

01 GENERAL INFORMATION AND TECHNICAL DATA

2013B

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1.6 Recommended consumable materials

1.6.1 Oil and grease types



The table below shows the lubricants which are used in production and are recommended for servicing. They have been carefully selected and are suitable for, among other things:

- extending the life of the products
- reducing electrical consumption
- having the greatest respect for the environment

If the recommended lubricants cannot be obtained, alternative lubricants must comply with the stated classifications. Bear in mind that it is important to follow the Atlet requirements for environmentally-friendly oils for the guarantee to be valid.

Biodegradable-classified oils have a poor conductive ability and therefore require that both the oil and the filter are well grounded to the chassis. If secure grounding is not present, this can cause problems, such as static discharge through the oil. If this takes place the oil becomes black (due to the build-up of sediment) and must be changed to prevent jamming of the hydraulic valves. We currently have grounding of all the truck models that may be affected by this problem. It is important that different products and brands are not mixed, particularly synthetic and mineral oils.

Refer to the purchasing documentation for more information about the products.

Product	Brand name and type	Part no.	Class
Hydraulic oil			
Standard	Mobil DTE 10 Exel	107173	ISO VG 46, viscosity index 150 or greater.
Cold store	Mobil Univis HVI 26	008936	ISO VG 26, viscosity index 300 or greater, (Liquid temperature, -40°C or better).
Biodegradable oil	Mobil EAL Hydraulic 32	014160	SS 15 54 34.  CAUTION! The guarantee only applies if the truck is delivered with this oil from the factory, as this oil cannot be mixed with other types of oil.
Oil for the food industry	Mobil DTE FM 32	014161	NSF H1.  CAUTION! The guarantee only applies if the truck is delivered with this oil from the factory, as this oil cannot be mixed with other types of oil.
Gearbox oil			
Drive unit, all models			
Standard	Mobilube HD-A 85w-90	116444	Class GL5, 85W-90. For ZF drive units the oil must be approved in the ZF list of TE-ML 17B lubricants.

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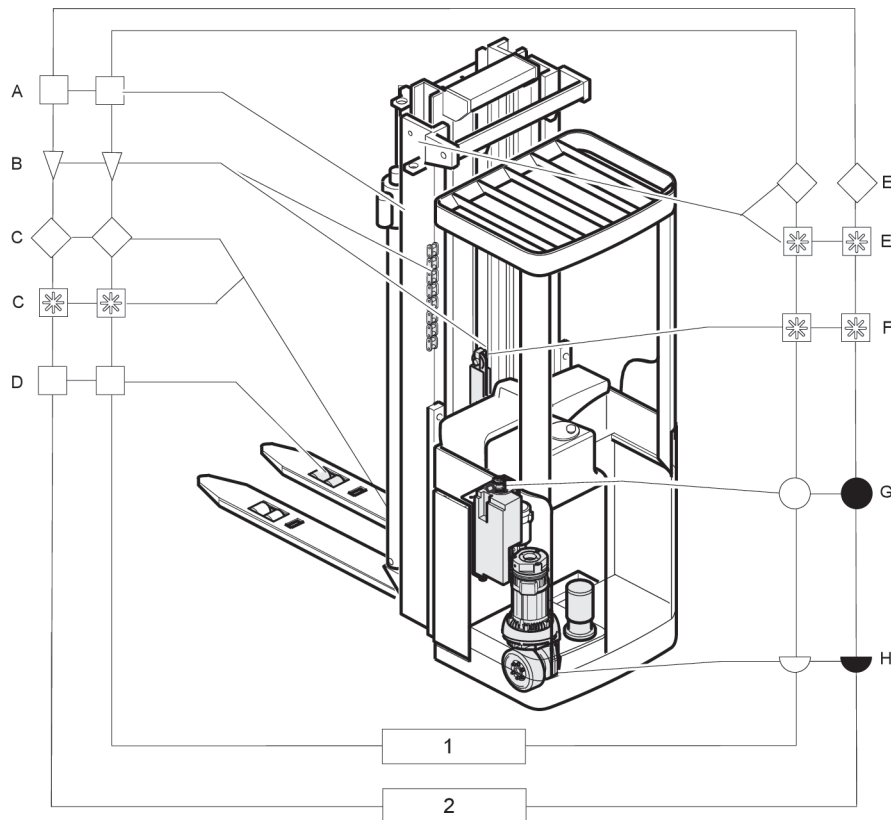


Figure 9. Lubrication schedule for A-Ergo.

For symbol key, see Table 17, page 32.

Service on an Atlet truck can be divided into service that must be carried out regardless of how heavily the truck is loaded and used (see Section 3.1.8, page 24) and an annual recurrent service:

1. 500 h service
2. Annual service

Location	Explanation	Location	Explanation
A	Mast section - roller surfaces and slide surfaces	E	Thrust rollers - all
B	Lift chains, all	F	Chain pulley, shaft
C	Fork carriage - support rollers	G	Hydraulic oil, filter
D	Bogie – axle (unloaded)	H	Gearbox oil



CAUTION!

All torsion springs in the machine should be lubricated during each service.

Production week	Screw quality	Screw identification	Tightening torque	Important comments
-2009w35	8.8	Bright zinc-coated	81 Nm	
2009w36-	12.9	Black, "12.9" stamped into the screw head	109 Nm	12.9 quality screws must be lubricated with special graphite grease. See Section 2.1, page 19.

4.2.2 Armrest

4.2.2.1 Removing the armrest

- 1) Slacken the height adjustment wing nut.
- 2) Remove the height adjustment knob from beneath the writing surface.
- 3) Pull up the armrest so that the locking screw for the right hand bracket can be removed.

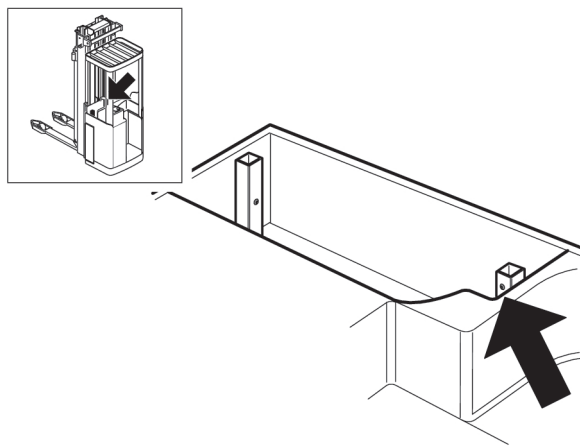


Figure 14. Armrest front securing screw

- 4) Lift up the armrest and detach all the wiring at the connectors.
- 5) Continue lifting the armrest so that the locking screw on the left bracket can be removed.

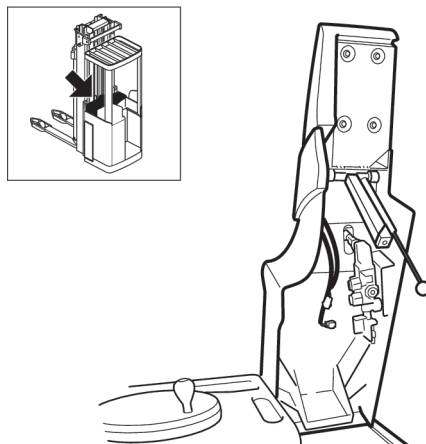



Figure 15. Armrest lifted up

5.2.2.4 Assembling the traction motor

- 1) Assemble in the reverse order to dismantling. Ensure that the "knob" on the bearing is positioned in alignment with the end shield.

- 2)  **Torque**
The nuts on the pinion on the motor shaft should be tightened to **50**

5.2.2.5 Storage of traction motor

Machines in storage that will not to be used within one month must be given special attention so that problems do not occur when they are to be used again. Dust, dirt, condensation and moisture caused by large changes in temperature and problems with rust and oxidation must be prevented. Motors should therefore be protected by waxed paper or the like, together with a moisture absorbing material, and stored indoors at room temperature, preferably in a cardboard box.

5.2.3 Gearbox

5.2.3.1 Changing the gearbox oil

- 1) If the oil needs to be drained out, this is done through the plug at the bottom of the gearbox (item 1).
- 2) Oil is added either through the plug (item 2) or by removing the motor.
- 3) The oil level must be at the hole in the plug (item 2). Fill with oil until it just begins to run out of the hole. A suction jet pump is recommended to facilitate filling and topping up via (item 2).

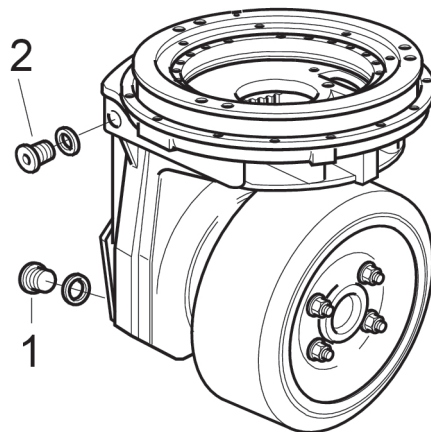


Figure 20. Gearbox

5.2.3.2 Removal and installation of the gearbox

- 1) Position the truck on a pallet. The drive wheel must hang free, about 30 mm above the floor.
- 2) Loosen the cable connections to the drive motor, servo motor, electric brake and steering wheel indicator. Label the cables that are not labelled to ensure correct reassembly.
- 3) Remove the motor, refer to Section 5.2.2, page 49.
- 4) Remove the 6 socket head cap screws from the bolted joint between the motor bed and the chassis.
- 5) Carefully lower the gearbox out of the truck (see Section 5.2.4, page 52).

06 MAST SYSTEM

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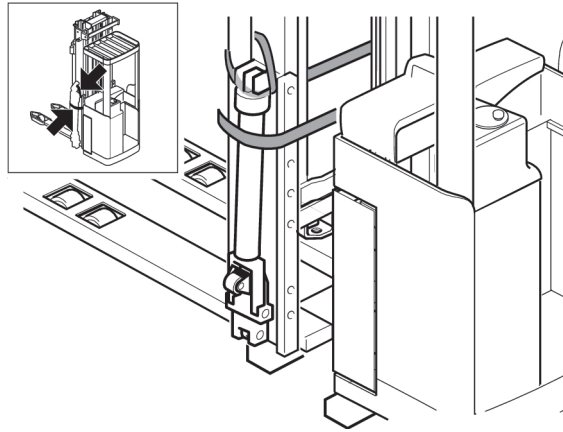


Figure 41. Secure the guides together

- 3) Be sure to screw tight the spacer between the mast and chassis in the guide in one of the screw holes that are not used.

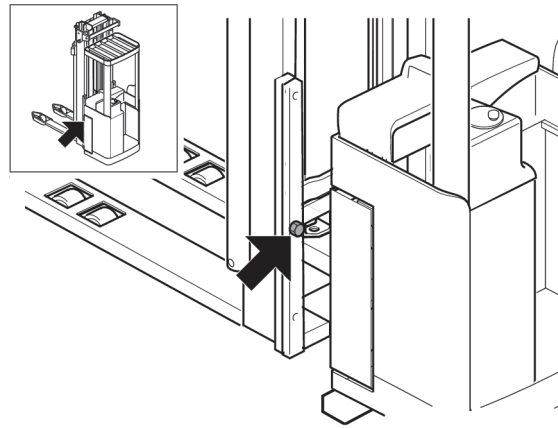


Figure 42. Spacer/guide screw

- 4) Insert a suitable number of shims, 3 is the standard number.

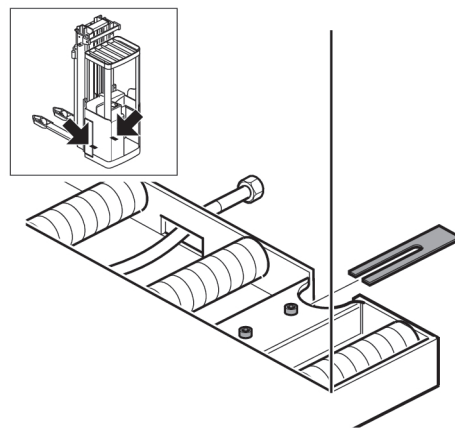


Figure 43. Shims

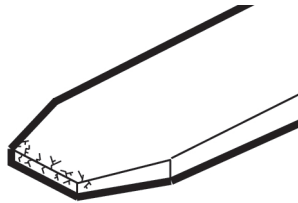
- 5) Lower the mast so that the link arms slide in under the chassis when the mast and chassis are brought together.
- 6) Connect the hydraulic couplings together.

Worn forks must not be welded or repaired in any other way.

The original thickness is found by:

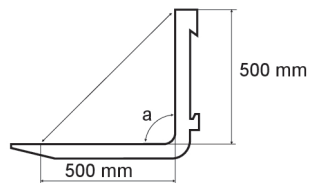
- Read the markings. The markings must show the lifting capacity in kg for one fork and the centre of gravity distance in mm. The markings often also show the original thickness.
- measure the blade thickness at the centre of the shank (position B).

6.2.4.3.5 Fork tip



As soon as a fork tip is worn, it must be shortened or the complete fork changed.

6.2.4.3.6 Fork angle



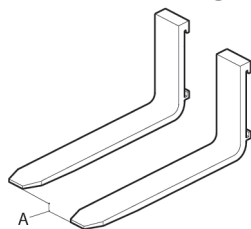
Measure 500 mm along the fork blade and 500 mm along the back of the fork and mark these positions. Measure the diagonal distance between these two points and use the table.

The distance must be within the acceptable values in accordance with Table 19, page 81, otherwise the forks must not be used.

Table 19. Fork angle

The results	Measurement result
Optimal	707 mm
Acceptable	695-713 mm

6.2.4.3.7 Difference in height between the tips of the forks



A. Difference in height between the forks

The difference in height between the fork tips must not exceed 3% of the fork blade length.

Example: fork length 1150 mm - max. height difference 34 mm.

If the difference in height between the fork blades is greater than 3%, the forks must not be used.

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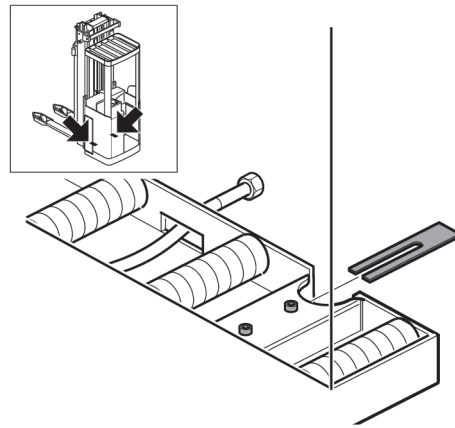


Figure 63. Positioning of shims

- 9) When the forks are parallel, check the height. The cylinders can be extended if it is not high enough.
- 10) Test lift, and check that the straddle legs do not lift skew. If so, adjust the length of the cylinders until the best lifting movement is obtained.
- 11) Check measure, and if necessary make further adjustments.

Table 21. Measuring the height of the vertically adjustable straddle legs/forks

Truck with vertically adjustable straddle legs	
Distance to the fork upper surface	Max 95 mm
Distance to top of straddle leg	Max 90 mm Min 85 mm

6.2.7.2 Dismantling and assembling of the vertically adjustable straddle legs

- 1) Lift up the straddle legs with the truck. Place a block under the fork tips and lower down the straddle legs, whereby the load wheel is lifted from floor level.
- 2) Tap out the retaining pin through the shaft and drive out the shaft that holds the fork wheel.
- 3) Tap out the retaining pin at the pressure link arm and pull out the load wheel, pull rods and pressure link arm as a complete assembly.
- 4) Tap out the shafts from the ends of the pull rods.
- 5) Check for wear and replace damaged parts if necessary.
- 6) Refit in the reverse order.
- 7) Check the lifting movement. If the straddle lift pulls at an angle it must be adjusted, see Section 6.2.7.1, page 90.

6.2.8 Side stabilisers

6.2.8.1 Checking the side stabiliser

- 1) Position the truck on a level surface.
- 2) Fix a tape measure with the zero at the top edge of one fork. Lift until the stabiliser switch in the mast breaks, i.e. until the mast stops, and measure the height. The lift height should be at 3000 mm +/- 25 mm.
- 3) Extend the stabilisers until the motor stops. Check that the wheels are pressed against the floor and check the residual suspension. See Table 22, page 92.

08 HYDRAULIC SYSTEM

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8.2 Repair and maintenance instructions

8.2.1 Hydraulic system

General rules



NOTE!

Cleanliness during all work with hydraulic components is of the greatest importance for the operating safety and service-life of the system. The following should be taken into consideration:

- Dirt particles must not get into components.
- Do not use cloths that release fibres or particles.
- Only use clean tools.
- Carefully clean tanks, pipes and hoses before installation.
- Welded or hot-bent pipes must be pickled (cleaned in an acid bath) and washed before they are built in.
- The oil tank must be closed and provided with an efficient air filter to prevent dirt contaminating the hydraulic oil.
- Sealing compounds such as flax, cement or thread tape are not permitted.
- Take into consideration the specified operating data.
- Do not exceed the permitted pressures and volume flows.
- Do not exceed or go below the specified temperature range.
- Pay attention to specified electrical voltages and power consumption.



NOTE!

All work with the hydraulic system should be carried in a pressureless state and in a clean environment.

Installation

To prevent dirt and corrosion in the hydraulic system all hydraulic components must be provided with plastic plugs blocking the connections before they are delivered. Only remove these plugs just before the component is to be installed in the machine. Retaining screws and connections must correspond with those on the drawing. Retaining screws should not be tightened with a higher torque than what is specified on the drawing. If such information is missing, the torque should not exceed that specified in Section 1.7.1.1, page 12.

Connections

Couplings must be fitted in accordance with the tightening torques specified in the table at Section 1.7.1.2, page 13. We recommend couplings with elastic seals. Such couplings are necessary for control valves. Ring couplings do not seal at the low torque generally applicable for proportional valves.

Connect pipes and hoses in accordance with the hydraulic diagram. Pay attention to the connection designations. Do not use force, and avoid building-in tensions in pipes, etc,

Start up

Check that everything is connected in accordance with the hydraulic diagram. Set the relief valves down to a very low pressure if they are not sealed. Start-up with low pressure and volume flows.

Test the function and tightness of the system. Clean the system by allowing oil to pass over the filter for a while, without loading the system (replace the filter insert at the recommended change intervals). Check the oil level. Slowly increase the pressures and volume flows to their appropriate values. If measuring equipment is fitted, check this continuously. Pay attention to the noise level since abnormal noise implies defects. Test during variable loads that components are correctly fitted, and that the system is tight.

8.2.8.8 Emergency lowering valve

The emergency lowering valve is used to lower the forks in the case of a power failure.



WARNING!

Ensure that the forks can be lowered unobstructed before opening the emergency lowering valve.

- 1) Open the emergency lowering valve (see item 3, Figure 84, page 118) with a 2.5 mm Allen key.
- 2) Close the emergency lowering valve once the forks have been lowered.

8.2.9 Adjusting the level limit position switch (ALL)

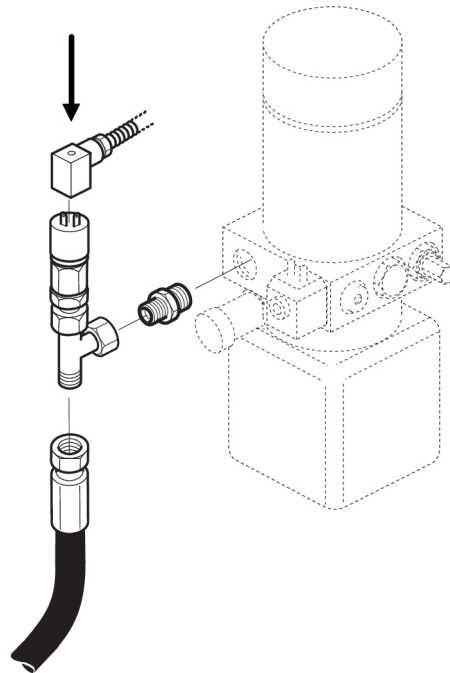


Figure 85. Adjusting pressure

- 1) Unscrew the connector securing screw (indicated by the arrow).
- 2) The pressure can be adjusted with the connector still connected using an Allen key (size 2) through the hole where the screw in point 1 is fitted.
- 3) Put the maximum rated load on the forks and make fine adjustments to the limit position switch setting to allow continuous movement during lifting and to stop the movement directly when the top position is reached.

8.2.10 Hydraulic pump motor

8.2.10.1 Removing the hydraulic pump motor

- 1) Lift the forks to their highest position to lower the hydraulic oil level in the tank, thus reducing oil leakage at the pump shaft when the motor is removed.



WARNING!

Do not work under the forks.

- 2) Electrically disconnect the battery.
- 3) Open the machine housing cover and disconnect the wiring to the hydraulic motor.
- 4) Slacken the two retaining bolts that secure the pump to the hydraulic motor.

09 LIFT CYLINDERS

9.1 Design and function

9.1.1 General

The lift cylinders consist of single-acting hydraulic cylinders, where hydraulic oil is pumped into the cylinder, pressing out the piston rod.

When the driver activates the lowering function the cylinders are pressed together through a control valve releasing oil out from the cylinders. They are then pushed together by the weight of the forks, at the same time as the oil returns to the hydraulic tank.

As opposed to the lift cylinders, the side stabiliser cylinders are double-acting. This implies that a hydraulic oil also acts in the opposite direction and pushes the cylinder together.

9.2 Repair and maintenance instructions

9.2.1 General

9.2.1.1 Bleeding of the hydraulic cylinders with the air bleed screw

WARNING! When bleeding, the air screw must be opened no more than approx. a half turn. If the air screw is opened completely the oil will spurt out and the forks crash uncontrollably to their bottom position. The hose rupture valves do not function in this phase.

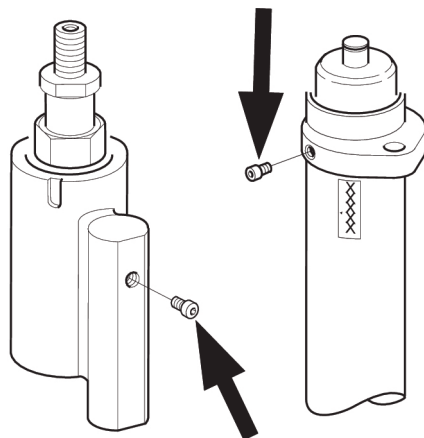


Figure 95. Example, air screw.

- 1) Open the air bleed screw about half a turn.
- 2) Check that there is sufficient oil in the hydraulic tank and that the pump does not suck air.
- 3) Carefully run the cylinder repeatedly between its end positions.
- 4) When oil without air bubbles comes out, the cylinders have been bled.
- 5) Adjust the oil level in the hydraulic tank.
- 6) Repeatedly lift from bottom to top position.
- 7) Check that the forks do not bounce. If they do, bleed the air one or more times.

9.2.1.2 Bleeding of the hydraulic cylinders without a bleed air screw

Cylinders without bleed air screws are bled by running the cylinder repeatedly between its end positions.

10 ELECTRICAL SYSTEM

10.1 General

10.1.1 Safety procedures

10.1.1.1 General

**WARNING!**

Working with electrical vehicles can result in personal injury.

- During all work on the truck's electrical system, or in its immediate vicinity, rings, watches and other metal objects must be removed since the battery capacity is such that a short circuit through such an object can result in very serious burn injuries.
- Working with electrical vehicles can result in personal injury. All testing, trouble shooting and adjusting must be carried out by authorised personnel. The drive wheel should run free of the floor and be able to rotate freely during work.

10.1.1.2 Electronic controllers

- All the electronic controllers in the truck have multiple safety systems.
- When replacing or repairing the electronic controllers, or removing cables, the battery should always be disconnected.

**NOTE!**

Incorrectly connected battery cables can destroy the electronic controllers.

**WARNING!**

During all work on the truck the drive wheel must be lifted up from the floor to prevent accidents occurring. In order to avoid burn injuries, wrist watches and other metal objects must be taken off.

After the power has been disconnected to the controller and work or trouble shooting is to be conducted, there can be residual voltage in the capacitors for a few minutes, so take care when using current-conducting tools during these minutes.

10.1.2 Safety checks

10.1.2.1 Servo controlled steering system

**NOTE!**

Checks on the external component functions in the servo controlled steering system must be carried out after every service and after work has been carried out on the electrical system. All functional tests of the safety system must be carried out with the truck speed controller in its neutral position.

The servo controlled steering system embodies a number of safety monitors, partly to check the controller circuits, but also such external circuits and components as the steering wheel sensors, steering motor and end position sensors.

Functional testing of the servo controlled steering system safety functions must result in an inability to activate the steering or drive systems and the brake not being able to go into its unbraked state.

The monitoring system for the steering wheel sensors and their wiring is checked by disconnecting the steering wheel sensor connector; this will result in an error code, see Section 10.4.4.3, page 186.

The steering motor monitoring system is checked by disconnecting one of the wiring connections to the motor, either at the motor or its controller. An error code must then be shown if the steering wheel is moved, see Section 10.4.4.3, page 186.

Pin	Descriptions	Remarks
E1.5	Supply to pump contactor	
E1.6	Control of vertically adjustable straddle legs valve	Controlled to B-
E1.7	CAN communication	CAN Low
E1.8	Neg. supply to lifting/lowering control	B-
E1.9	Pos. supply to traction motor encoder	+4-5 V
E1.10	Neg. supply to traction motor encoder	B-
E1.11	Pos. supply to instruments	+24 V
E1.12	Neg. supply to instruments	B-
E1.13	Input from speed reduction switch	From pressure switch, see note below (*)
E1.14	Input for lifting vertically adjustable straddle legs	+24V on activation
E1.15	Input for lowering vertically adjustable straddle legs	+24V on activation
E1.16	+12V supply to instruments	+12 V
E1.17	CAN communication	CAN High
E1.18	Signal from lift control	Neutral = approx. 2.5V Maximum lifting rate = approx. 4.5 V Maximum lowering rate = approx. 1.0 V
E1.19	Input A from traction motor encoder	Synchronises the motor movement with phase shifted pulses from the encoder
E1.20	Input B from traction motor encoder	
(*)	The input from the pressure switch is filtered so that pressure fluctuations will not trip the speed reduction. A change in the input value must be present for at least 1 second before it will be accepted. During lifting and lowering movements, no change in the input value will be accepted.	

Connector E2 (the figure shows the connector from the wiring side).

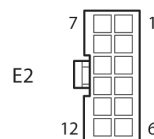


Table 26. Connector E2 traction motor controller AC1

Pin	Descriptions	Remarks
E2.1	Supply from electric lock	+24 V
E2.2	Supply to external units	+24 V
E2.3	Input from brake switch	+24 V required for driving
E2.4	Not used in the A models	
E2.5	Not used in the A models	
E2.6	Not used in the A models	

FUNCTION	VALUES		EXPLANATION
	Options	Basic setting	
NONE	0	-	Service reminder indicator switched off
OPTION #01	0	-	"Alarm99" at 300 hours of operation
OPTION #02	0	-	"Alarm99" + red LED lit on the MDI at 340 hours of operation
OPTION #03	0	-	"Alarm99" + red LED lit on the MDI at 340 hours of operation and the truck is stopped
OPTION #04	0	-	
OPTION #05	0	-	

On setting "AUX OUTPUT" and "RAMP ON/OFF" in the "SET OPTION" menu, different functions are obtained at the E1:3 pin output. The combinations are specified in Table 37, page 161 below.

Table 37. "Aux Output" set in combination with "Ramp On/Off, Traction motor controller

Aux Output	Pin E1.3 Driver:	Stop on ramp	Truck action when stopped on a ramp gradient
Brake	Magnetic brake	On	The truck is held stationary with the aid of the traction motor until the time set by the "auxiliary time" parameter has elapsed, when the electric brake is activated and the control signal to the traction motor is terminated. Only use this combination if the negative brake is installed.
		Off	The truck is held in place with the aid of the traction motor, but slowly descends the ramp until the time set by the "auxiliary time" parameter has elapsed, when the electric brake is activated and the control signal to the traction motor is terminated. Only use this combination if the negative brake is installed.
Hydr. Cont	A hydraulic unit contactor	On	The truck is held stationary with the aid of the traction motor until the time set by the "auxiliary time" parameter has elapsed, when the truck slowly descends the ramp until it reaches level ground
		Off	The truck is not braked electrically but just rolls slowly down a ramp until it reaches level ground.
Excl. Hydro	A hydraulic unit contactor	On	The truck is held stationary with the aid of the traction motor until the time set by the "auxiliary time" parameter has elapsed, when the truck slowly descends a ramp until it reaches level ground.
		Off	The truck is not braked electrically but just rolls slowly down a ramp until it reaches level ground.

The speed controller is now calibrated in both directions. Test the sensitivity, and if any parameter does not feel good, recalibrate that particular function.

10.3.2 Calibrating the lifting and lowering controls

This function stores the minimum and maximum values for the lifting and driving controls.

The minimum value is the lever position where the respective movement will start, and the maximum value is that where the movement has reached maximum speed.

The lifting and lowering movements are controlled by a linear lever that is supplied with 5 V.

In the neutral position, the lever delivers about 2.5 V. When the level is moved to the lift position, the voltage increases towards 4.5 V, and reduces towards 1.0 V during lowering.

In order to calibrate the start position and the maximum position, the Hand terminal is used.

- 1) Connect the Hand terminal, the display shows:

```
AC1 ZAPI Vx. x
12V 250A 00000
```

- 2) After starting, press both the upper outer buttons.

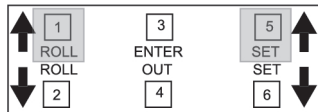
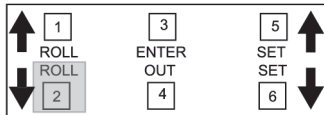


Figure 115. Keyboard

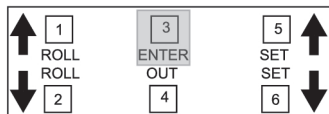
```
CONFIG MENU
SET MODEL
```

- 3) Step down to the Adjustment menu.

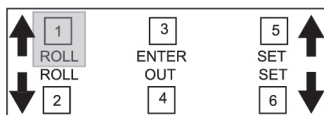


```
CONFIG MENU
ADJUSTMENT
```

- 4) Press ENTER to access this function.



- 5) Step to MIN LIFT.



```
ADJUSTMENT
MIN LIFT
```

- 6) Press ENTER.

Faults which at first sight seem to be associated with a controller may actually be due to a fault in another unit, so first look for error messages in all units, if the first does not show one that applies.

10.4.3.2 Error in the drive function

- 1) Connect the hand terminal to the traction motor controller and read off any error message; these appear automatically once the hand terminal has logged on to the traction motor controller.
- 2) If no error message is present, operate the brake switch and the speed control to see if an error message appears. If one does not, go over to the test menu and read off the brake switch function (Brake switch Table 31, page 157) and the output signal from the speed controller (ACCELERATOR).
 - see Section 10.3.1, page 168
There is no separate direction switch, the direction is determined by the throttle voltage from the speed control. In the test menu, however, the choice of direction can be studied by means of the "FORW SWITCH" and "BACK SWITCH" (indications that the system has identified the direction of travel)
 - see Table 31, page 157
- 3) Also check the positions of the speed reduction switches by using "SPEED SWITCH 1 and 2" in the test menu.
 - see Table 31, page 157
- 4) Also check the current to the motor "CURRENT RMS". If there is current to the motor but it does not move, or only moves slowly, this can be due to a fault in the encoder signal from the motor, which can be studied by using "ENCODER" in the test menu.
 - see Table 31, page 157
 - If the encoder is faulty, the encoder bearing in the drive motor must be changed, see Section 05, page 47.
- 5) At over +75 °C in the traction motor controller the maximum motor current is gradually reduced with increasing temperature. At 100 °C it is reduced to zero.

This is presented as a "HIGH TEMPERATURE" error message on the hand terminal, and as 16A61 on the instrument display (MDI).
- 6) If the error message "VACC NOT OK" is shown on the hand terminal, or 16A78 on the instrument display (MDI), the fault may be that the speed control is incorrectly calibrated.
 - To calibrate the speed control, see Section 10.3.1, page 168.

10.4.3.3 Fault in the servo steering system

- 1) Connect the Hand terminal to the controller.
- 2) Read off any error messages, and read the cause and solution in Section 10.4.4, page 182.

10.4.3.4 Fault in the lifting/lowering system

- 1) Connect the Hand terminal to the traction motor controller and read off any error messages, see Section 10.4.4, page 182.
- 2) Check the system settings against Table 29, page 154.
- 3) Use the Test menu, see Table 31, page 157, to study the following:

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