

## PM130 PLUS DATASHEET



### Multi-Functional Power Meter

The PM130 PLUS is a compact, multi-function power-meter, designed for metering three-phase AC current or three DC current circuits.

Featuring versatile I/O options, communication ports and protocols it is suitable for integration in utility substation or industrial SCADA systems.

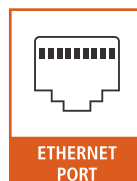
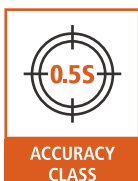
#### DIRECT DC METERING

Direct metering of DC systems (via Hall Effect sensors) is available in the PM130, featuring high accuracy.

### HIGHLIGHTS

- ▶ **Accuracy:** Class 0.5/0.5S per ANSI/IEC 62053-22, optional calibration as Class 0.2S
- ▶ **Communication:**
  - ▶ Built-in port: standard RS-485
  - ▶ Optional ports: ETH; 3G/4G cellular; Profibus
  - ▶ Open protocol: Modbus RTU, DNP3.0, IEC 60870-5-101/104
- ▶ **Digital and Analog I/O Modules:** up to 16 I/O
- ▶ **Dual Mounting:** suitable for 4-inch round and 92x92mm square cutouts
- ▶ **Broad-range frequency measurement:** 25-400 Hz
- ▶ **LED Bar-graph:** Displays load as percentage of nominal current

### MODULAR VERSATILITY



## FEATURES

### MULTIFUNCTIONAL 3-PHASE POWER METER

- ▶ True RMS volts, amps, power, power factor, neutral current, angles and unbalance for voltage and current, frequency and many more
- ▶ Symmetrical components
- ▶ Ampere/Volt demand meter
- ▶ 25, 50, 60 and 400 Hz measurements @ 3 decimal digit values
- ▶ 128 samples per cycle

### BILLING/TOU ENERGY METER (PM130E & PM130EH)

- ▶ Accuracy
  - ▶ Class 0.5S per IEC 62053-22
  - ▶ Class 0.2S as optional calibration
  - ▶ Class 0.2 per IEC 61557-12
  - ▶ Class 0.5 per ANSI C12.20
- ▶ Four-quadrant active and reactive energy polyphase static meter
- ▶ Three-phase total and per phase energy measurements; active, reactive and apparent energy counters
- ▶ Time-of-Use, 4 totalization and tariff energy/demand registers x 8 tariffs, 4 seasons x 4 types of days, 8 tariff changes per day,
- ▶ Easy programmable tariff calendar schedule
- ▶ Automatic daily energy and maximum demand profile log for total energy and tariff registers

### HARMONIC ANALYZER (PM130EH)

- ▶ individual voltage & current harmonic spectrum and harmonic angles up to 40<sup>th</sup> order harmonic
- ▶ Voltage and current THD, TDD and K-Factor

## MODELS

- PM130P** Basic model offering voltage, current, power and frequency measurements
- PM130E** Offers all the features above, as well as energy measurements and data logging (available in certain regions only).
- PM130EH** Offers all the features above, as well as harmonic analysis

All models offer identical communication and control features.

### REAL-TIME WAVEFORM CAPTURE

- ▶ Real-time “scope mode” waveform monitoring via PAS software

### PROGRAMMABLE LOGICAL CONTROLLER

- ▶ Embedded programmable controller
- ▶ 16 control setpoints; programmable thresholds and delays
- ▶ Relay output control
- ▶ 1-cycle response time

### EVENT AND DATA RECORDING (PM130E & PM130EH)

- ▶ non-volatile memory for timestamped event and data recording: 48 days for 2 daily TOU records, half-hourly writing of 4 parameters and recording over 100 events during the entire period

- ▶ Event recorder for logging internal diagnostic events and setup changes
- ▶ Two data recorders; programmable data logs on a periodic basis; automatic daily energy log and maximum demand profile

## VOLTAGE INPUT OPTIONS

- ▶ Direct Measurement:
    - 0-690V AC
    - 0-670V DC\*
- \* extended range up to 1500V DC is possible via SATEC VRM

## CURRENT OPTIONS

- ▶ 1A or 5A inputs from CT secondary
- ▶ 40mA input designed for SATEC HACs CTs (100-3000A options)
- ▶ DC metering: current measurements using Hall Effect Sensors. meter accuracy: 0.5%. System accuracy set by implemented sensor
- ▶ RS: unique input for 5A rated HACs CT

## DIGITAL AND ANALOG I/O

Available I/O modules:

- ▶ **TOD (TOU+4DI)**: four digital inputs with 1-ms scan time and battery backup for real time clock; automatic recording of last five digital input change events with timestamps (see the PM130 PLUS Modbus Reference Guide)
- ▶ **DIOR**: 4 digital inputs and 2 relay outputs with 1-cycle update time; unlatched, latched, pulse and KYZ operation; energy pulses, selection of solid state or electromechanical relays
- ▶ **12DIOR**: 12 digital inputs, 4 relay outputs (incl. optional ETH port or additional RS485 port)

- ▶ **4AO**: four optically isolated analog outputs with an internal power supply; selection of 0-20mA, 4-20mA, 0-1mA, and  $\pm 1$ mA output; 1 cycle update time.
- ▶ **8DI**: eight digital inputs with 1-ms scan time

## COMMUNICATION

- ▶ On-board interface
  - ▶ Standard 2-wire RS-485
- ▶ Optional interfaces
  - ▶ ETH (10/100Base T)
  - ▶ 2G/3G cellular modem
  - ▶ Multipurpose RS-232/422/485
  - ▶ PROFIBUS
  - ▶ RF (certain regions only)
- ▶ Client (Modbus/TCP over ETH or 3G/4G)
  - ▶ TCP notification client for communicating events or periodic reports to remote server
  - ▶ Expertpower client on subscription basis
- ▶ Communication protocols
  - ▶ Modbus RTU
  - ▶ SATEC ASCII
  - ▶ DNP 3.0 (Level 2)
  - ▶ IEC 60870-5-101 (optional)
  - ▶ IEC 60870-5-104 (optional)

## DISPLAY

- ▶ Easy to read 3-row (2x4 digits + 1x5 digits) bright LED display
- ▶ Adjustable display brightness and update rate
- ▶ Auto-scroll option with adjustable page; auto-return to a default page
- ▶ LED bar-graph displaying load as percentage of nominal load current (user-definable)

### METER SECURITY

- ▶ Password security for protecting meter setups and accumulated data from unauthorized changes

### UPGRADEABLE FIRMWARE

- ▶ Device firmware is easily upgraded through the serial or Ethernet port

### SOFTWARE SUPPORT

- ▶ SATEC's Power Analysis Software (PAS) for comprehensive configuration and data acquisition is available for download (free): [www.satec-global.com/power-analysis-software](http://www.satec-global.com/power-analysis-software). Always make sure to update .exe file with latest version on webpage
- ▶ SATEC's Expertpower web-based energy management platform (subscription). Please visit [www.satec-global.com/Expertpower](http://www.satec-global.com/Expertpower)
- ▶ Any 3<sup>rd</sup> party software supporting open-protocol

### REAL-TIME CLOCK

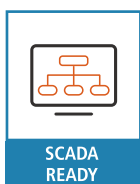
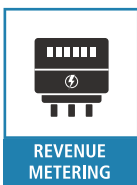
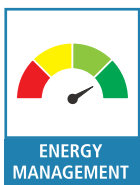
- ▶ Internal clock with 20-second retention time
- ▶ Optional battery backup (TOU+4DI module)

### UNIQUE DESIGN

- ▶ Pass through CT connection
- ▶ Built-in auxiliary terminal for loose CT wires.
- ▶ Dual panel mounting: 92x92mm square or 4" round cutout



## APPLICATIONS



## TECHNICAL SPECIFICATIONS

### INPUT RATINGS

#### VOLTAGE INPUTS

|                           |   |
|---------------------------|---|
| Nominal voltage (L-N/L-L) | 57.7/100V AC<br>120/208V AC<br>120/240V AC<br>230/400V AC<br>277/480V AC<br>400/690V AC |
| Operating range (L-N/L-L) | Direct input and input via PT<br>15- 480V AC / 15-828V AC                               |
| Burden for 400V           | < 0.4 VA  |
| Burden for 120V           | < 0.04 VA   |
| Over-voltage withstand    | 1000V AC continuous, 2000V AC for 1 second  |
| Input impedance           | 1 MΩ  |
| Wire size                 | up to 12 AWG (up to 3.5mm <sup>2</sup> )  |

### CURRENT INPUTS (VIA CT)

|                    |                                     |
|--------------------|-------------------------------------|
| Wire size          | 12 AWG (up to 3.5 mm <sup>2</sup> ) |
| Galvanic isolation | 3500V AC                            |

#### 5A SECONDARY

|                    |   |
|--------------------|---|
| Operating range    | Continuous 10A RMS  |
| Burden             | < 0.2 VA @ In=5A (with 12AWG wire and 1 m long)                     |
| Overload withstand | 15A RMS continuous, 300A RMS for 1 second (with 12AWG section wire) |

#### 1A SECONDARY

|                    |   |
|--------------------|---|
| Operating range    | Continuous 2A RMS   |
| Burden             | < 0.02 VA @ In=1A (with 12AWG wire and 1 m long)                  |
| Overload withstand | 3A RMS continuous, 80A RMS for 1 second (with 12AWG section wire) |

### REMOTE SENSORS (HACS) / DC

HACS: Depends on sensor rating.  
For details see [HACS web page](#) (datasheet available online)

DC: 40mA for Hall Sensors.  
Current range is determined by sensor rating

### SAMPLING RATE MEASUREMENT

|               |                   |
|---------------|-------------------|
| Sampling rate | 128 samples/cycle |
|---------------|-------------------|

### POWER SUPPLY

|                       |   |
|-----------------------|---|
| 120/230V AC-DC Option | » Rated input:<br>88-290V DC, Burden 9VA,<br>85-265V AC 50/60/400 Hz<br>Isolation: 1500V DC<br>» Input to ground: 2500V AC      |
| 12V DC Option         | » Rated input:<br>9.5-18V DC, Burden 4VA<br>» Isolation: 1500V DC   |
| 24/48V DC Option      | » Rated input:<br>18.5-58V DC, Burden 4VA<br>» Isolation: 1500V DC<br>» Wire size:<br>up to 12 AWG (up to 3.5 mm <sup>2</sup> ) |

### OPTIONAL MODULAR I/O

#### ELECTROMECHANICAL RELAY

|                    |   |
|--------------------|---|
| Dry contact        | 1 contact (SPST Form A)   |
| Rating             | 5A/250V AC; 5A/30V DC   |
| Galvanic isolation | » Between contacts and coil:<br>3000V AC @ 1 min<br>» Between open contacts:<br>750V AC |
| Operate time       | 10 ms max   |
| Release time       | 5 ms max  |
| Update time        | 1 cycle   |
| Wire size          | 14 AWG (up to 1.5 mm <sup>2</sup> )   |

#### SOLID STATE RELAY

|                    |                                     |
|--------------------|-------------------------------------|
| Dry contact        | 1 contact (SPST Form A)             |
| Rating             | 0.15A/250V AC/DC                    |
| Galvanic isolation | 3750V AC @ 1 min                    |
| Operate time       | 1 ms max                            |
| Release time       | 0.25 ms max                         |
| Update time        | 1 cycle                             |
| Connector type     | Removable, 4 pins                   |
| Wire size          | 14 AWG (up to 1.5 mm <sup>2</sup> ) |

\* Measuring up to 3000V DC is possible via adapter

## DIGITAL INPUTS

Dry Contacts, internally wetted @ 24V DC or Wet contact @ 250V DC (12DI/4DO only)

|                       |  |
|-----------------------|--|
| Sensitivity           | Open @ input resistance >100 k $\Omega$ , Closed @ Input resistance < 100 $\Omega$ |
| Galvanic isolation    | 3750V AC @ 1 min   |
| Internal power supply | 24V DC, 4DI/2DO or 12DI/4DO  |
| External power supply | 250V DC (12DI/4DO only supply)   |
| Scan time             | 1 ms   |
| Connector type        | Removable, 5 pins  |
| Wire size             | 14 AWG (up to 1.5 mm <sup>2</sup> )  |

## ANALOG OUTPUTS

|                     |   |
|---------------------|---|
| Ranges (upon order) | <ul style="list-style-type: none"> <li>» <math>\pm 1</math> mA, max. load 5 k<math>\Omega</math> (100% overload)</li> <li>» 0-20 mA, max. load 510 <math>\Omega</math></li> <li>» 4-20 mA, max. load 510 <math>\Omega</math></li> <li>» 0-1 mA, max. load 5 k<math>\Omega</math> (100% overload)</li> </ul> |
| Isolation           | 2500V AC @ 1 min  |
| Power supply        | Internal  |
| Accuracy            | 0.5% FS   |
| Update time         | 1 cycle   |
| Connector type      | Removable, 5 pins   |
| Wire size           | 14 AWG (up to 1.5 mm <sup>2</sup> )   |

## COMMUNICATION PORTS

### COM1 (BUILT IN)

|                                |  |
|--------------------------------|--|
| RS-485 optically isolated port |  |
| Isolation                      | 3000V AC @ 1 min                               |
| Baud rate                      | up to 115.2 kbps                               |
| Supported protocols            | Modbus RTU, DNP3, SATEC ASCII, IEC 60870-5-101 |
| Connector type                 | Removable, 3 pins                              |
| Wire size                      | Up to 14 AWG (up to 1.5 mm <sup>2</sup> )      |

### COM2 (OPTIONAL MODULE)

#### ETHERNET PORT

(as independent module OR add-on to 12DIOR module)

|  |   |
|--|---|
| Transformer-isolated 10/100BaseT Ethernet port |   |
| Supported protocols                            | Modbus/TCP (Port 502), IEC 60870-5-104, DNP3/TCP (Port 20000) |
| Num. of simultaneous connections               | 4 (2 Modbus/TCP + 2 DNP3/TCP)                                 |
| Connector type                                 | RJ45 modular  |
| Isolation                                      | 1,500V DC @ 1min  |

#### CELLULAR PORT

|                     |  |
|---------------------|--|
| Supported protocols | Modbus/TCP (Port 502), DNP3/TCP (Port 20000) |
| Connector type      | SMA  |

#### PROFIBUS DP (IEC 61158)

|  |   |
|--|---|
| RS-485 optically isolated Profibus interface |   |
| Connector type                               | Removable, 5 pins                       |
| Baud rate                                    | 9600 bit/s – 12 Mbit/s (auto detection) |
| 32 bytes input, 32 bytes output              |   |
| Supported protocols                          | PROFIBUS DP                             |

#### RS-232/422-485 PORT

|  |   |
|--|---|
| RS-232 or RS-422/485 optically isolated port |   |
| Isolation                                    | 3000V AC @ 1 min                                    |
| Baud rate                                    | Up to 115.2 kbps                                    |
| Supported protocols                          | Modbus RTU, DNP3, SATEC ASCII, IEC 60870-5-101      |
| Connector type                               | Removable, 5 pins for RS-422/485 and DB9 for RS-232 |
| Wire size                                    | Up to 14 AWG (up to 1.5 mm <sup>2</sup> )           |

## ADDITIONAL SPECIFICATIONS

### REAL TIME CLOCK

|                        |   |
|------------------------|---|
| Standard Meter Clock   | <ul style="list-style-type: none"> <li>» Non-backed clock</li> <li>» Accuracy—typical error: @ 1 minute per month @ 25°C</li> <li>» Typical clock retention time: 30 seconds</li> </ul>                             |
| TOU Module Meter Clock | <ul style="list-style-type: none"> <li>» Battery-backed clock</li> <li>» Accuracy—typical error: 7 seconds per month @ 25°C (<math>\pm 2.5</math>ppm)</li> <li>» Typical clock retention time: 36 months</li> </ul> |

## DISPLAY

High-brightness seven-segment digital LEDs, two 4-digit + one 5 digit windows

3 color LED load bar graph (40-110%)

Keypad 6 push buttons

## ENVIRONMENTAL CONDITIONS

Operating temperature -30°C to 60°C (-22°F to 140°F)

Storage temperature -40°C to 85°C (-40°F to 185°F)

Humidity 0 to 95% non-condensing

## CONSTRUCTION

Weight 0.70kg (1.54 lb.)

Dimensions [HxWxD] 114x114x109mm (4.5x4.5x4.3")

## MATERIALS

Case enclosure plastic PC/ABS blend

Front panel plastic PC

PCB FR4 (UL94-V0)

Terminals PBT (UL94-V0)

Connectors-Plug-in type Polyamide PA6.6 (UL94-V0)

Packaging case Carton and Stratocell® (Polyethylene Foam) brackets

Labels Polyester film (UL94-V0)

## STANDARDS COMPLIANCE

### ACCURACY

- ▶ Complies with IEC62053-22, class 0.2S
- ▶ Meets ANSI C12.20 –1998, class 10 0.5%
- ▶ Complies with IEC 61557-12 (PMD):
  - ▶ Total Apparent Power 0.2
  - ▶ Total Active Energy 0.5/0.2
  - ▶ Total Reactive Energy 0.5
  - ▶ Frequency 0.05
  - ▶ Current 0.2
  - ▶ Neutral Current 0.2
  - ▶ Voltage 0.2
  - ▶ Power Factor 0.2
  - ▶ THDV, THDI 1

### ELECTROMAGNETIC IMMUNITY

Complies with IEC 61000-6-2:

- ▶ IEC 61000-4-2 level 3: Electrostatic Discharge
- ▶ IEC 61000-4-3 level 3: Radiated Electromagnetic RF Fields
- ▶ IEC 61000-4-4 level 3: Electric Fast Transient
- ▶ IEC 61000-4-5 level 3: Surge

- ▶ IEC 61000-4-6 level 3: Conducted Radio Frequency
- ▶ IEC 61000-4-8: Power Frequency Magnetic Field
- ▶ Meets ANSI/IEEE C37.90.1: Fast Transient SWC

### ELECTROMAGNETIC EMISSION

- ▶ Complies with IEC 61000-6-4: Radiated/Conducted class A
- ▶ Complies with IEC CISPR 22: Radiated/Conducted class A

### SAFETY/CONSTRUCTION

- ▶ UL File no. E236895
- ▶ Meets IEC 61010-1: 2006

### AC AND IMPULSE INSULATION

- ▶ Complies with IEC 62052-11: 2500V AC during 1 minute
- ▶ 6KV/500Ω @ 1.2/50 μs impulse

## ORDER STRING

### MODELS

|                             |                     |
|-----------------------------|---------------------|
| Power Version               | <b>PM130P-PLUS</b>  |
| Energy Only                 | <b>PM130E-PLUS</b>  |
| Energy and Harmonic Version | <b>PM130EH-PLUS</b> |

### OPTIONS

#### CURRENT INPUTS

|   |             |
|---|-------------|
| 5 Ampere  | <b>5</b>    |
| 1 Ampere  | <b>1</b>    |
| 5A split core remote high accuracy current sensor (HACS), 50/60Hz only          | <b>RS5</b>  |
| High Accuracy Current Sensors (HACS), 50/60Hz only. Requires ordering of 3 HACS | <b>HACS</b> |

#### CALIBRATION AT FREQUENCY

|         |              |
|---------|--------------|
| 25 Hz*  | <b>25HZ</b>  |
| 50 Hz   | <b>50HZ</b>  |
| 60 Hz   | <b>60HZ</b>  |
| 400 Hz* | <b>400HZ</b> |

#### DISPLAY RESOLUTION

|                             |          |
|-----------------------------|----------|
| Low Resolution 1A, 1V       | <b>-</b> |
| High Resolution 0.01A, 0.1V | <b>H</b> |

#### POWER SUPPLY

|                              |             |
|------------------------------|-------------|
| 85-265V AC and 85-290V DC    | <b>ACDC</b> |
| 9.5-18V DC                   | <b>1DC</b>  |
| 18.5-58V DC (24V DC, 48V DC) | <b>23DC</b> |

#### COMMUNICATION PROTOCOL

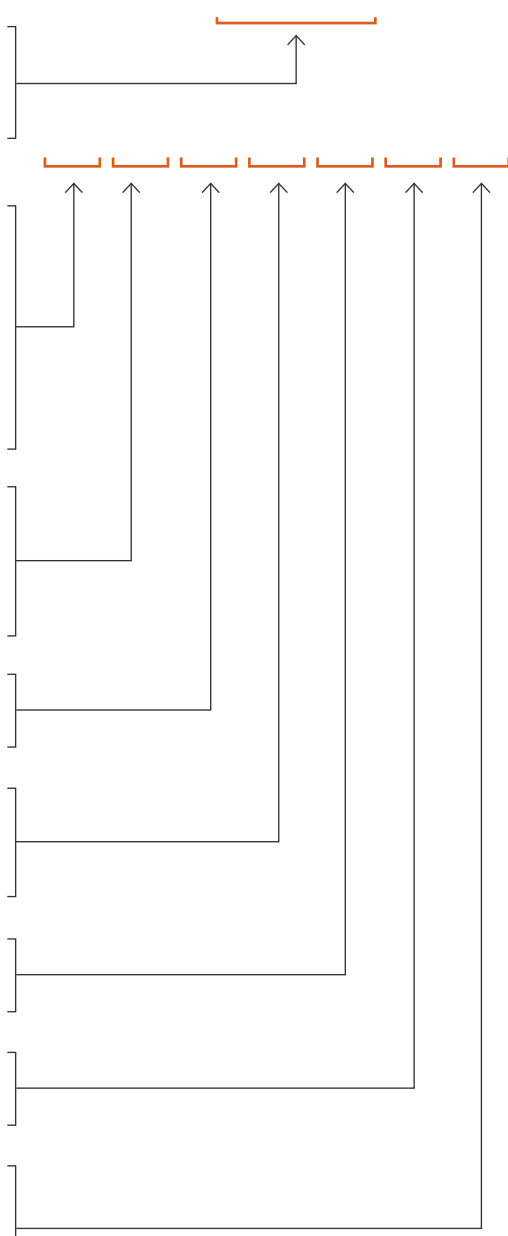
|                                  |            |
|----------------------------------|------------|
| Modbus and DNP 3.0               | <b>-</b>   |
| Modbus and IEC 60870-5-101/104** | <b>870</b> |

#### MOUNTING

|                        |            |
|------------------------|------------|
| Panel Mount (standard) | <b>-</b>   |
| DIN Rail Mounting      | <b>DIN</b> |

#### TESTING AND CERTIFICATE

|  |           |
|--|-----------|
| Full functional test, calibration at various work loads & detailed test report | <b>-</b>  |
| All of the above plus ISO 17025 and ILAC certified calibration certificate     | <b>CC</b> |



### NOTES

- \* Supports 1A and 5A models only
- \*\* -104 requires ETH, does NOT work over cellular network



## EXPANSION MODULE \*

### ANALOG OUTPUTS

|                          |            |
|--------------------------|------------|
| 4 Analog Outputs: ±1mA   | <b>AO1</b> |
| 4 Analog Outputs: 0-20mA | <b>AO2</b> |
| 4 Analog Outputs: 0-1mA  | <b>AO3</b> |
| 4 Analog Outputs: 4-20mA | <b>AO4</b> |
| 4 Analog Outputs: 0-3mA  | <b>AO5</b> |
| 4 Analog Outputs: ±3mA   | <b>AO6</b> |
| 4 Analog Outputs: 0-5mA  | <b>AO7</b> |
| 4 Analog Outputs: ±5mA   | <b>AO8</b> |

### ADDITIONAL COMMUNICATION PORTS

|  |               |
|--|---------------|
| Communication: Ethernet (TCP/IP)   | <b>ETH</b>    |
| Communication: PROFIBUS  | <b>PRO</b>    |
| Communication: RS232/422/485   | <b>RS232</b>  |
| Communication: 2G/3G GSM Modem**   | <b>T3G</b>    |
| Communication: 4G Modem **<br>x: G=Europe; V=Verizon (US); A=AT&T (US);<br>T=Telstra (AUS) | <b>T4x</b>    |
| Communication: RF  | <b>RF-x-y</b> |

### DIGITAL INPUTS

|  |             |
|--|-------------|
| 4 Digital Inputs (Dry Contact) /<br>2 Relay Outputs 250V / 5A AC | <b>DIOR</b> |
| 4 Digital Inputs (Dry Contact) /<br>2 SSR Outputs 250V / 0.1A AC | <b>DIOS</b> |
| 4 Digital Inputs (Dry Contact) /<br>TOU / RTC Battery            | <b>TOD</b>  |
| 8 Digital Inputs (Dry Contact)                                   | <b>8DI</b>  |

### 12 DI 4 RO MODULE

|   |                                       |
|---|---------------------------------------|
| 12 Digital Inputs / 4 Relay Outputs 250V/5A AC                  | <b>12DIOR</b>                         |
| Digital Inputs Rating - Dry Contact (DRC),<br>48V, 125V or 250V | <b>DRC or 48V or<br/>125V or 250V</b> |

### 12 DIOR module communication port:

|          |            |
|----------|------------|
| None     | <b>-</b>   |
| RS-485   | <b>485</b> |
| Ethernet | <b>ETH</b> |
| CAN      | <b>CAN</b> |



## NOTES

- \* Max. 1 module per instrument. Can be ordered separately.
- \*\* Does not support 870 protocol. Supplied with bendable antenna.