FELDBINDER

Original Instruction Manual

Silo Semi - Trailer

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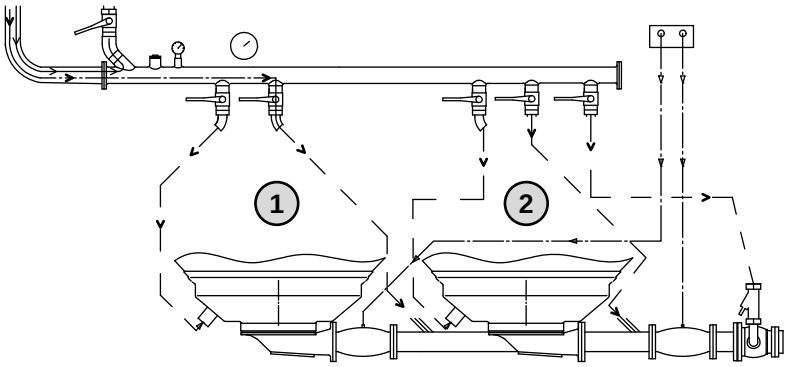
Quick guide: Unloading hopper-type silo tanks



Refer to the detailed operating instructions.

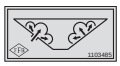
1. Connect the compressor.

2. Exhaust air valve CLOSED. Top air CLOSED. Aeration systems OPEN.

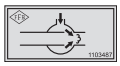
3. Connect the material hose.

4. Start the compressor and set to the correct speed.

5. When the container pressure reaches 1.9 bar: Open the shut-off fitting on the material discharge.



6. Open shut-off fitting for discharge vessel 2; aeration system of chamber 1 (front) CLOSED.



7. Regulate material with the shut-off fitting at the end of the material line as well as thrust air or injection air, and observe the following:
   - Material hose must be stationary.
   - Tank pressure must be 1.9–2.0 bar.

   A rapid pressure drop indicates chamber 2 (rear) is empty.

   Then close shut-off fitting for discharge vessel 2 immediately to avoid pressure loss.

8. Open the shut-off fitting for discharge vessel 1 (front).

9. Open the aeration system for chamber 1.

10. Close the aeration system for chamber 2.

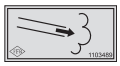
    A rapid pressure drop indicates chamber 1 (front) is empty.

    Then close the shut-off fitting for discharge vessel 1.

11. Open the shut-off fitting for discharge vessel 2 (rear):
    - Residual material is unloaded (20–80 kg).

12. Once the container has been completely unloaded, close the shut-off fitting on both discharge vessels.

13. Switch off the compressor: Operation from the lorry.



14. Open the exhaust air valve and leave open at a tank pressure of 0 bar to avoid vacuum damage.

Table of contents

1 Introduction

1.1 Warranty and liability

The respective, valid version of the Feldbinder Spezialfahrzeugwerke GmbH 'General Commercial Terms' always applies.

1.1.1 Technical changes

Do not carry out any changes on the chassis, tank, fittings or assemblies! This can lead to invalidation of the operating permit.

1.1.2 Original Feldbinder spare parts

Use only spare and wearing parts that are suitable for the silo semi-trailer!

1.2 Visualisation conventions and means of visualisation

1.2.1 Display and meaning of warnings

Warnings precede work steps. Read these warnings carefully before carrying out the subsequently described operation.

For warnings regarding components from suppliers, please refer to the respective manufacturers' documents. Please also observe these warnings.

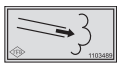
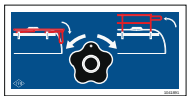
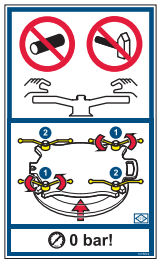
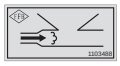
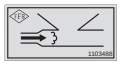
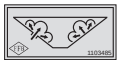
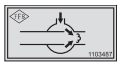
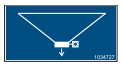
The warnings in these operating instructions are indicated by signal words with pictograms. Hazards are categorised into different levels with consequences of differing severity.

Signal word	Consequences
⚠ DANGER	This will result in fatal or serious injury.
⚠ WARNING	The consequences may be severe injury or death.
⚠ CAUTION	This could result in moderate or minor injury.
NOTICE	This could result in material damage.

1.2.2 Function pictograms

The following pictograms are attached as adhesive labels to the semi-trailer and are part of the operating instructions. Observe and heed these pictograms as well as the operating instructions. Keep the pictograms clean and legible. Do not remove, paint over or cover them.

Immediately replace illegible or missing pictograms. The order numbers for the pictograms can be found on the Feldbinder spare parts CD and on the pictograms themselves.

	Exhaust air		Top air
	Manlid		Sliding manlid
	Connection for a cleaning gun		Pneumatically deployed railing
	Open/closed		Closed/open
	Tighten the manlid by hand only		Thrust nozzle
	Injection nozzle		Aeration system
	Ring nozzle		Shut-off fitting

1.3 Terms and abbreviations

The following designations and abbreviations (selection, in alphabetical order) are used in these operating instructions:

Designation/abbreviation	Meaning
ABS	Anti-lock braking system (wheels when braking)
ADR	European Agreement concerning the International Carriage of Dangerous Goods by Road
Operating personnel	Drivers, loading personnel, cleaners, and service and maintenance personnel
Operator	Forwarding companies, vehicle owners, vehicle operators
Working pressure	Maximum permitted pressure used to fill or empty the tank.
EBS	Electronic brake system
ECE	Economic Commission for Europe, UN economic commission for uniform technical approval regulations for vehicles and equipment parts in Europe
ECAS	Electronically controlled air suspension
Vehicle	Silo semi-trailer or silo trailer (situation-dependent)
GGVSEB	Ordinance on the Transport of Dangerous Goods by Road, Rail and Inland Waterways (national, DE)
IMO	International Marine Organisation, responsible for regulations for the transport of hazardous goods by sea.
Inerting	Protection of sensitive loads by introducing an inert gas (nitrogen) into the tank
Product	Load, electrostatically charged materials; solid material that is to be filled, discharged or transported.
Test pressure	Pressure used to test the tank's pressure resistance
Silo vehicle	Silo trailer or silo semi-trailer (situation-dependent)
Silo semi-trailer	Feldbinder semi-trailer with silo tank
StVZO	German vehicle licensing regulations (Germany)
Shipper	Operator of a filling or unloading station
Perm.	Permitted

Table 1.1 Terms and abbreviations

2 Safety

2.1 Intended use

Feldbinder silo vehicles and silo trailers are intended for transporting goods in granular and powder form ('powder and flowing materials').

Silo vehicles for foodstuffs are intended solely for the transport of foodstuffs as stated by the European Food Law. The 'Only for foodstuffs' label on the silo tank must be legible at all times. Illegible or missing labels must be replaced immediately.

Only products that do not react aggressively with the tank material or the sealants that have been used may be transported. If in doubt, contact Feldbinder and perform a test.

Any other use or any use over and above this constitutes improper use.

Feldbinder Spezialfahrzeugwerke GmbH silo vehicles are only approved for operation on towing vehicles with brake systems that comply with the German road traffic licensing regulations (StVZO) or UN Directive ECE-R13.

Operating the silo semi-trailer is only permissible with properly connected lines for compressed air and the electrical and hydraulic systems.

The towing vehicle must be equipped with electrical plug connections in accordance with ISO 7638.

The permitted filling levels and axle loads and the permissible gross weight of the tank vehicle must be adhered to. This data is indicated on the type plate of the vehicle, on the tank data sheet accompanying the vehicle's registration document and in chapter „Technical data“.

Operator, loader and driver are obliged to ensure that no overstressing e. g. through overloading occurs. If specified weights are exceeded or weight limits disregarded, vehicle handling will be more difficult and the stopping distance will increase. This increases the risk of accidents.

Overloading can damage the silo vehicle when driving, especially on poor quality roads.

The following are not permitted:

- Driving with the tank vehicle when the entire tank is under pressure. There is a greater risk of accidents or of possible incipient damage to the tank when driving with a pressurised tank.

Inspection intervals

Proper use also includes adherence to the inspection intervals.

The maximum inspection intervals for your vehicle and your tank can be found in the associated inspection record book, see also „FFB minimum recommendation for the pressure vessel check“ on page 137. The operator can specify shorter inspection intervals.

Service life

The technical service life of the silo vehicle or its components is reached when one of the scheduled inspections is not passed. Professional maintenance and repair enables renewal of the operating licence and extends the service life.

2.2 Residual hazards

The tank vehicle has been designed using state-of-the-art technology and complies with the recognised technical safety rules. Nevertheless, its use can involve the risk of fatal injury to the user or other parties and damage to the tank vehicle itself and to other objects.

These instructions point out these residual dangers in the descriptions of component functions and the operation instructions.

2.2.1 Danger zones

This section provides an overview of the areas on and around the semi-trailer where there is an increased risk to yourself or others.

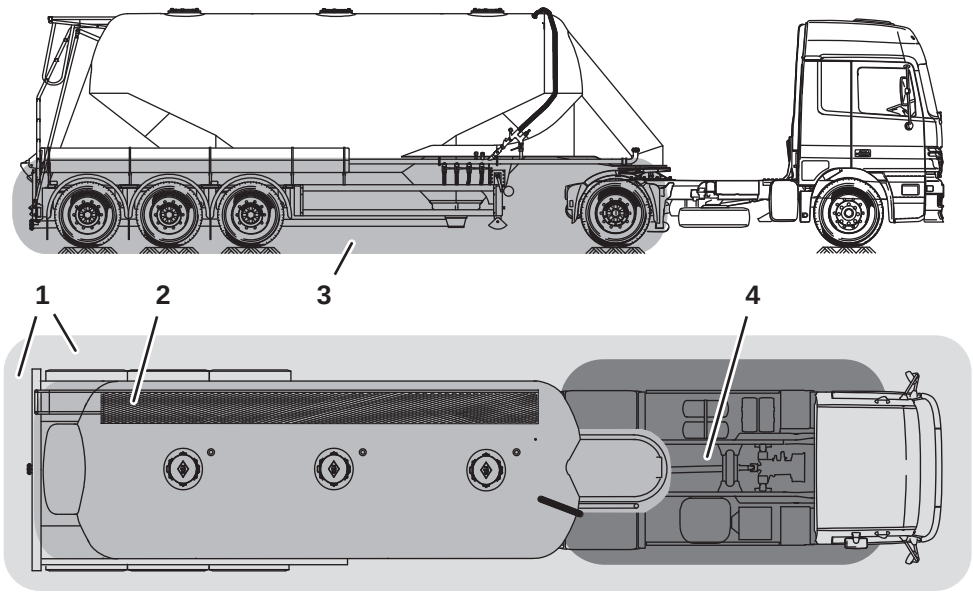


Illustration 2.1 Danger zones on the silo vehicle

Pos. Danger zone / Operational state

1 Around the silo trailer
The presence of unauthorised persons in the danger zone during loading and discharging procedures constitutes an unnecessary risk to their safety and the safety of others.
This area covers 5 m.
- Instruct unauthorised persons to leave the silo trailer danger zone.

2 Walkway on the silo tank, tank roof
A danger of falling from the silo tank results from getting onto or walking on the walkway without an erected folding safety rail.
- Always raise the folding safety rail before climbing on to the walkway.
- Only climb onto the pressurised silo tank in order to operate venting valves and to check safety and vacuum valves.

3 Under the unhitched semi-trailer
Faults could cause the unhitched semi-trailer to lower, thus causing injury.
- Stay away from the area beneath the unhitched semi-trailer unless you need to carry out a task there.
- Use a stable mechanical device for additionally supporting the semi-trailer during maintenance work.

4 Between the silo truck (vehicle) and the silo trailer
When the silo trailer is being coupled or uncoupled, there is a danger of people getting trapped or run over between the silo vehicle and the silo trailer.
- People should be kept out of the danger zone.

2.3 Safety equipment

This vehicle with pressure tank is fitted with safety devices which need to be in perfect working order if operation is to be safe. Perform regular checks to ensure they are in perfect working order.

For details on functional testing, see section „Function tests“ from page 130 on.

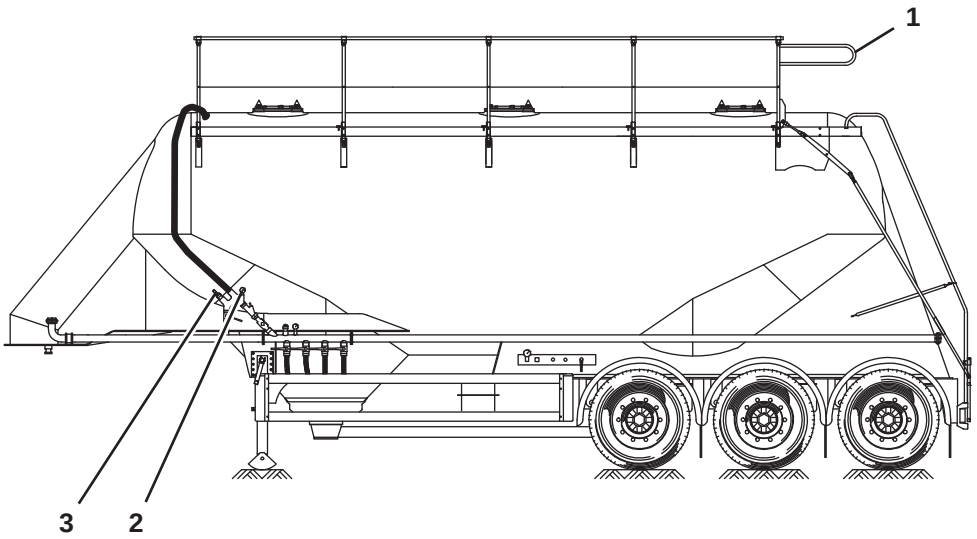


Illustration 2.2 Safety equipment

Pos. Safety device / Safety feature

1 Safety railing
Prevents persons falling from the walkway.

2 Pressure gauge
Pressure gauge; displays the current filling pressure. Enables monitoring of the pressure over time.

3 Safety valve
Limits the tank's working pressure to a maximum 2.00 bar, thereby preventing the tank from bursting due to high internal pressure.

-- Safety valve, connectable
Additional safety valve with reduced response pressure 0.90 bar. Function is as (3). Optional.

-- Equipotential bonding (earthing)
Prevents build-up of static charge on the tank walls, thus preventing sparks that could lead to an explosion.
- Via the Feldbinder material hoses that come as standard.
- Optionally via earthing pin, earthing lug or earthing cable with terminal.

2.3.1 Operation with safety equipment only

Safety equipment and securing equipment must not be removed, covered or bypassed. Operation can otherwise lead to serious injuries to persons as well as property and environmental damage.

2.4 Tank regulations

The tank is designed for the specified pressure load in the stopped condition. While driving, high loads can result from accidents, heat or poor road surfaces if the tank is pressurised, and there is a risk of bursting. Persons can be injured seriously or even fatally.

- Never drive with a pressurised tank.
- Completely release all pressure before departure.

The driver of the vehicle must not climb into the tank during the trip. Observe the valid regulations for work in vessels and enclosed spaces.

When transporting dangerous goods, ensure that the safety equipment specified in the product-related accident and other data sheets is available.

2.5 Personal protective equipment

When working on the tank vehicle, wear suitable personal protective equipment.

During transport of dangerous goods, the protective equipment specified in the product-related accident and safety data sheets must be available and must be used where appropriate. Use the specified personal protective equipment during all work on the tank vehicle and with the load.

2.5.1 Protection from fluids and particulates

Load residues may have set in valves and hoses; when blowing off the residual pressure, they can be carried along and released.

- Wear eye protection and/or respiratory protection as well as protective gloves.

2.5.2 Protection from emissions

When using non-silenced compressors and when releasing the remaining pressure, the tank system's A-weighted equivalent sound pressure level is above 82 dB(A).

During operation, the vibrator can produce a sound pressure level of 91 dBA.

Wear hearing protection and eye protection during the following work:

- When working with the compressor
- When testing a safety valve
- When operating the vibrator (temporarily)
- When blowing off the residual pressure

2.6 Personnel qualifications

The silo semi-trailer may only be operated and maintained by trained and authorised persons who have been instructed accordingly by the operator. The operator's operating personnel can be familiarised by qualified Feldbinder employees on request.

Persons involved in the maintenance and repair of the tank should have special experience in the maintenance and repair of pressure vessels, fittings and valves.

Qualified specialist personnel is required to service and maintain the semi-trailer.

2.7 Checks before departure

Carry out a pre-departure check before each journey. Walk around your silo vehicle during breaks in the journey. When doing so, check the most important items and take remedial action if necessary.

Also see "Pre-departure checks" under "Driving", from page 55.

Also see „Function tests“ from page 130.

2.7.1 Depending on the weather

Take the following weather-dependent requirements into account:

- Is the silo semi-trailer free of snow, ice or sand?

1. Remove any sand, ice or snow that has settled.
   ▷ When doing so, do not endanger persons near to the vehicle or yourself.

2.7.2 Checking after filling or emptying

After filling or emptying or after taking over the tank vehicle, also check the following points:

- Is the tank loaded correctly (filling level, load distribution)?
- Are all valves, butterfly valves and manlids in travel position, closed and secured?
- Are all material and air hoses securely stowed?
- Is the tank depressurised?
- For an empty silo tank without vacuum valve: Is the exhaust air valve open?

- Is the safety railing folded down and locked into place?
- Are all necessary hazard labels (placards) and material markings fixed in place and legible?

2.8 Checking after parking

Check the parking place. Secure and mark the vehicle as specified on parking. Use the wheel chocks.

The unsecured semi-trailer can roll away and cause property damage or hit and severely injure persons.

Information

Only use the wheel chocks on the wheels of rigid axles – never on the wheels of steered axles.

3 Technical data

3.1 Technical description

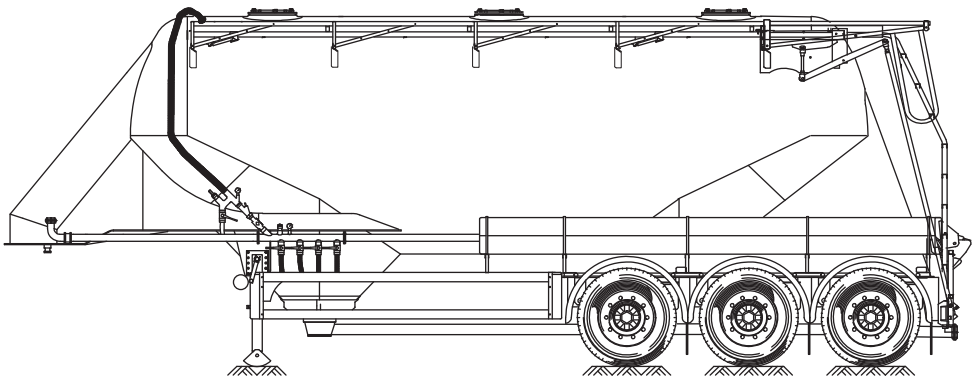


Illustration 3.1 General view of the silo semi-trailer

3.1.1 Silo tank

The silo tank is a welded aluminium tank with one or more chambers. For aggressive loads, the silo tank can be covered with a protective inner coating.

Product discharge is secured in multiple ways:

- By the shut-off fittings on the discharge sumps,
- Through the gate valve in the material pipe,
- Through the dummy cap on the material coupling on the central material pipe or manifold

For loading purposes, the silo tank is equipped with manlids and, on request, with loading couplings. Loading can be carried out using gravity via the hatch openings or using compressed air via the loading couplings.

It can be unloaded via the material coupling on the central material pipe or manifold or via the drains in the drain sumps. Unloading via the material coupling can be accelerated by means of compressed air. Only gravity discharge is possible through the open drop bottoms in the unloading sumps.

3.2 Type plate

3.2.1 Chassis type plate

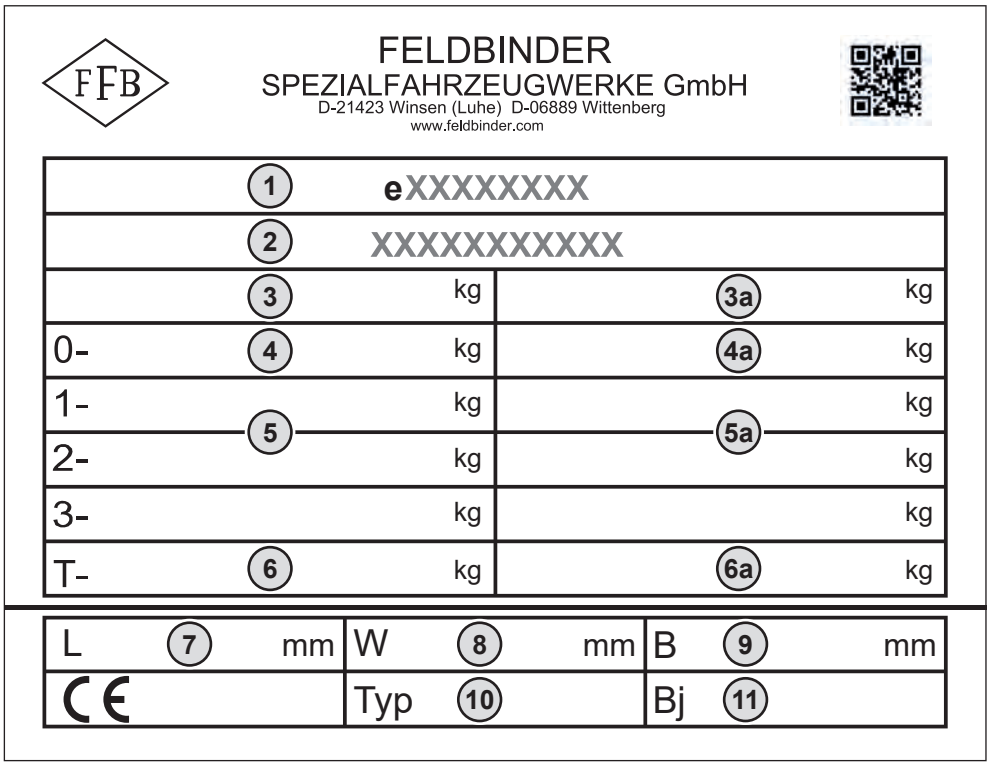


Illustration 3.2 Chassis type plate

no.	Information	no.	Information
1	Type approval number		
2	Chassis number		
3	Perm. total weight	3a	Technically perm. gross weight
4	'0- ' perm. trailer load	4a	Technically perm. trailer load
5	"1- ... 3-" perm. axle loads, 4 if applicable	5a	Technically perm. axle loads
6	"T-" perm. gross axle loads	6a	Technically perm. gross weight
7	Total length		
8	Total width		
9	Length from centre of kingpin to end of vehicle		
10	Type		
11	Year of construction		

3.2.2 Tank type plate

Information important for operation is provided on the type plate of the tank.

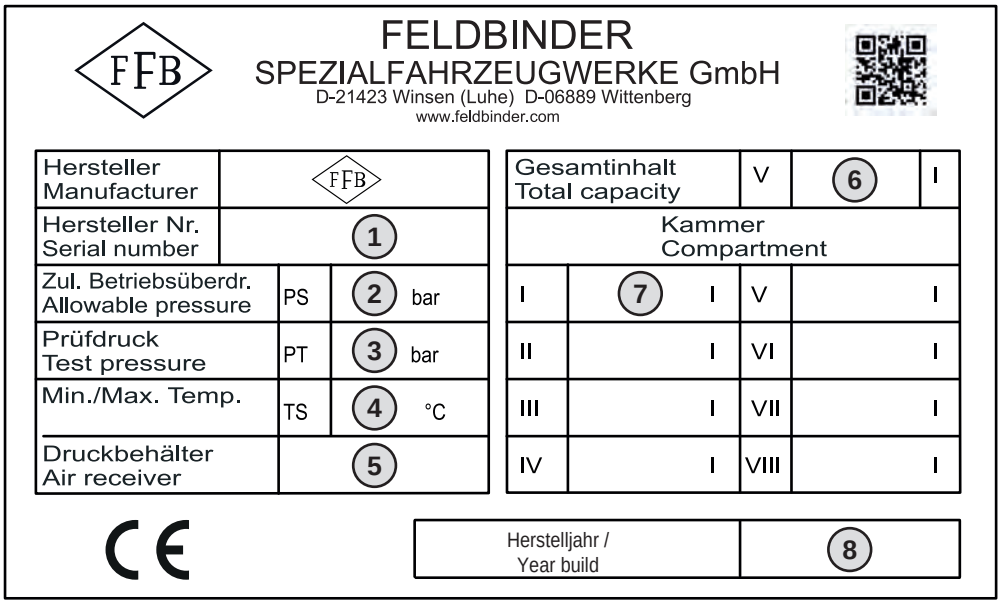


Illustration 3.3 Tank type plate

no.	Information
1	Tank serial number
2	Perm. working overpressure
3	Test pressure
4	Max. perm. temperature
5	Pressure tank type
6	Total capacity of the tank
7	Contents of the tank chambers
8	Year of construction

3.2.3 Type plate inspection intervals

The inspection interval dates for the next mandatory internal and external inspections are located on the type plate

You can also find the maximum working pressure of the silo tank here.

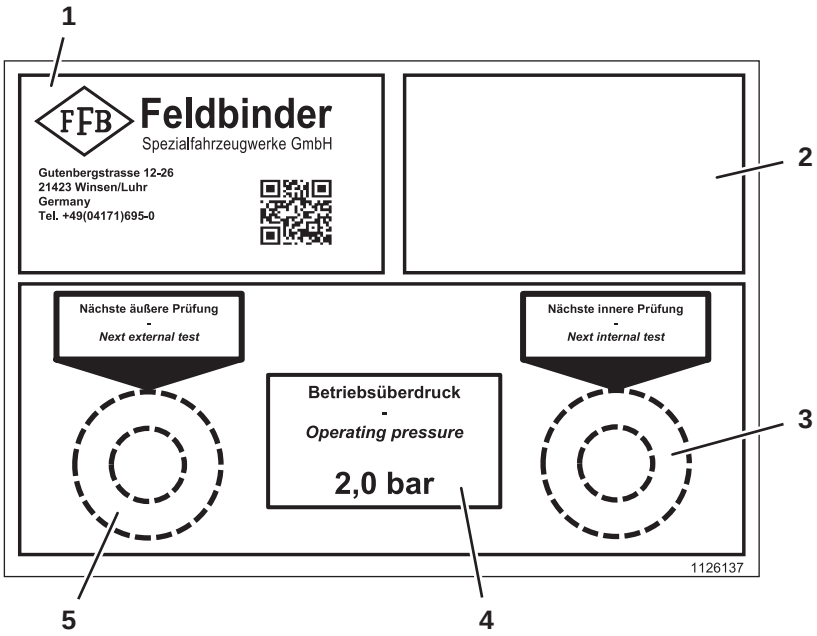


Illustration 3.4 Type plate inspection intervals

no.	Information
1	Manufacturer's address
2	Inspection company stamp
3	Date of next internal inspection
4	Maximum perm. working overpressure
5	Date of next external inspection

3.2.4 Tank type plate (ADR version)

Information important for operation of the tank for hazardous goods is stamped on the ADR model type plate.

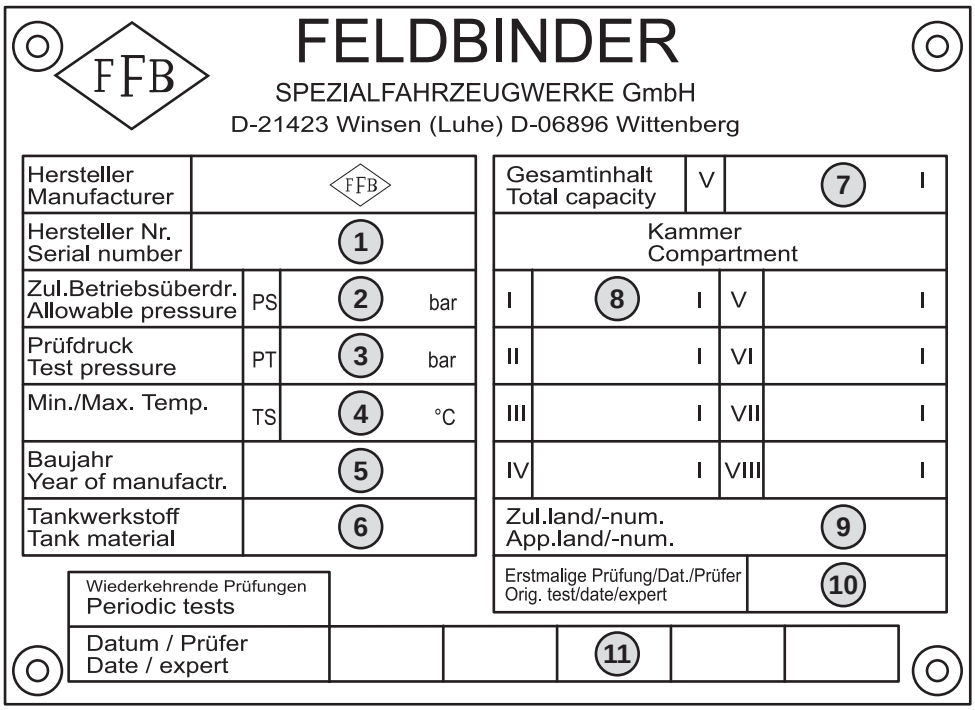


Illustration 3.5 Tank type plate, ADR version

no.	Information
1	Tank serial number
2	Perm. working overpressure
3	Test pressure
4	Max. perm. temperature
5	Year of construction
6	Tank material
7	Total capacity of the tank
8	Contents of the tank chambers
9	Country code permit
10	Date of the first inspection and inspector ID
11	Date of subsequent inspections and inspector ID

3.2.5 ECE approvals

The permits issued by ECE for the chassis and the subject-to-approval components are stated on its own sign.

Examples:

- Brake system
- ADR permit

Information

The permits are irrespective of proper use of the vehicle, e.g. for ADR transport.

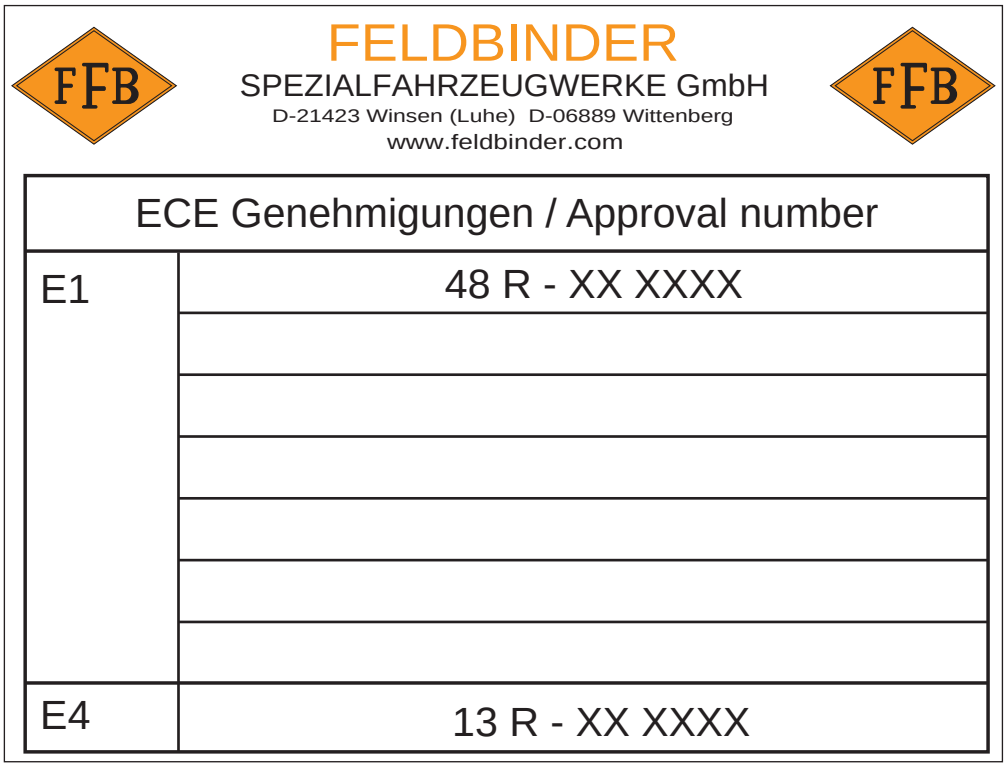


Illustration 3.6 Plate with ECE permits

"E" E key of approving country

"R" Permits

3.3 Pressure ranges

The working pressure values and all other pressure values are given as overpressure unless otherwise stated.

Example: The working pressure of 2.00 bar is equivalent to an absolute pressure of 3.00 bar.

For exact values, refer to the tank inspection log, the tank type plate and the markings on the respective valve.

Component	Working pressure
Silo tank	Max. 2.00 bar
Third-party systems for compressed air	Max. 2.00 bar
Dehumidifier	See page 111

Component	Response pressure
Safety valve	Max. 2.00 bar
Safety valve, response pressure (shut-off optionally available)	0.90 bar
Vacuum valve, standard version	-0.02 bar (vacuum) FFB: < -0.015 bar)
Vacuum valve version for low vacuum (ADR equipment)	-0.05 bar (vacuum)

Table 3.1 Pressure ranges

Information

The safety valve with reduced response pressure is optionally mounted on the air manifold. The upstream shut-off valve is opened when emptying load for which a lower working pressure is sufficient or specified.

3.4 Flow rates

Component	Flow rate
Safety valve, response pressure	Depending on pressure and design size, up to approx. 1000 m³/h
Vacuum valve, at response pressure (vacuum)	Not defined *

Table 3.2 Flow rates

* The vacuum valve is only used for pressure equalisation in the event of temperature fluctuations and has a correspondingly low flow rate. It only opens briefly at the response pressure.

Tank safety valve

For the blow-off capacity of the safety valve, the following applies:

- The maximum flow for the given working pressure must be greater than the maximum suction volume of the connected compressor unit.
  The compressor capacity must not, therefore, be too high.

3.5 Recommended operating materials

Operating material purpose	Designation
High-pressure grease for ■ Kingpin ■ Rubbing plates	Extreme-pressure grease with MoS_2 or graphite additive, e.g.: ■ BP L21 M ■ BP HTEP 1 ■ Esso multi-purpose grease M ■ Shell Retinax AM
Multi-purpose grease for lubrication points on: ■ Trailer support ■ Mechanically steered axle	Multi-purpose grease, e.g.: MZF L2

Table 3.3 Recommended operating materials

4 Operating the chassis

4.1 Overview

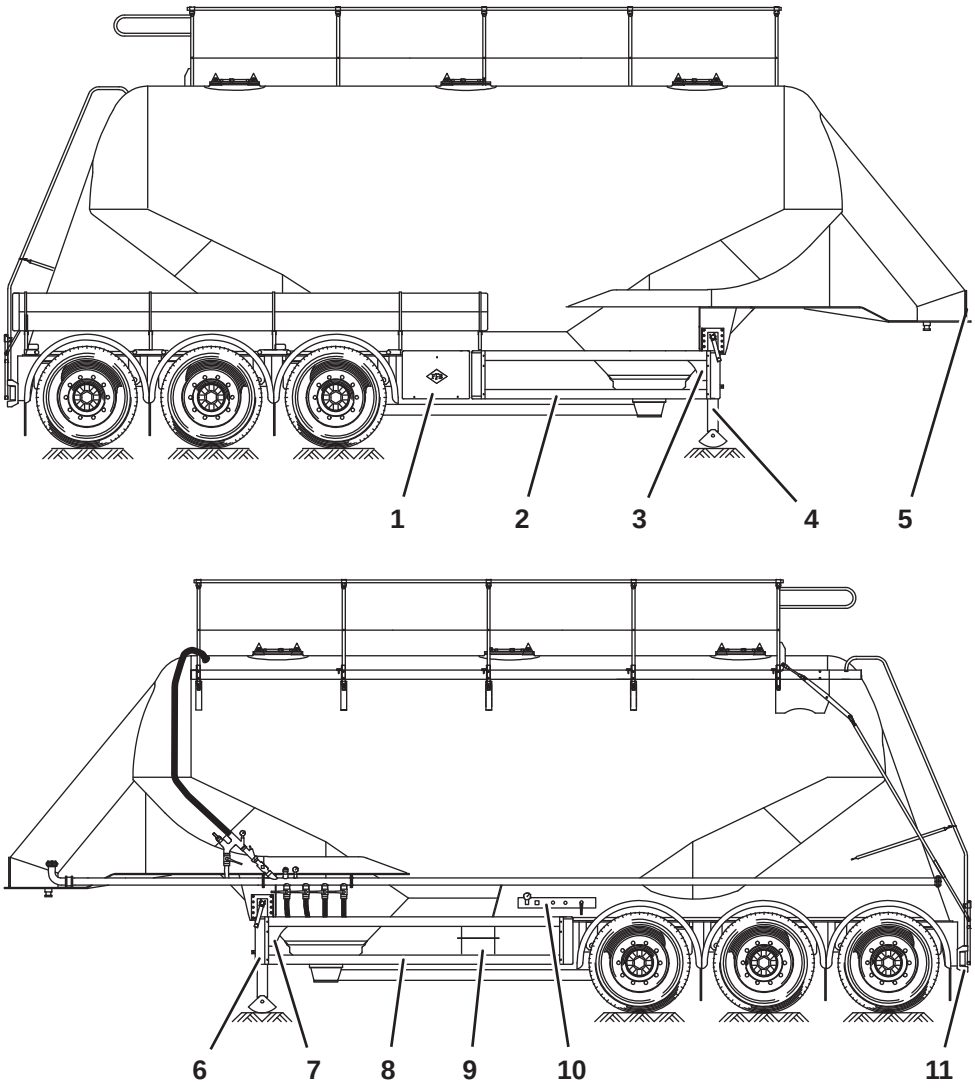


Illustration 4.1 Overview of silo semi-trailer

1 Toolbox
2 Right side guard
3 Right wheel chock
4 Right trailer support
5 Air brake system/electrical system connections
6 Left trailer support
7 Left wheel chock
8 Left side guard
9 Spare wheel bracket
10 Control console (brake/axles)
11 Underride protection (guard)

4.2 Brake system

Feldbinder semi-trailers are fitted with an air brake system that complies with ECE-R13. This comprises automatic load-dependent brake regulation and an ABS (anti-lock braking system), ESC and ASR in addition to other functions.

4.2.1 EBS

Feldbinder semi-trailers are normally equipped with EBS. The EBS plug connection must be checked before the journey.

⚠WARNING

DANGER OF ACCIDENTS!

If there is no EBS plug connection, the semi-trailer's ABS will not work and automatic load-dependent brake regulation will not function. The empty semi-trailer will be over-braked, which can cause skidding and accidents.

- ▶ Always connect the EBS plug connection between the towing vehicle and the trailer.
- ▶ Only use EBS plug connections that are entered in the vehicle's registration document.

4.2.2 Approved EBS plug connections

Semi-trailers with EBS may only be operated on towing vehicles with the following EBS plug connections:

- EBS plug connection ISO 7638-1996
  (7-pin, 24 V, EBS control via the towing vehicle)
- EBS plug connection ISO 7638-1985
  (5-pin, 24 V, EBS control in the trailer)

Observe the EBS warning sign of the system manufacturer.

4.2.3 Service brake with coupling heads

This equipment comprises a supply and a brake coupling head.

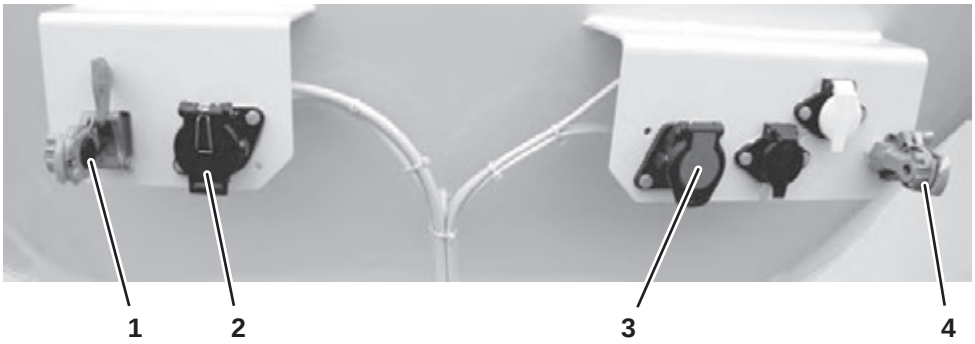


Illustration 4.2 Compressed air brake system couplings

1 Supply coupling head (red)
2 EBS plug connection
3 Electrical plug connection
4 Brake coupling head (yellow)

Connecting

Before connecting, apply the parking brake of the towing vehicle.

1. Open the protective caps on the coupling heads. Check the gasket surfaces of the coupling heads and clean them if necessary.
2. Connect the coupling head for the brake (4).
   ▷ The semi-trailer is braked.
3. Connect the supply coupling head (1).
4. Check that the coupling heads are properly sealed and replace faulty rubber seals.

Disconnecting

Before disconnecting, apply the parking brake of the towing vehicle.

1. Disconnect the supply coupling head (1).
   ▷ The semi-trailer is braked.
2. Disconnect the brake coupling head (4).
3. Close the protective caps on the coupling heads.

4.2.4 Service brake with Duo-Matic coupling

This equipment comprises a single, combined 'Duo-Matic' coupling head.

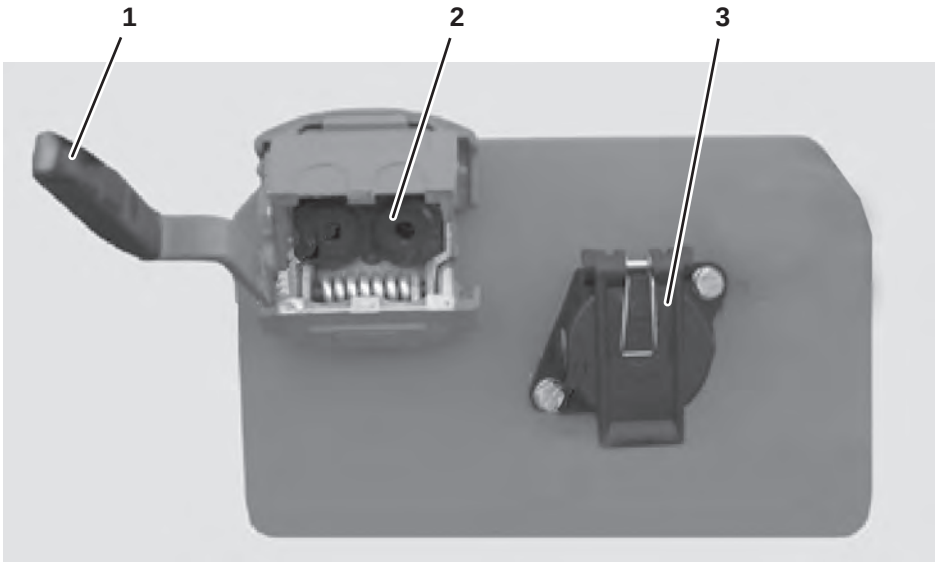


Illustration 4.3 Combined coupling for air brake system

1 Hand lever
2 Duo-Matic coupling head
3 EBS plug connection

Connecting

Before connecting, apply the parking brake of the towing vehicle.

1. Check the sealing surfaces of the connections and clean them if necessary.
2. Press down the hand lever (1) if present:
   ▷ The protective cover opens.
3. Connect the Duo-Matic coupling head (2) and release the hand lever if present.
   ▷ The connection's automatic shut-off valves open.
   ▷ The semi-trailer is braked.
4. Check that the connections are properly sealed and replace faulty rubber seals.
   ▷ No compressed air must escape.

Disconnecting

Before disconnecting, apply the parking brake of the towing vehicle.

1. Disconnect the Duo-Matic coupling head (2).
   ▷ The semi-trailer is braked.

4.2.5 Brake system control console

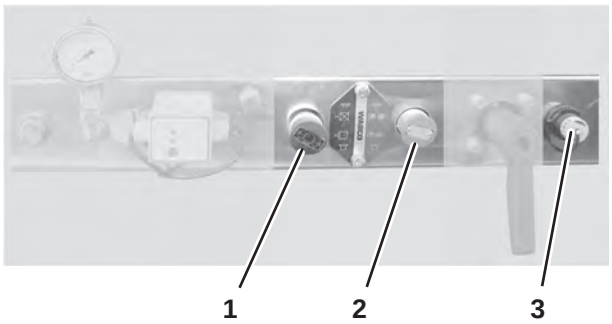


Illustration 4.4 Brake system control console

1 Service brake release valve, black
2 Parking brake release valve, red
3 ABS/EBS diagnostic connection

Double release valve version

Note the assignment of the pull/push switches to the right / left of the service brake (black) or the parking brake 'P' (red).

Information

Also heed the respective EBS diagnostics system (optional equipment) of the compressed air braking system manufacturer, see also „EBS diagnostic system“ on page 100.

4.2.6 Parking brake release valve

Feldbinder semi-trailers are fitted with a spring-loaded parking brake. There is no mechanical parking brake cable.

- The red release valve us used to release and apply the spring-loaded parking brake. See „Brake system control console“ on page 30.

Information

When the spring-loaded parking brake is applied, the air is sucked out of the spring-loaded brake cylinders. The spring-loaded parking brake can only be released when a pressure of at least 5.2 bar is present in the brake system's compressed air system.

The spring-loaded brake cylinders are equipped with a mechanical emergency release to enable the release of the spring-loaded parking brake without compressed air.

Releasing the parking brake

1. Press the red release valve.
   ▷ The spring-loaded parking brake is released and the semi-trailer is 'unbraked'.

Applying the parking brake

1. Pull out the red release valve.
   ▷ The spring-loaded parking brake is applied and the semi-trailer is braked.

4.2.7 Service brake release valve

When uncoupling the supply line, the service brake automatically brakes the semi-trailer. The release valve can then still be used to release the semi-trailer's service brake, e.g. for manoeuvring. Repeatedly releasing and actuating the release valve uses up the compressed air supply.

⚠WARNING

DANGER OF ACCIDENTS!

Serious personal injury or material damage from a semi-trailer rolling away.

Pressure losses in the brake system lead to a weaker braking effect of the service brake.

- ▶ Always secure the parked semi-trailer with the spring-loaded parking brake.
- ▶ In addition, always use the wheel chocks to secure the semi-trailer.

- The black release valve is used to release and actuate the service brake. See also „Brake system control console“ on page 30.

Releasing the service brake

1. Press the black release valve.
   ▷ The service brake is released. If the parking brake is released, the semi-trailer is unbraked.

Applying the service brake

1. Pull out the black release valve.
   ▷ The service brake is applied and the semi-trailer is braked.

4.3 Spring-loaded parking brake

In the event of a drop in compressed air in the brake system, the (spring-loaded) parking brake is applied mechanically. In special situations, e.g. during towing or if no compressed air is available, it can be released using the emergency release facility.

Information

It is essential to refer to the warning and safety instructions for your air brake system contained in the manufacturer's operating instructions.

The release spindle can be pre-mounted in the brake cylinder or included in a bracket, illustration 4.5.

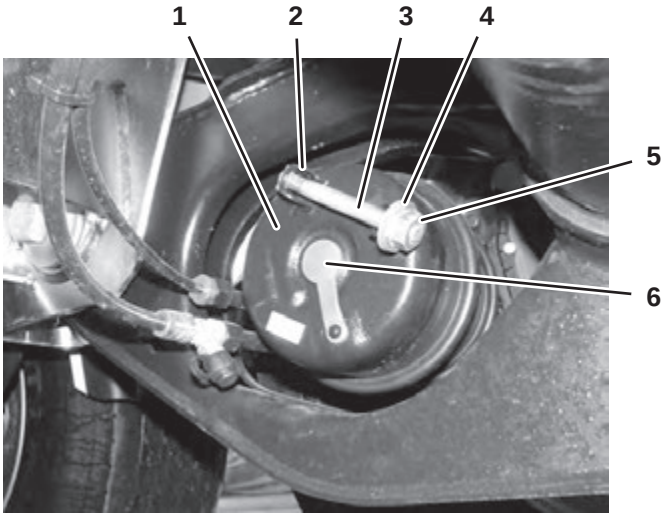


Illustration 4.5 Spring loaded-parking brake, emergency release device

1 Spring-loaded brake cylinder
2 Bracket
3 Release spindle
4 Plate
5 Nut
6 Dust cap

WARNING

DANGER OF ACCIDENTS!

The unbraked semi-trailer can roll away and trap and seriously injure personnel or other persons.

- ▶ Before applying the emergency release fixture: Always secure the semi-trailer with wheel chocks to prevent it from rolling away accidentally.
- ▶ Screw in the release spindle on the emergency release device before driving with the semi-trailer.

Emergency release of the parking brake

For the version with pre-mounted release spindle, steps 2-4 are not required.

1. Secure the semi-trailer to prevent it rolling away.
2. Remove the dust cap.
   Take the release spindle out of the holder and remove the nut and washer.
3. Insert the release spindle in the housing opening until it contacts the pressure plate.
   Turn the release spindle clockwise by 1/4 turn and pull slightly outwards until it grips.
4. Fit the washer and nut onto the thread.
5. Unscrew the release spindle almost fully by turning the nut (5) clockwise until a noticeable resistance can be felt.
   ▷ The spring-loaded parking brake is released.
6. Carry out the emergency release process on all wheels with spring-loaded brake cylinders.
   ▷ The semi-trailer is unbraked.

Stopping emergency release

As soon as the working pressure in the brake system is at least 5.2 bar, the release spindle of the emergency release device must be screwed back into the housing. Only then is it possible to brake the vehicle using the parking brake.

1. Secure the semi-trailer to prevent it rolling away.
2. Bring the brake system to working pressure.
3. Press the red release valve of the parking brake.
   ▷ Compressed air is applied to the spring mechanism. The parking brake is not yet active.

Version with pre-mounted release spindle:

4. Screw in the release spindle almost fully (3) by turning the nut.

Version with release spindle in holder:

5. Undo the firmly tightened nut.
   Undo the release spindle by 1/4 turn anticlockwise from the pressure plate and take out.
6. Insert the release spindle with washer and nut in the holder and slightly tighten the nut. Seal the housing opening with the dust cap.
7. On all other wheels with spring-loaded brake cylinder: end emergency release, repeat steps 4 or 5 and 6.
   ▷ The spring-loaded parking brake can be closed and released normally again. The semi-trailer is ready for driving.

4.4 Air suspension

The label on the switching valve indicates which type has been fitted.

⚠CAUTION

DANGER OF ACCIDENTS!

If the air suspension is not set to the DRIVE position before departure, the drive height can be too high. Accidents are possible due to poor driving characteristics or from getting caught in underpasses.

- ▶ Always set the shift valve to DRIVE position before departure.

In the 'Drive' position, the air suspension keeps the vehicle at the same height, irrespective of the load. The switching valve can be used to raise and lower the level of the stationary vehicle.

ECAS operating box

An ECAS operating box with corresponding functions can replace the valve lever for the air suspension, see also „ECAS (electronically controlled air suspension)“ on page 43.

⚠CAUTION

DANGER OF ACCIDENTS!

If the air suspension is not set to the normal height before departure, the drive height can be too high. Accidents are possible due to poor driving characteristics or from getting caught in underpasses.

- ▶ Always set the DRIVE HEIGHT (normal height) on the ECAS operating box before departure.

4.4.1 'Haldex' version

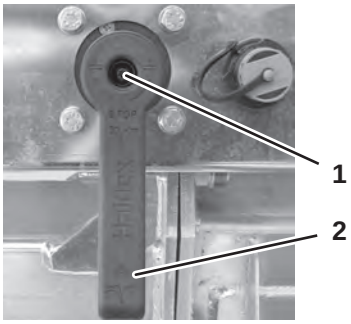


Illustration 4.6 Air suspension switching valve (shown in central position)

1 Shift valve (COLAS valve)

2 Hand lever

Information

The COLAS valve(1) has a safety feature, the so-called "Dead man's control". Thanks to this safety feature, whenthe hand lever (2) is released, the suspension bellows are no longer filled or deflated, and raising or lowering is immediately stopped.

Information

Another safety feature is that when a driving speed of 15 km/h is exceeded, the hand lever automatically switches from the "STOP" position to the "DRIVE" position. Therefore, driving with a lowered or raised semi-trailer is only possible up to a speed of 15 km/h.

The following shift valve positions are possible:

DRIVE position

1. The hand lever (2) is pulled out in the central position and cannot be moved to the side.

STOP position

2. Push in the hand lever from the DRIVE position.
   ▷ Now the hand lever can be swivelled.

RAISE position

3. Swivel the hand lever from the STOP position to the right (anticlockwise).
   ▷ The semi-trailer will be lifted for as long as the hand lever is activated.
   ▷ After the hand lever is released, it automatically returns to the STOP position and the raising operation is interrupted.

LOWER position

4. Swivel the hand lever from the STOP position to the left (clockwise).
   ▷ The semi-trailer is lowered for as long as the hand lever is activated.
   ▷ After the hand lever is released, it automatically returns to the STOP position and the lowering operation is interrupted.

To go to the DRIVE position, pull the hand lever from the STOP position to the DRIVE position.

4.4.2 'Wabco' version

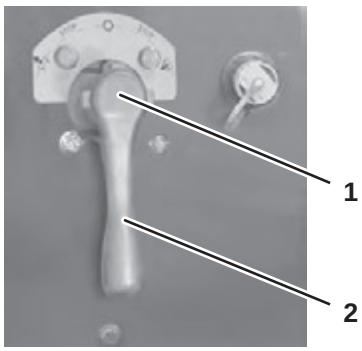


Illustration 4.7 Air suspension switching valve (shown in central position)

1 Switching valve

2 Hand lever

Information

The "Wabco" switching valve (1) does not have a "dead man's control". The air suspension bellows continue to be filled or deflated after the hand lever (2) is released. After the hand lever is released, the raising or lowering procedure is not halted.

The "Wabco" switching valve has a position for driving and several positions when stopped.

DRIVE position

1. Pull out the hand lever (2) into the central position
   - ▷ The hand lever cannot be moved to the side.
   - ▷ The vehicle is ready for driving.

The following shift valve positions are possible:

CENTRE position

1. Push in the hand lever from the DRIVE position.
   - ▷ The hand lever can be moved to the side.

STOP position

2. Swivel the hand lever from the CENTRE position to the left (LOWER/STOP) or to the right (RAISE/STOP) or

   swivel the hand lever from the RAISE position to the left (RAISE/STOP) or from the LOWER position to the right (LOWER/STOP).

   - ▷ The raising or lowering operation is interrupted and the currently set semi-trailer level is maintained.

RAISE position

3. Swivel the hand lever from the RAISE/STOP position to the right (anticlockwise).
   - ▷ The semi-trailer is raised.
   - ▷ After the hand lever is released, it remains in the RAISE position and the raising operation is not interrupted.

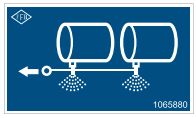
LOWER position

4. Swivel the hand lever from the LOWER/STOP position to the left (clockwise).
   - ▷ The semi-trailer is lowered.
   - ▷ After the hand lever is released, it remains in the LOWER position and the lowering operation is not interrupted.

The drive position is not automatically set: pull the hand lever from the CENTRE position to the DRIVE position to go to the drive position.

4.5 Compressed air tank

Modern towing vehicles are fitted with air dryers that effectively prevent the build-up of condensation water in the compressed air. Condensation in the compressed air tank reduces the available compressed air supply and damages downstream valves.



The compressed air tank illustration 4.8 (1) is located on the chassis in the semi-trailer's axle area.

A water drain valve is located on the bottom of the compressed air tank (2). Using this valve, check if there is condensation at regular intervals and drain it.

⚠WARNING

DANGER OF ACCIDENTS from FROST DAMAGE!

Frozen condensation can lead to total failure of the brake system and, hence, serious accidents.

- ▶ Drain the condensation more often if the outside temperature varies significantly.

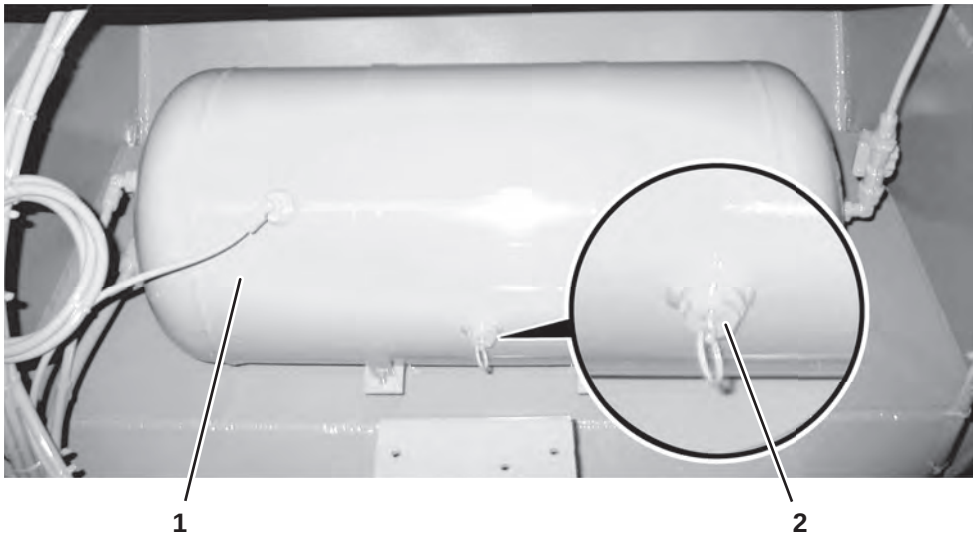


Illustration 4.8 Compressed air tank

1 Compressed air tank

2 Water drain valve

4.6 Axle load indicator

The axle load indicator for the air suspension is optionally located on the brake system control console. The axle load corresponds to the bellows pressure of the air suspension.

Illustration 4.9 Axle load indicator (bellows pressure)

1 Pressure gauge for bellows pressure indication

The values displayed on the pressure gauge (1) are read to obtain the current air suspension bellows pressure.

Information

Check the axle load before starting on a journey in order to detect immediately whether the load is exceeded. For the relevant values, see the type plate of the air suspension.

The manufacturer's type plate for the air suspension is located on the chassis or vehicle body on the front next to the chassis type plate.

4.6.1 Digital axle load indicator

The digital version of the axis load indicator is mounted on the silo tank at eye level. The electrical and compressed air connections to the towing vehicle must be connected to operate the unit.

The following settings can be made depending on the version and the software version.

- Display format (decimal place)
- Measurement graph (calibration)
- Analogue value output (RS 232)
- Alarm values for exceeding weight

NOTICE

MATERIAL DAMAGE from OVERLOADING!

If the axle load display is not calibrated correctly, tanks or vehicle can be overburdened. Accidents can result.

- Calibrate the axle load display accurately prior to travelling the first time with load.
- The vehicle is only pre-calibrated by Feldbinder Spezialfahrzeugwerke GmbH when delivered.
- Regularly check the calibration in accordance with the specifications of the operator and repeat as necessary.

Information

Refer to the instructions for operation, configuration and calibration in the enclosed operating instructions from the manufacturer.

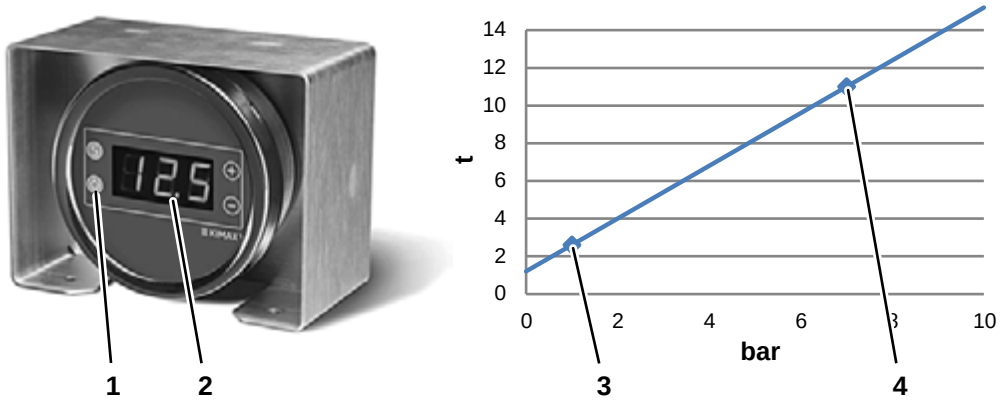


Illustration 4.10 Digital version of axle load display, KIMAX 1 in this case, calibration graph

1 + / - keys
2 Display
3 Lower calibration point 'Lo'
4 Upper calibration point 'Hi'

Calibration example

Before the first journey, calibrate the instrument with an empty weight and a full weight. Both values must be determined while the axle or axle unit sits on a scale.

1. Adjust the weight for the non-loaded axis ('Low' bellows pressure) and save the value.
2. Completely fill the silo tank.
3. Enter the weight for the loaded axle ('High' bellows pressure) with the silo tank full.

4.7 Lifting axle

The lifting axle is lowered to relieve the main axles in the axle assembly with a heavy load.

Several variants of the lifting axle control are possible:

- Manually actuated
- Electrically actuated or electronically controlled
- Automatically actuated

4.7.1 Manually actuated lifting axle

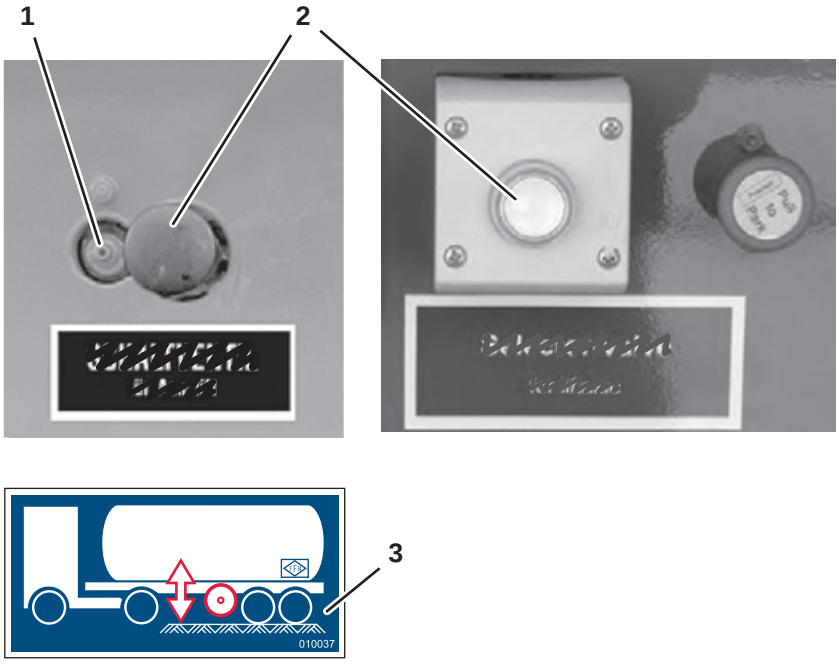


Illustration 4.11 Lifting axle pushbutton, variants

1 Switching valve
2 Pushbutton, version varies
3 Adhesive label 'Shift valve for axle lift'

Raising the lifting axle

1. Push in (2) pushbutton.
   ▷ The lifting axle is raised when the semi-trailer is empty or partly loaded.

The lifting axle is automatically lowered if the axle loads on the other two axles reach 80 % of the maximum permitted value. The pushbutton automatically releases when the lifting axle is lowered.

- To raise the lifting axle again when running empty or partially loaded, press the push-button in again.

4.7.2 Automatically actuated lifting axle without startup assistance

In automatic mode, the lifting axle is automatically raised and lowered, depending on the weight of the load.

Starting assistance is not possible.

4.7.3 Automatically actuated lifting axle with start-up assistance

A switch in the towing vehicle's cab can be used to raise the lifting axle to aid moving off if the vehicle speed is a maximum of 30 km/h. The two other axles are then subject to a load equal to 1.3x the maximum permissible value.

In addition, the lifting axle of an empty or partially loaded semi-trailer may be lowered if required.

Activating start-up assistance (loaded vehicle)

1. Press the switch in.
   ▷ The lifting axle rises and the start-up assistance is active.

Lowering the lifting axle (empty or loaded vehicle)

1. Pull the switch out.
   ▷ The lifting axle is lowered.

4.8 Steered axle

The semi-trailer can be equipped with a rear steered axle. When reversing (coupled), the steering function of the steered axle automatically locks.

Without the electrical connection to the towing vehicle, the semi-trailer can only be manoeuvred backwards when the steered axle is manually locked.

- Lock the steered axle via the rotary switch, illustration 4.12 (2).

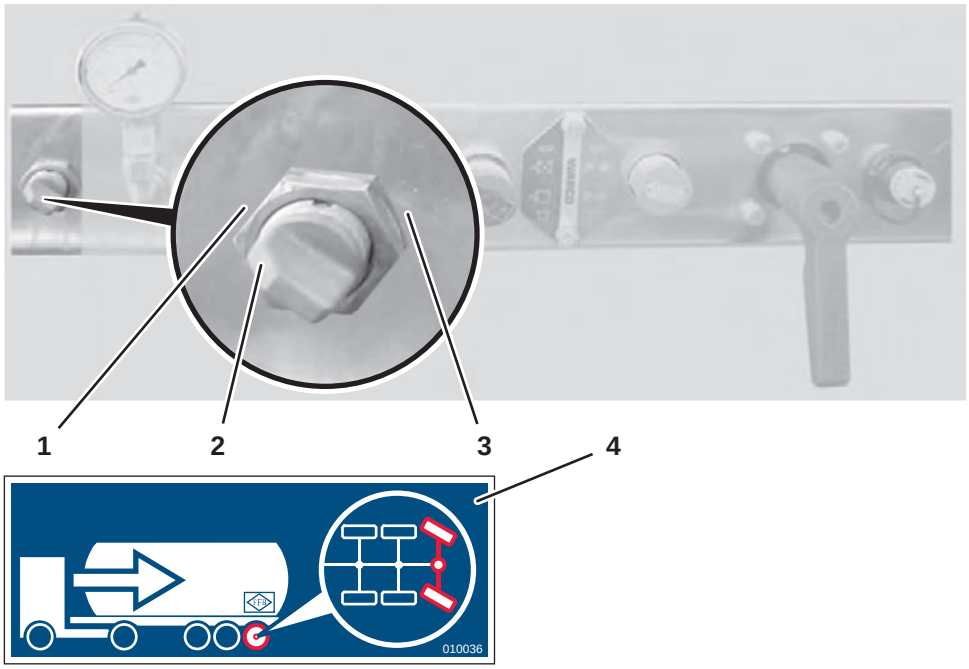


Illustration 4.12 Control console with 'steered axle' rotary switch

1 'DRIVE' position
2 'Steered axle' rotary switch
3 'LOCKED' position
4 Adhesive label: 'Rotary switch for steered axle'

Locking the steered axle

1. Turn the rotary switch (2) to the 'LOCKED' (3) position.
   ▷ The steered axle is locked.

Information

The steered axle remains locked until the rotary switch is moved back into the 'Drive' position.

Releasing the steered axle

1. Turn the rotary switch to the 'DRIVE' position (1).
   ▷ The steered axle is released.
   ▷ The steered axle locks automatically when engaging the reverse gear.

4.8.1 Pneumatic arrester

The pneumatic arrester causes blocking of the steered axle without bending angle. This is a requirement for problem-free reversing with the semi-trailer.

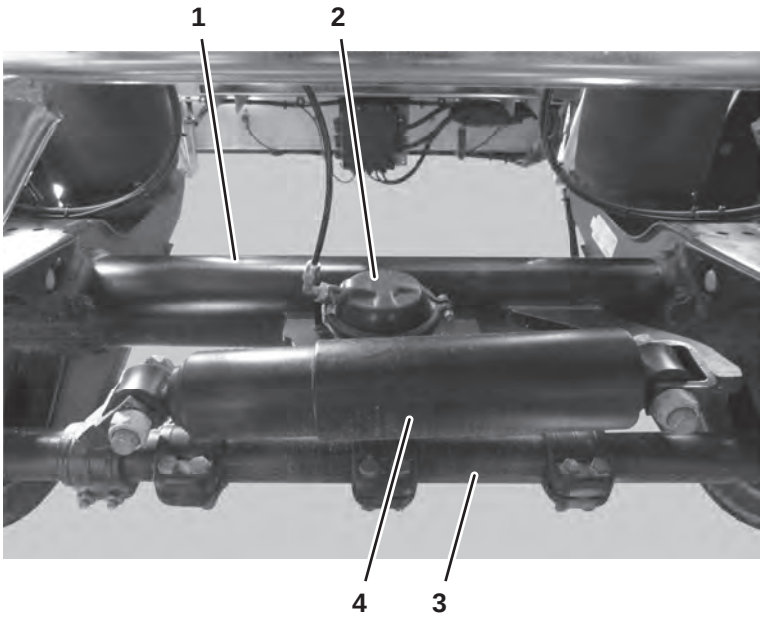


Illustration 4.13 Setup of the pneumatic arresting steered axle

1 Axle
2 Pneumatic arrester
3 Driver
4 Damper

Pneumatically locking the steered axle

1. Using the rotary switch, illustration 4.12.
2. Drive the vehicle a few metres forwards until the steered axle is straight and the lock engages.
3. Start reversing.

4.9 ECAS (electronically controlled air suspension)

ECAS is an electronically controlled air suspension system and is installed in Feldbinder trailers and semi-trailer as optional equipment. The control unit is located on the control console for the brake system.

Via ECAS a loaded lift axle can be raised as a start-up assistance. Observe the system manufacturer's operating instructions.

- Release the manual lifting axle lock again after manoeuvring, „Lifting axle“ on page 40.

Information

ECAS and lifting axle can be combined with the Optiload/Optiturn cornering assistant. If there any questions on parameterising the system, please contact Feldbinder Spezialfahrzeugwerke GmbH.

4.10 Trailer support

WARNING

MOVING TRAFFIC!

Passing vehicles could hit and fatally injure you.

- ▶ Wear a high-visibility vest when performing necessary work at the side of the road.
- ▶ Secure the vehicle, particularly at night and when visibility is poor.

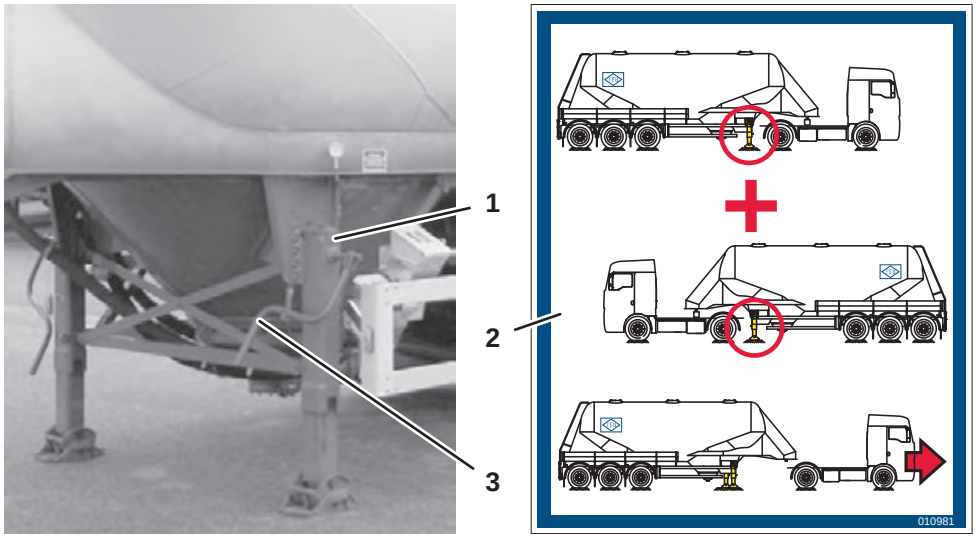


Illustration 4.14 Trailer support

1 Support leg

2 Adhesive label 'Lower landing gear before unhitching'

3 Crank (attached)

The trailer support is used for supporting the uncoupled silo vehicle and for height adjustment during the coupling and uncoupling procedures. It has a high gear and low gear (for lowering under load).

⚠CAUTION

MATERIAL DAMAGE!

The semi-trailer support may be damaged by overloading when attempting to raise or lower the silo vehicle in high gear.

- Once the support foot is on the ground, only use the trailer support in low gear whether the semi-trailer is empty or loaded.
- Only switch to high gear when unloading is complete and the support foot has been raised.
- Do not move the semi-trailer support against the limit stop.

Refer to the operating instructions from the manufacturer. After use, hook the crank (3) back into its holder.

4.10.1 Props

The version of props without crank and gearing are secured by a retaining bracket. The support foot falls out of the pipe as soon as the bracket is pulled out of the bore.

⚠CAUTION

DANGER OF INJURY!

Foot injury from falling support foot.

- Step to the side before pulling the retaining bracket from the bore.
- Wear protective gloves and safety shoes.

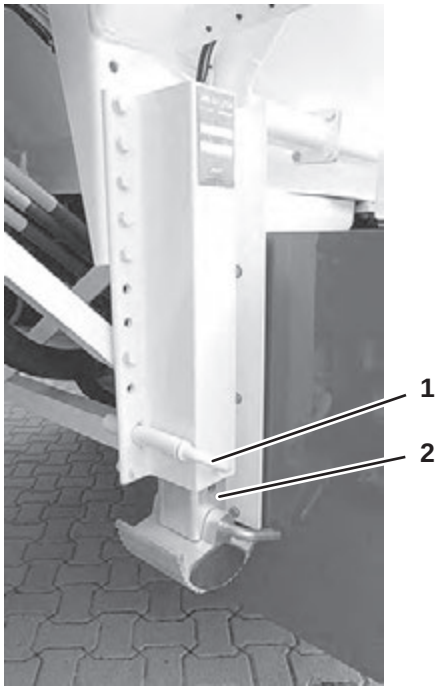


Illustration 4.15 Props (optional)

1 Retaining bracket

2 Support foot with locking bore

Setting up the props

1. Pull the retaining bracket (1) outwards.
   ▷ The support foot (2) falls downwards.
2. Push the retaining bracket fully into the highest free bore in the support foot.
   Push the support foot a few centimetres upwards if necessary.

Inserting the props

1. Pull the retaining bracket outwards.
2. Push the support foot upwards.
3. Push the retaining bracket fully into the lowest free bore.

4.11 Side guard

The side guard is attached to the side guard bracket with two or four bolts.

It can be folded up if required. For doing this, the screws need to be undone or the bolts removed.

⚠WARNING

DANGER OF INJURY!

If it is not secured, the side guard can drop down again on its own, thereby injuring anybody kneeling beneath it.

- ▶ When the side guard is lifted up, secure by tightening both upper screws or letting the spring bolt engage.

Depending on the design, the side guard can be held and secured by:

- a ratchet disc with spring bolt
- A gas spring and bolt with R-clip or,
- fixed screws (standard version)

⚠WARNING

MOVING TRAFFIC!

Passing vehicles could hit and fatally injure you.

- ▶ Wear a high-visibility vest when performing necessary work at the side of the road.
- ▶ Secure the vehicle, particularly at night and when visibility is poor.


Wear a high-visibility vest when working in moving traffic. Wear safety gloves.

4.11.1 Screwed side guard

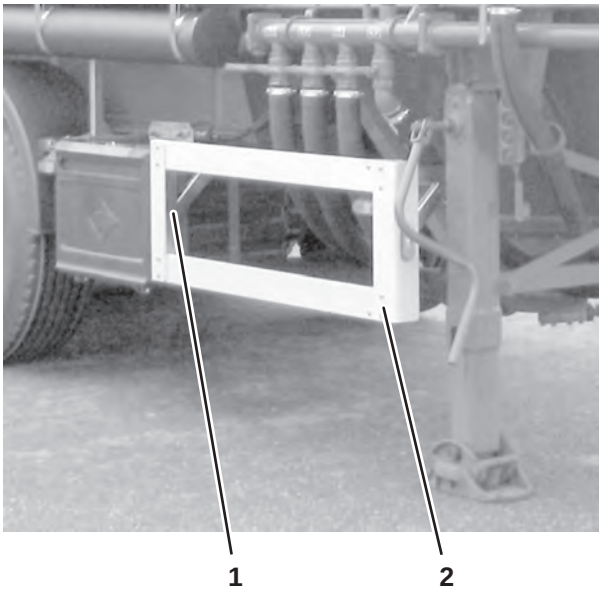


Illustration 4.16 Side guard, mounted

1 Side guard bracket
2 Side guard

Folding up the side guards

1. Release the locking device.
   - ▶ Remove the two lower bolts on the left and right.
     Loosen the two upper screws as required.
2. Raise the side guard.
3. Secure the raised side guard.
   - ▶ Tighten the upper screws.

Folding down the side guard, continuing to drive

1. Undo the screws and fold down the side guard.
2. Secure the side guard.
   - ▶ Tighten the four upper and lower screws.

4.11.2 Side guard with gas strut.

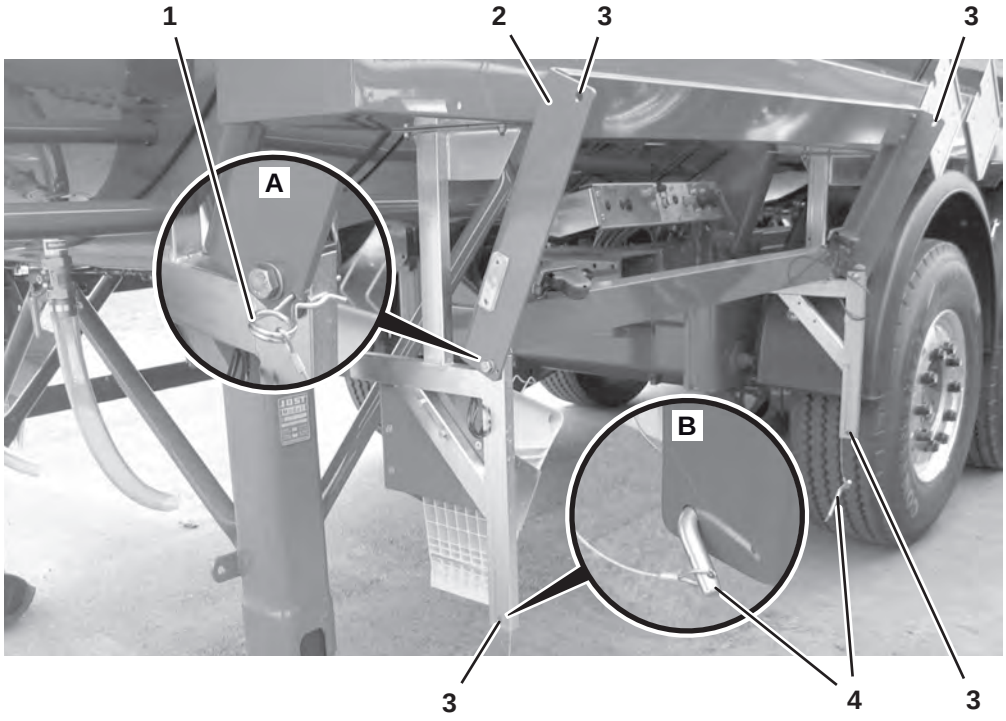


Illustration 4.17 Side guard with gas strut, raised and secured

A Side guard locking device with R-clip
B Side guard locking device with pin
1 Side guard bracket with R-clip
2 Side guard
3 Bores
4 Pins

Folding up the side guards

1. Release the locking device.
   - ▶ Remove the two lower bolts on the left and right, illustration 4.17 (A).
2. Raise the side guard.
3. Secure the raised side guard.
   - ▶ Insert the spring clip.

Folding down the side guard, continuing to drive

1. Pull out the safety device and unfold the ram guard.
2. Secure the side guard.
   - ▶ Put the bolt into the bore, illustration 4.18 (A).
   - ▶ Put the R-clip on a pin.

4.11.3 Side guard with locking disc

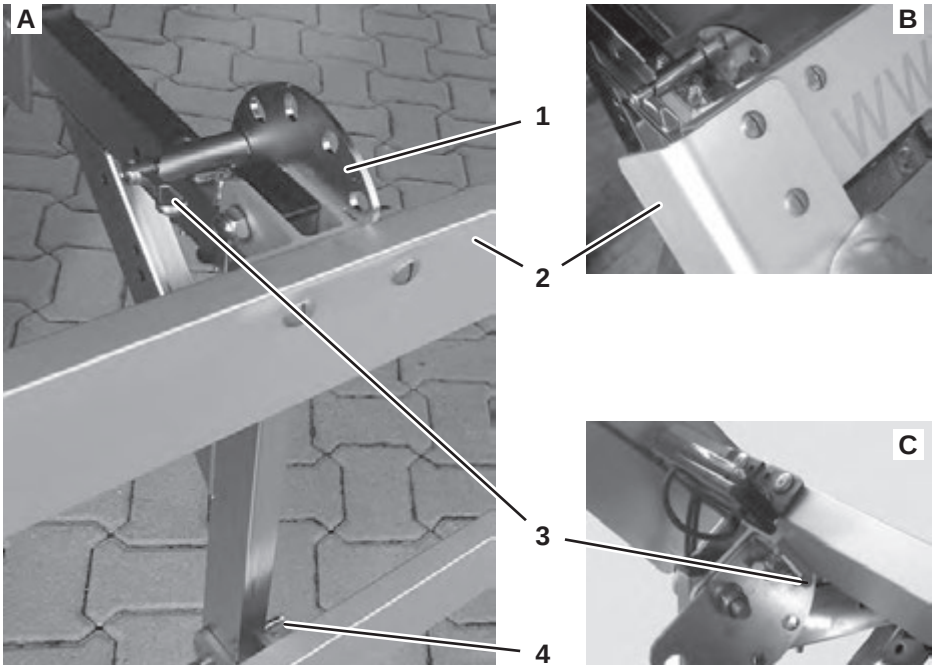


Illustration 4.18 Side guard with locking disc

A Side guard, folded down and secured
B Side guard, not secured
C Side guard, raised and secured
1 Ratchet disc with slots
2 Side guard
3 Spring bolt
4 Locking pin

Folding up the side guards

1. Release the locking device.
   ▶ Turn the spring bolt by 180°, illustration 4.18 (3).
   ▷ The spring bolt is guided out of the slot.
2. Raise the side guard.
3. Secure the raised side guard.
   ▶ Let the spring bolt engage in a slot at the appropriate height.

Folding down the side guard, continuing to drive

1. Pull out the safety device and unfold the ram guard.
2. Secure the side guard.
   ▶ Put the bolt into the bore, illustration 4.18 (A).
   ▶ Put the R-clip on a pin.

Information

If bolts with a locking plate are used, the R-clip is not required.

- Guide the bolt illustration 4.18 (4) through the hole and let locking plate fold down.

4.12 Underride protection (guard)

The underride protection is firmly attached to the chassis of the semi-trailer.

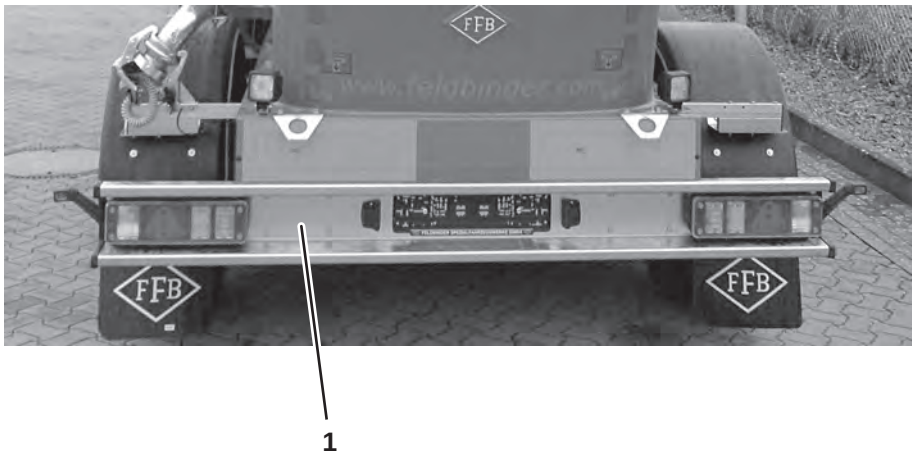


Illustration 4.19 Underride protection (example of equipment configuration)

1 Underride protection (guard)

Information

Modifications, adding or removing parts on approved components are not permitted by the operator. Also see "Warranty and Liability" in chapter see also „Introduction“ on page 10.

4.13 Hazardous goods identification

The orange warning signs as well as two to four plates for the hazard labels are attached to the holders provided.

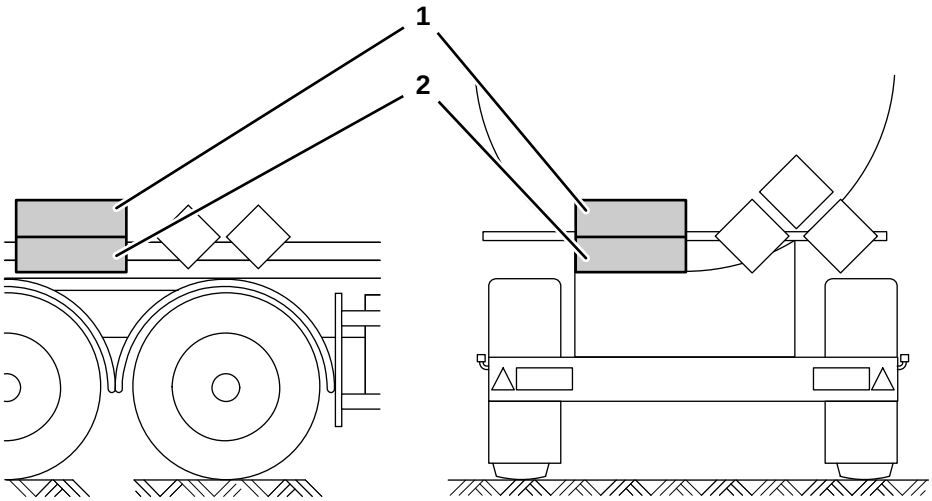


Illustration 4.20 Warning sign, attachment example

1 holder for hazard identification number (Kemler code)

2 holder for substance identification number (UN number)

Travelling empty with cleaned tank

The orange-coloured warning sign must not be visible when travelling empty with a cleaned tank.

- Remove the numbers from the holder and stow them in the toolbox.

or

- Close the sign by folding the lower part up and locking it or cover the sign.

4.13.1 Hazard label

In accordance with the ADR agreement, the vehicle must bear identification of the class of danger assigned to the load if

- the tank is filled with a hazardous substance or
- the tank is empty but has not yet been cleaned.

The hazard labels are stored in a box on the vehicle or mounted as rotating signs directly on the holder. The ADR vehicle is equipped with several holders on the sides and at the rear.

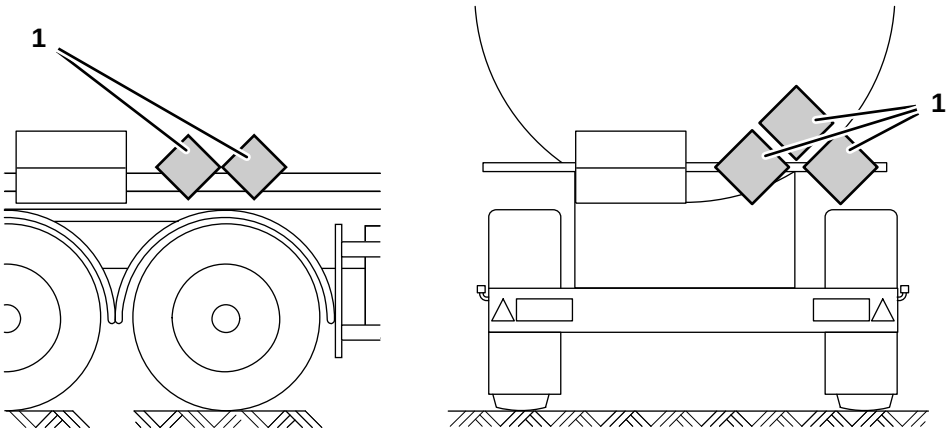


Illustration 4.21 Hazard label, attachment example

1 hazard label holder

Information

Always heed the stipulations for identification in the current version of the ADR as well as in country-specific regulations for the transport of hazardous goods.

4.14 Spare wheel bracket

The spare wheel bracket (optional) is located on the chasis between the side guard. The side guard must be folded up or unscrewed to remove the spare wheel, see also „Side guard“ on page 45.

When changing a wheel in moving traffic, always wear a high-visibility vest. Wear safety gloves.

After changing a wheel, secure all moveable parts with R-clip, securing bracket or hooks, as intended.

Feldbinder uses different versions of the spare wheel bracket:

Winch version

The spare wheel is attached to a cross member and a cable. It is lowered to the ground using a winch with hand crank.

CAUTION

Whipping hand crank

The spare wheel winch crank can whip back as soon as the nuts are removed from the cross member and the spare wheel is only hanging by the cable. This can cause injuries.

- Keep your head away from the area of the crank.
- Slowly lower the spare wheel.

'Spare wheel cage' cage model

The spare wheel is firmly bolted on a bracket made of bent pipe. The spare wheel bracket is released and lowered outside.

⚠CAUTION

Lowering cage with spare wheel

There is the risk of injuring your feet and hands when lowering the spare wheel bracket.

- ▶ Use the extendable pipe with a handle as a lever.
- ▶ Slowly lower the spare wheel bracket.

4.15 Wheel chocks

Make sure that the stipulated number of wheel chocks are carried on the vehicle and used. The wheel chocks must be undamaged. After use, the wheel chocks must be inserted in the intended brackets and secured for the journey.

ⓘInformation

Always secure the entire vehicle with the wheel chocks if it is parked in a sloping parking space. Secure the uncoupled semi-trailer with the wheel chocks in addition to the parking brake.

4.16 Tool box/stowage box

One or more tool boxes or stowage boxes of different sizes and versions can be attached to the semi-trailer.

Options:

- Aluminium, plastic or stainless steel version
- Side, top or bottom door hinge
- Door suspended on gas dampers
- Locking door handle

⚠CAUTION

LOOSE TOOLS!

If opened too quickly, tools or adapters can fall out and be damaged or injure your feet.

- ▶ Open the door slowly.
- ▶ Stow objects securely after use and close the door securely.

⚠CAUTION

DOOR OVERLOAD!

If the open door is overloaded, it can break off, resulting in possible injuries.

- ▶ Do not use the open door of the tool box or stowage box as a seat or ladder.

NOTICE

TOOL BOX OVERLOAD!

If it is overloaded, the tool box can break out of the bracket.

- Do not overload the tool box.
- The maximum permissible load of a tool box is 50 kg.

4.16.1 Aluminium version

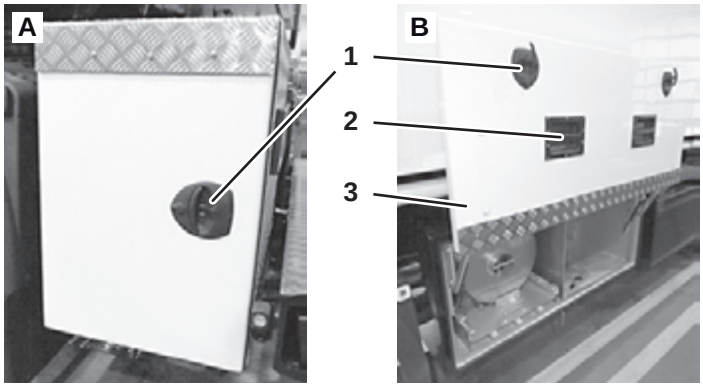


Illustration 4.22 Tool box/stowage box, aluminium version, closed and open

A Tool box, side door hinge
B Tool box, door with gas dampers
1 Lock with rotary handle, locked (A) / open (B)
2 Handle
3 Door, open

To open, pull out the rotary handle and turn it by 90°.

- Open the door (A) to the side.
- Pull the door (B) to the outside with both hands on the handles.
  The gas dampers pull the door up into the open position.

To close, swing the door back, press it gently against the seal and close it with the rotary handle.

4.16.2 Plastic version

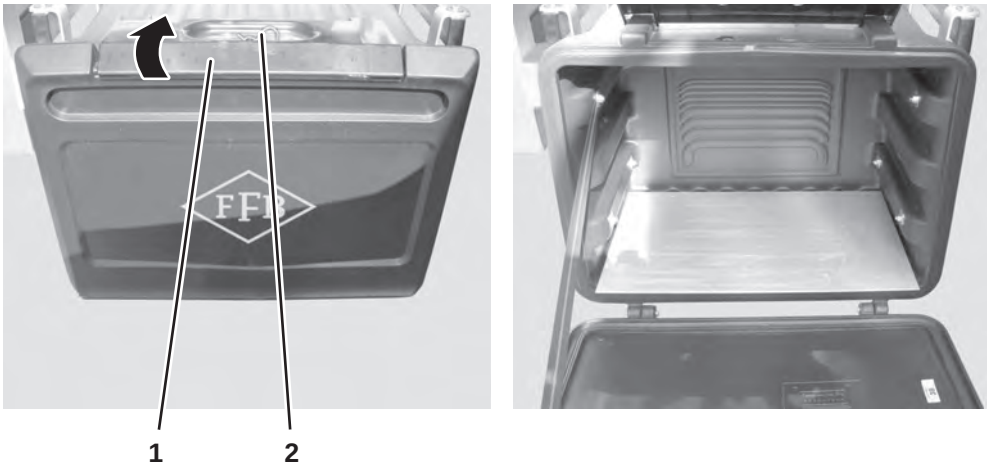


Illustration 4.23 Tool box/stowage box, plastic version, closed and open

1 Lock

2 Spring clip

When the tool box is closed, secure it with the lock (1) and the spring clip (2) or a padlock. Fold the lock upwards to open it.

4.16.3 Stainless steel version

The stainless steel version is opened upwards, downwards or to the side. Feldbinder offers several closure variants:

- With a lock for square-bit keys
- With lockable rotary handles
- With locked hinged lid

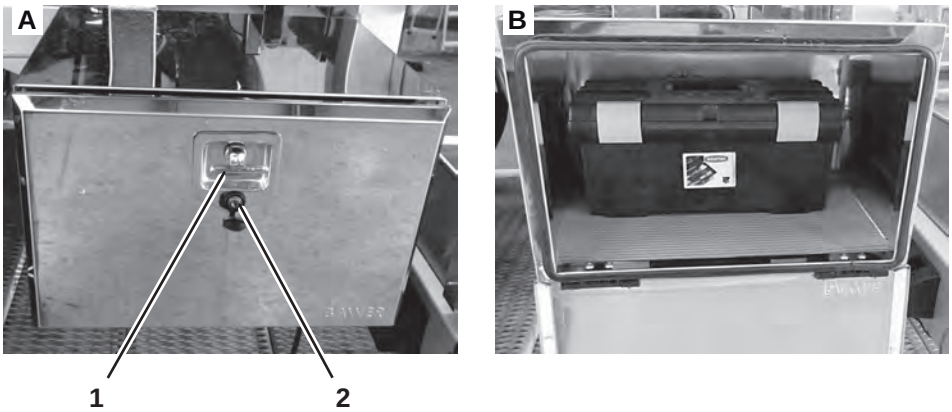


Illustration 4.24 Tool box/stowage compartment, stainless steel version with rotary handle

A Tool box, closed

B Tool box, door open downward

1 Rotary handle, locked

2 Lock

For version without rotary handle or hinged lid:

- Open or close the tool box with the supplied square-bit key.

5 Driving

5.1 Pre-departure checks

Carry out a pre-departure check before each journey. Walk around the tractor-trailer and check that it is roadworthy. Also see „Function test schedules“ on page 135.

Brake check

⚠CAUTION

DANGER OF ACCIDENTS!

Risk of a traffic accident from insufficient braking.

- Check the condition of the brake system at regular intervals, more frequently under high load.
- Upon reaching the wear limit, visit a workshop as soon as possible.

The brake lining must be replaced at the latest when the remaining thickness of the brake lining (without backing plate) is less than 2 mm at the thinnest spot.

Tank with safety railing

NOTICE

MATERIAL DAMAGE in UNDERPASSES!

Driving with the safety railing raised may cause it to become stuck and tear off in underpasses.

- When setting out on a journey, check that the safety railing is folded away and the safety device is engaged.
- Do not drive with the safety railing folded out.

5.2 First trip, wheel nuts and axle suspension

⚠WARNING

DANGER OF ACCIDENTS!

During the first few kilometres with newly mounted wheels, the wheel nuts can come loose; this may cause the wheels to come off, resulting in serious accidents.

- During the first loaded trip, at the latest after 50 km and again after 100 km, tighten the wheel nuts on all the wheels to the specified torque value.
- After every wheel change, at the latest after 50 km and again after 100 km, tighten the wheel nuts to the specified torque value.

Instructions for tightening/re-tightening the wheel nuts are given under („Fitting the wheels on the vehicle“ on page 140).

Please see the documentation from the wheel manufacturer.

Axle suspension

Observe the maintenance periods for the filter insert, see „Maintenance schedules“ on page 143.

Instructions for tightening/re-tightening the axle and spring bearing fixing screws are given under („Torque for chassis threaded connection“ on page 139).

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5.3 Brake synchronisation on the tractor-trailer unit

Vehicles featuring EBS

Brake synchronisation is not necessary on tractor/trailer units with EBS and dynamic brake regulation. In this case for semi-trailers and trailers, Feldbinder recommends a compliance inspection of the EC brake bands after the first 5000 km.

Vehicles without EBS

To avoid causing damage from overloading the disc brakes, the braking load should be equally distributed over all the brakes of a truck with trailer.

- After 1000 km of travel, carry out a brake adjustment on the truck and trailer with full load on a chassis dynamometer.
- Send a copy of the truck and trailer’s brake synchronisation log to Feldbinder Spezialfahrzeugwerke GmbH with the vehicle details. See also page 144.

Heat inspection

Information

After a test drive, check for uniform heating around every brake on all axles of the truck and trailer or articulated lorry. Cold brakes are not properly adjusted and will not be sufficiently effective.

CAUTION

RISK OF BURNS!

Hot brake discs or drums

- ▶ When carrying out the heat inspection be sure not to touch the brakes, brake discs or brake drums.

5.4 Coupling and uncoupling the semi-trailer

⚠WARNING

DANGER OF FATAL INJURY!

Persons in the danger area between the towing vehicle and semi-trailer could be overlooked and trapped or run over.

- Keep people away from the danger area.
- Nobody should be present near the coupling interlock of the towing vehicle during the coupling or uncoupling operation.
- Nobody should be present on the semi-trailer during a coupling or uncoupling operation.
- Required banksmen must maintain a sufficient lateral clearance from your towing vehicle.

Use your personal protective equipment during hitching and unhitching operations and wear a hard hat and safety shoes on building sites.

5.4.1 Hitching

1. Check the following before hitching:
   - Has the parking brake of the semi-trailer been applied?
   - Is the towing vehicle's kingpin load sufficient for the semi-trailer?
   - Are the fatigue strengths of semi-trailer coupling and kingpin sufficient? (Calculation of the D-value as per EU directive 94/20/EC as in regulation ECE-R 55, 2010.)
   - Is the tank loaded correctly? Follow the loading instructions, see page 116.
   - Do the coupling heights of the towing vehicle and semi-trailer match?
   - Is the parking brake on the semi-trailer applied?
   - Is the trailer kingpin attached securely to the plate and not worn?
2. Hitch the silo vehicle.
3. After hitching:

   The towing vehicle's handbrake must be applied!
   - Check that the fifth-wheel coupling is properly locked. Secure the fifth-wheel coupling. Follow the operating instructions from the manufacturer.
   - Connect the supply lines for compressed air and electrical equipment, see page 27.

⚠WARNING

DANGER OF ACCIDENTS!

If the EBS plug connection is not connected, the semi-trailer's ABS will not work and the automatic load-dependent brake regulation will not function. The unloaded semi-trailer will be over-braked, which can cause skidding and accidents.

- Driving the vehicle without an approved or connected EBS plug connection is prohibited by law.
- Always connect the EBS plug connection between the towing vehicle and the semi-trailer.
- Only use approved EBS plug connections which are entered in the vehicle's registration document.

- Connect the ABS or EBS connecting cable. Observe the instructions on page 27.
- Connect all the other supply lines (electrical system, hydraulic system, external heating).
- Retract the trailer support and secure the crank. Observe the manufacturer's operating instructions.
- Remove the wheel chocks and secure them to the vehicle.
- Release parking brake on semi-trailer.
- Move the air suspension to the drive position.
- Check clearance between cab and semi-trailer
- Check routing of all supply lines, see also „Supply lines“ on page 59.

4. Make the pre-departure check, see page 55.

5.4.2 Unhitching

⚠CAUTION

DANGER OF TIPPING OVER!

If the tank chambers are loaded unevenly or excessively, the semi-trailer can tip over and cause major damage to material and to the environment.

- Only unhitch an empty or uniformly loaded semi-trailer.
- A semi-trailer without trailer supports must only be unhitched in the empty condition and supported with a jack.
- Observe the loading instructions in these operating instructions.
- In case of doubt, place suitable supports (telescopic support, winch) under the semi-trailer.

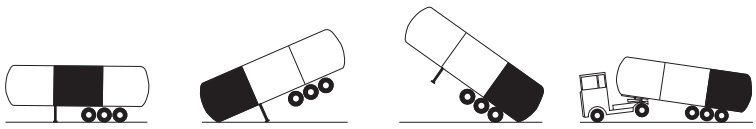


Illustration 5.1 Correct (A) and to be avoided (B, C, D) chamber filling conditions when unhitching

1. Before unhitching:
   - ▶ Choose a suitable location (level ground capable of bearing a load).
   - ▶ Apply the parking brake of the towing vehicle.
   - ▶ Evacuate semi-trailer air suspension bellows.
   - ▶ Release the parking brake of the towing vehicle and move the vehicle a little.
     - ▷ Stresses in the chassis of the semi-trailer are reduced.
   - ▶ Apply the parking brake of the towing vehicle again.
   - ▶ Place the wheel chocks underneath the semi-trailer (not underneath the lifting axle or steered axles).
   - ▶ Chassis with trailer support: Extend the trailer supports see also „Trailer support“ on page 43. Depending on the ground bearing capacity, use suitable pads under the support feet. Follow the operating instructions from the manufacturer.

2. Unhitching
   - ▶ Disconnect the compressed air lines and electric supply cables.
   - ▶ Disconnect all the other supply lines (electrics, hydraulics, external heating).
   - ▶ Apply the semi-trailer parking brake.
   - ▶ Check that the semi-trailer supports are securely seated.
   - ▶ Unlock and open the fifth-wheel coupling. Follow the operating instructions from the manufacturer.
   - ▶ Carefully drive the towing vehicle away.

5.5 Clearance

5.5.1 Swing radius

There must be enough clearance remaining between the rear wall of the driver's cab on the towing vehicle and the front of the silo semi-trailer that the two vehicles do not touch, even when the driver is driving round a bend.

5.5.2 Supply lines

The supply lines should not sag too much or scuff, nor should they be pulled too tightly when turning. Check the routing of the supply lines prior to departure.

5.5.3 Bending and tilting angle

⚠CAUTION

DANGER OF ACCIDENTS!

If the maximum permissible bending angle of 90° between the towing vehicle and the semi-trailer is exceeded, there is a danger of the supply lines tearing and the towing vehicle and silo vehicle becoming damaged.

- ▶ Never exceed the maximum permissible bending angle of 90° (right angle) for each side.

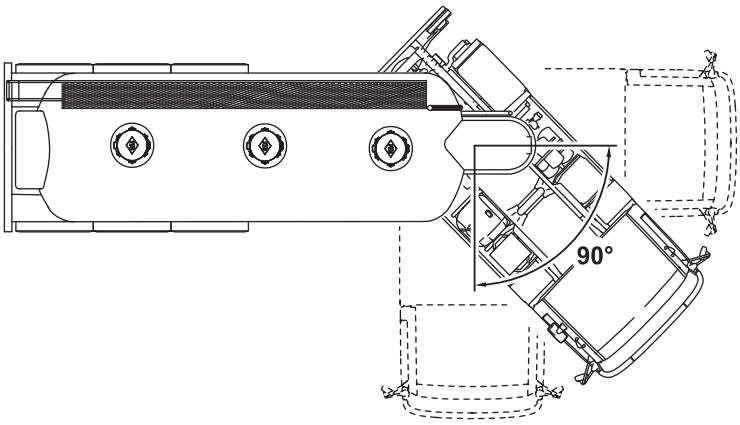


Illustration 5.2 Maximum bending angle

⚠CAUTION

DANGER OF ACCIDENTS

If the maximum permissible tilting angle is exceeded, there is a danger of the towing vehicle and silo vehicle becoming damaged.

- Never exceed the maximum permissible tilting angle.
- Be aware that the maximum permissible tilting angle for an angled towing vehicle may be lower.
- Before driving over uneven surfaces such as downward or upward sloping driveways, carwashes, ensure that the maximum permissible tilting angle is not exceeded.

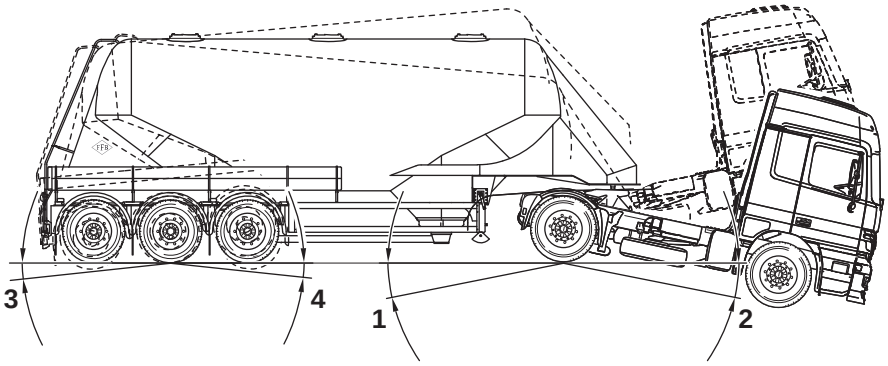


Illustration 5.3 Permissible tilting angle with aligned truck and trailer

No.	Slope	Tilting angle
1	Towing vehicle, up	max. 6° / < 30%
2	Towing vehicle, down	max. 6° / < 30%
3	Axle unit, rear, down	max. 3° / < 15%
4	Axle unit, rear, up	max. 3° / < 15%

Table 5.1 Permissible tilting angle

5.6 Loading onto ships and ferries

Semi-trailers to be used on ferries (e.g. with IMO 4 approval) or railway wagons must be equipped with stable lashing eyes.

The semi-trailer should not be lashed when the bellows are deflated.

⚠CAUTION

DANGER OF ACCIDENT from INFLATED BELLOWS!

Lashings can loosen if the air suspension settles as air is slowly released, thereby possibly causing the vehicle to tear loose and resulting in accidents.

- ▶ Deflate the air suspension bellows completely when parking the semi-trailer on a ferry.
- ▶ Only lash the semi-trailer when it is completely lowered on its air suspension.

1. Use the suspension's switch valve to lower the semi-trailer completely, see also „Air suspension“ on page 34.
2. Lash the semi-trailer.

Possible attachment points for six or eight lashing eyes are the rubbing plate substructure, the semi-trailer support, the front chassis and the axle mounts.

Lightweight lashing eyes are provided for securing the empty vehicle when transporting by ferry. They do **not** meet the requirements of IMO 4.

The sturdy lashing eyes meet the requirements of IMO 4.

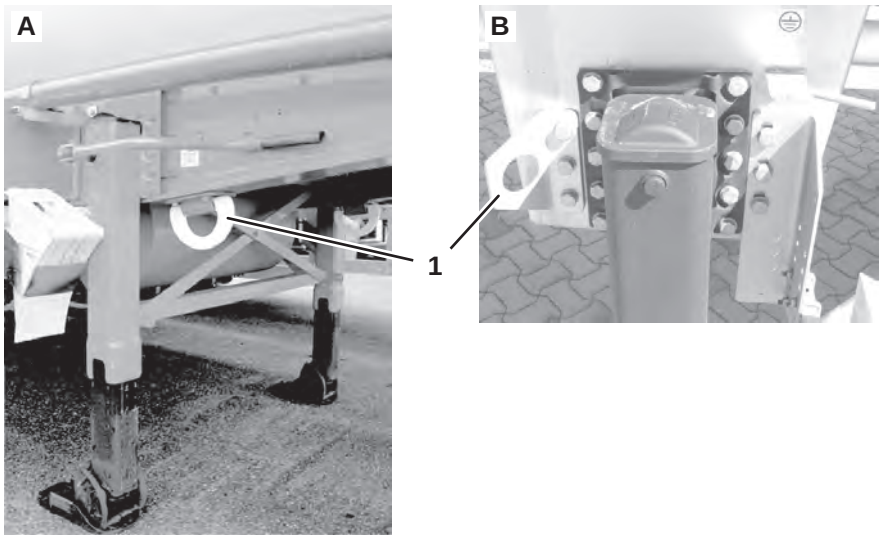


Illustration 5.4 Lashing on chassis (attachment example)

A Heavy-duty lashing eye, IMO 4 version

B Slight lashing eye on semi-trailer support, not suitable for IMO 4

1 Lashing eye

6 Operating the silo

6.1 Overview

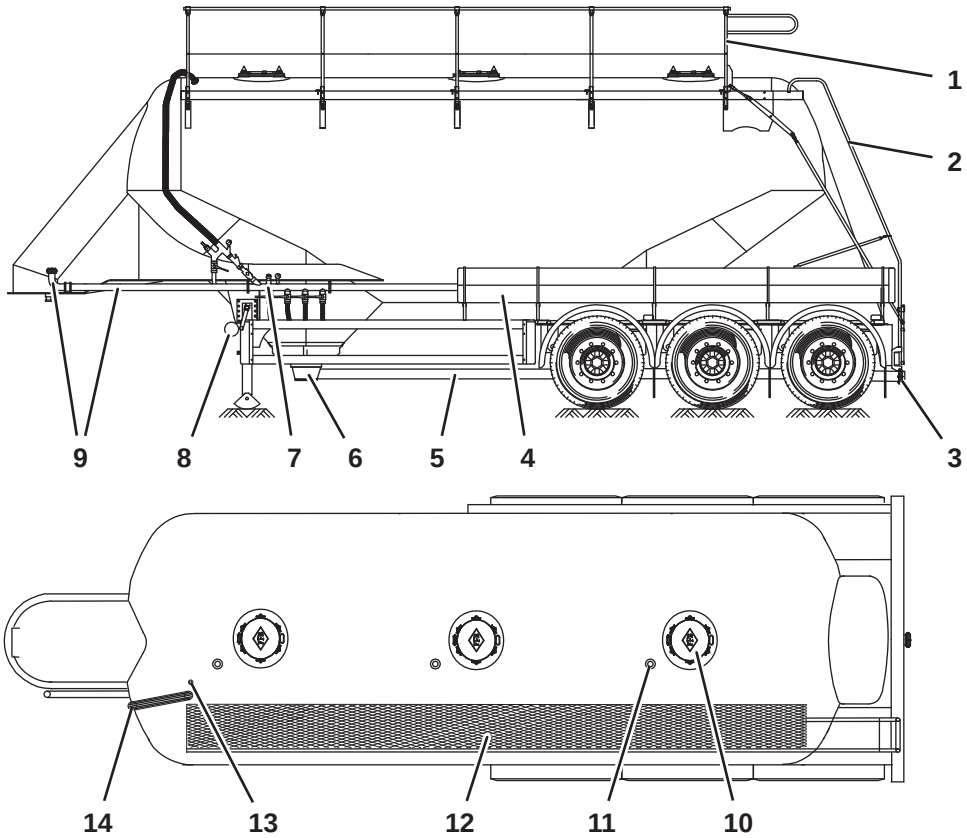


Illustration 6.1 Layout of control elements, side view, and top view

Nr.	Component / Function
1	Safety railing Safety device, page 88
2	Folding ladder For climbing onto the silo tank and raising the safety railing, page 91
3	Material outlet Connection for the material hose for discharging the silo tank, page 82
4	Hose pipe For storing the material hoses, page 84
5	Manifold For discharging the silo tank's chambers, page 81
6	Discharge vessel For discharging the silo tank's chambers, page 78
7	Air manifold For controlling and directing the air supply for loading and unloading, page 68
8	Hose pipe For storing the air hose (optional equipment), page 86
9	Air supply with air coupling For circulating compressed air, page 63

10 Manlid
For tank opening, gas-tight and pressure-tight, page 70

11 filler coupling
Connection for loading and bleeding the silo tank while filling (optional equipment), page 94

12 Walkway
Accessed the tank roof, page 88.

13 Vacuum valve
For protecting the silo tank from vacuum damage (optional equipment), page 98

14 Top air line
For supplying compressed air to the silo tank, page 63

6.2 Air flow routing overview

⚠CAUTION

RISK OF BURNS!

Components that carry compressed air can reach temperatures of more than 80 °C when in operation and can cause burns if touched.

- Wear protective gloves during operation.
- Allow components conducting compressed air to cool off prior to connection or maintenance activities.

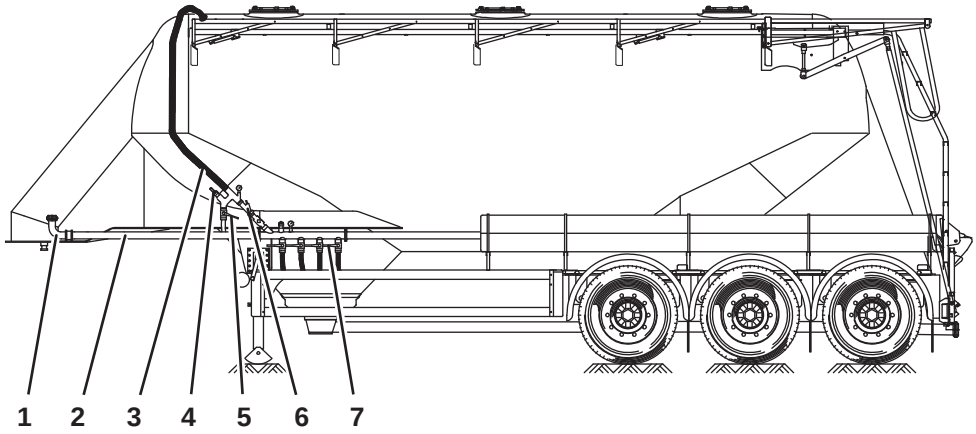


Illustration 6.2 Air flow routing

Nr. **Component / Function**

1 Air coupling
Used for connection of the compressed air source, page 64

2 Air line
Serves as a connection between the air coupling to the air manifold

3 Top air line
Supplies air to the silo tank

4 Safety valve
Limits the pressure in the silo tank, page 65

5 Exhaust air valve
Releases the pressure in the silo tank, page 66

6 Non-return valve
Prevents material back flow to the compressor

7 Air manifold silo tank
Controls the individual air supplies, page 68

-- Vacuum valve (optional equipment)
Prevents the silo tank from vacuum damage, page 132

6.3 Air flow routing on the silo tank

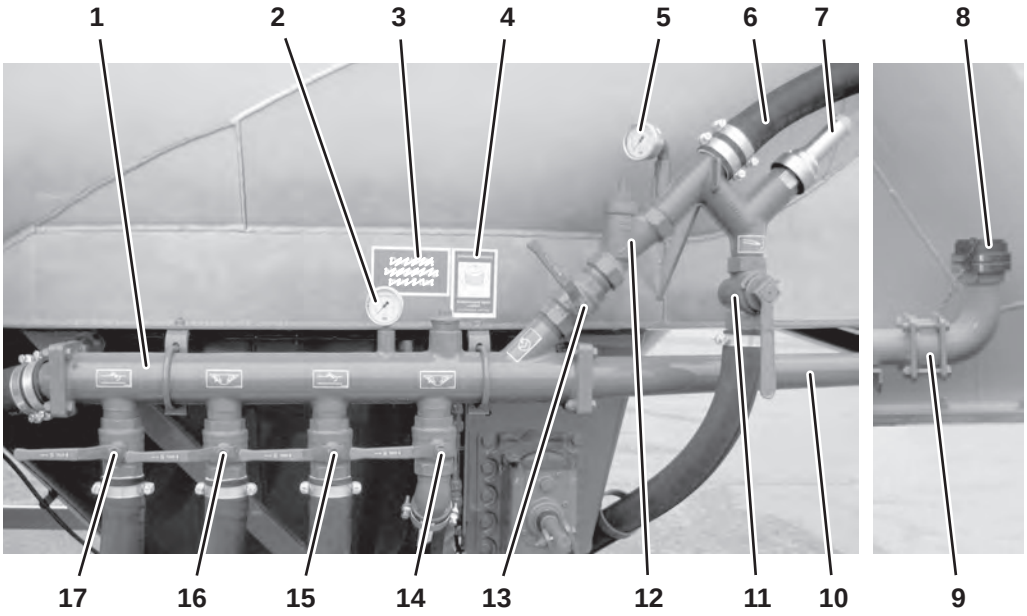


Illustration 6.3 Air line with air coupling and air manifold

1 air manifold
2 pressure gauge in air line
3 adhesive label 'Compressed air supply max. 2 bar'
4 adhesive label 'Safety valve maintenance'
5 silo tank working pressure pressure gauge
6 top air line
7 safety valve
8 air coupling
9 non-return valve
10 air line
11 exhaust air stop valve
12 non-return valve
13 top air stop valve
14 aeration air stop valve, front
15 injected air stop valve, front
16 aeration air stop valve, rear
17 injected air stop valve, rear

Connect an included or external compressed air source to the air coupling illustration 6.3 (8). The non-return valve (12) in the air line (10) prevents the air and material load from flowing back into the compressor.

Information

Only connect a compressed air source to the air coupling.

When it is not in use, close the external air coupling with the cap.

6.4 Safety valve

The safety valve illustration 6.3 (7) is an important protective device. It limits the excess pressure (working pressure) in the silo tank to a maximum of 2.00 bar, thus preventing the tank from bursting.

Information

Important information about testing the safety valve function can be found under „Safety valve“ on page 131. The precise working pressure can be found on the type plate.

The current internal tank pressure illustration 6.3 (5) and the pressure in the air line (2) can be read on the pressure gauges.

connectable safety valve

Information

Another safety valve can be mounted on the air manifold upon special request. It responds at a reduced pressure of 0.90 bar and can be activated or deactivated with a shut-off valve.

Connect the valve using the shut-off valve for transporting a light, dusty load, for example, that needs a reduced working pressure when it is being evacuated. In this case, the operating pressure is set and limited to 0.90 bar.

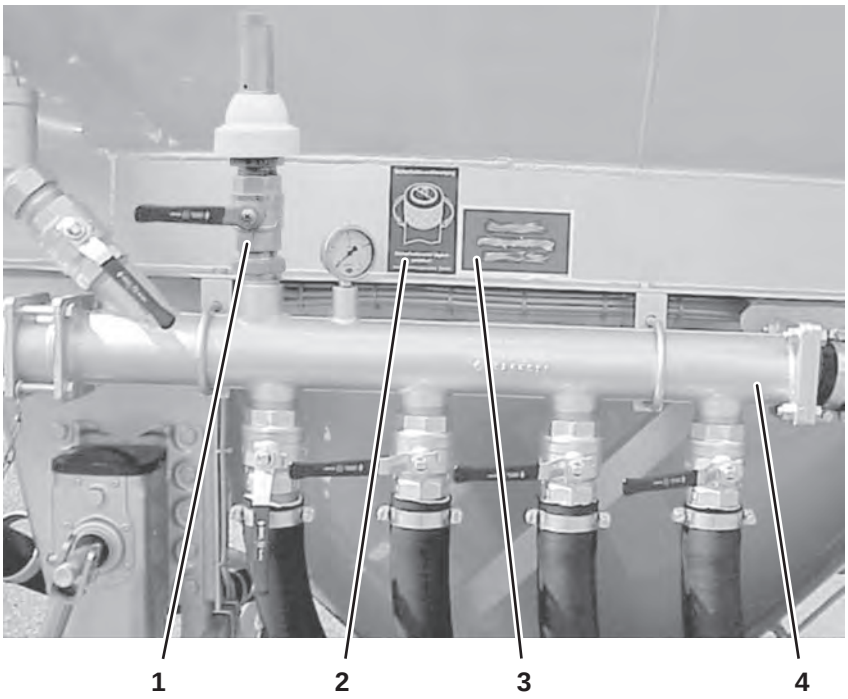


Illustration 6.4 Connectible safety valve (optional equipment)

1 connectable safety valve
2 adhesive label 'Safety valve maintenance'
3 adhesive label 'Compressed air supply max. 2.00 bar'
4 Air manifold

6.5 Exhaust air valve

You can bleed the silo tank and keep it depressurised using the exhaust air valve.

⚠WARNING

DANGER OF INJURY!

If the load is inhaled or comes into contact with the skin or eyes during venting, it can cause injuries such as chemical burns, burns and poisoning.

- ▶ Avoid any kind of physical contact with the load and avoid inhaling dust or vapours from the material.
- ▶ Wear safety clothing appropriate to the danger and nature of the load.
- ▶ In the event of injuries caused by the load, take action as described in the material safety data sheet for the load.

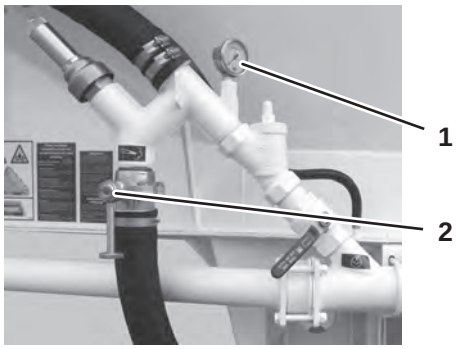


Illustration 6.5 Exhaust air valve

1 Pressure gauge

2 Exhaust air valve

Information

The exhaust air valve (2) is located on the air line. The pressure gauge (1) immediately next to it displays the pressure in the silo tank.

Close the exhaust air valve if:

- Compressed air needs to be used to discharge the tank.
- the load has to be inerted prior to transport.
- No irritant or hazardous product should escape to the outside.
- The tank has a vacuum valve with sufficient capacity for pressure equalisation during the journey.

Otherwise, leave the exhaust air valve open to prevent vacuum damage to the tank.

NOTICE

PRODUCT CONTAMINATION!

Product residues in the air line can contaminate subsequent products and make them unusable.

- ▶ Close the top air shut-off valve when venting.

This prevents product residues from reaching the air distribution line from the air flow.

As an optional equipment feature, the exhaust valve can be coupled to an exhaust hose running along the bottom of the vehicle. Further fittings with a filter bag or exhaust air silencer is possible.

6.6 Air manifold

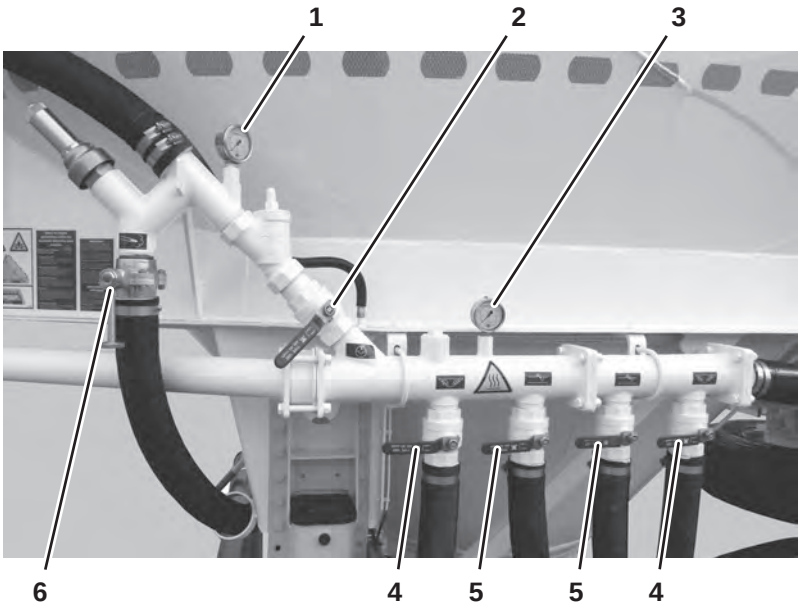


Illustration 6.6 Silo tank air manifold, stop valves and gauge

1 Top air/silo tank pressure gauge
2 Stop valve for top air
3 Pressure gauge in air line
4 Shut-off valve for aeration air
5 Shut-off valve for injected air
6 Air outlet stop valve

The air manifold is attached to the side of the silo tank. This is used to control the air supply when discharging the tank. The air supply can be adjusted by means of the appropriate stop valves for injected air illustration 6.6(5), aeration air (4) and top air (2). This makes it possible to control the flow of material and the tank pressure.

Information

For more information on the function of the air manifold and the stop valves, refer to the chapter "FILLING AND DISCHARGING".

6.6.1 Shut-off valve for injected air

The shut-off valve for injected air, illustration 6.6 (5), is located directly on the air manifold. When the shut-off valve is open, the injected air supports the flow of material through the central material pipe or manifold.

- Thrust nozzle at the start of the central material pipe
- Injected air branch-offs in the material pipe
- Injection nozzle directly on the discharge sump or, following the direction of flow, in the material pipe downstream.
  With regard to the injection nozzle upstream of the material outlet, see „Stop valve for ring nozzle“ on page 69.

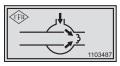
6.6.2 Shut-off valve for aeration air

The shut-off valve for aeration air, illustration 6.6 (4), is located on the air manifold. The shut-off valve makes it possible to loosen up certain types of bulk material during unloading. By mixing air with the material, thus enabling it to flow more freely, the aeration air prevents blockages forming in the discharge area. It also puts the silo tank under pressure.

6.6.3 Shut-off valve for top air

The shut-off valve for top air, illustration 6.6 (2), is located in a branch of the air manifold. It shuts the silo tank off from the air manifold. The silo tank can be pressurised via the top air.

6.6.4 Stop valve for ring nozzle



A stop valve may be available on the air manifold for the supply to the ring nozzle. The ring nozzle is located at the end of the material line before the material coupling. Similar to the injected air, the rotary air supports the flow of material.

The respective pressures can be read from the pressure gauges, illustration 6.6 (1) and (3), installed in the individual line sections.

6.7 Manlid

The manlids close the manhole openings in the silo tank. The manhole openings are used to fill the silo tank from above. As a manhole version, the manlid provides tank personnel with access to the inside of the tank.

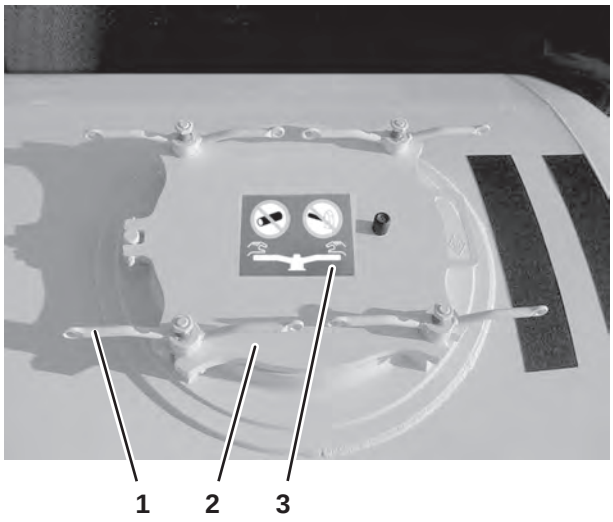


Illustration 6.7 Manlid, closed

1 Manlid clamp

2 Manlid

3 Adhesive label (open manlid only when depressurised, release crosswise, tighten by hand)

⚠DANGER

DANGER OF FATAL INJURY!

When the threaded connection of a manlid that is under pressure is loosened or tightened, the manlid can tear away explosively from the tank and injure or kill personnel or other persons.

- Never open or loosen the manlid clamp when the tank is pressurised.
- Never move a manlid clampwhile the tank is pressurised.

⚠DANGER

DANGER OF FATAL INJURY!

A damaged thread of a manlid clamp can give way, explosively ripping the manlid off the tank and injuring or even killing the operator or others.

- The container must not be pressurised if even just one thread is damaged.
- Only hand-tighten the manlid clamp.
- Replace damaged threads immediately.

A damaged thread of a manlid clamp cannot withstand the tank's internal pressure and will tear off.

Observe the following instructions when closing the manlid:

- Check that the sealing faces on the manlid and manhole are clean and undamaged before closing.
- Do not tighten the manlid clamp with your foot or using a pipe, a hammer or any other tool.
- Never tighten a manlid clamp when the tank is pressurised.

6.7.1 Types of threaded connections

Three different types of threaded connections may be installed, depending on what is required and desired:

- wing bolt
- container closure
- eccentric wing nut.

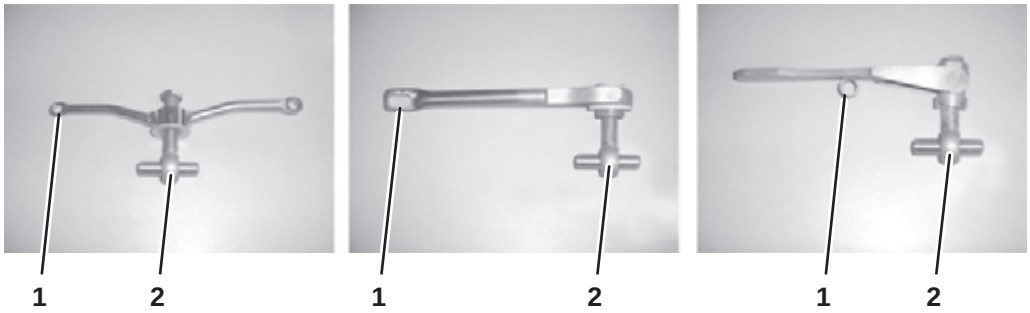


Illustration 6.8 Manlid threaded connections

1 customs tag eyelet

2 eye bolt with securing pin

(left)	wing bolt
(centre)	container closure
(right)	eccentric wing nut

6.7.2 Threaded connection

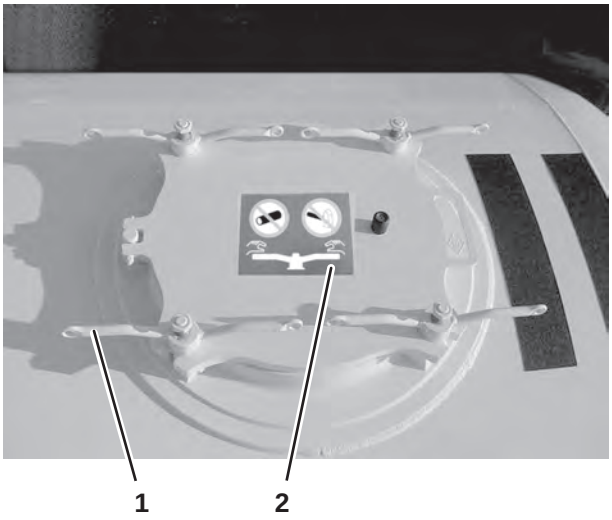


Illustration 6.9 Manlid

1 Manlid clamp (wing bolt)

2 Adhesive label 'Tighten clamp by hand only'

Opening

1. Ensure that the tank is completely depressurised.
   - ▶ Check this on the pressure gauges.
   - ▶ If necessary, use the exhaust air valve to completely bleed the tank.
2. Release the hatch clamps by hand.

Closing

1. Make sure that the compressed air supply is shut off.
2. Hand-tighten the manlid clamps crosswise to a uniform tightness.

Manlid with eccentric wing nut fasteners

Eccentric closures facilitate quick opening and closing and have a low overall height.

Information

With increasing use of the silo tank, the manlid seals will settle and can no longer provide a tight seal. This requires readjustment of the eccentric wing nuts, illustration 6.12.

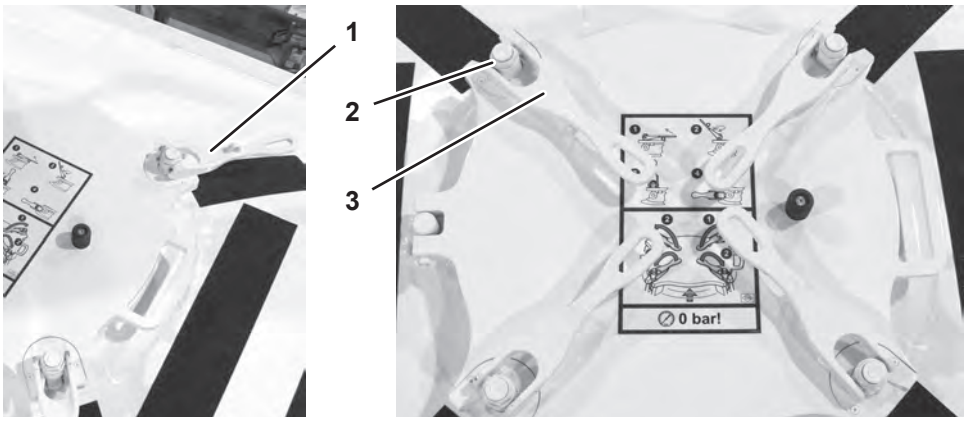


Illustration 6.10 Manlid with eccentric wing nut

1 Eccentric wing nut, open
2 Adjusting nut
3 Eccentric wing nut, closed

Information

The hinge spring pushes the manlid upwards as soon as the eccentric wing nut is released.

When opening and closing the lid with eccentric wing nuts, proceed as follows, illustration 6.10:

Opening

1. Lift the lever of the eccentric wing nut until there is no more closing force (approx. 130°).
2. Turn the lever by 90°, lift it sideways off the lid and lay it upside down on the tank, illustration 6.10 (1).

Closing

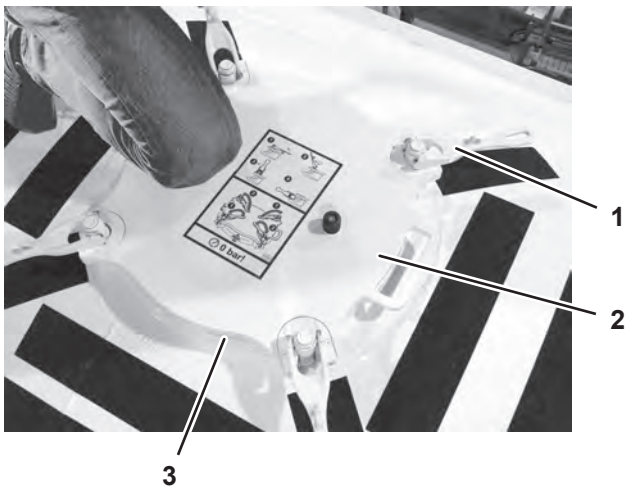


Illustration 6.11 Closing the manlid with eccentric wing nut

1 Eccentric wing nut, open
2 Manlid
3 Gasket

⚠WARNING

DANGER OF INJURY!

Escape of load if the manlid is not sealed tight. Tipping the tank shifts load directly under the manlid.

- ▶ Close the manlid carefully.
- ▶ Visually inspect the seals.
- ▶ Check the eccentric nut preload and readjust if necessary.

1. Check the seals and inside of the manlid for cleanliness and integrity.
   - ▷ Clean or replace the seal as necessary, see also „Function test schedules“ on page 135
2. Shut the manhole lid and align it properly.
   - ▷ The notches for the threaded bolts must be centred over the wing nuts.
3. Press the manlid down with a foot or knee next to the hinge.
4. Turn the eccentric wing nut lever by 90°, lift it sideways above the lid, turn it back and place it in an open position.
   - ▷ The levers point outwards and the fasteners lie upside down, see illustration 6.11 (1).
5. Tighten two eccentric wing nut fasteners at a time, working crosswise.
   - ▷ The levers point inwards, illustration 6.10 (3).
   - ▷ The closed levers must all be equally difficult to turn sideways.
6. Visually inspect the seal while it is closed.
   - ▷ Adjust the eccentric nut preload if the position or shape is uneven.

Adjusting the eccentric nut preload

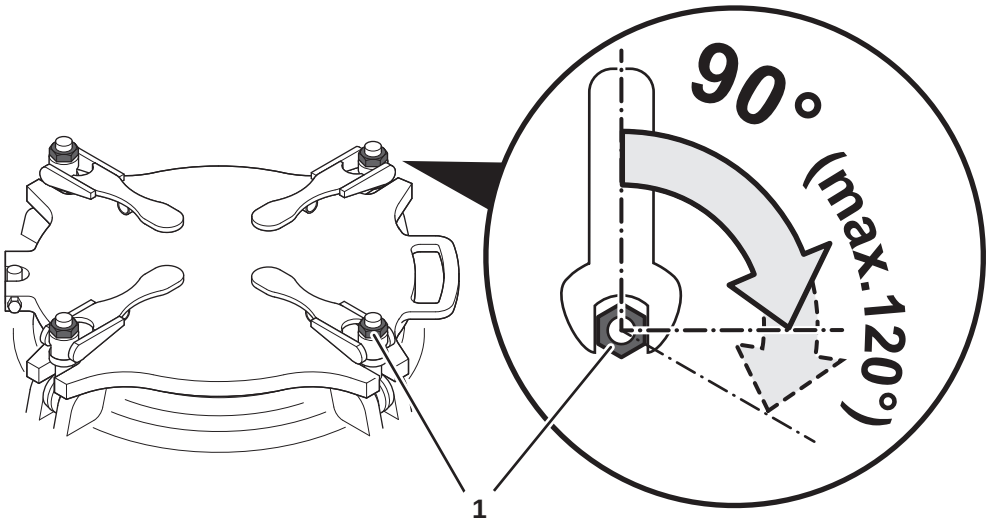


Illustration 6.12 Rotation angle for preloading the eccentric wing nut

1 Adjusting nut

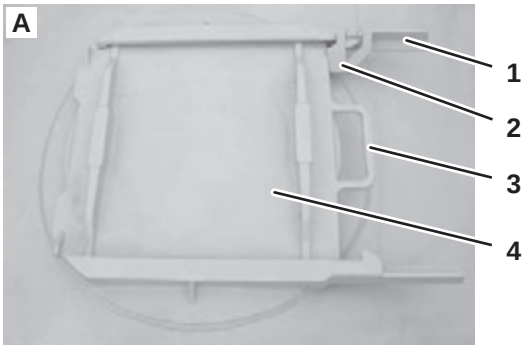
Procedure

1. Vent the silo tank completely via the exhaust air valve.
2. Align the manlid in the middle and press it down with your foot or knee, see illustration 6.11.
3. Loosen the adjustment nuts illustration 6.12 (1) on the closed eccentric wing nuts until there is no more closing force on the manlid.
   ▷ The closed levers must be easy to turn sideways with little resistance.
4. Working crosswise, tighten all the adjustment nuts to the same degree until there is a slight closing force.
5. Tighten all adjustment nuts crosswise using a wrench by a 1/4 turn (90°), maximum by 120°, illustration 6.12.
   ▷ The closed levers must all be equally difficult to move sideways.
   ▷ The eccentric wing nut fasteners are now correctly adjusted.
6. Tighten the eccentric fasteners crosswise.
7. Pressurise the tank to working pressure and check the manlid seals.
   ▷ It should not be possible to hear any compressed air escaping.
8. If a manlid does not seal properly, fully vent the tank via the exhaust air valve and repeat the eccentric preload adjustment. Check the tightness of the manlid again.
9. If a manlid is still not sealed properly, inspect the seal and inside of the manlid for cleanliness and integrity.
   ▷ Clean or replace the seals if necessary, page 134.

6.8 Sliding manlid

Silo vehicles may be equipped with sliding manlids instead of hinged manlids (page 70).

They can be operated mechanically (illustration 6.13 (A) or pneumatically (B).



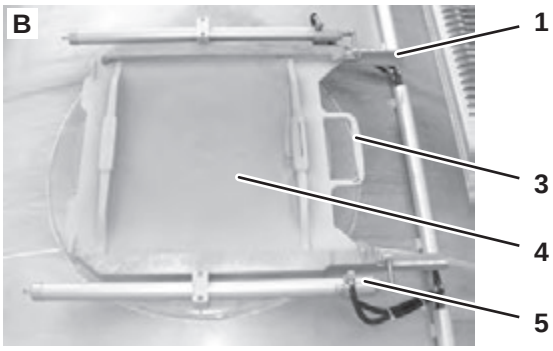


Illustration 6.13 Sliding manlid, mechanical (A) and pneumatic (B) operation

1 guide rail
2 safety device
3 handhold
4 manlid
5 pneumatic cylinder

Information

Observe the following instructions when operating the manlids:

- Mechanical sliding manlids can be pulled completely out of the guide rail. Afterwards, seal the manhole using the same lid. Swapping out sliding manlids may lead to them not closing with a tight seal.
- Clean dirty sliding manlids before opening them. Dirt residues on the lid may otherwise get into the load. If you close a sliding manlid with a soiled seal, the manlid may fail to close tightly.
- Clear the seal from water or snow in cold and damp weather. Water in the seal will freeze at low temperatures and cause leakage.

DANGER

DANGER OF INJURY.

When opening the sliding manlid of a silo tank under pressure, there is a danger that parts will come loose, fly off and injure you or others.

- ▶ **Never** open a sliding manlid when the silo tank is under pressure.
- ▶ Open the exhaust air valve before opening the sliding manlid.

WARNING

DANGER OF FALLING!

With pneumatically moved, sliding manlids may cause people to lose their hold and fall off the tank.

- ▶ Do not stand on the manlid.
- ▶ Do not activate a sliding manlid if someone is working on the tank.

6.8.1 Mechanical operation

Opening the manlid

1. Flip the safety device illustration 6.13 (2) up and unlock the manlid (4).
2. Slide the manlid with handhold (3) in the guide rail (1) to the side and open the manhole.

Closing the manlid

1. Push the manlid (4) in the guide rail (1) over the opened manhole until it reaches the stop.
2. Fold the safety latch down.
   ▷ The manlid is secured against accidental opening.

6.8.2 pneumatic operation

Information

Depending on the design, the sliding manhole lids can be operated individually or only together.

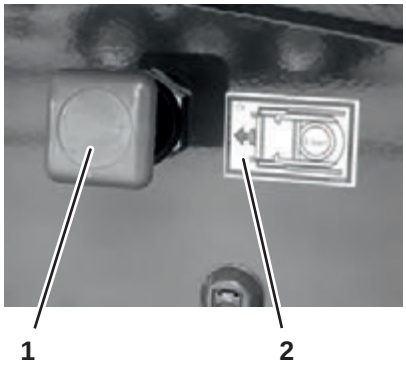


Illustration 6.14 Sliding manlid operation

1 Sliding manlid control lever

2 Adhesive label 'Only activate sliding manlid without pressure'

DANGER

DANGER OF INJURY!

When actuating the pneumatic sliding manlid, take care that no person is on the lid or within its range of movement. This can cause the person to fall or be seriously injured.

- ▶ Never open a sliding manlid when there is somebody on the lid or within its range of movement.
- ▶ Never close a sliding manlid when somebody is in the silo tank.

To open/close the pneumatic sliding manlid, push the control lever(s) (1) either forwards (away from you) or backwards (towards you).

6.9 Discharge vessel

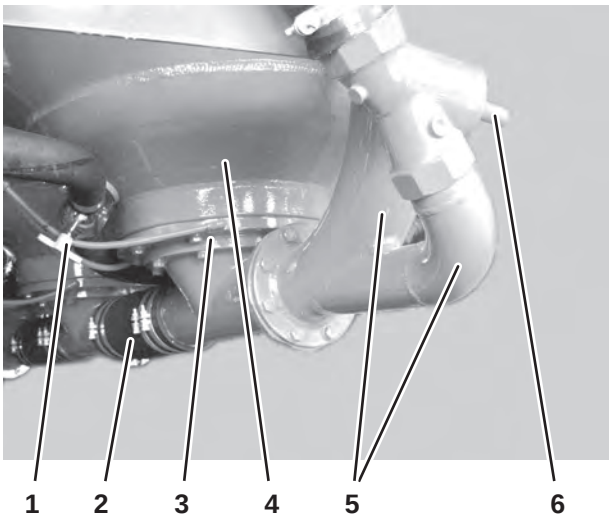


Illustration 6.15 Discharge vessel

1 Aeration air coupling
2 Material line, adapter piece
3 Discharge vessel (instead of material line, also possible with free-fall drop bottom)
4 Discharge cone
5 Injected air/material line
6 Non-return valve

The discharge vessel seals the conical material discharge of the individual chambers of the silo tank from the bottom. The coupling for aeration air is located on the discharge cone. The discharge vessel leads to the common material line page 81, and a drop bottom can be flanged to the discharge vessel to empty the silo tank, illustration 6.18.

The common material line leads from the individual chambers of the silo tank to the material coupling at the end of the tank. Shut-off fittings illustration 6.19 (ball valves, butterfly valves, pinch valves) are fitted in the line. They seal off the material discharge points of the individual chambers of the silo tank.

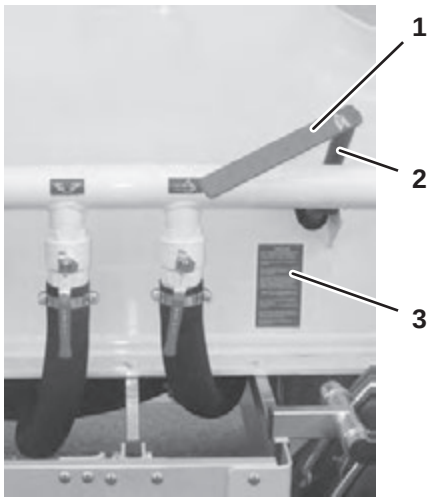


Illustration 6.16 Operating the butterfly valve

1 Lever for operating the butterfly valve

2 Cardan shaft

3 Adhesive label with safety instructions, see also „Brief instructions“ on page 129

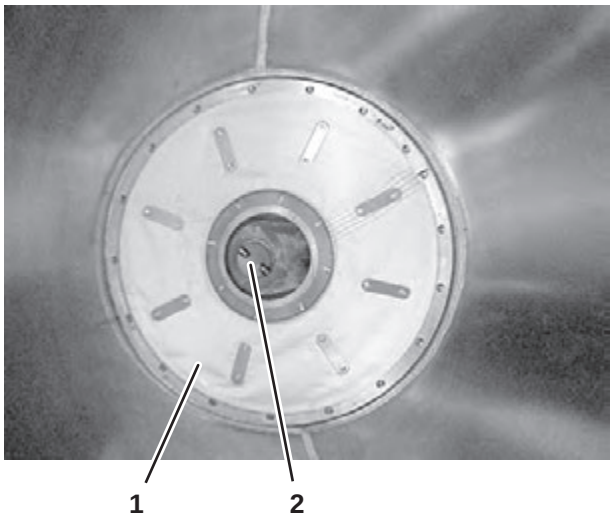


Illustration 6.17 Discharge sump (view from inside)

1 Aeration pad

2 Drop bottom, bottom valve

To assist the unloading procedure, the load material can be loosened by the introduction of aeration air.

The aeration air is blown from below into the discharge sump and through the aeration mat illustration 6.17 (1) mixes the load material with air. This prevents formation of lumps in the load material and improves its flow properties.

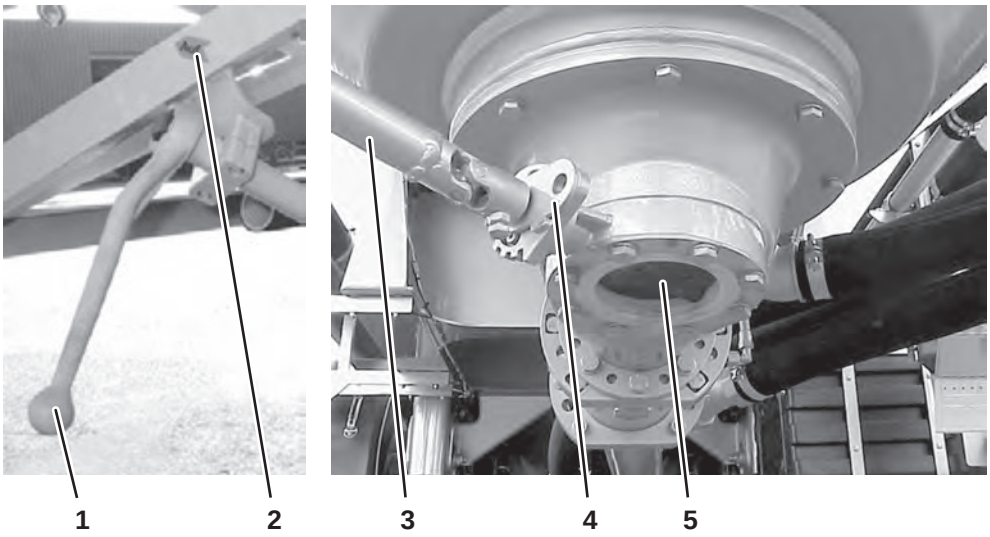


Illustration 6.18 Drop bottom, removable key

1 Key, inserted
2 Adhesive label 'OPEN'
3 Cardan shaft (remote control)
4 Custom tag eyelet
5 Drop bottom

The drop bottom illustration 6.18 (5) locks the discharge vessel of the silo tank downwards. It is used for free-fall emptyingof the load material.

The drop bottom is operated using the Cardan shaft (3), whose end is led out to the side of the tank trailer. The key (1) must be inserted for this.

Information

Ensure that the drop bottom is closed while emptying with compressed air. Otherwise, the load material can be pushed out through the drop bottom, see also „Drop bottom“ on page 83.

6.10 Material line and material discharge

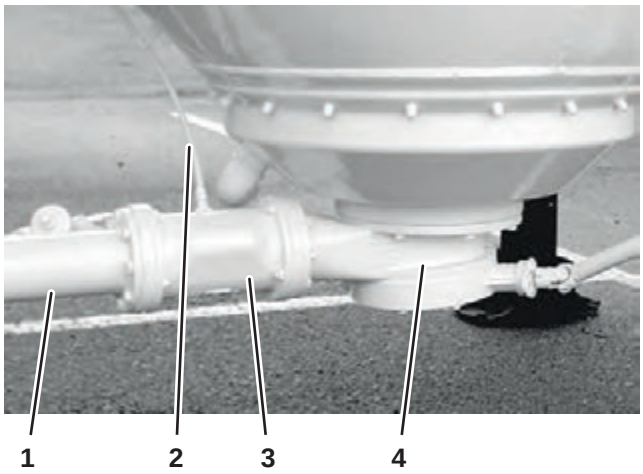


Illustration 6.19 Material line

1 Material line
4 Discharge sump, here with discharge cover
2 Hose for control air of pinch valve
3 Shut-off device in the material line (pinch valve)

The material line goes from the individual discharges of the silo tank to the material connection from which the load material is being unloaded. The lines of the individual chambers or discharges join into one line.

Information

It is possible that the material lines do not merge into a manifold, but are led out individually to the side of the silo vehicle. In such a case, the material hose must be connected to the material connection of the outlet to be emptied.

Shut-off fittings (ball valves, butterfly valves, pinch valves) can be fitted in the line sections of the material line. With these shut off controls, which chamber or discharge vessel is to be discharged can be decided.

Information

Like the drop bottoms, the mechanical butterfly valves can be activated with a lever via a Cardan shaft, which is led out to the side of the silo tank.

Material discharge and material hose

The material line (1) ends at material discharge. The material hose for transferring the load material can be connected to this. Before emptying, open the material outlet using the shut-off device and close it again after emptying the tank.

Information

The material hoses supplied by Feldbinder are made of a conductive material and meet the safety standards concerning potential equalisation.

The discharge process can be controlled using the shut-off valves on the air manifold. In doing so, also use injected air via the ring nozzle, see also „Compressed air unloading“ on page 125. Never use the shut-off devices in the material line to control the emptying of the silo tank.

A viewing window can be fixed in front of the material discharge. This makes it possible to check that the load material is flowing smoothly.

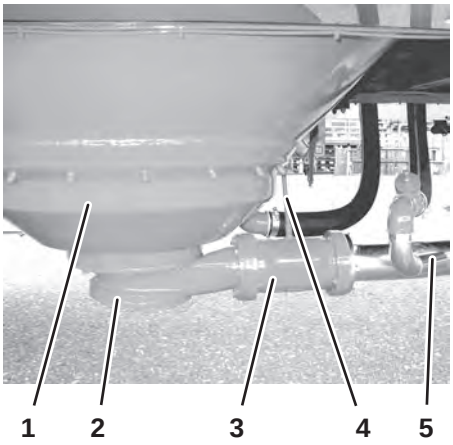


Illustration 6.20 Pinch valve in manifold

1 Material discharge (cone)
2 Discharge vessel
3 Shut-off device (pinch valve)
4 Control line for pinch valve
5 Material line with injected air supply

When the material line is equipped with pinch valves (3), its proper function is guaranteed only if sufficient pressure is built up in the tank for working air. The control air is fed to the pinch valve via the control line (4). In case of pressure failure, the pinch valve can still be opened.

The control of the pinch valves is carried out via valves (2) which are located on a special panel. For more information on the operation, see section „Compressed air unloading“ on page 125.

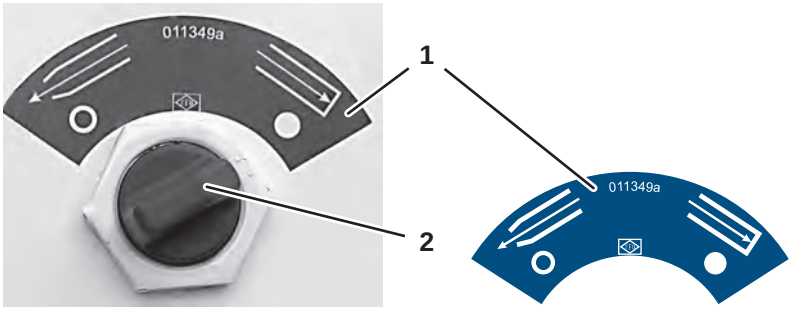


Illustration 6.21 Pinch valve control system, multiple equipment possible

1 Sticker for "Open/Closed" positions
2 Control valve for pinch valve (open/closed)

The switch positions for 'open' and 'closed' are marked with a pictogram. With multiple valves, the switch is marked with the number of the corresponding discharge vessel.

6.11 Drop bottom

The drop bottom (5) seals the discharge vessel of the silo tank from the bottom. The drop bottom is used to open the chamber of the silo tank and unload it via the free-fall process.

⚠CAUTION

VACUUM DAMAGE!

Unloading the silo tank without pressure equalisation will cause the silo tank to be damaged by implosion.

- ▶ Based on the type of load and the applicable regulations, ensure pressure equalisation via the open manlid of the silo tank chamber to be discharged.

The customs tag eyelets (4) are used to seal the silo tank's drop bottom with the customs cord in accordance with customs regulations.

The drop bottom is operated using a Cardan shaft as a remote control (3). The remote control for the drop bottom can only be activated with a key (2). Each discharge vessel is equipped with its own drop bottom. On the material discharge (cone) there may also be two discharge vessels with drop bottoms (optional equipment).

Information

The key for the remote control of the drop bottom is removable. After the silo trailer has been loaded, the key should be removed from the remote control and stowed away in the toolbox.

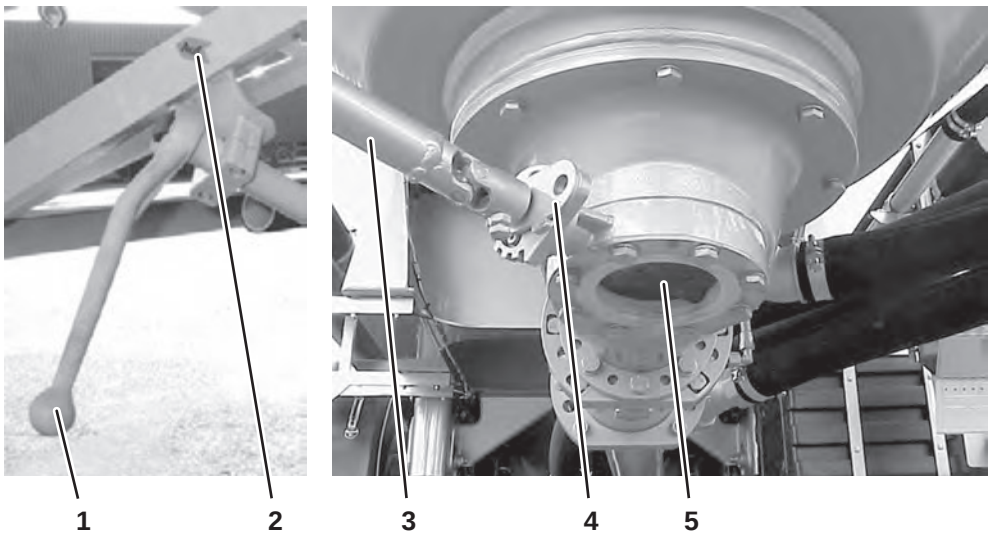


Illustration 6.22 Drop bottom

1 key
2 'OPEN' adhesive label (turning direction)
3 remote control
4 customs tag eyelet
5 drop bottom

6.12 Stowage pipes, hose trays

Stowage pipes for holding the material and air hoses required for loading and unloading the tank are located on the vehicle.

Your own material hoses or material hoses supplied by Feldbinder can be carried in the stowage pipes on the sides.

An air hose can be carried in the stowage pipe crosswise under the chassis (optional equipment).

⚠WARNING

DANGER OF INJURY!

If load is inhaled or comes into contact with the skin or eyes when draining product residues, it can cause injuries such as chemical burns, burns and poisoning.

- Avoid any kind of physical contact with the load and avoid inhaling dust.
- Wear safety clothing appropriate to the danger and nature of the load.
- If the load causes injury, take action as specified in the material safety data sheet for the load.

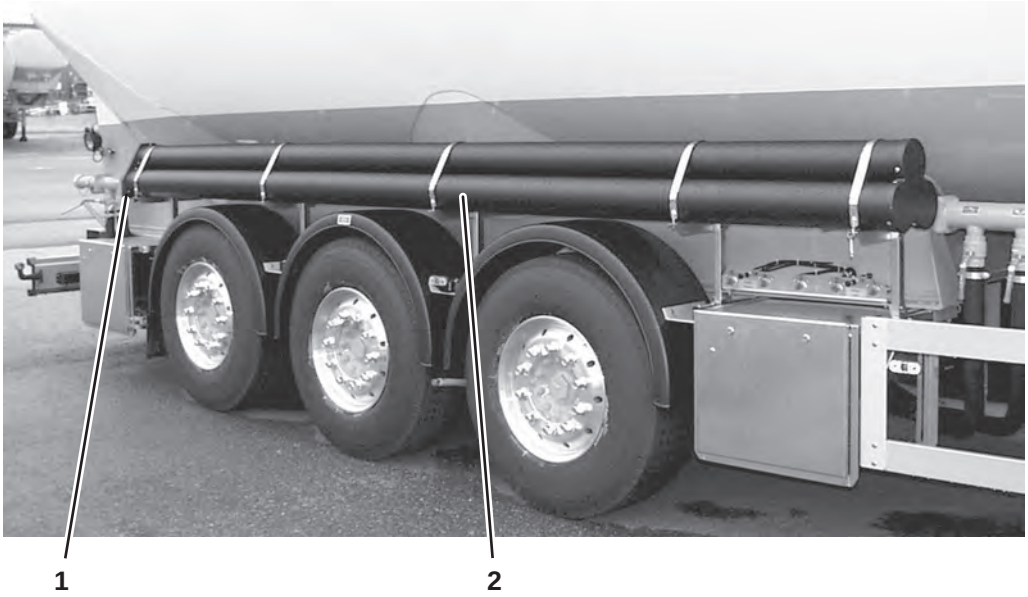


Illustration 6.23 Stowage pipes for material hose

1 Stowage pipe lid

2 Stowage pipe, plastic version

After use, secure the stowage pipe with the lid (1). Secure the lid by locking or with the rubber strap.

NOTICE

ENVIRONMENTAL CONTAMINATION!

Product residues from the material hoses, which are released into the environment could cause environmental contamination.

- Only open the discharge valve of a stowage pipe when the accumulated residues can be collected and disposed of in an environmentally-friendly manner.

Information

The material hoses supplied by Feldbinder are made of a conductive material and thus meet the safety standards concerning the necessary equipotential bonding, see also „Equipotential bonding conductor (earthing)“ on page 86.

6.12.1 Hose tray

A hose tray for holding the material and air hoses can be located on the side of the vehicle. The hose tray can be closed by a cover with gas struts (optional). Accumulated product residues, washing or rain water can be discharged from the hose tray and collected via the discharge valve.

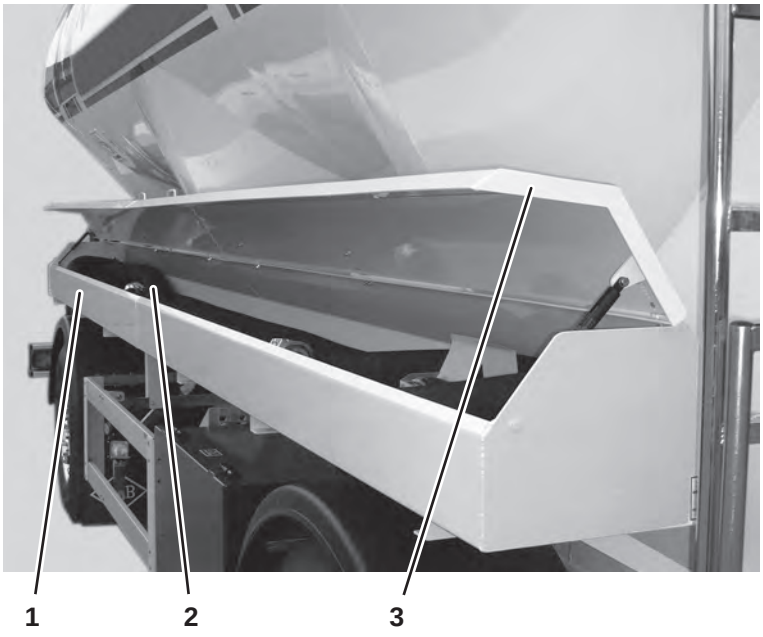


Illustration 6.24 Hose tray with lid

1 Hose tray
2 Hose with couplings
3 Lid

Secure the lid by locking or with existing rubber straps.

6.12.2 Stowage pipe for air hose

Stowage pipes for short air hoses are attached at right angles to the driving direction in the semi-trailer support area. The stowage pipe can optionally be equipped with a lock or straps as closing devices.

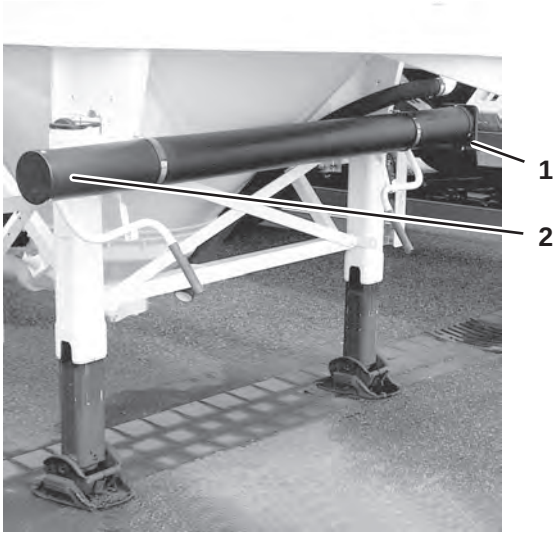


Illustration 6.25 Stowage pipe for air hose

1 Stowage pipe

2 stowage pipe cap

After stowing away the air hose, seal off the stowage pipe (1) using the stowage pipe cap(2).

6.13 Equipotential bonding conductor (earthing)

⚠WARNING

DANGER OF EXPLOSION!

If equipotential bonding is not ensured, static charges can cause sparks and thus explosions.

- ▶ Always provide equipotential bonding when filling or emptying the tank where the load demands this.

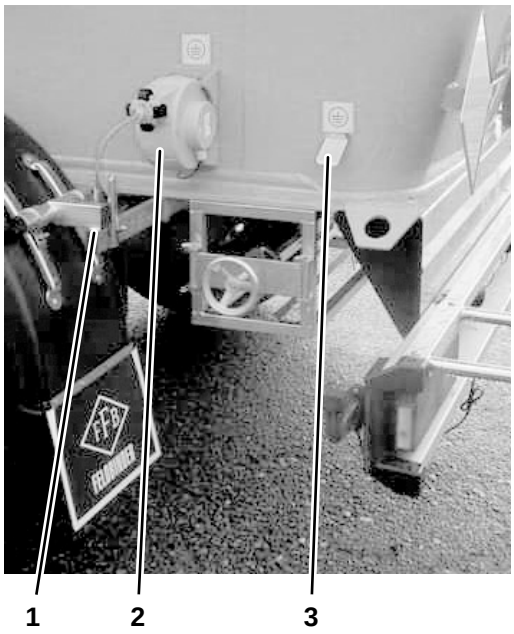


Illustration 6.26 Equipotential bonding

1 Cable reel

2 Clamp

3 Earthing shackle for external potential equalisation

Due to friction of the moving material, the tank walls can become electrostatically charged. When this electrical current is discharged, sparking can occur and cause an explosion.

Information

Equipotential bonding prevents the tank walls becoming electrostatically charged. In the same way as a lightning conductor, the equipotential bonding conductor provides a connection to ground.

Silo tanks for special applications can be supplied and operated without equipotential bonding conductor if the load does not cause electric charging. This applies e.g. to cement.

- Connect the clamp (2) of the cable reel (1) to a conductive point on the loading station.
- If using your own material hoses, check that they fulfil the safety requirements regarding equipotential bonding. Otherwise, connect the terminal to the earthing point provided at the loading station.

Information

The material hoses supplied by Feldbinder are made of a conductive material and thus meet the safety standards in terms of equipotential bonding.

External equipotential bonding conductor

Some loading/unloading points have their own equipotential bonding conductor. It can be used alternatively to the fixtures on the vehicle.

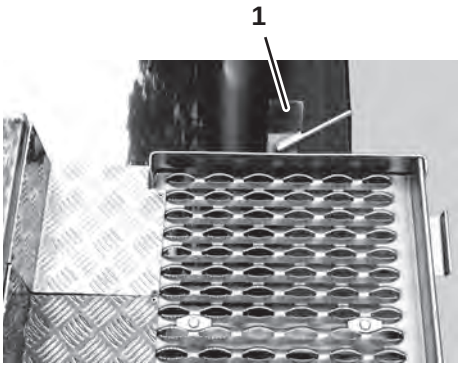


Illustration 6.27 Coupling point (earthing pin) for external equipotential bonding conductor

1 Earthing lug

Connect the external equipotential bonding conductor of the loading station to one of the connection points on the silo vehicle.

Coupling points for the equipotential bonding conductor can be found:

- Distributed around the silo vehicle
- on the walkway near the spill boxes, where present

6.14 Safety railing and walkway

The safety railing is located along the walkway on the tank. It guards against falling from the tank.

⚠WARNING

DANGER OF FALLING!

When the safety railing is not deployed and personnel stumble, for example, they can fall from the tank and be seriously injured.

- ▶ Always fold out the safety railing before getting on to the tank roof.
- ▶ Make sure that nobody is on the roof before folding down the safety railing.

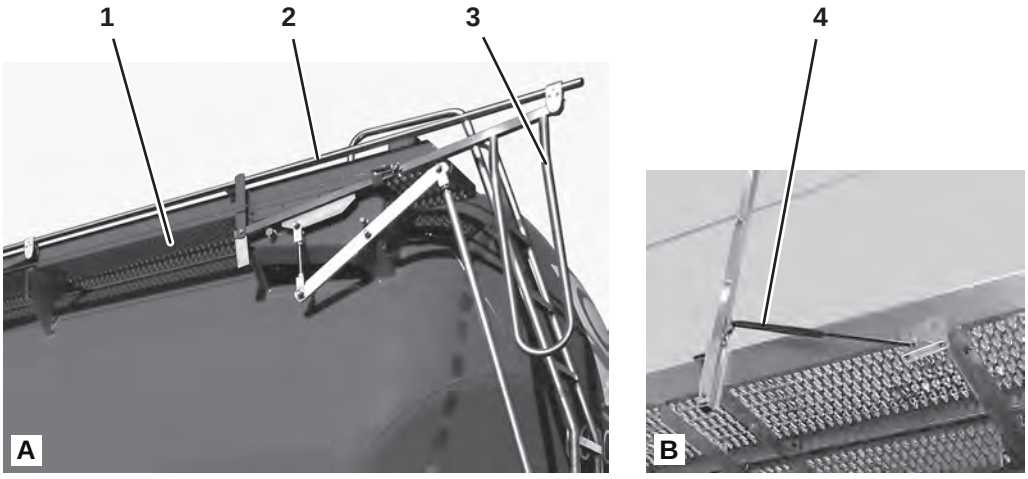


Illustration 6.28 Safety railing, version deployed from above

A Railing folded down
B Railing folded up
1 Walkway
2 Safety railing folded down
3 Bracket
4 Gas strut, mounted on the outside

Deployment mechanism

Different variants of the safety railing deployment mechanism are available:

- Deployed from above by hand
- Deployed from below using the folding ladder
- Deployed pneumatically from below

⚠CAUTION

RISK OF CRUSHING!

Hands can be crushed between the foldable and fixed parts of the ladder.

- ▶ Wear work gloves when raising or lowering the safety railing.
- ▶ Keep fingers out of the crushing zone.

Walkway

⚠WARNING

DANGER OF INJURY!

Objects placed on the walkway can cause personnel to slip or stumble and possibly injure themselves.

- ▶ Do not attach anything to the walkway.
- ▶ Clean the walkway regularly to prevent it becoming slippery, particularly in winter due to ice and snow.

Before stepping on the tank, carry out the following safety precautions:

- Secure the semi-trailer with wheel chocks to prevent it rolling away.
- Fold out the railing.

ⓘInformation

Active safety devices

If fall protection is part of the vehicle equipment, hook it to your catching vest before stepping on the fixed ladder.

6.14.1 Safety railing deployed from above

With a firmly installed ladder without bar, raise the safety railing from above. To do this, use the ladder to climb onto the walkway or tank roof.

If a pneumatic positioner is available, raise the safety railing from below using the corresponding operating lever or button, see page 93.

Raising

1. Climb to the end of the ladder.
2. Fold the securing bracket upwards.
3. Pull the bracket upwards.
   ▷ The handrail is raised automatically. If a spring bolt is available it must audibly click into place.
4. After setting up the railing, get off the ladder.

Information

The setting up of the safety railing is supported by installed or external gas struts.

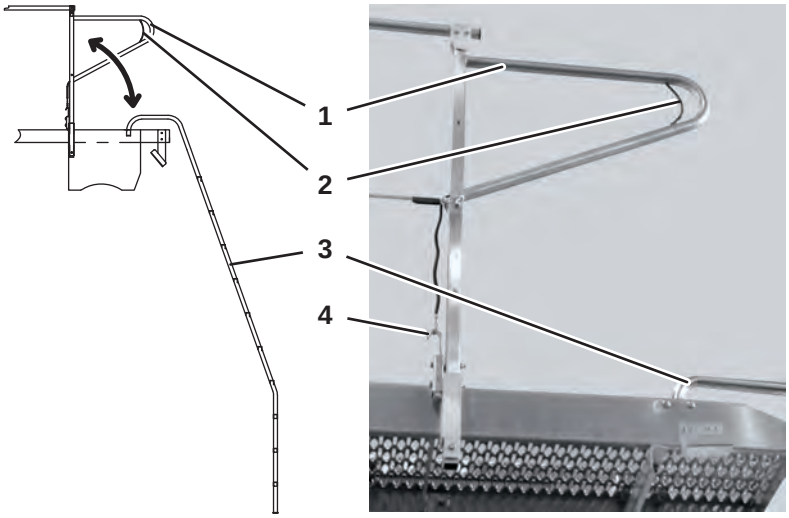


Illustration 6.29 Folding guard rail raised

1 Bracket
2 Cable pull for unlocking
3 Ladder
4 Spring bolt

Folding down

WARNING

RISK OF CRUSHING!

When folding the railing down, your hands could get caught and seriously injured.

- ▶ Carefully lower the safety railing.
- ▶ Make sure to remove your hand in time before finally folding down the railing.

1. Climb to the end of the ladder.
2. Pull the cable illustration 6.29 (2) in the turnaround of the bracket (1).
   ▷ The safety railing is unlocked.
3. Pull the bracket downwards (towards you).
   ▷ The safety railing is lowered.
4. Step off ladder.

6.14.2 Safety railing - deployed from below

Safety railing with folding ladder

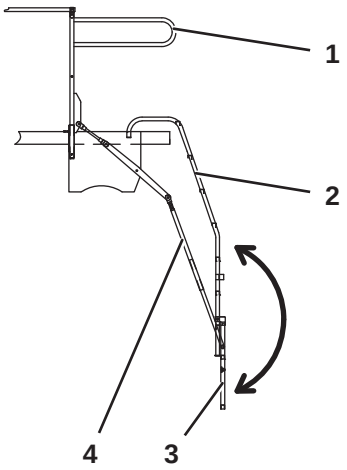


Illustration 6.30 Safety railing - can be set up via folding ladder

1 Bracket
2 Folding ladder
3 Riser
4 Bar

Raising

1. Pull the riser (3) of the folding ladder (2) downwards until it engages in the safety catches.
   ▷ The safety railing raises via the bar (4).

Folding down

1. Pull the folding ladder's riser out of the safety catches and fold it upwards until it engages.
   ▷ The safety railing lowers via the bar.
   ▷ The ladder is secured.

Securing the folding ladder

- Press the folding part of the ladder against the rubber stopper to prevent folding open during the journey.

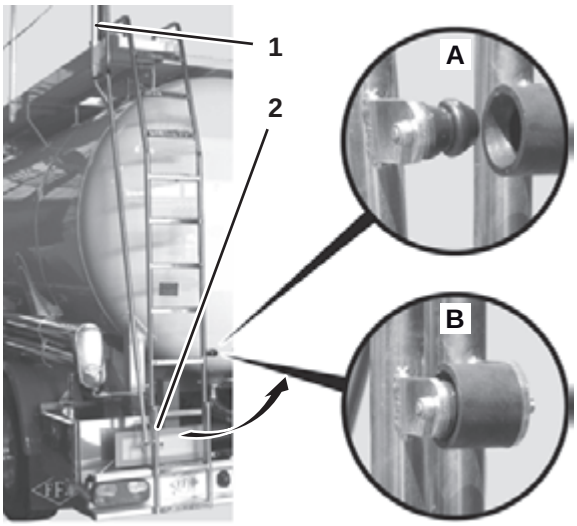


Illustration 6.31 Securing the folding ladder

A Safety device, open
B Safety device, secured
1 Safety railing
2 Ladder, folding

6.14.3 Safety railing, pneumatically deployed

⚠CAUTION

RISK OF CRUSHING!

When folding the railing down, hands or feet can become trapped between the bracket and the walkway, seriously injuring limbs.

- ▶ Only fold the safety railing down when nobody is on the walkway or the ladder.

The pneumatically deployable railing is erected by a pneumatic cylinder. To do this, operate the marked switch next to the ladder.

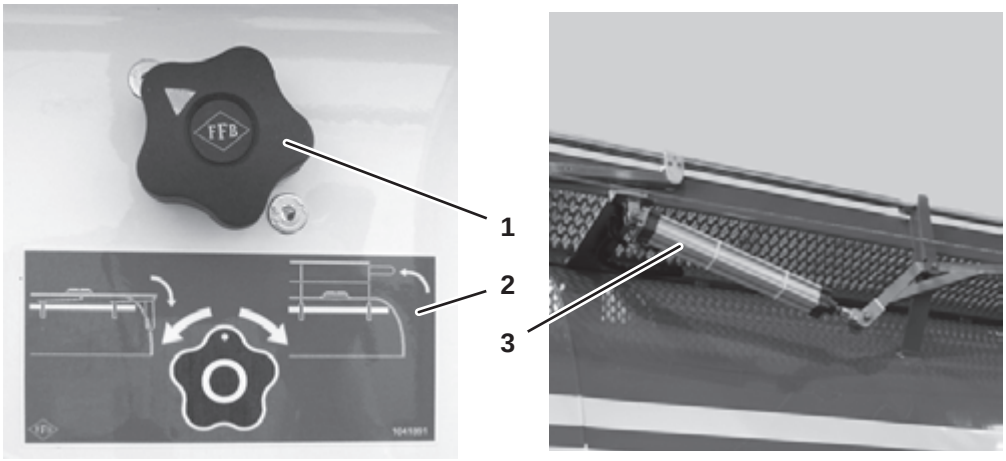


Illustration 6.32 Switch for pneumatically deployed railing

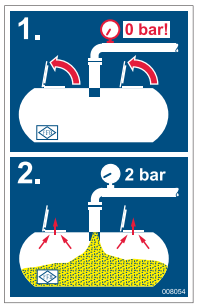
1 Switch
2 Pictogram of switch direction of rotation
3 Pneumatic cylinder

Information

The railing can only be raised pneumatically if the semi-trailer's compressed air supply is connected („Brake system“ on page 27) or if residual pressure is available in the pressure tank.

7 Optional equipment

7.1 Loading coupling



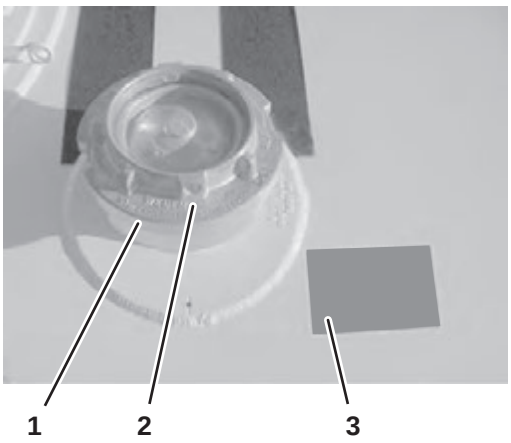


Illustration 7.1 Safety loading coupling on the silo tank

1 loading coupling (Storz coupling)

2 Cap

3 Adhesive sign 'Caution. Ensure sufficient ventilation of the tank before pressure filling.'

The silo tank can be filled from the top using one or more loading couplings with the help of compressed air via a hose.

⚠DANGER

DANGER OF FATAL INJURY!

When you open the loading coupling of a pressurised tank, there is a danger that the cap will open with explosive force.

- ▶ Before opening the loading coupling, check the pressure gauge to determine whether the tank is under pressure.
- ▶ Vent the tank completely via the exhaust air valve before opening the loading coupling.

Opening

1. Turn the cap (2) clockwise to the stop with a coupling spanner.
2. Slightly lift the cap up to the upper stop.
3. Turn the cap anticlockwise to the stop and remove it.

Closing

Closing the loading coupling takes place in the reverse order of opening:

1. Insert the cap through the recesses in the coupling and turn it manually **clockwise** to the stop.
2. Press the cap down on the seal of the loading coupling.
3. Turn the cap with a coupling spanner **anticlockwise** to the stop.

7.2 Fall protection

The fall protection reduces the risk of falling from the tank roof and sustaining injury. It constitutes an active safety device in addition to the folding railings.

Next to the walkway on the tank roof, there is a steel rope illustration 7.2 (2). A shackle, which is fastened to a pulley with a body harness for persons, comprises the steel rope as a rope slider. When working on the silo tank, the pulley retracts the body harness to the required length. The safety of personnel is thus always ensured close to the point of operation. If there is a fall, the pulley engages and the person is caught by the belt.

The system includes a suitable catching vest for the operating personnel which the operator provides.

Information

Observe the instructions concerning the safety railing in these operating instructions, page 88.

Observe the details on the 'Personal safety system' adhesive label on the vehicle.

Follow all instructions of the operator of the vehicle as well as of filling and unloading stations.

Always use the fall protection if it is part of the vehicle equipment!

DANGER

DANGER OF FALLING!

There is an increased risk of injury when working on the walkway without fall protection or if the fall protection is defective.

- Before using the fall protection, check the inspection date on the inspection seal.
- Use the fall protection as soon as you step on the ladder and walkway.

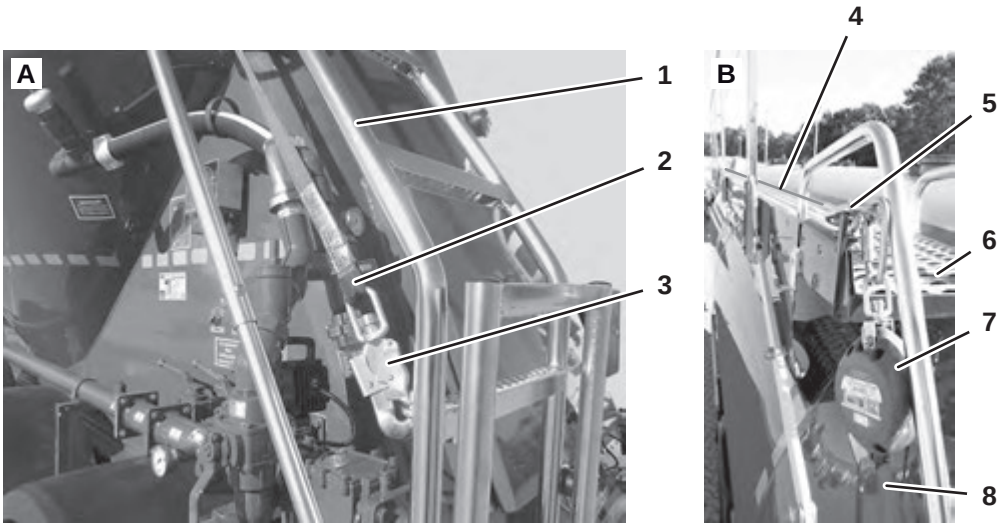


Illustration 7.2 Fall protection (e.g. ABS lock)

A Belt fastening on the fixed ladder (travelling position)
B Securing equipment on the walkway
1 Fixed ladder
2 Belt
3 Snap hook
4 Safety rope
5 Rope slider
6 Walkway
7 Pulley
8 Belt, see (2)

Use fall protection

1. Erect the safety railing.
2. Hook the snap hook illustration 7.2 (3) onto the catching vest. Step on the ladder.
3. When walking along the walkway, guide the fall protection along the safety rope (4). The rope slider (5) must not snag on obstacles.
4. Climb off the walkway via the ladder.
5. Detach the snap hook from the catching vest and hook it back into the ring provided on the ladder.
6. Fold down the safety railing.

7.3 Coupling for pressure equalisation

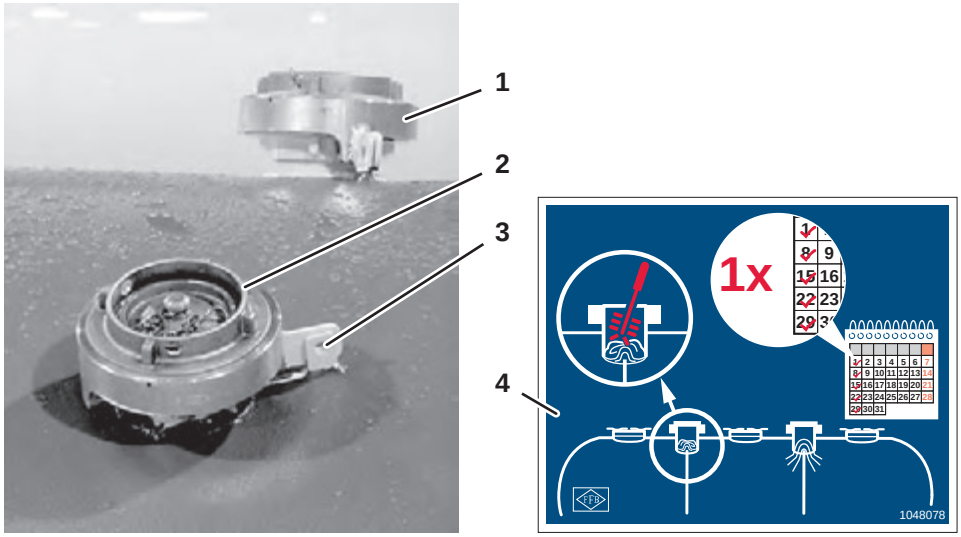


Illustration 7.3 Coupling for pressure equalisation

1 Coupling (Storz coupling)
2 Cap
3 Custom tag eyelet (option)
4 Cleaning instructions adhesive label: 'Open and clean once a week'

Pressure equalisation between the individual chambers of the silo tank is ensured through the couplings (1)

- while filling
- while emptying
- during transport

The Storz safety couplings on the supports can be opened for visual inspection and cleaning. Regular cleaning is required to prevent pressure damage to the tank. Several couplings can be found on the silo tank in the area of the chamber walls.

DANGER

DANGER OF DEATH!

When the coupling of a pressurised silo tank is opened, there is a danger that the cap will open with explosive force.

- ▶ Before opening the filler coupling, check the pressure gauge to determine whether the silo tank is under pressure.
- ▶ Bleed the silo tank completely via the exhaust air valve before opening the coupling.

Opening

1. Turn the cap (2) clockwise to the stop with a coupling spanner.
2. Slightly lift the cap up to the upper stop.
3. Turn the cap anticlockwise to the stop and remove it.

Closing

Closing the coupling takes place in the reverse order of opening:

1. Insert the cap (2) through the recesses in the coupling and turn it manually **clockwise** to the stop.
2. Press the cap down on the coupling seal.
3. Turn the cap with a coupling spanner **anticlockwise** to the stop.

7.4 Vacuum valve

NOTICE

VACUUM DAMAGE!

The flow rate of the vacuum valve is not sufficient for guaranteeing pressure equalisation when the tank is being discharged. This can lead to damage or destruction of the tank from implosion.

- ▶ Ensure pressure equalisation in accordance with the applicable regulations by opening a manlid or the exhaust air valve.

Information

Where possible, do not use the gas equalisation line for venting the tank. This prevents impurities in the valves and the line.

The vacuum valve prevents negative pressure in the silo tank due to changes in air pressure and temperature. Thus, it protects the silo tank from being damaged due to implosion (collapse). The vacuum valve is fitted directly on the silo tank or via a branch on the top air line.

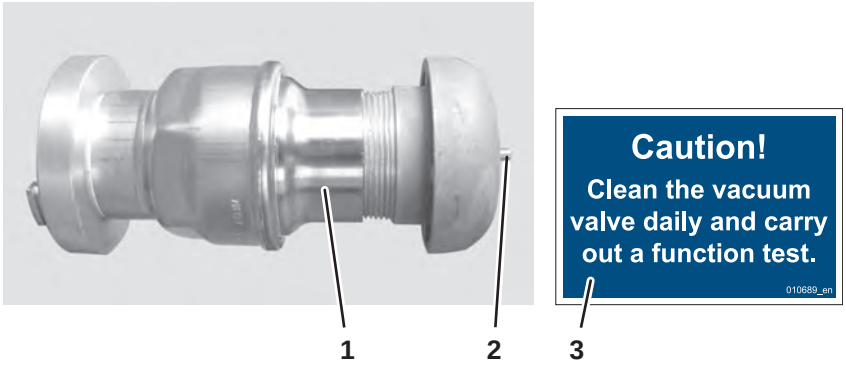


Illustration 7.4 Vacuum valve, vacuum valve maintenance adhesive sign

1 Vacuum valve
2 Plunger
3 Adhesive sign "Caution. Clean the vacuum valve daily and carry out a function test."

Information

Important information about testing the function of the vacuum valve can be found under „Vacuum valve“ on page 132.

7.5 Compressor assembly

The compressor is used to empty the silo tank by the pneumatic method, see also „Selecting the emptying procedure“ on page 124.

The construction and operation of the compressor depend on the type. Refer to the compressor assembly operating instructions for further information.

Information

Please observe local and company emission control regulations.

WARNING

HOT COMPONENTS!

Components conducting compressed air can reach temperatures of more than 80 °C when in operation and can cause burns if touched.

- Do not touch hot components.
- Allow the lines and compressor to cool down before starting work on them.
- Wear safety gloves.

WARNING

EMISSIONS DURING COMPRESSOR OPERATION!

During compressor operation, operating materials, noise, compressed air and other emissions lead to hazards that can cause damage to health.

- Observe the warning and safety instructions in the compressor manufacturer's enclosed operating instructions.
- Have damage or malfunctions on the compressor rectified immediately.

Note on operation

If there is an acoustic enclosure installed, it must remain closed during operation. All important displays can be seen through openings or windows, or are located in an instrument box or in the driver's cab.

Note on maintenance

The compressor can be damaged if it is not maintained as specified.

- Heed the maintenance intervals for the compressor and the motor or drive.

Note on repair

Note the following if the safety valve has to be replaced:

The blow-off capacity of the safety valve on the silo tank must not be less than the suction capacity of the compressor.

7.6 Brake lining wear monitoring system

Wear of the brake linings is monitored by sensors. The information is analysed in the EBS modulator. For trailers/semi-trailers, the status is sent to corresponding indicators in the towing vehicle.

Indication is also possible by the EBS diagnostic system (optional) of the brake manufacturer, see also „EBS diagnostic system“ on page 100.

The wear indicator does not in any way replace the specified checks of the thickness of the brake lining and the brake disc.

⚠WARNING

DANGER OF ACCIDENTS!

Risk of a traffic accident from insufficient braking.

- Check the condition of the brake system at regular intervals, more frequently under high load.
- Upon reaching the wear limit, visit a workshop as soon as possible.

The brake linings must be replaced at the latest when the remaining thickness of the brake lining (without backing plate) is less than 2 mm at the thinnest point.

For detailed information on the brake diagnostic system, please see the operating instructions and assembly manual supplied by the manufacturer.

7.7 EBS diagnostic system

The EBS diagnostic system is located on the control console of the brake system, see also „Brake system control console“ on page 30.

It allows the checking of several brake system parameters - also retroactively, and displays the wear of the brake linings and brake discs.

⚠WARNING

DANGER OF ACCIDENTS!

Risk of a traffic accident from insufficient braking.

- Check the condition of the brake system at regular intervals, more frequently under high load.
- Replace breaking linings that are too thin and worn brake discs.

For detailed information on the diagnostic system, refer to the operating and assembly instructions supplied by the manufacturer.

Operation

The control buttons can be used to select the functions and navigate through the menus. Refer also to the following chapter.

7.7.1 Haldex INFO CENTRE

The INFO CENTRE display can be used to call up information which is stored in the EBS control unit, e.g.:

- Mileage
- Loading
- Service dates
- Error messages

Normally, the INFO CENTRE is always connected with the EBS diagnostic coupling, which is also its power source.

You can select the functions and navigate through the menus using the control buttons.

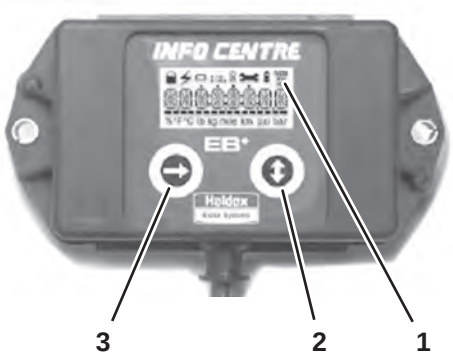


Illustration 7.5 INFO CENTRE

1 LCD display
2 'Arrow up/down' button
3 "Arrow right" button

Element	function
LCD display	**Display** of symbols, setting value, menu item and error message
'Arrow up/down' button	**Change** the menu item or value or **Scroll down**
"Arrow right" button	**Select** or **Confirm** menu item or value

Information

The INFO CENTRE is equipped with a battery, which enables information to be read out when the trailer is uncoupled.

- Replace the battery as required.

7.7.2 Wabco SmartBoard

Information on the EBS and on additionally installed components of the Wabco manufacturer can be called up and read on the LCD display of the SmartBoard.

The SmartBoard is powered via a 5-pin or 7-pin plug connector or a battery supply connected to the EBS.

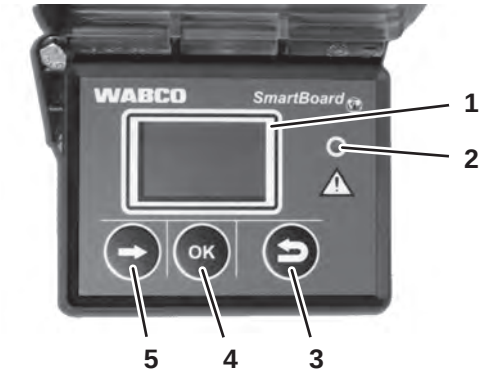


Illustration 7.6 SmartBoard

1 LCD display
2 Warning LED
3 "Back" button
4 "OK" button
5 "Arrow right" button

Element	Function
LCD display	**Display** of symbols, setting value, menu item and error message
Warning LED	**Display**of warning and error message
"Back" button	**Jump back** one menu level In the main menu: **Jump back** one menu element
"OK" button	**Acknowledge** or **carry out** current selection
"Arrow right" button	**Select** next menu element or next option

The SmartBoard is equipped with a battery that enables information to be read out when the trailer is unhitched.

If necessary, have the battery replaced in an authorised specialist workshop.

Information

The SmartBoard for ADR vehicles (446 192 111 0) is supplied without battery option.

7.8 Brake blocking

Brake blocking prevents the vehicle from driving or rolling away. Any covering of the sensor by a moving vehicle component (angle bracket, bars) causes the service brake to close.

Information

Prerequisites for proper functioning of the brake blocking are the power supply of the brake system and a sufficient supply of compressed air. After multiple use or consumption of compressed air by other components, the supply may be exhausted and the service brake no longer functions.

Sensors for brake blocking can optionally be installed on various moving components:

- Folding safety rail illustration 7.7
- Folding ladder
- Manlid
- Material outlet.

7.8.1 Brake blocking by folding guard rail

When the folding safety guard rail is being raised a railing rod swings in front of a proximity sensor directly or extended by an angle bracket; see illustration 7.7.

Activating brake blocking

1. Raise the railing.
   ▷ The railing rod (or an angle bracket) swings in front of the proximity sensor and the service brake closes.

Deactivating brake blocking

1. Fold down the railing.
   ▷ The proximity sensor is free and the service brake opens.
   ▷ Compressed air escapes.

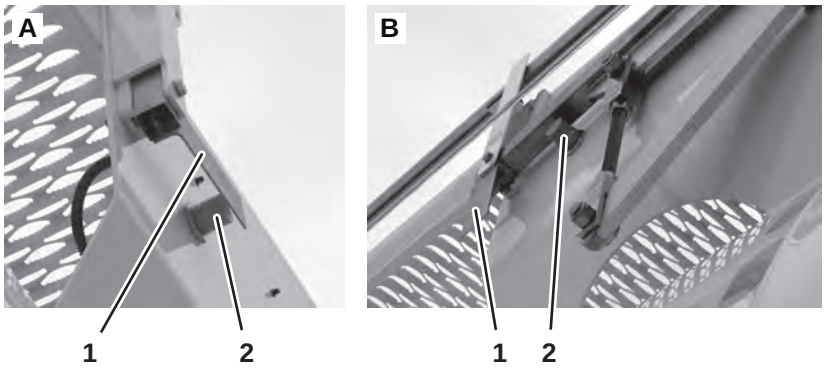


Illustration 7.7 Sensor for brake blocking on folding safety rail

A Folding guard rail, raised
B Folding guard rail, folded down
1 Bracket plates
2 Proximity sensor

Maintenance and cleaning

The proximity sensor is maintenance-free.

- After any accidents, check the distance to the angle bracket if used.
- Clean the proximity sensor when soiled.

7.9 Steered axle

The steered axle ('positive steering') is used for semi-trailers with a large axle spacing. It may be necessary for ensuring safe bend negotiation.

The bending angle of the towing vehicle is conveyed to the steered axle from the fifth wheel. Transmission is carried out hydraulically via hydraulic cylinders or mechanically via rods.

NOTICE

DANGER OF ACCIDENTS!

The steered axle can be damaged in bends or on inclines.

- ▶ When driving with a steered axle, pay special attention to the maximum steering and bending angles of the tractor-trailer.

Information

Vehicles with standard equipment have, where required, only one unsteered rear steered axle, see also „Steered axle“ on page 41.

Hydraulic steered axle

The hydraulic steering system reacts according to the speed and centres the steered axle at high speed. A remote control and a display are optionally available (VSE).

For adjustment, calibration and maintenance, please refer to the operating instructions supplied by the manufacturer (Tridec, VSE).

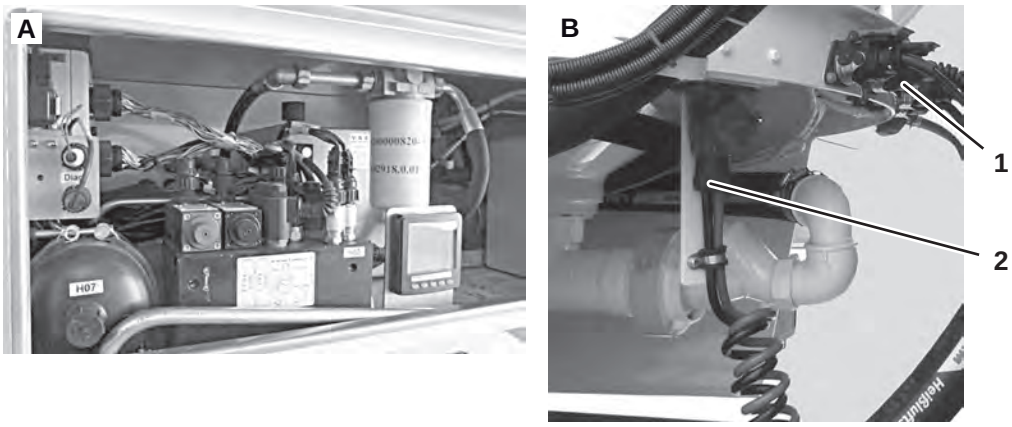


Illustration 7.8 Control of hydraulic steered axle (VSE ETS example), power supply connection

A Box with hydraulic control and display
B Connections on the semi-trailer
1 Standard brake and electrical system connections
2 Steering system power supply connection

Tridec '1' example: The system pressure must be preset in order to adjust directional stability. This is done using a control on the side of the vehicle. Operation is described on an adhesive label in the control box provided by the manufacturer.

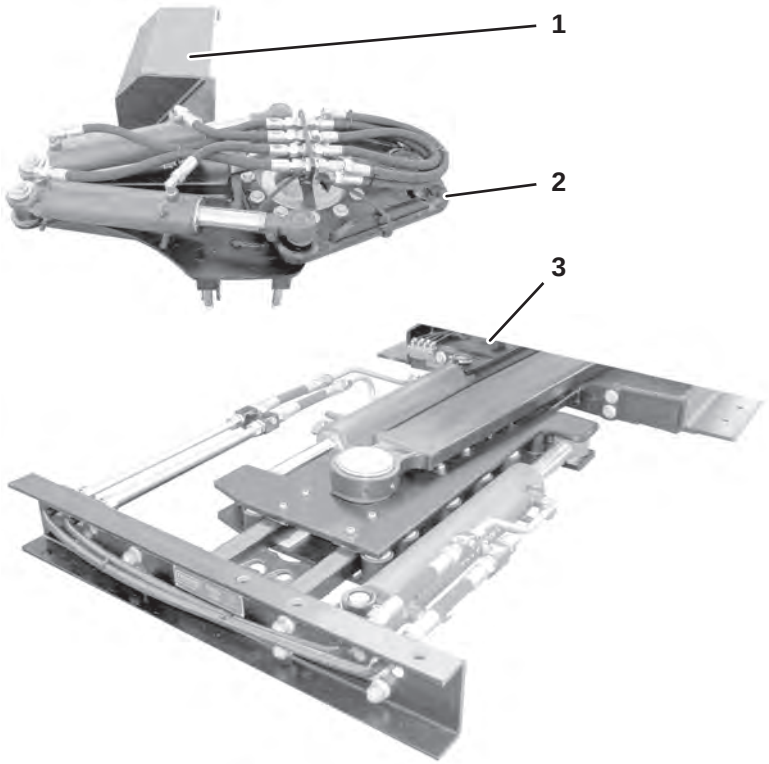


Illustration 7.9 Positive steering set with hydraulic transmission, e.g. Tridec

1 Box for hydraulic control

2 Fifth wheel part (before installation)

3 Axle part (before installation)

Mechanically steered axle

The rods for transferring the steering forces are mounted on the outer side of the chassis.

The steering wedge on the kingpin and the rod bearings are greased. Observe the instructions in the maintenance chapter („Function test schedules“ on page 135) and the manufacturer's operating and assembly instructions.

7.10 Multi-pin power connection

The multi-pin electrical connection (13 to 17 pins) is suitable for frequent use under poor weather conditions (rain, ice).

The contacts are brass pins. The version with special seals and a hook latch illustration 7.10 meets the requirements in accordance with ADR for vehicles transporting hazardous goods.

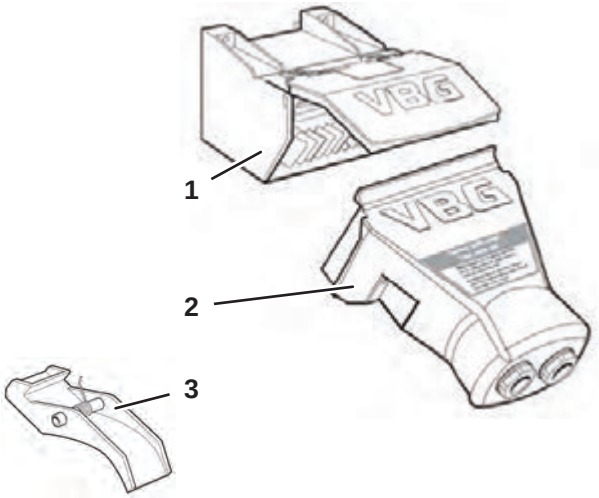


Illustration 7.10 Multi-pin power connection VBG

1 Socket
2 Plug (towing vehicle part, cable not attached)
3 Hook latch

Connecting the power supply

1. Open the protective cap.
2. Connect the connecting parts.
3. Engage the hook latch (if supplied).

Disconnecting the power supply

1. Disengage the hook latch (if supplied).
2. Lift the protective cap.
3. Pull the plug out of the socket.

Information

The plug connector releases automatically by pulling on the cable. This prevents damage in the event that the driver forgets to disconnect the connection when unhitching.

7.11 Internal coating

Feldbinder Spezialfahrzeugwerke GmbH offers an internal coating for the tank which allows the transport of aggressive products.

The plastic material has a low coefficient of friction and improves the flow properties of the load.

Information

The coating material was tested by the Federal Institute for Materials Testing (in Germany). It contains no organic solvents.

For questions regarding the compatibility with special products please contact Feldbinder.

NOTICE

TANK DAMAGE!

Increased loaded product temperature or large temperature differences between the inside and the outside of the tank can destroy the internal coating. Subsequently, the load can attack the tank wall.

- ▶ Fill the tank with load at a maximum temperature of 80 °C.
- ▶ Compare the inside and outside temperatures.

The load temperature may deviate from the ambient temperature by a maximum of 40 °C.

Information

Check the internal coating weekly for cracks. First, clean the silo tank and open the manlid and drop floors for visual inspection if necessary.

- Check the internal coating weekly for cracks. First, clean the silo tank and open the manlid and drop floors for visual inspection if necessary.
- Inspect the internal coating after any accidents even if there is only minor external damage to the tank.

7.12 Dehumidifier

The dehumidifier (optional equipment) is installed on the side of the chassis and is protected by the ram guard. It is used to keep the surviving air in the filled silo tank dry. This is necessary for products such as flour which lose their ability to flow with even a low moisture content.

If the product requires this, the dehumidifier can be switched on using the switch illustration 7.11 (4). There is a further optional switch on the chassis, see illustration 7.12.

Information

Please observe the technical data, safety information and instructions on the housing and in the instruction manual from the manufacturer. Observe the maintenance instructions.

The dehumidifier can be used at an outside temperature between -20 °C and 40 °C, see also „Technical data“ on page 111.

NOTICE

MALFUNCTION and MATERIAL DAMAGE!

The dehumidifier can become ineffective or damaged if there is no clear air supply.

- Never seal or adjust the air inlet of the dehumidifier.
- Clean the suction side and the humid air outlet downwards if there is heavy soiling.

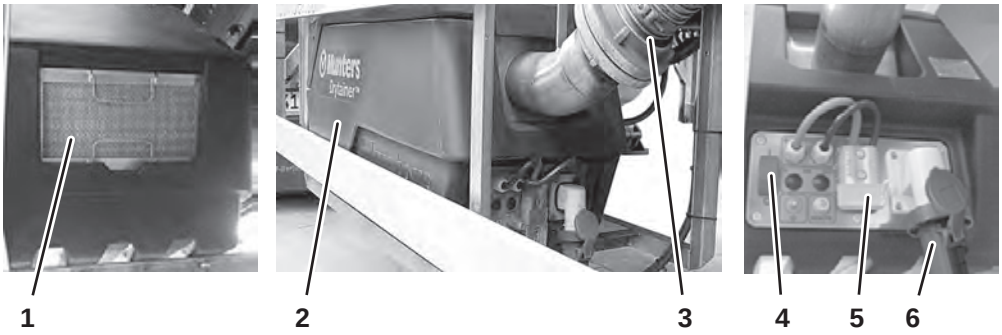


Illustration 7.11 Dehumidifier

1 Air inlet (filter) of the dehumidifier
2 Casing, upper part
3 Air outlet of the dehumidifier (air line, dry air to the vessel)
4 On/Off switch on the dehumidifier
5 Power socket for internal supply connection (24-V battery)
6 Plug connector for external mains connection (230 V, 50 Hz), optional

There is a switch on the connection plate of the dehumidifier, illustration 7.11 (4). A further external selector switch illustration 7.12 (3) is located on the side of the chassis or in a control box.

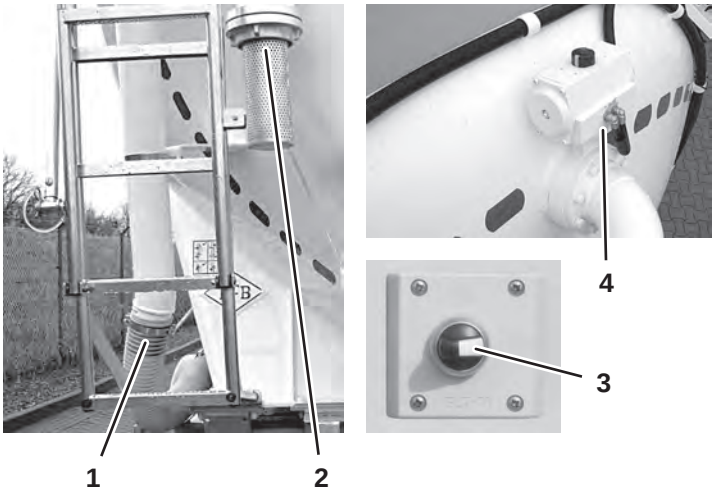


Illustration 7.12 Inlet/outlet line, dehumidifier rotary switch

1 Air line inlet
2 Air line outlet
3 On/Off switch on the chassis
4 Butterfly valve outlet*, pneumatic

* Identical version of the butterfly valve inlet (on the front of the vessel)

The butterfly valves of the inlet and outlet air lines are pneumatic as standard. They are controlled via the rotary switch illustration 7.12 (3).

As an option, the butterfly valves can be operated mechanically. They are then operated manually via a Cardan rod.

7.12.1 Driving – with dehumidifier operation

- Requirements: The lorry engine is running.
- The silo tank is depressurised.

4. Switch on the dehumidifier.
   - ▷ The butterfly valve for the outlet opens.
   - ▷ After a venting time of a few minutes, the butterfly valve for the inlet opens.
5. The dehumidifier starts to work.
6. At the end of the outlet line, check that an air stream exits.
   If there is no air flow, see also „Procedure if there is no air flow“ on page 110.

Information

With the mechanical version of the butterfly valves, first the butterfly valve for the outlet, then the butterfly valve for the inlet must be manually opened and only then the dehumidifier switched on.

7.12.2 Loading – without dehumidifier operation

When loading the silo tank, avoid soiling of the dehumidifier in the following way:

- The dehumidifier is switched off.
- Both butterfly valves illustration 7.12 (4) are closed.

7.12.3 Unloading – without dehumidifier operation

DANGER

FIRE HAZARD!

Dry bulk solids, especially combustible dusts, can ignite when a silo tank is evacuated using compressed air due to excessively hot air.

- ▶ When evacuating the compressed air of combustible load, do not use the dehumidifier and keep it switched off.
- ▶ With the mechanical version of the butterfly valves on the inlet and outlet, close them by hand.

Prerequisite for unloading

Do not operate the dehumidifier when unloading.

Unloading the silo tank

1. Switch off the dehumidifier.
   ▷ The butterfly valve for the inlet closes.
   ▷ The butterfly valve for the outlet closes.
2. Unload the silo tank.

If there is an **empty run** after the unloading:

3. Open the air outlet valve for equalising the pressure and then close it.

Information

With the mechanical version of the butterfly valves, they must be closed manually after the dehumidifier is switched off (first for the inlet, then for the outlet) and opened manually (first for the outlet, then for the inlet) before the dehumidifier is switched on.

7.12.4 Vehicle standstill

With the mechanical version of the butterfly valves, switch off the dehumidifier before a lengthy vehicle standstill, e.g. overnight.

With the dehumidifier still running.

1. Close the butterfly valve for the outlet opening (exhaust air is closed by the travel, otherwise close it).
2. Close the butterfly valve for the inlet opening.
3. Switch off the dehumidifier as soon as possible. Activate the switch on the plug connector plate or rotary switch on the chassis.
4. Switch off the lorry engine.

With the pneumatic version of the butterfly valves, the dehumidifier can be operated overnight using an external 230 V supply (optional), for example.

1. Connect the external mains connection, illustration 7.11 (6).
2. Proceed as in „Driving – with dehumidifier operation“ on page 109, but without the lorry engine running.

7.12.5 Troubleshooting

Procedure if there is no air flow

If no air flow can be felt at the outlet illustration 7.12 (2), wait a few minutes first. If air still does not escape, a reset is required:

- The tractor unit's engine must be running so the system receives a signal.
- The rotary switch on the chassis and switch on the plug connector plate must be switched on (position "**I**").

1. If the dehumidifier still does not run, open the dehumidifier casing and press the "Reset" switch inside.
   See also information for troubleshooting in the instruction manual provided by the manufacturer (Munters).

7.12.6 Maintenance instructions

- The system self-regenerates with the aid of an internal heating system. Draining of the condensate is not required.
- If the dehumidifier cover has been taken off (fastened with 6 Allen screws M8x55 mm), e.g. to change the filter, do not use a battery-operated screwdriver to fasten the cover as the threads are made of brass and can be damaged.
- If the desiccant must be replaced, e.g. after soiling by load, contact Feldbinder Spezialfahrzeugwerke GmbH.

7.12.7 Technical data

Dehumidifier parameters	Value
Temperature range	Temperature range: -20 °C ... 40 °C
Dry air overpressure (inlet)	ca. 0.1 bar
Connections	24 V, 230 V / 50 Hz (option)
Total power	0.95 kW

7.13 Vibrator

After lengthy transport and when emptying, material dust can settle on various places in the silo tank. This dust can be loosened using the vibrator.

NOTICE

TANK DAMAGE!

Long and continuous operation of the vibrator triggers vibrations which can destroy the welded joints of the silo tank.

- ▶ Operate the vibrator only for a short time.
- ▶ Release the pushbutton immediately once the vibrator responds.
- ▶ If necessary, repeat the procedure.

During operation, the vibrator can produce a sound pressure level of 91 dBA. Use hearing protection when operating the vibrator, even for short periods.

The vibrator is an electromechanical or pneumatic device which gets the silo tank to vibrate temporarily. This releases adhering product from the tank wall.

The vibrator (1) is mounted on a bracket on the outside of the silo tank.

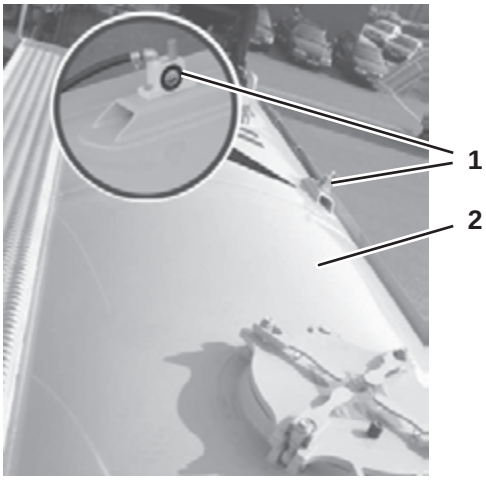


Illustration 7.13 Vibrator - mounting location

1 Vibrator
2 Tank roof

Several vibrators can be found on the silo tank. Each vibrator is operated using a push-button or toggle lever.

Operation

⚠CAUTION

DAMAGE TO HEALTH!

The noise caused by the vibrator can be harmful to your health.

- ▶ Only operate the vibrator when necessary (several times for a maximum of 5 seconds each time).
- ▶ Always use hearing protection within the danger zone.
- ▶ Ask persons without hearing protection to leave the danger zone around the silo vehicle.

A pushbutton per vibrator illustration 7.14 (1) is mounted on the control console or near to the fittings.

To operate the vibrator, press the pushbutton briefly.

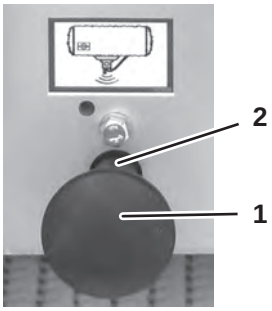


Illustration 7.14 Vibrator switch with adhesive label

1 Pushbutton
2 Control valve

Operate the vibrator(s) at least once a week to free the silo tank from the load adhering to it. This prevents load contamination and ensures complete discharge.

7.14 Fire extinguisher

The fire extinguisher is stored in a box. Make sure that you know how to use it, and have the fire extinguisher checked as per the inspection periods.

7.15 Inner exhaust air filter

An exhaust filter on the inside of the silo tank is used to remove dust from the exhaust air during the venting procedure before discharging it into the atmosphere.

The exhaust filter is accessed through the manhole opening (1).

After every use adhering or collected dust must be removed from the filter.

Cleaning the filter

The interior exhaust filter must be freed of accumulated dust after unloading. To do so, the compressed air is briefly returned into the silo tank through the filter bag (2).

1. Activate or open the compressed air supply.
2. Open and close the top air line several times using the valve on the air manifold.
   ▷ The top air line is opened and the dust is released from the exhaust filter.
3. Venting the silo container via the exhaust air valve, see „Exhaust air valve“ on page 66.

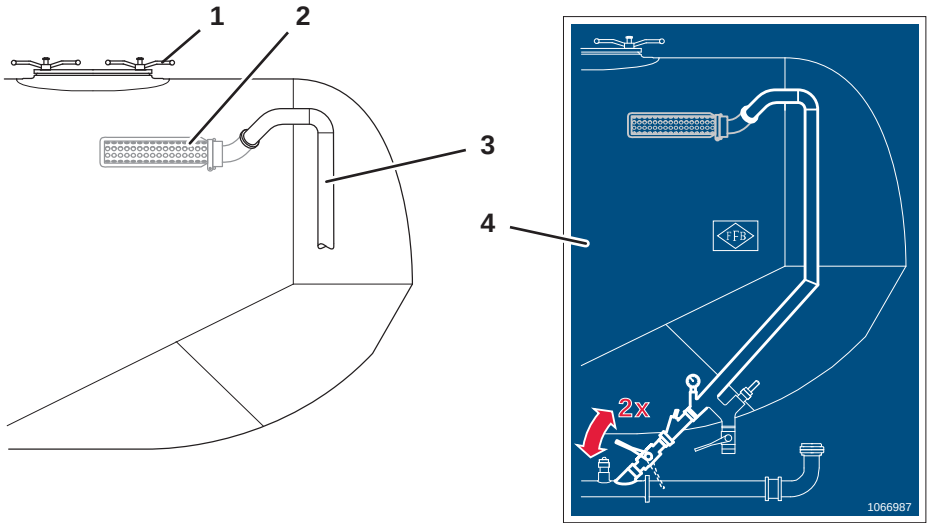


Illustration 7.15 Exhaust air filter, model without filter vessel

1 Manlid (rear of vehicle)
2 filter sack
3 Top air/Exhaust air line, silo tank
4 Cleaning instruction: "Open and close top air valve multiple times"

7.16 Hubometer

The hubometer is a mechanical wheel rotation counter which effectively measures and displays the distance travelled by the vehicle.

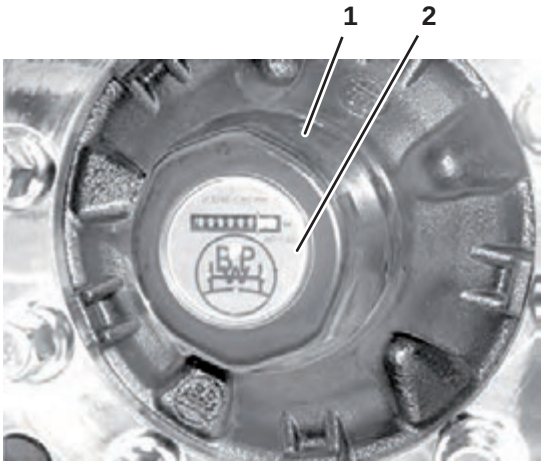


Illustration 7.16 Hubometer

1 axle hub

2 hubometer

The hubometer is installed on the wheel hub. It can be present on several axles of the vehicle. The system is maintenance-free.

7.17 Drain box/Unloading pipe protector

The box-shaped or round pipe protector keeps dust and fluids away from the discharge flange. This is necessary when transporting foodstuffs or other load material with high purity requirements.

NOTICE

MATERIAL DAMAGE from unlocked PIPE PROTECTOR!

An unlocked pipe protector can whip around during the journey and damage parts of the vehicle.

- ▶ Before starting off, close the drain box or the unloading pipe protector and all locks present.

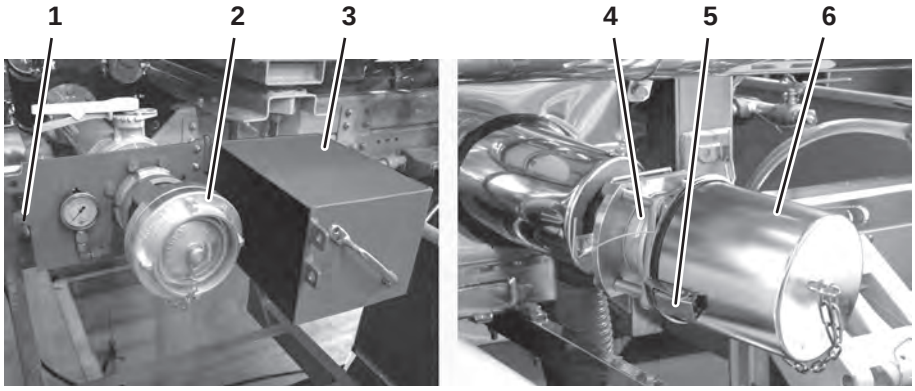


Illustration 7.17 Drain box, unloading pipe protector (examples of versions)

1 Closure
2 Discharge flange with cap
3 Discharge box, open
4 Discharge pipe
5 Latch
6 Pipe protector, closed

Operate the respective lock to open and close the discharge box. In each case, also close the discharge or the unloading pipe with the cap, see (2).

8 Filling and evacuating

8.1 Loading instructions

⚠WARNING

DANGER OF ACCIDENTS!

If the semi-trailer is tail heavy or top heavy, the driving and braking characteristics of the semi-trailer unit are impaired and therefore increase the risk of accident, especially if the load does not flow easily.

- Load the silo tank evenly.
- Adhere to the permissible gross weight.
- With multi-chamber tanks, adhere to the permissible minimum and maximum fill levels of the chambers.
- Give consideration to the permissible king pin and axle loads.

⚠WARNING

DANGER OF TIPPING OVER!

Loading or emptying an unhitched silo semi-trailer can cause it to buckle or tip over. The semi-trailer supports must not be overloaded.

- Only load or empty the silo semi-trailer when it is hitched to the towing vehicle.

Loading

Always load a multi-chamber silo tank from the front to the rear. While doing so, comply with the permissible trailer load and axle loads of the towing vehicle and the silo trailer.

Always load a multi-chamber tank from the front to the rear. While doing so, comply with the permissible trailer load and axle loads of the towing vehicle and the semi-trailer.

Emptying

Always empty a multi-chamber silo tank from the front to the rear.

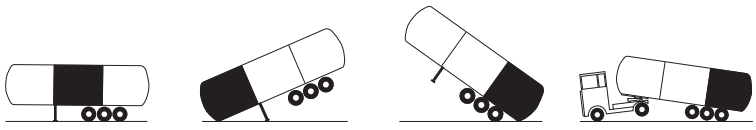


Illustration 8.1 Loading conditions and effects

Item	Loading status	Effect
A	All chambers are filled uniformly or only the middle chamber(s) is/are filled.	Unhitching possible. Hitched, good handling properties.
B	Only the front chamber(s) is (are) loaded or the front chamber(s) is (are) excessively loaded in comparison with the others.	Unhitching not possible. Hitched, poorer handling properties due to unfavourable axle load distribution. Overload of the towing vehicle.
C	Only the rear chamber(s) is (are) loaded or the rear chamber(s) is (are) excessively loaded in comparison with the others.	Unhitching not possible. Hitched, poorer handling properties due to unfavourable axle load distribution.
D	Only the rear chamber(s) is (are) loaded or the rear chamber(s) is (are) excessively loaded in comparison with the others.	Unhitching not possible. Like 'C' (poorer traction of the towing vehicle driving axle). Hazardous status without trailer load.

8.2 Filling

Information

The following descriptions and instructions apply to all filling methods.

8.2.1 Preparing for loading

Wear protective equipment

Put on the appropriate, specified protective equipment according to the type of load.

Follow the ADR regulations and the material safety data sheets for the load when transporting dangerous goods.

Cleaning the tank

Depending on the previous load that was transported, clean the silo tank properly before taking on a new load. Follow the cleaning instructions in chapter „Cleaning“ on page 147.

Secure the work area

⚠WARNING

DANGER OF FALLING!

If the safety railing is not raised and personnel stumble or catch on something, for example, they can fall from the tank.

- ▶ Always raise the safety railing before getting onto the tank walkway.
- ▶ Make sure that the safety railing engages properly.

⚠WARNING

DANGER OF INJURY!

Any objects present on the walkway increase the risk of stumbling and falling.

- ▶ Do not attach anything to the walkway.
- ▶ Clean the walkway regularly to prevent it becoming slippery, particularly in winter due to ice and snow.

Only get on to the tank walkway when the safety railing is raised and when the semi-trailer has been secured to prevent accidental movement.

The following requirements must be met:

- The parking brake is applied.
- The semi-trailer is positioned horizontally

The following work steps are necessary prior to filling:

- Check the shipper's industrial health and safety instructions before filling.
- Before filling, check and secure all connections again.
- Clarify with the shipper the compatibility of the product that is to be loaded with the materials of the tank and sealant materials. Pay attention to any inner coating or rubber lining.

Information

Always use the filling volume pre-selector for filling the tank. at the loading station, if present.

Connect the signal cables of the available measurement or dosing facilities. Switch on the stationary control system as per the operator's operating instructions.

Checking the load

If the tank or tank chambers are overfilled, the load may enter the air line.

The permissible total or axle weight can be exceeded if overfilled. In the case of partial loading, the vehicle can be destabilised by surging of the product to the front and back.

⚠WARNING

DANGER OF ACCIDENTS!

Overfilling or overloading can cause accidents and damage to the vehicle due to excessive stress on the load-bearing components, brakes and chassis parts.

- ▶ Load the semi-trailer so that neither the axle load nor the permitted gross weight are exceeded.

NOTICE

PRODUCT CONTAMINATION!

Product residues in the air line can contaminate subsequent products and make them unusable.

- ▶ Clean the air line if it is dirty. Dismantle the air line so it can be thoroughly cleaned.
- ▶ Also clean existing gasket caps, loading couplings or exhaust air valves after overfilling.

8.2.2 Filling the silo tank

Any load material permitted for the silo tank can be filled through the top manlid or filler couplings.

Depending on the technical design of the silo semi-trailer, you can choose from the following procedures for loading the silo tank:

- **Gravity:** Filling the silo tank without ancillary equipment through the manholes or filler couplings by 'allowing the load to flow'.
- **Pressure filling:** Filling the silo tank using compressed air. Filling is performed by the shipper using the loading couplings. Here, the exhaust air is led back into the storage tank through an exhaust line of the loading station. Alternatively, the exhaust air is expelled via an open manlid or second loading coupling to which a large filter bag is attached.

Information

Instructions for handling manlids can be found in chapter „Manlid“ on page 70, instructions for loading couplings in chapter „Loading coupling“ on page 94.

Pay special attention to the warnings listed there.

⚠DANGER

DANGER TO LIFE!

If the manlid fasteners are loosened or the loading coupling is opened when the tank is under pressure, there is a danger that these elements might be torn off explosively. If this happens, personnel or other persons could be fatally injured.

- ▶ Make sure that the tank is depressurised before filling it.
- ▶ Never try to open a manlid or loading coupling that is under pressure.
- ▶ While filling, always ensure that the tank is and remains de-pressurised.

Information

You can check the current pressure in the silo tank using the pressure gauge in the top air line (see „Operating the silo“).

If the filling station's loading nozzle has a sealing collar or sealing ball and does not have an internal gas return, ensure that the pressure is equalised. The same applies when filling the silo tank through the filling couplings. Pressure equalisation can be ensured via the following openings:

- One loading coupling
- One manlid
- The exhaust air valve.

Information

When selecting from these options for pressure equalisation, always follow the shipper's instructions.

WARNING

DANGER OF INJURY!

If the load is inhaled or comes into contact with the skin or eyes when checking the filling level, it can cause injuries such as chemical burns, burns and poisoning.

- ▶ Avoid physical contact with the load and the inhalation of any vapours from the load.
- ▶ Wear safety clothing appropriate to the danger and nature of the load.
- ▶ If the load causes injury, take action as specified in the material safety data sheet for the load.

Gravity filling

1. Prepare to fill.

Connect the potential equalisation conductor.

WARNING

DANGER OF EXPLOSION!

If potential equalisation is not ensured, static charge build-up can cause sparks and lead to an explosion.

- ▶ Always provide potential equalisation when filling or emptying the silo tank.

- ▶ Check that the silo tank is de-pressurised; if not, vent the silo tank completely using the exhaust air valve.
- ▶ Check that all the shut-off fittings (drop bottoms, butterfly valves, pinch valves) are closed.
- ▶ Raise the safety railing.
- ▶ Depending on the loading type, open one of the manlids or filler couplings for venting.

2. Start filling.
   - ▶ Insert the filling nozzle into the manhole or connect the filling hose to a filler coupling.
   - ▶ Authorise the loading staff to begin the filling operation.
   - ▶ Load the silo tank evenly through the manlids or filler couplings.
   - ▶ Monitor the filling operation.

3. Finish the filling operation.
   - ▶ Check that the product flow has stopped.
   - ▶ Pull out the filling nozzle and swing it away, or remove the filling hose from the filler coupling.
   - ▶ Close the manlid or filler coupling.
   - ▶ Close any air outlet(s) previously opened.

4. Complete the filling operation.
   - ▶ Close all valves in the air and material lines and attach the caps.

⚠CAUTION

VACUUM DAMAGE!

After filling, temperature changes in the silo tank may cause vacuum damage.

- ▶ Ensure pressure equalisation by opening the exhaust air or leaving it open.

- ▶ Open the exhaust air shut-off valve.
- ▶ If necessary, disconnect the potential equalisation conductor.
- ▶ Fold down the safety railing.
- ▶ Check the load distribution and min./max. filling level.
- ▶ When transporting dangerous goods, affix hazardous goods signs.

Pressure loading via filling couplings

1. Prepare to load.

Connect the potential equalisation conductor.

⚠WARNING

DANGER OF EXPLOSION!

If equipotential bonding is not ensured, static charge build-up can cause sparks and lead to an explosion.

- ▶ Always provide equipotential bonding when filling or discharging the silo tank.

- ▶ Check whether the silo tank is de-pressurised; if not, vent the silo tank completely using the exhaust air valve.
- ▶ Check whether all the shut-off fittings (drop bottoms, butterfly valves, pinch valves) are closed.
- ▶ Raise the safety rail.
- ▶ Open a filler coupling for venting and fit it with a filter sack.

2. Start loading.
   - ▶ Connect the filling hose to the filler coupling.
   - ▶ Authorise the loading staff to begin the loading operation.
   - ▶ Load the silo tank evenly through the loading couplings.
   - ▶ Monitor the loading operation.

3. Finish the filling operation.
   - ▶ Check that the product flow has stopped.
   - ▶ Remove filling hose from the filler coupling.
   - ▶ Remove filter bag from filling coupling.
   - ▶ Close all filler couplings.
   - ▶ Close any air outlet(s) previously opened.

4. Carry out the final steps in the filling operation.
   - ▶ Close all valves in the air and material lines and attach the caps.

⚠CAUTION

VACUUM DAMAGE!

After loading, temperature changes in the silo tank may cause vacuum damage.

- ▶ Ensure pressure equalisation by opening the exhaust air or leaving it open.

- ▶ Open exhaust air stop valve.
- ▶ If necessary, disconnect the equipotential conductor.
- ▶ Fold down the safety railing.
- ▶ Check the load distribution and min./max. filling level.
- ▶ When transporting dangerous goods, affix dangerous goods signs.

8.2.3 Refrain from overfilling

Remove overflowing load

Avoid tank overflowing. Have overflowing load removed immediately by qualified personnel.

⚠WARNING

DANGER OF FIRE and EXPLOSION!

Load that has overflowed can ignite, posing the danger of injury the operator or others, or damage to property.

- ▶ Terminate the filling immediately if load flows out.
- ▶ Avoid any sparking or flames forming on the vehicle or in the surroundings.

If there is any overfilling, proceed as follows:

1. Terminate the filling procedure.
2. Evacuate part of the product where possible.

3. Clean the air line, if fitted and used for compressed air unloading.
   Feldbinder Spezialfahrzeugwerke GmbH recommends dismantling the air line for cleaning.

8.3 Unloading

Information

The following descriptions and instructions apply to all unloading methods.

Also refer to the "Unloading" quick guide at the beginning of this instruction manual.

8.3.1 Preparation and instructions

Wear protective equipment

Put on the necessary/specified personal protective equipment based on the type of material.

Follow the ADR regulations and the material safety data sheets for the load material when transporting hazardous goods.

Secure the work area

⚠WARNING

DANGER OF FALLING!

If the safety rail is not raised and personnel stumble or catch on something, for example, they can fall from the silo tank.

- ▶ Always raise the safety rail before getting on to the walkway.
- ▶ Make sure that the safety railing engages properly.

⚠WARNING

DANGER OF INJURY!

Objects placed on the walkway can cause personnel to slip or stumble and possibly injure themselves.

- ▶ Do not attach anything to the walkway.
- ▶ Clean the walkway regularly to prevent it becoming slippery, particularly in winter due to ice and snow.

Only get onto the tank walkway when the safety rail is raised and when the semi-trailer has been secured to prevent accidental movement.

The following requirements must be met:

- The parking brake is applied.
- The semi-trailer is positioned horizontally

The following work steps are necessary prior to emptying:

- Check the owner's or loader's operational safety instructions.
- Position the tractor-trailer horizontally. Uniform emptying is achieved by the descending slope in the tank.
- Before evacuation, check and secure all connections again.

8.3.2 Selecting the emptying procedure

The following procedures are available for emptying the silo tank:

- **Compressed air:** Emptying the tank using compressed air. The compressed air is supplied by an external or accompanying compressed air source via the air connection (air-assisted emptying).
- **Gravity:** emptying without external aids, only through flow of the product with the help of gravity (gravity unloading).

When selecting a method of emptying, please take the underlying conditions into account:

- Product type and product characteristics
- Local conditions
- Customer specifications.

Information

Since the material characteristics of the load can vary, during discharge the regulation of the air supply through the air manifold must be varied accordingly with the aid of shut-off valves. This is based on the experience of the operator.

A few application examples for different load types are listed below:

- **Cement** has good flow characteristics. Normally, no top air is required. The silo tank is pressurised through the aeration system. Top air - closed, exhaust air - closed, aeration system - open, injected air - closed.
- **Animal feed** needs additional injected air and more aeration air. Depending on the granularity of the load, top air can also be used.
- **PVC/plastics** require a similar air supply to cement. A cooler is recommended as the load can stick together due to hot compressor air.

8.3.3 Equalising the pressure

DANGER

DANGER TO LIFE!

If the manlid fasteners are loosened or the loading coupling is opened when the tank is under pressure, there is a danger that these elements might be torn off explosively. If this happens, personnel or other persons could be fatally injured.

- ▶ Make sure that the tank is depressurised before emptying it.
- ▶ Never try to open a manlid or loading coupling that is under pressure.
- ▶ Relieve the tank pressure via the exhaust air valve.

NOTICE

VACUUM DAMAGE!

Emptying the tank without pressure equalisation will cause the tank to be damaged by compression.

The flow rate of the vacuum valve is not sufficient for pressure equalisation during unloading.

- Depending on the type of load, ensure pressure equalisation in accordance with the applicable regulations by opening a manlid or the exhaust air valve.

8.3.4 Connecting equipotential bonding

⚠WARNING

DANGER OF EXPLOSION!

If the potential equalisation conductor is not connected, static charges can cause sparks resulting in an explosion.

- Always connect the potential equalisation conductor when filling or emptying the silo tank.

8.3.5 Compressed air unloading

Information

If required, an additional intermediate piece with a viewing window (optional equipment) can be connected between the material outlet and material hose. This enables you to check if the material load is being discharged continuously.

Information

The compressor should only be started when the valves are open or it may be damaged.

Information

For a light powder load, discharging can be started at 0.7 bar.

Granular material and other easily flowing goods can be unloaded with additional top air.

The load-flow can be controlled with the stop valves for aeration air, injected air, top air and additional air on the air manifold. The regulation of the air supply in the air distributor must be varied to match the type of load.

Safety while venting exhaust

Wear goggles and hearing protection when releasing the residual pressure.

Information

Follow the consignee's safety instructions. Depending on regulations, relieve the excess pressure into the atmosphere or into the consignee's silo.

If air is blown too fast, it can be cooled below the dew point as a result of the expansion cooling. The humidity condenses and settles on the tank wall and in the aeration system.

Follow the loading instructions from page 116 onward.

Discharging the silo tank

1. Prepare to discharge.
   - ▶ Check that all manlids and filler couplings are sealed.
   - ▶ Connect the material hose to the material discharge (of the central/manifold line or the individual chambers), tighten and secure if possible.
   - ▶ Connect a potential equalisation conductor if a non-conductive material hose is used.
   - ▶ Connect the air coupling to the compressor.
   - ▶ Open the stop valve on the air distributor or air manifold to aerate the chamber being discharged.

2. Start discharging.
   - ▶ Start the compressor and set it to the specified speed (refer to the operating manual for the compressor).
     - ▷ The pressure in the silo tank increases slowly.
   - ▶ Apply adequate pressure (around 1.9 bar) in the silo tank according to the given load. To do so, use the stop valve for aeration air of the chamber to be discharged and readjust during the discharge procedure.
   - ▶ Open the stop valve for injected air.
   - ▶ Open the shut-off valve of the chamber to be discharged: The product is pressed out of the silo tank.
   - ▶ Monitor the evacuating process and the pressure.
   - ▶ Maintain constant working pressure with the stop valve for the ring nozzle, close partially if pressure drops.

     - ▷ Sudden drop in pressure on the pressure gauge indicates end of discharge process. Air flow in the material hose gives rise to eddies. The hose starts to flutter.

3. Finish discharging.
   - ▶ Close the shut-off fitting in the material line of the chamber to be discharged.
   - ▶ Close the stop valves for top air and injection air.
   - ▶ Open and close the stop valves for aeration air several times in succession.
   - ▶ Open the shut-off fitting in the material line.
   - ▷ Material line, material coupling and material hose are purged.

4. To discharge additional chambers, repeat steps (2) and (3).

5. Carry out the final steps for discharging.
   - ▶ Interrupt compressed air supply by switching off the compressor and disconnect the compressor from the air line.
   - ▶ Close all valves and shut-off fittings in the air and material lines. Attach the caps.
   - ▶ Ventilate the silo tank slowly with the exhaust air valve. Keep the exhaust air valve open until the next loading operation to avoid vacuum damage.

Making the silo vehicle ready to start

1. Remove the material hose.
2. Disconnect the equipotential bonding conductor.
3. Fold down the safety railing.

8.3.6 Remedial action for clogged material pipe

⚠WARNING

Material damage

The compressor can be damaged if it is switched on or off against pressure.

- ▶ Never switch the compressor on or off against pressure.

In case the material pipe becomes clogged while the silo tank is being unloaded, proceed as follows:

1. Close all valves and shut-off fittings in the air and material pipes.
2. Open the air outlet shut-off valve and leave it open.
   - ▷ The silo tank is vented.
3. Switch off the compressor.
4. Open ring nozzle / injected air shut-off valve (if present) on material outlet. (Keep material outlet closed).
5. Switch on the compressor until the safety valve responds.
6. Open shut-off valve on material pipe on the tank side.
   - ▷ The air that has accumulated in the material pipe flows rapidly into the silo tank and drags the material with it.
7. After a few seconds, the shut-off fitting must be closed again until the safety valve trips again.
8. Open the shut-off fitting in the material pipe.
   - ▷ When the safety valve no longer trips, the material pipe is free again.
9. Close the exhaust air shut-off valve and restart emptying with compressed air.

8.3.7 Gravity unloading via drop bottoms

Observe the loading instructions from page 116 and the consignee's unloading regulations.

⚠DANGER

DANGER OF DEATH!

If you loosen the clamps of the manlid or open the loading couplings or the product coupling of a silo tank under pressure, there is a danger that it might tear open explosively. If this happens, you or others could be fatally injured.

- ▶ Before discharging always check if the silo tank is under pressure.
- ▶ Never try to open a manlid or filler coupling that is under pressure.

⚠WARNING

DANGER OF EXPLOSION!

If the equipotential bonding conductor is not connected, static charges can cause sparks and thus explosions.

- ▶ Always provide equipotential bonding when filling, emptying or cleaning the silo tank.

NOTICE

VACUUM DAMAGE!

Unloading the silo tank without pressure equalisation will cause the silo tank to be damaged by implosion.

- ▶ Based on the type of load and the applicable regulations, ensure pressure equalisation via the open manlid of the silo tank chamber to be discharged.

Procedure with standard equipment:

1. Prepare to discharge.
   - ▶ Raise the safety rail.
   - ▶ Close all valves in the air and material pipes.
   - ▶ Connect the potential equalisation conductor.
   - ▶ Ensure that the silo tank is completely depressurised.
   - ▶ Then open the manlid of the chamber to be discharged for ventilation.
2. Start discharging.
   - ▶ Open the drop bottom on the discharge vessel.
     - ▷ Product flows out from the silo tank.
   - ▶ Monitor the unloading procedure.
3. Carry out the final steps for discharging.
   - ▶ Close the drop bottom on the discharge vessel.
   - ▶ Close the manlid.
   - ▶ Open the air outlet and leave it open to avoid vacuum damage.
   - ▶ Disconnect the equipotential bonding conductor.
   - ▶ Fold down the safety railing.

8.4 Brief instructions

The brief instructions listed below are affixed on the silo tank in the form of adhesive labels.

These are located on the front side of the support case.

8.4.1 Quick operating instructions for the FFB silo bottom-discharge vehicle

Order number of the adhesive label: 006047

8.4.2 Maintenance instructions and cleaning instructions

Order number of the adhesive label: 007591

9 Maintenance

The semi-trailer should only be operated when free of defects and with due attention being paid to safety and hazards. This means that the silo trailer must be serviced and maintained according to instructions. Any changes detected must be rectified immediately by a qualified professional workshop. This applies in particular to changes that compromise the safety of people and property.

The semi-trailer and all of its components must be serviced regularly and repaired if necessary so that safe and efficient use can be ensured. Inspections, servicing and repairs that are not carried out on schedule may cause components to fail, thus leading to accidents.

- Carry out function tests and maintenance work at the specified intervals and according to the instructions.
- Please also comply with the specified intervals and instructions for checking and servicing supplied components, e.g. axles, as indicated in the instruction manuals supplied.
- Perform repairs in a timely manner.

9.1 Function tests

Regular functional checks to ensure that safety devices are in good working order must be made if the vehicle is to operate safely. Carry out the following function tests at the specified intervals, see „Function test schedules“ on page 135.

Information

No additional expertise is required to carry out the function tests described here. However, if a function test does not deliver the necessary result, repairs must be carried out by a qualified workshop.

Valves

Valves can stick, jam or become blocked by residues of load. This is why regular checks must be carried out to ensure proper function. Defective valves and other safety devices should be replaced immediately.

Information

The inspection record book provides details explaining whether valves or pressure gauges must be officially approved and sealed.




Wear protective clothing for the functional tests!

9.1.1 Safety valve

DANGER

DANGER OF DEATH!

A defective safety valve can cause the vessel to explode due to excessive pressure.

- Do not pressurise the vessel and the air lines when the cap can no longer be turned or the safety valve does not blow off at maximum allowable working pressure, see type plate of the vessel.
- Replace defective safety valves immediately.

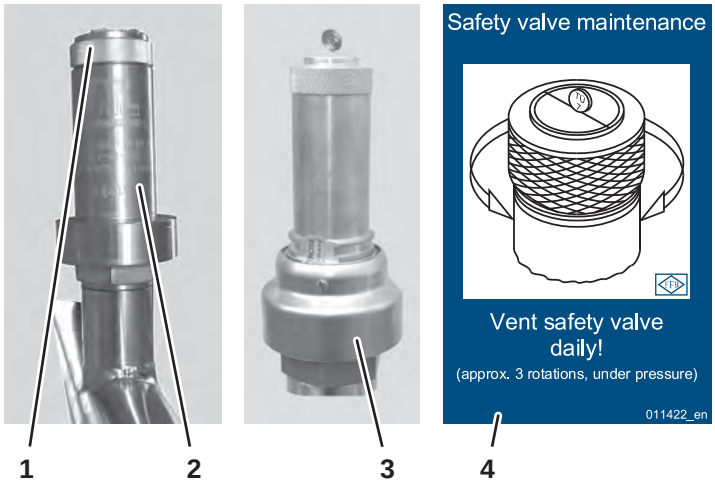


Illustration 9.1 Safety valve, models

1 cap

2 safety valve, simple model

3 safety valve, model with enclosure

4 'Safety valve maintenance' adhesive label. Vent safety valve daily! (approx. 3 rotations, under pressure)"

Check for smooth operation

1. Ensure that the compressed air line is completely depressurised.
2. Open and close the cap again (1) by 3 rotations.
   ▷ The cap must turn easily.

9.1.2 Vacuum valve

⚠CAUTION

DANGER OF INJURY!

Product residues on the cover cap can cause irritations to the skin.

- Wear protective gloves when carrying out function tests.
- Clean the cover cap before unscrewing.

NOTICE

VACUUM DAMAGE!

A vacuum valve that is defective, frozen or clogged by load cannot prevent damage to or destruction of the tank through implosion.

- Immediately replace a defective vacuum valve if the plunger does not move easily or if it does not come back out automatically.
- At temperatures below 0 °C, check the functioning of the vacuum valve more often.

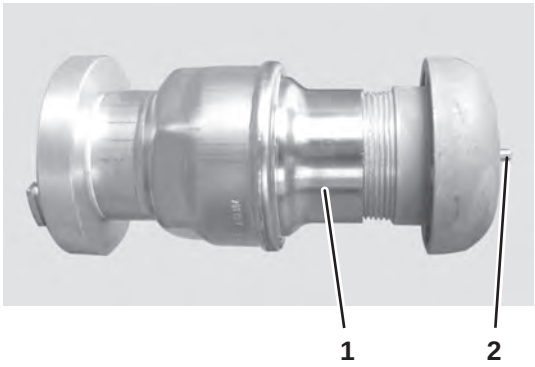


Illustration 9.2 Vacuum valve - standard version

1 Vacuum valve
2 Plunger in the cover cap

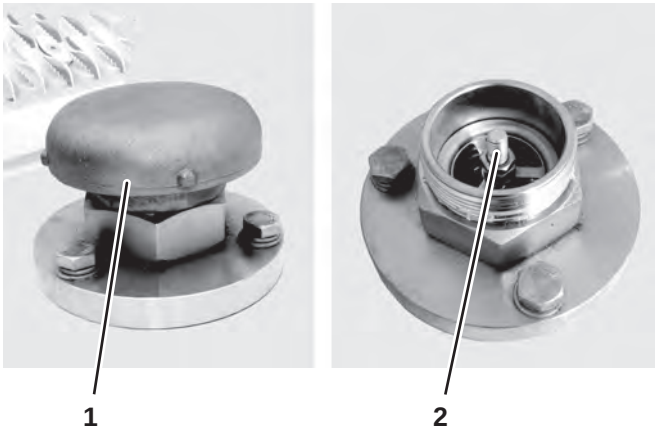


Illustration 9.3 Vacuum valve - ADR version

1 Cover cap
2 Plunger

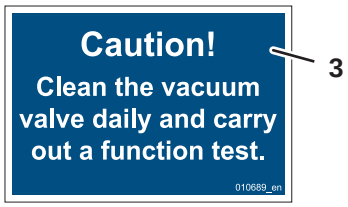


Illustration 9.4 Function test note

3 Sticker: "Caution! Clean the vacuum valve daily and carry out functional testing."

1. Press the plunger illustration 9.2 (2) down against the resistance.
   See illustration 9.3 in the ADR model.
2. If necessary, unscrew the cover cap and clean inside.

9.1.3 Manlid

DANGER

DANGER OF DEATH!

A damaged thread of a manlid threaded connection can yield, explosively tearing the manlid from the container and injuring or even killing personnel.

- The container must not be pressurised if just one thread is damaged.
- Only hand-tighten the manlid clamp.
- Replace damaged threads immediately.

Leak tightness

The manlids must always be correctly sealed. If any hissing can be heard, e.g. when evacuating the silo tank, this is a sign of leakage. This can cause damage to the manlid and the seal. In this case, depressurise the silo tank, seal the lid properly and/or reset the dome manlid threaded connection, see also „Manlid“ on page 70.

Seal

The seals can only be checked when the tank is depressurised. The dome manlids must be open.

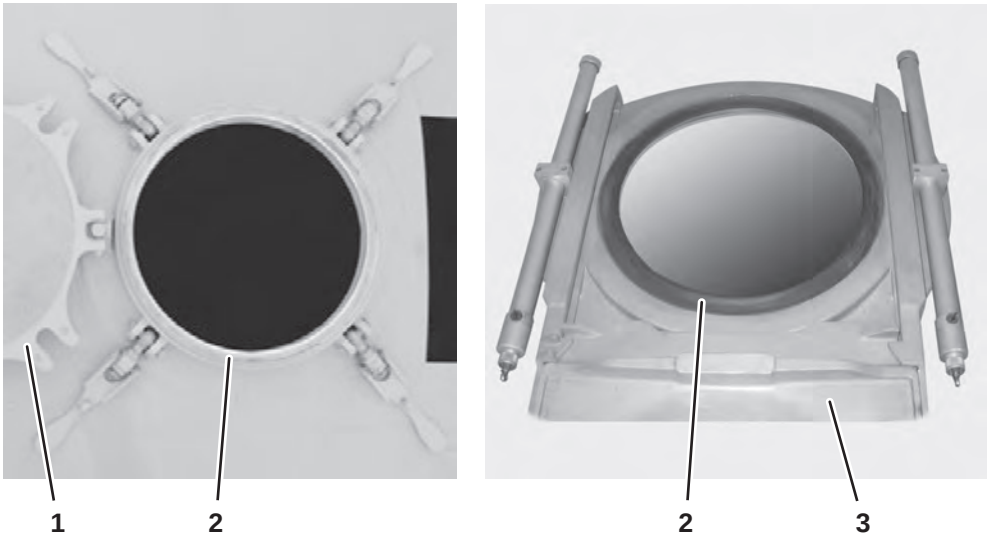


Illustration 9.5 Gasket in the manlid collar

1 Manlid
2 Gasket
3 Sliding manlid (optional)

The seals must be visually fault-free and clean. Replace damaged seals without delay.

Threaded connections

The threads of the manhole lid must be visually fault-free and easy to move.

Guide tubes

The guide pipes for sliding dome manlids must be visibly fault-free. The sliding dome manlids must be easy to move and must not tilt.

Threaded connections with eccentric lock

As the container is increasingly used, the manlid seal will settle down. As soon as the manlid does not close with a pressure-tight seal, the eccentric locks must be readjusted.

Observe the operating instructions in chapter „Manlid“ on page 70.

9.2 Function test schedules

Information

Also refer to the schedules for the function test of the components in the instruction manuals supplied.

9.2.1 After each filling or evacuating operation

The following components should be checked after each filling or evacuating procedure:

Component ■ Check	Notes
Manlid ■ Leaktightness ■ Visual inspection	The silo tank must be depressurised. page 133
Vacuum valve ■ Functional checks	page 132
Material outlet ■ Visual inspection ■ Leaktightness	The silo tank must be depressurised. page 81

9.2.2 Daily

The following components must be checked daily:

Component ■ Check	Notes
Safety valve (standard) ■ Function test, check at max. permissible working pressure (0.5 bar / 2.00 bar / 3.00 bar, see test book of the tank)	page 131
Safety valve (connectable) ■ Function test, check with lowered working pressure (0.90 bar tank pressure)	page 66

9.2.3 Whenever uncoupling takes place

The following components must be checked before and after each uncoupling:

Component ■ Check	Notes
Trailer kingpin and fifth wheel ■ Secure anchoring ■ Visual inspection	page 138
Steered axle ■ Visual check for leaks in the hydraulic system or ■ visual check for damage to rods and bearings	Follow the maintenance manual from the manufacturer.

9.2.4 Monthly

The following components should be tested once a month:

Component ■ Check	Notes
Manlid ■ Check seal and threaded connection.	page 133
Manlid with eccentric wing nut ■ Adjusting the eccentric nut preload	page 74 Adjust more often for greater loading.
Safety railing ■ Check fastening; all bolts must be present ■ Check for ease of movement and proper locking	

9.2.5 As per GGVSEB/ADR inspection certificate

Perform the following checks on vehicles with permits for transporting hazardous goods as per ADR:

Component ■ Check	Notes
Silo tank and equipment ■ Perform check and document	Adhere to the inspection periods determined in the inspection log Observe the last entry on the tank type plate Observe the next inspection date entered on the adhesive label on the tank Observe national regulations

9.2.6 FFB minimum recommendation for the pressure vessel check

Component ■ Check	Notes
Silo tank and compressed air lines ■ Perform check and document	■ External inspection every 2* years ■ Internal inspection every 5* years ■ Pressure test every 10 years

Information

* On operation involving high tank stress, Feldbinder recommends more frequent checks depending on the operator's risk assessment.

Feldbinder Spezialfahrzeugwerke GmbH points out that, in the respective area of applicability, inspection intervals must be observed in accordance with the EU Pressure Equipment Directive and national regulations.

Test schedules for the ADR tanks have priority, see table 'table 9.2.5 on page 136'.

9.3 Maintenance operations

9.3.1 Kingpin

⚠WARNING

DANGER OF ACCIDENTS!

Using a king pin with less than the specified minimum diameter (wear limit) can cause the semi-trailer to become accidentally uncoupled while on the road.

- ▶ Regularly check the kingpin diameter.
- ▶ A worn kingpin should be replaced as soon as possible.

For information on tightening torques and operating materials, please see:

- Tightening torques: See the documents supplied by the manufacturer.
- Recommended operating materials: This instruction manual, page 25.

Information

For any queries or faults that relate to the kingpin, please contact the manufacturer or a qualified workshop.

Maintenance instructions

- If the kingpins are bolted into aluminium plates, the bolts must be removed and the corrosion of the aluminium plate must be checked from the top once a year.
- When replacing kingpins with threaded connections, only use approved components with test certificates.
- Refer to the installation instructions of the manufacturer.

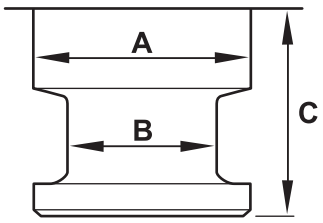


Illustration 9.6 Kingpin dimensions

		Kingpin 50 mm (2")	Kingpin 90 mm (3.5")
A	New condition	73	114
	Lower limit	71	112
B	New condition	50.8	89
	Lower limit	49	86
C	Minimum	82.5	72
	Maximum	84	74

Table 9.1 Dimensions of new and worn kingpins in mm

9.3.2 Torque for chassis threaded connection

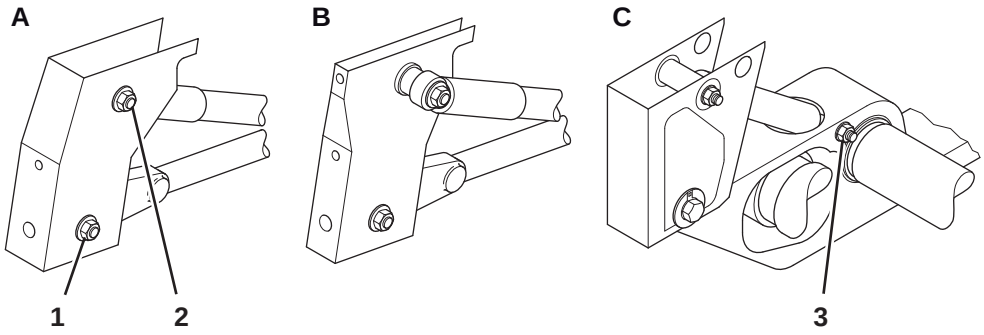


Illustration 9.7 Chassis threaded connection for Jost DCA, BPW Eco Plus and SAF INTRA types

A B C – see table table 9.2 and table 9.3

1 Spring support threaded connection

2 Shock absorber threaded connection (top)

3 Shock absorber threaded connection (bottom)

Information

The threads must be free of grease in order for the intended clamping force to be reached and no damage to occur.

NOTICE

Damaged connection elements

Retightening the spring support threaded connection can cause the bolt head to tear off and lead to axle damage.

- Do not tighten the spring support threaded connection again after initially tightening with the required torque and additional rotating angle.
- Always replace damaged or loose connection elements with new components.

For chassis in FFB aluminium (Alu) axle mounts, the required torque is achieved through the following tension and additional key rotations:

Dimension	Axle type "A" - Jost DCA	Axle type "B" - BPW	Axle type "C" - SAF INTRA
M24*2	400 Nm + 120°	400 Nm + 120°	400 Nm + 120°

Table 9.2 Spring support threaded connection (1), torque and rotating angle

Dimension	Axle type "A" - Jost DCA	Axle type "B" - BPW	Axle type "C" - SAF INTRA
M20*1.5	400 Nm (top) 450 Nm (bottom)		400 Nm (top) 400 Nm (bottom)
M24*2		320 Nm (top) 420 Nm (bottom)	

Table 9.3 Shock absorber threaded connection (2), (3), torque

Please observe the latest enclosed documentation from the manufacturer, especially in the case of a deviating axle type.

Test torque

The test torque is set to **630 Nm** to test the spring support connection at a later point.

Use to check the shock absorber threaded connection test torque as per table 9.3, „Shock absorber threaded connection (2), (3), torque,“ on page 139.

9.3.3 Fitting the wheels on the vehicle

Only coat the centring surfaces or the centre hole of the wheel before assembly with Alcoa ALgrease. The system surfaces must not be treated, they must be clean and smooth.

ALgrease or equivalent agents are heat-resistant and acceptable for aluminium and tyres. The agent is also suitable for tyre and valve installation. Assembly agents that contain water or heavy metals can lead to corrosion and should not be used on the rims.

NOTICE

Rim damage

Damage to rims.

- ▶ Never grease the wheel bolts.

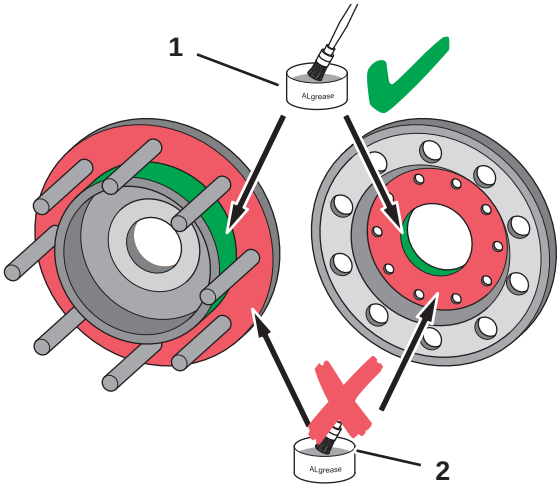


Illustration 9.8 Lubricating points and dry points on the wheel and hub

1 Grease here.

2 Do not grease here.

Tightening torque

Always ensure that the correct torque is used and regularly check the torque of the wheel and valve nut.

- Tighten the wheel nuts to 650 Nm.
- Tighten the valve nuts to 12.0 – 15 Nm.

Fitting devices

The securing flange of aluminium wheels is thicker (21 to 28 mm) than that of steel wheels (11 to 13 mm) and requires different fitting devices.

Use either:

- Longer wheel bolts with standard nuts or
- Sleeved cap nuts for wheel bolts of standard length. To ensure correct assembly, there must be sufficient thread length available:

Wheel hub centring

All European Alcoa wheels are hub-centred wheels. European Alcoa wheels have cylindrical bolt holes and are not suitable for bolt centring with conical or spheroidal nuts.

- Only two-piece wheel nuts with installed, freely moving washers for hub-centred fitting systems must be used to tighten European Alcoa wheels.
- For single or dual tyres, the centring must contact the wheels by 3 mm. Longer centrings make fitting easier.

Further information from the manufacturer can normally be found on the Internet. For example, at: www.alcoawheels.com.

9.3.4 Brake blocking via pneumatic sensor (optional equipment)

Functional test of all pneumatic proximity sensors, visual inspection of the line and of the counter plate where present.

- No further maintenance required.

9.3.5 Lubrication points

Various parts on the semi-trailer have lubrication points. These should be lubricated regularly, at least once a month.

- Semi-trailer support (first after 3 years, then annually)
- Kingpin
- Steered axle (optional equipment)

Information

Use multi-purpose grease L2 or similar as lubricant.

Support jacks

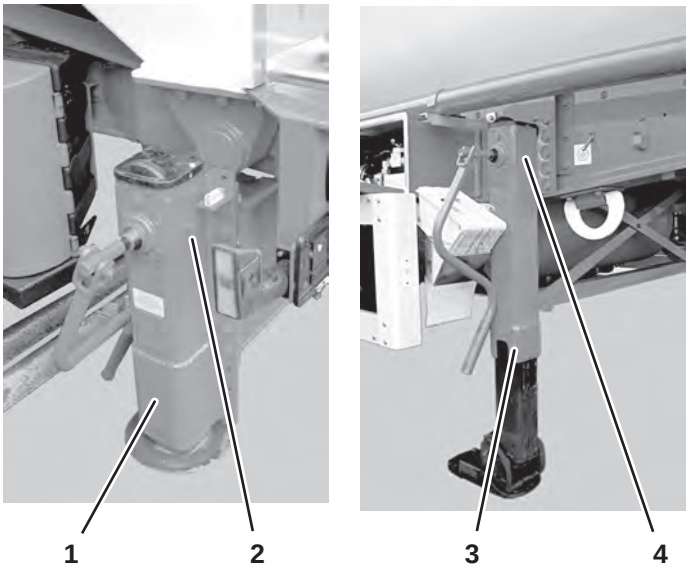


Illustration 9.9 Rear support legs (tipping tank) and trailer support lubrication points

1 Rear support legs (tipping tank only)
2 Lubricating nipple
3 Trailer support
4 Lubrication hole

Information

The support jack manufacturer stipulates further maintenance procedures in the installation and instruction manual. The supports must be dismantled for this purpose. Please refer to the corresponding instructions.

Kingpin

Heed the maintenance regulations of the manufacturer. See „Recommended operating materials“ on page 25 and „Kingpin“ on page 138.

Steered axle rods (optional equipment)

Heed the maintenance regulations of the manufacturer. Also see „Steered axle“ on page 104.

9.4 Maintenance schedules

Information

Also refer to the maintenance schedules for the components in the instruction manuals supplied.

9.4.1 For the first time after 50 km

Carry out the following maintenance tasks after 50 km and after every wheel change.

Component ■ Maintenance item	Notes
Wheels ■ Tightness of the fixing bolts check	And after each tyre change, see also page 55. Monitor the tightening torque

9.4.2 For the first time after 100 km

Carry out the following maintenance tasks after 100 km and after every wheel change.

Component ■ Maintenance item	Notes
Wheels ■ Check that the fixing screws are securely tightened	And after each tyre change, see also page 55. Monitor the tightening torque

9.4.3 After the first journey with a load

Carry out the following maintenance tasks after the first journey with a load.

Component ■ Maintenance item	Notes
Axle and spring bearing fixing screws ■ Check the firm seating of the mounting screws and tighten if necessary.	■ page 140; follow the maintenance instructions of the axle manufacturer

9.4.4 After first use

Carry out the following maintenance tasks after first use (loading and unloading procedure).

Component ■ Maintenance item	Notes
All air and material hose clamps ■ Check the firm seating of the mounting screws and tighten if necessary.	

9.4.5 After each transport

Carry out the following maintenance tasks after each transport.

Component ■ Maintenance item	Notes
■ Visual check within the framework of pre-departure check	page 17
■ Visual check of the air passages between the individual tank compartments	Clean in case of blockage, see also page 97

9.4.6 After 1000 km or 5000 km

Carry out the following maintenance tasks after the first 1000 km. Some brake manufacturers recommend traction adjustment after 5000 km only.

Component ■ Maintenance item	Notes
Brakes ■ Have traction adjustment carried out.	Have the result documented, see also page 56. Send journal to FFB (copy)

9.4.7 Weekly

Perform the following maintenance tasks once a week.

Component ■ Maintenance item	Notes
Silo tank ■ Visual inspection ■ Cleaning	page 150
Internal coating ■ Visual inspection	page 107 Repair by authorised specialist company only
Air hoses, material hoses ■ Check the hoses for damage ■ Check the hose clamps for firm seating	With shut-off devices
Stowage pipes, hose box ■ Intactness ■ internal cleaning	page 148

Component ■ Maintenance item	Notes
Material outlet ■ Intactness ■ Leaktightness, blanking plug	Also see "Material coupling" page 81
Kingpin ■ Check the firm seating of the mounting screws and tighten if necessary. ■ Apply high-pressure grease.	page 138
Friction plates of semi-trailer coupling/rubbing plate ■ Apply high-pressure grease.	

9.4.8 Every 14 days

Carry out the following maintenance operations every 14 days.

Component ■ Maintenance item	Notes
Axle and spring bearing fixing screws ■ Check the firm seating of the mounting screws and tighten if necessary.	page 139 Follow the maintenance instructions of the axle manufacturer.

9.4.9 Every three months

Carry out the following maintenance tasks every three months.

Component ■ Maintenance item	Notes
Safety valve, butterfly valve/bottom valve and valves ■ Inspect for leaks	

9.4.10 Biannually

Carry out the following maintenance tasks every six months.

Component ■ Maintenance item	Notes
Statutory safety inspection ■ Have the safety check carried out.	
Kingpin ■ Check the firm seating of the mounting screws and tighten if necessary. ■ Carry out a visual check to determine wear, damage and cracks. ■ Check for corrosion of steel rubbing plate.	page 138
Sterile filter (optional equipment) ■ Replace filter insert.	

9.4.11 Annually

Carry out the following maintenance operations every year.

Component ■ Maintenance item	Notes
■ Final investigation	In agreement with the statutory guidelines

10 Cleaning

10.1 Tank Cleaning

Aluminium is resistant to corrosion by many products because it forms a protective oxide layer on the surface.

However, the contaminating residues of the load material can corrode the surface of the tank if they are in contact with it long enough, especially when combined with water.

To avoid this, both the inside and the outside of the tank should be cleaned regularly and dried sufficiently quickly. Soiled areas can corrode and pitting can occur.

Information

It is important to have the tank cleaned as soon as possible after transporting chemicals and to vent it as often as possible. Cleaning of the tank may only be carried out by a properly equipped and qualified cleaning company.

The inside and outside of the tank should be visually inspected at regular intervals in order to identify possible damage at an early stage.

If pitting is observed, the tank should be passivated by an approved workshop. Feldbinder Spezialfahrzeugwerke GmbH recommend a Feldbinder Service Support Centre for this purpose.

Multi-chamber tank

For multi-chamber tanks with internal pressure equalisation, the openings in the inside must always be free of product residues. Carry out regular visual inspections. Open and regularly clean all pressure equalisation connection pieces, see also „Coupling for pressure equalisation“ on page 97.

10.2 Factory cleaning

When a new silo vehicle is delivered from the factory, the inside of the silo tank is rinsed with water.

There is no cleaning certificate.

Information

Before travelling with a load for the first time, have the interior cleaned by a qualified cleaning company.

10.3 Internal cleaning

When cleaning the interior of the tank, observe the valid regulations for work in tanks and enclosed spaces.

⚠DANGER

DANGER OF FATAL INJURY!

After transport, there may be dangerous amounts of inert gas or residues of other life-threatening substances in the tank.

- ▶ Only enter the tank if it is absolutely necessary.
- ▶ Only enter the tank after it has been ventilated thoroughly from above and below. Keep all manlids open. This is particularly important if the load has been inerted with nitrogen during transport of the load.
- ▶ Before entering the interior, take a gas measurement in compliance with the current regulations in order to ensure that there is sufficient oxygen in the tank.
- ▶ Accessing the inside of the tank is only permitted with a second person for safety.
- ▶ Leave the interior as soon as possible or immediately if breathing problems occur.

NOTICE

PRODUCT CONTAMINATION!

Product residues can e.g. enter the air line. Product residues in the air lines can cause product that is subsequently loaded to be mixed or contaminated. High material damage can result.

- ▶ Depending on the products to be loaded, the tank and the air lines may need to be cleaned.

10.3.1 Before cleaning

NOTICE

MATERIAL DAMAGE!

Incompatible cleaning agents can attack and damage the tank and its seals.

- ▶ Only use cleaning agents compatible with the tank and its seals.

Before cleaning, make sure that:

- The tank has been completely emptied and there is no product residue left in the fittings, couplings or hoses,
- You are in possession of a cleaning order with the name of the issuer and the tank number
- The silo tank and the compartments that are to be cleaned are depressurised and
- Equipotential bonding has been established in a suitable manner.

Air lines

- If the air lines also have to be cleaned, all valves must be open before cleaning.

Information

Feldbinder Spezialfahrzeugwerke GmbH recommends disassembling the air lines and taking them apart for cleaning.

Wet cleaning

- If the inside of silo tank has to be wet cleaned (with water or steam), all aeration systems must be pressurised before beginning the cleaning operation.
- Maintain the pressure even during and after the cleaning until the tank, the aeration pads and material pipes are dry.

10.3.2 While cleaning

Make sure that all components that come into contact with the product, including nozzles and couplings in spill boxes, toolboxes and cabinets, are also cleaned.

NOTICE

MATERIAL DAMAGE.

When a hot cleaned silo tank is cooling, vacuum damage may occur if the tank is not sufficiently vented.

- ▶ Ensure there is pressure equalisation until the tank has cooled and dried.

10.3.3 After cleaning

NOTICE

VACUUM DAMAGE!

When a hot, cleaned silo tank is cooling, vacuum damage may occur if the silo tank is not sufficiently aired.

- ▶ Make sure that there is sufficient ventilation via the manlids or valves.

Make sure that:

- Previously removed parts are attached completely and correctly again
- All seals are undamaged and seated correctly
- Previously released threaded connections are tightened correctly
- The bottom valves and butterfly valves are not closed until they have properly dried. This prevents contact corrosion
- That the silo tank is completely dry prior to further operation.

10.4 Cleaning the outside

NOTICE

PAINT DAMAGE!

Cleaning of newly painted surfaces is only permitted after a curing time of 4 weeks. Before this, the paint will not be completely cured and can be damaged.

- ▶ During the first 4 weeks only wash painted surfaces with a jet of cold water. Do not use high-pressure or steam jet devices or hard brushes.

NOTICE

PAINT DAMAGE!

After 4 weeks: Cleaning painted surfaces with excessive pressure, water temperatures or with aggressive cleaning materials can cause damage to the paintwork.

- ▶ Maintain a minimum distance of 60 cm from the painted surfaces when using a high-pressure or steam jet.
- ▶ Only wash the silo semi-trailer with water at a temperature below 60 °C.
- ▶ Do not use aggressive cleaning agents.

When cleaning the outside, the following must be done:

- Remove spilled load as quickly as possible.
- Remove road salt residue as quickly as possible at regular intervals.
- Clean the silo semi-trailer once a week with plenty of water and a mild cleaning agent that does not contain acid.

Information

When using a high-pressure cleaner, the following points must be taken into account:

- Observe the high-pressure cleaner manufacturer's safety regulations.
- Wear protective clothing, especially suitable safety glasses.
- Do not point the water jet at electrical components, plug connections, seals or hoses.

Brake blocking

Clean the proximity switches of the brake blocking when soiled.

If the vehicle has been treated with protective wax and transported: Remove all traces of wax from the proximity switch and the counterpart.

10.5 Care and maintenance of the wheels

Aluminium wheels, e.g. Alcoa wheels, are uncoated. The alloy used is highly corrosion-proof and exhibits only minimum oxidation. Salt, alkaline materials and chlorides could lead to corrosion, however.

Clean the wheels regularly!

Wash the wheels regularly with steam or high-pressure cleaners. Mild cleaning additives are recommended. Do not use alkaline or acidic cleaning agents (with a pH value above 8 or below 6).

Carefully rinse off the remains of cleaning additives with pure water before mounting the wheels and dry them. This also applies for the wheel contacting surfaces of the axle.

Avoid misuse!

A lack of care when changing tyres, sharp impacts on the wheel rim flange, overloading or running against kerbs could damage the wheel.

Do not repair the wheels!

Alcoa wheels must not be heated to carry out alignment work or other repairs. The aluminium alloy is heat-treated and any uncontrolled heating reduces its strength.

- Aluminium wheels are forged wheels and must not be welded under any circumstances.

Further information from the manufacturer can normally be found on the Internet. For example, at: www.alcoawheels.com.

11 Troubleshooting

11.1 FaultsHave faults remedied immediately

Faults and defects should be remedied by a qualified workshop. The Feldbinder Spezialfahrzeugwerke GmbH recommends a Feldbinder Service Support Centre for this purpose.

Refer to the enclosed Feldbinder Spezialfahrzeugwerke GmbH 'Sales/Service' brochure for contacts and addresses.

Also follow the component manufacturers' instruction manuals in the event of faults.

12 Shutdown

12.1 Temporary shutdown

If the silo semi-trailer is not to be used for several months, the valves, butterfly valves, seals and seal seats must be kept in good condition. This prevents the components from sticking and seizing up.

Reusing

After a break in operation, check that the preserved components function and seal properly. Inform yourself about which inspection intervals are affected by the temporary shutdown and have due inspections carried out.

12.2 Decommissioning, disposal

Except for smaller components, the silo vehicle is made from materials that are recyclable and can be properly disposed of at no hazard to the environment.

The silo vehicle must be decommissioned and disposed of by a suitable, qualified specialist company.

Refer to the enclosed Feldbinder Spezialfahrzeugwerke GmbH 'Sales/Service' brochure for contacts and addresses.

13 Spare parts

13.1 Spare parts

For contacts and addresses near to your location, please refer to the enclosed "Sales/Service" brochure provided by Feldbinder Spezialfahrzeugwerke GmbH.

If required, spare parts may be ordered via the internet. The online spare parts catalogue can be found at www.feldbinder.com.

13.2 Adhesive labels

The part numbers can be found on the adhesive labels or in the online spare parts catalogue at www.feldbinder.com.

14 Checklists

14.1 List of other relevant instruction manuals

For components integrated in the vehicle, separate documents from the manufacturers are included in the scope of delivery. The respective supplier/manufacturer is responsible for details of technical data and for safe operation.

Observe the manufacturer documents and adhere to the prescribed inspection and service intervals.

Instruction manual
Axles
Duo-Matic coupling
EBS diagnostics system
ECAS system/Lifting axle
Compressor assembly
Exhaust filter
Tyre pressure monitoring system
Semi-trailer coupling
Trailer support
Towing vehicle
Positive steering

14.2 Driver instructions

Confirm the instruction points that are relevant to you with regard to taking over your semi-trailer.

14.2.1 Instruction, chassis

Component	Instruction
Lights	
Brakes ■ Control console	
Spare wheel bracket	
Wheel chock	
Retractable axle	
Air suspension	
Trailer support	
Side protection	
Underride protection (guard)	
Supply connections ■ Brakes/Air reservoir ■ Duo-Matic ■ ABS/VCS/EBS ■ Electrical system	
Toolbox/Storage box	
Kingpin and rubbing plate	

14.2.2 Instruction, superstructure/tank

Component	Instruction
Top air stop valve	
Outlet pot	
Exhaust air valve	
Manlid	
Safety railing	
Compressor coupling	
Air supply, air battery	
Material coupling ■ Storz coupling ■ Hose coupling ■ Butterfly valve	
Stowage pipes, hose tray	

14.2.3 Optional equipment

Component	Instruction
ADR case, ADR plates	
Working searchlight	
Loading coupling	
EBS diagnostic system	
Inerting system	
Compact connection (VBG)	
Air cooler	
Vibrator	
Sliding manlid	
Brake wear indicator	

14.2.4 Instruction in operation

Operation	Instruction
Discharge sump with central material pipe or manifold and material coupling	
Filling ■ Gravity ■ Compressed air	
Manlids and locks	
Emptying ■ Gravity ■ Compressed air	
Cleaning	

14.2.5 Instruction, safety equipment

Safety equipment	Instruction
Fire extinguisher	
Folding safety rail	
Safety valve	
Equipotential bonding	

14.2.6 Inspection intervals

Inspection interval	Instruction
Chassis/SI (safety inspection)/GI (general inspection)	
Tank	

14.2.7 Confirmation of instruction and handover

Date:	
Chassis number:	
Tank serial number:	
Instructor's signature	**Driver's signature**

15 Customer form

15.1 Feedback regarding special incidents

Feldbinder Spezialfahrzeugwerke GmbH has many years of experience in developing, designing and manufacturing silo vehicles, tank vehicles, containers and container chassis as well as compressor aggregates for the international market.

We nevertheless continuously strive to improve the technical and functional aspects of our products and to implement precautions for optimum operating safety.

Our customers' experiences are of value to us and can contribute to satisfaction on both sides.

This customer form thus provides the opportunity to inform the manufacturer of any wishes, experience from everyday operation or knowledge of problems that have occurred during operation, which will be carefully evaluated by Feldbinder Spezialfahrzeugwerke GmbH and integrated into the transport concepts.

Information can also be submitted to us anonymously. We guarantee the confidentiality of your data.

Operating status	Component	Incident

Please send this page to:

Feldbinder Spezialfahrzeugwerke GmbH

Gutenbergstraße 12 - 26

D-21423 Winsen (Luhe)

Germany

Fax +49 (0)4171 / 485 6

Or send an e-mail to:

customer-service@feldbinder.com

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Feldbinder Spezialfahrzeugwerke GmbH

Silo Semi-Trailer Original Instruction Manual, Version 08/2018, english

ZINDEL AG, EUT_A22_en 08/2018