



INSTALLATION INSTRUCTIONS AND OPERATING MANUAL

Translation of the original installation instructions and
operating manual

Transport refrigeration units

Series

DKD 133 / DKD 133-E / DKD 327 / DKD 514 /

FK/TK 3950 / SKD 119 / TK 5950 /

UKD 221 / UKD 109 / UKD 325 / UKD 331

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Keep for future use!

This manual applies to the following transport refrigeration units and series:

Type	Series				
DKD 133	Fresh goods	FK 2320	FK 2321	FK 2620	FK 2621
	Deep freezing	TK 2520	TK 2521		
DKD 133-E	Fresh goods	FK 1120-E			
DKD 327	Fresh goods	FK 2720	FK 2721	FK 2722	FK 2724
		FK 3020	FK 3021	FK 3022	FK 3024
	Deep freezing	TK 2920	TK 2921	TK 2922	TK 2924
		TK 4020	TK 4021	TK 4022	TK 4024
	Deep freezing with dual-chamber units	TF 4120	TF 4124	TF 4220	TF 4224
DKD 514	Fresh goods	FK 4250			
	Deep freezing	TK 5550	TK 8050		
	Deep freezing with dual-chamber units	TF 5650			
FK/TK 3950	Fresh goods	FK 3950	FK 3951	FK 3952	FK 3954
		FK 3950 Pharma	FK 3952 Pharma	FK 3954 Pharma	
	Deep freezing	TK 3950	TK 3951	TK 3952	TK 3954
SKD 119	Fresh goods	FK 2650	FK 2651	FK 2350	FK 2351
	Deep freezing	TK 2550	TK 2551	TK 2850	TK 2851
UKD 109	Fresh goods	FK 1910	FK 2010		
UKD 221	Fresh goods	FK 1800	FK 2000	FK 2001	
UKD 325	Fresh goods	FK 2515			
	Deep freezing	TK 2915			
UKD 331	Fresh goods	FK 3410	FK 3414		
	Deep freezing	TK 4010	TK 4014		

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1 Introduction

This operating manual provides all the information you need to smoothly operate the transport refrigeration unit (hereinafter referred to as device).

All persons responsible for operating, maintaining, cleaning, and troubleshooting the device must read, understand, and heed the operating manual. This applies, in particular, to any safety information.

After reading the operating manual you will be able to

- operate the device safely
- maintain the device according to the rules and regulations
- clean the device according to the rules and regulations
- take the necessary action in the event of a fault

In addition to this operating manual, it is necessary to comply with the general laws and other regulations concerning accident prevention and environmental protection in the country of use. This operating manual must always be kept at the device's point of deployment.

1.1 Notational conventions

Passages of this operating manual that require special attention or are a direct hazard warning are shown as follows:

1.1.1 Section-related safety information

Section-related safety information does not only apply to a certain action but for all actions within the section.

Structure



SIGNAL WORD



Symbol for a more detailed explanation of the danger

Type and source of danger

Possible consequence(s) of non-adherence

- Measure(s) to avoid the danger

Danger levels



DANGER

Hazard which, unless avoided, involves a high risk of death or (serious) injury.



WARNING

Hazard which, unless avoided, may involve a medium risk of death or (serious) injury.

**CAUTION**

Hazard which, unless avoided, may involve a minor or moderate injury.

NOTE

Hazard which, unless avoided, can involve a low risk of material damage.

1.1.2 Embedded warnings

Embedded warnings apply to specific actions and are integrated directly into the action.

Structure

- ⚠ KEY WORD** Type and source of the danger
- Possible consequences of non-adherence
- Measures to avoid the danger

Danger levels

- **⚠** Section-related safety information **DANGER / WARNING / CAUTION** (see section 1.1.1)
- **NOTE** (without warning triangle, see section 1.1.1)

1.1.3 Other symbols



The info symbol provides useful information.

- Text following this mark represents an item in a list.
- Text following this mark describes actions to be performed in the specified order.
- " " Text in double quotation marks refers to other chapters or sections.

1.2 Warranty and liability

The respective valid "General basic warranty conditions of Konvekta AG" apply. You can obtain them from our GWL division: GWL@konvekta.com.

All information in this operating manual has been compiled in line with the applicable standards and regulations, the state of the art, and our longstanding knowledge and experience.

Warranty and liability claims for personal injury and material damage are excluded if they are attributable to one or more of the following causes:

- Unintended or inappropriate use of the device
- Inappropriate installation, commissioning, operation, maintenance or cleaning of the device
- Failure to heed information in the operating manual regarding installation, commissioning, operation, maintenance, and cleaning of the device
- Use of unqualified or inexperienced personnel
- Structural alterations to the device (the device is not allowed to be converted or otherwise altered without prior written permission from Konvekta AG. Any breach of this causes the device to lose its EC Conformity)
- Improperly executed repairs
- Use of non-permitted spare parts or of spare parts that do not satisfy the technically established requirements
- Disasters, effects of extraneous elements and force majeure

We reserve the right to make technical alterations in the course of further development and improvement of features.

1.3 Copyright

This operating manual is protected by copyright and intended for internal use only.

This operating manual or parts thereof must not be passed or disclosed to any third party or be reproduced or exploited in any form without the prior written consent of Konvekta AG except for internal use.

Contravention results in liability for damages. Further claims remain reserved.

1.4 Service/Customer service



Our Customer Service department is at your disposal for any technical queries you may have.

Phone: +49 (0) 66 91 76-124

In addition, our employees are consistently interested in new information and experiences resulting from the application that may be of value in improving our products.

2 Safety



WARNING

Failure to observe the safety information below may have serious consequences:

- Risk to persons due to electrical, mechanical or chemical effects
- Failure of important device functions
- Environmental damage due to leaking hazardous substances

Read the safety and hazard information in this section thoroughly before putting the device into operation.

In addition to the information specified in this operating manual, always comply with general safety and accident prevention regulations.

In addition to the information specified in this operating manual, the plant operator/machine operator must comply with national occupational, health, and safety regulations. It is also important to follow internal rules and regulations.

2.1 Intended use

The operational safety of the device is only ensured if it is used as intended.

The device is only intended for use as a transport refrigeration unit for maintaining the storage temperature of pre-chilled, stored goods and thus to sustain the cold chain.

The device is not intended for use other than as described here; other use counts as inappropriate.

Intended use also includes:

- Observing all information from the operating manual
- Complying with the inspection and maintenance intervals
- Using operating material and auxiliary resources in accordance with applicable safety regulations
- Adhering to the specified operating conditions.

The technical specifications listed in the technical data must be observed without exception.



Only use the device as intended; otherwise there is no guarantee of safe and reliable operation.

It is not the manufacturer but the device operator who is responsible for any and all personal injuries and material damage resulting from unintended use.

2.1.1 Operating conditions

Konvekta AG installs copper and aluminum components in the device that last a lifetime under normal ambient conditions.

However, if the device is operated under aggressive ambient conditions, e.g. air with an extremely high content of salt, phosphate or ammonia, corrosion of the copper and aluminum components cannot be excluded. The copper and aluminum components of the device are not suitable for these extreme operating conditions.

We expressly point out that corrosion is not subject to the liability for material defects. Konvekta AG does not accept liability for material defects in case of corrosion or resulting consequential damage. The same applies to corrosion or damage caused by cleaning the systems with highly compressed or corrosion-promoting substances.

2.1.2 Structural changes

Construction and manufacturer's acceptance are based on the German Product Safety Act (ProdSG). The device is not allowed to be converted or otherwise altered without prior written permission from Konvekta AG.

Any breach of this causes the device to lose its EC Conformity. Such a breach absolves the manufacturer of the device from warranty. This also applies to welding work on load-bearing parts.

Any parts not in a perfect state must be replaced immediately.

Use original spare/wearing/accessory parts only. These parts have been specifically designed for the device. For parts from other sources there is no guarantee that they have been designed and manufactured in line with load and safety requirements.

Parts and special features not delivered by Konvekta AG have not been released for use with the device.

2.1.3 Foreseeable misuse

Any use exceeding the concept of intended use and/or other use of the device can lead to severe injuries.

- Only use the device for its intended purpose.

The following operating conditions are classed as misuse:

- Operation as an air-conditioning system for air conditioning the driver's seat or passenger seats without special equipment and safety devices.
- Use of the fresh goods unit as a deep-freezing unit.
- Operation outside the permissible technical limit values.
- Non-observance of the safety data sheet for the refrigerant.
- Operation of the transport refrigeration unit in standby mode at non-commercial 230V or 400V power networks without integrated circuit interrupter (GFCI 30mA release current).
- Non-observance of and non-compliance to the relevant legal regulations and provisions applicable at the respective location.

2.2 Personnel requirements

The device is only allowed to be operated, maintained, and repaired by persons who have been qualified and/or trained for this. These persons must know the operating manual and act in accordance with it. The respective authorisations for personnel must be defined clearly.

Personnel require the following qualifications for the various activities:

Personnel requiring training

Personnel requiring training, such as trainees or temporary workers, are not aware of all hazards that operation of the device can entail. They are only allowed to work on the device under the supervision of qualified and instructed personnel.

Instructed personnel

Instructed personnel have been instructed by the plant operator or by qualified personnel about their tasks and the potential risks of inappropriate behavior.

Qualified personnel

Qualified personnel are able to do their work and recognize/avoid potential hazards on their own as a result of their training, knowledge and experience and their familiarity with regulations.

Refrigeration specialists

Refrigeration specialists (specialists or mechatronics technicians for refrigeration technology) are able to plan, install, and maintain refrigeration equipment and units as a result of their training, knowledge, and experience. They can recognize and avoid potential hazards on their own.

Electrical specialists

Electrical specialists are able to work on electrical equipment and recognize/avoid potential hazards on their own as a result of their training, knowledge and experience and their familiarity with standards and regulations.

Electrical specialists have been trained for their specific point of deployment and know the relevant standards and regulations.

2.2.1 Responsibilities

Inappropriate handling can lead to severe personal injury and material damage.

All activities must therefore be carried out by qualified personnel only.

- Personnel must consist of individuals who can be expected to perform their work reliably. Individuals whose response is impaired by drugs, alcohol, medication, and the like must not work on the device.
- All persons working on the device must read the operating manual and confirm with their signature that they have understood it.
- Initially, personnel requiring training are only allowed to work on the device under the supervision of qualified personnel. The completion and success of instruction must be confirmed in writing.

The plant operator is responsible for training and instructing personnel.

2.2.2 Obligations of personnel

Before working on or with the device, all persons undertake the following:

- To comply with basic regulations concerning health, safety, and accident prevention
- To read the safety information and warnings in this operating manual and to confirm with their signature that they have understood the issues

2.2.3 Unauthorized persons

Unauthorized persons who do not have the required qualifications are not aware of the hazards in the work area.

- Keep unauthorized persons away from the work area.
- Address persons in case of doubt and eject them from the work area if applicable.
- Interrupt work while any unauthorized persons are in the work area.

2.2.4 Instruction

Personnel must receive regular instruction from the plant operator. Keep a record of all instructions given in order to keep track of matters.

Date	Name	Type of instruction	Instruction given by	Signature

2.3 General safety information

- Always read and understand the operating manual before operating and maintaining the device.
- Only use the device for its intended purpose (see section "2.1 Intended use").
- Refrain from any act which is likely to compromise the health and safety of people and safe operation of the device.
- Do not exceed the technical data (see section "3.1.2 Technical data").
- Keep all safety and danger signs on the device clean and renew them if necessary.
- Only qualified or trained personnel are allowed to work on the device (see section "2.2 Personnel requirements").
- Take the device out of operation immediately if a fault occurs. Have faults rectified by appropriately trained specialists or by Konvekta AG.
- Always keep the operating manual at the device's point of deployment. It must be ensured that all personnel working on the device can view the operating manual at all times.

2.4 Safety measures for environment protection

In all work obey the regulations for waste avoidance and proper waste disposal/recycling. In the course of installation, maintenance, and decommissioning, in particular, it must be ensured that materials that could jeopardize the groundwater – such as greases, oils, refrigerants, solvent-containing cleaning fluids, and the like – do not pollute the ground or enter sewage systems. These materials must be caught, kept and transported in suitable containers and disposed of in compliance with national regulations.

2.5 Special hazard signs

2.5.1 Symbols used on the device



Fatal injury hazard due to electricity

This symbol warns of a life-threatening electrical hazard. Touching live parts poses a direct risk of death.



Keep all safety and danger signs on the device clean and renew them if necessary.

2.5.2 Hazards due to electricity



There is a hazard of electric shock from contact with live parts.

- Make sure electrical components are always fully closed.
- Work at electrical equipment should only be carried out by electrical specialists who, as a result of their training, knowledge and experience, are able to recognize and avoid potential hazards.
- Observe the five golden safety rules:
 1. Disconnect completely
 2. Secure against reconnection
 3. Verify that it is disconnected
 4. Carry out grounding and short circuiting
 5. Protect against live parts



An electric shock may have a number of secondary effects that lead to additional injury (e.g. falling if working at height).

- Always observe the five golden safety rules when working on electrical equipment.
- Only electrical specialists are allowed to work on the electrical equipment.
- Before working on electrical equipment, switch off the device and prevent unexpected restoration of power.
- Only electrical specialists are allowed to work on the electrical equipment.
- Prior to commissioning, check the unit according to DIN EN 60204-1.
- Regularly check the electrical equipment for defects such as loose connections or scorched cables. Have any defects rectified immediately.
- Have the electrical equipment and fixed electrical apparatuses tested by an electrical specialist according to DIN EN 60204-1 every 4 years at the latest.
- Fixed electrical apparatuses are permanently installed apparatuses or apparatuses that do not offer any carrying device and which, due to their weight, are difficult to move. This also includes electrical equipment that is fitted on a temporary basis and operated using movable device cabling.
- Have portable electrical equipment and extension and device cabling with plugs and sockets tested by an electrical specialist, or by a trained person using suitable inspection facilities, every 6 months or after 1 year at the latest.
- Equipment is portable if, by its nature and in its normal use, it is moved while under power. This includes, for example, electric floor cleaners.
- Alterations made after testing must comply with DIN EN 60204-1.
- Check proper functioning of all the device's safety devices regularly.
- Only use original fuses.
- Always keep the control cabinet doors locked.
- Have a damaged housing and pipes/hoses/cables repaired or replaced immediately before switching on the station.

2.5.3 Hazards due to hot surfaces

Contact with hot parts can cause burns.

- Always wear protective clothing and protective gloves when working near hot parts.
- Before maintenance and repair work, let all machine components cool down to the ambient temperature.

2.5.4 Hazards due to incorrect spare parts

Incorrect or faulty spare parts may cause damage, malfunctioning or total failure, and may also give rise to safety hazards.

- Use original spare parts only.
- Procure spare parts via Konvekta AG.
The necessary details about spare parts are given in the supplied bills of material or in the section "1.4 Service/Customer service".

2.6 Personal protective equipment

During device operation, always wear personal protective equipment, irrespective of the risk assessment at work, to minimize health hazards.

- Always wear the personal protective equipment required for the respective task when carrying out work.
- In the work area, obey all signs relating to personal protective equipment.

The symbols have the following meaning:



Protective clothing

Protective clothing refers to tight-fitting working clothes that tear easily and feature tight sleeves and no loose parts. They predominantly protect against becoming entangled in moving components.

Never wear rings, necklaces or other jewelry.



Safety shoes

Wear non-slip safety shoes to protect yourself against heavy falling parts and to prevent you from slipping.



Safety gloves

Wear safety gloves to protect your hands against friction, grazes, punctures, deeper wounds, hot surfaces, and chemical substances.



Safety goggles

Wear safety goggles to protect your eyes against media released under high pressure or flying parts.

The personal protective equipment must be provided by the plant operator and must be fit for purpose.

It is also necessary to obey national regulations, the guidelines of the risk assessment at work and, if applicable, the operator's internal instructions.

2.7 Safety devices and guards

- Before switching the device on, always make sure that all safety devices and guards have been fitted properly and are fully functional.
- When sub-components are delivered, the plant operator must ensure that the guards are fitted according to the rules.
- During operation, never bridge or remove safety devices and guards or defeat them in any other way.
- Guards are only allowed to be removed after the device has been switched off and after restoration of power to the device has been prevented.
- Check proper functioning of all the device's safety devices regularly.

2.8 Information for emergencies

Preventive measures

- Always be prepared for accidents or fires.
- Keep first aid equipment (first aid box, blankets etc.) and fire extinguishers at hand.
- Familiarize the personnel with accident reporting, first aid, fire-extinguishing, and rescue equipment.
- Keep access routes for rescue vehicles clear.




Measures in the event of accidents

- Bring persons out of the danger zone.
- In the event of cardiac and/or respiratory arrest, administer first aid immediately.
- If anybody is injured, notify the first aid officer and a paramedic or first responder.
- Clear the access routes for rescue vehicles. If necessary, appoint a member of staff to engage with fire and rescue services upon arrival and to provide them with the appropriate information.
- Extinguish any burning oil/grease with a CO₂ or powder extinguisher.
- Use a CO₂ extinguisher to put out any fire in the electric control system.

3 Description of the transport refrigeration unit

3.1 DKD 133

3.1.1 Overview of the series

	Evaporator variants			
	with driving compressor	with mains compressor for standby mode	Utilization	Refrigerant
	VD 2058			
	FK 2320	FK 2321	Fresh goods	R134a
	TK 2520	TK 2521	Deep freezing	R404A / R452A
	VD 3013			
	FK 2620	FK 2621	Fresh goods	R134a

3.1.2 Technical data

3.1.2.1 Fresh goods with refrigerant R134a



Type	Evaporator	Cooling capacity 30 °C / 0 °C	Standby cooling 30 °C / 0 °C	Vehicle voltage	Line voltage	Heating	Air capacity
FK 2320	VD 2058	2,361 W	—	12 V	—	Option	850 m³/h
FK 2321	VD 2058	2,361 W	1,115 W	12 V	230 V	Option	850 m³/h
FK 2620	VD 3013	2,398 W	—	12 V	—	Option	1,150 m³/h
FK 2621	VD 3013	2,398 W	1,157 W	12 V	230 V	Option	1,150 m³/h

3.1.2.2 Deep freezing with refrigerant R404A / R452A

Type	Evaporator	Cooling capacity 30 °C / 0 °C	Cooling capacity 30 °C / -20 °C	Standby cooling 30 °C / 0 °C	Vehicle voltage	Line voltage	Heating	Air capacity
TK 2520	VD 2058	2,470 W	1,337 W	—	12 V	—	Option	850 m³/h
TK 2521	VD 2058	2,470 W	1,337 W	1,579 W	12 V	230 V	Option	850 m³/h

3.2 DKD 133-E

3.2.1 Overview of the series

	Evaporator variant		
	with driving compressor	Utilization	Refrigerant
	VD 1013		
	FK 1120-E	Fresh goods	R134a







3.2.2 Technical data

3.2.2.1 Fresh goods with refrigerant R134a

Type	Evaporator	Cooling capacity mobile cooling 30 °C / 0 °C	Cooling capacity mobile cooling 30 °C / 0 °C	Current draw at 12 V	Alternator 12 V minimum	Battery minimum	Air capacity
FK 1120-E	VD 1013	1,100 W	1,000 W	65 A	125 A	90 AH	430 m ³ /h

3.3 DKD 327

3.3.1 Overview of the series

	Evaporator variants					Utilization	Refrigerant
	with driving compressor	with mains compressor for standby mode					
		F/S 12-230 V standard	F/S 12-230 V reinforced	F/S 12-400 V reinforced			
	VD 3031						
	FK 2720	FK 2721	FK 2722	FK 2724	Fresh goods	R134a	
	TK 2920	TK 2921	TK 2922	TK 2924	Deep freezing	R404A / R452A	
	VD 4015						
	FK 3020	FK 3021	FK 3022	FK 3024	Fresh goods	R134a	
	TK 4020	TK 4021	TK 4022	TK 4024	Deep freezing	R404A / R452A	
	Dual chamber variants				Utilization	Refrigerant	
	with driving compressor	with mains compressor for standby mode					
		F/S 12 - 400 V reinforced					
	VD 2058 and VD 3013						
	TF 4120		TF 4124		Fresh goods/ deep freezing	R404A / R452A	
	2 x VD 3013						
	TF 4220		TF 4224		Fresh goods/ deep freezing	R404A / R452A	

3.3.2 Technical data

3.3.2.1 Fresh goods with refrigerant R134a

Type	Evaporator	Cooling capacity 30 °C / 0 °C	Standby cooling 30 °C / 0 °C	Vehicle voltage	Line voltage	Heating	Air capacity
FK 2720	VD 3013	2,700 W	—	12 V	—	Option	1,150 m ³ /h
FK 2721	VD 3013	2,700 W	1,350 W	12 V	—	—	1,150 m ³ /h
FK 2722	VD 3013	2,700 W	1,900 W	12 V	230 V	Option	1,150 m ³ /h
FK 2724	VD 3013	2,700 W	1,900 W	12 V	400 V	Option	1,150 m ³ /h
FK 3020	VD 4015	3,327 W	—	12 V	—	Option	1,850 m ³ /h
FK 3021	VD 4015	3,327 W	1,115 W	12 V	230 V	Option	1,850 m ³ /h
FK 3022	VD 4015	3,327 W	1,855 W	12 V	230 V	Option	1,850 m ³ /h
FK 3024	VD 4015	3,327 W	1,855 W	12 V	400 V	Option	1,850 m ³ /h

3.3.2.2 Deep freezing with refrigerant R404A / R452A (evaporator variants)

Type	Evaporator	Cooling capacity 30 °C / 0 °C	Cooling capacity 30 °C / -20 °C	Standby cooling 30 °C / 0 °C	Vehicle voltage	Line voltage	Heating	Air capacity
TK 2920	VD 3013	2,976 W	1,560 W	—	12 V	—	Option	1,150 m ³ /h
TK 2921	VD 3013	2,976 W	1,560 W	1,350 W	12 V	230 V	—	1,150 m ³ /h
TK 2922	VD 3013	2,976 W	1,560 W	2,448 W	12 V	230 V	Option	1,150 m ³ /h
TK 2924	VD 3013	2,976 W	1,560 W	2,429 W	12 V	400 V	Option	1,150 m ³ /h
TK 4020	VD 4015	3,664 W	2,098 W	—	12 V	—	Option	1,850 m ³ /h
TK 4021	VD 4015	3,664 W	2,098 W	1,350 W	12 V	230 V	—	1,850 m ³ /h
TK 4022	VD 4015	3,664 W	2,098 W	2,554 W	12 V	230 V	Option	1,850 m ³ /h
TK 4024	VD 4015	3,664 W	2,098 W	2,554 W	12 V	400 V	Option	1,850 m ³ /h

3.3.2.3 Deep freezing with refrigerant R404A / R452A (dual chamber variants)

Type	Evaporator	Cooling capacity 30 °C / 0 °C	Cooling capacity 30 °C / -20 °C	Standby cooling 30 °C / 0 °C	Vehicle voltage	Line voltage	Heating	Air capacity
TF 4120	VD 3013 VD 2058	4,100 W	1,900 W	—	12 V	—	—	1,800 m ³ /h
TF 4124	VD 3013 VD 2058	4,100 W	1,900 W	2,200 W	12 V	400 V	—	1,800 m ³ /h
TF 4220	2x VD 3013	4,200 W	2,250 W	—	12 V	—	—	2,200 m ³ /h
TF 4224	2x VD 3013	4,200 W	2,250 W	2,600 W	12 V	400 V	—	2,200 m ³ /h

3.4 DKD 514

3.4.1 Overview of the series

		Evaporator variants			
		with driving compressor	with mains compressor for standby mode	Utilization	Refrigerant
		F/S 12-400 V reinforced			
VD 4015					
	FK 4250	12 V	FK 4250	Fresh goods	R134a
		24 V			
	TK 5550	12 V	TK 5550	Deep freezing	R404A / R452A
		24 V			
2 x VD 4015					
	TK 8050	24 V	TK 8050	Deep freezing	R404A / R452A
		Dual chamber variants			
		with mains compressor for standby mode	Utilization	Refrigerant	
		F/S 12 - 400 V reinforced			
VD 4015 and VD 3016					
	TF 5650 12-400 V		Fresh goods/ deep freezing	R404A / R452A	
	TF 5650 24-400 V				

3.4.2 Technical data

3.4.2.1 Fresh goods with refrigerant R134a

Type	Evaporator	Cooling capacity 30 °C / 0 °C	Standby cooling 30 °C / 0 °C	Vehicle voltage	Line voltage	Heating	Air capacity
FK 4250	VD 4015	4,200/4,400* W	—	12 V	—	Option	1,850 m ³ /h
FK 4250	VD 4015	4,200/4,400* W	—	24 V	—	Option	2,450 m ³ /h
FK 4250	VD 4015	4,200/4,400* W	2,400 W	12 V	400 V	Option	1,850 m ³ /h
FK 4250	VD 4015	4,200/4,400* W	2,400 W	24 V	400 V	Option	2,450 m ³ /h

*Compressor 215 cm³

3.4.2.2 Deep freezing with refrigerant R404A / R452A (evaporator variants)

Type	Evaporator	Cooling capacity 30 °C / 0 °C	Cooling capacity 30 °C / -20 °C	Standby cooling 30 °C / 0 °C	Vehicle voltage	Line voltage	Heating	Air capacity
TK 5550	VD 4015	4,200/5,240* W	2,150/2,820* W	—	12 V	—	Option	1,850 m ³ /h
TK 5550	VD 4015	4,200/5,240* W	2,150/2,820* W	—	24 V	—	Option	2,450 m ³ /h
TK 5550	VD 4015	4,200/5,240* W	2,150/2,820* W	3,600 W	12 V	400 V	Option	1,850 m ³ /h
TK 5550	VD 4015	4,200/5,240* W	2,150/2,820* W	3,600 W	24 V	400 V	Option	2,450 m ³ /h
TK 8050	2 x VD 4015	7,700/8,100* W	3,000/4,100* W	3,600 W	24 V	400 V	Option	4,900 m ³ /h

*Compressor 215 cm³


3.4.2.3 Deep freezing with refrigerant R404A / R452A (dual chamber variants)


Type	Evaporator	Cooling capacity 30 °C / 0 °C	Cooling capacity 30 °C / -20 °C	Standby cooling 30 °C / 0 °C	Vehicle voltage	Line voltage	Heating	Air capacity
TF 5650	VD 3016 VD 4015	4,200/5,300* W	2,150/3,030* W	3,600 W	12 V	400 V	—	1,850 m ³ /h
TF 5650	VD 3016 VD 4015	4,200/5,300* W	2,150/3,030* W	3,600 W	24 V	400 V	—	2,450 m ³ /h

*Compressor 215 cm³

3.5 FK/TK 3950 and TK 5950

3.5.1 Overview of the series

	Evaporator variants				
	with mobile compressor	with mains compressor for standby mode		Utilization	Refrigerant
	FK 3950	FK 3951	230 V	Fresh goods	R134a
		FK 3952	230 V reinforced		
		FK 3954	400 V reinforced		
	FK 3950 Pharma	FK 3952 Pharma	230 V reinforced	Pharmaceutical goods	R134a
		FK 3954 Pharma	400 V reinforced		
	TK 3950	TK 3951	230 V	Deep freezing	R404A / R452A
		TK 3952	230 V reinforced		
		TK 3954	400 V reinforced		
	TK 5950			Deep freezing	R404A / R452A

	Dual chamber variants				
	with driving compressor	with mains compressor for standby mode		Utilization	Refrigerant
	FK 3950	FK 3952	230 V reinforced	Fresh goods	R134a
		FK 3954	400 V reinforced		
	FK 3950 Pharma	FK 3952 Pharma	230 V reinforced	Pharmaceutical goods	R134a
		FK 3954 Pharma	400 V reinforced		
	TK 3950	TK 3952	230 V reinforced	Deep freezing	R404A / R452A
		TK 3954	400 V reinforced		

3.5.2 Technical data

3.5.2.1 Fresh goods with refrigerant R134a



Type	Cooling capacity 30 °C / 0 °C	Standby cooling 30 °C / 0 °C	Vehicle voltage	Line voltage	Heating	Dual chamber	Air capacity
FK 3950	3,327 W	—	12 V / 24 V	—	Option	Option	2,120 m³/h
FK 3951	3,327 W	1,350 W	12 V / 24 V	230 V	Option	—	2,120 m³/h
FK 3952	3,327 W	1,855 W	12 V / 24 V	230 V reinforced	Option	Option	2,120 m³/h
FK 3954	3,327 W	1,855 W	12 V / 24 V	400 V reinforced	Option	Option	2,120 m³/h
FK 3950 Pharma	3,000 W	—	12 V	—	Water heater	Option	2,120 m³/h
FK 3952 pharma	3,000 W	1,855 W	12 V	230 V reinforced	Water heater	Option	2,120 m³/h
FK 3954 Pharma	3,000 W	1,855 W	12 V	400 V reinforced	Water heater	Option	2,120 m³/h

3.5.2.2 Deep freezing with refrigerant R404A / R452A

Type	Cooling capacity 30 °C / 0 °C	Standby cooling 30 °C / 0 °C	Vehicle voltage	Line voltage	Heating	Dual chamber	Air capacity
TK 3950	3,676 W	1,927 W	—	12 V / 24 V	—	Option	2,120 m³/h
TK 3951	3,676 W	1,927 W	1,800 W	12 V / 24 V	230 V	Option	—
TK 3952	3,676 W	1,927 W	2,676 W	12 V / 24 V	230 V reinforced	Option	2,120 m³/h
TK 3954	3,676 W	1,927 W	2,676 W	12 V / 24 V	400 V reinforced	Option	2,120 m³/h

3.6 SKD 119

3.6.1 Overview of the series

	Evaporator variants			
	with driving compressor	with mains compressor for standby mode	Utilization	Refrigerant
	VD 2058			
	FK 2350	FK 2351	Fresh goods	R134a
	TK 2550	TK 2551	Deep freezing	R404A / R452A
	VD 3013			
	FK 2650	FK 2651	Fresh goods	R134a
	TK 2850	TK 2851	Deep freezing	R404A / R452A

3.6.2 Technical data

3.6.2.1 Fresh goods with refrigerant R134a




Type	Evaporator	Cooling capacity 30 °C / 0 °C	Standby cooling 30 °C / 0 °C	Vehicle voltage	Line voltage	Heating	Air capacity
FK 2350	VD 2058	2,361 W	—	12 V	—	Option	850 m³/h
FK 2351	VD 2058	2,361 W	1,115 W	12 V	230 V	Option	850 m³/h
FK 2650	VD 3013	2,398 W	—	12 V	—	Option	1,150 m³/h
FK 2651	VD 3013	2,398 W	1,157 W	12 V	230 V	Option	1,150 m³/h

3.6.2.2 Deep freezing with refrigerant R404A / R452A

Type	Evaporator	Cooling capacity 30 °C / 0 °C	Cooling capacity 30 °C / -20 °C	Standby cooling 30 °C / 0 °C	Vehicle voltage	Line voltage	Heating	Air capacity
TK 2550	VD 2058	2,470 W	1,337 W	—	12 V	—	Option	850 m³/h
TK 2551	VD 2058	2,470 W	1,337 W	1,579 W	12 V	230 V	Option	850 m³/h
TK 2850	VD 3013	2,821 W	1,767 W	—	12 V	—	Option	1150 m³/h
TK 2851	VD 3013	2,821 W	1,767 W	1,678 W	12 V	230 V	Option	1150 m³/h

3.7 UKD 109

3.7.1 Overview of the series




	Evaporator variants			
	with driving compressor	with mains compressor for standby mode	Utilization	Refrigerant
	VD 1013			
	FK 1910	FK 1910	Fresh goods	R134a
	VD 2058			
	FK 2010	FK 2010	Fresh goods	R134a

3.7.2 Technical data

Type	Evaporator	Cooling capacity 30 °C / 0 °C	Standby cooling 30 °C / 0 °C	Vehicle voltage	Line voltage	Heating	Air capacity
FK 1910	VD 1013	1,971 W	-	12 V	-	optional	430 m ³ /h
FK 1910	VD 1013	1,971 W	800 W	12 V	230 V	optional	430 m ³ /h
FK 2010	VD 2058	2,000 W	-	12 V	230 V	optional	850 m ³ /h
FK 2010	VD 2058	2,000 W	1,049 W	12 V	230 V	optional	850 m ³ /h

3.8 UKD 221

3.8.1 Overview of the series

	Evaporator variants			
	with driving compressor	with mains compressor for standby mode	Utilization	Refrigerant
	VD 1013			
	FK 1800		Fresh goods	R134a
	VD 2058			
	FK 2000	FK 2001	Fresh goods	R134a



3.8.2 Technical data

3.8.2.1 Fresh goods with refrigerant R134a

Type	Evaporator	Cooling capacity 30 °C / 0 °C	Standby cooling 30 °C / 0 °C	Vehicle voltage	Line voltage	Heating	Air capacity
FK 1800	VD 1013	1,718 W	-	12 V	-	Option	430 m ³ /h
FK 2000	VD 2058	2,044 W	-	12 V	-	Option	850 m ³ /h
FK 2001	VD 2058	2,044 W	1,049 W	12 V	230 V	Option	850 m ³ /h

3.9 UKD 325

3.9.1 Overview of the series

	Evaporator variants			
	with driving compressor	with mains compressor for standby mode	Utilization	Refrigerant
	VD 3013			
	FK 2515	FK 2515	Fresh goods	R134a
	TK 2915	TK 2915	Deep freezing	R404A / R452A

3.9.2 Technical data

3.9.2.1 Fresh goods with refrigerant R134a



Type	Evaporator	Cooling capacity 30 °C / 0 °C	Standby cooling 30 °C / 0 °C	Vehicle voltage	Line voltage	Heating	Air capacity
FK 2515	VD 3013	2,690 W	-	12 V	-	optional	1,150 m³/h
FK 2515	VD 3013	2,690 W	1,662 W	12 V	230 V	optional	1,150 m³/h

3.9.2.2 Deep freezing with refrigerant R404A / R452A

Type	Evaporator	Cooling capacity 30 °C / 0 °C	Standby cooling 30 °C / 0 °C	Vehicle voltage	Line voltage	Heating	Air capacity
TK 2915	VD 3013	2,980 W	-	12 V	-	optional	1,150 m³/h
TK 2915	VD 3013	2,980 W	2,200 W	12 V	400 V	optional	1,150 m³/h

3.10 UKD 331

3.10.1 Overview of the series

	Evaporator variants			
	with driving compressor	with mains compressor for standby mode	Utilization	Refrigerant
	VD 4015			
	FK 3410	FK 3414	Fresh goods	R134a
	TK 4010	TK 4014	Deep freezing	R404A /R452A

3.10.2 Technical data

3.10.2.1 Fresh goods with refrigerant R134a

Type	Evaporator	Cooling capacity 30 °C / 0 °C	Standby cooling 30 °C / 0 °C	Vehicle voltage	Line voltage	Heating	Air capacity
FK 3410	VD 4015	3,400 W	-	12 V	-	optional	1,850 m³/h
FK 3414	VD 4015	3,400 W	1,700 W	12 V	230 V	optional	1,850 m³/h

3.10.2.2 Deep freezing with refrigerant R404A / R452A

Type	Evaporator	Cooling capacity 30 °C / 0 °C	Standby cooling 30 °C / 0 °C	Vehicle voltage	Line voltage	Heating	Air capacity
TK 4010	VD 4015	3,800 W	-	12 V	-	optional	1,850 m ³ /h
TK 4014	VD 4015	3,800 W	2,100 W	12 V	400 V	optional	1,850 m ³ /h

4 Transport and storage

The device is delivered to the customer by Konvekta AG or by an authorized transport company.

Terms of transport

Always handle the device with care. During transport, make sure the device is stored safely and cannot be damaged. When transporting several devices at the same time, package each device individually to prevent the devices damaging each other.

The transport company is liable for transport damage.

4.1 Inspection by the recipient on handover

When the device arrives at the customer's plant, it must be inspected for visible shipping damage.

Immediately report any shipping damage to the forwarder.

4.2 Information about transport hazards



WARNING



The following specific hazards may arise during transport of the device:

- Suspended loads can fall, threatening life.
 - Using load handling attachments other than those stated here can lead to severe injury.
 - Protruding edges can cause crushes or cuts.
-
- The device/component is only allowed to be transported by suitably instructed, qualified personnel (certified forklift operators) in compliance with all safety information.
 - When choosing suitable lifting equipment and load handling attachments, always take the weight of the heaviest component into consideration (for weights, see the enclosed device drawing in section "10.1 Attached documents").
 - Wear protective clothing, safety shoes, safety gloves and a helmet during the work.
 - Always get an additional person to secure the transport route.
 - Make sure that nobody is in the transport route or beneath suspended loads.
 - Do not use pipes or add-on parts as attachment points. Transport lugs on parts (e.g. electric motor) are only used to lift the individual parts – not the entire assembly. Only lift the device or the individual components at the intended points (also see section "5.4 Installing components").
 - Always lift the device slowly and carefully to ensure stability and safety.

4.3 Intermediate storage

If the device is not installed directly after delivery, it must be stored carefully in a protected location. The device must be temporarily stored ensuring it is protected against cold, moisture, soiling, and mechanical influences.



No liability will be accepted for damage arising in the event of incorrect storage.

5 Installation

Installation of the transport refrigeration unit is performed exclusively by refrigeration specialists of the authorized service workshops.

5.1 Information about installation hazards



WARNING

Risk of injury when not using the intended attachment points to lift components!

- Only and always use the intended attachment points to lift the device components (see the following sections).



WARNING

Risk of accidents due to incorrect positioning of components!

If, e.g., the steering wheel or the gearshift lever are blocked, a clear view to the front is possibly not provided or the driver's freedom of movement is restricted to such a degree that there is a risk of accidents.

There is a risk of heat build-up within the device if ventilation openings or refrigeration units are covered up. There is a risk of fire.

- Only install the device at locations where it does not restrict use of the vehicle.
- When installing the device, make sure ventilation openings and refrigeration units remain uncovered.

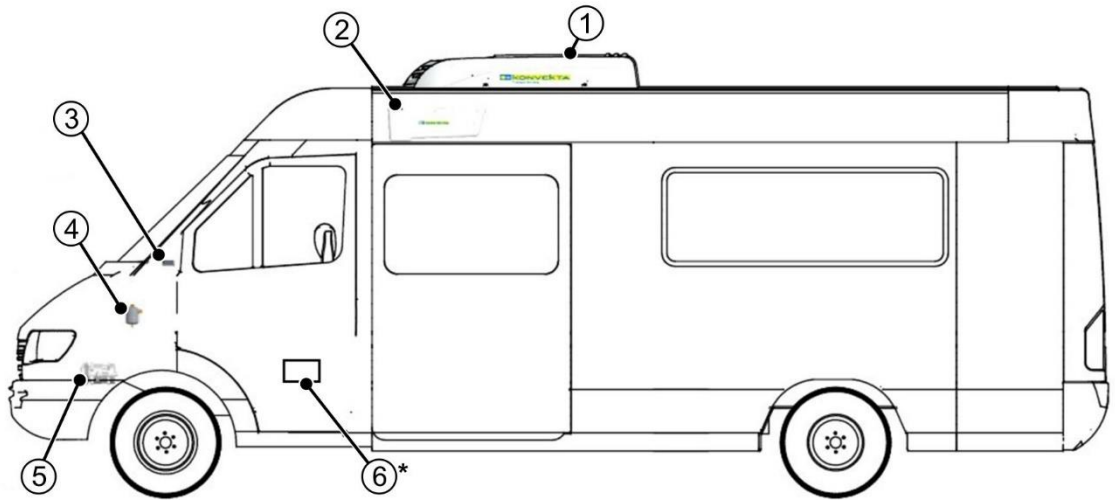
NOTE

If moisture or dust enter the device, it may result in malfunctioning and damage.

- When installing the device, make sure it is protected against excessive moisture and dust.

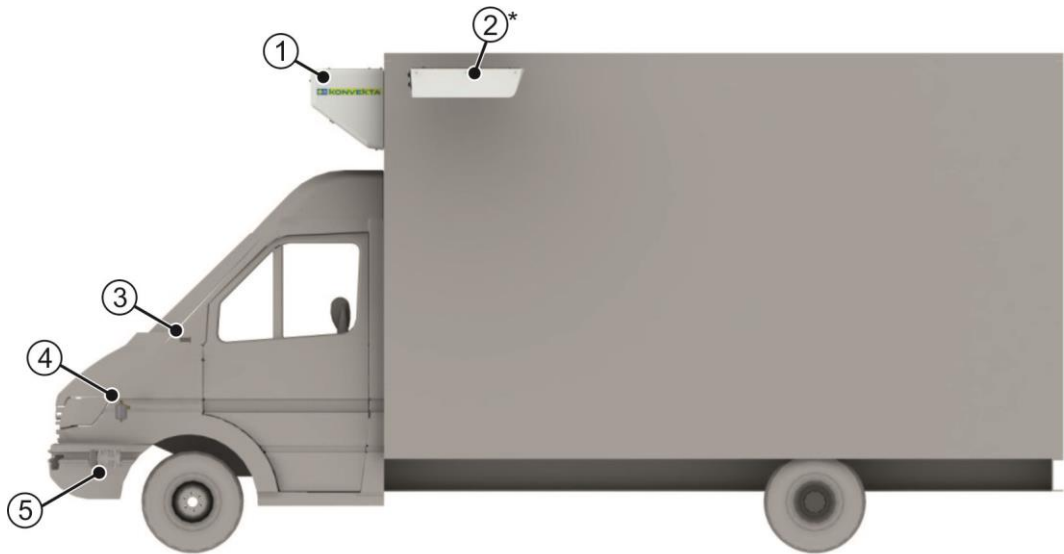
5.2 Installation overview

5.2.1 Roof-mounted condenser (DKD 133, DKD 133 E, DKD 327)



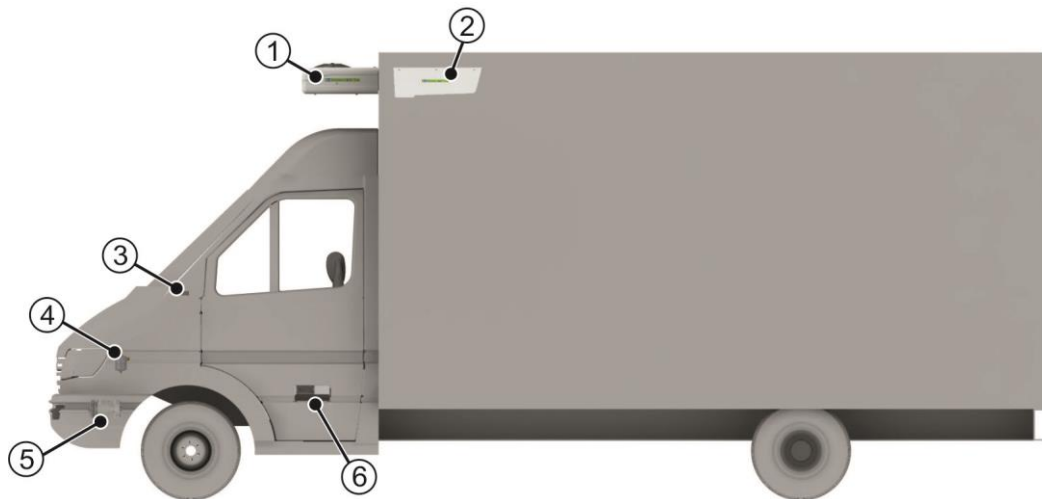
- 1 Roof-mounted condenser
- 2 Evaporator
- 3 Controller
- 4 Oil separator (optional), see point 5.4.8
- 5 Compressor
- 6 Switchbox/Relay board (*only DKD 133)

5.2.2 Front-wall condenser (DKD 514, FK/TK 3950, TK 5950)



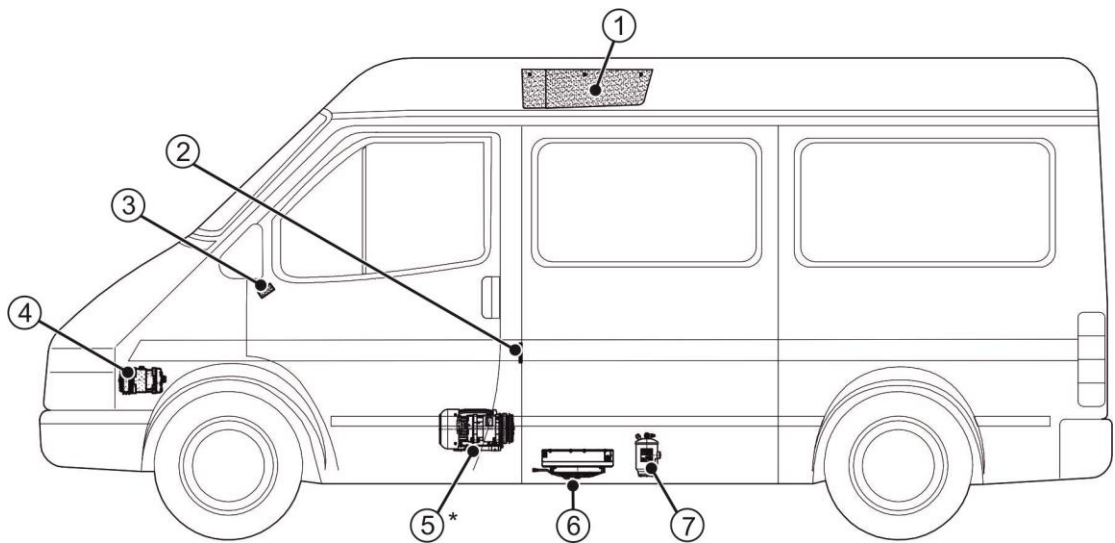
- 1 Front-wall condenser
- 2 Evaporator (*only DKD 514)
- 3 Controller
- 4 Oil separator, see point 5.4.8
- 5 Compressor

5.2.3 Front-wall condenser (SKD 119)



- 1 Front wall condenser
- 2 Evaporator
- 3 Controller
- 4 Oil separator, see point 5.4.8
- 5 Compressor
- 6 Switchbox/Relay board

5.2.4 Underfloor condenser (UKD 109, UKD 221, UKD 325, UKD 331)



- 1 Evaporator
- 2 Switchbox/Relay board
- 3 Controller
- 4 Compressor
- 5 Standby (*only FK1510, FK2010, FK2000, FK2510, FK2515, TK2915, UKD 331)
- 6 Underfloor condenser
- 7 Dryer/Receiver

5.3 Required tools

Besides standard workshop installation tools, the following special tools are to be provided for installation:

Special tools:

- Vacuum pump
- Refrigeration valves and fittings
- V-belt voltmeter
- Hose cutter GT 9006
(Konvekta item no. H99-200-36)
- Pliers FT 1357
(Konvekta item no. H99-200-361)

Special electrical tools:

- Crimping pliers
- Contact insertion tool
- Contact extraction tool

5.4 Installing components



WARNING

Risk of injury caused by falling!

There is a risk of falling from the vehicle roof if unsafe climbing aids (e.g. leaning ladders) are used to install components. Severe injury and fatal accidents may occur.

- Always use suitable working platforms or fall arresters when performing installation work.

5.4.1 Condenser

The condenser is ready for installation.

When leaving the factory, the condenser is filled with nitrogen (approx. 3 bar) as a protective atmosphere. The lines of the refrigeration circuit are sealed with dummy plugs or union nuts.



Make sure the vehicle roof / front wall of the box body are adequately stable to support the weight of the condenser. The weight of the condenser is shown in the enclosed device drawing.

Suitable lifting equipment (e.g. a crane) is necessary to install the condenser.

Before installing the condenser, the corresponding fastening holes for the condenser and the cable entries for the electrical wiring and refrigeration lines must be drilled within the vehicle. The required hole pattern or breakthroughs are shown in the enclosed device drawing.

- **⚠ CAUTION** The protective nitrogen filling escapes at a pressure of 3 bar.
 - Wear protective goggles when working.
 - Carefully remove the dummy plugs or union nuts from the lines of the refrigeration circuit.
- Disassemble the cover prior to installing the condenser:
 - Remove all the screws from the outer surface of the cover.
 - Remove the cover.

The cover must be reassembled before commissioning.

5.4.1.1 Lifting the roof-mounted condenser onto the vehicle

(DKD 133, DKD 133-E, DKD 327)



Device without standby (with driving compressor):

The roof-mounted condenser is fitted with four M6 eye bolts for the lifting procedure.



Device with standby (with mains compressor):

The roof-mounted condenser is fitted with two M6 eye bolts and one hoisting sling at the mains compressor for the lifting procedure

- Fix the roof-mounted condenser to the vehicle roof using six M8-8.8 fastening screws. For the required tightening torque, see Konvekta work instructions tightening torques AA 07 05 01 22 (see section "10.1 Attached documents").

5.4.1.2 Lifting the front-wall condenser onto the vehicle

(DKD 514, FK/TK 3950, TK 5950)



The front-wall condenser is fitted with four M8 eye bolts for the lifting procedure. Remove the assembly supports for the lifting procedure.

- Fix the front-wall condenser to the front wall of the box body using four M10-8.8 fastening screws.

For the required tightening torque, see Konvekta work instructions tightening torques AA 07 05 01 22 (see section "10.1 Attached documents").

(SKD 119)



Device without standby (with driving compressor):

The front-wall condenser is fitted with four M6 eye bolts for the lifting procedure.



Device with standby (with mains compressor):

The front-wall condenser is fitted with two M6 eye bolts and one hoisting sling at the mains compressor for the lifting procedure.

5.4.1.3 Installing the underfloor condenser

The underfloor condenser is installed on the underbody of the vehicle. Drill the necessary holes prior to installation. Pay attention to the drilling pattern (see section "10.1 Attached documents"). Installation of the underfloor condenser should only and always be performed from inside a pit.

5.4.2 Pressure switch

The pressure switch is installed in the roof or front wall unit. With integrated units, the pressure switch must be installed on the receiver / dryer unit.

Pressure switch for deep freezing with refrigerant R404A / R52A: (Konvekta item no.: H11-001-350)

		Off	On
Coupling	Low pressure	0.5 ± 0.2 bar	max. 1.8 bar
	High pressure	25 ± 1.5 bar	18 ± 1.5 bar
Fan		15 ± 1 bar	19 ± 1 bar

Pressure switch for fresh goods with refrigerant R134a (Konvekta item no.: H11-002-333)

		Off	On
Coupling	Low pressure	0.5 ± 0.2 bar	max. 1.8 bar
	High pressure	25 ± 1.5 bar	18 ± 1.5 bar
Fan		9 ± 1 bar	13 ± 1 bar

5.4.3 Evaporator



The FK/TK 3950 series is a compact unit with an already installed external evaporator. For this series, follow the further installation steps starting in section "5.4.3.1".

The evaporator is installed inside the storage area beneath the vehicle roof so that the exhaust air faces the rear door. Drill the necessary holes prior to installation (see the enclosed device drawing in section "10.1 Attached documents").

- Disassemble the cover prior to installing the evaporator:
 - Remove all the screws from the outer surface of the cover.
 - Remove the cover.
 The cover must be reassembled before commissioning.
- Position the evaporator beneath the vehicle roof with the aid of several people or suitable lifting equipment.

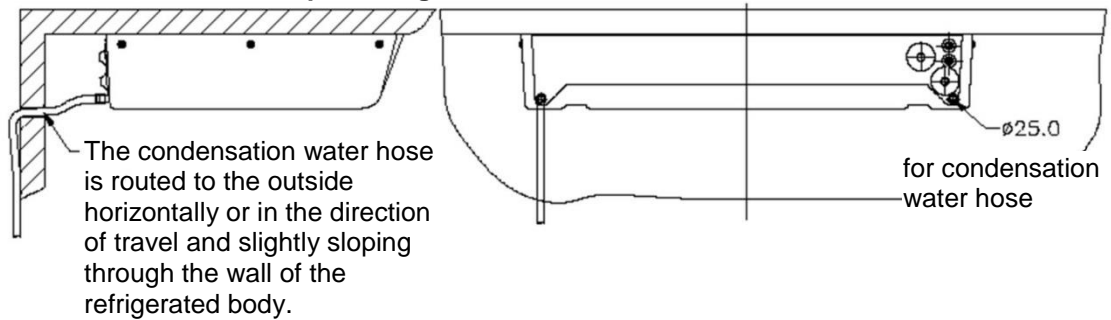
- Fix the evaporator into position using six M8-8.8 fastening screws. For the required tightening torque, see Konvekta work instructions tightening torques AA 07 05 01 22 (see section "10.1 Attached documents").

5.4.3.1 Installing the condensation water drains

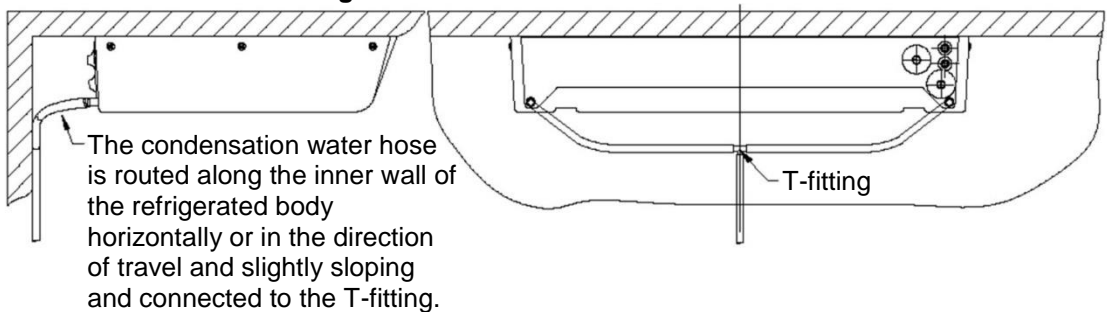
DKD 133, DKD 133-E, DKD 327, DKD 514

The evaporator box is equipped with one condensation drain each on the right and left. The supplied hose must be used for the further condensation water drain. The opening for the water drain through the vehicle insulation occurs beneath the evaporator, and the left and right water drain can be combined in the center. A respective hole should be drilled there. Outside, the water drain must be laid in a way that ensures the condensate can escape with any risk at all. With deep freezing units, the direct route through the vehicle insulation should be selected.

Recommendation for deep freezing:

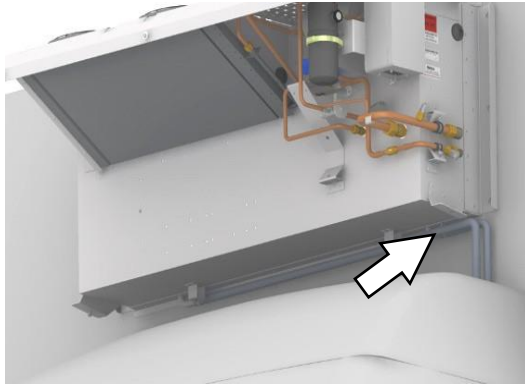


Recommendation for fresh goods:



To prevent freezing and clogging of the water drain, make sure that the hoses are not bent (hoses with wire core) and are laid with a sufficient gradient. For deep freezing, heating for the condensation drain is available (Konvekta item no.: B54-000-806). The water drain must be fixed with clamps at appropriate points and protected against damage. Subsequently insulate the opening in the vehicle wall against moisture and heat exposure.

FK/TK 3950



The evaporator box is equipped with one condensation drain each on the right and left. The supplied hose (see arrow) must be used for the further condensation water drain. Outside, the water drain must be laid in a way that ensures the condensate can escape with any risk at all.

To prevent freezing and clogging of the water drain, make sure that the hoses are not bent (hoses with wire core) and are laid with a sufficient gradient.

For deep freezing, heating for the condensation drain is available (Konvekta item no.: B54-000-806).

The water drain must be fixed with clamps at appropriate points and protected against damage.

5.4.3.2 Installing the temperature sensor

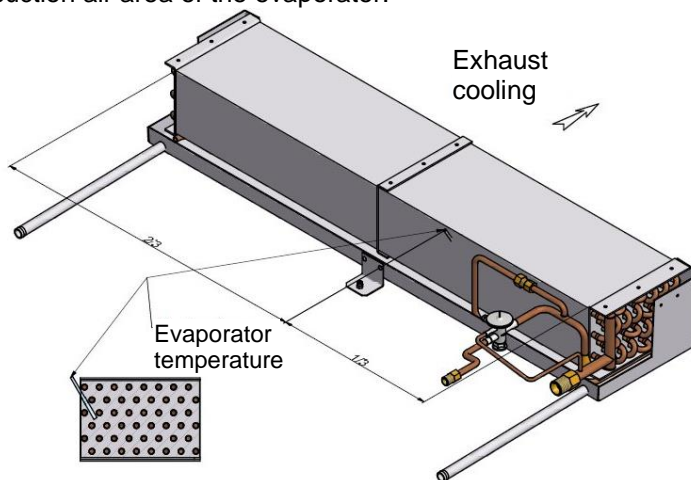
The device is equipped with a room temperature sensor for the cold storage room and an evaporator temperature sensor for controlling temperatures via the controller.



The room and the evaporator temperature sensor have an identical design. To avoid interchanging of the temperature sensors during subsequent connection to the control unit, it is advisable to label them accordingly.

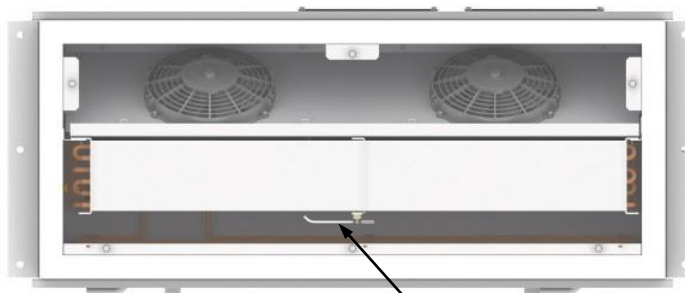
DKD 133, DKD 133-E, DKD 327, DKD 514

Install the room temperature sensor at a suitable location in the cold storage room, in the suction air area of the evaporator.



The evaporator temperature sensor must be inserted between the fins of the evaporator. To do so, the fins are pushed apart slightly, e.g. with a ballpoint pen, and the end of the sensor is inserted.

FK/TK 3950



Room temperature sensor

The room and the evaporator sensor are already assembled and only need to be connected to the controller.

All series

The room and the evaporator sensor must be wired to the controller according to the circuit diagram (also see section "5.4.7 Electric lines").

5.4.4 Mains compressor for standby mode (DKD 133-E)

The required components (BEL-F10STA004) are included in the scope of supply for installation of the standby.

This scope of supply must be installed by an electrical specialist inside the vehicle or in the driver's cab and connected in accordance with the circuit diagram contained in the scope of supply.

This must be checked in accordance with DGUV specification 3 prior to commissioning the device.

Standby



Switching power supply



Mounting plate for electrics



Ground fault circuit interrupter

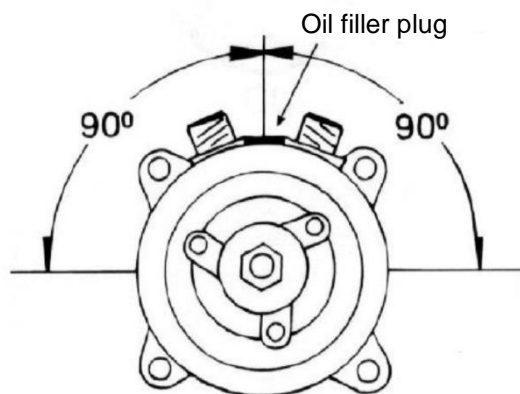
5.4.5 Compressor (DKD 133, DKD 327, DKD 514, FK/TK 3950, SKD 119)

i Installation of the compressor (BKO-...), including compressor support (BKH-...), depends on the vehicle. The required installation instructions are included in the scope of supply.

Install and commission the compressor according to the 'commissioning and installation guideline Sanden air conditioning compressors'. They are included in the enclosed Konvekta document BTD-00681A (see section "10.1 Attached documents").

The respective commissioning and installation guidelines of the manufacturer apply to other air conditioning compressors.

The compressor is installed at the vehicle engine and driven by the said engine via a V-belt. Ensure correct V-belt tension.



The installation position of the compressor can be swiveled to both sides by max. 90° from the vertical position.

i With mains compressor/standby, the oil of the driving compressor must be changed to the oil of the mains compressor. The amount of oil is included in the scope of supply.

The amount of oil of the complete unit must be adjusted according to the filling quantity of the refrigerant. For further information, see the Konvekta document TD000031A (see section "10.1 Attached documents").

NOTE

To prevent leaks at the shaft seals of the compressor:

Start the compressor once every 4 weeks for approx. 15 minutes!

This also applies if the vehicle is not used for a longer period of time or is used without the cooling unit.

5.4.6 Controller FR4.1



Install the controller at a suitable position inside the cab, possibly in the viewing range of the driver. Separate installation instructions are available for the installation of the control unit (see enclosed instructions 110023471AA in section "10.1 Attached documents").

Route the cable in a way ensuring the cable cannot be damaged or vehicle functions impaired. With a tiltable cab, route the supply line via the pivot point.

5.4.7 Electric lines



DANGER



Risk of electrocution!

- Operation of the transport refrigeration unit in standby mode is only permitted at commercial 230V and 400V power networks with integrated circuit interrupter (GFCI 30 mA release current).
- Supply lines from the mains to the transport refrigeration unit must correspond to type H07RN-F with a minimum cross section of 2.5 mm².
- Due to periodic tests, the supply lines are subject to DGUV specification 3.

All electric lines must be routed and connected by electrical specialists. Some lines are live with 400 V AC. Lay the cables in a protective conduit and fix them into position at suitable points on the vehicle frame. Protect them against damage (chafing). When connecting lines, observe the respective strain relief. Subsequently insulate the opening in the vehicle wall against moisture and heat exposure again.

The required circuit diagrams and terminal connections are available in the Service portal on the Konvekta website.

The electric lines of the roof condenser must be adjusted to the respective conditions, routed, and connected appropriately by electrical specialists.

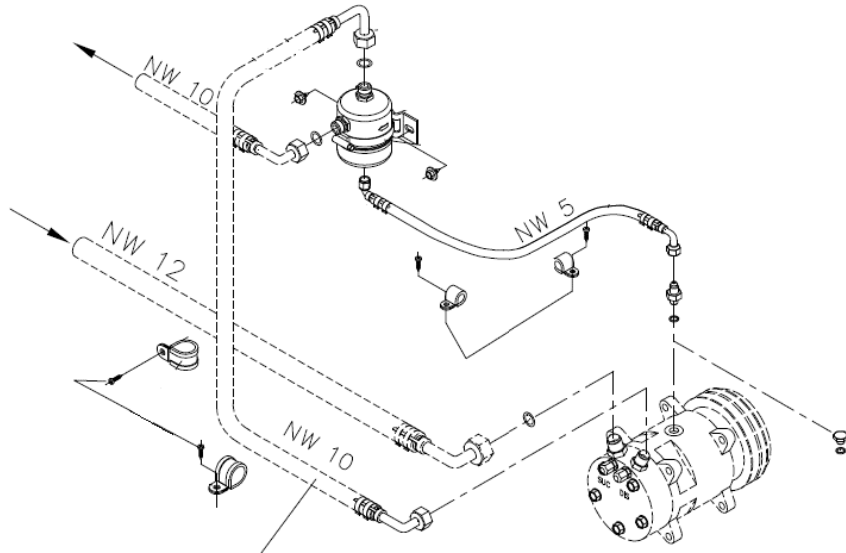
The electric lines of the roof condenser to the evaporator must be routed parallel to the refrigerant lines through the opening in the vehicle wall. The electric lines of the roof condenser to the control unit must be routed parallel to the refrigerant lines.

5.4.8 Oil separator

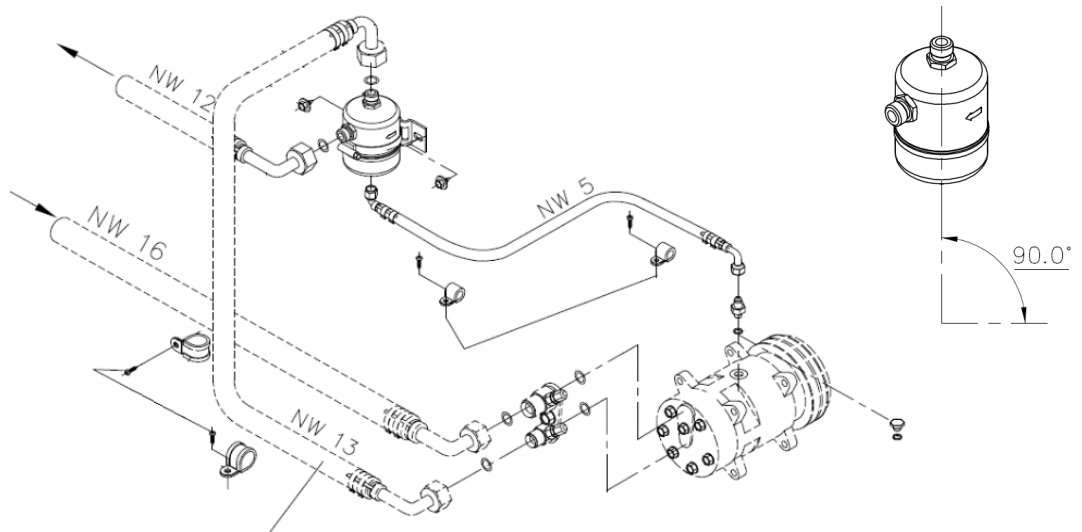
- The oil separator is required for transport refrigeration units with standby as well as deep freezing units. It must be installed above the compressor to ensure the safe return of the oil into the compressor. The oil separator must be filled with the respective refrigerant oil (included in the scope of supply).

Assembly kit for pressure line (exemplary presentation):

- NW10 3/4" O-ring: B54-000-494:



- NW13 7/8" O-ring: B54-000-495



The oil separator must be installed in a vertical position.
For detailed information, see the respective piping diagram for the device.

5.4.9 Switchbox (DKD 133, SKD 119, UKD 109, UKD 221, UKD 325, UKD 331)



The switchbox must be installed and wired **inside the vehicle** for devices with standby. The circuit diagram is available in the Service portal. (see section "10.1 Attached documents").

5.4.10 Refrigerant hoses

5.4.10.1 Piping diagrams

Refrigerant hoses must be installed according to the following piping diagrams:

DKD 133

Piping diagram		Variant
B54-000-702	Mobile	FK 2620
B54-000-703	Mobile / Standby	FK 2621
B54-000-704	Mobile	FK 2320 / TK 2520
B54-000-705	Mobile / Standby	FK 2321 / TK 2521
B54-000-714	Mobile with heating	FK 2620
B54-000-715	Mobile / Standby with heating	FK 2621
B54-000-716	Mobile with heater	FK 2320 / TK 2520
B54-000-717	Mobile / Standby with heating	FK 2321 / TK 2521

DKD 133-E

Piping diagram		Variant
B54-000-785	Mobile	FK 1120-E

DKD 327

Piping diagram		Variant
B54-000-641	Mobile	TF 4220 (dual chamber)
B54-000-642	Mobile	FK 3020 / TK 4020 with heating
B54-000-643	Mobile	FK 2720 / TK 2920 with heater
B54-000-644	Mobile / Standby	FK 3021-3024 / TK 4021-4024
B54-000-645	Mobile / Standby set	FK 2721-2724 / TK 2921-2924
B54-000-649	Mobile / Standby set with heater	FK 2721-2724 / TK 2921-2924
B54-000-650	Mobile / Standby set with heater	FK 3021-3024 / TK 4021-4024
B54-000-652	Mobile	FK 3020 / TK 4020
B54-000-653	Mobile	FK 2720 / TK 2920
B54-000-660	Mobile / Standby	TF 4124 / 4224 (dual chamber mobile /standby S)

DKD 514

Piping diagram		Variant
B54-000-612	Mobile / Standby	TF 5650 dual chamber
B54-000-640	Mobile / Standby set	FK 4250 / TK 5550
B54-000-646	Mobile / Standby	TK 8050

FK 3950 / TK 3950

Piping diagram		Variant
B54-000-665	Mobile / Standby	TK 3950
B54-000-804	Mobile / Standby with generator	TK 3950
B54-000-805	Mobile / Standby with generator	TK 3950
B54-000-813	Mobile / Standby with generator	TK 3950

UKD (integrated units)

Piping diagram		Variant
B54-000-337	Mobile	FK 1510 / 4 + Power
B54-000-338	Mobile / Standby	FK 1510 / 4 + FK 2000 / 4
B54-000-312	Mobile	FK 2510 / 4 F
B54-000-376	Mobile / Standby	FK 2510 / FK 2515 / TK 2915
B54-000-663	Mobile / Standby	UKD 331 + VD 4015
B54-000-689	Mobile	UKD 331 + VD 4015
B54-000-690	Mobile / Standby	FK 1510 / 2010 (standby)

The data are included in the scope of supply or can be found on our website www.konveкта.com under >Service<.

5.4.10.2 Hose assembly**1. Cutting the hose**

- Use hose cutter GT 9006 to cut the hose to the required length.

The cut must take place at a right angle to the axis of the hose.

2. Inserting two clips

- Insert two clips of the respective size into the cut end of the hose.

The orientation of the clips does not influence the performance of the connection. To facilitate installation, the clips should, however, be aligned equally.

3. Oiling the nipple

- Oil the nipple sufficiently with refrigerant oil. This must take place to reduce the force required for nipple installation.

4. Inserting the nipple in the hose

- To ensure that the nipple has been installed fully, check the gap between the end of the hose and the collar of the nipple.
- Do not bend or damage the hose otherwise when inserting it.

5. Installing the bracket

Installation step 5 must be carried out to ensure the following:

- The clips are mounted above the O-rings.
- The connection corresponds to its pressure category.



The arms of the bracket must face in hose direction.

- Let the bracket engage in the nipple groove.

If the bracket has been installed correctly in the nipple groove, it can be rotated relative to the nipple.

6. Installing the clips



- Position the clips via the arms of the bracket in the provided ducts.

7. Connecting the clips



- Use pliers FT 1357 to close the clips. When closing, hold the pliers at a right angle to the clip connection points.



If the pliers are not held at a right angle when closing the clips, the closure may be offset.

Use pliers FT 1357 to correct clip closure.

5.4.11 Filling refrigerant



WARNING

Risk of severe injury due to improper filling!

- Only refrigeration specialists may fill the device.

A minimum reserve of refrigerant oil is available in the refrigerant compressors. The oil of the driving compressor must be changed to the oil of the standby compressor for devices with standby. The required oil is included in the scope of supply. Additionally, the amount of oil must be adjusted to the filling quantity of refrigerant of the complete unit (see the enclosed document TD-00031A in section "10.1 Attached documents") and is filled into the oil separator. A refrigeration valve with pressure gauge is required to fill the refrigeration unit.

6 Commissioning / Operation

6.1 Safety information for commissioning

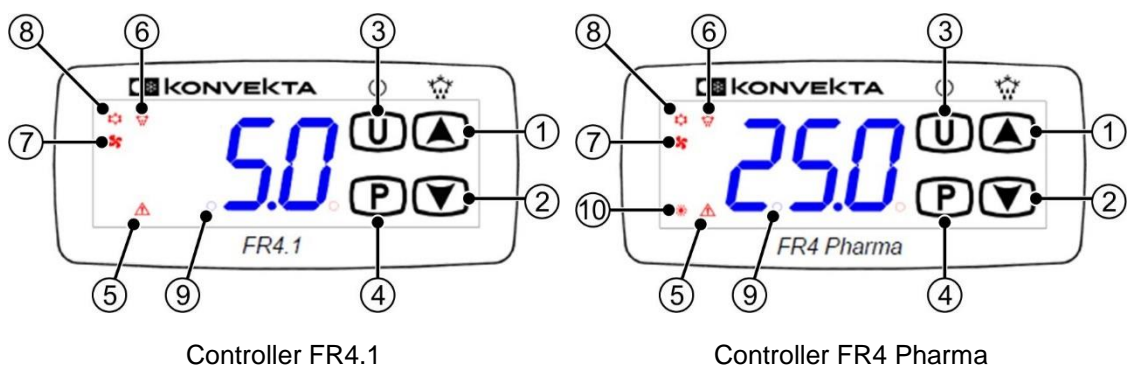
- Prior to each commissioning, thoroughly check the device.
- Prior to commissioning, check the unit according to DIN EN 60204-1.
- Check the device and all corresponding attachment parts such as compressor supports and operating elements for loose parts, wear, cracks, leaks, and intentional damage.
- Never put a faulty device into operation. Ensure that damage is eliminated immediately.
- Make sure that all hoods, covers, and lids are closed and locked and that all possibly attached warning signs are complete and legible.
- Ensure that you can clearly see and read all operating and display elements at all times. Protect displays and other display equipment against direct sunlight or other visual interference sources.
- Make sure that there is nobody on, at or below the vehicle / device. Warn people in the direct vicinity before commissioning the device.

6.2 Safety regulations for starting

- Prior to starting the vehicle / device, make sure all indicator lamps and instruments are functioning correctly. Set the operating elements to the neutral position.
- Make sure that there is nobody in the danger zone.
- Only let combustion engines run in closed rooms when there is sufficient venting. If necessary, open doors and windows to ensure a correct and sufficient supply of fresh air.
- Make sure the control unit of the device is functioning correctly.

6.3 Operation

Buttons and indicator lamps at the controller



Controller FR4.1

Controller FR4 Pharma

Pos.	Button	Function
1	UP	<ul style="list-style-type: none"> – The temperature setpoint is increased in setting mode. – When pressing for longer than 5 s, manual defrosting (below 8 °C) is switched on.
2	DOW N	<ul style="list-style-type: none"> – The temperature setpoint is reduced in setting mode. – In chilling mode, the complete operating hours are shown after pressing once and the hours since the last service after pressing twice. Both the operating and the service hours counter show 1/10 of the performed hours. <p>Operating hours: 0... 999 h x 10. Example: Display 125 => 125 x 10 = 1250 operating hours</p> <p>Service hours counter: The service hours counter can be programmed to a specific value. If the value is exceeded tenfold, 'SEr' (Service required) is shown for 5 s on the display each time the controller is switched on.</p> <p>Service hours: 0... 999 h x 10. Example: Display 200 => 200 x 10 = 2000 service hours => 'SEr' is shown after 2000 hours since the last service.</p>
3	U	<ul style="list-style-type: none"> – The controller is switched on/off by pressing the button for 5 s. – In chilling mode, the room temperature (Rr1) is shown after pressing once and the evaporator temperature (Pr2) after pressing twice.
4	P	<ul style="list-style-type: none"> – In chilling mode, the setpoint is shown after pressing once. This can be changed using the UP and DOWN buttons. – The changed temperature setpoint is acknowledged by pressing again.

Pos.	Indicator lamp	Function
5	Alarm	– Lights up if there is a fault.
6	Defrosting	<ul style="list-style-type: none"> – Lights up when defrosting is active. – Flashes during the dripping time.
7	Evaporator fan	– Lights up when the evaporator fan is active.
8	Compressor	<ul style="list-style-type: none"> – Lights up when the compressor is active. – Flashes when the minimum interrupting time of the compressor is active.
9	Standby	– Lights up when the controller is in standby mode.
10	Heating with warm water (with FR4 Pharma)	– Lights up when heating with warm water is active.

For further information on operation, see the enclosed Konvekta operating manual BA-FR4-1AB in section "10.1 Attached documents".

7 Fault

The following table provides information on the possible causes of malfunctioning and remedial measures.



WARNING

Risk of injury due to incorrectly performed troubleshooting!

- Troubleshooting may only be performed by instructed personnel or refrigeration specialists.
- If you have any questions, please contact our customer service by phone on the following number:

Phone: +49 (0) 66 91 76-124

7.1 Faults and remedial measures

Fault	Cause	Remedial measure
Device not running	Electric connections loose	– Check electric connections and reattach them
	Relay defective	– Check relay
	Overpressure	– Check whether the axial fans are running – Clean condenser fins
	Overpressure due to high outside temperature	– Let the device run until the pressure has stabilized
	Leak, lack of refrigerant	– Eliminate the leak – Refill refrigerant
	Dryer clogged, underpressure	– Replace dryer
	Bearing at compressor defective	– Replace bearing or compressor
	Plug coupling at compressor defective	– Replace plug coupling
	Compressor does not compress	– Check pressure on suction and pressure side, if necessary, replace compressor
E1	Room temperature sensor error, cooling does not work, only air circulation in the cold storage room	– Only a Konvekta Service station ¹ may eliminate this fault! It must be contacted immediately!
E2	Evaporator temperature sensor, control only still works via emergency program	
Device cannot be	Fuse defective or external	– Check whether a fuse is defective on the

¹ The contact details of our service partners near you can be found on our website www.konvekta.com under >Service<.

Fault	Cause	Remedial measure
switched on in driving or standby mode	voltage supply not connected or switched off	relay board and replace if necessary (Only use fuses with the same rated current!) – Only with devices in standby mode: Connect device to an external, switched on voltage supply

For further faults and remedial measures, see the enclosed Konvekta operating manual BA-FR4-1AB.

Another tool is the troubleshooter, which is available in the Service portal.

8 Maintenance

8.1 Safety measures for maintenance work

- Any work and intervention at the device, especially at the refrigeration unit, at all refrigerant carrying components, at the electrical equipment, etc. may only be performed by suitable, qualified, and trained refrigeration specialists.
- Observe the prescribed deadlines for periodical checks/inspections.
- Have specialist personnel check all lines, cables, hoses, and screw fittings for leaks and damage at regular intervals. Have leaks eliminated and faulty components replaced immediately.
- Spare parts must correspond to the technical requirements specified by Konvekta AG. Use only original Konvekta spare parts.
- Wear the following personal protective equipment for any work.
- Keep unauthorized persons away from the device/vehicle during maintenance work.
- Secure the device prior to and when performing work against unauthorized and/or accidental start-up.
- Before performing special and maintenance work, inform the operating personnel. Appoint a supervisor.
- When performing maintenance and repair work, always tighten loosened screw connections to the specified tightening torques.
- During maintenance work, especially when working in the engine compartment, attach a warning sign "Do not switch on" at the ignition lock and remove the ignition key.
- Before cleaning the device with water or steam jet (high-pressure cleaner) or other cleaning agents, cover/seal all device openings where water/vapor/cleaning agent must not enter due to safety and functional reasons. Particularly at risk are electric motors, switching and operating elements, plug connections, and heat exchangers. Make sure that all covers and seals are removed after completing cleaning work. After cleaning, check all fuel, engine oil, and refrigerant carrying lines for leaks, loose connections, chafing, and damage.
- Have any detected defect rectified immediately.
- Do not use aggressive cleaning agents to clean the device. In the first two months after initial commissioning or repainting, do not use steam jet devices to clean the device.
- Ensure safe and environmentally friendly disposal of operating materials and auxiliary resources as well as replacement parts. Observe the relevant safety regulations for handling oils, greases, and other chemical substances that apply to the respective product. If necessary, refer to the relevant safety data sheets of the respective manufacturer.
- Only operate combustion engines in sufficiently vented rooms. Before starting the engine in closed rooms, make sure there is sufficient venting. Heed the provisions and safety regulations in force at the point of deployment.
- If necessary, only use safe climbing aids and working platforms.
- Never use machine or vehicle parts that are not intended for this purpose as climbing aids.
- If arc welding is necessary at the vehicle, observe the information of the vehicle manufacturer.

Safety measures for working at electrical equipment

- Work on electrical equipment should be performed only by electrical specialists or by people competent to do so under the guidance and supervision of an electrical specialist in accordance with recognized standards that offer guidance on good electrical engineering practice.
- Have electrical equipment routinely tested. Have any faulty items, such as loose connections, blown fuses, scorched or chafed cables, repaired by an electrical specialist.
- If the power supply fails, switch off the device and secure it against unintentionally being switched back on by unauthorized personnel.
- If work is required on live parts, a second person must be present to turn off the system's power supply in cases of emergency.

- Cordon off the work area and keep unauthorized people at a safe distance. Only use insulated tools.
- Check disconnected parts first to see if they are really voltage free, ground them, and then short circuit them. Insulate neighboring voltage carrying parts.
- Only use original fuses with the electrical current for which they were designed.
- Adhere to point 2.5.2 Hazards due to electricity.

Carry out the following activities after maintaining and before starting up the device:

- Check that all previously released screw connections have been retightened properly.
- Check that all previously removed guards, covers, container lids, sieves, filters, and so on have been refitted properly.
- Make sure that all tools, materials, and other equipment have been removed from the work area.
- Clean the work area. Remove any escaped liquids or similar materials.
- Make sure that all the device's safety devices and guards are functioning correctly.
- Adhere to point 2.5.2 Hazards due to electricity

8.2 Safe maintenance of refrigerant hoses

- Inspect all hoses, hose lines, and screw fittings for leaks and any recognizable damage **at least once a year**. Damaged parts must be replaced immediately by authorized trained refrigeration specialists.
- Follow relevant regulations concerning the use and application conditions of refrigerant hose lines.
Repairs to refrigerant hose lines are strictly prohibited!
- Always replace hose lines if the following criteria are detected during inspections:
 - Damage to the outer surface up to the insertion point (e.g. chafing, cuts, and cracks)
 - Brittleness of the outer surface (cracks in the hose material)
 - Deformation that does not correspond to the natural shape of the hose, both when depressurized and pressurized or due to bending, e.g. delamination, blistering, torsion
 - Leaks
 - Non-adherence to installation requirements
 - Damage or deformation to the hose fittings that minimize the strength of the fittings or impair the hose/fitting connection
 - The hose has worked loosed from its original fitting
 - Corrosion to the fitting has a negative impact on correct functioning and strength
 - Storage periods and specified periods of use have been exceeded
- Route and install hoses and hose lines properly and do not change the connections.

8.3 Inspection and maintenance work

Enter inspection and maintenance work in the service booklet refrigeration BTD-00751A (see section "10.1 Attached documents").

Perform inspection and maintenance work in accordance with the maintenance schedule WP 07 05 06 20 (see section "10.1 Attached documents").

Request general information on repair and maintenance work by email: TKD@konvekta.com



WARNING

Risk of severe injury due to improper maintenance work!

- The work should only be performed by qualified specialist personnel or people supervised by qualified specialist personnel.
In this case, specialist personnel are fully trained specialists or mechatronics technicians for refrigeration technology. Specialist personnel must have experience and be familiar with maintenance and repair work at the device.
- Wear protective clothing, safety shoes, and safety gloves during all work.

Unauthorized work at and modifications to the device may cause malfunctioning and thus have a crucial impact on operational safety. We recommend that the maintenance tasks specified by us in the maintenance schedule are performed routinely at an authorized Konvekta service station.

The contact details of our service partners near you can be found on our website www.konvekta.com under >Service<.

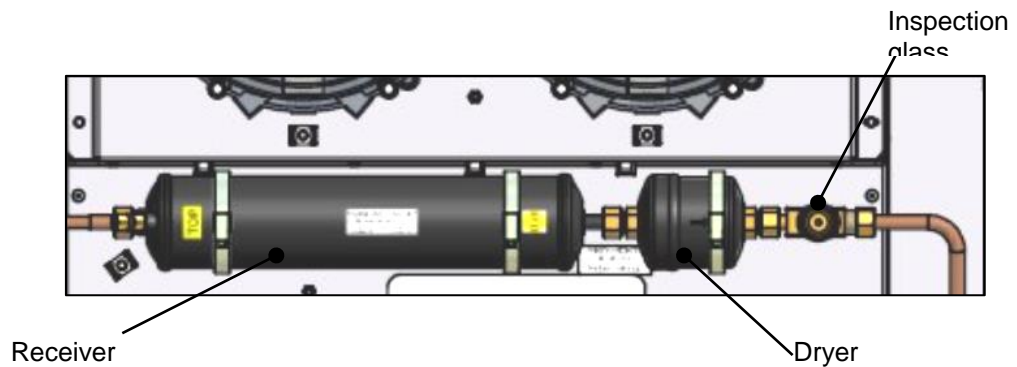
8.3.1 Inspection and maintenance work checklist

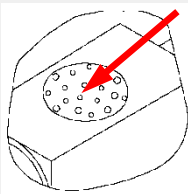
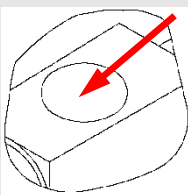
After complete installation, carry out the following checks and maintenance work:

- Visually inspect the entire transport refrigeration unit for damage.
- Check the compressor support for a firm fit and any signs of damage.
- Check the compressor fastening.
- Check the V-belt, making sure it is undamaged and fitted and tensioned correctly.
- Check routing of the refrigerant hoses and cables at the vehicle engine and gearbox and check for any chafing at the chassis.
Repair any detected faults.
- Check hose and cable routing at the box body or in the driver's cab.
- Check all hose fittings and screw fittings for leaks.
- Check the condenser unit for firm fit.
- Clean the condenser fins. If the fins are damaged, replace the condenser unit.
- Check fastening of the evaporator unit.
- Make sure the fan for the evaporator and condenser is working properly.
- Check the electric switch panel. If any changes in the color of the conductors are detected, they must be replaced, possibly along with the relays.
- Switch on the refrigeration unit and check the level of refrigerant (see section "8.3.2 Checking the level of refrigerant").
- If a filter/dryer/receiver combination is installed, the ball must swim in the middle. Standard inspection glasses must be free of bubbles.
- Filter/dryer and filter/dryer/receiver combinations must be replaced every time the refrigeration circuit is opened. If they are in operation for longer than one year, there is a risk of them clogging due to excessive moisture absorption!
- Replace the filter/dryer or clean the nozzle insert at the expansion valve (once a year).
- Connect a pressure gauge at the compressor and check pressure levels.
- Check air circulation at roof-mounted compact units.
- Air circulation within the air distribution plate must be prevented.
(Partition for suction air and exhaust air must be provided.)
- Make sure the air ducts for suction air and exhaust air are not blocked.
- Measure the temperature at the evaporator:
 1. Measure suction air.
 2. Measure exhaust air.

- If the devices are installed with standby, also check the electric installation for standby mode.
- Trial run; test electrical and refrigeration switching functions, check the parameter settings at the controller.
- Check correct attachment of the standby compressor and make sure it is working properly. Carry out a trial run until the desired temperature is reached in the cold storage room.
- Check the V-belt from the electric motor to the mains compressor.
- Check the correct functioning of the solenoid valves for devices with hot gas defrosting.
- Check the pressure switches.
- Check the condensation water drain.
- **Check correct functioning of the device during a trial run.**

8.3.2 Checking the level of refrigerant



Inspection glass	Cause	Remedy
	Bubbles form in the inspection glass: ⇒ Lack of refrigerant!	<p>NOTE</p> If the level of refrigerant is too low, increased bubble formation will be visible in the inspection glass.
	Inspection glass clear / no bubbles: Level of refrigerant correct.	<ul style="list-style-type: none"> – Switch off the device immediately to avoid damaging the compressor. – Contact a Konvekta service station²! – Refill refrigerant – Check the system for leaks

² The contact details of our service partners near you can be found on our website www.konvekta.com under >Service<.

9 Decommissioning and disassembly



WARNING



Risk of severe injury due to improper decommissioning/disposal!

- The work should only be performed by qualified specialist personnel or people supervised by qualified specialist personnel. In this case, specialist personnel are fully trained specialists or mechatronics technicians for refrigeration technology. Specialist personnel must have experience and be familiar with maintenance and repair work at the device.
- Switch off the device prior to disassembly work.
- Wear protective clothing, safety gloves, and protective goggles during the work.
- If in doubt, please contact Konvekta AG.

9.1 Decommissioning the device

- Use the vehicle ignition lock or disconnect the mains plug (for standby mode) to switch off the device.



DANGER



Fatal injury hazard due to electric shock

- There is a risk of fatal injury if work on the electric equipment is carried out by unqualified personnel.
- Only electrical specialists are allowed to work on the electrical equipment.

- Have all the energy supply lines disconnected by respective specialist personnel.

9.2 Disassembling the device



WARNING

Risk of injury caused by falling!

- There is a risk of falling from the vehicle roof if unsafe climbing aids (e.g. leaning ladders) are used to during disassembly work. Severe injury and fatal accidents may occur.
- Always use suitable working platforms or fall arresters.

9.3 Disposing of the device

NOTE

Environmental harm due to incorrect disposal!

Refrigerants are harmful to the environment. Always observe valid national regulations when handling refrigerants.

- Refrigerants and lubricants must **not** enter ground water, water courses or sewage systems.
- Cleaning agents and auxiliary products used to clean the device must be disposed of in accordance with local regulations and taking into account the information in the safety data sheets provided by the respective manufacturers.

NOTE



The device is made of stainless steel, aluminum, copper, steel, and plastic. All these materials can be recycled through a number of simple channels.



A suitable specialist company must dispose of the device and its respective components.

Always observe the national regulations at the location of the device valid at the time of disposal.

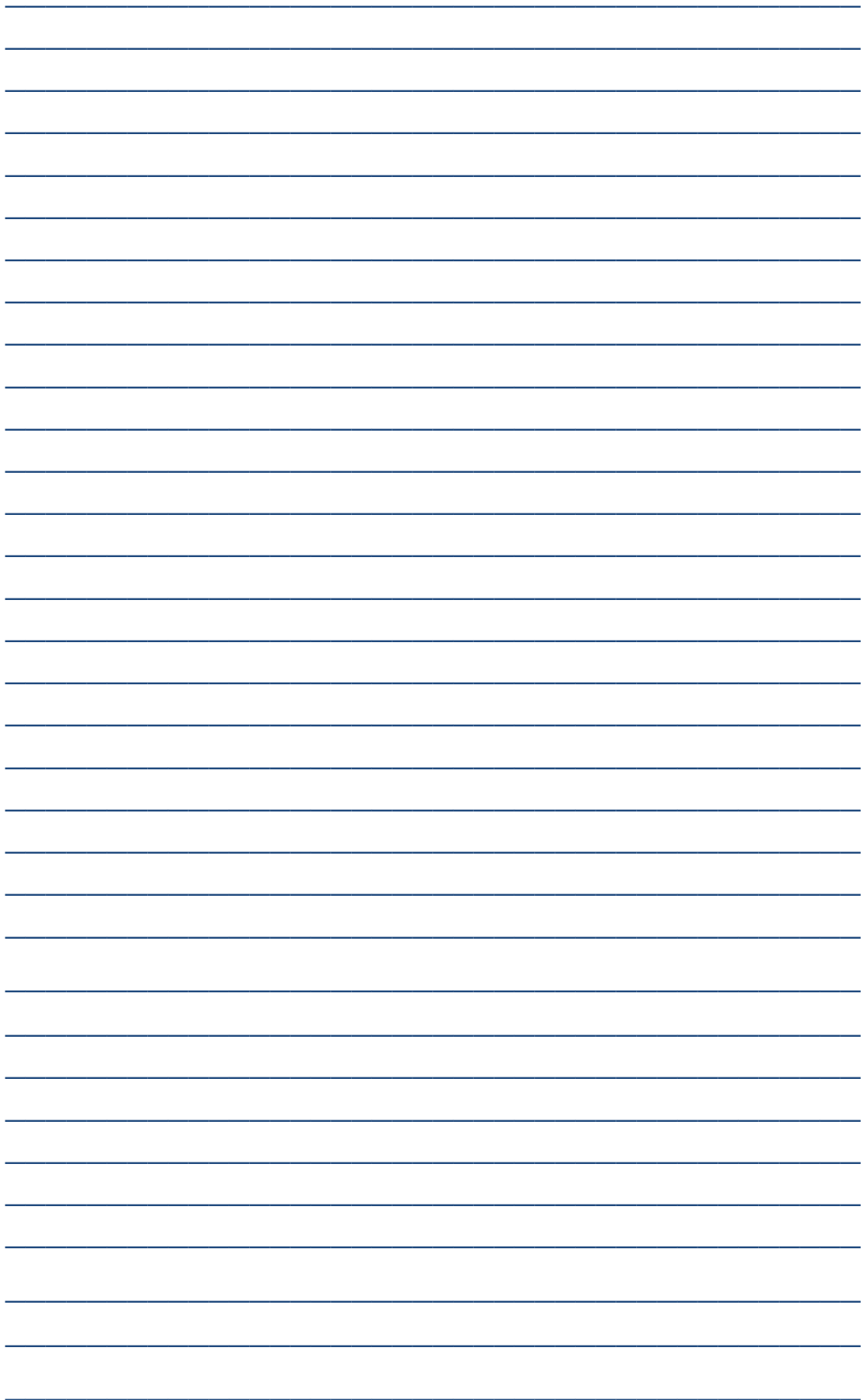
- Dispose of the device and its components in an environmentally friendly manner, separating the various materials.

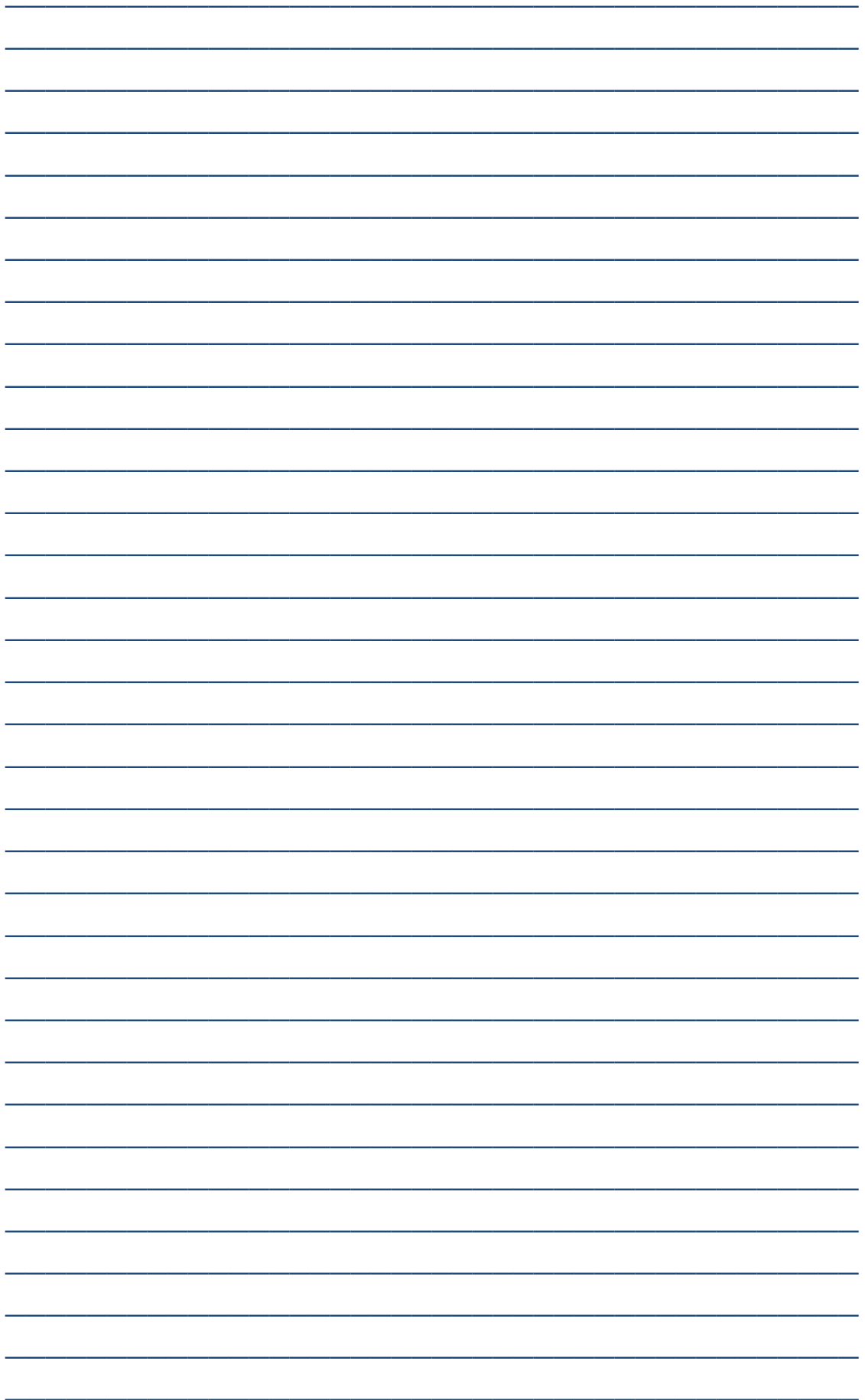
10 Annex

10.1 Attached documents

The following documents are provided with this operating manual:

- TD000031A - Sanden compressors
- AA 07 05 01 22 - Tightening torques O-ring connections
- BTD-00681A - Commissioning and installation guideline Sanden air conditioning compressors
- BTD-00751A - Refrigeration service booklet
- 110023471AA - Installation and service instructions fresh goods controller FR4.1
- BA-FR4-1AB - Operating manual transport refrigeration units with controller FR4.1 and FR4 Pharma
- WP 07 05 06 20 - Maintenance schedule refrigeration units
- Device drawing
- Circuit diagram
- Piping diagram





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