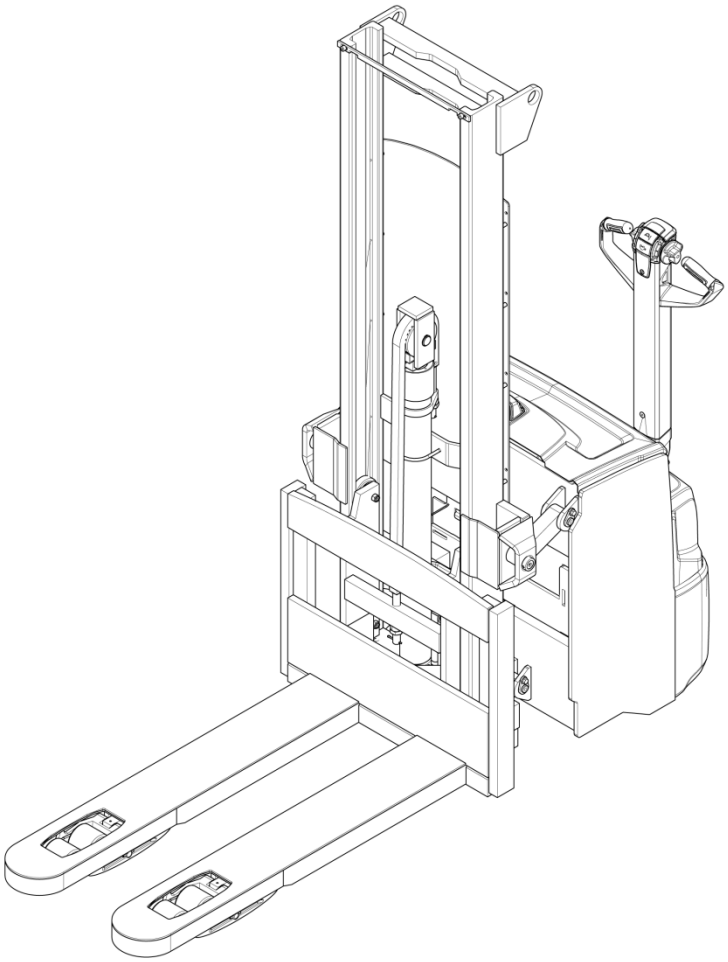
SERVICE MANUAL

NSP

10N2/12N2/12N/14N2/

14N2I/16N2/16N2I/16N2S



English 2013
616838

2.2.2 Other symbols and abbreviations

SYMBOL OR ABBREVIATION	DESCRIPTION
OP	Option
COM	Common terminal
NC	Normally closed terminal
NO	Normally open terminal
R1/4	Taper pipe thread (external) 1/4 inch (formerly PT1/4)
RC1/8	Taper pipe thread (external) 1/8 inch (formerly PT1/8)
G1/4A	Straight pipe thread (external) 1/4 inch (formerly PF1/4-A)
Rp1/8	Straight pipe thread (internal) 1/8 inch (formerly PS1/8)

2.3 Units

SI units are used in this manual.

The following table shows the conversion of SI units to customary units.

ITEM	SI UNIT	METRIC UNIT	YARD-POUND UNIT
Force	1 N	0.102 kgf	0.225 lbf
Pressure	1 MPa	10.1972 kgf/cm2	145.038 psi
Torque	1 N m	0.102 kgf m	0.7376 lbf ft
Length	1 mm 1 m	- -	0.039 inch 3.281 feet
Weight	1 kg	-	2.205 lb
Temperature	1°C	-	°F=1.8 x °C+32
Volume	1 L	-	0.264 US.gal.

4.3.2.2 Tiller arm positions

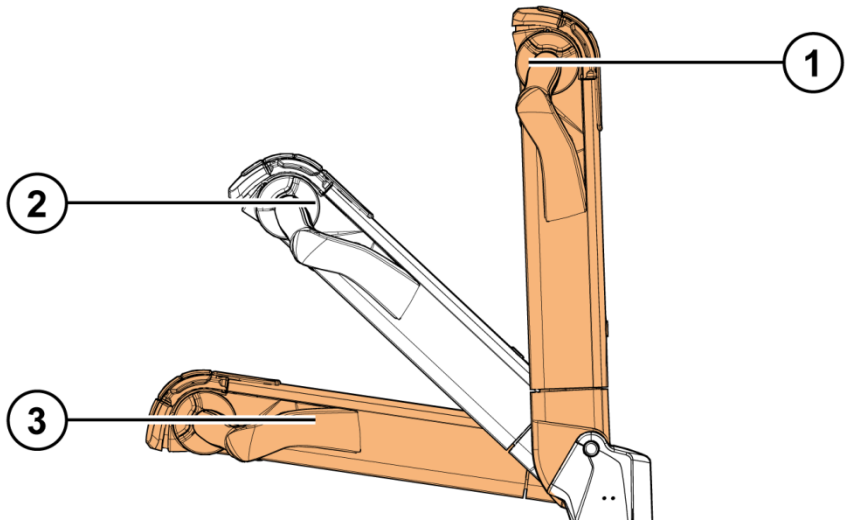
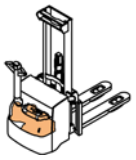


Figure 4. Tiller arm positions

1. *Rest position / emergency braking*
2. *Driving position*
3. *Emergency braking*

4.3.6.3 Traction motor

Type	3-phase AC
Voltage	16 V
Output power	2.3 kW



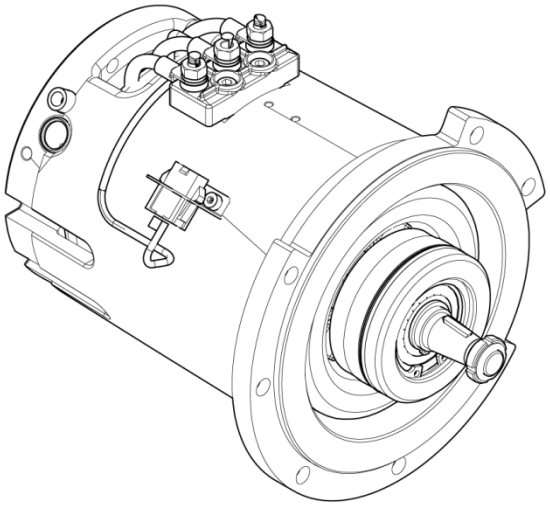


Figure 13. Traction motor

6 Nm

The correct tightening torque for the traction motor power terminals is 6 Nm.

9.3.3.2 Insulation resistance of the battery

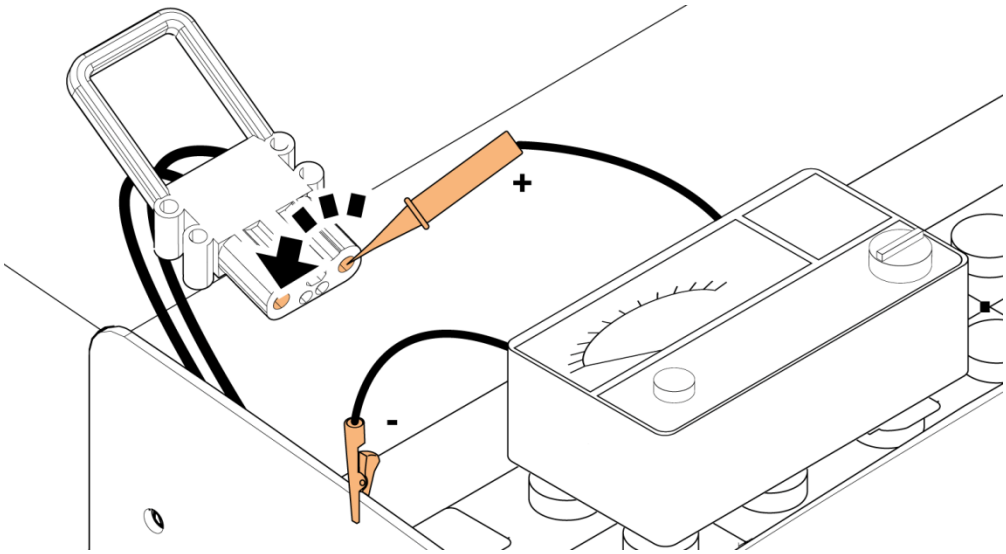


Figure 118. Measuring the insulation resistance of the battery

The insulation resistance of the disconnected, filled and charged traction battery mounted on the truck is at least 50 Ω multiplied by the nominal voltage of the truck system between the live parts and the frame of the truck. If the battery is fitted into more than one containers, this test is carried out with the electrically-connected sections (including metal battery containers).

NOMINAL VOLTAGE	MINIMUM INSULATION RESISTANCE
24 V	1,200 Ω
36 V	1,800 Ω
48 V	2,400 Ω
80 V	4,000 Ω

11 TruckTool Diagnostics

Software maintenance can be performed with a diagnostics application called TruckTool. This program runs on a laptop PC and connects to the truck's data bus (CAN) via a special adapter and wire harness.

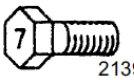
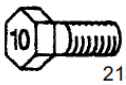
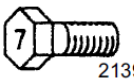
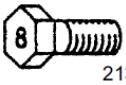
TruckTool can be used to receive, display and modify settings, update (flash) controller firmware, reset settings to hardware defaults, review and clear alarms, perform calibrations, execute a quick truck setup and monitor digital and analogue inputs and outputs.

The TruckTool program’s usage instructions are available in the application itself. Additional training is required to use the program.

Figure 124. TruckTool Diagnostics

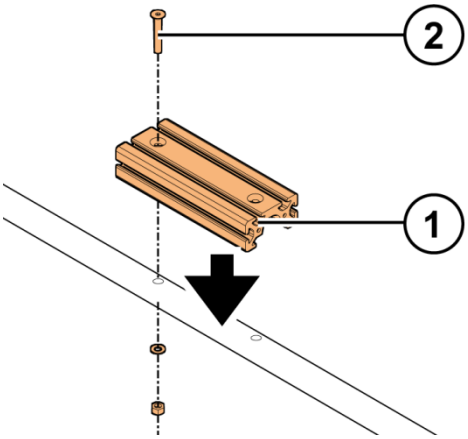
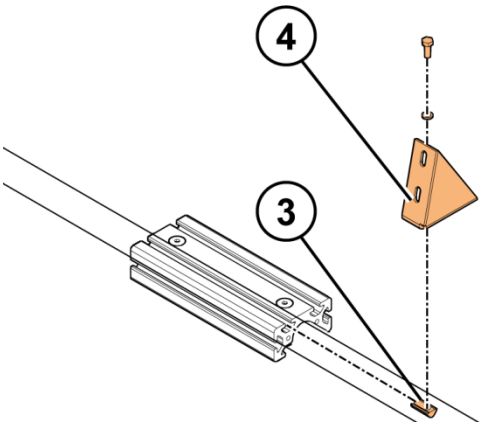
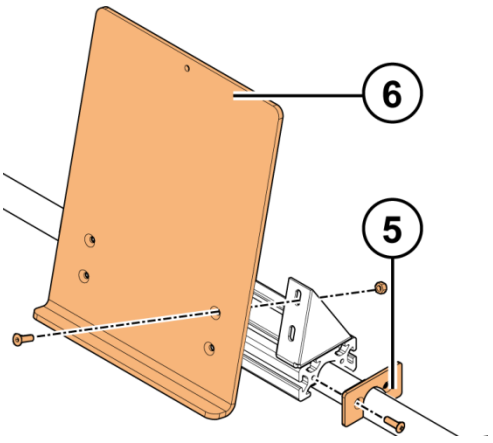
CODE	TRUCKTOOL AND DISPLAY DESCRIPTION		
13	Controller memory error EEPROM KO	(Warning)	Stored
	This warning is caused by a hardware or software defect of the non-volatile embedded memory supporting the controller parameters. This alarm does not prevent truck operation, but the truck will work with the default values. In case of this warning, perform a CLEAR EEPROM operation. Switch the key off and on to check the result. If the alarm occurs permanently, replace the traction controller. If the alarm disappears, the previously stored parameter values will have been replaced by the default values.		
17	Hardware high current protection failure LOGIC FAILURE #3	(Alarm)	Stored
	This alarm is caused by a hardware problem in the logic card circuit for high current (overload) protection. This fault is not related to external components, so when it appears, replace the traction controller.		
18	Motor voltage feedback circuit damaged LOGIC FAILURE #2	(Alarm)	Stored
	This alarm is caused by a fault in the logic board managing the phase's voltage feedback. This fault is not related to external components, so when it appears, replace the traction controller.		
19	Over or under voltage detected LOGIC FAILURE #1	(Alarm)	Stored
	This alarm is displayed when the controller detects an overvoltage or undervoltage condition. The overvoltage threshold is 35 V and the undervoltage threshold is 9.5 V in the 24V controller. If the alarm is displayed at startup or in the standby mode, it is due to an undervoltage. In such a case, check the following: • The key input signal voltage drops below the undervoltage threshold due to external loads, such as DC/DC converters starting up or relays or contactors energizing or de-energizing. • If no voltage transient is detected on the supply line and the alarm is displayed every time the key is switched ON, the problem is in the traction controller. If fault is displayed during motor driving, it is due to an undervoltage or an overvoltage condition. • If the alarm occurs during traction acceleration or driving hydraulic functions, it is caused by an undervoltage condition. In such a case, check the battery charge level and the power cable connections. • If the alarm occurs during release braking, it is caused by an overvoltage condition. In such a case, check the line contactor tips and the battery power cable connections. In some cases, this error can also happen during normal operation. Sharp hits may cause the emergency stop switch contacts to open for a short period of time. This causes a short 0 V pulse to the key line causing this error.		

CODE	TRUCKTOOL AND DISPLAY DESCRIPTION		
208	Controller memory error (EEPROM) EEPROM KO	(Alarm)	Stored
	This alarm is caused by a hardware or software defect in the non-volatile embedded memory supporting the controller parameters. This alarm does not prevent the truck from operating, but the truck will work with the default values. In the case of this alarm, perform the CLEAR EEPROM operation. Switch the key off and on to check the result. If the alarm persists, replace the traction controller. If the alarm disappears, the previously stored parameter values will have been replaced by the default parameter values.		
210	Controller memory error (RAM) WRONG RAM MEM.	(Alarm)	Stored
	This alarm is caused by a hardware or software defect in the volatile embedded memory. The controller could be damaged and it should be replaced.		
211	Traction motor jammed STALL ROTOR	(Alarm)	Stored
	This alarm indicates that the traction rotor is stuck or the encoder signal is not correctly received by the controller. In the case of this alarm, check if the sign of FREQUENCY and ENCODER on the tester menu are the same. Also check that it is not zero during a traction request.		
212	Controller memory error (RAM wrong) WRONG RAM	(Alarm)	
	This alarm indicates that the used program, etc. is incorrect.		
213	Auxiliary output driver error AUX BATT. SHORT.	(Alarm)	Stored
	If this alarm occurs, the POSITIVE EB parameter is probably not set correctly. Set the parameter to LEVEL=0.		
214	Lowering valve circuit open EVP COIL OPEN	(Alarm)	Stored
	This alarm is displayed if the solenoid valve circuit is open. In such a case, check the following: • Wiring, verify that the solenoid valve coil circuit is in order between XA1_B/3 and fuse 3F1. • Solenoid valve coil If the wiring and the solenoid valve coil are OK, the problem is in the traction controller.		

	Nominal size		Pitch		With spring washer								
					 213982			 213983			 213984		
Metric coarse thread	mm	in.	mm	in.	N·m	kgf·m	lbf·ft	N·m	kgf·m	lbf·ft	N·m	kgf·m	lbf·ft
	10	0.39	1.5	0.06	33.3	3.4	24.6	43.1	4.4	31.8	67.7	6.9	49.9
	12	0.47	1.75	0.07	58.8	6.0	43.4	76.5	7.8	56.4	115.7	11.8	85.3
	14	0.55	2	0.08	96.4	9.8	70.9	124.5	12.7	91.9	182.4	18.6	134.5
	16	0.63	2	0.08	147.1	15.0	108.5	191.2	19.5	141.0	274.6	28.0	202.5
	18	0.71	2.5	0.10	203.0	20.7	149.7	264.8	27.0	195.3	383.4	39.1	282.8
	20	0.79	2.5	0.10	286.4	29.2	211.2	371.7	37.9	274.1	536.4	54.7	395.6
	22	0.87	2.5	0.10	383.4	39.1	282.8	499.2	50.9	368.2	725.9	74.0	535.2
	24	0.95	3	0.12	492.3	50.2	363.1	640.4	65.3	472.3	924.8	94.3	682.1
	27	1.06	3	0.12	724.7	73.9	534.5	942.2	96.1	695.1	1350.4	137.7	996.0
	30	1.18	3.5	0.14	969.9	98.9	715.3	1259.2	128.4	928.7	1843.7	188.0	1359.8
	33	1.30	3.5	0.14	1328.8	135.5	980.1	1727.0	176.1	1273.7	2477.2	252.6	1827.1
	36	1.42	4	0.16	1676.0	170.9	1236.1	2180.0	222.3	1607.9	3199.9	326.3	2360.1
	39	1.54	4	0.16	2219.2	226.3	1636.8	2884.1	294.1	2127.2	4118.8	420.0	3037.9
	42	16.5	4.5	0.18	2754.7	280.9	2031.8	3581.4	365.2	2641.5	5137.7	523.9	3789.4
	Nominal size		Pitch		With spring washer								
					 213982			 213983			 213984		
	mm	in.	mm	in.	N·m	kgf·m	lbf·ft	N·m	kgf·m	lbf·ft	N·m	kgf·m	lbf·ft
	10	0.39	1.5	0.06	39.2	4.0	28.9	51.0	5.2	37.6	79.4	8.1	58.6
	12	0.47	1.75	0.07	69.6	7.1	51.4	90.2	9.2	66.5	135.3	13.8	99.8
	14	0.55	2	0.08	112.8	11.5	83.2	146.1	14.9	107.8	215.7	22.0	159.1
	16	0.63	2	0.08	172.6	17.6	127.3	224.6	22.9	165.6	323.6	33.0	238.7
	18	0.71	2.5	0.10	239.3	24.4	176.5	311.9	31.8	230.0	451.1	46.0	332.7
	20	0.79	2.5	0.10	336.4	34.3	248.1	437.4	44.6	322.6	630.6	64.3	465.1
	22	0.87	2.5	0.10	392.3	40.0	289.3	587.4	59.9	433.3	842.4	85.9	621.3
	24	0.95	3	0.12	578.6	59.0	426.7	753.2	76.8	555.5	1088.5	111.0	802.9
	27	1.06	3	0.12	852.2	86.9	628.5	1008.2	113.0	817.3	1588.7	162.0	1771.7
	30	1.18	3.5	0.14	1140.5	116.3	841.2	1481.8	151.1	1092.9	2168.3	221.1	1599.2
	33	1.30	3.5	0.14	1563.2	159.4	1153.0	2031.9	207.2	1498.7	2915.5	297.3	2150.4
	36	1.42	4	0.16	1972.1	201.1	1454.6	2564.4	261.5	1891.4	3765.8	384.0	2777.5
	39	1.54	4	0.16	2610.5	266.2	1925.4	3393.1	346.0	2502.6	4845.5	494.1	3573.8
	42	1.65	4.5	0.18	3241.1	330.5	2390.5	4212.9	429.6	3107.3	6044.8	616.4	4458.4

Remarks: 1. The tolerance on the torque is ± 10%
2. The torque is for “dry” condition.

15.2.2 Installation of the list bracket

1. Install the list bracket's mounting bracket to the middle of the accessory rack. **2.** Install and tighten the screws and nuts attaching the mounting bracket to the accessory rack.	
3. Slide the T-slot fasteners into the operator-side groove of the mounting bracket. **4.** Screw the two mounting pieces into the T-slot fasteners.	
5. Screw the cover plates to the sides of the mounting bracket. **6.** Screw the list bracket onto the mounting pieces.	

15.7 Abbot

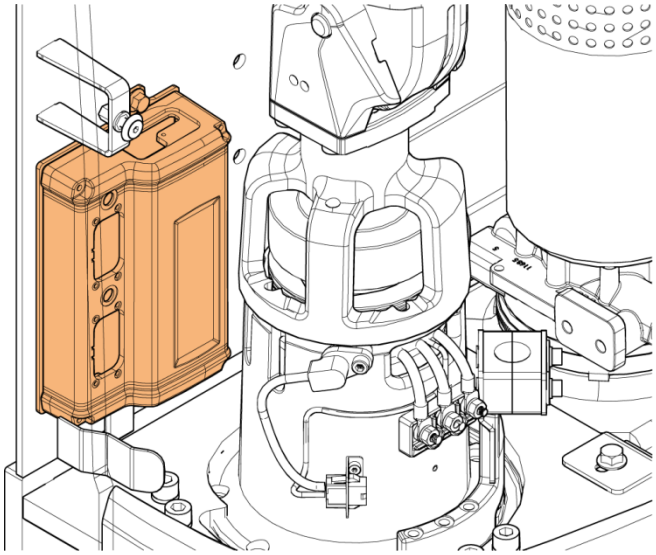


Figure 135. Abbot overview

Abbot is an Internet-based remote diagnostics system designed for forklifts and other similar local transport equipment. It relays use information from the forklifts to the client's computer for browsing and analysis.

Abbot measures, for example, driving forward and backward, lifting and lowering the forks, and records any collisions the forklift was involved in, the voltage of the battery, and the condition of the motor. If necessary, driver identification can be included with Abbot, which prevents unauthorised use of the forklift and records who operated it and when.

With the gathered information, one can see precisely how much the forklifts are actually being used, how they are used, and what kind of forklift operating culture prevails in the work environment. The condition of the motor and battery provide information of a potential need for servicing or repairs.

The equipment to be installed on the forklift consists of a central unit and a potential external collision sensor and iButton driver identification module. The information gathered of the forklifts is sent automatically to the Abbot server using either the GPRS or WLAN network. The information on the Abbot server is browsed in real-time using an Internet browser.

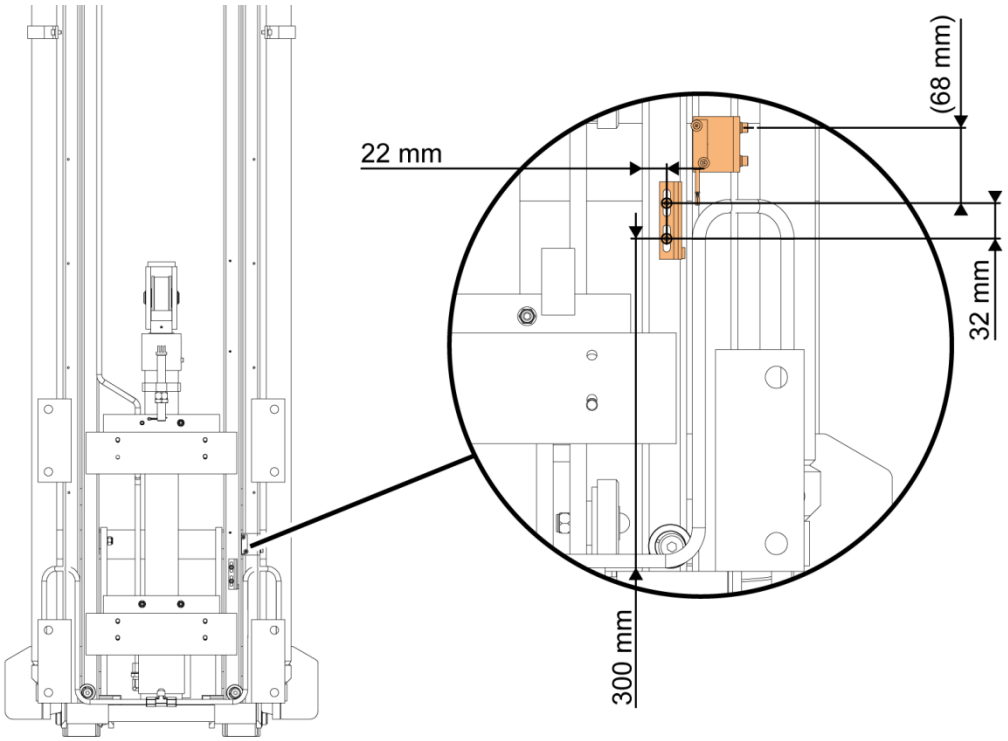


Figure 142. Correct placement of the driving speed reduction sensor (duplex mast with free lift)

15.10.1.3 Installation of the driving speed reduction sensor (triplex mast with free lift)

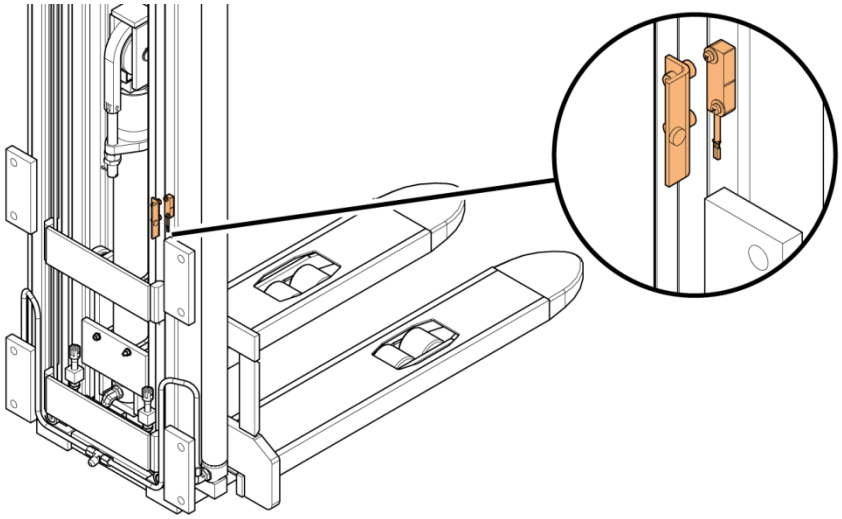


Figure 143. Driving speed reduction sensor overview (triplex mast with free lift)

4.35	Turning radius	Wa [mm]	1,383	1,383 (1,784)	1,447 (1,848)	1,447 (1,848)	1,535
5	**PERFORMANCE**						
5.1	Travel speed, laden / unladen	[km/h]	6.0 / 6.0	6.0 / 6.0	6.0 / 6.0	6.0 / 6.0	6.0 / 6.0
5.2	Lifting speed, laden / unladen	[m/s]	0.12 / 0.26	0.12 / 0.26	0.12 / 0.26	0.14 / 0.27	0.14 / 0.27
5.3	Lowering speed, laden / unladen	[m/s]	0.35 / 0.40	0.35 / 0.40	0.35 / 0.40	0.35 / 0.40	0.35 / 0.40
5.7	Maximum gradeability, laden / unladen	[%]	8 / 15	8 / 15	8 / 15	8 / 15	8 / 15
5.10	Service brake	[s]	Electric	Electric	Electric	Electric	Electric
6	**MOTORS**						
6.1	Drive motor S2 60 min	[kW]	1.0	1.0	1.0	1.0	1.0
6.2	Lift motor S3 kW/%	[kW]	2.2	2.2	2.2	3.2	3.2
6.4	Battery voltage / capacity (5 hr rating)	[V/Ah]	24 / 150	24 / 250	24 / 250	24 / 250	24 / 250
6.5	Battery weight (min. - max.)	[kg]	151	212	212	212	212
8	**MISCELLANEOUS**						
8.1	Speed control type		Stepless	Stepless	Stepless	Stepless	Stepless
8.4	Level of noise at the driver's ear level according to EN 12 053:2001 and EN ISO 4871 in work LpA	[dB (A)]	57	57	57	67	67
	Level of noise at the driver's ear level according to EN 12 053:2001 and EN ISO 487, drive / lift / idle LpA	[dB (A)]	60 / 60 / 41	60 / 60 / 41	60 / 60 / 41	70 / 72 / 41	70 / 72 / 41

Manufacturer reserves the right to make technical changes.

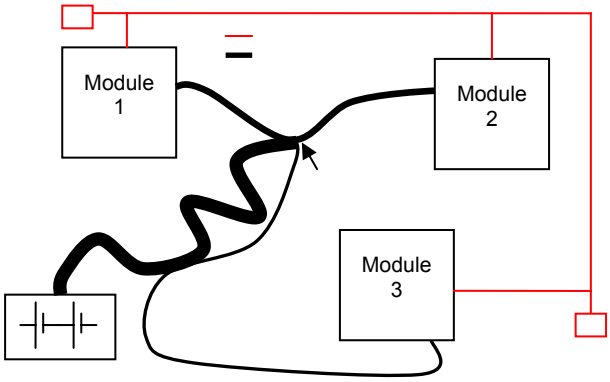
( ) = With initial lift
All the values have been measured with standard configuration, values can vary with different masts.
Ast3=Wa-x+l6+200
Ast=Wa+R+200

1 INTRODUCTION

The COMBIACX / ACEX inverter has been developed to perform all the electric functions that are usually presents in walkie and rider pallet trucks, stackers, low level order pickers.
The controller can perform the following functions:

- Controller for AC 600W to 2 kW AC motors;
- Pump controller for series wounded DC motors up to 5 kW (only for COMBIACX).
- Driver for Line Contactor coil
- Drivers for ON/OFF electrovalves and for one proportional valve (electro-distributor)
- Low side and high side (short circuit protected) drives for electric brake coil
- Canbus interface
- Interface for Canbus tiller
- Zapi patented sensorless and sense coil control
- 192 kBytes Flash memory embedded.
- Software downloadable via Serial link (internal connectors) or Canbus (external connector)
- ESD protection on Canbus inputs CANL and CANH

Correct Layout:



Note: Module 1 power ≈ Module 2 power > Module 3 power

In this case the power cables starting from the two similar controllers must be as short as possible. Of course also the diameter of the cable concurs in the voltage drops described before (higher diameter means lower impedance), so in this last example the cable between the minus of the Battery and the common ground point (pointed by the arrow in the image) must dimensioned taking into account thermal and voltage drop problems.

Can advantages

The complexity of today systems needs more and more data, signal and information must flow from a node to another. CAN is the solution to different problems that arise from this complexity
- simplified design (readily available, multi sourced components and tools)
- lower costs (less and smaller cables)
- improved reliability (fewer connections)
- analysis of problems improved (easy connection with a pc to read the data flowing through the cable)

4.2.4 Wirings: I/O connections

- After crimping the cable, verify that all strands are entrapped in the wire barrel.
- Verify that all the crimped contacts are completely inserted on the connector cavities

A cable connected to the wrong pin can lead to short circuits and failure; so, before turning on the truck for the first time, verify with a multimeter the continuity between the starting point and the end of a signal wire

- for information about the mating connector pin assignment see the paragraph “description of the connectors”

C4	CPOTTR	Accelerator potentiometer wiper input.
C5	CANH	High level CAN-BUS voltage I/O.
C6	DI0	Input of the switch DI0. The input is activated when it is connected to +Batt. With the logic hardware properly configured it can be used to supply the EB and MC positive voltage. The default function is the controller "TILLER" input.
C7	DI2	Input of the switch DI7. The input is activated when it is connected to +Batt. The default function is the controller "H&S" (Hard & Soft) request input, closing this input truck performances are modified.
C8	PPOT	Potentiometers positive supply. Hardware has to be configured to output +12V or +5 V.
C9	CPOTL	Lift/Lower potentiometer wiper input.
C10	CANL	Low level CAN-BUS voltage I/O.

6.1.4 CND external connector

D1	ENC A	Traction motor encoder phase A.
D2	PENC	Encoder Positive Supply. Hardware has to be configured to output +12V or +5 V
D3	PTHERM	Traction motor thermal sensor input. The internal pull-up is a fixed 2mA (Max 5V) source current.
D4	ENCB	Traction motor encoder phase B.
D5	NENC	Negative of the Encoder.
D6	NTHERM	Negative reference (GND) for the motor thermal sensor.

6.1.5 CNE internal connector

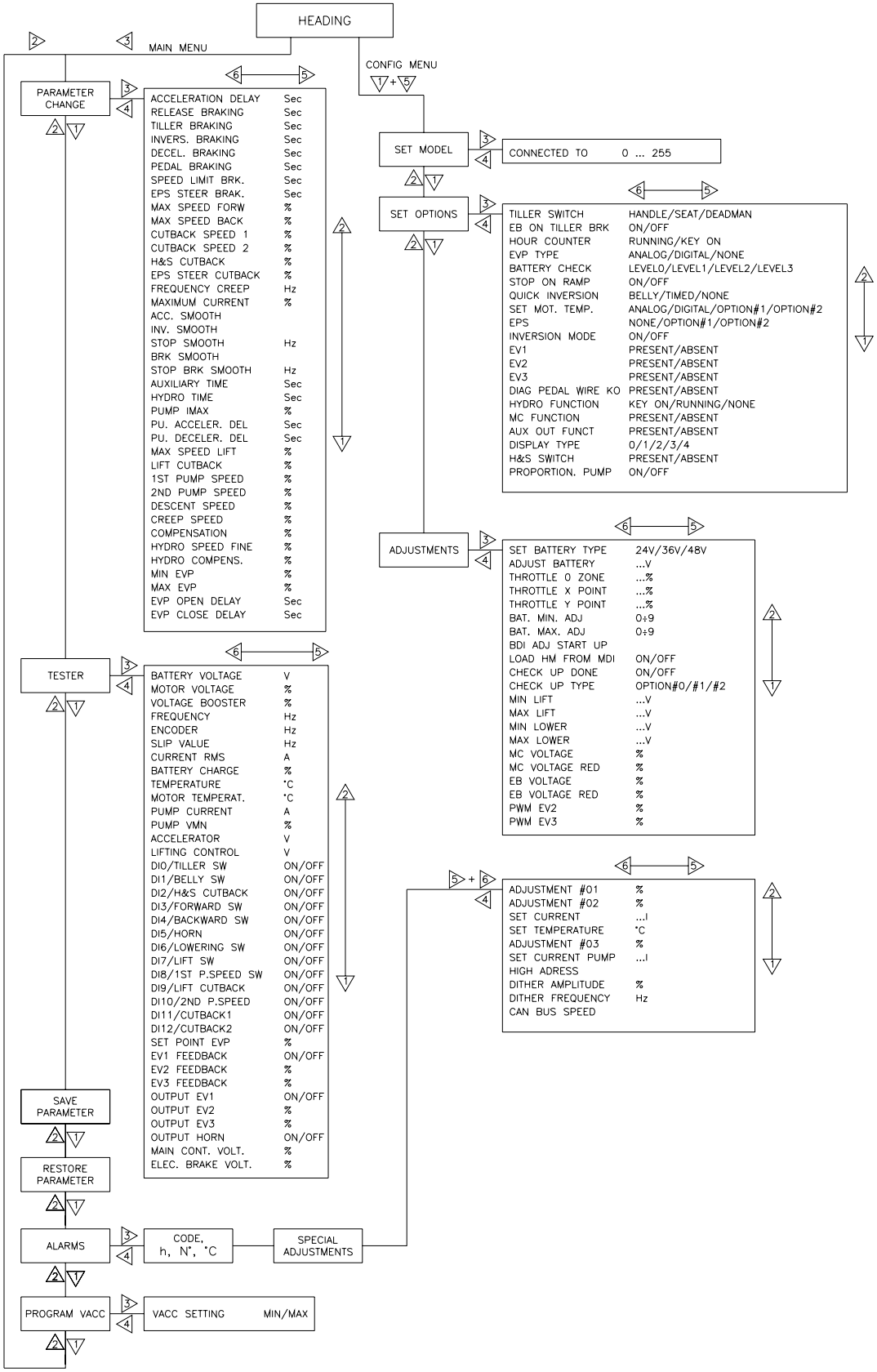
The connector used is a 8 way STRIP

E1		Not used Internally disconnected.
E2	NCLRXD	Negative serial reception pin.
E3	PCLTXD	Positive serial transmission pin.
E4	NCLTXD	Negative serial transmission pin.
E5	GND	Serial communication negative reference.
E6	+12	+12V serial communication supply.
E7	FLASH BOOT	To connect this pin to GND (E8) for software download via serial communication.
E8	GND	Serial communication negative reference.

This connector cannot be reached without removing the cover. It is used by Zapi for software download with Zapi Flasher, for communicating with a Zapi Handset or a lap-top, for controller setup and for diagnosis.

10.3 Description of the console menu

10.3.1 COMBIACX / ACEX Menu



speed applied when the Hard & Soft function, CNC#7 connector, is active. When set to 100% the speed reduction is ineffective.

15) EPS STEER CUTBCK
Tipically from 1% to 100%. It determines the percentage of the maximum speed when the wheel is completely turned (tipiccally 90 degrees).
If the wheel angle is a percentage of the maximum angle, the steer cutback is applied proportionally.

Note: the wheel angle is coming from EPS. If EPS option is set to NONE, this parameter is useless.

16) FREQUENCY CREEP
Hz value. This is the minimum speed applied when the forward or reverse switch is closed, but the accelerator is at its minimum.

17) MAXIMUM CURRENT
Maximum level of the current (percentage of the maximum current of the controller).

18) ACCELERATION SMOOTH
It gives a parabolic form to the acceleration ramp.

19) INVERSION SMOOTH
It gives a parabolic form to the acceleration ramp after a direction inversion.

20) STOP SMOOTH
Hz. It sets the level of frequency where the smooth effect of the acceleration parabolic form ends.

21) BRK SMOOTH
It gives a parabolic form to the deceleration ramp.

22) STOP BRK SMOOTH
Hz. It sets the level of frequency where the smooth effect of the deceleration parabolic form ends.

23) AUXILIARY TIME
Time units value (seconds). For the encoder version, it determines the time duration the truck is hold on the ramp if the STOP ON RAMP option is ON.

24) HYDRO TIME
Sec. It determines the time duration the pump motor is driven after the hydraulic request is released.

25) PUMP IMAX
Level 0 to 9. Set the maximum current for the pump motor.

26) PUMP ACCELERATION DELAY
In seconds. Set the acceleration ramp for the pump motor.

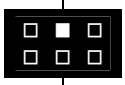
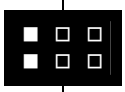
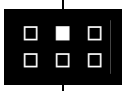
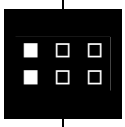
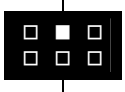
NOTE: in reality the SAVE and RESTORE function requires the Windows PC-Console.

11.2 Description of console “RESTORE” function

The RESTORE PARAM function allows transfer of the Console’s stored data into the memory of the controller. This is achieved in a fast and easy way using the method previously used with the SAVE PARAM. function.
The data that is available on the RESTORE PARAM. Function are listed here below:

- All Parameter Values (PARAMETER CHANGE).
- Options (SET OPTIONS)
- The level of the Battery (ADJUST BATTERY)

ATTENTION: When the RESTORE operation is made, all data in the controller memory will be written over and replaced with data being restored.
Flow Chart showing how to use the RESTORE function of the Digital Console.

Opening Zapi Display	
Press ENTER to go into the General menu	
The Display will show :	
Press ROLL UP or ROLL DOWN button until RESTORE PARAM. appears on the display	
The Display will show :	
Press ENTER to go into the RESTORE PARAM. function	
The Display shows the type of Model stored, with a Code Number	
Keep pressing either ROLL UP and ROLL DOWN buttons until the desired model appears on the Display	
	
Press ENTER to commence the Restore operation	
The Display will ask “ARE YOU SURE”.	

- If no problem are found on the motors, the problem is inside the controller.

3) "VMN HIGH"
   Cause 1:
   Before switching the LC on, the software checks the power bridge: it turns on alternating the Low side Power Mosfets and expects the phases voltage to decrease down to -Batt. If the phases voltage do not decrease, this alarm occurs.
   Cause 2:
   This alarm may occur also when the start up diagnosis is overcome, and so the LC is closed. In this condition, the phases' voltages are expected to be lower than 1/2 Vbatt. If it is higher than that value, fault status is entered.
   Troubleshooting:
   A) If the problem occurs at start up (the LC does not close at all), check:
      - Motor internal connections (ohmic continuity)
      - Motor power cables connections
      - If the motor connection are OK, the problem is inside the controller
   B) If the problem occurs after closing the LC (the LC closed and then opens back again), check:
      - Motor connections
      - If motor phases windings/cables have leakages towards truck frame
      - If no problem are found on the motors, the problem is inside the controller

4) "POWER MOS SHORT"
   Cause: Before switching the LC on, the software checks the power bridge: it turns on alternating the Low side and High side Power Mosfets and expects the phases voltage to decrease down to –BATT (increase up to +Batt). If the phases voltage do not follow the comands, this alarm occurs.
   Troubleshooting:
   This type of fault is not related to external components; replace the controller.

5) "COIL SHOR MC-EB"
   Cause:
   This alarm occurs when there is a short circuit of one of the coils connected to outputs of the COMBIACX / ACEX (LC coil or EB coil). After the overload condition has been removed, the alarm exits automatically by releasing and then enabling a travel demand.
   Troubleshooting:
   A) The typical root cause for this error code to be displayed is in the harness or in the load coil. So the very first check to carry out concerns connections between controller outputs and loads.
   B) In case no failures/problems have been found externally, the problem is in the controller, which has to be replaced.

6) "DRIVER SHORTED"
   Cause:
   The driver of the main contactor coil is shorted or the coil is disconnected.
   Troubleshooting:
   A) Check if there is a short or a low impedance pull-down between NLC CNB#6 and –BATT.
   B) The driver circuit is damaged in the controller, which has to be replaced.
   C) The wires to the LC coil are interrupted or not connected, so check the coil related harness.

6) “BATTERY LOW”
Cause:
It occurs when the battery charge is calculated being less than or equal to 10% of the full charge and the BATTERY CHECK setting is other than 0 (refer to SET OPTION menu).
Troubleshooting:
Get the battery charged. If it doesn’t work, measure with a voltmeter the battery voltage and compare it with the value in the BATTERY VOLTAGE parameter. If they are different adjust the value of the ADJUST BATTERY function.

7) “EEPROM KO”
Cause:
It’s due to a HW or SW defect of the non-volatile embedded memory supporting the controller parameters. This alarm does not inhibit the machine operations, but the truck will work with the default values.
Troubleshooting:
Try to execute a CLEAR EEPROM operation (refer to Console manual). Switch the key off and on to check the result. If the alarm occurs permanently, it is necessary to replace the controller. If the alarm disappears, the previously stored parameters will have been replaced by the default parameters.

8) “MOTOR TEMPERATURE”
Cause:
This warning occurs when the temperature sensor is opened (if digital) or has overtaken the threshold of 150°C (if analog).
Troubleshooting:
Check the thermal sensor inside the motor (use the MOTOR TEMPERATURE reading in the TESTER menu); check the sensor ohmic value and the sensor wiring. If the sensor is OK, improve the air cooling of the motor. If the warning is present when the motor is cool, then the problem is inside the controller.

9) “THERMIC SENS. KO”
Cause:
The output of the controller thermal sensor is out of range.
Troubleshooting:
This type of fault is not related to external components; replace the controller.

10) “CHECK UP NEEDED”
Cause:
This is just a warning to call for the time programmed maintenance.
Troubleshooting:
It is just enough to turn the CHECK UP DONE option to level ON after the maintenance is executed.

11) “DATA ACQUISITION”
Cause:
Acquisition of the current gains.
Troubleshooting:
The alarm ends when the acquisition is done.

12) “TILLER OPEN”
Cause:
Warning: when the tiller is released, after a fixed period of time of standby (30 seconds) the main contactor open.
Troubleshooting:

SPECIAL ADJUSTMENTS:		NPP_N2	NSP_N2	NPP_N2R		Explanation
ADJUSTMENT #01		preset	preset	preset		Factory Setting
ADJUSTMENT #02		preset	preset	preset		Factory Setting
SET TEMPERATURE		preset	preset	preset		Factory Setting
ADJUSTMENT #03		preset	preset	preset		Factory Setting
SET CURRENT PUMP		280 A	270 A	270 A		Factory Setting
HIGH ADDRESS		preset	preset	preset		Factory Setting
DITHER AMPLITUDE		2.50%	1.00%	2.50%		Factory Setting
DITHER FREQUENCY		31,2 Hz	83.3	31,2 Hz		Factory Setting
CAN BUS SPEED		125	125	125		Factory Setting
MOTOR RESIST.		Sequence	Sequence	Sequence		Factory Setting
IOM		57 A	57 A	57 A		Factory Setting
MAX FLUX		50	50	50		Factory Setting
MIN LOAD MOHM		10	10	10		Factory Setting
TWS/SWS/TPE		OPTION #	OPTION #	OPTION #3		Truck type selection (OPTION #1 = TWS, OPTION #2 = SWS, OPTION #3 = TPE)

HARDWARE SETTINGS:		NPP_N2	NSP_N2	NPP_N2R		Explanation
POSITIVE E.B.		LEVEL = 0	LEVEL = 0	LEVEL = 0		Factory Setting
TOP MAX SPEED		127 Hz	127 Hz	127 Hz		Truck absolute maximum speed. All other speeds are % of this. DO NOT CHANGE THIS VALUE!
TRUCK TYPE		LEVEL = 1	LEVEL = 1	LEVEL = 1		Factory Setting
COMPENSATION		ON	ON	ON		Factory Setting
NO POS TORQ. BRK		ON	ON	ON		Factory Setting
CONT.CLOSED DIAG		ON	ON	ON		Factory Setting
INVER ANTIROLL		16.10%	16.10%	16.10%		Factory Setting
K1		1.25	1.25	1.25		Factory Setting
K1 E		1.25	1.25	1.25		Factory Setting
FLUX AT K1		76%	76%	76%		Factory Setting
FLUX AT K1 E		76%	76%	76%		Factory Setting
K2		1.2	1.2	1.2		Factory Setting
K2 E		0.8	0.8	0.8		Factory Setting
FLUX AT K2		70%	70%	70%		Factory Setting
FLUX AT K2 E		70%	70%	70%		Factory Setting
K3		1.2	1.2	1.2		Factory Setting
K3 E		0.8	0.8	0.8		Factory Setting
FLUX AT K3		59%	59%	59%		Factory Setting
FLUX AT K3 E		59%	59%	59%		Factory Setting
MAX INCREMENT 0		250	250	250		Factory Setting
MAX PSEC 0		0	0	0		Factory Setting
MAX INCREMENT 1		170	170	170		Factory Setting
MAX PSEC 1		750	750	750		Factory Setting
MAX INCREMENT 2		80	80	80		Factory Setting
MAX PSEC 2		1200	1200	1200		Factory Setting
MAX INCREMENT 3		40	40	40		Factory Setting
MAX PSEC 3		1600	1600	1600		Factory Setting