# DFG/TFG 316s/320s

04.11 -

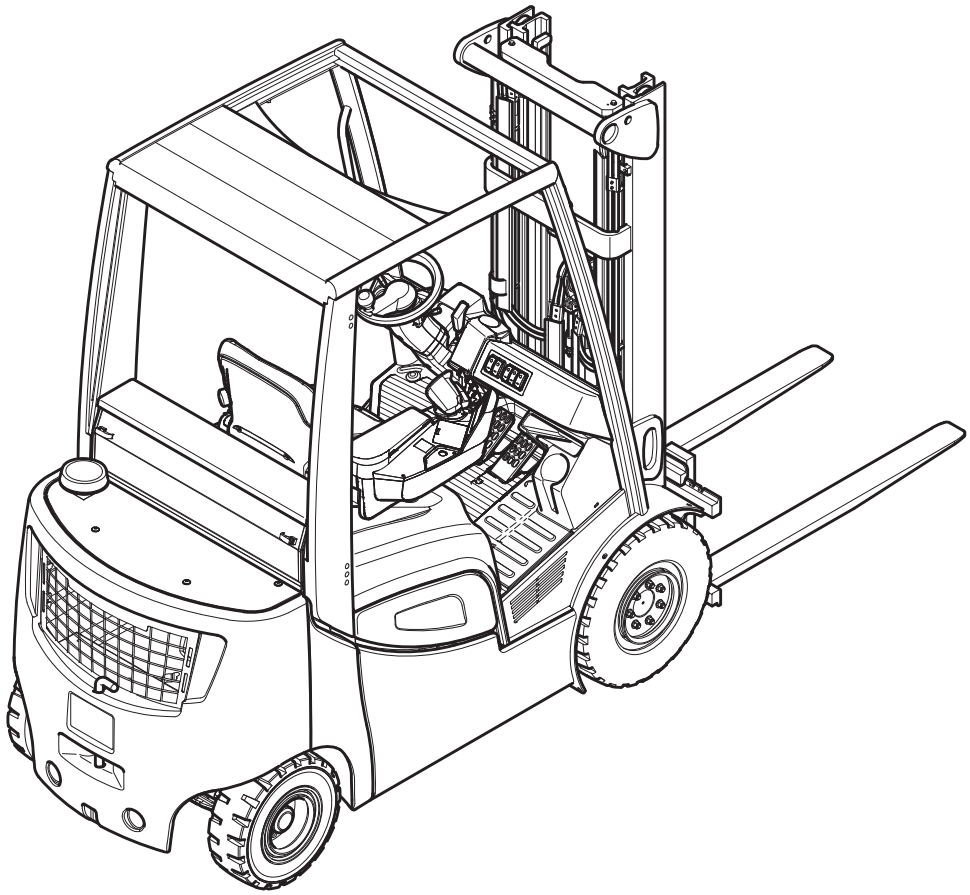
Operating instructions

GB

51209007

03.13

DFG 316s
DFG 320s
TFG 316s
TFG 320s



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# A Correct Use and Application

## 1 General

The truck must be used, operated and serviced in accordance with the present instructions. All other types of use are beyond its scope of application and may result in damage to personnel, the industrial truck or property.

## 2 Correct application

***NOTE***

The maximum load and load distance are indicated on the capacity plate and must not be exceeded.
The load must rest on the load handler or be lifted by an attachment approved by the manufacturer.
The load must be fully raised,see "Lifting, transporting and depositing loads" on page 88.

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– Lifting and lowering loads.
– Transporting lowered loads over short distances.
– Do not travel with a raised load (>30 cm).
– Do not carry or lift passengers.
– Do push or pull load units.
– Occasional towing of trailer loads.
– When towing trailer loads the load must be secured on the trailer.
– The permissible trailer load must not be exceeded.

**TFG 316s-320s**

| | Description | TFG 316s | TFG 320s | |
|---|---|---|---|---|
| Q | Capacity (where C = 500 mm) [1)] | 1600 | 2000 | kg |
| C | Load centre | 500 | 500 | mm |
| | Travel speed * w. / w.o. load | 19.5/19.5 | 19.5/19.5 | km/h |
| | Lift speed, w. / w.o. load | 0.60/0.62 | 0.60/0.62 | m/s |
| | Lower speed, w. / w. o. load | 0.54/0.57 | 0.54/0.57 | m/s |
| | Gradeability [2)] w / w.o. load | 27 | 26 | % |
| | Acceleration time * w / w.o. load to 15 m | 5.0/4.6 | 5.1/4.7 | s |
| | Available working pressure for attachments | 160 | 160 | bar |
| | Oil flow for attachments | 30 | 30 | l / min |

[1)] for vertical mast.

[2)] The values shown represent the maximum gradeability to overcome short differences in height and surface unevenness (surface edges). The truck must not operate on inclines of more than 15%.

## 4.2 Truck capacity plate

**⚠ CAUTION!**

**Accident risk from fork replacement**

If you replace the forks with ones that differ from the originals, the capacity will change.

- ▶When replacing the forks you must attach an additional capacity plate to the truck.
- ▶Trucks supplied without forks are given a capacity plate for standard forks (length: 1150 mm).

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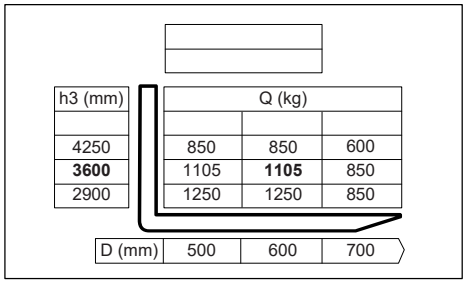
The capacity plate (35) gives the capacity (Q in kg) of the truck for a vertical mast. The maximum capacity is shown as a table with a given load centre of gravity D (in mm) and the required lift height H (in mm).

The capacity plate (35) of the truck indicates the truck's capacity with the forks as originally supplied.

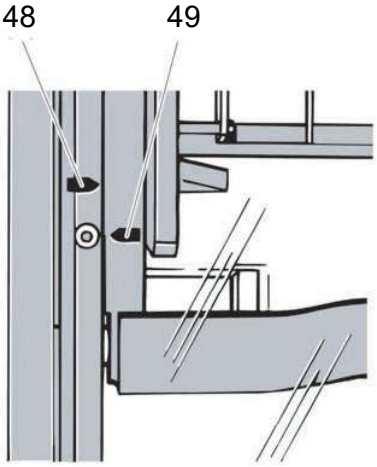
**Example of how to calculate the maximum capacity:**



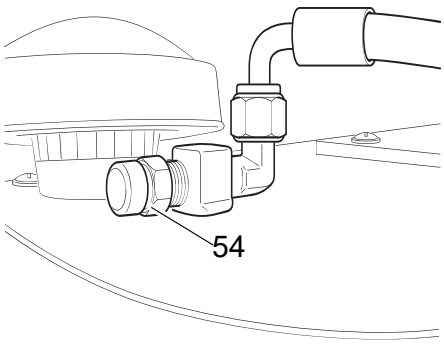

For a load centre of gravity D of 600 mm and a max. lift height $h_3$ of 3600 mm the maximum capacity Q is 1105 kg.

**Lift height restriction**

The arrow shaped markings (48 and 49) on the inner and outer masts show the operator when the prescribed lift limits have been reached.



## 1.2 LPG system relief valve




LPG powered trucks are fitted with a relief valve. This is located on the rear cover next to the gas bottle.

– In the event of a fault the pressure in the gas system is restricted to a maximum level. The relief valve is fitted with a plastic cover (54).
– When the valve is activated the plastic cover comes off, thereby clearly indicating a fault in the gas system.
– In this case the truck must not be operated.
– The gas system must be check by suitably qualified and trained personnel.
– The user must check that the plastic cover is in place each time he uses the truck.

**⚠ DANGER!**

**Danger from escaping liquid gas.**

Liquid gas can escape from faulty gas hoses.

▶ Use only gas bottles with an integrated line break safety valve.

▶ The gas bottle connection is also fitted with a line break safety valve which prevents the gas from escaping accidentally during operation.

▶ When replacing, always use a gas bottle connection with an integrated line break safety valve.

# E Operation

## 1 Safety Regulations for the Operation of the Forklift Truck

### Driver authorisation

The truck may only be used by suitably trained personnel, who have demonstrated to the proprietor or his representative that they can drive and handle loads and have been authorised to operate the truck by the proprietor or his representative.

### Operator’s rights, obligations and responsibilities

The operator must be informed of his duties and responsibilities and be instructed in the operation of the truck and shall be familiar with the operating instructions.

### Unauthorised use of truck

The operator is responsible for the truck during the time it is in use. The operator must prevent unauthorised persons from driving or operating the truck. Do not carry passengers or lift other people.

### Damage and faults

The supervisor must be informed immediately of any damage or faults to the truck or attachment. Trucks which are unsafe for operation (e.g. wheel or brake problems) must not be used until they have been rectified.

### Repairs

The operator must not carry out any repairs or alterations to the truck without authorisation and the necessary training to do so. The operator must never disable or adjust safety mechanisms or switches.

| Item | | Controls and displays | | Function |
|---|---|---|---|---|
| 122 |  | Warning indicator | ○ | Switches the warning indicator on and off. |
| 123 |  | “Lift cutout” override button | ○ | Switches the “lift cutout” override button on and off. |
| 124 |   | "P3" function key | ○ | Switches auxiliary equipment on and off. |

| | |
|---|---|
| ●= Series equipment | ○= Optional equipment |

*Five operating programs with different performance levels are available to adapt the travel and operating functions to the application at hand. Starting from operating program 1 (limited acceleration and speed together with sensitive application of the operating functions), the performance levels increase to program 5 (maximum performance for high throughput levels). If necessary the operating programs can also be adapted or restricted to suit the customer. Operating program 1 can be modified to adjust it in particular for shovel applications. Contact the manufacturer's customer service department.

## 3.5 Seat Belt

**⚠ WARNING!**

**Travelling without a seat belt increases the risk of injury.**

Accidents or personal injury can result if the seat belt is not worn or is modified.

- ▶ Always put the seat belt on before starting the industrial truck.
- ▶ Do not modify the seat belt.
- ▶ Damaged or non-operational seat belts must be replaced by trained personnel.
- ▶ Seat belts must always be replaced after an accident.
- ▶ Only original spare parts must be used for retrofits or repairs.
- ▶ Report any defects immediately to your supervisor.
- ▶ Remove the truck from service until a functional seat belt has been fitted.

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➔ Protect the seat belt from contamination (e.g. cover it when the truck is idle) and clean it regularly. Frozen belt locks or pulleys must be thawed out and dried to prevent them from freezing up again.
The temperature of the warm air should not exceed +60 °C!

**Starting the industrial truck on steep slopes**

The automatic blocking system locks the belt in the retractor when the truck is positioned on a steep slope. This prevents the belt from being pulled out of the retractor.

➔ Carefully drive the truck off the slope and then put on the belt.

***Checking the seat belt***

*Procedure*

- Check the attachment points for wear and damage.
- Check the cover for damage.
- Pull the belt out fully from the retractor and check for damage (loose seams, fraying and nicks).
- Test the belt buckle and make sure the belt returns correctly into the retractor.

***Check the automatic locking system***

*Procedure*

- Park the truck on a level surface.
- Jerk the seat belt out suddenly.

➔ The locking system should prevent the belt from coming out.

*The seat belt has now been checked.*

## 4.8 Steering

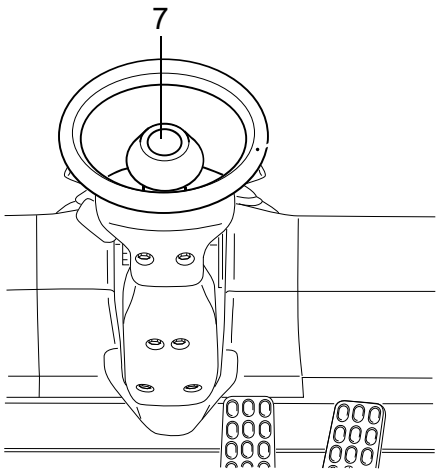
***Steering***

*Procedure*

Very little steering effort is required; you should therefore turn the steering wheel (7) sensitively.

- To negotiate a right-hand bend: Turn the steering wheel clockwise according to the required steering radius.
- To negotiate a left-hand bend: Turn the steering wheel anti-clockwise according to the required steering radius.

*The truck travels in the direction selected.*




## 4.9 Brakes

**⚠ WARNING!**

**Accident risk**

The brake pattern of the truck depends largely on the ground conditions.

▶ The operator must take into account the travel route conditions when braking.

▶ Brake with care to prevent the load from slipping.

▶ Allow for increased braking distance when travelling with an attached load.

▶ Use the service brake in emergencies.

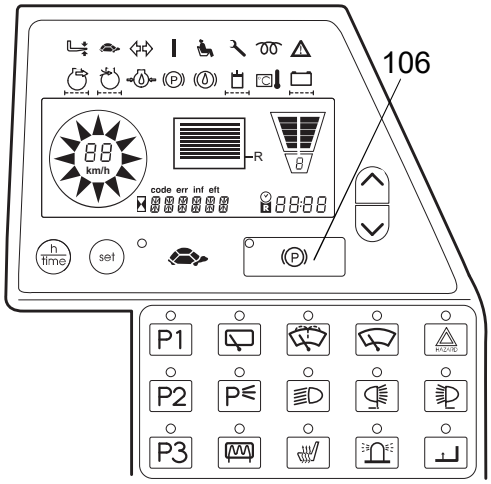
There are two ways of braking:

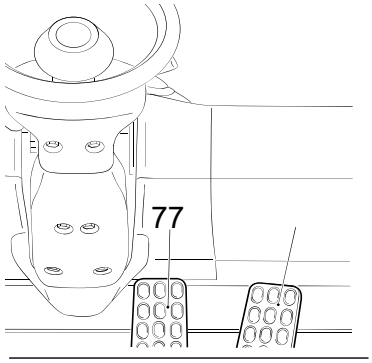
– Service brake

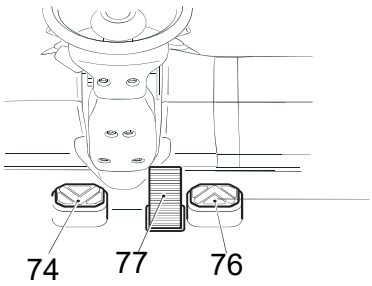
– Emergency stop brake (77)

and for secure parking:

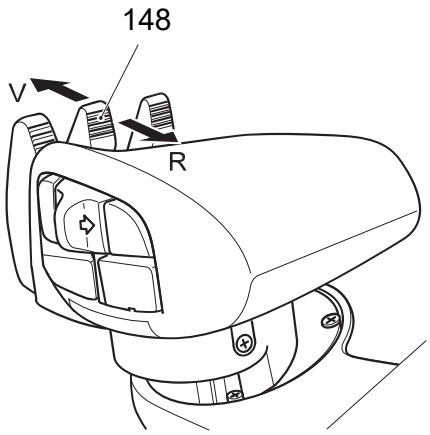
– Parking brake (106)



### *Tilting the mast forward / backward*




*Requirements*

– To prepare the truck for operation, see "Preparing the truck for operation" on page 74

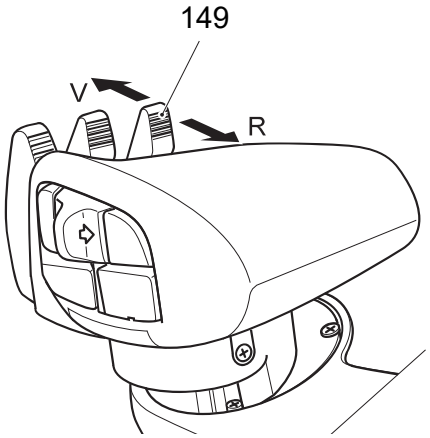
*Procedure*

- Pull the Solo-Pilot lever (148) in direction R to tilt the mast back.
- Push the Solo-Pilot lever (148) in direction V to tilt the mast forward.

*The mast is now tilted back / forward.*

➔ When the limit position for the operation has been reached (there will be a noise from the pressure relief valve) release the lever. The lever will revert automatically to neutral.

### *Positioning the integrated sideshift (option)*




*Requirements*

– Truck prepared for operation, see "Preparing the truck for operation" on page 74.

*Procedure*

- Pull the SOLO-PILOT lever (149) in direction R to move the load handler to the right (from the driver’s viewpoint).
- Push the SOLO-PILOT lever (149) in direction V to move the load handler to the left (from the driver’s viewpoint).

*The sideshifter is now positioned.*

➔ When the limit position for the operation has been reached (there will be a noise from the pressure relief valve) release the lever. The lever will revert automatically to neutral.

## 4.17 Operating additional attachments for the Multi Pilot

**⚠ WARNING!**

**Incorrect symbols can cause accidents**

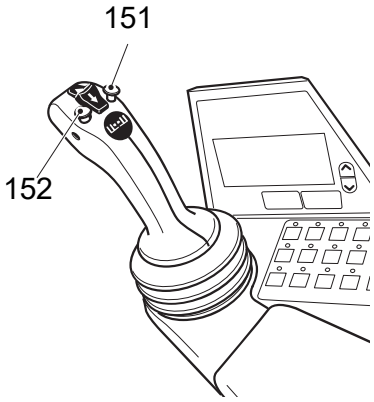
Symbols on controls that do not depict the function of the attachments can cause accidents.

▶ Mark the controls with symbols that indicate their function.

▶ Specify the attachments' direction of movement in accordance with ISO 3691-1 so that they match the controls' direction of movement.

### 4.17.1 Multi Pilot with control of ZH1 hydraulic port

Depending on the attachments used the (151, 152) buttons are assigned the function of the attachment. Unused buttons have no function. For connections see "Fitting additional attachments" on page 103.



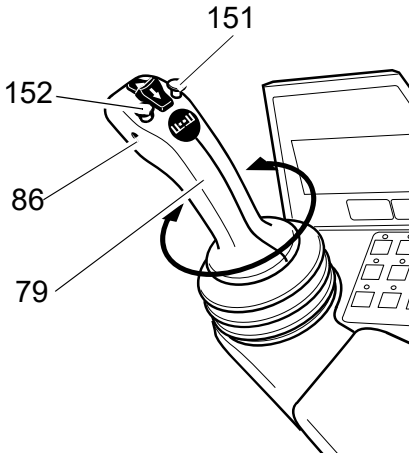

*Procedure*

- Operating hydraulic port ZH1:
  Press the (151) button or the (152) button.

*The attachment performs its operation.*

### 4.17.2 Multi Pilot with control of ZH1 and ZH2 hydraulic ports

Depending on the attachments used the buttons (151, 152) and the lever (79) are assigned the function of the attachment. Levers that are not required are void. For connections see "Fitting additional attachments" on page 103.



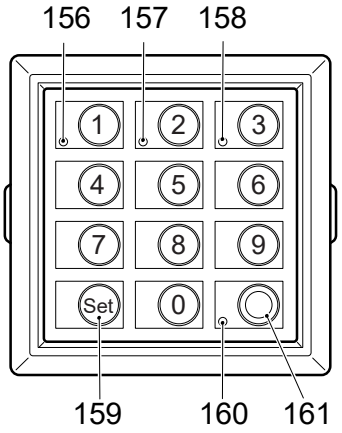

*Procedure*

- Operating hydraulic port ZH1:
  Press the (151) button or the (152) button.
- Operating hydraulic port ZH2:
  Set the MULTI-PILOT (79) to neutral and then turn it clockwise or anti-clockwise while at the same time pressing the button (86).

*The attachment performs its operation.*

### 6.1.4 Changing the master code

To change the length of the master code you must follow the procedure in "Choose length of the new master code (4-6 digit) and add user codes", see "Choose length of the new master code (4-6 digit) and add user codes" on page 120. If there are still user codes stored in the code lock, the master code to be changed must be the same length as the saved user codes.




*Requirements*

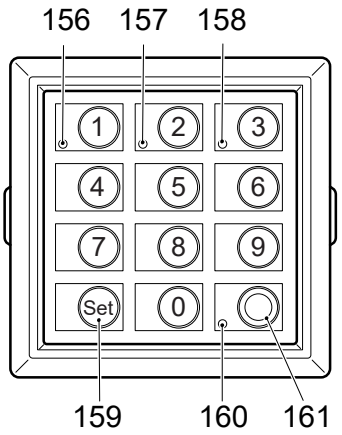
– To prepare the truck for operation, see "Preparing the truck for operation with the keypad (CanCode)" on page 110.

*Procedure*

- Press the O key (161).
- Enter the valid master code with the digit keys.
  *When you enter the valid master code the LED (160) flashes green.*
- Enter the parameters 0-0-0 with the digit keys.
- Confirm with the SET key (159).
  *The LEDs (156,160) flash green.*
- Enter the valid master code again with the digit keys.
- Confirm with the SET key (159).
  *The LEDs (157,160) flash green.*
- Enter the valid master code with the digit keys.
  The new master code must be different from existing user codes.
- Confirm with the SET key (159).
  *The LEDs (158,160) flash green.*
- Enter the new master code again with the digit keys.
- Confirm with the SET key (159).
  *Wait until the LED (160) flashes green. The setting is saved.*
- Press the O key (161).
  *The truck is switched off and the LED (160) is lit red.*
- Check the new master code:
  - Switch on the truck with the new master code, see "Preparing the truck for operation with the keypad (CanCode)" on page 110
    *When you enter the valid master code the LED (160) flashes green.*
  - Press the O key (161).

  *The truck is switched off and the LED (160) is lit red.*

### 6.1.10 Setting the automatic truck cutout (timeframe)




*Requirements*

– To prepare the truck for operation, see "Preparing the truck for operation with the keypad (CanCode)" on page 110.

*Procedure*

- Press the O key (161).
- Enter the valid master code with the digit keys.
  *When you enter the correct master code the LED (160) flashes green.*
- Enter the 0-1-0 parameter with the digit keys.
- Confirm with the SET key (159).
  *Wait until the LED (160) flashes green.*
- Set the truck automatic cutout (time period) with the digit keys:
  - 00:
    Automatic truck cutout is deactivated.
  - 01 - 30:
    Set time period (in minutes) after which the truck automatically cuts out (minimum cutout time is 1 minute,
    maximum cutout time is 30 minutes).
  - 31:
    After 10 seconds the truck cuts out automatically.
- Confirm with the SET key (159).
  *Wait until the LED (160) flashes green. The setting is saved.*
- Press the O key (161).
  *The truck is switched off and the LED (160) lights up red.*
- Checking the truck's automatic cutout:
  - Switch on the truck with a valid operator code, see "Preparing the truck for operation with the keypad (CanCode)" on page 110.
    *When you have entered a valid operator code the LED (160) lights up green, the travel program selected is indicated by the corresponding LEDs (156,157,158) and the truck is switched on.*
  - Do not perform any travel, steering or hydraulic operations with the truck.
  - Wait until the truck automatically cuts out at the end of the time period.

  *The truck is switched off and the LED (160) lights up red.*

## 6.6 Panel door

**⚠ CAUTION!**

**An open door can cause accidents (162)**

▶ Do not travel with an open door (162). When opening the door make sure there is nobody in the door's swing range.

▶ Always close the door tightly and make sure it is locked.

▶ Closing the door does not release the driver from his responsibility to wear a seat belt, see "Seat Belt" on page 71.

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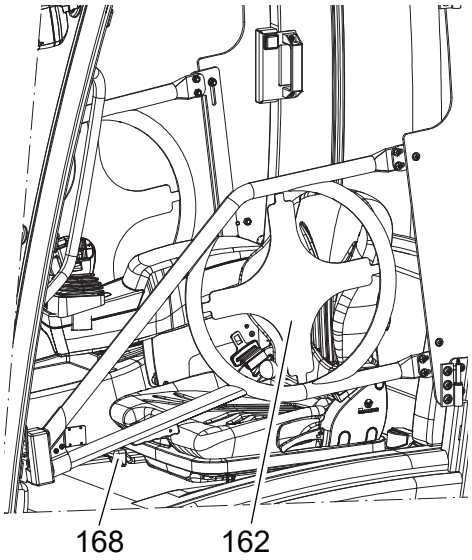
**Hazardous situations**

If the truck is about to tip over, do not loosen the seat belt. The operator must not jump off the truck. The operator must lean his upper body over the steering wheel and hold on with both hands. Tilt your body in the opposite direction of fall.




*Requirements*

– On trucks with a door monitoring sensor, travel is only enabled when the panel door is closed (○).

*Procedure*

- Pull the handle (168) towards the operator position, the door swings open.
- Pull the door (162) towards the operator; the door closes.

## 6.7 Operator position extension

**⚠ DANGER!**

**Altering the tilt resistance can be dangerous**

The lateral tilt resistance reduces with a higher truck centre of gravity.

The height above the overhead guard ($h_6$) increases by 300 mm, see "Dimensions" on page 22.

▶ Adapt the travel speed of the truck, in particular when cornering.

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For entry and exit see "Entry and exit" on page 65.

## 6.17 Optional equipment for working in dusty environments

When working in areas with high dust levels (lint, splinters) the truck can be fitted with an optional lint filter on the cooler.

**⚠ CAUTION!**

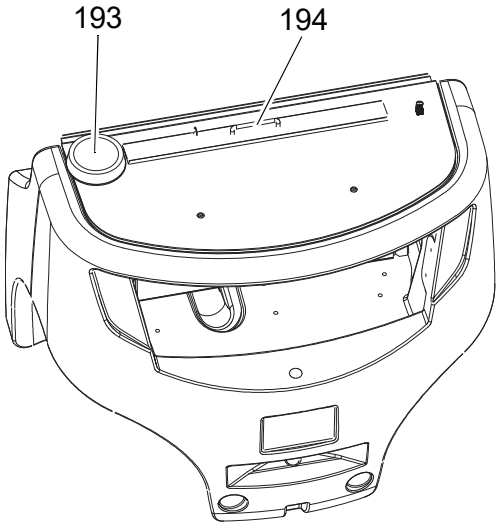
**Clogged lint filters can cause fires**

▶The lint filter must be cleaned regularly according to how much it is clogged.

*Procedure*

- Turn the quick release lock (193) to open it.
- Pull the lint mesh up by the handle (194) and clean it.
- Fit the lint mesh back and lock it.

*The lint mesh is now clean.*




## 6.18 Roof window wiper

The roof window wiper is activated by pressing the switch in the dashboard.

*Procedure*

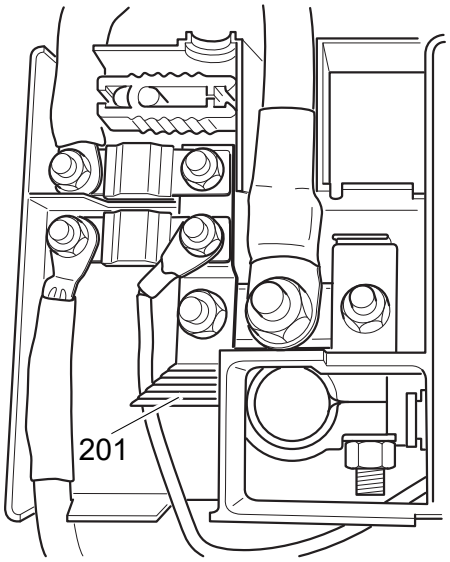
- Press switch to switch the roof window wiper on.
- Keep pressing the switch to turn the roof window wiper off.

### 7.2.4 Starting aid

**⚠ WARNING!**

**Danger from overheating**

▶ Use only an ISO 6722 battery jump lead with fully insulated terminal pliers and a lead diameter of at least 25 $mm^2$.

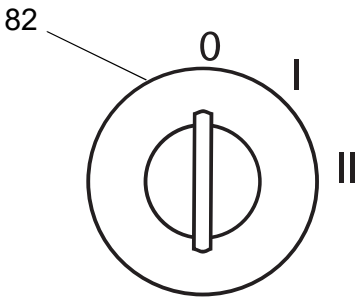


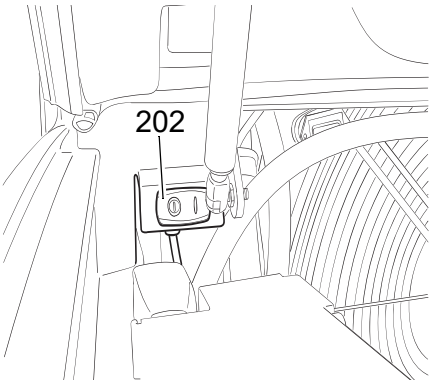

The jump start connection (201) is located in the main fuse box on the starter battery.

*Procedure*

- Open the engine cover, see "Opening the engine cover" on page 167.
- Attach the red lead of the donor battery to the jump start connection (201).
- Attach the black lead to the negative terminal of the donor battery and the mass point of the crane eye to the engine.
- Switch on the ignition by turning the key in the key switch (82) to the "I" position.
- Press the override switch (202).
- Start the engine by turning the key in the key switch (82) to the "I" position.
- When the engine has started first remove the negative lead followed by the positive lead.

If the starter motor does not switch on the motor after connecting the battery terminals, check that the battery leads are positioned correctly.



## 3.3 Consumables

| Code | Order no. | Quantity | Capacity | Description | Used for |
|---|---|---|---|---|---|
| A | 51037495<br>51037499 | 1 l<br>5 l | 40l | HVI<br>Renolin B46 | Hydraulic system |
| E | 50055726 | 400 gr | | Grease<br>K-P-2K | Mast roller and sideshifter contact surfaces; steer axle |
| G | 29201280 | 0.4 l | | Chain spray | Chains |
| K | 51210409 | 4.0 l | 4.5 l | Titan GT 1 Pro C-3 SAE 5W-30 | Engine oil |
| M | 51118018 | 1 l | 7.0 l | Fricofin G12 Plus | Coolant * |

* The coolant consists of a 1:1 mixture ratio of Fricofin G12 Plus and water

The volumes indicated are approximate.

**⚠ WARNING!**

**Using incorrect hydraulic oil can be dangerous**

▶Do not use hydraulic oils with a different specification or viscosity and do not mix with additives.

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**Grease guidelines**

| Code | Saponification | Dew point °C | Worked penetr. at 25°C | NLG1 class | Application temperature °C |
|---|---|---|---|---|---|
| E | Lithium | 185 | 265-295 | 2 | -35/+120 |

## 4.7 Checking the wheel attachments.

**⚠ WARNING!**

**Using different tyres can cause accidents**

The quality of tyres affects the stability and performance of the truck.

▶The diameter of the wheels must differ by no more than 15 mm.

▶Always replace tyres in pairs. After replacing the tyres check the wheel nuts are secure after 10 service hours.

▶Always use tyres of the same make, model and profile.

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***Checking the wheel attachment***

*Requirements*

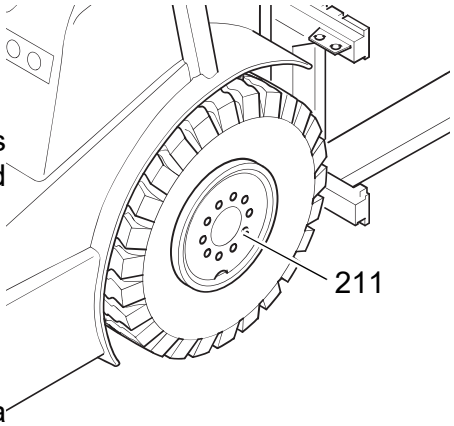
– Prepare the truck for maintenance and repairs (see "Preparing the truck for maintenance and repairs" on page 163).

*Tools and Material Required*

– Torque wrench

*Procedure*

• Torque the wheel nuts (211) crosswise with a torque wrench, for torques see "Tyre type" on page 25.



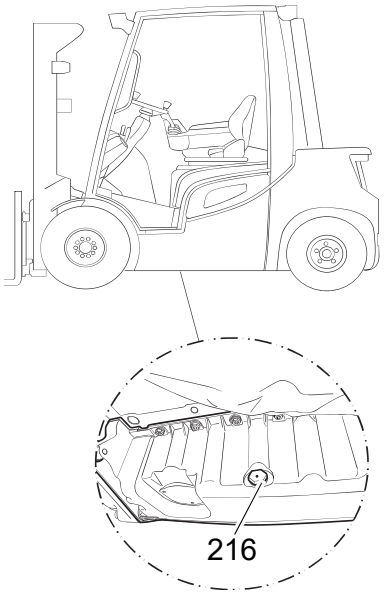

*The wheel attachment is now checked.*

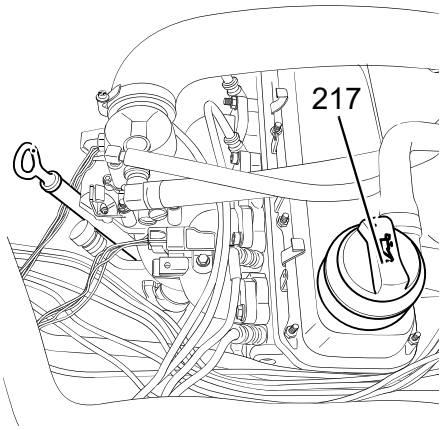
When using pneumatic tyres check the air pressure, for the air pressure see "Tyre type" on page 25

### *Draining the engine oil*

*Procedure*

- Remove the floorboard.
- Unscrew the filler cap (217).
- Thoroughly clean the oil drain plug (216) and around the drain hole.
- Unscrew the oil drain plug.
- Collect any oil that emerges.
- Screw in the oil drain plug with a new seal (torque 30 Nm).

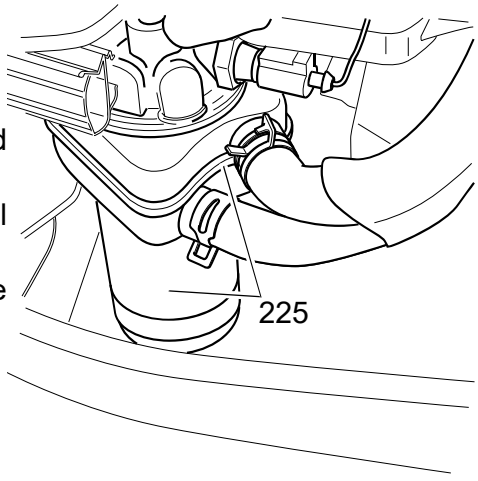



### *Replace the engine oil filter*

*Procedure*

- Undo the oil filter (225) with a filter wrench and manually unscrew it.
- Thoroughly clean the sealing faces of the oil filter flange.
- Apply a thin layer of engine oil to the seal of the new oil filter.
- Hand-tighten the oil filter.



| Item | Component | | Electric circuit | Rating (A) |
|---|---|---|---|---|
| 17 | 4F10 | ● | Fan | 5 |
| 18 | F1.1 | ● | Armrest terminal 15 | 5 |
| 19 | 9F26 | ● | Socket | 2 |
| 20 | | ○ | Not used | |
| 21 | OF1 | ○ | Option relay 1/2K63.1 | 15 |
| 22 | 9F17.2 | ○ | Option connector XS182/3 engine running. | 3 |
| 23 | OF2 | ○ | Option relay 2 2K63.2 | 7.5 |
| 24 | OF3 | ○ | Option relay 3 2K63.3 | 5 |
| 25 | 9F17.1 | ○ | Option connector XS182/2 engine running. | 3 |
| 26 | 9F17 | ○ | Option connector XS182/1 engine running. | 3 |
| 27 | 9F5 | ○ | Rear window heating | 10 |
| 28 | 5F1 | ○ | Front work lights | 10 / 5[1] |
| 29 | 9F2 | ○ | Seat heating / compressor | 10 |
| 30 | 9F14 | ○ | Rear window wiper | 7.5 |
| 31 | 5F1.2 | ○ | Rear work lights | 10 / 5[1] |
| 33 | 9F31 | ● | Charge control generator | 5 |
| 34 | 4F1 | ● | Horn | 10 |
| 35 | 4F11 | ● | ECU terminal 15 engine controller | 5 |
| 36 | | | Not used | |
| 37 | 9F17.5 | ○ | Option connector XS182/6 terminal 30 | 3 |
| 38 | 9F17.4 | ○ | Option connector XS182/5 terminal 30 | 3 |
| 39 | 9F17.3 | ○ | Option connector XS182/4 terminal 30 | 3 |
| 40 | F21 | ● | Fuse tester | |
| 41 | 9F2.1 | ○ | Jumper for relay | 25 |
| 42 | 9F14.1 | ○ | Option | 10 |
| 43 | 5F8 | ○ | Reading light | 5 |
| 44 | F14 | ○ | Heating | 30 |
| 45 | 9F30 | ● | TCU terminal 30 truck controller | 25 |
| 46 | 9F27 | ● | Engine controller ECU terminal 30 (DFG only) | 30 |
| 47 | 9F29 | ● | Immobiliser (DFG 316s-320s only)<br>Ignition coil (TFG only) | 15 |
| 48 | 9F28 | ● | Pre-heat time control (DFG only)<br>Reservoir valve 3 way control (TFG only) | 10 |

➔ [1] LED optional equipment

| ●= Series equipment | ○= Optional equipment |
|---|---|

## 5.3 Restoring the truck to service after decommissioning

*Procedure*

- Thoroughly clean the truck, see "Cleaning" on page 194.
- Lubricate the truck according to the lubrication schedule, see "Lubrication Schedule" on page 160.
- Clean the starter battery, grease the terminals and connect the starter battery.
- Charge the starter battery, see "Starter battery" on page 196.
- Replace engine oil. Condensation water could have formed.
- Replace hydraulic oil. Condensation water could have formed.

  The manufacturer's customer service department is specially trained to carry out these operations.
- Start up the truck, see "Preparing the Truck for Operation" on page 63.

**⚠ WARNING!**

**Faulty brakes can cause accidents**

As soon as the truck has been started, test the brakes several times.

▶Report any defects immediately to your supervisor.

▶Tag out and decommission the faulty industrial truck.

▶Only return the truck to service when you have identified and rectified the fault.

**Audible warning devices**

| Electrical System | | W | A | B | C |
|---|---|---|---|---|---|
| 1 | Test the buzzer / warning alarm, check for damage and make sure it is secure. | | | ● | |

**Trailer coupling**

| Chassis and Superstructure | | W | A | B | C |
|---|---|---|---|---|---|
| 1 | Check trailer coupling or tow mechanism stop. | | | ● | |

**Work Platform**

| Hydraulic operations | | W | A | B | C |
|---|---|---|---|---|---|
| 1 | Check attachment is properly secured to the truck and the supporting elements. | | | ● | |

**Work lights**

| Electrical System | | W | A | B | C |
|---|---|---|---|---|---|
| 1 | Test lighting. | | | ● | |

**Strobe light/beacon**

| Electrical System | | W | A | B | C |
|---|---|---|---|---|---|
| 1 | Test strobe light / beacon and check for damage. | | | ● | |

**Data recorder**

| Electrical System | | W | A | B | C |
|---|---|---|---|---|---|
| 1 | Check data recorder is secure and check for damage. | | | ● | |

**Drive Control**

| Travel | | W | A | B | C |
|---|---|---|---|---|---|
| 1 | Check the "Drive Control". | | | ● | |

**Electrical optional equipment**

| Electrical System | | W | A | B | C |
|---|---|---|---|---|---|
| 1 | Test the electrical optional equipment and check for damage. | | | ● | |

**Fire extinguisher**

| Agreed performance levels | | W | A | B | C |
|---|---|---|---|---|---|
| 1 | Check fire extinguisher is present, secure and Check test interval. | | | | ● |