

# KÖGEL



## *Operating manual*

*for  
semitrailer chassis*

*6602965*

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*Written by EPK*

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# 1 Safety

## 1.1 General

This operating manual must be carefully read through, understood and observed in every detail by those responsible for the Kögel vehicle and its various sub assemblies, as we are unable to accept liability for any damage or malfunctions caused as a result of failure to observe the provided instructions. Read through this operating manual before using the vehicle for the first time, noting and observing all warnings, indications and instructions.

Particularly important details for the operation, running and necessary care and maintenance of the vehicle are provided in this operating manual. It is only by being made familiar with these that faults can be avoided and trouble-free operation guaranteed.

The complete technical documentation should always be kept in the cab of the vehicle.

The manufacturer, Kögel Fahrzeugwerke GmbH, Industriestr. 1, 89349 Burtenbach, Germany, reserves the right to correct errors and make technical changes to construction, equipment and accessories referred to in the information, illustrations and descriptions of the operating manual. No claims whatever may consequently be derived from the information, illustrations and descriptions contained herein.

## 1.2 Proper and improper usage

### *Intended purpose*

Kögel vehicles and bodies are built in accordance with the generally acknowledged rules of technology and comply with safety regulations. Despite this, however, if used for other than their intended purpose, they can pose a hazard to life and limb for both users and third parties, or cause damage either to the Kögel vehicle itself or to other property.

Kögel vehicles and bodies are accordingly manufactured exclusively for duly executed transport operations as laid down by applicable conveying and haulage regulations.

The proper use of the vehicles includes also adherence to regulations, descriptions and instructions provided in these and in the suppliers' operating and maintenance manuals.

Should you be planning subsequent modifications to your Kögel vehicle or vehicle body, enquire in good time at a Kögel factory or at an approved Kögel workshop.

Only have accessory components fitted to your Kögel vehicle or vehicle body after consulting a Kögel factory or an approved Kögel workshop.

### *Improper usage*

Any utilization above and beyond the prescribed transport application is deemed as not in accordance with the intended purpose of the vehicle, for example the transportation of persons, coils or goods for which special regulations exist such as the transportation of animals. Improper usage also includes exceeding the legally permissible weights, axle loads, drawbar loads or dimensions.

The manufacturer: Kögel Fahrzeugwerke GmbH, Industriestr. 1, 89349 Burtenbach, Germany, shall not be liable for any damage resulting from non-observance - the user shall bear sole responsibility for any such risk.

The manufacturer shall not be liable in the event of:

- any changes carried out by the user to the vehicle and its components;
  - original parts or conversion parts/accessories approved by Kögel being exchanged for other components;
  - subsequent changes carried out on the vehicle (e.g. new drill holes made in the frame or the enlargement of existing drill holes in the frame). Any such intervention is classified by Kögel as a structural change, and accordingly invalidates the operating permit.
  - non-approved accessories such as spares or components of other makes which are not original Kögel parts being mounted or integrated. Any such action shall invalidate the operating permit for the vehicle and may even compromise insurance cover.
  - failure to adhere to maintenance intervals prescribed by the manufacturer.
- All resulting risks and liability waivers shall continue to apply in the event that:
- acceptances have been performed by inspectors/experts of the Technical Inspectorates or officially recognised organizations;
  - approvals have been granted by public authorities.



*Kögel vehicles/vehicle bodies carry a chassis number. This is applied on the front right-hand side of the frame. When enquiring or ordering parts, this number must always be stated!*

### 1.3 Personnel qualifications

Kögel vehicles and vehicle bodies and their operating components may only be used and maintained by personnel who have received instruction regarding:

- these operating instructions,
- the relevant transport vehicle with its respective towing vehicle,
- suppliers' operating and maintenance instructions,
- the Road Traffic Regulations (in Germany StVO) and the Road Licencing Regulations (in Germany StVZO),
- all the relevant working safety and accident prevention regulations as well as other laws relating to safety, industrial health and road traffic.

### 1.4 Sources of danger

- Coupling and uncoupling a trailer or semitrailer: No persons may remain in the danger area!
- Travelling with unsecured landing gear. Ensure that landing gear is doubly secured!
- Driving with things, e.g. snow, ice, twigs etc., on the roof / platform.
- Clearance heights on transport routes, and during loading and unloading!
- Exceeding the total permitted payload or uneven overloading due to incorrect distribution of weight!
- Badly secured or unsecured load and/or vehicle body components!
- Reversing manoeuvres - check area behind vehicle!
- Excessive torsion forces during manoeuvring!
- Overloading vehicles, axles and brakes!
- Excess strain as a result of fitting incorrect sizes of wheels or tyres!
- Use of wheels with incorrect wheel offset, unilateral runout or centrifugal imbalance.
- Uneven air pressure of the inner and outer tyre in dual fitments.
- Excessive stress due to unreasonable or rough driving behaviour or incorrect handling.
- Impacts and stress on the axles.
- Travelling at speeds which are unsuitable given the conditions of the road surface and the vehicle load properties - particularly on corners.
- Uncouple the vehicle on firm, level ground.

## 1.5 Checks to be made before each journey

- Put the folding underrun guard into the driving position and secure it
- Check that fifth wheel coupling and kingpin are in perfect working order
- Grease fifth wheel coupling adequately
- Lock fifth wheel coupling correctly
- Connect coupling hoses and brake pipes
- Make the electrical connections
- Release the brakes and do not drive until operational braking pressure has been attained.
- Drain the compressed air tank
- Retract and secure the landing gear
- Check wheels in case tyres or rims have any faults
- Check pressure of tyres, incl. spare tyre
- Check the tightening torque for the wheel nuts
  - With a new vehicle, retighten wheel nuts after
  - driving 50 km and after the first loaded journey.
- Set pneumatic suspension to Drive position
- Secure spare wheel, spare wheel holder, ladders and wheel chocks
- Test vehicle lights, replace any defective bulbs
- Immobilise and secure load
- Do not exceed the maximum permissible total weight

## 1.6 Safety instructions

Safety instructions in this manual are identified as follows:



### **Danger!**

*This symbol is a warning that there is a direct risk of personal injury which may endanger life or limb.*

*Failure to comply with these instructions may result in serious or even fatal injury.*

### **Caution!**

*This symbol is a warning of a hazardous situation.*

*Failure to comply with these instructions may result in minor injury.*



*This symbol:*

- *indicates a risk of material damage or*
- *flags up important advice to the user or other useful information.*

All warnings and instructions must also be passed on to other users or ancillary staff!

# 2 General Information

## 2.1 Vehicle identification

The law requires a Vehicle Identification Number (VIN) (e.g. WK0S0002401234567) to be designated for the identification of vehicles and vehicle bodies.

This number must be specified in enquiries relating to the vehicle.

Meaning of the vehicle identification number:

Field	1	2	3	4
VIN	WK0	S00024	0	1234567

1 = Kögel vehicle

2 = 4-digit type plus total gross weight

3 = Code for model year, in this case 2003

4 = 7-digit factory code

Field 4 corresponds to the order number.

## 2.2 Ordering spare parts



*Only use original Kögel spare parts!*

In the event of spare parts orders, the following information must be provided:

1. Part no. and designation in accordance with the spare parts list or build description
2. Vehicle type, chassis number and year of manufacture or:
3. Vehicle Identification Number
4. Production numbers of hydraulic equipment etc.

Spare parts can be ordered from:

### **Kögel Fahrzeugwerke GmbH**

- **Burtenbach Works**  
Head office
- **Spare parts centre, Ulm**  
- Management  
- Export
- Domestic
- Authorities (Federal Armed Forces)
- Authorities (Post) WBH

# 3 Driving with the semitrailer

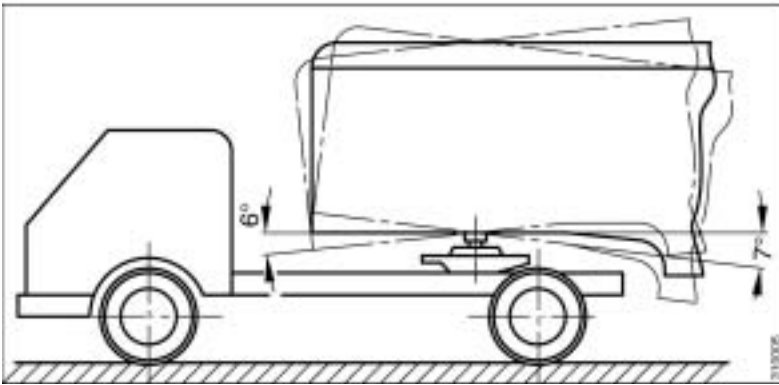
## 3.1 General



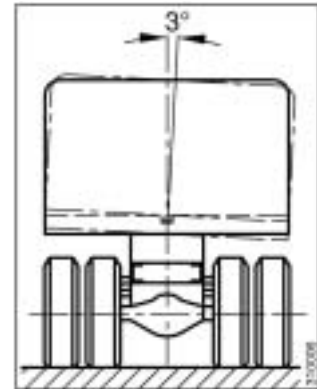
### Material damage

will be caused to the vehicle by exceeding the permitted inclination angle. When driving over dips and bumps in the road, don't forget

- that the connection between the fifth wheel coupling and the kingpin only permits a limited angle of inclination
- The angle of inclination conforms to DIN ISO 1726
  - and is 6° to the front, 7° to the rear
  - and 3° to the side
- if you articulate the trailer at an angle of less than 25° drive carefully over dips or bumps.



Vertical angle of inclination



Lateral angle of inclination



### Danger!

If the rear end swings out it can cause an accident resulting in serious or even fatal injury.

The rear end of a semitrailer with steering swings out more than a semitrailer without steering.

Adjust your driving style accordingly.

Observe the instructions of the steering system manufacturer.



Additional information can be found in the brochure from the employers' liability insurance association:

"BG-Information BGI 599 - Safe coupling of vehicles -"

### 3.2 Coupling up



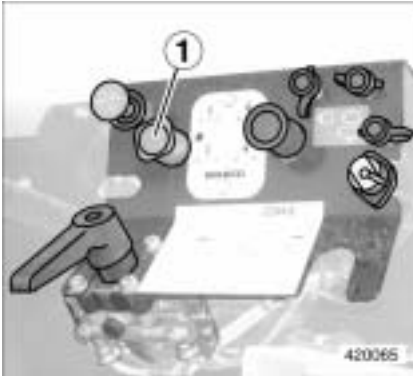
#### **Danger!**

*Towing vehicle moving.*

*Coupling/uncoupling the semitrailer to/from the towing vehicle can result in serious or even fatal injury.*

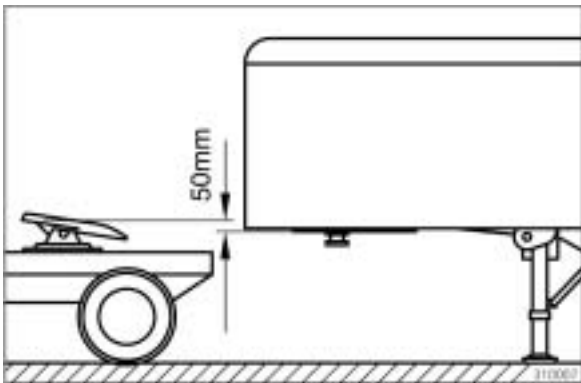
*Never stand or walk between towing vehicle and semi-trailer.*

*Keep the working platform on the towing vehicle clear.*



#### **Before coupling**

- Check that the parking brake is on; if not, apply the semitrailer parking brake. To do this, pull the red knob (1) out.



- The trailer plate must be positioned approx. 50 mm lower than the fifth wheel plate (adjust using the landing gear winch).



#### **After coupling, always carry out the following checks:**

- Is clearance between body and driver's cab sufficient?
- Have all connections been made?
  - Brakes
  - Supply line
  - Lighting
  - Use an EBS connection cable with seven assigned plug contacts
- Retract the support legs of the landing gear.
- Any wheel chocks used should be returned to their holders and secured.

**Information on operating the fifth wheel coupling can be found in the manufacturer's operating instructions.**

### 3.3 Uncoupling



#### **Danger!**

If the semitrailer brake is not applied, the vehicle can start to move and run over anyone standing nearby, which could result in serious or even fatal injury.

The following instructions should therefore be followed carefully when uncoupling.



#### **After uncoupling, always carry out the following checks:**

- Release the coupling lock of the fifth wheel coupling by moving the towing vehicle back gently and actuating the parking brake.
- Actuate the parking brake on the semitrailer
- Extend the landing gear support legs to the point at which there is a small gap between the fifth wheel coupling and the semitrailer drive-on plate.
- For safety, secure semitrailer against rolling away using wheel chocks
- Disconnect and safely stow the electrical and pneumatic supply lines
  - When disconnecting the brake hoses start with the supply line (red)
- Release safety catch and open fifth wheel coupling lock
- After ensuring that no-one is in the danger area, carefully drive the towing vehicle forwards.

**Information on operating the fifth wheel coupling can be found in the manufacturer's operating instructions.**

### 3.4 Landing gear



**Information on operation can be found in the manufacturer's operating instructions.**

- Always completely retract the support legs before driving off
- Secure crank handle
- On soft ground use an additional rigid support to prevent the support feet from sinking into the ground.

*Secure crank handle of the landing gear on the frame*

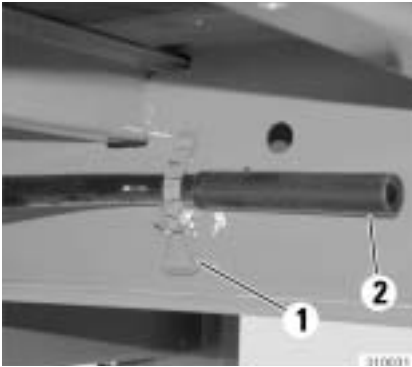


Arrangement of the landing gear

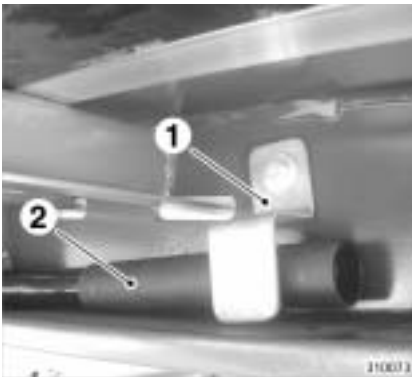


Storage of the crank handle

The landing gear comprises the landing gear winch and the support legs with levelling feet. The crank handle must be secured when not in use.

**Variant 1:**

- Pull the safety latch (1) up.
- Remove the crank handle (2) from its support.
- Swing the crank handle out from under the body.

**Variant 2:**

- Turn the safety latch (1) up.
- Pull out the crank handle (2) and
- Swing the crank handle out from under the body.

### 3.5 DUO-MATIC coupling heads

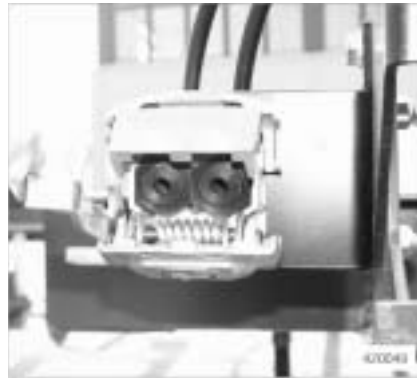
As a special equipment option, Kögel vehicles can be fitted with a DUO-MATIC automatic coupling head.

With this type, the supply and brake lines are always connected or disconnected at the same time due to their design and construction.

In the uncoupled condition, the coupling heads are automatically closed.



- Handle up
- Duo-Matic connected



- Handle down
- Duo-Matic open for coupling

**Coupling**

- Press the handgrip of the Duo-Matic trailer component downwards and push the Duo-Matic towing vehicle component under the opened protective cover.
- The connection is made.

Make sure that sealing surfaces are clean.

*To uncouple, follow the same steps in reverse order.*

### 3.6 Service brake system

#### General

The Kögel brake system is designed as an electronically controlled brake system (EBS) and corresponds to EC Directives 71/320/EEC and ECE R13. This means that it is possible to interchange vehicles fitted with pneumatic brake systems.



*Trailers with EBS may only be operated behind towing vehicles having the following plug-in connections:*

- *ABS/EBS plug-in connection, 7 pin, 24V, to ISO 7638-1996.*
- *ABS/EBS plug-in connection, 5 pin, 24V, to ISO 7638-1985.*

*Driving without one of these plug-in connections and/or driving without a plugged-in connection cable is illegal!*

*The plug-in connection must be entered in the vehicle registration document.*

In addition, it is a requirement that the brake system is designed as a dual-line system with non-interchangeable compressed air connections. The non-interchangeable coupling heads prevent incorrect connection of the brake and the supply lines.

The electronically controlled brake system is fitted with load-dependent braking pressure regulation (automatically adjusts to the actual load condition) and automatic wheel lock prevention (ABS function).



*If the EBS connection cable is not connected:*

- *the automatic control of braking force does not work,*
- *the empty vehicle brakes as though it were loaded,*
- *the trailer ABS does not work.*

*Always connect the towing vehicle and trailer via the EBS connection cable.*

***It is illegal to operate the trailer without the connecting cable in place!***



#### **Danger!**

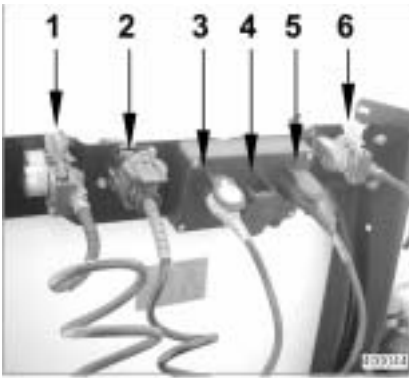
*If the brake is not applied the towing vehicle can begin to move. It can then run people over, causing serious or fatal injury.*

*When coupling or uncoupling the towing vehicle, always make sure that steps are carried out in the correct order:*

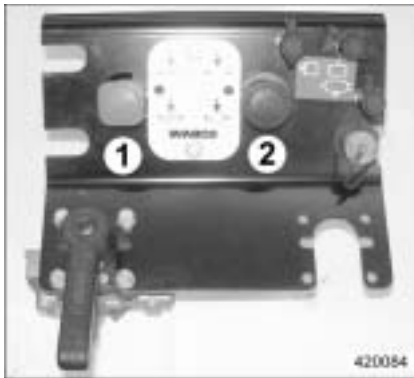
*Couple up the "Brake" (yellow) coupling head first.  
Uncouple the "Supply" (red) coupling head first.*

#### *Coupling to the towing vehicle:*

First connect the "Brake" (yellow) coupling head, followed by the "Supply" (red) coupling head.

**Possible connections:**

- 1 Supply line (red)
- 2 Use an EBS connection cable with seven assigned plug contacts (ISO 7638)
- 3 7-pin socket
- 4 15-pin socket (not connected up in this case)
- 5 7-pin socket
- 6 Brake line (yellow)

**Release the spring-loaded parking brake if applied.**

Press red button (1), brake is released.

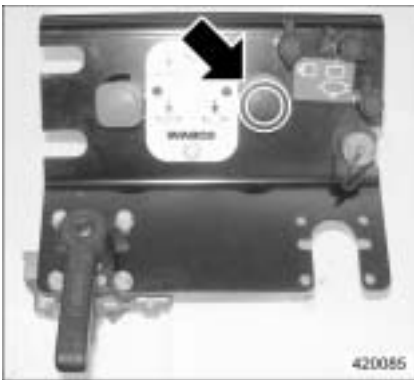
- 1 Pushbutton spring-loaded parking brake (red)
- 2 Pushbutton release valve (black)

Combined release valve

**Uncoupling from the towing vehicle**

First disconnect the "Supply" (red) coupling head, followed by the "Brake" (yellow) coupling head.

When the supply line is uncoupled, the trailer is braked.

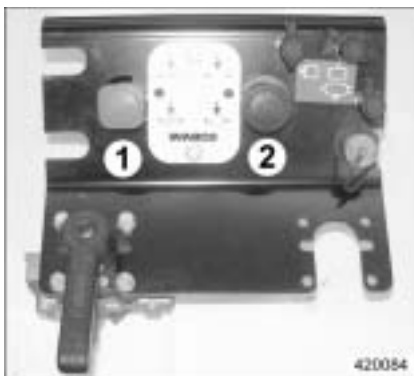
**Taking out of operation**

By venting the supply line during the uncoupling process the trailer is automatically braked.

For manoeuvring purposes, the service brake system must be set out of operation. Do this by pushing in the black knob of the release valve (see arrow). The brake cylinders will then be completely de-pressurised and the wheel brakes released.

By pulling out the knob of the release valve, the brake cylinders are pressurised and the trailer is braked again.

Repeated operation of the release valve causes the pressure in the compressed air tank to fall and with each press the braking effect is reduced. When the supply line is coupled up again, the release valve is automatically reset to the operating position.

**Applying the spring-loaded parking brake:**

Pull red button (1), brake is applied

- 1 Pushbutton spring-loaded parking brake (red)
- 2 Pushbutton release valve (black)

### 3.7 Brake lining wear indicator

The TCE and EBS systems indicate brake lining wear using the trailer ABS warning light in the towing vehicle.



The trailer ABS warning light in the towing vehicle indicates only the brake lining wear on the trailer or semitrailer.

#### Function

- Ignition ON
- The warning light flashes 4x at regular intervals.
  - The wear limit has been reached.
  - The brake lining must be replaced.
- Start engine
  - Warning light will go off.
  - Warning light ceases flashing while vehicle is moving.



### 3.8 Compressed air tank



#### Draining

- Pull actuating pin on drainage valve to the side and the condensed water will flow out of the compressed air tank
  - Continue to hold actuating pin until no more condensed water is flowing out
  - Release actuating pin and the drainage valve will close.
- We recommend draining off condensed water once per week.

#### Pressure level in the compressed air tank

The compressed air conveyed via the supply line from the towing vehicle to the trailer has an operating pressure of 6.5 to 8 bar (depending on the switch-off pressure of the compressor in the towing vehicle). When the trailer is uncoupled, the supply pressure can drop as a result of:

- leaks in the brake system
- repeated operation of the release valve.

When the supply pressure has dropped to below 3 bar, the trailer brake valve automatically switches to the braking position. The wheel brakes are applied and cannot be released again by operating the release valve.

If you wish to manoeuvre the trailer when in this state, the brake system must be filled with supply pressure, or vented by completely releasing the compressed air through the drainage valve of the compressed air tank.

### 3.9 Spring-loaded parking brake

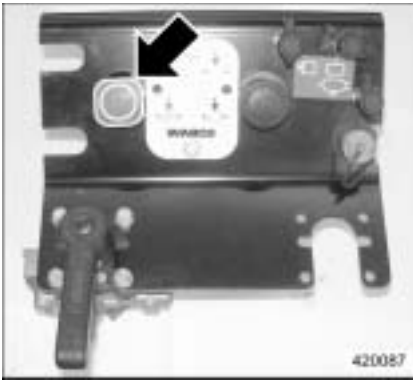


Observe the instructions for the spring-loaded parking brake emergency release device on page 68 in section 7.7.

#### General

The spring-loaded parking brake is pneumatically controlled and is applied via the spring-loaded diaphragm brake cylinders.

### 3.9.1 Actuation: Double release valve



#### Brakes

Pull out the red knob (see arrow).  
The vehicle is braked.

#### Releasing

Push in the red knob (see arrow). The brake is released.

#### Location of the red knob on the vehicle

The diagram on the left shows the location of the red knob (see arrow) on the vehicle. It can be found on the left behind the axle assembly (viewed in the direction of travel) (and depending on equipment).

## 3.10 Operate pneumatic suspension with ECAS or TCE



#### Power supply

Operation of the pneumatic suspension only works if the power supply between the towing vehicle and trailer

- is connected through the ABS/EBS line or if
- the trailer is equipped with separate batteries.

#### Lift axle

If a lift axle is fitted:

- it will move up and down completely automatically and irrespective of axle load and
- will automatically reach its driving height when driving at low speed even if the driving height has not been set using the control unit.

### 3.10.1 Standard control unit for TCE



The control unit is mounted on a bracket to the left of the frame.

#### Function keys

- 1 Raise
- 2 Drive position
- 3 STOP
- 4 Lower
- 5 Preselect key for lift axle
- 6 Indicator lamp

The indicator lamp comes on as soon as the preselect key is pressed.

#### a) Raising or lowering the body

- Press key 1 to "Raise" the body or
- press key 4 to "Lower" the body.

#### b) Raising the lift axle

- First press preselect key 5 followed by lift key 1.

#### c) Lowering (controlled lowering) of lift axle

- First press preselect key 5
- followed by Lower key 4, and the lift axle will move down to the ground.

#### d) Drive position

- First press preselect key 5 followed by driving position key 2.

#### e) Activating the stand-by-function:



- Do not uncouple the vehicle with the body raised.
- Ensure that there is an adequate air supply.

- First approach the required platform height.
- Switch off ignition and press and hold STOP button 3 for around 2 seconds.
- The stand-by- function controls the set platform height independently from the towing vehicle.

#### f) Correcting platform height



- Do not uncouple the vehicle with the body raised.
- Ensure that there is an adequate air supply.

- Uncouple the complete towing vehicle plus trailer on the platform.
- Switch on ignition or use battery operating mode
- Adjust platform height by means of "Raise or lower body".

### 3.10.2 Option: Operating unit for ECAS or TCE



The ECAS operating unit and (if fitted) battery are mounted in a protective housing on the left of the frame.



#### Function keys

- Preselect key for
  - rear trailer axle or
  - semitrailer axle assembly
- Preselect key for lift axle
- Drive position
- STOP
- Lower
- Raise
- Save
- Save
- Preselect key for front axle of turning bogie trailer
- Warning lights  
The warning light comes on as soon as the preselect key located below it is pressed.

#### a) Raising the semitrailer body

- First press preselect key 1
- followed by Raise key 6, the body will move upwards.

#### b) Lowering the semitrailer body

- First press preselect key 1
- followed by Lower key 5, the body will move downwards.

- c) Raising the lift axle**
- First press preselect key 2
  - followed by Raise key 6, the lift axle will move upwards.
- d) Lowering (controlled lowering) of lift axle**
- First press preselect key 2
  - followed by Lower key 5, and the lift axle will move down to the ground.
- e) Lifting trailer body**
- First press preselect keys 1 and 9
  - followed by Raise key 6, the body will move upwards.
- f) Lowering trailer body**
- First press preselect keys 1 and 9
  - followed by Lower key 5, the body will move downwards.
- g) Driving position for semitrailer or trailer**
- First press the relevant preselect keys
  - followed by Driving Position key 3, the pneumatic suspension will move to driving position.
- h) Saving the two platform levels (memory levels)**
- The saving of memory levels allows frequently needed platform heights to be approached as often as desired. The values are saved.
  - First press STOP key 4 at the same time as Save keys 7 or 8.
- i) Activating the platform level (memory level):**
- First press preselect key 1 followed by Save keys 7 or 8.
    - The platform levels are approached immediately.
    - An adequate air- supply is a prerequisite.
- j) Activating the approach aid: (Option depending on model of vehicle)**
- First press preselect key 2 and Save key 7 simultaneously.
    - Removing load from / raising first axle has the effect of increasing traction force on the drive axle of the towing vehicle.
    - In the case of semitrailers whose first axle is a lift axle, a platform approach aid can be activated. The platform approach aid used conforms to the EC Directive and finishes at a driving speed specified by Kögel.
- k) Activating the stand-by-function:**



- *Uncouple the vehicle with the body lowered.*
- *Ensure that there is an adequate air supply.*

- First approach the required platform height.
- Switch off ignition and press and hold STOP button 4 for around 2 seconds.
- The stand-by- function controls the set platform height independently from the towing vehicle.

**l) Correcting platform height**



- *Uncouple the vehicle with the body lowered.*
- *Ensure that there is an adequate air supply.*

- Uncouple the complete towing vehicle plus trailer on the platform.
- Switch ignition on.
- Adjust platform height by means of "Raise or lower body".

### m) Rectifying faults

Fault	Display	Cause	Rectify fault
Vehicle cannot be raised or lowered with the operating unit	Indicator lamp 10 no function	<ul style="list-style-type: none"> <li>No air supply</li> <li>No power</li> <li>ABS/EBS cable/plug faulty</li> <li>Fuse in towing vehicle defective</li> </ul>	Drive to approved workshop
The lift axle will not move upwards.	Indicator lamp in towing vehicle no function	<ul style="list-style-type: none"> <li>Vehicle is loaded</li> <li>See above, or</li> <li>fault in brake system</li> </ul>	Drive to approved workshop
No standby function		<ul style="list-style-type: none"> <li>Battery is flat</li> </ul>	Charge battery

### 3.11 Axle lift system



The TCE/EBS or ECAS system automatically controls an unloaded vehicle's lift axle:

- when vehicle is stationary or
- when it has reached a speed threshold.

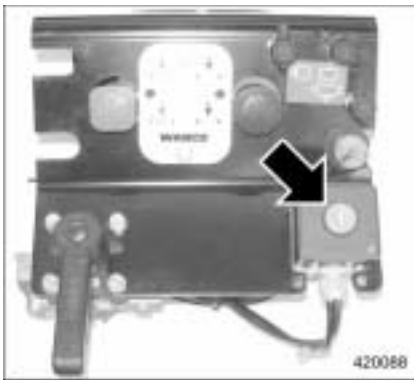
#### 3.11.1 Automatic axle lift system

*With an empty or partially-loaded vehicle:*

Control of the lift axle is fully automatic and load-dependent.

- When the ignition is "ON" and a road speed of approx. 25 km/h is exceeded, the lift axle moves up.
- When the ignition is switched off the lift axle comes down

#### 3.11.2 Automatic lowering or raising of lift axle with empty or partially-loaded vehicle:



*Pre-condition:*

- EBS connection is in place
- Ignition is on and
- permissible axle loads are not and will not be exceeded.

*Automatic raising*

- Press pushbutton and hold for about 2 to 4 secs.
- Lift axle will rise up

*Automatic lowering*

- Press pushbutton and hold for over 5 secs.
- The lift axle will move downwards.

#### 3.11.3 TCE/ECAS controlled axle lift system

See Section 3.10 on page 17S

### 3.12 Raise and lower system for height equalisation



**Danger!**

- Driving height exceeded
- Damaged tyres
- Unsatisfactory driving characteristics
- Malfunction in load-dependent braking force control

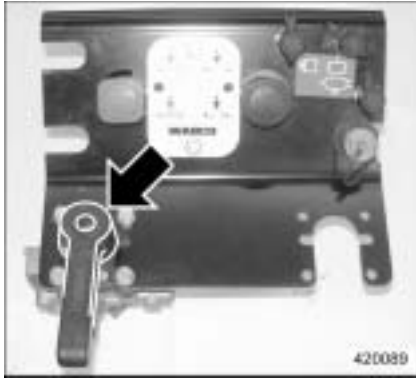
*This may result in injury or even death*

**Driving is permitted only in "DRIVE" position!**

### 3.12.1 Rotary switching valve variant 1

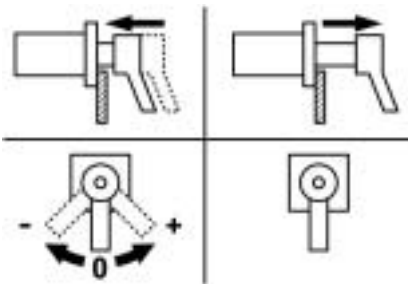


- At a speed of around 5 km/h the rotary switching valve automatically switches to "Drive" position.
- Observe the instruction notice beside the rotary switching valve!



#### Position of the rotary switching valve

The rotary switching valve (see arrow) is mounted on a console on the left viewed in the direction of travel behind the axle assembly.



#### Lever positions:

- 0 "STOP"
- "LOWER"
- + "RAISE"
- "DRIVE" position

Lower-----Raise"Drive" position



#### Lever locked in "DRIVE" position.

If the lever is turned with a force in excess of 35 Nm it may break off.

When "RAISING" or "LOWERING" the lift axle be sure to:

- Push lever straight in to come out of "DRIVE" position, then
- turn it to the "RAISE" or "LOWER" position and
- release it.

#### "DRIVE" position:

- The lever is in its middle position and is pulled out.
- There is a lock preventing the lever from being turned.

#### "STOP" position:

- The lever is in its middle position and is pushed in.

#### "RAISE" trailer:

- Turn lever from the "STOP" position to the "+" position.
- Release lever when trailer reaches required height.
  - Lever swings automatically to position "0".
  - The raising process stops.

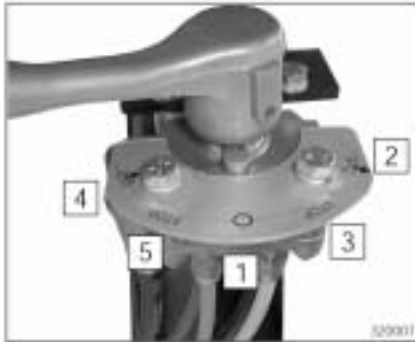
#### "LOWER" trailer:

- Turn lever from the "STOP" position to the "-" position.
  - Lever swings automatically to position "0".
  - The lowering process stops.

### 3.12.2 Rotary switching valve variant 2

#### Position of the rotary switching valve

The rotary switching valve is mounted on a console on the left viewed in the direction of travel behind the axle assembly.



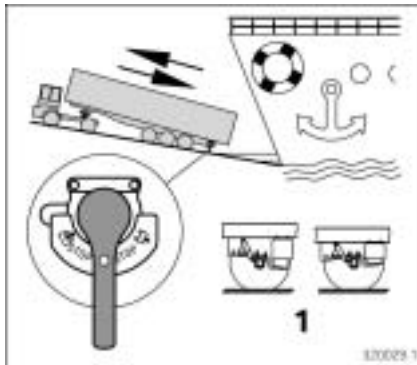
#### Lever positions

- Position 1: "DRIVE" position  
Raising and lowering are off.
- Position 2: "RAISE"  
- Press lever straight down and turn to position 2.  
- Turn lever to "STOP" position 3 when trailer reaches required height.  
The raising process stops.
- Position 4: "LOWER"  
- Press lever straight down and turn to position 4.  
- Turn lever to "STOP" position 5 when trailer reaches required height.  
The lowering process stops.

### 3.13 Ship or ferry transport



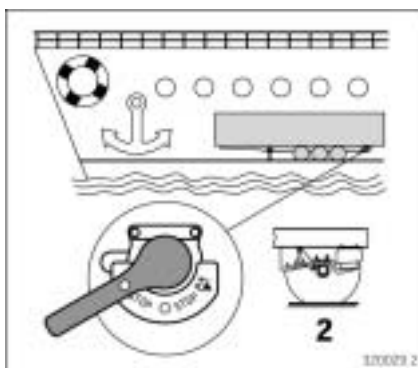
*Specific equipment is required when loading the vehicle on to ship or ferry transport and the corresponding regulations must be observed.*



1 Drive position

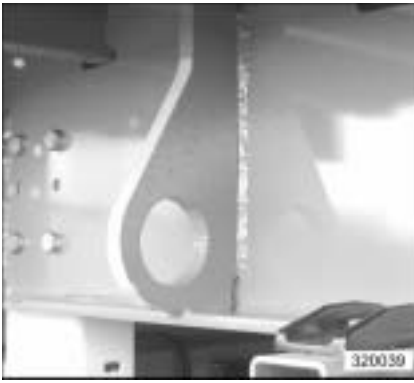


*When the vehicle is driven on or off a ship or ferry, the raise and lower valve must be switched to the Drive position and the pneumatic suspension bellows must be pressurized.*



2 Lowered

The vehicle must be lashed with the chassis fully lowered.  
Turn the hand lever of the raise and lower valve to Lower (pneumatic suspension bellows are de-pressurized)!



Heavy duty lashing rings are mounted rigidly on the front and rear chassis frame area for lashing the vehicle.



In the case of low frame heights the heavy duty lashing ring is mounted rigidly on the front frame area.

### 3.14 Steering trailing axle



*A steering trailing axle may cause damage when manoeuvring in reverse. Therefore, before manoeuvring in reverse always:*

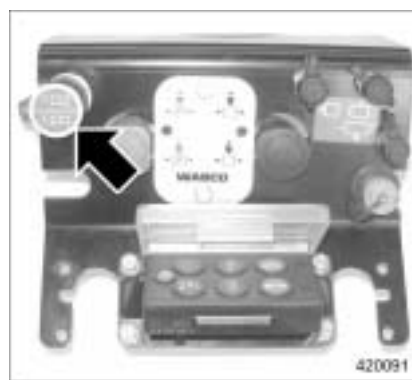
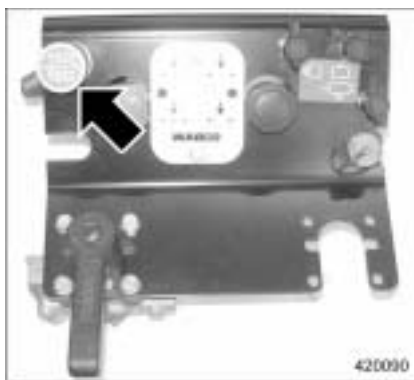
- *line vehicle up straight and*
- *disable steering trailing axle.*

*Re-enable the steering trailing axle for normal driving.*

Depending on the model, the reversing lock is implemented by:

- 1 selecting reverse gear,
- 2 actuating switch in driver's cab or
- 3 push/pull switch on semitrailer.

#### 3.14.1 Disabling the steering trailing axle



The push/pull switch (see arrow) is located on the left behind the axle assembly.

Disabling steering trailing axle:

- Line vehicle up straight.
- Pull switch - steering trailing axle is now disabled.

Enabling the steering trailing axle:

- Push switch - the steering trailing axle is enabled.

# 4 Operation: chassis

## 4.1 Loading and unloading

### 4.1.1 Preparation



#### Loading and unloading:

- Park vehicle on firm ground to prevent any possible sinking or tilting.
- Secure vehicle to prevent it from rolling away
  - Apply parking brake and
  - insert wheel chocks

#### When loading and unloading be sure:

- not to exceed total gross weight, axle loads, drawbar load or fifth wheel load
  - to keep the load's centre of gravity as low as possible
  - to distribute load evenly
  - to secure load and wedge it if necessary
- Observe information on securing loads on road vehicles from VDI 2700
- Vehicle rear wall must not be driven on or used as a ramp
  - In the case of a load that projects over the rear of the vehicle, please contact the Kögel Works or an approved workshop to enquire whether this is permissible.
  - Do not exceed maximum height or width when loading!



#### For personal safety:

For reasons of personal safety helmet, gloves and safety footwear should always be worn when loading and unloading.

### 4.1.2 Vehicle floor



#### Damage to floor!

An excessive load on the fork-lift truck's front axle can break the vehicle floor.

It is essential to comply with the warning sign showing maximum front-axle loading for fork-lift trucks.

Never exceed the maximum axle loading for fork-lift trucks.

The warning sign is attached to the right-hand rear corner stake.

#### Example:

Warning sign showing the maximum permissible front axle load of 5,460mm for a fork-lift truck.

## 4.2 Rollover resistance



### **Danger!**

#### *Semitrailer tipper.*

*An uncoupled semitrailer can tip over forwards or backwards,*

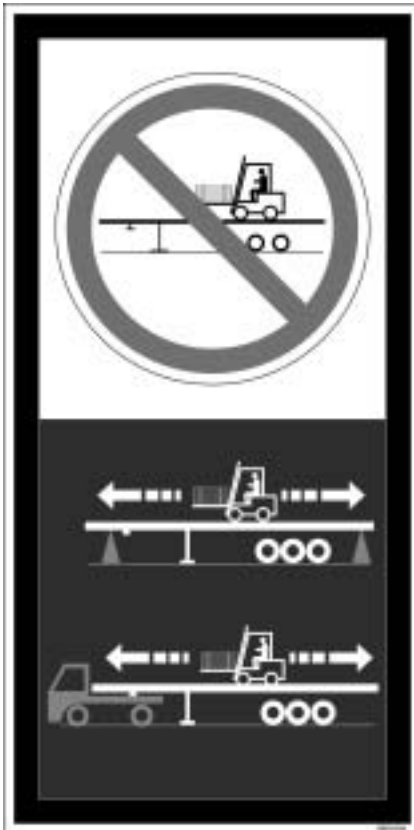
- if the fork-lift truck drives onto it*
- or the load is distributed unevenly.*

*This may result in serious or even fatal injury.*

*The uncoupled semitrailer that is to be loaded or unloaded:*

- should be secured at the front and rear with props or*
- coupled with the towing vehicle.*

*Observe the warning sign on the right-hand rear corner stake.*



### *Example: Combination sign:*

- 1 Do **not** drive fork-lift truck on an uncoupled semitrailer, load or unload it.
- 2 An uncoupled semitrailer can only be driven on by a fork-lift truck and loaded or unloaded if
  - additional supports are installed to the front and rear or
  - the towing vehicle is also used to immobilise the semitrailer

## 4.3 Securing the load

### General



*During loading and unloading, always observe the legal rules, accident prevention regulations, standards, directives and operating instructions for load securing.*

*Only use lashing material that has been approved by Kögel.*

Recommendations for load securing, for load distribution plan and for the selection of suitable lashing material are covered in (among other sources) the following VDI directives and standards:

VDI 2700, Load securing on road vehicles

VDI 2701, Load securing on road vehicles - lashing material

VDI 2702, Load securing on road vehicles - lashing forces

DIN 60 060 part 1, lashing straps manufactured from artificial fibre for securing loads on commercial vehicles for the transport of goods

Handbook BGF-ZH-1/413

Load securing on vehicles

Handbook for load securing

GDV Dienstleistungs GmbH, Item no. BRD-016-001

### 4.3.1 Lashing rings to DIN 75410



*Excessive tension loads and incorrect lashing angles cause material damage.*

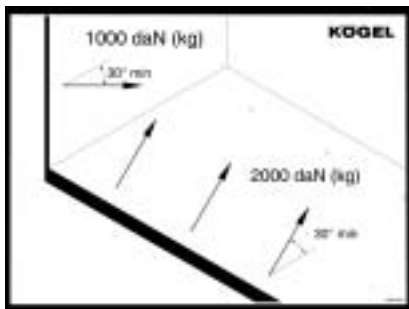
*Therefore, observe the instruction notice on the front wall of the cargo area.*

*The instruction notice gives information on:*

- *Max. tension loads for lashing rings and*
- *Angle between the cargo floor and the lashing material (tensioning strap).*



- Lashing rings at the edges of the cargo floor, in the outer frame, are provided for load securing.
- When the lashing rings are not required they must be folded down into the cargo floor or retracted into the outer frame.



An instruction notice on the front wall of the cargo area gives information on the maximum permitted loads of the DIN lashing rings.

Example:

- Max. tension loads for lashing rings: 2t per lashing ring
- The angle between the cargo floor and the lashing material (e.g. tensioning strap) must be:
  - 30° or
  - greater.

#### 4.4 Ladder



**Caution!**

*Danger of falling when climbing up or down.  
A fall can result in injury.*

*The ladder should therefore always be used.*

*The ladder should be retracted and secured before the vehicle drives off.*

##### 4.4.1 Extensible ladder



- Release and withdraw the ladder:
  - Push lever downwards (see arrow) to release the ladder
  - Carefully pull out the ladder and fold it down.

#### 4.5 Side underrun guards variant 1



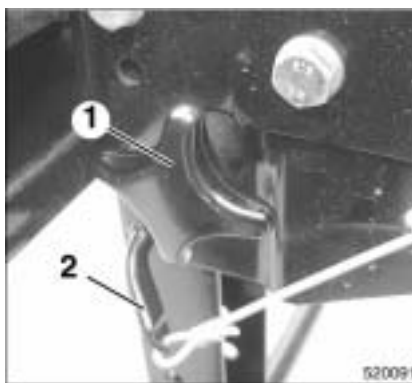
**Danger!**

*If the side underrun guard swings about while the vehicle is moving it can cause an accident, causing serious or even fatal injury.*

*The side underrun guard must be closed and secured before every journey.*



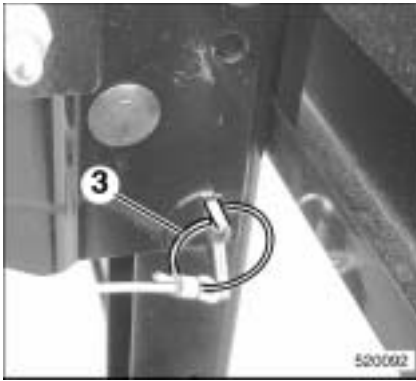
The side underrun guards must be folded up to remove the spare wheel.



**Prepare side underrun guards by:**

- undoing the star grips by turning them to the left. Do not remove !

- 1 Star grip
- 2 Securing pin



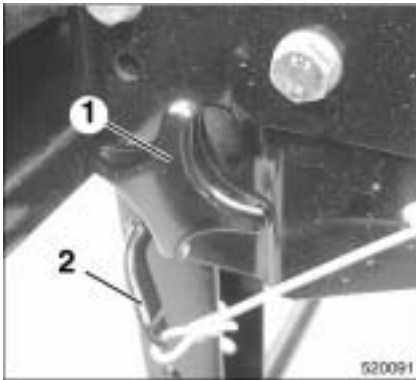
**Remove securing pin as follows:**

- Lift up safety ring (3) of cotter pin by 90°.
- Remove cotter pin.



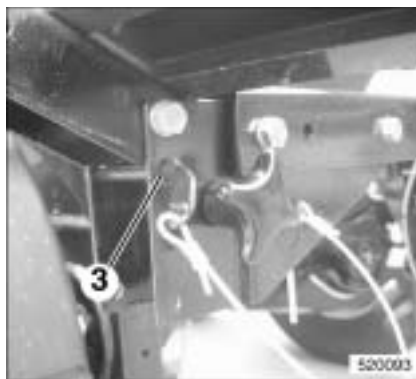
**Caution!**

*Fingers can become trapped when the cotter pin's safety ring is under spring pressure. Carefully lift up the cotter pin.*



- Remove locating pin. If removal is very difficult, push the side guard against the locating pin.
- In this way, remove all the locating pins.

- 1 Star grip
- 2 Securing pin



**Lift up side underrun guard:**

- Swing side underrun guard upwards.
- Push locating pin into hole that becomes free near the pivot bolt. This has the effect of preventing the side guard from folding.
- Push in all the locating pins for safety.



**Caution!**

*The side guard can fall down suddenly and cause injury through impact or trapping! Secure side guard in its raised position using all the securing pins.*

**Folding down the side guards**



**Remove or install spare wheel.**

- Fold down side guard.
- Push in all securing pins:
  - Side guard is now secured against swinging.
- Insert cotter pin, press down safety ring.
  - Securing pins are prevented from falling out.
- Clamp hoops by tightening star grips.

## 4.6 Side underrun guards variant 2



### **Danger!**

If the side underrun guard swings about while the vehicle is moving it can cause an accident, causing serious or even fatal injury.  
The side underrun guard must be closed and secured before every journey.



### **General**

The side underrun guards must be folded up to remove the spare wheel.



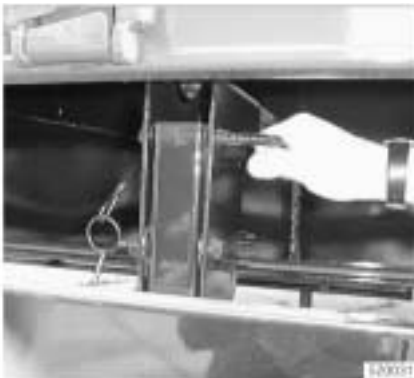
### **Raising**

- Lift up ring of cotter pin by 90°.
- Remove cotter pin.



### **Caution!**

Fingers can become trapped when the cotter pin's safety ring is under spring pressure.  
Carefully lift up the cotter pin.



- Remove locating pin. If removal is very difficult, push the side guard against the locating pin.
- In this way, remove all the locating pins.



- Fold up side guard completely.
- Push locating pin into hole that becomes free near the pivot bolt. This will secure the side guard, and prevent it from falling down
- Push in all the locating pins for safety.



### **Caution!**

The side guard can fall down suddenly and cause injury through impact or trapping!  
Secure side guard in its raised position using all the securing pins.

### Folding down the side guards



Remove or install spare wheel. Fold down the side underrun guards again. The steps are carried out in reverse order.

- The side guard must be secured against swinging out using all the locating pins.
- The locating pins must be secured against falling out. Therefore, insert the cotter pins and press down their safety rings.

## 4.7 Spare wheel storage

Before removing the spare wheel, fold up the "side underrun guards".

- When the spare wheel is removed or re-inserted and during maintenance and checks of spare wheel holders, the following regulations, safety rules and principles must be observed:
- Road Traffic Regulations (in Germany StVO)
- Motor Vehicle Safety Standards (in Germany StVZO)
- Accident prevention regulation - vehicles (in Germany VBG 12)
- Safety rules for the storage of spare wheels (in Germany ZH 1/13)

Principles for the inspection of vehicles by transport personnel (ZH 1/282.1)

Spare wheels must be secured by means of two effective and functionally independent devices.

When working in the road with moving traffic, a suitable safety waistcoat must be worn.

### 4.7.1 Spare wheel cradle



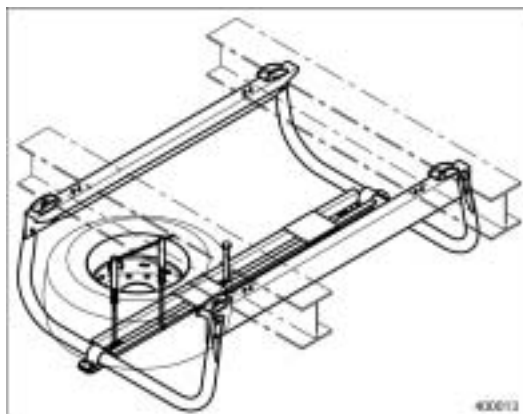
#### **Caution!**

*Spare wheel is heavy.*

*There are a number of dangers when changing the spare wheel: feet or hands may become trapped, the head may be banged on the frame.*

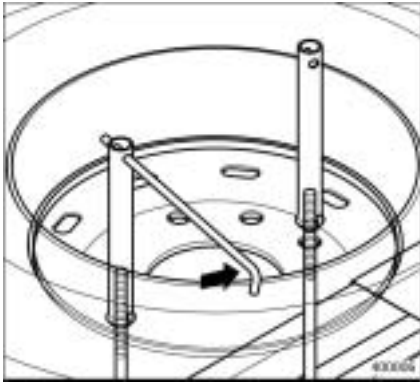
*Carefully take out or replace the spare wheel.*

*If necessary, obtain help from a second person.*



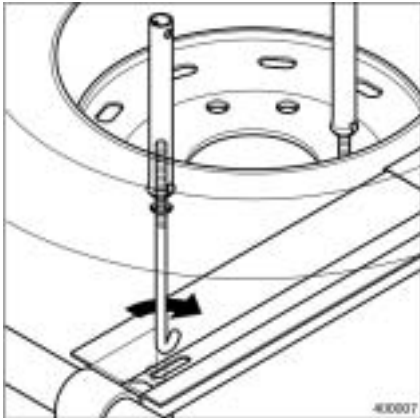
#### **General notes**

A spare wheel must not be installed in this cradle unless it is designed to fit there.

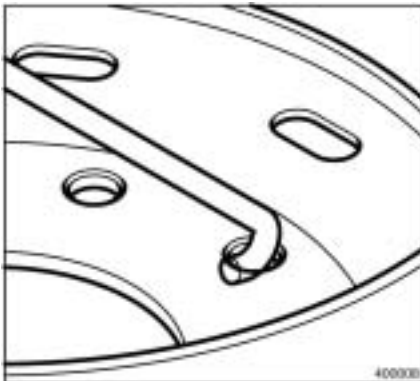


### Removing the spare wheel

- Remove padlock.
- Take out the crossbar and use it to loosen the barrel nuts and unscrew them approx. 15-20 mm.



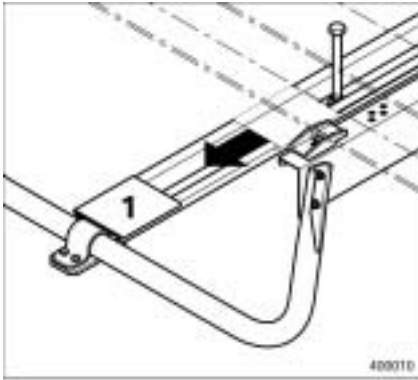
- Now, turn the hook bolts in conjunction with the barrel nuts about 90° and pull upwards.



- Remove the hook bolts with barrel nut as shown in the diagram on the left.
- Remove both hook bolts in this way.



- Remove the spare wheel.

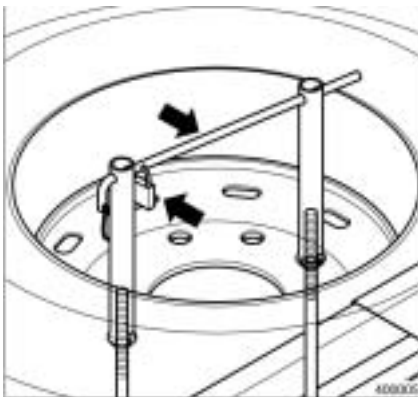


### Inserting the faulty wheel

- Pull support rail (1) fully outwards.
- Lift wheel, place it on support rail and push it into the spare wheel cradle.



- Turn the wheel so that two opposite stud holes are positioned over the slotted holes of the spare wheel support.
- Guide the hook bolts with the barrel nuts through the stud holes and the slotted holes and turn them so that the hooks are located.



- Tighten barrel nuts with max. 80 Nm  
Depending on the maintenance level and present condition of the screwed connections, the crossbar may be used to increase the applied torque.
- Push crossbar through both barrel nuts and fit padlock to prevent it from falling out.



*During the daily checks taken before driving off, ensure that the spare wheel holder and safety devices are in good order and securely attached.*

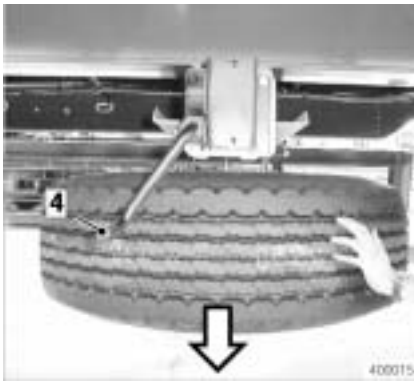
### 4.7.2 Spare wheel storage with winch, variant 1



### Lowering the spare wheel

- 1 Cotter pin with spring ring
- 2 Hexagonal nut
- 3 Threaded bolt

- Remove the padlock and the two cotter pins (1).
- Using a 32 mm spanner, unscrew the two (2) nuts.
- Remove the nuts.



#### 4 Crank handle

- Turn the crank handle (4) anti-clockwise and lower the spare wheel.
- When lowering, ensure that the threaded bolts (3) are not damaged by the cross member.
- The wheel support is removed through the large central hole.
- Fit the spare wheel.

#### *Inserting the spare or faulty wheel*

- Place the wheel below the spare wheel holder.
  - Lower the wheel support with the winch.
  - Guide the wheel support through the wheel's large central hole
  - Thread the centering pins into the two opposite wheel stud holes.
  - Raise the wheel with the winch.
  - Guide the threaded bolts on the wheel support through the holes in the spare wheel holder.
  - During raising, ensure that the threaded bolts are not damaged by the cross member.
  - Screw on the nuts using a 32 mm spanner and tighten.
  - Secure the nuts with the spring ring cotter pins.
- Secure the crank handle with the padlock.

### 4.8 Wheel chock



- *You must comply with German Motor Vehicle Safety Standards (StVZO).*
- *Additional information can be found in the brochure from the employers' liability insurance association:  
- "BG-Information BGI 599 - Safe coupling of vehicles -"*
- *After use, the wheel chock must always be returned to its holder and secured there.*

#### *Examples:*



Wheel chock on the landing gear.



Wheel chocks behind axle assembly.

#### 4.9 Stowage pallets/boxes



##### **Important:**

- Only use for transporting empty pallets
- Load pallets in a self-locking arrangement, see loading diagram
- Only drive when the stowage pallets/boxes are locked.
- Check that locks are closed
- Ensure that there is sufficient ground clearance when driving



##### **Open**

- Unlatch the toggle clips and suspend them at the side of the pallets/boxes.



- Carefully hinge open the cover and push in on the guide rails located on the underside of the stowage pallets/boxes.
- Using the cover attachment straps, attach to the lower edge of the box.



##### **Close**

- Pull the cover out from the guide rail.
- Carefully lift up the cover.
- Attach the toggle clips and close them.

### *Pallet loading plan*

The example shows a pallet stowage box with 36 pallets. Pallet stowage boxes for larger or smaller quantities of pallets should be loaded in the same self-locking manner.



#### 4.10 *Plastic toolbox*



- *The toolbox must be closed and secured before every journey.*
- *The specified load per area unit must be noted and adhered to, see manufacturer's instructions on inside of lid.*



A lockable toolbox is available as special equipment and this is stored at the side of the frame. The exact location depends on the other equipment of the trailer or body.

- Depending on the installation position, it may be necessary to first lift up the side underrun guards before the toolbox can be opened.
- Remove the safety device (cotter pin, padlock).
- Use the thumbs to push the safety catch on the lid up.
- Open lid of toolbox.  
Be aware that tools may fall out.

# 5 Electrical system

## 5.1 General (semitrailer)



### 15-pin socket

- The electrical system operates at 24V (see electrical wiring diagram page 39).
- Pin configuration see page 41
- conforms to DIN ISO 12098



The **warranty** is invalidated if you open or drill the socket cabinet!



### Socket box

- Special equipment
- 15-pin connection conforms to DIN ISO 12098
- 7-pin 24V-N conforms to Norm DIN ISO 1185
- 7-pin 24V-S conforming to DIN ISO 3731 is possible (see electrical wiring diagram page 40)

## 5.2 Change blade-type fuses in the combined distribution box



- Blade-type fuses are not fitted to vehicles with TCE
- The **warranty** is invalidated if you open or drill the combined distribution box!
- Only undo the screws on the case of the registration plate light



- Undo cross-head screws from the case of the registration plate light.
- Remove housing from registration plate light
- Replace any faulty blade-type fuses
- Mount case for registration plate light and
- carefully finger-tighten cross-head screws.

### 5.3 Configuration of the plug-in connections in the standard and extended combined distribution boxes

Fuses	"Standard", item no.: 333400	Item	Pin
Fuse 1; 2A	not used		
Fuse 2; 2A	not used		
Fuse 3; 2A	Tail lamp left	6	58L
Fuse 4; 2A	Outline marker red/white, right	8	58L
Fuse 5; 2A	Outline marker left	10	58L
Fuse 6; 3A	SMRL and outline marker left	12	58L
Fuse 7; 2A	Tail lamp right	1	58R
Fuse 8; 5A	not used		
Fuse 9; 2A	not used		
Fuse 10; 2A	Outline marker red/white, left	11	58R
Fuse 11; 2A	Outline marker right	10	58R
Fuse 12; 3A	SMRL and outline marker right	7	58R

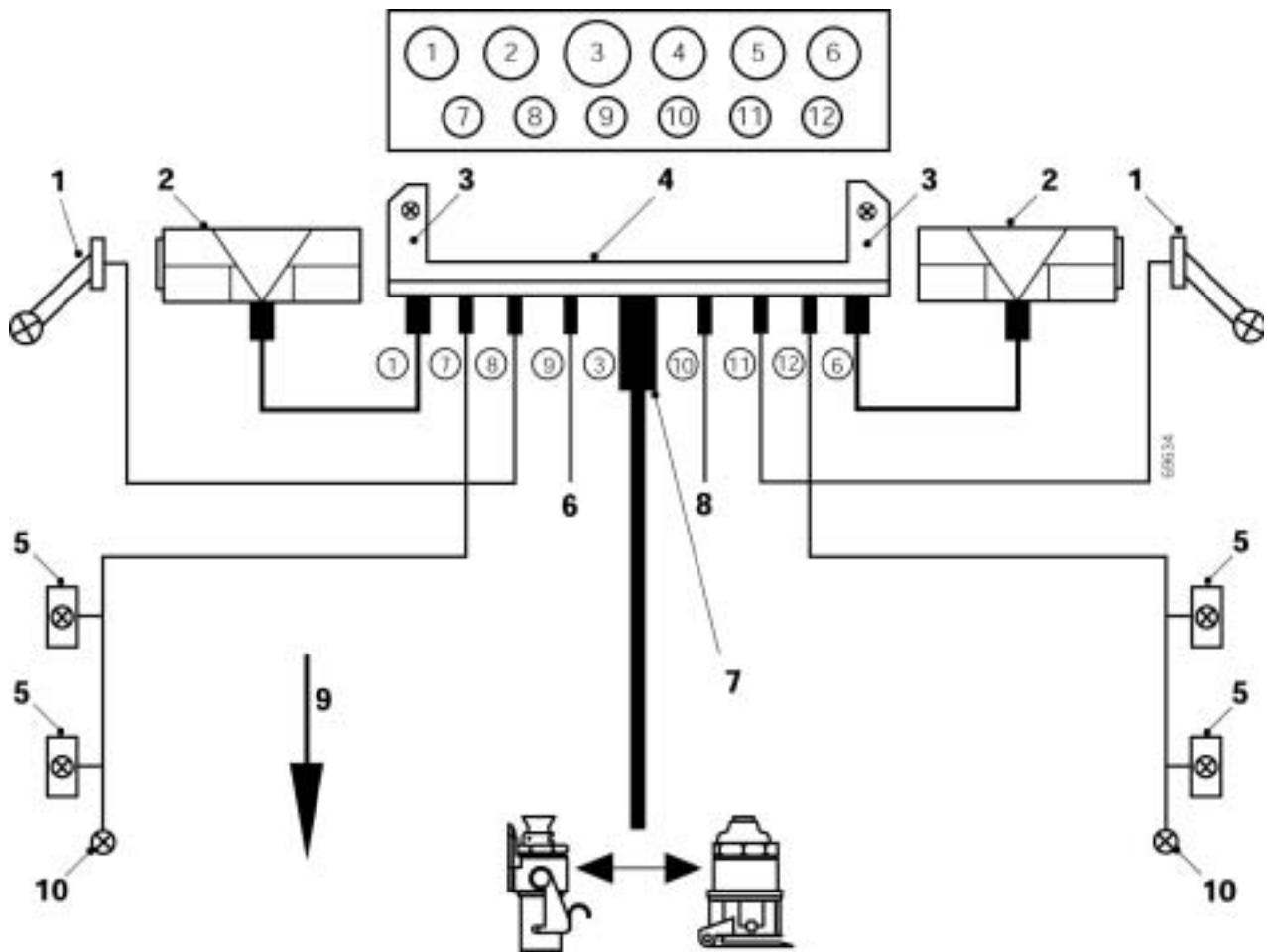
Fuses	"Extended" item no.:349041	Item	Pin
Fuse 1; 2A	Additional socket, left turn signal	4	27
Fuse 2; 2A	Left tail lamp/additional socket	6/4	58L/24
Fuse 3; 2A	Additional socket brake light	4	25
Fuse 4; 2A	Outline marker red/white, right	8	58L
Fuse 5; 2A	Outline marker left	2	17
Fuse 6; 3A	SMRL and outline marker left	12	58L
Fuse 7; 2A	Additional socket, right turn signal	4	26
Fuse 8; 5A	Interior lighting	9	34
Fuse 9; 2A	Right tail lamp/additional socket	1/4	58R/23
Fuse 10; 2A	Outline marker red/white, left	11	58R
Fuse 11; 2A	Outline marker right	2	18
Fuse 12; 3A	SMRL and outline marker right	7	58R

Fuses	"Extended" item no.:349042	Item	Pin
Fuse 1; 2A	Tail lamp left	6	58L
Fuse 2; 2A	Additional socket brake light	4	54
Fuse 3; 2A	not used		
Fuse 4; 2A	Left tail lamp/additional socket	4	58L
Fuse 5; 2A	Outline marker red/white, right	8	58L
Fuse 6; 3A	SMRL and outline marker left	12	58L
Fuse 7; 2A	Tail lamp right	1	58R
Fuse 8; 5A	not used		
Fuse 9; 2A	not used		
Fuse 10; 2A	Right tail lamp/additional socket	4	58R
Fuse 11; 2A	Outline marker red/white, left	11	58R
Fuse 12; 3A	SMRL and outline marker right	7	58R

Fuses	"Extended" item no.:333514	Item	Pin
Fuse 1; 2A	not used		
Fuse 2; 2A	Tail lamp 1 left	5	58L
Fuse 3; 2A	Tail lamp 2 left	6	58L
Fuse 4; 2A	Outline marker red/white, right	8	58L
Fuse 5; 2A	Outline marker left	10	58L
Fuse 6; 3A	SMRL and outline marker left	12	58L
Fuse 7; 2A	Tail lamp 1 right	1	58R
Fuse 8; 5A	not used		
Fuse 9; 2A	Tail lamp 2 right	2	58R
Fuse 10; 2A	Outline marker red/white, left	11	58R
Fuse 11; 2A	Interior lighting	9	34
Fuse 12; 3A	SMRL and outline marker right	7	58R

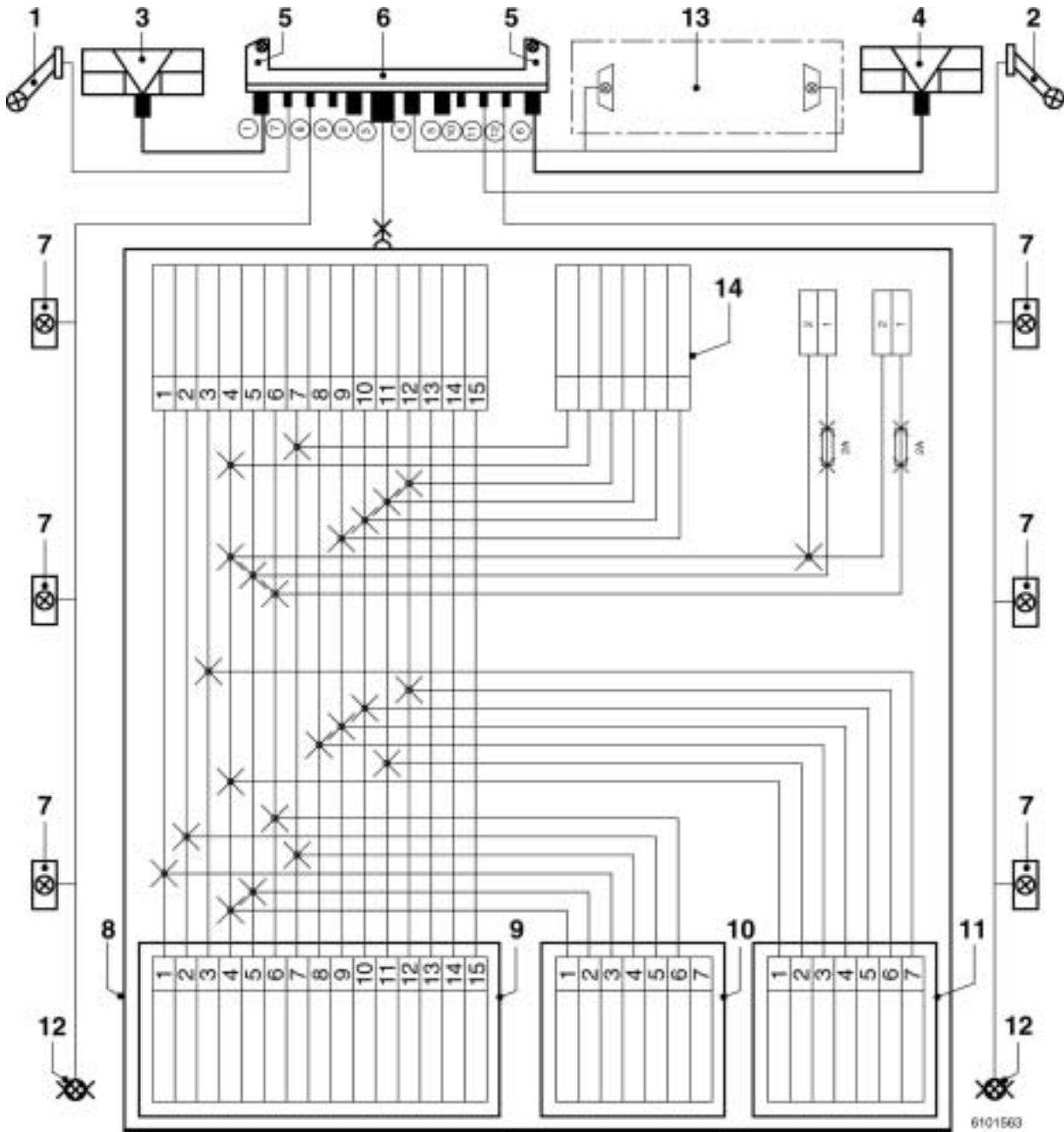
SMRL = side marker and rear reflector lamp

### 5.4 Electrical wiring diagram with 15 pin plug-in connection



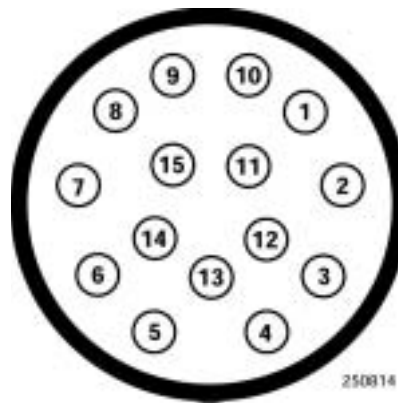
- 1 Outline marker right, red/white (URL)
- 2 Multi-compartment lamp with integrated SMRL
- 3 Fuse
- 4 Combined distributor ID no. 333400; Connection diagram in distributor housing
- 5 Side marker and rear reflector lamps (SMRL)
- 6 For the outline marker lights, right
- 7 15-pin plug
  - 1 = Turn indicator left
  - 2 = Turn indicator right
  - 3 = Rear fog lamp
  - 4 = Earth
  - 5 = Tail lamp left
  - 6 = Tail lamp right
  - 7 = Brake lamp
  - 8 = Reversing lamp
  - 9 - 15 = unallocated
- 8 For the outline marker lights, left
- 9 Direction of travel
- 10 Outline marker (rear) (BGL)

5.5 Electrical wiring diagram with socket cabinet



- |  |  |   |
|--|--|---|
| 1 Outline marker right, red/white  | 4 = Earth white                        | 3 = Turn indicator, left, amber         |
| 2 Outline marker left, red/white   | 5 = Tail lamp left black               | 4 = Brake light, red                    |
| 3 Multi-compartment lamp, right  | 6 = Tail lamp right brown              | 5 = Turn indicator right, green         |
| 4 Multi-compartment lamp, left   | 7 = Brake light, red                   | 6 = Tail lamp right brown               |
| 5 Fuses  | 8 = Reversing light pink               | 7 = Free                                |
| 6 "Standard" combined distributor, circuit and connection diagram in distributor housing | 9 = Permanent positive orange          | 11 7-pin socket 24V/S ISO 3731          |
| 7 Side marker and rear reflector lamps   | 10 = Reverse lock grey                 | 1 = Earth white                         |
| 8 Socket box   | 11 = Platform approach aid white/black | 2 = Platform approach aid white/black   |
| 9 15-pin socket ISO 12098  | 12 = Lift axle white/blue              | 3 = Reversing light pink                |
| 1 = Turn indicator, left, amber  | 13 = Earth white/red                   | 4 = Permanent positive orange           |
| 2 = Turn indicator right, green  | 14 = Data line white/green             | 5 = Reverse lock grey                   |
| 3 = Rear fog light, blue   | 15 = Data line white/brown             | 6 = Lift axle white/blue                |
|  | 10 7-pin socket 24V/N ISO 1185         | 7 = Rear fog light, blue                |
|  | 1 = Earth white                        | 12 Outline marker (rear) (BGL)          |
|  | 2 = Tail lamp left black               | 13 Second registration plate (optional) |
|  |  | 14 Plug connector 6-pin                 |

### 5.6 Pin configuration, 15 pin plug-in connection ISO 12098



Pin No.	Function
1	Turn indicator left
2	Turn indicator right
3	Rear fog lamp
4	Earth pin 1-3 and 5-12
5	Tail lamp left
6	Tail lamp right
7	Brake lamp
8	Reversing lamp
9	Permanent positive
10	Reversing lock
11	Platform approach aid
12	Lift axle
13	Earth
14	Data cable
15	Data cable

# 6

## Lubricants and hydraulic fluids

Perfect functioning, safety of operation and long service life of a vehicle depend to a large extent on the quality and correct choice of lubricants.

### 6.1 Lubricating grease

<i>Lubrication point</i>	<i>Lubricant</i>
Fifth wheel couplings, kingpin, fifth wheel pick-up plate, landing gear	High pressure grease (EP) with MOS2 or graphite additive e.g. BP: L21 M or HTEP 1; ESSO: Multi-purpose grease M; Shell: Retinax AM
Central lubrication system	Special grease; e.g. Texaco: Glissandro FL283, Kögel ID no. 75 613

### 6.2 Hydraulic oils

Perfect functioning, safety of operation and long service life of a hydraulic system depends to a great extent on the quality and correct choice pressure fluids. On this vehicle, hydraulic oils of the group H-LP are used. The H-LP hydraulic oils are composite mineral oils for the highest duty and have e.g.

- good viscosity, temperature and anti-corrosion properties
- compatibility with normal sealing materials
- increased wear protection through EP additives etc.

Various viscosity classes are available to allow easier selection.

The designation corresponds to the mean viscosity in  $\text{mm}^2/\text{s}$  at 40°C.

- Recommended for year-round use in central Europe: ISO VG 32

### 6.3 Disposing of lubricants and hydraulic fluids



*Used oil and grease is waste requiring monitoring and should be disposed of in accordance with legal waste regulations.*

*Information about the "European Waste Type Directory" can be obtained from appropriate authorities.*

#### 6.4 Refrigeration plant fuel tank



The fuel tank is located between the landing gear support legs.  
The filler pipe (1) is on the right hand side of the vehicle, near to the level indicator which is available as special equipment (2).



*Switch off the engine of the refrigeration plant when filling up the fuel tank.*

# 7 Inspection, care and maintenance

## 7.1 Inspection and maintenance

Vehicles must be inspected as frequently as required, but at least once a year by an authorised specialist to ensure that they are in roadworthy condition. For details of inspections to be performed, please refer to the "Principle requirements for the inspection of vehicles by authorised specialists" ZH 1/282.2.

Inspection of the roadworthy condition of the vehicle is also deemed to have been performed if an inspection has been successfully completed by an authorised specialist in accordance with the Motor Vehicle Safety Standards (in Germany StVZO).



- Always observe the accident prevention regulations when performing maintenance work.
- Observe environmental conservation guidelines.
- Switch off the engine before starting all maintenance work.
- Under no circumstances repair damaged fifth wheel couplings/kingpins, but replace with new.
- Damaged and non-functioning components must be replaced with original Kögel spare parts.

## 7.2 Kögel inspection log for load securing

*For your safety!*

Kögel platform semitrailer with an inspection log whose content is in accordance with:

- DC Directive 9.5 Edition 12 and/or
- Directives EN 12642XL and VDI 2700

They are to be inspected once a year by an authorized specialist of an approved KÖGEL workshop. Please comply with additional details in the relevant inspection log.

## 7.3 General

When performing all maintenance work, always observe the accident prevention regulations.

Switch off the engine before starting all maintenance work.

Observe environmental conservation guidelines.

### 7.3.1 Checking the firm fit of screws and nuts

*Tightening torques*

Metric thread	Tightening torque (Nm)		Metric thread	Tightening torque (Nm)	
	8.8 *)	10.9 *)		8.8 *)	10.9 *)
M 5	5,5	8,1	M 20	425	610
M 6	9,6	14	M 20x1.5	475	680
M 8	23	34	M 22	580	820
M 8x1	25	37	M 22x1.5	630	900
M 10	46	67	M 24	730	1050

*Tightening torques*

Metric thread	Tightening torque (Nm)		Metric thread	Tightening torque (Nm)	
M 10x1.25	49	71	M 24x2	800	1150
M 12	79	115	M 27	1100	1550
M 12x1.5	83	120	M 27x2	1150	1650
M 14	125	185	M 30	1400	2000
M 14x1.5	135	200	M 30x2	1500	2150
M 16	195	290	M 36	2450	3500
M 16x1.5	210	310	M 36x2	2650	3780
M 18	300	430	M 42	3930	5600
M 18x1.5	340	485	M 42x2	4280	6050

The specified tightening torques apply up to and including M 16x1.5 for screws with galvanised surface (coefficient of friction  $\mu = 0.125$ ).

In the case of screws with a larger diameter, the basis for the coefficient of friction is  $\mu = 0.14$ .

\* The specified numerical values 8.8 and 10.9 describe strength categories in accordance with DIN ISO 898 Part 1.



*The tightening torques do not apply in the case of:*

- *Wheel nuts (Torque: 650 Nm)*
- *Special mounting regulations: e.g. use of lubricants containing MoS<sub>2</sub> additives.*

*Screw strength*

Strength class	8.8	10.9
Minimum strength in N/mm <sup>2</sup>	800 (over M 16: 830)	1040
Minimum yield strength in N/mm <sup>2</sup>	640 (over M 16: 660)	940

All screws and nuts must be periodically checked for a firm fit. This also includes all screw connections on the frame and other attachments.



*When screws are removed, ensure that:*

- *new nuts are used and*
- *in the case of screws with locking devices, replace complete with locking device!*

**7.4 Maintenance plan**

All the intervals given in the following maintenance plan have been established from experience and should be used for the operational situations as described. Extension of the specified intervals due to operating experience gained by the user prior to expiry of the warranty period is only permitted with the agreement of the manufacturer: Kögel Fahrzeugwerke GmbH. The references listed in the maintenance plan refer to the maintenance work described in the following pages.

Maintenance work	After the first			Every		
	50 km	500 km 1. Journey with load	5,000 km	5,000 km (every 14 days)	10,000 km monthly	50,000 km six-monthly
Check wheel nuts for firm fit	X	X	X	X		
Check all fixing screws for firm fit, tighten if necessary		X	X			X
Check tyre pressures			X	X		
Brake system: Maintenance work		X	X	X		X
Check the brake setting/adjust if necessary		X	X	X		
Lubricate the slack adjuster (with lubricating nipple)					X	
Electrical system: Maintenance work					X	
Check the spare wheel mounting and lubricate moving parts		X	X			X
Lubricate fifth wheel coupling and kingpin			X	X		
Fifth wheel coupling, kingpin: Check screws for firm fit			X			X
Check the fifth wheel coupling and kingpin for wear					X	
Oil all moving parts, or lubricate if a lubricating nipple is available			X		X	
Check the frame and mounted parts for cracks and damage						X

## 7.5 Lubrication work

When there is no central lubricating system, all the following lubrication work must be performed.

For lubricating, only use high-pressure lubricating equipment which does not exceed a lubricating pressure of 250 bar. Damage to bearings, seals etc. can occur if the lubricating equipment used is not fitted with a safety device.



*Carefully clean lubricating nipples before lubricating!*

### **Axles**

See the manufacturer's operating instructions.

### ***Fifth wheel coupling, kingpin, fifth wheel pick-up plate***

The pick-up plate and kingpin as well as the top of the fifth wheel coupling plate, the wearing parts and wear ring must be well coated using long-life high-pressure grease containing a molybdenum or graphite additive (e.g. BP L21 M; BP HTEP 1; Esso Multi-purpose grease M; Shell Retinax AM). The lubricating grooves in the fifth wheel coupling plate must be completely filled with grease. Before coupling up each time, but especially before the semitrailer is coupled to the towing vehicle for the first time, and after every lubricating service, the fifth wheel coupling lock must be in the drive-in position.

### ***Landing gear***

See the landing gear manufacturer's operating instructions.

## 7.6 Maintenance work, mechanical components



For safety reasons all important mechanical components such as:

- Axles
- brakes
- hydraulic cylinders
- screws
- pipe connections
- and safety fastenings must be inspected and serviced at regular intervals.

Servicing instructions for the following sub assemblies can be found in the manufacturer's operating and maintenance manuals:

- Landing gear
- Axles
- Fifth wheel coupling and kingpin
- Tarpaulin frame
- Tail lift

The following maintenance and repair instructions refer only to mechanical components.

### 7.6.1 Automatic slack adjuster (AGS)

All adjustment components are enclosed in the protected interior of the slack adjuster. Its operation cannot therefore be impaired by the effects of dirt, moisture, ice or snow. The AGS is accordingly largely maintenance free. It only requires re-greasing (at the same intervals as the camshaft bearing; see the axle manufacturer's maintenance instructions) using the lubricating nipple. Slack adjusters that are greased for life must not be re-greased. Adjusting of the AGS can only be performed by an approved workshop.

### 7.6.2 Wheels and tyres



***Tyres may only be fitted by suitably qualified specialists!***

#### ***Tyre pressures***

- The relevant tyre pressures can be found in tyre manufacturers' manuals.
- Check at least once every two weeks and adjust if necessary. (including spare wheel)
- Inflate spare wheel to highest tyre pressure used on the vehicle.
- Tyre pressures should be checked when tyres are cold (before starting journey or after lengthy break from driving).
- In the case of dual wheels it is essential that the pressure in both wheels is kept equal.
- When tyre pressures are too high or too low, the mileage achieved by the tyres will be substantially reduced.

### Re-tightening the wheel nuts or wheel bolts



#### **Danger!**

##### *Loose wheel nuts or bolts*

*The wheel may fall off and cause an accident.*

*This may result in serious or even fatal injury.*

*You must therefore carry out the following without fail:*

- *Check wheel nuts or bolts regularly for a firm fit.*
- *Always re-tighten wheel nuts or bolts after the first hours of use (50 km), after the first journey with full load (max. 500 km), after the first 5000 km, and subsequently every one hundred hours of service.*
- *Always tighten the wheel nuts or bolts of a changed wheel after one hour of service.*
- *When using new or freshly painted rims, always additionally re-tighten wheel nuts or bolts after 20 to 100 hours of service.*



*Tighten wheel nuts or bolts crosswise.  
Observe the prescribed tightening torques.*

#### *Tightening torques for wheel nuts or bolts*

Wheel bolts	Tightening torque for bolt centring	Tightening torque for middle centring	For Trilex wheels
M 22x1.5	450 Nm	630 <sup>±30</sup> Nm	
M 18			300 Nm
M 20			350 Nm

### 7.6.3 Wheel changing



*When changing a wheel, always pay attention to the following points:*

- *Secure the vehicle against rolling away.*
- *Use specified tyre and rim sizes*
- *Guide rim carefully over wheel bolts*
  - *Replace wheel bolts if damaged*
- *Choose specified tyre load-bearing capacity and speed index*
- *Check tyre pressure*
- *Retain the same running direction of the wheels.*
- *On axles with pairs of wheels always use tyres with the same profile.*
- *Oil the threads lightly before fitting the wheel nuts. (Do not use oil with an molybdenum disulphide additive (MoS<sub>2</sub>)).*
- *Always tighten wheel nuts crosswise.*
- *Tighten wheel nuts again*
  - *after at least 1 hour of driving and*
  - *then after every 200 hours of driving.*
- *They should be re-tightened every time the wheel is changed.*

### 7.6.4 Alloy wheels

Alloy wheels are only permitted for middle centring.

#### *Lubricants for the hubs*

Only

- "Freylube"
- "Rocol MG"
- "Esso (Moly)" or

- similar lubricants should be applied to hubs.  
These greases prevent the wheel from adhering to the hub. The surfaces of the hub and brake drum must be smooth, level and clean.  
No conical or spherical nuts must be used. Only fit the supplied valves or those with nickel or chrome plating.

***When changing a wheel:***

- Check for a firm seating of the valve nut before fitting the wheel and then weekly during use.
- Always apply tightening torque of 9 - 14.6 Nm.

***Cleaning alloy wheels***

Wash regularly, and particularly after the vehicle has been used

- for transporting cattle
- for alkaline materials and
- in the winter when roads are treated with salt

Alloy wheels do not require any particular maintenance apart from occasional polishing.



***Use of brass valves.***

*Brass is incompatible with aluminium and encourages corrosion. The valve could break at the bend.*

- *Brass valves must therefore never be used!*
- *Treat the valve hole and seat with "Freyllube" or a similar type of lubricant.*

### 7.6.5 *Pneumatic suspension*

The pneumatic suspension is maintenance-free; however, the maintenance and care instructions from the axle manufacturer must still be observed.

### 7.6.6 *Spare wheel holder*

- The following regulations, safety rules and principles must be observed during maintenance and checking of spare wheel holders:
  - Road Traffic Regulations (in Germany StVO)
  - Road Licensing Regulations (in Germany StVZO)
  - Accident prevention regulations- vehicles (in Germany VBG 12)
  - Safety rules for the storage of spare wheels (in Germany ZH 1/13)
  - Principles for the inspection of vehicles by transport personnel (ZH 1/282.1)

### 7.6.7 *Cables*

Cables, e.g. of the spare wheel storage, must be regularly checked for breakage, deformation, corrosion and also cleaned and oiled. Wear protective work gloves - there is a risk of injury!  
Artificial fibre cables must be replaced at least every 3 years.

## 7.7 Maintenance work on the brake system



### **Brakes are safety components, therefore**

- the Road Licensing Regulations (in Germany StVZO) must be observed
- Main inspections must only be conducted by accredited workshops
- Check and service braking system regularly
- Work on the brake system may only be carried by persons with the appropriate levels of knowledge and experience!
- Any faults found in the braking system must be repaired immediately by a brake service workshop
- The brake valve settings specified by the manufacturer must not be altered
- When brake linings are changed, never use any other than the approved linings.

### 7.7.1 Compressed air system

The maintenance work described below must be performed conscientiously by the driver before starting each journey.

#### **Screwed connections**

- Check the screw connections periodically for firm fit. Re-tighten in the event of leaks.
- Replace damaged hoses and airlines in good time.

#### **Coupling heads**

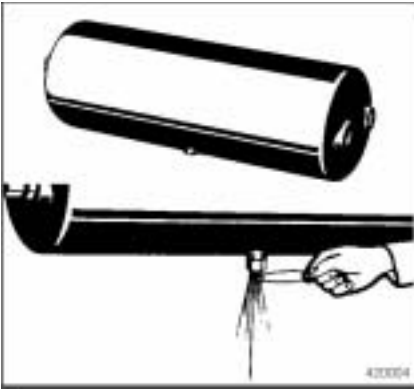
- When the trailer has been uncoupled, the covers of the coupling heads must be closed.
- The sealing surfaces of the non-interchangeable coupling heads must be cleaned with spirit before coupling up.
- Replace damaged sealing rings.



**Do not use petrol or diesel fuel for cleaning purposes.  
Do not allow the sealing rings to come into contact with grease.**

#### **Line filter**

- The line filter element must be removed and cleaned once every three months - but earlier if the vehicle has travelled 25,000 km since the last service.
- When dismantling the line filter - carefully withdraw the slide. The internal springs are pre-tensioned - hold down the lid! Remove the sealing cover, springs, intermediate cover and filter cartridge. Clean the filter cartridge with compressed air. Replace the filter cartridge if damaged.
- When reassembling the line filter, check the O-ring of the sealing lid and replace if damaged. Place the cleaned or new filter cartridge in the housing with the opening to the outside. Insert the large spring. Position the intermediate cover with its rim facing outwards on to the spring. Press the sealing cover together with the small spring into the housing. Do not tilt the sealing lid while pressing it on! This will damage the O-ring and cause the line filter to leak. With the sealing cover pressed in, push in the slide.



### Compressed air tank

- On vehicles fitted with manual drainage valves, the tanks must be regularly drained and leaking drainage valves must be replaced. To drain the compressed air tank, the actuating pin of the drainage valve screwed in on the underside of the tank must be pulled or pushed to the side when the tank is pressurised. This causes the condensed water to be forced out of the tank by the compressed air. When no more condensation emerges, the actuating pin is released and the drainage valve closes automatically.
- This operation is not required on vehicles fitted with automatic drainage valves.

### Test connection

- The protective cover of the test connection must always be screwed on! The tappet is greased with multi-purpose grease every three months, or earlier if the vehicle has travelled 25,000km since its last service. Corroded or leaking test connections must be replaced.

### Diaphragm brake cylinder

- In the case of a diaphragm brake cylinder, the pin of the slotted fork-type joint must be cleaned of dirt every three months - or earlier if the vehicle has travelled 25,000 km since the last service - and lubricated with machine oil. It must be replaced every two years at the latest.

## 7.7.2 Anti-lock brake system (ABS)

- When coupling-up, the additional ABS plug-in connection (ISO 7638) for the power supply to the electronic control unit of the trailer must be plugged in next to the 24 N connection. The towing vehicle is normally equipped with up to three warning or indicator lamps for the various functions and system monitoring.

## 7.7.3 Wheel brake

For all maintenance and repair work see: "axle manufacturer's maintenance instructions".



*When brake linings are replaced, only the same linings are to be fitted as used during manufacture or brake linings permitted according to the details given in the "brake system" description. Use of other brake linings will invalidate the operating licence. An application to obtain a valid licence can be made through the vehicle acceptance procedure (in Germany 19 StVZO). Independent of this, guarantee claims against the brake and vehicle manufacturer are invalidated.*

## 7.8 Spring-loaded parking brake emergency release device



### Caution!

*Pre-tensioned spring.*

*When the cylinder is opened the spring can be projected out causing serious impact injuries.*

*Repairs to the spring-loaded diaphragm cylinder may only be carried out by an approved service workshop.*

### Release in the case of a pressure drop

In case of a pressure drop in the brake system, the pre-tensioned spring is released, initiating an automatic braking operation.

### 78.1 Spring-loaded diaphragm cylinder type TSL



Example

1 Sealing cap

2 Release screw, plain washer and hexagonal nut

While the vehicle is in Drive mode, the release screw (2) is fastened at the side in a specially provided hole (see diagram).

The sealing cap (1) closes the hole in the cover of the spring-loaded diaphragm cylinder.

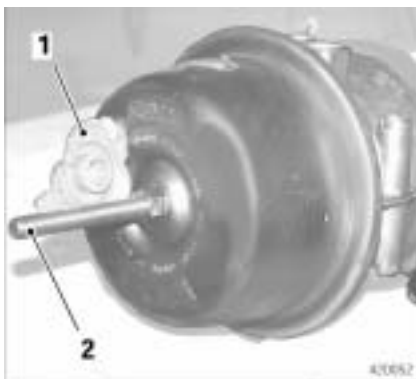


To release, i.e. tension the spring:

- Insert the release screw (2) through the hole in the cover into the "keyhole" and turn by 90 °.
- Slip on plain washer.
- Screw hexagonal nut (24 mm) onto release screw,
- Continue turning, so pulling the release screw outwards.



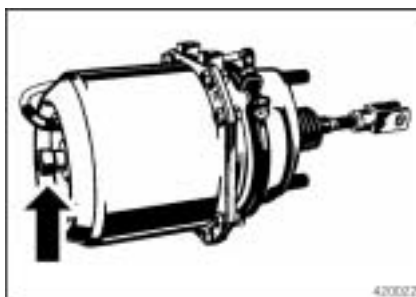
*A suitable tool (24 mm across flats) for operation of the emergency release device must be included in the on-board toolkit of the towing vehicle.*



Before restoring pressure to the brake system, the spring tension must be released.

- To do this, remove release screw (2): screw down hexagonal nut, back off hexagonal nut, pull off washer, turn release screw by 90° and remove.
- Fit release screw into specially provided hole on side of diaphragm cylinder.
- Close hole in cover using sealing cap (1).

### 78.2 Spring-loaded diaphragm cylinder type G



The brake is released by unscrewing the (24 mm) hexagonal bolt in the centre of the back of the spring-loaded diaphragm cylinder.



*A suitable tool (24 mm across flats) for operation of the emergency release device must be included in the on-board toolkit of the towing vehicle.*

## 7.9 Emergency operation with TCE / ECAS



The pneumatic suspension bellows are de-pressurized and cannot be raised or lowered using the operating unit.  
The required driving height is not known.  
This can result in damage to the axles.  
Do not drive without pressure in the pneumatic suspension bellows.  
Contact a Kögel or WABCO approved workshop for testing.

### 7.9.1 Front axle



Test connection on pneumatic suspension bellows

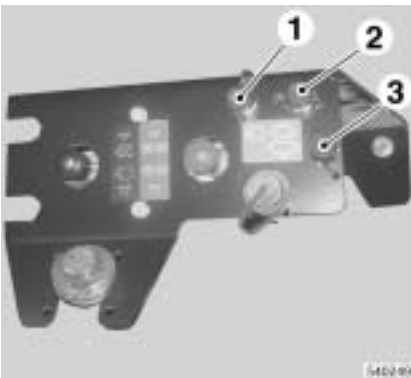


Test connection on the compressed air tank for brakes

In an emergency, the required driving height may be obtained temporarily by:

- an external air supply via the test connection on pneumatic suspension bellows or
- bridging from the test connection on the compressed air tank for the brakes to the test connection on pneumatic suspension bellows.

### 7.9.2 Rear axle / semitrailer



- 1 Test connection for the service brake cylinder.
- 2 Test connection for the pneumatic suspension bellows.
- 3 Test connection for the compressed air tank for brakes.

In an emergency, the required driving height may be obtained temporarily by:

- using an external air supply via test connection 2 or
- by bridging across from test connection 3 to test connection 2.

## 7.10 Electrical maintenance work



- Only qualified electrical engineers should be allowed to work on electrical systems.
- The electrical system must be serviced once a month, but earlier if the vehicle has travelled 10,000 km since the last service.
- Clean plug connections, dry them and treat with a corrosion inhibitor



### Caution!

Short circuits can cause fires.

Risk of burn injuries.

Before working on the electrical system always:

- disconnect all connecting plugs from the towing vehicle
- disconnect all connecting plugs from external power supplies
- switch off all consumers and
- disconnect the negative pole connection (-) at the battery.
- Use insulated tools.

### 7.10.1 Lighting

Check lamps at regular intervals

- Rear lamps and licence plate lamps
- Side marker lamps and outline markers (rear)

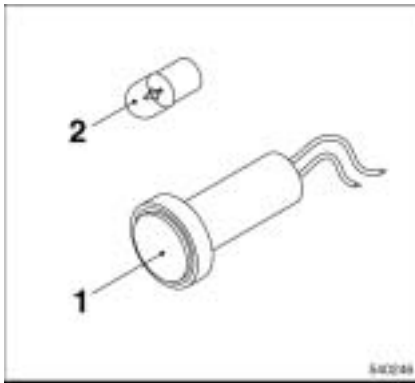
## Bulbs

Function		DIN desc.	Cap type	Output (W)
Side marker lamp			LED insert	
Outline marker and outline marker (rear) red/white		R5W	Ba15s	5
Outline marker, round, white		R5W	Ba15s	5
Multi-compartment lamp	Turn indicator lamp	P21W	Ba15s	21
Multi-compartment lamp	Brake lamp	P21W	Ba15s	21
Multi-compartment lamp	2 x tail lamp	R10W	Ba15s	10
Multi-compartment lamp	Reversing lamp	P21W	Ba15s	21
Multi-compartment lamp	Side marker lamp	C5W	SV8	5
Multi-compartment lamp	Rear fog lamp	P21W	Ba15s	21
Licence plate lamp		C5W	SV8	5

### 7.10.2 Replacing bulbs and lamps

- Switch off the lighting.
- Do not hold the bulbs with bare fingers (use gloves, a cloth or the bulb packing material).
- When replacing bulbs, clean the contacts.
- Ensure that the seals are correctly seated!
- Replace damaged seals!

### 7.10.3 Outline marker, round, white



- 1 Outline marker, round, white
- 2 Bulb
  - Remove lamp from its socket
  - Remove 2 pin plug
  - Lever out lens using a small screwdriver.
  - Carefully push screwdriver between rubber rim and lens.
  - Remove and replace faulty bulb.
  - Re-fit lens.
  - Plug in 2-pin plug.
  - Push lamp into its socket.

### 7.10.4 Side marker and rear reflector LED lamp



Replacing a faulty lamp.

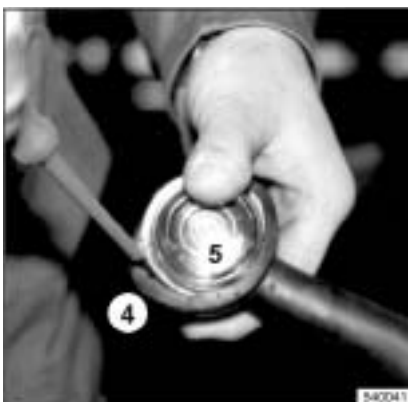
7.10.5 Outline marker and outline marker (rear) red/white



- 1 Lens
  - Lever out lens using a small screwdriver.
  - Push screwdriver between rubber housing and lens (see diagram).

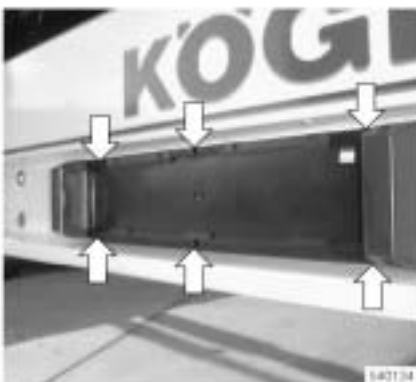


- 2 Rubber housing
- 3 Bulb
  - Push rubber housing to one side. Push bulb down, turn it anti-clockwise and remove it.



- 4 Rubber housing
- 5 Lens
  - After replacing the bulb, push the edge of the rubber housing outwards, insert the lens and using the screwdriver carefully pull the remaining rubber rim around the lens.
  - Do not damage the rubber rim!

7.10.6 Licence plate lamp



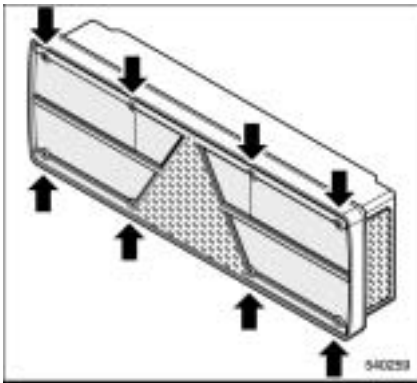
- Using a cross-point screwdriver, unscrew the fixing screws and remove the lamp cover.



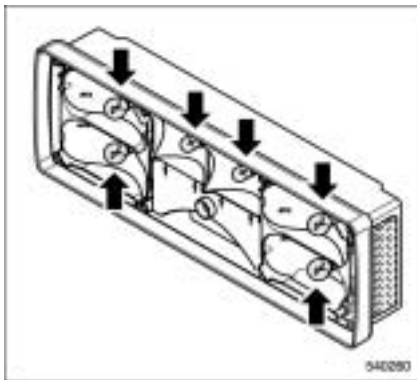
## Bulb

- Remove faulty festoon bulb.
- After changing the bulb, replace the cover of the lamp.
- Tighten screws again.

## 7.10.7 Multi-compartment lamp

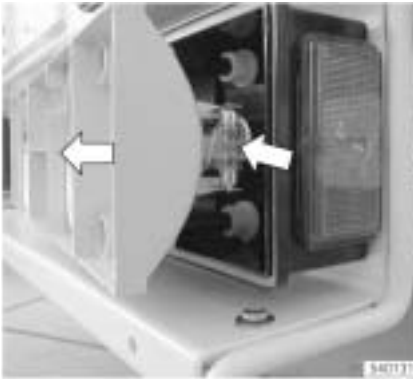


- Using a cross-point screwdriver, unscrew fixing screws and remove lens.



- To remove the faulty bulb, press down, turn it anti-clockwise and pull it out.
- After changing the bulb, replace the lens.
- Ensure that the seal is in the correct position!
- Tighten screws again.

### 7.10.8 Side marker and rear reflector lamp in the multi-compartment lamp



Example

- On the side near the side marker and rear reflector lamp, pull bulb holder partly out of housing.
- Remove faulty festoon bulb.
- After changing bulb, replace lens.
- Tighten screws again.

### 7.10.9 Fuses



- Always carry some spare fuses in the vehicle for emergencies.
- Fuses must not be re-wired or bridged.
- Before replacing a blown fuse, discover the cause of the short circuit. Ensure good contact of the location points.
- Configuration of the fuses: See Section 5.2, Page 36.

## 7.11 Painting, lettering

All Kögel trailers/semi-trailers and bodies are painted with air-dried synthetic resin or 2-part acrylic paint. The rate at which these paints dry out depends on the ambient temperature and can take several months at low temperatures. During this curing period, the paints are not fully resistant.

During this time, we recommend avoiding the use of high-pressure washing equipment or steam jets to clean the vehicle.

A sudden temperature shock (heat or cold shock) can have a detrimental effect; for example, when the temperature outside is low and the cold vehicle is driven into a warm hall. In these conditions, a film of condensation can form between the paint layer and the metal, and although invisible to the human eye, this has a detrimental effect on the paintwork.

### 7.11.1 Lettering work

To avoid damage to the paint during lettering work, please observe the following:

- Fresh paintwork must be left to dry at +20°C for at least 48 hours and be sufficiently hardened to ensure that the auxiliary films and tapes used for lettering, which are subsequently peeled off again, leave no markings on the paint surface (no aggressive adhesive films, i.e. those which form a permanent bond with the surface of the paintwork).
- Vehicles which have already been exposed to moisture (snow, rain, fog), must be dried in a temperature-stabilised hall (20°C) for at least 24 hours before any kind of lettering is carried out. In the event of frost, the drying time must be extended to allow time for the vehicle to reach the hall temperature.

These process guidelines and remarks are not intended for specific materials, but apply in general.

## 7.12 Cleaning and care of the vehicle

Observe the following points relating to vehicle cleaning:

- Only clean the vehicle at a suitable washing bay or station.
- Observe environmental protection guidelines.
- During the first three months, wash the vehicle using cold water only and never use steam jets etc.
- Wash using plenty of clean water (not over 60°C), in order to avoid scratching the paintwork. Keep paintwork surfaces as cool as possible, avoiding direct sunlight.
- **Do not** use any aggressive cleaning materials (e.g. trichloroethylene, detergents containing soda or alkaline cleaning agents).
- Any type of damage to paintwork should be repaired as quickly as possible.
- Carefully remove any greasy areas using pure petroleum ether (not petrol).
- **Do not** subject brake and hydraulic hoses to contact with petrol, benzene, petroleum or mineral oil. Remove any adhering dirt using water only. When spraying and lubricating, ensure that the brake and hydraulic hoses do not make contact with spray agents or grease.
  - **Do not** clean seals with mineral oil, benzene or solvents!

### 7.12.1 Cleaning with a high-pressure washer

Always read the manufacturer's operating instructions first!



- *Before cleaning, lubricate all lubrication points until the grease begins to emerge.*
- *Minimum distance between the high-pressure jet and the cleaned object:*
  - *in the case of round nozzles approx. 700 mm,*
  - *with 25° flat nozzles and dirt blasters approx. 300 mm.*
- *During the cleaning process, always keep the water jet moving.*
- *Do not aim the water jet directly at:*
  - *door gaps, seals*
  - *piston surfaces of the hydraulic cylinders, oil reservoir cover or*
  - *brake/hydraulic hoses.*

The use of high-pressure cleaners is permitted up to a pressure of 50 bar and a maximum temperature of 80°C.

Round nozzles must not be used for cleaning tyres.

The water jet can damage the tyres.

Lubricate the vehicle after cleaning with high-pressure cleaners or grease dissolving agents.

# 8 Troubleshooting

## 8.1 General

This section contains information relating to possible vehicle faults. The notes are intended to make it easier to find the source of a fault and enable it to be resolved sufficiently to drive to the nearest Kögel service centre.

Any faults due to ignoring the operating instructions or insufficient maintenance are not covered.

Clearly, it is not possible here to cover all eventualities or problems that may occur.

In the event of more serious faults we would ask you to inform **Customer Services, Technical Section:**

### **Kögel Fahrzeugwerke GmbH**

- **Burtenbach Works**  
Head office

### **Customer Services (technical) in Ulm**

- Management/Key account
- Key account
- Tipper
- Refrigerated/luggage
- Trailer

- E-mail:

Please provide the following information:

- Vehicle type
- Vehicle identification number
- Hours of operation
- Appearance of the fault
- Cause of the fault, if known.

Any attempt to repair or dismantle vehicle components or sub assemblies will result in forfeiture of the warranty cover.

## 8.2 Brake system

### *The compressed air supply fails to reach maximum pressure*

- Pressure regulator defective. Replace the pressure regulator.
- Compressor defective. Replace the compressor.

### *Brake shoes scraping, brake fails to release or release correctly*

- Brake not correctly adjusted. Adjust the brake.
- The brake shoe return springs are fatigued. Replace the springs.
- Brake drum out of round.
- The brake shaft is jamming.
- Fault in the compressed air system.

### *Brake locked*

- The brake has seized on to the drum. Release by driving forward.

### *Insufficient braking effect, brakes pull to one side*

- Brake linings worn, contaminated with oil or glazed. Re-surface the linings or replace.
- Brake shoes bent or lining defective. Replace the brake shoes complete with linings.

- Brake not correctly adjusted. Adjust the brake.
- Brake shoe damaged in the engagement area of the S cam. Replace the brake shoe.
- Fault in the compressed air system.

#### *Brake screeches and tends to lock*

- Brake drum out of round.
- Brake linings contaminated with oil or not engaging over full surface.
- Play at the brake shoe pins.

### **8.3 Electrical system**

#### *Wiring*

- Terminals loose or contaminated. Clean and re-tighten.
- Cable broken or terminal damaged. Repair or replace the cable or terminal.

#### *Lighting does not work*

- Bulb blown. Replace bulb.
- Switch not fully operated. Operate the switch correctly.
- Terminals loose or contaminated. Clean and re-tighten.
- Cable broken. Replace or repair terminal or cable.
- Short circuit in the electrical circuit or interruption of current. Repair short circuit or replace defective part.
- Relay for direction switchover defective. Replace relay(optional)

### **8.4 Axles**

#### *Premature bearing wear*

- Bearing adjusted too loose or too tight, insufficient lubrication.
- Collision with the kerb.
- Overloading.
- Foreign bodies present.
- Conduction of current during welding work at the vehicle.

#### *Worn or damaged wheel bolts*

- Tightening torque levels of the wheel nuts not adhered to or wheel nuts not tightened.