Screw Compressor Package

GEA Grasso M, SP1, SP2 and SPduo

Product Information (Translation from the original language)

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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 time form a handling sequence that should be completed in the prescribed order. The handling sequence can be divided into individual steps.

Handling sequence

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

The subsequent handling sequence is the expected result:

→ Result of the handling sequence.

Individual handling steps

Individual handling steps are marked thus:

- Individual work steps

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1 Description

1.1 General information

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 m^3/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 m^3/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 m^3/h.
  - GEA Grasso SP1 HP version:

    The high pressure package variant for the application with refrigerant CO_2 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 m^3/h (packages with CO_2 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 GEA Grasso SPduo series of screw compressor packages is offered to divide the capacity range to two compressors for energy-optimised partial load operation and as an alternative solution for two screw compressor packages, for cost- and space-saving, with two identical compressors.

Overview: GEA Grasso M

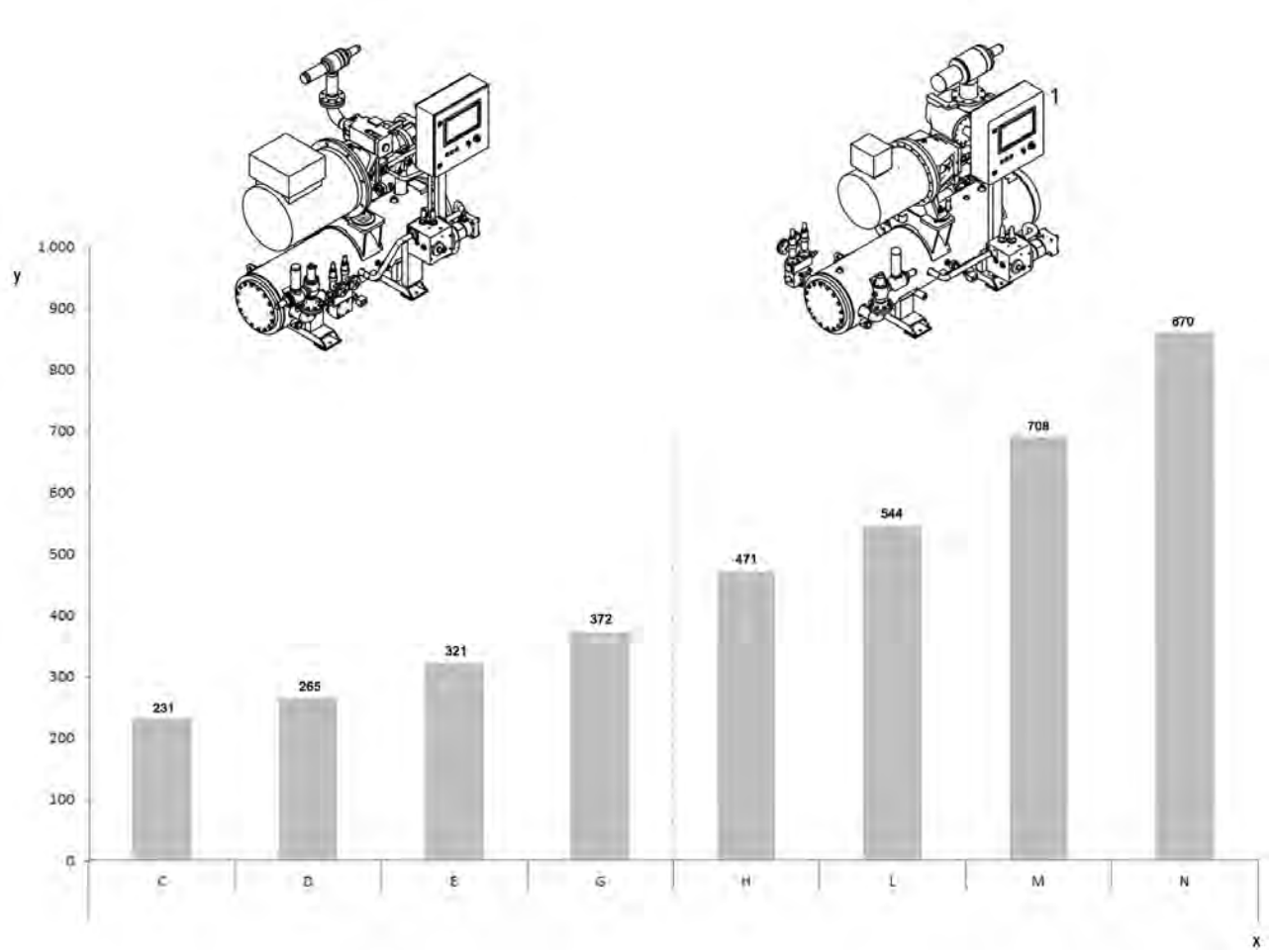


Fig.1: Types of GEA Grasso M

y	Swept volume in m³/h at 2940 rpm
x	Compressor frame size
1	Oil separator (installed horizontally)

Overview: GEA Grasso SP1 [1]

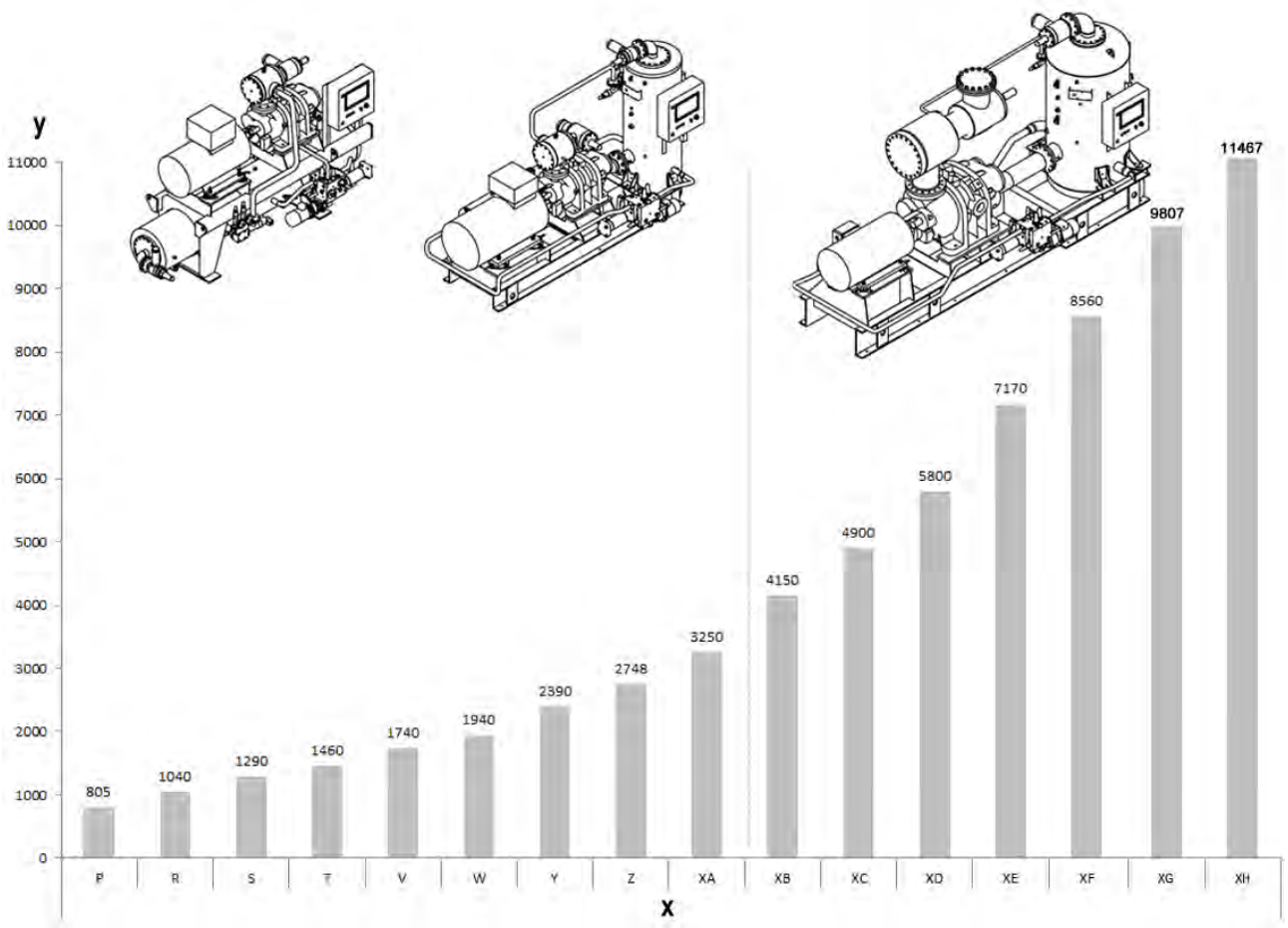


Fig.2: Types of GEA Grasso SP1

y	Swept volume in m³/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 (CO_2 to XA).

Overview: GEA Grasso SP2

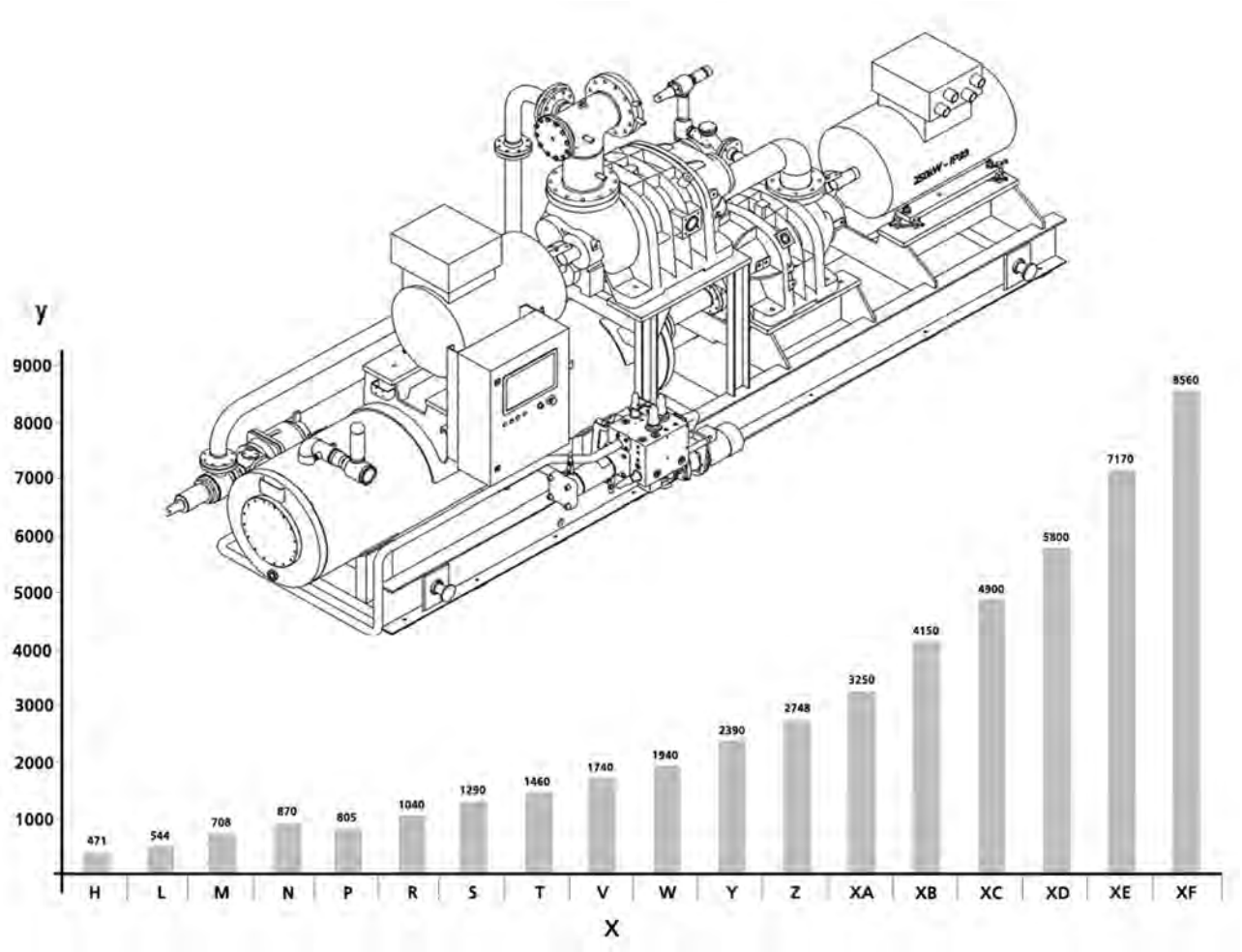


Fig.3: Types of GEA Grasso SP2

y	Swept volume in m³/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.

Overview: GEA Grasso SPduo

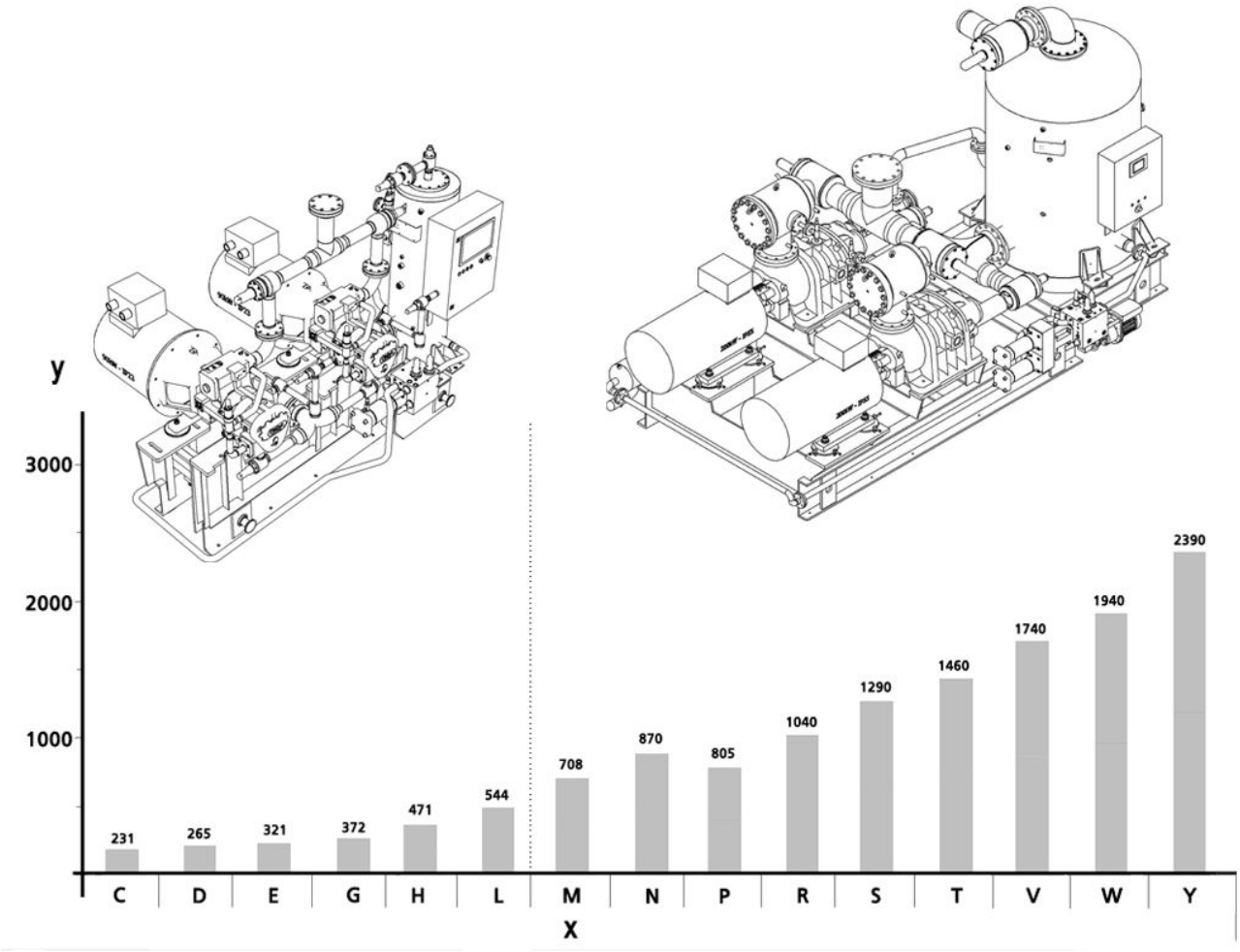


Fig.4: Types of GEA Grasso SPduo

y	Swept volume in m³/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. The specifications for the swept volume relate to one compressor and must be doubled 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	
Designation	**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 heaer:	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

Standard equipment	
Designation	**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

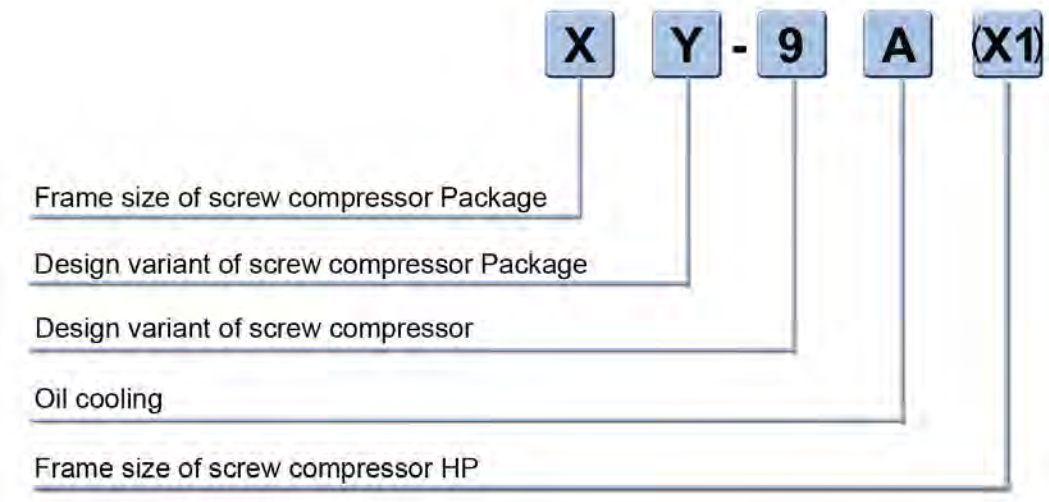
Optional equipment	
Designation	**Design** [4]
Intended environment:	Outdoor installation on request
Installation altitude:	> 1000 m above sea level on request
Electric motor:	supplied/installed by customer
Motor current converter:	can be supplied
Economizer:	can be supplied Design only with Economizer suction line
Oil separator:	additional oil separator
Oil cooling:	2nd oil cooler for heat recovery
Oil heaer:	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

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) *The LP screw compressor will be provided for the screw compressor packages in the GEO Grasso SP2 series (two-stage).*
Y	Design types of the screw compressor package
9	Screw compressor design types
A	Oil cooling
(X1)	Screw compressor frame size high pressure side *Only for screw compressor packages in the GEA Grasso SP2 series (two-stage).*

X / (X1) Screw compressor package frame size [5]

Code	Theoretical Volume flow at 2940 rpm in m³/h [5]		Code	Theoretical Volume flow at 2940 rpm in m³/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 volumetric flows specified always relate to the rotor size of the compressor. In certain application cases and under certain operating conditions, compressors with shortened rotors may be used so that the theoretical volumetric flow may not be derived from the frame size of the screw compressor package (compressor housing size)! The size of the rotors can be obtained from the precise compressor description in the technical specification.

Code	Theoretical Volume flow at 2940 rpm in m³/h [5]		Code	Theoretical Volume flow at 2940 rpm in m³/h [5]
N	870		**XD**	5800
P	805		**XE**	7170
R	1040		**XF**	8560
S	1290		**XG**	9807
T	1460		**XH**	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

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 **(XA)**, 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

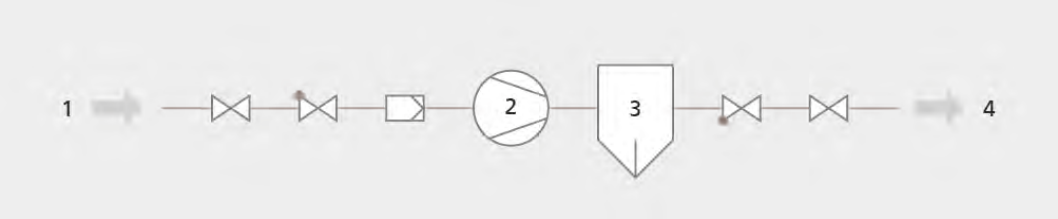


Fig.5: Process flow diagram GEA Grasso SP1, GEA Grasso M

1	Suction side
2	Compressor
3	Oil separator
4	Discharge side

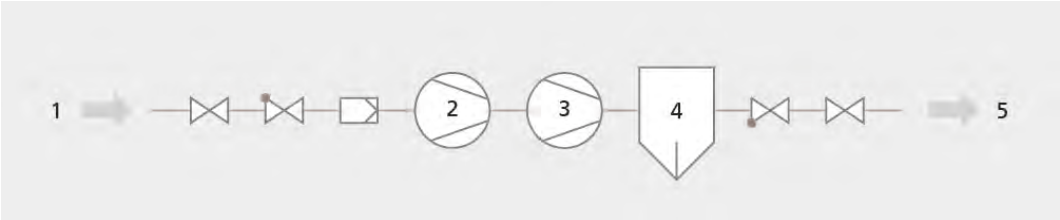


Fig.6: Process flow diagram GEA Grasso SP2

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

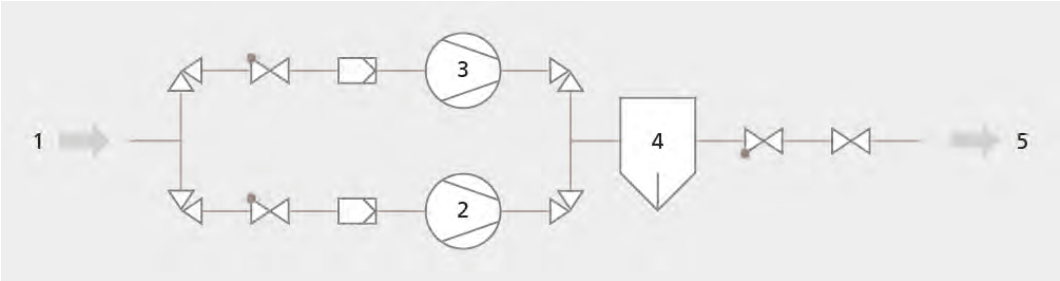


Fig.7: Process flow diagram GEA Grasso SPduo

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 %.

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 compressors are 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 compressors are operated with ammonia (NH_3) as the refrigerant. For the refrigerant, refrigerator oil is chosen in accordance with the lubricating oil information for screw compressors.

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

The screw compressors are driven directly by the compressor drive motor via a coupling.

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

3.2.2 Compressor drive motor

Standard: The compressors are driven via a coupling by means of an air-cooled 2-pole IP23 electric motor with an operating voltage of 400 V; 50 Hz.

Option: Other protection classes, operating voltages and frequencies as well as variable speed motors are available on request.

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

3.2.3 Coupling

The coupling helps in transmission of torque between compressor and compressor drive motor. The elastic 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

Several packages can be connected to an Economizer/inter-cooler in parallel.

► When doing so, each connection line must be provided with a pressure controller (constant/differential pressure controller) with automatic shut-off function.
► Schema as per Section 3.2.5.3, Page 33 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%.

3.2.5.2 Economizer - variants for single-stage screw compressor packages

Type A - Economizer port pipe

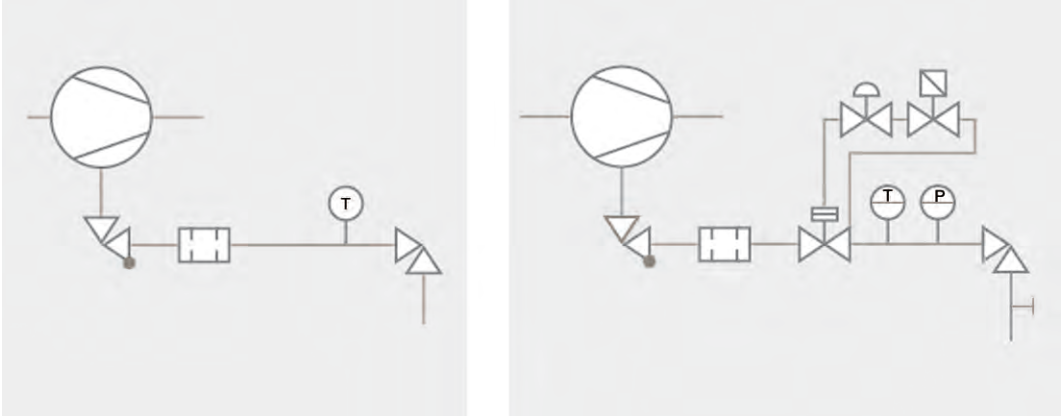


Fig.8: Economizer port pipe (basic design) / Economizer port pipe (with options)

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

Optional:

- Remote signalisation (pressure and temperature sensors), pressure controller (only with open flash Economizer), side load connection

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

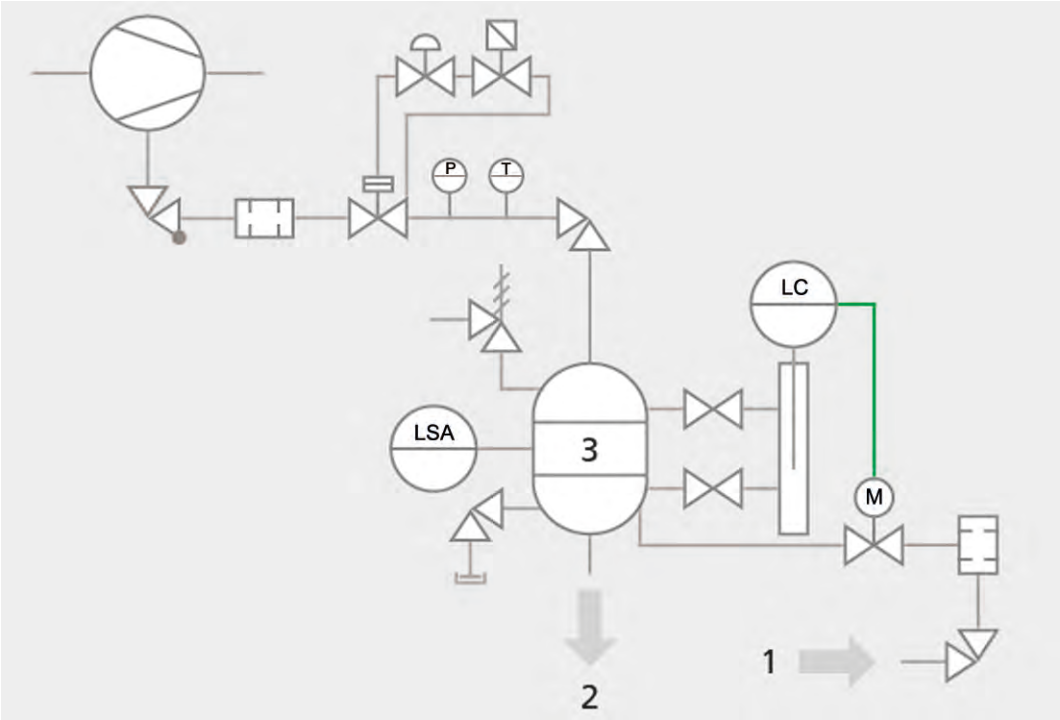


Fig.9: Economizer for two-stage pressure relief (open flash) with inlet control system

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 NH_3:

► 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 NH_3!

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

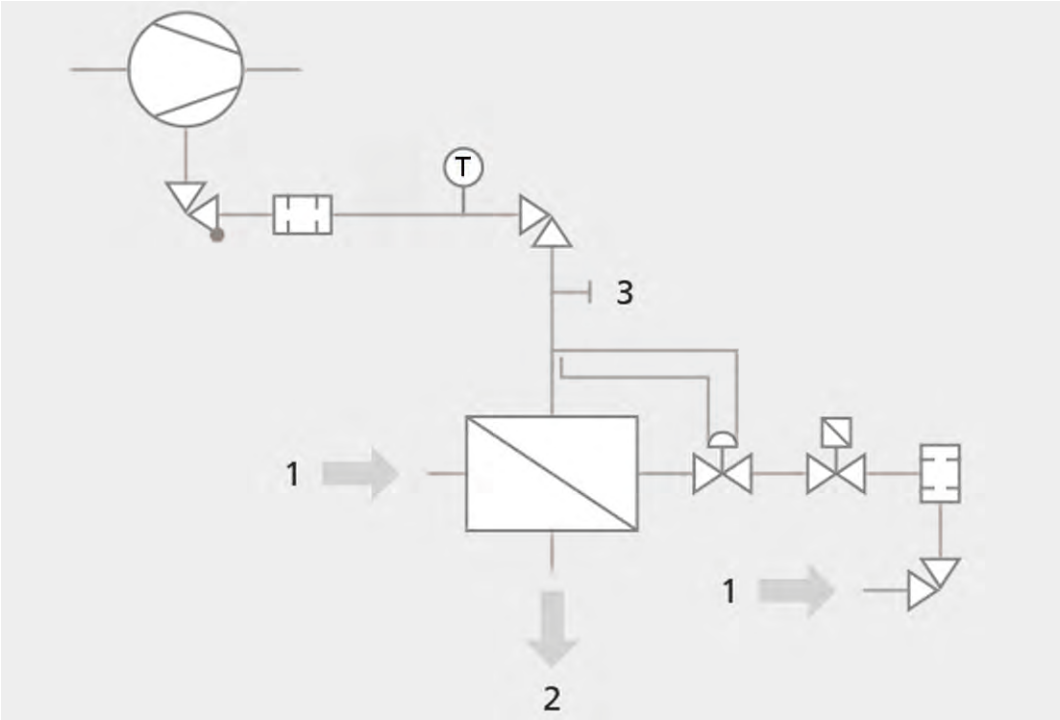


Fig.10: Economizer for single-stage pressure relief (closed flash) tube heat exchanger (shell and tube)

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

Scope of delivery:

- Suction line according type A
- 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 transducers with an automatic shut-off function must be installed in each Economizer line to the compressor.

3.2.5.3 Economizer - variants for DuoPack screw compressor packages

Type A - Duo Economizer port pipe

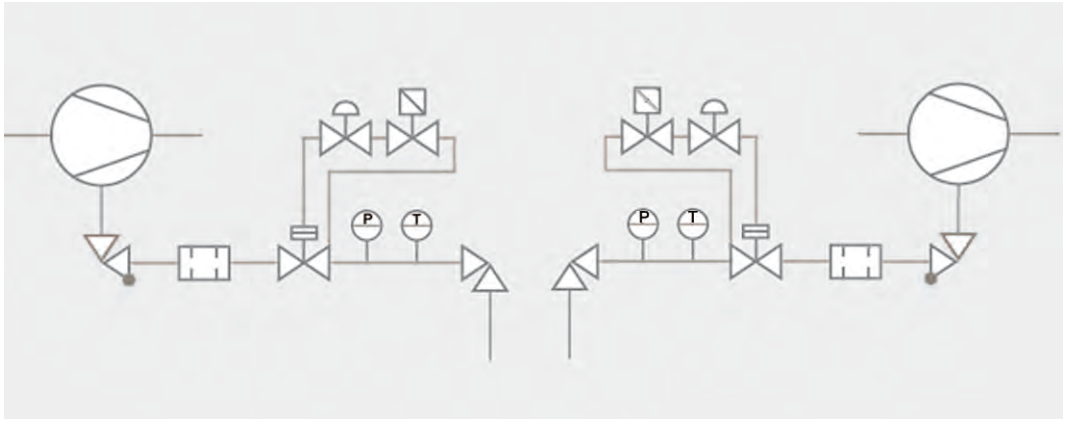


Fig.11: DuoPack Economizer port pipe

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]

Optional:

- Remote signalisation (pressure and temperature sensors) [9], side load connection [9]

9 designed in duplicate

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

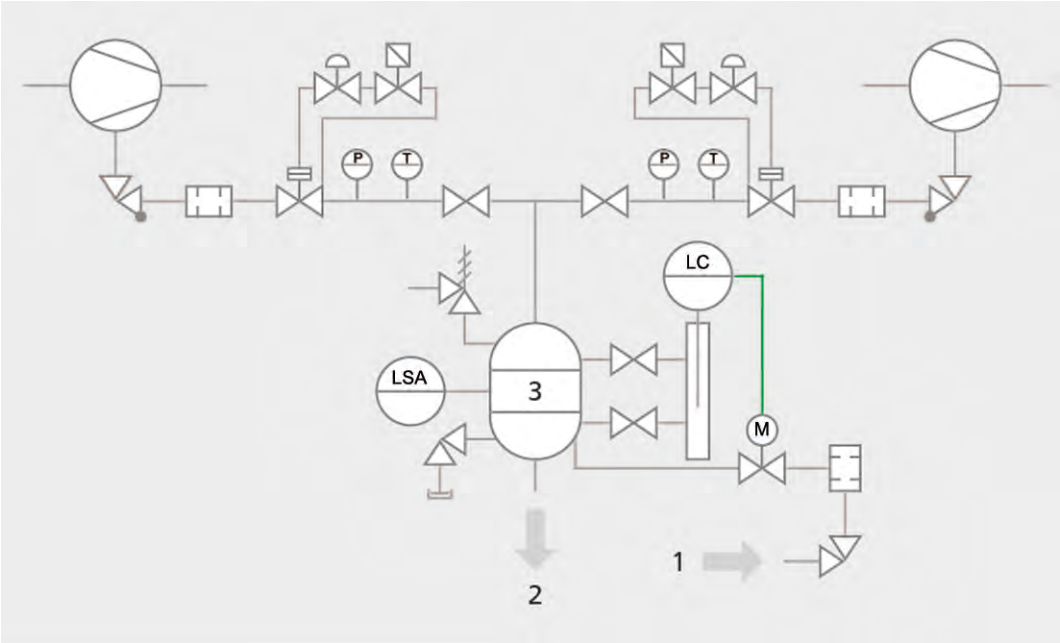


Fig.12: Economizer for two-stage pressure relief (open flash) with inlet control system

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 NH_3:

► 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 NH_3!

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

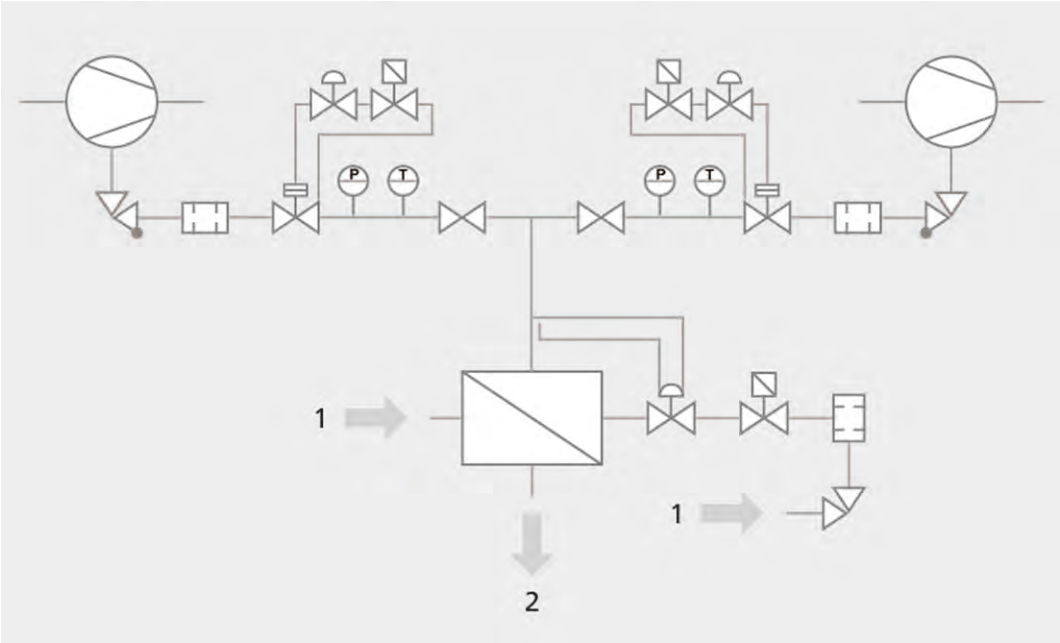


Fig.13: Economizer for single-stage pressure relief (closed flash) as tube heat exchanger (shell and tube)

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

Scope of delivery:

- Suction line according to type A - Duo
- Shell and tube Economizer (single circuit) installed on the screw compressor package
- Liquid line with thermostatic expansion valve, solenoid valve, filter, drain valve and stop valve

Notice

Due to lack of availability, dual-circuit (or more) shell and tube Economizers are not used in the standard design.

► The charging of two (or more packages) by means of a single-circuit tube heat exchanger always requires a pressure controller with automatic shut-off function in every suction line to the compressor!

3.2.5.4 Economizer variants for DuoPack screw compressor packages

Type A - two-stage inter-cooler connection line

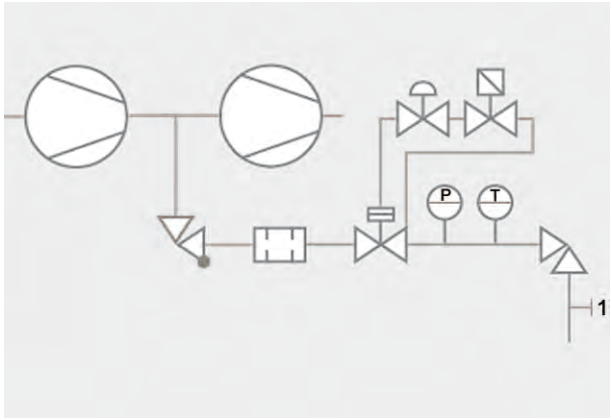


Fig.14: Inter-cooler connection line for two-stage packages (with options)

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

Optional:

- Remote signalisation (pressure and temperature sensors), pressure controller, side load connection

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

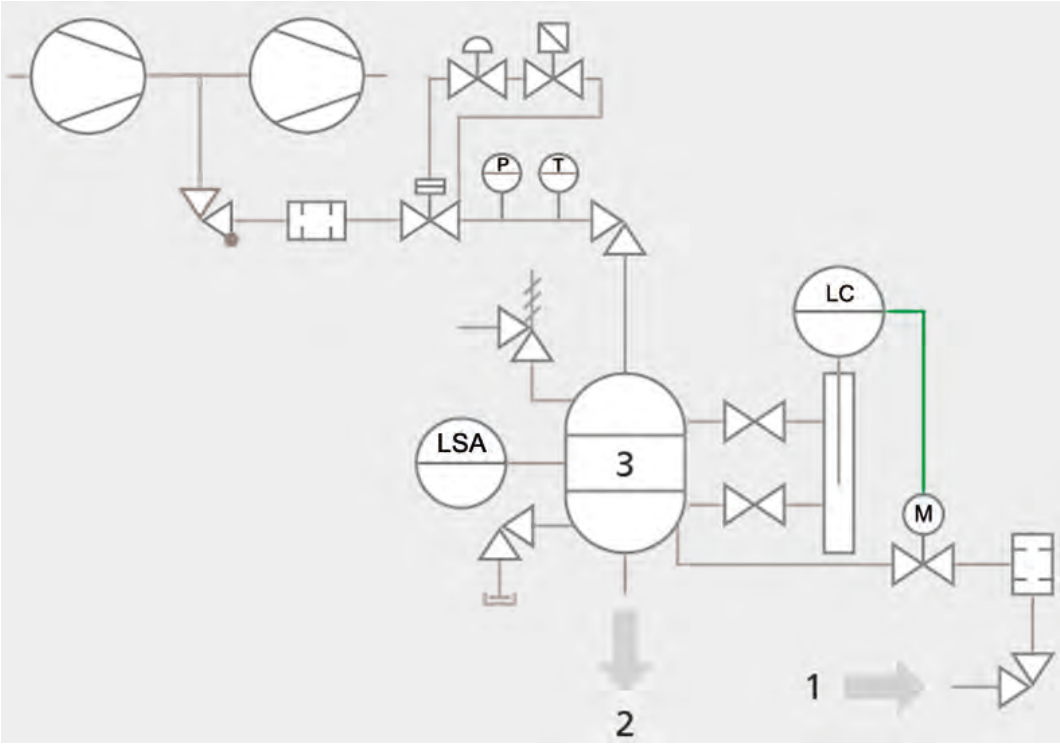


Fig.15: Inter-cooler for two-stage pressure relief (open flash) with inlet control system

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 NH_3:

► 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 NH_3!

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

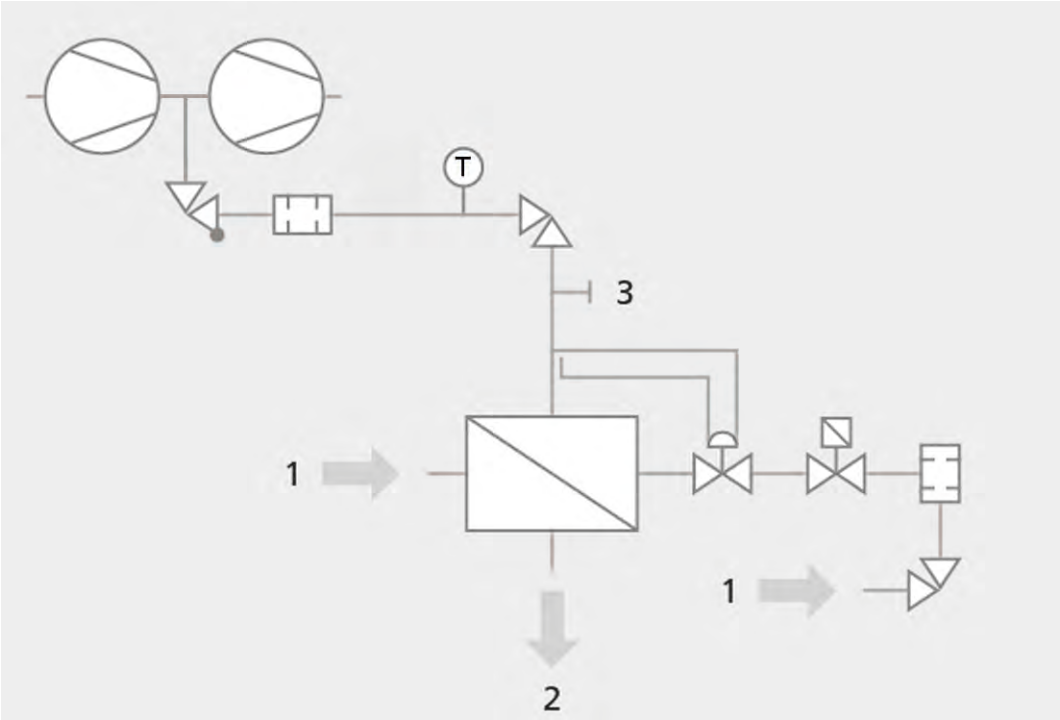


Fig.16: Inter-cooler for single-stage pressure relief (closed flash) tube heat exchanger (shell and tube)

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

Scope of delivery:

- Suction line according to type A - two stage
- 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 OMC (Oil Management Centre) - block with oil filter system

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 unit 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 (for ensuring a minimum oil temperature when starting the compressor).

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

3.2.7 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
- thermosysphon 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.

3.2.8 Oil filter

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. The filter has a relative filter fineness of 25 µm.

3.2.9 Oil pump

Oil pump (if present)

The oil pump runs for prelubrication and during the entire operation of the compressor.

It draws the refrigerating machine oil from the collection room 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.

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)

No additional pressure increase is necessary to supply the capacity control, bearings and the compression chamber with oil.

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.

3.2.10 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.

3.2.11 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.

3.2.12 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.

3.2.13 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 relief pressure is set to the maximum permissible operating pressure of the system and represents a hedge of the system in the absence of the safety valves on the oil separator.

The relief line has been dimensioned in accordance with EN 13136.

The electromechanical safety switching devices for pressure limiting comply with EN12263 and are type-approved. The settings meet 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. Therefore, before commissioning, the stipulations from the statutory operational safety regulations must be compared with those of EN 378-2.

The specified inspection intervals must be observed to ensure safe functioning of the safety devices pressure limiting. They can be found in the respective operational safety regulations.

3.2.14 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 cooling medium 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 • Motor feedback • Motor protection compressor • Oil pump feedback [10]	digital • Run compressor • Run oil pump [10]
analogue (4-20 mA) • Motor current compressor • Compressor motor speed	analogue (4-20 mA) • 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 • External On/Off • External "MORE" • External "LESS" • External motor start release • External reset • Changeover to 2nd setpoint • Compressor blocked	digital • Ready for external mode signal • Signal Compressor runs • Main failure • auxiliary output 1
analogue (4-20 mA) • external setpoint	analogue (4-20 mA) • Control slide or swept volume

Refrigeration plant - GEA Omni™	
from refrigeration plant to GEA Omni™ INPUTS	**from GEA Omni™ to refrigeration plant OUTPUTS**
digital • External EMERGENCY STOP • Separator level [12] • Eco level [12] • Gas sensor	digital: --
analogue (4-20 mA) --	analogue (4-20 mA) --

10 In case oil pump present
11 option, only for operation with frequency converter
12 option

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 • Discharge pressure safety switch • Oil level min. [12] • Oil level max. [12]	digital • 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) • 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) • Setpoint IntelliSOC injection valve

13 depending on the compressor type
14 depending on the compressor type and application

4.4 Option frequency inverter

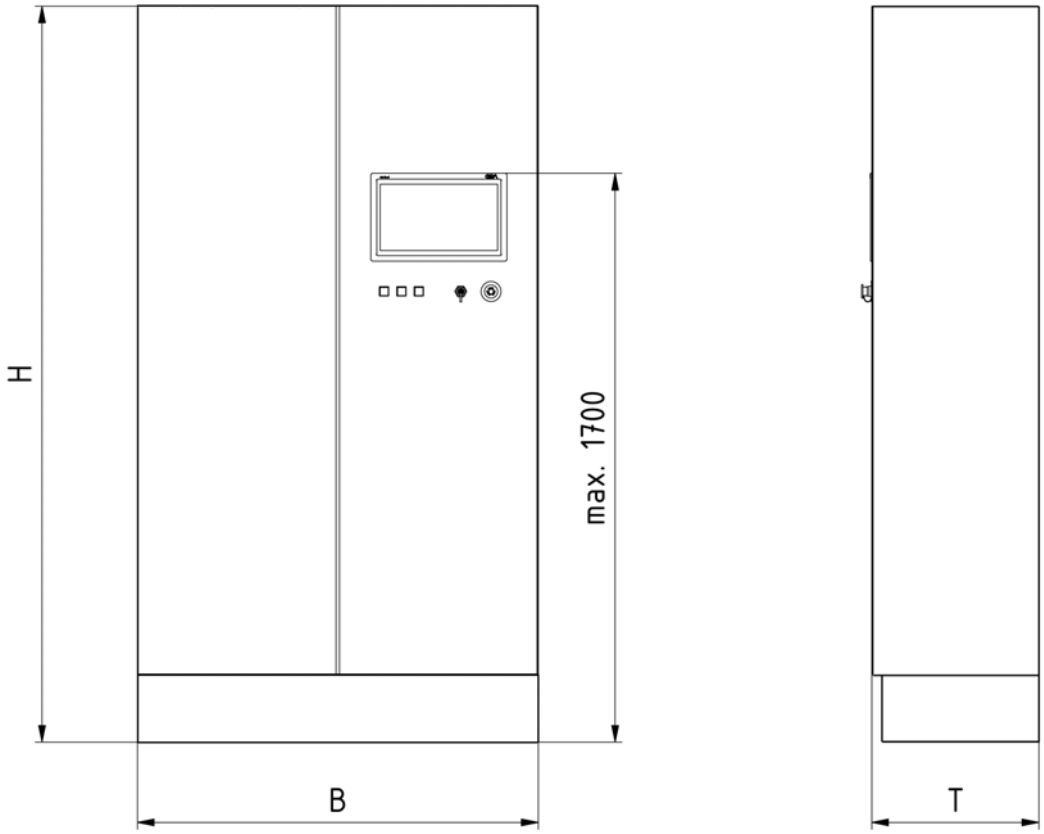


Fig.19: Power current panel and frequency inverter, view

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 y 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.

► 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 separator [16])

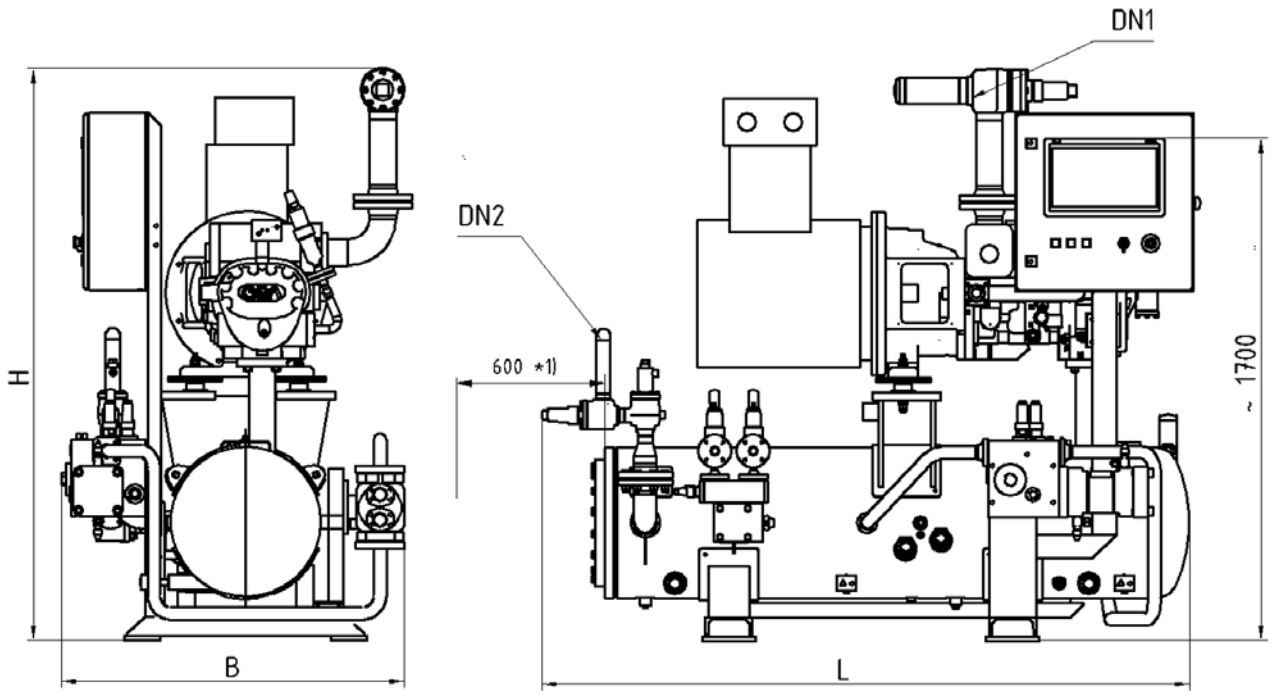


Fig.20: GEA Grasso M compressor frame size C, D, E, G

Technical specifications									
GEA Grasso Compressor	Nominal motor power (kW)	Oil separator Ø D (mm)	Oil charging quantity (l)	Dimensions (mm)			Nominal diameters		Weight without motor (kg)
				L	H	B	DN1	DN2	
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	65-125	40-65	1550
		610		2875	2075	1325			1750
G	45...132	508	110-150	2300	1975	1225		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.

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

(Horizontal oil separator [17])

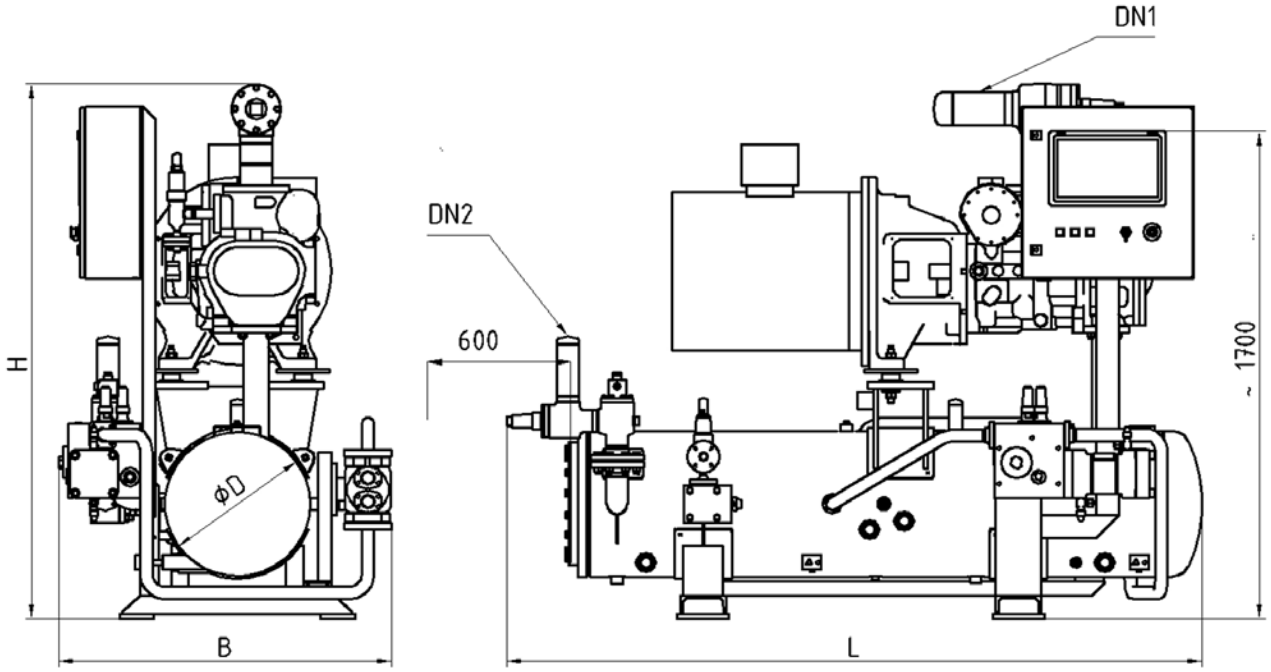


Fig.21: GEA Grasso M compressor, frame size H, L, M, N

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

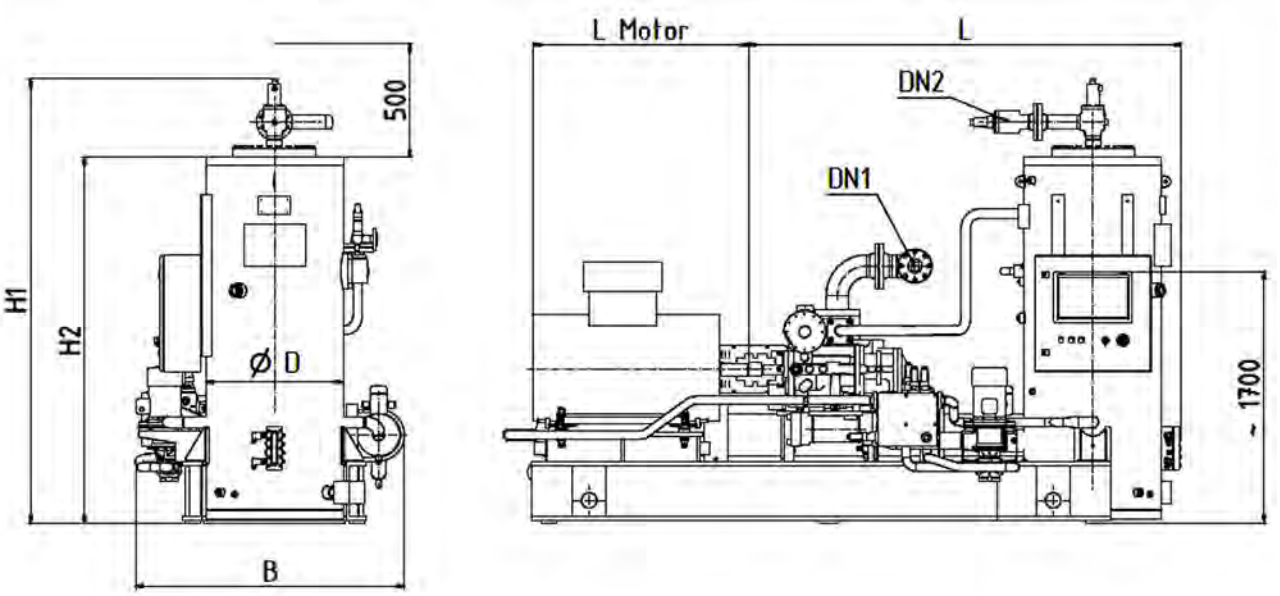


Fig.22: GEA Grasso SP1 HP compressor frame size E, G, H, L, M, N (oil circuit version depending on the application and operating conditions may differ from that represented)

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

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)

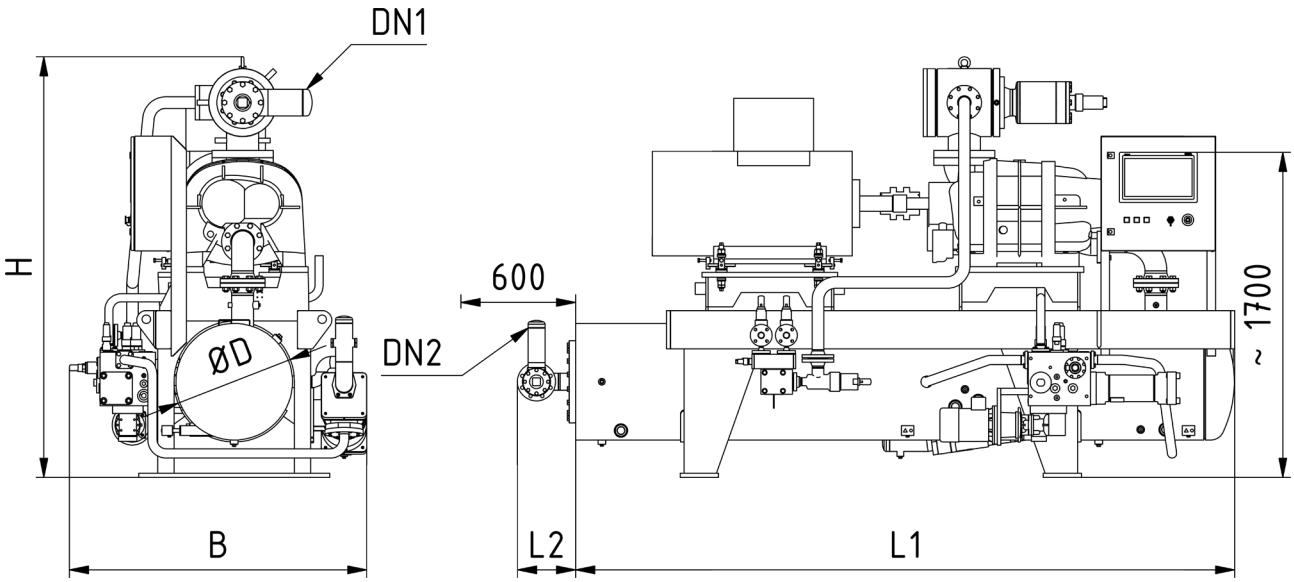


Fig.23: GEA Grasso SP1 compressor frame size P, R, S, T, V, W, Y

Technical specifications									
GEA Grasso Compres-sor	**Nominal capacity Motor (kW)**	**Ø 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 3765	2000 2100	1280 1380	100-250	40-125	2125 2225
R	75...355	508 610	140-180 180-200	3565 3765	2000 2100	1280 1380			2495 2575
S	90...400			3565 3765	2000 2100	1280 1380			2560 2650
T	90...400	508 610	150-220 220-290	3565 3765	2000 2100	1280 1380			2660 2750
V	110...550	508 610	160-240 220-270	3565 3765	2250 2350	1560 1660	150-300	50-200	3050 3350
W	110...630	508 610 711	190-270 250-310 290-350	3565 3765 3820	2250 2350 2500	1560 1660 1660			3100 3450 3800
Y	132...630	508 610 711	190-270 250-310 290-350	3565 3765 3820	2250 2350 2500	1560 1660 1660			3150 3500 3850

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

5.1.5 GEA Grasso SP1 compressor frame size Z, XA

(oil separator installed horizontally)

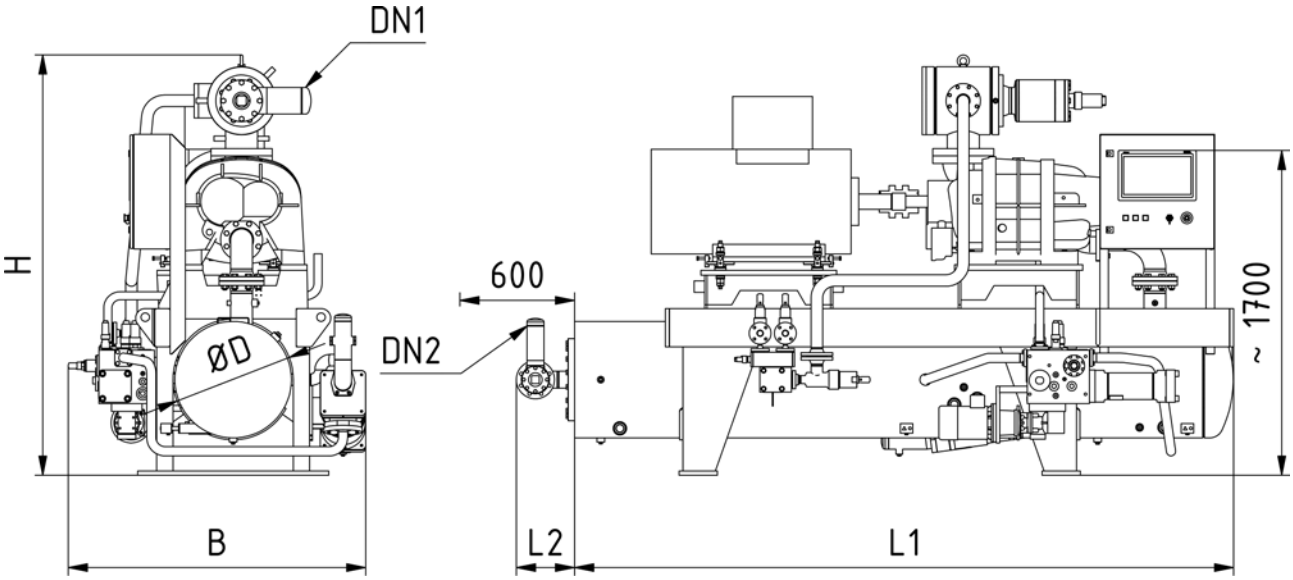


Fig.24: GEA Grasso SP1 compressor frame size Z, XA

Technical specifications									
GEA Grasso Compres-sor	**Nominal capacity Motor (kW)**	**Ø D (mm)**	**Oil charging quantity (l)**	**Dimensions (mm)**			**Nominal diameters**		**Weight without motor (kg)**
				L[19]	**H**	**B**	**DN1**	**DN2**	
Z	110... 750	610 711 813	270-350 310-390 340-420	3765 3820 4275	2550 2550 2800	1660 1660 1760	200-400	50-250	4350 4550 5000
XA	200... 900	610 711 813	270-350 310-390 340-420	3765 3820 4275	2550 2550 2800	1660 1660 1760			4450 4650 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)

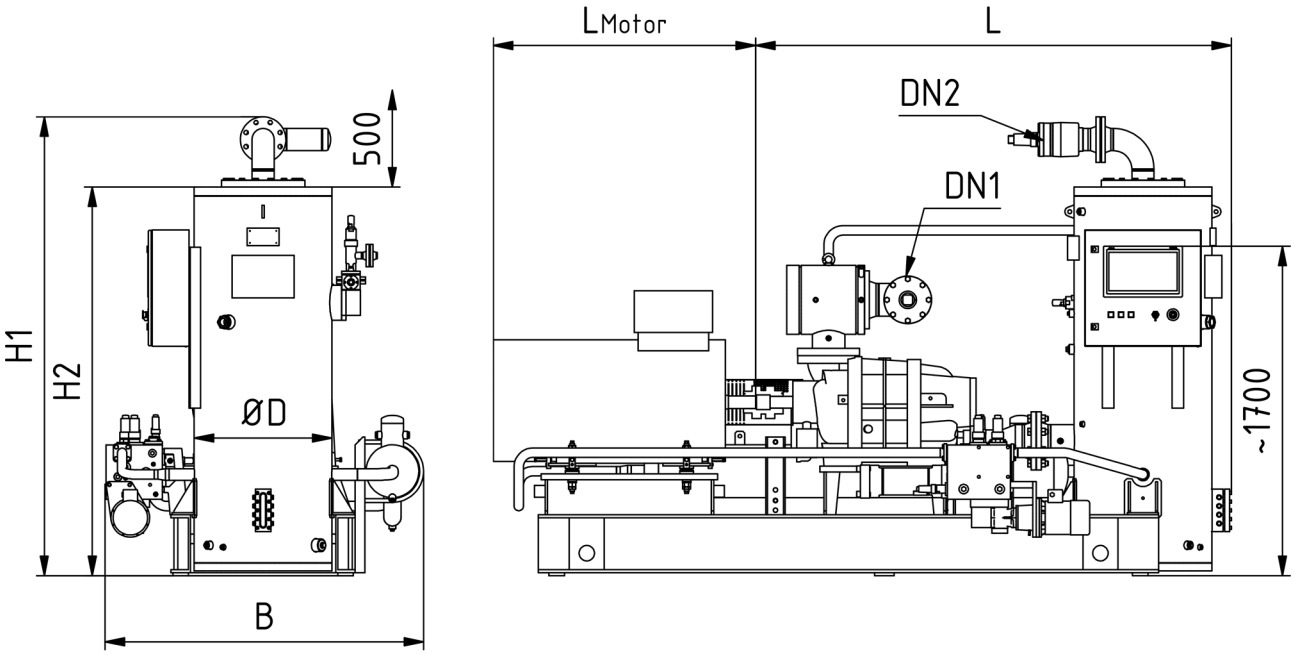


Fig.25: GEA Grasso SP1 compressor frame size P, R, S, T,

Technical specifications										
GEA Grasso Compressor	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	
P	55…710	508	110-190	2080	2050	1900	1400	100-200	40-125	2500
		610	180-220	2190	2100	1960	1450			2650
		711	190-270	2275	2010	1870	1475			2850
		813	210-315	2385	2090	1880	1600			3200
		914	250-360	2550	2290	2010	1800			3450
R		508	120-190	2350	2050	1900	1400			2750
		610	180-220	2400	2100	1960	1450			2900
		711	190-270	2450	2150	2010	1475			3050
		813	210-315	2385	2090	1880	1600			3400
		914	250-360	2550	2290	2010	1800			3650
S	90…800	508	130-190	2350	2050	1900	1400	100-250	40-150	2825
		610	180-220	2400	2100	1960	1450			2975
		711	190-270	2450	2150	2010	1475			3125
		813	210-315	2385	2090	1880	1650			3475
		914	250-360	2550	2290	2010	1800			3725
		1016	280-390	3200	2850	2200	1800			4050
T		508	130-190	2350	2050	1900	1400			2925
		610	180-220	2400	2100	1960	1450			3075
		711	190-270	2450	2150	2010	1475			3225
		813	210-315	2385	2090	1880	1650			3575
		914	250-360	2550	2290	2010	1800			3825
		1016	280-390	3200	2850	2200	1800			4150
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)	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)

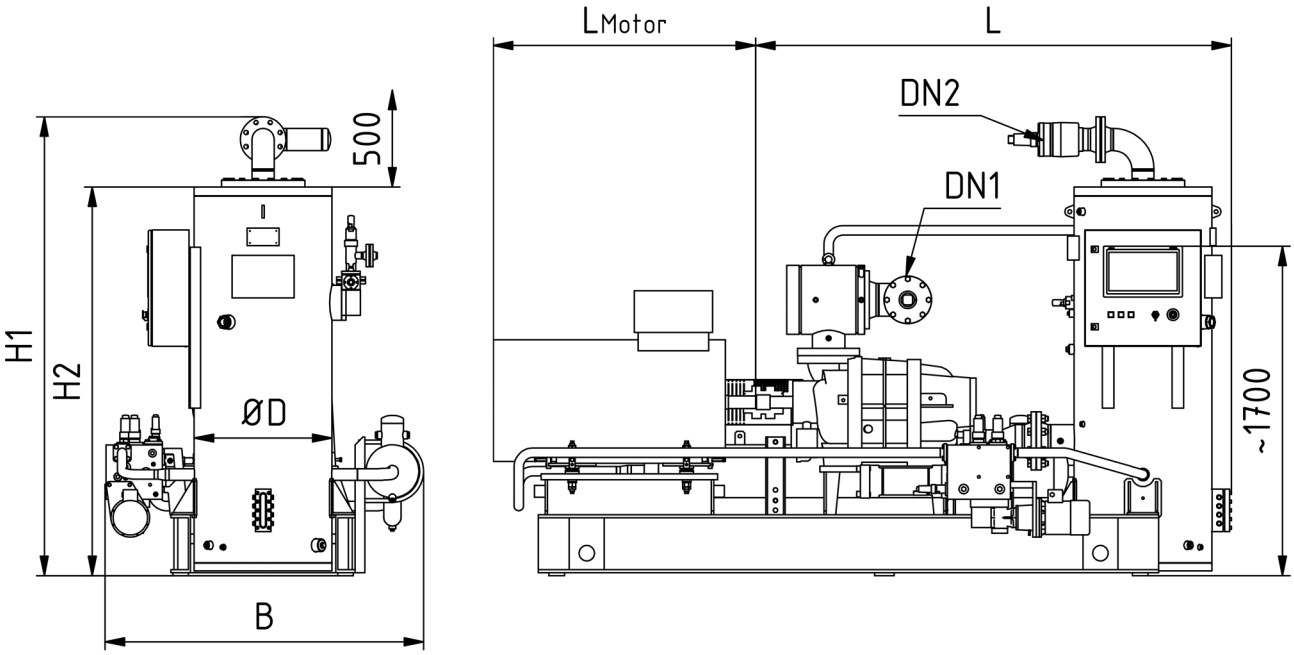


Fig.26: GEA Grasso SP1 compressor frame size V, W, Y

Technical specifications										
GEA Grasso Compressor	Nominal capacity Motor (kW)	Ø D (mm)	Oil charging quantity (l)	Dimensions (mm)				Nominal diameters		Weight without motor (kg)
				L	H1	H2	B	DN1	DN2	
V	110...1000	610	200-255	2550	2100	1960	1800	150-250	50-200	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	150-300		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			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

5.1.8 GEA Grasso SP1 and GEA Grasso SP1 HP compressor frame size Z, XA

(oil separator installed vertically)

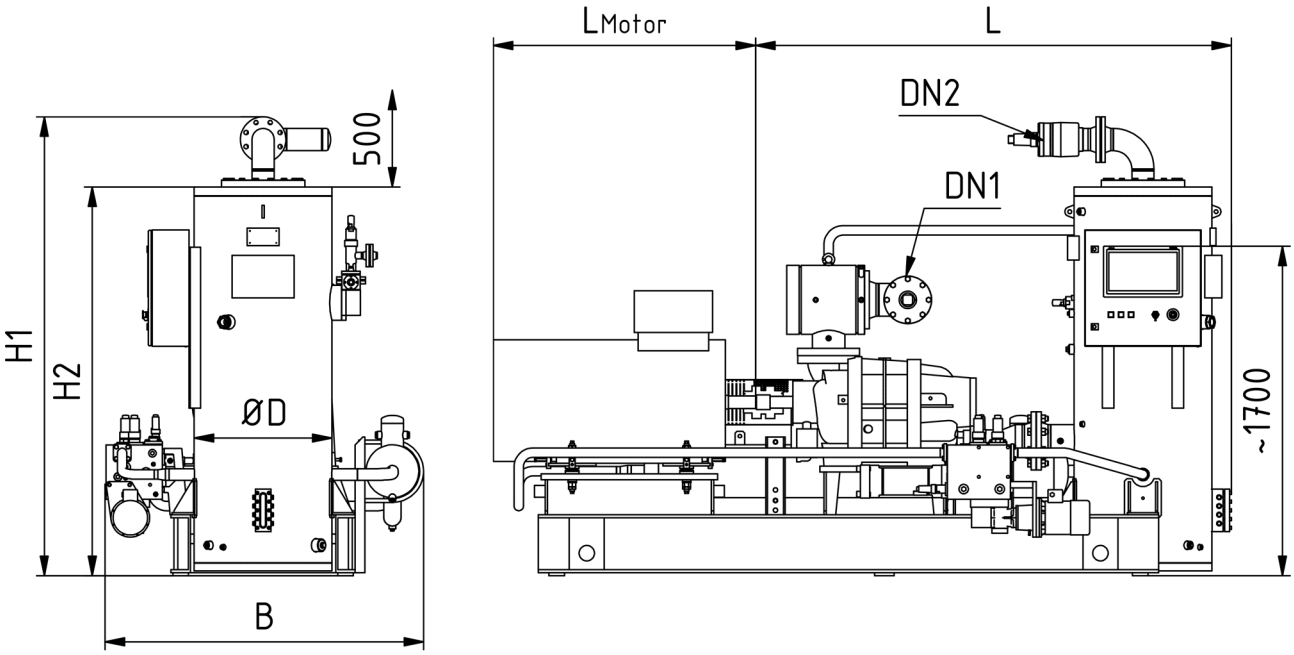


Fig.27: GEA Grasso SP1 compressor frame size Z, XA

Technical specifications										
GEA Grasso Compressor	Nominal motor power (kW)	Ø D (mm)	Oil charging quantity (l)	Dimensions (mm)				Nominal diameters		Weight without motor (kg)
				L	H1	H2	B	DN1	DN2	
Z	160...1200	813	265-340	2800	2190	2010	1800	200-400	50-250	4225
		914	310-385	3150	2290	2010	1800			4475
		1016	320-395	3800	2850	2200	1800			4800
		1200	350-500	4100	2975	2200	1820			5600
		1400	375-550	4300	3150	2300	1820			6200
XA	200...1500	813	275-350	2800	2190	2010	1800			4300
		914	310-385	3150	2290	2010	1800			4550
		1016	320-395	3800	2850	2200	1800			4875
		1200	350-500	4100	2975	2200	1820			5675
		1400	375-550	4300	3150	2300	1820			6275

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	2620 [20]	2375 [21]

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)

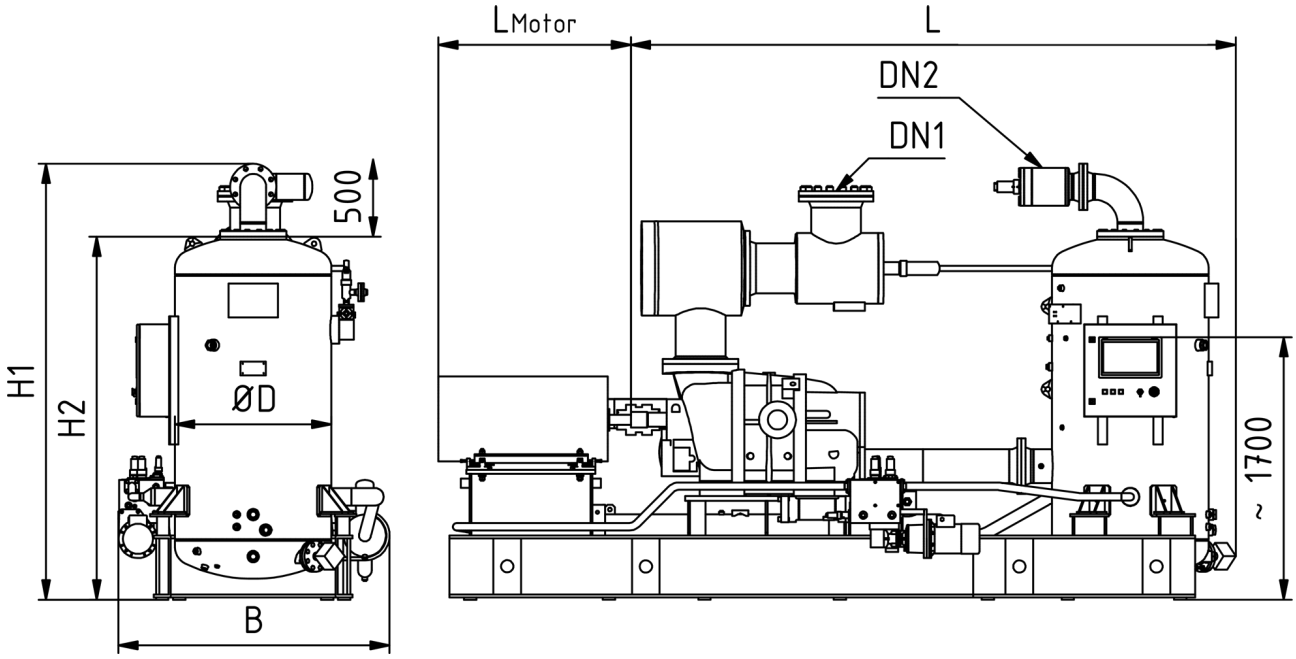


Fig.28: GEA Grasso SP1 compressor frame size XB, XC, XD, XE, XF

Technical specifications										
GEA Grasso Compressor	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	
XB	250...1800	813	285-410	3850	2675	2010	1820	250-500	65-300	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			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			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
		2000	610-1050	5250	3450	--	2020			12500
XE	400...3000	1016	360-595	4250	3150	2300	1820		80-350	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 specifications										
GEA Grasso Compres-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			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)

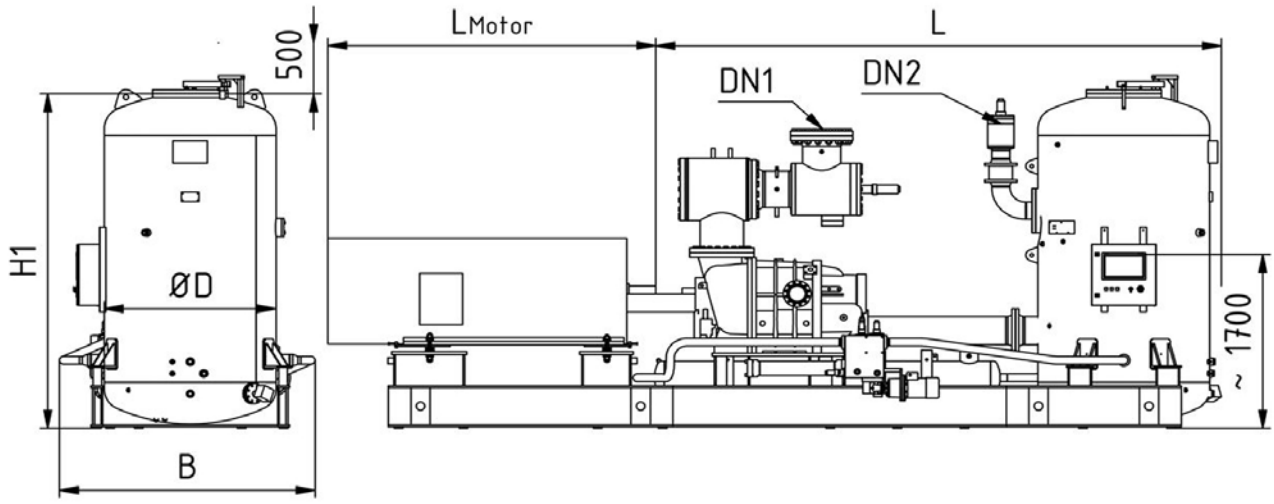


Fig.29: GEA Grasso SP1 compressor frame size XG, XH

Technical specifications										
GEA Grasso Compressor	Nominal capacity Motor (kW)	Ø D (mm)	Oil charging quantity (l)	Dimensions (mm)				Nominal diameters		Weight without motor (kg)
				L	H1	H2	B	DN1	DN2	
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)

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

(oil separator installed horizontally)

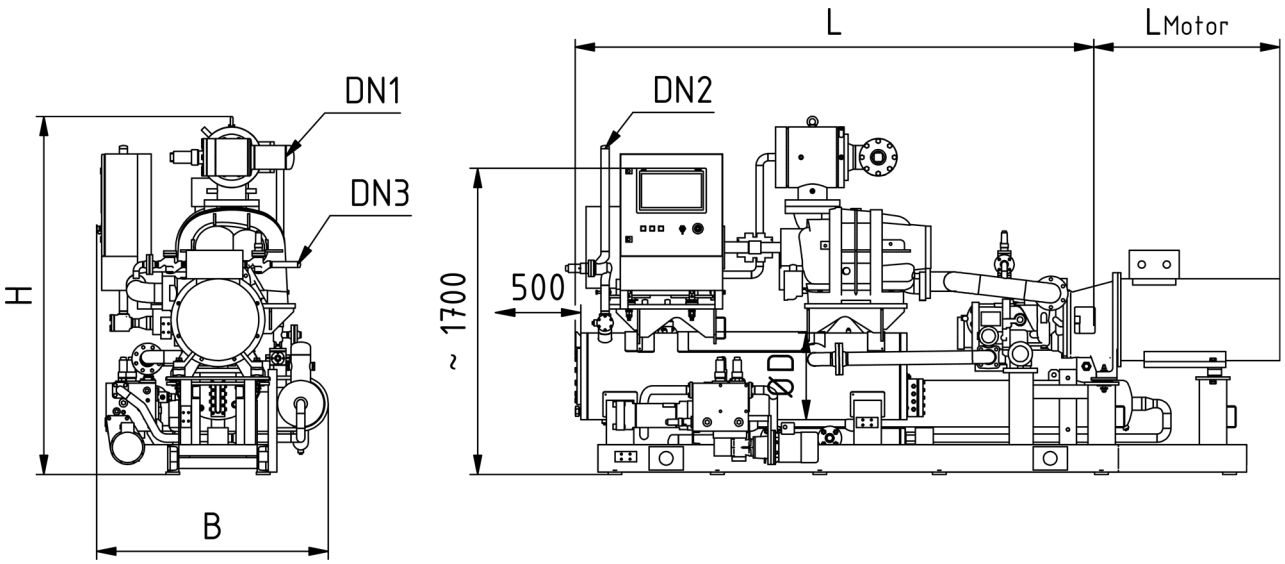


Fig.30: GEA Grasso SP2 compressor frame size (LP) H, L, M, N, P, R

Technical specifications											
GEA Grasso Compressor	Nominal motor power (kW)		Ø D (mm)	Oil charging quantity (l)	Dimensions (mm)			Nominal diameters			Weight without motor (kg)
	LP (kW)	HP (kW)			L	H	B	DN1	DN2	DN3	
H	37	37...75	508	150-190	2750	1970	1000	100-125	40-65	25-40	2300
L	45										2400
M	55...90	45...90			3050	2150	1100	100-150	50-65	30-50	3400
N	75...110	55...132									3600
P	55...90	45...90		180-210	2750	2150	1200	100-150			2900
R	75...110	55...132				2330					3100

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

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

(oil separator installed horizontally)

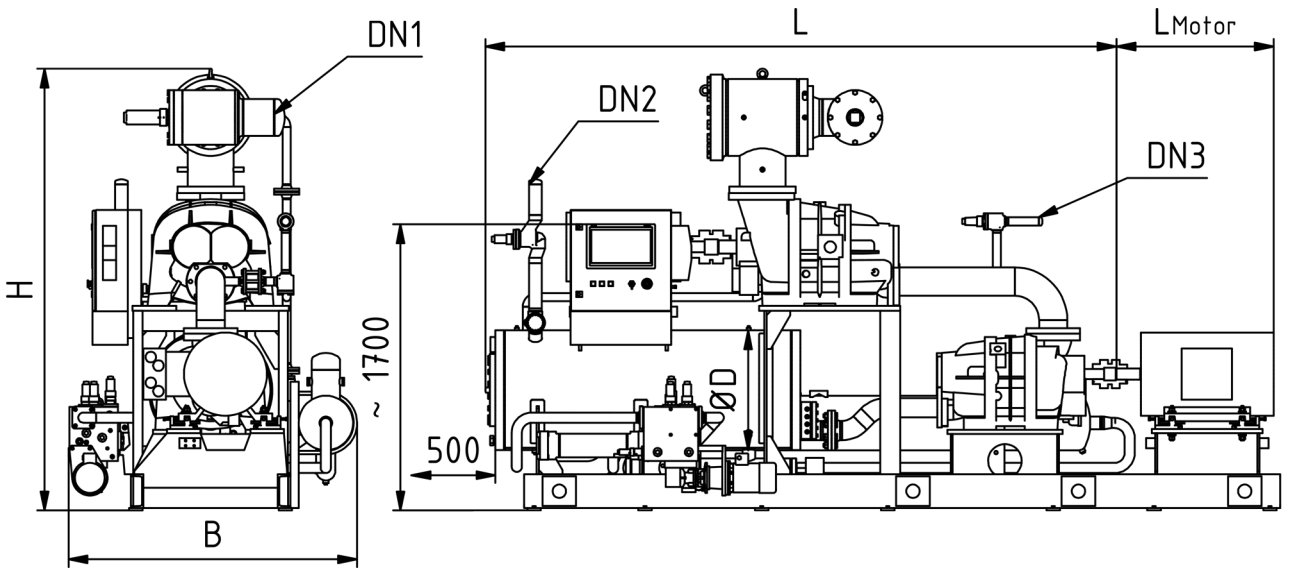


Fig.31: GEA Grasso SP2 compressor frame size (LP) S, T, V, W, Y, Z

Technical specifications											
GEA Grasso Compressor	Nominal motor power (kW)		Ø D (mm)	Oil charg-ing quantity (l)	Dimensions (mm)			Nominal diameters			Weight without motor (kg)
	LP (kW)	HP (kW)			L	H	B	DN1	DN2	DN3	
S	90...132	75...160	711	180-210	3580	2400	1200	125-200	50-80	40-65	3200
T	90...160										3350
V	110...160			180-250		2550	1480	150-300	65-100		3400
W	132...200	90...200		240-310							4000
Y	132...250	132...250								50-80	4200
Z	160...315			280-350							4400

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	

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

(oil separator installed vertically)

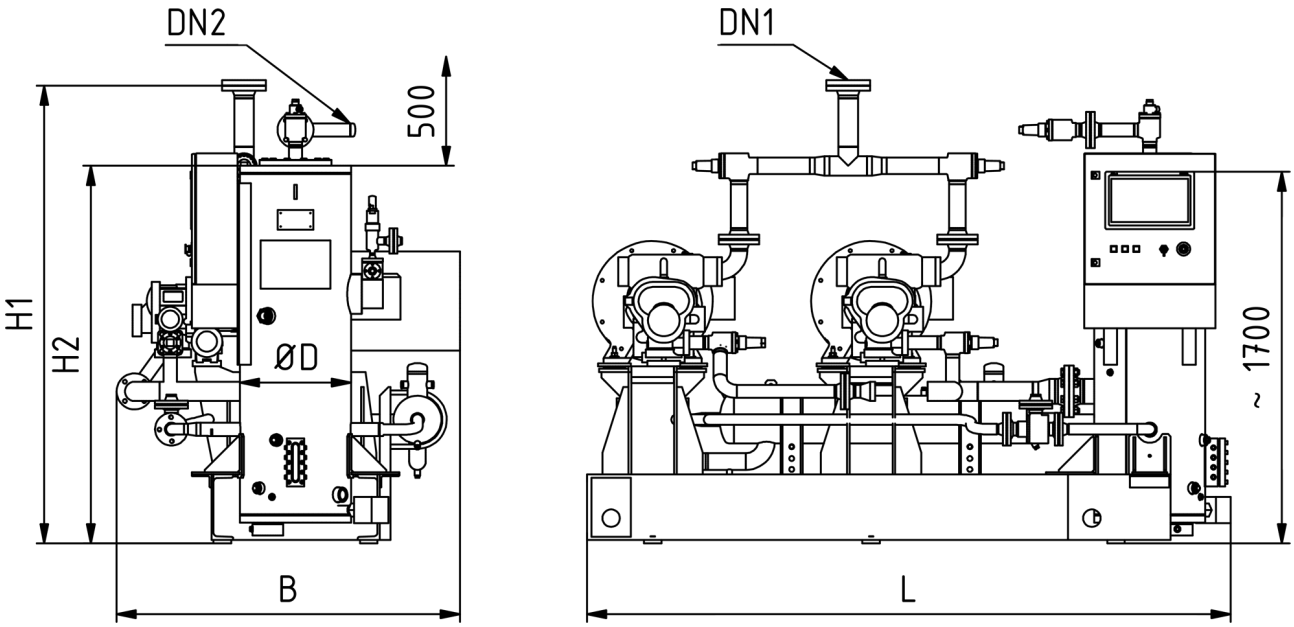


Fig.32: GEA Grasso SPduo compressor frame size C, D, E, G

Technical specifications										
GEA Grasso Compressor	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	
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			2250 2450
E	30...132	508 610			2360 2430		1600 1800	100-125	40-80	2400 2650
G	45...132						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	

5.1.14 GEA Grasso SPduo compressor, frame size H, L

(oil separator installed vertically)

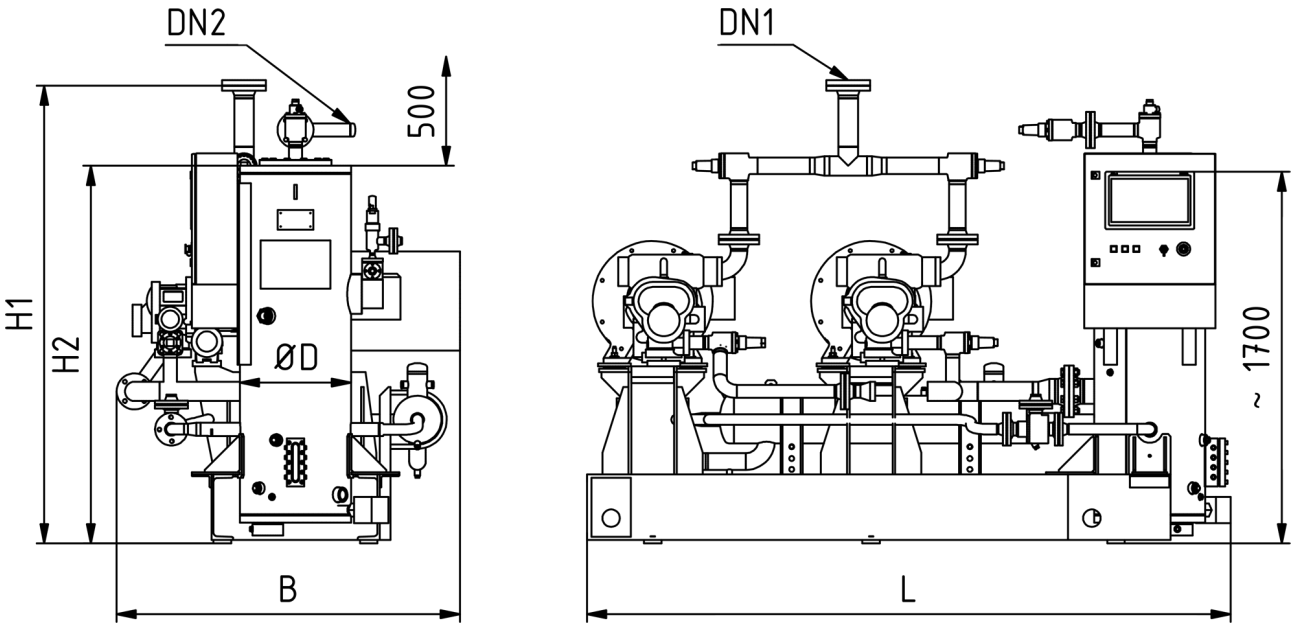


Fig.33: GEA Grasso SPduo compressor, frame size H, L

Technical specifications										
GEA Grasso Compres-sor	Nominal motor power 2x (kW)	Ø D (mm)	Oil charging quantity (l)	Dimensions (mm)				Nominal diameters		Weight without motor (kg)
				L	H1	H2	B	DN1	DN2	
H	37...160	508 610	120-180 160-210	2550 2600	2430 2500	1900 1960	2250	80-150	40-125	3900 4100
L	45...160	508 610 711	120-180 160-210 200-260	2550 2600 2650	2430 2500 2560	1900 1960 2010				3900 4100 4250

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

5.1.15 GEA Grasso SPduo compressor, frame size M, N

(oil separator installed vertically)

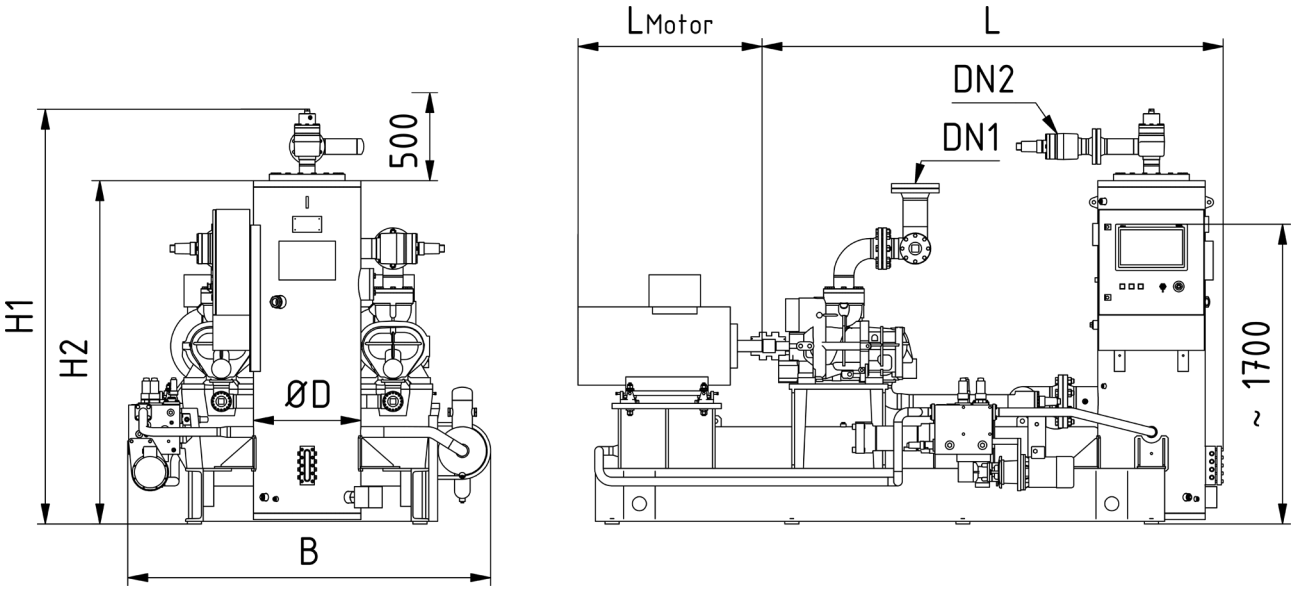


Fig.34: GEA Grasso SPduo compressor, frame size M, N

Technical specifications										
GEA Grasso Compressor	Nominal motor power 2x (kW)	Ø D (mm)	Oil charging quantity (l)	Dimensions (mm)				Nominal diameters		Weight without motor (kg)
				L	H1	H2	B	DN1	DN2	
M	55...200	508 610 711	130-190 170-220 210-270	2550 2600 2650	2460 2530 2590	1900 1960 2010	2350	100-200	40-150	5250 5400 5550
N	55...250	508 610 711 813	130-190 170-220 210-270 270-315	2550 2600 2650 2700	2460 2530 2590 2600	1900 1960 2010 2010				5250 5400 5550 5850

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 P, R, S, T,

(oil separator installed vertically)

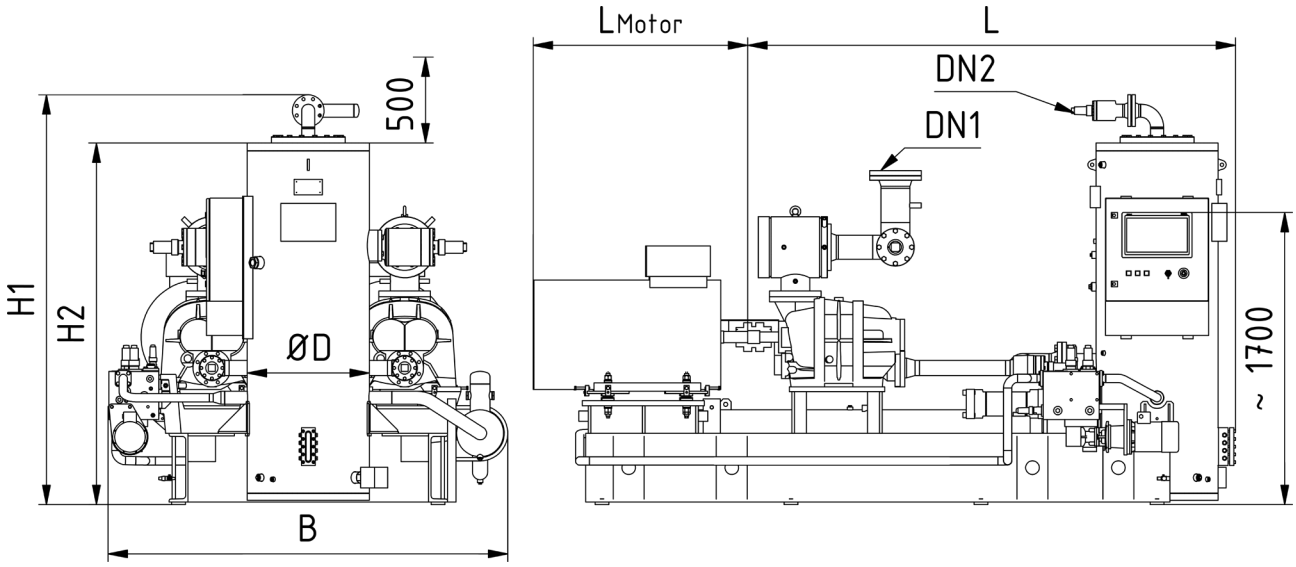


Fig.35: GEA Grasso SPduo compressor frame size P, R, S, T,

Technical specifications										
GEA Grasso Compressor	Nominal motor power 2x (kW)	Ø D (mm)	Oil charging quantity (l)	Dimensions (mm)				Nominal diameters		Weight without motor (kg)
				L	B	H1	H2	DN1	DN2	
P	55...250	610 711 813	120-190 170-230 220-280	2550 2600 2650	2370	2100 2150 2190	1960 2010 2010	125-200	40-150	5450 5600 6200
R	75...355									5900 6050 6700
S	90...400									5950 6100 6750
T		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			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

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

(oil separator installed vertically)

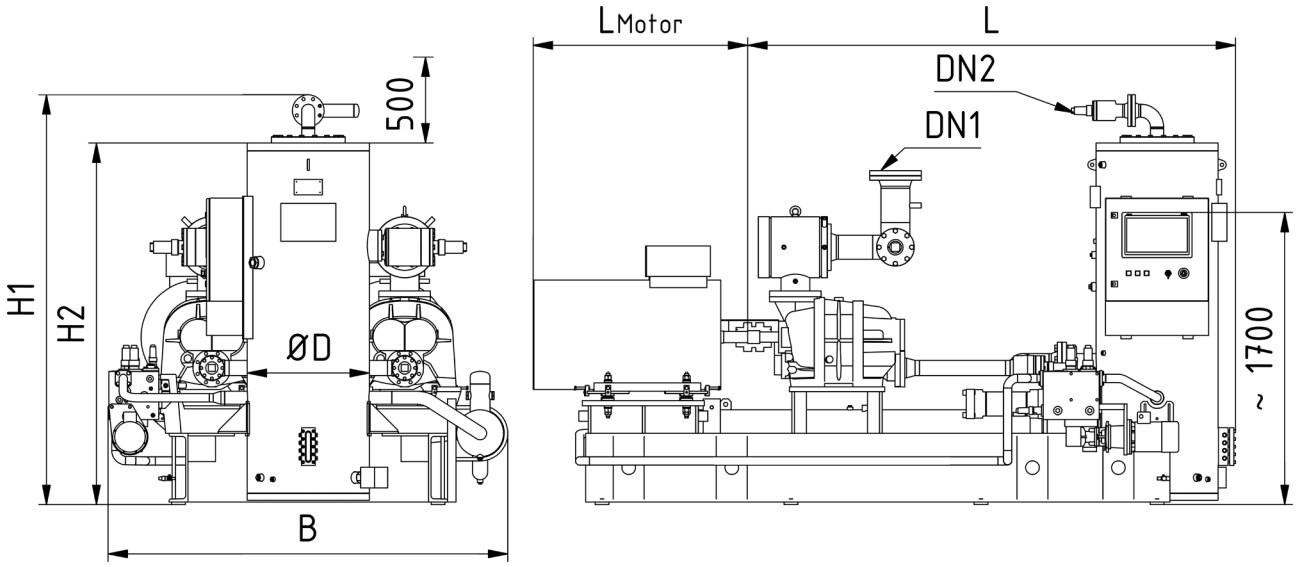


Fig.36: GEA Grasso SPduo compressor frame size V, W, Y

Technical specifications										
GEA Grasso Compressor	Nominal capacity Motor 2x (kW)	Ø D (mm)	Oil charging quantity (l)	Dimensions (mm)				Nominal diameters		Weight without motor (kg)
				L	H1	H2	B	DN1	DN2	
V	110...550	813	250-310	3000	2190	2010	2750	150-300	65-250	7550
W		914	290-350	3100	2290	2010	2750			7800
		1016	330-410	3650	2850	2200	2900			8250
Y	132...630	1200	390-470	3800	2975	2200	2900			9350

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 CO_2 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 [23]				
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
Oil temperature	t_{oil}	°C	min.	+ 30
			max.	+ 80
End temperature - Condensing temperature t_e - t_c	Δt	K	min.	10 [24]
Discharge temperature - Oil temperature t_d - t_{Oil}	Δt	K	min.	4
Oil temperature - Cooling medium tetemperature t_{Oil} - $t_{Cooling\ medium}$	Δt	K	min.	5
Ambient temperature	t_U	°C	min.	+ 5
			max.	+ 40
Ambient humidity	*f*	%	max.	95

23 The values apply for standard applications with ammonia (NH_3). 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 NH_3 heat pumps and CO_2 applications.

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

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 [25] at 2950 rpm 3550 rpm	 150 kW 180 kW	 300 kW 360 kW	 530 kW 640 kW	 1250 kW 1500 kW
max. Nominal torque	500 Nm	960 Nm	1700 Nm	4000 Nm
max. Permissible speed [26]	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 at 3550 rpm	 1250 kW 1500 kW	 1800 kW 2160 kW	 3000 kW 3600 kW	 3472 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).

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.

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

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

5.3 Water quality requirements, parameters

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

Notice

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

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

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

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

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

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

Notice

Recommended with use of plate heat exchangers

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

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

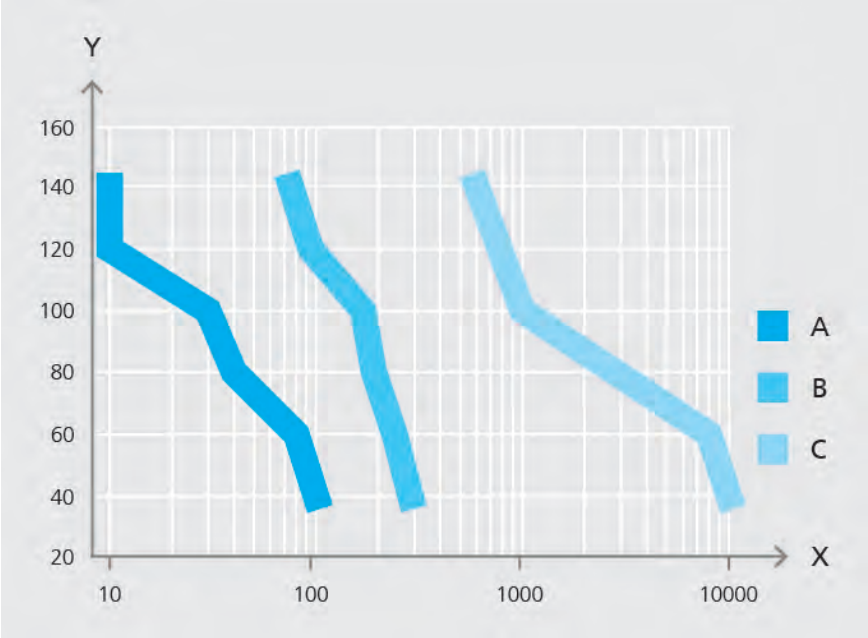


Fig.37: Corrosion resistance in presence of chlorides

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.

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 m^3/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**	**M 708**
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	95
	Min	88	88	88	88	88	88	88
75	Max	96	96	96	96	96	96	96
	Min	89	89	89	89	89	89	89
90	Max	97	97	97	97	97	97	97
	Min	90	90	90	90	90	90	90
110	Max		98	98	98	98	98	98
	Min		91	91	91	91	91	91
132	Max			98	99	99	99	99
	Min			92	92	92	92	92
160	Max					100	100	100
	Min					93	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 m^3/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**	**W 1990**
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	99
	Min	92	92	92	92	92	92	92
160	Max	100	100	100	100	100	100	100
	Min	93	93	93	93	93	93	93
200	Max	101	101	101	101	101	101	101
	Min	94	94	94	94	94	94	94
250	Max	102	102	102	102	102	102	102
	Min	95	95	95	95	95	95	95
315	Max			103	103	103	103	103
	Min			96	96	96	96	96
400	Max			104	104	104	104	104
	Min			97	97	97	97	97
450	Max				104	104	104	104
	Min				98	98	98	98
500	Max					105	105	105
	Min					98	98	98
560	Max					105	105	105
	Min					99	99	99
630	Max							105
	Min							99

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 m^3/h at 2940 rpm L_{WA} in dB(A) mains operation 400 V / 50 Hz**				
		Y 2296	**Z 2748**	**XA 3250**	**XB 4150**	**XC 4900**
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	104
	Min	96	96	96	100	100
400	Max	104	104	104	104	104
	Min	97	97	97	100	100
450	Max	104	104	104	104	104
	Min	98	98	98	100	100
500	Max	105	105	105	105	105
	Min	98	98	99	100	100
560	Max	105	105	105	105	105
	Min	99	99	100	100	100
630	Max	105	105	105	106	106
	Min	99	99	99	100	100
710	Max		105	106	106	106
	Min		99	99	100	100
800	Max		106	106	106	106
	Min		99	99	100	100
900	Max				107	107
	Min				100	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 m^3/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.

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