SERVICE MANUAL

Machine: *PLL PSD PSL PLE*

Manual No: *119000*

Edition 2008B

1 General information and technical data

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Scope of Service Manual

General

This manual describes the service procedures for ATLET low lifters and stackers. Use the manual for quick and correct service of respective truck models.

You may find contradictions in the manual compared to the models supplied due to optional designs and upgrades, and the like.

⚠ ***Warning!***

If the truck is rebuilt after delivery or supplemented in such a manner that safety may be affected, ATLET AB or its authorised representative should be contacted.

Unauthorised truck modification is not permitted. Only in the event that the truck manufacturer is no longer in business and there is no successor to the business, may the user arrange for a modification or alteration to a powered industrial truck, provided, however, that the user shall:

- Arrange for the modification or alteration to be designed, tested and implemented by an expert engineer(s) in industrial trucks and their safety.
- Maintain a permanent record of the design, test(s) and implementation of the modification or alteration.
- Approve and make appropriate changes to the capacity plate(s), decals, tags and instruction manuals.
- Affix a permanent and readily visible label to the truck stating the manner in which the truck has been modified or altered together with the date of the modification or alteration, and the name and address of the organisation that accomplished the tasks.

 The material has undergone careful examination with regard to correctness. Subject to alteration. In the event of inconsistent information in the Swedish and translated editions, it is the Swedish edition that applies.

Modifications and updates will be distributed via ATLET AB Service Manual Change.

Scope of the P series

The manual covers the low lifter PLL and stacker PSD.

How to use the manual

Structure

The manual is built up according to the same principles as ATLET spare parts catalogues, with the truck divided into one subsystem per section.

Sections 1 - 3 in this manual contain more comprehensive information regarding technical data, general service instructions and tools.

Sections 4-12 in this manual contain information limited to a specific area in the truck concerning the description of the mechanical handling of different components, e.g. Master (section 6) and Hydraulic system (section 8).

The software is described in section 10.

The main principle for extra accessories is to place them under the respective sections. Otherwise they are placed under section 12 “Miscellaneous”. For this reason section 12 is not always included in the Service Manual.

For specific problems or information about procedures, look in the main index for the correct section in the manual.

Symbol key

Warning!

Used for risk of personal injury.

Important!

Used for risk of damage to machine.

Note!

Used for general observation.

Safety instructions

General

Extreme importance must be placed on precautionary measures to avoid accidents during all work on the vehicle.

A general rule is to always implement preventive measures that are adapted to the type of vehicle to be worked on. The general rules below must always be observed:

- Smoking or naked flames are strictly forbidden as there is a risk of explosion in the vicinity of batteries and while working on gas equipped vehicles.
- The battery should always be protected during grinding work.
- Local fire directives should always be followed.
- The drive wheel should always be lifted up free from the floor during service work to prevent the vehicle from moving.
- The battery plug should be pulled out before working on the electrical system. The battery plug may only be connected while trouble shooting, and when the greatest of care is exercised, (with the truck raised).
- To prevent injuries caused by crushing the battery plug should always be removed when working on and around the mast and hydraulic unit. The mast or hydraulic unit can be actuated due to an electrical fault or a mistake while working.

Warning!

Having the power connected to the truck while working on and around the mast can lead to fatal injury!

- When working on and around lifting devices and the hydraulic unit, they must be locked by using the mast lock, wooden blocks or some other appropriate means.
- No other persons should be in the vicinity of the truck when it is test run in conjunction with repair work, in view of the risk of accidents or near-accidents from the truck making an unexpected manoeuvre.
- The system should not be pressurised, e.g. the pump motor switched off and the forks in their lowest position, when dismantling parts of the hydraulic system.
- All metal objects such as watches, chains, spectacles and rings should be removed when working on the electrical system, or in its immediate vicinity. A short-circuit from such objects can result in serious burn injuries.

Lifting the truck

Inspection/Preparation

- When the truck is lifted using a jack, make sure you secure it with blocks. The truck must not rest on the jack, while work is carried out.
- Ensure that straps, wires or chains have a sufficient lifting capacity before lifting the truck.
- Ensure that the drive wheel runs free of the floor before trouble shooting.

Permitted lifting points

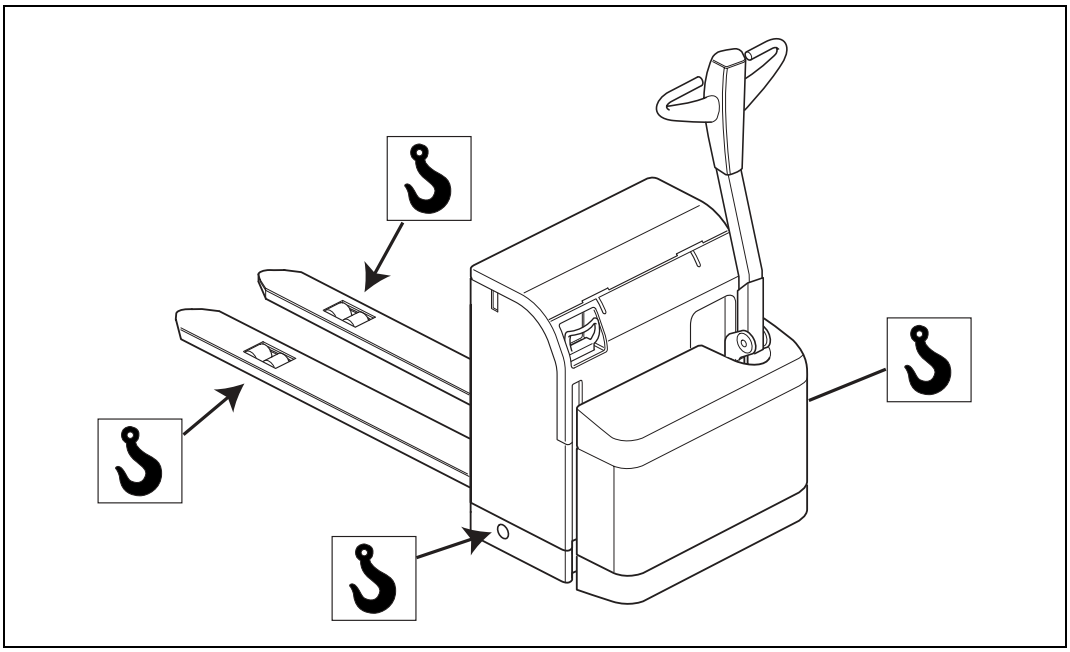

Figure 1.1 Permitted lifting points

Figure1.1 shows where the permitted lifting points are placed on the truck. The lifting points are marked with a decal representing a lifting hook.

⚠ ***Warning!***

The machine must never be lifted in any other points than the ones shown.

Figure 1.2 shows where the jack should be placed.

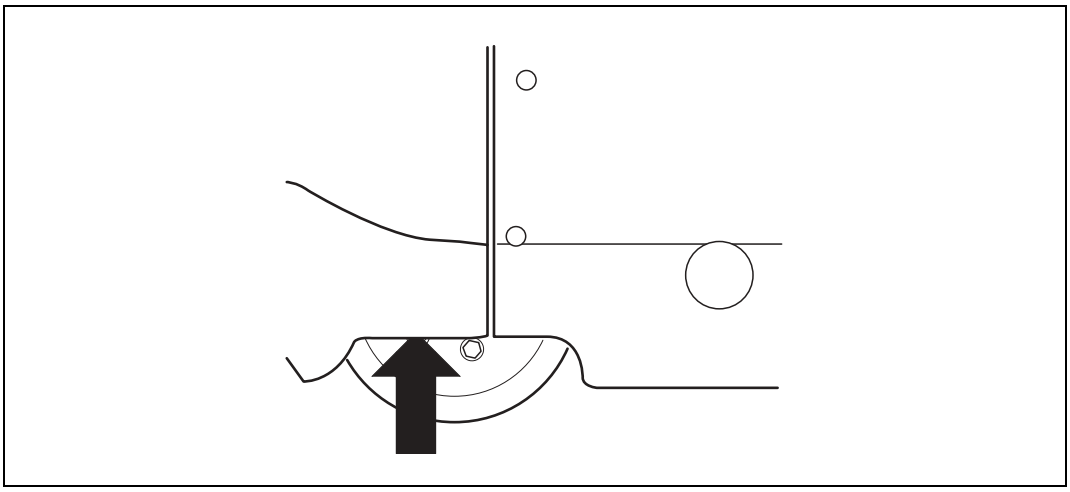

Figure 1.2 Permitted lifting points, jack

Welding on the truck

- During welding work the battery plug should always be disconnected and all connections to the control units and regulators (applies to all electronic units) disconnected. On completion of welding work the connectors should first be connected to the electronic units, after which the battery plug is then connected to the battery.
- The return cable clamp should always be connected as close the welding area as possible to eliminate damage to surrounding components.

Atlet AB takes care of the environment

The majority of our products consist of metal that can be completely recycled.

Environmental impact

All products have an impact on the environment throughout their entire life cycle.

The consumption of energy during their use is one of the most important factors that influences the environment.

Through correct care, maintenance and use the consumption of energy can be reduced, thereby reducing the environmental impact.

Waste

Waste material in conjunction with repairs, maintenance, cleaning, or scrapping, should be collected and disposed of in an environment-friendly way and in accordance with the directives of respective countries. Such work should only be carried out in areas intended for this purpose.

Recyclable material should be taken care of by specialised authorities.

Environmentally hazardous waste, such as oil filters, batteries and electronics, can have a negative effect on the environment, or health, if handled incorrectly.

Preparations

Service

- Go through all the safety instructions.
- Make sure that you have all the essential tools close at hand before starting work.
- Before cabling or other electrical components are disconnected, check the colour codes and check for damage to cables or connections.
- When complex components are repaired and dismantled, make sure that you have good control of the different component parts to avoid the risk of confusion.
- When repairing or maintaining sensitive components, make sure that you use clean tools and work on a clean work surface.
- Dismantle, inspect and adjust components according to the prescribed routines. See respective sections for detailed information.

Trouble shooting

When you suspect that a component is defective, do not replace it immediately. First check the surrounding equipment and carry out complete trouble shooting according to the trouble shooting chart. Make sure you know the reason for the fault before replacing a component.

Data PLL, PSD

Designations

Truck designation

Table 1.1 Truck designations

Truck type	PLL	Low lifter
	PSD	Stacker
	PSL	Stacker
Load capacity	PLL 145	1450 kg
	PLL 180	1800 kg
	PLL 200	2000 kg
	PSD 125/160	1250 kg forks only. 1600 kg in total (800+800 kg)
	PSL 125	1250 kg

Type designation

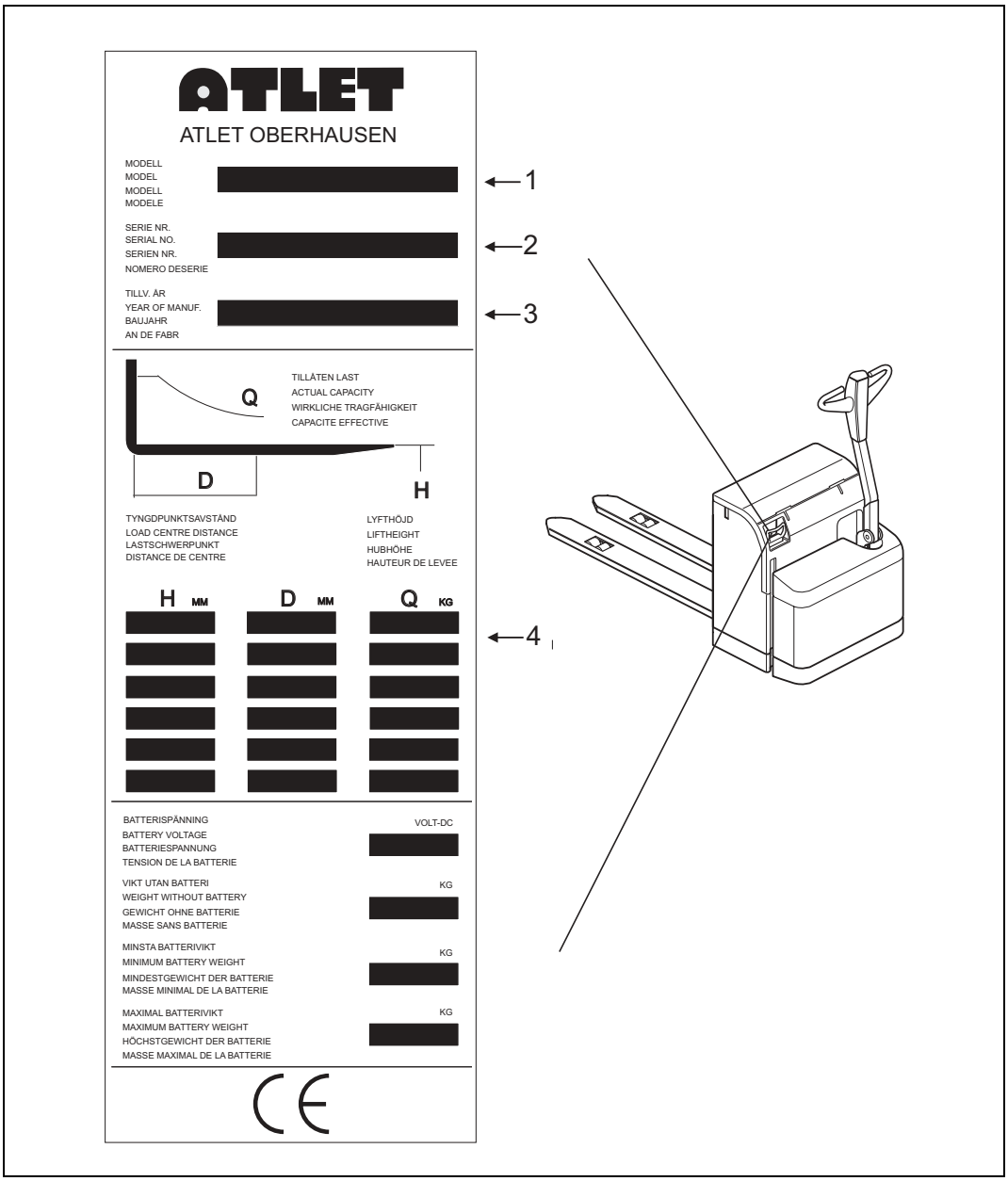

Figure 1.3 Example of type plate (–2006w36)

1. Model designation.
2. Type Series no/Version (S=Special ver.).
3. Year of manufacture, week, and warranty period in months (only Sweden). (On the assumption that the service instructions in the warranty regulations are followed).
4. Where appropriate load limitations depending on the position of the load on the forks (D) and/or lifting height (Q).

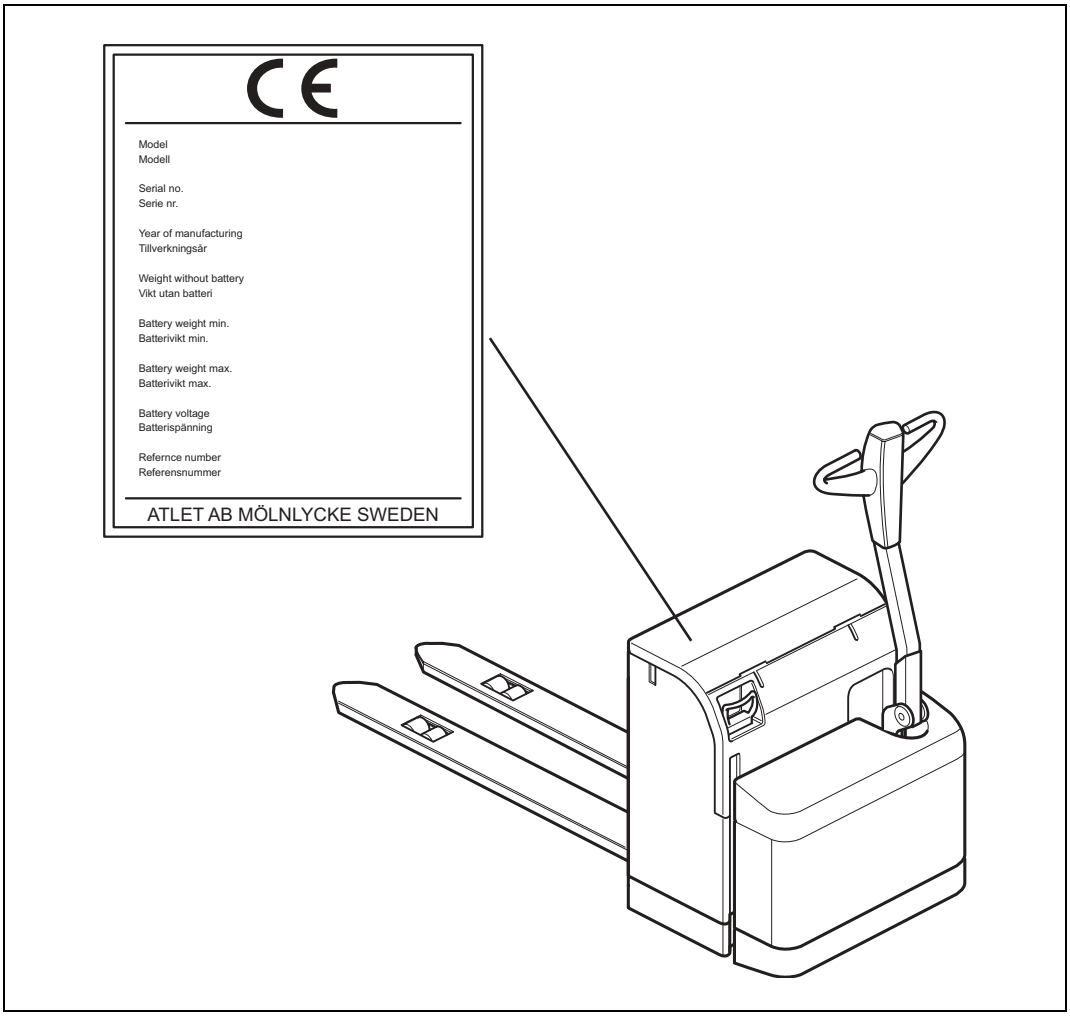

Figure 1.4 Example of type plate (2006w37–)

Explanation of Model designation

Example: **PSD 125 T 160 30**

Truck type
Load capacity/10
Mast type
Battery Ah/5
Charger Ampere

Note!

In cases where the machine plate has been lost or become illegible, it must be renewed immediately. In order to identify the machine's serial number, there is a plate located on each main component such as drive motor, gearbox, hydraulic unit, TMC etc. For some machines there is even a plate attached inside the battery compartment, or serial number punched on the side of the mast.

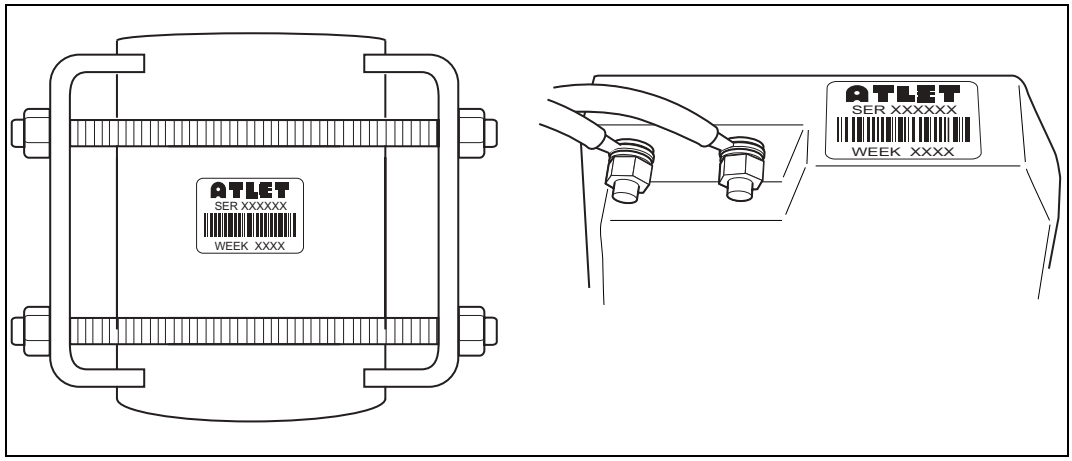

Figure 1.5 Example of plate with serial number.

Dimensions and weights

Dimensions PLL PSD

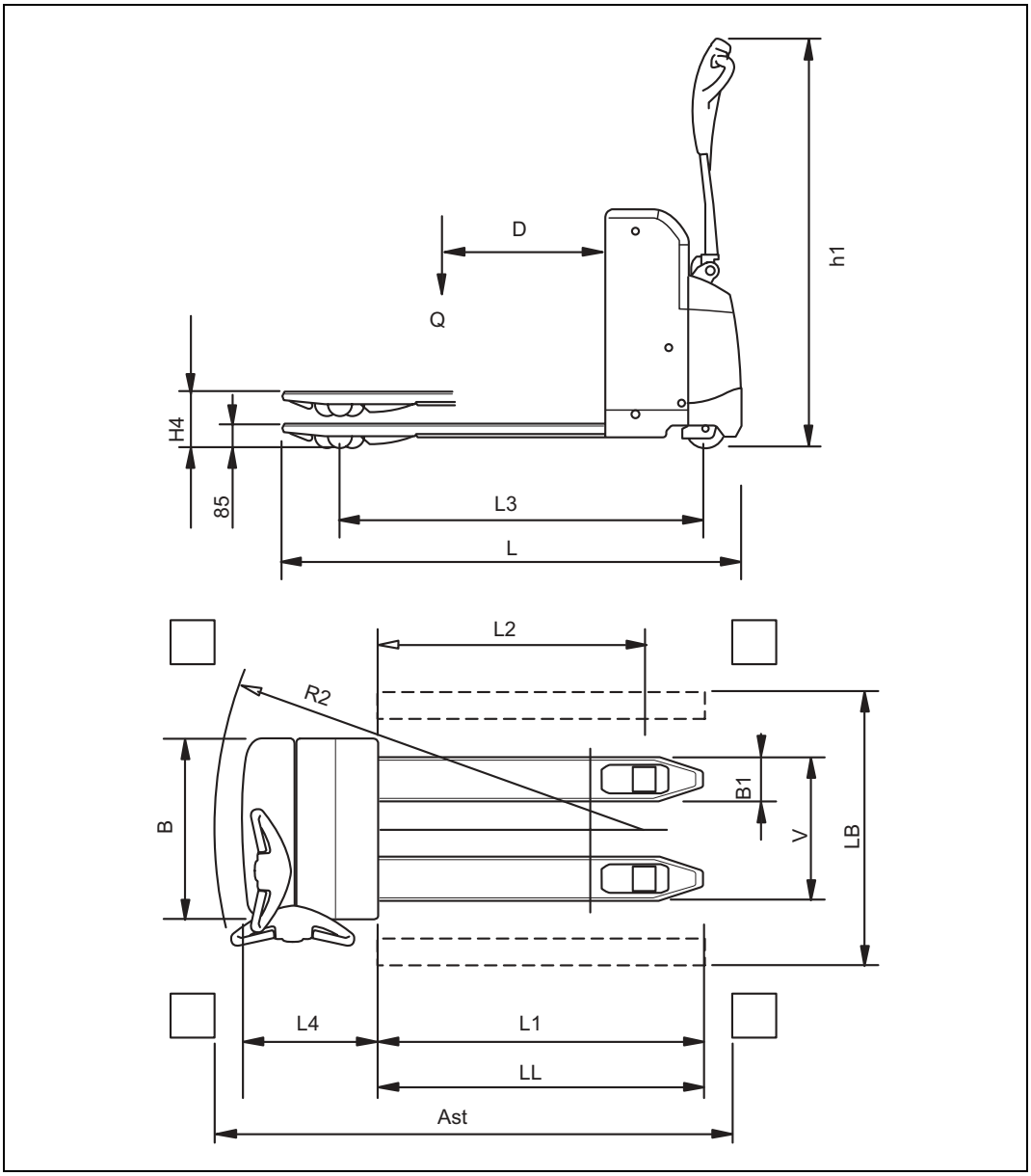

Figure 1.6 Positions for dimensions PLL

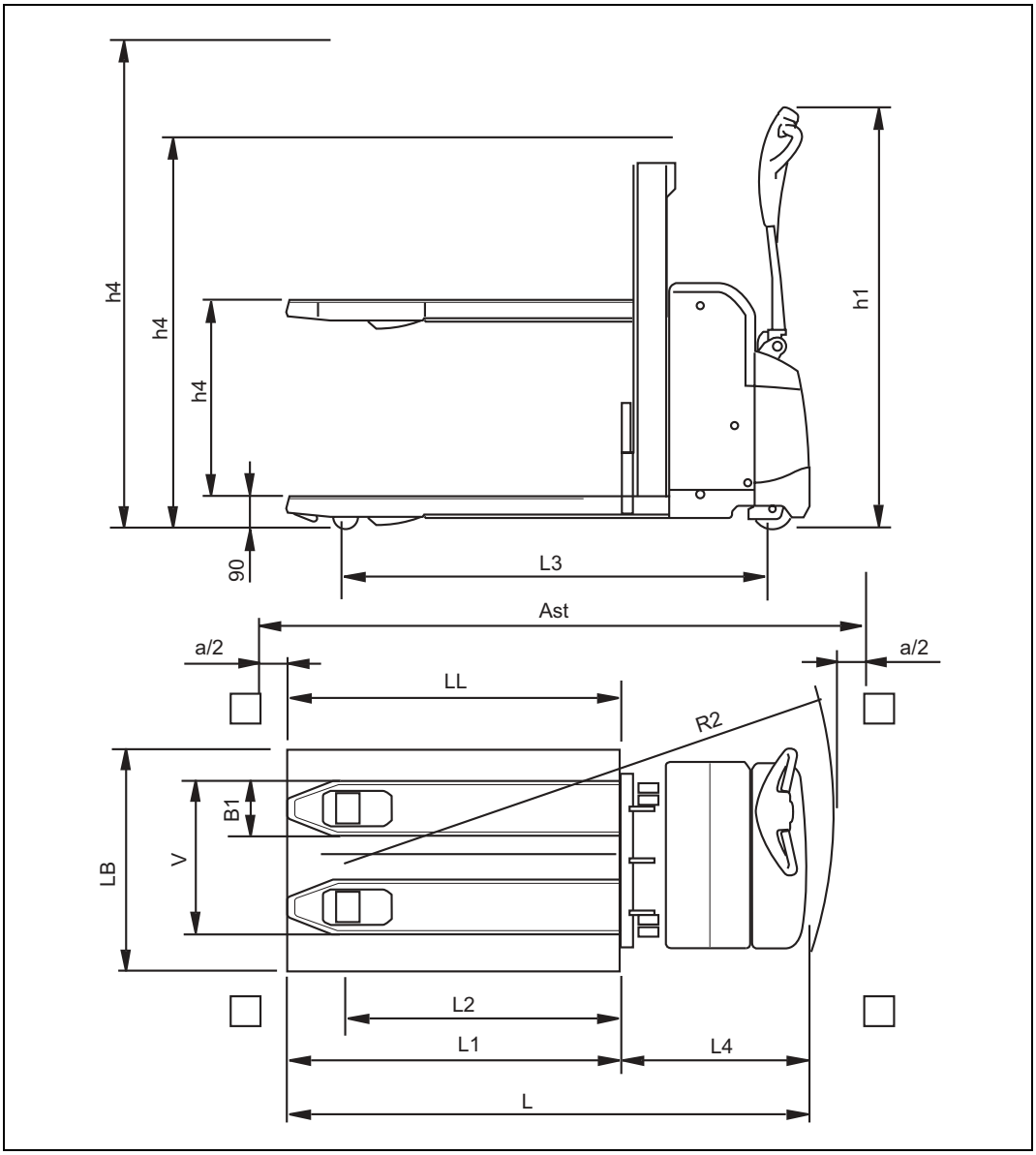

Figure 1.7 Positions for dimensions PSD

Component specification

Table 1.2 Component specification

Component		Specification	
Drive motor		Drive voltage	24V
		Output standard	1 kW 45 min
		Insulation resistance	25 MΩ
Gearbox		Gear ratio (standard)	31,3:1
		Oil volume	0.8 litres
Hydraulic system	PLL 180/200	Max pressure	150-160 bar
		Oil volume	max 0.75 litres
	PLL 145	Max pressure	150-160 bar
		Oil volume	max 0.6 litres
Hydraulic unit (motor and pump)		Output	2.2 kW
Control system for drive motor		Type FZ2009	AC0 CAN
		Voltage	24 V
		Max current	150A (RMS) for 2 min
Fuses		Control fuse 1	7.5 A
		Pump motor fuse 1	80 A
		Drive motor fuse 1	100 A

Recommended consumable materials

Oil and grease

Table 1.3 Table of recommended types of oil and grease

Brand	Gearbox oil As per API value GL-5		Hydraulic oil As per ISO VG 32, VG 15		Bearing grease NLGI 2 Lithium base
	Normal	Cold store	Normal (32)	Cold store (15)	
BP	BP Energear HYPO 80W140 EP	BP Energear SHX-S 75W/140 EPS	BP Bartran HV-32	BP Bartran SHF-S	Energrease LC 2
Castrol	-	-	Hyspin SHS 32	Hydraulic oil OM 15 Alt: Hyspin AWH 15	LMx
Mobil	-	-	DTE 13 M SHS 32	Flowrex 1	Mobilplex 48
Shell	-	-	Tellus oil TX 32	Tellus oil T 15	Retinax EP2
Statoil / Exxon	-	-	SHS 32	J 26	Uniway LIX 625
Texaco	-	-	Rando oil HDZ 32	Rando oil HDZ 15	Hytex EP2

Important!

Do not mix different lubricants, and absolutely not synthetic oil with mineral oil, since this can affect the properties of the oil!

Standards and abbreviations

Screws

Tightening torque, screws and nuts

Table 1.4 Tightening torque, screws and nuts

DIM	Tensile grade			
	4,6	8,8	10,9	12,9
	Nm	Nm	Nm	Nm
M4	1,1	2,9	4,0	4,9
M5	2,2	5,7	8,1	9,7
M6	3,7	9,8	14	17
M8	8,9	24	33	40
M10	17	47	65	79
M12	30	81	114	136
M14	48	128	181	217
M16	74	197	277	333
M18	103	275	386	463
M20	144	385	541	649

The tightening torque in the table above are standard values. In some cases a specific tightening torque is specified in respective sections. If no tightening torque is specified in the service instructions, the values shown in the table above apply.

Tightening torque, hydraulic couplings

Table 1.5 Tightening torque, hydraulic couplings

Tightening torque: Pipe thread / metric thread:			
Metric fine thread	**Whitworth pipe thread**	**MA (Nm) with**	**MA (Nm) with elastic (O-ring coupling)**
M10 x 1	G 1/8"	25	10
M12 x 1.5		30	20
M14 x 1.5	G 1/4"	50	30
M16 x 1.5	G 3/8"	80	35
M18 x 1.5		90	40
M20 x 1.5	G 1/2"	130	50
M22 x 1.5		150	60
M26 x 1.5		250	70
M27 x 1.5	G 3/4"	250	80
M27 x 2		250	90
	G 1"	350	140
M33 x 2		400	140
M42 x 2	G 11/4"	600	240
M48 x 2	G 11/2"	800	300

Conversion tables

Table 1.6 Conversion table, torque units

Newton metre (Nm)	Kilopond metre (kpm)	Poundforce inch (lbg x in)	Poundforce foot (lbf x ft)
1	0.10	8.85	0.74
9.81	1	86.80	7.23
0.11	0.01	1	0.08
1.36	0.14	12.00	1

Table 1.7 Conversion table, pressure units

Pa (N/m^2)	Bar (1mb=1hPa)	at (kp/cm2)	dry (mm Hg, 0 C)	atm
1	10 -5	1.020*10 -5	7.501*10 -3	9.869*10 -6
9.807*10 4	0.9807	1	735.6	0.9678
133.3	1.333*10 -3	1.360*10 -3	1	1.316*10 -3
1.013*10 5	1.013	1.033	760	1

Table 1.8 Conversion table, speed

m/s	km/h
1	3.6
0.278	1

Standard abbreviations

Table 1.9 Standard abbreviations

Magnitude	Unit	Designation
Current	Ampere	A
Voltage	Volt	V
Resistance	Ohm	Ω
Output	Watt	W
Torque	Newton metre	Nm
Pressure	Pascal	Pa

Screw types and tensile grades

Table 1.10

Figure	Screw type	Designation	Tensile grade
	M6S	Hexagon screw	8.8 10.9
	MC6S	Hexagon hole screw	8.8 10.9 12.9
	MF6S	Hexagon hole screw, countersunk	10.9
	MCS	Slotted screw	4.6
	MVBF	Oval head counter-sunk screw	4.6

Marking with the manufacturer's trademark, including the tensile grade, is compulsory for screws with a thread diameter from 5 mm and in tensile grades according to the table above. Marking only takes place when the shape of the product permits this.

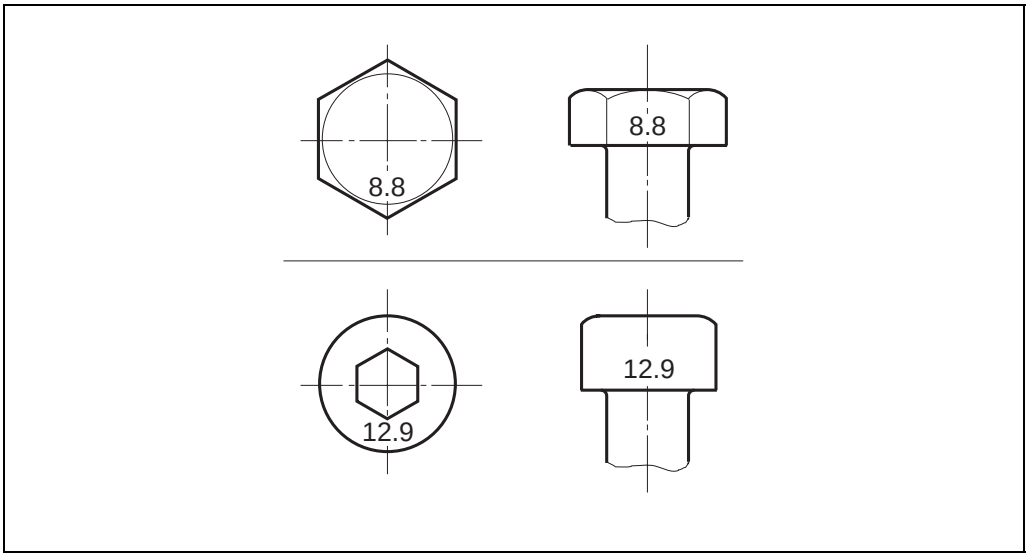

Figure 1.8 Example of marking

Colour of the truck

The truck is painted in colours with the following NCS colour codes:

Table 1.11 NCS colour codes

Machine colour	Designation
Yellow	NCS 0070-Y20R
Medium grey	NCS 7000
Dark grey	NCS 8000

Colour codes, cabling

The colour markings of all cables included in the truck can be seen in the Atlet wiring diagrams. The abbreviations have the following significance:

Table 1.12 Colour codes Atlet wiring diagrams

Code	Cable colour
Y	Yellow
BL	Blue
SB	Black
W	White
GN	Green
GR	Grey
R	Red
BN	Brown
VO	Violet
P	Pink
OR	Orange

Note!

Two-colour cables are shown with both colour codes separated by a slash.
E.g. blue/yellow cable is shown with colour code BL/Y.

Designations

Electrical components normally have a designation of two letters:

Table 1.13 First letter

Code	Designation (Eng)
A	Component or function without its own letter below
C	Capacitor
D/V	Diode
E	Electrical component
F	Fuse
I	Indicator
K	Connector
L	Coil/inductive element
M	Motor
P/X	Connection
R	Resistor
S	Switch
T	Terminal
Y	Valve/brake
H	Audible warning unit/light
G	Battery

Table 1.14 Second letter

Code	Designation (Eng)
B	Brake
C	Control system
E	Emergency function
F	Forward
H	Hour
K	Key
L	Lowering
M	Manoeuvre
P	Pump
R	Reverse
S	Speed