

Chillventa Specialist Forums 2024

Chillventa Fachforen 2024

**CONNECTING
EXPERTS.**



HOW SEMI-HERMETIC COMPRESSORS CAN SIMPLIFY THE SWITCH TO AMMONIA

Andrés Rosas, Ron Hoffmann

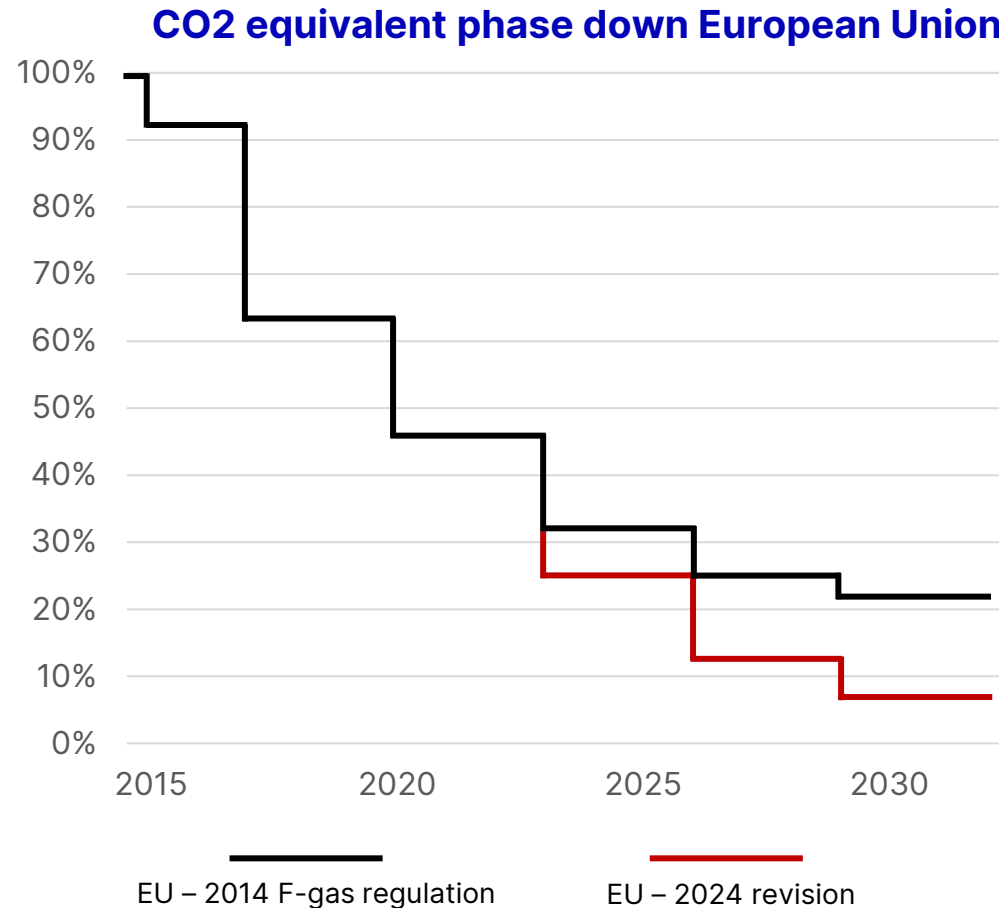
Refrigerants used – an Old World under pressure!

- F-gases worldwide under pressure!

- **Terms used:**

GWP – Global Warming Potential

PFAS – (Per- and Polyfluoroalkyl Substances)



F-gas Regulation just tightened

Reduction steps planned for 2027 realised in 2024

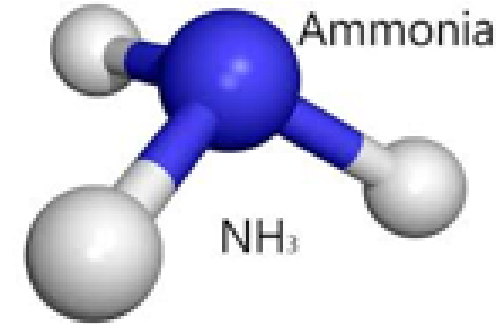
Potential restrictions on PFAS

- Independent from F-gas Regulation
- Would include high GWP refrigerants as well as low GWP alternatives (HFOs)

Corporate image

- Sustainability goals
- Public relations

Ammonia – R-717



1

ENERGY EFFICIENCY

- Ammonia is one of the most efficient refrigerants.
- Safe and sustainable choice for the future.
- Typically a flooded Ammonia system would be 15 – 20% more efficient than a DX R404A.

2

BETTER HEAT TRANSFER

- Better heat transfer properties than most of chemical refrigerants
- use of smaller equipment

3

ENVIRONMENT

- Climate friendly
- Natural refrigerant

GWP

Global Warming Potential = 0

ODP

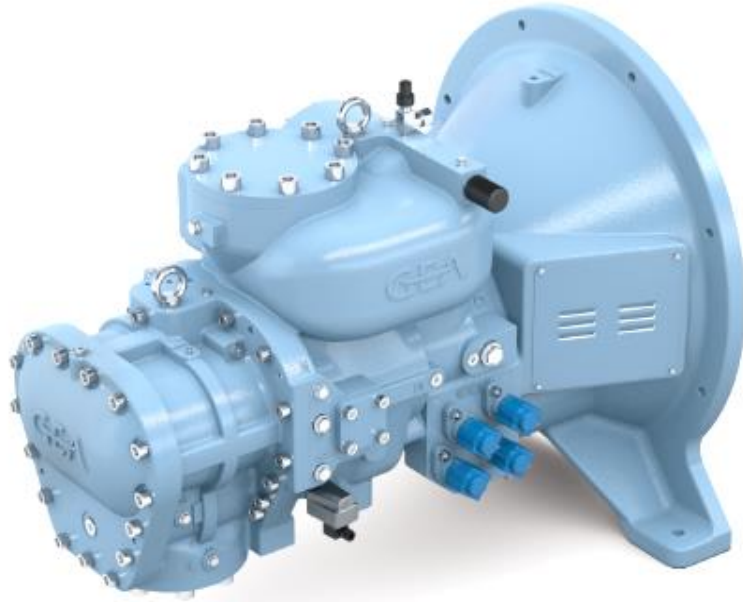
Ozone Depletion Potential = 0

4

SAFETY

- All Ammonia systems have to be designed with safety in mind.
- Toxic and flammable at certain concentrations (B2L)
- Can be detected by humans even at very low concentrations

Existing Solution – Open Type Compressor



Individual components can be optimized for the requirements



Flexibility

Direct access to individual components



Service & Maintenance

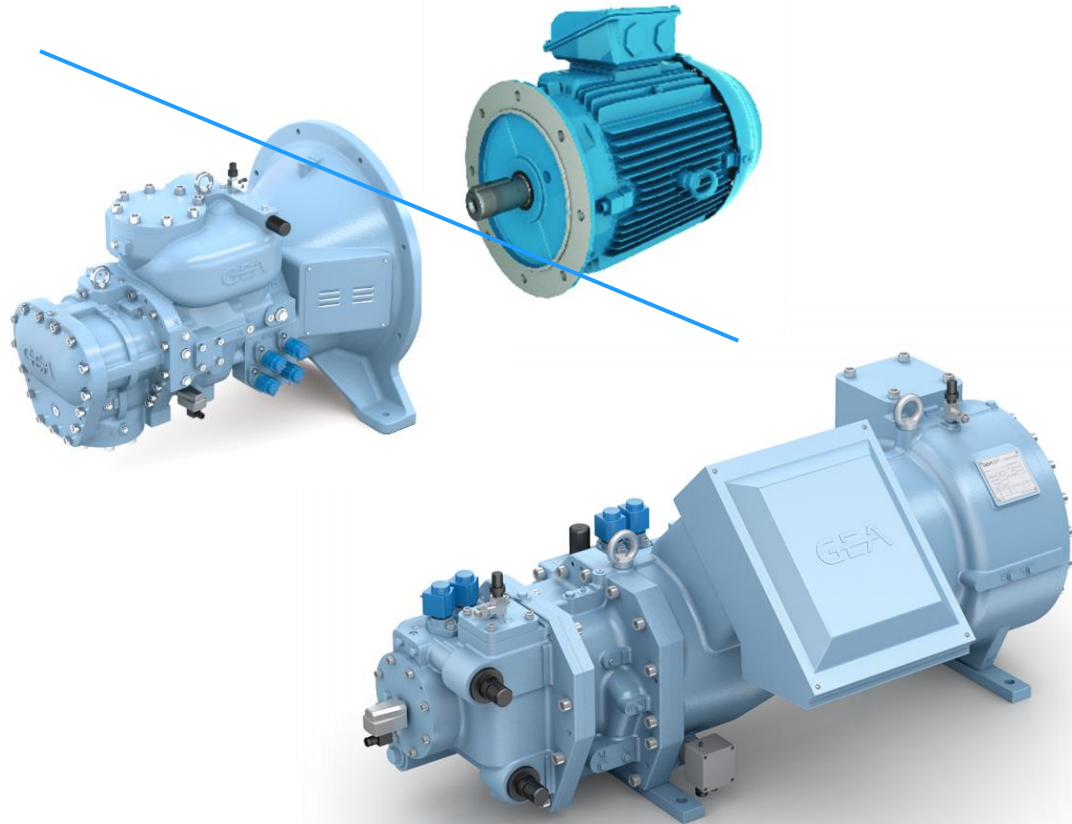
No suction gas superheat caused by the motor



Efficiency

GEA CompaX

Semi-hermetic R-717 Screw Compressor



No risk of shaftseal leakages!



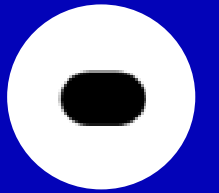
SAFETY

User friendly



OPERATION

Small footprint



COMPACT

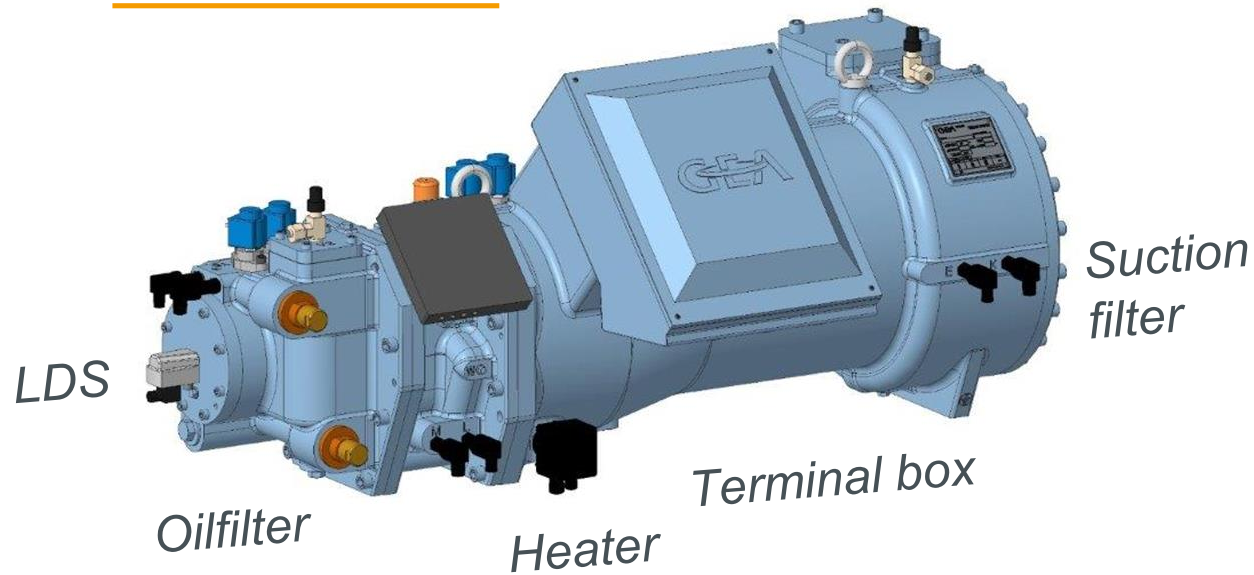
High efficiency



EFFICIENCY

GEA CompaX – compressor concept

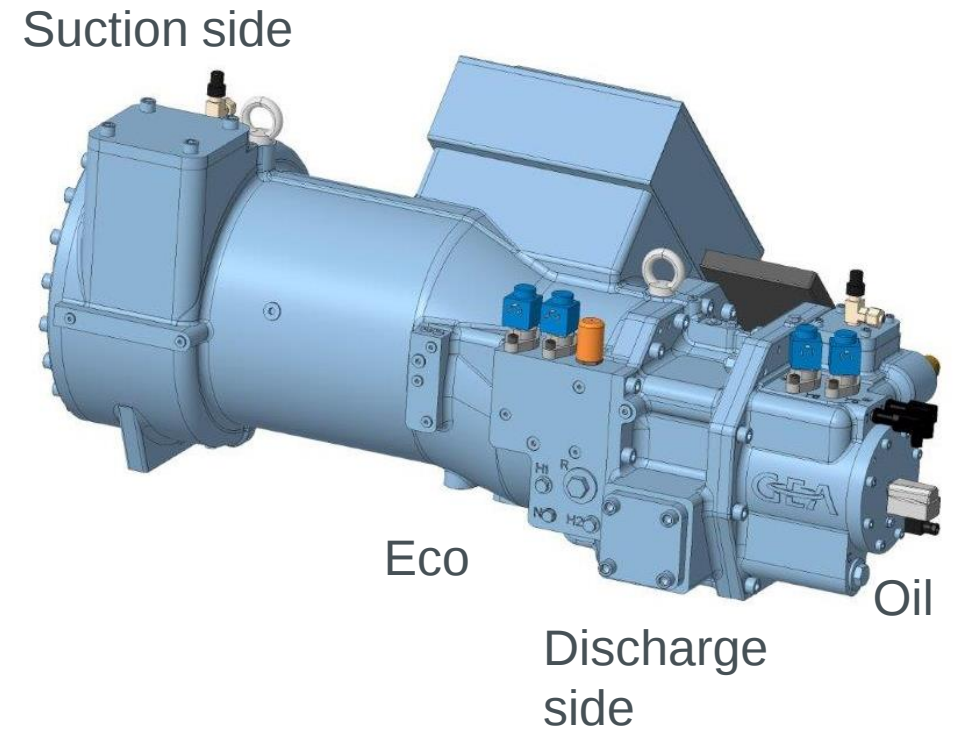
Service side



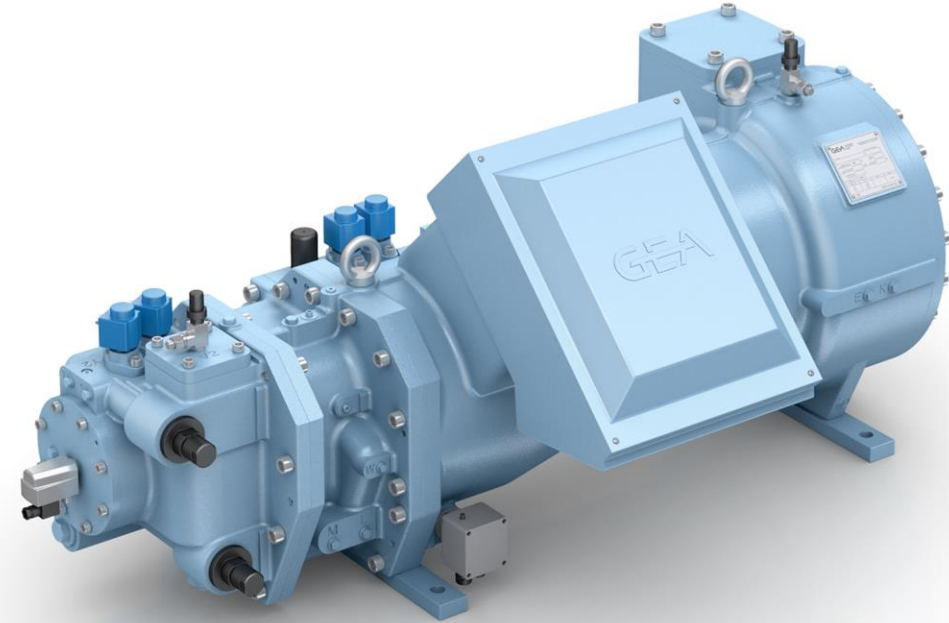
Also integrated:

- High efficient suction gas cooled motor
- Oil stop valve
- Overflow valve
- Check valve on discharge side

Connection side



Semi-hermetic screw compressor with industrial genes!

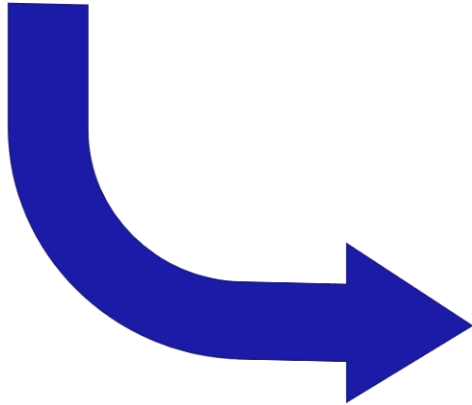


- Variable V_i , stepless adjustable
- Capacity control via speed and slide valve
- Adjustable injection oil flow/ discharge temperature
- Reliable design
- Service friendly concept

Efficiency - Semi-hermetic compressors

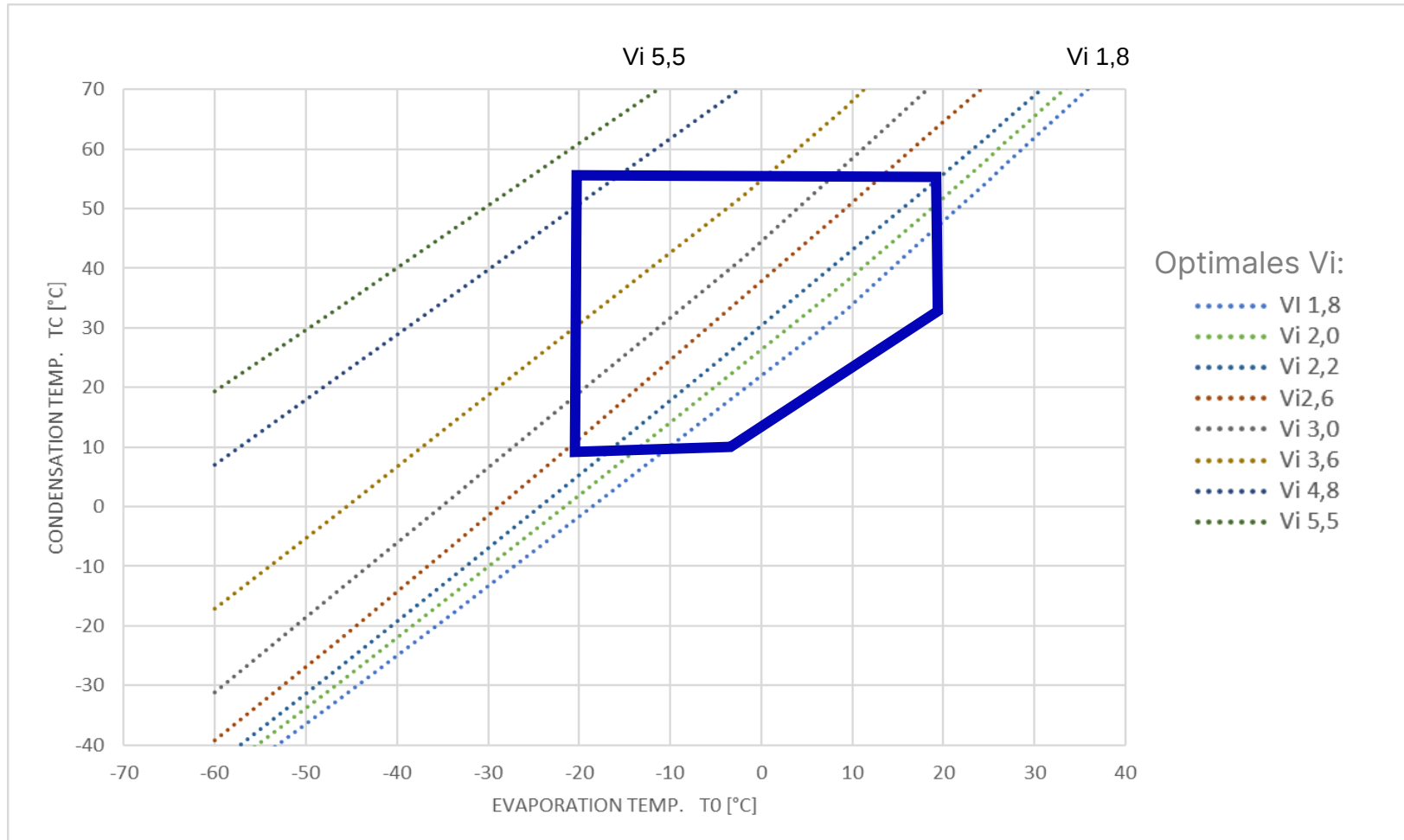
Generally:

- Suction gas superheat causes efficiency losses
- Simplified build e.g. limited Vi range



- Restrict the range of application
- Optimize efficiency for the defined range
- Highly efficient motors
- High speed range
- Variable Vi

Design CompaX 350 – 400



Var. Vi: 1,8... **5,0**

→ best efficiency
at all conditions

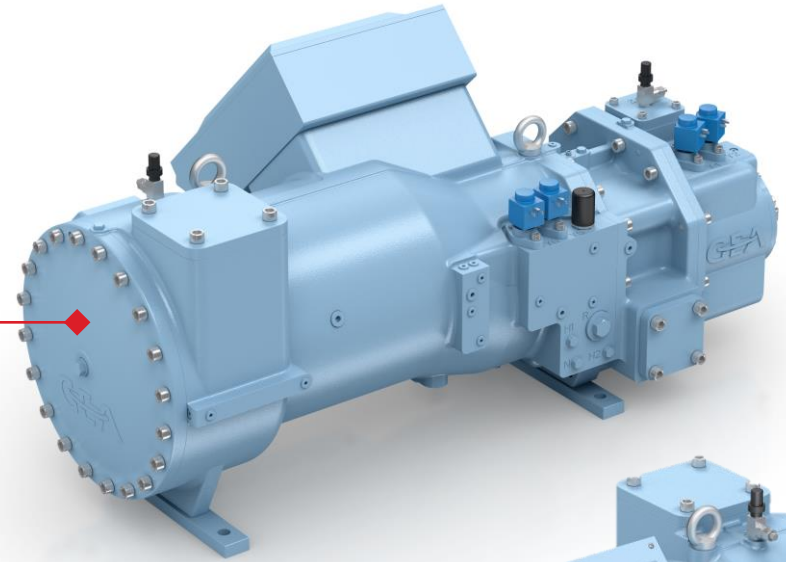
Highly efficient, powerful
permanent-magnet motor
→ 6000 min⁻¹
in the entire operating range

Maintenance

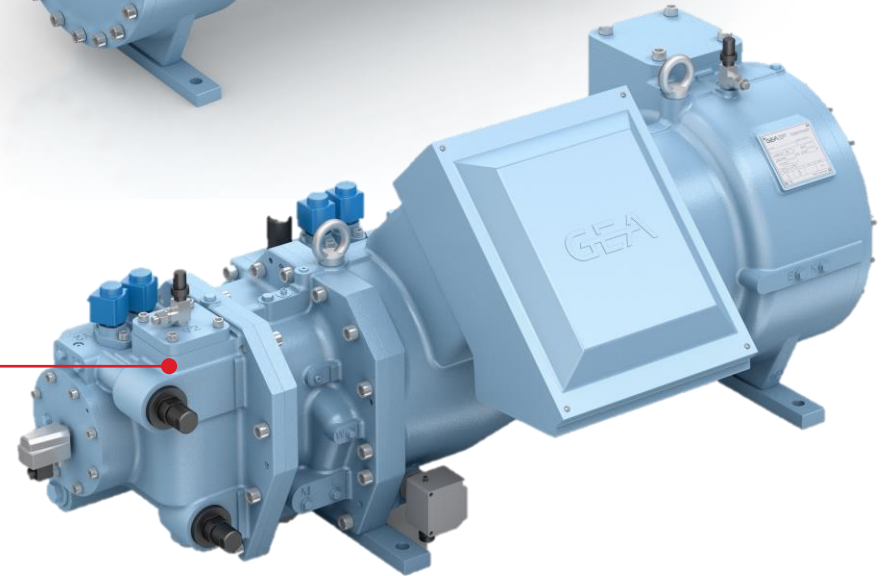
Minimized and easy

- Yearly check of:
 - Suction Filter
 - Oil filter
 - Major overhaul: After 55,000 hours
 - No maintenance on the shaft seal
 - No regular maintenance at the axial bearings
- Less care for stand by units
- Low maintenance costs

Suction filter

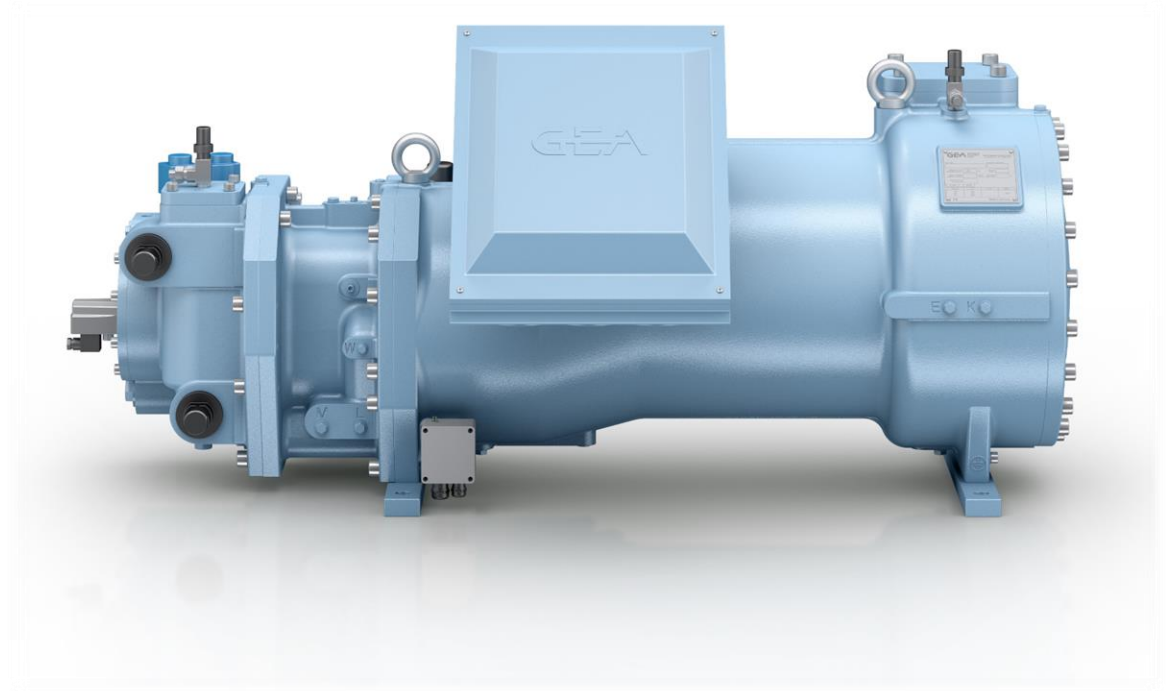


Oil filter



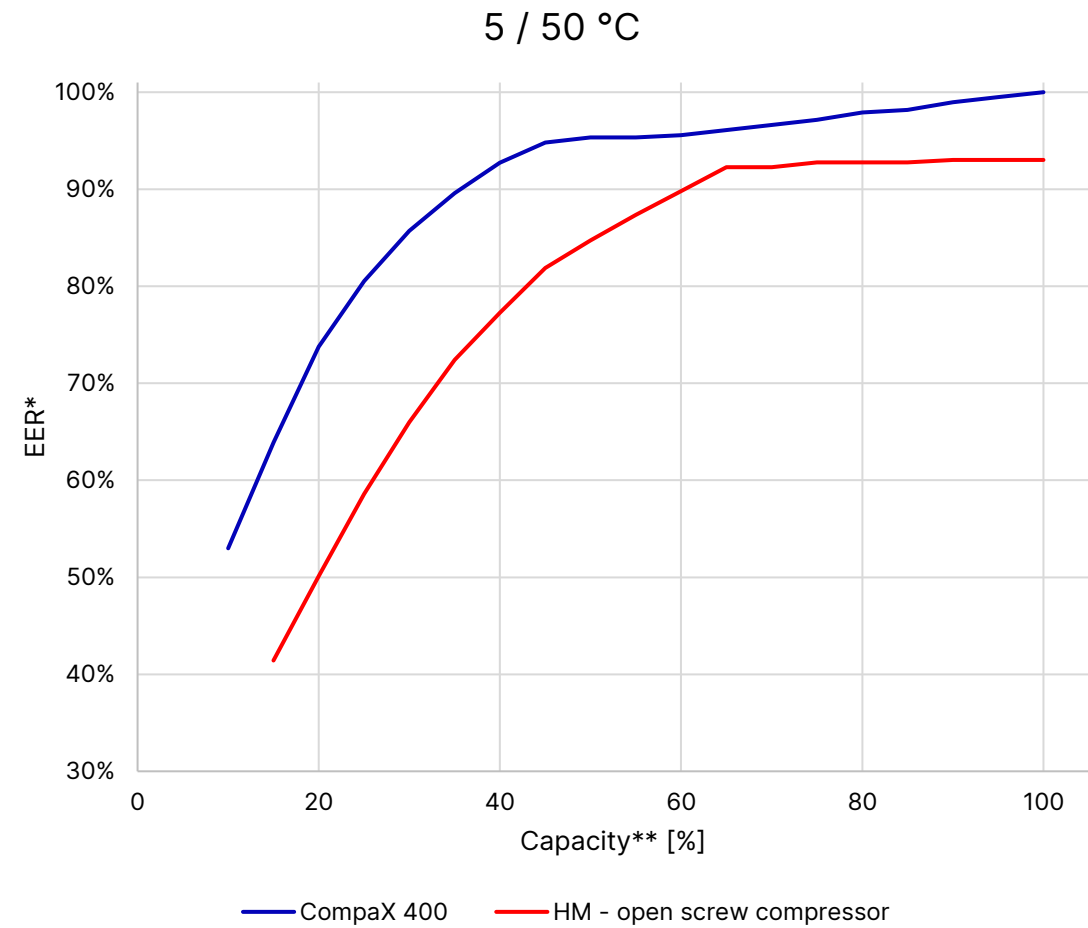
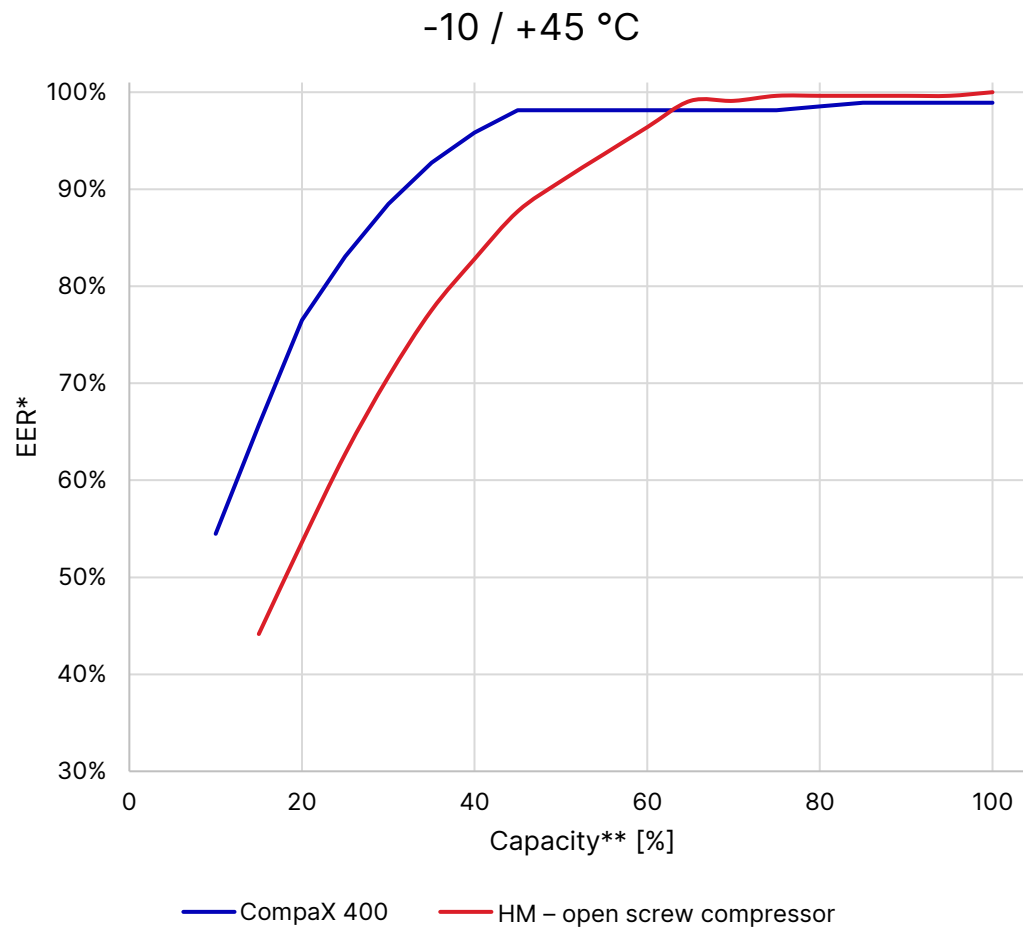
Sound and Vibration

- Capsuled solution
 - Sleeve bearing absorbs vibrations
 - No external motor cooling required
- Low vibration and sound level



~ 6 dB below open arrangement

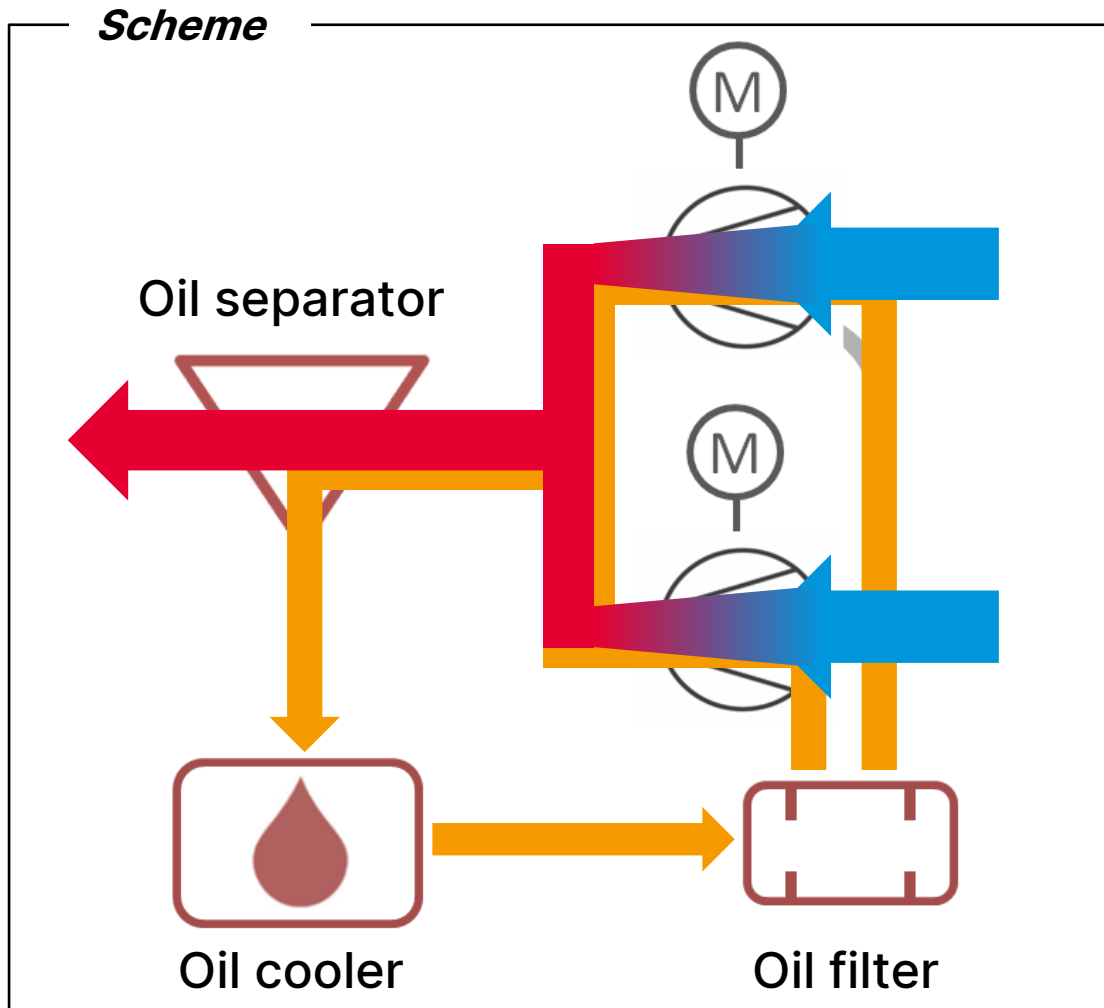
Efficiency comparison open vs. semi-hermetic



* Absorbed power (incl. motor, w/o inverter)

** VFD mode, 100% CompaX at 6000 min⁻¹, 100% HM at 4500 min⁻¹

Practical integration in multipacks

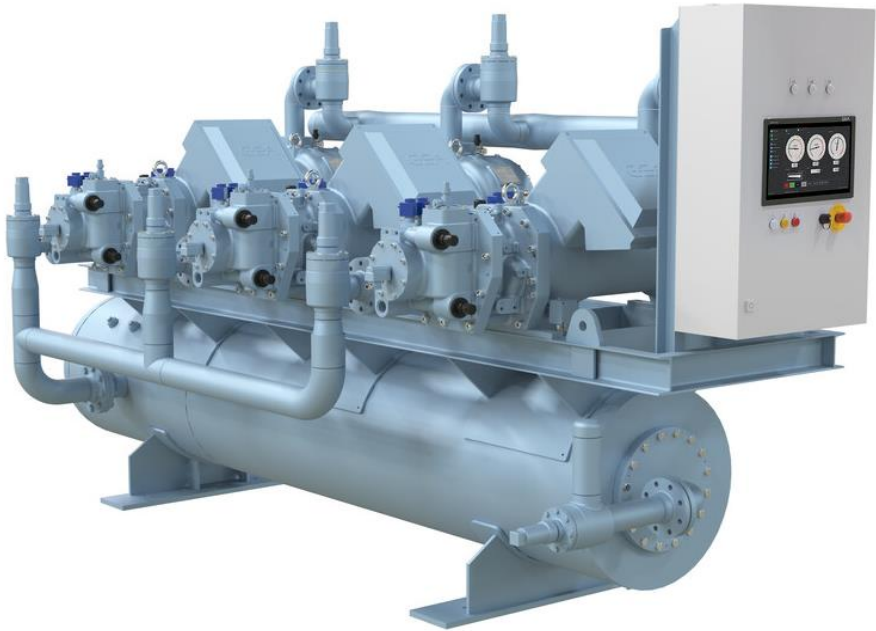


Why a multipack?

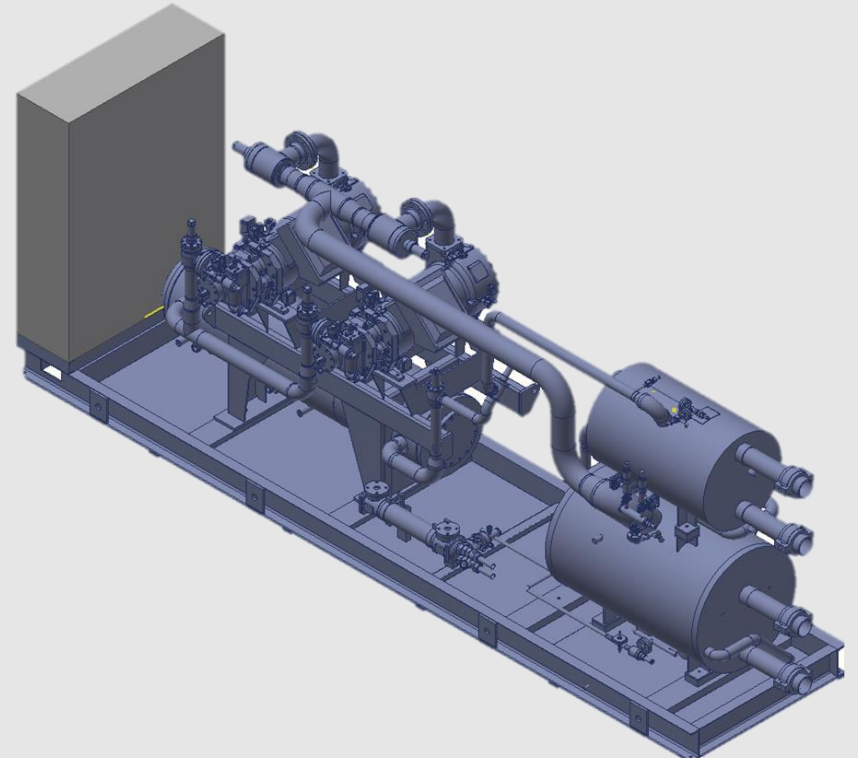
- Individual compressor operation for maximum flexibility
- Maximum efficiency in part load operation
- Redundancy for the compressor

Multipacks with the CompaX

Package in triple-pack execution

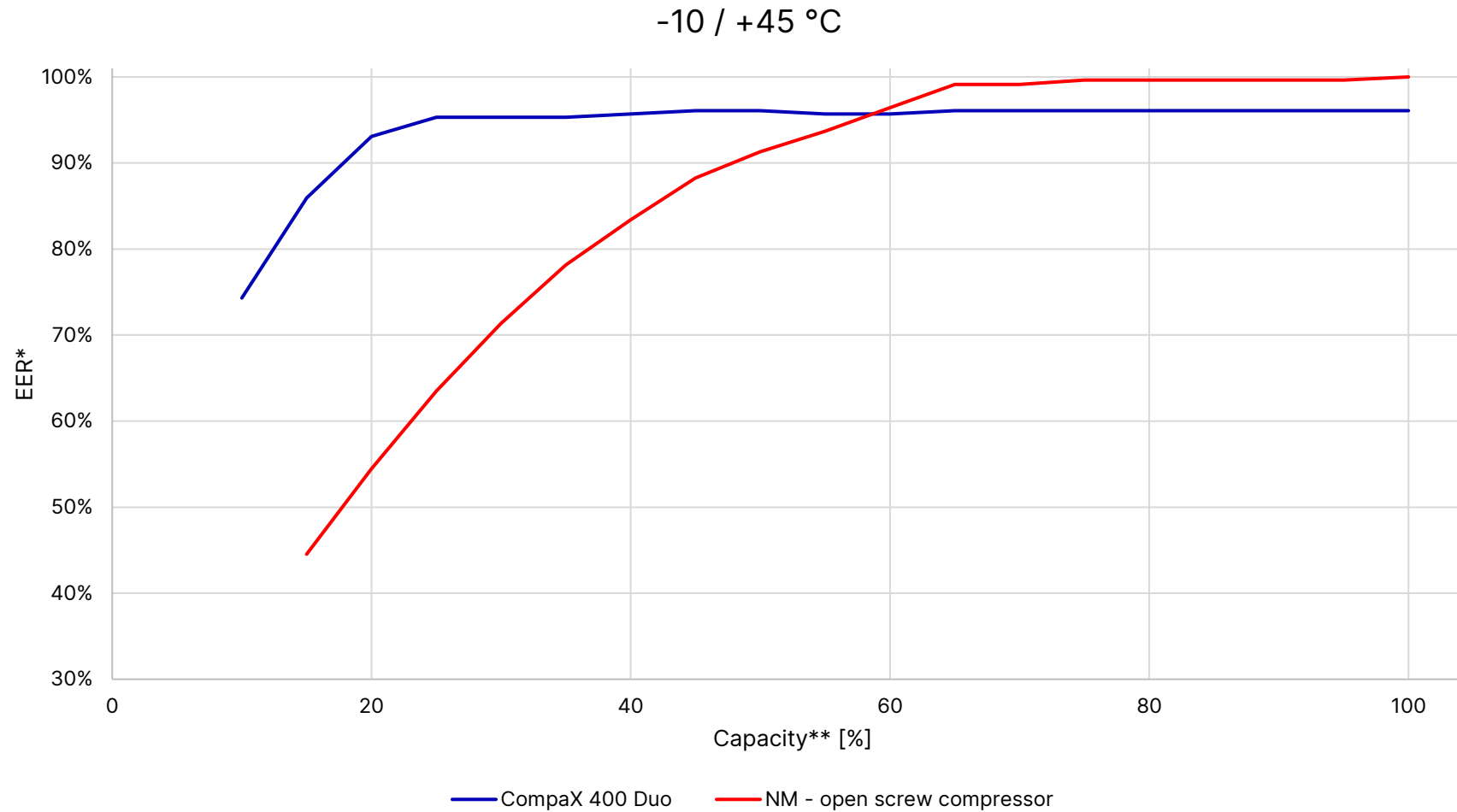


Chiller as duo version



Efficiency comparison

Open type single vs. semi-hermetic multipack

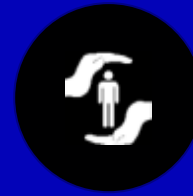
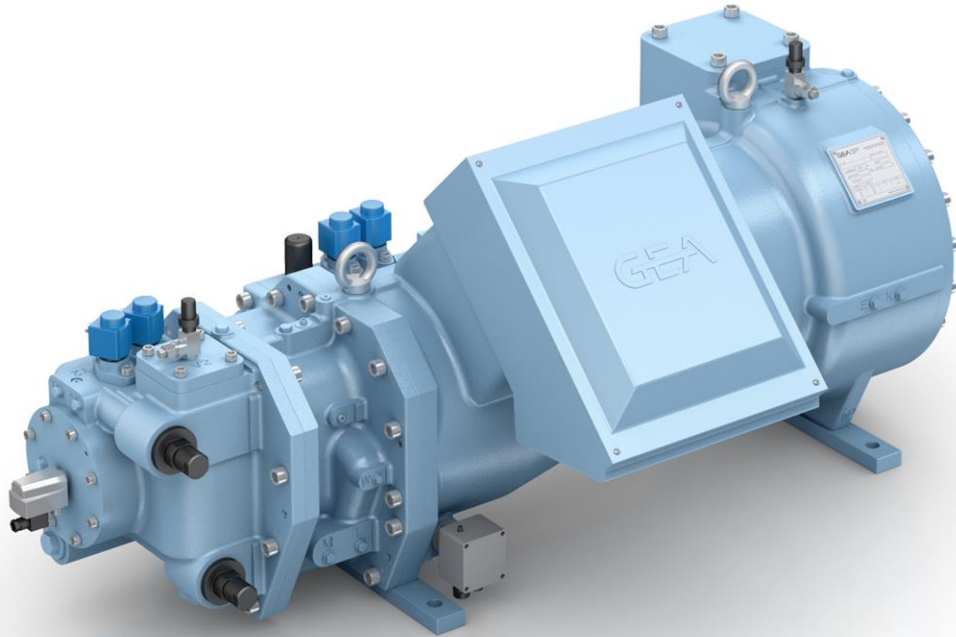


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GEA CompaX 350 & 400

Semi-hermetic screw for R-717



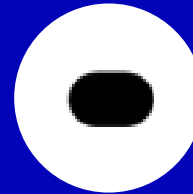
SAFETY

- Less external connections
- No shaft seal



OPERATION

- Less care for stand by units
- Low maintenance effort
- Low vibration and sound level



COMPACT

- Low foot print
- Easy to package
- High grade of integration



EFFICIENCY

- Highly efficient in the entire speed band (1000 - 6000 rpm)
→ High part load efficiency
- Wide Vi 1,8 - 5,0 → best efficiency at all conditions

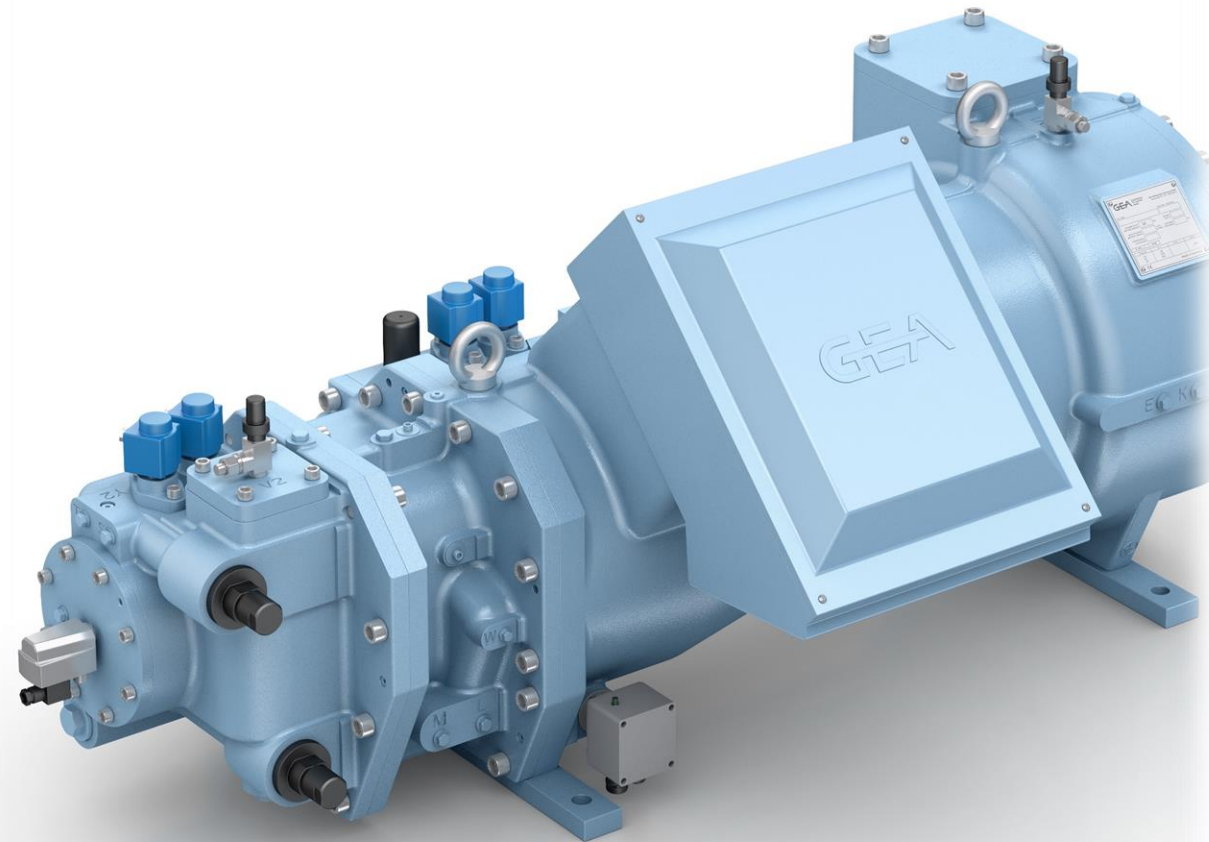
QUESTIONS?

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