



Vibration & Airgap Monitoring Card

PMS-300 PLUS — PMS-314P

KEY FEATURES

- Vibration and Airgap protection and condition monitoring card for the PMS-300 PLUS rack system
- 4x dynamic input channels up to 20KHz bandwidth
- Individually configurable inputs conditioning mode with sensor power supply outputs (Voltage, Current, IEPE)
- 1x phase reference channel for tachometer input (from PMS-340/341P card)
- Synchronous sampling of input channels
- Predefined processing mode (Vibration, Airgap, etc.)
- Dual data processing path: LF & HF
 - LF: DC up to 10KHz (user configurable with IIR filter)
 - HF: DC up to 20KHz (user configurable with IIR filter)
- Spectrum analyser (1600 lines FFT) for LF and HF paths
- LF data processing rate up to 62.5ms (including FFT)
 - Windows size 1 second with overlapping(8x)
- HF data processing rate (includes FFT): 1 second
- Up to 2 alarm levels per dynamic channels with latch and delay functions
- 4x Buffered BNC Outputs for RAW signal up to 29KHz
- 4x 4-20mA analogue outputs for processing values
- 13x 0-24V digital output for alarm triggers
- 6x 0-24V digital input for OTP mode, Save, Rotation Direction, Spare, Reset Alarm, Reset System function (from PMS-340/341P card)
- Profibus DP v2, Modbus RTU/TCP and OPC UA fieldbus interfaces
- Ethernet TCP/IP communication interface to CMS-500 PLUS Orca Condition Monitoring System.
- Time synchronization through NTP server (down to 1ms)

Monitoring solution



Endwinding monitoring



Air gap monitoring



Roller bearing monitoring



Axial thrust position



Shaft & bearing vibration



DESCRIPTION

Introduction

The PMS-314P is a 5 channels (4x dynamic signals and 1x reference signal) Vibration and Airgap protection and monitoring card specially designed for operation with the rack based Protection and Monitoring System (PMS) PMS-300 PLUS.

The PMS-314P consists of processing and inputs/outputs interfaces providing condition monitoring and protection of rotating machinery such as power generation turbine, oil and gas application and auxiliary equipment's.

The card is supplied as a part of the PMS-300 PLUS rack based system and is delivered with PMx-300 PLUS Manager real time software for real time data visualisation and configuration through Ethernet via TCP/IP protocol. The Ethernet port is also used for the communication with the CMS-500 PLUS Orca for long term trending and machine health analysis.

DESCRIPTION (continued)

PMS-300 PLUS rack-based monitoring system

The PMS-300 PLUS rack-based system is the third generation of acquisition system of MC-monitoring SA. Rack-based solutions is the most common solution when a centralized monitoring system is required with a large amount of measurement points. PMS-300 PLUS is the ideal solution for monitoring and protection of large turbines and generators or when a large number of smaller machinery such as motors and fans need to be monitored.

The PMS-300 PLUS offers excellent channel density with up to 32 (up to 8x PMS-314P) measurement channels in a 3HU rack format and 64 channels (up to 16x PMS-314P) in a 6 HU rack format. Furthermore, each PMS-300 PLUS rack-based system includes a power supply card (PMS-361P) and one card including the phase reference, digital inputs interfaces and fieldbus interface (PMS-340/341P).

Each of the PMS-314P card can be independently programmed to provide continuous monitoring, protection and communication with MCM softwares for a broad spectrum of measurement parameters, including vibration, position, air gap, temperature and speed, etc.

Signal Processing

PMS-314P monitoring card 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 cards.

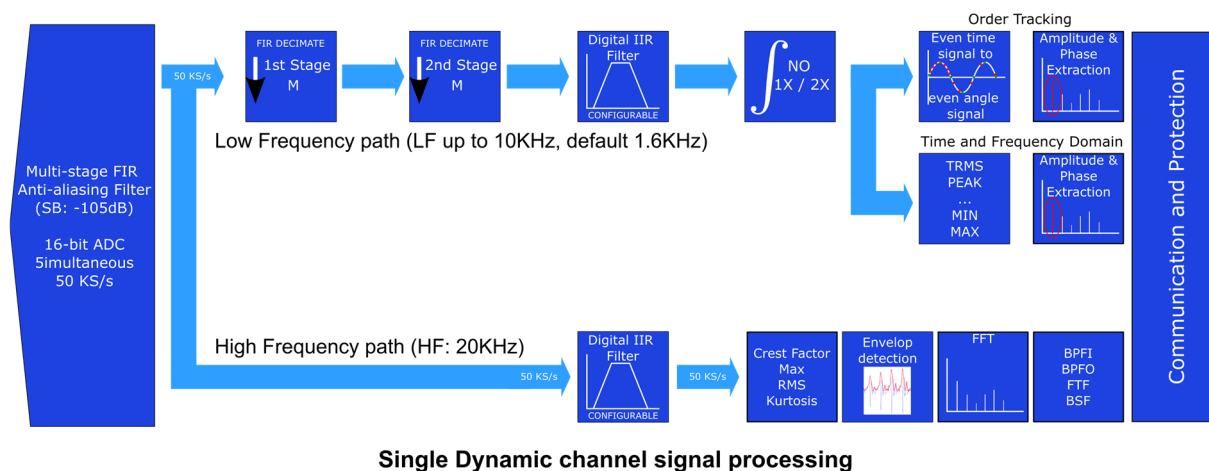
Each dynamic channel is split up in two distinct paths (LF: Low Frequency & HF: High Frequency) after the ADC.

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.



DESCRIPTION (continued)

Alarm and Status

Each dynamic channel of the PMS-314P 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 PMS-314P to drive the corresponding Digital Outputs or to trigger the relay of the PMS-361 card.

Software, Communication and Security

All PMS-314P cards 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.

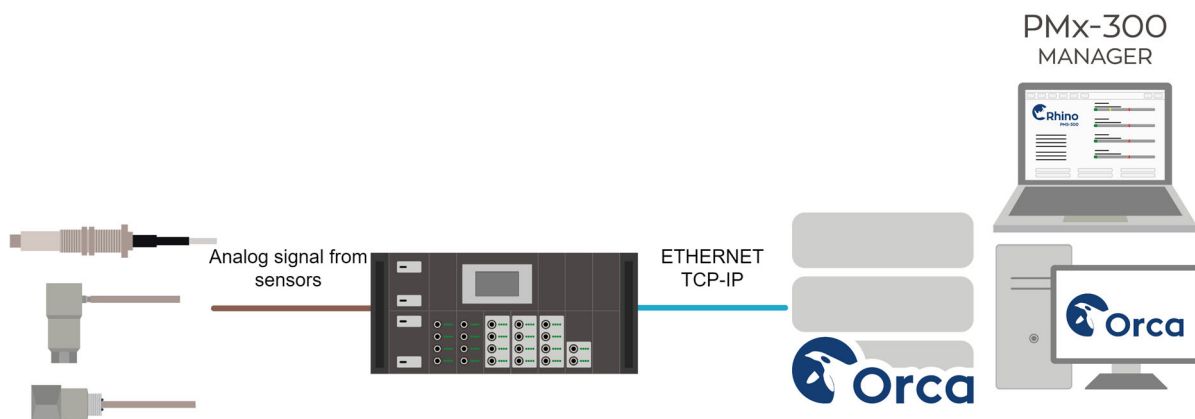
TCP/IP protocol ensures the communication with PMx-300 PLUS Manager which is used to configure and to visualize the real time data or with the CMS-500 PLUS Orca for long term trending and data analysis.

PMS-314P is fully compatible with the CMS-500 PLUS Condition Monitoring Software including storage, display and further processing of the RAW data. Data from PMS-314P are logged to a CMS-500 PLUS Orca Data Server running a PostgreSQL database and can be visualized with the CMS-500 PLUS Data Client Software.

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

Furthermore, PMS-314P can acts as a Profibus DP slave, 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 PMS-314P includes a built-in firewall which can be configured by the PMx-



PMS-314P (PMS-300 PLUS), PMx-300P Manager and CMS-500P Orca system overview

GLOBAL SPECIFICATION

POWER SUPPLIES

Inputs supply voltage	+24V _{DC} (Delivered by PMS-361P card)
Total power consumption	≤ 6W over all voltage range without sensors power supplies
Power supplies to sensors	4x (one per physical input channel) +24V _{DC} (+-1%) or -24V _{DC} (+-1%) Polarity: Both physically available on connector +1000mA and -250mA maximum
Constant current source	+4mA +-1%

MODULE DATA ACQUISITION

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 (-3dB)
Anti-aliasing filter	Multi-stage FIR filter with -105dB attenuation on stop band
Temperature deviation	±2ppm/°C at FS, 2μV/°C offset drift

DYNAMIC INPUT CHANNELS

Available conditioning mode	Voltage, Current, IEPE (single ended or differential)
Measurement range	
Voltage (AC+DC)	-24 V to +24 V
Current	-30mA to 30mA
IEPE	0V to +24V
Input coupling	DC-coupling
Input impedance	
Voltage	> 100KΩ between SIG+ and SIG- inputs
Current	250Ω +- 10Ω between SIG+ and SIG- inputs
Measurement Accuracy	
Amplitude	< 1% of full scale between 1Hz and 10KHz
Phase	< 2° between 1Hz and 200Hz, < 10° between 200Hz and 1KHz
Signal to Noise Ration (SNR)	≥ 68dB at 100Hz
Total Harmonic Distortion (THD)	≤ 0.01 % / 100Hz / 1Vrms
Common-mode rejection ratio (CMRR)	≥ 50 dB
Crosstalk attenuation	≥ 70dB

PHASE REFERENCE INPUT CHANNEL

Available conditioning mode	Voltage
Measurement range	-24 V to +24 V (DC-coupling)
Input impedance	> 100KΩ between SIG+ and SIG- inputs
Trigger method	Crossing of threshold with or without hysteresis
Triggering threshold	Rising of falling edge, configurable level
Speed measurement range	60RPM to 15'000 RPM (1Hz to 250Hz)
Measurement Accuracy	≤ 0.2% of maximum speed

GLOBAL SPECIFICATION

DIGITAL SIGNAL PROCESSING

Multi-Stage FIR anti-aliasing filter	-105dB 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 (84ms) / 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 even-time signal to even-angle signal
LF path refresh rate	Default 1s, configurable as 62.5ms,125ms,250ms,500ms, 1s and 2s
HF path refresh rate	1second

ALARM PROCESSING

Alarms	One Alert and Danger states by dynamic channel over an user selectable characteristics value.
Alarm range	Four configurable alarm range (Danger Above, Alert Above, Alert Below, Danger Below)
Alarm levels	Up to 16 different levels of alarm 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 alarms levels between 16 predefined levels.
RST AL	Digital Input to reset the latched alarms

SENSOR OK CHECK

Sensor OK range	Two user configurable range (Above and Below) for Sensor OK check based on sensor signals (+/-24V)
-----------------	--

DIGITAL INPUTS (From PMS-340/341P card)

Logical Level	+24V logic level (<3V : Low level and >12V : High 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 IN	Use for OTP mode combination
Reset System	A high level restarts the PMS-314P card

GLOBAL SPECIFICATION

BNC and RAW BUFFERED OUTPUTS

Signal	Buffered raw signal of the sensors
Bandwidth	DC to 29KHz—Low pass filtering
Scaling	1V:1V, non-inverting 250mV/mA in current mode
Minimum load on BNC	> 50K Ω
Maximum cable length on BNC	5m with typical capacitance of 100pF/m

ANALOG OUTPUTS

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

DIGITAL OUTPUTS

Outputs	13x +24V Digital outputs
Mapping	
System OK (1x)	Indicates PMS-314P card is working properly
Sensor OK (4x)	Indicates Sensor status (one per dynamic channel)
Alert (4x)	Indicates Alert status (one per dynamic channel)
Danger (4X)	Indicates Danger status (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-500 PLUS Orca Modbus TCP Server OPC UA Server
Fieldbus RS485	Profibus DP v2 / Modbus RTU Slave (configurable: 19200 to 115200) Common interface for all PMS-314P on PMS-340/341P card.

LED INDICATOR

Status (1x)	Indicates the Status of the PMS-314P (System OK)
Acquisition (1x)	Indicates if the data acquisition is running
Ethernet (1x)	Indicates the Ethernet communication status
Modbus (1x)	Indicates if the Fieldbus communication is running
Active (4x)	Indicates if the sensor is active (one per dynamic channel)
Sensor OK (4x)	Indicates the sensor status (one per dynamic channel)
Alert (4x)	Indicates Alert status (one per dynamic channel)
Danger (4x)	Indicates Danger status (one per dynamic channel)

GLOBAL SPECIFICATION

PREDEFINED OPERATING MODE

Vibration mode

4x Relative Vibration	Relative vibration monitoring according ISO 7919 method C
4x Absolute Vibration	Absolute vibration according ISO 10816 (ISO 20816 coming soon) and ISO2954

2x Relative and 2x Absolute Vib.	Mixed relative and absolute vibration for sleeve bearing monitoring
----------------------------------	---

Endwinding	Endwinding monitoring for large turbogenerator
------------	--

Airgap mode

Airgap	Four channels Airgap monitoring for hydro-generators, ring motors and gearless windmills.
--------	---

Misc. mode

AMT Pole Analysis	Special mode for Magnetic Flux and poles temperature measurement.
-------------------	---

Expert	Special mode with all calculations enabled
--------	--

Differential expansion	Measurement of expansion in steam turbine
------------------------	---

ENVIRONMENTAL CHARACTERISTICS (when used with PMS-300P rack system)

Temperature range

Operation	0°C to +55°C
-----------	--------------

Storage	-20°C to +70°C
---------	----------------

Humidity	Up to 90% (non-condensing)
----------	----------------------------

Protection rating (IEC 60529)	IP30
-------------------------------	------

APPROVALS (when used with PMS-300P rack system)

Conformity	European Union (EU) declaration of conformity (CE marking) United Kingdom (UK) declaration of conformity (UKCA marking)
------------	--

EMC	EN 61326-1
-----	------------

Electrical Safety	EN 61010-1
-------------------	------------

Environment management	RoHS compliant (2011/65/EU)
------------------------	-----------------------------

Environmental testing

Dry heat testing	IEC-60068-2-2
------------------	---------------

Damp heat steady state	IEC-60068-2-78
------------------------	----------------

Environment pollution	Degree 2, according IEC61010-1
-----------------------	--------------------------------

PHYSICAL CHARACTERISTICS

Mounting	19" / 3U Rack Mounting
----------	------------------------

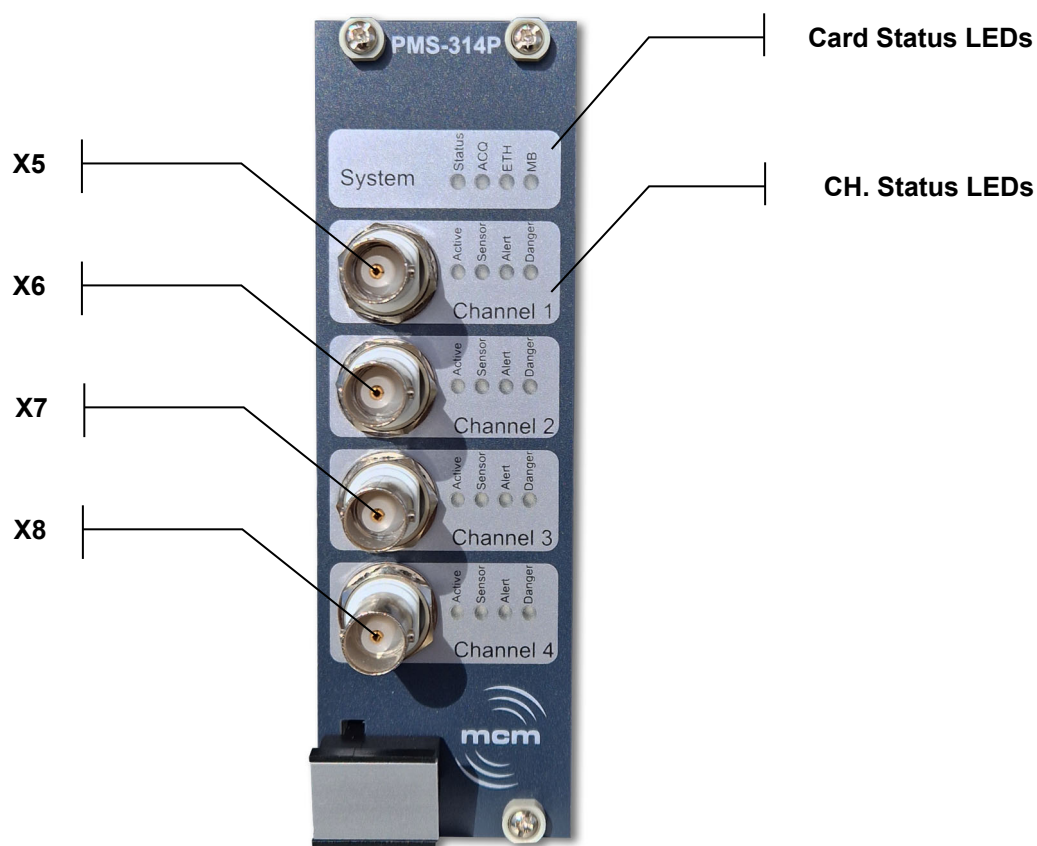
Terminals	Input and Output via push-in terminals , D-Sub14 and BNC
-----------	--

Size	Approx. h: 130mm L: 235mm l:40mm
------	----------------------------------

Weight	300g
--------	------

Ethernet cabling	Up to 100m with Augmented category 6 (Cat 6A), type S/FTP or SF/FTP
------------------	---

PINOUT DESCRIPTION



CONNECTORS

LEDs

X5 to X8

X5

X6

X7

X8

Card and Channel status

BNC

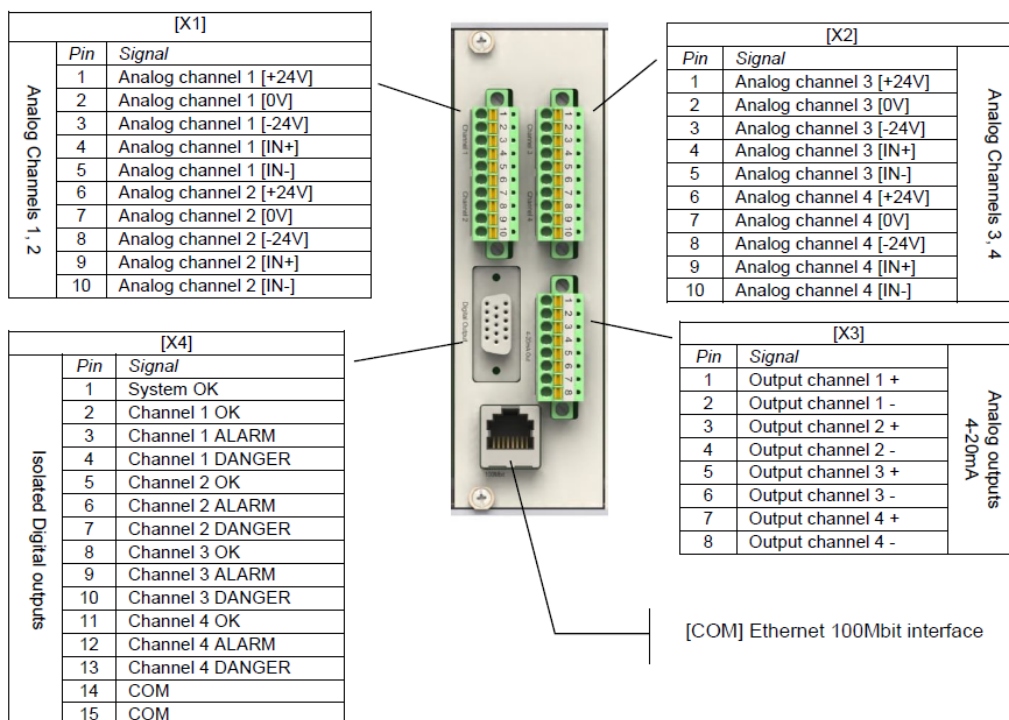
1:1 buffered RAW signal of CH1

1:1 buffered RAW signal of CH2

1:1 buffered RAW signal of CH3

1:1 buffered RAW signal of CH4

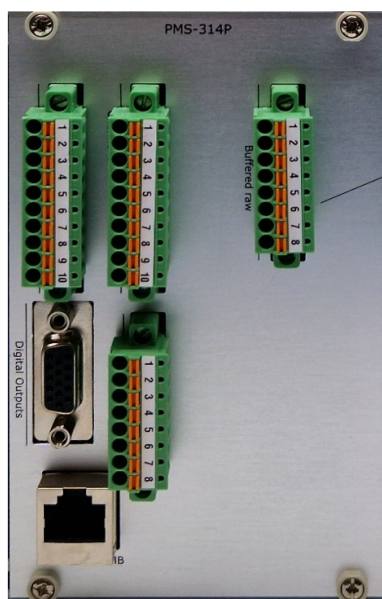
PINOUT DESCRIPTION WITHOUT RAW OUTPUTS



CONNECTORS

X1, X2	10-pin terminal strip header, push-in spring connection, clamping range 0.34mm ² to 1.5mm ²
X1.1 to X1.10	Dynamic channels inputs 1, 2 and Power Supplies (Analogue Inputs)
X2.1 to X2.10	Dynamic channels inputs 3, 4 and Power Supplies (Analogue Inputs)
X3	8-pin terminal strip header, push-in spring connection, clamping range 0.34mm ² to 1.5mm ²
X3.1 to X3.8	Analog outputs 4-20mA, Channel 1 to 4
X4	D-Sub 15
X4.1 to X4.15	Isolated Digital Outputs for card Status
COM	8P8C RJ45 connector female
Eth	TCP/IP communication and data exchange

PINOUT DESCRIPTION



[X5]		Buffered raw outputs
Pin	Signal	
1	Channel 1 raw output	
2	0V	
3	Channel 2 raw output	
4	0V	
5	Channel 3 raw output	
6	0V	
7	Channel 4 raw output	
8	0V	

CONNECTORS

X1, X2	10-pin terminal strip header, push-in spring connection, clamping range 0.34mm ² to 1.5mm ²
X1.1 to X1.10	Dynamic channels inputs 1, 2 and Power Supplies (Analogue Inputs)
X2.1 to X2.10	Dynamic channels inputs 3, 4 and Power Supplies (Analogue Inputs)
X3	8-pin terminal strip header, push-in spring connection, clamping range 0.34mm ² to 1.5mm ²
X3.1 to X3.8	Analog outputs 4-20mA, Channel 1 to 4
X4	D-Sub 15
X4.1 to X4.15	Isolated Digital Outputs for card Status
X5	8-pin terminal strip header, push-in spring connection, clamping range 0.34mm ² to 1.5mm ²
X5.1 to X5.8	Buffered raw outputs
COM	8P8C RJ45 connector female
Eth	TCP/IP communication and data exchange

ORDERING INFORMATION

Part type	Ordering code	Description
PMS-314P	20.314.401	PMS-314P Process Monitoring Card with standard FW
PMS-314P PB	20.314.402	PMS-314P Process Monitoring Card standard FW & Profibus DP v2
PMS-314P BPAW	20.314.411	PMS-314P Process Monitoring Card standard FW with buffered RAW outputs on the backplane.
PMS-314P PB BPAW	20.314.412	PMS-314P Process Monitoring Card standard FW & Profibus DP v2 with buffered RAW outputs on the backplane.

FIRMWARE OPTION

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

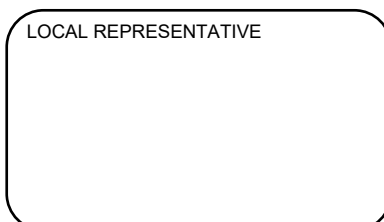
Accessories

Part type	Ordering code	Description
	<i>Coming soon</i>	

MC-monitoring Quality certifications



LOCAL REPRESENTATIVE



MC-monitoring SA
Route André Piller 19
CH-1762 Givisiez | Switzerland
Phone : +41 58 411 54 00
Mail : info@mc-monitoring.com
sales@mc-monitoring.com
Web : mc-monitoring.com