Activation Use
- **F3** Key Man Basket Use (Option)

The crane mode cannot be changed during the operation, unless the PTO is switched off and on again. Moreover, if a mode is selected and the levers which are not suitable for such mode are operated, the crane is locked.

### 3.3 First Movement Allowed

In order to avoid any problems regarding leaking inside the main boom cylinder caused by long parking time of the crane, a system has been installed that checks the position of the booms by the angle sensors. For this reason **the first movement allowed is the main boom down** for at least 1 second.



### **3.4 Emergency Stop**



The Emergency Stop control stops all crane movements and puts the delivery of oil to the pump in discharge condition. When the emergency pushbutton is released, the electronic control unit checks the restarting conditions and makes sure that the control valve block levers are in neutral position. If there aren't any anomalous conditions, the control unit enables crane operation. If the electronic control unit detects a dangerous condition (e.g. a continuously activated manoeuvre), it will wait for safe operating conditions to be resumed before enabling movement.

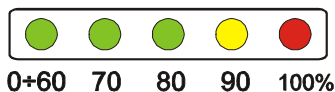
### **3.5 Load Limiting Device**

The operation of the load limiting device can be thus summarised: the pressure given by the load is detected by the pressure transducers (column, main boom and jib). When a load limit threshold is reached, the crane is blocked. On the basis of the position of the booms, detected by the angle sensors, and the movements of the same, detected by spool position sensors, the control unit will only enable manoeuvres that allow the load to approach the crane column axis.

The diagram below, provided in the Movements allowed section, describes the manoeuvres that can be performed when the crane is blocked.

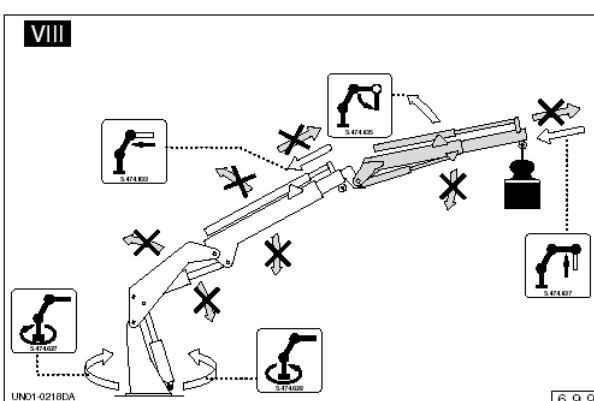
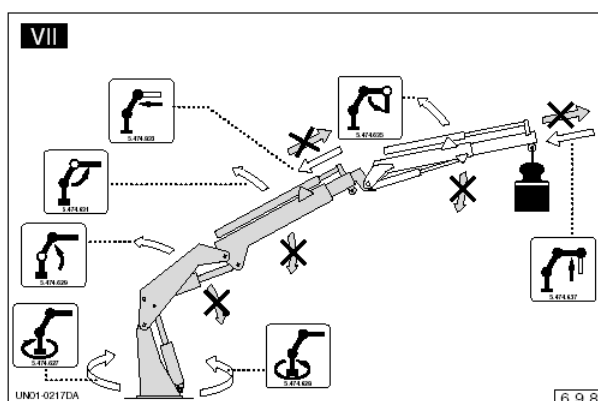
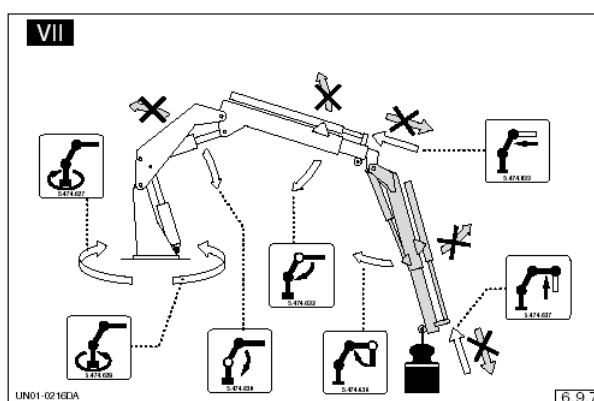
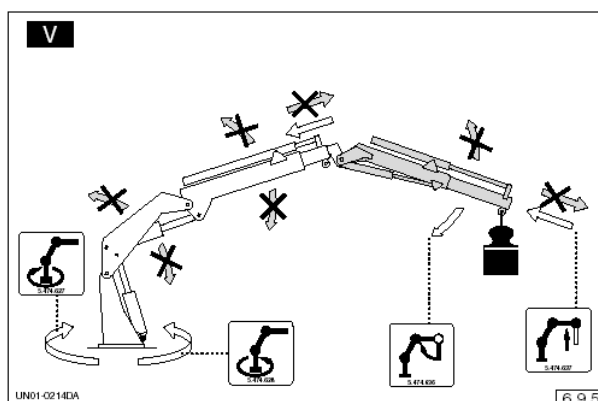
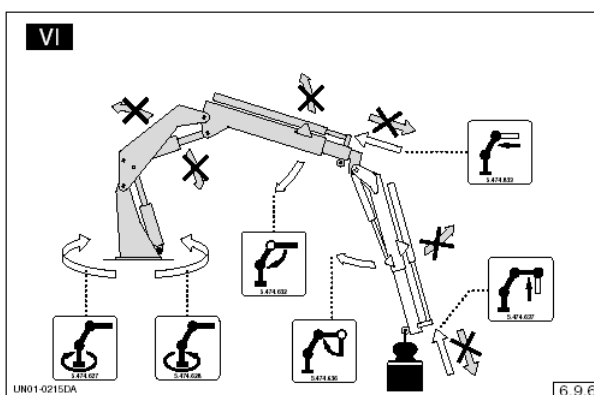
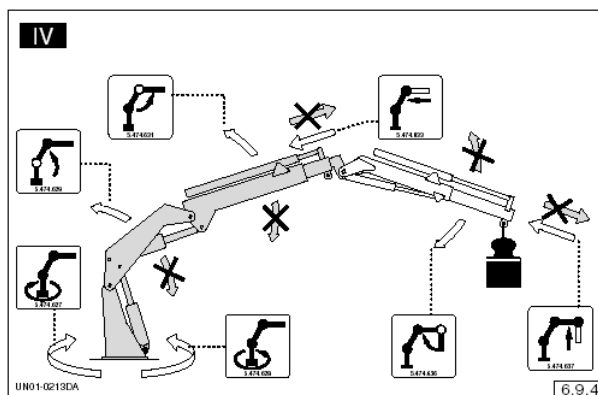
LED bars are provided to signal load increases.

Each bar is composed of five LEDs that switch on according to the following diagram:



The diagram below refers only to the operating mode of the crane (standard, Plus, downgraded) and to the calibration of the limiting device - not to the capacity of the crane.

### 3.5.1 Movements allowed in Overload Condition



### 3.6 Maximum overload

The **Power TRONIC Advance** has a pressure limit to prevent the structural damages of the crane. If the overload pressure is higher than 120% of the normal overload pressure, all the movement are locked. The only way to move the crane is to use the Reset function.

## 3.7 Pressure Planes Control

The Power Tronic controls different locking thresholds for control peak loads of boom extension cylinders. It is activated when a specific angle of inclination of the Boom Unit is exceeded (this angle varies depending on the model/configuration of the crane).

This function applies both to Boom Units and to Jib Booms (if these are fitted). The control of the latter has priority over control over the standard crane, in other words, if the crane is fitted with a jib, the control of peak loads will be performed on the jib and not on the crane.

### 3.7.1 Operation of the Crane Pressure Planes

This function is activated if the value of A2 (Boom pack angle) is between “120)START ANGLE CRANE VERTICAL CONTROL” and “121)STOP ANGLE CRANE VERTICAL CONTROL”.

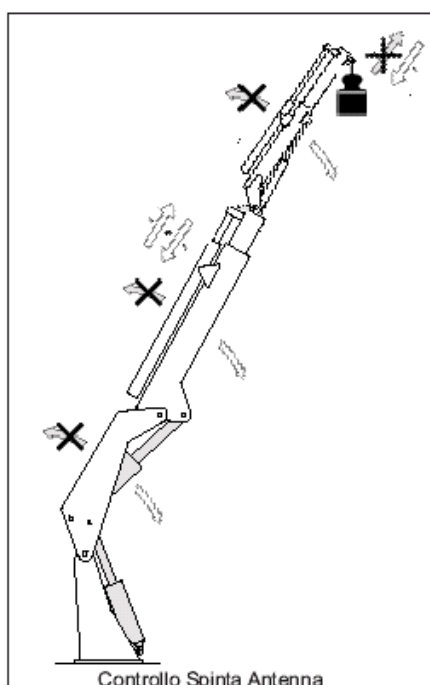
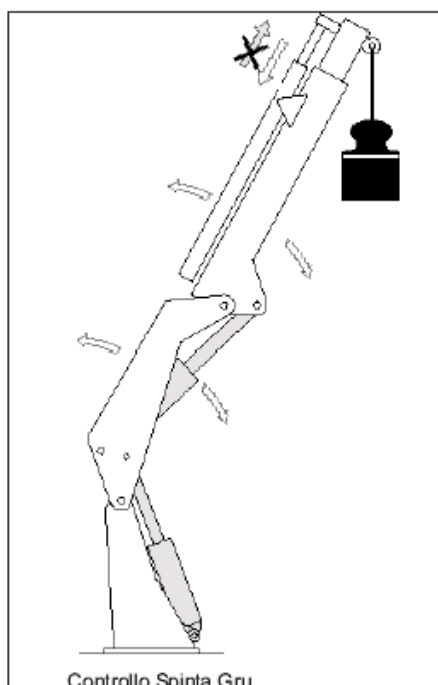
If the pressure is greater than the limit value of pressure ,calculated in real time by the system, the boom extension will not be allowed.

The pressure limit is a value between “122)START PRESSURE CRANE VERTICAL CONTROL” and “123)STOP PRESSURE CRANE VERTICAL CONTROL”.

### 3.7.2 Operation of the Jib Pressure Planes

In this case, the control differs slightly from that of the crane.

- Case 1 → If A3 (Jib Angle) is higher than “125)START ANGLE JIB VERTICAL CONTROL” and P3 is higher than “128)STOP PRESSURE JIB VERTICAL CONTROL”, all Column/Main Boom/Jib Articulation/Jib Extension are not allowed;
- Case 2 → If A3 is higher than “125)START ANGLE JIB VERTICAL CONTROL”, P3 is lower than “128)STOP PRESSURE JIB VERTICAL CONTROL” and higher than 2127)START PRESSURE JIB VERTICAL CONTROL”, only Jib Extension manoeuvre is not allowed.





### **3.8 Inclination Control**

The Power Tronic performs a control on two working angles, which limit vertically the crane and/or Jib, if this is fitted.

#### **3.8.1 Vertical Crane Control**



By measuring the angle of the Crane Boom Unit, the controls activated when the angle (A2) reaches the maximum threshold established by the Angle 04 parameter.  
The control is signalled by means of the corresponding icon.

#### **3.8.2 Vertical Jib Control**



This control is similar to the Vertical Crane Control, but with some differences concerning the angle checked, which is the A3 (Jib Angle). The control is activated when a specific angle is reached "131)JIB MAX ANGLE".  
The control is signalled by means of the corresponding icon.

## 4 Plus



This key controls the PLUS function on cranes featuring this device.

Thanks to the reduction of dynamic loads, the PLUS function increases the crane performance.

The PLUS can be controlled in two ways:

1. **PLUS in semi-automatic mode:** the Power Tronic activates this function automatically, when it reaches a pressure threshold. Therefore all manoeuvres which can determine a dynamic stress are slowed down roughly by 75%, thus enabling the crane to handle heavier loads. The PLUS is manually disengaged, therefore even if the pressure goes below the PLUS activation threshold, the manoeuvres used are still slowed down. It is the operator's task to disengage this function manually by pushing the PLUS key on the Power Tronic main panel or on the satellite units and/or on the remote control keyboard, if present.
2. **PLUS in manual mode:** the operator decides when to activate PLUS by pressing the key; if the crane reaches the threshold of pressure limit, you can manually activate the PLUS and then the pressure threshold is raised so the crane can lift heavier loads; in order to guarantee safe working conditions, when PLUS is activated, manoeuvres are performed at a speed that is approximately 75% lower than normal.  
PLUS is also manually deactivated, so is the operator that decide when to deactivate it pressing the PLUS key.  
N.B. if the pressure remains over the "not in PLUS" maximum threshold (LED/yellow light blinking), you can't deactivate the PLUS. To deactivate it is necessary to go down this pressure threshold and then to press the PLUS key.

The PLUS mode is signalled by a yellow lamp, a light turret and the LEDs on the main panel, satellite unit and remote control.

Concerning the Plus mode there are 3 different possibility:

Key LED switch OFF → PLUS OFF

Key LED BLINKING → PLUS ON and necessary (not disengaging)

Key LED switch ON → PLUS ON but not necessary (disengaging)

## 5 Reset

Is possible to use this function if the overloading remains even when the allowed movements have been performed.

Activation procedures:

- Pressing the "RESET" key; the corresponding LED switches on and the following icon appears on the display: .
- Performing a lowering movement (column, main boom, jib);
- If the overload is over, the crane will resume "normal" operation;
- If the overload is not over, any manoeuvre will be disabled for 30 seconds; the LED flash will indicate the wait time and the display will be showing .

### 5.1 Quick Reset

This function allows to reset temporary errors that can be notice by the Power Tronic system.

You can activate the Quick Reset by pressing the RESET keys on the central unit or radio control.

If the icon/code of error is not signalled anymore, you can take back the normal operation.

If the warning remains you must disengage and then restart the PTO.

## 6 Horn



If the corresponding output is connected, this key activates the truck horn to signal dangerous situations to persons that may be standing in the crane's operating radius, in conformity with EN12999.

## 7 Derating Area



This device enables crane operation at a reduced performance in the area in front of the truck cabin. If during the rotation, the crane enters the derating area with a load higher than what set, the crane is locked and the opposite manoeuvre can be performed in order to go back to the non-derating area. On the contrary, if the crane reaches the limit load once in the derating area, the manoeuvres which reduce the boom out will be available.

The default settings on the derating area are as follows:

AREA 180°

CAPACITY 50%

NOTE: The stability control in this area must be performed by the installer.

## 8 Electrical Rotation Lock



This device blocks the crane rotation in specific areas (e.g. front area). Therefore, once this area is set, the rotation in this area is not allowed.

## 9 Temperature Control



By means of the oil temperature sensor, the electronic control unit automatically controls:

- Crane operating range;
- Heat exchanger.

The temperature range allows to set limits for minimum and maximum temperature for crane use, thus protecting the hydraulic components.

The heat exchanger is started and stopped by the electronic card. It is hence possible to set intervention values.



## 10 Winch

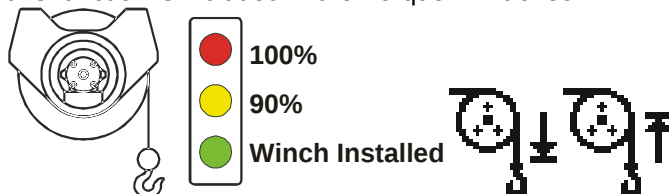
PM Power Tronic systems interface directly with the tow limiting devices of winches, to enable a more effective use of these accessories thanks also to the possibility to configure installation (on a crane or on a jib) and to automatically control the limit switches.

### 10.1 STD Winch

This control implies the acquisition of digital ON/OFF signals for:

- 90%
- 100%
- Downstroke Limit Switch

In some applications, the Upstroke Limit Switch Signal check is also envisaged. In all remaining cases, this function is included in the Torque Limit check.



### 10.2 Analogue Winch

This function allows for configuration of winches of the latest generation, e.g. Rotzler. The input signal is analogue (4÷20 mA), which means that it allows for differentiated management of the winch's performances. In other words, its lifting capacity will be the maximum allowed by the working configuration of the crane.

Management of the downstroke limit switch does not vary with respect to the standard version.

#### 10.2.1 Displacement of the Winch

This winch must be displaced toward the outside to allow the closing of the jib. An electric motor is installed on the support plate of the winch to displace it. The winch can work only when it is in axis with the booms.

To move the winch using the Power Tronic unit, hold down the F3 key to obtain the authorisation to move and at the same time press F1 or F2 to move it rightwards or leftwards. As an alternative, you can use the Scanreco/Hetronic radio control: press the outrigger button, hold down F1 to obtain the authorisation to move and use the fifth joystick.

N.B. The displacement is only possible if the load percentage of the winch is lower than 15%.



Not Ok (Winch not in axis with the booms)

Nok



Ok (Winch ready to work)

Ok

### 10.3 Locking the winch

With this function, you can lock operation of the winch when it is not used. Press the outrigger button on the Scanreco/Hetronic radio control and hold the RESET key down for a few seconds until the 'winch locked' icon appears on the display. To disengage the winch, repeat the same operation.



Locked Winch

Lck

## **11 Optional**

### **11.1 Mechanical Extensions**



Since it is interfaced with the LMU, the load limiting device enables control over the mechanical extensions. For instance, when the LMU detects overloading of a mechanical extension, it will enable only load lowering manoeuvres, which prevent dangerous situations.

### **11.2 Work lamp**

The work lamp can be installed on the crane's and/or jib's boom unit. It consists of a halogen lamp that is extremely handy when using the crane at night or in conditions of poor visibility.

To turn the lamp on/off from the control unit, press the F3 key; from the Scanreco radio control, hold the F1 key down for a few seconds; from the Hetronic radio control, press F3.

### **11.3 Multiple Activation**



The key **F1** engages/disengages the multiple activation valve, if present on the crane. The corresponding icon appears on the display.

### **11.4 Regenerative Valve**



The key **F2** engages/disengages the regenerative valve if present on the crane. The corresponding icon appears on the display.

When the crane is working in PLUS mode, the regenerative valve is automatically switched OFF.

### **11.5 Bucket use**



If the crane is fitted with an accessory, by activating this function, the crane performance will be automatically adapted to the new use. If you attempt to use the accessory without activating this operating mode, the crane will be blocked and you will need to activate it to continue using your crane.

## **12 Can-Bus System**

### **Description**

The CAN-BUS technology, on which the new electronic control unit is based, is an important innovation offering many possibilities for expansion and interfacing with other devices (e.g. radio control systems of the latest generation).

The CAN-BUS (Controller Area Network) is a data communication system for real-time applications. It was developed in 1986 by Bosch upon the request of Mercedes to enable communication of devices fitted to cars and trucks (ABS, ESP, Air Conditioning Control, central lock, etc.) and to reduce the amount of wiring needed for connection.

Advantages of the CAN system:

- Transmission rate 1Mbit/sec;
- Suitable for use in troublesome environments;
- Automatic error detection;
- Reduced wiring.

These features make the system ideal for use on cranes.



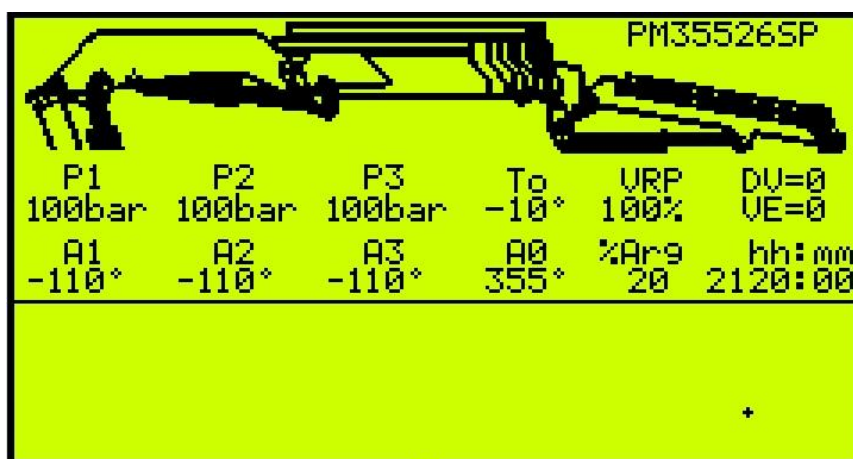
## 13 Display

In the **Power TRONIC Advance** system, particular attention has been paid to the user interface that not only features LED bars, signalling the load increases on the crane booms, but also an exhaustive graphic display with the exclusive **USER-FRIENDLY SYSTEM**. This means that icons and messages are used to give information about operation and faults, which makes the system ideal even for less expert users.

### INTERACTIVE WINDOWS

The Display constantly provides information about the status of the system. Use the Test Button to scroll pages from 1 to 3.

#### 13.1 Page 1 - Main Page



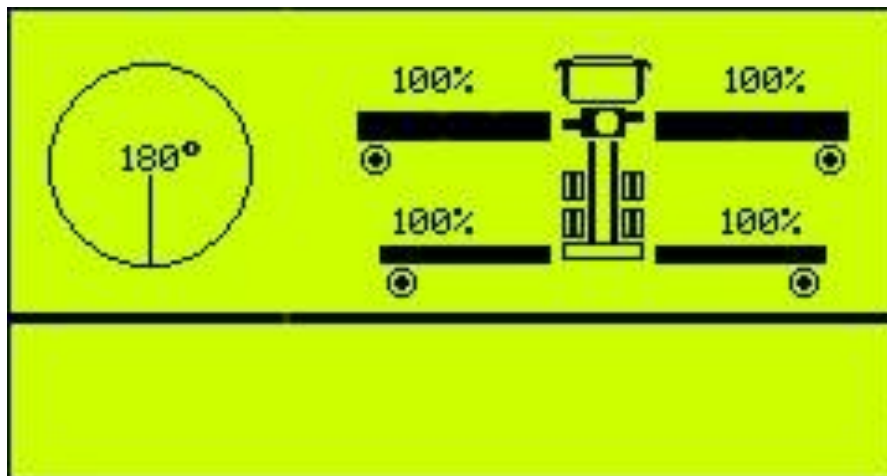
In the main page are displayed the measurement of each sensor.

|       |                                              |
|-------|----------------------------------------------|
| P1    | Main Cylinder Pressure                       |
| P2    | Second Cylinder Pressure                     |
| P3    | Fly Jib Cylinder Pressure (if jib installed) |
| A1    | Main Boom Angle                              |
| A2    | Boom Pack Angle                              |
| A3    | Fly Jib Angle (if jib installed)             |
| T0    | Oil Temperature                              |
| A0    | Slewing angle                                |
| VRP   | Speed reduction %                            |
| %Arg  | Winch torque limit % (if winch installed)    |
| DV    | DV signal from remote control                |
| VE    | Dump Valve power supply                      |
| hh:mm | Partial hour meter                           |



## **13.2 Page 2 – Outrigger status**

In the right side of the display are shown the outriggers status; to the left is shown the slewing angle.



## **13.3 Page 3 – System informations**

In this page are indicated:

- the lifetime hours of the crane;
- the loader version;
- the firmware version;
- the PLC software version;
- last 6 events recorded on the black box.



## 14 Icons

### 14.1 Status Icons

The status messages are information about crane operation; for instance, the display will signal if the crane is operating in a limited area or if a winch limit switch has been activated. These messages are called “status” messages because they do not signal errors. They are displayed below:

|                                                                                     |                                  |                                                                                     |                                 |
|-------------------------------------------------------------------------------------|----------------------------------|-------------------------------------------------------------------------------------|---------------------------------|
|    | Winch Downstroke Limit Switch    |    | Rotation Disabled               |
|    | Winch Upstroke Limit Switch      |    | De-Rating Area                  |
|    | Crane Thrust Area                |    | Emergency Button Pressed        |
|    | Jib Thrust Area                  |    | Regenerative Valve              |
|    | Crane Maximum Angle              |    | Overloaded Mechanical Extension |
|    | Jib Maximum Angle                |    | Use of the Platform             |
|    | Outrigger Use by Radio Activated |    | Radiator Running                |
|   | Jib Disconnected                 |   | Reset Activated (5 sec.)        |
|  | Crane Stabilized                 |  | Reset in Stand-by (30 sec.)     |
|  | Service                          |  | Displacement/Locked Winch       |
|  | Multiple Activation              |                                                                                     |                                 |
|  | Use of a Bucket                  |                                                                                     |                                 |

These messages relate to crane operation and will result in a manoeuvre procedure (e.g. if a winch downstroke limit switch is activated, the control unit will only allow manoeuvres that enable this condition to be quitted).



## **14.2 Alarm Icons**

Alarm messages give 'real time' information about faults of the systems or its sensors. Each message is associated to an icon and to an alphanumeric code that identifies the component causing the alarm. For instance, if a pressure sensor is malfunctioning, the icon will signal the transducer error condition, while the alphanumeric code will indicate which transducer is malfunctioning.

Unlike status messages and on the basis of their seriousness, alarm messages can downgrade crane performance or disable operation.

The alarm icons are:



Spool Position Control Valve Block K.O.



Alarm/General Error



CAN Error



High/Low Oil Temperature



Oil Filter Clogged

## **14.3 Icons Messages**

|     |                             |
|-----|-----------------------------|
| Lck | - Locked (Locked Winch)     |
| Nok | - Not Ok (Agreement denied) |
| Ok  | - Ok                        |



## 15 Error Codes

| ICON                                                                                | ERROR CODE | BB CODE | DESCRIPTION                                                   |
|-------------------------------------------------------------------------------------|------------|---------|---------------------------------------------------------------|
|    | 01         | 1       | - Clogged Filter                                              |
|    | 02         | 2       | - High Oil Temperature                                        |
|    | 03         | 3       | - Low Oil Temperature                                         |
| -                                                                                   | 04         | 4       | - Overloaded Column Cylinder (Crane Blocked)                  |
| -                                                                                   | 04B        | 124     | - Overloaded Main Boom Cylinder (Crane Blocked)               |
| -                                                                                   | 05         | 5       | - Overloaded Jib Cylinder (Jib Blocked)                       |
| -                                                                                   | 06         | 6       | - Overloaded Winch                                            |
|    | 07         | 7       | - Element 1 NOK (activated in both directions A/B)            |
|                                                                                     | 08         | 8       | - Element 2 NOK (activated in both directions A/B)            |
|                                                                                     | 09         | 9       | - Element 3 NOK (activated in both directions A/B)            |
|                                                                                     | 10         | 10      | - Element 4 NOK (activated in both directions A/B)            |
|                                                                                     | 11         | 11      | - Element 5 NOK (activated in both directions A/B)            |
|                                                                                     | 12         | 12      | - Element 6 NOK (activated in both directions A/B)            |
|                                                                                     | 13         | 13      | - Element 7 NOK (activated in both directions A/B)            |
|                                                                                     | 14A        | 14      | - Element 1 dir. A                                            |
|                                                                                     | 14B        | 134     | - Element 1 dir. B Levers not in idle position when system on |
|                                                                                     | 15A        | 15      | - Element 2 dir. A Levers not in idle position when system on |
|                                                                                     | 15B        | 135     | - Element 2 dir. B Levers not in idle position when system on |
|                                                                                     | 16A        | 16      | - Element 3 dir. A Levers not in idle position when system on |
|                                                                                     | 16B        | 136     | - Element 3 dir. B Levers not in idle position when system on |
|                                                                                     | 17A        | 17      | - Element 4 dir. A Levers not in idle position when system on |
|                                                                                     | 17B        | 137     | - Element 4 dir. B Levers not in idle position when system on |
|                                                                                     | 18A        | 18      | - Element 5 dir. A Levers not in idle position when system on |
|                                                                                     | 18B        | 138     | - Element 5 dir. B Levers not in idle position when system on |
|                                                                                     | 19A        | 19      | - Element 6 dir. A Levers not in idle position when system on |
|                                                                                     | 19B        | 139     | - Element 6 dir. B Levers not in idle position when system on |
|                                                                                     | 20A        | 20      | - Element 7 dir. A Levers not in idle position when system on |
|                                                                                     | 20B        | 140     | - Element 7 dir. B Levers not in idle position when system on |
|  | 21         | 21      | - Crane not stabilised (where the accessory is fitted)        |
|  | 22         | 22      | - Mechanical extension alarm (where the accessory is fitted)  |



| ICON                                                                                | ERROR CODE | BB CODE | DESCRIPTION                                           |
|-------------------------------------------------------------------------------------|------------|---------|-------------------------------------------------------|
|    | 23A        | 23      | - Main Boom Angle Sensor NOK (Disconnected)           |
|                                                                                     | 23B        | 143     | - Main Boom Angle Sensor NOK (Short-circuited)        |
|                                                                                     | 24A        | 24      | - Boom Angle Sensor NOK (Disconnected)                |
|                                                                                     | 24B        | 144     | - Boom Angle Sensor NOK (Short-circuited)             |
|                                                                                     | 25A        | 25      | - Jib Angle Sensor NOK (Disconnected)                 |
|                                                                                     | 25B        | 145     | - Jib Angle Sensor NOK (Short-circuited)              |
|                                                                                     | 26         | 26      | - Oil Temperature Sensor NOK                          |
|                                                                                     | 27A        | 27      | - Column Pressure Transducer NOK (Disconnected)       |
|                                                                                     | 27B        | 147     | - Column Pressure Transducer NOK (Short-circuited)    |
|                                                                                     | 28A        | 28      | - Main Boom Pressure Transducer NOK (Disconnected)    |
|                                                                                     | 28B        | 148     | - Main Boom Pressure Transducer NOK (Short-circuited) |
|                                                                                     | 29A        | 29      | - Jib Pressure Transducer NOK (Disconnected)          |
|                                                                                     | 29B        | 149     | - Jib Pressure Transducer NOK (Short-circuited)       |
|                                                                                     | 30A        | 30      | - Emergency Solenoid Valve Disconnected               |
|                                                                                     | 30B        | 150     | - Emergency Solenoid Valve Short-circuited            |
|                                                                                     | 31A        | 31      | - Solenoid Regeneration Valve Disconnected            |
|                                                                                     | 31B        | 151     | - Solenoid Regeneration Valve Short-circuited         |
|                                                                                     | 32A        | 32      | - Multiple Activation Solenoid Valve Disconnected     |
|                                                                                     | 32B        | 152     | - Multiple Activation Solenoid Valve Short-circuited  |
|   | 33         | 33      | - Winch Downstroke Limit Switch Activated             |
|  | 34         | 34      | - Winch Upstroke Limit Switch Activated               |
| -                                                                                   | 35         | 35      | - Use of Accessory Not Allowed                        |
| -                                                                                   | 36         | 36      | - Crane with Bucket Blocked (accessory)               |
|  | 37A        | 37      | - Rotation Solenoid Valve Disconnected                |
|                                                                                     | 37B        | 157     | - Rotation Solenoid Valve Short-circuited             |
|                                                                                     | 38A        | 38      | - Reduced Capacity Solenoid Valve Disconnected        |
|                                                                                     | 38B        | 158     | - Reduced Capacity Solenoid Valve Short-circuited (B) |
|                                                                                     | 39A        | 39      | - Spare Solenoid Valve Disconnected                   |
|                                                                                     | 39B        | 159     | - Spare Solenoid Valve Short-circuited                |
| -                                                                                   | 40         | 40      | - Crane in Limited Area Blocked                       |
|  | 41A        | 41      | - Solenoid Valve Spare 2 Disconnected                 |
|                                                                                     | 41B        | 161     | - Solenoid Valve Spare 2 Short-circuited              |
|                                                                                     | 42A        | 42      | - Analogue Winch Sensor NOK (disconnected)            |
|                                                                                     | 42B        | 162     | - Analogue Winch Sensor NOK (short-circuited)         |
|  | 43A        | 43      | - Lower Block Threshold of Top Roller                 |
|  | 43B        | 163     | - Upper Block Threshold of Top Roller                 |
|  | 44A        | 44      | - Solenoid Valve Spare 3 Disconnected                 |
|                                                                                     | 44B        | 164     | - Solenoid Valve Spare 3 Short-circuited              |



| ICON                                                                                | ERROR CODE | BB CODE | DESCRIPTION                                                      |
|-------------------------------------------------------------------------------------|------------|---------|------------------------------------------------------------------|
|    | 45         | 45      | - CAN Network NOK                                                |
|                                                                                     | 46         | 46      | - Radio CAN NOK                                                  |
|                                                                                     | 47         | 47      | - CAN LG/IO NOK                                                  |
|                                                                                     | 48         | 48      | - CAN LG/satellite NOK                                           |
|                                                                                     | 49         | 49      | - CAN MCS NOK                                                    |
|                                                                                     | 49B        | 169     | - CAN MCS SLAVE NOK                                              |
| -                                                                                   | 50         | 50      | - Tester access                                                  |
|    | 51         | 51      | - Encoder Position 1 NOK                                         |
|                                                                                     | 52         | 52      | - Encoder Position 2 NOK                                         |
|                                                                                     | 53         | 53      | - Encoder Position 3 NOK                                         |
|                                                                                     | 54         | 54      | - Encoder Position 4 NOK                                         |
|                                                                                     | 55         | 55      | - Inclination sensor X/Y NOK                                     |
|    | 60         | 60      | - Routine Maintenance Not Performed                              |
|                                                                                     | 61         | 61      | - Extra-duty Maintenance Not Performed                           |
| -                                                                                   | 62         | 62      | - Routine Maintenance Performed                                  |
| -                                                                                   | 63         | 63      | - Extra-duty Maintenance Performed                               |
|    | 64A        | 64      | - LG-SAT not found                                               |
|                                                                                     | 64B        | 184     | - LG-SAT not setted                                              |
| -                                                                                   | 65         | 65      | - Incorrect Shut-down Procedure                                  |
|   | 66A        | 66      | - Interlock 3-4 slewing microswitches disconnected               |
|  | 66B        | 186     | - Slewing Encoder NOK                                            |
| -                                                                                   | 70         | 70      | - Pressure Peak on Column Cylinder                               |
| -                                                                                   | 71         | 71      | - Pressure Peak on Main Boom Cylinder                            |
| -                                                                                   | 72         | 72      | - Pressure Peak on Jib Cylinder                                  |
| -                                                                                   | 73         | 73      | - Use of RESET function                                          |
| -                                                                                   | 74         | 74      | - Column Max Pressure Limit exceeded                             |
| -                                                                                   | 75         | 75      | - Improper Crane Operation                                       |
| -                                                                                   | 76         | 76      | - Reset Use in Emergency                                         |
|  | 77         | 77      | - Motor Start Output Short-circuited                             |
|                                                                                     | 78         | 78      | - Motor Stop Output Short-circuited                              |
|                                                                                     | 79         | 79      | - Winch Translation Output DX Short-circuited                    |
|                                                                                     | 80         | 80      | - Winch Translation Output SX Short-circuited                    |
|                                                                                     | 81         | 81      | - Horn Output Short-circuited                                    |
|                                                                                     | 82         | 82      | - Auto-RPM Output Short-circuited                                |
|  | 83A        | 83      | - Right Outrigger Piston Pressure Transducer NOK Disconnected    |
|                                                                                     | 83B        | 203     | - Right Outrigger Piston Pressure Transducer NOK Short-circuited |
|                                                                                     | 84A        | 84      | - Right Outrigger Rod Pressure Transducer NOK Disconnected       |
|                                                                                     | 84B        | 204     | - Right Outrigger Rod Pressure Transducer NOK Short-circuited    |
|                                                                                     | 85A        | 85      | - Left Outrigger Piston Pressure Transducer NOK Disconnected     |
|                                                                                     | 85B        | 205     | - Left Outrigger Piston Pressure Transducer NOK Short-circuited  |
|                                                                                     | 86A        | 86      | - Left Outrigger Rod Pressure Transducer NOK Disconnected        |
|                                                                                     | 86B        | 206     | - Left Outrigger Rod Pressure Transducer NOK Short-circuited     |
|                                                                                     | 102        | 102     | - Download                                                       |
|                                                                                     | 103        | 103     | - Black Box Deleted                                              |



## **16 Black Box**

Inside the POWER TRONIC there is a storage device called the BLACK-BOX where all the data processed by the microprocessor are stored.

Only the PM Service personnel is authorised to examine the Black-Box data storage device.

Besides the Black Box records any accesses to the system that have changed the functional parameters.

## **17 Service**

The Power Tronic calculates automatically the time when the service is due.

When the service is due, the corresponding icon is on.

**IMPORTANT:** if the switched icon is not associated to a number, it means that this is just a reminder for the operator, no reset is due and the visual signalisation disappears after 5 resets of the PTO.

On the contrary, the scheduled service is signalled by the icon and its corresponding code; in this case a reset must be performed.

The service time intervals vary according to the crane model. For more information, refer to the Operations and Maintenance Manual.



## 18 Input/Output Diagnostic Mode

With **Power Tronic Advance** is possible to check electrical faults using the diagnostic mode.  
This mode show the status of digital and analogic inputs and outputs.

To enter in this function press both F3 and Plus  
Scroll the pages with the scroll key.  
To exit press both F3 and Reset.

### Page1

#### DIGITAL INPUT

| INPUT | PIN        | DESCRIZIONE                                   |
|-------|------------|-----------------------------------------------|
| IND00 | CN1 PIN 32 | IND SPARE                                     |
| IND01 | CN1 PIN 12 | IND SPARE                                     |
| IND02 | CN1 PIN 16 | IND SPARE                                     |
| IND03 | CN1 PIN 44 | IND SPARE                                     |
| IND04 | CN1 PIN 18 | IND SPARE                                     |
| IND05 | CN1 PIN 47 | RADIO RESET                                   |
| IND06 | CN1 PIN 20 | RADIO DV                                      |
| IND07 | CN1 PIN 48 | RADIO ON                                      |
| IND08 | CN1 PIN 21 | RADIO SPARE                                   |
| IND09 | CN1 PIN 49 | RADIO AM                                      |
| IND10 | CN1 PIN 22 | RADIO RIG                                     |
| IND11 | CN1 PIN 52 | IND SPARE                                     |
| IND12 | CN2 PIN 03 | LEVER 1B                                      |
| IND13 | CN2 PIN 31 | LEVER 4A                                      |
| IND14 | CN2 PIN 04 | LEVER 1A                                      |
| IND15 | CN2 PIN 32 | LEVER 5B                                      |
| IND16 | CN2 PIN 05 | LEVER 2B                                      |
| IND17 | CN2 PIN 33 | LEVER 5A                                      |
| IND18 | CN2 PIN 06 | LEVER 2A                                      |
| IND19 | CN2 PIN 34 | LEVER 6B                                      |
| IND20 | CN2 PIN 07 | LEVER 3B                                      |
| IND21 | CN2 PIN 35 | LEVER 6A                                      |
| IND21 | CN2 PIN 40 | SW2                                           |
| IND22 | CN2 PIN 08 | LEVER 3A                                      |
| IND23 | CN2 PIN 36 | LEVER 7B                                      |
| IND24 | CN2 PIN 09 | LEVER 4B                                      |
| IND25 | CN2 PIN 37 | LEVER 7A                                      |
| IND26 | CN2 PIN 16 | SW1                                           |
| IND27 | CN2 PIN 44 | DOWN EDSTROKE WINCH                           |
| IND28 | CN2 PIN 17 | SW4                                           |
| IND29 | CN2 PIN 45 | MICRO AREA DX - SW22                          |
| IND30 | CN2 PIN 18 | FINECORSA ROTAZ. DX / CHECK ROT. INTERLOCK 5  |
| IND31 | CN2 PIN 46 | PLE                                           |
| IND32 | CN2 PIN 19 | FINECORSA ROTAZIONE SX                        |
| IND33 | CN2 PIN 47 | LMU                                           |
| IND34 | CN2 PIN 20 | MICRO AREA SX - SW23                          |
| IND35 | CN2 PIN 48 | SW0 / MICRO INTERLOCK 1                       |
| IND36 | CN2 PIN 21 | SW5 / 100% WINCH                              |
| IND37 | CN2 PIN 49 | SW3                                           |
| IND38 | CN2 PIN 22 | SW6 / 90% WINCH                               |
| IND39 | CN2 PIN 50 | MICRO OUTRIGGER LEVER - SW24                  |
| IND40 | CN2 PIN 23 | SW7 / UP ENDSTROKE WINCH                      |
| IND41 | CN2 PIN 51 | TRASLA ARGANO OK / PRES. OPER. POSTO IN PIEDI |
| IND42 | CN2 PIN 52 | TRASLA ARGANO NOK / FC ROTAZ. POSTO IN PIEDI  |



**Page 2**  
**ANALOG INPUT**

| INPUT | PIN        | DESCRIZIONE  |
|-------|------------|--------------|
| INA00 | CN2 PIN 10 | ANGLE A3     |
| INA01 | CN2 PIN 11 | ANALOG WINCH |
| INA02 | CN2 PIN 12 | ANALOG SPARE |
| INA03 | CN2 PIN 13 | PRESSURE P2  |
| INA04 | CN2 PIN 14 | ANGLE A1     |
| INA05 | CN2 PIN 42 | PRESSURE P1  |
| INA06 | CN2 PIN 15 | PRESSURE P3  |
| INA07 | CN2 PIN 43 | ANGLE A2     |

**Page 3**  
**DIGITAL OUTPUT**

| OUTPUT | PIN           | DESCRIZIONE      |
|--------|---------------|------------------|
| OUT00  | CN1 PIN 30    | OUT 90%          |
| OUT01  | CN1 PIN 31    | OUT 100%         |
| OUT02  | CN1 PIN 34    | OUT RADIO ON     |
| OUT03  | CN1 PIN 07    | CLACSON          |
| OUT04  | CN1 PIN 08    | OUT LUCE PLUS    |
| OUT05  | CN1 PIN 36    | GRU CHIUSA       |
| OUT06  | CN1 PIN 09    | TRASLA ARGANO DX |
| OUT07  | CN1 PIN 10    | STOP             |
| OUT08  | CN1 PIN 38    | TRASLA ARGANO SX |
| OUT09  | CN1 PIN 11    | WORK LAMP JIB    |
| OUT10  | CN1 PIN 41    | RADIO PLE        |
| OUT11  | CN1 PIN 14    | OIL COOLER       |
| OUT12  | CN1 PIN 43    | RADIO PLUS       |
| OUT13  | CN2 PIN 26/53 | + SENSOR         |
| OUT14  | CN2 PIN 54    | + SENSOR JIB     |
| OUT15  | CN2 PIN 27/55 | + SENSOR GRU     |
| OUT16  | CN1 PIN 05    | WORK LAMP CRANE  |
| OUT17  | CN1 PIN 37    | EV. OUTRIGGER    |
| OUT18  | CN1 PIN 06    | EV. RID.PORT.    |
| OUT19  | CN1 PIN 35    | EV. SLEWING      |
| OUT20  | CN1 PIN 40    | EV. AM 2         |
| OUT21  | CN1 PIN 39    | EV. AM 1         |
| OUT22  | CN1 PIN 33    | EV. REGENERATIVE |
| OUT23  | CN1 PIN 13    | EV. DUMP VALVE   |

**Page 4**  
**CAN 1 – NETWORK MAP (NOT USED)**

**Page 5**  
**CAN 2 – NETWORK MAP (NOT USED)**