



Introduction

Dear User,

This manual provides the user of the Spierings folding crane with information concerning the crane's construction, function and operation. Also detailed, technical descriptions and maintenance instructions are given in the maintenance section of this manual.

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Liability Clause

This liability clause was added to prevent possible miscommunication.

ARTICLE 1. USE

- 1.1. The Spierings truck may only be used for the designated purpose, and in the manner as laid down/described in the manual and possible additions thereto.
- 1.2. Any other than the designated use and/or any other manner of operation than laid down/described in this manual and possible additions thereto, and/or action inconsistent with the previous, will explicitly invalidate any guarantee claim as well as any liability for damage, consequential damage and future damage, by any reason and for no matter what.
- 1.3. Operating the Spierings truck is only permitted by people, who have the relevant expertise and a valid driving license for driving a heavy truck, and who are physically and mentally capable of properly carrying out the work involved.
- 1.4. In case of the additions to the manual, the user/operator/driver of the Spierings truck must be notified thereof immediately, and the additions must be added to the manual.

ARTICLE 2. Safety

- 2.1. For safety reasons, the user/operator/driver must strictly comply with the instructions in the manual and possible additions thereto.
- 2.2. If at any work site of the Spierings truck/crane the safety rules and regulations are more strict than those laid down in the manual, or possible additions thereto, these stricter rules are to be complied with under penalty of expiry of the guarantee and with exclusion of every liability.
- 2.3. The Spierings truck manufacturer explicitly warns the user/operator/driver and/or bystanders, to stay out of the Spierings truck/crane's danger zone.
If any unexpected situation, by whatever cause, occurs during use and/or operation of the Spierings truck, please contact your technical department or Spierings Service immediately.

ARTICLE 3. WARRANTY

- 3.1. Without previous written permission of the Spierings truck manufacturer, it is forbidden to carry modifications and/or welding at or on the Spierings truck.
- 3.2. Systematic maintenance and periodic inspections must be carried out according to the manual and possible additions thereto.
Deviating from these instructions without prior written consent of the Spierings truck manufacturer's, turns every guaranty claim invalid as well as every liability for damage, consequential damage and future damage, by any reason and for no matter what.

Explanation of the Symbols Used



CAUTION!



Wear safety goggles!



Wear gloves!



Wear safety shoes!



Wear a helmet!



Put on safety belt!



Check / test!



Manual action!



Automatic action!



Incorrect!



Good !



Information!



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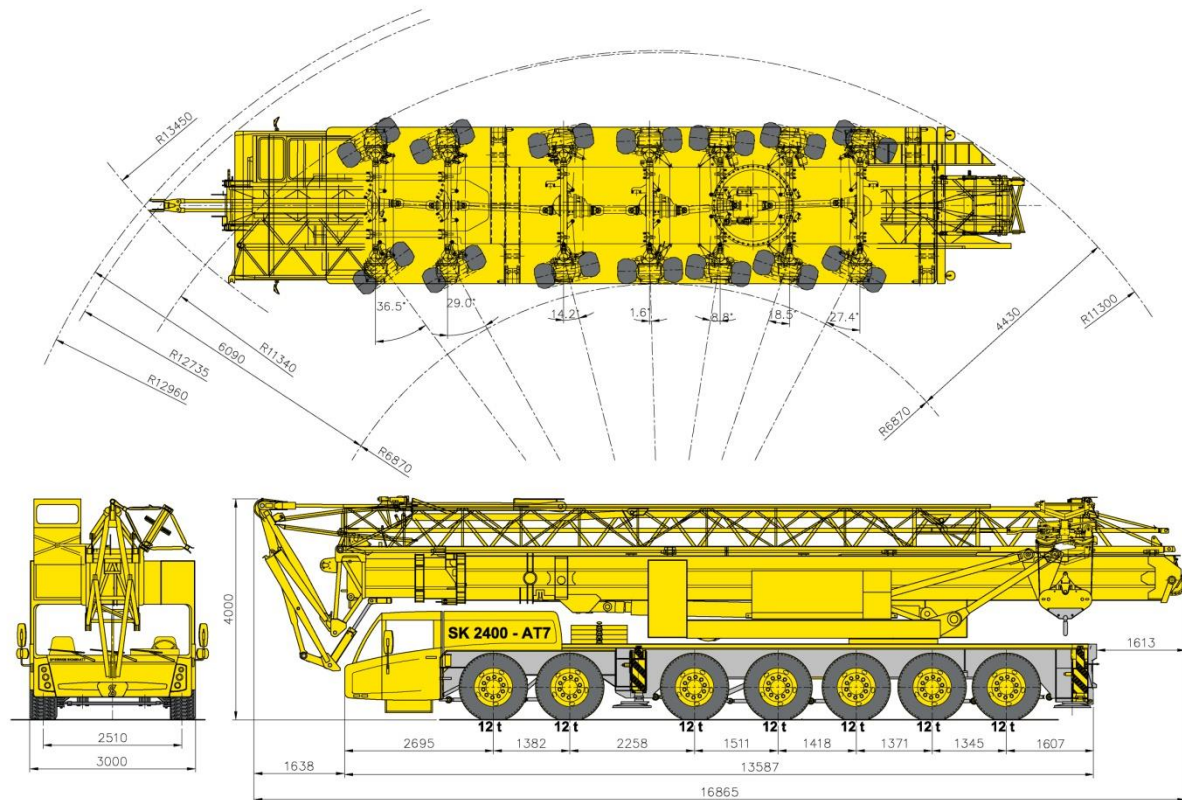


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1. General Data AT7

The AT7 carriage is especially designed for the Spierings SK2400 folding crane. Extra attention is paid to a safe and comfortable transport to the work site. The crane is suited for driving on public roads, fully equipped with counterweight and tools. The chassis is a specially rigid structure to create a good crane support.

Picture 1-1 shows the measurements of the SK2400 with the AT7-carriage. The measurements given are the overall dimensions, axle bases and turning circle.



Picture 1-1

Drive Line:

- 12.9 litre DAF-diesel engine with turbo compressor and intercooler (model: XM375S1).
- ZF-TC Tronic automatic gearbox with retarder and torque converter; twelve forward gears and 2 reverse gears (model: ZF12TC2740).
- STEYR transfer case, with high speed (road) and low speed (off the road) transmission (model: VG2701/400).
- Electronic accelerator "E-gas" with speed control.
- 7 Kessler & Co axles, of which axles 1, 3, 4 and 7 are driven.

**Steering:**

With regard to the steering, we distinguish between road and off the road steering.

- Road steering: Axles 1 to 3 are mechanically steered by means of the steering wheel, axle 4 remains rigid and, depending on the driving speed, axle 5 steers along in opposite direction up to 30 km/h, axles 6 and 7 up to 50 km/h respectively.

Off-the-road steering: these special steering programs are only available in off-the-road mode.

- "Small turning circle": This steering program enables an extra small turning circle.
- "Manual": this program enables you to control the steering movement of axle 7. Axles 4 to 6 steer along proportionally.
- "Crab steering": all 7 axles steer in the same direction.
- "Wall steering": Program to drive away from an object with minimal swing of the truck's rear end.

The 2-circuit steering system is hydraulically powered by means of a 2-circuit steering gear housing and auxiliary cylinders.

The steering system is fitted with an emergency steering pump, so in case of main control pump malfunction or diesel engine break-down, the truck remains steerable until it stands still.

- Provisions for driving off the road:
 - Adjustable axle height
 - Transfer case with off-the-road gear
 - Longitudinal and transverse differentials can be locked.
 - All axles participate in the steering process.

Suspension:

- Hydropneumatic suspension
- Possibility to block the suspension.

Braking System:

- Pneumatically operated brakes

4-point Outrigger System

- Wide (full support base): 7.95 m x 7.63 m
- Narrow (reduced support base): 7.95 m x 5.72 m

Further Data:

- Maximum speed limited to 83 km/h
- Minimum speed at 1.000 rpm: 1.85 km/h (is 30.8 m/min)
- Truck weight including superstructure approx. 84,000 kg.
- The axle load is 12,000 kg per axle.

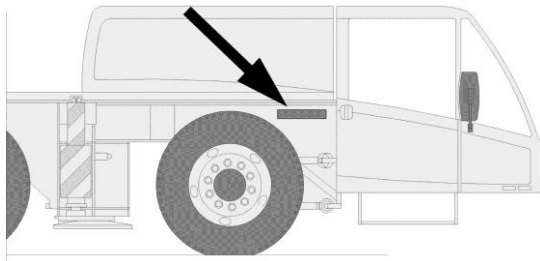


Identification:

- Engine number: on the valve cover or on the water pump.
- Carriage frame number: on the identification shield in the co-driver's leg-room (see *Picture 1-2*) and stamped in the right frame girder in front of the first axle. (see *Picture 1-3*).



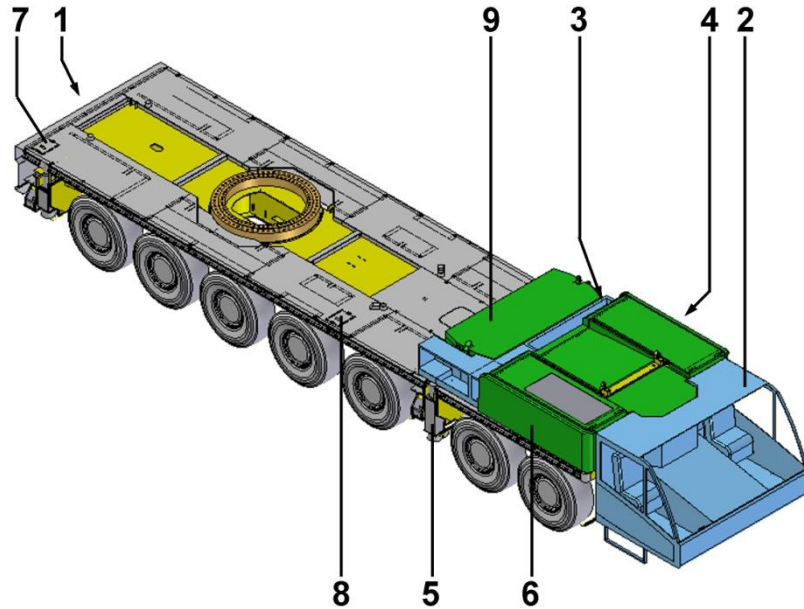
Picture 1-2



Picture 1-3

2. Operation

2.1. Introduction to the Truck



Picture 2-1

1. Bumper

The bumper, equipped with lighting fixture, can be folded up to hitch on a trailer.

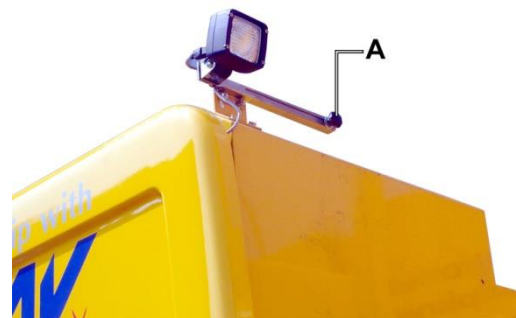
2. Truck Cab

In addition to driving the crane, the control panel in the truck cab can be used to operate the outrigger system and to adjust the axles' height.

3. Work Lamps

Work lamps are found at the rear of the engine cowling and at the rear of the truck, both at the left and right-hand side, which can be operated in the cab.

By loosening the screw (A) at the bracket, the lamp can be moved sideways. (Picture 2-2).

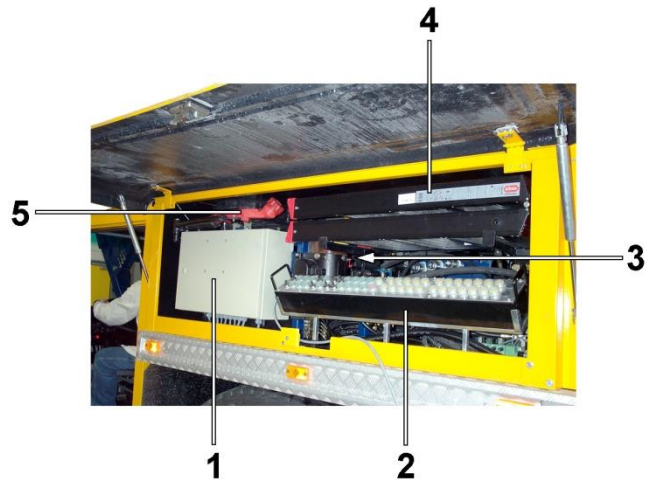


Picture 2-2

4. Left-hand Engine Cowling

At this side under the engine cowling, the following parts are found:

1. Control box
2. Grease container for automatic lubrication system
3. Auxiliary steps
4. Oil filling pipe



Picture 2-3

5. Outriggers

At both sides of the truck there are 2 extending outrigger beams (4), and to each beam a hydraulically operated outrigger (1). These outriggers keep the machine stable during hoisting operations. The outrigger beams have an antiskid coating (5) to prevent slipping. The outrigger pad holders (3) can be used to facilitate stepping on the outrigger beam.

With a separate (remote) control box the outriggers can be radio controlled. The level position of the crane can be checked by means of the levels.

Furthermore, the crane is equipped with a standard automatic outrigger control program.

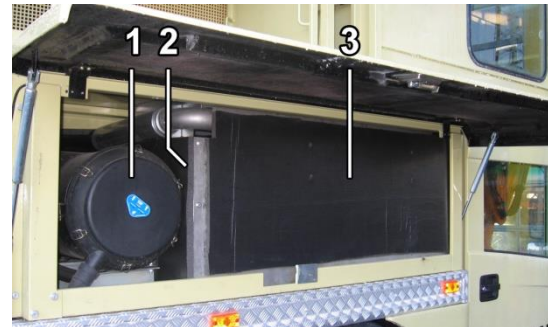


Picture 2-4

6. Right-hand Engine Cowling

At the right-hand side of the truck under the engine cowling, the following parts are found:

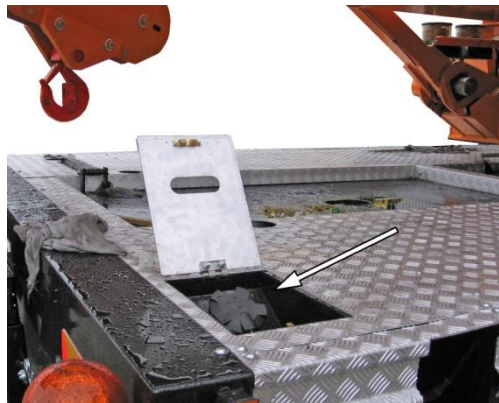
1. Air cleaner
2. Combined cooler (intercooler/radiator/oil cooler) with hydraulically driven fan.
3. Soundproof side



Picture 2-5

7. Fuel Tank

The fuel tank is integrated in the frame at the rear of the truck. The tank capacity is 725 litres and can be filled through a filler neck at the rear, right-hand side of the truck. (Picture 2-6).



Picture 2-6

8. AdBlue Tank

The filler neck on the AdBlue tank is at the right-hand side in the middle of the truck. The total capacity of this tank is 75 litres.



Picture 2-7

9. Outrigger Plates

Directly behind the truck cab 4 steel outrigger plates in all can be carried. They can be put in place by means of a hoisting arm mounted at the crane's outer tower.

2.2. Truck Cab

2.2.1. Getting in

Use the step under the door.

2.2.2. Doors

Turn the handle up to open the door from the inside. The door can only be locked up from the outside. There is an ashtray on the inside of the door. After opening the ashtray, you push the locking device down to remove the ashtray from the holder to empty it.

The windows can be operated by means of the switches on the dashboard.

2.2.3. Wing Mirrors

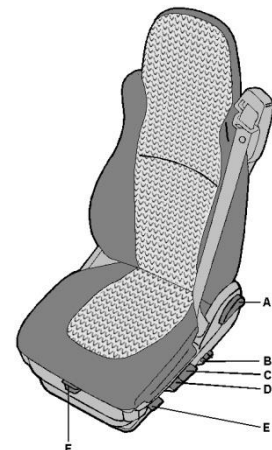
The wing mirrors may be adjusted by hand. Make sure the mirrors are adjusted before driving off, so that you have optimal view. The mirror heating can be switched on with a switch on the control panel.

2.2.4. Seats

The cab has room for the driver and a co-driver. The driver's seat has pneumatic suspension, the co-driver's seat does not. The seats' position can be adjusted. This should only be done when the vehicle stands still.

(see Picture 2-8).

- A) Back adjustment
- B) Lumbar support adjustment (push = inflate and pull = deflate)
- C) Height adjustment (pulling the handle = up and pushing it = down)
- D) Tilting the seat
- E) Handle rapid lowering
- F) Chair seat adjustment



Picture 2-8

2.2.5. Seat Belts

The seats are fitted with seat belts. Driver and co-driver must wear them when driving. Do not modify the belt or its attachment by yourself. Regularly check its operation by jerking the belt from its winding mechanism. The belt must lock when doing this. Have the lock repaired or replaced, if it does not function properly. When the belt was heavily loaded during a collision, it must be completely replaced, even if it looks like there is nothing wrong with it.

2.2.6. Storage Room

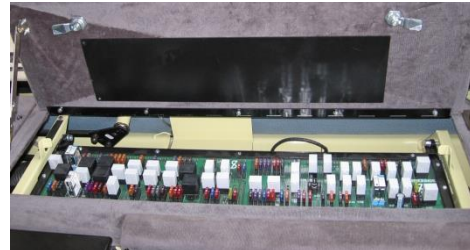
In the middle of the cab ceiling is a storage compartment. It has a lockable lid at the driver's side and at the side of the co-driver.

2.2.7. Sun Blind

To prevent sunlight from blinding you, a sun blind is mounted above the windscreen for the driver and the co-driver. Pull down the blind with the joggle in the middle of the blind. The blind will remain in the desired position. Push the button on the side of the blind to roll it up.

2.2.8. Fuse Box

The fuse box is found in the dashboard at the co-driver's side. (Picture 2-9).



Picture 2-9

2.2.9. Windscreen Washer Reservoir

This reservoir is found at the left-hand side of the co-driver.

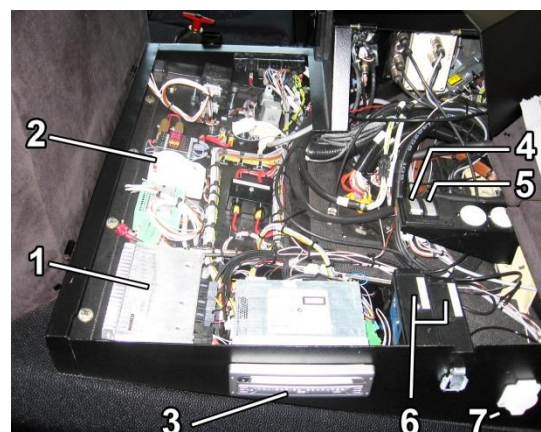


Picture 2-10

2.2.10. Central Console

All components under the central console at the co-driver's side can be reached through two lids. Here you will find a.o. the following components (Picture 2-11):

1. Computer ABS system
2. Central lubricating system timer
3. Navigation system
4. Transfer case neutral (when towing the vehicle)
5. Setting switch for rear axle steering
6. ECUs for rear axle steering
7. Socket 220V



Picture 2-11

2.2.11. Battery Charger Remote Control Batteries

The charging unit for the batteries of the remote controls is found at the left under the dashboard at driver's side.



Picture 2-12

Every remote control comes with 2 batteries each.

While the batteries are charged, the indicator lamp lights. As soon as they are fully charged, the lamp starts flashing.

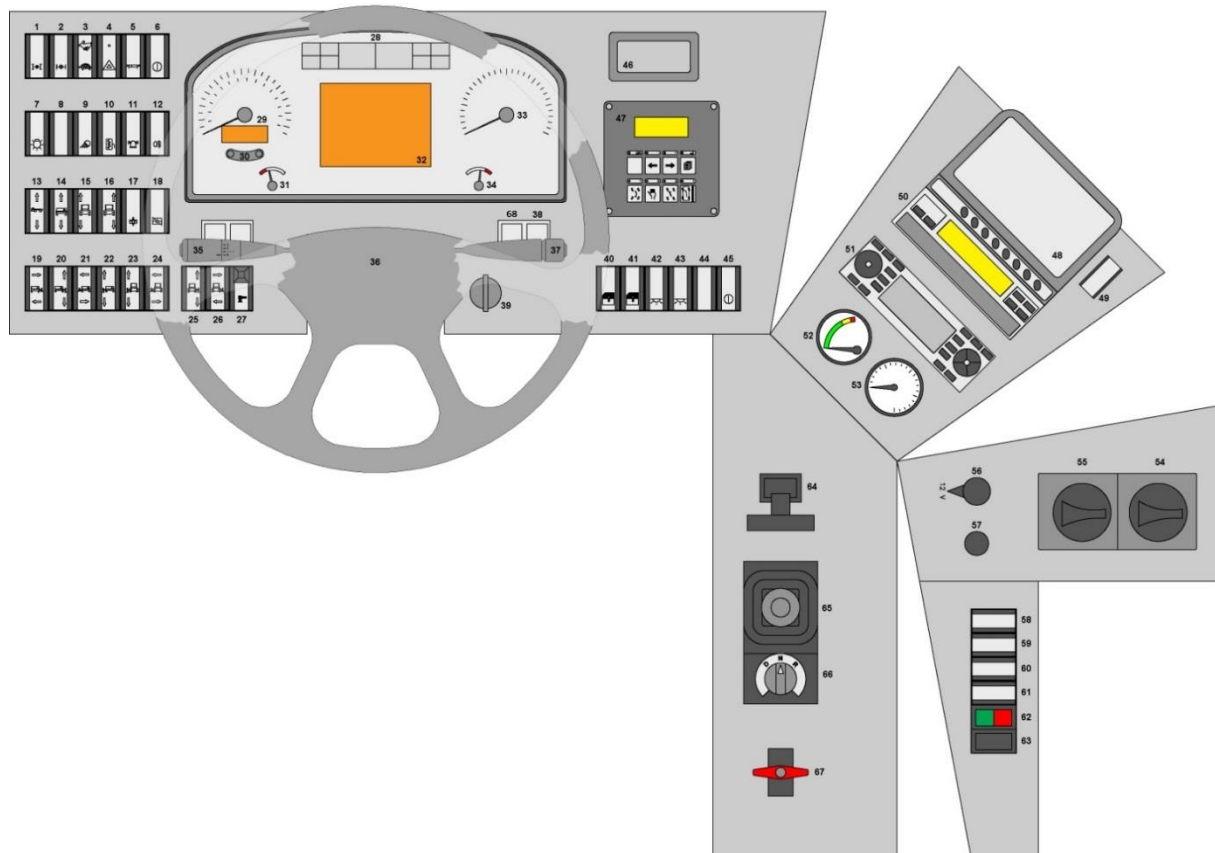
2.2.12. Fire Extinguisher

The fire extinguisher is situated behind the co-driver's seat.



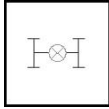
Picture 2-13

2.3. Control Panel

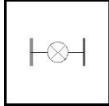


- | | |
|--|--|
| 1. Longitudinal differential lock | 35. Control lever direction indicator / windscreen wiper interval |
| 2. Transverse differential lock | 36. Steering wheel |
| 3. Transfer case high/low | 37. Control Lever Retarder/Cruise Control/Engine Speed Control (ESC) |
| 4. Switch alarm light | 38. Airport Lighting |
| 5. Aeronautic warning lamp | 39. Ignition lock |
| 6. Screen switch (32) | 40. Door window control left |
| 7. Light switch off/dipped head lights | 41. Door window control right |
| 8. Dimmer dashboard lighting | 42. Cab lighting driver's side |
| 9. Switch worklamps | 43. Cab lighting co-driver's side |
| 10. Switch mirror heating | 44. Steering system road/off-the-road |
| 11. Switch rotallares | 45. Shunting mode on/off |
| 12. Switch fog rear light | 46. Display automatic gearbox |
| 13. Switch axles up/down | 47. Control panel for axle steering |
| 14. Switch axles 1 and 2 up/down | 48. Monitor camera/navigation system |
| 15. Switch axles 3, 4, 5 and 6 left up/down | 49. Switch screen switching camera/navigation |
| 16. Switch axles 3, 4, 5 and 6 right up/down | 50. Digital tachograph |
| 17. Switch levelling out | 51. Radio/Cd-player |
| 18. Switch driving/blocking | 52. Oil temperature gauge retarder |
| 19. Switch outrigger beam front left-hand side retract/extend | 53. Oil-pressure gauge pump pressure |
| 20. Switch outrigger front left-hand side retract/extend | 54. Fan settings |
| 21. Switch outrigger beam rear left-hand side retract/extend | 55. Heat settings cab heater |
| 22. Switch outrigger rear left-hand side retract/extend | 56. 12 Volt socket |
| 23. Switch outrigger front right-hand side retract/extend | 57. Cigarette lighter |
| 24. Switch outrigger beam front right-hand side retract/extend | 58. Automatic outrigger system on/off |
| 25. Switch outrigger rear right-hand side retract/extend | 59. Automatic outrigger system start |
| 26. Switch outrigger beam rear right-hand side retract/extend | 60. Automatic outrigger system stop |
| 27. Switch outrigger controls on/off | 61. Automatic outrigger system "all axles retract" |
| 28. Monitor lamps | 62. Monitor lamps automatic outrigger system |
| 29. Speedometer with milometer and trip recorder | 63. Blind |
| 30. Trip recorder reset switch | 64. Slewing brake |
| 31. Fuel gauge | 65. Gear stick for manual gear shifting |
| 32. Instruments cluster | 66. Selector switch gearbox |
| 33. Tachometer | 67. Main battery switch |
| 34. Coolant temperature gauge | 68. Oil pump gearbox warning lamp |

Picture 2-14

**1. Switch Longitudinal Differential Lock**

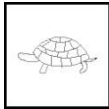
Switch on the longitudinal differential lock, when while driving off-road the vehicle has too little or no traction. The longitudinal differentials will be locked.

**2. Switch Transverse Differential Lock**

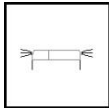
Switch on the transverse differential lock when while driving with longitudinal differential lock, the vehicle still has insufficient traction. The differentials in the axles are locked.

**3. Transfer Case high/low**

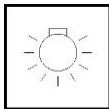
While driving on paved roads this switch must be on "high" (hare). The transfer case is in road mode. While driving off the road on difficult terrain, this switch can be changed to "low" (turtle). The transfer case switches to off-the-road mode.

**4. Switch Hazard Warning Lights**

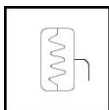
In the event of an emergency the hazard warning lights are switched on and off with this switch.

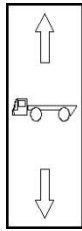
**5. Aeronautic Warning Lamp**

When the work site is near an airport, the aeronautic warning lamp must be switched on.

**7. Switch Dipped Head Lights****8. Dimmer Dashboard Lighting****9. Switch Worklamps**

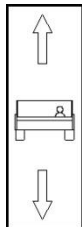
This switch operates the worklamps at the rear left- and right-hand side on the truck cab.

**10. Switch Mirror Heating****11. Switch Rota flare****12. Switch Fog Rear Light**



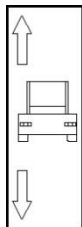
13. Switch All Axles up/down

With this switch the cylinders of all axles are simultaneously retracted or extended (e.g. during outrigger operation)



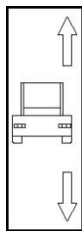
14. Switch Axles 1 and 2 up/down

With this switch the cylinders of axles 1 and 2 can be extended or retracted simultaneously.



15. Switch Axles 3, 4, 5 and 6 Left up/down

With this switch the cylinder at the left-hand side of the third, fourth, fifth and sixth axle are retracted or extended.



16. Switch Axles 3, 4, 5 and 6 Right up/down

With this switch the cylinder at the right-hand side of the third, fourth, fifth and sixth axle are retracted or extended.



17. Switch Levelling Out

To get all axles at the same height for transport mode, e.g. after outrigger operation, the cylinders of all axles must be levelled out.



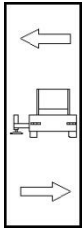
18. Switch driving/blocking



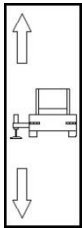
19. Switch outrigger beam front left-hand side retract/extend



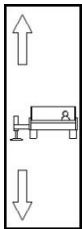
20. Switch outrigger front left-hand side retract/extend



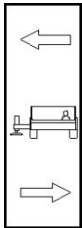
21. Switch outrigger beam rear left-hand side retract/extend



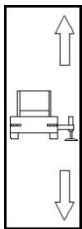
22. Switch outrigger rear left-hand side retract/extend



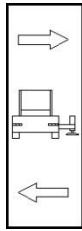
23. Switch outrigger front right-hand side retract/extend



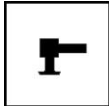
24. Switch outrigger beam front right-hand side retract/extend



25. Switch outrigger rear right-hand side retract/extend



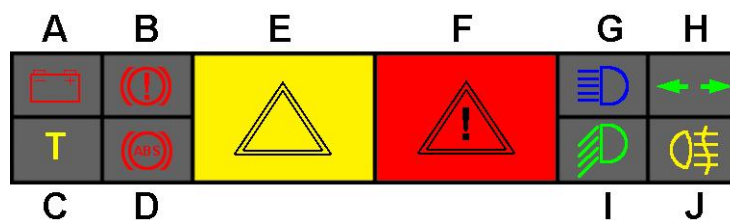
26. Switch outrigger beam rear right-hand side retract/extend



27. Switch Outrigger Controls on/off

Switch off the outrigger controls as soon as the outriggers are no longer operated. Do the same while the crane is being rigged up/down or during hoisting operations. The remote control is also deactivated. Failing to switch off the controls means the crane can not be operated over the full operating range ((full support base).

28. Monitor Lamps



Picture 2-15

A = Status Battery

- Lamp on: when the battery is not being charged by the generator.
- Lamp flashing + F + buzzer: battery charge under 18V or over 31V.

B = Status Brake System

- Lamp on: when the parking brake is activated.
- Lamp flashing + F + buzzer: when the air pressure in air circuit 1 and/or air circuit 2 is too low.

C = Status Tachograph

- Lamp on + E: when there is an error message in the tachograph.

D = Status ABS System

- Not active: ABS system not installed.

E = Warning lamp

- Lamp on + status lamp: have the malfunction repaired as soon as possible. (yellow light)

F = Error message lamp

- Lamp on + poss. buzzer: stop immediately and switch off the engine. (red light)

G = Status headlamp

- Lamp on: when headlamp is activated.

H = Status indicators

- Lamp flashes: when indicator left/right/hazard is activated.

I = Status dipped headlights

- Lamp on: when dipped headlights are activated.

J = Status fog lamp

- Lamp on: when the rear fog lamp is activated.

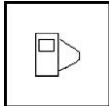
29. Speedometer with milometer and trip recorder

The truck has a standard speed limiter of 83 km/h.

The total mileage and the trip recorder are shown in the display under the speedometer dial. It also shows the time, which may be adjusted through the digital tachograph.

30. Trip Recorder Reset Switch

The right-hand switch is the reset switch for the trip recorder. Press it for at least 10 seconds to reset the trip recorder.

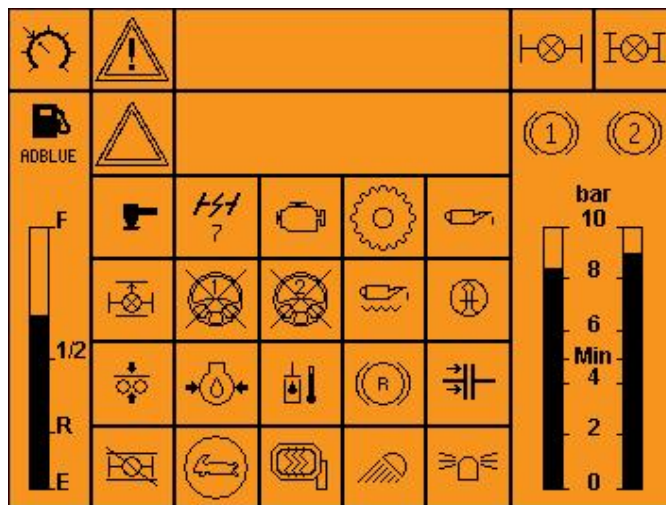


31. Fuel Gauge

The fuel gauge only shows the amount of fuel in the tank while the ignition is turned on.

32. Instruments Cluster (Main Screen)

The screen may be switched by means of switch 6.



Picture 2-16



Cruise Control

Active: The Cruise Control is activated.



Error message display

When the red error message lamp F in *Picture 2-15* is activated, the respective error message can be shown next to the symbol.

Transverse Differential Lock

Active: When all transverse differential lock statuses are present.
Not active: When not a single transverse differential lock status is present.
Flashes: When 1 or more transverse differential lock status is/are not present.



Longitudinal Differential Lock

Active: When all longitudinal differential lock statuses are present.
Not active: When not a single longitudinal differential lock status is present.
Flashes: When 1 or more longitudinal differential lock status is/are not present.



AdBlue Status with AdBlue Level Indicator

Active: After start up.



Flashes: If the AdBlue-level is in reserve.



Error message display

When the yellow error message lamp E in *Picture 2-15* is activated, the respective error message can be shown next to the symbol.



Air pressure circuit 1 with air pressure indicator

Active: After start up.
Flashes + red lamp: When the air pressure falls under 5 bar.



Air pressure circuit 2 with air pressure indicator

Active: After start up.
Flashes + red lamp: When the air pressure falls under 5 bar.



Outrigger Operation

Active: Outrigger operation is activated.



Rear Axle Steering

Active: When there is a malfunction in the rear axle steering.



Engine

Flashes + yellow lamp + buzzer: When there is a malfunction in the engine.
Have the malfunction repaired as soon as possible.
Flashes + red lamp + buzzer: When there is a serious malfunction in the engine. **Stop immediately and turn off the engine.**



AsTronic

Flashes + red lamp + buzzer: When there is a malfunction in the AsTronic.
Stop immediately and turn off the engine.



Oil Pressure Engine

Flashes + red lamp + buzzer: When the engine is running and the oil pressure has dropped.
Stop immediately and turn off the engine.



Off-the-road mode

Active: When the off-the-road mode is activated.



Steering Circuit 1

Flashes + yellow lamp: When there is a malfunction in steering circuit 1.
Have the malfunction repaired as soon as possible.



Steering Circuit 2

Flashes + yellow lamp: When there is a malfunction in steering circuit 2.
Have the malfunction repaired as soon as possible.



Oil Level

Flashes + yellow lamp + buzzer: When the oil level is low.
Have the malfunction repaired as soon as possible.



Air cleaner

Flashes + yellow lamp: When the air cleaner must be changed.
Have the malfunction repaired as soon as possible.



Levelling out

Active: When levelling operation is activated.



Hydraulic Oil Pressure

Flashes + yellow lamp:

When the hydraulic oil pressure exceeds 350 bar.

Have the malfunction repaired as soon as possible.



Hydraulic Oil Temperature

Flashes + yellow lamp:

When the hydraulic oil temperature exceeds 80°C.

Have the malfunction repaired as soon as possible.

Flashes + red lamp + buzzer:

When the hydraulic oil temperature exceeds 100°C.

Stop immediately and turn off the engine.



Retarder

Active:

When the retarder is activated.



Locking Clutch Discs

Active:

When the clutch discs are locked.



Axles Lock

Active:

When the axles lock is activated.



High



Low



Neutral



Malfunction

Transfer case

Active:

At symbol for transfer case high/low/neutral, the transfer case high/low/neutral is activated.

Flashes + red lamp + buzzer:

In case of error symbol, when there is a malfunction in the transfer case.

Stop immediately and turn off the engine.



Mirror heating

Active:

When the mirror heating is activated.



Work lamps

Active:

When the worklamps are switched on.



Rota flare

Active:

When the rota flare is switched on.

33. Revolution counter

This counter shows the diesel engine rpm.

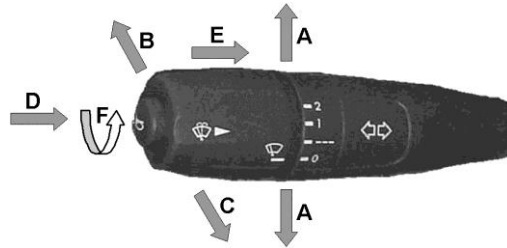


34. Coolant Temperature Gauge

This gauge shows the coolant temperature.

When the indicator is in the red: **Stop immediately and turn off the engine.**

35. Control lever direction indicator / windscreen wiper interval

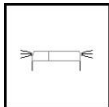


Picture 2-17

- A) With this switch the driving direction is indicated.
- B) Pushing the switch forward switches on the full beam headlight.
- C) By pulling the switch backwards, you can give light signals.
- D) When you push the switch towards the steering wheel, the horn is operated.
- E) Pressing the entire outer part of the lever towards the steering wheel activates the windscreen washer (H).
- F) Turning the outer part activates the windscreen wipers. The ---- position is intermittent. Position 1 is normal and position 2 high speed wiping.

37. Control Lever Retarder/Cruise Control/ESC

With this lever the retarder can be set in 4 various positions. It is also used to operate the cruise control and the ESC (Engine Speed Control = temporarily increasing the rpm). (See 2.9 Control Lever Retarder/ESC/CC).

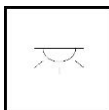


38. Airport Lighting



40. Door Windows

The door windows can be opened or closed with switches 40 and 41. At co-driver's side you will find a switch on the dashboard. All these switches only function with turned on ignition and closed door.



42. Cab Lighting

The cab lighting at driver's side can be switched on/off with switch 42, at the co-driver's side with switch 43.

44. Steering system road/off-the-road

To operate the steering system with the control panel for axle steering (47), it must be switched from on-the-road mode to off-the-road mode with switch 44.

45. Shunting Mode

When switch 45 is turned on, the shunting mode is activated. This means, that the clutch is locked, so the vehicle is driven using the torque converter.

46. Display Automatic Gearbox

See chapter 2.7.

47. Control Panel for Axle Steering



With this control panel, various axle steering programs can be selected.
(For explanation please refer to chapter 2.13)

48. Monitor Camera/Navigation System

This screen shows the navigation system or the image from the reverse camera (see enclosed manual).

49. Switch Screen Switching Camera/Navigation System

With this switch the input source of the Monitor can be selected.

50. Digital Tachograph

(see enclosed manual).

51. Radio/Cd-player

(see enclosed manual).

52. Oil Temperature Gauge Retarder

Always make sure, while the retarder is in use, that the temperature gauge remains in the green. If the temperature rises too much, gear down or turn off the retarder.

53. Oil Pressure Gauge Pump Pressure

When starting this gauge will read approx. 5 bar. As soon as the oil is warm approx. 3 bar.

54. Fan Settings

With this selector switch the heating fan can be set at 3 speeds and 0.

55. Heat Regulation Cab Heater

By turning this rotary knob the heat supply can be continuously regulated.

56. 12 Volt Socket

This is a universal 12 Volt socket, for e.g. a mobile phone battery charger.

58. to 62. Automatic Outrigger System on/off

Please refer to the manual SK2400 for operating the automatic outrigger system (section 3.3).

67. Main Battery Switch

Switch to shut off the power to the electrical system.

(While welding the power to the electrical system must be shut off).

2.4. Operating the Air-conditioning

The air-conditioning is situated at the truck cab ceiling.
(see *Picture 2-18*).



Picture 2-18

On the interior part of the air-conditioning are two rotary switches.

Switch B (*Picture 2-19*) is the selector switch for air delivery of the interior fan. When this switch is in OFF position, the airco cannot be turned on.

Switch A is the thermostat switch, it is used to select the desired temperature. When the switch is at the far left, passed the stop position, the air-conditioning is turned off, turn the switch to the right to lower the temperature.

The vents in the interior can be tilted and turned to regulate the air flow.



Picture 2-19

2.5. Driving the Spierings Crane

(For all number references please see Picture 2-14)



The truck driver must always comply with the local regulations for driving a Spierings crane.

While driving and manoeuvring the crane, the driver must be aware of the crane's unusual form, measurements and steering characteristics.

Please note the following:

- Crane parts are sticking out at the front and rear
- The crane's height of four metres (be careful in case of low passages and low branches)
- The crane's width of 3 metres (it could pose a problem in traffic).
- Because of the countersteering rear wheels the crane has a small turning circle.



Caution!

The crane's rear swings when taking a bend.

During running in (1500 km or 30 operating hours) we advise you not to load the engine to its maximum. A relatively high rpm causes less damage than overload at low speed.

2.5.1. Starting



Caution!

Do not run the diesel engine in a closed or non-ventilated room. There is a high risk of suffocation.

Before starting the engine, the gearbox must be in neutral (N) (switch 66) and the vehicle's parking brake (64) must be engaged.

2.5.2. Driving off

In order to drive off, the air pressure in the system must be 6,5 bar and the gearbox must be shifted from neutral (N) to drive (D).

On a flat road, the acceleration is fully automatic. The gearbox always selects 3rd gear to accelerate.

On hills or off the road, the gearbox must be geared down manually. To accelerate, proceed as follows:

- The engine is running and the parking brake is engaged (64).
- Shift the gearbox to "D" (66) and, if not done yet, in "automatic mode" (65).
- Step on the accelerator and release the parking brake simultaneously.
- The vehicle starts to move.

2.5.3. Reversing

In order to reverse the crane must come to a full stop.

- Step on the brake pedal.

- Shift the gearbox to “R” (66).

Display 46



The gearbox is shifted to reverse.

- Release the brake pedal and step on the accelerator
- The vehicle starts to move.

2.5.4. Stopping

The driver can stop the vehicle in any gear. For short stops, e.g. for a traffic light, you can keep the vehicle in gear.

2.5.5. Turn off the Engine

To switch off the engine, turn the ignition key to the left.

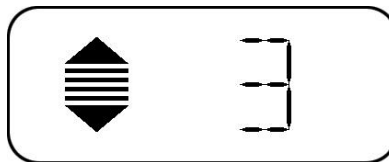
If the engine has run for a longer period of time under heavy load, we advise you to leave the engine running at idling speed for a few minutes before shutting it off, to prevent the coolant and turbo from overheating.

2.6. Gear Change

The AT7 is fitted with an automatic transmission, so there is no clutch pedal in the truck cab. The controls needed to get the crane moving are control lever (65) and rotary switch (66) on the central console and the accelerator pedal. To inform you on the selected gear etc. the dashboard contains a display (46). The gearbox has 12 forward gears and 2 reverse gears.

2.6.1. Automatic Gear Change

If you want to select the full automatic gear change, you turn rotary switch (66) on the central console in position “D” (“Drive”). The display (46) in the truck cab shows the gear number and to the left two arrows and four bars. (Picture 2-20).

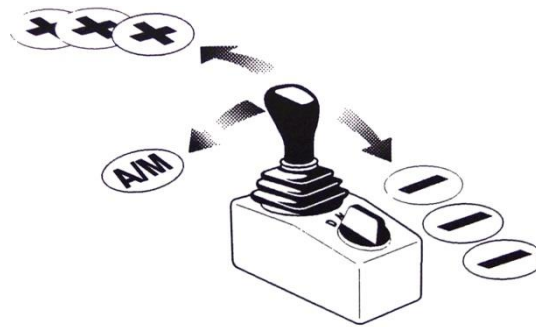


Picture 2-20

To accelerate step on the accelerator pedal. Keep the accelerator pedal pressed down while accelerating. The transmission changes gears automatically. While changing gears, the transmission electronics will arrange for the engine rpm to decrease. The electronics also operate the clutch and change to the next gear. The display shows the gear to which the transmission has changed. When accelerating from 0 to 83 km/h the transmission will automatically change gears in indiscriminate order. When the accelerator is kicked down, the transmission will jump some gears. As soon as you reach the desired speed, keep the accelerator in the respective position.

When you brake and drive on at a lower speed, the transmission will determine the accompanying gear in view of the driving speed, engine speed and the accelerator position.

In the automatic gear change mode (A) the gears can also be changed manually. (Picture 2-21) By moving the gear lever forward or backward, you can shift the transmission in lower or higher gear. However, you have to keep the rpm in a safe range, otherwise the transmission will not carry out the command.



Picture 2-21

2.7. Manual Gear Change

In view of easy operation it is not wise to often use the manual gear change function.

For manual gear change push the gear lever to the left. The two arrows and four bars on the display disappear. If the crane is not moving, the display only shows the number of the selected gear. As soon as the crane is moving, the display shows the optimal gear choice through the arrows and bars at the left of the number.

Three bars and an arrow downwards means gearing down from 8 to 5. To do so, pull the gear lever backwards three times. (Picture 2-21).

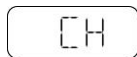

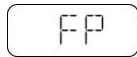
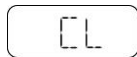
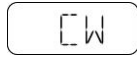




Manual operation; 4th gear



Manual operation; 8th gear with gearing down chance to the 5th gear. (1 bar stands for 1 gear)

2.7.1. Display Indications

Display	Indication
	Self-check of the gearbox.
	The truck air pressure system does not supply enough air pressure to change gears.
	Do not operate the accelerator. If the indication does not disappear, stop the crane immediately. Driving on is impossible.
	Clutch is overloaded. Gear down or shift to neutral in order to stop the overload.
	Clutch is worn out. Replace the clutch as soon as possible.
	Automatic gear change (transmission is in 8 th gear)
	Manual gear change (transmission is in 4 th gear)



Manual gear change (transmission is in 8th gear with gear down possibility to 5th gear)



Electronic error. Appears when the display communication is upset by the drive electronics.

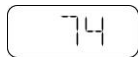


System error. Appears when the transmission can only work with restrictions. Driving on is possible, but the malfunction must be dealt with as soon as possible.

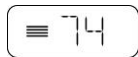


Serious system error. Stop immediately and solve the problem.

In order to take a look at the error message, the gear lever must be pushed forward once, while the vehicle stands still and the transmission is in neutral. A 2 or 3 digit code appears on the display in the following ways:



2-digit code: In this case error code 74.



3-digit code: The four bars stand for a hundred. In this case error code 174.

You can ask Spierings Kranen or ZF Friedrichshafen AG for the meaning of these error codes.

2.8. Brake System

The crane is equipped with four brake systems:

- Operating brake
- Parking brake (on axles 3, 4, 5 and 6)
- Vacuum brake
- Retarder

2.8.1. Operating Brake

The operating brake is operated with the brake pedal and works fully pneumatically. The brake system status is shown on the dashboard (28) by status lamp B. (*Picture 2-15*). If it is indicated that the air pressure in the brake system is low, the crane cannot be driven.

2.8.2. Parking Brake

The parking brake is engaged when the parking brake lever is moved (64) backwards. This bleeds the spring loaded brake boosters and engages the brake. (*Picture 2-14*) When pulled fully backwards, the lever is locked and the parking brake remains engaged. Pulling out the knob on the lever and pushing the lever forwards will release the parking brake.

If the air pressure for the operating brake is too low, the parking brake is used to slow down the moving vehicle. Move the parking brake lever gradually backwards. Once operated the parking brake can not be released until the air pressure is back to normal.

2.8.3. Vacuum Brake

The vacuum brake works by closing the fuel supply. Also the exhaust is closed by means of a valve. The vacuum brake controls are at the left-hand side on the truck cab floor. While this foot switch is pressed the vacuum brake is active. The vacuum brake is used to slow down through the engine (e.g. when travelling down-hill).

2.8.4. Braking with the Retarder

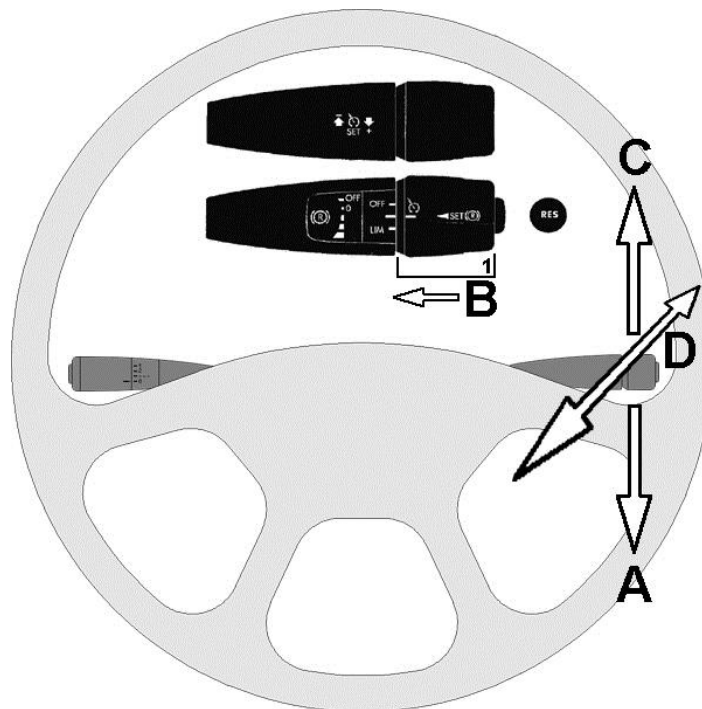
For slowing down when driving at high speed or on long stretches down-hill, the use of the retarder is advisable. It reduces the wear on the operating brake. The retarder is activated with the control lever at the right of the steering column. (See 2.9 Control Lever Retarder/ESC/CC). The instruments cluster (32) shows if the retarder is active. (See Picture 2-16) When the retarder is activated, you cannot operate the accelerator.

In case of frequent use of the retarder, the oil temperature in torque converter/retarder (WSK) can rise considerably. Keep an eye on the oil temperature gauge (52) while the retarder is in use. If the gauge is in the red, the oil temperature in the retarder has risen too high. Gear down and set the retarder to a lower position or switch it off. If this does not help to lower the oil temperature, the retarder will automatically switch off. (At 145°C a buzzer sound)

2.9. Control Lever Retarder/ESC/CC

2.9.1. Retarder

The retarder can be operated with the right-hand control lever on the steering column (37). (Picture 2-14 and Picture 2-22)



Picture 2-22

By moving the lever backwards (towards A) the retarder braking deceleration can be set in three different levels.

1. Approx. 33% of the maximum braking power
2. Approx. 66% of the maximum braking power
3. Maximum braking power.

Switch off the retarder by returning the lever to its original position.

2.9.2. The Bremsomat

The Bremsomat is used to set the retarder to a maximum speed, in order to maintain a constant speed while driving down hill.

The Bremsomat is activated and set to the actual speed by pushing the lever tip (1) towards the steering column (towards B) (Picture 2-22).

By pushing the lever forwards (towards C) the Bremsomat is turned off.

2.9.3. Cruise Control (CC)

The **Cruise Control** enables you to drive at a constant speed without having to operate the accelerator. The cruise control only works when the speed is over 30 km/h.

The CC can be switched on by:

- briefly moving the lever up/down (*Picture 2-22, D*).
The actual speed is saved in the memory until the ignition is turned off.
- pressing the switch "RES".
When the CC had already been activated since turning on the ignition, the vehicle will resume the last set speed.

When the CC is activated, the speed can be increased/decreased by moving the lever up/down (towards D). (By tipping the lever the speed will change at 0,5 km/h per tip.)

The Cruise Control is turned off by turning the lever tip (1) briefly to "OFF".

Conditions for turning the CC on or off:

		<i>Result</i>		
		CC is turned off	CC is prevented from turning on	CC is turned on
Controls	v = out of limit values	X	X	
	Parking brake	X	X	
	Foot brake	X	X	
	Vacuum brake	X	X	
	Position "OFF"	X	X	
	Lever towards D			X
	Switch "RES"			X
	Var. speed limiter	X	X	
	Retarder	X	X	

Next to braking the CC will also be switched off if the deceleration is more than 1,4 m/s². (E.g. in case of collision)



2.9.4. Variable Speed Limiter

The variable speed limiter enables you to set a speed limit. It will only work if the actual speed is over 30 km/h.

By turning the lever tip (1, *Picture 2-22*) briefly on "LIM", the actual speed is set as speed limit. This value can be increased/decreased by moving the lever up/down (towards D).

Turn the lever tip (1) to central position or kick down the accelerator to switch off the variable speed limiter.

2.9.5. Engine Speed Control (ESC)

The diesel engine's Speed Control may be set to a speed of 9 km/h. This function is used for e.g. outrigger operation. By pressing the switch "RES" the engine speed will go to 1260 rpm. *Picture 2-22*)

By moving the lever up/down (towards D) the rpm can be increased/decreased.

In the table below you will find the conditions for switching on or off ESC.

		<i>Result</i>		
		Turns off ESC	Prevents ESC from turning on	Turns on ESC
Controls	v = out of limit values	X	X	
	Parking brake turned off	X	X	
	Foot brake	X	X	
	Vacuum brake	X	X	
	Position "OFF"	X	X	
	Lever towards D			X
	Switch "RES"			X

Switch off the speed control by turning the lever tip (1) to "OFF".

2.10. Driving off the Road



The truck driver must always comply with the same regulations as while driving a crane on public roads.

2.10.1. Off-the-Road Mode Transfer Case

When driving off the road or when low speed is required (e.g. driving with erected tower) you can shift the transfer case to off-the-road mode (low, 3). (Picture 2-14).



The transfer case can only be shifted from low to high and v.v. when the vehicle has come to a full stop and the transmission is in neutral.

The transfer case position is indicated on instruments cluster (32) by turtle, hare or neutral.

2.10.2. Longitudinal Differential Lock

When while driving on unpaved terrain you have insufficient traction, the longitudinal differentials can be locked with the switch "longitudinal differential lock" (1).

The locking of the longitudinal differential is indicated by instruments cluster (32) on the dashboard.



Caution!

The longitudinal differential lock may only be engaged/released when the vehicle has come to a full stop!

Driving with engaged longitudinal differential lock is only allowed when the vehicle moves in a straight line!



After disengaging the longitudinal differential lock check if the symbol on the instruments cluster has disappeared!

If not, make brief steering movement when driving off. The symbol should then disappear (verify this!).

2.10.3. Transverse differential lock

If after engaging the longitudinal differential lock there is still too little traction, also the differentials in the axles may be locked

with switch "transverse differential lock" (2). To keep the transverse differential lock engaged, the button must be pressed. As soon as the button is released, it will spring back and release the transverse differential lock. The locking of the axles is indicated by the symbol for transverse differential on the instruments cluster.

Before driving on a paved road, it is required to release the transverse differential lock.

Caution!



The transverse differential lock may only be engaged/released when the vehicle has come to a full stop, and the longitudinal differential lock has already been engaged.

Driving with engaged transverse differential lock may only when the vehicle moves in a straight line on loose ground!



After disengaging the transverse differential lock check if the symbol on the instruments cluster has disappeared!

If not, make brief steering movement when driving off. The symbol should then disappear (verify this!).

2.11. Parking

Shift the transmission into neutral and engage the parking brake. Fully lower the vehicle. (See 2.12) Shut off the engine and subsequently the main battery switch.

In wintertime, when you park the (rigged down) crane temporarily, you risk freezing due to water accumulated in the tower. To run off the water you can put the (rigged down) crane inclined as follows:

- Retract the front axles until the front axle suspension cylinders are fully extended.
- Subsequently retract the rear axles until the rear axle suspension cylinders are fully retracted.
- Make sure the truck is still standing on all its wheels! (all tyres are still bulging)

2.12. Axle Height Adjustment

The truck axles are connected to the chassis by means of hydraulic cylinders. Each cylinder is fitted with an accumulator, so that the cylinders can compress.

The axle height adjustment can be operated from the truck cab. To operate the axle height adjustment, first switch 18 must be operated. (Picture 2-14) Subsequently it is possible to adjust the axle height by means of the switches 13, 14, 15, 16 and switch 17 for levelling out.

This is of use for e.g. outrigger operation or driving on difficult terrain. You may also use it to level out the crane when parking on slightly inclined terrain.

2.12.1. Suspension Locking (Axle Locking)

When driving with a rigged up tower, it is advisable, for a stable transport, to lock the suspension with the switch for outrigger operation (18). As soon as the symbol for axle locking appears on the instruments cluster, the accumulators are disengaged and the suspension is locked.

The axle height can be adjusted independent from the axle locking.



2.12.2. Off-the-Road Mode

In order to reach maximum ground clearance the crane can be put in off-the-road mode. Proceed as follows:

- Turn on the axle height adjustment (18)
- Extend all axle cylinders (13). (The cylinder will not extend fully, so there is some suspension travel left).

2.12.3. Levelling out

During levelling out, the axle suspension is automatically adjusted in travelling mode. This is useful when the axle height had become unsettled due to e.g. outrigger operation, off-the-road mode or lengthy standstill.



For transport the crane must always be levelled out in view of the travel height of 4 metres!

Outrigger operation must be turned off before levelling out (27).

Levelling the crane (*Picture 2-14, switch 17*) must be carried out on level ground, and is finished as soon as there is no more movement in the vehicle. Now reset the switch.



The crane can only be levelled out when in transport mode.



Switch levelling out (17) must be turned off before driving off. The monitor light is off.



When the brake pedal is operated, it is not possible to level out.

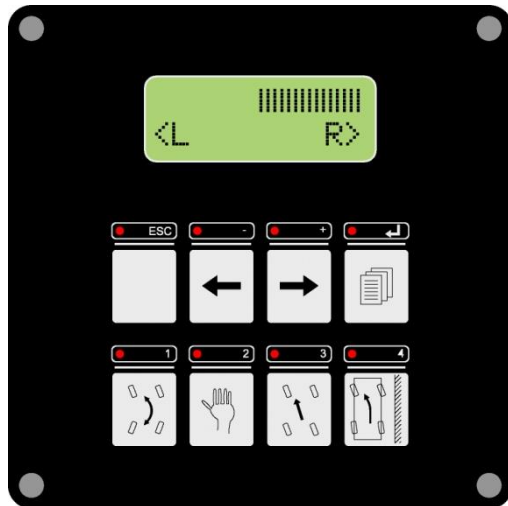
2.13. Control Panel Axle Steering



CAUTION!

The crane must be in transport mode for all steering programs. So **NEVER** activate a steering program when driving with rigged up tower!

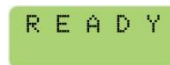
It goes for all steering programs that the transverse differential lock should **NEVER** be activated!



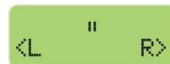
Picture 2-23

Use control panel (Picture 2-14, 47) to activate a steering program.

Display on the road steering:



After switching on the ignition.



All wheels in straight on position.



Steering to the right.



Steering fully to the left.

To use the control panel, you first have to operate switch 44.

Subsequently you can choose between 4 steering programs:

1. Small turning circle
2. Manual
3. Crab steering
4. Wall steering

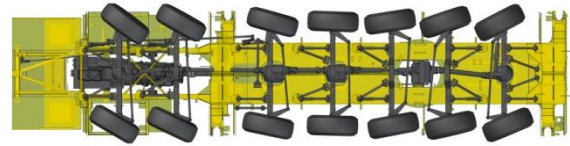
You can directly shift between the various steering programs.

To return to on the road steering, turn off the control panel with switch 44. Make sure you put all axles in straight on position first, before driving off.

2.13.1.Small Turning Circle

This steering program enables an extra small turning circle. The maximum driving speed is limited to 20 km/h.

Axes 1 to 3 are mechanically steered through the steering wheel, depending on the driving speed axes 4, 5, 6 and 7 steer along in opposite direction.



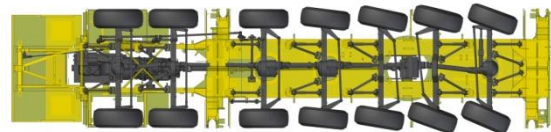
After activating the control panel with switch 44:

	<p>Select program 1 Light flashes:</p>	<p>The wheels are in such a position, that they cannot be put in the selected program automatically. Operate the steering wheel until the light stops flashing.</p>
	<p>Light burns:</p>	<p>The 'small turning circle' program is activated.</p>
	<p>All wheels in straight on position.</p>	
	<p>Steering to the right.</p>	
	<p>Sharpest bend to the left.</p>	

2.13.2.Manual

In case of manual steering, the position of axle 7 is adjusted. This steering program is used to facilitate shunting.

Axes 1 to 3 are steered mechanically through the steering wheel, axes 4 to 6 steer along proportionally, whereas axle 7 can be adjusted separately with the control panel in the truck cab. The maximum driving speed is limited to 20 km/h.



After activating the control panel with switch 44:

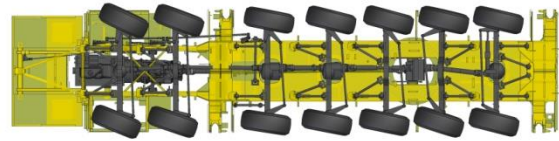
	<p>Select program 2 Light flashes:</p>	<p>The wheels are in such a position, that they cannot be put in the selected program automatically. Operate the steering wheel until the light stops flashing.</p>
	<p>Light burns:</p>	<p>The program for manual adjustment is activated.</p>
	<p>Use the + and – keys to adjust the steering movement of axle 7.</p>	
	<p>The steering movement of axle 7 is in straight on position.</p>	
	<p>The steering movement of axle 7 is to the right.</p>	
	<p>The steering movement of axle 7 is fully to the left.</p>	

2.13.3. Crab Steering

In case of crab steering all axles steer in the same direction, so you may drive to or from an object diagonally.

The maximum driving speed is limited to 20 km/h.

Axles 1 to 3 are steered mechanically with the steering wheel. Axles 4 to 7 steer along in the same direction.



After activating the control panel with switch 44:



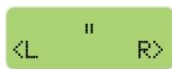
Select program 3

Light flashes:

The wheels are in such a position, that they cannot be put in the selected program automatically. Operate the steering wheel until the light stops flashing.

Light burns:

The 'crab steering' program is activated.



The steering movement of all axles is in straight on position.



The crane moves slightly diagonally to the right.

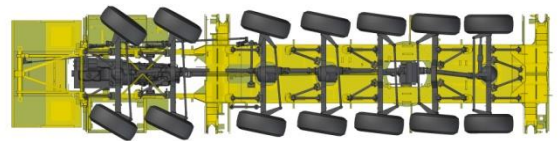


The crane moves fully diagonally to the left.

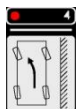
2.13.4. Wall Steering

In wall steering mode you can drive away from an object with minimal swing of the truck's rear. The vehicle's centre of rotation is at the rear.

Axles 1 to 3 are steered mechanically with the steering wheel, axles 4 to 6 steer along proportionally, whereas axle 7 remains rigid. The maximum driving speed is limited to 20 km/h.



After activating the control panel with switch 44:



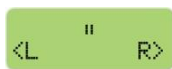
Select program 4

Light flashes:

The wheels are in such a position, that they cannot be put in the selected program automatically. Operate the steering wheel until the light stops flashing.

Light burns:

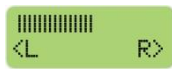
The 'wall steering' program is activated.



The steering movement of all axles is in straight on position.



The crane moves to the right without swing.



The crane moves fully to the left without swing.

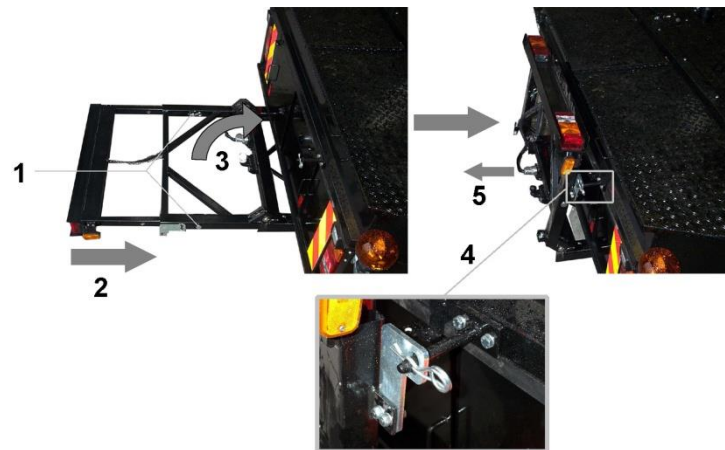
2.14. Driving with Rigged Up Tower

See manual SK2400

2.15. Driving with Trailer

To tow a trailer the crane is equipped with a towing hook with a 7-pins socket for lighting. To link up a trailer you first have to fold up the bumper, if present.

1. Remove the safety clips from the 2 pins in the box girders and pull out the 2 pins (*Picture 2-24*).
2. Slide the rear part to the front until the pins can be inserted in the next hole. Then lock them with the safety clips.
3. Remove the safety clip from the pin in the frame and fold up the complete bumper against the vehicle frame.
4. Now lock the bumper with the safety clip.
5. Then pull out the plug from the socket.
6. Link up the trailer and plug the trailer plug in the socket.
7. Check the lighting function.



Picture 2-24

2.16. Towing the Crane



Always contact Spierings Kranen before towing the crane.

2.16.1. Towing When the Diesel Engine Still Runs

When the crane must be towed and the diesel engine still runs, following steps must be taken:

- Shift the transmission in neutral.
- Shift the transfer case in neutral by pressing the switch under the central console. (See point 4, Picture 2-11)
- The air circuit for the brakes keeps its pressure thanks to the running diesel engine.
- The power steering remains activated thanks to the running diesel engine.
- Remove the cover in the middle of the front bumper and mount the supplied shunt coupling.
- Link the tow truck with a tow bar to the crane's shunt coupling; now the crane may be towed.

2.16.2. Towing When the Diesel Engine Does Not Run

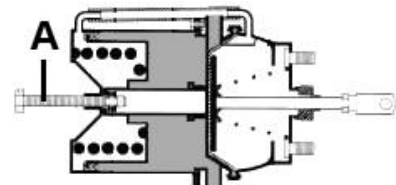
If the diesel engine does not run, the same procedure can be followed as in case of a running diesel engine. However, there are a number of additional problems:

- The brakes no longer work, because the air pressure has gone.
- The parking brake cannot be released.
- If the secondary circuit air receiver is empty, the transfer case cannot be shifted to neutral.
- The Power steering does not (fully) function.

Releasing the parking brake

If the crane must be moved over a (very) short distance, and there is no external air pressure, the parking brakes can be released as follows:

Unscrew the bolts at the rear of the spring brake boosters of axles 3, 4, 5 and 6. (Picture 2-25, A) The spring tension is removed from the brake, so it is released.



Picture 2-25

To move the crane over a longer distance, external air pressure is required.

Through the air valve over the right-hand outrigger beam an external compressor can be connected, to pressurize the air circuit. (Picture 2-26).



Picture 2-26

Shifting the transfer case in neutral

Also the transfer case can be shifted in neutral by connecting an external compressor to the secondary air circuit through the air valve. (Picture 2-26).

Power steering



The steering pumps driven by the diesel engine, no longer supply oil, so the power steering will be largely lost. Only the emergency steering pump supplies oil for the power steering. However, it only supplies oil as long as the crane is moving. Therefore, steering becomes a lot harder, as only one pump is active instead of two. The steering of the wheels of axles 4, 5, 6 and 7 is fully terminated. The emergency system has put the wheels of axles 4, 5, 6 and 7 automatically in straight on position. Only axles 1, 2 and 3 are still being steered. The crane's turning circle will increase considerably.

3. Maintenance



“Normal operating conditions” stand for:

- the forty-hour five days week
- 15.000 – 20.000km/year
- Ambient temperature: -15 to 40°C



All oil and filter specifications are found in *chapter 11. Technical Data*

3.1. Safety



Comply with all warning and safety regulations as mentioned in this manual. The safety must be observed at all times.



Never carry out repair work at the truck and/or never change the settings without express permission and the necessary training. Bad repair work or wrong settings may cause dangerous situations.

3.1.1. Clothing



Make sure to wear the correct clothing while carrying out maintenance on the truck. E.g. do not wear loose clothing, loose hanging hair and / or jewellery, which could get caught between moving parts.

3.1.2. Surroundings



Keep the crane's surroundings clean and free of oil or other fluids while carrying out maintenance, to prevent dangerous situations.

3.1.3. Diesel Engine



Do not run the diesel engine in a closed or non-aired room. There is a high risk of suffocation.

3.1.4. Moving parts



Stay at a safe distance from rotating and/or moving parts.

3.1.5. Oils and coolant



Different kinds of oil and lubricant, coolant, window washer fluid, battery acid and diesel oil can be harmful to your health when touched. Avoid any physical contact with these substances!

3.1.6. Environment



In order to be able to meet the present environmental requirements, you are advised to observe the following rules:

- Never pour old engine oil, hydraulic oils, greases and coolant in drains, sewers or on the ground.
- Make sure all used fluids, old batteries, oil filters and other chemical waste, are handed in separately to authorities for recycling or destruction.
- See to a proper and regular truck maintenance. A well maintained engine contributes to saving fuel and reduces polluting exhaust fumes.

3.1.7. Change Oil/Cooling System



Be careful when changing oil. Hot oil can cause severe bodily harm.

Never remove the cap from the cooling system while the engine is at operating temperature.

3.1.8. Fire Hazard



To prevent fire hazard, the engine and its surroundings must be free from highly inflammable substances.

3.1.9. Cleaning Components



While cleaning with a high-pressure cleaner the following rules must be complied with:

- While cleaning the radiator/intercooler make sure the cooler fins will not be damaged.
- While cleaning the engine compartment, do not point the nozzle directly to electrical components like starter motor, generator, sockets etc.
- Make sure no water penetrates through the breathers of gearbox, transfer case and differentials.



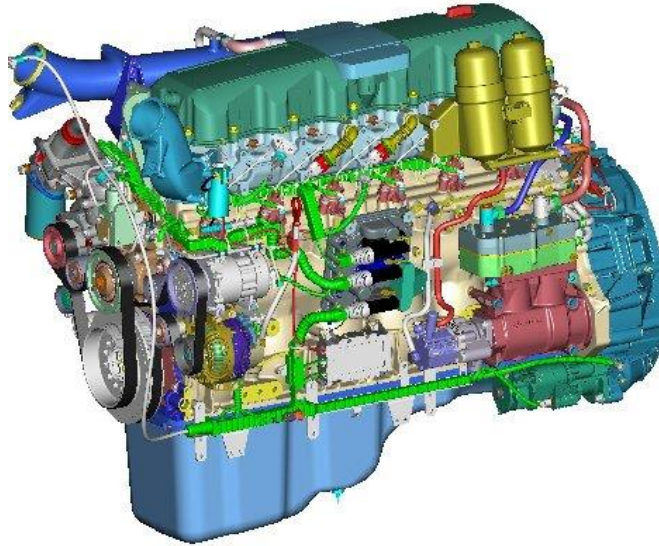
3.2. Maintenance Chart for the AT7 Truck

Component	Maintenance	Daily Maintenance	Weekly Maintenance	2-Monthly Maintenance	Annual Maintenance (15,000km)	2-Yearly Maintenance	5-Yearly Maintenance
Diesel Engine	Engine oil	Check			Change		
	Oil filter				Replace		
	Cooling system			Check			
	Coolant		Check			Change	
	Antifreeze				Check		
	Radiator/intercooler/oil cooler				Check		
	Air system			Check			
	Air cleaner		Clean		Replace		
	Fuel System			Check			
	Fuel filter				Replace		
	Water separator		Draining				
	Filter water separator				Replace		
	V-belts				Check		
	Exhaust system			Check			
Drive System	Gearbox			Check			
	Oil gearbox			Check		Change	
	Oil torque converter / retarder			Check		Change	
	Oil filter retarder				Replace		
	Transfer case			Check			
	Oil transfer case			Check	Change		
	Axles			Check			
	Oil differentials			Check	Change		
	Oil hubs			Check	Change		
	Tyres		Check				
	Tyre pressure			Check			
	Brake linings				Check		
	Steering system						
	System			Check	Align		
Electrical system	Lighting	Check			Check		
	Instrument lighting	Check			Check		
	Batteries			Check			
Hydraulic system	Hydraulic Oil			Check			Analyse
	Return oil filters				Replace		
	Fine filter				Replace		
	Accumulators				Check		
	Hydraulic brake axle 1			Check	Change		
	Hoses and couplings			Check			



Component	Maintenance	Daily Maintenance	Weekly Maintenance	2-Monthly Maintenance	Annual Maintenance (15,000km)	2-Yearly Maintenance	5-Yearly Maintenance
Pneumatic system	<i>Air dryer filter</i>					Replace	
	<i>Air vessels</i>		Draining				
	<i>Water separator</i>			Draining			
	<i>Brake pressure</i>				Check		
	<i>Hoses and couplings</i>				Check		
Lubrication							
	<i>Central lubrication</i>		Clean	Check			
Miscellaneous	<i>Manual lubrication</i>			Lubricate			
	<i>Windscreen washer fluid</i>		Check				
	<i>Fire Extinguisher</i>				Check		

4. Diesel Engine



Picture 4-1

As drive source the Spierings AT7 is fitted with a DAF-turbo diesel engine with intercooler.

Technical Data

Brand/type:	DAF MX-375 S1
Fuel system:	Water-cooled 6 cylinder 4-stroke diesel engine with direct injection
Inlet system:	Turbo charger intercooling
Engine capacity:	12.9 ltrs
Maximum power:	375 kW at 1900 rpm
Maximum torque:	2500Nm at 1000-1410 rpm
Compression ratio:	1:16.5
Bore x stroke:	130 mm x 162 mm
Emission level:	Euro 4 (5) AdBlue system
Weight:	1080 kg
Diesel tank capacity:	725 ltrs
AdBlue tank capacity:	75 ltrs



Caution!

Use only EN 590 diesel oil to prevent damage to the fuel system.

4.1. Service Inspections at Commencement of Operations

Not later than 8 weeks after delivery

The first servicing of the truck's diesel engine must be carried out by the regional DAF-dealer. At this occasion the DAF-dealer has to fill out the warranty form as supplied by Spierings. At this inspection the DAF-dealer will only charge you with the costs of oil and filters.

Not later than 4-5 months after delivery

Spierings 4 monthly inspection (same as the superstructure).

This inspection should preferably be carried out by Spierings Kranen at their workshop (Elsewhere travel expenses will be charged). The truck's diesel engine will be fully serviced. Also the oil in the truck's entire drive line will be changed. The oil used by Spierings Kranen is synthetic oil (75W90). This oil can remain in all drive line components for a duration of two years. The hydraulic filter will be replaced. Defects and malfunctions are repaired under guarantee.

At this inspection only the costs for oil, filters and repairs, not covered under guarantee, will be charged.

Hereafter, the truck must be serviced and maintained according to maintenance chart in this manual.

4.2. Access to the diesel engine

To gain full access to the diesel engine, various engine cowlings covers can be removed. The left and right side plates are always easy to remove, but barely give access to the engine.

The three upper plates can also be removed when the tower is in upright position. The middle plates give immediate access to the engine. Also from underneath the truck you can reach the engine. There are no plates at the bottom.



Picture 4-2

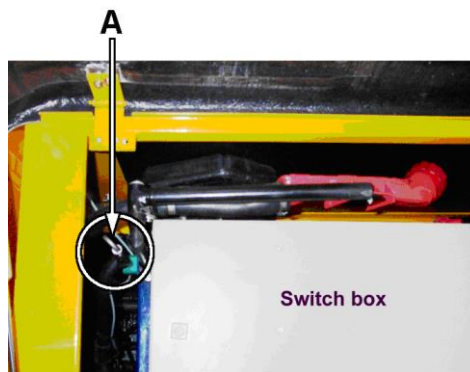
4.3. Engine Oil

4.3.1. Check the Engine Oil Level



Check the engine oil level daily.

1. Make sure the truck is standing on level ground.
2. Leave a warm engine turned off for at least 5 minutes, so the oil can settle in the sump.
3. Remove the dipstick (A) from the holder next to the control box and clean it with a clean non-fluff cloth. (Picture 4-3).



Picture 4-3

4. Reinsert the dipstick in the holder and take it out again.
5. Check if the oil level is between the "min" and "max" marking.
6. Reinsert the dipstick in the holder. .
7. If necessary top up engine oil. (4.3.2 Top up Engine Oil).

4.3.2. Top up Engine Oil

1. Make sure the truck is standing on level ground.
2. Turn the filler neck out as indicated in (Picture 4-4).
3. Always top up engine oil of the same brand and type. (When in doubt please consult Spierings Kranen.)
4. Check the oil level with the dipstick. (4.3.1 Check the Engine Oil Level.)



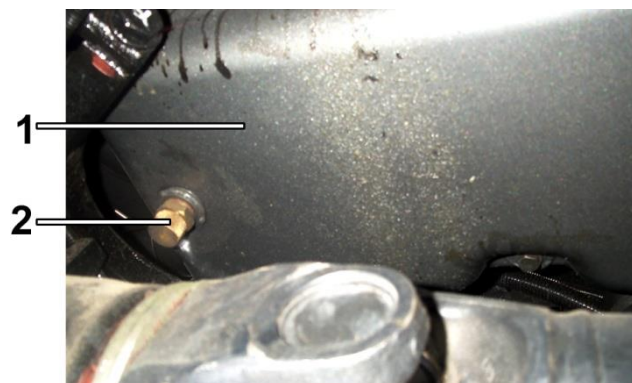
Picture 4-4

4.3.3. Change Engine Oil



Change the engine oil every 15,000km or at least once a year and during the annual inspection.

1. Make sure the truck stands on level ground.
2. Preferably run the engine till it reaches operating temperature and turn it off.
3. Put a sufficiently big trough under the drain plug (2) (quick drain) (*Picture 4-5*).
4. Remove the cap of the quick drain (2) at the bottom of sump (1) and attach the supplied drain hose, which will open the plug, so that the oil may run away.



Picture 4-5

5. Remove the drain hose and reinstall the cap.
6. Fill the engine with approx. 36 ltrs of engine oil. (*4.3.2 Top up Engine Oil*)

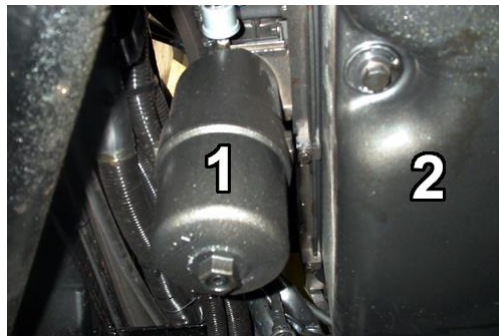
4.4. Oil Filters Engine

4.4.1. Oil Filter Replacement



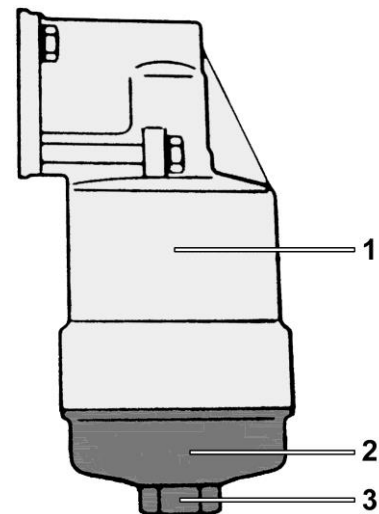
Replace the oil filter every 15,000 operating hours and during the annual service inspection under normal operating conditions.

1. Put a sufficiently big trough under the oil filter (1) at the left of the sump (2). (*Picture 4-6*).



Picture 4-6

2. Loosen the bottom part (2) (*Picture 4-7*) a few turns until the oil in the filter housing runs away through hole (3). Remove the filter element from the housing.
3. Check the sealing ring in the bottom part (2) and replace if necessary.
4. Sparingly coat the sealing ring with oil.
5. Place a new filter element in the filter housing.
6. Install the bottom part and tighten it manually.
7. Leave the engine running a couple of minutes. x
8. Check the oil level. (*4.3.1 Check the Engine Oil Level*).
9. Check for leakage.



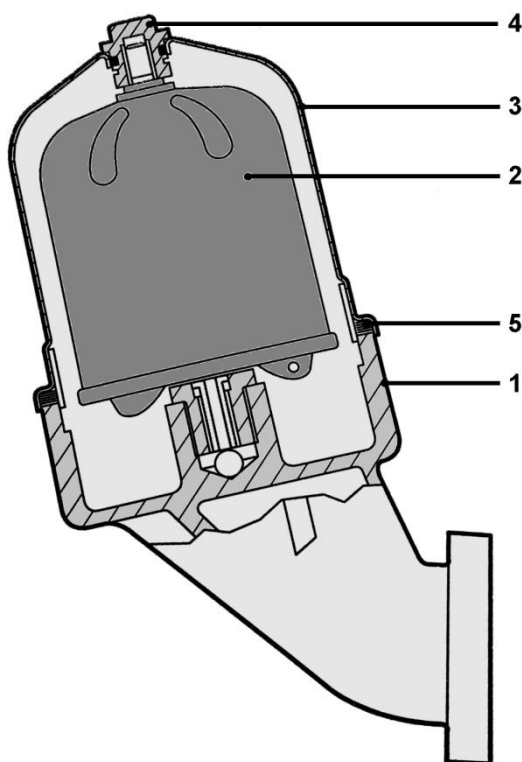
Picture 4-7

4.4.2. Centrifugal Filter Replacement



Replace the centrifugal filter every 15,000 operating hours and during the annual service inspection under normal operating conditions.

1. Clean the housing (3) and its surroundings. (*Picture 4-8*).
2. Remove the central bolt (4) and remove the housing.
3. Remove the rotor/filter element (2) from the housing.
4. Clean the housing's interior.
5. Check the central bolt (4) for damages and replace if necessary.
6. Replace the sealing ring (5).
7. Install the new rotor/filter element in the housing.
8. Coat the O-ring with lubricating oil and reinstall the housing.
9. Tighten the central bolt with a tightening torque of 20 Nm.
10. Start the engine and check for leakage.
11. Check the engine oil level and top up if necessary.



Picture 4-8

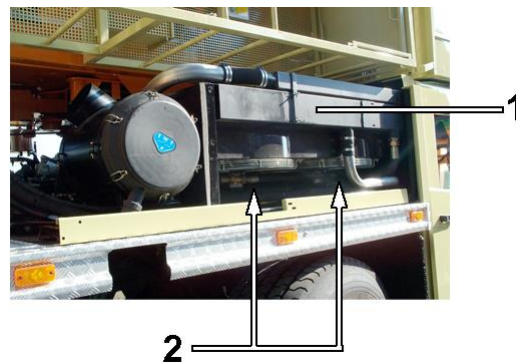
4.5. Cooling



Carefully check every two months for leaks in hoses, lines, couplings as well as for damage of radiator, intercooler and fan.

The DAF diesel engine is water-cooled. The radiator together with the intercooler are found at the right-hand side under the engine cowling in horizontal position. (See *Picture 4-9*).

1. Combined radiator, intercooler and oil cooler.
2. Double hydraulically driven cooling fan.



Picture 4-9

4.5.1. Check the Coolant Level



Check the coolant level every week under normal operating conditions.



NEVER remove the cap from the little expansion tank while the engine is at operating temperature.

1. If it is hot, leave the engine to cool down properly.
2. Remove the left upper cover from the engine cowling.
3. Carefully unscrew the filler cap (2) from the little expansion tank (1).
4. Look through the hole to see if the coolant level is visible.
5. If necessary top up coolant. (4.5.2 Top up Coolant).
6. Close the filler neck with the cap.
7. Reinstall the cover.



Picture 4-10

4.5.2. Top up Coolant



Prevent pouring cold coolant in a warm engine. If it is inevitable under special circumstances, it should be done very slowly while the engine is running.



Coolant is a harmful substance. Protect the eyes and skin when you are handling it.



1. Set the heater in the truck cab to max. "warm". so the heater valve fully opens.
2. Remove the left upper cover from the engine cowl.
3. Carefully unscrew the filler cap (2) from the little expansion tank (1). (Picture 4-10).
4. Top up until the level reaches the filler neck of the little expansion tank.
5. Start the engine and slowly top up the cooling system.
6. Warm up the engine until the thermostat opens.
7. Stop the engine and check the fluid level. (4.5.1 Check the Coolant Level).

4.5.3. Changing Coolant



Change the coolant every two years under normal operating conditions.



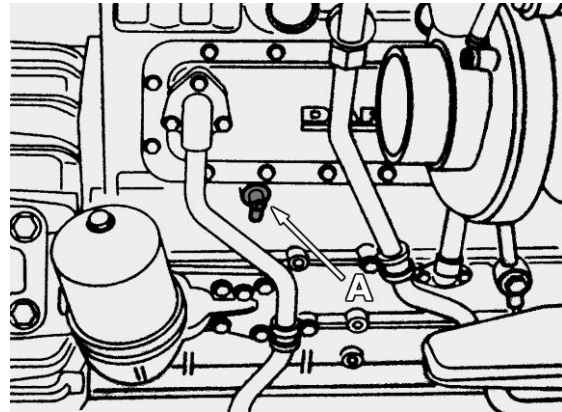
Prevent pouring cold coolant in a warm engine. If it is inevitable under special circumstances, it should be done very slowly while the engine is running.



Coolant is a harmful substance. Protect the eyes and skin when you are handling it.



1. If it is hot, leave the engine to cool down properly.
2. Set the heater in the truck cab to max. "warm". so the heater valve fully opens.
3. Remove the cooling system filler cap.
4. Place a trough beneath the drain plugs.
5. Drain the coolant at the engine block through drain cock (A). (Picture 4-11).
6. Drain the coolant at the radiator at point (B)
7. Fill the system with the prescribed coolant type. (4.5.2 Top up Coolant).



Picture 4-11

4.5.4. Antifreeze



Check the antifreeze concentration every year before commencement of the winter season.

We recommend that you check the coolant for the antifreeze concentration every time before the winter season starts.

Apply preferably 40% antifreeze on ethylene glycol basis.

4.5.5. Radiator / Intercooler / Oil Cooler



Check the radiator, intercooler and oil cooler annually for filthiness and deposit.



If the radiator is cleaned with water, special care should be taken of the electrical system. Avoid sensitive parts such as wiring and electronic components. Never clean the radiator by means of a high-pressure cleaner!



While cleaning the radiator we advise you to wear safety goggles.

If it is necessary to clean the radiator, the upper cover at the right of the engine cowl must be removed.

- Cleaning with compressed air

The easiest way to clean the radiator is by means of compressed air. Always blow clean the fins in longitudinal direction. in order to prevent damage.

- With cold or hot water

Preferably use a cold cleaning agent. Leave it to soak about 10 minutes and rinse it with a bound jet stream of water in longitudinal direction of the fins, in order to prevent damage.

4.6. Air Inlet System

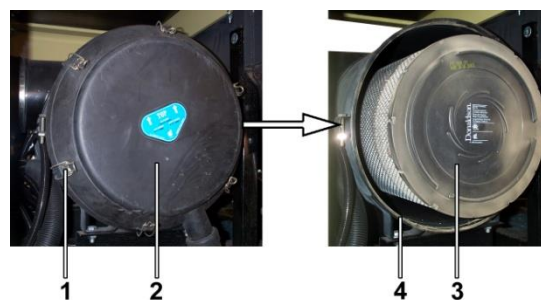


Check for leaks in hoses, pipes and couplings every two months.

4.6.1. Air Filter Cleaning



Clean the air filter every week under normal operating conditions. In case of damage to the air cleaner cartridge and seal ring, the cartridge must be replaced.



Picture 4-12

1. Make sure the engine is not running.
2. Open the right-hand cover of the engine cowling.
3. Release the clips (1) at the side of the air cleaner lid (2) and remove the lid (Picture 4-12).
4. Remove the air cleaner cartridge (3) from the housing (4).
5. Check for filthiness inside the housing and lid and clean if necessary.
6. Alternatively clear the filter inside out with compressed air (max. 5 bar). (Picture 4-12).



Picture 4-13

7. Reinstall the filter cartridge in the housing after having slightly oiled the seal ring with a non-aggressive oil or grease, which will not harm the rubber. (E.g. Vaseline).
8. Fasten the air cleaner lid with the clips.
9. Reinstall the side cover.

4.6.2. Air Cleaner Cartridge Replacement



Replace the air cleaner cartridge annually under normal operating conditions.

1. Make sure the engine is not running.
2. Open the right-hand cover of the engine cowling.
3. Release the clips (1) at the side of the air cleaner lid (2) and remove the lid (*Picture 4-12*).
4. Remove the filter cartridge (3) from the housing (4).
5. Check for filthiness inside the housing and clean if necessary.
6. Fit a new filter cartridge in the housing after having slightly oiled the seal ring with a non-aggressive oil or grease, which will not harm the rubber (Vaseline).
7. Fasten the air cleaner lid with the clips.

4.7. Fuel System



Check for leaks in hoses, pipes and couplings every two months.



Prevent open fire while working on the fuel system at all times. Smoking is strictly forbidden!

4.7.1. Fuel Filter Replacement

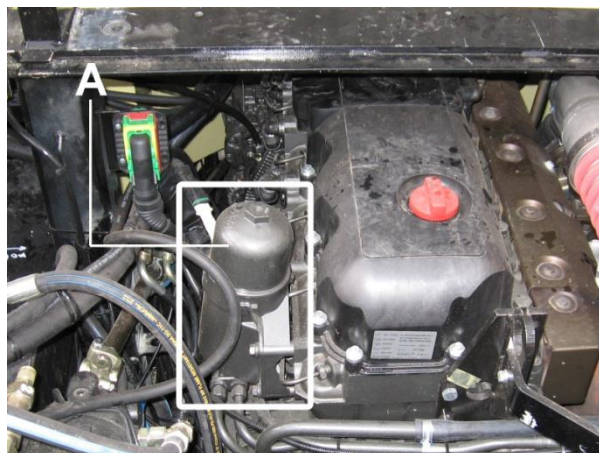


Replace the fuel filter every 15,000 operating hours and during the annual service inspection under normal operating conditions.

The fuel filter (A) is found at the left of the diesel engine. (*See Picture 4-14*).

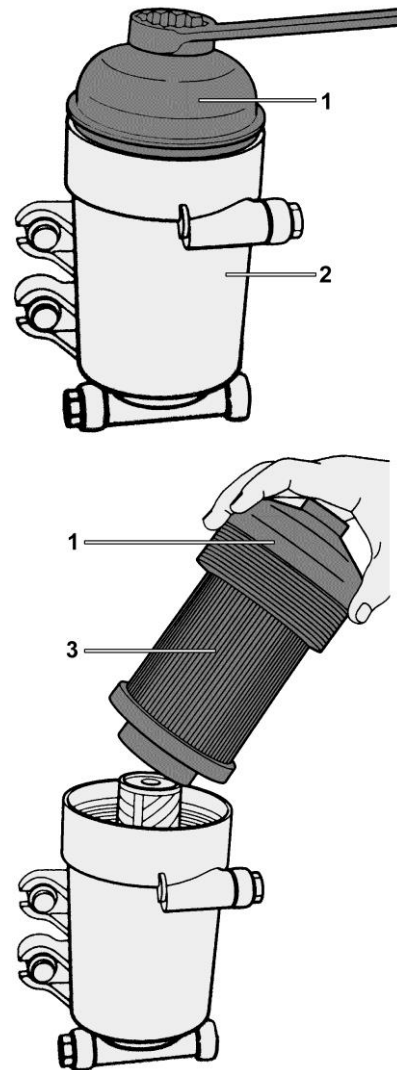
You have to rig up the tower first, before you can reach it.

Subsequently you have to remove the upper cover in the middle of the engine cowling.



Picture 4-14

1. Make sure the engine is not running.
2. Unscrew lid (1) from the filter housing (2) (you can hear air expanding in the filter housing) and pull the lid together with the filter element (3) from the filter housing. (see Picture 4-15).
3. Remove the filter element from the lid.
4. Check the sealing ring in the lid and replace if necessary.
5. Place a new filter element in the cap.
6. Install the lid together with the filter element on the filter housing.
7. Do not tighten the lid too firm.
8. Start the engine and check for possible leaks.
9. Reinstall the middle cover of the engine cowling.



Picture 4-15

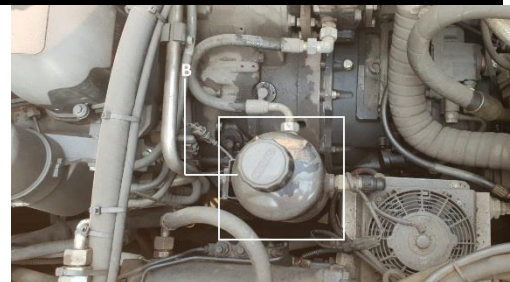
4.8. Oil pump gearbox



Fill it up to 75% and then the cap can be put on again. Replace if necessary of the oil is low and the light stays on. See Instrument panel Pos 68.

The oil pump gearbox (B) is found at the left of the diesel engine. (See Picture 4-1416).

You have to rig up the tower first, before you can reach it. Subsequently you have to remove the upper cover in the middle of the engine cowling.



Figuur 4-16

1. Make sure the engine is not running.
2. First you take out the old oil. At the bottom there is a T piece with a plug. This will get the old oil out.
3. Once the oil has been removed, the plug can be put back again.
4. Now remove the cap at the top.
5. Now you can refill the oil 75W90 completely until it is full.
6. Now start the engine ± 1 min. Then you can switch it off again.
7. Fill it up to 75% and then the cap can be put on again.
8. Start the engine and check for possible leaks.
9. Reinstall the middle cover of the engine cowling.

4.9. Fuel Filter/Water Separator

The fuel filter/water separator (1) is found in the middle of the slewing ring (2). (See *Picture 4-*)
This filter is the fuel system first filter.



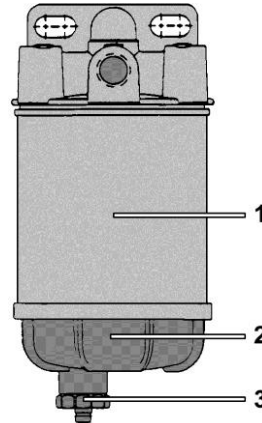
Picture 4-17

4.9.1. Draining the Water Separator



Drain the water separator every week.

1. Rig up the tower in upright position.
2. Unscrew the drain plug (3) at the bottom of the water separator some turns and drain the water. (*Picture 4-*).
3. Retighten the drain plug as soon as diesel oil comes out.



Picture 4-18

4.9.2. Fuel Filter/Water Separator Replacement



Replace the filter in the water separator during the annual service inspection under normal operating conditions.

1. Rig up the tower in upright position and turn off the engine.
2. Place a trough under the filter.
3. Unscrew the drain plug (3) at the bottom of the water separator some turns and drain all the fuel from the filter. (*See Picture 4-*).
4. Loosen the filter element (1) together with the bottom part (2) by turning it to the left.
5. Remove the bottom part of the old filter and clean the O-ring with a clean non-fluffy cloth.
6. Put engine oil on the bottom part seal ring and the new filter element with.
7. Screw the bottom part on the new filter element and fill it with clean diesel oil.
8. Reinstall the element manually.

4.10. Poly V-Belts

4.10.1. Poly V-Belts Replacement



Check the V-belts every 15,000 operating hours under normal operating conditions and during the annual service inspection.



Caution: Always use the same type Poly V-belt.

4.10.2. Poly V-Belt on the Cooler Pump

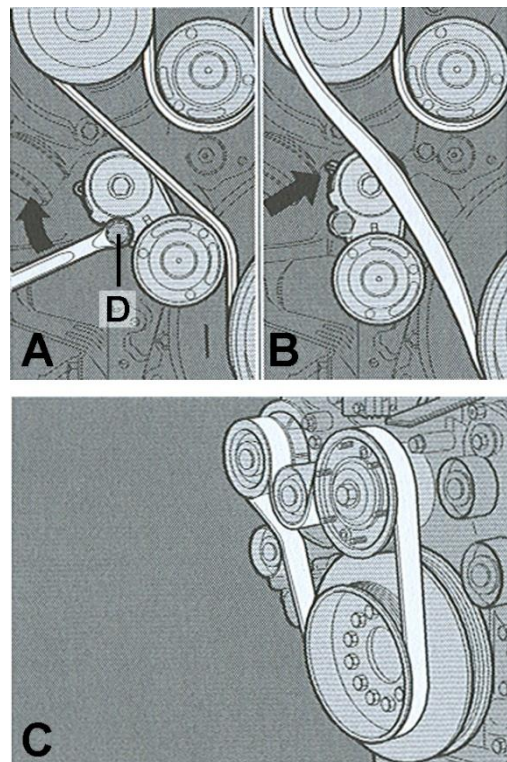
1. Turn off the electrical power to the system by means of the main battery switch (switch 67 cab)
2. Loosen the tension pulley lock nut (D) (17mm key). (Picture 4-19 A)

Caution: The tension pulley can be fixed temporarily by means of a 4-5 mm thick pin. (Picture 4-19 B).

3. Turn the tension pulley to easily remove the poly V-belt. (Picture 4-19 B).
4. Remove the poly V-belt.

If necessary, replace the alternators poly V-belt after this step. (See section 4.9.3.)

5. Let the automatic tension pulley spring back slowly to its stop, provided that it is not fixed.
6. Check the pulleys for rust and dirt.
7. Place the new poly V-belt over as many pulleys as possible.
8. Turn the automatic tension pulley from the direction of the poly V-belt, so it can be put around the remaining pulleys. (Remove the pin if the automatic tension pulley had been secured).
9. Now slowly let the automatic tension pulley run against the poly V-belt, so it tightly fits around the pulleys.
10. Make sure the poly V-belt properly runs in the pulleys' groove.
11. Retighten the lock nut.
12. Turn on the electrical power on the system by means of the main battery switch.



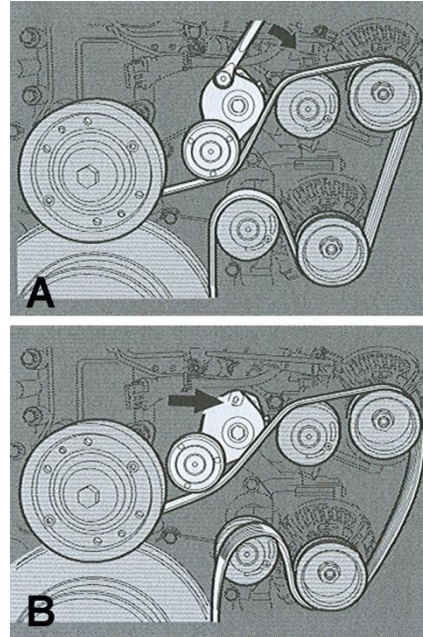
Picture 4-19

4.10.3. Poly V-Belt Generator

1. Turn off the electrical power to the system by means of the main battery switch (switch 67)
2. Loosen the tension pulley lock nut (17mm key).

Caution: The tension pulley can be fixed temporarily by means of a 4-5 mm thick pin. (Picture 4-20).

3. Turn the tension pulley to remove the poly V-belt.
4. Remove the poly V-belt.
5. Let the automatic tension pulley spring back slowly to its stop, provided that it is not fixed.
6. Check the pulleys for rust and dirt.
7. Place the new poly V-belt over as many pulleys as possible.
8. Turn the automatic tension pulley from the direction of the poly V-belt, so it can be put around the remaining pulleys. (Remove the pin if the automatic tension pulley had been secured).
9. Now slowly let the automatic tension pulley run against the poly V-belt, so it tightly fits around the pulleys.
10. Make sure the poly V-belt properly runs in the pulleys' groove.
11. Retighten the lock nut.
12. Turn on the electrical power on the system by means of the main battery switch.



Picture 4-20

4.11. Exhaust system



Check for leaks in silencer, exhaust pipe and flange couplings every two months. In view of fire hazard also make sure, no dirt accumulates near the exhaust system.

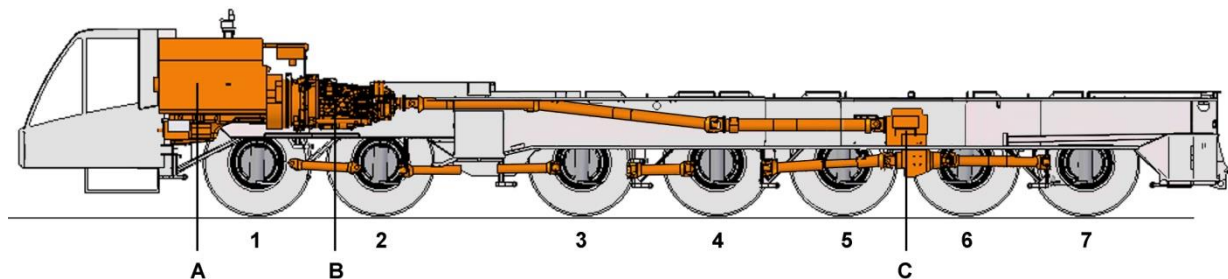


Caution!

After the engine has run for considerable time, the exhaust system is hot.

5. Drive System

Picture 5-1 shows the AT7 drive system make-up.

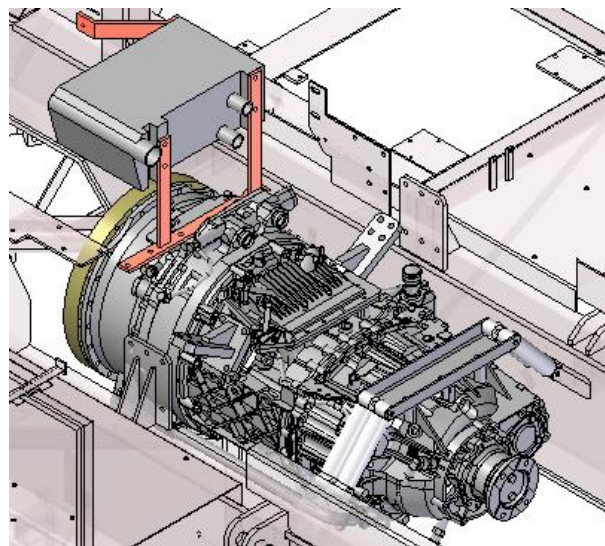


Picture 5-1

- A. Diesel Engine
- B. Automatic transmission with torque converter / retarder
- C. Transfer case

5.1. Gearbox

The ZF 12TC2740 is a fully automatic gearbox with a torque converter / retarder. This gearbox has 14 gears (12x forward, 2x reverse) which are changed electro pneumatically.



Picture 5-2

5.1.1. General Maintenance Gearbox



Check the gearbox every two months for external leaks and make sure the breather is free from dirt to ensure its function.



While cleaning with a high-pressure sprayer, make sure no water will enter the breather. It could seriously damage the gearbox.

5.1.2. Check Oil Level Gearbox



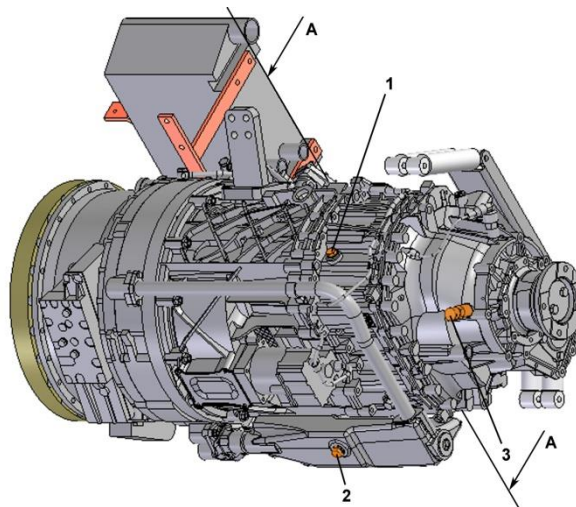
Check the oil in the gearbox every two months under normal operating conditions.



To prevent measuring errors, the oil level should not be checked immediately after operation. The oil temperature should be under 40°C.

1. Make sure the truck is standing on level ground.
2. Unscrew the plug from the filler hole (1). (Picture 5-3)
3. If the oil level is not directly under the filler hole, top up oil through filler hole (1).
4. Reinstall the plug (tightening torque 60 Nm).

Caution: Picture 5.3 is shown rotated, line A-A is the horizontal.



Picture 5-3

5.1.3. Change Gearbox Oil



Under normal operating conditions, change the oil every two years during the annual inspection.



Caution!

The gearbox and the oil are hot when the truck has run for considerable time.

1. Make sure the truck is standing on level ground.
2. Put a trough under drain plugs (2 and 3). (Picture 5-3).
3. Unscrew the magnet drain plugs (2 and 3).
4. Clean the drain plugs and replace the sealing rings.
5. Reinstall the drain plugs (tightening torque 60 Nm).
6. Pour fresh oil (approx. 11 litres) through filler hole (1) until the oil reaches the filler hole.

5.1.4. Check Oil Level Torque Converter / Retarder



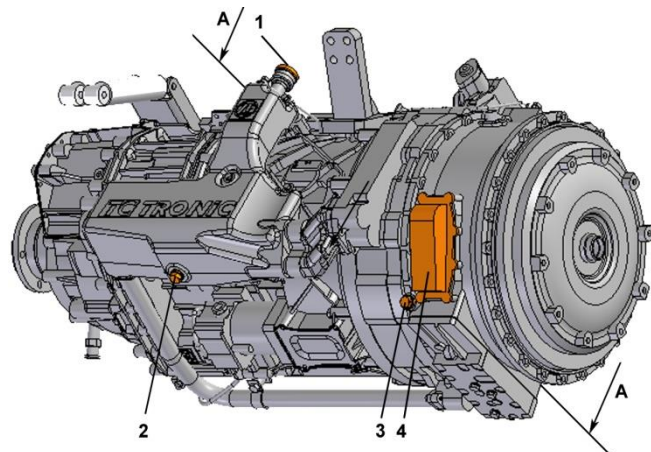
Check the oil in the torque converter / retarder every two months under normal operating conditions.



To prevent measuring errors, the oil level should not be checked immediately after operation. The oil temperature should be under 40°C.

1. Make sure the truck is standing on level ground.
2. Unscrew the cap with dip stick from filler neck (1). (Picture 5-4)
3. Check the dip stick to see if the oil level is at least at level B (1). (Picture 5-5)
4. Screw the cap with dip stick on the filler neck.

Caution: Picture 5.4 is shown rotated, line A-A is the horizontal.



Picture 5-4

5.1.5. Change Gearbox Oil



Under normal operating conditions, change the oil every two years during the annual inspection.



Caution!

The gearbox and the oil are hot when the truck has run for considerable time.

1. Make sure the truck is standing on level ground.
2. Put a trough under drain plugs (2 and 3). (Picture 5-3).
3. Unscrew the magnet drain plugs (2 and 3).
4. Clean the drain plugs and replace the sealing rings.

5. Reinstall the drain plugs (tightening torque 60 Nm).
6. Pour fresh oil (approx. 18 litres) through filler neck (1) until level A (*picture 5-5*) is reached.
7. Engage the parking brake and shift the gearbox in neutral N. Run the engine until the oil level has dropped to level C, in order to fill the heat exchanger and connecting lines with oil.
8. Subsequently carry out a test drive and once again check the oil level by means of the dipstick. Top up oil if necessary.

The oil level is correct if it is at level B.

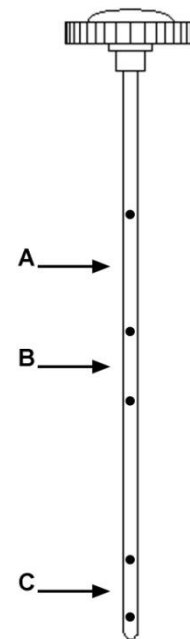
(Caution, the oil temperature could be $\pm 85^{\circ}\text{C}$)

9. Screw the cap with dip stick on the filler neck.

Caution: Not all dipsticks have 5 gauge marks, in that case you have to estimate the correct oil level.

When the engine is idling the oil level should be in range B.

(Range B is always marked on the dip stick).



Picture 5-5

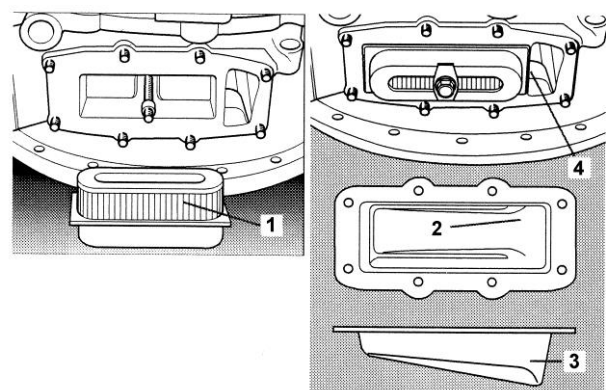
5.1.6. Oil Filter Torque Converter / Retarder Replacement



Under normal operating conditions replace the oil filter every year during the annual inspection, immediately after changing the oil.

For the place of the filter (4) please refer to (Picture 5-4)

1. Remove the bolts from the filter housing (*picture 5-6*)
2. Remove the filter element. (1)
Check if the filter element must be replaced or if it can be cleaned.
3. Clean the filter lining with petroleum or diesel oil; you may use compressed air or a special brush. Only use a brush if it is particularly intended for filter cleaning.
Make sure the filter lining does not get damaged.
4. Reinstall the (new) filter in the filter body.
5. Reinstall the filter housing on the torque converter / retarder, make sure the filter housing (3) is mounted over the inlet (4). Tightening torque 23 Nm.



Picture 5-6

5.2. Transfer Case

The transfer case is a STEYR model VG2701/400. This transfer case distributes the torque at input shaft (1) over 2 driven shafts (2 and 3). (Picture 5-7).

Driven shaft (2) is for driving the driven axles 1,3 and 4.

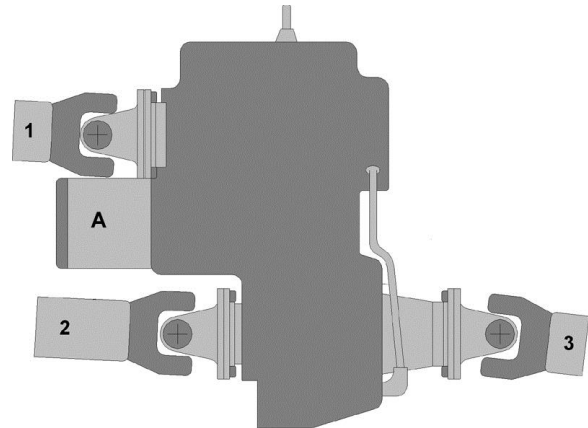
Driven shaft (3) is for driving the driven axle 7. (see Picture 5-1).

The transfer case has got two transmission ratios.

High: 1:0.91 (on the road)

Low: 1:1.41 (off the road)

A hydraulic pump is driven by drive shaft (A). It is the emergency steering pump, which is used in case the engine breaks down. It only works as long as the vehicle is moving.



Picture 5-7

5.2.1. General Maintenance Transfer Case



Check the transfer case every two months for external leaks and make sure the breather is free from dirt to ensure its function.



While cleaning with a high-pressure cleaner, make sure no water will enter the breather. It could seriously damage the gearbox.

5.2.2. Check Oil Level Transfer Case



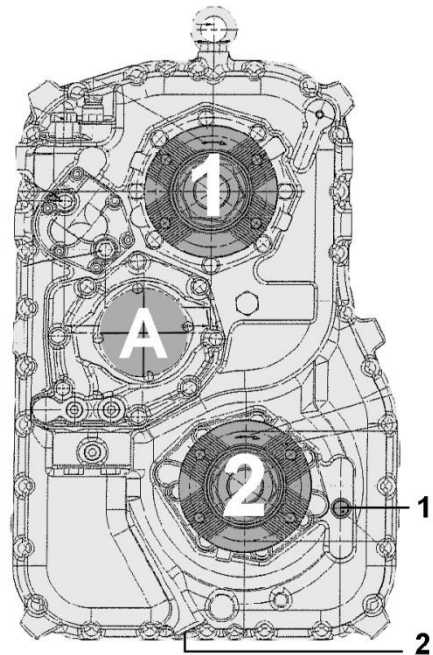
Check the transfer case oil level every two months under normal operating conditions.



To prevent measuring errors, the oil level should not be checked immediately after operation. The oil temperature should be under 40°C.

Shaft (1) is the input shaft and shaft (2) is the drive shaft for driving driven axles 1, 3 and 4. (Picture 5-8).

1. Make sure the truck is standing on level ground.
2. Unscrew the plug from the filler hole (1). (Picture 5-8).
3. If the oil level is not directly under the filler hole, top up oil through filler hole (1).
4. Reinstall the plug.



Picture 5-8

5.2.3. Change Oil in Transfer Case



Under normal operating conditions change oil every year during the annual inspection.

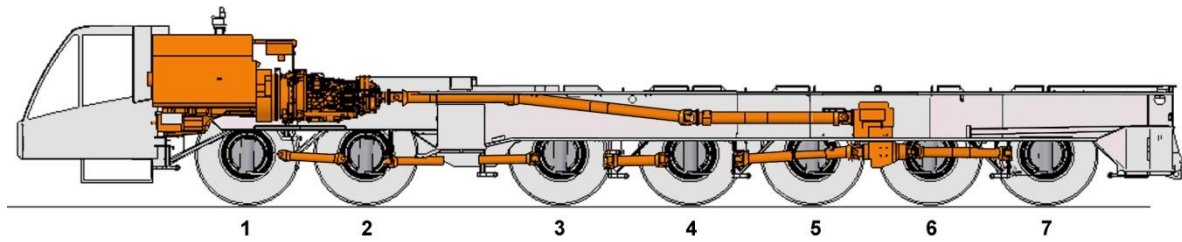


Caution!

The transfer case and the oil are hot when the truck has run for a considerable amount of time.

1. Make sure the truck is standing on level ground.
2. Place a trough under the drain plugs.
3. Unscrew drain plug (2) (Picture 5-8).
4. Clean the drain plug and fit it with new sealing rings.
5. Reinstall the plug.
6. Remove the plug from filler hole (1).
7. Pour in the hole approx. 12 litres fresh oil up to the filler hole.
8. Reinstall the plug with a new sealing ring in the filler hole.

5.3. Axles



Picture 5-9

7 Kessler & Co Axles

Axle No.	Steered		Driven	Differential	End Reduction
Axle 1	Yes	Yes	Mechanical	Single	7.33
Axle 2	Yes	No	-	-	-
Axle 3	Yes	Yes	Mechanical	Feed-through	7.29
Axle 4	Only: off-the-road	Yes	Mechanical	Feed-through	7.29
Axle 5	Yes	No	-	-	-
Axle 6	Yes	No	-	-	-
Axle 7	Yes	Yes	Mechanical	Single	7.29

5.3.1. General Maintenance Axles



Check the hubs and differentials of axles 1, 2* 3, 4 and 7 every two months for external leaks and make sure the breather is free from dirt, to guarantee its function.

* Axle 2 acts as coupling between axles 1 and 3, but is not driven.



While cleaning with a high-pressure cleaner, make sure no water will enter the breathers. It could seriously damage the axles.

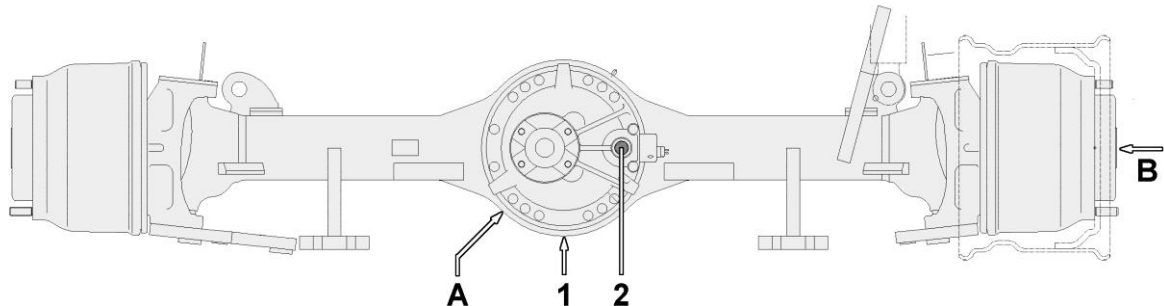
5.3.2. Check the Oil Level in the Differentials



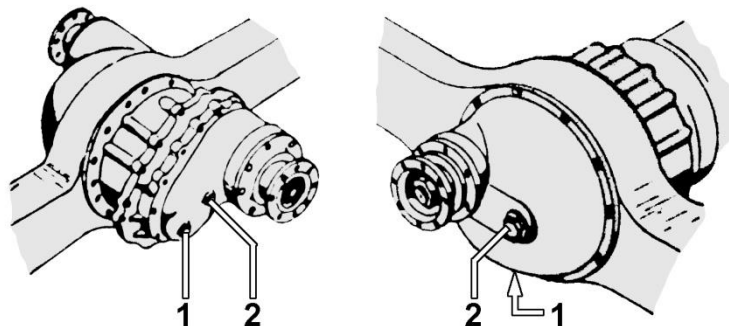
Check the differentials oil level every two months under normal operating conditions.



To prevent measuring errors, the oil level should not be checked immediately after operation. The oil temperature should be under 40°C.



Picture5 -10, axle version with end differential



Picture5 -11, axle version with feed through differential

1. Make sure the truck is standing on level ground.
2. Unscrew the plug (2) from the filler hole in differential (A). (Picture 5-10 and picture 5-11)
3. If the oil level is not directly under the filler hole, top up oil through the filler hole (2).
4. Reinstall the plug.

5.3.3. Change Oil in Differentials



Under normal operating conditions change oil every year during the annual inspection.



Caution!

The differentials and the oil are hot when the truck has run for a considerable amount of time.

1. Make sure the truck is standing on level ground.
2. Put a trough under the oil drain plug.
3. Unscrew the drain plug (1) (*picture 5-10 and picture 5-11*). clean the drain plug and fit it with a new sealing ring.
4. Reinstall the drain plug and unscrew the plug (2) from the filler hole.
5. Pour oil through the filler hole in the driven axles till the level is directly under the hole.

5.3.4. Check the Hubs Oil Level



Check the hubs oil level every two months under normal operating conditions.



To prevent measuring errors, the oil level should not be checked immediately after operation. The oil temperature should be under 40°C.

The hubs (B) of axles 1, 3, 4 and 7 are filled with oil. (*Picture 5-10*)

1. Make sure the truck is standing on level ground.
2. To check make sure the filling mark (A) is horizontal and the drain plug (1) is at the bottom. (*See Picture 5-12*).
3. Unscrew the plug (2) from the filler hole.
4. If the oil level is not directly under the filler hole, top up oil through the filler hole (2).
5. Reinstall the plug
6. Repeat this procedure for all 8 (4 x 2) hubs.



Picture 5-12

5.3.5. Chang Oil in the Hubs



Under normal operating conditions change oil every year during the annual inspection.



Caution!

The hubs and the oil are hot when the truck has run for a considerable amount of time.

1. Make sure the truck is standing on level ground.
2. Make sure the filling mark (A) is horizontal and the drain plug (1) is at the bottom.
3. Place a trough under the drain plug.
4. Unscrew drain plug (1).
5. Clean the drain plug and fit it with a new sealing ring.
6. Reinstall the drain plug and unscrew the plug (2) from the filler hole.
7. Pour oil through the filler hole in the driven axles till it reached the mark.

5.4. Tyres

5.4.1. General Maintenance Tyres



Check the truck tyres and rims every week under normal operating conditions.

To secure the safety on the way, the tyres and rims must be regularly checked for wear and damage, on the outside as well as on the inside of the wheels. If necessary, turn the steering wheel fully to the left and to the right.

5.4.2. Tyre Pressure



Check the tyre pressure every two months under normal operating conditions.

Check if the tyre pressure in all tyres is **9 bar**.
If this is not the case, correct the tyre pressure.



5.5. Check the Brake Linings



Check the brake lining during the annual inspection under normal operating conditions.

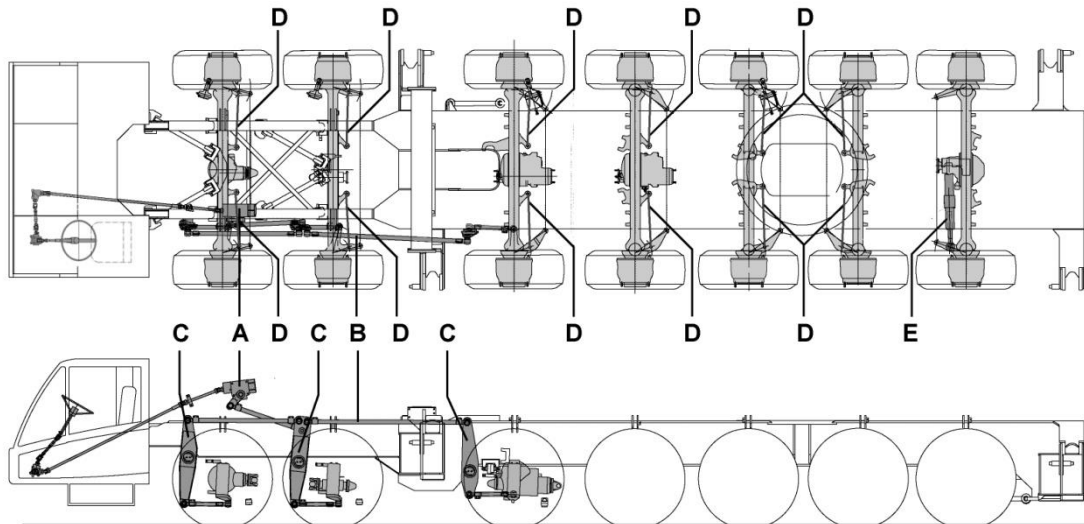
At the rear of every brake drum can be checked, if the brake lining is sufficiently thick for safe road travel. The brake lining must be replaced if it is worn up to the wear ring at the brake lining rim.

5.5.1. Braking System

We recommend to test the brakes on a braking test bench at least once a year.

6. Steering System

6.1 Steering System Structure



Picture 6-1

- A. Steering gear housing
- B. Steering rods
- C. Steering arms
- D. Hydraulic (auxiliary-)cylinders
- E. Main steering cylinder rear axle steering

Picture 6-1 shows the steering system's structure. The AT7 steering system can be operated in two modes, i.e. "on the road" and "off the road".

In "on the road" mode, axles 1, 2, 3, 5, 6 and 7 are steered, whereas axles 5, 6 and 7 steer in opposite direction from axles 1,2 and 3. This creates a smaller turning circle. Axle 4 remains rigid.

In the "off the road" mode all 7 axles may steer along, depending on the desired steering pattern. We distinguish between: 'crab steering', 'small turning circle', 'manual' and 'away from the wall') (see chapter 2.13 for a detailed description).

	<i>On the road</i>	<i>Off-the-road</i>
Axle 1	Mechanical	Mechanical
Axle 2	Mechanical	Mechanical
Axle 3	Mechanical	Mechanical
Axle 4	Rigid	Hydraulically
Axle 5	Hydraulically	Hydraulically
Axle 6	Hydraulically	Hydraulically
Axle 7	Hydraulically	Hydraulically

Table 6-1

Table 6-1 shows the steering mechanism for each axle. Here we distinguish between:

Mechanical (see Picture 6-1)

The steering wheel rotation is mechanically converted in the steering gear housing (A) and powered (D) in the movement of the steering rods (B). They for their part operate the steering arms (C) of axles 1,2 and 3.

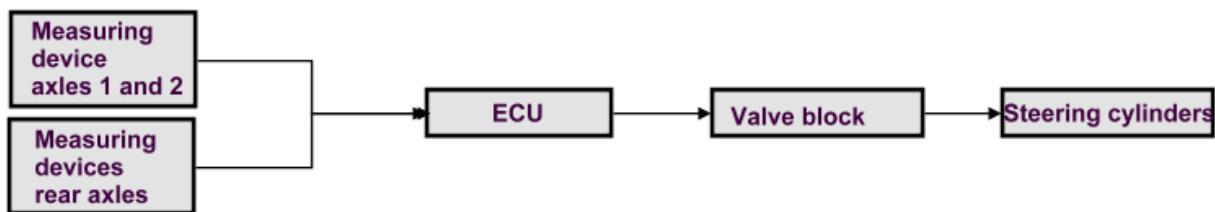
Hydraulically

The axles 4, 5, 6 and 7 are not mechanically linked to axles 1, 2 and 3. These axles are steered hydraulically by means of a valve block and a number of steering cylinders (D). How this rear axle steering works is explained in section 6.2.

6.2 Rear Axle Steering

6.2.1 Functioning Rear Axle Steering

On axles 1 and 2 measuring devices are mounted, that read the wheel deflection. Also on axles 4, 5, 6 and 7 measuring devices are mounted, that read the wheel deflection. The readings go to the steering system's ECU (computer). The ECU controls the rear axle steering valve block. Depending on the driving speed, the rear axle are steered in a direction depending on the selected steering pattern. The schematic picture is as follows:



Picture 6-2

6.2.2 Malfunction Rear Axle Steering

In case of a malfunction in the electronically steered rear axle steering, the system will lock axles 4 and 5, which means that the steering position at the moment of commencement of the malfunction is maintained. Axle 6 can move freely and will turn in the vehicle's steering direction (the least resistance). Axle 7 will centre itself and take up a rigid position. The three frontal axles remain steerable as usual. These measures were taken, to keep the crane steerable in case of malfunction.

The display in the central console in the truck cab will show the error message.

6.3 Check the Steering System



Check the play on the steering arms and ball couplings, steering gear housing (bolts) and steering rods every two months.

Check this with 2 people. Put the crane in transport mode. While one person turns the wheel somewhat to the left and right, the other person should check if there is no excessive play on the steering arms and ball couplings, steering gear housing (bolts) and steering rods.



6.1. Alignment



To prevent excessive tyre wear, the truck must be aligned every year.

Before aligning the truck, the play on the steering arm and rods must be checked. As the crane is fitted with an electronic rear axle steering, we advise that you contact Spierings Kranen when aligning the truck for the first time.

7. Electrical System

The truck's on-board voltage is 24V. It is supplied by two 12 Volt 165 Ah batteries, series connected. During operation, these batteries are charged by a 24V alternator with a max. charging current of 35Ah.

The truck's electrical system can be cut off by the main battery switch in the truck cab. It should be cut off when work to the electrical circuit or welding to the crane must be carried out, or when the vehicle will not be used for a longer period of time.

There is a print with fuses and relays in the dashboard at the co-driver's side (*Picture 7-1*).



Picture 7-1

A number of electrical components are mounted under the central console. They can be reached through a lid at the co-driver's side. (See chapter 2, Central console).

7.1. Lighting



Check the truck's lighting every day before driving off and during the annual inspection.

Replace a bulb as soon as possible in case it does not or scarcely burn and also if it burns too sharply, in order to guarantee optimal safety.

7.2. Dashboard Lighting



Check the truck's dashboard lighting every day before driving off and during the annual inspection.

Check the dashboard lighting for defective lights every day. Replace defective lights as soon as possible to prevent serious damage to the vehicle.

7.3. Batteries

7.3.1. Check the Batteries



Check the truck's batteries every two months.



Caution!

Battery acid is harmful for humans and environment. Handle with care!

When checking the batteries pay attention to the following:

- Is the fluid level still acceptable (top up with distilled water if necessary).
- Are there no worn cables.
- Check the tight fit of terminals and cables.
- Check if the batteries themselves are properly fitted.
- Do the batteries need charging?

7.3.2. Charging the Batteries



Caution!

Do not charge the truck engine's batteries with the superstructure diesel engine's batteries. They are in danger of discharging fully, especially in winter time.

To charge the batteries you need a charger and a cable with NATO connection. If you use a quick charger all battery cables must be dismounted with regard to damage to electronic components. In case of a normal charger, this is not necessary

1. Make sure the engine is not running. (Remove the key from the ignition.)
2. Open the left engine cowling.
3. Connect the cable with NATO-connection to the truck's connection and the charger's. (*Picture 7-2*).
4. Switch on the charger.
5. After the charging is finished, you always have to switch off the charger first.
6. Remove the cable.
7. Close the engine cowling.
8. Start the engine and leave it running for a couple of minutes.

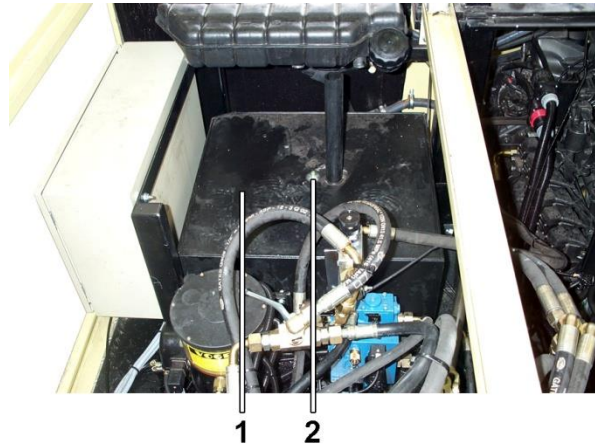


Picture 7-2

7.3.3. Batteries Replacement

We advise to first check the batteries' functioning before replacing them. Replace the batteries always by batteries of the same type and measurements.

1. Make sure the engine is not running. (Remove the key from the ignition.)
2. Rig up the crane's tower in upright position.
3. Remove the engine cowling at the upper left (1). (*Picture 7-3*).
4. Loosen the nut (2) and remove the cover.
5. Always loosen the battery terminals on the "-" poles first and then the "+" poles' terminal.
6. Remove the battery holder.
7. Remove the old batteries from the battery holder and install the new ones.
8. Secure the new batteries to the battery holder.
9. First connect the "+" terminals and then the "-" terminals. (Make sure they are properly connected).
10. Grease the poles with acid free grease (e.g. Vaseline.)
11. Reinstall the cover on the battery holder and fix it with the nut.
12. Install the engine cowling.
13. Start the engine and leave it running for a couple of minutes.



Picture 7-3

8. Hydraulic System

The AT7 has a hydraulic tank containing 400 litres, it is divided in 2 compartments of ± 200 litres each at both sides of the truck (in the chassis). These compartments are connected by means of a connecting line.

Furthermore, there is a separate hydraulic system for the brake power of axle 1. Please refer to section 8.6.

For the oil to be used, please refer to the enclosures, when in doubt please contact Spierings Kranen.

8.1. Check Oil Level Hydraulic Oil Tank

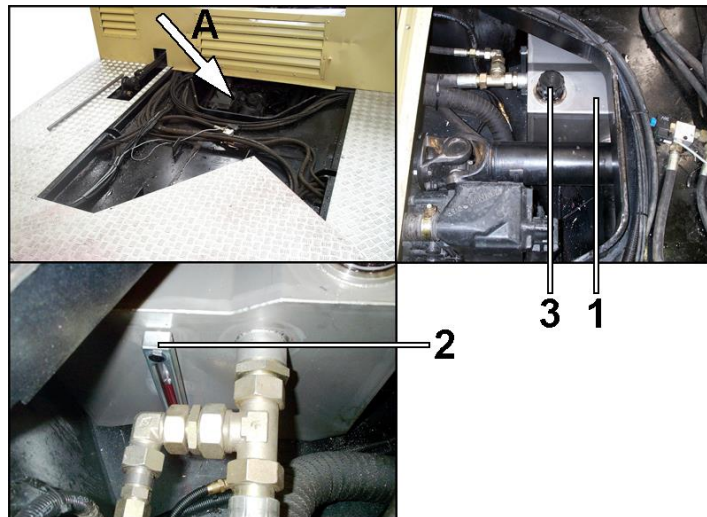


Check the hydraulic oil level every two months under normal operating conditions.



To prevent measuring errors, the oil level should not be checked immediately after operation. The oil temperature should be under 40°C.

1. Make sure the truck is standing on level ground.
2. Rig up the tower in upright position.
3. Loosen the central cover (A) directly behind the truck cab. (Picture 8-1).
4. Check if the oil level is at about 80% of the gauge glass (3) and (4) at the inside of the oil tanks (1) and (2).
5. If necessary, top up hydraulic oil through filler neck (3) in the oil tank.
6. Always top up hydraulic oil of the same brand and type. (In doubt please always consult Spierings Kranen.)



Picture 8-1

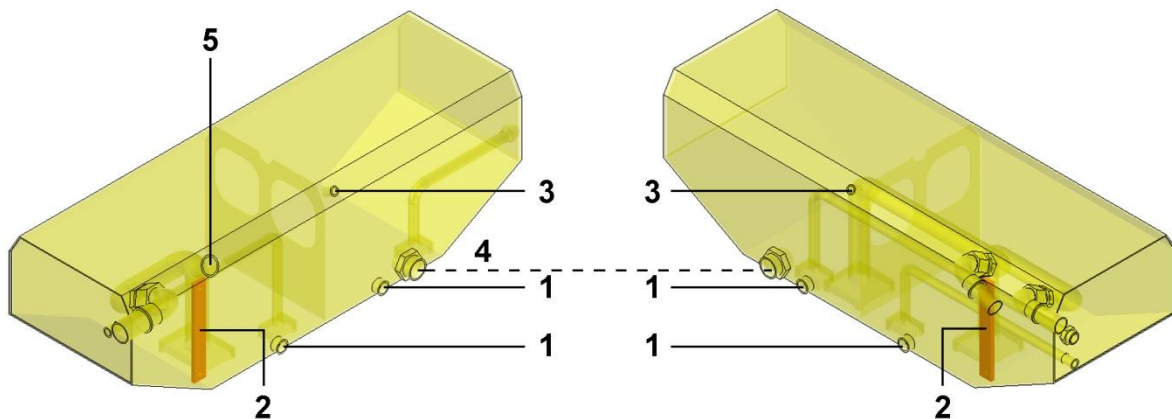
8.2. Changing Hydraulic Oil



Change the hydraulic oil every 5 years after oil analysis.

To change the hydraulic oil first an oil sample must be analyzed. If you have to change the oil, all hydraulic cylinders (including the suspension cylinders) must be retracted.

1. Unscrew the filler cap (3) from the oil tank (1). (*Picture 8-1*).
2. Place a trough under the drain plugs (1). (*Picture 8-2*).



Picture 8-2

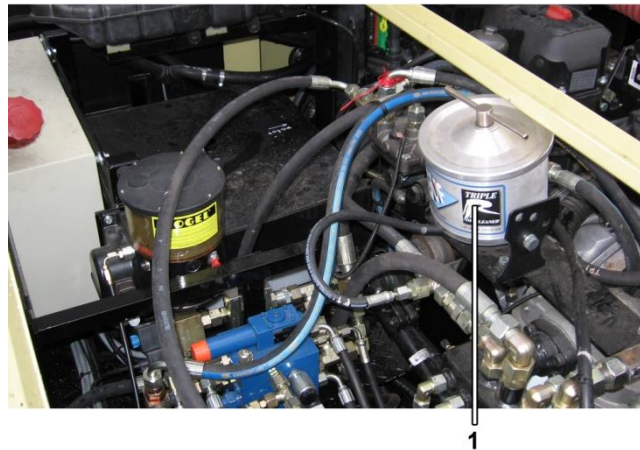
3. Loosen the drain plugs (1) and drain the oil from all four oil tank compartments.
Caution: When loosening the first drain plug, the tank will empty for approx. 75%, because of the openings in the partitions at the inside of the tank.
4. Fit all drain plugs with new seal rings and reinstall them.
5. Fill the tank through filler neck (5) with 400 litres hydraulic oil according to the specifications, until it is approx. 80% full. (Check this on the two gauge glasses (2))

8.3. Hydraulic Oil Filter Replacement



Replace the hydraulic oil filters during the annual service inspection under normal operating conditions.

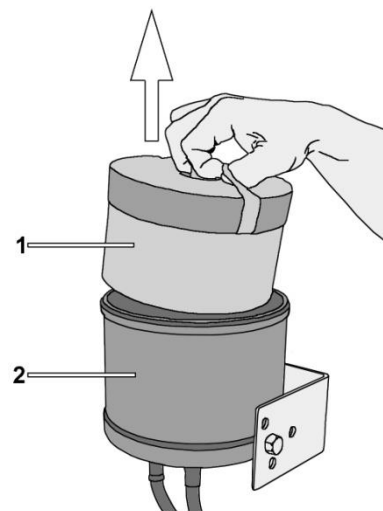
8.3.1. Hydraulic Fine Filter



Picture 8-3

The hydraulic fine filter (1) is found under the left engine cowling. (Picture 8-3) In order to reach it, the upper cover must be removed after the tower has been rigged up in upright position.

1. Unscrew the filter holder lid (2) by turning the lever to the left.
2. Remove the fine filter (1) from the holder (2) and replace it by a new one (Picture 8-4).
3. Manually tighten the filter holder lid firmly.
4. Leave the engine running for a couple of minutes.
5. Check the oil level by watching the gauge glass and top up oil if necessary.
6. Check for leakage.
7. Reinstall the cover plates.



Picture 8-4

8.3.2. Hydraulic Filters



Picture 8-5

The return filters are also found under the left-hand engine cowling under the fine filter. (Picture 8-5). Remove the upper cover at the left and the central cover after rigging up the tower in upright position.

1. Loosen the filters with a filter wrench.
2. Lightly grease the sealing rings on the new filters with oil, before reinstalling them.
3. Tighten the filters by hand.
4. Leave the engine running for a couple of minutes.
5. Check the oil level by reading the gauge glasses on the two hydraulic oil tanks, and top up oil if necessary.
6. Check for possible leakage.
7. Reinstall all cover plates.

8.4. Check the Suspension System Accumulators



Check the suspension system accumulators every year under normal operating conditions.

The AT7 suspension system has got 14 (7 x 2) accumulators, that are all mounted on the axles' hydraulic suspension cylinders. In order to check the accumulators you need a special HYDAC tool. The pressure should be 110 bar.

8.5. Hoses and Couplings Hydraulic System



Check all components of the hydraulic system every two months for leaks and damage.

All hoses, couplings, hydraulic blocks, filters, cylinders and the oil tank must be checked regularly for damage and leakage. Replace defective parts as soon as possible to prevent serious damage.

8.6. Hydraulic Brake Power Axle 1



Check the hydraulic oil level every two months under normal operating conditions.



Caution! Do NOT use DOT-oil, for oil specifications please refer to the enclosures.

The brake for axle 1 is partly hydraulically powered through a separate hydraulic circuit. It has its own small hydraulic reservoir in the cab, behind the co-driver's seat. (See *picture 8.6*).

8.6.1. Check Oil Level

Check the oil level in the reservoir every two months. If necessary, top up oil until the oil level is between the min. and max. mark.

8.6.2. Change Oil

The hydraulic oil for the brake power of axle 1 must be changed every three years.



Picture 8--6

9. Pneumatic System

The pneumatic system consists of a primary system and a secondary system. (For the pneumatic diagram please refer to the enclosures)

The primary system for the truck's brakes, consists of 3 circuits.

The secondary system for the accessories, consists of 2 circuits.

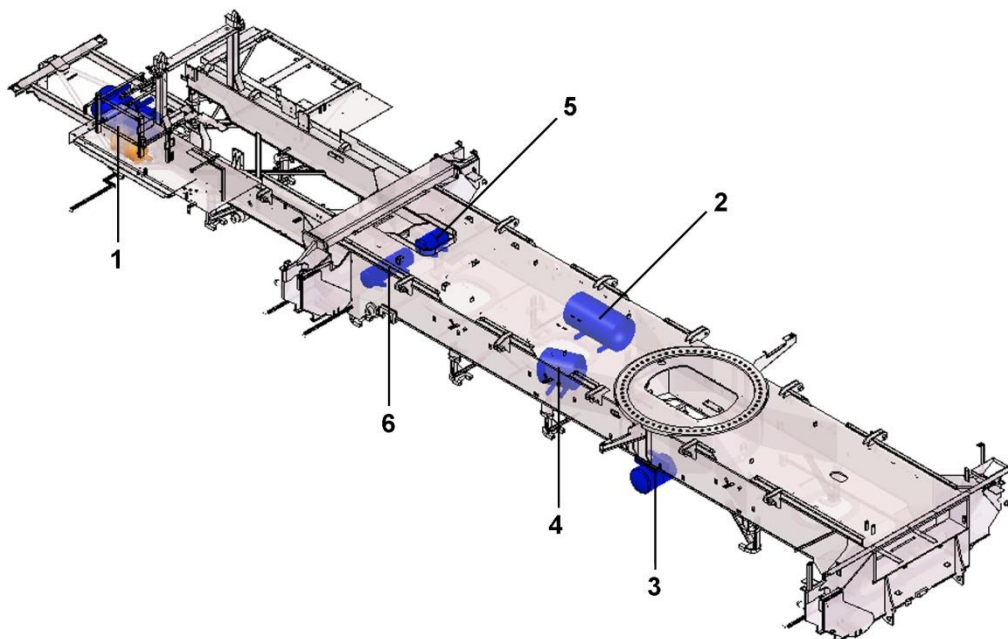
The air pressure is supplied by a compressor mounted on the engine.

Furthermore, the system is secured by a 4-circuit safety valve. If there is a leak in one of the circuits, this valve sees to it that the remaining circuits keep air pressure, so the truck brake can still be operated.

9.1. Primary System: Brake System

The primary system supplies the control and operating pressure for the brake system, which consists of the operating brake and the parking brake.

The brake system operates based on relay valves, controlled by means of air pressure. That means, that from the brake pedal or the parking brake valve, through an air pipe, a signal is sent to the various relay valves. To these relay valves air pipes with feed pressure are connected. As soon as the valves are driven by control air, the feed pressure will be sent to the brake boosters, so that the truck brakes will be powered.



Picture9-1: The air vessels on the truck chassis

The brake system consists of 4 air vessels (3 circuits);

- Vessel 1 (100 litres)
This vessel supplies the (operating) brake boosters of axles 1 to 3. Through the brake pedal, it also supplies the control air for operating the relay valves for the (operating) brake boosters of axles 1, 2 and 3, whereas the brake of axle 1 is partly hydraulically powered. (Please refer to section 8.5.)



- Vessel 2 + 3 (100 + 30 litres)
These vessels supply the (operating) brake booster of axles 4 to 7.
Through the brake pedal, they also supply the control air for operating the relay valves for the (operating) brake boosters of axles 3 to 6.
- Vessel 4 (60 litres)
This vessel supplies the parking brake boosters (axles 3 to 6).
Through the parking brake lever, it also supplies the control air for operating the relay valve for the parking brake boosters.

The parking brake operates on the basis of de-aeration. As soon as the brake lever is operated, the parking brake boosters on axles 3 to 6 are bled, engaging the brakes.

9.2. Secondary System: Accessories and Gearbox

There is a separate circuit for pneumatically operated components of the drive system.

To increase the life of secondary air circuit valves, a pressure relief valve with water separator is mounted directly after the air vessel.

The pressure relief valve of the secondary circuit is set to 5.5 bar.

The secondary system consists of two vessels;

- Vessel 5 (10 litres)
This vessel supplies the air pressure for all secondary components (accessories).
- Vessel 6 (20 litres)
In fact this is an emergency vessel for the gearbox with built-in torque converter/retarder. In case of an air pressure failure in the secondary system, it is still possible to shift gears a couple of times.

The components operated by the secondary air circuit are:

- Gearbox: - feeding various gearbox functions
- Vacuum brake - cutting off exhaust valve
 - Switching off fuel pump.
- Transfer case: - changing high/low gear.
 - Switching longitudinal differential lock.
- Axles: - Switching transverse differential lock axles 1, 3, 4 and 7.
 - Switching longitudinal differential lock axles 3 and 4.

9.3. Air Vessels



Check the air vessels for the presence of condensed water every week.

Check the air vessels for condensed water by pressing the drain valve ring under the air vessels. In case of frequent condensed water in the vessel, the air dryer element must be replaced. (See section 9.4.)



Picture 9-2

9.4. Air Dryer

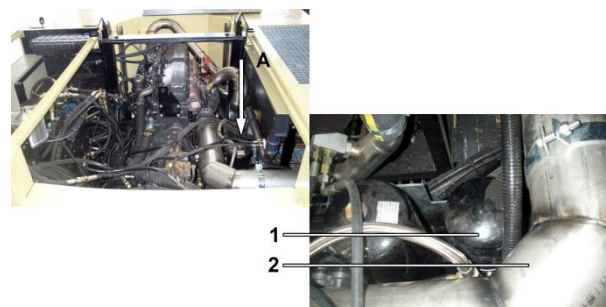


Replace the air dryer every two years under normal operating conditions.

To increase the components' life and to guarantee they work properly, the pneumatic system is equipped with an air dryer.

The air dryer is at the right of the pumps, behind the diesel engine air inlet (2). (Picture 9-3).

- Make sure the tower is in upright position and the engine is not running.
- Remove the left central cover from the engine cowling. (The filter element is found at A)
- Loosen the filter element (1) from the air dryer, using a filter wrench.
- Light oil the new filter element seal ring with engine oil.
- Install the new filter element on the filter holder and tighten it by hand.
- Start the engine and check for possible leakage.
- Reinstall the cowling cover.



Picture 9-3

9.5. Water Separator



Drain the water separator every two months under normal operating conditions.

The water separator is found in the chassis near the hydraulic tank on the right (behind the girder at axle 3).

The water separator is shown in *Picture 9-4* and consists of the following parts:

1. Pressure relief valve
2. Water separator
3. Valve water separator



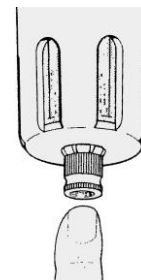
Picture 9-4

The water separator works semi-automatic as a standard.

If there is pressure on the air system the valve under the water separator will be closed and the condensation will accumulate in the shank.

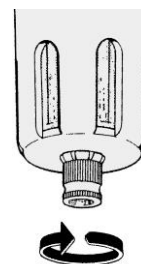
If there is no pressure in the system, the valve will open and drain the condensation.

Press the valve upwards to drain the condensation.
(*Picture 9-5*)



Picture 9-5

Turn the valve to the right to close it permanently.
(*Picture 9-6*)



Picture 9-6

To clean or replace the filter element, the bolt on the filter element must be loosened by means of a special filter wrench.
(Picture 9-7)



Picture 9-7

The secondary air circuit pressure (5,5 bar) can be set through pressure relief valve (1, Picture 9-4) on the water separator.

9.6. Check Brake Pressure



Check the brake pressures of all axles during the annual inspection.

Check the system pressure while the engine is running, by connecting a tester pressure gauge to one of the 100 litres vessels (1 and 3 in Picture 9-1, mounted in the chassis under the cab and between axles 3 and 4). The system pressure should be 9.8 bar. The system pressure can be adjusted through the pressure relief valve on the air dryer.

At the brake boosters of all axles measuring connections are mounted, to which the pressure gauge must be connected. Start the diesel engine and operate the operating brake with the brake pedal in the truck cab. Subsequently, check the following pressures (tolerance ± 0.1 bar).

- Brake boosters pressure axle 1: 8.0 bar.
- Brake boosters pressure axles 2 and 3: 8.5 bar.
- Brake boosters pressure axles 4 to 7: 6,0 bar.

The pressure can be adjusted through three pressure relief valves mounted in the control lines.

9.7. Hoses and Couplings Pneumatic System



Check all components of the pneumatic system every two months for leakage and damage.

All hoses, couplings, pneumatic valve blocks (under the chassis covers), filters, cylinders and vessels must be checked regularly for leakage and damage. Repair or replace defective parts as soon as possible, to prevent serious damage.

10. Lubrication

10.1. Central Lubricating System



Every two months the central lubrication must be checked, on all points that need lubrication. Also make sure to check the grease level in the grease container.

Coupling, hinges and bearings are points that need regular lubrication with grease, several so regularly, that a central lubricating system is the perfect solution. However, also these points need checking at set times. Insufficient greasing could result in damage.

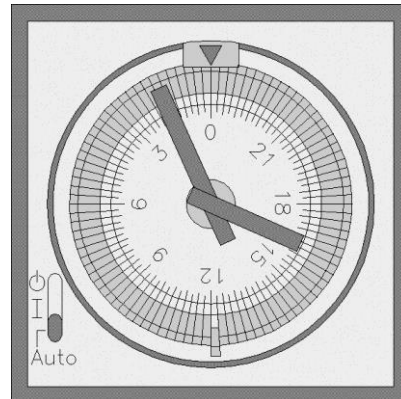
10.1.1.Timer Switch Central Lubricating System

The central lubricating system is controlled by a timer, on which the lubrication time in proportion to the driving time can be set (see Picture 10-1).

The timer must be set in such a way that 24 hours of driving time are followed by 15 minutes of lubrication. To do this one timer slide must be extended.

For the automatic lubrication, the timer must always be set to "Auto" or "A".
If additional lubrication is needed, set the timer to "I".
The grease pump will be controlled manually. Do not forget to set the timer back in the automatic mode after ± 15 min.

The central lubricating system timer is on the centre control panel at the co-driver's side.



Picture 10-1

10.1.2.Grease Container Central Lubricating System

The grease pump with the grease container for the central lubricating system is found under the left-hand engine cowling. (See Picture 10-2)
In order to check and refill it, the engine cowling left-hand cover must be opened.

The grease level in the grease container must be above the min.-mark (A). Use grease nipple (B) to refill grease.

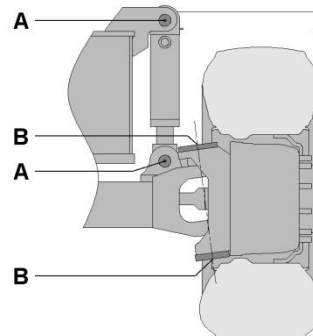
Use grease according to the specifications as stated in the chapter "Technical Data".



Picture 10-2

10.1.3. Grease Points Central Lubricating System

- A. Pins suspension cylinders top and bottom.
- B. Stub axles top and bottom
- C. Suspension bearing steering shaft



Picture 10-3



Picture 10-4

10.2. Manual Lubrication



The lubrication interval for points that need manual lubrication is every two months.

Use a grease gun for manual lubrication, unless stated differently. We recommend EP2 grease for all points.

10.2.1. Extending Cylinders Outrigger Beams

Picture 10-5 shows the location of the extending cylinder grease nipple within the outrigger beam (A).

In order to grease these nipples, the outrigger beams must be extended, until the holes appear outside the frame. Through these holes the grease nipples (1 for each outrigger beam) are accessible.



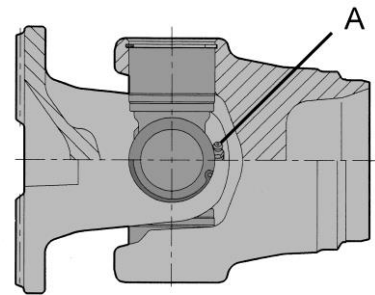
Picture 10-5

10.2.2.Cardan shafts

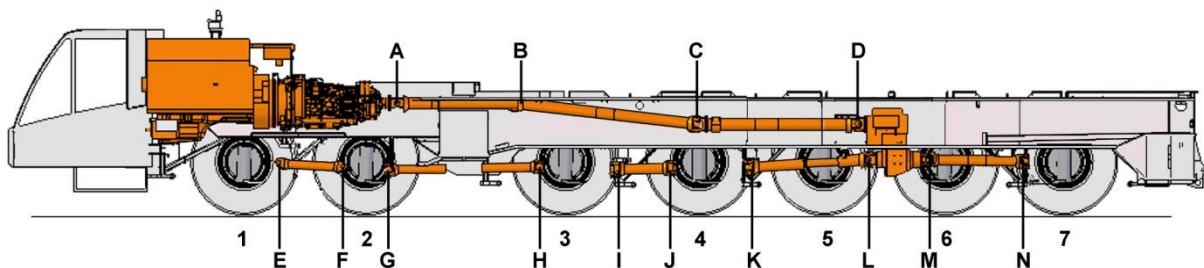
The universal joints must be lubricated manually.

In the universal joint you will find a grease nipple (A) (see picture 10-6).

Picture 10-7 (A to N) shows the locations of the universal joints.



Picture 10-6

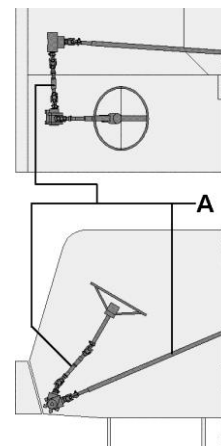


Picture10-7

10.2.3.Steering system

The various steering rods ball couplings are maintenance-free, except for the splain bushes. These need manual lubrication. (See A, picture 10-8)

In addition to checking the splain bushes lubrication, also check the play on all couplings and connections of the steering system.



Picture 10-8

10.2.4.Tower Support

The tower support is mounted directly after the cab, on top of the engine cowling. (See A, Picture 10-99)

Apply EP2 grease on the slide faces by means of a brush.



Picture 10-9

11. Miscellaneous

11.1. Check Windscreen Washer Fluid



Check the windscreen washer fluid level every week.

11.2. Fire Extinguisher



Have the fire extinguisher checked by an authorised body.

11.3. Air-conditioning (option)

The air-conditioning contains high-pressure coolant. You are strictly forbidden to dismount any parts of the air-conditioning system.



Work to the air-conditioning system should only be carried out by qualified personnel.



If the air-conditioning does not function, it must be repaired as soon as possible to prevent more serious damage to the system. If necessary, contact Spierings Kranen.



12. Technical Data

Diesel Engine		Spierings No.
Engine oil	ELF 10W40 = ACEA E4/E5	OLSM00100180
Oil filter	DAF No. 1397765	SERV01150065
Centrifugal filter	DAF No. 1376481	SERV01150066
Poly V-belt water pump		-
Poly V-belt generator		-
Coolant	SAE-J-1034 or ASTM D 3306 (COOLELF PLUS 37°C)	OLSM00100080
Air filter (outer part)	DONALDSON P77-7868	SERV03100170
Air filter (inner part)	DONALDSON P77-7869	SERV03100180
Water separator	DAF No. 1296851	SERV04300010
Fuel filter	DAF No. 1450184	SERV01150085
Injector tools	DAF No. 1329309 and 0694928	
Gearbox		
Oil gearbox (original at delivery)	ELF: TRANSELF SYNTHESSE FE 75W90	OLSM00100120
Oil gearbox (at maintenance by Spierings)		
Oil torque converter / retarder	ELF: TRANSELF SYNTHESSE FE 75W90	OLSM00100120
Transfer case		
Oil transfer case (original at delivery)	ELF: TRANSELF SYNTHESSE FE 75W90	OLSM00100120
Oil transfer case (at maintenance by Spierings)	ELF: TRANSELF SYNTHESSE FE 75W90	OLSM00100120
Seal ring oil drain plug	O-ring-A22x27-Cu DIN 07603	
Axles/brakes/tyres		
Oil axles at delivery	ELF: TRANSELF SYNTHESSE FE 75W90	OLSM00100120
Oil axles (at maintenance by Spierings)	ELF: TRANSELF SYNTHESSE FE 75W90	OLSM00100120
Exchange brake block truck	-	-
Tyres	445/75 R22.5	-
Tyre pressure	9 bar.	
Rim	22.5" x 14"	AACA01100030
Hydraulics		
Oil hydraulics	ATF Dexron-IID, -IIE, -III or Mercon-M (ao. ELF Elfmatic G3 22051)	OLSM00150010
Fine filter	GVF-Triple R	HYIN04100040
Oil filter (2x)	CS-15AN	HYIN04100211
Pneumatics		
Element air dryer	Wabco 432 410 2227	SERV05100010
General		
Grease (general)	EP2 (ao. AVIA Mystiek JT-6)	OLSM01500030
Grease central lubricating system	EP2 (ao. AVIA Mystiek JT-6)	



13. Enclosures

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General

Enclosure 2

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