



Distributed Protection & Monitoring Module

PMM-300 PLUS

The PMM-300 PLUS is a compact 5-channel module for machine monitoring and protection, offering advanced signal processing, configurable alarms, and real-time diagnostics.

KEY FEATURES

- Compact and self-contained design for easy installation
- Real-time data visualization and configuration
- Stackable up to 8 modules
- Bandwidth DC to 20kHz
- Modbus RTU, Modbus TCP, and OPC UA support
- CMS-500P integration via Ethernet (TCP/IP)
- Built-in firewall for cyber security



MONITORING SOLUTIONS



Endwinding



Air gap



Magnetic flux



Roller bearing



Axial thrust position



Shaft & bearing vibration



Rotor poles temperature



DESCRIPTION

The PMM-300P is a standalone distributed Protection & Monitoring Module (PMM) designed specifically for the condition monitoring and protection of rotating machinery, including power generation turbines, oil and gas applications, and auxiliary equipment. With its robust and compact design, the PMM-300P

can be directly mounted to machinery, reducing sensor cable length and mitigating associated costs and electrical noise issues. This self-contained module integrates seamlessly with the PMx-300P Manager real-time software, facilitating data visualization and configuration via Ethernet using the TCP/IP protocol. Furthermore, the Ethernet port enables communication with the CMS-500P Orca for long-term trending and in-depth machine health analysis.

PMM-300P AS A MONITORING SYSTEM

Up to eight PMM-300P can be stacked together to build a small size and economical monitoring system offering the same features and performances of rack-based system. The din-rail backplane feature an embedded bus used to share the power supply, the phase reference signal and the interconnection bus between all modules. When operating the PMM-300P in this way, one of the PMM-300P acts as a Master and the others devices as slaves. The status of each module are available at anytime per the master and the master informs all slaves of changes to the system inputs such as digital inputs. Furthermore, additional I/O module can be attached to the master trough the interconnection bus such as:

- Relay Extension Module
- Temperature Extension Module
- Analog Inputs (Operating parameters 1S/s) (coming soon)

Additional digital and relays outputs are managed by the master module and are user configurable with AND, OR and majority voting multilevel logical function. The combination of alarms and status enabling a block of PMM-300P to behave as one system though this last is composed of distinct modules.

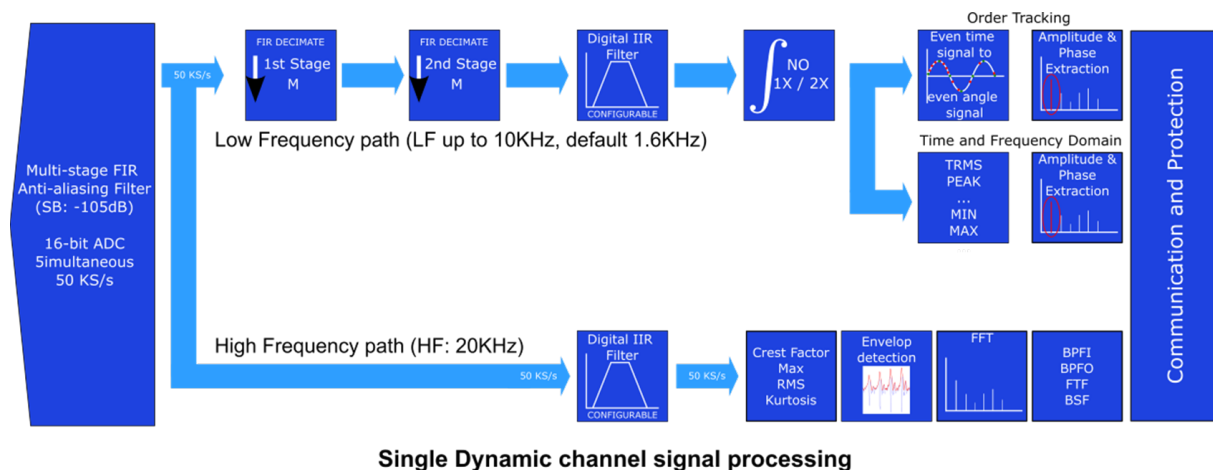
SIGNAL PROCESSING

The PMM-300P performs signal conditioning (IEPE, Current loop, Voltage), data acquisition, filtering and processing (characteristic values extraction) internally which means that no other device are necessary between the sensors and the modules.

Each dynamic channel is split up in two distinct paths (LF: Low Frequency & HF: High Frequency) after the ADC.

The LF path is used for conventional monitoring such as machine fault (balancing, misalignment, gap eccentricity..) with a maximum bandwidth of 10KHz. The LF path performs filtering, 1x/2x integration and advanced analysis such as spectral band extraction, advanced FFT analysis, order tracking and auto triggered run/up run/down acquisition. Each extracted value from the LF path can be refreshed each 125ms (default 1 second).

The HF path is designed for roller bearing analysis and high frequency analysis with a maximum bandwidth of 20KHz. Some advanced processing's are available over the HF path such as IIR Filtering, Hilbert transform, Envelop Analysis and FFT. From the HF path, the values are refreshed at the rate of one second.



ALARM AND STATUS

Each dynamic channel of the PMM-300P can be configured to generate two level of alarm (Alert and Danger) on one chosen parameter (one extracted value such as TRMS, Peak, Harmonic, etc.)

Once the value cross the user configurable limits an Alert or a Danger is triggered.

Limits are checked each time a new value is extracted from the dynamic signal with a maximum refresh rate of 125ms.

In addition, some limits can be applied for the "Sensor OK" check for each dynamic channel giving the status of the sensors in real time.

A total of 4 Alerts, 4 Dangers, 4 Sensors OK and 1 System OK signals can be generated by the PMM-300P to drive the Digital Outputs.

SOFTWARE, COMMUNICATION AND SECURITY

All PMM-300P modules communicate by Ethernet using TCP/IP protocol with a maximum data transfer rate of 100Mbps with a distance up to 100m using CAT 6a S/FTP or SF/FTP cable.

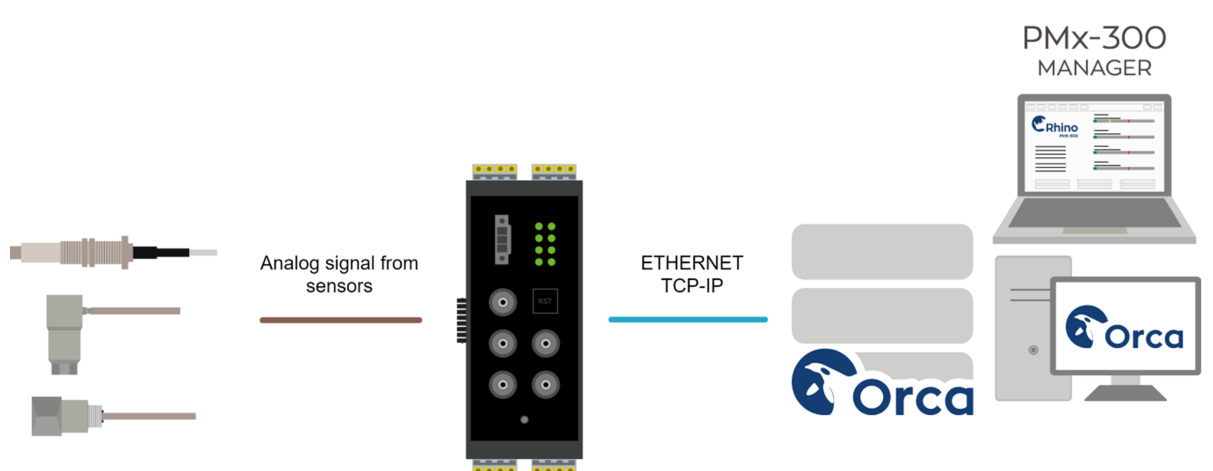
TCP/IP protocol ensures the communication with PMx-300 PLUS Manager which is used to configure and to visualize the real time data or with the CMS-500P Orca for long term trending and data analysis.

PMM-300P is fully compatible with the CMS-500P Condition Monitoring Software including storage, display and further processing of the RAW data. Data from PMM-300P are logged to a CMS-500P Orca Server running a PostgreSQL database and can be visualized with the CMS-500P Data Client Software.

The available plots in the CMS-500P Client include, but are not limited to, Bargraphe, Tables, Trend, Bode, Polar, Correlation, Shaft Centerline, Waveform, Pole Profile, Mingap Signature, Polar View, Orbit, Corbit, Spectrum, Full Spectrum, Waterfall and Cascade.

Furthermore, the PMM-300P can act as a Modbus RTU slave, a Modbus TCP slave or an OPC UA server natively. Modbus TCP and OPC UA use the same physical ethernet adapter as the TCP/IP communication to the MCm software and can be used simultaneously.

For security reason, the PMM-300P includes a built-in firewall which can be configured by the PMx-300 PLUS Manager to restrict access to authorized IP addresses only.



PMS-300P, PMx-300 PLUS Manager and CMS-500P Orca system overview

OPERATIONAL SPECIFICATION

POWER SUPPLY

Inputs supply voltage	+24V _{DC} nominal
Typical power consumption	< 15W at 24V; with DO: 8×30mA, AO: 4×20mA and Sensors power: 4×100mA
Power supplies to sensors	4 + 1 (one per physical input channel) Polarity: user configurable 0V, +24V _{DC} or -24V _{DC}
Constant current source	4mA

MODULE DATA ACQUISITION

A/D type	Sigma-delta 4+1 channels with true simultaneous sampling
A/D converter	16bits at 49152 S/s
Frequency bandwidth	DC to 20kHz (-3 dB)

DYNAMIC INPUT CHANNELS

Available conditioning mode	Voltage, Current, IEPE (single ended or differential)
Measurement range	-24 V to +24 V or -30mA to 30mA
Input coupling	DC-coupling
Measurement accuracy	
• Amplitude	< 1% of full scale between 1Hz and 10kHz
• Phase	< 2° between 1Hz and 200Hz, < 10° between 200Hz and 1kHz

PHASE REFERENCE INPUT CHANNEL

Available conditioning mode	Voltage
Measurement range	-24V to +24V (DC-coupling)
Trigger method	Crossing of threshold with or without hysteresis
Triggering threshold	Rising or falling edge, configurable level
Speed measurement range	60RPM to 15'000RPM (1Hz to 250Hz) by default
Measurement accuracy	≤ 0.2% of maximum speed

BNC - BUFFERED OUTPUTS

Signal	Buffered raw signal of the sensors
Bandwidth	DC to 50kHz — Low-pass filtering
Scaling	1V:1V, non-inverting / 250 mV/mA in current mode
Minimum load on BNC	> 50 k Ω
Maximum cable length on BNC	5m with typical capacitance of 100pF/m

ANALOG OUTPUTS

Outputs	Four (4) 2-wire single ended 4–20 mA current loop outputs
Mapping	One characteristic value per dynamic channel (user configurable)
Refresh rate	Default 1s, maximum 125ms for LP path
Admissible load on output	$\leq 500 \Omega$

DIGITAL SIGNAL PROCESSING

Multi-Stage FIR anti-aliasing filter	–100dB attenuation in stop band
LF path digital filtering	IIR Butterworth LP, HP, BP and SB user configurable
HF path digital filtering	IIR Butterworth LP, HP, BP and SB user configurable
LF path integrator	Digital Integration 1x/2x with custom High Pass filter cutoff
LF path measurement resolution	1024 to 24576 point waveform (1s) / 1600 lines spectrum
HF path measurement resolution	4096 point waveform (84 ms) / 1600 lines spectrum
Windowing	Hanning
Averaging	6x (applied on extracted values) (user configurable)
Characteristic values	Min, Max, Mean, Gap, TRMS, Peak, PeakPeak, Smax, BCU, Crest Factor, Kurtosis, RMS band, Harmonics Amp., Harmonic Phase, Speed
Order tracking	Digital resampling from event-time signal to even-angle signal
LF path refresh rate	Default 1s; configurable as 125ms, 250ms, 500ms, 1s and 2s
HF path refresh rate	1 second

ALARM PROCESSING

Alarms	One Alert and Danger states by dynamic channel over a user-selectable characteristic value
Alarm range	Four configurable alarm ranges (Danger Above, Alert Above, Alert Below, Danger Below)
Alarm levels	Up to 16 different alarm levels depending on OTP mode input (OTP mode selectable by Modbus or Digital Inputs)
Alarm options	User configurable latched and time-delayed alarms
Control signals	
• OTP Mode	Selectable by digital inputs or by Modbus to switch the alarm levels between 16 predefined levels
• RST AL	Digital input to reset the latched alarms

SENSOR OK CHECK

Sensor OK range	Two user-configurable ranges (Above and Below) for Sensor OK check based on sensor signals ($\pm 24V$)
Sensor line check	Short circuit or interruption
Sensor power check	Voltage and current monitoring

DIGITAL INPUTS

Logical level	+24V logic level
Isolated	No
DI Name	
• RST AL	A high level resets the latched alarms
• OTP	A high level switches the alarm level from OTP 0 to OTP 1
• ROT D	A high level means clockwise direction
• SAVE	A high level saves a dataset of raw signal

DIGITAL OUTPUTS

Outputs Eight (8) +24V Digital outputs

Mapping

• System OK	Indicates PMM-300P module is working properly
• Sensor OK	Common indicator for all Sensor OK (Logical AND)
• Alert	Common indicator for all Alert (standalone or system architecture with combined modules) (Logical OR)
• Danger	Common indicator for all Danger (standalone or system architecture with combined modules) (Logical OR)
• Danger CH1 to CH4	4× Danger outputs, one per dynamic channel

Refresh rate

Default 1s, maximum 125ms for LP path

Levels

0V / +24V logic level

COMMUNICATION INTERFACES

Ethernet 10/100 Mbit/s

Configuration & Commissioning with PMx-300 PLUS Manager
Monitoring & Analysis with CMS-500P
Modbus TCP Server and Modbus TCP Master
OPC UA Server

RS485

Modbus RTU Slave (configurable: 19200 to 115200)
No 120Ω termination resistor available

Interconnection bus

Available to connect multiple PMM-300P and share Power Supply, Phase reference signal and Status

LED INDICATOR

Power (PWR)

Diagnostic of power supply

System OK (Syst)

Diagnostic of module protection and monitoring

Ethernet (ETH)

Diagnostic of ETH connection

FAULT

Diagnostic of misc. faults

CH1 to CH4

Dynamic channel status as Sensor OK, Alert or Danger

PREDEFINED OPERATING MODE

Vibration mode

• 4x Relative Vibration	Relative vibration monitoring according to ISO 20816
• 4x Absolute Vibration	Absolute vibration according ISO 20816 Roller bearing vibration according DIN3832
• 2x Relative and 2x Absolute Vib.	Mixed relative and absolute vibration for sleeve bearing monitoring
• Endwinding	Endwinding monitoring for large turbogenerator

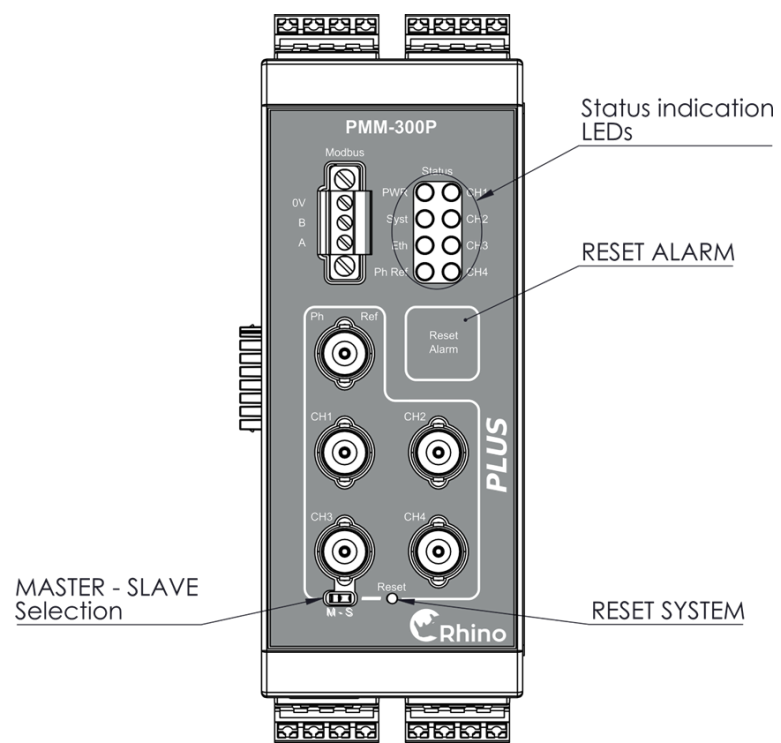
Air gap mode

• Air gap	Four channel Air gap monitoring for hydro-generators, ring motors and gearless windmills
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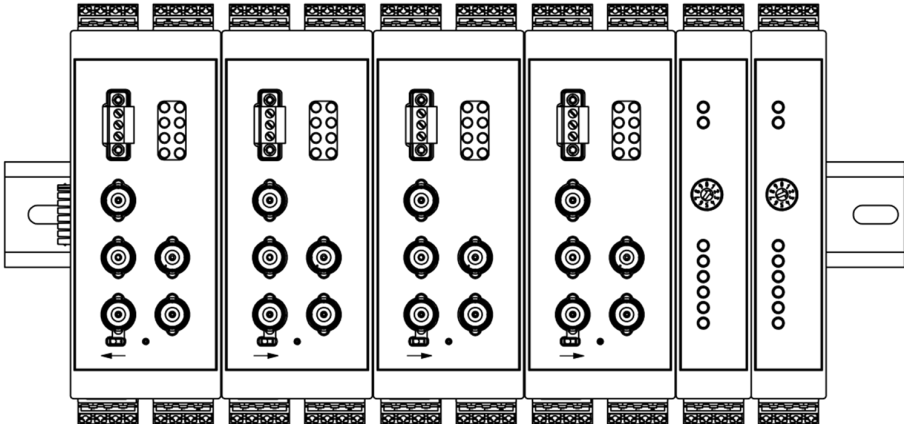
Misc. mode

• AMT Pole Analysis	Magnetic Flux and poles temperature measurement
• Expert	Special mode with all calculations enabled
• Differential expansion	Measurement of expansion in steam turbine

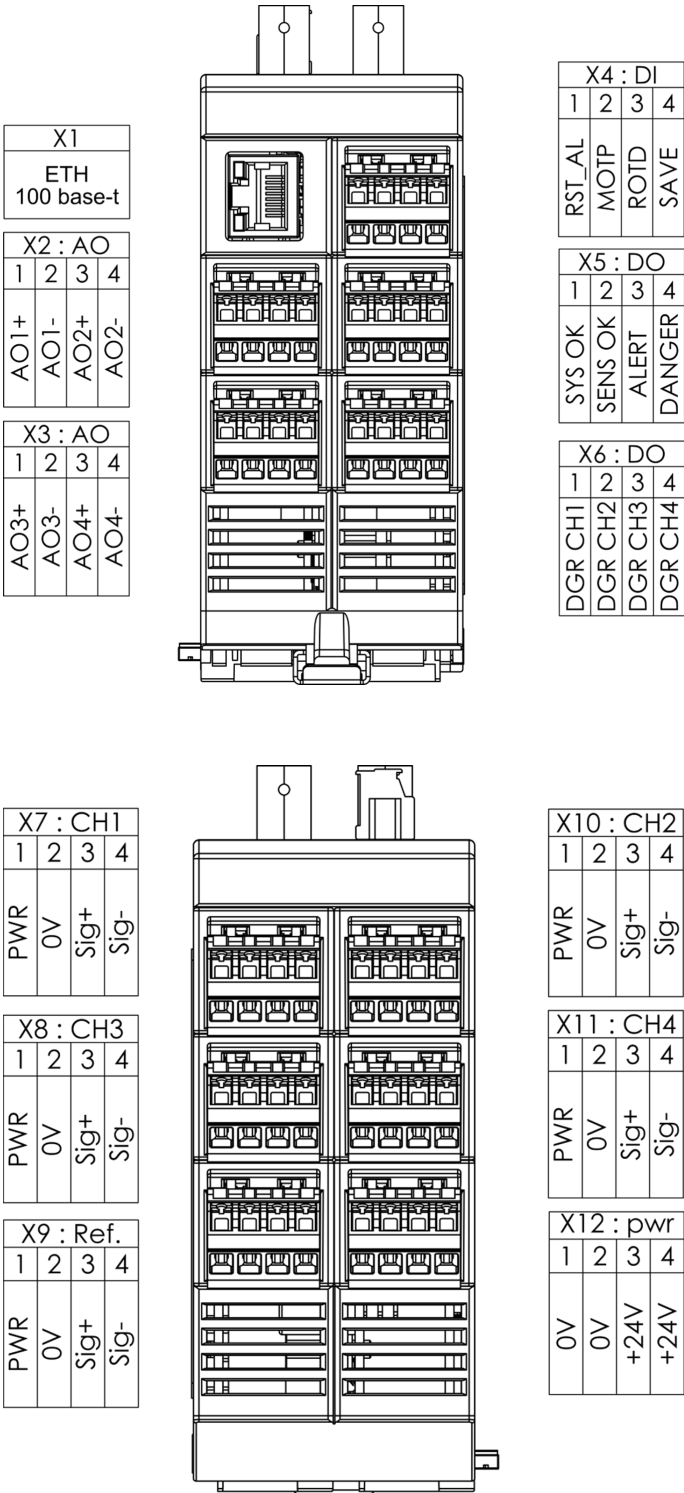
FRONT AND STACKED VIEW

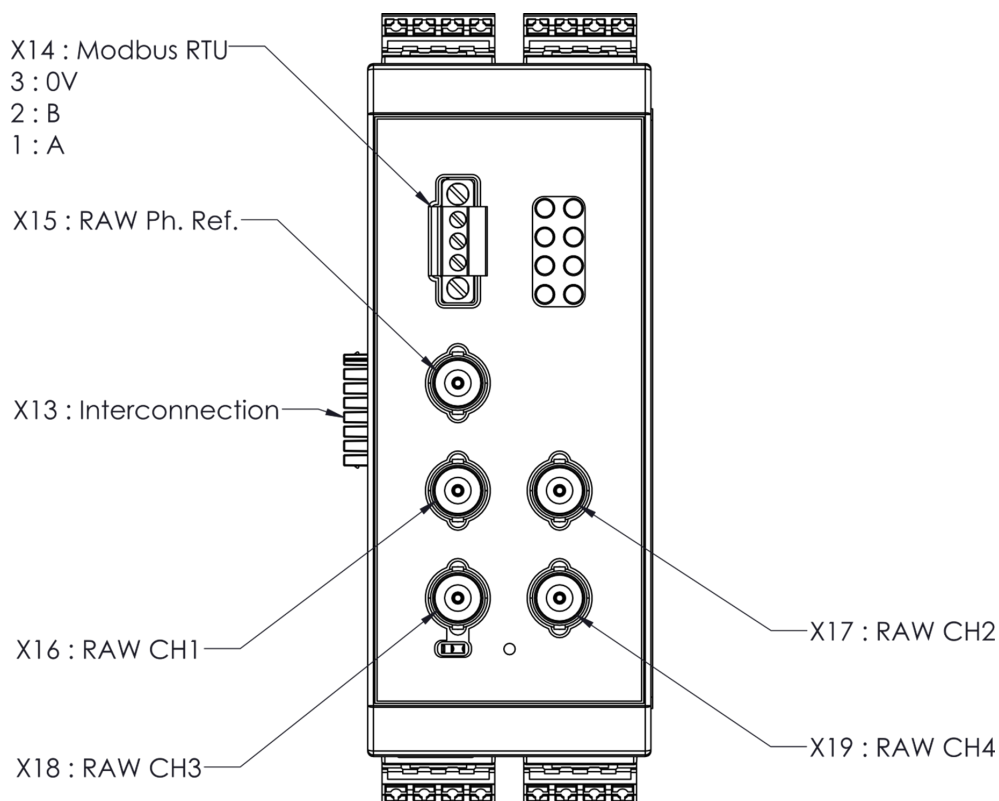


	PMM-300P Master	PMM-300P Slave 1	PMM-300P Slave 2	PMM-300P Slave 3	PMM-391P Slave 1	PMM-391P Slave 2
Device ID	n.a.	1	2	3	1	2



PINOUT DESCRIPTION

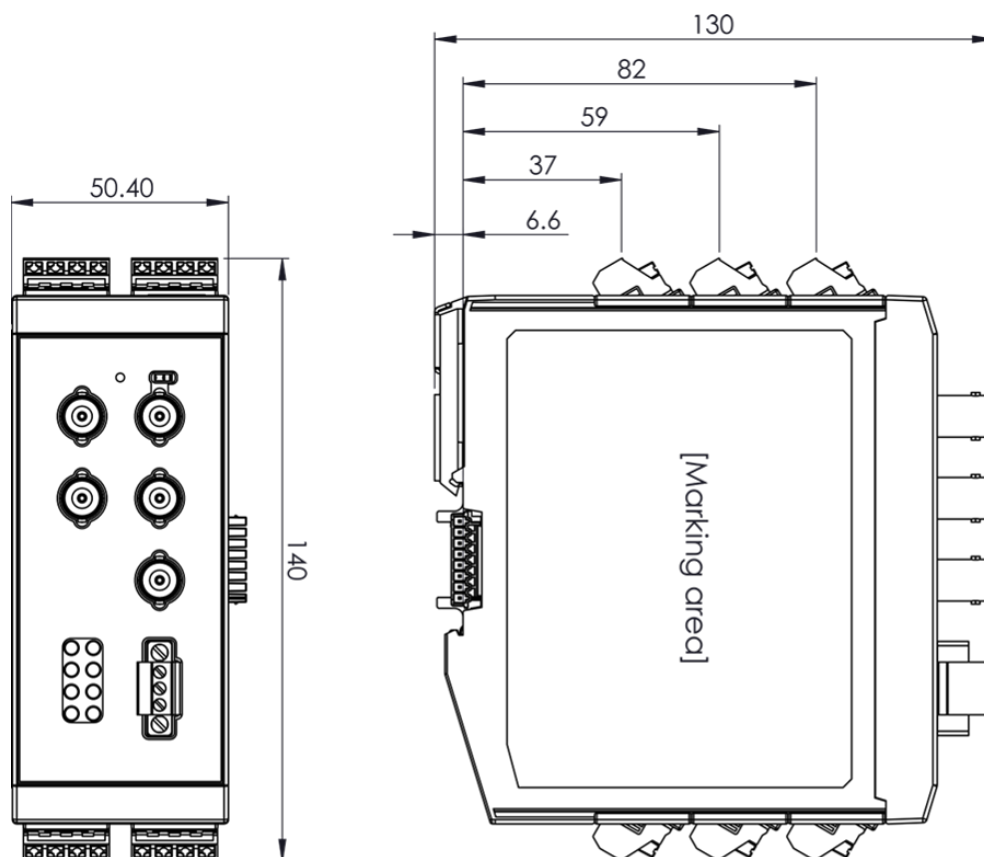




CONNECTORS

X1 Ethernet	bottom left	8P8C RJ45 connector female
X2 to X12		4-pin terminal strip header, push-in spring connection, clamping range 0.2mm ² to 2.5mm ²
X2–X3	bottom left	Analog Outputs 4–20mA
X4	bottom right	Digital Inputs +24V logic level
X5, X6	bottom right	Digital Outputs +24V logic level
X7	top left	Dynamic channel 1
X8	top right	Dynamic channel 3
X9	top left	Phase Reference channel
X10	top right	Dynamic channel 2
X11	top right	Dynamic channel 4
X12	top right	Main Power Supply +24V nominal
X13	side connector	Sidebus connector

MECHANICAL DRAWING



PHYSICAL CHARACTERISTICS

Mounting	DIN 35mm rail mount
Terminals	Input and output via push-in terminals, clamping range 0.2mm ² to 2.5mm ²
Size	Approx. h:140mm L:120mm l:52mm
Weight	Approx. 500g
Ethernet cabling	Up to 100m with Augmented category 6 (Cat 6A), type S/FTP or SF/FTP
Connection to other modules	X13 Sidebus connector for direct connection to other modules PMM-300P and PMM-39xP DO NOT CONNECT PMM-305 OR PMM-305P TO SIDEBUS CONNECTOR

PMM-300P SPECIFICATIONS

GENERAL SPECIFICATION

Item	Specification
Ambient operating temperature	0 to 55°C
Ambient storage temperature	-20 to 70°C
Ambient operating humidity	10 to 90% RH, No-condensing
Ambient storage humidity	10 to 90% RH, No-condensing
Operating atmosphere	No corrosive gases
Ingress protection	IP30
EMC compliance	IEC61326-1

POWER SUPPLY

Parameter	Min.	Typ.	Max.	Unit	Conditions
Voltage power supply	20.4	24.0	27.6	V	
Single module power consumption			10	W	No sensor powered, no outputs loaded
Single module current consumption		110		mA	powered with 24Vdc

ANALOG INPUTS AND PHASE REFERENCE

Common specifications

Parameter	Min.	Typ.	Max.	Unit	Conditions
Sensor power supply voltage					
		V_{DC}		V	+24V sensor mode, no load
	$V_{DC} - 0.7$			V	+24V sensor mode, full load
	-23.7	-24.0	-24.3	V	-24V sensor mode, no load
	-23.3			V	-24V sensor mode, full load
Sensor power supply impedance		2	3	Ω	
Sensor power supply current					
			150	mA	+24V sensor mode
			-25	mA	-24V sensor mode
Voltage channel gain error	-0.5	0	+0.5	%	of reading value
Current channel gain error	-1.0	0	+1.0	%	of reading value
Voltage channel offset error	-20	0	+20	mV	Sig+/Sig- shorted
Current channel offset error	-80	0	+80	μA	Sig+/Sig- shorted
Signal to noise ratio	70			dB	
Noise amplitude			1.6	mVpp	Sig+/Sig- shorted
Total harmonic distortion			0.007	%	
Voltage amplitude resolution		763		μV	
Current amplitude resolution		3		μA	
Aquisition sampling rate			49152	Hz	
Analog frequency bandwidth			24	kHz	-3dB
In-band frequency response max. ripple			0.6	dB	DC to 20kHz
Coefficient of thermal deviation of input amplifier + ADC			100	ppm/°C	

Voltage differential mode

Parameter	Min.	Typ.	Max.	Unit	Conditions
Differential voltage range	-24		+24	V	CHx+ to CHx-
Common mode voltage range	-25		+25	V	CHx+ or CHx- to 0V
Differential input impedance		100		k Ω	CHx+ to CHx-
Common mode input impedance		51		k Ω	CHx+ or CHx- to 0V

Voltage singled ended mode

Parameter	Min.	Typ.	Max.	Unit	Conditions
Input voltage range	-25		+25	V	
	0	0	0	V	Internally grounded
Input impedance		51		k Ω	

Current differential mode

Parameter	Min.	Typ.	Max.	Unit	Conditions
Current range	-30		+30	mA	CHx+ to CHx-
Internal shunt resistance	249.5	250	250.5	Ω	CHx+ to CHx-

Current singled ended mode

Parameter	Min.	Typ.	Max.	Unit	Conditions
Current range	-30		+30	mA	CHx+ to internal 0V
Internal shunt resistance	249.5	250	250.5	Ω	CHx+ to internal 0V

IEPE mode

Parameter	Min.	Typ.	Max.	Unit	Conditions
Input voltage range	0		20	V	
	0	0	0	V	Internally grounded
Input impedance		51		k Ω	
IEPE loop current		4		mA	Internally fixed

ANALOG OUTPUTS

Parameter	Min.	Typ.	Max.	Unit	Conditions
Output current gain error	-0.6		0.6	%	
Output current offset error	-40		40	μA	
Load resistor range	1		500	Ω	

RAW OUTPUTS (BNC)

Parameter	Min.	Typ.	Max.	Unit	Conditions
Output voltage gain error	-0.5		0.5	%	
Output voltage offset error	-20		20	mV	
Output scaling factor					
• Voltage and IEPE mode		1:1		-	diff. and single ended
• Current mode		250		mV/mA	diff. and single ended
Frequency bandwidth		50		kHz	Integrated LP filter

DIGITAL INPUTS

Parameter	Min.	Typ.	Max.	Unit	Conditions
Logic high input voltage range	9.2		26	V	
Logic low input voltage range	0		7.2	V	
Input resistance		12		k Ω	

DIGITAL OUTPUTS

Parameter	Min.	Typ.	Max.	Unit	Conditions
Output voltage high		24		V	Device powered with +24Vdc
Output voltage low		open			
Max. individual current output	1			A	
Max. totalized current output	1			A	

MODBUS RTU

Hardware protocol	RS-485
Line termination resistor	Not included

ORDERING INFORMATION

Part type	Ordering code	Description
PMM-300P	20.310.401	Distributed Protection & Monitoring Module with standard license

LICENSE OPTIONS

Part type	Ordering code	Description
OPC UA server	Var. OPCUA or 22.300.010	Enable OPC UA server for characteristics values and status
OPC UA server Advanced	Var. OPCUA-ADV or 22.300.011	Enable OPC UA server with characteristics values, status and RAW data

EXTENSION MODULE

Part type	Ordering code	Description
PMM-391P	20.391.401	Relay Extension Module
PMM-392P	20.392.401	Temperature Extension Module

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Quality certification



Local representative

MC-monitoring SA
Route André Piller 19
CH-1762 Givisiez
+41 58 411 54 00
info@mc-monitoring.com
sales@mc-monitoring.com
www.mc-monitoring.com