Heat pump

GEA RedAstrum

Product Information (Translation from the original language)

L_661011_4

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

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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 connection with GEA products and in this document, the term heat pump designates an ammonia chiller that is operated at high condensing temperatures (depending on the application, higher than approx. 50 °C or 55 °C) and has a maximum permissible pressure of at least 39 bar or higher.

The figure on the cover page shows a product with project-specific equipment (project-specific changes possible).

Many components and modules are used interchangeably in different GEA chiller and heat pump product series. The description of certain components and operational principles in this document are therefore general in nature.

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: GEA RedAstrum, front view

Parameter	Remark
Capacity range (Application example 1 pure heating mode, evaporator with ext. secondary refrigerant)	Approx. 620 - 2435 / 745 - 2910 kW (refrigerating/heating capacity) 40 °C / 35 °C (secondary refrigerant temperature) 40 °C / 70 °C (heat carrier temperature)
Capacity range (Application example 2 as "add-on" heat pump with NH_3 cascade evaporator)	Approx. 615 - 2255 / 740 - 2720 kW (refrigerating/heating capacity) Approx. 32 °C ... 33 °C (evaporating temperature) 40 °C / 70 °C (heat carrier temperature)
Capacity range (Application example 3 combined cooling and heating mode, evaporator with ext. secondary refrigerant)	Approx. 365 - 1170 / 510 - 1585 kW (refrigerating/heating capacity) 12 °C / 6 °C (secondary refrigerant temperature) 40 °C / 65 °C (heat carrier temperature)
Screw compressor	GEA Grasso M series, housing size E, G, H, L, M, N, R V_{th} = 231 ... 1040 m³/h (2940 rpm)
Screw compressor package	GEA Grasso M / SP1 horizontal high-pressure version
Heat pump	GEA RedAstrum
Evaporator type	Plate heat exchanger, fully welded, with integrated separator, charged with liquid secondary refrigerant (W) or as NH_3 cascade heat exchanger (K)
Working principle	flooded evaporation
Liquid separator	integrated
Condenser type	Fully welded plate heat exchanger
Transport	1 part [1]

1 As standard up to motor size 450 kW

1.2 Technical specifications

Notice

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

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

Standard equipment	
Designation	**Design**
Design pressure:	40 bar(g) and 52 bar(g)
Intended environment:	Closed machine rooms
Ambient temperatures:	+15 ℃ to +40 ℃
Installation altitude:	≤ 1000 m above sea level
Secondary refrigerant outlet temperature [2]:	-10 ℃ to +49 ℃
Evaporating temperature [3]:	+10 ℃ to +45 ℃
Heat carrier outlet temperature [4]:	+55 ℃ to +80 ℃
Electric motor:	scope of delivery
Refrigerant:	R717
Type of oil:	PAO-Öl Klüber R300 ⚠ **Caution!** Please contact the manufacturer in case of other types of oil. ► Contact the service or the design department of GEA Refrigeration Germany GmbH.
Oil cooling:	Scope of delivery (liquid-cooled)
Oil heater:	scope of delivery
Oil filter:	Single stage filter
Spare oil filter:	scope of delivery
Oil level switch:	none
Pressure sensors:	with stop valve
Safety pressure switch:	electronic
Overflow valve compressor:	scope of delivery
Overflow valve HP/LP:	scope of delivery
Safety valve LP:	Double safety valve with change-over valve
Flow monitor:	mechanical (paddle), for secondary refrigerant
Control:	GEA Omni™ incl. GEA VTrac™
Communication:	EtherNet/IP, Modbus TCP
Power current and frequency inverter:	Default scope of delivery, cable entry from below
Colour:	RAL 5014 (dove grey);
Soundproof housing:	not possible

2 Temperature difference of secondary refrigerant 10 K maximum, higher values on request, the max. flow velocity at the evaporator nozzle is 7.5 m/s (depending on the application, in this light the max. Outlet temperature of the secondary refrigerant may be limited to a value lower than +49 °C)

3 In the version with NH_3 cascade evaporator

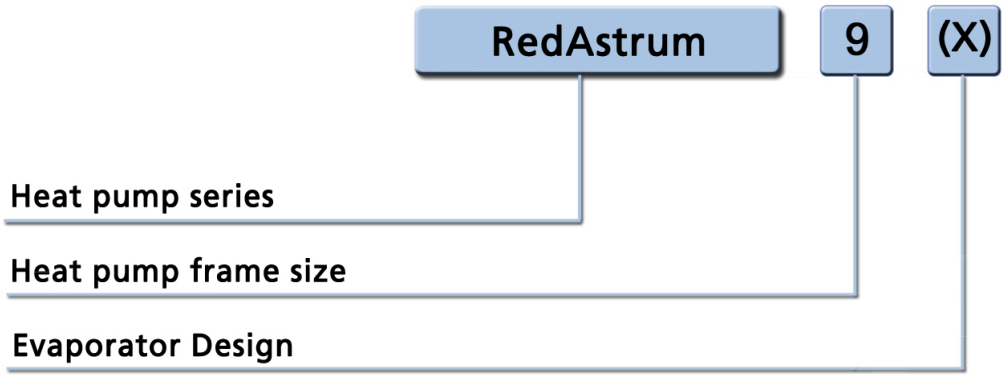
4 Temperature difference of heat carrier 30 K maximum, higher values on request

Standard equipment	
Designation	**Design**
Vibration isolators:	none
Approval of pressure equipment:	CE-PED, Module H (piping)
Documentation:	electronic (provided on a server)

Optional equipment	
Designation	**Design**
Intended environment:	Outdoor installation on request
Installation altitude:	> 1000 m above sea level on request
Electric motor:	supplied by customer, customer-specific design possible on request
Spare oil filter:	none
Oil level switch:	can be delivered
Overflow valve HP/LP:	version with double safety valve with change-over valve blowing to the surroundings
Flow monitor:	electronic, mechanical (paddle) or electronic also for heat carrier
Control:	GEA Omni™ SIEMENS HMI
Communication:	Profibus DP ProfiNet
Control options:	intelligent sequence control, energy measurement
Vibration isolators:	can be delivered
Approval of pressure equipment:	CE-PED, module H1 (complete heat pump), 100% weld seam inspection, French acceptance specifications, Russian acceptance specifications, Belarusian acceptance specifications, DOSH acceptance for Malaysia (on request), MOM acceptance for Singapore (on request)
Documentation:	USB, paper version

1.3 Product designation, heat pumps with screw compressors

GEA RedAstrum series



Product code description

Code	Description
RedAstrum	Heat pump series
9	Heat pump frame size (Housing and rotor size of the compressor)
(X)	Evaporator design type

RedAstrum = Heat pump series

9 = Heat pump frame size resulting from the compressor frame size (housing size) and the compressor's swept volume flow size (corresponds to the rotor size)

Compressor type [5]	Frame size (frame size and swept volume flow size of the compressor) [5]
EMR-C	EC
EMR-D	ED
EMR-E	EE
GMR-G	GG
HMR-E	HE
HMR-G	HG
HMR-H	HH
LMR-L	LL
MMR-H	MH
MMR-L	ML
MMR-M	MM
NMR-N	NN
RR-M	RM
RR-N	RN
RR-R	RR

(X) Evaporator design variant

5 The design type (normal with full rotors / heavy duty with shortened rotors) cannot be freely selected, this results automatically from the dependency of different influence factors of project-specific conditions (suction pressure, discharge pressure, speed, compressor type). Most typical heat pump conditions require a heavy-duty version with shortened rotors (non-shortened versions are not possible in these cases)

Code	Description
(W)	Water/liquid-cooled plate heat exchanger (fully welded) Heat pump for indoor installation
(K)	Evaporator as NH_3 cascade heat exchanger [6] Heat pump for indoor installation

Examples of designation

Examples	Description
RedAstrum MH (W)	Heat pump with screw compressor, evaporator with integrated separator**(RedAstrum)** Frame size of the heat pump, M compressor frame size with H swept volume flow **(MH)** Version with water/liquid-cooled evaporator as fully welded plate heat exchanger Heat pump for indoor installation (W)
RedAstrum RR (K)	Heat pump with screw compressor, evaporator with integrated separator **(RedAstrum)** Frame size of the heat pump, R compressor frame size with R swept volume flow **(RR)** Version with NH_3 cascade evaporator as fully welded plate heat exchanger Heat pump for indoor installation **(K)**

6 The evaporator design variant as NH_3 cascade heat exchanger (K) is also suitable for use in a two-stage chiller heat pump combination. This results in application-related design differences.

2 Scope of delivery

The heat pump of the GEA RedAstrum series consists of the following components:

- Screw compressor,
- Evaporator with integrated separator,
- Condenser,
- Electric motor with coupling,
- Oil supply system with oil separator,
- Oil cooler,
- Subcooler (optional),
- Oil filter,
- Suction filter,
- Check valves on the suction and discharge sides,
- Capacity control,
- Monitoring and safety devices,
- Frequency inverter,
- Low-voltage installation with control GEA Omni™,

All components are fully mounted.

Low-voltage installation with frequency inverter and control GEA Omni™ are wired.

The oil separator is arranged horizontally and mounted on the steel bearings bolted to the base frame.

The oil is cooled in a liquid-cooled oil cooler.

By default, a rigid installation on the foundation is intended. An installation with vibration isolators is available optionally.

All connections are closed tight.

Service fluids

The heat pumps of the GEA RedAstrum series are delivered without refrigerants. They are filled with dry nitrogen (approx. 0.2 bar ... 0.5 bar overpressure).

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

Insulation

Heated components (high pressure side) are insulated with mineral wool or PUR foam, including aluminium cladding.

Cold components (low pressure side) are insulated with mineral wool or PUR foam, including aluminium cladding or Armaflex.

Painting

The painting is done with 2 component EP paint RAL 5014 with a coating thickness of 120 µm.

Approval

After acceptance, the heat pumps of the GEA RedAstrum series are assigned a CE label in accordance with the Pressure Equipment Directive 2014/68/EU.

Documentation

Each heat pump of the GEA RedAstrum series is delivered with user documentation. The user documentation contains:

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

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

The transport instructions can be accessed as a separate document at GEA Refrigeration Germany GmbH.

3 Description of Design and Function

3.1 Design, applications

The GEA RedAstrum heat pump range provides tried and tested components as complete heat pump or refrigeration systems for medium heating, refrigeration and/or air conditioning requirements.

Main fields of application:

- (cold) and warm water for heat pump operation
- (cold) and warm brine for heat pump operation
- 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

The GEA RedAstrum heat pump can either be equipped with an evaporator (W) charged with an external secondary refrigerant or for use as an “add-on” heat pump on an existing chiller with an NH_3 cascade evaporator (K).

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

Equipped with the screw compressor series, the range of GEA RedAstrum heat pumps covers a heating capacity range of approx. 750 kW to 2900 kW for the heat carrier range.

The capacity ranges are determined by the 7 sizes of the screw compressor series (housing size E, G, H, L, M, N, R).

GEA RedAstrum heat pumps work with flooded evaporator systems in forced circulation operation and run with a condenser operated with cooling water (heat carrier).

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

- Screw compressor package in high pressure design
- Heat exchanger subassembly with integrated liquid separator and de-oiling system
- Low-voltage installation with frequency inverter and control

The modular construction of the heat pumps is modelled on the construction of the screw compressor packages. The oil separator is arranged horizontally. The arrangement of the components ensures the extremely compact design of the heat pumps.

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

Only plate condensers are used on the condenser side.

GEA RedAstrum heat pumps are supplied, as a standard, ready for connection, fully piped and wired.

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

The standard version of the heat pumps 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 heat pumps are delivered without refrigerant. They are filled with dry nitrogen (approx. 0.2 bar ... 0.5 bar overpressure).

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

The separate installation and maintenance manual are provided for detailed information about the screw 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 screw compressor draws refrigerant gas 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 screw compressor, oil is injected into the working chamber and then separated again from the refrigerant in the discharge side oil separator.

The oil which has heated up in the compressor is cooled in an oil cooler to reach the inlet temperature.

Despite the oil separation system, oil penetrates into the low pressure side of the circuit.

A special automatic and maintenance-free oil returning system developed by GEA Refrigeration Germany GmbH returns the oil from the evaporator / liquid separator back to the screw compressor.

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

The capacity of the screw compressor is controlled in a continuously variable manner by means of the compressor's control slide (not provided as standard for the GEA BluAstrum and GEA BluAir product series) as well as optionally by the FC control of the compressor drive motor (standard for the GEA BluAstrum, GEA BluAir and GEA RedAstrum product series). Thus the refrigerating capacity can be optimized to a maximum in accordance with the effectively required refrigerating capacity within a range of 0% to 100% (depending on the application area, the minimum position > 0%).

The Vi control slide is hydraulically adjusted and activated using 2 solenoid valves. The position of the Vi control slide is displayed on the compressor control.

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 Screw compressor

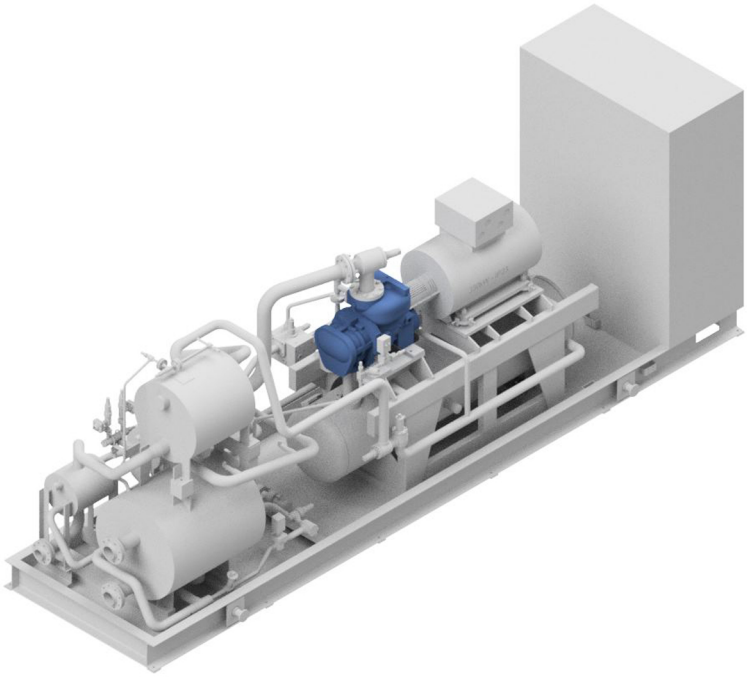


Fig.2: Arrangement of the compressor

The screw compressor is characterised by a compact design, high reliability, high-quality components and ease of maintenance.

Screw compressors are dual rotor positive displacement machines that work according to the displacement principle and are operated by oil injection.

The screw compressor is operated with ammonia (NH_3) as the refrigerant.

Specific machine oils are recommended depending on application. These can be found in the specifications or can be determined using a limited selection in the product configurator.

⚠ Caution!

Different types of oil that are not indicated in the specification must be agreed with the manufacturer.

► Contact the design or service department of GEA Refrigeration Germany GmbH.

Various series and frame sizes of screw compressors are available for different fields of application.

The screw compressor is driven directly by the motor via a coupling.

The documentation for the screw compressor (installation instructions, part lists, drawings) is an integral part of the product documentation.

3.3.2 Compressor drive motor

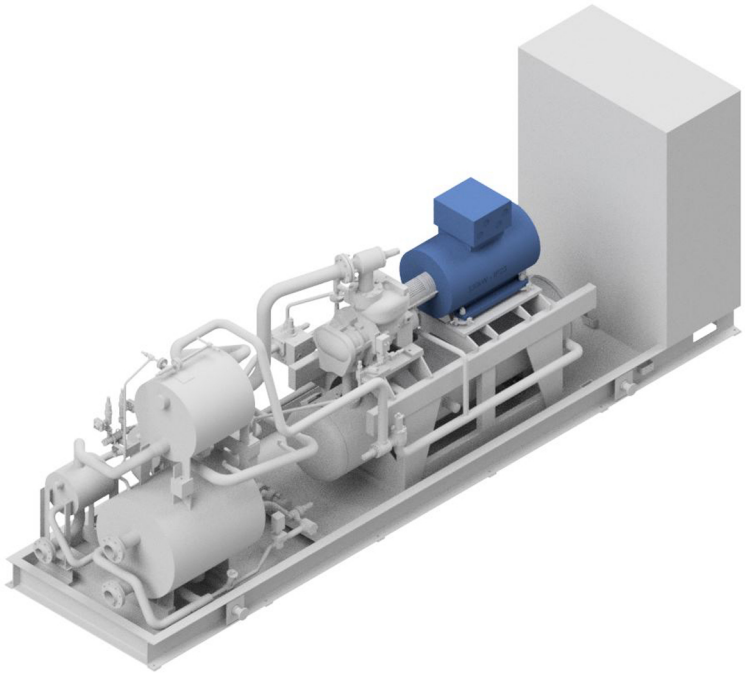


Fig.3: Position and arrangement of the motor:

Standard: The compressor is driven by an air-cooled 2-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 P and FX P duo series).

The maximum speed range is at 1000 rpm ... 4500 rpm, but is limited in both directions depending on the product and application.

The technical specifications provide information about the permissible speed range. Depending on the application, foot motors as per design IM B3, flange motors as per design IM B5, or a combination (design IM B35) are used.

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.

Notice

The use of an anti-condensation heater should be considered if there is a risk of condensation forming on the motor/product at the installation site, especially if high humidity levels above 60% and/or large temperature fluctuations are expected (especially motors that are at a standstill in humid environments).

► Whether this technical design is necessary must be decided by the customer/operator based on the actual system.

3.3.3 Coupling

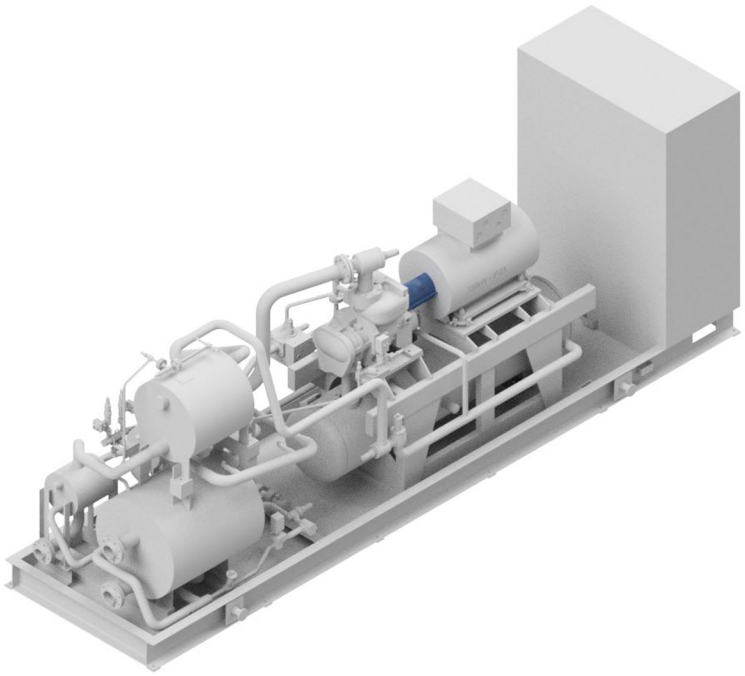


Fig.4: Arrangement of the coupling

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

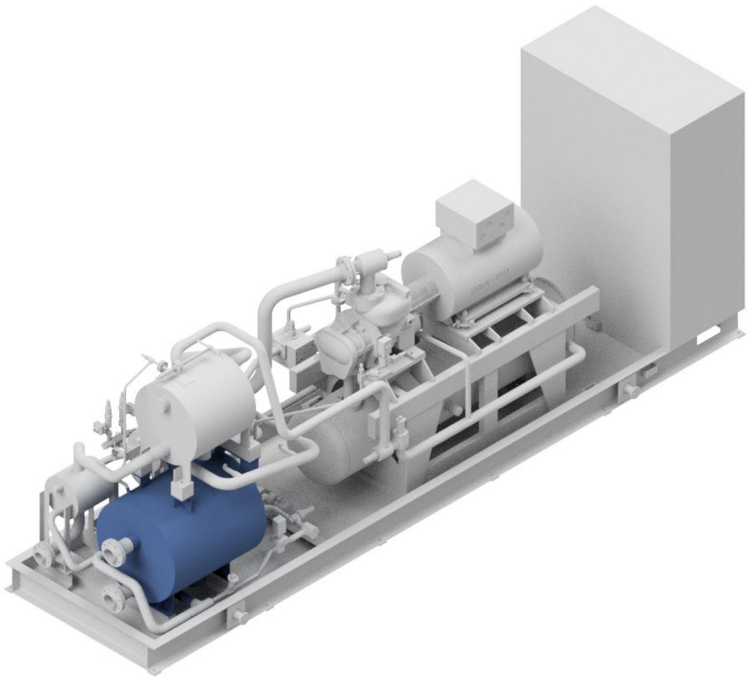


Fig.5: Arrangement of the evaporator

Variant (W) with evaporator charged with a secondary refrigerant:

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

Variant (K) with NH_3 cascade evaporator:

As a result of the evaporation of the refrigerant, heat is absorbed in the evaporator from the condensation of the refrigerant in the chiller circuit.

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

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

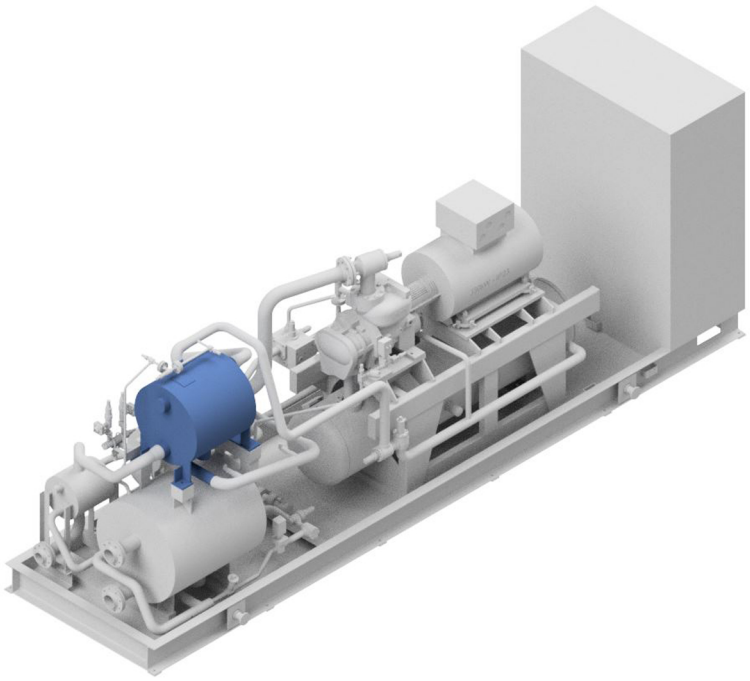


Fig.6: Position of the condenser

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

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

Condenser implemented 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 separator

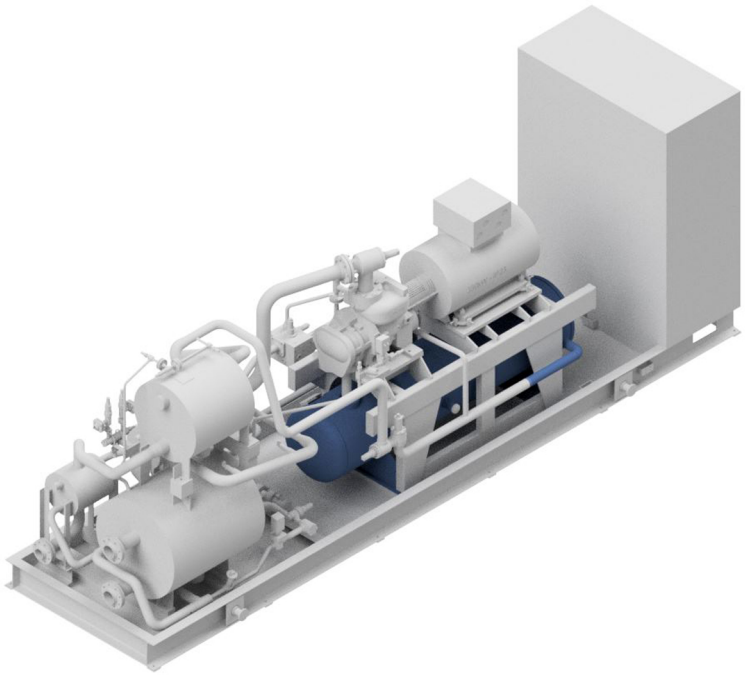


Fig.7: Arrangement of the oil separator

The design of the oil separator is standardised and it is characterised by less oil carry-over.

In the standard version, the oil separator is mounted horizontally (vertically on the GEA Grasso FX P and FXP duo series from compressor frame size P).

The documentation for the oil separator (operating and maintenance manuals, acceptance certificate) is an integral part of the product documentation.

Oil heater

Electric oil heaters are integrated in the oil separator to pre-heat the oil refrigerant mixture in the oil separator while the system is at standstill. The oil heater prevents refrigerant condensation from penetrating into the oil and, thus, any foaming of the oil during start-up.

The oil heater is switched on while the product is at standstill and is switched off automatically at start-up. A manual switch-off for long standstill periods is recommended.

The documentation for the oil heater (operating and maintenance manuals, acceptance certificate) is an integral part of the product documentation.

3.3.7 Oil cooler

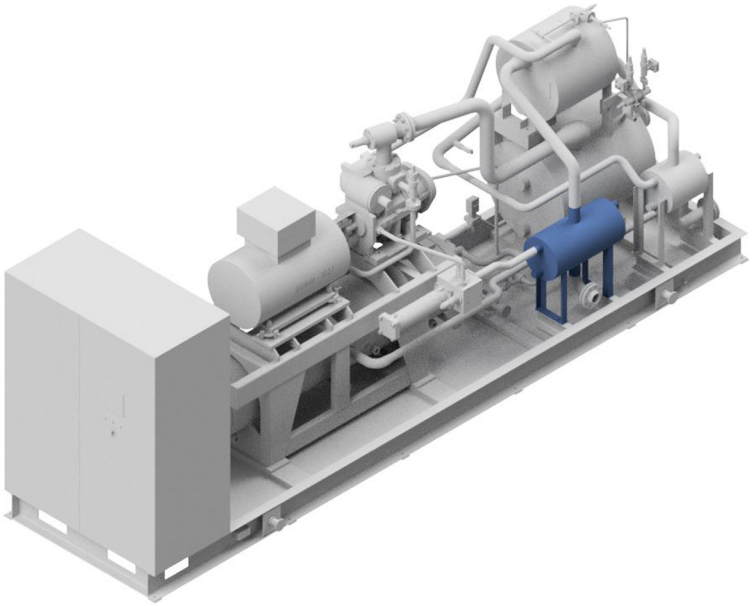


Fig.8: Arrangement of the oil cooler

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.

Depending on the product/application, the oil cooler is an optional component and is replaced with the injection of refrigerant into the compressor to cool the compression process.

For heat pumps and applications with heat recovery, a type of liquid cooling is used in which the oil cooler releases the oil's heat to a liquid medium (cooling medium/heat carrier).

The documentation for the oil cooler (operating manual, acceptance certificate) is an integral part of the product documentation.

3.3.8 Oil filter system with OMC-block (oil management centre)

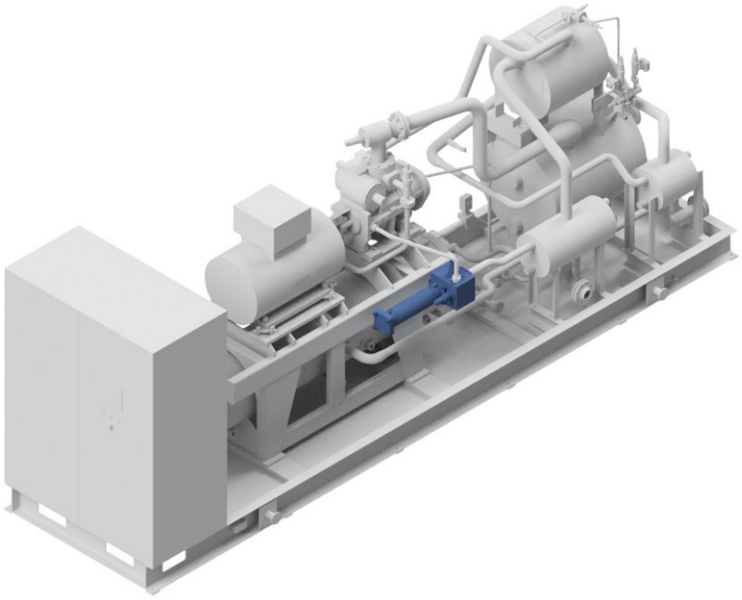


Fig.9: Arrangement of the oil filter system with OMC block

After cooling, the oil passes into the oil filter which holds back solid particles from the full oil flow.

Due to its large surface, the oil filter has a high absorbing capacity and thus a long operating lifetime. Depending on the application, the relative filter fineness is between 10 and 25 µm.

An additional coarse filter with a relative filter fineness between 40 and 80 µm may be installed upstream depending on the application.

The OMC block includes the oil distribution system of the oil circuit. Necessary control and shut-off fittings are integrated in the OMC block. Connections for temperature and pressure sensors as well as service ports are available. The OMC block is combined with a standardised filter system and oil pump units (if present) and forms the central control and regulation unit within the oil circuit.

Optionally, the OMC block can be equipped with a 3-way valve element (to ensure a minimum oil temperature when starting the compressor, not available as standard for all applications/products).

The documentation for the OMC block (operating manual, acceptance certificate) is an integral part of the product documentation

Notice

The OMC cannot be used under certain conditions (such as applications with high oil volume flows of more than 340 l/min and all products with a design pressure higher than 40 bar).

► In this case, all of the parts that are usually integrated in the OMC are installed separately in the oil circuit.

3.3.9 Oil pump

The oil pump is an essential component of the oil circuit. It is used for pumping and distributing refrigerator oil and ensures that the oil is distributed to the individual lubricating points (e.g. radial bearing, balance piston and packing gland of the compressor).

Under certain conditions, products based on the screw compressor of the GEA Grasso M series can or must be operated without a pump. In this case, the pressure difference between the suction and discharge sides of the compressor is used to ensure the oil supply.

The documentation of the oil pump (operating manual, acceptance certificate) is a part of the product documentation.

3.3.10 Subcooler (optional)

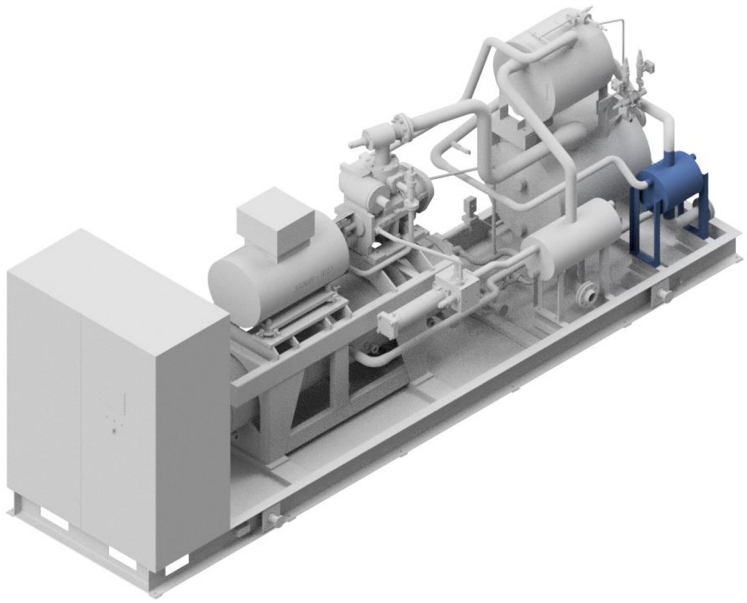


Fig.10: Position of the subcooler

Depending on the specific project conditions, incorporating a subcooler may have partly significant energy advantages and increase the efficiency of the heat pump, since the subcooler capacity adds to the heating and cooling capacity without requiring additional drive power.

After condensing, the refrigerant is supercooled in the subcooler by a certain temperature difference (depending on the level of the heat carrier inlet and outlet temperatures) and its heat is transferred to the heat carrier.

The documentation of the subcooler (operating manual, acceptance certificate) is part of the product documentation.

3.3.11 Suction filter combination

The suction filter combination contributes substantially to the high working reliability of the components and the overall product.

The suction filter combination prevents dirt particles carried by the suction flow from entering the screw compressor. The flow through the suction filter element is from the inside to the outside. It is designed such that monitoring is not required. The filter element can be cleaned.

The documentation of the suction filter combination (operating manual, acceptance certificate) is an integral part of the product documentation.

Compressor frame sizes H to N are equipped with a suction filter check valve integrated in the compressor as standard.

3.3.12 Control cabinet with control

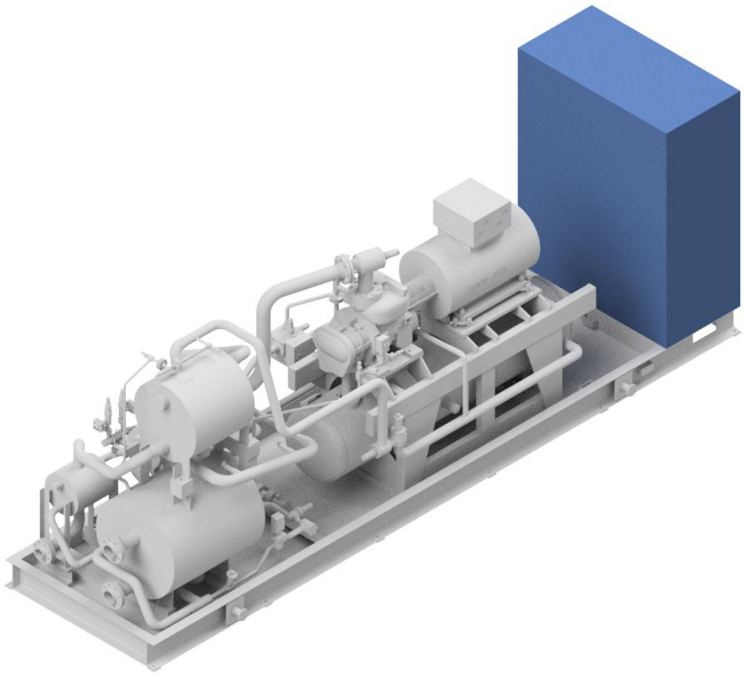


Fig.11: Position of the control cabinet

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 in 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.

3.3.13 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.

3.3.14 Safety devices

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

A suction as well as condenser pressure control and a rated current limitation control cause a speed reduction whenever the adjustable 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.

Following safety equipment is included if the product is delivered with CE label according to EN 378.

- Overflow valve (on the compressor) from discharge to suction side
- Double safety valve with pressure relief connection, installed on the low-pressure side of the product.

Notice

Proper installation of the pressure relief 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 position may also be sufficient depending on the application)
- Pressure relief device for each closable container which can contain liquid refrigerant.

  This applies to all containers with a diameter > 152 mm and a volume > 100 litres barring oil separator and oil filter.

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 as standard with the GEA BluAir and GEA BluAir duo series)

In case of delivery according to EN 378 with CE label, all parts of the documentation mentioned in the regulation are delivered in the national language of the place where the chiller is installed.

All other approvals have to be agreed upon separately.

3.3.15 Pressure limiting safety devices

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

The overflow valve to protect the compressor is designed according to EN 13136.

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

The blow-off pipe has been dimensioned in accordance with EN 13136.

The electro-mechanical safety switching devices for pressure limiting comply with EN12263 and are type-approved. The settings match the specifications of EN 378-2.

If electronic safety switching devices are used for pressure limiting, 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:

► dimensioning of the piping,
► safe discharge of refrigerant when the pressure relief device is triggered.

The safety devices for pressure limiting according to EN 378-2 are the minimum requirements. Before commissioning, the requirements specified in the local operational safety regulations must therefore be compared with those of EN 378-2.

The specified test intervals must be observed to ensure proper functioning of the safety devices for pressure limiting. They are specified in the respective operational safety regulations.

3.3.16 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 panel

4.1 Product Highlights

GEA stands for sophisticated high-precision solutions. With the new GEA Omni™ control system, the system supplier demonstrates again its technological leadership and innovation.

Powerful and practical, well thought out and intuitive, refined and simple – that is GEA Omni™.

GEA Omni™ keeps what it promises: maximum efficiency and reliable operation of the system. The next generation control includes all important components of a refrigeration and gas compression system. This allows it a demand-driven and highly efficient operation of the system.

GEA Omni™ benefits at a glance:

- System control with only one device
  control of the refrigeration plant with GEA Omni™
- High-resolution display
  → 1366 x 768 pixels
- Multi-touch display
  → Ergonomic and intuitive input
- Easy integration
  → Easy installation on site, ideal for retrofitting of existing systems
- Configurable Modbus TCP communication
  → Data exchange with other systems without additional wiring
- Hardware design
  → Standard industrial components with modular design
- Individual user profiles and management
  → Set-up of individual user profiles and recording of user inputs
- Drawings, manuals and videos
  → Technical documentation including helpful videos are available directly via the touch panel
- Intelligent service intervals
  → Timely notification of operating-specific maintenance recommendations
- 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
  → Globally available product 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 of control systems for refrigeration and gas compression systems

4.2 View

Fig.12: GEA Omni™ outer view without indicator lights

Fig.13: GEA Omni™ outer 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, output, number of operating hours, operating mode and status signals.

  Various 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 pressure
  - External temperature
  - Network temperature
  - Inlet temperature (evaporator, secondary refrigerant)
  - Outlet temperature (evaporator, secondary refrigerant)
  - Inlet temperature (condenser, cooling medium or heat carrier)
  - Outlet temperature (condenser, cooling medium or heat carrier)
- Monitoring of all operating parameters.

- Limited compressor capacity once any 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 against unauthorised access to important parameters
- Storage of software, configuration and settings in non-volatile memory.
- Regulation by a superior control via potential-free contacts.
- Program stored non-volatile on a CFast card
- Possibility of communication with master control via Modbus TCP, Ethernet/IP (optionally via Profibus DP and ProfiNet)
- Remote access (optional via Ethernet)

4.4 Components of the GEA Omni™

- Control cabinet (various sizes and installation options, see - IEC standard IP54 / NEMA 4 minimum classification)
- Control cabinet with:
  - Industrial PC with multi-touch screen and HD display for operation
  - EMERGENCY STOP switch – directly connected to the control outputs, to immediately switch off all rotating components
  - USB port – with IP54 cover for data exchange with the industrial PC
  - Optional indicator lights for:
    - → “Operation” – for status indicators start, operation or stop of the compressor
    - → “Warning” – for indication that an operating condition has exceeded the limit for a warning
    - → “Fault” – for indication that the compressor is switched off
- Control cabinet interior view:
  - Power supply for the industrial PC, input and output circuits and sensors
  - Frequency inverter (optional)
  - I/O system – as an interface for all digital and analogue inputs and controlled 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 by a fuse; the control and sensor power supplies are protected by circuit breakers
  - Cable ducts – as guide for the internal wiring

Fig.14: GEA Omni™ control cabinet interior view (frequency converter installed in the 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 low-voltage switchgear is included in the scope of supply.			
Supply: 100 ... 240 V, 50/60 Hz			
digital	• Motor feedback • Motor protection compressor • Oil pump feedback [7]	digital	• Run compressor • Run oil pump [7]
analogue (4-20 mA)	• Motor current compressor • Compressor motor speed [7]	analogue (4-20 mA)	• Compressor motor speed setpoint [7]

Remote controller or building management system - GEA Omni™			
from the remote controller (BMS) to the GEA Omni™ INPUTS		**from the GEA Omni™ to the remote controller (BMS) OUTPUTS**	
digital	• External On/Off • External "MORE" • External "LESS" • External motor start release • External reset • Changeover to 2nd setpoint • Compressor blocked	digital	• Message Ready for external mode • Signal Compressor runs • Main failure • auxiliary output 1
analogue (4-20 mA)	• external setpoint	analogue (4-20 mA)	• Control slide position

7 The signals in part relate to optional features or features that are unavailable depending on the type of operation or the product series

Chiller/heat pump - GEA Omni™	
from refrigeration plant/heat pump to GEA Omni™ INPUTS	**from GEA Omni™ to refrigeration plant/heat pump OUTPUTS**
digital • External EMERGENCY STOP • Separator level [7] • Eco level [7] • Gas sensor • Discharge pressure safety switch • Oil level min. [7] • Oil level max. [7]	digital: • Solenoid valve capacity control, max. [7] • Solenoid valve capacity control, min [7] • Solenoid valve - check valve suction side [7] • Solenoid valves - Vi control [7] • Solenoid valve - economiser operation [7] • Solenoid valve start-up unloading [7]
analogue (4-20 mA) • Control slide position [7] • Suction pressure • Discharge pressure • Oil pressure • Pressure after oil filter [7] • Suction temperature • Discharge temperature • Oil temperature • Eco temperature [7] • Eco pressure [7] • Vi-slider position [7]	analogue (4-20 mA) • Setpoint IntelliSOC injection valve [7] • Setpoint level control [7]

5 Technical data

5.1 Dimensions, weights, fill quantities and connections

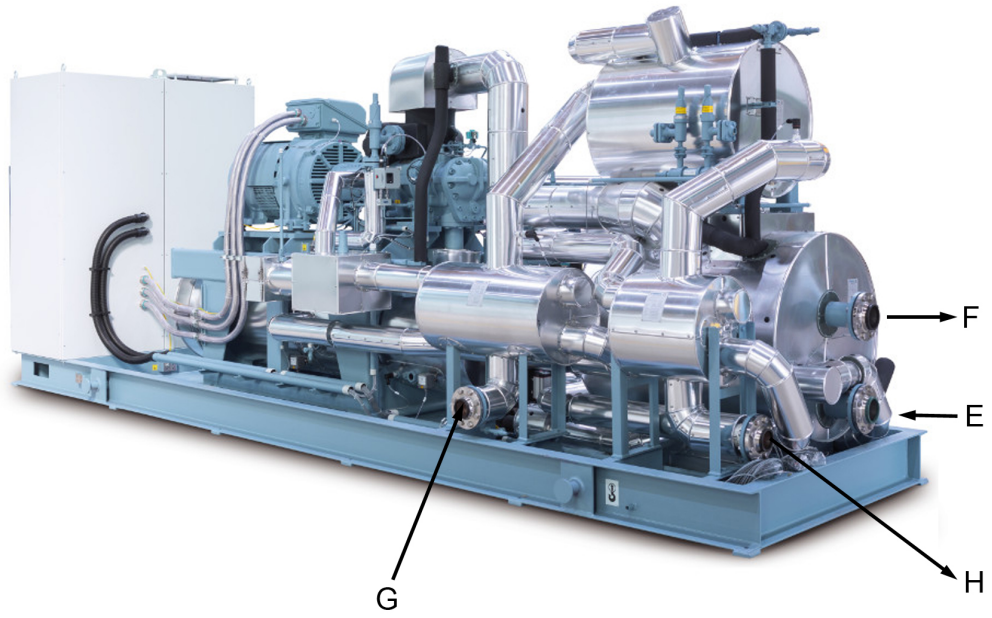


Fig.15: GEA RedAstrum connections

5.1.1 GEA RedAstrum EC (W) ... GEA RedAstrum RN (W) series

Notice

The data applies to the following standard conditions

(Application example 1 pure heating mode, evaporator charged with external secondary refrigerant):

► Secondary refrigerant temperature +40 °C / +35 °C
► Heat carrier temperature +40 °C/+70 °C

Data deviating from the standard can be the result of other conditions.

Characteristics						
Code	**Parameter**		**GEA RedAstrum (W) heat pump**			
			EC [8]	**ED** [8]	**HE** [8]	**HG** [8]
	Length [9]	mm	6000	7000	7000	7000
	Width	mm	1600	1800	1800	1800
	Height	mm	2350	2350	2450	2450
E	Connection [10] Cold water IN	DN	100	100	100	100
F	Connection [10] Cold water OUT	DN	100	100	100	100
G	Connection [11] Heat carrier ON	DN	100	100	100	100
H	Connection [11] Heat carrier OFF	DN	100	100	100	100
	Connection of blow-off line to safety valve	DN	25	25	25	25
	Weight without charging	kg	7200	7500	7700	8200
	Operating weight	kg	7420	7725	7945	8465
	Filling quantity (Oil)	l	180	185	200	220
	Charge (Refrigerant NH_3)	kg	70	72	78	82

Characteristics						
Code	**Parameter**		**GEA RedAstrum (W) heat pump**			
			MH [8]	**ML** [8]	**RM** [8]	**RN** [8]
	Length	mm	7300	7600	7900	7900
	Width	mm	1800	1800	2000	2000
	Height	mm	2450	2450	2450	2450
E	Connection [10] Cold water IN	DN	125	125	125	125
F	Connection [10] Cold water OUT	DN	125	125	125	125

8 Values subject to technical changes
9 plus frame protrusion (< 200 mm)
10 At high refrigerating capacities (secondary refrigerant volume flow), two inlet and two outlet connections can be provided for project-specific needs
11 The position of the inlet/outlet connections of the heat carrier varies depending on the arrangement of the heat exchanger (project-specific configuration)

Characteristics						
Code	**Parameter**		**GEA RedAstrum (W) heat pump**			
			MH [8]	**ML [8]**	**RM [8]**	**RN [8]**
G	Connection [11] Heat carrier ON	DN	125	125	125	125
H	Connection [11] Heat carrier OFF	DN	125	125	125	125
	Connection of blow-off line to safety valve	DN	25	25	25	25
	Weight without charging	kg	8900	9900	11200	12500
	Operating weight	kg	9185	10205	11540	12860
	Filling quantity (Oil)	l	235	250	275	290
	Charge (Refrigerant NH_3)	kg	90	100	110	120

5.1.2 GEA RedAstrum EC (K) ... GEA RedAstrum RN (K) series

Notice

The data applies to the following standard conditions

(Application example 2 "add-on" heat pump with NH_3 cascade evaporator):

► Evaporating temperatures approx. +32 °C … +33 °C
► Heat carrier temperature +40 °C/+70 °C

Data deviating from the standard can be the result of other conditions.

Characteristics						
Code	**Parameter**		**Heat pump GEA RedAstrum (K)**			
			EC [12]	**ED** [12]	**HE** [12]	**HG** [12]
	Length [13]	mm	6000	7000	7000	7000
	Width	mm	1600	1800	1800	1800
	Height	mm	2350	2350	2450	2450
E	Connection [14] NH_3 OFF	DN	100	100	100	100
F	Connection [14] NH_3 ON	DN	100	100	100	100
G	Connection [15] Heat carrier ON	DN	100	100	100	100
H	Connection [15] Heat carrier OFF	DN	100	100	100	100
	Connection of blow-off line to safety valve	DN	25	25	25	25
	Weight without charging	kg	7500	8400	8900	9600
	Operating weight	kg	7725	8630	9150	9870
	Filling quantity (Oil)	l	185	190	205	225
	Charge (Refrigerant NH_3)	kg	72	74	80	84

Characteristics						
Code	**Parameter**		**Heat pump GEA RedAstrum (K)**			
			MH [12]	**ML** [12]	**RM** [12]	**RN** [12]
	Length	mm	7300	7600	7900	7900
	Width	mm	1800	1800	2000	2000
	Height	mm	2450	2450	2450	2450
E	Connection [14] NH_3 OFF	DN	125	125	125	125

12 Values subject to technical changes
13 plus frame protrusion (< 200 mm)
14 At high refrigerating capacities (NH_3 volume flow) two inlet and two outlet connections can be provided for project-specific needs. The arrow directions shown in the figure must be interpreted in reverse here. A float on the NH_3 outlet of the cascade evaporator is included as standard in the scope of delivery (can be optionally deselected from the scope of delivery) but is not shown in the figure (nominal diameters and connection position may vary depending on the application)
15 The position of the inlet/outlet connections of the heat carrier varies depending on the arrangement of the heat exchanger (project-specific configuration)

Characteristics						
Code	**Parameter**		**Heat pump GEA RedAstrum (K)**			
			MH [12]	**ML [12]**	**RM [12]**	**RN [12]**
F	Connection [14] NH_3 ON	DN	125	125	125	125
G	Connection [15] Heat carrier ON	DN	125	125	125	125
H	Connection [15] Heat carrier OFF	DN	125	125	125	125
	Connection of blow-off line to safety valve	DN	25	25	25	25
	Weight without charging	kg	10200	11100	12200	13200
	Operating weight	kg	10490	11415	12550	13575
	Filling quantity (Oil)	l	240	255	285	300
	Charge (Refrigerant NH_3)	kg	92	102	113	123

5.1.3 GEA RedAstrum EE (W) ... GEA RedAstrum RR (W) series

Notice

The data applies to the following standard conditions

(Application example 3 combined cooling and heating mode, evaporator charged with external secondary refrigerant):

► Outlet temperature of secondary refrigerant +12 °C / +6 °C
► Heat carrier temperature +40 °C / +65 °C

Data deviating from the standard can be the result of other conditions.

Characteristics						
Code	**Parameter**		**GEA RedAstrum (W) heat pump**			
			EE [16]	**GG** [16]	**HH** [16]	**LL** [16]
	Length [17]	mm	6000	6000	6000	6000
	Width	mm	1600	1600	1600	1600
	Height	mm	2350	2350	2450	2450
E	Connection [18] Cold water IN	DN	100	100	100	100
F	Connection [18] Cold water OUT	DN	100	100	100	100
G	Connection [19] Heat carrier ON	DN	100	100	100	100
H	Connection [19] Heat carrier OFF	DN	100	100	100	100
	Connection of blow-off line to safety valve	DN	25	25	25	25
	Weight without charging	kg	6800	7200	7500	7700
	Operating weight	kg	6995	7400	7705	7915
	Filling quantity (Oil)	l	160	165	170	175
	Charge (Refrigerant NH_3)	kg	60	62	65	68

Characteristics					
Code	**Parameter**		**GEA RedAstrum (W) heat pump**		
			MM [16]	**NN** [16]	**RR** [16]
	Length	mm	7300	7300	7600
	Width	mm	1800	1800	2000
	Height	mm	2450	2450	2450
E	Connection [18] Cold water IN	DN	100	125	125
F	Connection [18] Cold water OUT	DN	100	125	125

16 Values subject to technical changes
17 plus frame protrusion (< 200 mm)
18 At high refrigerating capacities (secondary refrigerant volume flow), two inlet and two outlet connections can be provided for project-specific needs
19 The position of the inlet/outlet connections of the heat carrier varies depending on the arrangement of the heat exchanger (project-specific configuration)

Characteristics					
Code	**Parameter**		**GEA RedAstrum (W) heat pump**		
			MM [16]	**NN [16]**	**RR [16]**
G	Connection [19] Heat carrier ON	DN	100	100	125
H	Connection [19] Heat carrier OFF	DN	100	100	125
	Connection of blow-off line to safety valve	DN	25	25	25
	Weight without charging	kg	8500	9700	11000
	Operating weight	kg	8725	9945	11260
	Filling quantity (Oil)	l	180	190	205
	Charge (Refrigerant NH_3)	kg	75	85	92

5.2 Operation limits

The heat pumps from the GEA RedAstrum series can be operated within the specified operation limits according to the respective specifications under diverse work conditions. The operating limits listed below are based on the operating principle of the screw compressor, thermodynamic relations, containers and safety devices used as well as practical operating conditions. The appropriate compressor model should be selected for the particular operating conditions.

Permissible minimum and maximum values for heat pumps of the GEA RedAstrum series				
Parameter				**Value**
Speed [20]	n	rpm	min	1500
			max	3600
Maximum permissible pressure, high pressure side	PS	bar(g)	min	40
			max	52
Maximum permissible pressure, low pressure side	PS	bar(g)	min	16
			max	25
Suction pressure	p_{suc}	bar(g)	min	2.58
			max	13.50
Discharge pressure[21]	p	bar(g)	min	23.12
			max	46.10
Pressure ratio p / p_{suc} [21]	π	-	min	1.5
Pressure difference p - p_{suc} [21]	Δp	bar(g)	min	3.0
Inlet temperature of water as secondary refrigerant [22]	t_{K1}	°C	min	+3.5
			max	+50.0
Inlet temperature with frost-resistant secondary refrigerants [22]	t_{K1}	°C	min	-9.0
			max	+50.0
Outlet temperature of water as secondary refrigerant [22]	t_{K2}	°C	min	+2.5
			max	+49.0
Outlet temperature with frost-resistant secondary refrigerants [22]	t_{K2}	°C	min	-10.0
			max	+49.0
Difference inlet / outlet temperature of secondary refrigerant [22]	Δt_K	K	min	1.0
			max	10.0
Evaporating temperature NH_3 cascade evaporator	t_0	°C	min	10.0
			max	45.0

20 Models based on compressor type R (housing size) are limited to 3300 rpm in this application.

21 The given pressure ratio and pressure difference ensure reliable compressor operation. Furthermore, allowance must be made for the pressure difference necessary for the control valves fitted in the refrigerating plant. Generalised maximum values for pressure ratio and difference cannot be specified due to their dependence on different parameters. Depending on the suction pressure level, the maximum possible discharge pressure may be below the value specified. The respective compressor usage diagrams apply. To comply with the minimum pressure difference, we recommend customer to provide a water-side 3-way valve.

22 Minor inlet/outlet temperature differences of up to 1 K of the secondary refrigerant may be implemented as long as the max. permissible speed (7.5 m/s) is not exceeded at the heat-exchanger nozzle.

Permissible minimum and maximum values for heat pumps of the GEA RedAstrum series				
Parameter				**Value**
Heating agent inlet temperature in the heat pump	t_{W1}	°C	min	+15.0
			max	+70.0
Heat carrier outlet temperature from heat pump [23]	t_{W2}	°C	min	+55.0
			max	+80.0
Difference inlet / outlet temperature of heat carrier	Δt_W	K	min	5.0
			max	50.0
Oil temperature	t_{oil}	°C	min	+60
			max	+80
Discharge temperature at compressor outlet	t_{dis}	°C	min	+80
			max	+105
Discharge temperature - Condensing temperature $_{dis}$ - t_c	Δt	K	min	10
Discharge temperature - Oil temperature t_{dis} - t_{Oil}	Δt	K	min	4
Ambient temperature	t_U	°C	min	+5
			max	+40
Relative ambient humidity [24]	*f*	%	max	95

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, GEA Refrigeration Germany GmbH 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 quantity, oil type etc.).
4. The oil temperature at the compressor inlet must be at least 18 °C and below 80 °C.
5. The specified data refer to the operating conditions of a heat pump.

   During downtime or start-up, the limiting values may be exceeded or fallen short of for a short (never long-term) period of time.
6. The operating parameters of the order confirmation apply for an agreed field test.

23 Depending on the temperature level of the secondary refrigerant and the corresponding suction pressure, the maximum possible outlet temperature of the heat carrier may be below the value specified due to the maximum pressure ratios and pressure differences. The respective temperature operation limit diagrams of the compressor apply. Higher outlet temperatures on request.

24 The max. permanent permissible ambient humidity depends on the drive motor and can be below 95% depending on the motor manufacturer and design. Binding values are detailed in the order specification.

5.3 Water quality requirements, parameters

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

Notice

Disregarding the following rules for limiting values of non-corrosive water specified in VDI 3803, the manufacturer can not accept any warranty for water-contacting 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-level 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	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

Recommended with use of plate heat exchangers

► < 100 ppm Cl for the use of 1.4301 and max. 40 °C wall temperature in the plate heat exchanger

► < 200 ppm Cl for the use of 1.4401 and max. 100 °C wall temperature in the plate heat exchanger

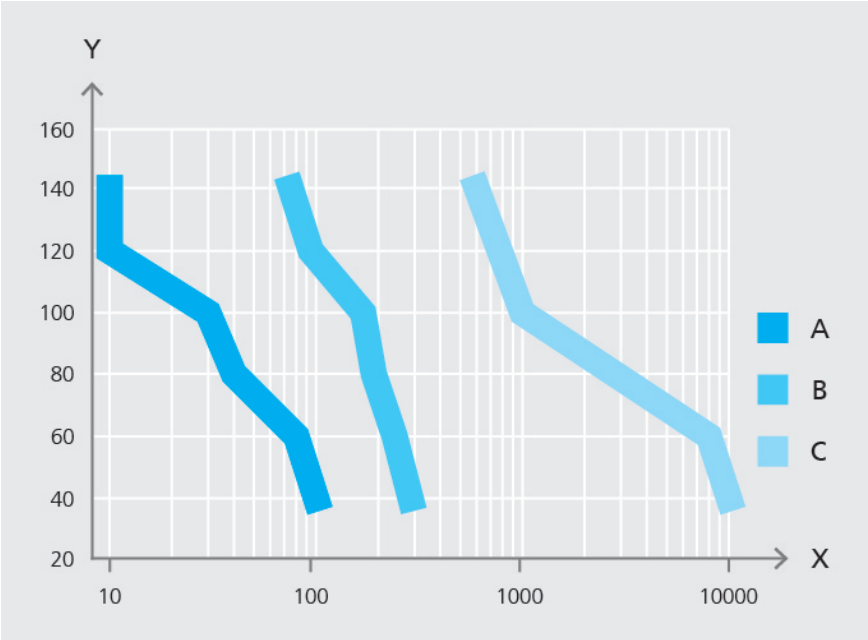


Fig.16: Corrosion resistance in presence of chlorides

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

Notice

Manufacturer recommendation: Use uncontaminated secondary refrigerants and cooling media, in particular in chillers 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 such a filter needs to be ≤ 0.9 mm!

► Should the chiller 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 recommends enlisting the services of a reputable water conditioning company.

5.4 Performance characteristics

5.4.1 GEA RedAstrum EC (W) ... GEA RedAstrum RN (W) series

Notice

The data applies to the following standard conditions

(Application example 1 pure heating mode, evaporator charged with external secondary refrigerant):

► Q_0: Refrigerating capacity at cooling water inlet/outlet temperatures = 40/35 °C
► P_e: Drive power (on mains (EC … ML at 3600 rpm and RM/RN at 3300 rpm))
► Q_H: Heating capacity at heat carrier inlet/outlet temperatures = 40/70 °C

Performance characteristics			
Frame size	**Q_0 in kW**	**P_e [25] in kW**	**Q_H in kW**
GEA RedAstrum EC	620	139	745
GEA RedAstrum ED	730	162	880
GEA RedAstrum HE	915	199	1095
GEA RedAstrum HG	1095	225	1300
GEA RedAstrum MH	1420	297	1690
GEA RedAstrum ML	1640	329	1940
GEA RedAstrum RM	1990	424	2380
GEA RedAstrum RN	2435	516	2910

5.4.2 GEA RedAstrum EC (K) ... GEA RedAstrum RN (K) series

Notice

The data applies to the following standard conditions

(Application example 2 as "add-on" heat pump with NH_3 cascade evaporator):

► Q_0: Refrigerating capacity at evaporating temperatures of approx. 32 °C … 33 °C
► P_e: Drive power on mains (EC … ML at 3600 rpm and RM/RN at 3300 rpm
► Q_H: Heating capacity at heat carrier inlet/outlet temperatures = 40/70 °C

Performance characteristics			
Frame size	**Q_0 in kW**	**P_e: [25] in kW**	**Q_H in kW**
GEA RedAstrum EC	615	140	740
GEA RedAstrum ED	725	162	870
GEA RedAstrum HE	910	199	1090

25 Power consumption from mains (including power losses at motor and frequency converter approx. 7% of total full load)

Performance characteristics			
Frame size	**Q_0 in kW**	**P_e: 25 in kW**	**Q_H in kW**
GEA RedAstrum HG	1085	224	1290
GEA RedAstrum MH	1390	299	1660
GEA RedAstrum ML	1580	331	1885
GEA RedAstrum RM	1880	407	2255
GEA RedAstrum RN	2255	508	2720

5.4.3 GEA RedAstrum EE (W) ... GEA RedAstrum RR (W) series

Notice

The data applies to the following standard conditions

(application example 2 combined cooling and heating mode):

► Q_0: Refrigerating capacity at cooling water inlet/outlet temperatures = 12/6 °C

► P_e: Drive power on mains (EC … ML at 3600 rpm and RM/RN at 3300 rpm)

► Q_H: Heating capacity at heat carrier inlet/outlet temperatures = 40/65°C

Performance characteristics			
Frame size	**Q_0 in kW**	**P_e: 25 in kW**	**Q_H in kW**
GEA RedAstrum EE	365	160	510
GEA RedAstrum GG	425	178	590
GEA RedAstrum HH	550	229	760
GEA RedAstrum LL	635	263	875
GEA RedAstrum MM	765	310	1050
GEA RedAstrum NN	935	378	1280
GEA RedAstrum RR	1170	450	1585

5.5 Information on noise emissions

The noise information provides approximate parameters and applies to the installation without any secondary noise protection measures.

The information has a tolerance of ±3 dB(A).

The precise data depend closely on the emission values for the motors, which are manufacturer dependent.

Should the local conditions require adherence to noise limits, a calculation should be made in individual cases with specific motor data.

Wearing hearing protection with sufficient noise reduction is recommended in rooms with running heat pumps.

⚠ Caution!

According to EU Directive 2003/10/EC, the permitted exposure threshold regarding the level of daily noise exposure is 80 dB(A).

► Should noise levels rise above this threshold, the system operator must provide the operator with information on exposure to noise and personal hearing protection and ensure that this is also worn (2003/10/EC Article 6).

Measuring-surface sound-pressure level Lp (A) @ 1 m (without soundproof housing)				
Motor size at 40 °C Pe in kW	**Lp in dB(A) @ 1 m mains operation 400 V/ 50 Hz [26] Heat pumps**			
	GEA RedAstrum EC / ED / EE / GG	**GEA RedAstrum HE / HG / HH / LL**	**GEA RedAstrum MH / ML / MM / NN**	**GEA RedAstrum RM / RN / RR**
160	83	-	-	-
200	84	84	-	-
250	86	86	86	-
280	87	87	87	-
315	88	88	88	-
355	90	90	90	90
400	-	93	93	93
500	-	-	96	96
560	-	-	-	99

The values in the table are verified by actual measurement. If no values are specified, these are not available or not applicable for the frame size of the heat pump.

26 at a distance of 1 m from the machine surface (A-close range sound level at open air conditions on reflecting surface)

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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