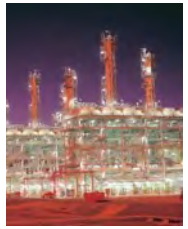
Baker Hughes

Centrifugal and Axial Compressors

Product line overview

50+ years of compression solutions



1967 — **First ammonia units**
Italy

1973 — **First re-injection unit**
Algeria

1985 — **First LNG train**
Australia

1999 — **First sour gas re-injection**
Kazakhstan

2003 — **World's biggest LNG plant**
Qatar

2009 — **Large ethylene 1.2 MTPA**
Saudi Arabia

2019 — **Oil-free compression offshore**
Denmark

Innovating with our customers

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Serving multiple markets

Refinery

- Fluid catalytic cracking
- Reforming
- Hydrocracking

Chem/petrochemical

- Syngas and fertilizers
- CO_2 for urea plants
- Ammonia synthesis
- Methanol synthesis

Upstream

- Oil production
- Gas production
- Gas lift
- Gas re-injection
- Gas storage
- Subsea

Downstream and distribution

- Liquefied natural gas
- Gas to liquid
- Pipeline

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Product line overview

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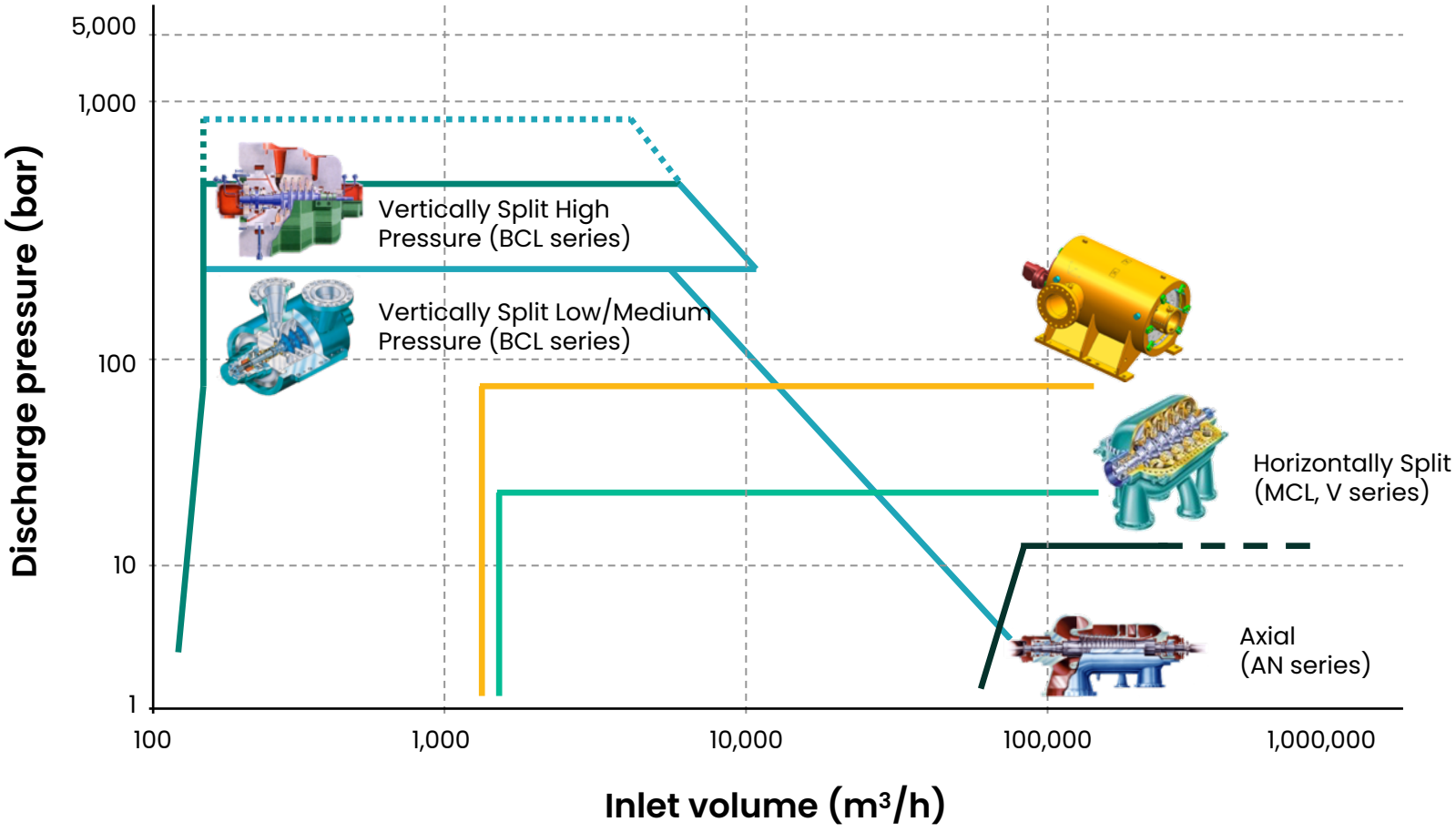
Product line: between-bearing design



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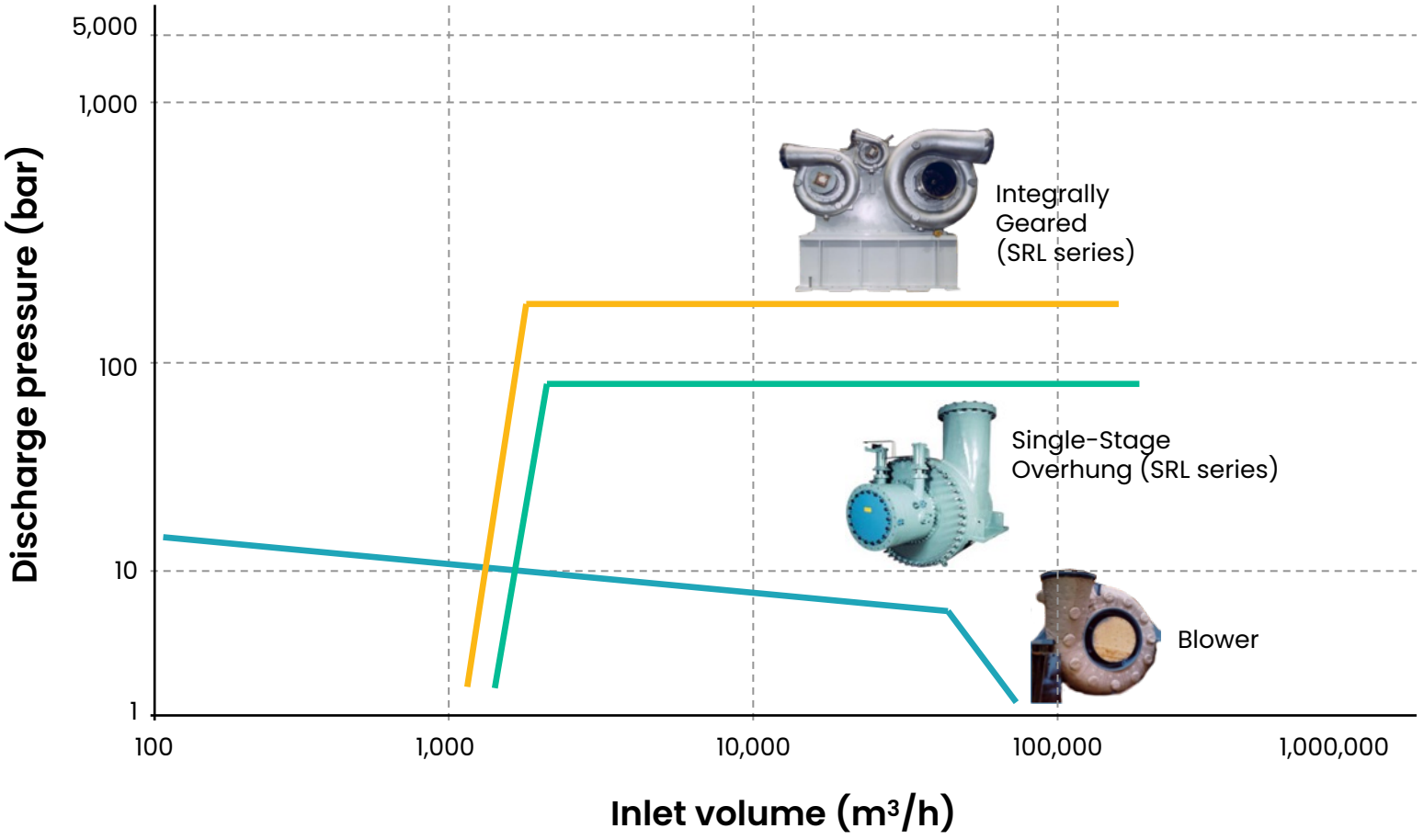
Product line: overhung design



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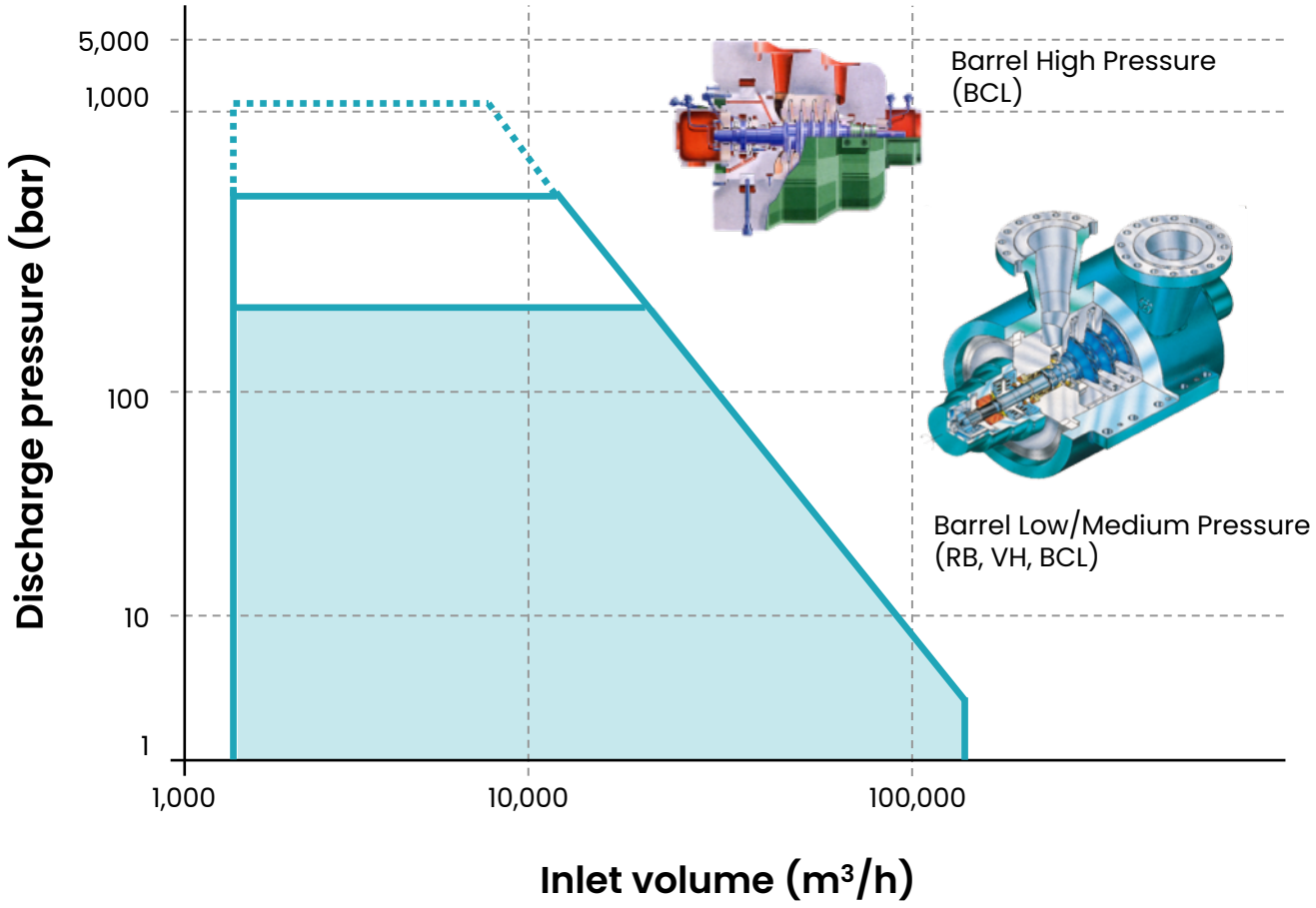
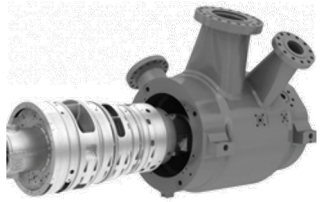
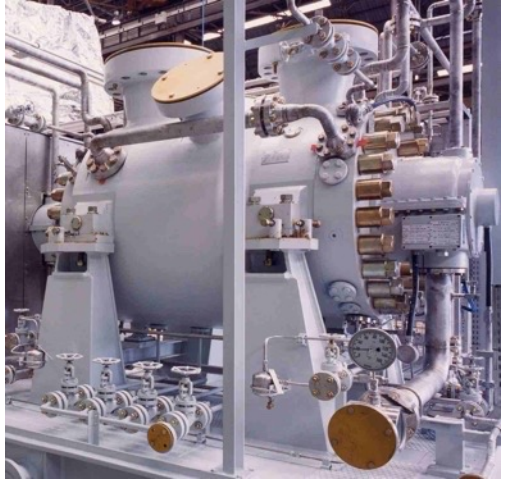
Vertically split compressors







Sizes

- From 300 to 1,200 mm, in-line or back-to-back
- Pressure ratio up to 30:1

Pressure

- Up to 800 bar
- Highest running pressure: 760 bar

Applications

- Primarily for high-pressure applications such as ammonia, urea and methanol synthesis, refinery recycle, natural gas compression, gas injection, re-injection, and hazardous gases

Over 2,400 units installed worldwide

Versatile, reliable designs for high-pressure and corrosive conditions

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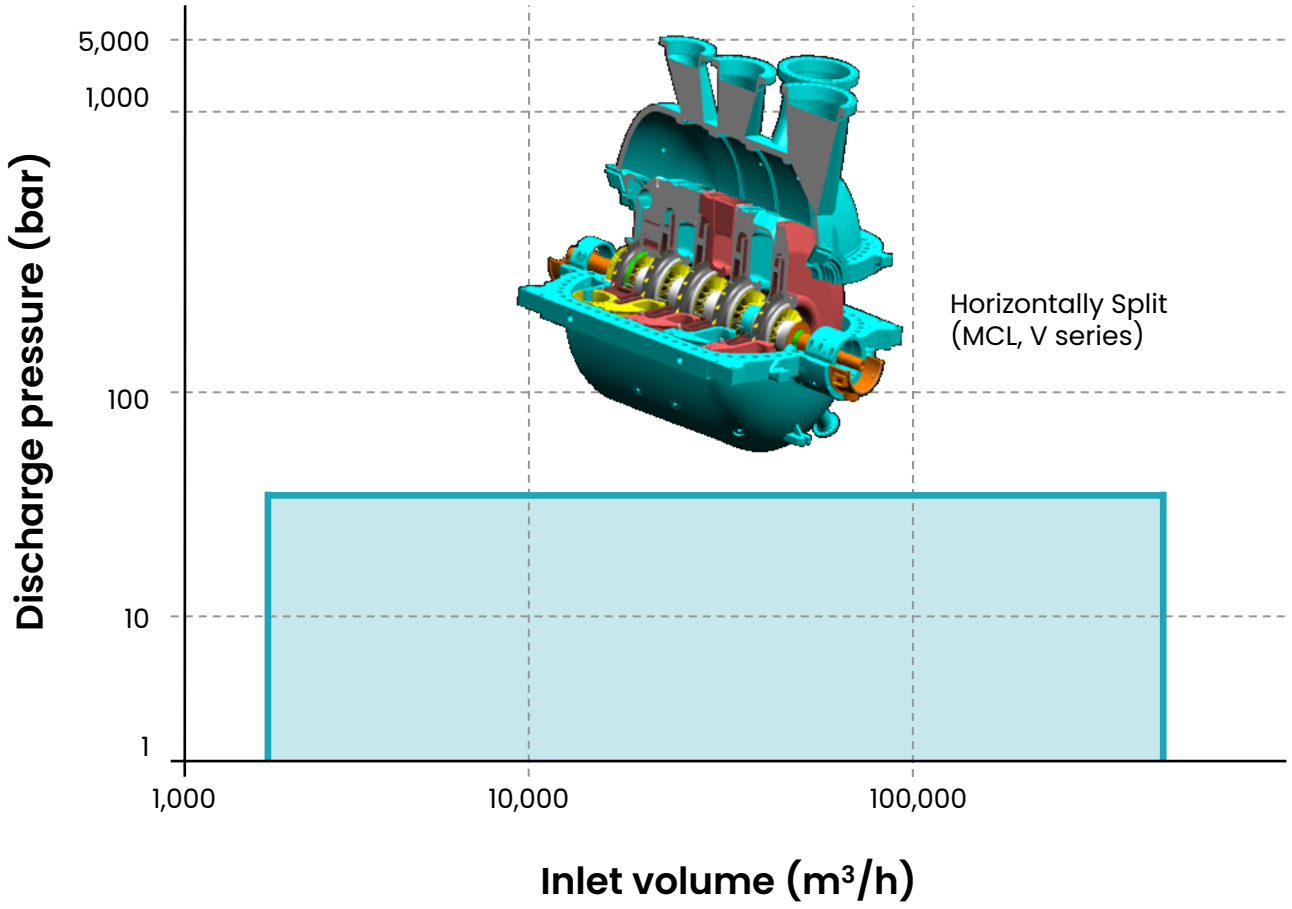
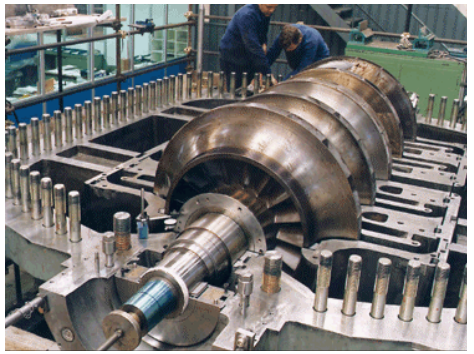
Horizontally split compressors





Sizes

- From 300 to 1,800 mm, in-line or back-to-back
- Flanges up to 86 inches
- Largest diameter impeller 1,850 mm

Pressure

- Up to 50 bar

Applications

- Primarily for low and medium pressure applications including: ethylene and fertilizer plants, refineries and petrochemical plants, LNG for refrigeration and air compression (typically handling wet gas), hydrocarbon refrigerants or natural gas

Over 1,000 units installed worldwide

High performance in applications from high-temperature cracking to extreme cryogenics

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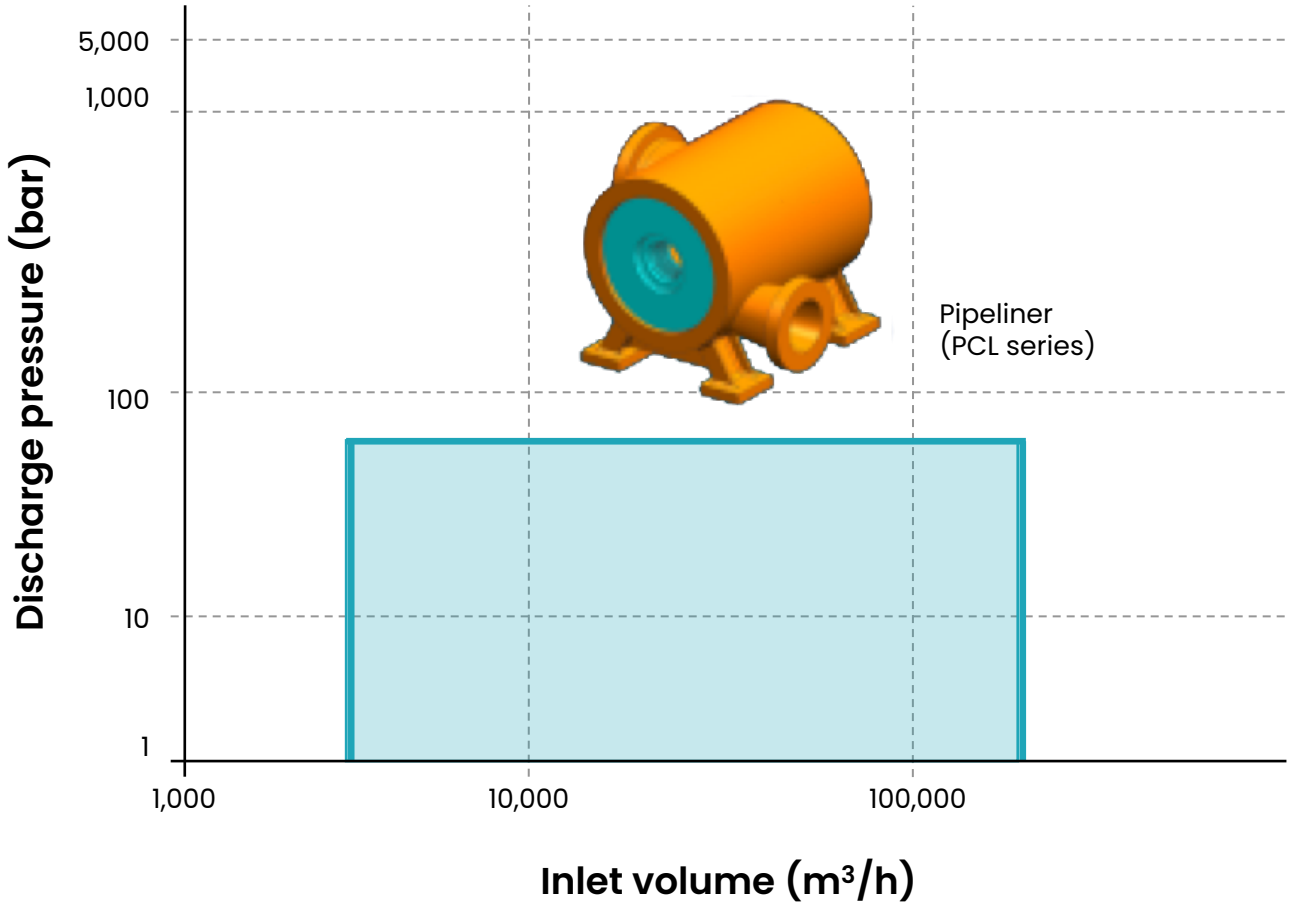
Pipeline compressors



Sizes

- From 500 to 1,000 mm

Pressure

- Up to 100 bar

Applications

- For low and medium pressure ratio pipeline service

Over 500 units installed worldwide

High efficiency and power in a compact package and small footprint

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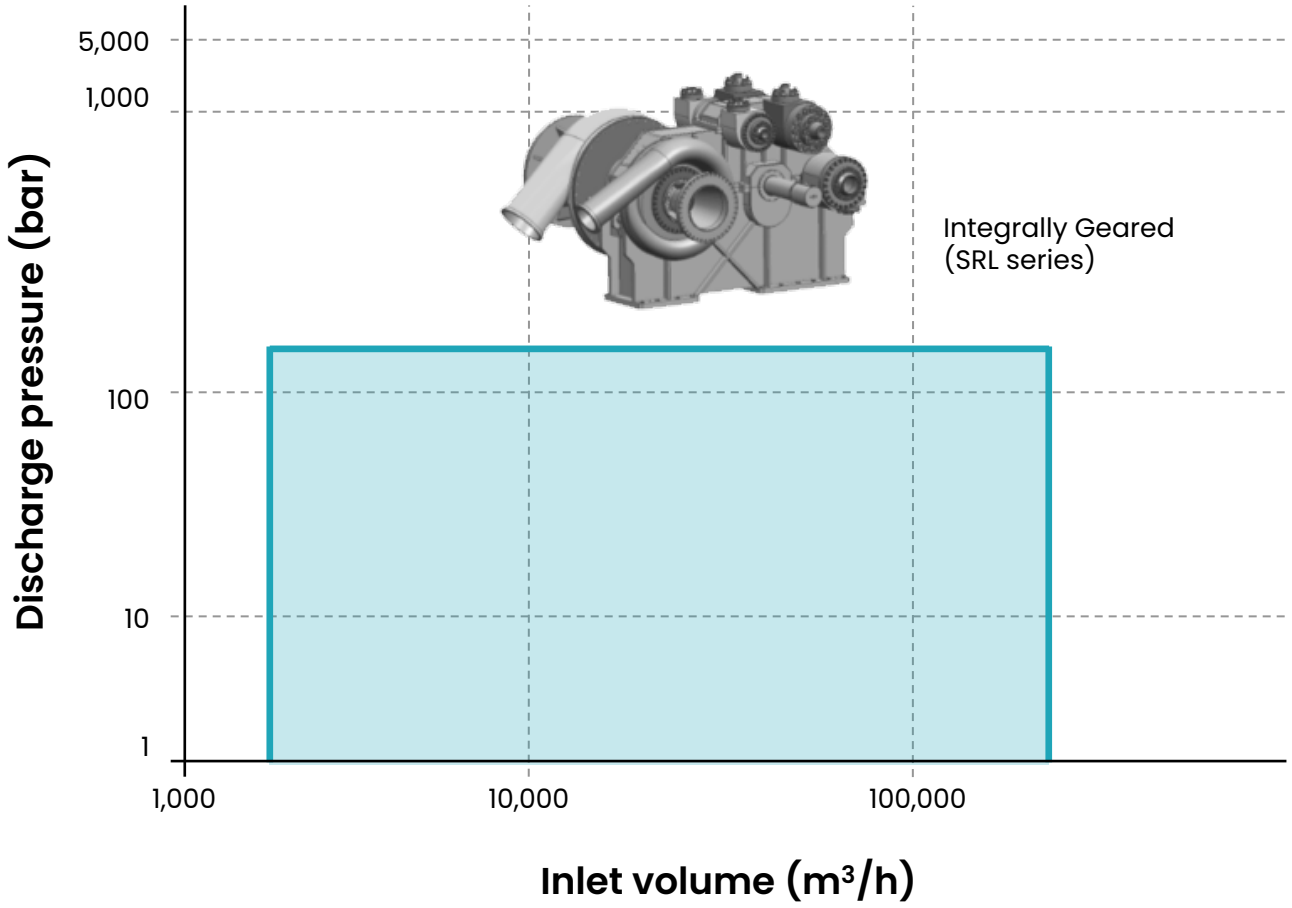
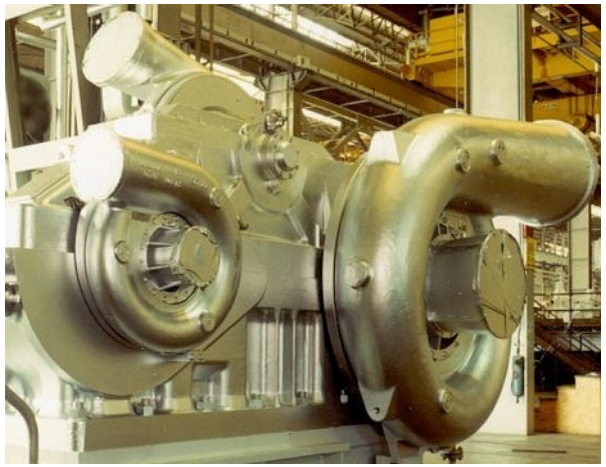
Integrally geared compressors





Sizes

- Multistages up to 10 wheels

Pressure

- Up to 200 bar

Applications

- For low, medium, and high-pressure service for air, steam, and inert gas; fuel gas services; some petrochemical and CCS applications

Over 200 units installed worldwide

Compact designs for heavy-duty applications with air, steam and other gases

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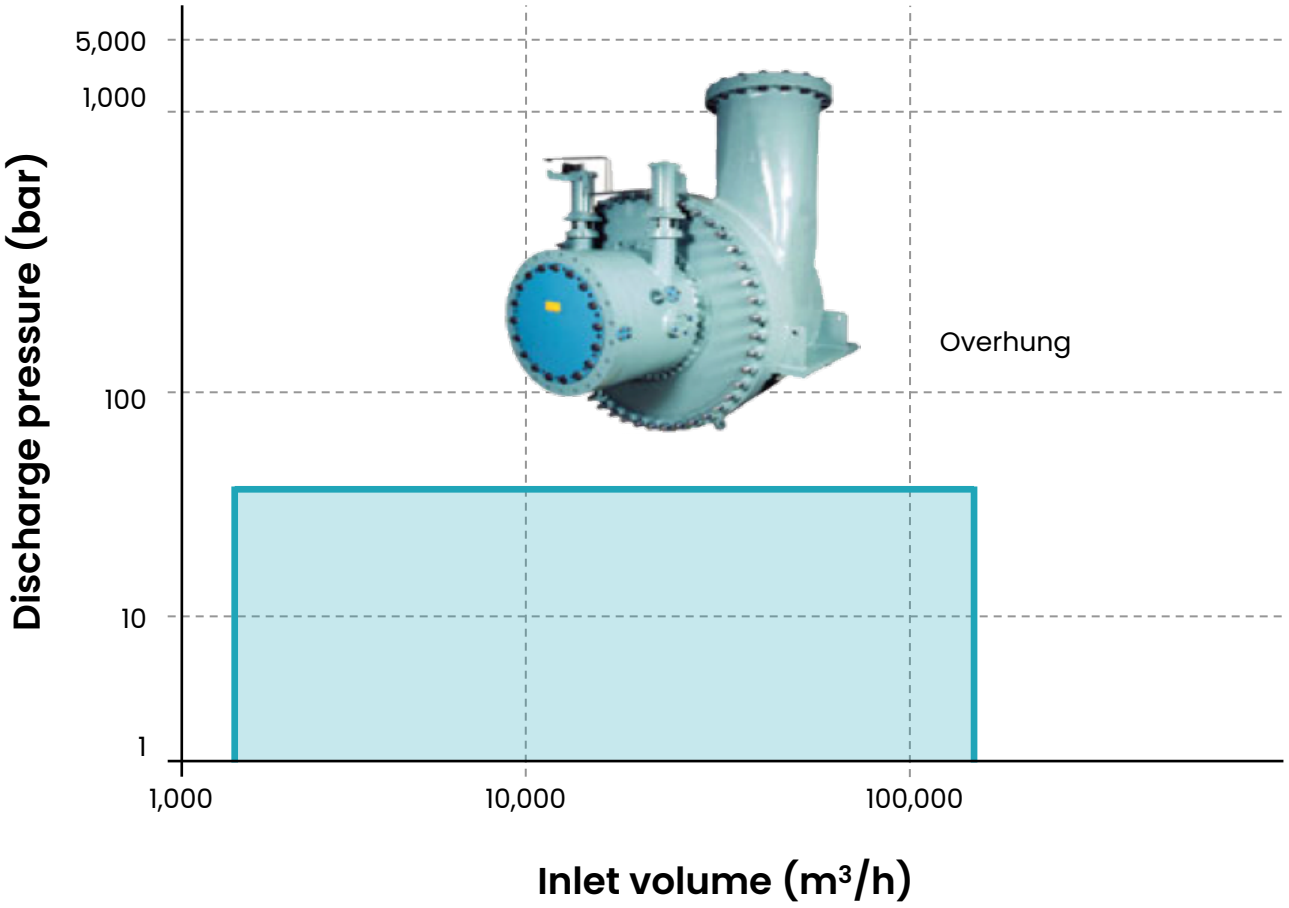
Single-stage overhung compressors



Sizes

- 1,000 mm

Pressure

- Up to 76 bar

Applications

- Booster or recycle compressors in many petrochemical applications including polyethylene, polypropylene, and ethylene oxide

Over 300 units installed worldwide

Best-in-class reliability for downstream applications

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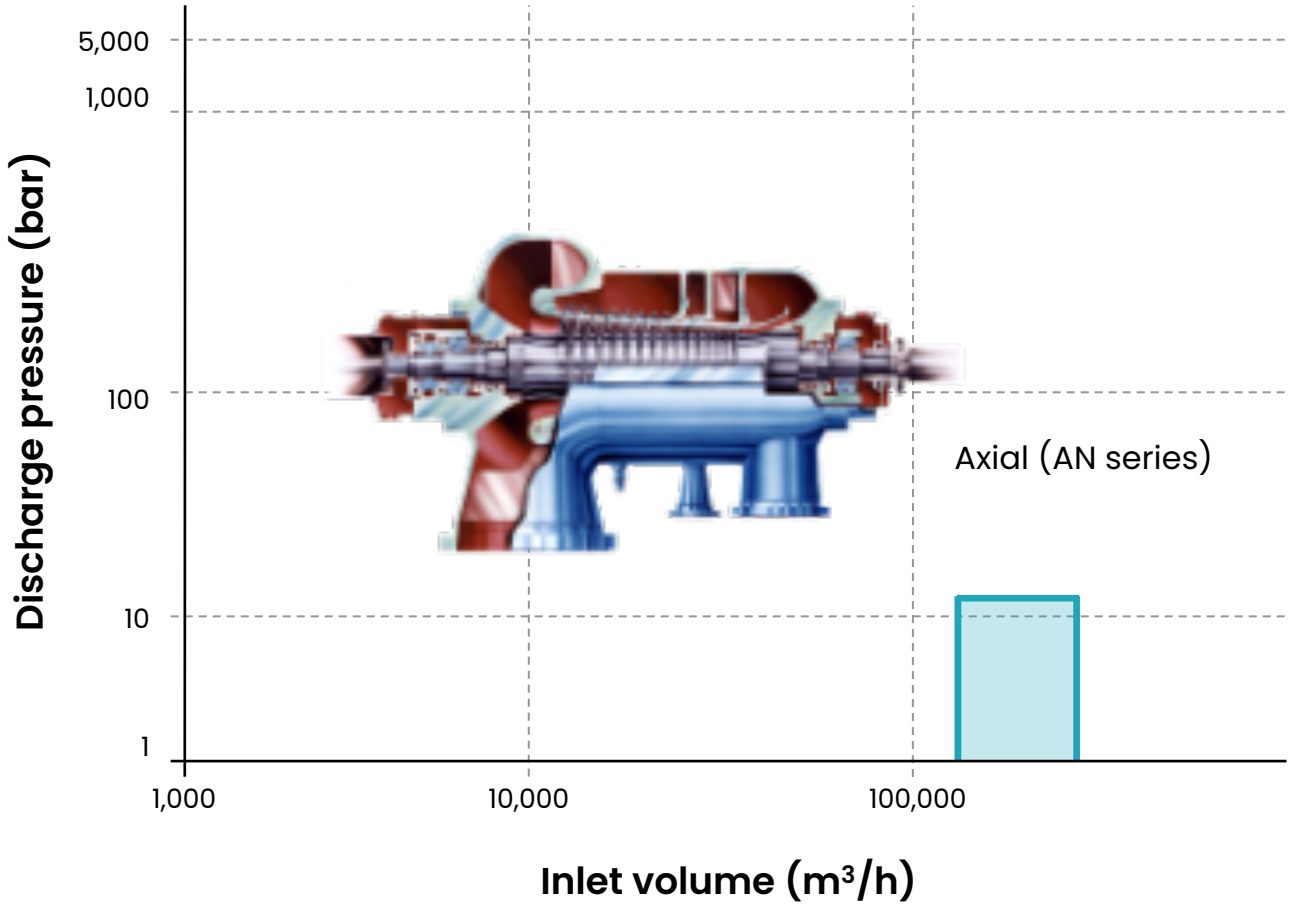
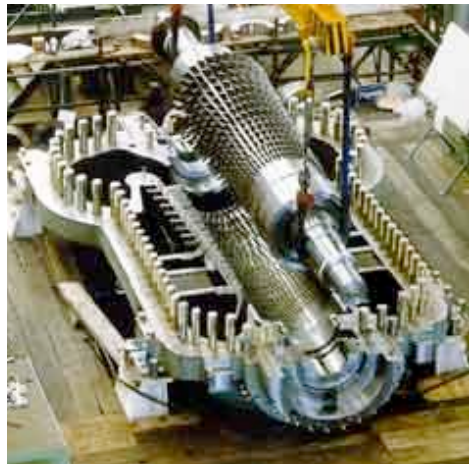
Axial compressors





Sizes

- Up to 25 bar
- Pressure ratio from 3:1 to 7:1

Applications

- Used for low-pressure, high-flow applications such as catalytic cracking plants, air service, air separation, LNG, nitric acid, and GTL

Over 20 units installed worldwide

Ideal for catalytic cracking, air compression, nitric acid, and gas to liquids

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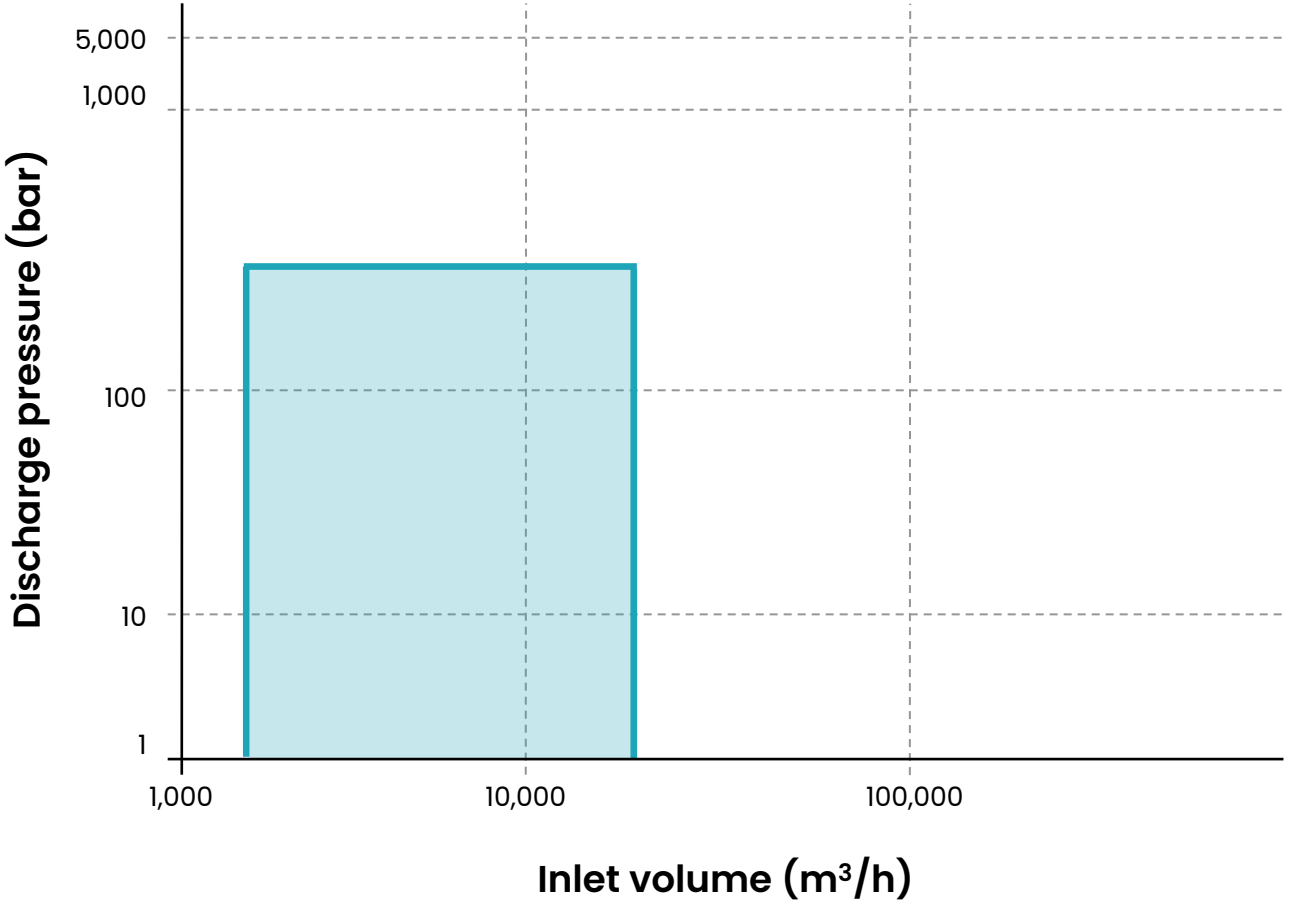
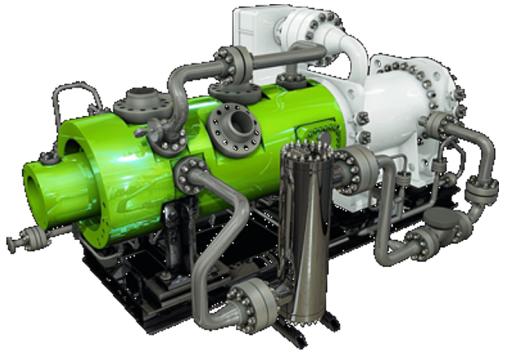
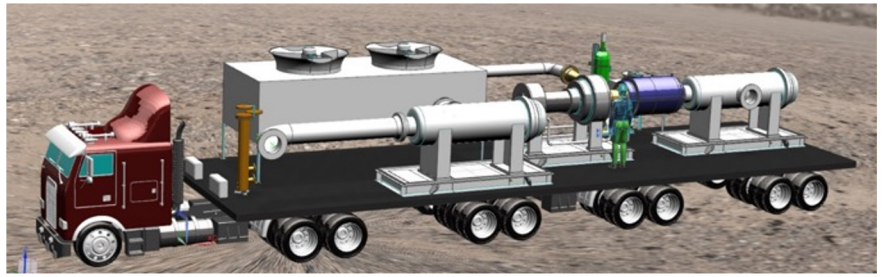
Integrated compressors







Sizes

- Up to 450 mm

Pressure

- Up to 300 bar

Applications

- Ideal solution for high efficiency, small footprint, low noise and minimized OPEX

26 units installed to date, mainly for pipeline and storage

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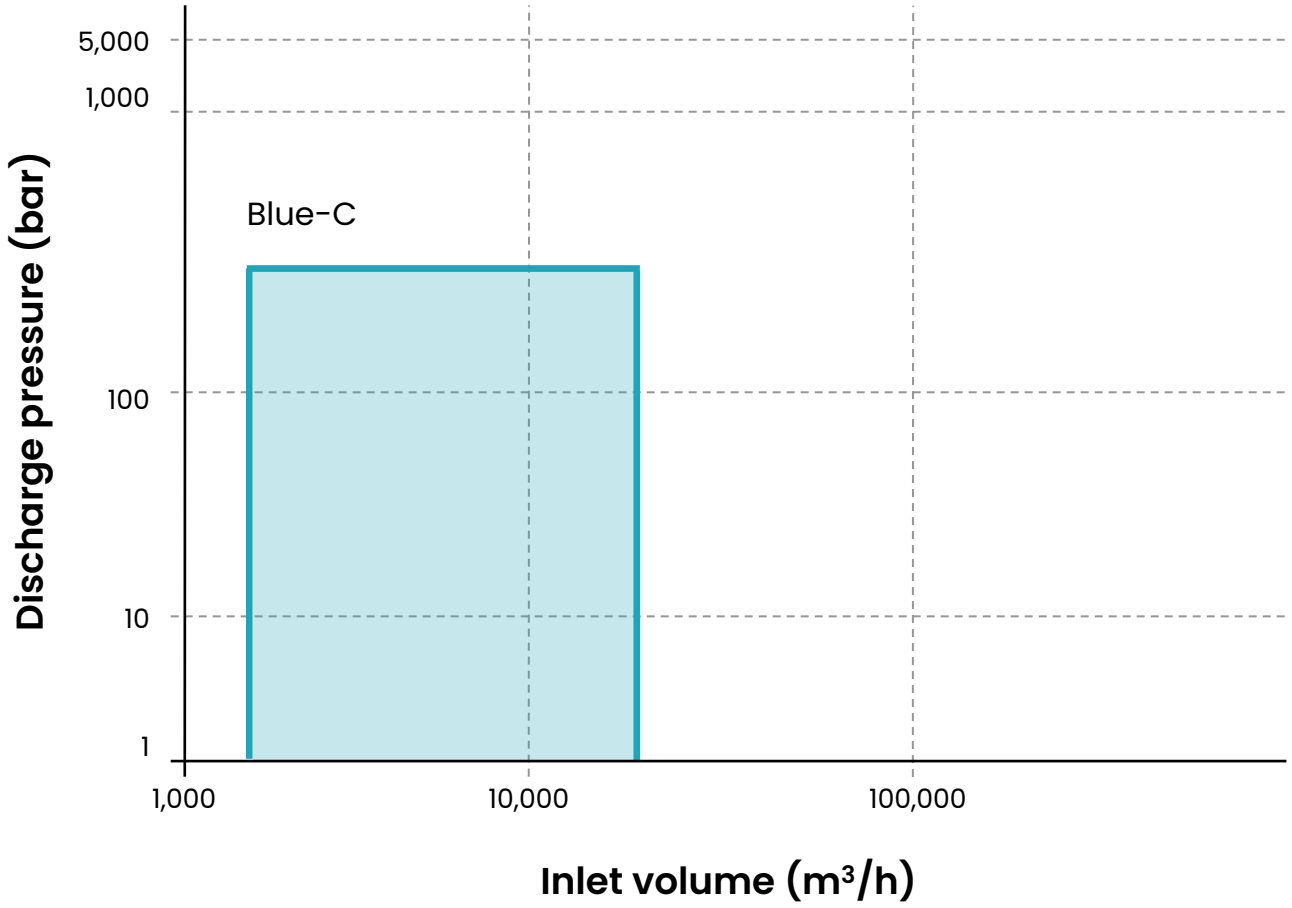
Integrated compressors



Sizes
- Up to 6 stages

Pressure
- Up to 175 bar

Applications
- Subsea to minimize topside equipment

Leveraging proven ICL technology to minimize topside footprint

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Main components

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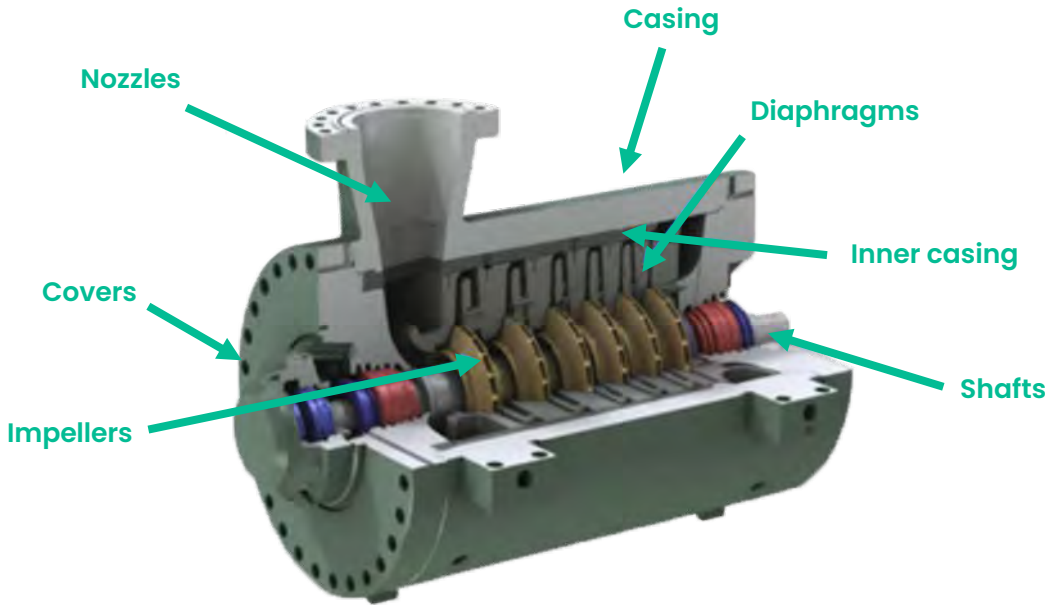
Outer casing and head flanges

- Forging or plate carbon steel
- Martensitic stainless steel also applicable
- Coatings applicable on carbon steel for cost-effective corrosion resistance




Casings


Head flanges


Assembled rotor


Diaphragms

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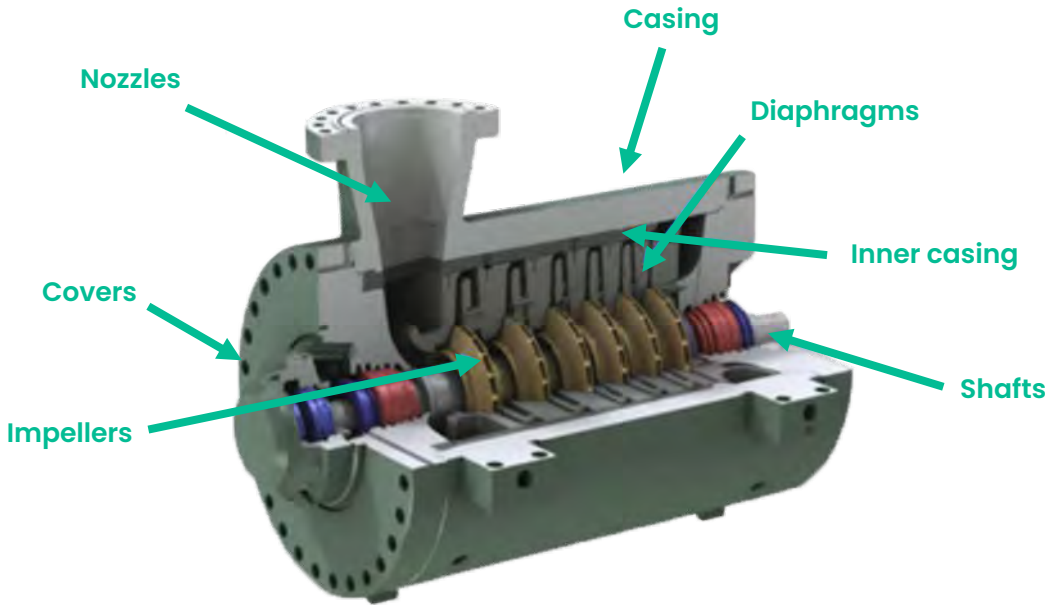
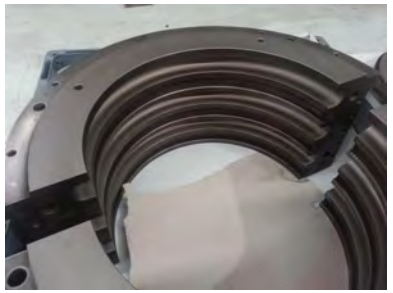
Inner casing and diaphragms

- Forged carbon steel
- Cast iron or cast stainless steel
- Ni-alloys forged or casted
- Coatings applicable on carbon steel for cost-effective corrosion resistance or anti-fouling



Head flanges



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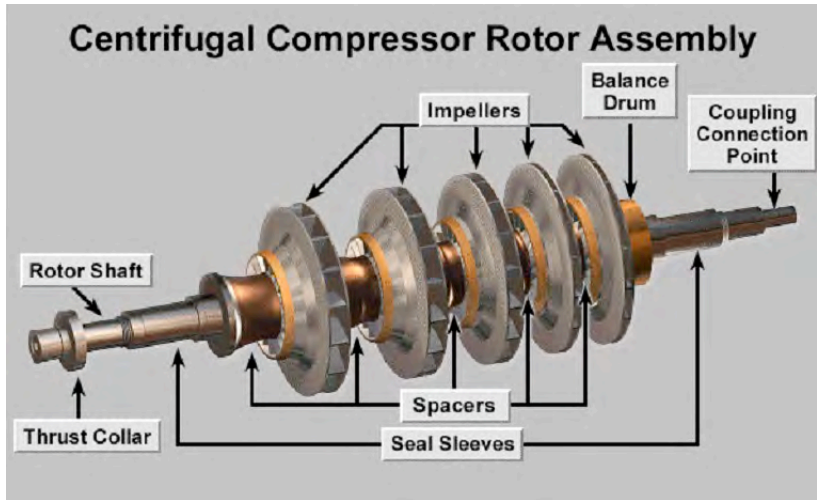
Rotor

- Shaft: forged carbon steel or stainless steel
- Impellers: full milling, EDM or brazed; forged carbon steel, stainless steel, Ni-alloys
- Coatings applicable on full assembly for cost-effective corrosion resistance or anti-fouling

Coated assembled rotor



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Seals

- Labyrinth seals in aluminum or thermoplastic materials suitable for acid and harsh environments
- Thermoplastic materials offer better performance than metallic options
- Abradable seals offer better efficiency

Bulk and hybrid design (with metallic carrier) for polymer labyrinth seals

Design with and without swirl brakes

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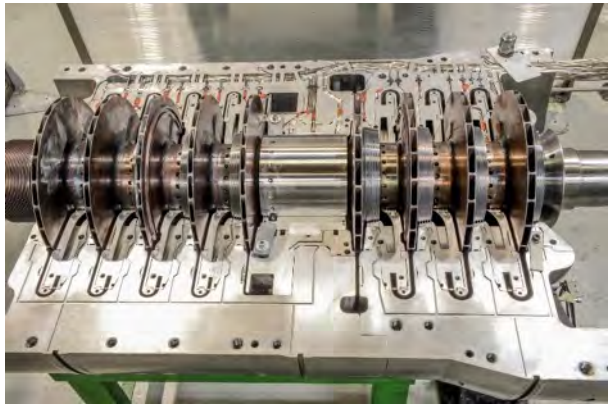
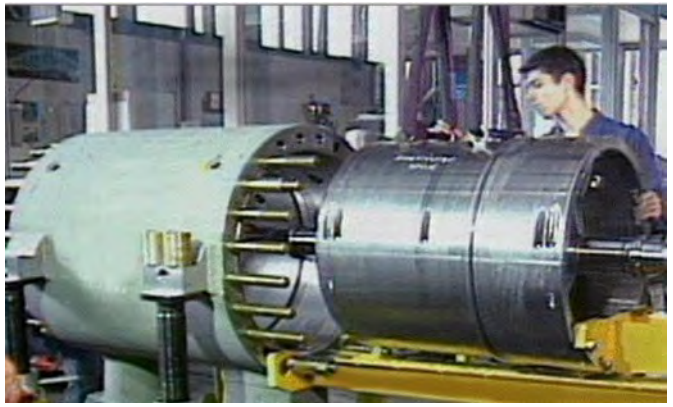
Split assemblies

BCL

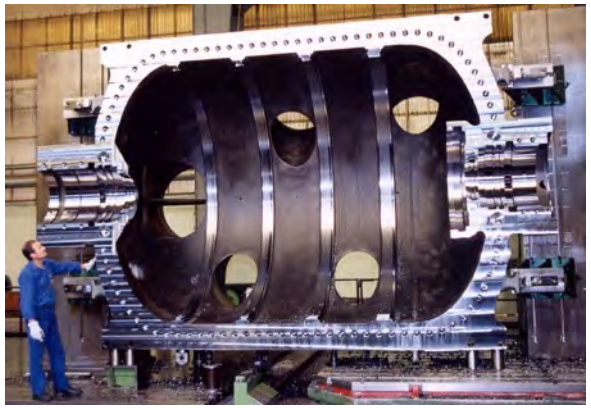
Vertically split

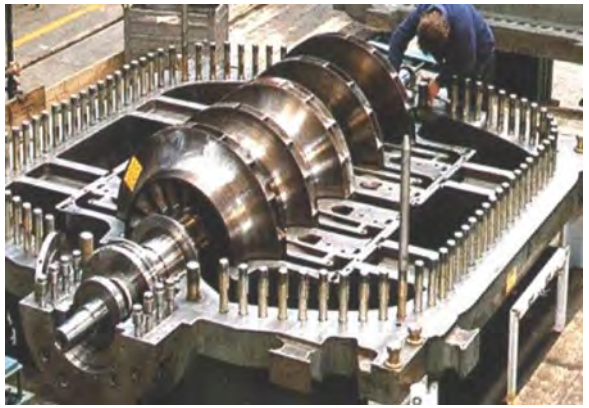




MCL

Horizontally split





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Testing

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Baker Hughes unique testing capabilities

Type of test	Test beds capacity		
	Florence	Massa	Avenza
Standard mechanical and/or thermodynamic tests on centrifugal compressor & steam turbine	18+1	4	-
Thermodynamic test for large compressors 25-61MW		2	
Running-in and/or string tests on reciprocating compressors	6	1	-
Standard & full load test (by electric generator)	4	2	-
Special string test	6+2	16	-
HSPT LM2500 spin test	2	-	-
LM2500 gas generator load test	-	1	-
Test on combined modules	-	1	10

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