USER MANUAL

4XL

AMCO VEBA
A HYVA GROUP COMPANY

7844039-02 05/18
subject to change without notice

ORIGINAL INSTRUCTIONS

USER MANUAL
4XL
INDEX

SYMBOLS

Symbols	Description
P1	Working pressure Current pressure in the 1st boom cylinder detected by the moment limiter
PJ	Working pressure Current pressure in the articulation jib cylinder detected by the moment limiter
P1L	Pressure limit for the 1st boom cylinder Max allowable working pressure in the 1st boom cylinder depending on stabilizer spreads and slewing angle
PJL	Pressure limit for the articulation jib cylinder Max allowable working pressure in the articulation jib cylinder. Constant value
L	Load suspended from the hook For the crane: load suspended from the hook of the last hydraulic extension For the winch: load hoisted with the winch, rope pull For a manual extension: load suspended from the hook of the manual extension
RL	Rated load For the crane hook: max lifting capacity at a given outreach For the winch: max pull capacity (constant value) For a manual extension: max lifting capacity, setting value for the load cell (constant value)
ROT	Rotation angle (slewing angle) Angle mesured in clockwise direction, between the dead point line and the crane booms axis (expressed in degrees)
SRS	Recovery and Stability Simulation System

A WARNINGS

A.1 IMPACT HAZARD

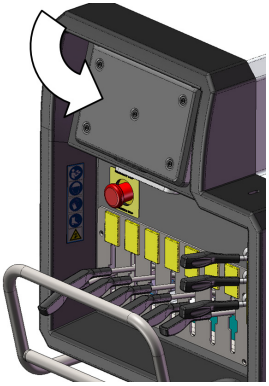
Impacts against the dashboard could cause malfunction of the System.
Residual hazards are associated with:

- impact with the suspended load
- impact caused by release of the load
- Impact during crane transport

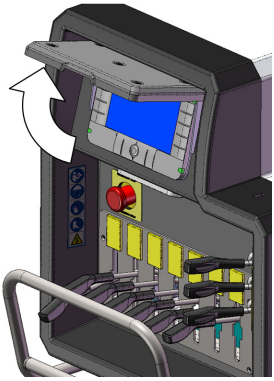
WARNINGS

- Be sure the load does Not bump against the dashboard during working operations.
- Be sure the dashboard is protected by its cover during crane inactivity.

⚠ Open the cover before starting any crane operation.



Cover closed during crane inactivity



Cover lifted during work

B DESCRIPTION OF THE SYSTEM

B.1 GENERAL

This electronic limiter includes stability control functions intended for CE cranes.
The system includes a moment limiter which monitors in real time the pressure inside the cylinder of the 1st boom (P1) and compares it with the pressure limits (P1L) obtained from the stability test (calibration) and calculated for any rotation angle by the system; these limits establish the max lifting capacity of the crane, ensuring vehicle stability based on the opening and positioning of the stabilizer extensions.
The system offers a wide series of functions and control buttons as described below:

OPERATING FUNCTIONS

#	Symbol	Functions	Functions	Symbol	#
F1		Radio / Manual mode	Horn		F6
F2		Stabilizers	Overload bypass		F7
F3		Lifting tools	Diagrams		F8
F4		Statistics	Work lights		F9
F5		Settings	Automatics (option)		F10

SPECIAL OPERATING FUNCTIONS (OPTION)

F2+F7		+		"Stability Simulation" Push F2 and F7 at the same time to activate this function

BUTTONS

#	Button	Functions
B1		Up/Plus Increases the screen brightness Allows to navigate in the menu, up Increases the selected value
B2		Down/Minus Decreases the screen brightness Allows to navigate in the menu, down Decreases the selected value
B3		Home Screen When pressed the system exits the current function and returns to Home Screen
B4		Esc When pressed the system exits the current function and returns to the previous one
B5		Return Confirms changes

FUNCTIONS FOR ENSURING CRANE SAFETY
See B.14

B.2 HOME SCREEN

The home screen shows the user the most important crane's operational parameters, warning (see D.4) and alarm messages (see D.5).

OPERATIONAL PARAMETERS

Param.	Description
CRANE%	P1/P1L (% given by a bar indicator)
P1	Pressure in the 1st boom cylinder (bar)
A1	Inclination of the 1st boom with respect to the horizontal (°) (with Automatics or SRS only)
A2	Inclination of the 2nd boom and the extensions with respect to the horizontal (°)
ROT	Rotation angle with respect to the direction of dead point (ROT = 0/360° at dead point)
T°	Oil temperature (°C) (with Danfoss CAN-Bus only)
'CRANE FOLDED'	It is displayed when the crane is folded in transport position
'STABILITY SIMULATION'	It is displayed when the "Stability Simulation" is active (with SRS only)
	It is displayed as a maintenance inspection is required
JIB%	PJ/PJL for jib (%given by a bar indicator)
PJ	Pressure in the jib articulation cylinder (bar)
AJ	Inclination angle of the jib boom with respect to the horizontal position (°)
LOAD%	L/RL for winch (%)
L	Load suspended from the hook of a manual extension (kg)

WARNING MESSAGE (See D.4)
ALARM MESSAGE (See D.5)

B.3 F1 - RADIO/MANUAL MODE

When the Home Screen is active, F1 enables/disables Radio/Manual controls.
F1 function may also be activated from radio transmitter.
If F1 button is pushed, the crane's operative mode switches in this way:

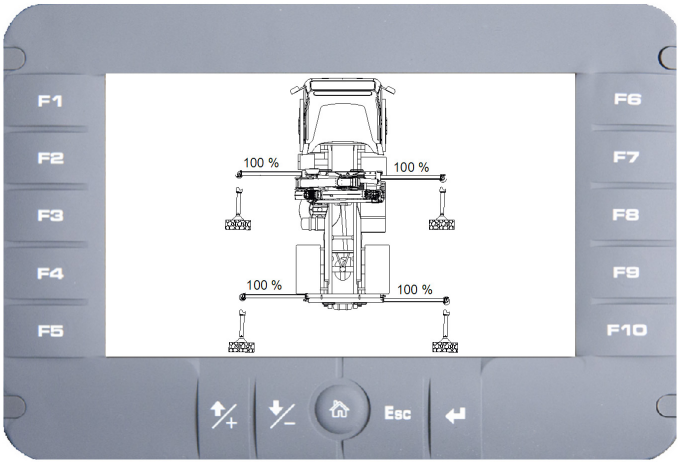
from Radio  → to Manual 

or

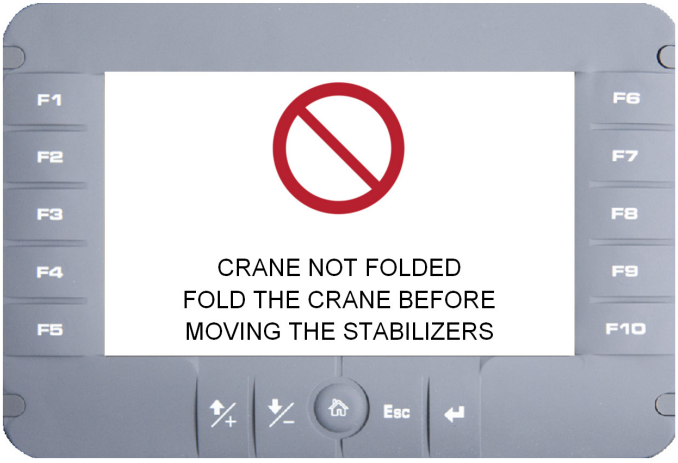
from Manual  → to Radio 

B.4 F2 - STABILIZERS

When the Home Screen is active, F2 button enables the stabilizers controls.
F2 function may also be activated from radio transmitter.
If the crane is folded in transport positon, the "Stabilizer Home Screen" appears.



The display shows the current stabilizer configuration: it indicates if the feet are on the ground and gives the spread ratio for every extension (0% = fully retracted; 100% = fully extended).
If the crane is open and not equipped with SRS, the display shows this message:



If the crane is open, equipped with SRS and all activating conditions are fulfilled, the following screen appears:

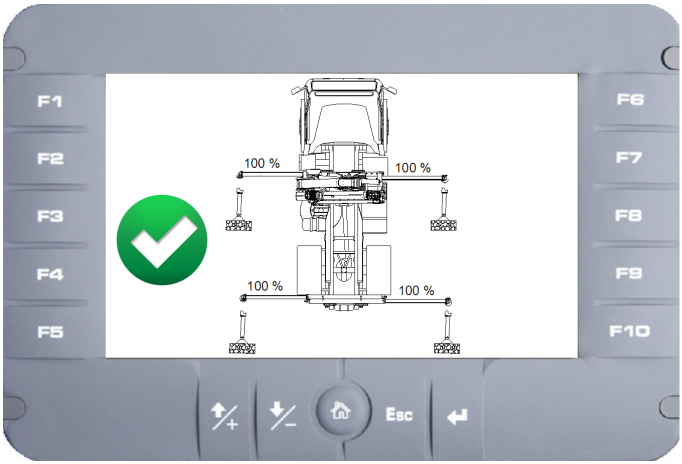
Push B3 button to get out of F2 function and to return to the Home Screen.
Push B5 button to enter the "Stabilizer Function". If the crane is open and equipped with SRS but the activating conditions are not fulfilled, the following screen appears:

At this point you can move the crane in order to bring the operational parameters within the limits (written in red). After all conditions are fulfilled, the system enables and automatically enters the "Stabilizer Function": the "Stabilizer Home Screen" appears.
Return to the Home Screen (B3) to exit the "Recovery Simulation".

B.4.1 RADIO-CONTROLLED STABILIZERS

If the crane is equipped with radio-controlled stabilizers, these are activated as follows:

- Be sure that the radio control is enabled
- Be sure that the crane is folded
- Push F2 button or "STAB FUNCTION" button on the radio transmitter to access the "Stabilizer Home Screen"
- Push for 2 seconds the BS button (see the Crane User Manual) on the side where you want to move the stabilizers: a green check mark is displayed on the selected side



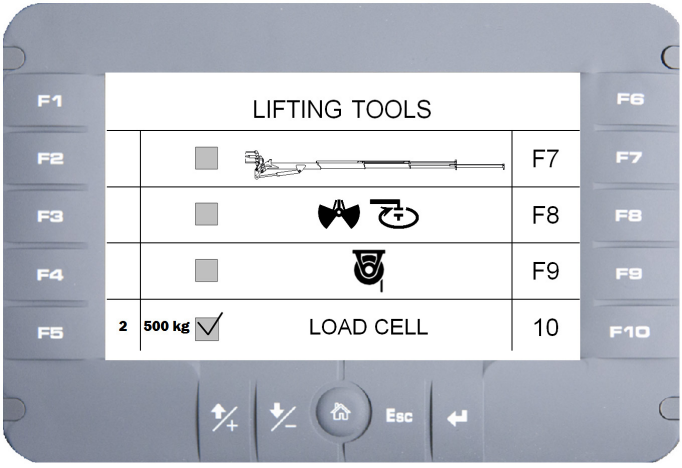
At this point the stabilizers can be radio-controlled.

If you don't move the stabilizers for 10 seconds, the stabilizer controls will be disabled: push again the BS button to reactivate the controls.

Push B3 (Home) or "STAB FUNCTION" to exit and enable the crane's controls.

B.5 F3 - LIFTING TOOLS

When the Home Screen is active, F3 button enables/disables the supplementary lifting tools.
F3 function is activable also from radio transmitter.
F3 function is active only if at least an additional lifting tool is available (jib, grab/rotator, winch, load cell). When F3 button is pushed, the following screen appears.



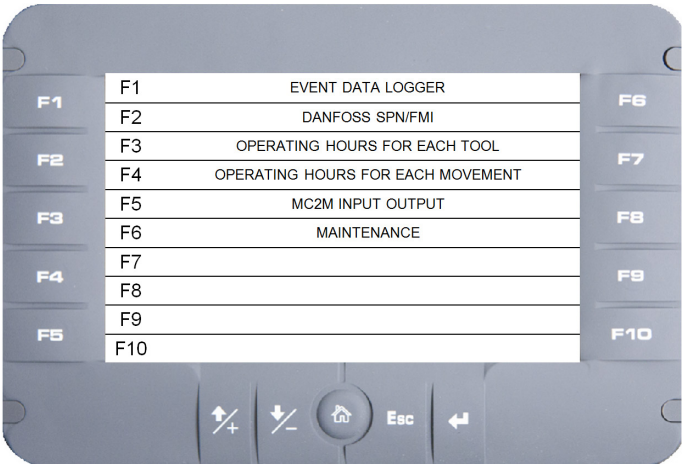
F7 enables/disables the jib boom
F8 enables/disables the supplementary activations for grab/rotator
F9 enables/disables the winch
F10 enables/disables the load cell for manual extensions. With F5 you can select the manual extension used (1, 2, etc.): its rated capacity is shown on the display.
The activated tools are indicated with a check mark.

and appear on the "Home Screen" together with their operational parameters (see B.2).

⚠ Winch and grab/rotor can not be activated at the same time: if you try to enable the grab while the winch is already activated, the system enables the grab but automatically disables the winch, and vice versa.

B.6 F4 - STATISTICS

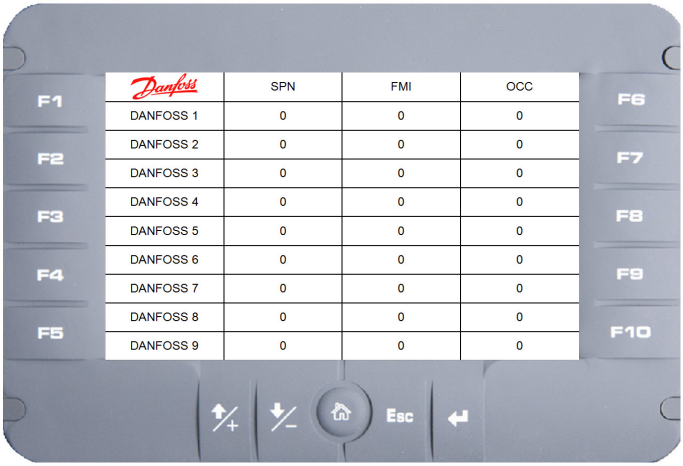
When the Home Screen is active, F4 button shows the Statistics Home Screen.



F1	EVENT DATA LOGGER
F2	DANFOSS SPN/FMI
F3	OPERATING HOURS FOR EACH TOOL
F4	OPERATING HOURS FOR EACH MOVEMENT
F5	MC2M INPUT OUTPUT
F6	MAINTENANCE
F7	
F8	
F9	
F10	

Only authorized personnel can enter F1 function.

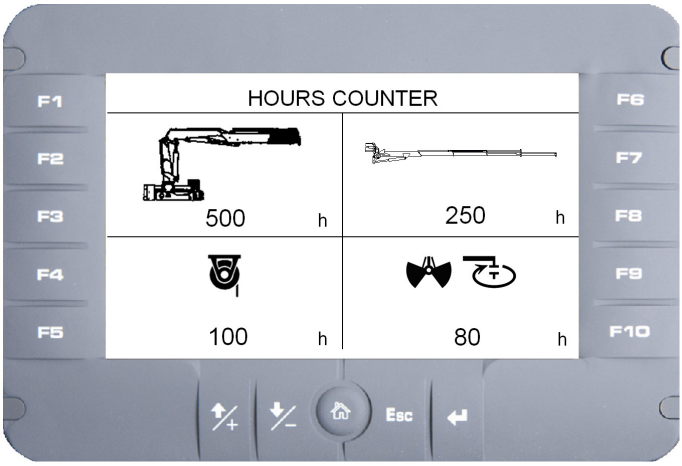
F2 - DANFOSS SPN/FMI



Danfoss	SPN	FMI	OCC
DANFOSS 1	0	0	0
DANFOSS 2	0	0	0
DANFOSS 3	0	0	0
DANFOSS 4	0	0	0
DANFOSS 5	0	0	0
DANFOSS 6	0	0	0
DANFOSS 7	0	0	0
DANFOSS 8	0	0	0
DANFOSS 9	0	0	0

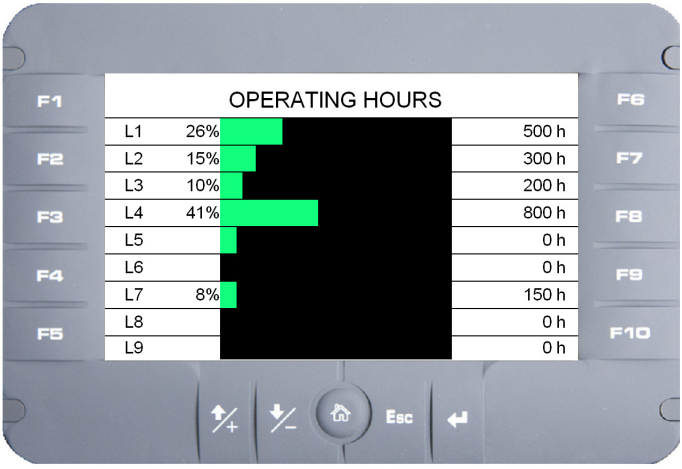
This function is active only for cranes equipped with Danfoss control valve.
This page shows all current alarms emitted by the single elements of the control valve.
The alarm codes are described in the document "PVED-CC Serie4", paragraph "Error description".

F3 - OPERATING HOURS FOR EACH TOOL



This page shows the total operating hours for crane (slewing, booms, extensions) and for available lifting tools: jib (boom, jib extensions), winch (winding/unwinding), grab/rotator (grabbing, rotation).

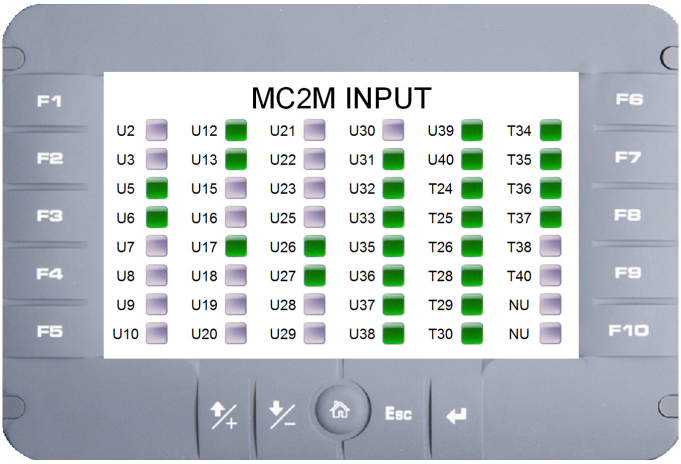
F4 - OPERATING HOURS FOR EACH MOVEMENT



This page shows the total operating hours and the utilization rate for each movement: the lengths of the green bars are proportional to the utilization rate.
L1,..., L9 movements are listed in the same order as the joysticks on radio transmitter: the figure above refers to a crane with slewing (L1), 2 articulated booms (L2, L3), hydraulic extensions (L4) and winch (L7).

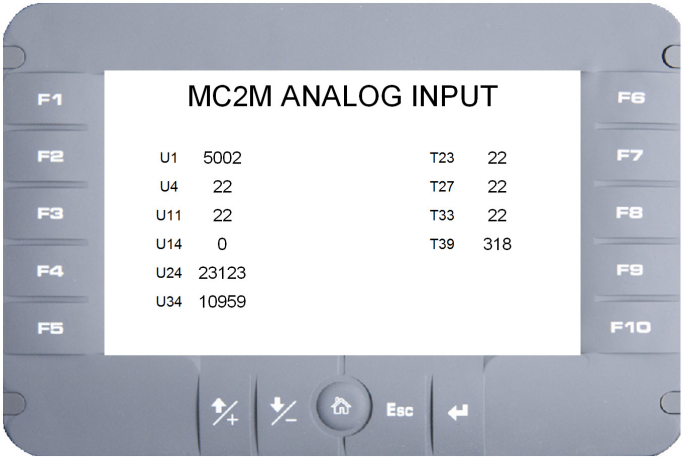
F5 - MC2M INPUT OUTPUT

Push F3 to enter the MC2M INPUT viewer.



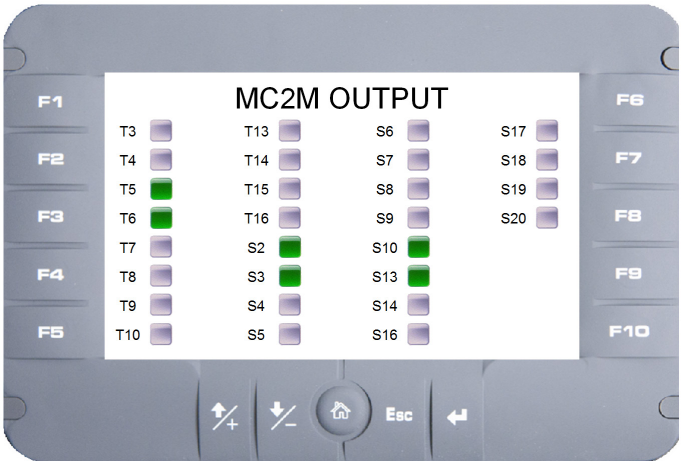
This page shows all digital inputs to the MC2M main controller: the input signal is high if the respective sign is green. Descriptions of input codes are given in D.6

Push F4 to enter the MC2M ANALOG INPUT viewer.



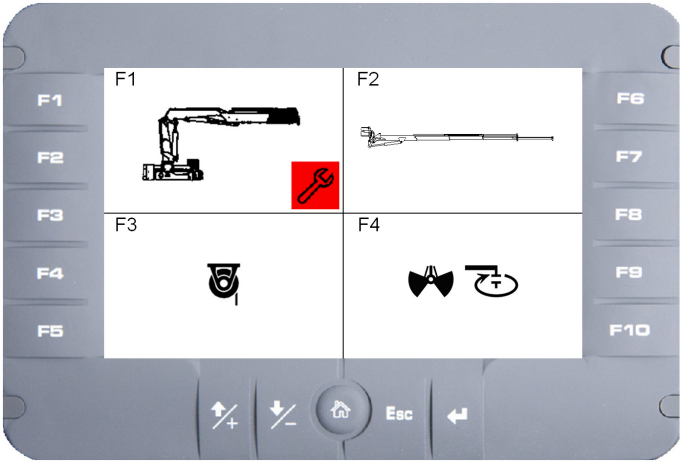
This page shows all analog input values to the MC2M main controller: if a value is lower than 30mA, the input is to be considered equal to 0. Descriptions of input codes are given in D.6

Push F5 to enter the MC2M OUTPUT viewer.

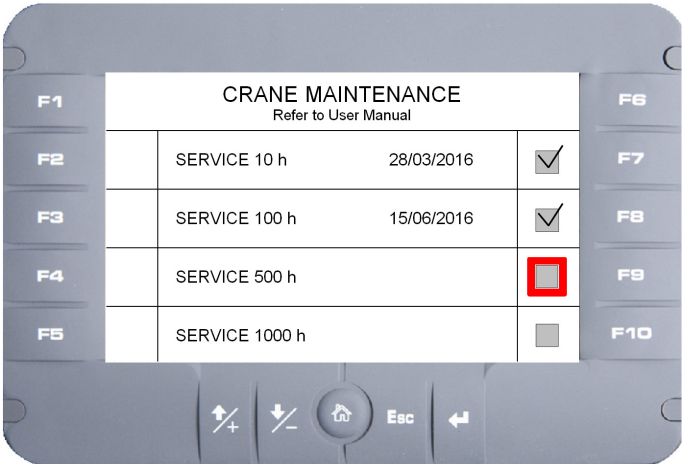


This page shows all digital ouputs from the MC2M main controller: the ouput signal is high if the respective sign is green. Descriptions of input codes are given in D.6

F6 - MAINTENANCE



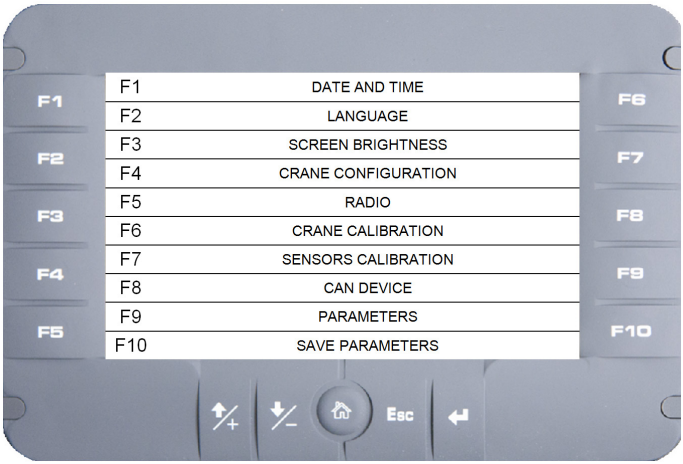
Push a function button (F1 ... F4) to enter the Maintenance Viewer for crane and/or available lifting tools. If maintenance inspection is required (see user manual), a red wrench icon indicates in this page the tool to be checked: the user must contact an authorized assistance centre as soon as possible.



The planned maintenance already performed is indicated with a check mark and its execution date (dd/mm/yyyy). The maintenance to be carried out is indicated in red.

B.7 F5 - SETTINGS

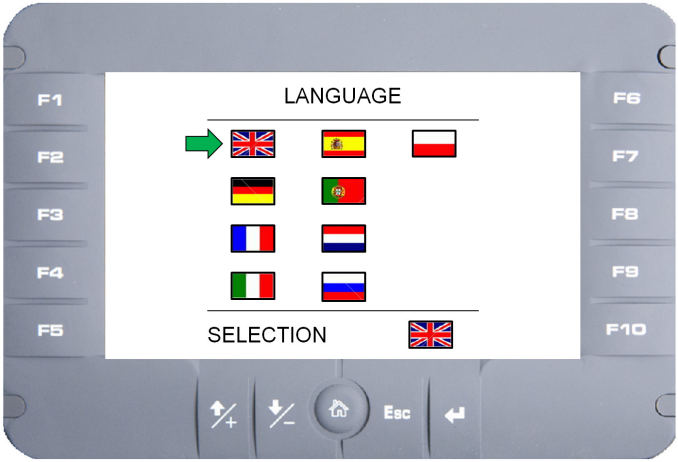
When the Home Screen is active, F5 button shows the Settings Home Screen.



F1	DATE AND TIME
F2	LANGUAGE
F3	SCREEN BRIGHTNESS
F4	CRANE CONFIGURATION
F5	RADIO
F6	CRANE CALIBRATION
F7	SENSORS CALIBRATION
F8	CAN DEVICE
F9	PARAMETERS
F10	SAVE PARAMETERS

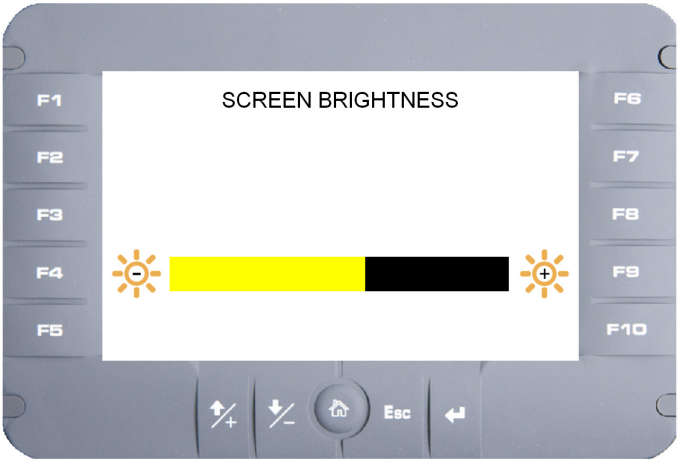
The user can enter only the submenus F2 and F3.

F2 - LANGUAGE



Change language moving the arrow with B1 (Up) and B2 (Down), then confirm with B5.

F3 - SCREEN BRIGHTNESS

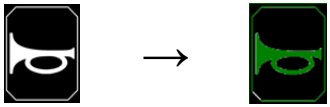


This function allows to change the level of screen brightness: this is reset to the default value at every next system startup.
Push F4 to decrease, F9 to increase the brightness level.
Push B3 to confirm and to return to Home Screen.

B.8 F6 - HORN

The user can activate the horn of the vehicle by keeping the F6 button pushed.
The icon becomes green when active.

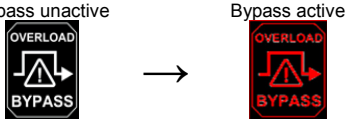
Horn not active → Horn active



B.9 F7 - OVERLOAD BYPASS

Under overload condition, this function allows the user to increase the pressure limit (P1L) ensuring anyhow the stability and the structure strength.
The user can enable for 5 seconds the descent of the 1st boom, the 2nd boom and the jib boom (at reduced speed) in order to restore the ordinary operating conditions. If the overload persists, these controls are disabled for another 30 seconds, after which it is possible to push the button again.
This procedure can be repeated 4 times.
Keep the F7 button pushed to maintain the bypass active: the icon becomes red.

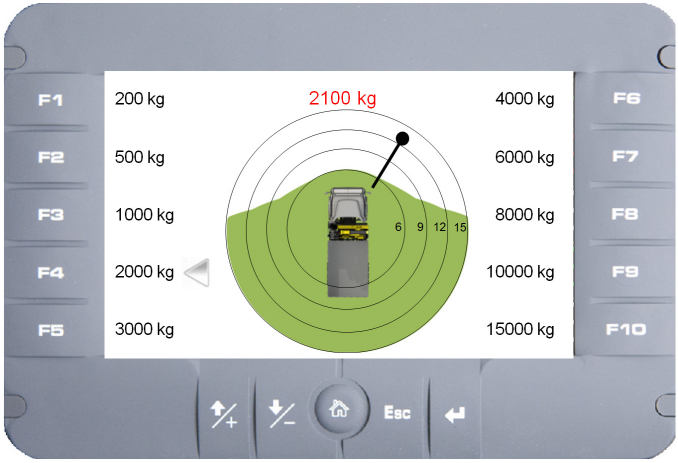
Bypass unactive → Bypass active



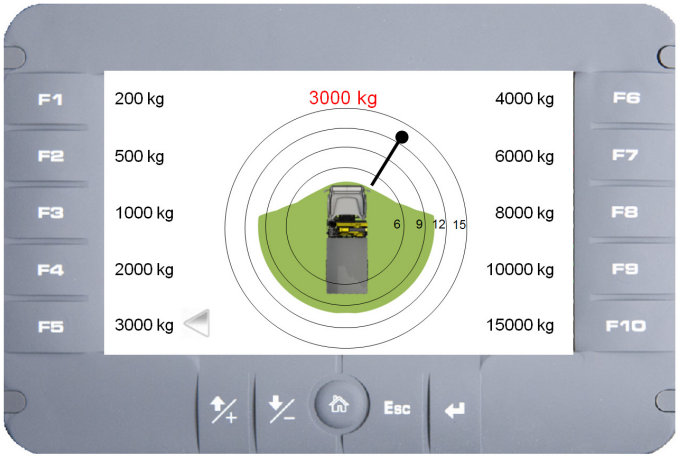
⚠ Use this function in emergency only.
Before lowering the booms, the user must fully retract the hydraulic extensions.

B.10 F8 - DIAGRAMS

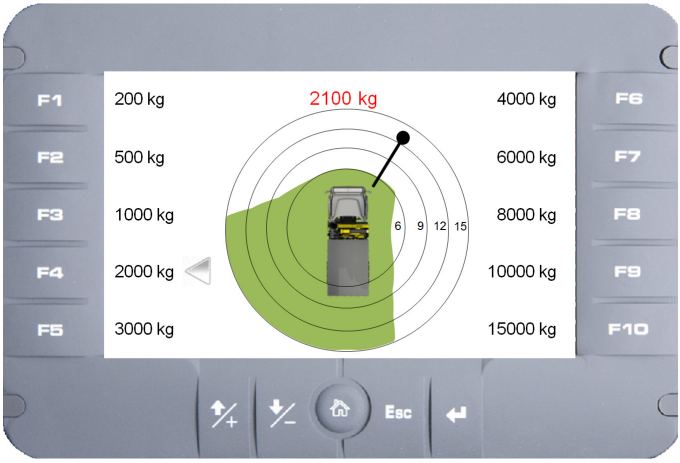
When the Home Screen is active, F8 button shows the Diagrams Screen.



This diagram shows the permitted area (green zone) where you can lift the input load (written in red) with horizontal crane booms, ensuring stability and structural integrity. In order to better understand the data, some working radius and the current direction of the crane booms are shown.
You can change the input load with the function buttons: the selection is indicated with an arrow.
It is possible to modify the selected value increasing (B1) and decreasing (B2) by 50 kg steps.
The permitted area changes depending on the input load and the spread of every stabilizer.
The diagram below shows the permitted area with increased input load: the area becomes smaller.



The following diagram shows the permitted area with stabilizer spreads reduced on the right side of the vehicle: the area becomes smaller only on the right side.

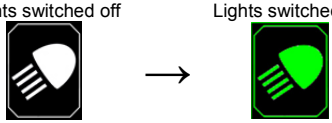


The green area includes also the boundary zone where the working pressure (P1) is between 90%-99% pressure limit (P1L) (see the yellow area in B.14.1).

B.11 F9 - WORK LIGHTS

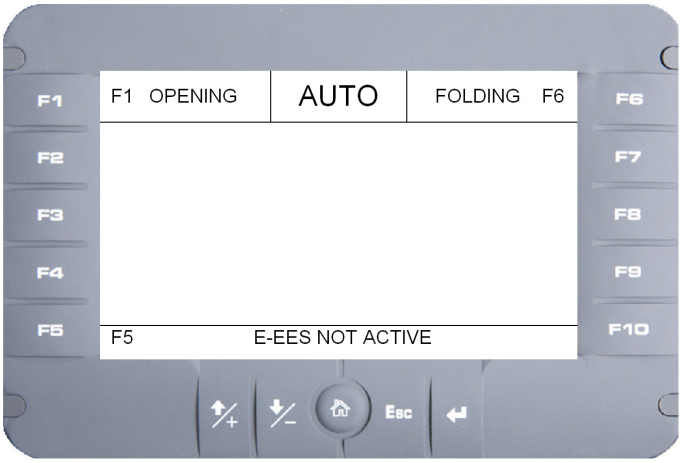
When the Home Screen is active, F9 button is used to switch work lights on and off.
When the work lights are switched on, the icon becomes green.

Lights switched off → Lights switched on



B.12 F10 - AUTOMATICS

This optional function is not available for the following cranes: K, T, cranes equipped with winch.
When the Home Screen is active, F10 function allows to automatically open or close the crane into the folded position. F10 function may also be activated from radio transmitter.
When F10 button is pushed, the following screens appears.



If the crane is folded, you can start the automatic opening procedure only.
If the crane is open, you can start the automatic folding procedure only.

F1 - AUTOMATIC OPENING
Keep F1 button pushed to automatically open the crane booms at reduced speed: "AUTO" flashes, the yellow tower light turns on and the audible alarm is active and intermittent.
The following image flashes:

The crane moves into a preset positions: usually 1st and 2 booms move into horizontal position, then the crane rotates in the folding direction.
Release F1 button to stop the function: the crane will stop in its current position.

⚠ Before using this function, be sure that nobody and nothing are in the operating area of the crane. The emergency stop button is active during the automatic opening procedure.

F6 - AUTOMATIC FOLDING
Keep F6 button pushed to automatically fold the crane at reduced speed: "AUTO" flashes, the yellow tower light turns on and the audible alarm is active and intermittent.
The following image flashes:

The crane moves according to the following preset sequence:
- retraction of the hydraulic extensions
- moving of the 1st and 2nd booms up to the preset inclination angles: this configuration avoids bumps between crane and vehicle (cab, body) during rotation.
- rotation up to the folding direction
- folding

Release F6 button to stop the function: the crane will stop in its current position.

Before using this function, be sure that nobody and nothing are in the operating area of the crane. Moreover be sure that:
- all manual extensions are removed.
- there are no loads suspended from the crane's hook.
- there is no lifting equipment (chains, bends, pallet forks, etc.) coupled to the crane's.

The emergency stop button is active during the automatic folding procedure.

F5 - EES (OPTIONAL)
Push F5 button to activate/deactivate the Extra Extension Speed valve on the extension cylinders: when EES is active the F5 command line becomes green.
If EES is not present, F5 button is disabled.

B.13 F2+F7 - STABILITY SIMULATION

This function is available if the crane is fitted with SRS.
The "Stability Simulation" allows to move the crane (only under certain conditions) even if all stabilizers are not deployed on the ground.
Push F2 and F7 at the same time to activate this function.
If the activating conditions are not fulfilled, the system shows the following screen.

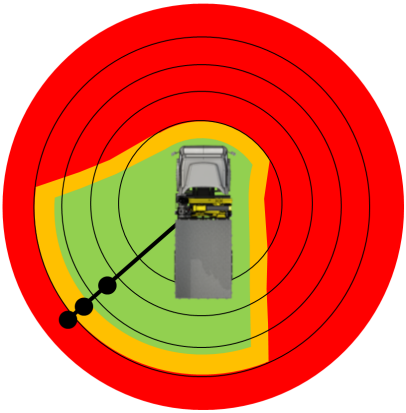
To enable the "Stability Simulation", you shall return to Home Screen pushing the B3 button, move the crane according to the directions of arrows in order to bring the operational parameters within the limits (written in red). When all conditions are fulfilled, you can activate the "Stability Simulation by again pushing F2 and F7 at the same time.
The message "STABILITY SIMULATION" is visualized on the Home Screen.
Enter the Stability Function (F2) to stop "Stability Simulation".

HOW THE CRANE WORKS IN "STABILITY SIMULATION" MODE
While the "Stability Simulation" is active, the yellow tower light turns on and the audible alarm is active and intermittent: all crane movements are permitted if the pressure in the 1st boom cylinder does not exceed the max pressure preset for the "Stability Simulation" mode.
However if the pressure exceeds the max preset value, the system intervenes, activating the "Overload Mode" (see B.14.1).

B.14 LOAD LIMITING FUNCTIONS

B.14.1 MOMENT LIMITER

The purpose of the load limiter is to protect the crane's structure and ensure machine stability.
It constantly analyses the operational parameters and intervenes when the lifting moment exceeds the max setting value.
In order to better understand how the limiter works, you may refer to the figure below that shows an iso-load diagram resulting from a generic input load and from stabilizer extensions retracted on the right side of the vehicle.



Symbols:
● : position of the load
▬ : direction of boom extensions

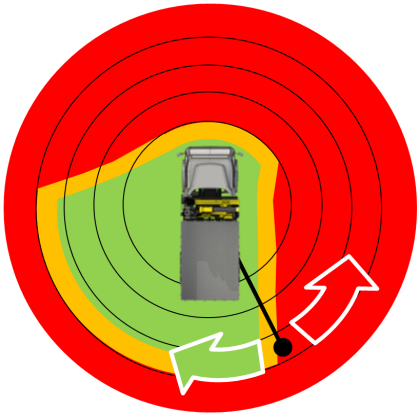
Depending on different levels of working pressure (P1) with respect to the pressure limits (P1L), the working area is divided as follows:
- green area, permitted: where P1 < 90% P1L
- yellow area, permitted: where 90% ≤ P1 < 100% P1L
- red area, forbidden: where P1 ≥ 100% P1L
- white area, inaccessible: area outside the max crane outreach

The moment limiter works as follows:

If 90% P1L is not exceeded (P1 < 90% P1L):
- the load bar in the Home Screen is green
- the yellow and red tower lights are off
- the audible alarm is deactivated

If 90% P1L is exceeded (90% ≤ P1 < 100% P1L):
- the load bar in the Home Screen becomes yellow
- the yellow tower light is on, the red light is off
- the audible alarm is active and intermittent.

If 100% P1L is reached, the system activates the "Overload Mode" (P1 ≥ 100% P1L):
- the load bar in the Home Screen becomes red
- the yellow and red tower lights are on
- the audible alarm is active and continous
- the system disables the boom movements which don't ensure safety (see D.3)
- the alarm message #6 is displayed on the Home Screen
- the system disables the slewing toward a working area where P1 > P1L (toward the red area). In the iso-load diagram below, green and red arrows indicate the permitted and forbidden slewing direction, respectively.



Only after the working pressure has fallen below P1L, the system restores the normal working conditions and allows all crane movements.

⚠ When the 1st boom cylinder is fully extended and if you continue to operate the lever to extend it, the load limiter could intervene even if the crane is not loaded: in this case push the bypass button (F7) to unblock the crane, then close the 1st boom cylinder slowly.

B.14.2 MOMENT LIMITER FOR THE JIB

If a crane is equipped with the jib, the moment limiter detects also the current pression in the articulation jib cylinder and intervenes when the moment acting on the jib exceeds the max setting value. The moment limiter works in the same way as described for the pressure overload in the 1st boom cylinder, comparing PJ with PJL.

If 90% PJL is exceeded (90% ≤ PJ < 100% PJL):
- the yellow tower light is on, the red light is off
- the audible alarm is active and intermittent

If 100% PJL is reached, the system activates the "Overload Mode" (PJ ≥ 100% PJL):
- the yellow and red tower lights are on
- the audible alarm is active and continous
- the system disables the boom movements which don't ensure safety (see D.3)
- the alarm message #7 is displayed on the Home Screen

B.14.3 WINCH PULL LIMITER

The system monitors in real time the rope pull and shows the load ratio (LOAD%) in the Home Screen.

If 90% winch rated pull (RL) is exceeded (90% ≤ L < 100% RL):
- the yellow tower light is on, the red light is off
- the audible alarm is active and intermittent.

If 100% winch rated pull (RL) is reached (L ≥ 100% RL):
- the yellow and red tower lights are on
- the audible alarm is active and continous
- the system disables the movements which don't ensure safety (see D.3)
- the warning message #16 is displayed on the Home Screen

Only after the load is placed on the ground, the system restores the normal working conditions and allows all crane movements.

⚠ When the counterweight bumps against the top roller and if you continue to push the lever for winding the rope, the pull limiter could intervene even if the crane is not loaded: in this case the pull limiter acts as rope ascent limiter.

B.14.4 WINCH ROPE DESCENT LIMITER

The system monitors in real time the number of rope wraps on the drum: when the number of wraps reaches the minimum safety value:
- the system disables the movements which don't ensure safety (see D.3)
- the warning message #18 is displayed on the Home Screen

B.14.5 LOAD CELL LIMITER (LIS)

The load cell limiter monitors in real time the weight of the load suspended from the hook: the system shows its value in the Home Screen.

If 100% rated load (RL) is reached (L ≥ 100% RL):
- the yellow tower light is off, the red light is on
- the audible alarm is active and continous
- the system disables the movements which don't ensure safety (see D.3)
- the alarm message #103 is displayed on the Home Screen

Only after the load is placed on the ground, the system restores the normal working conditions and allows all crane movements.

C MAINTENANCE FOR DASHBOARD

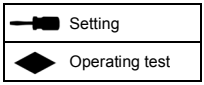
All modifications to the system must be performed exclusively by an authorised assistance centre.

C.1 ORDINARY MAINTENANCE

Periodically wipe the display with a soft cloth dampened in diluted biodegradable neutral detergent, then wipe clean with a dry cloth.
In any case it is forbidden to direct pressurized jets close to the dashboard.

C.2 PLANNED MAINTENANCE

The System must be tested by an authorised assistance centre in accordance with the maintenance register attached to the Crane User Manual.
The checks to be performed are indicated as follows:



C.3 EXTRAORDINARY MAINTENANCE

Extraordinary maintenance must be performed by an authorized assistance centre.

D ANNEXES

D.1 TECHNICAL DATA

Supply voltage	8V to 32V
Current absorbed by the system	max 1.2A at 12V
Environment working temperature	-30°C to 70°C
Environment storage temperature	-35°C to 85°C
IP protection class	IP 66
Operating System	Linux Embedded

D.2 WARNING SIGNALS

	Home Screen	Light tower	Audible alarm
Crane hook P1 < 90% P1L	CRANE %		
Crane hook 90% ≤ P1 < 100% P1L	CRANE %		
Crane hook P1 ≥ 100% P1L	CRANE %		
Jib hook PJ < 90% PJL	JIB %		
Jib hook 90% ≤ PJ < 100% PJL	JIB %		
Jib hook PJ ≥ 100% PJL	JIB %		
Winch 90% ≤ L < 100% RL	LOAD 90%-99%		
Winch L ≥ 100% RL	LOAD 100%		
Load cell L ≥ 100% RL	 «L» kg		
Crane folded in transport position	"CRANE FOLDED"	-	-
Stability Simulation activated (only with SRS)	"STABILITY SIMULATION"		
Automatics activated (option)	-		
Maintenance request		-	-

Legend

Tower light			Audible alarm		
					
off	flashing	on	deactivated	intermittent	continuous

D.3 MOVEMENTS PERMITTED UNDER OVERLOAD CONDITIONS

PRESSURE OVERLOAD IN THE CRANE'S ARTICULATION CYLINDERS

CRANE CONFIGURATION			CONTROLS ENABLED								
Slope of 1st boom	Slope of 2nd boom	Slope of jib boom									
		NO									
		NO									
		NO									
		NO									

OTHER OVERLOAD CONDITIONS

OVERLOAD CONDITIONS	CONTROLS ENABLED								
									
WINCH OVERLOAD (WINCH ROPE ASCENT LIMIT)									
WINCH ROPE DESCENT LIMIT									
LIS OVERLOAD									

Legend

 Boom inclined above the horizontal	 Boom inclined below the horizontal	 Lever up enabled	 Lever down enabled	 Lever enabled only with angular sensor on 1st boom

D.4 WARNING MESSAGES

ID	WARNING MESSAGE	DESCRIPTION
14	MAX ANGLE	Electric limit 1st boom rising
15	ROTATION LIMIT	Electric limit for slewing (CW and CCW)
16	WINCH OVERLOAD	Overload on winch
17	WINCH UP	Winch rising limit, it's possible going down only
18	WINCH DOWN	Winch down limit, it's possible rising only
19	OUTRIGGER NOT ON GROUND	At least one of the feet is off the ground
20	CLOSE THE SECOND BOOM (SAFE OPEN SYSTEM)	With crane folded and as soon as switched on, close the 2nd boom for 5 s.
30	WARNING! PRESSURE REDUCTION ACTIVE	Pressure reduction active for connecting the tools (grab/rotor)
40	PQUADRO FUNCTION ACTIVE	Slow down active due to load over 80% of max load with Pquadro
43	SLOW MOVEMENT	Slow down active due to load over 80% of max load without Pquadro
44	SLOW VERTICAL	Slow down during rising or going down for 2nd boom above a specific angle
45	DANGEROUS POSITION JIB	A dangerous position of jib is reached
46	ROTATION OVERLOAD	Slewing not possible due to access to lower stability area
47	OFP	The crane stop before entering in OFP zone
48	STAND UP PLATFORM	The crane stop before entering in stand up platform zone
49	STAND UP PLATFORM OPEN	Close the stand up platform before folding the crane
80	CRANE SERVICE 10 HOURS	The crane has been working for more than 10 hours
81	CRANE SERVICE 100 HOURS	The crane has been working for more than 100 hours
82	CRANE SERVICE 500 HOURS	The crane has been working for more than 500 hours
83	CRANE SERVICE 1000 HOURS	The crane has been working for more than 1000 hours
84	JIB SERVICE 10 HOURS	The Jib has been working for more than 10 hours
85	JIB SERVICE 100 HOURS	The Jib has been working for more than 100 hours
86	JIB SERVICE 500 HOURS	The Jib has been working for more than 500 hours
87	JIB SERVICE 1000 HOURS	The Jib has been working for more than 1000 hours
88	GRAB SERVICE 50 HOURS	The grab has been working for more than 10 hours
89	GRAB SERVICE 100 HOURS	The grab has been working for more than 100 hours
90	GRAB SERVICE 500 HOURS	The grab has been working for more than 500 hours
91	GRAB SERVICE 1000 HOURS	The grab has been working for more than 1000 hours
92	WINCH SERVICE 10 HOURS	The winch has been working for more than 10 hours
93	WINCH SERVICE 100 HOURS	The winch has been working for more than 100 hours
94	WINCH SERVICE 500 HOURS	The winch has been working for more than 500 hours
95	WINCH SERVICE 1000 HOURS	The winch has been working for more than 1000 hours
99	NEW CAN DEVICE	New device has been detected on CAN-Bus

D.5 ALARM MESSAGES

ID	ALARM MESSAGE	DESCRIPTION
1 ... 4	ALARM CRC	Data write error
5	BYPASS ACTIVE!	Overload Bypass is active
6	CRANE OVERLOAD	Pressure in the 1st cylinder exceeds the pressure limit
7	JIB OVERLOAD	Pressure in the jib cylinder exceeds the pressure limit
8	EMERGENCY BUTTON	Emergency stop button on the crane is pushed
9	EMERGENCY RADIO BUTTON	Emergency stop button on the radio transmitter is pushed
12	CAN BUS MTS 1	No signal from CAN-Bus of the crane slewing
13	CAN BUS MTS 2	No signal from CAN-Bus of the crane slewing
14	CAN BUS HETRONIC 1	No signal from Radio CAN-Bus 1
15	CAN BUS HETRONIC 2	No signal from Radio CAN-Bus 1
18	CAN BUS CROSS-BEAM ENCODER 1	No signal from cross-beam encoder 1
19	CAN BUS CROSS-BEAM ENCODER 1 REDUNDANCY	No signal from cross-beam encoder 1 redundancy
20	CAN BUS CROSS-BEAM ENCODER 2	No signal from cross-beam encoder 2
21	CAN BUS CROSS-BEAM ENCODER 2 REDUNDANCY	No signal from cross-beam encoder 2 redundancy
22	CAN BUS CROSS-BEAM ENCODER 3	No signal from cross-beam encoder 3
23	CAN BUS CROSS-BEAM ENCODER 3 REDUNDANCY	No signal from cross-beam encoder 3 redundancy
24	CAN BUS CROSS-BEAM ENCODER 4	No signal from cross-beam encoder 4
25	CAN BUS CROSS-BEAM ENCODER 4 REDUNDANCY	No signal from cross-beam encoder 4 redundancy
30	CAN BUS DANFOSS 1	No signal from Danfoss CAN element 1
31	CAN BUS DANFOSS 2	No signal from Danfoss CAN element 2
32	CAN BUS DANFOSS 3	No signal from Danfoss CAN element 3
33	CAN BUS DANFOSS 4	No signal from Danfoss CAN element 4
34	CAN BUS DANFOSS 5	No signal from Danfoss CAN element 5
35	CAN BUS DANFOSS 6	No signal from Danfoss CAN element 6
36	CAN BUS DANFOSS 7	No signal from Danfoss CAN element 7
37	CAN BUS DANFOSS 8	No signal from Danfoss CAN element 8
38	CAN BUS DANFOSS 9	No signal from Danfoss CAN element 9
40	BOOM ANGLE 1A LOW VALUE	1st signal of 1st boom angle less than 4 mA
41	BOOM ANGLE 1A HIGH VALUE	1st signal of 1st boom angle more than 20 mA
42	BOOM ANGLE 1B LOW VALUE	2nd signal of 1st boom angle less than 4 mA
43	BOOM ANGLE 1B HIGH VALUE	2nd signal of 1st boom angle more than 20 mA
44	BOOM ANGLE 2A LOW VALUE	Signal of 2nd boom angle less than 4 mA
45	BOOM ANGLE 2A HIGH VALUE	Signal of 2nd boom angle more than 20 mA
46	BOOM ANGLE 2B LOW VALUE	2nd signal of 2nd boom angle less than 4 mA
47	BOOM ANGLE 2B HIGH VALUE	2nd signal of 2nd boom angle more than 20 mA
48	BOOM ANGLE JA LOW VALUE	1st signal of jib boom angle less than 4 mA
49	BOOM ANGLE JA HIGH VALUE	1st signal of jib boom angle more than 20 mA
50	BOOM ANGLE JB LOW VALUE	2nd signal of jib boom angle less than 4 mA
51	BOOM ANGLE JB HIGH VALUE	2nd signal of jib boom angle more than 20 mA
52	PRESSURE TRASD 1A LOW VALUE	1st signal of pressure transducer on 1st boom cyl. less than 4 mA
53	PRESSURE TRASD 1A HIGH VALUE	1st signal of pressure transducer on 1st boom cyl. more than 20 mA
54	PRESSURE TRASD 1B LOW VALUE	2nd signal of pressure transducer on 1st boom cyl. less than 4 mA
55	PRESSURE TRASD 1B HIGH VALUE	2nd signal of pressure transducer on 1st boom cyl. more than 20 mA
56	PRESSURE TRASD JA LOW VALUE	1st signal of pressure transducer on jib boom cyl. less than 4 mA
57	PRESSURE TRASD JA HIGH VALUE	1st signal of pressure transducer on jib boom cyl. more than 20 mA
58	PRESSURE TRASD JB LOW VALUE	2nd signal of pressure transducer on jib boom cyl. less than 4 mA
59	PRESSURE TRASD JB HIGH VALUE	2nd signal of pressure transducer on jib boom cyl. more than 20 mA
60	EV CROSS-BEAM 1 DOWN FBK	Negative feedback for output of cross-beam leg down, electrovalve 1
61	EV CROSS-BEAM 2 DOWN FBK	Negative feedback for output of cross-beam leg down, electrovalve 2
62	EV CROSS-BEAM 3 DOWN FBK	Negative feedback for output of cross-beam leg down, electrovalve 3
63	EV CROSS-BEAM 4 DOWN FBK	Negative feedback for output of cross-beam leg down, electrovalve 4
64	EV CROSS-BEAM 1 OUT FBK	Negative feedback for output of cross-beam out, electrovalve 1
65	EV CROSS-BEAM 2 OUT FBK	Negative feedback for output of cross-beam out, electrovalve 2
66	EV CROSS-BEAM 3 OUT FBK	Negative feedback for output of cross-beam out, electrovalve 3
67	EV CROSS-BEAM 4 OUT FBK	Negative feedback for output of cross-beam out, electrovalve 4
68	EV CROSS-BEAM 1 UP FBK	Negative feedback for output of cross-beam leg up, electrovalve 1
69	EV CROSS-BEAM 2 UP FBK	Negative feedback for output of cross-beam leg up, electrovalve 2
70	EV CROSS-BEAM 3 UP FBK	Negative feedback for output of cross-beam leg up, electrovalve 3
71	EV CROSS-BEAM 4 UP FBK	Negative feedback for output of cross-beam leg up, electrovalve 4
72	EV CROSS-BEAM 1 IN FBK	Negative feedback for output of cross-beam in, electrovalve 1
73	EV CROSS-BEAM 2 IN FBK	Negative feedback for output of cross-beam in, electrovalve 2
74	EV CROSS-BEAM 3 IN FBK	Negative feedback for output of cross-beam in, electrovalve 3
75	EV CROSS-BEAM 4 IN FBK	Negative feedback for output of cross-beam in, electrovalve 4
76	OUTPUT YELLOW TOWER LIGHT FBK	Negative feedback for output of yellow tower light
77	OUTPUT RED TOWER LIGHT FBK	Negative feedback for output of red tower light

78	EV CROSS-BEAM FBK	Negative feedback for cross-beam electrovalve
79	EV EMERGENCY FBK	Negative feedback for emergency solenoid valve
80	EV AVPS FBK	Negative feedback for AVPS system
81	OUTPUT EMERGENCY STOP BUTTON FBK	Negative feedback for output signal of emergency stop button
82	OUTPUT WORK LIGHT FBK	Negative feedback for output signal of work lights
83	OUTPUT CROSS-BEAM LIGHT FBK	Negative feedback for output signal of cross-beam light strips
84	OUTPUT RPM INCREASE FBK	Negative feedback for output signal of engine speed increase
85	OUTPUT RPM DECREASE FBK	Negative feedback for output signal of engine speed decrease
86	OUTPUT STOP ENGINE FBK	Negative feedback for output signal of engine stop
87	OUTPUT START ENGINE FBK	Negative feedback for output signal of engine start
88	EV OUTPUT CROSS-BEAM DOWN ON CAB SIDE FBK	Negative feedback for output of cross-beam leg down, on cab side
89	EV OUTPUT CROSS-BEAM UP ON CAB SIDE FBK	Negative feedback for output of cross-beam leg up, on cab side
90	OUTPUT LEVER LIGHT FBK	Negative feedback for output signal of lever light
91	OUTPUT HORN FBK	Negative feedback for output signal of horn
94	ALARM! LEVERS NOT CENTERED	Alarm! The levers are not centered correctly
100	CAN BUS LOAD CELL	No signal from load cell CAN-Bus
101	LOAD CELL ALARM ACTIVE	Load cell internal alarm
102	LOAD CELL DOES NOT RECEIVE	Load cell does not receive radio signal
103	LOAD CELL OVERLOAD	The load cell lifts a load higher than its rated capacity
106	STABILIZERS NOT ON THE GROUND	The stabiliser feet are not on the ground
107	SECOND BOOM OPEN	The 2nd boom is open, not folded
108	JIB OPEN	The jib boom is open, not folded
110	WINCH EXTENSIMETER VALUE TO LOW	Output signal of winch pull limiter less than 4 mA
111	WINCH EXTENSIMETER VALUE TO HIGH	Output signal of winch pull limiter more than 20 mA
120	DANFOSS 1 SPN/FMI	Alarm SPN/FMI from Danfoss CAN element 1
121	DANFOSS 2 SPN/FMI	Alarm SPN/FMI from Danfoss CAN element 2
122	DANFOSS 3 SPN/FMI	Alarm SPN/FMI from Danfoss CAN element 3
123	DANFOSS 4 SPN/FMI	Alarm SPN/FMI from Danfoss CAN element 4
124	DANFOSS 5 SPN/FMI	Alarm SPN/FMI from Danfoss CAN element 5
125	DANFOSS 6 SPN/FMI	Alarm SPN/FMI from Danfoss CAN element 6
126	DANFOSS 7 SPN/FMI	Alarm SPN/FMI from Danfoss CAN element 7
127	DANFOSS 8 SPN/FMI	Alarm SPN/FMI from Danfoss CAN element 8
128	DANFOSS 9 SPN/FMI	Alarm SPN/FMI from Danfoss CAN element 9
131	ALARM! LEVER 1 NOT CENTERED	Lever 1 CAN-Bus / Digital distributor not centered at crane switching on
132	ALARM! LEVER 2 NOT CENTERED	Lever 2 CAN-Bus / Digital distributor not centered at crane switching on
133	ALARM! LEVER 3 NOT CENTERED	Lever 3 CAN-Bus / Digital distributor not centered at crane switching on
134	ALARM! LEVER 4 NOT CENTERED	Lever 4 CAN-Bus / Digital distributor not centered at crane switching on
135	ALARM! LEVER 5 NOT CENTERED	Lever 5 CAN-Bus / Digital distributor not centered at crane switching on
136	ALARM! LEVER 6 NOT CENTERED	Lever 6 CAN-Bus / Digital distributor not centered at crane switching on
137	ALARM! LEVER 7 NOT CENTERED	Lever 7 CAN-Bus / Digital distributor not centered at crane switching on
138	ALARM! LEVER 8 NOT CENTERED	Lever 8 CAN-Bus / Digital distributor not centered at crane switching on
139	ALARM! LEVER 9 NOT CENTERED	Lever 9 CAN-Bus / Digital distributor not centered at crane switching on

D.6 MC2M INPUT - OUTPUT CODES

CODE	DESCRIPTION
U1	Pressure transducer 1 on 1st boom cylinder (TP1)
U2	Stabilizer extension 1 in half extended position
U3	Stabilizer extension 2 in half extended position
U4	N/A
U5	Stabilizer foot 1 on the ground
U6	Stabilizer foot 2 on the ground
U7	Stabilizer extension 3 in half extended position
U8	Stabilizer extension 4 in half extended position
U9	2nd boom folded with respect to the1st boom (microswitch, automatic folding)
U10	Jib boom folded in transport position
U11	Pressure transducer 1 on jib boom cylinder
U12	Signal from spool 9A (activation 2)
U13	Signal from spool 1A (slewing leftwards)
U14	Inclinometer 1 on the 1st boom
U15	Stabilizer extension 1 in fully extended position (proximity)
U16	Stabilizer extension 2 in fully extended position (proximity)
U17	Signal from spool 1B (slewing rightwards)
U18	2nd boom folded in transport position (proximity)
U19	Button activating the stabilizers controls by radio, on the main control valve side
U20	Activation of stabilizers controls by radio, for stabilizers on the opposite main control valve side
U21	Activation of stabilizers controls by radio, for stabilizers on the front of the cab
U22	Closing of the footboard gate
U23	Emergency stop button on the radio transmitter
U24	Winch extensometer
U25	Stabilizer foot 3 on the ground
U26	Stabilizer foot 4 on the ground
U27	IR sensor for OFP on the main control valve side / IR sensor on footboard
U28	IR sensor for OFP on the opposite main control valve side
U29	Winch rope fully unwound
U30	Winch rope fully wound (counterweight stops against the top roller)
U31	Signal from spool 2A (1st boom UP)
U32	Signal from spool 9B (activation 2)
U33	Serie of emergency stop buttons
U34	Inclinometer 1 on the 2nd boom
U35	Stabilizer extension 3 in fully extended position (proximity)
U36	Stabilizer extension 4 in fully extended position (proximity)
U37	Signal from spool 2B (1st boom DOWN)
U38	Signal from spool 3A (2nd boom UP)
U39	Signal from spool 3B (2nd boom DOWN)
U40	Signal from spool 4A (hydraulic extensions OUT)
T3	Electrovalve of stabilizers controlled by radio (leg IN)
T4	Elecrovalve of stabilizer legs controlled by radio (rod IN)
T5	Electrovalve of crane's stabilizer leg controlled by radio (selects the stabilizer on the B side)
T6	Electrovalve of crane's stabilizer extension controlled by radio (selects the stabilizer on the B side)
T7	Electrovalve of crane's stabilizer leg controlled by radio (selects the stabilizer on the A side)
T8	Electrovalve of crane's stabilizer extension controlled by radio (selects the stabilizer on the A side)
T9	Electrovalve of additional stabilizer leg controlled by radio (selects the stabilizer on the D side)
T10	Electrovalve of additional stabilizer extension controlled by radio (selects the stabilizer on the D side)
T13	Electrovalve of additional stabilizer leg controlled by radio (selects the stabilizer on the C side)
T14	Electrovalve of additional stabilizer extension controlled by radio (selects the stabilizer on the C side)
T23	N/A
T24	Signal from spool 4B (hydraulic extensions IN)
T25	Signal from spool 5A (jib boom UP)
T26	Signal from spool 5B (jib boom DOWN)
T27	Inclinometer 1 on the jib boom
T28	Signal from spool 6A (jib extensions IN)
T29	Signal from spool 6B (jib extensions OUT)
T30	Signal from spool 7A (winch)
T33	N/A
T34	Signal from spool 7B (winch)
T35	Signal from spool 8A (activation 1)
T36	Signal from spool 8B (activation 1)
T37	Extensions fully retracted (microswitch, automatic folding)
T38	Jib extensions fully retracted (microswitch, automatic folding)
T39	Oil temperature sensor
T40	Front stabilizer foot on the ground

CODE	DESCRIPTION
S2	Horn
S3	Light tower, yellow visual signal
S4	Light tower, red visual signal
S5	Stabilizers electrovalve
S6	Emergency eletrovalve
S8	AVPS electrovalve
S9	N/A
S10	Work light and light over the control levers
S13	Turning on of LED strips on stabilizer legs
S14	Increase of engine RPM
S15	Decrease of engine RPM
S16	Engine stop
S17	Engine start
S18	EES electrovalve
S19	Automatic engine RPM
S20	Work light

D.7 ELECTRIC SCHEMATICS

DESCRIPTION	CODE
COMPLETE SYSTEM	1010227
COMPLETE SCHEMATIC	1010279
MC2M CONTROLLER SUPPLY / EMERGENCY STOP LINE	1010279-12
WARNING LIGHTS	1010279-13
HYDROCONTROL CONTROL VALVE	1010279-14
DANFOSS CONTROL VALVE	1010279-15
SPOOL DRIVE FOR STABILIZERS CONTROL VALVE	1010279-16
CAN BUS DANFOSS CONTROL VALVE	1010279-17
STABILIZERS ACTIVATION FROM RADIO CONTROL	1010279-18
SOLENOID VALVES	1010279-19
HETRONIC RADIO RECEIVER	1010279-20
SCANRECO RADIO RECEIVER	1010279-21
TRUCK LINE	1010279-22
PROXIMITY SENSORS ON STABILIZERS LEGS / EXTENSIONS	1010279-23
MICROSWITCHES FOR AUTOMATIC OPENING / FOLDING	1010279-24
INCLINOMETERS / PRESSURE TRANSDUCERS	1010279-25
MULTILINK CAN BUS SENSORS LINE	1010279-26
MULTILINK CAN BUS SENSORS LINE IN CASE OF ADDITIONAL STABILIZERS	1010279-27
WINCH - CRANE RECOVERY - OFP	1010279-28
BALLAST WEIGHT DETECTOR - OIL TEMPERATURE SENSOR - LOAD CELL	1010279-29
CAN BUS DISPLAY - KEYPAD	1010279-30
DISPOSABLE WIRING	1010279-31