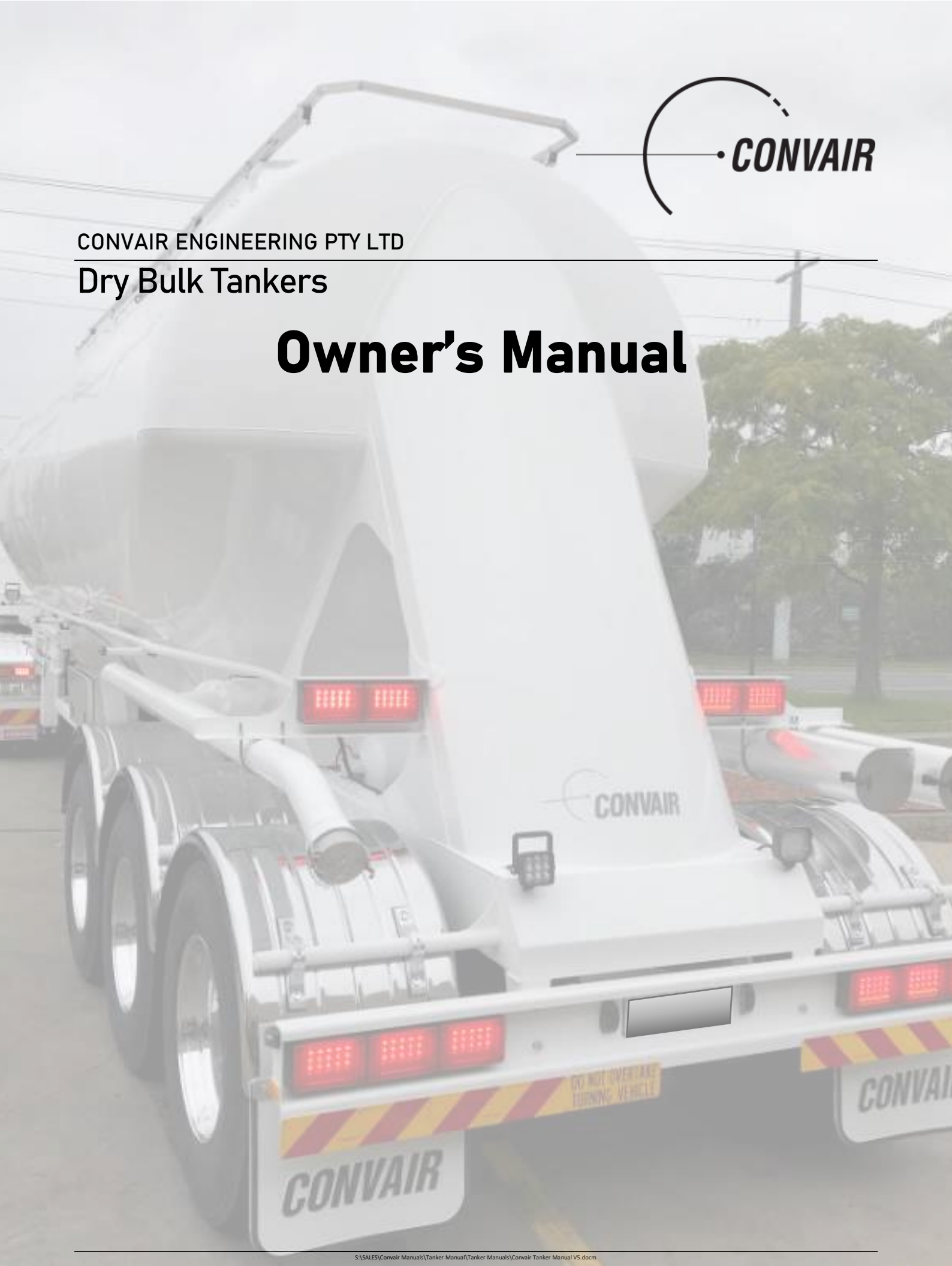
CONVAIR ENGINEERING PTY LTD

Dry Bulk Tankers

Owner's Manual



DRY BULK TANKERS

Owner's Manual

Version 001

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Printed in Australia.

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Foreword

Thank you for choosing a Convair tanker.

This manual will familiarise you with operational, maintenance and safety information about your new tanker. Convair urges you to read these documents carefully and follow the recommendations to ensure safe and productive operation of your tanker.

Convair offers a variety of options, components and features for its various models. Therefore, some of the equipment described in this manual, along with the various illustrations, may not be applicable to your tanker.

The information and specifications provided in this manual were accurate at the time of printing. Convair reserves the right to discontinue or change specifications or design at any time without notice and without incurring any obligation.

If you have questions, always check with Convair Engineering.

Convair assures you of our continuing interest in your safe- and productive tanker operation, and satisfaction with your Convair tanker.

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1 YOUR TANKER AT A GLANCE

1.1 SPECIFICATION & REGISTRATION DETAILS.

The specification and registration details of your tanker are summarised in the Service document which is supplied alongside this manual.

1.2 GENERAL DESCRIPTION OF EQUIPMENT.

Your tanker is classified under the Australian pressure vessel code AS1210 as an unfired pressure vessel. It is manufactured from carbon steel boilerplate in accordance with AS1210 or BS PD5500.

The vessel is fitted with a pressure gauge, and a pressure relief valve to prevent over pressurising. Being a pressure vessel, it must be maintained and kept in good working order in accordance with AS3788, Australian code for service and maintenance of pressure vessels.

It is constructed with internal "shedder plates" to guide the product towards the outlet where it is fluidised and conveyed through the outlet valve, into the discharge manifold, through the discharge hose, and into the silo.

The function of the aeration devices near the bottom of each discharge cone is to mix air with the dry product such that it can be pumped through the discharge pipework like a fluid.

Fine powders such as cement, fly ash and flour retain air quite well and are therefore conveyed well pneumatically but are relatively difficult to fluidise initially.

Other dry products like sugar, dry sand, poultry feed, and plastic pellets require little or no fluidising as they will not retain air.

The common methods of fluidising used are either aerators, or aerator pads.

Each of these materials have different conveying properties. The information in this manual will greatly assist the owner/operator in understanding how to get the most out of your Convair tanker and keep it in optimal condition.

1.3 PNEUMATIC TANKER SCHEMATIC LAYOUT.

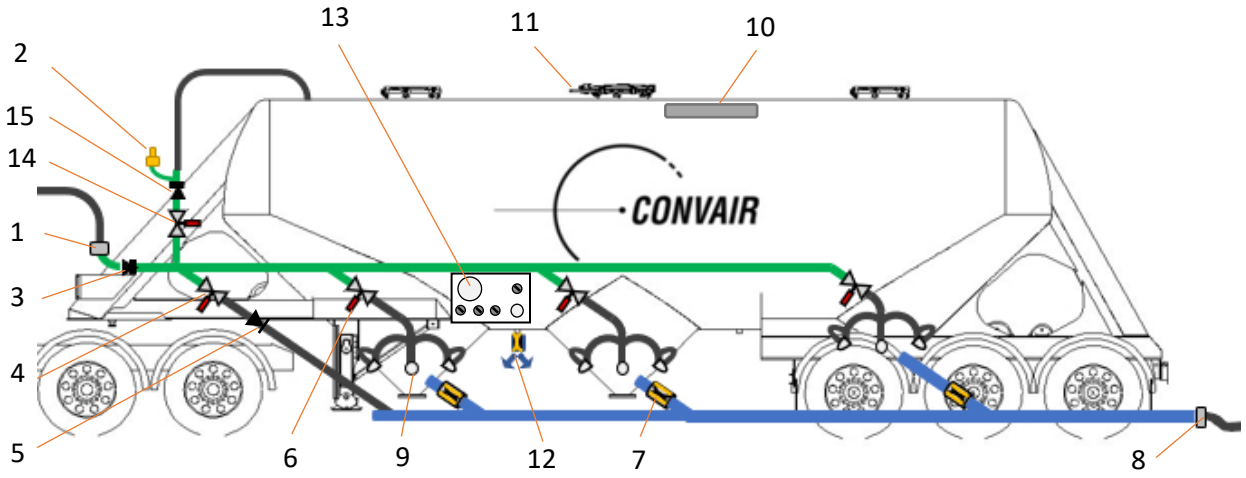

Figure 1.3 – Pneumatic tanker schematic layout

#	Description	#	Description
1	Supply air connection	9	Aerator
2	Pressure relief valve	10	Internal filter
3	Air manifold check valve	11	Loading hatch
4	Boost valve	12	Air dump valve
5	Boost line check valve	13	Tank pressure gauge
6	Aeration valve	14	Top air valve
7	Product discharge valve	15	Top air check valve
8	Discharge outlet		

Table 1.3 – Pneumatic tanker key components

1.3.1 PNEUMATIC TANKER COMPONENTS.

1. Air Supply.

The air supply to the tanker can come from a variety of sources, such as a PTO driven compressor mounted on the prime mover, or a self-contained powerpack fitted on the tanker, or the air supply can be provided by the plant. In most cases the source of the air supply will be a compressor or blower.

It is most important that the air supply never be started up or shut down under load. Starting the air supply under load places a great deal of stress on the compressor, or in the case of a blower it will most likely result in damage to its rotors. Starting the compressor or blower against load also greatly increases the likelihood of reverse flow of product in the air line/ aeration system, resulting in irreparable damage to the compressor/ blower.

Any air supply will have a balance of volumetric capacity and pressure. The way the tanker is operated depends on the product to be unloaded, the silo arrangement that you are unloading into & the type of air supply available to operate the tanker with.

A high-pressure low volume air supply by means of a compressor will be ideal for products that are easily aerated such as cement, fly ash, flour, and lime. Products that are easily aerated use pressure in the tanker & only limited airflow to be efficiently conveyed.

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Products such as Soda Ash, coarser Lime, sugar, pellets etc are not easily aerated and require higher air volume to be conveyed efficiently.

2. Pressure Relief Valve.

A pressure relief is required to be fitted to a pressure tank, by law. Its function is to limit the pressure that the tanker can achieve, ensuring that the pressure vessel is protected against over-pressurisation.

It is vital that the relief valve be tested on a weekly basis and maintained in good order.

3. Air Manifold Check Valve.

The air manifold check valve is there to provide protection for the air supply against a reverse flow of air and/or product. The failure of a check valve can result in permanent- and very expensive damage to the compressor/blower.

4. Boost Valve.

The boost valve is used to control the operating pressure of the tanker, and -consistency of product flow during discharge. The setting of this valve constantly changes during discharge. Generally, the setting of this valve should be just enough to maintain a consistent flow and maintain an optimum pressure in the tanker.

5. Boost Line Check Valve.

The boost line check prevents product from travelling backwards into the air manifold, which could otherwise block the aeration system and possibly cause damage to the compressor.

6. Aeration Valve.

Is an on/off valve that is used to control airflow to the aerators in individual discharge cones. Aerators are operated either fully open or closed.

7. Discharge Valve.

A golden rule when operating a pneumatic tanker: The discharge valve is always the last valve to open, and the first one to close.

Used to start or stop fluidised product flow in the product discharge line. Before operating these valves, the path for the airflow should be checked, i.e. camlocks secure, valves set accordingly.

8. Discharge Outlet.

Can be an extremely dangerous place. Make sure camlocks have seals and are in good condition, and the discharge hose is in good order. Importantly ensure that the hose is clamped to the camlock with at least two ‘Mikalor’ type clamps at each end. Camlock caps should have a hole drilled to ensure there is no residual pressure build up behind the cap when removing. It is highly recommended to use self-locking camlock fittings.

9. Aerator.

Very important to the efficient unloading of a tanker. Wear will cause them to leak air backwards, and when this happens generally product will follow and cause the air manifold to block. Leaking aerators should be replaced immediately. Wear rate of aerators vary according to application. Wear of aerators must be monitored.

10. Internal Filter.

Internal filters are used to prevent product from inside the tanker from entering vent lines which enable air to be vented from inside the tanker to either under the shedder plates, or to the atmosphere. It is important that these filters be kept in good order.

11. Loading Hatch.

Must be kept in good order. Accidents involving hatches are a common cause of injury and death with pneumatic tankers. Great care must be taken when opening hatches and the tank pressure gauge must read ZERO. Even residual pressure built up during travel will be enough for the hatch to fly open explosively when opened carelessly!

12. Air Dump Valve.

The vent valve discharges air pressure from the tanker to outside (atmosphere). It is a good habit to always leave this valve open at the completion of discharge. This ensures that the tanker is always at atmospheric pressure, except when the tanker is being pressurised to unload.

13. Tank Pressure Gauge.

The pressure gauge provides an indication of the internal pressure of the tanker. They should always be kept in good order and be accurate. They should be redlined with the working pressure of the tanker or compressor. Often a second pressure gauge is fitted in the air line. This is of assistance during discharge of difficult products when line pressure can vary from tank pressure.

14. Top Air Valve.

This valve when opened will pass air into the tanker. It is the most efficient way to pressurise the tanker. It is recommended to always unload the tanker with this valve open, in order to pressurise the tanker with the top air valve and one aeration valve, which prevents product fouling the pressure relief valve, reduces rat-holing, reduces aerator wear and prolongs their life.

Leaving this valve open will also prevent product building up in the top air line.

15. Top Air Check Valve.

The top air check prevents product from travelling backwards into the air manifold, which could otherwise block the aeration system and possibly cause damage to the compressor.

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2 USER INSTRUCTIONS

2.1 About this instruction manual

This instruction manual is part of the technical documentation supplied with the product by Convair Engineering. It provides important instructions on how to operate the tanker safely, properly and efficiently. Following these instructions will help to avoid danger, reduce repair costs and downtime, and increase the tanker's reliability and service life.

It is aimed at users of the tanker and is intended solely for the owner and the owner's operating and maintenance personnel.

The owner should supplement the instruction manual by consulting the current national regulations regarding health and safety in the workplace and environmental protection.

Apart from the instruction manual and the regulations concerning accident protection that apply in the user's country at the place of deployment, the approved technical regulations governing safe and proper work practices must be followed.

The instruction manual constitutes a part of the tanker. All documentation, consisting of this instruction manual plus all other manuals supplied, must be kept permanently available at the site where the tanker is deployed. If the tanker is rented out or sold all the documentation must also be passed on.

The instruction manual must be read, understood and used by every person involved in the following tasks relating to the tanker:

- driving and manoeuvring
- loading and unloading
- cleaning the tank (particularly on the inside)
- rectifying operational problems
- disposal of operating- and process materials
- maintenance (care, service, repair).

Particular attention should be paid to:

- the chapter “SAFETY”
- the safety instructions within each of the individual chapters.

2.1.1 Information, warning and prohibition signs

The information, warning and prohibition signs located on the tanker form part of this instruction manual. Therefore, these signs must be followed in the same way as the instruction manual itself.

Keep the signs clean and legible and never remove-, overwrite- or cover them.

Immediately replace illegible or missing signs.

2.2 Warranty and liability

In general, the latest version of the 'Standard Terms and Conditions of Business' of Convair Engineering shall apply. Convair will recognise no claims on the warranty or accept liability when personal injury or material damage occurs if it is attributable to one or more of the following causes:

- improper use of the tanker (see also “Proper use” on page 16)
- operation of the tanker when safety equipment has been improperly installed or is not functional
- failure to follow the instructions, orders and prohibitions described in the instruction manual
- unauthorised structural modification of the tanker
- negligent monitoring of parts subject to wear and tear
- improperly carried out and late maintenance work.

2.2.1 Original spare parts

Only use spare parts suitable for the tanker. Using unsuitable or unauthorised spare parts will affect safety and warranty.

2.3 Meaning of the safety instructions

Safety instructions precede work steps. Read these safety instructions carefully before you carry out the subsequently described action.

Safety instructions concerning the supplier components are given in the respective supplier's documentation. Follow these instructions carefully as well.

If the safety instructions are not followed, there is a risk of (in some cases fatal) accidents to persons as well as material and environmental damage.

The safety instructions in this instruction manual are illustrated by pictograms. Beneath each pictogram is a single word indicating the hazard severity.

A pictogram used with the word 'DANGER' is a warning about an **immediate threat** to the person's health or life.

Failure to observe these instructions will lead to serious and possibly fatal injury.

▶ To avoid these risks, it is essential that you observe the described procedures.

A pictogram used with the word 'WARNING' is a warning about a **possible hazard** placing the person's health or life at risk.

Failure to observe these instructions can lead to serious and possibly fatal injury.

▶ To avoid these risks, it is essential that you observe the described procedures.

A pictogram used with the word 'CAUTION' is a warning about a **possible hazard** posing a risk to people's health or warning about damage to property and the environment.

Disregarding these instructions can cause minor to severe injuries as well as material and environmental damage.

▶ To avoid these risks, it is essential that you observe the described procedures.

A pictogram with the word 'NOTICE' is a warning about possible **damage to property and the environment**.

▶ Disregarding these instructions can cause damage to property and the environment.

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2.4 Means of visualisation

Below you will find a brief explanation of the various means of visualisation used in this instruction manual.

2.4.1 Operational instructions

Operational instructions require you to do something. If more than one work step is involved, there will be an operational sequence that must be carried out in the order specified. The operational sequence can be divided into individual work steps.

Operational sequence

1 Operational sequence step 1

- ▶ Work step 1
- ▶ Work step 2

2 Operational sequence step 2

The expected result is shown after the operational sequence:

- ▷ Result of the operational sequence

Single operation

Single operations are identified as follows:

- ▶ Single work step

2.4.2 Descriptions

The names of other texts or references to them, e.g.:

- Details on the contents are given in the corresponding section 'name of the section'.

2.4.3 Safety and information pictograms

Certain parts of the text in this instruction manual are marked with pictograms. The pictograms have the following meanings:

This pictogram indicates that there is a general danger. This pictogram is used with safety instructions ("Meaning of the safety instructions" page 12).

This pictogram warns that there is danger of slipping. This pictogram is used with safety instructions ("Meaning of the safety instructions" page 12).

This pictogram warns that there is danger of falling. This pictogram is used with safety instructions ("Meaning of the safety instructions" page 12).

Information pictogram used to mark important instructions, additional information and tips.

Protective gloves pictogram, which instructs you to wear gloves that offer protection from burns and other hand injuries.

Hard hat pictogram, which instructs you to wear a hard hat that protects you against head injuries.

Safety goggles pictogram, which instructs you to wear goggles to prevent eye injury.

Hearing protection pictogram, which instructs you to wear hearing protection to prevent damage to your hearing.

Safety shoe pictogram, which instructs you to wear either safety shoes or acid-proof rubber boots to prevent foot injuries.

High-visibility clothing pictogram, which instructs you to wear a high-visibility clothing to enable other road users to see you more easily.

Acid-proof suit pictogram, which instructs you to wear an acid-proof suit to prevent chemical burns, if applicable.

Eye rinse bottle pictogram, which instructs you to keep an eye rinse bottle at hand.
This pictogram indicates where the eye rinse bottle is located on the vehicle.

Equipotential pictogram, which reminds you to connect the equipotential conductor (earthing), where applicable.
This pictogram indicates the connection point on the vehicle for an external cable to the equipotential conductor (optional).

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2.5 Terms and abbreviations

The terms and abbreviations below (in alphabetical order) are used in this instruction manual:

Term/Abbreviation	Meaning
ABS	Anti-lock brake system prevents the wheels locking when the brakes are fully applied or when braking on a slippery surface
ABV	Automatic brake lock-up prevention system
ADR	Carriage of dangerous goods by road regulation (international)
Operating personnel	Drivers, loading personnel, cleaners, and service and maintenance personnel
Owner	Forwarding companies, vehicle owners, vehicle operators
Operating pressure	Pressure used to empty the tank
EBS	Electronic brake system
ECAS	Electronically controlled air suspension
Vehicle	Tractor-trailer combination (towing vehicle and semi-trailer)
Tot. weight	Total weight
GGVS	Carriage of dangerous goods by road regulation (national)
Product	Load, electrostatically charged materials, liquid or solid requiring loading, unloading or transport
Test pressure	Pressure used to test the tank's pressure resistance.
Tanker	Convair semi-trailer
Loader	Operator of a filling or discharge station

3 SAFETY

This section covers information vital to you when operating and maintaining the tank trailer.

3.1 Tanker break-in process

No special break-in period is required for the tank vessel itself.

By following a few simple precautions, you may add to the performance, economy and life of your tanker.

- Avoid hard stops for the first 1000km, except in emergencies, to allow the brakes to seat properly.
- Adhere to the service and warranty requirements as set out in the Service & Warranty conditions set out in this manual.
- Check hose clamps, airline fittings for leaks. Rubber hoses expand and contract following use. During this settling-in period, hose clamps and fittings may lose initial torque settings and may leak or come loose. Re-tighten any loose clamps.
- Allow paint to cure on new tankers by washing it with clean water only for the first 12 weeks.
- For tankers fitted with SAF running gear, a 5000km free service is required as part of its warranty.

3.2 Proper use

Pneumatic dry bulk tankers are intended for transport of goods in granular and powder form ('powder and bulk materials').

Only materials which do not attack the material of the tank or the sealant materials used may be transported.

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

MATERIALS WITH ELEVATED TEMPERATURE MAY NOT BE LOADED IN THE TANKER. PERMANENT DAMAGE WILL OCCUR.

Guidelines

Convair tankers are only approved for operation on towing vehicles with brake systems that comply with Australian design rule ADR38.

The tank trailer and semi-trailer are only permitted to be used with properly connected compressed air, electric and supply lines and with the EBS connecting cable.

The towing vehicles must be equipped with electrical connectors in accordance with ADR35. The following may be required depending on the tank trailer's equipment:

Data in accordance with Australian pressure vessel standard AS1210 are indicated on the tank and in the supplied test manual for the tank.

The minimum and maximum filling levels must be observed. The permitted axle loads and total weight of the tanker and the tank trailer 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”.

Make sure that no excessive stress is exerted, e.g. by overloading. In case of non-observance or exceeded limits, vehicle handling will worsen, and the braking distance will increase. This increases risk of accidents.

The following are prohibited:

- transporting materials or products that attack the tank material or the sealant materials used. There is a risk of the seals or tank being damaged.
- driving with the tank trailer or semi-trailer when the tank is under pressure. When you are driving with a pressurised tank, the risk involved in the event of accidents is increased due to any previous damage to the tank, e.g. improperly executed weld seams or scratches.

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DO NOT LOAD THE TANK WITH MATERIALS THAT HAVE AN ELEVATED TEMPERATURE

NOTICE

Technical modifications

Do not modify the tank trailer or semi-trailer. Doing so could affect the tank trailer's safety.

Operating instructions

Intended use includes complying with this and all the other instruction manuals supplied as well as observing the inspection and maintenance intervals and requirements specified therein.

Inspection intervals

Intended use also includes observing the legal inspection intervals. Inspections must be documented by an independent, approved technical expert.

Please familiarise yourself with the current version of AS3788. For tank trailers and semi-trailers with standard pressure tanks, the inspection intervals in accordance with AS3788:2006 are:

INSPECT	Steel vessel	Aluminium vessel
EXTERNAL	Every 3 years	Every 2 years
INTERNAL	Every 6 years	Every 2 years

Lifespan

The lifespan of the tank trailer or semi-trailer and its components is reached when one of the scheduled inspections is not passed.

3.3 Residual hazards

This tanker has been designed using state-of-the-art technology and in compliance with generally accepted safety rules. Nevertheless, danger for the operator's life or other persons' lives as well as damage to the tanker and other objects can occur during use. The following summary shows residual hazards that can occur during work with the tanker. It does not claim to be complete.

Source of danger	Consequences
Components conveying compressed air	Risk of burns! Components conveying compressed air can reach temperatures above 100°C when in operation and can cause burns if touched. ▪ Wear protective gloves when operating the air lines.
Loose hoses when air pressure is being released	Danger of injury! Loose, whipping hose ends can cause physical injury. ▪ Only apply pressure to hoses when they are connected at both ends. ▪ Only use the exhaust line to vent off compressed air.
Pressurised tank / hatch	Danger of death! If you loosen or tighten the threaded connection of a pressurised hatch, the hatch or hose can tear away explosively from the tank and kill you or other people. ▪ Never attempt to loosen or tighten the threaded connection of a pressurised hatch. ▪ Never remove the blind cover from a coupling under pressure. ▪ Connect the product discharge hoses before applying pressure to the system.
Coming into contact with the load when unloading, loading or cleaning the tanker	Danger to health! Under certain circumstances, the load can pose a risk to health if inhaled or if it comes into contact with your skin or eyes. ▪ Avoid any physical contact with the load and inhaling any escaping dust. ▪ Wear safety clothing appropriate to the hazardousness and the properties of the load. ▪ If the load causes injury, act as specified in the material safety data sheet.
Friction between the load and the tank wall and fittings	Danger of fire and explosion (depending on product)! If equipotential bonding (option) is not ensured, static charges can cause sparks and lead to an explosion, for particular product. ▪ Ensure that there is equipotential bonding while loading, unloading and cleaning, where applicable. ▪ See material data sheet if unsure.
Hose couplings	Danger of injury! Escaping loads under pressure can cause serious injury to the face and body. ▪ Never open the dummy caps on compressed air- or material lines. ▪ Never loosen hose couplings while filling or emptying. ▪ Always connect the hose couplings carefully and secure them with the safety mechanisms provided, BEFORE pressure is applied.
Entering the interior of the tank	Danger of death! After journeys in which the load has been inerted, entering the inside of the tank to inspect, maintain, clean or for other purposes can pose a serious danger to health. ▪ Only enter the tank if absolutely necessary. ▪ Confined space entry requires a permit and a second person standing by. ▪ Only enter the tank after ventilating it thoroughly from the top and -below. ▪ Take a gas measurement to ensure that there is sufficient oxygen in the tank before you enter the tank.

Table 3.3 – Sources of danger

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3.3.1 Danger areas

The following overview indicates the areas on and around the tanker where there is an increased risk to yourself or others.

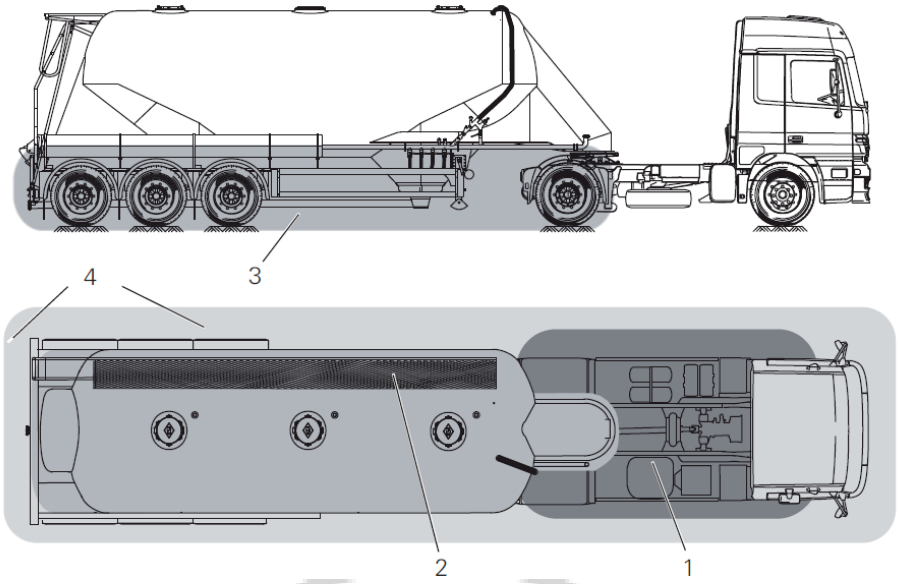

Fig.3.3.1 – Danger areas on the tanker

	Danger area	Type of operation
1	Between the towing vehicle and the tanker	When coupling or uncoupling the tanker, people are in danger of getting trapped or run over between the towing vehicle and the semi-trailer. ▪ People should be kept away from the danger area.
2	Walkway on the tank	When getting onto or walking on the walkway without an erected safety railing you are in danger of falling from the tank. ▪ Always raise the safety railing before climbing onto the walkway.
2	On the tank	When getting onto or walking on the pressurised tank you are at increased risk of injuring yourself. ▪ Do not climb on the tanker for any reason while it is pressurised.
3	Under the unhitched tanker	Faults could cause the unhitched tanker to lower and thus cause injury. ▪ Never remain beneath the unhitched tanker. ▪ Use a stable mechanical device for additionally supporting the tanker during maintenance work.
4	Around the tanker	The presence of unauthorised persons in the danger area during loading and unloading operations constitutes an unnecessary risk to their safety and the safety of others. This distance is 5 m. ▪ Order unauthorised persons to leave the danger area around the tanker.
4	Around the tanker	Unloading with the vibrator switched on and relieving the residual pressure can cause hearing damage due to noise. The presence of persons in the danger zone without hearing protection is an unnecessary risk. This distance is 10 m. ▪ Always use hearing protection within the danger zone. ▪ Ask people without hearing protection to leave the danger zone around the tank semi-trailer.

Table 3.3.1 – Danger areas

3.4 Safety equipment

This tanker is fitted with safety equipment which must be in perfect operating condition if operations are to be safe. Check all safety equipment regularly for faultless performance.

For details on function testing see "Function tests" from page 79 onwards.

Fig.3.4 – Safety equipment on the tanker

No.	Safety device	Safety function
1	Pressure relief valve	Limits the tank's working pressure to the design pressure of the vessel and thereby prevents the tank from bursting due to excessive internal pressure.
	Backup pressure relief valve	Additionally, there will be a pressure relief valve on the air supply compressor (not shown).
2	Safety railing	Prevents persons falling from the top of the tank.
	Equipotential bonding (earthing)	Prevents static charge build-up on the tank walls and thus prevents sparks that could lead to an explosion. This is mandatory for certain products, and optional for others (not shown on Fig.3.4).

Table 3.4 – Safety equipment

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3.5 Personal protective equipment

Use your personal protective equipment when working with the tanker. This particularly applies during loading/unloading and cleaning the interior.

The protective equipment specified in the product related accident and safety data sheets must be available and must be used where appropriate.

3.5.1 Protection from dust and particulate

Traces of the load may have settled in valves and hoses and may become dislodged when the residual pressure is released.

Therefore, wear eye protection and/or respiratory protection and/or protective gloves.

3.5.2 Protection from noise

If non-silenced compressors are used and when residual pressure is being released, the tank system's A-weighted equivalent sound pressure level exceeds 85 dBA.

Under operation, the vibrators can produce a sound pressure level of 91 dBA.

DAMAGE TO HEALTH!

Over the long-term unimpeded noise may cause damage to your health.

- Therefore, wear hearing protection!
- Always wear hearing and eye protection:
  - when working with the compressor,
  - when checking the pressure relief valves and
  - when releasing residual pressure (relieving the tank).
- Use hearing protection when operating the vibrator even for short periods.

3.6 Qualifications of deployed personnel

The tanker may only be operated, maintained, and serviced by trained and authorised persons who have been instructed accordingly by the owner.

- Personnel undergoing training may only work on the tanker under the supervision of an experienced and authorised person.
- Only persons holding a valid driving licence may drive the tanker on public roads or use the tanker to transport materials.

Persons involved in the service and repair of the chassis must be trained vehicle mechanics and have experience in servicing and repairing commercial vehicles and trailers/superstructures.

Persons involved in the service and repair of the tank's electrical components should be skilled, trained electricians.

Persons involved in the service and repair of the tank should have special experience in servicing and repairing pressure tanks, fittings and valves.

Welding work on the tank may only be carried out by a company possessing a permit in accordance with AS1210.

3.6.1 Instruction

The owner of the tanker is responsible for ensuring that only instructed persons are permitted to work with the tanker.

On request, the owner's operating personnel will receive instruction from qualified Convair staff.

3.7 Before departure

3.7.1 Pre-start checks

Pre-start checks make a significant contribution to safety.

Walk around the trailer before starting each part of the journey, including the start of the shift, during short or long breaks along the journey, before- and after loading and unloading. While doing so, check the relevant items on the check list and eliminate any deficiencies which come to your attention.

See "Pre-start check list" on page 98.

Please note that some items on the pre-start check list depends on the tanker's optional fittings or the nature of the product being transported.

The company's own guidelines regarding the manner and extent of checks should be added to the pre-start check list.

DANGER OF VACUUM DAMAGE

Temperature fluctuations may lead to damage to the tank.

- Always keep the air dump valve open, except when the tanker is pressurised during product discharge.

PLASTIC MEMORY

- To avoid sleeve deformation, keep pneumatic pinch valves OPEN while the tank is empty (only).

3.7.2 Depending on the weather

Be mindful of the road conditions and how it impacts the load behaviour of the equipment.

3.7.3 Before loading or unloading

Note the owner's-, loading station's and unloading station's operating regulations, including the type and scope of checks.

DAMAGE TO PROPERTY caused by PRODUCT CONTAMINATION!

Product residue can, for example, find its way into the air line. Product residue in the air lines can cause subsequently loaded products to be mixed or contaminated. This can cause considerable material damage.

- The air lines should be cleaned if the product to be loaded is not compatible with the previously transported material.

DANGER OF SILO DAMAGE

Silos are NOT designed as pressure vessels and can be damaged by incorrect tanker unloading processes.

- Obey any signs indicating the maximum allowable plant unloading pressure.
- Always stay with the tanker and monitor the tank pressure while unloading.
- Follow the recommended unloading procedure page 70 .

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4 TECHNICAL DATA

4.1 Technical description

Fig. 4.1 – Overall view of the tanker

4.1.1 Tank

The tanker is designed- and equipped to be used for transporting dry material in granular- or powder form.

Unintended product discharge is prevented by:

- discharge valves leading from the discharge cones
- isolating valves (optional) along the product discharge line/manifold
- the cap on the product discharge connection.

For loading purposes, the tank is equipped with hatches and/or optional pneumatic fill lines. Loading can be done by gravity via the hatch openings, or by compressed air via optional fill couplings.

Unloading is done pneumatically via the discharge hose coupling on the product discharge line/manifold.

Examples of granular, pelleted and powder material groups which can be conveyed pneumatically:

- foodstuffs
- feed and agricultural products
- construction materials and chemicals
- industrial materials.

4.2 Compliance plates

When viewed in the direction of travel, the ADR compliance plate and Convair plate are affixed to the front right part of the chassis, near the king pin.

4.2.1 Convair compliance plate

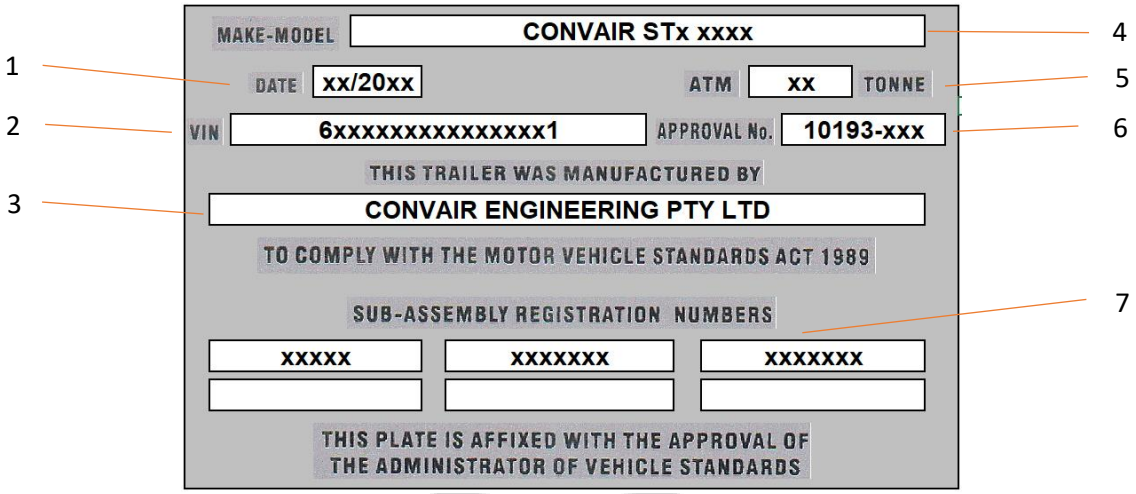

Fig. 4.2.1 – ADR compliance plate

No.	Specification	No.	Specification
(1)	Date of manufacture	(5)	Aggregate Trailer Mass (Gross Mass)
(2)	Chassis number	(6)	ADR approval number
(3)	Manufacturer	(7)	Sub-assembly registration numbers
(4)	Tanker model		

Table 4.2.1 – ADR compliance plate specifications

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4.2.2 Hydrostatic test plate

Information important for operation of the tank is stamped on the hydrostatic test plate.

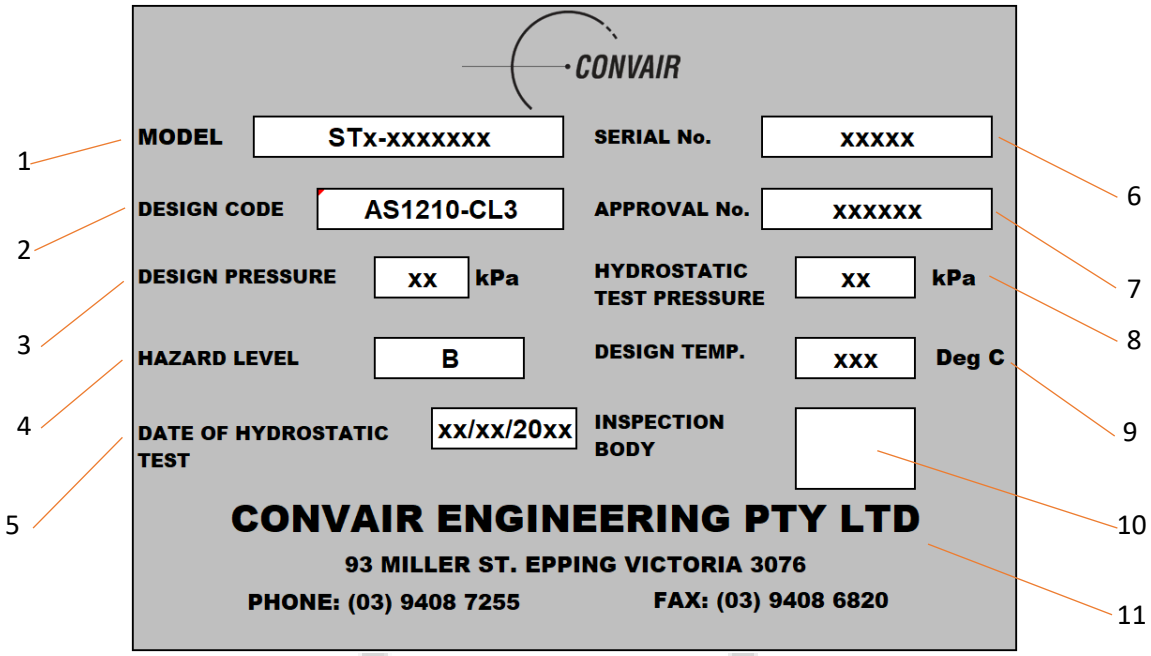

Fig. 4.2.2 – Hydrostatic test plate

No.	Specification	No.	Specification
(1)	Tanker model	(7)	3rd party certified vessel design approval number
(2)	Vessel design code	(8)	Hydrostatic test pressure
(3)	Vessel design pressure	(9)	Maximum allowable operating temperature
(4)	AS2010 hazard level	(10)	Certified inspection body stamp
(5)	Date of initial hydrostatic test	(11)	Manufacturer
(6)	Manufacturers serial number		

Table 4.2.2 – Hydrostatic test plate specifications

4.2.3 Chassis number

The chassis number is stamped on the chassis in the same area where the ADR compliance- and Hydrostatic test plates are located.

Fig. 4.2.3 – Chassis number

4.2.4 AS1210 vessel ID plate

The AS1210 vessel ID plate is welded on top of the vessel, or near the front end of the tanker.

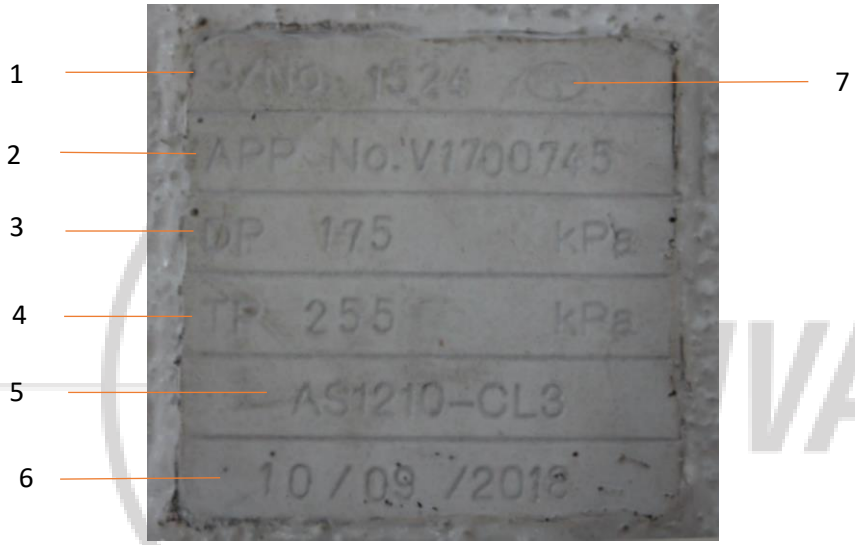

Fig. 4.2.4 – AS1210 vessel ID plate

No.	Specification	No.	Specification
(1)	Manufacturers serial number	(5)	AS1210 vessel classification
(2)	3rd party certified vessel design approval number	(6)	Date of initial hydrostatic test
(3)	Vessel design pressure	(7)	Certified inspection body stamp
(4)	Hydrostatic test pressure		

Table 4.2.4 – AS1210 vessel ID plate specification

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4.3 Pressure range

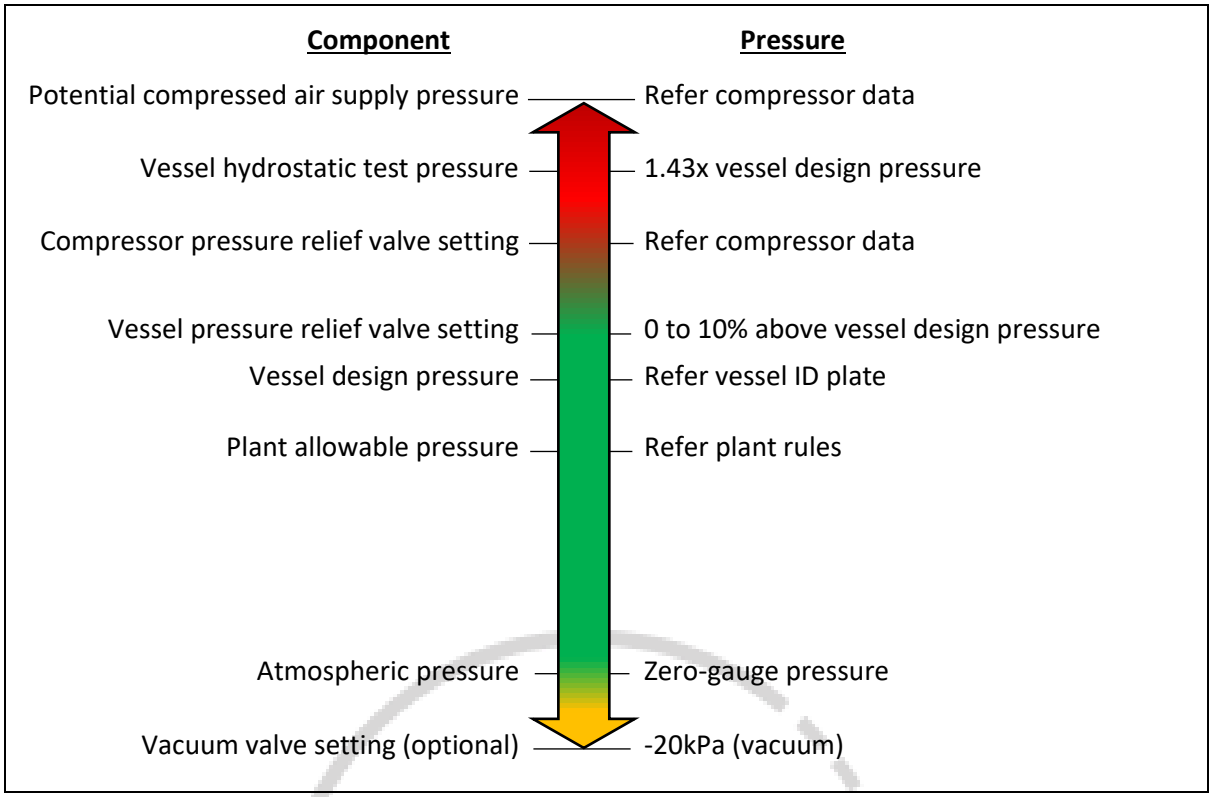

Fig. 4.3 – Pressure range

4.4 Tightening torques

Please consult the documents supplied for the tightening torques:

- axle manufacturer
- kingpin manufacturer.

4.5 Recommended lubrication

Operating material purpose	Description
High-pressure grease for: ▪ kingpins ▪ rubbing plates	▪ Refer manufacturers data
Multi-purpose grease for lubrication points on: ▪ semi-trailer support ▪ mechanically steered axle	▪ Refer manufacturers data

Table 4.5 – Recommended lubrication

5 OPERATING THE CHASSIS

5.1 Overview

Fig. 5.1 – Overview of tank semi-trailer chassis

No	Description	No	Description
1	Control/brake air-, and electrical system connections	5	Handrail raise/lower control
2	Left trailer support (landing leg)	6	Right trailer support (landing leg)
3	Toolbox/stowage compartment	7	Spare wheel bracket (winch model)
4	Handrail in raised position	8	Handrail in lowered position

Table 5.1 – Semi-trailer chassis components

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5.2 Brake system

Every Convair tanker is equipped with an air brake system in accordance with ADR38, and EBS as a standard feature.

5.2.1 EBS

Every Convair tanker equipped with an EBS includes automatic anti-lock braking system (ABS) and automatic load-dependent brake power regulation as standard features.

DANGER OF ACCIDENTS!

NOTICE

If the EBS plug cannot be connected, the ABS of the tanker does not work and the automatic load-dependent brake power regulation system does not function – the empty tanker is over-braked, which can lead to accidents due to skidding.

- ▶ It is mandatory to connect the trailer to the prime mover with an approved EBS cable connected at either end (Ref. ADR 38/05).
- ▶ Always connect the EBS plug connection between the towing vehicle and the tanker.

5.2.2 EBS plug connections

Tankers with EBS may only be operated behind towing vehicles with the following EBS plug connections:

- EBS plug connection ISO 7638-1996 (7-pin, 12V or 24 V, EBS control via the towing vehicle)

Fig. 5.2.2 – EBS plug connection and adhesive label

The EBS warning sign is part of the instruction manual.

Observe the sign and keep it legible.

Replace the EBS warning sign if it is missing or illegible.

5.2.3 Supply- and brake couplings

Fig. 5.2.3 – Compressed air brake system couplings

#	Description	#	Description
1	Supply coupling	3	Supply coupling – Gladhand type option (red)
2	Brake coupling	4	Brake coupling – Gladhand type option (blue)

Table 5.2.3 – Compressed air brake system coupling components

Connecting

The towing vehicle's parking brake must be applied.

1 Check the sealing surfaces of the coupling heads and clean them if necessary.
2 Always connect the brake coupling (2 or 4) first.
▷ The tanker is braked.
3 Connect the supply coupling (1 or 3).
4 Check that the couplings are properly sealed and replace faulty rubber seals.

Disconnecting

The towing vehicle's parking brake must be applied.

1 Always disconnect the supply coupling (1 or 3) first.
▷ The tanker is braked.
2 Disconnect the brake coupling (2 or 4).
3 Close the protective caps if Gladhand couplings.

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5.2.4 Service brake with Duo-Matic coupling (optional)

Convair tankers can optionally be equipped with Duo-Matic coupling heads.

The system is approved for a maximum air pressure of 10 bar.

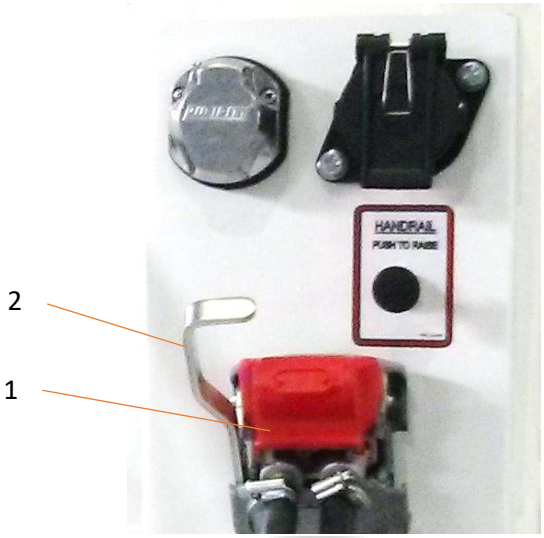

Fig. 5.2.4 – Air brake system connection

(1) Duo-Matic coupling head

(2) Handle

Connecting

The towing vehicle's parking brake must be applied.

1 Check the sealing surfaces of the connections and clean them if necessary.
2 Press the handle (2) down, if fitted:
   ▷ The protective cover opens.
3 Connect the towing vehicle's Duo-Matic connection with the Duo-Matic coupling head (1) and release the handle, if fitted.
   ▷ The connection's automatic shut-off valves open.
   ▷ The tanker is braked.
4 Check that the connections are properly sealed and replace faulty rubber seals.
   ▷ No compressed air may escape.

Disconnecting

The towing vehicle's parking brake must be applied.

▶ Disconnect the Duo-Matic coupling head (1).
   ▷ The tanker is braked.

5.2.5 Service brake

The service brake is not suitable for braking the parked tanker permanently!

NOTICE

DANGER OF ACCIDENTS!

Brake system pressure losses lead to a declining service brake braking effect and the tanker can roll away and cause accidents.

▶ Always secure the parked tanker with the spring-loaded parking brake.

When the brake air supply line is uncoupled, the tanker is automatically braked via the service brake.

In an emergency the service brake of the tanker can be released by fitting the pins into the brake boosters and winding the spring brakes off.

Repeated release and activation of the release valve uses up compressed air.

5.3 Air suspension

Check the detail specification sheet to determine the type of suspension that has been installed.

For specific detail refer to the specific supplier requirements.

5.4 Lifting axle

The lifting axle (where fitted) is controlled either by the EBS system, or a pneumatic system as described below.

The lifting axle is automatically lowered as soon as the axle loads have reached 80% of the maximum permissible value.

The switch on the right side of the tanker must be actuated again to raise the lifting axle again when the semi-trailer is empty or partially loaded.

If the axle load of the axles reaches 80% of the maximum permissible value, the lifting axle cannot be raised.

5.4.1 ECAS (electronically controlled air suspension) (optional)

ECAS is an electronically controlled air suspension system and can be installed in Convair tankers as optional equipment.

The control unit is mounted on the control console for the brake system.

If fitted, please consult the manufacturer's instruction manual for a detailed description of the system's features and for instructions on using the ECAS.

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5.5 Compressed air tank

Most towing vehicles are equipped with air dryers which largely prevent the formation of condensation in the compressed air. Condensation in the compressed air tank reduces the usable compressed air supply available, causing damage to the downstream valves.

The compressed air tank (1) is located on the chassis in the tanker's axle area.

Therefore, please check the water drain valve (2) on the compressed air tank from time to time to determine whether condensation is present and drain it off via the water drain valve.

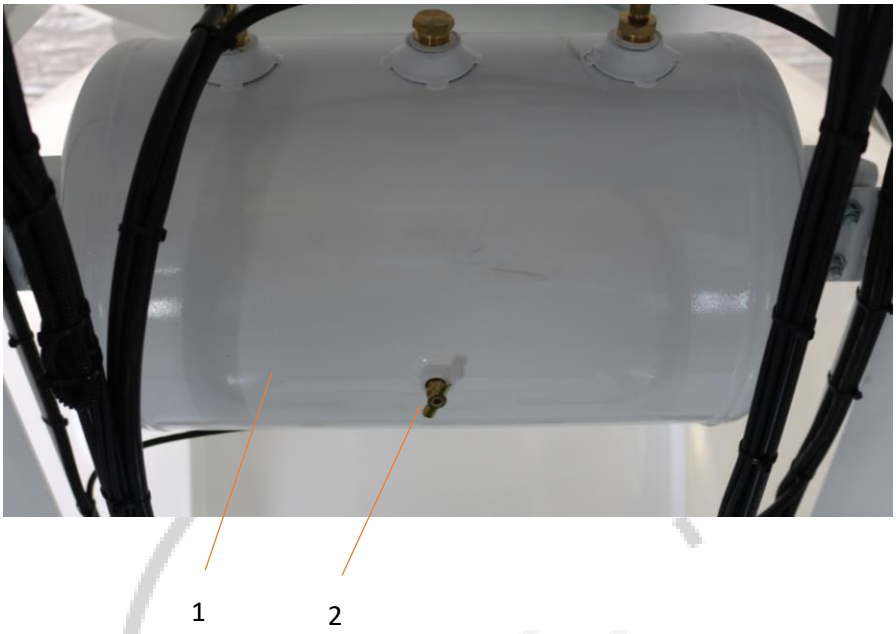

Fig. 5.5 – Compressed air tank (view from below)

(1) Compressed air tank

(2) Water drain valve

5.6 Axle load indicator

The (optional) axle load indicator for the air suspension system is typically located near the axles, at the side of the tanker or on top of the tanker.

Fig. 5.6a – Bellows pressure indicator

(1) Pressure gauge for bellows pressure indication

The value shown on the pressure gauge (1) indicates the current bellows pressure of the air suspension, which depends on the axle load. The greater the pressure, the more load on the axle.

Before setting off, check the axle load in order to detect any out-of-range values in good time.

For the relevant values, consult the air suspension's type plate, located on the frame next to the tanker's type plate.

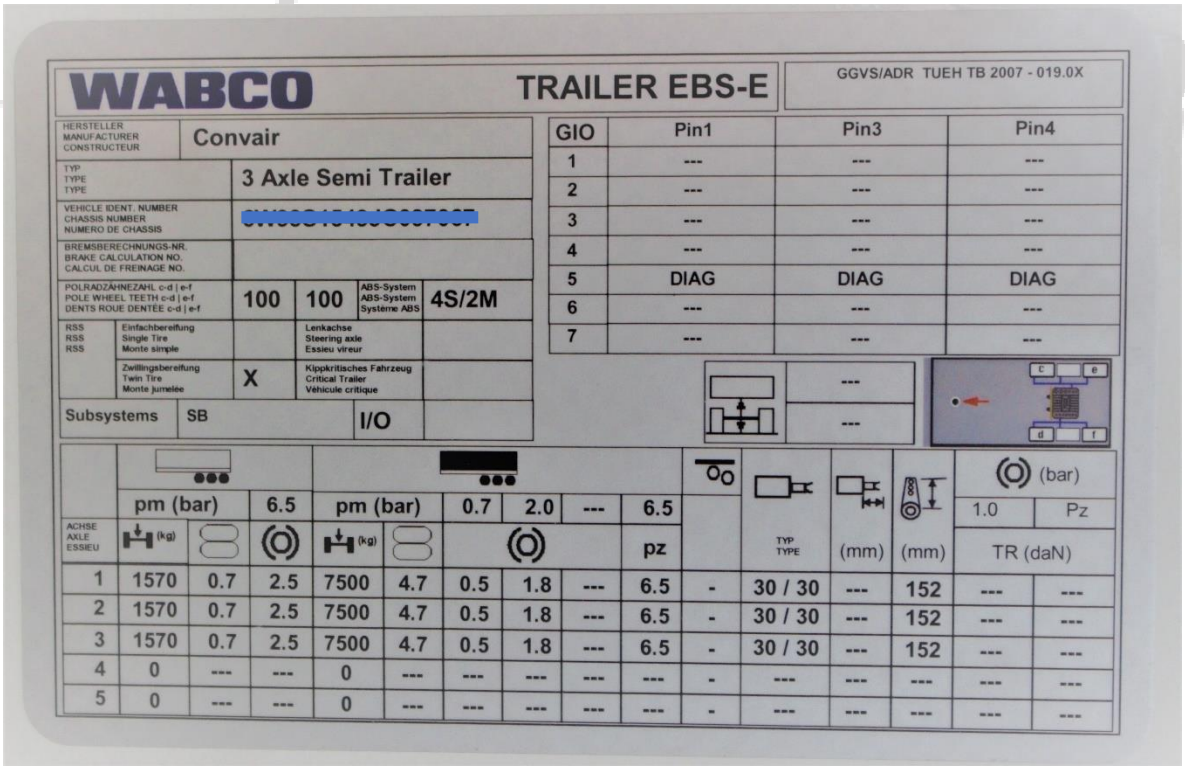

Fig. 5.6b – Air suspension type plate (WABCO)

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5.7 Semi-trailer support

Always wear a high-visibility clothing when coupling/uncoupling in moving traffic. Wear protective gloves.

Fig. 5.7 – Semi-trailer support

(1) Landing leg

(2) Support foot

(3) Crank

(4) Bracket

The semi-trailer support is used for supporting the unhitched tanker and for adjusting the height during the hitching or unhitching operation. It has a high gear and low gear (for lowering under load).

Preparation:

- Supporting ground must be level.
- Ground immediately below landing legs must ideally be reinforced concrete. If not possible, the ground surface must be hard.

MATERIAL DAMAGE!

The semi-trailer support may be damaged by overloading if you attempt to raise or lower the tanker in high gear.

- Once the support foot is on the ground, only use the semi-trailer support in low gear, whether the tanker is empty or loaded.
- Only switch to high gear after no load is applied and the support foot has been raised.
- Do not move the semi-trailer support against the limit stop.
- It is permissible to disconnect a loaded tanker, provided the above steps are adhered to.

Observe the manufacturer's instruction manual! After use, hook the crank (3) into its bracket (4).

5.8 Spare wheel bracket (optional)

The (optional) spare wheel bracket is located on the chassis behind the side guard.

CAUTION

DANGER OF ACCIDENTS!

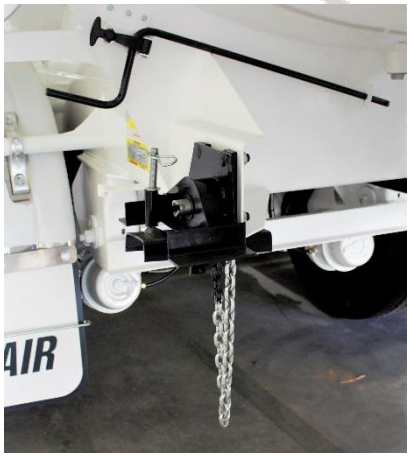
You may have to change a wheel on the side facing moving traffic where you could be in danger of injury by other vehicles.

- Wherever possible, choose a location away from moving traffic to change the wheel.
- Take appropriate measures to make the tanker safe, particularly at night or when visibility is poor.
- Wear a high-visibility clothing.

When changing a wheel in traffic conditions, always wear high-visibility clothing. Wear protective gloves.

5.8.1 Winch version

Fig. 5.8.1a – Spare wheel, fitted



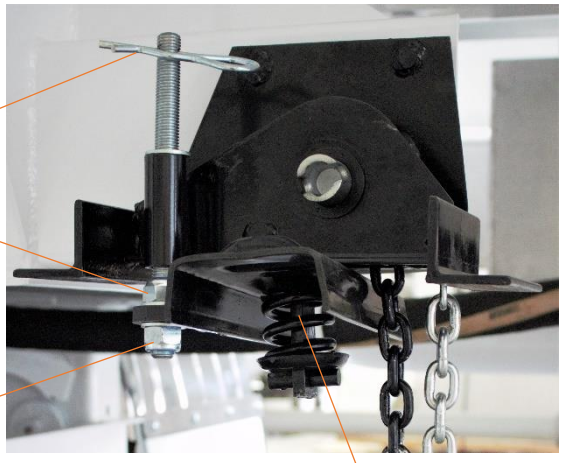


Fig. 5.8.1b – Spare wheel bracket, winch version

(1) R-clip

(2) Nut

(3) Cross member

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CAUTION

DANGER OF INJURY!

The crank of the spare wheel winch can fly back once both nuts are removed, and the spare wheel is only attached to the chain.

- Keep your head away from the area of the crank.
- Hold the crank tightly with one hand before removing the lower nut.
- Slowly lower the spare wheel.

1 Removing the spare wheel

- Remove the R-clip (1).
- Unscrew both nuts (2) (spanner width: 27mm).

Before removing the lower nut, hold the crank down with one hand.

- Lower the spare wheel to the ground with the winch.
- Allow enough slack to remove the cross member from the spare wheel.

2 Installing the spare wheel

- Insert the cross member (3) from below through the bores of the rim.
- Make sure that both washers contact the face of the cross member (3).
- Use the winch to lift the spare wheel. Insert the two threads of the cross member (3) through the bores in the spare wheel bracket.
- Position a nut and tighten by hand. While doing so, for reasons of safety hold the crank in place with the other hand.
- Firmly tighten both nuts (2).
- Secure the nut (2) with the R-clip (1).

Depending on the type of rim used on the tanker, proper fastening of the spare tyre may require the use of an intermediate ring. The intermediate ring is inserted between the rim and the spare wheel bracket.

The spare wheel bracket's winch may be designed with a lever arm (option).

5.9 Toolboxes / stowage compartments

One or more toolboxes or stowage compartments (pad stowage) of different sizes and versions can be attached to the trailer.

When opening the box, be careful that no objects fall out.

CAUTION

If the open lid of the toolbox or stowage compartment is used incorrectly, e.g. as a seat or as a climbing aid, it may break and lead to injury.

▶ Do not use the open lid of the toolbox or stowage compartment as a seat or instead of a ladder.

5.9.1 Aluminium version

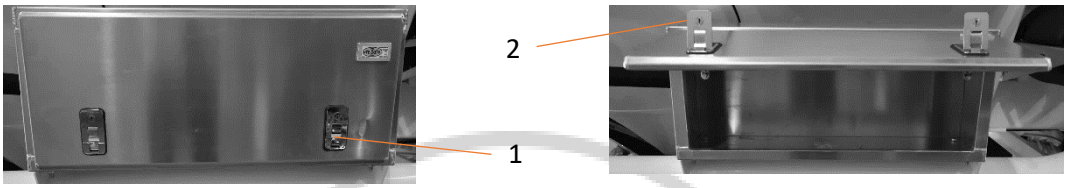

Fig. 5.9.1 – Toolbox / stowage compartment, aluminium version (shown closed and open)

(1) Lock

(2) Catch

When the toolbox is closed, secure it with the catch (2).

Press the lock (1) then flip the catch (2) out on each lock up to open the cover.

CAUTION

DANGER OF INJURY!

Aluminium toolbox covers are not designed to carry load.

▶ Do not load anything on top of aluminium toolbox covers.

5.9.1 Plastic version

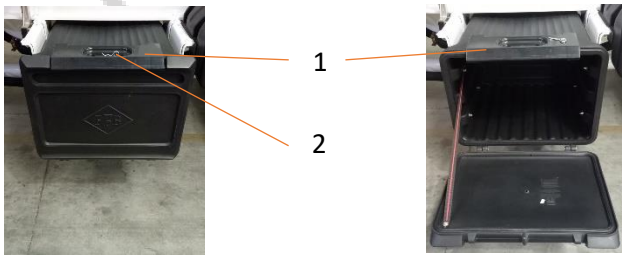

Fig. 5.9.1 – Toolbox / stowage compartment, plastic version (shown closed and open)

(1) Catch

(2) R-clip

When the toolbox is closed, secure it with the catch (1) and the R-clip (2) or a padlock.

Flip the catch (1) up to open it.

Do not exceed the toolbox's maximum permitted load. See inside of the cover.

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6 DRIVING

6.1 Staff qualifications

The following qualifications are required to drive the tanker:

- a valid driving licence, appropriate to the type and configuration of vehicle
- training/instruction in the operation of the tanker and
- a valid training certificate if dangerous goods are to be transported.

Topics which are important for an understanding of this chapter plus further information can be found under "OPERATING THE CHASSIS" from Page 28.

6.2 Tank

DANGER OF BURSTING AND EXPLOSION!

A pressurised tank is not designed for the additional loads that occur during driving; the tank could be damaged or destroyed.

- ▶ Never drive with a pressurised tank.
- ▶ Completely release all pressure before departure and leave the air dump valve OPEN.

The vehicle's driver must not climb into the tank during the trip.

The tank vessel is a confined space, subject to all requirements of Australian standard AS2865: Confined spaces.

6.3 Pre-departure checks

Carry out a pre-departure check prior to each journey. Walk around the tanker and check that it is roadworthy. See also "Before departure" on page 22.

6.4 First trip, wheel nuts

DANGER OF ACCIDENTS!

When you are driving 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.

- ▶ Tighten the wheel nuts on all the wheels to the specified torque value during the first laden trip, or at the latest after 50 km, and again after 100 km.
- ▶ Tighten the wheel nuts to the specified torque after every wheel change and then at the latest after 50 km and again after 100 km.

The specified torque values for tightening/re-tightening the wheel nuts are given under "Torque for chassis threaded connection" on page 83.

Follow the axle manufacturer's instructions.

6.5 Brake adjustments on the tractor-trailer unit

Unlike drum brakes, a disc brake does not show any apparent reduction in braking action when it is overloaded.

The overload manifests itself in the form of overheated brake discs, which can cause damage to the wheel bearings and brake components as well as increased wear of the brake pads.

In order to avoid serious damage from over-braking of the tanker, the braking work must be equally distributed over all the tractor-trailer unit's brakes.

After the first 1000 km, tractor-trailer synchronisation must be carried out in laden condition. Convair Engineering also recommends brake adjustments when the tractor unit and tanker have EBS.

To maintain your rights vis-à-vis Convair and the axle manufacturer under the warranty, send a copy of the trailer's brake adjustment log to Convair Engineering Pty Ltd and include the vehicle details.

6.6 Hitching and unhitching the tanker

CAUTION

DANGER OF DEATH!

It is not permitted for persons to be in the danger area between the towing vehicle and the tanker during any coupling or uncoupling operations!

Persons in the danger area of the tanker could be overlooked and squashed or run over.

- Make sure to 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 tanker during a coupling or uncoupling operation.

Use your personal protective equipment during hitching and unhitching operations and wear safety shoes.

CAUTION

DANGER OF ACCIDENTS!

The tanker could roll over during transport if the fifth wheel has a ball race and no king pin block on the trailer, or if the fifth wheel does not have a ball race while the trailer has a block behind the king pin the block can be torn off.

- If the fifth wheel has a ball race, the trailer MUST have a block fitted behind the king pin.
- If the fifth wheel does not have a ball race, the trailer must NOT have any block fitted behind the king pin.

6.6.1 Hitching

1 Before hitching, check the following:
- Is the towing vehicle's kingpin load sufficient for the tanker?
- Are the D values of semi-trailer coupling and kingpin applicable for the gross mass?
- Is a kingpin block required?
- Is the tank suspension lowered?
- Do the coupling heights of towing vehicle and tanker match?
- Is the tanker's parking brake applied?
- Check the kingpin for tight fit and wear.

2 Hitch the tanker.

3 After hitching:
The towing vehicle's parking brake must be applied!
- Check the semi-trailer coupling for proper interlocking. Secure the semi-trailer coupling. Observe the manufacturer's instruction manual!
- Connect supply lines for compressed air and electrical equipment (Page 29).

CAUTION

DANGER OF ACCIDENTS!

If the EBS plug cannot be connected, the ABS of the tanker does not work and automatic load-dependent brake power regulation does not function.

The empty tanker will be over-braked; this could cause skidding and accidents.

- Driving the vehicle without an approved EBS plug connection or without a proper EBS plug connection is not permitted by law.
- Always connect the EBS plug connection between the towing vehicle and the tanker.
- Only use approved EBS plug connections which are entered in the vehicle's registration document.

- Connect ABS and EBS connecting cables. Observe the instructions on (Page 29)!
- Connect all other supply lines (electrical equipment, hydraulic system).
- Retract the semi-trailer support and secure the crank. Observe the manufacturer's instruction manual!
- Release the tanker's parking brake.

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- Move the air suspension to the drive position (Page 32).
- Check the clearance between the driver's cab and the tanker (Page 42).
- Check the routing of all supply lines (Page 42).

4 Carry out pre-departure checks (Page 22).

6.6.2 Unhitching

DANGER OF TIPPING OVER!

If the load in the tank is unevenly distributed or too high the tanker may tip over and lead to serious damage to property and the environment.

- Whenever possible, only unhitch an empty or evenly loaded tanker. A vehicle without trailer supports must only be unhitched in empty condition.
- Observe the loading instructions in this instruction manual.
- In case of doubt, place suitable supports (telescopic support, winch) under the tanker.

For loading instructions see “Loading instructions” on page 64.

1 Before uncoupling:
- Choose a suitable foundation (level ground capable of bearing a load).
- Apply the towing vehicle's parking brake.

Observe the manufacturer's instruction manual!

2 Unhitching
- Disconnect the supply lines for compressed air and electrical equipment (Page 29).
- Disconnect all other supply lines (electrical equipment, hydraulic system, compressor air supply hose).
- Drive the towing vehicle away.

6.7 Clearance

6.7.1 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 tanker that the towing vehicle and tanker do not touch even when the truck is articulating.

6.7.2 Supply lines

Check the routing of the supply lines. The supply lines must neither hang down too far and rub nor be pulled too tight.

6.7.3 Articulation- and tilting angle

CAUTION

DANGER OF ACCIDENTS!

If the maximum permissible articulation angle of 90° between the towing vehicle and tanker is exceeded, there is a danger of the supply lines tearing and the towing vehicle and tanker becoming damaged.

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

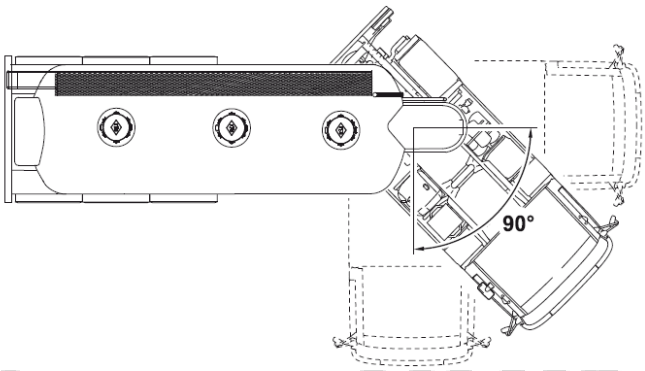

Fig. 6.7.3a – Maximum articulation angle

CAUTION

DANGER OF ACCIDENTS!

If the maximum permissible tilting angle is exceeded, there is a danger of the towing vehicle and tanker 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, ensure that the maximum permissible tilting angle is not exceeded.

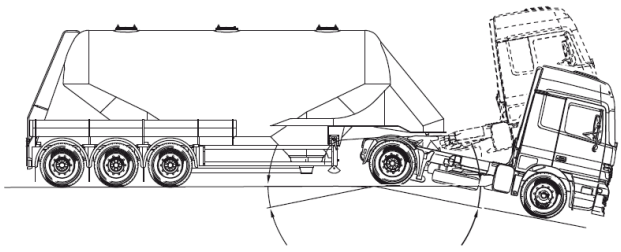

Fig. 6.7.3b – Permissible tilting angle with straight tractor-trailer combination

No.	Slope	Tilting angle
1	Upwards	Max. 6°
2	Downwards	Max. 6°

Table 6.7.3b – Permissible tilting angle

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7 OPERATING THE TANK

7.1 Overview

Fig. 7.1a – Overview of the operating controls layout – passenger side; handrail up

Fig. 7.1b – Overview of the operating controls layout – driver side; handrail down

No.	Component	Function
1	Air flow routing with air coupling	Circulates compressed air, Page 44
2	Air manifold	Controls and directs the air supply for loading and unloading, Page 48
3	Discharge manifold	For emptying the tank's compartments, Page 53
4	Outlet connection	For emptying the tank's compartments, Page 53
5	Hatch	Tank opening, gas- and pressure-tight
6	Stowage pipe	For storing the air hose (optional equipment), Page 55
7	Auto hatch controls	To open or close the (optional) pneumatic hatch

Table 7.1 – Tank operating controls

7.2 Air flow routing, overview

CAUTION

RISK OF BURNS!

Components conducting compressed air can reach temperatures above 100°C when in operation and can cause burns if touched.

▶ Wear protective gloves during operation.

Fig. 7.2 – Air flow routing

No.	Component	Function
1	Air coupling	Is used for connection of the compressed air source, Page 45
2	Air manifold	Serves as a connection between the air coupling to the air manifold
3	Top air line	Supplies air to the tank
4	Pressure relief valve	Limits the pressure in the tank, Page 46
5	Air dump valve	Discharges compressed air from the tank, Page 47
6	Non-return valve	Prevents back flow to the compressor
7	Air manifold	Controls the individual air supplies, Page 48

Table 7.2 – Air flow routing components

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7.3 Air flow routing on the tanker

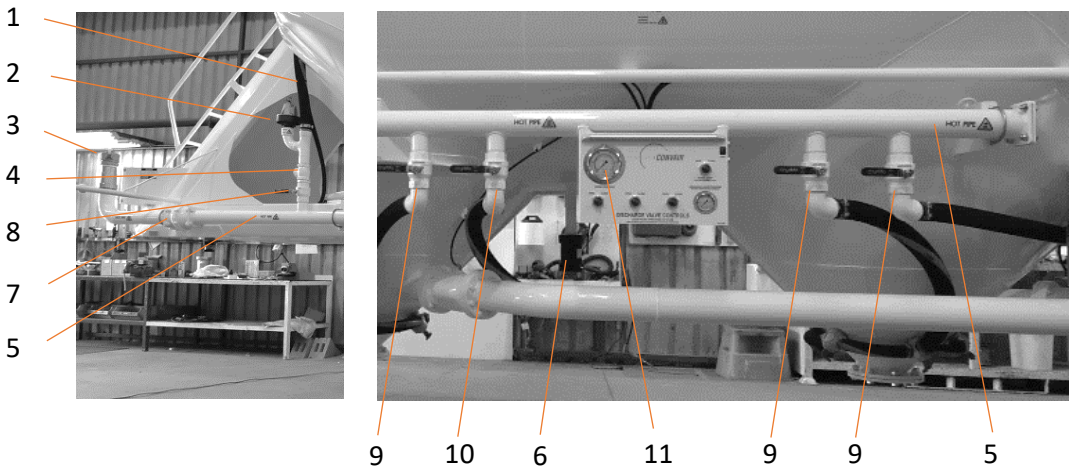

Fig. 7.3 – Air line with air coupling and air manifold

No	Description	No	Description
1	Top air line	**7**	Non-return valve
2	Pressure relief valve	**8**	Top air valve
3	Air coupling	**9**	Aeration valves
4	Non-return valve	**10**	Boost valve
5	Air manifold	**11**	Tank pressure gauge
6	Air dump valve		

Table 7.3 – Air flow routing components

Connect an accompanying or external compressed air source to the air coupling (Fig. 7.3, (3)).

The non-return valve in the air line (7) prevents air and payload flowing back into the compressor.

Only connect a compressed air source to the air coupling.

When the air coupling is not in use, seal it off with the vented cap.

7.4 Pressure Relief valve

The pressure relief valve (Fig. 7.4 (1)) is an important protective device which limits the excess pressure (working pressure) in the tank to a maximum of design pressure of vessel and thus prevents the tank bursting.

Important information about testing the pressure relief valve function is given under “Pressure relief valve” on page 46.

The pressure relief valve (1) can be found on the air manifold (5).

You can read the current internal tank pressure and the pressure in the air line from the pressure gauge on the discharge control panel.

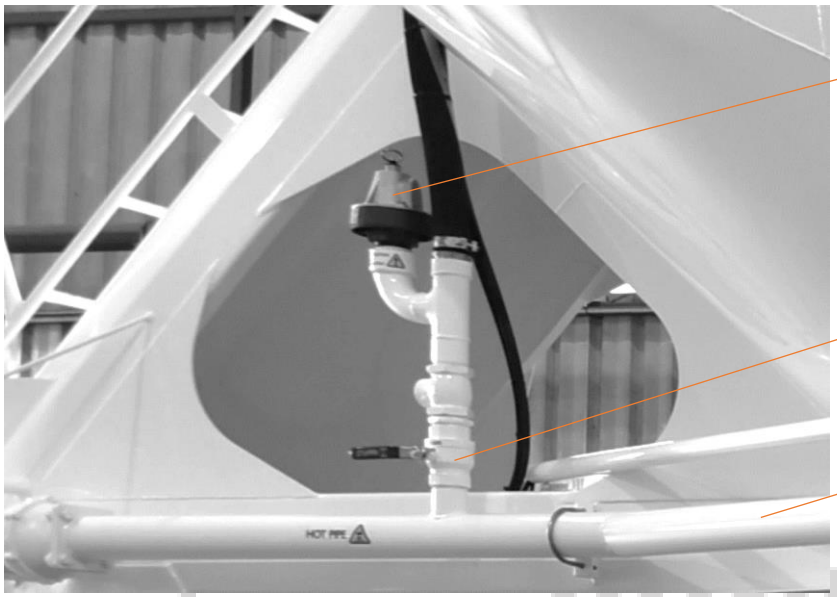

Fig. 7.4 – Pressure relief valve

(1) Pressure Relief valve

(2) Top air valve

(3) Air manifold

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7.5 Vent valve

The vent valve (“dump valve”) (1) is located below the tank vessel. The vent valve is controlled pneumatically from a pneumatic control switch located on the valve control panel.

NOTICE

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 physical contact with the load and the inhalation of any vapours from the load.
- Wear safety clothing appropriate to the hazardousness of the load.
- In the event of injuries caused by the load, act as described in the load's safety data sheet.

Fig. 7.5 – Vent valve (shown open)

(1) Vent valve

(2) Vessel pressure gauge

(3) Vent valve control valve

Use the vent valve (1) to vent the tank. Close the vent valve only:

- if compressed air needs to be used to empty the tank, or
- if the load has to be inerted prior to transport.

Otherwise leave the vent valve fully open to prevent vacuum damage to the tank.

7.6 Air manifold

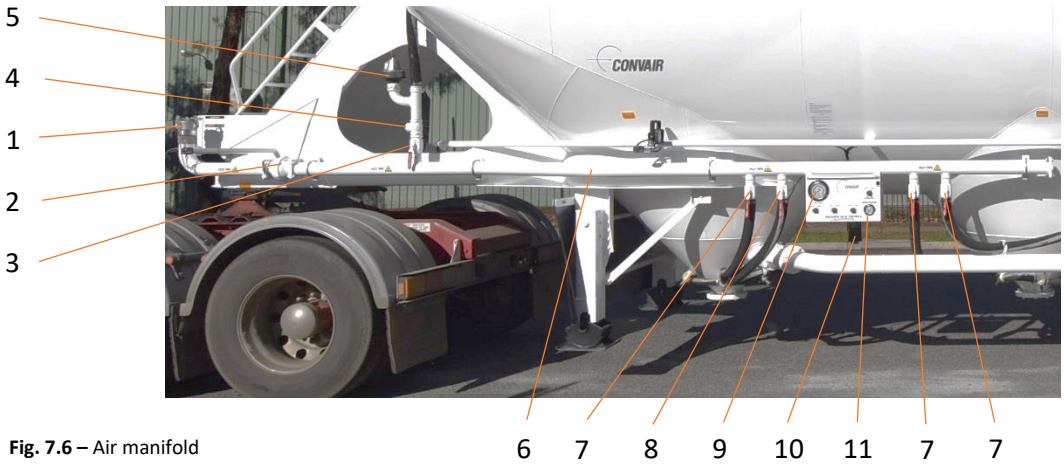

Fig. 7.6 – Air manifold

No	Description	No	Description
1	Air supply hose connection	**7**	Aeration valve
2	Air manifold check valve	**8**	Boost (“injected”) air valve
3	Top air valve	**9**	Tank vessel pressure gauge
4	Top air check valve	**10**	Vent (“dump”) air valve
5	Tank pressure relief valve	**11**	Control air line pressure gauge
6	Air supply manifold		

Table 7.6 – Air manifold components

The air manifold is on the side of the tank. You can control the air supply with the air manifold while emptying the tank.

You can regulate the air supply using the respective stop valves for boost air (8), aeration air (7) and top air (3). This enables you to control the flow of material and the tank pressure.

For more information on the functions of the air manifold and the stop valves, please refer to chapter “LOADING AND UNLOADING”.

7.6.1 Stop valve for boost air

The stop valve for boost air (8) is located on the air manifold. When the stop valve is open, the boost air supports the flow of material through the material line/manifold.

7.6.2 Stop valve for aeration air

The stop valve for aeration air (7) is located on the air manifold. The stop valve makes it possible to loosen up certain types of bulk material during unloading. By mixing air with the material and thus enabling it to flow more freely, the aeration air prevents blockages forming in the discharge area. It also puts the tank under pressure.

7.6.3 Stop valve for top air

The stop valve for top air (3) is located on the air manifold.

It seals off the connection between the tank and the air manifold. You can pressurise the tank via the top air.

7.6.4 Stop valve for additional boost line air supply

In addition to the stop valves already mentioned, a stop valve for additional boost line air may be on the air manifold. The second boost valve is located at the end of the material line/manifold before the material coupling. Like the boost air, the second boost air supports the flow of material.

There are pressure gauges ((9) and (11)) installed in the individual lines to show the respective pressures.

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7.7 Hatch

The hatches close the manholes in the tank. These are used for loading the tank from above, for cleaning and for accessing the inside of the tank (e. g. for inspections).

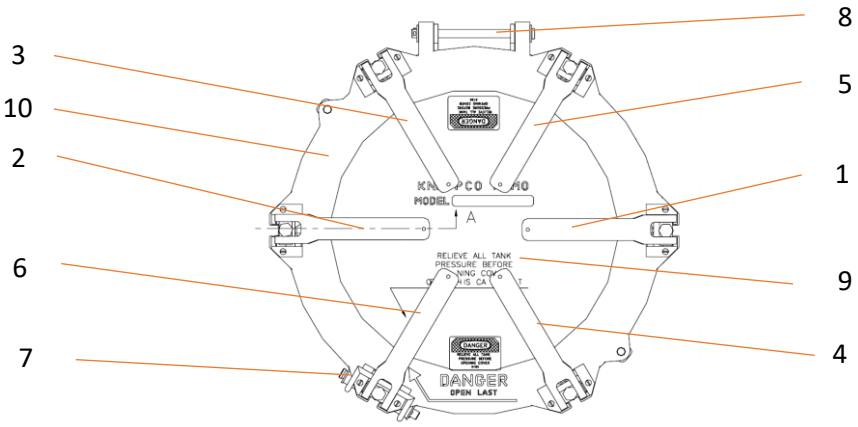

Fig. 7.7a – Manual Hatch

(1-6) Hatch Levers

(7) Safety Catch

(8) Hatch Hinge

(9) Warning "DANGER, OPEN LAST"

(10) Hatch Cover

If a tank is under internal pressure, the hatch is subject to a force of several tonnes!

DANGER

DANGER OF DEATH!

When you release or secure any hatch leaver of a hatch that is under pressure, the hatch can tear away explosively from the tank and maim or kill you or other people.

- **Never** operate any levers of a hatch when the tank is under pressure.
- **Never** adjust any hatch lever tightness when the tank is under pressure.

DANGER

DANGER OF DEATH!

A damaged thread of a hatch lever connection can yield, explosively tearing the hatch from the tank and injuring or even killing you or others.

- The tank must not be pressurised if even only one thread is damaged.
- Do not over-tighten the hatch lever thread connection.
- Replace damaged threads immediately.

The damaged thread of a hatch lever connection cannot withstand the tank's internal pressure and tears off.

Observe the following instructions to prevent damage to the screw joints:

- Do not tighten the hatch lever connection with a lever, hammer or any other tool.
- Never re-tighten a hatch lever connection when the tank is under pressure.
- Never loosen a hatch lever connection when the tank is under pressure.
- Regularly lubricate the thread of the hatch lever connection.

Opening

DANGER

Ensure that the tank is completely depressurised!

- ▶ Check this on the pressure gauges.
- ▶ If necessary, use the air outlet valve to completely bleed the tank.

1 Open / Disengage cams (1) and (2), followed by cams (3), and (4)
2 Open / Disengage cams (5) and (6), but **DO NOT disengage safety catch,** (7).
3 Keep safety catch engaged / in place if cover lifts with hissing of relieving pressure.

If hissing sound stops, or if cover lifts without hissing, undo safety catch and open cover.

Closing

1 Close hatch cover.
2 Press the hatch down with your foot or knee in the area of the safety catch and close the safety catch.
3 Close / Engage cam 6, followed by cams 5 and 6
4 Close / Engage cams 4 and 3, followed by cams 2 and 1.
▷ The levers point inwards (see Fig. 7.7a).

Adjusting

DANGER

Ensure that the tank is completely depressurised!

- ▶ Check this on the pressure gauges.
- ▶ If necessary, use the air outlet valve to completely bleed the tank.

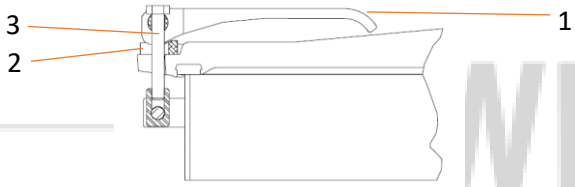

Fig. 7.7b – Section A-A

(1) Hatch Lever

(2) Wear Plate

(3)

To avoid leaks in the tank, the hatch levers must be correctly adjusted, as follows:

1 Position cam levers (1) on cover and close cam at each hold-down position.
Minimal friction resistance between bottom of cam & top of wear plate (2) should be evident.
(see Fig. 7.7b).
2 Ensure upper pivot pin is centred between cam lever “ears.”
Use socket wrench to tighten hex bolt (3) on top until gasket and weld ring’s top surface make contact at each of the six cam locations.
3 To ensure a good peripheral seal tighten the hex bolt one additional turn at each of the six positions
(Each turn of hex bolt = 1.2mm)
Care should be taken so that stud adjustment does not compress gasket more than 1.9mm.
Over compressing could result in premature gasket indentation and permanent grooving.
4 Repeat for each cam position.

DANGER

DANGER OF DEATH!

A hatch under even low pressure can tear away explosively from the tank and maim or kill you or other people.

- ▶ Before opening- or adjusting any hatch lever, ensure that the tank is not under pressure.

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7.8 Hinged Pneumatic (Auto) Hatch

As an option, tankers can be fitted with pneumatic operated hatches instead of-, or alongside manual hatches.

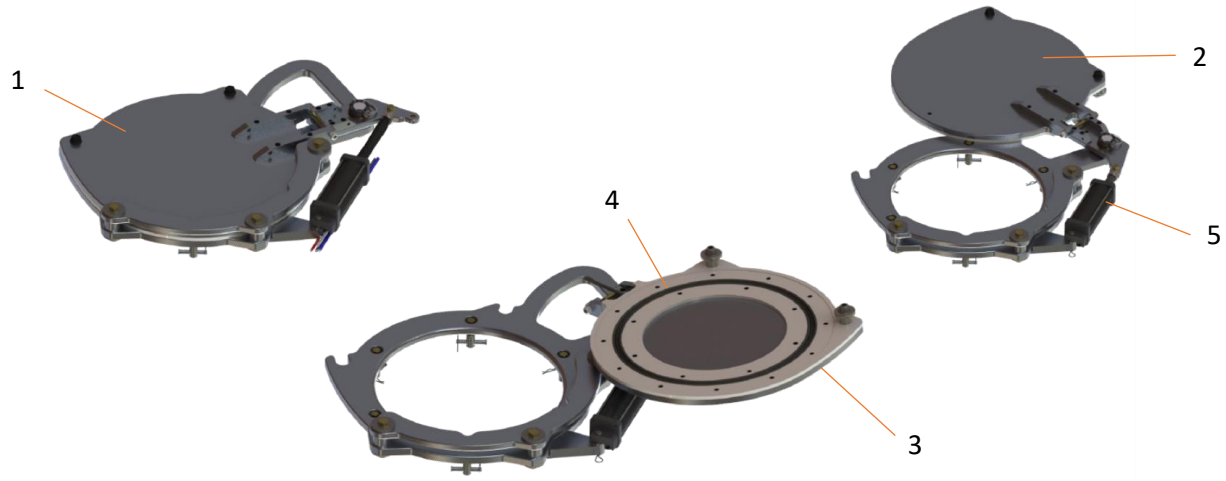

Fig. 7.8 – Hinged pneumatic hatch

(1) Hatch closed pneumatically

(2) Hatch opened pneumatically

(3) Hatch lifted manually

(4) Hatch seal

(5) Pneumatic cylinder

DANGER OF INJURY

If you try to open a tank that is currently under pressure, parts on the hatch may tear away with explosive force and cause injury to you and others.

- Before operating the hatch, check the tank pressure on the pressure gauge.
- Never open any hatch when the tank is under pressure.

7.8.1 Pneumatic hatch operation

The tanker's compressed air supply must be guaranteed to operate the pneumatic hatches. The pneumatic hatches are opened/closed by means of control buttons located in a control box, usually on the driver side of the tanker.

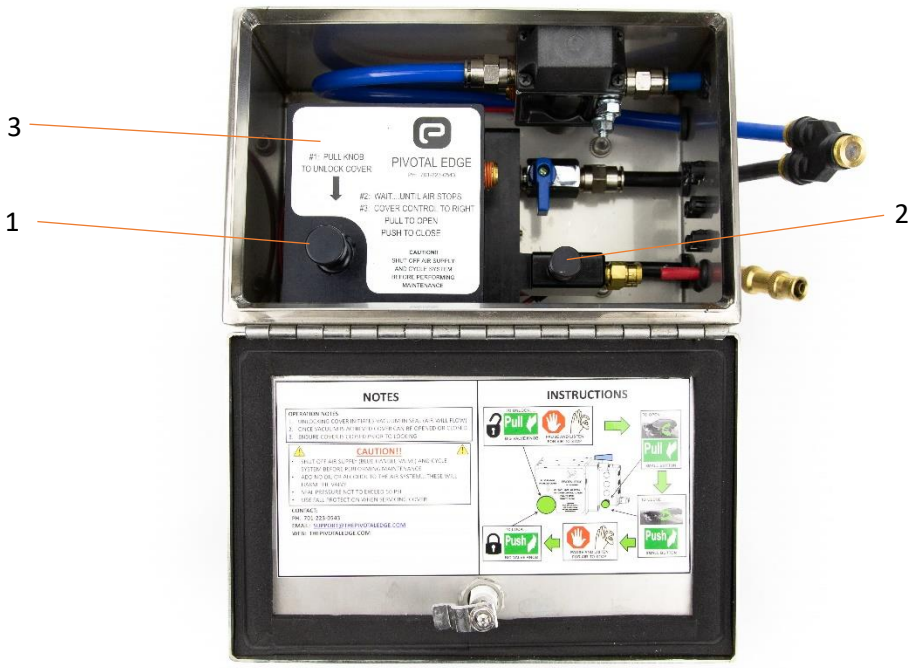

Fig. 7.8.1 – Auto hatch control box

(1) Hatch seal inflate/deflate push/pull button

(2) Hatch swing open/closed push/pull button

(3) Basic hatch operating instructions sticker

DANGER OF INJURY!

When operating the pneumatic hatch, make sure no persons are on the cover or within its range of motion.

- **Never** open a pneumatic hatch when there is somebody on the cover or within its range of motion.
- **Never** close a pneumatic hatch when somebody is in the manhole.

To open the pneumatic hatch, deflate the hatch seal by pulling the seal button (1) out, wait until the air stops, then pull the hatch open button (2).

To close the pneumatic hatch, push the hatch open button (2) in, wait for the hatch to close, then inflate the hatch seal by pushing the seal button (1) in.

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7.9 Outlet connection

Fig. 7.9a – Outlet connection

(1) Discharge cone

(2) Aerator

(3) Cover flange (blank)

(4) Aeration supply

(5) Cone outlet

(6) Product discharge manifold

(7) Discharge valve (pinch valve)

The cover flange (3) is opened only during scheduled maintenance.

The discharge valve (7) is located between the cone outlet (5) and the product discharge manifold (6), and is opened to empty the load, one compartment at a time.

To fluidise the product handled during the discharge process, air is mixed into the product through the aerators (2) near the bottom of each discharge cone.

The product discharge manifold (6) is connected to each discharge cone (1) and leads to the discharge connection at the rear of the tank.

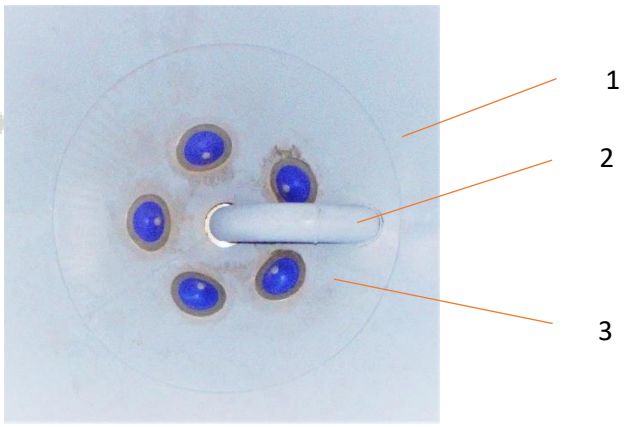

Fig. 7.9b – Discharge cone – Internal view

(1) Discharge cone (inside)

(2) Discharge outlet

(3) Aerator

7.10 Material line/manifold

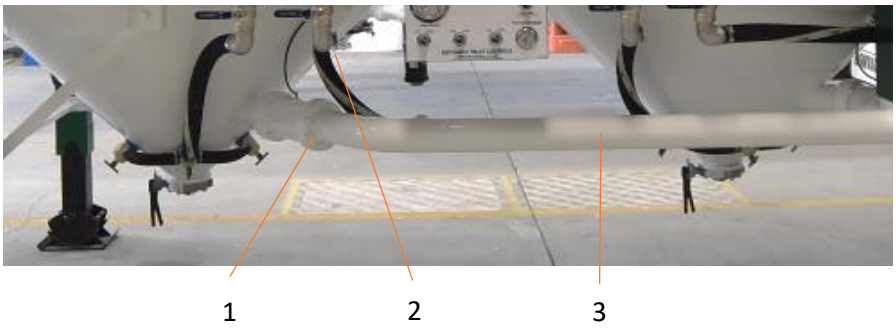

Fig. 7.10a – Discharge manifold with pinch valve

(1) Pinch valve

(2) Control air line

(3) Discharge manifold

The discharge manifold (3) leads from the individual compartments of the tank to the material connection from where the bulk material is unloaded. Individual cone discharge lines merge into the discharge manifold.

The pinch valve requires air pressure 200kPa above the vessel pressure to close and create a tight seal. Always ensure the control air pressure is at least 200kPa higher than the vessel pressure.

In case of control pressure failure, the pinch valve fails open.

The pinch valves are controlled via manual selector valves (pneumatic switches) (4), (5) and (6) (see Fig. 7.10b) located on the discharge control panel. For more information on the operation see section "Emptying by means of compressed air" on page 73.

Fig. 7.10b – Controlling the pinch valves (for a 3-pod tanker)

(4) Front pinch valve control (Open/Close)

(5) Centre pinch valve control (Open/Close)

(6) Rear pinch valve control (Open/Close)

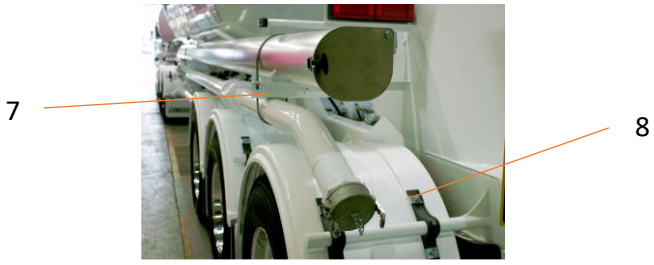

Fig. 7.10c – Material line/manifold with material connection

(7) Discharge manifold

(8) Discharge connection (closed with a vented dust cap)

The discharge manifold (7) from the tank compartments ends in the discharge connection (8). The product discharge hose for emptying the tank can be connected to it.

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Food grade discharge hoses supplied as an option by Convair are made of a conductive material and thus meet the relevant safety standards concerning the necessary equipotential bonding (earthing), for the unloading of relevant product.

7.11 Stowage pipes

The stowage pipes for the product discharge hoses (Fig. 7.11) are located on the right and/or left of the tank above the mudguards.

WARNING

DANGER OF INJURY!

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

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

Fig. 7.11 – Stowage pipe for discharge hose

(1) Stowage pipe

(2) Stowage pipe cover

Food grade discharge hoses supplied as an option by Convair are made of a conductive material and thus meet the relevant safety standards concerning the necessary equipotential bonding (earthing), for the unloading of relevant product.

7.12 Safety railing

The safety handrail is located along the tank walkway. It is used to protect you from falling while walking on the tank walkway.

Fig. 7.12a – Safety railing - down

(1) Safety railing (folded down)

DANGER OF FALLING!

If the safety handrail is not raised, you might, e.g., stumble, fall from the tank and seriously injure yourself.

- ▶ Always raise the safety handrail before getting onto the tank walkway.

DANGER OF INJURY!

Objects placed on the walkway can cause you to slip or stumble, leading to possible injuries.

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

Before getting onto the tank semi-trailer ensure that the following conditions are fulfilled:

- Secure the tank trailer with parking brake to prevent it rolling away.
- Before getting onto the tank make sure the safety handrail is raised to protect you from falling.

The safety handrail is operated via a pneumatic valve located at the base of the access ladder.

Fig. 7.12b – Safety railing – raised

(2) Safety hand rail

(3) Access ladder

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CAUTION

RISK OF ACCIDENT!

The operation of the handrails includes a parking brake safety interlock. This is a secondary safety function only and owing to the requirements of the Australian Design Rules, under particular circumstances it may be possible for the parking brakes to release before the handrails have retracted.

- Do not drive with the safety railing raised; it may become stuck and tear off in underpasses.
- Before departure, ALWAYS check whether the safety railing is folded away.

7.13 Internal filter

A pancake type filter on the inside of the tank is used to remove dust from the exhaust air during the venting procedure, before discharging it to atmosphere.

The exhaust filter is accessed through one of the hatches of the tank vessel.

Fig. 7.13 – Exhaust filter, pancake type

If product dust is expelled from the vent line during operations it indicates immediate action is required to service the internal filter. Stop using the tanker immediately.

8 OPTIONAL EQUIPMENT

8.1 Pneumatic fill- and vent connections (optional)

Fig. 8.1 – Pneumatic fill- and vent couplings on the tank

(1) Fill line isolating valve

(2) Fill line vented cap

(3) Vent line isolating valve

(4) Vent line vented cap

The tank can be filled through a hose using compressed air, while venting the tank to atmosphere through a filter.

DANGER

DANGER OF DEATH!

When you open the isolating valves on the vent- or fill connections of a pressurised tank there is a danger that the cap will open with explosive force.

- Before connecting- or disconnecting hoses to the fill- or vent connections, check the pressure gauge to determine whether the tank is under pressure.
- Bleed the air completely from the tank via the air dump valve before connecting- or disconnecting the hoses.

Loading the tank semi-trailer via pneumatic fill- and vent connections

1 Prepare to load (See also “Loading using compressed air” on page 69).

- Connect the equipotential conductor (option for relevant product).
- Ensure that there is no pressure in the tank before continuing.
- Close all shut-off fittings and valves.
- Remove the vented caps from the fill- and vent connections ((2), (4)).

2 Start loading.

- Connect- and secure a vent hose between the vent connection and the filter.
- Connect- and secure a filling hose between the fill connection and the product source.
- Open the fill- and vent line isolating valves ((1), (3)).
- Start the unloading operation from the product source.
- Monitor the filling operation at the tank semi-trailer.

Observe the maximum filling level of the tank. Check the pressure reading on the axle load pressure gauge on the semi-trailer as an indication of the loading state. If possible, use a vehicle scale for a precise check.

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3 Complete the loading operation.
- ▶ Stop product inflow: interrupt the compressed air supply (switch off compressor).
- ▶ Close the discharge valve on the product source.
- ▶ Close the fill- and vent line isolating valves ((1), (3)).
- ▶ Open the air dump valve and confirm that the tank pressure is zero before proceeding.
- ▶ Disconnect the hoses from the fill- and vent connections and from the product source- and filter.

4 Stop loading.
- ▶ Secure the vented caps on the fill and vent connections ((2), (4)).
- ▶ Leave the air dump valve open: avoid vacuum damage!
- ▶ Check the load distribution and min./max. filling level.
- ▶ If necessary, disconnect the equipotential conductor (option for relevant product).

8.2 Vacuum valve (optional)

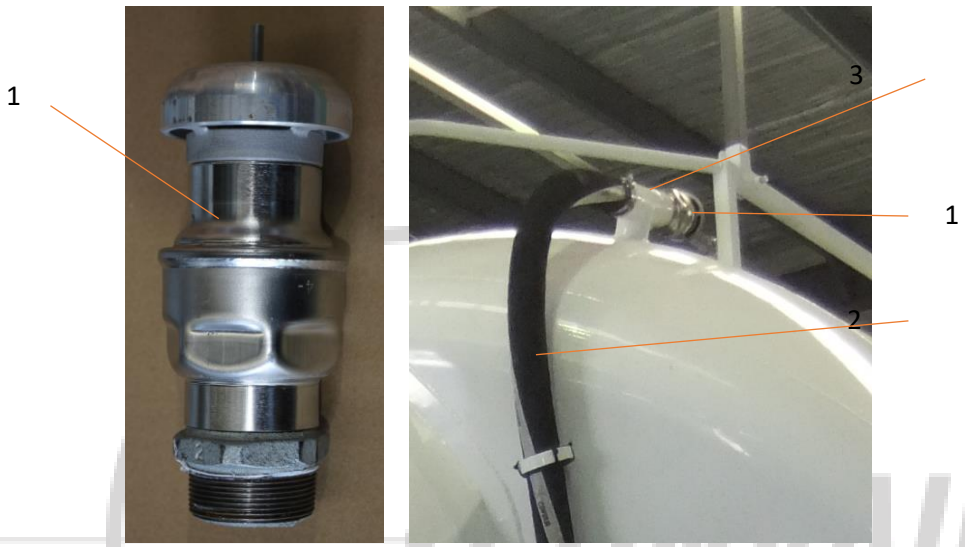

Fig. 8.2 – Vacuum valve

(1) Vacuum valve

(2) Top air hose

(3) Tee

To protect the tank from vacuum collapse (implosion), a vacuum valve (1) can be fitted directly to the tank.

The vacuum valve (1) prevents negative pressure occurring in the tank due to changes in air pressure and/or -temperature.

Important information about testing the vacuum valve can be found under ”Vacuum valve (optional equipment)” on page 81.

CAUTION

VACUUM DAMAGE!

The capacity of the vacuum valve is not sufficient for equalising the pressure when discharging the tank under vacuum. This can lead to vacuum collapse/implosion of the tank.

- ▶ Follow vacuum discharge procedures to ensure that the tank pressure is equalised while discharging the tank using vacuum.

NOTICE

VACUUM DAMAGE!

Vacuum valves could freeze at temperatures of under 0°C and no longer function.

- ▶ Particularly at temperatures below 0°C check the functioning of the vacuum valve.

8.3 Compressor (optional)

A compressor or blower is required to unload tank pneumatically (See also "Selecting the unloading method" on page 66).

A compressor delivers more pressure than a blower does, while a blower delivers more flow rate than a compressor does, and the selection of either depends on the product to be conveyed pneumatically.

Fine powders such as cement, fly ash and flour are more efficiently conveyed using a compressor.

Other dry products like poultry feed, and plastic pellets are generally more suited to a blower.

The compressor/blower can be mounted:

- on the chassis of the truck, or
- within the rear frame of the tanker trailer, or
- on a skid on site, or
- on a transportable trailer.

The compressor/blower can be driven by the truck PTO or hydraulically when mounted on the chassis of the truck, or it can be driven by a diesel motor when mounted within the trailer frame or on a skid or transportable trailer, or it can be driven by an electric motor when mounted on a skid on site with power available.

COMPRESSOR DAMAGE!

Starting- or stopping a compressor under load can cause serious permanent damage to the compressor, the PTO and the truck's transmission! A compressor/blower should never be started- or stopped under load.

- ▶ Always ensure that there is an open passage for air from the compressor to be discharged direct to atmosphere before starting- or stopping the compressor.
- ▶ In most cases this requirement is met when the top air valve and the air dump valve are both fully open.

Refer to the relevant compressor manual for starting- and stopping procedures.

DANGER OF DEATH!

Compressed air has tremendous energy with explosive force.

- ▶ ALWAYS ensure that any hoses are connected- or disconnected only when the tank pressure is ZERO, and the compressor/blower is turned OFF.

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8.4 Pneumatic Vibrator (optional)

During the emptying procedure it can happen that material dust condenses and sticks at different places inside the tank. After unloading the majority of the load, this residue can be released using the vibrator.

NOTICE

DANGER OF DAMAGE!

Long and continuous operation of the vibrator can weaken the welded joints of the tank.

The pneumatic vibrator also uses air from the auxiliary air tanks and can deplete the air supply required to close the pneumatic pinch valves if used for long periods.

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

The vibrator is a pneumatic/mechanical device which causes the tank to vibrate temporarily to release adhering load from the tank wall.

The vibrator (1) is mounted on a bracket (2) on the outside of the tank (3).

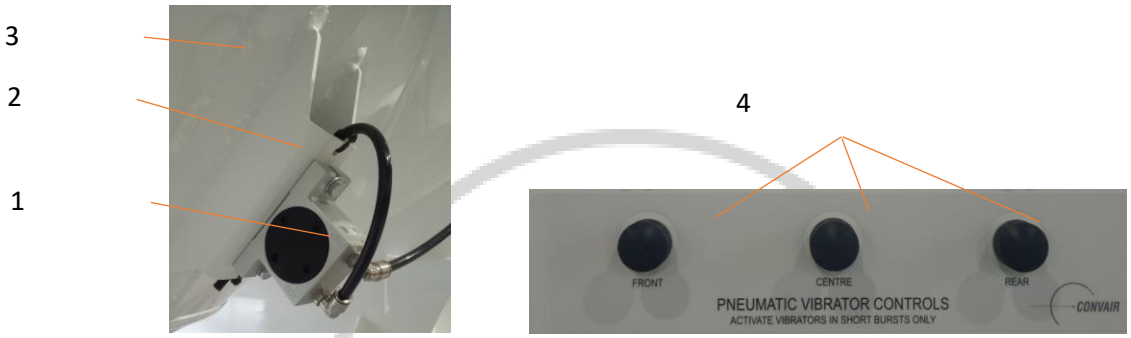

Fig. 8.4 – Vibrator and pushbuttons

(1) Vibrator

(2) Bracket

(3) Tank

(4) Pneumatic vibrator pushbuttons

It is possible that the vibrator is mounted at a location on the tank other than the location shown in the illustration or the tanker is equipped with several vibrators. Operation takes places via additional pushbuttons (4). The pushbuttons are typically located below the pinch valve control panel.

CAUTION

DAMAGE TO HEALTH!

The noise caused by the vibrator can be up to 91dBa and can be harmful to your health.

- Only operate the vibrator when necessary (several times, for no longer than 5 seconds each).
- Always use hearing protection within the danger zone.
- Ask people without hearing protection to leave the danger zone around the tank.

Operate the vibrator(s) at least once a week to free the tank from load adhering to it. In this way you will prevent contamination of the load and ensure complete unloading of the compartments of the tank.

8.5 Inerting system (optional)

Inerting is the process of replacing the oxygen in the air or reactive and explosive gasses in the tank with the 'inert' gas known as nitrogen.

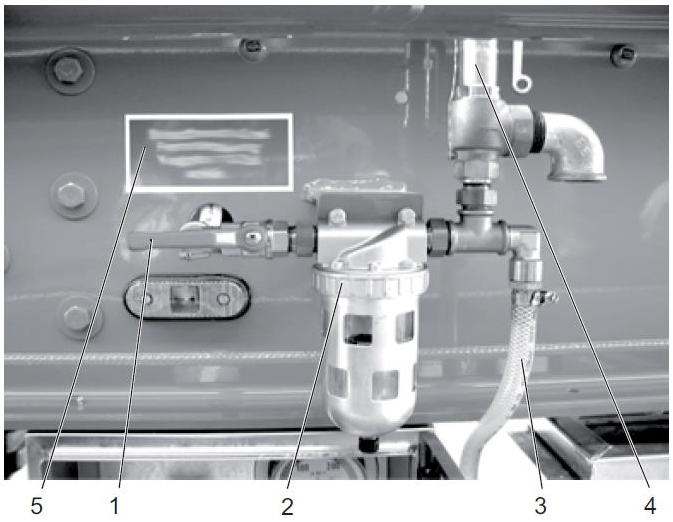

Fig. 8.5 – Inerting system stop valve

(1) Stop valve (opened here)

(2) Water separator

(3) Connection from fine pressure reducer

(4) Pressure relief valve

(5) Adhesive label 'Close nitrogen connection for external inerting / 1/2-inch ball valve'

When particular dry solids are transported in the form of fine dust, granules or chips, there is danger of them igniting spontaneously in air. The risk increases with the electrostatic charge received during loading or unloading, which can cause sparks to ignite the material. This applies especially to loads from the dangerous goods class of spontaneously combustible materials.

Nitrogen gas can only be introduced from an external source via the air connection of the vehicle. In this case the stop valve (1) for the inerting system (Fig. 8.5) must be closed.

The nitrogen gas can also be directed into the tank via the inerting system from a nitrogen flask on the vehicle. In this manner nitrogen can be filled into the tank during transport if necessary.

In both cases the nitrogen gas is directed into the tank via the top air connection.

DANGER

DANGER OF DEATH!

After inerting a surplus of nitrogen may remain in the tank, leading to danger of suffocation due to lack of oxygen.

- Only enter the tank after you have ventilated it thoroughly from the top and from below.
- Take a gas measurement in line with the current regulations in order to ensure that there is sufficient oxygen in the tank before you enter the inside of the tank.
- Accessing the inside of the tank is only permitted with a second person for safety.

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8.6 Equipotential bonding (earthing) (optional)

WARNING

DANGER OF EXPLOSION!

For particular products, if equipotential bonding is not ensured, static charges can cause sparks and thus explosions.

- ▶ Always ensure there is equipotential bonding when loading or unloading the tank for such products.
- ▶ Check the material data sheet if unsure.

Fig. 8.6 – Equipotential bonding

(1) Clamp

(2) Cable reel

(3) Food grade hose with copper wire embedded

(4) Earthing lug (alternative if plant have their own equipotential bonding equipment)

Due to load friction, particularly with products like flour, the tank walls can become statically charged. When this electrical potential is discharged sparking can occur and cause an explosion.

The equipotential conductor prevents the tank walls becoming electrically charged. Similar to a lightning conductor, the equipotential conductor provides a connection to ground. Connect the clamp (1) to a conductive earthing point provided for this purpose at the loader's premises.

The equipotential bonding is established during loading and unloading through the food grade (optional) product discharge hoses (3).

Food grade (optional) product discharge hoses (3) supplied by Convair have a copper wire embedded which connects the camlock fittings at either end of the hose to ensure equipotential bonding (earthing).

Some loading/unloading stations have their own equipotential bonding equipment which should be clamped on the earthing lug (4). It does not matter which of the two equipotential bonding options is chosen, as long as one of the two methods are applied.

9 LOADING AND UNLOADING

9.1 Staff qualifications

The following qualifications are required for loading and unloading (filling and emptying) the tanker:

- training/instruction in the operation of the tanker and
- a valid training certificate if dangerous goods are to be transported.

Topics which are important for an understanding of this chapter plus further notes can be found under "OPERATING THE TANK" from Page 43 and "OPTIONAL EQUIPMENT" from Page 58.

9.2 Loading instructions

The correct loading of the tanker and the correct distribution of the load are important for road safety and manoeuvrability. These factors affect the durability of the tanker. Apart from the specified minimum and maximum loading levels, the correct distribution of the load in the tank is important.

DANGER OF ACCIDENTS!

If the tanker is tail-heavy or top-heavy, the driving and braking characteristics of the towing vehicle are impaired and increase the risk of accident, especially if load does not flow easily.

- ▶ Load the tank evenly, as described in the loading instructions.
- ▶ Pay attention to the permissible kingpin and axle loads.
- ▶ Pay attention to the minimum and maximum filling levels.

DANGER OF TIPPING OVER!

Loading and unloading an unhitched tanker can cause the tanker to tip over.

- ▶ Only load or unload the tanker when it is hitched to the towing vehicle.

9.3 Pre-departure checks

Make a pre-departure check before each journey. Walk around the tanker and check that it is roadworthy. See also "Before departure" on page 22.

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9.4 Loading

9.4.1 Preparation and instructions

Use protective equipment

Wear the required/specified protective equipment appropriate to the load type. Follow the ADR regulations and the material safety data sheets for the load when transporting dangerous goods.

Cleaning the tank

Clean the tanker properly according to the previous load that was transported before you take on a new load. Follow the cleaning instructions in chapter "CLEANING" on page 89.

PRODUCT CONTAMINATION!

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

- ▶ Clean the air line if it is dirty. Dismantle the airline so that it can be thoroughly cleaned.
- ▶ Also clean any filler couplings or air outlet valves after overfilling.

Securing the work area

DANGER OF FALLING!

Without the safety railing erected, you may fall from the tank if you stumble, catch your foot or slip.

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

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 from becoming slippery, particularly in winter due to ice and snow.

Only get onto the tank walkway when the safety railing is erected and when the tanker is secured against accidental movement. The following conditions must be met:

- The parking brake is applied.
- The tanker is positioned horizontally.

Work steps necessary prior to loading:

- Check the loader's operational safety instructions.
- Check and secure all couplings again.
- Clarify with the loader that the product to be loaded is compatible with the tank and sealant materials.
- Check material temperature.

Checking the load

Always use the loading station's load quantity pre-selector, if available, to load the tank. Check the total weight on a scale.

DANGER OF ACCIDENTS!

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

- ▶ Only load the tanker to a point where neither the axle and support loads nor the permitted total weight is exceeded.

Observe the specified minimum and maximum filling levels for the tank. If necessary, check the filling level of the tank. Heed the properties of the product (specific weight) and the loading instructions on Page 64.

DANGER OF INJURY!

When checking the filling level, inhaling or having skin or eye contact with the load may 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 load.
- ▶ Wear safety clothing appropriate to the hazardousness of the load.
- ▶ If the load causes injury, act as specified in the material safety data sheet.

Selecting the loading method

You can fill any bulk material permitted for the tank through the top hatch or filler couplings.

Depending on the technical design of the tanker, you can choose from the following procedures for loading the tank:

- **Gravity:** filling the tank without ancillary equipment through the manholes or filler couplings by 'allowing the load to flow'.
- **Pressure loading:** filling the tank using compressed air. Filling is carried out by the loader using the filler couplings. The exhaust air is expelled via an open hatch or filler coupling to which a large filter bag is attached.

Instructions for handling hatch and filler couplings can be found in chapter “OPERATING THE TANK” on page 43.

Especially observe the danger instructions listed there.

Check the pressure in the tank by means of the pressure gauge on the air outlet valve and the air manifold (see Page 45).

DANGER OF DEATH!

If you loosen the threaded connection of the hatch or open the filler couplings of a tank under pressure, there is a danger that this may be torn off with explosive force. If this happens, you or others could be fatally injured.

- ▶ Before filling always ensure that the tank is depressurised.
- ▶ Never try to open a hatch or filler coupling that is under pressure.

VACUUM DAMAGE!

After loading, the tank may expand or contract due to temperature fluctuations. This can cause damage to the tank.

- ▶ Ensure pressure equalisation by opening the air dump valve and leaving it open.

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Equipotential bonding

DANGER OF EXPLOSION!

For particular products, if equipotential bonding is not ensured, static charges can cause sparks and thus explosions.

- ▶ Always ensure there is equipotential bonding when loading or unloading the tank for such products.
- ▶ Check the material data sheet if unsure.

9.4.2 Gravity loading

1 Prepare to load.

- Raise the safety railing.
- Connect the equipotential conductor (where applicable).
- Check whether the tank is depressurised; if not, vent the tank completely using the air dump valve.
- Ensure that all shut-off fittings (drop bottoms, butterfly valves, pinch valves) are closed.
- Depending on the loading arrangement it may be necessary to open an additional hatch for venting.

2 Start loading.

- Lower/insert the loading nozzle into the loading.
- Authorise the loading personnel to begin the loading operation.
- Load the tank evenly.
- Monitor the loading operation.

3 Complete the loading operation.

- Check that the product flow has stopped.
- Raise/extract the loading nozzle.
- Close the hatch.
- Close any air outlet(s) previously opened.

4 Stop loading.

- Close all valves in the air and material lines.
- Open the air dump valve and leave it open.
- Disconnect the equipotential conductor (where applicable).
- Fold down the safety railing.
- Check the load distribution and min./max. filling level.
- When transporting dangerous goods, affix dangerous goods signs.

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9.4.3 Loading using compressed air

1 Prepare to load.

- Raise the safety railing.
- Connect the equipotential conductor (where applicable).
- Check whether the tank is depressurised; if not, vent the tank completely using the air outlet valve.
- Check whether all the shut-off fittings (drop bottoms, butterfly valves, pinch valves) are closed.
- Check tank is empty and fill- and vent lines are clear.
- Ensure vent line is connected to suitable filter system.

2 Start loading.

- Connect the filling hose to the filler coupling.
- Authorise the loading personnel to begin the loading operation.
- Load the tank evenly through the loading couplings.
- Monitor the loading operation and the pressure. Do not leave the tanker.

3 Complete the loading operation.

- Check whether the product flow has stopped.
- Remove filling hose from the filler coupling.
- Close all filler couplings.
- Close all open air outlets.

4 Stop loading.

- Close all valves in the air and material lines and attach the caps.
- Open the air dump valve and leave it open.
- Disconnect the equipotential conductor (where applicable).
- Fold down the safety railing.
- Check the load distribution and min./max. filling level.
- When transporting dangerous goods, affix dangerous goods signs.

9.5 Unloading

9.5.1 Preparation and instructions

Use protective equipment

Wear the required/specified protective equipment appropriate to the load type. Follow the material safety data sheets for the load when transporting dangerous goods.

Securing the work area

DANGER OF FALLING!

Without the safety railing erected, you may fall from the tank if you stumble, catch your foot or slip.

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

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 from becoming slippery, particularly in winter due to ice and snow.

Only get onto the tank walkway when the safety railing is raised and when the tanker is secured against accidental movement.

- The parking brake is applied.
- The tanker is positioned horizontally.

Work steps necessary prior to unloading:

- Park the tank semi-trailer horizontally. Uniform unloading is achieved by the descending slope in the tank.
- Check the consignee's operational safety instructions before unloading.
- Before unloading, check and secure all connections again.

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Selecting the unloading method

You can choose from the following methods for unloading the tank:

- **Gravity**: unloading without ancillary equipment, simply allowing the product to flow under gravity (free-fall unloading).
- **Compressed air**: emptying the tank using compressed air. Compressed air is supplied by an external or built-in compressed air source through the air coupling (unloading with compressed air).

When selecting an unloading method, please take underlying conditions into account:

- product type and product properties,
- on-site conditions and
- customer specifications.

Since the material characteristics of the load can vary, the regulation of air supply through the air manifold using stop valves during unloading should also vary accordingly.

Equalising the pressure

DANGER OF DEATH!

If you loosen the threaded connection of the hatch or open the filler couplings of a tank under pressure, there is a danger that this may be torn off with explosive force. If this happens, you or others could be fatally injured.

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

VACUUM DAMAGE!

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

- ▶ Based on the type of load and the applicable regulations, ensure pressure equalisation via the open hatch of the tank compartment to be emptied.

Equipotential bonding

DANGER OF EXPLOSION!

For particular products, if equipotential bonding is not ensured, static charges can cause sparks and thus explosions.

- ▶ Always ensure there is equipotential bonding when loading or unloading the tank for such products.
- ▶ Check the material data sheet if unsure.

9.5.2 Unloading by gravity (via drop bottom)

1 Observe the loading instructions from Page 64 and the consignee's unloading regulations.

- ▶ Prepare to unload.
- ▶ Raise the safety railing.
- ▶ Connect the equipotential conductor (where applicable).
- ▶ Close all valves in the air and material lines.
- ▶ Ensure that the tank is completely depressurised. Then open the hatch of the compartment to be unloaded for ventilation.

2 Start unloading.

- ▶ Open the drop bottom on the outlet connection.
  - ▷ Product flows out from the tank.
- ▶ Monitor the unloading operation. Do not leave the tanker.

3 End the unloading operation.

- ▶ Close the drop bottom on the outlet connection.
- ▶ Close the hatch.
- ▶ Close all valves in the air and material lines and attach the caps.
- ▶ Open the air dump valve and leave it open to avoid vacuum damage.
- ▶ Disconnect the equipotential conductor (where applicable).
- ▶ Fold down the safety railing.

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9.5.3 Unloading by means of compressed air

Observe the loading instructions from Page 64 and the consignee's unloading regulations.

DANGER

RISK OF PERSONAL INJURY

NEVER open or adjust any hatch, cover or hose clamp anywhere on the tanker if the pressure gauge reads any higher than ZERO.

Stay clear of the discharge hose, which moves around with considerable force during unloading and can trip- or knock you over unexpectedly.

NOTICE

RISK OF SILO DAMAGE

Plant silos are not designed to handle pressure. Do not exceed the maximum discharge pressure as indicated on the target silo. Observe all plant regulations.

NOTICE

RISK OF COMPRESSOR DAMAGE

A compressor must only be started against open valves. Otherwise it may be damaged!

- ▶ Open the air dump valve and the top air valve, fully, before starting the compressor.
- ▶ Check the compressed air pressure gauges.

NOTICE

RISK OF EQUIPMENT DAMAGE

- ▶ Do not use any compressor or tanker without a functioning pressure relief valve.
- ▶ Have the tanker serviced at the required intervals.

USE TOP AIR

Top air path has least resistance and is most efficient to pressurise the tank, prevents product back-flow onto the pressure relief valve, and minimises “rat-holing” of air between aerators and product discharge inlet.

OPERATE ONLY ONE CONE AT A TIME

The compressor is sized to generate the amount of air required to effectively aerate the product in one cone, pressurise the tank (top air valve), and move the product (boost valve).

- ▶ Discharge only one cone at a time and aerate only the cone being discharged.

UNLOADING CONE ORDER

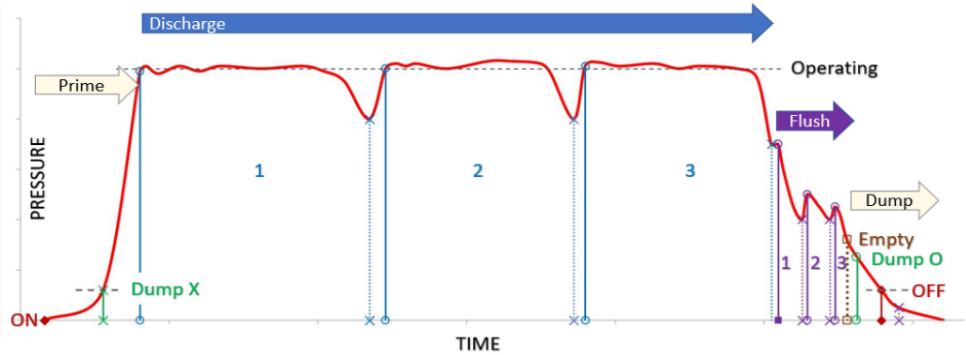
Always unload the tanker cones in the same, starting from the cone closest to the product discharge hose connection, then the adjacent cone, and so on.

This ensures the most efficient unblocking process if required during the discharge stage, and also cleans out the full length of the product discharge manifold during the flush stage.

PNEUMATIC UNLOADING PRESSURE MANAGEMENT

Rapid- or large pressure reduction causes massive air flow rate which can damage the silo filter and it can cause condensation inside the tank, pipework, silo and product.

Separate the unloading process in two stages: Discharge majority of product in each cone while maintaining the tank pressure as steady as possible, then flush the remnant from each cone while the tank pressure slowly decreases to zero.



9.6 RECOMMENDED UNLOADING PROCEDURE

Complete the pre-start check list before starting the shift (refer Convair pre-start check list).

1 Upon arrival at unloading plant

- ▷ Compressor should be OFF.
- ▷ Air dump valve should be fully OPEN.
- ▷ All other valves should be CLOSED.
- ▷ Tank pressure should be ZERO.

2 Preparing to unload

- ▶ Ensure that all hatches and filler couplings are closed and secured.
- ▶ Connect- and secure the product discharge to the material discharge point with the discharge hose.
- ▶ Connect the equipotential bonding (where applicable).
- ▶ Connect the compressor or compressed air system to the air connection.
- ▶ Ensure that the silo fill line is open and the dust filter is working!

3 Starting the compressor

- ▶ Open the top air valve fully.
- ▷ The air dump valve should remain fully open, and tank pressure should still be ZERO.
- ▶ Start the compressor.
- ▶ Once the compressor is running at set RPM, close the air dump valve.
- ▶ The pressure in the tank should now increase slowly.
- ▶ Once the tank pressure reaches the unloading pressure, open the boost valve.
- ▶ Now start discharging the first cone (closest to the discharge hose connection).

4 Discharging the cones

- ▶ Open the aeration valve of the cone to be discharged.
- ▶ Open the product discharge valve of the cone to be discharged.
- ▷ Product is discharged from the tank.
- ▶ Monitor the unloading process and the pressure.
- ▶ Control the compressed air supply pressure during the emptying procedure by modulating the boost air valve opening.
- ▶ Do not leave the tanker.
- ▷ A sudden drop in pressure on the pressure gauge indicates the discharge stage is completed for this cone.
- ▷ If the cone is fitted with aerators, they will start to become noisy at this point as well.
- ▶ Immediately close the product discharge valve on this cone, and close the aeration valve on this cone.
- ▷ Any remnant product remaining in the cone to be flushed LATER.
- ▶ Once the previous cone has been discharged, **QUICKLY** move to the next cone and repeat the same steps for discharging the cone above.
- ▶ Repeat this for every cone.
- ▶ Once the last cone has been discharged, **QUICKLY** close the boost valve, close any open discharge valve, and close any open aeration valve.
- ▶ OPEN the top air valve FULLY, then start flushing remnant from the cone closest to the discharge hose connection.

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6 Flushing the cones

- ▷ Only the top air valve should be open at this point.
- ▷ The flushing stage uses air flow passing from the tank directly into the discharge manifold, with very little, or no boost air.
- ▶ Open the aeration valve-, and the discharge valve of only the cone closest to the discharge connection.
- ▷ Any remnant product is carried out by air from within the tank only.
- ▶ Observe the discharge hose and listen to the aerators (if fitted).
- ▷ If the tank pressure seems to increase during the flushing stage it means that there is a minor blockage. If this happens, allow the pressure to build automatically, which will flush the relatively small volumes without increasing the pressure unnecessarily.
- ▷ Do NOT increase the tank pressure by changing valve positions during the flushing stage.
- ▶ When the discharge hose lies still and aerators hum constantly, QUICKLY close the open discharge valve and open the next discharge valve.
- ▶ Repeat this for all cones, until all product has been flushed from the tank.

7 Stopping the compressor

- ▷ The compressor should still remain running at this point.
- ▷ Do not increase tank pressure.
- ▷ The top air valve should remain open.
- ▶ Open the air dump valve.
- ▶ Open all product discharge valves.
- ▶ Open the boost valve.
- ▶ Reduce compressor RPM.
- ▶ Wait for tank pressure to drop to ZERO, then stop compressor.

8 Before departing

- ▶ Leave the air dump valve open. This ensures that the vessel remains at ZERO pressure at all times other than during the unloading process.
- ▶ If the tanker is to remain empty for some time, leave all pneumatic pinch valves OPEN (if fitted) to avoid premature sleeve deformation and wear.
- ▶ Disconnect the product discharge hose only when tank pressure gauge reads ZERO.
- ▶ Turn off the silo dust filter and close the silo fill valve (where applicable).
- ▶ Disconnect the equipotential conductor (where applicable).
- ▶ Stow all hoses and tools before departing.

Wear hearing protection and safety goggles.

Note: The recommended unloading procedure applies to tankers fitted with rubber aerators. For tankers fitted with cloth aeration pads, the recommended unloading procedure will also work, but may be altered to suit the product handled.

9.6.1 BLOCKAGES

When a blockage occurs, the tank- and/or compressor pressure relief valve will activate.

Blockages can occur due to:

- ▷ blocked- or under-sized silo filter, or
- ▷ an over-filled silo, or
- ▷ too low air velocity causing “duning” of product in horizontal sections of pipework.

Although the reverse pressure differential unblocking procedure does not involve actual vacuum, the common reference to this process is “sucking” the product back into the tank.

UNBLOCKING PROCEDURE

- ▶ If the blockage is due to a full silo or blocked filter, open the top air valve and the air dump valve fully, then wait for the tank pressure to drop as close as possible to zero before stopping the compressor.
- ▷ Blocked silo filter or over-filled silo first need to be fixed by the plant operators before the reverse pressure differential unblocking procedure can start.

Pipe blockages due to “duning” can often be cleared by simply forcing the blockage clear by pressure, as follows:

- ▶ Leave the compressor running.
- ▶ Close top air valve, all aerator valves, all discharge valves.
- ▶ Open the boost valve and the air dump valve, fully.
- ▷ This directs all compressor air into the discharge line and may force the blockage clear by pressure.
- ▷ The dump valve is opened in anticipation of reverse pressure differential unblocking procedure, in case the blockage cannot be cleared by pressure.
- ▷ The compressor pressure relief valve will activate until the blockage is cleared (this is OK).

If the blockage is not cleared by pressurising the discharge line, proceed with the reverse pressure differential unblocking procedure:

- ▷ At this stage, the top air valve, all aerator valves, and all discharge valves should already be closed, and the boost valve and the dump valve should be fully open.
- ▶ Wait for tank pressure to drop to ZERO.
- ▶ If the compressor was stopped, start it again and bring it to operating RPM.
- ▶ When tank pressure is ZERO and the discharge line is under pressure (compressor relief valve goes off), quickly OPEN, then CLOSE discharge valve of the first (most empty) pod.
- ▶ Repeat quick opening and closing of this discharge valve until the blockage is cleared.
- ▷ By repeating this process, the reversed pressure differential draws (“sucks”) the product from the high pressure blockage area back towards the low pressure in the tank.
- ▷ When the blockage is cleared, the compressor pressure relief valve will stop releasing air, and you may hear product flowing back into the tank.
- ▶ Once the blockage is cleared, you can resume unloading.

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9.7 Brief instructions

9.7.1 Quick guide to loading and unloading

A. Loading

1 Load the tank evenly through the hatch and/or the filler coupling.
Pay attention to the weight distribution, especially in case of material with poor flowing characteristics and compartmentalised tanks.
2 Close the lid and tighten it uniformly by hand! Do not use a hammer, pipes or similar aids.
3 Open the air outlet valve in the air line and leave it open (vacuum hazard!).

B. Unloading

1 Note the maximum operating pressure is determined by the design pressure of the tanker. Refer to ID plate of tanker.
2 Do not switch the compressor on or off under pressure!
3 During gravity unloading, ensure adequate tank ventilation by opening one or more hatches!

C. General instructions

1 During transport and particularly in the case of extreme temperature fluctuations in the tank or externally, leave the air outlet valve in the air line open!
2 Check pressure-limiting valves, non-return valves, stop valves and control devices regularly to ensure that they are functioning properly. These components must never be incorrectly adjusted, blocked or made inoperative in any other way or be restricted as regards function!
3 Any pressure gauges, pressure-limiting valves or other safety equipment that is defective must be replaced without delay and, if required, officially approved and sealed.
4 If the tank is under internal pressure, walking on the roof is prohibited. Do not then re-tighten or loosen hatches, discharge bowls, locking bolts, hose couplings or other pressurised parts!

Follow the instructions in the owner's manual!

9.7.2 Important information

Caution!

Check and if necessary, tighten the axle and suspension mounting bolts after the first laden trip and subsequently every 6 months.

Follow the axle manufacturer's maintenance instructions.

Tighten all air and product discharge hose clamps after the first use.

Danger of slipping!

Check the non-return valve and the stop valves for leakage. If material flows back, close the valves immediately; otherwise the material will move under aeration.

Cleaning instructions

In the first three months only use cold water for cleaning.

Do not use high-pressure or steam jet devices.

After three months: avoid water temperatures above 60°C and do not use any aggressive cleaning agents.

Minimum distance between the spray nozzle and the vehicle: 30 cm.

9.7.3 Accident prevention procedures

Observe accident prevention procedures.

Particularly note:

1 **Pressure relief valve**

It is forbidden to modify, adjust, block or deactivate the pressure relief valves.

2 **Tank pressure gauge**

Defective pressure gauges showing incorrect values must be replaced immediately.

3 **Hatch**

As long as there is pressure in the tank, the operating levers must neither be loosened nor removed.

4 **Hatch threaded connections**

Please pay attention to the hatch threaded connections.

The threads must always be in good condition.

5 **Material and air lines**

The hose couplings must have a tight fit. Hose connections must not be adjusted, re-tightened or loosened when the tank is under pressure.

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10 MAINTENANCE

Only operate the tanker when it is free of defects and with due attention being paid to safety and hazards. This means that the tanker must be serviced and maintained according to regulations. Any changes to the tanker must be rectified by a qualified professional workshop without delay. This applies in particular to changes that compromise the safety of personnel and property.

The tanker and all its components must be serviced regularly and, if necessary, repaired to ensure safe and efficient operation. Checks, servicing and repairs that are not carried out in a timely manner may cause components to fail and thus lead to accidents.

- Carry out function tests and maintenance work at the specified intervals and according to the instructions.
- Also comply with the specified intervals and instructions for checking and servicing supplied parts, e.g. axles and semi-trailer support, as indicated in the instruction manuals supplied.
- Carry out repairs in a timely manner.

10.1 Staff qualifications

Servicing and repair of the tanker must be carried out by suitably qualified personnel.

Servicing and repair that is not carried out by properly qualified personnel can cause incalculable risks, with negative consequences for people, the tanker and the environment.

- Persons involved in the service and repair of the chassis must be trained vehicle mechanics and have experience in servicing and repairing commercial vehicles and trailers/superstructures.
- Persons involved in the service and repair of the tank's electrical components should be skilled, trained electricians.
- Persons involved in the service and repair of the tank must be trained and experienced in servicing and repairing pressure tanks, fittings and valves.
- Welding work on the tank must only be carried out by specially trained and certified welders in a workshop.

10.2 Function tests

Regular function tests of safety equipment are required in order for safe tanker operation to be ensured. Carry out the following function tests at the specified intervals (See also “Function test schedules” on page 83).

No additional expertise is required to carry out the checks 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 get stuck or become jammed or clogged due to product residue. This is why regular checks must be carried out to ensure proper function.

Defective safety equipment such as valves, pressure gauges and other safety equipment must be replaced without delay. Some components have regulatory requirements for maintenance.

Wear goggles, hearing protection and safety gloves while carrying out function tests!

10.2.1 Pressure relief valve

DANGER

DANGER OF DEATH!

A defective pressure relief valve can cause the tank to explode due to excessive overpressure!

- ▶ Do not pressurise the tank or the airlines if the cap cannot be turned or if the pressure relief valve does not blow off at its design pressure.
- ▶ Replace defective pressure relief valves immediately.

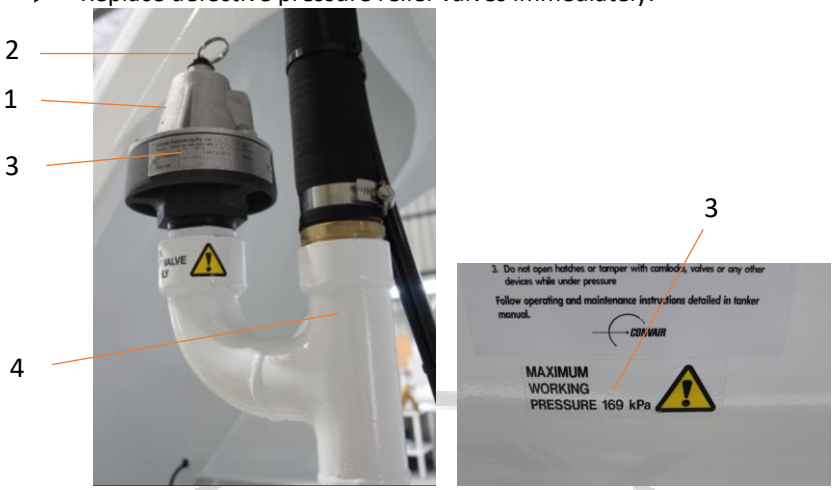

Fig. 10.2.1 – Pressure relief valve for compressed air supply

(1) Pressure relief valve

(2) Test pin (ring)

(3) Relief valve activation pressure

(4) Top air line

1 Check for smooth operation.

2 Check the blow-off pressure.

- ▶ Close all valves (air outlet stop valve, top air stop valve etc.).
- ▶ Open top air and aeration air valves.
- ▶ Use the compressor to increase the pressure in the tank to the relief valve activation pressure (4) while observing the pressure gauge.
  - ▷ The pressure relief valve must release air when the relief valve activation pressure (4) is reached. If the pressure exceeds the activation pressure (4), switch the compressor off immediately, release the pressure, then replace the pressure relief valve!
- ▶ Switch off the compressor.
- ▶ Release the pressure.

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10.2.2 Vacuum valve (optional)

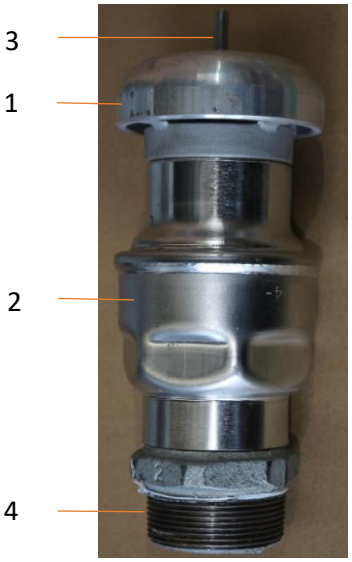

Fig. 10.2.2 – Vacuum valve

(1) Cap

(2) Vacuum valve

(3) Plunger

(4) Threaded connection

Check all vacuum valves as described below (in fitted condition).

CAUTION

DANGER OF INJURY!

Product residues on the cap can cause chemical burns to the skin.

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

- ▶ Unscrew the cap (1) and, if necessary, the threaded connection (4).
- ▶ Press the plunger (3) down against the resistance.
  - ▷ The vacuum valve is in working order if the plunger can be moved easily and comes back out automatically.
- ▶ Screw on the threaded connection and cap again.

CAUTION

VACUUM DAMAGE!

A defective vacuum valve can cause damage to the tank through implosion.

- ▶ Replace a defective vacuum valve immediately if the plunger does not move easily or if it does not come back out automatically.

10.2.3 Hatch

DANGER

DANGER OF DEATH!

If the thread of a hatch threaded connection is damaged, it can give way, allowing the hatch to be torn off the tank with explosive force and fatally strike you or others.

- The tank must not be pressurised if even only one thread is damaged.
- Only hand-tighten the hatch threaded connection.
- Replace damaged threads immediately.

Leak tightness

The hatches must always be correctly sealed when the tanker is in operation.

Any hissing sound heard, e.g., while the tank is being unloaded is a sign of leakage.

This can lead to damage to the hatch and the seal. In this case, depressurise the tank, seal the hatch properly and/or readjust the hatch threaded connection.

Sealing

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

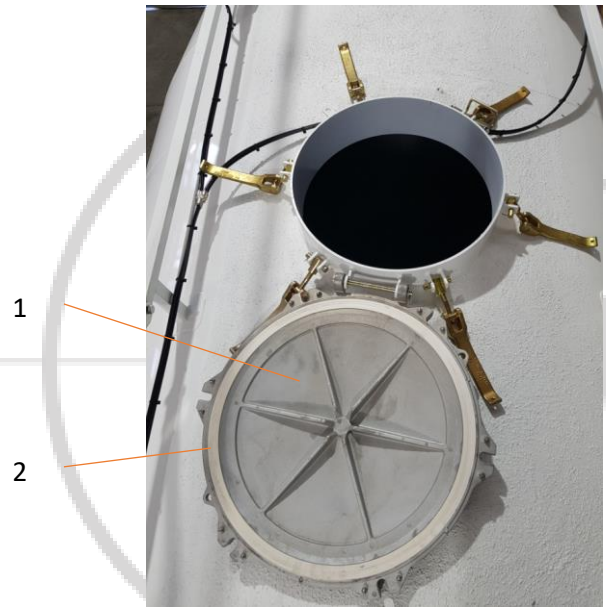

Fig. 10.2.3 – Hatch seal

(1) Hatch

(2) Seal

The seals must be:

- in visibly good condition and
- clean.

Replace damaged seals without delay.

Hatch clamps

The hatch's threads must be:

- in visibly good condition and
- non-sticking.

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10.3 Torque for chassis threaded connections

Refer torque sheets in test book.

10.4 Function- & Safety test schedules

10.4.1 After each transport journey

The following components should be checked after each loading or unloading operation:

Component ▪ Test	Notes
Pressure relief valve ▪ Carry out function test with tank pressure at design pressure.	Page 46
Vacuum valve ▪ Function test	Page 81
Hatch ▪ Leak tightness ▪ Visual inspection	The tank must be depressurised!
Hose clamps ▪ Check for tightness	

Table 10.4.1 – Daily function tests

10.4.2 During each unhitching operation

The following components should be checked before and after each unhitching operation:

Component ▪ Test	Notes
Kingpin and plate ▪ Secure anchoring ▪ Visual inspection	If fifth wheel has a ball race, a block MUST be fitted behind the king pin. If fifth wheel does not have a ball race, there must be NO block behind the king pin!
Jack ▪ Visual check for leaks	
Steering axle ▪ Visual check for leaks in hydraulic system and damage to rods and bearings	

Table 10.4.2 – Function tests during each unhitching operation

10.4.3 Monthly

The following components should be tested once a month:

Component ▪ Test	Notes
Hatch ▪ **Check seal and threaded connection.**	
Safety railing ▪ **Check mounting; all bolts must be in place.** ▪ **Check for ease of movement and proper locking.**	

Table 10.4.3 – Monthly function tests

10.4.4 In accordance with AS3788

Component ▪ Test	Notes
Tank and equipment (lines, valves etc.) ▪ Carry out the check and have it documented by an independent, authorised expert.	

Table 10.4.4 – Function tests as stipulated by the test manual

Also refer to the maintenance schedules for the components in the component manuals supplied.

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10.5 Maintenance schedules

TANKER OWNERS MAINTENACE TASKS	After the FIRST..				After EVERY..										Ref.
	50 km	100 km	laden journey	unload	1000 km	5000 km	week	2 weeks	3 months	6 months	2 years	3 years	6 years	wheel removal	page#
Check fixing torque on wheel nuts or bolts.	✓	✓												✓	36, 89
Check fixing torque on axle and spring mounting bolts			✓					✓							89
Re-tighten all air line- and discharge hose clamps				✓					✓						
Have tractor-trailer brake synchronisation carried out by approved agent. Document results.					✓										39
Have SAF Holland running gear warranty service carried out by approved agent						✓									
Re-tighten kingpin securing bolts							✓			✓					88
Apply high-pressure grease to kingpin							✓								88
Check friction plates of semi-trailer coupling / rubbing plate for wear / damage							✓			✓					88
Apply high-pressure grease to rubbing plate. Do not grease if Teflon (PTFE) layer.							✓								88
Carry out visual external inspection of tank							✓								91
Check for leaks on pressure relief valve, ball- and butterfly valves, and pneumatic valves									✓						
Have statutory safety check carried out by approved agent										✓					
Have external- and internal AS3788 vessel inspection carried out if Aluminium tank											✓				
Have external AS3788 vessel inspection carried out if Steel tank												✓	✓		
Have internal AS3788 vessel inspection carried out if Steel tank													✓		

10.6 Maintenance work

10.6.1 Kingpin

NOTICE

DANGER OF ACCIDENTS!

Using a kingpin with less than the specified minimum diameter (wear limit) can cause the semi-trailer to become accidentally uncoupled while on the road.

- ▶ Check the kingpin diameter regularly.
- ▶ A worn kingpin should be replaced as soon as possible.

For information on tightening torques and operating materials please see:

- tightening torques: manufacturer's documents supplied.
- recommended operating materials: this instruction manual, Page 27.

For any queries or faults that relate to the kingpin please contact the manufacturer or a qualified workshop.

Maintenance instructions

- When replacing kingpins with threaded connections, only use approved components with test certificates.
- Refer to the manufacturer's installation instructions.

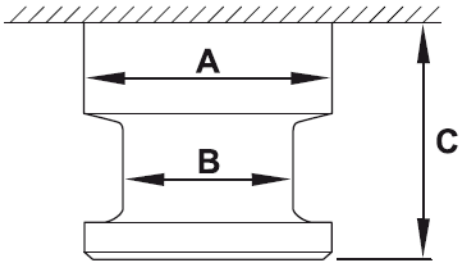


Fig. 10.6.1 – Kingpin dimensions

Dimension	Kingpin 50 (2”)	Kingpin 90 (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

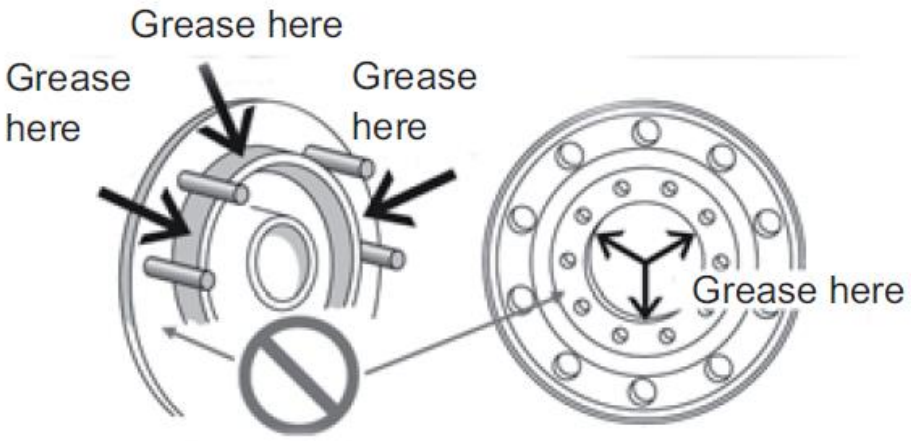
Table 10.6.1 – Dimensions of new and worn kingpins

10.6.2 Fitting the wheels on the vehicle

Only coat the centring rests or the centre bore hole of the wheel with AL grease prior to fitting. The contact surfaces must not be treated but should be clean and smooth.

AL grease or equivalent agents are heat-resistant and tolerable for aluminium and tyres.

The agent is also suitable for installing tyres and valves. Assembly agents which contain water or heavy metals may lead to corrosion and should not be used.



Ensure that the contact surfaces of the wheel and hub are clean and not greased.

Torque

Tighten the wheel nuts as recommended by the vehicle/axle manufacturer. Tighten valve nuts to 9.0 - 14.6 Nm. Always ensure that the correct torque is used and regularly check the wheel and valve nut torques.

Fitting devices

The securing flange of the 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
- sleeve wheel bolts with standard-length wheel bolts. To guarantee correct fitting, an adequate thread length must be available: the recommended length of thread engagement between the bolt and nut threads corresponds to 90% or more of the bolt diameter.

Wheel hub centring

All Aluminium wheels are hub-centred wheels which 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 Aluminium wheels.
- The centring facility should have at least 3 mm contact with the wheels for single and twin tyres. Longer centring facilities facilitate fitting.

10.6.3 Brake blocking at the ladder

Visual inspection and function test of the pneumatic switch and connections.

- Replace leaking compressed air lines.
- Replace damaged or faulty valve.
- Function test operation.

10.7 Lubrication point diagram

Trailer supports

On the tanker, the trailer supports are provided with lubricating points. These should be regularly lubricated, at least once a month.

Please use multi-purpose grease L2 or a similar grease for lubricating.

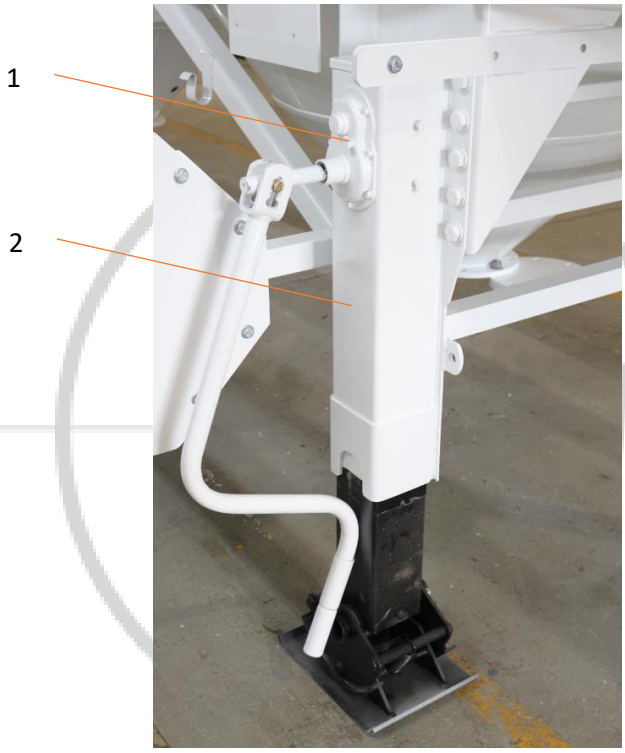


Fig. 10.7 – Trailer support lubricating points

(1) Lubricating nipple

(2) Trailer support (front right)

In its assembly manual and operating instructions, the manufacturer of the trailer support and rear support legs prescribes additional maintenance work. For this purpose, the supports / support legs must be taken apart. Please read the relevant instructions for this.

Kingpin

See “Recommended operating materials” on page 27 and “Kingpin” on page 86.

Steering axle rods (optional)

Refer to the manufacturer's maintenance instructions.

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11 CLEANING

11.1 General

The contaminating residues of the material load can corrode the surface of the tank if they are in contact with it long enough, especially when combined with moisture.

For this to be avoided, tanks should be cleaned regularly on the inside and the outside and dried sufficiently quickly. Soiled areas can corrode and pitting can occur.

In this context, it is important to have the tank cleaned as soon as possible after transporting chemicals and to air it as often as possible. The tank must only be cleaned by properly equipped and qualified cleaning companies.

Frequent visual inspections of the inside and outside of the tank should also be carried out in order for possible damage to be identified at an early stage.

If you detect pitting have the tank passivated by an authorised workshop. Convair Engineering recommends a Convair Service Centre for this purpose.

11.2 Factory cleaning

The inside of the tank is cleaned without the use of chemical additives prior to delivery of a new tanker from the factory.

A factory cleaning document can be issued to you on request when the tanker is delivered.

11.3 Cleaning the inside

When cleaning the inside of the tank, follow all regulations relevant to working in tanks and confined spaces.

DANGER OF DEATH!

After transport there may be residues of nitrogen or other life-threatening substances in the tank.

- Only enter the tank if it is absolutely necessary.
- Only enter the tank after you have vented it thoroughly, also from below. This is particularly important if the load has been inerted with nitrogen during transport.
- Take a gas measurement in accordance with the usual guidelines in order to ensure that there is no longer any inerting gas in the tank before you enter it.

PRODUCT CONTAMINATION!

Product residue can, for example, find its way into the air line. Product residues in the air lines can cause subsequently loaded products to be mixed or contaminated. This can cause considerable material damage.

- Depending on the products loaded, the airlines may also need to be cleaned.

Observe the following instructions regarding cleaning the inside of the tank.

11.3.1 Before cleaning

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 is completely empty and there is no product residue remaining in the valves and fittings, couplings or hoses,
- you are in possession of a cleaning order with the name of the issuer and the tank number,
- the tank and the compartments that are to be cleaned are depressurised and
- equipotential bonding has been established in a suitable manner (where applicable).

Air lines

- If the air lines also must be cleaned, make sure to open all valves before cleaning.

Convair Engineering recommends disassembling the air lines and taking them apart for cleaning.

Wet cleaning

- If the interior of the tank has to be wet cleaned (with water or steam), all aeration systems must be pressurised before the cleaning operation is commenced.
- Make sure to maintain the pressure even during and after the cleaning until the tank, the aeration pads and material lines are dry.

11.3.2 While cleaning

Make sure all components, including nozzles and couplings in toolboxes and cabinets, that come into contact with the product are also cleaned in accordance with the issued work order.

MATERIAL DAMAGE!

When a hot-cleaned tank cools down, vacuum damage can occur if the tank is not sufficiently ventilated.

▶ Make sure that during and after cleaning all aeration pads are pressurised until the aeration pads and the material lines are dry.

11.3.3 After cleaning

VACUUM DAMAGE!

When a hot-cleaned tank cools down, vacuum damage can occur if the tank is not sufficiently ventilated.

▶ Make sure that there is sufficient ventilation via the hatches or valve.

Make sure that:

- removed components are fully and properly reassembled,
- all seals are free of damage and firmly seated,
- loosened threaded connections are properly re-tightened and
- bottom valves and butterfly valves are not closed until they are completely dry (this prevents contact corrosion).

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11.4 Cleaning the outside

DAMAGE TO PAINTWORK

Newly painted surfaces may only be cleaned after 12 weeks' curing time. Before this time, the paint will not be completely cured and may be damaged.

- ▶ Only wash the tanker with a cold-water jet during the first 12 weeks.
- ▶ Do not use high-pressure or steam jet devices or hard brushes.

DAMAGE TO PAINTWORK

After 12 weeks: cleaning painted surfaces with excessive water temperatures or with aggressive cleaning materials can cause damage to the paintwork.

- ▶ Only wash the tanker with water at a temperature below 60°C.
- ▶ Do not use aggressive cleaning agents.
- ▶ Maintain the minimum distance required for the cleaning jet when using a high pressure or steam jet.

When cleaning the outside, you must:

- remove spilled load as quickly as possible.
- remove road salt residue regularly and as quickly as possible.
- clean the tanker once a week with plenty of water and a mild, non-corrosive detergent.

When using a high-pressure cleaner, you must take the following points into account:

- Refer to the manufacturer's safety instructions.
- Wear safety clothing and goggles.
- Distance to be maintained between a round jet nozzle and the surface being cleaned: 70 cm.
- Distance to be maintained between a flat jet nozzle or a rotating spray nozzle and the surface being cleaned: min. 30 cm.
- Do not point the water jet at electrical components, plug connections, seals or hoses.

11.5 Care and maintenance of the wheels

Aluminium wheels are not coated. The alloy which is used is highly corrosion-resistant and exhibits minimal oxidation. However, certain environmental influences such as alkaline materials and chlorides may lead to corrosion.

Regular cleaning

Wash the wheels regularly using steam or high-pressure cleaners. Mild cleaning additives are recommended. Do not use alkaline or acidic cleaning agents.

Avoid misuse

A lack of care when changing tyres, sharp impacts on the wheel rim flange, overloading or running against kerbs may damage the wheel.

Do not repair the wheels.

Alloy must not be heated to carry out straightening work or other repairs. The aluminium alloy is heat-treated and any uncontrolled heating reduces its strength.

- ▷ Aluminium wheels must not be welded under any circumstances.

12 TROUBLESHOOTING

12.1 Remedying faults

Faults and defects must be remedied by a qualified workshop. Convair Engineering recommends a Convair Service Support Centre for this purpose.

A local support centre can be found in the enclosed address list.

Also follow the component manufacturers' instruction manuals in the event of malfunctions.

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13 SHUTDOWN

13.1 Temporary shutdown

If the tanker is not going to be used for several months the valves, butterfly valves, seals and seal seats must be preserved. This prevents the components from sticking and seizing up. Open all pinch valves to avoid permanent deformation (“plastic memory”) of the sleeves.

After a break in operation, check that these components function and seal properly.

13.2 Decommissioning and disposal

Except for smaller components, the tanker is made from materials that are recyclable or can be properly disposed of without a hazard being posed to the environment.

The tanker must be decommissioned and disposed of by a suitable qualified expert enterprise.

14 SPARE PARTS

14.1 Spare parts

The Convair spare parts book provides an overview of the spare parts that can be supplied along with order numbers, repair instructions and a list of service points with contact addresses.

Spare parts can also be ordered online from Convair Engineering at https://convair.com.au

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15 CHECKLISTS

15.1 List of other relevant instruction manuals

For components integrated into 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 manufacturers' documents and adhere to the inspection and service intervals specified therein.

Instruction manual
Axles
Towing vehicle instruction manual
WABCO
Compressor
Semi-trailer coupling
Trailer support

15.2 Driver instructions

Confirm the instruction points that are relevant to you and your tanker.

15.2.1 Chassis	Instruction
Lights	
Brakes ▪ **Control console**	
Spare wheel bracket	
Fire extinguisher	
Wheel chock	
Steering axle	
Lifting axle	
Air suspension	
Side guard	
Trailer support	
Semi-trailer supply connections ▪ **Brakes / air reservoir** ▪ **Duo-Matic** ▪ **ABS/EBS** ▪ **Electrical equipment**	
Toolboxes / stowage compartments	
Kingpin and rubbing plate	

15.2.2 Tank	Instruction
Top air stop valve	
Outlet connection	
Hatch	
Dangerous goods signs	
Safety railing	
Compressor coupling	
Air manifold	
Material connection ▪ TL coupling ▪ STORZ coupling ▪ Hose coupling ▪ Butterfly valve	
Stowage pipes	
Pressure relief valve	

15.2.3 Optional equipment	Instruction
Air outlet valve	
Filling and unloading lines	
Filler couplings	
Inerting system	
Compressor	
Vibrator	
Vacuum valve	
Brake wear indicator	

15.2.4 Safety equipment	Instruction
ADR plates	
Fire extinguisher	
Safety railing, folding ladder	
Equipotential conductor (earthing) (option)	
Pressure relief valve	
Vacuum valve (option)	

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15.2.5 Tank operation	Instruction
Outlet connection with material line/manifold and material coupling	
Loading ▪ **Gravity** ▪ **Compressed air**	
Hatches and locks	
Unloading ▪ **Gravity** ▪ **Compressed air**	
Cleaning	

15.2.6 Inspection intervals	Instruction
Tank	
Chassis / SP (expert check) / HU (adept check)	

15.2.7 Confirmation of instruction and handover

Date: _____

Chassis number: _____

Tank serial number: _____

_____

Instructor's signature **Driver's signature**

APPENDIX 1: Pre-start check list

- ☐ Is the trailer coupling properly locked and secured?
- ☐ Are the trailer landing legs retracted and the crank handle(s) secured?
- ☐ Is the air suspension levelling valve in 'DRIVE' position (where fitted)?
- ☐ Are the air suspension bellows free of creases and undamaged?
- ☐ Is the spare wheel attached and secured?
- ☐ Are all tyres in roadworthy condition and inflated to the correct pressure?
- ☐ Are all mudguards and mudflaps present and in roadworthy condition?
- ☐ Is the hubometer working? Record its reading at the start of each shift.
- ☐ Are all air couplings, electrical trailer- and EBS cables in good condition, and connected and secured at either end between the truck and trailer?
- ☐ Is the lighting and signalling system working and are all lenses in good condition?
- ☐ Are all toolboxes and other accessories secured?
- ☐ Are the ladder and the walkway clear of all objects and are all access ladders folded away and secured?
- ☐ Are there no leaks on the handrail air rams?
- ☐ Is the safety railing or handrail folded down?
- ☐ Do any pneumatic (auto) hatches open and close properly when operated by the control switches?
- ☐ Are the hatch seals clean and in good condition?
- ☐ Are there no cracks, signs of stress or corrosion on the pipework, -tank vessel, and front- and rear frames?
- ☐ Are there no soft spots-, tears- or chafing along air supply- and product discharge hoses?
- ☐ Are all camlock fittings and camlock seals in good condition?
- ☐ Do each lever arm on all camlock fittings have a safety pin or self-locking mechanism?
- ☐ Are all hose clamps in good condition, secured and tight?
- ☐ Are all air supply- and product discharge hoses stowed securely and are the hose tube latches in good condition?
- ☐ Are vented dust caps secured on the product discharge connection and on the air inlet connection?
- ☐ Is the pressure relief valve seal intact, and does its pressure relief setting on the label correspond to the tank maximum operating pressure as shown on the tank label?
- ☐ Is the tank pressure gauge reading ZERO, and does it have a red line starting from the tank maximum, operating pressure?
- ☐ Check the operation of pinch valve switches; listen for open/close, confirm no leaks?
- ☐ Are all aeration valves operational?
- ☐ Are all hatches closed and secured?
- ☐ If there is product in the tank, are all discharge valves closed?
- ☐ Is the air dump valve open fully?

DO NOT USE EQUIPMENT THAT IS NOT SAFE!

WARNING

Convair Engineering Pty Ltd ABN 79 058 868 134
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16 CUSTOMER FORM

16.1 Remarks on this instruction manual

This instruction manual describes the standard version dry bulk tanker (Tank semi-trailer instruction manual), plus certain items of optional equipment.

The versions and locations of the components in your dry bulk tanker (Tank semi-trailer instruction manual) and the corresponding operation may deviate from the specifications given herein.

If the function of your dry bulk tanker (Tank semi-trailer instruction manual) deviates fundamentally from the contents of this instruction manual, please inform us.

Instruction manual: **(Title, version)**	**Section**	**Remark**

Please forward this page to:

Convair Engineering Pty Ltd

Fax: +03 9408 7255

Or send an email to:

sales@convair.com.au

16.2 Feedback regarding special events

Convair Engineering has many years of experience in developing, designing and manufacturing containers, tankers and tank vehicles for the Australian market.

The manufacturer nevertheless continuously strives to improve the technical and functional aspects of its products and to implement precautions for optimal operating safety.

Our customers' experiences are of value to us and can be mutually beneficial.

This customer form therefore offers you the opportunity to provide the manufacturer with information and Convair Engineering will carefully evaluate your wishes, experiences from daily operation or knowledge of problems which have arisen during operation and will integrate these into its design concepts.

Of course, you can also forward the information to us anonymously.

We guarantee that we will treat your data as confidential.

Type of operation	Vehicle component	Event

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