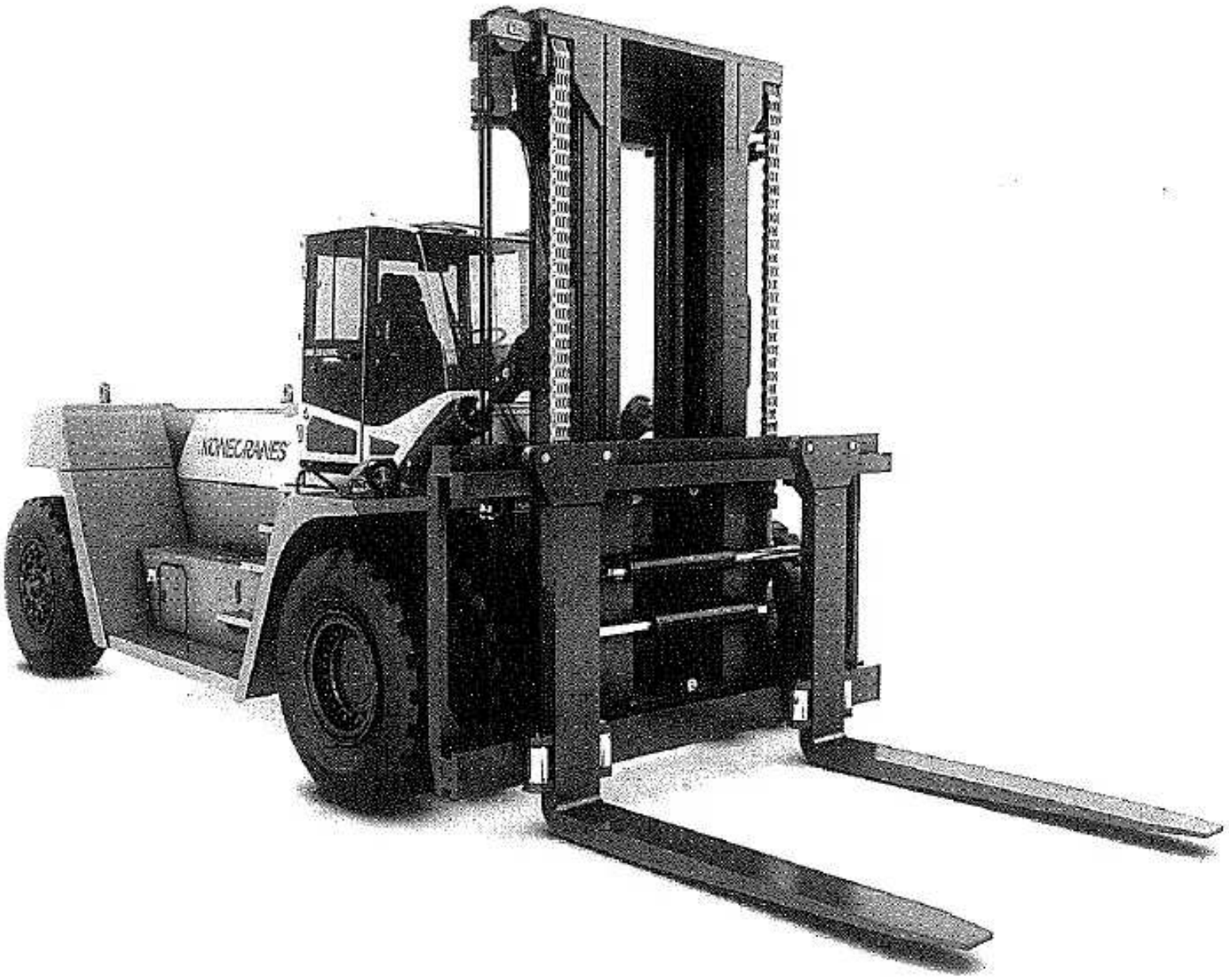
OPERATOR'S MANUAL

KONECRANES®
Lifting Businesses™

SMV 10-65 C / SMV 37-52 C GANTRY



ORIGINAL INSTRUCTIONS
X046720en / A / 10 Nov 2015
OMFLTC.01

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1.2.2 Identification of the product

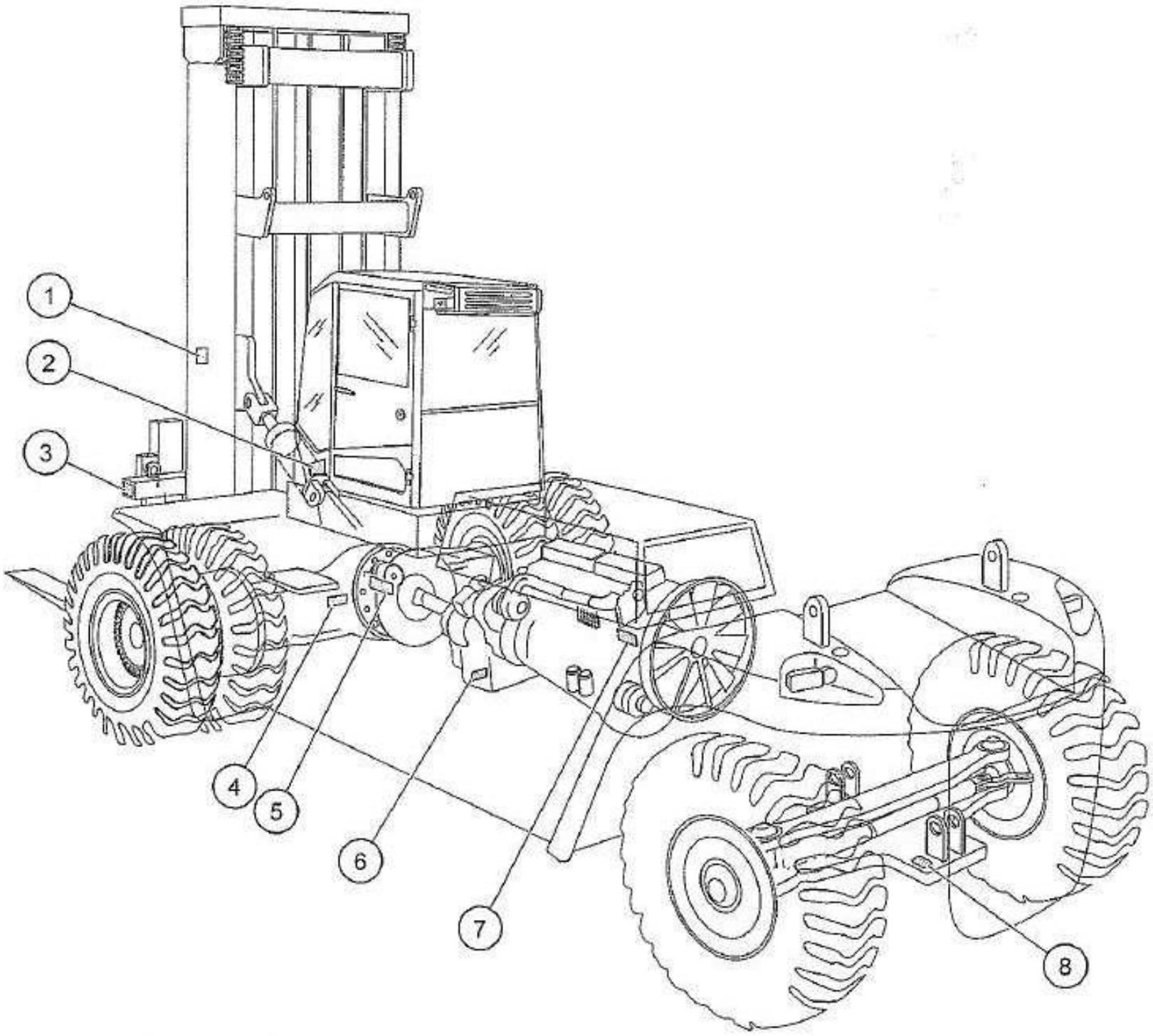


Figure 1. Plates and serial numbers

1. *Mast number*
2. *Lifting capacity plate*
3. *Fork carriage number*
4. *Drive axle number*
5. *Chassis number*
6. *Transmission number*
7. *Engine number*
8. *Steer axle number*

3 PRODUCT DESCRIPTION

3.1 Technical description

Specification SMV 33-1200 C means:

- SMV = Product name
- 33-1200 = 33-ton lift capacity on 1200-mm load center
- C = Model C

Engine

The engine is a water-cooled, turbo-charged diesel engine. The engine drives a transmission using a torque converter.

Transmission

The transmission is of power declutch type. The transmission is equipped with an oil cooler. On the brake pedal in the cabin, there is a declutch switch. The declutch switch disengages the transmission so that the operator can control the hydraulics while maintaining a high engine RPM during stacking maneuvers.

Axles

The transmission uses a universally jointed propshaft to drive the drive axle.

The axle is of the heavy-duty double reduction type. The primary reduction is through the hypoid crown wheel and pinion gear set. The secondary reduction is achieved by a planetary gear set that is set within the wheel hub. The wheel hubs are carried on taper roller bearings.

The steer axle is mounted in "sphere elastic" bushes which allow sufficient wheel movements for stability on uneven ground. The parallel steering links are between the steer cylinder and the spindles.

Brakes

An oil-cooled wet disc brake system operates the brakes. The service brakes are controlled by the foot brake valve which activates the drive axle. The parking brake is controlled electrically and activates a hydraulic cylinder. The hydraulic cylinder acts on a brake disc that is mounted between the drive axle and the propshaft.

Hydraulic system

The hydraulic system is equipped with load-sensing variable piston pumps. The brake system is equipped with one or two gear pumps.

Steering

The steering is fully servo-assisted. If the engine stalls, it is still possible to steer the machine without servo assistance, even though it is heavy going.

Control valve

Machine sizes 10-16 are equipped with one control valve. Machine sizes 18-60 are equipped with two control valves. These control valves are mounted on the chassis and controlled from the cabin using power-assisted levers to the right of the operator. The levers control the functions for mast lifts, tilts, sideshift movement of the fork carriage and the fork positioning, as well as any extra functions.

Mast

The duplex standard mast consists of:

- One outer mast
- One inner mast
- One fork carriage
- Two lift cylinders
- Two tilt cylinders

The inner mast section moves along the outer section using mast wheels and support rollers. The mast is mounted on two axles in the chassis using bearings. The fork carriage is of a rolling type with sideshift movement and fork positioning.

Operator's cabin

The operator's cabin fulfills international safety standards, and is rubber-mounted to protect the operator from vibrations. Entrance to the cabin is on the left side using the steps on the machine.

Hydraulics control levers

The hydraulics control levers for the lifting functions are to the right of the operator's seat. The gear switch is on the left side of the control levers. The function selectors and windshield wiper controls are on the keypad. The display and the indicator lamps for the hazard lights, parking lights and the rotating beacon are on the right side of the cabin.

Electrical system

The electrical system is 24 V.

3.2 Machine outline

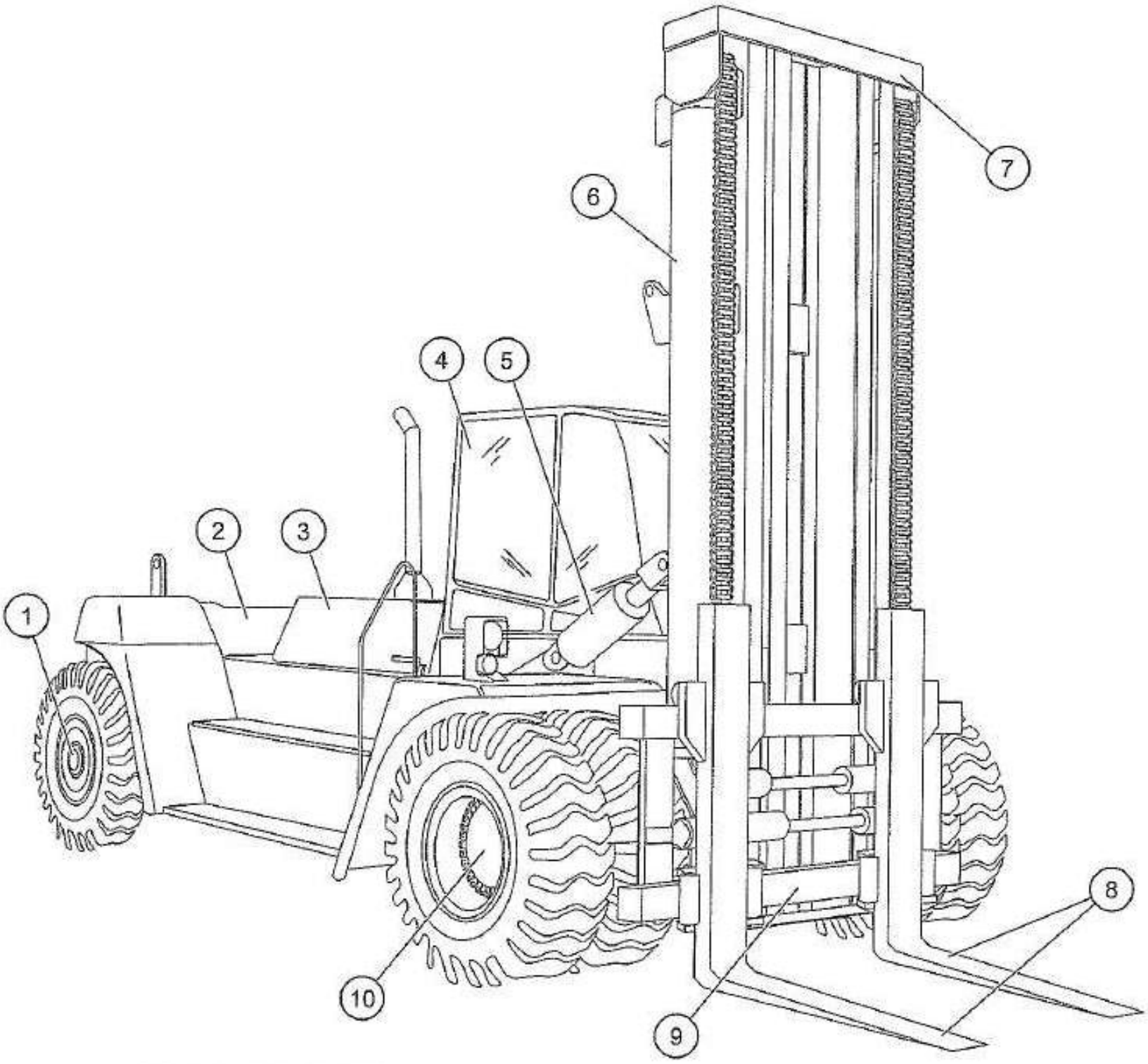


Figure 6. Machine outline

1. *Steer axle*
2. *Counterweight*
3. *Engine hood*
4. *Operator's cabin*
5. *Tilt cylinder*
6. *Lift cylinder*
7. *Mast*
8. *Forks*
9. *Fork carriage*
10. *Drive axle*

3.3 Controls and indicators in the cabin

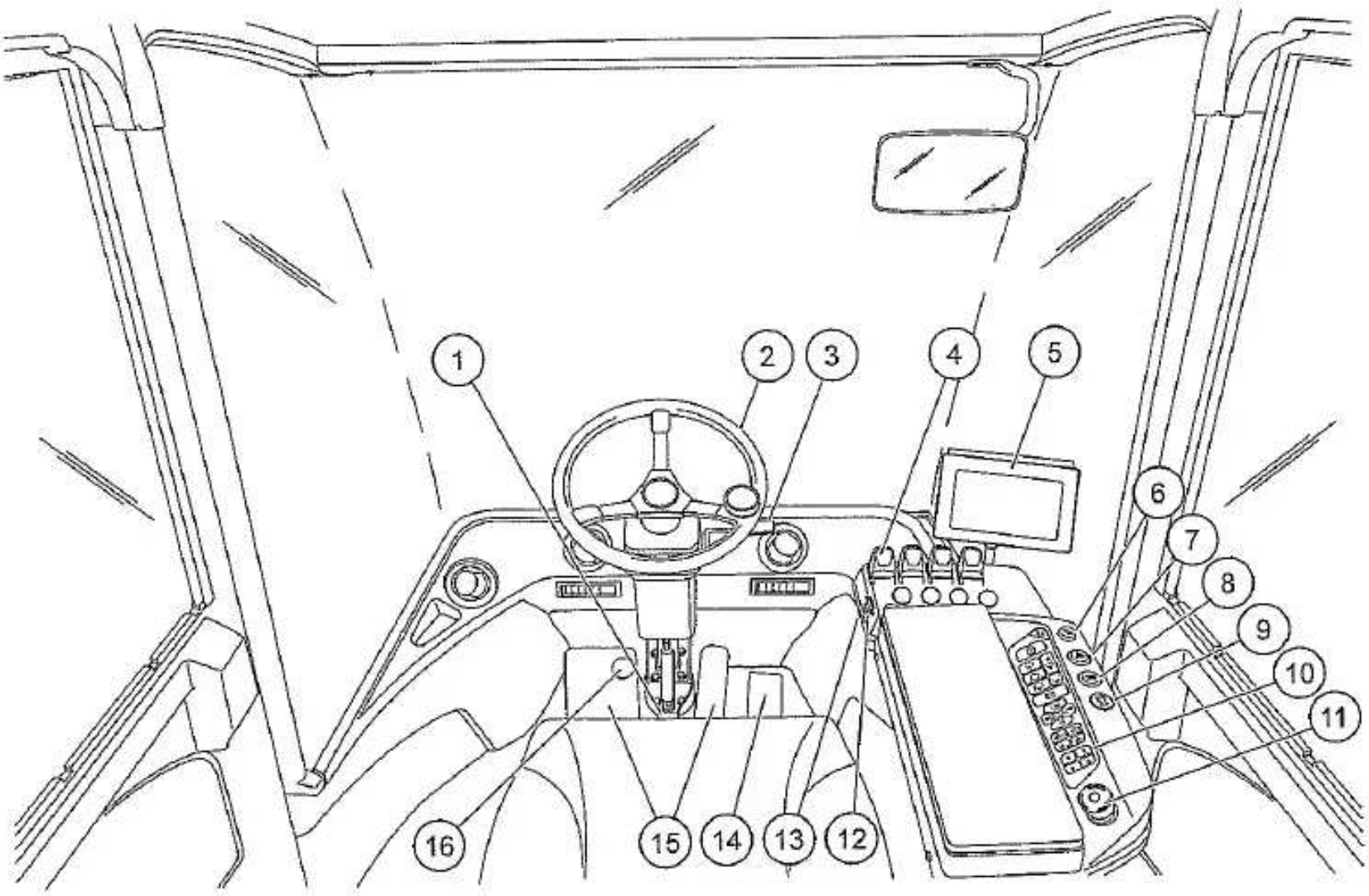


Figure 7. Controls and indicators in the cabin

1. *Adjustment pedal for the steering wheel column*
2. *Steering wheel*
3. *Adjustment lever for the steering wheel*
4. *Control levers for the hydraulics*
5. *Display*
6. *Ignition switch*
7. *Hazard light*
8. *Parking lights*
9. *Rotating beacon(s)*
10. *Keypad*
11. *Emergency stop*
12. *Gear switch*
13. *Horn*
14. *Accelerator pedal*
15. *Brake pedal*
16. *Declutch*

The position of controls may vary from machine to machine depending on the customer order.

3.4 Keypad

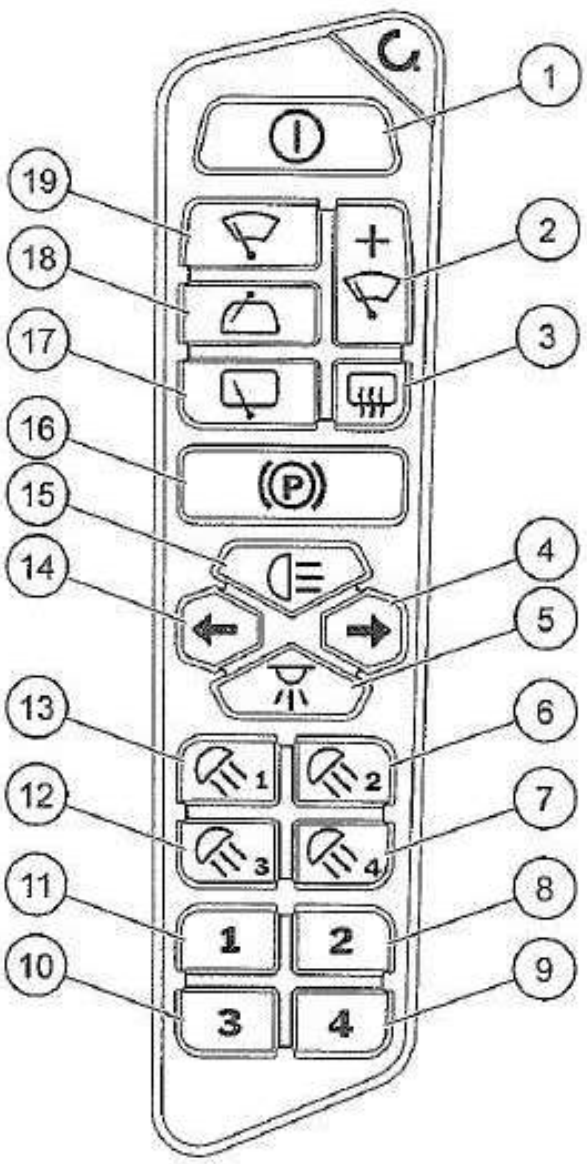


Figure 8. Keypad

1. *Start/stop engine*
2. *Wiper one-stroke*
3. *Rear window defroster*
4. *Turn signal indicator, right*
5. *Cabin interior light*
6. *Working light for roof*
7. *Extra working light*
8. *Option 2*
9. *Option 4*
10. *Option 3*
11. *Option 1*
12. *Extra working light*
13. *Working light for mast*
14. *Turn signal indicator, left*
15. *Main beam headlights*
16. *Parking brake*
17. *Rear window wiper, push and hold down for washer* [1)]
18. *Roof window wiper, push and hold down for washer* [1)]
19. *Windshield wiper, push and hold down for washer* [2)]

[1)] intermittent/second speed/off

[2)] intermittent/first speed/second speed/off

Optional equipment can be installed as a part of an ergonomic instrumentation layout.

3.5 MD4 display

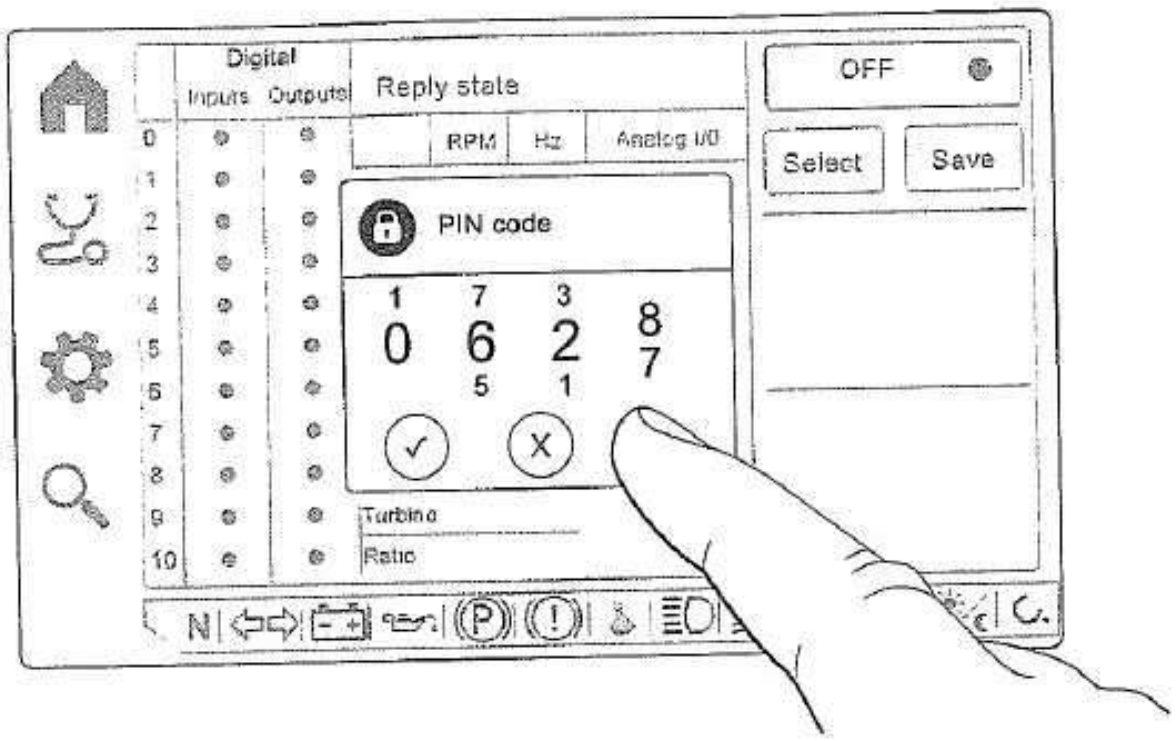


Figure 9. MD4 touch display

The MD4 display is an 18 cm (7") touch display. It is robust, weatherproof, and manufactured for outdoor use. The optical bonding reduces reflections and improves readability.

The display has a user-friendly touch interface: to navigate between views, you simply tap on the screen. With the display, you can monitor the hydraulics system and drive line with the help of analog and digital signals from various sensors. It gives you a complete overview of the machine's activities during operation.

The active keypad function is shown at the bottom left corner.

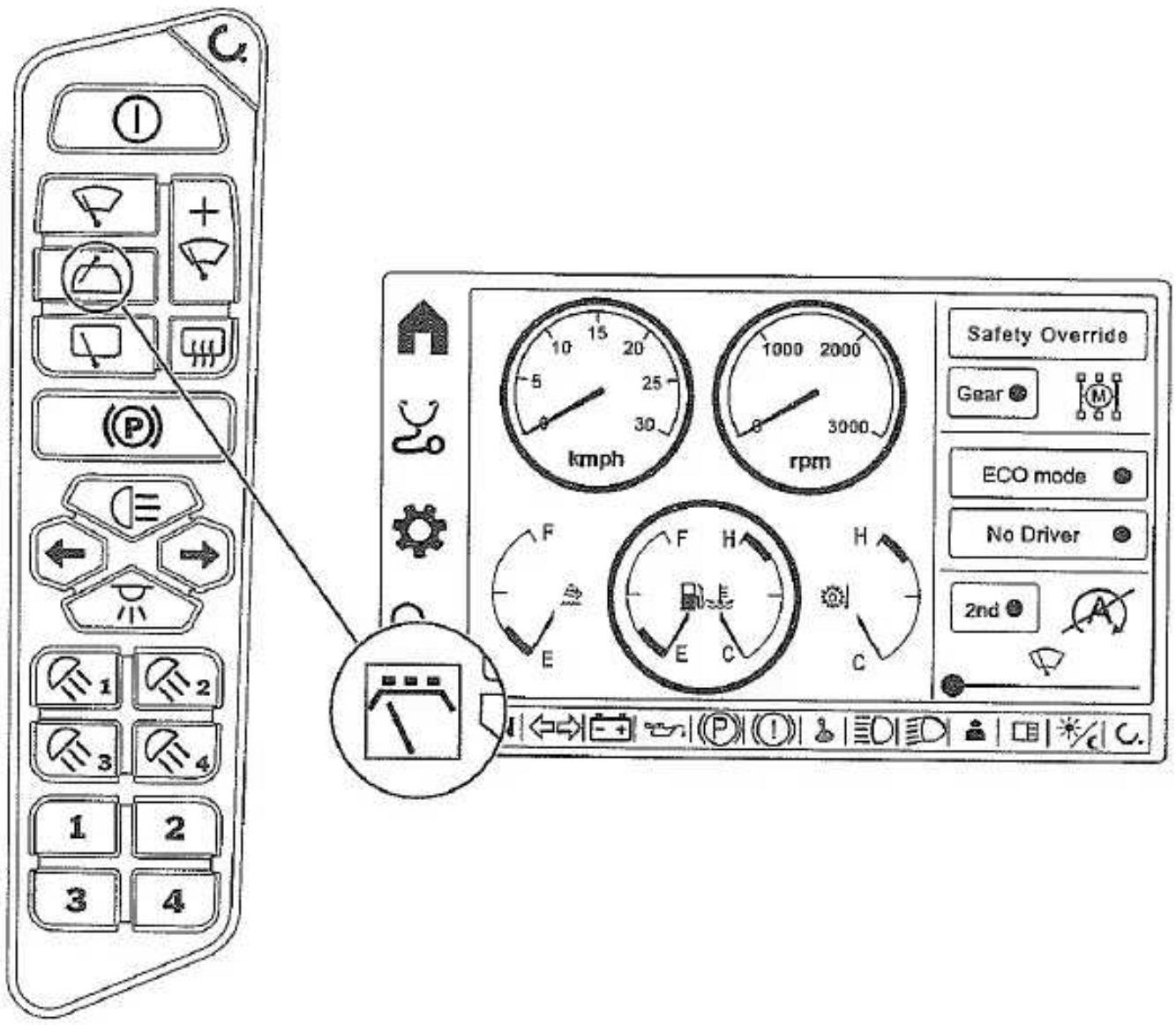
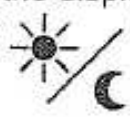


Figure 10. Example of active keypad function: roof window wipers, intermittent

You can view the display in the day mode or in the night mode. To switch between the modes, press the icon  at the bottom right corner.

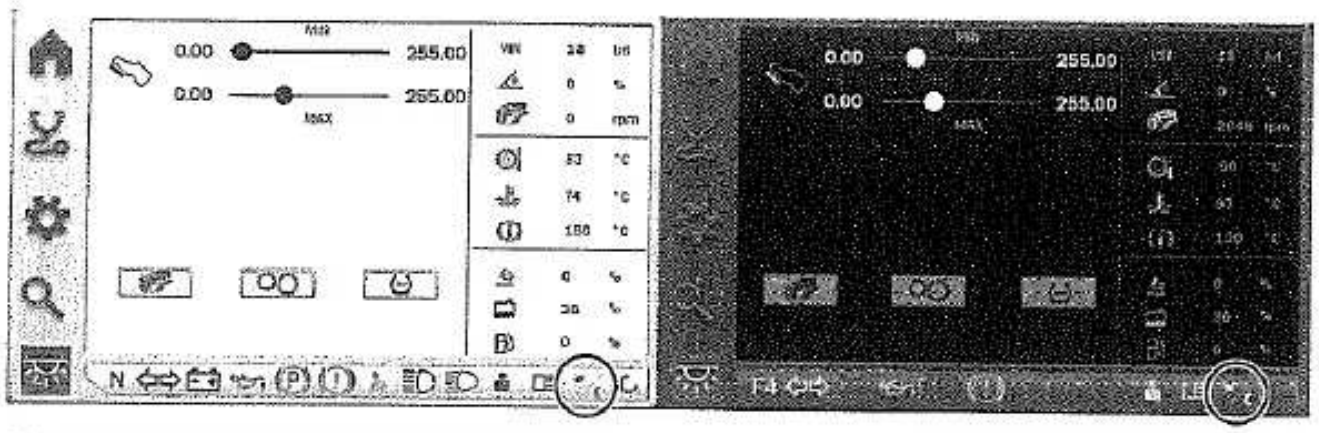


Figure 11. Day mode and night mode

3.5.1 Keypad symbols on the display

When you select a function in the keypad, its symbol is shown on the display.

Front window wipers

Front window wipers, slow

Front window wipers, fast

Front window wipers, intermittent

Rear window wipers

Rear window wipers, intermittent

Rear defroster

Roof and rear washer

Roof window wipers

Roof window wipers, intermittent

Cabin interior light

Working light

3.5.2 User interface

Introduction to MD4 pages

The MD4 pages can be accessed by clicking on the frame icons. They show various data needed during operation and allow the operator to change required settings.

3.5.3 MD4 display frame

The MD4 display frame is always visible, except in the settings pages and the attachment settings page. This makes it easy to navigate in the system and to switch between the day and night mode.

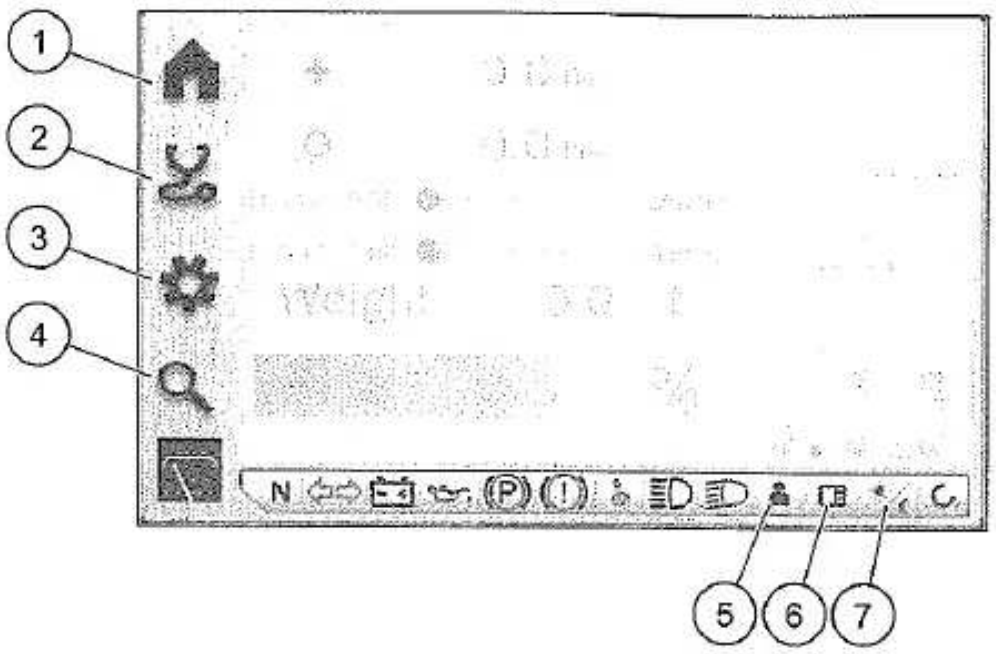


Figure 12. MD4 frame icons

1. *Home page*
2. *Machine overview page*
3. *Settings page*
4. *Information page*
5. *Operator page*
6. *Main page selection*
7. *Night/day mode*

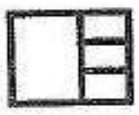
Left side of the MD4 display frame

Using the left-side frame icons, you can return to the **Home page** and access **Machine overview page**, **Settings page** and **Information page**.

Icon	Meaning
	**Home page**
	**Machine overview** page shows engine fluid data and gives access to transmission, engine and tire pressure monitoring pages.
	**Settings** allows you to view and edit settings and calibration data. Only service personnel is allowed to modify the settings.
	**Information page** shows various counters, such as container counter and time to next service.

Bottom of the MD4 display frame

The bottom of the MD4 display shows operator control and engine status symbols. The symbols are grey when the function is not on or the status is normal. From the bottom frame, you can also access the **Operator** page and **Main page selection** page and switch between the **Day mode** and **Night mode**.

Symbol	Meaning
N	Selected gear: N for neutral, R1, R2, R3, or R4 for reverse, F1, F2, F3, or F4 for a forward gear. The number of gears depends on the type of transmission in the machine.
	The turn signal: blinks green when you push the turn signal button.
	Red when the battery is low.
	Red when the engine oil is low.
	Red when the parking brake is on.
	Red when the brake pressure is low.
	Joystick steering is active.
	Green when the low beam is on.
	Green when the high beam is on.
	Access to the **Operator page**.
	Access to the **Main page selection**.
	Switch between the **Day mode** and **Night mode**.

3.5.4 MD4 pages

Start-up page

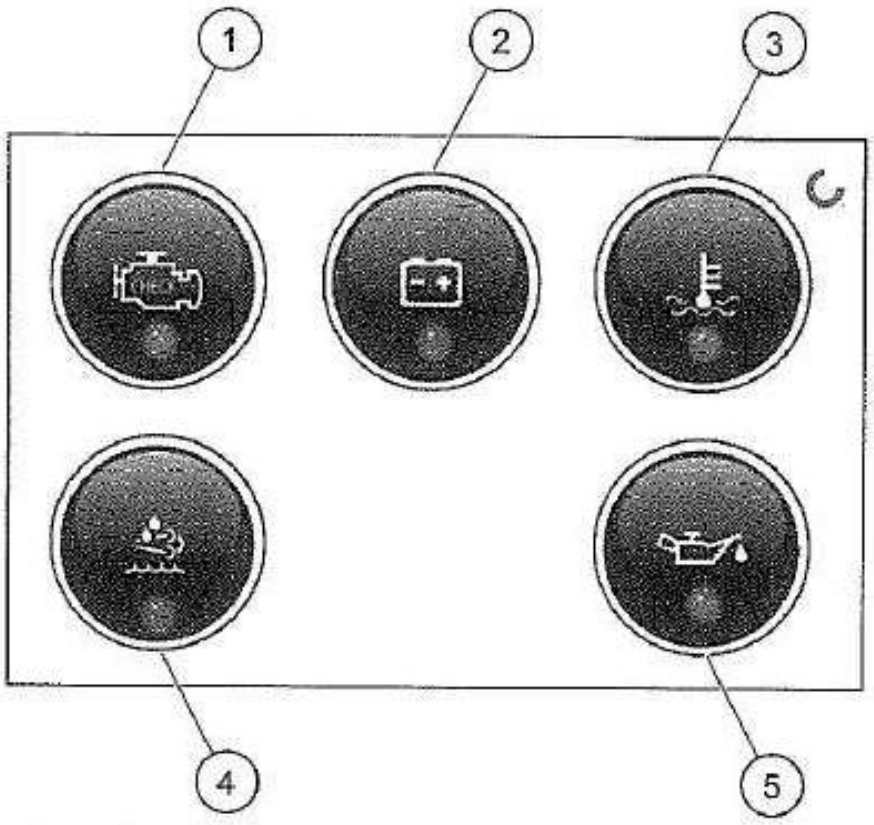


Figure 13. Start-up page

1. *Engine check*
2. *Battery check*
3. *Engine coolant check*
4. *AdBlue check*
5. *Engine oil check*

The **Start-up page** is displayed when you start the machine. After 10-15 s, it changes automatically to the **Home page**. Green light indicates normal status, red light indicates error.

Home page

Figure 14. Home page

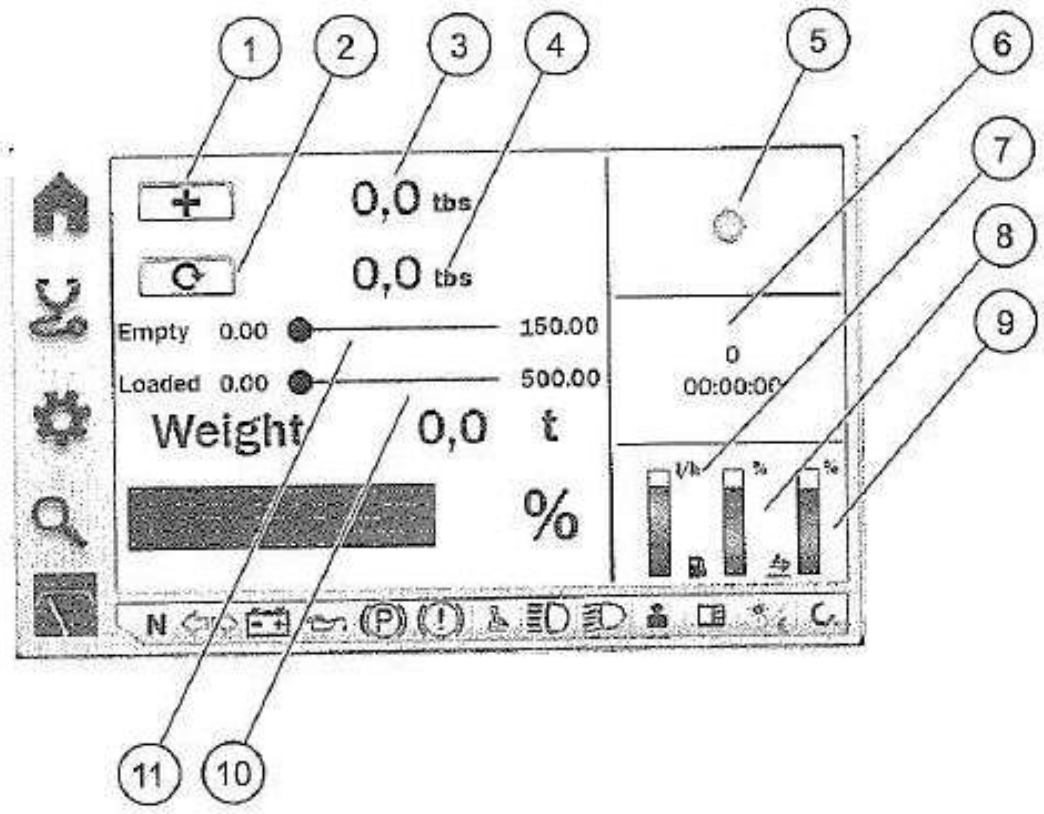
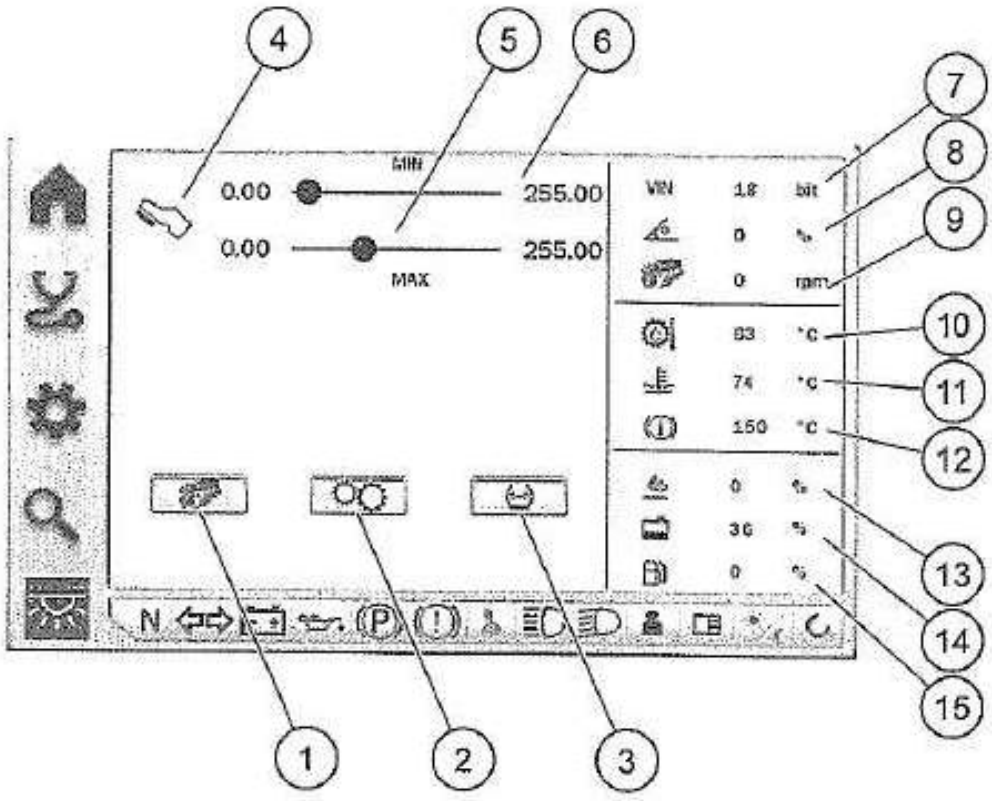


Figure 15. Home page

1. *Add weight*
2. *Reset weight*
3. *Last load*
4. *Total load weight*
5. *Twistlock indication*
6. *Date and time*
7. *Fuel consumption*
8. *Fuel level*
9. *AdBlue level*
10. *Weight calibration without a load*
11. *Weight calibration with maximum capacity load*

Machine overview page



The **Machine overview page** gives you access to engine data, transmission data, and tire pressure monitoring as well as basic motor fluid data.

1. *Engine diagnostics*
2. *Transmission diagnostics*
3. *Tire pressure monitoring*
4. *Accelerator pedal indicator (only in calibration mode) **
5. *Accelerator pedal calibration, maximum position (only in calibration mode) **
6. *Accelerator pedal calibration, minimum position (only in calibration mode) **
7. *Raw value from accelerator pedal*
8. *Accelerator pedal 0-100%*
9. *Engine RPM*
10. *Transmission oil temperature*
11. *Engine coolant temperature*
12. *Brake oil temperature*
13. *AdBlue level*
14. *Engine coolant level*
15. *Fuel level 0-100%*

*Only visible if you have entered the service code.

Engine diagnostics

Machine overview > Engine diagnostics

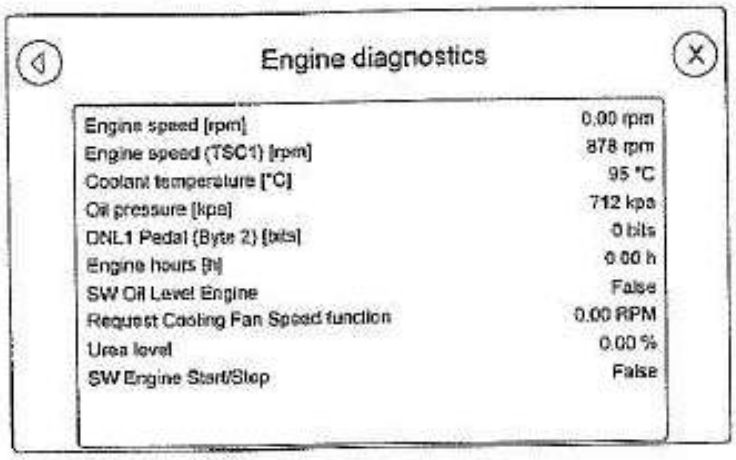


Table 1. Measurements for engine diagnostics

Measurement	Meaning
Engine speed [rpm]	Actual engine RPM
Engine speed TSC1 [rpm]	Requested engine RPM
Coolant temperature [°C]	Coolant temperature
Oil pressure [kpa]	Engine oil pressure
DNL1 Pedal (Byte 2) [bits]	Request to Scania engine for auto engine acceleration
Engine hours [h]	Not used for reading machine hours
SW Oil Level Engine	Special option for Scania engine
Request Cooling Fan Speed function	Requested cooling fan RPM from machine
Urea level	Urea/AdBlue level in %
SW Engine Start/Stop	Start request signal (Engines with CAN-bus start)

ZF transmission

Machine overview > ZF transmission

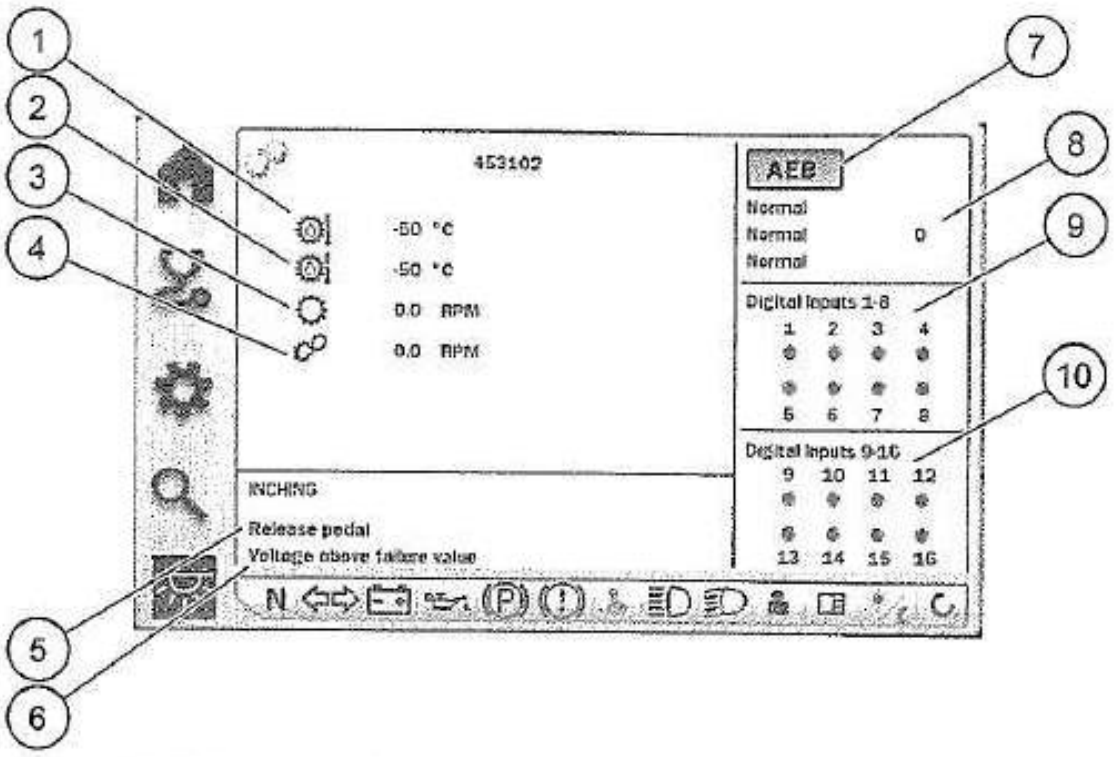


Figure 16. ZF transmission

1. *Temperature of the converter*
2. *Temperature of the sump*
3. *Engine speed from transmission*
4. *Output shaft speed*
5. *Status of inching pedal*
6. *Fault reason*
7. *AEB button to start calibration*
8. *Status of transmission calibration*
9. *Digital input 1-8 on-off*
10. *Digital input 9-16 on-off*

DANA transmission

Machine overview > DANA transmission

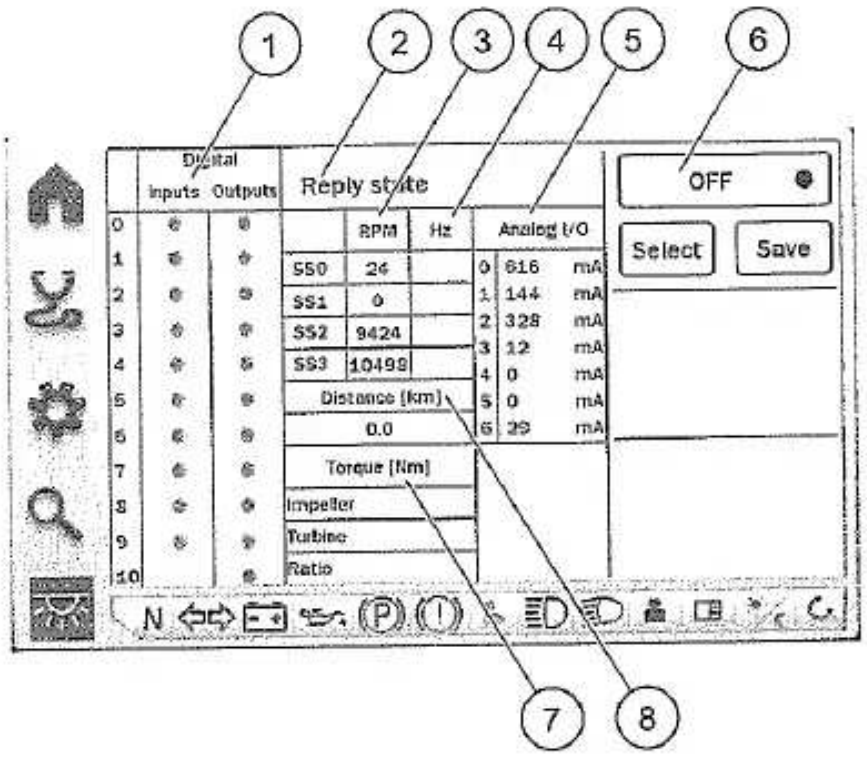


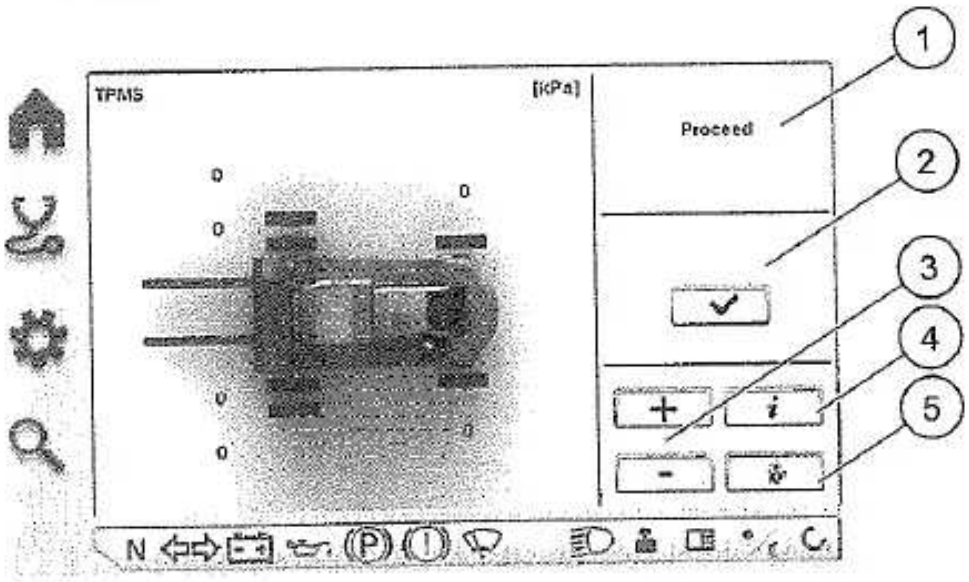
Figure 17. DANA transmission

1. *Digital inputs and outputs of the transmission, 0-9 and 0-10*
2. *State selected in (6)*
3. *Value in RPM from the speed sensors*
4. *Value in Hz from the speed sensors*
5. *Information about analog inputs and outputs*
6. *Transmission drop-down menu (selection of calibration and heating mode)*
7. *Torque information*
8. *Shows traveled distance in [km]*

Press (6) to measure or calibrate.

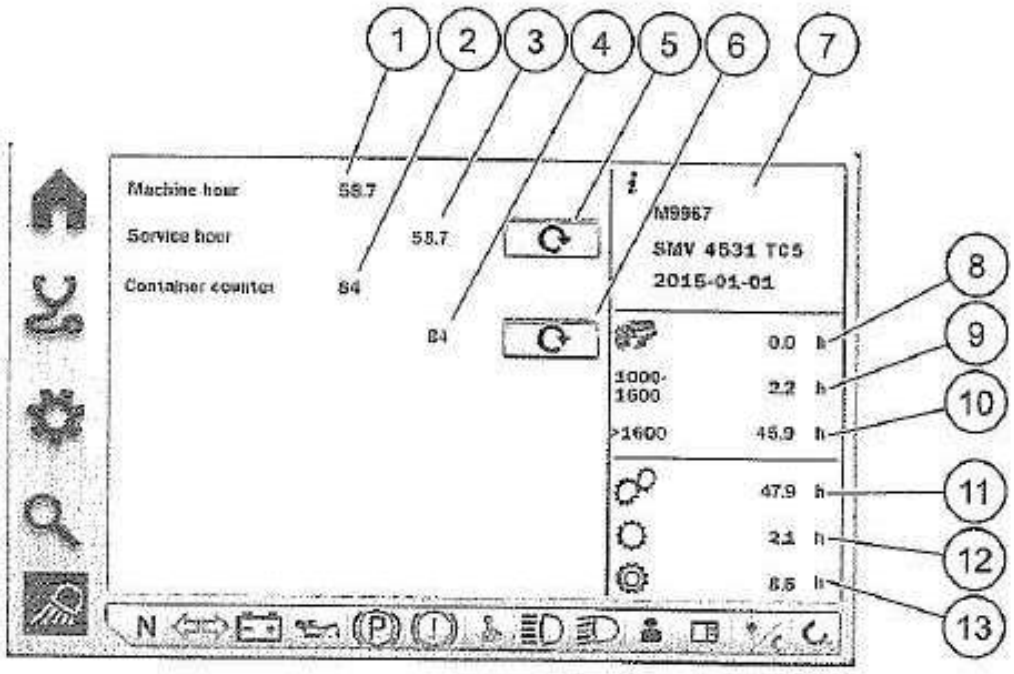
Tire pressure monitoring page

Machine overview > TPMS



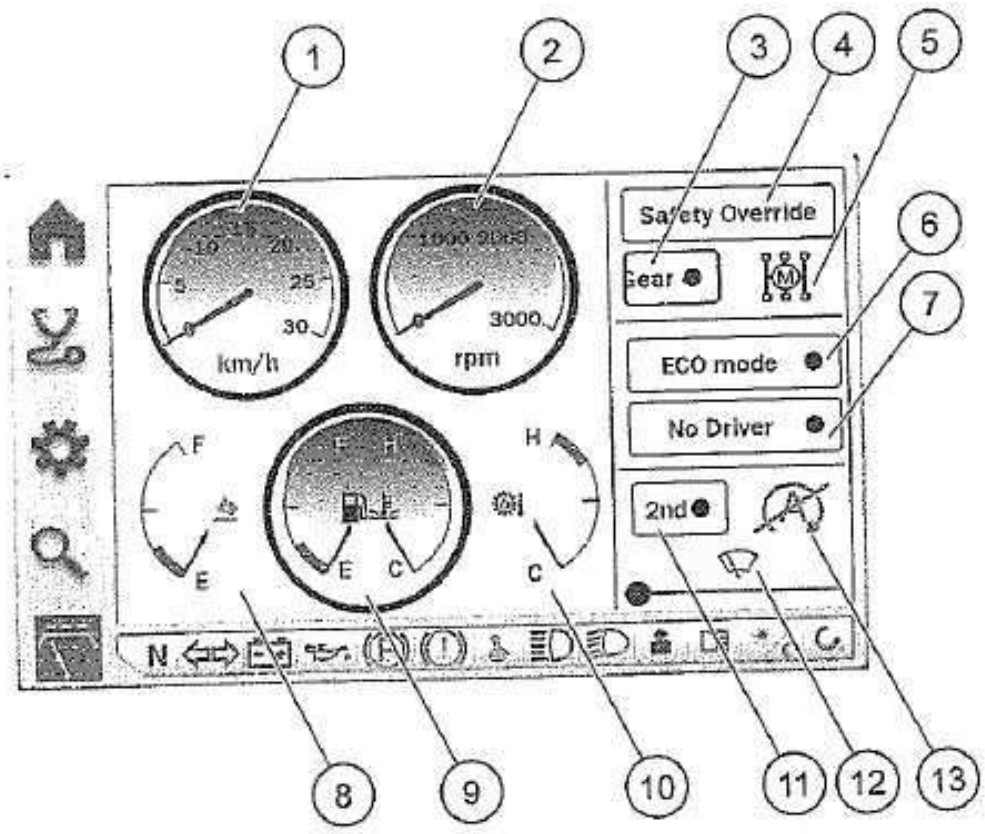
1. *Status from the TPMS module:*
   - *Proceed*
   - *Busy*
   - *Operation completed*
   - *Operation failed*
2. *Accept selection from buttons (3), (4), (5)*
3. *Add sensors +, delete sensors -*
4. *i = information from sensors (pressure and temperature)*
5. *Unlock the buttons*

Information page



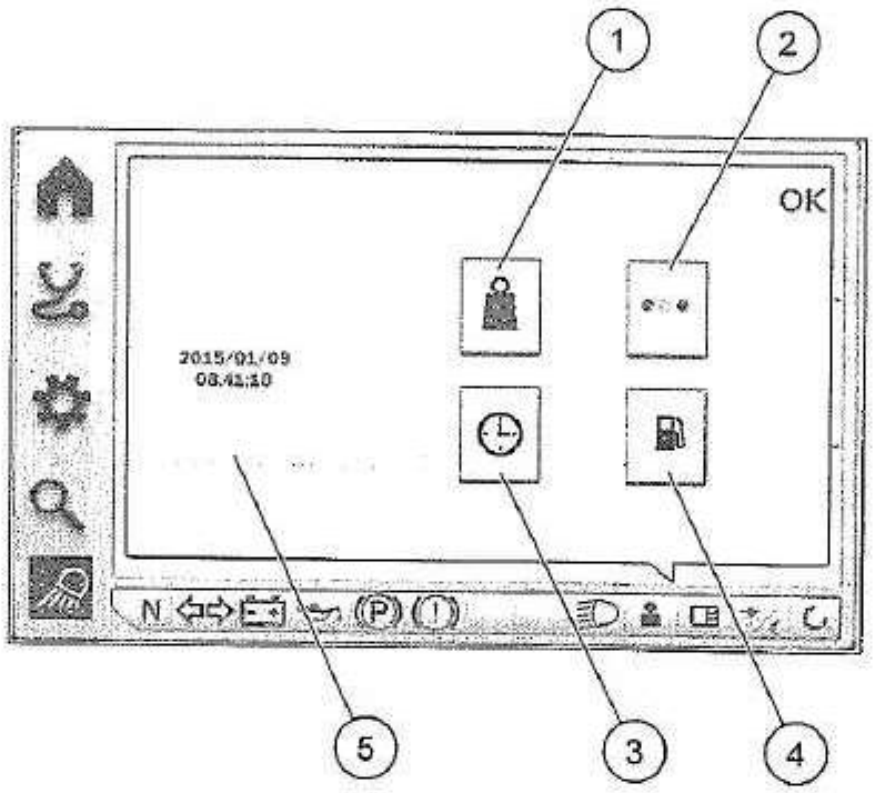
1. *Machine hours*
2. *Container counter*
3. *Time to the next service*
4. *Container counter (can be reset)*
5. *Resets service hour (3) (can only be done by service personnel)*
6. *Resets container counter*
7. *Machine information*
8. *Engine hours*
9. *Engine running between 1000-1600 RPM hourmeter*
10. *Engine running > 1600 RPM*
11. *The total number of driving hours for the transmission*
12. *Number of driving hours with the transmission in neutral, but exceeding idling RPM*
13. *Transmission idling hours*

Operator page



1. *Driving speed*
2. *Engine RPM*
3. *Select top gear*
4. *Safety Override for the attachment*
5. *Automatic or manual gear selection*
6. *Eco mode or productivity mode*
7. *Operator login*
8. *AdBlue level*
9. *Fuel level and coolant temperature*
10. *Transmission oil temperature*
11. *Starting gear*
12. *Intermittent wiper*
13. *Autostop function: the symbol is visible if the machine has the autostop function. Press the symbol to disable the autostop function for 2 minutes.*

Main page selection



In the **Main page selection**, you can select the view that you want to see when you are operating the machine.

1. *Home (weight) page*
2. *Attachment page*
3. *Time and date page*
4. *Eco driving page*
5. *Shows which page is selected*

Eco driving page

Main page selection > Eco driving

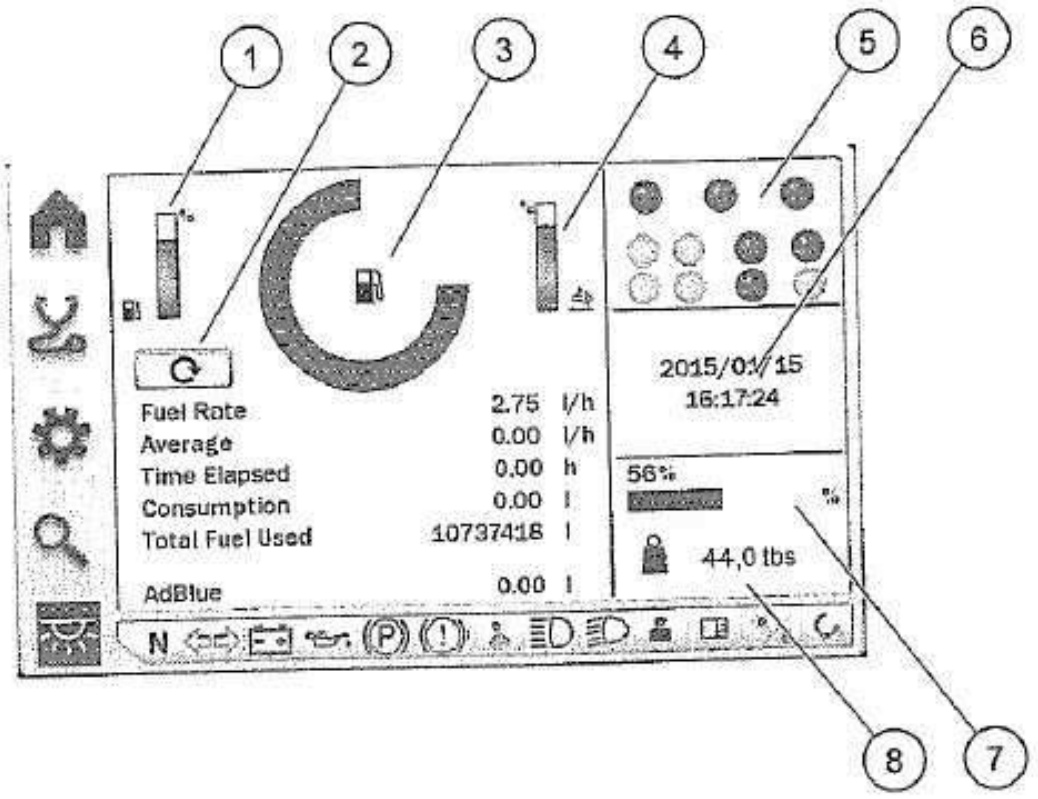


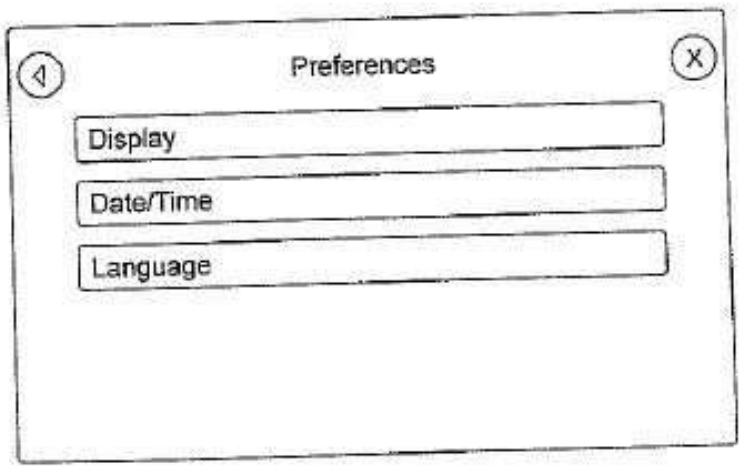
Figure 18. Eco driving page

1. *Fuel level*
2. *Reset other values except total fuel used and total AdBlue solution used:*
   - *Fuel rate: how much fuel is currently being consumed per hour*
   - *Average: how much fuel, on average, is consumed per hour*
   - *Time elapsed: time since last reset*
   - *Consumption: fuel consumption since last reset*
   - *Total fuel used: fuel used since the machine was first started*
   - *AdBlue: AdBlue solution used since the machine was first started*
3. *Fuel consumption in %*
4. *AdBlue level*
5. *Twistlock indication*
6. *Time and date*
7. *Percentage of maximum load*
8. *Actual load weight*

3.5.5 Preferences

Settings > Preferences

Select the item to be changed from the **Preferences** menu:



- Display (backlight strength and screen saver on/off)
- Date and time
- Language

Setting the display backlight and screen saver

1. To set the backlight, set the value with [-] and [+].
2. To turn screen saver **ON** or **OFF**, press [-] or [+].

Setting the language

1. Select the language from the menu.
2. The interface language changes.

Setting the date and time

1. To set the year:
   1.1. Set the year with [-] and [+].
   1.2. Press (✓).
2. To set the month:
   2.1. Set the month with [-] and [+].
   2.2. Press (✓).
3. To set the day:
   3.1. Set the day with [-] and [+].
   3.2. Press (✓).
4. To set the time:
   4.1. Set the hours with [-] and [+].
   4.2. Press (✓).
   4.3. Set the minutes with [-] and [+].
   4.4. Press (✓).

3.6 Lifting loads

3.6.1 Lifting capacity plate

WARNING! MACHINE MISUSE HAZARD

Incorrect lifting of a load may lead to serious personal injury and damage to the machine.

Check that the load is centered between the forks. Check that the forks are in good condition.

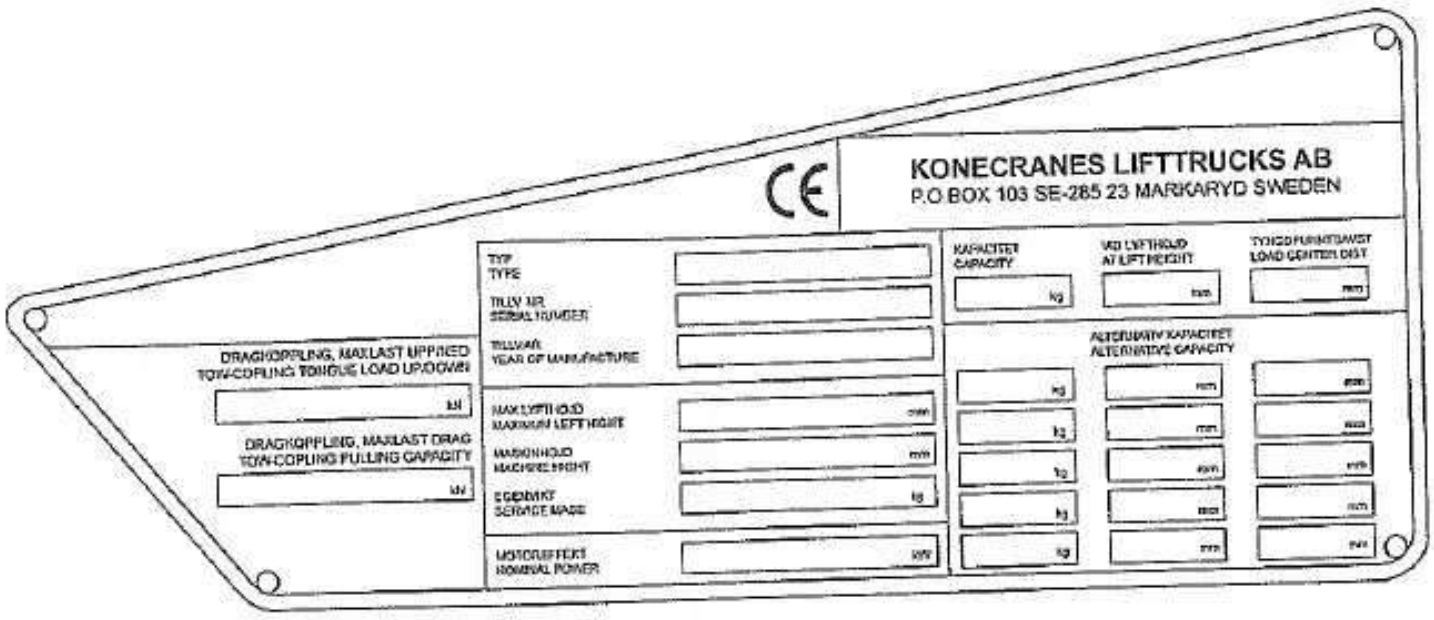
WARNING! MACHINE MISUSE HAZARD

Exceeding the maximum load affects the stability and safety margins of the machine.

Do not use the machine to handle a greater load than what is stated on the lifting capacity plate.

WARNING! MACHINE MISUSE HAZARD

Konecranes is responsible for the safety of the machine and the warranty only applies as long as it is used within the areas of limitation that are clear from its machine plate and EC assurance.



The lifting capacity plate is on the left side of the cabin. If an additional unit has been fitted, read the lifting capacity plate for the additional unit. The values that are indicated on the lifting capacity plate are valid for compact and regular loads. If the values are exceeded, there is a risk to the stability of the machine and the tensile strength of the forks and the mast. The maximum capacity depends on the lifting height and the distance to the load center (LC). LC is the distance between the front of the fork shaft and the load center.

The following is an example of values for the main lifting capacity and the alternative lifting capacities, which are indicated on the lifting capacity plate.

Main lifting capacity

Lifting capacity is 33 t at lifting height 4,000 mm (157.5 in) and center of load 1,200 mm (47.2 in) (related to model).

Alternative lifting capacities

The lifting capacity decreases as the center of load and the lifting height increase, according to the following examples:

Lifting capacity is 22 t at lifting height 4,500 mm (177.2 in) and center of load 1,500 mm (59 in) (related to model).

Lifting capacity is 19.5 t at lifting height 4,500 mm (177.2 in) and center of load 1,800 mm (70.9 in) (related to model).

3.6.2 Maneuvering the mast

⚠ WARNING

MACHINE MALFUNCTION HAZARD

Incorrect lifting of a load may lead to serious personal injury and damage to the machine. Handling of the machine outside of its area of use may lead to overloading and instability.

Use the mast and its additional equipment only for approved work. The operator must be trained in the handling of the machine and its equipment.

- Always maneuver the levers gently and slowly
- The speed of the hydraulic functions depends on the movement of the lever
- The lever automatically returns to its original position when released
- The hydraulic levers are on the console to the right of the operator's seat

WARNING! MACHINE MISUSE HAZARD

Adding an attachment that is not suitable for the machine may cause the attachment to fall off. Risk of serious personal injury and damage to the machine.

Optional equipment that was not supplied with the machine may only be used if an authorized dealer has ensured that safe operations can be guaranteed in terms of lifting capacity and stability.

NOTE ***Pay attention to the operational symbols and the directional arrows.***

- To raise the fork carriage, pull the lever (1) backwards.
- To lower the fork carriage, move the lever (1) forwards.
- To tilt the fork carriage backwards, pull the lever (2) backwards.
- To tilt the fork carriage forwards, move the lever (2) forwards.
- To move the forks to the right, pull the lever (3) backwards.
- To move the forks to the left, move the lever (3) forwards.
- To decrease the distance between the forks, pull the lever (4) backwards.
- To increase the distance between the forks, move the lever (4) forwards.

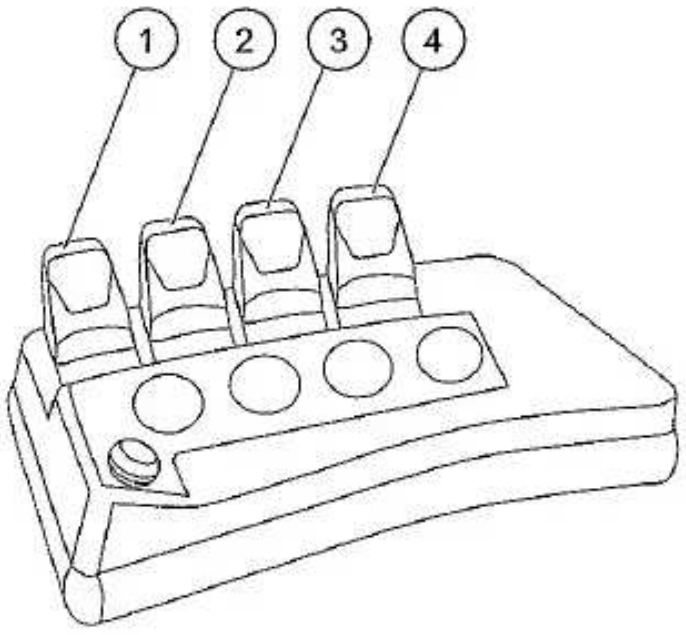


Figure 19. Lever functions

4 OPERATING INSTRUCTIONS

4.1 Before driving

4.1.1 Daily maintenance before operation

1. *Check the battery main switch.*
2. *Check the tire pressure, condition, and wheel nuts.*
3. *Check the engine oil level.*
4. *Check the transmission oil level.*
5. *Check the coolant level.*
6. *Check the hydraulic oil level.*
7. *Check the brake cooling oil level (when applicable).*
8. *Check the MD4 warnings for clogging of engine air filter.*
9. *Clean the engine air filter's coarse separator.*
10. *Check the windshield washer level.*
11. *Check the fuel level.*
12. *Check the AdBlue level (when applicable).*
13. *Check the functioning of the brake system.*
14. *Check the functioning of the steering system.*
15. *Check the functioning of the hydraulic system.*
16. *Check the lights and horn.*

4.1.2 Turning on and turning off the battery main switch

WARNING! ELECTRICAL HAZARD

The main disconnect does not cut the power to the alternator.

To reduce the risks of electric shock and personal injury always remove jewelry and conductive material before working on the electrical system. Always disconnect the ground (minus) cable at the battery when working near or on the alternator.

WARNING! TIPPING OVER HAZARD

Risk of serious personal injury and damage to the machine.

When turning off the battery main switch while the machine is moving, the machine may tip over. Unless in an emergency situation, do not turn off the battery main switch while the engine is running.

WARNING! EXPLOSION HAZARD

Short-circuiting the battery may cause a fire or explosion, which cause a risk for serious injury or death.

To reduce the risks of electric shock and personal injury always remove jewelry and conductive material before working on the electrical system.

WARNING! EXPLOSION HAZARD

Batteries generate explosive hydrogen when charged, which may cause a risk for serious injury or death.

Always use the necessary protective equipment. Ensure that there is good ventilation and avoid sparking.

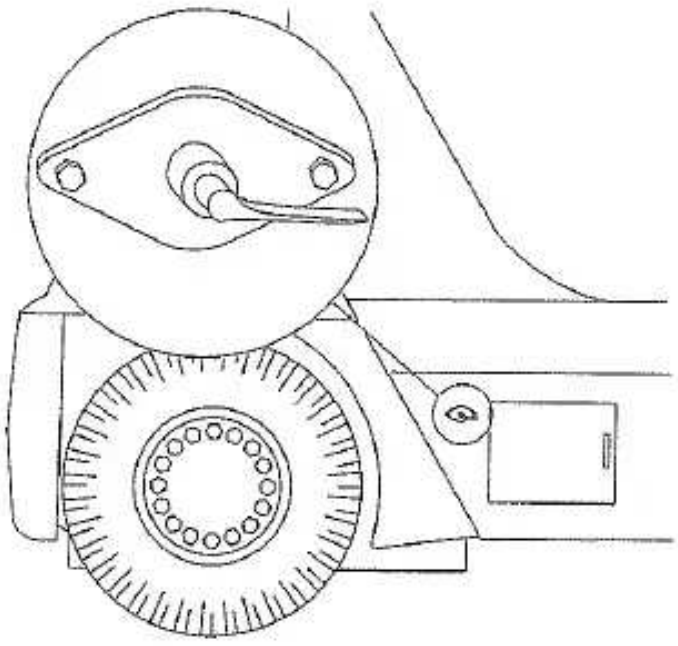


Figure 20. Battery main switch

1. Before operating, turn on the battery main switch. Turn the battery main switch clockwise.
2. After operating, turn off the battery main switch. Turn the battery main switch counterclockwise.

4.1.3 Checking the condition and pressure of the tires

⚠ WARNING

HIGH PRESSURE HAZARD

Release of high-pressured air could cause death or serious personal injury.

Proceed with caution when working with pressured air systems. Use approved personal protective equipment. Follow all safety requirements.

⚠ DANGER

HIGH PRESSURE HAZARD

The tires may explode when inflated. Standing inside the danger zone during a tire explosion will cause death.

Always stand aside the wheel when deflating or inflating tires, see deflating danger zone illustration. Use safety glasses.

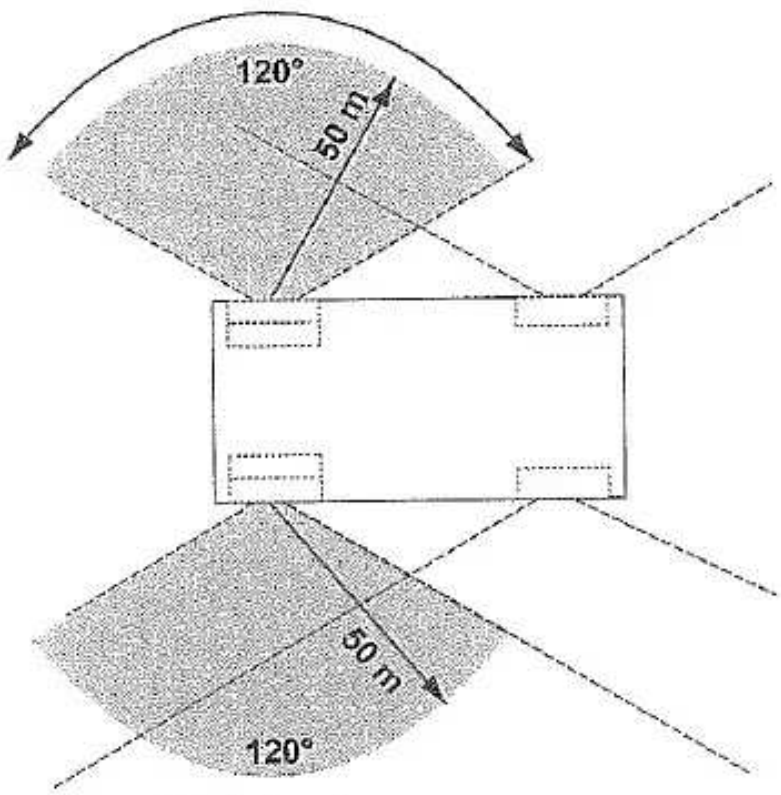


Figure 21. Deflating danger zone

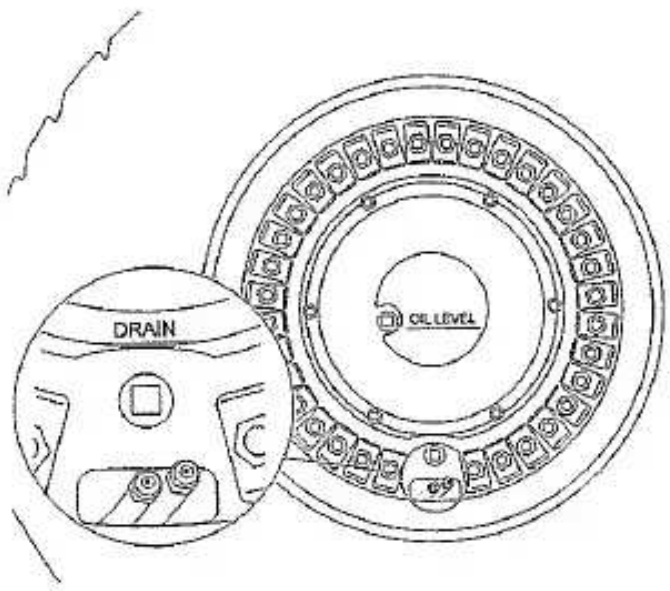


Figure 22. Drive axle tires

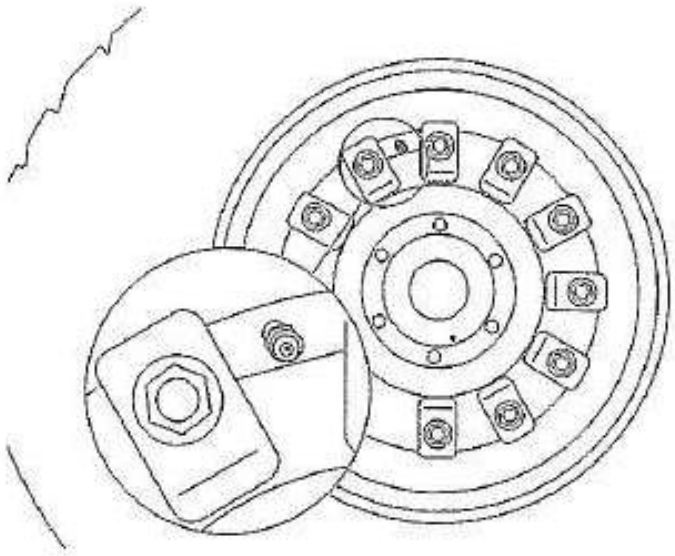


Figure 23. Steer axle tires

1. Check that the tires have not been damaged or become too worn.
2. Remove any deposit from the tread.
3. Check that the tires have the correct pressure according to the tire manufacturer's recommendations.
4. Pump the tires according to the relevant regulations.
5. Check that no wheel nuts are missing.

4.1.4 Checking the engine oil level

NOTE ***Make sure that the engine is switched off before checking the engine oil level.***

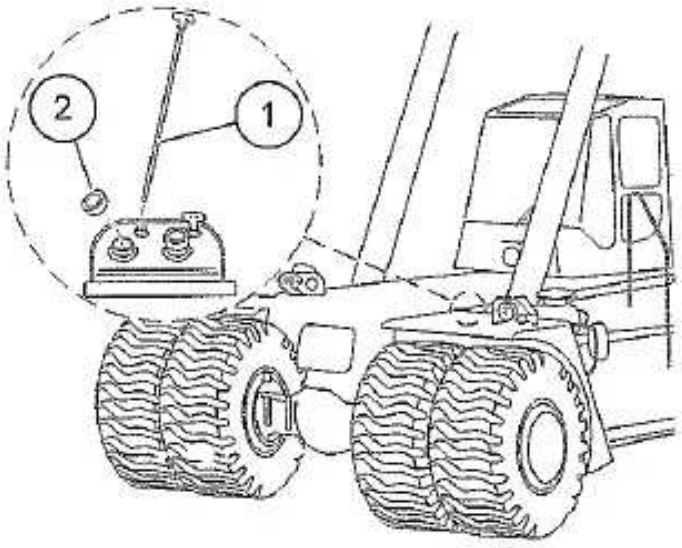


Figure 24. Checking the engine oil level: Volvo stage 2 - Stage 4, Cummins and Scania, stage 2 - 3B

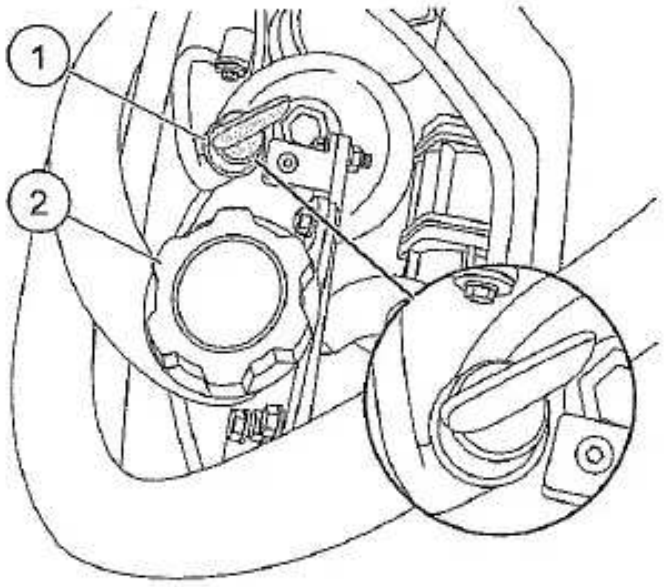


Figure 25. Checking the engine oil level, Scania stage 4[1)]

1)With the stage 4 Scania engine, you can check the oil level from the MD4 display.

1. Open the hatch for the dipsticks and oil filling.
2. Remove the dipstick (1) and dry it off with a clean cloth.
3. Put the dipstick back fully and remove again.
   The oil level must be between the minimum and maximum level indicators (in the operating temperature, at least 65°C or 149°F).
4. If necessary, remove the filler cap (2) and top up the oil.
5. Fill with the recommended oil.
   Make sure that the oil level is between the minimum and maximum marks on the dipstick.
   Do not fill above the maximum oil level.

   See maintenance data for the volume.

4.1.5 Checking the DANA transmission oil level

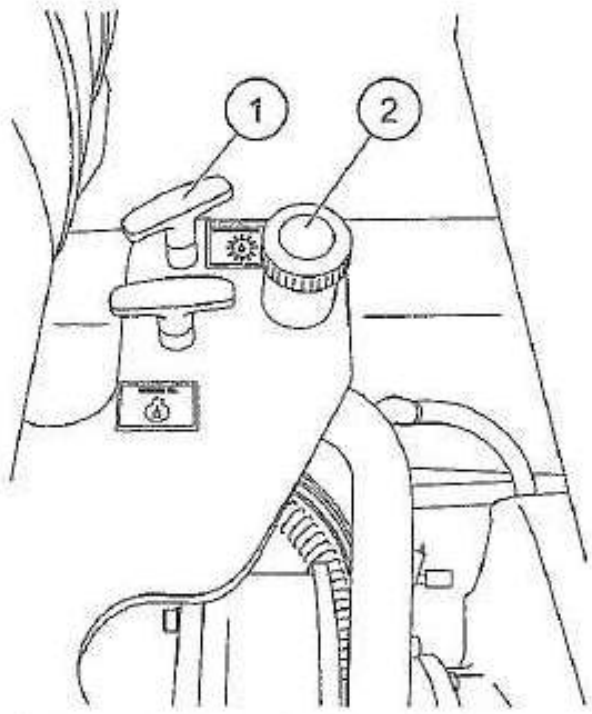


Figure 26. Transmission oil level

WARNING! HOT FLUID HAZARD
Risk of serious personal injury.
Avoid spilling hot oil and do not touch hot surfaces.

1. Start the engine and run until the oil has reached operating temperature (at least 65°C or 149°F).
2. Open the hatch for the dipsticks and oil filling.
3. Remove the dipstick (1) and dry it off with a clean cloth.
4. Insert the dipstick fully and remove it again.
   The oil level must be between the minimum and maximum level indicators.
5. If necessary, remove the filler cap (2) and top up the oil.

NOTE ***Turn off the engine before topping up the oil.***

Make sure that the oil level is between the minimum and maximum marks on the dipstick.
Do not fill above the maximum oil level.

See maintenance data for volume.

4.1.6 Checking the ZF transmission oil level

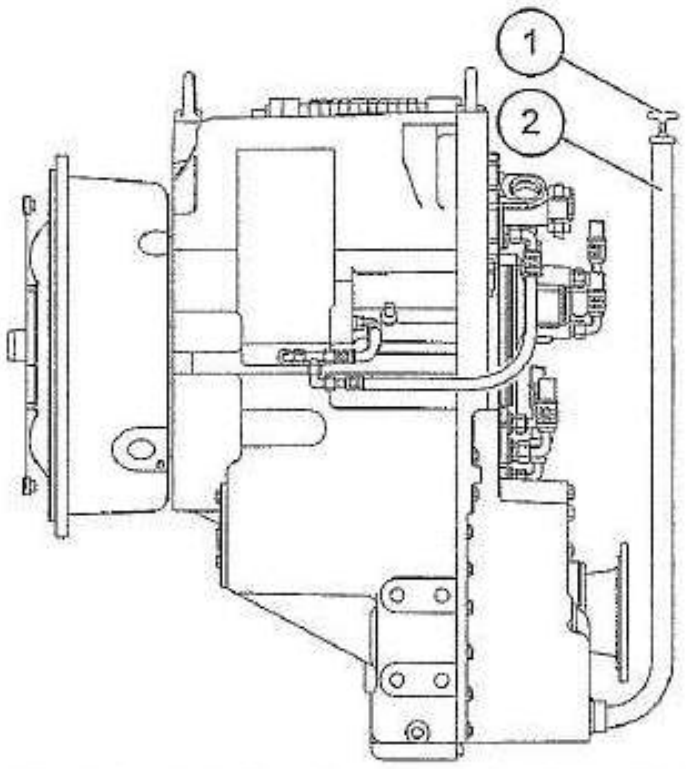
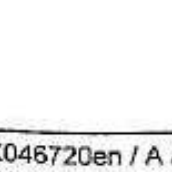


Figure 27. Checking the ZF transmission oil level



WARNING! HOT FLUID HAZARD
Risk of serious personal injury.
Avoid spilling hot oil and do not touch hot surfaces.

1. Start the engine and run until the oil has reached operating temperature (at least 65°C or 149°F).
2. Remove the dipstick (1) and dry it off with a clean cloth.
3. Put back the dipstick fully and remove it again.
   The oil level must be between the minimum and maximum level indicators.
4. If necessary, fill oil through the filler cap (2) and top up the oil.

NOTE ***Turn off the engine before topping up the oil.***

Make sure that the oil level is between the minimum and maximum marks on the dipstick. Do not fill above the maximum oil level.

See maintenance data for volume.

4.1.7 Checking the coolant level

WARNING! HOT FLUID HAZARD

Hot coolant may spray from the refill, which may cause a risk of serious injury.

Allow engine to cool and release pressure before opening the filler cap.

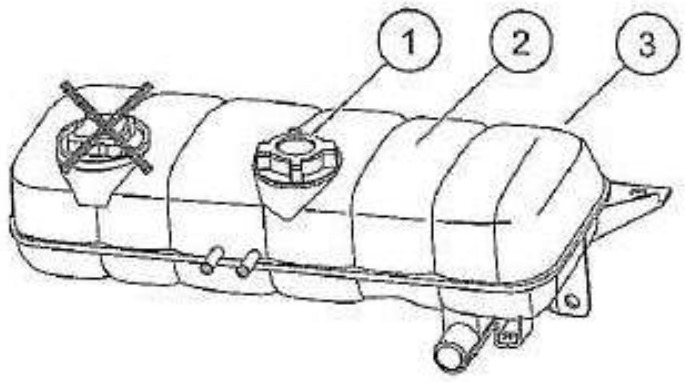
WARNING! HIGH PRESSURE HAZARD

The system may be under pressure even if it is not of the high-pressure type. The coolant may be under pressure and hot, which may cause serious injury.

Open the filler cap slowly.

NOTE ***Never remove the pressure chamber cap when refilling coolant.***

1. Check the level of the coolant.
   The level should be up to the maximum level indicator (3) of the expansion tank (2).



2. First open the filler cap (1) of the tank a quarter of a turn to ensure that the system is under no pressure.
3. Open the filler cap of the tank completely.
4. Fill the coolant tank.

NOTE ***Check from <u>Recommended fluids and lubricants (page 79)</u> whether green or yellow coolant is needed. Never mix different coolant types!***

5. Replace the filler cap (1) .

4.1.8 Checking the hydraulic oil level

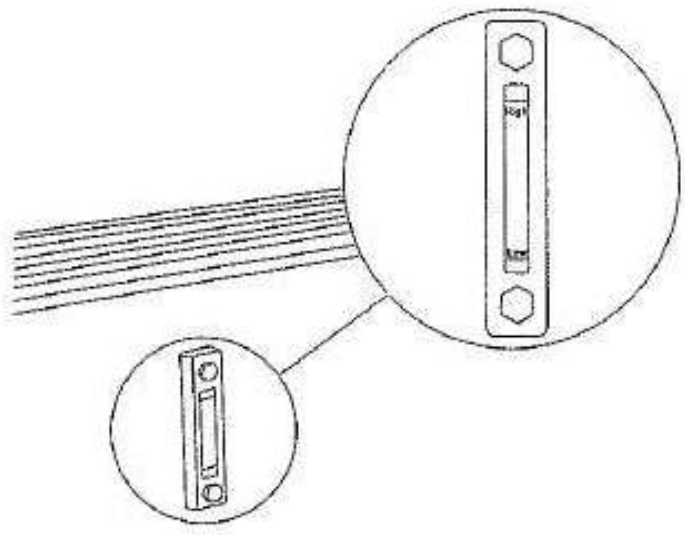
WARNING! HOT FLUID HAZARD

Hot hydraulic oil may spray from the oil refill, which may cause a risk of serious personal injury.

Do not open the filler cap while the engine is running.

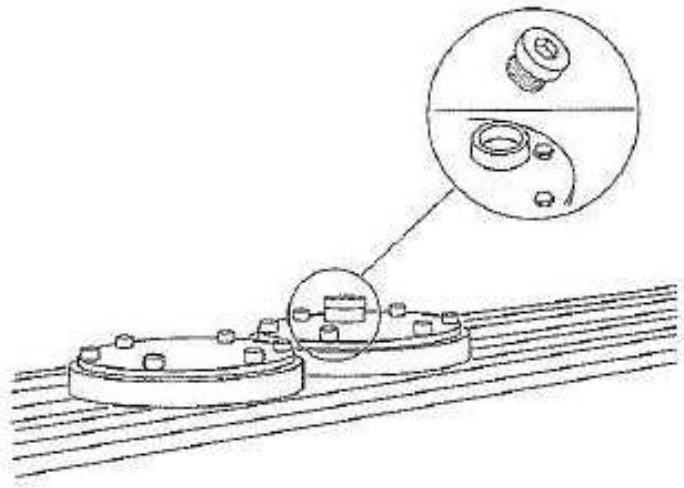
Before checking the hydraulic oil level, make sure that the mast is lowered.

1. Check that the oil level is between the minimum and maximum level indicators of the indicator at the side of the hydraulic oil tank.



2. If necessary, unscrew the filler cap and top up the oil.

NOTE ***To avoid the tank overflowing, do not fill it completely at once. It takes roughly 5 minutes for the oil to seep through the filters, so instead, fill up the tank gradually.***

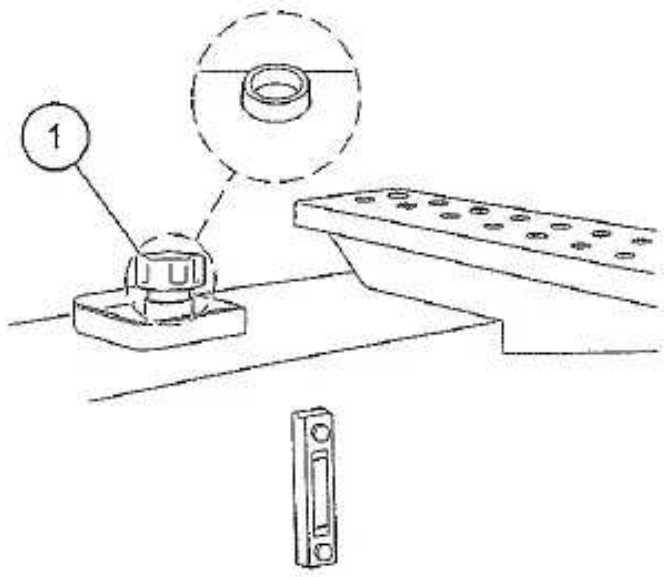


3. Fill with the recommended hydraulic oil. Make sure that the oil level is between the minimum and maximum marks. Do not fill above the maximum oil level.
4. Screw the filler cap back on.

4.1.9 Checking the brake cooling oil level

NOTE ***This section only applies to machines using brake cooling oil. Brake cooling oil is an option.***

1. Check that the brake cooling oil level is between the minimum and maximum level indicators at the side of the brake cooling oil tank.
2. If necessary, unscrew the breathing filter (1) to top up the brake cooling oil.

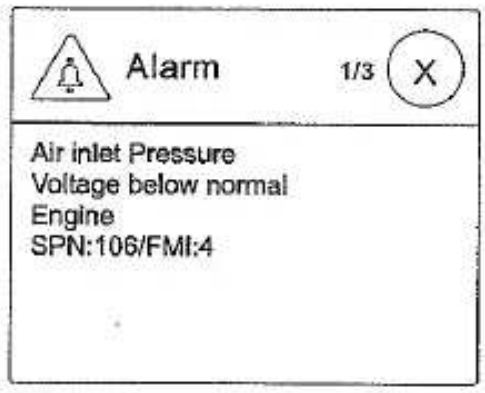


3. Fill up with the recommended brake cooling oil. Make sure that the oil level is between the minimum and maximum marks. Do not fill above the maximum oil level.
4. Screw the breathing filter back on.

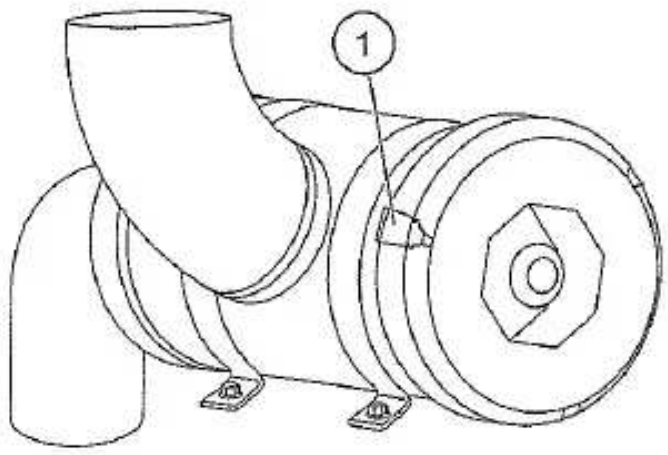
4.1.10 Checking the engine air filter

NOTE ***In sandy or dusty environments with a large number of particles, clean the engine air filter more frequently.***

1. When the engine air filter needs to be checked, a warning about air inlet pressure appears on the MD4 display.



2. Open the hatches (1) and loosen the side cover to access the engine air filter.



3. Clean the engine air filter.

NOTE ***Do not use water when you clean the engine air filter. The filter is made of paper and water will damage it. When cleaning the filter with compressed air, do not apply full power. Use care when cleaning the filter with compressed air.***

4. Start the engine. If the error still appears, stop the engine and replace the engine air filter.

4.1.11 Cleaning the engine air filter's coarse separator

NOTE ***In sandy or dusty environments with a large number of particles, clean the coarse separator more frequently.***

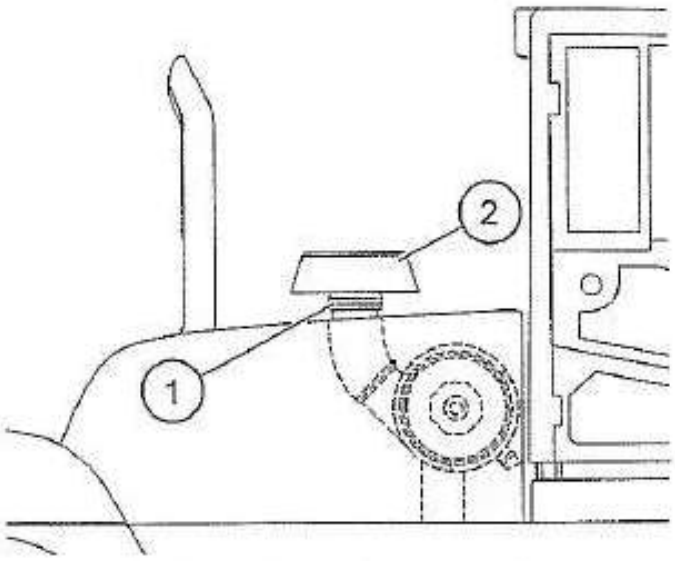


Figure 28. Coarse separator, standard

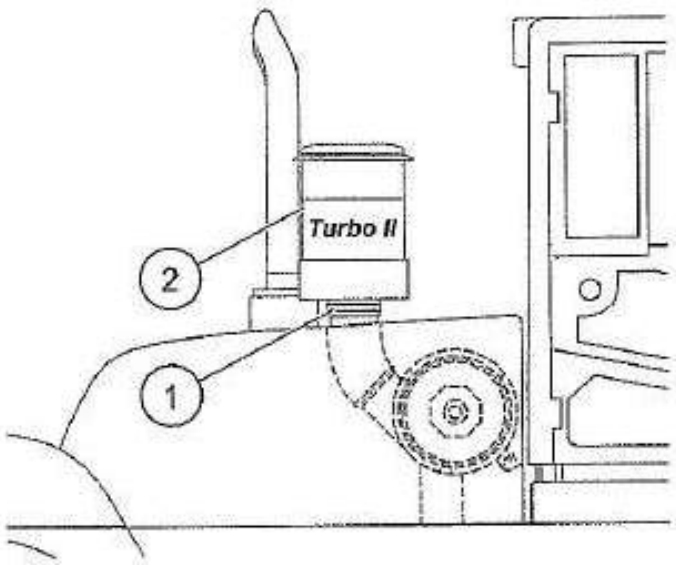


Figure 29. Coarse separator, turbo II

1. Remove the hatch (1) from the coarse separator (2).
2. Remove the coarse separator (2).
3. Remove particles and dry out the coarse separator with a cloth.
4. Refit the coarse separator (2) and screw the hatch (1) in place.

4.1.12 Checking the windshield washer level

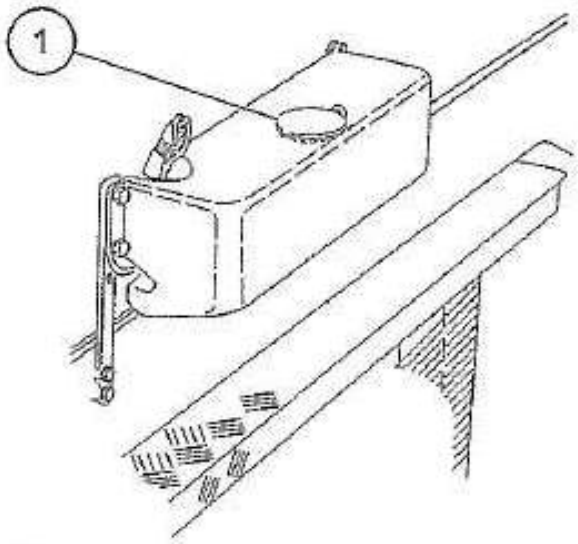


Figure 30. Washer fluid tank

1. Check the windshield washer level in the washer fluid tank (1).
2. Fill the washer fluid tank when necessary.

4.1.13 Adding fuel

WARNING! IGNITION HAZARD

Spilling fuel may start a fire, which may cause serious injury or death and damage to the machine.

Do not spill fuel.

NOTE ***If air enters the fuel system, the engine stops. To avoid air being sucked into the fuel system, never run the machine until the fuel tank is empty. Bleed the fuel system if air enters the fuel system.***

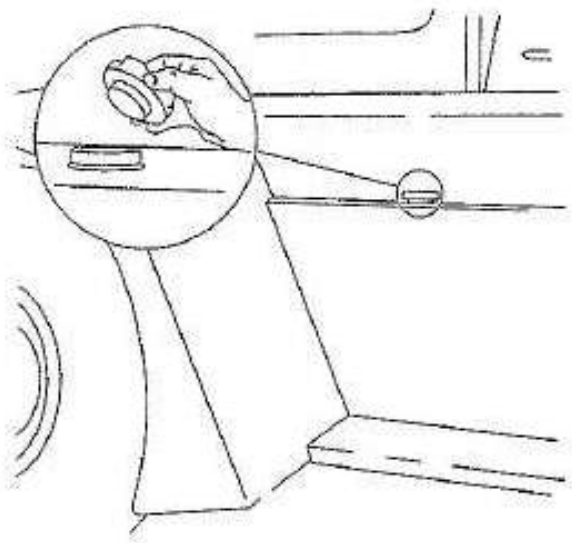


Figure 31. Adding fuel

1. Open the filler cap that is on the fuel tank.
2. Fill with the recommended fuel.
   See maintenance data for volume.
3. Screw on the filler cap.

4.1.14 Checking the AdBlue level

WARNING! HARMFUL SUBSTANCE HAZARD

Causes irritation on skin or eye contact.

Handle carefully, avoiding contact with skin and eyes. If you get AdBlue solution on your skin or eyes, quickly wash it off with soap and water.

WARNING! CORROSIVE SUBSTANCE HAZARD

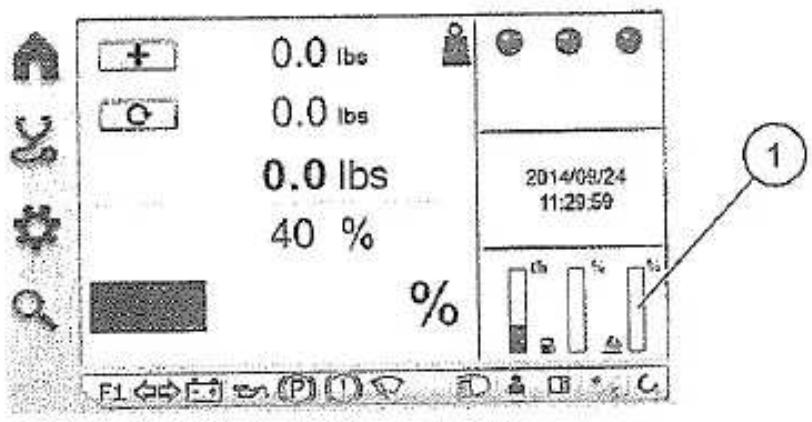
The AdBlue solution is corrosive towards certain metals such as copper and aluminum, used in harnesses, cables and connectors.

Do not allow the AdBlue solution to come into contact with any parts made of copper or aluminum. Corrosion starts and progresses rapidly.

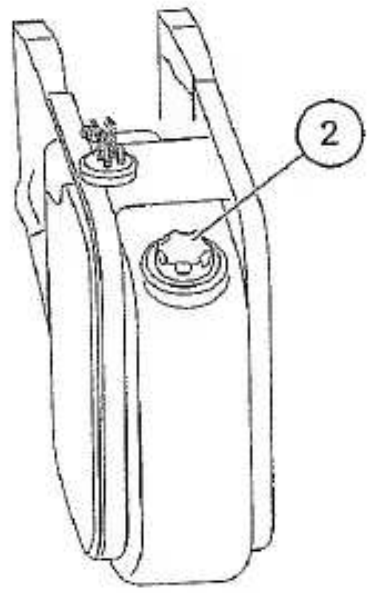
NOTE ***AdBlue level must not be less than 10%.***

NOTE ***In temperatures below -11°C (12°F), the AdBlue solution freezes. Do not store below -11°C (12°F).***

1. Start the engine.
2. The home page shows the AdBlue level (1) as percentage of the total tank volume.

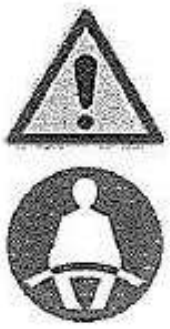


3. If the level is too low, open the hatch to access the Adblue tank.
4. Open the AdBlue tank cap (2) and fill with the recommended AdBlue solution.
   See maintenance data for volume.



5. Refit the AdBlue tank cap.
6. Close the hatch for AdBlue.

4.1.15 Adjusting the operator's seat



WARNING! UNCONTROLLED MOVEMENT HAZARD

During an accident, not wearing the seat belt could result in serious personal injury or death.

Always fasten the seat belt before driving.

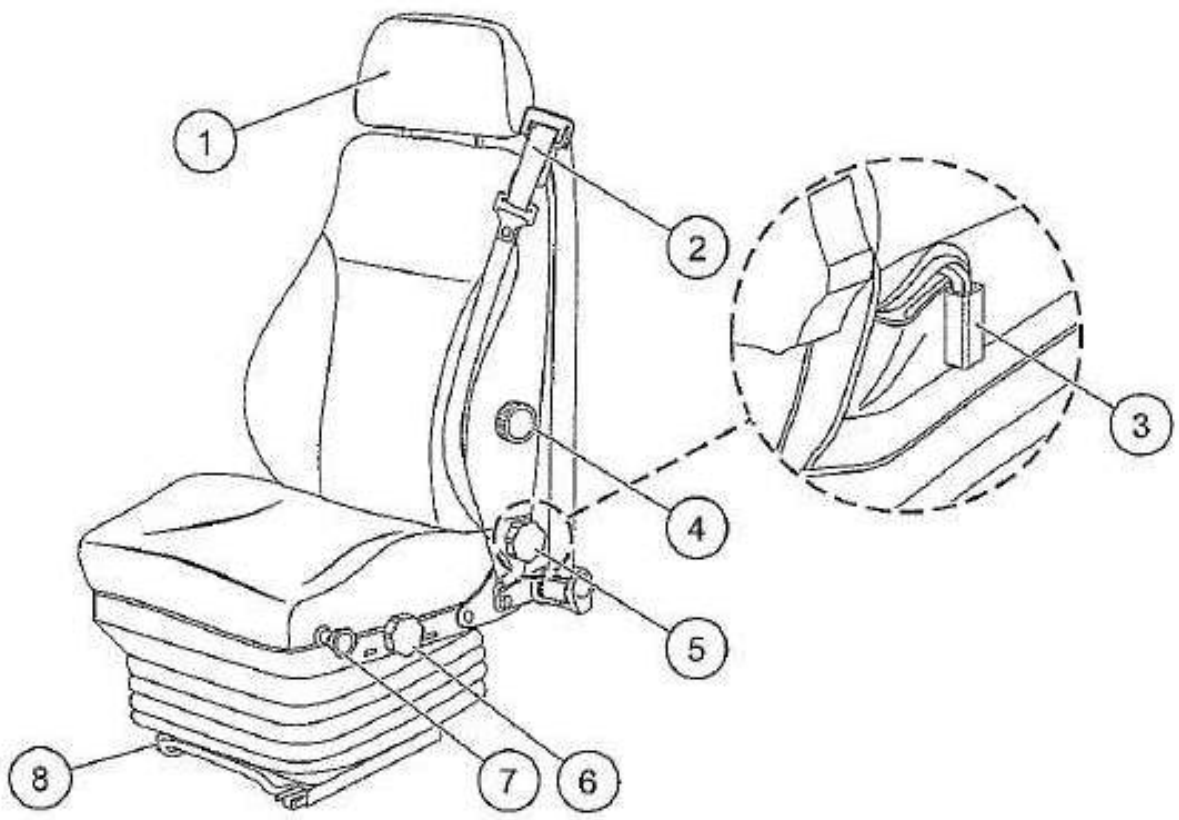


Figure 32. Controls for the operator's seat

1. *Adjustable headrest, 4-way (option)*
2. *Integrated 3-point seat belt*
3. *Lever to lock height adjustment during transport*
4. *Lumbar support adjustment*
5. *Backrest adjustment*
6. *Seat cushion angle adjustment*
7. *Height adjustment*
8. *Length adjustment 160 mm (6.30 inches)*

For optimum safety, always adjust the seat to your individual preferences and measurements before starting the machine.

4.1.16 Adjusting the steering wheel

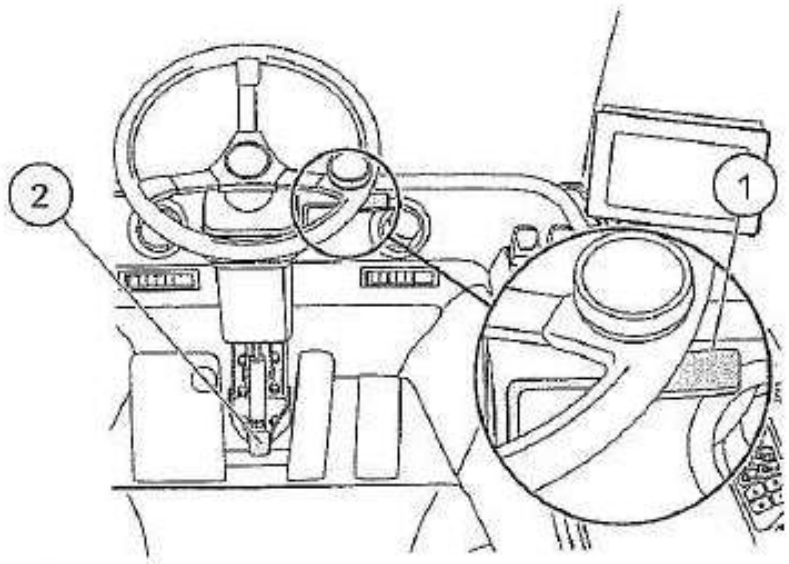
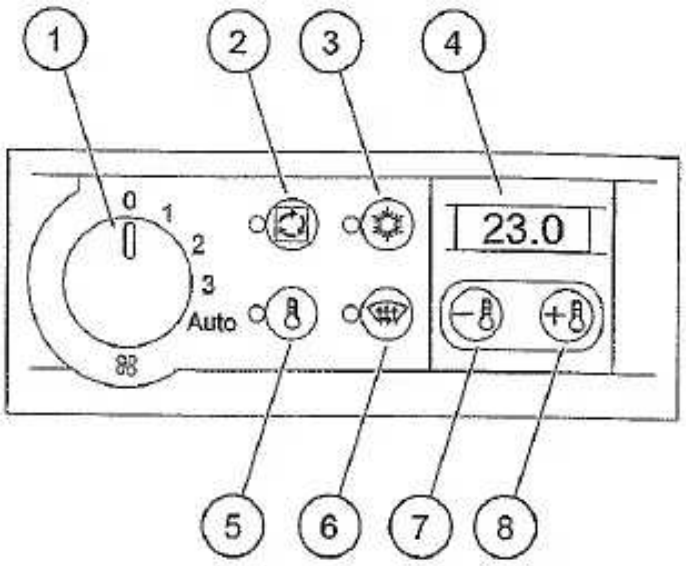


Figure 33. Lever

1. Pull lever (1) upwards to adjust the height.
2. Pull lever (1) downwards to adjust the tilt.
3. Step on the steering wheel column pedal (2) to adjust the steering wheel frame.

4.1.17 Using the cabin ventilation



A lamp lights up when a function (2, 3, 5, 6) is active. Press again to deactivate.

1. *Fan speed*
2. *Air recirculation*
3. *Air-conditioning*
4. *Temperature display*
5. *Display outside temperature*
6. *Defrost*
7. *Temperature control -*
8. *Temperature control +*

The cabin temperature is controlled by a heating/air-conditioning unit with a motorized water valve and an external air flap. The temperature display (4) shows the inside temperature you have set for the cabin. You can set the value between 18°C and 28°C (corresponding to 64°-82°F).

Set the temperature by pressing the - and + buttons (7, 8).

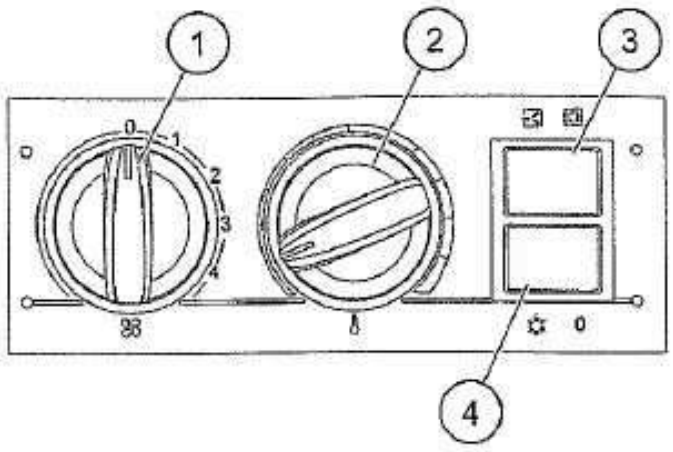
Press (5) to display the outside temperature on the 4-digit display (4). To switch the unit of temperature between Celsius and Fahrenheit, press (5) for more than 20 s.

Controls may vary according to customer options.

Tips for working with the air-conditioning system:

- To reduce humidity in the cabin, operate the machine with the air-conditioning system on.
- Recirculated air helps to cool down the cabin faster.
- When driving and with normal humidity, use external air intake.
- To reduce fog build-up during humid weather, use the defroster.

4.1.18 Using the cabin heating



1. *Fan speed*
2. *Heat control*
3. *External air (open) or air recirculation (closed)*
4. *Not in use*

1. Turn (1) to select the desired fan speed.
2. Turn (2) to control the temperature.
3. When (3) is closed, internal air is recirculated. When (3) is open, external air is used.

4.2 Mounting and dismounting the machine

WARNING! SLIPPING HAZARD

Failing to maintain three points of contact can cause personal injury or death.

Maintain three points of contact when mounting or dismounting: either two hands and one foot or two feet and one hand.

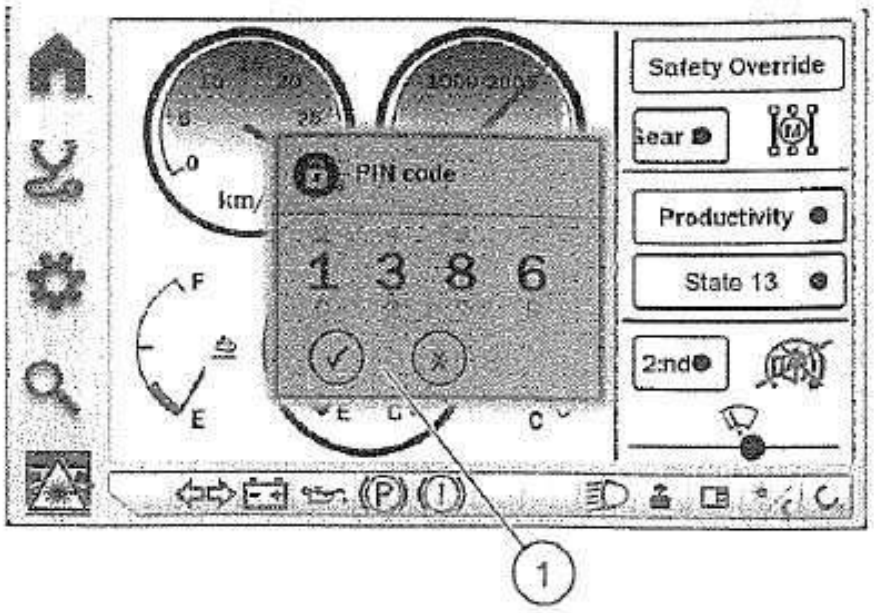
NOTE ***Climb on and off only when the machine is stationary.***

1. Mount and dismount facing the machine.
2. Maintain three points of contact until you reach the cabin or the ground.

4.3 Driver login

If the operator changes or the machine is shut down and restarted, you need to enter the operator's login code.

1. When you enter the **Home page**, a pop-up screen (1) appears.



2. Enter your personal login code.

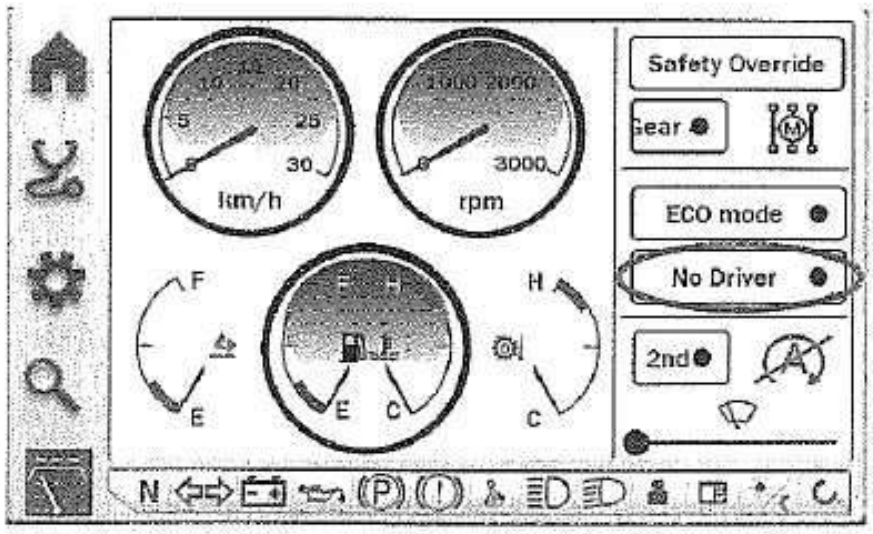
4.4 Changing the driver

If the operator changes, you need to change the login code.

1. On the display bottom frame, select **Operator page**.

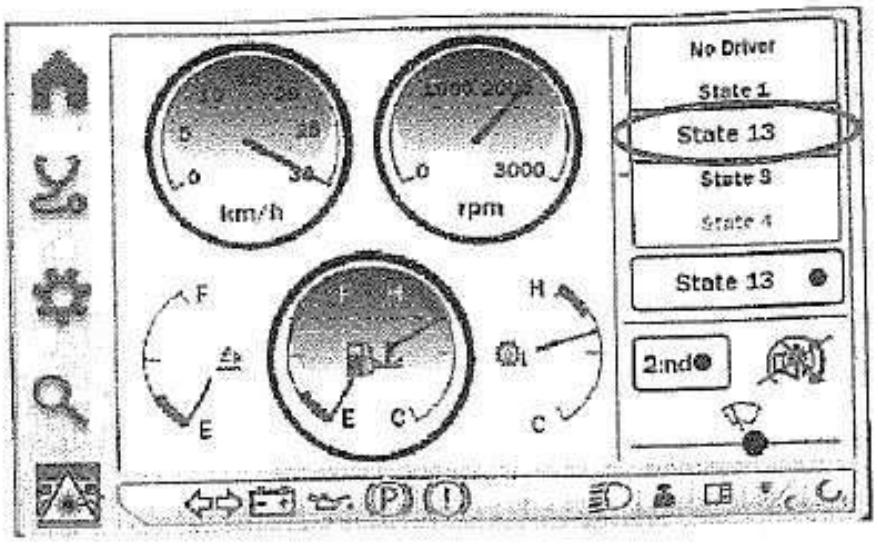
The **Operator page** opens.

2. Select the operator ("Driver state").

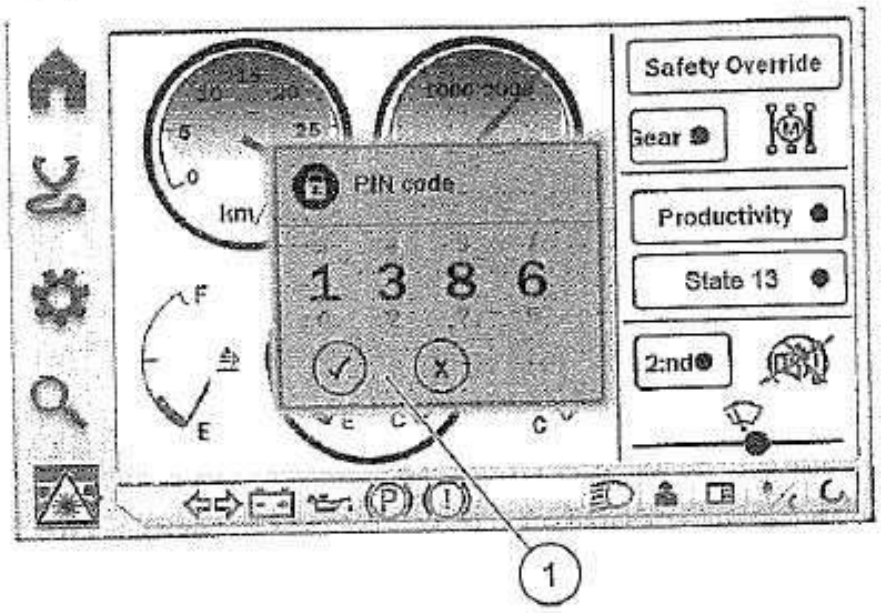


A drop-down list opens.

3. Select youre driver's number ("state") from the drop-down list, for instance, **State 13**.



4. A pop-up window (1) opens. Enter your login code.



Now you can start the machine.

4.5 Steering and braking

4.5.1 Steering

To minimize unnecessary wear and tear to the tires, turn the steering wheel only when the machine is moving.

4.5.2 Activating the declutch

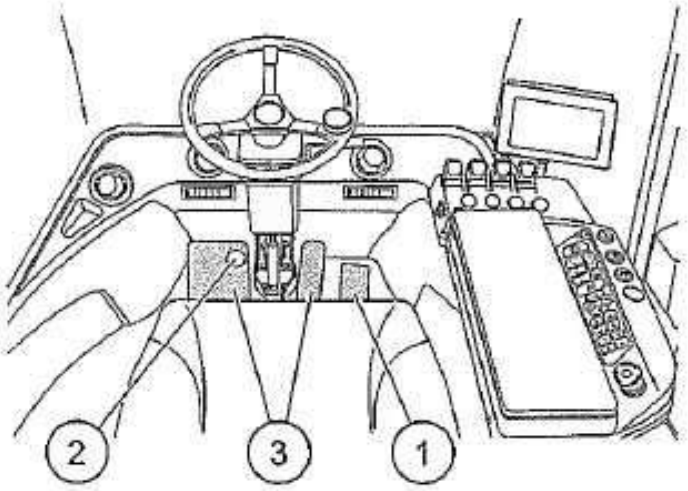


Figure 34. Activating the declutch

The declutch switch disengages the transmission so that the operator can control the hydraulics while maintaining a high engine RPM during stacking maneuvers.

1. To activate the declutch, press the declutch switch (2).
   If the declutch switch is pressed at the same time as the brake pedal (3), the brakes are applied. When braking using only the brake pedal (1), the declutch is not activated.

4.5.3 Activating the parking brake

WARNING! FORWARD TIPPING HAZARD

The machine may tip over if the parking brake is used while the machine is moving. Risk of serious injury and damage to the machine.

Do not use the parking brake to bring the machine to a halt, except in an emergency.

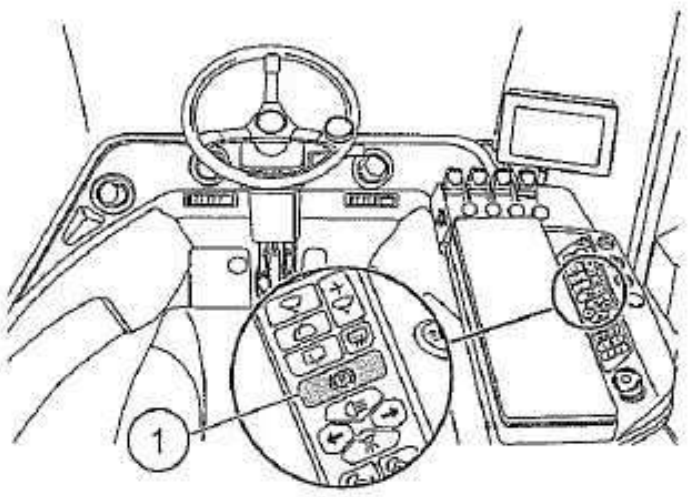


Figure 35. Parking brake

If the operator leaves the seat and the parking brake is not activated, an audio signal is activated.

NOTE ***Only use the parking brake to stop the machine in case of emergency. After using the parking brake in such an emergency situation, check and adjust the parking brake and the parking brake disc. If necessary, replace the pads and the parking brake disc. Check the functioning of the parking brake daily.***

1. Bring the machine to a stop.
2. Press (1) to activate the parking brake.

4.5.4 Parking

Before parking the machine, check the following:
- Mast is fully lowered
- Forks are tilted forward and the fork tips touch the ground

After parking, make sure that battery main switch is switched off.

4.5.5 Emergency stopping

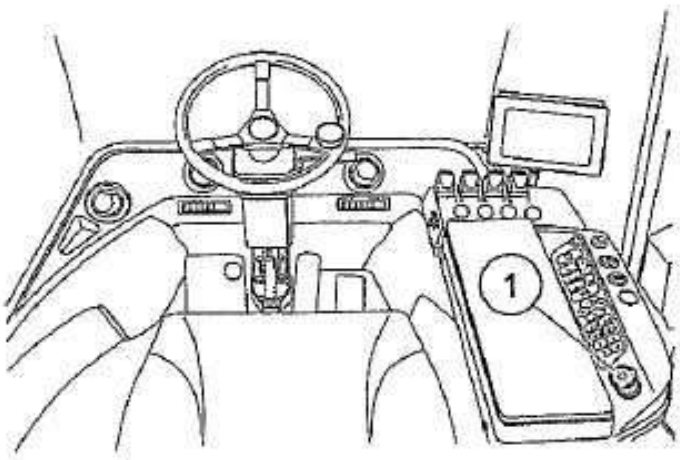
WARNING! FORWARD TIPPING HAZARD

If the emergency stop is used when the machine is moving, the machine may tip over. Risk of serious personal injury and damage to the machine.

Only use the emergency stop in an emergency.

After you press the emergency stop button (1), all functions are cut out, the parking brake is activated and the engine stops. In normal operation, do not use the emergency stop button to stop the machine. Instead, use the brake pedal. Routinely using the emergency stop button increases wear on the product.

You must check condition of the parking brake disc and the parking brake pads after each time you use the emergency stop. Contact the Konecranes Lifttrucks service personnel for the check-up.



NOTE ***Do not operate the equipment unless you know the location of the emergency stop button.***

4.6 Emergency stopping

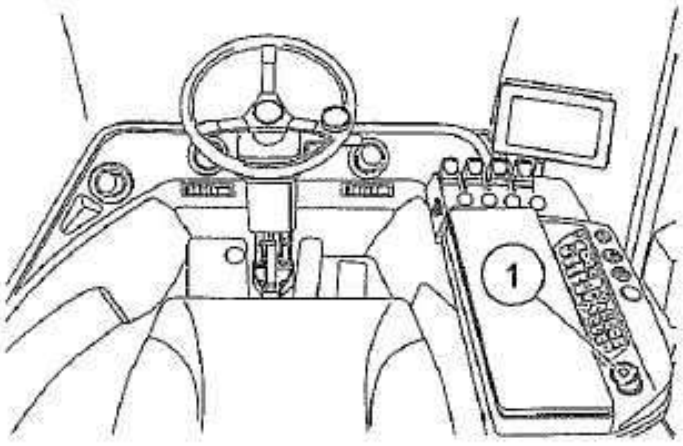
WARNING! FORWARD TIPPING HAZARD

If the emergency stop is used when the machine is moving, the machine may tip over. Risk of serious personal injury and damage to the machine.

Only use the emergency stop in an emergency.

After you press the emergency stop button (1), all functions are cut out, the parking brake is activated and the engine stops. In normal operation, do not use the emergency stop button to stop the machine. Instead, use the brake pedal. Routinely using the emergency stop button increases wear on the product.

You must check condition of the parking brake disc and the parking brake pads after each time you use the emergency stop. Contact the Konecranes Lifttrucks service personnel for the check-up.



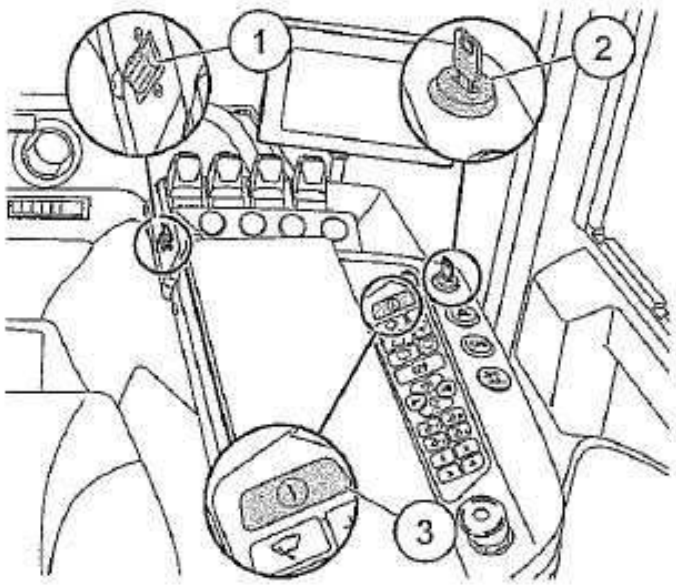
NOTE ***Do not operate the equipment unless you know the location of the emergency stop button.***

4.7 Operating

4.7.1 Starting the engine, with a key

WARNING! TOXIC SUBSTANCE HAZARD
Exhaust fumes are harmful and may cause serious personal injury or death.
Never run the engine in unventilated places. Use fume extraction.

1. Position yourself in the operator's seat.

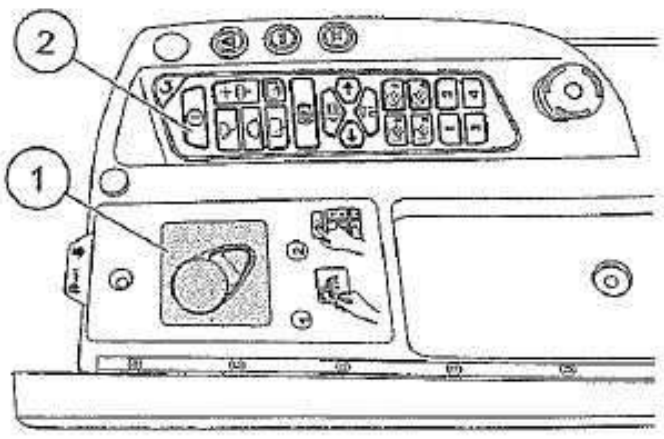


2. Ensure that the gear switch (1) is in neutral.
3. Insert the ignition key (2) and turn it clockwise.
4. Wait until the display shows the home page.
5. Press the start button (3). The engine starts.

4.7.2 Starting the engine, keyless

WARNING! TOXIC SUBSTANCE HAZARD
Exhaust fumes are harmful and may cause serious personal injury or death.
Never run the engine in unventilated places. Use fume extraction.

1. Position yourself in the operator's seat.
2. Ensure that the gear switch is in the neutral gear.
3. Swipe the tag over the marked area (1).



4. Wait until the display shows the home page.
5. Press the start button (2). The engine starts.

4.7.3 Stopping the engine, with a key

NOTE ***Use the emergency stop only in an emergency situation. For more information, see Emergency stopping (page 16).***

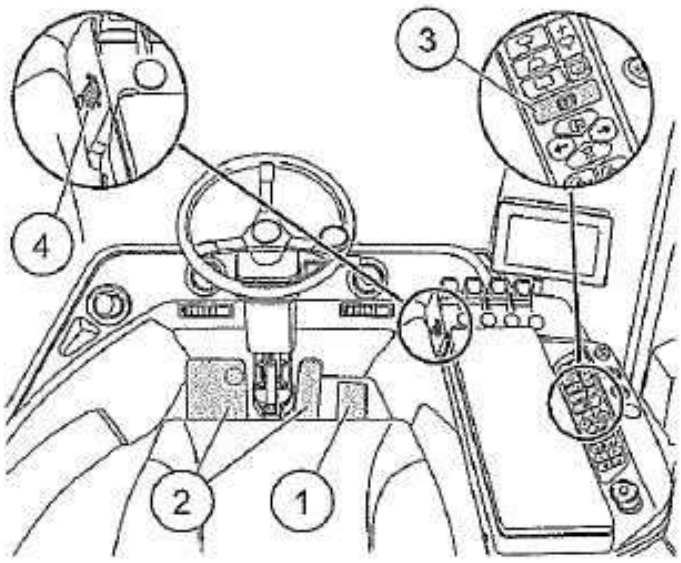


Figure 36. Stopping the engine

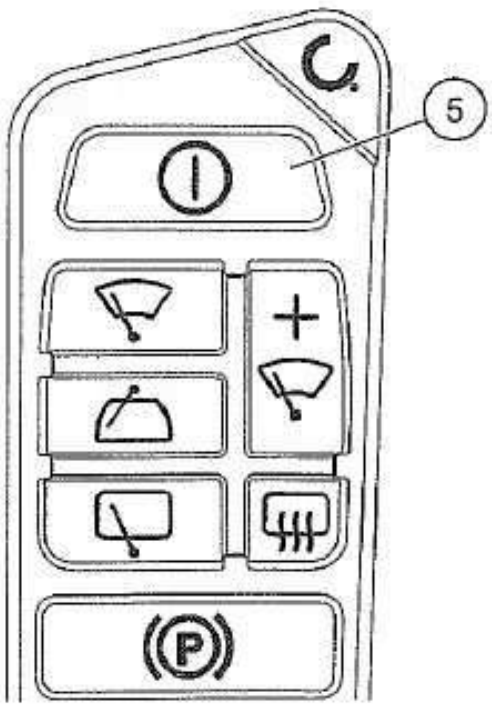
1. Release the accelerator pedal (1).
2. Apply the brakes (2) and stop the machine.
3. Activate the parking brake (3).
4. Select the neutral gear (4).

RISK OF DAMAGE TO THE MACHINE

NOTICE **If you do not let the engine cool down before turning it off, there is a risk of turbo damage and overheating.**

Allow the engine to idle for a few minutes.

5. Push the **start/stop** button (5) to stop the engine.



6. Turn the ignition key anti-clockwise. The engine and the ignition are now off.
7. If you leave the machine unsupervised, turn off the battery main switch.

4.7.4 Stopping the engine, keyless

NOTE *Use the emergency stop only in an emergency situation. For more information, see* *Emergency stopping (page 16).*

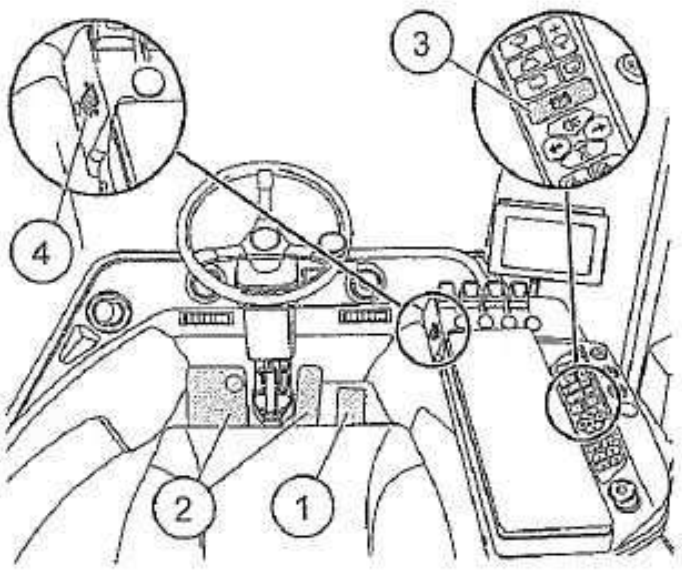


Figure 37. Stopping the engine

1. Release the accelerator pedal (1).
2. Apply the brakes (2) and stop the machine.
3. Activate the parking brake (3).
4. Select the neutral gear (4).

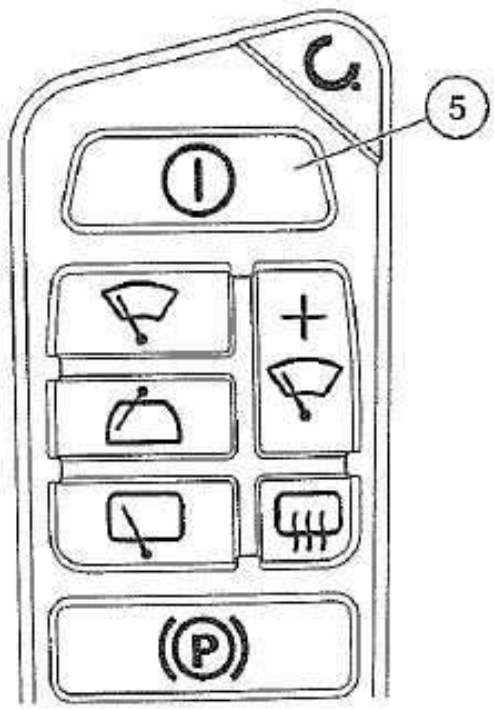
RISK OF DAMAGE TO THE MACHINE

NOTICE **If you do not let the engine cool down before turning it off, there is a risk of turbo damage and overheating.**

Allow the engine to idle for a few minutes.

5. Press the **Start/stop** button (5) to stop the engine.

   The engine and the ignition are now off.



6. If you leave the machine unsupervised, turn off the battery main switch.

4.7.5 Operating the machine

WARNING! SIDEWAYS TILTING HAZARD

Driving on uneven terrain may damage the machine. Driving on surfaces with insufficient support may cause the machine to roll or sink. Risk of serious personal injury and damage to the machine.

Drive the machine only on level ground that is intended for the total weight and ground pressure of the machine.

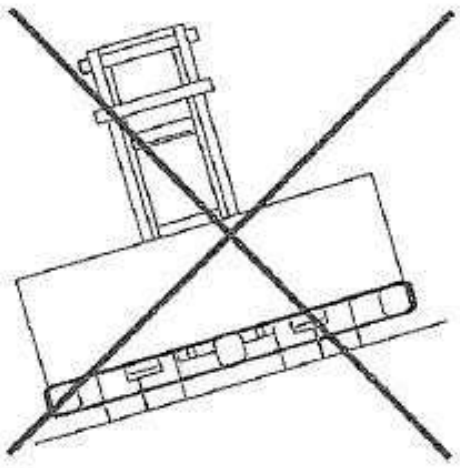


Figure 38. Do not drive on uneven terrain

WARNING! LIMITED VISIBILITY HAZARD

The working range of the machine is large and visibility from the operator's cabin is limited. Risk of serious personal injury and damage to the machine.

Before you start to move the machine, check that the road ahead is free and that you have an unobstructed view.

WARNING! TIPPING AND COLLISION HAZARD

If you drive on slopes steeper than 15%, the brakes may fail to stop the machine and machine may roll. Risk of serious personal injury and damage to the machine.

Do not drive on slopes steeper than 15%.

NOTE ***If you must drive the machine along steeper slopes, contact your Konecranes Liftrucks authorized dealer.***

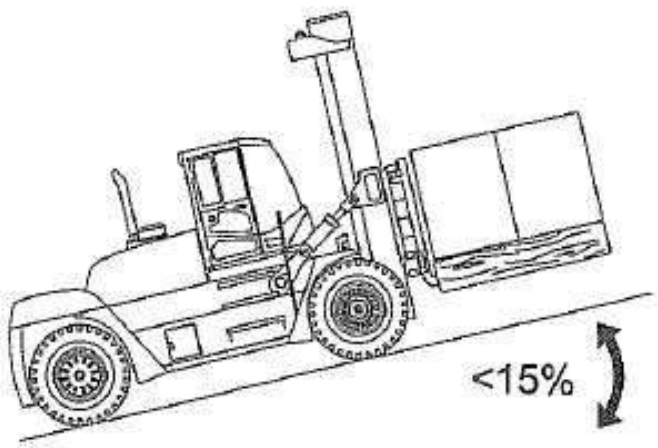


Figure 39. Do not drive on slopes steeper than 15%

- The machine is not intended for off-road driving.
- The machine is not equipped with wheel suspension.
- Always adjust your method of driving to the condition of the road (bumps, and so on), to hazards within the working area and the load.
- The hill-climbing capacity of the machine indicated in the data sheet is based on the pulling power of the machine. It applies only to driving over obstacles and minor irregularities in ground level.

1. Start the engine.
2. Lift just enough to still maintain a clear view above the load.
   If the load is so large it obstructs your view, drive the machine in reverse for better visibility.
3. Hold the steering wheel steady. Always use the whole of your hand to hold the wheel knob.

4.7.6 Driving forwards

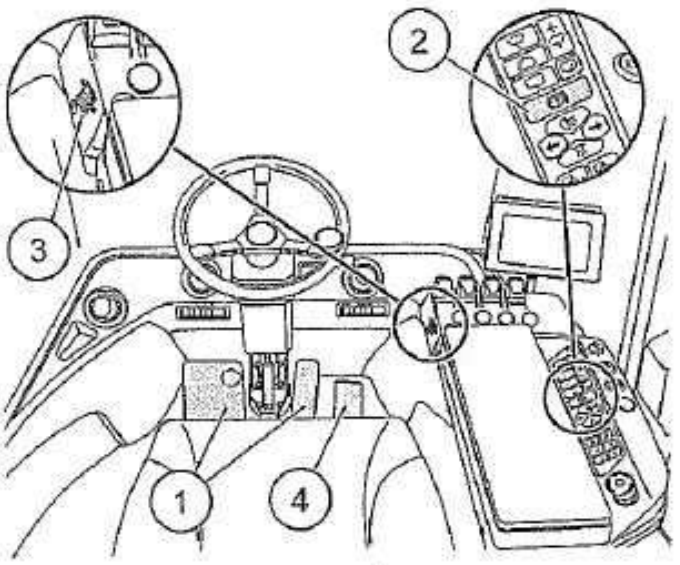


Figure 40. Driving controls

1. Press the brake pedal (1).

NOTE ***To avoid damage and prevent the transmission from overheating, always start in the first or second gear.***

2. Release the parking brake (2).
3. Select forward (3).
4. Release the brake pedal (1).
5. Press the accelerator pedal (4) slowly.

NOTE ***When starting uphill, hold the machine still using the brake pedal (4), until you have sufficient pulling power.***

4.7.7 Stopping the machine

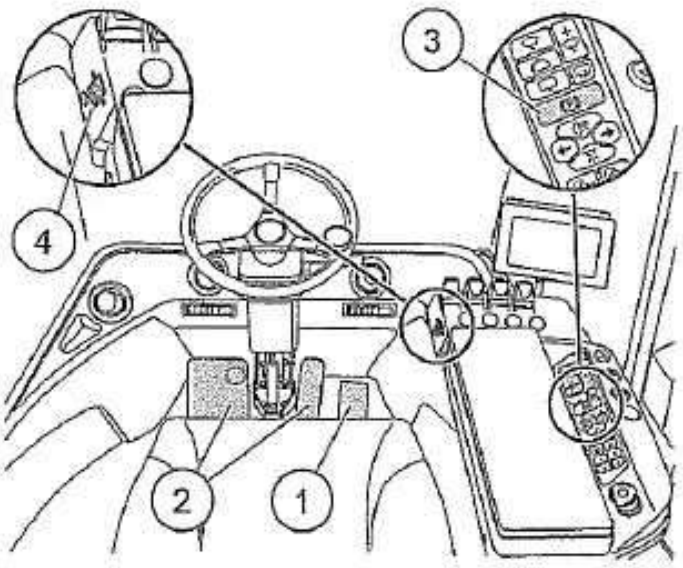


Figure 41. Driving controls

1. Take your foot off the accelerator pedal (1).
2. Press the brake pedal (2) and stop the machine in a gentle, controlled manner.

WARNING! FORWARD TIPPING HAZARD

Sudden braking and acceleration may cause the machine to roll or tip. Risk of serious personal injury and damage to the machine.

Avoid violent acceleration and braking.

NOTICE

RISK OF PROPERTY DAMAGE

Do not use the transmission as a brake.

3. When the machine has stopped, activate the parking brake (3) before releasing the brake pedal.
4. Select the neutral gear (4).

4.7.8 Driving in reverse

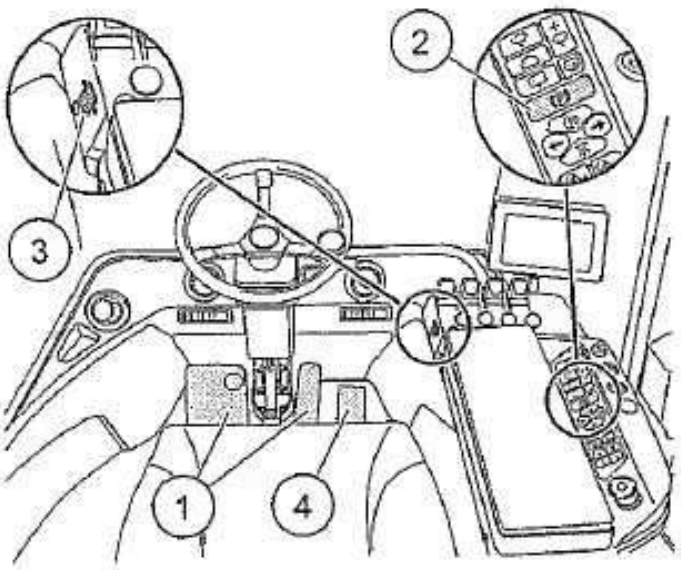


Figure 42. Driving controls

1. Press the brake pedal (1).

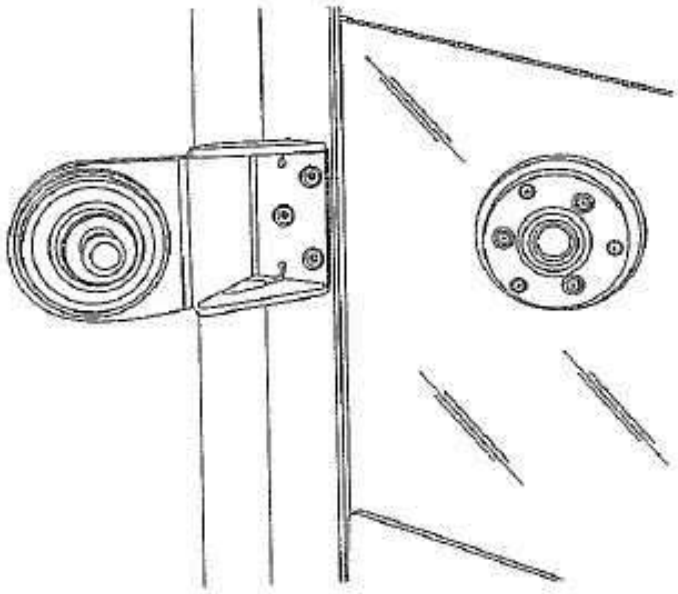
NOTE ***To avoid damage and prevent the transmission from overheating, always start in the first or second gear.***

2. Release the parking brake (2).
3. Select reverse (3).
4. Release the brake pedal (1).
5. Press the accelerator pedal (4) slowly.

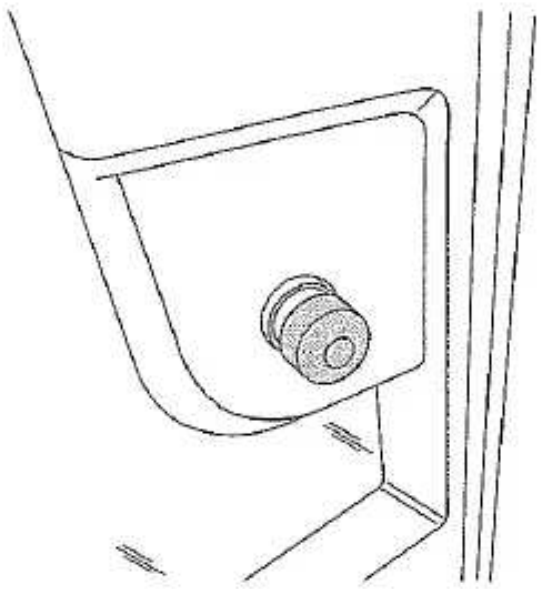
NOTE ***When starting uphill, hold the machine still using the brake pedal (4) until you have sufficient pulling power.***

4.8 Locking the cabin door

1. To fasten the cabin door to open position, open the cabin door and push it into the lock.



2. To unlock the door from open position, push the button on the inside of the cabin door.



4.9 Running in

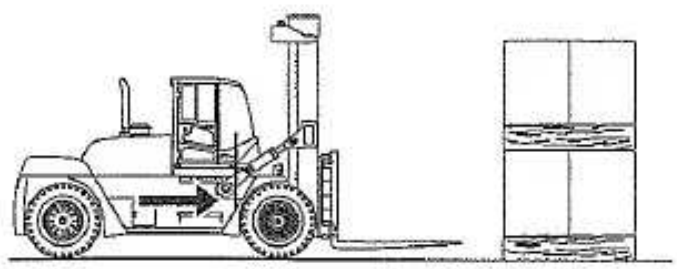
The machine can be driven at full speed right from the start. However, prolonged maximum loading of the hydraulic system and transmission must be avoided during the first 50 hours of operation.

After the first 150 hours, carry out first service. For more information, see the maintenance manual.

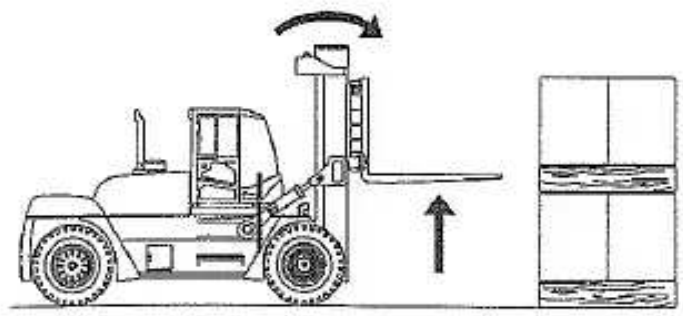
4.10 Lifting and driving with a load

4.10.1 Lifting a load

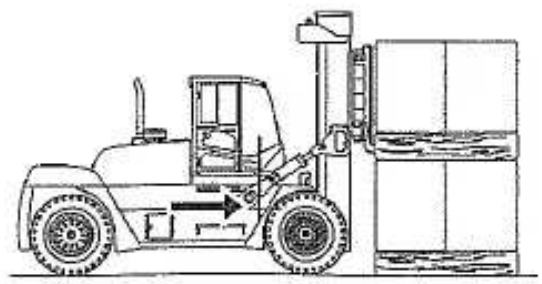
1. Drive forward towards the load.
   When approaching the load, check that the center of the machine is aligned with the center of the load.



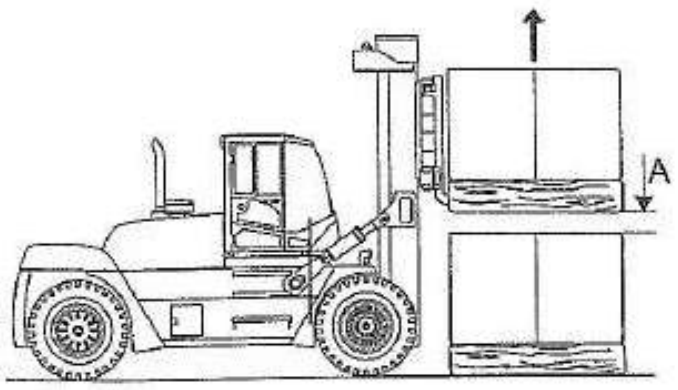
2. Raise or lower the forks to the correct height.



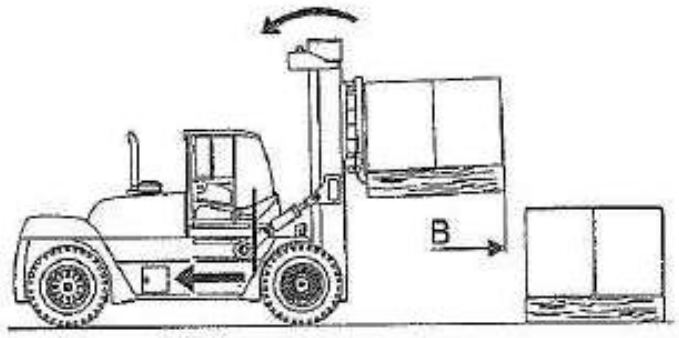
3. Place the mast in its vertical position.
4. Carefully push the forks under the load until the fork shafts touch the load.



5. Raise the mast until the load is resting on the forks, but only so much that the load is free from the surface below. Check that the load is centered in the middle between the forks.
   A = 20–40 cm (8–16 in).

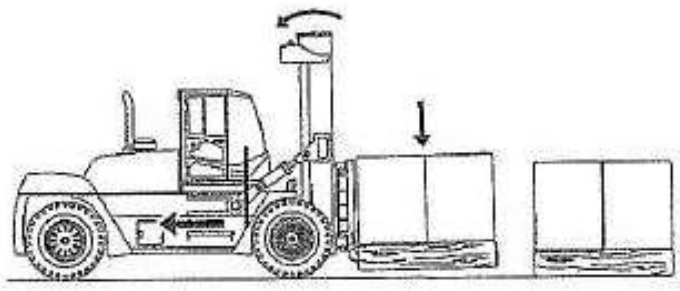


6. Tilt the mast backwards.



7. Drive the machine backwards until the load is free from the front of the stack. B = 20–40 cm (8–16 in).

8. Lower the load to the transport position.
   Ready to transport load.



4.10.2 Transporting a load

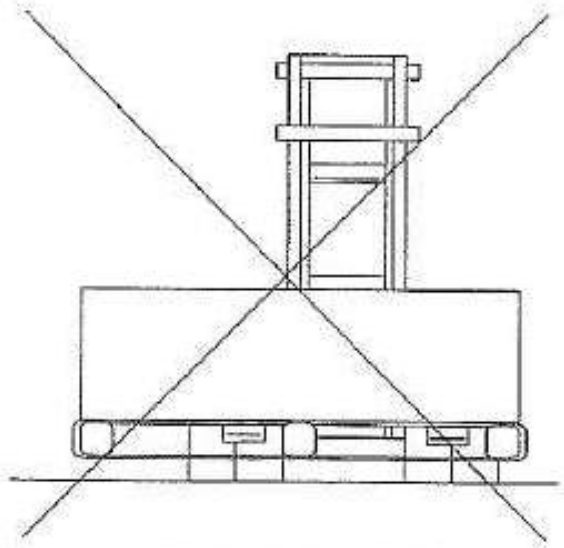
⚠ WARNING

FALLING LOAD HAZARD

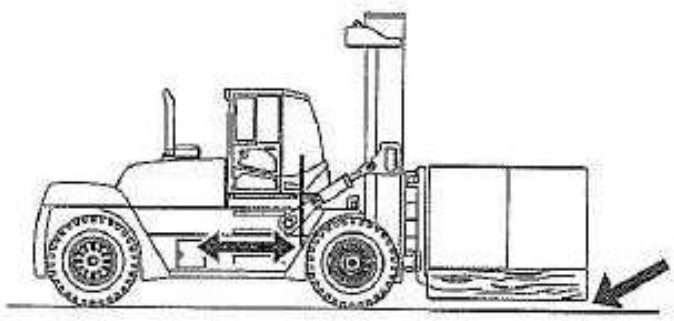
Load and attachment may drop and lead to serious personal injury or death.

Do not allow anyone to stand or walk under the elevated part of the machine whether it is empty or loaded. Never park or leave a machine with raised load unsupervised.

- Do not drive with the load displaced sideways (for example, by side maneuvering).



- Transport the load close to the ground.



- Avoid driving on slopes or uneven surfaces when transporting a load.
- Always drive with the load turned upwards on a slope. Never drive across, or turn on a slope.
- Never drive with raised forks or a raised load.
- If the view is reduced, ask someone to guide you.
- If the load has been stacked so high that it prevents a forward view, drive the machine backwards.

4.10.3 Emergency lowering

⚠ DANGER

FALLING LOAD HAZARD

Danger of serious personal injury or damage to vehicle. The mast and carriage descend fast, about 1 m/s.

Ensure that the carriage and the mast can be lowered without hindrance. Ensure that there are no people or items underneath or near to the load.

The machine is equipped with hydraulic assistance (optional electric and hydraulic assistance). If the engine stops or if a fault occurs in the hydraulics preventing the assistance from working, you cannot lower using the maneuvering levers.

The directional control valve is therefore equipped with a mechanical control that allows manual lowering.

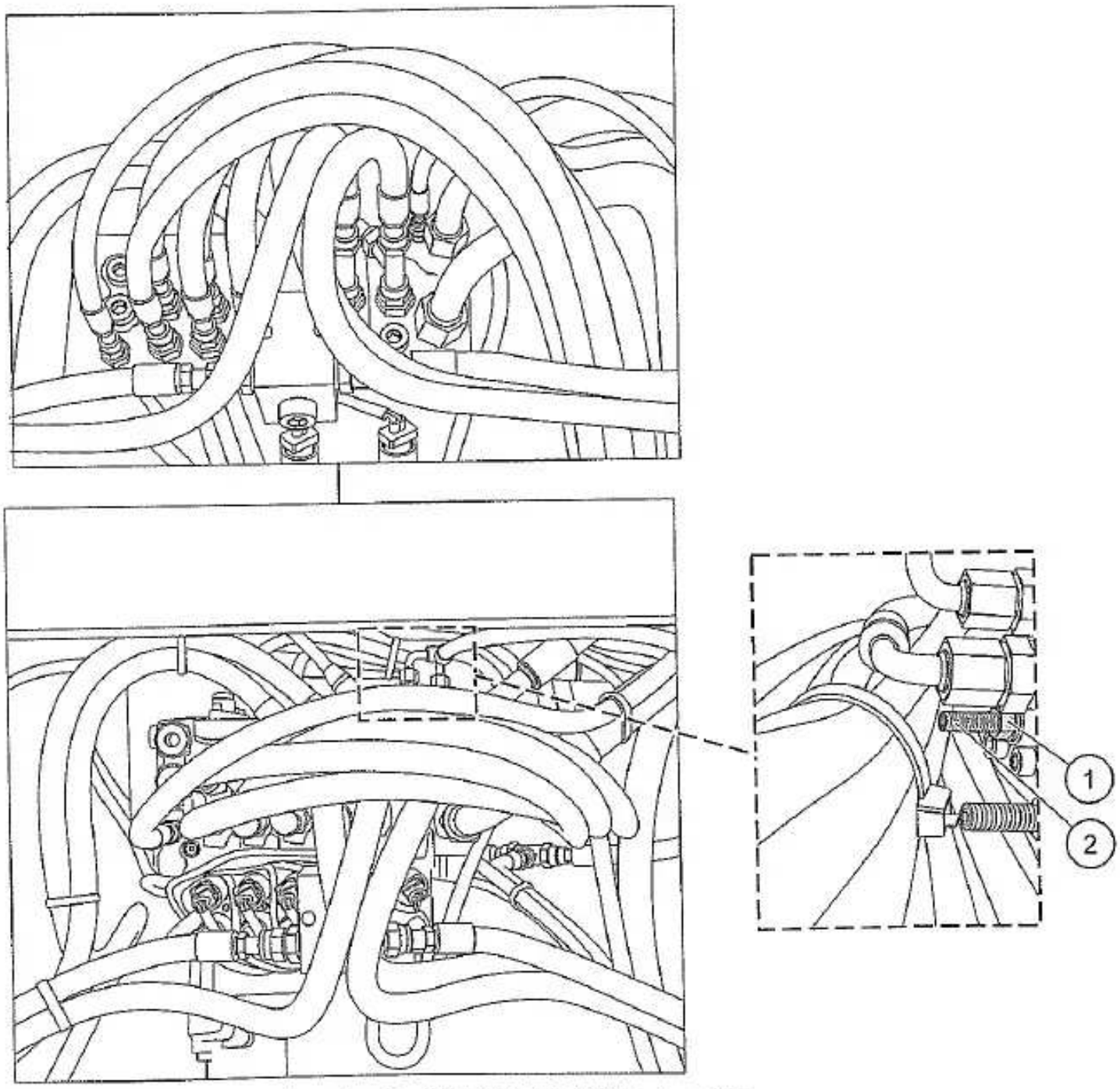


Figure 43. Emergency lowering for SMV 10-16, L90 Main valve

NOTE ***The emergency lowering locknut is located behind the hoses, as shown in the pictures above. The top view is from the side, the bottom one from above.***

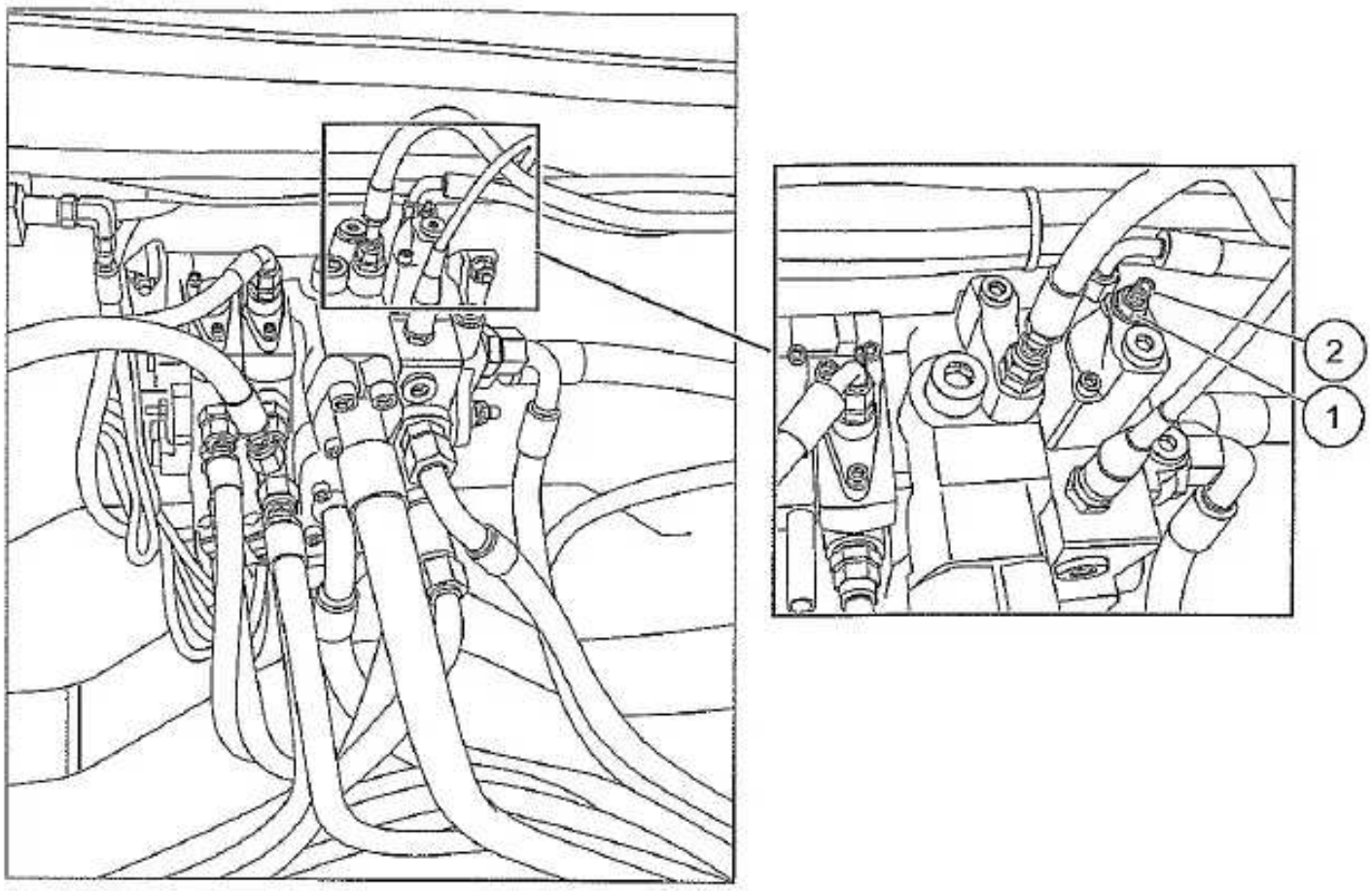


Figure 44. Emergency lowering for SMV 18-60 , K220/L90 main valve

1. Tilt the cabin upwards.
2. Loosen the locknut (1).
3. Open the lockscrew (2) with an allen wrench.

   The mast descends rapidly.

4.10.4 Unloading a load

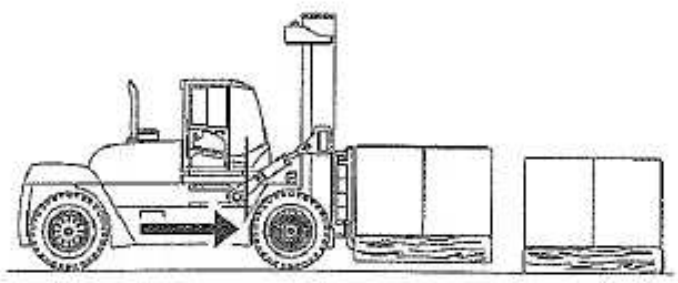
⚠ WARNING

COLLISION HAZARD

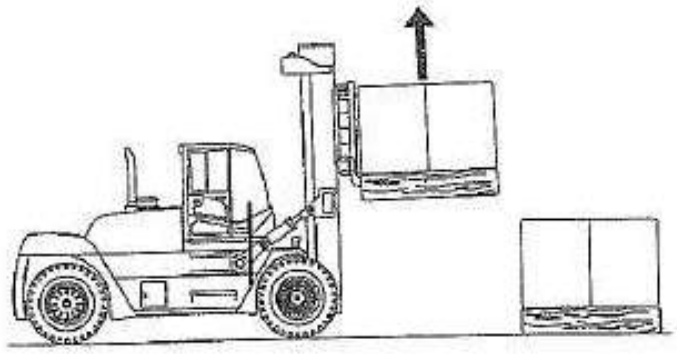
Driving with the forks or load in the raised position, could result in serious personal injury or death.

Never drive with the forks or load in the raised position.

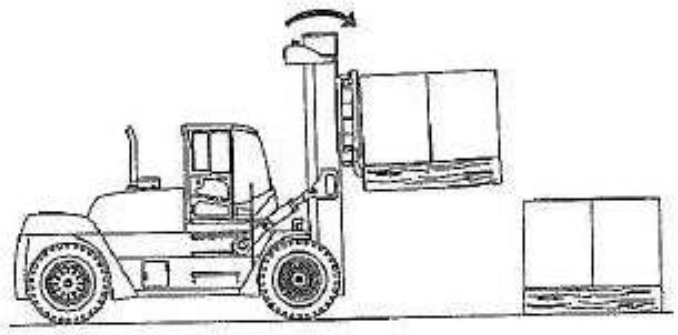
1. Drive up to the stack or unit on which you want to unload as precisely as possible.



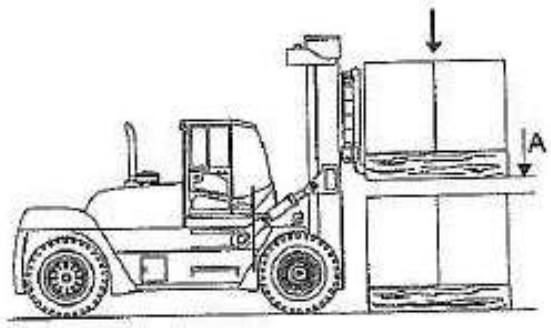
2. Raise the fork carriage to the correct height.



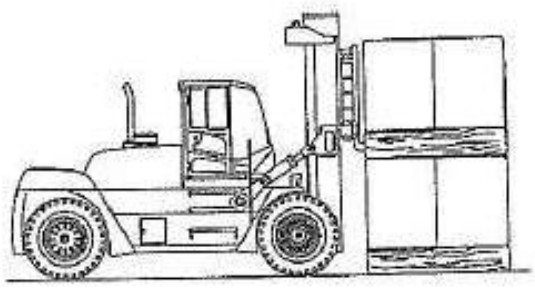
3. Place the mast vertically.



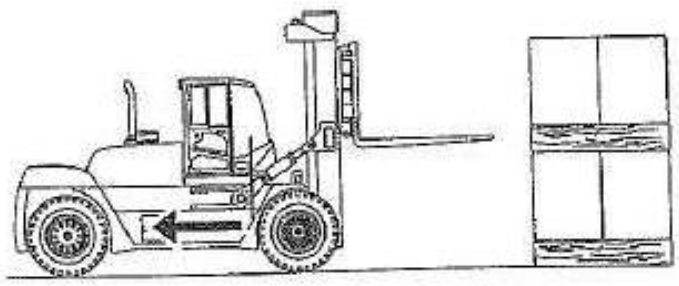
4. Carefully drive up to the stack.



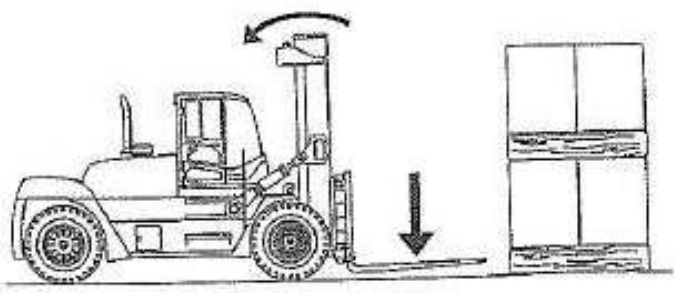
5. Lower the load.



6. Carefully reverse from the stack. Ensure that the forks are free.



7. Lower the forks to the transport position. Tilt the mast backwards.



APPENDIX I: FUEL AND OIL RECOMMENDATIONS

Quality of the engine oil

The engine oil must comply with one of the following classifications for oil:

- ACEA E7
- API CH-4
- API CI-4
- Volvo VDS-3
- Volvo VDS-4

Check with your oil supplier that your oil meets these demands.

For engines that do not use fuel with low sulphur content, the TBN (Total Base Number) value should be at least 12 according to ASTM 2896. Check with your oil supplier that your oil meets these demands.

Since the oil wear depends on operating conditions, and the quality of the oil and fuel, the intervals between changing the oil may vary in length.

The engine oil must be replaced after a maximum of one year's operation.

The viscosity of the oil varies according to the temperature. Therefore the ambient temperature is vital to the choice of the engine oil viscosity range (see figure below).

Changing the oil due to a change in season may be avoided by using multi-grade oils. Specified intervals for changing the oil also apply to multi-grade oils.

NOTE ***No oil additives should be added to the recommended oils. Using such additives may invalidate the engine warranty.***

Avoid mixing different brands of oil.

The temperature ranges for adjacent SAE classes overlap, so you do not need to replace the oil when short-term temperature changes occur.

NOTE ***To ensure trouble-free cold starts, select the SAE class according to the ambient temperature.***

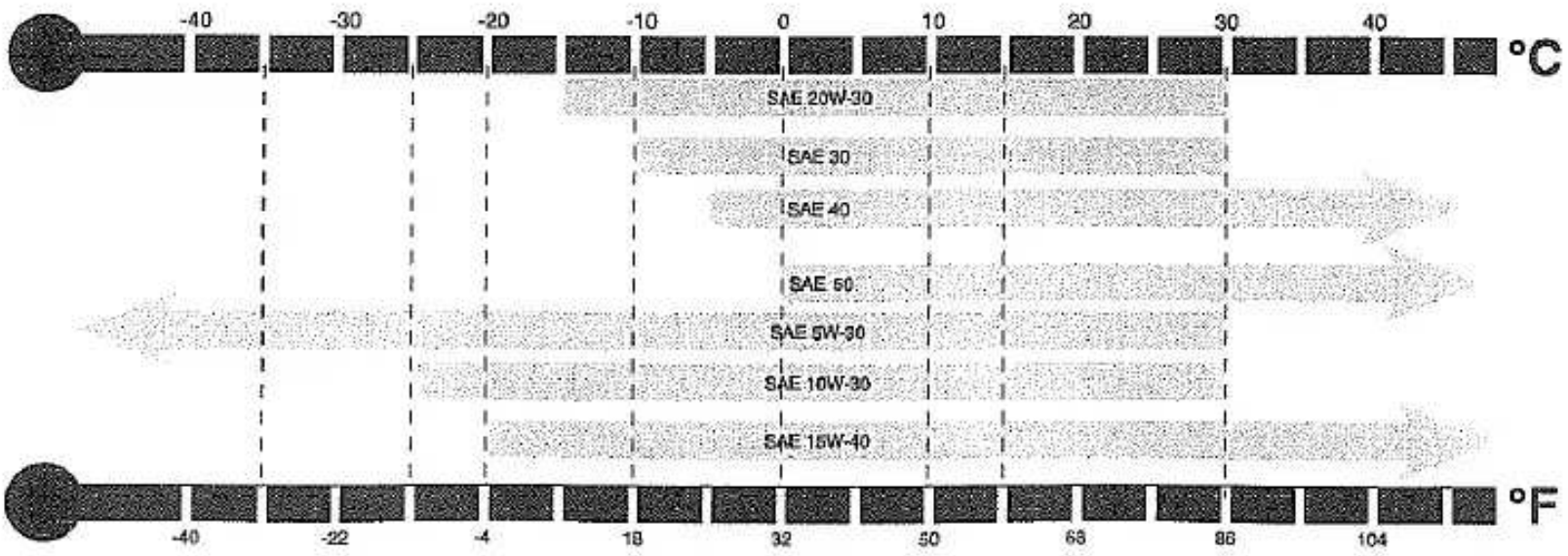


Figure 45. Oil temperature ranges

Extended oil change interval

Extended oil service life may result when using synthetic fluids. Appropriate change intervals should be determined for each engine by measuring oil oxidation and wear metals over time, to determine a baseline. Wear metals analysis can provide useful information, but an engine should not be removed from service that is based solely on this analysis.

Recommended fluids and lubricants

Diesel fuel

The diesel fuel must comply with one of the following classifications:

- EN 590
- ASTM D 975 No 1-D and 2-D

NOTE ***As the ambient temperature falls, the flow characteristics of the diesel fuel are reduced and paraffin begins to precipitate. Use the correct diesel quality according to the ambient temperature.***

NOTE ***Using additives to improve the flow is not recommended. Additives may reduce the capacity to start from cold.***

Biodiesel (FAME)

Vegetable oil esters (Fatty Acid Methyl Esters, FAME), also called "biodiesel", are increasingly available as a blending component in diesel fuels.

The engine manufacturer accepts the same FAME content as in major on-road fuels EN590 and ASTM D975. The maximum FAME content is 7%, without any specific additional service requirements. Contact the engine manufacturer for further information.

NOTE ***Higher FAME blends negatively impact performance, emissions, and fuel consumption. It also affects negatively the function of the SCR engines exhaust after treatment system.***

AdBlue solution

Only use an AdBlue solution that fulfills the ISO 22241 standard. The AdBlue solution consists of deionized water that is mixed with 32.5% urea.

Table 2. Engines using AdBlue solution

Engine family	Engine
VOLVO	VOLVO TAD 560, 561, 762 VE
	VOLVO TAD 571 VE
	VOLVO TAD 871 VE
	VOLVO TAD 1171, 1172 VE
	VOLVO TAD 1360, 1361 VE
	VOLVO TAD 1371 VE
	VOLVO TAD 571 VE
SCANIA	SCANIA DC13 - 77A, 81A
	SCANIA DC13 - 084-384A, 087-387A

Transmission oil

DANA transmission: ATF Dexron III

ZF transmission: Mineral oil -based engine oil (API CD/CE/CF-4/CF/CG-4/CH-4/ CI-4/SF/SG/SH/SJ/SL or ACEA, categories A, B, E). Viscosity degrees: SAE 20W-20 / 30 / 10W-30 / 10W-40 / 15W-30 / 15W-40 / 20W-40. For more information, see the ZF recommended oil list TE-ML 03.

Oil change interval

Drain and refill the system every 1000 h for average environmental and duty cycle conditions. Severe or sustained high operating temperature or dusty environments cause accelerated deterioration or contamination. Judgment must be used to determine the required change intervals for extreme conditions.

Drive axle oil

API GL.5 SAE 80 W-140

NOTE ***The above are strictly recommendations. If you have any doubts, contact your Konecranes Liftrucks authorized dealer for advice.***

Brake cooling oil

Universal Tractor Transmission Oil (UTTO)

The oil must comply with one of the following classifications:

- John Deere: JD20C
- Massey Ferguson: MF1141/MF1135/ MF1143
- ZF: TE-ML 03E/TE-ML 05F/TE-ML 06K

It is also possible to use a hydraulic oil according to specification below in addition with 1.5% Lubrizol.

Hydraulic oil

DIN 51524 Part 2 HLP and Part 3 HVLP

Use hydraulic oil from a well-known oil company for mobile applications.

Viscosity	Temperature range
SHS 32	-30°C...+10°C (-22°F...+50°F)
SHS 46	-20°C...+50°C (-4°F...+122°F)
SHS 68	±0°C...+50°C (+32°F...+122°F)

Grease

Multipurpose type E.P. according to NLGI Grade 2.

Coolant

Use only ethylene glycol-based coolants with an additive that prevents corrosion. Do not mix different coolant types with each other. Do not mix the coolant with antifreeze that contains ethanolamine.

WARNING! HARMFUL SUBSTANCE HAZARD

Using wrong coolant may damage the machine.

Use the recommended coolant and never mix different coolants.

WARNING! TOXIC SUBSTANCE HAZARD

It is highly dangerous to drink ethylene glycol. It can cause skin irritation and eye damage.

Do not drink ethylene glycol and avoid contact with skin.

Table 3. Coolants for Volvo engines

Engine	Coolant
VOLVO TAD 560, 561, 762 VE	Havoline Extended Life Antifreeze Coolant (green)
VOLVO TAD 620, 722, 660, 760 VE	Havoline Extended Life Antifreeze Coolant (green)
VOLVO TAD 1340 VE	Havoline Extended Life Antifreeze Coolant (green)
VOLVO TAD 1360, 1361 VE	Havoline Extended Life Antifreeze Coolant (green)
VOLVO TAD 1371 VE	Havoline Extended Life Antifreeze Coolant (green)
VOLVO TAD 541 VE	Volvo Penta Coolant VCS and VCS Ready Mixed (yellow)
VOLVO TAD 571 VE	Volvo Penta Coolant VCS and VCS Ready Mixed (yellow)
VOLVO TAD 841 VE	Volvo Penta Coolant VCS and VCS Ready Mixed (yellow)
VOLVO TAD 851 VE	Volvo Penta Coolant VCS and VCS Ready Mixed (yellow)
VOLVO TAD 871 VE	Volvo Penta Coolant VCS and VCS Ready Mixed (yellow)
VOLVO TAD 1141, 1151 VE	Volvo Penta Coolant VCS and VCS Ready Mixed (yellow)
VOLVO TAD 1171, 1172 VE	Volvo Penta Coolant VCS and VCS Ready Mixed (yellow)

Table 4. Coolants for Scania engines

Engine	Coolant
SCANIA DC13 - 74A, 76A	Havoline Extended Life Antifreeze Coolant (green)
SCANIA, AdBlue DC13 - 77A, 81A	Havoline Extended Life Antifreeze Coolant (green)
SCANIA, AdBlue DC13 - 084-384A, 087-387A	Havoline Extended Life Antifreeze Coolant (green)

Table 5. Coolants for Cummins engines

Engine	Coolant
CUMMINS QSB 6,7-C260	Havoline Extended Life Antifreeze Coolant (green)
CUMMINS QSM 11-C335	Havoline Extended Life Antifreeze Coolant (green)

Liquid antifreeze at the lowest temperature	Percentage of volume mixture liquid antifreeze	Mixture of antifreeze and water
-12°C (10.4°F)	25	1:3
-18°C (-0.4°F)	30	1:2
-25°C (-13°F)	40	1:1.5
-37°C (-34.6°F)	50	1:1
-60°C (-76°F)	66	2:1

APPENDIX II: FUSES AND RELAYS

Fuses

Fuses are located behind the operator seat in the cabin and in the battery compartment on the right side of the machine.

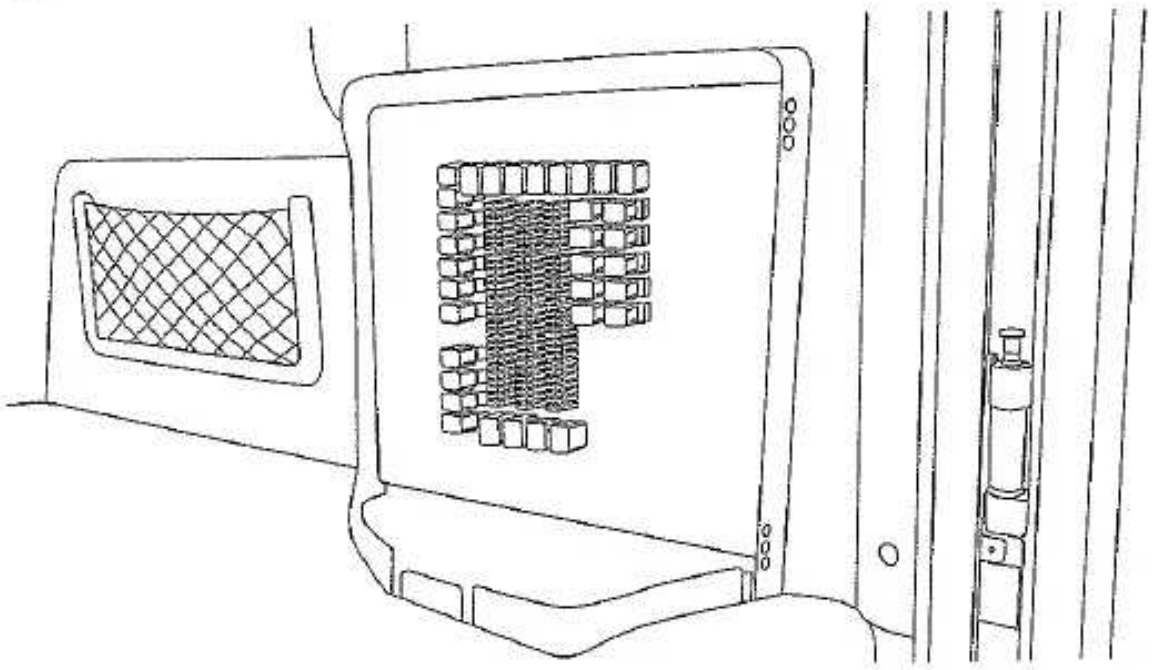


Figure 46. Location of fuses

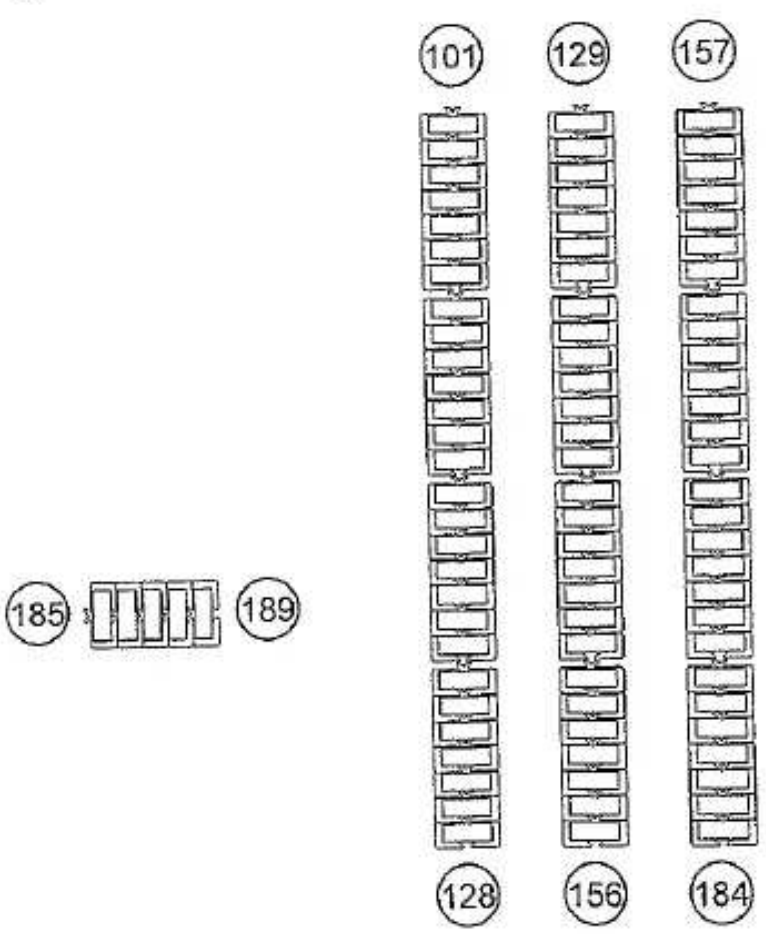


Figure 47. Numbering order of the fuses

Table 6. Fuses and their function

Number	Size	Function
F101	7.5 A	Cabin heating
F102	7.5 A	Option
F103	7.5 A	Option

Number	Size	Function
F104	7.5 A	Central lubr. pump chassis
F105	7.5 A	Converter 12 V option
F106	7.5 A	Reverse light
F107	7.5 A	Working light extra 2
F108	7.5 A	PCB 48-PIN STD D
F109	7.5 A	PCB 48-PIN STD D
F110	7.5 A	PCB 48-PIN STD D
F111	7.5 A	PCB 48-PIN STD D
F112	7.5 A	Clutch for HVAC compressor
F113	3 A	Position light right
F114	3 A	Position light left
F115	7.5 A	High beam
F116	7.5 A	Low beam
F117	10 A	Seat suspension air compressor
F118	7.5 A	Reverse alarm in the front
F119	7.5 A	Working lights extra 1
F120	10 A	Option
F121	7.5 A	Working light mast/boom, right
F122	7.5 A	Working light mast/boom, left
F123	10 A	Main fuse for the lights, F115 and F116
F124	3 A	ACR RFID keyless entry
F125	3 A	Battery clock (RTC)
F126	15 A	Ignition
F127	7.5 A	Beacon
F128	3 A	Power supply controller
F129	7.5 A	Hazard
F130	10 A	HV/AC condensor blower 1
F131	10 A	HV/AC condensor blower 2
F132	10 A	HV/AC condensor blower 3
F133	7.5 A	K128 Door open switch
F134	5 A	Reading light
F135	15 A	Rear window heating
F136	7.5 A	RCU

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Number	Size	Function
F137	7.5 A	Diagnostic connector on the PCB
F138	7.5 A	CAN extra connector on the PCB
F139	5 A	Turn signal
F140	7.5 A	PCB 48-PIN STD D
F141	7.5 A	PCB 48-PIN STD D
F142	5 A	Rearview mirror heater
F143	5 A	I/O units in the armrest, XC21, XC21 OPT C1, XC21 OPT C2
F144	7.5 A	Seat heater
F145	7.5 A	MD4
F146	3 A	Truconnect modem
F147	3 A	RFID nearguard 2
F148	3 A	Tire pressure gateway
F149	10 A	Connection for computer
F150	3 A	RFID nearguard 1
F151	7.5 A	Main fuse (F113, F114) for position light and brake lights
F152	3 A	Alcohol ignition interlock
F153	7.5 A	24 V dashboard
F154	3 A	GSM G2 modem
F155	10 A	12 V reverse camera
F156	7.5 A	12 V dashboard
F157	10 A	24 V roof
F158	7.5 A	Converter roof
F159	7.5 A	12 V roof
F160	7.5 A	12 V radio
F161	7.5 A	Working light roof/boom (opt)
F162	7.5 A	Working light roof/boom (opt)
F163	10 A	Wiper rear/roof/front washer
F164	7.5 A	PCB 48-PIN STD E
F165	7.5 A	PCB 48-PIN STD E
F166	7.5 A	Converter
F167	7.5 A	Converter 2 rear wall
F168	10 A	Horn
F169	7.5 A	PCB 48-PIN STD E

Number	Size	Function
F170	7.5 A	PCB 48-PIN STD E
F171	7.5 A	PCB 48-PIN STD E
F172	7.5 A	PCB 48-PIN STD E
F173	7.5 A	Fuel heater
F174	7.5 A	Option
F175	7.5 A	Option
F176	7.5 A	Option
F177	7.5 A	Option
F178	7.5 A	Particle detecting monitor (PDM)
F179	10 A	XA2 OPT, external expansion unit in the chassis
F180	10 A	XA2-STD, external expansion unit in the chassis
F181	10 A	Connection for computer
F182	7.5 A	Reverse camera
F183	3 A	HVAC controller
F184	15 A	HVAC blower
F185	3 A	Spare fuse
F186	5 A	Spare fuse
F187	7.5 A	Spare fuse
F188	10 A	Spare fuse
F189	15 A	Spare fuse
F190	-	Fuse test

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Fuses and relays in the battery compartment

WARNING! EXPLOSION HAZARD

Short-circuiting the battery may cause a fire or explosion, which can cause a risk for serious injury or death.

WARNING! CORROSIVE SUBSTANCE HAZARD

The battery contains corrosive acid that may cause a risk for serious injury or death.

Always use the necessary protective equipment.

WARNING! EXPLOSION HAZARD

Batteries generate explosive hydrogen when charged, which may cause a risk for serious injury or death.

Always use the necessary protective equipment. Ensure that there is good ventilation and avoid sparking.

WARNING! ELECTRICAL HAZARD

The main disconnect does not cut the power to the alternator.

To reduce the risks of electric shock and personal injury always remove jewelry and conductive material before working on the electrical system. Always disconnect the ground (minus) cable at the battery when working near or on the alternator.

WARNING! TIPPING OVER HAZARD

Turning off the battery main switch while the machine is moving applies the parking brake and the machine may tip over. The software in the control unit can get damaged.

Do not turn it off while the engine is running.

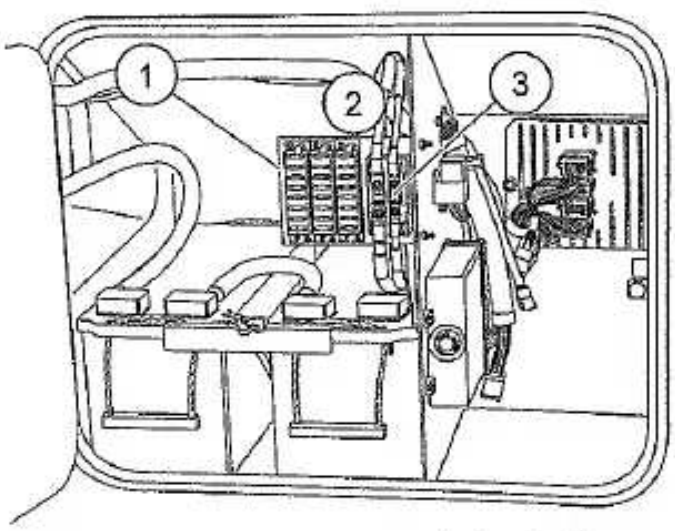

Figure 48. Fuses and relays in the battery compartment

1. *Fuses F51–F58, F71-78, F92-F98 (1)*
2. *Relay K32 (2), behind the three fuse lines*
3. *Fuses F61-F62, F80*

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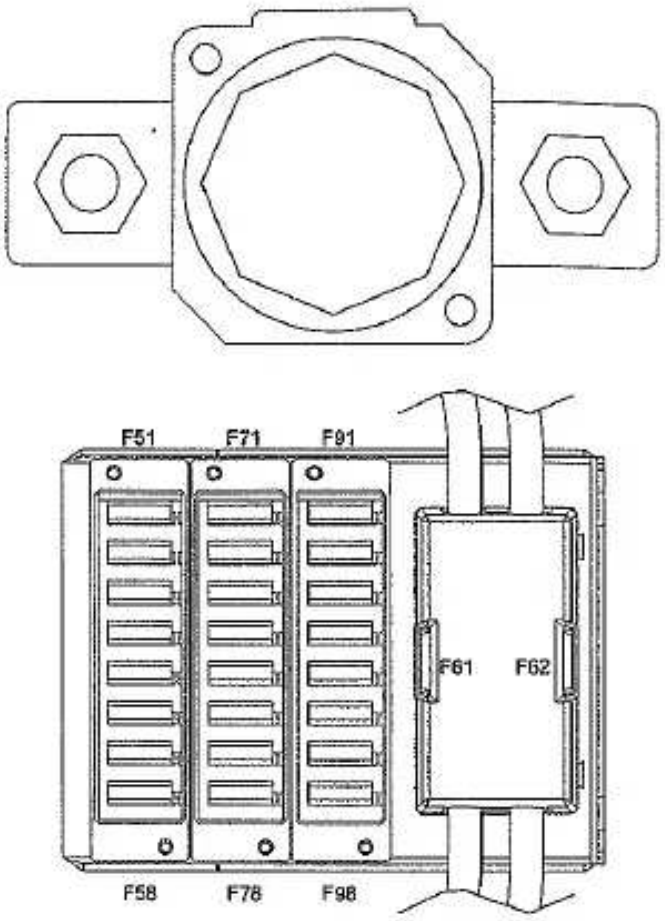

Figure 50. Numbering order of the fuses

Table 7. Fuses and their functions

Number	Size	Function
F51	10 A	MD4 internal clock (IQAN-MD4 RTC)
F52	20 A	Starter for Scania DC13 EU4
F53	20 A	Scania DC13 EU4 AdBlue control unit
F54	7.5 A	Option
F55	7.5 A	Fuel heater (cummins 20A)
F56	7.5 A	TCU battery power supply (DANA)
F57	20 A	Scania DC13 EU4 (20A), cummins QSB (15A)
F58	20 A	Scania DC13 EU4 (20A)/Cummins QSB (15A)
F61	100 A	Main fuse 15 ignition
F62	60 A	Main fuse 30 battery
F71	7.5 A	Option
F72	7.5 A	Fuel shut-off (option)
F73	7.5 A	Option
F74	10 A	Engine ignition
F75	7.5 A	DANA/ZF transmission control unit (TCU) ignition power supply
F76	25 A	Hydraulic oil cooler
F77	20 A	Scania DC13 EU4 exhaust gas recirculation valve (EGR)

Number	Size	Function
F78	-	Option
F80	70 A	Cummins engine starter
F91	10 A	Attachment lights/RS: attachment
F92	10 A	Chassis 48-pin STD F/RS: attachment
F93	10 A	Chassis 48-pin STD F/RS: attachment
F94	10 A	Chassis 48-pin STD F/RS: attachment
F95	10 A	Chassis 48-pin STD F/RS: attachment
F96	10A	Chassis 48-pin STD F/RS: attachment
F97	10A	Chassis 48-pin STD F/RS: attachment
F98	10 A	Power supply, attachment/RS: attachment

Relays

Relays K32, K35, and K36 are mounted next to the main fuses in the battery compartment. K101-K135 are mounted behind the operator seat in the cabin.

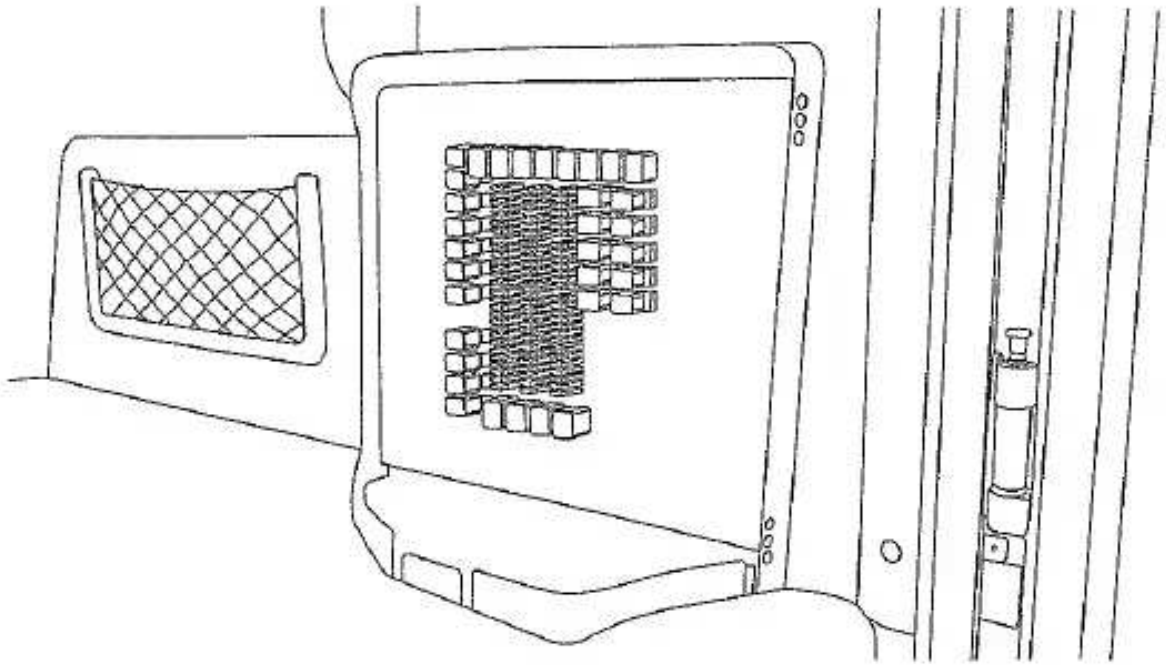

Figure 51. Relay location K101-K135

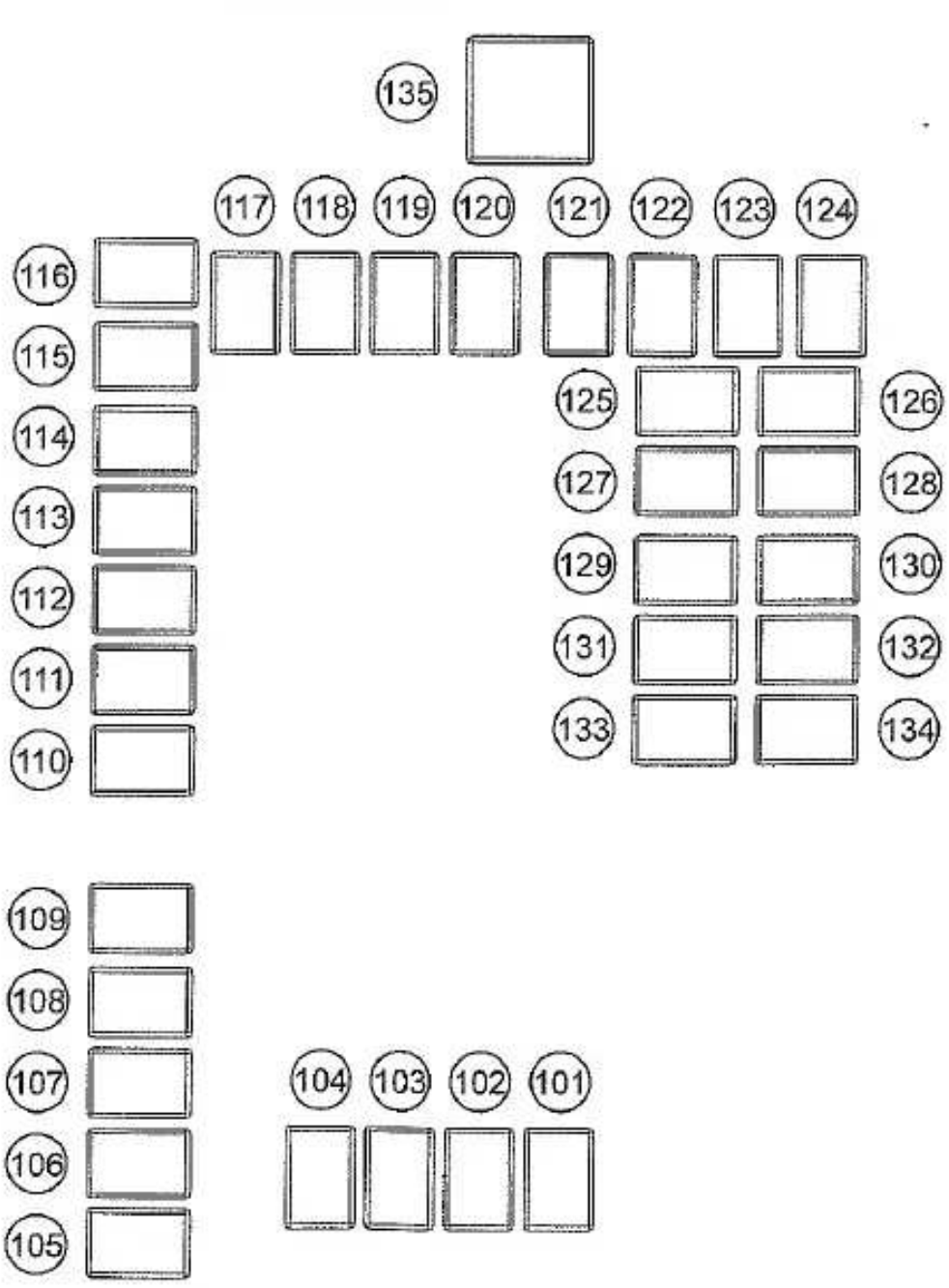

Figure 52. Relays K101-135

Table 8. Relay functions

Number	Function
K	Hydraulic oil cooler
K32	Q1 ignition
K35	Engine starter cummins QSB and QSM (Engine shut-off for Volvo engines)
K36	Fuel heater
K101	Pre-heating power supply for HVAC (heating, ventilation, air-conditioning)
K102	Signal for HVAC (heating, ventilation, air-conditioning), engine running with cabin doors closed
K103	Brake lights
K104	Inverted brake lights (turnable seat)
K105	Keyless ignition ACR RFID
K106	Working light mast/boom F121 and F122
K107	Working light extra 1
K108	Front alarm
K109	Door switch
K110	Low beam
K111	High beam
K112	Clutch for HVAC compressor
K113	Blinker right
K114	Blinker left
K115	Working light extra 2
K116	Reverse lights
K117	Central lubrication pump chassis
K118	Option
K119	Option
K120	Option
K121	Working light roof F161, F162
K122	Windshield wiper motor roof
K123	Windshield wiper motor rear
K124	Rear/front window washer motor
K125	Rear window heating
K126	Windshield wiper motor front, 1st speed
K127	Rear/front window washer motor
K128	Windshield wiper motor front, 2nd speed

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Number	Function
K129	Horn
K130	Fuel heater
K131	RCU
K132	Option
K133	Option
K134	Communication radio
K135	Hazard
K201	FLT: attachment lights (opt)

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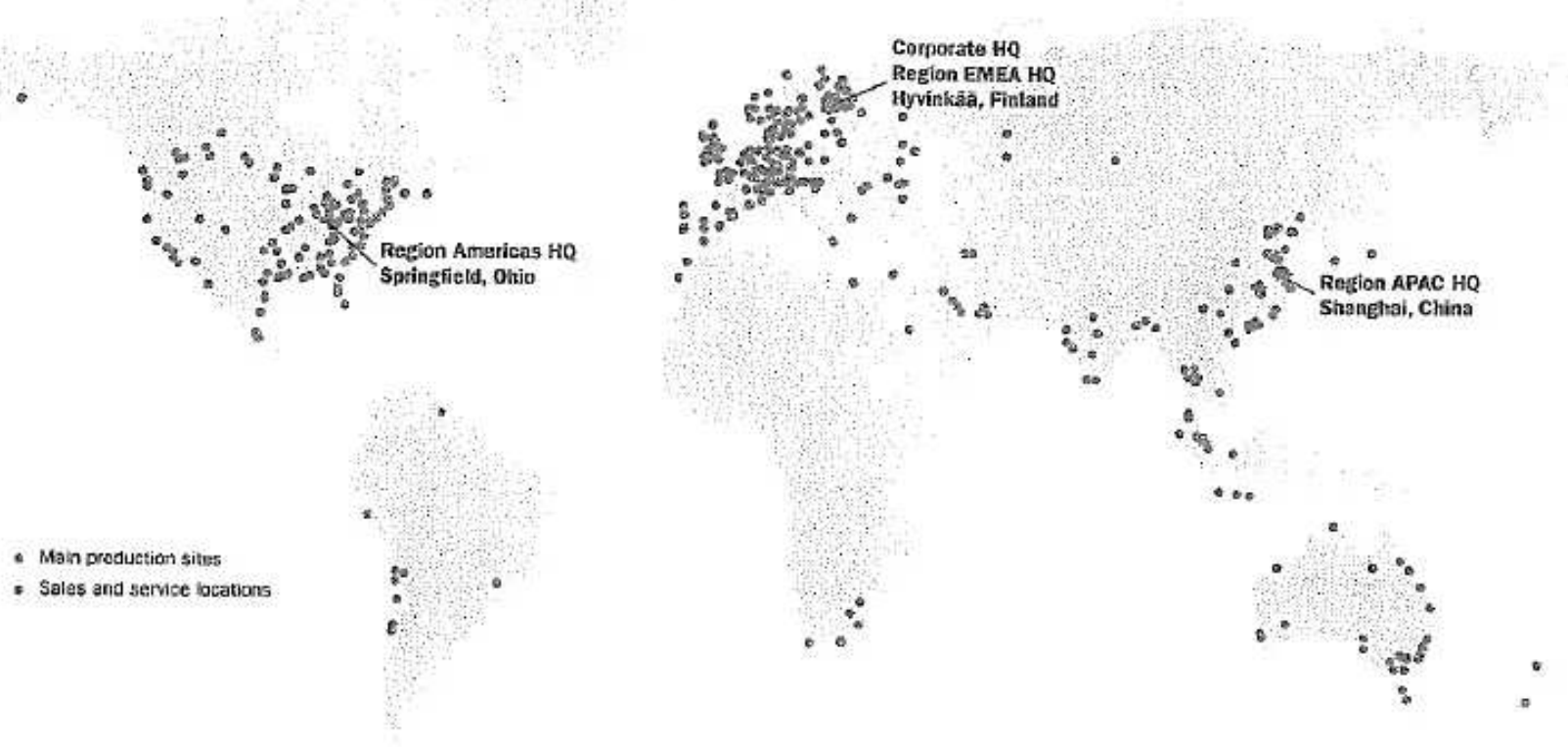

KONECRANES®

Lifting Businesses™

KONECRANES LIFTTRUCKS AB, BOX 103, SE-285 23 Markaryd, SWEDEN
Phone +46 433 73 300 Fax +46 433 73 310 E-mail: info.lifttrucks@konecranes.com
www.kclifttrucks.com