

2017 Catalog



# Easergy P3

Network Protection Relays

[easergy.schneider-electric.com](http://easergy.schneider-electric.com)

Life Is On

**Schneider**  
Electric



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# Take the Easergy P3 further with EcoStruxure™

## 450,000

EcoStruxure™ systems deployed since 2007 with the support of our 9,000 system integrators.

### EcoStruxure™ ready



#### Efficient asset management

Boost your efficiency and reduce downtime using **predictive** maintenance tools.



#### 24/7 connectivity

Make better informed decisions with real-time data that's available **everywhere, anytime**.



#### Increased safety

Enhance your people and equipment's safety with **embedded arc flash** protection that's based on proven designs and experience.

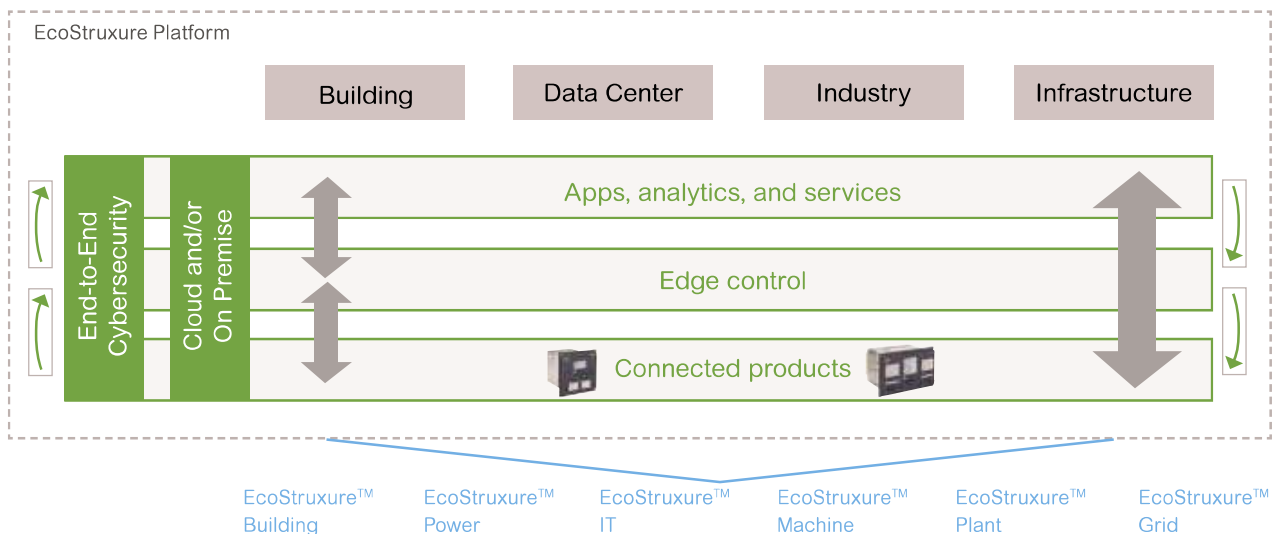
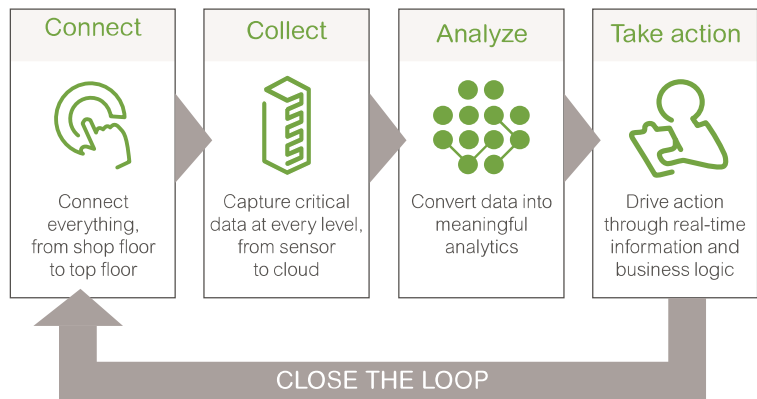
EcoStruxure™ architecture and interoperable technology platform bring together energy, automation, and software. This provides you with enhanced value through greater safety, reliability, efficiency, sustainability, and connectivity.

## Turn data into action

EcoStruxure™ architecture lets you maximize the value of your data.

It helps you::

- Translate data into actionable intelligence and better business decisions
- Make informed decisions to secure uptime and operational efficiency thanks to real-time control platforms
- Get visibility into your electrical distribution by measuring, collecting, aggregating, and communicating data



# Easergy P3 at a glance



## What is Easergy P3?

Easergy P3 is a complete range of protection relays for medium voltage applications, including feeder, motor, transformer, and generator protection. It embeds all the latest communication protocols on serial or Ethernet links.

Based on more than 100 years of experience in network protection relays, Easergy P3 benefits from the reliability of Sepam, MiCOM and Vamp.



Unparalleled Efficiency



Better Connectivity



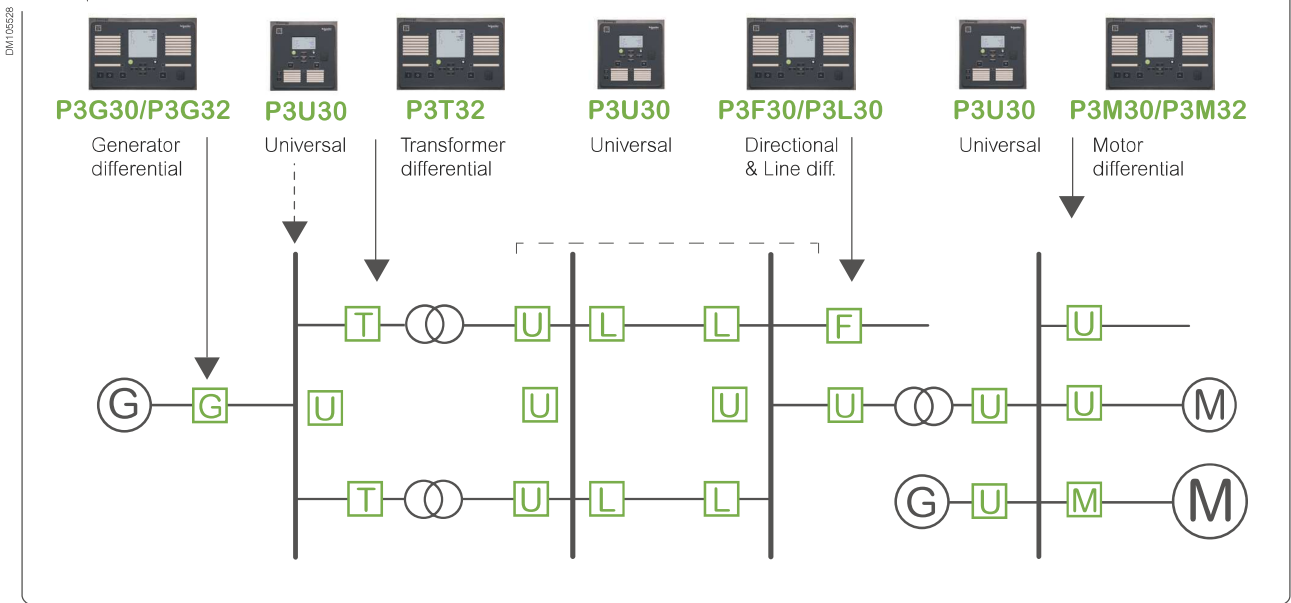
Enhanced Safety

- Simple selection and ordering with EcoReal MV
- Simplified configuration with the new eSetup Easergy Pro setting tool
- Faster delivery with on-the-shelf availability of standard configurations

- Simpler operation and maintenance with the Easergy SmartApp
- 9 communication protocols in one box, including IEC 61850
- Increased number of inputs and outputs for more possibilities

- Embedded arc protection
- Built-in virtual injection testing
- Compliant with international standards (i.e. IEC 60255-1)

## Range overview



# Easergy P3

## Range description

# Easergy P3

## Range description

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PM1108572



Easergy P3 Standard

PM1108574



Easergy P3 Advanced

Easergy P3 is a family of digital protection relays for distribution networks dedicated to:

- **Buildings and Industry:**
  - Retail
  - Hotels
  - Healthcare
  - Education and research
  - Transportation
  - Industrial buildings
- **Utilities - Energy distribution**
- **Large sites:**
  - Oil and Gas
  - Mining
  - Mineral and Metals
  - Water

Easergy P3 protection relay is based on proven technology concepts and developed in close cooperation with customers, so it's built to meet your toughest demands. It's available in two sizes to best fit your needs:

- The Easergy P3 Standard combines protection functions such as directional earth fault for feeder and motor protection in a one-box solution.
- The Easergy P3 Advanced features a modular design that allows user-defined conventional protection and arc flash protection solutions in both new and existing power distribution systems.

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 detection (Easergy P3 Advanced)
- Dedicated circuit breaker control with single-line diagram, push buttons, programmable function key and LEDs, and a customizable alarm
- 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 Ed.1 & Ed.2



## Easergy P3 contains

Two main devices, each with specific functions to address your needs in a one-box design, regardless of application.

### Voltage

### Feeder

### Transformer

### Motor

### Generator

### Characteristics

Phase current	1/5A CT (x3)		
Measuring inputs	Residual current		
	1/5A CT or 0.2/1A CT		
	Voltage		
	VT (x1)	VT (x4)	
Arc-flash sensor input	-		
Digital	Input	2	10
	Output	5 + SF	5 + SF
Analogue	Input	-	0 or 4 <sup>(1)</sup>
	Output	-	0 or 4 <sup>(1)</sup>
Temperature sensor input	-		
Front port	0 or 8 or 12 <sup>(1)</sup>		
Nominal power supply	USB		
Ambient temperature, in service	24V dc or 48-230V ac/dc		
	-40 to 60°C (-40 to 140°F)		

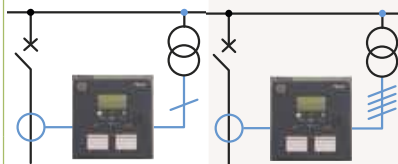
### Communication

Rear ports	-	•	•
RS232, IRIG/B, RS485, Ethernet	-	•	•
IEC61850 ed1 & ed2	-	•	•
IEC 60870-5-101 & 103	-	•	•
DNP3 over Ethernet	-	•	•
DNP3 serial	-	•	•
Modbus serial	-	•	•
Modbus over Ethernet	-	•	•
Ethernet IP	-	•	•
DeviceNet	-	•	•
Profibus DP	-	•	•
SPAbus	-	•	•
Redundancy protocols (RSTP/PRP)	-	•	•

### Others

Control	1 object mimic	6 controlled + 2 monitored objects mimic	
Logic (Matrix + Logic equation)	•		
Withdrawable CT connector with shorting	•		
Remote HMI	-		
Hardware dimensions (W/H/D)	-		

## Easergy P3 Standard



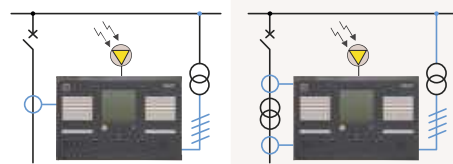
-	-	-
P3U10	P3U20	P3U30 with directional O/C with voltage protection

1/5A CT (x3)	1/5A CT (x3)	1/5A CT (x6)
1/5A CT or 0.2/1A CT	1/5A CT or 0.2/1A CT	1/5ACT (x2) & 1A CT or 1A CT & 0.2A CT
VT (x1)	VT (x4)	VT (x4)
2	10	16
5 + SF	5 + SF	8 + SF
-	0 or 4 <sup>(1)</sup>	0 or 4 <sup>(1)</sup>
-	0 or 4 <sup>(1)</sup>	0 or 4 <sup>(1)</sup>
-	0 or 8 or 12 <sup>(1)</sup>	0 or 8 or 12 <sup>(1)</sup>
USB	USB	USB
24V dc or 48-230V ac/dc	24V dc or 48-230V ac/dc	24 to 48V dc or 110-240V ac/dc
-40 to 60°C (-40 to 140°F)	-40 to 60°C (-40 to 140°F)	-40 to 60°C (-40 to 140°F)

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1 object mimic	6 controlled + 2 monitored objects mimic	
•	•	
•	•	
-	-	
171 x 176 x 214 <sup>(3)</sup> mm / 6.73 x 6.93 x 8.43 in	264 x 177 x 208 mm / 10.39 x 6.97 x 8.19 in	

## Easergy P3 Advanced



-	-
P3F30 with directional	-
P3L30 line diff. & distance	-
-	P3T32 with directional
P3M30	P3M32 with directional
P3G30	P3G32 with directional

1/5A CT (x3)	1/5A CT (x6)
1/5A CT & 1A CT or 1A CT & 0.2A CT	1/5ACT (x2) & 1A CT or 1/5A CT & 1A CT & 0.2A CT
VT (x4)	VT (x4)
0 to 4 point sensor <sup>(1)(2)</sup>	0 to 4 point sensor <sup>(1)</sup>
6 to 36	6 to 16
10 to 21 + SF	10 to 13 + SF
-	0 or 4 <sup>(1)</sup>
-	0 or 4 <sup>(1)</sup>
-	0 or 8 or 12 <sup>(1)</sup>
USB	USB
24 to 48V dc or 110-240V ac/dc	24 to 48V dc or 110-240V ac/dc
-40 to 60°C (-40 to 140°F)	-40 to 60°C (-40 to 140°F)

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6 controlled + 2 monitored objects mimic
•
-
•
264 x 177 x 208 mm / 10.39 x 6.97 x 8.19 in

(1) Depends on optional module  
 (2) Arc flash protection option not available on Easergy P3L30  
 (3) 226 mm (8.90 in) with ring-lug connectors

Protection functions	ANSI code	Standard (P3U)		Advanced (P3x)						
		P3U10 P3U20	P3U30	P3F30	P3L30	P3M30	P3M32	P3G30	P3G32	P3T32
Distance	21	-	-	-	1	-	-	-	-	-
Under-impedance	21G	-	-	-	-	-	-	2	2	-
Fault locator	21FL	-	1	1	1	-	-	-	-	-
Overfluxing	24	-	-	-	-	-	-	1	1	1
Synchro-check	25	-	2	2	2	2	2	2	2	2
Undervoltage	27	-	3	3	3	3	3	3	3	3
Positive sequence undervoltage	27P	-	-	-	-	-	-	2	2	-
Stator earth-fault detection	27TN/64G	-	-	-	-	-	-	1	1	-
Directional active underpower	32	-	2	2	2	2	2	2	2	2
Phase undercurrent	37	1	1	-	-	1	1	-	-	-
Temperature monitoring	38/49T	12 <sup>(0)(1)</sup>	12 <sup>(1)</sup>	12 <sup>(1)</sup>	12 <sup>(1)</sup>	12 <sup>(1)</sup>	12 <sup>(1)</sup>	12 <sup>(1)</sup>	12 <sup>(1)</sup>	12 <sup>(1)</sup>
Field-failure (impedance/Q)	40 / 32Q	-	-	-	-	-	-	2/1	2/1	-
Negative sequence overcurrent (motor, generator)	46	2	2	-	-	2	2	2	2	2
Cur. unbalance, broken conductor	46BC	1	1	1	1	-	-	-	-	-
Incorrect phase sequence	47	-	-	-	-	1	1	-	-	-
Excessive start time, locked rotor	48/51LR	1	1	-	-	1	1	-	-	-
Thermal overload	49	1	1	1	1	1	1	1	1	1
Phase overcurrent	50/51	3	3	3	3	3	3	3	3	3
Earth fault overcurrent	50N/51N	5	5	5	5	5	5	5	5	5
Breaker failure	50BF	1	1	1	1	1	1	1	1	1
Switch On To Fault (SOTF)	50HS	1	1	1	1	1	1	1	1	1
Capacitor bank unbalance	51C	1	1	2	2	2	2	-	-	-
Voltage dependant overcurrent	51V	-	1	1	1	-	-	1	1	-
Overvoltage	59	-	3	3	3	3	3	3	3	3
Capacitor overvoltage	59C	1	1	1	1	-	-	-	-	-
Neutral voltage displacement	59N	3	3	2	2	2	2	2	2	2
CT supervision	60	1	1	1	1	1	1	1	2	2
VT supervision	60FL	-	1	1	1	1	1	1	1	1
Restricted earth-fault	64REF	-	-	-	-	-	-	-	1	1
Frequent start inhibition	66	1	1	-	-	1	1	-	-	-
Directional phase overcurrent	67	-	4	4	4	4	4	4	4	4
Directional earth-fault o/c	67N	3	3	3	3	3	3	3	3	3
Transient intermittent	67NI	1	1	1	1	-	-	-	-	-
Magnetizing inrush detection	68F2	1	1	1	1	1	1	1	1	1
Fifth harmonic detection	68H5	1	1	1	1	1	1	1	1	1
Pole slip	78PS	-	-	-	-	-	-	1	1	-
Auto-recloser	79	5	5	5	5	-	-	-	-	-
Over or under frequency	81	-	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2
Rate of change of frequency	81R	-	1	1	1	1	1	1	1	1
Under frequency	81U	-	2	2	2	2	2	2	2	2
Lockout	86	1	1	1	1	1	1	1	1	1
Line differential	87L	-	-	-	2	-	-	-	-	-
Machine differential	87M	-	-	-	-	-	2	-	2	-
Transformer differential	87T	-	-	-	-	-	-	-	-	2
Programmable stages	99	8	8	8	8	8	8	8	8	8
Arc-flash detection		-	-	8	-	8	8	8	8	8
Cold load pick-up		1	1	1	1	1	1	1	1	1
Programmable curves		3	3	3	3	3	3	3	3	3
Setting groups <sup>(3)</sup>		4	4	4	4	4	4	4	4	4

(0) No temperature sensors for P3U10 and 12 optional for P3U20

(2) P3U10 and P3U20 offer one voltage input. Function availability depends on the connection of the voltage input

(1) Using external RTD module

(3) Not all protection functions have 4 setting groups. See details in the manual.

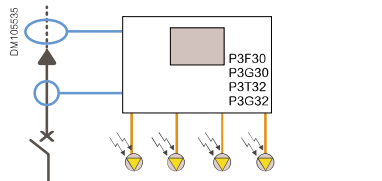
Control functions	Standard (P3U)		Advanced (P3x)						
	P3U10 P3U20	P3U30	P3F30	P3L30	P3M30	P3M32	P3G30	P3G32	P3T32
Switchgear control and monitoring	1/6	6	6	6	6	6	6	6	6
Switchgear monitoring only	2	2	2	2	2	2	2	2	2
Programmable switchgear interlocking	•	•	•	•	•	•	•	•	•
Local control on single-line diagram	•	•	•	•	•	•	•	•	•
Local control with O/I keys	•	•	•	•	•	•	•	•	•
Local/remote function	•	•	•	•	•	•	•	•	•
Function keys	2	2	2	2	2	2	2	2	2
Custom logic (logic equations)	•	•	•	•	•	•	•	•	•
Control with Smart App	•	•	•	•	•	•	•	•	•
<b>Measurement</b>									
RMS current values	•	•	•	•	•	• <sup>(1)</sup>	•	• <sup>(1)</sup>	• <sup>(1)</sup>
RMS voltage values	•	•	•	•	•	•	•	•	•
RMS active, reactive and apparent power	-	•	•	•	•	•	•	•	•
Frequency	•	•	•	•	•	•	•	•	•
Fundamental frequency current values	•	•	•	•	•	• <sup>(1)</sup>	•	• <sup>(1)</sup>	• <sup>(1)</sup>
Fundamental frequency voltage values	-	•	•	•	•	•	•	•	•
Fundamental frequency active, reactive and apparent power values	-	•	•	•	•	•	•	•	•
Power factor	-	•	•	•	•	•	•	•	•
Energy values active and reactive	-	•	•	•	•	•	•	•	•
Energy transmitted with pulse outputs	-	•	•	•	•	•	•	•	•
Demand values: phase currents	•	•	•	•	•	•	•	•	•
Demand values: active, reactive, apparent power and power factor	-	•	•	•	•	•	•	•	•
Min and max demand values: phase currents	•	•	•	•	•	•	•	•	•
Min and max demand values: RMS phase currents	•	•	•	•	•	•	•	•	•
Min and max 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	-	•	•	•	•	•	•	•	•
Max and min values: currents	•	•	•	•	•	•	•	•	•
Max and min values: voltages	•	•	•	•	•	•	•	•	•
Max and min values: frequency	•	•	•	•	•	•	•	•	•
Max and min values: active, reactive, apparent power and power factor	-	•	•	•	•	•	•	•	•
Harmonic values of phase current and THD	•	•	•	•	•	• <sup>(1)</sup>	•	• <sup>(1)</sup>	• <sup>(1)</sup>
Harmonic values of voltage and THD	-	•	•	•	•	•	•	•	•
Voltage sags and swells	-	•	•	•	•	•	•	•	•
<b>Logs and Records</b>									
Sequence of event record	•	•	•	•	•	•	•	•	•
Disturbance record	•	•	•	•	•	•	•	•	•
Tripping context record	•	•	•	•	•	•	•	•	•
<b>Monitoring functions</b>									
Trip circuit supervision (ANSI 74)	1	1	1	1	1	1	1	1	1
Circuit breaker monitoring	1	1	1	1	1	1	1	1	1
Relay monitoring	•	•	•	•	•	•	•	•	•

(1) Function available on both sets of CT inputs

### Busbar arc protection

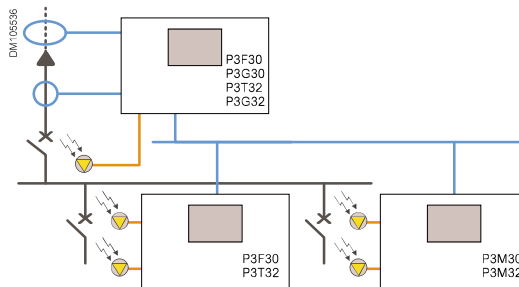
- Arc protection, activated by overcurrent and light signals, or light signals alone

#### Centralized busbar arc protection



- Up to 4 light point sensors to monitor the busbar

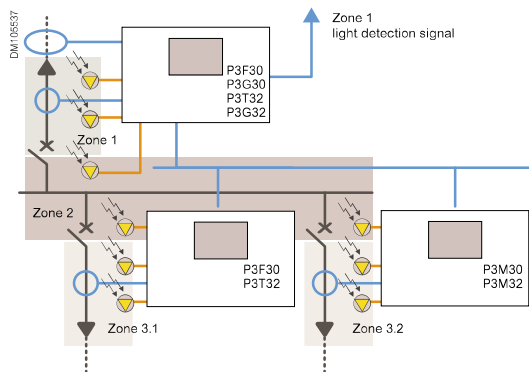
#### De-centralized busbar arc protection



- Up to 4 light point sensors in each relay
- Transmission of light detection signals via digital I/O or IEC 61850 GOOSE messages

### Zone arc protection

- Up to 8 arc protection stages in each relay

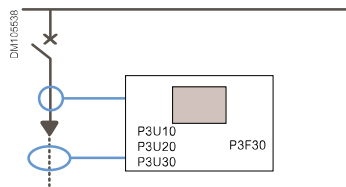


- Light detection in zone 1: signal sent to upstream relay for tripping
- Light detection in zone 2: incomer Easergy P3 trips, if fault confirmed by overcurrent
- Light detection in zone 3: corresponding outgoing Easergy P3 trips, if fault confirmed by overcurrent

### Outgoing protection

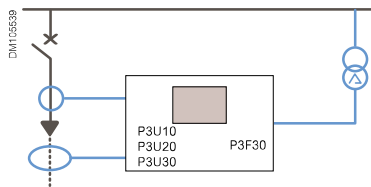
- Feeder overcurrent protection
- Feeder overload protection

**Protection of low-capacitance feeders in impedance-earthed or solidly-earthed neutral systems**



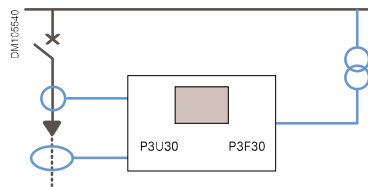
- Feeder earth-fault overcurrent

**Protection of high-capacitance feeders in impedance-earthed or compensated or isolated neutral systems**



- Directional earth-fault overcurrent
- Transient intermittent earth-fault

**Protection of feeders with metering**

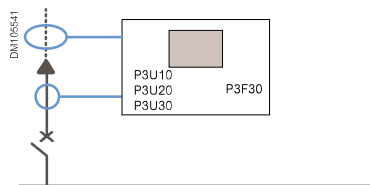


- Power and energy measurement
- Min and max demand values over the last 31 days and 12 months

### Incomer protection

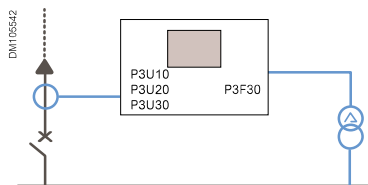
- Busbar overcurrent protection

**Incomer protection without voltage monitoring**



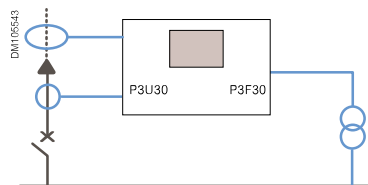
- Earth-fault overcurrent

**Incomer protection with voltage and frequency monitoring**



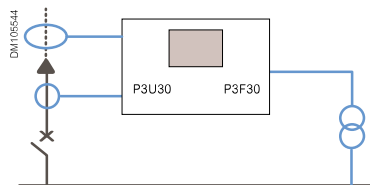
- Neutral voltage displacement protection for isolated system

**Incomer protection with voltage and frequency monitoring**



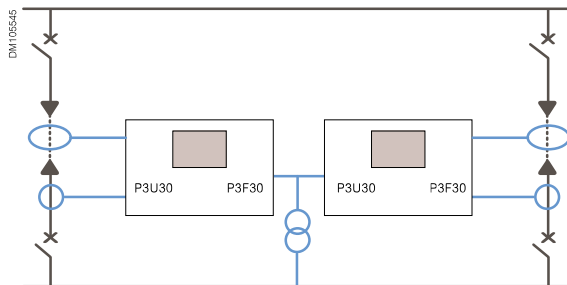
- Under/over voltage
- Frequency, rate of change of frequency

**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**

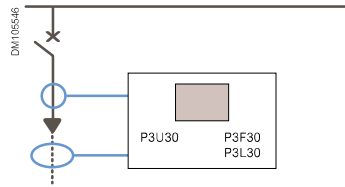


- Directional phase overcurrent
- Directional earth-fault overcurrent

### Line protection

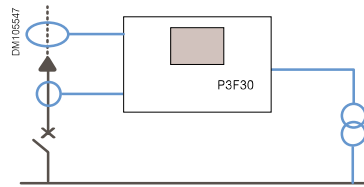
- Overcurrent and earth-fault protection (directional and non-directional)
- Feeder overload protection

#### Overhead line protection



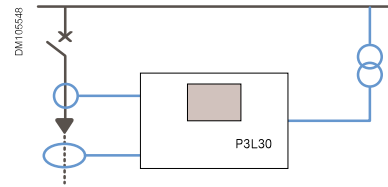
- Recloser
- Feeder fault locator

#### Incomer protection with fault locator



- Incomer fault locator

#### Line protection with line differential and distance functions

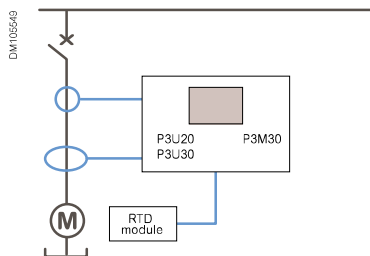


- Line differential protection
- Distance protection

### Motor protection

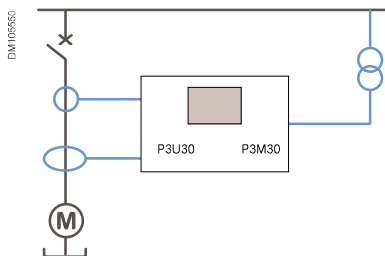
- Motor overcurrent and earth-fault overcurrent
- Thermal overload
- Motor start-up supervision
- Motor restart inhibition

#### Motor protection without voltage monitoring



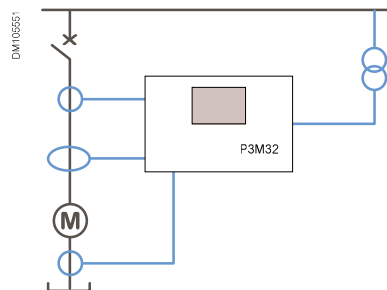
- Temperature measurement (stator, bearings)

#### Motor protection with voltage monitoring



- Undervoltage protection

#### Motor protection with differential function

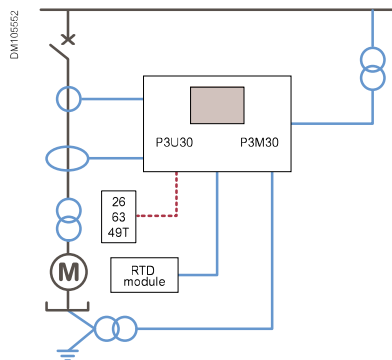


- Differential protection

### Motor-transformer unit protection

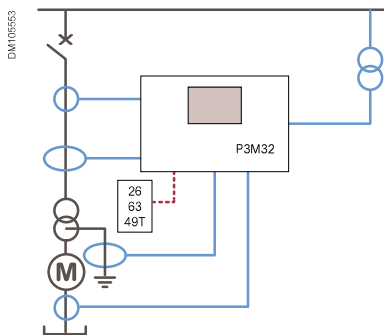
- Motor-transformer overcurrent
- Transformer earth-fault overcurrent
- Thermal overload
- Motor start-up supervision
- Motor restart inhibition
- External trip from thermostat/Buchholz

#### Motor-transformer unit protection



- Temperature measurement (stator, bearings)
- Motor neutral point displacement

#### Motor-transformer unit protection with differential function

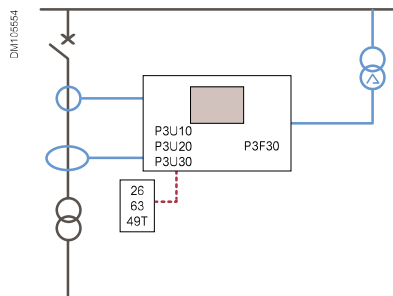


- Differential protection
- Motor earth-fault overcurrent

### Transformer feeder protection

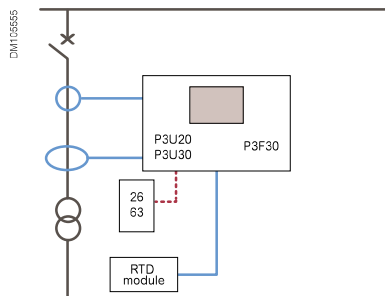
- Transformer overcurrent and earth-fault overcurrent protection
- Thermal overload protection
- External trip from thermostat/Buchholz

#### Transformer feeder protection



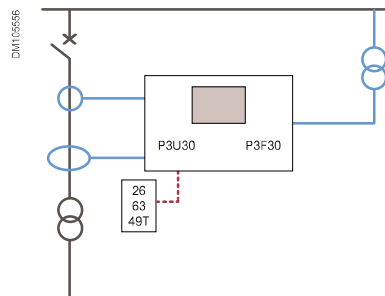
- Directional earth-fault overcurrent for impedance earthed or compensated neutral systems

#### Transformer feeder protection without voltage monitoring



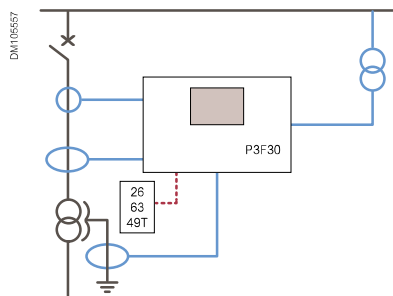
- Temperature measurement (ambient, oil)

#### Transformer feeder protection with voltage monitoring

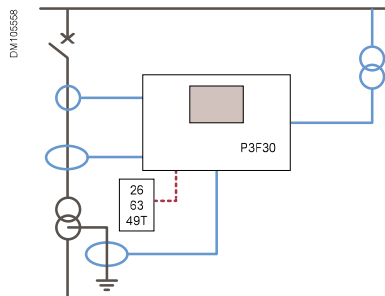


- Over and undervoltage protection

#### Transformer feeder protection with additional current measurement

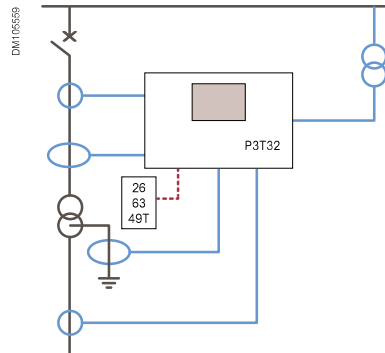


- Tank earth-leakage protection



- Earth-fault overcurrent on the secondary side

#### Transformer feeder protection with differential function



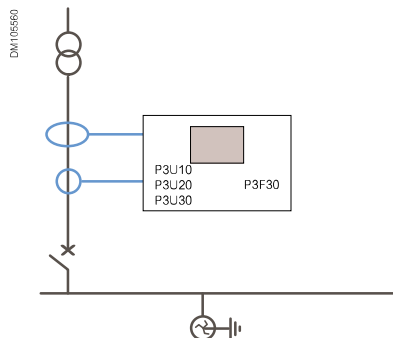
- Differential protection
- Restricted earth-fault protection



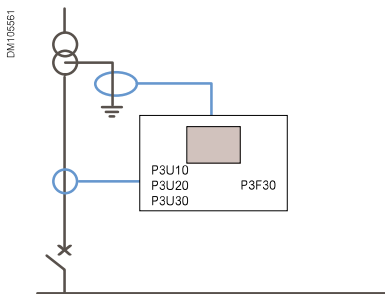
### Transformer in-circuit protection

- Busbar overcurrent protection
- Inter-trip from primary CB protection

#### Transformer in-circuit protection without voltage monitoring

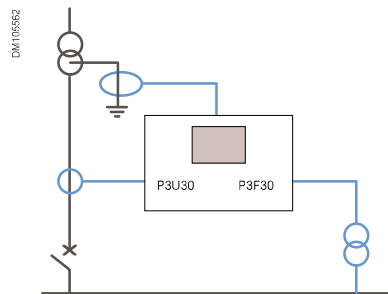


- Transformer earth-fault overcurrent



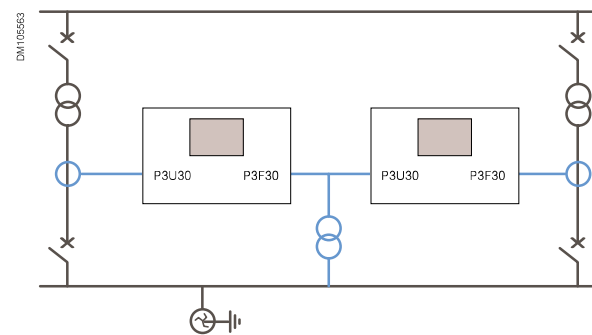
- Earth-fault overcurrent for transformer and back-up protection

#### Transformer feeder protection with voltage monitoring



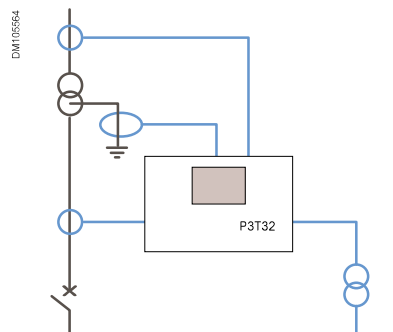
- Over and undervoltage protection
- Power and energy measurement
- Min and max demand values over the last 31 days and 12 months

#### Parallel transformer in-circuit protection



- Directional phase overcurrent

#### Transformer in-circuit protection with differential function overcurrent



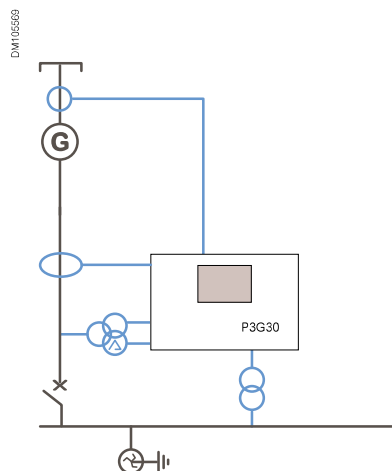
- Transformer differential overcurrent
- Restricted earth-fault overcurrent



**Mid-size generator protection**

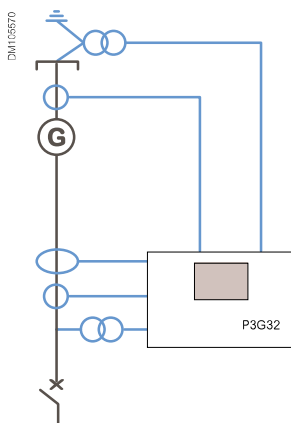
- Under-impedance
- Loss of field
- Voltage and frequency monitoring

Protection of a generator coupled to another source



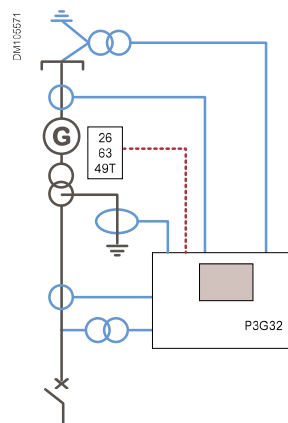
- Earth-fault overcurrent protection of the generator when coupled
- Neutral voltage displacement to detect generator earth-fault when CB is open
- Synchro-check

Generator protection with differential function



- Stator earth-fault detection
- Differential protection

Generator-transformer unit protection with differential function

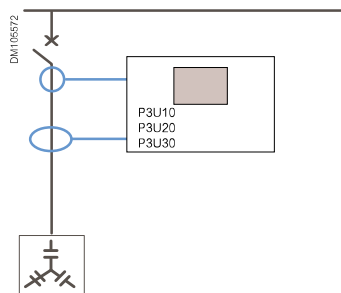


- Stator earth-fault detection
- Differential protection
- Restricted earth-fault protection

### Capacitor bank protection

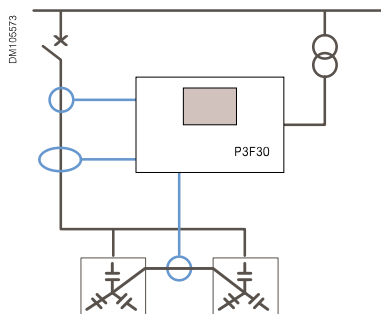
- Capacitor bank overcurrent and earth-fault protection
- Capacitor bank overload protection

#### Capacitor bank protection without voltage monitoring



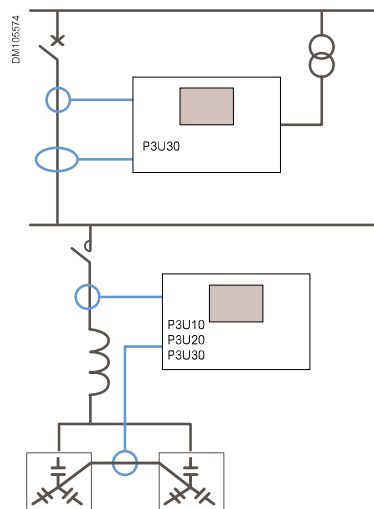
- Capacitor overvoltage protection, based on current measurement and harmonics
- Current harmonic values and THD

#### Capacitor bank protection with voltage monitoring

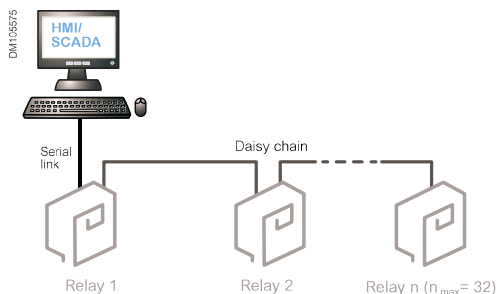


- Capacitor bank unbalance
- Overvoltage
- Current and voltage harmonic values and THD

#### Protection of harmonic filters



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



### Connection to SCADA using serial line

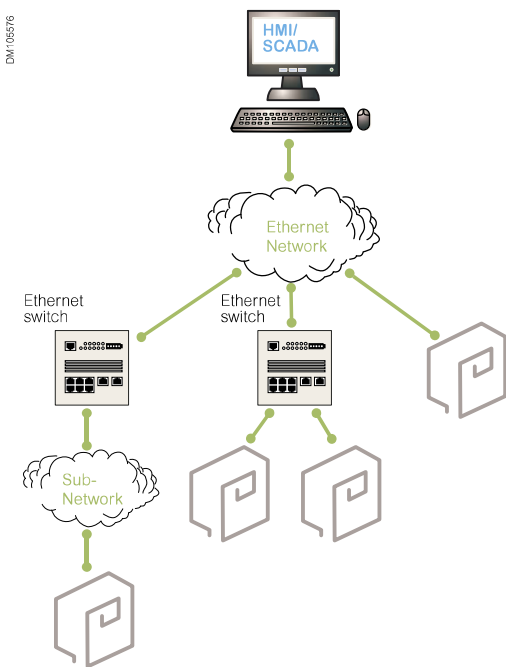
This architecture allows you to connect HMI/SCADA to a set of Easergy protection relays using a multi-drop serial communication link with master-slave communication.

#### Available protocols:

- Modbus RTU
- IEC 60870-5-101
- IEC 60870-5-103
- DNP3
- DeviceNet
- Profibus
- SPAbus

#### Time synchronisation protocol:

- IRIG-B
- Minute pulse



### Connection to SCADA using Ethernet

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

#### Available protocols:

- IEC 61850
- IEC 60870-5-101
- DNP3
- Modbus
- EtherNet/IP

Note: It is possible to mix on the same Ethernet network the IEC 61850 protocol with any of the 4 other protocols.

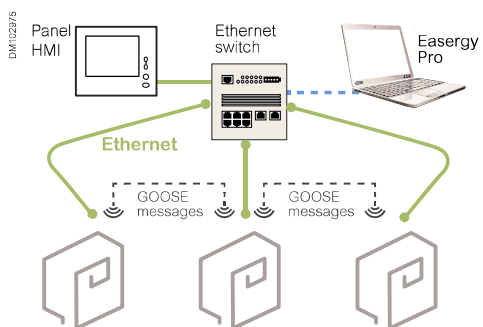
This allows you to use the GOOSE messages between relays together with another protocol for communication to SCADA.

It is also possible to connect an Easergy relay to 2 different control systems, using the same Ethernet communication port and IEC 61850 protocol for one of them and any available protocol for the other one.

The Easergy P3 relay handles the IEC 61850 station bus, in compliance with standards IEC 61850-6, 7-1, 7-2, 7-3, 7-4 and 8-1 Ed.1 or Ed.2, according to configuration.

#### Other available Ethernet protocols:

- FTP for file transfer
- SNTP for time synchronization
- HTTP for web server



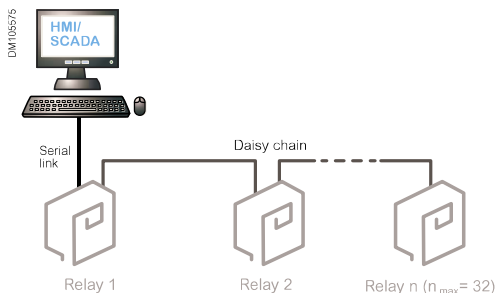
### Architecture example 1

#### Switchboard internal network

This architecture allows fast GOOSE communication between Easergy protection relays of the switchboard, thus 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 Easergy Pro.

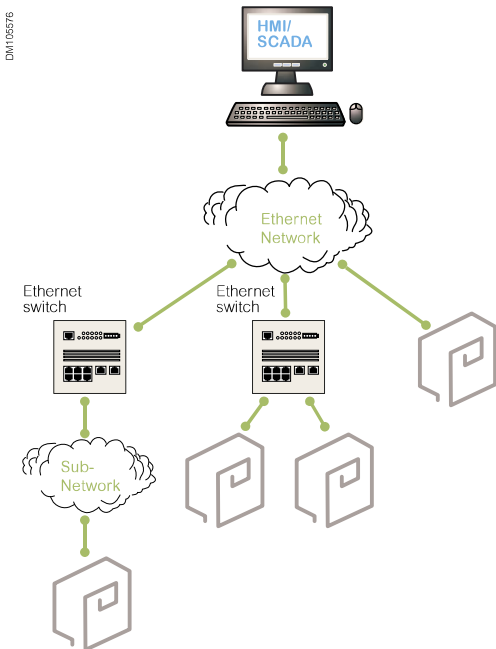


### Architecture example 2

#### Connection to SCADA using serial lines and legacy protocols

This architecture allows you to connect HMI/SCADA to a set of Easergy protection relays using a multi-drop serial communication link with master-slave communication protocols such as Modbus-RTU, DNP3, or IEC 61870-5-103.

The RS485 serial communication port of the Easergy protection relay enables simple daisy chaining wiring thanks to its 2 RJ45 connectors, suited for 2-wire or 4-wire cabling. A termination module is plugged into the last connection. As an alternative, the fiber optic serial communication port can be used.



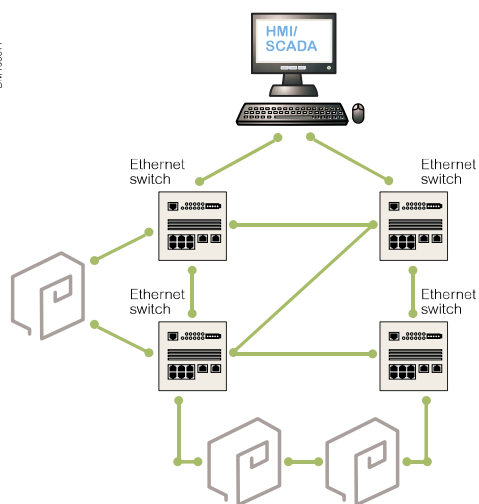
### Architecture example 3

#### Connection to HMI/SCADA using Ethernet with redundant paths

When using an Ethernet infrastructure for the system network, redundant paths are often created. This is usually a deliberate action to improve communication availability, but can also result from non-mastered and overly complicated network architectures.

Redundant paths, however, can result in loops that are not compatible with normal Ethernet operation because they permit frames to propagate endlessly, inducing a phenomenon known as "frame storm." Using such network topologies therefore requires the use of special management techniques.

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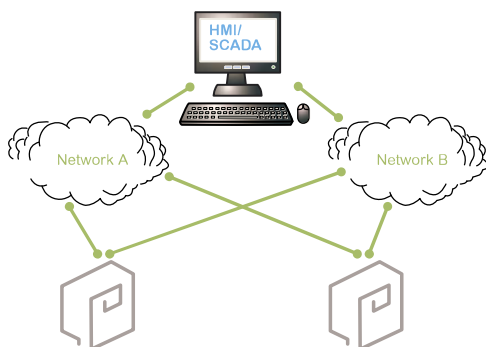


### RSTP (Rapid Spanning Tree Protocol)

The principle of RSTP is to virtually cut 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.

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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 eliminating the redundant frame if it is received.

PRP features a 0 ms recovery time in case of failure.

PRP is supported by Easergy P3 relays.

# Communication

Data exchanged between Easergy P3 and SCADA

## Ethernet ports

Protocol	IEC 61850	Ethernet/IP	FTP
<b>Real-time data</b>			
Measurement	•	•	-
Alarms and status	•	•	-
Controls	•	•	-
Time-stamped events	•	•	-
<b>Historical data</b>			
Disturbance records	•	-	•
<b>Setting management</b>			
Setting group change	•	•	-

## Serial Ports

Protocol	IEC 60870-5-103	DeviceNet	Profibus	SPAbus
<b>Real time data</b>				
Measurement	•	•	•	•
Alarms and status	•	•	•	•
Controls	•	•	•	•
Time-stamped events	•	•	•	•
<b>Historical data</b>				
Disturbance records	•	-	-	-
Sequence of event record files	•	-	-	-
<b>Setting management</b>				
Setting group change	•	•	•	•
Settings	-	-	-	•



# Communication

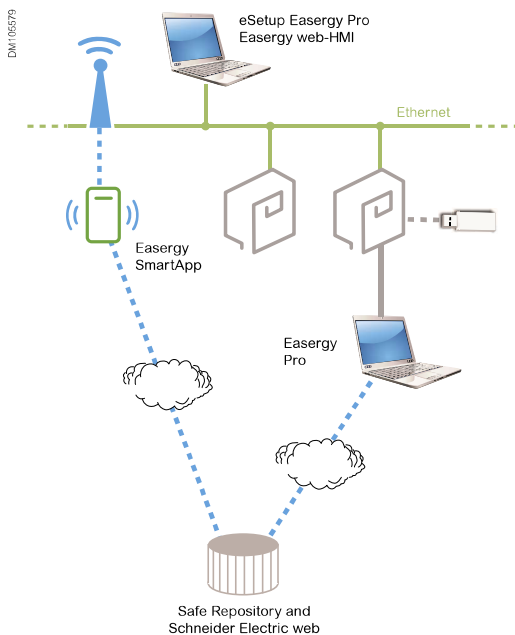
Data exchanged between  
Easergy P3 and SCADA

## Ethernet or Serial ports

Protocol	DNP3	IEC 60870-5-101	Modbus
<b>Real-time data</b>			
Measurement	•	•	•
Alarms and status	•	•	•
Controls	•	•	•
Time-stamped events	•	•	•
<b>Setting management</b>			
Setting group change	•	•	•

# Communication

## Engineering system and System configuration



### Engineering system

#### eSetup Easergy Pro

eSetup Easergy Pro can be connected to a single Easergy protection relay on the front USB port or to a group of Easergy protection relays via Ethernet.

eSetup Easergy Set allows you to prepare the configuration of the relay without having any physical relay. For this purpose, eSetup Easergy Pro provides the latest version of the configuration description file directly from the web.

#### Easergy SmartApp

Easergy SmartApp can be connected to the Easergy protection relays using a Wi-Fi router.

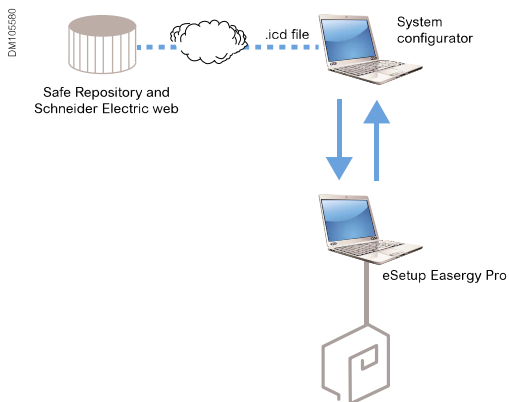
Easergy SmartApp is also connected to the safe repository, allowing you to access todocuments and store files downloaded from the relay.

#### Easergy web-HMI

In addition to eSetup Easergy Pro, most of the resources of the relay can be accessed with a standard web browser, using the web pages embedded into the relay.

### System configuration according to IEC 61850

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



#### .icd file

When the configuration of an Easergy protection relay is done, setting tool can generate IED capability file. This file can be used by the system configurator.

# Communication

## Arc flash protection system by network communication

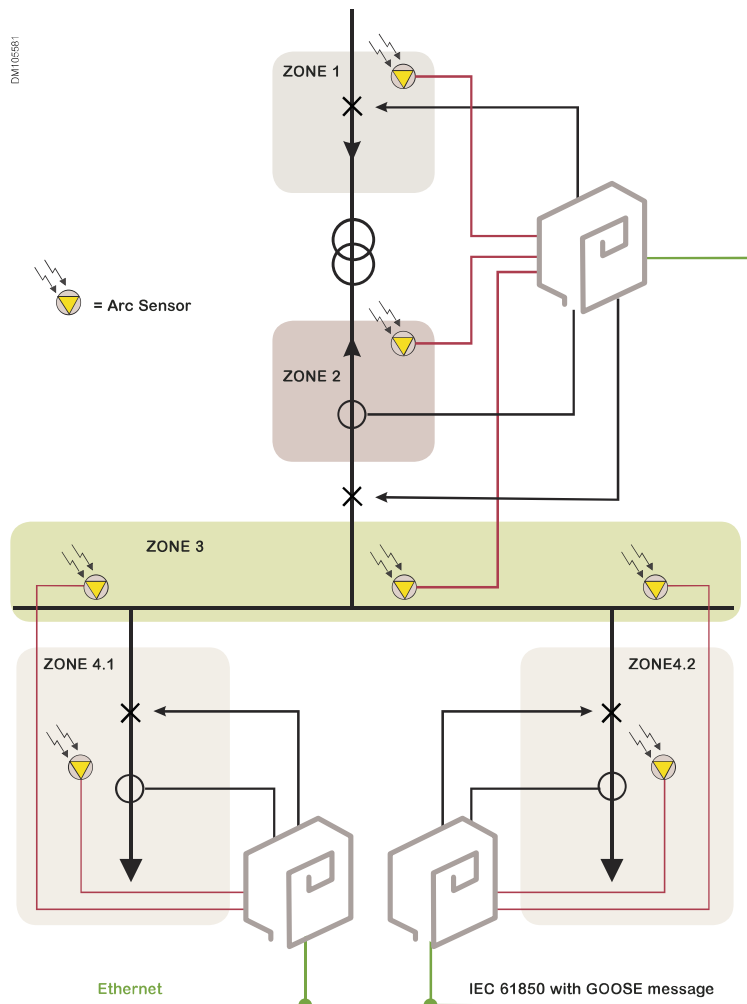
### Arc flash protection system: Application example

In this application example, the arc flash sensor for zone 4.1 is connected to Device 1. If the arc flash sensor awakens and simultaneously Device 3 sends a current signal, the zone 4.1 is isolated by the outgoing feeder breaker.

The arc flash sensor for zone 4.2 is connected to Device 2 and operates the same way.

The arc flash sensors for zone 3 are connected to Device 1, 2, or 3. If a sensor awakens 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 or 2 does not necessarily activate the current element in Device 2. However, arc detection can be achieved by using the light-only principle. If an arc flash occurs in cable termination, zone 1, or zone 2, the fault is cleared by the upstream circuit breaker.



# Maximize protection

## MiCOM series 10, 20, 30, 40

Comprehensive range of digital protection relays



Make the most of your energy

**Schneider**  
Electric

# Increase energy availability



Fast response

+



Maximum dependability

=

## 100% available energy

Your electrical equipment is under control. With MiCOM protection relays, you get maximum energy availability for your process.

**Maximize energy availability and the profits generated by your installation while protecting life and property.**

## The MiCOM range of relays

offers scalable levels of functionality and hardware options to best suit your protection requirements, and allows you to choose the most cost effective solution for your application.

The MiCOM protection relay range provides the capability for a wide variety of protection, control, measurement, monitoring and communication.

The versatile hardware and common relay management software (MiCOM S1 studio) allows a simple configuration and installation in different applications.

A standard and simple user interface across the entire range makes MiCOM ideal in any environment, from the more complex bay level control with mimic, to the most simple LCD display with menu interrogation.

### Keep informed to manage better

Every MiCOM relay provides you with intuitive access to all system information in your own language so that so that you can manage your electrical installation effectively.

If a problem occurs, clear and complete information puts you in a position to make the right decisions immediately. The electrical supply is restored without delay.

### Maintain installation availability

MiCOM relays maintain high energy availability thanks to their diagnostics function that continuously monitors the network status.

In-depth analysis capabilities and high reliability ensure that the equipment is de-energised only when absolutely necessary.

Risks are minimised and servicing time reduced by programming maintenance operations.

## 1999

Launch of first MiCOM relay protection

## 2013

Over 500,000 MiCOM units installed around the world

# Increase your capabilities...

From cost effective to high end protection and control, the comprehensive MiCOM series allows complete optimisation of your solution.

## MiCOM series 10

Fulfils the basic requirements of Buildings and small Industries applications with particular focus on overcurrent and motor protection. Two families are available.

- Auxiliary powered
- Self powered / dual powered.



## MiCOM series 20

Fulfils the basic/medium requirements of Industrial, Utility and Building applications providing simplicity and ease of use in a wide range of installations.

- Scalable solutions where type and quantity of protection features is model dependent
- Flexible logic equations available on most models
- Compact hardware options for easy installation
- Common functions throughout the range
- Multi-language HMI
- Advanced protection functions



## MiCOM series 30

Fulfils the protection requirements of Utility and Industrial applications with particular focus on integrated feeder control and provides dedicated railway protection devices.

- Protection with bay level control options to facilitate feeder management
- Input/Output quantity selectable based on requirements
- Numerous rear port communication hardware options available with a wide range of protocols selectable via software
- Protection functions available for isolated/Petersen coil earthed systems
- Surface and flush mounted (including detachable HMI option) as well as compact case models available in the range
- Full Programmable Scheme Logic (PSL) and function keys



## MiCOM series 40

Fulfils the protection requirements for a wide market of Utility and Industrial application and offers a wide range of protection functions.

- Full Programmable Scheme Logic available with graphic configuration tool for easy setting
- Scalable Input/Output hardware depending on requirements
- Operating voltage selectable via software for opto inputs
- Hardware accessories available for easy mounting in racks or panels.



# ... with a comprehensive range

	series 10	series 20	series 30	series 40
Feeder	P11x	P12x	P13x	P14x
Motor	P21x	P22x		P24x
Generator				P34x
Distance			P43x	P44x
Line differential		P52x	P53x	P54x
Transformer			P63x	P64x
Busbar		P72x		P74x
Breaker Failure		P821		P84x
Voltage and frequency		P92x		
Preferred application				

## MiCOM relays fulfil the requirements at all voltage levels:



# Save time...

# ... with a simple operating software

The MiCOM S1 Studio programming and operating software provides a single environment for the entire range. The result is a simple, user-friendly approach for fast commissioning.

## Configuration

### Equipment setup

Upload data on-line from the relay or off-line from a data model template

### Automatic hardware description

### Protection activation

Enable protection functions

### Application compliance

### Summary of functions

Easily and quickly apply protection, control and monitoring settings

### Fine tune capability

Name	Value	Address
OP PARAMETERS		
CONFIGURATION		
[49] THERMAL OVERLOAD		
teta INHIBIT ?	NO	0200
Iteta =	0.20In	0201
FLUENCE ?	1mn	0202
LARM ?	5mn	0203
ORBIT START ?	10mn	0204
SHORT-CIRCUIT ?	NO	0205
E/GND CT PRIM	NO	0206
E/GND CT SEC	NO	0207
E/GND CT SEC	NO	0208
E/GND CT SEC	NO	020A

## Operation

Setting file ready to be downloaded to MiCOM relay

download



export

Straightforward facility for commissioning

### Analysis of waveform capture

Display, analysis and printing of disturbance recording data.

### Real-time supervision

Supervision of the status of all the relays in the electrical installation

### Management of alarms and events



Complete peace of mind during operation

# Protect your network...

## Protect



MiCOM protection relays were launched in 1999 using best-in-class protection techniques now combined with latest technology to position MiCOM as a highly dependable range of device.

At Schneider Electric, these protection techniques are fine tuned to give you the best possible protection for your assets. We also engineer quality into every device in line with best in class standards to match our protection performance.

Our latest range of devices are better than they have ever been.

## Secure



Our comprehensive self monitoring provides peace of mind that errors are detected to ensure high reliability for your plant and assets.

Schneider Electric's Cyber Security solution encompasses the entire substation, many elements are now available.

Please contact your local Schneider Electric representative for availability.

## Communicate



Local and remote communication is provided and designed for use with the MiCOM S1 Studio software. Rear communication port(s\*) are intended for remote communication to SCADA or engineering access.

When an Ethernet card is installed in series 30 or 40 devices, IEC 61850 communication is available for the latest in high speed communication and GOOSE messaging. Various network architectures are supported including Parallel Redundancy Protocol (PRP) on series 40. All port types, quantities and protocols vary by product, please check the order form for availability.

\*Optional rear communication port on many relays.

## Setting



Setting is achieved with the MiCOM S1 Studio support package. The intuitive support software is all you need for the management of your entire MiCOM installed base, which manages all setting files with its unique substation file management facility.

The in-built datamodel manager also ensures that you always have the latest support files installed on your computer for all of your devices. Multiple independent setting groups are supported in most MiCOM relays, they can be activated locally, remotely or via a dedicated input condition, to allow for different system operating conditions or adaptive relaying.

# ... with a complete set of tools

## Mesure



MiCOM devices measure (and store) a wide comprehensive range of system values such as Current, Voltage, Frequency, Power etc. from instantaneous or derived values.

Measurements can be displayed on the front LCD display or transferred via the communication ports. The high accuracy measurement class transformers throughout the MiCOM range provide data that you can rely on.

## Records



Event records are generated by status changes to logic inputs, outputs, settings and alarms. They are readily available for view on the LCD display, or extraction via the communication ports. All records are time tagged to a resolution of 1ms and are maintained during auxiliary supply interruptions.

Fault records capture information including Fault number, date and time, active setting group, function that issued the trip and measurement values. Disturbance records capture the sampled values of all analogue inputs such as phase currents or voltages present during the fault. Oscillographic analysis using MiCOM S1 Studio provides quick analysis of analogue and digital signals on the same time-scale. They can be extracted from the relay via the communication ports and saved in COMTRADE format.

## Control



Fully programmable function keys and programmable tri-state LEDs (red/yellow/green) are available on MiCOM series 30 and 40. Bay Control on selected series 30 devices is provided on a graphical display with customizable mimic. MiCOM series 40 also provides programmable hot-keys for direct menu access (e.g. Trip/Close command).

Time synchronisation of the internal real-time clock can be implemented from various sources including an optional IRIG-B port (MiCOM series 30, Compact and 40) or communication protocol (protocol and device dependent).

## Logic

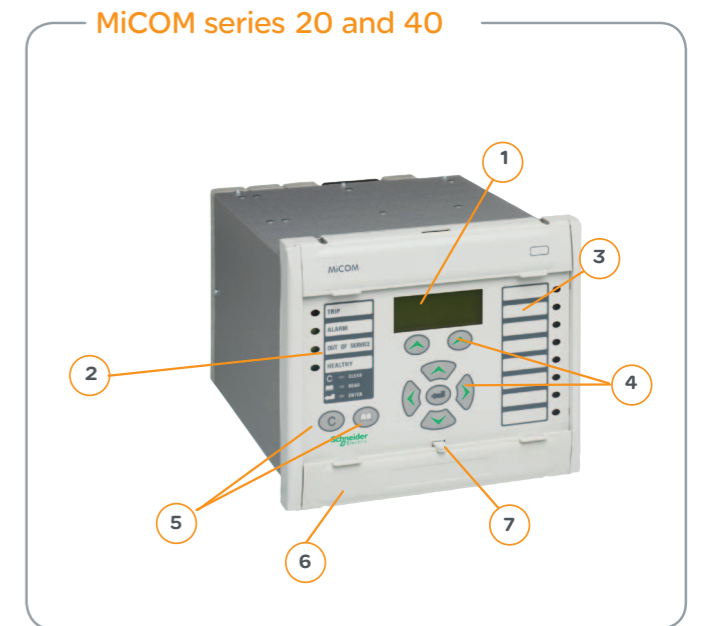
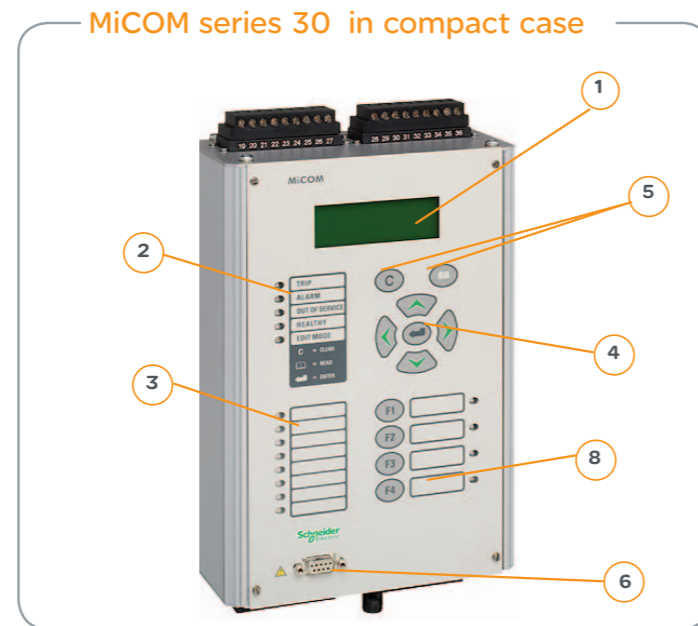
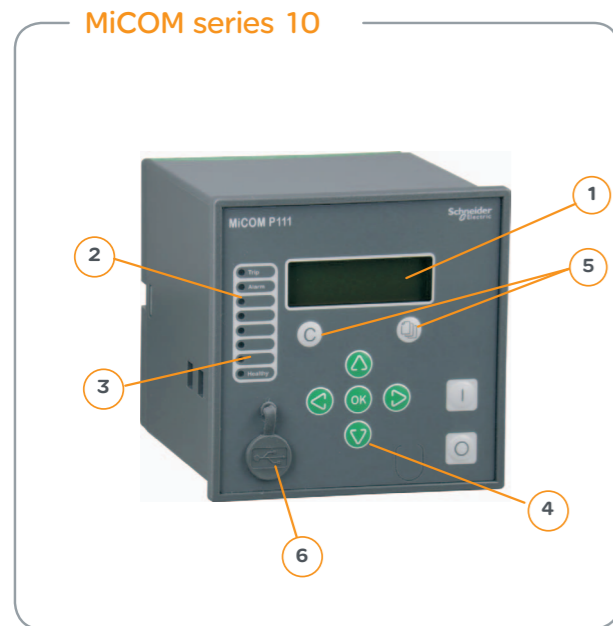


Programmable scheme logic is configured using the MiCOM S1 Studio. MiCOM series 20 uses Boolean equations, whilst series 30, Compact and 40 use graphical programming (series 30 and Compact can use either method). Flexible logic in most series 20 relays allows users to create equations to be assigned to LEDs, outputs, trips, alarms or back into other equations. Programmable graphical logic in MiCOM series 30 and 40 relays are an extremely powerful tool. Users can customise protection and control functions or add additional supervision or custom schemes, e.g. trip circuit supervision or frequency restoration. This logic is event driven to ensure that protection is not delayed.



# Simplify your operation...

# ... with a user friendly interface



The user interface and menu text is available in English, French, German and Spanish as a standard. Other languages such as for example Russian and Chinese are supported on some relays depending on the market requirements.

The ability to customize the menu text and alarm descriptions is also supported on series 30 and 40.

The front panel user interfaces comprises:

- ① A back-lit liquid crystal display (series 10, 20, 30, 40)  
Graphic LCD display (series 30)
- ② 3 fixed function LEDs (series 10)  
4 fixed function LEDs (series 20, 40)  
5 fixed function LEDs (series 30)
- ③ Up to 4 user programmable LEDs (series 20)  
Up to 18 user programmable LEDs (series 30)  
Up to 8 user programmable LEDs (series 40)
- ④ Menu navigation and data entry keys



User language options that provide true global convenience

- ⑤ “READ” and “CLEAR” keys for viewing and reset of alarms
- ⑥ Front communication port
- ⑦ Facility for fitting a security seal
- ⑧ Programmable Function keys (compact case, series 30 and 40)
- ⑨ Switchgear control keys up to 6 bays control (series 30)

# Mechanical description

## Case construction

The MiCOM series are housed in specially designed cases which provide a high density of functionality within the product. Communication ports and model/serial number information is concealed by upper and lower covers on certain models.

Physical protection of the front panel user interface and prevention of casual access is provided by an optional transparent front cover (selected models only), which can be fitted or omitted, since the front panel has been designed to IP52 protection against dust and water.

The cases are suitable for either rack or panel mounting.

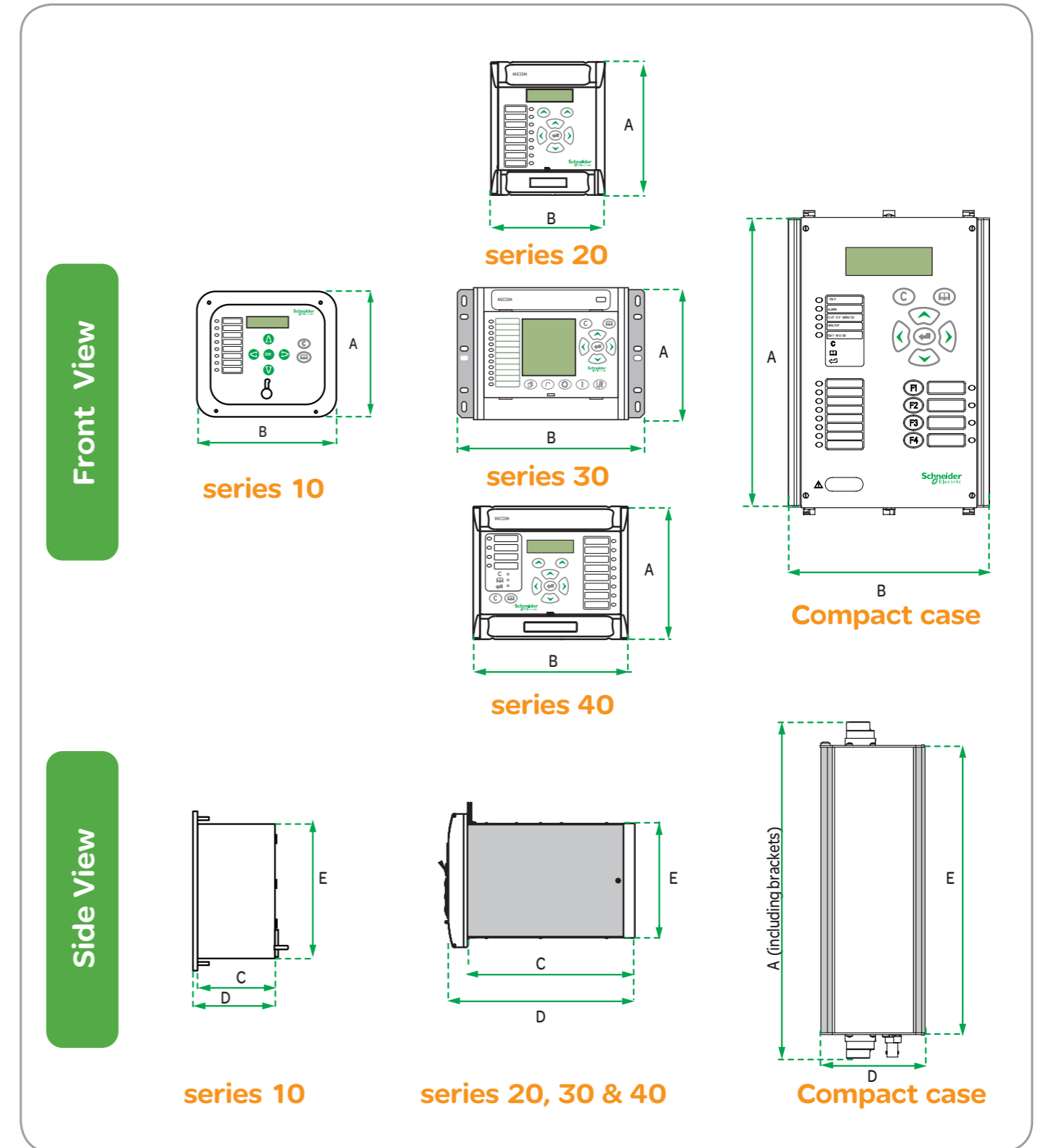
An option for surface mounting and a compact case is also supported on the series 30 for installations with space limitations.

The differing case widths of relays can be combined with or without the use of standard blanking plates to form a complete 19" mounting. This saves space and allows for a neat installation.

## Dimensions

		A	B	C	D	E
series 10	Compact 1	106.5	106.5	113	118	101.5
	Compact 2	184	157	110	140	150
series 20	20TE	177	103	240 (incl. wiring)	270 (incl. wiring)	157.5
	30TE		155	139.8 223	166.4 249.6	155.2 156
series 30	24TE	184,5	186.4	227.9	253.6	177.5
	40TE		260.2			
	84TE		481.6			
	40TE Surface		260.2	257.1	177.5	
	84TE Surface		481.6			
series 40	40TE	177	206	240 (incl. wiring)	270 (incl. wiring)	157.5 max
	60TE		309.6			
	80TE		413.2			
	80TE Rack		483			
series 30 Compact	Compact	294.4	175.6		88.5	253

Note: Maximum sizes for guidance only, for specific product information please check the relevant product documentation. (All dimensions in mm)



Typical case dimensions

## Wiring

External connections are made via ring type terminal except on the compact case. These take pin type terminals along with the series 30 relays as an option.

# Technical data description

## Power supplies

A wide range of power supply options are available at the ordering stage.

	Nominal Voltage Vnom.	Operate Range (V)	
		dc	ac
series 10	24-60Vdc/ac	19-72	19-66
	60-250 Vdc / 90-240 Vac	48-300	71-265
series 20	24-250 Vdc / 48-240 Vac	19.2-300	38.4-264
	48-250 Vdc / 48-240 Vac	38.4-300	38.4-264
series 30	24-60 Vdc	19-72	-
	60-250 Vdc / 100-230 Vac	48-300	100-230
series 40	24-48 Vdc	19-65	-
	48-110 Vdc / 40-100 Vac	37-150	32-110
	110-250 Vdc / 100-240 Vac	87-300	80-265

## Digital Inputs

A wide range of opto input voltages are supported throughout the range

	Auxiliary Voltage	Thresholds (V)
series 10	> 24 Vdc/ac	> 19.2 Vdc/ac
	> 90 Vac	> 71 Vac
	> 90 Vdc	> 77 Vdc
series 20	24- 250 Vdc / 48-240 Vac	> 19.2 Vdc/ac (Variant code "Z")
	48- 250 Vdc / 48-240 Vac	> 19.2 Vdc/ac (Variant code "Z")
		> 105 Vdc (Variant code "H")
	> 77V (70% of Uaux. 110 Vdc; Variant code "V")	
	> 154V (70% of Uaux. 220 Vdc; Variant code "W")	
series 30	Thresholds	
	Standard Variant > 18 (Uaux. 24-250 Vdc)	Further Options > 73 V (67% of Uaux. 110 Vdc) > 90 V (60-70% of Uaux. 125/150 Vdc) > 146 V (67% of Uaux. 220 Vdc) > 155 V (60-70% of Uaux. 220/250 Vdc)
series 40	Universal programmable voltage thresholds	
	24/27, 30/34, 48/54, 110/125 and 220/250 Vdc	

## General series data

	series 10	series 20	series 30		series 40
			Standard case	Compact case	
Frequency 50/60Hz	■	■	■	■	■
Dual rated 1A/5A *	■	■	■	■	■
Opto inputs	max 8	max 12	max 82	2	max 64
Output contacts	max 8	max 9	max 48	8	max 60
Continuous carry	5A	5A	5A	5A	10A
Make and carry	25A for 3s	30A for 3s	30A for 0.5s	30A for 0.5s	30A for 3s
High break contacts			■		■
LED indication (freely programmable)	8 (6)	8 (4)	29 (24)	17 (12)	22 (18)
Function keys / Hot keys	No	No	6	4	10/2 **
Settings groups	up to 2	up to 8	4	4	4 (2)
Fault records	20	25	8	8	5
Event records	200	250	1000	200	250-512
Disturbance records	5 (6s max)	5 (15s max)	8 (16.4s max)	8 (16.4s max)	75 s max.
Programmable logic	No	Flexible logic **	Fully programmable	Fully programmable	Fully programmable
IRIG B	No	Option	Option	Option	Option
LCD display	Alphanumeric	Alphanumeric	Alphanumeric / Graphical **	Alphanumeric	Alphanumeric
Front port	USB	RS 232	RS 232	RS 232	RS 232
Rear Port/2nd rear port	Yes/No	Yes/Option	Yes/Option	Yes/Option	Yes/Option
Courier	No	EIA(RS)485 **	EIA(RS)485 or fibre	EIA(RS)485 or fibre	K-Bus/ EIA(RS) 485 or fibre**
Modbus	Yes	EIA(RS)485	EIA(RS)485 or fibre	EIA(RS)485 or fibre	EIA(RS) 485 or fibre**
IEC 60870-5-103	Yes	EIA(RS)485	EIA(RS)485 or fibre	EIA(RS)485 or fiber	EIA(RS) 485 or fibre **
IEC 60870-5-101	No	No	EIA(RS)485 or fibre	EIA(RS)485 or fibre	No
DNP3.0	No	EIA(RS)485 **	EIA(RS)485 or fibre	EIA(RS)485 or fibre	EIA(RS) 485 or fibre**
IEC 61850	No	No	With Ethernet	No	With Ethernet
One box bay control with mimic	No	No	Yes **	No	No
Terminals	Pin or Ring **	Ring	Pin or Ring	Pin	Ring

\* CT thermal ratings continuous: 4 In/10s & 30 In/1s & 100 In

\*\* model dependent

# MiCOM series description

## Feeder management and overcurrent relays

	series	10				20						
		model	P111	P114D	P115	P116	P120	P121	P122	P123	P125	P126
Case size						20TE	20TE	20TE	20TE	30TE	30TE	30TE
CT Inputs		4	4	4	4	1	4	4	4	1	4	4
VT Inputs										1	1	3
Opto Inputs ( max)		8	2	2	6	2	2	3	5	4	7	12
Output Contacts (max)		8	4	4	7	5	5	7	9	7	9	9
Output for striker triggering			1	1	1							
Magnetic flags (max)					5							
RTDs (max. option)												
Analogue Input/ Output (max)												
Function Keys/Hotkeys												
Bay Control & Monitoring												
- with Mimic												
Interlocking logic												
PROTECTION FUNCTION		ANSI										
Check synchronising	25											
Directional power	32											■
Master sequence device	34											
Undercurrent	37				■			■	■		■	■
Negative sequence overcurrent	46				■			■	■		■	■
Broken conductor	46BC				■			■	■		■	■
Negative sequence overvoltage	47											■
Incomplete sequence relay	48											
Thermal overload	49	■			■			■	■		■	■
Ground fault	50/51N	■	■	■	■		■	■	■	■	■	■
3 Phase overcurrent	50/51P	■	■	■	■		■	■	■		■	■
1 Phase or earth overcurrent	50/51P/N					■				■		
Circuit breaker failure	50BF	■		■	■			■	■		■	■
Motor	51LR											
Voltage controled overcurrent	51V											■
Over/Under voltage	59/27											■
Residual over voltage	59N									■	■	■
Restricted earthfault	64					■	■	■	■	■	■	■
Startup monitoring	66											
Ground fault directional	67N									■	■	■
Sensitive directional earthfault	67N											
Phase directional	67P											■
Wattmetric earthfault	67W									■	■	■
Autoreclose	79				■				■		■	■
Under/Over frequency	81											■
Rate of change of frequency	81R											■
Protective signalling	85											
Lock-out	86	■		■	■	■	■	■	■	■	■	■
Current transformer supervision	CTS											■
Switch on to fault	SOTF	■			■				■		■	■
Trip circuit supervision	TCS	■			■			■	■		■	■
Voltage transformer supervision	VTS											■
Neutral admittance	YN											
Circuit breaker monitoring		■			■			■	■		■	■
Cold load pick-up		■			■			■	■		■	■
Inrush blocking		■			■			■	■			■
InterMiCOM												
Limit value monitoring												

## Feeder management relays

	30			40				series
	model	P130C	P132	P139	P141	P142	P143	
Case size		Compact	24, 40 or 84TE	40 or 84TE	40TE	40TE	60 or 80TE	60TE
CT Inputs		4	4	4	5	5	5	5
VT Inputs		3	4 or 5	4 or 5	3	3	3 or 4	3 or 4
Opto Inputs ( max)		2	70	70	8	16	32	32
Output Contacts (max)		8	32	28	8	15	30	32
Output for striker triggering								
Magnetic flags (max)								
RTDs (max. option)			10	10				
Analogue Input / Output (max)			1/2	1/2				
Function Keys/Hotkeys		■	■	■	■	■	■	■
Bay Control & Monitoring			■	■				
- with Mimic				■				
Interlocking logic			■	■				
PROTECTION FUNCTION		ANSI						PROTECTION FUNCTION
Check synchronising	25		■	■			■	■
Directional power	32	■	■	■				
Master sequence device	34			■				
Undercurrent	37	■	■	■	■	■	■	■
Negative sequence overcurrent	46	■	■	■	■	■	■	■
Broken conductor	46BC	■	■	■	■	■	■	■
Negative sequence overvoltage	47	■	■	■	■	■	■	■
Incomplete sequence relay	48	■	■	■				
Thermal overload	49	■	■	■				
Ground fault	50/51N	■	■	■	■	■	■	■
3 Phase overcurrent	50/51P	■	■	■	■	■	■	■
1 Phase or earth overcurrent	50/51P/N		■	■				
Circuit breaker failure	50BF	■	■	■	■	■	■	■
Motor	51LR	■	■	■				
Voltage controled overcurrent	51V		■	■	■	■	■	■
Over/Under voltage	59/27	■	■	■	■	■	■	■
Residual over voltage	59N	■	■	■	■	■	■	■
Restricted earthfault	64		■	■	■	■	■	■
Startup monitoring	66	■	■	■				
Ground fault directional	67N	■	■	■	■	■	■	■
Sensitive directional earthfault	67N		■	■	■	■	■	■
Phase directional	67P	■	■	■	■	■	■	■
Wattmetric earthfault	67W	■	■	■	■	■	■	■
Autoreclose	79	■	■	■		■	■	■
Under/Over frequency	81	■	■	■	■	■	■	■
Rate of change of frequency	81R	■	■	■	■	■	■	■
Protective signalling	85	■	■	■				
Lock-out	86	■	■	■	■	■	■	■
Current transformer supervision	CTS	■	■	■	■	■	■	■
Switch on to fault	SOTF	■	■	■	■	■	■	■
Trip circuit supervision	TCS	■	■	■	■	■	■	■
Voltage transformer supervision	VTS	■	■	■	■	■	■	■
Neutral admittance	YN		■	■	■	■	■	■
Circuit breaker monitoring		■	■	■	■	■	■	■
Cold load pick-up		■	■	■	■	■	■	■
Inrush blocking		■	■	■	■	■	■	■
InterMiCOM		■	■	■	■	■	■	■
Limit value monitoring		■	■	■				

## Motor management relays

	series	10			20			30			40		
	model	P211	P220	P225	P130C	P132	P139	P241	P242	P243			
Case size		-	30TE	30TE	Compact	24, 40 or 84TE	40 or 84TE	40TE	60TE	80TE			
CT Inputs		4	4	4	4	4	4	4	4	7			
VT Inputs				1 or 3	3	4 or 5	4 or 5	3	3	3			
Opto Inputs (max)		4	5	11	2	70	70	8	16	16			
Output Contacts (max)		4	6	6	8	32	28	7	16	16			
RTDs / Thermistors			6/0 or 4/2	10/3 or 0/0		10/0	10/0	10/0	10/0	10/0			
Analogue Input/Output (max)			0/1	0/2		1/2	1/2	4/4	4/4	4/4			
Function keys					■	■	■	■	■	■			
Interlocking logic						■	■	■	■	■			
PROTECTION FUNCTION		ANSI											
Speed switch input	14	■		■		■	■	■	■	■			
Check synchronising	25					■	■						
Reacceleration	27LV		■	■	■	■	■	■	■	■			
Unbalance/Lock out	30/46/86		■	■	■	■	■	■	■	■			
Directional power	32L/O/R				■	■	■						
Reverse power	32R				■	■	■	■	■	■			
Loss of load	37	■	■	■	■	■	■	■	■	■			
Undercurrent	37P/37N		■	■	■	■	■	■	■	■			
Thermal overload	38/49	■	■	■	■	■	■	■	■	■			
Loss of field	40						■	■	■	■			
Negative sequence overcurrent	46	■		■	■	■	■	■	■	■			
Negative sequence over voltage	47				■	■	■	■	■	■			
Neutral over voltage	47N				■	■	■						
Phase overcurrent	50/51P	■	■	■	■	■	■	■	■	■			
Circuit breaker failure	50BF			■	■	■	■	■	■	■			
Ground fault	50N/51N	■	■	■	■	■	■	■	■	■			
Locked rotor	50S/51LR/51S	■	■	■	■	■	■	■	■	■			
Out of step	55						■	■	■	■			
Under/Over voltage	59/27			■	■	■	■	■	■	■			
Residual over voltage	59N				■	■	■	■	■	■			
Wattmetric earth fault	64N/32N				■	■	■	■	■	■			
Startup monitoring	66/48/51	■	■	■	■	■	■	■	■	■			
Ground fault directional	67N				■	■	■						
Sensitive directional earth fault	67N				■	■	■	■	■	■			
Phase directional	67P				■	■	■						
Over frequency	81O				■	■	■						
Under frequency	81U				■	■	■	■	■	■			
Rate of change of frequency	81R				■	■	■						
Motor differential	87M									■			
Current transformer supervision	CTS		■	■	■	■	■	■	■	■			
Trip circuit supervision	TCS		■	■	■	■	■	■	■	■			
Voltage transformer supervision	VTS				■	■	■	■	■	■			
Anti Backspin				■			■	■	■	■			
Circuit breaker monitoring			■	■		■	■	■	■	■			

## Generator management relays

	series	40			
	model	P342	P343	P344	P345
Case size		40 or 60TE	60 or 80TE	80TE	80TE
CT Inputs		5	8	8	9
VT Inputs		4	4	5	7
Opto Inputs (max)		24	32	32	32
Output Contacts (max)		24	32	32	32
RTDs		10	10	10	10
Analogue Input/Output (max)		4/4	4/4	4/4	4/4
Function keys		■	■	■	■
Interlocking logic		■	■	■	■
PROTECTION FUNCTION		ANSI			
Underimpedance	21	■	■	■	■
Overfluxing	24	■	■	■	■
Check synchronising	25	■	■	■	■
100 % stator earth fault (3rd)	27TN/59TN	■	■	■	■
Directional power	32L/O/R	■	■	■	■
Thermal overload	38/49	■	■	■	■
Loss of field	40	■	■	■	■
Negative sequence overcurrent	460C	■	■	■	■
Negative sequence thermal	46T	■	■	■	■
Negative sequence over voltage	47	■	■	■	■
Thermal overload	49T	■	■	■	■
Unintentional energisation	50/27	■	■	■	■
Phase overcurrent	50/51P	■	■	■	■
Circuit breaker failure	50BF	■	■	■	■
Ground fault	50N/51N	■	■	■	■
Interturn/split phase	50DT		■	■	■
Voltage dependent O/C	51V	■	■	■	■
Under/over voltage	59/27	■	■	■	■
Residual over voltage	59N	■	■	■	■
Restricted earth fault	64	■	■	■	■
Wattmetric earth fault	64N/32N	■	■	■	■
Rotor earth fault (MiCOM P391 option)	64R	■	■	■	■
100 % stator earth fault (low frequ.)	64S				■
Sensitive directional earth fault	67N	■	■	■	■
Phase directional	67P	■	■	■	■
Wattmetric sensitive earth fault	67W	■	■	■	■
Pole slipping	78		■	■	■
Turbine abnormal frequency	81AB	■	■	■	■
Under/Over frequency	81	■	■	■	■
Generator Differential	87G/87GT		■	■	■
Current transformer supervision	CTS	■	■	■	■
Trip circuit supervision	TCS	■	■	■	■
Voltage transformer supervision	VTS	■	■	■	■
Circuit breaker monitoring		■	■	■	■

## Distance protection relays

	series	30					40					
	model	P430C	P433	P435	P437	P439	P441	P442	P443	P444	P445	P446
Case size		Compact	40 or 84TE	40 or 84TE	84TE	40 or 84TE	40TE	60TE	80TE	80TE	40 or 60TE	80TE
CT Inputs		4	4	4	4 or 5	4	4	4	5	4	4	8
VT Inputs		3	4 or 5	4 or 5	4 or 5	4 or 5	4	4	4	4	4	5
Opto Inputs (max)		2	70	82	36	70	8	16	32	24	16	24
Output Contacts (max)		8	32	48	48	28	14	21	32	46	16	32
RTDs (option)			1	1	1	1						
Analogue Input/Output (max)			1/2	1/2	1/2	1/2						
Function keys/hotkeys		■	■	■	■		■	■	■	■	■	■
Bay control & monitoring with Mimic						■						
Interlocking logic			■	■	■							
PROTECTION FUNCTION	ANSI											
Distance	21/21N	■	■	■	■	■	■	■	■	■	■	■
Check synchronising	25		■	■	■	■	■	■	■	■		
Directional power	32	■	■	■	■	■						
Negative sequence overcurrent	46	■	■	■	■	■	■	■	■	■	■	■
Directional negative sequence	46/67	■			■		■	■	■	■	■	
Broken conductor	46BC	■	■	■	■	■	■	■	■	■	■	■
Thermal overload	49	■	■	■	■	■	■	■	■	■	■	■
Switch on-to fault	50/27	■	■	■	■	■	■	■	■	■	■	■
Earth fault	50/51N	■	■	■	■	■	■	■	■	■	■	■
Phase overcurrent	50/51P	■	■	■	■	■	■	■	■	■	■	■
Stub bus protection	50ST	■	■	■	■	■	■	■	■	■	■	■
Over/Undervoltage	59/27	■	■	■	■	■	■	■	■	■	■	■
Residual overvoltage	59N	■	■	■	■	■			■	■	■	■
Circuit breaker failure	62/50BF	■	■	■	■	■	■	■	■	■	■	■
Earth fault directional	67N	■	■	■	■	■	■	■	■	■	■	■
Transient earth fault directional	67N		■	■		■						
Phase directional	67P						■	■	■	■	■	■
Wattmetric earth fault	67W	■	■	■	■	■						
Out of step tripping	68	■	■	■	■	■			■			■
Power swing blocking	78	■	■	■	■	■	■	■	■	■	■	■
Autoreclose	79	3 pole	3 pole	1/3 pole	1/3 pole	3 pole	3 pole	1/3 pole	1/3 pole	1/3 pole	3 pole	1/3 pole
Over/Under frequency	81	■	■	■	■	■	■	■	■	■	■	■
Rate of change of frequency	81R	■	■	■	■	■						
Channel aided scheme logic	85	■	■	■	■	■	■	■	■	■	■	■
Capacitive voltage transformer supervision	CVTS						■	■		■		
Trip Circuit Supervision	TCS	■	■	■	■	■	■	■	■	■	■	■
Voltage/Current transformer supervision	VTS/CTS	■	■	■	■	■	■	■	■	■	■	■
Delta directional comparison	$\Delta/\Delta V$								■			
Neutral admittance	YN	■	■	■	■	■						
InterMiCOM		■	■	■	■	■	■	■	■	■	■	■
Mutual compensation					■		■	■	■	■		

## Line differential protection relays

	series	20	30	40								
	model	P521	P530C	P532	P541	P542	P543	P544	P545	P546	P547	
Case size		30TE	Compact	40 or 84TE	40TE	60TE	60TE	60TE	80TE	80TE	80TE	
CT Inputs		4	4	4	4	4	5	8	5	8	5	
VT Inputs			3	4 or 5			4	5	4	5	4	
Opto Inputs (max)		5	2	46	8	16	16	16	32	24	24	
Output Contacts (max)		8	8	30	7	14	14	14	32	32	32	
Function Keys/Hotkeys			■	■	■	■	■	■	■	■	■	
Interlocking logic				■								
PROTECTION FUNCTION	ANSI											
Distance	21							■	■	■	■	■
Check synchronising	25			■				■	■	■	■	■
Loss of load/Undercurrent	37	■										
Negative sequence overcurrent	46	■	■	■				■	■	■	■	■
Thermal overload	49	■	■	■	■	■	■	■	■	■	■	■
Earth fault	50/51N	■	■	■	■	■	■	■	■	■	■	■
Phase overcurrent	50/51P	■	■	■	■	■	■	■	■	■	■	■
Circuit breaker failure	50BF	■	■	■	■	■	■	■	■	■	■	■
Over/Under voltage	59/27		■	■				■	■	■	■	■
Wattmetric earth fault	64W		■	■				■	■	■	■	■
Earth fault directional	67N		■	■				■	■	■	■	■
Sensitive directional earth fault	67N			■				■	■	■	■	■
Phase directional	67P		■	■				■	■	■	■	■
Power swing blocking	78							■	■	■	■	■
Autoreclose	79		3 pole	3 pole		3 pole	1/3 pole	1/3 pole	1/3 pole	1/3 pole	1/3 pole	
Under/Over frequency	81							■	■	■	■	■
Line differential (terminal)	87L	2	2	2	2/3	2/3	2/3	2/3	2/3	2/3		
Phase comparison	87L										■	
CT supervision	CTS	■						■	■	■	■	■
Trip Circuit Supervision	TCS	■	■	■	■	■	■	■	■	■	■	■
2 breaker configuration									■		■	
2nd harmonic restraint		■	■	■	■	■	■			■		
Copper wire signalling		■	■	■								
Direct/Permissive inter tripping		■	■	■	■	■	■	■	■	■	■	
FO signalling		■	■	■	■	■	■	■	■	■		
In Zone transformer		■			■	■	■		■			
PLC signalling												■
SDH/Sonet networks								■	■	■	■	
Vector Compensation		■			■	■	■	■	■			

## Transformer protection relays

	series	30					40			
	model	P721	P630C	P631	P632	P633	P634	P642	P643	P645
Case size		20TE	Compact	40TE	40 or 84TE	40 or 84TE	84TE	40TE	60TE	60 or 80TE
CT Inputs		2	6	6	8	12	15	8	12	18
VT Inputs					1	1	1	1 or 2	1 or 4	1 or 4
Opto Inputs (max)		2	2	4	34	40	34	12	24	24
Output Contacts (max)		4	8	14	22	30	22	12	24	24
Analogue Input/Output (max)					1/2	1/2	1/2	4/4	4/4	4/4
RTDs (option)					1	1	1	10	10	10
Function Keys/Hotkeys			■	■	■	■	■		■	■
Interlocking logic					■	■				
PROTECTION FUNCTION	ANSI									
Overexcitation	24				■	■	■	■	■	■
Negative sequence overcurrent	46		■	■	■	■	■	■	■	■
Negative sequence overvoltage	47							■	■	■
Thermal overload	49		■	■	■	■	■	■	■	■
Ground fault	50/51N	■	■	■	■	■	■	■	■	■
Phase overcurrent	50/51P		■	■	■	■	■	■	■	■
Circuit breaker failure	50BF	■		■	■	■	■	■	■	■
Over/Under voltage	59/27				■	■	■		■	■
Ground fault directional	67N							■	■	■
Phase directional	67P							■	■	■
Under/Over frequency	81				■	■	■	■	■	■
Restricted earth fault	87G/64	1			2	3	3	2	3	3
Transformer diff. (windings)	87T		2	2	2	3	4	2	3	3
CT supervision	CTS	■		■	■	■	■	■	■	■
Trip Circuit Supervision	TCS	■	■	■	■	■	■	■	■	■
VT supervision	VTS							■	■	■
2 nd harmonic restraint			■	■	■	■	■	■	■	■
Overfluxing/ 5th harmonic			■	■	■	■	■	■	■	■

## Busbar protection relays

	series	40				
	Device	P723	P741	P742	P743	P746
Case size		20TE	80TE	40TE	60TE	80TE
CT Inputs		8		4	4	18
VT Inputs						3
Opto Inputs (max)		5	8	16	24	40
Output Contacts (max)		8	8	8	21	32
Function Keys/Hotkeys			■		■	■
PROTECTION FUNCTION	ANSI					
Ground fault	50/51N			■	■	■
Phase overcurrent	50/51P			■	■	■
Circuit breaker failure	50BF	■	■	■	■	■
Busbar	87BB	■	■	■	■	■
Check Zones	87CZ	■	■			■
Phase segregated differential	87P	■	8 zones			2 zones
Sensitive earth fault differential	87P	■	8 zones			
CT supervision	CTS	■	■	■	■	■
Trip Circuit Supervision	TCS	■	■	■	■	■
VT supervision	VTS			■	■	■
Phase comparison						■
Central unit (Nbr of feeders)		No limit	up to 28			
Peripheral units 8 zones				■	■	
CT supervision				■	■	
CT saturation detection			■	■	■	

## Voltage, frequency, and ancillary protection relays

	series	20				40		
	model	P821	P921	P922	P923	P341	P841	P849
Dimensions		20TE	20TE	20TE	20TE	40 TE or 60TE	60TE or 80 TE	80TE
CT Inputs		4				4	5 or 8	
VT Inputs			4	4	4	4	4 or 5	
Opto Inputs (max)		5	2	5	5	16	16 or 24	64
Output Contacts (max)		9	4	8	8	15	14 or 32	60
PROTECTION FUNCTION	ANSI							
Check synchronising	25					■	1 or 2	
Undervoltage	27		■	■	■	■	■	
Phase sequence voltage	47/27D			■	■		■	
Breaker failure protection	50BF	■				■	1 or 2	
Overvoltage	59		■	■	■	■	■	
Residual overvoltage	59N		■	■	■	■	■	
Restricted earth fault	64					■		
Wattmetric earth fault	64N/32N					■		
Phase directional with DLR option	67P					■		
Autoreclose	79						1 or 1/2	
Under/Over frequency	81			■	■	■	■	
Rate of change of frequency (df/dt+t)	81R				■	■	■	
Frequency supervised average rate of change of frequency (f+Δf/Δt)	81RAV				■			
Frequency supervised rate of change of frequency (f+df/dt)	81RF				■			
Voltage vector shift	dVq					■		
Trip circuit supervision	TCS		■		■	■		
3 pole tripping		■	■	■	■		■	■
Ferroresonance detection							■	
High speed contact							■	■

# Rail protection relays

	series	30			
	model	P138	P436	P438	P638
Case size		40 or 84TE	40 or 84TE	40 or 84TE	84TE
CT Inputs		2	3	3	5
VT Inputs		1	2	2	1
Opto Inputs (max)		22	28	28	38
Output Contacts (max)		48	46	46	64
RTDs (option)		1	1	1	1
Analogue Input/ Output (max)		1/2	1/2	1/2	1/2
Function Keys/Hotkeys		■	■	■	■
PROTECTION FUNCTION		ANSI			
Distance	21/21N		■	■	
Over/Under voltage	27/59	■	■	■	■
Thermal overload	49	■	■	■	■
Switch on-to fault	50/27		■	■	
High current supervision	50H		■	■	
High current earth fault (tank protection)	50/51N	■			■
Phase overcurrent	50/51P		■	■	■
Circuit breaker failure	62/50BF	■	■	■	■
Phase directional	67P	■	■	■	■
Under/Over frequency	81	■			■
Lock-out	86	■	■	■	■
Transformer differential (windings)	87T				2
Train startups	di/dt, dv/dt, dΦ/dt		■	■	
Rail catenary protection	Hz		16 2/3	25/50/60	
Trip circuit supervision	TCS	■	■	■	■
Current transformer supervision	CTS		■	■	
Voltage transformer supervision	VTS	■	■	■	
2nd harmonic restraint			■	■	■
Defrost protection				■	
High impedance fault detection				■	
InterMiCOM			■	■	



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