Data sheet

AMB Control cabinet MBX22

BG20015-xxN / BG20017-xxN / BG20019-xxN

Key Features

- Modular design for turbo machinery with up to 9-axes AMB system
- Up to 22 kVA output power per channel
- Up to 300m cable length without additional amplifier
- 3 x 400 V input voltage, backed up by an UPS
- Digital I/O, analog outputs, relay outputs
- Inductive position and pulse sensors
- Field bus interface to connect the AMB system to a superior control system
- Fully digital control system
- Automatic sensor calibration
- Data and event logger
- 1600 x 800 x 2100 mm, incl. 100 mm plinth
- Redundant auxiliary 12V/24V power supply

AMB Control cabinet MBX22

BG20015-xxN / BG20017-xxN / BG20019-xxN

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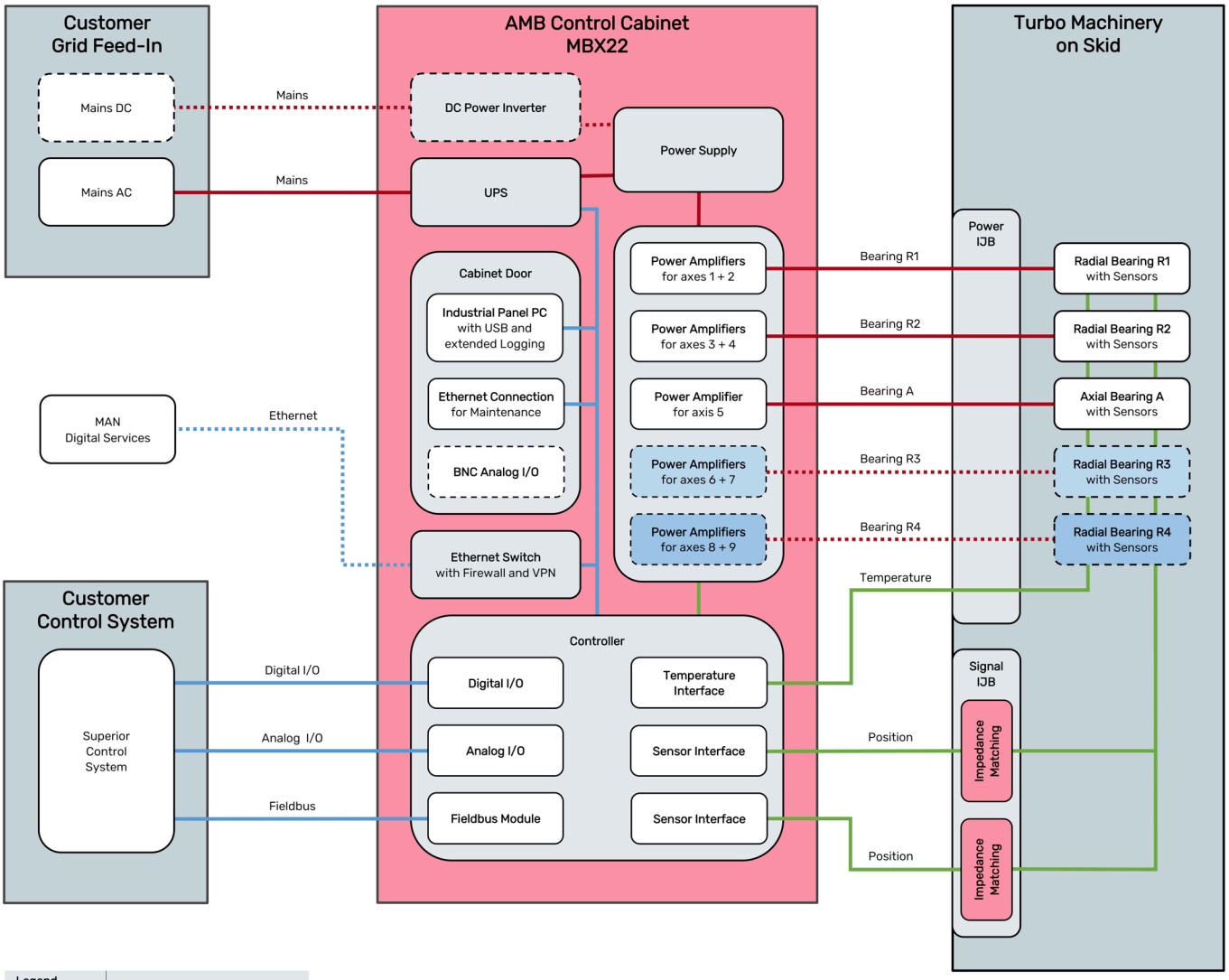
System overview



Legend	
	Optional components
	Extension for 7 axes
	Extension for 9 axes
	Optional connections
	Power connections
	Signal connections
	Data & Maintenance connections

Control cabinet

Environmental conditions	
General information	Indoor, non-hazardous, safe area
Temperature range	+0 ... +30 °C Temporary up to 40°C is possible, but the lifetime of the UPS batteries will be reduced
Maximum installation height	2000 m above sea level, above, output power is limited
Relative humidity	< 95 %, non-condensing

Mechanical specifications			
Dimensions (W x D x H)	1612 mm x 808 mm x 2108 mm (including 100 mm plinth) Control cabinet including DC supply (option): 2424 mm x 808 mm x 2108 mm (including 100 mm plinth)		
Cabinet Model	Rittal VX25		
Color	RAL 7035 (standard), other colors on request (option)		
IP Rating	IP54		
Weight		MBX22	MBX22 with DC power supply (option)
	5-axis system:	1035 kg	1280 kg
	7-axis system:	1055 kg	1300 kg
	9-axis system:	1080 kg	1325 kg
Cabinet doors	2 doors (3 doors for DC supply version), each with a door stay for escape routes and 180° hinges		
Door locking system	Electrically controlled mechanical interlocking, Key switch at front door for manual override		
Air inlet and outlet	Total 2 temperature controlled fans (redundant 100% cooling power)		
Cable entry	Bottom, right hand side Standard Rittal cable entry system		
Wiring/cable ducts	Halogen-free Color code and marking acc. to MECOS standard		
Component marking	PMMA labels		
Overall Cabinet Noise Level	Max. 75dB(A) when all fans (main cabinet fans, amplifier fan, UPS fan) are running at full speed		

Control cabinet options	
Power supply options	• External battery breaker for the internal UPS system • Usage of external UPS instead of the internal UPS System • UPS with dual feed input • DC supply input for mains power (see page 6 «1 x 108 VDC Supply») • Choice between fused and non-fused main switch for AC supplied version (see page 5 «3 x 400 VAC Supply»)
Cooling and heating options	• Anti-condensation heating • 2 additional fans and air outlets, incl. additional fan controller
Mechanical options	• Earthquake kit

Power supply / losses: 3 x 400 V_{AC} Supply (standard)	
General information	Mains power supply is fully backed up by a cabinet internal UPS, for a rundown without de-levitation of the rotor in case of a power failure
Rated Mains Power	23 kW
Nominal Mains Voltage	3 x 400 V_{AC} +6 %/-10 %
Mains Type	3P + N + PE
Nominal Mains Frequency	50/60 Hz ±5 %
Overvoltage category	II
Electrical safety	IEC61010-1
Operating current	Typical continuous standby current [1] (rotor levitated): 14 A Max current (5 ... 9 axis system): 33.3 A
Pre-fuse	40 A, type: gR/gS
Main Switch Type	Fused (34A) or non-fused
Connection	Spring-type terminals, max. 25 mm^2
UPS	Classification: VFI SS 111 according to EN 62040-3:2001 Battery type: VLRA, maintenance-free
Auxiliary Power Supply	24 V_{DC} dual redundant for power electronic fans 12 V_{DC} dual redundant for AMB controller

1 Calculated typical values for a standard setup. Values depend on AMB losses, cable length, ambient temperature, controller settings, machine alignment and UPS battery charge level.

Power supply / losses: 1 x 108 V_{DC} Supply (option)	
General information	Mains power supply is not backed up, it is strongly recommended that the DC supply is backed up by an external UPS
Main switch type	Software switch on supply input inverter

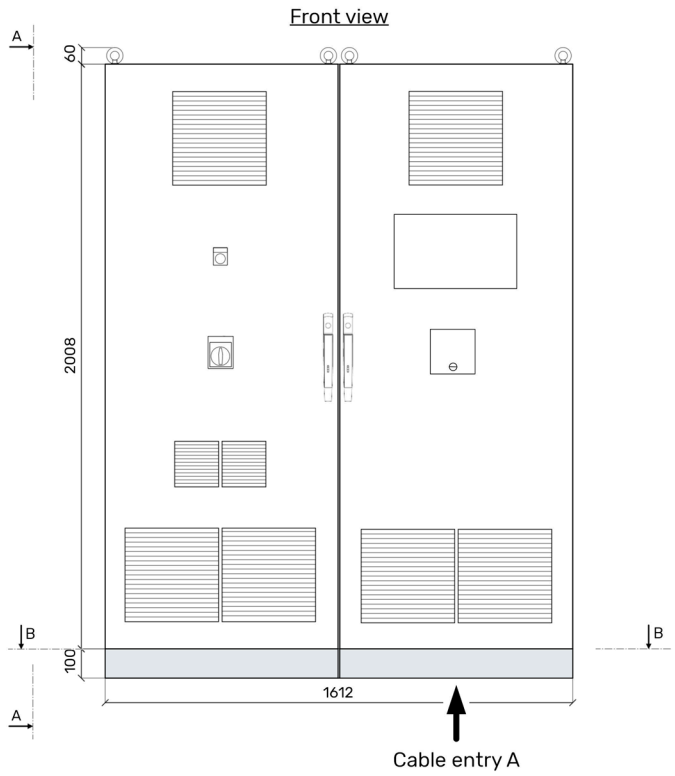
DC input characteristics:	
Overvoltage category	III / 2.5 kV
Rated Mains Power	25 kW
Nominal Mains Voltage	1 x 108 V_{DC} +25 %/-15 %
Mains Type	DC+ / DC- / PE
Operating current	Typical continuous standby current [2] (rotor levitated): 92A Max current (5 / 7 / 9 axis system): 232 A
Pre-fuse	250 A gG without selectivity 400 A gG with selectivity
Main fuse type	NH1 250A gG
Connection	Screw-type terminals, max. 95 mm^2

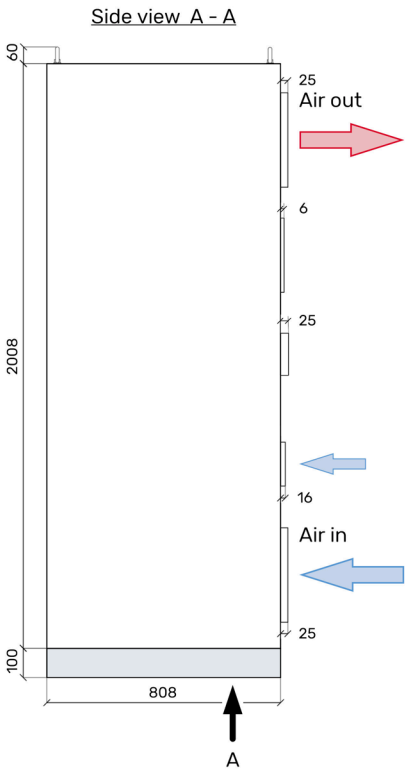
AC Bypass Input Characteristics:	
Overvoltage category	II / 2.5 kV
Rated Mains Power	20 kW
Nominal Mains Voltage	3 x 400 V_{AC}
Mains Type	3P + N + PE
Operating current	Typical continuous standby current [2] (rotor levitated): 14A Max current (5 / 7 / 9 axis system): 33.3 A
Pre-fuse	50 A Neozed gG with selectivity
Main fuse type	Neozed 35 A gG
Connection	Screw-type terminals, max. 10 mm^2

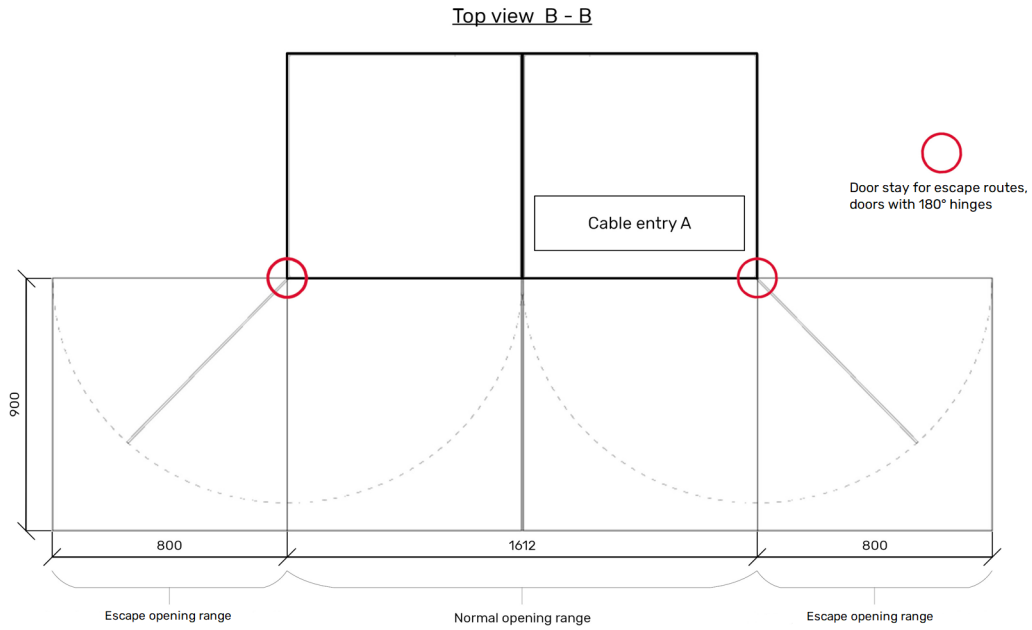
2 Calculated typical values for a standard setup. Values depend on AMB losses, cable length, ambient temperature, controller settings and machine alignment.

Dimensions

Control cabinet layout: 3 x 400 V_{AC} supply (standard)

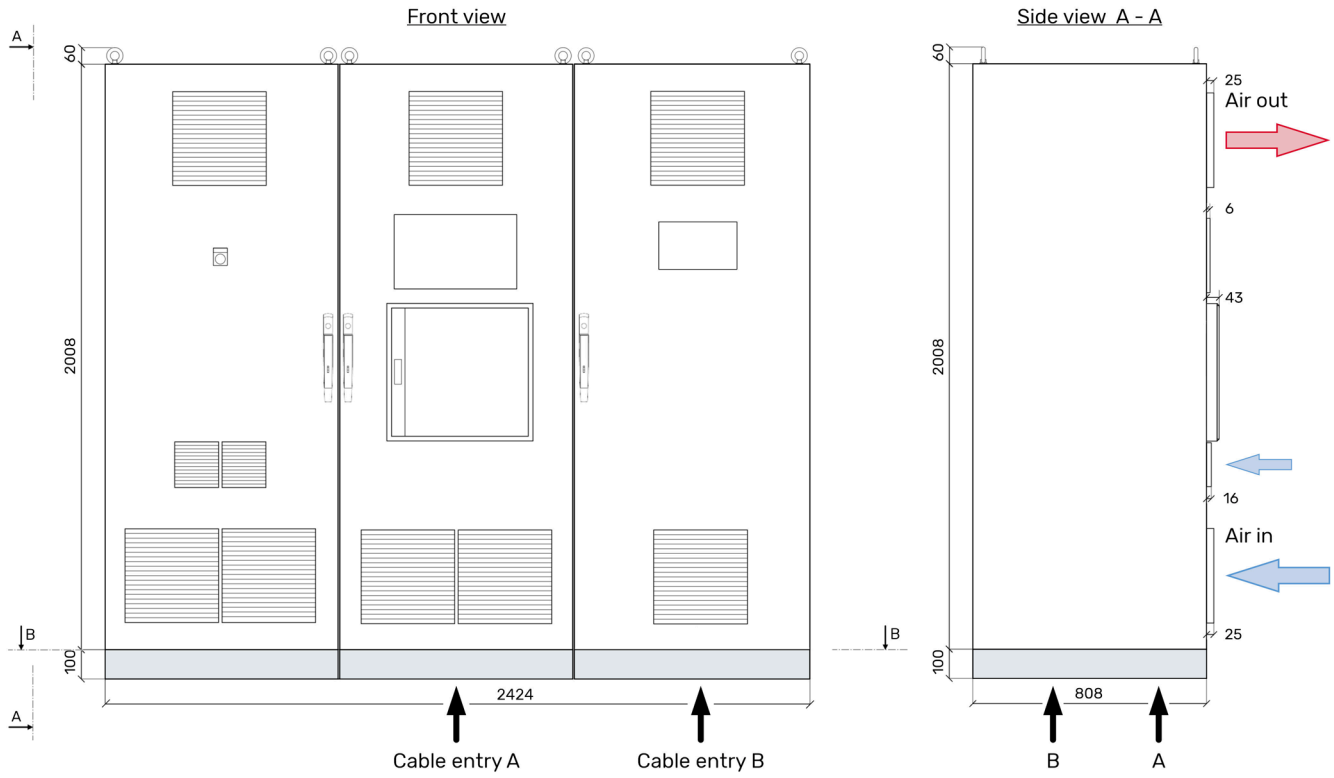


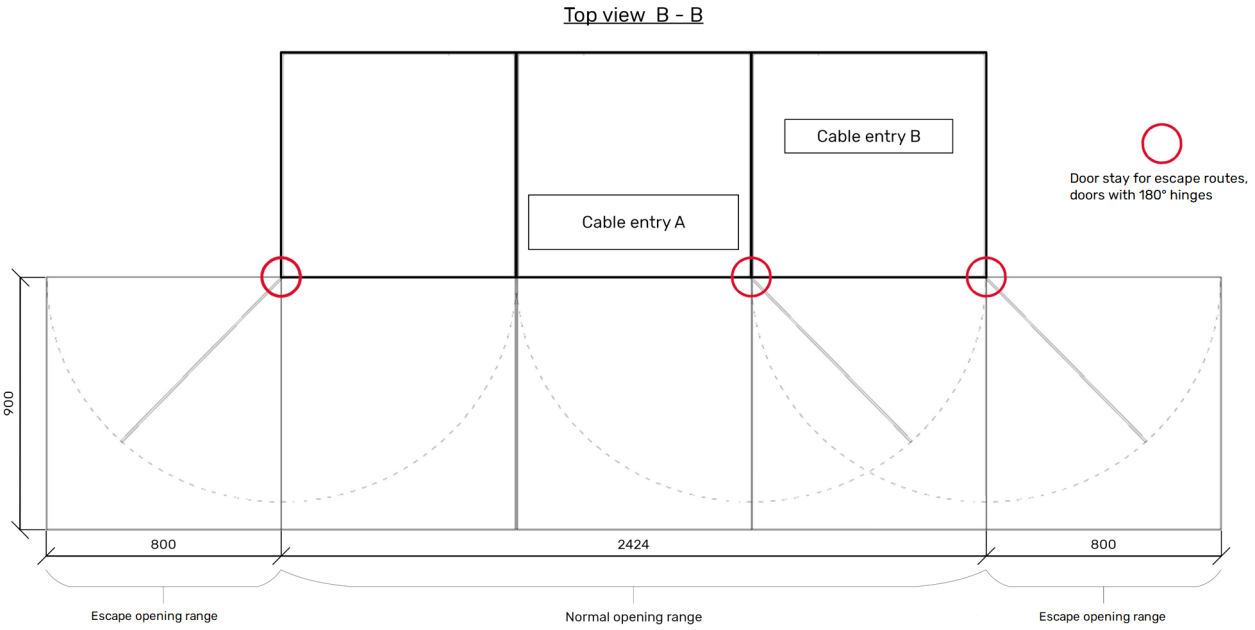




All dimensions in mm

Control cabinet layout: DC supply (option) and BNC box (option)



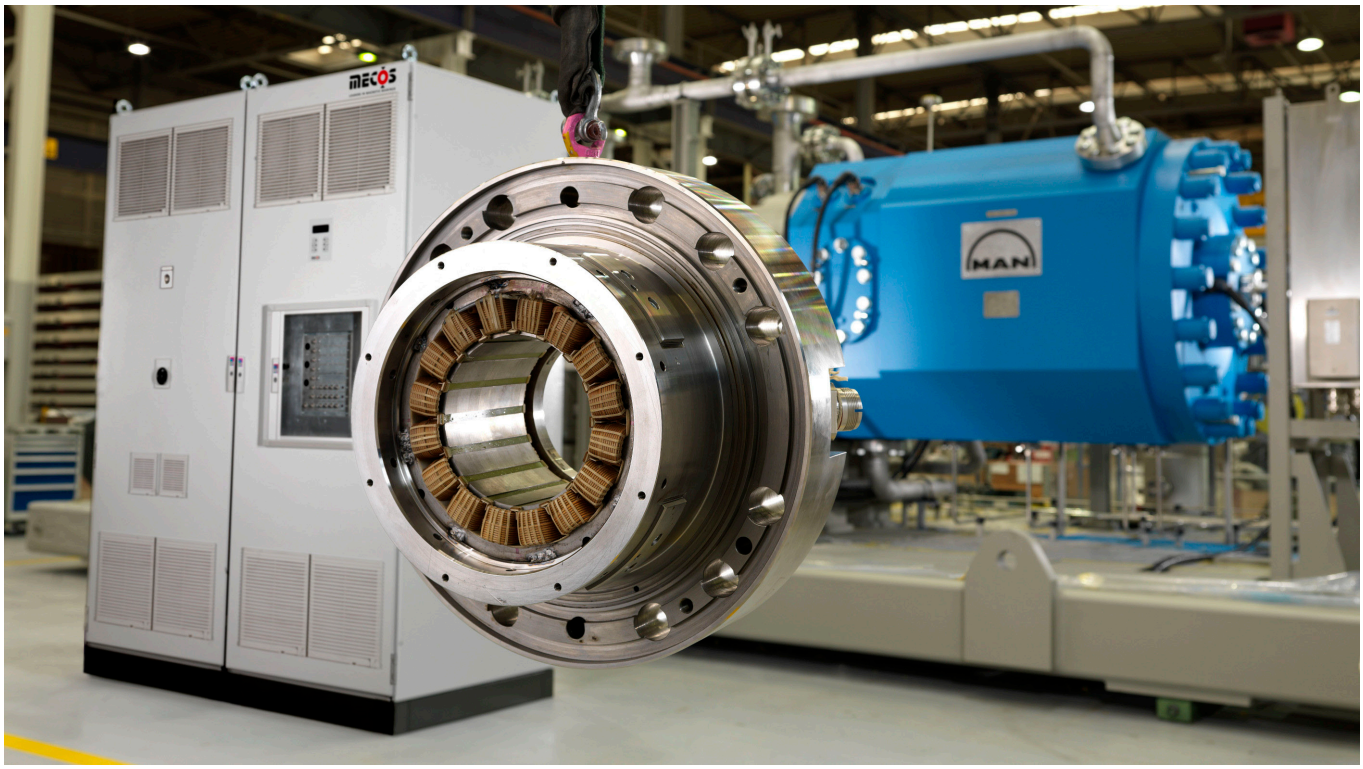


All dimensions in mm

Actuator Power Supply/ power electronics

Electrical data	
Rated Output Power	22 kVA per channel
DC Link Voltage (Intermediate Circuit)	±300 V_{DC}
Output voltage	-300 ... +300 V, filtered PWM signal
Output current	30 A continuous, 33 A peak
PWM-Frequency	80 kHz
Cooling	2 redundant fans per channel, cooling is monitored
Power Cable Connection Type	Spring-type terminals, max. 16 mm^2

System data	
Magnetic Bearing Type	Unipolar bearing
Number of bearings	5-axis system: 1 thrust bearing (1 axis) 2 radial bearings (2 axes each) 7-axis system: 1 thrust bearing (1 axis) 3 radial bearings (2 axes each) 9-axis system: 1 thrust bearing (1 axis) 4 radial bearings (2 axes each)



Sensor electronics

Position and pulse sensors	
Sensor Type	Inductive
Nominal Power of Excitation	2 x 5 W @ 100 Ohm
Number of sensor channels There is the possibility to read a second axial position sensor and a second pulse sensor (number in brackets)	5-axis system: 5 (6) positions + 1 (2) pulse 7-axis system: 7 (8) positions + 1 (2) pulse 9-axis system: 9 (10) positions + 1 (2) pulse
Impedance Matching	The sensor interpretation unit (measurement, processing) requires a impedance matching unit type SMX7. For all configurations (5/7/9 axes) 2 SMX7 units are used. ATEX certification magnetic bearing sensors: II 2G Ex db eb IIB T3 Gb IECEx certification magnetic bearing sensors: Ex db eb IIB T3 Gb IECEx Certificate No. : SEV 19.0015X, SEV 19.0017 ATEX certification SMX7: II 2G Ex eb mb IIC T4 Gb IECEx certification SMX7: Ex eb mb IIC T4 Gb IECEx Certificate No. : SEV 19.0016X
Signal Cable Connection Type	Spring-type terminals, max. 2.5 mm^2

Temperature sensors	
Sensor Type	PT100 (ATEX certification: II 2G Ex eb IIC, IECEx certification : Ex ia IIC, IECEx Certificate No. : IBE 11.0001U)
Operating Current	1 mA
Number of sensor channels	6
Sensor system	2- or 4-wire system applicable
Signal Cable Connection Type	Spring-type terminals, max. 2.5 mm^2

Interface Overview

The MBX22 Control System is equipped with the herein listed communication interfaces. Detailed information on the functions and properties of the individual interfaces are given in the overview tables in the following sections.

Overview	
Digital inputs	3 digital inputs, galvanically isolated
Digital outputs	5 digital outputs, dry contacts
Special	1 input for «Compression system depressurized»
Analog output	1 output, galvanically isolated
Service Interface (Ethernet based)	For configuration, maintenance and extended fault diagnostics
Field bus	Profibus or Modbus interface to transfer AMB data to a superior control system
Display	15.6" TFT WXGA Display Module with touch interface for basic control and advanced graphical representation of various cabinet and machinery data
BNC inputs and outputs (option)	• 32 analog system signal outputs • 1 pulse output • 8 analog inputs

Interfaces to control system (compressor unit control cabinet)

Digital inputs	
Number	3
Isolation type and voltage	Optocoupler, 250 V_{AC}
Description	Inputs using a common ground, supplied from cabinet internal 24V source. To be switched with dry contact in superior control system.
Function	• Levitation On • Rotor Rotating • Pulse Signal Time Synchronization
Connection	Spring-type terminals, max. 2.5 mm^2
Cable	max. 5 x 2 x 2.5 mm^2 (incl. 2 x 2 x 2.5 mm^2 spare) with individual and overall screen

Digital outputs	
Number	5
Isolation type and voltage	Relay, 2.5 kV
Description	1 NO (1 NC, not used) contact per relay, 1 common terminal
Function	Terminal block 1: • Rotor levitated • Ready to Rotate • Common Alarm Terminal block 2: • Common shutdown • System Failure Watchdog
Cable Connection Type	Spring-type terminals, max. 2.5 mm^2
Cable	Terminal block 1: max. 5 x 2 x 2.5 mm^2 (incl. 2 x 2 x 2.5 mm^2 spare) with individual and overall screen Terminal block 2: max. 4 x 2 x 2.5 mm^2 (incl. 2 x 2 x 2.5 mm^2 spare) with individual and overall screen

Special input	
Number of inputs	1
Description	Input supplied from cabinet internal 24V source. To be switched with dry contact in superior ESD system.
Power Supply	Internal 24 V_{DC}
Function	«Compression system depressurized» Input superior ESD system to switch off DC Link and bearing actuators when the compressor system is depressurized.
Cable Connection Type	Spring-type terminals, max. 2.5 mm^2
Cable	max. 3 x 2 x 2.5 mm^2 (incl. 2 x 2 x 2.5 mm^2 spare) with individual and overall screen

Analog output	
Number	1
Isolation type and voltage	Digital isolator, 250 V_{AC}
Description	Isolated output: 4 … 20 mA / 24 V_{DC} (Standard) or ± 10 V / max. 30 mA (Option)
Accuracy	0.5 % on the total range
Load	Maximal 500 Ohm
Function	Rotor speed for superior control system
Cable Connection Type	Spring-type terminals, max. 2.5 mm^2
Cable	max. 2 x 2 x 2.5 mm^2 (incl. 1 x 2 x 2.5 mm^2 spare) with individual and overall screen

Communication interfaces

Service Interface (PC communication)	
Type interface	Ethernet (10/100/1000 Mbit/s)
Functionality	One (1) interface for maintenance and remote access as well as for configuration and external data processing
Communication protocol	MECOS uses a proprietary protocol based on Ethernet. Access via industrial computer (IPC)

Fieldbus	
Type of fieldbus	Modbus TCP or Profibus DPV1
Description	One (1) interface to connect the AMB system to a superior control system (output of operating parameters)
Modbus configuration	Addressing according to MECOS standard
Profibus configuration	Addressing according to MECOS standard Cyclic data (152 bytes): For dynamic signals, e.g. rotor vibration, rotor position, bearing temperatures, system status, etc. Acyclic data: For quasi-static values, e.g. signal ranges, alarm and trip values, etc.

Display	
Description	Interface for basic operation of the AMB system, diagnostic, status and readings of the AMBs incl. graphical charts
Type	15.6" TFT WXGA 16:9 panel
Input	Touch interface (no buttons on the outside of the control cabinet)
Mounting	Built in front door

Options of interfaces	
Fieldbus	Choice between Profibus and Modbus

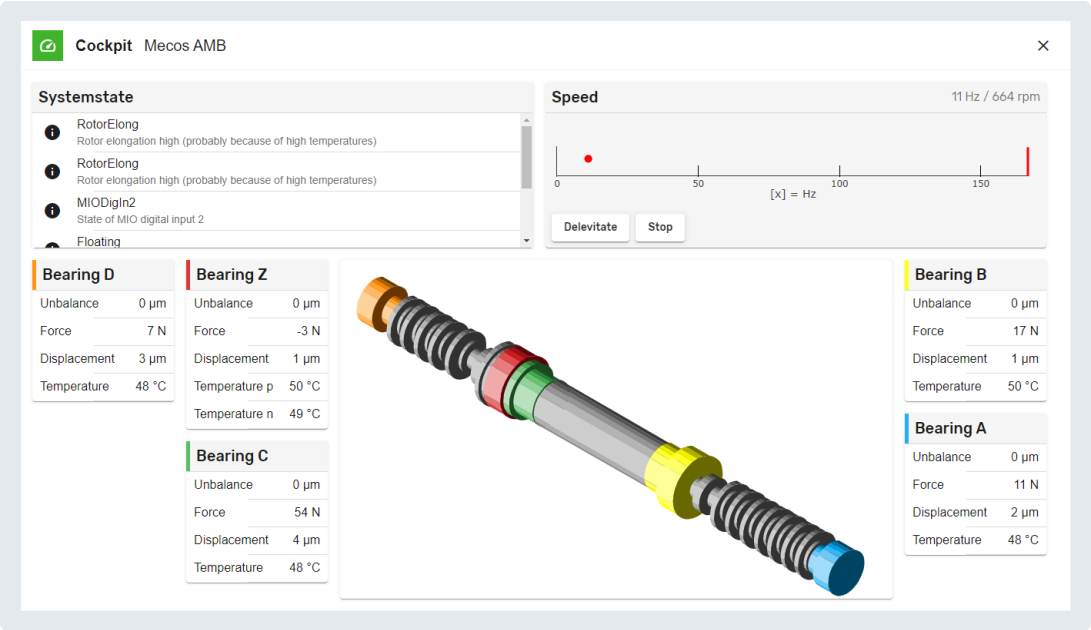
BNC inputs and outputs (option)

Functionality	Analog inputs and outputs for measuring purposes
Number of channels	1 pulse output, 8 analog inputs, 32 analog outputs
Connector plug	BNC
Electrical description	Configurable via DIP switches 0 ... 10 V / -10 ... +10 V / 0 ... 20 mA / 4 ... 20 mA Gain and offset configurable by parameter file (parameter file)

IPC / internal Ethernet network

Infrastructure	
Ethernet infrastructure	Internal Ethernet network consist of following components: • 5 Port Gigabit-Switch • IPC • MAN mGuard for remote access via VPN tunnel Internal and external connectivity
Connections	Front doors: • RJ45 Ethernet connection for maintenance purposes • USB-A port for alternative data transfer Control cabinet internal: • RJ45 Ethernet connector for customer LAN or Internet connection (for remote access only)

Industrial PC	
Type	Cincoze CV-W115 Panel PC
Function	Industrial PC for extended data logging and router for remote access
Software	• Microsoft Windows 10® • MECOS SMServer and Datalogger



Controller and software

System controller

- Powerful multi-core controller
- Well-proven software and robust algorithms
- Digital control of the power amplifiers
- Digital signal processing of sensor signals grants high robustness of the system and low noise
- Extensive service interface functionality for efficient commissioning und maintenance

Control Features

- Fully digital control path
- Efficient pass through of bending criticals of the rotor by creating synchronous damping forces
- Adaptive tracking filters aim at eliminating synchronous forces due to unbalance
- Automatic calibration of the position sensors
- Solid rotor position measurement due to compensation of periodic interference signals

Trend data / data logger	
Function	Logging of long term trend data
Recording clock rate	1 Hz
Data storage	Industrial computer
Data capacity	Minimal 1 year of logging data

Eventlogger	
Function	Logging of events. Events are defined as state changes within the MBX22, e.g. the switching of the digital I/O.
Logging Rate	Event triggered
Data storage	150 events on the system controller, event data is automatically exported to the industrial PC.

Fault History and Fault / Fast Log	
Function	• Logging of system variables in case of a trip or alarm • Records chronological trend of variables Variables logged are configurable by a parameter file
Clock rate / recording time	Circular buffered logger: • Fault Log: 50 Hz / ±30 s, trigger adjustable • Fast Log: 10 kHz / ±100 ms and 1 kHz / ±30 s Circular buffer data will be stored in case of fault
Data storage	• Fault Log: 150 events on the system controller • Fast Log: 2 events on the system controller Data and fault history are automatically exported to the industrial Computer