REVISION: 201202
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ENGLISH

ASSEMBLY INSTRUCTIONS MICROPROP DC2

WHEEL CONTROL

In control
Control Systems for Mobile Machinery

CONTENT

GENERAL

The purpose of this assembly instruction is to give relevant information in order to assembly Microprop DC2. Stated safety information is independent of machine model and directly connected to Microprop DC2. Aside from this assembly instruction you must read and understand the safety information of the machine and other equipment.

Note that if a machine specific instruction exists for your machine it is superior to this instruction.

WARNING!

Do no attempt to assemble, use or maintain the Microprop DC2 before you have read and understood all information regarding the tiltrotator, optional equipment and the machine. Be very attentive to the safety information.

DECLARATION OF INCORPORATION

This declaration covers the control system Microprop DC2 wheel control

Microprop AB hereby declares that the control system complies with directive: 2006/42/EC, Annex 1; clause 1 and 3 and that the technical documentation is compiled in accordance with Annex 7 (B) of the directive.

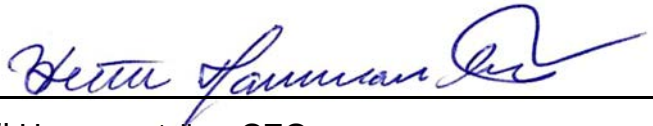
Microprop AB undertakes to transmit, in response to a reasoned request by the appropriate national authorities, relevant information on the machine identified above.

The control system is incomplete and must not be put into service until the machinery into which it is to be incorporated has been declared in conformity with the provisions of the directive 2006/42/EG.

We declare that the control system as above complies with directive: 2004/108/EG and 2006/42/EG.

Harmonizing standards	Note
SS-EN ISO 13849-1:2008	Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design
SS-EN 12643 + A1:2008	Earth-moving machinery - Rubber-tyred machines - Steering requirements (ISO 5010:1992 modified)
SS-EN ISO 12100:2010	Safety of machinery - General principles for design - Risk assessment and risk reduction
SS-EN 474-1:2006+A1:2009	Earth-moving machinery - Safety - Part 1: General requirements
SS-EN 474-5:2006+A1:2009	Earth-moving machinery - Safety - Part 5: Requirements for hydraulic excavators
SS-EN 60204-1:2006	Safety of machinery - Electrical equipment of machines - Part 1: General requirements
SS-ISO 15998:2008	Earth-moving machinery - Machine-control systems (MCS) using electronic components - Performance criteria and tests for functional safety
SS-EN 13309:2010	Construction machinery - Electromagnetic compatibility of machines with internal power supply

Responsible for compiling the technical documentation
Roberth Jonsson, product manager Microprop DC2



Bertil Hammarström, CEO

2011-12-31 Umeå

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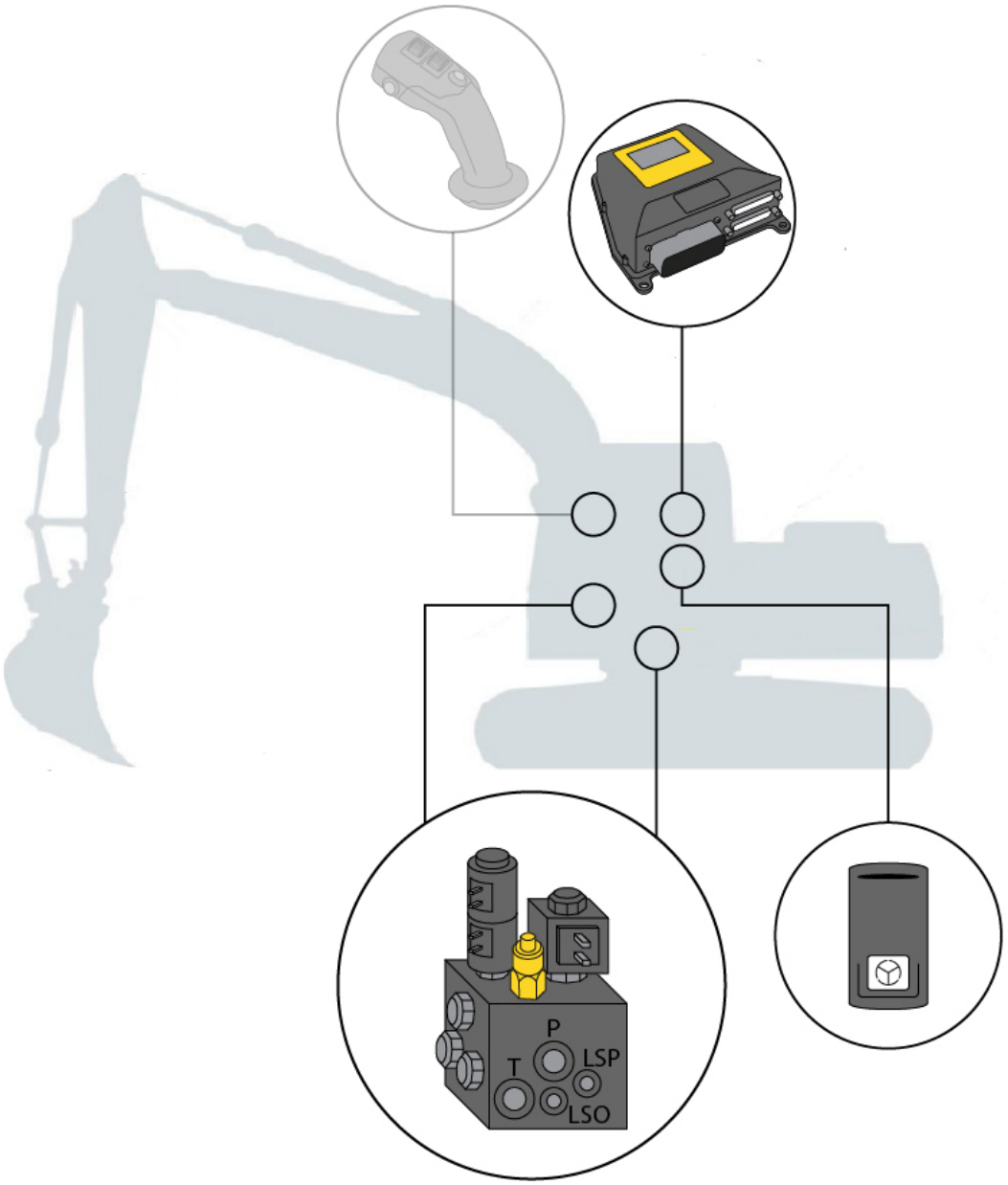
SYSTEM OVERVIEW – MICROPROP DC2



1.SAFETY REGULATIONS

1.1. GENERAL

It is of outmost importance that you have read and understood all warnings before assembling and using the tiltrotator/rotator and supplied equipment. The warnings focus on potential risks and how these are avoided. If uncertain – contact your employer or supplier.

Remember – with a good judgment and great knowledge of the machine many risks are sufficiently reduced. The user should therefore make time to learn how to use Microprop DC2 and the other equipment in a safe way before the machine is put into service.

1.2. CHECKLIST SAFETY

WARNING!

Broken or damaged equipment can cause injury or damage on persons, environment or property. Ensure that service and maintenance is made according to recommendation.

WARNING!

Never attempt to increase the equipment's maximum capacity by modifications not approved by the supplier.

WARNING!

Exchange damaged and/or unreadable labels and warning signs before the machine is put into use.

WARNING!

Maintenance and reparation of the electrical system may only be made by educated personnel.

WARNING!

Risk of crushing at moving parts.

WARNING!

If uncertain of knowledge, equipment or working on safety details – contact your sypplier or engcon Sweden AB.

WARNING!

Make sure that the labels are consistent to the machine function before putting the machine in use.

WARNING!

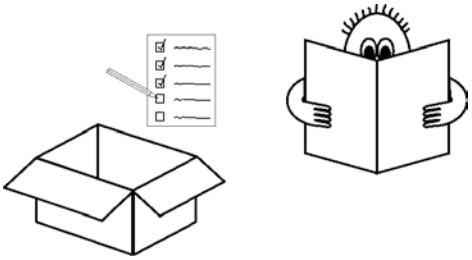
Assembling and calibration may only be made by an authorized work shop. Changes in the assembly may not be made without the manufacturer’s consent.

WARNING!

Be careful when calibrating the wheel control as the machine might move in unexpected ways. Make sure there is enough space to maneuver the tiltrotator safely.

Risk for person injury

2.SYMBOLS

	Wheel control
 **WARNING!**	Risk for material or human damage
	Read attached documentation for more information.
	No / incorrect measure
	Yes / correct measure

3.CHECKLIST OF CONTENT

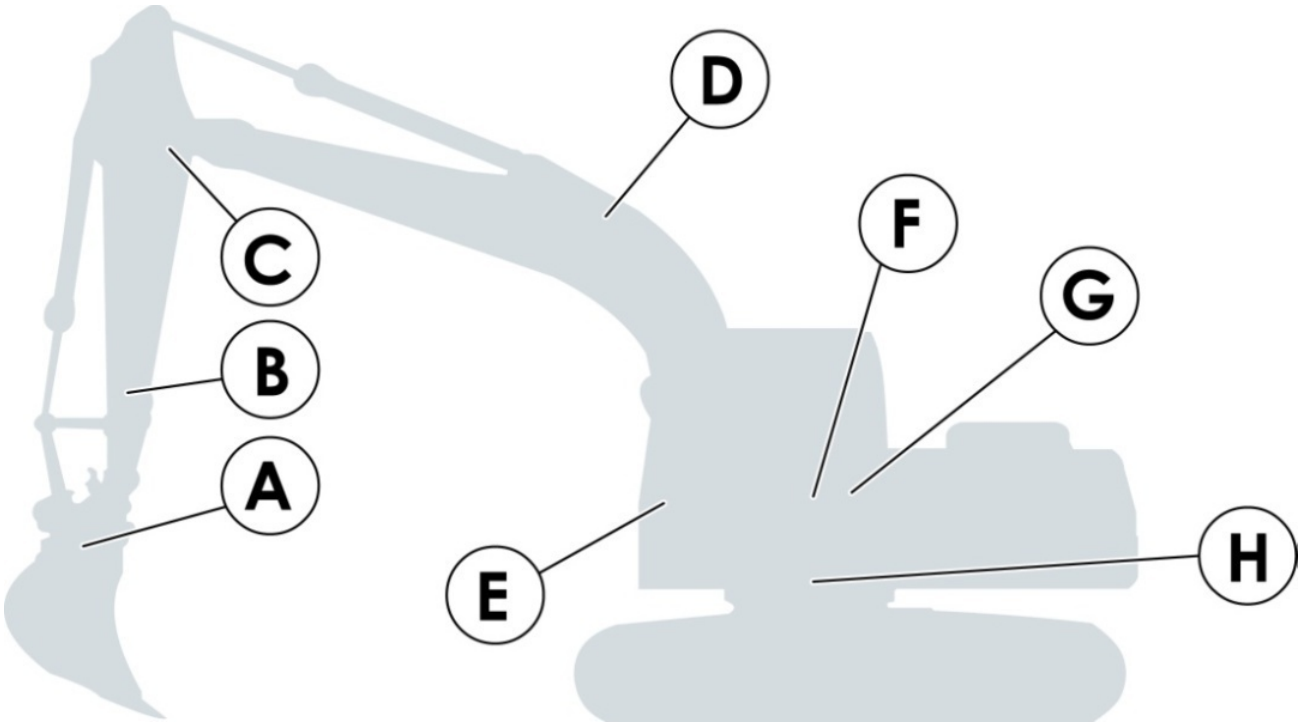
3.1. 841358 WHEEL CONTROL FIXED SYSTEM

Pos	Artikel	Benämning	Antal
1	841201	Wheelsteering 30l fixed system	1
2	841202	Logic function wheel control	1
3	841203 841204	Coil 12V µ-Prop DC2 Coil 24V µ-Prop DC2	1
4	841176	Cable wheel control	1
5	841175	Activation switch wheel control	1
6	841164	Label wheel control	1
7	841180	Cable 2-pol FCI	1
8	841184	Cable 2-pol AMP-seal	1

3.2. 841359 WHEEL CONTROL LS SYSTEM

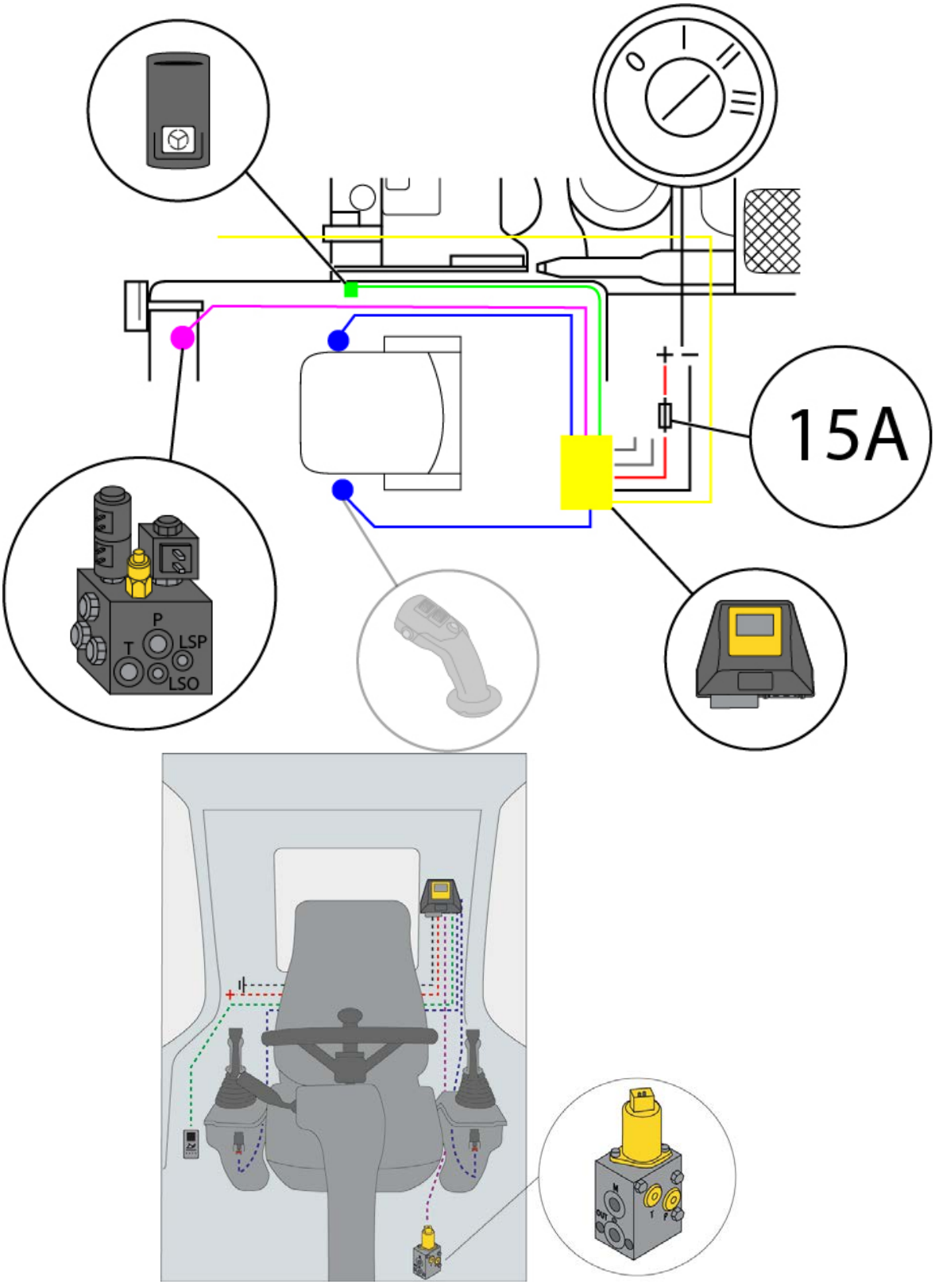
Pos	Artikel	Benämning	Antal
1	841205	Wheelsteering 30 LS system	1
2	841203 841204	Coil 12V µ-Prop DC2 Coil 24V µ-Prop DC2	1
3	841176	Cable wheel control	1
4	841175	Activation switch wheel control	1
5	841164	Label wheel control	1
6	841180	Cable 2-pol FCI	1
7	841184	Cable 2-pol AMP-seal	1

4.ASSEMBLY



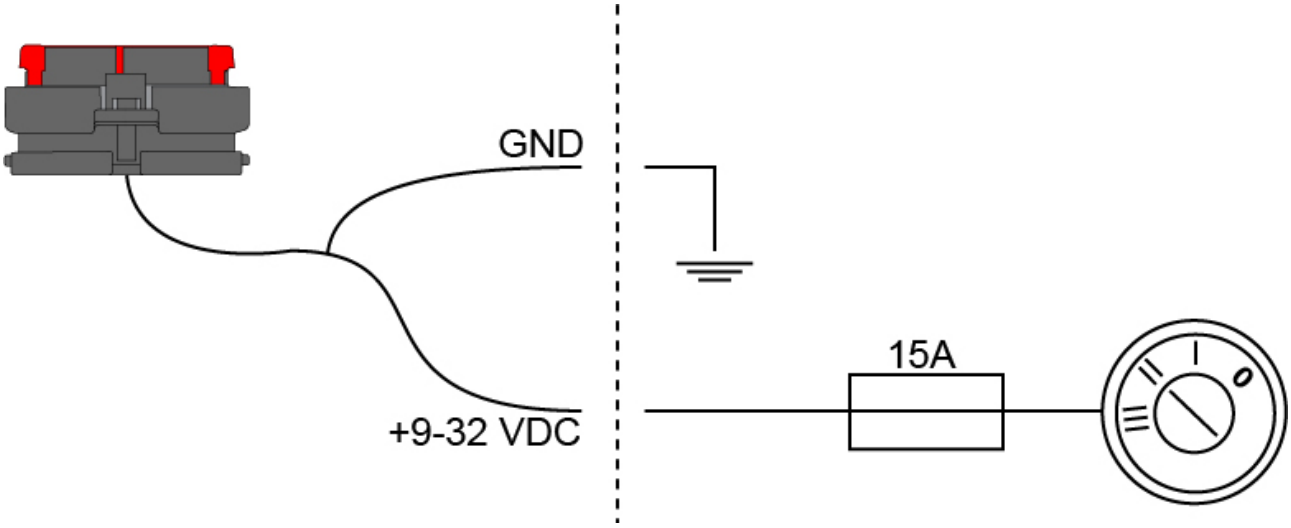
4.1. AREA F (CABIN)

4.1.1.1. Overview

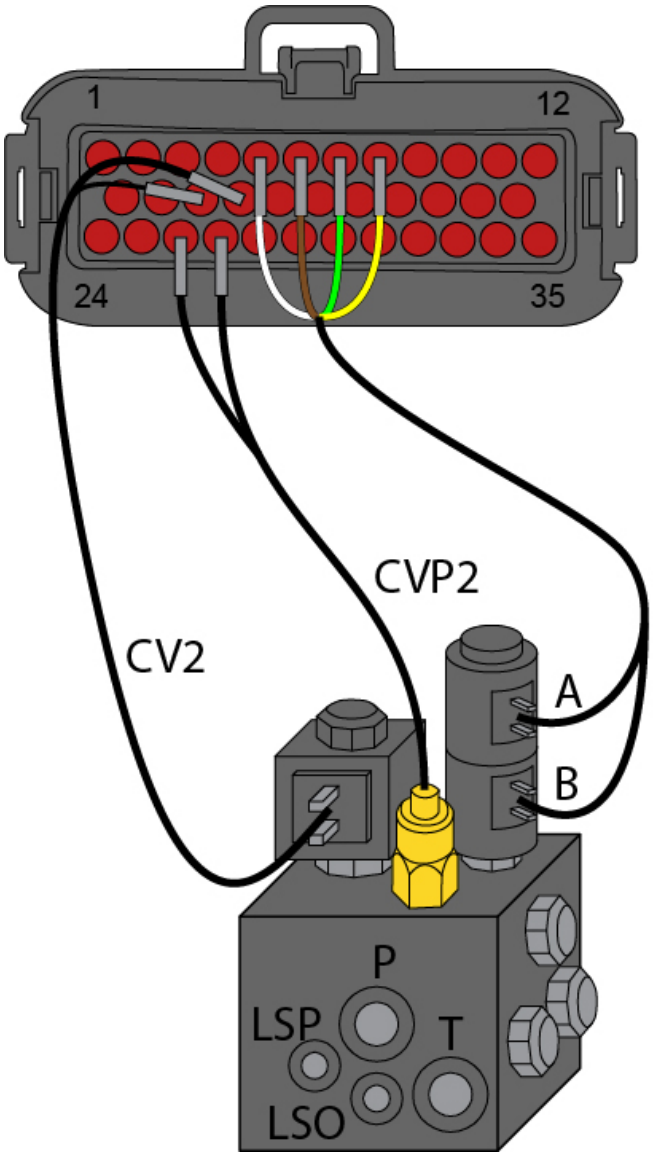


4.2. AREA G (CABIN)

4.2.1.1. Connecting supply voltage



4.2.1.2. Connecting X1 wheel control



Pos	
A	Left turn
B	Right turn

4.2.2. Blocking of speed

The machine may not move faster than 20kph with wheel control activated. This means that a block of the speed must be made.There are two different (general) connections that can be made:

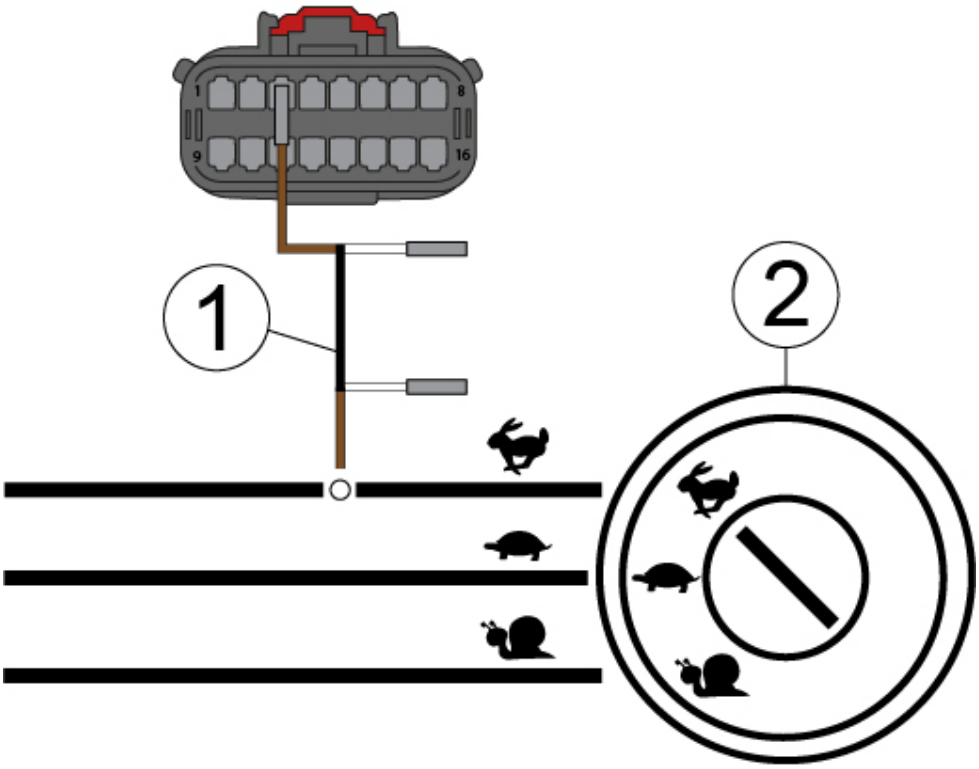
1. Block the machine so that the speed cannot increase over 20kph with wheel control activated.
    a. Use DO3 (CM_X1:17)
2. Block the control system when the machine moves faster than 20kph.
    a. Use DI14 (CM_X3:3)

4.2.2.1. Block the system at high gear (CM_X3:3) (positive signal)

WARNING!

The applicator is responsible that the machine does not exceed 20kph when commissioned.

Note! This connection may not be used if the machine has an automatic gear shift too high gear.



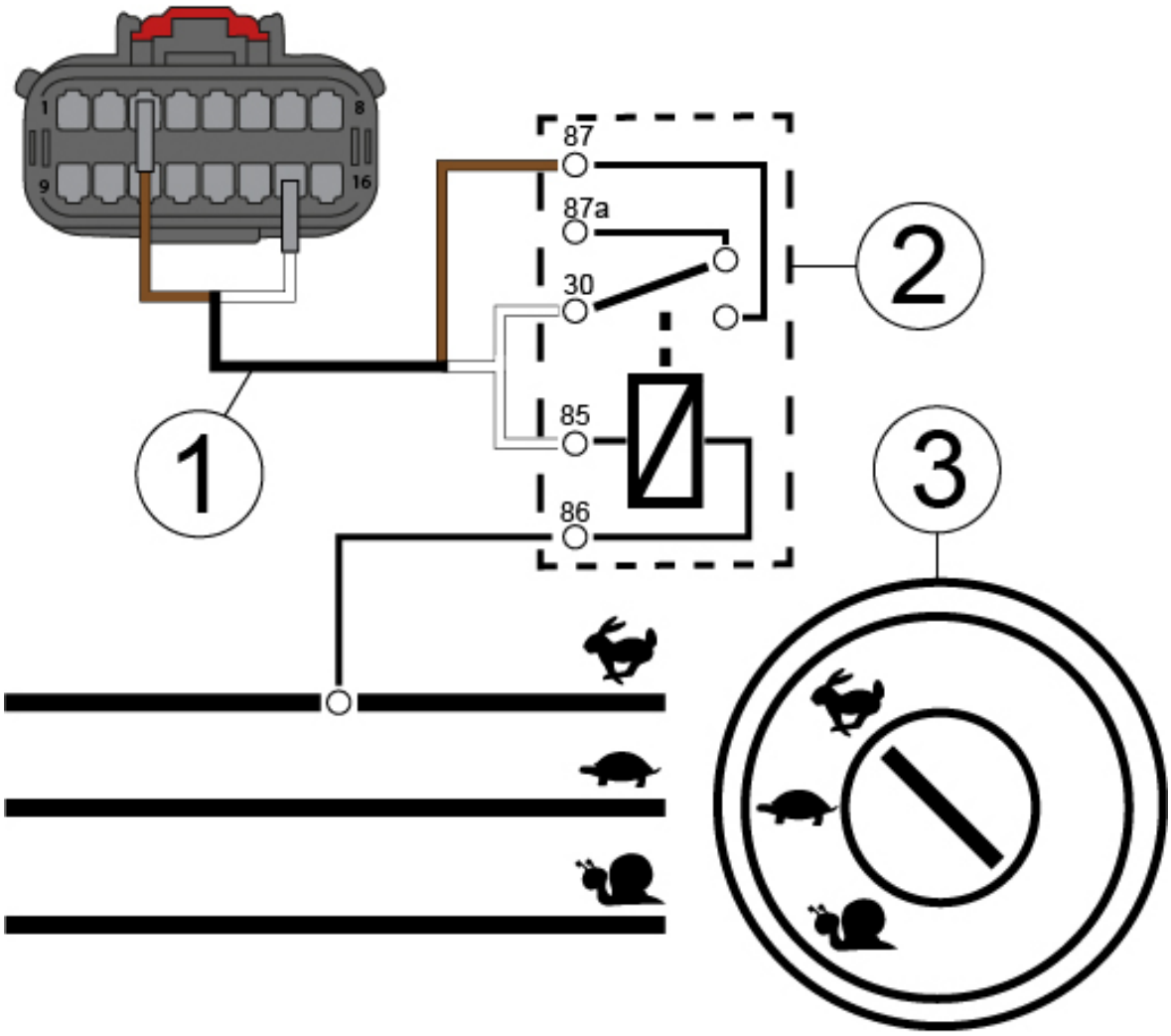
Pos	Benämning
1	841180
2	Gear switch

4.2.2.2. Block the system at high gear (CM_X3:3) (negative signal)

WARNING!

The applicator is responsible that the machine does not exceed 20kph when commissioned.

Note! This connection may not be used if the machine has an automatic gear shift too high gear.

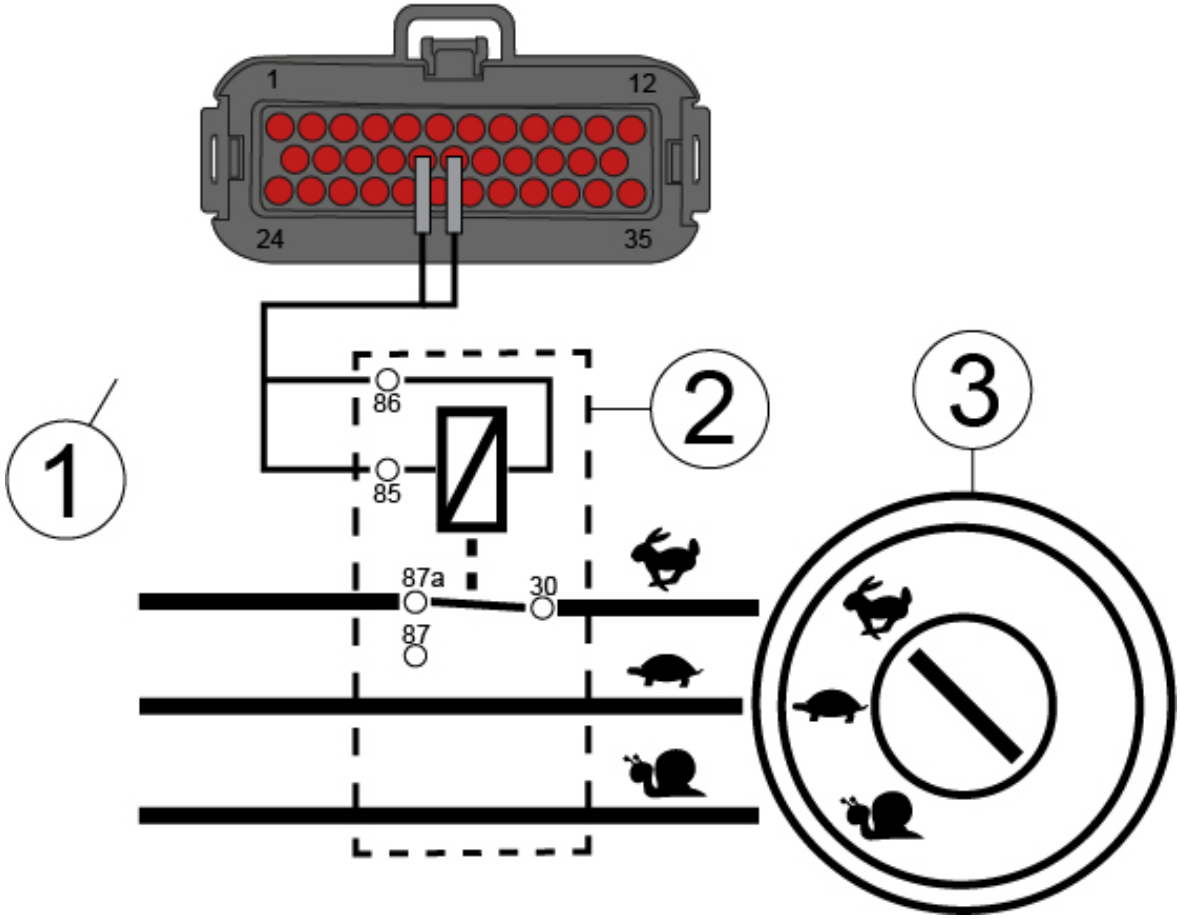


Pos	Benämning
1	841180
2	Relay for inverting signal
3	Gear switch

4.2.2.3. Block the machine speed with a digital output (CM_X1:17)

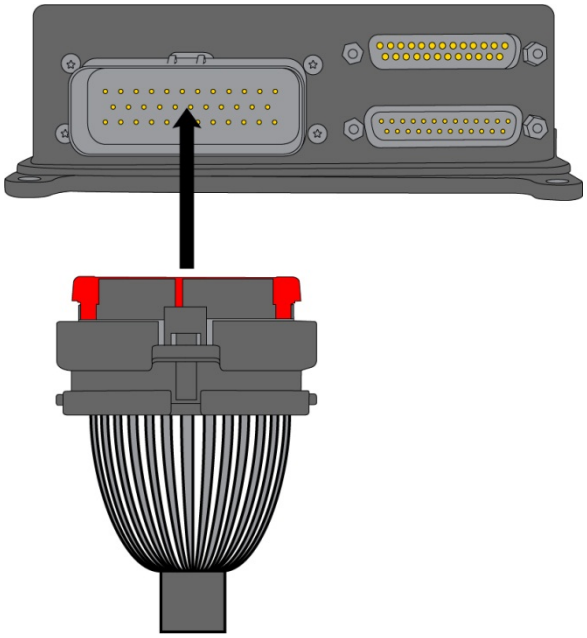
WARNING!

The applicator is responsible that the machine does not exceed 20kph when commissioned.

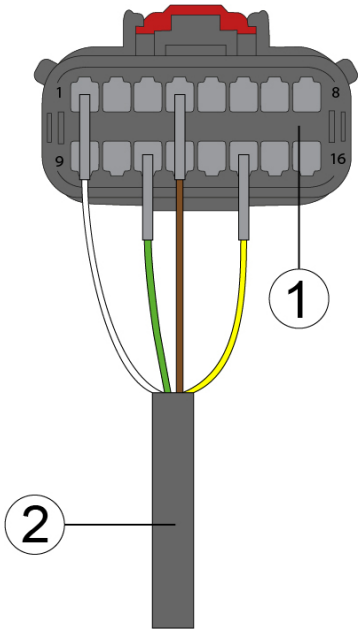


Pos	Benämning
1	841184
2	Relay for blockingo of the machine high gear
3	Gear switch

4.2.3. Connecting X1 to cabin module

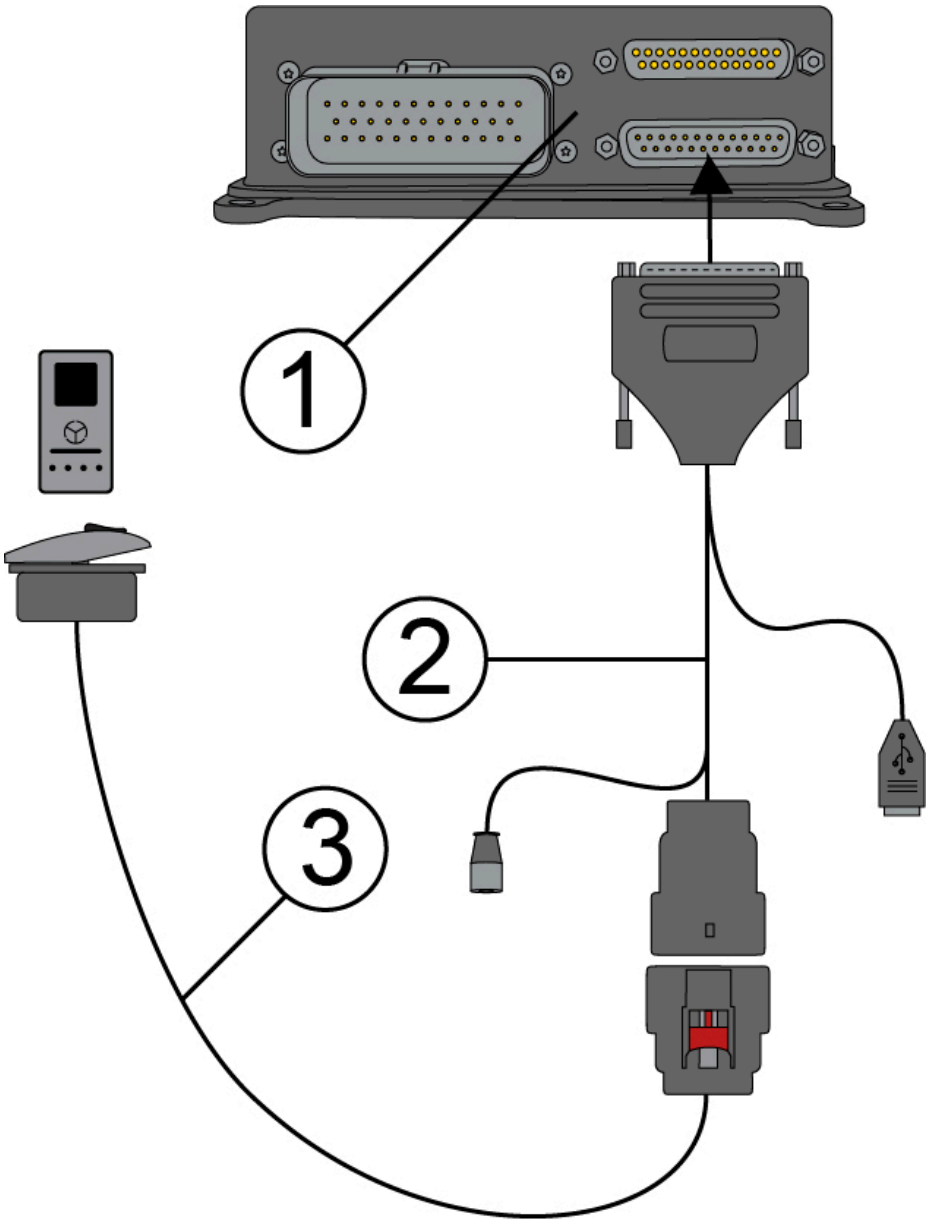


4.2.4. Connecting activation switch 841119



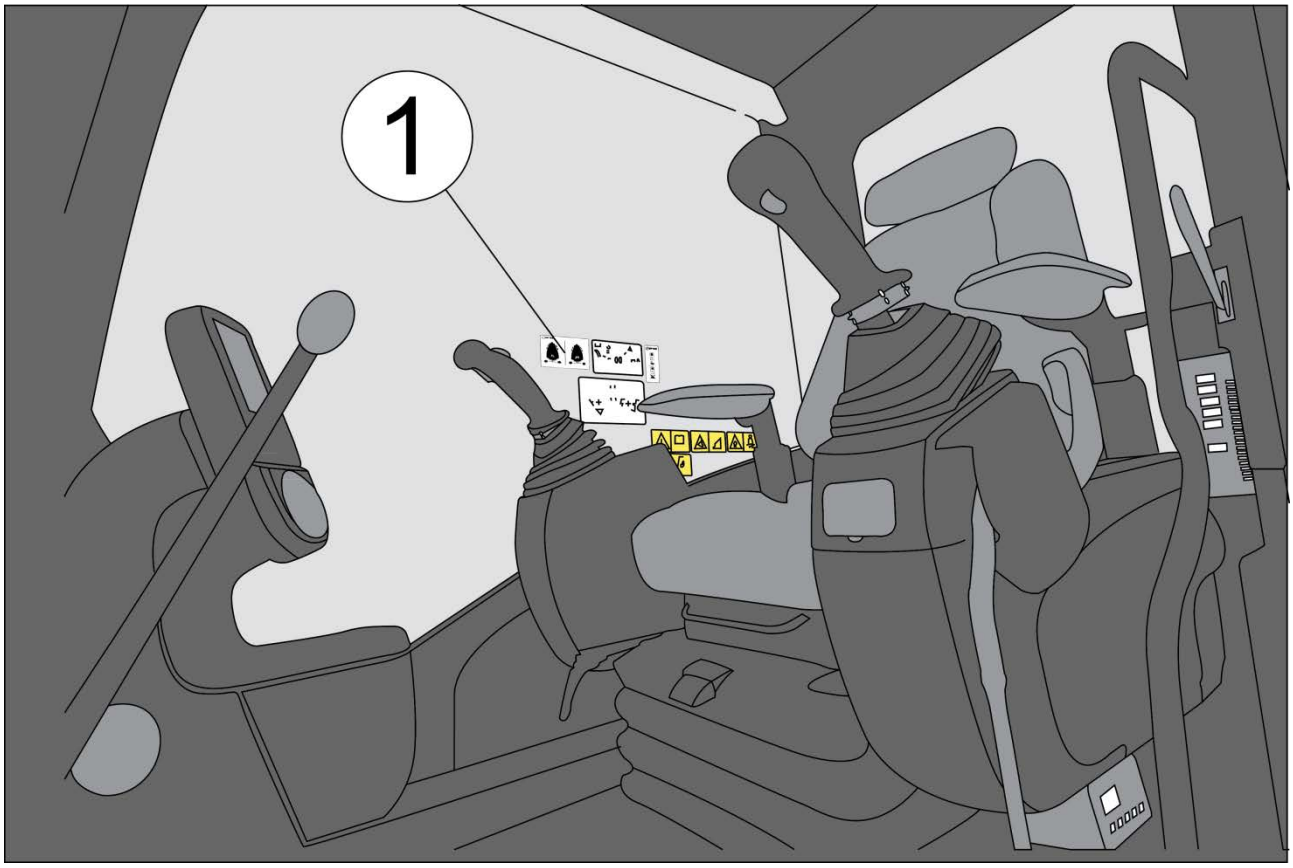
Pos	Artikel
1	841135
2	841175

4.2.5. Connecting activation switch 841119 (X3)



Pos	Artikel
1	841105
2	841135
3	841175

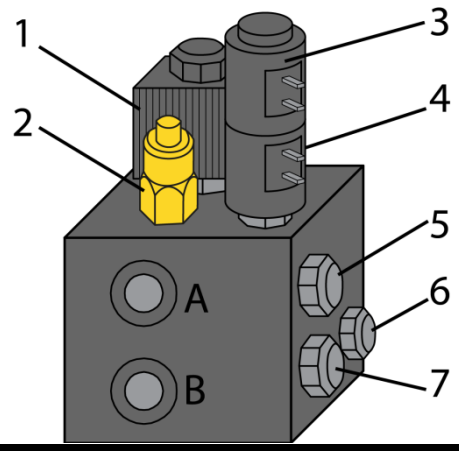
4.2.5.1. Label activation switch



Pos	Artikel
1	841164

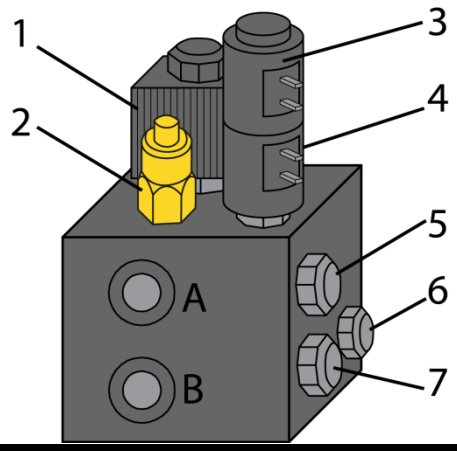
4.3. AREA H (BENEATH CABIN FLOOR)

4.3.1.1. Wheel control 841201



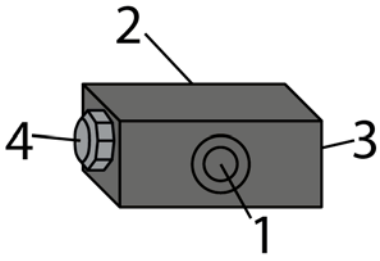
Pos	Artikel
1	ON/OFF valve (CV2)
2	Pressure switch (CVP2)
3	Proportional valve
4	Priority valve for orbitrol. (3/2 valve, adjustable)
5, 7	Load holder (adjustable)
6	Pressure limiter (adjusted to 250 bar)

4.3.1.2. Wheel control 841205



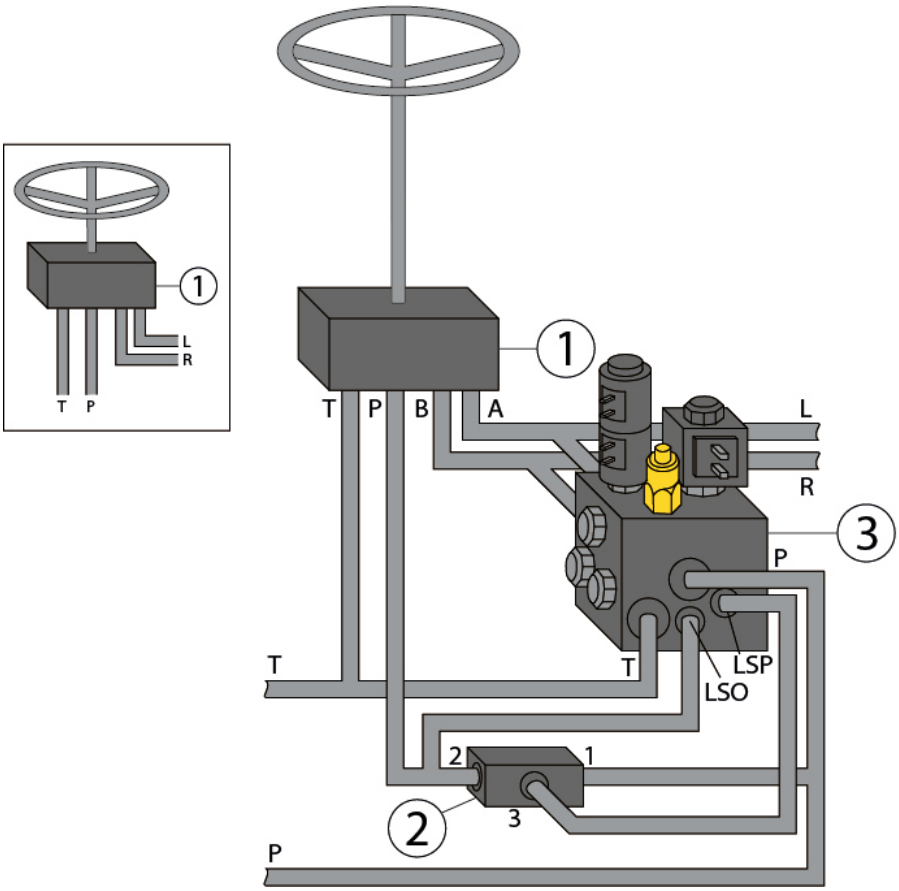
Pos	Artikel
1	ON/OFF valve (CV2)
2	Pressure switch (CVP2)
3	Proportional valve
4	Priority valve for orbitrol. (3/2 valve, adjustable)
5, 7	Load holder (adjustable)
6	Pressure limiter (adjusted to 250 bar)

4.3.1.3. Logic function 841202



Pos	Artikel
1	Connection for P
2	Connection for P_out
3	Connection for LSP
4	Adjustable pressure for priority

4.3.1.4. Connection wheel control - fixed system



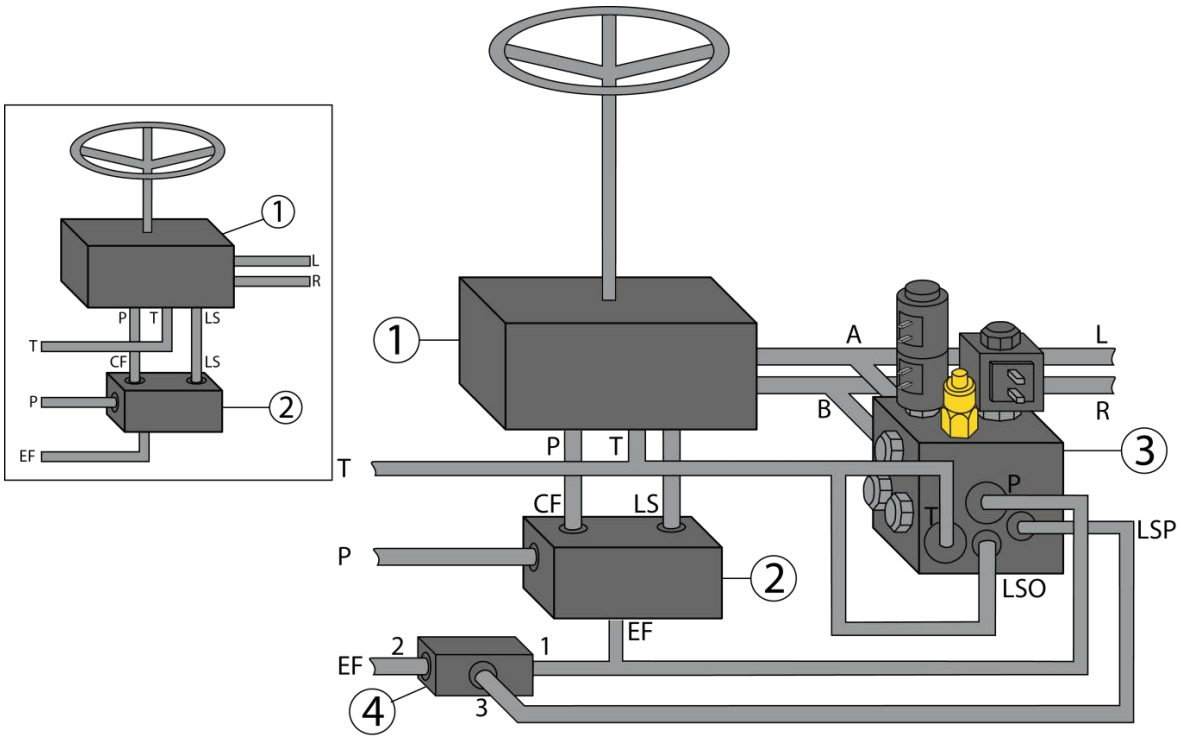
Pos	Artikel
1	Orbitrol
2	841202
3	841201
P	Pressure
T	Tank
LSO	Load sense to orbitrol
LSP	Load sense to priority valve

Note! If the speed is not enough it can be because the pilot valve of 841202 does not close properly.

Note! The adapter in (1) of 841202 is a flow reducing orifice and must not be removed.

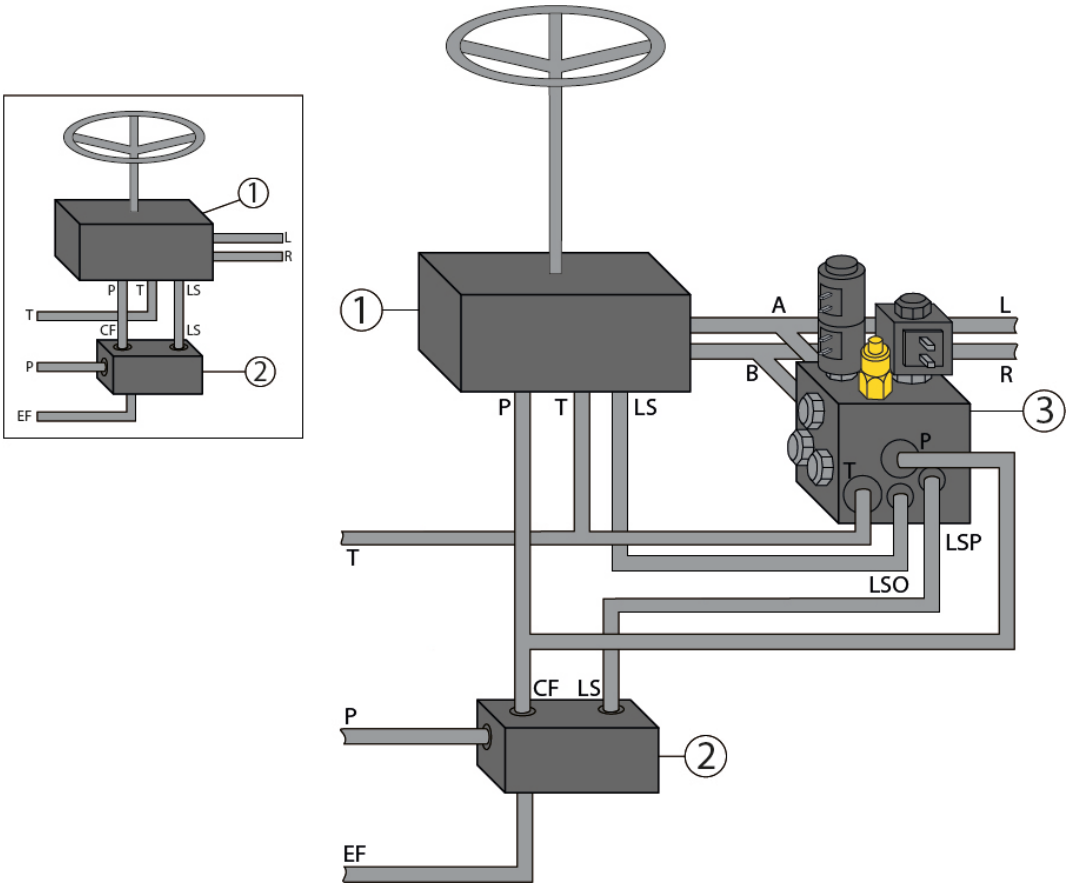
4.3.1.5. Anslutning hjulstyrningshydraulik - LS-system

If CF/LS from the priority valve is hard to connect to this connection may be used, Note! (4) must never be entirely closed.



Pos	Artikel
1	Orbitrol
2	Priority valve
3	841202
3	841201
P	Pressure
T	Tank
LSO	Connect LSO to T
LSP	Load till prioriteringsventil
LS	Load sensing (Load Sense)
CF	Till orbitrol (Controlled flow)
EF	Övrigt flöde (Excess flow)

4.3.1.6. Anslutning hjulstyrningshydraulik - LS-system



Pos	Artikel
1	Orbitrol
2	Prioriteringsventil
3	841205
P	Tryck
T	Tank
LSO	Load sense to orbitrol
LSP	Load sense to priority valve
LS	Load sensing (Load Sense)
CF	To orbitrol (Controlled flow)
EF	Other flow (Excess flow)

5.COMISSIONING

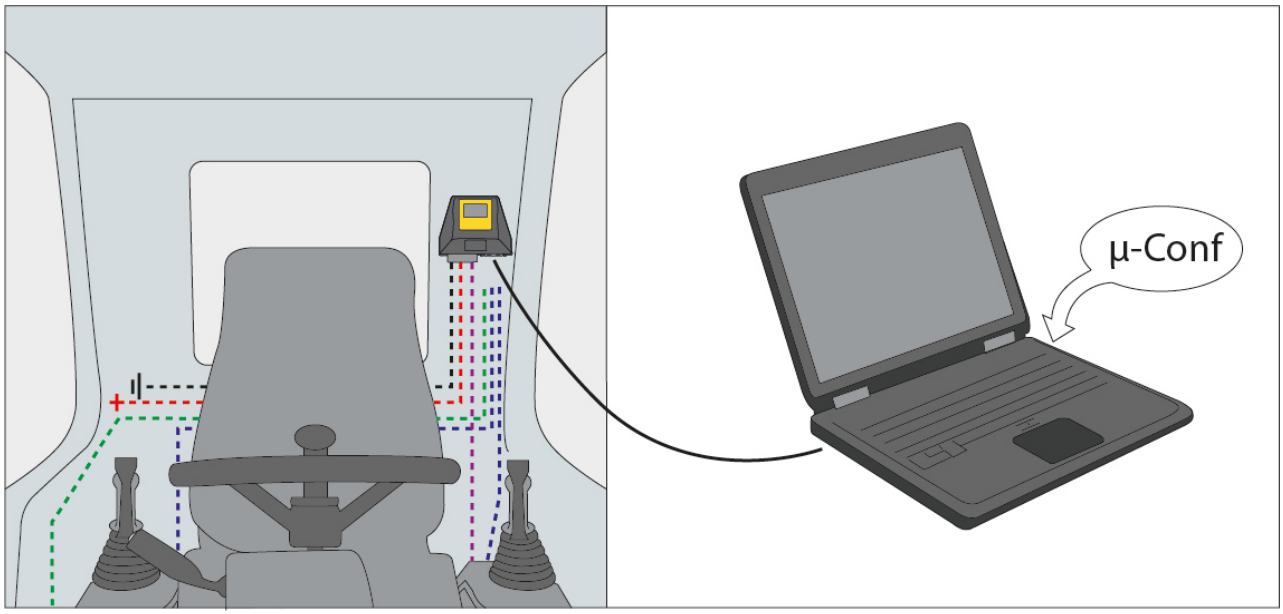
5.1. CALIBRATION

WARNING!

Be careful when calibrating the wheel control as the machine might move in unexpected ways. Make sure there is enough space to maneuver the tiltrotator safely.

Risk for person injury

Microprop DC2 is calibrated with PC and the PC-program Microconf DC2 which can be downloaded from www.engcon.se.



5.2. FUNCTIONAL CHECK

Make sure that all functions correspond to labels and user manual for the machine and Microprop DC2.

The following tests must be made:

- The machine original control (steering wheel) must be prioritized.
- The machine must not move faster than 20kph if wheel steering with Microprop is activated.
- The steering shall be as fast as the steering wheel when the steering wheel is moved as fast as possible.

If any of these tests fail the fault must be taken care of before the machine is commissioned.

 **WARNING!**

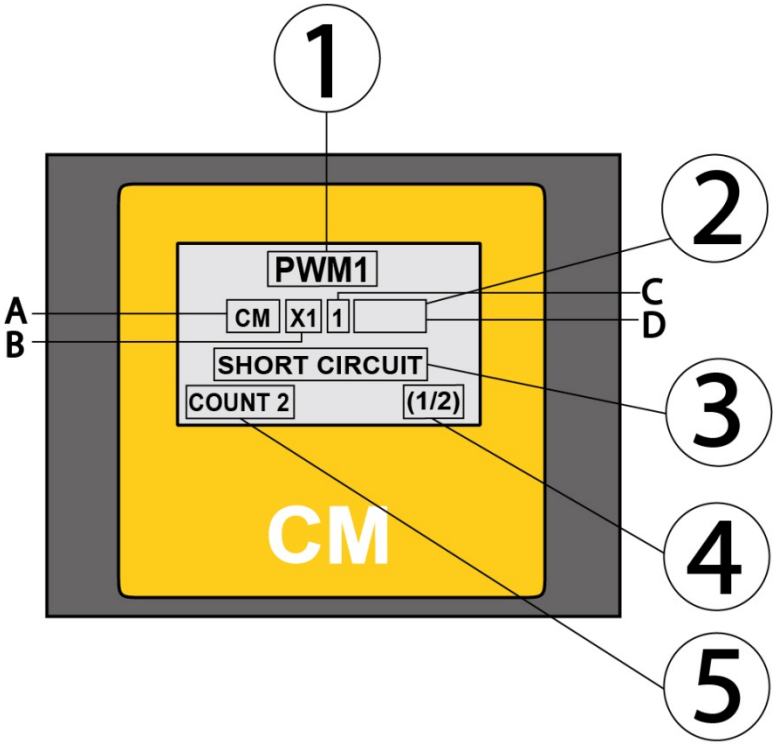
Do no attempt to assemble, use or maintain the Microprop DC2 before you have read and understood all information regarding the tiltrotator, optional equipment and the machine. Be very attentive to the safety information.

 **WARNING!**

Control that the functional label are consistent to the machine function before putting the machine in use.

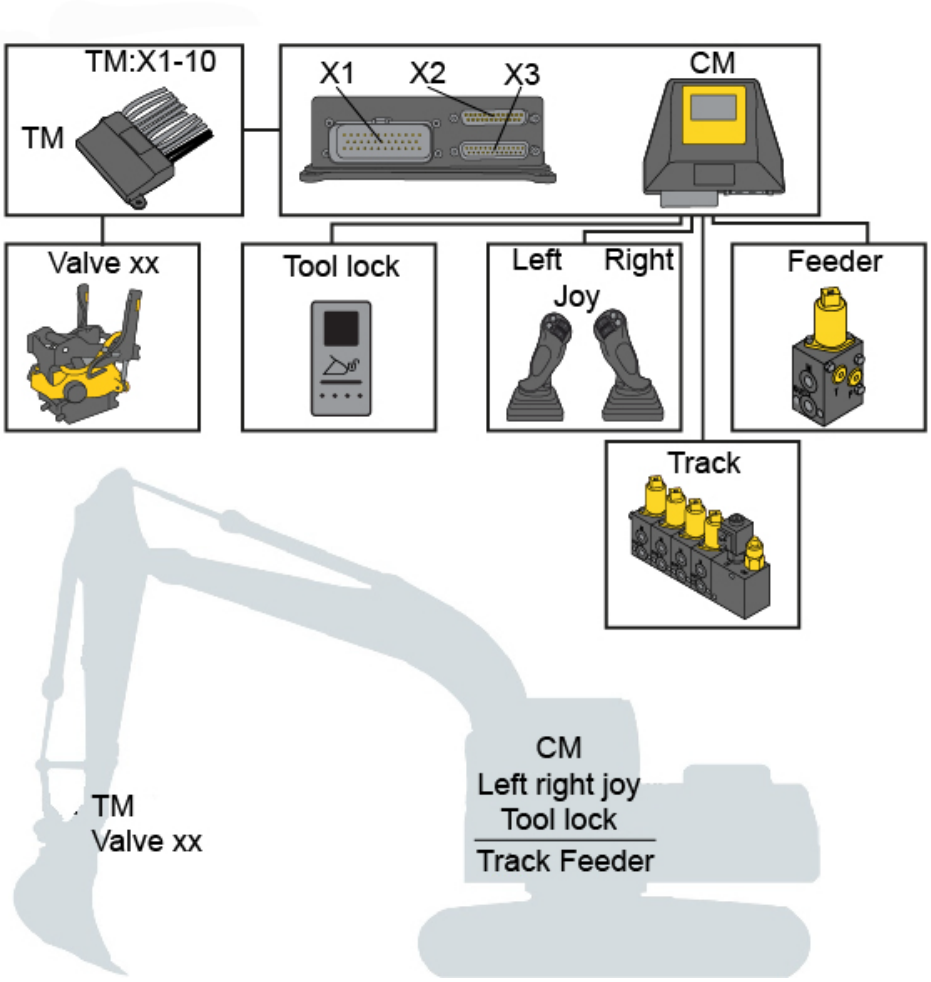
6.ALARMS

6.1. ALARM EXPLANATION



Pos	Note
1	Headline
2.A	Module
2.B	Connector
2.C	Pin
2.D	Faulty function
3	Short description
4	Shown alarm of total number of alarms
5	Number of times the alarm has been activated

6.2. ALARM OVERVIEW



Larmrubrik	Förklaring
CM	Cabin module
TM	Tiltrotator module
VALVE XX	Tiltrotator valve
LEFT/RIGHT JOY	Right or left joystick
TOOL LOCK	Tool lock
FEEDER	Oil feeder valve
WHEEL	Wheel control
SAFE STATE: X (Y)	A safe state according to EN 13849-1. X is description and Y is number of occasions.

6.3. LIST OF ALARMS

In this table X is exchanged to corresponding letter or number shown in the cabin module.

Alarm headline	Connector	Short description	Note
SAFESTATE 1-8	-	-	A safe state caused by internal errors. Repeating errors may mean the system should be exchanged. Contact support personnel.
SAFESTATE 9	-	-	A safe state caused by faulty pressure on CVP1. Control the valve and pressure sensor and the connections.
SAFESTATE 10	-	-	A safe state caused by faulty pressure on CVP2. Control the valve and pressure sensor and the connections.
SAFESTATE 11	-	-	A safe state caused by missing pressure on CVP1. Control the valve and pressure sensor and the connections.
SAFESTATE 12	-	-	A safe state caused by missing pressure on CVP1. Control the valve and pressure sensor and the connections.
CVP MALFUNCTION	CM-X1.XX	NO PRESSURE	No signal from pressure switch CVPx. Control pressure switch and wiring.
DOX	CM-X1.X	SHORT CIRCUIT	Short circuit in digital output.
DOX	CM-X1.X	OPEN CIRCUIT	Open circuit in digital output.
PWM X	CM-X1.X	SHORT CIRCUIT	Short circuit in analog output.
PWM X	CM-X1.X	OPEN CIRCUIT	Open circuit in analog output.

Alarm headline	Connector	Short description	Note
PWM X	CM-X3.X	SHORT CIRCUIT	Short circuit in PWM output.
PWM X	CM-X3.X	OPEN CIRCUIT	Open circuit in PWM output.
PWM X	CM-X3.X	SIGNAL ERROR	Wrong PWM signal from PWM output.
ACT. SWITCH	CM-X3.1	NOT ACTIVE	Activation switch for track or wheel control is inactive.
JOYSTICK	AI CALIBRATION	INVALID	Faulty calibration on analog inputs.
JOYSTICK	CM-X2.X (XAX)	SHORT CIRCUIT	Short circuit in analog input.
JOYSTICK	CM-X2.X (XAX)	OPEN CIRCUIT	Open circuit in analog input.
JOYSTICK	CM-X2.X (XAX)	BELOW MIN / ABOVE MIN	Faulty calibration on analog inputs.
JOYSTICK	CM-X2.X (XAX)	START:OUTSIDE DB	Analog input affected at start up.
JOYSTICK	CM-X2.X-X (XAX)	SIGNAL ERROR	Error at inverted signal.
JOYSTICK	CM-X2.XX-XX (XDX)	SHORT CIRCUIT	Short circuit in digital input.
JOYSTICK	CM-X2.XX-XX (XDX)	OPEN CIRCUIT	Open circuit in digital input.
JOYSTICK	CM-X2.XX-XX (XDX)	START: DI ACTIVE	Digital input affected at start up.
DI SUPPLY	CM-X2.7	SHORT CIRCUIT	Short circuit supply to digital functions.
DI SUPPLY	CM-X3 CM.X1	SHORT CIRCUIT	Short circuit supply to digital functions.
AI SUPPLY	CM-X2.19	SHORT CIRCUIT	Short circuit supply to analog functions.
TOOL LOCK	CM-X3.18-19 (TL)	SHORT CIRCUIT	Short circuit tool lock switch.
TOOL LOCK	CM-X3.18-19 (TL)	START: DI ACTIVE	Tool lock switch active at start up.

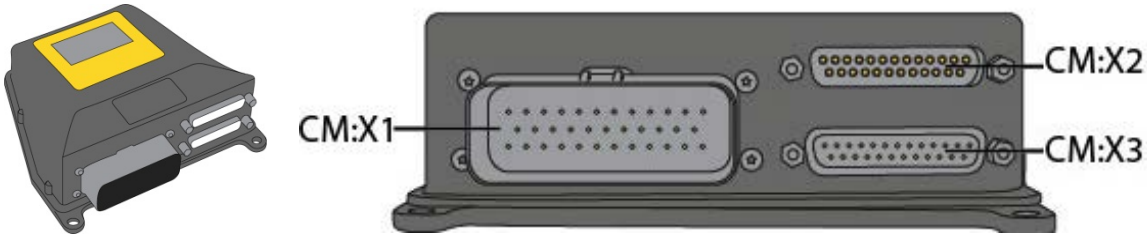
Alarm headline	Connector	Short description	Note
Tiltrotator module (TM)			
TM FAULT	CM-X1.28-35	NO HEARTBEAT	No can bus communication with TM.
CAN SUPPLY	CM-X1.XX	SHORT CIRCUIT	Short circuit supply voltage to TM.
TM VALVES	TM-X2-X10	SHORT CIRCUIT	Short circuit at any of TM analog outputs.
VALVE X	TM-XX XXX X	OPEN CIRCUIT	Open circuit at analog output of TM.
VALVE 1	TM-X1 TOOL LOCK	SHORT CIRCUIT	Short circuit at tool lock at TM.
VALVE 1	TM-X1 TOOL LOCK	OPEN CIRCUIT	Open circuit at tool lock at TM.

7.TECHNICAL DATA

7.1. CABIN MODULE (CM)

Supply voltage	9-32VDC 15A
Enclosure	IP54.
Display	Graphical display 128x64 white backlight
Size	146x145x47mm.
Temp. range	-40 – +85 °C
Outputs	6 analog outputs 2A (2+2A/B) 2 PMW- outputs 4 Digital outputs 3A 3 Digital outputs 100mA
Inputs	17 Digital inputs 6 Analog inputs
Bus	CAN-bus

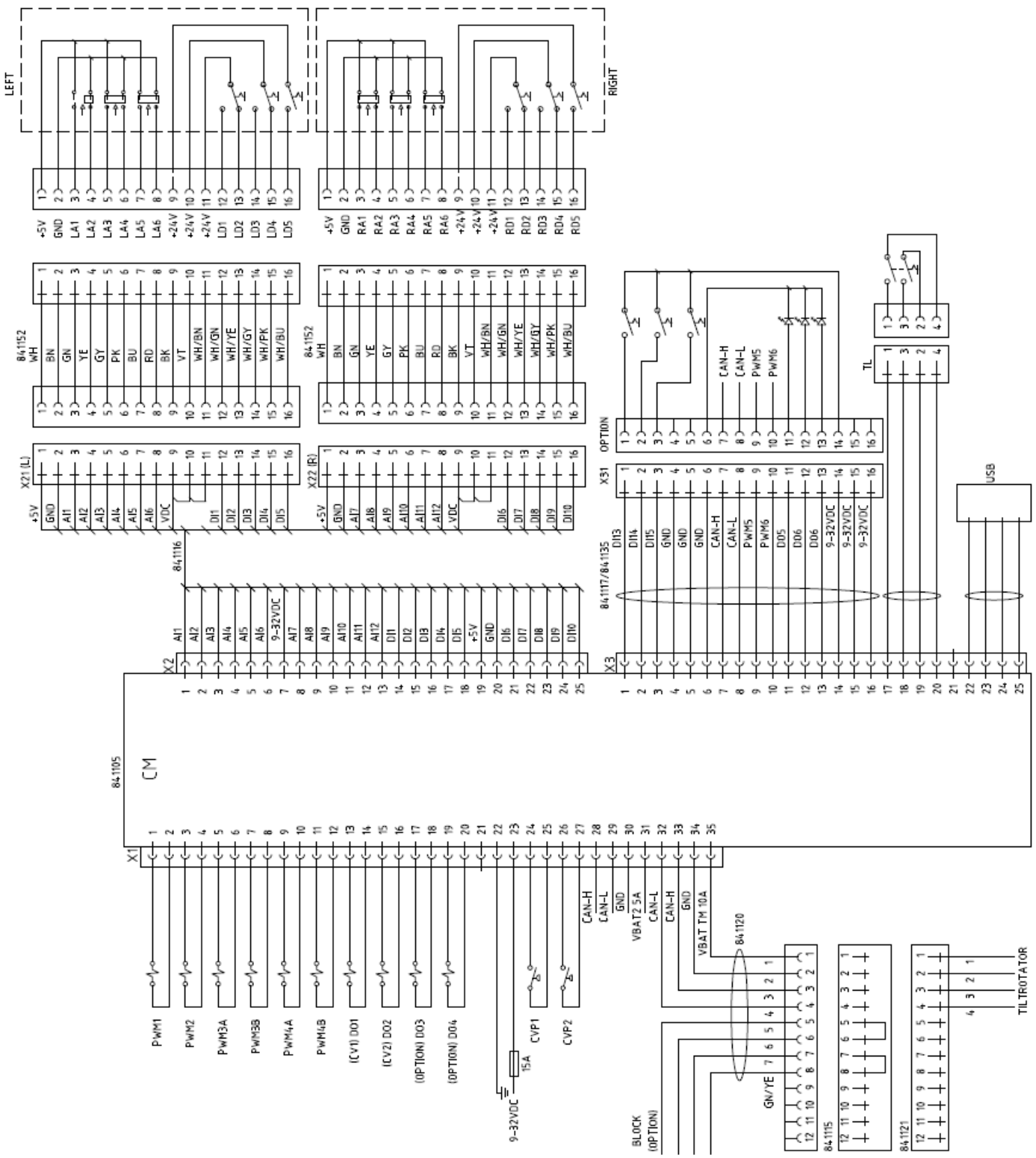
7.1.1.1. Connectors



CM :X1	Function	CM :X2	Function	CM :X3	Function
1	PWM1 (0-2A)	1	AI1 (LA1)	1	DI13
2	GND	2	AI2 (LA1)	2	DI14
3	PWM2 (0-2A)	3	AI3 (LA2)	3	DI15
4	GND	4	AI4 (LA2)	4	GND
5	PWM3A (0-2A)	5	AI5 (LA2)	5	GND
6	GND	6	AI6 (LA2)	6	GND
7	PWM3B (0-2A)	7	+12/24V	7	CAN-H
8	GND	8	AI7 (RA1)	8	CAN-L
9	PWM4A(0-2A)	9	AI8 (RA1)	9	PWM5 (0-100%)
10	GND	10	AI9 (RA2)	10	PWM6 (0-100%)
11	PWM4B (0-2A)	11	AI10 (RA2)	11	DO5 (100mA)
12	GND	12	AI11 (RA3)	12	DO6 (100mA)
13	DO1 (CV1) (3A)	13	AI12 (RA3)	13	DO7 (100mA)
14	GND	14	DI1 (LD1 NO)	14	+12/24V
15	DO2 (CV2) (3A)	15	DI2 (LD1 NC)	15	+12/24V
16	GND	16	DI3 (LD2 NO)	16	+12/24V
17	DO3 (3A)	17	DI4 (LD2 NC)	17	+12/24V
18	GND	18	DI5 (LD3)	18	DI16 (TL_NEG)
19	DO4 (3A)	19	+5V	19	DI17 (TL_POS)

CM :X1	Function	CM :X2	Function	CM :X3	Function
20	GND	20	GND	20	GND
21	Not connected	21	DI6 (LD1 NO)	21	GND
22	GND	22	DI7 (LD1 NC)	22	GND
23	+9-32VDC 15A	23	DI8 (LD2 NO)	23	USB 5V
24	DI11 (CVP1)	24	DI9 (LD2 NC)	24	USB - DATA
25	+12/24V	25	DI10 (LD3)	25	USB - DATA
26	DI12 (CVP2)				
27	+12/24V				
28	CAN-L				
29	CAN-H				
30	GND				
31	VBAT2 (5A)				
32	CAN-L				
33	CAN-H				
34	GND				
35	VBAT1 (10A)				

7.2. SYSTEM OVERVIEW



MICROPROP DC2
WHEEL CONTROL

ADDITION TO MACHINE USER MANUAL.

In this machine the control has been modified with Microprop DC2 wheel control.. This means that the user must be attentive of the changes that has been made..

The machine original joysticks have been replaced in this machine. The servo controlled functions in the joysticks has not been changed..

Review labels and the user manual of Microprop wheel control for further instructions.

The assembling firm is obligated to attach this information in the machine user manual.

Place for assembling firm stamp.

Name:_____

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