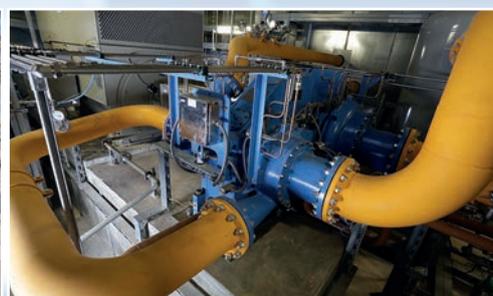


# **BORSIG** ZM COMPRESSION ZM

## PROFILE & PRODUCTS



## Our Company History

Johann Friedrich August Borsig founded BORSIG in 1837. Within 15 years the company had become one of the largest industrial manufacturers in Europe.

In 1842 the Zwickau mechanical engineering company (Zwickauer Maschinenfabrik) began manufacturing steam engines and pumps for hard coal mining. BORSIG expanded into compressor technology in 1857 followed almost half a century later by ZM in 1903.

Almost 170 years later the two companies merged to become **BORSIG ZM Compression GmbH**.

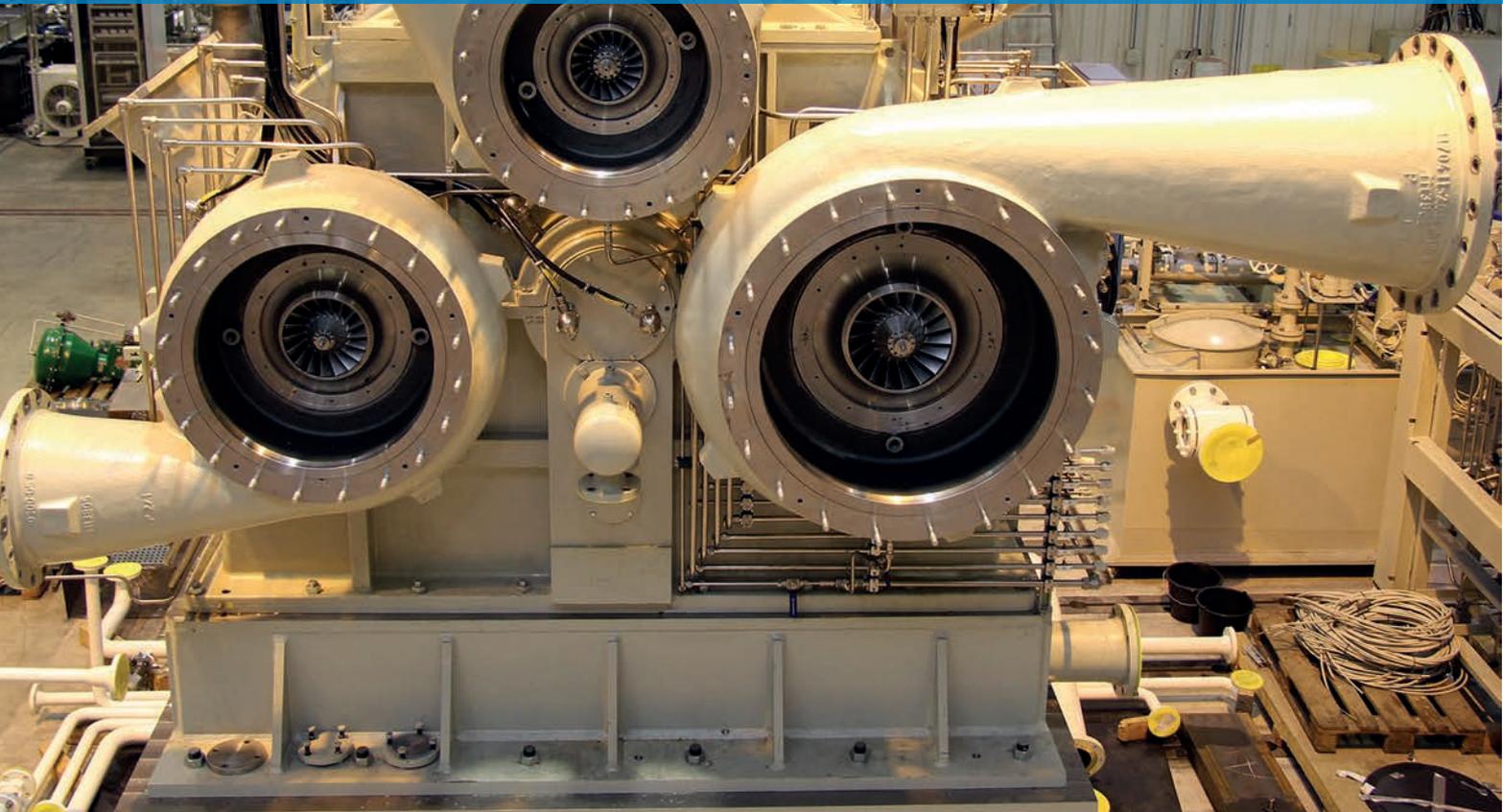
In 2006 BORSIG ZM moved into a newly built plant in Meerane, Saxony and relaunched the BORSIG Bx series. At the same time the company continued to develop its centrifugal compressor business and compressor services.

In 2009 BORSIG ZM Compression consolidated its expertise in the field of compression by acquiring BORSIG Compressor Parts GmbH, a well established compressor valve manufacturer now situated in Gladbeck, Germany.

In 2012 BORSIG ZM introduced the BORSIG BlueLine system to its portfolio incorporating a control system, emergency shutdown, machine protection and condition monitoring for reciprocating and centrifugal compressor units.

With its established core competence in the compressor business BORSIG ZM is a part of the BORSIG Group, a global leading supplier and manufacturer for pressure vessels, heat exchangers, membrane technology and power plant and industrial services headquartered in Berlin, Germany.

## About BORSIG ZM Compression GmbH



**BORSIG ZM Compression GmbH** is a member of the BORSIG Group and manufactures reciprocating and integrally geared centrifugal compressor units. The company additionally offers compressor valves, the BORSIG BlueLine system and a comprehensive compressor service.

BORSIG ZM Compression GmbH is situated in Meerane at the centre of Leipzig, Chemnitz and Zwickau economic area. Zwickau is the birthplace of the composer Robert Schumann and the automobile industry in Saxony, and has continued to develop into a modern and efficient business location over the past few years adding to the federal state's industrial reputation.

Our competence is based on a 180-year company history which enables us to successfully meet economic, technical and social challenges both now and in the future.

At BORSIG ZM Compression GmbH innovative solutions, state-of-the-art technology, highly trained specialists and comprehensive expertise provide the basis for our position as a single source supplier of leading technology.

**BORSIG ZM Compression GmbH –  
Commitment for Life**

# Reciprocating Compressors for Process Gases

With around 160 years of manufacturing expertise in reciprocating compressors, **BORSIG ZM Compression GmbH** offers horizontal and vertical compressor solutions for process gases with all auxiliary equipment (turnkey solutions).

Our compressors are driven either by electric motors, gas engines or steam turbines and comply with API 618 design standards as well as other international and manufacturing standards.

Thanks to the high level of vertical integration in the manufacturing of compressor components, BORSIG ZM Compression GmbH can transfer and closely monitor the high demand on the parts directly from the design into the manufacturing process.

We use state-of-the-art 3D design tools that enable complete system visualisation and design as well as the specific design and construction of the components using FEM software. Particular attention is paid here to the values obtained in relation to durability, strength and stiffness. The benefits of this engineering are passed on directly to the customer in the form of longer life, higher wear resistance and thus lower lifecycle costs.

## Power ranges:

Discharge pressure:	... 1,000 bara
Capacity / flow:	... 115,000 m <sup>3</sup> /h
Power:	... 16,000 kW

## Typical applications:

- Chemical and petrochemical industries
- Oil and gas industry
- Crude oil recovery
- Natural gas recovery and processing, transport and storage
- Refinery technology
- Power plants
- Low-temperature engineering
- Gas liquefaction, e.g. LPG, LNG
- Gas gathering and injection
- Various industrial processes

Fig. 1: Reciprocating compressor Bx45, 6 cranks, 43,000 Nm<sup>3</sup>/h

Fig. 2: Reciprocating compressor Bx40, 2 cranks, 125,000 Nm<sup>3</sup>/h and PH422, 4 cranks, 8,000 Nm<sup>3</sup>/h

Fig. 3: Reciprocating compressor PV422, 4 cranks, 21,100 Nm<sup>3</sup>/h

Fig. 4: Reciprocating compressor Bx45, 4 cranks, 35,000 Nm<sup>3</sup>/h



Fig. 1

Fig. 2



Fig. 3



Fig. 4



# Integrally Geared Centrifugal Compressors for Process Gases

**BORSIG ZM Compression GmbH** has been manufacturing centrifugal compressors for process gases for more than 55 years. The BORSIG ZM centrifugal compressor series comprises multistage integrally geared centrifugal compressors with steam turbine, gas turbine or electric motor as driver with all auxiliary equipment (turnkey solutions). The compressors comply with the corresponding API design standards such as API 617, 672 and 614.

The impeller is the heart of the centrifugal compressor stage. BORSIG ZM offers open and closed type impellers, designed and manufactured with state-of-the-art CAD/CAM tools to operate at very high efficiency. Special materials for the impellers (e.g. stainless steel or

titanium) and volutes guarantee that all process industry requirements are met.

#### Power ranges:

Discharge pressure:	... 150 bar
Capacity / flow:	... 300,000 m <sup>3</sup> /h
Power:	... 25,000 kW

Higher pressure, capacity/flow and power on request

#### Typical applications:

- Chemical and petrochemical plants
- Refineries
- Fuel gas delivery for gas turbine refinery systems (fig. 2 and 3)
- Process gases
- CO<sub>2</sub> applications
- Air separation
- Gas storage
- Mechanical vapor recompression

Fig. 1: Centrifugal compressor with 6 stages, 51,000 Nm<sup>3</sup>/h

Fig. 2: Gas booster skid with 2 stages, 62,000 Nm<sup>3</sup>/h

Fig. 3: Centrifugal compressor with 4 stages, 54,000 Nm<sup>3</sup>/h

Fig. 4: Centrifugal compressor with 2 stages, 12,200 Nm<sup>3</sup>/h

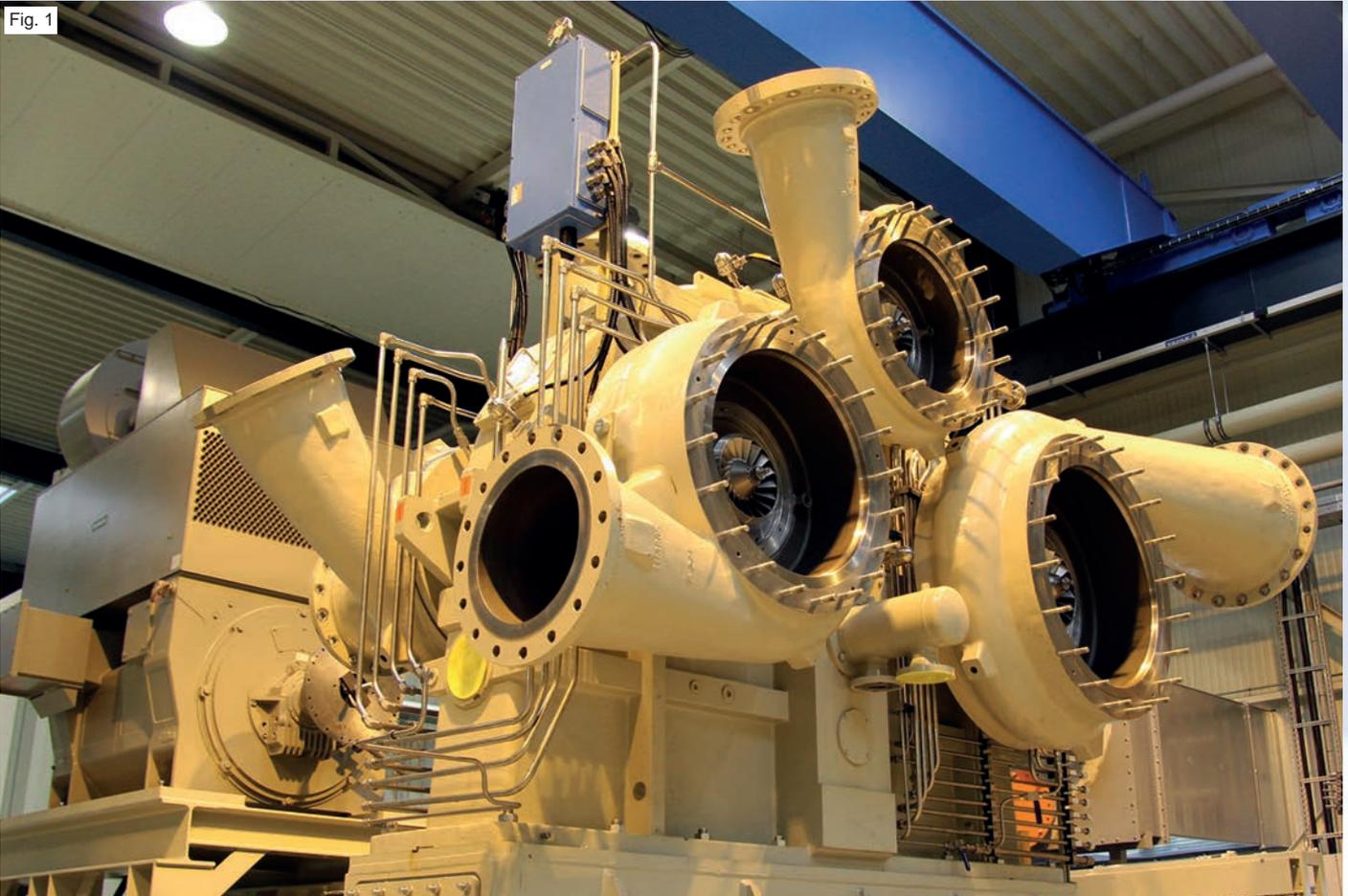
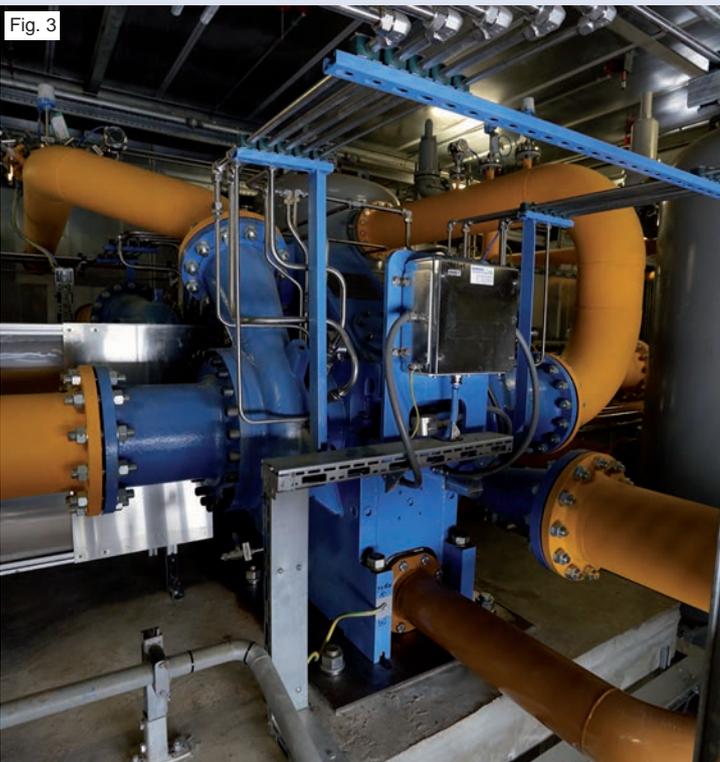


Fig. 1



# Compressor Valves

Fig. 1



Fig. 2



**BORSIG ZM Compression GmbH** offers a wide range of compressor valves through its subsidiary **BORSIG Compressor Parts GmbH**.

For more than 30 years **BORSIG Compressor Parts GmbH** has specialized in the development, production, processing and modification of compressor valves and thus continues the BORSIG tradition in compressor valve technology.

Over the years BORSIG Compressor Parts GmbH has analyzed hundreds of reciprocating process gas compressors. Around 35% of these could be optimized.

We have used these findings together with our orientation towards customer-specific requirements and the continuous expansion of our expertise to develop new products such as systems for diagnosing reciprocating compressors.

Our long-standing experience has proved that customers' problems can usually be solved by recalculating and modifying existing parts with reliable compressor and valve analysis and tailor-made engineering.

BORSIG's team of experienced engineers guarantee an efficient service for analyzing and solving problems with reciprocating compressors.

#### Products and services at a glance:

- Engineering and manufacturing of valves for different purposes
- Actuators for capacity control
- Damage analysis, valve reconditioning and modification
- Spare parts for compressor valves of all common types
- Software to analyze compressors and valves
- Testing of valves

Fig. 1/ Fig. 2: Valve manufacturing

Fig. 3: Valve before and after reconditioning

Fig. 4: Modification - broken steel plate (left), alternative plastic plate (right)

Fig. 5: Finite element analysis of valve plate and valve seat

Fig. 3



Fig. 4

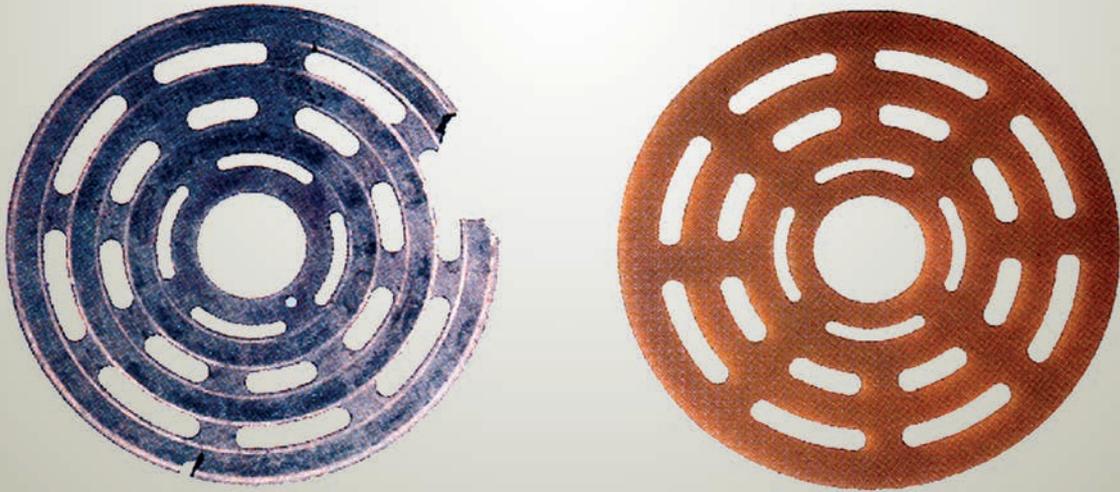
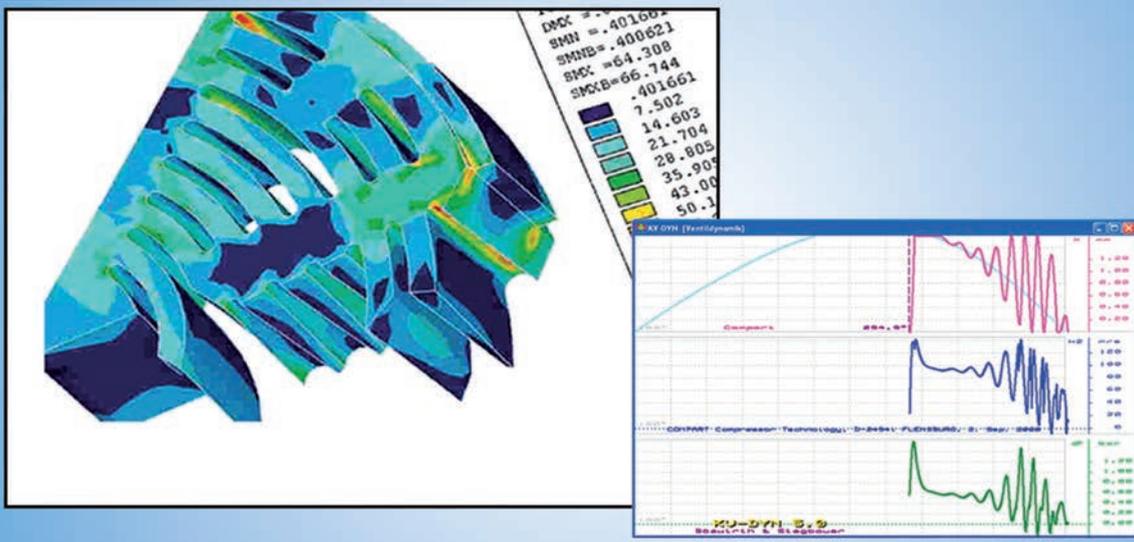


Fig. 5



# BORSIG BlueLine

The BORSIG BlueLine combines a control system, emergency shutdown, machine protection and condition monitoring for reciprocating and centrifugal compressor units by **BORSIG ZM Compression GmbH** as well as by other manufacturers.

The BORSIG BlueLine system range is the basis for integrated SIL3 automation. Safety-related communication and processing with multiple redundancies, if required, enable the efficient distribution of complex applications and the integration of several systems.

In addition to regular automation, modern plants increasingly require certified safety functions. BORSIG BlueLine systems enable the mixed operation of certified safety components (up to SIL3) with standard automation systems in one computer system. The transparency between these components is guaranteed.

## Features of BORSIG BlueLine:

- Highest safety, certified up to SIL3 (IEC61508, IEC61511, IEC62061), PL e and CAT 4 (ISO 13849, DIN 954) for open-loop and closed-loop control
- Highest system availability by redundancy and hot swap component replacement
- Hardware diagnostics of all I/O signals with error detection
- Mixed configuration of certified safety, measuring and control systems possible
- Integrated Machinery Monitoring System (MMS) consisting of Machinery Protection System (MPS) and Condition Monitoring System (CMS)
- Strict separation of MPS, SPS and ESD not required
- Full integration of PLC, ESD, MPS and CMS systems, also available as individual modules
- Low space requirements and reduction of interfaces
- Freely programmable with SIL3 certified function blocks
- Open communication interfaces: Open Modbus TCP, RTU Modbus, others on request
- Process visualization system with integrated, high-resolution recording of the process data and sequences

Fig. 1: Concept of BORSIG BlueLine

Fig. 2: BORSIG BlueLine GA BASIC / CM

Fig. 3: BORSIG BlueLine GA DUPLEX/7-S dual-redundant architecture

Fig. 4: Measurement data and trends of a centrifugal compressor and turbine

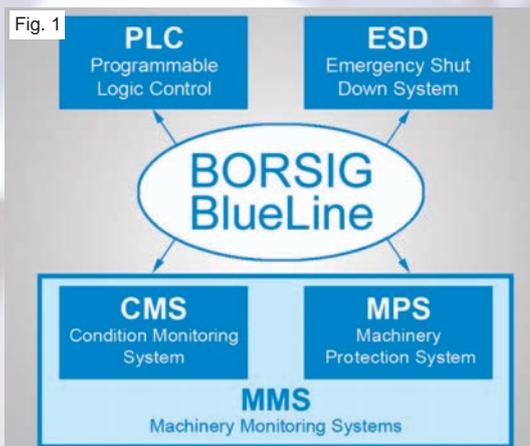


Fig. 3

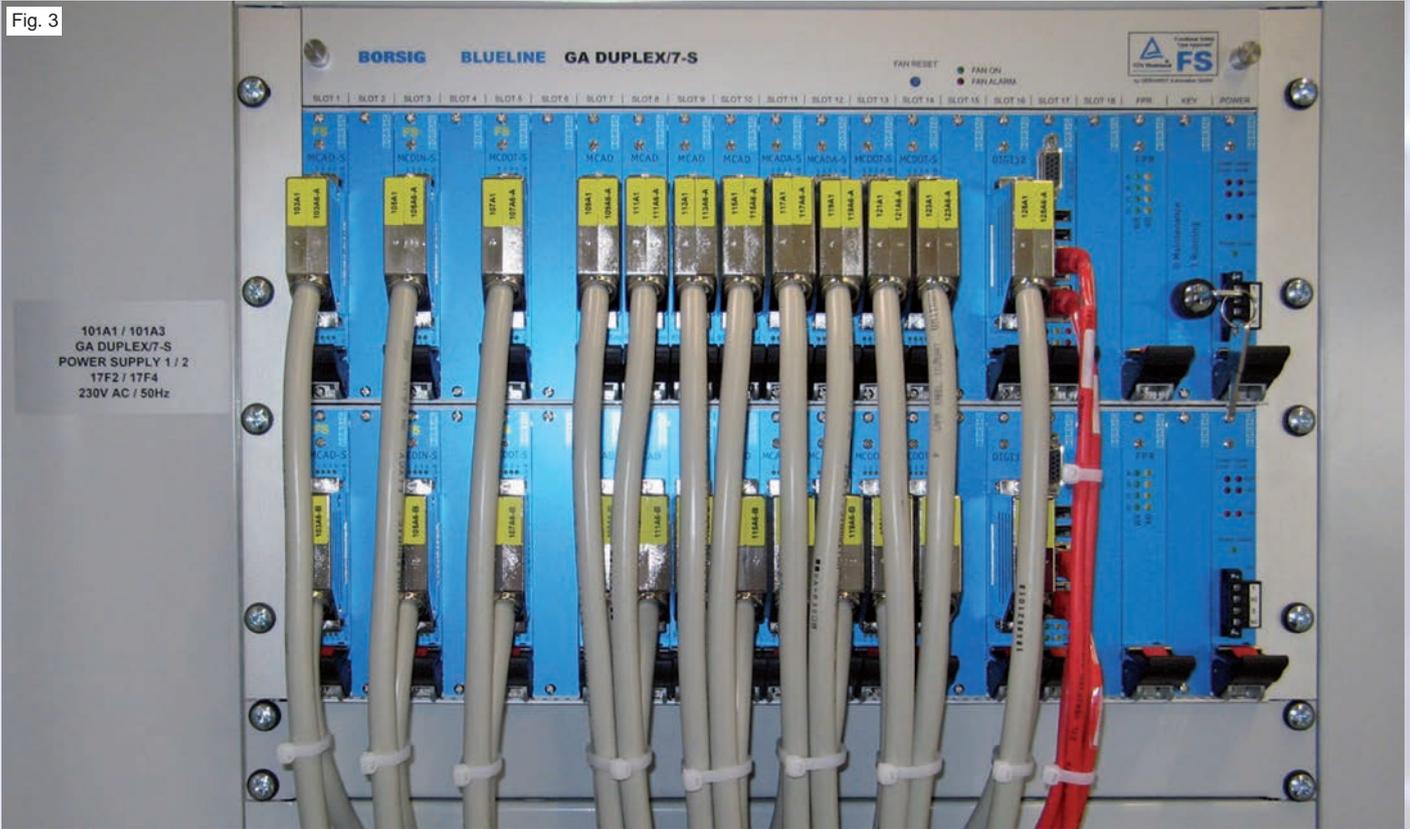
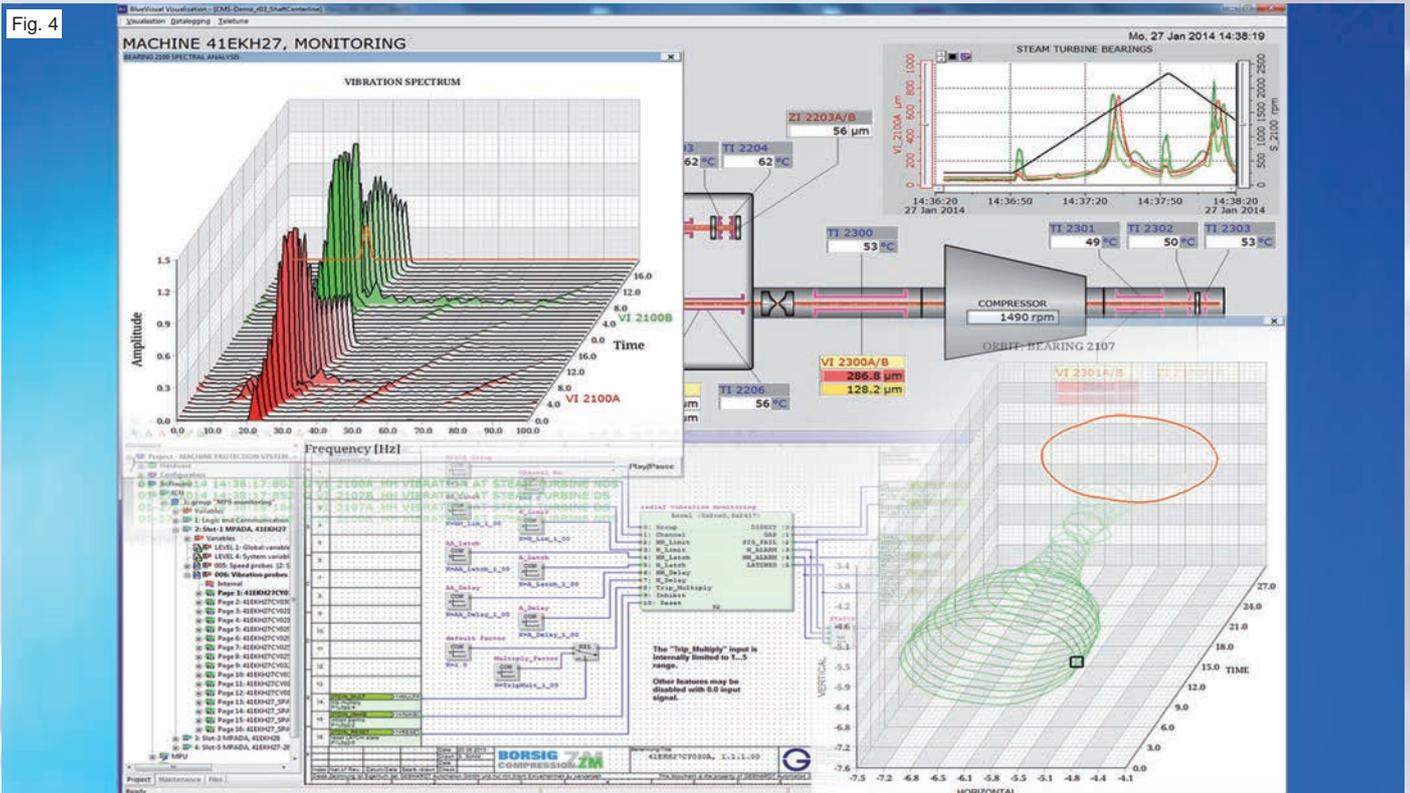


Fig. 4



# Engineering

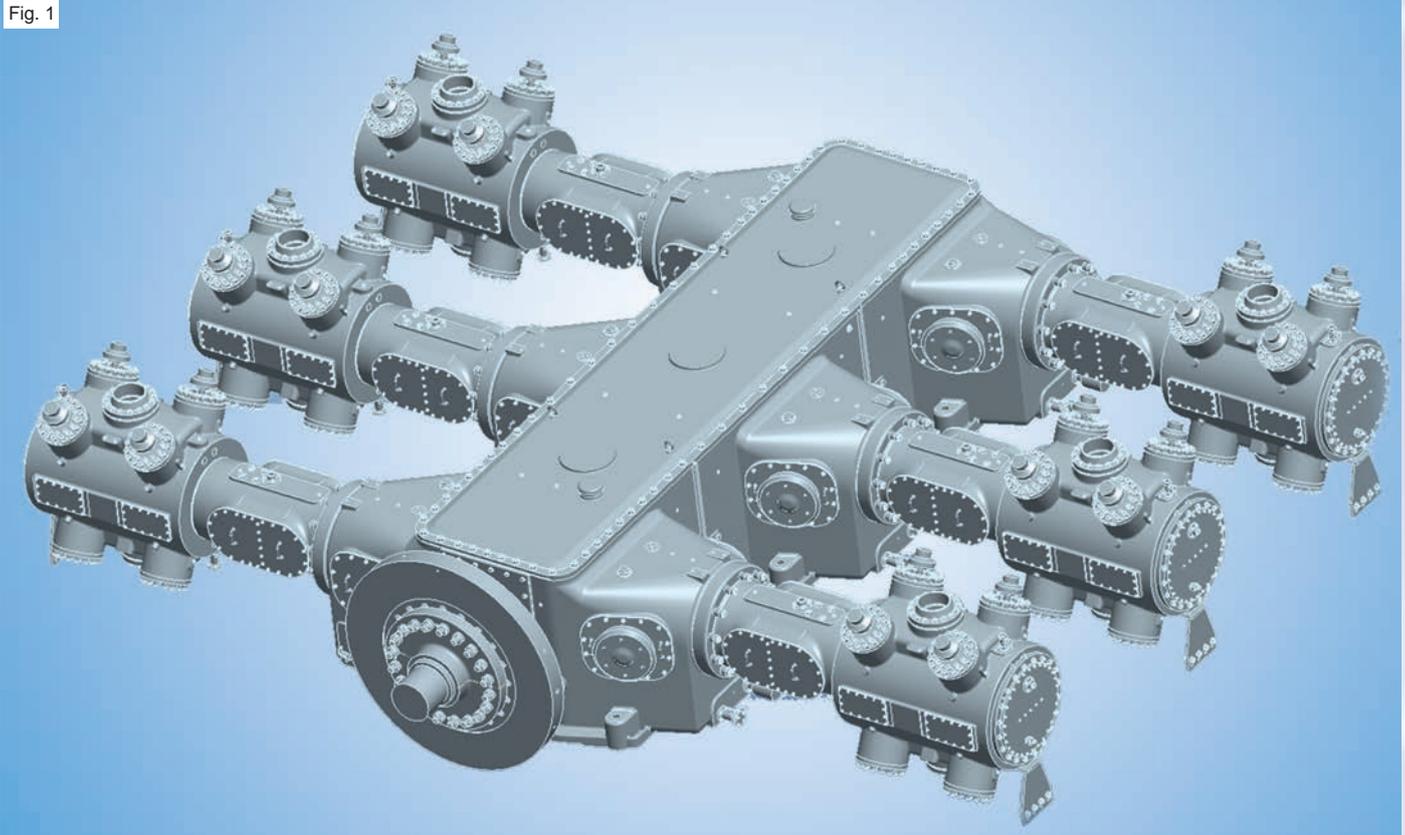


Fig. 1

A high level of expertise, the adoption of sophisticated technologies and the flexibility and dedication of our highly skilled designers form the core of our successful engineering business.

**BORSIG ZM Compression GmbH** offers customized solutions based on the latest CAE and CAD software. BORSIG ZM uses a range of cutting edge 3D modeling and computer graphics programs as standard practice.

We collaborate closely with our customers and their engineering partners. The design of our compressors, equipment and control systems is security conscious and oriented towards ease of maintenance and operation.

BORSIG ZM uses COMOS PT as an integrated work order concomitant engineering system.

This object-oriented CAE system is capable of illustrating the complete lifecycle of a compressor unit.

National and international standards such as DIN, ISO, API, ASME, British Standard as well as project specific customer specifications are taken into consideration.

- Fig. 1: CAD model of 6-crank reciprocating compressor Bx45
- Fig. 2: CAD model of booster station for gas turbine power plant with two 4-stage centrifugal compressors
- Fig. 3: CAD model of open milled impeller for centrifugal compressor
- Fig. 4: Unit engineering - oil system according to API 614

Fig. 2

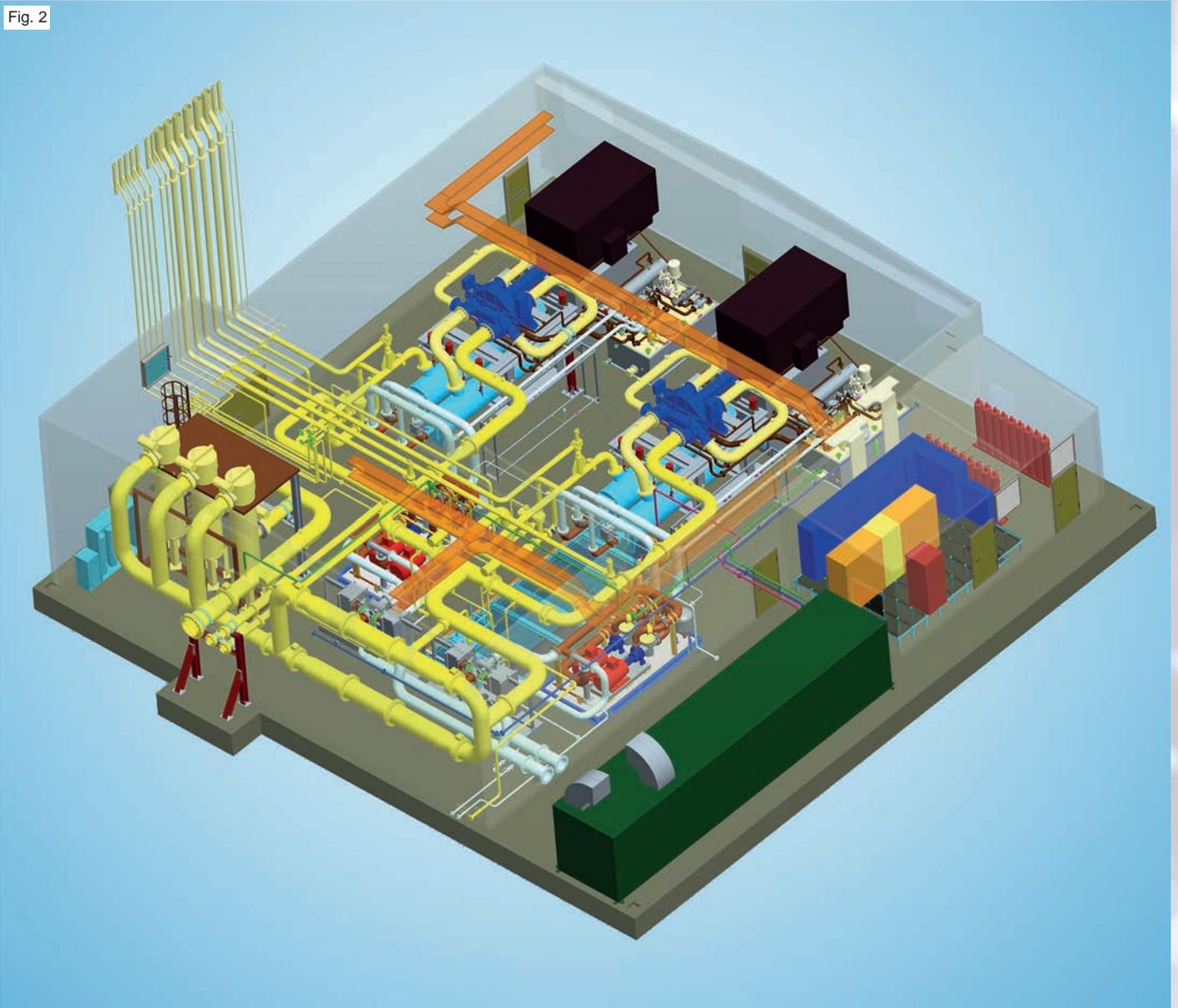


Fig. 3

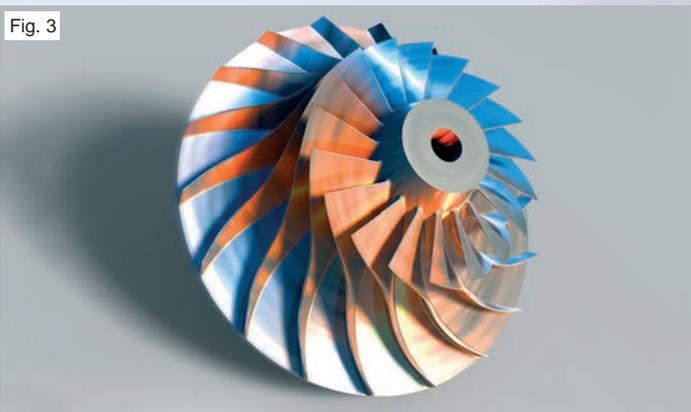


Fig. 4



# Manufacturing

The **BORSIG ZM Compression GmbH** plant in Meerane, Saxony has a 10,000 m<sup>2</sup> production area with up to 100 tonnes crane capacity.

At the heart of the plant are two CNC boring and milling machines with a maximum travel path of 14 m and a piece weight of up to 40 tonnes. The extensive CNC machinery is linked to a modern programming system for the simulation of complex machining tasks and error-free processing. BORSIG ZM is thus able to machine cylinders, impellers and other components for our compressors in-house. The machining of forged components, cast steel, modular graphite cast-iron and stainless steel is part of our daily routine. All compressor units are carefully assembled and prepared for the contractual test runs.

A high degree of vertical integration, a sophisticated machine outfit and well-trained permanent staff are guarantors of BORSIG ZM's high quality production standards. Quality assurance and timely delivery are fundamental elements of the BORSIG ethos.



Fig. 1

Fig. 1: Plant in Meerane

Fig. 2: Machining of crank shaft tunnel for the 6-crank case of Bx series

Fig. 3: Assembly works at reciprocating compressor

Fig. 4: 5-axis machining of integrally milled impeller with 580 mm diameter



Fig. 2

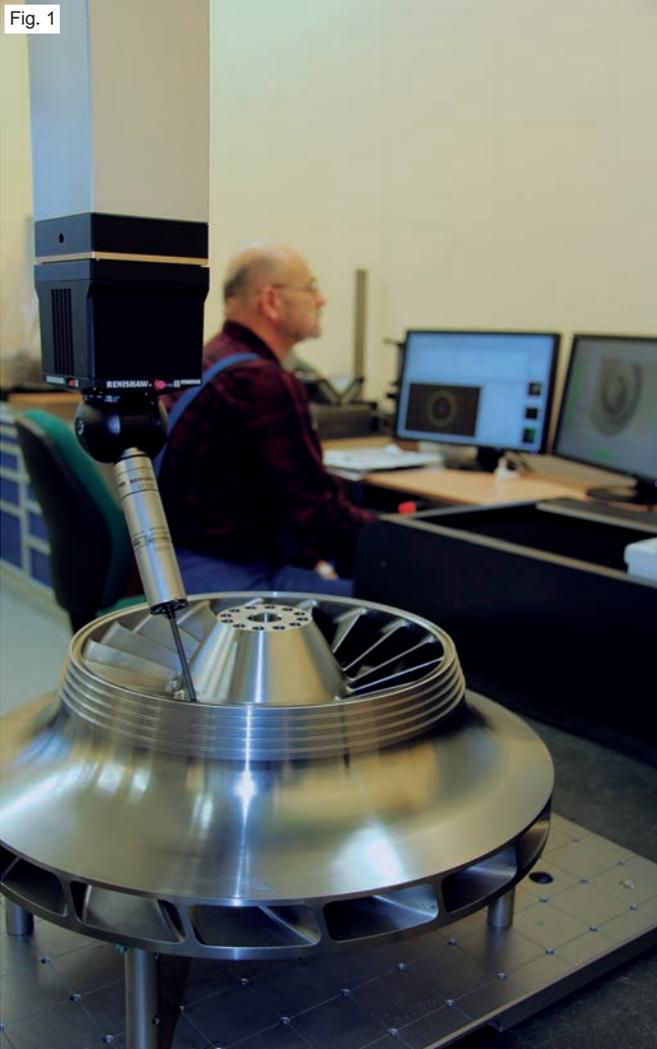
Fig. 3



Fig. 4



# Quality



The **BORSIG ZM Compression GmbH** Quality Management System is certified according to DIN EN ISO 9001:2008.

Our high quality standards are also verified according to additional certifications such as the DIN EN ISO 14001 - Environmental Management System and the SCC\*\* certificate (Safety Certificate Contractors).

Competent engineering, state-of-the-art production processes and comprehensive quality management guarantee the high standards of our products. BORSIG ZM applies modern portable measurement techniques such as laser trackers, scanners, index arms etc.

The Quality Assurance Team works according to appropriate testing schedules, measurement equipment administration and is linked to the production planning and control system (PPS).

The Quality Assurance Team at BORSIG ZM runs tests independently of manufacturing and production control. It guarantees the compliance of processed material, manufactured components, equipment, products and services with national and international standards, regulatory and contractual requirements and BORSIG's internal rules and policies.

We have our own test field with 1,700 m<sup>2</sup>, 8 work stations and a power input of up to 5 MW to carry out function and performance tests of our compressors as well as any other machinery with high current or even mean voltage.

Fig. 1: Impeller measurement with 3D coordinate measuring machine

Fig. 2: Axis measurement at crank case with laser tracker

Fig. 3: Performance test according ASME PTC 10 of 6-stage centrifugal compressor

Fig. 4: Calibration of laser tracker measurement system

Fig. 5: Mechanical test run according API of 6-crank reciprocating compressor

Fig. 3



Fig. 4



Fig. 5



# Compressor Services

As a leading manufacturer of compressor systems worldwide **BORSIG ZM Compression GmbH** offers a comprehensive service from one source. Our after sales service responds flexibly and efficiently to inquiries to provide comprehensive care of BORSIG ZM products as well as compressors supplied by other manufacturers. Competence based on our long-standing expertise in the field of compressors and the high quality of our services makes us the partner you can rely on.

## Portfolio of services

- Installation and commissioning of compressor units
- Spare part management
- Revamp and refurbishment engineering
- Feasibility and pulsation studies
- Maintenance and overhauling
- In-house and onsite training
- Compressor valve service and engineering

## Portfolio of products

- Reciprocating compressors for process gases
- Centrifugal compressors for process gases

Based on its own engineering, BORSIG ZM provides support from the installation and commissioning of compressor units to their revamp, modification and modernisation.

We provide a comprehensive maintenance service to keep systems available and running at an optimal level.

A wide range of constantly available spare parts together with short manufacturing times and high quality standards guarantee minimal downtime for your compressor.

In emergencies short reaction times are crucial. BORSIG ZM's service staff is available for its customers worldwide, 24 hours a day, 7 days a week and 365 days of the year.

## 24-hour service hotline

**Phone: +49 3764 5390 5120**

**E-mail: [service@zm.borsig.de](mailto:service@zm.borsig.de)**

Fig. 1: Installed centrifugal compressor unit

Fig. 2: Mechanical cylinder processing

Fig. 3: Re-engineering and modernisation of reciprocating compressor unit

Fig. 4: Practical in-house training

Fig. 5: Quality control

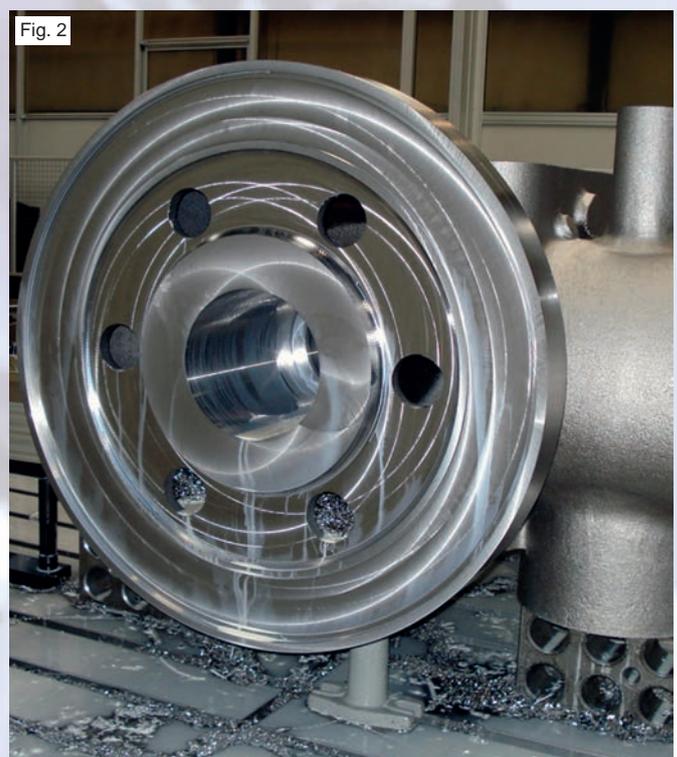
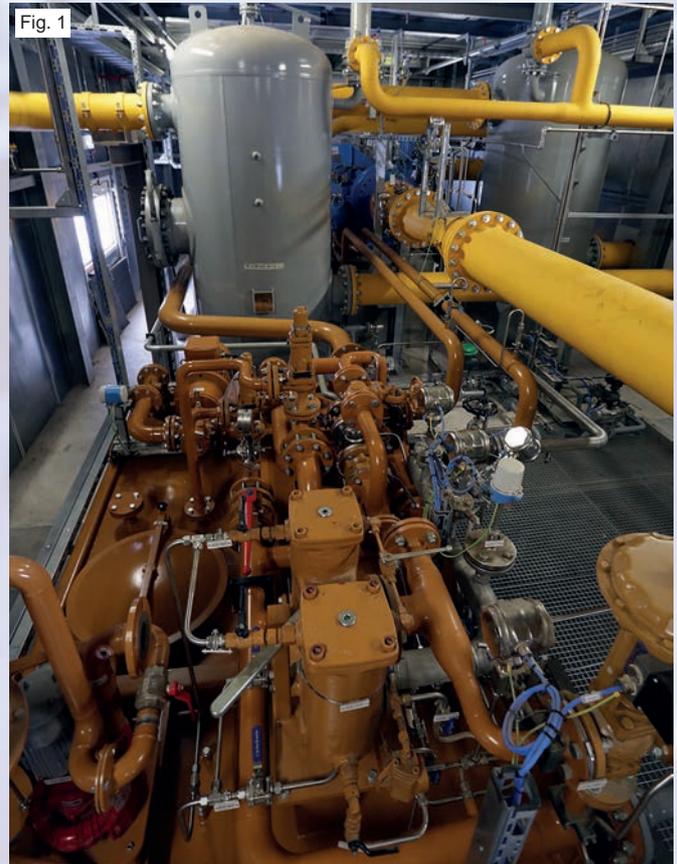


Fig. 3

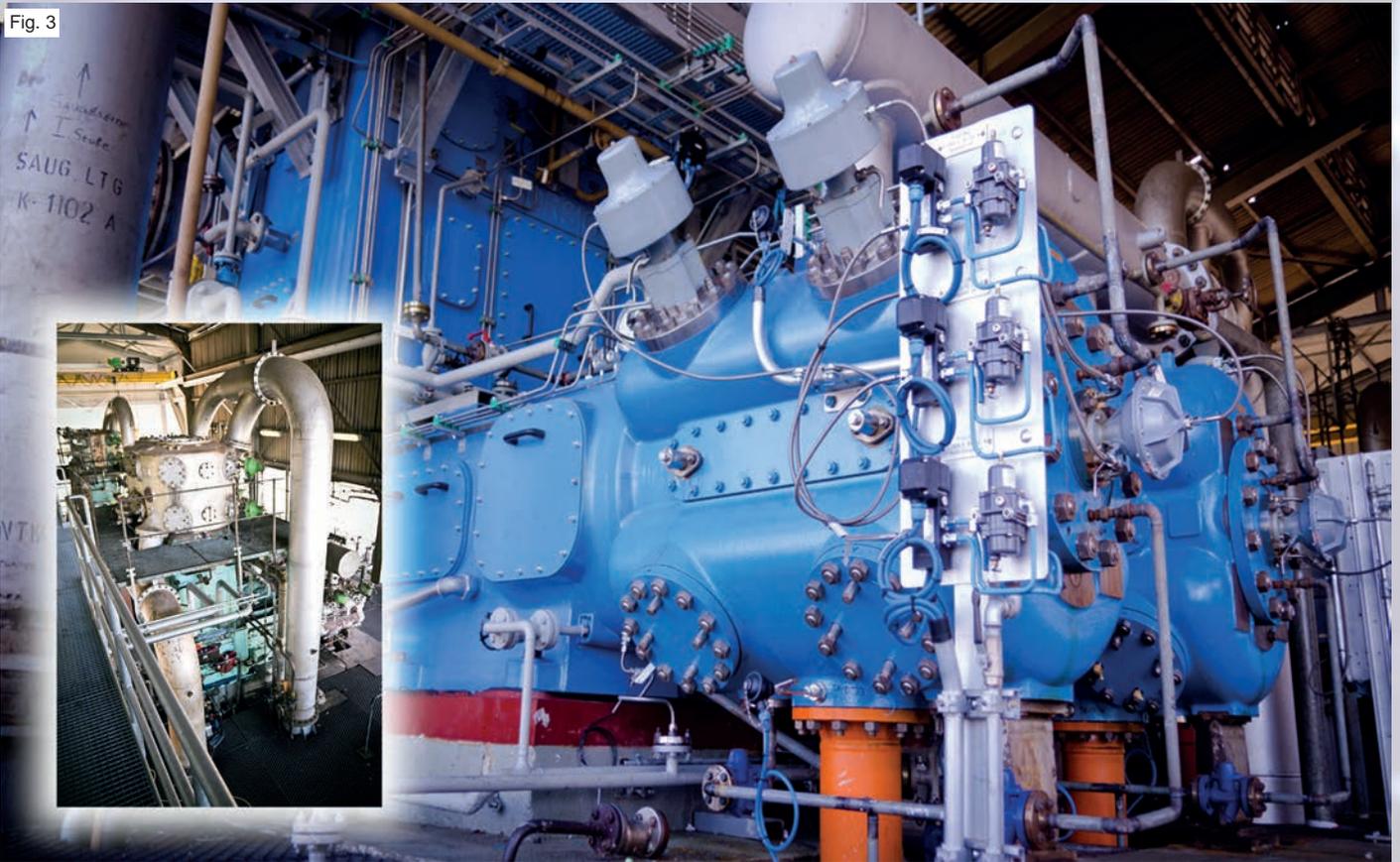


Fig. 4



Fig. 5



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