# Easergy P5
# Range description

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# Overview

Easergy P5 protection relay is based on proven technology concepts and developed in close cooperation with customers, so it's built to meet your toughest demands:

- Modular design that allows user-defined conventional protection and arc-flash protection solutions.
- Compatible with conventional CTs/VTs or low power instrument transformers LPCT/LPVT compliant to IEC 61869-10 and IEC 61869-11 standards.
- Embeds latest cybersecurity functionality to help prevent intentional mis-use and cyber-threats.
- Fast replacement with enhanced safety thanks to withdrawability and back-up memory that automatically restore parameters without using any configuration tools.

Easergy products are designed to be user friendly, a feature that is proven in our customer reports day after day. You'll benefit from features that include:

- A complete set of protection functions, related to the application.
- Arc-flash detection in Easergy P5x30 models.
- Dedicated circuit breaker control with single-line diagram, push buttons, programmable function keys, LEDs, and customizable alarms.
- Multilingual HMI for customized messaging.
- Settings tool relay management software for setting parameters, configuring, and network fault simulation.
- Both serial and Ethernet communication, including redundancy.
- IEC 61850 standard Edition1 & Edition 2.

Easergy P5 is available in two sizes to best fit your needs:

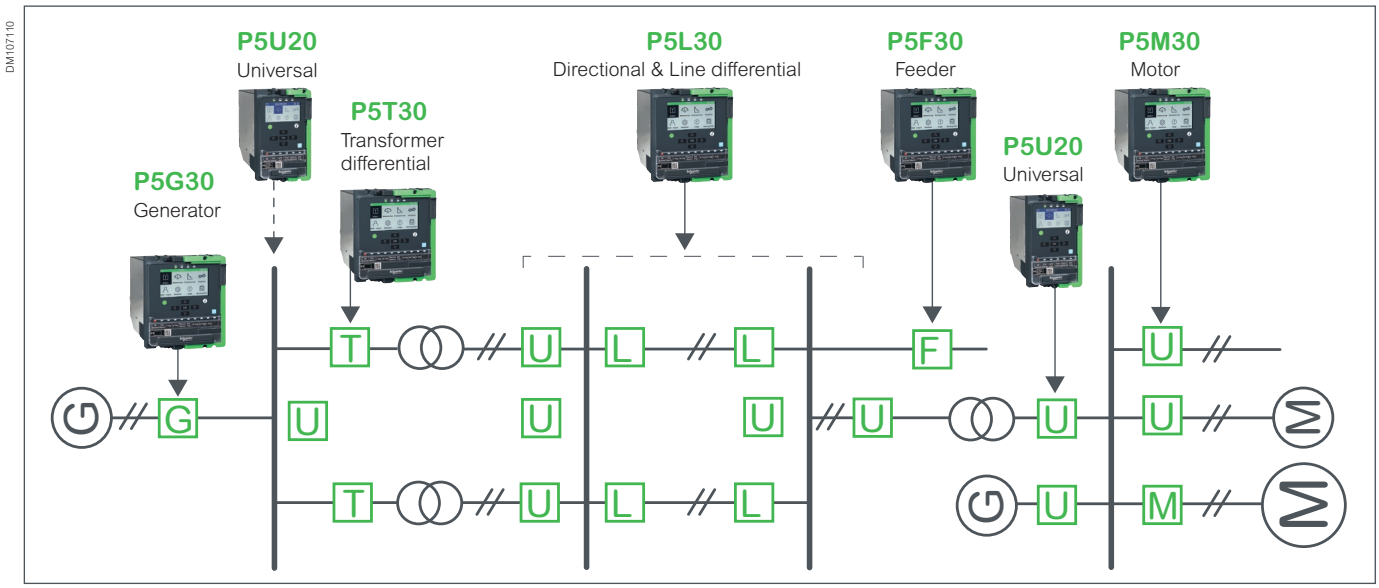
Easergy P5x20

Easergy P5x30

Easergy P5 digital protection relays are designed for power distribution networks in:

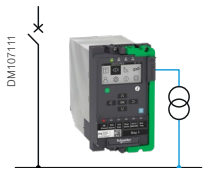
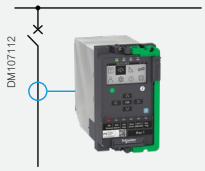
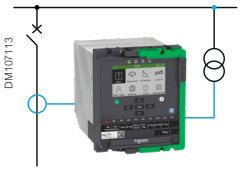
- Utilities - Energy distribution
- Critical buildings and Industry:
  - Healthcare
  - Transportation
  - Industrial buildings
  - Data Center
- Large industrial processes:
  - Oil and Gas
  - Mining
  - Mineral and Metals
  - Water

## Range overview



# Selection guide

**Easergy P5 contains two main devices, each with specific functions to address your needs in a one-box design, regardless of application.**

| | | Easergy P5x20 | | Easergy P5x30 |
|---|---|---|---|---|
| | |   |   |   |
| **Voltage** | | P5V20 | - | - |
| **Feeder** | | - | P5U20 with directional in LPCT/LPVT version | P5F30 with directional |
| **Transformer** | | | | - |
| **Motor** | | | | P5M30 |
| **Characteristics** | | | | |
| Measuring inputs | Phase current | - | 1/5A CT (x3) or LPCT (x3) (1) | 1/5A CT (x3) or LPCT (x3) |
| | Residual current | - | 1/5A CT & 1A CT or CSH core balance CT | 1/5A CT & 1A CT or CSH core balance CT |
| | Voltage | VT (x4) | LPVT (x4) (1) | VT (x4) or LPVT (x4) |
| Arc-flash sensor inputs | | - | | 0 to 6 point sensors |
| Digital | Inputs | 4 to 10 | | 4 to 22 |
| | Outputs | 3 to 7 + Watchdog (WD) | | 3 to 15 + Watchdog (WD) |
| Temperature sensor input | | - | 0 to 16 (external modules) | 0 to 16 (external modules) |
| Front ports | | 1 USB for configuration 1 USB for USB key | | 1 USB for configuration 1 USB for USB key |
| Power supply | | 24-250 VDC ; 100-230 VAC | | 48-250 VDC ; 100-230 VAC |
| Ambient temperature, in service | | -40 to 70°C (-40 to 158°F) | | -40 to 70°C (-40 to 158°F) |
| **Communication** | | | | |
| Hardware modules | Extension(2) + Backup memory | ● | | ● |
| | Serial | ● | | ● |
| | Ethernet | ● | | ● |
| | 2nd Ethernet | - | | ● |
| Protocols | IEC 61850 Ed.1 & Ed.2 | ● | | ● |
| | IEC 60870-5-103 & 101 | ● | | ● |
| | DNP3 Ethernet | ● | | ● |
| | DNP3 serial | ● | | ● |
| | Modbus Ethernet | ● | | ● |
| | Modbus serial | ● | | ● |
| | EtherNet IP | ● | | ● |
| Redundancy protocols | RSTP | ● | | ● |
| | PRP / HSR | ● | | ● |
| **Others** | | | | |
| Control | | 6 controlled + 2 monitored objects Mimic | | 6 controlled + 2 monitored objects Mimic |
| Logic (Matrix + Logic Equations) | | ● | | ● |
| Cybersecurity | | ● | | ● |
| Draw-out device (withdrawability) | | ● | | ● |
| Hardware dimensions (H/W/D) | | 102 / 176 / 219 mm 4.01 / 6.93 / 8.62 in | | 152 / 176 / 219 mm 6.0 / 6.93 / 8.62 in |

(1) In case P5U20 is choosen for cooperation with low power sensors, it contains LPCT (x3) and LPVT (x4) channels
(2) for connection of RTD module and IRIG-B module

# Selection guide by functionality

| Protection Functions | ANSI code | IEC 61850 Logical Node | P5V20 | P5U20 | P5U20 LPCT/LPVT | P5F30 | P5M30 |
|---|---|---|---|---|---|---|---|
| Current protection | | | | | | | |
| Phase overcurrent | 50/51 | OC**PTOC** | - | 3 | 3 | 3 | 3 |
| Earth/ground fault overcurrent (1) | 50N/51N | EF**PTOC** | - | 5 / 8 | 3 | 5 / 8 | 5 / 8 |
| Directional phase overcurrent | 67 | DOC**PTOC** | - | - | 4 | 4 | 4 |
| Directional earth/ground fault overcurrent | 67N | DEF**PTOC** | - | - | 3 | 3 | 3 |
| Transient intermittent/ground fault | 67NI | IOIO**PTEF** | - | - | - | 1 | - |
| Neutral admittance | 21YN | EF**PADM** | - | - | - | 2 | 2 |
| Negative sequence overcurrent | 46 (I2/I1) | NEG**PTOC** | - | 1 | 1 | 1 | 1 |
| Current unbalance, Broken conductor | 46BC (I2) | UIBC**PTOC** | - | 1 | 1 | 1 | - |
| Breaker failure | 50BF | CBFP**PIOC** | 1 | 1 | 1 | 1 | 1 |
| Phase undercurrent | 37 | UC**PTUC** | - | 1 | 1 | - | 1 |
| Switch on to fault (SOTF) | 50HS | | - | 1 | 1 | 1 | 1 |
| Cold load pickup (CLP or CLPU) | | | - | 1 | 1 | 1 | 1 |
| Voltage protection | | | | | | | |
| Undervoltage | 27 | UV**PTUV** | 3 | - | 3 | 3 | 3 |
| Overvoltage | 59 | OV**PTOV** | 3 | - | 3 | 3 | 3 |
| Earth/ground fault overvoltage | 59N | UO**PTOV** | 3 | - | 3 | 3 | 3 |
| Negative sequence overvoltage | 47 | NEG**PTOV** | 2 | - | 2 | 2 | 2 |
| Frequency protection | | | | | | | |
| Over and/or underfrequency | 81 | OFUF**PTOF** | 2 | - | 2 | 2 | 2 |
| Underfrequency | 81U | UF**PTUF** | 2 | - | 2 | 2 | 2 |
| Rate of change of frequency | 81R | DFDT**PFRC** | 2 | - | 2 | 2 | - |
| Thermal protection | | | | | | | |
| Thermal overload | 49 | THF**PTTR** | - | 1 | 1 | 1 | 1 |
| Temperature monitoring | 38 | RTD**GAPC** | - | 16 | 16 | 16 | 16 |
| Power protection | | | | | | | |
| Wattmetric earth/ground fault | 32N | EF**PDOP** | - | - | - | 2 | 2 |
| Directional active underpower | 32/37N | REVP**PDOP** | - | - | - | 2 | 2 |
| Rotating machine protection | | | | | | | |
| Frequent start inhibition | 66 | FST**PMRI** | - | 1 | 1 | - | 1 |
| Motor start-up supervision, locked rotor | 48/51LR | STAL**PMSS** | - | 1 | 1 | - | 1 |
| Positive sequence undervoltage | 27P | UVPS**PTUV** | 2 | - | - | - | 2 |
| Line protection | | | | | | | |
| Fault locator | 21FL | FL**RFLO**/ SC**RFLO** | - | - | - | 1 | - |
| Auto-Recloser | 79 | AR**RREC** | - | 1 | 1 | 1 | - |
| Transformer protection | | | | | | | |
| Magnetizing inrush detection | 68H2 | HAR2**PTOC** | - | 1 | 1 | 1 | 1 |
| Fifth harmonic detection | 68H5 | HAR5**PTOC** | - | 1 | 1 | 1 | 1 |
| Capacitor protection | | | | | | | |
| Capacitor bank unbalance | 51C | | - | 2 | - | 2 | - |
| Capacitor overvoltage | 59C | | - | 1 | - | 1 | - |
| Other protection | | | | | | | |
| Arc-flash detection | 50ARC | ARCM**PIOC** | - | - | - | 8 | 8 |
| Programmable stages | 99 | PS**GAPC** | 8 | 8 | 8 | 8 | 8 |
| Programmable curves | | | 3 | 3 | 3 | 3 | 3 |
| Control, monitoring, supervision | | | | | | | |
| Synchronization check | 25 | **RSYN** | 1 | - | - | 1 | - |
| Lockout relay | 86 | | 1 | 1 | 1 | 1 | 1 |
| CT supervision | 60 | CTS**GGIO** | - | 1 | 1 | 1 | 1 |
| VT supervision | 60 | VTS**GGIO** | 1 | - | 1 | 1 | 1 |
| Setting groups | | LLN0/SPSG-CB | 4 | 4 | 4 | 4 | 4 |

(1) Number of stages depends on the number of residual current inputs.

# Selection guide by functionality

| Control functions | P5V20 | P5U20 | P5U20 LPCT/LPVT | P5F30 | P5M30 |
|---|---|---|---|---|---|
| Control with Mobile application | ● | ● | ● | ● | ● |
| Switchgear control and monitoring | 6 | 6 | 6 | 6 | 6 |
| Switchgear monitoring only | 2 | 2 | 2 | 2 | 2 |
| Programmable switchgear interlocking | ● | ● | ● | ● | ● |
| Local control on single-line diagram | ● | ● | ● | ● | ● |
| Local switchgear control with OPEN/CLOSE keys | ● | ● | ● | ● | ● |
| Local/remote function | ● | ● | ● | ● | ● |
| Function keys | 1 | 1 | 1 | 7 | 7 |
| Custom logic (equations) | ● | ● | ● | ● | ● |

| Measurement functions | P5V20 | P5U20 | P5U20 LPCT/LPVT | P5F30 | P5M30 |
|---|---|---|---|---|---|
| RMS current values | | ● | ● | ● | ● |
| RMS voltage values | ● | | ● | ● | ● |
| RMS active, reactive and apparent power | | | ● | ● | ● |
| Frequency | ● | ● | ● | ● | ● |
| Fundamental frequency current values | | ● | ● | ● | ● |
| Fundamental frequency voltage values | ● | | ● | ● | ● |
| Fundamental frequency active, reactive and apparent power values | | | ● | ● | ● |
| Power factor | | | ● | ● | ● |
| Energy values: active and reactive | | | ● | ● | ● |
| Demand values: phase currents | | ● | ● | ● | ● |
| Demand values: active, reactive, apparent power and power factor | | | ● | ● | ● |
| Maximum demand values: phase currents | | ● | ● | ● | ● |
| Minimum and maximum demand values: RMS phase currents | | ● | ● | ● | ● |
| Minimum and maximum demand values: active, reactive, apparent power and power factor | | | ● | ● | ● |
| Maximum demand values over the last 31 days and 12 months: active, reactive, apparent power | | | ● | ● | ● |
| Minimum demand values over the last 31 days and 12 months: active, reactive power | | | ● | ● | ● |
| Maximum and minimum values: currents | | ● | ● | ● | ● |
| Maximum and minimum values: voltages | ● | | ● | ● | ● |
| Maximum and minimum: frequency | ● | ● | ● | ● | ● |
| Maximum and minimum: active, reactive, apparent power and power factor | | | ● | ● | ● |
| Harmonic values of phase current and THD | | ● | ● | ● | ● |
| Harmonic values of voltage and THD | ● | | ● | ● | ● |
| Voltage sags and swells | ● | | ● | ● | ● |

| Logs and records | P5V20 | P5U20 | P5U20 LPCT/LPVT | P5F30 | P5M30 |
|---|---|---|---|---|---|
| Sequence of event record | ● | ● | ● | ● | ● |
| Disturbance record | ● | ● | ● | ● | ● |
| Tripping context record | ● | ● | ● | ● | ● |
| Relay maintenance data log | ● | ● | ● | ● | ● |
| Security data log | ● | ● | ● | ● | ● |

| Monitoring functions | ANSI code | P5V20 | P5U20 | P5U20 LPCT/LPVT | P5F30 | P5M30 |
|---|---|---|---|---|---|---|
| Trip circuit supervision | 74 | 1 | 1 | 1 | 1 | 1 |
| Circuit breaker monitoring | | 1 | 1 | 1 | 1 | 1 |
| Relay monitoring | | ● | ● | ● | ● | ● |

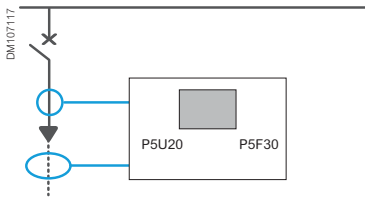
# Selection guide by application

## Feeder / Incomer application

### Outgoing protection

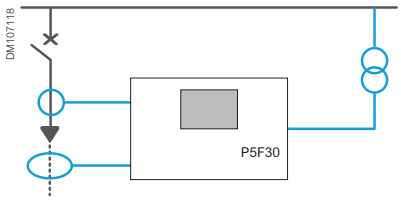
**• Feeder overcurrent protection**
**• Feeder overload protection**

#### Feeder protection



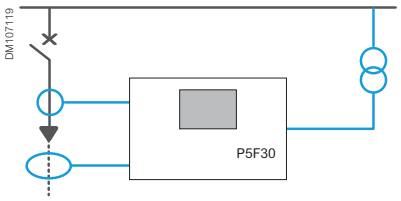

- Feeder earth/ground fault overcurrent

#### Overhead line protection




- Directional phase and earth/ground fault overcurrent
- Recloser
- Fault locator

#### Protection of feeders with metering

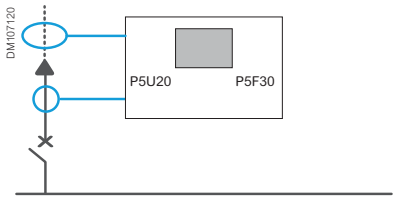



- Power and energy measurement
- Min and max demand values over the last 31 days and 12 months

### Incomer protection

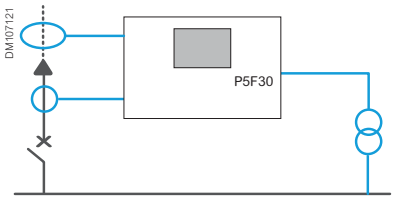
**• Busbar overcurrent protection**

#### Incomer protection without voltage monitoring



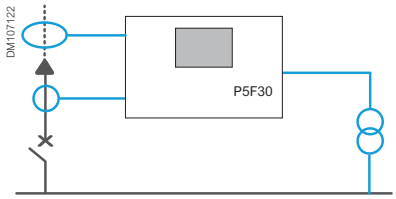

- Earth/ground fault overcurrent

#### Incomer protection with voltage and frequency monitoring



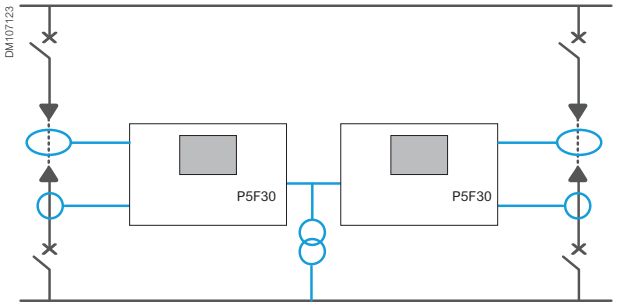

- Under/over voltage
- Frequency, rate of change of frequency

#### Incomer protection with power quality monitoring




- Voltage and frequency min and max values
- Voltage harmonic values and THD
- Voltage sags and swells

#### Parallel incomer protection




- Directional phase overcurrent
- Directional earth/ground fault overcurrent

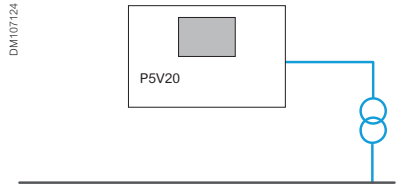
# Selection guide by application

## Feeder / Incomer and Motor applications

## Feeder / Incomer application

**Voltage monitoring**

- **Under/over voltage protection**
- **Earth/ground fault overvoltage**
- **Under/over frequency protection**



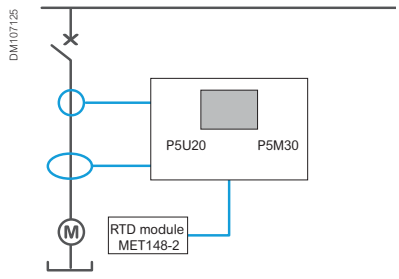

- Load-shedding-specific function: rate of change of frequency

## Motor application

**Motor protection**

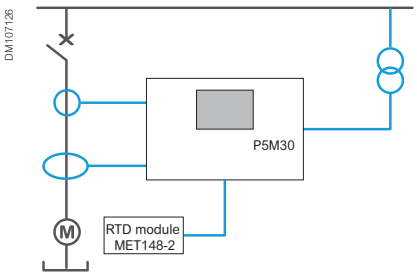
- **Motor overcurrent and earth/ground fault overcurrent**
- **Thermal overload**
- **Motor start-up supervision**
- **Motor restart inhibition**

**Motor protection without voltage monitoring**




- Temperature measurement (stator, bearings)

**Motor protection with voltage monitoring**




- Undervoltage protection

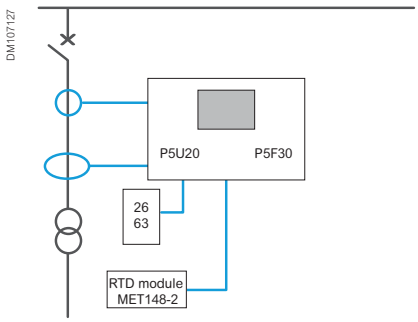
# Selection guide by application

## Transformer application

### Transformer feeder protection

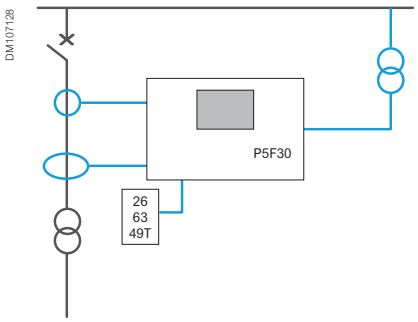
- **Transformer overcurrent and earth/ground fault overcurrent protection**
- **Thermal overload protection**
- **External trip from thermostat/Buchholz**

**Transformer feeder protection without voltage monitoring**



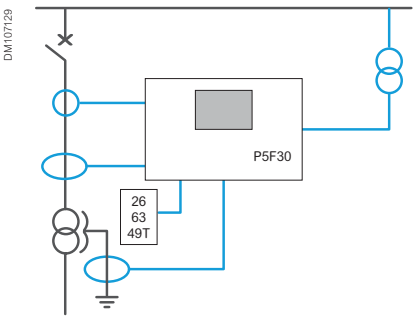

- Temperature measurement (ambient, oil)

**Transformer feeder protection with voltage monitoring**

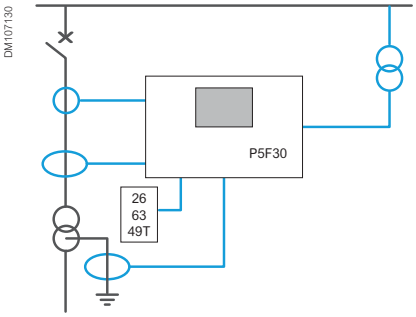



- Over and undervoltage protection

**Transformer feeder protection with additional current measurement**




- Tank earth/ground leakage protection




- Earth/ground fault overcurrent on the secondary side

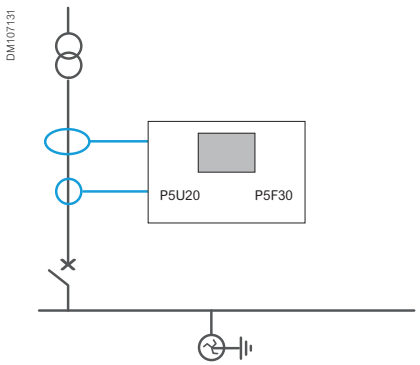
# Selection guide by application

## Transformer application

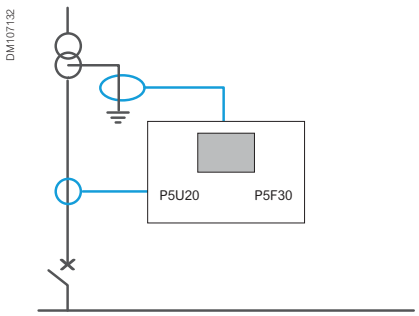
### Transformer incomer protection

**• Busbar overcurrent protection**
**• Inter-trip from primary circuit breaker protection**

#### Transformer incomer protection without voltage monitoring

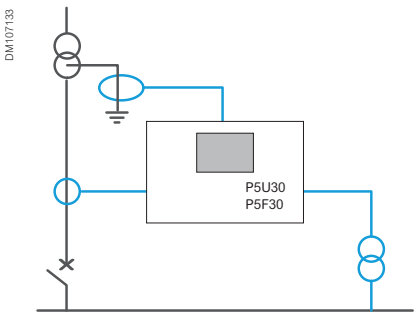



- Transformer earth/ground fault overcurrent



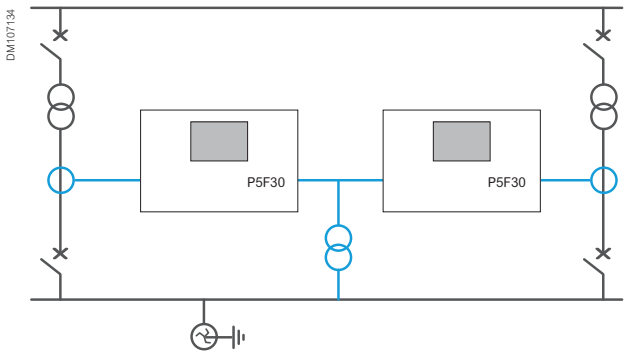

- Earth/ground overcurrent for transformer and back-up protection

#### Transformer feeder protection with voltage monitoring




- Over and undervoltage protection
- Power and energy measurement
- Min and max demand values over the last 31 days and 12 months

#### Parallel transformer incomer protection




- Directional phase overcurrent

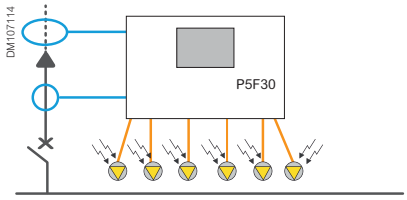
# Selection guide by application

## Arc-flash application

### Busbar arc-flash protection

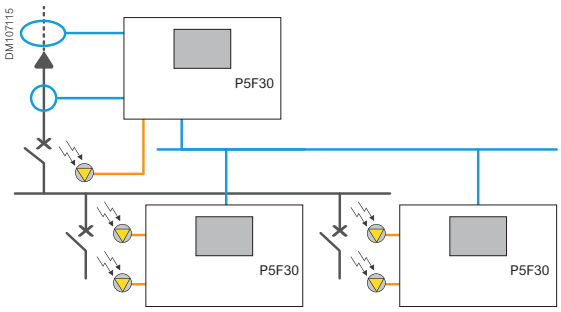
**• Arc-flash protection, activated by overcurrent and light signals, or light signals alone**

**Centralized busbar arc-flash protection**




- Up to 6 light point sensors to monitor the busbar

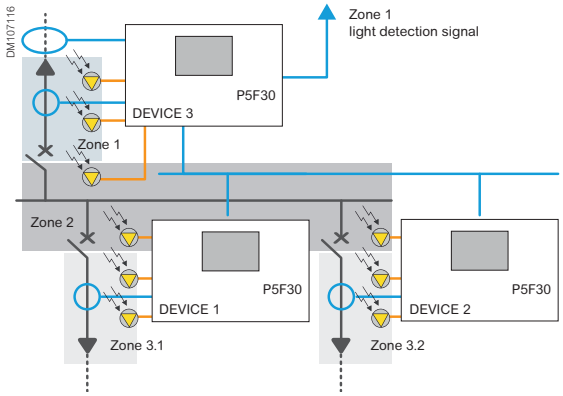
**De-centralized busbar arc-flash protection**




- Up to 6 light point sensors in each relay
- Transmission of light detection signals via digital I/O or IEC 61850 GOOSE messages

### Zone arc-flash protection

**• Up to 8 arc-flash protection stages in each device (P5x30)**
**• Transmission of signals via digital I/O or IEC 61850 GOOSE messages**




In this application example, the arc-flash sensor for zone 3.1 is connected to Device 1. If the arc-flash sensor detects light and simultaneously Device 3 detects and sends an overcurrent condition, the zone 3.1 is isolated by the outgoing feeder breaker.

The arc-flash sensor for zone 3.2 is connected to Device 2 and operates the same way.

The arc-flash sensors for zone 2 are connected to Device 1, 2, or 3. If a sensor detects a flash in zone 3, the light-only signal is transferred to Device 3, which then trips the main circuit breaker.

An eventual arc-flash fault in zone 1 does not necessarily activate the current element in Device 3. However, arc-flash detection can be achieved by using the light-only principle. If an arc-flash occurs in the cable termination of zone 1, an inter-trip signal is sent by Device 3 to the upstream circuit breaker.

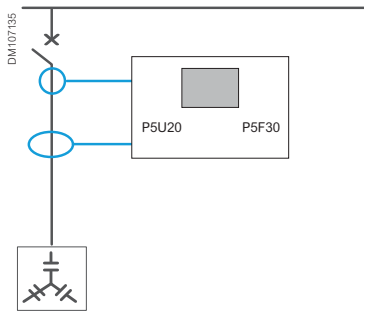
# Selection guide by application

## Capacitor application

### Capacitor bank protection

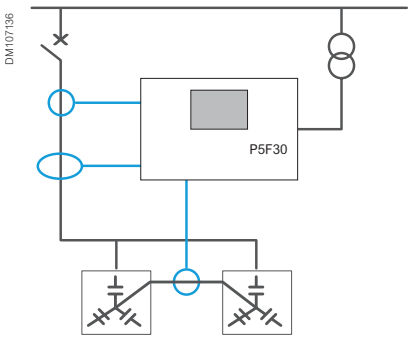
**• Overcurrent and earth/ground fault protection**
**• Overload protection**

#### Capacitor bank protection without voltage monitoring



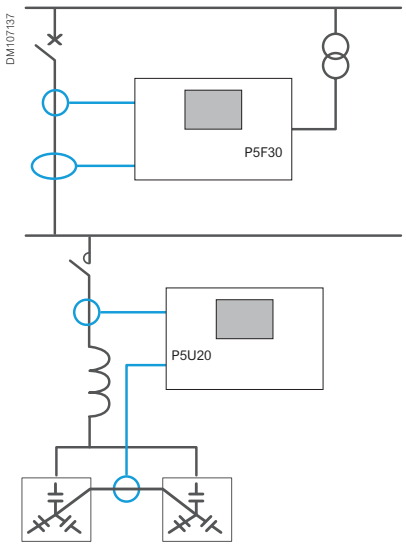

- Capacitor overvoltage protection, based on current measurement and harmonics
- Current harmonic values and THD

#### Capacitor bank protection with voltage monitoring




- Capacitor bank unbalance
- Overvoltage
- Current and voltage harmonic values and THD

#### Protection of harmonic filters




- Overvoltage
- Capacitor bank unbalance
- Capacitor overvoltage protection, based on current measurement and harmonics
- Current harmonic values and THD

# Functions and description

## Fault locator - ANSI 21FL

The function can be used to locate a short-circuit fault and an earth/ground fault in radially operated networks. The fault location is given as reactance (Ohms) and as distance in kilometers or miles. The fault value can then be exported, for example, with an event to a Distribution Management System (DMS). The system can then locate the fault. If a DMS is not available, the distance to the fault is displayed as kilometers and as a reactance value.

| Functions | Settings |
|---|---|
| Pick-up | 0.10 to 5.00 In |
| Line reactance | 0.010 to 10.000 Ohm/km |
| Earth/ground factor | 0.000 to 10.000 |
| Earth/ground factor angle | -60° to +60° |

## Neutral admittance - ANSI 21YN

The neutral admittance protection function can be applied in high resistance earthed, unearthed or compensated power systems to detect earth fault with increased sensitivity. The neutral admittance Yn is calculated based on the zero-sequence current $I_0$ and the zero-sequence voltage $U_0$.

- Two independent stages with definite time delay.
- Each stage settable for over-admittance or over-conductance or over-susceptance.
- Four setting groups.

| Functions | Settings |
|---|---|
| Pick-up for Yn | 1% - 200% In/Un for current measured with very sensitive earth/ground fault CT |
| | 5% - 1000% In/Un for current measured by standard earth/ground fault CTs |
| | 5% - 1000% In/Un for current measured by standard earth/ground fault CTs |
| Pick-up for Gn | 1% - 100% In/Un for current measured with very sensitive earth/ground fault CT |
| | 5% - 500% In/Un for current measured by standard earth/ground fault CTs |
| | 25% - 2500% In/Un for current measured by CSH and for calculated Io |
| Pick-up for Bn | 1% - 100% In/Un for current measured with very sensitive earth/ground fault CT |
| | 5% - 500% In/Un for current measured by standard earth/ground fault CTs |
| | 25% - 2500% In/Un for current measured by CSH and for calculated Io |
| Directional mode | Non-directional, Forward, Reverse |
| Operation delay | 0.05 to 300 s |
| Reset time | 0 to 100 s |
| SOL(1) operation | Disable/Enable |
| SOL(1) operation delay | 0.05 to 300 s |

(1) SOL = Selective Overcurrent Logic

# Functions and description

## Synchro-check - ANSI 25

This function checks the phase to phase voltages on both sides of a circuit breaker (CB) and allows CB closing when the voltage phase angle, magnitude, frequency differences are all within permitted limits.

- Seven operation modes of no-voltage conditions are provided (dead line, dead bus).
- Synchronous mode is provided, where the frequency difference is less than 0.3 Hz.
- Asynchronous mode is provided, where CB close time is compensated.
- Independent settings for voltage phase angle, magnitude, frequency differences.
- Four setting groups.

| Functions | Settings |
|---|---|
| Synchronization mode | Off, Asynchronous, Synchronous |
| Voltage check mode | DD, DL, LD, DD/DL, DD/LD, DL/LD, DD/DL/LD (1) |
| Circuit breaker close time | 0.04 to 0.6 s |
| Dead line voltage setting limit | 1% to 120% Un |
| Active line voltage setting limit | 1% to 130% Un |
| Frequency difference | 0.01 to 1.0 Hz |
| Voltage difference | 1% to 60% Un |
| Phase angle difference | 2° to 90° |
| Request timeout | 0.1 to 600 s |

*(1) D = no-voltage condition, L = voltage condition*

## Under voltage - ANSI 27

This function is applied to detect abnormal system voltage decreases, to trigger automatic load shedding, voltage source transfer, or trip out motor loads to avoid motor stall. This protection works with the minimum phase to phase voltage.

- Three independent stages with definite time are provided.
- Low voltage self-blocking operates when the maximum phase to phase voltage is less than 10%Un.
- Four setting groups for each stage.

| Functions | Settings |
|---|---|
| Pick-up | 20 to 120 % Un |
| Hysteresis | 0.1 to 20 % |
| Delay type | 0.03 to 300 s |
| Adjustable reset | 0.3 to 300 s |

# Functions and description

## Positive sequence under voltage - ANSI 27P

This function is applied to detect insufficient or unbalanced system voltages and detect reverse rotation.

- Two independent stages with define time are provided.
- Low voltage self-blocking will operate when the maximum phase to phase voltage is less than 10% Un.

| Functions | Settings |
|---|---|
| Pick-up | 20 % to 120 % Un |
| Time delay | 0.08 to 300.00 s |
| Low voltage self-blocking | 2 % to 100 % Un |

## Directional active underpower - ANSI 32/37P

This function can be used as underpower protection (e.g. loss of load of a motor) or as reverse power protection (e.g. power generation by a motor if supply is disconnected). It starts if measured active power drops below the set threshold and operates with definite time delay.

- Two independent stages with definite time delay are provided
- Undervoltage blocking if the maximum phase to phase voltage is less than 5% Un.
- Four setting groups for each stage.

| Functions | Settings |
|---|---|
| Pick-up | -200 % to 200 % Sn(1) *with Sn = √3 Un In* |
| Time delay | 0.3 to 300.0 s |

## Wattmetric earth/ground fault - ANSI 32N

This function detects single phase to earth/ground faults in Petersen coil compensated power systems. It operates on active residual power. Using memory mode also allows operation on intermittent earth/ground faults.

- Neutral displacement voltage $U_0$> element to enable function.
- Settable forward/reverse direction.
- Operating characteristic with settable minimum active power and sector angles.
- Dedicated blocking input.
- Dedicated input to bypass operate time delay.
- Four setting groups for each stage.

| Functions | Settings |
|---|---|
| Direction mode | Reverse, forward |
| Setting range | 0.1 % to 20 % Sn |
| Time delay | 0.05 to 300.00 s |
| $U_0$> | 2 % to 80 % Un |
| Sector angle | 0° - 90° |
| Memory mode | None, voltage, time, voltage+time |
| Memory hold time | 0.05 to 10.00 s |
| Memory operating time | 0.00 to 100.00 s |
| SOL(1) operation | Active, inactive |
| SOL(1) operation delay | 0.05 to 300.00 s |

(1) SOL = Selective Overcurrent Logic

# Functions and description

## Phase undercurrent - ANSI 37

This function is typically used to detect defects in motor drives based on loss of load detection due to a significant drop of current. It measures the fundamental component of the phase currents.

- One stage with definite time delay is provided.
- Low-current blocking if maximum current is less than 15% In.
- Four setting groups for each stage.

| Functions | Settings |
|---|---|
| Pick-up | 20 % to 70 % |
| Time delay | 0.3 s to 300 s |

## Temperature monitoring - ANSI 38

This function is used to detect abnormal heat rise by directly measuring the temperature inside equipment (transformer, motors, generators, …) with RTD thermal sensors such as Pt100, Ni100 or Ni120.

- Two independent set points: alarm and tripping for each RTD sensor.
- Inbuilt RTD supervision (shorting, open loop).

| Functions | Settings |
|---|---|
| Pick-up | 0 to 180 °C (32 at 356 °F) |
| Time delay | 0.3 to 600.0 s |

## Negative sequence overcurrent - ANSI 46

This function provides greater sensitivity to detect phase to phase faults at the end of long lines or behind transformers. It can also be used for machine protection (against temperature rise caused by unbalanced power supplies, phase inversion, or loss of phase).

- One stage with definite time or inverse time delay
- Four setting groups.

| Functions | Settings |
|---|---|
| Pick-up | 0.02 to 5.00 In |
| Definite time delay | 0.07 to 300.00 s |
| Inverse time delay curves | IEC: NI, VI, EI, LTI |
| | IEEE: VI, EI, LTI, LTEI, LTVI, MI, STI, STEI |
| | IEEE2: NI, VI, EI, MI |
| | Others: RI, RXIDG |
| | Programmable: 3 curves with 16 setting points |
| Inverse time coefficient | 0.05 to 20.00 for IEC curves and others (RI) |
| | 0.5 to 20.0 for IEEE, IEEE2 curves and others (RXIDG) |

## Unbalanced overcurrent, broken conductor - ANSI 46BC

This function is applied to detect broken conductor conditions, based on the ratio between the negative sequence current and positive sequence current.

- One stage with definite time delay is provided.
- This function is not available in 2CT mode.
- Four setting groups.

| Functions | Settings |
|---|---|
| Pick-up | 2 to 70 % |
| Time delay | 0.07 s to 300 s |

## Negative sequence overvoltage - ANSI 47

Protection of a rotating machine from being energized with a reverse voltage sequence or prevention of overheating of the motor due to a broken conductor condition. It monitors the voltage phase sequence detecting a reverse rotation or voltage unbalance due to a missing (asymmetrical) phase. The detection of these conditions can then be used to trip the machine to prevent damage to both motor and any mechanically coupled processes.

- Two independent stages with definite or inverse time delay.
- When the VT connection is configured to LL/LLy the function is automatically disabled.
- Four setting groups for each stage.

| Functions | Settings |
|---|---|
| Pickup value | 1% Un - 100% Un |
| Delay type | Definite time (DT), inverse time (INV) |
| Operation delay | 0.08 s to 300 s |
| Reset time | 0.03 s to 300 s |

# Functions and description

## Motor start-up supervision - ANSI 48

Protection of motors against overheating caused by excessive start time due to heavy motor load or too low voltage.

- Motor start detection is based on circuit breaker (CB) position and current.
- Operation with definite time delay or inverse time delay.

| Functions | Settings |
|---|---|
| Motor start detection current | 1.3 to 10.0 In |
| Motor start detection mode | CB position, current, CB position and current |
| Delay type | Definite time (DT), inverse time (INV) |
| Motor start time | 1 s to 300.0 s |

## Thermal overload protection for feeders - ANSI 49F

This function is applied to detect conditions where thermal damage may be caused by overloads on cables. The thermal capacity is calculated by the thermal replica according to IEC60255-149. The equivalent current for the thermal replica is the maximum RMS current of 3 phases.

- Independent settable alarm stage and trip stage are provided.
- Current based setting mode and temperature based setting mode are provided.
- Temperature sensor can be applied for ambient temperature based mode.
- A digital input can be applied to inhibit the thermal overload protection
- Four setting groups are provided.

| Functions | Settings |
|---|---|
| Basic current setting | 0.10 In to 4.00 In |
| k factor | 0.10 to 1.50 |
| Heating time constant | 1.0 min to 1000 min |
| Thermal alarm value | 50 % to 100 % |
| Reserve time thermal alarm | 1.0 min to 1000 min |
| Temperature based mode | Current, Ambient |
| Nominal ambient temperature | -40 °C to 300 °C |
| Max object temperature | -40 °C to 300 °C |
| Alarm object temperature | 0 °C to 300 °C |
| Min object temperature | -40 °C to 300 °C |
| Default object temperature | -40 °C to 300 °C |
| Thermal level initiation | 0 to 90% |

# Functions and description

## Thermal overload protection for motor - ANSI 49M

This function is applied to detect conditions where thermal damage may be caused by overloads on motors or cables. The thermal capacity is calculated by the thermal replica according to IEC 60255-149. The equivalent current for the thermal replica considers the maximum RMS current of 3 phases and the negative phase sequence current with a settable weighting coefficient.

- Independent settable alarm stage and trip stage are provided.
- Current based setting mode and temperature based setting mode are provided.
- Temperature sensor can be applied for ambient temperature based mode.
- A digital input can be applied to inhibit the thermal overload protection
- Four setting groups.

| Functions | Settings |
|---|---|
| Basic current setting | 0.1 In to 4.0 In |
| k factor | 1.0 to 1.5 |
| Heating time constant | 1.0 min to 1000 min |
| Time constant for motor start | 1.0 min to 1000 min |
| Cooling time constant | 1.0 min to 1000 min |
| Thermal alarm value | 50% to 100% |
| Reserve time thermal alarm | 1.0 min to 1000 min |
| Temperature based mode | Current, Ambient temperature |
| Nominal ambient temperature | -40 °C to 300 °C |
| Max object temperature | -40 °C to 300 °C |
| Alarm object temperature | 0 °C to 300 °C |
| Min object temperature | -40 °C to 300 °C |
| Default object temperature | -40 °C to 300 °C |
| Thermal level initiation | 0 to 90% |
| Unbalance factor | 0 to 10 |

# Functions and description

## Arc-flash - ANSI 50ARC

This function is used to detect and minimize the effects of an internal arcing fault, commonly by tripping the CB faster than conventional protection to mitigate the fault.

- Eight independent arc-flash stages.
- GOOSE communication to share informations between two Easergy P5 relays.
- Three to six arc-flash sensors available.
- Trip in 4 ms maximum if light detection only.
- Trip in 15 ms maximum if light detection and overcurrent conditions detected with GOOSE communication between two Easergy P5 relays.

| Functions | Settings |
|---|---|
| Arc-flash stage 1 to 8 | On, Off |
| Detection mode | Light, light + current |
| Pick-up phase current | 0.50 to 8.00 In |
| Pick-up ground/earth current | 0.10 to 5.00 |
| Trip delay | 0 ms to 255 ms |
| Hold time | 20 ms to 2500 ms |

## Breaker failure - ANSI 50BF

The circuit breaker failure function (CBF) can be used to operate any upstream circuit breaker (CB) if the programmed output signals, to the main breaker, have not disappeared within a given time after the initial command.

- Two circuit breaker controls are available.

| Functions | Settings |
|---|---|
| Phase current pick-up | 0.02 to 4.00 In |
| Earth/ground current pick-up | 0.02 to 4.00 Ino with 1/5 A standard CT |
| | 0.05 to 4.00 Ino with CSH core balance CT |
| Very sensitive earth/ground current pick-up | 0.002 to 4.000 Ino |
| Time delay | 0.02 s to 50.00 s |

# Functions and description

## Switch onto fault (SOTF) - ANSI 50HS

This function is applied to provide fast tripping based on instantaneous overcurrent protection, when the CB is closed onto a faulted line.

- One stage instantaneous overcurrent is provided.
- CB open/dead line detection is based on a low current threshold 0.02 In or digital input.
- SOTF active duration after CB closure is settable.

| Functions | Settings |
|---|---|
| Pick-up | 1.0 to 40.0 In |
| Dead line detection delay | 0 to 60.0 s |
| SOTF active time | 0.1 to 60.0 s |

## Cold Load Pick-up (CLP)

This function helps avoid unwanted tripping of overcurrent protecton elements (50/51, 50N/51N, 50G/51G and 67) during energisation after long periods of outage. Depending on installation characteristics such operations can generate inrush currents that can exceed the pick-up level of protection. These inrush currents may be caused by:

- Magnetizing currents of power transformers.
- Motor starting currents.
- Simultaneous re-energization of the entire facility load (air conditioning, heating...).

In principle the protection settings should be defined in order to avoid tripping on such inrush currents. However if the settings result in insufficient sensitivity levels or too long delays, the CLP function can be used to temporarily increase or inhibit thresholds after re-energization.

| Functions | Settings |
|---|---|
| Pick-up | 0.02 to 20.0 In |
| Definite time delay | 0.03 to 300.00 s |
| Inverse time delay curves | IEC, IEEE, IEEE2, Others, 3 programmable curves |
| Inverse time coefficient (k ) | 0.05 to 20.00 for IEC curves and others (RI) |
| | 0.5 to 20.0 for IEEE, IEEE2 curves and others (RXIDG) |

# Functions and description

## Phase overcurrent - ANSI 50/51

These functions are used to detect short circuit faults and heavy overloads. The overcurrent function measures the fundamental frequency components (1st harmonic) of the phase currents. The protection is sensitive to the highest of the three phase currents. Whenever this value exceeds the user's start setting of a particular stage, a start signal is issued. If the fault situation remains present longer than the operation delay setting, a trip signal is issued.

- Two stages ((I> and I>>) with definite time or inverse time delay.
- One stage (I>>>) with definite time delay and a maximum starting time of 20 ms (P5x30).
- Cold load pick-up function.
- Four setting groups for each stage.

| Functions | | Settings |
|---|---|---|
| Definite time (DT) pick-up | I> | 0.05 to 20.00 In |
| | I>> | 0.10 to 20.00 In |
| | I>>> | 0.10 to 40.00 In |
| Inverse time (IDMT) pick-up | I> | 0.05 to 5.00 In |
| | I>> | 0.10 to 5.00 In |
| Definite time delay | | 0.03 to 300.00 s |
| Inverse time delay curves | | IEC : NI, VI, EI, LTI |
| | | IEEE : VI, EI, LTI, LTEI, LTVI, MI, STI, STEI, others |
| | | IEEE2 : NI, VI, EI, MI |
| | | Others : RI, RXIDG |
| | | Programmable : 3 curves with 16 setting points |
| Inverse time coefficient (k) | | 0.05 to 20.00 for IEC curves and others (RI) |
| | | 0.5 to 20.0 for IEEE, IEEE2 curves and others (RXIDG) |
| Reset time | | 0.03 to 100.00 s |

# Functions and description

## Earth/ground fault overcurrent - ANSI 50N/51N and ANSI 50G/51G

Earth/ground fault protection (ANSI 50N/51N) is based on the measured residual current from a 1A/5A standard CT or CSH core balance CT. Alternatively, it can also apply the calculated residual current.

Sensitive earth/ground fault protection (ANSI 50G/51G) is based on measured residual current with very sensitive 1 A standard CT.

- ANSI 50N/51N - Two stages with definite and inverse time delay and three stages with definite time delay.
- ANSI 50G/51G - Two stages with definite and inverse time delay and one stage with definite time delay.
- Cold load pick-up.
- Selective overcurrent logic settable for the first four stages.
- Four setting groups for each stage.

| Functions | | Settings | | |
|---|---|---|---|---|
| Io (ANSI 50N/51N) | | Measured with 1 A/5 A CT | | |
| | | Measured with 1 CSH core balance CT | | |
| | | Calculated with the sum of the 3 phase currents | | |
| Io' (ANSI 50G/51G) | | Measured with 1 A CT | | |
| | | CT | CSH core balance CT | Calculated earth/ground fault |
| Definite time (DT) pick-up | Io>, Io'>, Io>>, Io'>> | 0.02 to 10.00 Ino | 0.05 to 10.00 Ino | 0.05 to 20.00 In |
| | Io>>>, Io'>>>, Io>>>> | 0.02 to 20.00 Ino | 0.05 to 20.00 Ino | 0.05 to 20.00 In |
| | Io>>>>> | 0.05 to 10.00 Ino | - | - |
| Inverse time (IDMT) pick-up | Io>, Io'>, Io>>, Io'>> | 0.02 to 5.00 Ino | 0.05 to 5.00 Ino | 0.05 to 5.00 In |
| Definite time delay | | 0.03 to 300 s | | |
| Inverse time delay curves | | IEC : NI, VI, EI, LTI | | |
| | | IEEE : VI, EI, LTI, LTEI, LTVI, MI, STI, STEI | | |
| | | IEEE2 : NI, VI, EI, MI | | |
| | | Others : RI, RXIDG | | |
| | | Programmable : 3 curves with 16 setting points | | |
| Inverse time coefficient (k) | | 0.05 to 20.00 for IEC curves and others (RI) | | |
| | | 0.5 to 20.0 for IEEE, IEEE2 curves and others (RXIDG) | | |
| Reset time | | 0.03 to 100 s | | |

# Functions and description

## Capacitor bank unbalance - ANSI 51C

This function is used in double-wye-connected capacitor banks. The unbalance current is measured with a dedicated current transformer (i.e. 5A/5A) between two starpoints of the bank.

- Two stages with definite time delay.
- Unbalance current measured with standard earth/ground fault CT or CSH core balance CT.
- Four setting groups for each stage.

| Functions | Settings |
|---|---|
| Pick-up | 0.02 to 10.00 Ino for standard CT |
| | 0.05 to 10.00 Ino for CSH core balance CT |
| Time delay | 0.03 to 300 s |

## Locked rotor - ANSI 51LR

Protection of motors against overheating caused by motor rotor jam due to heavy motor load or a mechanical failure after the normal start.

- Operation with definite time delay or inverse time delay.
- Automatically blocked when the motor is starting.

| Functions | Settings |
|---|---|
| Pick-up | 10 to 100.0 % IStart |
| Time delay | 1 to 300.0 s |
| Time delay type | Definite time (DT), Inverse time (INV) |

## Overvoltage - ANSI 59

This function is applied to detect an abnormal higher system voltage or to check sufficient voltage for voltage source transfer. This protection works with the maximum phase to phase voltage.

- Three independent stages with definite time delay are provided.
- Four setting groups for each stage.

| Functions | Settings |
|---|---|
| Pick-up | 50 to 150 % Un |
| Hysteresis | 0.1 to 20 % |
| Trip | 0.04 to 300 s |
| Hold | 0.03 to 300 s |

# Functions and description

## Capacitor overvoltage - ANSI 59C

This function calculates the voltages of a three-phase Y-connected capacitor bank using the measured currents of the capacitors. No voltage measurements are needed.

Especially used in filter applications, harmonics are present, which depending on phase angles, can increase the peak voltage. This protection function calculates the worst-case overvoltage in per-unit values using Equation 7.10 according to IEC 60871-1 standard. Harmonics up to 15$^{th}$ are taken into account.

- Three independent stages with define time.
- Four setting groups.

| Functions | Settings |
|---|---|
| Pick-up setting UC> | 0.10 to 2.50 UCLN |
| Time delay | 1.0 to 30.0 s |
| Rated L-N voltage UCLN | 100 to 260 000 V |
| Capacitance per phase | 1.00 to 650.00 µF |

## Neutral voltage displacement - ANSI 59N

This function is used for general earth/ground fault detection and for backup protection (unselective). It measures the fundamental component of the neutral displacement voltage.

- 3 stages with DT operating time
- Attenuation of the third harmonic by more than 60 dB
- Faster high-set stage U0>>>.
- 4 setting groups for each stage.

| Function | Settings |
|---|---|
| Pick-up | 2 to 120 % Uno |
| Time delay | 0.04 s to 300.00 s |

## Motor restart inhibition - ANSI 66

This function prevents too frequent motor starts. Every motor has a restriction on the number of starts within a defined period to avoid thermal overload, mainly inside the rotor. A settable time interval between two consecutive starts is also necessary to allow the motor to cool down following the previous start.

- Settable number of starts per hour.
- Settable minimum time between consecutive starts.

| Functions | Settings |
|---|---|
| Time from motor start | 0 min, 120 min |
| Maximum hot starts / hour | 1 to 20 |
| Maximum cold starts / hour | 1 to 20 |
| Minimum time between starts | 0.0 min to 100.0 min |

# Functions and description

## Directional phase overcurrent - ANSI 67

This function provides directional short circuit protection.

- Four independent stages with definite time delay (DT), two of them with inverse time delay (IDMT).
- Settable directionality
- Directional voltage memory with fixed duration of 3.2 s.
- Cold Load Pickup (CLP).
- Four setting groups for each stage.

| Functions | | Settings |
|---|---|---|
| Direction mode | | Directional |
| | | Non directional |
| | | Directional + Backup |
| Definite time (DT) pick-up | I> | 0.05 to 20.00 In |
| | I>> | 0.10 to 20.00 In |
| | I>>> | 0.10 to 40.00 In |
| Inverse time (IDMT) pick-up | I> | 0.05 to 5.00 In |
| | I>> | 0.10 to 5.00 In |
| Definite time delay | | 0.03 to 300.00 s |
| Inverse time delay curves | | IEC: NI, VI, EI, LTI |
| | | IEEE: VI, EI, LTI, LTEI, LTVI, MI, STI, STEI, others |
| | | IEEE2: NI, VI, EI, MI |
| | | Other : RI, RXIDG |
| | | Programmable: 3 curves with 16 setting points |
| Inverse time coefficient (k) | | 0.05 to 20.00 for IEC curves and others (RI) |
| | | 0.5 to 20.0 for IEEE, IEEE2 curves and others (RXIDG) |
| Reset time | | 0.03 s to 100.00 s |
| Angle offset | | -180° to +179° |

# Functions and description

## Directional earth/ground fault overcurrent - ANSI 67N

This function provides selective and sensitive earth/ground fault protection for various network earthing systems of power neworks.

- Residual current and voltage can be either measured or internally calculated based on phase currents and voltages.
- Three independent stages with definite time and inverse time delay.
- Directional voltage memorywith fixed duration of 3.2 s.
- Settable directionality.
- Four setting groups for each stage.

| Functions | Settings | | | |
|---|---|---|---|---|
| Io / Io' | Io - Measured with 1 A/5 A CT | | | |
| | Io - Measured with 1 CSH core balance CTIo - | | | |
| | Io - Calculated with the sum of the 3 phase currents | | | |
| | Io' - Measured with 1 A CT | | | |
| | Standard CT | TCSH core balance CT | Calculated earth/ground fault | Very sensitive CT |
| Definite time (DT) pick-up | 0.02 to 10.00 Ino | 0.05 to 10.00 Ino | 0.05 to 20.00 In | 0.002 to 1.00 Ino |
| Inverse time (IDMT) pick-up | 0.02 to 5.00 Ino | 0.05 to 5.00 Ino | 0.05 to 5.00 In | 0.002 to 1.00 Ino |
| Definite time delay | 0.03 to 300 s | | | |
| Inverse time delay curves | IEC: NI, VI, EI, LTI | | | |
| | IEEE: VI, EI, LTI, LTEI, LTVI, MI, STI, STEI | | | |
| | IEEE2: NI, VI, EI, MI | | | |
| | Others: RI, RXIDG | | | |
| | Programmable: 3 curves with 16 setting points | | | |
| Inverse time oefficient (k) | 0.05 to 20.00 for IEC curves and others (RI) | | | |
| | 0.5 to 20.0 for IEEE, IEEE2 curves and others (RXIDG) | | | |
| Residual voltage Uo | 1 to 50 % Uno | | | |
| Directional mode | Resistive, capacitive, sector, non directional | | | |
| Offset angle | -180° to +179° | | | |

# Functions and description

## Transient intermittent earth/ground fault - ANSI 67NI

This function detects short transient intermittent phase to earth/ground faults in compensated networks, which cannot be correctly recognized by steady-state directional earth/ground fault functions using the fundamental frequency components only.

- Neutral displacement voltage $U_0$> element to enable function.
- Settable forward/reverse direction.
- Dedicated blocking input to coordinate with AR.
- Four setting groups.

| Functions | Settings |
|---|---|
| Io | Io measured with standard earth/ground fault CT or CSH core balance CT |
| Io' | Io' measured with very sensitive earth/ground fault CT |
| Direction mode | Reverse, Forward |
| Minimum of number of peaks | 1 to 20 |
| $U_0$> setting | 1 to 60 % Uno |
| Time delay | 0.02 to 300.00 s |
| Memory hold time | 0,01 to 300.00 s |
| Reset time | 0.06 to 300.00 s |

## 2nd harmonic (H2) detection - ANSI 68H2

This function detects inrush current flows that occur when transformers or machines are energized. It may be used to stabilize protection functions (e.g. phase overcurrent, earth/ground fault overcurrent, …) or even to issue a trip if the inrush condition persists too long.

- Based on proven $I_2/I_1$ measurement.
- Measurement per phase.

| Functions | Settings |
|---|---|
| Pick-up | 10 to 100 % |
| Time delay | 0.03 to 300.00 s |

## 5th harmonic (H5) detection - ANSI 68H5

This function detects 5th harmonic current flows that occur during overexcitation of transformers. It may be used to stabilize protection functions or even to trip if the condition persists too long.

- Based on proven $I_5/I_1$ measurement.
- Measurement per phase.

| Functions | Settings |
|---|---|
| Pick-up | 10 to 100 % |
| Time delay | 0.03 to 300.00 s |

# Functions and description

## Auto-recloser function - ANSI 79

The auto-recloser (AR) function can be used in feeder protection relays to help protect an overhead line. It limits the interruption of service in case of transient or semi-permanent faults that affect overhead lines. The function uses the object control function to control the CB open/close sequence. All other object control methods are in simultaneous use, including object failure monitoring. If the circuit breaker (CB) control fails or another function controls the CB, the AR sequence stops.

- One to four autorecloser shots.
- Control of one or two circuit breakers.
- Control via binary or virtual inputs (IEC 61850).

| Functions | Settings |
|---|---|
| Enable Auto-Recloser | On; Off<br>with digital input (DI), virtual input (VI), virtual output (VO) or function key |
| Breaker 1 object | Object 1 to Object 6 |
| Breaker 2 object | Object 1 to Object 6 |
| Auto CB selection | On; Off |
| Input for CB selection | digital input (DI), virtual input (VI), virtual output (VO) or function key |
| Reclaim time | 0.02 to 3000.00 s |
| Block by external synchro. check | digital input (DI), virtual input (VI), virtual output (VO) or function key |
| Shot specific reclaim time | On; Off |
| Settings per shot | 0.01 to 1200.00 s (dead time) |
| | 0.02 to 300.00 s (discrimination time) |
| Additional setting 1st shot | 0.02 to 300.00 s (start delay) |

## Under and Over frequency - ANSI 81

Frequency deviations result from an imbalance between power generation and power loads. The over/under frequency protection function is used for load shedding, loss of power system detection, load restoration and as a backup protection for overspeeding in generators.

- Two independent stages with definite time delay are provided.
- The function is activated with a settable voltage threshold.
- Automatically inhibited if the maximum phase to phase voltage goes below the setting threshold.
- Four setting groups for each stage.

| Functions | Settings |
|---|---|
| Trip condition | Under, over |
| Pick-up | 40 to 70 Hz |
| Time delay | 0.1 s to 300 s |
| Low voltage blocking | 30 to 100 % Un |

# Functions and description

## Rate of change of frequency - ANSI 81R

This function (ROCOF) is appliced to detect the rate of change of system frequency, for fast load shedding or fast disconnection of islanded generators under loss of main condition.

- Two independent stages with definite time delay.
- Direction of the frequency change is settable.
- Automatically inhibited if the maximum phase to phase voltage goes below the setting threshold.
- Four setting groups for each stage.

| Functions | Settings |
|---|---|
| Direction of change | Negative, Positive, Either |
| Pick-up | 0.1 to 10 Hz/s |
| Time delay | 0.05 to 10 s |
| Low voltage blocking | 30 to 100 % Un |

## Under frequency - ANSI 81U

This function is applied to detect an abnormally low system frequency, to trigger load shedding, or indicate the loss of main grid.

- Four independent stages with definite time delay are provided.
- Automatically inhibited if the maximum phase to phase voltage goes below the setting threshold.
- Four setting groups for each stage.

| Functions | Settings |
|---|---|
| Pick-up | 40 to 64 Hz |
| Time delay | 0.1 s to 300 s |
| Low voltage blocking | 30 to 100 % Un |

# Functions and description

## Lockout - ANSI 86

The lockout feature, also called latching, ensures that a manual intervention is required to reset all alarm or tripping conditions, for example to enable CB re-closing. It can be programmed in the output matrix setting view. Any protection stage start or trip, digital input, logic output, alarm and GOOSE signal connected to the following outputs can be latched when required:

- Output contacts.
- LEDs on the local panel.
- Virtual outputs.

## Programmable stages - ANSI 99

For special applications the user can build their own detection stages by selecting the supervised signal and the comparison mode. This allows the user to trigger an event from a selection of signals and select the type, level and timing to suit the application.

- Eight independent stages with definite time delay.
- Priority selection for fast operation needs.
- Multiple coupling and comparison conditions.
- Four setting groups for each stage.

| Functions | Settings |
|---|---|
| Coupling | Phase currents and earth/ground currents,<br>Simple or composed voltages,<br>Cuurent and voltage distortion values,<br>Direct current or voltage,<br>Inverse current or voltage,<br>Phase and earth/ground effective current |
| Trip conditions | Under, over, difference, absolute difference |
| Time delay | 0,08 to 300 s |

# Functions and description

## Selective Overcurrent Logic (SOL)

The Selective Overcurrent Logic (SOL) function, can considerably reduce the tripping time of the circuit breakers closest to the source, compared to pure time discrimination, and may be used for logic discrimination in closed ring networks also using directional protection. SOL function is applied to the phase overcurrent, directional phase overcurrent, earth/ground fault overcurrent (except stage 5), very sensitive earth/ground fault overcurrent protection elements, with definite time and inverse time delays.

The selective overcurrent logic allows:

- To send a blocking signal when a fault is detected by overcurrent or earth/ground fault protection elements (ANSI 50/51, 50N/51N, 50G/51G, 67, 32N).
- To receive a blocking signal that inhibits the protection elements.

| Functions | Settings |
|---|---|
| Definite time delay | 0.03 to 300 s |
| Inverse time delay curves | IEC, IEEE, IEEE2, others, three programmable curves |
| Inverse time delay coefficient | 0.05 to 20.00 for IEC curves and others (RI) |
| | 0.5 to 20.0 for IEEE, IEEE2 curves and others (RXIDG) |

## Circuit Breaker (CB) monitoring

Periodic maintenance of circuit breakers is necessary to ensure that the trip circuit and mechanism operate correctly and that the interrupting capability has not deteriorated due to previous fault interruptions. The Easergy P5 protection relay records various statistics related to each circuit breaker operation, allowing an accurate assessment of the circuit breaker condition. Statistics are recorded to allow evaluation of both the electrical wear of the breaker contacts and the mechanical wear of the breaker mechanism.

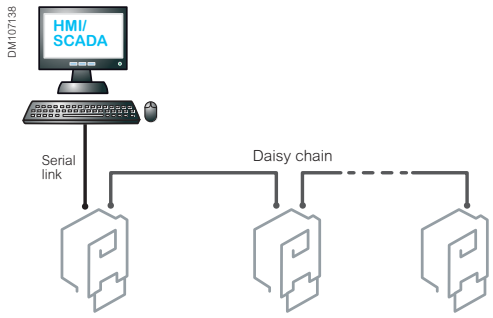
Following counters are provided:

- Number of all circuit breaker operations.
- Number of circuit breaker operations triggered by protection functions e.g. faults.
- Cumulative broken current.
- Circuit breaker operating times.
- Charging times.
- Number of rack-in and rack-out operations.

This feature, when paired with EcoStruxure Asset Advisor brings a proactive maintenance approach to electrical distribution critical assets, combining newest technologies with Schneider Electric's expertise and services. EcoStruxure Asset Advisor offers the ability to anticipate and address issues before they become critical incidents, mitigating safety risks, avoiding unplanned downtime, operational losses and expensive maintenance interventions.

# Communication

## Examples of architectures




## Connection to SCADA using serial line

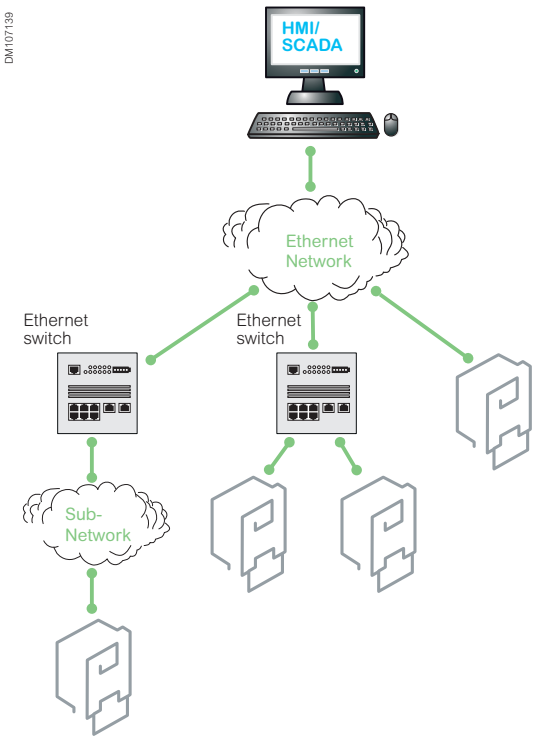
This architecture allows you to connect HMI/SCADA to a set of Easergy P5 protection relays using a multi-drop serial communication link with master-slave communication.

### Available protocols:

- Modbus RTU
- IEC 60870-5-101
- IEC 60870-5-103
- DNP3

### Time synchronisation protocol:

- IRIG-B
- Minute pulse




## Connection to SCADA using Ethernet

This architecture allows you to connect a set of Easergy P5 protection relays directly to an Ethernet network.

### Available protocols:

- IEC 61850 Edition 1 and Edition 2
- DNP3
- EtherNet/IP
- Modbus TCP/IP

Note: It is possible to mix IEC 61850 protocol with other communication or redundancy protocols from Easergy P5 on the same Ethernet network. This allows you to use GOOSE messages between relays together with another protocol for communication to SCADA.

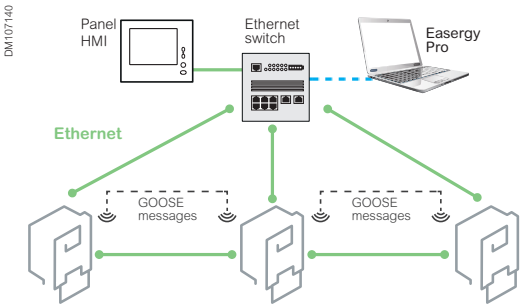
It is also possible to connect to two different control systems, using the same Ethernet communication port and IEC 61850 protocol for one network, and any available protocol for the second network.

Equipped with two Ethernet modules, Easergy P5x30 can handle 3 Ethernet protocols simultaneously with a single IP or 3 different IP adresses. Optionally, Easergy P5x30 offers a capability of dual redundancy providing PRP/HSR protocol for one system and a separate RSTP protocol for another system or engineering channel.

Easergy P5 protection relay handles the IEC 61850 station bus, in compliance with IEC 61850-6, 7-1, 7-2, 7-3, 7-4 and 8-1 Edition 1 or Edition 2 standards, according to the configuration.

### Other available Ethernet protocols:

- FTP for file transfer
- SNTP for time synchronization
- HTTPs for web server (setting changes)




## Switchboard internal network

This architecture allows fast GOOSE communication between Easergy protection relays in the same switchboard, this avoiding costly wiring. Typical uses are logic discrimination, load shedding, etc.
In addition, a panel HMI featuring a web browser can be used to monitor and control the entire switchboard.
A spare connection on the panel Ethernet switch can also be provided for connecting the eSetup Easergy Pro setting and configuration tool.
On Easergy P5x30 models, two independent Ethernet communication modules are available. This allows implementation of the switchboard internal network and the communication to SCADA on two separate Ethernet networks.

# Communication

## Redundancy protocols

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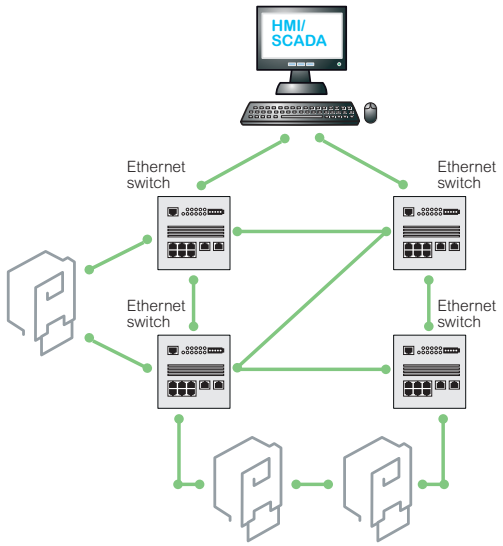


### RSTP (Rapid Spanning Tree Protocol)

The principle of RSTP is to virtually remove all links that are not necessary at a given time, changing the meshed topology into a tree topology.

The main advantage of RSTP is that it is widespread and works on any network topology. On the other hand, RSTP takes milliseconds or seconds to reconfigure the network in case of network interruption.

With Easergy P5, the typical reconfiguration time for a loop of 10 relays is 0,050s.

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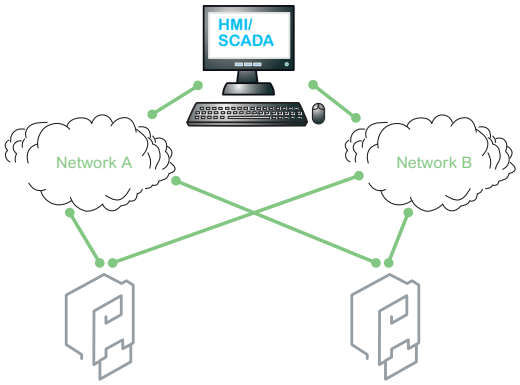


### PRP (Parallel Redundancy Protocol)

The principle of PRP is to transmit frames in parallel on two independent network infrastructures: A and B.

The receiving device is in charge of removing the redundant frame, if it has already been received.

PRP protocol provides an instantaneous recovery time in case of failure, since no re-transmission of the message is needed.

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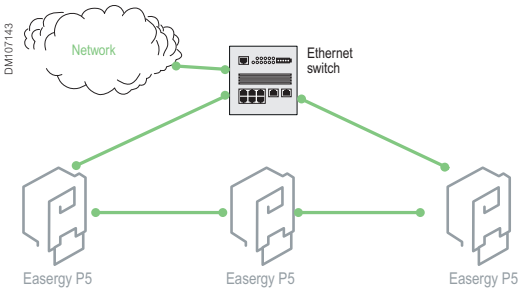



### HSR (High-availability Seamless Redundancy)

HSR is similar to PRP but only works on a ring architecture.

Frames are transmitted on the ring in both directions and the receiving device eliminates redundant frames.

HSR protocol provides an instantaneous recovery time and is an alternative to PRP when network topology is restricted to a ring.

Both PRP and HSR protocols are listed in IEC 62439-3 as part of IEC 61850 standard. They both provide standardized, interoperable and high performance redundant Ethernet solutions.

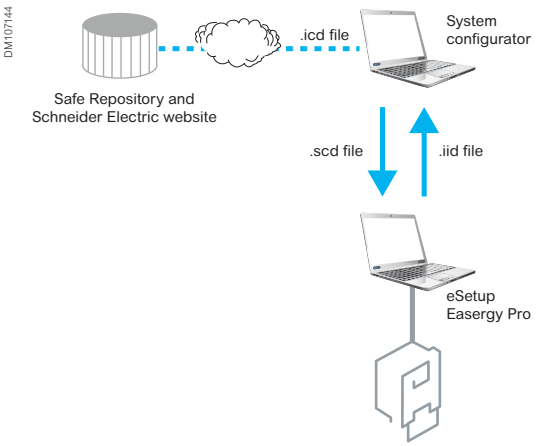
# Communication

## Data exchanged

## Data exchanged with SCADA

| Ports | Ethernet | | | Serial or Ethernet | | Serial | |
|---|---|---|---|---|---|---|---|
| Protocol | IEC 61850 | Ethernet/IP | FTP | DNP3 | Modbus | IEC 60870-5-103 | IEC 60870-5-101 |
| **Real time data** | | | | | | | |
| Measurement | ● | ● | - | ● | ● | ● | ● |
| Alarms and status | ● | ● | - | ● | ● | ● | ● |
| Controls | ● | ● | - | ● | ● | ● | ● |
| Time-stamped events | ● | ● | - | ● | ● | ● | ● |
| **Historical data** | | | | | | | |
| Disturbance records | - | - | ● | ● | - | ● | - |
| Sequence of event record files | - | - | ● | - | - | - | - |
| **Setting management** | | | | | | | |
| Setting group change | ● | ● | - | ● | ● | ● | ● |
| Settings | ● | - | - | - | ● | ● | - |

## Data exchanged according to IEC 61850




The Methodology described in the IEC 61850-6 standard can be applied with Easergy P5 protection relays, in order to build a protection and control system based on this standard.

### .icd file

For each model of Easergy P5 relay, the IED capability file can be downloaded from the Schneider Electric website.

### .scd file

The system description file generated by the system configurator can be processed by eSetup Easergy Pro and the relevant system settings integrated in the Easergy P5 configuration.

### .iid file

When the configuration of an Easergy P5 protection relay is completed or modified, eSetup Easergy Pro can generate an Instantiated IED Description file to be used by the system configurator to update the system description.

# Cybersecurity

## Cybersecurity systems

Cybersecurity features implemented in Easergy P5 help to mitigate cyber threats.

Easergy P5 can be ordered, either with:

- Cybersecurity basic package or
- Cybersecurity advanced package.

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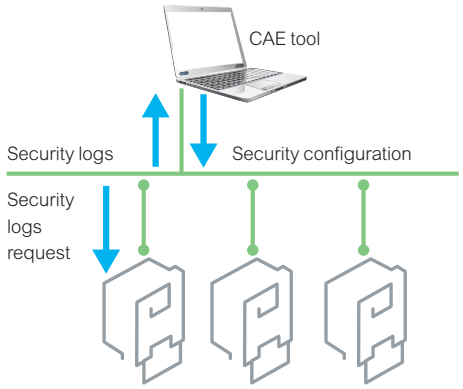


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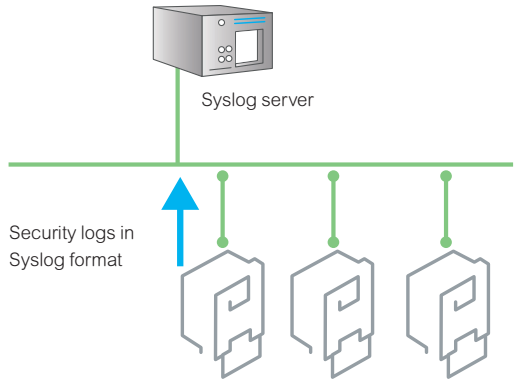


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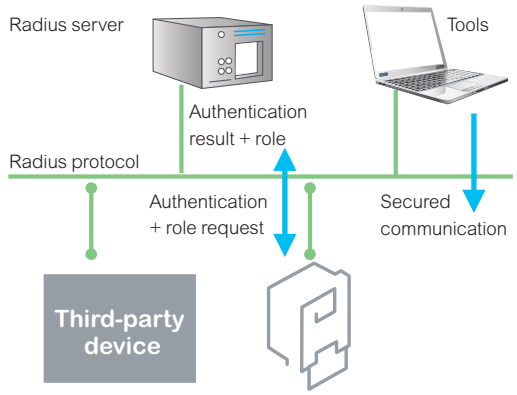



## Common features of all packages

- Secured communication between Easergy P5 protection relays and associated tools.
- Protection of the hardware and logical communication ports.
- Firmware signature.
- Password based user authentication.
- Role Based Access Control (RBAC) authorization management.
- Secured log storage.
- Client IP address filter
- Compliant to NERC CIP and BDEW standard requirements.

## Extra features provided by cybersecurity advanced package

With the cybersecurity advanced package, Easergy P5 protection relays take benefit of EcoStruxure Cybersecurity Admin Expert (CAE), a windows-based tool that allows a central management of security configuration and access to security logs of each Easergy P5 device connected to the substation network.

Easergy P5 security configuration includes:

- Roles and permissions: Role Base Access Control (RBAC),
- Users with associated roles,
- Security policy, for example password complexity or password strategy,
- Rules for security logs, choose between various standards.

With the cybersecurity advanced package, the Easergy P5 protection relay becomes part of a cybersecurity management system consisting of servers for security logs, authentication and authorization, using standard network protocols.

Easergy P5 can send security logs to any standard syslog server.

**Two use-cases are available for authentication and authorization features:**

### Advanced - Local Authentication and Authorization

In this usecase, local authentication and authorization don't rely on any external servers. Security configuration is stored locally in each Easergy P5. User authentication and authorization using associated roles are performed locally (RBAC). CAE is used to update the global security configuration of all the Easergy P5 devices located inside the substation, so that users, associated passwords, and other parameters are consistent on all devices.

### Advanced - Centralized Authentication and Authorization

In this usecase, centralized authentication and authorization relies on one or two Radius servers with the IEC 62351-8 extension.

This allows the use of a Unified Account management system shared across heterogenous solutions. The same credentials are used at the front panel of each device, tools and also third party devices.

The Radius server is in charge of authenticating users and providing the associated role. Then Easergy P5 protection relays allow access based on this role and the internal security configuration (RBAC).

Typically, the Radius server is implemented with a windows server component: NPS + Active Directory.

Schneider Electric can also provide an IEC62351-8 compliant Radius server already configured with authorization. This server allows a fast and reliable solution, managed by the CAE software, in addition including a syslog server.

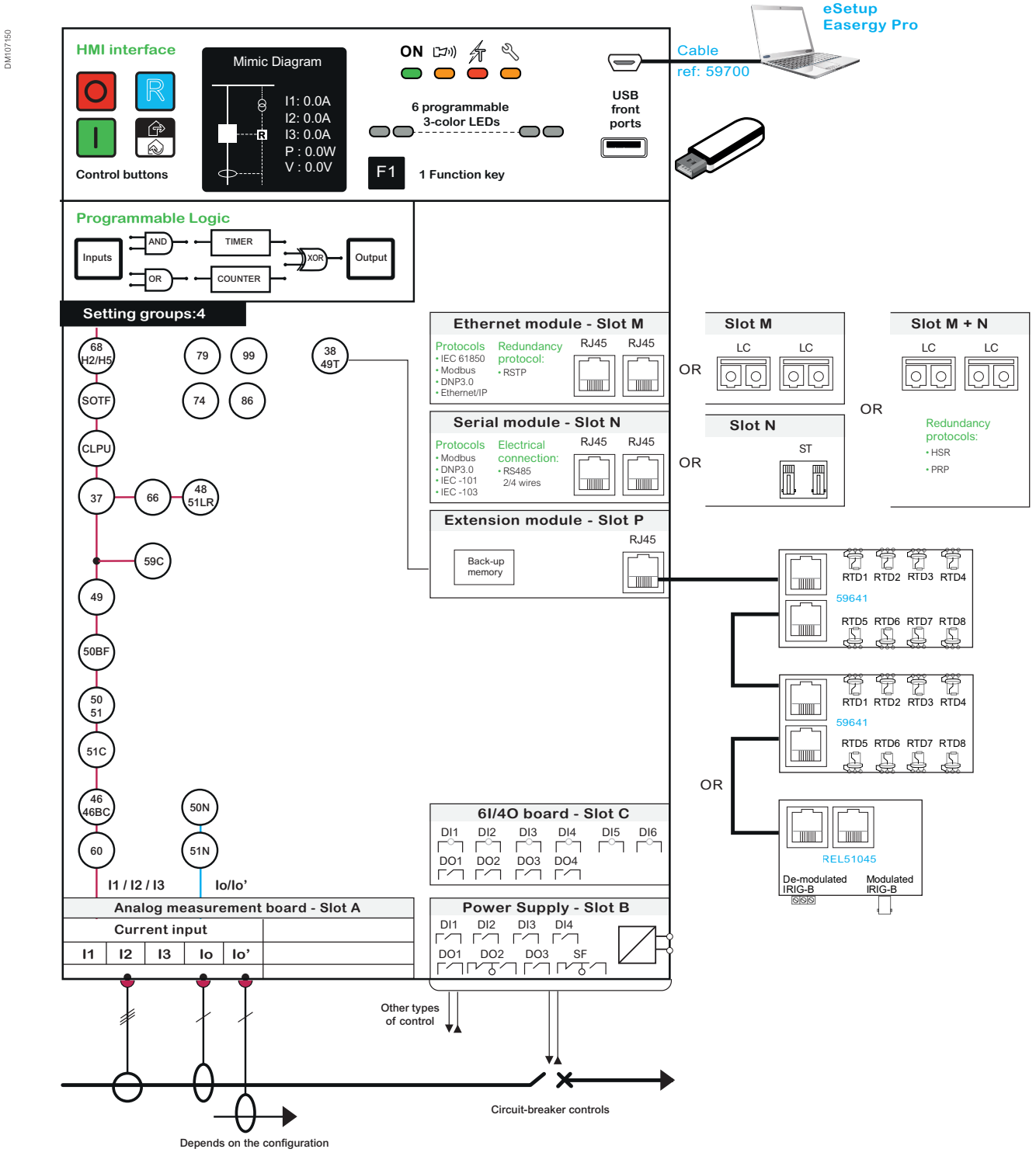
# Easergy P5
# Product description

# Functional description

## Easergy P5U20 - Universal application

Easergy P5U20 is used for feeder (incomer and outgoing), motor, or distribution transformer protection.

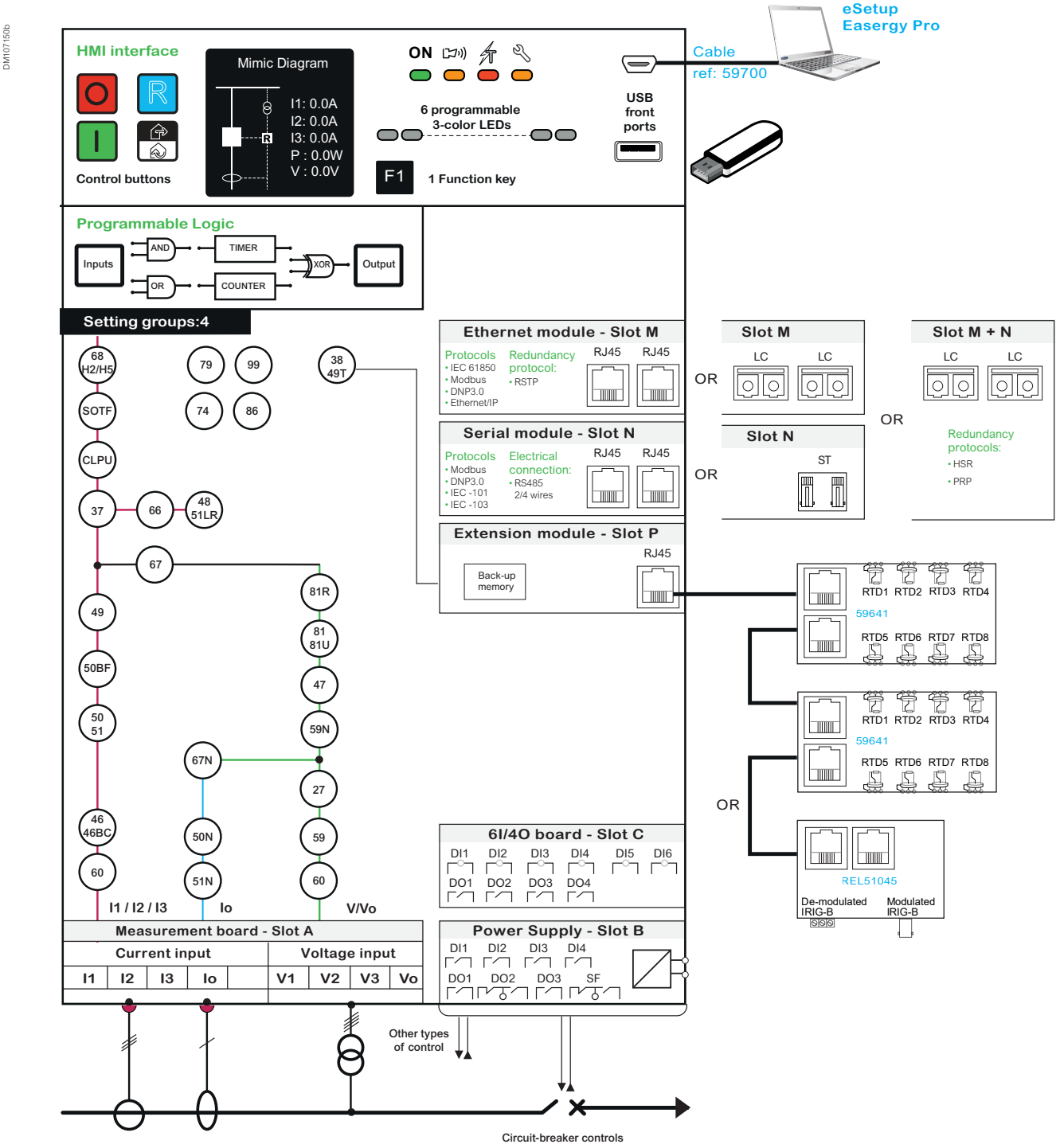
It offers a complete set of current-based protection functions and measurement, control facilities and recording/monitoring functionsfor efficient operation of the power system.



# Functional description

## Easergy P5U20 - Universal application with LPCT/LPVT

Easergy P5U20 with Low Power CTs/VTs can be used for feeder (incoming and outgoing), motor, or distribution transformer protection. It offers essential current and voltage based protection functions, measurements, control facilities and recording/ monitoring features for efficient operation of the power system. It is designed for use with low-power sensors and is applicable in distribution networks of industrial installations and utility substations for all levels of voltages.

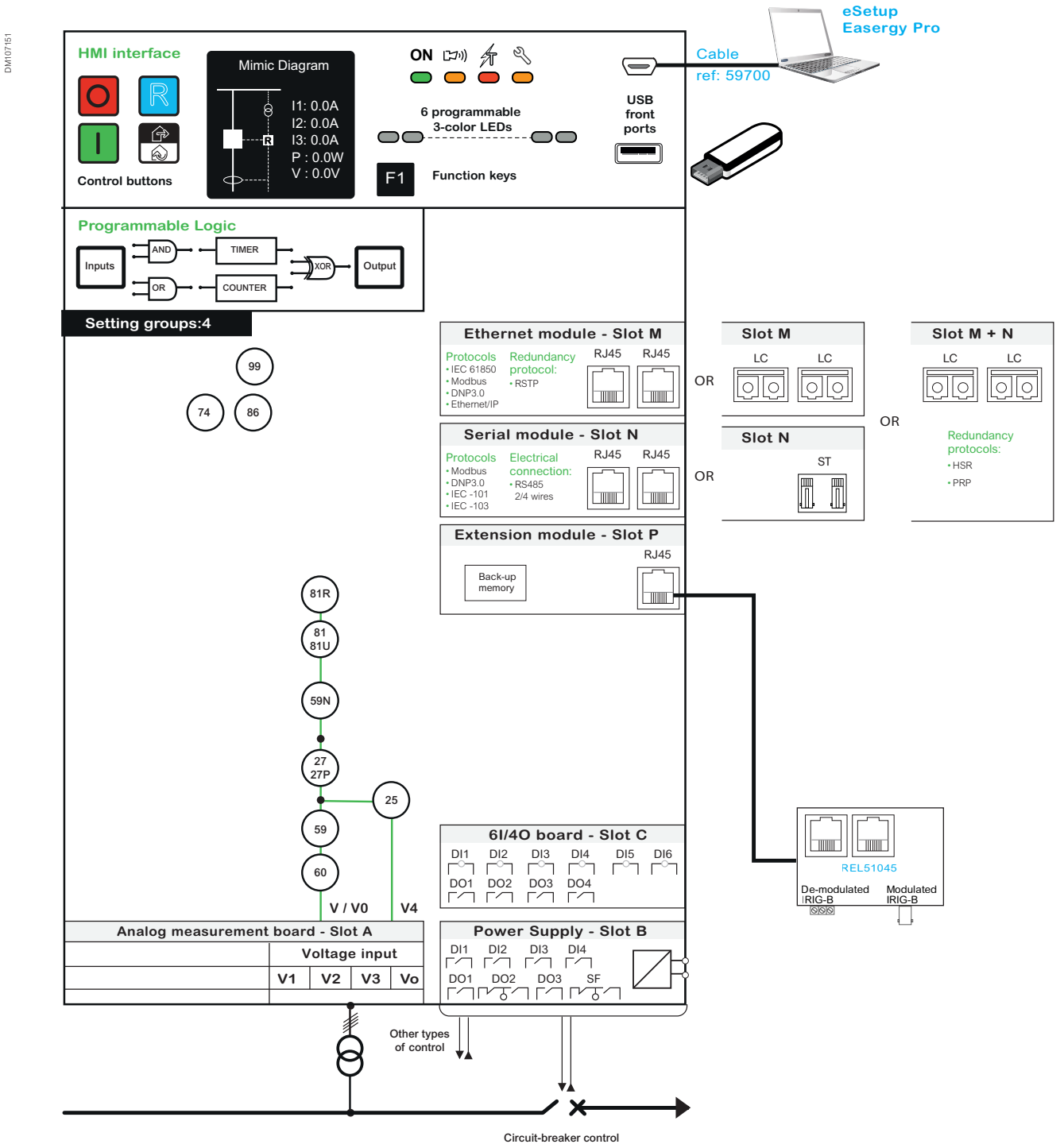


# Functional description

## Easergy P5V20 - Voltage application

Easergy P5V20 protection relay offers a complete set of voltage and frequency protection functions, as well as measurements and recording/monitoring functions for efficient operation of the power system.

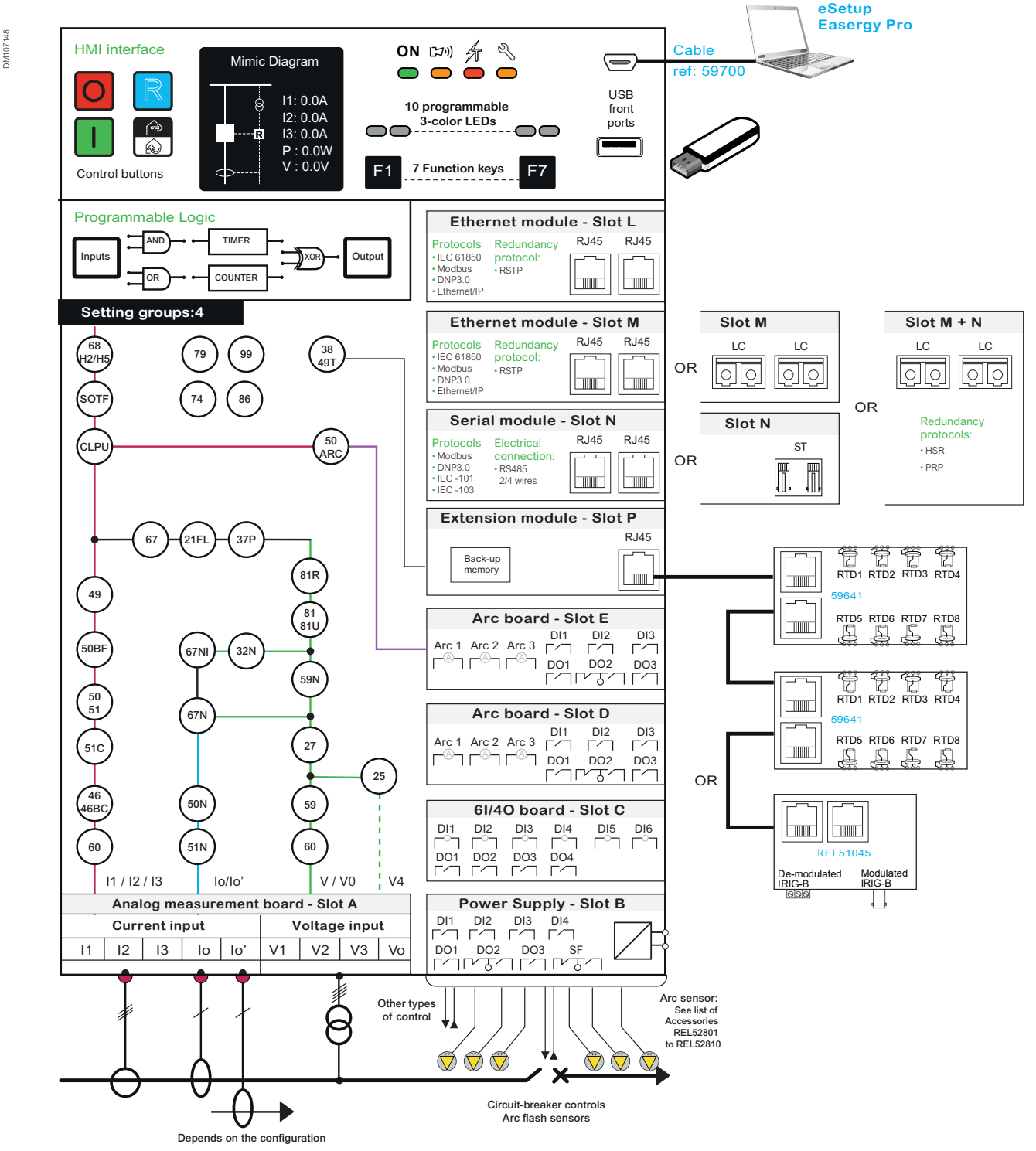
In addition it can be used for the control of switchgear.



# Functional description

## Easergy P5F30 - Feeder application

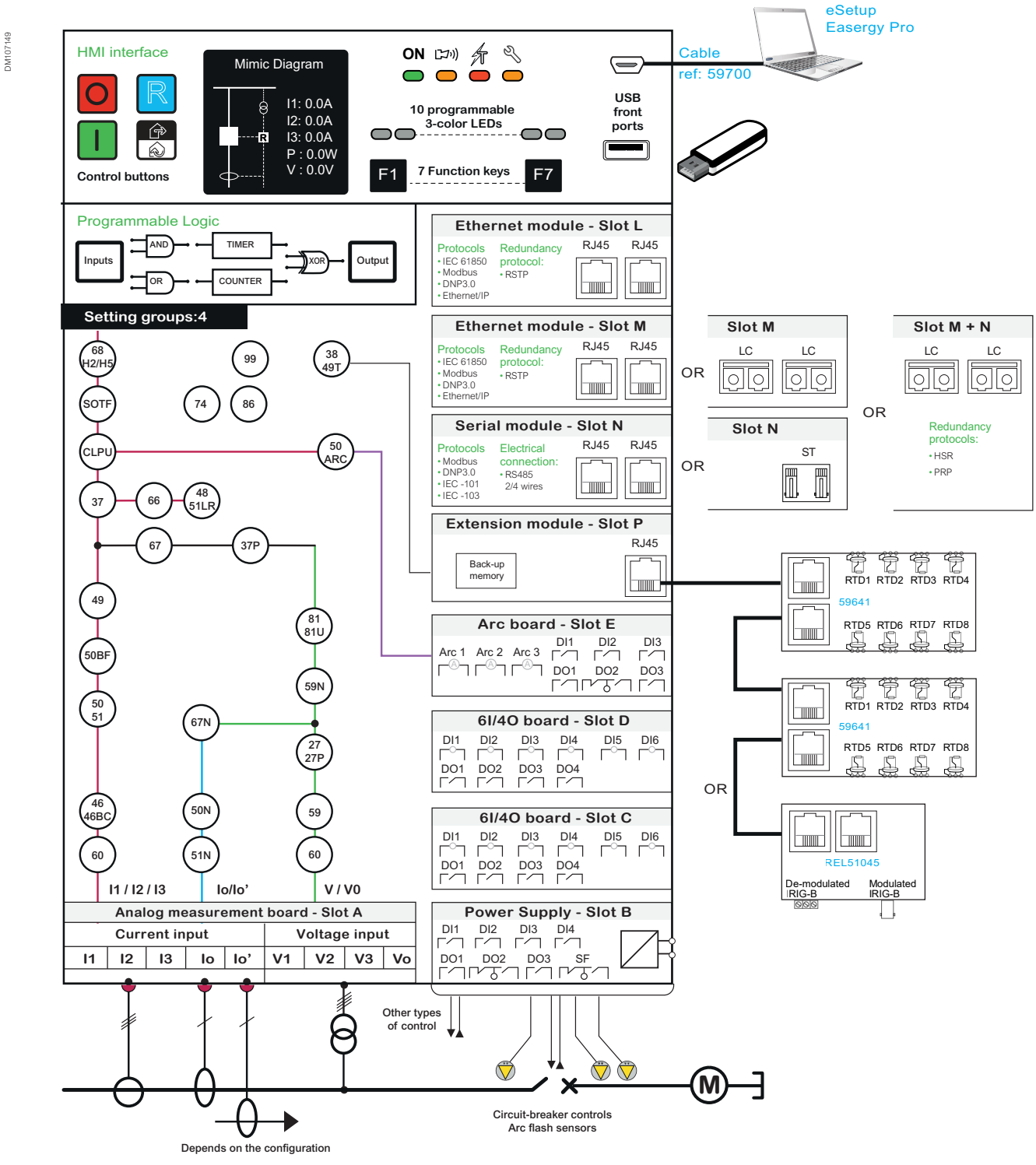
Easergy P5F30 protection relay is designed for the operation of electrical distribution networks of industrial installations and utility substations for all levels of voltages. It offers a complete set of current and voltage based protection functions, measurements, control facilities and recording/monitoring functions for efficient operation of the power system. It is suitable for application on solidly grounded, impedance grounded, Petersen coil grounded and isolated systems.



# Functional description

## Easergy P5M30 - Motor application

Easergy P5M30 protection relays are a compact solution developed and designed for medium and large sized rotating machines, performing an essential role in many industrial processes and generation. It offers more than a conventional protection relay, with numerous additional functions suitable and crucial for a wide range of applications, which involve protection, monitoring, diagnosis, fault analysis tools, and maintenance aids.



# Base unit description

## Hardware specification

PM107312

## Optional modules

Options in slots A, B, C, D, E must be selected when ordering the device (measuring inputs, power supply and input/output optional boards). Communication modules in slots L, M, N, P can be ordered separately and added on site when more communication capabilities are required. The relay will automatically integrate added modules. Additionnally, external modules are available for RTD inputs and for IRIG-B time synchronization.

PM107326

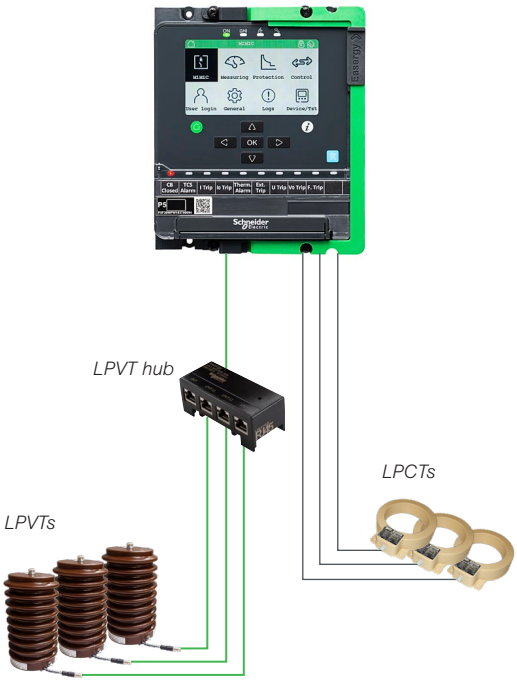
## Withdrawable design (draw-out)

Easergy P5 protection relays can be drawn-out, offering faster and easier maintenance with less risk:

1. Removable parts (including the I/O board, CPU board and power supply) can be easily replaced if required.
2. Thanks to the backup memory included in the extension module (optional), configuration and log records are automatically reloaded, allowing quick relay restart without additional configuration. No recommissioning is necessary.
3. The CT and VT inputs are isolated when the device is withdrawn.

# Base unit description

## Hardware specification




*LPCT and LPVT connection to Easergy P5U20, P5F30 and P5M30 protection relays*

*LPCT TLP130 - 0,72 kV insulation*

*LPVT GIS type C - 24 kV insulation*

## Compatibility with low power sensors LPCT/LPVT...

Easergy P5 relays can be ordered with either a conventional CT/VT measuring module or with a low-power CT/VT measuring module, compatible with low-power sensors compliant to IEC 61869-10 and IEC 61869-11 standards.

Easergy P5 protection relays can work with both resistive divider and capacitive divider LPVTs.

Low Power Current Transformer (LPCT) is a magnetic sensor with integrated shunt providing a voltage output (mV) which represents the primary current (A). LPCTs provide a low voltage output signal compatible with Easergy P5 protection relays.

Low Power Voltage Transformer (LPVT) is a voltage sensor based on resistor dividers for digital protection and measuring devices. LPVTs provide a low voltage output signal compatible with Easergy P5 protection relays.

The LPCT/LPVT compatiblity of Easergy P5 allows users to move from conventional instrument transformers to better low power sensors technology which brings a variety of benefits at every stage of the project and throughout the whole life cycle of your installation.

## ...for more reliability...

Low power sensors are free of ferroresonance and represent high accuracy up to short circuit levels.

They can be used in protection and measurement purposes with very wide operating range. This technology ensures easier maintenance thanks to very low voltage values present on the secondary side.

## ... and simplicity

Solutions bring significant simplificaton during project execution stage.

Simpler engineering (no CT sizing), procurement, stocking (very less variants) and installation ensures high effectivness and improves the project delivery time.

# Base unit description

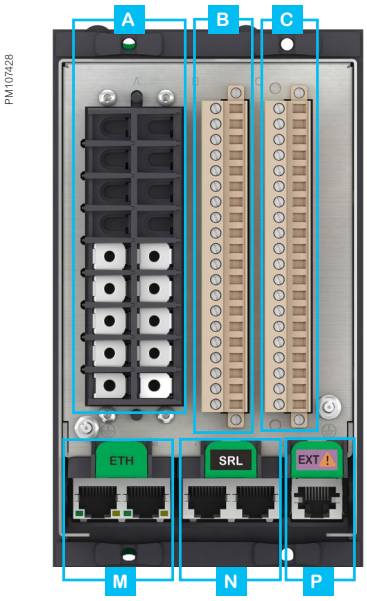
## Rear panel description

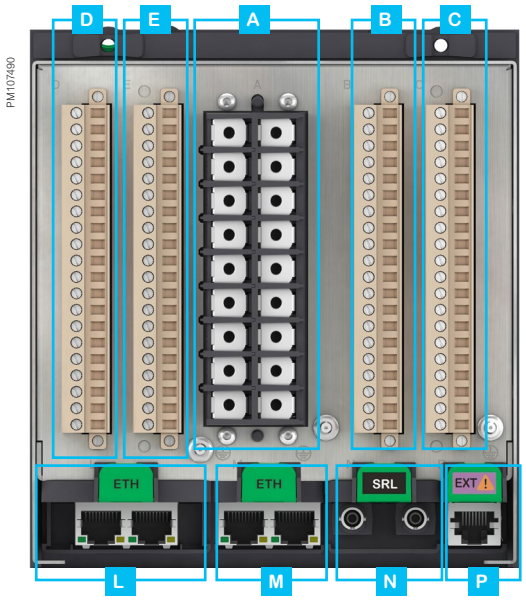
### Rear communication modules:

**ETH** Dual port copper (RJ45) or optical fibre (multimode glass fiber) Ethernet module

**SRL** RS485 or optical fibre serial communication module

**EXT** Extension port for connection with external modules



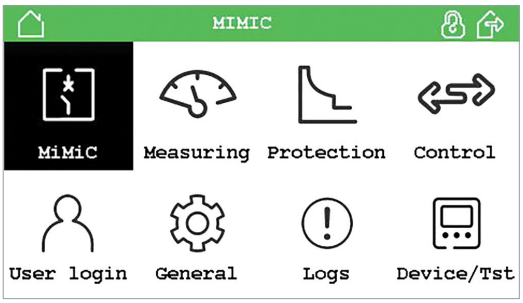

| | | Easergy P5x20 | Easergy P5x30 |
|---|---|---|---|
| **Slot A** | Measuring inputs | 3 phase CT + 2 residual CT or<br>3 phase CT + CSH core balance CT or<br>3 phase LPCT + CSH core balance CT + 4 LPVT or<br>4 VT | 3 phase CT + 2 residual CT + 4 VT or<br>3 phase CT + CSH core balance CT + 4 VT or<br>3 phase LPCT + CSH core balance CT + 4 LPVT |
| **Slot B** | Power supply and digital I/O | 24-250 $V_{DC}$ / 100-230 $V_{AC}$<br>+ 4 DI + 3 DO + watchdog (WD) | 48-250 $V_{DC}$ / 100-230 $V_{AC}$<br>+ 4 DI + 3 DO + watchdog (WD) |
| **Slot C** (1) | Additional digital inputs and outputs 1 | 6 DI + 4 DO | 6 DI + 4 DO |
| **Slot D** (1) | Additional digital inputs and outputs 2 | | 6 DI + 4 DO or<br>3 Arc + 3 DI + 3 DO |
| **Slot E** (1) | Additional digital inputs and outputs 3 | | 6 DI + 4 DO or<br>3 Arc + 3 DI + 3 DO |
| **Slot M** (1) | Communication interface 1<br>*Ethernet port* | Ethernet TP module with RSTP or<br>Ethernet FO module with RSTP | Ethernet TP module with RSTP or<br>Ethernet FO module with RSTP |
| **Slots M&N** (1) | Communication interface 1<br>*Ethernet port with PRP/HSR* | Ethernet FO module with HSR/PRP | Ethernet FO module with HSR/PRP |
| **Slot N** (1) | Communication interface 2<br>*Serial port* | RS485 serial line module or<br>Fiber optic serial line module | RS485 serial line module or<br>Fiber optic serial line module |
| **Slot L** (1) | Communication interface 3<br>*Ethernet port* | | Second Ethernet TP module with RSTP |
| **Slot P** (1) | Extension port | Extension module with backup memory | Extension module with backup memory |

(1) Optional board

# Base unit description

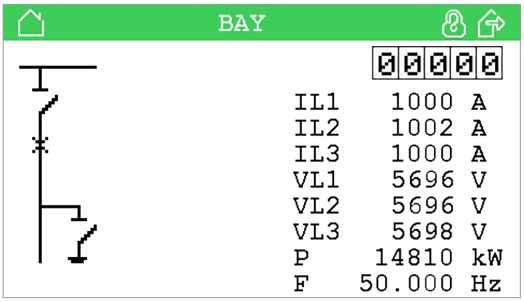
## Front panel description

DM107197




*Home page with easy navigation*

DM107196




*Single-line diagram for easy operation*

## Comprehensive data for fast and easy operation

All data required for a local equipment operation may be displayed on demand:

- Display the single-line diagram and freely assignable analog values.
- Display of all measurements.
- Display of operation and alarm messages.
- Display and setting of all protection functions.
- Display and setting of all other functions and scaling parameters.
- Entry of password to protect parameter and protection settings.

## Ergonomic data presentation

- 480 x 272 color LCD screen (Easergy P5x30 models) or 192 x 96 LCD screen (Easergy P5x20 models) can display any character or symbol
- Dedicated keys for operation:
  - Control buttons (O/I) to operate the circuit breaker and other controllable objects
  - Reset button (R) to clear the alarms and reset the lockout/latching function.
  - Local / Remote button
- Programmable function keys:
  - 1 on Easergy P5x20 models
  - 7 on Easergy P5x30 models
- Dedicated LEDs for indication of:
  - Power on
  - Relay maintenance
  - Trip
  - Alarm
- Tri-color programmable LEDs:
  - 6 on Easergy P5x20 models
  - 10 on Easergy P5x30 models

## Working languages

All texts and messages displayed on the Easergy P5 protection relay are available in two languages: English plus a local language. Files of different languages can be downloaded from the Schneider Electric website.

# Base unit description

## Easergy P5x20 - Front panel description

| KEYS | |
|---|---|
| | HOME key: return to previous menu. Three second press returns to main menu |
| | INFO push-button for viewing additional information, entering the password view, and adjusting the LCD contrast |
| | Reset control key |
| Navigation keys | |
| OK | ENTER key: activate or confirm a function |
| | UP key: move up in the menu or increase a numerical value |
| | DOWN key: move down in the menu or decrease a numerical value |
| | LEFT key: move backwards in a parallel menu or select a digit in a numerical value |
| | RIGHT key: move forwards in a parallel menu or select a digit in a numerical value |
| | Switchgear control key (OPEN) |
| | Switchgear control key (CLOSE) |
| | Local/remote control key |
| F1 | Customizable function key |


| LEDS | |
|---|---|
| | On (Green) |
| | Alarm (Yellow) |
| | Trip (Red) |
| | Maintenance (Yellow) |
| | 6 customizable tri-color LEDs |

| PORTS | |
|---|---|
| | USB mini B (Computer) |
| | USB A (USB key) |

**ACCESS COVER (OPEN)**

| LABELS |
|---|
| Customizable LED labels |
| Customizable Bay label |


**ACCESS COVER (CLOSED)**

# Base unit description

## Easergy P5x30 - Front panel description

### KEYS

| | |
|---|---|
| | HOME key: return to previous menu. Three second press returns to main menu |
| | INFO push-button for viewing additional information, entering the password view, and adjusting the LCD contrast |
| | Reset control key |
| Navigation keys | |
| OK | ENTER key: activate or confirm a function |
| | UP key: move up in the menu or increase a numerical value |
| | DOWN key: move down in the menu or decrease a numerical value |
| | LEFT key: move backwards in a parallel menu or select a digit in a numerical value |
| | RIGHT key: move forwards in a parallel menu or select a digit in a numerical value |
| | Switchgear control key (OPEN) |
| | Switchgear control key (CLOSE) |
| | Local/remote control key |
| F1 | 7 customizable function keys |


### LEDS

| | |
|---|---|
| | On (Green) |
| | Alarm (Yellow) |
| | Trip (Red) |
| | Maintenance (Yellow) |
| | 10 customizable tri-color LEDs |

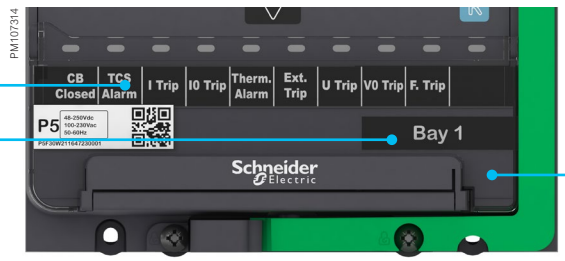
### PORTS

| | |
|---|---|
| | USB mini B (Computer) |
| | USB A (USB key) |

**ACCESS COVER (OPEN)**

### LABELS

- Customizable LED labels
- Customizable Bay label




**ACCESS COVER (CLOSED)**

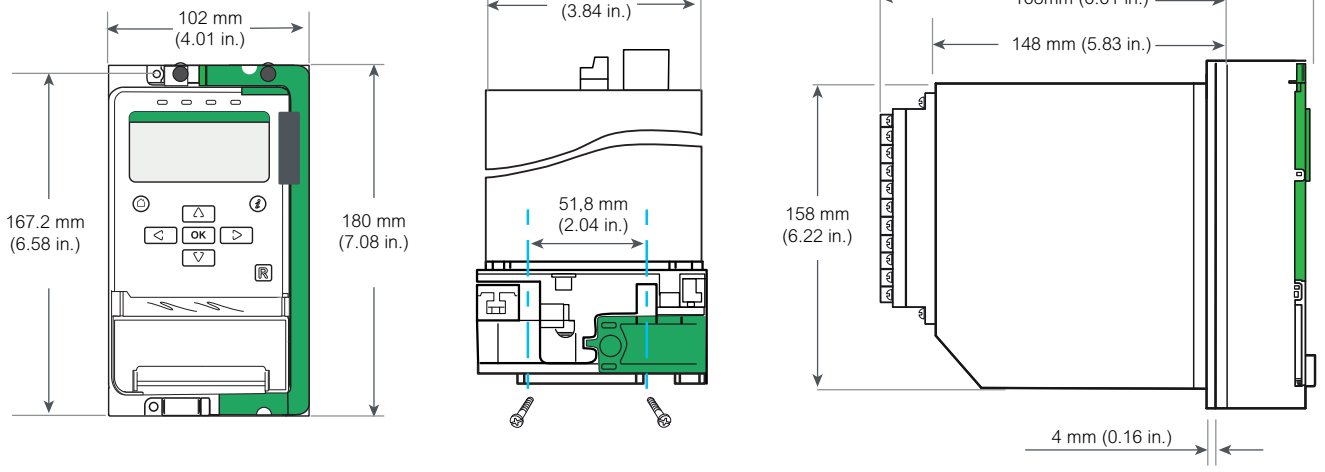
# Base unit description

## Easergy P5x20 - dimensions and weight

## Dimensions and weight

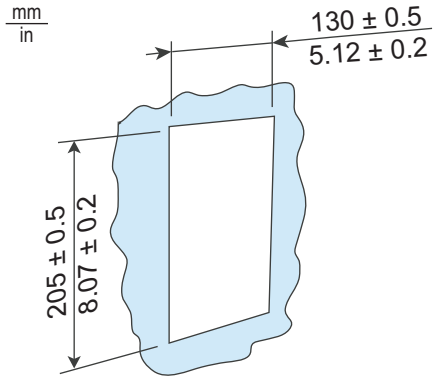
| Dimensions | mm | in |
|---|---|---|
| Height | 180 | 7.08 |
| Width | 102 | 4.01 |
| Depth | 224 | 8.82 |
| **Weight** | **kg** | **lb** |
| Weight | 2.5 to 3.5 | 5.5 to 7.7 |

DM107165




## Flush mounting installation

DM107199




| Cut-out dimensions | mm | in |
|---|---|---|
| Height | 205 | 8.07 |
| Width | 130 | 5.12 |

More info on installation accessories page 81

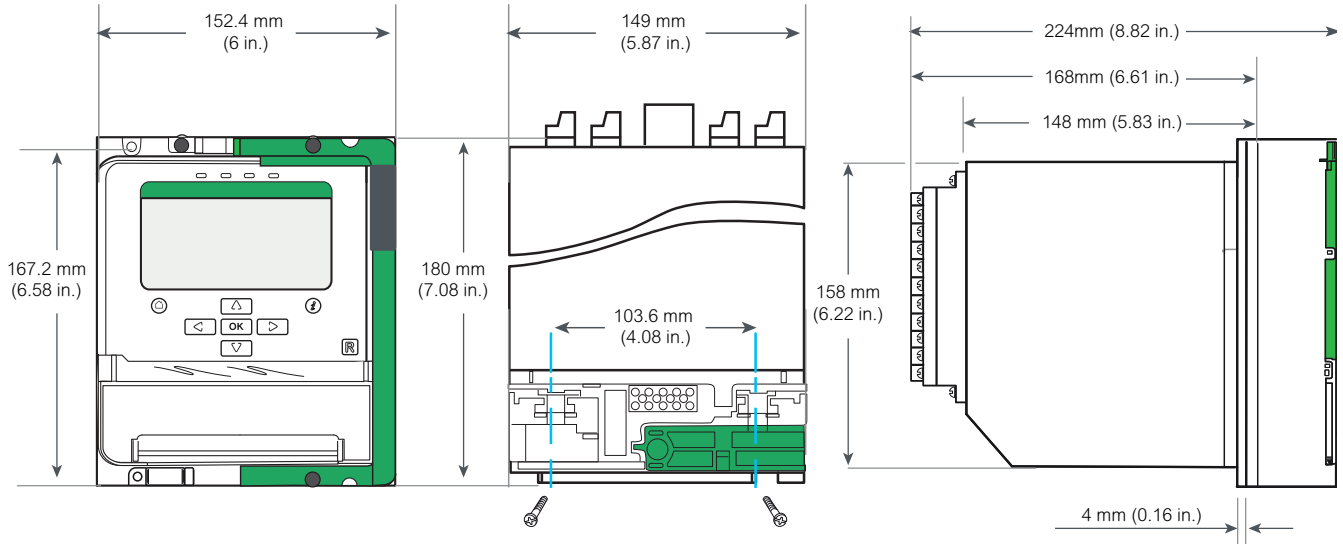
# Base unit description

## Easergy P5x30 - dimensions and weight

## Dimension and weight

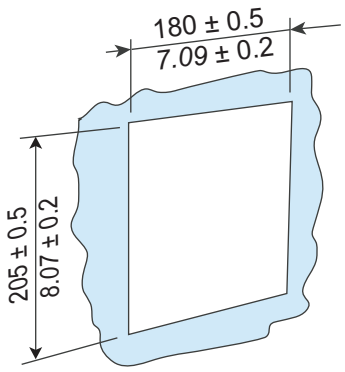
| Dimensions | mm | in |
|---|---|---|
| Height | 180 | 7.08 |
| Width | 152.4 | 6 |
| Depth | 224 | 8.82 |
| **Weight** | **kg** | **lb** |
| Weight | 2.5 to 3.5 | 5.5 to 7.7 |

DM107168




## Flush mounting installation

DM107199




| Cut-out dimensions | mm | in |
|---|---|---|
| Height | 205 | 8.07 |
| Width | 180 | 7.09 |

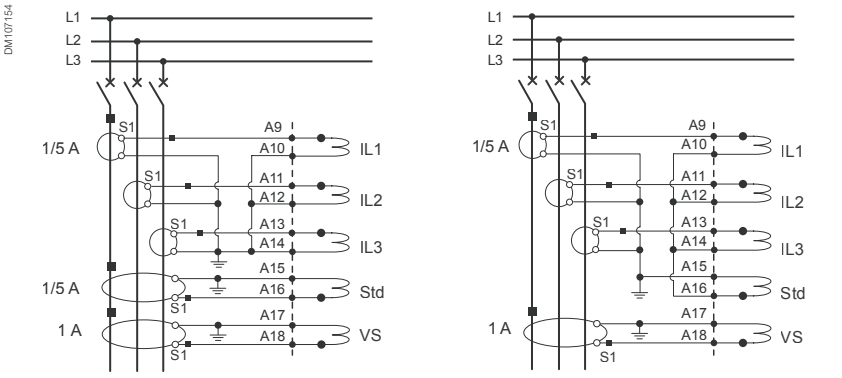
More info on installation accessories page 84

# Connection diagrams

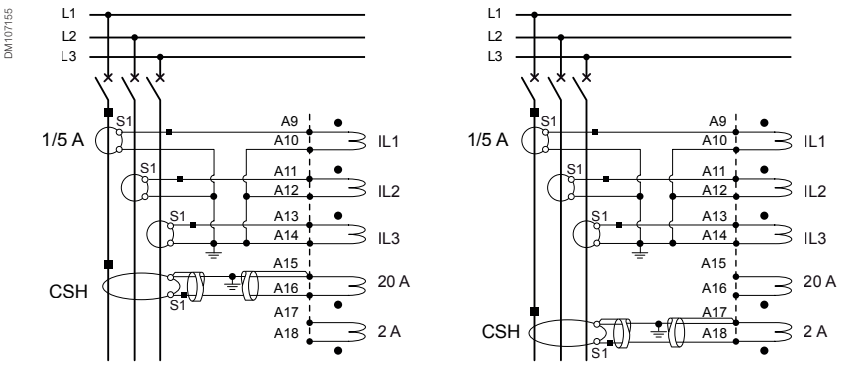
## Current Transformers (and LPCT)

## CT and LPCT connection – slot A

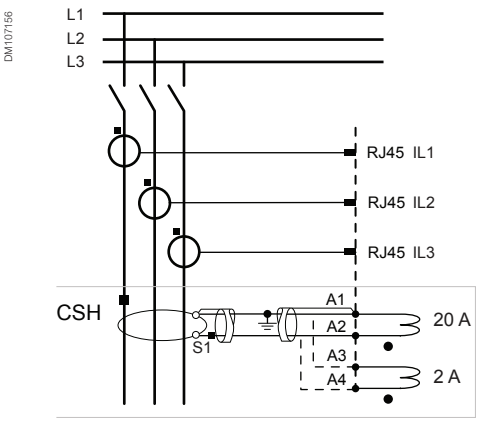
### Model with 3 phase CT + 2 residual CT inputs




### Model with 3 phase CT + 1 CSH inputs




### Model with 3 phase LPCT + 1 CSH inputs



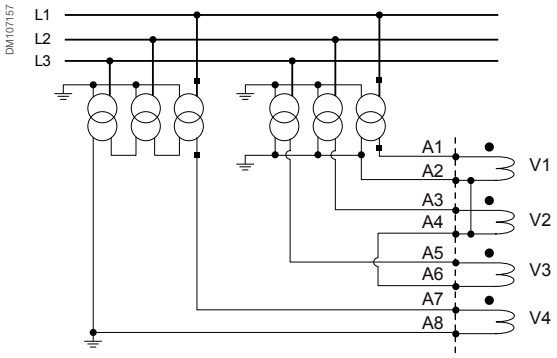
# Connection diagrams

## Voltage Transformers (and LPVT)

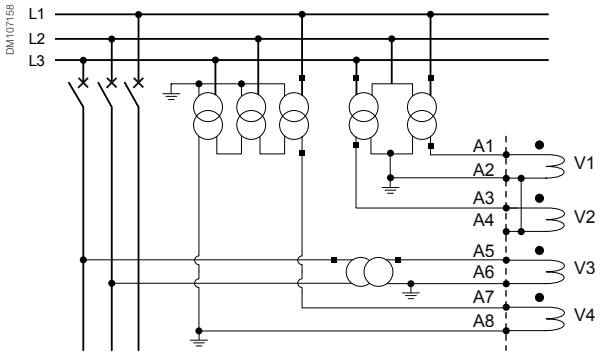
## VT and LPVT connection – slot A

### Model with 4 VT inputs

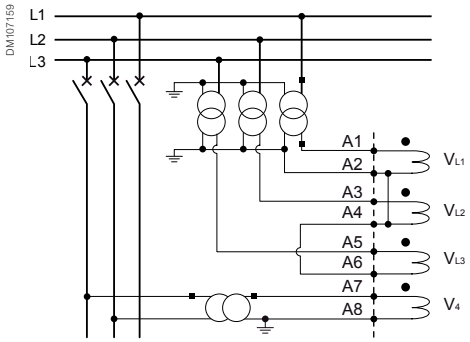
**3 phase-to-neutral voltages and 1 residual voltage**



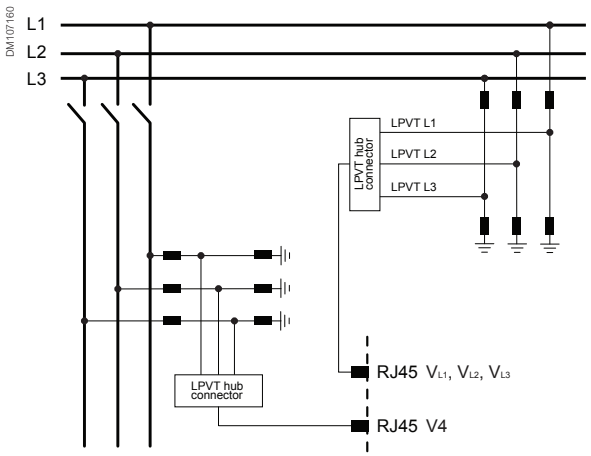

**2 phase-to-phase voltages + 1 residual voltage + 1 additional phase-to-phase voltage**




**3 phase-to-neutral voltages + 1 additional phase-to-phase voltage**




### Model with 4 LPVT inputs (1)




V4 = $V_{L2}$-$V_{L1}$ or
V4=$V_{L1}$
according to setting

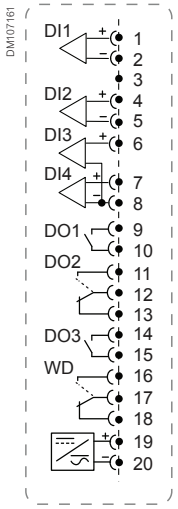
(1) Contact us for availability

# Connection diagrams

## Power supply, Inputs and Outputs

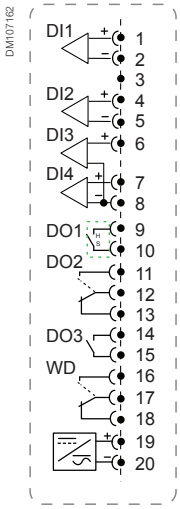
## Power supply and digital I/O – slot B

### P5U20 – P5V20




| |
|---|
| 24 to 250 V supply + 4 DI + 3 DO + WD |
| DI1 to DI4: universal digital inputs |
| DO1, DO2 and DO3:<br>control relay outputs |
| Watchdog (WD): signaling relay output |

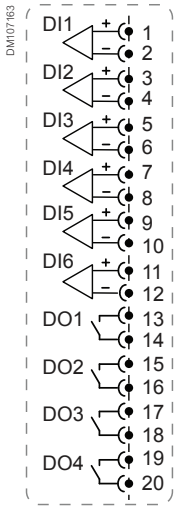
### P5F30 – P5M30




| |
|---|
| 48 to 250 V supply + 4 DI + 3 DO + WD |
| DI1 to DI4: universal digital inputs |
| DO1: high-speed/high-break output<br>DO2 and DO3: control relay outputs |
| Watchdog (WD): signaling relay output |

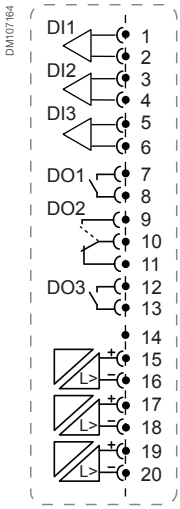
## Additional digital I/O and arc-sensors inputs – slots C, D, E

### P5U20 – P5V20 – P5F30 – P5M30




| |
|---|
| 6 DI + 4 DO |
| DI1 to DI6: universal digital inputs |
| DO1 to DO4: signaling relay outputs |

### P5F30 – P5M30




| |
|---|
| 3 Arc + 3 DI + 3 DO |
| DI1 to DI3: universal digital inputs |
| DO1 and DO2: control relay outputs<br>DO3: signaling relay outputs |
| 3 point light sensor inputs |

# Technical characteristics

## Electrical characteristics

| Power supply | | |
|---|---|---|
| Rated voltage | P5x20 | 24-250 Vdc; 100-230 Vac |
| | P5x30 | 48-250 Vdc; 100-230 Vac |
| Variation | | -20% / +20% |
| Typical burden (1) | P5x20 | 4 W ; 10 VA at 230 Vac |
| | P5x30 | 8 W ; 15 VA at 230 Vac |
| Maximum burden | P5x20 | 6 W ; 15 VA at 230 Vac |
| | P5x30 | 11 W ; 22 VA at 230 Vac |
| Maximum interruption time | | 100 ms |

| Measurement Inputs | |
|---|---|
| Rated frequency | 50/60 Hz |
| **Phase CT and standard earth/ground fault CT inputs** | |
| Rated current | 1 A / 5 A |
| Input impedance | < 0.02 Ohm |
| Thermal withstand, continuous | 20 A |
| Thermal withstand, 1 s | 500 A |
| **Very sensitive earth/ground fault CT input** | |
| Rated current | 1 A |
| Input impedance | < 0.02 Ohm |
| Thermal withstand, continuous | 4 A |
| Thermal withstand, 1 s | 100 A |
| **CSH input (for 470/1 dedicated sensors)** | |
| Rated current | 2 A / 20 A (primary value) |
| Input impedance | < 0.02 Ohm |
| Thermal withstand, continuous | 300 A (primary value) |
| Thermal withstand, 1 s | 20 kA (primary value) |
| **LPCT inputs** | |
| Rated voltage | 22.5 mV |
| Extended rated voltage | 0.25 to 31.5 rated voltage |
| Input impedance | 2 MOhms / 500 pF |
| Thermal withstand | 60 V |
| **VT inputs** | |
| Rated voltage | 200 V |
| Input impedance | > 100 kOhms |
| Voltage withstand, continuous | 1.2 rated voltage |
| **LPVT inputs** | |
| Rated voltage | 3.25 V/√3 |
| Extended rated voltage | 0.25 to 1.5 rated voltage |
| Input impedance | 10 MOhms / 15 pF |
| Thermal withstand | 25 V |

*(1) According to configuration*

# Technical characteristics

## Electrical characteristics

| Digital inputs | |
|---|---|
| Rated voltage | 240 V DC or AC |
| Switching threshold voltage | 10 to 200 V, settable |
| Current drain | 1 to 28 mA, settable (1) |

| Digital outputs (relays) | |
|---|---|
| Control relay outputs | |
| Rated voltage | 240 V DC or AC |
| Continuous current | 8 A |
| Making current | 30 A, 200 ms |
| Breaking capacity (L/R < 40 ms) | 50 W (24 to 127 V) / 30W (240 V) (2) |
| Signaling relay output | |
| Rated voltage | 240 V DC or AC |
| Continuous current | 2 A |
| Breaking capacity (L/R < 20 ms) | 2 A (24 V) / 1 A (48 V) / 0.2 A (127 V) / 0.1 A (240 V) |
| High-speed and high-break output | |
| Rated voltage | 240 V DC or AC |
| Continuous current | 10 A |
| Making current | 30 A, 200 ms |
| Breaking capacity (L/R < 40 ms) | 10 A (24 to 240 V) |
| Closing / opening time | 1 ms / 200 ms |

*(1) According to configuration*
*(2) 50 W at 24 V with additional customer protection (RC or zener diode)*

# Technical characteristics

## Environmental characteristics

| Electromagnetic compatibility | Standard | Level / Class | Value |
|---|---|---|---|
| **Emission Tests** | | | |
| Conducted emission | CISPR 11 | Class A | 0.15 to 0.5 MHz: 79 dBµV (quasi peak) |
| | CISPR 22 | Class A | 0.5 to 30 MHz: 73 dBµV (quasi peak) |
| | IACS E10 | | 0.15 MHz to 0.3 MHz: 80 to 50 dBµV/m |
| Radiated emission | CISPR 22 | Class A | 30 MHz to 230 MHz: 40 dBµV (quasi peak) |
| | | | 0.3 MHz to 100 MHz: 60 to 54 dBµV/m |
| | IACS E10 | | 100 MHz - 2000 MHz, 54 dBµV/m<br>except for: 156 MHz - 165 MHz, 24 dBµV/m |
| **Immunity tests – radiated disturbances** | | | |
| Electrostatic discharge | IEC 61000-4-2 | Class 3 | 8 kV air / 6 kV contact |
| | ANSI C37.90.3 | Class 4 | 15 kV air / 8 kV contact |
| Radiated electromagnetic energy | IEC 61000-4-3 | Level 3 | 10 V/m, 80 MHz to 2.7 GHz, 80% AM (1 KHz) |
| | ANSI C37.90.2 | | 20 V/m, 80 MHz to 1 GHz, 80% AM (1 KHz) |
| | GOST 32137 | | 10 V/m, 80 MHz to 1 GHz, 80% AM (1 KHz) and pulse 200 Hz |
| | GOST 30804.4.3 | | 30 V/m, 800 to 960 MHz & 1.4 to 2 GHz |
| | IACS E10 | | 10 V/m, 80 MHz to 1 GHz |
| Magnetic fields at power frequency | IEC 61000-4-8 | Level 5 | 100 A/m continuous, 1000 A/m, 3 s |
| Pulse magnetic fields | IEC 61000-4-9 | Level 5 | 1000 A/m |
| Oscillatory magnetic fields | IEC 61000-4-10 | Level 5 | 100 A/m, 100 kHz and 1 MHz, 2 s |
| **Immunity tests – conducted disturbances** | | | |
| Radio frequency disturbances | IEC 61000-4-6 | Level 3 | 10 V CM, 0.15 MHz to 80 MHz |
| Slow damped oscillatory waves | IEC 61000-4-18 | Level 3 | 2.5 kV CM, 1 kV DM, 100 kHz & 1 MHz |
| | ANSI C37.90.1 | | 2.5 kV, 1 MHz, CM and TM |
| | IEC 61000-4-12<br>GOST30804.4.12 | | 2 kV CM, 1 kV DM, 100 kHz<br>Source impedance: 12 Ω |
| Fast damped oscillatory waves | IEC 61000-4-18 | Level 3 | 2 kV CM, 3MHz, 10MHz, 30MHz |
| Conducted disturbances 0 to 150 kHz | IEC 61000-4-16 | Level 4 | 300 V CM, 150 V DM, 0 to 150 kHz<br>30 V, continuous at power frequency |
| Electrical fast transient or burst | IEC 61000-4-4 | Level 4 | 4 kV CM, 5 kHz and 100 kHz |
| | ANSI C37.90.1 | | 4 kV, 5 kHz CM and TM |
| | IACS E10 | | 2 kV power supply, 1 kV digital I/Os, 5min |
| Surge | IEC 61000-4-5 | Level 4 | 4 kV CM, 2 kV DM<br>Communication ports: 2 kV CM, 1 kV DM |

# Technical characteristics

## Other characteristics

| Safety | Standard | Value |
|---|---|---|
| General safety | | IEC 60255-27 |
| Creepage distances and clearances | IEC 60255-27 | Pollution degree 2<br>overvoltage category III |
| High voltage withstand | IEC 60255-27 | 2 kV rms, 1mn<br>1 kV rms, 1mn across opened contacts |
| | ANSI C37.90 | 1.5 kV rms 1 mn across opened contacts of control relays |
| Impulse voltage withstand | IEC 60255-27 | 5 kV, 1.2 µs/50 µs |
| Insulation | IEC 60255-27 | Insulation resistance > 100 MΩ at 500 Vdc |

| Electromagnetic compatibility | Standard | Level / Class | Value |
|---|---|---|---|
| Disturbances on the power supply | | | |
| Voltage dips | IEC 61000-4-11 | | 0%, 5/6 cycles min |
| | | | 40%, 10/12 cycles |
| | | | 70%, 25/30 cycles |
| | IEC 61000-4-29 | | 0%, 100 ms min |
| | | | 40%, 200 ms |
| | | | 70%, 500 ms |
| Interruption | IEC 61000-4-11 | | 0%, 250/300 cycles |
| | IEC 61000-4-29 | | 0%, 5 s |
| Voltage variations | IEC 61000-4-14 | Class 3 | ±12 % Un |
| Frequency variations | IEC 61000-4-28 | Level 4 | ±15 % of frequency variation |
| Ripples | IEC 61000-4-17 | | 15%, 100 Hz to 120 Hz |
| Gradual shutdown | IEC 61000-4-27 | | |
| Reverse of DC power supply | IEC 61000-4-27 | | |

*AM : Amplitude Modulation / CM : Common Mode / DM : Differential Mode / TM : Transversal Mode*

# Base unit description

## Other characteristics

| Mechanical robustness | Standard | Level / Class | Value |
|---|---|---|---|
| In operation | | | |
| Vibrations | IEC 60255-21-1 | Class 2 | 1 Gn, 10 Hz to 200 Hz |
| | GOST 17516.1 | | 0,015 mm peak, 0,5 Hz to 57,6 Hz<br>1 Gn 57,6 Hz to 150 Hz |
| | IACS E10 | | 13.2 Hz to 100 Hz – acceleration ± 0.7 g |
| Shocks | IEC 60255-21-2 | Class 2 | 10 Gn / 11 ms |
| Earthquakes | IEC 60255-21-3 | Class 2 | 2 Gn horizontal / 1 Gn vertical |
| De-energized | | | |
| Vibrations | IEC 60255-21-1 | Class 2 | 2 Gn ; 10 Hz - 150 Hz |
| Shocks | IEC 60255-21-2 | Class 2 | 30 Gn / 11 ms |
| Jolts | IEC 60255-21-2 | Class 2 | 20 Gn / 16 ms |

# Base unit description

## Other characteristics

| Climatic withstand | Standard | Level / Class | Value |
|---|---|---|---|
| **In operation - Operating condition: -40°C to +70°C (-40°F to +158°F)** | | | |
| Operating conditions | | | -40°C to +70°C (-40°F to +158°F) |
| Exposure to cold | IEC 60068-2-1 | Ad | -40°C (-40°F) ; 96 h |
| Exposure to dry heat | IEC 60068-2-2 | Bd | +70°C (+158°F), 96 h<br>+85°C (+185°F), 16 h |
| Exposure to damp heat | IEC 60068-2-78 | Cab | 93% RH without condensation, 40°C (104°F), 56 days |
| | IEC 60068-2-30 | Db | 93-95% RH, 25°C to 55°C (77°F to 131°F), 6 cycles (12 + 12 hours) |
| Temperature variation | IEC 60068-2-14 | Nc | -40°C to +70°C (-40°F to +158°F)<br>10°C/mn (18°F/mn) |
| **In storage** | | | |
| Storage conditions | | | -40°C to +85°C (-40°F to +185°F) |
| Exposure to cold | IEC 60068-2-1 | Ab | -40°C (-40°F) ; 96 h |
| Exposure to dry heat | IEC 60068-2-2 | Bb | +85°C (+185°F) ; 96 h |
| Exposure to damp heat | IEC 60068-2-78 | Cab | 93% RH to 95% RH, 40°C (104°F), 56 days |
| **Corrosive atmosphere** | | | |
| Salt mist | IEC 60068-2-52 | Kb / 1 | |
| Corrosive 2 and 4 gas tests | IEC 60068-2-60 | Ke | • Method 1;<br>0,5 ppm $H_2S$; 1 ppm $SO_2$<br>• Method 4;<br>– 0,071 ppm H2S, 0,26 ppm $NO_2$,<br>– 0,034 ppm $CL_2$, 0,11 ppm $SO_2$ |
| | IEC 60721-3-3 | 3C2 | 21 days |

### Cybersecurity

| | Standard |
|---|---|
| Certification | Achilles, Level I |
| Certificate number | 453-071119 |

### Marking and homologations

| Standard | Value | |
|---|---|---|
| IEC60255-26<br>IEC60255-27 | CE marking according to:<br>EMC Directive 2014/30/EU<br>LV Directive 2014/35/EU | CE |
| UL508<br>ANSI/IEEE C37.90<br>CAN/CSA C22.2 No.14 | File E354250, NRGU | c UL us |

# Digital experience

# Set up software

## eSetup Easergy Pro

Minimum requirements for running eSetup Easergy Pro:

- Windows 7 or higher
- 512 MB RAM
- 50 MB Disk space

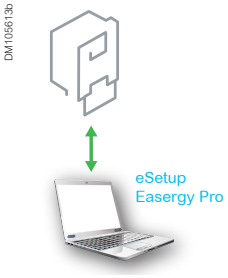
## At every step of the digital life

eSetup Easergy Pro offers full facilities to set up Easergy P5 protection relays. Intuitive and simple, eSetup Easergy Pro is a user-oriented interface to assist you during the engineering, commissioning and operation of Easergy P5 protection relays.

Its streamlined workflow and graphical representations have been designed to simplify your configuration process.

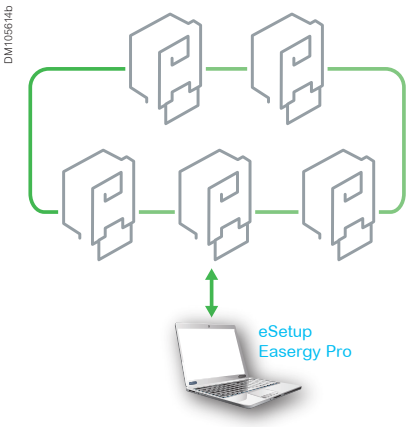
The software is available for download on the Schneider Electric website.


Use eSetup Easergy Pro in standalone mode during engineering to prepare the configuration.




Connect the PC running eSetup Easergy Pro to the USB port of the Easergy P5 protection relay during commissioning to adjust the settings and test the protection relay.

*For connection to Easergy P5, use the connection cord ref: 59700*

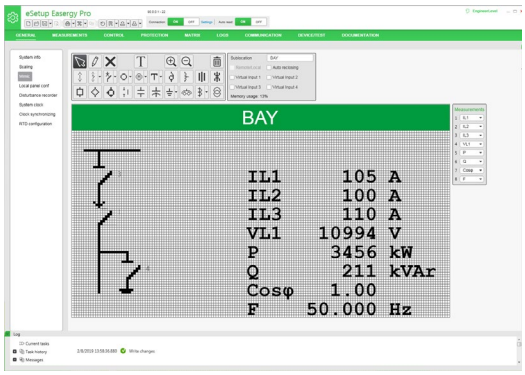



Connect the PC running eSetup Easergy Pro to the Ethernet network during operation to retrieve data from the protection relays and update the system.

# Set up software

## eSetup Easergy Pro

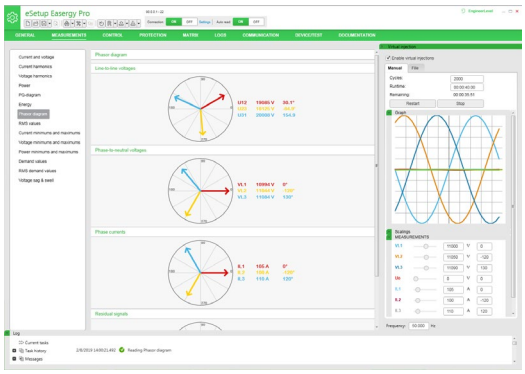
EM106160




## During engineering

- Create the configuration of the Easergy P5 relay: select the appropriate options and receive the ordering code.
- Set the characteristics of the CTs, VTs, or sensors connected to the relay, and select the protection functions that will be activated and their settings.
- Build a specific logic equations file, if required, using a graphical editor.
- Map the digital inputs of the relay and different internal signals to the relevant functions, LEDs, and digital outputs, using a straightforward matrix format.
- Draw the single-line diagram that will appear on the front display of the relay for switchgear control and select the measurements that will be displayed. If required, build the interlocking logic using a matrix format.
- For IEC 61850 protocol, configure the data set and the report control blocks that will be published and select the GOOSE data to which you want to subscribe.
- Complete the setting of additional functions (disturbance recorder, event logging system, clock synchronization, etc.).

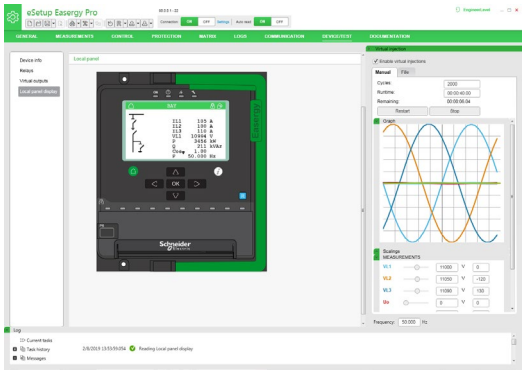
EM106163




## During commissioning

- Connect to the front panel of one single relay or access several relays by connecting to Ethernet.
- Open the Digital Inputs menu to check the status of inputs. Reverse the polarity or add a filtering delay if necessary.
- Open the Relays menu and force the status change of the output relays in order to check the wiring.
- Open the Phasor Diagram menu to see in real time the injected currents and voltages and the value.
- Use virtual injection for testing protection settings and circuit breaker tripping and for checking LEDs and connected outputs.
- Open the Logic or the Matrix menu if the logic needs to be tested. The active signals appear in a different color and are updated in real time. Changes in the logic or in the matrix can be made and applied simply to the relay.

EM106166




## During operation

- Connect to the front panel of a single relay or gain access to several relays by connecting to Ethernet
- During normal operation, get the most of the metering capabilities of the Easergy protection relay:
  - Open the different Measurements menus to access the power monitoring and power quality data.
  - Open the disturbance recorder menu to get a waveform capture or program the recording of a power trend.
- After a trip, use eSetup Easergy Pro to understand the fault:
  - Check the fault log of the protection that has tripped the circuit breaker
  - Download the disturbance record from the Easergy P5 and display it with a disturbance recorder evaluation tool, eg. Wavewin.

# Web-HMI

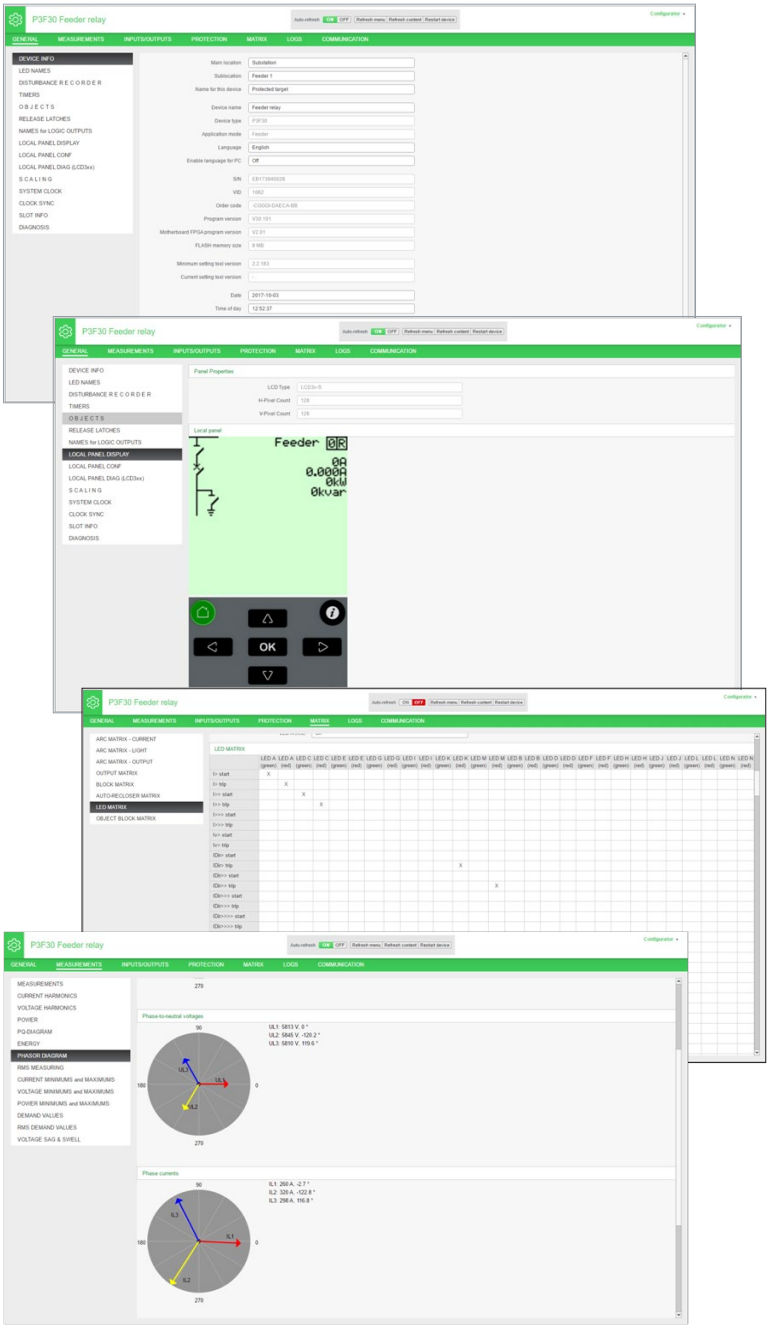
## Description

## Enhance operational efficiency

- **Direct access to protection and communication settings**
- **Control and monitoring of circuit breakers and switches**
- **Mirror HMI function**
- **Direct access to measurements including graphical phasor diagrams**
- **Device diagnosis**
- **MATRIX status**
- **Access to logs and other information**

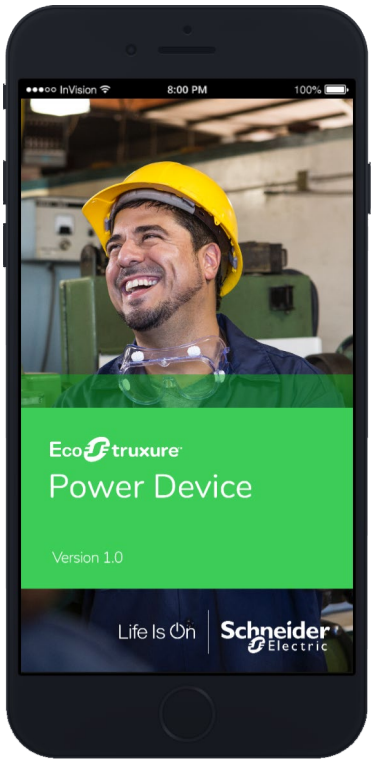
## Boost operational efficiency with the embedded web-HMI

Quickly and conveniently configure, monitor, and operate your Easergy P5 protection relay with our web-HMI. The web-HMI, accessible online via the IP address of the relay, doesn't require you to install specific computer software - simply use your web browser to connect to the device. You just need to enable the web server service during the initial configuration of Easergy P5 with eSetup Easergy Pro. The web-HMI is based on the same page design as eSetup Easergy Pro, making it easy to use!



# Mobile application

## Description




## EcoStruxure™ Power Device app

Within the palm of your hand you can be connected to your Schneider Electric:

- Masterpact MTZ air circuit breaker
- TeSys GV4 motor circuit breaker
- Easergy P5 protection relays
- ... and more!

EcoStruxure Power Device app is a single mobile application with necessary information and capabilities to operate and efficiently maintain devices in the EcoStruxure architecture.

This app can be installed on your IOS and Android smartphone. The protection devices can be identified on the app by simply scanning their QR codes.

Wireless communication is possible via by WIFI(1), Bluetooth(2), NFC(2) technologies for operation and monitoring within the proximity of the devices. Get real time notifications about the electrical installation: load levels, health status, warnings and alarms, protection settings…and more!

## Free download EcoStruxure Power Device on:

Download on the App Store

GET IT ON Google Play

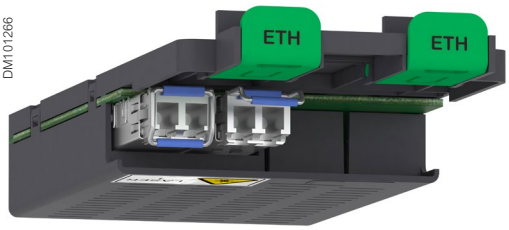
(1) WIFI is not embedded in Easergy P5, a separate WIFI router connected to an Ethernet port of the device is required.
(2) Contact Schneider Electric for availability.

# Additional Modules and Accessories

# Communication accessories

## Modules

DM101266




Ethernet HSR/PRP FO module

## Ethernet communication module with HSR and PRP redundancy

**REL51033: Ethernet HSR/PRP FO module**

The Ethernet communication module with HSR and PRP redundancy is inserted in both slots M and N of the Easergy P5. The module can be selected as an option when ordering the Easergy P5 or purchased later and installed on site. This module requires fiber optic connection.

In addition to relay communication protocols on Ethernet, it also enables the use of PRP (Parallel Redundancy Protocol) and HSR (High-availability Seamless Redundancy) – selectable by configuration, which allow instantaneous reconfiguration of the communication system without communication packet loss.

### Characteristics

| | | |
|---|---|---|
| Standard | 2 ports: 100 Base FX | |
| Baud rate | 100 Mbits/s | |
| Fiber type | Multimode glass fiber | |
| Wavelength | 1300 nm | |
| Connection | LC | |
| Maximum attenuation (fiber optic + connectors) | Fiber optic diameter | Max attenuation |
| | 50/125 or 62.5/125 µm | 14 dB |

### Back-up power supply input

| | |
|---|---|
| Rated voltage | 12VDC ±20% |
| Burden | 0.5 W |
| Dielectric withstand | 500V, 50Hz, 1 mn |

**DANGER**

**HAZARD OF DAMAGE TO THE EYES**

Never look into the end of a fiber optic or connectors of the module

Failure to follow these instructions will result in death or serious injury.

# Communication accessories

## Modules

## Ethernet communication module with RSTP redundancy

The Ethernet communication module is inserted in slot M of Easergy P5. The module can be selected as an option when ordering the device or purchased later and installed on site. This module is available in 2 versions for copper wire or fiber optic connection.

In addition to relay communication protocols on Ethernet, it also enables the use of RSTP (Rapid Spanning Tree Protocol), which allows fast reconfiguration of the communication system.

DM101268

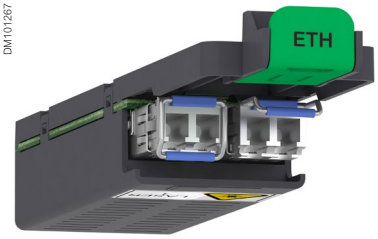

Ethernet TP module

### REL51038: Ethernet TP module

#### Characteristics

| | |
|---|---|
| Standard | 2 ports: 10/100 Base TX |
| Baud rate | 10 or 100 Mbits/s |
| Type of cable | Standard Ethernet CAT 5 |
| Connection | RJ45 |

DM101267




Ethernet FO module

### REL51039: Ethernet FO module

#### Characteristics

| | | |
|---|---|---|
| Standard | 2 ports: 100 Base FX | |
| Baud rate | 100 Mbits/s | |
| Fiber type | Multimode glass fiber | |
| Wavelength | 1300 nm | |
| Connection | LC | |
| Maximum attenuation (fiber optic + connectors) | Fiber optic diameter | Max attenuation |
| | 50/125 or 62.5/125 µm | 14 dB |

**DANGER**

**HAZARD OF DAMAGE TO THE EYES**

Never look into the end of a fiber optic or connectors of the module

Failure to follow these instructions will result in death or serious injury.

# Communication accessories

## Modules

DM107335


Second Ethernet TP module

## Second Ethernet communication module with RSTP redundancy

**REL51042: Second Ethernet TP module**

The second Ethernet communication module is inserted in slot L of Easergy P5x30. It can be selected as an option when ordering the device or purchased later and installed on site. This option maximises the application flexibility for advanced network architectures.

In addition to relay communication protocols on Ethernet, it also enables the use of RSTP protocol which allows fast reconfiguration of the communication system. In combination with first Ethernet communication modules it provides dual redundancy capability.

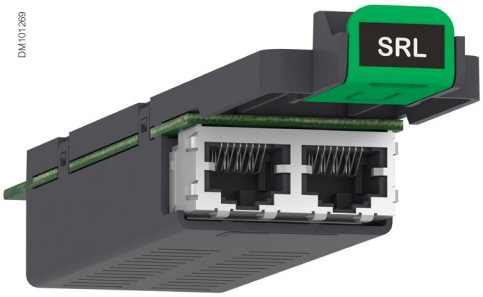
### Characteristics

| | |
|---|---|
| Standard | 2 ports: 10/100 Base TX |
| Baud rate | 10 or 100 Mbits/s |
| Type of cable | Standard Ethernet CAT 5 |
| Connection | RJ45 |

# Communication accessories

## Modules

## Serial line communication module



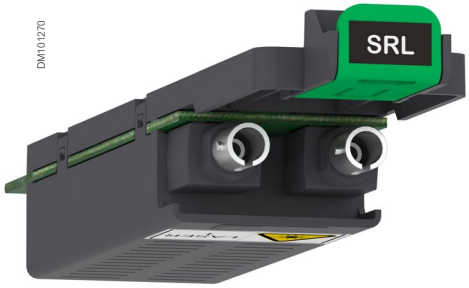

RS485 serial line module

### REL51036: RS485 serial line module

The serial line communication module is inserted in the slot N of the Easergy P5. The module can be selected as an option when ordering the Easergy P5 or purchased later and installed on site. This module is available in two versions for RS485 or fiber optic connection.

#### Characteristics

| | |
|---|---|
| Standard | EIA 2-wire RS485 differential or<br>EIA 4-wire RS485 differential<br>(selection by configuration) |
| Line polarization | 12V, internally provided |
| Connection | 2x RJ45 – pin-out as follows:<br>1. RXD0<br>2. RXD1<br>4. TXD1 (D1)<br>5. TXD0 (D0)<br>8. Common |




Fibre optic serial line module

### REL51040: Fiber optic serial line module

#### Characteristics

| | | |
|---|---|---|
| Fiber type | Multimode glass fiber (HSC) | |
| Wavelength | 820 nm | |
| Connection | ST | |
| Maximum attenuation (fiber optic + connectors) | Fiber optic diameter | Max attenuation |
| | 50/125 µm | 5.6 dB |
| | 62.5/125 µm | 9.4 dB |
| | 100/140 µm | 14.9 dB |
| | 200 µm | 19.2 dB |

**DANGER**

**HAZARD OF DAMAGE TO THE EYES**

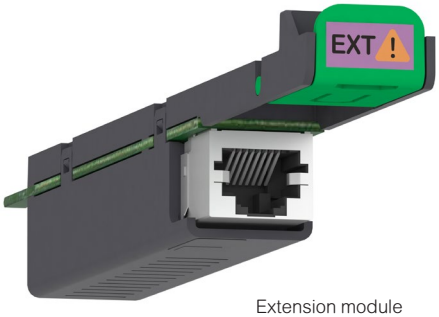
Never look into the end of a fiber optic or connectors of the module

Failure to follow these instructions will result in death or serious injury.

# Communication accessories

## Modules

DM101271




Extension module

## Extension module

**REL51034: Extension module**

The extension module is inserted in the slot P of Easergy P5. The extension module can be selected as an option when ordering the Easergy P5 or purchased later and installed on site. This module provides:

- connection to the external modules
- automatic back-up of data:
  - active configuration file and all four setting groups parameters
  - disturbance records
  - motor-startup records (when available)
  - sequence of events records
  - power system maintenance data log
  - maintenance data of circuit-breaker, switches, motor and transformer (whichever available)

### Characteristics

| | |
|---|---|
| Connection | RJ45 |
| Type of cable | Specific cables have the following references:<br>• 59660: length 0.6 m<br>• 59661: length 2 m<br>• 59662: length 4 m |

# Communication accessories

## Modules

## LPVT hub connector

PM106130


### EMS59573: LPVT hub connector

The LPVT hub connector is a simple passive device that combines three LPVT signals coming from 3 different connectors into one single RJ45 connections.

The output of the LPVT hub connector is directly connected to the LPVT input of the Easergy P5 protection relay.

This accessory is indispensable when connecting Easergy P5 Protection relays to LPVTs.

#### Characteristics

| | |
|---|---|
| Input voltage | < 10 V |
| Input voltage limits | < 30 V |
| Network frequency | 50/60 Hz |
| Electrical connection | output: RJ45 connector |
| | inputs: 3 x RJ45 connectors |
| Dimension (L x W x H) | 95 x 40 x 40 mm (3.74 x 1.57 x 1.57 in) |
| Weight | 0.25 kg (0.55 lb) |
| Mounting support | DIN Rail |
| Operating altitude | ≤ 3000 m (1.86 miles) |

## Voltage adapter

PM106126


### EMS59572: Voltage adapter[1]

The voltage transformer adapter is made with 4 resistor bridges used to interface conventional voltage transformers (VTs) with the Easergy P5 protection relay equipped for LPCT/LPVT sensors.

#### Characteristics

| | |
|---|---|
| Input voltage | 50 Vac to 200 Vac (line-to-line) |
| Voltage max | 600 V max permanent |
| Network frequency | 50/60 Hz |
| Weight | 0.15 kg (0.33 lb) |
| Mounting support | Symmetrical DIN Rail |

*(1) Contact us for availability*

# Communication accessories

## Sensors

DE88206

CSH120, CSH200 and CSH300 core balance CTs.

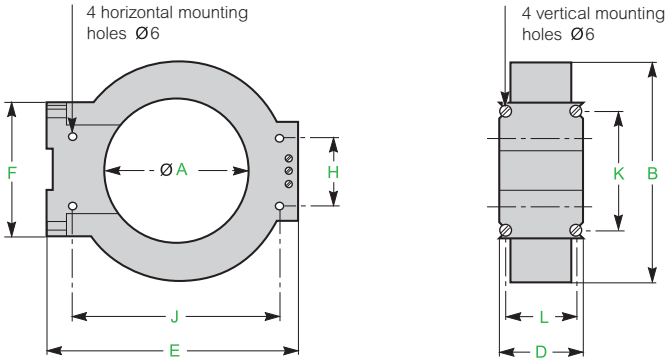
## CSH core-balance current transformers

The CSH120, CSH200 and CSH300 core balance CTs are especially designed for direct residual or earth/ground fault current measurement. The only difference between them is the diameter.

| Core balance CT | 59635: CSH120 | 59636: CSH200 | 59637: CSH300 |
|---|---|---|---|
| Inner diameter | 120 mm (4.7 in) | 200 mm (7.9 in) | 300 mm (11.8 in) |
| Weight | 0.6 kg (1.32 lb) | 1.4 kg (3.09 lb) | |
| Transformation ratio | | 1/470 | |
| Maximum permissible current | | 20 kA - 1 s | |

### Dimensions

DE88396




| | 59635: CSH120 | | 59636: CSH200 | | 59637: CSH300 | |
|---|---|---|---|---|---|---|
| | mm | in. | mm | in. | mm | in. |
| A | 120 | 4.75 | 196 | 7.72 | 291 | 11.46 |
| B | 164 | 6.46 | 256 | 10.1 | 360 | 14.17 |
| D | 44 | 1.73 | 46 | 1.81 | | |
| E | 190 | 7.48 | 274 | 10.8 | 390 | 15.35 |
| F | 80 | 3.14 | 120 | 4.72 | 120 | 4.72 |
| H | 40 | 1.57 | 60 | 2.36 | 60 | 2.36 |
| J | 166 | 6.54 | 254 | 10 | 369 | 14.53 |
| K | 65 | 2.56 | 104 | 4.09 | | |
| L | 35 | 1.38 | 37 | 1.46 | | |

# Arc-flash sensors

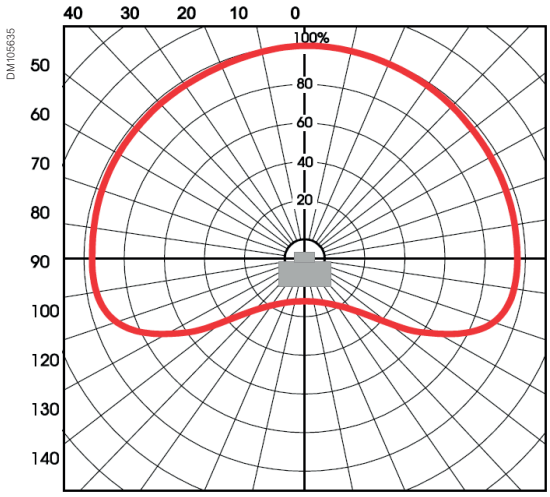
## For Easergy P5x30 only

## Sensors description

The sensors are used by the arc flash protection function (P5x30 models) to detect the light coming from the arc-flash incident.

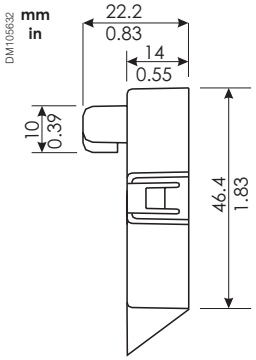
The sensor is activated by strong light as found during arc flash incidents. The sensor transforms the light information into the current signal, which is used by the protection device to indicate arc-flash.

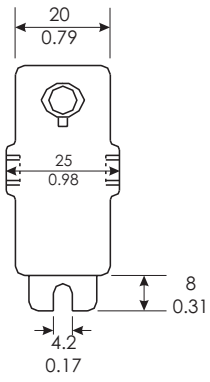
| Arc-flash sensors | Standard | | | | | | Pipe | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Characteristics** | **REL52801** | **REL52802** | **REL52803** | **REL52804** | **REL52805** | **REL52806** | **REL52807** | **REL52808** | **REL52809** | **REL52810** |
| Material | Plastic | | | | | | | | | |
| Weight | *1,000 g*<br>*2.20 lb* | *1,300 g*<br>*2.87 lb* | 1,300 g<br>2.87 lb | 300 g<br>0.66 lb | 400 g<br>0.88 lb | 400 g<br>0.88 lb | 1,000 g<br>2.20 lb | 1,300 g<br>2.87 lb | 300 g<br>0.66 lb | 400 g<br>0.88 lb |
| Cable length (m) | 6 | 20 | 20 | 6 | 6 | 6 | 20 | 20 | 6 | 6 |
| Shielded cable | - | - | ● | - | - | ● | - | ● | - | ● |
| Halogen free | - | ● | - | ● | - | - | - | - | - | - |
| Environment | Pollution Degree 2 | | | | | | | | | |
| Operation temperature | -25°C *(-13°F)* to +70°C *(+158°F)* | | | | | | | | | |
| Light spectrum sensitive area | 400 – 1100 nm | | | | | | | | | |
| Detection time | 1 ms | | | | | | | | | |
| Light sensitivity | 8 000 – 10 000 lux | | | | | | | | | |
| Loop supervision | Yes | | | | | | | | | |



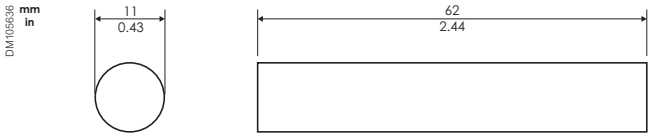

*Sensitivity area*

### REL52801 - 52806 dimensions



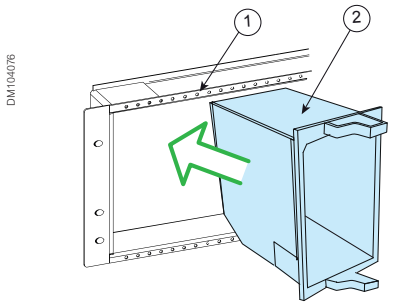




### REL52807 - 52810 dimensions




*Arc-flash sensor: Pipe type*

# Mounting accessories



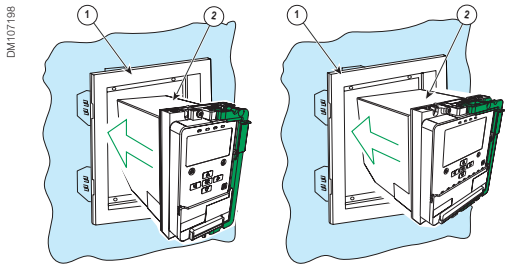

Assemble the case (2) and the rack frame (1)

Easergy P5 protection relays are available for flush mounting or rack mounting.

## Rack mounting accessories

Rack mounting frames have been designed to have dimensions in accordance with IEC60297 and are supplied ready-to-use. On a standard 483 mm (19") rack system, this enables combinations up to four Easergy P5x20 protection relays. If the space is not used, 3 sizes of blanking plates are also available.

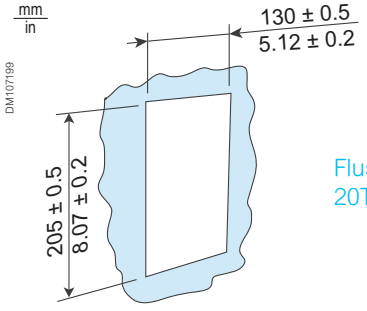
| | |
|---|---|
| **REL51020:** | **Blanking plate 10TE**<br>50.2 mm x 177 mm or 2 in. x 6.97 in |
| **REL51019:** | **Blanking plate 20TE**<br>103.2 mm x 177 mm or 4 in. x 6.97 in. |
| **REL51018:** | **Blanking plate 30TE**<br>206.8 mm x 177 mm or 8 in. x 6.97 in. |
| **REL51021:** | **19 inch rack mounting accessory**<br>483 mm x 178 mm x 78 mm or 7.00 in. x 3.07 in. |




Assemble the flush mounting accessory (1) and the case (2)

## Flush mounting accessories

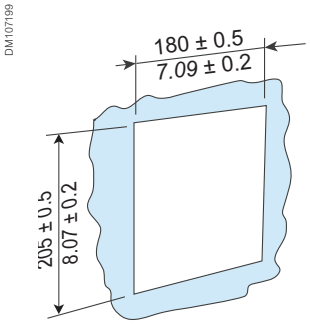
Easergy P5 protection relays may be flush mounted using dedicated accessories to help easy and quick installation.




Flush mounting for 20TE model

**REL51032: 20TE Flush mounting accessory**

This reference can be used with all Easergy P5x20 protection relays.

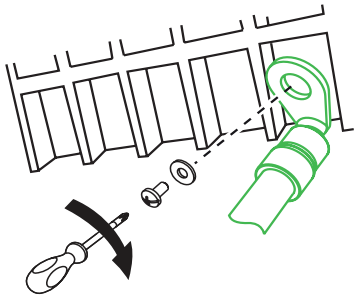


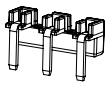
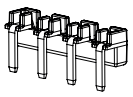
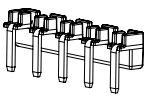
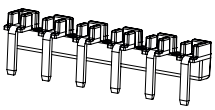

Flush mounting for 30TE model

**REL51052: 30TE Flush mounting accessory**

This reference can be used with all Easergy P5x30 protection relays.

# Wiring accessories

| 90° Ring wiring | Commercial reference | Wire section | Description |
|---|---|---|---|
| DM107172  | REL51059 | 0.5 to 1.5 $mm^2$ (AWG 20 ... 16) | Ring lug terminal 3.68 mm (0.14 in.) Color: Red |
| | REL51060 | 1.5 to 2.5 $mm^2$ (AWG 16 ... 14) | Ring lug terminal 4.45 mm (0.18 in.) Color: Blue |
| | REL51061 | 2.5 to 6 $mm^2$ (AWG 14 ... 10) | Ring lug terminal 6.35 mm (0.25 in.) Color: Yellow |

| Comb-busbars for wiring at slots C, D, E | Commercial reference | Quantity pack | Description |
|---|---|---|---|
| To facilitate the wiring of the terminals in Slots C, D, E of Easergy P5 protection relay, users can order the following comb-busbars that are provided in 50-pieces or 100-pieces packs. | | | |
| DM107173  | REL51054 | 100 pieces | 2-pin comb-busbar |
| DM107174  | REL51055 | 100 pieces | 3-pin comb-busbar |
| DM107175  | REL51056 | 50 pieces | 4-pin comb-busbar |
| DM107176  | REL51057 | 50 pieces | 5-pin comb-busbar |
| DM107177  | REL51058 | 50 pieces | 6-pin comb-busbar |

# Services

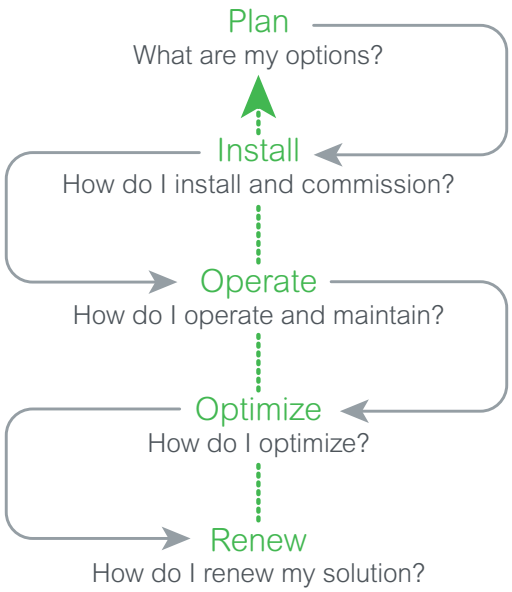
# Greater peace of mind throughout your installation lifecycle

**How can you reduce costs and improve performance at the same time?**

When it comes to your electrical distribution infrastructure, the answer is straightforward: get professional expertise.

## Life cycle services

DM409843




### When it comes to your electrical distribution installation, we can help you:

- Increase productivity, reliability, and safety
- Mitigate risk and limit downtime
- Keep equipment up to date and extend lifespan
- Cut cost and increase savings
- Improve your return on investment

### CONTACT US!

*https://www.schneider-electric.com/en/work/services/field-services/electrical-distribution/*

## Plan

Schneider Electric helps you plan the full design and execution of your solution, looking at how to make your process more dependable and optimize time:

- **Technical feasibility studies:** Design solution in your environment.
- **Preliminary design:** Accelerate turnaround time to reach a final solution design.

## Install

Schneider Electric will help you to install more efficient, more reliable and safer solutions based on your plans:

- **Project management:** Complete your projects on time and within budget.
- **Commissioning:** Ensure your actual performance versus design, through on-site testing and commissioning, and tools and procedures.

## Operate

Schneider Electric helps you maximize your installation uptime and control your capital expenditures through its services offering:

- **Asset operation solutions:** Provide the information you need to increase safety, enhance installation performance, and optimize asset maintenance and investment.
- **Advantage service plans:** Customize service plans that include preventive, predictive and corrective maintenance.
- **On-site maintenance services:** Deliver extensive knowledge and experience in electrical distribution maintenance.
- **Spare parts management:** Ensure spare parts availability and optimized maintenance budget of your spare parts.
- **Technical training:** Build necessary skills and competencies to properly and safely operate your installations.

## Optimize

Schneider Electric proposes recommendations for improved safety, availability, reliability and quality:

- **MP4 electrical assessment:** Define an improvement and risk management program.

## Renew

We extend the life of your system while providing upgrades and we can even offer to take full responsibility for the end-of-life processing of old electrical equipment:

- **Retrofit:** Keep up to date and improve the performance of electrical installations.
- **MV product end of life:** Recycle and recover outdated equipment with end-of-life services.

# On-site condition maintenance with ProDiag MV Relay

DM107178

## Why carry out diagnostics?

Business competitiveness depends strongly on productivity, and productivity means uptime. On-site condition maintenance, with regular diagnostics, provides a long-term solution to avoid downtime.

### Why perform Easergy relay diagnostics with Schneider Electric?

Schneider Electric offers a complete range of maintenance services to provide you with the necessary level of maintenance for your Easergy devices. Having Schneider Electric at your side means our highly qualified personal can perform the right maintenance, while complying with manufacturer procedures and international services.

## Diagnosing protection relay tripping capability

The ProDiag MV Relay diagnostic solution should be used on MV protection relays that have not received any diagnostics within the last four years.

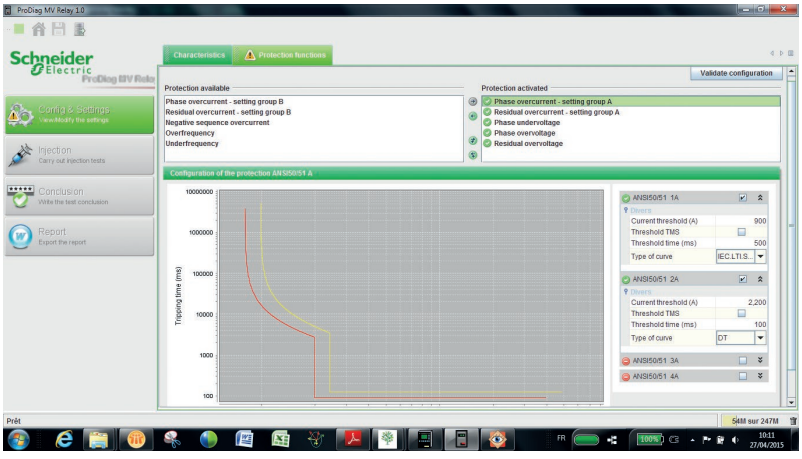
This diagnostic checks the protection relay's conformity against the original product specifications to ensure that they meet their goals of:

- Reducing risks by isolating hazardous segments of the network where an electrical fault has been detected
- Maintaining high energy availability to avoid a total power outage and costly downtime
- Maximizing uptime by performing in-depth analysis and de-energizing equipment only when absolutely necessary

ProDiag MV Relay's unique features:

- Automatic download of all protection relay settings through drivers in the ProDiag MV Relay manager
- Easy verification of modifications made to protection settings since the last visit
- Easy verification of MV Relay original technical specifications

EM100201




**ProDiag MV Relay: Included in the extended 10-year warranty***

The Easergy P5 extended 10-year warranty applies under the following conditions:

- The product is registered within 18 months. Simply use the "My Schneider" app to scan the QR code found on the front of your Easergy P5
- The ProDiag MV Relay diagnostic is performed every FOUR YEARS (when Easergy P5 is used under normal operating conditions)
- Any replaced or repaired products have the latest hardware and firmware versions, and are functionally compliant with the original product

Easergy 10 years Warranty

* Standard warranty 2 years.
*Please check with your local Schneider Electric representative for extended warranty availability and conditions.*

# Achieve higher sustainability with ECOFIT™ solutions

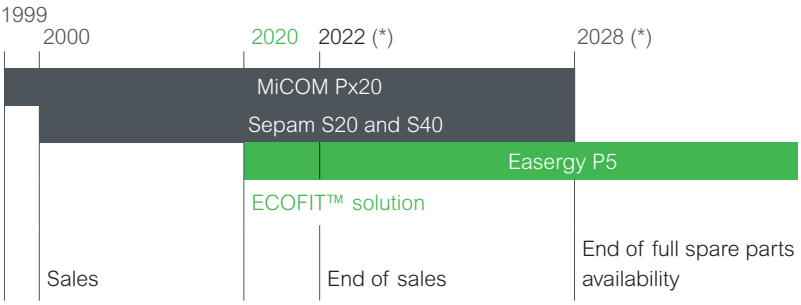
Modernizing and upgrading your medium voltage switchgear doesnt need to mean destroying your existing infrastructure.

Schneider Electric retrofit solutions, combined with proper switchgear maintenance helps you to improve the reliability of your installation while achieving higher sustainable performance with ECOFIT™ - a Green Premium™ service.

## ECOFIT™ for your MV Switchboard

- Extend your switchgears lifetime
- Access asset and energy management with digitization
- Reduce your environmental impact
- Enhance your process dependability
- Optimize your maintenance service costs and limit your investment
- New ECOFIT™ spare parts availability.

**A true extended life time with ECOFIT™ protection relays**




*(*) Please consult Schneider Electric*

## ECOFIT™ offers:

| | Sepam S20 | Sepam S40 | MiCOM Px20 | Easergy P5 |
|---|---|---|---|---|
| Case | Flush mounting | Flush mounting | Flush mounting | Flush mounting |
| Installation | Fixed case | Fixed case | Withdrawable case | Withdrawable case |
| Language | Multilanguage | Multilanguage | Multilanguage | Multilanguage |
| Communication | IEC 60870-5-103<br>DNP3<br>Modbus serial | IEC 61850 Station bus<br>IEC 60870-5-103<br>DNP3<br>Modbus serial<br>Modbus Ethernet | Modbus serial<br>Kbus<br>Courier<br>IEC60870-5-103<br>DNP3 | IEC 61850 Ed.1 & Ed.2<br>IEC 60870-5-103 & 101<br>DNP3 Ethernet<br>DNP3 serial<br>Modbus Ethernet<br>Modbus serial<br>EtherNet/IP |
| Power supply | 24 - 250 Vdc<br>48 - 240 Vac | 24 - 250 Vdc<br>48 - 240 Vac | 24 - 250 Vdc<br>48 - 240 Vac | 48 - 250 Vdc<br>100 - 230 Vac |
| Control LED | 11 LEDs | 11 LEDs | 8 LEDs | Easergy P5x20: 10 LEDs<br>Easergy P5x30: 14 LEDs |
| Cybersecurity | No | No | No | Yes |
| Arc-flash protection | No | No | No | Easergy P5x30: 0 to 6 sensors |
| Back up memory | No | No | No | Yes |
| Compatibility with | Easergy P5x20:<br>S20 / S24 / T20 / T24 / B21 / B22 / M20 | Easergy P5x30:<br>S40 / S41 / S42 / S43 / S44 / S50 / S51 / S52 / S53 / S54 / T40 / T42 / T50 / T52 / M40 / M41 / G40 | Easergy P5x20:<br>P120 / P121 / P122 /P123 / P921 / P922 / P923 / P721 / P723 / P920<br>Easergy P5x30:<br>P126 / P127 / P225 / P521 / P220 / P125 | |

# Environmental information with Green Premium™ ecolabel


## An industry leading portfolio of offers delivering sustainable value

The Green Premium program stands for our commitment to deliver customer valued sustainable performance. It has been upgraded with recognized environmental claims and extended to cover all offers including Products, Services and Solutions.

More than 75% of our product sales offer superior transparency on the material content, regulatory information and environmental impact of our products:

- RoHS compliance
- REACh substance information
- Industry leading # of PEP's*
- Circularity instructions

### $CO_2$ and P&L impact through… Resource Performance

Green Premium brings improved resource efficiency throughout an asset's lifecycle. This includes efficient use of energy and natural resources, along with the minimization of $CO_2$ emissions.

### Cost of ownership optimization through… Circular Performance

We're helping our customers optimize the total cost of ownership of their assets. To do this, we provide IoT-enabled solutions, as well as upgrade, repair, retrofit, and remanufacture services.

### Peace of mind through… Well-being Performance

Green Premium products are RoHS and REACh compliant. We're going beyond regulatory compliance with step-by-step substitution of certain materials and substances from our products.

### Improved sales through… Differentiation

Green Premium delivers strong value propositions through third-party labels and services. By collaborating with third-party organizations we can support our customers in meeting their sustainability goals such as green building certifications.

Discover what we mean by green
Check your products!

*PEP: Product Environmental Profile (i.e. Environmental Product Declaration)

# Ordering

# Easergy P5 configurator

## Selecting product

Easergy P5 CONFIGURATOR:
The unique web tool to quickly and easily configure your Easergy P5.

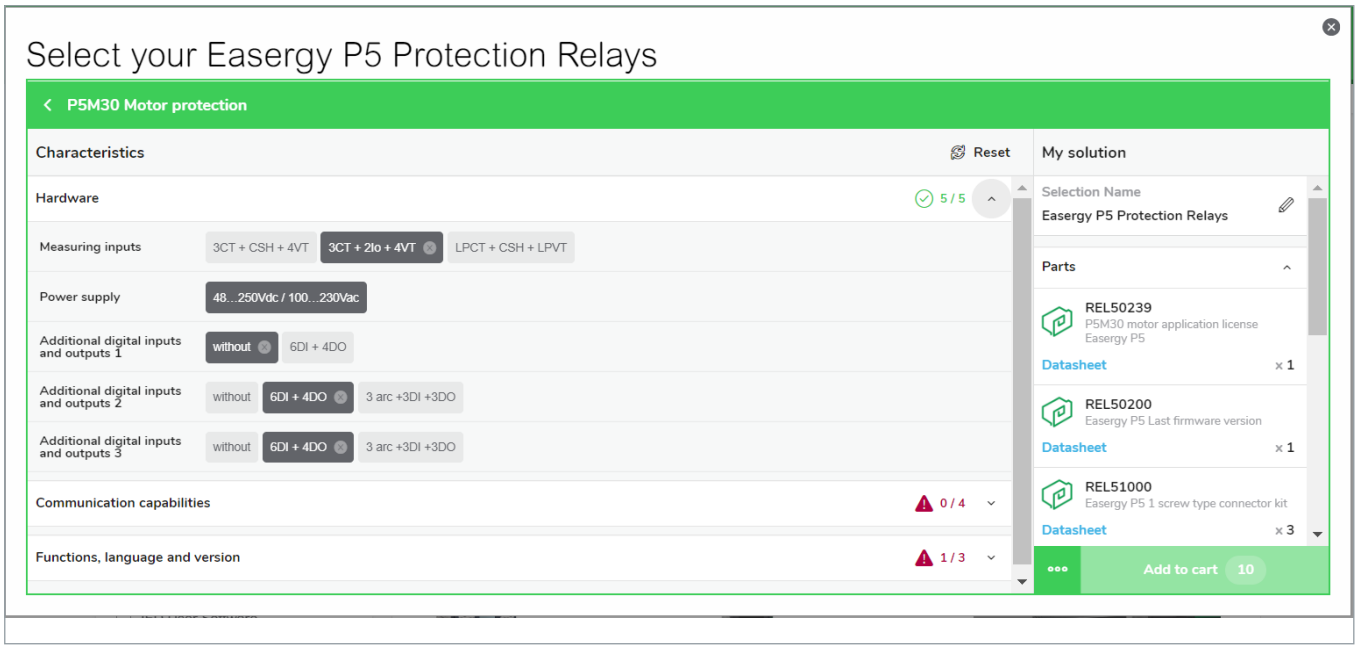
## Fast and Simple

See more on:

- schneider-electric.com/easergy-p5

Or click directly on : **help me choose tool**

EM100202



# Ready-to-use configuration

## Easergy P5x20 ordering variants

## Easergy P5x20 ordering variants

- Please indicate the Part No. (for example: **REL50006**) to your Schneider Electric correspondant
- For other variants please contact your Schneider Electric correspondant
- Click on the specific Part No. to visit a dedicated web page and download the datasheet

The order forms can be used to define Easergy P5 accessories.

| Part No. | Qty. | | Designation |
|---|---|---|---|
| **Easergy P5U20 Current relay - 24-250 V** | | | |
| REL50301 | ☐ | P5U20-AABA-BAAAA-AAAA | 3CT 2Io + 4DI-4DO, no communication, no extension + basic cybersecurity |
| REL50302 | ☐ | P5U20-AABA-CAAAA-AAAA | 3CT 1CSH + 4DI-4DO, no communication, no extension + basic cybersecurity |
| REL50303 | ☐ | P5U20-AABB-BAAAA-AAAA | 3CT 2Io + 10DI-8DO, no communication, no extension + basic cybersecurity |
| REL50304 | ☐ | P5U20-AABB-CAAAA-AAAA | 3CT 1CSH + 10DI-8DO, no communication, no extension + basic cybersecurity |
| REL50331 | ☐ | P5U20-AABA-BABAH-AAAA | 3CT 2Io + 4DI-4DO, RSTP Eth RJ45, extension + basic cybersecurity |
| REL50332 | ☐ | P5U20-AABA-CABAH-AAAA | 3CT 1CSH + 4DI-4DO, RSTP Eth RJ45, extension + basic cybersecurity |
| REL50333 | ☐ | P5U20-AABB-BABAH-AAAA | 3CT 2Io + 10DI-8DO, RSTP Eth RJ45, extension + basic cybersecurity |
| REL50334 | ☐ | P5U20-AABB-CABAH-AAAA | 3CT 1CSH + 10DI-8DO, RSTP Eth RJ45, extension + basic cybersecurity |
| **Easergy P5V20 Voltage relay - 24-250 V** | | | |
| REL50305 | ☐ | P5V20-AABA-DAAAA-AAAA | 4VT + 4DI-4DO + no communication + no extension + basic cybersecurity |
| REL50306 | ☐ | P5V20-AABB-DAAAA-AAAA | 4VT + 10DI-8DO + no communication + no extension + basic cybersecurity |
| REL50339 | ☐ | P5V20-AABA-DABAH-AAAA | 4VT + 4DI-4DO + RSTP Eth RJ45 + extension + basic cybersecurity |
| REL50340 | ☐ | P5V20-AABB-DABAH-AAAA | 4VT + 10DI-8DO + RSTP Eth RJ45 + extension + basic cybersecurity |

# Ready-to-use configuration

## Easergy P5x30 ordering variants

## Easergy P5x30 ordering variants

- Please indicate the Part No. (for example: **REL50006**) to your Schneider Electric correspondant
- For other variants please contact your Schneider Electric correspondant
- Click on the specific Part No. to visit a dedicated web page and download the datasheet.

The order forms can be used to define Easergy P5 accessories.

| Part No. | Qty. | Designation | |
|---|---|---|---|
| **Easergy P5F30 Feeder protection relay - 48-250 V** | | | |
| REL50401 | ☐ | P5F30-AACB-GAAAA-AAAA | 3CT + 2Io + 4VT + 10DI-8DO + no communication + no extension + basic cybersecurity |
| REL50402 | ☐ | P5F30-AACB-HAAAA-AAAA | 3CT + 1CSH + 4VT + 10DI-8DO + no communication + no extension + basic cybersecurity |
| REL50404 | ☐ | P5F30-BACB-GAAAA-AAAA | 3CT + 2Io + 4VT + 16DI-12DO + no communication + no extension + basic cybersecurity |
| REL50405 | ☐ | P5F30-BACB-HAAAA-AAAA | 3CT + 1CSH + 4VT + 16DI-12DO + no communication + no extension + basic cybersecurity |
| REL50451 | ☐ | P5F30-AACB-GABAH-AAAA | 3CT + 2Io + 4VT + 10DI-8DO + RSTP Eth RJ45 + extension + basic cybersecurity |
| REL50452 | ☐ | P5F30-AACB-HABAH-AAAA | 3CT + 1CSH + 4VT + 10DI-8DO + RSTP Eth RJ45 + extension + basic cybersecurity |
| REL50453 | ☐ | P5F30-BACB-GABAH-AAAA | 3CT + 2Io + 4VT + 16DI-12DO + RSTP Eth RJ45 + extension + basic cybersecurity |
| REL50454 | ☐ | P5F30-BACB-HABAH-AAAA | 3CT + 1CSH + 4VT + 16DI-12DO + RSTP Eth RJ45 + extension + basic cybersecurity |
| REL50403 | ☐ | P5F30-AACB-IAAAA-AAAA | 3LPCT + 1CSH + 4LPVT + 10DI-8DO + no comm + no extension + basic cybersecurity |
| REL50406 | ☐ | P5F30-BACB-IAAAA-AAAA | 3LPCT + 1CSH + 4LPVT + 16DI-12DO + no comm + no extension + basic cybersecurity |
| **Easergy P5M30 Motor protection relay- 48-250 V** | | | |
| REL50407 | ☐ | P5M30-AACB-GAAAA-AAAA | 3CT + 2Io + 4VT + 10DI-8DO + no communication + no extension + basic cybersecurity |
| REL50408 | ☐ | P5M30-AACB-HAAAA-AAAA | 3CT + 1CSH + 4VT + 10DI-8DO + no communication + no extension + basic cybersecurity |
| REL50410 | ☐ | P5M30-BACB-GAAAA-AAAA | 3CT + 2Io + 4VT + 16DI-12DO + no communication + no extension + basic cybersecurity |
| REL50411 | ☐ | P5M30-BACB-HAAAA-AAAA | 3CT + 1CSH + 4VT + 16DI-12DO + no communication + no extension + basic cybersecurity |
| REL50455 | ☐ | P5M30-AACB-GABAH-AAAA | 3CT + 2Io + 4VT + 10DI-8DO + RSTP Eth RJ45 + extension + basic cybersecurity |
| REL50456 | ☐ | P5M30-AACB-HABAH-AAAA | 3CT + 1CSH + 4VT + 10DI-8DO + RSTP Eth RJ45 + extension + basic cybersecurity |
| REL50457 | ☐ | P5M30-BACB-GABAH-AAAA | 3CT + 2Io + 4VT + 16DI-12DO + RSTP Eth RJ45 + extension + basic cybersecurity |
| REL50458 | ☐ | P5M30-BACB-HABAH-AAAA | 3CT + 1CSH + 4VT + 16DI-12DO + RSTP Eth RJ45 + extension + basic cybersecurity |
| REL50409 | ☐ | P5M30-AACB-IAAAA-AAAA | 3LPCT + 1CSH + 4LPVT + 10DI-8DO + no comm + no extension + basic cybersecurity |
| REL50412 | ☐ | P5M30-BACB-IAAAA-AAAA | 3LPCT + 1CSH + 4LPVT + 16DI-12DO + no comm + no extension + basic cybersecurity |

# Ready-to-use configuration

## Additional modules ordering variants

## Additional modules

| Part No. | Qty. | Designation |
|---|---|---|
| External modules | | |
| REL51038 | | Ethernet TP module - slot M |
| REL51039 | | Ethernet FO module - slot M |
| REL51042 | | Ethernet TP module - slot L |
| REL51033 | | Ethernet HSR/PRP FO module - slots M and N |
| REL51036 | | RS485 serial line module - slot N |
| VW3A8306RC | | RS485 line termination accessory |
| REL51040 | | Fiber optic serial line module - slot N |
| REL51034 | | Extension module - slot P |
| External modules | | |
| 59641 | | 8 temperature sensor module (MET148-2) |
| REL51045 | | IRIG-B module |
| 59660 | | 0.6 m remote module connection cord |
| 59661 | | 2 m remote module connection cord |
| 59662 | | 4 m remote module connection cord |
| Sensors | | |
| 59635 | | Core balance CT, Ø=120 mm (CSH120) |
| 59636 | | Core balance CT, Ø=200 mm (CSH200) |
| 59637 | | Core balance CT, Ø=300 mm (CSH300) |
| EMS59572 | | VT adapter |
| EMS59573 | | LPVT hub connector |
| 03813519N0 | | 1 phase LPCT TLP130 0,72 kV 130 mm diam 4m cable with intermediary connection |
| 03818034N0 | | 1 phase LPCT TLP130/a 0,72 kV 130 mm diam 6.5 m cable |
| 03811060N0 | | 1 phase LPCT TLP160 0,72 kV 160 mm diam 6.5 m cable |
| 03811061N0 | | 1 phase LPCT TLP190 0,72 kV 190 mm diam 6.5 m cable |
| 03816498N0 | | 1 phase LPVT 24 kV GIS type C |
| 03816686N0 | | 1 phase LPVT 12 kV GIS type C |
| 03816695N0 | | 1 phase LPVT 24 kV GIS type C |
| LPVT36GC | | 1 phase LPVT 36 kV GIS type C |
| LPVT17GNKT | | 1 phase LPVT 17,5 kV GIS type NKT |
| LPVT24GNKT | | 1 phase LPVT 24 kV GIS type NKT |
| LPVT17GNE | | 1 phase LPVT 17,5 kV GIS type NEXANS, short cone |
| LPVT24GNE | | 1 phase LPVT 24 kV GIS type NEXANS, short cone |
| LPVT17A | | 1 phase LPVT 17,5kV AIS |
| LPVT24A | | 1 phase LPVT 24kV AIS |