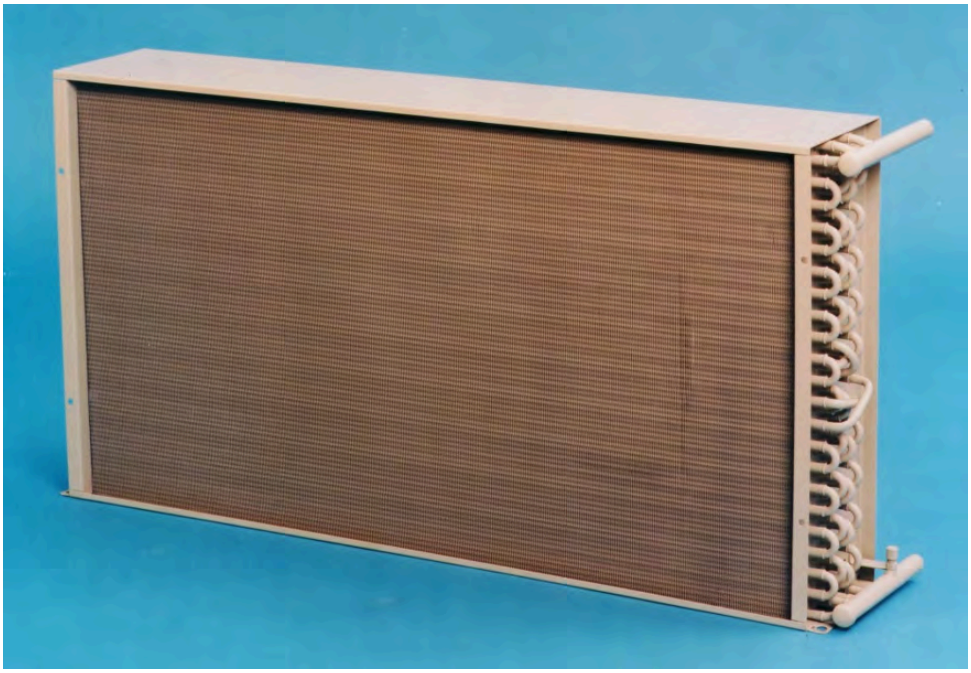
Operating instructions

Transport | Installation | Operation | Maintenance | Disposal



finoox

condenser, air cooler, evaporator, fluid cooler, oil cooler, subcooler, gas cooler

This manual is to be considered part of the unit.
Read and follow this manual carefully before starting work on the unit.
Always keep this manual accessible and in the immediate vicinity of the unit.

guntner.com/uk

About us

Product family:	GCO
Version number:	7
Date of revision:	2025-08-20

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Contents

Version history

The following table lists the respective changes compared to the old versions.

Attention! Minor changes to the instructions, such as the wording of the text or the layout, are not listed separately.

Version of the instructions	Changes/additions
7	Version of the instructions after which the version history was introduced

1 Key basic information

1.1 Importance of the instructions

These instructions apply for heat exchangers of the GCO series. The GCO series is characterised by its versatile application options and can be operated with various working fluids. It offers flexible operating principles and a wide range of material combinations that can be adapted to specific requirements.

Legal framework

These instructions have been written for the European Union and the United Kingdom.

They are based on the Pressure Equipment Directive 2014/68/EU that governs the placing on the market and use of pressure equipment.

1.2 Set-up and applicable documents

The following documents are applicable:

- These instructions
- For further technical data, see nameplate

These instructions are part of the system's operating instructions, which are provided by the system's manufacturer.

1.3 Responsibilities

1.3.1 Responsibilities of the manufacturer of the system

The responsibilities of the manufacturer of the system are reflected in the unit's construction in acc. with EN 378-2 (design, manufacture and testing).

The manufacturer of the system has the following obligations:

- Planning, design and calculation of the system in acc. with the statutory provisions, possibly also by an external planning consultancy (for required qualifications, see "Definition of the target group and requirements").
- Creation of the technical documentation and the system's operating instructions.
- Performing the conformity assessment procedure(s) and creation of the declaration(s) of conformity.
- Planning and preparing emergency measures:
  To avoid consequential damage caused by malfunction, a warning system that immediately signals all faults must be provided on site. Prepare emergency measures that prevent consequential damage to persons, property and the environment should faults occur.
- Specify checking and maintenance intervals:
  The system must be designed and equipped with all required equipment for maintenance, servicing and testing in acc. with EN 378-4.

- Point out the need for sufficient instruction of the operating and monitoring personnel for the operation and maintainance of the system.
- Inform Güntner GmbH & Co. KG (component supplier) immediately if faults occur during the installation, startup and operation:
  claims@guentner.com

When the unit is integrated into the refrigeration system, the working fluid and unit type must not deviate from the order-related information specified in the order documents.

It is recommended that the future customer staff – if possible – is present on site during the installation, for tightness tests and cleaning, while the system is being filled with working fluid and for the adjustment of the system.

The accident prevention rules and regulations that apply for the place of installation must also be observed.

1.3.2 Responsibilities of the owner or operator

The responsibilities of the owner or operator are reflected in the operation, maintenance, repair and recovery of the system in acc. with EN 378-4.

The owner or operator must ensure that the employees entrusted with the operation, monitoring and maintenance of the system are adequately instructed and competent.

The operating personnel responsible for the system must have sufficient knowledge and experience with regard to the operating principles, operation and daily monitoring of this system.

Before commissioning the system, the owner or operator must ensure that the operating personnel are sufficiently instructed about the system's documentation (which is part of these instructions) on the set-up, monitoring, operating principles and maintenance of the system and the safety measures to be observed, and with regard to the properties and handling of the working fluid to be used.

The owner or operator must ensure that when operating, monitoring and maintaining the system, the working fluid and unit type do not deviate from the information specified in the order documents.

Planning and preparing emergency measures: To avoid consequential damage caused by malfunction, a warning system that immediately signals all faults must be provided on site. Prepare emergency measures that prevent consequential damage to persons, property and the environment should faults occur.

Responsibility remains with the owner or operator of the system if the system is used by anybody else unless there is an agreement on a different division of responsibilities.

1.4 Definition of the target group and requirements

General

Only persons who meet the requirements for the personnel may work in the area of the unit. This group of persons is defined below. To prevent damage to health and property, the operator must take measures to prevent unauthorised persons from gaining access to the unit.

Persons who are responsible for working on this unit in the various phases of its life cycle must have the necessary qualifications and competence for the respective tasks in acc. with the applicable local regulations.

Definition of the group of persons

Person	Qualification
Consultant for technical building equipment (TBE)	Master's or Bachelor's degree, or similar educational background, in the field of plant construction, supply engineering or refrigeration and air conditioning
Lorry driver	Valid LGV licence, additional training for heavy loads if necessary
Crane/industrial truck driver	Valid driving licence for crane/industrial truck with forks
Warehouse worker	Specialised training as a warehouse worker or at least sufficient in-house qualification
Fitter/welder	Qualified training for the installation and welding of pipes and the installation of cooling circuits and refrigeration plants
Skilled welder	Qualified training to become a welder for coolant and refrigerant pipes that are subject to approval due to their classification in acc. with the Pressure Equipment Directive.
Refrigeration technician	Training to become a recognised mechatronics technician for refrigeration and air conditioning technology (master craftsman), or refrigeration engineer (Bachelor's degree). If necessary, additional training for handling flammable or toxic refrigerants such as propane or NH_3
Mechanic	Training to become an industrial mechanic or comparable specialised training
Operator	Is able to monitor the safe operation of the system
Cleaning professional	Instruction in the use of cleaning methods and suitable cleaning agents

Definition of tasks for the different life cycle phases

Life cycle phase	Task	Group of persons
Transport and storage	Transporting to the storage location or place of installation	Lorry driver
	Loading/unloading	Crane/industrial truck driver, warehouse worker
	Performing incoming goods inspection	Warehouse worker
	Performing intermediate storage	Crane/industrial truck driver, warehouse worker
Unpacking	Unpacking	Mechanic, warehouse worker
	Checking the transport pressure	Fitter/welder, refrigeration technician
	Disposing of packaging material	Warehouse worker
Mounting/installation	Loading/unloading at the place of installation	Crane/industrial truck driver
	Mounting/installing and removing	Fitter/welder, refrigeration technician, mechanic
Connection	Connecting hydraulic/refrigeration components	Fitter/welder, refrigeration technician
	Welding/brazing refrigerant pipes	Skilled welder
	Flushing the pipes	Fitter/welder, refrigeration technician
	Performing an acceptance test	Fitter/welder, refrigeration technician
Commissioning	Filling with working fluid	Fitter/welder, refrigeration technician
	Performing the commissioning und adjusting settings	Fitter/welder, refrigeration technician
Operation	Performing functional checks on the plant as a whole	Operator
	Monitoring the cooling operation	Fitter/welder, refrigeration technician, operator
	Checking for damage	Fitter/welder, refrigeration technician, operator
Troubleshooting	Performing a visual inspection	Fitter/welder, refrigeration technician, mechanic, operator, cleaning professional
	Performing refrigeration tests	Refrigeration technician

Life cycle phase	Task	Group of persons
Maintenance/repair	Performing a visual inspection	Operator
	Performing annual maintenance	Fitter/welder, refrigeration technician, mechanic
	Fixing leaks	Fitter/welder, refrigeration technician, skilled welder
	Performing cleaning tasks	Fitter/welder, refrigeration technician, cleaning professional
Shutdown and taking out of operation	Taking out of operation (plant as a whole)	Fitter/welder, refrigeration technician
	Shutting down (plant as a whole)	Fitter/welder, refrigeration technician
	Draining/removing by suction (refrigerant)	Refrigeration technician
	Draining (water)	Fitter/welder
Removal	Disconnecting connections	Refrigeration technician
	Disassembling/dismantling/removing	Fitter/welder, refrigeration technician, mechanic
Disposal	Disposing of materials	Crane/industrial truck and lorry driver, refrigeration technician, operator

1.5 Legal note

Note that warranty claims require the existence of a defect that must be proved. These installation instructions are part of the unit and must be observed in their entirety. Damage and malfunctions resulting from the failure to comply with the installation instructions are not covered by the warranty. This applies in particular to the use of spare parts other than those specified (original spare parts in case of doubt) and modifications to the unit compared to its original condition on delivery without the consent of Güntner GmbH & Co. KG. Modifications in this sense are, in particular, the use of working fluids other than those specified, changes to the operating parameters and mechanical changes such as metal-cutting operations (e.g. drilling) without sufficient protection of the unit against chips.

1.6 Document conventions

Mark-up elements for special information

bold	Requires special attention!
⇨ _	Instructions Instructions (sub-item)
• ◦	Listing Listing (sub-item)

1.7 List of abbreviations

Abbreviation	Meaning
°C	Degrees Celsius (Celsius scale temperature)
bar	bar (pressure indication)
CO_2	Carbon dioxide working fluid
PED	Pressure Equipment Directive
DX	Direct expansion
EN	European standard
EN 378	European standard 378: Refrigeration systems and heat pumps; safety-related and environmental requirements
FC/HFC	(Hydro)fluorocarbons working fluid
IP	Degree of protection against the penetration of solids/liquids
ISO	International Organization for Standardization
l	Litre (volume)
mm	Millimetre
NH_3	Ammonia working fluid
P	Pump (forced circulation)
PPE	Personal protective equipment

1.8 Conventions for safety signs and instructions

1.8.1 General safety signs and their meaning in these instructions

⚠ DANGER

This signal word is used to show an **immediately dangerous situation** which, if not avoided, **will cause** severe injury or death.

⚠ WARNING

This signal word is used to show a **potentially dangerous situation** which, if not avoided, **could cause** severe injury or death.

⚠ CAUTION

This signal word is used to show a **potentially dangerous situation** which, if not avoided, **could cause** minor or moderate injury.

ATTENTION

This signal word **without any safety symbols** is used to show a possible risk of damage to property.

NOTICE

This signal word indicates additional information that is useful for the reader, such as operator tips and cross references.

1.8.2 Warning signs and their meaning in these instructions

Warning of hand injury
Failure to observe the warnings can result in hands or fingers being crushed, drawn in or otherwise injured.

Warning of hot surface
The temperature is above +45 °C (the temperature at which protein clots) and can cause burns.

Warning of extreme cold
The temperature is below 0 °C and can cause frostbite.

Warning of heavy loads
Severe injuries can occur when lifting.

Warning of risk of crushing
Transport, loading and unloading can result in life-threatening injury.

Warning of the the risk of slipping
After defrosting, after cleaning work or due to other circumstances, there is a risk of slipping.

Warning of flammable substances at the place of installation
Use of ignition sources can cause fire at the place of installation.

Warning of suspended loads
Standing under suspended loads can cause injury or death.

Warning of high operating pressure
Breakage of pressurised components can cause injury or death.

Warning of corrosive substances
Contact with corrosive substances can cause injuries, especially to the eyes.

Warning of the risk of cutting
Sharp edges and corners.

Warning of the risk of falling
Risk of falling when working high up.

Warning of explosive substances at the place of installation
Use of ignition sources can cause explosions at the place of installation.

Warning of toxic substances at the place of installation
Contact with or inhaling toxic substances can cause injury or death.

Warning of risk of suffocation
Being in an atmosphere with oxygen deficiency or with hazardous substances, gases or vapours can cause suffocation and death.

1.8.3 Prohibitory signs and their meaning in these instructions

No fire, no naked flames and no smoking!
Ignition sources must be kept away or at a safe distance, and ignition sources must not develop.

1.8.4 Mandatory signs and their meaning in these instructions

Use eye protection!
Eye protection must protect against mechanical, chemical and radiation hazards.

Wear protective clothing!
Personal protective clothing must be suitable for the working fluid used and for low temperatures respectively, and must have good heat insulation properties.

Wear protective headgear!
Head protection must protect against hazards caused by impact with objects, swinging objects, falling objects or ejected objects.

Wear safety shoes!
Safety shoes must protect against external, damaging influences and offer protection against slipping.

Wear protective gloves!
Protective gloves must protect against mechanical and chemical dangers.

Use respiratory protection!
Breathing apparatuses must be suitable for the working fluid used. Breathing apparatuses must consist of:

- At least two self-contained breathing apparatuses (respiratory protective devices)
- For ammonia: an additional breathing apparatus with filter (full mask) or a self-contained breathing apparatus (respiratory protective device)

2 Safety

2.1 Intended/improper use

2.1.1 Intended use

Güntner GCO units are finned heat exchangers. They are intended for installation in a refrigerating/cooling plant or for outdoor installation and are used for the heat transfer between a working fluid and the ambient air. The heat exchanger surface is the entire outer surface of the finned heat exchanger through which the air flow to be cooled or heated flows.

The operator of the system determines the operating point.

The nameplate indicates the state of matter of the fluid (liquid/gaseous), the fluid group (hazardous/non-hazardous), the permissible pressure and the temperature.

The machine must be operated in the professional sector.

2.1.2 Operating conditions

Safety measures

Observe the following to avoid personal injury, environmental damage and damage to property in acc. with the state of the art:

- The unit must be used only in acc. with the proper intended use.
- Maintain and clean the unit regularly (see section "Maintenance and cleaning").
- Ensure that the working fluid and unit type do not deviate from the information specified in the order documents when operating, monitoring and maintaining the system.
- Ensure that maintenance measures are performed in compliance with the system's operating instructions.
- Operate the unit only with the working fluids indicated on the nameplate (fluid group and state). Filling the unit with a different fluid is permitted only with the prior written consent of the manufacturer.
- Certain working fluids may be used only in conjunction with specific materials."Types of GCO"
- The maximum permissible operating pressure stated on the nameplate must NOT be exceeded.

2.1.3 Improper use

General

The unit is being used improperly if:

- an unspecified working fluid, an unspecified pressure, an unspecified temperature and/or an unspecified connecting piping not prescribed in acc. with the instructions are used,
- the unit is not completely disconnected for cleaning/maintenance purposes,
- the main dimensions, weight, distances and recommended fixing sizes are not taken into account/adhered to during mounting,
- the wrong fixing elements or not all of the fixing points provided were used for mounting,

- the unit (if operated as an evaporator or air cooler) is defrosted improperly, which leads to severe icing on core tubes, fins and in the connection compartment, which in turn can lead to cracks and fractures in refrigerating system components,
- the unit is operated in an environment or for capacity requirements (e.g. aggressive/corrosive environment; capacity range) the unit with its material combination or capacity is not designed for, or which do not correspond to the intended use.

Improper modifications

The unit must not be modified without prior written consent of Güntner GmbH & Co. KG. Modifications to the unit are:

- Change of the operating point (the specified operating point is indicated in the order-related documents)
- Changing the volume of the working fluid passing through
- Changeover to a different working fluid
- Changeover of the originally designed defrost technology (for use as an air cooler/evaporator)
- Modification to load-bearing components or the casing (remodelling/changes)

Improper operation

The unit must not be operated if it is damaged. All damage must be reported to Güntner GmbH & Co. KG immediately and must be rectified without delay.

2.2 Basic safety instructions

2.2.1 Please note

NOTICE
 Only persons who meet the requirements for the personnel may work in the area of the unit (see section "Definition of the target group and requirements"). The operator must prevent persons under the age of 14 and unauthorised persons from gaining access to the unit.

NOTICE
 Prior to all work on the unit and in case of danger respectively: • Refer to the order documents for the permissible working fluid • Observe the safety data sheets for the working fluid • Wear personal protective equipment (PPE) • The manufacturer assumes no responsibility for electrical components, particularly with regard to voltage and current. It is highly recommended to completely disconnect the unit on the system side and secure it against unintentional restart – unless the instructions for the plant as a whole specify a different procedure.

2.2.2 Hazard due to working fluids

Working fluids pose various residual risks such as irritation, suffocation, poisoning, burns, frostbite, fire hazard and/or explosion hazard. Observe the following safety measures:

- Observe the safety data sheet of the working fluid.
- Comply with the safety regulations for the system in acc. with the EN 378 series of standards.
- Observe the pressure and temperature specified on the nameplate.
- Observe the type of fluid, the fluid charge and material selection in acc. with the technical data.
- Before performing any maintenance work, ensure that the unit is depressurised. Completely drain any working fluid from the unit if necessary.

⚠ WARNING






EXPLOSION HAZARD! FIRE HAZARD! RISK OF SUFFOCATION! RISK OF POISONING! RISK OF FROSTBITE! RISK OF CHEMICAL BURNS!

When working on the pipes of the heat exchanger (e.g. soldering or welding work), or if the flammable working fluid escapes through leaks and forms an explosive mixture over time, the working fluid catches fire or explodes and injures bystanders.

Bystanders may inhale the escaped working fluid. Inhaling the working fluid causes anything from breathing problems to suffocation or poisoning.

Contact with the working fluid can cause frostbite and/or irritation and chemical burns (e.g. ammonia combined with water).

Leakage of the working fluid can also lead to environmental damage.

- Drain the unit prior to work and for transport respectively.
- Ensure that the operator provides appropriate firefighting equipment for soldering and welding work.
- Ensure that the plant is designed in such a way that the unit can be filled/emptied safely.
- Do not fill with a working fluid other than that specified in acc. with the order documents!
- Take measures to prevent high working fluid concentrations on site.
- Monitor the degree of icing regularly and observe the defrosting requirements.
- Check the unit regularly for leaks and leakage (see section "Inspection/maintenance schedule"). Avoid leaks and leakage and, if necessary, have them fixed as quickly as possible by an expert.
- Only put the unit back into operation when all leaks have been repaired.
- Pay attention to the risk of ignition of oil residues carried over.
- Avoid all sources of ignition when working!
- Observe all applicable standards and directives with regard to waste disposal.
- Wear personal protective equipment (PPE), including respiratory protection if necessary (see safety data sheet for the relevant working fluid).




ATTENTION

RISK OF FREEZING!
Units filled with a heat carrier/coolant can be damaged or destroyed in frost if adequate frost protection measures have not been taken. There is a risk of freezing during pressure testing, operation, standstill or after draining units that cannot be completely drained.

- Ensure that the antifreeze concentration is sufficient.
  Caution! The operator must ensure that the antifreeze concentration is sufficient.
- When draining, the unit must be sufficiently ventilated!

2.2.3 Hazard due to pressurised parts

⚠ WARNING

EXPLOSION HAZARD! PERSONAL INJURY AND DAMAGE TO PROPERTY DURING OPERATION OR MAINTENANCE!
The pressure in the heat exchanger exceeds the specified limit values (e.g. due to improper installation) and results in an explosion or breakage of pressurised pipes/components. This causes objects to be ejected and/or working fluid to be released, resulting in personal injury or damage to property (see section "Hazard due to working fluids").

- Comply with all regulations regarding installation, operation, maintenance and maximum permissible operating pressure.
- Drain the unit prior to work and for transport respectively.
- Ensure that the operator provides appropriate fire-fighting equipment for soldering and welding work.
- Ensure that the plant is designed in such a way that the unit can be filled/emptied safely.
- Monitor the degree of icing regularly and observe the defrosting requirements.
- Ensure that relief devices (if any) against liquid expansion are available.
- Ensure that subcooled liquid is present only to a minimal extent in parts of the system when the refrigerating plant is at a standstill – by minimising the number of “dead end traps”.

2.2.4 Thermal hazard

⚠ WARNING

RISK OF BURNS OR RISK OF FROSTBITE!
Contact with the working fluid (e.g. during filling/draining) or with the unit surface or pipes can cause severe burns/frostbite.

- Wear personal protective equipment.
- Monitor the degree of icing regularly and observe the defrosting requirements.
- Retrofit a thermal insulation to the pipes and the connection system as required.
- If necessary, wait until the temperature has equalised to the ambient temperature before starting to work.

2.2.5 Mechanical hazard

⚠ WARNING

RISK OF CUTTING AND CRUSHING!
Persons can cut or otherwise injure themselves on the packaging (e.g. wood) or on sharp edges of the unit (e.g. sheet metal edges/fins) or the accessories.

- Wear personal protective equipment.

3 Technical data

3.1 Unit

See nameplate and order documents.

4 Description

4.1 Types of GCO

Introduction

Güntner's GCO is a unit with variable equipment. Depending on the requirements, it can be configured in the most diverse variants.

Refer to the order documents for the exact unit name.

NOTICE

If not marked separately, all information in the following sections refer to the standard unit!

Available working fluids and their operating modes

Working fluid	Operating mode of the cold side	Operating mode of the warm side
FCs/HFCs of class A1	Direct expansion (DX) / pump (P)	Dry (D)
CO_2	DX/P	D
Refrigerants of classes A2L to A3	DX/P	D
Coolants (e.g. water/glycol)	P	D
Ammonia (NH_3)	DX/P	D
Oil	P	D

Defrost types available for evaporators and air coolers

	Circulating air	Hot gas*	Warm brine*
Coil	X	X	X
Tray	X	X	X

* Accessories

Material combinations available as a standard

Material	Core tube	Fin	Casing/frame*	Tray*
AlMg		X	X	X
Aluminium		X		
Copper	X	X		

Material	Core tube	Fin	Casing/frame*	Tray*
Aluminium, epoxy resin-coated		X		
Steel sheet, galvanised / coated			X	X
Stainless steel V2A / V4A / AISI 304	X	X	X	X

* Accessories

Time limits

Service life: 10 – 12 years

Optional accessories available

- Hot gas defrosting
- Warm brine defrosting
- Condensation water tray
- Droplet separator

4.2 Design and function

4.2.1 Operating modes

Introduction

The unit can be operated in different ways:

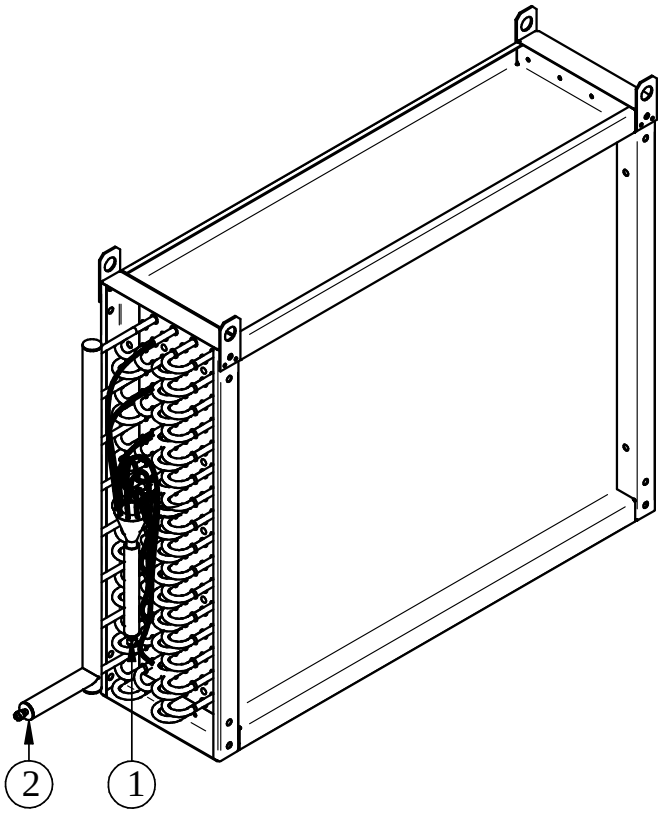
Evaporators/air coolers (cold side):

- Direct expansion with evaporators (**DX**)
- Pump operation with flooded evaporators (**P**)
- Pump operation with air coolers (**P**)

Condensers/gas coolers/dry coolers (warm side):

- Dry operation with condensers/gas coolers (**D**ry)
- Dry operation with dry coolers (**D**ry)

Direct expansion with evaporators (cold side)



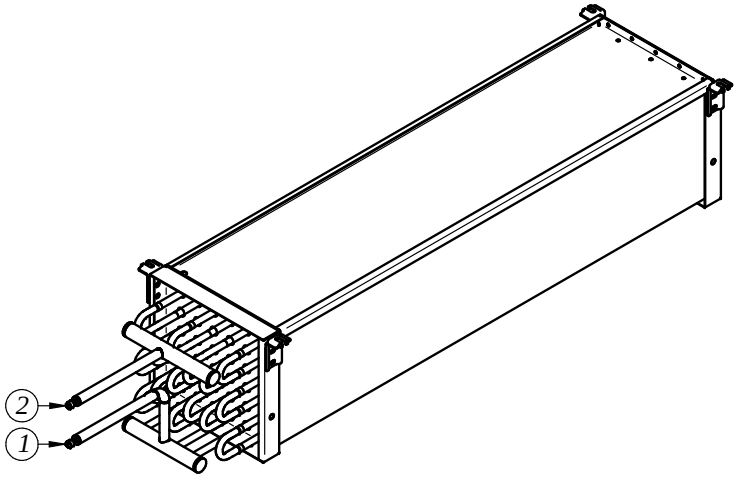
Evaporator (DX)

No.	Designation
1	Inlet of refrigerant via expansion valve (throttle valve) and distributor
2	Outlet of refrigerant

Operating principle

The liquid working fluid enters the evaporator (1) via the expansion valve at low temperature and low pressure and is evenly distributed in the piping system through a distributor (2). In the piping system, the working fluid absorbs heat from the ambient air over the entire heat exchanger surface and evaporates. The compressor sucks in the gaseous working fluid and the working fluid leaves the evaporator via the outlet (3). The working fluid is compressed under high pressure in the compressor, thus raising the temperature level. The working fluid is liquefied again in the condenser. During this process, it releases the absorbed evaporation and compressor heat again. The expansion valve expands the working fluid, and the cycle starts again from the beginning.

Pump operation with flooded evaporators (cold side)



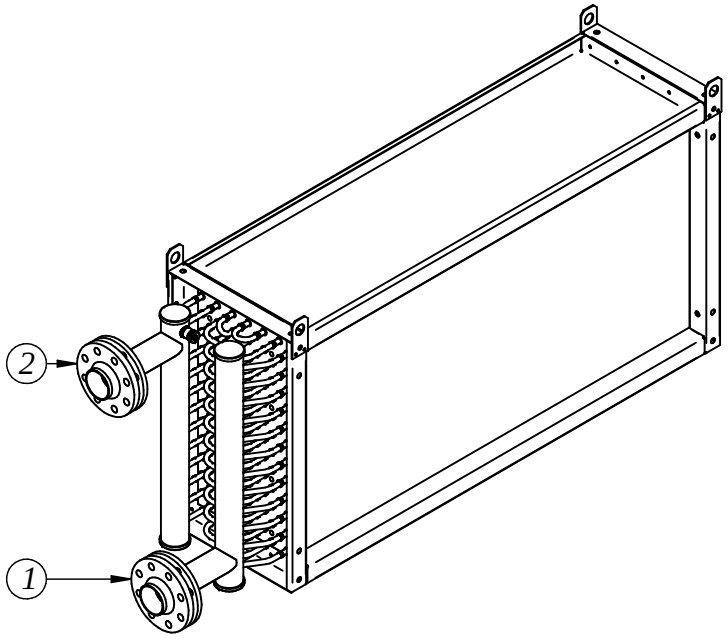
Flooded evaporators (P)

No.	Designation
1	Inlet of refrigerant
2	Outlet of refrigerant

Operating principle

In pump operation using CO_2, NH_3 and refrigerants of classes A2L to A3, the principle of flooded evaporation applies. The pumped working fluid is directed to the evaporator via the inlet point (1), where it is heated by absorbing heat. At the same time, the circulated air is cooled. However, the working fluid does not completely evaporate – a mixture of vapour and liquid is present at the outlet point (2). Later on in the circuit, these phases are separated from each other using a container.

Pump circulation with air coolers (cold side)



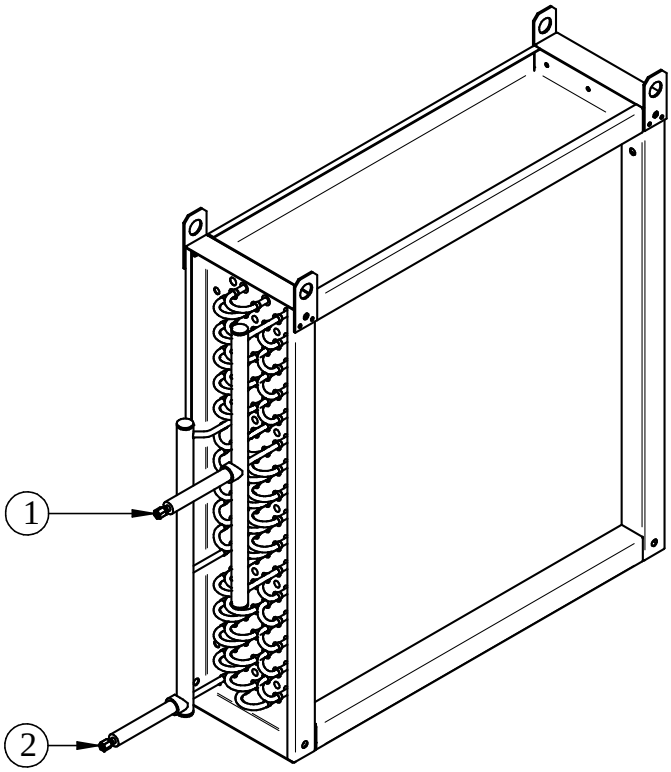
Air cooler (flange connection optional)

No.	Designation
1	Inlet of coolant
2	Outlet of coolant

Operating principle

With water/glycol, oil and other coolants, the liquid working fluid absorbs heat as it passes through the air cooler without changing its state of matter. It leaves the unit as liquid working fluid.

Dry operation with condensers/gas coolers (warm side)



Condenser and gas cooler

No.	Designation
1	Inlet of refrigerant
2	Outlet of refrigerant

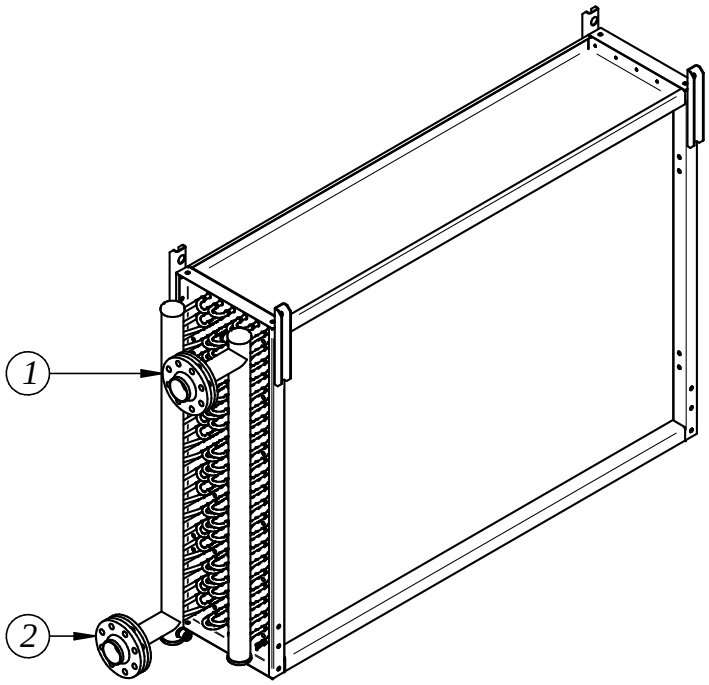
Operating principle

Condensers liquefy the refrigerant by dissipating heat to the air that is guided over the dry heat transfer surface.

With gas coolers (CO_2), there are two different operating modes. In transcritical operation, the unit acts as a gas cooler and in subcritical operation as condenser.
In transcritical operation, the incoming gaseous CO_2 is cooled by dissipating heat into the ambient air. There is no change of state.
In subcritical operation, the incoming gaseous CO_2 is cooled, liquefied and subcooled by dissipating heat into the ambient air.

The subcooler ensures reliable subcooling of the already condensed refrigerant.

Dry operation with dry coolers (warm side)



Dry cooler (flange connection optional)

No.	Designation
1	Heat carrier inlet
2	Heat carrier outlet

Operating principle

Dry coolers (fluid coolers) cool the heat carrier by dissipating heat to the air (air side) that is guided over the heat transfer surface. There is no change of state.

5 Transport and unpacking

5.1 Safety instructions for transport and unpacking

⚠ WARNING





RISK OF INJURY OWING TO STRONG IMPACTS!
RISK OF CRUSHING AND SHEARING!

The following hazards may occur:

- When transporting or manoeuvring the means of transport, bystanders are caught by the unit. This causes severe impact injuries.
- Bystanders get under the unit or are caught by a falling component/unit and lose limbs or are crushed.
- The unit loses its stability due to accelerations during transport and falls over or falls from the goods vehicle. Bystanders are seriously injured.
- Attempting to transport the unit by hand causes injury (e.g. to the spine) due to the lifting of an overload.

Take the following measures:

- Transportation including loading and unloading only by specialist staff.
- Do not stand in the loading/danger zone under or in the vicinity of suspended loads.
- Ensure that the unit is protected against slipping and mechanical damage.
- Remove foreign material before lifting the unit, and sweep off snow.
- Ensure that the unit is not filled during transport.
- Suspend or position the unit so that it has a stable centre of gravity.
- Use appropriate lifting or tie-down points.
- Use suitable tools and working equipment.
- Do not lift the unit in strong winds.
- Observe maximum permissible total weight.
- Wear personal protective equipment.




ATTENTION

The lifting capacity of the means of transport must be at least 1.5 times the weight of the unit.
Do not use connection pieces and outlet headers as attachment points for lifting, pulling, fixing and climbing. This can result in leakage.

ATTENTION

The finned heat exchangers must be protected against hard impacts and shocks during unloading and internal transport, and against slipping, mechanical damage as well as harmful effects of the atmosphere (packaging units)!

NOTICE	
	Observe all basic safety instructions (see section "Basic safety instructions").

5.2 Transport and storage of the unit

5.2.1 Transporting the unit

General

NOTICE	
	Read and observe the transport signs on the unit packaging!

ATTENTION	
	Permanent mechanical load caused by uneven road surfaces and potholes, and vibrations during ship transport, can result in transport damage. • Supports of outlet headers and flanges must be added if required.

⇨ Transport the packed unit by 2 persons or with suitable transport equipment (e.g. industrial truck with forks or crane) to the final place of installation.

⇨ Remove cover.

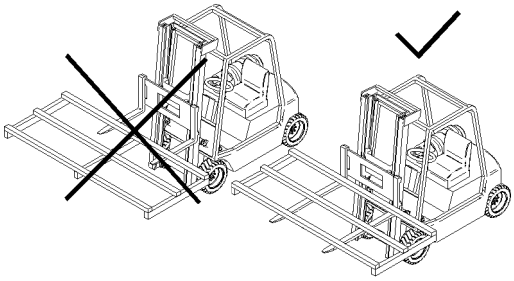
⇨ Unload the unit.

⇨ Only unloading equipment that is suitable for the weight of the packaging unit may be used.

⇨ Make sure the weight is evenly distributed.

Industrial truck with forks

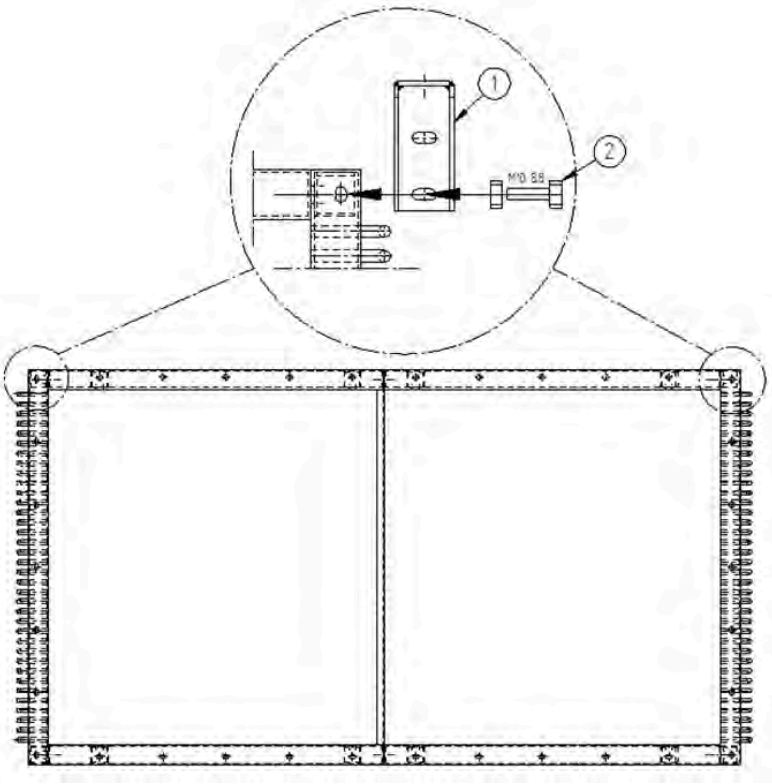
NOTICE	
	Before lifting the pallet with an industrial truck with forks, slide the forks far enough underneath the open spaces of the pallet so that they reach to the end of the pallet.



Crane

NOTICE

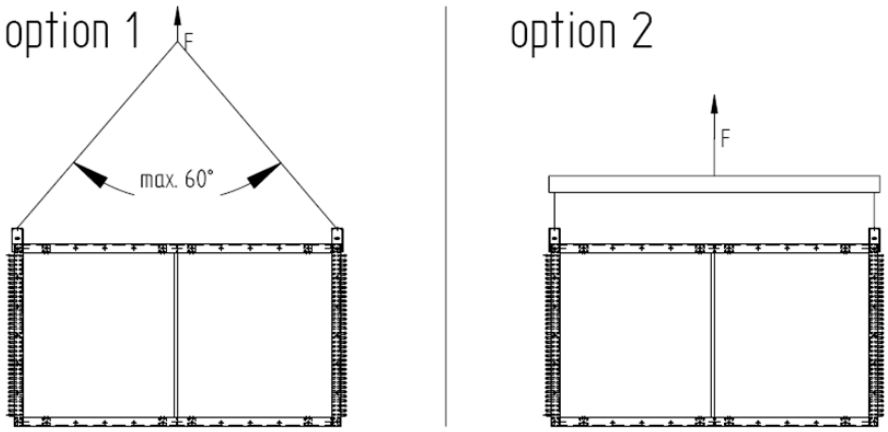
When transporting the unit with a crane, pay attention to the angle between the cables/chains/loops.
If too great an angle is allowed between the cables/chains/loops when transporting with a crane, this can lead to excessive mechanical stress on the crane lugs, which can break in extreme cases, causing the unit to fall down.



1 Crane lug, 2 Set of screws

Observe the following regulations when transporting with a crane:

⇨ Use crane lugs.
⇨ Ensure that the cables/chains/loops do not rub against other components.
⇨ The angle between the cables/chains/loops must not exceed 60° (option 1).
⇨ If necessary (option 2), use a lifting beam (lifting capacity > 5 tonnes).
⇨ The cables/chains/loops should pull upwards in as straight a line as possible when viewed from the front.
⇨ Prevent any vibration of the unit.



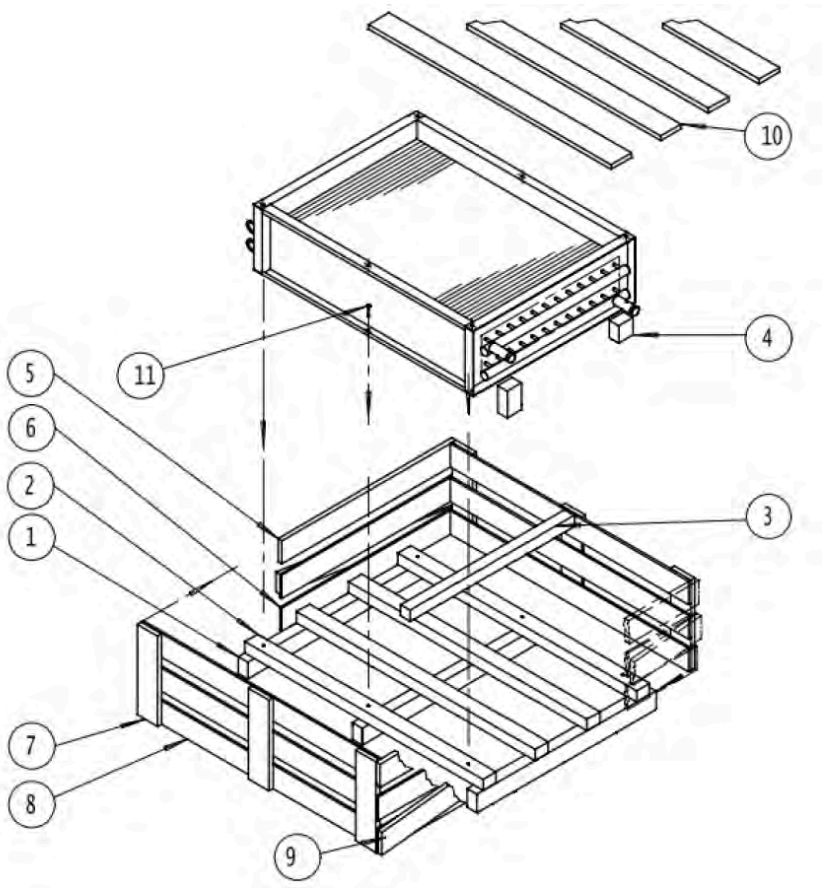
5.2.2 Storing the unit prior to installation

⇨ Protect the unit against dust, dirt, moisture and wetness, damage and other harmful influences until it is mounted.
⇨ Check, once a month and prior to installation, if the transport pressure is still present to ensure that the unit is leak-tight. If the pressure is too low or if there is no transport pressure at all, be sure to contact the service department of the manufacturer. Before moving the unit to the installation site, check the load capacity and structural integrity of the crane lugs and replace them if required. Store the unit only in its original packaging until installation.
⇨ If the unit installation is delayed beyond the initial deadline scheduled for installation: Protect the unit against weather and other harmful effects and dirt with an appropriate tarpaulin. In this context, ensure good ventilation of the unit.

5.3 Unpacking the unit

Unpacking the unit

The units are delivered in installation position in wooden packaging.



No.	Number	Designation
1	3	Squared timber
2	4	Squared timber
3	1	Squared timber
4	2	Squared timber
5	2	Lining boards
6	4	Lining boards
7	6	Lining boards
8	6	Lining boards
9	2	Lining boards
10	4	Lining boards
11	6	Wooden screw with washer

⇨ Remove the transport protection.

⇨ Use a transport rack to lift the unit.

⇨ Remove the unit from its packaging.
⇨ Check scope of delivery for completeness. For the scope of delivery, refer to the order documents.
⇨ State transport damages and/or missing parts on the delivery notes. Immediately notify the manufacturer in writing about the matter. Damaged fins can be repared on site using a fin comb.

5.4 Checking the transport pressure

Introduction

The section applies only to units supplied with transport pressure.

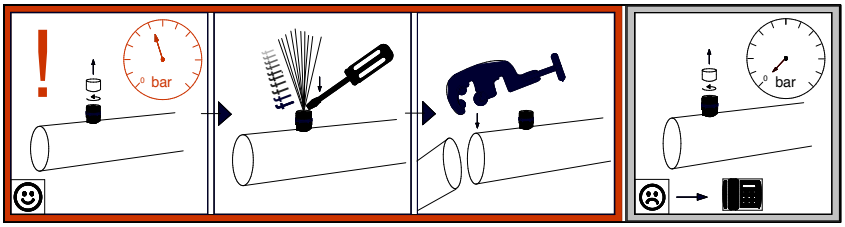
All units are delivered by the manufacturer with approx. 1 bar of transport pressure (cleaned and dehumidified air). The transport pressure is used to check the leak tightness.

Specific hazards

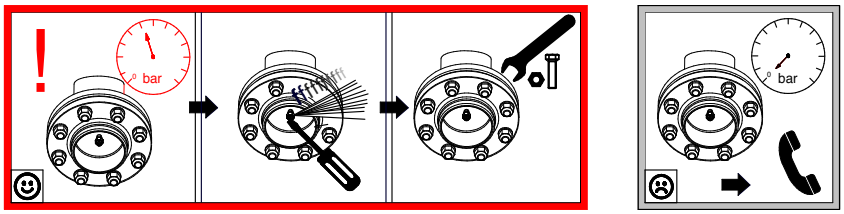
⚠ CAUTION

RISK OF DAMAGE TO PROPERTY!
The unit is pressurised! An unpressurised unit indicates a leak due to transport damage.
- Do not put the unit into operation!
- Immediately report any pressure drop of the unit to the manufacturer and note it on the delivery note.

Procedure immediately before the installation



In the case of factory-sealed pipe ends without flanges



In the case of factory-sealed pipes with flanges

⇨ Check and release the transport pressure.

⇨ Cut off the sealed pipe ends without flanges from the pipes (e.g. with a suitable saw). **Caution!** The sealed pipe ends must not be cut off more than 2 cm from the end.

⇨ Unscrew the flanges from the pipes with flanges. The counterflanges can be reused. However, the gaskets and flange bolts must be replaced by the customer.

6 Installation and commissioning

6.1 Safety instructions for installation and commissioning

Please note

NOTICE
 Observe the basic safety instructions and the safety instructions for transport (see sections "Basic safety instructions" and "Safety instructions for transport and unpacking").

NOTICE
 Mounting/installation must be performed by competent persons. The manufacturer's warranty does not cover damage resulting from improper installation.

NOTICE
 During filling and after filling the system, properly vent the heat exchanger. To do this, keep the vent connections open until no more air escapes from the unit! Observe the safety data sheets of the working fluid used!

NOTICE
 After commissioning, document the installation and settings and have them signed by the responsible persons.

Specific hazards

⚠ WARNING

RISK OF DAMAGE TO PROPERTY!
In order to avoid stray currents, heat exchanger tubes, casing parts and the like must not be used as return line when performing welding work as these load-bearing components and lifting accessories are not designed for high welding currents.
If not observed, unintended or improper current flow can damage heat exchanger pipes of the unit and lead to damage during operation.

- Securely connect the insulated welding return line to the workpiece to be welded directly at the welding point.

ATTENTION

RISK OF DAMAGE TO PROPERTY!
To prevent damage to the heat exchangers, always connect them without force and torque. There must be no forces or moments acting on the heat exchanger at any time. Failure to observe this can result in leaks and further damage to the heat exchanger in the short and medium term.

- Ensure that the outlet headers and flanges (if any) are not used as a climbing aid. They are not designed for external forces.
- Ensure that no forces or moments act on the heat exchanger at any time by using suitable fixed bearings during pipe installation.

6.2 Requirements for the place of installation

Dimensions/weights

For dimensions and weights, refer to the order documents.

Environmental conditions and load limits

The unit is designed for the following ambient conditions:

- The maximum permissible temperatures (TS) and pressures (PS) are specified on the unit's nameplate.
- At fluid temperatures below 0 °C, frost and ice is likely to form.

When using the unit on the cold side, the unit is subject to the following load limits:

- Max. ice load on the heat exchanger: 1 mm on the fins
- Max. ice load on refrigerating system components: 1 mm

The material selection of all components must be suitable for the local conditions.

Installation conditions

⇨ The layout plan must be drawn up by the system operator.
⇨ Place the unit in such a way that it can be reached safely and cannot be damaged by internal traffic or transport processes.
⇨ Place the unit so that it can be monitored and checked from all sides at all times.
⇨ Ensure that sufficient space is available for maintenance.
⇨ Ensure that all working fluid-carrying components, connections, shut-off devices and pipes and all electrical connections and lines are easy to access.
⇨ Ensure that the labelling of the pipes is easily visible.
⇨ Ensure that there is sufficient free space on the side of the unit (e.g. the side distance from the unit to any possible obstructions) and under the unit so that the hinged side plates and the tray (if any) can be opened and closed in a safe and obstruction-free manner.
⇨ Take appropriate measures when operating the unit in locations with extreme environmental conditions (e.g. aggressive atmosphere, low external temperature, etc.)! Consult the manufacturer if required.
⇨ The unit must be securely fixed at all fixing points without vibration.

NOTICE	
	The operator or installer of the equipment is responsible for ensuring that the bolted connections are of an adequate strength.

Mounting/installation guidelines

The unit must be mounted/installed in acc. with the specifications in the order documents.

6.3 Installation of the unit

6.3.1 Mounting the unit

Required staff

- At least 2 persons are required for mounting.

Auxiliary equipment/tools

- Lifting accessories and lifting gear
- Climbing aids
- Master gauge for holes (on the system side)
- Instruments for measuring lengths and angles
- Writing materials
- Drilling tool
- Wall plugs
- Fixing bolts/nuts

- Washers
- Spanner or appropriate assembly tools for screws and nuts

Provisions for fixing

- Prevent mechanical stress on the unit as follows:
  - Ensure that all fixing points are at the same distance from the fixing level and that this distance is maintained permanently even under load.
- At the place of installation, bolt the units into place via all available fixing points using fixing bolts with washers. The fixing points must support the weight of the respective unit. The operator or installer of the equipment is responsible for ensuring that the bolted connections are of an adequate strength.
- Observe the following instructions when fixing the units:
  - The diameters of the mounting holes have been statically determined by the manufacturer; use suitable fixing bolts and washers. When calculating the bearing strength, it is imperative to take into account the total weight of the unit (= structural weight of the unit + weight of tube volume + additional weight such as moisture, ice and dirt).
  - Secure fixing bolts against loosening by means of appropriate locking devices.
  - Do not overtighten the fixing screws.
  - Tighten all fixing screws equally.
- Fix the unit in position and secure it against moving.
- Ensure that the drip water drains properly. Set up the unit horizontally and in a level position (optional with drip tray).
- Use the fixing points provided to fix the unit. Tighten all fixing bolts evenly to achieve the most even load distribution possible.

6.4 Connecting the unit

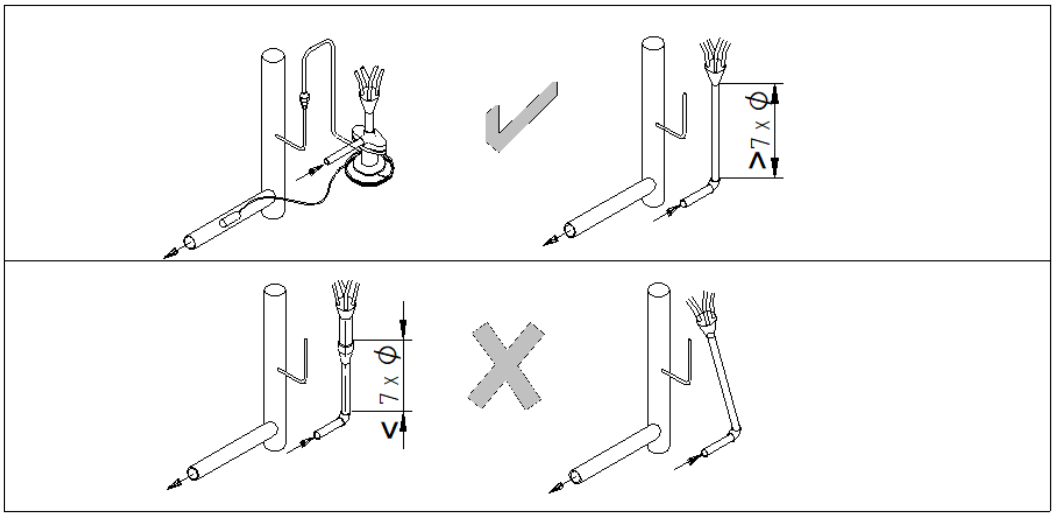
6.4.1 Connecting the unit to the plant

Safety

NOTICE	
	Observe all safety instructions on the installation and commissioning (see section "Safety instructions for installation and commissioning", page 37).

Distributor connection (with DX)

Connect the distributor to the system in acc. with the following instructions:



NOTICE

After installation, check the capillary tubes of the distributor for free movement.
Vibrations can result in mechanical damage and leaks. It is therefore essential to align or additionally secure the capillary tubes (e.g. using plastic cable ties).

Important notes on connecting the unit

- Regarding welding work: Observe the safety instructions on connecting the welding return line (see "Safety instructions for installation and commissioning").
- Perform soldering and welding work only on unpressurised units .
- Ensure that mechanical stresses and vibrations from the system are not transferred to the unit.
- Ensure that relief devices against liquid expansion are available.
- With condensers and gas coolers/condensers: Ensure that the (subcooled) liquid can drain freely into the liquid receiver.
- It is imperative that working fluid connections are installed without tension and protected against linear thermal expansion and vibrations using Lyra bends or pipe compensators.
- Support the on-site piping with at least two fixed points before connecting to the unit.
- Never use pliers for the tray drain (if any)! Tighten by hand!
- In the case of threaded connections: In addition, use a wrench/spanner to counterhold when connecting and disconnecting the threaded connections of pressurised pipes and components to prevent leaks.
- With the water/glycol working fluid: Use water of drinking water quality.

Installation notes on pipes

- The connections are easily accessible.
- Keep the installation of pipes as short as possible; use as few bends as possible, and only those with large radii, to minimise the pressure drop.
- External loads must not act on the pipes and unit connections.
- Lay pipes (liquid and discharge lines, supply and return lines) separately from each other and insulate on both sides.

- Ensure that pipes are secured against vibrations, mechanical stresses and force transmission due to linear expansion.
- The free space around the unit must be sufficiently large to allow for the following measures:
  - Regular maintenance of components
  - Checking of components, pipes and fittings
  - Repairs
- It must be possible to shut off the unit in the event of leakage.

Procedure

⇨ Install the pipes in acc. with EN 378-1 and EN 378-3.
⇨ With stainless steel, the connection to the system must be welded.
⇨ With copper, the connection to the system must be brazed.
⇨ With units with threaded connections/flanges, bolt the connections together.
⇨ In the case of threaded connections, prevent the pipe from twisting by holding it in place.
⇨ When brazing, observe the following:
  - Braze all connections!
  - Caution! With TS < -40 °C, use silver solder! Ask the manufacturer for brazing specifications if necessary!
  - Avoid end-to-end joints; use copper pipe ends expanded on one side (capillary brazing)!
  - Avoid leaks, braze conscientiously and carefully!
  - Avoid overheating when brazing (risk of excessive scaling)!
  - Use shielding gas when brazing (to avoid scaling)!
⇨ When welding, observe the following:
  - Avoid leaks, weld conscientiously and carefully.
  - Prevent overheating when welding (risk of excessive scaling).
  - Use shielding gas when welding (to prevent scaling).

6.5 Performing an acceptance test

Safety

⚠ WARNING

RISK OF PERSONAL INJURY AND DAMAGE TO PROPERTY!
Escaping working fluid can cause personal injury (see safety instructions regarding working fluids in sections "Hazard due to working fluids" and).
- Have the following acceptance test performed by a competent person before commissioning the unit, after making important changes to the unit and after replacing the unit.

Requirement

- The temperature and humidity at the place of installation correspond to the permissible operating range (see nameplate).

When to perform an acceptance test

- Before commissioning the unit
- After making important changes to the unit
- After replacing the unit

Procedure

⇨ When operated with water, the unit must be put into operation quickly after initial filling (maximum two weeks) to prevent pitting corrosion caused by stagnant water.
⇨ Ensure that sufficient air can be sucked in and blown out.
⇨ Check the unit for vibrations and movements that could be caused by the operation of the plant. Eliminate vibrations and external forces, following consultation with the manufacturer if required.
⇨ Perform a visual inspection of the structural design, the brackets and fastenings (materials, connections), the operability and the arrangement of the fittings.
⇨ Check the pipe connections.
⇨ Check that working fluid-carrying pipes are laid correctly.
⇨ Ensure that the unit is protected against mechanical damage.
⇨ Ensure the unit is protected against excessive heating up and cooling down.
⇨ Ensure that the unit can be inspected at any time and is always freely accessible:
  ° Is the unit positioned so that it can be monitored and checked from all sides at all times?
  ° Is sufficient space available for maintenance?
  ° Are all working fluid-carrying components, connections and pipes and all electrical connections and lines easy to access?
  ° Are the pipe identifications easily visible?
⇨ Check heat exchanger surfaces for dirt and clean if required (see section "Cleaning the coil").
⇨ Check the quality and execution of all connections (soldered connections, electrical connections and fixing connections).
⇨ Be sure to perform a pressure test in acc. with EN 378-2.
⇨ Perform a system test in acc. with the locally applicable regulations, e.g. EN 378-2 for the European region.
⇨ Check the corrosion protection: Perform a visual inspection of all pipes, components and component holders that are not heat-insulated. Document and archive the test results.
⇨ Perform a test run. Observe and check the unit during the test run, in particular for:
  ° Leaks

Procedure in case of defects

⇨ Report all defects to the manufacturer immediately.
⇨ Rectify the defects only upon consultation with the manufacturer.

Check after 48 operating hours

⇨ Check the unit and the unit's interaction with the system again after approx. 48 operating hours.
⇨ Document the test result.

7 Operation

7.1 Safety instructions for operation

Please note

NOTICE

Observe the basic safety instructions (see section "Basic safety instructions").

Specific hazards

⚠ WARNING

RISK OF PERSONAL INJURY AND DAMAGE TO PROPERTY!
Escaping working fluid can cause personal injury (see section "Hazard due to working fluids").

- Put the unit into operation only if all requirements are met (see section "Putting the unit into operation").
- Ensure that the maximum operating pressure is never exceeded (also after shutdown)!

NOTICE

To prevent corrosion caused by stagnant water, units with water as working fluid must be put into operation within two weeks after filling.

7.2 Putting the unit into operation

Requirements

Put the unit into operation only if the following requirements are met:

- A thorough and complete initial cleaning has been performed to remove dirt and other contaminants caused by transport and installation.
- Safe filling is ensured.
- The unit has been properly installed and connected (see section "Installation of the unit").
- A full acceptance test has been performed (see section "Performing an acceptance test").

- The operational readiness has been checked, and the operating point has been set (see below).
- All prescribed safety measures have been taken.

Checking the operational readiness

⇨ Ensure that all working fluid-side connections are securely established.

⇨ Ensure that all threaded connections on the fans, the fixing bolts on the unit and all other threaded connections are tight.

Setting the operating point

⇨ For the parameters for setting the operating point, refer to the order documents.

⇨ Ensure that the specified operating point is maintained. For this, secure the operating elements for setting the operating point against access by unauthorised persons (e.g. by sealing, screwing on caps, removing the handwheels).

Procedure

⇨ Check and switch on the system including the electrical system (see the system's operating instructions).

⇨ Open the valves on the inlet and outlet side of the system.

⇨ Wait until the operating point is reached. Once the operating point is reached, the unit is ready to operate (see the system's operating instructions).

⇨ Check units with heat carrier/coolant regularly for correct bleeding after starting the pump.

7.3 Taking the unit out of operation

Introduction

The units are components of a system. The unit is taken out of operation by switching off the system in acc. with the system's operating instructions and after the unit has been shut down (see section "Shutting down the unit").

NOTICE	
	When shutting down the unit, observe the max. operating pressure! When required, take precautions to ensure that it cannot be exceeded, or drain the unit.

Procedure

⇨ Switch off external devices (e.g. fans, electrical installation)

7.4 Shutting down the unit

Safety

NOTICE	
	All refrigerants must be removed from the unit by suction and disposed of by an approved specialist company in the field of refrigeration.

Procedure

⇨ Shut the unit down (see above).
⇨ Secure the unit as follows:
  ° Secure the working fluid-carrying pipes against supply with working fluid.
  ° Protect against damaging effects at the place of installation or intermediate storage location so that the unit's components are kept in good condition and the intended use and usability of the unit are maintained. To this end, appropriate storage conditions (see section "Storing the unit prior to installation") must be provided, precautionary corrosion protection measures must be taken and the shutdown unit must be checked regularly.
⇨ With refrigerants (FC/HFC, NH_3, CO_2, and refrigerants of classes A2L to A3) prior to disassembly/removal: Completely remove the working fluid from the unit by suction into a suitable refrigerant container, and completely drain the lubricating oil for refrigerating compressors if necessary.
⇨ With coolants prior to disassembly/removal: Completely drain the working fluid from the unit.

If the system is shut down for a period of three weeks or longer, the following must be observed:

⇨ Completely disconnect the unit (on the system side) and indicate this accordingly.
⇨ Remove dirt and deposits from the outside and inside of the unit.
⇨ Store the unit in a place that is not exposed to sunlight.

7.5 Putting the unit back into operation after shutdown

Introduction

The unit must be put back into operation in acc. with the system-specific design as set out in the system's operating instructions.

Procedure

⇨ Test the unit's readiness for operation.
⇨ Perform a pressure test in acc. with EN 378-2 and a visual inspection for corrosion protection.
⇨ Put the unit into operation (see section "Putting the unit into operation").

ATTENTION	
	Water residues in a refrigerating plant operated with refrigerants can result in damage to property! • Evacuate to ensure that a sufficient degree of dryness of the refrigeration circuit is achieved in acc. with the requirements of EN 378.

7.6 Defrosting evaporators and air coolers

7.6.1 Defrosting functions

Introduction

Recommendations for controlling the defrosting cycle are given below. These recommendations should be adapted according to the local conditions in the cold room in order to achieve optimum defrosting behaviour.

If several evaporators or air coolers are installed in a larger cold room, group defrosting can be useful. Here, the units are divided into several groups that are alternately taken out of cooling mode and defrosted. These groups should be arranged in such a way that the units in defrosting cycle and those in cooling mode interfere with each other as little as possible.

Recommended defrost sensor positioning

In order to achieve optimal defrosting (heat exchanger completely free, moisture entry into the cold room minimised), it is curcial to position the defrost sensor carefully. Place it in the fin surface that is visible from the outside (usually the air inlet) where defrosting is finished at the latest time. This is usually also the coldest point in the heat exchanger.

The final defrost temperature should range between approx. 5 and 8 °C.

If the visible fin surface is on the air outlet side of the unit, the final defrost temperature must be set a little higher.

In case the final defrost temperature is set too low, “ice pockets” can build up due to repeated insufficient defrosting.

If the final defrost temperature is set too high, this can cause extreme water vapour formation, which in turn causes the formation of frost and ice around the unit.

NOTICE	
	The defrost sensor is clamped and fixed directly between two fins. Positioning in an existing contact/supporting tube is not permitted! Check the position selected during the first defrosting cycles and adjust if necessary. Check if the defrost sensor measures the correct temperature. With longer connecting cables, it may be required to correct the measured value.

Types of defrosting

The following defrosting types are feasible for the GCO:

- Air defrosting
- Hot gas defrosting
- Warm brine defrosting

7.6.1.1 Air defrost

Operating principle

With units that are operated at a cold room temperature of at least +4 °C, defrosting by means of circulated room air is sufficient in most cases.

For this, the supply line of the working fluid is interrupted. The “warm” room air in combination with the (system-side) fan waste heat ensures sufficient defrosting. As inherent to the functional principle, a certain degree of room cooling is thus maintained even during the defrosting process.

The frost accumulation increases the air velocity across the heat exchanger. If the fans installed in the unit by the customer allow it, their speed should be reduced during defrosting to such an extent that condensate carry-over in the air flow is prevented.

Start the refrigeration mode again only after complete defrosting as described above.

7.6.1.2 Hot gas defrost

Operating principle

The superheated hot gas downstream of the compressor can be used energetically to provide the required defrost heat. For this purpose, it is conveyed to the evaporator to be defrosted. There, its temperature reduces/it condenses while releasing heat.

Usually, the hot gas passes through those pipes of the heat exchanger that also serve to generate cold so that defrosting can be carried out quickly and in a targeted manner. Compared with electric defrosting, efficiency is significantly higher.

A sufficiently large quantity of hot gas must be available to heat the heat exchanger evenly. This is achieved by defrosting only a part of the installed evaporators.

Rule of thumb:

Normal temperature: 2 evaporators in cooling mode, 1 evaporator in defrosting cycle

Deep freezing: 3 evaporators in cooling mode, 1 evaporator in defrosting cycle

As standard, the piping that is optionally available ex works is designed in such a way that the hot gas first flows through the condensate tray and then through the heat exchanger. However, it can make sense to control the tray and the heat exchanger separately, e.g. in order to reheat the tray for improved condensate drain while the actual defrosting of the heat exchanger has already been completed.

The defrost heat is used more efficiently with double-wall insulation of the tray (optional).

Injection evaporator

The hot gas is fed to the heat exchanger via a distributor. If capillary tubes with a diameter of 4.0 mm or 5.0 mm are used for cooling operation, a second distributor with a larger flow area is installed for the hot gas.

From a capillary diameter of 6.0 mm for cooling operation, the existing distributor can be used for the hot gas. To this end, a T-piece is integrated in front of the Venturi distributor. Between the T-piece and the distributor, sufficient stabilisation distance of at least seven times the tube diameter is provided.

Flooded evaporators

Depending on the design of the connection system, the optional factory-fitted piping of the hot gas line is designed as follows:

Horizontal inlet/outlet headers: The standard version provides for the hot gas that has already flowed through the condensate tray to be supplied to the heat exchanger via the outlet header

at the top. An integrated jumper bend prevents the accumulation of liquid working fluid in the pipe coil of the condensate tray. Optionally, a check valve can be installed in addition in the connecting line.

Alternatively, the hot gas can be supplied to the distribution pipe at the bottom. Here, the installation of a check valve is mandatory and already installed ex works.

Vertical inlet/outlet headers: The hot gas coming from the condensate tray is supplied to the heat exchanger via the outlet header. A check valve is mandatory and already installed ex works.

7.6.1.3 Warm brine defrost

Operating principle

When defrosting with warm brine, waste heat generated on site can be put to good use as a source of energy. This allows very efficient defrosting. If identical brines are used for cooling and defrosting, an additional piping system in the heat exchanger for the warm brine is not required.

We recommend to start the defrosting process for tray and coil in parallel. In this case, we recommend a flow temperature of at least 20 °C. The required brine quantities and the resulting pressure drops are specified separately for heat exchanger and tray on the technical data sheets of our GPC selection software.

If, contrary to our recommendation, it is desired to pipe the hot brine via the tray first and only then through the heat exchanger (piping in series), an increased flow temperature of 30 °C should be used. As the entire amount of brine must flow through the tray, the pressure drop of the fluid increases considerably compared to our specification on the data sheet.

The defrost heat is used more efficiently with double-wall insulation of the condensate tray (optional).

7.6.2 Defrosting the unit

Safety

⚠ CAUTION

RISK OF SLIPPING!
During defrosting, condensation water forms that can drip onto the floor and subsequently freeze. There is a risk of slipping.
- Ensure that the drain of the tray is kept clear.

NOTICE

Observe all safety instructions for operation (see section "Safety instructions for operation", page 44).

Defrosting checks

As the local conditions have a very strong influence on the operating behaviour of the unit and the need for defrosting, the heat exchanger must be checked regularly and specifically for frost accumulation and icing during operation.

Procedure

⇨ With a frost thickness of max. 1 mm per fin side, defrost the unit to ensure proper functioning and reliable operation.
⇨ Initiate the defrosting process in good time (see section "Defrost control", page 50).
⇨ Consider alternating operating states, e.g. changes of use at the place of installation.
⇨ Choose the right final defrost temperature.

7.6.3 Factors influencing the defrosting process

Time interval between defrosting cycles

How often defrosting is necessary depends on many influencing factors, e.g.:

- Type of refrigerated goods
- Ambient temperature
- Temperature difference between working fluid and room
- Frequency of entering (opening the cold room door)
- Fin spacing

When the defrosting process is finished, ensure that defrosting has been completed.

7.6.4 Defrost control

General rules

The defrosting process is started at pre-set intervals or in line with demand. The process completion must be verified twice (time/temperature and temperature/temperature).

The defrosting cycle can be divided into four stages:

- Pump-out phase/heating of working fluid
- Defrosting process
- Drip phase
- Freeze-on phase/delayed fan start (system-side)

NOTICE	
	Control the defrosting so that frost formation is limited to max. 1 mm.

Pump-out phase/heating of working fluid:

The supply of the working fluid is interrupted while the “warm” room air flows across the heat exchanger. Any refrigerant still present inside the heat exchanger is evaporated or removed by suction. If a cold brine is used, it is preheated to room temperature.

Defrosting process:

The actual defrosting process takes place. The required heat is supplied in one of the following ways:

- Warm room air
- Hot gas
- Warm brine

Depending on the system concept, different defrosting types can be used for the heat exchanger and the condensate tray.

Drip phase:

It takes about 10 – 15 minutes during which the defrost heat supplied is still retained in the unit. The ice water drips off completely and is drained via the condensation pipe.

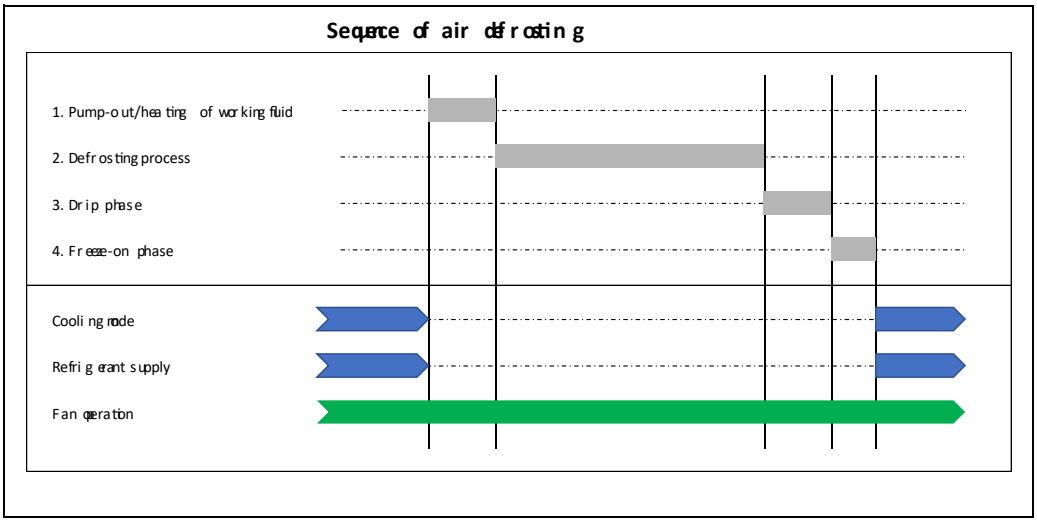
Freeze-on phase/delayed fan start (system-side):

The cooling circuit is started without switching on the fans. This cools down the heat exchanger to operating temperature and prevents warm and humid air from entering the cold room.

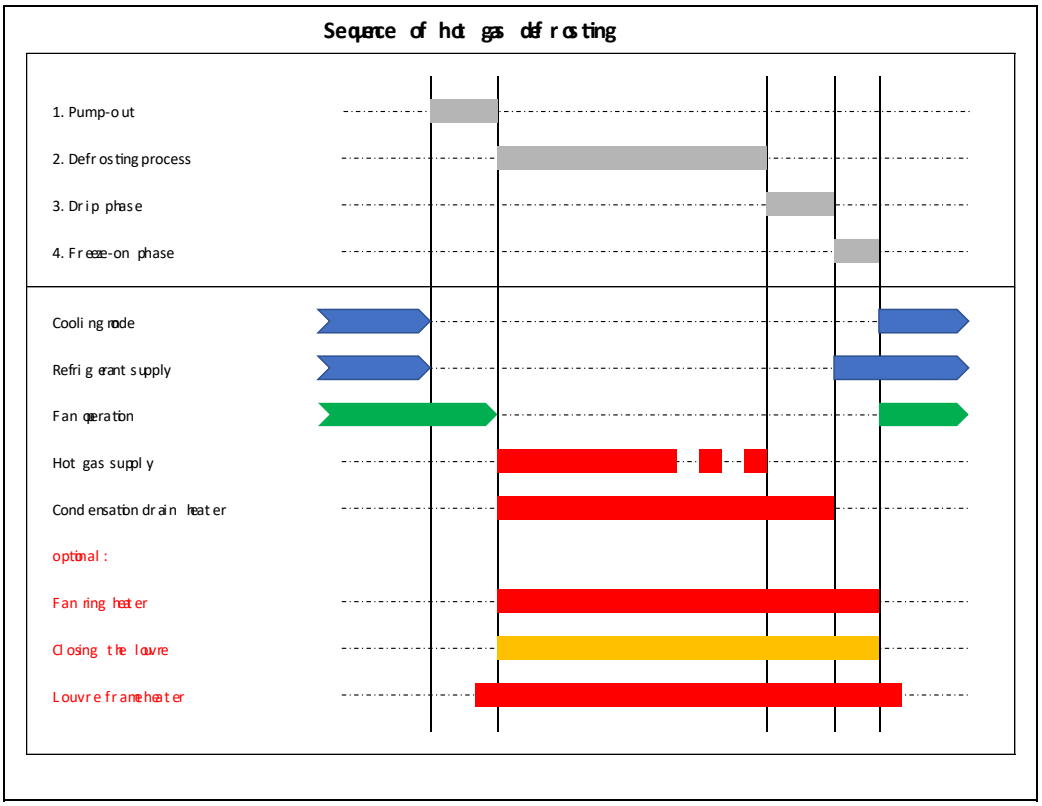
Defrosting process

We recommend to carry out the defrosting process in acc. with the following sequences:

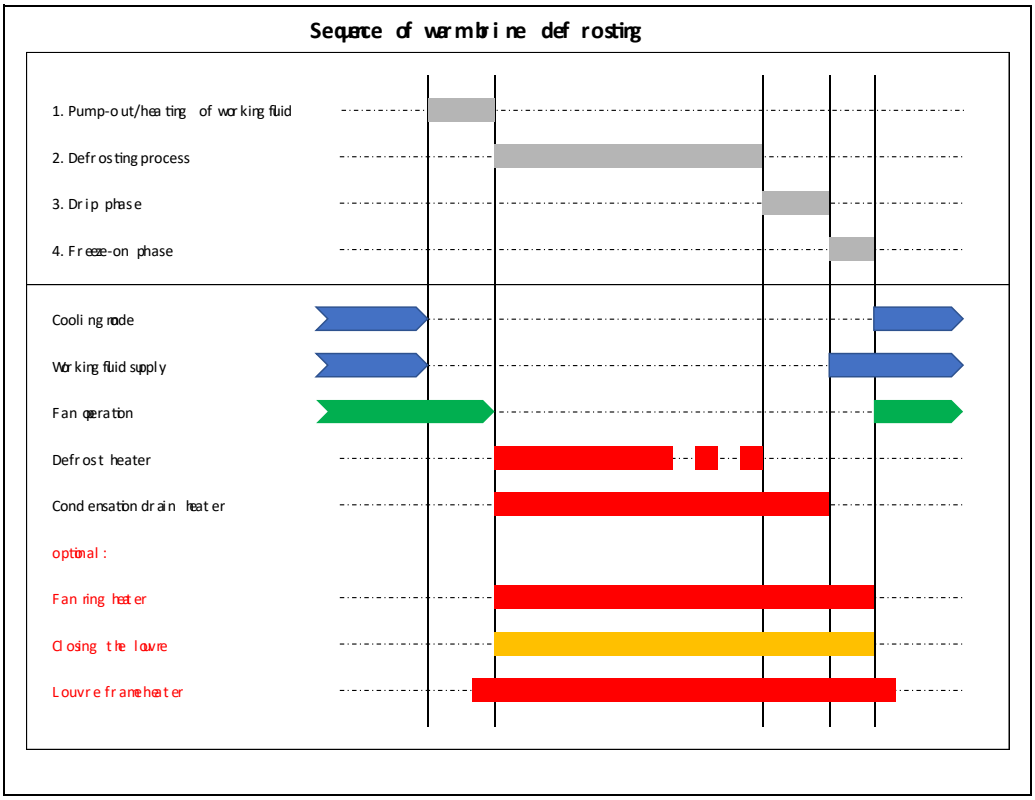
Air defrosting:



Hot gas defrosting:



Warm brine defrosting:



7.7 Changeover to a different working fluid

Specific hazards

⚠ WARNING

RISK OF PERSONAL INJURY AND DAMAGE TO PROPERTY!
Operating the unit with a different working fluid without the prior consent of the manufacturer can result in significant dangers (see section "Hazard due to working fluids").

- The unit must not be changed over to a different working fluid without prior written consent from the manufacturer.

Requirements for the working fluid

- Ensure that the unit manufacturer has agreed to the changeover.
- Ensure that the unit is filled with the correct working fluid.
- Ensure that all materials used in the unit are compatible with the new working fluid.
- Ensure that the permissible pressure is not exceeded.
- Check that the new working fluid can be used without requiring a new test certificate for the unit.
- Ensure that classification is complied with.
- Reset the safety device for the unit or replace it where necessary.

- Prevent mixtures with residues of working fluid and possibly oil.
- Change all information regarding the new working fluid accordingly.
- Change the complete documentation including these instructions and the system's operating instructions accordingly.

Procedure

⇨ Change the working fluid following written consent by Güntner GmbH & Co. KG and in compliance with the requirements for the working fluid.
⇨ Perform an acceptance test (see section "Performing an acceptance test").

7.8 Troubleshooting

Safety instructions

NOTICE	
	Observe all basic safety instructions and the safety instructions for operating the unit (see sections "Basic safety instructions" and "Safety instructions for operation"). Use suitable tools, protective clothing and safety devices.

Hotline

Phone +49 8141 242-190

E-mail: claims@guentner.com

Troubleshooting table

The following table shows possible faults and the measures to correct them.

Fault	Possible cause(s)	Remedy
Unit capacity is not achieved	Coil is very dirty, frosted, iced up on the air side	Clean the coil and defrost it if necessary (if used as an evaporator or air cooler)
	Working fluid pressurising defective (temperature and quantity insufficient)	Set working fluid pressurising values (temperature and quantity) to setpoint values
	Wrong mixing ratio (with the working fluid water/glycol)	Adjust mixing ratio (concentration, inhibition)
Working fluid escaping	Working fluid-carrying components of the unit are leaking	Shut off the working fluid feed, close leak

Rectify faults

⇨ Close the main lines of the working fluid supply
⇨ Wear personal protective equipment (PPE)

⇨ Wear respiratory protection if necessary (e.g. with NH_3)
⇨ Determine and document the size of the leak
⇨ Shut off all working fluid supply lines
⇨ If it is possible to enter the room with respiratory protection, then
  ° activate emergency ventilation,
  ° shut off all working fluid supply lines.
⇨ With the slightest suspicion of injured persons in the working fluid area, sound the alarm. First get persons to safety, then eliminate leaks (see section "Fixing leaks"). Close all doors to the room in which the working fluid is escaping.
⇨ Ensure that the system is switched off. This switches off valves, motors and other components to prevent working fluid from escaping.
⇨ Close shut-off valves, especially on the liquid side, where possible section by section so that the working fluid volume in the leakage area is kept as low as possible.
⇨ If possible, siphon off or drain the system section concerned and move the working fluid to other parts of the system. Here too it must be ensured that no liquid working fluid is locked in by shutting off system sections.
⇨ If the escaped liquid working fluid (with NH_3 working fluid) has formed a puddle underneath the unit, reduce the heat supply to the liquid and thereby prevent further vapour formation by covering the puddle with a film (PE for example) or synthetic medium expansion foam (fire brigade), so that there is enough time for disposal measures.

8 Maintenance and cleaning

8.1 Safety instructions for maintenance and cleaning

Please note

NOTICE
 Observe the basic safety instructions (see section "Basic safety instructions").

NOTICE
 Non-compliance with the maintenance schedule can result in cracks and breakage in the pipes and leakage of the working fluid.

NOTICE
 The operator is responsible for providing protective clothing for maintenance and cleaning.

NOTICE
 When cleaning, follow the instructions of the manufacturer of the cleaning agent!

Specific hazards

⚠ WARNING

RISK OF FROSTBITE!
Person suffers severe frostbites from contact with the unit surface (with evaporators and air coolers).
- Wear personal protective equipment.
- If possible, wait for the temperature to equalise before starting any work.

⚠ WARNING

RISK OF BURNS!
Person suffers severe burns from contact with the unit surface (with condensers, gas coolers and dry coolers).
- Wear personal protective equipment.
- If possible, wait for the temperature to equalise before starting any work.

⚠ WARNING

RISK OF PERSONAL INJURY!
Risk of personal injury caused by escaping working fluid.
- See section "Hazard due to working fluids".

⚠ WARNING

RISK OF SLIPPING!
Unit is cleaned using water at sub-zero temperatures. The water collects on the floor and ice builds up under the unit. Person slips and falls.
- Operation and cleaning only by specialist staff.
- The cleaning agents and methods must be adapted to the ambient temperatures.
- Wear safety shoes.

⚠ CAUTION

RISK OF INFECTION!
During operation, cleaning or defrosting of the unit, water can accumulate, especially in hard-to-reach areas with insufficient slope. Standing water, in turn, results in the formation and proliferation of germs which are released into the ambient air and can infect bystanders when the unit is switched on again.

- The operator must ensure that the tray's drain is kept free.
- Clean the unit regularly and observe hygiene regulations.
- Define cleaning intervals in relation to the requirements of the respective applications.

⚠ CAUTION

RISK OF DAMAGE TO THE EYES!
During cleaning work, there is a risk of injury from the water or air jet, dust or chemical cleaning agents.

- Wear safety goggles!

8.2 Procedure prior to all maintenance work

Before performing any maintenance work, carry out the following safety measures:

⇨ Completely disconnect the unit (on the system side) and secure it against accidental switching on.
⇨ Drain or siphon off the coil (heat exchanger) of the unit.
⇨ Completely remove the working fluid from the leaky unit, especially prior to soldering and welding work.
⇨ Clean and blow out the coil (heat exchanger) of the unit.

8.3 Procedure after all maintenance work

After completing all maintenance work, carry out the following safety measures:

⇨ Ensure that the switching and activation devices, the measuring and display devices and the safety devices function properly.
⇨ Ensure that the working fluid fittings function properly.
⇨ Check the labelling of the pipes and ensure that the labels/tags are visible and legible.
⇨ Check the fastening and the corrosion protection of the components concerned.
⇨ Ensure the temperature and humidity at the place of installation are the same as those specified in the order documents.
⇨ Perform a pressure test in acc. with EN 378-2 and a leak test (see operating instructions of the plant).
⇨ Perform an acceptance test (see section "Performing an acceptance test").

⇨ Perform a functional test (see the system's operating instructions).
⇨ Document all tests performed and their results.

8.4 Inspection/maintenance schedule

8.4.1 Heat exchanger coil

External inspection

Have an expert (recommendation: Güntner GmbH & Co. KG) perform a regular external check (visual inspection) on the unit every 5 years.

Maintenance schedule

d = daily, w = weekly, m = monthly, y = yearly				
Work to be performed	d	w	m	y
Check the coil for dirt, frost and ice accumulation. • In the event of dirt accumulation: Clean heat exchanger (see section "Cleaning the coil") • In the event of frost and ice accumulation (cold side): Defrost the coil (see section "Defrosting the unit")	X			
Check return bends of the coil side as well as all connections and pipes inside the casing for icing (cold side) • In case of icing: Defrost the unit (see section "Defrosting the unit")				X*
Check heat exchanger's general condition • If damage is detected: Rectify damage and contact the manufacturer if required		X		
Check the heat exchanger's operating point (see section "Installation and commissioning") • If a change in the volume of air flowing through the heat exchanger is detected (e.g. a change in the fan output on the system side): Restore required system-side conditions • If change in surface temperatures is detected: Restore required system-side conditions			X	
Check the coil and connections for leak tightness (leakage test) • Repair unit sections affected (see section "Fixing leaks")				X*
Check working fluid pressurising of the heat exchanger • Restore required system-side conditions				X
Check the coil for corrosion • Corrosion or damage on core tubes, fins, supporting structures, pipe connections, fixings: Repair unit sections affected				X*

*) Recommended: every six months

8.5 Maintenance work

8.5.1 Fixing leaks

Procedure

⇨ Report any leaks on the unit to Güntner and have them fixed as quickly as possible by a competent person.

⇨ Perform all work including pressure, acceptance and functional test (see section "Performing an acceptance test").

8.5.2 Cleaning the coil

Introduction

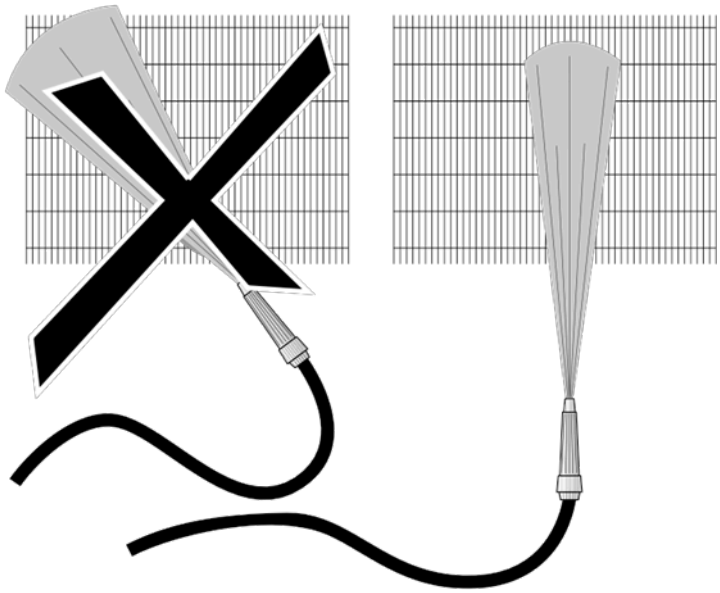
The cleaning method depends on the type and degree of soiling and the place of installation. With loose and dry dirt, cleaning with compressed air is sufficient. With solid, damp and greasy dirt, we recommend hydraulic cleaning.

Specific hazards

⚠ CAUTION

RISK OF DAMAGE TO PROPERTY!
If the pressure is too high, the distance is too small or the cleaning jet hits the fins at an angle, the fins can be damaged. Mechanical cleaning with hard objects (e.g. steel brushes, screwdrivers, etc.) will damage the heat exchanger.

- Use a pressure of max. 30 bar for hydraulic cleaning and max. 8 bar for cleaning with compressed air!
- Keep a minimum distance of 200 mm from the fins!
- Always direct the jet at right angles to the fins (max. deviation of ±5 degrees) to prevent the fins from bending!
- Do not use hard objects for cleaning!



Preparation for cleaning

⇨ Perform defrosting process (if operated as an evaporator or air cooler)
⇨ Prepare and shut off the unit in acc. with the system's operating instructions
⇨ Clean the coil (heat exchanger) with one of the following procedures:
  ° Cleaning with compressed air (see section "Cleaning with compressed air")
  ° Hydraulic cleaning (see section "Hydraulic cleaning")
  ° Cleaning with brush or brush and compressed air (see section "Cleaning with brush or brush and compressed air")

8.5.2.1 Cleaning with compressed air

Procedure

⇨ Blast the coil with compressed air (max. 8 bar pressure, distance to the fins at least 200 mm; against the air flow direction) to remove dirt and impurities. Please note:
  ° Preferably clean from inside to outside and from top to bottom so that loosened dirt cannot move to areas that have already been cleaned.
⇨ Clean until all dirt has been removed.

8.5.2.2 Hydraulic cleaning

Procedure

⇨ Always remove heavier damp or greasy dirt against the airflow direction, using a high-pressure water jet (max. 30 bar pressure) or a steam pressure jet (max. 30 bar pressure). In either case, use a flat spray nozzle (distance of at least 200 mm) and, if required, neutral cleaning agents. Always direct the jet at right angles to the fins (max. deviation of ±5 degrees). Please note:
  ° With oily and greasy deposits, add a cleaning agent to the water.
  ° When applying cleaning agents, change them from time to time to prevent resistance development in germs.

- When using chemical cleaning agents, ensure that they do not attack the surfaces of the unit. After cleaning, the unit must be rinsed with warm water so that it is free of cleaning agents.
- Clean against the air flow direction and from top to bottom (Güntner recommendation) so that dirt is not pushed even deeper into the heat exchanger or does not move to already cleaned areas.

⇨ Clean until all dirt has been removed.

8.5.2.3 Cleaning with brush or brush and compressed air

Procedure

⇨ Remove dry dust or dirt with a brush, a hand brush or with compressed air (max. 8 bar pressure, minimum distance of 200 mm to the fins; against the airflow direction) or with a powerful industrial vacuum cleaner. Please note:
- Use soft brushes (no steel brushes or similar).
- Preferably clean from inside to outside and from top to bottom so that loosened dirt cannot move to already cleaned areas.

⇨ Clean until all dirt has been removed.

⇨ Always brush in the longitudinal direction of the fins, never across.

9 Dismantling and disposal

9.1 Safety instructions on dismantling and disposal

Please note

NOTICE

Oberserve all basic safety instructions (see section "Basic safety instructions"), all safety instructions for transport (see section "Safety instructions for transport and unpacking"), all safety instructions for installation (see section "Safety instructions for installation and commissioning") and all safety instructions for maintenance (see section "Safety instructions for maintenance and cleaning")!

Specific hazards

⚠ WARNING

RISK OF ENVIRONMENTAL DAMAGE!
Recovering or disposing of working fluid can result in working fluid or refrigerator oil emissions being released into the environment, causing pollution.

- All working fluids must be removed from the unit by suction and disposed of by an approved specialist company in the field of refrigeration.
- Ensure that no working fluid enters the groundwater.
- Operate the facility for recovering or disposing of working fluids in such a way that the risk of working fluids being released into the environment is kept as low as possible.
- Ensure that all applicable standards and guidelines are complied with.
- Observe local regulations.

⚠ CAUTION

RISK OF INJURY CAUSED BY CORROSION!
The unit is exposed to corrosive environment for a long time. Due to the onset of corrosion, the unit loses stability and is no longer suitable for lifting by crane or industrial truck with forks and endangers bystanders.

- Defrost the unit properly and keep it free of ice.
- Check the fan unit in acc. with the maintenance schedule.
- Check all fixing bolts and fixing devices, load-bearing components, lifting elements, fixing elements and fans of the unit regularly and especially before and after lifting the unit for corrosion damage, lifting capacity and structural integrity, and replace them if necessary. In case of doubt, hire a specialised company.

⚠ CAUTION

RISK OF POLLUTION!
If the materials are not disposed of correctly, this could result in environmental damage.
- Only dispose of materials in compliance with the waste disposal laws that are binding for the country of operation.

NOTICE

Prior to dismantling and disposal of the unit, ensure that there are no loose or slack parts on the unit.

9.2 Dismantling the unit

Required staff

- Dismantling must be performed by at least two people.

Auxiliary equipment/tools

- Lifting accessories and lifting gear
- Climbing aids
- Tools

Procedure

⇨ Shut down and drain the unit (see section "Shutting down the unit").
⇨ Remove accessories (if any)
⇨ Follow the installation steps in reverse order (siehe Abschnitt "Installation of the unit").

9.3 Disposing of the unit

Introduction

At the end of its life cycle, the unit requires proper and professional disposal of the materials and substances used.

Procedure

⇨ Disposal must be performed by competent persons.
⇨ All unit components, e.g. working fluids, lubricating oil for refrigerating compressors, coil (heat exchanger), fans and optional accessories must be disposed of properly.
⇨ Treat used working fluid that is not intended for reuse as waste and dispose of it safely. There must be no emissions into the environment.

- ⇨ Do not use a disposable single-use container as working fluid vapour residues in the container could escape during disposal.
- ⇨ Do not overfill the working fluid container. The maximum permissible pressure of the working fluid container must not be exceeded during the entire work process.
- ⇨ Do not pour the working fluid into a fluid container that contains a different or an unknown working fluid. Do not release this other or unknown working fluid into the atmosphere but rather identify it, reclaim it or properly dispose of as specified.
- ⇨ Instruct an officially authorised facility to destroy the working fluid.
- ⇨ With evaporators: Keep used lubricating oil for refrigerating compressors that has been recovered from the unit and cannot be reclaimed in a separate, suitable container, treat it as waste and dispose of it safely.
- ⇨ All applicable laws, regulations, directives and standards must be complied with when disposing of materials and substances.

10 Accessories

10.1 Droplet separator

Introduction

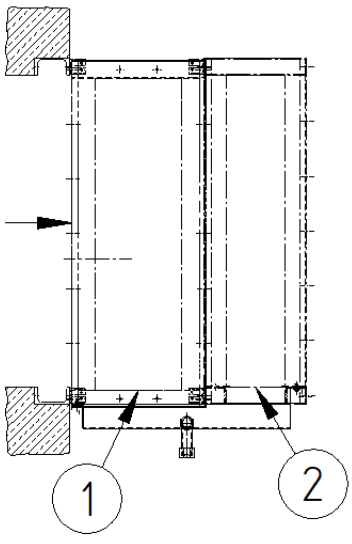
The droplet separator is used to separate liquid droplets from the flowing air, i.e. to remove moisture from the air.

Safety

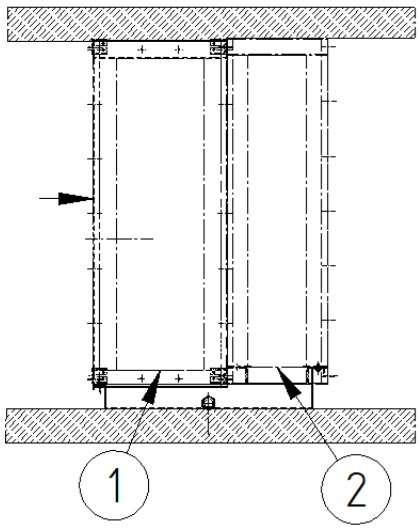
NOTICE	
	When mounting/installing, ensure that the air flow and flow direction are correct! When mounting on the wall, note that only one connection per tray needs to be installed (even though three variants are possible)!

Overview

Wall mounting



Duct installation/modular unit (tray provided by customer)



1 - Heat exchanger; 2 - Droplet separator

Mounting/installation

The droplet separator can be delivered factory-mounted and, together with the heat exchanger and enclosed tray (optional), transported in one packaging unit.

Tighten the screws on the supplied and factory-mounted droplet separator.

If the droplet separator is not factory-mounted, it must be mounted in acc. with the order-specific drawings.

Maintenance schedule

After mounting/installing the droplet separator (or after reconnecting), the heat exchanger must be cleaned.

A monthly visual inspection and cleaning of the droplet separator is recommended.

Replace the droplet separator as required.