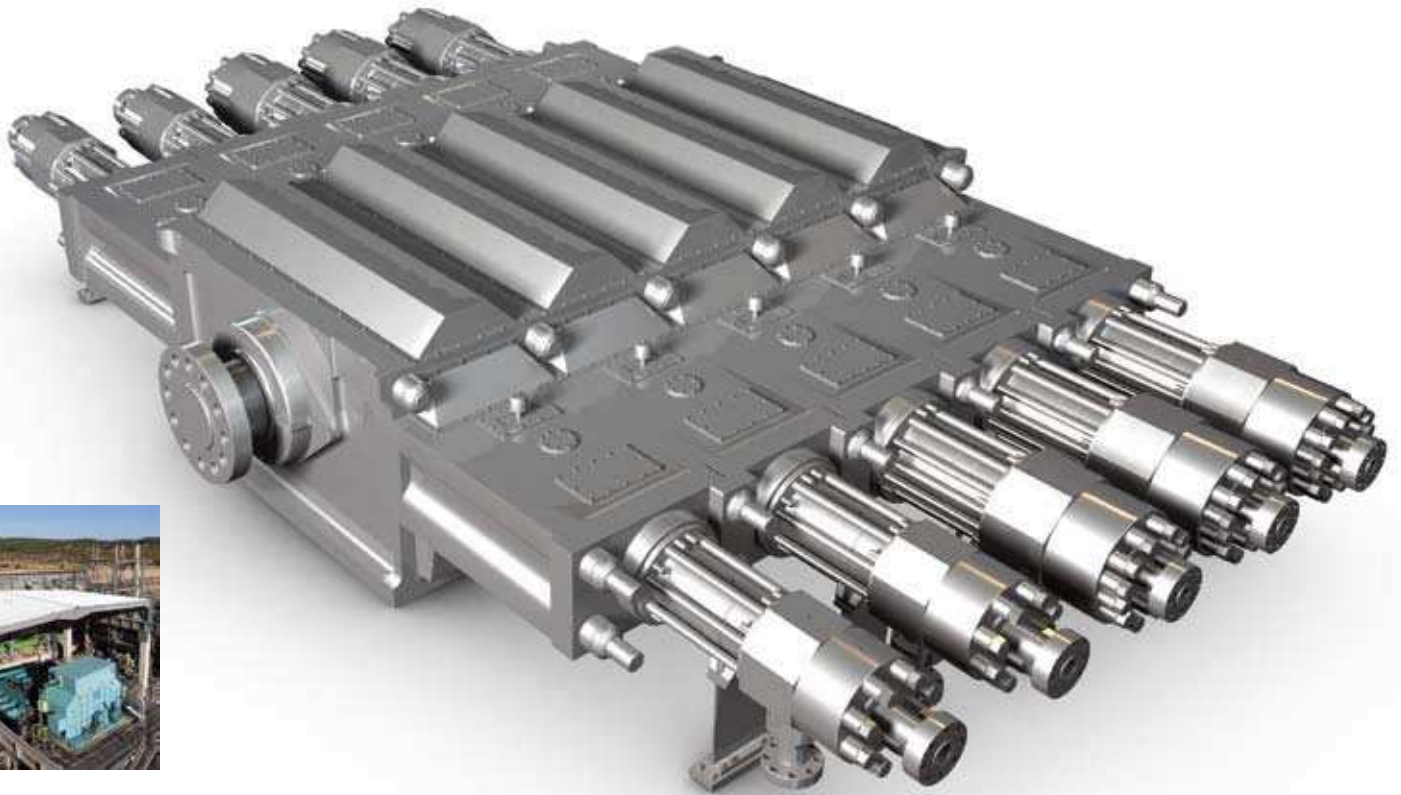




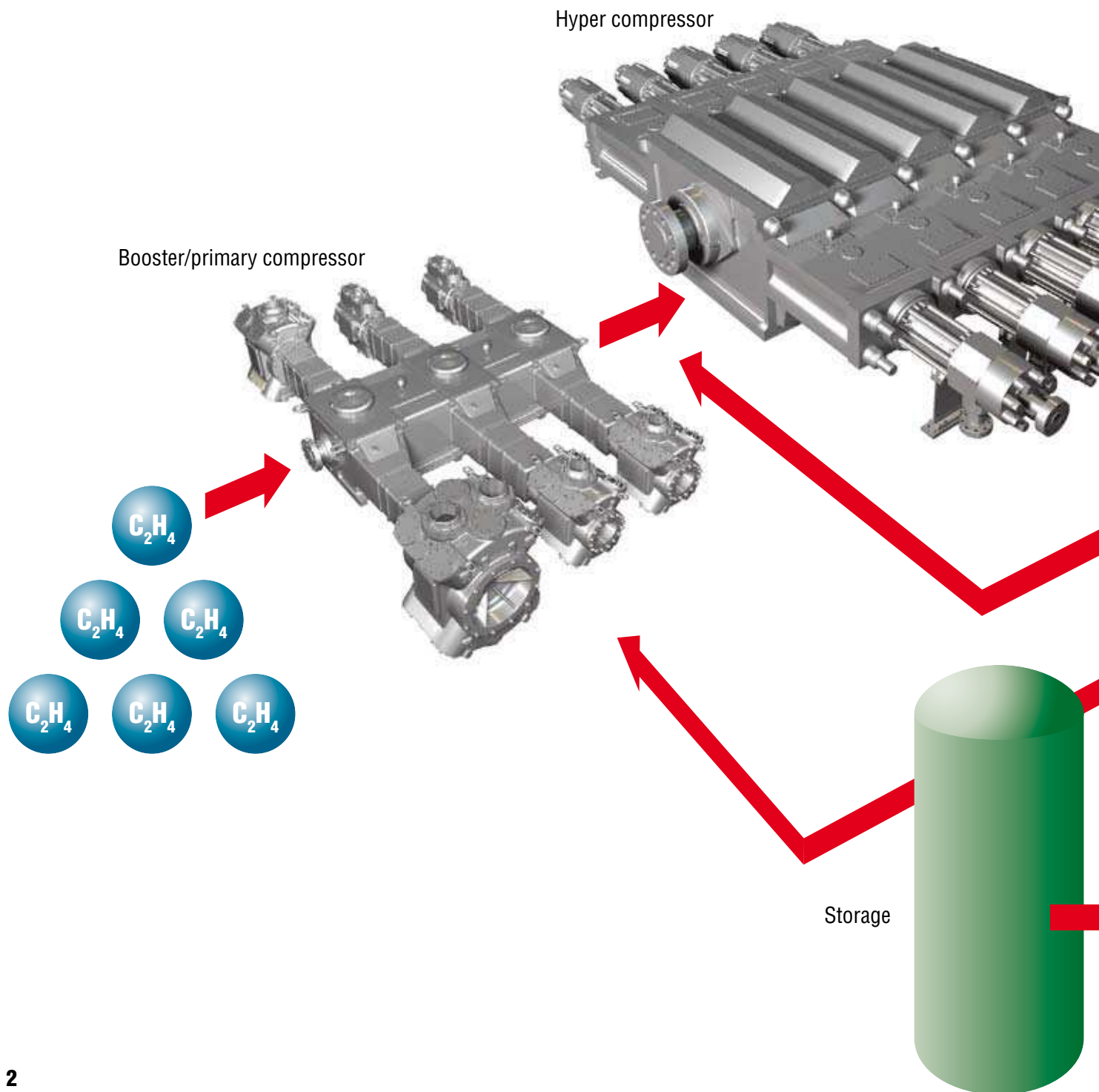
**Burckhardt Compression**

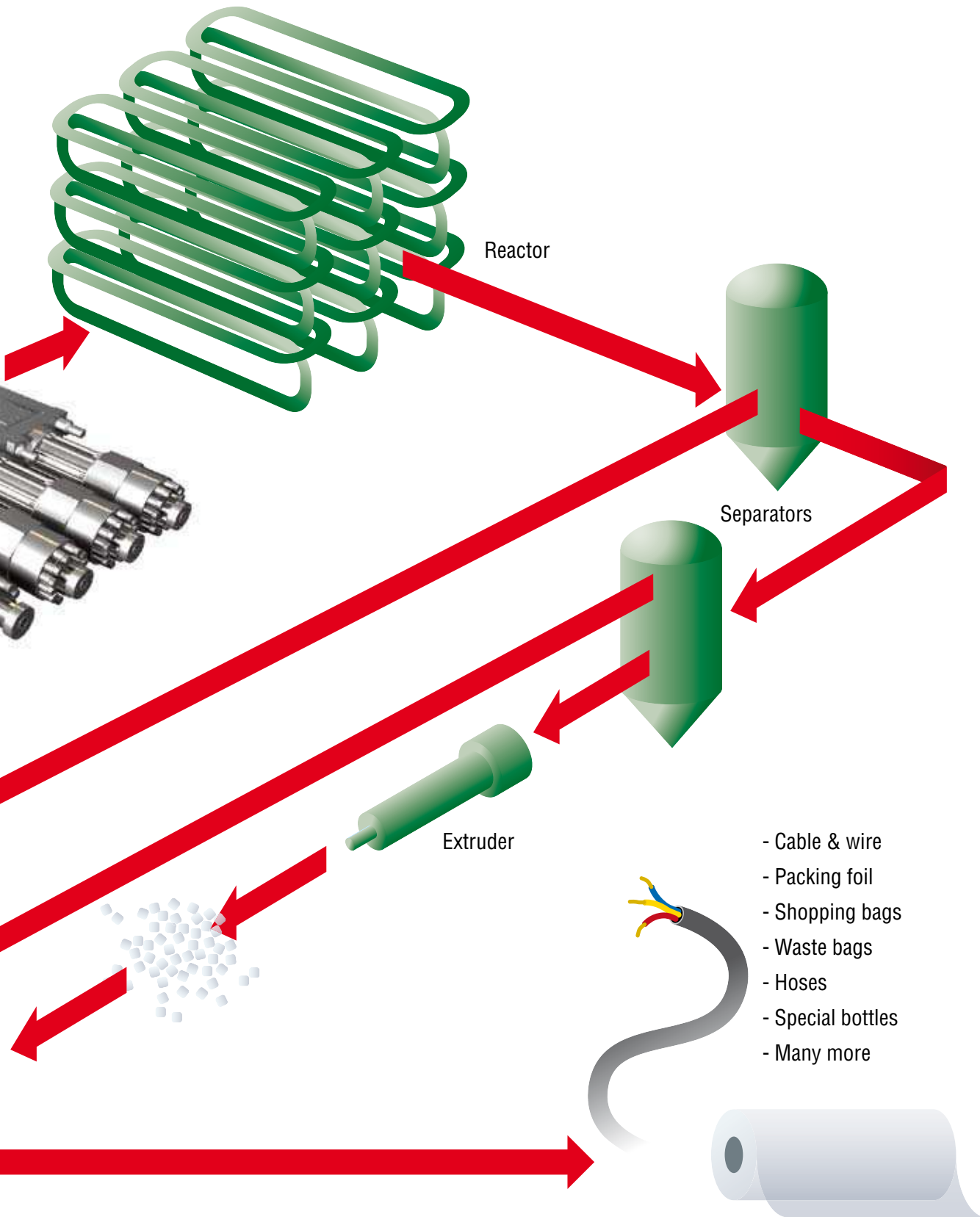
# Hyper Compressors

For LDPE Production – Customers' Choice since 1951



# Market and Application – A Sound Foundation for a Beneficial Partnership





Please contact us for more information:  
[www.burckhardtcompression.com](http://www.burckhardtcompression.com)  
[info@burckhardtcompression.com](mailto:info@burckhardtcompression.com)

# Technology at Its Best – Safety and Reliability

## ● Latest technologies – for best performance

### High pressure packing

Applied technology based on decades of experience  
Extremely high sealing efficiency and lifetime  
Different materials and designs for various copolymer applications

### High pressure packing cups

Special design to withstand fretting  
Surface treated to avoid fissures

### Low pressure packing

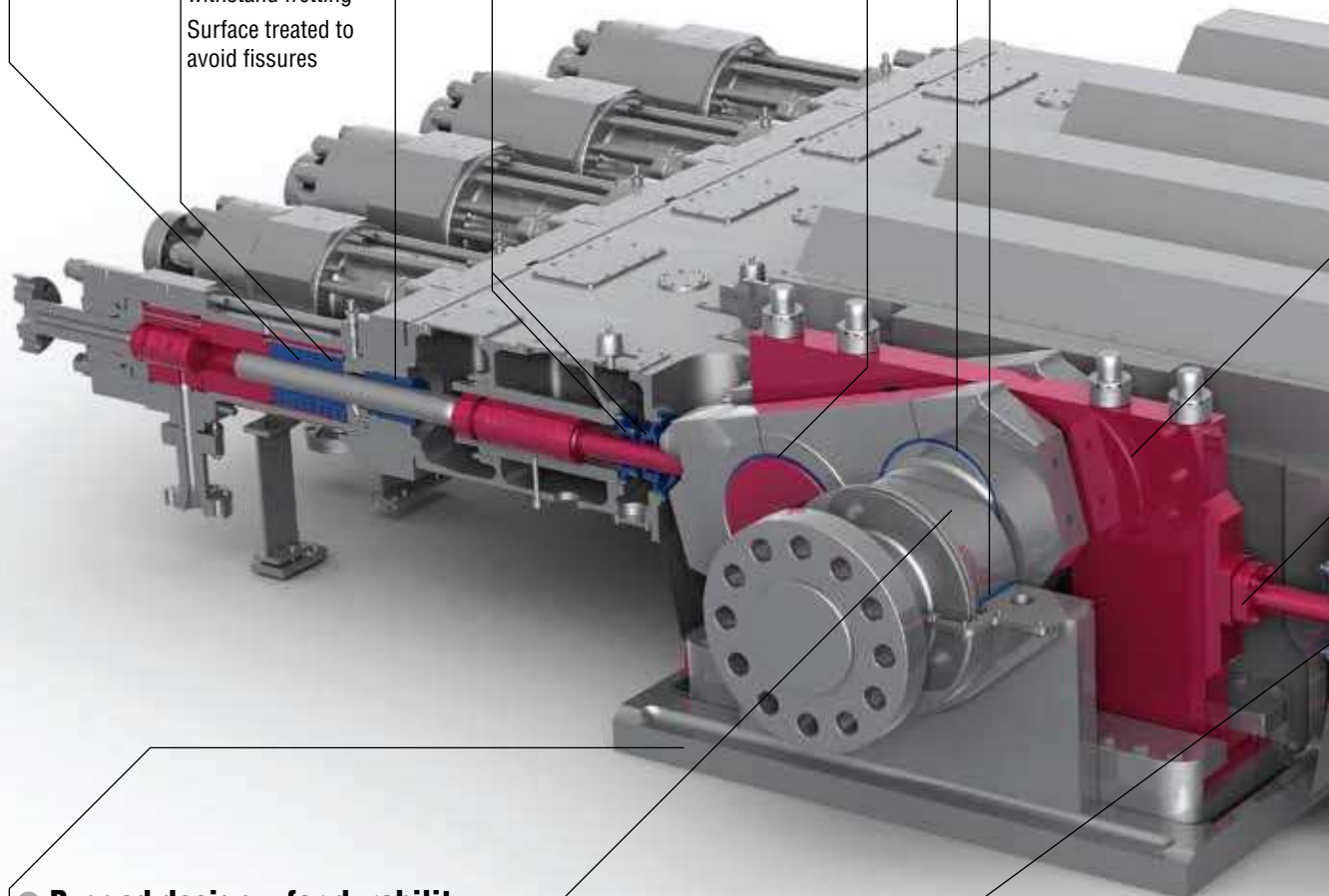
Provides extra safety  
Avoids flow of ethylene into the distance piece

### Oil seals

Separate seals for crankgear and distance piece  
Self-centering design

### Bearings

Large diameters for low specific load  
Expected lifetime > 15 years  
Tri-metal galvanic layers for increased wear protection



## ● Rugged design – for durability

### Crankgear

Three types to minimize cylinders in operation  
Robust design with low specific loads  
Welded construction for K type  
Cast construction for H and F types  
Separate oil tank, no oil sump

### Crankshaft

With camshaft design  
Without webs  
Without bores  
Rigid against torsion and bending

### Distance piece

To prevent ethylene from entering the crankgear  
For increased safety  
Double-compartment design  
No explosion relief valve required  
Vented interspace for extra safety

● **In-house engineered and manufactured key components – for reliability**

**Crosshead frame**

Bottom guidance for easy service access  
Massive construction for low vibration level

**Elastic rod coupling**

Low tolerance connection for excellent guidance of the auxiliary guide and plunger

**Auxiliary guide**

With elastic rod  
To eliminate undesired plunger movement  
For exact plunger alignment

**Plunger coupling**

Simple taper design to avoid tractive forces  
For less adjustment work and easy access

**Burckhardt HyproPack™ – Cartridge system**

Pre-assembled module including base cup, high pressure cups, cups for the guide ring and the throttle ring, shrunk liner (cylinder) and head core (valve seat)  
For fast exchange and service

**Central valve**

Combined suction/discharge multi-poppet valve for compact design  
In full metal execution to withstand wear for long durability  
Autofrettage treated to withstand high pressures  
Optimized flow for best performance and long lifetime

**Instrumentation (not illustrated)**

Latest technology implemented  
For safe-guarding (protective circuits) and condition monitoring

**Large cross sections of cooling/flushing piping**

Extra safety in case of a plunger failure

**Safety device**

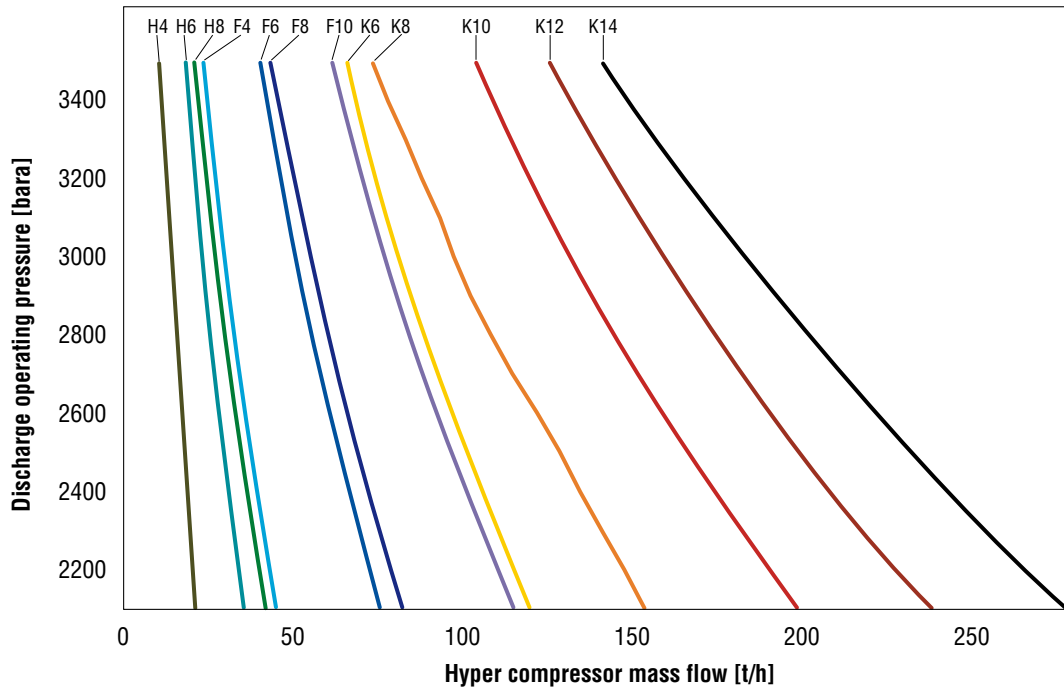
Rupture disk provides extra safety in case of leakage of high pressure cups

**Cylinder tie bolts**

Extra long and elastic design  
Allow safe gas decomposition

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[www.burckhardtcompression.com](http://www.burckhardtcompression.com)  
[info@burckhardtcompression.com](mailto:info@burckhardtcompression.com)

# Technical Data – Perfect Fit for Your Plants – Now and in the Future

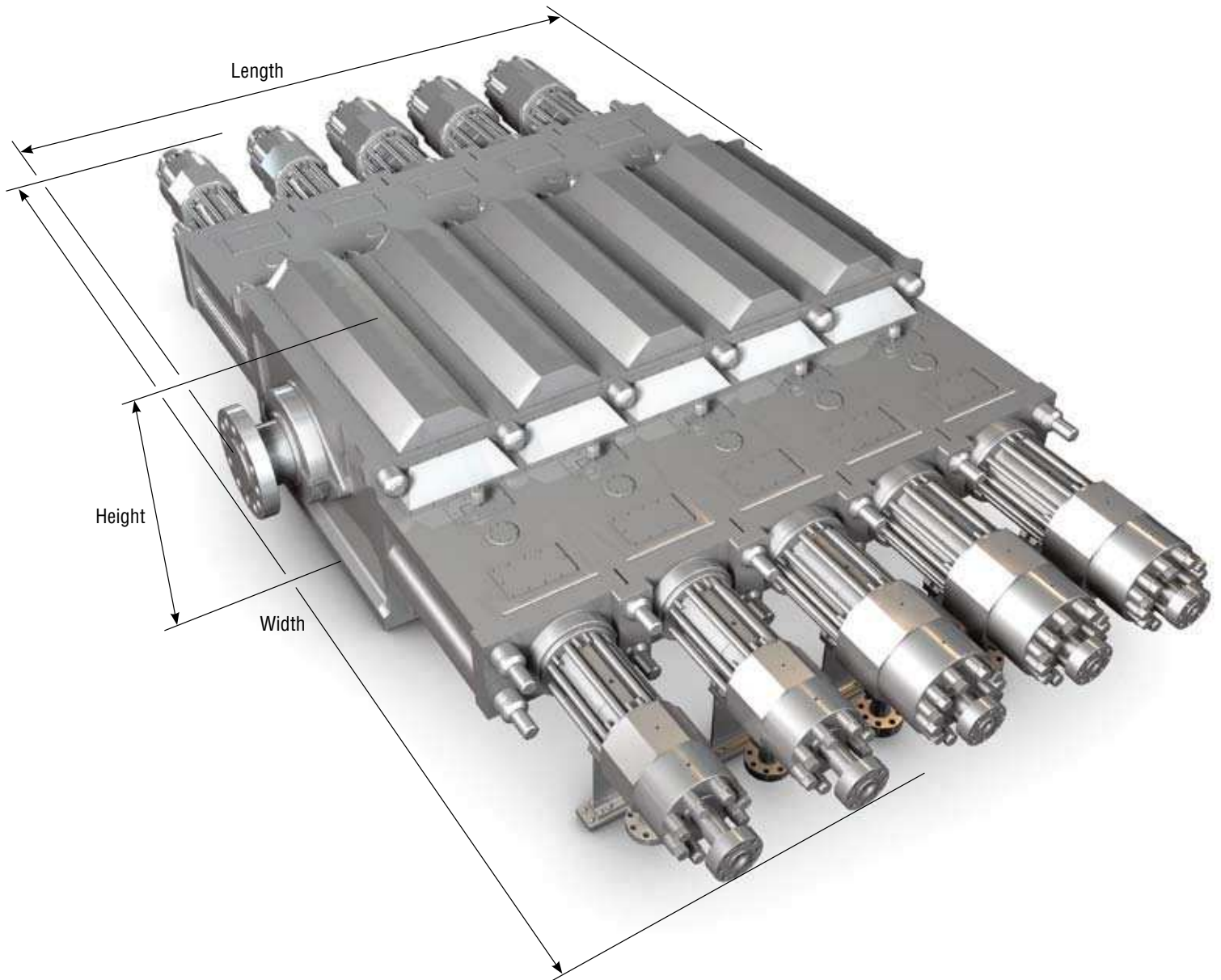


## Dimensions

Type	No. of Cylinders	Design Power [kW / hp]	Width [mm / in.]	Height [mm / in.]	Length [mm / in.]	Max. Pressure [bar / psi]	Plant Cap. [kt / a]*
H	4	2'500	8'430/332	1'590/63	2'720/107	3'500/50'760	33
	6	4'000			3'400/134		59
	8	5'000			4'080/161		66
F	4	5'000	9'750/384	1'950/77	3'350/132		69
	6	8'500			4'250/167		128
	8	10'000			5'150/202		137
	10	12'500			6'050/238		206
K	6	12'500	11'300/445	2'110/83	5'000/197		210
	8	17'000			6'100/240		226
	10	23'500			7'200/283		332
	12	27'500			8'300/327		400
	14	32'500			9'400/370		452

\* Assumed values: suction pressure 270 bara, discharge pressure 3'100 bara, suction temperature 40 °C, pure ethylene, 200 rpm, 8'000 operating hrs/a, reactor conversion rate 31%

Machine configurations for larger plant capacities upon specific request.

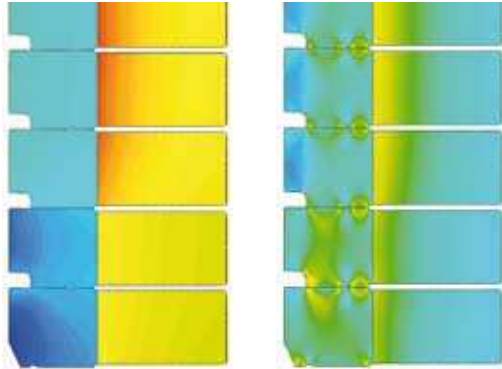


The nominal speed of all Burckhardt Compression Hyper compressors is designed for a comparable low speed of 215 rpm to minimize the overall wear of the machine.

Burckhardt Compression also offers the corresponding booster/primary compressors. Our Process Gas Compressors are designed according to API 618 specifications and represent highest quality and reliability.

# Key Components from Your OEM – For Highest Quality and System Availability

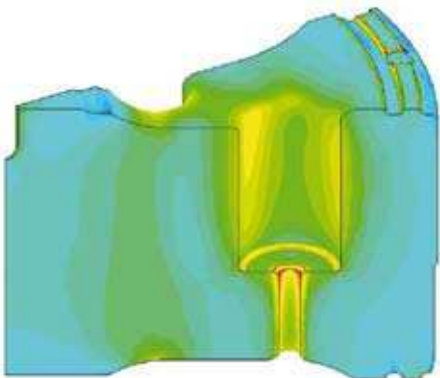
## Customization



High pressure packing  
radial deformation

High pressure packing  
static load

- Hyper compressors are tailor-made – customization is the only way to find the best individual component characteristics for your compressor
- Extensive research resources
- Broad experience with more than 220 realized projects with different gas compositions, processes, additives and environmental conditions
- Pulsation and vibration studies including compressor model with integrated cylinder stretch forces and pipings with supporting structures models of the interstage heat exchangers, preheater and reactor
- Instationary fluid dynamics simulations



Effective stress on valve

## Plunger



Component with highest mechanical stress

- High demands on surface finish and tolerances
- Specifications and quality assurance by Burckhardt Compression
- Design and material selection based on decades of experience
- 1st stage: tungsten carbide plated (depending on pressure and customer preference)
- 2nd stage: solid tungsten carbide (depending on pressure)
- Unique one-touch connection without alignment

## High pressure packing



- Applied technology based on decades of experience
- Extremely high sealing efficiency and lifetime
- Pressure breakers with advanced design and improved functionality
- Experience with special design and material selection for various copolymer applications

## Low pressure packing



- Provides extra safety
- Avoids flow of ethylene into the distance piece
- Meets environmental requirements
- Advanced tribological in-house research provides up-to-date materials for longest operating time

## Central valve



- Customized sizing for optimized efficiency
- FEM optimized flow and multi-poppet design for best performance and long lifetime
- Autofrettage treated to withstand high pressures

## Cylinder lubrication pump



- In-house engineered design with hundreds of references
- One pump for one lubrication point for most effective lubricant distribution
- Multiple adjustment possibilities for each lubrication situation

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[www.burckhardtcompression.com](http://www.burckhardtcompression.com)  
[info@burckhardtcompression.com](mailto:info@burckhardtcompression.com)

# Ease of Maintenance – Smart Features for Shortest Downtimes

## Designed for lowest maintenance



- Design with lowest number of cylinders in the market
- Resulting in minimized number of wear parts
- Low speed to reduce wear
- Advanced lubrication system for all main bearings and the entire cylinder assembly
- Easy and quick access to all wear parts

## Crosshead frame



- Bottom guidance for easy access to the entire crankcase
- Easy access to crankgear, crosshead, frame, auxiliary guide, elastic rod coupling and oil seals of distance piece
- Crosshead shoes can be removed without disassembling neither the distance piece nor the cylinders

## Burckhardt HyproPack™ – Cartridge system



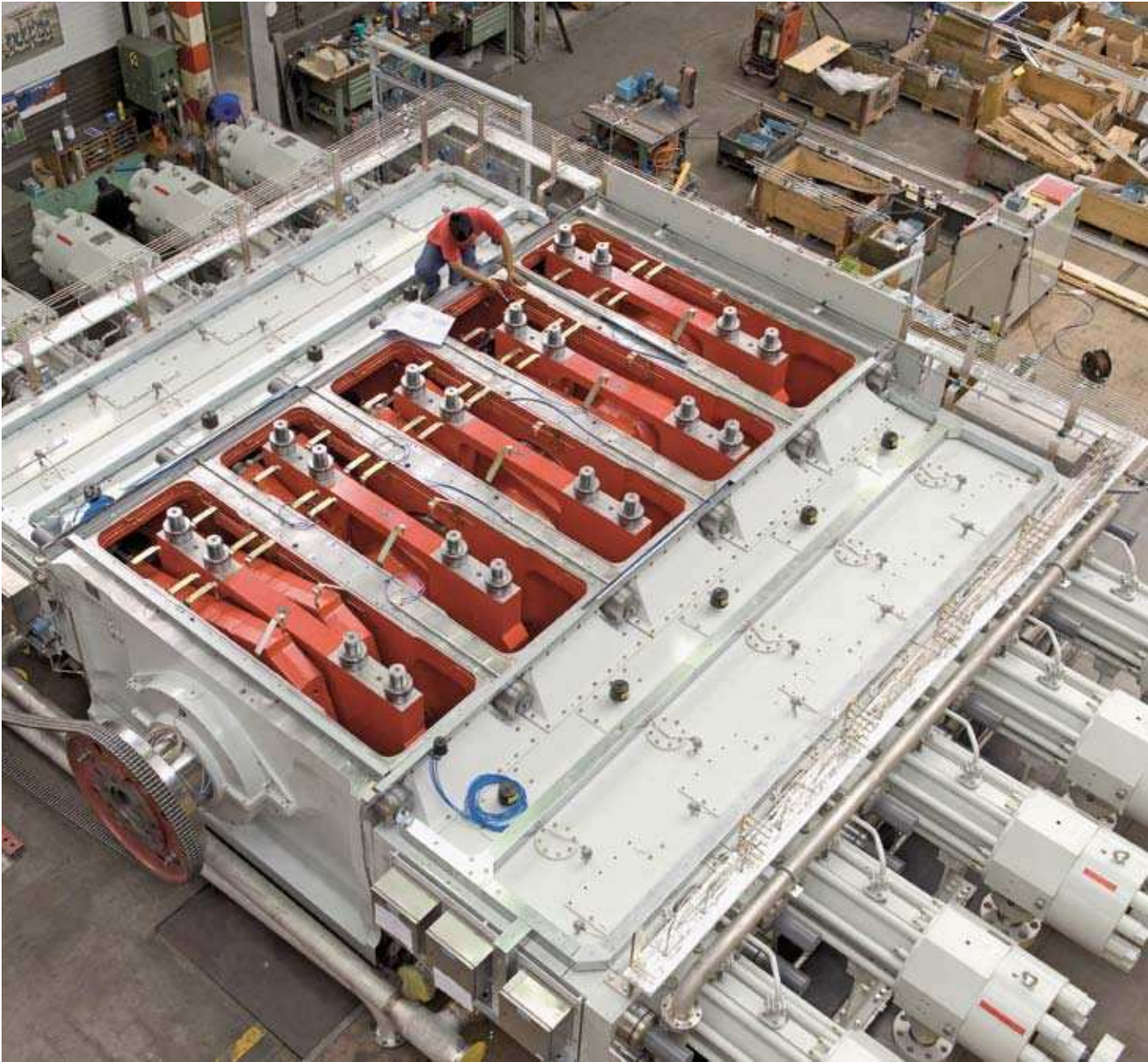
- Pre-assembled unit including base cup, high pressure cups, cups for the guide ring and the throttle ring, shrunk liner (cylinder) and head core (valve seat)
- For fast exchange and service
- Special tools included

## Burckhardt HyproPull™ – Integrated hydraulic cylinder



- Pre-tensioning of the center bolt
- For quick disassembly of the cylinder
- No torsional stress to the cylinder
- Scope of supply includes hydraulic pump

**Easy access to the crankgear**



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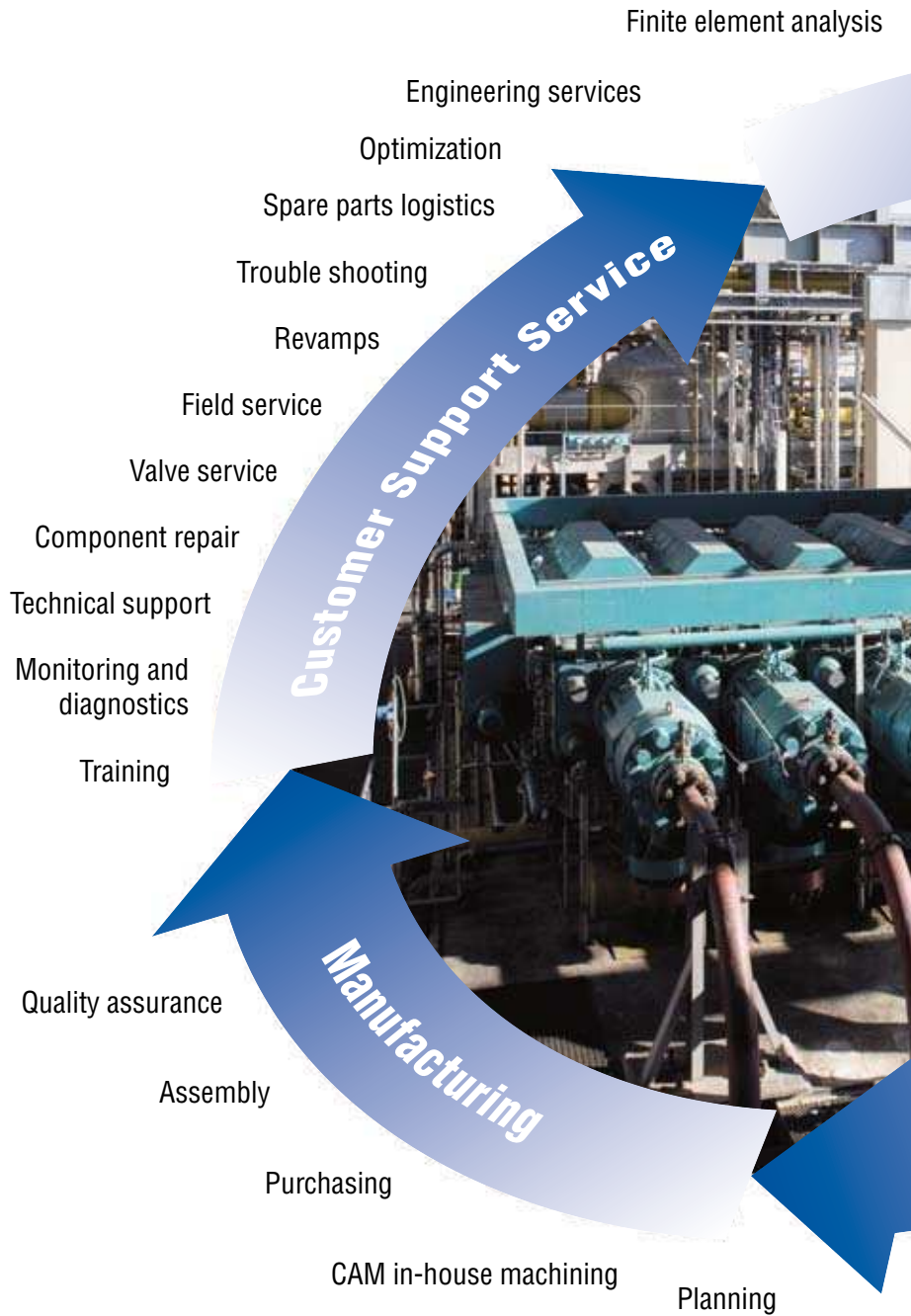
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Objekt 2207



Bodenbelastung  
2000 Kg/m<sup>2</sup>

World's most powerful single frame Hyper compressor K12

# Burckhardt Compression – The Hyper Pioneer with Thorough In-House Expertise...



Research and testing of lubricants

Mechatronics

Instationary fluid dynamics

Pre-sales support

Engineering analysis

Feasibility study

Selection and sizing

Pulsation and vibration studies

3D CAD

Compressor valves

Rings and packings

Contracting

Customer and standard specifications

Lubrication skid

Cooling water skid

Cooling/flushing skid

Instrument and control, motors

PLC programming

**Research & Development**

**Compressor Design**

**Auxiliary Engineering**



**... from Pre-Sales to Field Optimization  
Both for EPC Contractors and  
Plant Operators**

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# Top Quality for Lowest Lifecycle Cost – This is Swiss Engineering

Our Hyper compressors are the result of the broad experience gained by Burckhardt Compression over many decades. The second to none design has been accomplished in close collaboration with our customers throughout the world. Based on their needs, Burckhardt Compression provides a robust and reliable compressor of Swiss engineering. Certified Swiss manufacturing, quality management and committed workforce ensure a constant high quality level.



**Plant: Nanjing**  
**Country: China**

*Our company BYC is located in China and is a joint venture between BASF and SINOPEC. We purchased two booster/primary compressors and two Hyper compressors from Burckhardt Compression. The compressors are in operation since May 2005. Up to now, we are satisfied with the project management and the good quality of the compressors that represent high reliability - especially a long lifetime of the packings and valves. We appreciate the good after-sales service and the periodical visits of Burckhardt Compression. In case of any issues they provide strong and prompt technical support.*

*We are happy to have Burckhardt Compression as a partner.*

**Guan Xinchun, Plant Maintenance Manager**  
**Nanjing, BASF-YPC Company Limited**

## Lowest initial costs

- Lowest number of cylinders in operation
- Advanced machining technology
- Global sourcing
- Efficient manufacturing



## Low operating costs

The high quality of our compressors results in a long MTBO and in low consumption of:

- Energy
- Lubricants



## Maintenance costs

Unpredicted downtimes are the main cost factor of a Hyper compressor. We are the only one that can provide:

- Unique maintenance oriented design features
- Guaranteed lowest downtime



## Total costs of ownership

**The over-all result of our continuous development are compressors with lowest lifecycle costs.**



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[www.burckhardtcompression.com](http://www.burckhardtcompression.com)  
[info@burckhardtcompression.com](mailto:info@burckhardtcompression.com)

# Customer Support Service – The Full Range from Your Hyper Special

## **TECHNICAL SUPPORT** – Solutions for your technical questions

- Start-up support
- Project management
- Analysis of compressor performance
- Trouble shooting
- Failure analysis
- Consulting
- OEM engineering
- Increase of efficiency
- Debottlenecking

**24-hours available**

## **ENGINEERING SERVICES** – Rejuvenate or tune your compressor

- Sizing
- State-of-the-art sizing tools
- Any reciprocating compressor can be modeled and calculated
- Valve dynamics
- Valves can be optimized for every application
- Finite element studies
- Stress analysis of components under dynamic load

**Improve the performance of your system**

## **COMPONENT REPAIR** – Save money

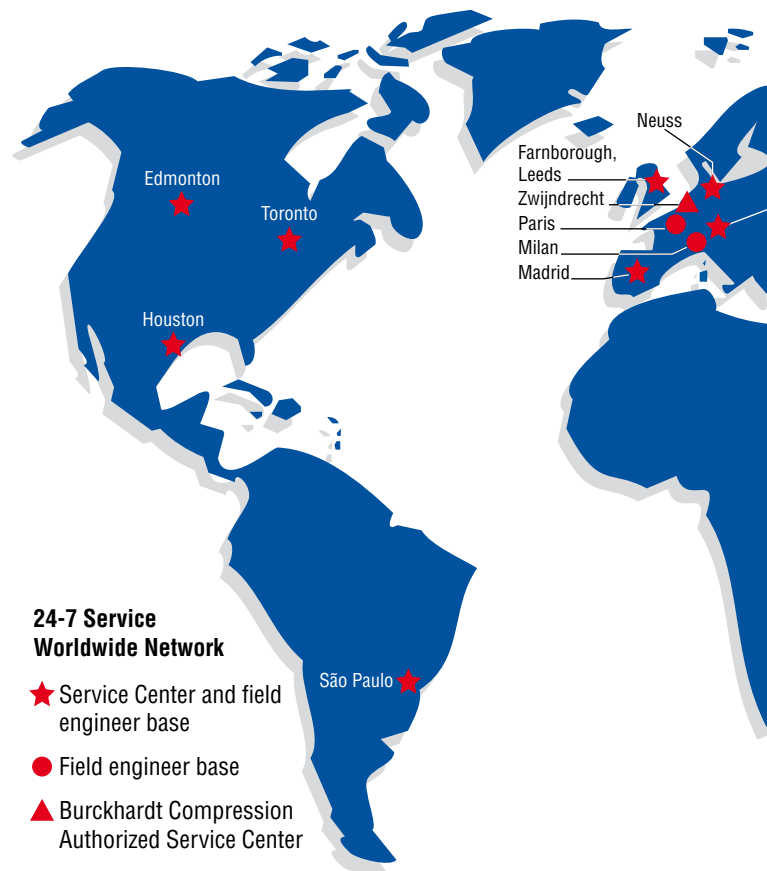
- High pressure/low pressure packings
- Piston rod packings
- High pressure lubrication pumps
- Guide bearings
- Crosshead frames
- Crankshafts
- Elastic rods
- Cylinders

**Your benefit – our expertise**

## **REVAMPS** – Yesterday's equipment gets a new life

- Upgrades/Retrofits
- Modernizing
- Relocation of machines

**Reliability and efficiency as today's equipment**



## **BURCKHARDT VALVE SERVICE** – Rely on Burckhardt Compression as an OEM

- Analysis of valve condition
- OEM valve engineering
- Valve cleaning and overhauls
- Complete quality inspection
- Corrosion protection
- Optimal packing

**You receive as-new guarantee**

# list – Fast, Competent and Worldwide

## **SPARE PARTS LOGISTICS – All out of one hand**

- Express service for emergencies
- Stock recommendations to save money
- Consulting
- Spare parts contracts
- Standard parts on stock

## **OEM guarantee and best life cycle costs**

## **TRAINING – Improve your knowledge in compressor operation and maintenance**

- Training in Switzerland or on-site
- Seminars in German, English and French – other languages on request

## **Efficient and economical operation**



## **BURCKHARDT COMPRESSION: MORE THAN 220 INSTALLED HYPER COMPRESSORS WORLDWIDE**

Europe, CIS	51%
Asia/Australia	30%
Middle East	6%
North America	4%
South America	9%

## **FIELD SERVICE – The specialists you are looking for**

- On site assembly and installation
- Erection/commissioning
- Project management on site
- Start-up
- Service contracts/preventive maintenance
- Plant overhaul/revision

## **Experience and efficiency to save costs**

24-hours technical support:

Tel. +41 (0)52 262 53 53

Please contact us for more information:  
[www.burckhardtcompression.com](http://www.burckhardtcompression.com)  
[info@burckhardtcompression.com](mailto:info@burckhardtcompression.com)

## Training – Have Your Own Hyper Specialists

### **The Burckhardt Compression Training Center**

Our Training Center features the complete range of Hyper compressor service parts and components. It is the right place to train your staff for the demanding activities of a Hyper compressor service without the stress of getting the machine back into production.

What we can offer you in our training:

- 1-5 days intensive training including compressor specific information
- Theoretical advice and practical training
- Full size equipment
- Qualified supervision
- Full documentation
- Training of all operations until perfect
- In a professional environment

We also offer customized trainings on-site.

For more detailed information about training, please contact:

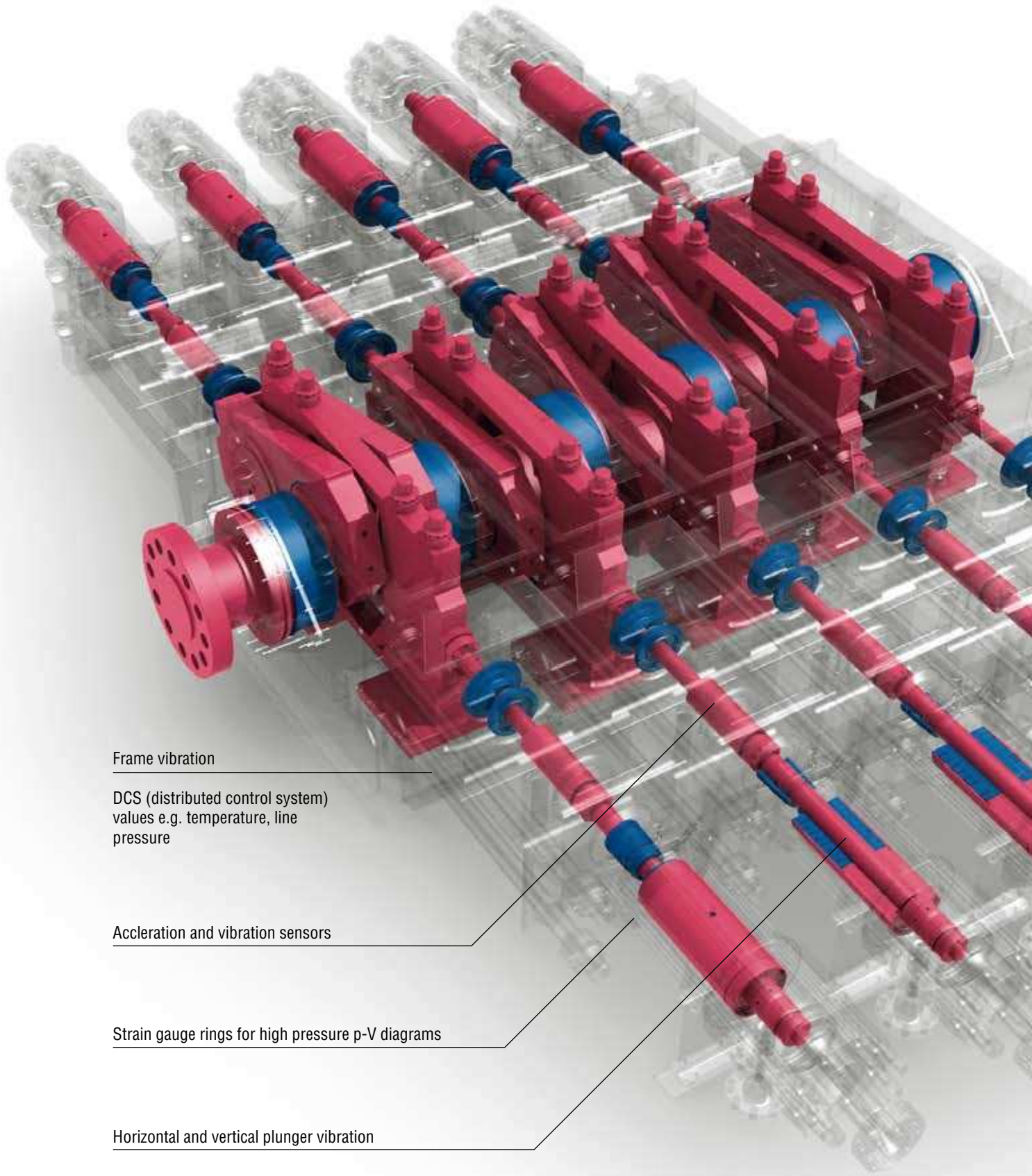
Tel: +41 (0)52 262 55 00

[info@burckhardtcompression.com](mailto:info@burckhardtcompression.com)

[www.burckhardtcompression.com/training](http://www.burckhardtcompression.com/training)







Frame vibration

DCS (distributed control system)  
values e.g. temperature, line  
pressure

Acceleration and vibration sensors

Strain gauge rings for high pressure p-V diagrams

Horizontal and vertical plunger vibration

# Monitoring and Diagnostics – Crystal Clear Information for Advanced Operation

Online condition monitoring and diagnostics of compressors in LDPE service demand a highly adaptable and reliable technology. PROGNOST®-NT is the leading diagnostic system of booster/primary and secondary compressors worldwide.

It has been chosen as the No.1 OEM and retrofit solution. More than 60 compressors in LDPE service are equipped with PROGNOST®-NT today.

## Technology highlights

- Reliable and super-fast machinery protection functions using an intelligent shutdown logic.
- The Early Failure Detection module identifies mechanical defects in early stages. Clear text messages with accurate information about component damages (including location and probability) are supporting the maintenance decision.
- Continuous Wear Monitoring avoids unplanned machine stops and allows full component utilization.
- PROGNOST® Efficiency Optimization is based on dynamic p-V analyses and automatically informs about sealing problems even within Hyper compressor cylinders.
- Integration of PROGNOST®-NT into existing DCS enables an automatic, operating condition based threshold monitoring to avoid false alarms.



www.prognost.com

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[www.burckhardtcompression.com](http://www.burckhardtcompression.com)  
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# Milestones of our Company History

**1834** Sulzer was founded • **1844** Engineering works Burckhardt established in Basel • **1935** First Laby® – labyrinth piston compressor • **1940** First Laby® for oxygen • **1951** First Hyper compressor for IdPE production at 1500 bar • **1971** First Laby® for LNG boil-off at minus 160 °C • **1982** Merger of Sulzer and Burckhardt piston compressor businesses to form Sulzer-Burckhardt Engineering Works Ltd. • **1982** First Laby® for IIdPE and PP • **1998** First hermetically sealed, oil-free high-pressure compressor package for hydrogen • **1999** World's most powerful Hyper compressor with 23'500 kW • **2000** Consolidation of all business activities in Winterthur; manufacturing facilities and offices in Basel closed down • **2002** Legal independence through a management buyout, Sulzer-Burckhardt Engineering Works Ltd. becomes Burckhardt Compression AG • **2007** World's most powerful single frame Hyper compressor with 27'500 kW delivered

## Reciprocating Compressors – The full range at your disposal



Laby® Compressor  
With labyrinth sealing



Process Gas Compressor  
According to API 618



Hyper Compressor  
For pressures up to 3500 bar

## Customer Support Service – The full range at your disposal

Your local contact

**Compressors for a Lifetime**



**Burckhardt  
Compression**

Burckhardt Compression AG · CH-8404 Winterthur, Switzerland  
Tel. +41 (0)52 262 55 00 · Fax +41 (0)52 262 00 51 · 24-hours technical support Tel. +41 (0)52 262 53 53  
info@burckhardtcompression.com · www.burckhardtcompression.com