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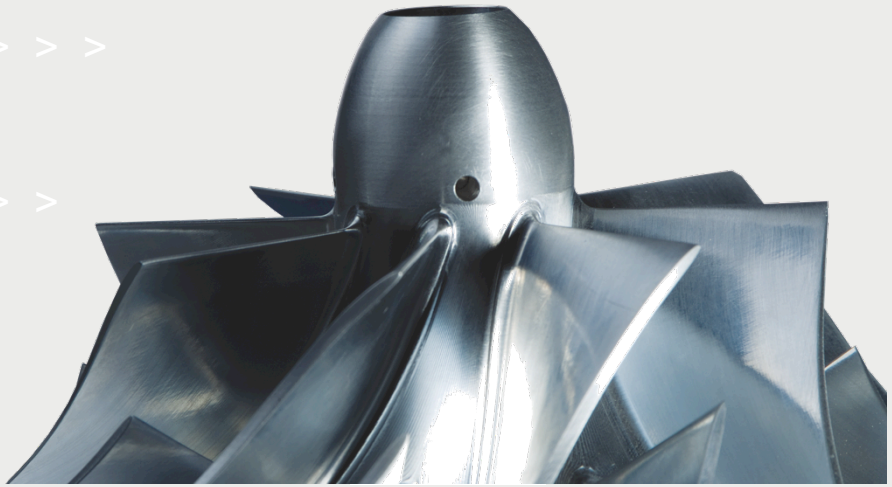
Piller Industrieventilatoren GmbH



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PRESENTATION OVERVIEW

- Compressor types
- The **PillA*erato*r** concept
- The magnetic bearing concept
- How does the **PillA*erato*r** works?
  - The mechanical side
  - The electronical side
- The **PillA*erato*r** software
- Measurement and PID
- Compressor characteristics
- The **PillA*erato*r** BrainBox

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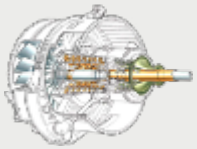
BLOWER TYPES

- Types of Compressors
  - Positive Displacement
    - Reciprocating
      - Single Acting
      - Double Acting
    - Rotating
      - Roots
      - Screws
  - Dynamic
    - Axial
    - Radial



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BASIC INFORMATION OF THE **PillA*erator***

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PillA*erator* / THE CONCEPT

- Turbo compressor with magnetic bearings
- Polytropic efficiency up to 84 %
- Integrated speed control
- Without shaft sealing

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THE MAGNETIC BEARING

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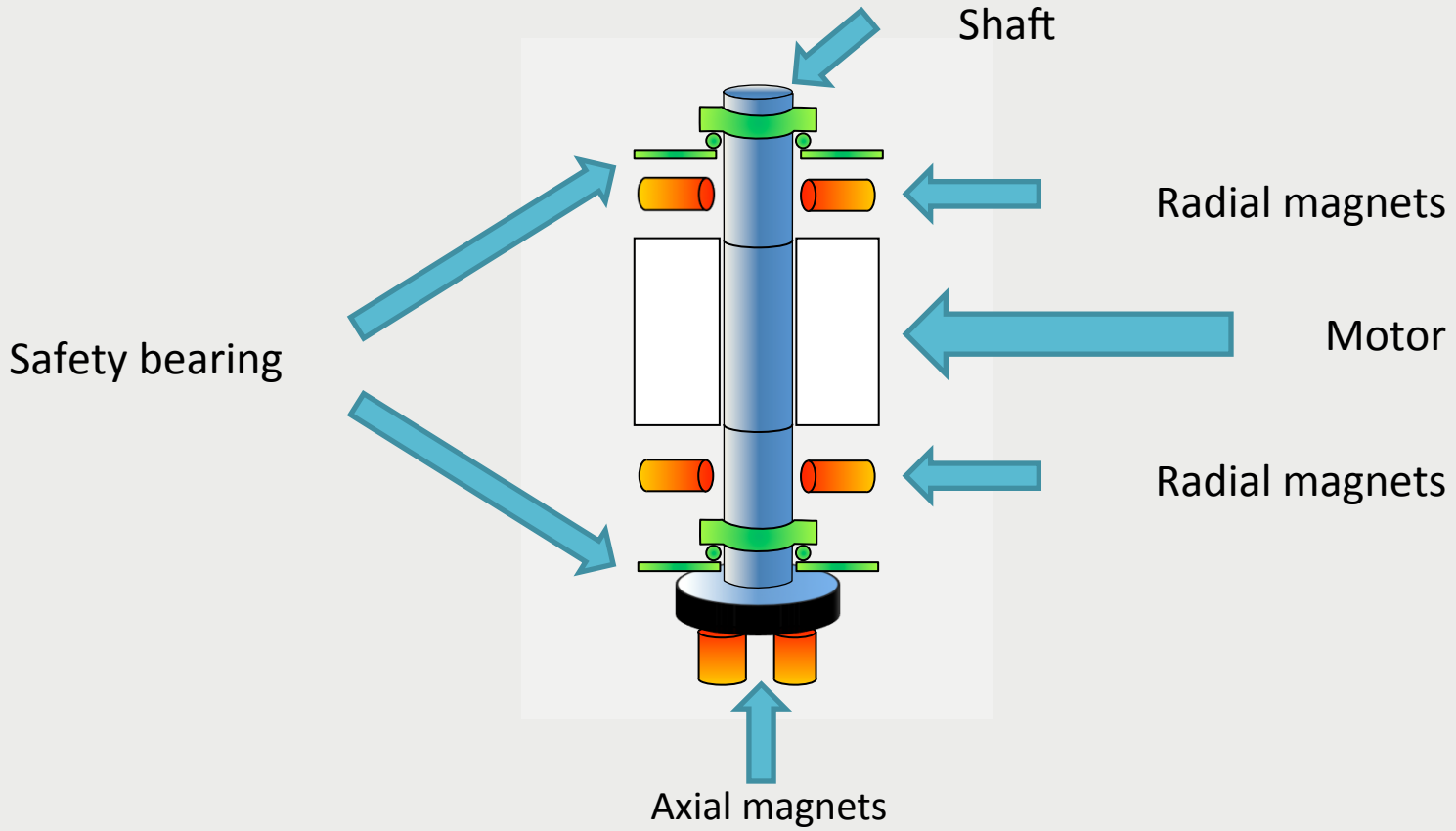
THE MAGNETIC BEARING / CONCEPT



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THE MAGNETIC BEARING / CONTROLLED STOPPING

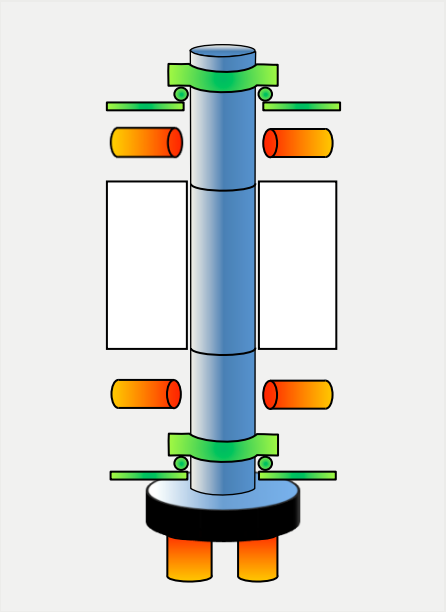
In case of an power failure:

> Motor changes to generator mode

> Enough restant energy for up to 10 seconds

> At 0 rpm the safety bearings take the shaft

> The motor with 150 kW: stops in approx. 2 sec.
The motor with 300 kW: stops in approx. 3,5 sec.



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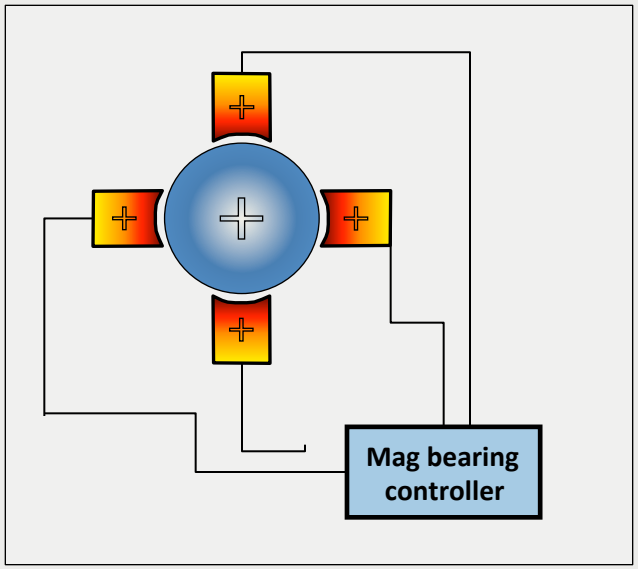
THE MAGNETIC BEARING / SECURITY SYSTEM

> Function: keeps the shaft centered

> **Automatic stop:**

Having a deviation of more than ± 25 µ radial or ± 60 µ axial the **PillA*erator*** stops automatically.



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HOW DOES THE **PillA*erator*** WORKS?

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PillA*erator* / DIVIDED INTO TWO PARTS

Electrical side

Mechanical side

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MECHANICAL SIDE
THE COMPONENTS

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MECHANICAL SIDE / THE COMPONENTS

Air filter

Unit including
- Motor
- Impeller
- Impeller casing
- Bypass

Silencer

Water pump
And air-water-cooler

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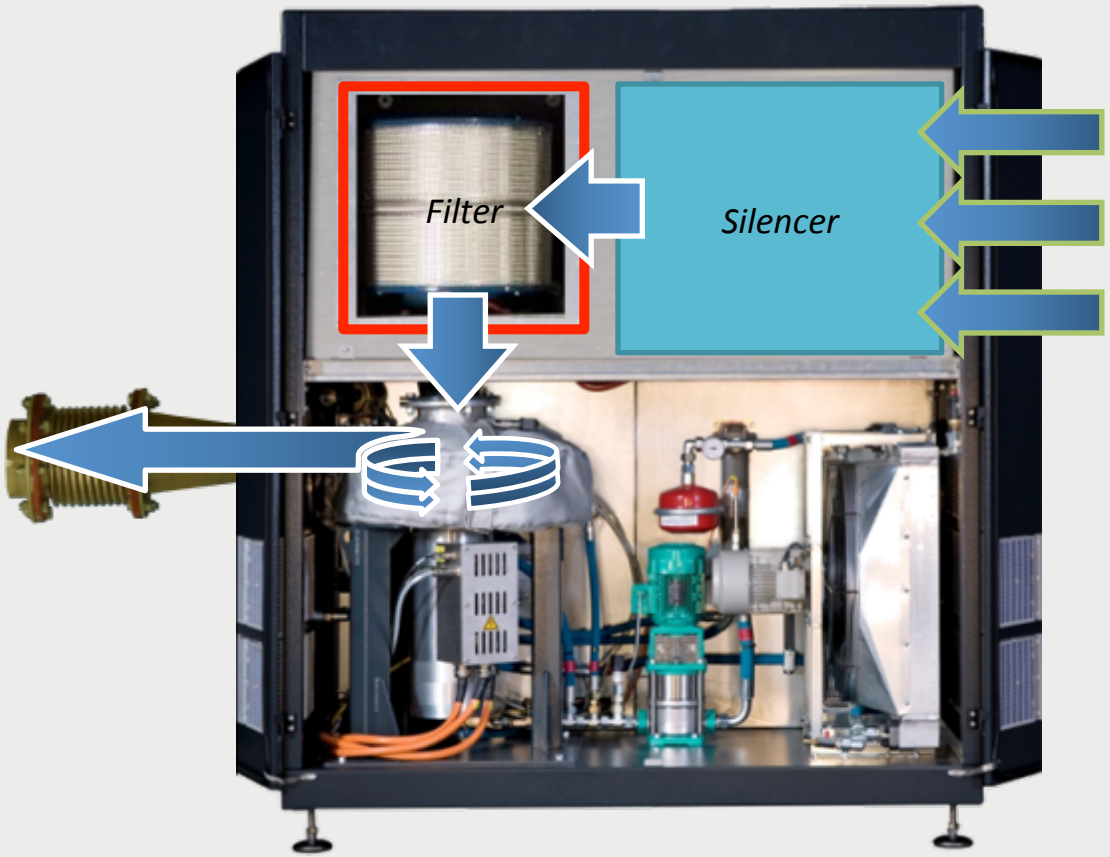
MECHANICAL SIDE / THE WAY OF THE AIR



Direct Aspiration
or by ducting

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MECHANICAL SIDE / THE IMPELLER

Made of a high grade Aluminium cube.

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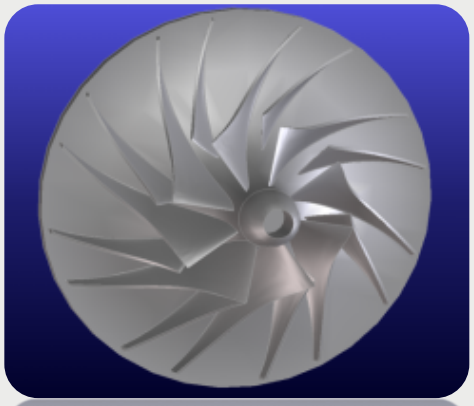
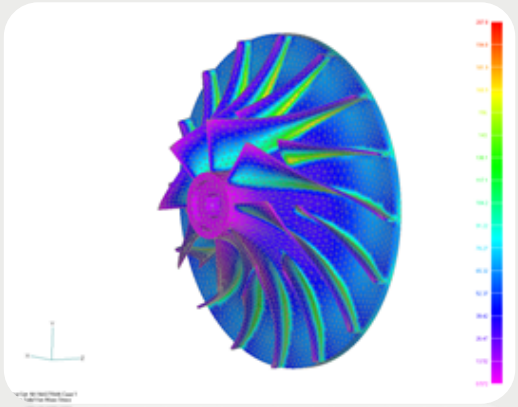
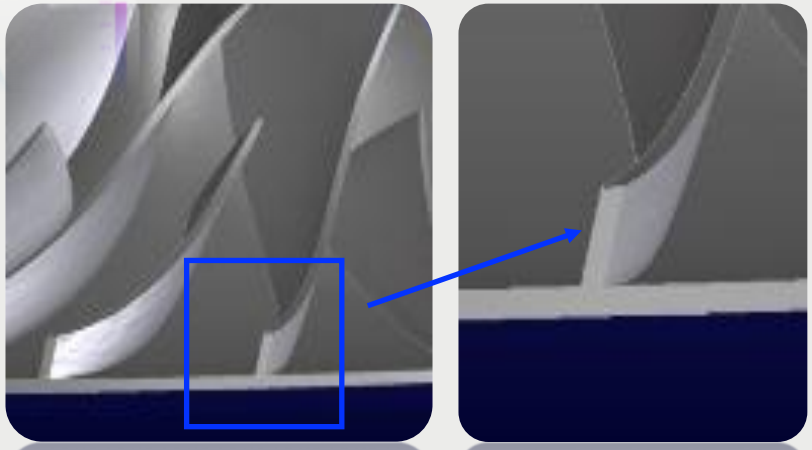
MECHANICAL SIDE / OUR INTERNAL DEVELOPMENT





For the design of the rotors we use development systems like CFD and FEM…



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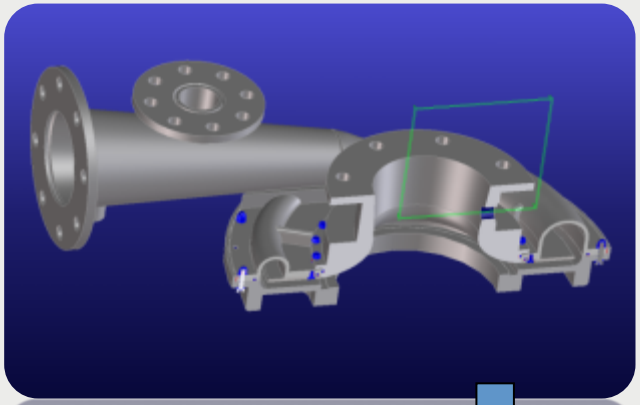
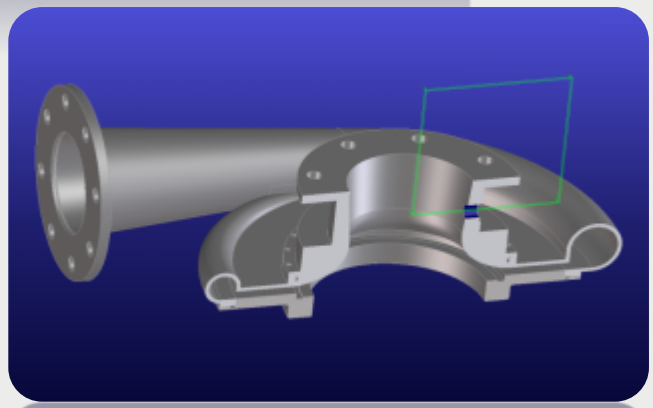
MECHANICAL SIDE / OUR INTERNAL DEVELOPMENT





… as for the impeller casing.

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MECHANICAL SIDE / THE MOTOR

- Gas tight
  – no pollution
  – no contact with agressive gases
- No shaft sealing – no maintenance
- Water cooled
  – constant cooling of all components
  – compact motor design
- Constant water temperature (40°C)
  – motor working constant at best conditions
- Endless Start-Stop‘s possible

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MECHANICAL SIDE / ADVANTAGES OF OUR MOTOR

- > Permanent monitored balanced shaft
- > No contact– no wear
- > No lubricant – no maintenance
- > With safety bearings
- > Without batteries
- > Long life design

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MECHANICAL SIDE / SYNCHRONIOUS MOTOR WITH MAGNETIC BEARINGS (WATER COOLED)

PillA*erato*r HP 4000, MP 6000 and LP 8000(*)

Voltage	3 x 0 … 480 V
Current	250 A
Motor power	150 kW

PillA*erato*r HP 8000(*), MP 12000 and LP 14000(*)

Voltage	3 x 0 … 480 V
Current	500 A
Motor power	300 kW

(*)actually in development

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MECHANICAL SIDE / COOLING SYSTEM

- Closed primary water cooling circuit
- Air-cooling system for the cooling of the primary cooling circuit
- Additional cooling by external water having extreme temperatures
- Constant water temperature at 40°C at entry of the motor

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DIVIDED INTO TWO PARTS

The electronical side

The mechanical side

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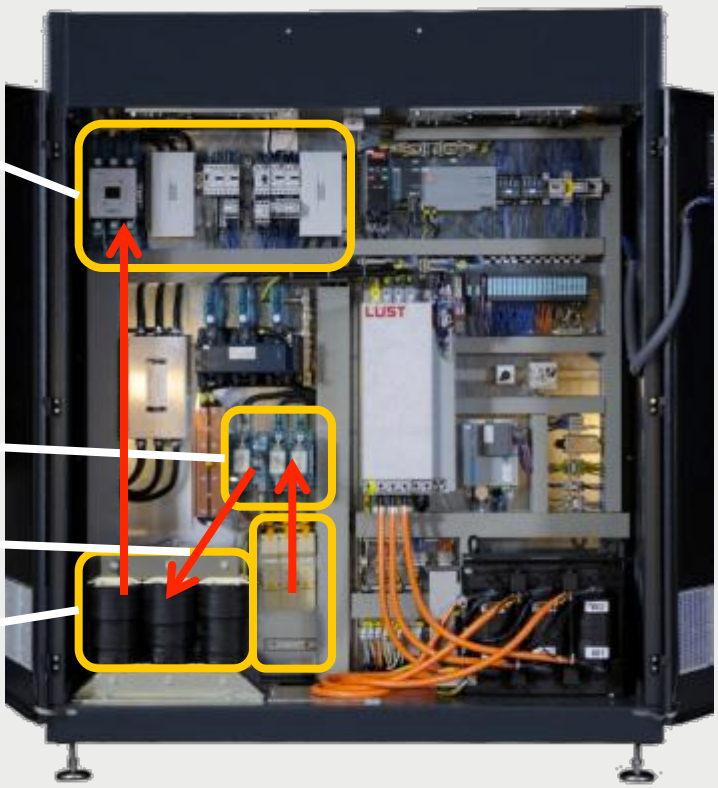
THE ELECTRONICAL SIDE / COMPONENTES INSTALADAS

Fuses for the components of the right side

Primary fuses

Entry of electricity

Transformer



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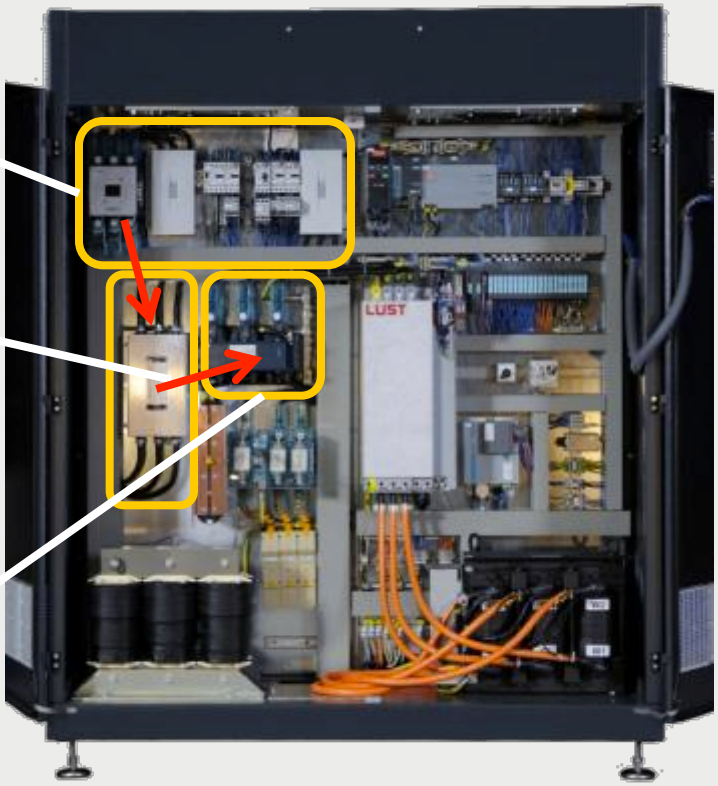
THE ELECTRONICAL SIDE / INSTALLED ELECTRONICAL COMPONENTS

Fuses for the components of the right side.

EMV line filter

Commutating throttle



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THE ELECTRONICAL SIDE / INSTALLED ELECTRONICAL COMPONENTS

Commutating throttle

Frequency converter

Line Filter

… power to the motor

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THE ELECTRONICAL SIDE / INSTALLED ELECTRONICAL COMPONENTS

Power supply for controlling components
- Bearing control system
- Water pump
- Air-water-cooler
- … etc.

Siemens PLC S7-300

Magnetic Bearing Controller

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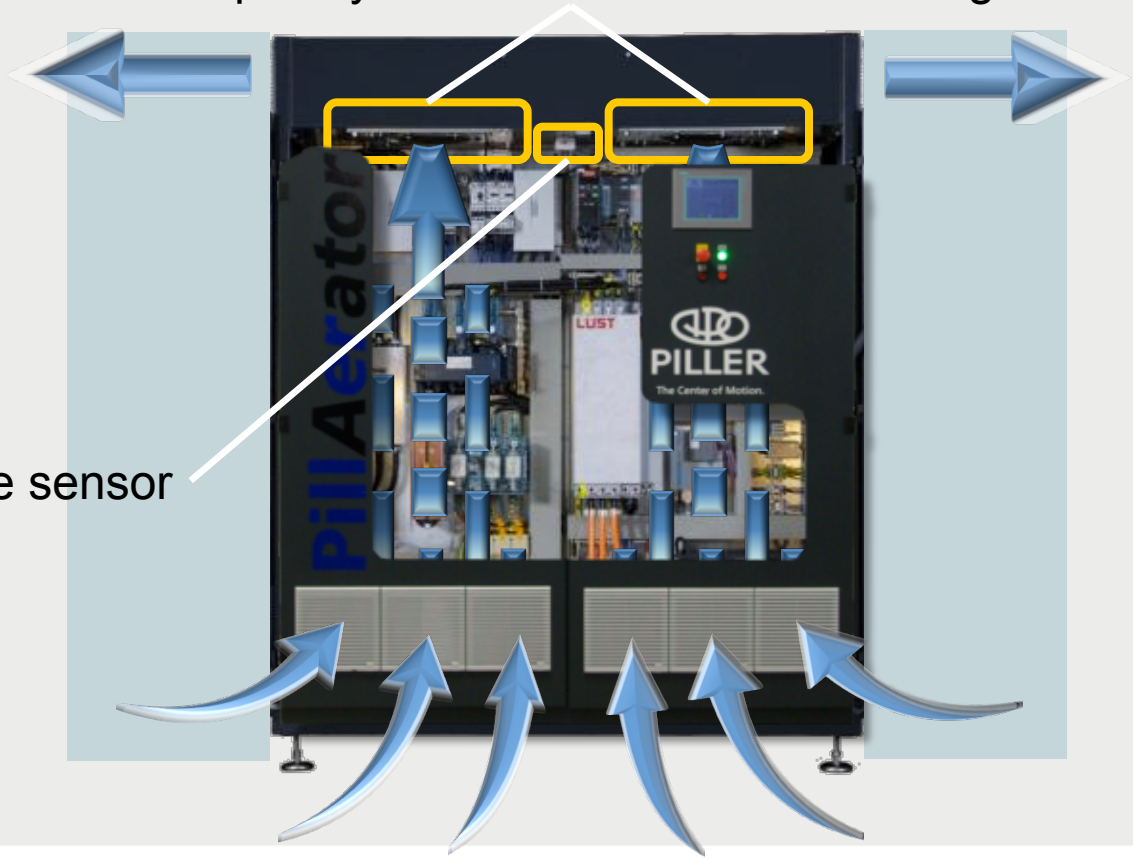
THE ELECTRONICAL SIDE / COOLING OF THE ELECTRONICAL SIDE

Sequency controlled fans in the sealing



Temperature sensor

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PillA*erator*

SOFTWARE SPS S7-300

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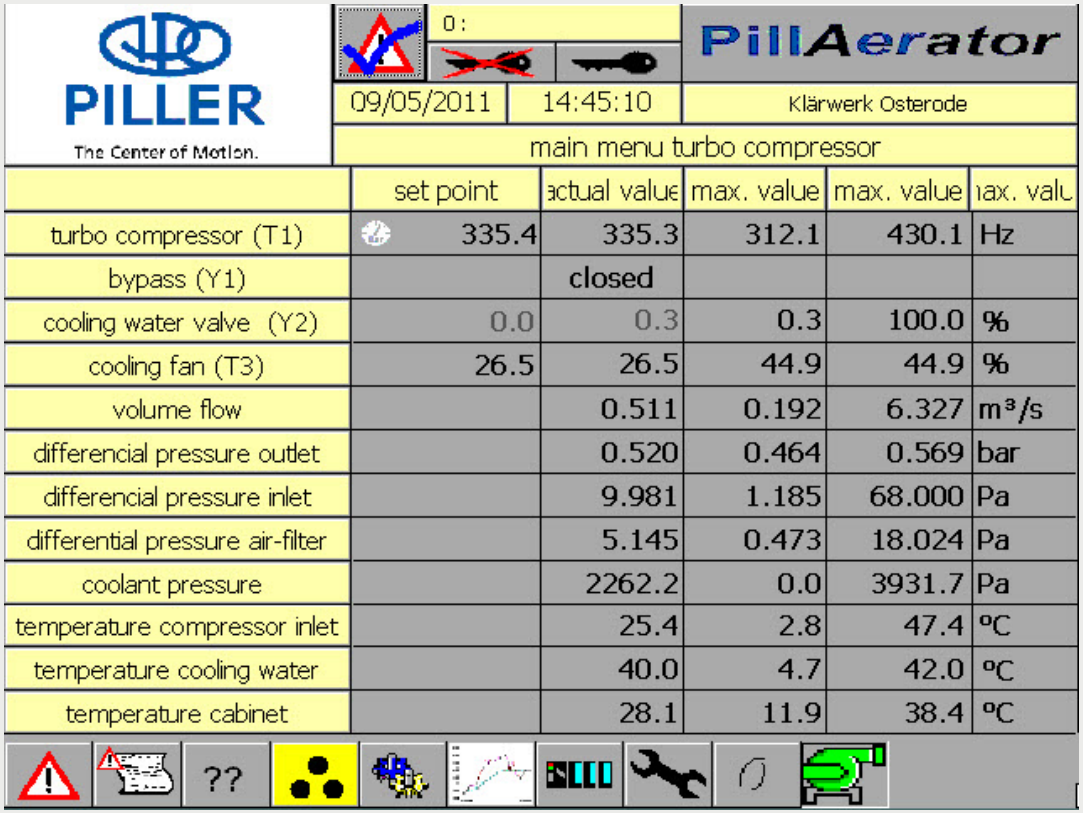
PillA*erator* / SOFTWARE SPS S7 - 300



	set point	actual value	max. value	max. value	max. valu
turbo compressor (T1)	335.4	335.3	312.1	430.1	Hz
bypass (Y1)		closed			
cooling water valve (Y2)	0.0	0.3	0.3	100.0	%
cooling fan (T3)	26.5	26.5	44.9	44.9	%
volume flow		0.511	0.192	6.327	m³/s
differencial pressure outlet		0.520	0.464	0.569	bar
differencial pressure inlet		9.981	1.185	68.000	Pa
differential pressure air-filter		5.145	0.473	18.024	Pa
coolant pressure		2262.2	0.0	3931.7	Pa
temperature compressor inlet		25.4	2.8	47.4	°C
temperature cooling water		40.0	4.7	42.0	°C
temperature cabinet		28.1	11.9	38.4	°C

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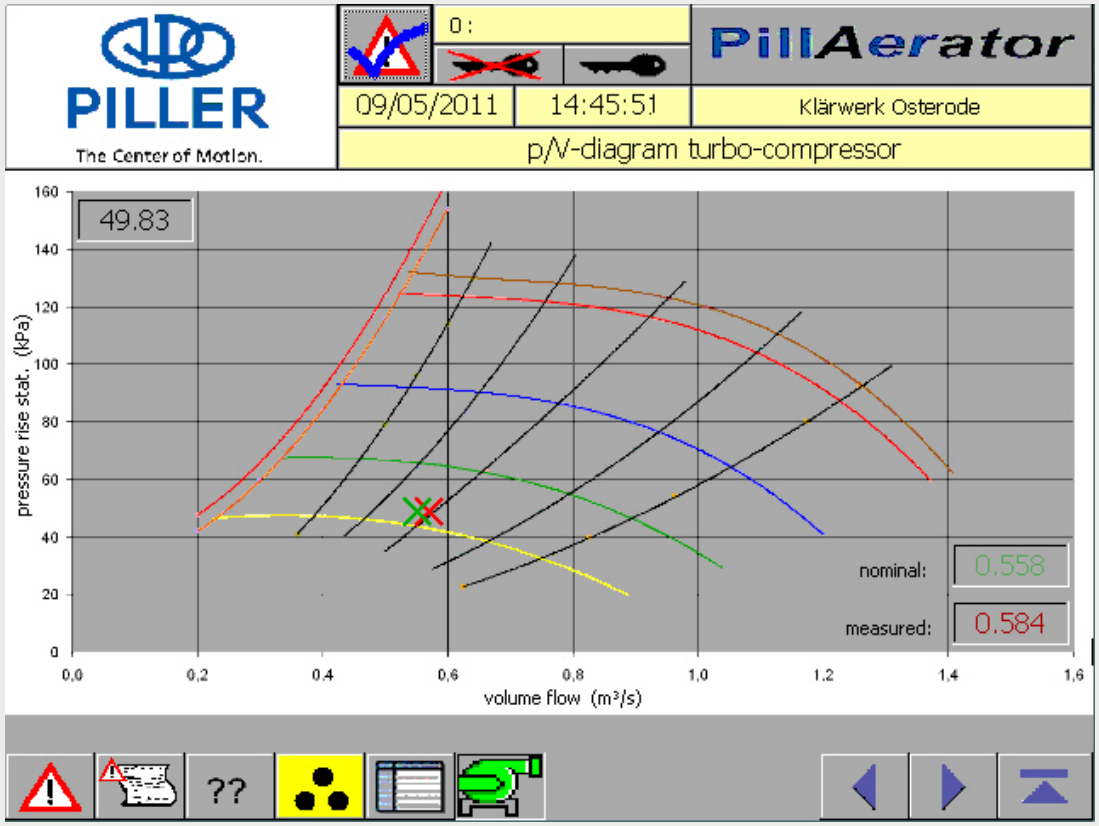
PillA*erator* / SOFTWARE SPS S7 - 300



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MEASUREMENT

Atmospheric pressure	➔	Calculation of the operating point ➔ Control against the control line
Suction temperature		Volume flow
Pressure at discharge	➔	Control of the ducting pressure
Temperature in the cabinet	➔	Control of the internal cooling system
Sensors in the water cooling system	➔	Control the motor cooling system

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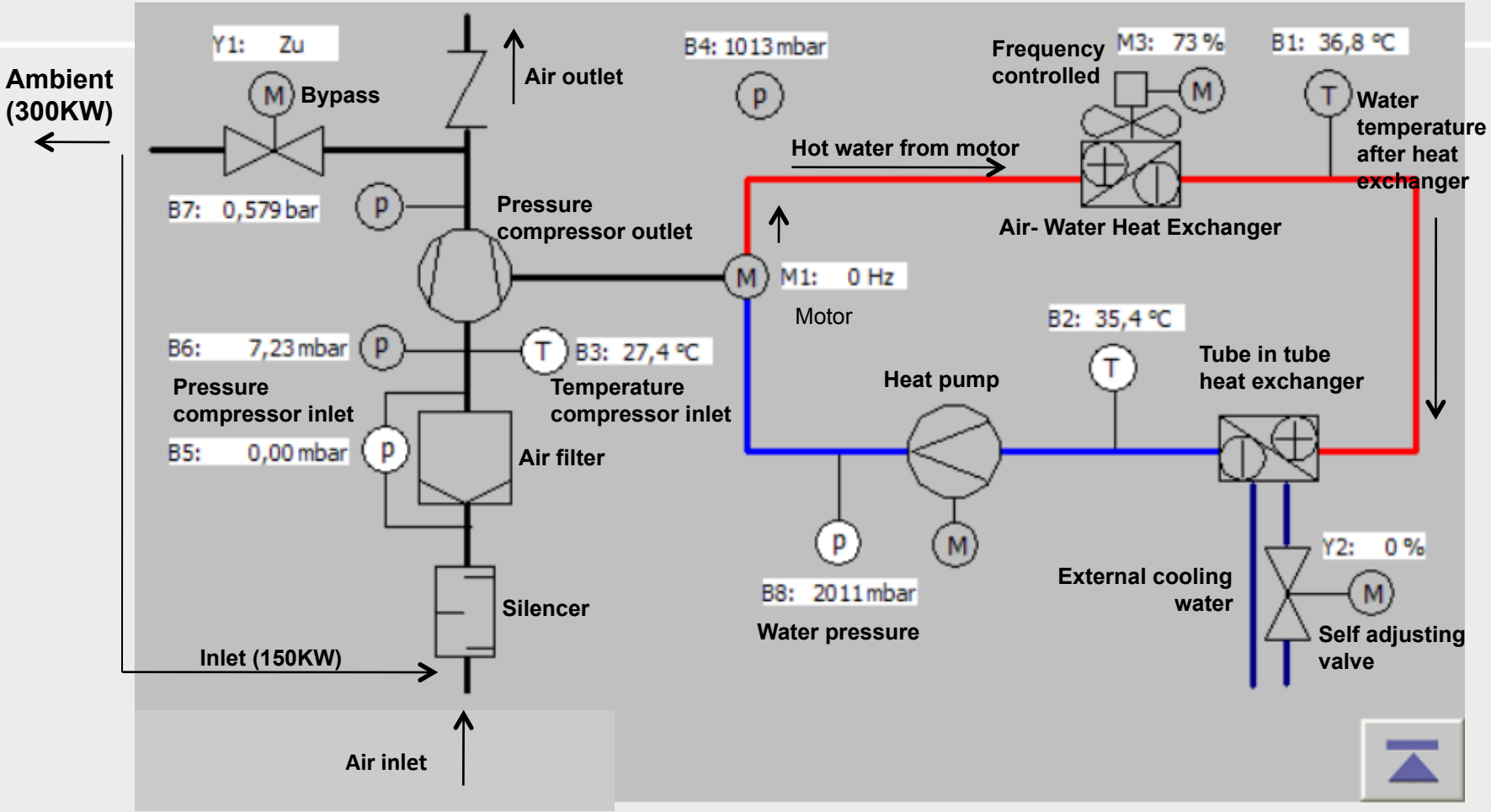
PID



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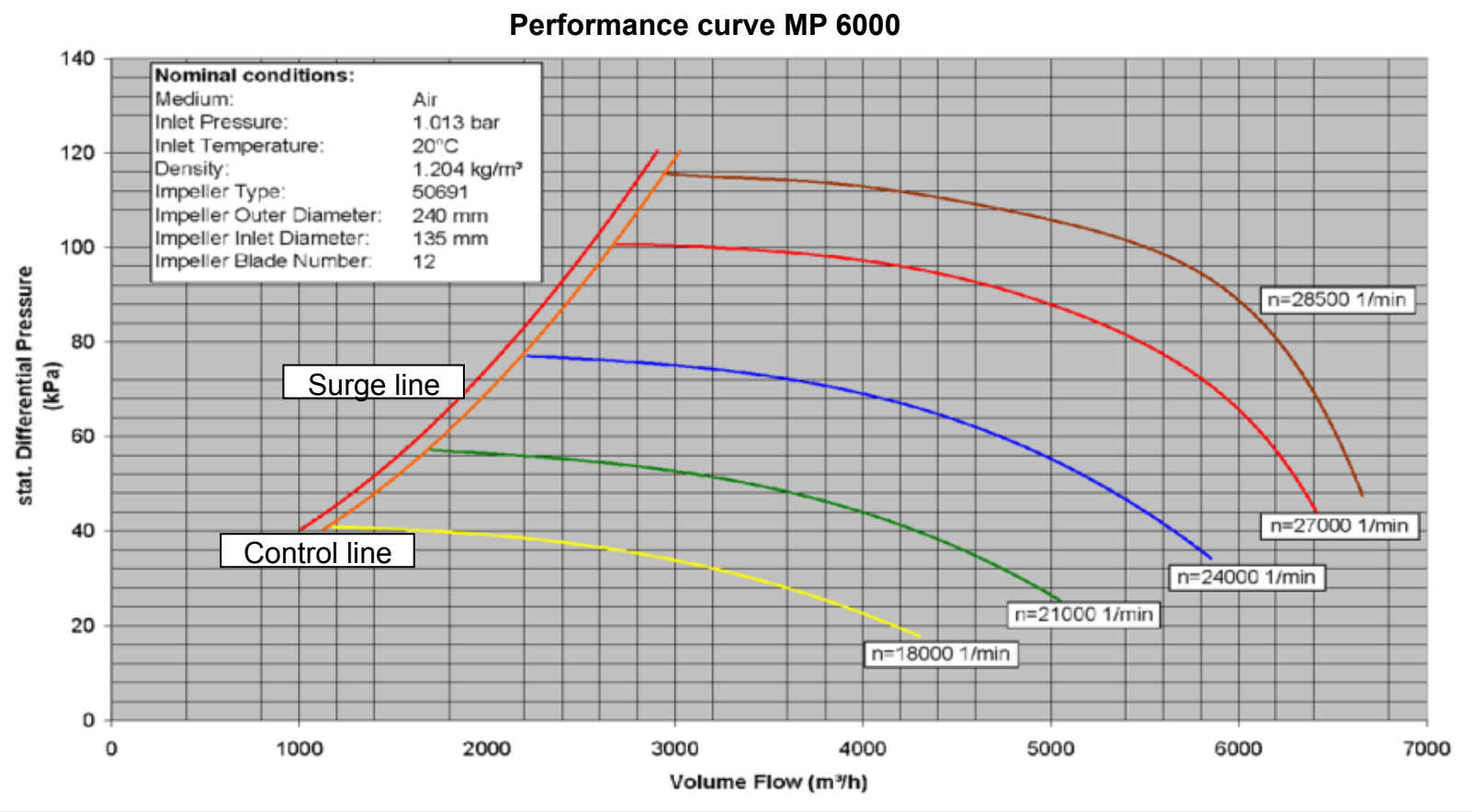
COMPRESSOR CHARACTERISTICA



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BENEFITS

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ALL INCLUSIVE – NO MORE EXTRA

Standard equipment in the **PillA*erator*** :

- > Speed control
- > Motor cooling system
- > Silencer
- > Filters for the first start
- > PLC-System (PLC S7-300 Siemens)
- > 8‘‘ touch screen (languages: German, English, French, Chinese, Spanish, etc.)
- > Anti surge system
- > Included Measurement (Temperature, pressure, volume flow, power consumption)

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EASY TO USE

> Large touchscreen for easy communication

> PillAerator controlled by external oxygen sensor and / or

> Communication by ProfiBus DP or by analog and digital signals

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FROM “Plug and Play” TO “Plug and Aerate”

What is necessary for an installation:

- Power connection
- Duct connection
- Connection to the plant control system
- Plain surface for installation

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MINIMAL MAINTENANCE

Filter changing:

> Open sound hood

> Loosen sensor tube

> Dismount round filter

> Clean/exchange filter pads

> Repeat in reversed order

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REMOTE CONTROL SERVICE

> Optional Router

> Software updates by Piller

> Monitoring on request of the customer
or
with a remote control service regularly

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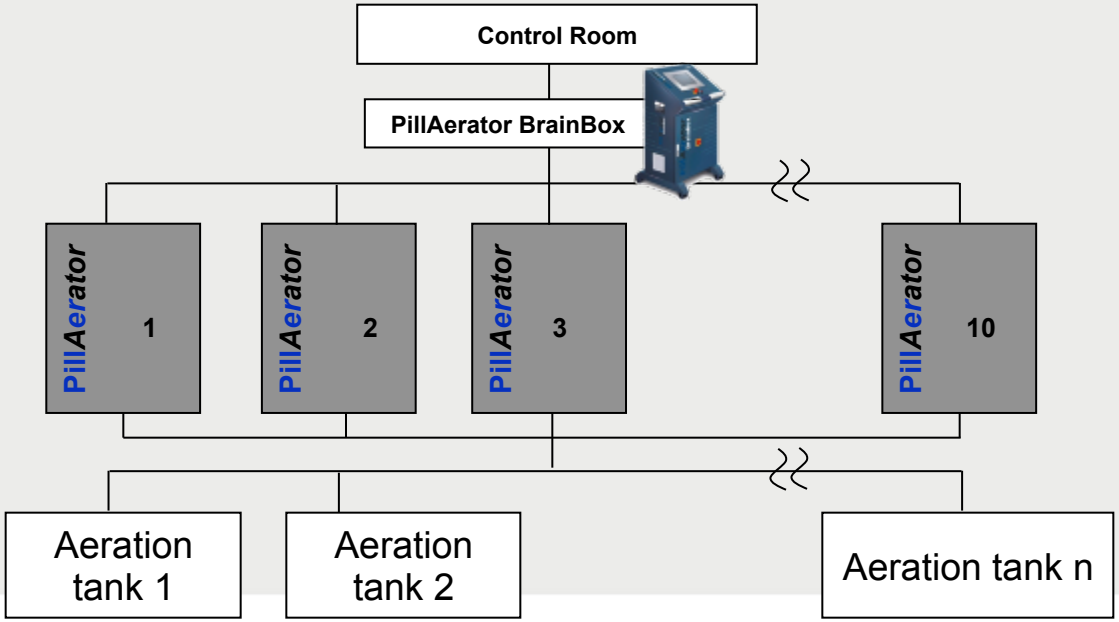
MULTI-CONTROL BY THE PillA*erator* BrainBox

- Controls up to 10 PillA*erator*s at the same time
- Reaches the operating point as energy efficient as possible
- Monitors all parameters of all connected PillA*erator*
- Remote control by Profibus and/or touchscreen



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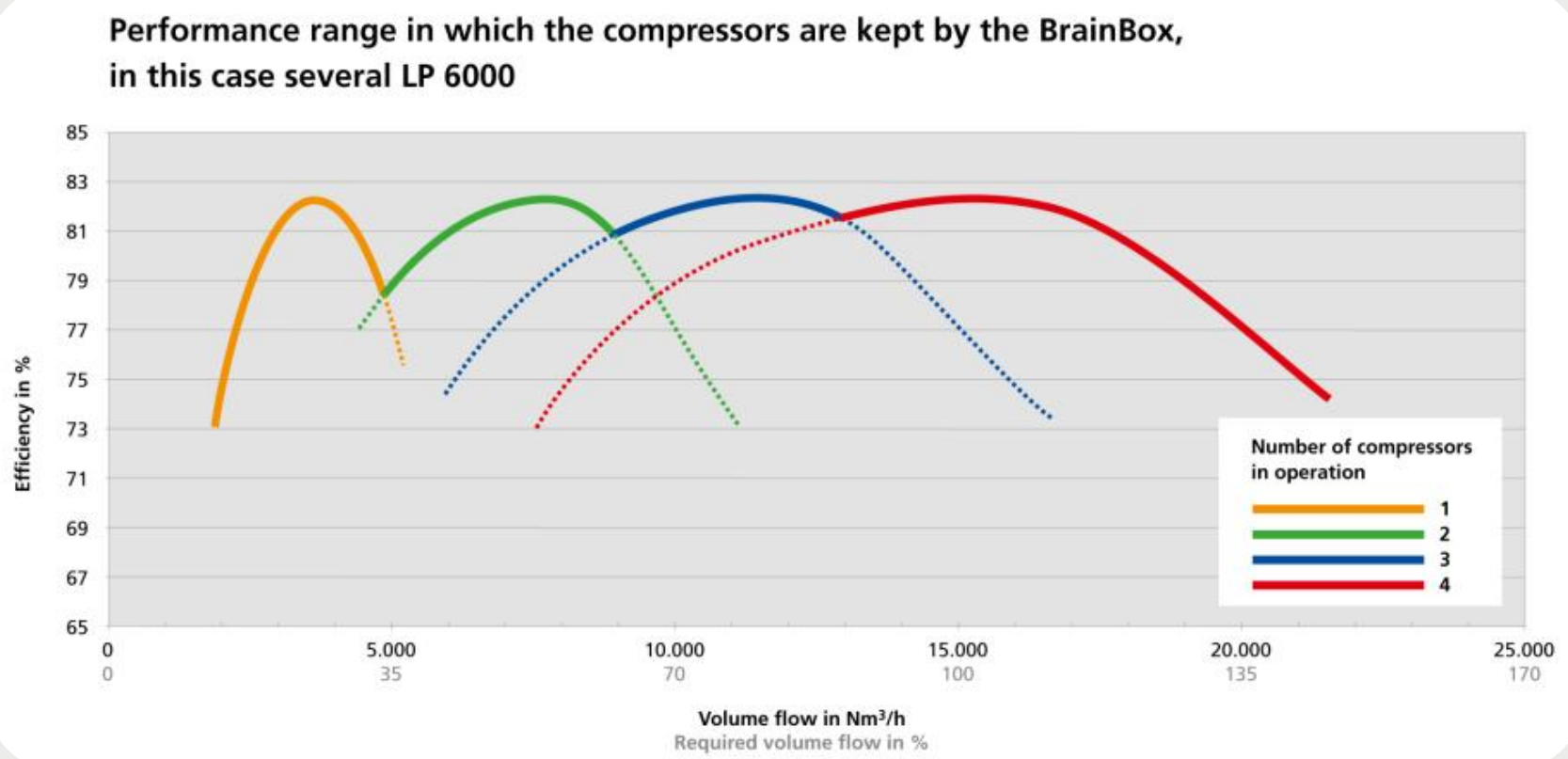
PillA*erator* BrainBox



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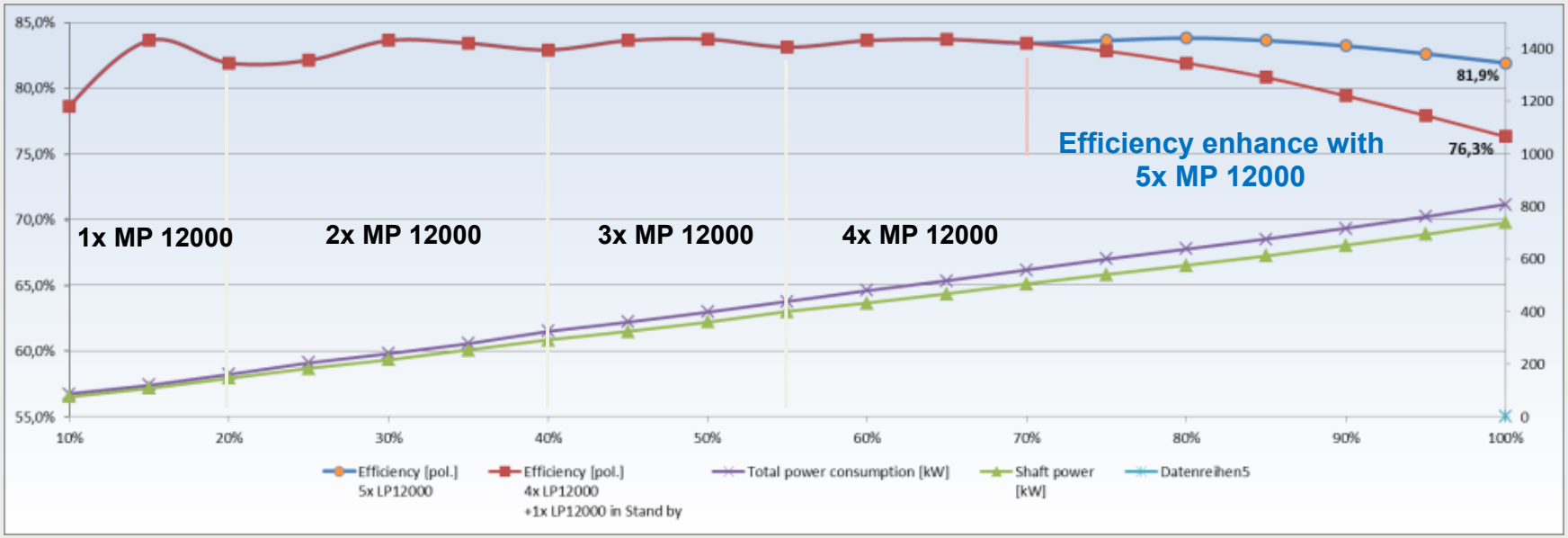
PillA*erator* BrainBox / Classic stand by vs. the 'PillA*erator* BrainBox' solution

required: 4x MP12000 + 1x MP12000 in stand by



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SUMMARY

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ACTUAL COMPRESSOR TYPES

	HP4000	MP6000	MP12000	
Volume flow:	1	1,3	2,5	m^3/s
	3.600	4.680	9.000	m^3/h
Static pressure:	1,2	0,8	0,8	bar
Max. speed:	30.000	30.000	22.000	rpm
Power connection:	380-690	380-690	380-690	V
Motor power consumption:	150	150	300	kW
Polytropic Efficiency:	82,5	84	84	%
Weight:	1.780	1.780	3.700	kg

All machines bear the European Standard's CE mark and are in conformity with the Provisions of EU Machinery Directive 2006/42/EC, EU Low-Voltage Directive 2006/95/EC, EU Electromagnetic Compatibility Directive 2004/108/EC. The performance test is executed according to ISO 5389.

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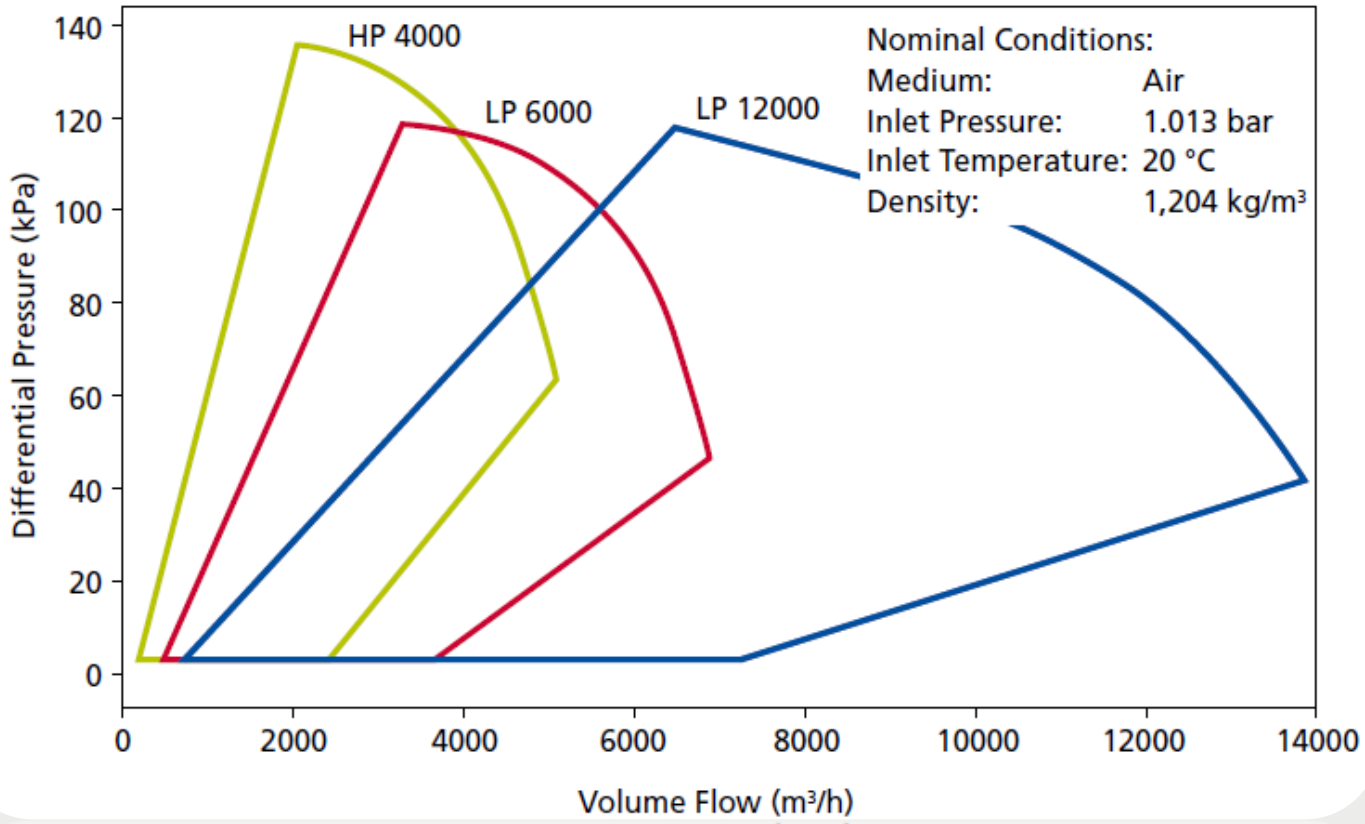
ACTUAL **PillA*erat*or**-CURVES



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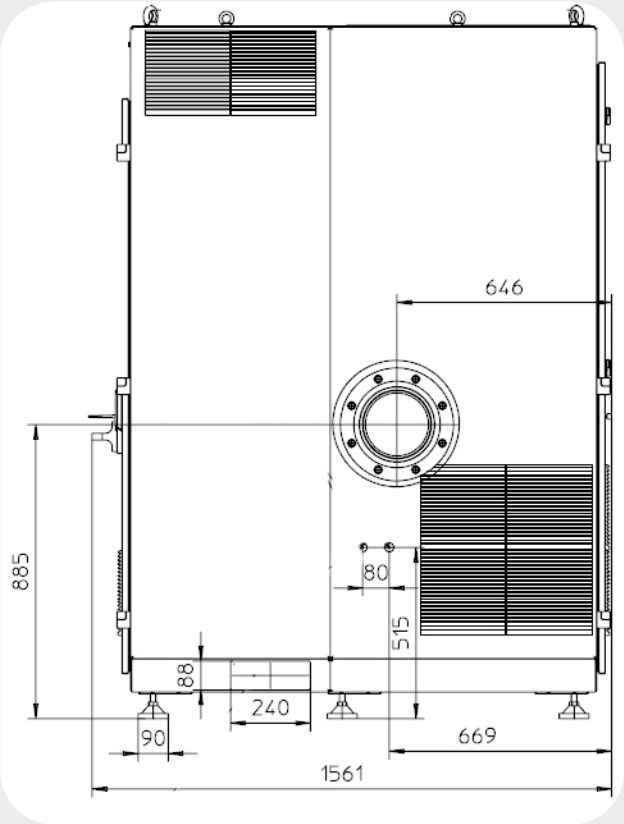
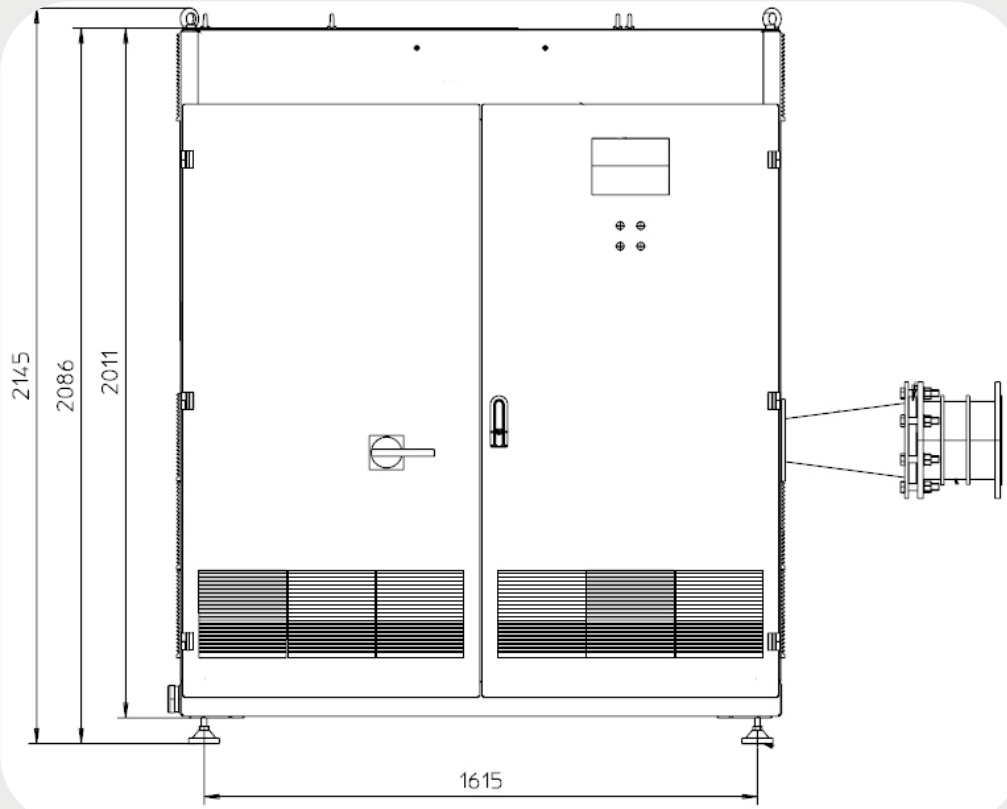
PillA***erator*** / HP 4000, MP 6000, LP 8000





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PillA*erator* / HP 9000, MP 12000, LP 14000