SIEMENS

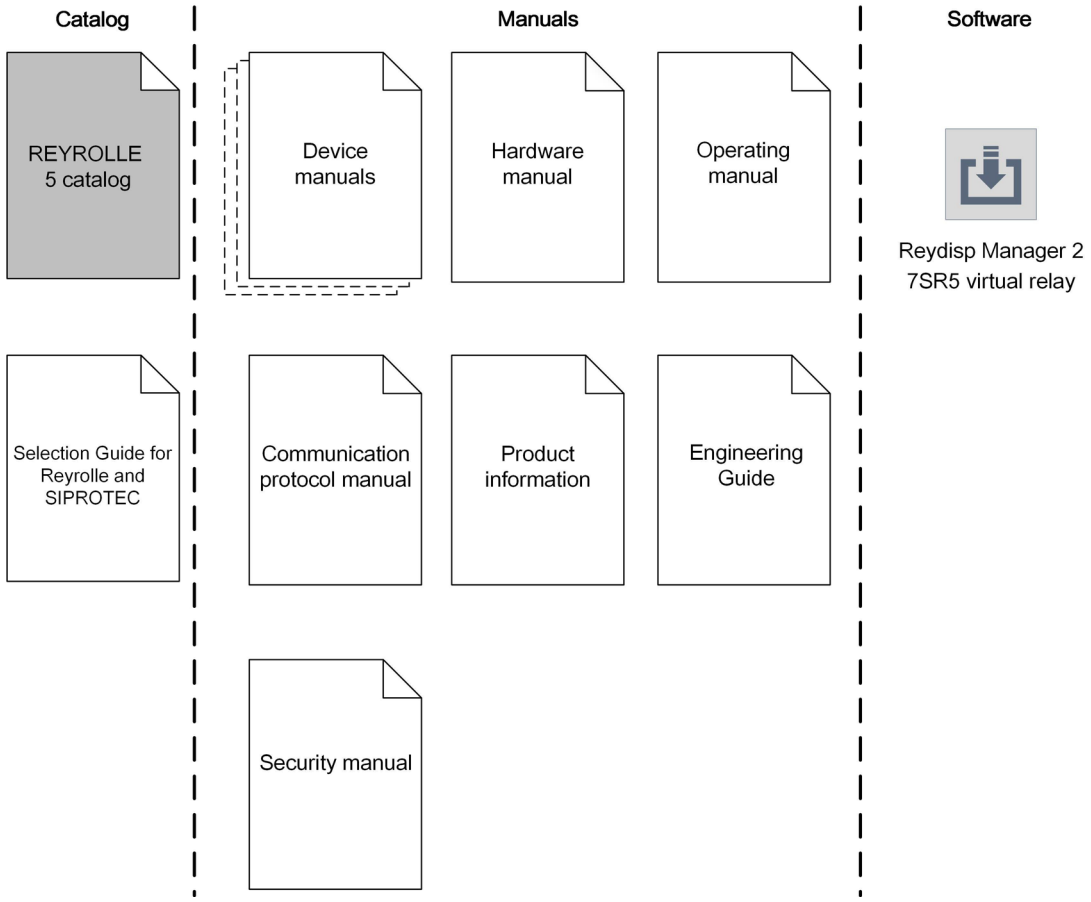
Ingenuity for life

Reyrolle 7SR5 Platform

Protecting Grids With Confidence

Catalog Reyrolle 7SR5 · Edition 4.0

Overview of documentation



Device manuals
Each device manual describes the functions and applications of a specific Reyrolle device. The printed manual for the device has the same informational structure.

Hardware manual
The hardware manual describes the hardware building blocks and device combinations of the Reyrolle device family.

Operating manual
The operating manual describes the basic principles and procedures for operating and installing the devices of the Reyrolle range.

Communication protocol manual
The communication protocol manual contains a description of the protocols for communication within the Reyrolle device family and to higher-level network control centers.

Security Manual
The security manual describes the security features of the Reyrolle 5 devices and Reydisp Manager.

Product information
The product information includes general information about device installation, technical data, limiting values for input and output modules, and conditions when preparing for operation. This document is provided with each Reyrolle device.

Engineering Guide
The engineering guide describes the essential steps when engineering with Reydisp Manager 2. In addition, the engineering guide shows you how to load a planned configuration to a Reyrolle device and update the functionality of the Reyrolle device.

Virtual Relay
The virtual relay allows a user to view, control and manipulate a virtual device. The virtual relay is a tool that can facilitate training and understanding of the controls and functions on a Reyrolle device.

Reyrolle 5 catalog
The Reyrolle 5 catalog describes the system features and the devices of Reyrolle 5.

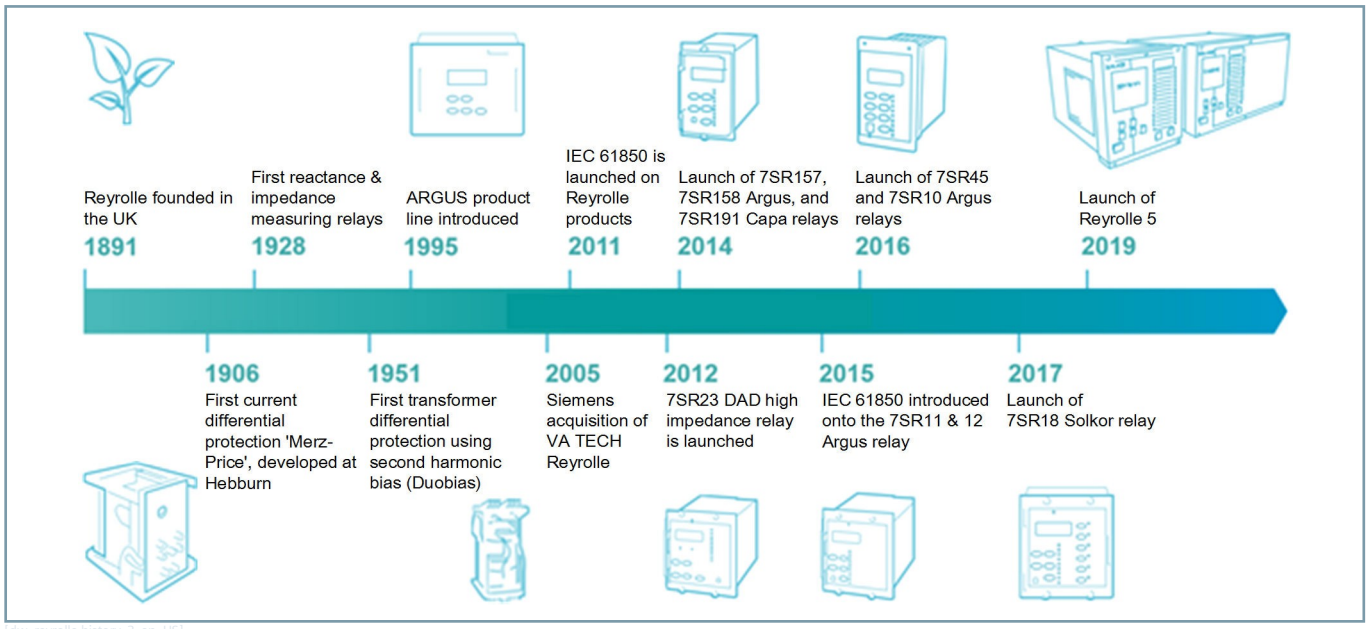
Selection guide for Reyrolle and SIPROTEC
The selection guide offers an overview of the device series of the Siemens protection devices, and a device selection table.

Digital Grid Reyrolle 7SR5 Platform Catalog

Catalog Reyrolle 5 - Edition 4.0

1

Reyrolle – Solutions for Distribution Grids



[dw_reyrolle history, 3, en_US]

Reyrolle digital protection products have established a strong reputation over many years of installed service experience with a large variety of users.

The new Reyrolle 7SR5 devices provide comprehensive functionality and can be implemented in a wide range of applications – typically subtransmission networks, distribution networks, and industrial installations. In these areas the 7SR5 is an integral component and helps provide a secure interconnected power system and is an important part of distributed energy-supply and demand systems.

The 7SR5 is the new generation of 7SR devices providing an updated user interface linking to the latest hardware platform and software implementation. The hardware platform offers a flexible solution relevant to changing power grids and load flows. The 7SR5 builds on the proven performance of the existing 7SR1 and 7SR2 products, the function implementation and user interface are instantly recognizable to users of previous generation products but have also has been updated and enhanced. In-service experience and the need for future proofing has been incorporated by implementing flexible modular hardware architecture and modular software structure.

Many enhancements and additions to the 7SR5 product construction and functionality have been incorporated, these include:

- Flexible hardware – minimized ordering options
- Full applications functionality is available in each device
- Large LCD facilitates device setting and display of network status from the front fascia
- 28 LEDs as standard
- Selectable binary input operating thresholds
- IP54 from front
- 3-winding transformer protection
- Additional standard front pushbuttons improve flexibility
- Standard IEC 61850 functionality supports system automation
- Cyber-security functionality
- User selectable languages: English, French, German, Portugese, Spanish, Turkish

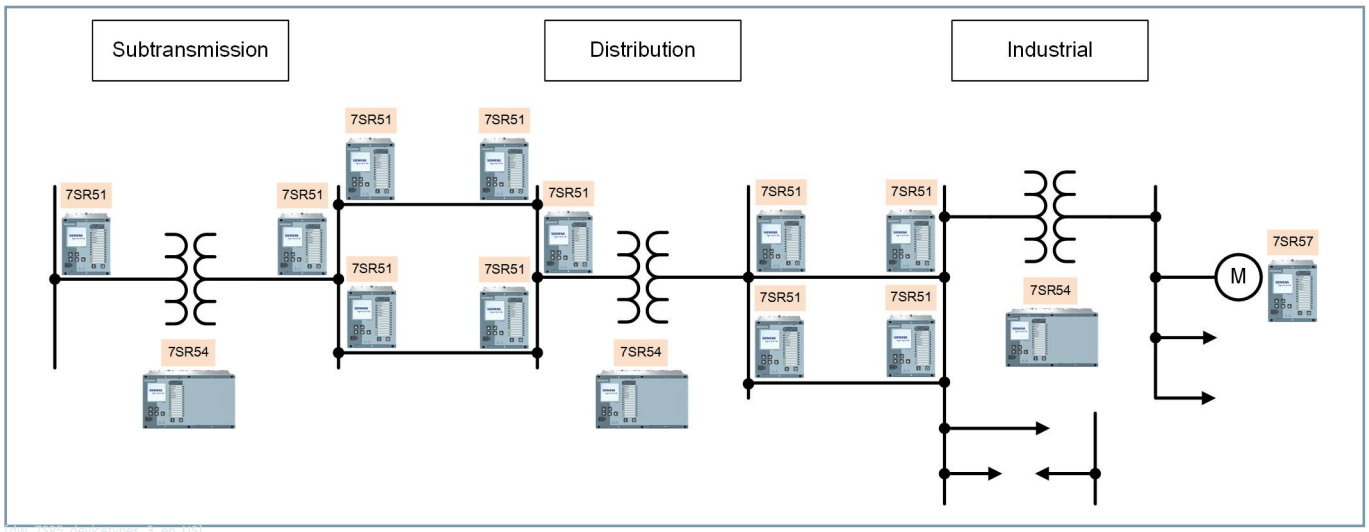
With the Reyrolle 5 you are able to install a product that will be upgradeable. As the power system grows to meet changing consumer requirements then the 7SR5 device will be reconfigurable without the need for replacement devices. The specific fit required for the application will be provided by the 7SR5 both at the time of installation and when future network and automation changes are required.

[sc_size6Front, 2, –, –]

Figure 1/1 Reyrolle 7SR5 Device (Size 6)

[sc_size12Front, 1, –, –]

Figure 1/2 Reyrolle 7SR5 Device (Size 12)


Subtransmission
Distribution
Industrial
7SR51
7SR54
7SR57
M

Devices and Application

Device Types

Main function	Device
Overcurrent and Feeder Protection	
Overcurrent Protection with control and monitoring	7SR51
Transformer Differential Protection	
Transformer Differential Protection with control and monitoring	7SR54
Motor Protection	
Motor Protection with control and monitoring	7SR57

ANSI	Functions	7SR5110 Overcurrent	7SR5111 Directional Overcurrent	7SR5121 Directional Overcurrent	7SR5420 2 Winding Transformer	7SR5421 2 Winding Transformer	7SR5430 3 Winding Transformer	7SR5431 3 Winding Transformer	7SR5710 Motor	7SR5711 Motor
14	Locked rotor protection	–	–	–	–	–	–	–	■	■
21FL	Fault locator	–	■	■	–	–	–	–	–	–
21LB	Load blinder	–	■	■	–	■	–	■	–	–
24	Overexcitation protection	–	–	–	–	■	–	■	–	–
25	Synchrocheck – synchronizing function	–	■	■	–	■	–	■	–	–
27	Undervoltage protection – 3-phase	–	■	■	–	■	–	■	–	■
27Vx	Undervoltage protection – Vx	–	■	■	–	■	–	■	–	■
32	Power protection	–	■	■	–	–	–	–	–	■
37	Undercurrent protection – phase	■	■	■	■	■	■	■	■	■
37G	Undercurrent earth fault – measured	■	■	■	■	■	■	■	■	■
46	Negative sequence overcurrent protection	■	■	■	■	■	■	■	–	–
46BC	Broken conductor detection	■	■	■	■	■	■	■	■	■
46PR	Phase-rotation reversal	–	–	–	–	–	–	–	■	■
46UB	Phase unbalance	–	–	–	–	–	–	–	■	■
47	Sequence overvoltage protection	–	■	■	–	■	–	■	–	■
48	Starting-time supervision	–	–	–	–	–	–	–	■	■
49	Thermal overload protection	■	■	■	■	■	■	■	–	–
49R	Motor thermal overload protection	–	–	–	–	–	–	–	■	■
49TS	Temperature sensor supervision [1]	■	■	■	■	■	■	■	■	■
50	Instantaneous overcurrent – phase	■	■	■	■	■	■	■	■	■
50AFD	Arc flash detection [2]	–	–	–	■	■	■	■	■	■
50BCL	Break capacity limit	■	■	■	–	–	–	–	■	■
50BF	Circuit-breaker failure protection – 3-pole	■	■	■	■	■	■	■	■	■
50G	Instantaneous earth fault – measured	■	■	■	■	■	■	■	■	■
50GHS	High speed earth fault – measured	■	■	■	–	–	–	–	–	–
50GI	Intermittent earth fault	■	■	■	–	–	–	–	–	–
50GS	Instantaneous sensitive earth fault – measured	■	■	■	–	–	–	–	–	–
50HS	High speed overcurrent – phase	■	■	■	–	–	–	–	–	–
50N	Instantaneous earth fault – calculated	■	■	■	■	■	■	■	■	■
50SOTF	Switch onto fault	■	■	■	–	–	–	–	–	–
51	Time delayed overcurrent – phase	■	■	■	■	■	■	■	■	■
51CL	Cold load overcurrent – phase	■	■	■	■	■	■	■	–	–
51G	Time delayed earth fault – measured	■	■	■	■	■	■	■	■	■
51GS	Time delayed sensitive earth fault – measured	■	■	■	–	–	–	–	–	–
51N	Time delayed earth fault – calculated	–	■	■						
	Voltage dependent overcurrent – phase	■	■	■	■	■	■	■	■	■
51V	Circuit-breaker control	–	■	■	–	■	–	■	–	–
52	Power factor	–	■	■	■	■	■	■	■	■
55	Overvoltage protection – 3-phase	–	■	■	–	–	–	–	–	■
59	Neutral voltage displacement				–	■	–	■	–	■
59N					–	■	–	■	–	■

1 An external interface unit is required.

2 Requires external components

Devices and Application

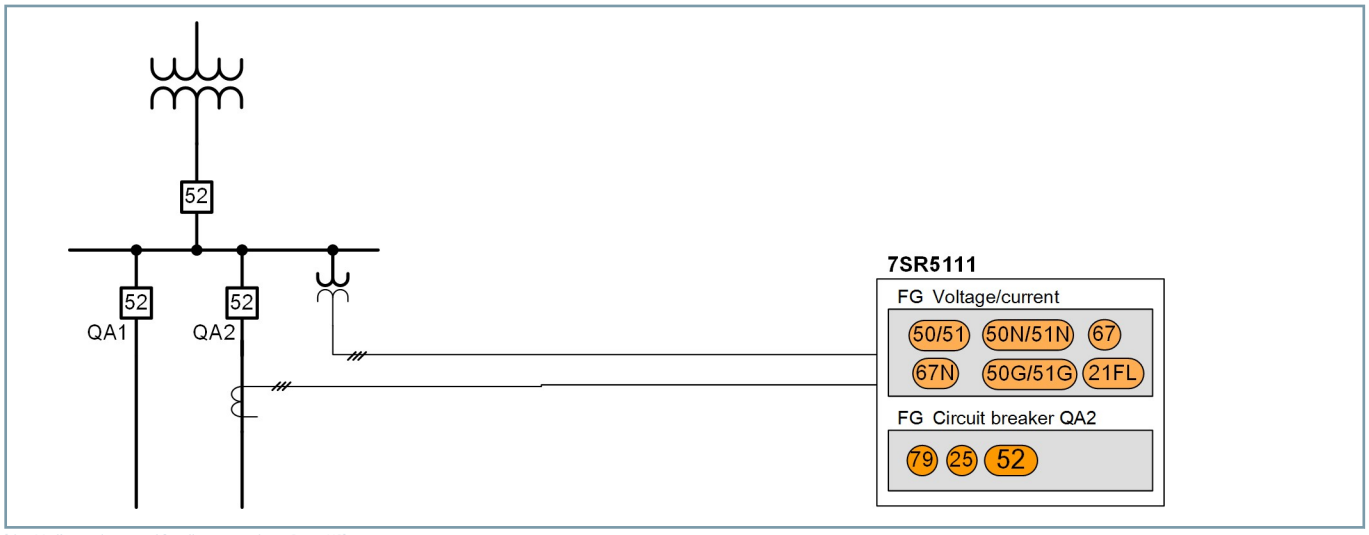
Relay Selection Guide

ANSI	Functions	▫ 7SR5110 Overcurrent	■/▫ 7SR5111 Directional Overcurrent	■/▫ 7SR5121 Directional Overcurrent	▫ 7SR5420 2 Winding Transformer	■/▫ 7SR5421 2 Winding Transformer	▫ 7SR5430 3 Winding Transformer	■/▫ 7SR5431 3 Winding Transformer	▫ 7SR5710 Motor	■ 7SR5711 Motor
59Vx	Overvoltage protection – Vx	■	■	■	■	■	■	■	■	–
60CTS-I	CT supervision – current reference	–	■	■	–	–	–	–	–	■
60CTS-V	CT supervision – voltage reference	–	■	■	–	■	–	■	–	■
60VTS	VT supervision	–	–	–	–	–	–	–	■	■
66	Number of starts	–	■	■	–	■	–	■	–	■
67	Directional overcurrent – phase	–	■	■	–	■	–	■	–	■
67G	Directional earth fault – measured	–	■	■	–	–	–	–	–	–
67GI	Directional Intermittent Earth Fault	–	■	■	–	–	–	–	–	–
67GS	Directional sensitive earth fault – measured	–	■	■	–	■	–	■	–	■
67N	Directional earth fault – calculated	–	■	■	–	■	–	■	–	■
74CC	Close-circuit supervision	■	■	■	■	■	■	■	■	■
74TC	Trip-circuit supervision	■	■	■	■	■	■	■	■	■
78VS	Voltage vector shift	–	■	■	–	■	–	■	–	–
79	Automatic reclosing	■	■	■	–	–	–	–	–	–
81	Frequency protection – "f>" or "f<"	–	■	■	–	■	–	■	–	■
81B	Backspin monitor	–	–	–	–	–	–	–	■	–
81B-V	Backspin monitor – voltage reference	–	–	–	–	–	–	–	–	■
81HB2	Inrush current detection	–	–	–	–	–	–	–	–	–
81HB5	Overfluxing detection – 5th harmonic	■	■	■	■	■	■	■	■	■
81R	Frequency protection – "df/dt"	–	–	–	■	■	■	■	–	–
86	Lockout	–	■	■	–	■	–	■	–	–
87GH	Restricted earth fault protection – high-impedance	■	■	■	■	■	■	■	■	■
87NL	Restricted earth fault protection - low-impedance	■	■	■	■	■	■	■	■	■
87T-BD	Transformer differential protection – biased	■	■	■	■	■	■	■	–	–
87T-HS	Transformer differential protection – highset	–	–	–	■	■	■	■	–	–
	Measured values	–	–	–	■	■	■	■	–	–
	Switching-statistic counters	■	■	■	■	■	■	■	■	■
	Circuit-breaker wear monitoring	■	■	■	■	■	■	■	■	■
	Logic editor	■	■	■	■	■	■	■	■	■
	External trip initiation	■	■	■	■	■	■	■	■	■
	Control	■	■	■	■	■	■	■	■	■
	Fault recording of analog and binary signals	■	■	■	■	■	■	■	■	■
	Sequence of events recorder	■	■	■	■	■	■	■	■	■
	Motor operating records	■	■	■	■	■	■	■	■	■
	Security log	5000	5000	5000	5000	5000	5000	5000	5000	5000
	Monitoring and supervision	–	–	–	–	–	–	–	■	■
	Setting groups	2048	2048	2048	2048	2048	2048	2048	2048	2048
	Changeover of setting group	■	■	■	■	■	■	■	■	■
	Binary inputs (max)	4	4	4	4	4	4	4	4	4
	Binary outputs (max) incl. healthy contact	■	■	■	■	■	■	■	■	■
	Current inputs	38	39	39	16	37	24	35	13	19
		18	20	20	8	18	10	16	8	12
		4	4	5	8	8	12	12	4	4

ANSI	Functions	7SR5110 Overcurrent	7SR5111 Directional Overcurrent	7SR5121 Directional Overcurrent	7SR5420 2 Winding Transformer	7SR5421 2 Winding Transformer	7SR5430 3 Winding Transformer	7SR5431 3 Winding Transformer	7SR5710 Motor	7SR5711 Motor
	Voltage inputs	0	4	4	0	4	0	4	0	4
	Size	6 or 12	6 or 12	12	12	12	12	12	6 or 12	6 or 12
	LCD resolution	128x128								
	Push buttons	7	7	7	7	7	7	7	7	7
	LEDs	28	28	28	28	28	28	28	28	28
	Power supply unit rated voltages	DC 24 to 250 V AC 100 to 230 V								
	Front user interface	■	■	■	■	■	■	■	■	■
	User selectable languages: English, French, German, Portugese, Spanish, Turkish	■	■	■	■	■	■	■	■	■
	IEC 60870-5-103	■	■	■	■	■	■	■	■	■
	IEC 61850	■	■	■	■	■	■	■	■	■
	Modbus RTU	■	■	■	■	■	■	■	■	■
	Modbus TCP	■	■	■	■	■	■	■	■	■
	DNP3	■	■	■	■	■	■	■	■	■
	Time synchronization	■	■	■	■	■	■	■	■	■

■ - Basic

Medium-Voltage Applications for all System Grounding Types



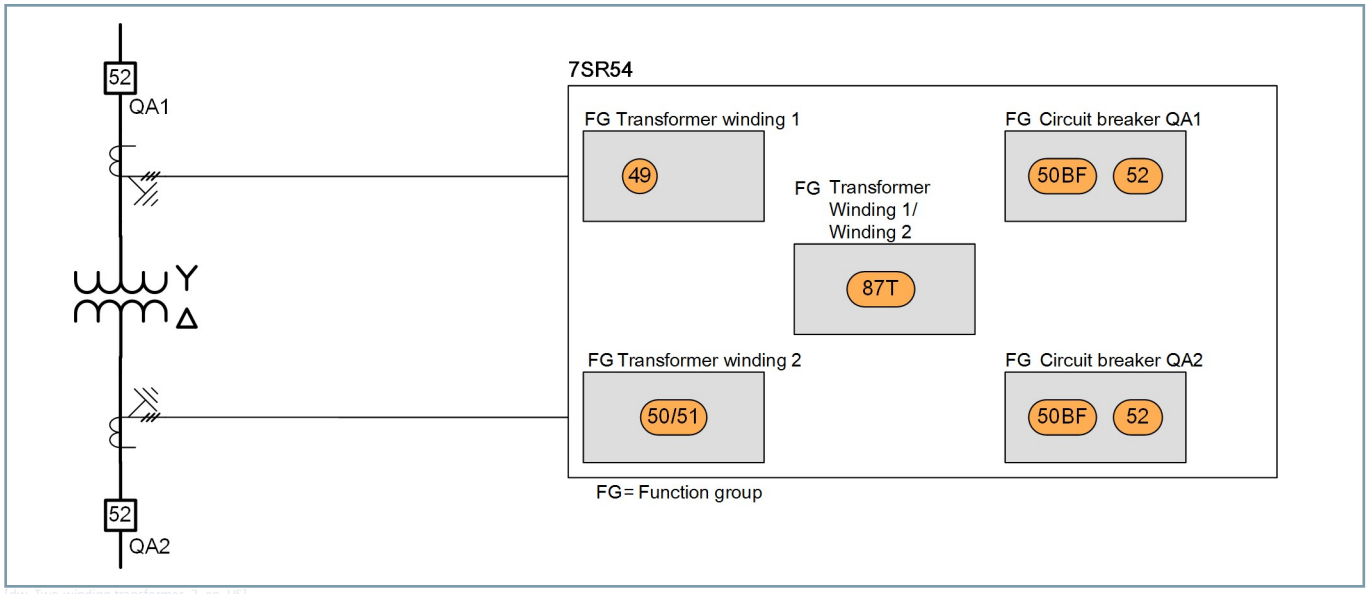
{dw_Medium-voltage appl for all sys ground typ, 3, en_US}

Figure 2.3/1 Medium-Voltage Applications for all System Grounding Types

Properties

- Reliable detection of transients and static ground faults
- Cost saving due to integrated autoreclose function
- Directional and non-directional protection and control functions

Two-Winding Transformer



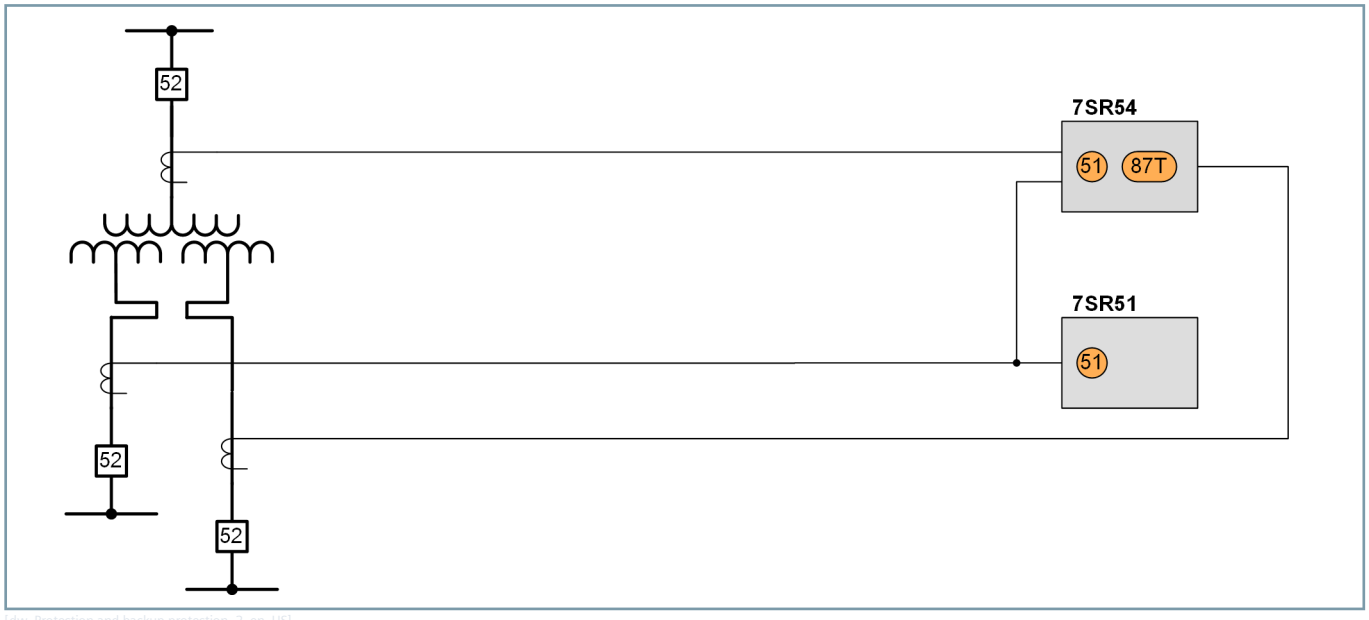
[dw_Two-winding transformer, 2, en_US]

Figure 2.3/2 2-Winding Transformer

Properties

- Clear assignment of the functions to the primary element
- Reduced investment
- Simple parameterization
- Reduced wiring and faster commissioning

Protection and Backup Protection Solution for 3-Winding Transformers



[dw_Protection and backup protection, 2, en_US]

Figure 2.3/3 Protection and Backup Protection Solution for 3-Winding Transformers

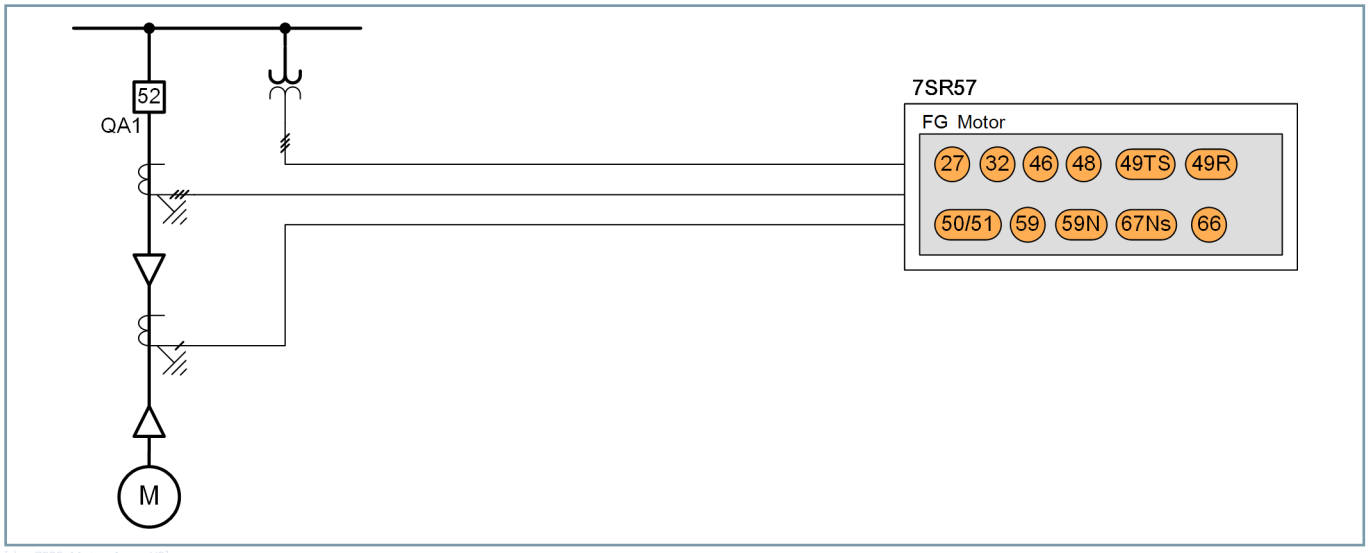
Properties

- Protection and backup protection concept
- Increased availability

2.3

Motor Protection

Induction Motor: Protection and Control



[dw_7SR5_Motor, 1, en_US]

Figure 2.3/4 Induction Motor: Protection and Control

Properties

- Reduced investment due to protection and control in one device
- Thermal motor protection functions for reliable motor monitoring
- Thermal motor protection functions with direct connection of temperature sensors

Description

The Reyrolle 5 is designed for the electricity networks of the future with enhanced communications and cyber security while maintaining a user-friendly interface and easy product management.

The Reyrolle 7SR51 overcurrent device includes a wide range of protection functions and IEC 61850 Ethernet communications as standard. To further minimize the product variants the power supply and the binary inputs cover the full operating range with configurable binary input thresholds.

The large LCD, tactile pushbuttons and programmable LEDs provide a user-friendly product interface and the relay element is withdrawable for easy replacement.

Inputs and outputs	4 I + 8 BI + 6 BO 4 I + 13 BI + 8 BO 4 I + 3 AFD + 13 BI + 11 BO (inc. 3 HSBO) 4 I + 23 BI + 12 BO 4 I + 38 BI + 18 BO 4 I + 4 V + 9 BI + 8 BO 4 I + 4 V + 3 AFD + 9 BI + 11 BO (inc. 3 HSBO) 4 I + 4 V + 14 BI + 10 BO 4 I + 4 V + 19 BI + 12 BO 4 I + 4 V + 3 AFD + 19 BI + 15 BO (inc. 3 HSBO) 4 I + 4 V + 24 BI + 14 BO 4 I + 4 V + 3 AFD + 24 BI + 17 BO (inc. 3 HSBO) 4 I + 4 V + 39 BI + 20 BO 4 I + 4 V + 3 AFD + 39 BI + 23 BO (inc. 3 HSBO) 5 I + 4 V + 17 BI + 10 BO 5 I + 4 V + 22 BI + 12 BO 5 I + 4 V + 3 AFD + 22 BI + 15 BO (inc. 3 HSBO) 5 I + 4 V + 37 BI + 18 BO 5 I + 4 V + 3 AFD + 37 BI + 21 BO (inc. 3 HSBO)
Communication	Standard front USB port (for configuration using Reydisp PC based software tool) rear RS485, 2 x RJ45 electrical ports or optional optical Ethernet connections
Housing	Size 6 or 12 with withdrawable design
Display	Backlit 128 x 128 LCD with text and graphical display capabilities suitable for single line mimic diagrams

- Compact design and low product life-cycle cost
- Reliable operation due to powerful, proven protection algorithms
- IEC 61850 Edition 1 & 2 with HSR, PRP and RSTP operation for increased availability
- Simple product ordering
- Combined 1 A and 5 A current transformer inputs

- 28 programmable tri-color LEDs for clear indications
- User selectable languages: English, French, German, Portugese, Spanish, Turkish
- Conformal coating ordering option

Functions

Standard Functionality

- 37/37G Undercurrent protection – phase/earth
- 46 Negative sequence overcurrent protection
- 46BC Broken conductor detection
- 49 Thermal overload protection
- 49TS Temperature sensor supervision [3]
- 50/50G/50N Instantaneous overcurrent/earth fault
- 50AFD Arc flash detection [4]
- 50BF Circuit-breaker failure protection – 3-pole
- 50GHS High speed earth fault – measured
- 50GI Intermittent earth fault
- 50GS Instantaneous sensitive earth fault – measured
- 50HS High speed overcurrent – phase
- 50SOTF Switch onto fault
- 51/51G/51N Time delayed overcurrent/earth fault
- 51CL Cold load overcurrent – phase
- 51GS Time delayed sensitive earth fault – measured
- 52 Circuit-breaker control
- 60CTS CT supervision
- 74CC/74TC Close-circuit and trip-circuit supervision
- 79 Automatic reclosing
- 81HB2 Inrush current detection
- 86 Lockout
- 87GH Restricted earth fault protection – high-impedance
- 87NL Restricted earth fault protection - low-impedance

3 An external interface unit is required.

4 Requires external components

Additional Functionality – Devices with VT Inputs

- 21FL Fault locator
- 21LB Load blinder
- 25 Synchrocheck – synchronizing function
- 27/27Vx Undervoltage protection
- 32 Power protection
- 47 Sequence overvoltage protection
- 51V Voltage dependent overcurrent – phase
- 55 Power factor
- 59/59Vx Overvoltage protection
- 59N Neutral voltage displacement
- 60VTS VT supervision
- 67/67G/67GI/67GS/67N Directional – phase/earth fault
- 78VS Voltage vector shift
- 81 Frequency protection – "f>" or "f<"
- 81R Frequency protection – "df/dt"

Monitoring Functions

- Primary, secondary, and phase sequence, current & voltage
- Frequency, power, energy and fault location
- Fault data, event and waveform records

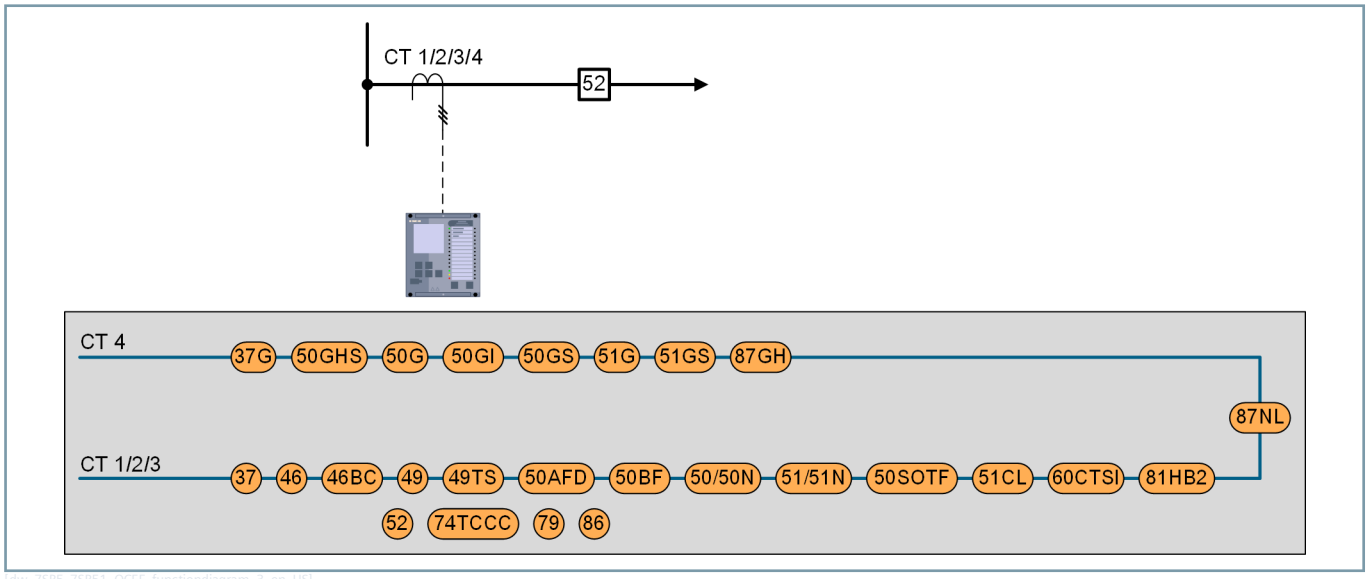
Applications

- Overcurrent and earth fault protection for medium voltage substations
- Backup protection for other main protection devices e.g. on lines, transformers, generators, motors, and busbars
- 5 CT model to provide measured standby earth fault for protection of transformer earthing resistors in addition to high-impedance earth fault protection
- Selectable directional overcurrent and earth fault elements for interconnected systems
- Measured and calculated earth fault protection elements provide a flexible solution when both earth fault and sensitive earth fault current detection is required
- Detection of earth faults in all networks including isolated and compensated networks
- High speed overcurrent elements for use with arc fault detectors to provide high speed fault detection and tripping
- Blocked overcurrent schemes using hardwiring or configurable IEC 61850 elements
- Configurable automatic reclosing to restore power flow after transient network faults

Communication

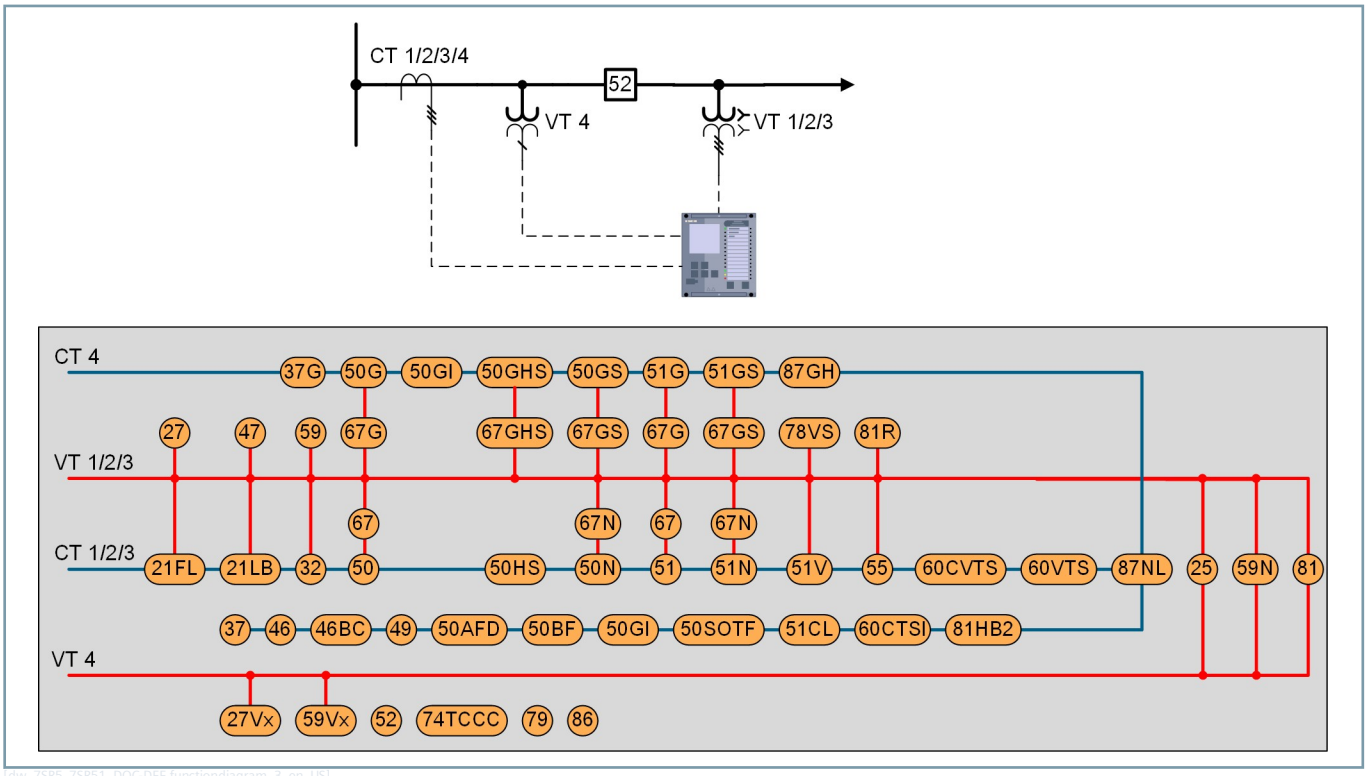
- IEC 60870-5-103, Modbus TCP
  Modbus RTU, DNP3, IEC 61850

Application Templates



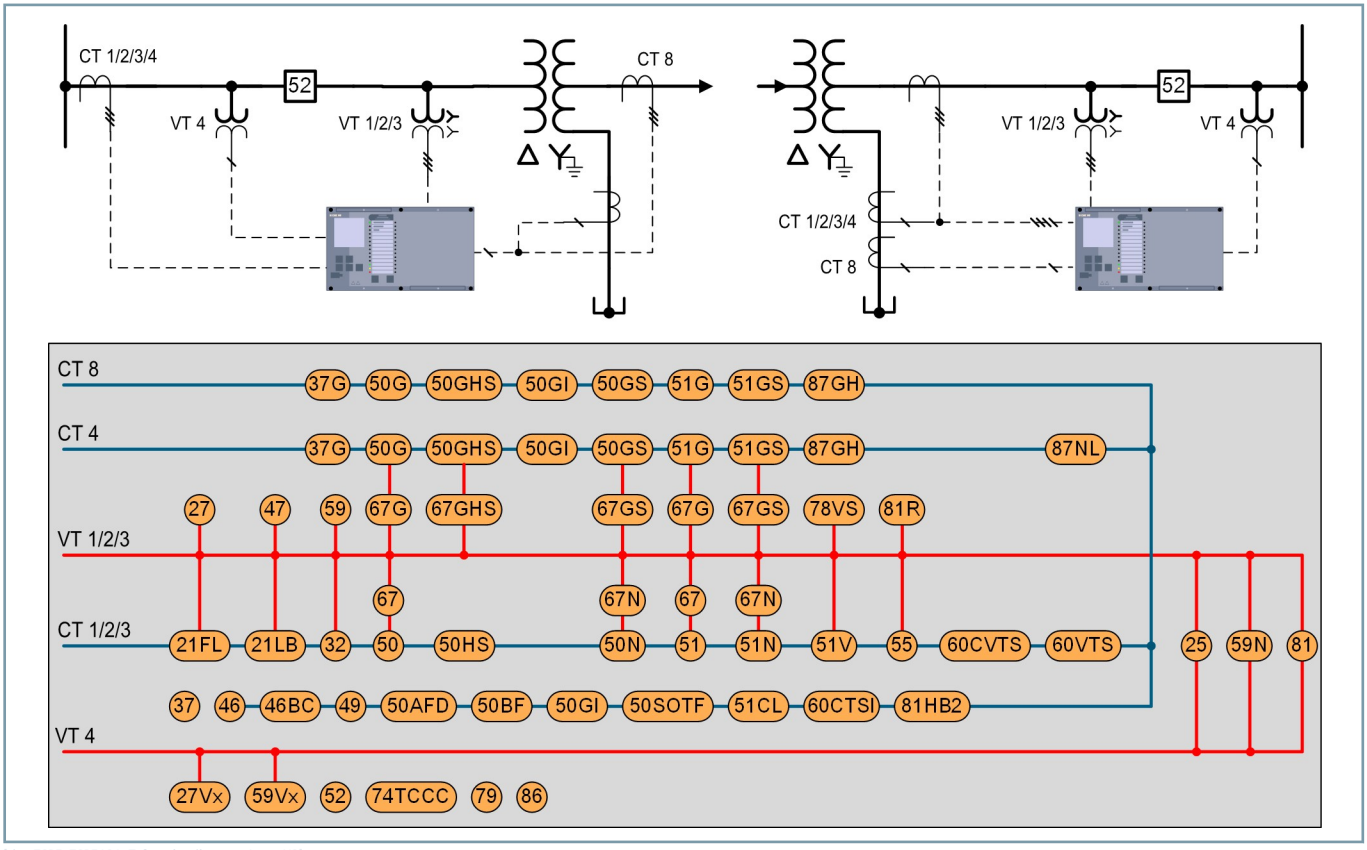
[dw_7SR5_7SR51_OCEF_functiondiagram, 3, en_US]

Figure 2.4/1 Function Diagram: 7SR5110 OCEF Protection



[dw_7SR5_7SR51_DOC-DEF functiondiagram, 3, en_US]

Figure 2.4/2 Function Diagram: 7SR5111 DOC/DEF Protection



[dw_7SR5_7SR5121_Txfunctiondiagram, 1, en_US]

Figure 2.4/3 Function Diagram: 7SR5121 DOC/DEF Protection

Functions, Application Templates

ANSI	Functions	7SR5110	7SR5111	7SR5121
21FL	Fault locator	–	■	■
21LB	Load blinder	–	■	■
25	Synchrocheck – synchronizing function	–	■	■
27	Undervoltage protection – 3-phase	–	■	■
27Vx	Undervoltage protection – Vx	–	■	■
32	Power protection	–	■	■
37	Undercurrent protection – phase	■	■	■
37G	Undercurrent earth fault – measured	■	■	■
46	Negative sequence overcurrent protection	■	■	■
46BC	Broken conductor detection	■	■	■
47	Sequence overvoltage protection	–	■	■
49	Thermal overload protection	■	■	■
49TS	Temperature sensor supervision [5]	■	■	■
50	Instantaneous overcurrent – phase	■	■	■
50AFD	Arc flash detection [6]	■	■	■
50BF	Circuit-breaker failure protection – 3-pole	■	■	■
50G	Instantaneous earth fault – measured	■	■	■
50GHS	High speed earth fault – measured	■	■	■
50GI	Intermittent earth fault	■	■	■
50GS	Instantaneous sensitive earth fault – measured	■	■	■
50HS	High speed overcurrent – phase	■	■	■
50N	Instantaneous earth fault – calculated	■	■	■
50SOTF	Switch onto fault	■	■	■
51	Time delayed overcurrent – phase	■	■	■
51CL	Cold load overcurrent – phase	■	■	■
51G	Time delayed earth fault – measured	■	■	■
51GS	Time delayed sensitive earth fault – measured	■	■	■
51N	Time delayed earth fault – calculated	■	■	■
51V	Voltage dependent overcurrent – phase	–	■	■
52	Circuit-breaker control	■	■	■
55	Power factor	–	■	■
59	Overvoltage protection – 3-phase	–	■	■
59N	Neutral voltage displacement	–	■	■
59Vx	Overvoltage protection – Vx	–	■	■
60CTS-I	CT supervision – current reference	■	■	■
60CTS-V	CT supervision – voltage reference	–	■	■
60VTS	VT supervision	–	■	■
67	Directional overcurrent – phase	–	■	■
67G	Directional earth fault – measured	–	■	■
67GI	Directional Intermittent Earth Fault	–	■	■
67GS	Directional sensitive earth fault – measured	–	■	■
67N	Directional earth fault – calculated	–	■	■
74CC	Close-circuit supervision	■	■	■
74TC	Trip-circuit supervision	■	■	■
78VS	Voltage vector shift	–	■	■
79	Automatic reclosing	■	■	■
81	Frequency protection – "f>" or "f<"	–	■	■
81HB2	Inrush current detection	■	■	■

5 An external interface unit is required.

6 Requires external components

ANSI	Functions	7SR5110	7SR5111	7SR5121
81R	Frequency protection – "df/dt"	–	■	■
86	Lockout	■	■	■
87GH	Restricted earth fault protection – high-impedance	■	■	■
87NL	Restricted earth fault protection - low-impedance	■	■	■
	Measured values	■	■	■
	Switching-statistic counters	■	■	■
	Circuit-breaker wear monitoring	■	■	■
	Logic editor	■	■	■
	External trip initiation	■	■	■
	Control	■	■	■
	Fault recording of analog and binary signals	■	■	■
	Sequence of events recorder	5000	5000	5000
	Security log	2048	2048	2048
	Monitoring and supervision	■	■	■
	Setting groups	4	4	4
	Changeover of setting group	■	■	■
	Binary inputs (max)	38	39	39
	Binary outputs (max) incl. healthy contact	18	20	20
	Current inputs	4	4	5
	Voltage inputs	0	4	4
	Size	6 or 12	6 or 12	12
	LCD resolution	128x128		
	Push buttons	7	7	7
	LEDs	28	28	28
	Power supply unit rated voltages	DC 24 to 250 V AC 100 to 230 V		
	Front user interface	■	■	■
	User selectable languages: English, French, German, Portugese, Spanish, Turkish	■	■	■
	IEC 60870-5-103	■	■	■
	IEC 61850	■	■	■
	Modbus RTU	■	■	■
	Modbus TCP	■	■	■
	DNP3	■	■	■
	Time synchronization	■	■	■

Table 2.4/1 Reyrolle 7SR51 – Functions and Application Templates

NOT

■ - Basic

Standard Variants

Standard Variants for 7SR511		
7SR5110-1AA	3/8, 8 BI, 6 BO, 4 I	
	Housing width 3/8 x 19" (size 6), housing height 4U 8 binary inputs 6 binary outputs (1 break, 2 changeover, 3 make) 4 current transformer inputs Communication: USB, RS485, 2 x Ethernet	
7SR5110-2AA	3/8, 13 BI, 8 BO, 4 I	
	Housing width 3/8 x 19" (size 6), housing height 4U 13 binary inputs 8 binary outputs (1 break, 2 changeover, 5 make) 4 current transformer inputs Communication: USB, RS485, 2 x Ethernet	
7SR5110-2AD	3/8, 13 BI, 11 BO (inc. 3 HSBO), 4 I, 3 AFD	
	Housing width 3/8 x 19" (size 6), housing height 4U 13 binary inputs 11 binary outputs (1 break, 2 changeover, 8 make) 4 current transformer inputs Communication: USB, RS485, 2 x Ethernet	
7SR5110-4AA	3/4, 23 BI, 12 BO, 4 I	
	Housing width 3/4 x 19" (size 12), housing height 4U 23 binary inputs 12 binary outputs (1 break, 2 changeover, 9 make) 4 current transformer inputs Communication: USB, RS485, 2 x Ethernet	
7SR5110-7AA	3/4, 38 BI, 18 BO, 4 I	
	Housing width 3/4 x 19" (size 12), housing height 4U 38 binary inputs 18 binary outputs (1 break, 2 changeover, 15 make) 4 current transformer inputs Communication: USB, RS485, 2 x Ethernet	
7SR5111-1AA	3/8, 9 BI, 8 BO, 4 I, 4 V	
	Housing width 3/8 x 19" (size 6), housing height 4U 9 binary inputs 8 binary outputs (1 break, 2 changeover, 5 make) 4 current transformer inputs 4 voltage transformer inputs Communication: USB, RS485, 2 x Ethernet	
7SR5111-1AD	3/8, 9 BI, 11 BO (inc. 3 HSBO), 4 I, 4 V, 3 AFD	
	Housing width 3/8 x 19" (size 6), housing height 4U 9 binary inputs 11 binary outputs (1 break, 2 changeover, 8 make) 4 current transformer inputs 4 voltage transformer inputs Communication: USB, RS485, 2 x Ethernet	

7SR5111-2A	3/4, 14 BI, 10 BO, 4 I, 4 V	
	Housing width 3/4 x 19" (size 12), housing height 4U 14 binary inputs 10 binary outputs (1 break, 2 changeover, 7 make) 4 current transformer inputs 4 voltage transformer inputs Communication: USB, RS485, 2 x Ethernet	
7SR5111-3A	3/4, 19 BI, 12 BO, 4 I, 4 V	
	Housing width 3/4 x 19" (size 12), housing height 4U 19 binary inputs 12 binary outputs (1 break, 2 changeover, 9 make) 4 current transformer inputs 4 voltage transformer inputs Communication: USB, RS485, 2 x Ethernet	
7SR5111-3D	3/4, 19 BI, 15 BO (inc. 3 HSBO), 4 I, 4 V, 3 AFD	
	Housing width 3/4 x 19" (size 12), housing height 4U 19 binary inputs 15 binary outputs (1 break, 2 changeover, 12 make) 4 current transformer inputs 4 voltage transformer inputs Communication: USB, RS485, 2 x Ethernet	
7SR5111-4A	3/4, 24 BI, 14 BO, 4 I, 4 V	
	Housing width 3/4 x 19" (size 12), housing height 4U 24 binary inputs 14 binary outputs (1 break, 2 changeover, 11 make) 4 current transformer inputs 4 voltage transformer inputs Communication: USB, RS485, 2 x Ethernet	
7SR5111-4D	3/4, 24 BI, 17 BO (inc. 3 HSBO), 4 I, 4 V, 3 AFD	
	Housing width 3/4 x 19" (size 12), housing height 4U 24 binary inputs 17 binary outputs (1 break, 2 changeover, 20 make) 4 current transformer inputs 4 voltage transformer inputs Communication: USB, RS485, 2 x Ethernet	
7SR5111-7AA	3/4, 39 BI, 20 BO, 4 I, 4 V	
	Housing width 3/4 x 19" (size 12), housing height 4U 39 binary inputs 20 binary outputs (1 break, 2 changeover, 17 make) 4 current transformer inputs 4 voltage transformer inputs Communication: USB, RS485, 2 x Ethernet	
7SR5111-7AD	3/4, 39 BI, 23 BO (inc. 3 HSBO), 4 I, 4 V, 3 AFD	
	Housing width 3/4 x 19" (size 12), housing height 4U 39 binary inputs 23 binary outputs (1 break, 2 changeover, 20 make) 4 current transformer inputs 4 voltage transformer inputs Communication: USB, RS485, 2 x Ethernet	

7SR5121-2AA	3/4, 17 BI, 10 BO, 5 I, 4 V	
	Housing width 3/4 x 19" (size 12), housing height 4U 17 binary inputs 10 binary outputs (1 break, 2 changeover, 7 make) 5 current transformer inputs 4 voltage transformer inputs Communication: USB, RS485, 2 x Ethernet	
7SR5121-6AA	3/4, 37 BI, 18 BO, 5 I, 4 V	
	Housing width 3/4 x 19" (size 12), housing height 4U 37 binary inputs 18 binary outputs (1 break, 2 changeover, 15 make) 5 current transformer inputs 4 voltage transformer inputs Communication: USB, RS485, 2 x Ethernet	
7SR5121-6AD	3/4, 37 BI, 21 BO (inc. 3 HSBO), 5 I, 4 V, 3 AFD	
	Housing width 3/4 x 19" (size 12), housing height 4U 37 binary inputs 21 binary outputs (1 break, 2 changeover, 18 make) 5 current transformer inputs 4 voltage transformer inputs Communication: USB, RS485, 2 x Ethernet	

Table 2.4/2 Standard Variants for 7SR51

The technical data of the devices can be found in the hardware manual.

Description

The Reyrolle 5 is designed for the electricity networks of the future with enhanced communications and cyber security while maintaining a user-friendly interface and easy product management.

The Reyrolle 7SR54 provides protection, control and monitoring for 2- and 3-winding transformers. All transformer vector groups and earthing connections are supported.

The Reyrolle 7SR54 device includes a wide range of protection functions and IEC 61850 Ethernet communications as standard. To further minimize the product variants the power supply and the binary inputs cover the full operating range with configurable binary input thresholds.

The large LCD, tactile pushbuttons and programmable LEDs provide a user-friendly product interface and the relay element is withdrawable for easy replacement.

Inputs and outputs	8 I + 16 BI + 8 BO 8 I + 3 AFD + 21 BI + 13 BO (inc. 3 HSBO) 8 I + 4 V + 12 BI + 8 BO 8 I + 4 V + 3 AFD + 17 BI + 13 BO (inc. 3 HSBO) 8 I + 4 V + 22 BI + 12 BO 8 I + 4 V + 3 AFD + 22 BI + 15 BO (inc. 3 HSBO) 8 I + 4 V + 37 BI + 18 BO 8 I + 4 V + 3 AFD + 37 BI + 21 BO (inc. 3 HSBO) 12 I + 24 BI + 10 BO 12 I + 3 AFD + 24 BI + 13 BO (inc. 3 HSBO) 12 I, 4 V, 25 BI, 12 BO 12 I + 4 V + 3 AFD + 25 BI + 15 BO (inc. 3 HSBO) 12 I + 4 V + 35 BI + 16 BO 12 I + 4 V + 3 AFD + 35 BI + 19 BO (inc. 3 HSBO)
Communication	Standard front USB port (for configuration using Reydisp PC based software tool) rear RS485, 2 x RJ45 electrical ports or optional optical Ethernet connections
Housing	Size 12 with withdrawable design
Display	Backlit 128 x 128 LCD with text and graphical display capabilities suitable for single line mimic diagrams

Benefits

- Compact design and low product life-cycle cost
- Reliable operation due to powerful, proven protection algorithms
- IEC 61850 Edition 1 & 2 – with HSR, PRP and RSTP operation for increased availability
- Simple product ordering
- Combined 1 A and 5 A current transformer inputs
- 28 programmable tri-color LEDs for clear indications
- Conformal coating ordering option

[sc_size12Front15%, 1, –,–]

2.5

Functions

Standard Functionality

- 37/37G Undercurrent protection – phase/earth
- 46 Negative sequence overcurrent protection
- 46BC Broken conductor detection
- 49 Thermal overload protection
- 49TS Temperature sensor supervision [7]
- 50/50G/50N Instantaneous overcurrent/earth fault
- 50AFD Arc flash detection [8]
- 50BF Circuit-breaker failure protection – 3-pole
- 51/51G/51N Time delayed overcurrent/earth fault
- 51CL Cold load overcurrent – phase
- 52 Circuit-breaker control
- 60CTS CT supervision
- 74CC/74TC Close-circuit and trip-circuit supervision
- 81HB2 Inrush current detection
- 81HB5 Overfluxing detection – 5th harmonic
- 86 Lockout
- 87GH Restricted earth fault protection – high-impedance
- 87NL Restricted earth fault protection - low-impedance
- 87T-BD Transformer differential protection – biased
- 87T-HS Transformer differential protection – highset

Additional Functionality – Devices with VT Inputs

- 21LB Load blinder (7SR5421)
- 24 Overexcitation protection
- 25 Synchrocheck – synchronizing function
- 27/27Vx Undervoltage protection
- 47 Sequence overvoltage protection
- 51V Voltage dependent overcurrent – phase (7SR5421)
- 59/59Vx Overvoltage protection
- 59N Neutral voltage displacement
- 60VTS VT supervision

7 An external interface unit is required.

8 Requires external components

- 67/67G/67N Directional – phase/earth fault (7SR5421)
- 78VS Voltage vector shift
- 81 Frequency protection – "f>" or "f<"
- 81R Frequency protection – "df/dt"

Monitoring Functions

- Primary, secondary, and phase sequence, current & voltage
- Frequency, power, energy and fault location
- Fault data, event and waveform records
- Event records (selectable events viewable on fascia)

Applications

- Comprehensive protection for 2- or 3-winding transformers.
- Differential protection for auto-transformers, reactors and motors.

Communication

- IEC 60870-5-103, Modbus TCP
  Modbus RTU, DNP3, IEC 61850

2.5 **Application Templates**

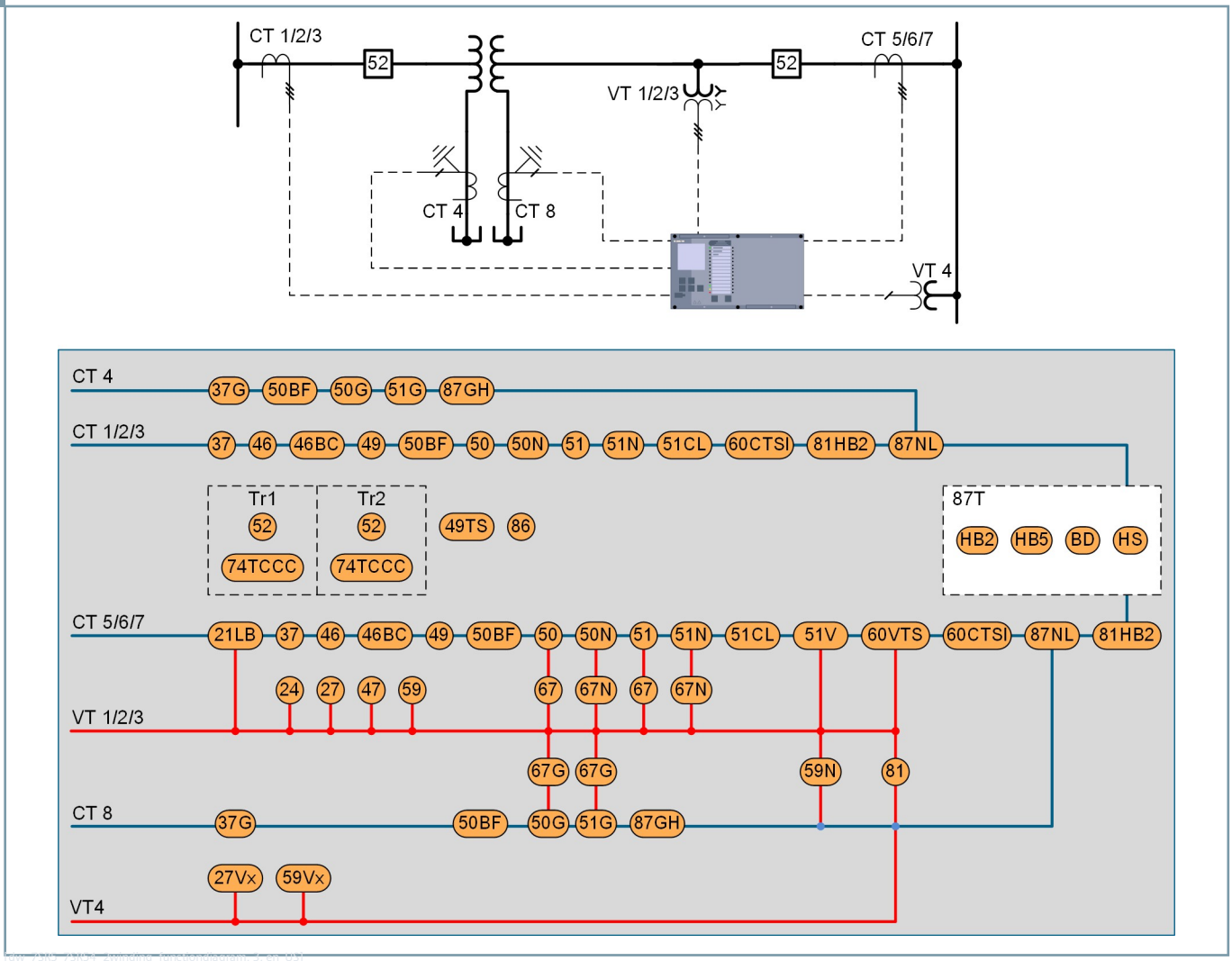
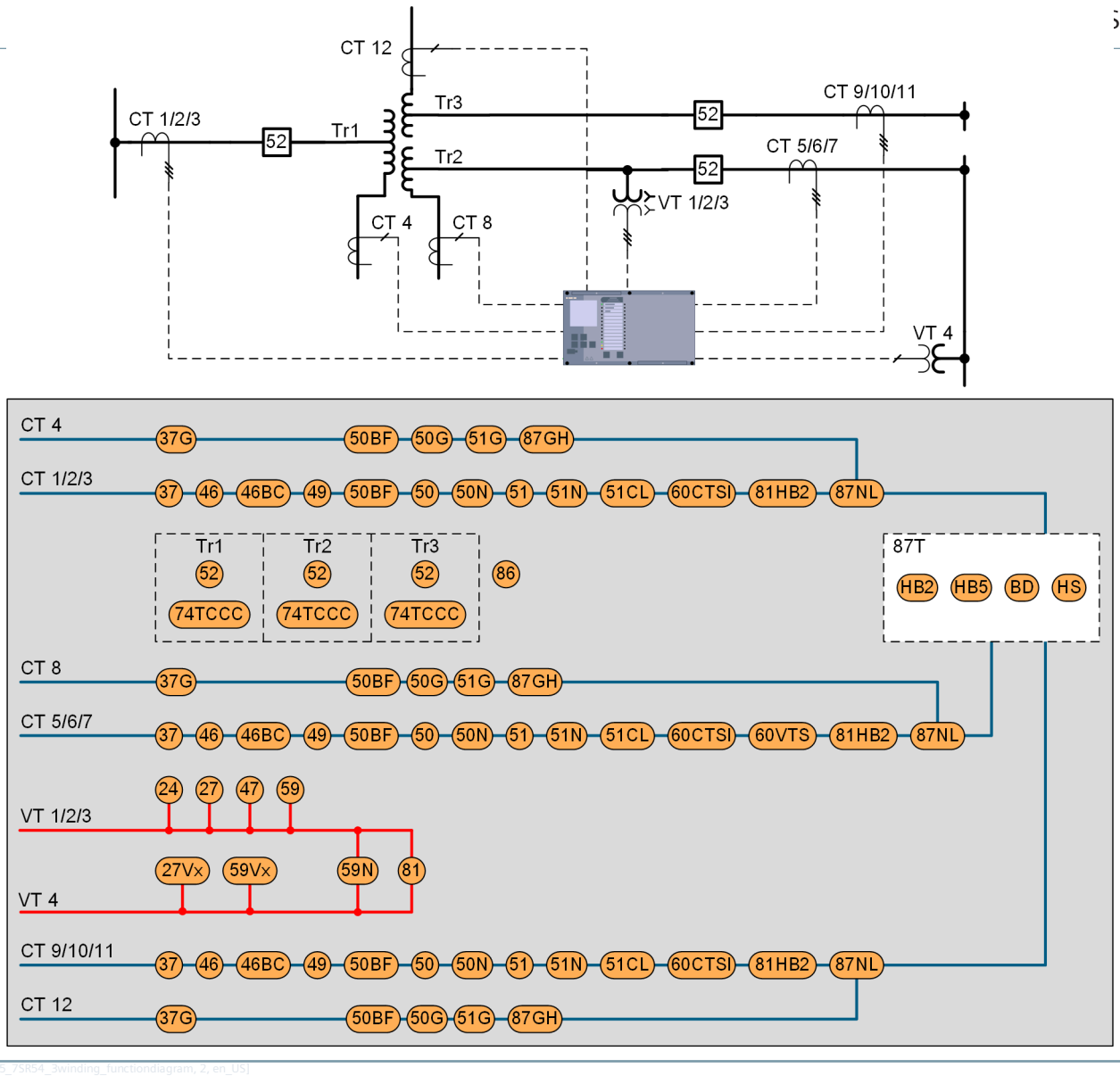


Figure 2.5/1 7SR5421 2-Winding Transformer Protection Function Diagram

VT1,2,3 shown assigned to winding 2



[dw_7SR5_7SR54_3winding_functiondiagram, 2, en_US]

Figure 2.5/2 7SR5431 3-Winding Transformer Protection Function Diagram

VT1,2,3 shown assigned to winding 2

Functions, Application Templates

ANSI	Functions	7SR5420	7SR5421	7SR5430	7SR5431
21LB	Load blinder	–	■	–	■
24	Overexcitation protection	–	■	–	■
27	Undervoltage protection – 3-phase	–	■	–	■
27Vx	Undervoltage protection – Vx	–	■	–	■
37	Undercurrent protection – phase	■	■	■	■
37G	Undercurrent earth fault – measured	■	■	■	■
46	Negative sequence overcurrent protection	■	■	■	■
46BC	Broken conductor detection	■	■	■	■
47	Sequence overvoltage protection	–	■	–	■
49	Thermal overload protection	■	■	■	■
49TS	Temperature sensor supervision [9]	■	■	■	■
50	Instantaneous overcurrent – phase	■	■	■	■
50AFD	Arc flash detection [10]	■	■	■	■
50BF	Circuit-breaker failure protection – 3-pole	■	■	■	■
50G	Instantaneous earth fault – measured	■	■	■	■
50N	Instantaneous earth fault – calculated	■	■	■	■
51	Time delayed overcurrent – phase	■	■	■	■
51CL	Cold load overcurrent – phase	■	■	■	■
51G	Time delayed earth fault – measured	■	■	■	■
51N	Time delayed earth fault – calculated	■	■	■	■
51V	Voltage dependent overcurrent – phase	–	■	–	■
52	Circuit-breaker control	■	■	■	■
59	Overvoltage protection – 3-phase	–	■	–	■
59N	Neutral voltage displacement	–	■	–	■
59Vx	Overvoltage protection – Vx	–	■	–	■
60CTS-I	CT supervision – current reference	■	■	■	■
60VTS	VT supervision	–	■	–	■
67	Directional overcurrent – phase	–	■	–	■
67G	Directional earth fault – measured	–	■	–	■
67N	Directional earth fault – calculated	–	■	–	■
74CC	Close-circuit supervision	■	■	■	■
74TC	Trip-circuit supervision	■	■	■	■
78VS	Voltage vector shift	–	■	–	■
81	Frequency protection – "f>" or "f<"	–	■	–	■
81HB2	Inrush current detection	■	■	■	■
81HB5	Overfluxing detection – 5th harmonic	■	■	■	■
81R	Frequency protection – "df/dt"	–	■	–	■
86	Lockout	■	■	■	■
87GH	Restricted earth fault protection – high-impedance	■	■	■	■
87NL	Restricted earth fault protection - low-impedance	■	■	■	■
87T-BD	Transformer differential protection – biased	■	■	■	■
87T-HS	Transformer differential protection – highset	■	■	■	■
	Measured values	■	■	■	■
	Switching-statistic counters	■	■	■	■
	Circuit-breaker wear monitoring	■	■	■	■
	Logic editor	■	■	■	■
	External trip initiation	■	■	■	■
	Control	■	■	■	■

9 An external interface unit is required.

10 Requires external components

ANSI	Functions	7SR5420	7SR5421	7SR5430	7SR5431
	Fault recording of analog and binary signals	■	■	■	■
	Sequence of events recorder	5000	5000	5000	5000
	Security log	2048	2048	2048	2048
	Monitoring and supervision	■	■	■	■
	Setting groups	4	4	4	4
	Changeover of setting group	■	■	■	■
	Binary inputs (max)	16	37	24	35
	Binary outputs (max) incl. healthy contact	8	18	10	16
	Current inputs	8	8	12	12
	Voltage inputs	0	4	0	4
	Size	12	12	12	12
	LCD resolution	128x128			
	Push buttons	7	7	7	7
	LEDs	28	28	28	28
	Power supply unit rated voltages	DC 24 to 250 V AC 100 to 230 V			
	Front user interface	■	■	■	■
	User selectable languages: English, French, German, Portugese, Spanish, Turkish	■	■	■	■
	IEC 60870-5-103	■	■	■	■
	IEC 61850	■	■	■	■
	Modbus RTU	■	■	■	■
	Modbus TCP	■	■	■	■
	DNP3	■	■	■	■
	Time synchronization	■	■	■	■

Table 2.5/1 Reyrolle 7SR54 – Functions and Application Templates

NOT

■ - Basic

Standard Variants

Standard Variants for 7SR54		
7SR5420-2AA	3/4, 16 BI, 8 BO, 8 I	
	Housing width 3/4 x 19" (size 12), housing height 4U 16 binary inputs 8 binary outputs (1 break, 2 changeover, 5 make) 8 current transformer inputs Communication: USB, RS485, 2 x Ethernet	
7SR5420-3AD	3/4, 21 BI, 13 BO (inc. 3 HSBO), 8 I, 3 AFD	
	Housing width 3/4 x 19" (size 12), housing height 4U 21 binary inputs 13 binary outputs (1 break, 2 changeover, 10 make) 8 current transformer inputs Communication: USB, RS485, 2 x Ethernet	
7SR5421-1AA	3/4, 12 BI, 8 BO, 8 I, 4 V	
	Housing width 3/4 x 19" (size 12), housing height 4U 12 binary inputs 8 binary outputs (1 break, 2 changeover, 5 make) 8 current transformer inputs 4 voltage transformer inputs Communication: USB, RS485, 2 x Ethernet	
7SR5421-2AD	3/4, 17 BI, 13 BO (inc. 3 HSBO), 8 I, 4 V, 3 AFD	
	Housing width 3/4 x 19" (size 12), housing height 4U 17 binary inputs 13 binary outputs (1 break, 2 changeover, 10 make) 8 current transformer inputs 4 voltage transformer inputs Communication: USB, RS485, 2 x Ethernet	
7SR5421-3AA	3/4, 22 BI, 12 BO, 8 I, 4 V	
	Housing width 3/4 x 19" (size 12), housing height 4U 22 binary inputs 12 binary outputs (1 break, 2 changeover, 9 make) 8 current transformer inputs 4 voltage transformer inputs Communication: USB, RS485, 2 x Ethernet	
7SR5421-3AD	3/4, 22 BI, 15 BO (inc. 3 HSBO), 8 I, 4 V, 3 AFD	
	Housing width 3/4 x 19" (size 12), housing height 4U 22 binary inputs 15 binary outputs (1 break, 2 changeover, 12 make) 8 current transformer inputs 4 voltage transformer inputs Communication: USB, RS485, 2 x Ethernet	

7SR5421-6AA	3/4, 37 BI, 18 BO, 8 I, 4 V	
	Housing width 3/4 x 19" (size 12), housing height 4U 37 binary inputs 18 binary outputs (1 break, 2 changeover, 15 make) 8 current transformer inputs 4 voltage transformer inputs Communication: USB, RS485, 2 x Ethernet	
7SR5421-6AD	3/4, 37 BI, 21 BO (inc. 3 HSBO), 8 I, 4 V, 3 AFD	
	Housing width 3/4 x 19" (size 12), housing height 4U 37 binary inputs 21 binary outputs (1 break, 2 changeover, 18 make) 8 current transformer inputs 4 voltage transformer inputs Communication: USB, RS485, 2 x Ethernet	
7SR5430-3AA	3/4, 24 BI, 10 BO, 12 I	
	Housing width 3/4 x 19" (size 12), housing height 4U 24 binary inputs 10 binary outputs (1 break, 2 changeover, 7 make) 12 current transformer inputs Communication: USB, RS485, 2 x Ethernet	
7SR5430-3AD	3/4, 24 BI, 13 BO (inc. 3 HSBO), 12 I, 3 AFD	
	Housing width 3/4 x 19" (size 12), housing height 4U 24 binary inputs 13 binary outputs (1 break, 2 changeover, 10 make) 12 current transformer inputs Communication: USB, RS485, 2 x Ethernet	
7SR5431-3AA	3/4, 25 BI, 12 BO, 12 I, 4 V	
	Housing width 3/4 x 19" (size 12), housing height 4U 25 binary inputs 12 binary outputs (1 break, 2 changeover, 9 make) 12 current transformer inputs 4 voltage transformer inputs Communication: USB, RS485, 2 x Ethernet	
7SR5431-3AD	3/4, 25 BI, 15 BO (inc. 3 HSBO), 12 I, 4 V, 3 AFD	
	Housing width 3/4 x 19" (size 12), housing height 4U 25 binary inputs 15 binary outputs (1 break, 2 changeover, 12 make) 12 current transformer inputs 4 voltage transformer inputs Communication: USB, RS485, 2 x Ethernet	
7SR5431-5AA	3/4, 35 BI, 16 BO, 12 I, 4 V	
	Housing width 3/4 x 19" (size 12), housing height 4U 35 binary inputs 16 binary outputs (1 break, 2 changeover, 13 make) 12 current transformer inputs 4 voltage transformer inputs Communication: USB, RS485, 2 x Ethernet	

7SR5431-5AD	3/4, 35 BI, 19 BO (inc. 3 HSBO), 12 I, 4 V, 3 AFD	
	Housing width 3/4 x 19" (size 12), housing height 4U 35 binary inputs 19 binary outputs (1 break, 2 changeover, 16 make) 12 current transformer inputs 4 voltage transformer inputs Communication: USB, RS485, 2 x Ethernet	

Table 2.5/2 Standard Variants for 7SR54

The technical data of the devices can be found in the hardware manual.

Description

The Reyrolle 5 is designed for the electricity networks of the future with enhanced communications and cyber security while maintaining a user-friendly interface and easy product management.

The Reyrolle 7SR57 motor protection devices include a wide range of protection functions and IEC 61850 Ethernet communications as standard. To further minimize the product variants the power supply and the binary inputs cover the full operating range with configurable binary input thresholds.

The large LCD, tactile pushbuttons and programmable LEDs provide a user-friendly product interface and the relay element is withdrawable for easy replacement.

Input and outputs	4 I + 8 BI + 6 BO 4 I + 3 AFD + 8 BI + 9 BO (inc. 3 HSBO) 4 I + 13 BI + 8 BO 4 I + 3 AFD + 13 BI + 11 BO (inc. 3 HSBO) 4 I + 4 V + 9 BI + 8 BO 4 I + 4 V + 3 AFD + 9 BI + 11 BO (inc. 3 HSBO) 4 I + 4 V + 19 BI + 12 BO 4 I + 4 V + 3 AFD + 19 BI + 15 BO (inc. 3 HSBO)
Communication	Standard front USB port (for configuration using Reydisp PC based software tool) rear RS485, 2 x RJ45 electrical ports or optional optical Ethernet connections
Housing	Size 6 or 12 with withdrawable design
Display	Backlit 128 x 128 LCD with text and graphical display capabilities suitable for single line mimic diagrams

Benefits

- Compact design and low product life-cycle cost
- Reliable operation due to powerful, proven protection algorithms
- IEC 61850 Edition 1 & 2 with HSR, PRP and RSTP operation for increased availability
- Simple product ordering
- Combined 1 A and 5 A current transformer inputs
- 28 programmable tri-color LEDs for clear indications.
- User selectable languages: English, French, German, Portugese, Spanish, Turkish
- Conformal coating ordering option

Functions

Standard Functionality

- 14 Locked rotor protection
- 37/37G Undercurrent protection – phase/earth
- 46BC Broken conductor detection
- 46PR Phase-rotation reversal

[sc_7SR5_7SR57, 1, --_--]

- 46UB Phase unbalance
- 48 Starting-time supervision
- 49M Motor thermal overload protection
- 49TS Temperature sensor supervision [11]
- 50/50G/50N Instantaneous overcurrent/earth fault
- 50AFD Arc flash detection [12]
- 50BCL Break capacity limit
- 50BF Circuit-breaker failure protection – 3-pole
- 51/51G/51N Time delayed overcurrent/earth fault
- 52 Circuit-breaker control
- 60CTS CT supervision
- 66 Number of starts
- 74CC/74TC Close-circuit and trip-circuit supervision
- 81B Backspin monitor
- 81HB2 Inrush current detection
- 86 Lockout
- 87GH Restricted earth fault protection – high-impedance

Additional Functionality – Devices with VT Inputs

- 27/27Vx Undervoltage protection
- 32 Power protection
- 47 Sequence overvoltage protection
- 55 Power factor
- 59/59Vx Overvoltage protection
- 59N Neutral voltage displacement
- 60VTS VT supervision
- 67/67G/67N Directional – phase/earth fault
- 81 Frequency protection – "f>" or "f<"
- 81B-V Backspin monitor – voltage reference

Monitoring Functions

- Primary, secondary, phase sequence, current and voltage
- Frequency, power, and energy
- Fault data, event and waveform records
- Motor start data log

11 An external interface unit is required.

12 Requires external components

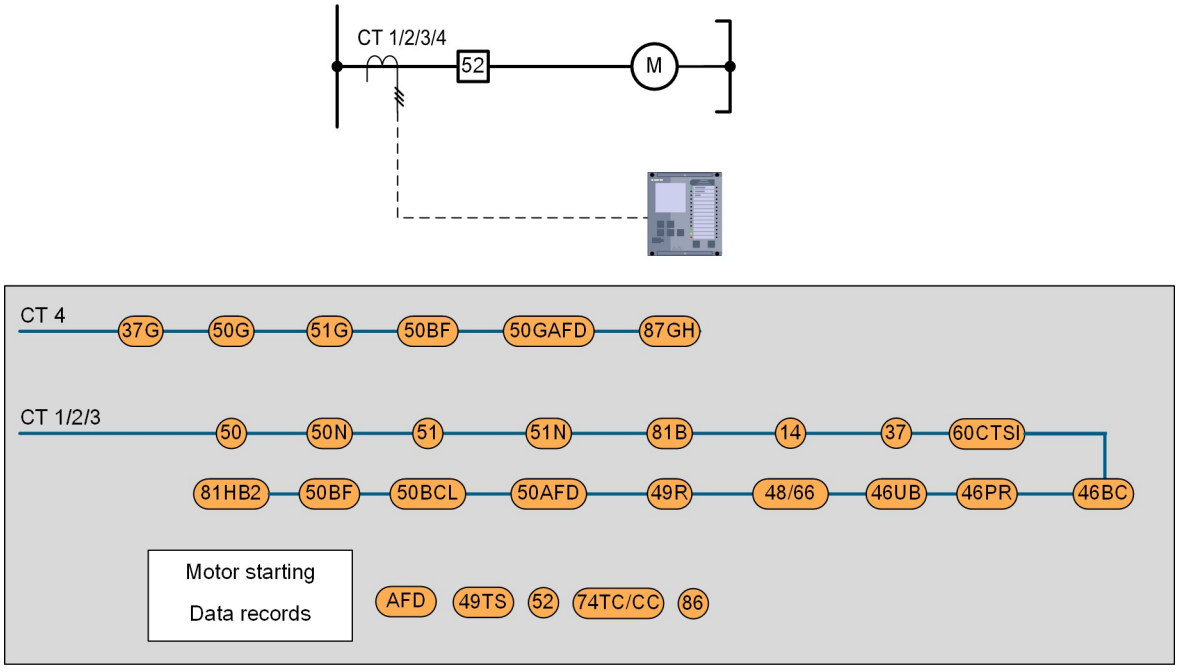
Applications

- Motor protection functions designed to protect during all motor starting and running sequences
- Thermal algorithm optimized to closely match the thermal characteristics of motors
- Thermal monitoring via plant temperature sensors supported

Communication

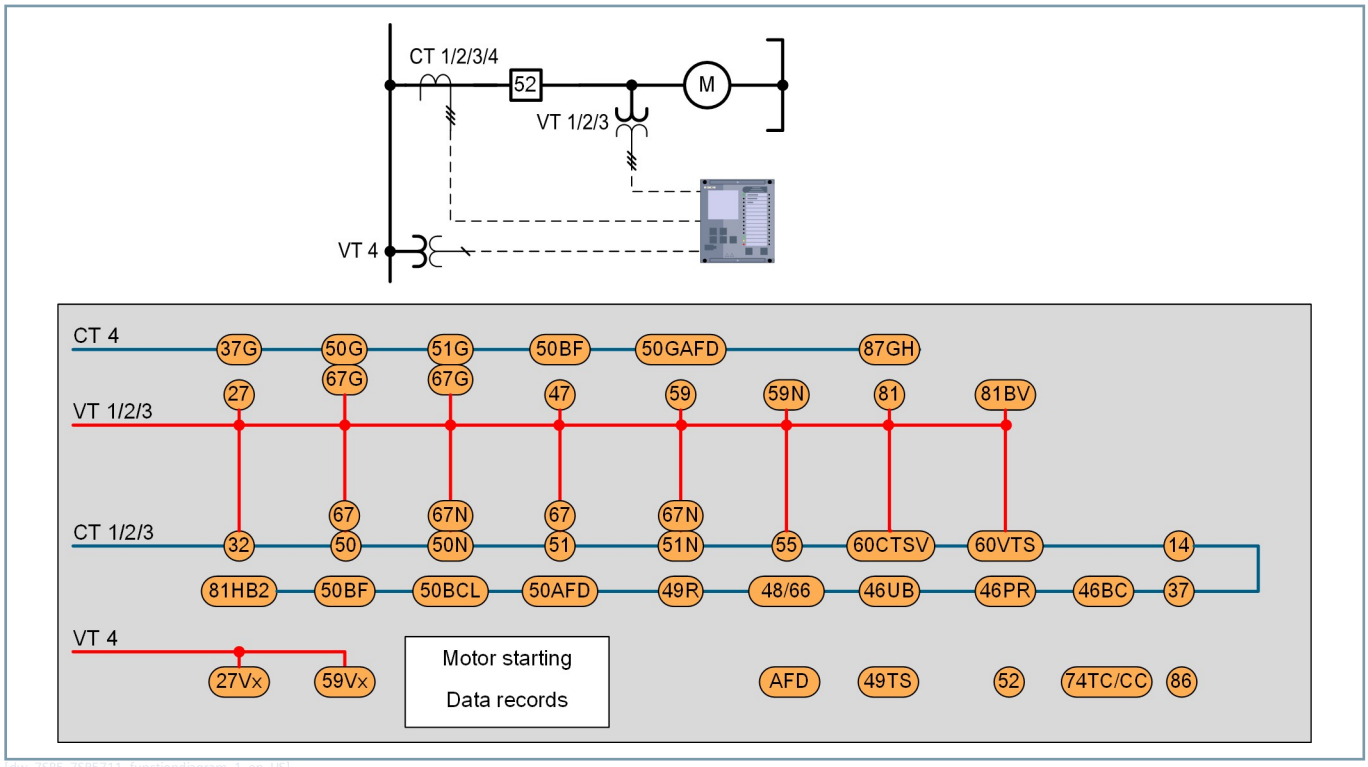
- IEC 60870-5-103, Modbus TCP, Modbus RTU, DNP3, IEC 61850, Modbus Client for connection to external RTD box

Application Templates



{dw_7SR5_7SR5710_functiondiagram, 1, en_US}

Figure 2.6/1 7SR5710 Motor Protection Function Diagram



[dw_7SR5_7SR5711_functiondiagram, 1, en_US]

Figure 2.6/2 7SR5711 Motor Protection Function Diagram

Functions, Application Templates

ANSI	Functions	7SR5710	7SR5711
14	Locked rotor protection	■	■
27	Undervoltage protection – 3-phase	–	■
27Vx	Undervoltage protection – Vx	–	■
32	Power protection	–	■
37	Undercurrent protection – phase	■	■
37G	Undercurrent earth fault – measured	■	■
46BC	Broken conductor detection	■	■
46PR	Phase-rotation reversal	■	■
46UB	Phase unbalance	■	■
47	Sequence overvoltage protection	–	■
48	Starting-time supervision	■	■
49R	Motor thermal overload protection	■	■
49TS	Temperature sensor supervision [13]	■	■
50	Instantaneous overcurrent – phase	■	■
50AFD	Arc flash detection [14]	■	■
50BCL	Break capacity limit	■	■
50BF	Circuit-breaker failure protection – 3-pole	■	■
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	■	■
52	Circuit-breaker control	■	■
55	Power factor	–	■
59	Overvoltage protection – 3-phase	–	■
59N	Neutral voltage displacement	–	■
59Vx	Overvoltage protection – Vx	–	■
60CTS-I	CT supervision – current reference	■	–
60CTS-V	CT supervision – voltage reference	–	■
60VTS	VT supervision	–	■
66	Number of starts	■	■
67	Directional overcurrent – phase	–	■
67G	Directional earth fault – measured	–	■
67N	Directional earth fault – calculated	–	■
74CC	Close-circuit supervision	■	■
74TC	Trip-circuit supervision	■	■
81	Frequency protection – "f>" or "f<"	–	■
81B	Backspin monitor	■	–
81B-V	Backspin monitor – voltage reference	–	■
81HB2	Inrush current detection	■	■
86	Lockout	■	■
87GH	Restricted earth fault protection – high-impedance	■	■
	Measured values	■	■
	Switching-statistic counters	■	■
	Circuit-breaker wear monitoring	■	■
	Logic editor	■	■
	External trip initiation	■	■
	Control	■	■

13 An external interface unit is required.

14 Requires external components

ANSI	Functions	7SR5710	7SR5711
	Fault recording of analog and binary signals	■	■
	Sequence of events recorder	5000	5000
	Motor operating records	■	■
	Security log	2048	2048
	Monitoring and supervision	■	■
	Setting groups	4	4
	Changeover of setting group	■	■
	Binary inputs (max)	13	19
	Binary outputs (max) incl. healthy contact	8	12
	Current inputs	4	4
	Voltage inputs	0	4
	Size	6 or 12	6 or 12
	LCD resolution	128x128	
	Push buttons	7	7
	LEDs	28	28
	Power supply unit rated voltages	DC 24 to 250 V AC 100 to 230 V	
	Front user interface	■	■
	IEC 60870-5-103	■	■
	IEC 61850	■	■
	Modbus RTU	■	■
	Modbus TCP	■	■
	DNP3	■	■
	Time synchronization	■	■

Table 2.6/1 Reyrolle 7SR57 – Functions and Application Templates

NOT

■ - Basic

Standard Variants

Standard Variants for 7SR57		
7SR5710-1AA	3/8, 8 BI, 6 BO, 4 I	
	Housing width 3/8 x 19" (size 6), housing height 4U 8 binary inputs 6 binary outputs (1 break, 2 changeover, 3 make) 4 current transformer inputs Communication: USB, RS485, 2 x Ethernet	
7SR5710-1AD	3/8, 8 BI, 9 BO (inc. 3 HSBO), 4 I, 3 AFD	
	Housing width 3/8 x 19" (size 6), housing height 4U 8 binary inputs 9 binary outputs (1 break, 2 changeover, 6 make) 4 current transformer inputs Communication: USB, RS485, 2 x Ethernet	
7SR5710-2AA	3/8, 13 BI, 8 BO, 4 I	
	Housing width 3/8 x 19" (size 6), housing height 4U 13 binary inputs 8 binary outputs (1 break, 2 changeover, 5 make) 4 current transformer inputs Communication: USB, RS485, 2 x Ethernet	
7SR5710-2AD	3/8, 13 BI, 11 BO (inc. 3 HSBO), 4 I, 3 AFD	
	Housing width 3/8 x 19" (size 6), housing height 4U 13 binary inputs 11 binary outputs (1 break, 2 changeover, 8 make) 4 current transformer inputs Communication: USB, RS485, 2 x Ethernet	
7SR5711-1AA	3/8, 9 BI, 8 BO, 4 I, 4 V	
	Housing width 3/8 x 19" (size 6), housing height 4U 9 binary inputs 8 binary outputs (1 break, 2 changeover, 5 make) 4 current transformer inputs 4 voltage transformer inputs Communication: USB, RS485, 2 x Ethernet	
7SR5711-1AD	3/8, 9 BI, 11 BO (inc. 3 HSBO), 4 I, 4 V, 3 AFD	
	Housing width 3/8 x 19" (size 6), housing height 4U 9 binary inputs 11 binary outputs (1 break, 2 changeover, 8 make) 4 current transformer inputs 4 voltage transformer inputs Communication: USB, RS485, 2 x Ethernet	
7SR5711-3AA	3/4, 19 BI, 12 BO, 4 I, 4 V	
	Housing width 3/4 x 19" (size 12), housing height 4U 19 binary inputs 12 binary outputs (1 break, 2 changeover, 9 make) 4 current transformer inputs 4 voltage transformer inputs Communication: USB, RS485, 2 x Ethernet	

7SR5711-3AD	3/4, 19 BI, 15 BO (inc. 3 HSBO), 4 I, 4 V, 3 AFD	
	Housing width 3/4 x 19" (size 12), housing height 4U 19 binary inputs 15 binary outputs (1 break, 2 changeover, 12 make) 4 current transformer inputs 4 voltage transformer inputs Communication: USB, RS485, 2 x Ethernet	

Table 2.6/2 Standard Variants for 7SR57

The technical data of the devices can be found in the hardware manual.

NOTE

For devices that have more than one current input group the source of the operating current for each element can be configured.

14 Locked Rotor Protection

Each function 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.

21FL Fault Locator

The relay provides a basic single-end type fault locator which is able to estimate the fault position using analogue information measured by the relay at one end of the protected circuit during the short duration of the fault.

21LB Load Blinder

Load blinders block directional overcurrent tripping during periods of high reverse load currents that can occur due to increased contribution from distributed generation in the network. The blinder is operated during user defined load conditions. The application of appropriate settings can be derived by analysis of the data logger stored records.

24 Overexcitation Protection

Excess flux density causes stray flux to flow into transformer components external to the core, causing eddy currents and over-heating. Damage can be caused to transformer insulation.

In DTL mode 2 elements are provided each having an independent definite time lag (DTL) characteristic.

In 'User Defined' mode a user defined pick-up/time characteristic is implemented. Operation occurs where the measured Voltage : Frequency ratio is above setting for a time in excess of the time delayed operation.

25 Synchrocheck – Synchronizing Function

Voltage, phase and frequency differences on opposing sides of the open circuit-breaker are checked before manual close and autoreclose circuit-breaker operations to ensure that the circuit-breaker is not closed in abnormal system conditions.

27 Undervoltage Protection – 3-Phase

Each element has settings for voltage pickup, drop-off (hysteresis) and definite time lag (DTL) operate delay. Operation occurs where the voltage falls below setting for the duration of the DTL setting.

27Vx Undervoltage Protection – Vx

This single phase element has settings as per 27 undervoltage protection – 3 phase.

32 Power Protection

Directional power elements are used to detect reverse load flow or loss of load.

Each element can be set to measure real, apparent or reactive power. Settings for pickup level and definite time lag (DTL) delayed operation are available for each element.

37 Undercurrent Protection

Undercurrent elements are used to detect loss of load or current flow. In some transformer applications an undercurrent check is used as a primary plant switching inter-lock/check.

Each element has settings for pickup level and definite time lag (DTL) delay – operating where the current falls below setting for a time exceeding the DTL setting.

46 Negative-Sequence Overcurrent Protection

NPS current elements can be used to detect unbalances on the system or remote earth faults when a delta-star transformer is in circuit.

2 elements, one DTL and one IDMT, with user settings for pickup level and delays, will operate if NPS current exceeds setting and delay.

46BC Broken Conductor Detection

Elements are used to detect transformer OLTC mechanism failures or broken phase conductors.

Each phase unbalance element has settings for pickup level and DTL delay – operating where 1 or 2 of the measured currents fall below the pick-up setting for a time exceeding the DTL setting.

46PR Phase-rotation reversal

Detects rotation of the current vectors and is used to avoid reverse rotation of the motor.

46UB Phase Unbalance

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.

47 Sequence Overvoltage Protection

Phase sequence voltage elements operate where the selected sequence voltage (V1, V2 or V0) exceeds setting for a period in excess of the operate time.

Each element has settings for pickup level and definite time lag (DTL) delays. Operation occurs where the voltage exceeds setting for the duration of the DTL setting.

48 Starting-Time Supervision

Motor start up time is monitored by this function.

An output is raised if the start time exceeds the setting.

49 Thermal Overload Protection

The thermal algorithm calculates the circuit thermal state from the measured currents. 2 elements provide different heating time constants for natural and forced cooling operation.

Outputs are available for thermal overload and thermal capacity.

49R Motor Thermal Overload Protection

The enhanced thermal algorithm provides compliance with IEC 60255-8 (Thermal Electrical Relays).

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.

49TS Temperature Sensor Supervision

Resistance temperature detectors (RTDs) can also be connected via an optional external Temperature Monitoring Interface. Up to 12 Pt100 sensors can be monitored.

The interface is connected to the RS485 serial communications port.

50 Instantaneous Overcurrent – Phase

The 3 phase currents are measured to provide instantaneous overcurrent protection.

Settings for pickup current operation are available for each independent time (50) element.

An operate time delay can also be applied.

50AFD Arc Flash Detection

Relays can be used with the 7XG31 ReyArc range of Arc flash detection devices.

Arc detection is 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 the relay which also monitors the load current on the system.

50BCL Breaking-Capacity Limit

Operation of the tripping outputs can be blocked if the measured current exceeds this setting. This function is used to prevent the interrupting capacity of the primary switching device being exceeded.

50BF Circuit-Breaker Failure Protection – 3 Pole

Where a CB fails to open and current continues to flow then an alternative means of interrupting the current flow must be implemented. A CB fail output can be used to re-trip the CB (e.g. second trip coil) or to trip adjacent CBs. 2 DTLs are provided to facilitate 2 stage operation if required.

The circuit-breaker fail function can be initiated from an internal trip signal or from a binary input.

Line currents are monitored following trip initiation and outputs issued if any current is still flowing after elapse of a user selectable time delay.

50G Instantaneous Earth Fault – Measured

Earth current is directly measured from an independent CT or the residual connection of the 3 line CTs.

Settings for pickup current operation are available for each independent time (50G) element.

50GHS High Speed Earth Fault – Measured

High speed measured earth fault element for faster clearance of high current faults.

50GI Intermittent Earth Fault

For identification of intermittent, self clearing earth faults by counting fault occurrences and integration of fault current pulse duration for use on compensated networks and cable systems.

50GS Instantaneous Sensitive Earth Fault – Measured

Earth current is directly measured from an independent CT or the residual connection of the 3 line CTs.

Settings for pickup current and time delayed operation are available for each independent time (50G) element.

50HS High Speed Overcurrent – Phase

High speed overcurrent element for faster clearance of high current faults.

50N Instantaneous Earth Fault – Calculated

Earth current is calculated from the sum of the 3 phase CT inputs.

Settings for pickup current operation are available for each independent time (50N) element.

50SOTF Switch onto Fault

SOTF functionality provides high speed tripping if a fault is still present on the feeder after the reclosure of the circuit-breaker (Close-on-to-Fault) or if earthing clamps are left connected after maintenance.

51 Time-Delayed Overcurrent – Phase

The 3 phase currents are measured to provide time delayed overcurrent protection.

Settings for time delayed operation are available for each dependent time (51) element.

Dependent time elements (51) also have selectable IEC/ANSI operate and reset characteristics.

Minimum operating time and additional Follower DTL can also be configured for increased flexibility.

51CL Cold Load Overcurrent – Phase

If a circuit-breaker is closed onto load that has not been powered for a prolonged period a higher than normal load-current can flow until the load stabilizes. To allow optimum setting levels to be applied during this period the cold load pickup feature applies alternative overcurrent settings for a limited time.

The overcurrent function reverts to normal in service settings when either the circuit-breaker has been closed for a defined period, or the current has fallen below a set level for a defined period.

51G Time-Delayed Earth Fault – Measured

Earth current is directly measured from an independent CT or the residual connection of the 3 line CTs.

Settings for time-delayed operation are available for each dependent time (51G) element.

Dependent time elements (51G) also have selectable IEC/ANSI operate and reset characteristics.

51GS Time-Delayed Sensitive Earth Fault – Measured

Earth current is directly measured from an independent CT or the residual connection of the 3 line CTs.

Settings for time-delayed operation are available for each dependent time (51G) element.

Dependent time elements (51G) also have selectable IEC/ANSI operate and reset characteristics.

51N Time-Delayed Earth Fault – Calculated

Earth current is calculated from the sum of the 3 phase CT inputs.

Settings for time-delayed operation are available for each dependent time (51N) element.

Dependent time elements (51N) also have selectable IEC/ANSI operate and reset characteristics.

51V Voltage-Dependent Overcurrent – Phase

In 'Restrained' mode this element increases the sensitivity of the overcurrent protection proportionally with the decrease in the system voltage.

In 'Control' mode the element modifies the time multiplier applied to the 51/67 phase fault elements when the system voltage falls below setting.

55 Power Factor

This feature is used to monitor the system power factor, it is used for system monitoring and/or in conjunction with load flow optimization schemes.

Each element has independent settings for pickup level and definite time lag (DTL) delayed operation.

59 Overvoltage Protection – 3 Phase

Each element has settings for voltage pickup, drop-off (hysteresis) and definite time lag (DTL) operate delay. Operation occurs where the voltage exceeds setting for the duration of the DTL setting.

59N Neutral Voltage Displacement

2 elements, 1 DTL and 1 IDMTL, have user settings for pickup level and delays. These will operate if the neutral voltage exceeds the setting for duration of delay. Neutral overvoltage can be used to detect earth faults in high-impedance earthed or isolated systems.

60CTS-I CT Supervision – Current Reference

Open or short circuited CTs will not allow correct fault detection or stability measurement. Open circuited CTs may cause damaging over-voltages.

Protections can be blocked or an alarm raised, each element has settings for pickup level and DTL delay – operating where 1 or 2 of the line currents fall below the pick-up setting for a time exceeding the DTL setting.

60CTS-V CT Supervision – Voltage Reference

Each element has settings for V_{nps} and I_{nps} pickup levels and DTL delay – operating where V_{nps} is below setting and I_{nps} is above setting for a time exceeding the DTL setting. The CT supervision function typically provides an alarm output.

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.

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.

67 Directional Overcurrent – Phase

Each element can be user set for forward, reverse, or non-directional operation.

Directional overcurrent elements are polarized from 3 phase quadrature voltage.

67G Directional Earth Fault – Measured

Each element can be user set for forward, reverse, or non-directional operation.

On 7SR5121 models with 2 measured earth current inputs, the source of the 67G current can be selected. Overcurrent elements using that measured current input can provide the directional option.

Earth fault elements are polarized using a residual voltage reference Vo.

67GI Directional Intermittent Earth Fault

Settings are provided for directional polarizing which are independent of the other earth fault elements.

On 7SR5121 models with 2 measured earth current inputs, the source of the 67GI current can be selected. Overcurrent elements using that measured current input can provide the directional option.

Elements are polarized using the residual voltage reference V0. Each element can be set for forward, reverse, or non-directional operation.

67GS Directional Sensitive Earth Fault – Measured

Each element can be user set for forward, reverse, or non-directional operation.

On 7SR5121 models with 2 measured earth current inputs, the source of the 67GS current can be selected. Overcurrent elements using that measured current input can provide the directional option.

Sensitive earth fault elements are polarized using a residual voltage reference Vo.

67N Directional Earth Fault – Calculated

Each element can be user set for forward, reverse, or non-directional operation.

Where a suitable Vo reference is not available then calculated earth fault element (N) can also operate in 'NPS Voltage Polarising' mode.

74CC Close-Circuit Supervision

The close-circuit supervision can be monitored via binary inputs connected in basic, intermediate or comprehensive schemes. Close-circuit failure raises an HMI alarm and output(s).

74TC Trip-Circuit Supervision

The trip-circuit supervision can be monitored via binary inputs connected in basic, intermediate or comprehensive schemes. Trip-circuit failure raises an HMI alarm and output(s).

78VS Voltage Vector Shift

The voltage vectors of each phase are monitored and an output initiated when an abrupt phase shift above setting is detected simultaneously in all 3 phases. This indicates a sudden change in the system generation/load balance.

The function is applied to detect 'islanding' or loss of connection between a generator and the main utility supply.

79 Automatic Reclosing

Flexible, independent automatic reclosing sequences for phase and earth fault protection operations are provided.

Up to 5 trips + 4 reclose operations can be attempted.

Automatic reclosing sequences can be user set to any configuration of 'Instantaneous' or 'Delayed' protection trips, with independent reclose (Dead) times. Instantaneous/Delayed elements are user defined from the dependent and independent time elements available.

Limits can be set for the number of 'Delayed' trips to lockout and 'High set' trips to lockout.

The automatic reclosing feature can also be initiated by external protection devices e.g. from a separate line protection relay. External trips can be blocked to allowing the implementation of grading by overcurrent protections.

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

Frequency protection is used to initiate load shedding or generator start up. Over-frequency detectors can be used for generation shedding or within a load restoration permissible logic scheme.

Each element has settings for frequency pickup, drop-off (hysteresis) and definite time lag (DTL) operate delay. Operation occurs where the frequency exceeds setting for the duration of the DTL setting.

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.

81HB2 Inrush Current Detection

A high content of second harmonic current is an indication of transformer energization inrush current.

Harmonic detectors are provided for both line and differential currents.

Where the measured second harmonic level is above the setting operation of the transformer differential and the overcurrent protection is blocked by 81HB2.

81HB5 Overfluxing Detection – 5th Harmonic

A high content of fifth harmonic current can indicate transformer over-fluxing conditions.

Harmonic detectors measure the fifth harmonic level in the transformer differential current and when above setting operation of the biased differential element (87T-BD) protection can be blocked.

81R Frequency Protection – "df/dt"

Each element has settings for pickup level and definite time lag (DTL) delay. Operates when the df/dt gradient exceeds setting for duration of delay.

The function is typically applied in load shedding schemes or to detect 'islanding' or loss of connection between a generator and the main utility supply.

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.

87GH Restricted Earth-Fault Protection – High-Impedance

Restricted earth fault protection provides high sensitivity and high operating speed for internal earth faults as it is associated with only one transformer winding and so does not require harmonic stabilization.

To implement the high impedance restricted earth fault protection scheme the secondary windings of the line and neutral CTs are wired in parallel and connected to the measured earth current input. Class PX CTs with identical ratios must be used.

An external series stabilizing resistor and a voltage limiting (non-linear) resistor are required to complete the scheme.

87NL Restricted Earth-Fault Protection – Low-Impedance

The line and neutral CTs provide inputs to a low-impedance restricted earth fault scheme.

For 7SR5121 models with 2 earth current inputs, CT4 is used.

A percentage biased algorithm is implemented.

Internal current multpiliers allow the use of line and neutral CTs with different ratios.

87T-BD Transformer Differential Protection – Biased

The differential characteristic incorporates an initial setting and two bias stages – the first stage for steady state errors i.e. tap position and CT ratios the second stage for transient errors i.e. CT saturation.

87T-HS Transformer Differential Protection – Highset

Unrestrained differential elements provide a fast protection for high internal fault currents e.g. terminal faults.

Programmable User Logic

The user can map binary inputs and protection operated outputs to function inhibits, logic inputs, LEDs and/or binary outputs. In addition to graphical user logic that is configured in the PC tool the user can map binary inputs and protection operated outputs to fuction inhibits, logic inputs, LEDs, and/or binary outputs using simple text based equations that can be viewed and edited at the device fascia. The user can also enter up to 16 equations defining scheme logic using standard functions e.g. timers, AND/OR gates, inverters and counters. Each protection

element output can be used for alarm & indication and/or tripping.

Circuit-Breaker Maintenance

Up to 3 sets of circuit-breaker operations counters are provided. For each set:

- The maintenance counters record the overall number of operations.
- The delta counter records the number of operations since the last reset.
- The 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. These counters assist with maintenance scheduling.

Plant Maintenance

2 circuit-breaker operations counters are provided. The maintenance counters record the overall number of operations and the delta counter the number of operations since the last reset.

An I^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. These counters assist with maintenance scheduling.

Plant Control

Plant control can be provided from the relay fascia or via the data comms channel(s).

The fascia mimic screen can be configured to provide a visual representation of the primary plant configuration and operate state.

Can include

Instruments and Meters

- Current:
  - Primary phases and earth
  - Secondary phases and earth
  - Relay operate and restraint
  - Phase sequence (PPS, NPS, ZPS)
  - Differential operate and restraint
- Voltage:
  - Primary
  - Secondary
  - Phase sequence (PPS, NPS, ZPS)
- Frequency & fluxing
- Power
- Energy
- Fault location
- Binary input/output and virtual I/O status
- Time and date
- Fault data records
- Event records (selectable events viewable on fascia)
- Waveform records
- Motor start records

Plant Data

- CB trip counters
- CB trip current counters
- CB I^2t summation (wear) counters
- Plant parameters
- Data logging (demand history)

Energy Metering

The imported and exported energy values are stored. Data is available for both active (Wh) and reactive (Varh) energy quantities.

Fault Data Records

The last 100 fault records are displayed on the HMI, with time and date of trip, measured quantities and type of fault.

Waveform Records

The waveform recorder stores analogue data for all inputs, protection function states, binary inputs/outputs and LEDs.

A waveform record can be triggered from protection function, binary input or via data communications.

The latest 20 waveform records can be stored. Waveform records are of 1, 2, 5 or 10 s duration. The ratio of pre-fault to post-fault storage is user selectable.

Waveforms are available for all relay functions and analogue inputs – the displayed waveforms are user selectable.

Motor Start Records (7SR57 Devices)

The records for motor starts include the following information:

- Start date
- Start time
- Number of starts
- Motor start duration
- Thermal capacity used for last start
- Total thermal capacity used
- Maximum starting current
- Minimum start voltage (requires voltage inputs)

Event Records

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

Selectable events can be displayed on the relay fascia or in the event recorder readout.

Data Log

The average values of current, voltage, power, and power factor (where applicable) are recorded at a user selectable interval e.g. every 15 min covers the preceding 7 days.

This stored data log facilitates load flow analysis. In conjunction with data communications and control this information can be used to optimize network power flows, for example in dynamic grids.

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. The real-time clock supports the main and backup clock signals as well as SNTP.

Communications

Reyrolle 7SR5 devices are equipped with high performance integrated communication interfaces as standard. All devices include:

- Front USB port for local connection configuration
- Rear RS485 serial communication for SCADA interface

In addition 2 rear Ethernet interface ports are provided as standard. Ordering options provide the selection for: The Ethernet port types are specified when ordered as

- 2 x RJ45 Eeectrical Ethernet interfaces/connections **OR**
- 2 x duplex LC 1300-nm optical Ethernet interfaces/connections

The electrical Ethernet interface can be configured with or without an integrated switch. The maximum electrically permitted distance via CAT 5/CAT 6 patch cables is 20 m.

The optical Ethernet interface can be configured with or without an integrated switch. The maximum optically permitted distance via 50/125 µm or 62.5/125 µm multimode optical fibers is 2 km.

Serial Protocols (RS485 Port)

The RS485 port is intended for connection to a system interface and can be selected to **Off** or to use any one of the serial protocols, IEC 60870-5-103, Modbus RTU or DNP3. The implementation is compatible with existing Reyrolle 7SR solutions. The serial protocol mapping information can be viewed and configured in Reydisp Manager, this enables adaptation to existing solutions and the interchangeability of devices without changes in the systems control.

IEC 60870-5-103

In addition to indications, measured values, and fault records, metered values, and customer-specific defined indications of systems control are also available in protocol extensions. Control commands for switching devices can also be transmitted via the protocol.

DNP3

DNP3 information about a device and the fault records of the device can be routed and transmitted using the DNP3 protocol. Switching commands can be executed in control direction.

Modbus RTU

Modbus can be used to transmit messages (single-point and double-point indications), measured values, and metered values to 1 master. In command direction, switching of switching objects is possible via the protocol.

Ethernet Protocols

Ethernet modules are used for Ethernet-based protocol applications, for example, IEC 61850, Modbus TCP, time synchronization via SNTP, and network management via SNMP etc. Several applications can run in parallel, unused applications can be switched off for security reasons. The rear Ethernet interfaces are not configured with an IP address by default and must be configured prior to use.

IEC 61850-8-1 Client-Server Communication is always provided on the 7SR5 Ethernet interface and it supports 6 client-server associations with reporting function and GOOSE messages. Messages, measured values, and fault records can be read from an IEC 61850 client and the time of the device can be set via an SNTP server. Measured and metered values can be transmitted via the client-server communication in static and dynamic reports to a maximum of 6 clients (substation controllers). Dynamic reports are created and read by the client without configuring the parameters of the device. The static reports are created via the IEC 61850 system configurator and are permanently saved in the device as indication lists. Fault records can also be retrieved in COMTRADE format. Extensive control functions are available from the client, such as for the safe switching of a circuit breaker.

IEC 61850-8-1 GOOSE

GOOSE has been established as a worldwide standard for the exchange of messages between devices. The exchange itself occurs via high-performance IP network connections or Ethernet network connections. GOOSE messages can be used to exchange time-critical information that must be transmitted in a few milliseconds e.g. to replace protection signals between contacts and binary inputs. GOOSE applications are generated in the system configurator for this purpose.

Modbus TCP

Modbus TCP communication protocol utilises the electrical or optical Ethernet interface and can be used alongside the IEC 61850. Modbus TCP uses TCP packets for data transmission and is similar in operation to the Modbus RTU protocol. Modbus TCP can be used to transmit messages (single-point and double-point indications), measured values, metered values to 1 or 2 (redundant) masters. In the command direction, control operation of switching objects is possible via the protocol. Time synchronization can take place via the Modbus TCP protocol but should not be used when the SNTP time synchronizing is used.

Further Ethernet-based Protocols and Services in addition to the actual protocol application, can be run in parallel on an Ethernet interface.

Ethernet redundancy is supported on both the electrical and optical Ethernet allowing the building of redundant ring structures. They are independent of the substation automation protocol or the selected additional services.

With an integrated switch, electrical or optical rings with a maximum of 40 devices can be established using RSTP (Rapid Spanning Tree Protocol).

Seamless Redundancy with a reduced time for the reconfiguration of communication networks in the event of interruptions is supported with:

- PRP = Parallel Redundancy Protocol
- HSR = High Availability Seamless Redundancy

Time Synchronization via SNTP

Time Synchronization with SNTP Protocol is supported. The device can poll the absolute time from 1 or 2 time servers via an SNTP server. In redundant operation, both servers are read and the time of the 1st server is used for setting the device clock. If this server fails, the time is synchronized by the 2nd server.

Network Monitoring via SNMP

The device can be integrated in network monitoring or power management systems via the SNMP protocol V3. SNMPV3 supports security features with authentication and privacy features. Monitoring variables, for example the state of the Ethernet interfaces, their data throughput etc. can be made known to the monitoring system via MIB (Management Information Base) files. No values can be changed in the device via SNMP. It serves exclusively as a diagnosis interface.

Cyber Security

With the increasing integration of bay devices in Ethernet-based communication networks, communication must be secured against internal disturbances and attacks from outside. Standards and directives contain requirements for the secure operation of devices in a critical communications infrastructure environment, and must be addressed by both manufacturers and operators.

By default only the front USB is enabled in the device to allow local connection. The rear Ethernet ports are not configured by default in the device and can be enabled and configured with Reydisp Manager.

Secure authentication takes place between the device and the communication partner (Reydisp Manager or web interface). This prevents an unauthorized program accessing the devices and reading or writing data there. The use of the transmission protocol secured by Datagram Transport Layer Security (DTLS) or Hypertext Transfer Protocol Secure (HTTPS) ensures the integrity and confidentiality of the transmitted data.

To ensure the Integrity of firmware and configuration of the 7SR5 device, files are digitally signed. In this way, corruption from outside by viruses or trojans, for example by manipulated firmware files, is reliably prevented.

The 7SR5 device provides user authentication using a connection password and maintenance password.

The user has read and write access to the device only after the connection has been established by entering the predefined password.

The maintenance password is configured to restrict access for firmware upgrades, security log access and resetting of the connection password.

The passwords conform to the cybersecurity requirements for assigning passwords defined in NERC CIP. Passwords must have between 8 and 30 characters and must include upper-case and lower-case letters, digits, and special characters.

Operational security (safety) by means of confirmation ID for local access to the control operations and parameter changes from the fascia is also provided. These confirmation IDs can be configured by the user in Reydisp Manager and may be different for different fields of application. After entering the confirmation ID's the user has access until timed out.

Logging of events relevant to cybersecurity, such as login attempts or device restarts, are recorded and optionally transmitted to a central server via the standardized Syslog UDP protocol. The device-internal log entries are secured to prevent deletion and protected against unauthorised access with the Security ID for fascia access and the Maintenance Password for browser access.

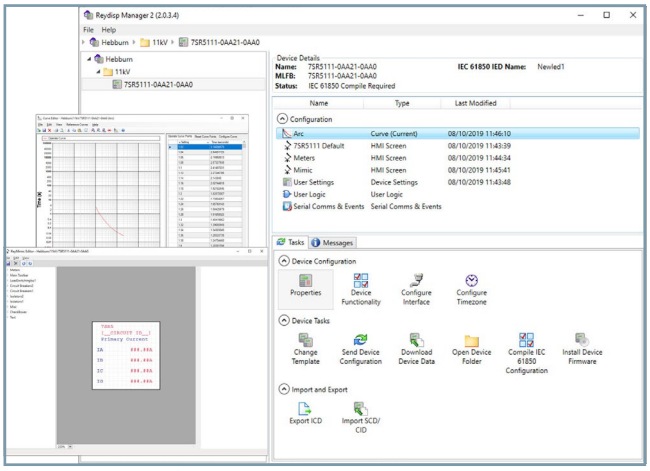
Reydisp Manager 2

Reydisp Manager 2 (RM2) is a PC based engineering tool used for the setting, configuration and commissioning all Reyrolle 5 relays. Available to download free of charge from our web site this easy to use software ensures an efficient work flow.

A connection can be made to the relay via the high speed USB port or over an Ethernet network.

RM2 provides a modern interface allowing the user to apply and interrogate settings, create logic, retrieve event records, disturbance records and waveform records and project management of multiple devices.

For system configuration engineering of IEC 61850 projects an IEC 61850 system configuration tool will be required. Either the Siemens IEC 61850 System Configurator, as used by DIGSI, or a 3rd party IEC 61850 system configurator tool.



[sc_ReydispManager2, 1, --_--]

Figure 3.4/1 Typical Reydisp Manager 2 screenshot

Overview of Functions

- Protection setting parameterization both offline and online
- Device configuration
- Viewing of device instrumentation
- Logic editing
- Creation of user curves
- Serial protocol point editing
- HMI screen design and configuration
- Real time indications on all records allowing direct correlation between all relay records e.g. between waveform and event records
- Indication of all element operate states
- User triggering of protection, control and supervision functions from Reydisp
- Relay BI/BO matrix display
- Reports can be produced and exported
- Comtrade files

- Communications Editor
- Curve Editor
- Mimic Creator
  - Mimic Control: Primary plant can be controlled by the mimic interface
  - Mimic Display: The mimic can display primary plant positions/status

The product platform includes the following:

- Backlit 128x128 LCD with text and graphical display capabilities
- 7 x menu navigation buttons – including 2 x I/O buttons
- 28 Programmable tri-colour LEDs
- Multi-language support capability

The device is housed in a draw-out case designed for panel mounting.

The rear connection comprises of screw type, fixed terminals.

Figure 3.5/1 Size 6

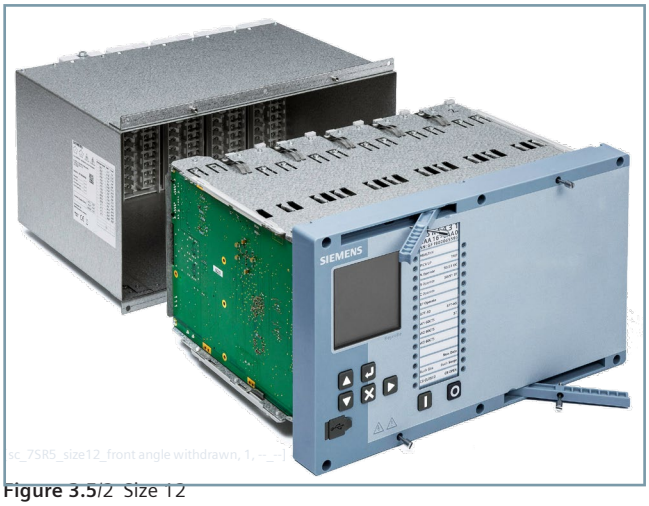


Figure 3.5/2 Size 12

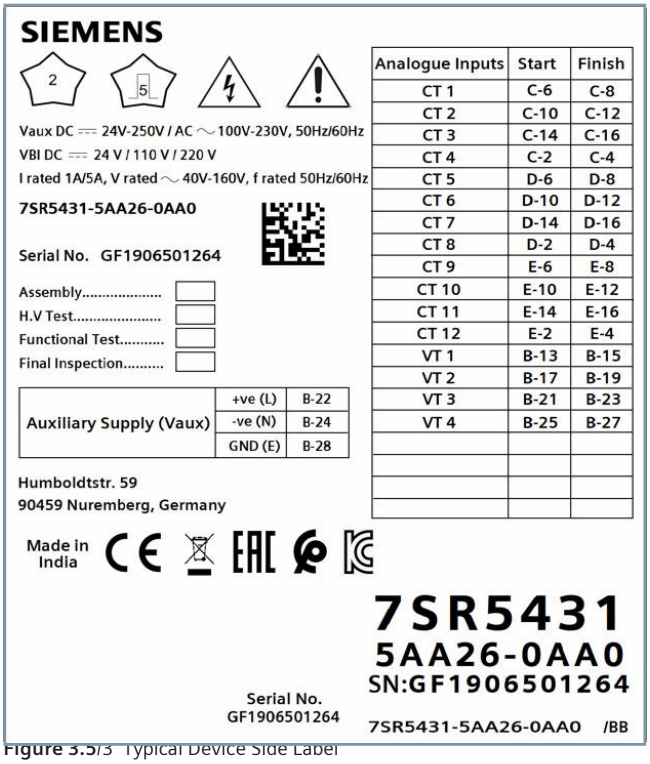


Figure 3.5/3 Typical Device Side Label

Relay Information

The device fascia displays the MLFB order code, serial number, and device identification reference.

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

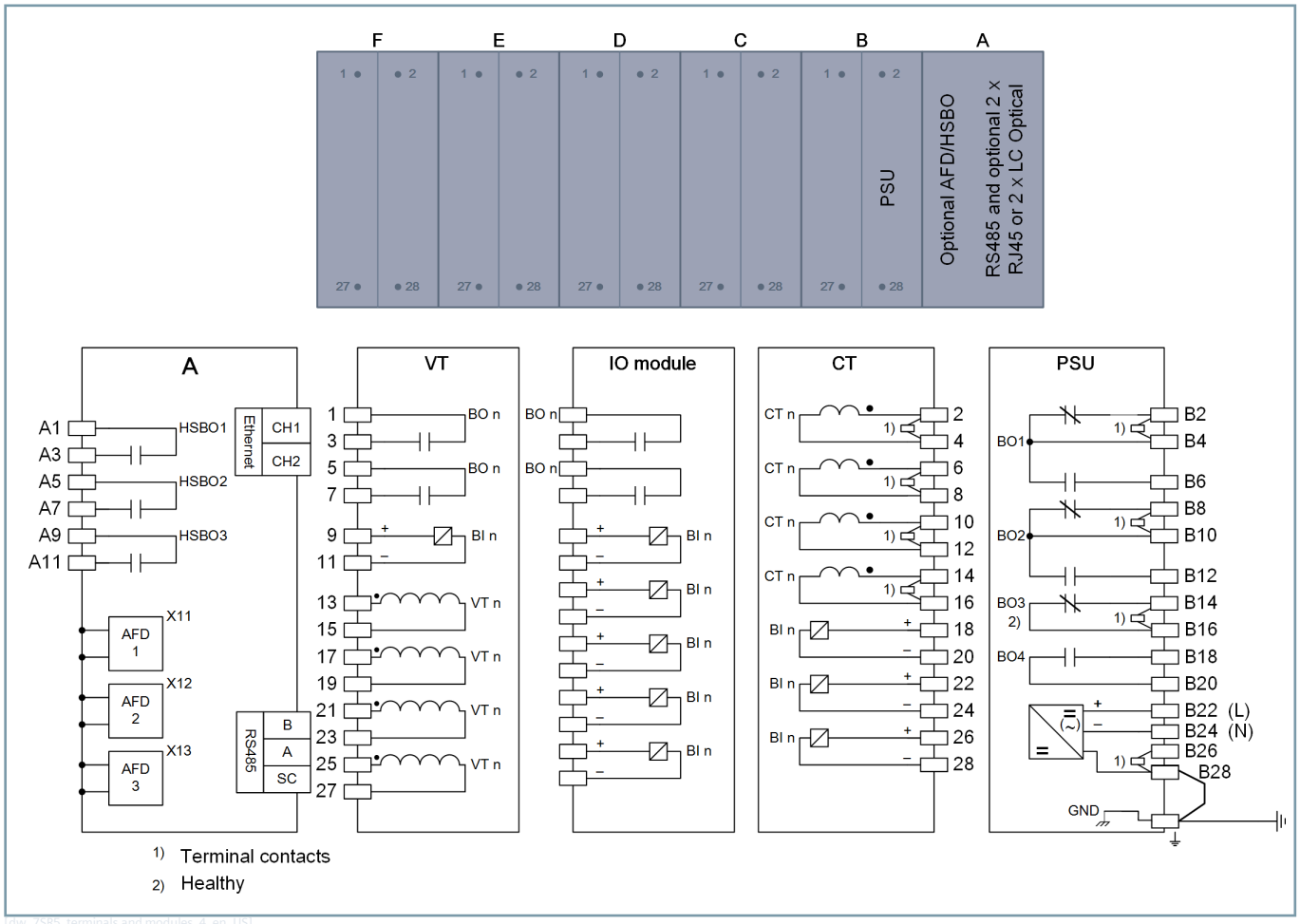
	QR code that can be scanned using a QR code reader application. This allows the device serial number to be quickly identified.
2	AC 2 kV insulation test of reset coil, trip coil, and output contacts
5	5 kV impulse voltage test (type test) in compliance with Class III
	Electrical Hazard
CE	European CE marking
	Refer to device documentation
	Waste Electrical and Electronic Equipment Directive (WEEE)
EAC	Guideline for the Eurasian Market
	USB port to connect to other devices e.g. laptop
	Electrostatic Sensitive Devices warning

Function LED's

28-user programmable tri-colour LEDs are provided, each can be configured to illuminate red, green or yellow allowing for indication of the associated function's state.

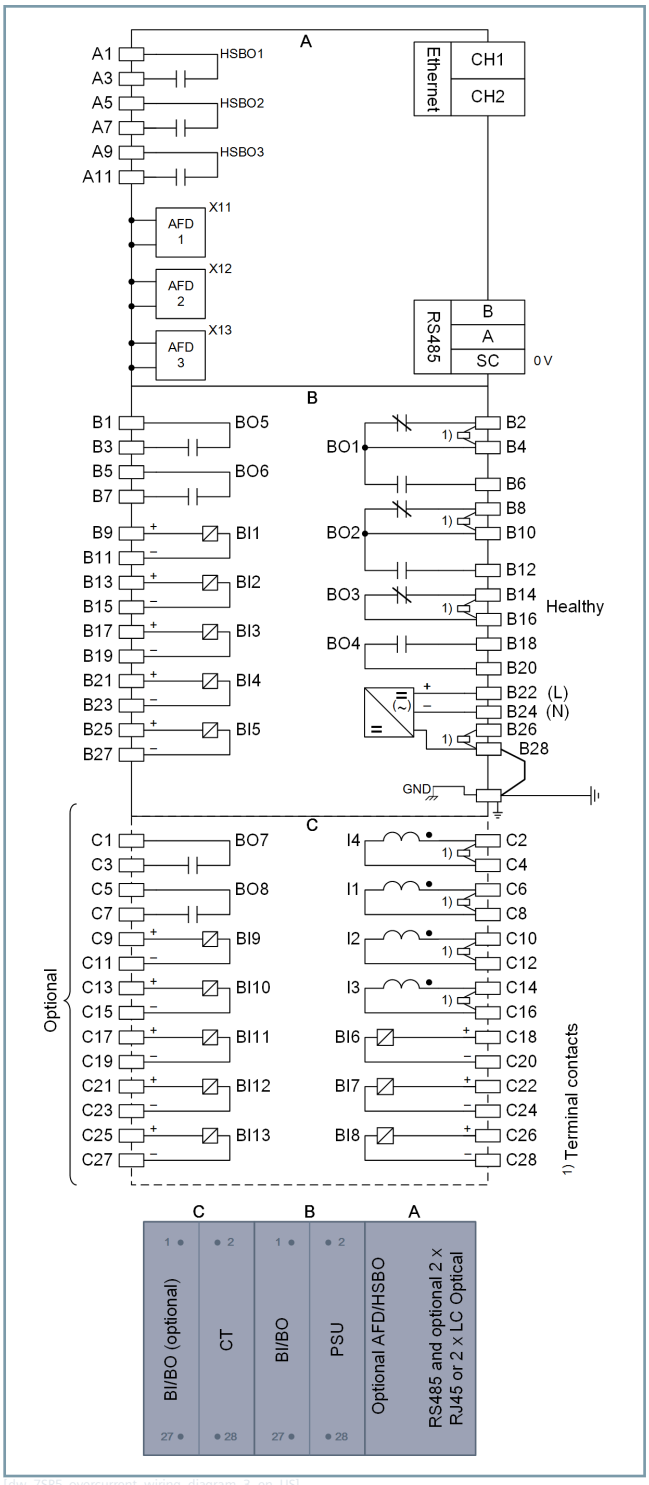
An LED label can be inserted behind the transparent hinged cover on the relay fascia.

The relay settings include a menu allowing the user to input further explanatory text for LED functionality. This is displayed in the LCD.



[dw_7SR5_terminals and modules, 4, en_US]

Figure 3.5/4 Rear View: Arrangement of Terminals and Modules



[dw_7SR5_overcurrent_wiring_diagram, 3, en_US]

Figure 4.1/1 7SR5110 Overcurrent Relay Wiring Diagram

BI Binary input

BO Binary output relay

COM Data communications

CT Current transformer connection

GND Ground/earth

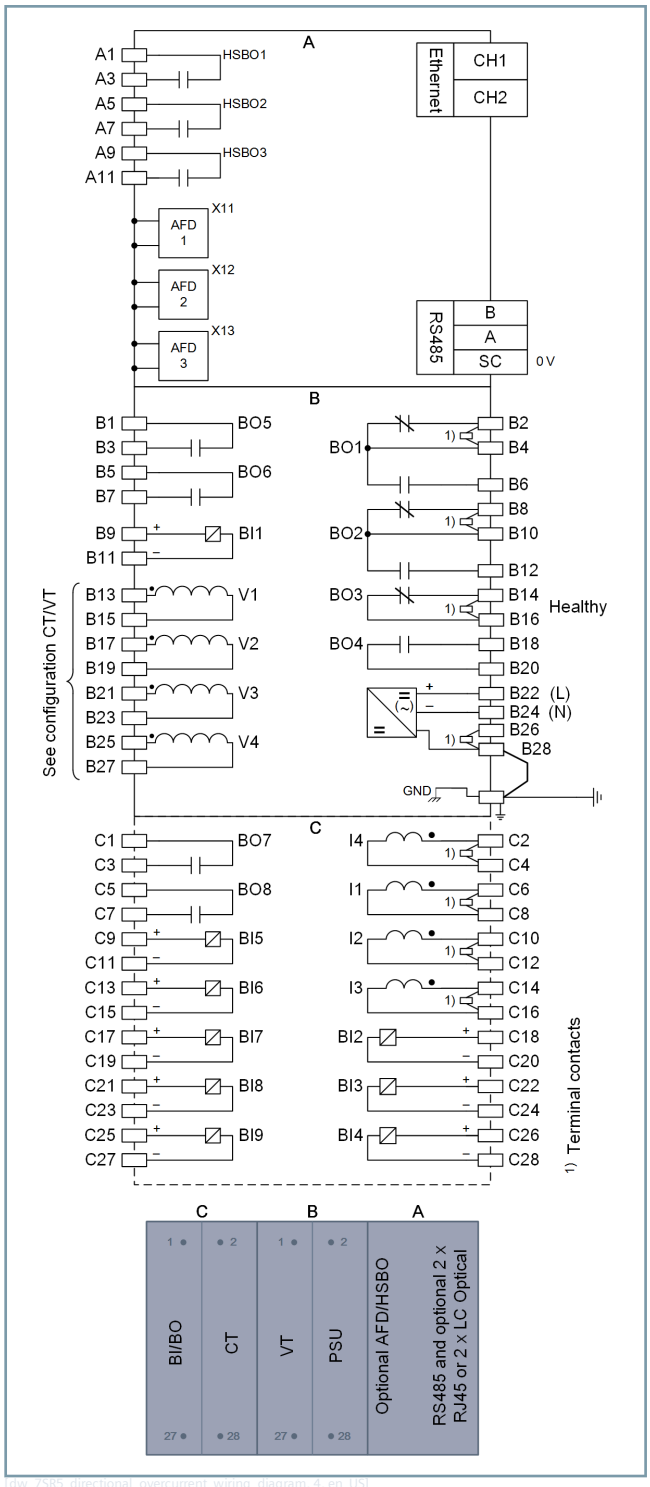
PSU Power supply unit

Module 'A' is shown with optional AFD/HSBO fitted.

The case earth stud should be solidly earthed to the panel earth. Terminal B28 (power supply unit) should be connected to the case earth stud. A minimum wire size of 2.5 mm^2 is recommended.

Terminal contacts internal to the relay case assembly close when the relay element is withdrawn from the case.

Hardware Configurations: The wiring diagram shows a size 6 case. Where the size 12 case is used, additional BI/BO modules can be specified at extra cost – see ordering information sheet.



[dw_7SR5_directional_overcurrent_wiring_diagram_4_en_US]

Figure 4.1/2 7SR5111 Directional Overcurrent Relay Wiring Diagram

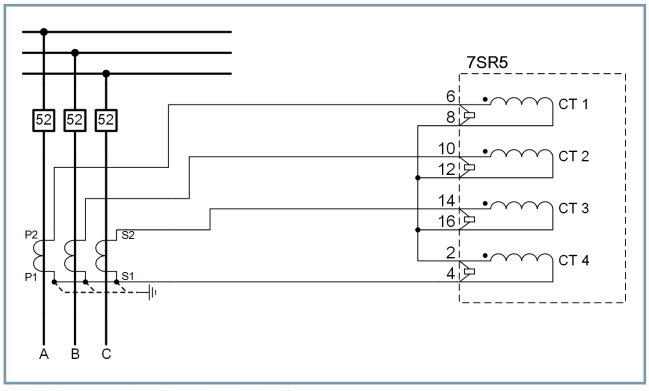
BI Binary input
BO Binary output relay
COM Data communications
CT Current transformer connection
GND Ground/earth
PSU Power supply unit
VT Voltage transformer connection

Module 'A' is shown with optional AFD/HSBO fitted.

The case earth stud should be solidly earthed to the panel earth. Terminal B28 (power supply unit) should be connected to the case earth stud. A minimum wire size of 2.5 mm^2 is recommended.

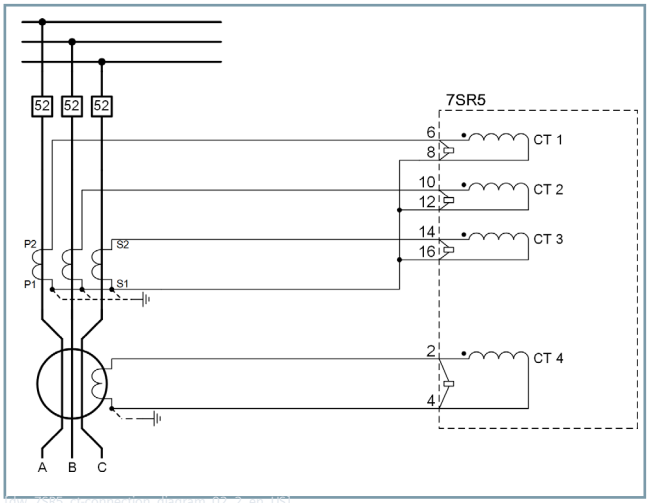
Terminal contacts internal to the relay case assembly close when the relay element is withdrawn from the case.

Hardware Configurations: The wiring diagram shows a size 6 case. Where the size 12 case is used, additional BI/BO modules can be specified at extra cost – see ordering information sheet.



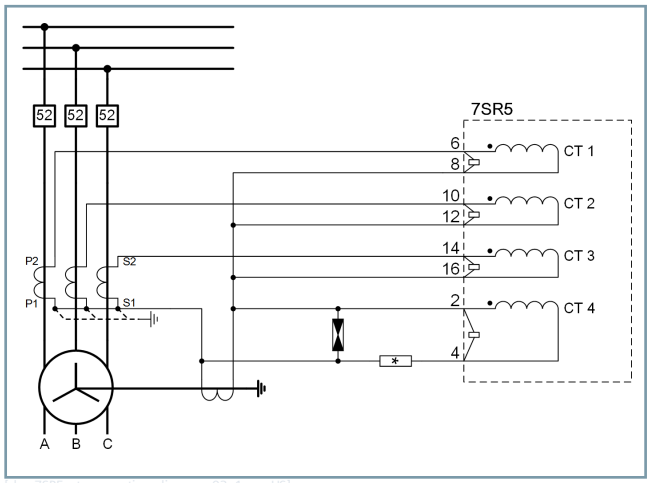
[dw_7SR5_ct-connection_diagram_01_1_en_US]

Figure 4.1/3 CT Connections: 3 Phase and Earth Current Measurement using 'Holmgreen' Connected CTs



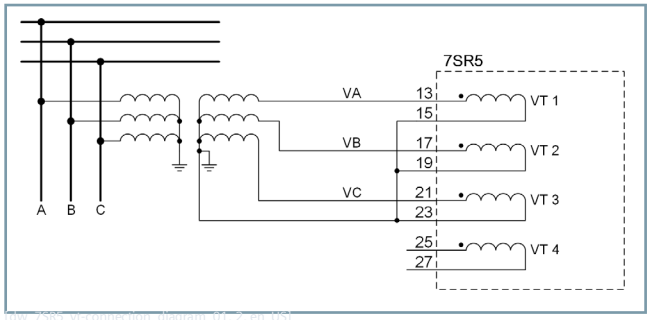
[dw_7SR5_ct-connection_diagram_02_2_en_US]

Figure 4.1/4 CT Connections: 3 Phase Current Measurement. Earth Current Measurement using Ring Core CT



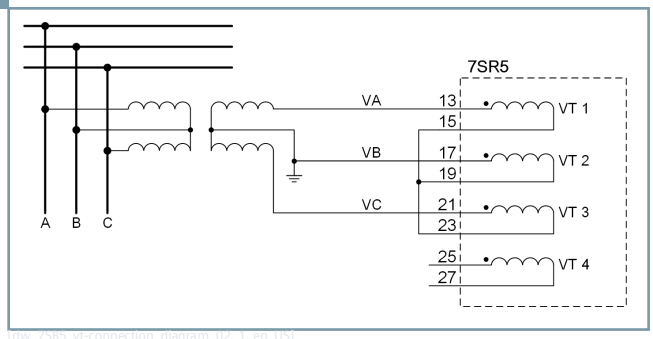
[dw_7SR5_ct-connection_diagram_03, 1, en_US]

Figure 4.1/5 CT Connections: 3 Phase Current Measurement. High Impedance Restricted Earth Fault Protection



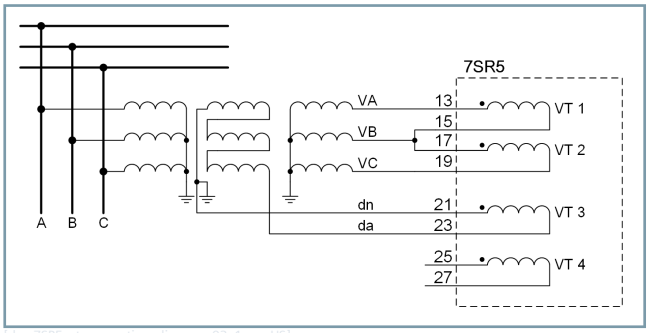
[dw_7SR5_vt-connection_diagram_01, 2, en_US]

Figure 4.1/6 Configuration CTs/VTs > VT 1/2/3 Config = Van, Vbn, Vcn



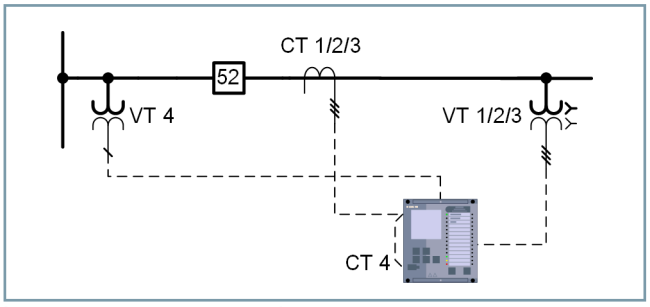
[dw_7SR5_vt-connection_diagram_02, 1, en_US]

Figure 4.1/7 Configuration CTs/VTs > VT 1/2/3 Config = Va, Vb, Vc



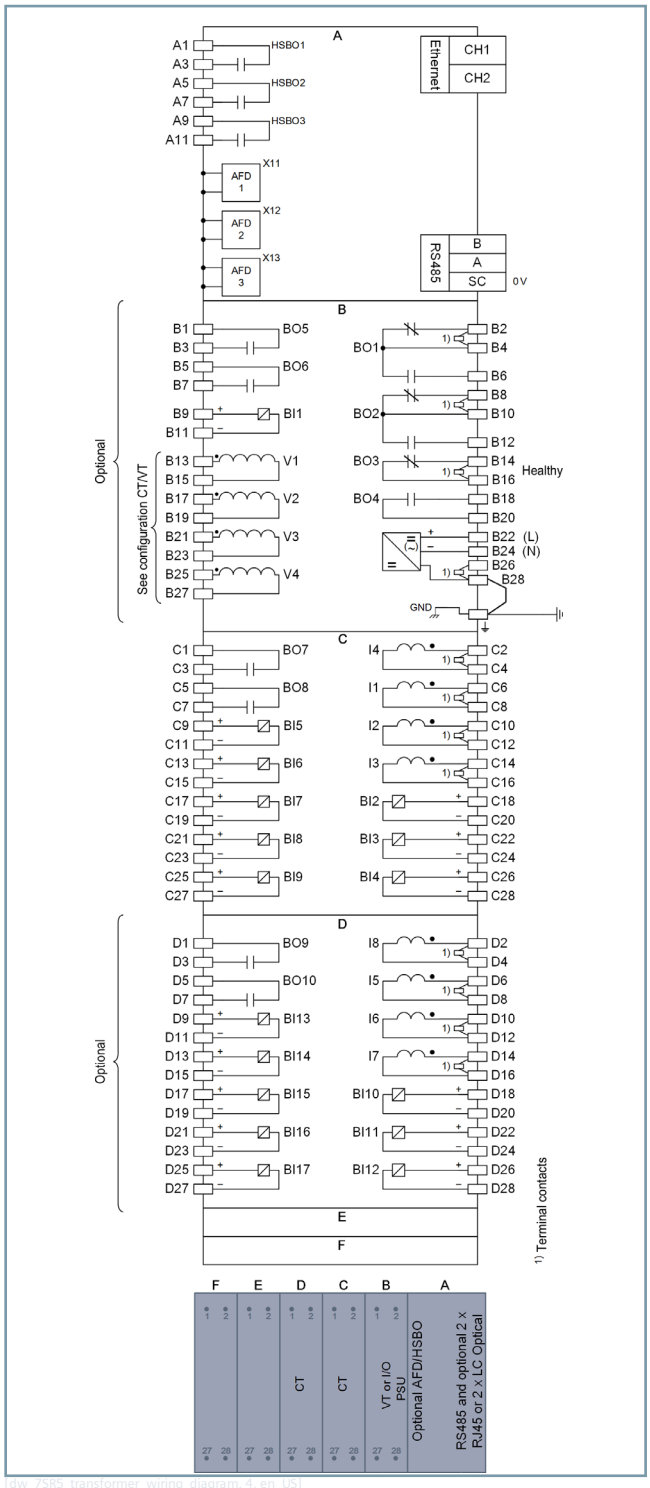
[dw_7SR5_vt-connection_diagram_03, 1, en_US]

Figure 4.1/8 Configuration CTs/VTs > VT 1/2/3 Config = Vab, Vbc, 3V0



[dw_7SR5_ct-vt-connection_diagram, 1, en_US]

Figure 4.1/9 Typical 4 CT, 4 VT Device Overall CT/VT Arrangement



[dw_7SR5_transformer_wiring_diagram, 4, en_US]

Figure 4.1/10 7SR5421 Transformer Relay Wiring Diagram

BI Binary input
BO Binary output relay
COM Data communications
CT Current transformer connection
GND Ground/earth
PSU Power supply unit
VT Voltage transformer connection

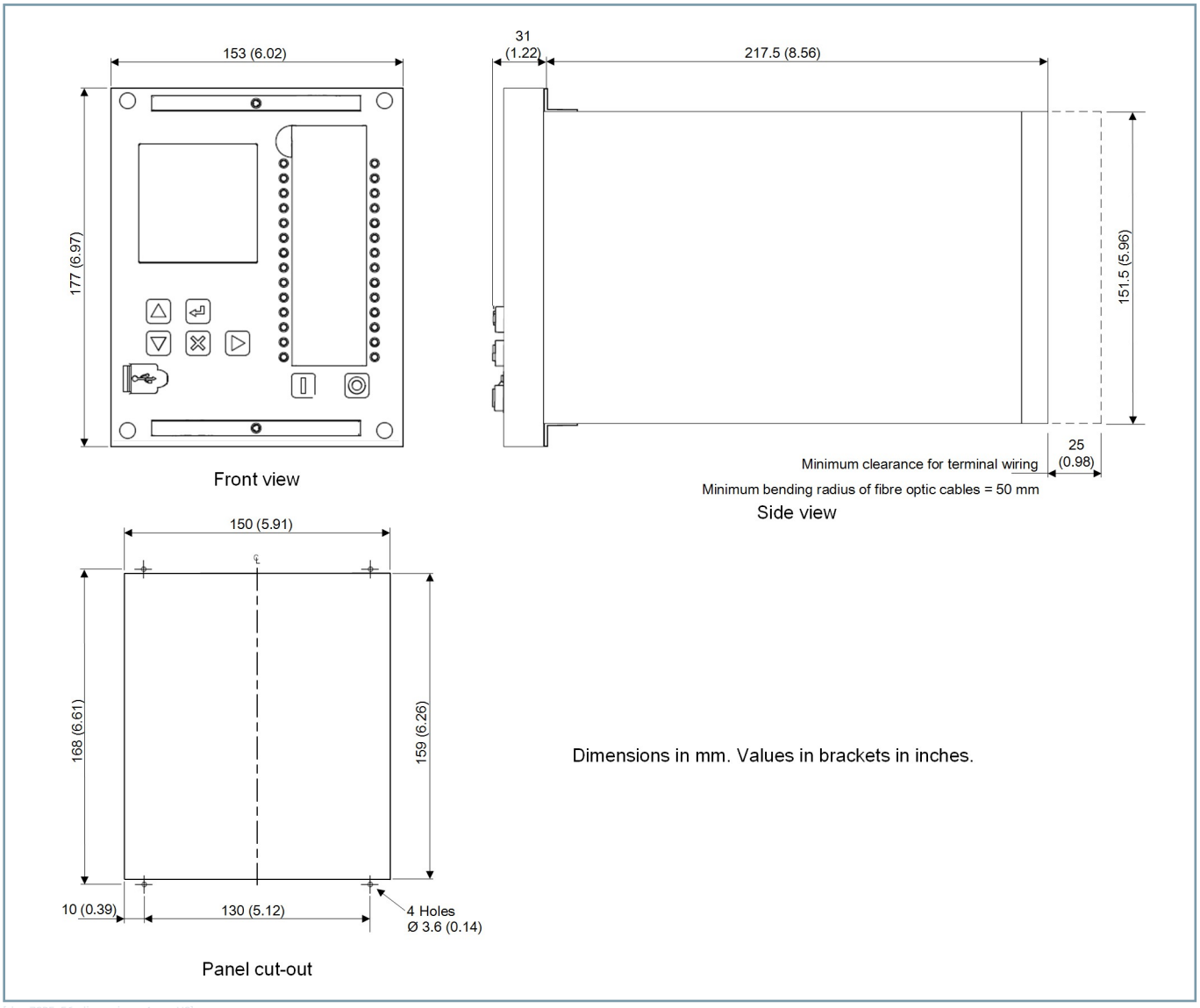
Module 'A' is shown with optional AFD/HSBO fitted.

The case earth stud should be solidly earthed to the panel earth. Terminal B28 (power supply unit) should be connected to the case earth stud. A minimum wire size of 2.5 mm^2 is recommended.

Terminal contacts internal to the relay case assembly close when the relay element is withdrawn from the case.

Hardware Configurations: The wiring diagram shows a size 12 case for a 2-winding transformer protection relay. Additional BI/BO modules can be specified at extra cost – see ordering information sheet.

Dimension drawings

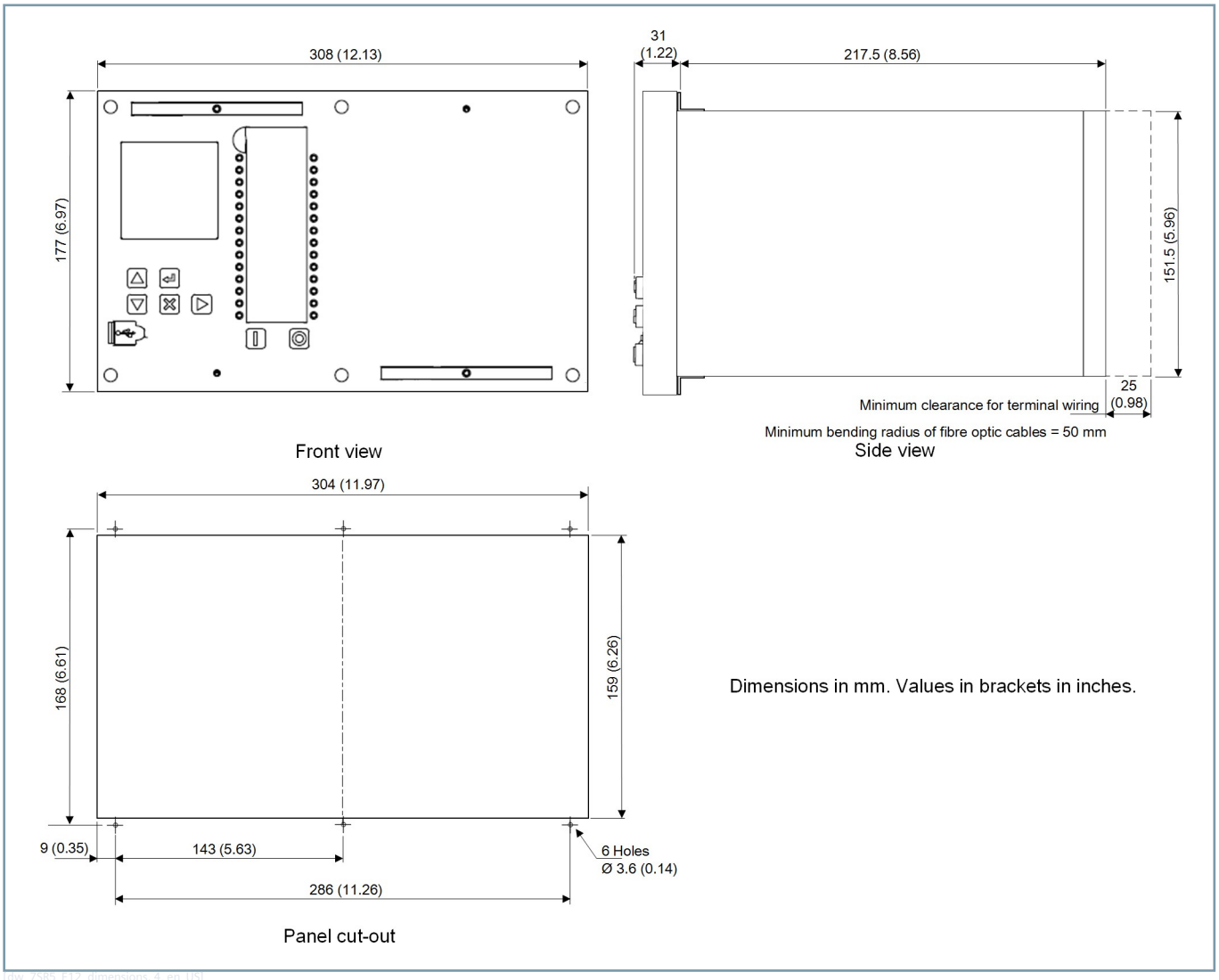


[dw_7SR5_E6_dimensions, 4, en_US]

Figure 4.2/1 Size 6 Case: Dimensions and Panel Drilling Details

NOT

3.6 mm holes are suitable for M4 thread-forming screws supplied with the device for typical panel thickness.



[dw_7SR5_E12_dimensions, 4, en_US]

Figure 4.2/2 Size 12 Case: Dimensions and Panel Drilling Details

NOT

3.6 mm holes are suitable for M4 thread-forming screws supplied with the device for typical panel thickness.

Inputs and Outputs

Current Inputs

(IEC 60255-1, IEC 60255-27)

Quantity	See MLFB structure
Rated current I_{rated}	1 A/5 A
Measuring range	0.05 to 80 · I_{rated} (phase) 0.005 to 32 · I_{rated} (EF/SEF)
Sampling rate	32 samples per cycle
Instrumentation (0.1 to 2 · I_{rated})	± 1 % or ± 1 % I_{rated}
Nominal frequency	50 Hz/60 Hz
Thermal withstand: Continuous 1 Second	 4.0 · I_{rated} (20 A) 100 · I_{rated} (500 A)
Burden @ I_{rated}	≤ 0.1 VA (phase and earth/SEF elements)

Voltage Inputs

(IEC 60255-1, IEC 60255-27)

Quantity	See MLFB structure
Rated voltage	AC 40 V to AC 160 V
Sampling rate	32 samples per cycle
Instrumentation (0.1 to 1.2 · V_{rated})	± 1 % or ± 1 % V_{rated}
Rated frequency	50 Hz/60 Hz
Thermal withstand: Continuous	 300 V
Burden @ 110 V	≤ 0.1 VA

Auxiliary Supply

(IEC 60255-1, IEC 60255-26, IEC 60255-27)

Rated Voltage	Operating Range
DC 24 to 250 V	DC 19.2 V to DC 275 V
AC 100 to 230 V	AC 80 V to AC 253 V (50 Hz/60 Hz)

Rated Voltage	Quiescent Burden	Maximum Burden
DC 24 V	9.9 W	14.9 W
DC 48 V	9.3 W	14 W
DC 60 V	9.1 W	13.8 W
DC 110 V	8.9 W	13.2 W
DC 125 V	8.8 W	13.2 W
DC 220 V	8.1 W	12.3 W
DC 250 V	8.3 W	12.5 W

Rated Voltage	Quiescent Burden	Maximum Burden
AC 100 V	20.8 VA	29.2 VA
AC 110 V	20.9 VA	30.1 VA
AC 115 V	21 VA	30.1 VA
AC 120 V	21.1 VA	30.6 VA

Rated Voltage	Quiescent Burden	Maximum Burden
AC 200 V	23.2 VA	33.2 VA
AC 230 V	24.6 VA	34.7 VA

(IEC 60255-26)

Allowable superimposed AC component	≤ 15 % of DC voltage
Allowable breaks/dips in supply (collapse to zero from nominal voltage)	≤ 50 ms

Binary Inputs

(IEC 60255-1, IEC 60255-26)

Operate voltage setting (user selectable)	DC 24 V/DC 110 V/DC 220 V
Maximum DC current for operation	2 mA
'High' level	> 80 % V_{rated}
'Low' level	< 40 % V_{rated}
Pick-up delay	0 to 14400 s
Dropoff delay	0 to 14400 s

Binary Outputs

(IEC 60255-1)

Operating voltage	AC 250 V/DC 250 V
Contact operate time Release time	8 ms typical 6 ms typical
Making capacity	1000 W at L/R ≤ 40 ms
Carry continuously	AC 5 A or DC 5 A
Make and carry (≤ AC 250 V/ DC 250 V)	30 A for 1 s
Breaking capacity (≤ 5 A and ≤ 250 V): AC resistive DC resistive DC inductive	 1250 VA 75 W 30 W at L/R ≤ 40 ms
Mechanical endurance loaded	Make ≥ 1000 cycles Break ≥ 1000 cycles

Mechanical Tests

Vibration – Sinusoidal

(IEC 60255-21-1 Class I)

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

Shock and Bump
(IEC 60255-21-2 Class I)

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

Seismic
(IEC 60255-21-3 Class I)

Type	Level	Variation
Seismic response	X-plane – 3.5 mm displacement below crossover frequency (8 to 9 Hz) 1 gn above.	≤ 5 %
	Y-plane – 1.5 mm displacement below crossover frequency (8 to 9 Hz) 0.5 gn above.	

IP Ratings
(IEC 60259)

Type	Level
Installed front face	IP 54
Rear enclosure(case)	IP 40
Rear wiring terminal access	IP 10

Product Safety

Protection Class

Protection class	I

Insulation – Dielectric Withstand
(IEC 60255-27)

Type	Level
Between any terminal and earth	AC 2.5 kV RMS for 1 min
Between independent circuits	
Across open contacts	AC 1.0 kV RMS for 1 min

Transient Overvoltage – Impulse Voltage Withstand
(IEC 60255-27)

Between all terminals and earth or between any 2 independent circuits	5 kV, 1.2/50 µs, 0.5 J

Insulation Resistance
(IEC 60255-27)

Insulation resistance at 500 V	> 100 MΩ

Creepage Distances and Clearances
(IEC 60255-27)

Pollution degree	2
Overvoltage category	III

EMC Tests

Conducted Radio Frequency – Emissions
(IEC 60255-26)

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

Radiated Radio Frequency – Emissions
(IEC 60255-26)

Type	Limits at 3 m, Quasi–peak
30 MHz to 230 MHz	50 dB (µV/m)
230 MHz to 1 GHz	57 dB (µV/m)
1 GHz to 3 GHz	76 dB (µV/m)
3 GHz to 6 GHz	80 dB (µV/m)

Radiated Immunity
(IEC 60255-26)

Type		Level
80 MHz to 1000 MHz	Sweep	10 V/m
1.4 GHz to 2.7 GHz	Sweep	10 V/m
80 MHz, 160 MHz, 380 MHz, 450 MHz, 900 MHz, 1850 MHz, 2150 MHz	Spot	10 V/m

Electrostatic Discharge
(IEC 60255-26)

Type	Level	Variation
Contact discharge	8 kV	≤ 5 %
Air discharge	15 kV	≤ 5 %

Conducted Disturbance Induced by Radio Frequency Fields
(IEC 60255-26)

Type	Level
0.15 MHz to 80 MHz	10 V

Fast Transient/Burst Immunity
(IEC 60255-26 Zone A)

Type	Level	Variation
Case, aux power, I/O & earth	4 kV, 5 kHz	≤ 10 %
Metallic communica-tions	2.0 kV, 5 kHz	No data loss

Slow Damped Oscillatory Wave/HF Disturbance
(IEC 60255-26, IEC 61000-4-18)

Type	Level	Variation
Case, aux power & I/O: common (longitu-dinal) mode	2.5 kV	≤ 10 %
Case, aux power & I/O: differential (trans-verse) mode	1.0 kV	

Surge Immunity
(IEC 60255-26 Zone A, IEC 61000-4-5)

Type	Level	Variation
Aux power & I/O: between all terminals and earth	4 kV	≤ 10 %
Aux power & I/O: between any two inde-pendent circuits	2 kV	
Communications	4 kV	No data loss

Power Frequency Disturbance
(IEC 60255-26 Zone A, IEC 61000-4-16 level 4)

Type	Level 0 to 150 kHz
I/O common mode	300 V
I/O differential mode	150 V

Magnetic Field with Power Frequency
(IEC 61000-4-8, level 5)

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

Climatic Tests

Temperature
(IEC 60068-2-1/2)

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

Humidity
(IEC 60068-2-78)

Operational test	56 days at 40°C and 93 % relative humidity

Corrosive Gas
(IEC 60068-2-60)

Test Ke	Flowing mixed gas

Performance

Instrumentation

Current (0.1 to 2 · I_{rated})	±1 % or ±1 % · I_{rated}
Voltage (0.1 to 1.2 · V_{rated})	±1 % or ±1 % · V_{rated}
W Power (P) VAr Reactive power (Q) VA Apparent power (S) (S_{rated} = V_{rated} · I_{rated} V = V_{rated} I = 10 % to 200 % I_{rated} PF ≥ 0.8)	±3 % S_{rated}
Power factor (V = V_{rated} I = 10 % to 200 % I_{rated} PF ≥ 0.8)	± 0.05
Frequency (f_{rated} ± 5 %)	± 10 mHz

21LB Load Blinder

I_{nps} (I_2) setting (3Ph) (I_{set})	0.05 · I_{rated} to 5 · I_{rated}
I_{zps} (I_0) setting (1Ph) (I_{set})	0.05 · I_{rated} to 5 · I_{rated}
V_{pps} (V_1) setting	1 V to 110 V
Angle + setting	5° to 85°
Angle – setting	5° to 85°
Z_{set} Impedance setting	1Ω to 100Ω
I_{op} Operate level	I_{set} ± 5 % or ± 1 % I_{rated}
V_{op} Operate level	V_{set} ± 2 % or ± 0.5 V
V Reset level	110 % V_{op} ± 5 % V_{rated}
Angle operate level	± 5°
Impedance operate level	Z_{set} ± 5 % or ± 0.1Ω

24 Overexcitation Protection

Setting (V/Hz_{set})	0.1 to 2 p.u.
Hysteresis setting	0 to 80 %
Delay setting	0 to 14400 s
V/Hz_{op} (Operate level)	100 % V/Hz_{set}, ± 0.01 p.u.
Reset level	(100 % - hysteresis) · V/Hz_{op}, ± 0.01 p.u.
Basic operate time	t_{basic} + t_{delay}, ± 1 % or ± 10 ms
Operate time following delay	t_{basic} + t_{delay}, ± 1 % or ± 10 ms

27 Undervoltage Protection – 3-Phase

Operate	Any, all
Voltage guard	1 to 200 V
Setting V_{set}	5 to 200 V
Hysteresis setting	0 to 80 %
V_{op} Operate level	V_{set} ± 2 % or ± 0.5 V

Reset level	V_{op} + hysteresis, ± 2 % or 0.5 V
Delay setting t_{delay}	0 to 14400 s
Basic operate time t_{basic}: (1.1 to 0.5 · V_{set})	 63 ms ± 10 ms
Operate time following delay	t_{basic} + t_{delay} , ± 1 % or ± 10 ms

27Vx Undervoltage Protection – Vx

Voltage guard	1 to 200 V
Setting V_{set}	5 to 200 V
Hysteresis setting	0 to 80 %
V_{op} Operate level	V_{set} ± 2 % or ± 0.5 V
Reset level	V_{op} + hysteresis, ± 2 % or 0.5 V
Delay setting t_{delay}	0 to 14400 s
Basic operate time t_{basic}: (1.1 to 0.5 · V_{set})	 63 ms ± 10 ms
Operate time following delay	t_{basic} + t_{delay} , ± 1 % or ± 10 ms

32 Power Protection

Operation	Under, over
Power	P, Q or S
U/C guard	0.05 to 1 · I_{rated}
Setting S_{set}	0.05 to 2 · S_{rated}
Operate level S_{op}	S_{set} ± 5 % or ± 2 % S_{rated}
Reset level	≥ 95 % S_{op} (operation = over) ≤ 105 % S_{op} (operation = under)
Basic operate time t_{basic}: (1.1 · S_{set} (over)) (2 · S_{set} (over)) (0.5 · S_{set} (under))	 60 ms ± 10 ms 45 ms ± 10 ms 40 ms ± 10 ms
Delay setting t_{delay}	0 to 14400 s
Operate time following delay	t_{basic} + t_{delay} , ± 1 % or ± 10 ms

37 Undercurrent Protection – Phase

Operate	Any, all
U/C guard	0.05 to 5 · I_{rated}
Setting range I_{set}	0.05 to 5 · I_{rated}
Operate level	I_{set} ± 5 % or ± 1 % · I_{rated}
Current guard	Phase 0.05 to 5 · I_{rated}
Delay setting t_{delay}	0 to 14400 s
Basic operate time t_{basic}: (1.1 to 0.5 · I_{rated})	 40 ms ± 10 ms
Operate time following delay	t_{basic} + t_{delay} , ± 1 % or ± 10 ms
Overshoot time	< 40 ms

37G Undercurrent Earth Fault – Measured

Operate	Any, all
U/C guard	0.05 to 5 · I_{rated}
Setting range I_{set}	0.005 to 5 · I_{rated}
Operate level	I_{set} ± 5 % or ± 1 % · I_{rated}
Current guard	Phase 0.05 to 5 · I_{rated}
Delay setting t_{delay}	0 to 14400 s
Basic operate time t_{basic}: (1.1 to 0.5 · I_{rated})	 40 ms ± 10 ms
Operate time following delay	t_{basic} + t_{delay} , ± 1 % or ± 10 ms
Overshoot time	< 40 ms

46 Negative-Sequence Overcurrent Protection

DT setting DT_{set}	0.05 to 4 · I_{rated}
DT operate level	DT_{set} ± 5 % or ± 1 % · I_{rated}
DT delay setting t_{delay}	0 to 14400 s
DT basic operate time t_{basic}	40 ms ± 10 ms (2 · DT_{set}) 30 ms ± 10 ms (5 · DT_{set})
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 IT_{set}	0.05 to 2.5
Time multiplier Tm	0.025 to 100
IT operate level	105 % IT_{set}, ± 4 % or ± 1 % I_{rated}
Overshoot time	< 40 ms

46BC Broken Conductor Detection

U/C guard	0.05 to 5 · I_{rated}
Setting $(I_1/I_2)_{set}$	20 % to 100 %
Delay setting t_{delay}	0.03 to 14400 s
Operate level I_{op}	$(I_2/I_1)_{set}$ ± 5 %
Basic operate time t_{basic}	40 ms ± 10 ms
Operate time following delay	t_{basic} + t_{delay}, ± 1 % or ± 20 ms

47 Sequence Overvoltage Protection

Setting V_{set}	1 V to 90 V
Hysteresis setting	0 to 80 %
Operate level	V_{set} ± 2 % or ± 0.5 V
Delay setting t_{delay}	0 to 14400 s
Basic operate time t_{basic}: (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

49 Thermal Overload Protection

Setting I_{set}	0.1 to 3 · I_{rated}
Operate level	I_{set} ± 5 % or ± 1 % · I_{rated}
Time constant setting	1 to 1000 min
Operate time	$T = \tau \cdot \ln\left[\frac{I^2 - I_p^2}{I^2 - I_\theta^2}\right]$ ± 5 % or ± 100 ms (I_{set}: 0.3 to 3 · I_{rated}) I = Average rms current I_p = Pre-load current I_θ = Thermal overload setting current τ = Thermal heating time constant (minutes) ln = Natural logarithm t = Operate time (minutes)

49R Motor Thermal Overload Protection

Setting I_{set}	0.1 to 3 · I_{rated}
NPS weighting factor (K)	0.1 to 10, Δ 0.1
TauH heating constant	0.5 to 1000 min, Δ 0.5 min
TauS starting constant	0.005 to 1 · TauH, Δ 0.005
TauC cooling constant	1 to 100 · TauH, Δ 1
Hot/cold ratio	Off, 1 to 100 %, Δ 1 %
Operate level	I_{set} ± 5 % or ± 1 % · I_{rated}
Operate time	$t = \tau \cdot \ln\left\{\frac{I_{EQ}^2 - \left(1 - \frac{H}{C}\right)I_P^2}{I_{EQ}^2 - I_\theta^2}\right\}$ ± 5 % or ± 100 ms (I_{set}: 0.3 to 3 · I_{rated}) I = Average rms current I_p = Pre-load current I_θ = Thermal overload setting current τ = Thermal heating time constant (minutes) ln = Natural logarithm t = Operate time (minutes)
Capacity alarm level	Disabled, 50 to 100 %
Load alarm level	Off, 0.5 to 1 · I_θ, Δ 0.05
Thermal restart inhibit	20 to 100 %, Δ 1 %
Inhibited by	Binary or virtual input

50 Instantaneous Overcurrent – Phase

Operation [15]	Non-directional, forward or reverse (see 67)
Setting I_{set}	0.05 to 25 · I_{rated}
Delay setting t_{delay}	0 to 14400 s
Operate level I_{op}	I_{set} ± 5 % or ± 1 % · I_{rated}
Reset level	≥ 95 % I_{op}
Basic operate time t_{basic}	35 ms ± 10 ms (2 · I_{set}) 25 ms ± 10 ms (5 · I_{set})
Operate time following delay	t_{basic} + t_{delay}, ± 1 % or ± 10 ms

50AFD Arc Flash Detection

Setting I_{set}	1 to 10 · I_{rated}
Operate level I_{op}	I_{set} ± 10 %
Reset level	≥ 95 % I_{op}
Operate time	< 20 ms (50AFD overcurrent) 15 ms to 25 ms (AFD zone operate time)

50BF Circuit-Breaker Failure Protection – 3 Pole

Setting I_{set}	0.05 to 2 · I_{rated}
Time delays t_{delay}	Timer 1: 20 to 60000 ms Timer 2: 20 to 60000 ms
Operate level	I_{set} ± 5 % or ± 1 % · I_{rated}
Operate time following delay	t_{delay} ± 1 % or ± 20 ms

50G Instantaneous Earth Fault – Measured

Operation [15]	Non-directional, forward or reverse (see 67G)
Setting I_{set}	0.005 to 25 · I_{rated}
Delay setting t_{delay}	0 to 14400 s
Operate level I_{op}	I_{set} ± 5 % or ± 1 % I_{rated}
Reset level	≥ 95 % I_{op}
Basic operate time t_{basic}	35 ms ± 10 ms (2 · I_{set}) 25 ms ± 10 ms (5 · I_{set})
Operate time following delay	t_{basic} + t_{delay}, ± 1 % or ± 10 ms

50GHS High Speed Earth Fault – Measured

Setting I_{set}	0.5 to 25 · I_{rated}
Delay setting t_{delay}	0 to 14400 s
Operate level I_{op}	I_{set} ± 5 % or ± 1 % I_{rated}
Reset level	≥ 95 % I_{op}

15 Requires VT inputs

Basic operate time t_{basic}	20 ms ± 4 ms (2 · I_{set}) 14 ms ± 4 ms (5 · I_{set})
Operate time following delay	t_{basic} + t_{delay}, ± 1 % or ± 10 ms

50GI Intermittent Earth Fault

Setting I_{set}	0.005 to 2 · I_{rated}
Applied current pulse duration	> 5 ms
Minimum time between current pulses	40 ms
Operate level I_{op}	I_{set} ± 5 % or ± 1 % I_{rated}
Pickup Time at 4 · I_{set}	20 ms ± 5 ms
Basic operate time t_{basic}	± 1 % or ± 10 ms for each pulse

50GS Instantaneous Sensitive Earth Fault – Measured

Operation [15]	Non-directional, forward or reverse (see 67GS)
Setting I_{set}	0.005 to 1 · I_{rated}
Delay setting t_{delay}	0 to 14400 s
Operate level I_{op}	I_{set} ± 5 % or ± 1 % I_{rated}
Reset level	≥ 95 % I_{op}
Basic operate time t_{basic}	35 ms ± 10 ms (2 · I_{set}) 25 ms ± 10 ms (5 · I_{set})
Operate time following delay	t_{basic} + t_{delay}, ± 1 % or ± 10 ms

50HS High Speed Overcurrent – Phase

Setting I_{set}	0.5 to 50 · I_{rated}
Delay setting t_{delay}	0 to 14400 s
Operate level I_{op}	I_{set} ± 5 % or ± 1 % · I_{rated}
Reset level	≥ 95 % I_{op}
Basic operate time t_{basic}	20 ms ± 4 ms (2 · I_{set}) 14 ms ± 4 ms (5 · I_{set})
Operate time following delay	t_{basic} + t_{delay}, ± 1 % or ± 10 ms

50N Instantaneous Earth Fault – Calculated

Operation [15]	Non-directional, forward or reverse (see 67N)
Setting I_{set}	0.05 to 50 · I_{rated}
Delay setting t_{delay}	0 to 14400 s
Operate level I_{op}	I_{set} ± 5 % or ± 1 % I_{rated}
Reset level	≥ 95 % I_{op}
Basic operate time t_{basic}	40 ms ± 10 ms (2 · I_{set}) 30 ms ± 10 ms (5 · I_{set})
Operate time following delay	t_{basic} + t_{delay}, ± 1 % or ± 10 ms

51 Time-Delayed Overcurrent – Phase

51V Setting V_{set} [15]	5 V to 200 V
51V Operate level	V_{set} ± 5 % or ± 1 % V_{rated}
51CL Reduced current level	0.05 to 2.5 · I_{rated}
Measurement	RMS, fundamental
Directional control [15]	Non-directional, forward or reverse (see 67)
Setting I_{set}	0.05 to 2.5 · I_{rated}
Characteristic	IEC: NI,VI,EI,LTI ANSI: MI,VI,EI DTL
Time multiplier Tm	0.025 to 100
Delay setting (DTL)	0 to 20 s
Minimum operate time	0 to 20 s
Follower delay	0 to 20 s
Reset	ANSI decaying 0 to 60 s
51V Multiplier [15]	0.25 to 1
Operate level	105 % I_{set}, ± 4 % or ± 1 % · I_{rated}
Basic operate time t_{basic}	20 ms ± 20 ms (2 · I_{set})
Operate time	
IEC	$t_{op} = \left[\frac{K}{\left(\frac{I}{I_{set}}\right)^{\alpha} - 1}\right] \cdot Tm$ ± 5 % or ± 30 ms
ANSI	$t_{op} = \left[\frac{A}{\left(\frac{I}{I_{set}}\right)^{P} - 1} + B\right] \cdot Tm$ ± 5 % or ± 30 ms
DTL	DTL ± 1 % or ± 20 ms

51G Time-Delayed Earth Fault – Measured

Measurement	RMS, fundamental
Directional Control [15]	Non-directional, forward or reverse (see 67G)
Setting I_{set}	0.005 to 1 · I_{rated}
Characteristic	IEC: NI,VI,EI,LTI ANSI: MI,VI,EI DTL
Time multiplier Tm	0.025 to 100
Delay setting (DTL)	0 to 20 s
Minimum operate time	0 to 20 s
Follower delay	0 to 20 s
Reset	ANSI decaying 0 to 60 s
51V Multiplier [15]	0.25 to 1
Operate level	105 % I_{set}, ± 4 % or ± 1 % · I_{rated}

Basic operate time t_{basic}	20 ms ± 20 ms (2 · I_{set})
Operate time	
IEC	$t_{op} = \left[\frac{K}{\left(\frac{I}{I_{set}}\right)^{\alpha} - 1}\right] \cdot Tm$
	± 5 % or ± 30 ms
ANSI	$t_{op} = \left[\frac{A}{\left(\frac{I}{I_{set}}\right)^{P} - 1} + B\right] \cdot Tm$
	± 5 % or ± 30 ms
DTL	DTL ± 1 % or ± 20 ms

51GS Time-Delayed Sensitive Earth Fault – Measured

Directional Control [15]	Non-directional, forward or reverse (see 67GS)
Setting I_{set}	0.005 to 1 · I_{rated}
Characteristic	IEC: NI,VI,EI,LTI ANSI: MI,VI,EI DTL
Time multiplier Tm	0.025 to 100
Delay setting (DTL)	0 to 20 s
Minimum operate time	0 to 20 s
Follower delay	0 to 20 s
Reset	ANSI decaying 0 to 60 s
51V Multiplier [15]	0.25 to 1
Operate level	105 % I_{set}, ± 4 % or ± 1 % · I_{rated}
Basic operate time t_{basic}	20 ms ± 20 ms (2 · I_{set})
Operate time	
IEC	$t_{op} = \left[\frac{K}{\left(\frac{I}{I_{set}}\right)^{\alpha} - 1}\right] \cdot Tm$
	± 5 % or ± 30 ms
ANSI	$t_{op} = \left[\frac{A}{\left(\frac{I}{I_{set}}\right)^{P} - 1} + B\right] \cdot Tm$
	± 5 % or ± 30 ms
DTL	DTL ± 1 % or ± 20 ms

51N Time-Delayed Earth Fault – Calculated

Directional Control [15]	Non-directional, forward or reverse (see 67G)
Setting I_{set}	0.05 to 2.5 · I_{rated}
Characteristic	IEC: NI,VI,EI,LTI ANSI: MI,VI,EI DTL
Time multiplier Tm	0.025 to 100
Delay setting (DTL)	0 to 20 s
Minimum operate time	0 to 20 s
Follower delay	0 to 20 s
Reset	ANSI decaying 0 to 60 s
51V Multiplier [15]	0.25 to 1
Operate level	105 % I_{set}, ± 4 % or ± 1 % · I_{rated}
Basic operate time t_{basic}	20 ms ± 20 ms (2 · I_{set})
Operate time	
IEC	$t_{op} = \left[\frac{K}{\left(\frac{I}{I_{set}}\right)^{\alpha} - 1}\right] \cdot Tm$
	± 5 % or ± 30 ms
ANSI	$t_{op} = \left[\frac{A}{\left(\frac{I}{I_{set}}\right)^{P} - 1} + B\right] \cdot Tm$
	± 5 % or ± 30 ms
DTL	DTL ± 1 % or ± 20 ms

55 Power Factor

Operation setting	Under, over
Directional control	Non-Directional, lead, lag
U/C guard setting	0.05 to 1
Setting PF_{set}	0.05 to 0.99
Delay setting t_{delay}	0 to 14400 s
Operate level	PF_{set} ± 0.05
Basic operate time t_{basic}	≤ 70 ms
Operate time following delay	t_{basic} + t_{delay} ± 1 % or ± 10 ms

59 Overvoltage Protection – 3 Phase

Operate	Any, all
Setting V_{set}	5 to 200 V
Hysteresis setting	0 to 80 %
Operate level	V_{set} ± 2 % or ± 0.5 V
Reset level	V_{op} - hysteresis, ± 2 % or 0.5 V
Delay setting t_{delay}	0 to 14400 s

Basic operate time t_{basic}	73 ms ± 10 ms (1.1 · V_{set}) 63 ms ± 10 ms (2 · V_{set})
Operate time following delay	t_{basic} + t_{delay} , ± 1 % or ± 10 ms

59N Neutral Voltage Displacement

DT setting DT_{set}	1 to 100 V
DT operate level	DT_{set} ± 2 % or ± 0.5 V
DT delay setting t_{delay}	0 to 14400 s
DT basic operate time t_{basic}	76 ms ± 20 ms (1.5 · DT_{set}) 63 ms ± 20 ms (10 · DT_{set})
DT operate time following delay	t_{basic} + t_{delay} , ± 1 % or ± 20 ms
IT char setting	IDMTL and DTL
IT setting IT_{set}	1 to 100 V
Time multiplier Tm	0.1 to 140
Delay (DTL)	0 to 20 s
Reset	ANSI decaying 0 to 60 s
IT operate level	IT_{set} ± 2 % or ± 0.5 V

59Vx Overvoltage Protection – Vx

Setting V_{set}	5 to 200 V
Hysteresis setting	0 to 80 %
Operate level	V_{set} ± 2 % or ± 0.5 V
Reset level	V_{op} - hysteresis, ± 2 % or 0.5 V
Delay setting t_{delay}	0 to 14400 s
Basic operate time t_{basic}	73 ms ± 10 ms (1.1 · V_{set}) 63 ms ± 10 ms (2 · V_{set})
Operate time following delay	t_{basic} + t_{delay} , ± 1 % or ± 10 ms

60CTS-I CT Supervision – Current Reference

CTS-I setting I_{set}	0.05 to 2 · I_{rated}
Delay setting t_{delay}	0.03 to 14400 s
Basic operate time t_{basic}	30 ms ± 20 ms
Operate time following delay	t_{basic} + t_{delay} , ± 1 % or ± 20 ms

60CTS-V CT Supervision – Voltage Reference

CTS-V I_{nps} (I_2) setting I_{nps}	0.05 to 1 · I_{rated}
CTS-V V_{nps} (V_2) setting V_{nps}	7 to 110 V
Delay setting t_{delay}	0.03 to 14400 s
Basic operate time t_{basic}	30 ms ± 20 ms
Operate time following delay	t_{basic} + t_{delay} , ± 1 % or ± 20 ms

60VTS VT Supervision

Component setting	NPS, ZPS
Current setting I_{set}	0.05 to 1 · I_{rated}
Voltage setting V_{set}	7 to 110 V
V_{pps} (V_1) setting	1 to 110 V
I_{pps} (I_1) load setting	0.05 to 1 · I_{rated}
I_{pps} (I_1) fault setting	0.05 to 20 · I_{rated}
Delay setting t_{delay}	0.03 to 14400 s
Basic operate time t_{basic}	32 ms ± 10 ms
Operate time following delay	t_{basic} + t_{delay} , ± 1 % or ± 10 ms

67 Directional Overcurrent – Phase

Angle setting θ_{set}	-95° to +95°
Minimum voltage setting	1 V to 20 V
Operating angle	θ_{set} - 85° ± 5° to θ_{set} - 85° ± 5° (Forward)
Minimum operating voltage	> 1 V ± 0.25 V
Operate time	Typically 32 ms < 40 ms at characteristic angle
Reset time	< 65 ms at characteristic angle

67G Directional Earth Fault – Measured

Angle setting θ_{set}	-95° to +95°
Minimum voltage setting	0.33 V to 3 V
Operating angle	θ_{set} - 85° ± 5° to θ_{set} - 85° ± 5° (Forward)
Minimum operating voltage	> 0.33 V ± 0.25 V
Operate time	Typically 32 ms < 40 ms at characteristic angle
Reset time	< 65 ms at characteristic angle

67GI Directional Intermittent Earth Fault

Angle setting θ_{set}	-95° to +95°
Minimum voltage setting	0.33 V to 3 V
Operating angle	θ_{set} - 85° ± 5° to θ_{set} - 85° ± 5° (Forward)
Minimum operating voltage	> 0.33 V ± 0.25 V
Operate time	< 25 ms at characteristic angle
Reset time	< 25 ms at characteristic angle

67GS Directional Sensitive Earth Fault – Measured

Angle setting θ_{set}	-95° to +95°
Minimum voltage setting	0.33 V to 3 V
Operating angle	θ_{set} - 85° ± 5° to θ_{set} - 85° ± 5° (Forward)
Minimum operating voltage	> 0.33 V ± 0.25 V
Operate time	Typically 32 ms < 40 ms at characteristic angle
Reset time	< 65 ms at characteristic angle

67N Directional Earth Fault – Calculated

Angle setting θ_{set}	-95° to +95°
Minimum voltage setting	0.33 V to 3 V

Operating angle	θ_{set} - 85° ± 5° to θ_{set} - 85° ± 5° (Forward)
Minimum operating voltage	> 0.33 V ± 0.25 V
Operate time	Typically 32 ms < 40 ms at characteristic angle
Reset time	< 65 ms at characteristic angle

78VS Voltage Vector Shift

Angle setting θ_{set}	2° to 30°
Operate level	θ_{set} ± 2°
Operate time	≤ 40 ms

79 Automatic Reclosing

Operating mode	Phase, earth, SEF, external
Number of reclosures	4
Number of trips	5
Dead time	0 to 14400 s
Reclaim time	0 to 600 s

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

Setting f_{set}	43 Hz to 68 Hz
Hysteresis setting	0 to 2 %
Delay setting t_{delay}	0 to 14400 s
Operate level	f_{set} ± 10 mHz
Basic operate time t_{basic}	< 150 ms
Operate time following delay	t_{basic} + t_{delay}, ± 1 % or ± 10 ms

81R Frequency Protection – "df/dt"

Setting df/dt_{set}	0.05 to 10 Hz/s
Hysteresis setting	0 to 2 %
Delay setting t_{delay}	0 to 14400 s
Operate level	df/dt_{set} ± 50 mHz/s
Basic operate time t_{basic}	< 200 ms, typically < 185 ms (2 · df/dt_{set})
Operate time following delay	t_{basic} + t_{delay}, ± 1 % or ± 10 ms

87GH Restricted Earth-Fault Protection – High-Impedance

Setting I_{set}	0.005 to 0.95 · I_{rated}
Delay setting t_{delay}	0 to 14400 s
Operate level	I_{set} ± 5 % or ± 1 % · I_{rated}
Basic operate time t_{basic}	45 ms ± 10 ms (2 · I_{set}) 35 ms ± 10 ms (5 · I_{set})
Operate time following delay	t_{basic} + t_{delay}, ± 1 % or ± 10 ms

87NL Restricted Earth-Fault Protection – Low-Impedance

Guard setting	0.05 to 5 · I_{rated}
Differential settings: Initial setting I_{set} S1 (1st bias slope) S1L (1st bias slope limit) S2 (2nd bias slope)	 0.05 · I_{rated} to 2 · I_{rated} 0.1x to 0.7x 0.5 · I_{rated} to 2 · I_{rated} 1x to 2x
Delay setting t_{delay}	0 to 1 s
Operate level	$I_{op} = \lvert I_n \pm I_g \rvert$ $I_{BIAS} = \frac{\lvert I_g \rvert + \lvert I_n \rvert}{2}$ I_{BIAS} = 0 p.u. to 1 p.u.: $I_{op} > I_{set}$ I_{BIAS} = 1 p.u. to S1L: I_{op} > S1-1 + I_{set} I_{BIAS} > S1L: I_{op} > S2 (I_{BIAS} - S1L) + S1(S1L - 1) + I_{set} ± 10 % of setting or ± 0.01 I_{rated}
Reset level	> 90 % I_{op}
Basic operate time t_{basic}:	< 30 ms (≥ 3 · I_{op})
Operate time following delay	t_{basic} + t_{delay} , ± 1 % or ± 10 ms

87T-BD Transformer Differential Protection – Biased

Differential settings: Initial setting I_{set} S1 (1st bias slope) S1L (1st bias slope limit) S2 type (bias slope 2) S2 (2nd bias slope)	 0.1 · I_{rated} to 2 · I_{rated} 0.1x to 0.7x 1 · I_{rated} to 20 · I_{rated} Line, curve 1x to 2x
Delay setting t_{delay}	0 to 1 s
Operate level	$S0L = \frac{I_S}{S1}$ I_{BIAS} = 0 to S0L: $I_{op} > I_s$ I_{BIAS} S0L to S1L: I_{op} > S1(I_{BIAS} - S0L) + I_s I_{BIAS} > S1L: I_{op} > S2 (I_{BIAS} - S1L) + S1(S1L - S0L) + I_s
Reset level	> 90 % I_{op}
Basic operate time t_{basic}: (inrush action enabled)	< 30 ms (≥ 3 · I_{op})
Operate time following delay	t_{basic} + t_{delay} , ± 1 % or ± 10 ms

87T-HS Transformer Differential Protection – Highset

Differential setting I_{set}	1 to 30 · I_{rated}
Delay setting t_{delay}	0 to 1 s
Operate level	± 10 % of setting or ± 0.01 I_{rated}

Reset level	> 90 % I_{op}
Basic operate time t_{basic}: (inrush action enabled)	$I_{op} = [I_{W1} + I_{W2} + I_{W3}]$ < 25 ms (≥ 1.5 · I_{op})
Operate time following delay	t_{basic} + t_{delay} , ± 1 % or ± 10 ms

Control Functions

CB	Open, close
Inst prot	In/out
EF	In/out
SEF	In/out
Hot line	In/out
Relay mode	Local, remote, local or remote
Reset	LEDs & binary outputs

Circuit-Breaker Maintenance

Total trip counter	0 to 10000
Delta trip counter	0 to 10000
Counts to AR block	0 to 10000
Frequent operations	0 to 10000
I^2t alarm	10 to 100000

Ordering Information – 7SR51 Overcurrent Protection Relay

Product Description	Order No.																
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
7SR51 Overcurrent Protection Relay	7	S	R	5	1	n	n	-	n	A	a	n	n	-	n	A	A	0
						|	|	-	|		|	|	|	-	|			
Overcurrent: I/O Configurations						*6*	*7*	-	*8*		*10*	|	*12*	-	|			
4 I, 8 BI, 6 BO						1	0	-	1		A	|	1	-	|			
4 I, 13 BI, 8 BO						1	0	-	2		A	|	1	-	|			
4 I, 3 AFD, 13 BI, 11 BO (inc. 3 HSBO)						1	0	-	2		D	|	1	-	|			
4 I, 23 BI, 12 BO						1	0	-	4		A	|	6	-	|			
4 I, 38 BI, 18 BO						1	0	-	7		A	|	6	-	|			
						|	|	-	|		|	|	|	-	|			
Directional Overcurrent: I/O Configurations						*6*	*7*	-	*8*		*10*	|	*12*	-	|			
4 I, 4 V, 9 BI, 8 BO						1	1	-	1		A	|	1	-	|			
4 I, 4 V, 3 AFD, 9 BI, 11 BO (inc. 3 HSBO)						1	1	-	1		D	|	1	-	|			
4 I, 4 V, 14 BI, 10 BO						1	1	-	2		A	|	6	-	|			
4 I, 4 V, 19 BI, 12 BO						1	1	-	3		A	|	6	-	|			
4 I, 4 V, 3 AFD, 19 BI, 15 BO (inc. 3 HSBO)						1	1	-	3		D	|	6	-	|			
4 I, 4 V, 24 BI, 14 BO						1	1	-	4		A	|	6	-	|			
4 I, 4 V, 3 AFD, 24 BI, 17 BO (inc. 3 HSBO)						1	1	-	4		D	|	6	-	|			
4 I, 4 V, 39 BI, 20 BO						1	1	-	7		A	|	6	-	|			
4 I, 4 V, 3 AFD, 39 BI, 23 BO (inc. 3 HSBO)						1	1	-	7		D	|	6	-	|			
						|	|	-	|		|	|	|	-	|			
Special Applications Overcurrent: I/O Configurations						*6*	*7*	-	*8*		*10*	|	*12*	-	|			
5 I, 4 V, 17 BI, 10 BO						2	1	-	2		A	|	6	-	|			
5 I, 4 V, 22 BI, 12 BO						2	1	-	3		A	|	6	-	|			
5 I, 4 V, 3 AFD, 22 BI, 15 BO (inc. 3 HSBO)						2	1	-	3		D	|	6	-	|			
5 I, 4 V, 37 BI, 18 BO						2	1	-	6		A	|	6	-	|			
5 I, 4 V, 3 AFD, 37 BI, 21 BO (inc. 3 HSBO)						2	1	-	6		D	|	6	-	|			
											|	|	|	-	|			
Auxiliary I/O (Slot 2)											*10*	|	|	-	|			
No auxiliary I/O											A	|	|	-	|			
3 arc flash detector (AFD) inputs/3 BO (high speed)											D	|	|	-	|			
												|	|	-	|			
CPU/Data Communication												*11*	|	-	|			
Standard: 1 x USB (front), RS485 (rear) ports												11	|	-	|			
2 x RJ45 ports												1	|	-	|			
2 x optical LC ports												2	|	-	|			
													|	-	|			
Case & Fascia													*12*	-	|			
Housing width 3/8 x 19" (size 6), Housing height 4U													1	-	|			
Housing width 3/4 x 19" (size 12), Housing height 4U													6	-	|			
															|			
Conformal Coating															*13*			
Standard device (without conformal coating)															0			
Including conformal coating															1			

NOT

CT inputs: 1 A/5 A, 50 Hz/60 Hz

VT inputs: 40 V to 160 V, 50 Hz/60 Hz

PSU: DC 24 V to DC 250 V, AC 100 V to AC 230 V

PSU: AC = 50 Hz/60 Hz

BI: DC 24 V/DC 110 V/DC 220 V

IEC 61850 Ethernet editions 1 and 2

Modbus TCP

Modbus RTU, IEC 60870-5-103, DNP3

SNMP

Syslog

SNTP

User selectable languages: English, French, German, Portugese, Spanish, Turkish

Ordering Information – 7SR54 Transformer Protection Relay

Product Description	Order No.																
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
7SR54 Transformer Protection Relay	7	S	R	5	4	n	n	-	n	A	a	n	6	-	n	A	A	0
						|	|	-	|		|	|	|	-	|			
2 Wdg. Transformer: I/O Configurations						*6*	*7*	-	*8*		*10*	|	|	-	|			
8 I, 16 BI, 8 BO						2	0	-	2		A	|	|	-	|			
8 I, 3 AFD, 21 BI, 13 BO (inc. 3 HSBO)						2	0	-	3		D	|	|	-	|			
8 I, 4 V, 12 BI, 8 BO						2	1	-	1		A	|	|	-	|			
8 I, 4 V, 3 AFD, 17 BI, 13 BO (inc. 3 HSBO)						2	1	-	2		D	|	|	-	|			
8 I, 4 V, 22 BI, 12 BO						2	1	-	3		A	|	|	-	|			
8 I, 4 V, 3 AFD, 22 BI, 15 BO (inc. 3 HSBO)						2	1	-	3		D	|	|	-	|			
8 I, 4 V, 37 BI, 18 BO						2	1	-	6		A	|	|	-	|			
8 I, 4 V, 3 AFD, 37 BI, 21 BO (inc. 3 HSBO)						2	1	-	6		D	|	|	-	|			
						|	|	-	|		|	|	-	|			
3 Wdg. Transformer: I/O Configurations						*6*	*7*	-	*8*		*10*	|	|	-	|			
12 I, 24 BI, 10 BO						3	0	-	3		A	|	|	-	|			
12 I, 3 AFD, 24 BI, 13 BO (inc. 3 HSBO)						3	0	-	3		D	|	|	-	|			
12 I, 4 V, 25 BI, 12 BO						3	1	-	3		A	|	|	-	|			
12 I, 4 V, 3 AFD, 25 BI, 15 BO (inc. 3 HSBO)						3	1	-	3		D	|	|	-	|			
12 I, 4 V, 35 BI, 16 BO						3	1	-	5		A	|	|	-	|			
12 I, 4 V, 3 AFD, 35 BI, 19 BO (inc. 3 HSBO)						3	1	-	5		D	|	|	-	|			
											|	|	|	-	|			
Auxiliary I/O (Slot 2)											*10*	|	|	-	|			
No auxiliary I/O											A	|	|	-	|			
3 arc flash detector (AFD) inputs/3 BO (high speed)											D	|	|	-	|			
												|	|	-	|			
CPU/Data Communication												*11*	|	-	|			
Standard: 1 x USB (front), RS485 (rear) ports												11	|	-	|			
2 x RJ45 ports												1	|	-	|			
2 x optical LC ports												2	|	-	|			
													|	-	|			
Case & Fascia													*12*	-	|			
Housing width 3/4 x 19" (size 12), Housing height 4U													6	-	|			
															|			
Conformal Coating															*13*			
Standard device (without conformal coating)															0			
Including conformal coating															1			

NOT

CT inputs: 1 A/5 A, 50 Hz/60 Hz

VT inputs: 40 V to 160 V, 50 Hz/60 Hz

PSU: DC 24 V to DC 250 V, AC 100 V to AC 230 V

PSU: AC = 50 Hz/60 Hz

BI: DC 24 V/DC 110 V/DC 220 V

IEC 61850 Ethernet editions 1 and 2

Modbus TCP

Modbus RTU, IEC 60870-5-103, DNP3

SNMP

Syslog

SNTP

User selectable languages: English, French, German, Portugese, Spanish, Turkish

Ordering Information – 7SR57 Motor Protection Relay

Product Description	Order No.																	
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
7SR57 Motor Protection Relay	7	S	R	5	7	1	n	-	n	a	a	n	n	-	1	A	A	0
							|	-	|	|	|	|	|	-	|			
Motor: I/O Configurations							*7*	-	*8*	*9*	*10*	|	*12*	-	|			
4 I, 8 BI, 6 BO							0	-	1	A	A	|	1	-	|			
4 I, 3 AFD, 8 BI, 9 BO (inc. 3 HSBO)							0	-	1	A	D	|	1	-	|			
4 I, 13 BI, 8 BO							0	-	2	A	A	|	1	-	|			
4 I, 3 AFD, 13 BI, 11 BO (inc. 3 HSBO)							0	-	2	A	D	|	1	-	|			
4 I, 4 V, 9 BI, 8 BO							1	-	1	A	A	|	1	-	|			
4 I, 4 V, 3 AFD, 9 BI, 11 BO (inc. 3 HSBO)							1	-	1	A	D	|	1	-	|			
4 I, 4 V, 19 BI, 12 BO							1	-	3	A	A	|	6	-	|			
4 I, 4 V, 3 AFD, 19 BI, 15 BO (inc. 3 HSBO)							1	-	3	A	D	|	6	-	|			
										|	|	|	|	-	|			
Extended I/O Configurations (highest no. slots)										*9*	*10*	|	*12*	-	|			
No extended I/O										A	|	|	|	-	|			
											|	|	|	-	|			
Auxiliary I/O (Slot 2)											*10*	|	|	-	|			
No auxiliary I/O											A	|	|	-	|			
3 Arc flash detector (AFD) inputs / 3 BO (high speed)											D	|	|	-	|			
												|	|	-	|			
CPU/Data Communication												*11*	|	-	|			
Standard: 1 x USB (front), RS485 (rear) ports, plus												11	|	-	|			
2 x RJ45 ports												1	|	-	|			
2 x optical LC ports												2	|	-	|			
													|	-	|			
Case & Fascia													*12*	-	|			
Housing width 3/8 x 19" (size 6), Housing height 4U													1	-	|			
Housing width 3/4 x 19" (size 12), Housing height 4U													6	-	|			
															|			
Conformal Coating															*13*			
Standard device (without conformal coating)															0			
Including conformal coating															1			

NOT

CT inputs: 1 A/5 A, 50 Hz/60 Hz

VT inputs: 40 V to 160 V, 50 Hz/60 Hz

PSU: DC 24 V to DC 250 V, AC 100 V to AC 230 V

PSU: AC = 50 Hz/60 Hz

BI: DC 24 V/DC 110 V/DC 220 V

IEC 61850 Ethernet editions 1 and 2

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SNMP

Syslog

SNTP

User selectable languages: English, French, German, Portugese, Spanish, Turkish

Ordering Information – 7SR5 Spares and Accessories

Product Description	Order No.																	
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
7SR5 Spares and Accessories	7	X	G	1	n	n	1	-	0	A	A	0	0	-	0	A	A	0
					|	|												
Fiber optic data communication port inserts (7SR5)					1	1												
Terminal plug for RS485 wiring (3-way)					1	3												
Captive screws for fascia levers (7SR5)					6	1												
Hinged cover for fascia LED label (7SR5)					6	2												

Indication of conformity

CE This product is CE compliant to relevant EU directives.

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