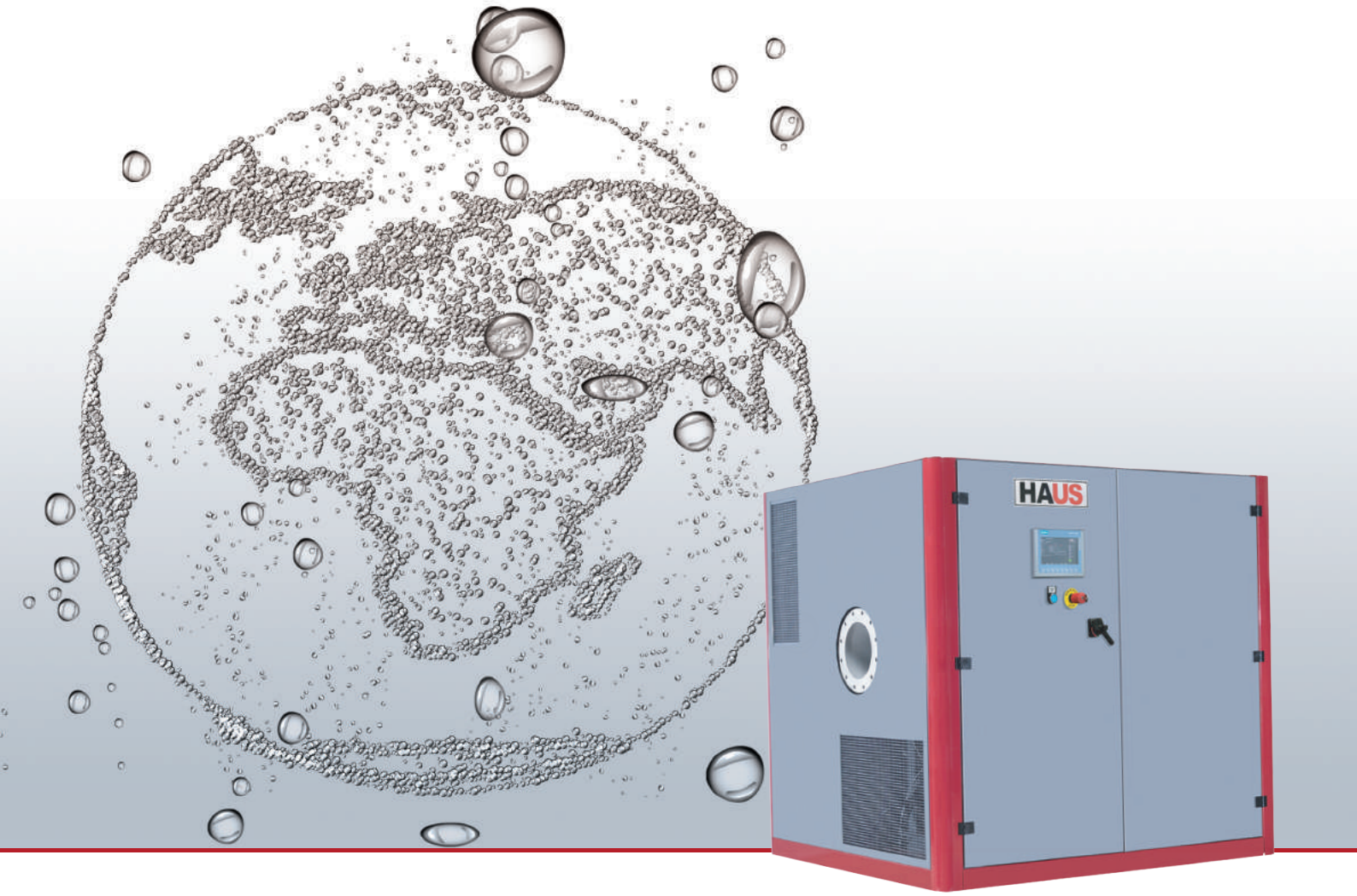
TURBO BLOWER

Magnetic Bearing Technology



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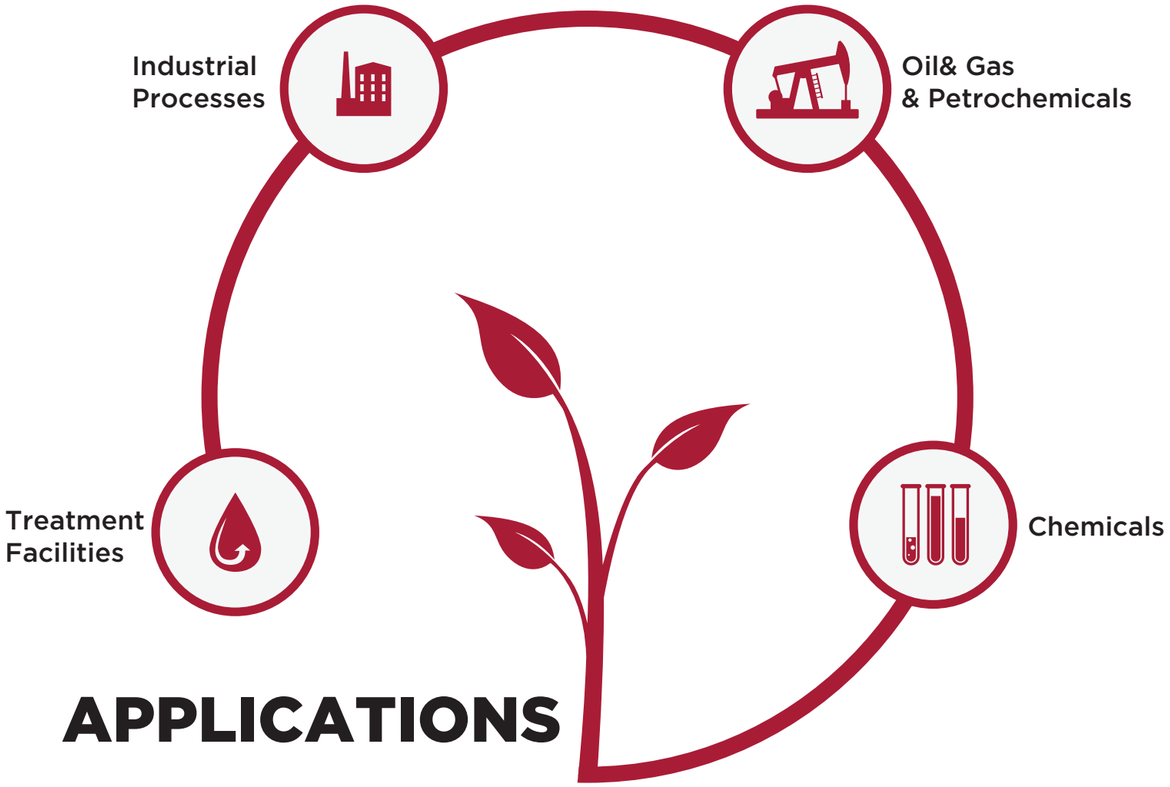
HAUS
CENTRIFUGE TECHNOLOGIES



APPLICATIONS

HAUS TURBO BLOWER's

for aeration and air compression

HAUS Turbo Blower, a Centrifugal Compressor with Magnetic Bearing and Variable Speed, is one of the most advanced technology blower on the market.

Blowers and Air Compressors are extensively used in the treatment plants for the aeration of ventilation pools and the sludge treatment in general, as well as in many industrial processes which need aeration.

The use of blower is fundamental but also critical for the energy consumption, the continuity of operations and overall for the cost of the plant functioning.

A new technology is available today and able to save **up to 40%** in terms of operational cost in respect to conventional technology.

HAUS Turbo Blower is an innovative solution to increase the process efficiency together with consistent energy and maintenance saving, which make very short the payback of the initial investment.

HAUS Turbo Blowers are a family of blowers made by different compressor shapes and motor power sizes, such to cover all together a large range of volume flow.

DESIGN

HAUS provides specially designed blowers in different configurations for waste water treatments and industrial applications. **The HAUS Turbo Blowers** are single stage centrifugal compressors, with variable speed drive, adopting Magnetic Bearing technology.

WORKING PRINCIPLE

The air is sucked from the room (or from a pipe), filtered, and enters in the centrifugal compressor. Thanks to the speed of rotation and the shape of the compressor, the air flow is compressed and its pressure is increased. The compressed air is subsequently discharged into the user pipe through the blower air diffuser (Discharging Cone)

The Magnetic Bearing associated with Variable Speed Motor, makes very high speed and therefore high performance possible.
An extensive use of control equipment, increases the reliability, the flexibility and finally the competitivity of this solution.

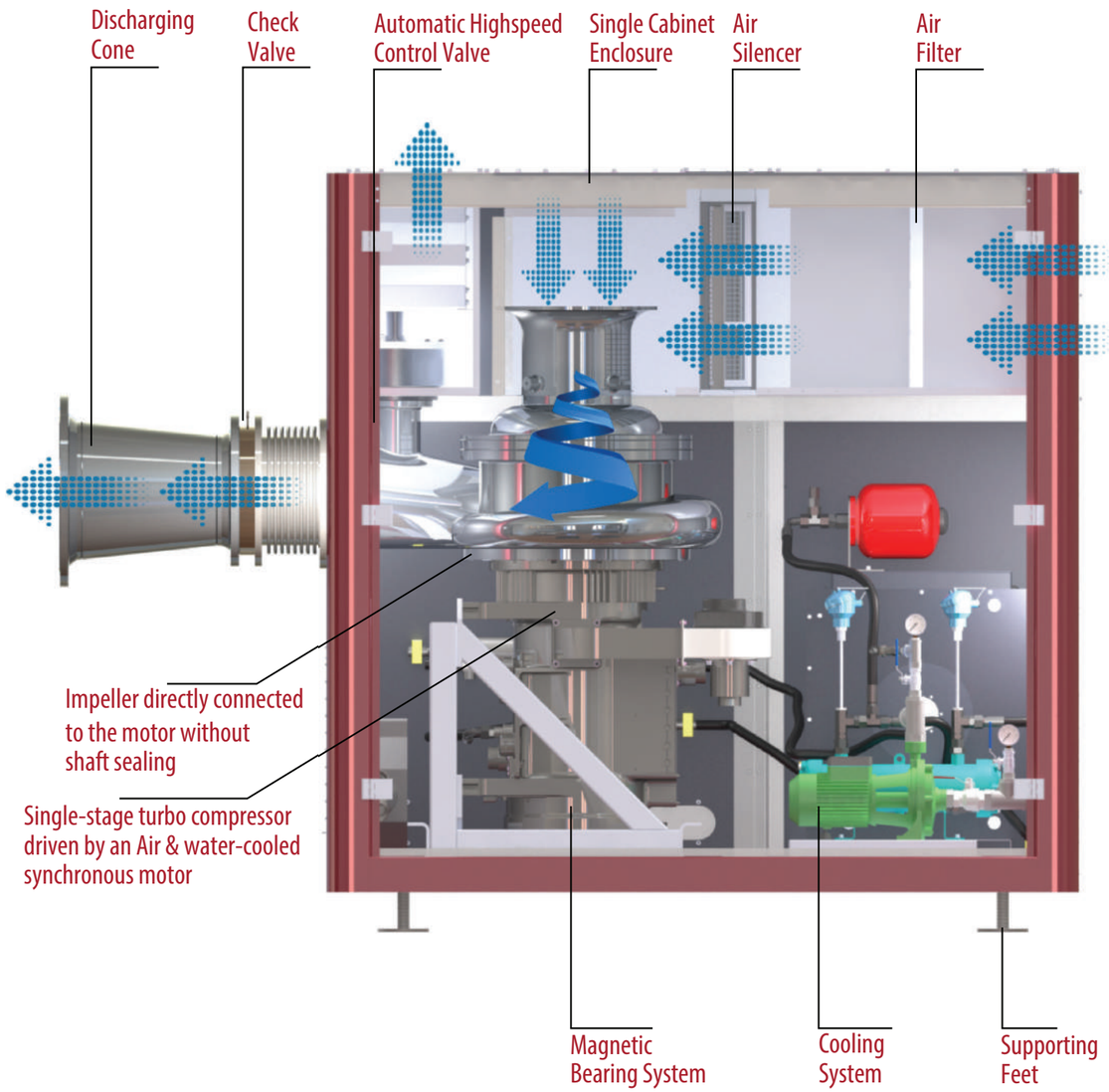
The HAUS TURBO BLOWER functioning is managed by the proprietary software developed by the IT Department. The software has the aim to minimize the energy required to run at the requested operating point. The Maestro Software is handling the load distribution on multiple installation (HAUS Blower Sequencer)

Choice of top quality electronic components and innovative solution for power filters, make the HAUS BLOWER the right solution to comply with standing directive, reducing the installation cos

MAIN COMPONENTS

The electronic and mechanical components are integrated with the control panel in a single structure, protected by insulating panels, and standing on its own feet. Each HAUS Turbo Blower is delivered as a stand alone box, ready to be connected to the user air pipes and to the power cable, to operate.

- **Compressor stage**
- **Variable speed drive**
- **Cooling System**
- **System Bypass valve**
- **Control system**
- **Cabinet**
- **Intake Air Filter**
- **Intake Silencer**
- **Discharge cone**
- **Check valve**
- **Expansion joint**



THE HAUS TURBO BLOWER
Advantages

The **HAUS Turbo Blower** is capable to compress a large amount of air with less power consumption: thanks to the compressor stage, the magnetic bearing tech, the advanced power transmission and finally the manufacturing technique.

- Ultimate Technology Solutions
- All in one
- Easy to install
- Safe and Reliable Operation
- Industry 4.0 Advanced
- High Effifciency Compressor
- High Quality Manufacturing
- 3D Modelling Optimised,
- Direct Drive,
- High speed,
- Flexible working range
- Contactless
- No lubrication

All together an innovative answer to the actual environmental and industrial demands.

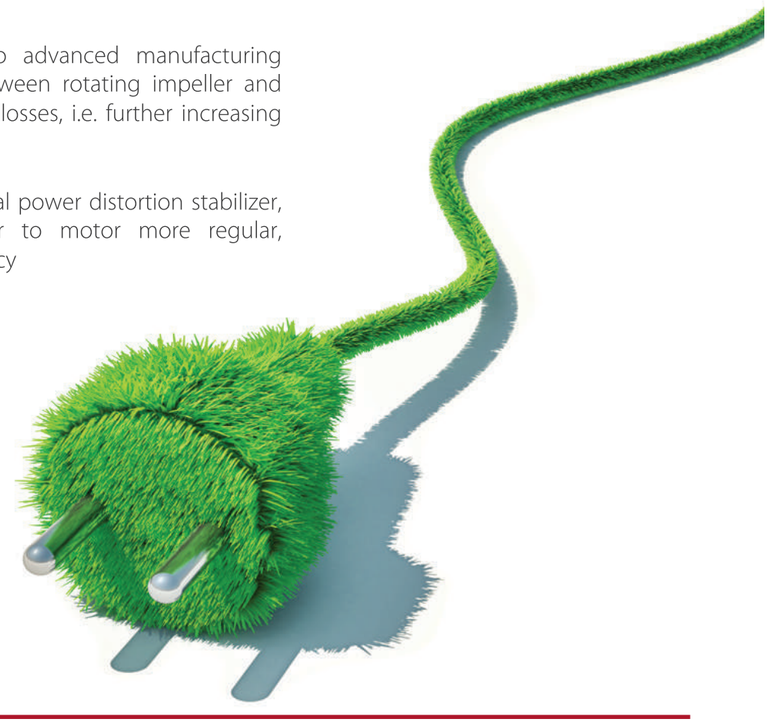
THE HAUS TURBO BLOWER
Energy Saving

- The VFD allows to set different speed while distributing the power to the motor in the most efficient way
- The control software is able to read the characteristic curves of the compressor and to select the speed of rotation which maximaze the efficiency for each working condition
- Direct Drive assembly with the impeller directly connected with the motor, without losses of coupling or gears
- Magnetic Bearing system needs no lubrication, and therefore not losses asociated with lubricants.
- Magnetic Bearing system with control board allow for a tight alignment of the impeller shaft, reducing the flow losses, i.e increasing the energy transfer rate

HAUS Turbo Blower is a centrifugal compressor of higher class, in terms of fluid energy transfer, speed of rotation, material resistance , resulting from the application of advanced CFD and FEM analysis to the design

HAUS Turbo Blower thanks to advanced manufacturing technique has a reduced gap between rotating impeller and casing, further decreasing the flow losses, i.e. further increasing the energy transfer rate

HAUS Turbo Blower has an internal power distortion stabilizer, which makes the power transfer to motor more regular, further increasing the motor efficiency



HAUS TURBO BLOWER COST SAVING

The HAUS Turbo Blower offers other opportunities for cost saving, in terms of installation, commissioning, operation and maintenance.

INSTALLATION

- Single and comprehensive enclosure, not external components.
- Standing on supporting feet, not need of foundation work.
- Air Outlet Diffuser Cone with flange included in the delivery, ready for connection with client duct.
- Air Inlet suction from room (no needs for further work) or from client air duct.
- Noise level below 80dB(A), requiring no additional* noise protection.

COMMISSIONING

- Working parameters yet loaded in the blower before delivery
- Adaptive functions to adjust to local variation
- Adaptive functions to distribute the load between multiple units (Turbo Mæstro)
- Senior Expertise Assistance

MAINTENANCE

- No rotating parts to maintain
- No lubricants to be controlled and changed
- No gaskets to be controlled and changed
- Closed Cooling Circuit on Magnetic motor, avoiding external contamination
- Only needs to change air filters according to poling conditions and cooling pump
- Pro-active control of air filters

OPERATION

- Continuous check of blower status
- Continuous control and correction of the impeller position
- Protection from return flow with check valve
- Integrated blow-off valves
- Internal filter for stabilizing the current to the motor
- Wide temperature range
- Able to optimaze multiple units via Turbo Maestro

NOTE

* The air flow generated by the blower in the client ducts can be a source of noise to be reduced by opportune work on the ducts themselves.

FEATURES
Core Components

Air input and output

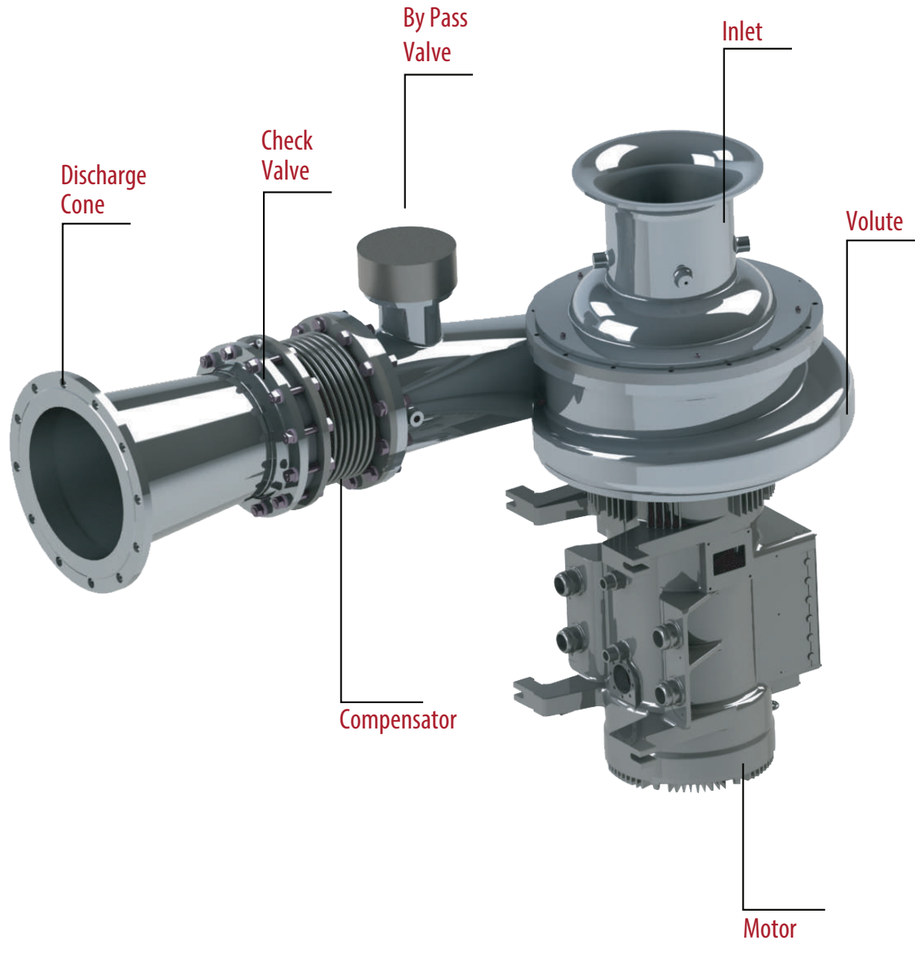
- The air intake is directly from the room, with air filter
- Integrated Air silencer reducing the sound emission to LA eq ≤ 80db(A)
- Diffuser cone with flange to directly connect with the user pipe
- High Speed Anti Surge Valve to protect the compressor

Advanced Air Centrifugal Compressor

- Compressor geometrically optimised with 3D Computational Fluid Dynamic (CFD) Analysis
- Impeller dimensioned for higher centrifugal force with Finite Element Method (FEM) Analysis
- Single Piece Aluminium Impeller, machined on high precision multi axis control
- Aerodynamic excellence of rotating parts
- High speed capability
- High stability and low vibration

Electronic Protection

- EMC filter to protect the environment from Electromagnetic emission
- Line Filter Assembly to reduce the line current distortion (ILP and ELP alternative configurations)
- Sinus Filter: to protect the compressor motor from power distortion



Variable Speed Drive

- The Optimum compressor speed to the duty
- Adjusting the parameter for the best efficiency

Magnetic Bearings with Active Controller

- The rotating parts are kept on position with high precision by the Magnetic Bearing field
- The control function requires low power (less then 1kW)
- The Magnetic Field acts as vibration dumper, allowing safe transient though critical speeds
- Unlimited start/stop capability with memory function
- Pro-active alarm in case of alignment out of safety margin
- Support bearing for positioning during emergency shut down

Direct Drive with Permanent Magnet Motor

- The impeller is directly connected to the synchronous motor without coupling or gear
- The motor has a compact frame size, it is cleaner, faster and more efficient
- High and Low speed capability and high performance around the nominal power

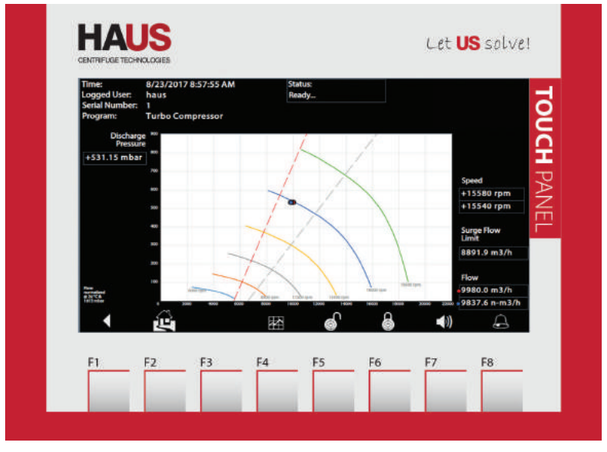
FEATURES (OTHER)

Sensor and Measurement

- Compressor speed and cooling fan speed
- Actual Power absorbed by the magnetic motor and the cooling fan
- High precision pressure sensors for atmosphere, inlet air, outlet air, air filter, air cooling
- High precision temperature sensor for atmosphere, cooling air, cooling water
- Frequency converter multiple data
- Magnetic Bearing data
- Connection for user external sensors (Oxygen sensor) and external data via SCADA

Multiple operating modes

- Speed Control mode
- Volume Flow Control mode
- Pressure Control mode
- Dissolved Oxygen Control mode
- Integrated Surge Control
- Error Handling



Integrated Cooling System

- Closed Water-Glycol Circuit for the motor cooling, free from contamination and losses
- Closed Air Circuit for VFD and Electronics cooling, with Fan driven by VFD
- Integration of the two system via Heat Exchanger to dissipate excess heat
- Temperature control efficient and stable under all climatic conditions
- External water demand even of low quality (industrial standard) no special demand for cooling water quality

PLC ve HMI

- Touchscreen mounted on the blower panel
- Single storage and access point of all the data from motor, VFD and sensors
- Optimization routine for flow volume calculation and power optimization.
- Automatic Diagnostic and Monitoring for Anti Surge,
- Overload, Bypass
- Predictive Maintenance Routine for Air Filter and Cooling Liquid
- Integration with customer DCS and SCADA
- Remote monitoring available

ILP and ELP Configuration: electrical compliance solutions

- ILP configuration offer an integrated solution to compliance with a THDI less then 5% (IEEE 519 recommendation)
- ILP adopts an Integrated Active Filter which makes the Turbo Blower a Low Harmonic Distortion equipment without needs for external filter
- The Integrated Active Filter is an original design being a competitive solution in respect to an external filter
- The ELP configuration is available for all the other case, with an internal choke filter to limit the disturbances.
- All the HAUS TURBO Blowers have RFI Filters to fully comply with EMC Directive

HAUS Turbo Mæstro – HTM (Turbo Blower Sequencer)

- Proprietary software
- Supervision of multiple blowers in one installation
- Optimization of energy consumption
- Load distribution according best utilization routine
- Dialogue with control room
- Equally aging of multiple Turbo Blower

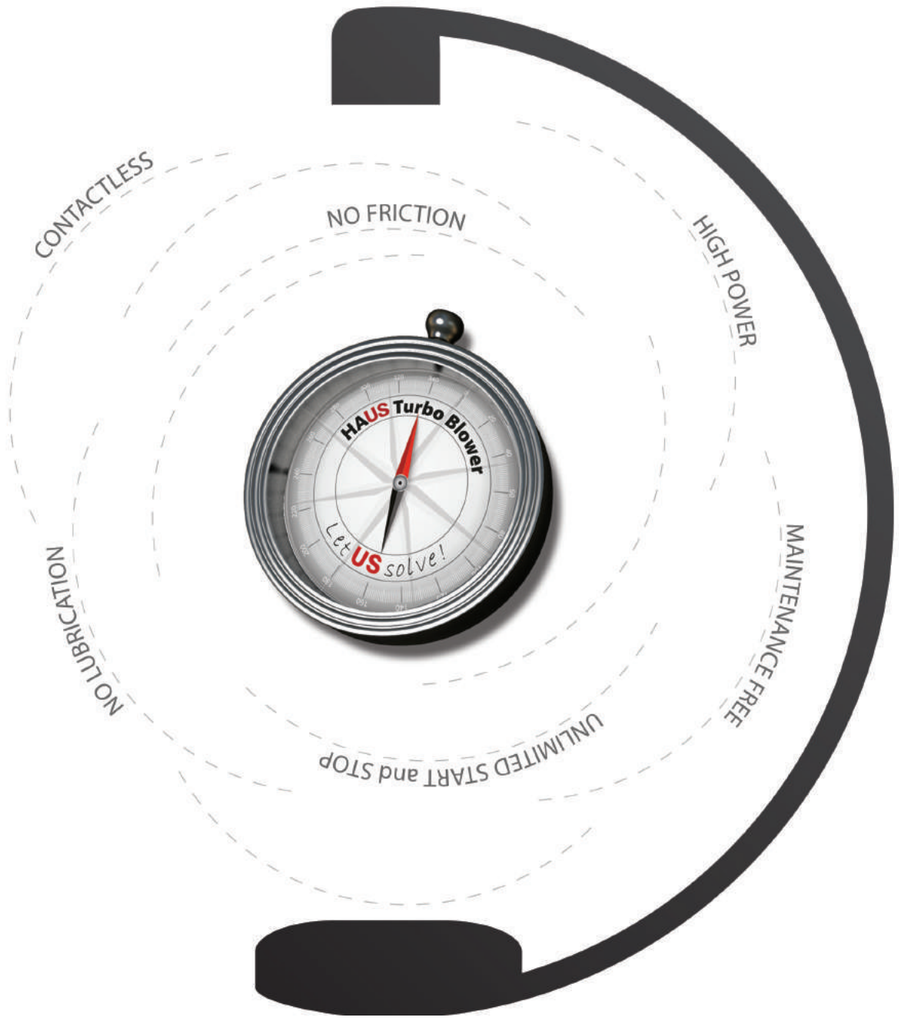
Standards and Directives

- Directive 2014/30/EU Electromagnetic Compatibility (EMC),
- Directive 2014/35/EU Low Voltage (LVD),
- Directive 2006/42/EC Machine Directive (MD) and 2012/19/EU The Waste Electrical and Electronic Equipment Directive (WEEE)
- TS/EN 1012-1:2010 Compressors and vacuum pumps – Safety Rules – Chapter 1: Air compressors
- TS/ISO 5389:2005 Turbocompressors – Performance Test Codes.

Factory Performance Test

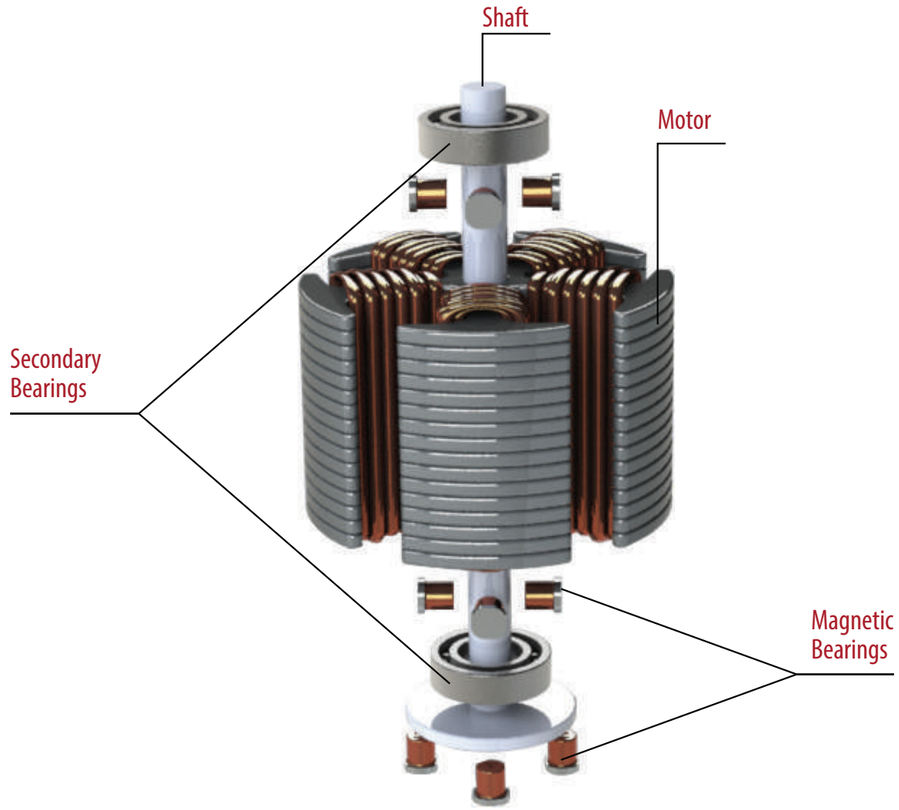
- Configuration according project demand
- Performance Test results in accordance with international standard
- Performance Test Document released with the equipment
- Pre-configuration for an easier installation, problem free and without surprise

MAGNETIC BEARING SYSTEM
The Advantages



THE MAGNETIC BEARING
An Advanced Technology Solution

- The magnetic field is able to control and maintain with high precision the position of the shaft supporting the impeller.
- The precise positioning of the impeller allows to reduce the air gap with the casing, and therefore the pressure losses, resulting in a compressor with higher power efficiency.
- The energy required by the positioning system is very low, less then 1kW, making the magnetic bearing really competitive in respect to other technologies.
- The magnetic bearing controller register and memorize the geometrical data. The correct position is therefore immediately recovered at every start.
- Being contactless and with an efficient control, a magnetic bearing system is designed for maintenance free operation and unlimited start and stop cycles.
- The magnetic bearing system can electronically adapt a "damping effect" on the rotational vibration, in function of the bearing type and the system characteristic. This make possible to run trouble free through the system "critical speeds".
- Thanks to magnetic bearing technology no need for transmission, sealing, gearbox etc. Thus, contactless and oil free design.



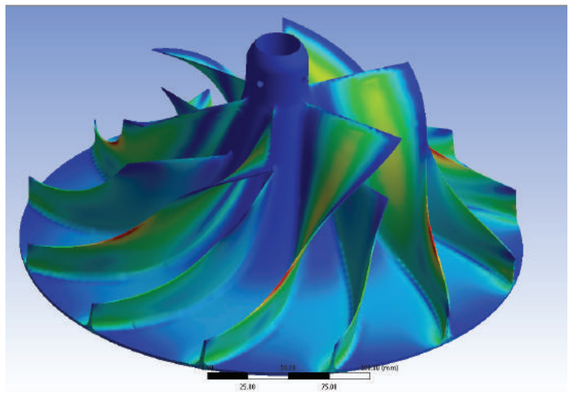
TURBO BLOWER: an HIGH TECH PRODUCT

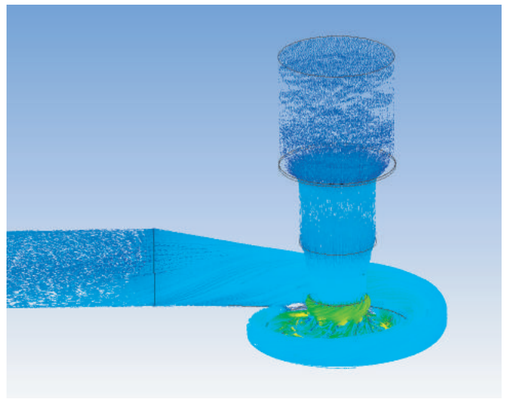
The HAUS TURBO BLOWER reachs high efficiency thanks to the high technology which links together with the design, the manufacturing, the installed components and the optimization during operation.

The shape of core components working on the fluid compression (impeller, volute casing) is optimized with Computational Fluid Dynamics and Finite Element Method by the R&D Department with:

· Linear Stress Analysis,
· Nonlinear Analysis,
· Thermal Structural Analysis,
· Finite Element Analysis (FEA),
· Frequency Analysis,
· Metal Fatigue Analysis,
· Computational Fluid Dynamics (CFD),
· Dynamic Analysis

HAUS makes this technology available at competitive conditions, thanks to the innovative manufacturing. Any designs, no matter the complexity, are realized with multiple axis CNC Machines.



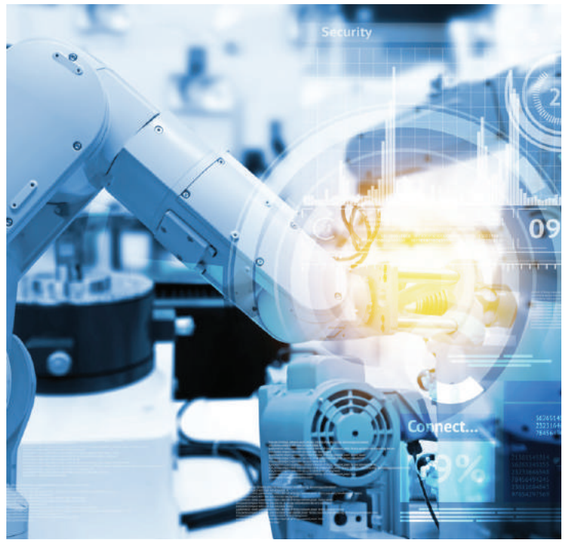


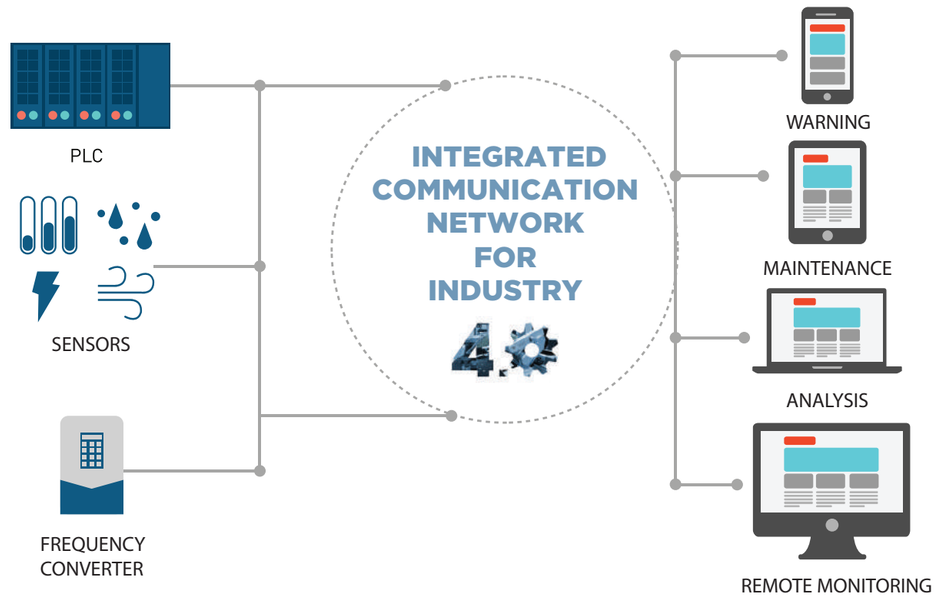
Particularly, the impeller, is realized in a single part on a single advanced tool machine, able to make real the more difficult geometry.

The adoption of Magnetic Bearing System allows to realize the assembly with a smaller safety gap between rotating and stationary parts. This means that less energy is lost, while performance are higher. The challenge is fulfilled by the adoption of design and execution with higher precision machining.

TURBO BLOWER: Industry 4.0

- Multiple **internal sensors** to signal working condition of various components.
- **Automatic continuous adjustment** to optimal condition or safety status
- Multiple **external sensors** to monitor the power grid status, the other equipment in line, the physical variables linked to the working mode
- **Computer intelligence**, running higher level routine based on internal and external sensor data, to achieve desired performance with less energy consumption, and make proactive maintenance call.
- **Real time connectivity** via intranet for dialogue and control, and with extranet for remote and emergency control
- **Data storage** capability, for statistics, diagnostic, troubleshooting, traceability





HAUS produces equipment to improve the customer processes over 60 years.

HAUS provides decanter centrifuges, disc stack separators, continuous system olive oil plants, BioDigestors, screw presses and turbo blowers for industrial, food and environmental applications. The Research and Development Center continuously elaborate solutions which are innovative, more efficient, environment friendly and energy saving. Advanced manufacturing technology and top edge fabrication tools assure the best quality at competitive conditions. An extended and proactive network of service centers assist the customers to maintain and prolong the value of the equipment.

HAUS has been proven to be the right partner to support the customer growth.

Advanced Manufacturing

- Integrated factory in Aydın / Turkey
- Latest technology equipment
- Quality system management

Quality system

- ISO 9001:2008
- ISO 14001:2004
- OHSAS 18001:2007
- ISO 22000:2005

R&D CENTERS

- Design, Test Area and Laboratory
- HAUS Turkey
- HAUS Turbo Compressor - Germany

After Sales Services

- Installation and commissioning.
- Original spare parts.
- Periodical maintenance.
- Customer assistance.

Global Presence

- HAUS Europe / The Netherlands
- HAUS SEA / Malaysia
- HAUS MED / Italy
- HAUS İstanbul / Turkey
- Over 30 local representatives

Broad Product Range

- Decanter centrifuges
- Disc stack separators
- Continuous System Olive Oil Plants
- Bio Digestors
- Screw presses
- Turbo Blowers in various capacities.

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HAUS İstanbul:
Şerifali Mevkii Bayraktar Bulvarı
Yükseliş Sok. No:5 Kat:1, 34775
Ümraniye / İSTANBUL
Tel: +90 216 576 06 27
Fax: +90 216 576 06 37

HAUS Europe:
Oosterparkweg 35c
2985 SX Ridderkerk - Holland
Tel: +31 85 48 91 190
info@hauseurope.com
www.hauseurope.com

HAUS SEA:
Megan Avenuel I,
189, Jalan Tun Razak,
50400 Kuala Lumbur CC
Tel: +603-2333 8933
Fax: +603-2333 8899

HAUS MED:
Via Stresa 6 20125
Milano / İtalya
Tel: +39 038268274
gino.celletti@haus-med.com

Factory:
ASTİM OSB No: 110
Aydın - TÜRKİYE
Tel: +90 256 231 04 81 - 82
Fax: +90 256 231 04 83