SIEMENS

Reyrolle 7SR10 Platform

Protecting grid with confidence

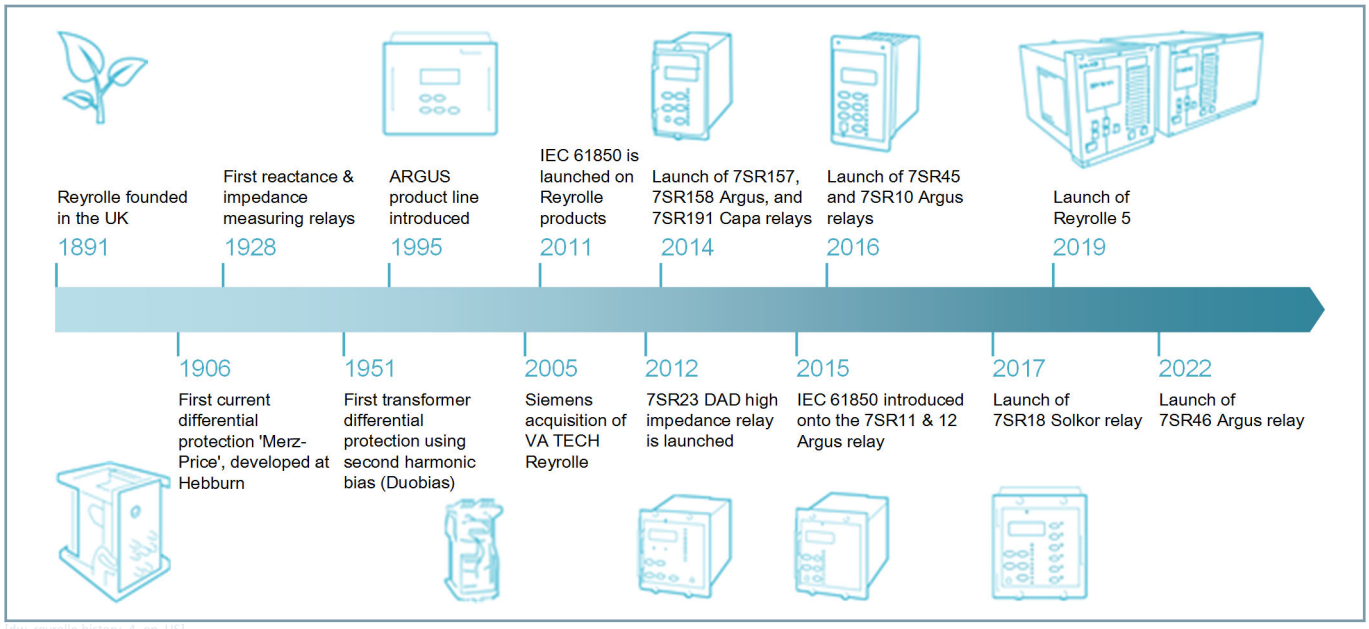
Catalog Reyrolle 7SR10 · Edition 16

siemens.com/reyrolle

Digital Grid
7SR10 Platform Catalog

1

Reyrolle – Solutions for Distribution Grids



[dw_reyrolle history, 4, en_US]

Figure 1/1 History of Reyrolle

Reyrolle has been synonymous with electrical protection devices in the sectors of subtransmission, distribution, and industrial applications for decades. Historically, Reyrolle relays were sold mainly in traditional markets but are now sold worldwide as part of the Siemens protection network.

Since its foundation, Reyrolle has been an innovation driver in product development – based on a strong focus on market, customer and technology. Worldwide established brand names such as "Solkor" and "Argus" demonstrate this. But there is more: A wide range of Reyrolle products has determined technological firsts in the market.

The comprehensive range of Reyrolle products provides the total protection requirements of distribution markets – ranging from overcurrent protection via transformer protection and voltage control to a full spectrum of auxiliary and trip relays. The portfolio includes many famous products such as "Argus", "Duobias", "Solkor", "Rho", etc.

To serve specific needs in industrial applications, a range of proven products such as "Argus overcurrent", "Solkor line differential" and "Rho motor protection devices" is offered.

Through successive generations, Reyrolle numerical products have been developed to increase value to system operators. This increase in value is the result of consistent development:

- Ease-of-use as a principle – our withdrawable product solutions allow flexible, easy operation through high user friendliness.
- One size fits all – the 4U housing height and the latest generation of numerical products features 1 A/5 A CT Input, and some models are provided with universal DC power supplies.
- Learn once, know all – the new product generation provides a similar look and feel as earlier products. If Reyrolle numerical devices have been previously used, there is a high consistency in both programming and interrogation.
- With Reydisp Evolution, a comprehensive software support toolkit for relay setting, fault interrogation and general system information is provided. It is backward-compatible with all previous Reyrolle numerical devices.
- IEC 61850 communication interface option

[sc_7SR10-ObjView, 1, --_--]

Figure 1/2 Front View Reyrolle 7SR10

[sc_7SR105-ObjView, 1, --_--]

Figure 1/3 Front View Reyrolle 7SR105

Device-Specific Overview of the Areas of Application

Main function	Device	Catalogue Number
Overcurrent and Feeder Protection		
Overcurrent Protection with control	*7SR10 Argus*	THIS CATALOG (C53000-X7040-C021-1)
	7SR11/12 Argus	EMEA-C10028-00-76GB
	7SR21/22 Argus	EMEA-C10030-00-76GB
	7SR51	C53000-X7040-C022-1
RMU Protection		
Self-powered Overcurrent Protection	7SR45 Argus	EMEA-C10020-00-76GB
Line Protection		
Line Differential Protection with control	7SR18 Solkor	EMDG-C10087-00-76GB
Transformer Differential Protection		
Transformer Differential Protection with control and monitoring	7SR242 Duobias	EMEA-C10035-00-76GB
	7SR54	C53000-X7040-C022-1
Motor Protection		
Motor Protection with control	*7SR105 Rho*	THIS CATALOG (C53000-X7040-C021-1)
	7SR17 Rho	EMEA-C10037-00-76GB
Voltage and Frequency Protection		
Applicable for system decoupling, load shedding and load restoration	7SR158 Argus	EMEA-C10033-00-76GB
Synchronizing		
Synchronizing	7SR157 Argus	EMEA-C10032-00-76GB
Distribution Automation		
Protection and Automation for overhead lines	7SR224 Argus	EMEA-C10031-00-76GB
Capacitor-Bank Protection		
Capacitor-bank Protection	7SR191 Capa	EMEA- C10036-00-76GB
High-Impedance Protection		
High-impedance Protection	7SR23 DAD	EMEA-C10034-00-76GB

The Reyrolle product range offers a wide variety of protection devices. The table above lists all of the devices available and the main application with protection type.

2.1

ANSI	Functions	7SR10	7SR105
	Protection functions for 3-pole tripping	■	■
14	Locked rotor protection		■
27	Undervoltage protection – 3-phase	●	
32	Power protection	●	
32S	Sensitive power protection	●	
37	Undercurrent protection – phase	●	■
37G	Undercurrent earth fault – measured	●	
37SEF	Undercurrent earth fault - sensitive	●	
46	Phase unbalance protection		■
46BC	Broken conductor detection	■	
46NPS	Negative sequence overcurrent protection	■	
46PhRev	Phase reversal		■
47NPS	Sequence overvoltage protection	●	
48	Starting-time supervision		■
49	Thermal overload protection	■	■
50	Instantaneous overcurrent – phase	■	■
50AFD	Arc flash detection	■	
50BCL	Break capacity limit		■
50BF	Circuit-breaker failure protection – 3-pole	■	■
50G	Instantaneous earth fault – measured	■	■
50GLC	Line-check overcurrent protection	■	
50LC	Line check	■	
50N	Instantaneous earth fault – calculated	■	■
50SEF	Instantaneous sensitive earth fault – measured	■	■
50SEFLC	Line check sensitive earth fault – measured	■	
51	Time-delayed overcurrent – phase	■	■
51CL	Cold load overcurrent – phase	■	
51G	Time delayed earth fault – measured	■	■
51N	Time-delayed earth fault – calculated	■	■
51SEF	Time-delayed sensitive earth fault – measured	■	■
51V	Voltage-dependent overcurrent protection	●	
52	Circuit-breaker control	■	■
55	Power factor	●	
59	Overvoltage protection – 3-phase	■	
59N	Neutral voltage displacement	●	
60CTS	CT supervision	●	
60VTS	VT supervision	●	
64H	Restricted earth fault protection – high-impedance	●	
66	Number of starts		■
67	Directional overcurrent – phase	●	
67G	Directional earth fault – measured	●	
67N	Directional earth fault – calculated	●	
67SEF	Directional sensitive earth fault – measured	●	
67SEF	Directional sensitive earth fault – measured 3V0/I0, φ	■	
74CC	Close-circuit supervision	■	■
74TC	Trip-circuit supervision	■	■
79	Automatic reclosing	●	
81	Frequency protection – "f>" or "f<"	●	
81B	Backspin monitor		■
81HBL2	Inrush current detection	■	
81I_THD	Total harmonic distortion supervision	●	
86	Lockout	■	■

ANSI	Functions	7SR10	7SR105
TEMP	Temperature supervision		●
	Measured values	■	■
	Switching-statistic counters	■	■
	Circuit-breaker wear monitoring	■	■
	Logic editor	■	■
	External trip initiation	■	■
	Control	■	■
	Fault recording of analog and binary signals	■	■
	Faults records	100	15
	Sequence of events recorder	1000	1000
	Monitoring and supervision	■	■
	No. setting groups (max)	4	2
	Changeover of setting group	■	■
	Binary inputs (max)	9	6
	Binary outputs (max) incl. life contact	6	6
	Internal RTD inputs (max)		6
	Current inputs (max)	4	4
	Voltage inputs (max)	3	
	Size (x E)	4	4
	Small display (lines)	4	4
	Push buttons	7	7
	LEDs (max)	10	10
	Pluggable terminal blocks	■	■
	PSU variants	AC 60 V to 240 V/ DC 60 V to 240 V	AC 60 V to 240 V/ DC 60 V to 240 V
		DC 24 V to 60 V	
		DC 24 V to 240 V/ AC 48 V to 240 V	DC 24 V to 60 V
	Front user interface	■	■
	IEC 60870-5-103	■	■
	Modbus RTU slave	■	■
	DNP3 serial	■	■
	Time synchronisation	■	■

■ Basic

● Optional

The Reyrolle 7SR10 Platform devices come equipped with numerous protection functions and features. A full list of these can be seen in the table above.

Reyrolle 7SR10 Overcurrent Relay

Description

The Reyrolle 7SR10 Argus is an overcurrent and earth fault relay intended as a simple protection solution for distribution and industrial applications. It consists of non-directional functions and additional voltage inputs providing directional functions.

The conformal coating on device electronic modules increases protection against harmful environmental influences such as extreme moisture, corrosive gases and aggressive dust.

Main Function	Feeder protection, monitor and control for distribution and industrial networks	
Inputs and Outputs	4CT	3 Binary inputs, 3 binary outputs and 10 LEDs
	4CT	6 or 9 Binary inputs, 6 binary outputs and 10 LEDs
	4CT and 3VT	9 Binary inputs, 6 binary outputs and 10 LEDs
Communication	Front port: USB Rear port: RS-485 (optional for remote connection)	
Protocols	IEC 60870-5-103, DNP3.0 or Modbus RTU	
Housing	Size 4, 4U high – non draw-out case	

Benefits

- Circuit-breaker open and close fascia push button
- Protection settings can be viewed and edited from the fascia
- 9 user programmable tri-color LEDs
- Cold load protection
- 2 setting groups for non-directional relay
- 4 setting groups for directional relay
- Password protection– 2 levels[1]
- User programmable logic aided by 8 virtual inputs/outputs
- User specific curve
- Self monitoring
- Circuit-breaker trip and maintenance counter
- The last 100 fault records are available
- Waveform recorder stores 15 records (1 second duration)
- 20 character x 4 line backlit LCD
- Up to 1 000 event records with 1 ms resolution

Functions

Protection Functions

- 27 Undervoltage protection – 3-phase
- 32 Power protection
- 32S Sensitive power protection
- 37 Undercurrent protection – phase
- 37G Undercurrent earth fault – measured
- 37SEF Undercurrent earth fault - sensitive
- 46NPS Negative sequence overcurrent protection
- 47NPS Sequence overvoltage protection

[sc_7SR10 device, 2, en_US]

Figure 2.2/1 7SR10 Device

- 49 Thermal overload protection
- 50 Instantaneous overcurrent – phase
- 50AFD Arc flash detection
- 50G Instantaneous earth fault – measured
- 50GLC Line-check overcurrent protection
- 50LC Line check
- 50N Instantaneous earth fault – calculated
- 50SEF Instantaneous sensitive earth fault – measured
- 50SEFLC Line check sensitive earth fault – measured
- 51 Time-delayed overcurrent – phase
- 51CL Cold load overcurrent – phase
- 51G Time delayed earth fault – measured
- 51N Time-delayed earth fault – calculated
- 51SEF Time-delayed sensitive earth fault – measured
- 51V Voltage-dependent overcurrent protection
- 55 Power factor
- 59 Overvoltage protection – 3-phase
- 59N Neutral voltage displacement
- 64H Restricted earth fault protection – high-impedance
- 67 Directional overcurrent – phase
- 67G Directional earth fault – measured
- 67N Directional earth fault – calculated
- 67SEF Directional sensitive earth fault – measured
- 67SEF Directional sensitive earth fault – measured 3V0/I0, φ
- 81 Frequency protection – "f>" or "f<"

Supervision Functions

1 This password is a confirmation ID for settings change and control functions.

- 46BC Broken conductor detection
- 50BF Circuit-breaker failure protection – 3-pole
- 60CTS CT supervision
- 60VTS VT supervision
- 74CCS Close-circuit supervision
- 74TCS Trip-circuit supervision
- 81HBL2 Inrush current detection
- 81I_THD Total harmonic distortion supervision

Control Functions

- 52 Circuit-breaker control
- 86 Lockout
- 79 Automatic reclosing

Additional Functions

- User programmable logics
- User defined curves

Communications

- IEC 60870-5-103
- MODBUS RTU
- DNP 3.0

Reydisp Software

Our user friendly PC software tool ensures a smooth installation providing an efficient and intuitive interface to the relay.

Applications

- Feeder overcurrent protection
- Backup protection
- Compact substation
- Protection against harmonic injection into grid by non conventional sources of energy
- Focused on renewable energy sources
- Industry medium voltage and low voltage applications

Application

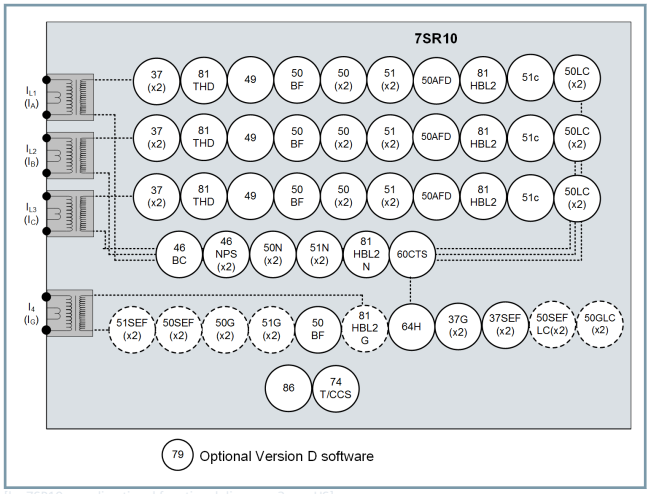
The 7SR10 overcurrent relay is a numerical overcurrent protection relay intended for use in the distribution and industrial networks. It provides a highly comprehensive functional software package with a range of integral application functions aimed at reducing installation, wiring, and engineering time.

The 7SR10 consists of overcurrent and earth fault protection functions with additional voltage inputs providing directional, voltage, frequency, and power protection functions.

A wide range of measured values can be viewed on the front LCD or remotely via the communication channel.

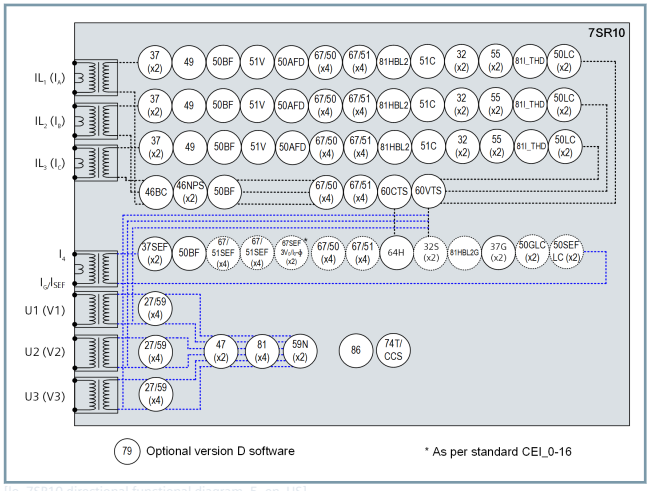
The integrated control feature allows the operation of a single circuit-breaker and the monitoring of it's trip and closed circuits.

7SR10 Functional Diagram



[Io_7SR10 non-directional functional diagram, 3, en_US]

Figure 2.2/2 7SR10 Non-Directional Overcurrent Relay



[Io_7SR10 directional functional diagram, 5, en_US]

Figure 2.2/3 7SR10 Directional Overcurrent Relay

Function Matrix

ANSI	Functions	7SR1002/3-1***0-2CA0	7SR1002/3-2***0-2CA0	7SR1002/3-1***0-2DA*	7SR1002/3-2***0-2DA0	7SR1004-3**20-2CA0	7SR1004-4**20-2CA0	7SR1004-3**20-2DA0	7SR1004-4**20-2DA0	7SR1004-5**20-2CA0
PROTECTION										
27	Undervoltage protection – 3-phase					■	■	■	■	■
32	Power protection					■	■	■	■	■
32S	Sensitive power protection						■		■	■
37	Undercurrent protection – phase	■	■	■	■	■	■	■	■	■
37G	Undercurrent earth fault – measured	■		■		■		■		
37SEF	Undercurrent earth fault - sensitive		■		■		■		■	■
46NPS	Negative sequence overcurrent protection	■	■	■	■	■	■	■	■	■
47NPS	Sequence overvoltage protection					■	■	■	■	■
49	Thermal overload protection	■	■	■	■	■	■	■	■	■
50	Instantaneous overcurrent – phase	■	■	■	■	■	■	■	■	■
50AFD	Arc flash detection	■	■	■	■	■	■	■	■	■
50G	Instantaneous earth fault – measured	■		■		■		■		
50GLC	Line-check overcurrent protection	■				■				
50LC	Line check	■	■			■	■			■
50N	Instantaneous earth fault – calculated	■	■	■	■	■	■	■	■	■
50SEF	Instantaneous sensitive earth fault – measured		■		■		■		■	■
50SEFLC	Line check sensitive earth fault – measured		■				■			■
51	Time-delayed overcurrent – phase	■	■	■	■	■	■	■	■	■
51CL	Cold load overcurrent – phase	■	■	■	■	■	■	■	■	■
51G	Time delayed earth fault – measured	■		■		■		■		
51N	Time-delayed earth fault – calculated	■	■	■	■	■	■	■	■	■
51SEF	Time-delayed sensitive earth fault – measured		■		■		■		■	■
51V	Voltage-dependent overcurrent protection					■	■	■	■	■
55	Power factor					■	■	■	■	■
59	Overvoltage protection – 3-phase					■	■	■	■	■
59N	Neutral voltage displacement					■	■	■	■	■
64H	Restricted earth fault protection – high-impedance	■	■	■	■	■	■	■	■	■
67	Directional overcurrent – phase					■	■	■	■	■
67G	Directional earth fault – measured					■		■		
67N	Directional earth fault – calculated					■	■	■	■	■
67SEF	Directional sensitive earth fault – measured						■		■	■
67SEF	Directional sensitive earth fault – measured 3V0/I0, φ									■
81	Frequency protection – "f>" or "f<"					■	■	■	■	■
SUPERVISION										
46BC	Broken conductor detection	■	■	■	■	■	■	■	■	■
50BF	Circuit-breaker failure protection – 3-pole	■	■	■	■	■	■	■	■	■
60CTS	CT supervision	■	■	■	■	■	■	■	■	■
60VTS	VT supervision					■	■	■	■	■
74CC	Close-circuit supervision	■	■	■	■	■	■	■	■	■
74TC	Trip-circuit supervision	■	■	■	■	■	■	■	■	■
81I_THD	Total harmonic distortion supervision	■	■	■	■	■	■	■	■	
81HBL2	Inrush current detection[2]	■	■	■	■	■	■	■	■	■

2 Inrush current detection is not applicable for SEF CT.

ANSI	Functions	7SR1002/3-1***0-2CA0	7SR1002/3-2***0-2CA0	7SR1002/3-1***0-2DA*	7SR1002/3-2***0-2DA0	7SR1004-3**20-2CA0	7SR1004-4**20-2CA0	7SR1004-3**20-2DA0	7SR1004-4**20-2DA0	7SR1004-5**20-2CA0
CONTROL										
52	Circuit-breaker control	■	■	■	■	■	■	■	■	■
79	Automatic reclosing			■	■			■	■	
86	Lockout	■	■	■	■	■	■	■	■	■
	User programmable logic and user defined curves	■	■	■	■	■	■	■	■	■

■ Included as basic

Reyrolle 7SR105 Motor Protection Relay

Description

7SR105 relay is a numerical protection relay intended for use in motor protection applications. It provides a highly comprehensive functional software package with a range of integral application functions aimed at reducing installation, wiring, and engineering time.

The conformal coating on device electronic modules increases protection against harmful environmental influences such as extreme moisture, corrosive gases and aggressive dust.

Main Function	Protection, control and monitoring
Inputs and Outputs	4 Current transformers with 1 A and 5 A inputs, 6 binary inputs, and 6 binary outputs
	4 Current transformers with 1 A and 5 A inputs, 6 temperature inputs, 6 binary inputs, and 6 binary outputs
Communication	Front port: USB (for configuration via Reydisp)
	Rear port: RS-484
Housing	Size 4, 4U high – non draw-out case

[sc_7SR105 device, 1, en_US]

Figure 2.3/1 7SR105 Device

Benefits

- 2 settings groups
- Password protection – 2 levels[3]
- User programmable logic
- Self monitoring
- Circuit-breaker trip and maintenance counter
- Trip timers
- Motor start/stop control
- Up to 1 000 events records with 1 ms resolution
- Protection settings can be viewed and edited from the fascia
- 9 user programmable tri-color LEDs
- The last 100 fault records are available
- Waveform recorder stores 15 records (1 second duration)
- 20 character x 4 line backlit LCD

Functions

Protection Functions

- 27 Locked rotor protection
- 37 Undercurrent protection – phase
- 46 Phase unbalance protection
- 48 Starting-time supervision
- 49 Thermal overload protection
- 50 Instantaneous overcurrent – phase
- 50G Instantaneous earth fault – measured
- 50N Instantaneous earth fault – calculated
- 51 Time-delayed overcurrent – phase
- 51G Time delayed earth fault – measured
- 51N Time-delayed earth fault – calculated
- 66 Number of starts

Supervision Functions

- 46PhRevPhase reversal
- 50BCL Break capacity limit
- 50BF Circuit-breaker failure protection – 3-pole
- 74CC Close-circuit supervision
- 74TC Trip-circuit supervision
- 81B Backspin monitor
- TEMP Temperature supervision
- Circuit-breaker wear monitoring

Control Functions

- 52 Circuit-breaker control
- 86 Lockout
- Motor start/stop control
- User programmable logic

Communications

- IEC 60870-5-103
- MODBUS RTU
- DNP 3.0

Reydisp Software

Our user friendly PC software tool ensures a smooth installation providing an efficient and intuitive interface to the relay.

Applications

- Motor protection for industrial applications
- Sewage, water treatment plants and pumping station
- CHP handling plants

3 This password is a confirmation ID for settings change and control functions.

- Automotive conveying systems
- Typically for current based protection of motors less than 1 MW

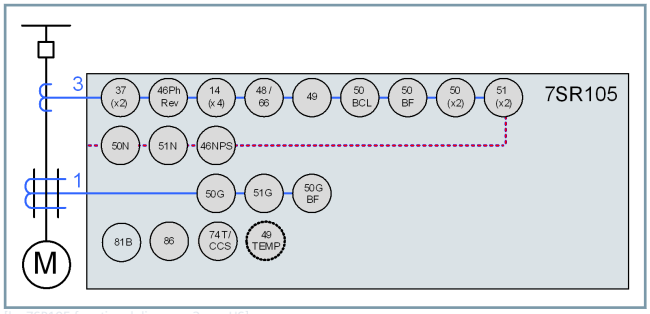
Application

The 7SR105 Rho motor protection relay is a numerical protection relay intended for use in the motor protection applications. It provides a highly comprehensive functional software package with a range of integral application functions aimed at reducing installation, wiring, and engineering time.

A wide range of measured values can be viewed on the front LCD or remotely via the communication channel.

The integrated control feature allows the safe operation of a motor and monitoring its start and stop operations.

7SR105 Functional Diagram



[fo_7SR105 functional diagram, 2, en_US]

Figure 2.3/2 7SR105 Rho Motor Protection Relay

Function Matrix

ANSI	Functions	7SR1053-2*A21-2EA0	7SR1053-2LA22-2FA0
	PROTECTION		
14	Locked rotor protection	■	■
37	Undercurrent protection – phase	■	■
46	Phase unbalance protection	■	■
48	Starting-time supervision	■	■
49	Thermal overload protection	■	■
50	Instantaneous overcurrent – phase	■	■
50G	Instantaneous earth fault – measured	■	■
50N	Instantaneous earth fault – calculated	■	■
51	Time-delayed overcurrent – phase	■	■
51G	Time delayed earth fault – measured	■	■
51N	Time-delayed earth fault – calculated	■	■
66	Number of starts	■	■
	SUPERVISION		
46PhRev	Phase reversal	■	■
50BCL	Break capacity limit	■	■
50BF	Circuit-breaker failure protection – 3-pole	■	■
74CC	Close-circuit supervision	■	■
74TC	Trip-circuit supervision	■	■
81B	Backspin monitor	■	■
TEMP	Temperature supervision		■
	CONTROL		
86	Temperature supervision	■	■
	Motor start/stop control	■	■
	User programmable logic	■	■

■ Included as standard

Protection and Supervision Functions

14 Locked Rotor Protection

Each element has a single definite time overcurrent characteristic with settings for pickup level and definite time lag (DTL) delays.

Operation can be controlled from motor stopped or running conditions.

27 Undervoltage Protection – 3-Phase

Each element has settings for pickup level, drop-off level and DTL delays. Operation occurs if voltage is below setting for duration of delay.

32 Power Protection

Each element has settings for pickup level, DTL delay and direction. Each element can be set as under or over power, to operate from apparent, real or reactive power and can be set for any phase or all 3 phases.

32S Sensitive Power Protection

This is provided in 4 pole SEF relays and provides elements operated by single phase measured current in the I_{SEF} input. Each element has settings for pickup level, DTL delay and direction. Each element can be set as under or over power, to operate from apparent, real or reactive power.

37 Undercurrent Protection – Phase

Each element has settings for pickup level and DTL delays. Operation occurs if current falls below setting for duration of delay.

37G Undercurrent Earth Fault - Measured

Each element has settings for pickup level and DTL delays. Operation occurs if current falls below setting for duration of delay.

37SEF Undercurrent Earth Fault – sensitive

Each element has settings for pickup level and DTL delays. Operation occurs if current falls below setting for duration of delay.

46BC Broken Conductor Protection

This element has settings for pickup level and DTL delay. With the circuit breaker closed, if the NPS: PPS current ratio is above setting this could be due to a broken conductor.

46 Phase Unbalance Protection

Unbalance current has a significant heating effect on the motor.

2 phase unbalance measurement modes are available. Either NPS current or the difference between maximum and minimum phase currents can be used as a measurement of the unbalance level. Inverse or definite time operation can be selected.

46PhRev Phase Reversal

Each element has a setting for pickup level and DTL delay. If the ratio of NPS and PPS current is above the set value, then this operation occurs. A high value indicates incorrect current phase rotation and this is used to prevent inadvertent reverse operation of the motor.

46NPS Negative Sequence Overcurrent Protection

Each element has user settings for pickup level and IDMTL or DTL delay. The element operates 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.

47NPS Sequence Overvoltage Protection

Each element has settings for pickup level and DTL delays. Operation occurs if NPS voltage exceeds setting for duration of delay.

48 Starting-Time Supervision

The feature provides settings to control both the number of times a motor can be started within a specified time period and the minimum time between starts. Motor starting can be inhibited when this limit is reached.

Motor start time can also be monitored.

49 Thermal Overload Protection

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

49 Thermal Overload Protection – Rotating Field

The operating curves take into account the effects of present loading, prior loading and unbalanced currents on the motor operating temperature. A user definable thermal curve is selectable to allow matching of the relay thermal characteristic to all motor and cooling system types. 'Starting' and 'cooling' constants modify the thermal characteristic during motor run-up and stopped conditions.

50 Instantaneous Overcurrent – Phase

50 INST/DTL elements provide overcurrent protection, each with independent settings for pickup current and time-delays.

50AFD Arc Flash Detection

The 7SR10 relays can be used with the 7XG31 ReyArc range of Arc Flash Detection devices. Arc fault protection is a technique employed for the fast clearance of arcing faults on busbars, within metal clad switchgear and associated cable boxes. The arc is detected using an optical sensor and the signal input to a protection device which also monitors the load current on the system. A trip signal can be achieved in less than 10 ms using arc detection only or within 20 ms when using overcurrent check.

7XG31 ReyArc arc flash detection devices can be ordered separately.

50BCL Break Capacity Limit

A motor trip or contactor release should not be attempted if the short circuit current exceeds the breaking capacity.

If any phase current exceeds the breaking capacity setting then the relay blocks the operation of all contacts assigned as "General Trip".

50BF Circuit-Breaker Failure Protection – 3 Pole

The circuit-breaker fail function may be triggered from an internal trip signal or from a binary input. Line currents and earth currents are monitored following a trip signal and an output is issued if any current is still detected above the setting after a specified time interval. Alternatively, if the trip is from a mechanical protection the circuit-breaker position can be used to determine a failure. A second time delay is available to enable another stage to be utilized if required. An input is also available

to bypass the time delays when the circuit-breaker is known to be faulty.

50G Instantaneous Earth Fault – Measured

This function directly measures the earth current from an independent CT, or the residual connection of the 3 line CTs.

50G INST/DTL elements provide earth fault protection, each with independent settings for pickup current.

50GLC Line-Check Overcurrent Protection

This function prevents a CB being repeatedly manually closed onto a faulted line. It is enabled upon the Manual CB Close output being issued.

50LC Line Check

This function prevents a CB being repeatedly manually closed onto a faulted line. It is enabled upon the Manual CB Close output being issued.

50N Instantaneous Earth Fault – Calculated

This function derives the earth current internally from the 3 phase CT inputs to give earth fault.

2 earth fault measurement stages are available.

50N INST/DTL elements provide earth fault protection, each with independent settings for pickup current.

50SEF Instantaneous Sensitive Earth Fault – Measured

2 sensitive earth fault measurement stages are available. This function directly measures the earth current from an independent CT, or the residual connection of the 3 line CTs.

50SEF INST/DTL elements provide earth fault protection, each with independent settings for pickup current and time-delays.

50SEFLC Instantaneous Sensitive Earth Fault – Measured

This function prevents a CB being repeatedly manually closed onto a faulted line. It is enabled upon the Manual CB Close output being issued.

51 Time-Delayed Overcurrent – Phase

51 IDMTL/DTL elements provide overcurrent protection, each with independent settings for pickup current, time-multiplier (51) and time-delays. Users can select IEC or ANSI time current characteristics. The IDMT stage has a user selectable reset characteristic, either DTL or shaped reset characteristic to improve the grading with electromechanical protection.

51CL Cold Load Overcurrent – Phase

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 applies alternative current 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.

51G Time-Delayed Earth Fault – Measured

2 earth fault measurement stages are available. This mode directly measures the earth current from an independent CT, or the residual connection of the 3 line CTs.

51G IDMTL/DTL elements provide earth fault protection, each with independent settings for pickup current, time-multiplier, and time-delays. Users can select IEC or ANSI time current characteristics. The IDMT stage has a user selectable reset characteristic either DTL or shaped reset characteristic to improve grading with electromechanical protection.

51N Time-Delayed Earth Fault – Calculated

2 earth fault measurement stages are available.

This function derives the earth current internally from the 3 phase CT inputs to give earth fault.

51N IDMTL/DTL elements provide earth fault protection, each with independent settings for pickup current, time-multiplier, and time-delays. User can select IEC or ANSI time current characteristics. The IDMT stage has a user selectable reset characteristic either DTL or shaped reset characteristic to improve grading with electromechanical protection.

51SEF Time-Delayed Sensitive Earth Fault – Measured

2 sensitive earth fault measurement stages are available. This function directly measures the earth current from an independent CT, or the residual connection of the 3 line CTs.

51SEF IDMTL/DTL elements provide earth fault protection, each with independent settings for pickup current, time-multiplier, and time-delays. Users can select IEC or ANSI time current characteristics. The IDMT stage has a user selectable reset characteristic either DTL or shaped reset characteristic to improve grading with electromechanical protection.

51V Voltage-Dependent Overcurrent Protection

Each phase shaped overcurrent element can be independently controlled by the level of measured input voltage. For applied voltages above setting, the 51-n element operates in accordance with its current setting but for voltages below the setting a multiplier is applied to reduce the 51-n pick up current setting.

55 Power Factor

Each element has settings for under or over power factor pickup level, DTL delay and lead/lag direction. Each can also be set for any phase or all 3 phases operation.

59 Overvoltage Protection – 3 Phase

Each element has settings for pickup level, drop-off level and DTL delays. Operation occurs if voltage exceeds setting for duration of delay.

59N Neutral Voltage Displacement

Neutral overvoltage can be used to detect earth faults in high impedance earthed or isolated systems.

Operation occurs if the neutral voltage exceeds setting for duration of delay.

60CTS CT Supervision

The relay has 2 methods of CT supervision. The 7SR10 Directional relay monitors each phase current input and operates if any one or two inputs fall below the setting. An addition

method that 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.

Both element types have 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.

64H Restricted Earth Fault Protection – High-Impedance

The measured earth current input may be used in a 64H high-impedance restricted earth fault scheme to provide sensitive high-speed unit protection. A calculation is required to determine the values of the external series stabilizing resistor and non-linear shunt resistor which can be ordered separately.

66 Number of Starts

The feature provides settings to control both the number of times a motor can be started within a specified time period and the minimum time between starts. Motor starting can be inhibited when this limit is reached.

Motor start time can also be monitored.

67 Directional Overcurrent – Phase

Phase overcurrent elements can be directionalized.

Phase overcurrent elements can be user set to forward, reverse, or non-directional.

Directional phase fault elements are polarized from quadrature voltage.

67G Directional Earth Fault – Measured

Measured earth fault elements can be directionalized.

Measured earth faults can be user set to forward, reverse, or non-directional.

Directional measured earth fault elements are polarized from V0.

67N Directional Earth Fault – Calculated

Calculated earth fault elements can be directionalized.

Calculated earth fault elements can be user set to forward, reverse, or non-directional.

Directional calculated earth fault elements can be user set to be polarized from V0 or negative phase sequence voltage.

67SEF Directional Sensitive Earth Fault – Measured

Sensitive earth fault element can be directionalized.

Each element can be set to forward, reverse, or non-directional.

Directional sensitive earth fault elements are polarized from $3V_0$.

74CC Close-Circuit Supervision

The close circuit(s) can be monitored via binary inputs.

74TC Trip-Circuit Supervision

The trip circuit(s) can be monitored via binary inputs. Trip-circuit failure raises an HMI alarm and output(s).

79 Automatic Reclosing

A high proportion of faults on an overhead line network is transient and can be cleared quickly by high speed tripping followed by an automated circuit-breaker reclose sequence. The function provides independent phase fault and earth fault/sensitive earth fault sequences of up to 5 trip i.e. 4 reclose attempts before lockout. An auto-reclose sequence can be user set to be initiated from internal protection operation or via binary input from an external protection.

81 Frequency Protection – "f>" or "f<"

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

81B Backspin Monitor

To inhibit attempted restarting of the motor until after the rotor has completely stopped backspin protection is applied. Starting is inhibited until the 81B time delay has elapsed.

81HBL2 Inrush Current Detection

Where second harmonic current is detected (i.e. during transformer energization) user selectable elements can be blocked and an alarm given.

81I_THD Total Harmonic Distortion Supervision

Total harmonic distortion is the percentage of harmonics present in fundamental frequency current. THD calculates the 2^{nd} to 15^{th} harmonic currents, presents inline current and displayed in the 'Harmonic Meter' window as a percentage of fundamental frequency current. Separate THD threshold setting and delay is available as a function.

86 Lockout

Output relays can be configured to self reset, pulsed or hand reset operation.

Output relays can be used to directly trip the circuit-breaker. The operate "break" duty of output relays is limited so the circuit-breaker trip coil must be open circuited by a suitably rated contact, typically a circuit-breaker auxiliary switch.

TEMP Temperature Supervision

Motor resistance temperature detectors (RTDs) can be connected via temperature inputs. Up to 6 RTD sensors can be monitored. Provision to configure 7 types of RTD inputs (3 wire configuration). Temperature inputs can be configurable for RTD alarm and trip application.

NOTE

Any one of the RTD type can be configured for all 6 temperature inputs.

Programmable Logic

The user can map binary inputs, protection elements, LEDs and binary outputs together in a logical scheme.

Up to 4 logic equations can be defined using standard logic functions, for example timers, AND/OR gates, inverters and counters to provide the user required functionality.

Each logic equation output can be used for alarm and indication and/or tripping.

User Specific Curves

User specific curves can be configured in Reydisp Manager or using curve editor it can be configured. The custom curve appears as an additional option in the Char setting list using the name that is entered in Reydisp Manager for all elements for which the curve is applicable.

Virtual Inputs/Outputs

There are 8 virtual inputs/outputs to provide internal logical states to assist in the application of the functions. Each virtual I/O can be assigned in the same way as a physical I/O.

Circuit-Breaker Maintenance

2 circuit breaker operations counters are provided to assist with maintenance scheduling. The maintenance counter records the overall number of operations and the delta counter records the number of operations since the last reset.

An I^2t 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. A CB trip time meter is also available, which measures the time between the trip or open command being issued and the auxiliary contacts changing state.

Monitoring

Self-Monitoring

The self monitoring supervision includes monitoring of power supply signals, code execution watchdog, memory checks by check sum and processor/ADC health checks and the relay is connected to an auxiliary power supply.

Protection healthy LED is illuminated when the power supply signals are healthy.

If the internal relay watchdog detects an internal fault then the LED will continuously flash. A changeover contact can be programmed via the binary input matrix to provide an external protection healthy signal.

If the relay detects an internal failure a message will be displayed on the LCD and the relay will reset in an attempt to rectify the failure.

Instruments & Meters

The following information is monitored and displayed in the relays instrument menu.

Primary/Secondary Current Phases and Earth
Direction of Faults
Primary/Secondary Line and Phase Voltages
Apparent Power and Power Factor
Real and Reactive Power
W Hr & VAr Hr Forward and Reverse
Historical Demand Record
Positive Phase Sequence (PPS) Voltage & Current
Negative Phase Sequence (NPS) Voltage & Current
Zero Phase Sequence (ZPS) Voltage & Current
Thermal Equivalent and Unbalanced Currents
Total Harmonic Distortion
Frequency
Binary Input/Output Status
Trip Circuit Healthy/Failure
Time and Date
Starters
Fault Records
Event Records
Energy
Circuit-Breaker Trip Counters and Time to Trip
I^2t Summation for Contact Wear
Thermal Overload Status Monitoring
Temperature Input Values

Data Acquisition and Recording

Sequence of Event Records

Up to 1000 events are stored and time tagged to 1 ms resolution.

Fault Records

The last 100 fault records (non-directional and directional relay, motor protection relay) 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 and post trigger data. A record can be triggered from protection function, binary input or via data communications. 15 records of 1 s duration are stored.

Demand Metering

A rolling record of demand over the last 24 h 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 15 min averages for the last 7 days.

Real-Time Clock

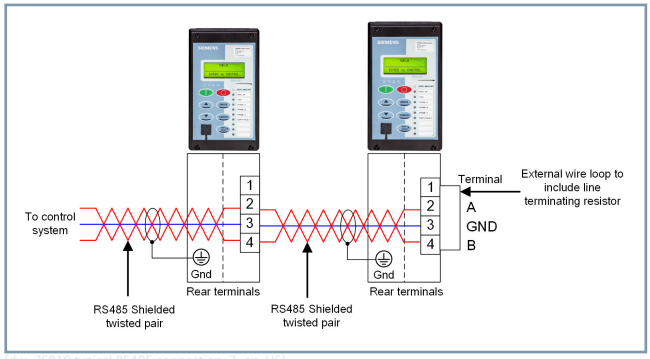
The time and date can be set and are maintained while the relay is de-energized by a back up storage capacitor. The time can be synchronized from a binary input pulse or the data communication channel.

Serial Communications

The relay offers a USB serial port as standard on the front of all units. All of the relays functions can be set on a PC using Reydisp Evolution via the USB port. The connection is made with a USB cable and operates with a “plug and play” connection, so no pre-setting of the relay is required.

The front port can be switched off or set to use either the DNP3.0, MODBUS-RTU, IEC 60870-5-103, and ASCII protocols for testing purposes.

A rear RS485 electrical connection is optionally available on the relay for system interface connections. An internal terminating resistor is provided, which can be connected into the circuit by adding a wire loop between the relevant terminals.



[dw_7SR10 typical RS485 connection, 3, en_US]

Figure 3.3/1 Typical RS485 Connection

The rear RS485 can be user selected to be OFF, IEC 60870-5-103, MODBUS RTU or DNP3.0 protocol.

Language Editor

The language editor software gives the user the ability to customize the text displayed in the relays, menu structure and instrumentation views. The tool allows a language file to be created and transferred to the relay also containing western european characters.

The data acquisition via communication interface can be done by Reydisp Evolution.

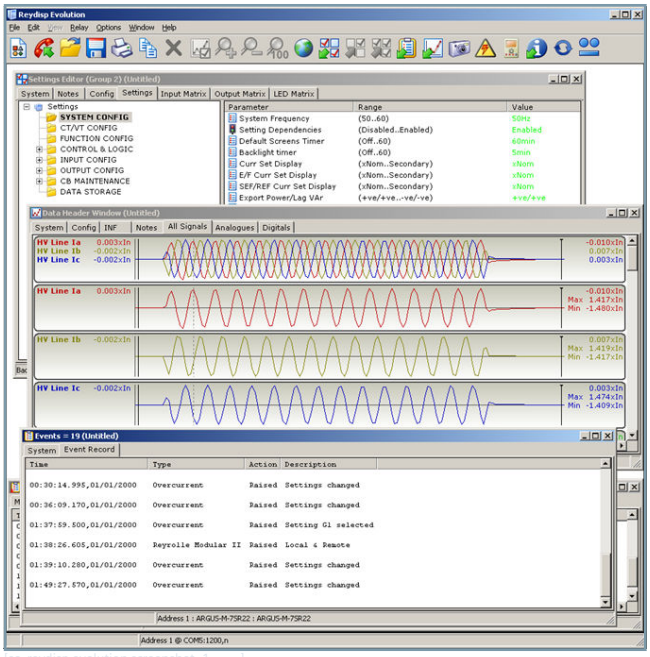
Communications Editor

To facilitate easier interfacing to a substation the relays default protocol configuration may be modified using the communication editor software tool.

The communication editor is a PC based software package provided within the Reydisp software suite which allows modification of the IEC 60870-5-103, DNP 3.0 and MODBUS protocols.

Reydisp Evolution

Reydisp Evolution is a Windows based software tool, providing the means for the user to apply settings, interrogate settings and retrieve events and disturbance waveforms from the device and is common to the entire range of Reyrolle protection relays.



[sc_reydisp evolution screenshot, 1, --_--]

Figure 3.3/2 Typical Reydisp Evolution Screenshot

Reydisp Manager

Reydisp Manager is a Windows based application which enables configuration of multiple Reyrolle devices.

It provides the following features:

- Project based handling of all features of multiple devices to allow engineering of IEC 61850 projects
- Template based structure allowing offline configuration
- Configure and store device settings for all settings groups
- Create and edit graphical logic diagrams
- Configure data points and options for serial protocols
- Configure language
- Configure user curves
- Update device firmware

Please refer to the Reydisp Manager User Guide for further information.

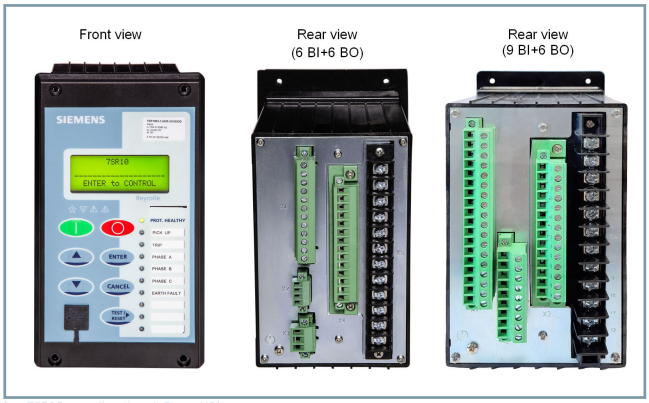
Hardware Construction

The relay is housed in a non draw-out case 4U high, size 4 case.

The rear connection comprises of user friendly pluggable type terminals for wire connections for BI, BO, VT [4], communication, temperature inputs [5], and power supply.

The fascia cover can be ordered with one push button to allow the user to reset the fault indication without removing the cover. [4]

The CT terminals are suitable for ring type lug connection to provide a secure and reliable termination.

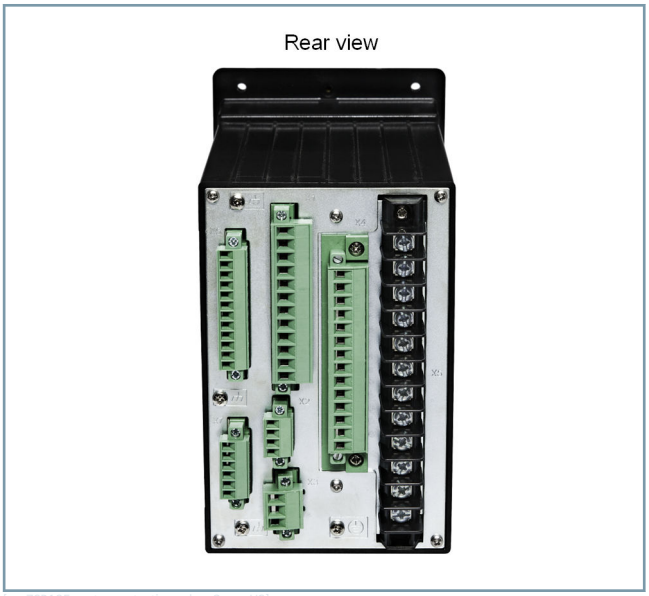


[sc_7SR10 non-directional, 3, en_US]

Figure 3.4/1 7SR10 Non-Directional Relay

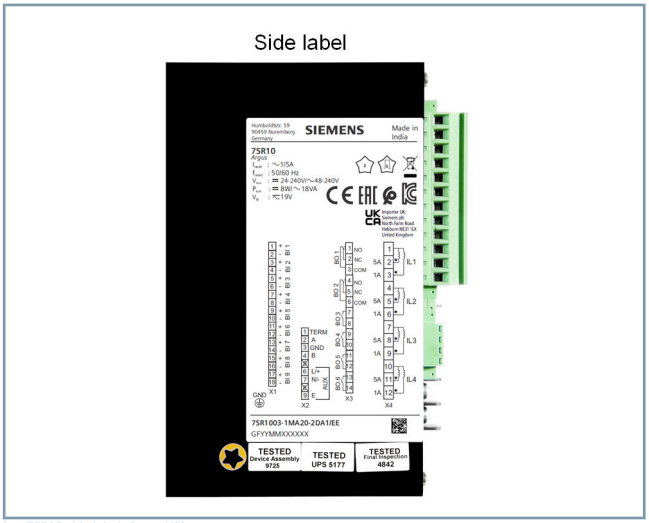
[sc_7SR10 directional, 2, en_US]

Figure 3.4/2 7SR10 Directional Relay



[sc_7SR105 motor protection relay, 2, en_US]

Figure 3.4/3 7SR105 Motor Protection Relay

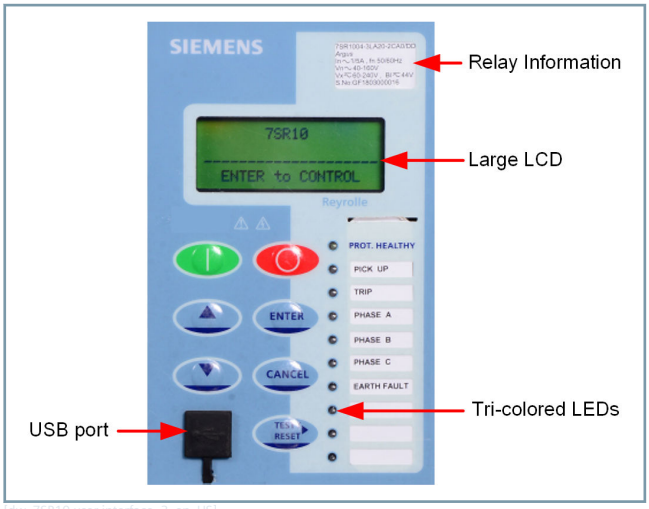


[sc_7SR10 side label, 6, en_US]

Figure 3.4/4 7SR10 Relay Side Label

4 7SR10 only
5 7SR105 only

User Interface



[dw_7SR10 user interface, 3, en_US]

Figure 3.4/5 User Interface

The operator interface is designed to provide a user friendly method of controlling, viewing menus, entering settings, and retrieving data from the relay. 5 buttons are provided for navigation around the menu structure.

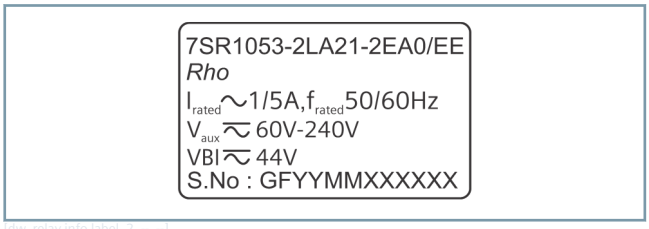
2 dedicated push buttons are provided on the HMI to execute the CB manual close and open operations on the 7SR10 or motor start/stop on the 7SR105.

LCD

A 4 line by 20 character liquid crystal display with power save operation indicates the relay identifier, settings, instrumentation, fault data and control commands. Up to 6 user programmable general alarms can be configured to display your own indications on the LCD.

Relay Information

The device is identified by the rating label on the front fascia. The user can also give the device its own identity by editing the **Relay Identifier** displayed on the LCD.



[dw_relay info label, 2, --]

Figure 3.4/6 Fascia Relay Rating Label

The device terminal label displays the MLFB code, serial number, relay description, terminal contact details, and safety symbols.

	QR code
2	AC 2 kV insulation test of the voltage inputs, current inputs, and binary outputs
5	5 kV impulse voltage test (type test) in compliance with Class III
	Electrical Hazard
CE	European CE marking
	Caution, risk of danger Refer to device documentation before operation
	Waste Electrical and Electronic Equipment Directive (WEEE)
EAC	Guideline for the Eurasian Market
	Mandatory Conformity Mark for Electronics and Electrotechnical Products in Morocco
	South Korea KC Certification for Electrical and Electronic Products
UK CA	United Kingdom (UK) Conformity Assessed marking

LEDs

A green steadily illuminated LED indicates the **Protection Healthy** condition. 9 users programmable LEDs are available eliminating the need for expensive panel mounted pilot lights and associated wiring. Each LED is tri-color (red, green, yellow) allowing for clear indication of the associated function's state and has a label for identification.

Password Protection

The relay allows the user to set a 4 character configuration ID (shown as a **Password** in the relay LCD display). If a confirmation ID has already been set, then user must enter the confirmation ID to gain access to the editing mode for setting parameters.

General Alarms

Up to 4 general alarms of 16 characters can be configured to display a text message on the LCD. The general alarms can be triggered from one or more inputs.

Control Mode

The relay has a control menu with access to commonly used command operations. Access to the control commands is restricted by a 4 character control function confirmation ID (shown as a **Password** in the relay LCD display). Each command requires a select then execute operation, if the execute operation is not performed within a time window the command is aborted. The control mode supports the CB operation control function only.

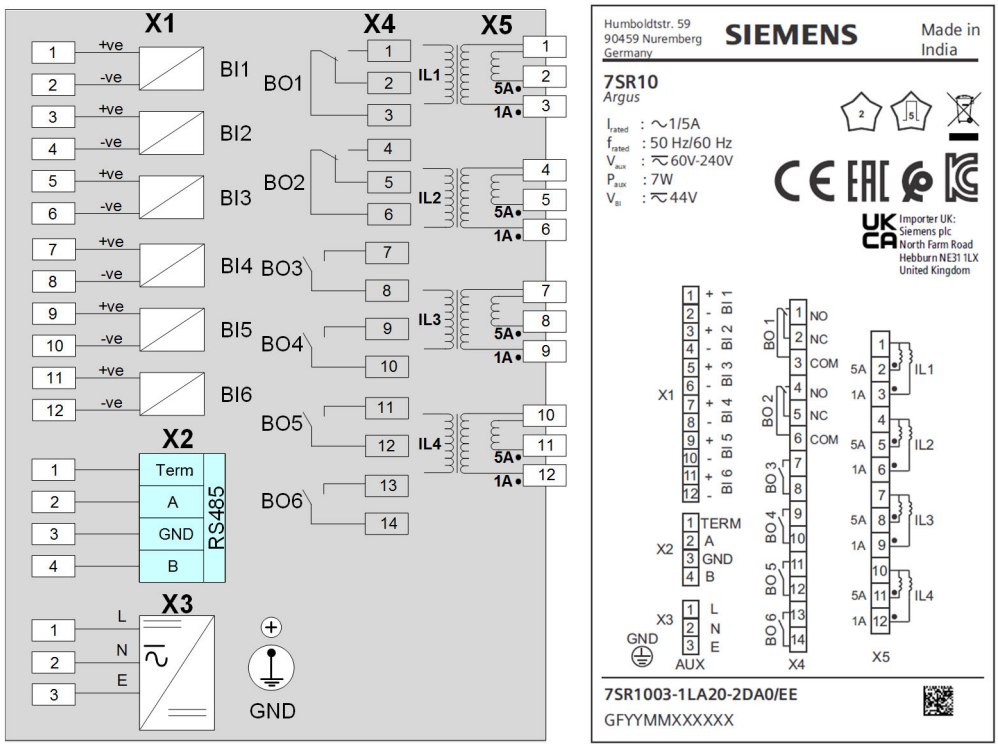
CB Open/Close

The circuit breaker (CB) control function is used to manually open and close the CB when it is connected to the power system. 2 dedicated push buttons are provided on the HMI to execute the CB manual close and open operations.

Motor Start/Stop

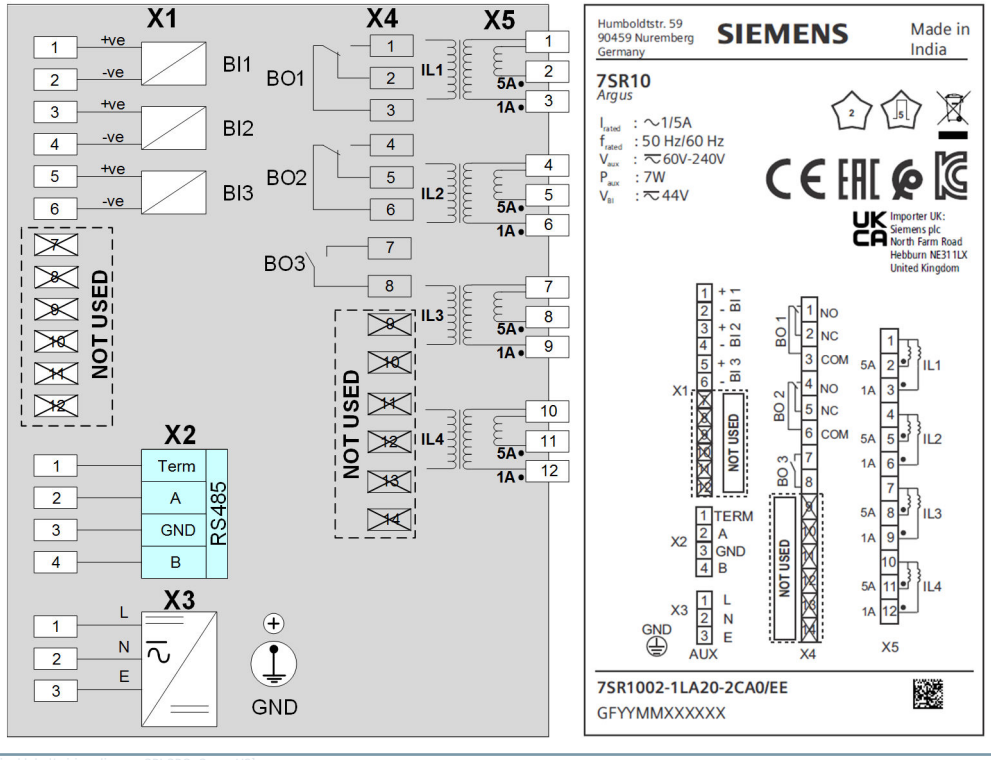
The motor control function is used to manually start and stop the motor when it is connected to the power network. 2 dedicated push buttons are provided on the HMI to execute the motor manual start and stop operations.

Connection Diagrams



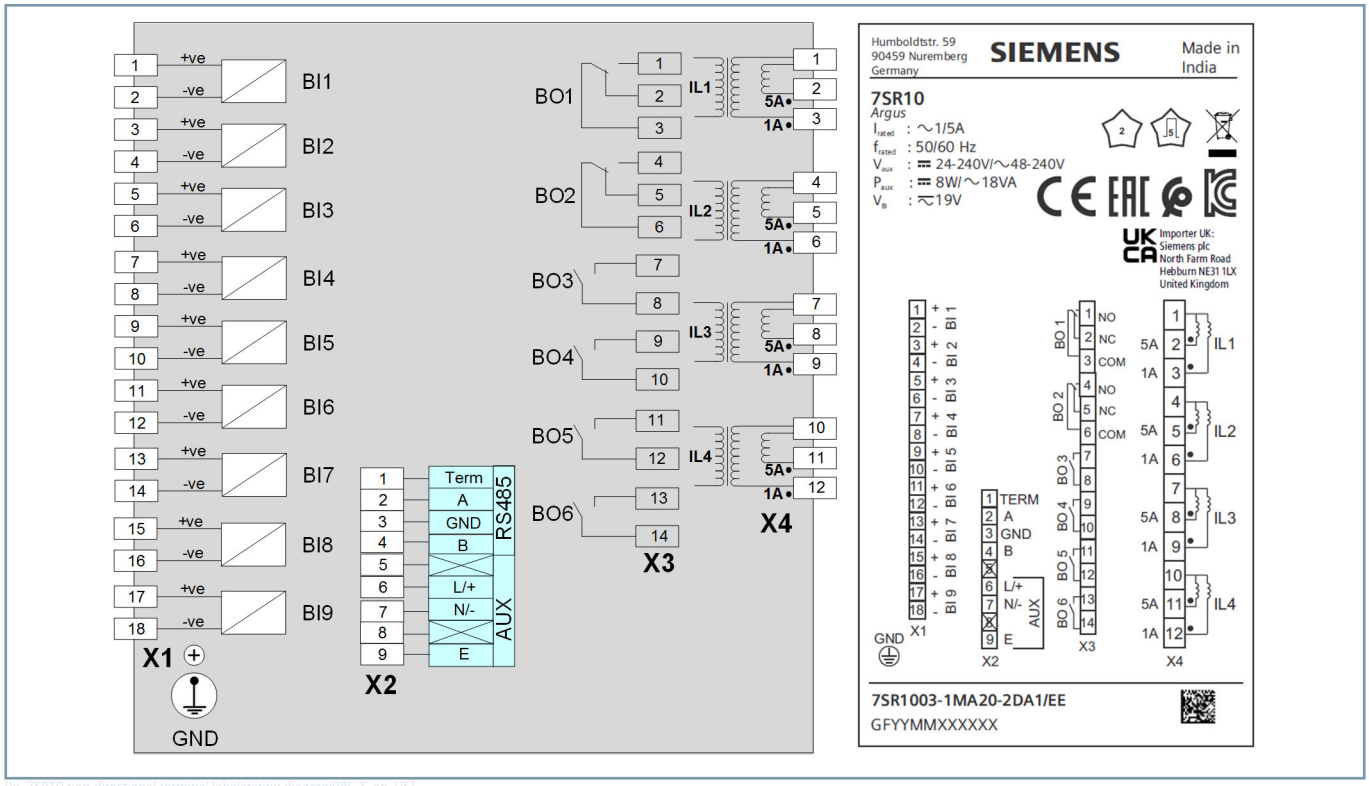
[lo_7SR10 non-directional terminal label/wiring diagram, 8, en_US]

Figure 4.1/1 Terminal/Wiring Diagram of 7SR10 Non-Directional Overcurrent Relay



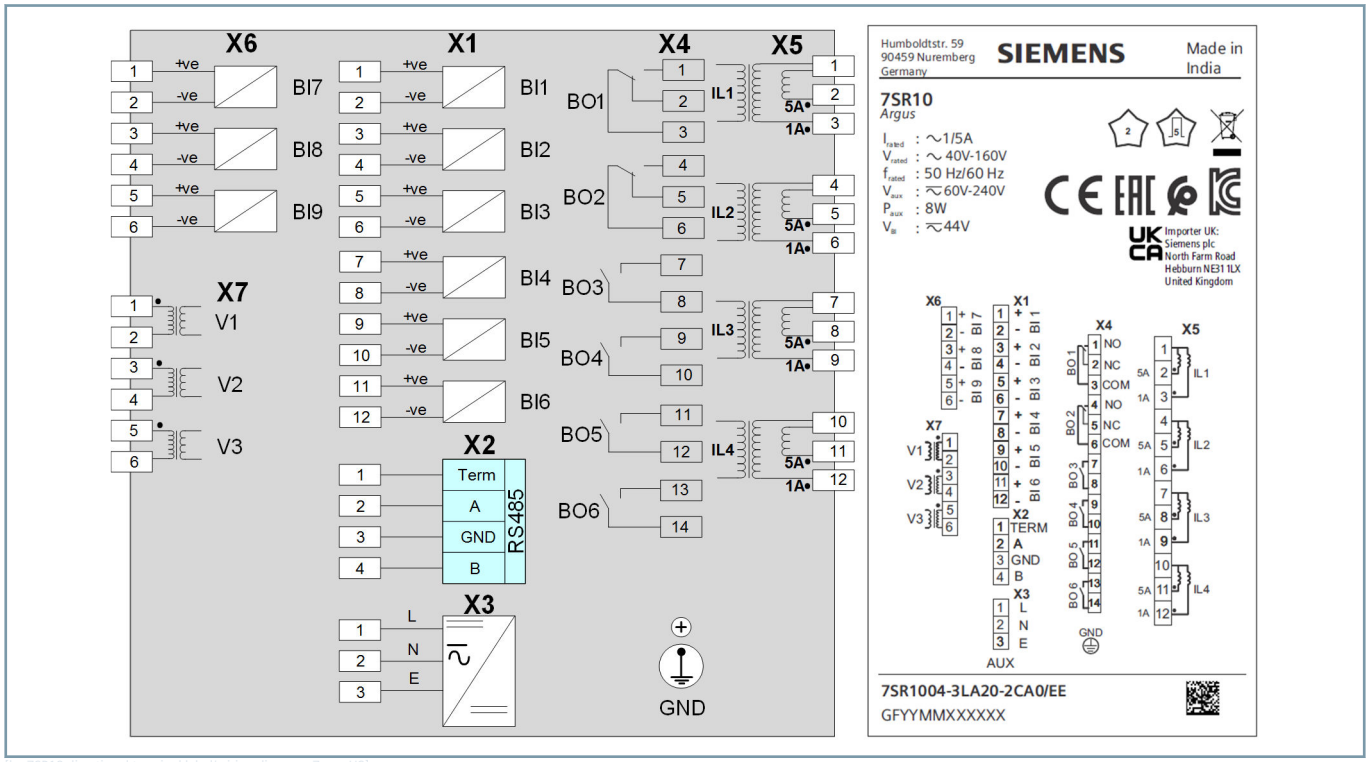
[lo_7SR10 non-directional terminal label/wiring diagram3BI-3BO, 2, en_US]

Figure 4.1/2 Terminal/Wiring Diagram of 7SR10 Non-Directional Overcurrent Relay (3 BI, 3 BO)



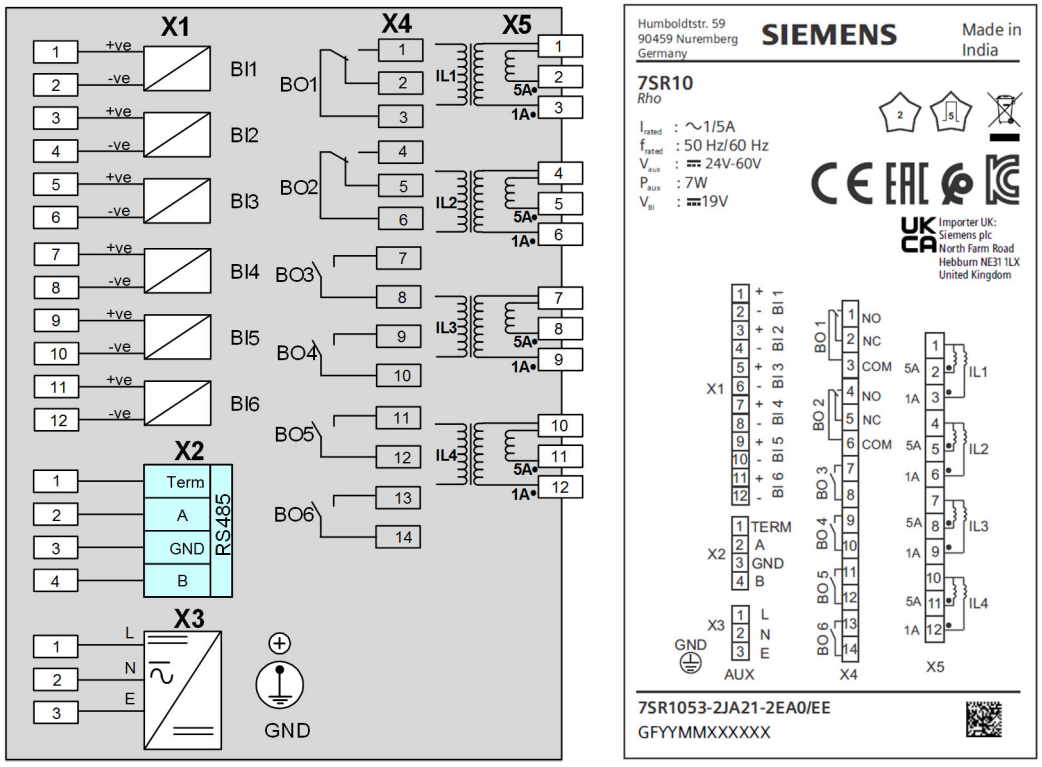
[Io_7SR10 non-directional terminal label/wiring diagram9BI, 3, en_US]

Figure 4.1/3 Terminal/Wiring Diagram of 7SR10 Non-Directional Overcurrent Relay, Universal Power Supply



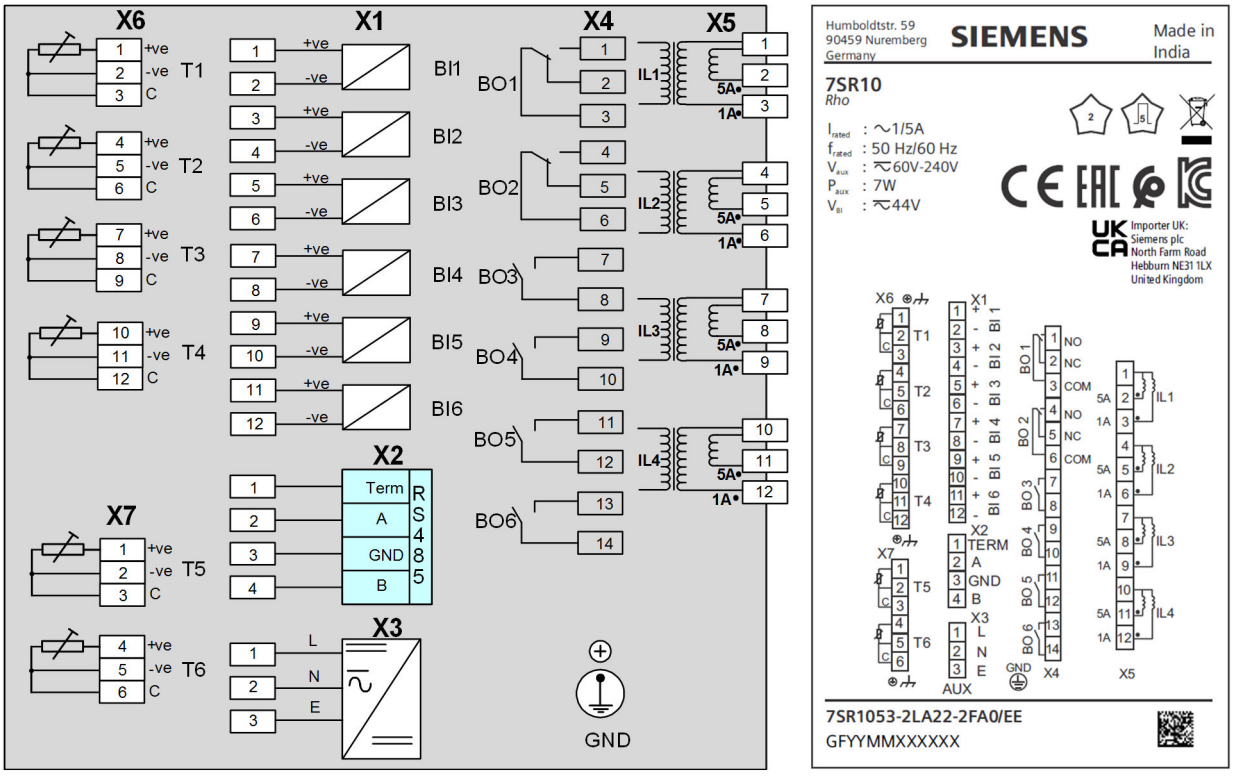
[Io_7SR10 directional terminal label/wiring diagram, 7, en_US]

Figure 4.1/4 Terminal/Wiring Diagram of 7SR10 Directional Overcurrent Relay



[Io_7SR105 nonRTD terminal label/wiring diagram, 5, en_US]

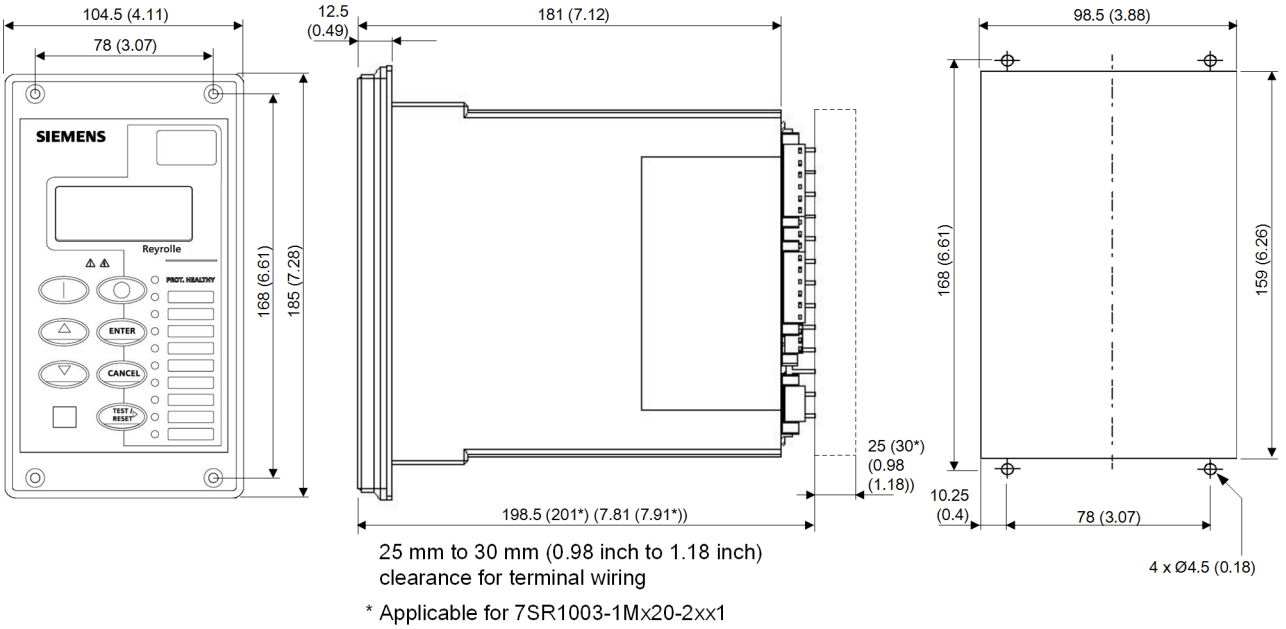
Figure 4.1/5 Terminal/Wiring Diagram of 7SR105 Non-RTD



[Io_7SR105 RTD terminal label/wiring diagram, 5, en_US]

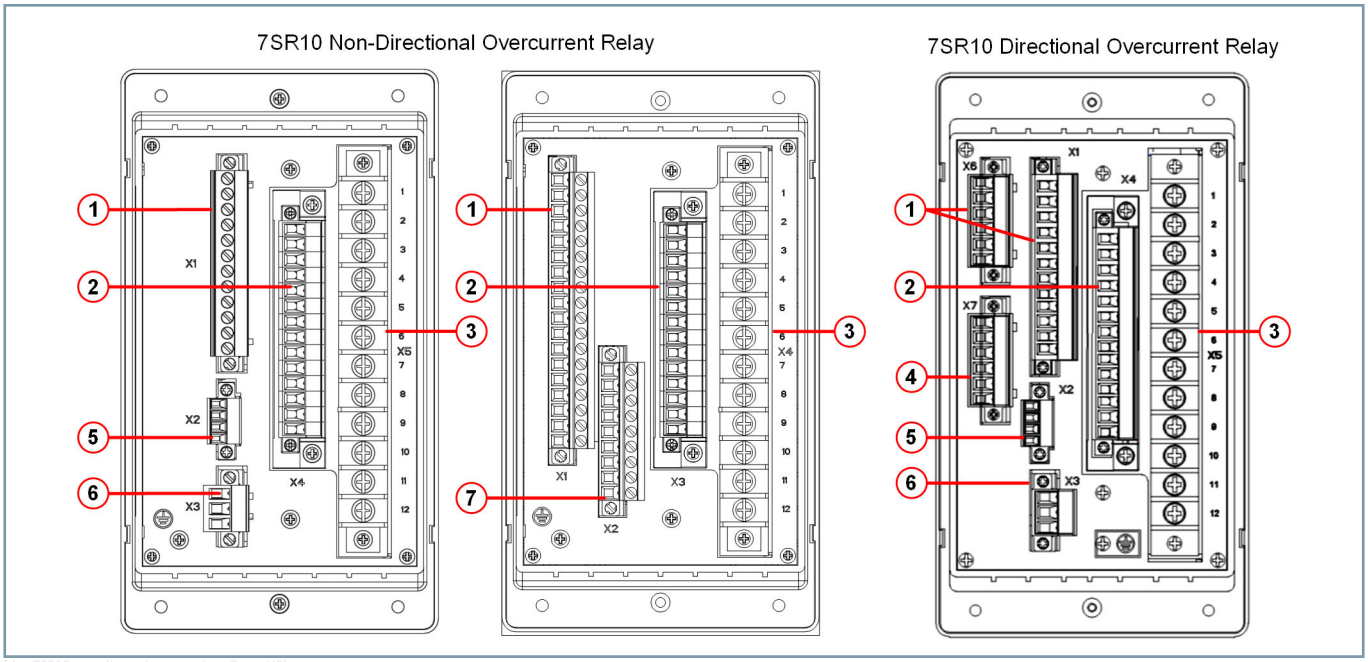
Figure 4.1/6 Terminal/Wiring Diagram of 7SR105 RTD

Dimension Drawings



[dw_7SR10-casedimensions, 1, en_US]

Figure 4.2/1 Front View, Side View and Panel Cut-out View

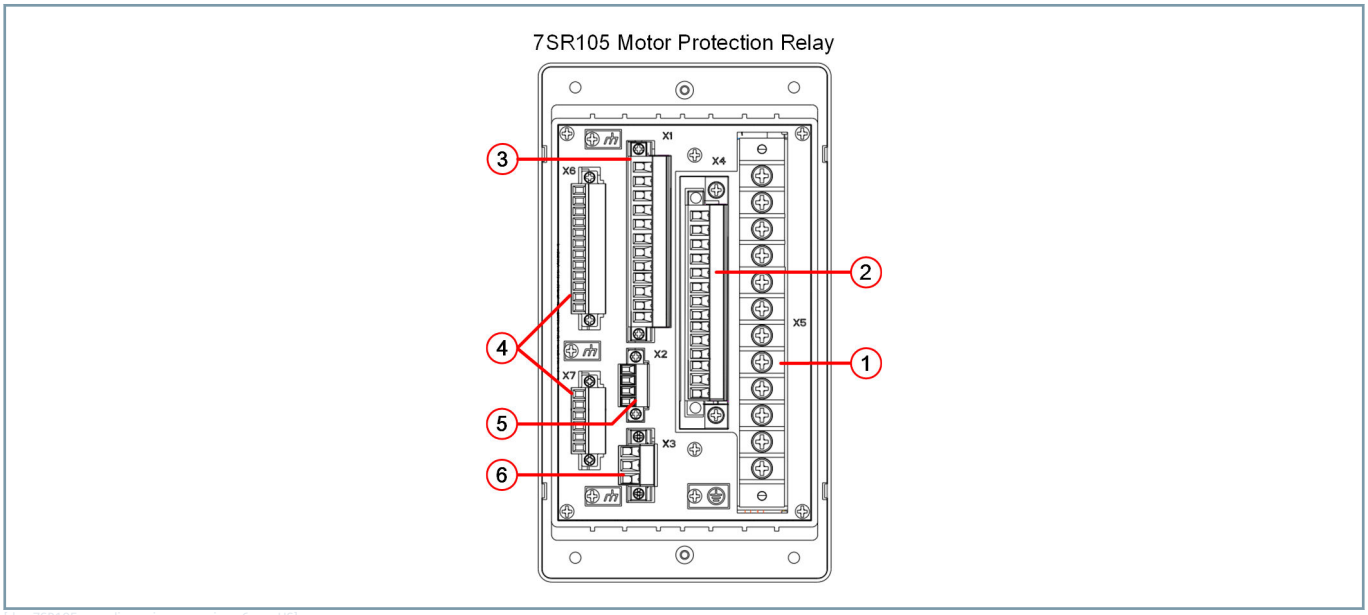


[dw_7SR10 case dimensions rearview, 3, en_US]

Figure 4.2/2 Rear View - Terminals

(1) Binary inputs
(2) Binary ouputs
(3) Current inputs
(4) Voltage inputs
(5) Rear communication port
(6) Auxiliary power supply
(7) Auxiliary power supply and rear communication port

Dimension Drawings



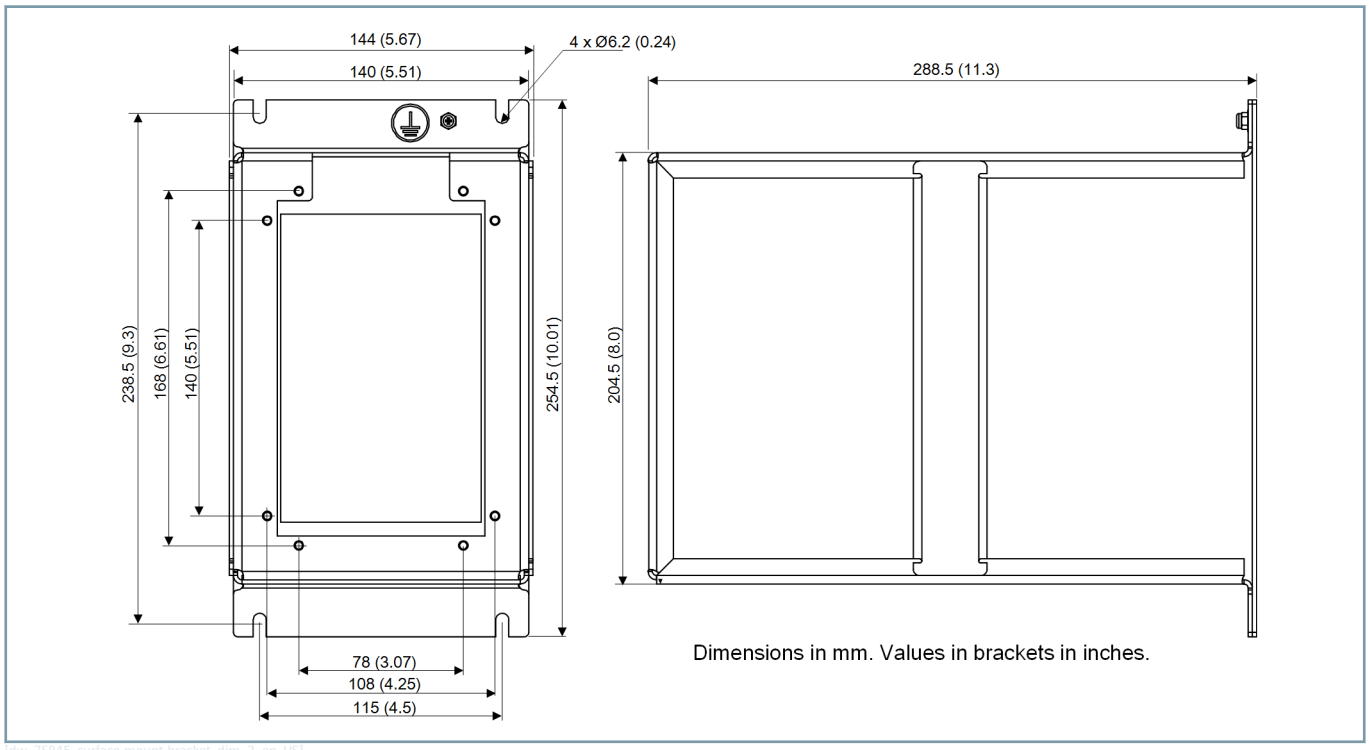
[dw_7SR105 case dimensions rear view, 6, en_US]

Figure 4.2/3 Rear View - Terminals

(1) Current inputs
(2) Binary outputs
(3) Binary inputs
(4) RTD inputs
(5) Rear communication port
(6) Auxiliary power supply

Surface Mounting Bracket Dimensions and Panel Cut-out View

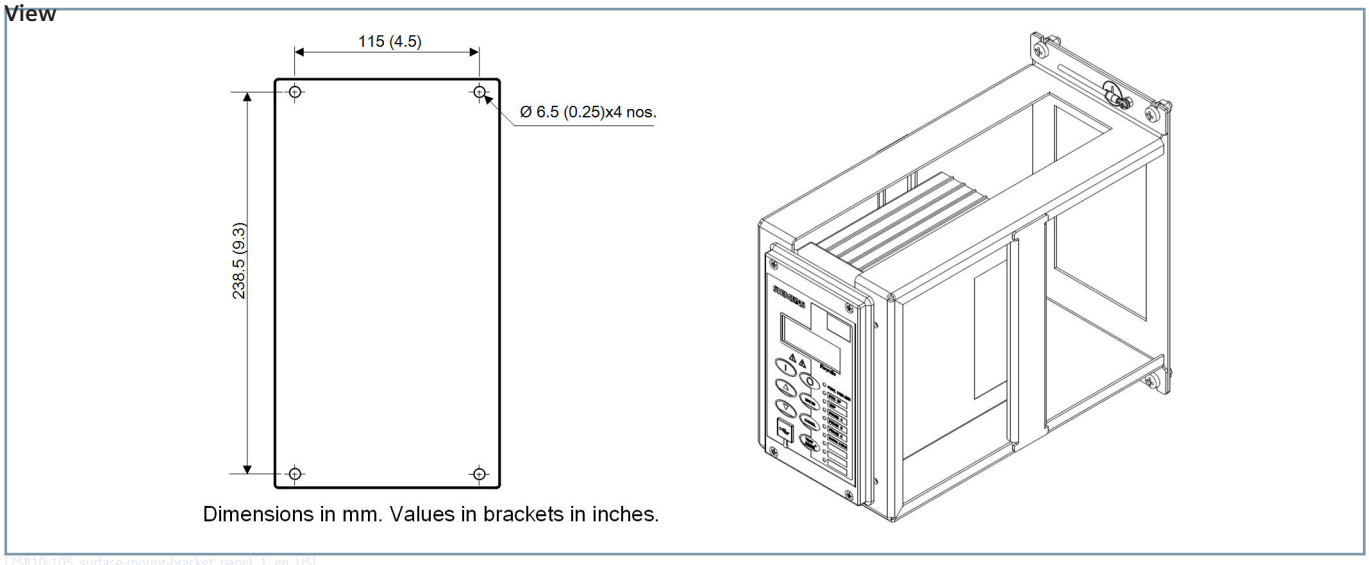
Accessory Variant	Description
7XG1900-0MA55-0FC0	Surface mounting bracket



[dw_7SR45_surface-mount-bracket_dim, 2, en_US]

Figure 4.2/4 Front and Side Views

Surface Mounting Bracket Dimensions and Panel Cut-out View



[7SR10-105_surface-mount-bracket_panel, 1, en_US]

Figure 4.2/5 Mounting Holes for Surface Mount Bracket and Assembled Bracket with 7SR10/7SR105

Technical Data

For full technical data, refer to the Technical Specification Section of the 7SR10 Operating Manual and 7SR10 Device Manual.

Indication of Conformity

This product complies with the directive of the Council of the European Communities on the harmonization of the laws of the Member States relating to electromagnetic compatibility (EMC Directive 2014/30/EU) and concerning electrical equipment for use within specified voltage limits (Low Voltage Directive 2014/35/EU) as well as restriction on usage of hazardous substances in electrical and electronic equipment (RoHS Directive 2011/65/EU).

This conformity has been proved by tests conducted by Siemens AG in accordance of the Council Directive in accordance with the product standard IEC/EN 60255-26 for the EMC directives, and with the standard IEC/EN 60255-27 for the low-voltage directive.

RoHS directive 2011/65/EU is met using the standard IEC/EN 63000. The device has been designed and produced for industrial use.

Technical Data Overview

Product family (Auxiliary powered)	**Overcurrent relay**
Case and LEDs	Non draw-out polycarbonate case (size 4 standard, non draw-out design), 10 LEDs
Measuring inputs	1 A/5 A 40 V to 160 V, 50 Hz/60 Hz
Auxiliary voltage	AC/DC 60 V to 240 V DC 24 V to 60 V AC 48 V to 240 V/DC 24 V to 240 V
Communication	Default front communication port Back port: RS485 (optional – IEC 60870-5-103 or Modbus RTU or DNP 3.0)
Protection functions	27, 32, 32S, 37, 37G, 37SEF, 46NPS, 47, 49, 50, 50G, 50N, 50SEF, 50LC, 50GLC, 50SEF LC, 50AFD, 51, 51c, 51G, 51N, 51SEF, 51V, 55, 59, 59N, 64H, 67, 67G, 67N, 67SEF, 81
Supervision and control functions	46BC, 50BF, 60CTS, 60VTS, 74CCS, 74TCS, 79AR, 81HBL2, 81ITHD, 86
Binary input	3 BI or 6 BI or 9 BI
Binary output	3 BO or 6 BO (2 changeover contact)
Overvoltage	Category III
Pollution degree	2

Product family (Auxiliary powered)	**Motor protection relay**
Case and LEDs	Non draw-out polycarbonate case (size 4 standard, non draw-out design), 10 LEDs
Measuring inputs (current)	1 A/5 A, 50 Hz/60 Hz
Auxiliary voltage	AC 60 V to 240 V DC 60 V to 240 V DC 24 V to 60 V
Communication	Default front communication port (IEC 60870-5-103 or Modbus RTU) Rear port: RS485 (optional - IEC 60870-5-103 or Modbus RTU or DNP 3.0)
Protection functions	14, 37, 46, 48, 49, 50, 50G, 50N, 51, 51G, 51N, 66
Supervision and control functions	46PhRev, 50BCL, 50BF, 74CCS, 74TCS, 81B, 86, TEMP
Binary input	6 BI
Binary output	6 BO (2 changeover contact)
Overvoltage	Category III
Pollution degree	2

Mechanical Specifications

Design	Flush mounting, non draw-out polycarbonate moulded case
Enclosure	IP 54 (front panel) IP 20 protection for terminals (rear side) Depth is 199 mm
Weight	1.6 kg (approx)

Terminal Blocks (7SR10 Non-directional Overcurrent Relay)

Current inputs (X5)	Terminal connectivity PIDG series insulated tin plated crimp ring terminal, M3.5 stud size, 2.6 mm^2 to 6.6 mm^2, 12 AWG
Binary outputs (X4)	8 or 14 position, M3 screw-type plug-in terminals suitable for 2.5 mm^2 cable
Binary inputs (X1)	6 or 12 position, M3 screw-type plug-in terminals suitable for 2.5 mm^2 cable
Rear communication port (X2)	4 position, M2 screw-type plug-in terminals suitable for 1.5 mm^2 cable
Auxiliary supply (X3)	3 position, M3 screw-type plug-in terminals suitable for 2.5 mm^2 cable
Ground terminal	Tin plated crimp ring terminal, M3 stud size, 4 mm^2 to 6 mm^2, 12 AWG to 10 AWG, yellow
Front communication port	USB, type B

Terminal Blocks (7SR10 Non-directional Overcurrent Relay, Universal Power Supply)

Current inputs (X4)	Terminal connectivity PIDG series insulated tin plated crimp ring terminal, M3.5 stud size, 2.6 mm^2 to 6.6 mm^2, 12 AWG
Binary outputs (X3)	14 position, M2.5 screw-type plug-in terminals suitable for 2.5 mm^2 cable

Binary inputs (X1)	18 position, M2.5 screw-type plug-in terminals suitable for 2.5 mm² cable
Rear communication port and auxiliary power supply (X2)	9 position, M2.5 screw-type plug-in terminals suitable for 2.5 mm² cable
Ground terminal	Tin plated crimp ring terminal, M3 stud size, 4 mm² to 6 mm², 12 AWG to 10 AWG, yellow
Front communication port	USB, type B

Terminal Blocks (7SR10 Directional Overcurrent Relay)

Current inputs (X5)	Terminal connectivity PIDG series insulated tin plated crimp ring terminal, M3.5 stud size, 2.6 mm² to 6.6 mm², 12 AWG
Binary outputs (X4)	8 or 14 position, M3 screw-type plug-in terminals suitable for 2.5 mm² cable
Binary inputs (X1)	6 or 12 position, M3 screw-type plug-in terminals suitable for 2.5 mm² cable
Binary inputs (X6)	6 position, M3 screw-type plug-in terminals suitable for 2.5 mm² cable
Rear communication port (X2)	4 position, M2 screw-type plug-in terminals suitable for 1.5 mm² cable
Auxiliary supply (X3)	3 position, M3 screw-type plug-in terminals suitable for 2.5 mm² cable
Ground terminal	Tin plated crimp ring terminal, M3 stud size, 4 mm² to 6 mm², 12 AWG to 10 AWG, yellow
Front communication port	USB, type B

Terminal Blocks (7SR105 Motor Protection Relay)

Current inputs (X5)	Terminal connectivity PIDG series insulated tin plated crimp ring terminal, M3.5 stud size, 2.6 mm² to 6.6 mm², 12 AWG
Binary outputs (X4)	8 or 14 position, M3 screw-type plug-in terminals suitable for 2.5 mm² cable
Binary inputs (X1)	6 or 12 position, M3 screw-type plug-in terminals suitable for 2.5 mm² cable
RTD inputs/Temperature inputs (X6, X7)	Pin type lug/1.5 mm² control cable
Rear communication port (X2)	4 position, M2 screw-type plug-in terminals suitable for 1.5 mm² cable
Auxiliary supply (X3)	3 position, M3 screw-type plug-in terminals suitable for 2.5 mm² cable
Ground terminal	Tin plated crimp ring terminal, M3 stud size, 4 mm² to 6 mm², 12 AWG to 10 AWG, yellow
Front communication port	USB, type B

Inputs and Outputs

Current Inputs

Quantity	3 x phase and 1 x earth
Rated current I_{rated}	1 A/5 A
Measuring range	80 · I_{rated} 8 · I_{rated} (SEF)
Instrumentation	± 1 % or ± 1 % I_{rated} (0.1 · I_{rated} to 3 · I_{rated}) ± 3 % (> 3 · I_{rated} to 80 · I_{rated}) SEF: ± 1 % (typical) (0.01 · I_{rated} to 0.3 · I_{rated}) ± 3 % (> 0.3 · I_{rated} to 8 · I_{rated})
Rated frequency	50 Hz (range: 47.5 Hz to 52.5 Hz) 60 Hz (range: 57 Hz to 63 Hz)
Thermal withstand [6] Continuous 1 second	 4 · I_{rated} 100 A (1 A) and 350 A (5 A)
Burden @ I_{rated}	≤ 0.3 VA per phase and earth for both 1 A and 5 A

Voltage Inputs

Rated voltage (V_{rated})	40 to 160 V_{RMS}
Operating range	0 to 200 V_{RMS}
Instrumentation ≥ 0.8 · V_{rated}	± 1 % V_{rated}
Burden @ 110 V	Approx 0.06 VA
Overvoltage withstand	300 V_{RMS}

Auxiliary Supply

Rated auxiliary voltage	AC 60 V to 240 V/DC 60 V to 240 V Tolerance -20 % to +10 %
Allowable super imposed AC component	15 % of DC voltage
Typical power consumption (DC) Typical power consumption (AC)	< 8 W < 16 VA (< 7 VA 0.5 PF [7])
Max interruption time (collapse to zero)	≤ 100 ms (DC 110 V) ≤ 1000 ms (AC 230 V)

6 ZY20 – Special version with thermal withstand 500 A (5 A CT) for 1 s.

7 7SR105 only

Technical Data

Auxiliary Supply

Rated voltage	AC 48 V to 240 V/DC 24 V to 240 V Tolerance -20 % to +10 %
Allowable super imposed AC component	15 % of DC voltage
Typical power consumption (DC) Typical power consumption (AC)	< 8 W < 18 VA
Max interruption time (collapse to zero)	≤ 50 ms (DC 24 V) ≤ 50 ms (AC 48 V)
Inrush current	74 A at AC 230 V ≤ 200 µS (Applicable only for MFLB 7SR1003-1Mx20-2xx1)

Auxiliary Supply

Rated voltage	DC 24 V to 60 V Tolerance -20 % to +10 %
Allowable super imposed AC component	15 % of DC voltage
Typical power consumption (DC)	< 8 W
Max interruption time (collapse to zero)	20 ms (DC 24 V)

Binary Inputs

Parameter	BI Voltage Rating	BI Operating Range
BI Threshold/Operating range	DC 19 V	DC 19 V to 66 V
	AC 44 V/DC 44 V	AC 36 V to 265 V DC 44 V to 265 V
	AC 71 V/DC 88 V	AC 71 V to 265 V DC 88 V to 265 V
	AC 15 V/ DC 19 V	AC 15 V to 265 V DC 19 V to 265 V
Current for operation (Applicable only for MFLBs 7SR10xx-x[J/K/L]xxx-2xx0)	1.5 mA to 3.5 mA	
Current for operation (Applicable only for MFLB 7SR1003-1Mx20-2xx1)	0.65 mA to 2.5 mA	
Pick Up Delay	User selectable 0 to 14,400,000 ms (up to 4 hours)	
Drop Off Delay	User selectable 0 to 14,400,000 ms (up to 4 hours)	
Number of binary inputs	3 or 6 or 9	

For more details about binary inputs, refer to the *7SR10 Operating Manual* and *7SR10 Device Manual*.

DC Performance

Attribute	Value
Reset/operate voltage ratio	≥ 90 %
Response time	< 9 ms
Response time when programmed to energize an output relay contact (i.e. includes output relay operation)	< 20 ms

Binary Outputs

Number	3 or 6 (2 change over contacts)
Operating voltage	Voltage free
Operating mode	User selectable – self or hand/electrical reset or pulsed
Operating time from energizing binary input	< 20 ms
Making capacity: Carry continuously Make and carry (L/R ≤ 40 ms and V ≤ 300 V)	 AC 5 A/DC 5 A AC 30 A/DC 30 A for 0.5 s
Breaking capacity: (≤ 5 A and ≤ 300 V): AC resistive AC inductive DC resistive DC inductive	 1250 VA 250 VA at PF ≤ 0.4 75 W 30 W at L/R ≤ 40 ms 50 W at L/R ≤ 10 ms
Disengaging time	< 20 ms

Temperature Inputs (7SR105)

Number	6
Measuring range	-50 °C to +250 °C 100 % T_{set}, ±2 % or ±2 °C For Cu10: ±2 % or ±5 °C
Response time	< 3 s
Sensing current	< 0.5 mA

Rear Communication Port

Quantity	1 no. (optional)
Electrical connection	RS485, 2 wire electrical
Protocol support	MODBUS RTU, IEC 60870-5-103, DNP 3.0
Rate	Data transfer rate: 75 Bit/s to 38400 Bit/s

Front Communication Port

Quantity	1 no.
Electrical connection	USB, type B

Data Storage

Fault record	100 (non-directional and directional relay, motor protection relay)
Waveform record	15 rec · 1 s 7 rec · 2 s 3 rec · 5 s 1 rec · 15 s Pre trigger 10 to 90 %
Events	1000 events (1 ms resolution)

Mechanical Tests

Test	Standard
Degree of protection	IEC 60529 IP 54 front IP 20 rear
Vibration	IEC 60255-21-1 Response and endurance, class 1
Shock and bump	IEC 60255-21-2 Shock response and withstand, class 1 Bump, class 1
Seismic	IEC 60255-21-3, class 1
Contact	IEC 60255-1 (Ref: std IEC 61810-1)
Electrical endurance test	IEC 60255-1 (Ref: std IEC 61810-1) (10000 operations at 250 V, 5 A)

Electrical Tests

Test	Standard
Insulation resistance	IEC 60255-27 [8] DC 500 V, > 100 MΩ
Impulse voltage withstand	IEC 60255-27 [8] 5 kV, 5 +ve, -ve pulses
AC dielectric voltage	IEC 60255-27 [8] 2 kV RMS @1 min (Between any terminal and earth, independent circuits) AC 1 kV_{RMS} for 1 min (across normally open contacts)
Slow damped oscillatory wave	IEC 60255-26 **Common-mode:** Test voltage: 2.5 kV peak voltage **Differential-mode:** Test voltage: 1.0 kV peak voltage Voltage oscillation frequency: 1 MHz Repetition frequency: 400 Hz
Electrostatic discharge	IEC 60255-26 8 kV air discharge 6 kV contact discharge
Electrical fast transient or burst [9]	IEC 60255-26 Zone A Test severity amplitude: ± 4 kV Repetition frequency: 5 kHz
Surge immunity [9]	IEC 60255-26 Test level: zone A Line to line: 0.5, 1, 2 kV Line to earth: 0.5, 1, 2, 4 kV Front time/time to half-value: 1.2/50 µs Source impedance: 2 Ω
Radiated immunity	IEC 60255-26 80 MHz to 1.0 GHz and 1.4 GHz to 2.7 GHz Both frequency at 10 V/m
Conducted radio frequency interference	IEC 60255-26 150 kHz to 80 MHz 10 V_{RMS}
Power frequency magnetic field	IEC 60255-26 30 A/m applied 1 min, 300 A/m applied for 3 s [10]
Conducted emissions	IEC 60255-26
Radiated emissions	IEC 60255-26
Thermal withstand Continuous 1 s	IEC 60255-27 4 · I_{rated} 100 A (1 A) 350 A (5 A) [11]
Burden (at 1 A and 5 A)	IEC 60255-1 ≤ 0.3 VA per phase and earth
Functional	IEC 60255-1 IEC 60255-12 IEC 60255-127 IEC 60255-149 IEC 60255-151

8 All aspect of IEC 60255-5 have been covered under IEC 60255-27

9 60 ms [MLFBs 7SR10xx-x[J/K/L]xxx-2xx0] or 100 ms [MLFB 7SR1003-1Mx20-2xx1] DTL pick-up delay applied to binary inputs

10 5 % · I_{rated} additional tolerance needs to be considered for SEF CT

11 ZY20 – Special version with thermal withstand 500 A (5 A CT) for 1 s

Test	Standard
Maximum allowable temperature	IEC 60255-6 Max. temperature limit +100 °C
Limiting dynamic value	10 ms 700 A peak AC (1 A) and 2500 A peak AC (5 A)
Gradual shutdown/start-up test	IEC 60255-26 Shut down/start up ramp 60 s Power off 5 min
Power frequency immunity test[12]	IEC 60255-26 **Common-mode:** • Test voltage: 300 V • Coupling resistor: 220 Ω • Coupling capacitor: 0.47 µF

Climatic Environmental Tests

Temperature

IEC 60068-2-1/IEC 60068-2-2/IEC 60255-1

Operating temperature range	-10 °C to +60 °C (continuous)
Permissible temporary service temperature range (tested for 16 h)	-40 °C to +70 °C [13],[14].

Humidity

IEC 60068-2-30/IEC 60068-2-78/IEC 60255-1

Damp heat test, cyclic	6 days at 25 °C to 40 °C (12 h + 12 h cycle) and 93 % relative humidity
Damp heat test, steady state	10 days at 95 % RH, +40 °C
Maximum altitude of operation	Up to 2000 m

Corrosion Test

IEC 60068-2-60:2015 (Method 4)

Mixed gas corrosion test (Environment condition as per ISA 71.04: 2013 G3)	H_2S 10 ppb, NO_2 200 ppb, Cl_2 10 ppb and SO_2 200 ppb

Product Safety Test

IEC/EN 60255-27

Type Test	Parameters	Values
Clearances and creepage distances	Clearances and creepage distances between external circuits mutual and to the enclosure	≥ 4 mm
Protective bonding resistance	Test voltage: < AC 12 V/DC 12 V Test duration: 1 min Bonding resistance	 < 0.1 Ω
Protective bonding continuity	Accessible conductive parts should be bonded with the protective conductor terminal	Low current continuity test
Flammability of insulating materials, components and fire enclosures	Structure part Terminals Terminal mounting Wiring (CT) Components mounting Enclosure PCB LCD	Standard for insulating material of flammability class Class UL 94 V-0 Class UL 94 V-0 (N)2GFAF (VDE) Class UL 94 V-0 Class UL 94 V-0 Class UL 94 V-0 Class UL 94 V-0
Single fault condition	Assessment of: • Insulation between circuits and parts • Compliance with requirements for protection against the spread of fire • Overloads • Intermittently rated resistors • Compliance with requirements for mechanical protection	The equipment shall not present a risk of electric shock or fire after a single-fault test.

IEC/EN 61010-1

Test Description	Applicable Clause Number
Marking and documentation	5
Protection against electric shock	6
Protection against mechanical hazard	7
Resistance to mechanical stresses (shock and impact)	8
Protection against the spread of fire	9

12 DC binary input ports interfacing with cables whose total length is more than 10 m, need to have a multi core twisted screened cable for providing immunity against high level of power frequency interferences.

13 Outside the operating-temperature range, the characters of the LCD display are not clearly visible and there is degradation in MTBF.

14 Temporary deviation of VT accuracies and intermittent loss in communication beyond the lower temperature limit (-10 °C)

Test Description	Applicable Clause Number
Equipment temperature limits and resistance to heat	10
Protection against liberated gases and substances, explosion and implosion	13
Components and sub assemblies	14
Hazards resulting from application	16
Risk assessment	17

Performance

14 Locked Rotor Protection

Number of elements	4
Setting range I_{set}	0.05 to 10 · I_{rated}
Time delay	0.00 to 14400 s
Operate level	100 % I_{set} ± 5 % or ± 1 % · I_{rated}
Operate time 2 · I_{set} 5 · I_{set}	 35 ms ± 10 ms 25 ms ± 10 ms
Operate time following delay	t_{basic} + t_{delay} , ± 1 % or ± 10 ms
Controlled by	Stopped, no acceleration, running, none
Disengaging time	< 50 ms

27 Undervoltage Protection – 3-Phase/59 Overvoltage Protection – 3 Phase

Number of elements	4 (under or over)
Operate	Any phase or all phases
Voltage guard V_g	1 to 200 V
Setting range V_{set}	5 to 200 V
Hysteresis setting	0 to 80 %
Operate level V_{set}	100 % V_{set}, ± 1 % or ± 0.25 V
Reset level: Overvoltage Undervoltage	 = (100 % - hysteresis) · V_{op}, ± 1 % = (100 % + hysteresis) · V_{op}, ± 1 %
Delay setting t_{delay}	0.00, 0.01 to 20, 20.5 to 100, 101 to 1000, 1010 to 10000, 10100 to 14400 s
Basic operate time: 0 to 1.1 · V_{set} (over) 0 to 2.0 · V_{set} (over) 1.1 to 0.5 · V_{set} (under)	 73 ms ± 10 ms 63 ms ± 10 ms 58 ms ± 10 ms
Operate time following delay	t_{basic} + t_{delay} , ± 1 % or ± 10 ms
Inhibited by	Binary or virtual Input VT supervision Voltage guard

32 Power Protection

Number of elements	2 forward or reverse
Operate	P, Q or S
U/C guard	0.05 to 1.0 · I_{rated}
Setting range S_{set}	0.05 to 2.0 · S_{rated}
Operate level S_{op}	100 % S_{set}, ± 5 % or ± 2 % S_{rated}
Reset level	≥ 95 % S_{op}
Basic operate time: 1.1 · S_{set} (over) 2.0 · S_{set} (over) 0.5 · S_{set} (under)	 60 ms ± 10 ms 45 ms ± 10 ms 30 ms ± 10 ms
Delay setting t_{delay}	0 s to 14400 s
Operate time following delay	t_{basic} + t_{delay} , ± 1 % or ± 10 ms
Inhibited by	Undercurrent guard, VTS, binary or virtual input

32S Sensitive Power Protection

Number of elements	2 forward or reverse
Operate	P, Q or S
U/C guard	0.005 to 1.0 · I_{rated}
Setting range S_{set}	0.005 to 2.0 · S_{rated}
Operate level	100 % S_{set}, ± 5 % or ± 2 % S_{rated}
Reset level	≥ 95 % S_{op}
Basic operate time: 1.1 · S_{set} (over) 2.0 · S_{set} (over) 0.5 · S_{set} (under)	 60 ms ± 10 ms 45 ms ± 10 ms 30 ms ± 10 ms
Delay setting t_{delay}	0 s to 14400 s
Operate time following delay	t_{basic} + t_{delay} , ± 1 % or ± 10 ms
Inhibited by	Undercurrent guard, VTS, binary or virtual input

37 Undercurrent Protection – Phase

Number of elements	2 element
Operate	Any phase or all
Setting range I_{set}	0.05 to 5.0 · I_{rated}
Operate level	100 % I_{set}, ± 5 % or ± 1 % · I_{rated}
Reset level	≤ 105 % I_{op}
Current guard	0.05 to 5.0 · I_{rated}
Delay setting t_{delay}	0.00, 0.01 to 20, 20.5 to 100, 101 to 1000, 1010 to 10000, 10100 to 14400 s
Basic operate time: 1.1 to 0.5 · I_{rated}	 35 ms ± 10 ms
Operate time following delay	t_{basic} + t_{delay} , ± 1 % or ± 10 ms
Overshoot time	< 40 ms
Inhibited by	Binary or virtual input

37G Undercurrent Earth Fault - Measured

Number of elements	2 element
Setting range I_{set}	0.05 to 5.0 · I_{rated}
Operate level	100 % I_{set}, ± 5 % or ± 1 % · I_{rated}

Reset level	≤ 105 % I_{op}
Delay setting t_{delay}	0.00, 0.01 to 20, 20.5 to 100, 101 to 1000, 1010 to 10000, 10100 to 14400 s
Basic operate time: 1.1 to 0.5 · I_{rated}	 35 ms ± 10 ms
Operate time following delay	t_{basic} + t_{delay} , ± 1 % or ± 10 ms
Overshoot time	< 40 ms
Inhibited by	Binary or virtual input

37SEF Undercurrent Earth Fault – sensitive

Number of elements	2 element
Setting range I_{set}	0.005 to 5.0 · I_{rated}
Operate level	100 % I_{set}, ± 5 % or ± 1 % · I_{rated}
Reset level	≤ 105 % I_{op}
Delay setting t_{delay}	0.00, 0.01 to 20, 20.5 to 100, 101 to 1000, 1010 to 10000, 10100 to 14400 s
Basic operate time: 1.1 to 0.5 · I_{rated}	 35 ms ± 10 ms
Operate time following delay	t_{basic} + t_{delay} , ± 1 % or ± 10 ms
Overshoot time	< 40 ms
Inhibited by	Binary or virtual input

46 Phase Unbalance Protection

Number of elements	1 (magnitude difference or NPS)
Setting range I_{set}	0.1 to 0.4 · θ
Operate level	100 % I_{set}, ± 5 % or ± 1 % · I_{rated}
IT min. operate time	0 to 20 s
DT delay setting t_{delay}	0 to 20 s
DT basic operate time for NPS 2 · I_{set} 5 · I_{set}	 65 ms ± 10 ms 60 ms ± 10 ms
DT basic operate time for magnitude - 2 · I_{set} 5 · I_{set}	 60 ms ± 10 ms 50 ms ± 10 ms
DT operate time following delay	t_{delay} ± 1 % or ± 30 ms
Tm time multiplier	0.025 to 2.0
Disengaging time	< 80 ms
Inhibited by	Binary or virtual input

46BC Broken Conductor Protection

46BC setting, NPS to PPS ratio	20 to 100 %
Delay setting t_{delay}	0.03, 04, 20.0, 20.1, 100, 101, 1000, 1010 to 14400 s
Operate level I_{op}	100 % I_{set} ± 5 % or 1% of I_{rated}
Reset level	90 % I_{op} ± 5 %
Basic operate time t_{basic}	1 · I_{rated} to 0 A: 40 ms
Operate time	t_{delay} + t_{basic} , ± 1 % or ± 20 ms

46NPS Negative Sequence Overcurrent Protection

Number of elements	DT & IT
DT setting range I_{set}	0.05 to 4.0 · I_{rated}
DT operate level	100 % I_{set}, ± 5 % or ± 1 % · I_{rated}
DT delay setting t_{delay}	0.00, 0.01 to 20, 20.5 to 100,101 to 1000, 1010 to 10000, 10100 to 14400 s
DT basic operate time 0 to 2 · I_{set} 0 to 5 · I_{set}	 40 ms ± 10 ms 30 ms ± 10 ms
DT operate time following delay	t_{basic} +t_{delay} , ± 1 % or ± 10 ms
IT char setting	IEC NI,VI,EI,LTI, ANSI MI,VI,EI & DTL
IT setting range	0.05 to 2.5
Tm time multiplier	0.025, 0.030 to 1.6, 1.7 to 5, 6 to 100
Char operate level	105 % I_{set}, ± 4 % or ± 1 % I_{rated}
Overshoot time	< 40 ms
Inhibited by	Binary or virtual input

46PhRev Phase Reversal

NPS to PPS ratio	20 to 100 %
Delay setting	0 to 14400 s
Operate level	100 % I_{set} ± 5 %
Reset level	> 85 % I_{op},
Basic operate time	1 · I_{rated} to 0 A (60 ms)
Operate time	t_{basic} + t_{delay}, ± 1 % or ± 20 ms

47NPS Sequence Overvoltage Protection

Number of elements	2
Setting range V_{set}	1 to 90 V
Hysteresis setting	0 to 80 %
Operate level	100 % V_{set}, ± 2 % or ± 0.5 V
Delay setting t_{delay}	0.00, 0.01 to 20, 20.5 to 100, 101 to 1000, 1010 to 10000, 10100 to 14400 s
Basic operate time: 0 V to 1.5 · V_{set} 0 V to 10 · V_{set}	 80 ms ± 20 ms 55 ms ± 20 ms
Operate time following delay	t_{basic} + t_{delay} , ± 2 % or ± 20 ms
Overshoot time	< 40 ms
Inhibited by	Binary or virtual input, voltage guard

48 Starting-Time Supervision

Max. no. of starts	OFF, 1 to 20
Max. starts period	1 to 60 minutes

Start inhibit delay	1 to 60 minutes
Time between starts	OFF, 1 to 60 minutes

49 Thermal Overload Protection (7SR10)

Operate levels	Operate and alarm
Setting range I_{set}	0.10 to 3.0 · I_{rated}
Operate level	100 % I_{set}, ± 5 % or ± 1 % · I_{rated}
Time constant setting	1 to 1000 min
Operate time (minutes)	$t = \tau \cdot I_n \left[\frac{I^2 - I_{pre-load}^2}{I^2 - (k \cdot I_B)^2}\right]$ t = Time in minutes τ = 49 Time Constant setting (minutes) I = Measured thermal current I_n = Log natural I_P = Previous steady state current level/pre-load k = Constant (predefined, k = 1.05) I_B = Basic current, typically same as I_n k.I_B = 49 Overload Setting (I_θ)
Alarm level	Disabled, 50 to 100 %
Inhibited by	Binary or virtual input

49 Thermal Overload Protection (7SR105)

Operate levels	Operate and alarm
Setting range I_{set}	0.10 to 3.0 · I_{rated}
NPS weighting factor (K)	0.1 to 10.0 Δ 0.1
Tauh heating constant	0.5 to 1000 min, Δ 0.5 min
Taus starting constant	0.005 to 1.0 · Tauh , Δ 0.005
Tauc cooling constant	1 to 100 · Tauh , Δ 1
Hot/cold ratio	OFF, 1 to 100 %, Δ 1 %
Operate level	100 % I_{set}, ± 5 % or ± 1 % · I_{rated}
Time constant setting	1 to 1000 min
Operate time (minutes)	$t = \tau \cdot \ln\left[\frac{I_{equiv}^2 - \left(1 - \frac{H}{C}\right) I_{pre-load}^2}{I_{equiv}^2 - I_\theta^2}\right]$ t ± 5 % or ± 100 ms (Iθ: 0.3 to 3 · I_{rated} $I_{equiv} = \sqrt{I_1^2 + kI_2^2}$ τ = Thermal heating time constant (49 Tauh - heating constant or 49 Taus - starting constant) $\frac{H}{C}$ = Hot/cold ratio setting I_1 = Positive phase sequence current I_2 = Negative phase sequence current I_{equiv} = Equivalent heating current $I_{pre-load}$ = Pre-load current I_θ = Thermal overload setting current K = NPS weighting factor ln = Natural logarithm
Capacity alarm level	Disabled, 50 to 100 %
Load alarm level	OFF, 0.5 to 1.0 · Iθ, Δ 0.05
Thermal restart inhibit	20 to 100 %, Δ 1 %
Inhibited by	Binary or virtual input

50 Instantaneous Overcurrent – Phase / 67 Directional Overcurrent – Phase

Operation	Non-directional, forward and reverse
Elements	Phase fault
Setting range I_{set} (50)	0.05 to 50 · I_{rated}
Time delay	0.00 to 14400 s
Operate level I_{op}	100 % I_{set}, ± 5 % or ± 1 % · I_{rated}
Reset level	≥ 95 % I_{op}
Operate time	0 to 2 · I_{set} - 35 ms, ± 10 ms 0 to 5 · I_{set} - 25 ms, ± 10 ms
Directional (67)	Typically 32 ms, < 40 ms at characteristic angle + 50 element operate time
Operate time following delay	t_{basic} + t_{delay} , ± 1 % or ± 10 ms
Inhibited by	Binary or virtual input Inrush detector VT supervision

50AFD Arc Flash Detection

Setting	1 to 10 · I_{rated}
Operate level (no DC transient) I_{op}	100 % I_{set}, ± 10 %
Reset level	≥ 95 % I_{op}

Repeatability	± 5 %
50AFD Overcurrent operate time t_{basic}	10 ms - 16 ms
AFD Zone Operate time (Flash and 50AFD) t_{op}	15 ms - 25 ms
Repeatability	± 10 ms
Disengaging time	< 50 ms

50BCL Break Capacity Limit

Setting	1.0 to 50 · I_{rated}
Operate level	100 % I_{set}, ± 5 % or ± 1 % I_{rated}
Reset level	≥ 95 % I_{op}
Element basic operate time	0 to 2 · I_{set}: 20 ms or ± 10 ms 0 to 5 · I_{set}: 15 ms or ± 10 ms

50BF Circuit-Breaker Failure Protection – 3 Pole

Operation	Current check – phase and measured earth with independent settings Mechanical trip CB faulty monitor
Setting range I_{set}	0.05 to 2.0 · I_{rated}
2 stage time delays	Timer 1: 20 to 60000 ms Timer 2: 20 to 60000 ms
Operate level	100 % I_{set}, ± 5 % or ± 1 % · I_{rated}
Disengaging time	< 20 ms
Operate time following delay	Tcbf ± 1 % or ± 20 ms
Triggered by	Any function mapped as trip contact
Inhibited by	Binary/virtual input
Timer by pass	Yes, 50BF CB faulty input

50G Instantaneous Earth Fault – Measured / 67G Directional Earth Fault – Measured

Operation	Non-directional, forward and reverse
Elements	Measured earth fault
Setting range I_{set} (50G)	0.05 to 50 · I_{rated}
Time delay	0.00 to 14400 s
Operate level I_{op}	100 % I_{set}, ± 5 % or ± 1 % · I_{rated}
Reset level	≥ 95 % I_{op}
Operate time	0 to 2 · I_{set} - 35 ms, ± 10 ms 0 to 5 · I_{set} - 25 ms, ± 10 ms
Directional (67G)	Typically 32 ms, < 40 ms at characteristic angle + 50G element operate time
Operate time following delay	t_{basic} + t_{delay} , ± 1 % or ± 10 ms
Inhibited by	Binary or virtual input Inrush detector VT supervision

50LC Line Check / 50GLC Line-Check Overcurrent Protection

Setting I_{set}	0.05 to 50 · I_{rated}
Delay setting t_{delay}	0.00 to 14400 s
Operate level I_{op}	100 % I_{set}, ± 5 % or ± 1 % I_{rated}
Reset level Repeatability	≥ 95 % I_{op} ± 1 %
Element basic operate time t_{basic} [15]	0 to 2 · I_{set}: 35 ms, ± 10 ms 0 to 5 · I_{set}: 25 ms, ± 10 ms
Operate time following delay t_{op} [15]	t_{basic} + t_{delay} , ± 1 % or ± 10 ms
Repeatability	± 1 % or ± 10 ms
Overshoot time	< 40 ms
Disengaging time	< 50 ms

50N Instantaneous Earth Fault – Calculated / 67N Directional Earth Fault – Calculated

Operation	Non-directional, forward and reverse
Elements	Derived earth fault
Setting range I_{set} (50N)	0.05 to 50 · I_{rated}
Time delay	0.00 to 14400 s
Operate level I_{op}	100 % I_{set}, ± 5 % or ± 1 % · I_{rated}
Reset level	≥ 95 % I_{op}
Operate time	0 to 2 · I_{set} - 40 ms, ± 10 ms 0 to 5 · I_{set} - 30 ms, ± 10 ms
Directional (67N)	Typically 32 ms, < 40 ms at characteristic angle + 50N element operate time
Operate time following delay	t_{basic} + t_{delay} , ± 1 % or ± 10 ms
Inhibited by	Binary or virtual input Inrush detector VT supervision

50SEF Instantaneous Sensitive Earth Fault – Measured / 67SEF Directional Sensitive Earth Fault – Measured

Operation	Non-directional, forward and reverse
Elements	Sensitive earth fault
Setting range I_{set} (50SEF)	0.005 to 5 · I_{rated} 0.005 to 1.6 · I_{rated} [16]
Time delay	0.00 to 14400 s
Operate level I_{op}	100 % I_{set}, ± 5 % or ± 1 % · I_{rated}
Reset level (50SEF)	≥ 95 % I_{op} or I_{op} - 0.1 % · I_{rated}

15 Additional 9 ms to be considered when binary input is used for initiating 50LC.

16 Applicable for MLFB 7SR1004-5-20-2CAO

Operate time	0 to 2 · I_{set} - 35 ms, ± 10 ms 0 to 5 · I_{set} - 25 ms, ± 10 ms
Operate time (67SEF)	Typically 32 ms, < 40 ms at characteristic angle + 50SEF element operate time
Operate time following delay	t_{basic} + t_{delay} , ± 1 % or ± 10 ms
Inhibited by	Binary or virtual input Inrush detector VT supervision
Directional SEF – Wattmetric	
Setting (P_o)	0.05 to 20 · I_{rated} · W (where I_{rated} = 1 A or 5 A)
Operate level (P_{op})	100 % P_o, ± 25 % or ± 25 mW
Reset level	≥ 90 % P_{op}
Element basic operate time t_{basic}	< 50 ms
Repeatability	± 1 % or ± 10 ms

67SEF Directional Sensitive Earth Fault – Measured 3V0/I0, φ

Setting range I_{set}	0.01 to 0.5 · I_{rated}
Elements	Sensitive earth fault for resonant and isolated networks
Characteristic angle (CA)	-180° to +180°
Operating angle (OA)	0° to 180°
Operate level	100 % I_{set}, ± 5 % or 1 mA for I_{rated}= 1 A
	100 % I_{set}, ± 5 % or 5 mA for I_{rated}= 5 A
Reset level	≥ 90 % I_{op}
Operating angle accuracy (forward)	CA+OA±3° to CA-OA±3°
Non-directional element operating time	0 to 2 · I_{set} - 35 ms, ± 10 ms 0 to 5 · I_{set} - 25 ms, ± 10 ms
Directional element operate time t_{basic}	Typically 35 ms, < 50 ms at characteristic angle + non-directional element operate time
Operate time following delay	t_{basic} + t_{delay} , ± 1 % or ± 10 ms
Reset time	< 100 ms

50SEFLC Line Check Sensitive Earth Fault – Measured

Setting range I_{set}	0.005 to 5 · I_{rated}
	0.005 to 1.6 · I_{rated} [17]
Delay setting t_{delay}	0.00 to 14400 s
Operate level I_{op}	100 % I_{set}, ± 5 % or ± 1 % I_{rated}
Reset level	≥ 95 % I_{op} or I_{op} - 0.1 % I_{rated}
Repeatability	± 1 %
Element basic operate time t_{basic}	0 to 2 · I_{set}: 35 ms, ± 10 ms 0 to 5 · I_{set}: 25 ms, ± 10 ms
Operate time following delay t_{op}	t_{basic} + t_{delay} , ± 1 % or ± 10 ms
Repeatability	± 1 % or ± 10 ms
Overshoot time	< 40 ms
Disengaging time	< 50 ms

51 Time-Delayed Overcurrent – Phase / 67 Directional Overcurrent – Phase

Operation	Non-directional, forward and reverse
Elements	Phase fault
Characteristic	IEC-NI, -VI, -EI, -LTI; ANSI-MI, -VI, -EI; DTL
Setting range I_{set} (51)	0.05 to 4 · I_{rated}
Time multiplier	0.01, 0.015 to 1.6, 1.7 to 5, 6 to 100
Time delay	0 to 20 s
Operate level	105 % I_{set}, ± 4 % or ± 1 % · I_{rated}
Operate time IEC	$t_{op} = \left[\frac{K}{\left(\frac{I}{I_{set}}\right)^{\alpha} - 1}\right] \cdot Tm$
ANSI	$t_{op} = \left[\frac{A}{\left(\frac{I}{I_{set}}\right)^{P} - 1} + B\right] \cdot Tm$
Reset time IEC and ANSI Decaying curve	$t_{res} = \left[\frac{R}{\left\{1 - \left(\frac{I}{I_{set}}\right)^{2}\right\}}\right] \cdot Tm$
Directional (67)	± 5 % or absolute ± 40 ms for TMS setting (0.01 to 0.245) ± 5 % or absolute ± 30 ms for TMS setting (0.25 to 100) Typically 32, < 40 ms at characteristic angle + 51 element operate time
Follower delay	0 s to 20 s
Reset	ANSI decaying, 0 s to 60 s
Inhibited by	Binary or virtual input Inrush detector VT supervision

51G Time-Delayed Earth Fault – Measured / 67G Directional Earth Fault – Measured

Operation	Non-directional, forward and reverse
Elements	Measured earth fault
Characteristic	IEC-NI, -VI, -EI, -LTI; ANSI-MI, -VI, -EI; DTL
Setting range I_{set} (51G)	0.05 to 4 · I_{rated}(7SR10) 0.01 to 0.5 · I_{rated}(7SR105)
Time multiplier	0.01, 0.015 to 1.6, 1.7 to 5, 6 to 100
Time delay	0 to 20 s

17 Applicable for MLFB 7SR1004-5-20-2CAO

Operate level	105 % I_{set}, ± 4 % or ± 1 % · I_{rated}
Operate time IEC ANSI	$t_{op} = \left[\frac{K}{\left(\frac{I}{I_{set}}\right)^{\alpha} - 1}\right] \cdot Tm$ $t_{op} = \left[\frac{A}{\left(\frac{I}{I_{set}}\right)^{P} - 1} + B\right] \cdot Tm$
Reset time IEC ANSI	$t_{res} = \left[\frac{R}{\left\{1 - \left(\frac{I}{I_{set}}\right)^{2}\right\}}\right] \cdot Tm$ $t_{res} = \left[\frac{R}{\left\{1 - \left(\frac{I}{I_{set}}\right)^{2}\right\}}\right] \cdot Tm$
Directional (67G)	± 5 % or absolute ± 40 ms for TMS setting (0.01 to 0.245) ± 5 % or absolute ± 30 ms for TMS setting (0.25 to 100) Typically 32, < 40 ms at characteristic angle + 51G element operate time
Follower delay	0 s to 20 s
Reset	ANSI decaying, 0 s to 60 s
Inhibited by	Binary or virtual input Inrush detector VT supervision

51N Time-Delayed Earth Fault – Calculated / 67N Directional Earth Fault – Calculated

Operation	Non-directional, forward and reverse
Elements	Derived earth fault
Characteristic	IEC-NI, -VI, -EI, -LTI; ANSI-MI, -VI, -EI; DTL
Setting range I_{set} (51N)	0.05 to 4 · I_{rated}
Time multiplier	0.01, 0.015 to 1.6, 1.7 to 5, 6 to 100
Time delay	0 to 20 s
Operate level	105 % I_{set}, ± 4 % or ± 1 % · I_{rated}
Operate time IEC ANSI	$t_{op} = \left[\frac{K}{\left(\frac{I}{I_{set}}\right)^{\alpha} - 1}\right] \cdot Tm$ $t_{op} = \left[\frac{A}{\left(\frac{I}{I_{set}}\right)^{P} - 1} + B\right] \cdot Tm$
Reset time IEC ANSI	$t_{res} = \left[\frac{R}{\left\{1 - \left(\frac{I}{I_{set}}\right)^{2}\right\}}\right] \cdot Tm$ $t_{res} = \left[\frac{R}{\left\{1 - \left(\frac{I}{I_{set}}\right)^{2}\right\}}\right] \cdot Tm$
Directional (67N)	± 5 % or absolute ± 40 ms for TMS setting (0.01 to 0.245) ± 5 % or absolute ± 30 ms for TMS setting (0.25 to 100) Typically 32, < 40 ms at characteristic angle + 51N element operate time
Follower delay	0 s to 20 s
Reset	ANSI decaying, 0 s to 60 s
Inhibited by	Binary or virtual input Inrush detector VT supervision

51SEF Time-Delayed Sensitive Earth Fault – Measured / 67SEF Directional Sensitive Earth Fault – Measured

Operation	Non-directional, forward and reverse
Elements	Sensitive earth fault
Characteristic	IEC-NI, -VI, -EI, -LTI; ANSI-MI, -VI, -EI; DTL
Setting range I_{set} (51SEF)	0.005 to 0.5 · I_{rated}
Time multiplier	0.01, 0.015 to 1.6, 1.7 to 5, 6 to 100
Time delay	0 to 20 s
Operate level	105 % I_{set}, ± 4 % or ± 1 % · I_{rated}
Operate time IEC ANSI	$t_{op} = \left[\frac{K}{\left(\frac{I}{I_{set}}\right)^{\alpha} - 1}\right] \cdot Tm$ $t_{op} = \left[\frac{A}{\left(\frac{I}{I_{set}}\right)^{P} - 1} + B\right] \cdot Tm$
Reset time IEC ANSI	$t_{res} = \left[\frac{R}{\left\{1 - \left(\frac{I}{I_{set}}\right)^{2}\right\}}\right] \cdot Tm$ $t_{res} = \left[\frac{R}{\left\{1 - \left(\frac{I}{I_{set}}\right)^{2}\right\}}\right] \cdot Tm$

Directional (67SEF)	± 5 % or absolute ± 40 ms for TMS setting (0.01 to 0.245) ± 5 % or absolute ± 30 ms for TMS setting (0.25 to 100) Typically 32, < 40 ms at characteristic angle + 51SEF element operate time
Follower delay	0 s to 20 s
Reset	ANSI decaying, 0 s to 60 s
Inhibited by	Binary or virtual input Inrush detector VT supervision

51V Voltage-Dependent Overcurrent Protection

Setting range	5 to 200 V
Operate level	100 % V_{set}, ± 5 % or ± 1 % · V_{rated}
Multiplier	0.25 to 1 · 51 I_{set}
Inhibited by	VT supervision

55 Power Factor

Number of elements	2
Operation	Under or over, lead or lag
U/C guard	0.05 to 1.0
Setting range PF_{set}	0.05 to 0.99
Time delays	0 to 14400 s
Operate level	± 0.05
Basic operate time	≤ 80 ms
Operate time following delay	t_{basic} + t_{delay} ± 1 % or ± 10 ms
Inhibited by	Undercurrent guard, VTS, binary/virtual input

59N Neutral Voltage Displacement

Number of elements	DT & IT
DT setting range I_{set}	1 to 100 V
DT operate level	100 % V_{set}, ± 2 % or ± 0.5 V
DT delay setting t_{delay}	0 to 14400 s
DT basic operate time: 0 V to 1.5 · V_{set} 0 V to 10 · V_{set}	 76 ms ± 20 ms 63 ms ± 20 ms
DT operate time following delay	t_{basic} + t_{delay} ± 1 % or ± 20 ms
IT char setting	IDMTL & DTL
IT setting range	1 to 100 V
Tm time multiplier (IDMT)	0.1 to 140
Delay (DTL)	0 to 20 s
Reset	0 to 60 s
Char operate level	105 % V_{set}, ± 2 % or ± 0.5 V
Inhibited by	Binary or virtual input

60CTS CT Supervision

CT	Current or V_{nps} & I_{nps}

60VTS VT Supervision

VT	NPS/ZPS

64H Restricted Earth Fault Protection – High-Impedance

Setting range	SEF input EF input	0.005, 0.006 to 0.100, 0.105 to 0.950 · I_{rated} 0.05, 0.055 to 0.95 · I_{rated}
Operate level	100 % I_{set}, ± 5 % or ± 1 % · I_{rated}	
Time delay	0.00 to 14400 s	
Basic operate time	0 to 2 · I_{set} 45 ms ± 10 ms 0 to 5 · I_{set} 35 ms ± 10 ms	
Inhibited by	Binary or virtual input	

66 Number of Starts

Max. number of starts	OFF, 1 to 20
Max. starts period	1 to 60 minutes
Start inhibit delay	1 to 60 minutes
Time between starts	OFF, 1 to 60 minutes

74CC Close-Circuit Supervision

Number of supervisable circuits	3 x close
Number of BI's required	1 or 2 per function

74TC Trip-Circuit Supervision

Number of supervisable circuits	3 x trip
Number of BI's required	1 or 2 per function

NOTE

Use the correct threshold voltages for BI when using TCS with 2 BI.

79 Automatic Reclosing

Operating mode	Phase, earth, SEF, external
Number of reclose	1 to 4
Number of trips to lockout	1 to 5
Dead time	0 to 14400
Reclaim timer	0 to 600
Lockout reset	CB, timer & BI

81 Frequency Protection – "f>" or "f<"

Number of elements	4 under or over
Under voltage guard	Yes/no
Setting range Hz	43 to 68 Hz
Hysteresis setting	0 to 2 %
Operate level	100 % f_{set} ± 10 mHz

Operate time	Typical < 190 ms
Operate delay V_{set}	0 to 14400 s

81HBL2 Inrush Current Detection

I setting (Ratio of 2nd harmonic current to fundamental component current)	0.10 to 0.5
Element basic operate time t_{basic}	Will pickup before operation of any protection element due to magnetic inrush
Reset time	Will operate until drop-off of any protection element due to magnetic inrush

81I_THD Total Harmonic Distortion Supervision

Setting I_{THD}	5 to 100 %
Delay setting t_{delay}	0.02, 0.03 to 20.00, 20.10 to 100, 101 to 1000, 1010 to 10000, 10100 to 14400 s

TEMP Temperature Supervision

Temperature input type (temperature coefficient resistance based on DIN/IEC 60751 standard)	Cu10 (0.00427), Ni100 (0.00618), Pt100 (0.00385), Ni120 (0.00672), Pt250 (0.00385), Ni250 (0.00618), and Pt1000 (0.00385)
Temperature input alarm	0 to 250 °C
Temperature input trip	0 to 250 °C
Operate value	100 % T_{set}, ± 2% or ± 2 °C, For Cu10: ± 2 % or ± 5 °C
Response time	< 3 s
Sensing current	≤ 0.5 mA
Maximum lead resistance	25 Ω/lead; For Cu10: 2.5 Ω/lead

Control Functions

CB	Trip/close
AR	In/out
Inst prot	In/out
EF	In/out
SEF	In/out
Hot line	In/out
Relay mode	Local/remote/local or remote
Reset	LEDs & BOs (test/reset key)
Motor (7SR105)	Start/stop

CB Maintenance

Trip counter	Total and delta, 0 to 10000
Alarm I^2t	10 to 100000

Ordering Information – 7SR10 Non-Directional Overcurrent Relay

Product Description	Order Number																					
	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16		17	18	19	20
7SR10 Argus	7	S	R	1	0	0	□	–	□	□	□	□	0	–	□		□	|		□	□	□	□
							|		|	|	|	|			|	|	|	|		|	|	|	|
Non-Directional O/C Relay (Argus)							|		|	|	|	|			|	|	|	|		|	|	|	|
Case, I/O and Fascia							|		|	|	|	|			|	|	|	|		|	|	|	|
Size 4 moulded case, 4 CT, 3 binary inputs, 3 binary outputs, 10 LEDs							2		1	|	|	|			|	|	A	0		|	|	|	|
Size 4 moulded case, 4 CT, 6 binary inputs, 6 binary outputs, 10 LEDs							3		|	|	|	2		|	|	|	0		|	|	|	|
Size 4 moulded case, 4 CT, 9 binary inputs, 6 binary outputs, 10 LEDs							3		|	M	|	2		|	|	|	1		|	|	|	|
							|		|	|	|	|		|	|	|	|		|	|	|	|
Measuring Input							|		|	|	|	|		|	|	|	|		|	|	|	|
1 A/5 A, 50 Hz/60 Hz [18]							2/3		1	|	|	|			|	|	|	|		|	|	|	|
1 A/5 A, 50 Hz /60 Hz with SEF input [19]							3		2	|	|	|			|	|	|	|		|	|	|	|
							|		|	|	|	|		|	|	|	|		|	|	|	|
Auxiliary Voltage							|		|	|	|	|		|	|	|	|		|	|	|	|
AC 60 V to AC 240 V/DC 60 V to DC 240 V, binary input threshold AC 44 V/DC 44 V							|		|	L	|	|		|	|	|	0		|	|	|	|
AC 60 V to AC 240 V/DC 60 V to DC 240 V, binary input threshold AC 88 V/DC 88 V							|		|	K	|	|		|	|	|	0		|	|	|	|
DC 24 V to DC 60 V, binary input threshold DC 19 V							|		|	J	|	|		|	|	|	0		|	|	|	|
DC 24 V to DC 240 V/AC 48 V to AC 240 V, binary input threshold AC/DC 19 V							|		1	M	|	|		|	|	|	1		|	|	|	|
							|				|	|		|	|	|	|		|	|	|	|
Protective Cover							|				|	|		|	|	|	|		|	|	|	|
Standard version – no cover							|				A	|		|	|	|	|		|	|	|	|
Plastic cover with 1 push button for test/reset							|				B	|		|	|	|	|		|	|	|	|
							|					|		|	|	|	|		|	|	|	|
Communication							|					|		|	|	|	|		|	|	|	|
Front port: USB							2					1			|	|	|	|		|	|	|	|
Front port: USB and rear port: RS-485 supporting IEC 60870-5-103 or Modbus RTU or DNP 3.0							2/3					2			|	|	|	|		|	|	|	|
															|	|	|	|		|	|	|	|
Front Fascia															|	|	|	|		|	|	|	|
Standard version – with breaker control push buttons															2	|	|	|		|	|	|	|
																|	|	|		|	|	|	|
Protection and Supervision Function Packages																C	|	|		|	|	|	|
Standard version – included in all models																|	|	|		|	|	|	|
37 Undercurrent protection – phase																|	|	|		|	|	|	|
37G Undercurrent earth fault – measured [18]																|	|	|		|	|	|	|
37SEF Undercurrent earth fault - sensitive [19]																|	|	|		|	|	|	|
46BC Broken conductor detection																|	|	|		|	|	|	|
46NPS Negative sequence overcurrent protection																|	|	|		|	|	|	|
49 Thermal overload protection																|	|	|		|	|	|	|
50 Instantaneous overcurrent – phase																|	|	|		|	|	|	|
50AFD Arc flash detection [20]																|	|	|		|	|	|	|
50BF Circuit-breaker failure protection – 3-pole																|	|	|		|	|	|	|
50G Instantaneous earth fault – measured																|	|	|		|	|	|	|
50GLC Line-check overcurrent protection																|	|	|		|	|	|	|
50LC Line check																|	|	|		|	|	|	|

18 4CT is configured as 3PF + EF

19 4CT is configured as 3PF + SEF

20 Refer 7XG31XX documents for Arc Fault Interface Module and sensor ordering information.

Ordering Information

Product Description	Order Number							
50N Instantaneous earth fault – calculated	|	|	|		|	|	|	|
50SEF Instantaneous sensitive earth fault – measured [19] [21]	|	|	|		|	|	|	|
50SEFLC Line check sensitive earth fault – measured	|	|	|		|	|	|	|
51 Time-delayed overcurrent – phase	|	|	|		|	|	|	|
51CL Cold load overcurrent – phase	|	|	|		|	|	|	|
51G Time delayed earth fault – measured	|	|	|		|	|	|	|
51N Time-delayed earth fault – calculated	|	|	|		|	|	|	|
51SEF Time-delayed sensitive earth fault – measured [19] [21]	|	|	|		|	|	|	|
60CTS CT supervision	|	|	|		|	|	|	|
64H Restricted earth fault protection – high-impedance	|	|	|		|	|	|	|
74CC Close-circuit supervision	|	|	|		|	|	|	|
74TC Trip-circuit supervision	|	|	|		|	|	|	|
81HBL2 Inrush current detection [22]	|	|	|		|	|	|	|
81I_THD Total harmonic distortion supervision	|	|	|		|	|	|	|
86 Lockout	|	|	|		|	|	|	|
Programmable logic	|	|	|		|	|	|	|
	|	|	|		|	|	|	|
Standard Version – Plus	|	|	|		|	|	|	|
79 Automatic reclosing	D	|	|		|	|	|	|
	|	|	|		|	|	|	|
Conformal Coat	|	|	|		|	|	|	|
Standard version - No conformal coating on PCBA	|	A	|		|	|	|	|
Conformal coating on PCBA	|	B	|		|	|	|	|
	|		|					
Additional Hardware	|		|					
No additional BI/BO	|		0					
3 BI additional	|		1					
	|				|	|	|	|
Special version [23]	D				Z	Y	2	0

21 Only with position 7 = 3

22 Not available on SEF input

23 Special version for Turkey market with thermal withstand capability of 500 A (5 A CT), 1 sec and supporting Turkish scripts. Applicable only for MLFBs 7SR1003-1[L/J]A20-2DA0-ZY20 and 7SR1003-1MA20-2Dx1-ZY20.

Ordering Information – 7SR10 Directional Overcurrent Relay

Product Description	Order Number																				
	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16				
7SR10 Argus	7	S	R	1	0	0	□	–	□	□	□	□	0	–	□		□	0	□	□	□	□
							|		|	|	|	|			|	|	|		|	|	|	|
Directional O/C Relay (Argus)							|		|	|	|	|			|	|	|		|	|	|	|
Case, I/O and Fascia							|		|	|	|	|			|	|	|		|	|	|	|
Size 4 moulded case, 4 CT, 3 VT, 9 binary inputs, 6 binary outputs, 10 LEDs							4		|	|	|	|			|	|	|		|	|	|	|
									|	|	|	|			|	|	|		|	|	|	|
Measuring Input									|	|	|	|			|	|	|		|	|	|	|
1 A/5 A, 40 V to 160 V, 50 Hz/60 Hz [24]									3	|	|	|			|	|	|		|	|	|	|
1 A/5 A, with SEF input, 40 V to 160 V, 50 Hz/60 Hz [25]									4	|	|	|			|	|	|		|	|	|	|
1 A/5 A, 50 Hz/6 0Hz with SEF input, 63.5 V/110 V [26]									5	|	|	|			|	|	|		|	|	|	|
										|	|	|			|	|	|		|	|	|	|
Auxiliary Voltage										|	|	|			|	|	|		|	|	|	|
AC 60 V to AC 240 V/DC 60 V to DC 240 V, binary input threshold AC 44 V/DC 44 V										L	|	|			|	|	|		|	|	|	|
AC 60 V to AC 240 V/DC 60 V to DC 240 V, binary input threshold AC 88 V/DC 88 V										K	|	|			|	|	|		|	|	|	|
DC 24 V to DC 60 V, binary input threshold DC 19 V										J	|	|			|	|	|		|	|	|	|
											|	|			|	|	|		|	|	|	|
Protective Cover											|	|			|	|	|		|	|	|	|
Standard version – no cover											A	|			|	|	|		|	|	|	|
Plastic cover with 1 push button for test/reset											B	|			|	|	|		|	|	|	|
												|			|	|	|		|	|	|	|
Communication												|			|	|	|		|	|	|	|
Front port: USB and rear port: RS-485 supporting IEC 60870-5-103 or Modbus RTU or DNP 3.0												2			|	|	|		|	|	|	|
															|	|	|		|	|	|	|
Front Fascia															|	|	|		|	|	|	|
Standard version – with breaker control push buttons															2	|	|		|	|	|	|
																|	|		|	|	|	|
Protection and Supervision Function Packages																C	|		|	|	|	|
Standard version – included in all models																|	|		|	|	|	|
27 Undervoltage protection – 3-phase																|	|		|	|	|	|
32 Power protection																|	|		|	|	|	|
32S Sensitive power protection [25]																|	|		|	|	|	|
37 Undercurrent protection – phase																|	|		|	|	|	|
37G Undercurrent earth fault – measured [24]																|	|		|	|	|	|
37SEF Undercurrent earth fault - sensitive [25]																|	|		|	|	|	|
46BC Broken conductor detection																|	|		|	|	|	|
46NPS Negative sequence overcurrent protection																|	|		|	|	|	|
47NPS Sequence overvoltage protection																|	|		|	|	|	|
49 Thermal overload protection																|	|		|	|	|	|
50 Instantaneous overcurrent – phase																|	|		|	|	|	|
50AFD Arc flash detection [27]																|	|		|	|	|	|
50BF Break capacity limit																|	|		|	|	|	|
50G Instantaneous earth fault – measured [24]																|	|		|	|	|	|
50GLC Line-check overcurrent protection																|	|		|	|	|	|
50LC Line check																|	|		|	|	|	|
50N Instantaneous earth fault – calculated																|	|		|	|	|	|

24 4CT is configured as 3PF + EF

25 4CT is configured as 3PF + SEF

26 4CT is configured as 3PF+SEF and this hardware supports Directional Earth fault V_0/I_0 Phase angle measurement function as per CEI 0-16:2012 specification. Refer to setting range for 7SR1004-5xx20-2CA0 for 50SEF and 50SEFLC functions. 81I_THD function is not available.

27 Refer 7XG31XX documents for Arc Fault Interface Module and sensor ordering information.

Ordering Information

Product Description	Order Number							
50SEF Instantaneous sensitive earth fault – measured [25]	|	|		|	|	|	|
50SEFLC Line check sensitive earth fault – measured	|	|		|	|	|	|
51 Time-delayed overcurrent – phase	|	|		|	|	|	|
51CL Cold load overcurrent – phase	|	|		|	|	|	|
51G Time delayed earth fault – measured [24]	|	|		|	|	|	|
51N Time-delayed earth fault – calculated	|	|		|	|	|	|
51SEF Time-delayed sensitive earth fault – measured [25]	|	|		|	|	|	|
51V Voltage-dependent overcurrent protection	|	|		|	|	|	|
55 Power factor	|	|		|	|	|	|
59 Overvoltage protection – 3-phase	|	|		|	|	|	|
59N Neutral voltage displacement	|	|		|	|	|	|
60CTS CT supervision	|	|		|	|	|	|
60VTS VT supervision	|	|		|	|	|	|
64H Restricted earth fault protection – high-impedance	|	|		|	|	|	|
67 Directional overcurrent – phase	|	|		|	|	|	|
67G Directional earth fault – measured	|	|		|	|	|	|
67N Directional earth fault – calculated	|	|		|	|	|	|
67SEF Directional sensitive earth fault – measured	|	|		|	|	|	|
67SEF Directional sensitive earth fault – measured 3V0/I0, φ (Resonant and Isolated Networks)[26]	|	|		|	|	|	|
74CC Close-circuit supervision	|	|		|	|	|	|
74TC Trip-circuit supervision	|	|		|	|	|	|
81 Frequency protection – "f>" or "f<"	|	|		|	|	|	|
81HBL2Inrush current detection [28]	|	|		|	|	|	|
81I_THD Total harmonic distortion supervision	|	|		|	|	|	|
86 Lockout	|	|		|	|	|	|
Programmable logic	|	|		|	|	|	|
	|	|		|	|	|	|
Standard Version – Plus	|	|		|	|	|	|
79 Automatic reclosing	D	|		|	|	|	|
	|	|		|	|	|	|
Conformal Coat	|	|		|	|	|	|
Standard version - No conformal coating on PCBA	|	A		|	|	|	|
Conformal coating on PCBA	|	B		|	|	|	|
	|			|	|	|	|
Special version [29]	D			Z	Y	2	0	

[28] Not available on SEF input

[29] Special version for Turkey market with thermal withstand capability of 500 A (5 A CT), 1 sec and supporting Turkish scripts. Applicable only for MLFBs 7SR1004-3xx20-2Dx0-ZY20.

Ordering Information – 7SR105 Motor Protection Relay

Product Description	Order Number																				
	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16				
7SR105 Rho	7	S	R	1	0	5	□	–	□	□	□	□	□	–	□	□	□	0	□	□	□	□
Case, I/O and Fascia							|		|	|	|	|	|		|	|	|		|	|	|	|
Size 4 moulded case, 4 CT inputs, 6 binary inputs, 6 binary outputs, 10 LEDs							3		|	|	|	|	|		|	|	|		|	|	|	|
									|	|	|	|	|		|	|	|		|	|	|	|
Measuring Input									|	|	|	|	|		|	|	|		|	|	|	|
1 A/5 A, 50 Hz/60 Hz									2	|	|	|	|		|	|	|		|	|	|	|
										|	|	|	|		|	|	|		|	|	|	|
Auxiliary Voltage										|	|	|	|		|	|	|		|	|	|	|
AC 60 V to AC 240 V/DC 60 V to DC 240 V, binary input threshold AC 44 V/DC 44 V										L	|	|	|		|	|	|		|	|	|	|
DC 24 V to DC 60 V, binary input threshold DC 19 V										J	|	|	1		|	|	|		|	|	|	|
											|	|	|		|	|	|		|	|	|	|
Protective Cover											|	|	|		|	|	|		|	|	|	|
Standard version – no cover											A	|	|		|	|	|		|	|	|	|
												|	|		|	|	|		|	|	|	|
Communication												|	|		|	|	|		|	|	|	|
Front port: USB and rear port: RS-485 supporting IEC 60870-5-103 or Modbus RTU or DNP 3.0												2	|		|	|	|		|	|	|	|
													|		|	|	|		|	|	|	|
Temperature Input													|		|	|	|		|	|	|	|
Without RTD													1		|	|	|		|	|	|	|
6 RTD input													2		|	|	|		|	|	|	|
															|	|	|		|	|	|	|
Front Fascia															|	|	|		|	|	|	|
Standard version – with breaker control push buttons															2	|	|		|	|	|	|
																|	|		|	|	|	|
Protection Function Packages																E	|		|	|	|	|
Standard version – included in all models																|	|		|	|	|	|
14 Locked rotor protection																|	|		|	|	|	|
37 Undercurrent protection – phase																|	|		|	|	|	|
46 Phase unbalance protection																|	|		|	|	|	|
46PhRev Phase reversal																|	|		|	|	|	|
48 Starting-time supervision																|	|		|	|	|	|
49 Thermal overload protection																|	|		|	|	|	|
50 Instantaneous overcurrent – phase																|	|		|	|	|	|
50BCL Break capacity limit																|	|		|	|	|	|
50BF Circuit-breaker failure protection – 3-pole																|	|		|	|	|	|
50G Circuit-breaker failure protection – 3-pole																|	|		|	|	|	|
50N Instantaneous earth fault – calculated																|	|		|	|	|	|
51 Time-delayed overcurrent – phase																|	|		|	|	|	|
51G Time delayed earth fault – measured																|	|		|	|	|	|
51N Time-delayed earth fault – calculated																|	|		|	|	|	|
66 Number of starts																|	|		|	|	|	|
74CC Close-circuit supervision																|	|		|	|	|	|
74TC Trip-circuit supervision																|	|		|	|	|	|
81B Backspin monitor																|	|		|	|	|	|
CB counters																|	|		|	|	|	|
I^2T CB wears																|	|		|	|	|	|
Programmable logic																|	|		|	|	|	|
Standard Version Plus																|	|		|	|	|	|
Additional function in temperature input version model																F	|		|	|	|	|
Additional Functionality																|	|		|	|	|	|

Ordering Information

Product Description	Order Number								
Without conformal coating			A		|	|	|	|
With conformal coating			B		|	|	|	|

Indication of conformity

CE This product complies with the directive of the Council of the European Communities on harmonization of the laws of the Member States relating to electromagnetic compatibility (EMC Directive 2014/30/EU) and concerning electrical equipment for use within specified voltage limits (Low Voltage Directive 2014/35/EU) as well as restriction on usage of hazardous substances in electrical and electronic equipment (RoHS Directive 2011/65/EU).

This conformity has been proved by tests conducted by Siemens AG in accordance of the Council Directive in accordance with the product standard IEC/EN 60255-26 for the EMC directives, and with the standard IEC/EN 60255-27 for the low-voltage directive.
RoHS directive 2011/65/EU is met using the standard EN 63000. The device has been designed and produced for industrial use.

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Siemens AG
Smart Infrastructure
Digital Grid
Humboldtstraße 59
90459 Nuremberg
Germany
Web: www.siemens.com/reyrolle5
Customer Support: www.siemens.com/csc

For enquires please contact our Customer Support Center
Phone: +49 911 2155 4466
Email: energy.automation@siemens.com

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