ETM/V 110/112/114/116

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Operating instructions

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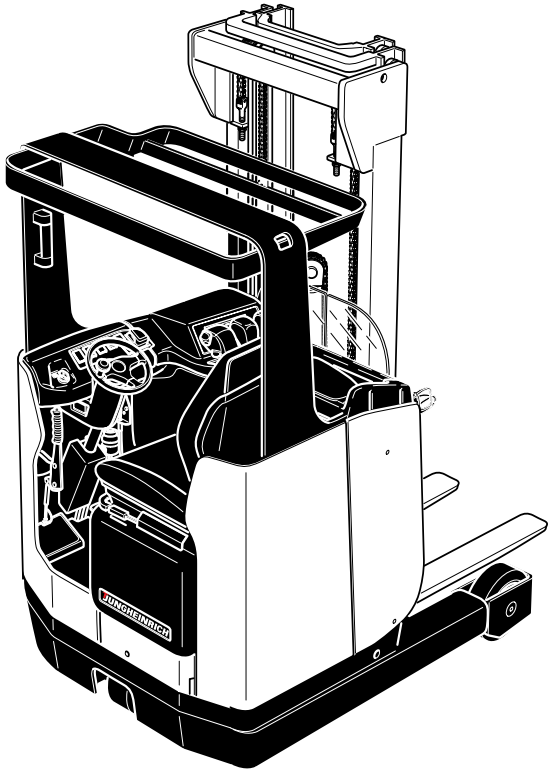

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Important notes on transporting and mounting load lifting devices to reach trucks

Transport

Depending on the overall height of the lifting mast and the local conditions transport can be performed in three different ways

– Standing, with the lifting mast mounted (for trucks with low overall height)
– Standing, with martially mounted lifting mast tilted towards the overhead guard (for trucks with medium overall height). Hydraulic line for the lifting function is interrupted.
– Standing, with the lifting mast dismounted (for trucks with large overall height)

Safety Instructions for Assembly and Commissioning

The assembly of the truck on site, commissioning the truck and instructing the driver must be carried out by personnel trained and authorised by the manufacturer

Connect the hydraulic lines to the basic machine / mast interface and commission the truck only after having installed the mast as per the instructions.

Foreword

The present ORIGINAL OPERATING INSTRUCTIONS are designed to provide sufficient instruction for the safe operation of the industrial truck. The information is provided clearly and concisely. The chapters are arranged by letter. Each chapter starts with page 1. The page identification consists of a chapter letter and a page number.
For example: Page B 2 is the second page in chapter B.

The operating instructions detail different truck models. When operating and servicing the truck, make sure that the instructions apply to your truck model.

Safety instructions and important explanations are indicated by the following graphics:

Used before safety instructions which must be observed to avoid danger to personnel.

Used before notices which must be observed to avoid material damage.

Used before notices and explanations.

- ● Used to indicate standard equipment.
- ○ Used to indicate optional equipment.

Our trucks are subject to ongoing development. Jungheinrich reserves the right to alter the design, equipment and technical features of the truck. No guarantee of particular features of the truck should therefore be inferred from the present operating instructions.

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A Correct use and application of the truck

The “Guidelines for the Correct Use and Application of Industrial Trucks” (VDMA) are included in the scope of delivery for this truck. The guidelines are part of these operating instructions and must always be heeded. National regulations are fully applicable.

The fork lift truck described in these operating instructions is a truck that is suitable for lifting and transporting loads.
It must be used, operated and maintained according to the information in these operating instructions. Any other uses are outside the design envelope and can lead to injury to persons or damage to equipment and property. Above all, overloading caused by excessively heavy or unbalanced loads must be avoided. The max. admissible load to be picked up is indicated on the identification plate or load diagram label shown on the truck. The fork lift truck must not be operated in spaces subject to fire or explosion hazards, or in spaces where corrosive or very dusty atmospheres prevail.

Duties of the user: A “user” within the meaning of these operating instructions is defined as any natural or legal person who either uses the fork lift truck himself, or on whose behalf it is used. In special cases (e.g. leasing or renting), the user is considered the person, who, in accordance with existing contractual agreements between the owner and the user of the fork lift truck, is charged with the observance of the operating duties.
The user must ensure that the truck is not abused and only used within its design limits and that all danger to life and limb of the operator, or third parties, is avoided. In addition to this, it must be ensured that the relevant accident prevention regulations and other safety-related provisions, as well as the operating, servicing and maintenance guidelines, are observed. The user must also ensure that all persons operating the truck have read and understood these operating instructions.

If these operating instructions are not observed the warranty becomes void. The same applies if improper works are carried out at the device by the customer and/or third parties without permission of our Customer Service.

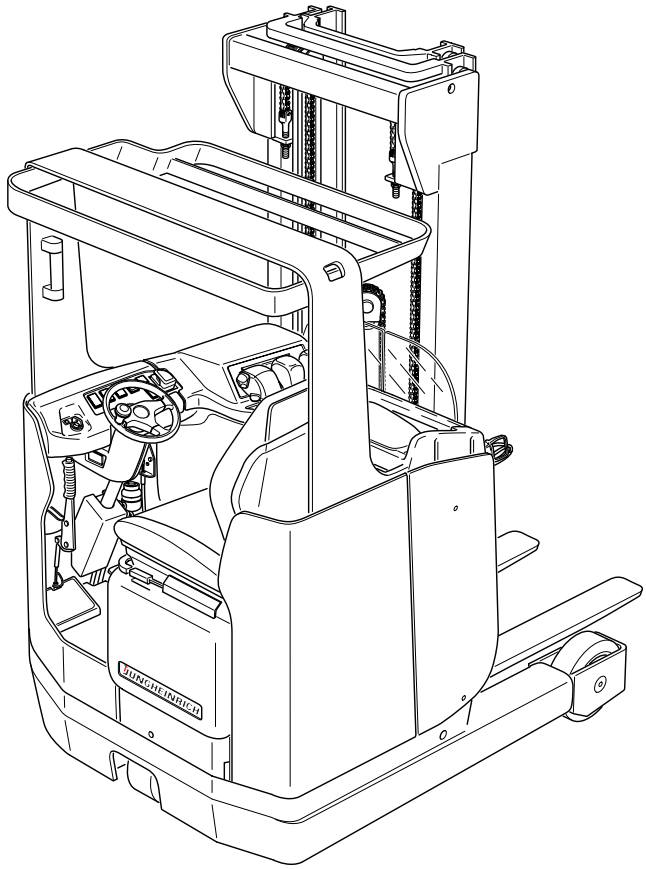
Mounting of attachments: The mounting or installation of any attachments which will interfere with, or supplement, the functions of the truck is permitted only after written approval by the manufacturer has been obtained. If necessary, the approval of local authorities has to be obtained.
Any approval obtained from local authorities does not, however, make the approval by the manufacturer unnecessary.

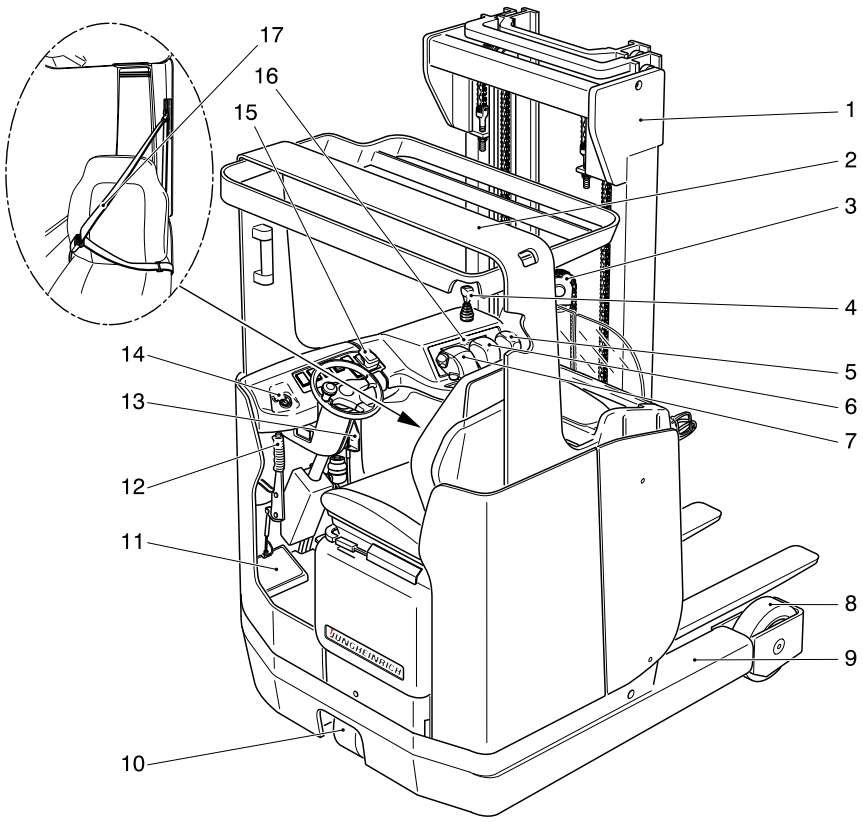
B Description of the truck

1 Application

The ETM/V 110-116 is an electrically driven three-wheel truck incorporating a traversing mast and a lateral seat. It is intended for the lifting and transportation of goods on level ground. It can pick up pallets of open ground support, pallets provided with lateral boards arranged outside or inside the range of the load-bearing wheels, or trolleys. Loads can be stacked in and out and transported across greater distances.
Its capacity is shown on the identification label.

Type	Capacity	Load centre distance
ETM/V 110	1000 kg	600 mm
ETM/V 112	1200 kg	600 mm
ETM/V 114	1400 kg	600 mm
ETV 116	1600 kg	600 mm





Item		Designation	Item		Designation
1	●	Clear-view lifting mast	10	●	Drive wheel
2	●	Overhead guard	11	●	Foot switch
3	●	Free-lift cylinder	12	●	Battery trolley unlocking system
4	○	Auxiliary hydraulics (ZH2)	13	●	Parking brake
5	●	Control lever „Mast tilting“	14	●	Key switch
6	●	Control lever „Traversing of Mast“	15	●	Master switch (emergency stop)
7	●	Solo-pilot	16	●	Information and service display (LISA)
8	●	Load-bearing wheels	17	○	Safety belt
9	●	Wheel arm			
● = Standard equipment			○ = Optional equipment		

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2.1 Truck

Safety installations: The enclosed truck contour featuring rounded edges ensures safe handling of the ETM/V 110-116 truck. The driver is protected by the overhead guard (2). The drive wheel (10) and the load-bearing wheels (8) are enclosed by a sturdy collision guard.
The master switch (15) ensures instant cut-out of all electrical functions in an emergency. Six red LED warning lights in the information and service display (16) indicate the following states:

- Direction of motion Forward (V), „Drive direction“
- Parking brake applied
- Direction of motion Backward (R), „Load direction“
- Lack of brake liquid
- Center position of lateral traversing device (option)
- Battery locking

In case of malfunctions within the hydraulic system, line break safety devices limit the speed at which the load is lowered.

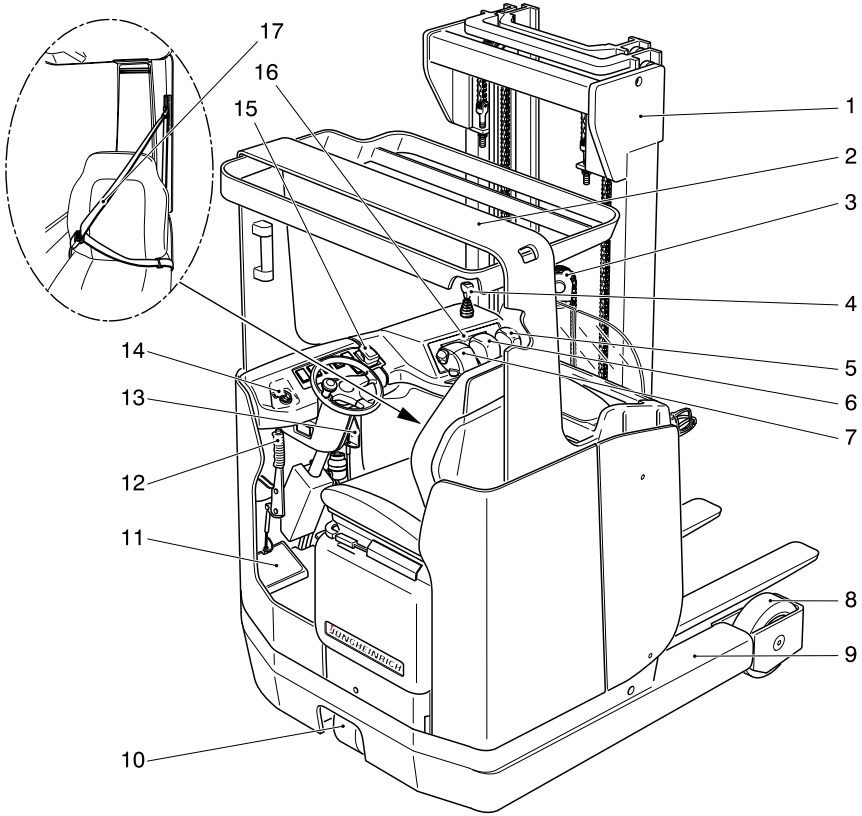
Indicating instruments: Information and service display (LISA) (16) with large indications in LCD-technology. Hour meter and battery discharge indicator with lifting movement cut-out function.

Drive system: The complete drive unit is screwed into the vehicle chassis. A stationary shunt motor with an output of 5.4 kW drives the drive wheel (10) via a spur wheel gear. The electronic drive current control system provides variable speed to the drive motor, thus allowing smooth starting without jerks, vigorous accelerating and electronically controlled regenerative braking.
The rate of energy regeneration can be set with the LISA system.

Brake system: Two independent brake systems act on the drive wheel. The service brake is designed as a hydraulic drum brake with asbestos-free brake linings and is applied by means of the foot pedal. The parking brake (12) acts mechanically as an electromagnetic brake on the drum brake by pulling a rope.
The brake fluid level is monitored by the LISA system. A warning light shows when the parking brake is applied.

Steering system: Chain-operated steering using a steering gear and, as standard, hydraulic steering. The pivoted drive unit can be swivelled by 90° to both sides. The steering head can be adjusted hrizontally.

Driver position: The driver’s place is ergonomically designed and equipped with a large foot space. In order to obtain an ergonomic seating position, the driver can adjust the driver’s seat and the steering column.
Accelerator and brake pedals are arranged as found in normal vehicles.



Item		Designation	Item		Designation
1	●	Clear-view lifting mast	10	●	Drive wheel
2	●	Overhead guard	11	●	Foot switch
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5	●	Control lever „Mast tilting“	14	●	Key switch
6	●	Control lever „Traversing of Mast“	15	●	Master switch (emergency stop)
7	●	Solo-pilot stick	16	●	Information and service display (LISA)
8	●	Load-bearing wheels	17	○	Safety belt
9	●	Wheel arm			
● = Standard equipment			○ = Optional equipment		

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Operating controls and indicators: The operating controls and indicators are clearly laid out and arranged at the driver position.

Control lever (5) is used to operate the “Mast tilting” function, control lever (6) to operate the “Forward/backward traversing of mast” function. The solo-pilot stick (7) is used to operate the “Lifting/lowering” function, to select the direction of travel, to move the lateral traversing device to the left or right in lateral traversing device operation (auxiliary hydraulics ZH1) and to actuate the horn.
As an option, an auxiliary hydraulic system (ZH2) can be operated via control lever (4).

Hydraulic system: Pump unit with an externally ventilated series-wound motor and a noiseless precision jetting pump. The system is controlled using the individual levers (5-7) and the optional auxiliary hydraulics (4).

Electric system: 48 V two-wire system.
As a standard feature, the truck is equipped with an electronic drive and lifting control system. The electronic drive control system variably controls the travelling speed and allows counter-current braking when switching the direction of travel.
The information and service display (LISA) (16) allows a adjustment of the driving and lifting parameters according to the current requirements. Warning indications, operating error indications and service functions are also shown on the LISA.
For possible drive batteries, see chapter D.

2.2 Load lifting system

Mast holder: The mast holder is borne by supporting rollers. The protracting and retracting movements are carried out directly by a simply telescoping traversing cylinder. The guide rails for the mast holder are screwed onto the wheel arms (9).

Hoist frame: The trucks are equipped with tiltable, telescoping free-vision hoist frames (1) supported by the mast holder. Adjustable lateral rollers and guide pieces absorb the lateral pressure acting on the fork carrier when transporting unbalanced loads. The mounting of the fork to the fork carrier permits adjustments to be made to the tines. In the case of the double-lift triplex mast (DZ), the initial lifting sequence of the load carriage (free lift), which does not change the total height, is effected by a short free-lift cylinder (3) arranged off-centre. In the case of the telescopic mast (ZT), the free-lift sequence is limited to 100 mm due to the construction of the truck.

Attachments: Mechanical and hydraulic attachments are available as optional equipment.

3 Technical data - Standard version

Technical data to VDI 2198.
Technical data are subject to alteration and extension in scope.

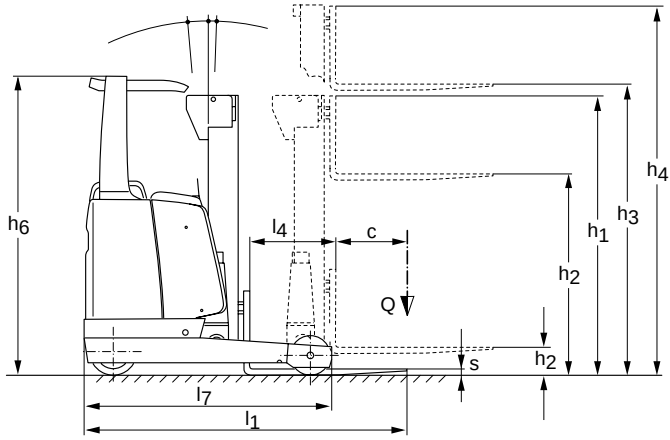
3.1 Output data for standard truck versions

	Designation	ETM/V 110	ETM/V 112	ETM/V 114	ETV 116	
Q	Capacity (at C = 600 mm)	1000	1200	1400	1600	Kg
C	Load centre distance	600	600	600	600	mm
	Travelling speed with / without load	9,4 / 9,9	9,3 / 9,9	9,2 / 9,8	10,3 / 10,6	km/h
	Lifting speed with / without load	0,35 / 0,55	0,34 / 0,55	0,31 / 0,45	0,33 / 0,54	m/s
	Lowering speed with / without load	0,50	0,50	0,50	0,50	m/s ±15%
	Traversing speed with / without load	0,2	0,2	0,2	0,2	m/s
	Climbing ability with / without load	7 / 10	7 / 10	7 / 10	7 / 10	%
	Max. climbing ability (max. 5 min) with / without load	10 / 15	10 / 15	10 / 15	10 / 15	%

3.2 Standard hoist frame versions

	Designation	Telescopic mast (ZT)	Double lift triplex mast (ZZ)*	Double lift triplex mast (DZ)	
h_1	Total height	1950 - 3050	1950 - 2400	1950 - 2900	mm
h_2	Free lift	100	1315 - 1765	1315 - 2256	mm
h_3	Lift	2890 - 5290	2890 - 3790	4250 - 7100	mm
h_4	Max. height	3460 - 5860	3460 - 4360	4894 - 7744	mm

*) ETM/V 110/112



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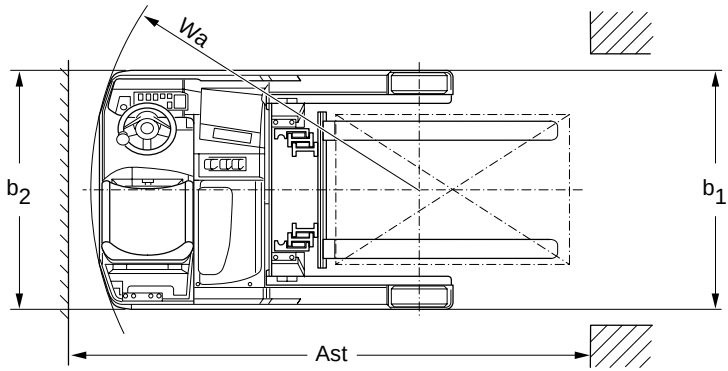
3.3 Dimensions

	Designation	ETM/V 110 (ZT/DZ/ZZ)	ETM/V112 (ZT/DZ)	ETM/V114 (ZT/DZ)	ETV116 (ZT/DZ)	
s	Height of lowered fork	40	40	40	40	mm
h_6	Height above overhead guard	2075	2075	2075	2190	mm
l_1	Total length	1870 a)	1954 b)	1957/1985 b)	1967/1995 c)	mm
l_4	Traversing distance	602 d)	618 e)	624/602 e)	666/644 e)	mm
l_7	Length across wheel arms	1625	1725	1725	1812	mm
b_1	Total width	1120/1238	1120/1238	1120/1238	- /1238	mm
b_2	Total width ETM/V	1106	1106	1106	1186	mm
W_a	Turning radius	1538	1636	1636	1690	mm
Ast	Working aisle width 800 x 1200 pallets, lengthwise	2508/2606 f)	2590/2690 g)	2592/2614 g)	2756/2775 g)	mm
Ast	Working aisle width1000 x 1200 pallets, crosswise	2308/2566 f)	2390/2653 g)	2392/2414 g)	2716/2731 g)	mm
	Dead weight :				Refer to truck identification plate	

a) with fork length 800 mm; 330 Ah ±0 mm; 420 Ah battery: +84 mm; 560 Ah battery: +174 mm
b) with fork length 800 mm; 560 Ah battery: +90 mm
c) with fork length 800 mm; 560 Ah battery: +90 mm / 700 Ah battery: +180 mm
d) 420 Ah battery: -84 mm; 560 Ah battery: -174 mm
e) 420 Ah battery: ±0 mm; 560 Ah battery: -90 mm
f) with 280 Ah battery
g) with 420 Ah battery



3.4 EN standards

Continuous sound level: 67dB(A)

according to EN 12053 as stipulated in ISO 4871.

☞ The continues sound level is an average value determined according to the standard's guidelines and takes into consideration the sound level when driving, lifting and in idle mode. The sound level is measured at the driver's ear.

Vibration: 0,30 m/s^2

according to document N47E of CEN/TC 150/WG8.

☞ The vibration acceleration applied to the operator's body is measured according the standard's guidelines as a linearly integrated, weighted acceleration in vertical direction. The acceleration is measured when driving across bumps at steady speed.

Electromagnetic compatibility (EMC)

The following limit values are observed according to the product standards "Electromagnetic Compatibility of Industrial Trucks (9/95)":

- interference emission (EN 50081-1)

- interference immunity (EN 50082-2)

- electrostatic discharge (EN 61000-4-2).

☞ Electrical or electronic components and their arrangement may only be modified after written approval by the manufacturer has been obtained.

3.5 Operation conditions

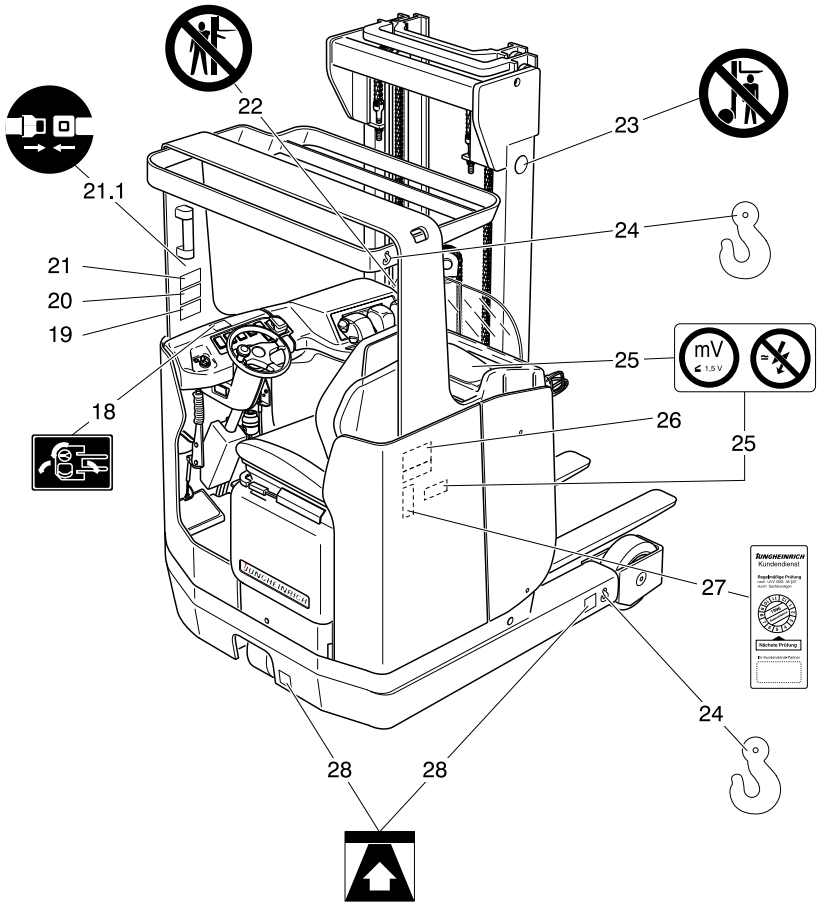
Environmental temperature

in operation: –25°C to 40°C

☞ If the truck is operated continuously below 0°C, it is recommended to fill the hydraulic system with frost resisting oil as approved by the manufacturer.

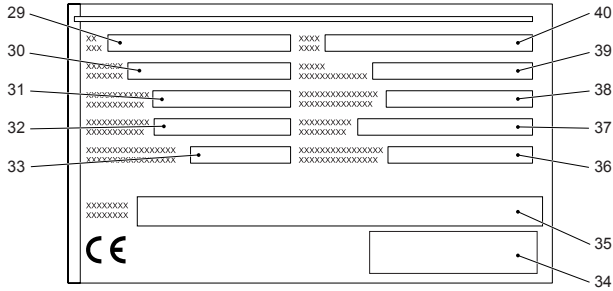
For applications in cold stores resp. in areas with extreme temperature or humidity changes the truck has to be specially equipped and approved.

4 Location of instruction labels and identification plates



Item	Designation
18	Drive direction when locking the steering wheel (option)
19	Load diagram, capacity / lateral traversing device
20	Load diagram, capacity / load centre / fork
21	Load diagram, capacity / load centre / lifting height
21.1	Sign: Put on safety belt
22	Prohibitive sign “Do not reach through the hoist frame”
23	Prohibitive sign “Keep away from under the load lifting device”
24	Pick-up points for crane transportation
25	Warning sign "Low voltage electronics"
26	Truck identification plate
27	Plaque confirming accident prevention checks (only Ⓓ)
28	Pick-up points for lifting jack

4.1 Truck identification plate)



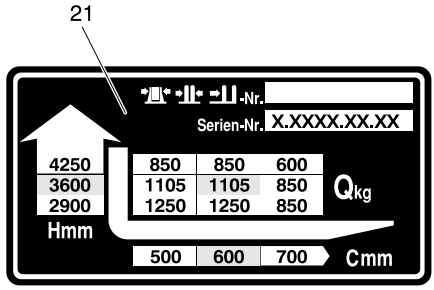
Item	Designation	Item	Designation
29	Type	35	Manufacturer
30	Serial No.	36	Min./max. battery weight in kg
31	Rated capacity in kg	37	Drive power in kW
32	Battery: Voltage V	38	Load centre distance in mm
33	Empty weight without battery in kg	39	Year of manufacture
34	Manufacturer logo	40	Option

☞ In event of queries relating to the truck or spare part orders, please state the serial no. (30) of the truck.

4.2 Load diagram / capacity / load centre / lifting height

The load diagram (21) shows the capacity of the truck in Q kg with the hoist frame in vertical position. The diagram indicates the maximum capacity at a standard load centre* C (in mm) and at the desired lifting height H (in mm) in the form of a table.

*) Apart from the height of the load, the standard load centre also includes the width of the load.



Example showing the determination of the max. capacity:

At a load centre C of 600 mm and a max. lifting height H of 3600 mm, the max. capacity Qkg is 1105 kg.

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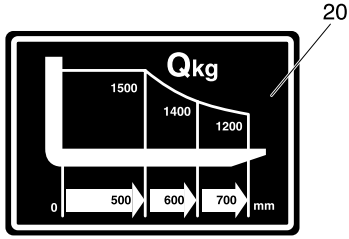
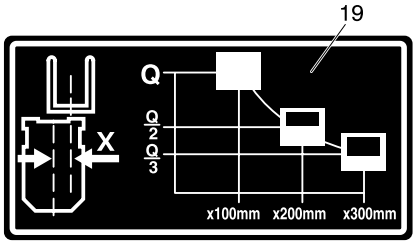
4.3 Load diagram, capacity / load centre / fork

The load diagram (20) shows the capacity Q of the fork in kg. A diagram shows the max. capacity at different load centres (C in mm).



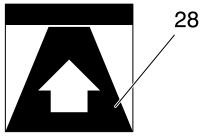
4.4 Load diagram, capacity / lateral traversing device

The load diagram (19) shows the reduced capacity Q in kg with the lateral traversing device extended.



4.5 Pick-up points for lifting jack

For lifting and jacking up the truck (28). (Refer to chapter F)



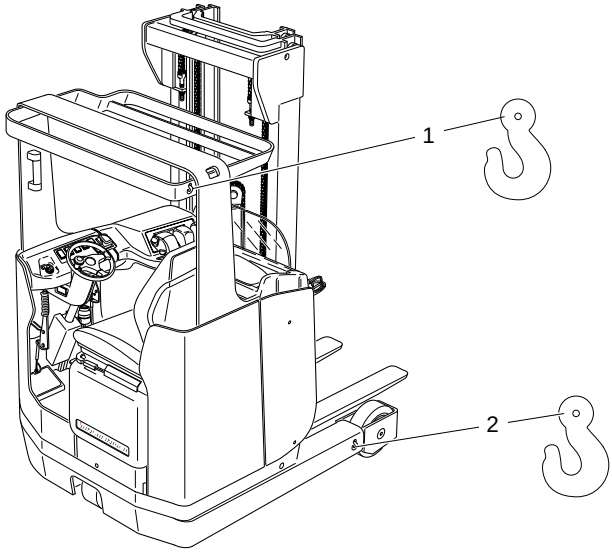
C Transportation and commissioning

1 Loading and unloading of trucks by crane

Ensure that the lifting gear is of adequate capacity (Transportation weight = net weight + battery weight; see truck identification plate)

- To load the truck with lifting gear, lay the loop of the rope around the strut of the overhead guard (1). Two lifting points (2) are provided on the wheel arms.
- Park the truck and render it safe (refer to chapter E).
- Use chocks to prevent the truck from moving!

The lilting gear must be secured to the lifting points in such a way that it does not come into contact with any attachments when the truck is lifted.



2 Commissioning

The truck must only be operated on battery current. Rectified alternate current will damage the electronics. Cables connected to the battery (towing cable) must be less than 6 meters in length.

To prepare the truck for work following delivery or transportation, the following operations must be performed:

- Check that the equipment is complete.
- If necessary, install the battery. Do not damage the battery cable. (Refer to chapter D)
- Charge the battery. (Refer to chapter D)
- Commission the truck as prescribed. (Refer to chapter E)

3 Moving a defective truck

– Secure the towing device to the recovery vehicle and to the truck to be towed away.
– Disconnect the battery connector
– Release the parking brake.

The towed truck must be steered by a person seated on the truck seat. Tow the truck at a walking pace.

As the power steering is not operative, the truck can only be steered with increased effort.

D Battery - servicing, recharging, replacement

1 Safety regulations governing the handling of lead-acid batteries

The truck must be parked and rendered safe, before any operations on batteries are to be undertaken (refer to Chapter E).

Servicing staff: Recharging, servicing and replacing of batteries must only be performed by qualified personnel. The instructions contained in this operating manual, and the instructions as prepared by the battery supplier and as available at the battery recharging station must be observed, when performing the above operations.

Fire protection measures: Smoking and naked flames are not permitted when handling batteries. No inflammable substances or spark-generating materials must be present or stored within a distance of 2 meters of the truck parked for battery recharging. The location must be well ventilated and fire fighting equipment must be kept ready.

Servicing of batteries: The battery cell screw caps must be kept dry and clean. Terminals and cable shoes must be clean, lightly greased with pole grease and must be securely tightened.

Disposal of the battery: Batteries must only be disposed of as stipulated in the national environmental protection regulations or waste disposal provisions. The manufacturer's specifications for the disposal must be heeded.

Before closing the battery hood, make sure that the battery cable cannot be damaged.

Batteries contain dissolved acid, which is toxic and caustic. For this reason protective clothing and goggles must be worn whenever work is undertaken on batteries. Avoid physical contact with battery acid. If clothing, skin or eyes have accidentally come into contact with battery acid, liberally flush the affected parts with clean water. Consult a doctor, when skin or eyes have come into contact with battery acid. Spilled battery acid must be immediately neutralized.

2 Battery type

The batteries are designed in accordance with IEC 254 / EN 60254.
Depending on use, the ETM/V 110-116 can be equipped with different types of batteries:

	Capacity	Standard	Performance-Enhanced
48 V - 2PzS - Battery	220 Ah [1])	220L	240HX
48 V - 2PzS - Battery	280 Ah [1])	280L	300HX
48 V - 3PzS - Battery	330 Ah	330L	360HX
48 V - 3PzS - Battery	420 Ah	420L	450HX
48 V - 4PzS - Battery	560 Ah	560L	600HX
48 V - 5PzS - Battery	700 Ah [2])	700L	750HX

[1]) Only for ETM/V 110
[2]) Only for ETV 116

The battery weights can be seen on the battery identification plate.
Depending on the type of battery used, it is also possible to use models with enhanced performance or maintenance-free batteries.

When replacing or installing batteries, ensure that the battery is correctly secured in the battery compartment of the truck. Battery weight and battery dimensions have a considerable effect on the stability of the truck. Battery type changes are therefore permitted only after obtaining approval from the manufacturer.

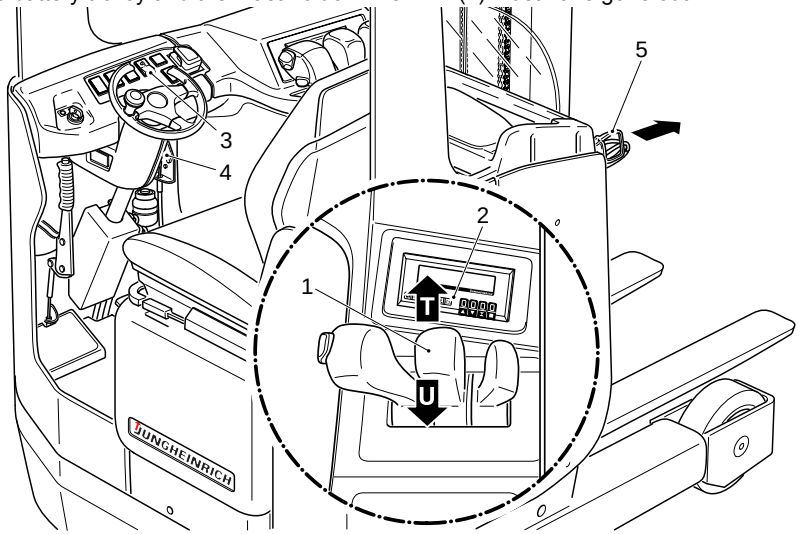
3 Exposing the battery

- Sit on the driver´s seat
- Render the truck ready for operation (refer to chapter E, section 3).
- Tilt the control lever (1) in direction of arrow (U), drive mast holder to its limit stop position towards the battery and release control lever (1) (mast is in final position).
- Tilt the control lever (1) once again in direction of arrow (U) and go on driving mast holder to its limit stop position towards the battery (preparation of battery unlokking).
- Actuate the battery trolley unlocking system (4). The LED (2) lights up.
- Tilt the control lever (1) in the T direction and push the mast holder with the coupled battery trolley forward until the battery is exposed for servicing.
- Switch off the master switch and the key switch.

Connecting and disconnecting of battery connector and socket is permitted only with the master switch and battery charger switched off.

- Withdraw the battery connector (5) from the socket.
- Remove any insulating matting from the batteries.

The safety switch of the battery unlocking system interrupts the driving function as long as the battery trolley is unlocked and the LED (2) is lit. Before commissioning the truck again, the battery trolley must be returned to the original position to uncouple the battery trolley and the mast holder. The LED (2) must have gone out.



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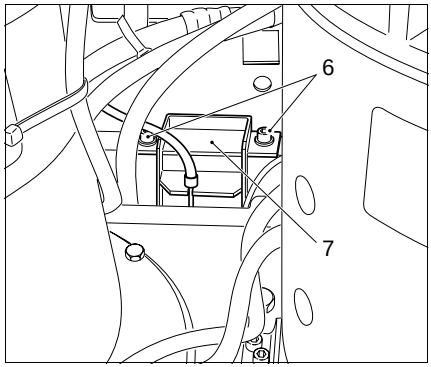
3.1 Bypassing the drive current interruption

– Switch on the switch “Cut-back speed” (3).

If the battery is protruding, the truck may only be driven at cut-back speed in the battery charging station!

3.2 Battery trolley emergency unlocking system



– Render the truck ready for operation (refer to chapter E).
– Tilt control lever (1) in direction of arrow (U), drive mast holder to its limit stop position towards the battery and release control lever (1).
– Tilt control lever (1) once again in direction of arrow (U) and go on driving mast holder to its limit stop position towards the battery.
– Switch off the master switch and the key switch.
– Open seat hood(see chapter F)
– Loosen screws (6) of the battery lokking system and pull out locking system (7).
– Close seat hood.
– Connect master switch and key switch.
– Tilt the control lever (1) in the T direction and push the mast holder with the coupled battery trolley forward until the battery is exposed for servicing.
– LED (2) lights up.
– Disconnect main switch and key switch.

Eliminate the malfunction of the battery unlocking system before mounting the battery locking system.

The safety switch of the battery unlocking system interrupts the driving function as long as the battery trolley is unlocked and the LED (2) is lit. Before commissioning the truck again, the battery trolley must be returned to the original position to uncouple the battery trolley and the mast holder. The LED (2) must have gone out.

4 Charging the battery

– Expose the battery (refer to section 3).

During the recharging operation the tops of the battery cells must be exposed to ensure adequate ventilation. No metal objects must be placed on the battery. Prior to starting the recharging operation, check all cable connections and plugged connections for visible damage.

– Remove any insulating mats from the battery.
– Connect the charging cable of the battery charger to the battery connector (5).
– Recharge the battery observing the instructions provided by the battery supplier and by the battery charger supplier.

All safety instructions as provided by the battery supplier and battery charger supplier must be strictly observed.

5 Removing and installing the battery

– Expose the battery (refer to chapter D, section 3).

Batteries with open poles, or open cell bridges, must be covered with a rubber mat to prevent short-circuiting. When using a crane in battery replacing operations, ensure that the crane is of adequate capacity (refer to the battery weight indicated on the battery identification plate located at the battery trough). The battery must be lifted vertically to prevent crushing of the battery trough. Lifting hooks must be applied in such a way that, with the lifting gear slack, they will not drop on to the battery cells.

Removing and installing the battery using lifting gear

– Secure the lifting gear to the battery trough (8).
– Loosen counternut (10) and screw (11) at the red battery lock (9).
– Pull out the red battery lock (9).
– With the lifting gear attached, lift out the battery and move it to one side.

Installation is in the reverse order of operations.

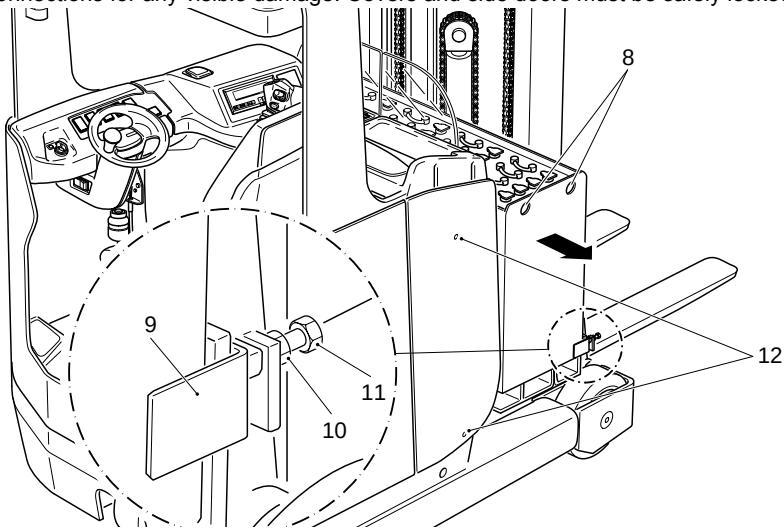
Removing and installing the battery using a battery trolley

The truck must stand horizontally so that the battery does not automatically roll out when the battery safety device is removed.

– Use the service key to open the side door (12).
  (only required for battery capacity 560 Ah for ETM/V 110).
– Loosen counternut (10) and screw (11) at the red battery lock (9).
– Pull out the red battery lock (9).
– Pull the battery laterally onto the battery transport trolley.

Installation is in the reverse order of operations.

When replacing batteries, ensure that a battery of the same type is fitted. Upon completion of the battery refitting operations, check all cable connections and plugged connections for any visible damage. Covers and side doors must be safely locked.



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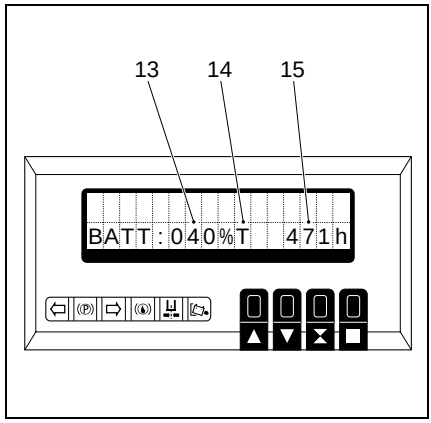
6 Battery discharge indicator, battery discharge monitor and hour meter

Battery discharge indicator: The charging state of the battery (13) is indicated in 10% steps in the LISA display.



⚠ The standard setting of the battery discharge indicator / discharge monitor is made using standard batteries..
When using maintenance-free batteries, the indication has to be adjusted in a way that the symbol (T) (14) comes up behind the percent indication. When this setting is not performed, the battery might suffer damage caused by exhaustive discharge.
Setting of the instrument should be performed by service staff from the manufacturer of the truck.

In case of a rest capacity of the battery of
20% for standard batteries or
40% for maintenance-free batteries, a battery charge is necessary.

Battery discharge monitor: In case of undershooting the rest capacity the lifting function is disconnected. LISA indicates a corresponding message.

☞ Lifting will only become possible again, after the battery has been recharged to at least 70 per cent.

Hour meter: The service hours (15) are indicated besides the charging state of the battery. The hour meter indicates the overall time of the driving and the lifting movements.

E Operation

1 Safety regulations governing the operation of the truck

Driving permission: The truck must only be operated by persons who have been trained in the operation of trucks, who have demonstrated to the user or his representative their capability of moving and handling loads, and who have expressly been charged by the user or his representative with the operation of the truck.

Rights, duties and conduct of the driver: The driver must be: informed of his rights and duties; trained in the operation of the fork-lift truck; and familiar with the contents of these operating instructions. All necessary rights must be granted to him. If the fork-lift truck can be used in the pedestrian-controlled mode, the driver must wear safety boots when operating the truck.

Prohibition of unauthorized use: The driver is responsible for his truck during working time. He must forbid unauthorized persons to drive or operate the truck. The transport or lifting of persons is forbidden.

Damage and defects: Damage or defects noted on the truck or on the attachments must immediately be brought to the notice of the person in charge. Trucks that cannot be safely operated (e.g. due to worn tyres or defective brakes) must not be used until they have been properly repaired.

Repairs: Without specific training and express authorization the driver is not allowed to perform any repairs or modifications on the truck. Under no circumstances must the driver change the setting of switches or safety installations, or render them ineffective.

Danger area: As danger area is considered the area within which persons are endangered by the travelling or lifting movements of the truck or its load lifting devices (e.g. fork or attachments), or by the loads being transported. This includes also the area within reach of dropping loads or dropping truck attachments.

Unauthorized persons must be asked to leave the danger area. The driver must give a warning signal, whenever a situation presenting danger to persons might develop. The truck must immediately be brought to a standstill, if persons, although asked, do not leave the danger area.

Safety devices and warning labels: The safety devices, warning labels and warning notes described in the present operating instructions must always be heeded.

2 Description of the operating controls and indicators

Item	Operating control /indicator		Function
1	Control lever „Inclining of mast“	●	Operates the following function: – Tilting the hoist frame forward / backward
2	Control lever „Inclining of fork“	●	Operates the following function: – Pushing forward / retracting the mast holder
3	Solo-pilot	●	Operates the following functions: – Forward / reverse drive direction – Lifting / lowering the load lifting device – Moving the lateral traversing device to the left / right – Horn key
4	Accelerator	●	Stepless control of the truck travelling speed.
5	Brake pedal	●	Braking of the truck.
6	Foot key	●	– not pressed: The driving and lifting functions, as well as the auxiliary functions, are locked. The lowering function remains functional. The truck rolls to a stop. – pressed: The driving and lifting functions, as well as the auxiliary functions, are released.
7	Driver seat lock	●	Horizontal adjustment of the driver seat.
8	Driver seat weight adjustment	●	Setting of driver weight for optimum seat damping.
9	Backrest adjustment	●	Adjustment of the driver seat backrest.
10	Steering column adjusting mechanism	●	The steering column is adjusted to the required distance and locked in that position.
11	Parking brake	●	Prevents the truck from moving when parked.
12	Battery trolley unlokking system	●	Unlocks the battery trolley.
13	Key switch with key	●	For connection and disconnection of the battery voltage to the truck. – Red key (No. 702): for the user – Grey key (No. 738): for service and workshop
14	Switch - cut-back speed	●	Switches cut-back speed on and off.

● = Standard equipment	○ = Optional equipment

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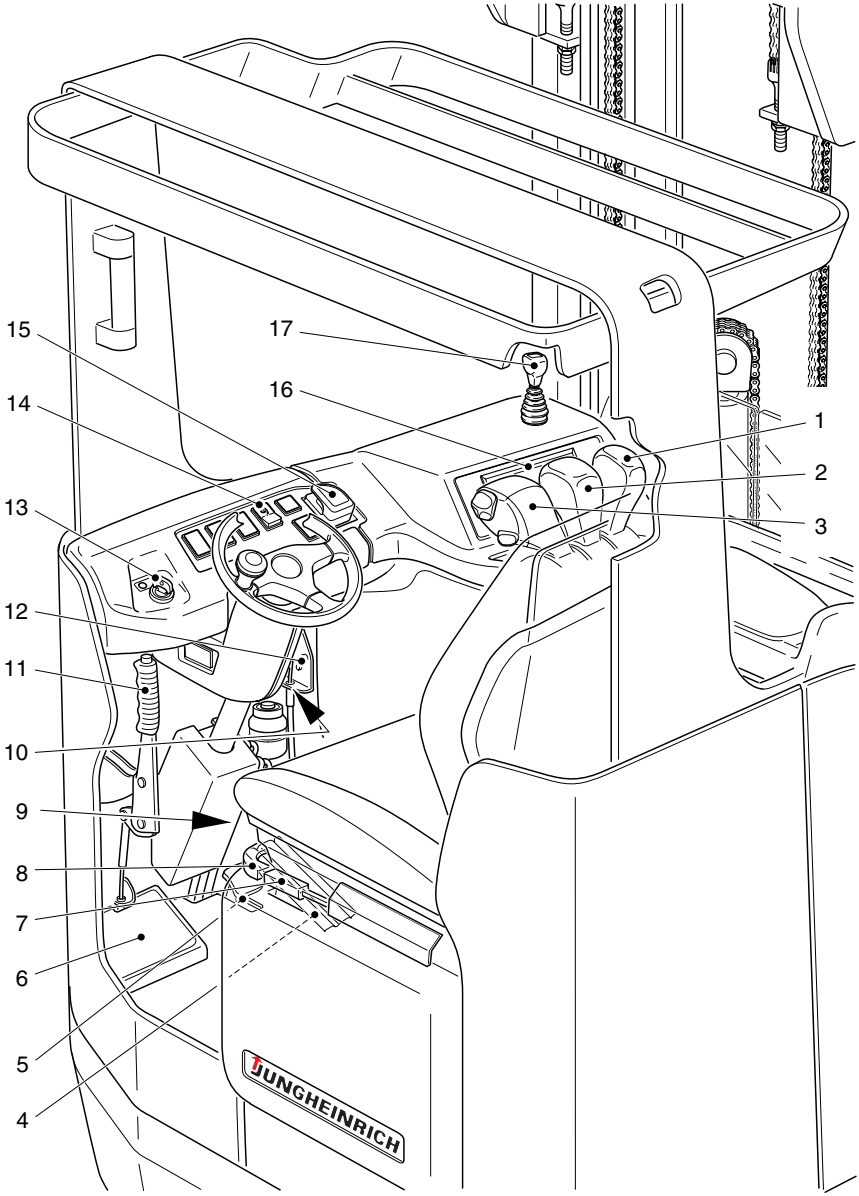
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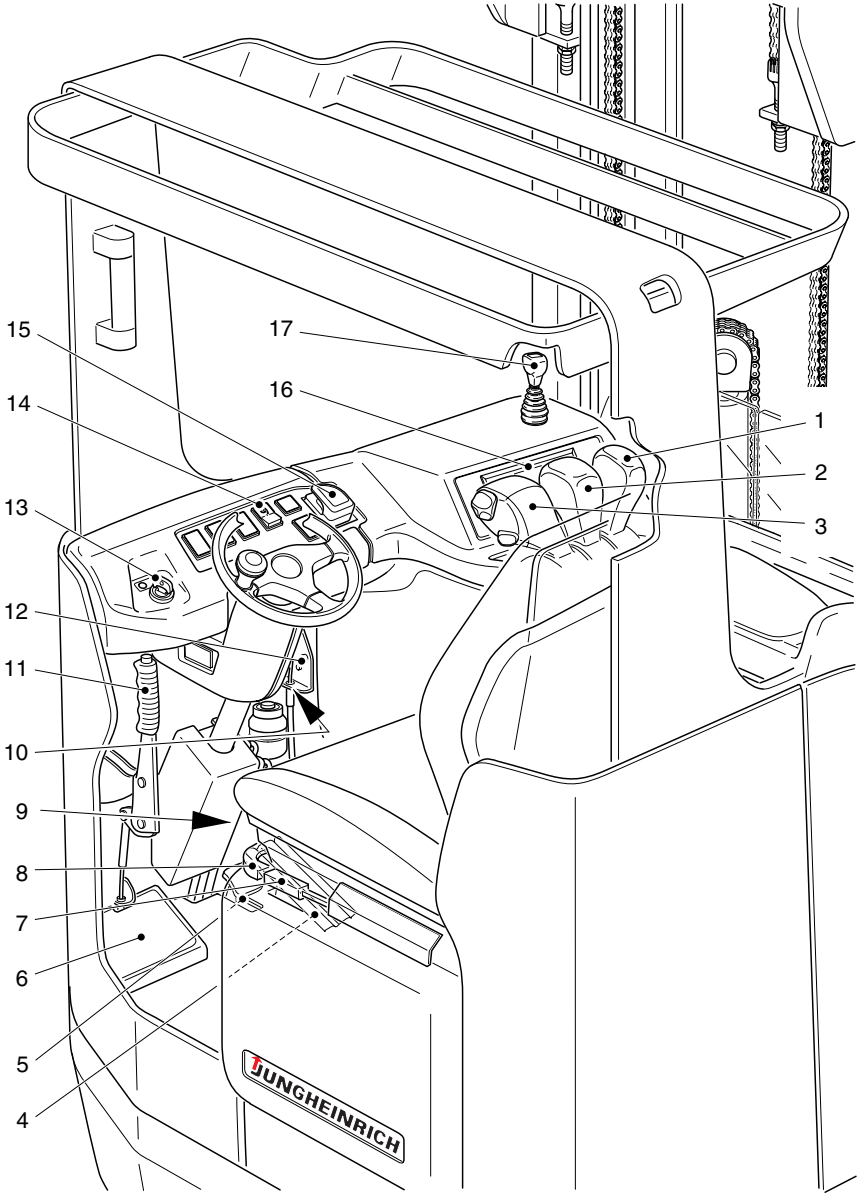
Item	Operating control /indicator		Function
15	Master switch (emergency stop)	●	The circuit is interrupted, all electrical functions are switched off and automatic braking of the truck is triggered.
16	Information and service display (LISA)	●	Display of essential driving parameters, lifting parameters, warning signals, operating error indications and service indications
17	Control lever ZH 2	○	Controls the second auxiliary hydraulic system.

● = Standard equipment	○ = Optional equipment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3 Start-up of truck

The driver must make sure that nobody is within the danger area of the truck, before the truck is switched on or operated, or before a load is lifted.

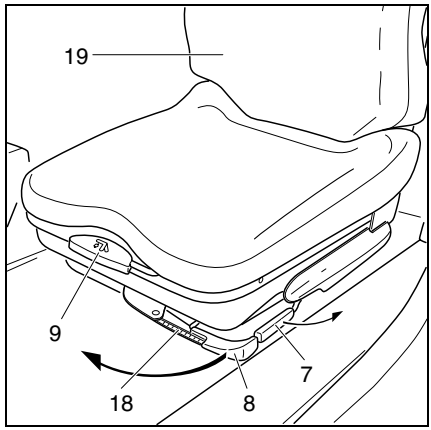
Checks and operations to be performed before starting daily work

- Perform a visual check of the entire truck (especially wheels and load lifting equipment) for visible damage.
- Check the load chains for uniform tension.
- Visually check the security of the battery and the cable connections.

Adjusting the driver seat

To ensure optimum shock absorption, the driver seat must be adjusted to the weight of the driver.
The driver seat must not be occupied while being adjusted to the driver weight.

Setting the driver weight:
- Pull the lever (8) in the direction indicated by the arrow and release it again.



The previously set driver weight is reset to the minimum value. Setting range for the shock absorption: 50 kg to 130 kg.

- Pull the lever (8) again in the direction indicated indicated by the arrow until reaching the appropriate weight mark on the scale (18). Then release the lever again.
- Sit down on the driver seat.

Do not reach between the seat and the chassis wall/overhead guard.

Adjusting the backrest:
- Pull the locking lever (9) upward and adjust the inclination of the backrest (19).
- Release the locking lever again, the backrest is locked in position.

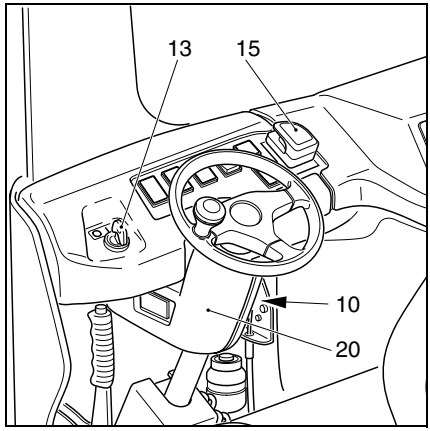
Adjusting the seat position:
- Pull the locking lever (7) of the driver seat locking system outward and move the driver seat forward or backward to a comfortable position.
- Let the locking lever (7) engage again.

The driver seat locking system must be properly engaged in the set position. The position of the seat must not be changed while driving!

The driver seat adjusting mechanism shown relates to the standard version. For all different designs the adjusting instructions as supplied by the manufacturer apply.
When performing the seat adjustments, ensure that all operating controls are within easy reach.

Adjusting the steering column

– Release the steering column locking mechanism (10) and adjust the inclination and the height of the steering column (20) as required.
– Tighten steering column locking mechanism.



Switching on the truck

– Pull up the master switch (15).
– Insert the key in the key switch (13) and turn clockwise against the stop to position "I".
– Check the horn for proper function.
– Check the brake pedal and the parking brake for correct functioning (refer to chapter E, section 4.2).

The truck is now ready for operation. The battery discharge monitor shows the current battery capacity.

3.1 How to use the safety belt ○

STOP Read this section completely before starting up the floor conveyor.

– Fasten the belt before performing any movement of the floor conveyor.
– Adjust the belt height setting (49) according to your size.

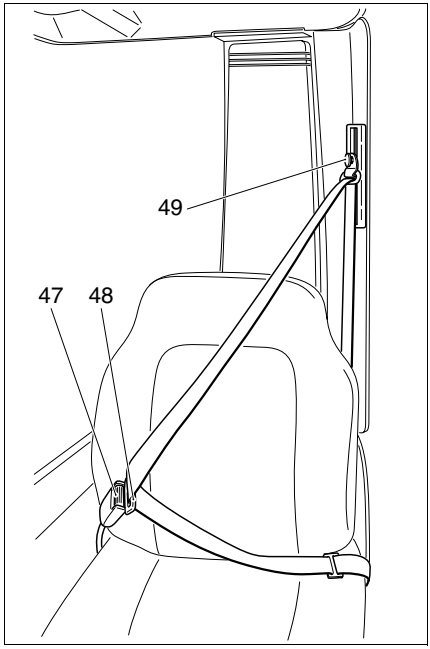
STOP The belt protects you against severe injuries.

– If the belt buckle (47) or the belt reel-up device is frozen in, let it thaw and dry.

⚠ The temperature of the warm air-stream must not exceed +60°C.

STOP Do not modify the safety belt.

– After an accident has occurred, check the safety belt and the seating cover for damages. Exchange them, if required.
– Damaged or not fully functioning safety belts may only be exchanged by contract dealers or branches.
– Only original spare parts may be used for upgrading or repairs.

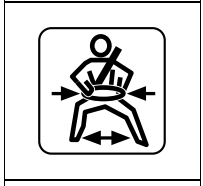


○ Behaviour in unusual situations

⚠ Proceed as follows, if there is danger of the floor conveyor tipping over.

– Press the upper part of your body against the the backrest.

– Keep both hands at the steering wheel and use your feed for additional support.



– Bend your body against the falling direction.

○ Operating instruction of the safety belt

Before starting up the floor conveyor, pull the belt continuously out of the reel-up device and let it catch in with the belt fitting tight to your body.

STOP The belt must not be twisted when being fastened.

When operating the floor conveyor (e.g. driving, lifting, lowering, etc.) always try to sit with your back having contact with the backrest.

The locking mechanism of the reel-up device permits enough freedom of motion when sitting.

STOP If you are sitting on the front edge of the seat, protecton will decrease due to the belt band being too loose.

☞ Use the belt only for protecting one person.

– After using the belt, press the red button and direct the belt locking tongue back to the reel-up device with your hand.

○ Behaviour for starting up the floor conveyor on steep slopes

The locking mechanism blocks the belt drawing mechanism if the floor conveyor is parked on a steep slope. The belt can no longer be pulled out of the reel-up device.

☞ Drive the floor conveyor carefully out of its slope position and fasten the belt.

4 Truck operation

4.1 Safety regulations applicable when operating the truck

Driving lanes and work areas: Only such lanes and routes that are specially allocated for truck traffic must be used. Unauthorized persons must stay away from work areas. Loads must only be stored at places specially provided for this purpose.

Driving conduct: The travelling speed must be adapted to the prevailing local conditions. The truck must be driven at slow speed when negotiating bends or narrow passages, when passing through swing doors and at blind spots. The driver must always observe an adequate braking distance between his truck and the vehicle in front and he must be in control of his truck at all times. Sudden stopping (except in emergencies), rapid U-turns and overtaking at dangerous or blind spots is not permitted. It is forbidden to lean out of or reach beyond the working and operating area.

Visibility: The driver must look in the direction of travel and must always have a clear view of the route ahead. When loads blocking the view are carried, the ETM/V 10-12 must be driven with the load at the rear. If this is not possible, a second person must walk in front of the truck to give suitable warnings.

Negotiating slopes and inclines: Negotiating of slopes and inclines is permitted only, when they are recognized lanes, when they are clean and non-slipping, and when the technical specification of the truck permits safe driving on such slopes or inclines. Loads must always be carried at that end of the truck facing uphill. U-turns, cutting obliquely over slopes or inclines and parking of the truck on slopes or inclines is not permitted. Inclines must only be negotiated at slow speed with the driver ready to brake at any moment.

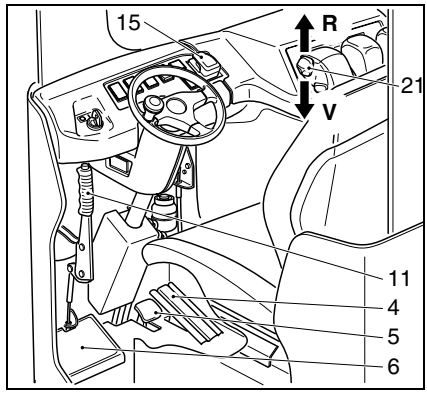
Use of lifts and driving on loading platforms: Lifts and loading platforms must only be used, if they are of adequate load bearing capacity, if suitable for driving on, and if authorized by the user of the truck for truck traffic. The truck driver has to satisfy himself accordingly before driving into lifts or on to loading platforms. The truck must enter lifts with the load in front and must take up a position which does not allow it to come into contact with the walls of the lift shaft. Persons riding in the lift together with the truck must only enter the lift after the truck has come safely to a standstill, and must leave the lift before the truck.

Nature of the loads carried: Only loads that have been safely and correctly secured must be carried. Never transport loads stacked higher than the top of the fork carriage, or stacked higher than the guard grille.

4.2 Driving, steering, braking

Emergency cut-out

– Depress the master switch (15).
This will switch off all electric functions. Functioning of the switch must not be affected by object placed on it.



Driving

STOP Do not drive the truck unless the hoods are closed and locked in the stipulated manner.

The main direction of travel is in the direction of the drive (V). Be especially careful when driving in the direction of the load (R).

☞ The truck should only be driven in the direction of the load (R) for positioning purposes and for picking up or depositing loads.

– Render truck ready for operation (refer to section 3).
– Release the parking brake (11).
– Set the travel direction switch (21) to the desired travelling direction (V) or (R).
– Press the accelerator pedal (4) and the foot key (6).
The truck will now move in the selected direction.

STOP The foot key (6) prevents the operator's foot from protuding beyond the truck's contour while driving.
If it is not pressed, all electrical func-tions except for the steering, the information and service display (LISA), the horn and the battery discharge indicator are deactivated.
The truck rolls to a stop.
The lowering function remains functional.

☞ The travelling speed is controlled by means of the accelerator (4).

Steering

When the steering wheel is actuated, the steering booster is automatically switched on and the position of the drive wheel is set accordingly.

● Contradirectional steering (standard version)
When travelling forward (travel direction switch (21) set to V = drive direction), turning the steering wheel to the left results in a left turn and turning the wheel to the right in a right turn.
The position of the drive wheel is shown on the LISA display.

○ Synchronized steering
When travelling forward (travel direction switch (21) set to V = drive direction), turning the steering wheel to the left results in a right turn and turning the wheel to the right to a left turn.
The position of the drive wheel is shown on the LISA display.

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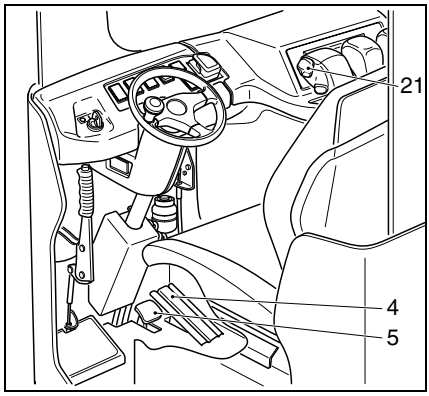
Braking

The braking behaviour of the truck strongly depends on the state of the floor. This must be taken into account by the driver for his driving behaviour.

The truck can be braked in three ways:
– by counter-current braking,
– by coasting, or by
– using the service brake.



If the truck is operated by several drivers (for instance in multi-shift operations), the braking and travelling behaviour of the truck must be checked, when the parameters are individually set. Check the truck reactions when taking over the truck.

Counter-current braking:
– Change over the travelling direction switch (21) during travel to the opposite driving direction. The truck is then braked by the drive current control system until movement in the opposite direction commences.

This mode of braking reduces energy consumption, as it involves energy recovery via the drive current control system.

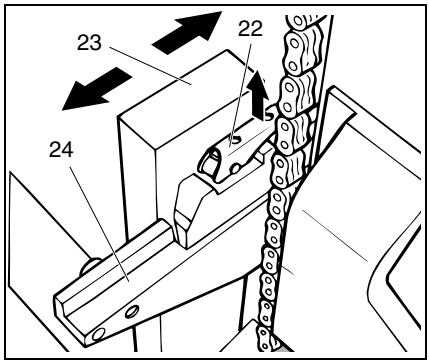
Braking by coasting:
– Slowly release the accelerator pedal while driving. The truck is braked by the drive current control according to the position of the accelerator pedal.

Braking using the service brake:
– Depress the brake pedal (5).

The truck is braked hydraulically by means of a drum brake (respectively additional load wheel brakes for ETV 116).

4.3 Adjusting the fork tines

To ensure safe picking up of loads, the tines should be apart as far as possible and set centrally to the truck. The load centre must be located centrally between the fork tines.



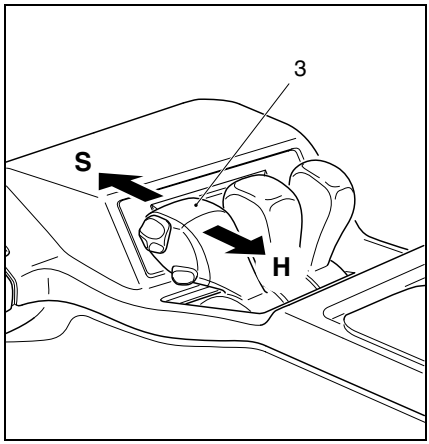
– Swivel the locking lever (22) upwards.
– Push the fork tines (23) along the fork carrier (24) to the required position.
– Swivel the locking lever downwards and deplace the fork until it engages a groove.

4.4 Picking up and setting down loads

Before picking up a load, the driver has to check that the load rests properly on its pallet and that it does not exceed the capacity of his truck.

– Pass the fork tines as far as possible under the load.

Lifting



Persons must not be allowed to stand under raised forks.

Pull the solo-pilot (3) in the H direction.

The inclination angle of the control lever controls the lifting speed.

– Do not release the solo-pilot until the desired lifting height has been reached.

If the fork moves against the end stop (audible noise emitted by the pressure limiting valve), the multi-pilot stick must immediately be returned to its neutral position.

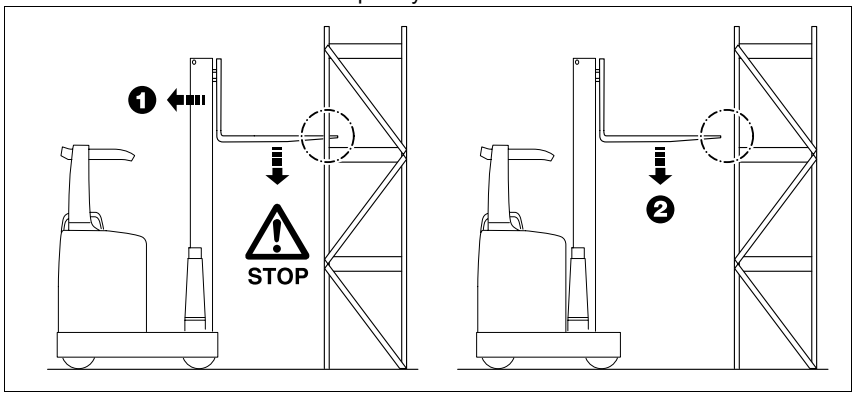
Lowering

– Push the solo-pilot (3) in the S direction.

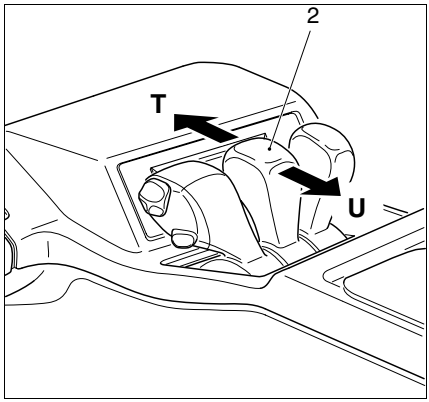
The inclination angle of the solo-pilot controls the lowering speed.

Avoid impacting of the load to prevent damage to the load and to the racking.

The fork must be free before they can be lowered from the rack.
Do not start before the fork is completely lowered.



Pushing the mast holder forward



Do not reach between the mast and the battery hood.

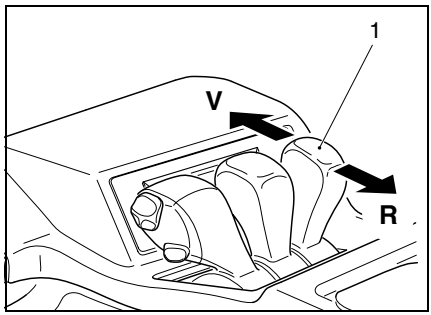
– Tilt the control lever (2) in the T direction to push the mast holder forward and in the U direction to retract it.

The inclination angle of the control lever controls the traversing speed.

Transport runs with or without load must only be performed with the mast holder retracted, the hoist frame tilted backwards and the load lifting device lowered.

Mast tilting

– Move control lever (1) in direction (V) for front inclining and in direction (R) for back inclining.



4.5 Picking up, lifting and transporting of loads

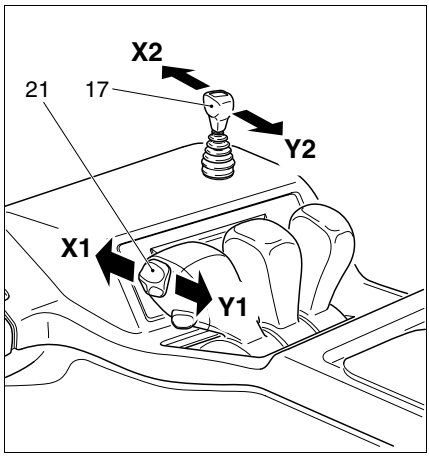
– Tilt the control lever (2) in the V or the R direction to bring the fork tines into a horizontal position.
– Move the truck up to the load.
– Tilt the control lever (2) in the T direction to push the mast holder forward.
– Pull the solo-pilot (3) in the H direction to lift the fork tines to the appropriate height.
– Move the fork tines under the load.
– Pull the solo-pilot (3) in the H direction to lift the load clear.
– Tilt the control lever (2) in the U direction to retract the mast holder.

Transport runs with or without load must only be performed with the mast holder retracted, the hoist frame tilted backwards and the load lifting device lowered.

– Press the solo-pilot (3) in the S dir. to lower the load to the transport position.
– Pull the control lever (2) in the R direction to tilt the load backward.
– Transport the load to the required location.
– Press the control lever (2) in the V direction to bring the load into the horizontal position.
– Bring load to the desired height: Pull the solo-pilot (3) the H direction, if necessary, tilt the control lever (2) the T direction in order to extraxt the mast holder.
– Press the solo-pilot (3) in the S direction to set down the load.
– Pull the control lever (3) in the U direction to retract the mast holder.

4.6 Operating an attachment

○ **Integrated lateral traversing device**



☞ The directions “to the left” and “to the right” refer to the load lifting device as seen from the operator’s position.

Moving the lateral traversing device to the left:
– Press the switch (21) in the X1 direction.

Moving the lateral traversing device to the right:
– Press the switch (21) in the Y1 direction.

STOP Reduced capacity must be taken into account when traversing of load is required (refer to chapter B, section 4.4).

○ **Hydraulic attachments**

The control lever (17) controlling the functions (X2) and (Y2) is provided for the operation of a hydraulic attachment. (Refer to the operating instructions provided by the manufacturer).

STOP Check the capacity of the respective attachment.

STOP Observe load chart for the truck with attachment and the truck and attachment operator manuals.

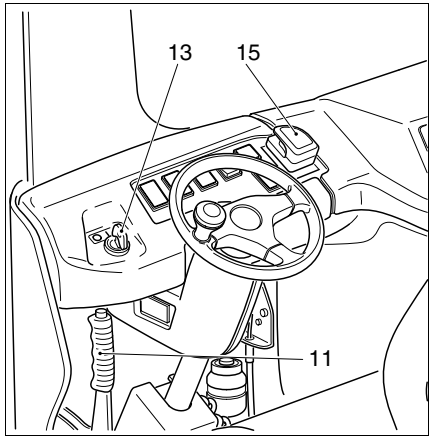
– The attachment must only be operated by trained and authorised personnel.
– Any operation that could affect safety must be prohibited.
– The attachment must only be operated when fully functional.
– Check the attachment for visible signs of damage at least once a shift.
– Report any signs of damage immediately.

4.7 Rendering vehicle safe when parking

When the vehicle is parked and left unattended, it has to be rendered safe, even if it is left unattended for only a short period of time.

Never park the truck on a slope or incline. The load lifting device must always be completely lowered.

- Press the parking brake switch (11).
- Completely lower the load lifting device and move it to a horizontal position.
- Completely retract the mast holder.
- Depress the master switch (15) to the position "OFF".
- Switch the key switch (13) to the position "0" and remove the key from the key switch.



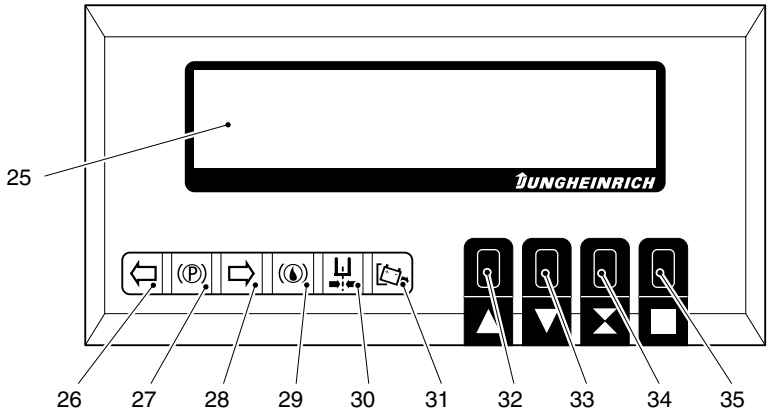
5 Information and service display (LISA)

The display (25) of the LCD information and service display (LISA) shows the operation data, the battery charge, the service hours as well as service data and diagnostical data. Below the display there are six LEDs (26) - (31). The keyboard (four keys (32) - (35) serves for the selection, the reading and the modification of vehicle parameters.

The vehicle is delivered with two different keys:

for the user	Key code: 702 (red): Use of vehicle possible, LISA only displays current driving data.
for service / workshop	Key code: 738 (grey): Use of vehicle possible, LISA allows modifications of vehicle parameters in the user mode (see section 5.4).

Modifications in the service mode must only be performed by authorized service personnel of the manufacturer!



5.1 LED warning lamps

Six red light-emitting diodes indicate the following states:

Item		Function
26		Direction of motion forward (drive direction) (green LED)
27		Parking brake applied (red LED)
28		Direction of motion backward (load direction) (green LED)
29		Brake liquid level too low (red LED)
30		Lateral traversing device in center position (green LED)
31		Battery unlocked (red LED)

5.2 Key assignment

Item		Function
32		Double function - incremental increase of the selected parameter - selection of the individual menu items in ascending order
33		Double function - incremental decrease of the selected parameter - selection of the individual menu items in descending order
34		Double function - release of a selection menu from the main menu - acknowledging a query with "NO" -> "**x**"
35		Quadruple function – exiting from a selected menu point – storing of modified parameters – acknowledging a query with "YES" -> "■" – Display change between „service hours“ / „time“

5.3 Displays

The display shows operating data and fault messages. The user menu permits the setting of the following driving parameters:

Here the time between max. operation of the controller and 100 % control by the electronics is set.

When releasing the controller, the drive current control system will start braking the truck. The value is between 0% (rolling to a standstill) and a max. value, which is equal to the minimum value for counter-current braking.

The setting of the counter-current brake affects braking when changing direction. Actual braking when changing direction is also a function of the accelerator position.

Adjustment of maximum speed in drive wheel direction af motion.

Adjustment of maximum speed in drive wheel direction af motion when actuating the slow speed switch.

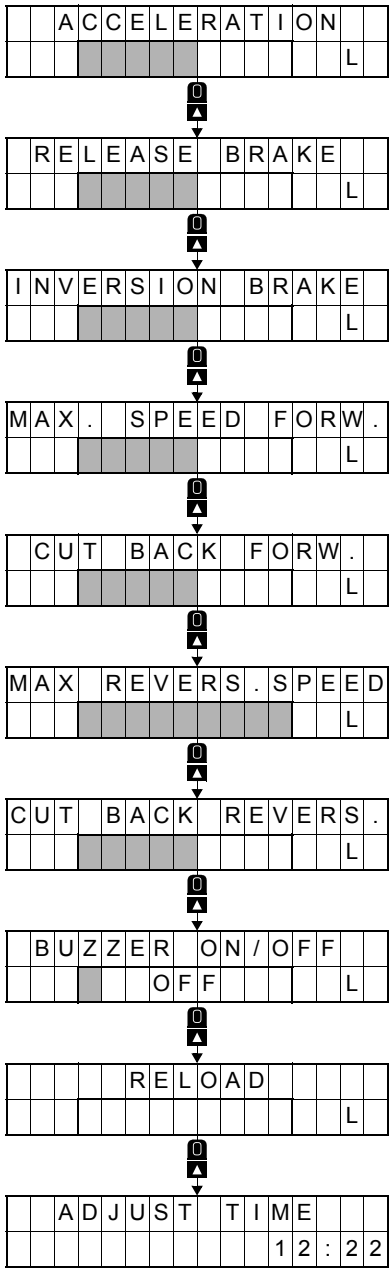
Adjustment of maximum speed in load part direction af motion.

Adjustment of maximum speed in load part direction af motion when actuating the slow speed switch.

Issues an acoustic alarm in case of operating errors.

Preset values can be called up and adjusted.

Time adjustment.
Select hour or minute with key 34. Modify adjustment with keys 32 and 33.



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5.4 Changing truck parameters

Changing of truck parameters will also change the driving behaviour of the truck. This must be taken into account when commissioning the truck!Parameters may only be changed while the truck is at a standstill and no lifting movements are performed.

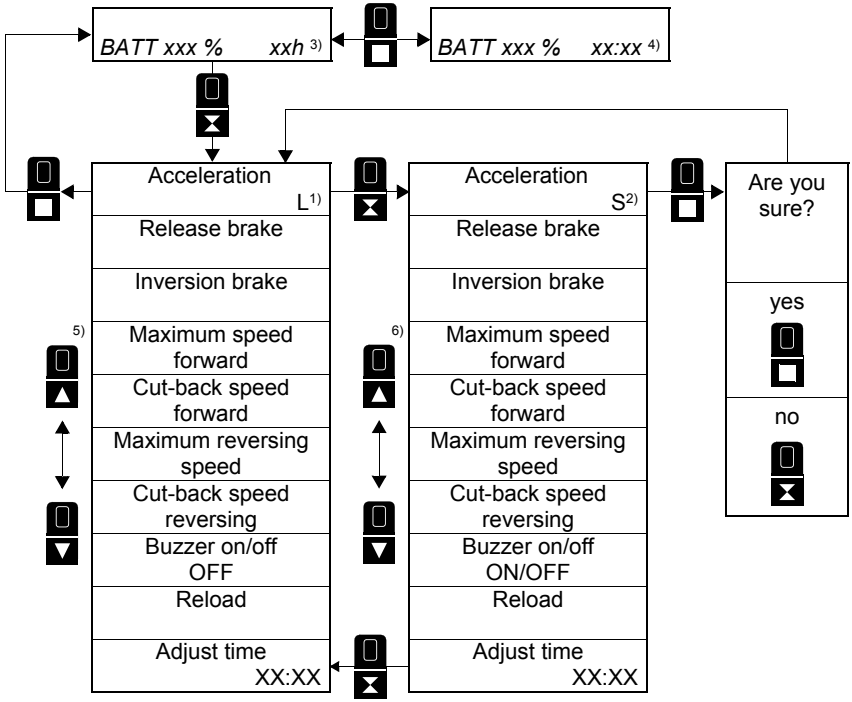
– Commission the truck (refer to chapter E, section 3).
  Insert key (738) into key switch and turn to the right until reaching the limit stop.

The display shows the user menu with vehicle name for about three seconds, after that the battery charge and the service hours are indicated.

– Press the selection menu key (34).

The display shows „acceleration" with the corresponding parameter.

– To view or change the truck parameters, proceed in accordance with the following diagram.
– Moving between the 10 setting parameters is effected by means of the keys (32) and (33).



1) L = Operating parameters are read out (Reading mode)
2) S = The chosen operational parameter can be modified (Writing mode)
3) Service hours display
4) Time display
5) Selection of parameters
6) Changing parameters

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6 Fault locating operations

This chapter enables the user to locate and to remedy simple faults or the consequences of operating errors. Fault locating operations should be performed in the order as set out in the table below.

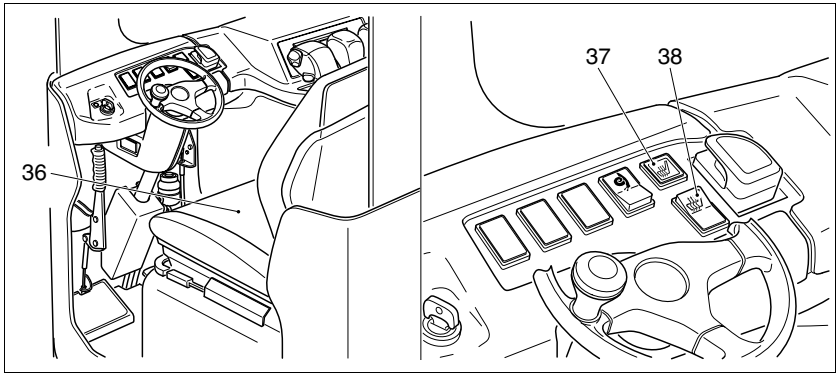
Fault	Possible cause	Remedy
Truck does not move	Battery connector not connected	Check the battery connector, or connect, if required
	Master switch depressed	Release the master switch
	Key switch in position "0"	Switch the key switch to position "I"
	Battery charge too low	Check the charge condition of the battery and recharge if required
	Defective fuse	Check fuses
	Parking brake applied	Release the parking brake
	Foot switch not pressed	Press foot switch
Load cannot be raised	Truck not operative	Perform all remedial actions indicated under fault "Truck does not move"
	Hydraulic oil level too low	Check the hydraulic oil level
	Battery charge too low, lift cut-out active	Check the charge condition of the battery and recharge if required
	Defective fuse	Check fuses
	Load too high	Comply with maximum load (see nameplate)

☞ If the fault could not be eliminated after performing the "troubleshooting procedures", contact the customer service of the manufacturer since all follow-up troubleshooting can only be performed by specially trained and qualified service staff.

7 Auxiliary electrical systems

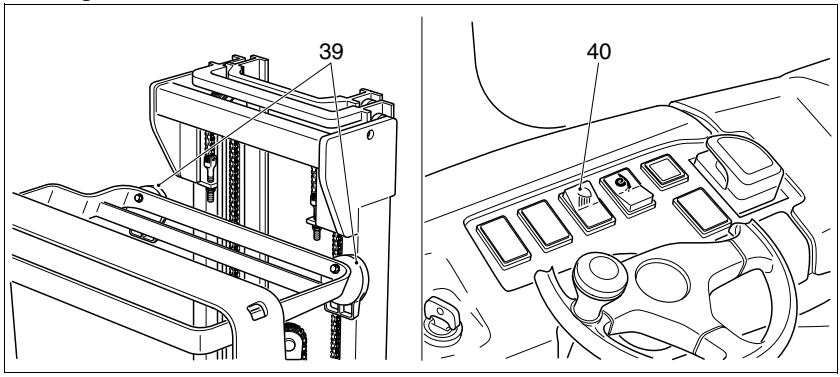
7.1 Seat heating

☞ All auxiliary electrical systems are activated regardless of the key switch position. The battery master switch must have been switched on (see section, “Switching on the truck”). To prevent discharge of the battery after the truck has been parked, always heed section, “Rendering vehicle safe when parking”.



Item		Designation
36	◯	Heatable seat surface (fabric or imitation leather)
37	◯	Control lamp - seat heating
38	◯	Switch - seat heating ON/OFF

7.2 Floodlight



Item		Designation
39	◯	Floodlight
40	◯	Switch - floodlight ON/OFF

☞ The floodlight is equipped with a joint that can be swivelled in all directions.

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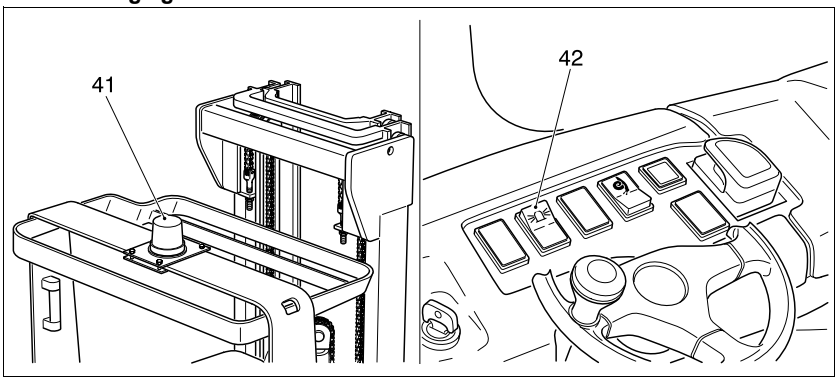
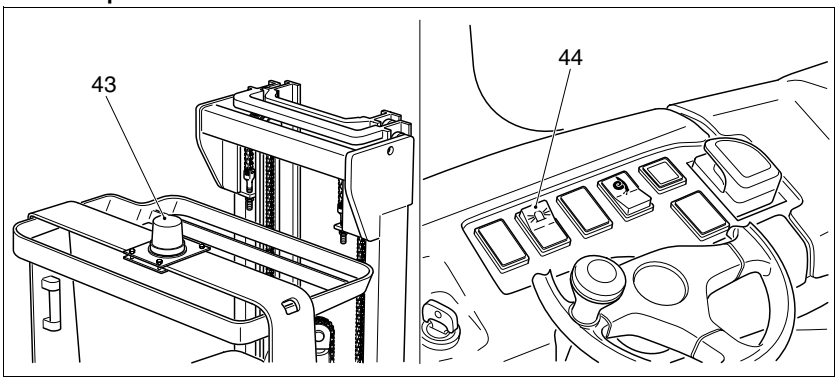
7.3 360° warning light



Item		Designation
41	◯	360° warning light
42	◯	Switch - 360° warning light ON/OFF

7.4 Flash lamp

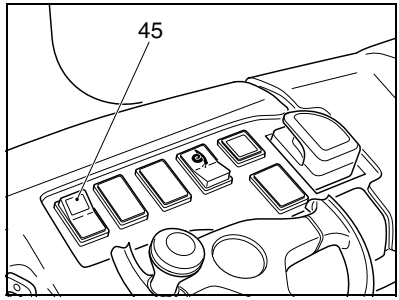


Item		Designation
43	◯	Flash lamp
44	◯	Switch - flash lamp ON/OFF

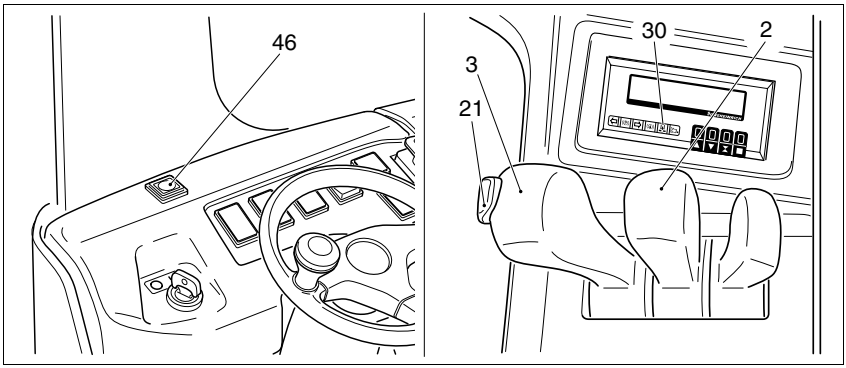
7.5 DC/DC transformer on/off switch

Switches the DC/DC transformer 48/24V or 48/12V respectively on or offOverride button (ESA / Electrical lifting limitation)

Item		Designation
45	○	Switch DC/DC transformer.



7.6 Override switch ESA



Item		Designation
46	○	Override switch

○ **Bridge switch**

Lateral traversing device

When the mast slide is below the safety height in front of the wheel arms, the mast slide retraction movement is blocked by limit switches.

When the lateral traversing device is between the wheel arms and below the safety height, the lateral traversing movement is blocked by limit switches.

The blocking of the mast holder retraction movement and the lateral traversing device movement, respectively, performed by the safety switch (ESA), can be bridged by pressing the bridge switch (46) and simultaneous use of the control lever (2) or the pushbutton (21), respectively.

Lifting limitation

When the mast slide reaches the adjusted disconnection height, further lifting movements are blocked. It is possible to surpass the disconnection height by pressing the bridging switch (46) and simultaneous use of the control lever (3).

7.7 LED Lateral traversing device in centre position

When the lateral traversing device is out of the centre position, and the mast slide is below the safety height in front of the wheel arms, the mast slide retraction movement is blocked by limit switches. The mast slide retraction movement is unblocked when the green LED (30) lights up.

When the lateral traversing device is between the wheel arms and below the safety height, the lateral traversing movement is blocked by limit switches. It unblocks when the mast slide is lifted above the safety height.

F Maintenance of the fork-lift truck

1 Operational safety and environmental protection

The checks and servicing operations contained in this chapter must be performed in accordance with the intervals as indicated in the servicing checklists.

Modifications of fork-lift truck assemblies, especially of the safety installations, are not permitted. On no account must the operational speeds of the truck be changed.

Only original spare parts have been certified by our quality assurance service. To ensure safe and reliable operation of the fork-lift truck, only spare parts of the manufacturer must be used. Used parts, oils and fuels must be disposed of in accordance with the applicable environmental protection regulations. For oil changes, the oil service of the manufacturer is available to you.

Upon completion of any checking and servicing activities, the operations contained in the section “Recommissioning” must be performed (refer to chapter F).

2 Safety regulations applicable to truck maintenance

Servicing and maintenance personnel: The fork-lift truck must only be serviced and maintained by trained personnel of the manufacturer. The service organization of the manufacturer has external technicians trained especially for these assignments. We thus recommend signing a maintenance contract with the relevant service location of the manufacturer.

Lifting and jacking up: When a fork-lift truck is to be lifted, the lifting gear must only be secured to the points specially provided for this purpose. When the truck is to be jacked up, suitable measures must be taken to prevent the truck from slipping or tipping over (use of wedges, wooden blocks). Work underneath the raised load lifting device must only be carried out when the fork is immobilised and supported by a chain of adequate strength.

Cleaning operations: No inflammable liquids must be used when cleaning the fork-lift truck. Prior to commencing cleaning operations, all safety measures that are required to prevent sparking (e.g. by short-circuits) have to be taken. For battery-operated fork-lift trucks, the battery plug must be removed. Only weak indraft, weak compressed air and non-conducting, antistatic brushes must be used for the cleaning of electric or electronic assemblies.

If the fork-lift truck is to be cleaned using a water jet or a high-pressure cleaner, all electric and electronic components must be carefully covered beforehand because moisture can lead to incorrect functioning.
Cleaning by means of a steam jet is not permitted.

Upon completion of cleaning work, the operations detailed in the section “Recommissioning” must be performed.

Work on the electric system: Work on the electric system of the truck must only be performed by personnel specially trained for such operations. Before commencing any work on the electric system, all measures required to prevent electric shocks have to be taken. For battery-operated fork-lift trucks, the truck must also be depowered by removing the battery plug.

Welding operations: To prevent any damage to electric or electronic com-ponents, these have to be removed from the fork-lift truck before any welding operations are undertaken.

Settings: When repairing or replacing hydraulic, electric or electronic compo-nents or assemblies, all truck-specific settings have to be retained.

Tyres: The quality of the tyres greatly affects the stability and the driving behaviour of the fork-lift truck. Changes must only be made following consultations with the manufacturer. When replacing wheels or tyres, it must be ensured that the fork-lift truck remains level (tyres and wheels must always be replaced in pairs, i.e. left and right together).

Lift chains: The lift chains wear rapidly if not lubricated. The intervals in the service checklist apply to normal duty. If requirements are higher (dust, temperature), lubrication is required more often. The specified chain spray must be used as specified. The external application of grease does not provide sufficient lubrication.

Hydraulic hoses: The hoses must be renewed every six years. When replacing hydraulic components, also renew the hoses in this hydraulic system.

3 Servicing and inspection

Thorough and expert servicing is one of the most important preconditions for safe operation of the fork-lift truck. The neglect of regular servicing intervals can lead to fork-lift truck failure and constitutes a potential hazard to personnel and equipment.

⚠ The indicated servicing intervals are based on single-shift operation under normal operating conditions. For applications in dusty environments, or involving large temperature fluctuations or multiple-shift operation, the servicing intervals must be shortened accordingly.

The following servicing checklist indicates the operations to be performed and the respective intervals to be observed. The servicing intervals are defined as follows:

W1 = Every 50 operating hours, but at least once per week
M3 = Every 500 operating hours, but at least every 3 months
M6 = Every 1000 operating hours, but at least every 6 months
M12 = Every 2000 operating hours, but at least every 12 months

In the running-in phase of the truck, the following additional operations have to be carried out:

After the first 100 operating hours:
– Check the wheel nuts for security and retighten, if required.
– Check the hydraulic connections for leaks and retighten, if required.
– Check steering chain tension, adjust if necessary.

After the first 500 operating hours:
– Replace the hydraulic oil and the filter cartridge.

4 Maintenance Check

			Maintenance intervals			
			W	M	M	M
		standard = ● cold store = ✳	1	3	6	12
Chassis and superstruct.:	1.1	Check all load bearing elements for damage		●		
	1.2	Check all bolted connections		●		
	1.3	Check driver's protective roof and load guard for secure fastening	✳	●		
Drive unit:	2.1	Check the transmission for noises and leakage		●		
	2.2	Check whether the drive support plate and screws are fitted tightly		●		
	2.3	Check the transmission oil level		●		
	2.4	Check the mechanical pedal linkage; adjust, if necessary		●		
	2.5	Change the transmission oil			✳	●
Wheels:	3.1	Check for wear and damage	●			
	3.2	Check the wheel bearings and ensure secure fastening of wheels	✳	●		
Steering:	4.1	Check the steering chain and chain sprocket for wear, adjust and grease	✳	●		
	4.2	Check mechanical parts of the steering head		●		
	4.3	Check the steering for correct function and adjustment		●		
	4.4	Check the hydraulic assemblies for correct functioning and leakage		●		
	4.5	Check and, if necessary, adjust the steering angle limiter		●		
Brake system:	5.1	Check the brake linings for wear		●		
	5.2	Performance and adjustment check	✳	●		
	5.3	Check the brake linkage, adjust and grease, if necessary	✳	●		
	5.4	Check the brake lines and connections		●		
	5.5	Change the brake fluid			✳	●
	5.6	Check brake cable of the parking brake and replace it, if necessary		●		
Hydraulic system:	6.1	Performance check	✳	●		
	6.2	Check all connections for leakage and damage	✳	●		
	6.3	Check hydraulic cylinders for leakage, damage and secure attachment	✳	●		
	6.4	Check the oil level	✳	●		
	6.5	Replace the hydraulic oil, the filter cartridge and the vent filter			✳	●
	6.6	Check the hose run for correct functioning and damage	✳	●		
	6.7	Check the pressure relief valves for correct functioning			✳	●
	6.8	Remove and rinse the coarse strainer in the control valve		●		

☞ The maintenance intervals refer to normal service conditions. In case of aggravated conditions, the intervals must be reduced as required.

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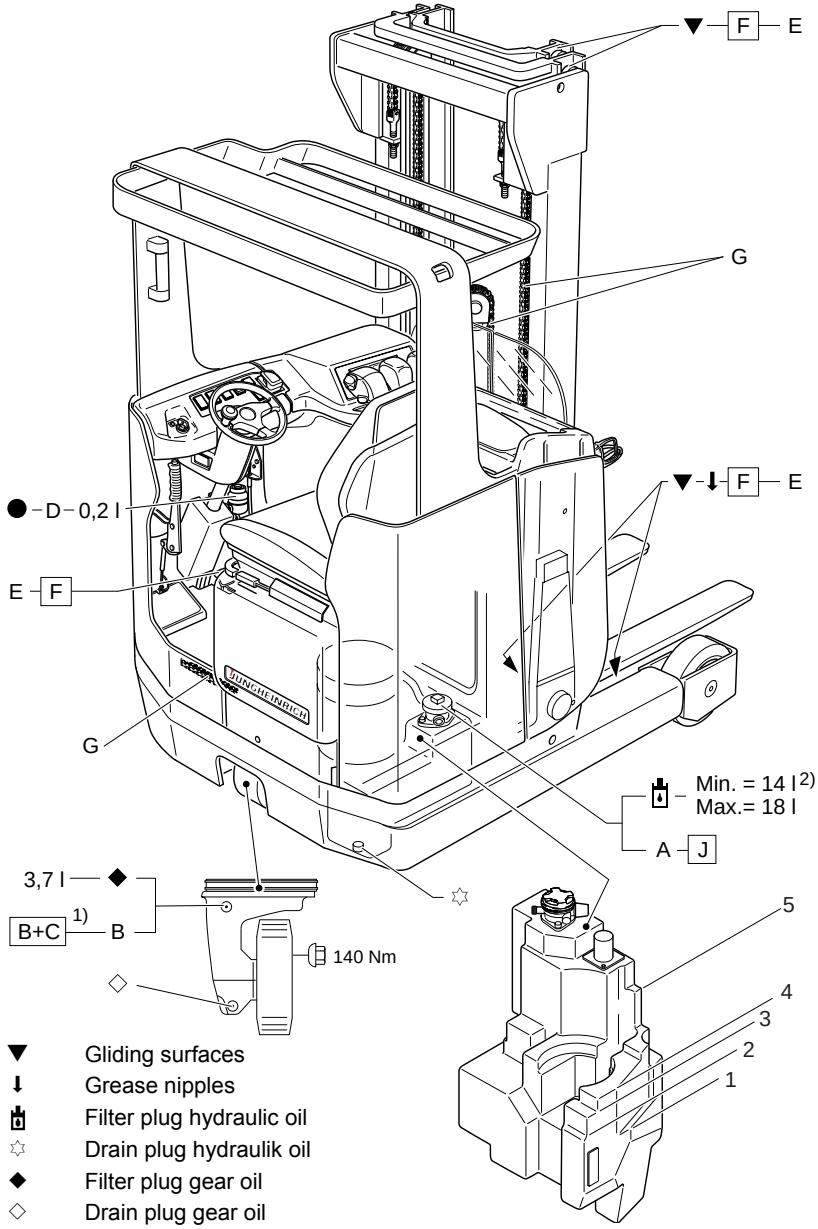
			Maintenance intervals standard = ● cold store = ✳	W 1	M 3	M 6	M 12
Electrical system:	7.1	Performance check			●		
	7.2	Check all cables for secure connection and damage			●		
	7.3	Check the fuses for correct amperage			●		
	7.4	Check switches and trip cams for secure attachment and correct functioning			●		
	7.5	Check the warning installation for correct functioning		✳	●		
	7.6	Check contactors, replace wearing parts, if necessary			●		
	7.7	Check the electronic boards for tight seat and cleanliness			●		
Electric motors	8.1	Check the carbon brushes for wear			●		
	8.2	Check the motor for secure attachment			●		
	8.3	Clean motor housing by means of a vacuum cleaner and check the commutator for wear			✳	●	
Battery:	9.1	Check the battery cables for damage, renew, if necessary			●		
	9.2	Check battery trolley locking, performance and adjustment			●		
	9.3	Check acid density, acid level and cell voltage		✳	●		
	9.4	Check the terminals for secure attachment and apply grease		✳	●		
	9.5	Clean battery connections, check for tight seat		✳	●		
Hoist frame:	10.1	Check the mast anchorage			●		
	10.2	Check lifting chains and chain guides for wear, adjust and grease		✳	●		
	10.3	Check support and attachment of tilt cylinder			●		
	10.4	Check the tilt angle of mast					●
	10.5	Perform sight check of rollers, sliding elements, and stops		✳	●		
	10.6	Check hoist frame bearing			●		
	10.7	Check the traversing systems for wear and damage, adjust lateral play, if necessary			●		
	10.8	Check fork tines and fork carrier for wear and damage		✳	●		
Mounted implement:	11.1	Performance check		✳	●		
	11.2	Check the attachment to the vehicle and all load bearing elements		✳	●		
	11.3	Check bearings, guide elements, and stops for wear and damage, grease			●		
General measurements:	12.1	Check the electrical system for a grounding fault					●
	12.2	Check the driving speed and braking distance					●
	12.3	Check the lifting and lowering speed					●
	12.4	Check safety and shutdown devices			●		
Lubrication:	13.1	Grease the vehicle in accordance with the lubrication schedule		✳	●		
Demonstration:	14.1	Perform a trial run under nominal load			●		
	14.2	Upon completion of servicing operations, demonstrate the vehicle to the person responsible		✳	●		

5 Lubrication Schedule



▼ Gliding surfaces
⬇ Grease nipples
Filter plug hydraulic oil
☆ Drain plug hydraulik oil
◆ Filter plug gear oil
◇ Drain plug gear oil
● Filter plug brake fluid
□ Cold store usage

1) Compound cold store 1:1
2) Filling level: refer to the table on section 5.2

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5.1 Fuels, coolants and lubricants

Handling consumption type material: Consumption type material must always be handled properly. Manufacturer's instructions to be observed.

Improper handling is injurious to health, life, and environment. Consumption type materials must be stored in adequate containers. They might be inflammable and, therefore, must not come into contact with hot components or open fire.

When filling in consumption type materials use clean containers only. It is prohibited to mix consumption type materials of different grades or qualitiies resp., except if mixing is expressively prescribed in these operating instructions.

Avoid spilling. Spilt liquid must be removed immediately using a suitable binding agent, and the mixture of consumption type material and binding agent is to be disposed of according to the regulations.

Code	Order-no.	Supply Qty	Designation	Used for:
A	29 200 670	5,0 l	H-LP 46, DIN 51524	Hydraulic system
B	29 200 680	5,0 l	CLP 100, DIN 51517	Transmission
C	29 200 810	5,0 l	H-LP 10, DIN 51524	Transmission, hydraulic system
D	29 200 150	1,0 l	Brake fluid	Brake system
E	29 201 430	1,0 kg	Grease, DIN 51825	Lubrication
F	29 200 100	1,0 kg	Grease, TTF52	Lubrication
G	29 201 280	0,51 kg	Chain spray	Chains
J	29 202 020	5,0 l	Aero Shell Fluid 4	Hydraulic system

Grease data

Code	Saponification	Dropp. point °C	Worked penetr. at 25 °C	NLG1 class	Service temperat. °C
E	Lithium	185	265-295	2	-35/+120
F	--	--	310-340	1	-52/+100

5.2 Reservoir filling level ETM/V 110, 112, 114

Marking upper level	Litre	Lift. height (h_3) in cm		
		ZT	ZZ	DZ
5	ca. 30	-	-	-
4	ca. 25	-	-	-
3	ca. 23	-	-	bis 6800
2	ca. 20	bis 5290	bis 3790	bis 5000
1	ca. 16	bis 3590	bis 2890	-

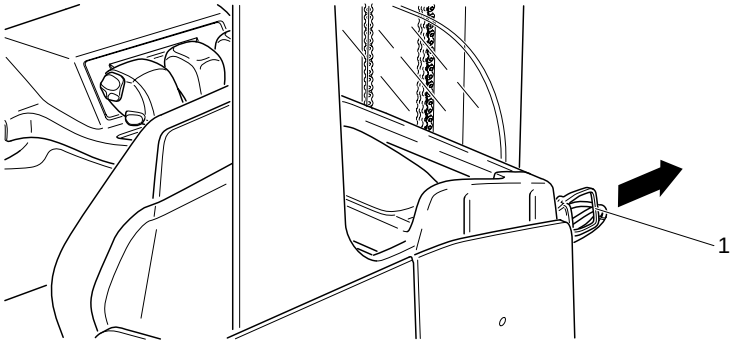
*) See “Type” on the truck identification plate.

6 Instructions for the servicing operations

6.1 Preparing the truck for the performance of servicing and maintenance operations

All required safety measures must be taken to prevent any accidents in the course of the servicing and maintenance operations. The following preparatory operations must be performed:

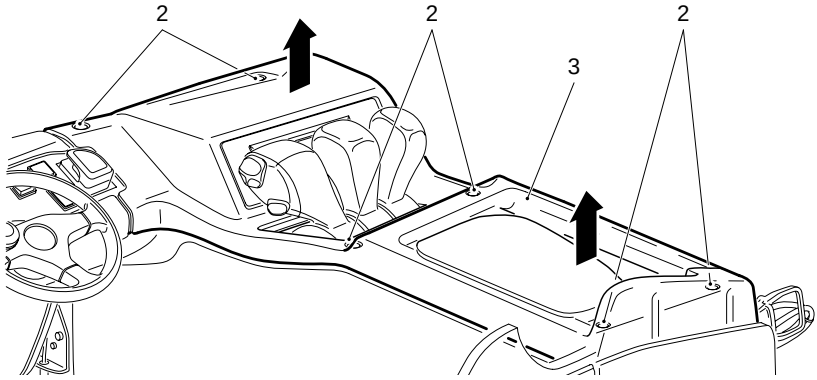
– Park and secure the truck (refer to chapter E).
– Disconnect the battery plug (1) to prevent accidental starting of the truck.



When work has to be performed under the raised fork or under the jacked up truck, suitable measures must be taken to prevent any dropping, tilting or slipping of the fork or truck. When lifting the truck, the instructions contained in chapter "Transportation and commissioning" have to be observed.
When performing work on the parking brake, the truck must be secured against moving.

6.2 Opening the hood

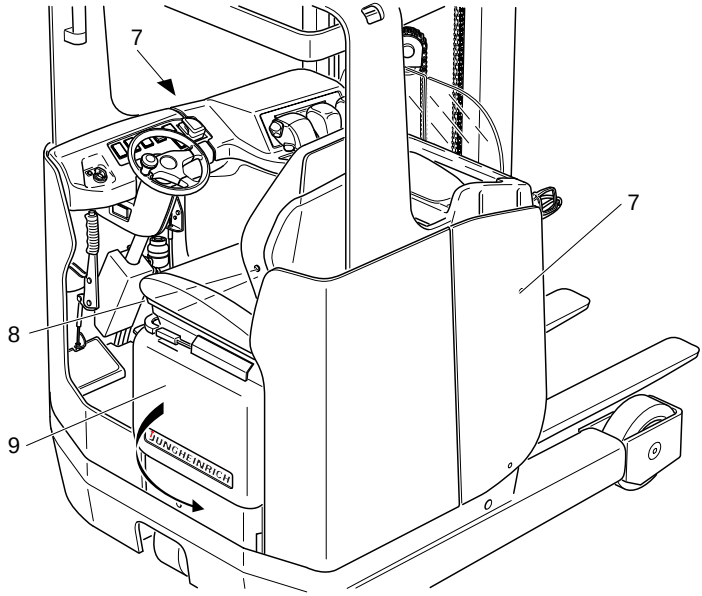
– loosen six screws (2)
– Swing the (3) hood upward..



The drive current control system and the truck fuses are readily accessible for servicing purposes.

6.3 Opening the battery doors and the seat hood

– Unlock the battery door (4) using the service key and remove it.

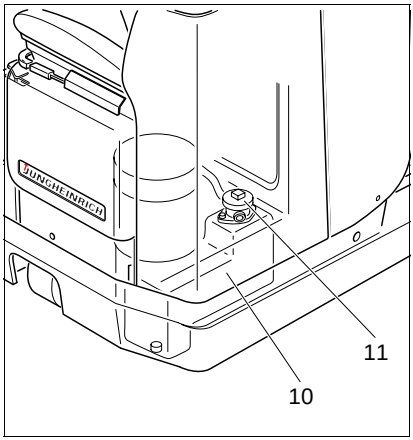


– Unlock the seat hood (6) using the service key and screw out the securing screw (5).
– Swing the seat hood sideways in the direction of the arrow.

☞ The drive unit and the hydraulic unit are accessible for servicing purposes.

6.4 Checking the hydraulic oil level

– Prepare the truck for servicing and maintenance.
(Refer to chapter F, sections 6.1 and 6.3 - "Opening the seat hood").
– Open the seat hood
(see chapter F, section 6.3).
– Check the hydraulic oil level in the hydraulic reservoir (7)



☞ The oil level must be checked at the hydraulic reservoir with the load lifting device completely lowered.

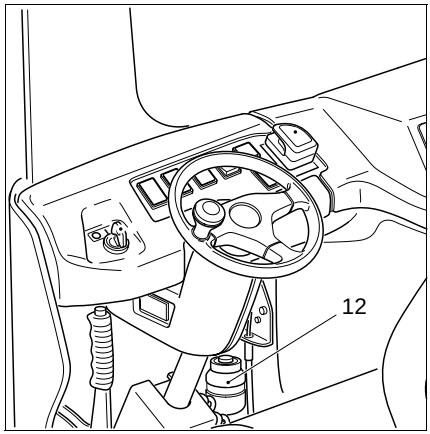
– If necessary, top up through the filler neck (8) using oil of the correct specification.
For the hydraulic oil specification, refer to chapter F, section 5.1.
– Lock the seat hood again and screw in the securing screw.Lock the seat hood again and screw in the securing screw.

6.5 Checking the brake fluid level

Brake fluid is poisonous and must therefore be stored in the closed original containers.

Lack of brake fluid is indicated by a red LED on the information and service display.

– Park and secure the truck (refer to chapter E).
– Visually check the brake fluid level on the brake fluid reservoir (9); if necessary, add brake fluid (refer to chapter F, section 5.1)



The brake fluid level must be visible between the “Min.” and “Max.” marks.

Replaced oils and lubricants must be disposed of as specified by the applicable environment protection laws.

6.6 Safety belt maintenance ○

It is recommended that the driver checks daily condition and function of the safety belt daily before starting up the floor conveyor. Only regular checks ensure that a fault or defective is detected in time.

– Pull out the belt completely and check the fibres for wear and tear.
– Check the function of the belt buckle and control whether the belt is perfectly winding up in the reel-up device.

Checking the blocking mechanism:

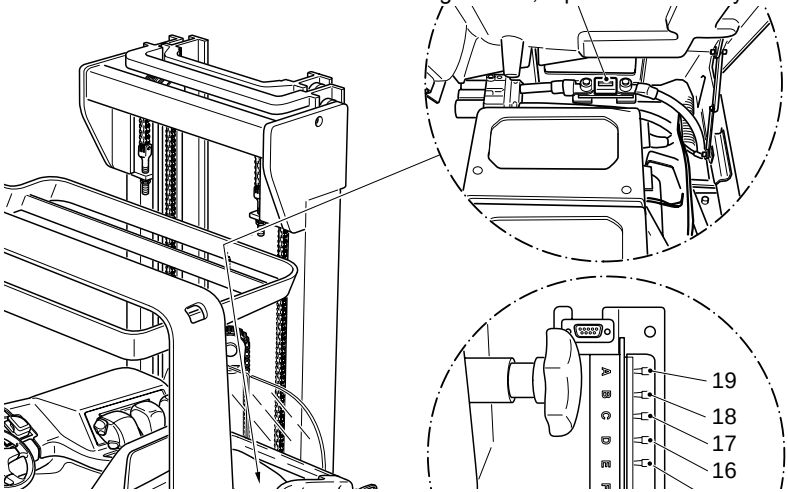
– Park the floor conveyor in horizontal position.
– Pull out the belt jerkily.

The mechanism must block the pull-out movement.

Do not operate the floor conveyor with a defective safety belt - have it exchanged immediately!

6.7 Checking the electric fuses

– Prepare the truck for servicing and maintenance (refer to section 6.1).
– Check all fuses for correct value according to table, replace if necessary. .



Item	Designation		Value / type
10	F8	Main fuse	355 A
11	1F10	Fuse, field “Driving”	30 A
12	-	-	-
13	9F4	Fuse, options	10 A
14	1F9	Control fuse, driving / lifting electronics	3 A
15	1F8	Control fuse, interface	3 A
16	F1	Overall control system fuse	30 A

6.8 Recommissioning the truck

Recommissioning of the truck following the performance of cleaning or mainten-ance work is permitted only, after the following operations have been performed:

– Check the horn for proper functioning
– Check the master switch for correct function.
– Check the brake for correct function.

7 Decommissioning the truck

If the truck is to be decommissioned for more than two months, it must be parked in a frost-free and dry location and all measures to be taken before, during and following decommissioning must be performed as detailed below.

⚠ During decommissioning the truck must be jacked up ensuring that the wheels are clear of the ground. Only this measure will ensure that wheels and wheel bearings do not suffer damage.

If the truck is to be decommissioned for periods in excess of six months, the JUNGHEINRICH service must be contacted for further measures to be taken.

7.1 Operations to be performed prior to decommissioning

– Thoroughly clean the truck.
– Check the brakes for correct function.
– Check the hydraulic oil level and top up, if required (refer to chapter F).
– Apply a thin film of oil or grease to all parts not protected by a paint coating.
– Grease the truck as detailed in the lubrication chart (refer to chapter F).
– Recharge the battery (refer to chapter D).
– Disconnect and clean the battery. Apply pole grease to the battery poles.

☞ In addition to this, all instructions as given by the battery supplier have to be observed.

– Spray all exposed electrical contacts with a suitable contact spray.

7.2 Measures to be taken during decommissioning

Every 2 months:

– Recharge the battery (refer to chapter D).

⚠ Regular recharging of the battery is very important, as otherwise, caused by self-discharging, excessive depletion of the battery would occur, which, owing to sulfatization, will result in the destruction of the battery.

7.3 Recommissioning the truck

– Thoroughly clean the truck.
– Lubricate the truck according to the lubrication chart (refer to chapter F).
– Clean the battery. Grease the pole screws using pole grease and reconnect the battery.
– Recharge the battery (refer to chapter D).
– Check if the gear oil contains condensed water and change, if required.
– Check if the hydraulic oil contains condensed water and change, if required.
– Start up the truck (refer to chapter E).

☞ If switching troubles are experienced in the electric system, spray the exposed contacts with contact spray and remove a possible oxide layer on the contacts of the operating controls by repeated operation.

STOP Perform several brake tests immediately after recommissioning the truck.

8 Safety checks to be performed at regular intervals and following any untoward incidents (Ⓓ: Accident prevention check according to BGV D27)

At least once yearly, or after any untoward incident, the truck has to be checked by a qualified inspector. The inspector must assess the condition of the truck from a standpoint purely concerned with safety aspects, uninfluenced by any company or economic circumstances. The inspector must be adequately informed and experienced to be able to assess the condition of the truck and the effectiveness of the safety installations based on the technical rules and principles governing the inspection of trucks.

The inspection must comprise a comprehensive check of the technical condition of the truck with regard to accident prevention aspects. Apart from this, the truck must be thoroughly inspected for damage possibly caused by incorrect use of the truck. The inspection results must be recorded in an inspection report which has to be kept available for a period spanning at least the next two inspection intervals.
The user has to ensure that all defects are eliminated without delay.

☞ The manufacturer has set up a special safety service with specially qualified staff. As visual proof that the truck has passed the safety inspection, a plaque will be affixed to it. This plaque indicates in which month of which year the next test will be due.