PMX

Measuring amplifier system

Measuring, testing and automation


CODESYS

HBM

The industry standard in applications worldwide

PMX is a measuring amplifier system specially developed for use in industrial production and test benches. Powerful, precise, reliable and highly efficient.

Monitoring pressing and joining

PMX allows you to achieve maximum efficiency in monitoring of pressing and joining processes. PMX shows its strengths with integrated math monitoring functions and real-time signal calculations.
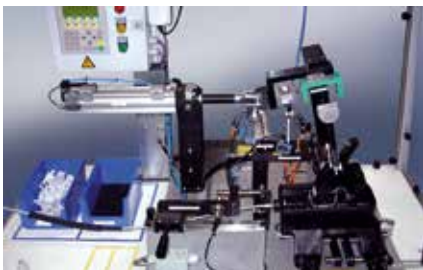
End–of–line test benches

PMX ensures optimum professional quality control and quality improvement during and after the production process. Hundreds of channels and control and integrated regulating functions by way of internal computing channels make it possible to use PMX in small and medium-size test benches without any problems.

Monitoring of machines / systems

Early detection of machine damage allows for cost-effective preventive maintenance, thereby minimizing machine and system downtimes. Real-time monitoring with integrated intelligence in the measuring amplifier reduces the load on the central control system and speeds up control cycle times.

Industrial test benches

Automation makes use of fast analog output signals or limit values and Ethernet-based fieldbuses. The additional integrated Soft-PLC (as per EN61131) is able to perform demanding automation and visualization tasks. Because PMX is multi-client capable, data can be stored in parallel via Ethernet.

PMX combines measurement technology with control as per IEC61131

PMX can be equipped with CODESYS V3 Soft-PLC and is then ready to be used for automation tasks with appropriate control and visualization.
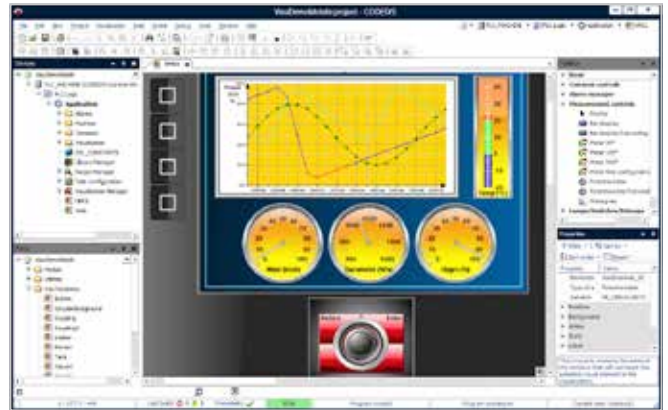
- **Factory automation**
  PMX worldwide in series production and special machines for industrial goods and merchandise of all kinds, e.g. in press manufacturing, printing of books and magazines and manufacturing of furniture or components for motor vehicles

- **Mobile automation**
  PMX in construction machinery, cranes, industrial trucks and open-cast mining machines

- **Energy automation**
  PMX used in industrial applications for producing and distributing energy, e.g. to control small solar energy systems, pump stations and wind power plants

- **Embedded automation**
  PMX in special applications for industrial compressors, integrated weighing and filling control systems and for medical technology

- **Process automation**
  PMX for control of processes and systems, e.g. in steel and aluminum rolling mills and for monitoring and control of sewage treatment or paper converting processes and in remote control technology

- **Building automation**
  PMX for automation of business buildings and private homes, e.g. for intelligent lighting control, shading and climate control monitoring

Everything from a single source

»Beginning this year, TRW Automotive GmbH in Koblenz, Germany, has been using HBM's PMX data acquisition system in their production systems for the first time.

The system measures and evaluates the pump output pressures of ESP aggregates in the lower kHz range and sends the results to the system controller. The user-friendly, browser-based operator interface and high flexibility of the system that enables measured signals to be internally processed and complex calculations to be carried out have been decisive factors for the use of this HBM product.«

Frank Lomberg
Head of assembly planning and electronics system engineering

Precision and dynamics from HBM – optimized for production

HBM stands for quality and precision in measurement technology. PMX gives you maximum precision in your production. Now you can benefit from greater efficiency through high accuracy!

- High accuracy through low–noise 24–bit A/D conversion with high signal resolution and larger measuring bandwidth
- Galvanic isolation, compensation for line lengths and interference frequencies, and good EMC stability ensure high measurement quality
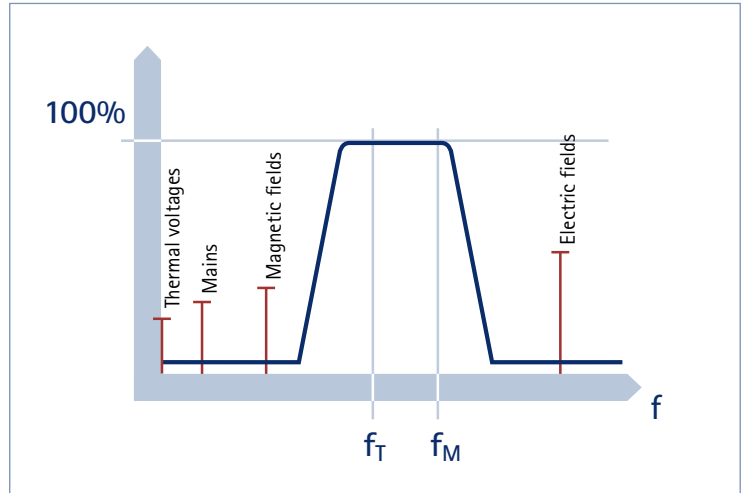

The carrier frequency amplifier signal systematically masks interference.

## Case study: process monitoring

Your advantages with PMX:

- Greater accuracy makes it possible to record manufacturing tolerances more precisely.
- Components are precisely tested and manufactured with the necessary tolerance.
- Reduces rejects and conserves resources while maximizing output.

...without PMX
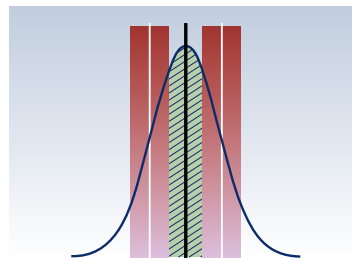
Process monitoring with conventional measuring amplifiers, high rejection rate due to measuring inaccuracies

... with PMX
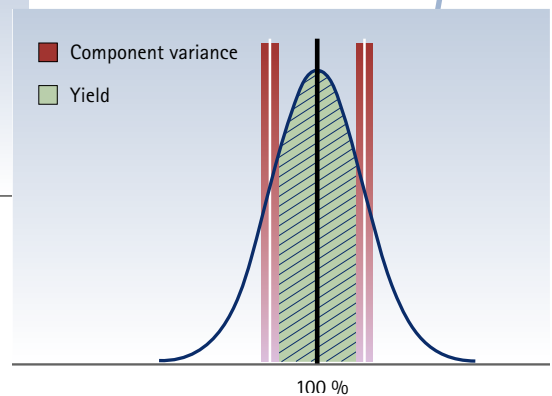
Increased efficiency with PMX, optimum yield with precise measurement results

PMX: lab measurement quality for industrial environments

The PMX measuring amplifier system is ideally suited for integration with your production and testing applications. With a wide range of hardware and software interfaces, PMX supports many commonly used automation systems and communication protocols that are needed for industrial automation.

Benefit from saving time

- Easy integration, even with complex production and test bench environments
- Optimum control and parameterization of the measuring amplifier with TEDS sensor detection and web server operation
- Boosts operating safety and transparency with internal device diagnostics

Industrial Ethernet for more productivity

- Operation, visualization and data storage in networked structures including remote maintenance using network-capable FastEthernet (TCP/IP with 100 Mbit)
- Fast control and regulating processes through real-time Ethernet (PROFINET®[1], EtherCAT®[2] up to 9.6 kHz, EtherNet/IP™[3]) with high user data rate and diagnostics
- Increase the number of channels and complexity of your application by integrating additional CAN field modules with CAN interface

Industrial Ethernet

Modularly expandable

Precise, reliable

[1] PROFINET® is a registered brand of Profibus & Profinet International
[2] EtherCAT® is a registered brand and patented technology, licensed by Beckhoff Automation GmbH, Germany
[3] EtherNet/IP™ is a registered trademark, licensed by ODVA

One device, three solutions

Measurement

Evaluation

PMX detects your transducers automatically via TEDS for the most important measurement variables.

This saves time and prevents errors. The high resolution of 24 bits allows for accurate partial load measurements and high measuring bandwidths. A sampling rate of 19.2 kHz or 38.6 kHz for frequency measurements for every channel ensures high measuring bandwidths.

- SG full bridges
- SG half bridges
- Inductive full bridges
- Inductive half bridges
- Active sensors for current and voltage
- LVDTs
- Potentiometric sensors
- Piezoresistive sensors
- Current-fed piezoelectric sensors (IEPE)
- Resistance thermometers (Pt100)
- Frequency signals
- Angular/incremental encoders
- SSI sensors
- PWM sensors
- Magnetic transducers
- Pulse counters

PMX analyzes and processes your data in real time (< 1 millisecond).

The measuring amplifier system has integrated algorithms to support the actual measurement and pre-process data. 32 computing channels are available. That replaces small and mid-size machine control units and saves a tidy sum of money.

Scaling

- Two-point scaling
- Characteristic curve table
- Polynomial
- Taring
- 6x6 matrix
- SG stress analysis

Technology functions

- Two-point controllers
- PID controllers
- Pt100 to PX455
- Signal generators
- Logic blocks
- Multiplexer 4:1
- Deadband
- Edge detector
- Pulse-width measurement
- Timer
- CODESYS channel

Automation

PMX transfers data to your automation system.

Ethernet-based fieldbuses and Soft-PLC as well as digital inputs/outputs and monitoring outputs ensure fast machine control and automation.

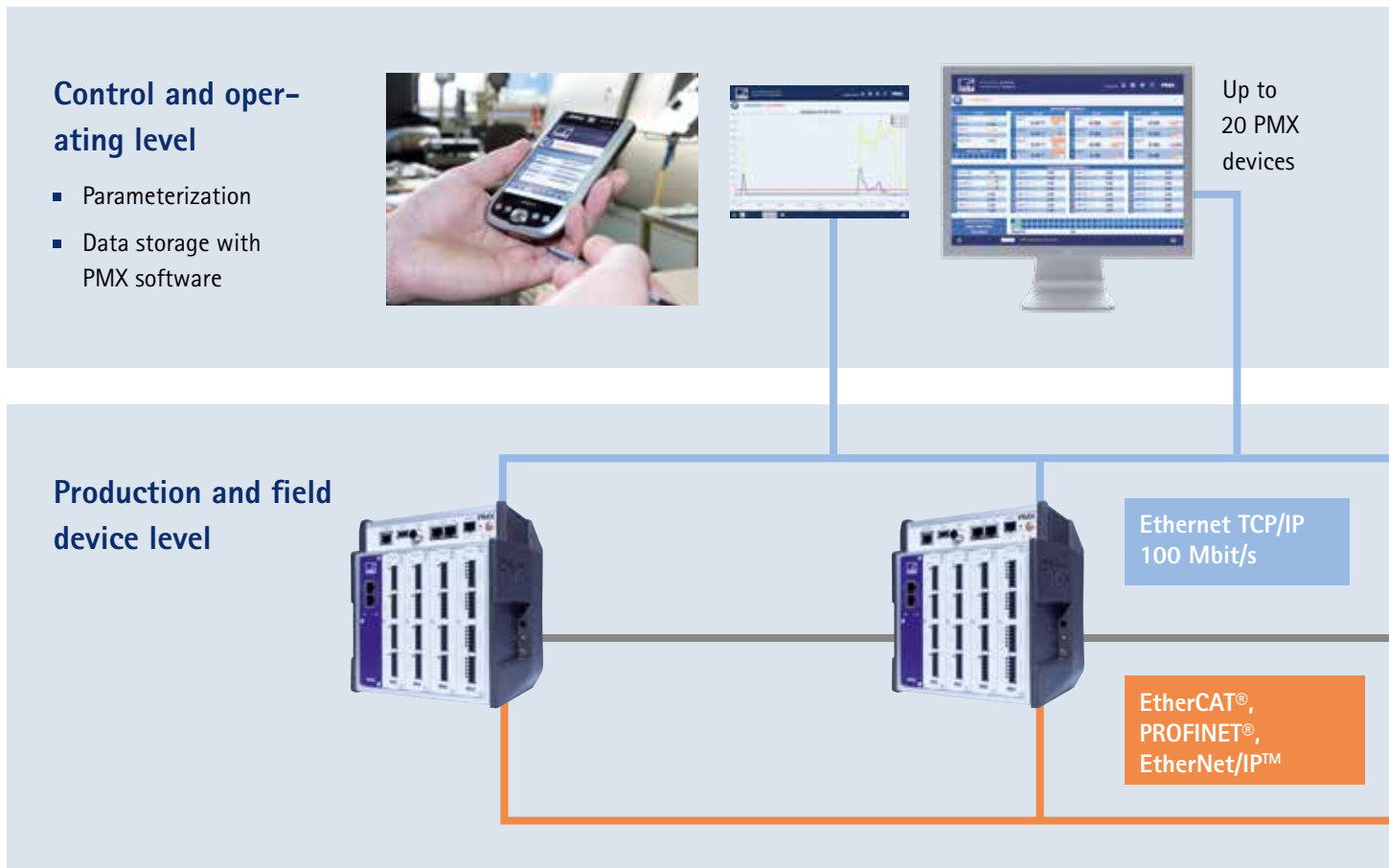|	
EtherCAT	EtherCAT®
PROFINET	PROFINET®
EtherNet/IP	EtherNet/IP™
CODESYS	CODESYS
CANopen	CANopen (1 Mbit/s)
ETHERNET	Fast Ethernet (100 Mbit/s)
	Digital in-/ outputs
	Analog output: voltage

Mathematical functions

- Adder/subtractor
- Multiplier
- Divider
- Counter
- Integrator
- Differentiator
- Cartesian to polar coordinates
- Polar to cartesian coordinates
- Modulo function
- Constant signal

Evaluation

- Filter
- Angle-synchronous filter (CASMA)
- Peak values
- Tolerance window
- Hold (analog triggering)
- Hold (digital triggering)
- Mean value/RMS
- Moving average
- Trigger (range)
- Trigger (pulse)

PMX grows with your requirements

Your production changes and PMX adapts. With practical plug-in cards for different measurement
variables, the system can be expanded flexibly to meet your specific needs.

- Ready for operation immediately
- Use as a stand-alone device or as part of a group, depending on your needs
- Scalable and time-synchronous within the group of devices, with up to 300 measurement channels and 600 math computing channels
- Can be synchronized with other recording systems via NTP, for example with MGCplus, QuantumX or optical interrogators

- Visualization and option for connecting additional devices via USB for backup and data storage
- Can be expanded with additional field modules via CAN interface
- Flexible with up to 100 internal measurement and test programs (parameter sets)
- Freely programmable with internal Soft-PLC control as per EN61131-3

Control and oper- ating level

- Parameterization
- Data storage with PMX software

Up to
20 PMX
devices

Production and field device level

Ethernet TCP/IP
100 Mbit/s

EtherCAT®,
PROFINET®,
EtherNet/IP™

Users can customize the graphical user interface with PMX command libraries (PMX command set, dotNET-API, LabVIEW driver[4], DIAdem driver, MLab sd.Solutions)

EtherCAT

PROFINET

EtherNet/IP

Standard tools such as STEP7[5], TwinCAT[6] and LogixStudio[7] are used for machine control and programming

AutoSync: measuring grid-synchronous data acquisition

Production or test bench

[4] Registered trademarks of National Instruments Corporation and Vector Informatik GmbH

[5] STEP7 is a registered trademark of Siemens AG

[6] TwinCAT is a registered trademark of Beckhoff Automation GmbH

[7] LogixStudio is a registered trademark of Rockwell Inc.

Innovative web technology

PMX software features impressive user friendly features, flexibility and the option of remote remote maintenance.

PMX features innovative GWT web technology and is ready for operation immediately without software installation.

- Simple touchscreen operation with zoomable PMX web browser and data monitoring
- Can be used on different browser-based devices, without any need for training
- Network-capable with standard Ethernet technology
- Ideal for remote maintenance via company network or Internet
- Use of web server on mobile terminal devices via W-LAN

Flexible and cost-saving

Whether you are a machine operator or installer, configurable, three-level user administration (operator, service, administrator) always gives you access to all relevant device and diagnostic data. This cuts down on the number of software tools you need and reduces complexity and system faults.

Easy integration with the control system

HBM measurement technology can be easily integrated with the control system and test bench environment using various software drivers, the PMX command set, LabVIEW and the .NET/API programming interface. That makes it easy to implement individual solutions and safeguard application know-how.

- LabVIEW, DIAdem
- NET/API
- Test bench software sd.Solutions MLab (data acquisition and analysis)

PMX software is also very easy to operate by touchscreen.
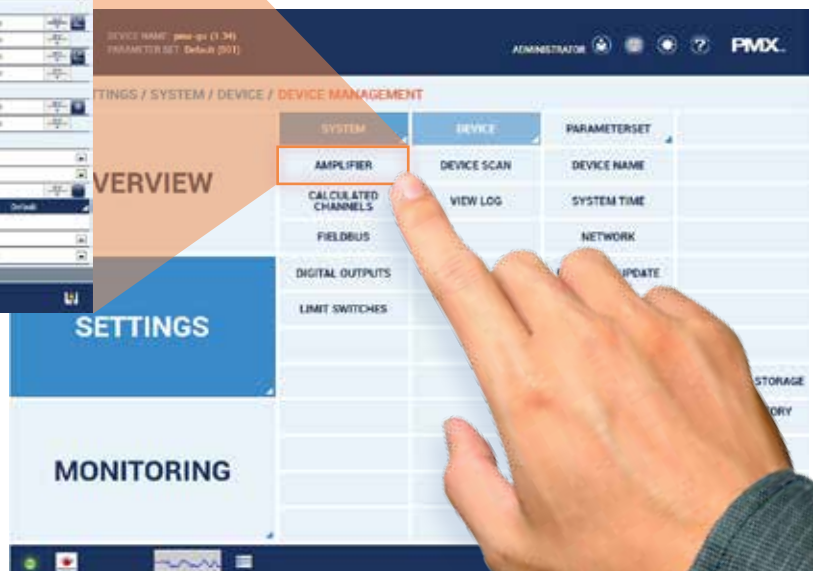
Data analysis made easy

Would you like to analyze your production data?
catman EASY/AP software from HBM makes it easy to display and
save your production data for monitoring purposes. This is a great
advantage for service and maintenance.
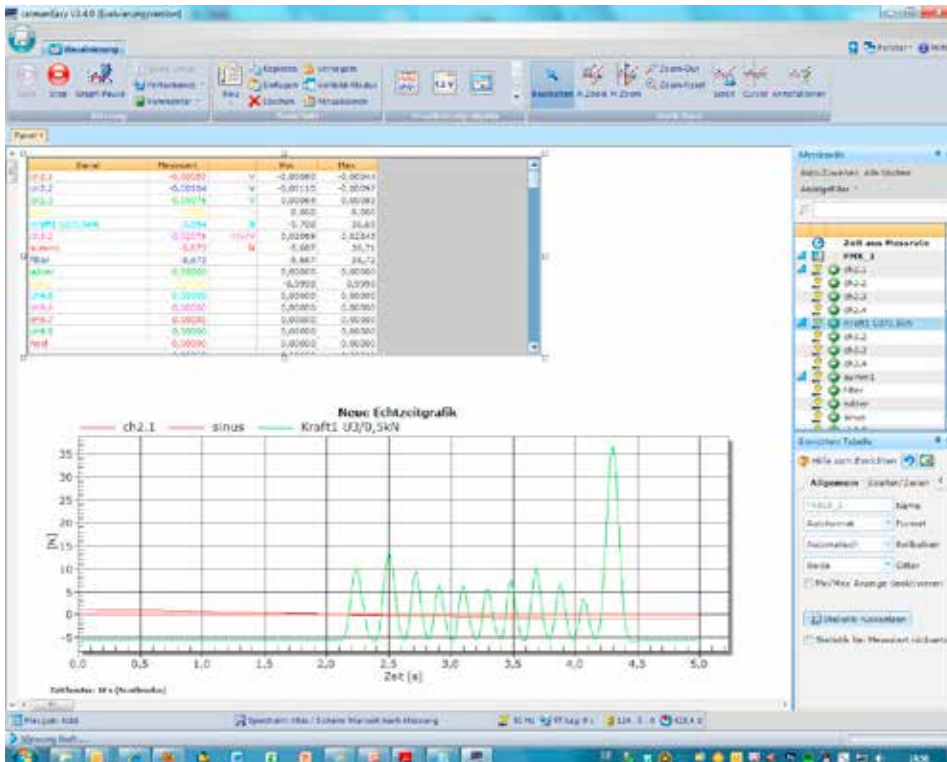
- Professional software for visualization, storage and analysis of PMX
  measurement data, internal PMX computing channels and digital
  inputs/outputs

- Easy PMX system and channel configuration
  (sensor database, TEDS editor, sampling rate, filter, etc.)

- Start recording measured values via PMX digital inputs
  (pre/post trigger, cyclic storage, long duration measurement, etc.)

- Powerful data analysis (signal-to-signal, zoom, magnifying glass, ruler,
  min/max, cut to size, eliminate outliers, etc.)

- Create reports and export measurement data and displays
  automatically (to Microsoft Word, Excel)

Create your PMX automation solution, including visualization

CODESYS, the comprehensive software suite for automation technology, includes everything you need for programming, fieldbus and I/O configuration, visualization, motion control and other tasks as well as your own plug-ins. CODESYS V3 software platform is based on the IEC 61131-3 programming system. All programming languages in that system are supported.
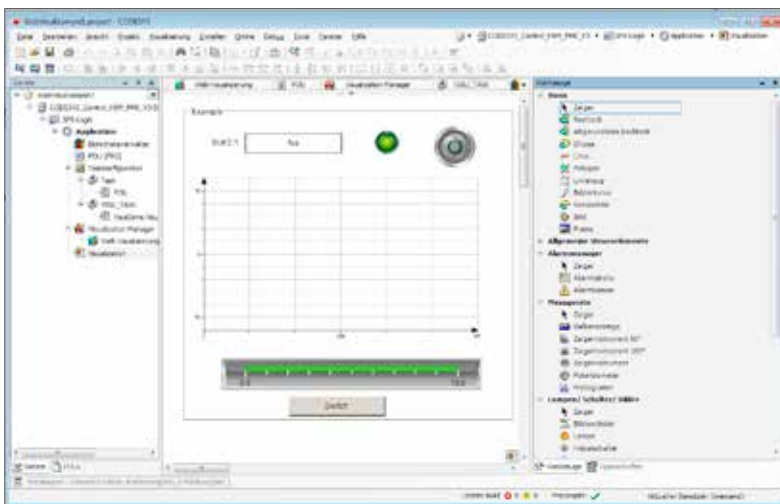
CODESYS programming environment
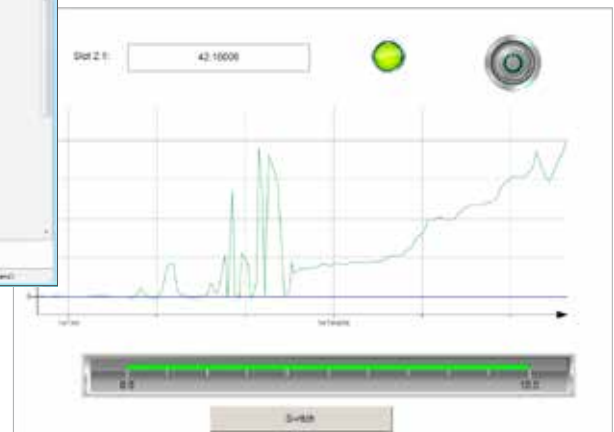
CODESYS web visualization

CODESYS engineering

Professional engineering of IEC 61131-3 applications for specialists and software engineers – from ladder diagram to UML in one expandable platform.

CODESYS visualization

Creation of professional visualization interfaces, fully integrated into the PLC programming system. Display on the target device, on a PC or in the web browser.

CODESYS fieldbus

Integrated fieldbus support in the IEC 61131-3 tool (i.e. the CANopen interface is supported in PMX). You can receive CAN data (CAN master) or send CAN data (SDO/PDO mode).

CODESYS web and target visualization via Ethernet

Process control through on-site web visualization

PMX, the modular CODESYS PLC controller with integrated visualization

Simple remote maintenance via smart phone and micro or HTML5 browser

Transparent monitoring from plant control room or machine PC

A CODESYS runtime license is already included in PMX with the WGX001 basic device. You receive the CODESYS software V3.5 on the CD included with delivery. The corresponding PMX package and a collection of helpful sample programs for generating code, web visualization and integration of CANopen modules are also included. The CD is included with delivery or available from HBM free of charge: **www.hbm.com/codesys**

HBM has the CODESYS know-how for your application

Speak with our CODESYS experts. We will assess your task and create a project for you. From creation of the program to the complete application with necessary documentation.

You can reach us at **customsystems@hbm.com**

PMX: The facts.

PMX is the industry standard in measurement technology.
The most important technical data at a glance:

| WGX001 / WGX002	PX401	PX455	PX460
PMX basic device	**4-channel card**	**4-channel card**	**4-channel card**
5 slots	⏀ Analog input: voltage	SG full bridge	Channels 1 and 3: frequency measurements up to 2 MHz
Communication card	⏀ Analog input: current	SG half bridge	Channels 2 and 4: frequency (digital, inductive)
4 measurement input/output cards	With active sensor supply	Inductive full bridge	min⁻¹ Counter/encoder
Ethernet system interface TCP/IP up to 100 Mbit/s	Current-fed piezoelectric sensor (IEPE) (in conjunction with EICP-B-x smart module)	Inductive half bridge	Magnetic transducer/pulse counter
USB for data/parameter backup		LVDT	SSI
WGX001: CODESYS Soft-PLC and CANopen interface (master/slave)		Piezoresistive full bridge	PWM
		Potentiometric transducer	
		Resistance thermometer (Pt100) (in combination with completion resistor)	

Typical applications	**Typical applications**	**Typical applications**	**Typical applications**
Industrial applications in production and test benches, system and machine monitoring	Universal signal acquisition of sensors that have an active output	Noise-free carrier frequency measurements of force, pressure, displacement, strain and weight	Measuring frequencies, speeds, angles of rotation and displacement with rotary encoders or angular encoders.
Long duration measurements quality data control		The sensors can also be operated in the intrinsically safe area using Zener barriers	HBM torque flanges (T10, T12, T40): with max. two torque flanges for torque and rotational speed (without measurement of direction of rotation/angle of rotation) or one torque flange for torque, rotational speed, angle and direction of rotation or reference pulse detection
Simple and complex control and automation tasks			
Special features	**Special features**	**Special features**	**Special features**
· Total sampling rate up to 400,000 measured values/s	· TEDS sensor detection	· TEDS sensor detection	· TEDS sensor detection
· Automatic measured value/time synchronization with up to 20 PMX devices	· 19.2 kHz sampling rate	· 19.2 kHz sampling rate	· 38.4 kHz sampling rate
· Device status LED as direct diagnostics information	· 24-bit A/D conversion	· 24-bit A/D conversion	· Bandwidth up to 6 kHz
· 32 internal computing channels	· Bandwidth up to 3 kHz	· Bandwidth up to 2 kHz	· Shunt calibration
· 100 parameter sets	· Channel status LED as direct diagnostics information	· Channel status LED as direct diagnostics information	· Channel status LED as direct diagnostics information
· 3-level user administration (operator, service, administrator)			

Easy integration into the electrical design with ePLan macros, available free of charge

PX878	PX01PN	PX01EC	PX01EP
Combination card	**Communication card**	**Communication card**	**Communication card**
Combined input/output card	Real-time Ethernet card for PROFINET®	Real-time Ethernet card for EtherCAT®	Real-time Ethernet card for EtherNet/IP™
8 digital in-/ outputs	2 RJ45 connections	2 RJ45 connections	2 RJ45 connections
5 analog outputs	Transfer of measured values and diagnostic data	Transfer of measured values and diagnostic data	Transfer of measured values and diagnostic data
	GSDML description file and certification are available	XML description file and certification are available	EDS device description file and certification are available
Output of all measurement and computing channels as well as diagnostic functions			

PX878	PX01PN	PX01EC	PX01EP
Typical applications	**Typical applications**	**Typical applications**	**Typical applications**
Recording and indicating machine and system states. Data transfer to downstream measurement acquisition and control systems	PMX as PROFINET® -RT/IRT slave (IO-RT device, IO-IRT device) in automation systems	PMX as EtherCAT® slave (complex slave) in automation systems	PMX as Ethernet/IP™ slave (communication adapter) in automation networks
Special features	**Special features**	**Special features**	**Special features**
Freely configurable signals can be used for control and regulation	· PROFINET® -RT/IRT protocol	· EtherCAT® protocol	· EtherNet/IP™ protocol
· 1 ms switching speed for I/Os	· Transmission rates up to 1 kHz	· Transmission rates up to 9.6 kHz	· Transmission rates up to 1kHz
· 3 kHz bandwidth of the analog outputs	· Status LEDs as direct diagnostics information	· Status LEDs as direct diagnostics information	· Status LEDs as direct diagnostics information
· 16-bit D/A conversion	· Output of all measurement and computing channels as well as diagnostic functions	· Output of all measurement and computing channels as well as diagnostic functions	· Output of all measurement and computing channels as well as diagnostic functions
· Channel status LED as direct diagnostics information			

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measure and predict with confidence

HBM