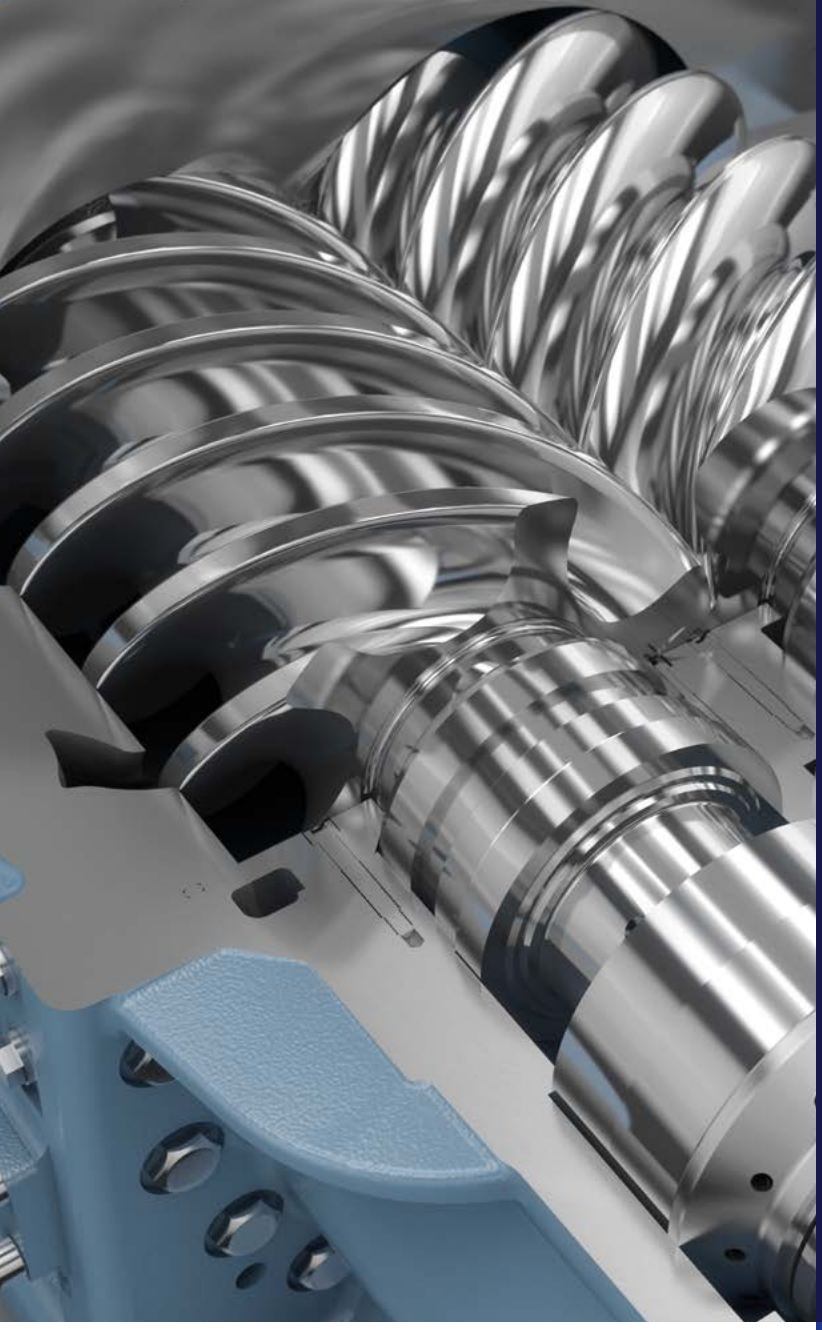
PROCESS REFRIGERATION AND GAS COMPRESSION SOLUTIONS

GEA Engineering for a better world.

GEA.com



INNOVATIVE, PROVEN SOLUTIONS FROM A GLOBAL TECHNOLOGY LEADER

GEA applies decades of process refrigeration and gas compression experience in providing efficient and reliable custom-engineered systems for the oil & gas, power, petrochemical, chemical, pharmaceutical, and related industries. The company's comprehensive product offering includes screw compressor packages, chiller systems, condensing units, shell & tube heat exchangers, pressure vessels, controls, and service support. Dependable performance of our customers' systems is critically important, and we at GEA take very seriously the responsibility for providing high-quality, industry-leading equipment with demonstrated reliability. It is a privilege to be entrusted with our customers' capital investments and to play a role in contributing to their success.

CUSTOM-DESIGNED SYSTEMS TO SUPPORT YOUR PROCESS

Gas Processing Plants
- Dew point control
- Cryo plant refrigeration
- Deethanizer plant refrigeration

Chemical & Petrochemical Plants and Refineries
- Water/glycol chilling
- Heat transfer fluid (HTF) chilling
- Chlorine liquefaction
- Hydrocarbon refining

Fertilizer Plants
- Ammonia storage
- Loading & unloading refrigeration
- Boil-off gas (BOG) compression

Hydrocarbon Storage Facilities
- Propane & butane storage
- Loading & unloading refrigeration
- BOG compression

Liquefied Natural Gas (LNG) Plants
- BOG condensing units
- Gas turbine inlet air chilling
- Turbine fuel gas compression

Power Generation Plants
- Gas turbine inlet air chilling
- Turbine fuel gas compression

Pharmaceutical Facilities
- Water/glycol chilling
- HTF chilling
- Low-temperature refrigeration

Environmental Systems
- Environmental test chambers
- Flare gas recovery
- CO2 compression & liquefaction
- Carbon sequestration & EOR
- Vapor recovery units

Industrial Gas Applications
- Process gas chilling & condensing
- Nitrogen chilling
- Air chilling

Global process refrigeration and gas compression solutions

GEA provides refrigeration equipment for dew point control and for separation of gas constituents, such as ethane, propane, butane, and light gasoline. From screw compressor packages to full-scope refrigeration systems, and everything in between, GEA fulfills your unique requirements.

Propane refrigeration unit
Model 1210GL; 1,600 HP

Chemical & Petrochemical Plants and Refineries

GEA offers refrigeration systems for both direct and indirect process cooling. These systems are used for overhead condensers in oil & gas separation facilities. These systems are also used for various HTF chilling applications typically utilized in chemical processes. Common chemical facility applications are toluene diisocyanate (TDI), linear low-density polyethylene (LLDPE), low-density polyethylene (LDPE), and high-density polyethylene (HDPE). And, GEA excels at providing refineries with the equipment and systems that meet stringent specifications and industry codes.

Glycol chiller

HTF chilling system
Model 1160S; 2,500 HP

HTF chilling system
Models 60GS; 125 HP

HTF chilling system
Models 2110GL; 2,500 HP

Fertilizer Plants

GEA produces screw compressor packages and condensing systems for ammonia boil-off systems. In addition, GEA can provide industrial refrigeration systems for tank loading & unloading, and for other plant utilities.

Ammonia refrigeration system
Model 575S; 750 HP

Ammonia condensing unit
Model 1435GL; 1,750 HP

Ammonia compressor package
Model 235S; 450 HP

Ammonia BOG compressor package
Model 565GL; 872 HP

Hydrocarbon Storage Facilities

GEA also designs and manufactures screw compressor packages and condensing systems for hydrocarbon storage boil-off systems, as well as tank loading & unloading facilities. GEA API-619 compliant compressors are uniquely suited for these applications.

Mixed-gas compressor package
Model 1640S; 2,670 HP

BOG compressor unit
Model 1210GL; 1,800 HP

Propane refrigeration compressor package
Model 1920S; 2,700 HP

Liquefied Natural Gas (LNG) Plants

GEA provides refrigeration solutions applied to gas liquefaction and gas separation in LNG facilities. These plants typically utilize gas turbines in the liquefaction process. GEA specializes in supplying equipment to chill inlet air to enhance the performance of gas turbines.

Power Generation Plants

In addition to gas turbine inlet air cooling systems and carbon capture & storage, our solutions for power generation also include fuel gas boosting. GEA 28- and 52-bar screw compressor packages efficiently deliver natural gas in a wide range of required pressures for injection into gas turbines.

Pharmaceutical Facilities

GEA refrigeration systems are used for various HTF and low-temperature chilling applications.

Industrial Gas Applications

GEA provides chiller systems for various gas-chilling applications, such as air and nitrogen. Our offerings include both direct and indirect solutions for cooling industrial gases.

Environmental Systems

GEA process chillers are used for vent gas condensing and separation. In addition, our oil-flooded screw compressors are used for the recovery of flare gas. And for carbon capture & storage (CCS) and CO2 recovery, our customers benefit from our extensive experience with these applications.

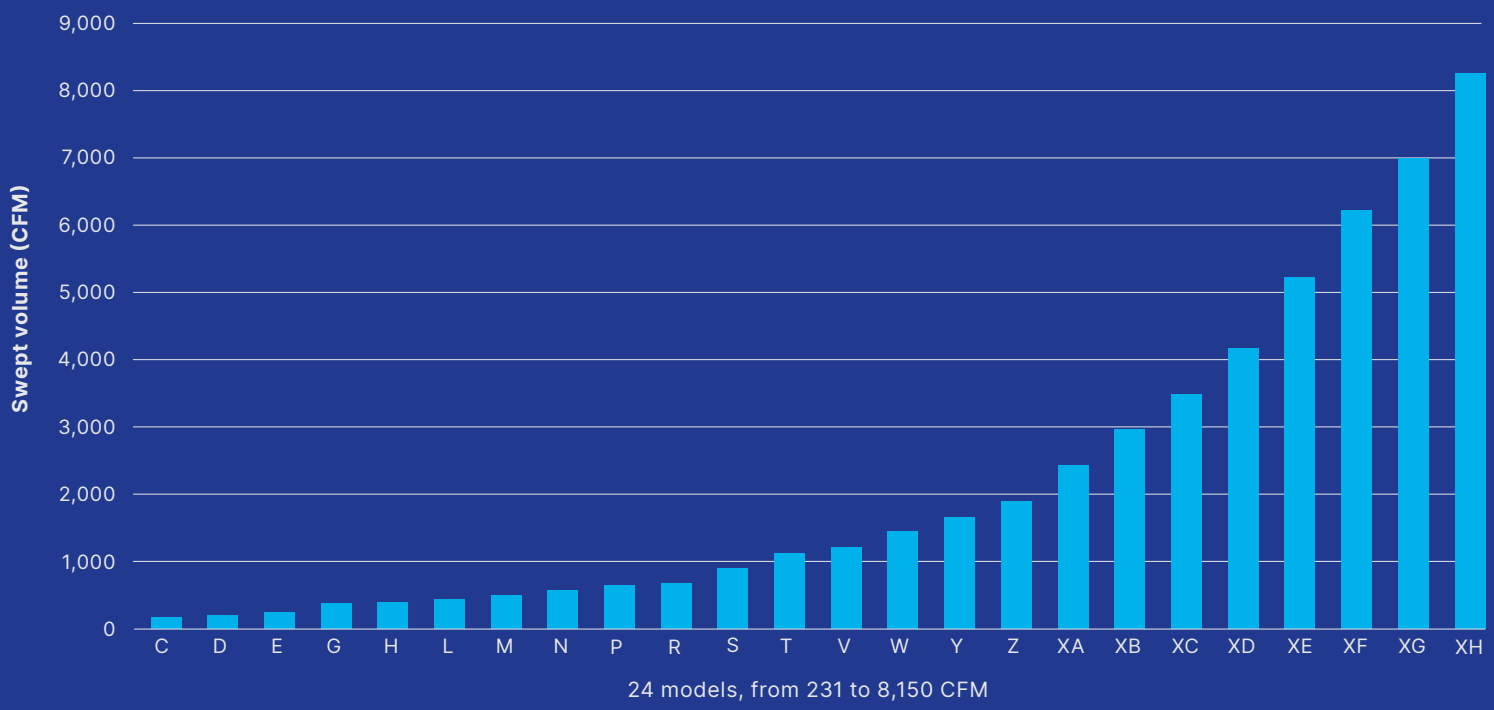
Process gas condensing system

Glycol chilling system
Model 180GL; 200 HP

ROTARY TWIN-SCREW COMPRESSORS

The heart of the system

GEA screw compressor range



GEA satisfies the pulse of the market by offering a wide range of oil-flooded, twin-screw compressors for a variety of applications in the process gas compression and industrial refrigeration markets. GEA's robust screw compressors are compact and designed for ease of maintenance. Designed for use with natural refrigerants, low GWP refrigerants and synthetic refrigerants, GEA has the ability to apply a refrigerant that meets your preference and specifications. In addition, GEA compressors are suitable for use in mixed-gas applications. A broad choice of driver options, such as electric motors, steam turbines, natural gas, and diesel engines, are available. Twin-screw compressors operate by drawing gas into the spaces between the lobes of two rotors. As the rotors turn, the gas is forced by the rotor profile into continuously decreasing space until it reaches the discharge port of the compressor Since screw compressors are positive-displacement machines, they can cope with the wide range of molecular-weight gases found in many process gas compression applications. Positive-displacement screw compressors do not generate out of-balance forces; therefore, they require significantly less foundation strength than other compressor types. With tens of thousands of compressor installations worldwide, leading companies around the globe rely on GEA's engineering expertise and reliable products for use in their critical applications.

GEA Model XH compressor

Swept volume: 8,150 CFM

High-efficiency rotors
- GEA-specified 5/6 rotor profile
- Compact and rigid design

Capacity- and Vi-control
- Compact and integrated system
- Infinite capacity control (10% - 100%)
- Best COP at full and part load

Radial sleeve bearings
- Hydrodynamic operation for high loads
- No wear, unlimited lifetime
- Temperature monitoring available

Axial thrust bearings
- Easy, quick access from non-drive end
- Designed for maximum service life
- Field replaceable
- Roller element design (standard)
- Tilting pad design (available)

Large series screw compressors

Advantages
- Optimized main rotor dimensions
- Sleeve bearings for radial loads
- Roller element bearings for thrust loads
- Stepless adjustable capacity control
- Non-wearing, hermetically sealed position indicating system
- Power up to 5,623 HP (4,193 KW)
- Speed range up to 3,600 rpm

Compressor Model	Package Model	Capacity Swept Volume (CFM)
P	180GL	572
R	230GL	739
S	290GL	917
T	340GL	1,030
V	400GL	1,237
W	475GL	1,415
Y	565GL	1,699
Z	675GL	1,953
XA	800GL	2,309
XB	1025GL	2,949
XC	1210GL	3,482
XD	1435GL	4,122
XE	1770GL	5,095
XF	2110GL	6,083
XG	2450GL	6,970
XH	2850GL	8,150

All compressors available in 28- and 52-bar rating (63 bar for select models)

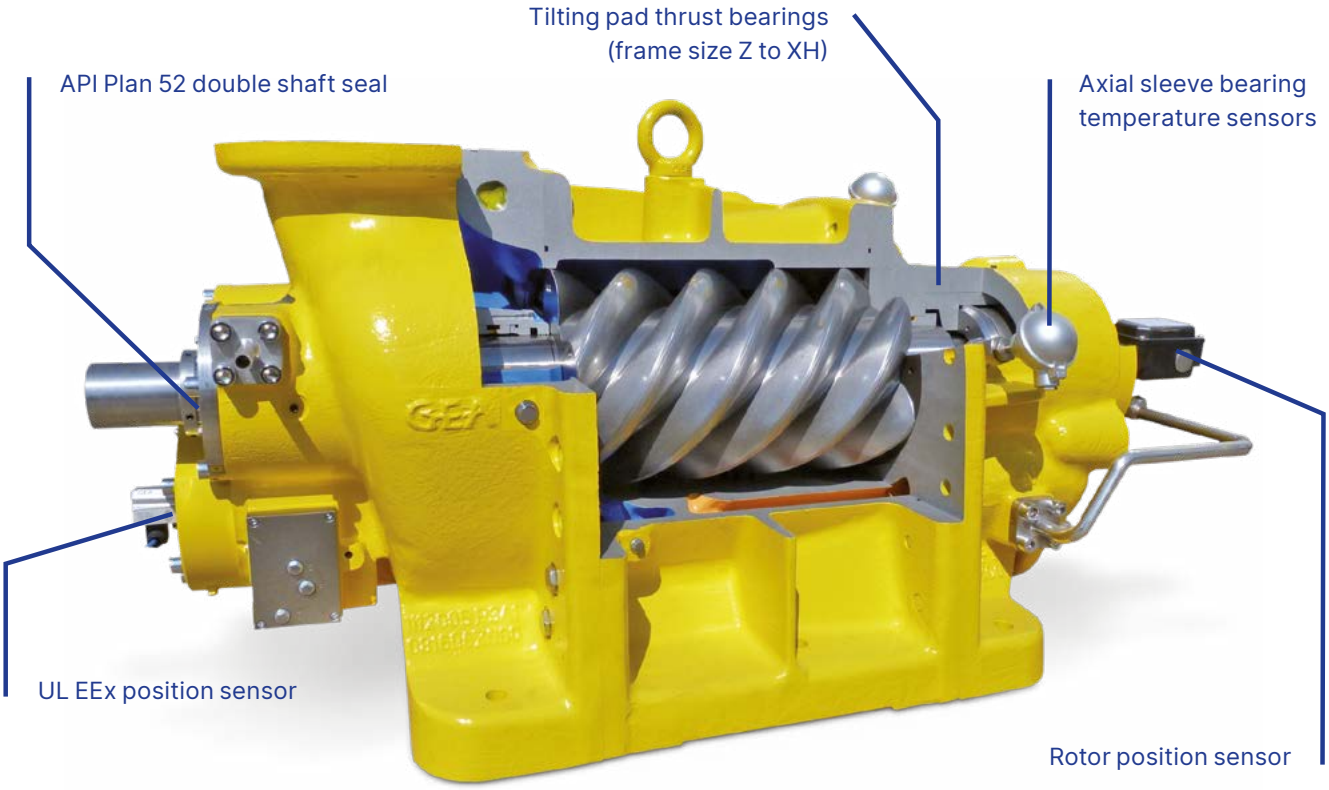
Medium series screw compressors

Advantages

- Roller element bearings for thrust and radial loads
- Stepless adjustable capacity control
- Non-wearing, hermetically sealed position indicating system
- Speed range up to 4,500 rpm

Compressor Model	Package Model	Capacity Swept Volume (CFM)
C	55GM	164
D	60GM	188
E	75GM	228
G	85GM	264
H	110GM	335
L	125GM	387
M	160GM	490
N	195GM	611

All compressors available in 28- and 52-bar rating (63 bar for select models)



GEA API 619 compressors

GEA API 619 compressors have prepared connections for vibration sensor mounting. The cast steel casing is available as an option on most large series models.

API 619 options

- Nodular iron housings
- Cast steel housing material
  (select models: ASTM A352 Grade LCB)
- Tilt pad thrust bearings (select models)
- Double shaft seal (wet/wet API Plan 52)
- Sleeve bearing temperature monitoring
  (large series only)
- Rotor position monitoring
- Material certificates
- Four-hour run test
- Performance test (ammonia)
- Other test options

PRESSURE VESSELS AND SHELL & TUBE HEAT EXCHANGERS

Design and manufacture

Capabilities extend to the design and manufacture of pressure vessels and shell & tube heat exchangers. These refrigeration and gas compression components are generally incorporated into the systems that GEA designs and builds, and are typically factory skid-mounted with piping and controls. GEA offers a comprehensive portfolio of vessels and exchangers, including condensers, evaporators, economizers, receivers/accumulators, suction traps/scrubbers, and oil separators.

Pressure vessel material types & sizes
6” to 144” diameter; up to 40’ length; up to 120,000 lbs.; carbon steel, 3.5 percent nickel steel, 304 & 316 stainless steel.

Heat exchanger material types & sizes
3” to 70” diameter; up to 44’ tube length; more than 120,000 lbs.; carbon steel, 3.5 percent nickel steel, 304, 316, 2205 & 2507 stainless steel, copper, 90/10 & 70/30 cupronickel, admiralty brass, titanium.

Certifications & standards
ISO 9001; ASME U & R and National Board NB Stamps; SNT-TC-1A Certification Program; TEMA; API; Australian, Brazilian, Canadian (CRN), Malaysian & Singapore registrations.

Pressure design ratings
2,000 psig to full vacuum and 650°F to -100°F designs.

Flooded glycol chiller
64” OD x 432” tube length with 60” OD header

Propylene condenser
50” OD x 408” tube length

Manufacturing competencies

Plate burning
CNC plasma cutting table 12’W x 25’L table with oxy-fuel option.

Welding
Fully integrated GTAW, SMAW, GMAW-S, GMAW-Sp, GMAWRMD, SAW-AC, SAW-DC; 3-ton positioners; 30-ton turning rolls.

Plate rolling
Up to ¾” thick and 15’W carbon steel.

Machining
Bullard Cutmaster vertical turret lathe, 72” swing by 60” height.

Blasting
22’W x 20’H x 40’L recirculated shot & grit blast room with crane & rail access and stainless steel silica aluminum media option; 20’W x 16’H x 20’L hot water phosphate wash bay.

Painting
20’W x 20’H x 42’L environmentally controlled room with crane & rail access; 13’W x 13’H x 16’L environmentally controlled room with rail access.

Engineering & design
Aspen Shell & Tube Exchanger and Mechanical, finite element analysis (FEA), AutoCad, and Inventor.

Propane receiver
106” OD x 532” OAL

CONTROLS

The intuitive touch for process refrigeration and gas compression control technology

GEA is synonymous with precision-engineered solutions, and the GEA Omni control panel extends its history of leadership and innovation. Featuring a high-definition, multi-touch screen, GEA Omni delivers the ease of use and technical wow factor that industrial professionals have come to expect from GEA. From dedicated compressor control to system control, GEA Omni is the control solution of choice for leading global companies. GEA Omni can also be easily retrofitted to existing equipment to enhance controlability and monitoring. In addition, Allen-Bradley PLCs are avilable as an alternative.

Complete system control in one panel
- Control your entire refrigeration or gas compression system with one GEA Omni

Hardware layout
- Standard industrial components with modular layout

High-definition display
- 1366 x 768 resolution

Unique user setup and auditing
- Create unique users and monitor usage/actions

GEA OmniLink
- Application to remotely view and manage your GEA Omni control panels with Ethernet file transfer

Configurable Modbus TCP Ethernet communication
- Read/write information from other controllers without additional wiring

Multi-touch display
- Natural and intuitive input

GEA peace of mind
- Invented, manufactured, and backed by the worldwide leader in refrigeration and gas compression control panel technology

Drawings, manuals, and videos
- Documentation at your fingertips with helpful videos available on the panel display

Field configurability
- Easy retrofit panel installation
- Predictive maintenance
- Notifications for recommended service

Global product with local sales and support
- Single design
- Manufactured in North America, and Europe
- Preconfigured in more than 30 languages

GEA OmniHistorian
- Application to view historical data from GEA Omni control panels and perform detailed analysis

PRODUCT SUPPORT

GEA peace of mind

Service
GEA's worldwide service support includes trained technicians and product specialists ready to support your GEA equipment.

Parts
Field experience has proven that the use of genuine GEA parts maximizes compressor performance and reliability, while minimizing the total cost of ownership. GEA's vast parts inventory allows for fast delivery to minimize downtime.

Training
GEA recognizes the importance of customer support. This can only be achieved when the right training programs are available. Local representatives and contractors are able to attend these training courses. These trainings, geared for design and service engineers, as well as service technicians, are focused on the correct selection and application of GEA compressors as well as performing the correct service to maintain the highest level of reliability.

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