



Operating instruction for transport refrigeration units with control FR4.1 and FR4 Pharma



Technical leadership starts with ideas.

Data of your transport refrigeration unit

These data are entered from your KONVEKTA service station during the assembly of the transport refrigeration unit.

Contents

Here you can find the exact designation of your transport refrigeration unit and the individual components.

Data

Designation	Data
Type of the transport refrigeration unit:	
KONVEKTA-Order Number:	
Refrigerant:	
Amount of Refrigerant [kg]:	
Type evaporator:	
Serial number evaporator:	
Type condenser:	
Serial number condenser:	
Stand chiller:	<input type="checkbox"/> Yes <input type="checkbox"/> No
Optional components:	

Data of your transport refrigeration unit

Data

Designation	Data
Installation location of the fuse box:	
Installation location of the main switch:	
Installation location of the fresh service regulator:	
Year of manufacture (MM/JJ):	
Commissioned on (TT/MM/JJ):	
KONVEKTA Service Station:	

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1. Introduction

1.1 Outline

Summary

In this chapter you will find

- General information about operating instructions,
- Information about assembling / construction and use / application of the operating instructions,
- The determined utilization of the transport refrigeration unit,
- The tasks and responsibilities of the user while working with the transport refrigeration unit and
- The demands of the manufacturer on operating and maintenance staff.

1.2 General

Validity

The operating instruction is valid for transport refrigeration units with control unit FR4.1 and FR4 Pharma.

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1. Introduction

Output data

June 2016

Storage and completeness

- This operating instruction is an element of the transport refrigeration unit and has to be stored visibly for the authorized group of people at any time.
- Not at any point of time it is allowed to remove chapters from this operating instruction. A missing operating instruction or missing pages – especially the chapter „To your safety“ – have to be replaced immediately in case of a loss.

Copyright

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All further rights are reserved by us.

Alteration / Modification service

This documentation does not underlie the modification service through the company of Konvekta AG.

Changes in this documentation can be executed without further announcements.

Tacit guarantee

After a high-handed conversion of the transport refrigeration unit the company Konvekta AG is possibly no longer regarded as the manufacturer of the transport refrigeration unit.

In these cases the legal conformity evaluation proceedings have to be executed in accordance with 2006/42/EG from the beginning on in every part.

1. Introduction

1.3 Assembly and use of the operating instruction

Chapters

The operating instruction includes the following chapters:

Chapter	Summary
1	General information <ul style="list-style-type: none">• About the operating instruction,• The use and• The staff requirements.
2	<ul style="list-style-type: none">• Explanation of the applied symbols• Fundamental safety information
3	<ul style="list-style-type: none">• Instruction and functioning of the transport refrigeration unit• Technical data of the transport refrigeration unit
4	Use of the transport refrigeration unit
5	fault signal
6	<ul style="list-style-type: none">• Maintenance• Cleaning
7	Information about disposal
8	Liability for defects
9	Index

1. Introduction

Abbreviations

The following abbreviations are used in the operating instruction:

Abbreviation	Meaning
Appr.	Approximately
FK	Refrigeration unit
KD	Condenser
Max.	Maximal
Min.	Minimal
TK	Deep-freezing unit
VD	Evaporator

1.4 Use according to purpose and misuse

Use according to purpose

The transport refrigeration unit is predestined for the distributor operation to uphold / maintain the storage temperature of stored pre-cooled products and hence is for the preservation of the cooling chain from the place of origin (manufacturer) to your customer.

1. Introduction

The permissible storage temperature is

± 0 °C to +12 °C with refrigeration units

± 0 °C to -20 °C with deep-freezing units

The permissible utilization includes also:

- The observance of the operating instructions,
- the regular maintenance of the transport refrigeration unit and
- observing and keeping the legal regulations and rulings valid in situ
- The operation of the transport refrigeration unit with connection to a 230V or 400V public electricity supply with integrated safety switch (FI 30mA tripping current).

The utilization of the deep-freezing unit as refrigeration unit is not designated, but permissible.

Misuse

The following operating conditions are categorized as misuses:

- The use as air conditioning system to air-condition the driver's cabin or the passenger compartment without special equipment and safety fittings.
- The use of the refrigeration units as deep-freezing units.
- The use outside the permissible technical limiting value.
- The non-observance of the safety data page for the refrigerant.
- The non-observance and non-compliance of the legal regulations and rulings valid in situ.
- The operation of the transport refrigeration unit with connection to a 230V or 400V not public electricity supply without integrated safety switch (FI 30mA tripping current).

1. Introduction

Misuse

Any further utilization methods, which are not named above, are categorized as misuses of the appliances.

1.5 Operator´s duty of care

Safety of the transport refrigeration unit

The operator has to secure especially that

- The transport refrigeration unit is used only according to purpose (compare chapter description),
- The transport refrigeration unit is only used in a perfect and operative condition,
- Integrated safety fittings are regularly maintained and proved to be operable,
- Utilization, maintenance and repairs of the transport refrigeration units are only to be authorized by sufficient qualified and authorized personnel.

Protection of staff

The operator especially has to secure that the necessary personal-protection equipment for a cold working place for

- The operating staff,
- The maintenance staff and
- The repairing staff

Are available and are being used.

1. Introduction

Instruction and training

The operator especially has to secure that

- The staff is instructed in all the applying questions referring occupational safety and environmental protection before the first start-up and even afterwards one time a year minimum,
- The operating instructions is available at any time in a readable and complete condition at the operating place of the transport refrigeration unit,
- The staff knows the operating instruction and especially the safety information included,
- The attached safety and warning information are not to be removed and to stay readable.

1.6 Qualification of the personnel

Definition authorized person

A person is categorized as authorized in case he / she is given several tasks at or with the transport refrigeration unit according to instructions.

Tasks of the operating staff

The operating staff has to recognize disturbances or rather irregularities and – as far as possible and permissible – dispose them.

Demands on operating staff

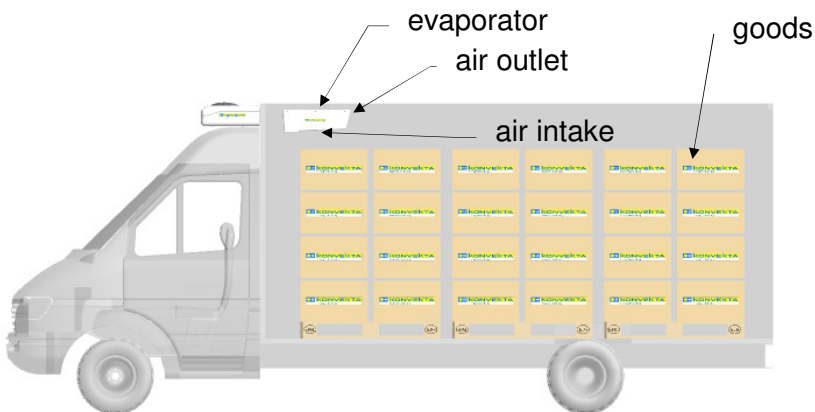
To fulfill the tasks, the operating staff has to meet the following requirements:

- The controller has to obtain an instruction about the transport refrigeration unit by the operator.

1. Introduction

1.7 Loading instructions

Please ensure that an optimal air circulation is guaranteed in your vehicle. An optimum air flow around and through the loaded goods is necessary for maintaining the quality of the goods during transport. If this is not ensured, the goods can thaw locally and glaciations cannot be excluded. The use of pallets also promotes good air guidance. There should be a distance of about 30 cm. between the inner side of the vehicle roof and the load in order to allow an optimal air circulation. The air intake and air outlet of the evaporator must not be blocked. When loading the vehicle please note that an adequate distance between the insulation of the vehicle and the goods is guaranteed. Please check carefully the temperature of the goods before loading. The temperature of the goods must correspond to the transport temperature. The performance of the refrigeration unit guarantees the preservation of the temperature of the goods during transport. The storage area must be pre-cooled. Before closing the doors make sure that no persons are in the hold.



1. Introduction

1.8 Notes on dealing with the F-gas Regulation 517/2014

The revised F-gas Regulation 517/2014 has been in force since 01.01.2015. This regulation covers the handling of partially fluorinated hydrocarbons and is also aimed at operators of refrigerated trucks and refrigerated trailers.

In future, the plants of this application will no longer be classified by refrigerant charge, but by CO₂ equivalent. Depending on the amount of that CO₂ equivalent, an annual leakage check is required, of which proof must be provided.

How is this CO₂ equivalent determined?

Each fluorinated greenhouse gas (refrigerant) has a so-called GWP value (Global Warming Potential). This GWP indicates the ratio of the refrigerant to CO₂ emission.

Type R134a refrigerant has a GWP of 1.430. This means that 1 kg of R134a emission equals 1,430 kg of CO₂ emission.

The following GWP values apply to the refrigerant we use:

R134a	=	GWP 1.430
R404A	=	GWP 3.922

In order to determine the so-called CO₂ equivalent of a plant, the GWP of the refrigerant is multiplied by the plant capacity (refrigerant charge).

Example:

A deep-freezing plant has a charge of 1.6 kg R404a. The CO₂ equivalent of this plant is therefore calculated as follows:

$1.6 \text{ kg} \times 3,922 = 6,275 \text{ kg}$ (6.275 tons) of CO₂ equivalent

1. Introduction


As of 01.01.2017, the plant operator with a CO₂ equivalent of >5.0 has also to do an annual leakage check and provide appropriate proof. Such documentary proof can be recorded in the service record of the plant.

This applies to plants with a charge of >3.5 kg R134a and >1.3 kg R404A.

Labelling requirement according to F-gas Regulation 517/2014

The installer has to determine the charge after the commissioning of the plant and specify the corresponding CO₂ equivalent on the supplied label. This enables the operator to quickly establish whether his plant has been tested. The plant must be labelled in the area of the access point to the refrigeration cycle.

Identification label H25-003-028

	KONVEKTA
Thermosysteme	
Kältemittel/Refrigerant: _R_____	
Füllmenge / Charge: _____ kg	
GWP Wert / GWP value: _____	
CO ₂ Äquivalent/ CO ₂ Equal: _____ to	

2. To your safety

2.1 Outline

Summary

In this chapter you will find

- The explanation of the applied symbols,
- Fundamental information about the safe handling with the transport refrigeration unit and
- The safety fittings of the transport refrigeration unit, their function and information.

Important information!

In this context, we refer implicitly to the compliance with our general installation guidelines. These can be obtained from the KONVEKTA technical after sales service: TKD@konvekta.com.

Please observe our valid safety instructions, available under www.konvekta.de/asv.html. In case of order placement or any other conclusion of contract the safety instructions get integral part of the contract.

2.2 Applied symbols



Danger!

This symbol indicates that dangers of life and health of people exist. “**Extremely dangerous**” is special notice if there is a risk of life.



Danger!

This symbol indicates that dangers of life and health of people exist on the basis of electrical tension.

2. To your safety



Attention!

This symbol indicates that dangers for the transport refrigeration unit, material or the environment exist.



Disposal!

This symbol characterizes information for the disposal of component parts or working material.

2.3 Fundamental safety information



Danger!

Valid only for transport refrigeration units with standby operation.

Please, obey absolutely the following safety instructions to avoid endangerments through electrical tension:

Possible danger	Measures to avoid
<p>Danger to life! Endangering people through electric shock.</p> <p>Explanation: During standby modus the transport refrigeration unit works with voltages of 230/400 V with the corresponding high amperage. As current amperages from 44 mA could be lethal, corresponding precautionary measures are necessary.</p>	<ul style="list-style-type: none">• Do not touch live-parts.• Let a KONVEKTA Service Station do the repairing works of damaged cables.• Maintenance and repairing works are only to be done by a KONVEKTA Service Station• Operate the transport refrigeration system only secured by a safety switch power supply network (FI 30mA tripping current)

1. Compare with handbook „KONVEKTA Service Stations“.

2. To your safety



Danger!

Please, obey absolutely the following safety instructions to avoid dangers to life and health:

Possible danger	Measures to avoid
<p>Combustion danger! Endangering people through hot surfaces.</p> <p>Explanation: The hose line from or rather to the compressor inside the engine compartment and inside the Standby-unit can reach a surface temperature of about 60°C . Lest there is a danger of combustion of hands of operating and maintenance staff.</p>	<p>Obey the following steps before opening the engine compartment:</p> <ol style="list-style-type: none"> 1. Secure the vehicle against rolling away – if necessary, see operating instruction. 2. Stop the engine of the vehicle. 3. Pull out the key from the vehicle. 4. Keep safe the key of the vehicle. 5. Let the coolant circuit cool down for 2 hours min. 6. Open the engine compartment.
<p>Danger of contusions and intake! Endangering people through contusions or rather intake.</p> <p>Explanation: The compressor inside the engine compartment and inside the Standby-unit is driven by a belt. If the operating and maintenance staff reaches into the belt or rather into the belt pulley while the engine is working, the result could be heavy injuries of fingers and hands.</p>	

2. To your safety

2.4 Safety fittings



Danger!

The transport refrigeration system must not be operated with defective and / or decommissioned safety devices!

Triple pressure switch

The transport refrigeration unit is equipped with a triple pressure switch, which should not be removed or manipulated in any case. The triple pressure switch supervises the pressure of the transport refrigeration unit's system.

- If the pressure of the system drops down under $0,5 \pm 0,2$ bar, the transport refrigeration unit will be turned off automatically. If the pressure of the system rises again to over 1,8 bar, the transport refrigeration unit again will be put into operation automatically.
- If the pressure of the system rises over $25,0 \pm 1,5$ bar, the transport refrigeration unit will be turned off automatically. If the pressure of the system drops down again to under $18,0 \pm 1,5$ bar, the transport refrigeration unit again will be put into operation automatically.

Pressure relief valve

The transport refrigeration unit is equipped with an pressure relief valve, which should not be removed or manipulated in any case. If the system pressure rises to over 32 bar, the refrigerant will be released into the atmosphere.

If the system pressure again drops down to under 32 bar, the pressure relief valve will close automatically.

3. Description

3.1 Outline

Summary

In this chapter you will find

- An overview of the most important elements of the transport refrigeration unit,
- The description of the function of the transport refrigeration unit,
- An overview of the transport refrigeration unit's control elements and their functions and
- The technical data.

3.2 Outline transport refrigeration unit

Electrical elements of the transport refrigeration unit

In general the transport refrigeration unit consists of the following electrical elements:

- Control unit FR4.1 or FR4 Pharma
- Fuse box
- Relay holding with relay
- Temperature sensor inside the cold-storage room
- Temperature sensor on the evaporator
- Condenser fan
- Evaporator fan or blower
- 230V or 400V engine for standby operation
- Semi-hermetic compressor
- Hermetic compressor
- Switch box for standby operation

3. Description

Refrigeration parts of the transports refrigeration unit

In general the transport refrigeration unit consists of the following refrigeration parts:

- Compressor with electromagnetic clutch
- Evaporator with expansion valve
- Condenser
- Triple pressure switch
- pressure relief valve
- Dryer
- Standby-compressor – only with transport refrigeration units with standby operation

3.3 Description transports refrigeration unit

Description and function of the transport refrigeration unit

The transport refrigeration unit is a refrigeration unit for mobile application.

The transport refrigeration unit works like an air-conditioning system or a refrigerator.

The evaporating freezing mixture inside the evaporator withdraws the heat out of the cold-storage room, this means coldness is being produced. The refrigerant becomes gaseous.

The compressor draws off the gaseous refrigerant from the evaporator and leads the refrigerant to the air-conditioned condenser.

The condenser expels the warmth of the gaseous refrigerant.

The refrigerant becomes liquid.

Inside the dryer the refrigerant is cleaned and dehydrated. The liquid refrigerant is led back to the evaporator, which closes the cycle.

When the adjusted nominal value inside the cold-storage room is reached, the compressor will be turned off automatically. The cooling process is stopped.

3. Description

If the temperature inside the cold-storage room rises over the adjusted nominal value, the compressor will be put into operation automatically. The cooling process starts again.

Description and function of the transport refrigeration unit

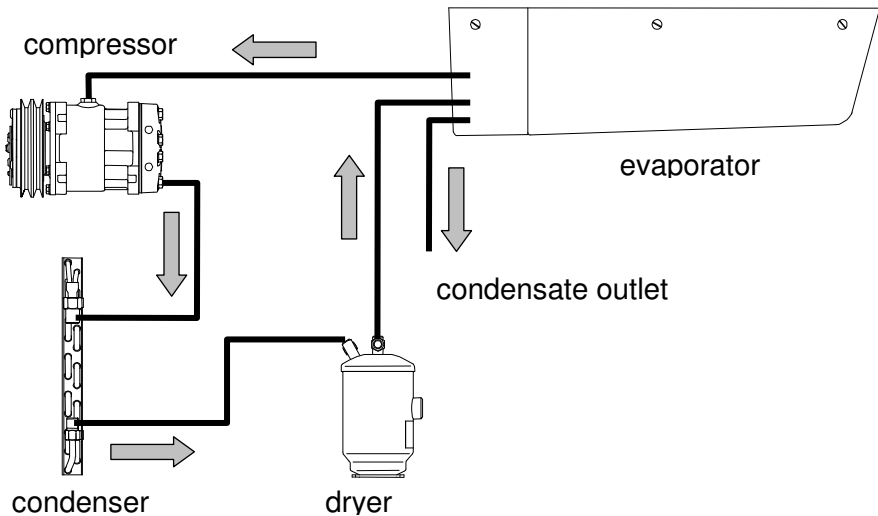
The transport refrigeration unit recognizes independently at what time the evaporator has to be de-iced and automatically turns on the defrosting cycle.

You also can turn on the defrosting cycle manually.

The transport refrigeration unit is only ready for use when the motor of the vehicle is working or rather when the power-supply plug is tuned in.

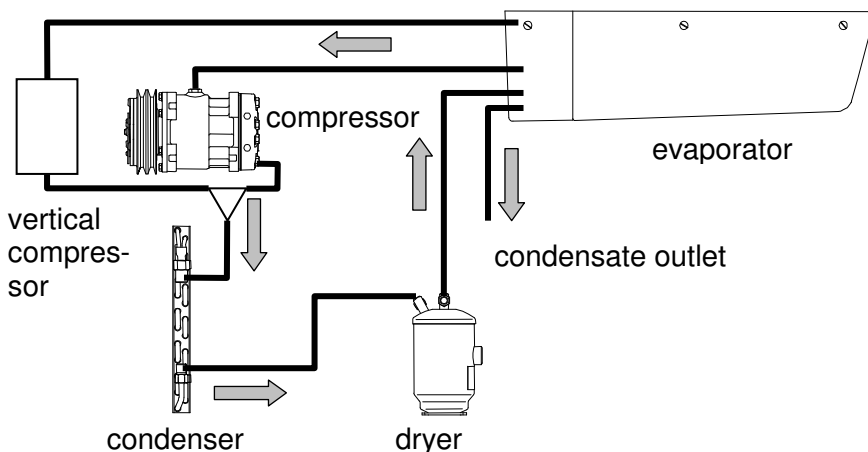
The transport refrigeration unit is controlled and operated through the control unit FR4.1 / FR4 Pharma.

Scheme of the refrigeration cycle for transport refrigeration units without standby operation



3. Description

Scheme of the refrigeration cycle for transport refrigeration units with standby operation



Description and function of the refrigeration unit (FK)

The refrigeration unit is predestined for the distributor operation to uphold / maintain the storage temperature of stored pre-cooled products and hence for the preservation of the cooling chain from the place of origin (manufacturer) to your customer.

In consideration of the “Heating and cooling load calculation“ according to DIN 8959 the storage temperature can be ± 0 °C to $+12$ °C.

Another use going beyond that, for example as transport refrigeration unit and/or to air-condition the driver’s cabin or the passenger compartment, requires special equipment and safety fittings.

The chilling unit is neither a deep-freezing unit nor an air-conditioning system, but only a chilling unit to maintain the storage temperature of stored pre-cooled chilled goods.

3. Description

Description and function of the deep-freezing unit (TK)

The refrigeration unit is predestined for the distributor operation to uphold / maintain the storage temperature of stored pre-cooled products and hence for the preservation of the cooling chain from the place of origin (manufacturer) to your customer.

In consideration of the “Heating and cooling load calculation“ according to DIN 8959 the storage temperature can be ± 0 °C to – 20 °C.

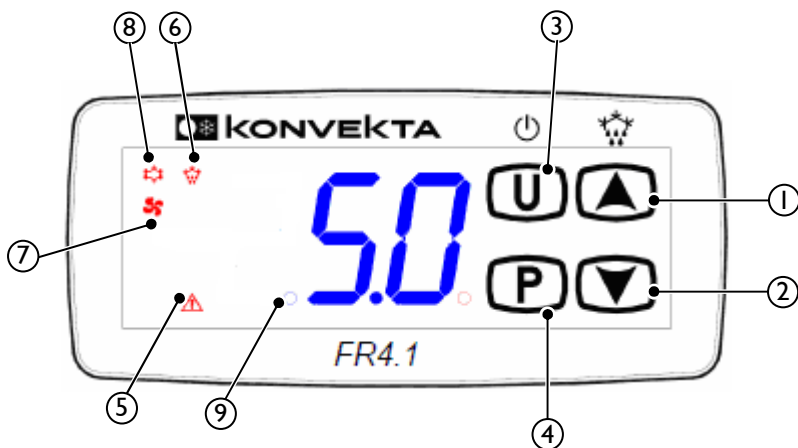
Another use going beyond that, for example as transport refrigeration unit and/or to air-condition the driver’s cabin or the passenger compartment, requires special equipment and safety fittings.

The deep-freezing unit is neither a chilling unit nor an air-conditioning system, but only a deep-freezing unit to maintain the storage temperature of stored pre-cooled frozen goods.

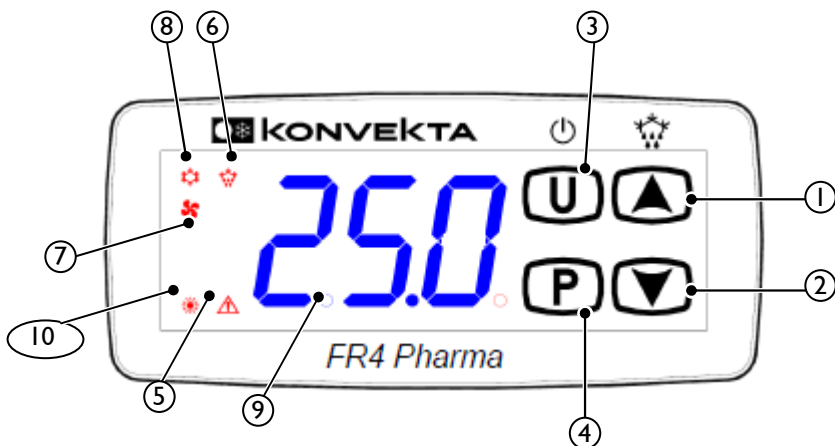
3. Description

3.4 Control elements

Control unit FR4.1



Control unit FR4 Pharma



3. Description

The Control units FR4.1 and FR4 Pharma have the following control elements:

Pos.	Button	Function
1	UP	<ul style="list-style-type: none">• In setting mode you rise with this button the temperature setpoint.• If you press this button longer than 5 seconds, you activate manual defrosting.
2	DOWN	<ul style="list-style-type: none">• In setting mode you reduce with this button the temperature setpoint.• By pressing this button once during cooling operation, the total operating hours are indicated; by pressing this button twice the service hours after last service are indicated.
3	U	<ul style="list-style-type: none">• By pressing this button for 5 seconds, the control unit FR4.1 is switched on and off.• By pressing this button once during cooling operation, the room temperature (Pr1) is indicated; by pressing this button twice the evaporator temperature (Pr2) is indicated.
4	P	<ul style="list-style-type: none">• By pressing this button once during cooling operation, the setpoint is indicated. It can be changed with the buttons UP and DOWN.• By pressing this button once again the changed temperature setpoint is confirmed.

3. Description

Pos.	Designation	Function
5	Indicator lamp alarm	<ul style="list-style-type: none">• Is illuminated, if there is a malfunction.
6	Indicator lamp defrost	<ul style="list-style-type: none">• Is illuminated, if defrosting is active.• Is blinking during drip-off time
7	Indicator lamp evaporator blower	<ul style="list-style-type: none">• Is illuminated, if the evaporator blower is active.
8	Indicator lamp compressor	<ul style="list-style-type: none">• Is illuminated, if the compressor is active.• Is blinking, if the minimum off-time of the compressor is active.
9	Indicator lamp standby	<ul style="list-style-type: none">• Is illuminated, if the control unit FR4 is in standby mode.
10	Indicator lamp heating with hot water (only FR4 Pharma)	<ul style="list-style-type: none">• Is illuminated, when heating with hot water is active (only FR4 Pharma)

3. Description

Relay circuit board

Inside the Relay circuit board you will find all electric safety fuses of the transport refrigeration unit.

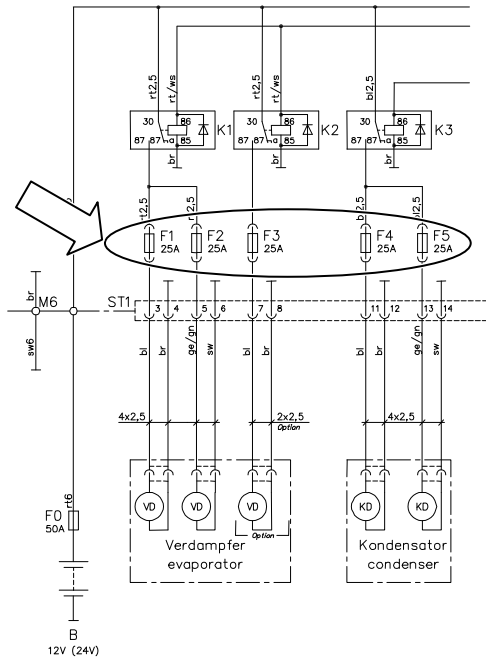
You will find the installation place of the Relay circuit board in “Data of your transport refrigeration unit” at the beginning of this operating instruction.

The safety fuses are lettered. In the including wiring scheme you will find the safety fuses and the rated current of the safety fuses.

Window of a wiring scheme

Here you can see a windowing of a wiring scheme.

This wiring scheme is not the one of your transport refrigeration unit.



In the wiring scheme the safety fuses of your transport refrigeration unit are marked in. You will find the term F0 – F7 in the fuse Relay circuit board. The rated current is written below the prevailing safety fuse.

4. Operation

4.1 Outline

Summary

In this chapter you will find all the information to work with the transport refrigeration unit.



Risk to life!

If you operate the transport refrigeration system while driving, your attention could be drawn away from the road traffic.

You could cause an accident.

The transport refrigeration unit should be operated only while parking.

Pay attention to the valid traffic regulations of the prevailing country.



Attention!

If the vehicle is in use for a long period of time without using the transport refrigeration unit, the transport refrigeration unit should be put into operation every 10 days for 20 minutes.

Otherwise, the shaft seal of the compressor could be damaged by vibrations of the engine.

4.2 Valid documentation

Documentation of the vehicle manufacturer


The statements/details in the documentation of the vehicle manufacturer are valid for the operation of the vehicle – like starting and turning off the engine.

4. Operation

4.3 Switch-on the transport refrigeration unit

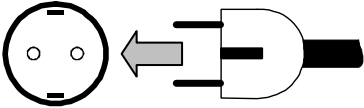

Switch-on the transport refrigeration unit during driving operation

Please proceed as follows to switch on your transport refrigeration unit in driving operation:

Step	Activity	Picture
1	Start the vehicle engine.	
2	Press button U for 5 seconds. The current room temperature is indicated in the display of control unit FR4.1 or FR4 Pharma.	

Switch-on the transport refrigeration unit during stand-by operation

If your transport refrigeration unit is equipped with a stand-by operation, please proceed as follows to switch on your unit in stand-by operation:

Step	Activity	Picture
1	Connect the vehicle with the respective external voltage supply.	
2	Press button U for 5 seconds. The current room temperature is indicated in the display of control unit FR4.1 or FR4 Pharma.	


4. Operation

If the vehicle is equipped with a Scroll compressor 400 V, the rotating field of the current supply is monitored. If the rotating field is not correct, the fans and the standby compressor will not run. The phase changing- switch in the power plug of the system must be rotated.



4.4 Operate control unit FR4.1 / FR4 Pharma

Adjust the set point for the room temperature

Please proceed as follows to adjust the set point of the room temperature to the storage temperature of your goods:

Step	Activity	Picture
1	Press shortly button „P“. In the display appears „SP1“ alternately with the currently adjusted set point.	 The image shows a black rectangular control unit for a Konvekta FR4.1. At the top left, the brand name 'KONVEKTA' is printed in white. To its right are a power button (circle with a vertical line) and a light icon. Below these are two small red indicator lights. The central digital display shows the number '4.0' in large blue digits. To the right of the display are four buttons: 'U' with an upward arrow, 'P' with a downward arrow, and two other buttons. The model number 'FR4.1' is printed at the bottom of the unit.

4. Operation

2	<p>For changing the set point please press buttons „UP“ or „DOWN“ within 15 seconds.</p> <p>Button functions: Pressing button once, DOWN: reduces the value, UP : raises the value, by 0,1 °C.</p> <p>Keep the button pressed DOWN: reduces the value UP : raises the value in short processing time.</p>	
3	<p>After 15 seconds the adjusted value is stored. Or press button „P“.</p> <p>The adjusted value is stored directly.</p> <p>The current room temperature is indicated in the display.</p>	

Indication of the adjusted set point

Press once shortly the button „P“.

Now the adjusted set point for the room temperature is indicated in the display alternately with „SP1“.

4. Operation

Activating manual defrosting

The control unit FR4.1 or FR4 Pharma starts automatically with defrosting for 10 minutes within a preset interval.

If the evaporator is iced massively you can also activate the defrosting manually. (only below 8°C)

Press button „UP“ until the indicator lamp shows „defrost ❄️“ and in the display appears „deF“.

Now the manual defrosting is activated.

If the conditions do not comply with the defrosting, for example at too high temperature in the evaporator, the defrosting will not be executed

Display in cooling mode

In cooling mode, the current room temperature is shown on the display.


The lights "compressor" and "evaporator fan" light up.

4. Operation

4.5 Switch-off transport refrigeration unit


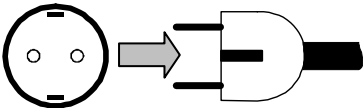
Switch-off transport refrigeration unit during driving operation

Please proceed as follows to switch-off the transport refrigeration unit in driving operation:

Step	Activity	Picture
1	Press button U for 5 seconds. The display of control unit FR4.1 or FR4 Pharma only shows the LED for „stand-by“.	
2	Stop the vehicle engine.	

Switch-off transport refrigeration unit during stand-by operation

Please proceed as follows to switch-off the transport refrigeration unit in stand-by operation:

Step	Activity	Picture
1	Press button U for 5 seconds. The display of control unit FR4.1 or FR4 Pharma only shows the LED for „stand-by“.	
2	Disconnect the external voltage supply.	

5. Faults

5.1 Outline

Summary

In this chapter you will find

- Possible faults
- The reasons and
- The elimination of faults.

5.2 Fault indications

The fault is shown in the display of control unit FR4.1 or FR4 Pharma.

Additionally the indication lamp for „alarm“ is illuminated in the display of control unit FR4.1 or FR4 Pharma.

Indicated faults

The following faults could be indicated:

Indications	Cause	Remedy
E1	Room sensor fault Refrigeration does not work anymore! There is only an air circulation in the cooling chamber!	This fault must be remedied by a KONVEKTA service station ¹ . Please frequent immediately a KONVEKTA service station ¹ .
E2	Evaporator sensor The control unit is only running by an emergency program.	This fault must be remedied by a KONVEKTA service station ¹ . Please frequent immediately a KONVEKTA service station ¹ .

1. Compare with Handbook „KONVEKTA Service Stations“.

5. Faults

5.3 Other faults

Other possible faults

Fault	Reason	Elimination of defects
It is not possible to put the transport refrigeration unit into operation while driving modus.	A fuse is defect or the external power supply is not connected or rather turned off.	<ol style="list-style-type: none"> 1. Look inside the Relay circuit board if any fuse is defect 2. If necessary replace the defect fuse. Insert only fuses with the same rated current intensity! 3. Only valid for transport refrigeration units in standby operation: Secure that the transport refrigeration unit is connected with the external power supply and that the external power supply is turned on. <p>If the fault continues to occur, please contact a KONVEKTA Service Station ¹ immediately.</p>
It is not possible to put the transport refrigeration unit into operation while stand-by modus.		

1. Compare with handbook „KONVEKTA Service Stations“.

6. Maintenance

6.1 Outline

Summary

In this chapter you will find information about maintaining the transport refrigeration unit.



Danger!

Valid only for transport refrigeration units with standby operation.

Obey the following safety instructions in any case to avoid dangers through electrical tension:

Possible danger	Measures to avoid
<p>Risk to life! Endangering people through electric shock.</p> <p>Explanation: During standby operation the transport refrigeration unit works with voltages of 230/400 V with the corresponding high amperage. As current amperages from 44 mA could be lethal, corresponding precautionary measures are necessary.</p>	<ul style="list-style-type: none">• Do not touch tension-leading parts.• Let a KONVEKTA Service Station do the repairing works of damaged cables.• Maintenance and repairing works are only to be done by a KONVEKTA Service Station¹.• Supply cables from the power supply to the transport refrigeration system must correspond to the type H07RN-F, 2,5mm² minimum cross section. In addition these cables are subject to periodic inspections according to the BGV A3.• The vehicle must be tested in accordance with BGV A3.• The supply cables must be inserted appropriately within the component in order to prevent damages within the insulation and minimize insulation faults• The function of the safety switch 30mA must be checked regularly.

6. Maintenance

6.2 Regular maintenance work

Maintenance and inspections have to be executed according to the “KONVEKTA Refrigeration Service brochure“.

The execution of maintenance works required by us is to be made in the intervals indicated and to be executed by an authorized KONVEKTA Service Station¹.

1. Compare with handbook „KONVEKTA Service Stations“.

7. Shutdown and disposal

7.1 Outline

Summary

In this chapter you will find information about

- Shutdown and
- disposal

of the transport refrigeration unit.



Danger!

Valid only for transport refrigeration units with standby operation.

Obey the following safety instructions in any case to avoid endangering through electrical tension:

Possible danger	Measures to avoid
<p>Risk to life! Endangering people through electric shock.</p> <p>Explanation: During standby operation the transport refrigeration unit works with voltages of 230/400 V with the corresponding high amperage. As current amperages from 44 mA could be lethal, corresponding precautionary measures are necessary.</p>	<ul style="list-style-type: none">• Do not touch tension-leading parts.• Let a KONVEKTA Service Station do the repairing works of damaged cables.• Maintenance and repairing works are only to be done by a KONVEKTA Service Station¹.

1. Compare with handbook „KONVEKTA Service Stations“.

7. Shutdown and disposal



Danger!

Obey the following safety instructions in any case to avoid endangering of life and health:

Possible danger	Measures to avoid
<p>Combustion danger!</p> <p>Explanation: The hose line from or rather to the compressor inside the engine compartment and inside the Standby unit can reach a surface temperature of about 60°C. Lest there is a danger of combustion of hands of operating and maintenance staff.</p>	<p>Obey the following steps before opening the engine compartment:</p> <ol style="list-style-type: none"> 1. Secure the vehicle against rolling away – if necessary, see operating instruction. 2. Stop the engine of the vehicle. 3. Pull out the key from the vehicle. 4. Keep safe the key of the vehicle. 5. Let the coolant circuit cool down for 2 hours min. 6. Open the engine compartment.
<p>Danger of contusions and intake!</p> <p>Explanation: The compressor inside the engine compartment and inside the Standby unit is driven by a belt. If the operating and maintenance staff reaches into the belt or rather into the belt pulley while the engine is working, the result could be heavy injuries of fingers and hands.</p>	

7. Shutdown and disposal

7.2 Shutdown

Demands on staff

The disassembling of the transport refrigeration unit is only to be executed by authorized personnel in the field of refrigeration plant construction.

Preparing the shutdown

Execute the following works to prepare the shutdown of the transport refrigeration unit:

Step	Activity
1	Inform yourself how the separate construction parts and the refrigerant used have to be disposed. If necessary, ask your Environmental Representative.
2	Disconnect the transport refrigeration unit from the power supply.
3	Remove the refrigerant by suction and dispose it in a way that excludes damages of health and environment.
4	Now you can open the refrigeration cycle.

7.3 Disposal



For a disposal according to the regulations after the phase of utilization the responsibility lies in the hand of the owner.

Dispose all the parts of the transport refrigeration unit in a way that excludes damages of health and environment.

The environmental laws of the prevailing country are valid in situ.

7. Shutdown and disposal

You will receive special instructions for the disposal:

- In the documentation and the data pages of the supplier and
- From your environmental representative.

Materials used

The following materials were used in the construction of the transport refrigeration unit:

Material	Used in / with
Copper	Pipelines, leads and cables
Aluminum	Case of the transport refrigeration unit
Galvanized steel plate	Case of the transport refrigeration unit
Plastic, rubber, PVC	<ul style="list-style-type: none">• waterproofing• Tubes• Case of the transport refrigeration unit• Pipelines, leads and cables
Tin	Printed circuit board (pcb)

Parts with separate disposal

The following parts and auxiliary agents have to be disposed separately:

Material	Used in / with
LED-Displays	Control panel
Electronic scrap	<ul style="list-style-type: none">• Electric supply• Control unit• Printed circuit boards with electronic components
Refrigerant	Refrigerant cycle

8. Liability for defects

The liability for defects of Konvekta transport refrigeration units is valid for – only for complete units:

- 24 months from date of installation
- no longer than 30 months after date of delivery
- or max. 100.000 km
- or max. 4 000 operating hours

Depending on what occurs first.

After one year the following wearing parts are excluded from the liability for defects:

- Ventilator/blower
- Dryer
- V-belt
- Refrigerant and
- Filter, or rather filter material
- Servomotor

The liability for defects does not include:

- Installation, assembly and service works of the executing firms.
- Assembly of components.
- Non-genuine parts
- Works, which are attributed to the normal wearing of the refrigeration.
- Maintenance works and the therefore needed parts and machinery materials.

The liability for defects and its services does not include normal wear and tear and damages, which were caused by defective or careless handling, excessive use, unsuitable machinery materials, inadequate installation works or false utilization after the passing of risk.

In the case of chemical, electronic, mechanical or electrical influences, which came into being without the fault of Konvekta, a liability for defects is excluded.

8. Liability for defects

Changes on the refrigeration system or the transport refrigeration unit, especially repairs, no matter if they are executed by the owner, user or in their order by a third person, are interventions to the system, which release Konvekta from the liability for defects.

If parts are installed or changes are made which are not authorized or released by Konvekta, Konvekta is discharged from the liability for defects as well.

Works on the refrigeration are only to be executed by an authorized KONVEKTA Service Station¹ and their qualified staff.

The execution of works in the case of liability for defects does not extend the duration of the liability for defects!

In general we refer to our general terms and conditions of business (AGB).

If the owner of the vehicle wants to claim liability for defects for himself, he has to present the filled in maintenance brochure with the proof of the execution of the required maintenance works.

1. Compare with <http://www.konvekta.de/service.html>

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