



Reyrolle  
Protection  
Devices

## 7SR210 & 7SR220 Argus

Overcurrent Protection Relay

Answers for energy

# 7SR210 7SR220 Argus

Overcurrent Protection Relay



## Description

The 7SR210n and 7SR220n are a new generation of non-directional and directional overcurrent protection relays, built on years of numeric relay protection experience with the Argus family of products. Housed in 4U high, size E6 or E8 cases, these relays provide protection, control, monitoring, instrumentation and metering with integrated input and output logic, data logging & fault reports. Communication access to relay functionality is via a front USB port for local PC connection or rear electrical RS485 port for remote connection. Additional rear port options are available.

## Function Overview

### Standard Functionality

37	Undercurrent
46BC	Broken Conductor / Load Unbalance
46NPS	Negative Phase Sequence Overcurrent
49	Thermal Overload
50	Instantaneous Overcurrent
50G/N	Instantaneous Earth Fault
50BF	Circuit Breaker Fail
51	Time Delayed Overcurrent
51G/N	Time Delayed Measured Earth Fault /SEF
60CTS-I	CT Supervision
64H	High Impedance REF
74TC	Trip Circuit Supervision
81HBL2	2nd Harmonic Block/Inrush Restraint
51c	Cold Load Pickup
8	Settings Groups
	Password Protection – 2 levels
	User Programmable Logic
	Self Monitoring

### Additional Functionality 7SR220n Directional Relay

27/59	Under/Over Voltage
47	Negative Phase Sequence (NPS) voltage
51V	Voltage Controlled Overcurrent
59N	Neutral Voltage Displacement
60CTS	CT Supervision
60CTS-I	CT Supervision
60VTS	VT Supervision
67/50	Bi-Directional Instantaneous Overcurrent
67/50G/N	Bi-Directional Instantaneous Earth Fault
67/51	Bi-Directional Time Delayed Overcurrent
67/51G/N	Bi-Directional Time Delayed Earth Fault
81	Under/Over Frequency

### Optional Functionality

79	Auto Reclose
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## User Interface

- 20 character x 4 line backlit LCD
- Menu navigation keys
- 3 fixed LEDs
- 8 or 16 Programmable Tri-colour LEDs (Option)
- 6 Programmable Function Keys each with Tri-colour LED (Option)

## Monitoring Functions

### Standard Monitoring Functionality

- Primary current phases and earth
- Secondary current phases and earth
- Positive Phase Sequence (PPS) Current
- Negative Phase Sequence (NPS) Current
- Zero Phase Sequence (ZPS) Current
- Binary Input/Output status
- Trip circuit healthy/failure
- Time and date
- Starters
- Fault records
- Event records
- Frequency
- Waveform records
- Circuit breaker trip counters
- I<sup>2</sup>t summation for contact wear
- Demand metering

### Additional Monitoring Functionality 7SR220n Directional Relay

- Direction
- Primary line and phase voltages
- Secondary voltages
- Apparent power and power factor
- Real and reactive power
- W Hr forward and reverse
- VAr Hr forward and reverse
- Historical demand record
- Positive phase sequence (PPS) Voltage
- Negative phase sequence (NPS) Voltage
- Zero phase sequence (ZPS) Voltage

## Data Communications

### Standard Communications Ports

Communication access to relay functionality is via a front USB port for local PC connection or rear electrical RS485 port for remote connection

### Optional Communications Ports

2 Rear ST fibre optic ports (2 x Tx/Rx) + IRIG-B port  
1 Rear RS485 + IRIG-B port  
1 Rear RS232 + IRIG-B port  
2 Electrical Ethernet  
2 Optical Ethernet

### Protocols

IEC60870-5-103, Modbus RTU and optional DNP 3.0 protocols – User selectable with programmable data points  
IEC61850 over Ethernet - optional

### Data

Event records  
Fault records  
Waveform records  
Measurands  
Commands  
Time synchronism  
Viewing and changing settings

## Description of Functionality

With reference to figure 7 and figure 8 'Function Diagrams'.

## Standard Functionality

### 37 Undercurrent

Each element has settings for pickup level and Definite Time Lag (DTL) delays. Operates if current falls below setting for duration of delay.

### 46BC Phase Unbalance/Broken Conductor

Element has settings for pickup level and DTL delay. With the circuit breaker closed, if one or two of the line currents fall below setting this could be due to a broken conductor.

### 46NPS Negative Phase Sequence Overcurrent

Two elements, one DTL and one IDMT, with user settings for pickup level and delays, will operate if NPS Current exceeds setting and delay. NPS Current elements can be used to detect unbalances on the system or remote earth faults when a delta-star transformer is in circuit.

### 49 Thermal Overload

The thermal algorithm calculates the thermal states from the measured currents and can be applied to lines, cables and transformers. Outputs are available for thermal overload and thermal capacity.

### 50/51 Phase Fault

50 INST/DTL and 51 IDMT/DTL elements provide overcurrent protection, each with independent settings for pickup current, time-multiplier (51) and time-delays. User can select IEC or ANSI Time Current Characteristics. The IDMT stage has a user programmable reset characteristic, either DTL or shaped current/time reset characteristic, to improve grading with electromechanical protection.

### 50G/51G/50N/51N Earth Fault/Sensitive Earth Fault

Two earth fault measurement modes are available. One mode directly measures the earth current from an independent CT, or the residual connection of the 3 line CTs. This input can be set to be either earth fault or sensitive earth fault (50G/51G). The second mode derives the earth current internally from the 3 phase CTs (50N/51N). 50 INST/DTL and 51 IDMT/DTL elements provide overcurrent protection, each with independent settings for pickup current, time-multiplier (51) and time-delays. User can select IEC or ANSI Time Current Characteristics. The IDMT stage has a user programmable reset characteristic either DTL or shaped current/time reset characteristic to improve grading with electromechanical protection.

### 50BF Circuit Breaker Fail

The circuit breaker fail function may be triggered from an internal trip signal or from a binary input. Line currents are monitored following a trip signal and an output is issued if any current is still detected after a specified time interval. This can be used to re-trip the CB or to back-trip an upstream CB. A second back-trip time delay is available to enable another stage to be utilized if required.

### 60CTS-I CT Supervision

The CTS-I CT Supervision function monitors each phase current input and operates if any one or two inputs fall below the setting.  
The element types have user operate and delay settings.

### 64H Restricted Earth Fault - scheme

The measured earth fault input may be used in a 64H high impedance restricted earth fault scheme.  
Required external series stabilising resistor and non-linear shunt resistor can be supplied.

### 74TC Trip Circuit Supervision

The trip circuit(s) can be monitored via binary inputs connected in H4/H5/H6 or H7 schemes. Trip circuit failure raises an HMI alarm and output(s).

### 81HBL2 Harmonic Block / Inrush Restraint

Where second harmonic current is detected (i.e. during transformer energisation) user selectable elements can be blocked.

### 51c Cold Load

If a circuit breaker is closed onto a 'cold' load, i.e. one that has not been powered for a prolonged period, this can impose a higher than normal load-current demand on the system which could exceed normal settings. These conditions can exist for an extended period and must not be interpreted as a fault. To allow optimum setting levels to be applied for

normal operation, the cold load pickup feature will apply alternative settings for a limited period. The feature resets when either the circuit breaker has been closed for a settable period, or if the current has reduced beneath a set level for a user set period.

#### Programmable User Logic

The user can map Binary Inputs and Protection operated outputs to Function Inhibits, Logic Inputs, LEDs and/or Binary Outputs.

The user can also enter up to 16 equations defining scheme logic using standard functions e.g. Timers, AND/OR gates, Inverters and Counters.

Each Protection element output can be used for Alarm & Indication and/or tripping.

#### Circuit Breaker Maintenance

Two circuit breaker operations counters are provided. The Maintenance Counters record the overall number of operations and the Delta Counter the number of operations since the last reset.

An I<sup>2</sup>t summation Counter provides a measure of the contact wear indicating the total energy interrupted by the circuit breaker contacts.

Each counter has a user set target operations count which, when reached, can be mapped to raise Alarms/ Binary Outputs.

These counters assist with maintenance scheduling

#### Function LED's

Eight or sixteen user programmable tri-colour LED's are provided eliminating the need for expensive panel mounted pilot lights and associated wiring. Each LED can be user set to red, green or yellow allowing for clear indication of the associated function's state. A slip-in label pocket along-side enables the user to insert customised notation. A printer compatible template is available.

#### Function Keys

Six user programmable function keys are available for implementing User logic and scheme control functionality, eliminating the need for expensive panel mounted control switches and associated wiring. Each function key has an associated user programmable tri-color LED (red, green, yellow) allowing for clear indication of the associated function's state. A slip-in label pocket along-side enables the user to insert his own notation for the function Key LED Identification.

Each Function Key can be mapped directly to any of the built-in Command functions or to the User Logic equations.



Fig 1. Tri-colour LED's and function keys

## Additional Functionality

### 27/59 Under/Over Voltage

Each element has settings for pickup level, drop-off level and Definite Time Lag (DTL) delays. Operates if voltage 'exceeds' setting for duration of delay. Can be applied in load shedding schemes.

### 47 Negative Phase Sequence Overvoltage

Each element has settings for pickup level and Definite Time Lag (DTL) delays. Operates if NPS Voltage exceeds setting for duration of delay.

### 51V Voltage Controlled OverCurrent

Element has settings for UnderVoltage pickup level and operates if voltage falls below setting. On Pick-up this element applies the set 51v Multiplier to the pickup setting of the 67/51 phase fault elements.

### 59N Neutral Overvoltage

Two elements, one DTL and one IDMTL, have user settings for pickup level and delays. These will operate if the Neutral voltage exceeds the setting for duration of delay. Neutral overvoltage can be used to detect earth faults in high impedance earthed or isolated systems.

### 60CTS CT Supervision

The CT Supervision considers the presence of negative phase sequence current, without an equivalent level of negative phase sequence voltage, for a user set time as a CT failure. Element has user operate and delay settings.

### 60VTS VT Supervision

The VT Supervision uses a combination of negative phase sequence voltage and negative phase sequence current to detect a VT fuse failure. This condition may be alarmed or used to inhibit voltage dependent functions. Element has user operate and delay settings.

### 67/67N Directional Control

Phase fault, Earth fault and Sensitive Earth fault elements can be directionalised. Each element can be user set to Forward, Reverse, or Non-directional.

Directional Phase fault elements are polarised from quadrature voltage.

Earth fault elements can be user set to be polarised from residual voltage or negative phase sequence voltage.

### 81 Under/Overfrequency

Each element has settings for pickup level, drop-off level and Definite Time Lag (DTL) delays. Operates if frequency exceeds setting for duration of delay. Typically applied in load shedding schemes.

## Optional Functionality

### 79 Auto-Reclose

This function provides independent Phase fault and Earth Fault/Sensitive Earth fault sequences of up to 5 Trips i.e. 4 Reclose attempts before Lockout. Auto-Reclose sequence can be user set to be initiated from internal protection operation or via Binary Input from an external Protection. The user can set each trip in the sequence to be either instantaneous (Fast) or delayed. Independent times can be set by the user for Reclose (Dead) time and Reclaim time.

## Data Acquisition - Via Communication Interface

### Sequence of event records

Up to 5000 events are stored and time tagged to 1ms resolution.

### Fault Records

The last 10 fault records are displayed on the relay fascia and are also available through the communication interface, with time and date of trip, measured quantities and type of fault.

### Waveform recorder

The waveform recorder stores analogue data for all poles and the states of protection functions, binary inputs, LEDs and binary outputs with user settable pre & post trigger data. A record can be triggered from protection function, binary input or via data communications. Waveform storage is selectable from either 10 records of 1 second, 5 records of 2 seconds, 2 records of 5 seconds or 1 record of 10 seconds duration.

### Demand Monitoring

A rolling record of demand over the last 24h is stored. The demand is averaged over a user selectable period of time. A rolling record of such demand averages is stored and provides the demand history. A typical application is to record 15min averages for the last 7 days.

### Real Time Clock

The time and date can be set and are maintained while the relay is de-energised by a back up storage capacitor. The time can be synchronized from a binary input pulse or the data communication channel.

### Data Log

The average values of voltages, current and real & reactive power are recorded at a user selectable interval and stored to provide data in the form of a Data Log which can be downloaded for further analysis. A typical application is to record 15 minute intervals over the last 7 days.

# Reydisp Evolution

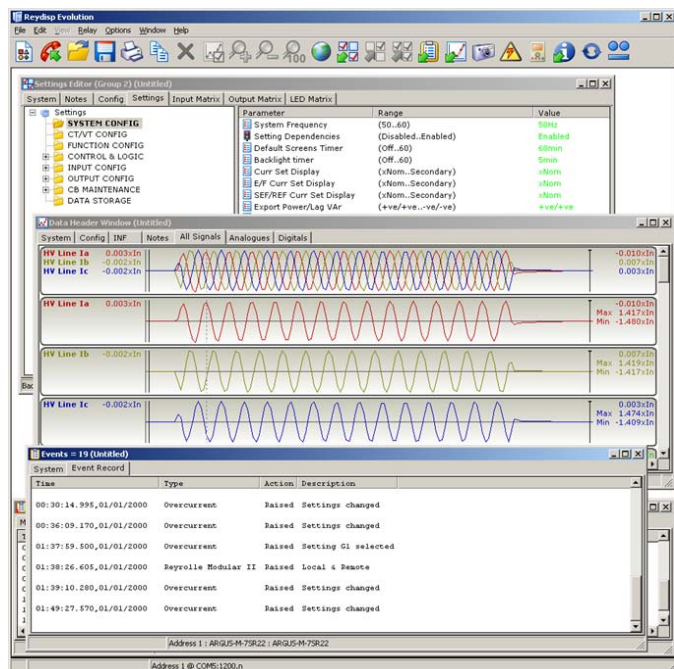


Fig 2. Typical Reydisp Evolution screenshot

Reydisp Evolution is common to the entire range of Reyrolle numeric products. It provides a means for the user to apply settings, interrogate settings and also to retrieve events & disturbance waveforms from the relay.

## Technical Data

For full technical data refer to the Performance Specification Section of the Technical Manual.

## Inputs and Outputs

### Current Inputs

Quantity	3 x Phase & 1 x Earth or Sensitive Earth
Rated Current I <sub>N</sub>	1/5A
Measuring Range	80 xI <sub>N</sub>
Instrumentation $\geq 0.1 \times I_N$	$\pm 1\% I_N$
Frequency	50/60Hz
Thermal Withstand:	
Continuous	3.0 xI <sub>N</sub>
10 Minutes	3.5 xI <sub>N</sub>
5 Minutes	4.0 xI <sub>N</sub>
3 Minutes	5.0 xI <sub>N</sub>
2 Minutes	6.0 xI <sub>N</sub>
3 Seconds	57.7A (1A) 202A (5A)
2 Seconds	70.7A (1A) 247A (5A)
1 Second	100A (1A) 350A (5A)
1 Cycle	700A (1A) 2500A (5A)

Burden @ In	$\leq 0.1VA$ (1A phase and Earth element) $\leq 0.3VA$ (5A phase and earth element)
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### Voltage Inputs

Quantity	4
Nominal Voltage	40...160V a.c. Range
Instrumentation $\geq 0.8 \times V_N$	$\pm 1\% V_N$
Thermal Withstand:	
Continuous	300V
1 Second	
Burden @ 110V	$\leq 0.1VA$

### DC Auxiliary supply

Nominal voltage	Operating Range V dc
30/48/110/220/ V dc	Range 24 to 290V dc
Allowable superimposed ac component	12% of DC voltage
Allowable breaks/dips in supply (collapse to zero)	20ms

### Auxiliary supply: Burdens

Power Consumption	Quiescent (typical)	Quiescent (back-light on)
30V dc	6.0W	7.0W
48V dc	5.5W	6.5W
110V dc	6.5W	7.5W
220V dc	7.5W	8.5W

### Binary Inputs

Operating Voltage	19V dc: Range 17 to 290V dc 88V: Range 74 to 290V dc
Maximum dc current for operation	1.5mA

### Binary Outputs

Operating Voltage	Voltage Free
Operating Mode	User selectable - Self or Hand Reset
Contact Operate / Release Time.	7ms / 3ms
Making Capacity:	
Carry continuously	5A ac or dc
Make and carry (L/R $\leq 40$ ms and V $\leq 300$ V)	20A ac or dc for 0.5s 30A ac or dc for 0.2s
Breaking Capacity ( $\leq 5$ A and $\leq 300$ V):	
AC Resistive	1250VA
AC Inductive	250VA at p.f. $\leq 0.4$
DC Resistive	75W
DC Inductive	30W at L/R $\leq 40$ ms 50W at L/R $\leq 10$ ms

## Mechanical Tests

### Vibration (Sinusoidal)

IEC 60255-21-1 Class I

Type	Level	Variation
Vibration response	0.5gn	≤ 5 %
Vibration endurance	1.0gn	≤ 5 %

### Shock and Bump

IEC 60255-21-2 Class I

Type	Level	Variation
Shock response	5gn, 11ms	≤ 5 %
Shock withstand	15gn, 11ms	≤ 5 %
Bump test	10gn, 16ms	≤ 5 %

### Seismic

IEC 60255-21-3 Class I

Type	Level	Variation
Seismic response	1gn	≤ 5 %

### Mechanical Classification

Durability	>10 <sup>6</sup> operations
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## Electrical Tests

### Insulation

IEC 60255-5

Type	Level
Between any terminal and earth	2.0kV AC RMS for 1min
Between independent circuits	2.0kV AC RMS for 1min
Across normally open contacts	1.0kV AC RMS for 1min

### High Frequency Disturbance

IEC 60255-22-1 Class III

Type	Level	Variation
Common (longitudinal)	2.5kV	≤ 5 %
Series (transverse) mode	1.0kV	≤ 5 %

### Electrostatic Discharge

IEC 60255-22-2 Class IV

Type	Level	Variation
Contact discharge	8.0kV	≤ 5 %

### Fast Transients

IEC 60255-22-4 Class IV

Type	Level	Variation
5/50ns 2.5kHz repetitive	4kV	≤ 5 %

### Surge Immunity

IEC 60255-22-5

Type	Level	Variation
Between all terminals and earth	4.0kV	≤ 10% or 1mA
Between any two independent circuits	2.0kV	

### Conducted Radio Frequency Interference

IEC 60255-22-6

Type	Level	Variation
0.15 to 80MHz	10V	≤ 5 %

### Radiated Radio Frequency

IEC 60255-25

Type	Limits at 10m, Quasi-peak
30 to 230MHz	40dB(μV/m)
230 to 10000MHz	47dB(μV/m)

### Conducted Radio Frequency

Type	Limits	
	Quasi-peak	Average
0.15 to 0.5MHz	79dB(μV)	66dB(μV)
0.5 to 30MHz	73dB(μV)	60dB(μV)

### Radiated Immunity

IEC 60255-22-3 Class III

Type	Level	Variation
80MHz to 1000MHz	10V/m	≤ 5 %

### Magnetic Field with Power Frequency

IEC 61000-4-8, Class V

Type	Level
100A/m (0.126mT) continuous	50Hz
1000A/m (1.26mT) for 3s	

## Environmental Tests

### Temperature

IEC 60068-2-1/2

Operating Range	-10°C to +55°C
Storage range	-25°C to +70°C

### Humidity

IEC 60068-2-3

Operational test	56 days at 40°C and 95% relative humidity
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### IP Ratings

IEC 60529

Type	Level
Installed with cover	IP 50 from front of relay
Installed with cover removed	IP 30 from front of relay

For full technical data refer to the Performance Specification Section of the Technical Manual.

## Performance

### 27/59 Under/Over Voltage

Number of Elements	4 Under or Over
Operate	Any phase or All phases
Voltage Guard	1, 1.5...200V
Setting Range Vs	5,5.5...200V
Hysteresis Setting	0,0.1...80%
Vs Operate Level	100% Vs, ±1% or ±0.25V
Reset Level: - Undervoltage Overvoltage	$= (100\% + \text{hyst}) \times V_{op}$ , ±1% or 0.25V $= (100\% - \text{hyst}) \times V_{op}$ , ±1% or 0.25V
Delay Setting td	0.00,0.01...20,20.5...100,101...1000,1010...10000,10100...14400s
Basic Operate Time: - 0 to 1.1xVs 0 to 2.0xVs 1.1 to 0.5xVs	73ms ±10ms 63ms ±10ms 58ms ±10ms
Operate time following delay.	$t_{basic} + t_d$ , ±1% or ±10ms
Inhibited by	Binary or Virtual Input VT Supervision, Voltage Guard

### 37 Undercurrent

Number of Elements	2
Setting Range Is	0.05,0.10...5.0 x In
Operate Level	100% Is, ±5% or ±1% xIn
Delay Setting td	0.00,0.01...20,20.5...100,101...1000,1010...10000,10100.....14400s

Basic Operate Time: - 1.1 to 0.5xIn	35ms ±10ms
Operate time following delay.	$t_{basic} + t_d$ , ±1% or ±10ms
Overshoot Time	< 40ms
Inhibited by	Binary or Virtual Input

### 46 Negative Phase Sequence Overcurrent

Number of Elements	DT & IT
DT Setting Range Is	0.05,0.10...4.0 x In
DT Operate Level	100% Is, ±5% or ±1% xIn
DT Delay Setting td	0.00,0.01...20,20.5...100,101...1000,1010...10000,10100.....14400s
DT Basic Operate Time – 0 to 2 xIs 0 to 5 xIs	40ms ±10ms 30ms ±10ms
DT Operate time following delay.	$t_{basic} + t_d$ , ±1% or ±10ms
IT Char Setting	IEC NI,VI,EI,LTI ANSI MI,VI,EI & DTL
IT Setting Range	0.05, 0.06...2.5 xIn
Tm Time Multiplier	0.025,0.050...1.6
Char Operate Level	105% Is, ±4% or ±1% xIn
Overshoot Time	< 40ms
Inhibited by	Binary or Virtual Input

### 47 Negative Phase Sequence Voltage

Number of Elements	2
Setting Range Vs	1,1.5...90V
Hysteresis Setting	0,0.1...80%
Operate Level	100% Vs, ±2% or ±0.5V
Delay Setting td	0.00,0.01...20,20.5...100,101...1000,1010...10000,10100.....14400s
Basic Operate Time: - 0V to 2.0xVs 0V to 10xVs	80ms ±20ms 55ms ±20ms
Operate time following delay.	$t_{basic} + t_d$ , ±2% or ±20ms
Overshoot Time	< 40ms
Inhibited by	Binary or Virtual Input

### 49 Thermal Overload

Operate levels	Operate and Alarm
Setting Range Is	0.10,0.11...3.0 xIn
Operate Level	100% Is, ±5% or ±1% xIn
Time Constant Setting	1,1.5...1000min
Operate time	$t = \tau \times \ln \left\{ \frac{I^2 - I_p^2}{I^2 - (k \times I_B)^2} \right\}$ ±5% absolute or ±100ms where Ip = prior current
Capacity Alarm Level	Disabled, 50,51...100%
Inhibited by	Binary or Virtual Input



## 50 (67) Instantaneous & DTL OC & EF (Directional)

Operation	Non directional, Forward or reverse
Elements	Phase, Derived Earth, Measured Earth & SEF
Number of Elements	4 x OC 4 x Derived E/F 'N' 4 x Measured E/F 'G' 4 x SEF
Setting Range Is: - O/C Derived E/F 'N' Measured E/F 'G' SEF	0.05,0.06...50 xIn 0.05,0.06...50 xIn 0.005...25 xIn 0.005...5 xIn
Time Delay	0.00...14400s
Operate Level	100% Is, ±5% or ±1% xIn
Operate time	0 to 2xIs – 35ms, ±10ms, 0 to 5xIs – 25ms, ±10ms
Operate time following delay	t <sub>basic</sub> +t <sub>d</sub> , ±1% or ±10ms
Inhibited by	Binary or Virtual Input Inrush detector VT Supervision

## 51(67) Time Delayed OC&EF (Directional)

Operation	Non directional, Forward or reverse
Elements	Phase, Derived Earth, Measured Earth & SEF
Number of Elements: -	4 x OC 4 x Derived EF 'N' 4 x Measured EF 'G' 4 x SEF
Characteristic	IEC NI,VI,EI,LTI ANSI MI,VI,EI & DTL
Setting Range Is: - O/C Derived E/F 'N' Measured E/F 'G' SEF	0.05,0.06...2.5 xIn 0.05,0.06...2.5 xIn 0.005...1 xIn 0.005...1 xIn
Time Multiplier	0.025,0.05...1.6
Time Delay	0,0.01... 20s
Operate Level	105% Is, ±4% or ±1%xIn
Minimum Operate time IEC	$t_{op} = \frac{K}{\left[\frac{I}{I_s}\right]^{\alpha} - 1} \times T_m$
ANSI	$t_{op} = \left[ \frac{A}{\left[\frac{I}{I_s}\right]^p - 1} + B \right] \times T_m$ ± 5 % absolute or ± 30 ms
Follower Delay	0 - 20s
Reset	ANSI decaying, 0 – 60s
Inhibited by	Binary or Virtual Input Inrush detector VT Supervision

## 51V Voltage Controlled Overcurrent

Setting Range	5,5.5...200V
Operate Level	100% Vs, ±5% or ±1% xVn
Multiplier	0.25.0.3...1
Inhibited by	VT Supervision

## 50BF Circuit Breaker Fail

Operation	Current check - Phase and Measured Earth with independent settings, Mechanical Trip, CB Faulty Monitor
Setting Range Is	0.05,0.055...2.0 xIn
2 Stage Time Delays	Timer 1 20...60000ms Timer 2 20...60000ms
Operate Level	100% Is, ±5% or ±1% xIn
Basic Operate time	< 20ms
Operate time following delay	t <sub>delay</sub> ±1% or ±20ms
Triggered by	Any function mapped as trip contact.
Inhibited by	Binary/Virtual Input
Timer By pass	Yes, 50BF CB Faulty Input

## 59N Neutral Voltage Displacement

Number of Elements	NDT & NIT
NDT Operate Level	100% Vs, ±2% or ±0.5V
NDT Delay Setting t <sub>d</sub>	0, 0.01 20, 20.5... 100, 101... 1000, 1010... 10000, 10100... 14400s
NDT Basic Operate Time: - 0V to 1.5 xVs 0V to 10 xVs	76ms ±20ms 63ms ±20ms
NDT Operate time following delay.	t <sub>basic</sub> +t <sub>d</sub> , ±1% or ±20ms
NDT & NIT Setting Range Is	1, 1.5...100V
T <sub>m</sub> Time Multiplier(IDMT)	0.1, 0.2... 10, 10.5... 140
Delay (DTL)	0, 0.01...20s
Reset	ANSI decaying, 0 ... 60s
NIT Operate Level	105% Vs, ±2% or ±0.5V
Inhibited by	Binary or Virtual Input

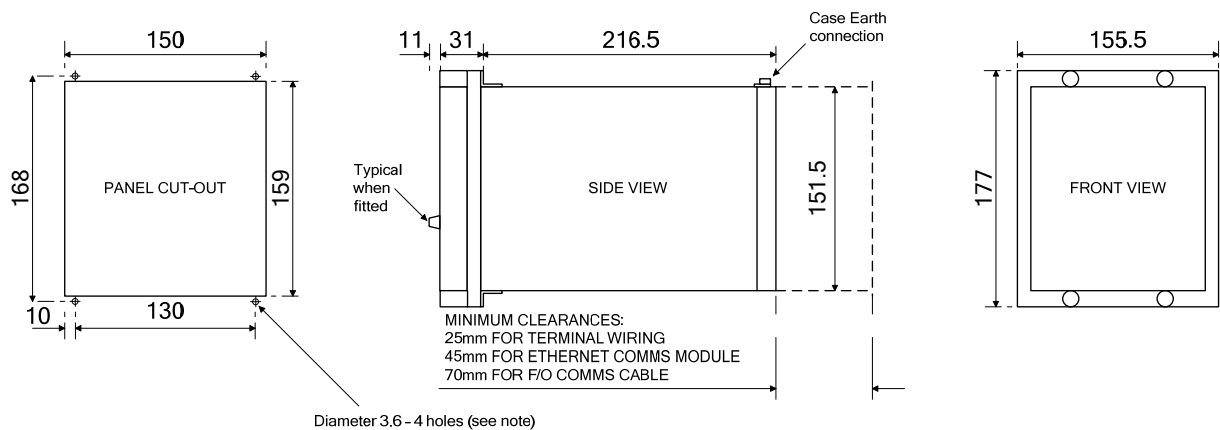
## 60 Supervision

CT	(7SR210n) CTS-I (7SR220n) CTS-I, CTS Vnps, CTS Inps
VT	(7SR220n) VTS Vnps, VTS Vzps
Delay	0.03, 0.04... 20.00, 20.50... 100, 101... 1000, 1010...10000, 10100... 14400s

## 64H Restricted Earth Fault

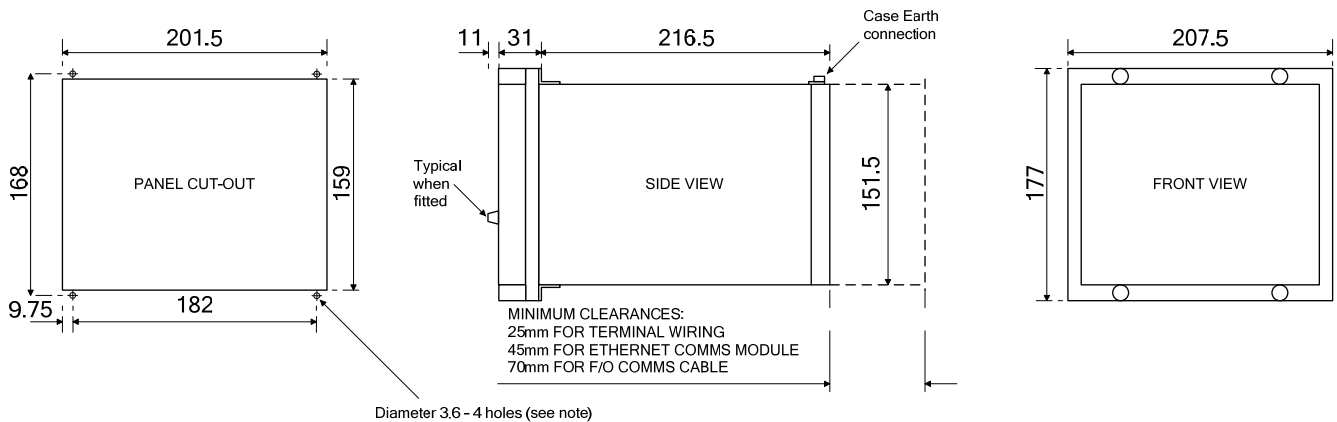
Setting Range	0.005...0.95 xIn
Operate Level	100% Is, ±5% or ±1% xIn
Time Delay	0.00... 14400s
Basic Operate Time	0 to 2 xIs 40ms ±10ms 0 to 5 xIs 30ms ±10ms
Inhibited by	Binary or Virtual Input

## Case Dimensions



NOTE:  
 THE 3.6 HOLES ARE FOR M4 THREAD FORMING (TRILOBULAR) SCREWS. THESE ARE SUPPLIED AS STANDARD AND ARE SUITABLE FOR USE IN FERROUS / ALUMINIUM PANELS 1.6mm THICK AND ABOVE. FOR OTHER PANELS, HOLES TO BE M4 CLEARANCE (TYPICALLY 4.5 DIAMETER) AND RELAYS MOUNTED USING M4 MACHINE SCREWS, NUTS AND LOCKWASHERS (SUPPLIED IN PANEL FIXING KIT).

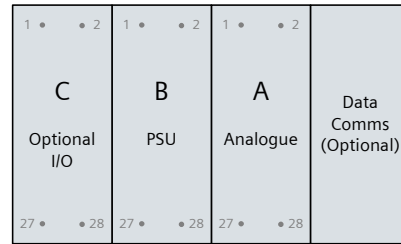
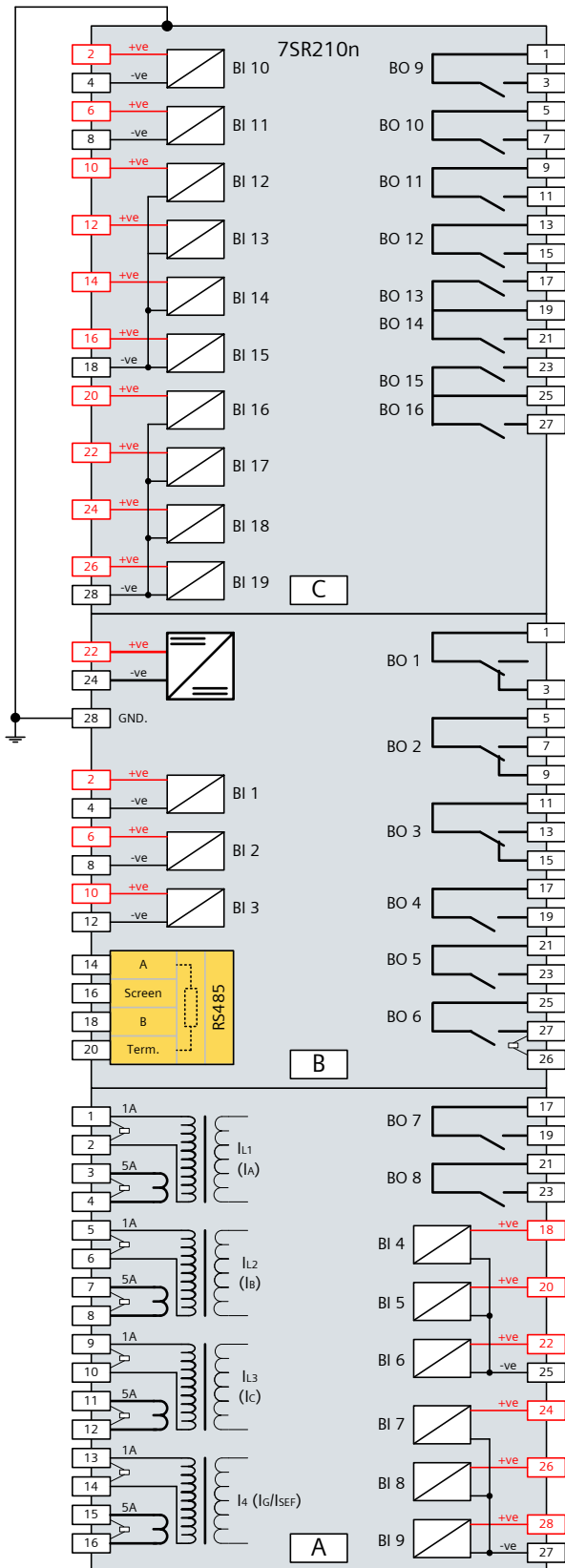
Fig 3. E6 Case overall dimensions and panel drilling details (All dimensions in are mm)



NOTE:  
 THE 3.6 HOLES ARE FOR M4 THREAD FORMING (TRILOBULAR) SCREWS. THESE ARE SUPPLIED AS STANDARD AND ARE SUITABLE FOR USE IN FERROUS / ALUMINIUM PANELS 1.6mm THICK AND ABOVE. FOR OTHER PANELS, HOLES TO BE M4 CLEARANCE (TYPICALLY 4.5 DIAMETER) AND RELAYS MOUNTED USING M4 MACHINE SCREWS, NUTS AND LOCKWASHERS (SUPPLIED IN PANEL FIXING KIT).

Fig 4. E8 Case overall dimensions and panel drilling details (All dimensions are in mm)

# 7SR210 Connection Diagram



Rear View  
Arrangement of terminals and modules

**NOTES**

- BI = Binary Input
- BO = Binary Output

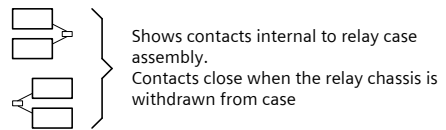


Fig 5. 7SR210 Wiring Diagram

# 7SR220 Connection Diagram

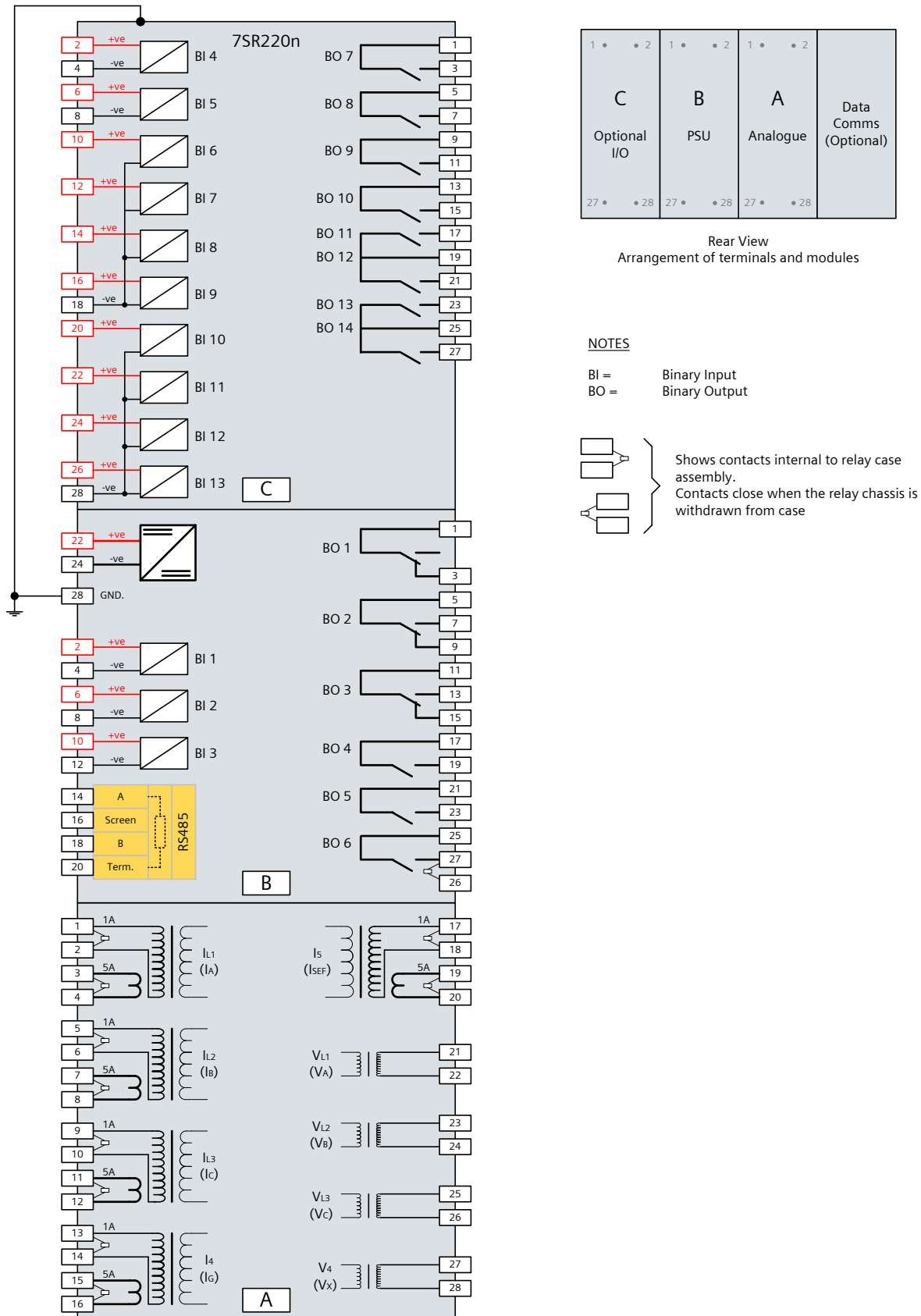


Fig 6. 7SR220 Wiring Diagram

# Function Diagrams for 7SR210 & 7SR220

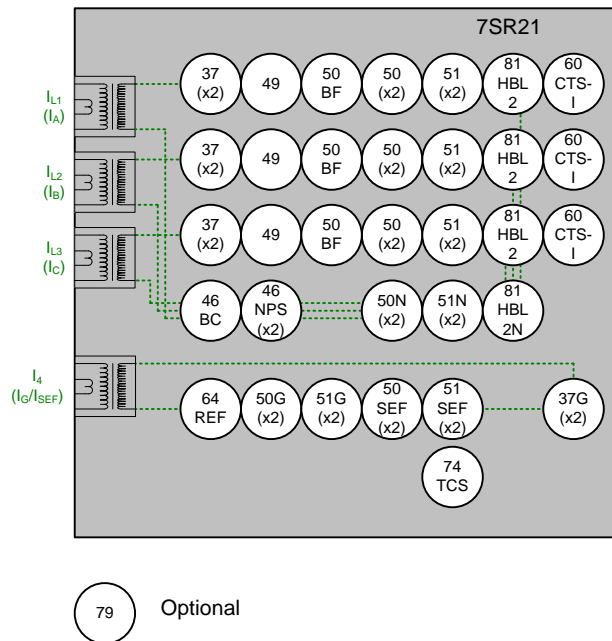


Fig 7. 7SR210 Function Diagram

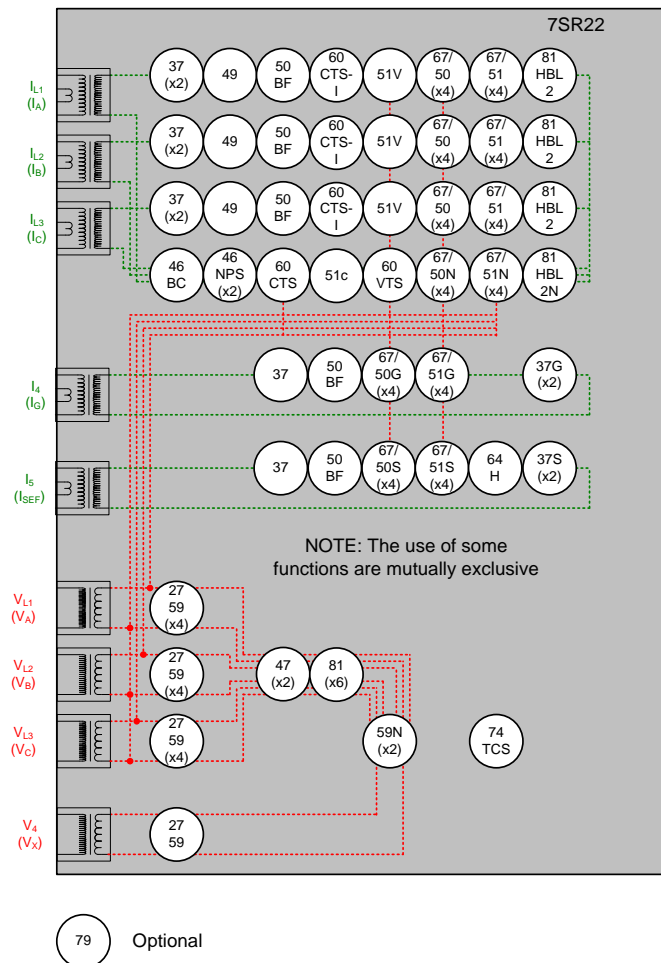


Fig 8. 7SR220 Function Diagram

# Ordering Information – 7SR210 Overcurrent Relay

Product description	Variants	Order No.
<b>Nondirectional O/C Relay</b> Multi function overcurrent and earth fault protection relay	<u>Protection Product</u> Overcurrent – Non Directional	7 S R 2 1 0 □ - 1 □ A □ □ - 0 □ A ↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑ 1
	<u>Case I/O and Fascia</u> <sup>1)</sup> E6 case, 4 CT, 9 Binary Inputs / 8 Binary Outputs, 8 LEDs E8 case, 4 CT, 19 Binary Inputs / 16 Binary Outputs, 16 LEDs E8 case, 4 CT, 19 Binary Inputs / 16 Binary Outputs, 8 LEDs + 6 Keys	2 3 4
	<u>Measuring Input</u> 1/5 A, 50/60Hz	1
	<u>Auxiliary voltage</u> 30 to 220V DC, binary input threshold 19V DC 30 to 220V DC, binary input threshold 88V DC	A B
	<u>Communication Interface</u> Standard version – included in all models, USB front port, RS485 rear port Standard version – plus additional rear F/O ST connectors (x2) and IRIG-B Standard version – plus additional rear 1x RS485 and IRIG-B Standard version – plus additional rear 1x RS232 and IRIG-B Standard version – plus additional rear 2 x Electrical Ethernet Standard version – plus additional rear 2 x Optical Ethernet	1 2 3 4 7 7 8 7
	<u>Protocol</u> IEC 60870-5-103 and Modbus RTU (user selectable setting) IEC 60870-5-103, Modbus RTU and DNP3.0 (user selectable setting) IEC 60870-5-103, Modbus RTU and DNP3.0 (user selectable setting) IEC61850	1 2 7/8 7
	<u>Protection Function Packages</u> Standard version – Included in all models 37 Undercurrent 46BC Broken conductor/load unbalance 46NPS Negative phase sequence overcurrent 49 Thermal overload 50 Instantaneous phase fault overcurrent 50BF Circuit breaker fail 50G/50N Instantaneous earth fault 51 Time delayed phase fault overcurrent 51G/51N Time delayed earth fault/SEF 60CTS-I CT Supervision 64H High Impedance REF 74TC Trip circuit supervision 81HBL2 2 <sup>nd</sup> harmonic block/inrush restraint Cold load pickup Programmable logic	C
	Standard version – plus 79 Autoreclose	D
	<u>Additional Functionality</u> No Additional Functionality	A

<sup>1)</sup> 4CT is configured as 3PF + EF/SEF (user selectable setting).

# Ordering Information – 7SR220 Directional Overcurrent Relay

Product description	Variants	Order No.
<b>Directional O/C Relay</b>		7 S R 2 2 0 □ - 2 □ A □ □ - 0 □ A
Multi function overcurrent and earth fault protection relay		
	<u>Protection Product</u> Overcurrent – Directional	2
	<u>Case I/O and Fascia</u> <sup>1)</sup> E6 case, 5 CT, 4 VT, 3 Binary Inputs / 6 Binary Outputs, 8 LEDs	2
	E8 case, 5 CT, 4 VT, 13 Binary Inputs / 14 Binary Outputs, 16 LEDs	3
	E8 case, 5 CT, 4 VT, 13 Binary Inputs / 14 Binary Outputs, 8 LEDs + 6 Keys	4
	<u>Measuring Input</u> 1/5 A, 63.5/110V, 50/60Hz	2
	<u>Auxiliary voltage</u> 30 to 220V DC, binary input threshold 19V DC 30 to 220V DC, binary input threshold 88V DC	A B
	<u>Communication Interface</u> Standard version – included in all models, USB front port, RS485 rear port Standard version – plus additional rear F/O ST connectors (x2) and IRIG-B Standard version – plus additional rear 1x RS485 and IRIG-B Standard version – plus additional rear 1x RS232 and IRIG-B Standard version – plus additional rear 2 x Electrical Ethernet Standard version – plus additional rear 2 x Optical Ethernet	1 2 3 4 7 7 8 7
	<u>Protocol</u> IEC 60870-5-103 and Modbus RTU (user selectable setting) IEC 60870-5-103, Modbus RTU and DNP3.0 (user selectable setting) IEC 60870-5-103, Modbus RTU and DNP3.0 (user selectable setting) IEC61850	1 2 7/8 7
	<u>Protection Function Packages</u> Standard version – Included in all models	
	27/59 Under/overvoltage	
	37 Undercurrent	
	37G Ground Undercurrent	
	37SEF SEF Undercurrent	
	46BC Broken conductor/load unbalance	
	46NPS Negative phase sequence overcurrent	
	47 Negative phase sequence voltage	
	49 Thermal overload	
	50BF Circuit breaker fail	
	51V Voltage controlled overcurrent	
	59N Neutral voltage displacement	
	60CTS CT supervision	
	60CTS-I CT Supervision	
	60VTS VT supervision	
	64H High Impedance REF	
	67/50 Directional instantaneous phase fault overcurrent	
	67/50G 67/50N Directional instantaneous earth fault	
	67/51 Directional time delayed phase fault overcurrent	
	67/51G 67/51N Directional time delayed earth fault/SEF	
	74TC Trip circuit supervision	
	81 Under/over frequency	
	81HBL2 2 <sup>nd</sup> harmonic block/inrush restraint	
	Cold load pickup	
	Programmable logic	
	Standard version – plus	
	79 Autoreclose	D
	<u>Additional Functionality</u> No Additional Functionality	A

<sup>1)</sup> 5CT is configured as 3PF + EF + SEF/REF (user selectable setting).

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