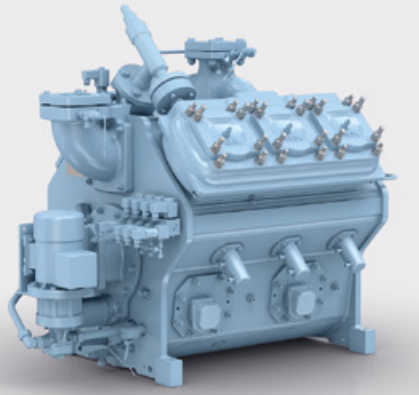
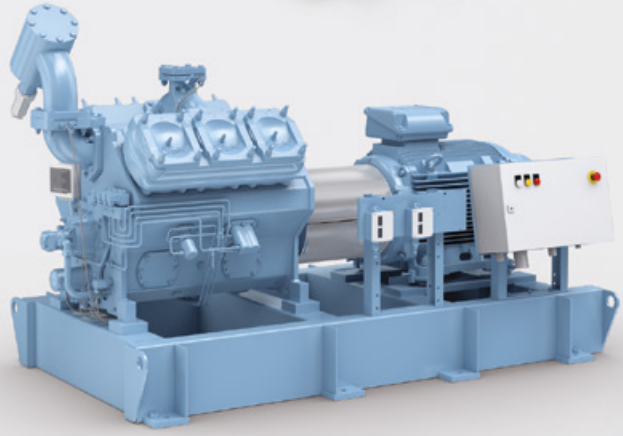
GEA Engineering for a better world.

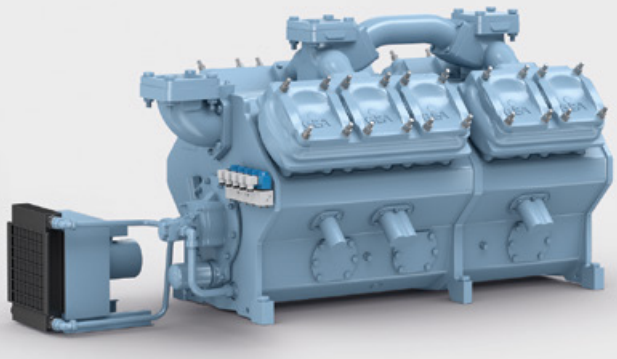
GEA.com

GEA RECIPROCATING COMPRESSORS.

Reciprocating compressors for industrial refrigeration, air conditioning and heating







COOLING AND HEATING EVOLVED FROM EXCELLENCE.

Leading technology and experience, all in touch with your markets and processes.

GEA provides cooling and freezing technology tailored to the requirements and wishes of our customers: cost-efficient, long-life, energy-efficient, sustainable and customized. After all, we know your business and your needs from experience of more than 100 years. This is why we offer the best solutions together with top quality products. Solutions for your processes, for greater efficiency and for enhanced climate protection.

GEA is one of the leading manufacturers of reciprocating and screw compressors and packages for industrial refrigeration and heating. The extensive range of high-quality, reliable and modern refrigeration compressors can be applied in almost every industrial refrigeration process. Our products find their way to the end-user via contractors, distributors and Original Equipment Manufacturers (OEM). Our main markets are:

- Food, dairy and beverage processing
- Storage and distribution
- Facility climatization and heating
- Industrial processes
- Sport and leisure

From the beginning, GEA refrigeration solutions have continuously been extended to cover many different industries. Our latest developments go even further addressing the heating sector, too. For most industrial cooling, freezing and heating applications our products offer optimal solutions with high reliability and low energy consumption.

Refrigeration and heating technology is an inherent and essential part of the food processing industry. GEA supplies an excellent range of components which can be used throughout the whole value chain, beginning with the production itself and ending with the product ready for market. GEA solutions comprise components for cold storage on fishing vessels, heating, cooling and freezing solutions for meat, vegetables, beer and beverages, dairy products – within the production process or for storage. For storage and distribution of food along the trade chain, cooling and freezing is a must.

Refrigeration from GEA is also responsible for entertainment and well-being in leisure time. Winter sports like ice skating and skiing in a perfect, cool winter atmosphere – independent of season or geographical region – are the result of the application of GEA components.

Heating from GEA has become extremely relevant, too, in view of the necessary decarbonization of the heat supply and the subsequent replacement of fossil fueled heating systems like boilers with modern heat pumps. GEA heating equipment is suitable for all applications with heating demands, from industrial processes in the food, beverage, dairy sector, in the paper or chemical industry to communal heating grids to decentralized facility heating.

REDUCE YOUR TOTAL COST OF OWNERSHIP – AND YOUR CARBON FOOTPRINT.

GEA reciprocating compressors stand for a future-proof solution.

Trendsetter GEA Grasso V series
With the GEA Grasso V series reciprocating compressors, GEA heralded the start of a complete new era for the industrial refrigeration market. GEA continues to invest in reciprocating technology with a clear vision for the future, and with good reason. The total cost of ownership, where energy consumption is the major part, has become an important parameter, which is why the market is now demanding energy-efficient solutions.

The successful V series now has become a blueprint for further developments with regards to higher speeds or higher pressures and temperatures.

Innovation
During the development of Grasso reciprocating compressors, GEA continually put itself in the position of the end-user. Time and again, each component was assessed for the most important elements that contribute to a low total cost of ownership:

- Energy efficiency
- Minimal maintenance costs
- Maximum reliability with minimal downtime

Sustainability
To get the maximum out of the GEA Grasso compressors, we focus on natural refrigerants like ammonia. At zero global warming potential (GWP = 0) and zero ozone depletion potential (ODP = 0) our customers can be sure that climate friendly NH_3 is not subject to the global warming and ozone layer discussions. And when it comes down to efficiency, ammonia is definitely number one.

Total cost of ownership

GEA Grasso compressors are a 100% European quality product. More than 100 years of design experience have been combined with state-of-the-art research and technology. The results are not only the most efficient and reliable pistons on the market, but also extended and flexible service intervals. With the V series, GEA sets a new standard for the future.

REVOLUTIONARY DESIGN AND PERFORMANCE.

The end-users' choice for well-designed, cost-effective solutions.

Energy
Reciprocating compressor technology is synonymous with highly efficient operation resulting in lower power consumption. This is the result of minimum internal leakages, automatic head pressure adjustment and increased efficiency at lower speed especially in combination with a frequency inverter.

Minimum maintenance
The selection of the highest quality parts and construction methods enables GEA to reduce the downtime and maintenance frequency. Furthermore, we believe that maintenance should only be carried out when it is necessary – which is in contradiction with the fixed maintenance schedules in general use today for industrial compressors. That is why each compressor of GEA Grasso V family is factory-fitted with a so-called 'conditional maintenance monitor', which indicates the right time for maintenance.

Unconditional reliability
GEA believes its customers should be able to focus 100% on their business. That is why we place so much emphasis on reliable and trustworthy systems. With the maintenance carried out in accordance with the GEA Maintenance Monitor, you can be sure of problem-free operation throughout the entire lifespan of the machine.

Lower investment
The optimized components of this new compressor series as well as the chosen running speed result in a lower price per kW cooling power. Due to the very low oil carry-over of the complete range of the GEA Grasso V series, packaging these compressors without oil separator is an option.

An unequalled design
The design of the welded compressor crankcase housing is innovative 'from top to bottom'. This is probably the most striking change in the history of GEA welded compressor construction. By using a revolutionary process of forming the steel sections creating the complete crankcase, the optimum shape and size can be made without compromises, and it retains all the advantages of a welded concept.

An unequalled performance
The optimized shape and size of the compressor crankcase made it possible to achieve the highest energy efficiency, minimum maintenance and maximum reliability. Another result is a much lower sound level. The unique combination of a welded crankcase with integrated, generously sized suction chamber and cast-iron cylinder heads placed externally much better separates temperatures between the suction side and the discharge side of the compressor. The results is less internal superheat, more stable oil temperature and a higher volumetric efficiency. Another effect is that the field of application for part load running has been extended.

OUR PORTFOLIO – A PERFECT FIT FOR EACH APPLICATION.

The GEA reciprocating compressor range includes 18 compressor models in total, subdivided into the two series, GEA Grasso V and GEA Grasso 5HP.

Trendsetter GEA Grasso V series
With the GEA Grasso V series reciprocating compressors, GEA heralded the start of a complete new era for the industrial refrigeration market. GEA continues to invest in reciprocating technology with a clear vision for the future, and with good reason. The total cost of ownership, where energy consumption is the major part, has become an important parameter, which is why the market is now demanding energy-efficient solutions.

The successful V series now has become a blueprint for further developments with regards to higher speeds or higher pressures and temperatures.

Innovation
During the development of Grasso reciprocating compressors, GEA continually put itself in the position of the end-user. Time and again, each component was assessed for the most important elements that contribute to a low total cost of ownership:

- Energy efficiency
- Minimal maintenance costs
- Maximum reliability with minimal downtime

Sustainability
To get the maximum out of the GEA Grasso compressors, we focus on natural refrigerants like ammonia. At zero global warming potential (GWP = 0) and zero ozone depletion potential (ODP = 0) our customers can be sure that climate friendly NH_3 is not subject to the global warming and ozone layer discussions. And when it comes down to efficiency, ammonia is definitely number one.

Swept volume range

Series	Motor speed	Swept volume (m³/h)
GEA Grasso 5HP (4 sizes)	at 1,500 rpm 100–202 m³/h	
GEA Grasso V (3 sizes)	at 1,500 rpm 290–580 m³/h	
GEA Grasso V (4 sizes)	at 1,200 rpm 637–1,592 m³/h	
GEA Grasso V HS (4 sizes)	at 1,500 rpm 796–1,992 m³/h	
GEA Grasso V HP (3 sizes)	heating at 1,500 rpm 290–580 m³/h	
GEA Grasso V XHP (4 sizes)	heating at 1,500 rpm 376–941 m³/h	

GEA Grasso 5HP is the reciprocating compressor series for CO_2 refrigeration and NH_3 heating. A trusted and established component to make industrial applications with small to medium capacity demands sustainable with fully natural refrigerants.

GEA GRASSO 5HP – SUSTAINABLE AND RELIABLE FREEZING AND HEATING.

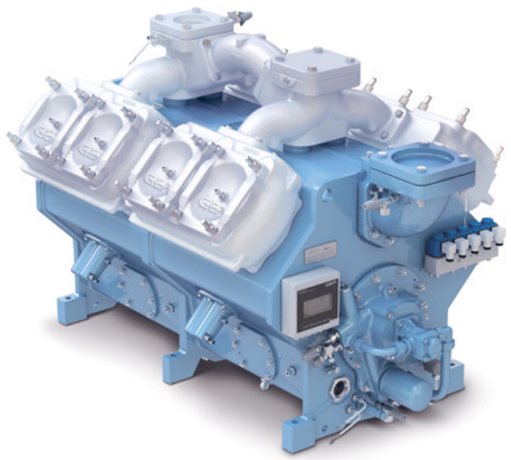
The GEA Grasso 5HP compressor is a big performer – thanks to the extremely low volume flow in relation to the cooling capacity. The high-pressure series is developed for many applications using the natural refrigerants CO_2 and NH_3 for freezing, cooling and heating. 4 single stage models from 3 up to 6 cylinders cover a wide range of capacities.

The 50 bar compressor has been developed originally for use in CO_2 cascade freezing systems and is a well-accepted and reliable appearance in the industrial refrigeration market. A logic further development of the GEA Grasso 5HP Series is the integration in NH_3 heat pump systems. The 50 bar design makes it possible to condensate up to 80°C and results in producing high level of water temperatures.

Highlights at a glance
- 50 bar design pressure
- CO_2 freezing applications as low as –55 °C
- NH_3 heating applications as high as +80 °C
- Suited for variable speeds 500 – 1,500 min-1
- Robust design

GEA GRASSO V SERIES – COOLING AND FREEZING EVOLVED FROM EXCELLENCE.

GEA Grasso V series reciprocating compressors have set new standards. Focusing on highest possible efficiency and reliability, GEA offers sustainability, low total cost of ownership, and a future-proof solution.



With the GEA Grasso V reciprocating compressor series, GEA heralds the start of a completely new era for the industrial refrigeration market. During the development of the GEA Grasso V series, GEA continually puts itself in the position of the end user. Every component was assessed for the most important elements that contribute to a low total cost of ownership like energy, maintenance and reliability with minimum downtime.

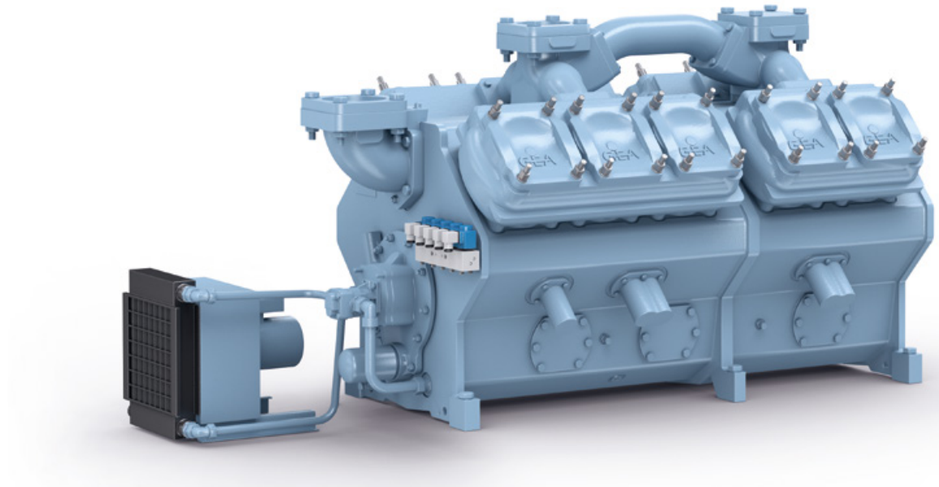
The result is not only the most efficient reciprocating compressor on the market, but also a compressor with electronically controlled service intervals (extended as well as flexible) in order to reduce the total cost of ownership without jeopardizing reliability.

The GEA Grasso V series covers a large range of single-stage and two-stage models.

Highlights at a glance

- 25 bar design pressure
- NH_3 freezing and cooling heating applications
- Suited for variable speeds 500 – 1,500 min-1
- Best-in-class efficiency returning highest sustainability and lowest total costs

TWO-STAGE V SERIES – IMPROVE YOUR PERFORMANCE.



Two-stage models GEA Grasso V T

GEA Grasso two-stage-or 'compound' reciprocating compressors benefit from the same characteristics as the single-stage models. Internally they have separate suction chambers for low and intermediate pressure and, on the outside, two connections are added for the intermediate side. The range also comprises seven models, each with only one LP/HP cylinder ratio in order to simplify the selection procedure. For the two-stage compressors several highly efficient and patented intermediate cooling systems are available.

Two-stage models are relevant for applications requiring low evaporation temperatures, like freezers. The minimum suction temperature of the GEA Grasso V T series is –55 °C.

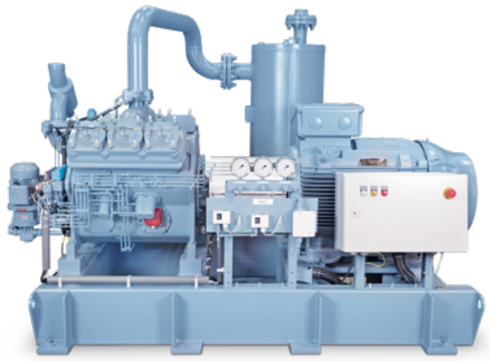
High-speed models GEA Grasso V HS

The speed increase from 1,200 to 1,500 min-1 provides clients with a significant increase in capacity. Because of the proportional correlation of compressor speed, swept volume and resulting capacity, 25% more capacity can now be gained using the same models. That returns a significant improvement (reduction) of the relative price as in Kilowatts per Euro. Alternatively, users with a specific, fixed capacity requirement can benefit from the higher speeds by allowing them to achieve the capacity demands with smaller compressor equipment meaning less investment and less service expenses.

Compressors at higher speeds offer significant savings potentials for your total cost of ownership, reduced footprint and CO_2 emissions.

GEA GRASSO V HP – SUSTAINABLE HEATING AT TOP EFFICIENCY.

The GEA Grasso V HP high-pressure series is first choice for heating demands up to +70 °C heat sink temperatures. Unparalleled efficiencies, the use of the fully natural refrigerant NH_3, and the reliable, proven concept make the future-proof solution an integral element to decarbonize your heat supply.



Welcome to a new era of industrial heating: Based on the successfully proven GEA Grasso V series, a 39 bar high-pressure series has been designed. Providing heat sink temperatures up to +70 °C the GEA Grasso V HP series suits heating demands in all kinds of industries and communities – an integral part in the decarbonization of the heat supply.

Industry-leading efficiency was a central factor in developing the GEA Grasso V HP series. A unique housing shape and the use of specific materials allow high-end temperature and separates them extremely well from the suction temperatures making extra cylinder head cooling unnecessary and ensuring best performances. The lower energy consumption not only further increase sustainability but also reduce your total costs of ownership.

An external oil pump on the new models ensures prelubrication and a guaranteed continuous oil flow for maximum reliability in full and part load. A further step towards Industry 4.0. is the unique Continuous Status Analysis (CSA) function for measuring operating conditions and alerting the operator in case of deviation from normal values.

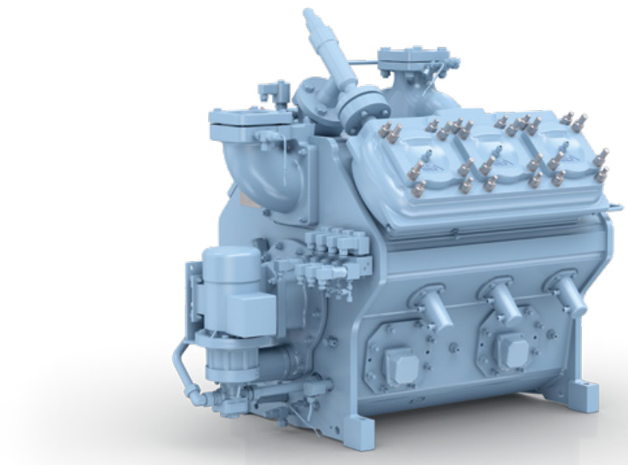
In short, the new V HP is true to its roots in the V series philosophy, which has efficiency and reliability in its DNA.

Highlights at a glance

- 39 bar design pressure
- Heat carrier supply temperatures up to +70 °C
- Suited for variable speeds 500–1,500 min-1
- Reliability with high-pressure design specials

GEA GRASSO V XHP – A NEW BREAK-THROUGH GENERATION OF INDUSTRIAL HEATING.

Higher temperatures, more capacity, additional models: The GEA Grasso V XHP compressor series takes industrial heating to new heights. Evolved from the best-in-class GEA Grasso V HP series, the extra high-pressure models allow supply temperatures up to +95 °C and twice the capacity range compared with any other comparable models.



The GEA Grasso V XHP series is the next generation of sustainable industrial heating equipment. Evolved from the industry-leading GEA Grasso V HP series, the V XHP models at 63 bar design provide higher temperatures up to +95 °C and an enhanced capacity range with four different types (4, 6, 8 and 10 cylinders).

The GEA Grasso V XHP series provides in combination with the speed range up to 1,500 min-1 twice the capacity compared with benchmark models, so customers save costs, footprint and maintenance when larger capacity demands can be fulfilled with fewer installations.

Highlights at a glance

- 63 bar design pressure
- Heat carrier supply temperatures up to +95 °C
- Heat source temperatures up to +60 °C
- Suited for variable speeds 500–1,500 min-1
- Patented condensate drain system
- V and V HP series highlights included

OPTIMIZE THE PERFORMANCE – WITH INGENIOUS MONITORING AND SERVICE.

We are proud of the quality and reliability of all GEA solutions. Our after sales and service philosophy enhance performance and maintenance for you.

GEA Maintenance Monitor (GMM)
GEA Grasso V based compressors are equipped with the GMM. This compact, microprocessor-based stand-alone unit monitors relevant data online to determine flexible 'on-time' maintenance intervals. Automatically generated messages can be read directly from a small built-in display, remote PC, or can be sent by email to the person/company responsible for the maintenance. Packaged units and complete heat pumps including the GEA Omni control panel provide the device integrated in the GEA Omni.

Connected to a network, even real-time data are available as well as information about any upcoming service. 'On-time' maintenance balances the lifetime of wearing components and the expected reliability. In other words: The end user benefits from longer service intervals without jeopardizing reliability. In industrial refrigeration this is quite a new approach. The traditional 'fixed' service intervals will slowly be taken over by the new system. We are happy about another contribution to the reduce your total cost of ownership.

GEA service
Our objective is to ensure that GEA reciprocating compressors are well-designed and properly installed and maintained. We know that correct preventive maintenance will ensure the highest level of reliability and unexpected breakdowns can be minimized. At the same time the lifetime of compressors will increase.

With this in mind GEA takes care of its customers by offering the best possible service in terms of technical consultation, warrantee management, field service and training courses. All supported by rapid spare parts supply all over the world.

Spare parts
A practical and fast-working spare parts organization has been established to supply the required spare parts worldwide. To shorten delivery times further, distribution centers have been created at GEA offices throughout the world. We have an extensive stock of spare parts, covering new as well as phased-out GEA compressors.

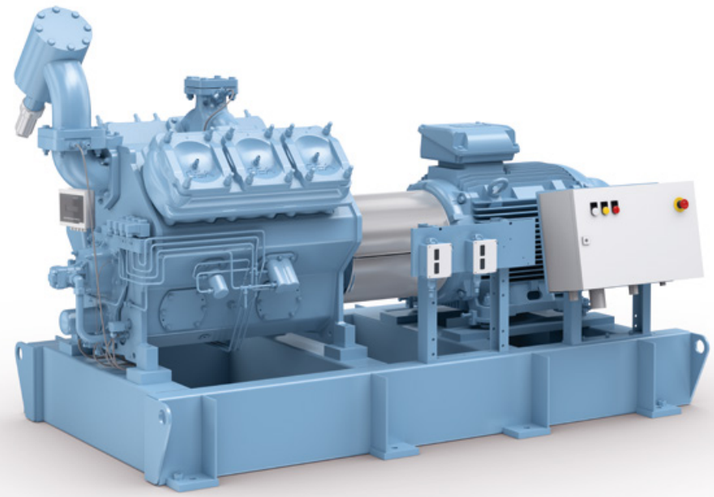
Laboratory tests and field experience have proven that the use of genuine GEA parts keeps compressor performance, reliability and a low total cost of ownership at the optimum level.

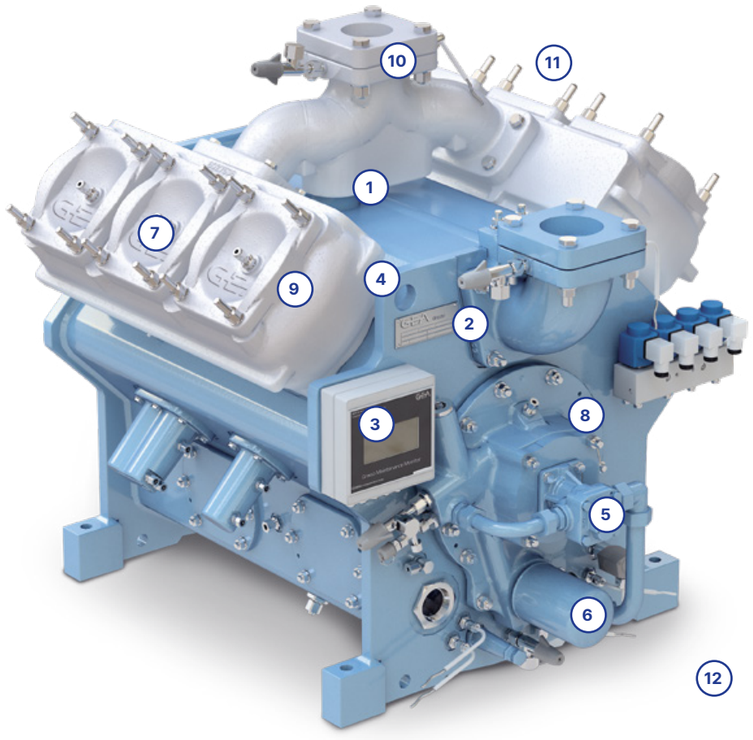
Training courses
For GEA is it very important to ensure maximum support for the end-users all over the world. This can only be achieved when the right training programs are available. Local representatives and contractors are welcome to attend these training courses. Tuned for design and service engineers, they focus on the correct selection and application of GEA compressors as well as performing the correct service to maintain the highest level of reliability.

Courses take place at the GEA manufacturing site for reciprocating compressors but can on request also happen locally if more convenient for a larger audience. We strongly recommend attending our training courses on a regular basis to offer the local market the best possible up-to-date support.

KEY FEATURES AND REASONS TO CHOOSE GEA RECIPROCATING COMPRESSORS.

GEA Grasso reciprocating compressors are used worldwide across many industries and communities. For many good reasons!





1. Safety first
- Counter pressure independent overflow valve(s) between suction and discharge chamber to secure a safe operation.

2. Optimized suction gas entry
- Oversized suction gas chamber and optimized filtering and distribution results in low pressure drop and increased resistance against liquid hammer.

3. Flexible and extended maintenance
- To calculate and indicate upcoming maintenance intervals by means of measuring of actual running conditions.

4. Optimized temperature separation
- The cold suction chamber is clearly separated from the hot discharge area by means of an isolating gasket and an air gap. In this way we have less internal heating up the suction gas resulting in lower discharge temperatures and more flexibility in part load operation.

5. Oil pump
- Different sizes tuned to compressor model.

6. Oil filter
- Large capacity ‘screw-on’ oil filter to cover long service intervals. Externally accessible.

7. Maximum lifetime
- Composite material for suction and discharge valves.
- Free-flow discharge valve configuration with gas damping chambers.
- High volume and low gas velocity suction chamber.
- Oil pump size adapted to compressor size.

8. Reliability and ease of maintenance
- Axial roller bearing construction to withstand high crankcase pressures for maximum lifetime at high loads.
- Increased main bearing diameter for stable low-speed inverter drive running.
- Large-capacity, externally mounted oil filter for long service intervals.
- Full oil pump flow over shaft seal for maximum cooling/life time extension.

9. O-ring sealing for maximum tightness
- Easy disassembly and assembly.
- Over 60% fewer fixing bolts contribute to reduced service times.

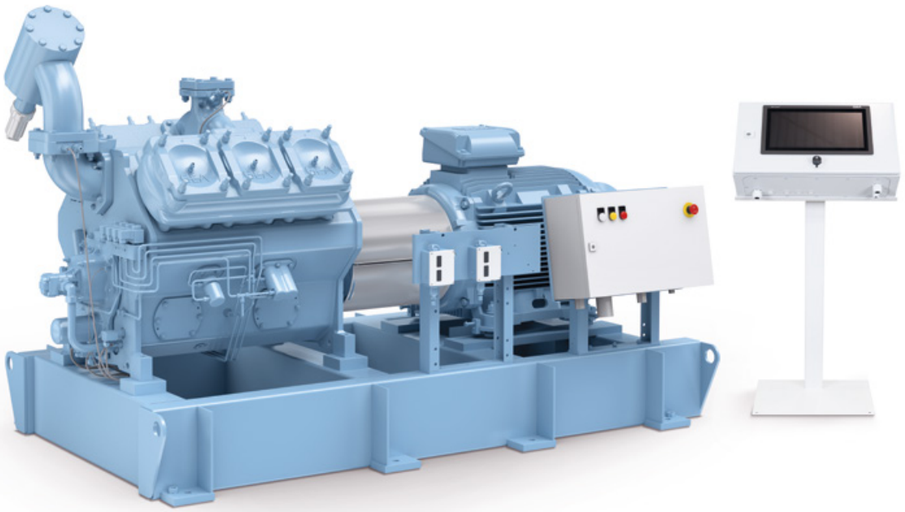
10. Minimized oil carry-over to refrigeration system
- The oversized common suction chamber, the position of the cylinder liners, as well as the increased distance between oil sump and crankshaft (and lower internal temperatures) result in an extremely low oil carry-over. The necessity of using an oil separator is subject to application and, in some cases, can be omitted.

11. Low noise level
- Modular setup of the steel-welded housing in combination with the rigid cast iron cylinder heads guarantees the lowest possible noise emissions.

12. Future-proof sustainability
- Highest efficiency through revolutionary design, the use of NH_3, smart maintenance not only reduce your total cost of ownership but also the carbon footprint.

PACKAGED RECIPROCATING COMPRESSOR UNITS.

Most compressors produced at GEA are turned into compact packaged before they leave the factory.



The choice of components to fit on and around the compressors is huge, and the fact that all required components are factory-fitted gives the contractor the advantage to concentrate 100% on the erection of the refrigeration plant.

Direct drive or V belt drive arrangements are available for all V series based compressors, the GEA Grasso 5HP series is optimized for direct drive only. The introduction of high power inverters in combination with maintenance-free couplings gives the customer the opportunity to positively influence energy and maintenance costs.

The extremely low oil carry-over, related to the design of the compressor particularly on cooling applications, is even less than 10 ppm and gives the customer the opportunity to execute a compressor package with or without an oil separator, depending on the system demands. The use of GEA's high-efficiency oil separator will further reduce the carry-over to an absolute minimum, and oil contamination through to the installation.

TECHNICAL DATA

GEA Grasso 5 HP
NH_3 Heatpump applications/50 Bar

Model	Swept Volume* (m^3/h)	Heating capacity (kW)**		Dimensions (mm)			Weight (kg)
		+35/+80°C	+35/+70°C	L	W	H	without motor
GEA Grasso 35HP	101	261	278	883	861	718	552
GEA Grasso 45HP	135	348	370	883	861	718	552
GEA Grasso 55HP	168	435	463	919	943	768	633
GEA Grasso 65HP	202	521	555	919	943	768	633

* Theoretical swept volume based on max. speed of N = 1,500 min.-1

** Capacity based on: 2K superheat, 0K subcooling

GEA Grasso 5 HP
CO_2 Freezing applications/50 Bar

Model	Swept Volume* (m^3/h)	Cooling capacity (kW)**		Dimensions (mm)			Weight (kg)
		−50/0°C	−40/−10°C	L	W	H	without motor
GEA Grasso 35HP	101	88	152	883	861	718	552
GEA Grasso 45HP	135	117	202	883	861	718	552
GEA Grasso 55HP	168	147	252	919	943	768	633
GEA Grasso 65HP	202	176	303	919	943	768	633

* Theoretical swept volume based on max. speed of N = 1,500 min.-1

** Capacity based on: 2K superheat, 0K subcooling

GEA Grasso V
NH_3 Cooling applications/Single stage

Model	Swept Volume* (m^3/h)	Number of cylinders	Speed min-1	Cooling capacity (kW)** NH_3		Dimensions (mm)			Weight (kg)
				−10/+35°C	0/+40°C	L	W	H	without motor
GEA Grasso V 300	290	4	1,500	155	237	882	933	922	575
GEA Grasso V 450	435	6	1,500	233	355	1,076	933	922	751
GEA Grasso V 600	580	8	1,500	310	474	1,363	933	922	1,042
GEA Grasso V 700	637	4	1,200	367	549	1,062	1,076	1,013	794
GEA Grasso V 1100	955	6	1,200	550	823	1,306	1,076	1,013	1,054
GEA Grasso V 1400	1,274	8	1,200	734	1,098	1,666	1,076	1,027	1,495
GEA Grasso V 1800	1,592	10	1,200	917	1,372	1,909	1,076	1,027	1,725

* Theoretical swept volume based on low stage cylinders

** Based on: 0 K subcooling superheat, 2K subhead (non-useful)

GEA Grasso V
NH_3 Cooling applications/Two stage

Model	Swept Volume* (m^3/h)	Number of cylinders	Speed min-1	Cooling capacity (kW)** NH_3***		Dimensions (mm)			Weight (kg)
				−35/+35°C	−40/+35°C	L	W	H	without motor
GEA Grasso V 300T	217	3/1	1,500	45	34	935	940	922	590
GEA Grasso V 450T	290	4/2	1,500	67	52	131	940	922	769
GEA Grasso V 600T	435	6/2	1,500	90	68	1,425	940	922	1,062
GEA Grasso V 700T	478	3/1	1,200	108	85	1,060	1,072	1,013	814
GEA Grasso V 1100T	637	4/2	1,200	157	123	1,304	1,072	1,013	1,077
GEA Grasso V 1400T	955	6/2	1,200	217	170	1,672	1,072	1,027	1,520
GEA Grasso V 1800T	1,114	7/3	1,200	262	203	1,874	1,072	1,027	1,755

* Theoretical swept volume based on low stage cylinders

** Based on: 0 K subcooling superheat, 2K subhead (non-useful)

GEA Grasso V HS
NH_3 Cooling applications/Single stage

Model	Swept Volume (m^3/h)	Numbers of cylinders	Speed min -1	Cooling capacity (kW) NH_3
	@ 1,500 rpm			−10/+35°C
GEA Grasso V 700HS	796	4	1,500	459
GEA Grasso V 1100HS	1,194	6	1,500	688
GEA Grasso V 1400HS	1,593	8	1,500	917
GEA Grasso V 1800HS	1,992	10	1,500	1,146

GEA Grasso V HP
NH_3 Heatpump applications/39 Bar

Model	Swept Volume* (m^3/h)	Heating capacity (kW)**	Total no of cylinders	Cylinder bore	Reciprocating stroke
		+25/+70°C			
GEA Grasso V 300HP	290	569	4	110	85
GEA Grasso V 450HP	435	893	6	110	85
GEA Grasso V 600HP	580	1,190	8	110	85

* Theoretical swept volume based on max. speed of N = 1,500 min.-1

** Capacity based on: 2K superheat, 0K subcooling

GEA Grasso V XHP
NH_3 Heatpump applications/63 Bar

Model	Swept Volume (m^3/h)	Number of cylinders	Speed min-1	Heating capacity (kW)** NH_3		Dimensions* (mm)			Weight* (kg)
	@ 1,500 rpm			+30/+85°C	+40/+95°C	L	W	H	without motor
GEA Grasso V 350XHP	376	4	1,500	858	1,076	1,188	1,030	1,190	944
GEA Grasso V 550XHP	564	6	1,500	1,285	1,613	1,432	1,030	1,190	1,236
GEA Grasso V 750XHP	753	8	1,500	1,712	2,149	1,774	1,030	1,190	1,729
GEA Grasso V 950XHP	941	10	1,500	2,139	2,686	2,018	1,030	1,190	2,009

* Capacity based on: 2K superheat, 0K subcooling

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