



Screw Compressor Package

GEA Grasso M, SP1, SP2 and SPduo

Product Information (Translation from the original language)

P_201011_13

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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.

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 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

Series

GEA Grasso M / GEA Grasso SP1 - single stage screw compressor packages

The series of single stage screw compressor packages comprises 24 compressor frame sizes subdivided into 2 series.

- GEA Grasso M series: The GEA Grasso screw compressors C, D, E, G, H, L, M, and N of the GEA Grasso M series screw compressor packages ensure a theoretical swept volume ranging from 231 to 870 m³/h.
- GEA Grasso SP1 series: The high performance screw compressors P, R, S, T, V, W, Y, Z, XA, XB, XC, XD, XE, XF, XG, and XH of the GEA Grasso SP1 series ensure a theoretical swept volume ranging from 805 to 11467 m³/h.
 - GEA Grasso SP1 horizontal version:
For the screw compressors P, R, S, T, V, W, Y, Z, XA, as an alternative to the vertical design of the GEA Grasso SP1 screw compressor packages, there is a design type in horizontal oil separator design and guarantees a theoretical swept volume of 805 to 3250 m³/h.
 - GEA Grasso SP1 HP version:
The high pressure package variant for the application with refrigerant CO₂ and for heat pump operation with ammonia with screw compressors E, G, H, L, M, N, P, R, S, T, V, W, Y, Z, XA, XB, XC and XD ensure a theoretical swept volume of 231 (screw compressor E shortened to rotor size C) to 5800 m³/h (packages with CO₂ refrigerant only up to compressor frame size XA).

GEA Grasso SP2 - two-stage screw compressor packages

Two-stage screw compressor packages are equipped with a separately operated low- and high-pressure compressor. Both compressors are mounted on a common base frame. There is a common oil circuit with a horizontal oil separator. The particularly compact and simple design of single stage screw compressor packages is effectively combined with energetically favourable two-stage operation. The GEA Grasso SP2 series of two-stage screw compressor packages comprises 16 frame sizes.

GEA Grasso SPduo - DuoPack screw compressor packages

The series of GEA Grasso SPduo screw compressor packages are used to divide the capacity range to two identical compressors arranged in parallel for energy-optimized partial load operation and as an alternative solution to using two screw compressor packages, and to save on costs and space. The series comprises 15 frame sizes and consists of two identical compressors in each case, arranged in parallel.

DescriptionGeneral information

On special request, the series within the six small compressor frame sizes can be extended by another identical compressor so that three units are arranged in parallel. A special request for a solution of this kind must be submitted to GEA Refrigeration Germany GmbH.

Overview: GEA Grasso M

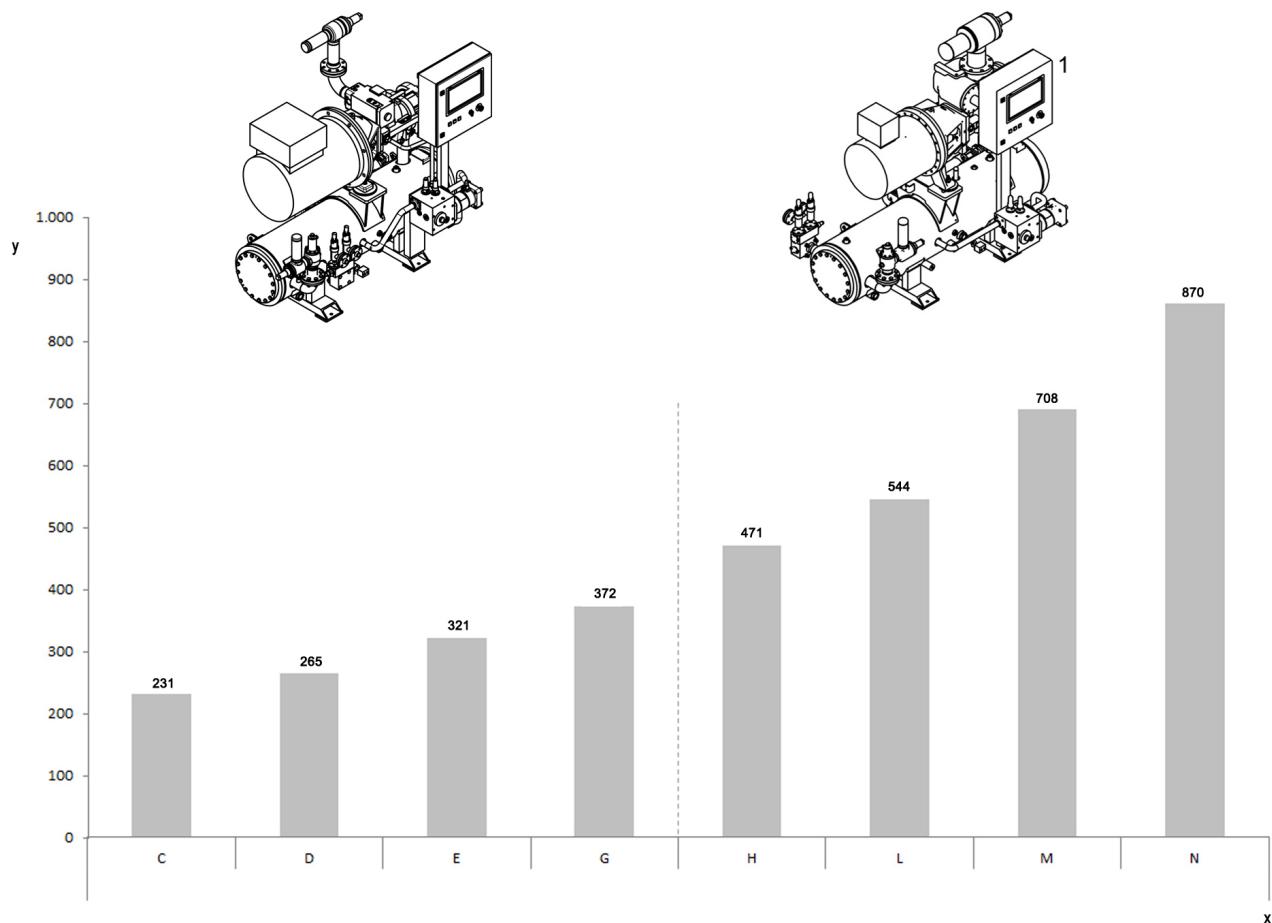


Fig.1: Types of GEA Grasso M

y	Swept volume in m^3/h at 2940 rpm
x	Compressor frame size
1	Oil separator (installed horizontally)

Description

General information

Overview: GEA Grasso SP1¹

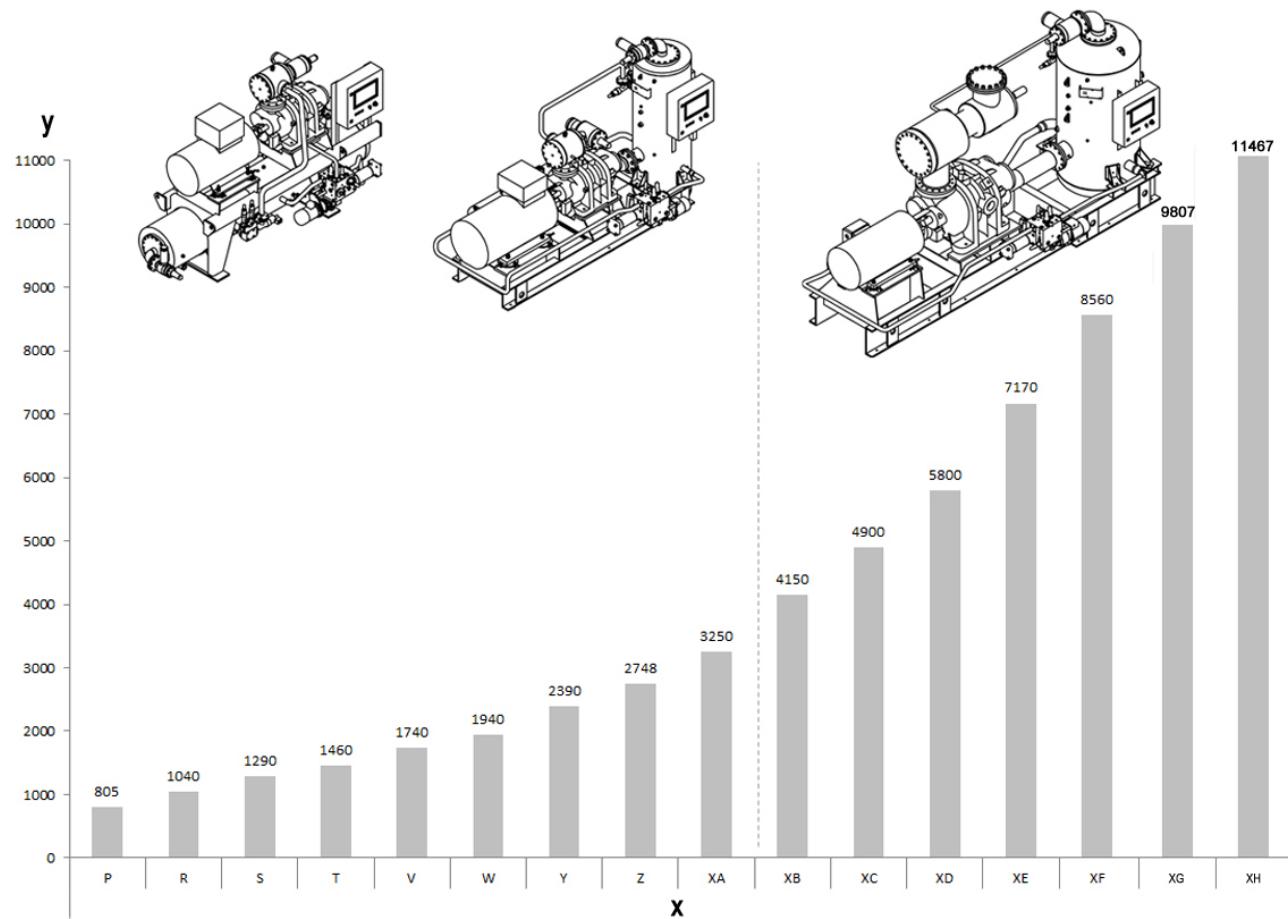


Fig.2: Types of GEA Grasso SP1

y	Swept volume in m ³ /h at 2940 rpm
x	Compressor frame size

- 1 The GEA Grasso SP1 horizontal variant is available in compressor frame sizes P - XA, the GEA Grasso SP1 HP variant is designed as per SP1 with a vertical oil separator and is available in compressor frame sizes G - XD (CO₂ to XA).

Overview: GEA Grasso SP2

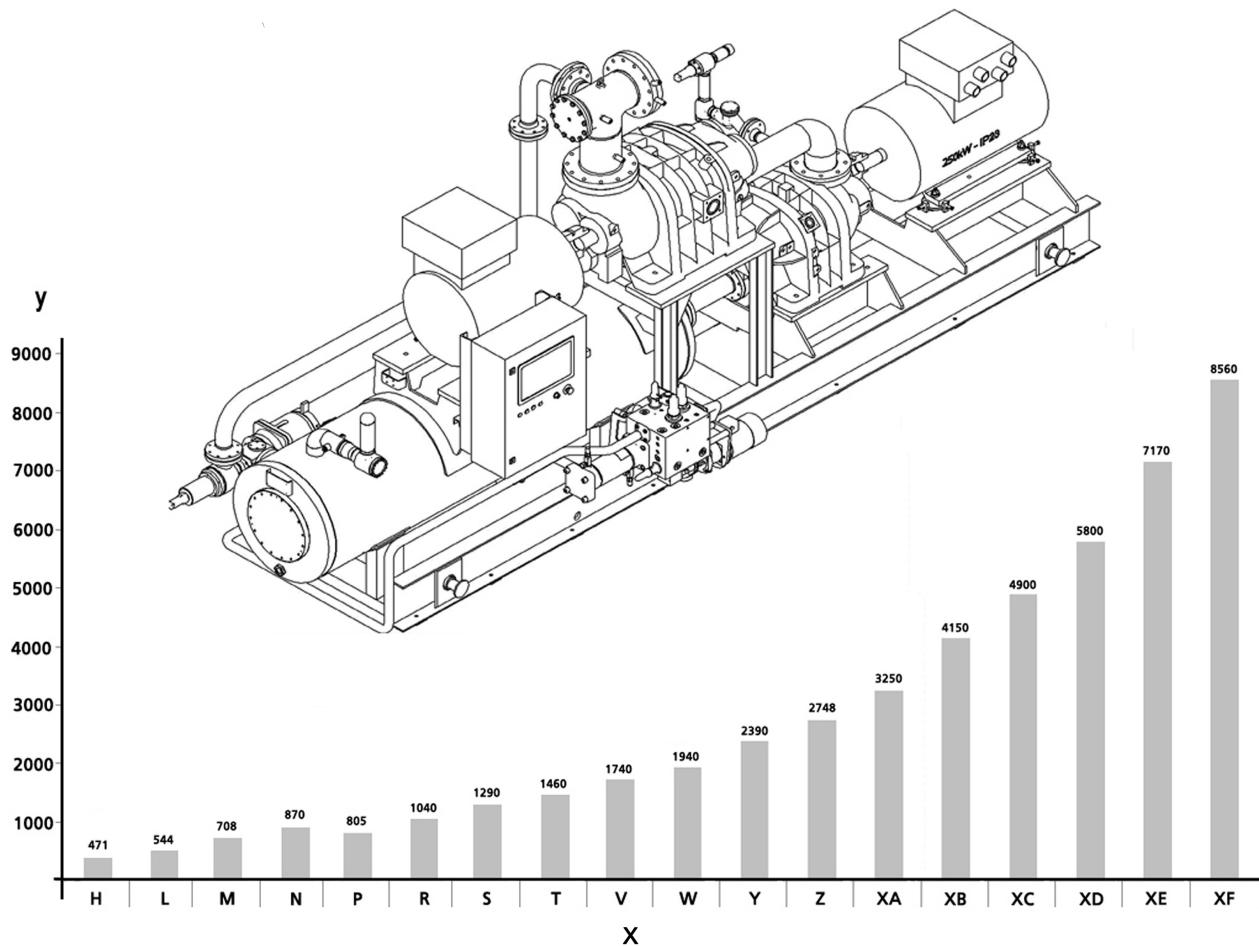


Fig.3: Types of GEA Grasso SP2

y	Swept volume in m ³ /h at 2940 rpm
x	Compressor frame size ²

- 2 For the specified compressor frame sizes, these are the available sizes of the first low pressure compressor side (booster). Depending on the operating conditions, the low pressure compressor can be combined with high pressure compressors of different frame sizes in the range C - XF.

Description

General information

Overview: GEA Grasso SPduo

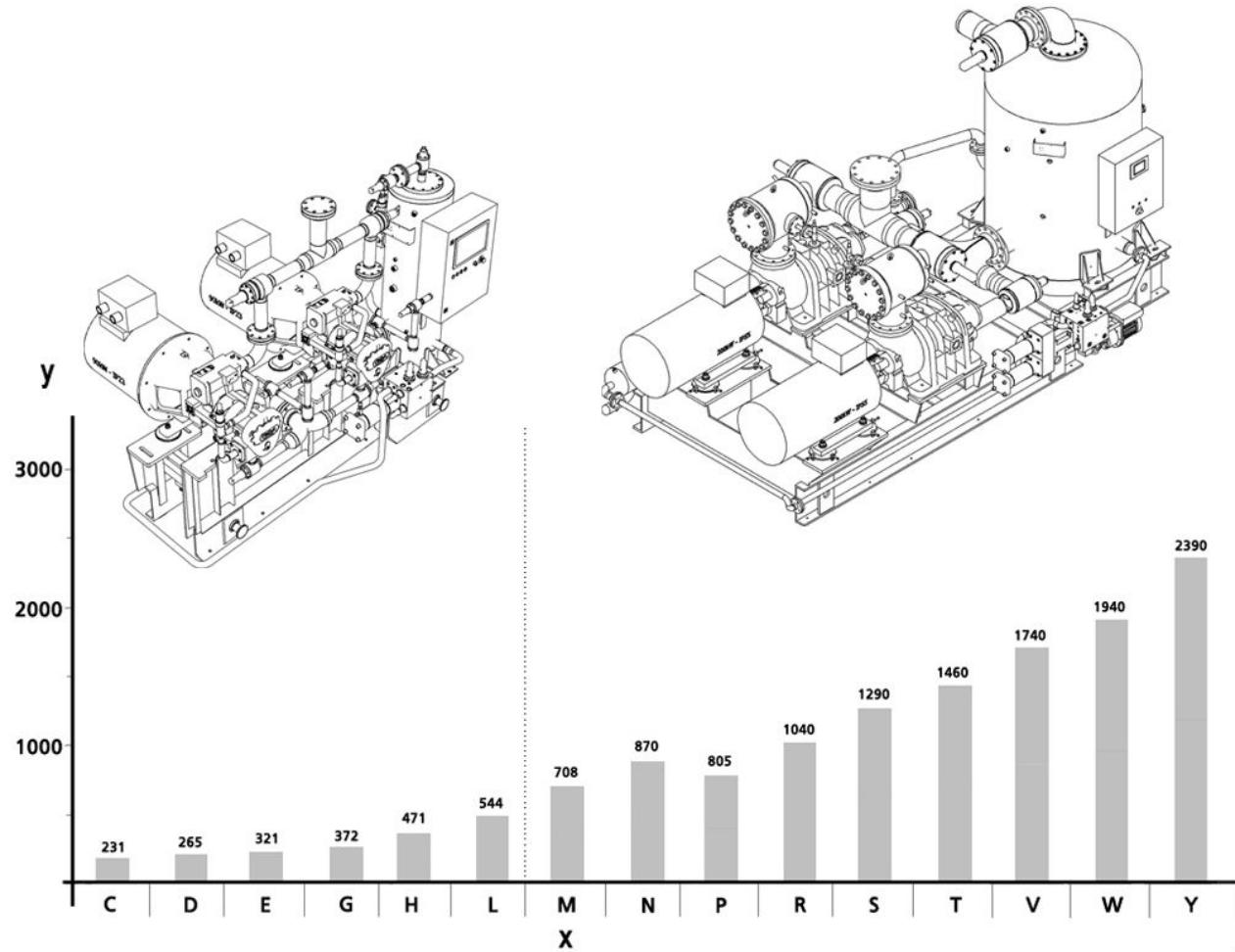


Fig.4: Types of GEA Grasso SPduo

y	Swept volume in m ³ /h at 2940 rpm
x	Compressor frame size ³

- 3 Each screw compressor package from the GEA Grasso SPduo series consists of two identical compressors as standard. On special request, compressor frame sizes C to L can be extended by up to three identical compressors (GEA Refrigeration Germany GmbH must be consulted). The specifications for the swept volume are for one compressor and must be doubled (tripled) accordingly for the entire SPduo package.

1.2 Technical specifications

Notice

The product is manufactured and delivered according to technical specifications.

- Optional equipment variants can be considered on the basis of the standard equipment.

Standard equipment	
Item	Design ⁴
Design pressure:	max. 28 bar max. 52 bar (GEA Grasso SP1 HP)
Intended environment:	Indoor installation
Ambient temperatures:	+5 °C to +40 °C +15 °C to +40 °C (GEA Grasso SP1 HP with R-717)
Installation altitude:	≤ 1000 m above sea level
Temperatures:	see also permissible minimum and maximum values for compressor packages
Electric motor:	scope of delivery
Refrigerant:	R717, R134a, R404A, R507, R744 (standard) R410a, R22, R23, R290, R600a, R1150, R1270 (on request) Others on request
Economizer:	none
Type of oil:	see also Offer/order specification and oil selection list
 Caution! Deviating types of oil must be agreed with the manufacturer. ► Contact the Design or Technical Customer Service of GEA Refrigeration Germany GmbH.	
Oil separator:	scope of delivery
Oil cooling:	water or refrigerant-cooled or via refrigerant injection
Oil heater:	scope of delivery
Oil filter:	Single stage filter
Spare oil filter:	none GEA Grasso M incl. 3x pcs Replacement filter elements
Oil level switch:	none
Oil pump:	scope of delivery Depending on the application and usage conditions, the GEA Grasso M and GEA Grasso SPduo C, D, E, G, H, L, M, N series are not fitted with an oil pump
Oil temperature control:	scope of delivery
Temperature sensors:	Standard scope of delivery, directly in the pipe/component
Thermometer:	none
Pressure sensors:	Standard scope of delivery, with stop valve
separate pressure switches:	none
Gauge board:	none
Valves:	scope of delivery
Overflow valve HP/LP:	scope of delivery

4 deviations are possible depending on the series and application

Description

Technical specifications

Standard equipment	
Item	Design 4
Safety valve:	single, standard scope of delivery
Safety pressure limiter:	Standard scope of delivery, with internal and external reset
Control:	GEA Omni™
Communication:	Interfaces for EtherNet/IP or Modbus TCP
Power current panel	none
Colour:	RAL 5014 (dove grey);
Vibration isolators:	none
Approval of pressure equipment:	CE-PED, Module H (piping)
Documentation:	Electronic provision on server

Optional equipment	
Designation	Design 4
Intended environment:	Outdoor installation on request
Installation altitude:	> 1000 m above sea level on request
Electric motor:	supplied/installed by customer
Motor current converter:	can be supplied
Economizer:	can be supplied Design only with Economizer suction line
Oil separator:	additional oil separator
Oil cooling:	2nd oil cooler for heat recovery
Oil heater:	none
Oil filter:	Double filter
Spare oil filter:	can be supplied
Oil level switch:	can be supplied
Oil temperature control:	none
Thermometer:	can be supplied
Pressure sensors:	directly in the pipe/component on the central panel
separate pressure switches:	can be supplied
Gauge board:	can be supplied
Valves:	valves with handwheels without suction-side and pressure-side stop valves
Overflow valve HP/LP:	without (only when safety valve included in scope of delivery)
Safety valve:	Double safety valve with change-over valve without (only when overflow valve included in scope of delivery)
Control:	GEA Omni™ Siemens HMI with GEA Grasso M, SP1 and SP1 horizontal: without control (cabling on terminal box) control supplied by customer
Communication:	Profibus DP Profinet

4 deviations are possible depending on the series and application

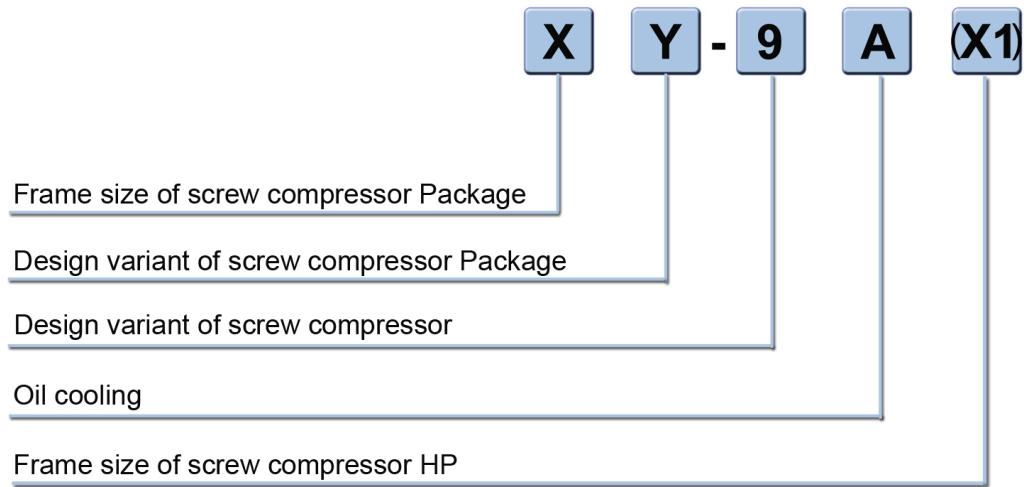
Optional equipment	
Designation	Design 4
Control options:	Vibration monitoring system GEA VTrac™ Intelligent sequence control Control cabinet with vibration damper Control cabinet with integrated additional venting
Power current panel:	can be supplied
Colour:	any RAL colours
Vibration isolators:	can be supplied
Acceptance specifications:	Module H (entire package) 100% welded seam inspection French acceptance specifications Russian acceptance specifications Belarusian acceptance specifications DOSH acceptance for Malaysia MOM acceptance for Singapore All common ship acceptances
Documentation:	USB / CD ROM Paper version

Description

Product designation, screw compressor package

1.3 Product designation, screw compressor package

GEA Grasso M, GEA Grasso SP1, GEA Grasso SP2 and GEA Grasso SPduo series



Product code description

Code	Description
X	Screw compressor package frame size (corresponds with the compressor housing size) <i>The LP screw compressor will be provided for the screw compressor packages in the GEA Grasso SP2 series (two-stage).</i>
Y	Design types of the screw compressor package
9	Screw compressor design types
A	Oil cooling
(X1)	Screw compressor frame size high pressure side <i>Only for screw compressor packages in the GEA Grasso SP2 series (two-stage).</i>

X / (X1) Screw compressor package frame size ⁵

Code	Theoretical Volume flow at 2940 min ⁻¹ in m ³ /h ⁵	Code	Theoretical Volume flow at 2940 min ⁻¹ in m ³ /h ⁵
C	231	V	1740
D	265	W	1940
E	321	Y	2390
G	372	Z	2748
H	471	XA	3250
L	544	XB	4150
M	708	XC	4900

- 5 The frame size of the screw compressor package is defined by the frame size (housing size) of the compressor used. The theoretic volume flows specified always relate to the rotor size of the compressor (swept volume letter). In certain application cases and under certain operating conditions, compressors with shortened rotors may be used so that the theoretical volume flow may not be derived from the frame size of the screw compressor package (compressor housing size)! The swept volume letter can be obtained from the precise compressor description in the technical specification.

Description	
Product designation, screw compressor package	

Code	Theoretical Volume flow at 2940 min ⁻¹ in m ³ /h ⁵	Code	Theoretical Volume flow at 2940 min ⁻¹ in m ³ /h ⁵
N	870	XD	5800
P	805		7170
R	1040		8560
S	1290		9807
T	1460		11467

Y Screw compressor package design type

Design type Screw compressor package	RF ⁶ NH ₃	RF ⁶ R22	RF ⁶ HFC	RF ⁶ R290 R600a	CO ₂ ⁷
Horizontal oil separator installed below	A	H	R	F	O
Oil separator installed vertically	B	K	S	G	P
Oil separator horizontally in series	C	L	T		
GEA Grasso SPduo - DuoPack/multiple configuration	D	M	V	Y	W
GEA Grasso SP2 (two-stage)	E	N	U		

9 Screw compressor design types

Code	Description	Vi =
1	Standard refrigerating compressor	1.8; 2.0; 2.2; 2.6; 3.0
2	Standard refrigerating compressor	3.6
3	Standard refrigerating compressor	4.8
4	Standard refrigerating compressor	5.5
5	Standard refrigerating compressor	variable
6	Booster	fixed
7	Heat pump compressor	fixed or variable
8	Swing compressor	fixed or variable
9	--	--

A Oil cooling

Code	Oil cooling
A	Water-cooled oil cooler
B	Refrigerant cooled oil cooler
C	Refrigerant injection
G	Water-cooled oil cooler and water-cooled oil cooler (WRG)
D	Refrigerant-cooled oil cooler and water-cooled oil cooler (WRG)
E	Refrigerant injection and water-cooled oil cooler (WRG)
H	Refrigerant injection and refrigerant-cooled oil cooler
X	DX oil cooler

6 Refrigerant

7 and special media

Description

Code	Oil cooling
S	Other special variants
F	Without oil cooler

Examples of designation

Examples	Description
NA-3B	Singe stage screw compressor package GEA Grasso M with screw compressor frame size N (N), refrigerant NH ₃ and horizontally installed oil separator (A)fixed internal volume ratio Vi = 4.8 (3), with fine oil separator and refrigerant cooled oil cooler (B)
TA-5A	Singe stage screw compressor package GEA Grasso SP1 with screw compressor frame size T (T), refrigerant NH ₃ and horizontally installed oil separator (A), variable internal volume ratio Vi (5), with fine oil separation and water cooled oil cooler (A)
XAB-6A	Singe stage screw compressor package GEA Grasso SP1 with screw compressor frame size XA (X A), refrigerant NH ₃ and vertically installed oil separator (B), booster with fixed internal volume ratio (6), with fine oil separation and water cooled oil cooler (A)
WE-6A(L)	Two-stage screw compressor package with LP screw compressor frame size W (W), refrigerant NH ₃ two-stage compressor package(E), LP-compressor as booster (6), with fine oil separation and water cooled oil cooler (A), high pressure screw compressor frame size L (L)
LD-2A	Screw compressor package GEA Grasso SPduo with 2 of screw compressors frame size L (L), refrigerant NH ₃ and DuoPack design type or multiple configuration (D)fixed internal volume ratio Vi = 3.6 (2), with fine oil separation and water cooled oil cooler (A)
VB-7A	Singe stage screw compressor package GEA Grasso SP1 HP with screw compressor frame size V (V), refrigerant NH ₃ and vertically installed oil separator (B), heat pump (7), with fine oil separation and water cooled oil cooler (A)
MP-1B	Singe stage screw compressor package GEA Grasso SP1 HP with screw compressor frame size M (M), refrigerant CO ₂ and vertically installed oil separator (P), fixed internal volume ratio Vi = 2.6 (1), with fine oil separator and refrigerant cooled oil cooler (B)

2 Scope of delivery

Complete screw compressor packages are available to ensure all necessary operating functions of the GEA Grasso screw compressors. GEA Grasso screw compressor packages are delivered as a single-stage, two-stage or DuoPack package depending on the required refrigerating capacity, the refrigerant, evaporating and condensing temperatures.

The screw compressor packages of the **GEA Grasso SP1, M, SP2, and SPduo** series consist of the following components:

- Screw compressor,
- Electric motor with coupling
- Oil supply system with oil separator,
- Oil cooler,
- Oil filter and oil pump,
- Suction filter,
- Check valves on the suction and discharge sides,
- Equipment for capacity control,
- Monitoring and safety devices,
- Compressor control system.

Deviations to the standard scope of supplier are possible depending on the series and application.

All components are fully mounted. The compressor control system is wired.

The oil separators are installed either horizontally or vertically. A fine separation stage is provided for the oil separators.

The oil cooling is effected using water. Optionally solutions for heat recovery, refrigerant cooled oil cooler or a refrigerant injection system are available.

By default, a rigid installation on the foundation is intended. An installation insulated against structure-borne sound is available optionally.

All connections are closed tight.

Painting

The painting is done with 2 component EP paint RAL 5014 with a coating thickness of 120 µm. Other colours are optional or can be delivered on request.

Approval

After acceptance, the screw compressor packages of the above-mentioned series receive a CE label in accordance with the Pressure Equipment Directive 2014/68/EU.

Documentation

User documentation is delivered with each screw compressor package. The user documentation contains:

- Drawings and part lists,
- Safety Instructions,

- Operating manual (including 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.

2.1 Service fluids

Notice

The screw compressor packages are delivered without refrigerant and refrigerating machine oil.

► They are filled with dry nitrogen (0.2 bar overpressure).

Refrigerant

The following refrigerants are provided:

- R717
- R134a
- R404A
- R507
- R410a ⁸
- R744
- R22 ⁸
- R23 ⁸
- R290 ⁸
- R600a ⁸
- R1150 ⁸
- R1270 ⁸

Refrigerator oils

The following oil grades are provided:

- Mineral oil
- Synthetic oil based on alkyl benzol
- Synthetic oil based on poly-alpha-olefin
- Synthetic oil based on polyolester

⁸ on request

Notice

More information, selection criteria and selection tables are summarised in the technical information "Lubricant oils for screw compressors". This technical information forms part of the product documentation or can be provided as a separate document.

- GEA Refrigeration Germany GmbH can provide assistance in the selection of a suitable refrigeration machine oil on request.
-

3 Description of Design and Function

3.1 General functional description

The screw compressor packages are components of refrigerating plants and serve to compress all usual refrigerants. Use as a heat pump is also possible.

Refrigerant circuit

The screw compressor draws in refrigerant vapour via the suction check valve and suction filter and then discharges the compressed vapour into the plant via the oil separator and discharge check valve.

The suction-side check valve prevents a sudden pressure compensation with the low pressure side of the chiller, while also preventing reverse rotation of the screw compressor. The pressure side check valve prevents refrigerant from re-condensing in the oil separator.

Note: the discharge side check valve can be integrated into the oil separator for screw compressor packages with discharge side nominal diameters up to DN 150.

The suction filter prevents dirt particles carried by the suction flow from penetrating into the compressor. The filter element is characterised by a very large filtering area. The filter fineness is max. 140 µm.

Gas vibrations which can arise in the compressor compression chamber at high pressure ratios in the zero discharge zone are avoided by a gas vibration protection device. This consists of a pressure compensation line between the oil separator and the compressor working chamber.

Process flow diagrams

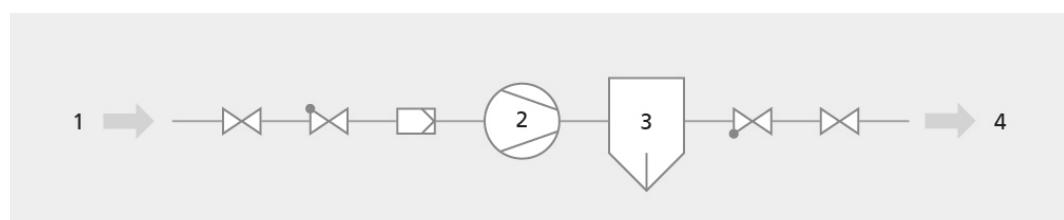


Fig.5: Process flow diagram GEA Grasso SP1, GEA Grasso M

1	Suction side
2	Compressor
3	Oil separator
4	Discharge side

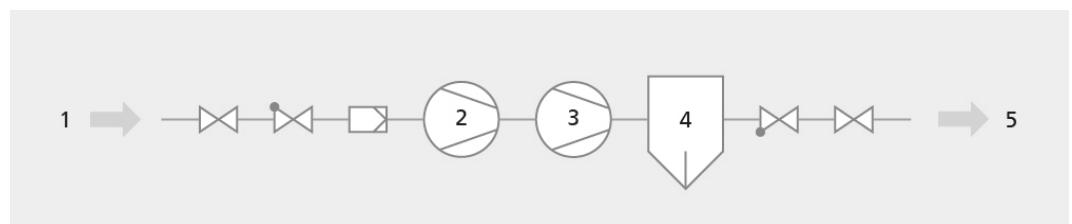


Fig.6: Process flow diagram GEA Grasso SP2

1	Suction side
2	Low pressure compressor
3	High pressure compressor
4	Oil separator
5	Discharge side

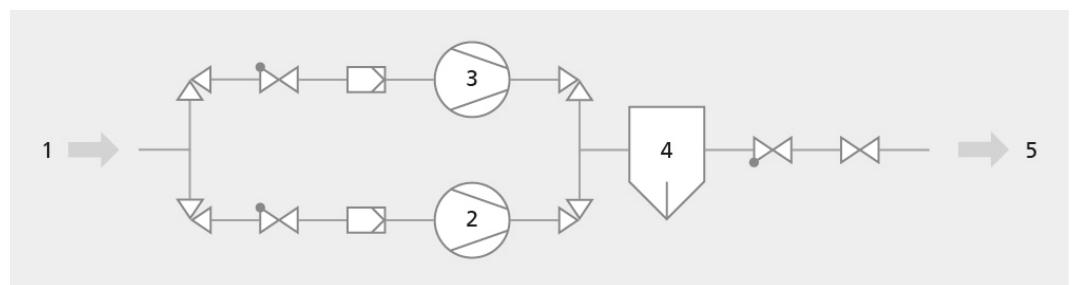


Fig.7: Process flow diagram GEA Grasso SPduo

1	Suction side
2	Compressor 1
3	Compressor 2
4	Oil separator
5	Discharge side

Oil circuit

The screw compressors operate oil-flooded. During the compression process, refrigerating machine oil is supplied to the compressor for lubrication, sealing, noise reduction, and absorption of part of the compression heat. After the compression process, the oil is separated again from the refrigerant in the oil separator.

Oil injection

The injection oil is usually supplied to the compressor without a pump via the oil injection control valve.

The required compressor discharge temperature is controlled by the oil injection control valve.

The control valve is provided with a check valve function to prevent sucking refrigerant through the oil pump.

Capacity control

The screw compressors are fitted with a continuous capacity control with a range of 10 -100 %.

Description of Design and Function

General functional description

Output is adjusted by shortening the screw compressor stroke. The defining factor for the compression process is the effective rotor length; this is altered by a hydraulically operated control slide.

The position of the control slide is recorded by the position sensor. The reaching of the MIN or MAX end position of the control slide is signalled at the control device and the relative control slide position can be shown as a percentage at the touch panel.

The hydraulic adjustment of the control slide is done using solenoid valves which are integrated into a single block.

The control slide travel speeds in the MIN and MAX directions should be the same as much as possible during operation to ensure better compressor control.

Vi adjustment (optional)

The dimension of compressor volume flow is adapted by a hydraulically operated control slide to prevent an improper compression.

Depending on the current operating conditions, thereby getting the best efficiency is ensured.

3.2 Main components

3.2.1 Screw 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.

3.2.2 Compressor drive 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.
-

3.2.3 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.

3.2.4 Oil separator

The design of the oil separators is standardised and features low oil carry-over and low oil consumption.

Oil separation (installed vertically)

The refrigerant-oil mixture is led into the lower part of the oil separator.

The oil separator consists of two chambers where the three-phase separation of the oil from the refrigerant is performed.

The first chamber employs gravity separation and drop separation in the demister. This separated oil collects on the bottom of the first chamber. At the same time, this chamber serves as an oil collector.

The fine separation of the aerosol-type oil portion from the refrigerant is performed in the second chamber of the oil separator with replaceable fine oil separation cartridges.

The oil separated in the fine separation part of the oil separator is returned to the compressor via an additional orifice.

Oil separation (horizontal)

The refrigerant-oil mixture is led into the first part of oil separator. The oil separator consists of three chambers.

The first chamber employs gravity separation. The hot gas passes the demister while flowing out of the first chamber into the second chamber. The separated oil is collected in the second chamber.

Both the chambers simultaneously serve as oil collector. The fine separation of the aerosol-type oil portion from the refrigerant is performed in the third chamber of oil separator using replaceable fine oil separation cartridges.

The oil separated in the fine separation part of the oil separator is returned to the compressor via an additional orifice.

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

Oil heater

The oil heater on the oil separator is to be started when the package is shut down in order to ensure a minimum oil temperature and sufficient oil viscosity required for restarting the package.

The oil heater is used in a regulated and non-regulated version. The maximum temperature of the heating rod is always restricted.

The oil heater is switched on when the chiller is stopped and is switched off automatically on starting. 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.

3.2.5 Economizer and inter-cooler

3.2.5.1 Application and release

To ensure the complete action of the Economizer/inter-cooler as well as safe operation, the following designs and information must be observed.

Notice

Economizer operation may not be suitable for the following applications. GEA Refrigeration Germany GmbH can assist with any corresponding requests and enquiries.

- ▶ Heat pump applications (GEA Grasso SP1 HP variant) with high evaporating temperatures above +10 °C
- ▶ Application uses with external subcooler

Notice

The Economizer (vessel) included in the GEA scope of delivery is optional. In this case, one Economizer is provided for each package. Several packages can be connected to a joint Economizer/inter-cooler in parallel by the customer.

- ▶ When doing so, each connection line must be provided with a pressure controller (constant/differential pressure controller) with automatic shut-off function. This does not apply to closed flash Economizers in multi-circuit designs.
- ▶ Schema as per Section 3.2.5.3, Page 35 Economizer variants for Duo-Pack screw compressor packages.

Notice

The effect of the Economizer/inter-cooler may be restricted in partial load operation and depends on the configuration of the package as well as the settings on the control.

The release of the Economizer/inter-cooler currently takes place via the control slide position (setting in %) of the screw compressor:

- ▶ Two-stage pressure relief (open flash): ON 5% / OFF 0%.
- ▶ Single-stage pressure relief (closed flash): ON 85% / OFF 75%.

Notice

If there are large differences between the machinery room temperature level and intermediate temperature on a DX Economizer (shell and tube), the gaskets on the flanges of the tube bundle package can become very overloaded.

On refrigeration plants with two-stage compressors, one inter-cooler is operated at a higher intermediate temperature level to ensure that the gaskets are not overloaded.

- ▶ If the suction temperature is below -35°C, the closed flash Economizer vessel on single stage package designs is therefore designed as a fully welded version.

3.2.5.2 Economizer - variants for single-stage screw compressor packages

Type A - Economizer port pipe

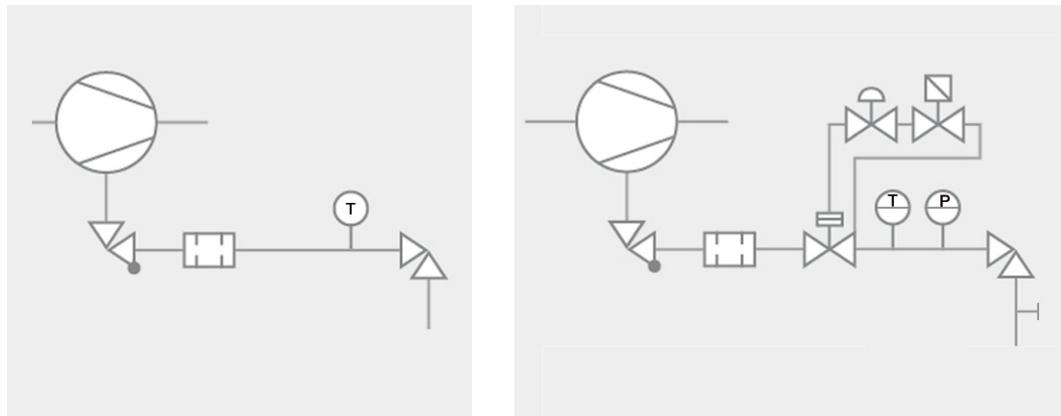


Fig.8: Economizer port pipe (basic design) / Economizer port pipe (with options)

P	Pressure sensor (optional)
T	Temperature sensor (optional)

Suction line (installed on the screw compressor package) consisting of:

- Stop valve
 - Filter
 - Check valve
 - Thermometer / service valve
 - Pressure controller (only with open Economizer and two-stage pressure relief)
- Optional:
- Remote signalisation (pressure and temperature sensors), no pressure controller (only if installed by the customer), side load connection

Notice

For single-stage pressure relief (closed flash), GEA recommends installing an Economizer for each package.

- If two or more packages are operated via a joint closed flash Economizer that does not have more than one circuit, a pressure controller with a shut-off function must be installed in the Economizer suction lines.

Type B - Economizer for two-stage pressure relief (open flash) with inlet control system

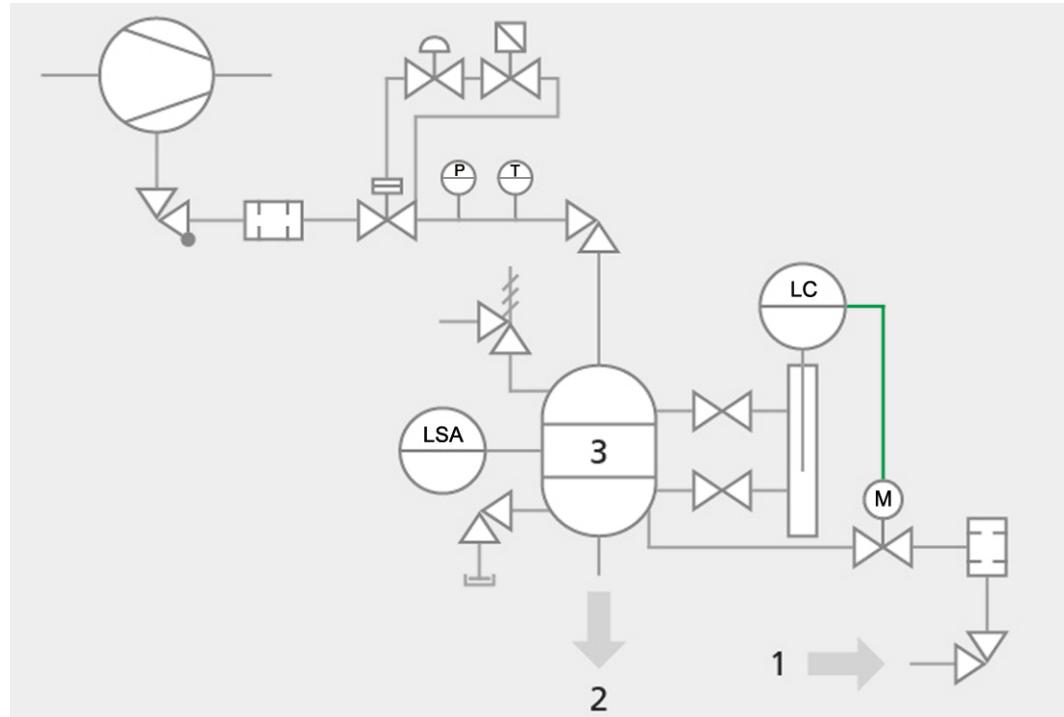


Fig.9: Economizer for two-stage pressure relief (open flash) with inlet control system

P	Pressure sensor (optional)
T	Temperature sensor (optional)
LSA	Level monitor
LC	Level controller
1	from condenser
2	to evaporator
3	Open flash vessel (vertical)

Scope of delivery:

- Suction line according to type A with pressure controller
- Open Economizer vessel installed on the screw compressor package
- Safety valve
- Vent valve and oil draining valve
- Shuttable and drainable vessel with maximum level limiter for expansion control
- Liquid line with electronic expansion valve, filter, drain valve and stop valve

Notice

Economizer for two-stage pressure relief (open flash vessel) with inlet control system in the Economizer - especially for use of NH₃:

- Refrigerant collector in the high pressure part is required!

Notice

Instead of an inlet control system, Economizer operation for two-stage pressure relief (open flash) can be operated by means of a high pressure float valve on the inlet and outlet side (special request, not standard).

- Refrigerant collector in the high pressure part is required, primarily for NH₃!
-

Type C - Economizer for single-stage pressure relief (closed flash) with tube heat exchanger (shell and tube)

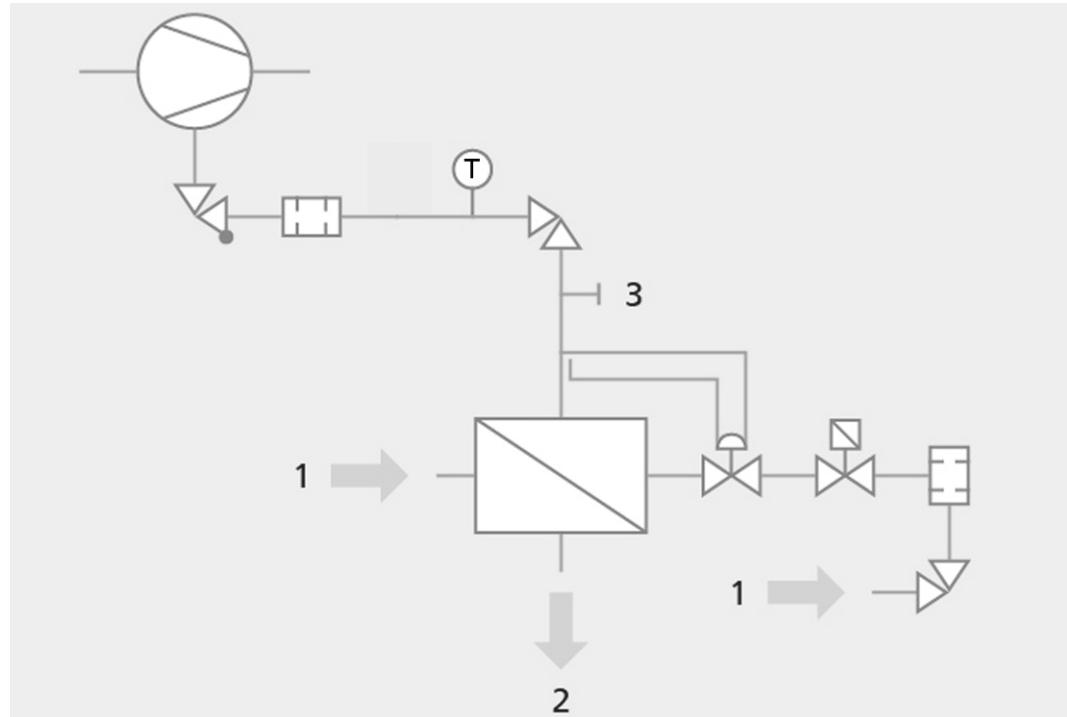


Fig.10: Economizer for single-stage pressure relief (closed flash) tube heat exchanger (shell and tube)

T	Thermometer
1	from condenser
2	to evaporator
3	Side load connection (optional)

Scope of delivery:

- Suction line according to type A without pressure controller
- Shell and tube Economizer mounted on the package
- Liquid line with thermostatic expansion valve, solenoid valve, filter, drain valve and stop valve

Notice

A plate heat exchanger can be used as an Economizer instead of a tube heat exchanger (special request, not standard).

► Schema as per type C.

Notice

The manufacturer recommends installing an Economizer for single-stage pressure relief (closed flash) per compressor package.

► When connecting two or more compressor packages to the same Economizer, pressure controllers with an automatic shut-off function must be installed in each Economizer suction line to the compressor. This does not apply to closed flash Economizers with two or more circuits.

3.2.5.3 Economizer - variants for DuoPack screw compressor packages

Type A - Duo Economizer port pipe

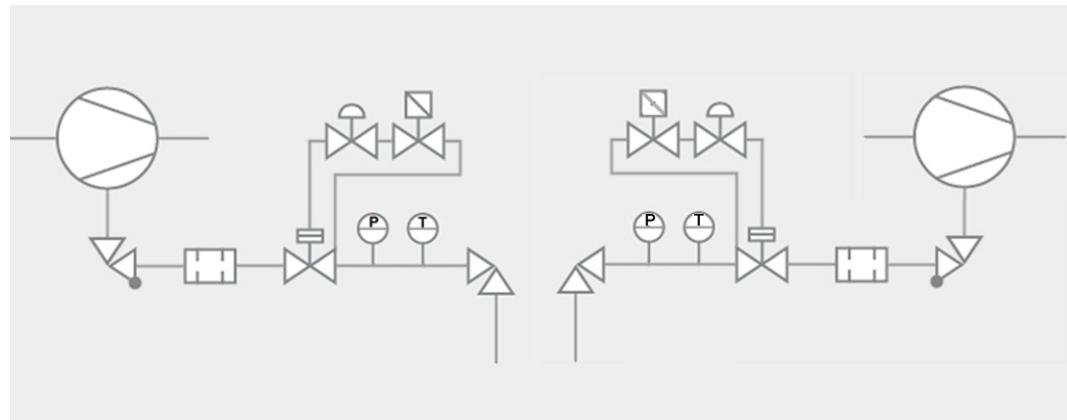


Fig.11: DuoPack Economizer port pipe

P	Pressure sensor (optional)
T	Temperature sensor (optional)

Suction line (installed on the screw compressor package) consisting of:

- Stop valve ⁹
- Filter ⁹
- Check valve ⁹
- Thermometer/service valves ⁹
- Pressure controller including shut-off function ⁹ (unnecessary if two-circuit DX Economizer is connected)

Optional:

- Remote signalisation (pressure and temperature sensors) ⁹, no pressure controller (only if installed by the customer), side load connection ⁹

⁹ designed in duplicate

Description of Design and Function

Main components

Type B - Duo Economizer for two-stage pressure relief (open flash) with inlet control system

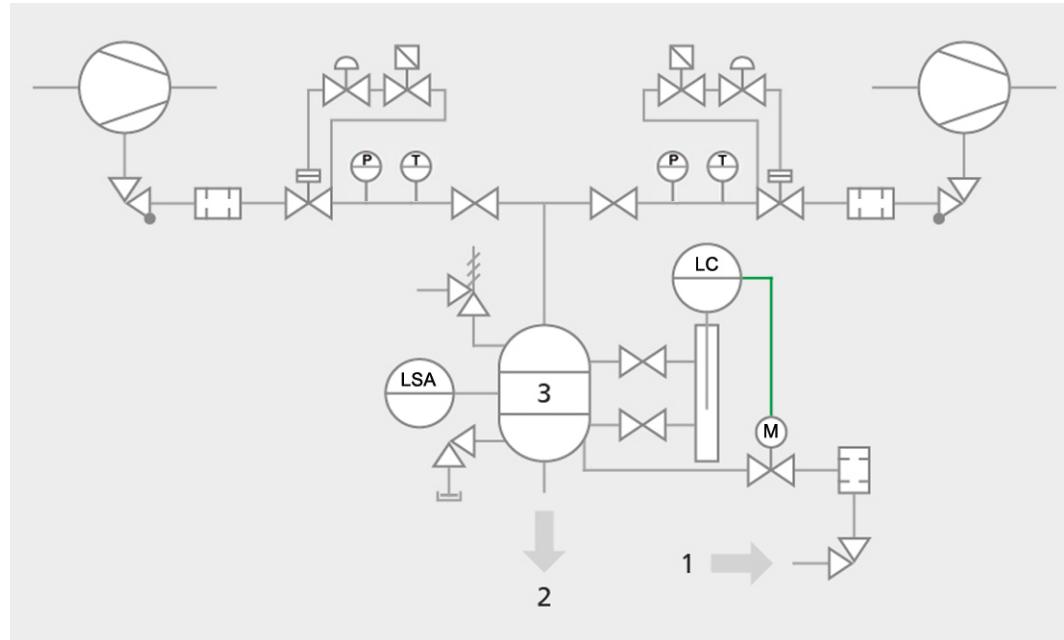


Fig.12: Economizer for two-stage pressure relief (open flash) with inlet control system

P	Pressure sensor (optional)
T	Temperature sensor (optional)
LSA	Level monitor
LC	Level controller
1	from condenser
2	to evaporator
3	Open flash vessel (vertical)

Scope of delivery:

1. Suction line according to type A - Duo
2. Open Economizer vessel installed on the screw compressor package
3. Safety valve
4. Vent valve and oil draining valve
5. Shuttable and drainable vessel with maximum level limiter for expansion control
6. Liquid line with electronic expansion valve, filter, drain valve and stop valve

Notice

Economizer for two-stage pressure relief (open flash vessel) with inlet control system in the Economizer - especially for use of NH₃:

► Refrigerant collector in the high pressure part is required!

Notice

Instead of an inlet control system, Economizer operation for two-stage pressure relief (open flash) can be operated by means of a high pressure float valve on the inlet and outlet side (special request, not standard).

- Refrigerant collector in the high pressure part is required, primarily for NH₃!
-

Type C - Duo single-stage pressure relief (closed flash) with tube heat exchanger (shell and tube)

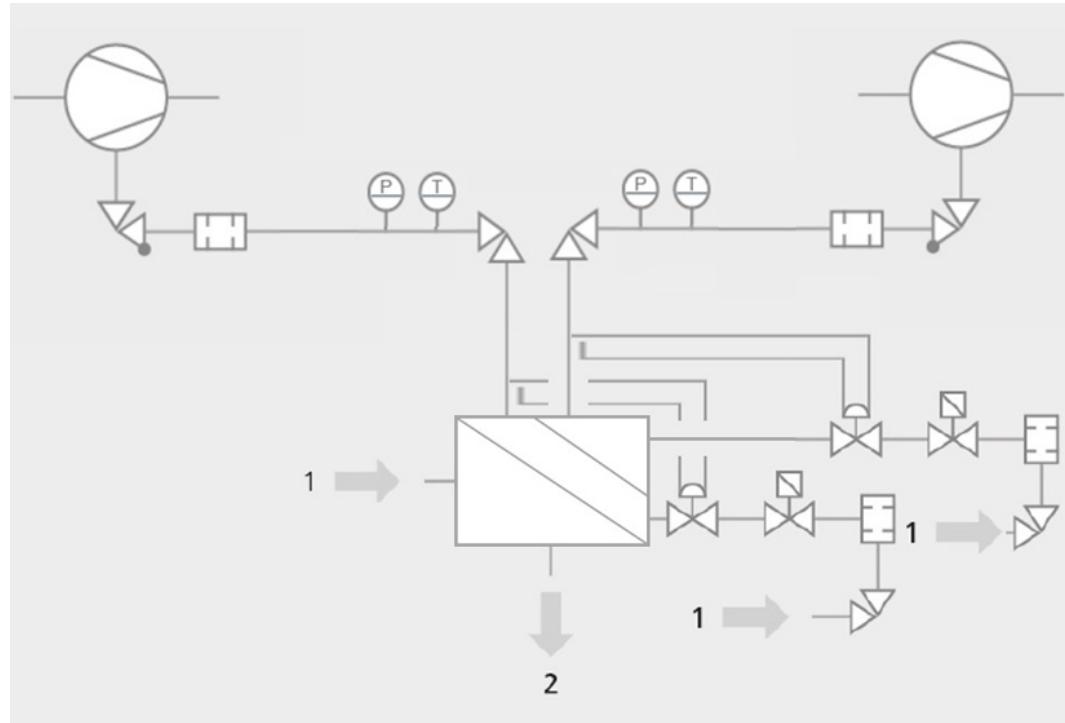


Fig.13: Economizer for single-stage pressure relief (closed flash) as tube heat exchanger (shell and tube)

P	Pressure sensor (optional)
T	Temperature sensor (optional)
1	from condenser
2	to evaporator

Scope of delivery:

- Suction line according to type A - duo without pressure controller
- Shell and tube Economizer (dual circuit) installed on the screw compressor package
- Liquid line with thermostatic expansion valve, solenoid valve, filter, drain valve and stop valve

Notice

For standardization purposes, a uniform closed flash Economizer vessel series (dual circuit) is used for all temperature ranges.

- In this series, the tube bundle package is welded to the jacket tube just as in the fully welded single-circuit series. The tube side is flanged.

3.2.5.4 Economizer variants for DuoPack screw compressor packages

Type A - two-stage inter-cooler connection line

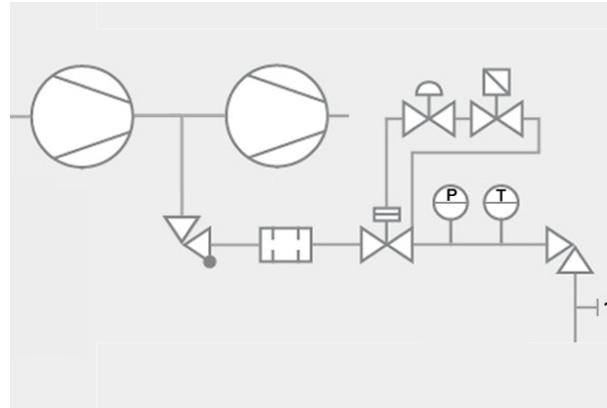


Fig.14: Inter-cooler connection line for two-stage packages (with options)

P	Pressure sensor (optional)
T	Temperature sensor (optional)
1	Side load connection (optional)

Suction line (installed on the screw compressor package) consisting of:

- Stop valve
 - Filter
 - Check valve
 - Thermometer/ Service valve
 - Pressure controller (only with open inter-cooler and two-stage pressure relief)
- Optional:
- Remote signalisation (pressure and temperature sensors), no pressure controller (only if installed by the customer), side load connection

Description of Design and Function

Main components

Type B - two-stage inter-cooler for two-stage pressure relief (open flash) with inlet control system

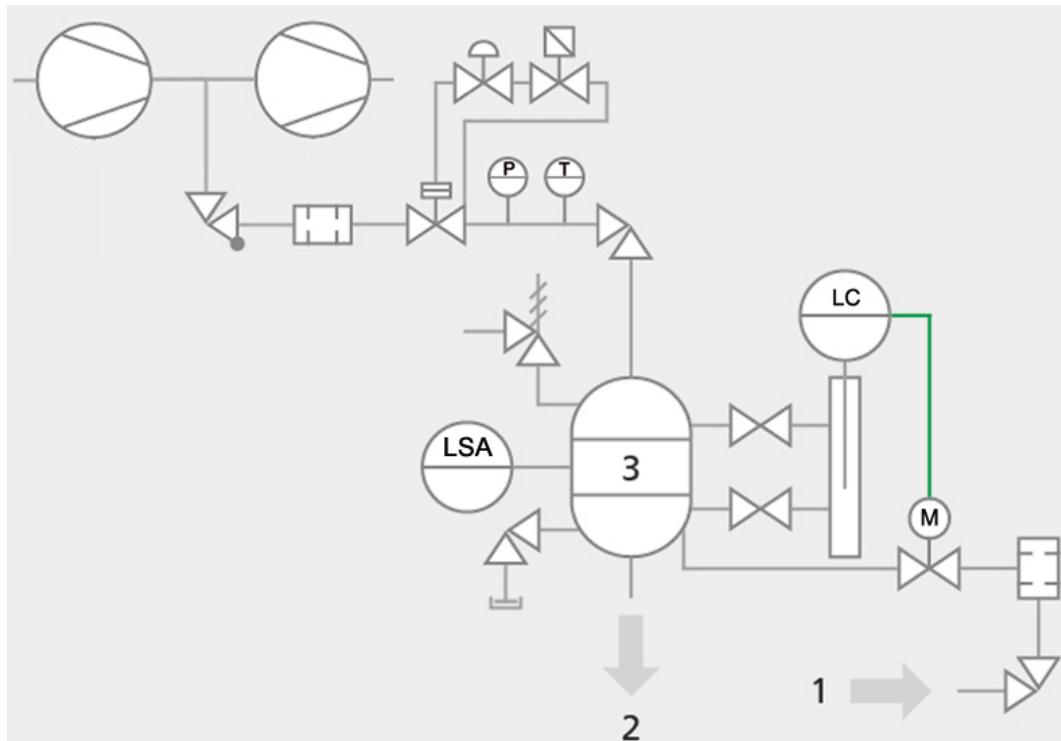


Fig.15: Inter-cooler for two-stage pressure relief (open flash) with inlet control system

P	Pressure sensor (optional)
T	Temperature sensor (optional)
LSA	Level monitor
LC	Level controller
1	from condenser
2	to evaporator
3	Open flash vessel (vertical)

Scope of delivery:

- Suction line according to type A - two stage with pressure controller
- Open inter-cooler vessel mounted on the screw compressor package
- Safety valve
- Vent valve and oil draining valve
- Shuttable and drainable vessel with maximum level limiter for expansion control
- Liquid line with electronic expansion valve, filter, drain valve and stop valve

Notice

Inter-cooler for two-stage pressure relief (open flash) with inlet control system in the inter-cooler - especially for use of NH₃:

► Refrigerant collector in the high pressure part is required!

Notice

Instead of an inlet control system, inter-cooler operation for two-stage pressure relief (open flash) can be operated by means of a high pressure float valve on the inlet and outlet side (special request, not standard).

- Refrigerant collector in the high pressure part is required, primarily for NH₃!
-

Type C - Two-stage inter-cooler for single-stage pressure relief (closed flash) with tube heat exchanger (shell and tube)

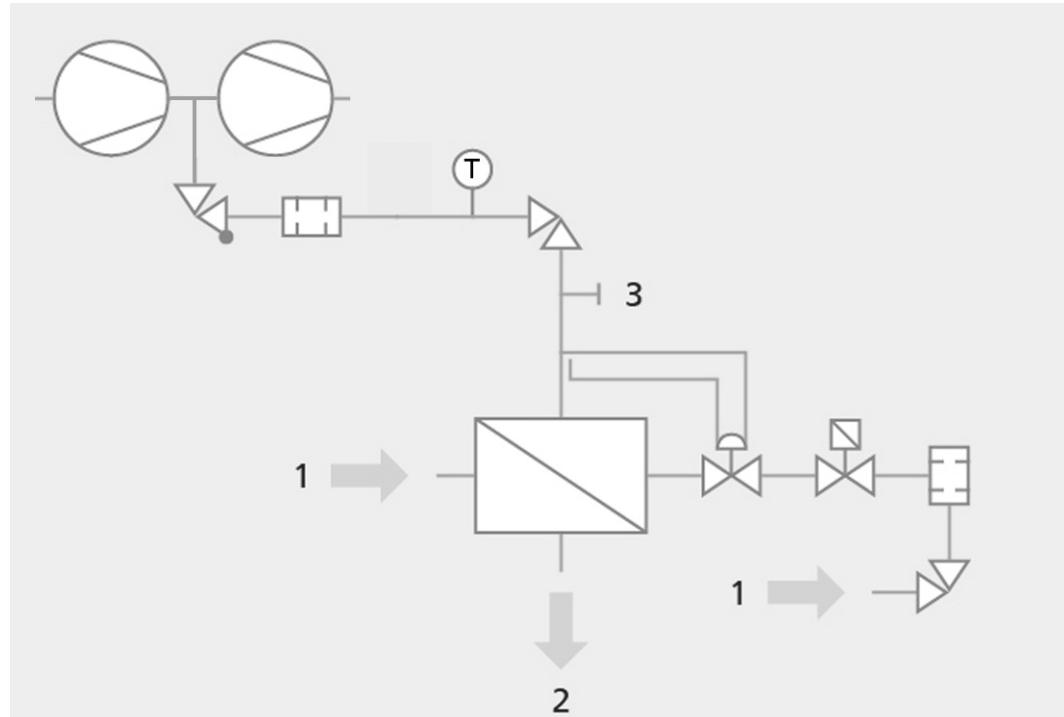


Fig.16: Inter-cooler for single-stage pressure relief (closed flash) tube heat exchanger (shell and tube)

T	Thermometer
1	from condenser
2	to evaporator
3	Side load connection (optional)

Scope of delivery:

- Suction line according to type A - two-stage without pressure controller
- Shell and tube inter-cooler mounted on the screw compressor package
- Liquid line with thermostatic expansion valve, solenoid valve, filter, drain valve and stop valve

Notice

A plate heat exchanger can be used as an inter-cooler instead of a tube heat exchanger (special request, not standard).

- ▶ Schema as per type C - two stage.

3.2.6 Oil cooler

The oil cooler is used for cooling the oil heated in the compressor to a temperature which ensures that the oil supplied to the compressor has an adequate viscosity.

The following oil cooling types are available:

- liquid cooling

- water (non corrosive)
- propylene-glycol
- ethylene-glycol
- Other cooling media on request
- thermosyphon cooling
- DX oil cooling
- refrigerant injection into the compressor

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

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

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.

3.2.8 Oil pump

Oil pumps (with)

When using series LT compressors, the oil pump runs for prelubrication and during the entire operation of the compressor.

It draws the refrigerator oil from the receiving chamber in the oil separator, via the oil cooler and oil filter and pumps it to the bearings, the balance piston, the shaft seal, to the capacity control system and, if fitted, to the compressor's hydraulic Vi adjustment system.

Under certain conditions, series M compressors must also be operated with an oil pump (for example when using certain refrigerants or NH₃ if a certain pressure difference falls below the set limit during an operating condition or there is a risk of insufficient lubrication).

In this case, in contrast to series LT compressors, it is not designed for prelubrication purposes but for capacity control and to ensure an adequate supply of the drive and also therefore runs throughout operation of the compressor.

The oil pump pumps more oil than the compressor uses. This surplus quantity of oil is returned to the oil pump suction side via the spring loaded oil pressure regulating valve. The oil pressure regulating valve controls a pressure difference between oil pump pressure side and end pressure of the package according to the information in the R+I diagram.

Oil pump (without)

Under certain conditions, series M compressors do not require any additional pressure increase via an oil pump to supply oil to the capacity control, bearings and compression chamber.

The pressure difference between the suction and discharge sides of the compressor is used to ensure the oil supply.

The minimum pressure difference between the suction and discharge side must be higher than 3 bar. The oil pressure must be at least 2 bar above the suction pressure.

3.2.9 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.

3.2.10 Control

The screw compressor package is equipped with a GEA Omni™ control as standard.

The control consists of the control unit with operator keypad and display unit, indicator lights for "Running", "Warning" and "Fault", the EMERGENCY STOP button, the output relays and the casing.

The control is mounted directly on the package as standard, but alternatively may also be set up in a control centre.

The control system performs the following functions as standard:

- Display of all important physical and technical parameters, e.g. pressure, temperature, motor current, output, number of operating hours, operating mode and status signals

- Automatic start-up and shut-down of the screw compressor package and capacity control dependent on the suction pressure or an external temperature
- Monitoring of all operating parameters
- Compressor output limitation, in case overload is indicated in the measured discharge pressure, suction pressure, refrigerant temperature or motor current
- Fault memory with date and time
- Wire failure detection for all analogue input signals
- Password protection for preventing unauthorised access to important parameters
- Non-volatile storage of the program on a CFast card
- Possibility of communication with master control via Modbus TCP, Ethernet/IP (optionally via Profibus-DP, Profinet or Modbus RTU)

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

3.2.11 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.

3.2.12 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.

3.2.13 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.17: GEA Omni™ outer view without indicator lights



Fig.18: GEA Omni™ outer view with indicator lights

4.3 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 <ul style="list-style-type: none"> • Motor feedback • Motor protection compressor • Oil pump feedback ¹⁰ 	digital <ul style="list-style-type: none"> • Run compressor • Run oil pump ¹⁰
analogue (4-20 mA) <ul style="list-style-type: none"> • Motor current compressor • Compressor motor speed 	analogue (4-20 mA) <ul style="list-style-type: none"> • Setpoint compressor motor speed ¹¹

Remote master or BMS - GEA Omni™	
from the remote controller (BMS) to the GEA Omni™ INPUTS	from the GEA Omni™ to the remote controller (BMS) OUTPUTS
digital <ul style="list-style-type: none"> • External On/Off • External "MORE" • External "LESS" • External motor start release • External reset • Changeover to 2nd setpoint • Compressor blocked 	digital <ul style="list-style-type: none"> • Ready for external mode signal • Signal Compressor runs • Main failure • auxiliary output 1
analogue (4-20 mA) <ul style="list-style-type: none"> • external setpoint 	analogue (4-20 mA) <ul style="list-style-type: none"> • Control slide or swept volume

Refrigeration plant - GEA Omni™	
from refrigeration plant to GEA Omni™ INPUTS	from GEA Omni™ to refrigeration plant OUTPUTS
digital <ul style="list-style-type: none"> • External EMERGENCY STOP • Separator level ¹² • Eco level ¹² • Gas sensor 	digital: --
analogue (4-20 mA) <ul style="list-style-type: none"> -- 	analogue (4-20 mA) <ul style="list-style-type: none"> --

¹⁰ In case oil pump present

¹¹ option, only for operation with frequency converter

¹² option

GEA Omni™ control panel
Input and Output Signals

Screw compressor package - GEA Omni™	
from the screw compressor package to the GEA Omni™ INPUTS	from the GEA Omni™ to the screw compressor package OUTPUTS
digital <ul style="list-style-type: none"> • Discharge pressure safety switch • Oil level min. ¹² • Oil level max. ¹² 	digital <ul style="list-style-type: none"> • Solenoid valve capacity control, max. ¹³ • Solenoid valve capacity control, min. ¹³ • Solenoid valve - check valve suction side ¹³ • Solenoid valves - Vi control ¹³ • Solenoid valve - economiser operation ¹² • Solenoid valve start-up unloading ¹²
analogue (4-20 mA) <ul style="list-style-type: none"> • Control slide position ¹³ • Suction pressure • Discharge pressure • Oil pressure • Pressure after the oil filter ¹⁴ • Suction temperature • Discharge temperature • Oil temperature • Eco temperature ¹² • Eco pressure ¹² • Vi-slider position ¹³ 	analogue (4-20 mA) <ul style="list-style-type: none"> • Setpoint IntelliSOC injection valve

¹³ depending on the compressor type

¹⁴ depending on the compressor type and application

4.4 Option frequency inverter

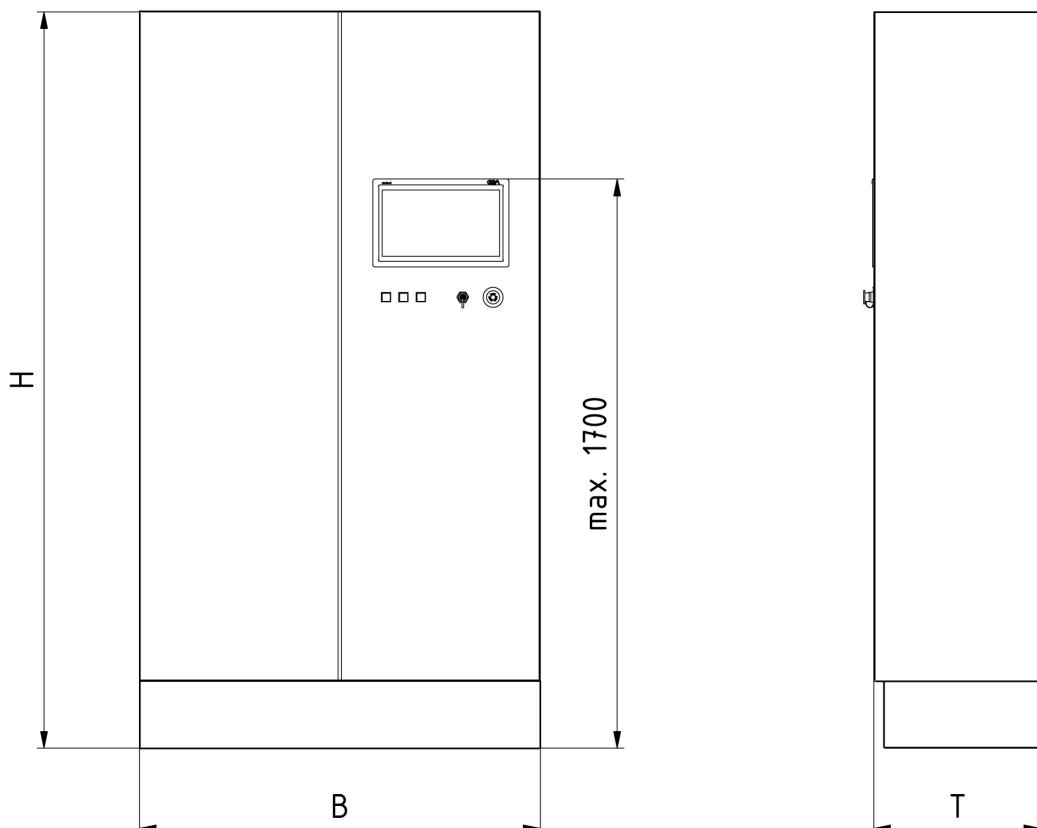


Fig.19: Power current panel and frequency inverter, view

The screw compressor packages with screw compressors and frequency controllers are driven at a minimum speed of 1000 rpm (compressor series M) or 1500 rpm (compressor series LT). The permissible max. speed is 4500 rpm (compressor series M) or 3600 rpm (compressor series LT).

The power current panel with frequency inverter is delivered loose as an option and must be connected to the compressor drive motor using shielded cables on-site. When connecting, the output side power cables must be kept as short as possible for minimising the electromagnetic disturbances.

The communication of the control unit with the frequency inverter is effected via hardware cabling.

The drive power of the compressor drive motors of the series of the screw compressor packages with frequency controls is limited to 710 kW. Higher capacities are possible only on request.

The capacity is regulated using a combined slider/speed regulation.

Technical data of frequency inverter (default by GEA Refrigeration Germany GmbH)	
Parameters	Description
Operating frequency	25-50 Hz
Operating voltage	3 phase, 400 V +/- 5%
Filter	EMC filter class A according to EN 55011
Communication	Hardware cabling

Technical data of frequency inverter (default by GEA Refrigeration Germany GmbH)	
Parameters	Description
Display	Display for displaying operating parameters, error and warning messages
Type of control	Sine weighted pulse width modulation, constant U/f characteristic curve
Protective functions	Overcurrent
Resonance protection	Suppressible frequency bands
Conditions of use	< 93 % rel. humidity, +5°C to +40°C, max. 1000 m above mean sea level

Power current panel

The power current panel contains the input and output assemblies as well as the star-delta switching (or the frequency converter) with the components described. Oil pump and oil heater are switched on/off using the MCBs included in the power current panel. Motor current converter and motor winding protection are installed in the power current panel. The power current panel is supplied loose as optional equipment feature. The control with operation / display unit and EMERGENCY OFF switch is not integrated in the power current panel, it is installed in a control cabinet on the screw compressor package.

Compressor drive motor

For a screw compressor package with frequency controller, compressor drive motors with special roller bearings corresponding to the requirements of the frequency inverter operation are used. The sound power level in case of operation with frequency controller increases by 4 dB - 8 dB.

Other power current panel technical specifications								
Nominal capacity Motor (kW)	without frequency converter				with frequency converter (integrated)			
	Weight (kg)	Dimensions incl. plinth (mm)			Weight (kg)	Dimensions incl. plinth (mm)		
B	H ¹⁵	T	B	H ¹⁵	T			
45	190	800	2200	400	210	1200	2200	500
55	190	800	2200	400	210	1200	2200	500
75	200	800	2200	400	210	1200	2200	500
90	200	800	2200	400	210	1200	2200	500
110	230	800	2200	400	285	1200	2200	500
132	230	800	2200	400	285	1200	2200	500
160	230	800	2200	400	285	1600	2200	500
200	330	1000	2200	400	435	1800	2200	500
250	330	1000	2200	400	435	1800	2200	500
315	330	1200	2200	400	435	2400	2200	500
355	350	1200	2200	400	510	2400	2200	600
400	350	1600	2200	400	510	2400	2200	600
450	350	1600	2200	400	510	2400	2200	600
500	400	1600	2200	400	1500	2600	2200	600
560	420	1600	2200	400	1500	2600	2200	600

15 Depending on the cable entry and rated output can also be implemented at lower heights.

Other power current panel technical specifications								
Nominal capacity Motor (kW)	without frequency converter				with frequency converter (integrated)			
	Weight (kg)	Dimensions incl. plinth (mm)			Weight (kg)	Dimensions incl. plinth (mm)		
		B	H ¹⁵	T		B	H ¹⁵	T
630	450	1600	2200	400	1500	2600	2200	600
710	500	1600	2200	400	1500	2600	2200	600

If the screw compressor package is supplied without the option power current panel, in case of a speed control, a matching frequency converter must be provided by the customer. The customer takes over the complete responsibility for the installation as well as the wiring of the frequency inverter with the compressor drive motor and the control in accordance with the EMC Directive 2004/108/EC (shielded cables, separate cable ducts).

Detailed information about the operation of variable speed motors and the connection of a frequency converter are available in a separate document.

15 Depending on the cable entry and rated output can also be implemented at lower heights.

5 Technical data

5.1 Dimensions, weights, fill quantities and connections

Notice

All data are subject to change and only for the first overview.

- All of the figures and data are for the standard equipment of GEA Grasso products. (Special) options, such as Economizer vessels and oil separators, can have a corresponding affect on the charging quantities, dimensions and weights.
 - GEA Refrigeration Germany GmbH reserves the right to make technical changes or change supplier during the course of further development of the products covered by this product information.
 - Illustrations and drawings in this product information are simplified representations.
 - The technical data and dimensions are subject to change. No claims can be made on the basis of them.
 - More accurate details shall be provided by the respective technical proposal for one of the products listed.
-

5.1.1 GEA Grasso M compressor frame size C, D, E, G

(Horizontal oil separator¹⁶⁾

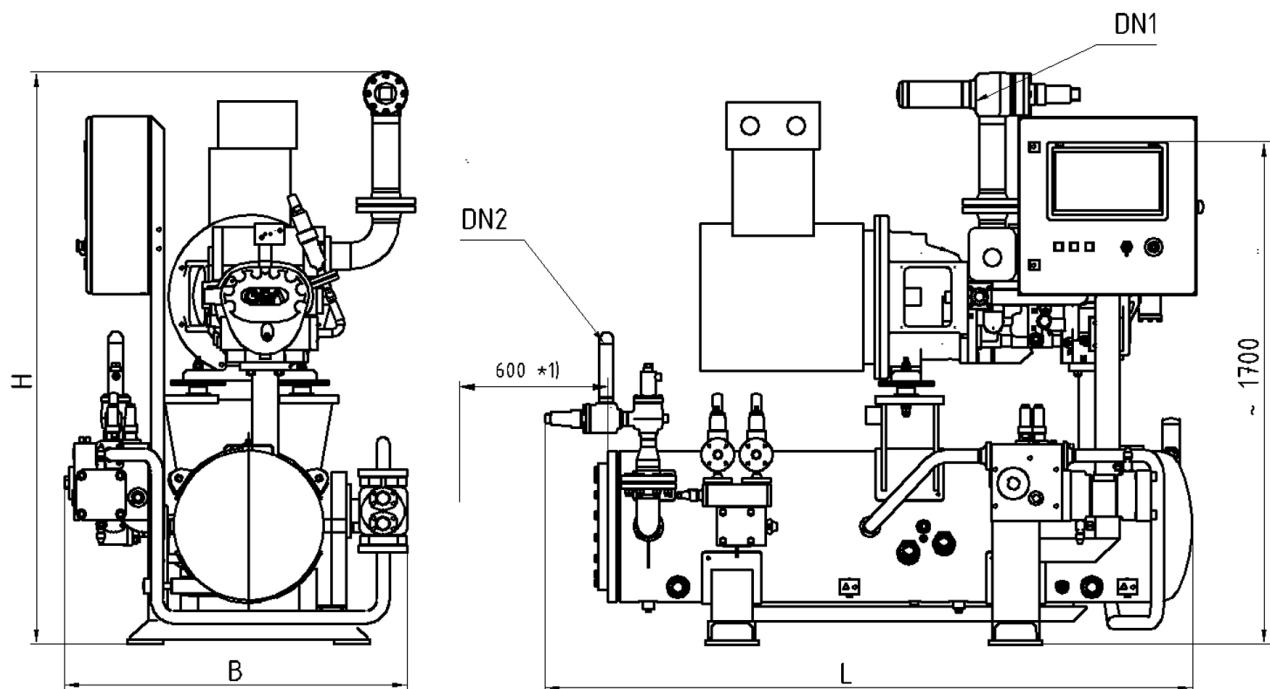


Fig.20: GEA Grasso M compressor frame size C, D, E, G

Technical specifications								
GEA Grasso Compre- ssor	Nominal motor power (kW)	Oil separator Ø D (mm)	Oil charg- ing quan- tity (l)	Dimensions (mm)			Nominal dia- meters	Weight without motor (kg)
				L	H	B		
C	22...75	508	80-120	2200	1950	1225	50-100	40-50 1350
D	22...90	508					1220	1450
E	37...132	508	100-140	2200	1975	1225	40-65	1550
		610		2875	2075	1325		1750
G	45...132	508	110-150	2300	1975	1225	65-125	40-80 1650
		610		2900	2075	1325		1850

16 Special custom applications may, under certain circumstances, be carried out in horizontal oil separator design mounted on a fixed base frame.

Technical data

Dimensions, weights, fill quantities and connections

5.1.2 GEA Grasso M compressor, frame size H, L, M, N

(Horizontal oil separator¹⁷⁾

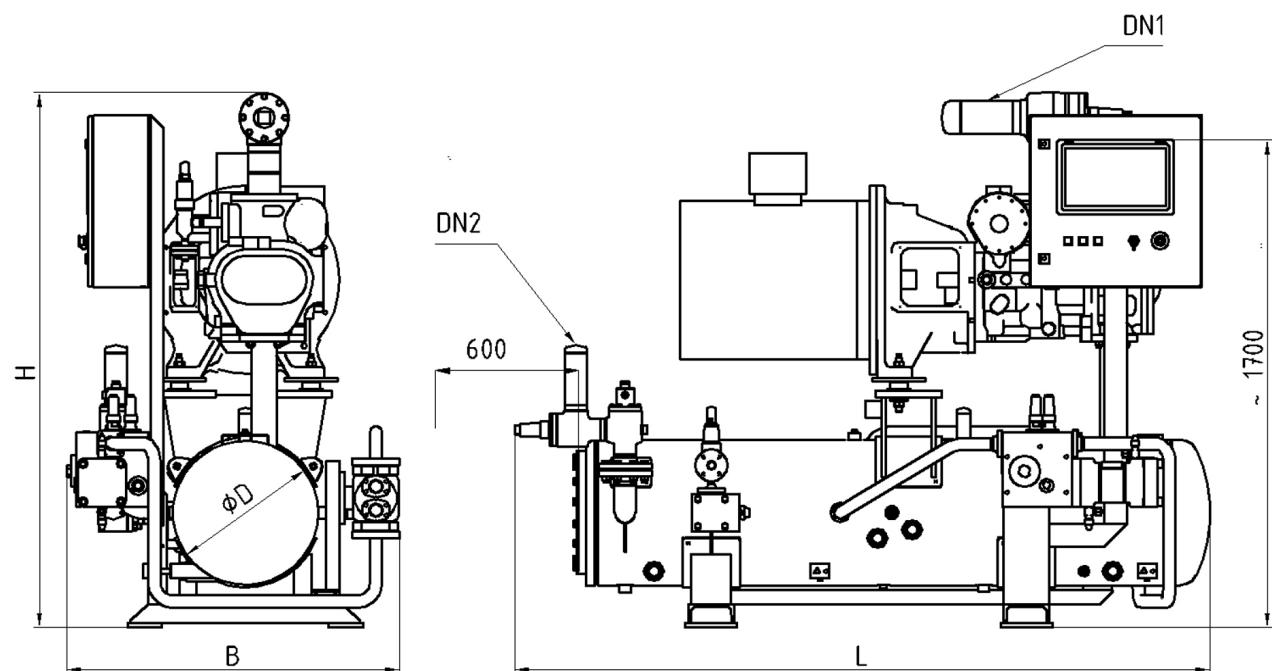


Fig.21: GEA Grasso M compressor, frame size H, L, M, N

Technical specifications									
GEA Grasso Compre- ssor	Nominal motor power (kW)	$\emptyset D$ (mm)	Oil charg- ing quan- tity (l)	Dimensions (mm)			Nominal diameters		Weight without motor (kg)
				L	H	B	DN1	DN2	
H	37...160	508	120-180	2550	1950	1225	80-150	40-80	1725
		610	160-210	2900	2100	1325			1850
L	45...160	508	120-180	2550	1950	1225	100-200	40-100	1800
		610	160-210	2900	2100	1325			1925
		711	200-260	2950	2175	1450			2275
M	55...200	508	130-190	2600	2025	1225	100-200	40-100	1875
		610	170-220	2950	2175	1325			2050
		711	210-270	3000	2225	1450			2350
N	55...250	508	130-190	2600	2025	1225	100-200	40-100	1925
		610	170-220	2950	2175	1325			2125
		711	210-270	3000	2225	1450			2425
		813	270-315	3050	2325	1550			2700

17 Special custom applications may, under certain circumstances, be carried out in horizontal oil separator design mounted on a fixed base frame.

5.1.3 GEA Grasso SP1 compressor frame size E, G, H, L, M, N (HP variant)

(oil separator installed vertically)

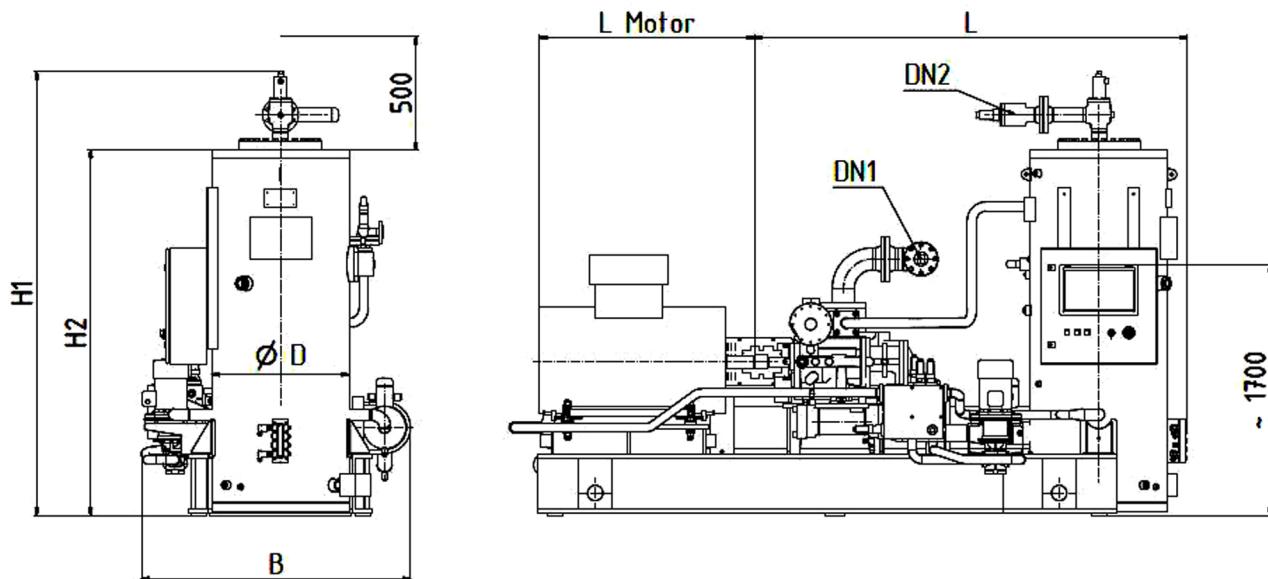


Fig.22: GEA Grasso SP1 HP compressor frame size E, G, H, L, M, N (oil circuit version depending on the application and operating conditions may differ from that represented)

Technical specifications										
GEA Grasso Compre- ssor	Nominal capacity Motor (kW)	\varnothing D (mm)	Oil charg- ing quan- tity (l)	Dimensions (mm)				Nominal diameters		Weight without motor (kg)
				L	H1	H2	B	DN1	DN2	
E	37...250	508	130-190	2030	1980	1740	1350	65-125	40-65	1925
		610	170-220	2190	2000	1810	1400			2075
		711	210-270	2275	2010	1870	1450			2150
		813	270-315	2385	2090	1880	1550			2350
G	45...300	508	130-190	2030	1980	1740	1350	80-150	40-80	1950
		610	170-220	2190	2000	1810	1400			2100
		711	210-270	2275	2010	1870	1450			2175
		813	270-315	2385	2090	1880	1550			2375
H	45...400	508	130-190	2080	1980	1740	1350	100-200	40-100	2150
		610	170-220	2190	2000	1810	1400			2300
		711	210-270	2275	2010	1870	1450			2500
		813	270-315	2385	2090	1880	1550			2800
L	45...450	508	130-190	2080	1980	1740	1350	100-200	40-125	2200
		610	170-220	2190	2000	1810	1400			2350
		711	210-270	2275	2010	1870	1450			2550
		813	270-315	2385	2090	1880	1550			2850
M	55...560	508	130-190	2080	1980	1740	1350	100-200	40-125	2450
		610	170-220	2190	2000	1810	1400			2600
		711	210-270	2275	2010	1870	1450			2750
		813	270-315	2385	2090	1880	1550			3100
		914	300-360	2550	2290	2010	1800			3400
N	55...630	508	130-190	2080	1980	1740	1350	100-200	40-125	2500
		610	170-220	2190	2000	1810	1400			2650
		711	210-270	2275	2010	1870	1450			2800
		813	270-315	2385	2090	1880	1550			3150
		914	300-360	2550	2290	2010	1800			3450

Technical data

Dimensions, weights, fill quantities and connections

L_{Motor} (mm) for standard motors IP23 and IP55, design IMB3 (with stand)								
Capacity (kW)	55	75	90	110	132	160	200	250
L _{motor} IP23	709	747	823	823	935	935	935	1151
L _{motor} IP55	965	965	1071	1071	1244	1244	1244	1353
Capacity (kW)	280	315	355	400	450	500	560	630
L _{motor} IP23	1151	1151	1151	1465	1465	1465	1465	1650
L _{motor} IP55	1353	1412	1412	1607	1607	2075	2240	2240

5.1.4 GEA Grasso SP1 compressor frame size P, R, S, T, V, W, Y

(oil separator installed horizontally)

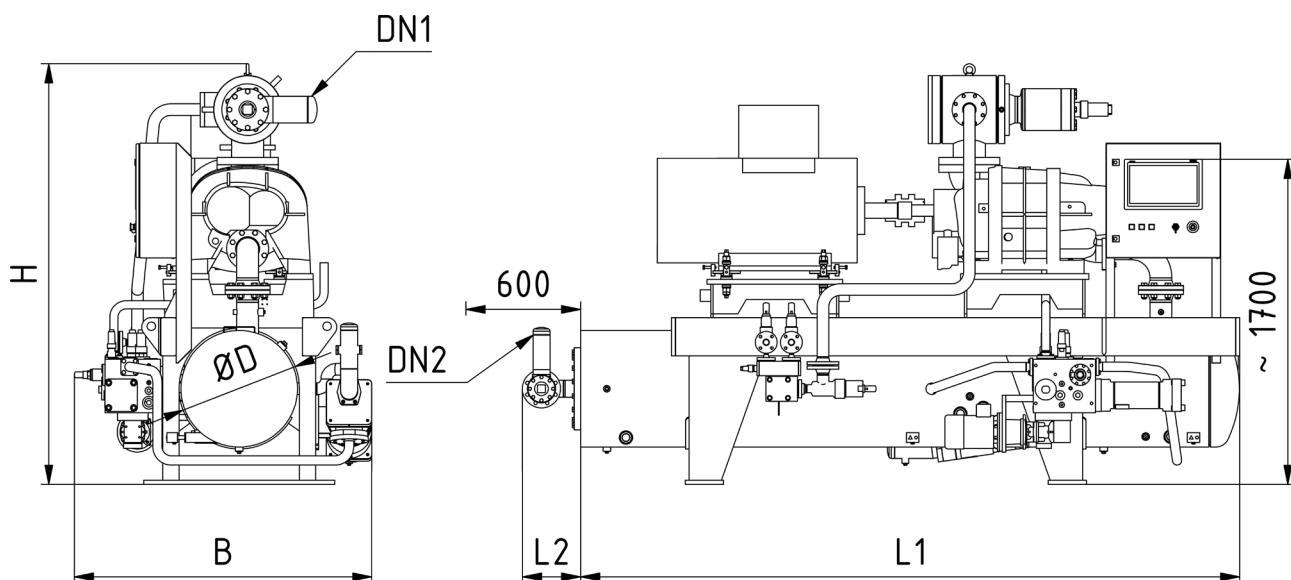


Fig.23: GEA Grasso SP1 compressor frame size P, R, S, T, V, W, Y

Technical specifications									
GEA Grasso Compre- ssor	Nominal capacity Motor (kW)	$\varnothing D$ (mm)	Oil charging quantity (l)	Dimensions (mm)			Nominal diameters		Weight without motor (kg)
				L1 ¹⁸	H	B	DN1	DN2	
P	55...250	508 610	130-170 170-190	3565	2000	1280	100-250	40-125	2125 2225
				3765	2100	1380			2495 2575
R	75...355	508 610	140-180 180-200	3565	2000	1280	100-250	40-125	2560 2650
				3765	2100	1380			2660 2750
S	90...400	508 610	150-220 220-290	3565	2000	1280	150-300	50-200	3050 3350
				3765	2100	1380			3100 3450 3800
T	90...400	508 610	160-240 220-270	3565	2250	1560	150-300	50-200	3150 3500 3850
				3765	2350	1660			3100 3450 3800
V	110...550	508 610	190-270 250-310 290-350	3565	2250	1560	150-300	50-200	3150 3500 3850
				3765	2350	1660			3100 3450 3800
W	110...630	508 610 711	190-270 250-310 290-350	3565	2250	1560	150-300	50-200	3150 3500 3850
				3765	2350	1660			3100 3450 3800
Y	132...630	508 610 711	190-270 250-310 290-350	3565	2250	1560	150-300	50-200	3150 3500 3850
				3765	2350	1660			3100 3450 3800
DN2	40	150	200	50	65	80	100	125	250
L2	235	475	525	255	285	310	365	420	615

18 total length = L1 + L2

Technical data

Dimensions, weights, fill quantities and connections

5.1.5 GEA Grasso SP1 compressor frame size Z, XA

(oil separator installed horizontally)

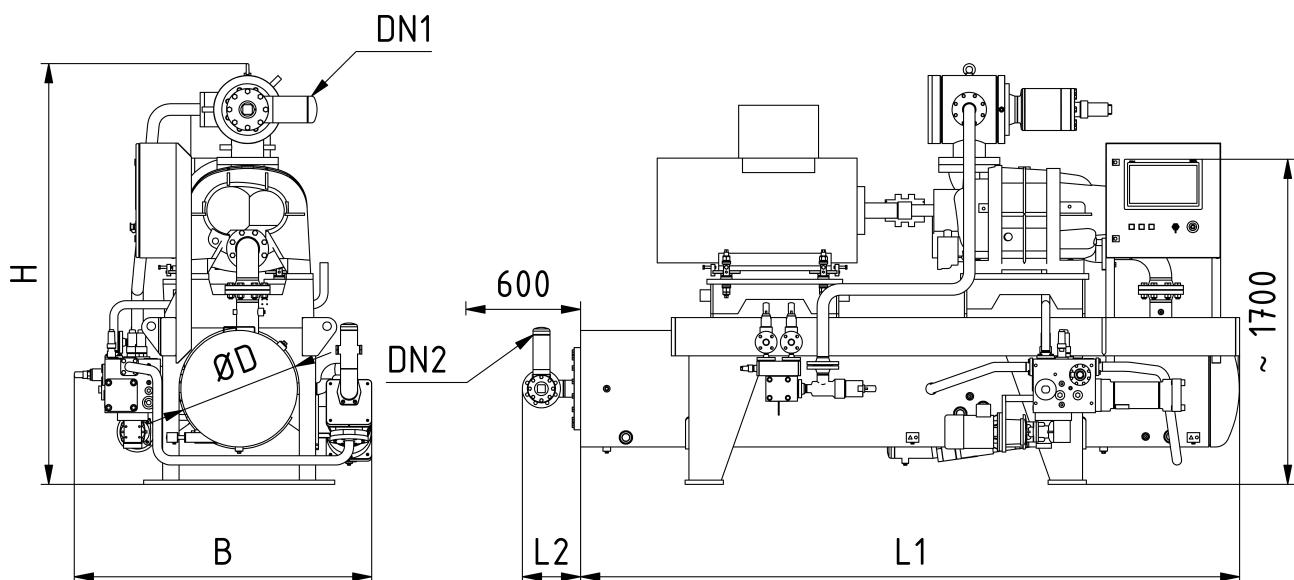


Fig.24: GEA Grasso SP1 compressor frame size Z, XA

Technical specifications									
GEA Grasso Compre- ssor	Nominal capacity Motor (kW)	\varnothing D (mm)	Oil charging quantity (l)	Dimensions (mm)			Nominal diameters		Weight without motor (kg)
				L ¹⁹	H	B	DN1	DN2	
Z	110... 750	610	270-350	3765	2550	1660	200-400	50-250	4350
		711	310-390	3820	2550	1660			4550
		813	340-420	4275	2800	1760			5000
XA	200... 900	610	270-350	3765	2550	1660			4450
		711	310-390	3820	2550	1660			4650
		813	340-420	4275	2800	1760			5050
DN2	40	50	65	80	100	125	150	200	250
L2	235	255	285	310	365	420	475	525	615

19 total length = L1 + L2

5.1.6 GEA Grasso SP1 and GEA Grasso SP1 HP compressor frame size P, R, S, T

(oil separator installed vertically)

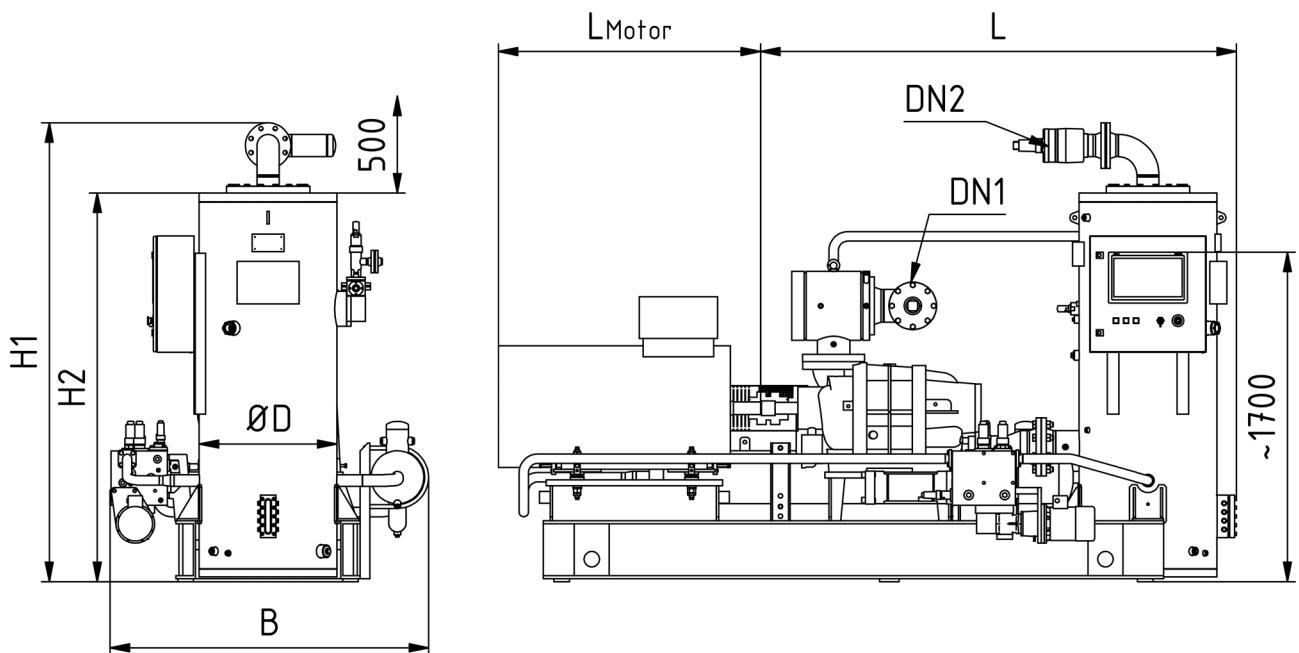


Fig.25: GEA Grasso SP1 compressor frame size P, R, S, T,

Technical specifications									
GEA Grasso Compre- ssor	Nominal motor power (kW)	$\varnothing D$ (mm)	Oil charging quantity (l)	Dimensions (mm)				Nominal diameters	Weight without motor (kg)
				L	H1	H2	B		
P	55...710	508	110-190	2080	2050	1900	1400	100-200	40-125
		610	180-220	2190	2100	1960	1450		
		711	190-270	2275	2010	1870	1475		
		813	210-315	2385	2090	1880	1600		
		914	250-360	2550	2290	2010	1800		
R	55...710	508	120-190	2350	2050	1900	1400	100-200	40-125
		610	180-220	2400	2100	1960	1450		
		711	190-270	2450	2150	2010	1475		
		813	210-315	2385	2090	1880	1600		
		914	250-360	2550	2290	2010	1800		
S	90...800	508	130-190	2350	2050	1900	1400	100-250	40-150
		610	180-220	2400	2100	1960	1450		
		711	190-270	2450	2150	2010	1475		
		813	210-315	2385	2090	1880	1650		
		914	250-360	2550	2290	2010	1800		
		1016	280-390	3200	2850	2200	1800		
T	90...800	508	130-190	2350	2050	1900	1400	100-250	40-150
		610	180-220	2400	2100	1960	1450		
		711	190-270	2450	2150	2010	1475		
		813	210-315	2385	2090	1880	1650		
		914	250-360	2550	2290	2010	1800		
		1016	280-390	3200	2850	2200	1800		

Depending on the version and the operating conditions, the table values for the version GEA Grasso SP1 HP may be a little higher.

Technical data

Dimensions, weights, fill quantities and connections

L_{Motor} (mm) for standard motors IP23 and IP55, design IMB3 (with stand)									
Capacity (kW)	55	75	90	110	132	160	200	250	280
L _{motor IP23}	709	747	823		935			1151	
L _{motor IP55}	965		1071		1244			1353	
Capacity (kW)	315	355	400	450	500	560	630	700	710
L _{motor IP23}	1151		1465			1560			
L _{motor IP55}	1412		1607		2075	2240			2380

5.1.7 GEA Grasso SP1 and GEA Grasso SP1 HP compressor frame size V, W, Y

(oil separator installed vertically)

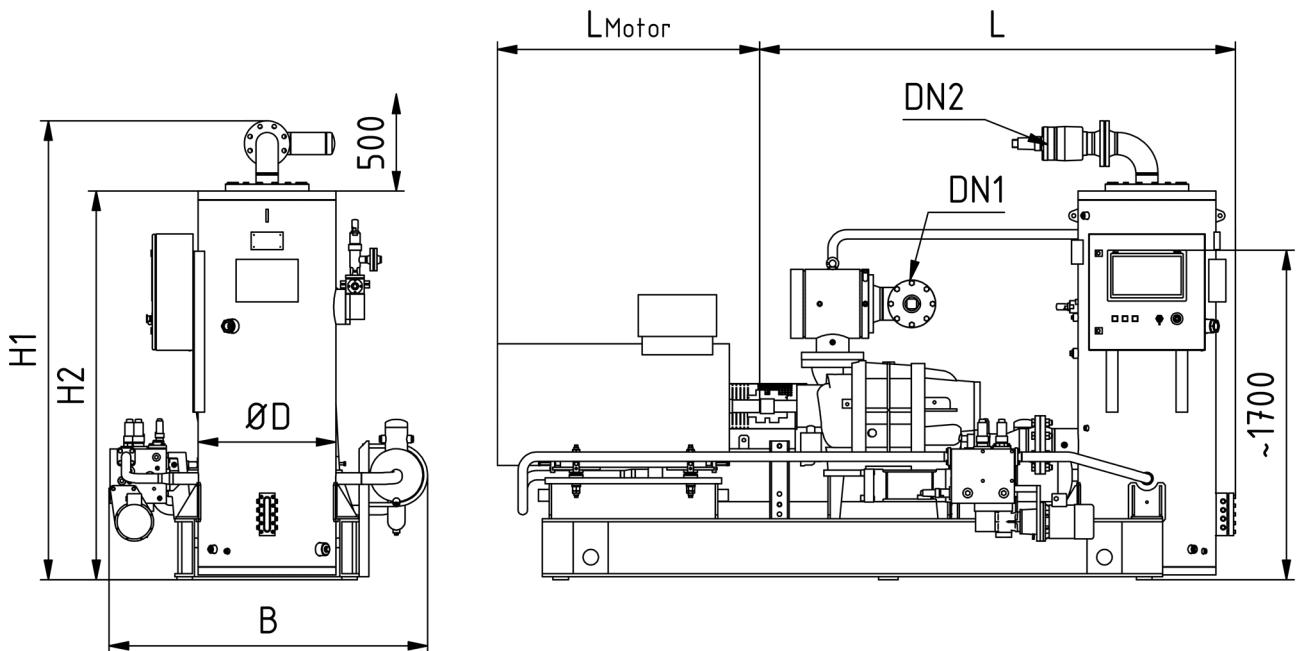


Fig.26: GEA Grasso SP1 compressor frame size V, W, Y

Technical specifications									
GEA Grasso Compre- ssor	Nominal capacity Motor (kW)	Ø D (mm)	Oil charging quantity (l)	Dimensions (mm)				Nominal diame- ters	Weight without motor (kg)
				L	H1	H2	B		
V	110...1000	610	200-255	2550	2100	1960	1800	150-250	3400
		711	220-270	2600	2150	2010	1800		3550
		813	240-315	2650	2190	2010	1800		3800
		914	250-360	2750	2290	2010	1800		4050
		1016	280-390	3200	2850	2200	1800		4375
		1200	300-500	3500	2975	2200	1820		5175
W	110...1100	610	200-255	2550	2100	1960	1800	50-200	3450
		711	220-270	2600	2150	2010	1800		3600
		813	240-315	2650	2190	2010	1800		3850
		914	250-360	2750	2290	2010	1800		4100
		1016	280-390	3200	2850	2200	1800		4425
		1200	300-500	3500	2975	2200	1820		5225
Y	132...1100	711	220-270	2600	2150	2010	1800	150-300	3675
		813	245-315	2650	2190	2010	1800		3925
		914	280-360	3000	2290	2010	1800		4175
		1016	280-390	3200	2850	2200	1800		4500
		1200	300-500	3500	2975	2200	1820		5300

Depending on the version and the operating conditions, the table values for the version GEA Grasso SP1 HP may be a little higher.

L _{Motor} (mm) for standard motors IP23 and IP55, design IMB3 (with stand)																	
Capacity (kW)	110	132	160	200	250	280	315	355	400	450	500	560	630	700	710	800	900
L _{motor IP23}	823	935		1151				1465				1650					
L _{motor IP55}	1071	1244		1353		1412		1607		2075		2240			2380	2620	

Technical data

Dimensions, weights, fill quantities and connections

5.1.8 GEA Grasso SP1 and GEA Grasso SP1 HP compressor frame size Z, XA (oil separator installed vertically)

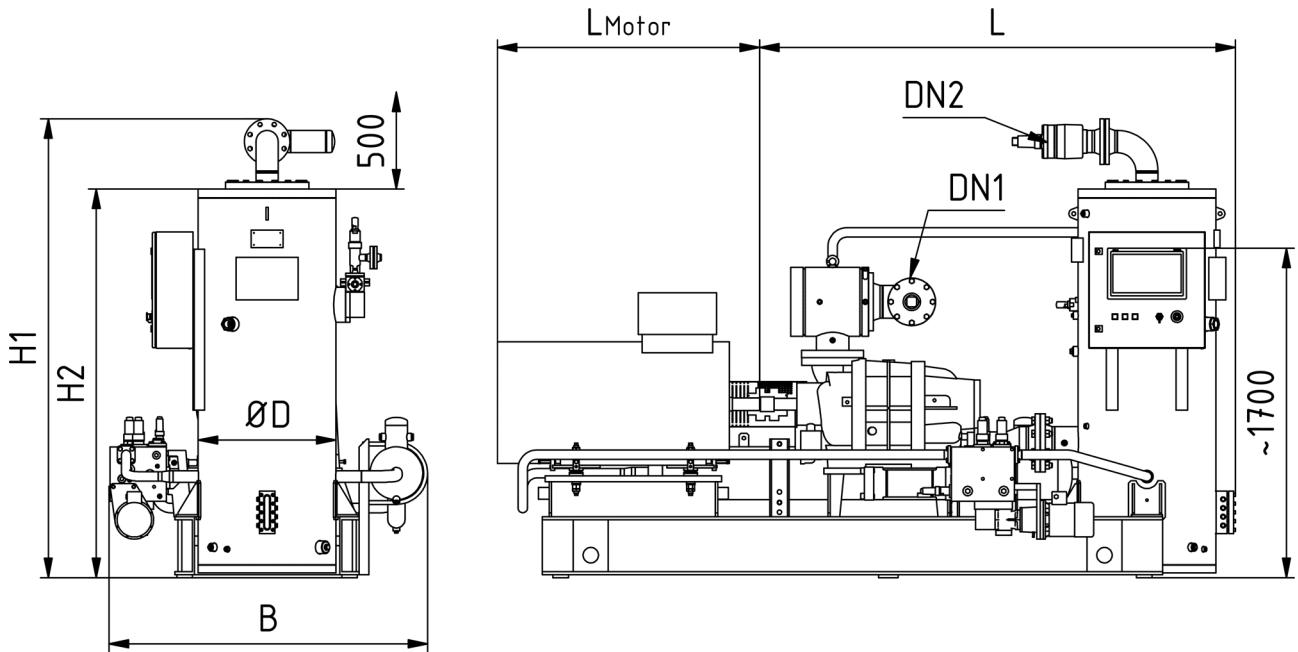


Fig.27: GEA Grasso SP1 compressor frame size Z, XA

Technical specifications									
GEA Grasso Compressor	Nominal motor power (kW)	$\varnothing D$ (mm)	Oil charging quantity (l)	Dimensions (mm)				Nominal diameters	Weight without motor (kg)
				L	H1	H2	B		
Z	160...1200	813	265-340	2800	2190	2010	1800	200-400	4225 4475 4800 5600 6200
		914	310-385	3150	2290	2010	1800		
		1016	320-395	3800	2850	2200	1800		
		1200	350-500	4100	2975	2200	1820		
		1400	375-550	4300	3150	2300	1820		
XA	200...1500	813	275-350	2800	2190	2010	1800	50-250	4300 4550 4875 5675 6275
		914	310-385	3150	2290	2010	1800		
		1016	320-395	3800	2850	2200	1800		
		1200	350-500	4100	2975	2200	1820		
		1400	375-550	4300	3150	2300	1820		

Depending on the version and the operating conditions, the table values for the version GEA Grasso SP1 HP may be a little higher.

L_{Motor} (mm) for standard motors IP23 and IP55, design IMB3 (with stand)																	
Capacity (kW)	160	200	250	280	315	355	400	450	500	560	630	700	710	800	900	1000	1100
$L_{motor\ IP23}$	935		1151				1465		1650								
$L_{motor\ IP55}$	1244		1353		1412		1607		2075		2240		2380		2620	²⁰ 2620	²¹ 2375

²⁰ L_{Motor} (mm) for standard motors IP23 and IP55, 400 V, style IMB3 (with stand)

²¹ L_{Motor} (mm) for standard mean voltage motors IP55, 6 kV, style IMB3 (with stand)

5.1.9 GEA Grasso SP1 compressor frame size XB, XC, XD, XE, XF and GEA Grasso SP1 HP compressor frame size XB, XC, XD

(oil separator installed vertically)

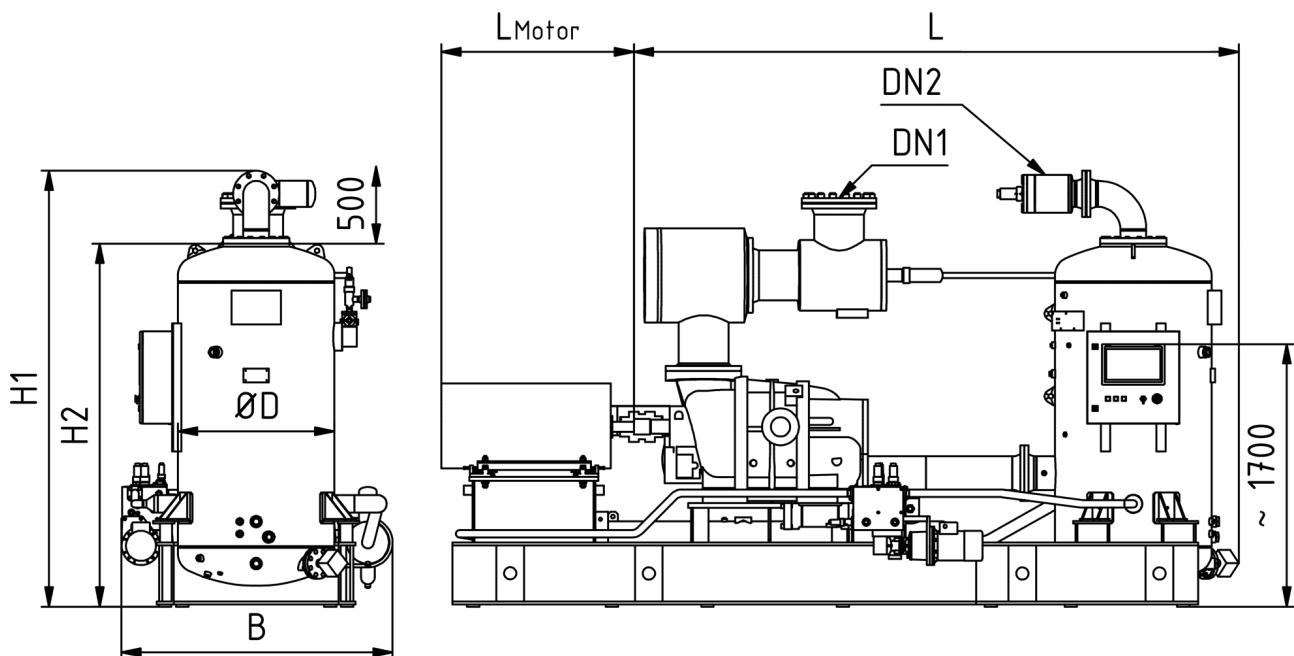


Fig.28: GEA Grasso SP1 compressor frame size XB, XC, XD, XE, XF

Technical specifications									
GEA Grasso Compre- ssor	Nominal motor power (kW)	\varnothing D (mm)	Oil charging quantity (l)	Dimensions (mm)				Nominal diameters	Weight without motor (kg)
				L	H1	H2	B		
XB	250...1800	813	285-410	3850	2675	2010	1820	DN1 DN2	7500
		914	320-435	3900	2775	2010	1820		7700
		1016	330-455	3950	2975	2200	1820		7900
		1200	360-550	4250	2975	2200	1820		8725
		1400	385-600	4450	3150	2300	1820		9500
		1600	420-675	4650	3250	--	1820		10350
XC	315...1800	914	330-475	3900	2775	2010	1820	65-300	7875
		1016	340-495	3950	2975	2200	1820		8075
		1200	370-600	4250	2975	2200	1820		8900
		1400	395-650	4450	3150	2300	1820		9675
		1600	430-725	4650	3250	--	1820		10525
		1800	500-800	4950	3250	--	1820		11400
XD	355...2000	914	340-525	3900	2775	2010	1820	250-500	7975
		1016	350-545	3950	2975	2200	1820		8175
		1200	380-650	4250	2975	2200	1820		9000
		1400	405-700	4450	3150	2300	1820		9775
		1600	440-775	4650	3250	--	1820		10625
		1800	510-850	4950	3250	--	1820		11500
XE	400...3000	2000	610-1050	5250	3450	--	2020	80-350	12500
		1016	360-595	4250	3150	2300	1820		9600
		1200	390-700	4450	3150	2300	1820		10400
		1400	415-750	4650	3150	2300	1820		11400
		1600	450-825	4850	3250	--	1820		12400
		1800	520-900	5150	3250	--	1820		13400
		2000	620-1100	5550	3450	--	2020		14400

Technical data

Dimensions, weights, fill quantities and connections

Technical specifications

GEA Grasso Compre- sor	Nominal motor power (kW)	Ø D (mm)	Oil charging quantity (l)	Dimensions (mm)				Nominal diameters		Weight without motor (kg)
				L	H1	H2	B	DN1	DN2	
XF	400...3000	1016	370-645	4250	3150	2300	1820	250-500	80-350	9600
		1200	400-750	4450	3150	2300	1820			10400
		1400	425-800	4650	3150	2300	1820			11400
		1600	460-875	4850	3250	--	1820	250-500	80-350	12400
		1800	530-950	5150	3250	--	1820			13400
		2000	630-1150	5550	3450	--	2020			14400

Depending on the version and the operating conditions, the table values for the version GEA Grasso SP1 HP may be a little higher.

L_{Motor} (mm) for standard motors IP23 and IP55, 400 V, design IMB3 (with stand)

Capacity (kW)	250	280	315	355	400	450	500	560	630	710	800	900	1000
L _{motor} IP23	1151				1465				1628				
L _{motor} IP55	1353		1412		1607		2075		2240		2380		2620

L_{Motor} (mm) for standard mean voltage motors IP55, 6 kV, style IMB3 (with stand)

Capacity (kW)	1100	1200	1300	1400	1500	1600	1800
L _{motor} IP55	2375			2580			3200

5.1.10 GEA Grasso SP1 compressor frame size XG, XH

(oil separator installed vertically)

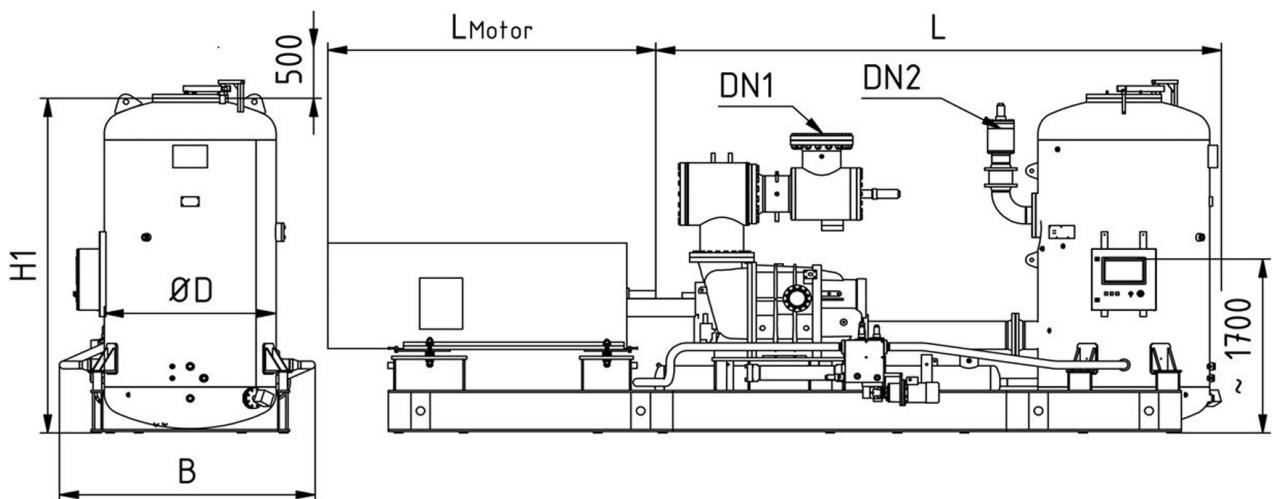


Fig.29: GEA Grasso SP1 compressor frame size XG, XH

Technical specifications										
GEA Grasso Compre- ssor	Nominal capacity Motor (kW)	\varnothing D (mm)	Oil charging quantity (l)	Dimensions (mm)				Nominal diameters	Weight without motor (kg)	
				L	H1	H2	B			
XG	400...3400	1200 ²²	410-800	4450	3150	2350	1820	250-500	100-400	11000
		1400 ²²	435-850	4650	3150	2350	1820			12500
		1600	470-925	4850	3250	--	1820			13500
		1800	540-1000	5150	3250	--	1820			14500
		2000	640-1200	5550	3450	--	2020			15500
		2200	720-1300	5450	3450	--	2220			16500
XH		1400	445-900	4650	3150	2350	1820			12800
		1600	480-975	4850	3250	--	1820			13800
		1800	550-1050	5150	3250	--	1820			14800
		2000	650-1250	5550	3450	--	2020			15800
		2200	730-1350	5450	3450	--	2220			16800

L_{Motor} (mm) for standard motors IP23 and IP55, 400 V, design IMB3 (with stand)

Capacity (kW)	250	280	315	355	400	450	500	560	630	710	800	900	1000
L _{motor IP23}			1151			1465			1628				
L _{motor IP55}	1353		1412		1607	2075		2240		2380		2620	

L_{Motor} (mm) for standard mean voltage motors IP55, 6 kV, style IMB3 (with stand)

Capacity (kW)	1100	1200	1300	1400	1500	1600	1800
L _{motor IP55}	2375			2580			3200

22 For dimensions, see figure Grasso SP1 (with Grasso screw compressor frame size: XB, XC, XD, XE, XF)

Technical data

Dimensions, weights, fill quantities and connections

5.1.11 GEA Grasso SP2 compressor frame size (LP) H, L, M, N, P, R

(oil separator installed horizontally)

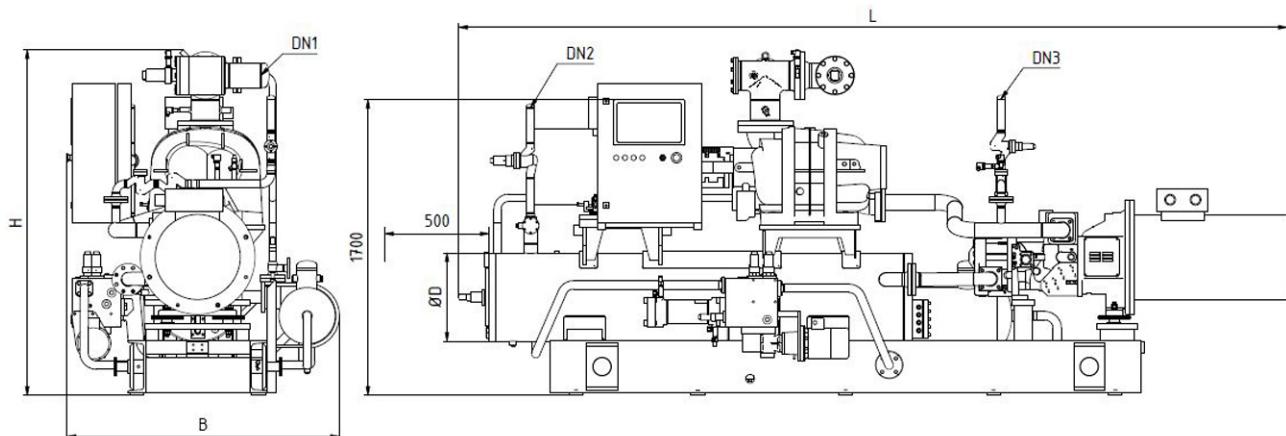


Fig.30: GEA Grasso SP2 compressor frame size (LP) H, L, M, N, P, R

Technical specifications										
GEA Grasso Compre- sor LP stage	Nominal motor power (kW)		\varnothing D (mm)	Oil charg- ing quantity (l)	Dimensions (mm) ²³			Nominal diameters		Weight with motor (kg) ²³
	LP stage	HP stage			L+L motor	H	B	DN1	DN2	
H	37...75	37...75	508	150-190	3600	2000	1500	80-125	40-65	3000
L	45...75			170-200	4050	2450	1500	100-150	50-65	
M	55...90			180-210	4500	2350	1600	100-150	50-65	3800
N	75...110				4770					
P	55...90									4000
R	75...110									4300
										4600

L _{Motor} (mm) for standard motors IP23 and IP55, design IMB5 (with flange) (for HP compressor frame size C, D, E, G)							
Capacity (kW)	37	45	55	75	90	110	132
L _{motor IP23}	624	671	709	747	823		935
L _{motor IP55}	767	856	965		1071		1244

²³ In contrast to other series, the specifications for the GEA Grasso SP2 package include the motors. Please note that the length and weight may vary depending on the type and size of the motor that is installed.

5.1.12 GEA Grasso SP2 compressor frame size (LP) S, T, V, W, Y, Z, XA

(oil separator installed horizontally)

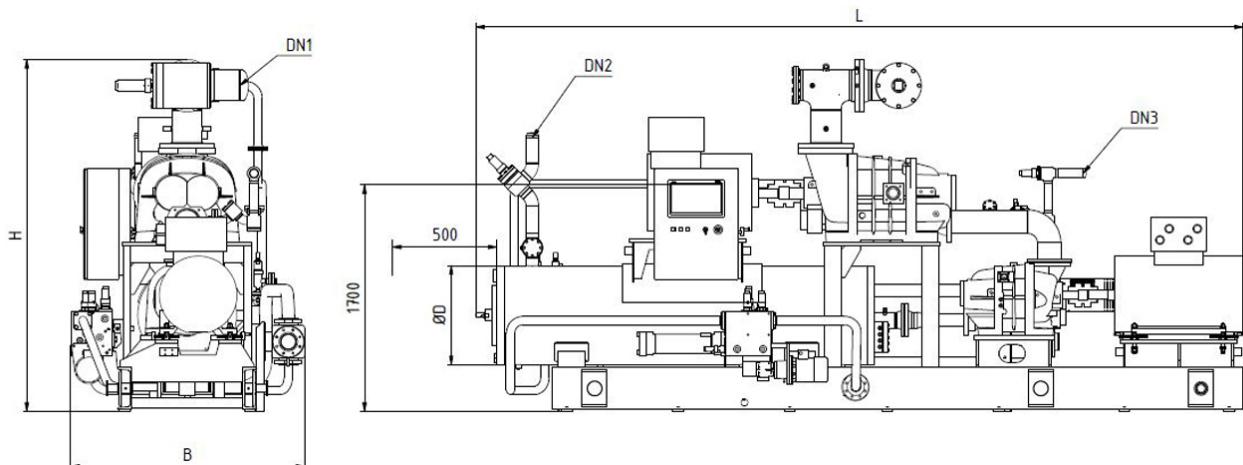


Fig.31: GEA Grasso SP2 compressor frame size (LP) S, T, V, W, Y, Z, XA

Technical specifications												
GEA Grasso Compressor (LP stage)	Nominal motor power (kW)		Ø D (mm)	Oil charg- ing quantity (l)	Dimensions (mm) ²⁴			Nominal diameters			Weight with motor (kg) ²⁴	
	(LP stage)	(HP stage)			L+L motor	H	B	DN1	DN2	DN3		
S	90...132	75...160	610/ 711	180-210	4700	2400	1700	125-200	50-80	40-65	6000	
T	90...160				5800						6500	
V	110...160			180-250	5600	2670					7000	
W	132...200	90...200	240-310	5900	1800	2800	2000	150-300	65-100		7500	
Y	132...250				5900						8000	
Z	160...315	132...250		711	6100				50-80	8500		
XA	160...355			280-350	6400					9600		

L _{Motor} (mm) for standard motors IP23 and IP55, design IMB3 (with stand)										
Capacity (kW)	75	90	110	132	160	200	250	280	315	355
L _{motor IP23}	747	823		935			1151			
L _{motor IP55}	965	1071		1244			1353		1412	

²⁴ In contrast to other series, the specifications for the GEA Grasso SP2 package include the motors. Please note that the length and weight may vary depending on the type and size of the motor that is installed.

Technical data

Dimensions, weights, fill quantities and connections

5.1.13 GEA Grasso SP2 compressor frame sizes (LP) XB, XC, XD, XE, XF

(oil separator installed horizontally)

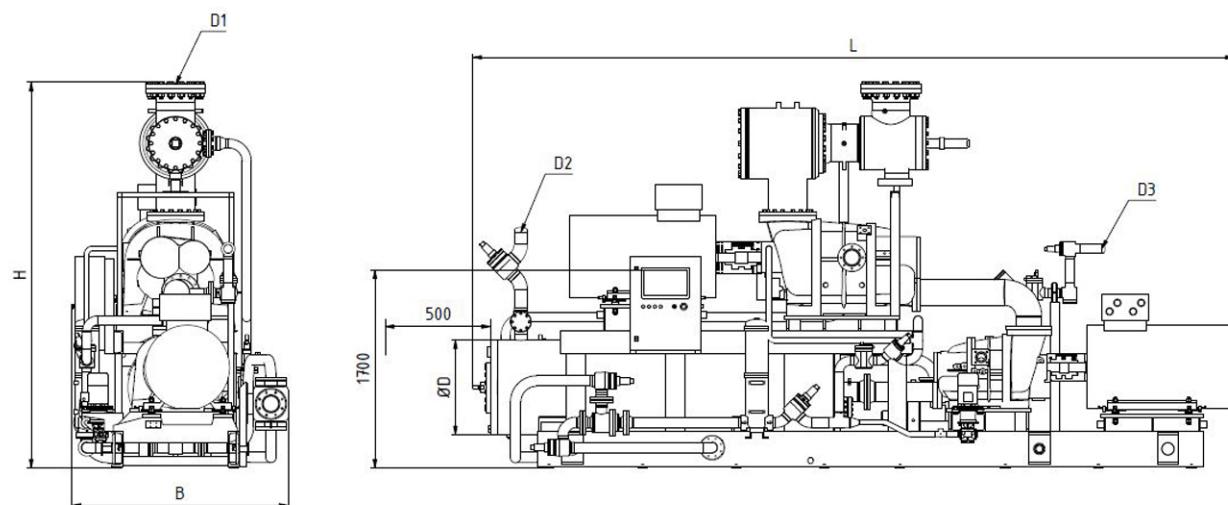


Fig.32: GEA Grasso SP2 compressor frame sizes (LP) XB, XC, XD, XE, XF

Technical specifications											
GEA Grasso Compressor (LP stage)	Nominal motor power (kW)		Ø D (mm)	Oil charg- ing quantity (l)	Dimensions (mm) ²⁵			Nominal diameters		Weight with motor (kg) ²⁵	
	(LP stage)	(HP stage)			L+L motor	H	B	DN1	DN2		
XB	250...450	250...450	813	350-450	6850	3350	2100	250-300	80-125	5-80	13200
XC	355...450	355...450			6900			300-350	100-125	65-100	13700
XD	400...450	400...450		400-550	7000	3500	2400	350-400	125		14600
XE	450...560	450...560			7100					15000	15000
XF	500...560	500...630									16500

L _{Motor} (mm) for standard motors IP23 and IP55, 400 V, design IMB3 (with stand)									
Capacity (kW)	250	280	315	355	400	450	500	560	630
L _{motor IP23}	1151					1465			
L _{motor IP55}	1353			1412		1607		2075	2240

²⁵ In contrast to other series, the specifications for the GEA Grasso SP2 package include the motors. Please note that the length and weight may vary depending on the type and size of the motor that is installed.

5.1.14 GEA Grasso SPduo compressor frame size C, D, E, G

(oil separator installed vertically)

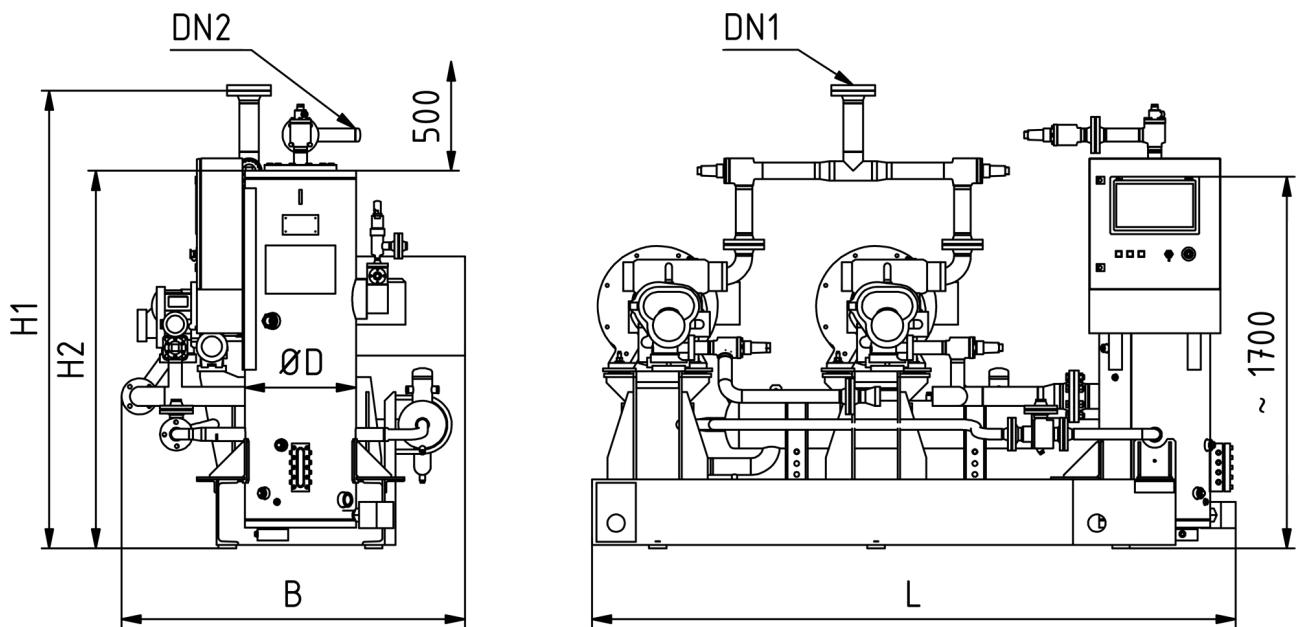


Fig.33: GEA Grasso SPduo compressor frame size C, D, E, G

Technical specifications											
GEA Grasso Compre- ssor	Nominal motor power (kW)	\varnothing D (mm)	Oil charging quantity (l)	Dimensions (mm)				Nominal diameters	Weight without motor (kg)		
				L	H1	H2	B				
C	22...75	508 610	120-145	3600	2280 2350	1900 1960	1500 1650	80-100	40-65	2250 2400	
D	22...90				1550 1750		1600 1800			2250 2450	
E	30...132	508 610		3600	2360 2430		1600 1800	100-125	40-80	2400 2650	
G	45...132				1950 2050		1950 2050			2550 2850	

L _{Motor} (mm) for standard motors IP23 and IP55, design IMB3 (with stand)										
Capacity (kW)	22	30	37	45	55	75	90	110	132	160
L _{motor IP23}	577	586	624	671	709	747	823		935	
L _{motor IP55}	664		767		856		965	1071		1244

Technical data

Dimensions, weights, fill quantities and connections

5.1.15 GEA Grasso SPduo compressor, frame size H, L

(oil separator installed vertically)

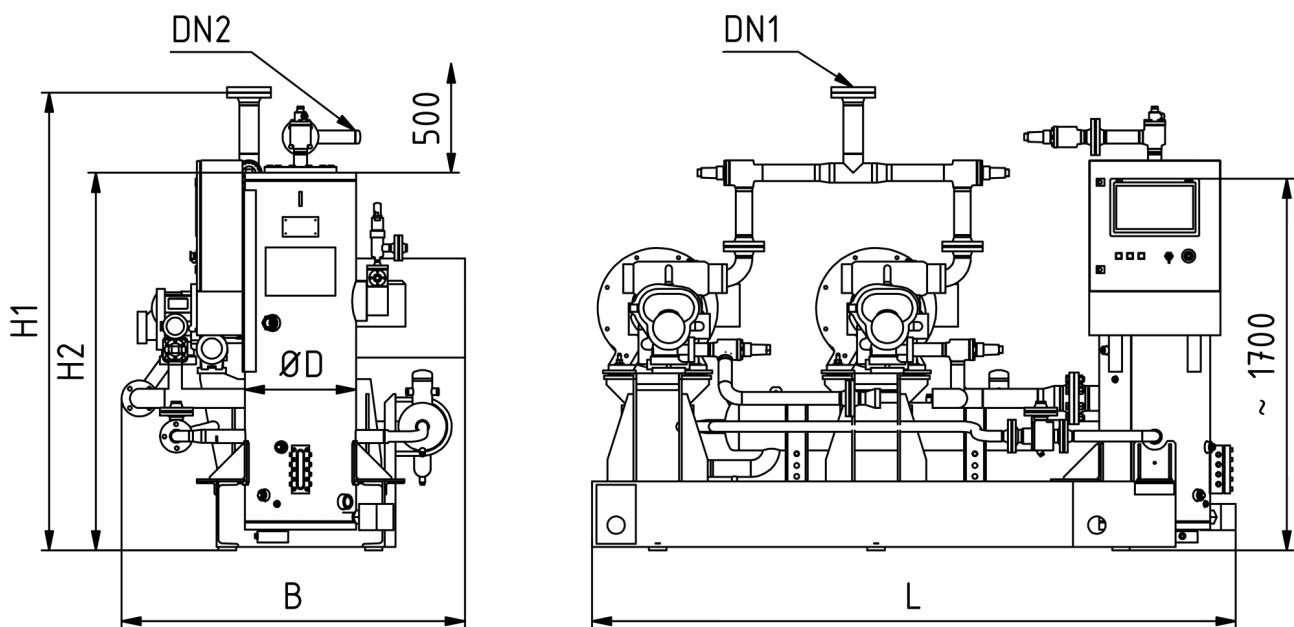


Fig.34: GEA Grasso SPduo compressor, frame size H, L

Technical specifications								
GEA Grasso Compre- ssor	Nominal motor power 2x (kW)	\varnothing D (mm)	Oil charging quantity (l)	Dimensions (mm)			Nominal diameters	Weight without motor (kg)
				L	H1	H2		
H	37...160	508	120-180	2550	2430	1900	2250	3900 4100
		610	160-210	2600	2500	1960		
L	45...160	508	120-180	2550	2430	1900	80-150 40-125	3900 4100 4250
		610	160-210	2600	2500	1960		
		711	200-260	2650	2560	2010		

L _{Motor} (mm) for standard motors IP23 and IP55, design IMB3 (with stand)										
Capacity (kW)	37	45	55	75	90	110	132	160	200	250
L _{motor IP23}	624	671	709	747	823			935		1151
L _{motor IP55}	767	856	965		1071			1244		1353

5.1.16 GEA Grasso SPduo compressor, frame size M, N

(oil separator installed vertically)

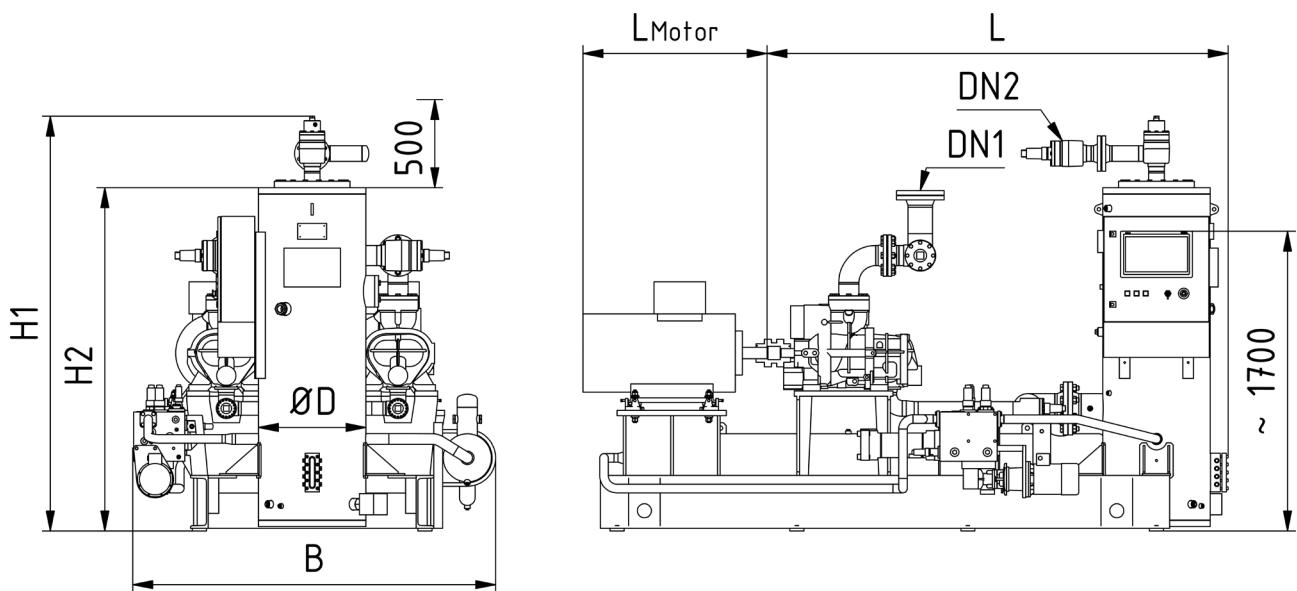


Fig.35: GEA Grasso SPduo compressor, frame size M, N

Technical specifications									
GEA Grasso Compre- ssor	Nominal motor power 2x (kW)	\varnothing D (mm)	Oil charging quantity (l)	Dimensions (mm)				Nominal diameters	Weight without motor (kg)
				L	H1	H2	B		
M	55...200	508	130-190	2550	2460	1900	2350	100-200	5250 5400 5550
		610	170-220	2600	2530	1960			
		711	210-270	2650	2590	2010			
N	55...250	508	130-190	2550	2460	1900	2350	40-150	5250 5400 5550 5850
		610	170-220	2600	2530	1960			
		711	210-270	2650	2590	2010			
		813	270-315	2700	2600	2010			

L_Motor (mm) for standard motors IP23 and IP55, design IMB3 (with stand)										
Capacity (kW)	37	45	55	75	90	110	132	160	200	250
L_motor IP23	624	671	709	747	823		935		1151	
L_motor IP55	767	856	965		1071		1244		1353	

Technical data

Dimensions, weights, fill quantities and connections

5.1.17 GEA Grasso SPduo compressor frame size P, R, S, T, (oil separator installed vertically)

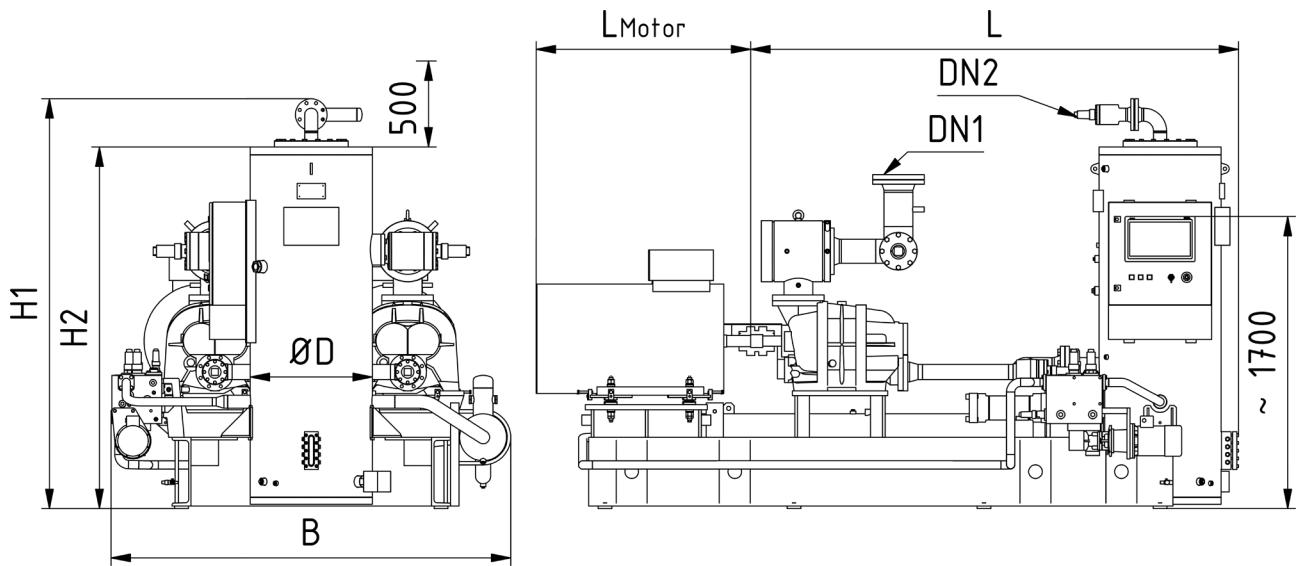


Fig.36: GEA Grasso SPduo compressor frame size P, R, S, T,

Technical specifications									
GEA Grasso Compre- ssor	Nominal motor power 2x (kW)	\varnothing D (mm)	Oil charging quantity (l)	Dimensions (mm)				Nominal diameters	Weight without motor (kg)
				L	B	H1	H2		
P	55...250								5450 5600 6200
R	75...355	610 711 813	120-190 170-230 220-280	2550 2600 2650	2370	2100 2150 2190	1960 2010 2010		5900 6050 6700
S								125-200	40-150
T	90...400	610 711 813 914	120-190 170-230 220-280 260-340	2550 2600 2650 2700	2370 2370 2370 2600	2100 2150 2190 2290	1960 2010 2010 2010		5950 6100 6750
									6000 6150 6800 7000

L_{Motor} (mm) for standard motors IP23 and IP55, design IMB3 (with stand)												
Capacity (kW)	55	75	90	110	132	160	200	250	280	315	355	400
L_{motor} IP23	709	747	823			935			1151			1465
L_{motor} IP55	965		1071		1244		1353		1412			1607

5.1.18 GEA Grasso SPduo compressor frame size V, W, Y

(oil separator installed vertically)

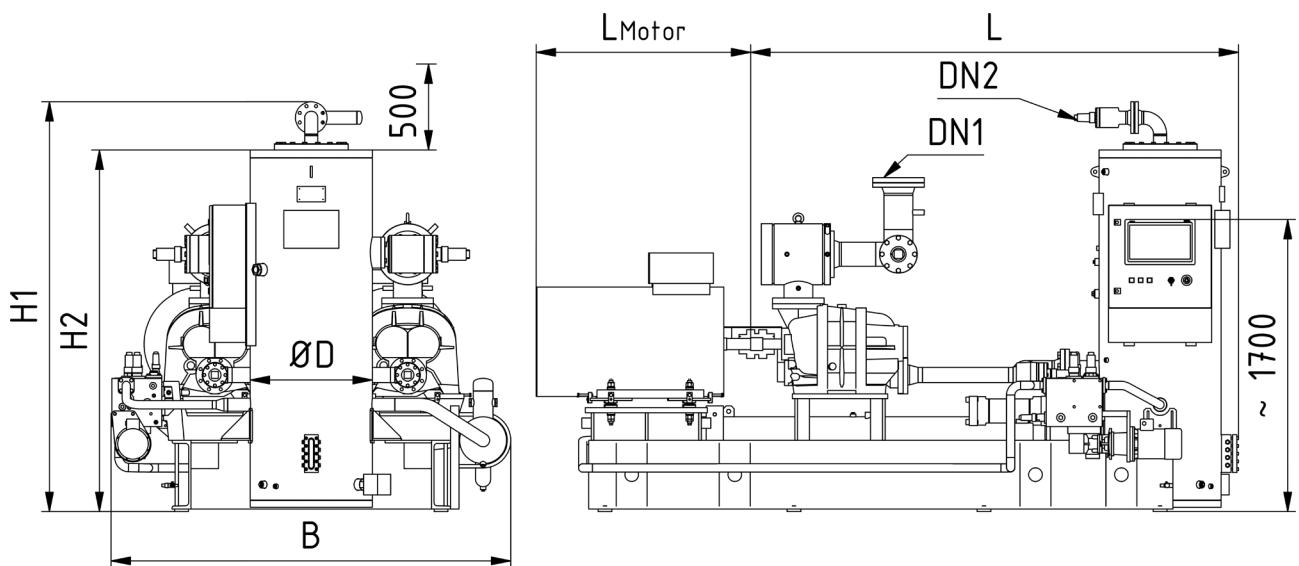


Fig.37: GEA Grasso SPduo compressor frame size V, W, Y

Technical specifications									
GEA Grasso Compre- ssor	Nominal capacity Motor 2x (kW)	$\varnothing D$ (mm)	Oil charging quantity (l)	Dimensions (mm)				Nominal diameters	Weight without motor (kg)
				L	H1	H2	B		
V	110...550	813	250-310	3000	2190	2010	2750	150-300	7550 7800 8250 9350
W		914 1016	290-350 330-410	3100 3650	2290 2850	2010 2200	2750 2900		
Y	132...630	1200	390-470	3800	2975	2200	2900		

L _{Motor} (mm) for standard motors IP23 and IP55, design IMB3 (with stand)													
Capacity (kW)	110	132	160	200	250	280	315	355	400	450	500	560	630
L _{motor IP23}	823	935			1151				1465				1650
L _{motor IP55}	1071	1244			1353		1412		1607		2075	2240	

5.2 Operation limits

The screw compressors can be operated under the specified operating conditions within the given operation limits. The listed operation limits of the screw compressors ensure trouble-free and reliable operation of the screw compressors for a long period of time. The values apply to the application as a refrigerant package.

The manufacturer reserves the right to certain restrictions or extensions of the operation limits for specific applications. Special constructive designs are possible.

Notice

Comply with the operation limits.

- For specific operations the selection and evaluation will take place within the manufacturer's compressor selection programme.
- For applications with CO₂ refrigerant, sudden load changes can have a negative impact on the tribological properties (lubricity) of the oil and refrigerant mixture. To reduce any possible effects, the condensate pressure change must be limited to maximum 1 bar every 10 seconds.



Warning!

A "zero flow" of the compressor can cause damage to the compressor.

- To avoid damage, the minimum control slide position must be considered during ongoing operation. This must be secured by the control of the compressor.

Permissible minimum and maximum values for compressor packages				
Parameter ²⁶				
Maximum permissible pressure	p	bar g.	max.	28
Pressure ratio p / p ₀	π	-	min.	1.5
Pressure difference p - p ₀ (t ₀ < 11 °C)	Δp	bar	min.	0.8
Pressure difference p - p ₀ (t ₀ > 11 °C)	Δp	bar	min.	3.5
Suction temperature (compressor inlet)	t _{0h}	°C	min.	- 60
Discharge temperature (compressor outlet)	t _e	°C	max.	+105
Condensing temperature	t _c	°C	max.	+57

26 The values apply for standard applications with ammonia (NH₃). Changes with regard to the application are possible. The GEA Grasso SP1 HP series is designed for a maximum operating pressure of 52 bar (g.p.). Temperatures vary for NH₃ heat pumps and CO₂ applications.

Parameter ²⁶				
Oil temperature	t_{oil}	°C	min.	+30
			max.	+80
End temperature - Condensing temperature $t_e - t_c$	Δt	K	min.	10^{27}
Discharge temperature - oil temperature $t_d - t_{oil}$	Δt	K	min.	4
Oil temperature - cooling medium temperature $t_{Oil} - t_{Coolant}$	Δt	K	min.	5
Ambient temperature	t_u	°C	min.	+5
			max.	+40
Relative ambient humidity ²⁸	f	%	max.	95

Driving power and speed performance GEA Grasso SP1, M, SP2 and GEA Grasso SPduo series				
Screw compressor Frame size	C, D, E, G	H, L, M, N	P, R, S, T	V, W, Y
max. Drive power ²⁹ at 2950 rpm	150 kW	300 kW	530 kW	1250 kW
3550 rpm	180 kW	360 kW	640 kW	1500 kW
max. Nominal torque	500 Nm	960 Nm	1700 Nm	4000 Nm
max. Permissible speed ³⁰	4500 rpm	4500 rpm	3600 rpm	3600 rpm
min. Permissible speed	1000 rpm	1000 rpm	1500 rpm	1500 rpm
Screw compressor Frame size	Z, XA	XB, XC, XD	XE, XF	XG, XH
max. Driving power at at 2950 rpm	1250 kW	1800 kW	3000 kW	3472 kW
at 3550 rpm	1500 kW	2160 kW	3600 kW	4193 kW
max. Nominal torque	4000 Nm	5750 Nm	9500 Nm	11278 Nm
max. Permissible speed	3600 rpm	3600 rpm	3600 rpm	3600 rpm
min. Permissible speed	1500 rpm	1500 rpm	1500 rpm	1500 rpm

The electric drive motors can be operated directly from the mains as well as via a frequency inverter.

For compressor packages with compressors of frame size C to N, an external oil pump must be provided, in case the pressure difference between suction and discharge side does not ensure a sufficient oil supply. In general, the pressure difference must be higher than 4 bar.

A variable internal volume ration is not available for booster applications.

Refrigerant injection into the compressor as an oil cooling option is approved for R717 only.

For all other oil cooling options, the oil temperature for R717 should be at least 5 K below the discharge temperature (10 K for freons).

27 With regard to application, lower values up to 5 K are also possible

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

29 With the variant GEA Grasso SP1 HP with screw compressor as 52 bar version, higher drive powers may occur.

30 For the GEA Grasso SP1 HP packages with screw compressor as 52 bar version, we recommend a general speed limit of 3600 rpm.

Note the manufacturer's oil recommendations when selecting the oil. Considering the solubility of the oils, the oil viscosity should be between 7 und 70 cSt at the oil supply ports of the bearings.

Should the given limits not be adhered to in individual cases, the manufacturer needs to be consulted.

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/m ³
General hardness, for stabilization	GH	< 20	°d
Carbonate hardness without hardness stabilizer	KH	< 4	°d
Chloride	Cl	< 150	g/m ³
Sulphur	SO ₄	< 325	g/m ³
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

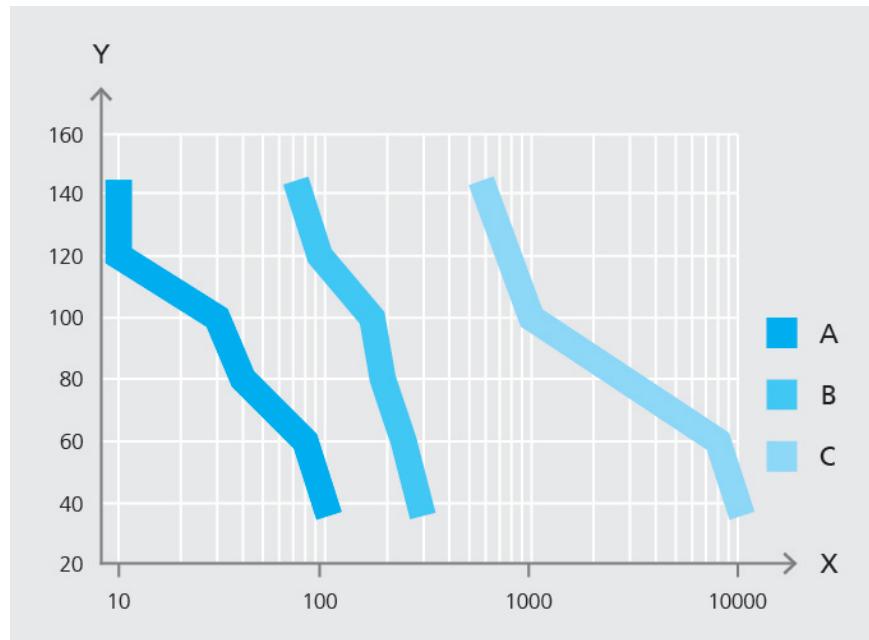


Fig.38: Corrosion resistance in presence of chlorides

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

Notice

The output of a product depends on different parameters, for example:

- The temperature regime
- The compressor speed
- The contact person at GEA Refrigeration Germany GmbH will be pleased to prepare a technical offer.

5.5 Information on noise emissions

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

The data have a tolerance of ± 3 dB

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

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

Noise protection measures such as motor encapsulation e.g. complete package encapsulation can achieve a considerable noise reduction.

Wearing hearing protection with sufficient noise reduction is recommended in rooms with running compressor packages.

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).

Hint: The individual emission data for the motor-compressor combinations can be found in the tables and added using logarithms for compressor package and chillers (DuoPack version) as well as two-stage compressor packages.

Technical data

Information on noise emissions

Sound power level L_{WA} at compressor frame size C to M							
Compressor drive motor at 40 °C P_e in kW		Compressor frame size/theoretical swept volume in m³/h at 2940 rpm L_{WA} in dB(A) mains operation 400 V / 50 Hz					
		C 231	D 265	E 321	G 372	H 471	L 544
22	Max	91	91	91			
	Min	84	84	84			
30	Max	92	92	92	92		
	Min	85	85	85	85		
37	Max	93	93	93	93	93	
	Min	86	86	86	86	86	
45	Max	94	94	94	94	94	94
	Min	87	87	87	87	87	87
55	Max	95	95	95	95	95	95
	Min	88	88	88	88	88	88
75	Max	96	96	96	96	96	96
	Min	89	89	89	89	89	89
90	Max	97	97	97	97	97	97
	Min	90	90	90	90	90	90
110	Max		98	98	98	98	98
	Min		91	91	91	91	91
132	Max			98	99	99	99
	Min			92	92	92	92
160	Max					100	100
	Min					93	93
200	Max						101
	Min						94

Sound power level L_{WA} at compressor frame size N to W							
Compressor drive motor at 40 °C P_e in kW		Compressor frame size/theoretical swept volume in m³/h at 2940 rpm L_{WA} in dB(A) mains operation 400 V / 50 Hz					
		P 805	N 870	R 1040	S 1290	T 1460	V 1640
55	Max	95	95				
	Min	88	88				
75	Max	96	96	96			
	Min	89	89	89			
90	Max	97	97	97	97		
	Min	90	90	90	90		
110	Max	98	98	98	98	98	98
	Min	91	91	91	91	91	91
132	Max	99	99	99	99	99	99
	Min	92	92	92	92	92	92
160	Max	100	100	100	100	100	100
	Min	93	93	93	93	93	93
200	Max	101	101	101	101	101	101
	Min	94	94	94	94	94	94
250	Max	102	102	102	102	102	102
	Min	95	95	95	95	95	95
315	Max			103	103	103	103
	Min			96	96	96	96
400	Max			104	104	104	104
	Min			97	97	97	97
450	Max				104	104	104
	Min				98	98	98
500	Max					105	105
	Min					98	98
560	Max					105	105
	Min					99	99
630	Max						105
	Min						99

Technical data

Information on noise emissions

Sound power level L_{WA} at compressor frame size Y to XC					
Compressor drive motor at 40 °C P_e in kW		Compressor frame size/theoretical swept volume in m³/h at 2940 rpm L_{WA} in dB(A) mains operation 400 V / 50 Hz			
		Y 2296	Z 2748	XA 3250	XB 4150
132	Max	99			
	Min	92			
160	Max	100	100		
	Min	93	93		
200	Max	101	101	101	
	Min	94	94	94	
250	Max	102	102	102	103
	Min	95	95	95	100
315	Max	103	103	103	104
	Min	96	96	96	100
400	Max	104	104	104	104
	Min	97	97	97	100
450	Max	104	104	104	104
	Min	98	98	98	100
500	Max	105	105	105	105
	Min	98	98	99	100
560	Max	105	105	105	105
	Min	99	99	100	100
630	Max	105	105	105	106
	Min	99	99	99	100
710	Max		105	106	106
	Min		99	99	100
800	Max		106	106	106
	Min		99	99	100
900	Max				107
	Min				100
1000	Max				107
	Min				100

Sound power level L_{WA} at compressor frame size XD to XH						
Compressor drive motor at 40 °C P_e in kW		Compressor frame size/theoretical swept volume in m³/h at 2940 rpm L_{WA} in dB(A) mains operation 400 V / 50 Hz				
		XD 5800	XE 7170	XF 8560	XG 9807	XH 11467
315	Max	105				
	Min	101				
400	Max	105	105	105		
	Min	101	102	102		
450	Max	105	105	105	106	106
	Min	101	102	102	103	103
500	Max	105	105	105	106	106
	Min	101	102	102	103	103
560	Max	105	105	105	106	106
	Min	101	102	102	103	103
630	Max	106	106	106	107	107
	Min	101	102	102	103	103
710	Max	106	106	106	107	107
	Min	101	102	102	103	103
800	Max	106	106	106	107	107
	Min	101	102	102	103	103
900	Max	107	107	107	107	107
	Min	101	102	102	104	104
1000	Max	107	107	107	108	108
	Min	101	102	102	104	104

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.

Locations:

GEA Refrigeration Germany GmbH

Werk Berlin

Holzhauser Str. 165

13509 Berlin, Germany

Tel.: +49 30 43592-600

Fax: +49 30 43592-777

Web:www.gea.com

E-Mail: refrigeration@gea.com

GEA Refrigeration Germany GmbH

Werk Halle

Berliner Straße 130

06258 Schkopau/ OT Döllnitz, Germany

Tel.: +49 345 78 236 - 0

Fax: +49 345 78 236 - 14

Web:www.gea.com

E-Mail: refrigeration@gea.com



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GEA Germany

GEA Refrigeration Germany GmbH

Holzhauser Strasse 165
13509 Berlin, Germany

Tel +49 (0)30 435 92 600
Fax +49 (0)30 435 92 777

www.gea.com/contact
www.gea.com