

Devices and Application

Transformer Differential Protection – Reyrolle 7SR54

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.



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- 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 – synchronization function
- 27/27Vx Undervoltage protection
- 32 Power protection
- 47 Sequence overvoltage protection
- 51V Voltage-dependent overcurrent – phase (7SR5421)
- 55 Power factor
- 59/59Vx Overvoltage protection
- 59N Neutral voltage displacement
- 60VTS VT supervision
- 67/67G/67N Directional – phase/earth fault (7SR5421)
- 78VS Voltage vector shift

Inputs and outputs	Current inputs – 8 or 12 Voltage inputs – 0 or 4 Binary inputs (max) – 37 Binary outputs (max) incl. healthy contact – 18 Arc flash detector inputs (AFD) – 0 or 3 High speed binary outputs (HSBO) – 0 or 3 Temperature sensor inputs (TSI) – 0 or 8
Communication	Standard front USB port (for configuration using Reydisp Manager 2, a PC based software tool) rear RS485, 2 x RJ45 electrical ports or optional optical Ethernet connections
Housing	Size 8 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, Portuguese, Spanish, Turkish
- Conformal coating ordering option

Functions

Standard Functionality

- 37/37G Undercurrent protection – phase/earth
- 46 Negative sequence overcurrent protection
- 46BC Broken conductor detection

⁷ An external interface unit is required where optional TSI module not fitted.

⁸ Requires external components

- 81 Frequency protection – " $f >$ " or " $f <$ "
- 81R Frequency protection – " df/dt "

Monitoring Functions

- Primary, secondary, and phase sequence, current & voltage
- Frequency, power
- 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, DNP3 TCP
Modbus RTU, DNP3, IEC 61850

Application Templates

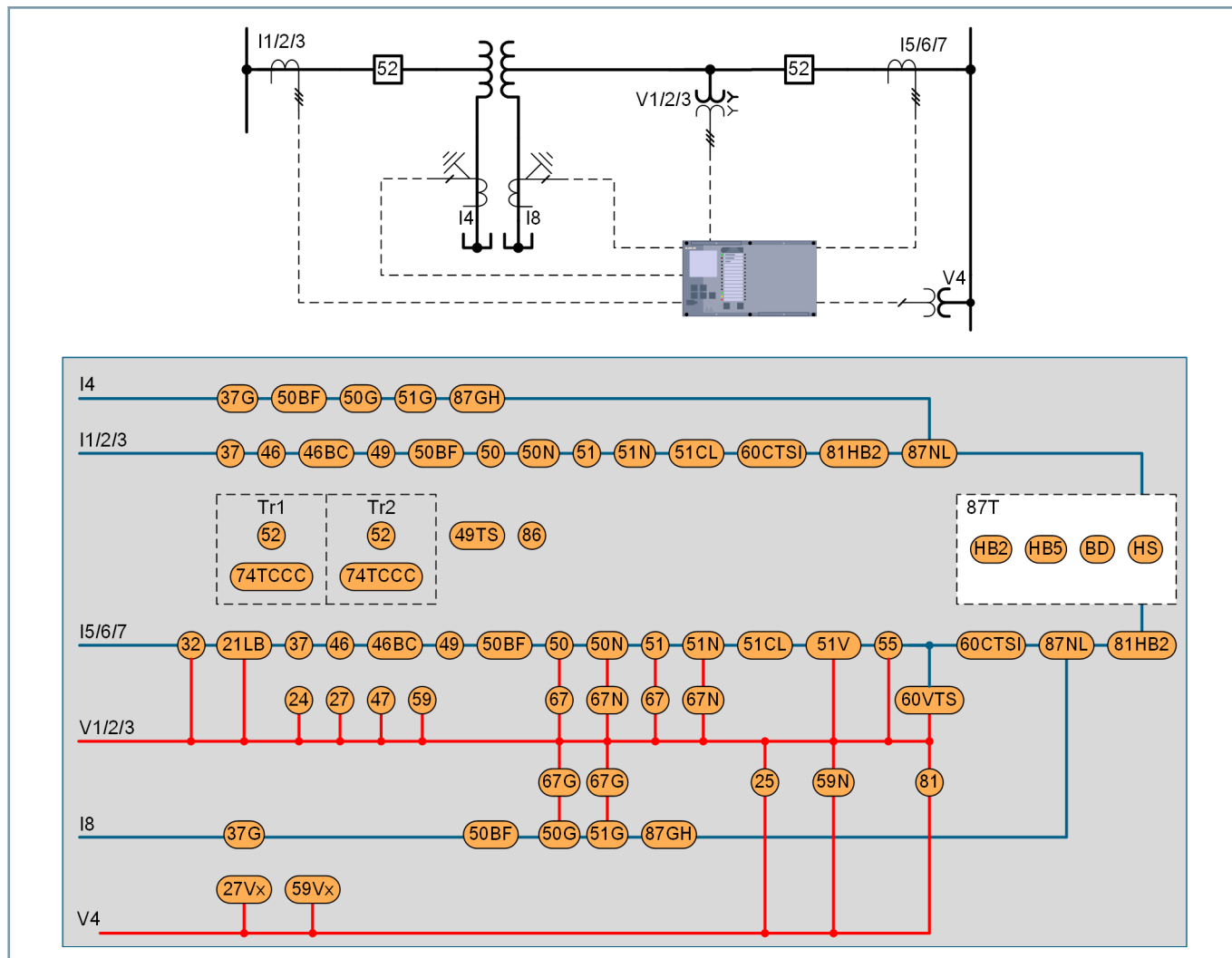


Figure 2.5/1 7SR5421 2-Winding Transformer Protection Function Diagram

VT1,2,3 shown assigned to winding 2

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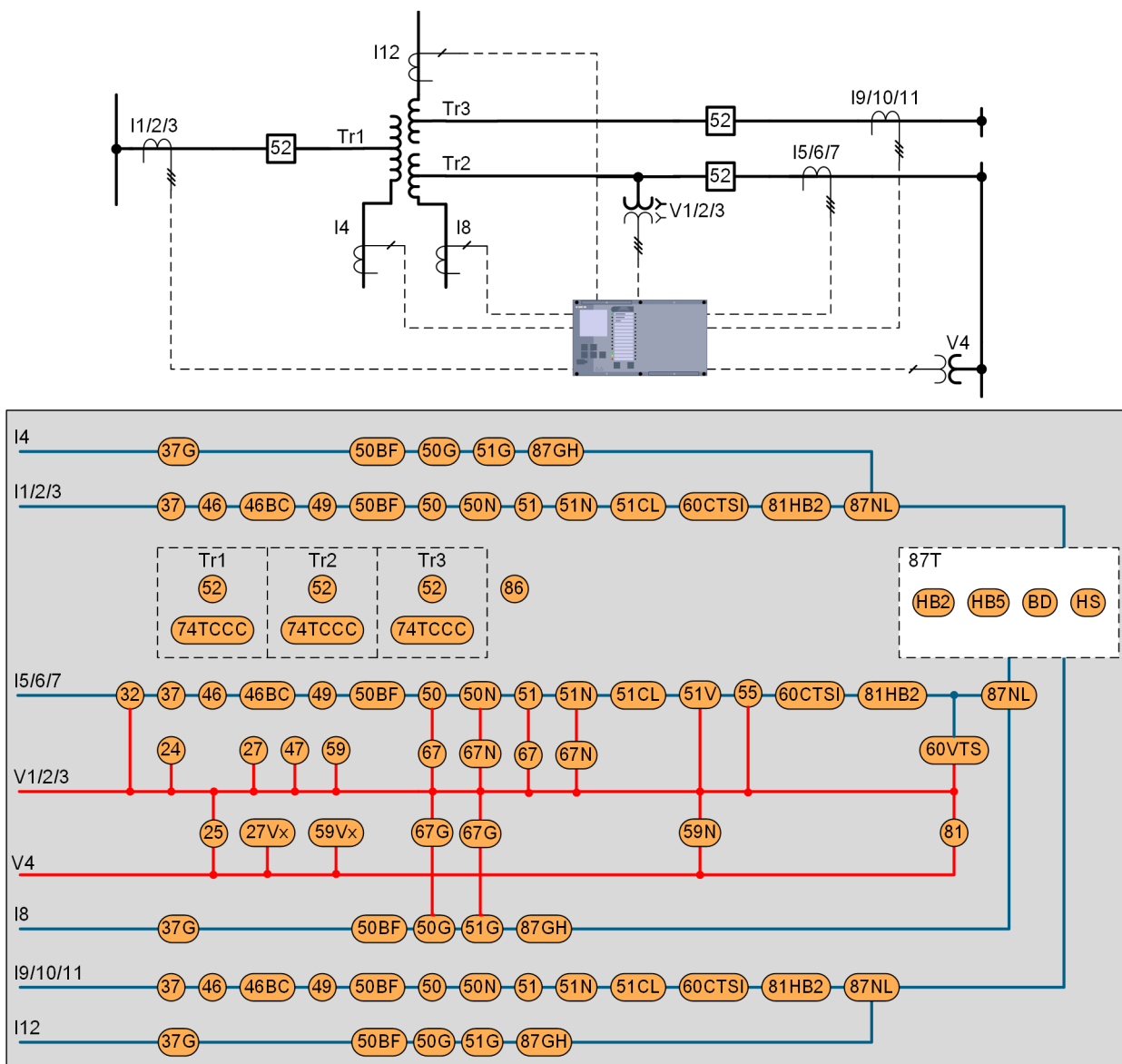


Figure 2.5/2 7SR5431 3-Winding Transformer Protection Function Diagram

VT1,2,3 shown assigned to winding 2

Functions, Application Templates

ANSI	Functions	7SR5420	7SR5421	7SR5430	7SR5431
21LB	Load blinder	–	■	–	■
24	Overexcitation protection	–	■	–	■
25	Synchrocheck – synchronization 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 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	■	■	■	■
55	Power factor	–	■	–	■
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	■	■	■	■

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⁹ An external interface unit is required where optional TSI module not fitted.

¹⁰ Requires external components

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ANSI	Functions	7SR5420	7SR5421	7SR5430	7SR5431
	Logic editor	■	■	■	■
	External trip initiation	■	■	■	■
	Control	■	■	■	■
	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)	21	37	24	35
	Arc flash detector inputs (AFD)	0 or 3	0 or 3	0 or 3	0 or 3
	Temperature sensor inputs (TSI)	0 or 8	0 or 8	0 or 8	0 or 8
	Binary outputs (max) incl. healthy contact	10	18	10	16
	High speed binary outputs (HSBO)	0 or 3	0 or 3	0 or 3	0 or 3
	Current inputs	8	8	12	12
	Voltage inputs	0	4	0	4
	Size	8 or 12	8 or 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, Portuguese, Spanish, Turkish	■	■	■	■
	IEC 60870-5-103	■	■	■	■
	IEC 61850	■	■	■	■
	Modbus RTU	■	■	■	■
	Modbus TCP	■	■	■	■
	SNMP v3	■	■	■	■
	DNP3	■	■	■	■
	DNP3 TCP	■	■	■	■
	Time synchronization: Binary input, DNP3, Modbus RTU, DNP TCP, Modbus TCP, SNTP, IEEE 1588 PTP	■	■	■	■

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



NOTE

■ - Basic

Standard Variants

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

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

7SR5421-6AA	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	
7SR5421-6AF	3/4, 37 BI, 18 BO, 8 I, 4 V, 8 TSI	
	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	
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	
7SR5430-3AF	3/4, 24 BI, 10 BO, 12 I, 8 TSI	
	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	
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	

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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	
7SR5431-3AF	3/4, 25 BI, 12 BO, 12 I, 4 V, 8 TSI	
	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	
7SR5431-5AA	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	
7SR5431-5AF	3/4, 35 BI, 16 BO, 12 I, 4 V, 8 TSI	
	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	

Table 2.5/2 Standard Variants for 7SR54

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