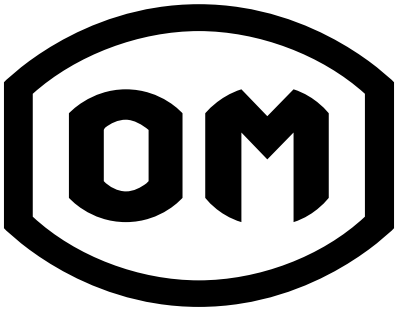


Workshop literature

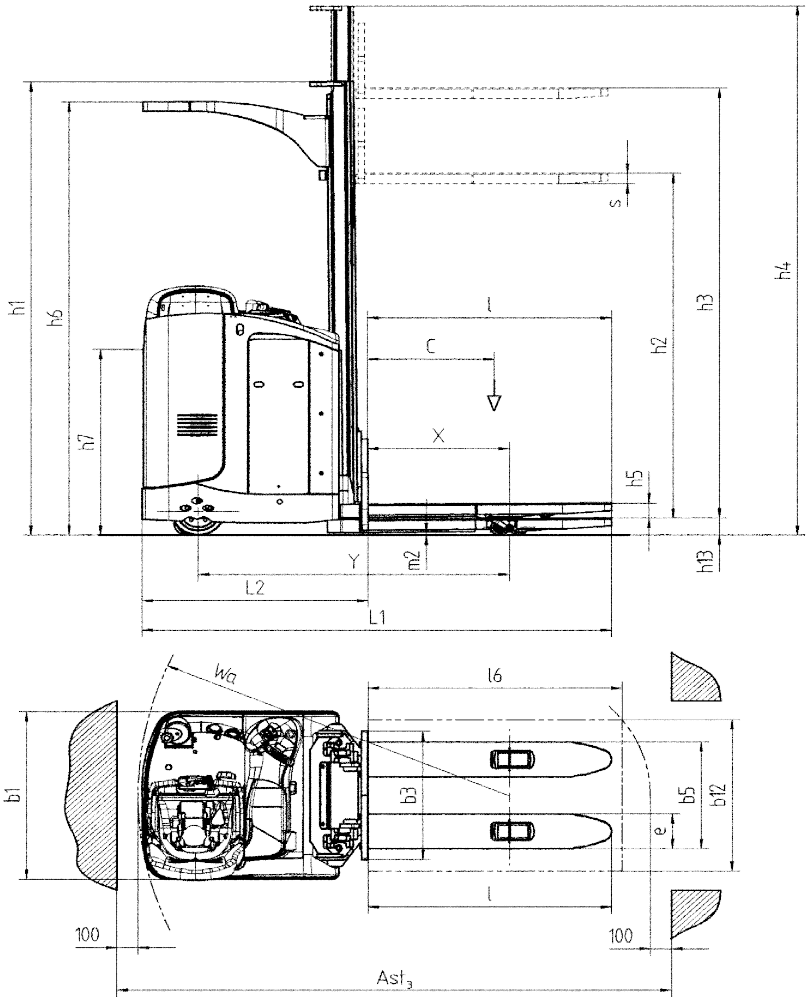
Series 4557, 4548

CSR(12/16)ac CSRi(12/16)ac

45578042301 EN

Edition 09/2008

Technical Data



OM1403

Characteristics						
1.2	Model		CSR12ac	CSR16ac	CSRi12ac	CSRi16ac
1.3	Propelling unit: electr., diesel, gasoline, gas, network electr.		Electric			
1.4	Driving: tiller, accompanied, standing, sitting, order picker		sitting with steering wheel			
1.5	Load capacity / Load	Q (t)	1200	1600	1200	1600
1.6	Load centre-of-gravity distance	c (mm)	600			
1.8	Load distance from load wheel axle with forks raised	x (mm)	672(2)		647(2) (3)	

Maintenance

General

In order to keep the forklift safe and in good condition, have it serviced according to the scheduled maintenance operations indicated in the following "synoptic table of maintenance intervals".

⚠ CAUTION

When the forklift is used in dusty environments, at below zero temperatures and for especially heavy uses, it is necessary to reduce the interval between the various scheduled maintenance operations.

Synoptic Table of Maintenance Operations

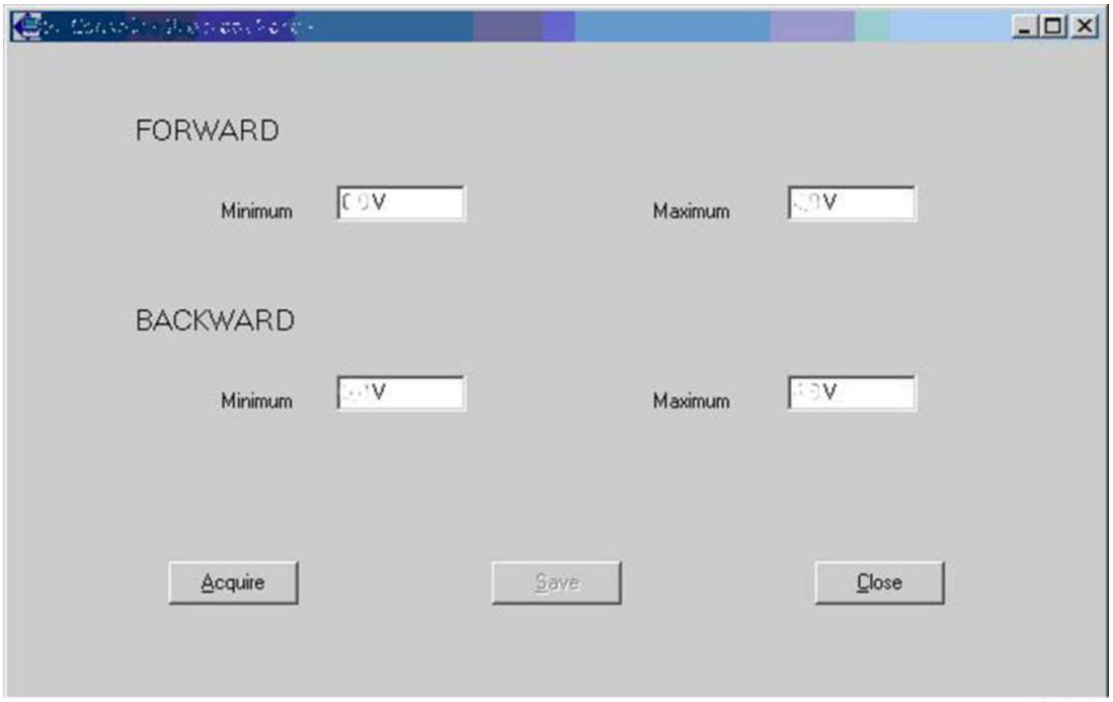
Operations	Intervals in hours		
	1000	2000	3000
Fork wear check ☐	•		
Clean the steering and lift electric motors	•		
Apply grease to linkages, struts and front sliding profiles	•		
Check insulation between chassis and any electric motors	•		
Check insulation between chassis and electronic controls	•		
Check the condition of the piping	•		
Check hydraulic system oil level	•		
Check reduction gear oil level	•		
Check the steering and lift motor manifolds			
Lubricate gears	•		
Lubricating the mast	•		
Clean and lubricate chains	•		
Adjust chains ▲	•		
Check chain wear and conditions ☐	•		
Check and adjust front bearings	•		
Check and lubricate the fork carriage and slide guides		•	
Replace the lifting motor brushes			•
Change hydraulic system oil			•

☐ = Every 1000 hours or at least every 12 months

■ = Every 1000 hours or at least every 3 months

ENVIRONMENT NOTE

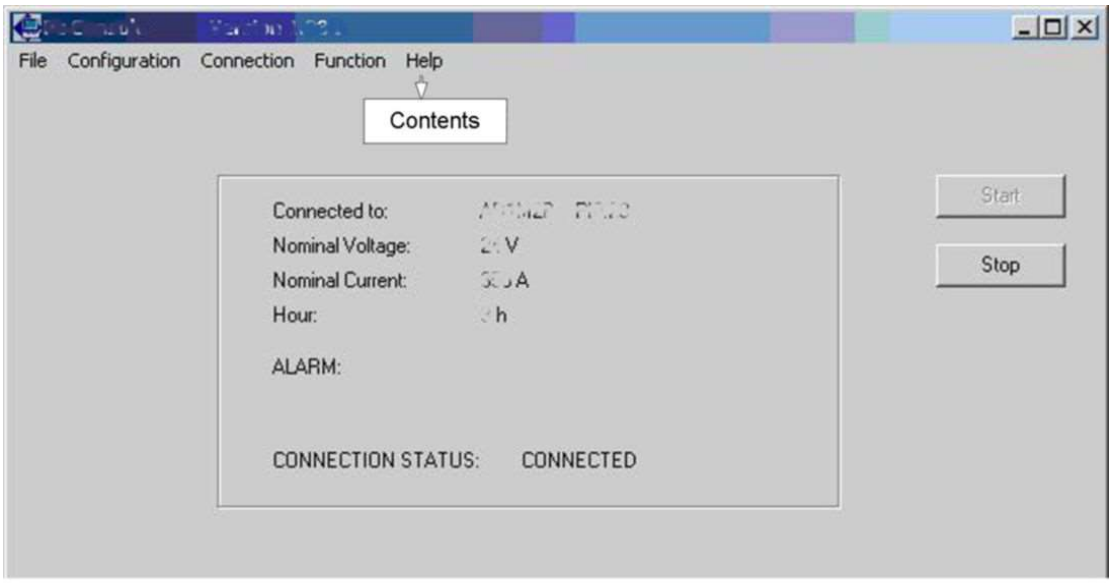
During the maintenance operations, follow the instructions contained in the paragraph "Safety Regulations Relative to Operating Materials" in "Chapter 2".



W30341

The PROGRAM VACC menu allows calibration of the potentiometers. The analog signal acquisition procedure is described in the chapter "Analog signals".

HELP menu



W30342

The HELP menu allows to access the online guide.

Drive section TESTER function (MASTER)

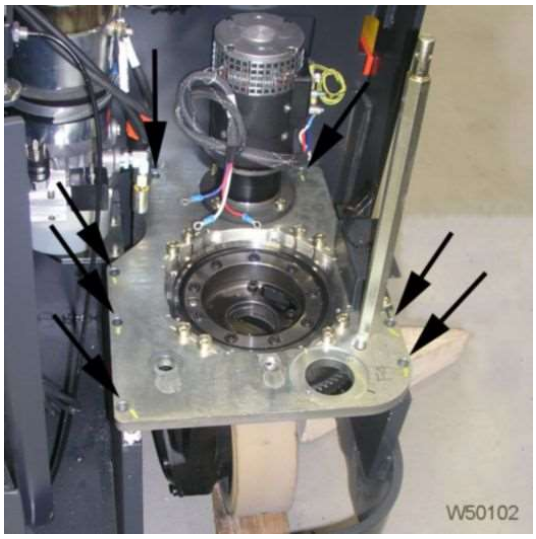
Name	Meaning	U.D.M.
BATTERY VOLTAGE	Battery voltage.	V
MOTOR VOLTAGE	Voltage supplied to drive motor. Expressed as battery voltage percentage.	%
VOLTAGE BOOSTER	Booster contribution to voltage actually supplied to the motor expressed as a percentage of the battery voltage.	%
FREQUENCY	Frequency of the waveform generated by the inverter.	Hz
ENCODER	Motor speed measured by the encoder expressed in the same unit of measure as the frequency.	Hz
SPEED	Motor speed expressed in rpm.	rpm
SLIP VALUE	Difference between value expressed by frequency and encoder (slip).	Hz
CURRENT RMS	Motor current rms value.	A.
BATTERY CHARGE	Shows the residual battery charge expressed as a percentage of the max. charge level.	%
TEMPERATURE	Temperature of the electronic control system.	°C
TH. MOTOR SWITCH	Temperature of the motor measured by an analog sensor placed inside the motor itself.	°C
TR. ACCELERATOR	Drive potentiometer voltage (pin 24).	V
LIFT ACCELERATOR	Lift potentiometer voltage (pin 25).	V
DEADMAN SWITCH	Logical level of the dead man's pedal input (pin 35), active high.	ON/ OFF
TILLER SWITCH	Logical level of the LES drive input (pin 7), active high.	ON/ OFF
FORWARD SWITCH	Logical level of the forward input non-fork side (pin 18), active high.	ON/ OFF
BACKWARD SWITCH	Logical level of the forward input fork side (pin 33), active high.	ON/ OFF
BRAKE SWITCH	Logical level of the brake pot (pin 20), active low.	ON/ OFF
PRESSURE SWITCH	Logical level of the load pressure switch input (pin 11), active low.	ON/ OFF
SPEED LIMIT SW	Logical level of the select model input (pin 34).	ON/ OFF
OIL SWITCH	Logical level of the oil micro switch 1800mm (pin 38), active low.	ON/ OFF
LIFT SWITCH	Logical level of the lift input (pin 36), active high.	ON/ OFF
DESCEND SWITCH	Logical level of the fork arm/wheel lowering input (pin 5), active high.	ON/ OFF
LIFTING CUTOUT	Logical level of the lifting block input (pin 37), active low.	ON/ OFF
LLEN SWITCH	Logical level of the wheels enable input (pin 6), active high.	ON/ OFF
FCR SWITCH	Logical level of the wheel limit input (pin 19), active low.	ON/ OFF
STEERING POT	Drive wheel potentiometer analog input (the indicated value is 1/3.3 of the real value).	V

PUMP MOTOR TEMPERATURE The temperature detected by the sensor is >150°C.	Internal or external error.	Check correct operation of the temperature sensor. Increase motor cooling. Replace the electronic control system if the problem persists.
HIGH TEMPERATURE The power section basic temperature is >75°C.	Internal or external error.	Check correct operation of the temperature sensor. Check current consumption and mechanical transmission efficiency. Replace the electronic control system if the problem persists.
REDUCTION BY MASTER	Internal error.	Replace electronic control system.

33	Power status of the motor: Short circuited or motor disconnected.	Possibilities: • Blown fuse • HS motor (breakdown?) • Low quality connections on the whole power line • Motor brushes damaged
34	Voltage supply to potentiometers outside limits. The voltage of the potentiometer is beyond the action allowed by the processor to guarantee good functioning of the steering.	• Open the window (61) to check the voltage reading (between 9 and 9.5V) • Then open the window (32) which shows the voltage at the moment of the breakdown. The defect also appears when: • The battery is very low • The potentiometer power supplier is short circuited • Defect in the internal adjustment device
35	Anomalous value of the steering potentiometer: Cut out or short circuit of one or more connections.	Possible causes: • Interrupted wire (cut or broken) • Poor connection • Oxidised connector • Potentiometer badly fitted mechanically, involving stress at the edge of the tracks • Potentiometer damaged • Mechanical limits of the stroke-end have been exceeded
36	Anomalous value of the drive wheel potentiometer. Interruption or short circuit of one or more connections.	The same possible causes of error 35
37	Overheating of the stage at MOS-FET.	This overheating occurs in the module that contains all the MOS-FET power components, free wheel diode, and the voltage regulator
38	24V short circuit at the output of the wheel position indicator.	
39	The steering potentiometer signals are incompatible in the sense that under normal conditions the sum of the two signals must be equal to the 10V power supply (Vpo).	Possible causes: • Potentiometer breakdown • Low quality wiring contact • Disconnected cursor
40	The drive wheel potentiometer signals are incompatible in the sense that under normal conditions the sum of the two signals must be equal to the 10V power supply (Vpo).	Possible causes: • Potentiometer breakdown • Low quality wiring contact • Disconnected cursor
41	Output 11, which enables functioning of the LDC module, is already at the battery negative when the control is supplied with power: when functioning normally before the end of initialisation, output 11 is not at negative	Causes of the error: • External LES connections short circuited • Problem inside the cars To identify the cause of the error, detach Pin 11 and initialise the truck again. If the problem persists, the cause is inside the module.
42	Output 11, which enables functioning of the LCD module, is inactive during normal functioning of the truck.	As for code 41

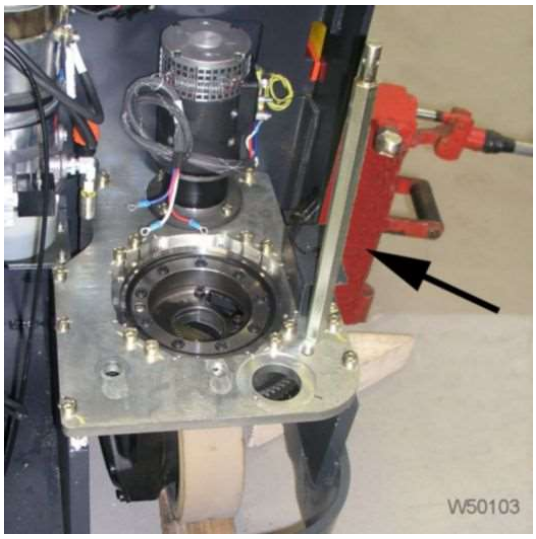
- Push the entire assembly towards its housing, or rather towards the battery, and fit the fastening screws of the anchorage plate onto the body, tightening them by hand as far as possible.

▷



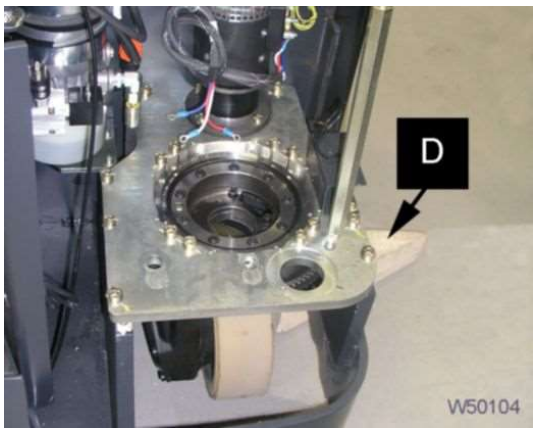
- Using a jack, raise the body from the drive group side until the anchorage plate rests against the body.
- Tighten all screws to the correct tightening torque, as shown in paragraph "Safety screw tightening torque table".

▷



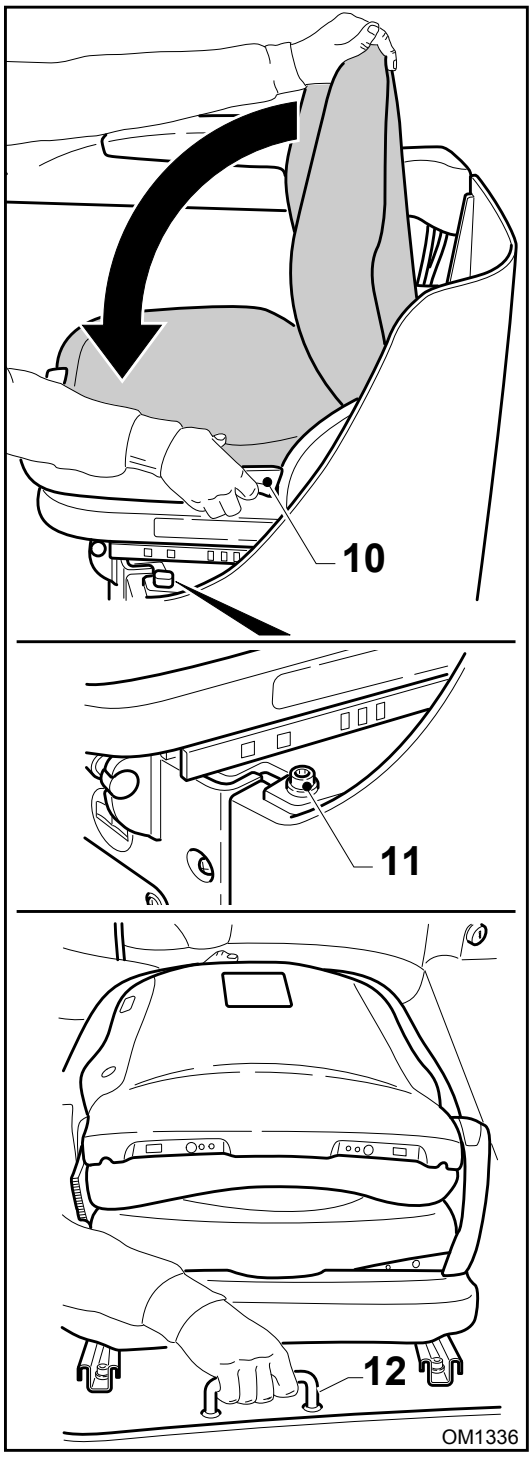
- Remove the wooden slats under the drive wheel, and rest the machine on the side chock "D".

▷



➢ To access the motor compartment, fold the seat back down over the seat using the lever (10), unscrew the screw (11)and completely raise the seat using the handle (12)marks.

▷



Electrical steering

Electrical steering system

The LES (Linde Electrical Steering) applied to the steering wheel is used.

The steering wheel is stiffened using a clutch system.

The maximum rotation of the steering wheel is equal to 4.25 turns, while that of the drive wheel is +80° clockwise and -100° anticlockwise.

The steering motor is of the serial type with two split field coils. Specifications:

- Power supply voltage 24V DC
- Power 0.15 kW

The steering system is started by pressing the dead man's switch (DM) pedal.

Operating condition	DM pedal	Electrical steering
A.	Released	STAND-BY (Steering motor not powered)
B.	Pressed	ON (Steering motor constantly delivering traction)

When changing from condition **B** to condition **A**, the system requires **approximately 8 seconds** to switch to STAND-BY mode.

LES electronic control module

The software is invoked by means of an appropriate connection to the TRUCK CODE input pins, as shown in the following table:

25-pin connector (LES)			Model
Pin 4 (TRUCK CODE A)	Pin 18 (TRUCK CODE B)	Pin 21 (TRUCK CODE C)	
Connected to -B	Not connected	Connected to -B	**002** (side motor)

This electronic module supplies power to and receives electrical signals from the potentiometers, controls the steering motor and manages system safety. In the event of a breakdown, the truck is automatically blocked by the electronic braking. Braking is guaranteed by the simultaneous presence of two separate control signals:

- An electronic command opens the LES internal relay contacts and disconnects the power supply to the electromagnetic brake.
- The LES unit disconnects the power supply to relay 7K1, deactivating the dead man's switch and consequently activating the brakes.

Wheels

Access to the drive wheel retaining nuts

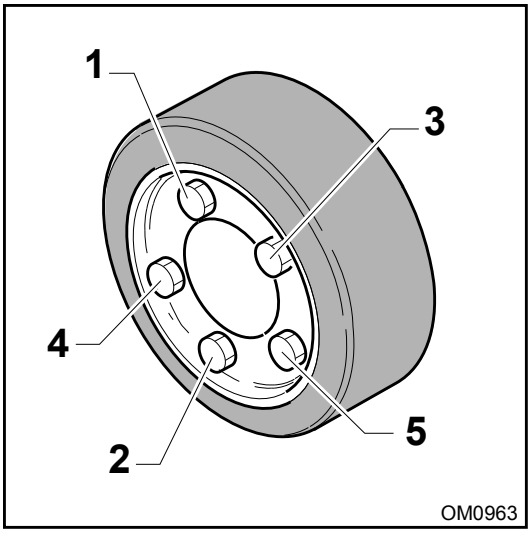
➢ To access the retaining nuts of the drive wheel, position the truck so that the appropriate slots on the body are completely aligned with the nuts.

Wheel Tightening Check

- Check the wheel nut tightening according to the intervals indicated in the maintenance table and when a wheel is replaced.
- Follow the instructions provided in the relative chapter when replacing a wheel.
- The figures at the side indicate the order in which the wheel fastening nuts should be tightened.
- The nut tightening torque values are given below.

Drive Wheel

140 ±5% Nm / 14 ±5% kgm

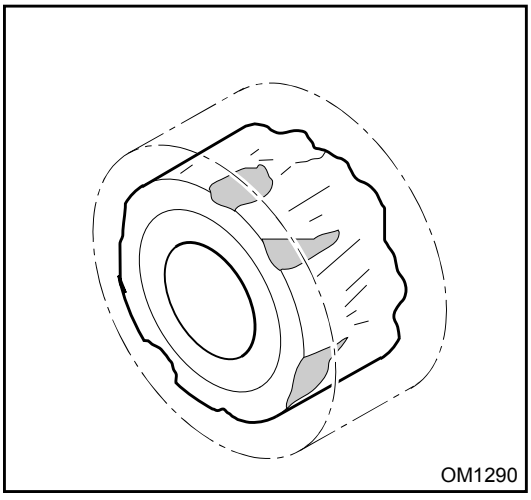


Wheel Wear Check

The wheels and rollers on the forklift should be replaced when they appear to be worn.

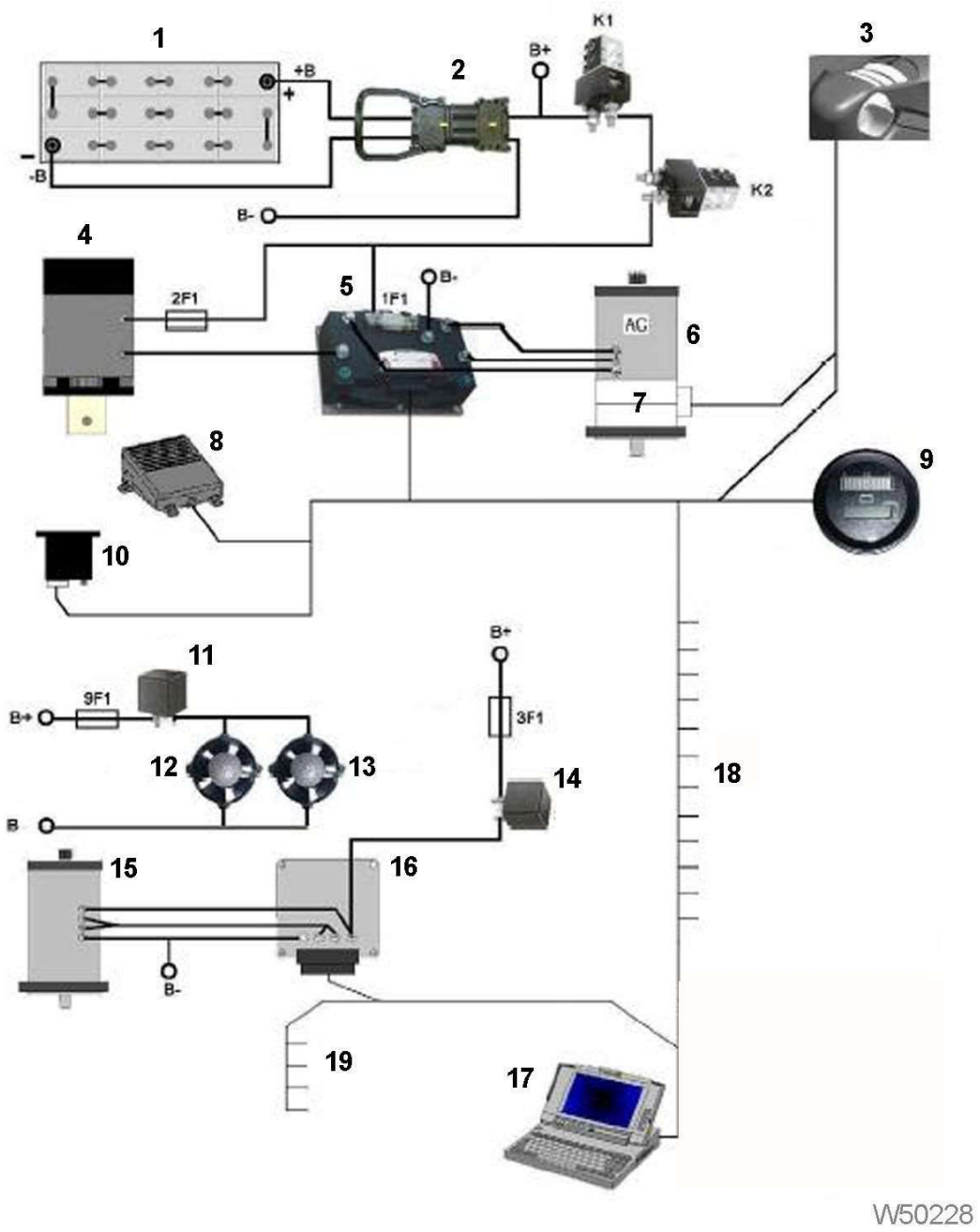
NOTE

Contact the service center authorized by the manufacturer for replacement of the wheels and rollers.



Electrical/electronic system: general information

COMBI AC1 electronic control functional diagram



1	24V dc Battery	9	IBS (flat battery indicator)
2	Plug/socket	10	eABS module
3	Handlebar card	11	9K1 relay
4	Lifting motor	12	9M1 fan
5	INVERTER	13	9M2 fan
6	Drive motor	14	3K1 relay
7	Drive motor temperature sensor	15	Steering motor
7	Drive motor encoder	16	LES Controller
8	Dead man's pedal	17	PC with PC CONSOLE software

Battery replacement

- Turn off the forklift and perform the operations preliminary to maintenance.
- Disconnect the plug from the battery socket.
- Open the battery cover and the battery side doors as described in the "Internal accessibility" section.
- Lift the battery holding bar **(1)**, tilt it and remove it.
- Position the extraction roller unit **(2)** next to the forklift (see the relevant section on using the roller unit), then remove the battery **(3)** onto the roller unit.
- Replace the battery and reassemble it by performing the extraction procedures in reverse.
- Position the plugs mounted on the battery doors **(6)** in the best position to reduce the lateral clearance of the battery to a minimum. The plugs should be positioned according to the width of the battery and have three possible settings **(A, B, C)**.

Maximum width setting **(A)**:

- The plugs should be placed in the upper housing on both battery side doors.

Intermediate width setting **(B)**:

- One plug should be placed in the upper housing on one of the two side doors, while the other plug should be placed in the lower housing on the opposite battery side door.

Minimum width setting **(C)**:

- The plugs should be placed in the lower housing on both battery side doors.

⚠ DANGER

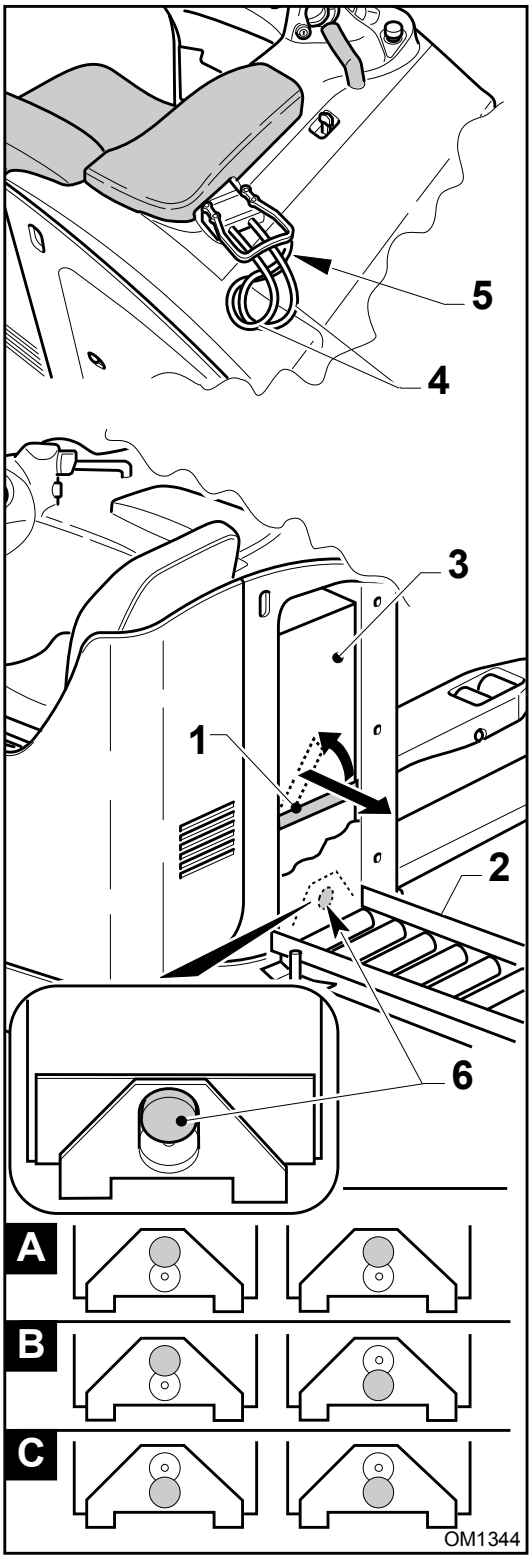
Make sure that the battery has been clamped with both the battery holding bars.

⚠ CAUTION

When closing the battery cover, be careful to position the battery plug cables **(4)** in their holding fixture **(5)** to prevent damaging them.

⚠ CAUTION

To decide which type of battery to use, check the battery characteristics provided in the "TECHNICAL DATA" chapter.

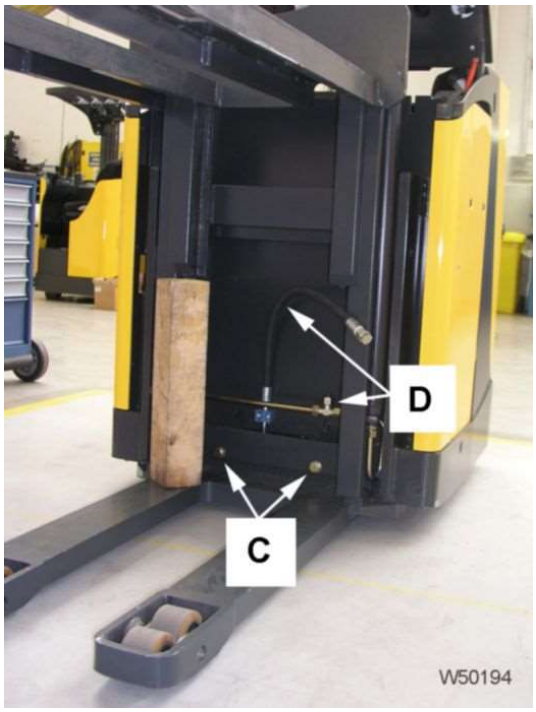


➢ Position a wooden block under the movable parts for safety. ▷

⚠ DANGER

Do not forget to position a wooden block under the movable parts in order to avoid cutting injuries.

➢ Proceed with bolting the fixed part of the lift to the truck, without tightening the bolts to their tightening torque, and connect the hydraulic pipes. (C)bolts; (D)pipes. ▷



➢ Use an electronic level to measure the inclination of the lift: it must be 90°.

➢ If the inclination is less than this, loosen the fastening bolts of the lift and insert shims.

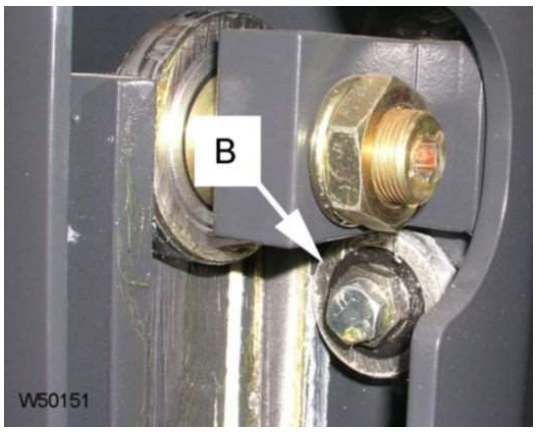
NOTE

The same number of shims must be used on both fastening points of the lift.

➢ Repeat the shimming until the inclination is correct.

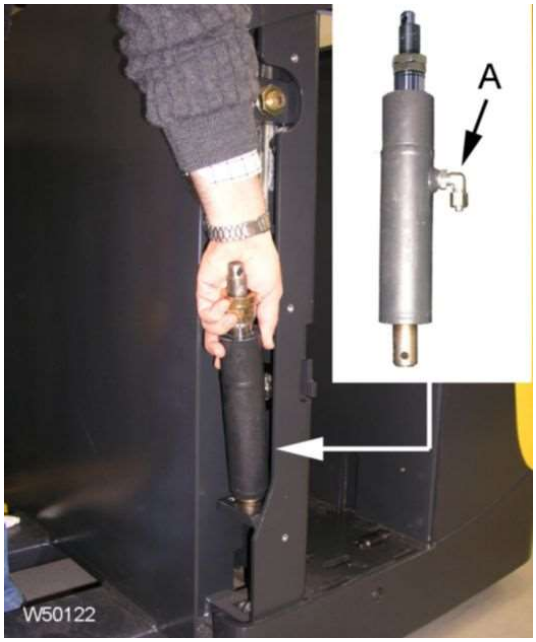
Adjustment of the side grip bearings

- For the adjustment of the "side grip bearings"**B**, proceed as follows:
- Loosen the central fastening screw of the bearings.
- Stand on the fork arms and use crosswise movements to make the entire mobile structure oscillate in order to make it settle mechanically.
- Using the nut of the eccentric pin, turn the two pins until the two side grip bearings rest on the rib of the profile; hold the eccentric pin stationary in this position and tighten the central fastening screw.
- Perform some lifting and lowering manoeuvres to check that there is no jamming or excessive play. If jamming or excessive play is found, the adjustment must be repeated.



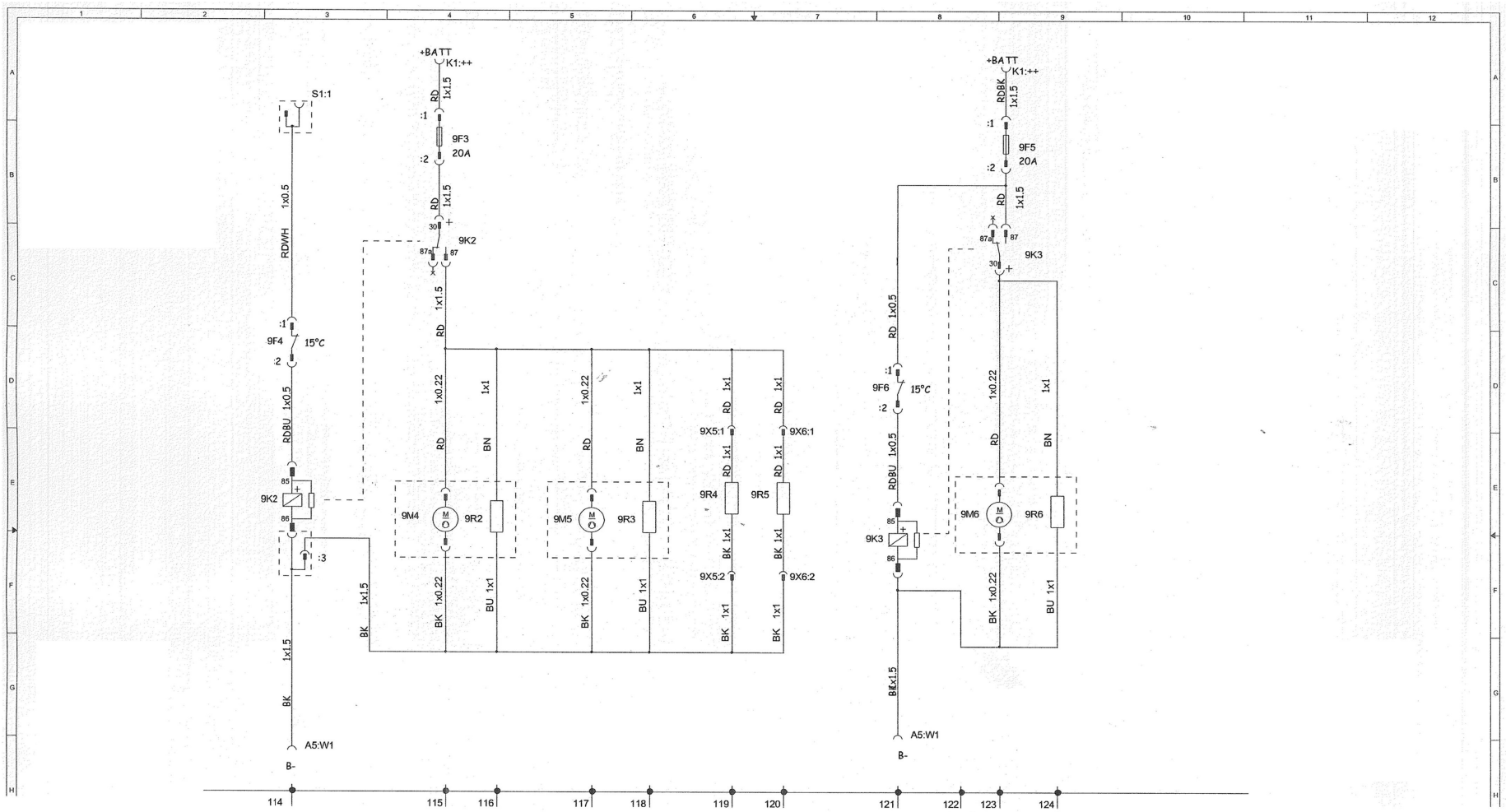
Replacement of the lift cylinder gaskets

- Disassemble the lift cylinders of the machine and remove the feed line connection **A** from each cylinder.
- Completely drain the oil from the cylinder.



- Extract the rod to the end position.

Circuit diagram "Cold store" (optional): model with preliminary fork lifting function



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Hydraulic diagrams

Hydraulic connection diagram for "DPX - TPX lift masts": model with preliminary fork lifting function - sheet 1/2