

# Oil free screw compressors

Packaged systems for gas compression





# Keeping your process running with reliable, safe and efficient gas compression.

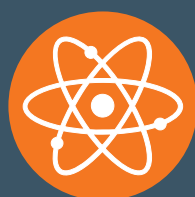
There are many situations where oil free technology presents the best approach. Oil free screw compressors are available in different configurations and materials providing the most compact arrangement, to allow the handling of gases with high levels of liquid, dirt and particulates. Their configurations are suitable for use with hazardous or corrosive gases, or where contamination is an issue.

Oil free screw compressors are positive displacement and operate at relatively low tip speeds which means they are not as susceptible to erosion from free liquids or particulates. They do not experience surge like a centrifugal compressor making them more equipped to handle varying molecular weights and unpredictable gases.

Polymer forming gases can be harmful to other compressor technologies such as centrifugal and reciprocating compressors. The build-up of polymer or tar can create imbalance and vibration problems with high speed compressors; however, this build-up does not have an adverse impact on a screw compressor. Oil free screw compressors are designed for a minimum of 5 years with uninterrupted service and can meet API 619 or other industry standards. For processes where availability and reliability are paramount, the oil free screw compressor is the best option.



Designed to operate for a minimum of **5 years with uninterrupted service**



Equipped to handle varying **molecular weights and unpredictable gases**



**Not susceptible to erosion** from free liquids or particulates



Suitable to handle **polymer forming gases**

Revolving Around You™



## Why Howden?

Howden products are designed to achieve maximum efficiency and long reliable operational life through our focus on engineering excellence. This has been established and enhanced across one of the largest installed bases of screw compressors in the world since first commercialising screw technology in 1938.

Our manufacturing facilities maintain the highest levels of excellence with modern equipment and strict quality controls accredited to international standards.

A full test capability across our entire range ensures confidence in the performance quality of each unit. Testing can be carried out in either our UK or USA facilities, giving our customers the potential of inspection

time and cost savings through selection of the most advantageous location.

In addition, we can offer remote monitoring of tests being carried out in our UK facility. This utilises our Uptime monitoring tool.

We have experts in multiple regions with access to our selection software programme and so can swiftly determine the best compressor selection in line with your project and process requirements. This means we can provide customers options to consider and enable judgements to be made on potential impacts to the wider project design.

With over 50 operational sites globally we have the largest coverage for service backed up by direct access to product experts. This can translate directly to the quick resolution of any unexpected issues, thereby maximising production time and associated revenues.



Digitally enabled test suite.



# Fields of application

There are many applications benefitting from the use of oil free screw compressors. These often occur in situations involving polymer forming gases, gases with varying composition or operating conditions, process gases with liquid carry over or dirty and corrosive gases.



## Oil and gas production

Flash gas/low pressure gas boosting within onshore and offshore separation plants.

Off/vent gas processing from stabilization units.

Tail gas processing within gas treatment plants.

Flare gas recovery within onshore and offshore production facilities.



## Petrochemical and chemicals

Off/ vent gas processing in a wide range of plants dealing with highly corrosive and difficult gases (e.g. polyethylene, acrylonitrile, styrene, vinyl chloride monomer, maleic anhydride, soda ash).

Feed and recycle gas boosting of butadiene, acetylene and hydrogen (within multiple plants such as linear alkyl butadiene or aniline).



## Oil refining

Off/vent gas processing within production units such as Fluid Catalytic Converters, Delayed Cokers, CDU and Alkylation.

Flare gas recovery systems.

Tail gas processing within hydrogen recovery plants.



## Metal production

PTS (nitrogen) compression for conveying of pellets in certain Direct Reduced Iron processes.

Coke oven gas compression.

## Industrial utilities

Fuel gas boosting for gas turbine power units within energy production facilities.



## Selected references

### Flare gas compression

2 stage system in offshore oil development (Abu Dhabi)  
Volume: 2867 m<sup>3</sup>/h (1687 cfm)  
Pressure: 1 bar to 6.8 bar a (14.5 to 98.6 psi)

### LP booster

2 stage system in offshore oil development (Canada)  
Volume: 5502 m<sup>3</sup>/h (3238 cfm)  
Pressure: 1.4 bar to 10 bar a (20.3 to 145 psi)

### Nitrogen regeneration

Propylene plant (Abu Dhabi)  
Volume: 4360 m<sup>3</sup>/h (2566 cfm)  
Pressure: 3 bar to 6 bar a (43.5 to 87 psi)

### Fuel gas booster

Multiple units for offshore oil platform (China)  
Volume: 3958 m<sup>3</sup>/h (2329 cfm)  
Pressure: 4.4 bar to 9.6 bar a (63.8 to 139.2 psi)

### Hydrogen regeneration

Oil refinery (Belarus)  
Volume: 5491 m<sup>3</sup>/h (3231 cfm)  
Pressure: 5.8 bar to 8.4 bar a (84.1 to 121.8 psi)

### Deheptanizer net gas

Petrochemical plant (South Korea)  
Volume: 15150 m<sup>3</sup>/h (8916 cfm)  
Pressure: 1 bar to 7.0 bar a (14.5 to 101.5 psi)

### Stabilizer off gas

Oil production facility (Iraq)  
Volume: 11995 m<sup>3</sup>/h (7059 cfm)  
Pressure: 1.1 bar to 3 bar a (15.9 to 43.5 psi)

### Vapour recovery

Oil field development (Malaysia)  
Volume: 1748 m<sup>3</sup>/h (1028 cfm)  
Pressure: 4.4 bar to 12.9 bar a (63.8 to 187 psi)

### VCM recovery

2 stage system in petrochemical plant (Mexico)  
Volume: 5010 m<sup>3</sup>/h (2948 cfm)  
Pressure: 1.1 bar to 5.0 bar a (15.9 to 72.5 psi)

### Butadiene recycle

Refining and petrochemical complex (India)  
Volume: 15371 m<sup>3</sup>/h (9047 cfm)  
Pressure: 1.6 bar to 5.5 bar a (23.2 to 79.7 psi)

### PTS gas compression

Steel plant (Egypt)  
Volume: 10457 m<sup>3</sup>/h (6154 cfm)  
Pressure: 2.9 bar to 11.3 bar a (42 to 163.8 psi)

### PSA nitrogen startup

Oil refinery (Peru)  
Volume: 1536 m<sup>3</sup>/h (904 cfm)  
Pressure: 8.8 bar to 10.8 bar a (127.6 to 156.6 psi)

### Butane BOG recovery

NGL plant (UK)  
Volume: 3900 m<sup>3</sup>/h (2295 cfm)  
Pressure: 0.9 bar to 3.1 bar a (13 to 44.9 psi)

### Flash gas compression

Offshore oil platform (Dubai)  
Volume: 5447 m<sup>3</sup>/h (3205 cfm)  
Pressure: 2.3 bar to 11.4 bar a (33.3 to 165.3 psi)

### VDU Off Gas

2 stage systems for oil refinery (Saudi Arabia)  
Volume: 806 m<sup>3</sup>/h (474 cfm)  
Pressure: 1.2 bar to 3.5 bar a (17.4 to 50.7 psi)



# Key features

## Package

Designed around our core compressor technology in single or multistage configuration and meeting API 619 with minimal deviations

## Drives

Electric motor sourced from leading OEMs  
Steam turbine using Howden's KK&K brand or others on request.

## Gearbox (as required)

Speed increasing gearbox in line with API or other applicable industry standards.

## Instrumentation

Condition monitoring covering bearing temperatures, radial vibration, casing vibration and axial position  
Process instrumentation for package control and safeguarding.

## Lube oil and seal systems

Lube oil and seal systems manufactured in line with project requirements with the option to mount on separate skids as necessary to suit site layout constraints.

## Acoustic equipment

Silencers and acoustic enclosure as required to ensure that the emitted noise meets the HSE requirements.

## Gas conditioning equipment

Suction and discharge knock out drums and coolers as necessary for process requirements.

## Extended scope

Potential to add elements such as knock out drums, process valves, process coolers and piping.

## Temperature control

Liquid injection with bottom discharge

## Casing

Horizontal or vertical split casing options  
Material options from cast carbon to high chrome steels meeting EN, ASTM and NACE standards as required

## Uptime module

Integrated machine learning and performance mapping (subject to activation)

## Bearings

Options include sleeve or tilt pad journal

## Rotors

Howden designed profile  
Optimised for temperatures up to 250°C/482F

## Sealing

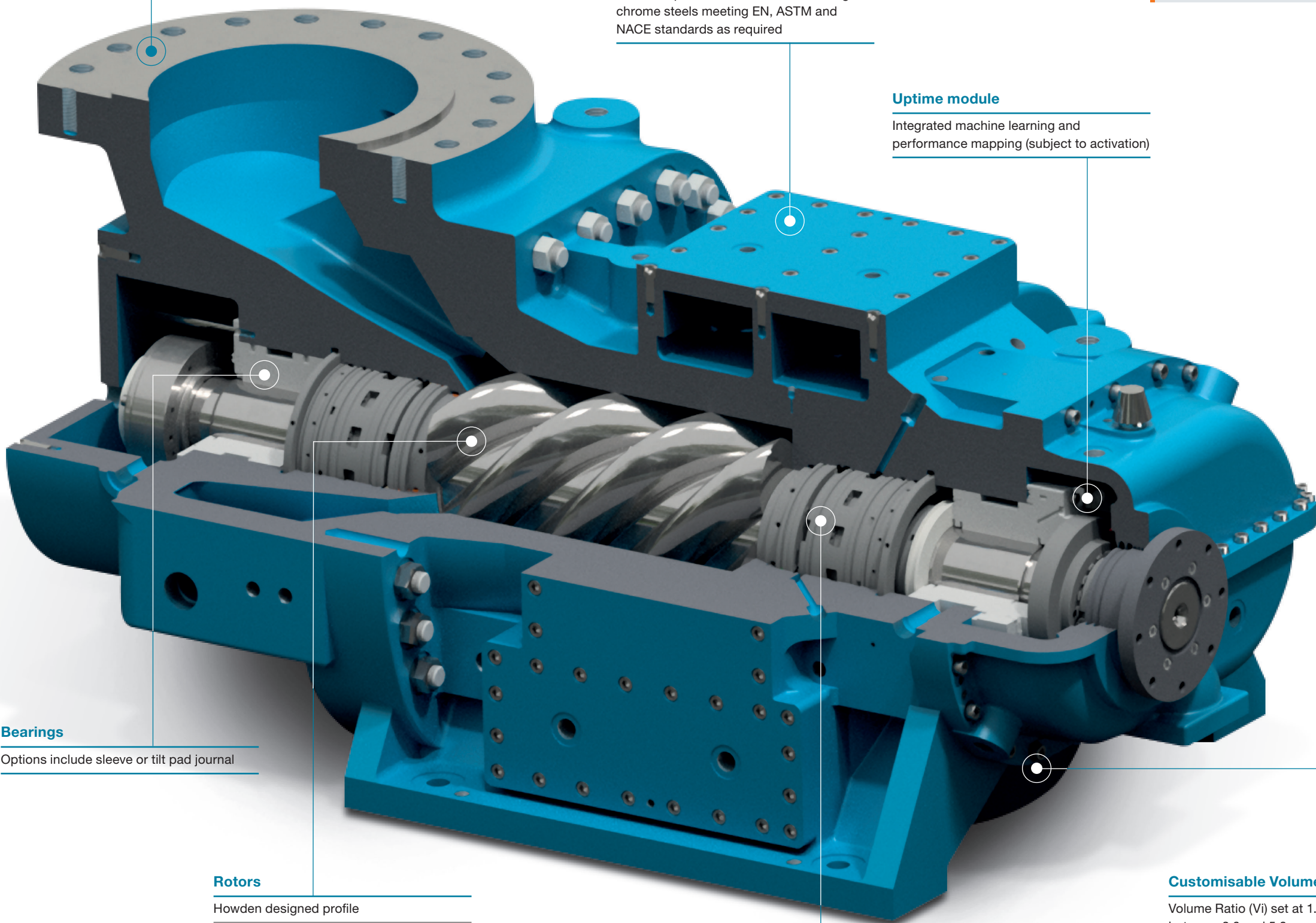
Options include dry gas, wet mechanical and carbon ring

## Compressor

Proprietary oil free design compressors in 9 frame size ranging from 127mm to 816mm

## Customisable Volume Ratio

Volume Ratio (Vi) set at 1.5 or customisable between 2.6 and 5.0





# Key value points from Howden's oil free range



## Long term reliable and efficient performance

The Howden compressor enables a wide range of gases, even those with particles, liquids and prone to polymerization, to be processed within a surge free, low vibration operation. This results in greater reliability and longer run times between major overhauls.

The oil free design provides the benefit of no contamination of the compressed gas and lower viscous friction leading to higher speed operation, volumetric delivery and efficiency.

The compressor is optimised for performance with rotors designed to achieve the volumetric flow with the lowest power requirement. As the compressor can run at temperatures of up to 250°C the number of stages needed to achieve the required pressure is also minimised.

### Benefits

High availability maximising production – simplified operation and no oil related maintenance issues.

Lower operating costs – high efficiency, low maintenance requirements, minimal gas clean-up prior to compression, no replacement oil.

Minimised capital costs with smallest applicable compressor selected for high pressure ratio applications and elimination of expensive anti-surge systems.



## Flexible to application duties

Our comprehensive range of 9 frames sizes, including horizontal casings designed for high capacity and vertical casings for high pressure, mean our packages are suitable for a large number of applications. The horizontal casing also means easier access for maintenance, while the vertical casing offers a more compact solution where space is at a premium.

### Multiple design options give flexibility to configure the solution to meet specific technical and commercial demands:

- Casing material options are available from cast carbon to high chrome steels.
- Standard or enhanced thrust balancing options with higher axial loading capabilities offer the ability to operate at higher pressure.
- Sleeve or tilting pad journal bearing options meet different operating conditions based on bearing performance (enhanced rotor stability).
- Seal arrangements can be customised to fit the specifics of site location (availability of sealing gas, utilities etc.) or general customer preference.

### Benefits

Potential capex and opex reductions through matching capacity and pressure requirements within a single or smaller compressor.

Lower installation costs with compact package and ease of maintenance meeting Human Factors Engineering requirements.

Lower capital cost requirements where process allows lower cost materials.

Reliable long term operation with higher specification materials where gas make-up or process necessitates.



## Control by design to match process requirements

Volume ratios can be set to best fit the process in which the compressor will operate (based on one time selection). Liquid injection is provided to manage discharge temperatures and increases thermal stability with minimal distortion of casings. This also prevents gas polymerization and fouling in the compressor. Bottom discharge aligns with this capability allowing better drainage of liquid.

### Benefits

Optimised energy use and minimised cost by operating at the most efficient point (avoiding over and under compression issues).

Maximised performance when dealing with gases of high risk of polymerisation through process control.

Reliable operation and lower lifetime costs by effective removal of liquids and casing/ compressor failure prevention.



## Full package solution engineered to project specification

Howden's packaging expertise ensures a complete solution is designed and engineered to meet the project requirements. Each package is able to fulfil API 619 with minimal deviations, meeting the most stringent operational standards.

When a wider scope of supply is needed this can be accommodated to include elements such as knock out drums, process valves, process coolers and piping.

### Benefits

Clarity within project stages over specification compliance with comments on deviations when any are required.

Less time and effort in sourcing additional elements required to deliver a fully operational package.



## Optimised operation enhanced by Howden Uptime

Each compressor package comes with instrumentation required to monitor conditions such as bearing temperatures, radial vibration and axial position. This is enhanced further by the installation of Howden Uptime.

When enabled this offers operators real time assessment of equipment performance by applying machine learning and opportunities to optimise the compressor performance as well as identify any potential issues.

### Benefits

Improved reliability with reduced downtime and impact on production output through ability to plan maintenance.

Most efficient performance based on real operational intelligence.



# Worldwide lifetime support

Every Howden process screw compressor is the product of over seven decades of experience.



Every Howden process screw compressor installation, from a stand-alone machine to the most complex package with full instrumentation, gas processing equipment and hook-up pipework, comes with a lifetime commitment. The track record of such installations makes it clear that they can be expected to give years of problem-free round-the-clock operation. If, however, upgrade or refurbishment is required, even many decades after initial installation, Howden will be able to offer expert advice based on the original production drawings and our own leading-edge research. The back up extends to complete plant removal and re-installation on a different site if required.

Howden is a global organisation, with a permanent presence on every continent and a network of engineers capable of offering a local response wherever required. Our highly experienced personnel can draw on the services of Howden Technology – our highly experienced research division.

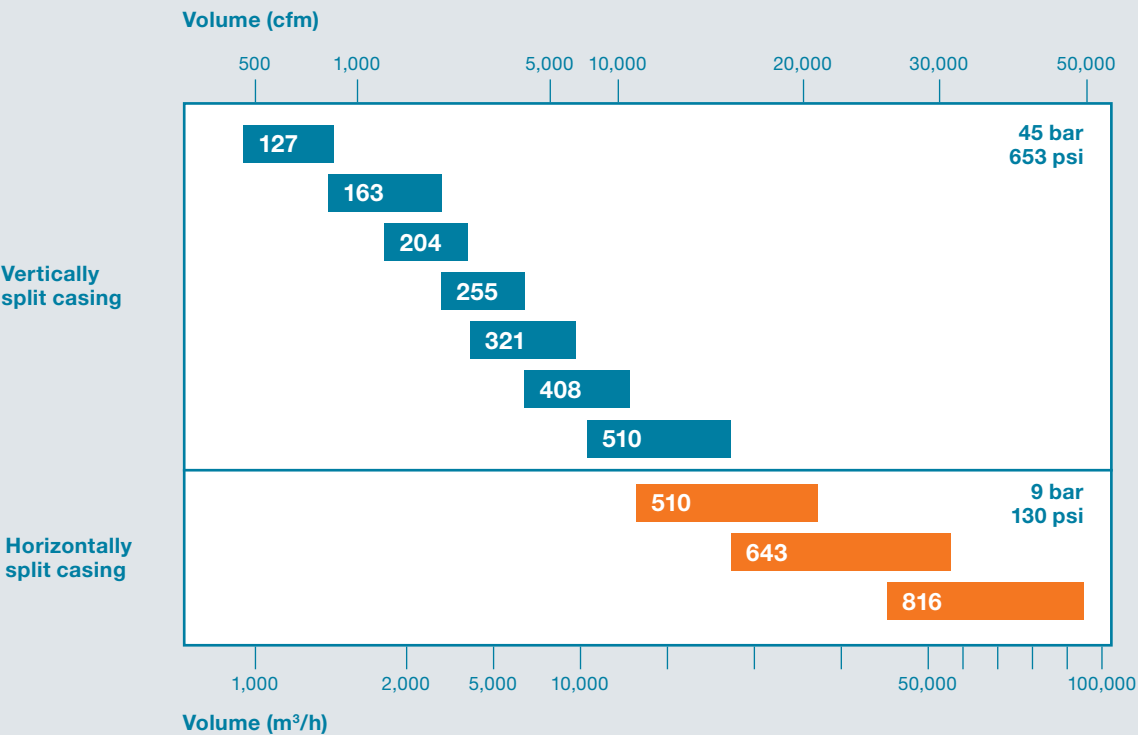
**Spares and upgrades**

We provide a full spare and replacement parts service, backed by comprehensive records to ensure that replacements are accurate and upgrades are appropriate. Parts are certified OEM spares, the only way to maintain original levels of efficiency, performance and reliability, and are delivered on site worldwide to be fitted by your own personnel or, where appropriate installed by Howden engineers.

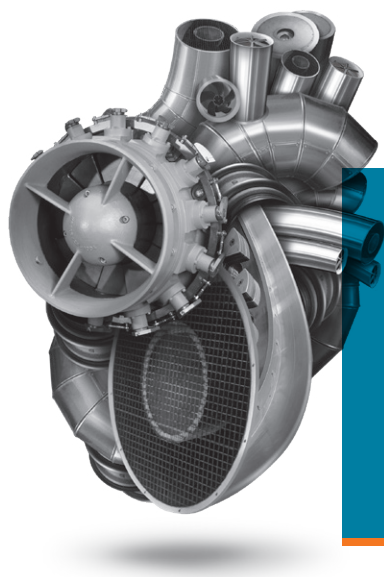
We supply spares kits for many screw compressors, covering seals, bearings, valve assemblies, annual inspection kits and overhaul kits designed to prevent unexpected outages. Where compressors have been in operation for many years and a full refurbishment is thought advisable, we can arrange a full rebuild of compressors followed by a full testing procedure and underpinned by a renewed warranty.

# Product range

The oil free compressor range is able to provide gas compression to up to discharge pressures of 46 bar (653 psi) and 15 bar (217 psi) differential pressure. Available in 10 models the range covers flows up to 92,000 m³/h (54,150 cfm).







## At the heart of your operations

Howden people live to improve our products and services and for over 160 years our world has revolved around our customers. This dedication means our air and gas handling equipment adds maximum value to your operations. We have innovation in our hearts and every day we focus on providing you with the best solutions for your vital operations.



### Howden

Old Govan Road  
Renfrew PA4 8XJ  
United Kingdom

**Tel:** +44 141 885 7500

**Email:** [screw.package@howden.com](mailto:screw.package@howden.com)

**Email:** [screw.aftermarket@howden.com](mailto:screw.aftermarket@howden.com)

**Revolving Around You™**