Overview

PowerLogic 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.
- 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.
- Advanced logic engine (option) supports the most complex automation & control schemes.

PowerLogic 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 PowerLogic 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 communication protocol including flexible product naming for smooth multi-vendor integration.

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

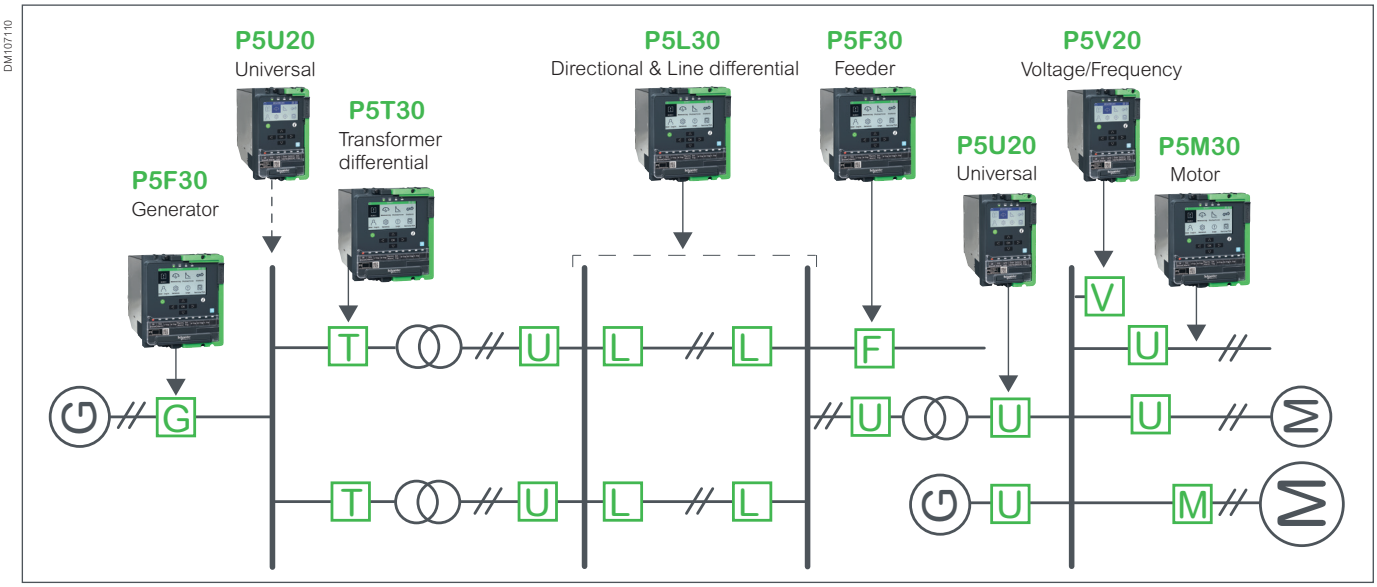
PowerLogic P5x20

PowerLogic P5x30

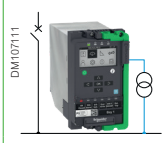
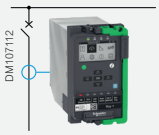
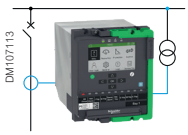
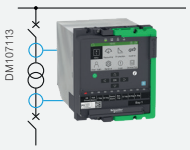
PowerLogic P5 digital protection relays are designed for power distribution networks in:

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

Range overview



Selection Guide

PowerLogic P5 contains two main devices, each with specific functions to address your needs in a one-box design, regardless of application.		PowerLogic P5x20		PowerLogic P5x30	
					
Voltage		P5V20	-	-	-
Feeder		-	P5U20 with directional in LPCT/LPVT version	P5F30 with directional	-
Transformer				-	P5T30
Motor				P5M30 with directional	-
Characteristics					
Measuring inputs	Phase current	-	1/5A CT (x3) or LPCT (x3) (1)	1/5A CT (x3) or LPCT (x3)	1/5A CT (x6)
	Residual current	-	1/5A CT & 1A CT or CSH core balance CT	1/5A CT & 1A CT or CSH core balance CT	1/5A CT (x2)
	Voltage	VT (x4)	LPVT (x4) (1)	VT (x4) or LPVT (x4)	VT (x1)
Arc-flash sensor inputs		-		0 to 6 point sensors	
Digital	Inputs	4 to 16		4 to 40	
	Outputs	3 to 8 + Watchdog (WD)		3 to 18 + 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		24 - 48 VDC or 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	●		●	
Time synchronization	Pulse, IRIG-B(3)	●		●	
	SNTP, PTP IEEE 1588 v2(4)	●		●	
Others					
Control		6 controlled + 2 monitored objects Mimic		6 controlled + 2 monitored objects Mimic	
Logic (Matrix + Programmable logic)		●		●	
Optional Advanced Logic Engine (order option)		●		●	
Cybersecurity		Basic or Advanced		Basic or Advanced	
Draw-out device (withdrawability)		●		●	
Hardware dimensions (W/H/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
(3) IRIG-B module is a separate accessory
(4) PTP IEEE 1588 v2 is availaible with HSR/PRP communication board

Selection Guide by Functionality

Protection Functions	ANSI code	IEC 61850 Logical Node	P5V20 VT variant	P5U20 CT variant	P5U20 LPCT/LPVT variant	P5F30 CT/VT variant LPCT/LPVT variant	P5M30 CT/VT variant LPCT/LPVT variant	P5T30 CT/VT variant
Current protection								
Non-direction or directional phase overcurrent(1)	50/51/67	OC**PTOC**	-	6	6	6	6	6
Non-directional or directional earth/ground fault (2)	50N/51N 50G/51G 67N	DEFU**PTOC**	-	6	6	6	6	6
Transient intermittent/ground fault	67NI	IOIO**PTEF**	-	-	-	1	-	-
Neutral admittance	21YN	EF**PADM**	-	-	-	2	2	-
Negative sequence overcurrent	46 (I2/I1)	NEG**PTOC**	-	2	2	2	2	2
Current unbalance, Broken conductor	46BC (I2)	UIBC**PTOC**	-	2	2	2	-	2
Breaker failure	50BF	CBFP**PIOC**	1	1	1	1	1	2
Phase undercurrent	37	UC**PTUC**	-	1	1	1	1	-
Low Impedance Restricted earth/ground fault4	64REF	REF**PDIF**	-	1	-	1	1	2
High impedance restricted earth/ground fault4	87N		-	A	-	A	A	A
High impedance busbar differential4	87BB		-	A	-	A	A	A
Switch on to fault (SOTF)	50HS	SOTF**PIOC**	-	1	1	1	1	-
Cold load pickup (CLP or CLPU)		CLP**PIOC**	-	1	1	1	1	-
Voltage controlled overcurrent	51V		-	A	A	A	A	-
Voltage protection								
Undervoltage	27	OF**PTOF**	3	-	3	3	3	-
Overvoltage	59	OV**PTOV**	3	-	3	3	3	-
Neutral voltage displacement	59N	UO**PTOV**	3	-	3	3	3	3
Negative sequence overvoltage	47	NEG**PTOV**	2	-	2	2	2	-
Frequency protection								
Overfrequency	81	OFUF**PTOF**	2	-	2	2	2	-
Underfrequency	81U	UF**PTUF**	8	-	8	8	8	-
Rate of change of frequency (RoCoF)	81R/81RF	DFDT**PFRC**	9	-	9	9	-	-
Thermal protection								
Thermal overload	49	THF**PTTR**	-	1	1	1	1	1
Temperature monitoring	38	RTD**GAPC**	-	16	16	16	16	16
Power protection								
Wattmetric earth/ground fault	32N	EF**PDOP**	-	-	-	2	2	-
Directional active underpower	32P	REVP**PDOP**	-	-	2	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	-
Underspeed (3)	14	MOT**PZSU**	-	2	2	-	2	-
Overspeed (3)	12	MOT**POVS**	-	2	2	-	2	-
Anti-backspin(3)	ABS	MABS**PMSS**	-	1	1	-	1	-
Emergency restart			-	1	1	-	1	-
Line protection								
Fault locator	21FL	FL**RFLO**/ SC**RFLO**	-	-	-	1	-	-
Auto-Recloser	79	AR**RREC**	-	1	1	1	-	-
Transformer protection								
Inrush / 2nd harmonic detection	68H2	ID**PHAR**	-	1	1	1	1	2
Fifth harmonic detection	68H5	HAR5**PTOC**	-	1	1	1	1	-
2-winding transformer differential	87T	OCPDIF	-	-	-	-	-	1
Thermostat / Buchholz	26/63	TRF**SIML**	-	-	-	-	-	2
Overfluxing	24	TVF**PVPH**	-	-	-	-	-	3
Capacitor protection								
Capacitor bank unbalance	51C	CAP**PTOC**	-	2	-	2	-	-
Capacitor overvoltage	59C	CAP**PTOV**	-	1	-	1	-	-
Other protection								
Arc-flash detection	50ARC	ARCM**PIOC**	-	-	-	8	8	8
Programmable stages	99	PS**GAPC**	8	8	8	8	8	8
Programmable curves			3	3	3	3	3	3
Control, monitoring, supervision								
Synchronization check	25	**RSYN**	1	-	-	1	-	-
Lockout relay	86		1	1	1	1	1	1
CT supervision	60	CTS**GGIO**	-	1	1	1	1	2
VT supervision	60	VTS**GGIO**	1	-	1	1	1	-
Setting groups			4	4	4	4	4	4

(1) Only non-directional phase overcurrent is availaible in P5U20 CT variant and P5T30.
(2) Only non-directional earth/ground fault overcurrent is availaible in P5U20 CT variant.
(3) Function available if 12 BI / 4 BO board is present.
(4) Only available with conventional (phase or neutral) CTs
A Function available by application guidelines

Selection Guide by Functionality (cont'd)

Control functions	P5V20 VT variant	P5U20 CT variant	P5U20 LPCT/LPVT	P5F30 CT/VT variant LPCT/LPVT variant	P5M30 CT/VT variant LPCT/LPVT variant	P5T30 CT/VT variant
Control with Mobile application	●	●	●	●	●	●
Switchgear control and monitoring	6	6	6	6	6	6
Switchgear monitoring only	2	2	2	2	2	2
Programmable switchgear interlocking	●	●	●	●	●	●
Local control on single-line diagram	●	●	●	●	●	●
Local switchgear control with OPEN/CLOSE keys	●	●	●	●	●	●
Local/remote function	●	●	●	●	●	●
Programmable function keys	1	1	1	7	7	7
Programmable logic	●	●	●	●	●	●
Advanced logic engine (order option)	●	●	●	●	●	●
Measurement functions	**P5V20 VT variant**	**P5U20 CT variant**	**P5U20 LPCT/LPVT**	**P5F30 CT/VT variant LPCT/LPVT variant**	**P5M30 CT/VT variant LPCT/LPVT variant**	**P5T30 CT/VT variant**
RMS current values		●	●	●	●	●
RMS voltage values	●		●	●	●	●[2]
RMS active, reactive and apparent power			●	●	●	
Frequency	●	●	●	●	●	●
Fundamental frequency current values		●	●	●	●	●
Fundamental frequency voltage values	●		●	●	●	●[2]
Fundamental frequency active, reactive and apparent power values			●	●	●	
Power factor			●	●	●	
Phase differential currents						●
Phase bias currents						●
Motor speed detection [(1)]		●	●		●	
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	●		●	●	●	●[2]
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	●		●	●	●	●[2]
Voltage sags and swells	●		●	●	●	
Logs and records	**P5V20 VT variant**	**P5U20 CT variant**	**P5U20 LPCT/LPVT**	**P5F30 CT/VT variant LPCT/LPVT variant**	**P5M30 CT/VT variant LPCT/LPVT variant**	**P5T30 CT/VT variant**
Sequence of event record	●	●	●	●	●	●
Last fault record	●	●	●	●	●	●
Disturbance record	●	●	●	●	●	●
Tripping context record	●	●	●	●	●	●
Relay maintenance data log	●	●	●	●	●	●
Security data log	●	●	●	●	●	●

Monitoring functions	ANSI code	P5V20 VT variant	P5U20 CT variant	P5U20 LPCT/LPVT	P5F30 CT/VT variant LPCT/LPVT variant	P5M30 CT/VT variant LPCT/LPVT variant	P5T30 CT/VT variant
Trip circuit supervision	74	1	1	1	1	1	2
Circuit breaker monitoring		1	1	1	1	1	1
Relay monitoring		●	●	●	●	●	●

(1) Function available if 12DI / 4DO board is present (2) For 1 voltage channel

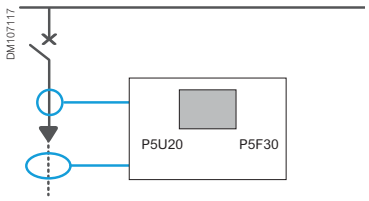
Selection Guide by Application

Feeder/Incomer Application

Outgoing protection

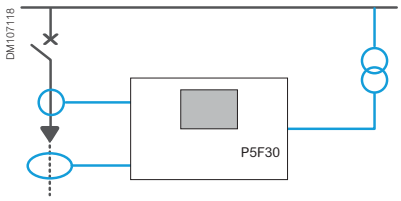
• Feeder overcurrent protection
• Feeder overload protection

Feeder protection



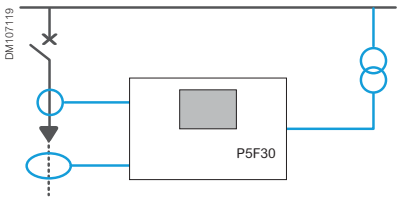
- Feeder earth/ground fault overcurrent

Overhead line protection



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

Protection of feeders with metering

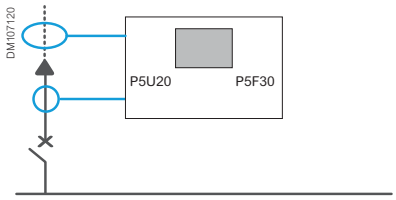


- Power and energy measurement
- Min and max demand values over the last 31 days and 12 months

Incomer protection

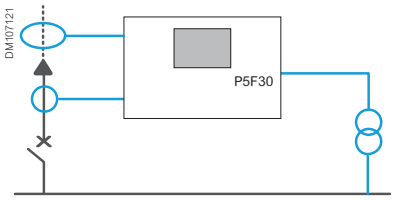
• Busbar overcurrent protection

Incomer protection without voltage monitoring



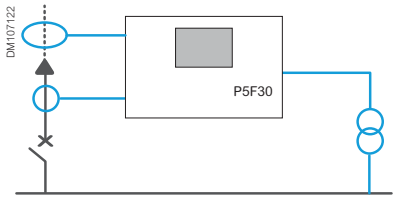
- Earth/ground fault overcurrent

Incomer protection with voltage and frequency monitoring



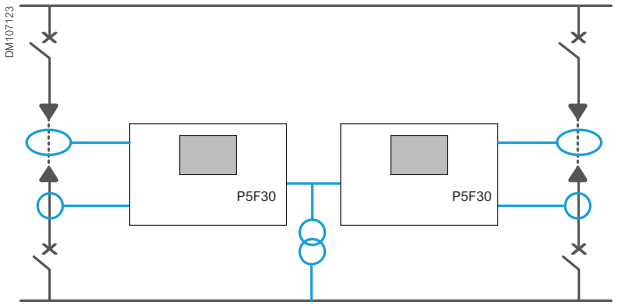
- Under/over voltage
- Frequency, rate of change of frequency

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

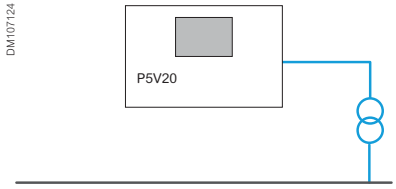
Selection Guide by Application

Feeder/Incomer and Motor Applications

Feeder/Incomer application

Voltage monitoring

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



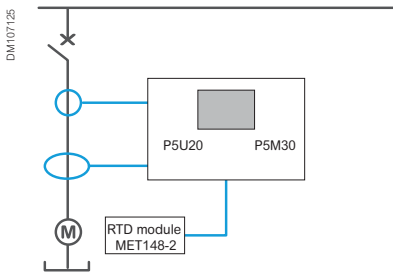
- Load-shedding-specific function: rate of change of frequency

Motor application

Motor protection

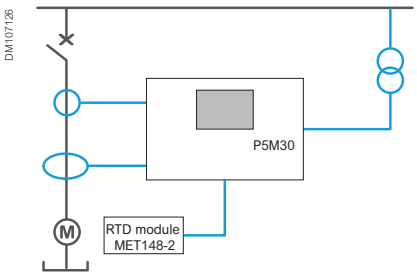
- **Motor overcurrent and earth/ground fault overcurrent**
- **Thermal overload**
- **Motor start-up supervision**
- **Motor restart inhibition**

Motor protection without voltage monitoring



- Temperature measurement (stator, bearings)

Motor protection with voltage monitoring



- Undervoltage protection

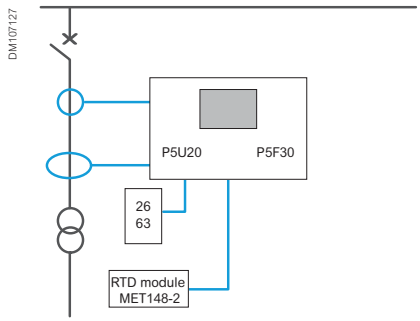
Selection Guide by Application

Transformer Application

Transformer feeder protection

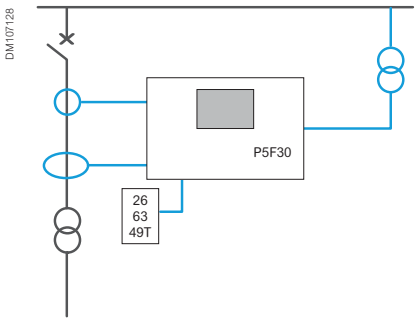
- **Transformer overcurrent and earth/ground fault overcurrent protection**
- **Transformer differential protection**
- **Thermal overload protection**
- **External trip from thermostat/Buchholz**

Transformer feeder protection without voltage monitoring



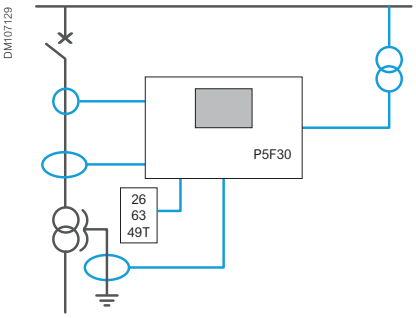
- Temperature measurement (ambient, oil)

Transformer feeder protection with voltage monitoring

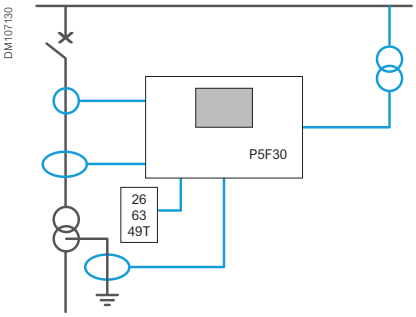


- Over and undervoltage protection

Transformer feeder protection with additional current measurement

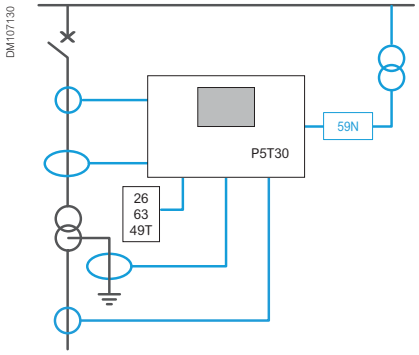


- Tank earth/ground leakage protection



- Earth/ground fault overcurrent on the secondary side

Transformer feeder protection with differential function



- Differential protection
- Restricted earth-fault protection

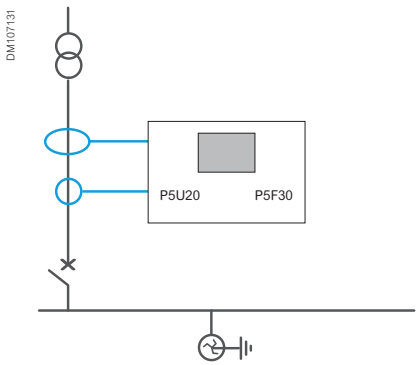
Selection Guide by Application

Transformer Application

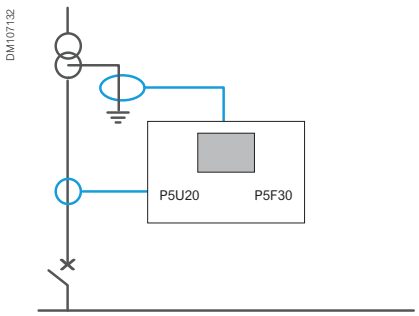
Transformer incomer protection

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

Transformer incomer protection without voltage monitoring

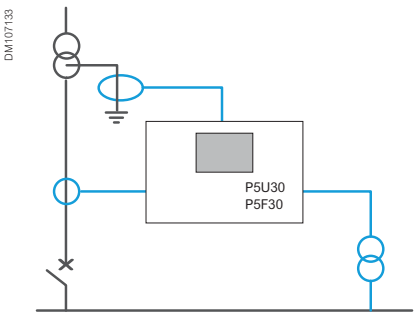


- Transformer earth/ground fault overcurrent



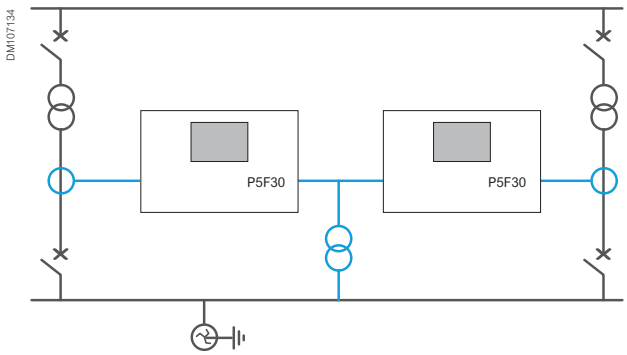
- Earth/ground overcurrent for transformer and back-up protection

Transformer incomer protection with voltage monitoring



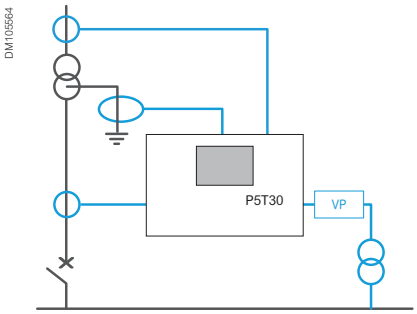
- Over and undervoltage protection
- Restricted earth/ground fault protection
- Power and energy measurement
- Min and max demand values over the last 31 days and 12 months

Parallel transformer incomer protection



- Directional phase overcurrent

Transformer incomer protection with differential function



- Transformer differential
- Restricted earth-fault
- Overfluxing protection

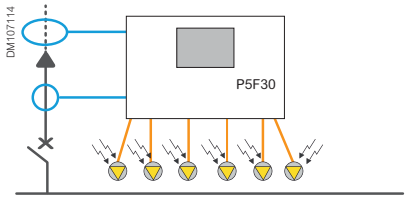
Selection Guide by Application

Arc-flash Application

Busbar arc-flash protection

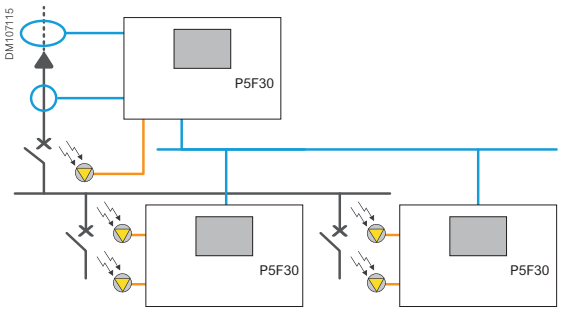
• Arc-flash protection, activated by overcurrent and light signals, or light signals alone

Centralized busbar arc-flash protection



- Up to 6 light point sensors to monitor the busbar

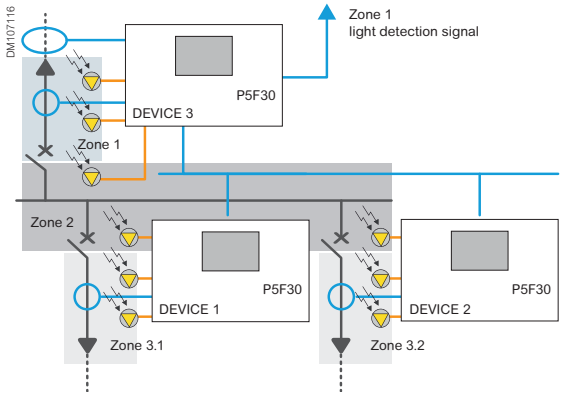
De-centralized busbar arc-flash protection



- 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.

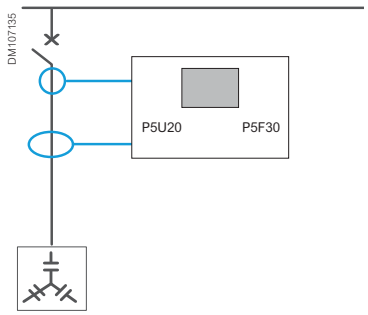
Selection Guide by Application

Capacitor Application

Capacitor bank protection

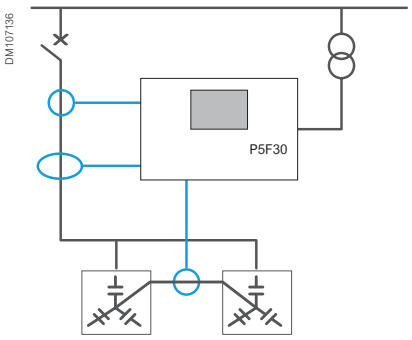
- **Overcurrent and earth/ground fault protection**
- **Overload protection**

Capacitor bank protection without voltage monitoring



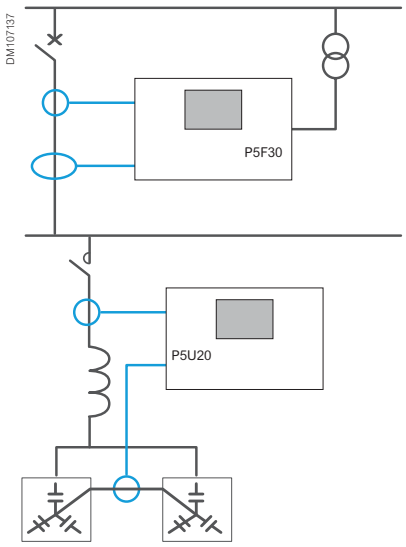
- Capacitor overvoltage protection, based on current measurement and harmonics
- Current harmonic values and THD

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