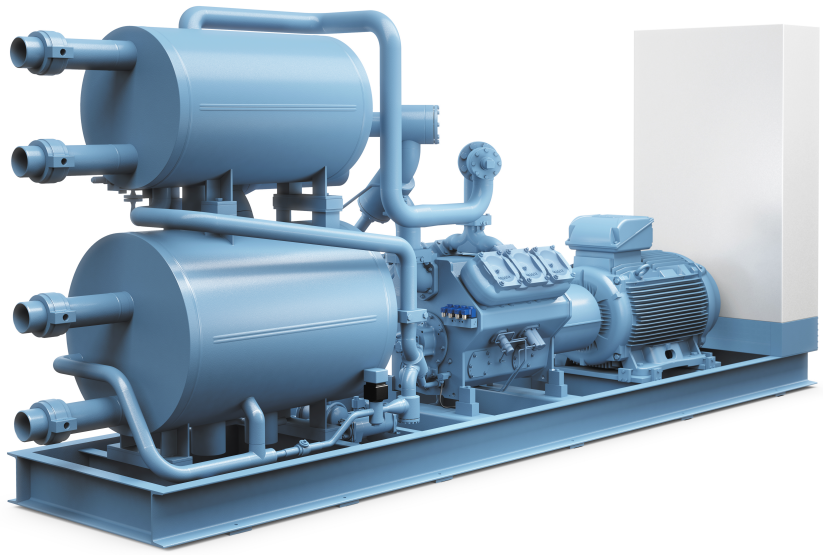
PRODUCT INFORMATION

Original document



GEA BluGenium

Chiller

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LEGAL NOTICE

This product information is to be used for product presentations and customer consultation. It contains important information and technical data regarding the product.

The product information makes the technical, product related and commercial information available to the customer in detail before the sale of the product.

This product information serves as a support and technical advisory service for our partners and customers as well as for the marketing team. Apart from serving as the medium for transfer of product know-how, it also forms the basis for product demonstrations, the organisation and conduction of technical seminars as well as the technical support at trade fairs.

This product information should be supplemented with the information about the industrial safety and health related regulations at the site of installation of the product. The regulations vary form place to place as a result of the statutory regulations applicable at the site of installation of the product and are therefore have not been considered in this product information.

In addition to this product information and the accident prevention regulations applicable for the respective country and area where the product is used, the accepted technical regulations for safe and professional work must also be observed.

GEA Refrigeration Germany GmbH reserves the right to make technical changes during the course of further development of the equipment covered by this product information.

Illustrations and drawings in this product information are simplified representations. As a result of the improvements and changes, it is possible that the illustrations do not exactly match the current development status. The technical data and dimensions are subject to change. No claims can be made on the basis of them.

SYMBOLS USED

⚠ Danger

Stands for an immediate danger leading to severe physical injuries or death.

► Description for avoiding the danger.

⚠ Warning!

Stands for a potentially dangerous situation leading to severe physical injuries or death.

► Description for avoiding the dangerous situation.

⚠ Caution!

Stands for a potentially dangerous situation which could lead to minor physical injuries or damage to property.

► Description for avoiding the dangerous situation.

Notice

Stands for important information that must be observed for the intended use and function of the product.

► Description of the required action for the intended function of the product.

PREFACE

In addition to other products, the portfolio of GEA Refrigeration Germany GmbH includes complete chillers and heat pumps.

In light of the fact that the working principle is identical, GEA documentation differentiates between the terms chillers and heat pumps as follows:

A chiller is a system where the application focus lies on generating refrigeration (cooling a liquid secondary circuit), regardless of possible heat recovery options via a liquid-cooled condenser and/or oil cooler. The GEA chillers include the standard GEA Blu series BluAstrum, BluGenium, BluAir (duo), BluX (duo) as well as the modular GEA Grasso FX series and the MX as a special series.

A heat pump is a system where the application focus lies on generating heat (heating a liquid heated medium). Here, the heat exchanger concept on the high pressure side is optimised with respect to this application. GEA heat pumps include the standard GEA Red series RedAstrum, RedGenium and the special series GEA Grasso HX.

The GEA Blu-Red Fusion product can be seen as a two-stage heat pump or also as a combined chiller-heat pump. Since the product is always (also) designed for a specific heating application, it is formally part of the GEA Red Standard series.

Many components and modes are used in the same way in different GEA chiller and heat pump product series. The descriptions of some components and operating principles are thus expressed in general terms in this document.

The figure on the front page shows the product in a project-specific version (project-related modifications possible).

LAYOUT INFORMATION

Bullet points and numbered list characters

Bullet points are used to separate logical contents within a section:

- Bullet point 1
  - Types of bullet point 1.
- Bullet point 2
  - Types of bullet point 2.

Numbered list characters are used to separate enumerations within a descriptive text:

Descriptive text with consecutive numbering:

- Numbered list point 1
- Numbered list point 2

Handling instructions

Handling instructions prompt you to do something. Several steps in sequence time form a handling sequence that should be completed in the prescribed order. The handling sequence can be divided into individual steps.

Handling sequence

1. Handling sequence step 1
   - step 1,
   - step 2,
   - step 3.
2. Handling sequence step 2

The subsequent handling sequence is the expected result:

→ Result of the handling sequence.

Individual handling steps

Individual handling steps are marked thus:

- Individual work steps

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1 Description

1.1 General information

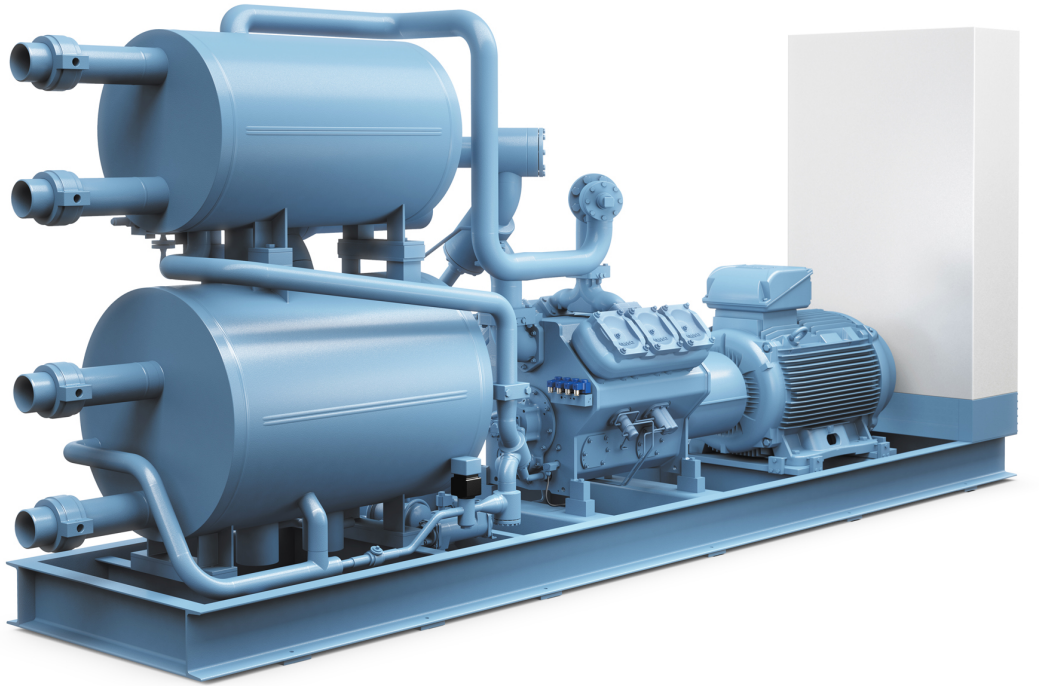


Fig.1: Chiller GEA BluGenium

Parameter	Remark
Capacity range	300 - 1200 kW 12/ 6 °C (secondary refrigerant temperature) 30/ 35 °C (coolant temperature)
Reciprocating compressor	GEA Grasso V300 - V1100 frame size V_{th} = 290 ... 1194 m³/h
Chiller	GEA BluGenium
Evaporator type	Fully welded plate heat exchanger with integrated separator
Working principle	flooded evaporation
Liquid separator	integrated
Condenser type	Fully welded plate heat exchanger
Transport	1 part

1.2 Scope of delivery

Notice

The **GEA BluGenium** is manufactured and delivered according to technical specifications.

► Optional design variants based on the standard equipment can be considered.

Standard equipment	
Designation	**Design**
Maximum permissible pressure:	Max. 25 bar
Intended environment:	Indoor installation
Ambient temperatures:	+5 ℃ to +40 ℃ (+5 °C to +32 °C with housing)
Installation altitude:	≤ 1000 m above sea level
Cooling agent temperature[1]	-15 °C/ 6 °C/ 18 °C
Electric motor:	Default scope of delivery IP 23
Refrigerant:	R717
Type of oil:	According to order specification. Compare also the technical information on the lubricating oils for GEA packages, chillers and heat pumps. ⚠ **Caution!** Deviating types of oil must be agreed with the manufacturer. ► Contact the Design or Technical Customer Service of GEA Refrigeration Germany GmbH.
Oil cooling: (GEA BluGenium 900 to 1200)	liquid cooled (pipes fully installed)
Oil heater: (in compressor crankcase)	Standard scope of delivery
Oil filter:	Single stage filter
Spare oil filter:	Oil pressure filter cartridge, delivered separately (included)
Oil level switch:	none
Pressure sensors:	on sensor block compressor
separate push-button switch:	none
Overflow valve:	scope of delivery
Safety valve HP / LP:	Safety shuttle valve combination
Flow monitor:	electronic
Control:	GEA Omni
Communication	Modbus TCP
Power current panel and frequency converter:	Standard scope of delivery, cable entry from below
Colour:	RAL 5014 (dove blue), switching cabinet RAL 7035
Soundproof housing:	without (standard)
Vibration isolators:	without (standard)
Approval of pressure equipment:	CE-PED, Module H (piping)
Documentation:	2x paper form + 1 USB stick

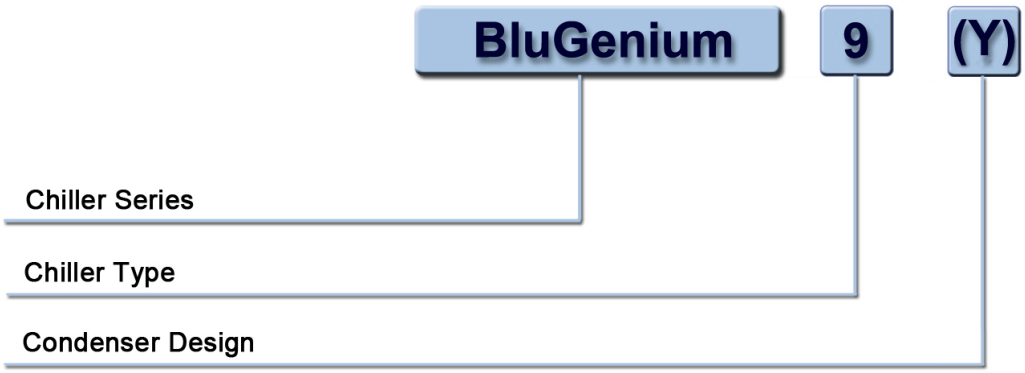
Optional equipment	
Designation	Design
Spare oil filter:	available
Communication:	Profibus DP ProfiNet
Electric motor:	IP 55

1 Temperature difference secondary refrigerant maximum 10 K / standard 5 K

Optional equipment	
Flow monitor:	mechanically (paddle)
Vibration isolators:	available
Approval of pressure equipment:	CE-PED, Module H1 (complete chiller)

1.3 Product designation chillers with reciprocating compressors

GEA BluGenium series



Product code description

Code	Description
BluGenium	Chiller series
9	Chiller capacity (kW) related to cold water operation 12°C/ 6°C
Y	Condenser version

BluGenium = Chiller series

9 Frame size of the chiller as a result of the compressor frame size

Compressor frame size	Frame size
V300	300
V450	450
V600	600
V700	900
V1100	1200
V1400	1400
V1800	1800

(Y) Condenser version

Code	Description
(W)	Water/liquid-cooled plate heat exchanger (completely welded), chiller for indoor installation
(R)	Evaporating or air-cooled condenser [2], Chiller for indoor installation

2 Not in the scope of delivery for GEA Refrigeration Germany.

Example of designation

Example	Description
BluGenium 900 (W)	Chiller with reciprocating compressor, flooded evaporation with integrated separator **(BluGenium)** Capacity of the chiller 900 kW **(900)** Evaporator and condenser designed as a completely welded plate heat exchanger Chiller for indoor installation **(W)**

2 Components

The chillers of the series **GEA BluGenium** comprise the following components:

- Reciprocating compressor,
- Evaporator with integrated separator
- Condenser
  (design type (R): not included in scope of delivery),
- Electric motor with coupling
- automatic oil return system,
- oil cooler(GEA BluGenium 900 and 1200),
- Oil filter,
- Suction filter,
- Speed-dependent capacity control,
- Monitoring and safety devices,
- Frequency converter
- Low-voltage supply with control unit GEA Omni™,
- HP-receiver (for condenser design type (R) only).

All components are fully mounted. Low-voltage installation with frequency converter and control device are wired.

A water-cooled oil cooler provides the oil cooling (GEA BluGenium 900 and 1200).

By default, a rigid installation on the foundation is intended. If needed (e.g. installation on soffit ceilings), installation with structure-borne insulation must be carried out. The vibration isolators required for the installation are optionally available.

When installing on vibration isolators, the pipe connections on the side of the secondary refrigerant and cooling water must be isolated from vibration by means of rubber compensators.

All connections are closed tight.

Service fluids

The chillers of the series **GEA BluGenium** are delivered without refrigerant and oil. They are filled with dry nitrogen (0.2 bar ... 0.5 bar overpressure).

When commissioning a start-up or a factory acceptance test (FAT) the refrigerating machine oil is included in the scope of delivery.

Insulation

Insulation without system components in PUR/Alu.

The insulation is basically designed for an ambient temperature of 20 °C and a humidity of 70 %.

Painting

Coating system S 2.15 acc. to EN ISO 12944-5 for environmental conditions C2 acc. to EN ISO 12944-2.

Designed for room temperatures of 5 °C up to 40 °C.

Colour scheme chiller: RAL 5014 pigeon blue

Colour scheme control cabinet: RAL 7035

Approval

The chillers of the series **GEA BluGenium** are awarded a CE label in accordance with the Pressure Equipment Directive 2014/68/EC after approval.

Documentation

Every chiller of the series **GEA BluGenium** includes user documentation. The user documentation contains:

- Drawings and part lists,
- Safety Instructions,
- Operating manual

  (with the description of the refrigerant and oil circuits, the instructions for installation, start-up and maintenance),
- Documentation of the main components (electrical motor, control),
- Maintenance manual,
- Acceptance certificate for components requiring acceptance

This transport instructions are also available from GEA Refrigeration Germany as a separate document if necessary.

2.1 Chillers in remote design

In addition to the chillers completely equipped ex works with a condenser, so called remote chillers are often also operated.

This means that the chiller delivered ex works does not contain a condenser but has only been designed for the requested condensation temperature.

The customer himself then selects a suitable condenser and connects this with the supplied remote chiller. The external (remote) condenser is either an air cooled condenser or an evaporative condenser.

3 Description of Design and Function

3.1 Design, applications

The **GEA BluGenium** Chiller Programme provides proven components as complete refrigeration systems for medium and large refrigeration and/or air conditioning requirements.

Main fields of application:

- cold water for air conditioning
- cold brine for air conditioning with combined ice storage operation
- cold water for industrial processes
- cold brine for industrial processes
- (cold) and warm water for heat pump operation

In principle, these refrigeration systems use ammonia as refrigerant which is characterized by a high refrigerating capacity, low energy consumption and a favourable price and are completely neutral towards the environment.

Equipped with the reciprocating compressor series, the **GEA BluGenium** chillers cover the refrigerating capacity range of 300 to 1200 kW for cold water.

The output ranges are defined by five frame sizes of the reciprocating compressor series.

The **GEA BluGenium** chillers work with flooded evaporator systems on the basis of gravity recirculation and can be fitted with a variety of condenser types.

The chillers have a modular design and comprise the following main modules:

- Standard compressor package
- Heat exchanger subassembly with integrated liquid separator and de-oiling system
- Low-voltage installation with frequency inverter and control

The arrangement of the components ensures the extremely compact design of the chillers.

Only flat plate evaporators with integrated separator are used as evaporators.

On the condenser side, the following versions are used:

- Plate type condenser
- Evaporative condenser (R)
- air-cooled condenser (R)

The **GEA BluGenium** chillers are supplied, as a standard, ready for connection, fully piped and wired.

The **GEA BluGenium (R)** chillers are supplied in such a complete state that on site only the air cooled condenser or the evaporative condenser has to be integrated.

The heat exchangers are designed according to the parameters of a project, taking into account a maximum energy efficiency on the evaporator and the condenser side.

Notice

The use of several GEA BluGenium with only one common condenser is not permitted.

► When operating with an external condenser (type GEA BluGenium (R)), a separate condenser must be available for each GEA BluGenium!

The standard version of the chillers is equipped with a freely programmable control.

All operating and fault signals as well as the process variables can be read from a display.

The control device is operated via a Touch Panel.

The chillers are delivered without refrigerant and refrigerating machine oil. They are filled with dry nitrogen (approx. 0.2 bar ... 0.5 bar overpressure).

When commissioning a start-up or a factory acceptance test (FAT) the refrigerating machine oil is included in the scope of delivery.

Each chiller is supplied with user documentation containing a description of the refrigeration cycle, commissioning instructions, an operating manual and the maintenance manual.

Separate installation and maintenance manuals are provided for detailed information about the reciprocating compressors.

3.2 General mode of operation of chillers and heat pumps

Chillers and heat pumps are systems operating automatically in a cycle process in which a refrigerant absorbs heat at a low temperature level (source) and releases it at a high temperature level (sink).

The reciprocating compressor draws the refrigerant from the liquid separator and compresses it to condensation pressure.

The refrigerant condenses as it is cooled and releases the heat to a cooling medium or heat carrier. Before or after condensing, superheat or subcooling heat can be extracted from the refrigerant in an external desuperheater or subcooler. The liquid refrigerant is then expanded in the liquid separator.

In the liquid separator, the refrigerant vapour and liquid are separated.

The liquid is led through the evaporator by gravity circulation (thermosiphon principle). As result of liquid refrigerant absorbing heat (flooded evaporation) the refrigerant evaporates and the secondary refrigerant is cooled down. With a cascade version, an evaporator can be used which can be charged with compressed refrigerant from the low pressure stage instead of a secondary refrigerant fluid. The refrigerant from the process of the low pressure stage is condensed in the process.

During the operation of the reciprocating compressor, oil in the crankcase is used to lubricate moving parts. Since, as opposed to applications based on a screw compressor, the oil is not injected into the working chamber and does not mix with the refrigerant, no oil separation is required.

Despite this, tiny oil particles enter the refrigerant circuit and its low pressure side.

An automatic and maintenance-free oil return system, specifically developed for this purpose by GEA Refrigeration Germany GmbH, guides the oil out of the evaporator/liquid separator back into the reciprocating compressor.

This is a basic precondition for fault-free operation of the evaporator system.

The capacity of the reciprocating compressor is controlled by incrementally switching off the compressor or cylinder using internal controllers in the chiller as well as optionally by the FC control of the compressor drive motor (standard for the GEA BluGenium and GEA RedGenium series).

The refrigerating capacity can thus be adapted optimally to the effectively required refrigerating capacity.

During partial load operation, the cold water/brine and heat carrier volumetric flow rates may be reduced by a max. of 50% to guarantee the efficient transfer of heat to the heat exchanger systems.

3.3 Main components

3.3.1 Reciprocating compressor

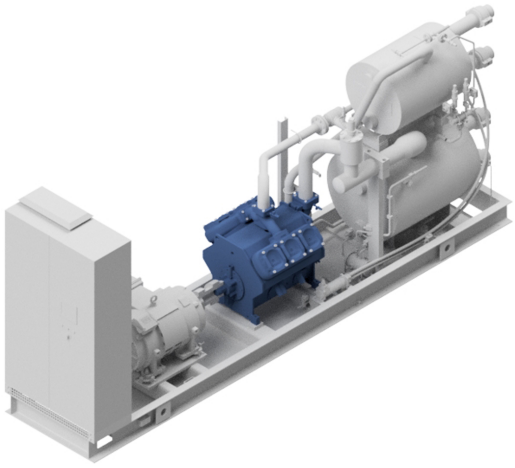


Fig.2: Position of the reciprocating compressor

The product uses open, single-action, multi-cylinder reciprocating compressors for the refrigerant ammonia (R717).

The reciprocating compressors are characterised by compact design, high reliability, high quality components and ease of maintenance.

The compressors are operated with ammonia (NH_3) as the refrigerant.

With the compressor the suction of the ammonia vapour and its compression created in the evaporator takes place at condensing pressure.

The pressure and temperature transmitters installed on the compressor are used to monitor the operating values of the compressor. With the compressor the individual cylinders can be switched off either by bypass valves or suction valve relief devices.

The compressors have the following equipment features:

- Start-up load relief
- Capacity control by switching off cylinders and through continuous speed adjustment (optional equipment for FX GC and FX GC duo series chillers)
- Monitoring oil difference pressure
- Oil heater
- Monitoring discharge pressure
- Monitoring suction pressure
- Monitoring crankcase pressure
- Monitoring discharge temperature
- Monitoring oil temperature
- Monitoring suction temperature

Safety equipment on the pressure generators is standard in compliance with EN 378 by current linkage valves combined with DBK safety pressure limiters.

The documentation of the reciprocating compressor (installation and maintenance instruction, part lists, drawings) is part of the product documentation.

3.3.2 Compressor drive motor

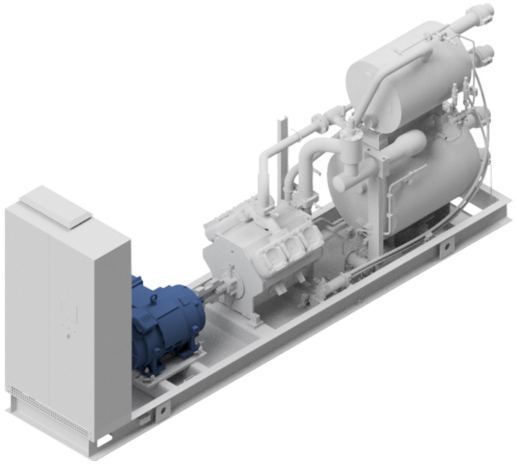


Fig.3: Arrangement of the compressor drive motor

Standard: The compressor is driven by an air-cooled 4-pole electric motor IP23 with an operating voltage of 400 V; 50 Hz using a coupling.

The motor speed is controlled using a frequency converter (optional equipment with chillers of the FX GC and FX GC duo series). The speed range is at 500 rpm ... 1500 rpm.

Option: Other manufacturers, operating voltages, frequencies, protection and efficiency classes, additional monitoring sensors and anti-condensation heaters, products without motor are available (to be supplied by the customer). Others on request.

The documentation for the electric motor (operating manual) is an integral part of the product documentation.

3.3.3 Coupling

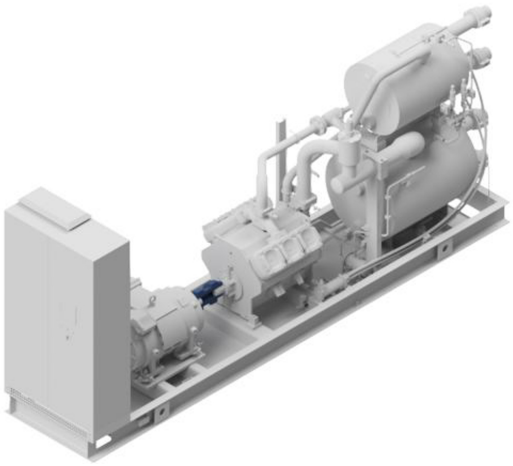


Fig.4: Arrangement of the coupling

The coupling helps in transmission of torque between compressor and compressor drive motor. The design of the coupling brings about decoupling from otherwise disturbing influences such as axial or radial forces, vibrations or offset.

Speed fluctuations and speed shocks are damped and cushioned, while torsional vibrations are reduced.

The documentation of the coupling (operating manual) is a part of the product documentation.

3.3.4 Evaporator

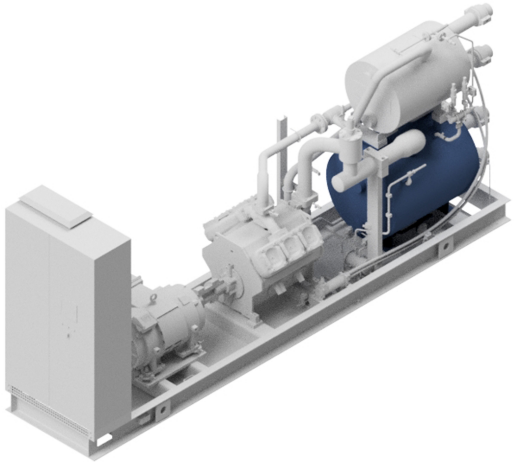


Fig.5: Arrangement of the evaporator

In the evaporator heat is absorbed from the secondary refrigerant (which is thereby cooled) by way of evaporation of the refrigerant. The evaporator works by the principle of overflowed evaporation.

Liquid drops are effectively separated in the liquid separator integrated into the evaporator.

In the case of external condensing systems (design variant (R) of the condenser), a maximum level indicator is installed in the level sensor vessel to provide additional protection against overfilling. The suction pressure and secondary refrigerant outlet temperature are monitored to provide reliable protection against freezing.

Design, manufacture and acceptance of the evaporator with integrated liquid separator comply with the requirements of the Pressure Equipment Directive.

The documentation of the evaporator (operating and maintenance instructions, acceptance certificate) is a part of the product documentation.

3.3.5 Condenser

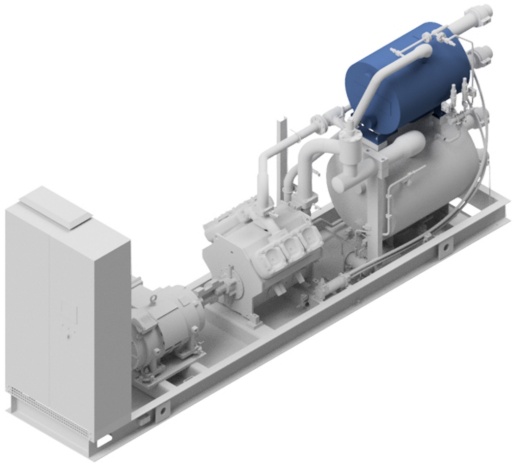


Fig.6: Position of the condenser

In the condenser the compressed refrigerant vapour is desuperheated and liquefied by dissipating the energy absorbed in the evaporator and compressor to the coolant (heating).

Design, manufacture and acceptance of the condenser comply with the requirements of the Pressure Equipment Directive.

Condenser designed as a plate heat exchanger (included in the scope of delivery)

The documentation of the condenser (operating and maintenance instructions, acceptance certificate) is a part of the product documentation.

3.3.6 Oil cooler

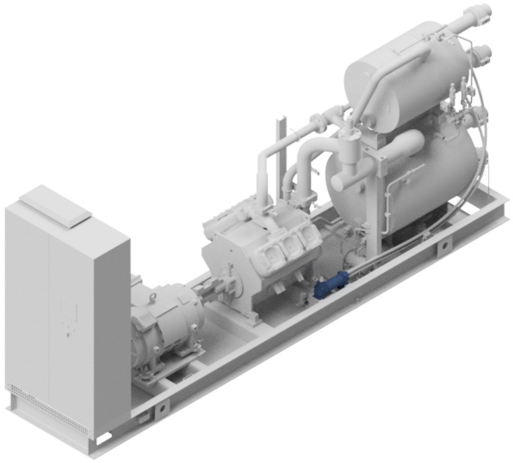


Fig.7: Arrangement of the oil cooler

The GEA BluGenium 900 to 1200 chillers are equipped with a liquid cooled oil cooler.

(The GEA BluGenium 300 to 600 types are designed without an oil cooler.)

The oil cooler is used for cooling the oil heated in the compressor in order to ensure sufficient oil viscosity for supplying to the compressor.

The oil cooler is complete piped on water side.

The documentation of the oil cooler (acceptance certificate) is a part of the product documentation.

3.3.7 Switching cabinet/control/frequency inverter

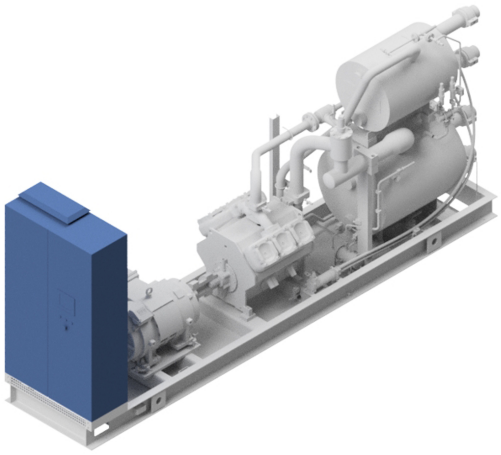


Fig.8: Position of the control cabinet

The product is equipped with a GEA Omni control as standard.

The switching cabinet and control device consists of the control with operating and display unit, indicator lights for “Operation”, “Warning” and “Fault”, EMERGENCY STOP button, coupling elements as well as the casing.

For motors with an output power of up to 450 kW, the control cabinet with the control is directly mounted on the product.

For certain product series, the control cabinet can be optionally removed from the scope of delivery. In this case, only the GEA Omni control is mounted in a control cabinet on the product.

If the product operates with variable speed (standard for the GEA Blu chiller and GEA Red heat pump series), the frequency converter is integrated in the control cabinet.

Notice

Depending on the motor size, the frequency converter (FC) must be installed in a separate cabinet. Depending on the application, the complete control cabinet is mounted in a different configuration than the one shown, or the FC cabinet is supplied separately.

► Details can be found in the project-specific specifications or the order drawings.

More details on the functional scope of the control can be found in the separate chapter concerning the GEA Omni.

The documentation for the control (operating manual, circuit diagram, parameter list, communication guideline) is an integral part of the product documentation.

Notice

The communication guideline offers detailed information about communication of the controller.

► The communication guideline can be made available before a planned installation.

3.3.8 Fittings

The term 'fittings' generally designates a control element of the product. Among other things, the term 'fittings' is also used for valves if they are used for the control and regulation of fluid flows in the pipes.

Furthermore, all kinds of installations in pipes, such as sight glasses, measurement apertures, filters and similar, are also designated as fittings. Therefore, fittings also include all kinds of valves, such as

- Stop valves
- Check valves
- Safety valves
- Throttle valves

Each fitting has its own field of use, according to the pressure or temperature in the pipe, the size of the pipe, the sealing requirements for the fitting, the reduction and direction of the flow of liquid, as well as the medium itself.

The safety fittings are used to limit the pressure in systems which are under pressure.

Each fitting is designed for the specific application. The fittings can be operated manually or by motor, e.g. by gear motors, or pneumatic or hydraulic cylinders. In reset fittings, the flow of fluid in the pipe causes automatic closing of the valve.

Depending on the model, different closing elements (e.g. valve discs, flaps, washers) close the pipe connected to the fitting.

The documentation of the fittings (acceptance certificate) forms part of the product documentation.

3.3.9 Safety devices

The product is equipped with a comprehensive software safety chain preventing excessive pressures, temperatures and the hazard of freezing.

A suction as well as condenser pressure control and a rated current limitation control will adjust the speed if the set limit values are exceeded.

Due to the applicable laws and regulations, various certifying bodies require a vast range of auxiliary equipment with independent safety devices.

The following safety equipment is included, if the chiller is delivered with CE label according to EN 378:

- Overflow valve (on the compressor) from discharge to suction side,
- Dual safety valve with blow-out connection, installed on the low pressure side of the product,

Notice

Correct installation of the blow-out connection.

► The contractors must guarantee that the pressure relief connection is safely operated to the outside.

- Safety pressure limiter via 2 switching positions with manual internal and external reset (one switching level may be enough for some applications)
- Pressure relief device for each closable container which can contain liquid refrigerant.

  This applies to all vessels in accordance with the requirements of the Pressure Equipment Directive.

The scope of delivery does not include the following safety devices in relation to escaping ammonia:

- Protective equipment (health and industrial safety)
- Gas warning device / gas warning sensors (included in the GEA BluAir and GEA BluAir duo series as standard)

In case of delivery according to EN 378 with CE label, all parts of the documentation mentioned in the regulation are also supplied in the national language.

All other approvals have to be agreed upon separately.

3.3.10 Safety devices for pressure limitation

The safety devices for pressure limitation of the product comply with EN 378-2.

The overflow valve for the protection of the compressor is designed according to EN 13136.

The blow-off pressure is set to the maximum permissible pressure of the system.

The blow-off pipe has been calculated according to EN 13136.

The electromechanical safety switching devices for pressure limitation comply with EN12263 and are type-tested. The settings correspond to the specifications of EN 378-2.

If electronic safety switching devices are used for pressure limitation, the setting may deviate from the standard specifications (see EN 378-2) due to the increased precision.

Notice

When using safety valves for pressure relief, the operator is responsible for:

► the calculation of the dimensioning of the blow-off pipes upstream of the safety valve,

► the safe discharge of refrigerant when the pressure relief device responds.

The safety equipment for pressure limitation according to EN 378-2 represents the minimum requirements. Therefore, before commissioning, the specifications from the national operational safety regulations must be compared with those of EN 378-2.

For the safe function of the safety devices for pressure limitation, the specified test intervals must be observed. These result from the respective industrial safety regulations.

3.3.11 Components installed by the client

⚠ Warning!

GEA Refrigeration Germany GmbH does not assume any liability for arising damages or for the violation of the safety regulations resulting from the use of unsuitable materials or a modification to the product that is not included in the original safety concept.

► The material properties of components and system parts provided by and monitored by the customer, in particular in the secondary refrigerant and heat carrier or coolant circuit as well as in the oil circuit, must be suitable for the fluids flowing there. Furthermore, in the event of modifications to the product by the customer, the effects upon the safety devices must be checked.

4 GEA Omni control

4.1 Product highlights

GEA stands for sophisticated precision solutions. The system provider once again demonstrates its technological leadership and innovation with the new GEA Omni control system.

Powerful and practical, sophisticated and intuitive, refined and simple. This is GEA Omni.

GEA Omni delivers what it promises: maximum efficiency and reliable system operation. The next generation control integrates all important components of a refrigeration and gas compression plant. This permits the system to be operated according to demand and in a particularly efficient manner.

GEA Omni advantages at a glance:

- System control with one device
  → Control of the refrigeration system with GEA Omni
- High-resolution display
  → 1366 x 768 pixel
- Multitouch display
  → Ergonomic and intuitive input
- Easy integration
  → Easy installation on site, ideal for retrofitting existing systems
- Configurable Modbus TCP communication
  → Data exchange with other systems without additional cabling required
- Hardware design
  → Standard industrial components with modular design
- Individual user profiles and management
  → Setup of individual user profiles and record user entries made
- Drawings, manuals and videos
  → Technical documentation including helpful videos can be accessed directly via the touch panel
- Intelligent service intervals
  → Timely modification of maintenance recommendations depending on the operation
- GEA OmniLink
  → Application for remote control of the GEA Omni via Ethernet with integrated data transmission
- GEA OmniHistorian
  → Application for detailed analysis of recorded operating data histories
- Global product with local sales and service
  → Product available worldwide in a uniform design

- Production in North America, Europe and Asia
  → available in over 25 languages
- Reliability with GEA
  → Developed, manufactured and supported by the market leader for control systems for refrigeration and gas compression systems

4.2 View

Fig.9: GEA Omni exterior view without indicator lights

Fig.10: GEA Omni exterior view with indicator lights

4.3 Standard function

The GEA Omni supports the following standard functions:

- Display of all important physical and technical parameters, e.g. pressure, temperature, motor current, capacity, number of run hours, operation mode and status signals,
  Different parameters and menus are hidden if they are not needed.
- Automatic start/stop of the product and capacity control depending on, for example:
  - Suction pressure
  - Discharge pressure
  - External setpoint value
  - External temperature
  - Network temperature
  - Inlet temperature (evaporator, secondary refrigerant)
  - Outlet temperature (evaporator, secondary refrigerant)
  - Inlet temperature (condenser, secondary refrigerant or heat carrier)
  - Outlet temperature (condenser, secondary refrigerant or heat carrier)
- Monitoring of all operating parameters.

- Limitation of the compressor capacity as soon as one of the defined limit values is reached or exceeded.
- Notification history (messages, warnings and faults) with date and time.
- Wire failure detection for all analogue input signals.
- Password protection to prevent unauthorised access to important parameters
- Saving of software, configuration and settings in non-volatile memory.
- Control via master controller via floating contacts.
- Programme saved on non-volatile CFast card.
- Possibility of communication with master controller via Modbus TCP, Ethernet/IP.
  (optionally via Profibus-DP and ProfiNet)
- Remote access (optional via Ethernet)

4.4 Components of GEA Omni

- Control cabinet (different sizes and mounting options, see - IEC standard IP54 / NEMA 4 minimum classification)
- Control cabinet with:
  - Industrial PC with multi-touch screen and HD display for operation
  - EMERGENCY-OFF switch - directly connected to the control outputs to be able to switch off all rotating components immediately.
  - USB interface - with IP54 cover for data exchange with the industrial PC
  - Optional indicator lights for:
    → “operation” – for status displays start, operation or stop of the compressor
    → “warning” – for the display that an operating condition has exceeded the limit value for a warning.
    → “fault” – for indicating that the compressor is switched off.
- Control cabinet interior view:
  - Power supply for the industrial PC, input and output circuits and sensor
  - Frequency converter (optional or standard depending on the product)
  - I/O system – as interface for all monitored digital and analogue inputs and regulated outputs
  - Connections – for incoming power supply and cabling connections
  - Fuses and circuit breakers - as short-circuit and overvoltage protection. Industrial PC and I/O logic are protected with a fuse. The power supplies of the control system and the sensors are protected by circuit breakers
  - Cable ducts - as a guide for internal cabling

Fig.11: GEA Omni control cabinet interior view (frequency converter installed in control cabinet)

4.5 Input and Output Signals

Low-voltage switchgear - GEA Omni			
from the low-voltage switchgear to the GEA Omni INPUTS		**from the GEA Omni to the low-voltage switchgear OUTPUTS**	
Not applicable if the scope of delivery contains a low-voltage switchgear.			
Input: 100 ... 240 V, 50/60 Hz			
digital	• Motor feedback • Motor protection compressor • Feedback external oil pump [3]	digital	• Run compressor • Run external oil pump [3] • Confirm malfunction
analogue (4-20 mA)	• Motor current compressor drive motor • Speed compressor drive motor [4]	analogue (4-20 mA)	• Compressor drive motor speed setpoint [4]

Remote controller or control system - GEA Omni			
from the remote controller (control system) to the GEA Omni INPUTS		**from the GEA Omni to the remote controller (control system) OUTPUTS**	
digital	• External ON/OFF • External "MORE" • External "LESS" • External run release • Confirm external fault • Switchover 2. Setpoint • Block compressor	digital	• Ready for external mode • Signal Compressor runs • Main failure • auxiliary output 1 (Default setting collective warning)
analogue (4-20 mA)	• Remote setpoint	analogue (4-20 mA)	• Swept volume

3 If fitted.
4 Only when operated with a frequency converter.

Chiller / heat pump - GEA Omni			
from the cooling system / heat pump to the GEA Omni INPUTS		**from the GEA Omni to the cooling system / heat pump OUTPUTS**	
digital	• external EMERGENCY-OFF (or EMERGENCY-STOP) • Separator level [5] • Eco-level [5] • Gas sensor • Discharge pressure safety switch • min. oil level [6] • max. oil level [6] • Level of refrigerant top / bottom [5]	digital:	• Solenoid valve capacity control max. [7] • Solenoid valve capacity control min.[7] • Solenoid valves capacity control [8] • Solenoid valve check valve suction side [5], [7] • Solenoid valves Vi-control [5], [7] • Solenoid valve economizer operation[5] • Solenoid valve start-up unloading [5] • Solenoid valves, oil return • Solenoid valve low pressure-high pressure relief [3] • Solenoid valve oil return from fine oil filter stage [3]
analogue (4-20 mA)	• Control / primary slide position[7] • Vi / control slide stop position [5], [7] • suction pressure • discharge pressure • Oil pressure • Pressure after oil filter[7] • Crankcase pressure [8] • Evaporating pressure [9] • Suction temperature • Discharge temperature • Oil temperature • Oil temperature oil separator sump [3] • Oil temperature compressor on / off [10] • Eco temperature[3] • Eco pressure[3] • Secondary refrigerant temperature on/off [11] • Inlet temp. refrigerant low pressure cooling system [12]	analogue (4-20 mA)	• Setpoint level control [5] • Setpoint IntelliSOC injection valve [5] • Setpoint motor valve suction line [3] • Setpoint motor valve remote condenser control[3] • Setpoint motor valve hot gas bypass start-up unloading[3]

5 The signals refer in part to optional features (not available for all products).
6 For screw compressor, optional.
7 Depends on compressor type.
8 For reciprocating compressor.
9 For heat pumps with motor valve on the suction side.
10 For heat pumps with reciprocating compressor.
11 For heat pumps with water/saltwater-based heat sources.
12 For heat pumps with a heat source of NH_3-condensation of the low pressure cooling system.

Chiller / heat pump - GEA Omni	
from the cooling system / heat pump to the GEA Omni INPUTS	**from the GEA Omni to the cooling system / heat pump OUTPUTS**
• Outlet temp. refrigerant low pressure cooling system [13] • Heat carrier / cooling medium temperatures [14]	

13 For heat pumps with a heat source of NH3-condensation of the low pressure cooling system (is substituted with the discharge temperature sensor of the low pressure level for products of the GEA Blu-Red Fusion series).

14 For heat pumps heat carrier temperature sensors on/off for every heat exchanger standard, for chillers optional, only 1x inlet/outlet respectively into / out of the product.

5 Technical data

5.1 Dimensions, weights, fill quantities and connections

Notice

The data is applicable to the following conditions:

- ► Temperature of the secondary refrigerant +12°C / +6°C
- ► Temperature of the refrigerant +30 °C / +35 °C

Data may differ in other conditions.

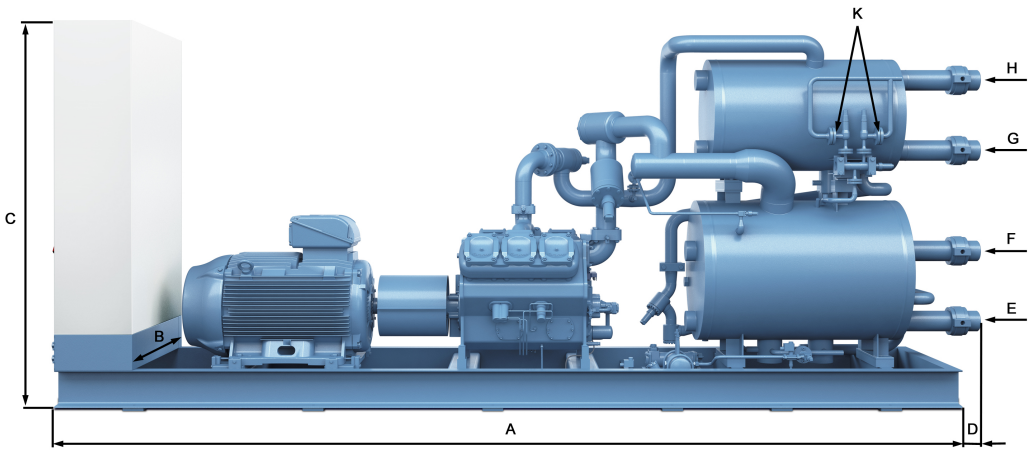


Fig.12: GEA BluGenium 300 ... GEA BluGenium 1200

Characteristics							
Code	**Parameter**		**GEA BluGenium chiller**				
			300 [15]	**450** [15]	**600** [15]	**900** [15]	**1200** [15]
A	Length	mm	4600	4600	5300	5300	5600
B	Width	mm	1200	1200	1200	1200	1200
C	Height	mm	2140	2220	2270	2340	2460
D	Frame overhang	mm	165	165	165	165	165
E	Connection Cold water IN	DN	80	100	100	100	125
F	Connection Cold water OUT	DN	80	100	100	100	125
G	Connection Cooling water ON	DN	80	80	100	100	125
H	Connection Cooling water OFF	DN	80	80	100	100	125
K	Connection of blow-off line to safety valve	DN	25	25	25	25	25
	Weight without charging	kg	4010	4740	5900	6270	8600
	Operating weight	kg	4270	4950	6360	6690	9100

15 subject to technical changes

Characteristics							
Code	**Parameter**		**GEA BluGenium chiller**				
			300 [15]	**450** [15]	**600** [15]	**900** [15]	**1200** [15]
	Filling quantity (Oil)	l	17	24	35	23	32
	Filling quantity (refrigerant NH_3)	kg	33	25	40	47	57

15 subject to technical changes

5.2 Operation limits

The chillers from the GEA BluGenium series can be operated within the specified operation limits according to the respective specifications under diverse work conditions. The operation limits listed below are based on the operational principle of the reciprocating compressor, thermodynamic relationships, the vessels and safety devices in use, and the practical operating conditions.

Operation limits				
Parameter		Unit	Value	
Refrigerant				NH_3
Speed	n	rpm	min max	500 1500
Suction pressure	p_0	bar (a)	min max	1.9 VL7,0/VM8,5
Outlet temperature of water as secondary refrigerant	t_{K2}	°C	min max	+ 2.5 +18
Outlet temperature with frost-resistant secondary refrigerants [16]	t_{K2}	°C	min max	- 15 + 18
Compression discharge pressure	$p_{dis} = p_c$	bar (a)	max	22.5
Condenser inlet temperature of coolant	t_{W1}	°C	min max	12 45
Condensing temperature	t_c	°C	min max	18 52
Discharge temperature at compressor outlet	t_{dis}	°C	max	150
Pressure ratio (p_c/p_0)	π	-	min max	1.5 10
Pressure difference (p_c-p_0) [17]	Δ p	bar	min max	4 19.0

Notes

1. When considering a specific application, all the conditions specified in the table must be taken into account and adhered to.
2. If the specified limits are exceeded for a specific application, the manufacturer must be consulted.
3. In addition to the operating limits stated in the tables, the applicable operating conditions of the compressor must also be considered (e. g. start-up regime, oil pressure, oil temperature, oil quantity, oil type, etc.).
4. The specified data refer to the operating conditions of a cooling or air-conditioning system.

   During downtime or start-up, the limiting values may be exceeded or fallen short of for a short (never long-term) period of time.

16 GEA BluGenium 900 / 1200 max. +15 °C due to the operating limit of the VL compressor (V Large)
17 The specified pressure difference ensures reliable compressor operation. Furthermore, allowance must be made for the pressure difference necessary for the control valves fitted in the refrigerating plant.

5.3 Water quality requirements, parameters

All water bearing components of the manufacturer provide optimum performance and maximum protection from corrosion, if all recommended limiting values of VDI 3803 issue 2010-02 (Tab. B3) for non-corrosive water and adequate water conditioning are met.

Notice

If the limits specified in VDI 3803 are not adhered to, the manufacturer cannot provide any warranty regarding the water-conducting parts of the delivered components.

► All components are designed for use with non-corrosive water. Water and glycol brine analysis is essential in protecting system components. Analyses prior to start up will prevent corrosion.

Following are shown required limiting values of VDI 3803, for use of carbon steel components in non corrosive water systems.

Water quality requirements, parameters			
Parameter		**Value**	**Unit**
Appearance		clear, without sediment	
Colour		colourless	
Odour		none	
pH-value at 20 °C		7.5 - 9.0	
Electrical conductivity	LF	< 220	mS/m
Soil alkali	Ca^{2+}, Mg^{2+}	< 0.5	mol/m³
General hardness, for stabilization	GH	< 20	°d
Carbonate hardness without hardness stabilizer	KH	< 4	°d
Chloride (see also following information)	Cl	< 150	g/m³
Sulphur	SO_4	< 325	g/m³
Active biological components	KBE	< 10,000	per ml
Thickness factor	EZ	2 - 4	

The use of carbon steel and cast iron required in the most of applications water conditioning with corrosion inhibitors.

The use of stainless steel requires very special monitoring of water in apply to Chloride contents (risk of stress crack and pitting corrosion).

Notice

Recommend for use of plate heat exchangers

► < 100 ppm Cl for the use of 1.4301 (AISI 304) and maximum 40 °C wall temperature in the plate heat exchanger

► < 200 ppm Cl for the use of 1.4401 (AISI 316) and maximum 100 °C wall temperature in the plate heat exchanger

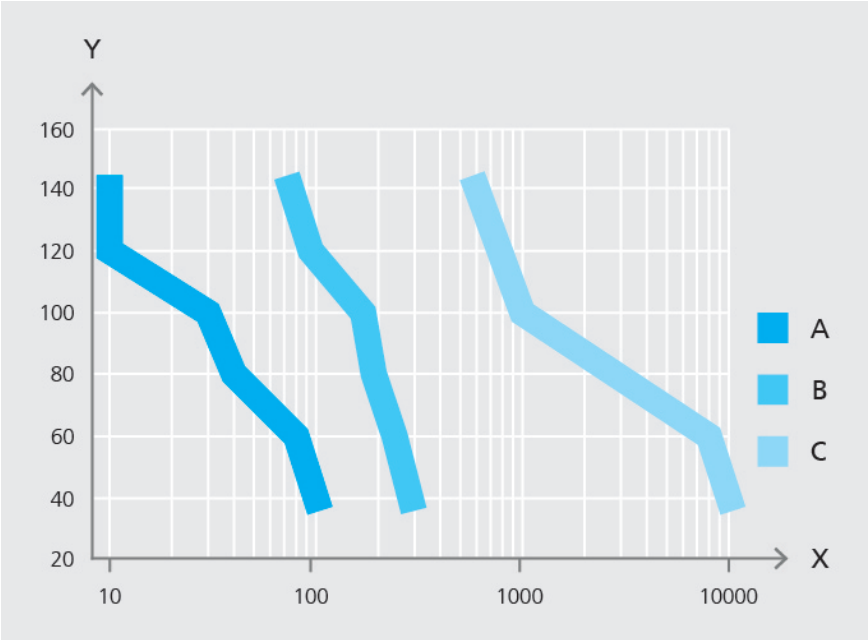


Fig.13: Corrosion resistance in presence of chlorides

X	Chloride ion concentration ppm Cl^-
Y	Wall temperature heat exchanger in °C
A	AISI 304
B	AISI 316
C	SMO 254

Notice

Manufacturer recommendation: Use uncontaminated cooling agents and cooling media, in particular in chillers / heat pumps and the use of plate heat exchangers.

► The media quality needs to be assured through an appropriate filter on the inlet to the heat exchanger. The mesh for these kinds of filters needs to be ≤ 0.9 mm!

► Should the system need to remain in operation during filter cleaning, double filters need to be used. Pressure loss through the filter need to be taken into consideration on the building side when configuring the pump.

The manufacturer will inform you on request about qualified specialist companies that can support you in the water analysis and the derived measures.

5.4 Performance characteristics

Secondary refrigerant inlet temperature = 12 °C

Secondary refrigerant outlet temperature = 6 °C

Q_0: refrigerating capacity

P_e: driving power (clamping performance)

Q_c: Condenser capacity at cooling medium inlet / outlet temperatures = 30/35 °C

Performance characteristics			
Frame size	**Q_0 in kW**	**P_e[18] in kW**	**Q_c in kW**
GEA BluGenium 300	280	54	330
GEA BluGenium 450	420	81	495
GEA BluGenium 600	560	106	660
GEA BluGenium 900	810	149	949
GEA BluGenium 1200	1210	220	1419

5.5 Sound pressure level

Measuring-surface sound-pressure level

at a distance of 1 m from the machine surface (A-close range sound level at open air conditions on reflecting surface) for chillers (1 compressor and 1 drive motor).

Determination of the measured values without secondary sound insulation

Notice

Measuring-surface sound-pressure level strongly depends on the type of the chiller and especially on the type of the drive motor (manufacturer, type, protection type).

► The values in the tables are purely guide values, which have to be confirmed by the technical specifications of the project.

Measuring surface sound pressure level (without sound enclosure)					
Motor	**GEA BluGenium chiller**				
at 40 °C P_e in kW	**300**	**450**	**600**	**900**	**1200**
75	78	-	-	-	-
110	-	78	-	-	-
132	-	-	79	-	-
160	-	-	-	81	-
250	-	-	-	-	87
315	-	-	-	-	-

The values in the table are verified by actual measurement. If no values are specified, these are not yet available or not applicable for the chiller size.

18 clamping performance (including motor / frequency inverter power losses)

6 Application form

GEA Refrigeration Germany GmbH supplies products of high quality and reliability. With regard to project requirements, every product is configured, constructed and manufactured individually.

Are you looking for the optimum solution for your application? Contact GEA sales and on request, we can provide you with an application form that you can also conveniently fill in and send away electronically.

You can find an overview of sales offices and contacts at:

www.gea.com

6.1 Manufacturer address

GEA Refrigeration Germany GmbH is a company of the GEA Group AG and provides its customers around the world with high-quality components and services for refrigeration and process technology applications.

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