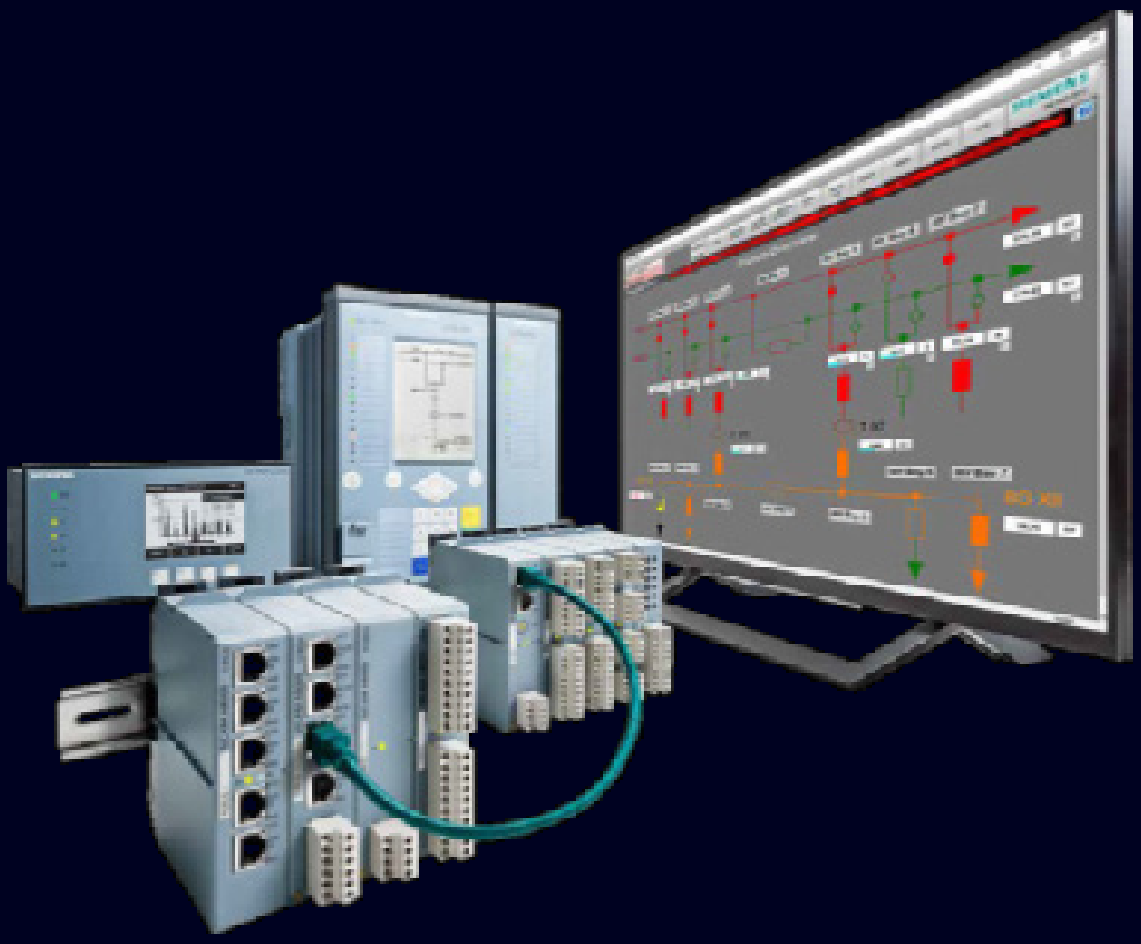
SIEMENS



CATALOG EDITION 8

Accessories

Protection, Substation Automation, Power Quality and Measurement

Accessories Energy Automation, Industrial Automation, Power Supplies

Catalog - Edition 8

Invalid:
Catalog - Edition 7

Introduction	1
Auxiliary Relays	2
Bistable Fast-Acting Lockout Relay	2.1
Monostable Relay	2.2
Signal Relay	2.3
Auxiliary Relay	2.4
High Speed Trip Relay	2.5
Trip-Circuit Supervision Relay	2.6
AC/DC Supervision Relay	2.7
Supply Supervision Relay	2.8
Trip Relay Supervision Relay	2.9
Interposing Relay	2.10
Trip Circuit Supervision Resistors	2.11
Communication	3
Cables	3.1
RS485 Bus System	3.2
10 dB Attenuator	3.3
2-Channel Serial Optical Repeater	3.4
Converters	3.5
RUGGEDCOM Ethernet Switches	3.6
RUGGEDCOM Redundancy Box (HSR/PRP)	3.7
RUGGEDCOM Multiprotocol Router	3.8
RUGGEDCOM Media Converter	3.9
RUGGEDCOM Serial Device Servers	3.10
RUGGEDCOM Software	3.11
Mobile Wireless Routers Scalance M	3.12
PROFIBUS/MPI Router SCALANCE M804PB	3.13
Mobile Wireless Antennas	3.14
Industrial Security Appliances SCALANCE S	3.15

Content

3.16	SINEMA Remote Connect
3.17	Industrial Ethernet – Cable System Technology
4	**Power Supply**
4.1	LOGO!Power
4.2	SITOP PSU
4.3	SITOP Add-on Modules
4.4	SITOP DC UPS
5	**Machine Protection**
5.1	Miniature Current Transformers
5.2	20 Hz Generator
5.3	20 Hz Band-Pass
5.4	Injection Unit
5.5	Coupling Unit
5.6	Resistor Unit
5.7	Resistance-Coupling Unit
5.8	Voltage Divider
6	**High Impedance Protection Accessories**
6.1	Auxiliary Units
6.2	Resistors
6.3	Metrosils
7	**Devices for Input/Output Signals**
7.1	SICAM I/O-Unit
7.2	SICAM AI-Unit
8	**Temperature Measurement**
8.1	RTD Unit TR1200
8.2	RTD Unit TR800Web
8.3	RTD Unit TR1200IP

Content

Arc Protection	**9**
Sensors for SIPROTEC 5 and Reyrolle 5	9.1
ReyArc 7XG35	9.2
Test Equipment	**10**
Test Switch/Test Block	10.1
Time Synchronization	**11**
SNTP Master/Server	11.1
Bus Cable for Time Synchronization	11.2
GPS Time Synchronization Unit	11.3
Miscellaneous	**12**
Voltage-Transformer Circuit Breaker	12.1
Isolating Transformer	12.2
Diodes	12.3
Reyrolle Device Accessories	12.4
Appendix	**13**
Index	**14**

1

Introduction

Selecting high-grade accessories is an important decision.

Ensure that all accessories you require meet the quality, innovation, and technology standards which you expect from the products, services, and solutions provided by Siemens.

This catalog provides an overview and descriptions of the accessories for the Energy Automation products – protection devices, station automation equipment, and devices for power quality and measurement – and for automation-engineering products.

The catalog is broken down as follows:

- **General accessories**

  Voltage and auxiliary current transformers, voltage controllers, and relays

- **Communication**

  Fiber-optic cable, Ethernet-patch cable, star coupler, converter, etc.

- **Power Supply**

  LOGO!Power, SITOP

- **Machine Protection**

  Miniature current transformer, 20-Hz generator/band-pass filters, resistor units, etc.

- **Devices for Input/Output Signals**

  Binary signal transmitter, SICAM I/O unit, SICAM AI unit

- **Temperature Measurement**

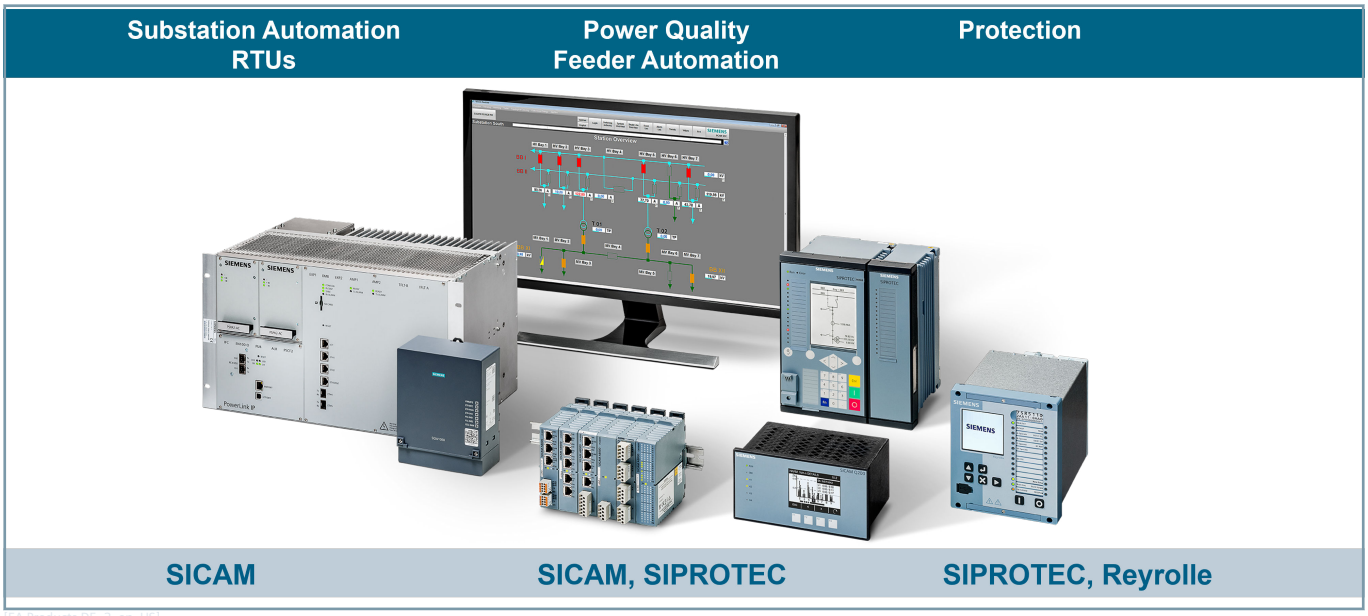
  RTD units

- **Test Equipment**

  Switches for testing protection devices

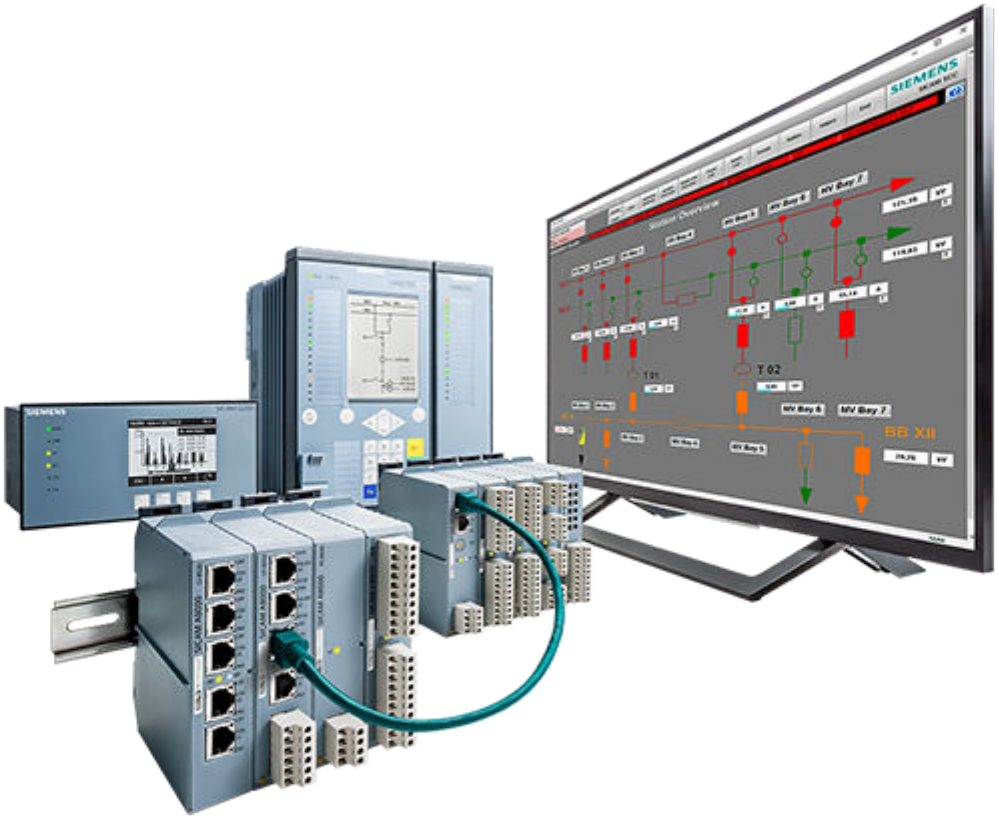
- **Time Synchronization**

  SNTP master/server, bus cables, and GPS time synchronization system



[EA Products DE, 2, en_US]

Figure 1/1 Product Portfolio


SIEMENS
T 02
BB XII

Bistable Fast-Acting Lockout Relay – 7PA22

Description

7PA22 is a bistable fast-acting auxiliary relay with 8 change-over contacts.

Due to their quality, reliability, and their structure, these relays are suitable for applications requiring high reliability and availability, as for example power plants, switchgear, railroad systems and industrial plants. Typical examples for this are the petrochemical industry, chemical industry, cement industry, and rolling mills.

The relays comply with IEC, EN, IEEE standards (type testing and routine testing) and bear the CE marking.

The sturdy switch contacts distinguish themselves with a high switching capacity, overload capacity and continuous current capacity which provides perfect insulation. The direct control of high-voltage and medium-voltage systems is possible.

Their high degree of protection and the transparent cover ensure reliable operation under tropical environmental conditions and/or use in salty sea air.

7PA22 Fast-Acting Relay with Suppressor Diode

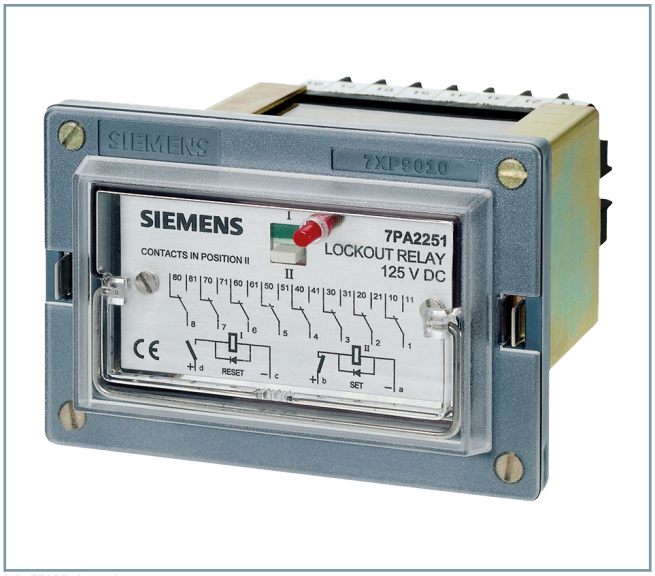
Bistable fast-acting lockout relay with eight change-over contacts, plugged into a flush-mounting frame of type 7XP9014-1 for cabling with screws at the rear, or in an assembly frame of type 7XP9012-0 for cabling with screws at the front.

Benefits

Tested according to IEC, EN, IEEE standards and bearing the CE marking.

No continuous internal consumption. Position display on the front. Mechanical reset button.

Position memory with two stable positions (for example, open/closed, automatic/manual, local/remote). Mechanically sturdy contacts, high insulation resistance, high making and breaking power, and a high continuous current enable direct switching in high-voltage and medium-voltage systems. The high degree of protection and the transparent cover ensure absolute reliability during operation within a wide temperature range, and in a tropical or salty environment.



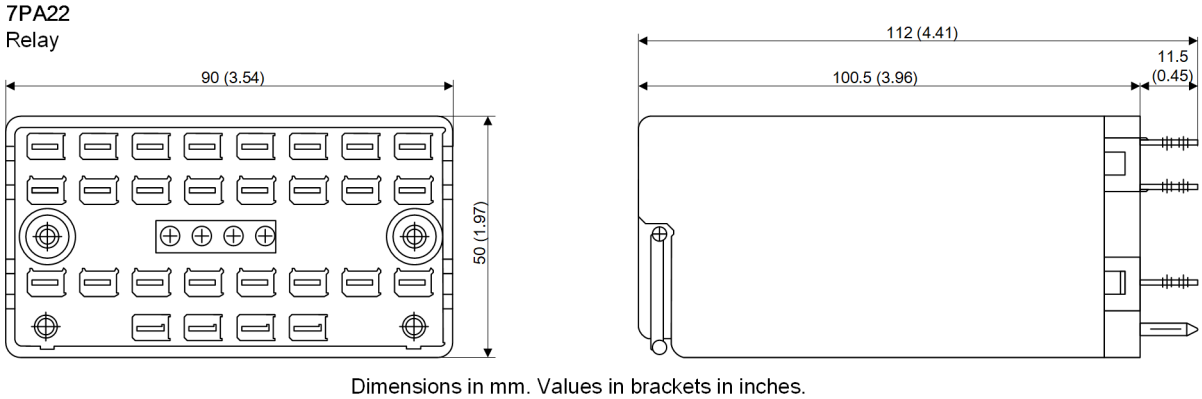
[ph_7PA22, 1, --_--]

Figure 2.1/1 Auxiliary Relay 7PA22

Applications

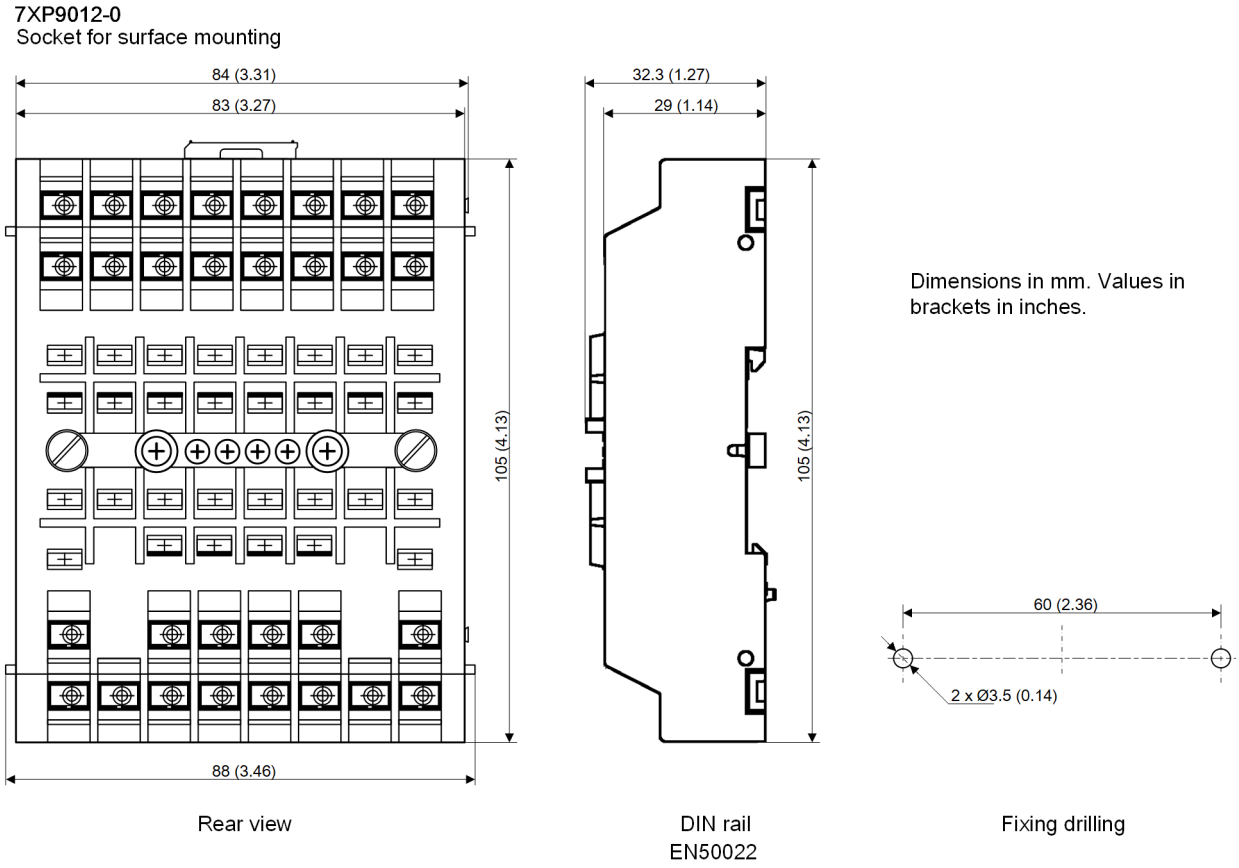
The design, quality and high durability of the relays ensure reliable usability under highly demanding conditions such as in power plants, generator stations, transformer stations and railroads. They are suitable for use in energy systems and process control systems for large-scale industry applications, the petrochemical sector, steel and cement factories, and many more.

Dimensions and Connections



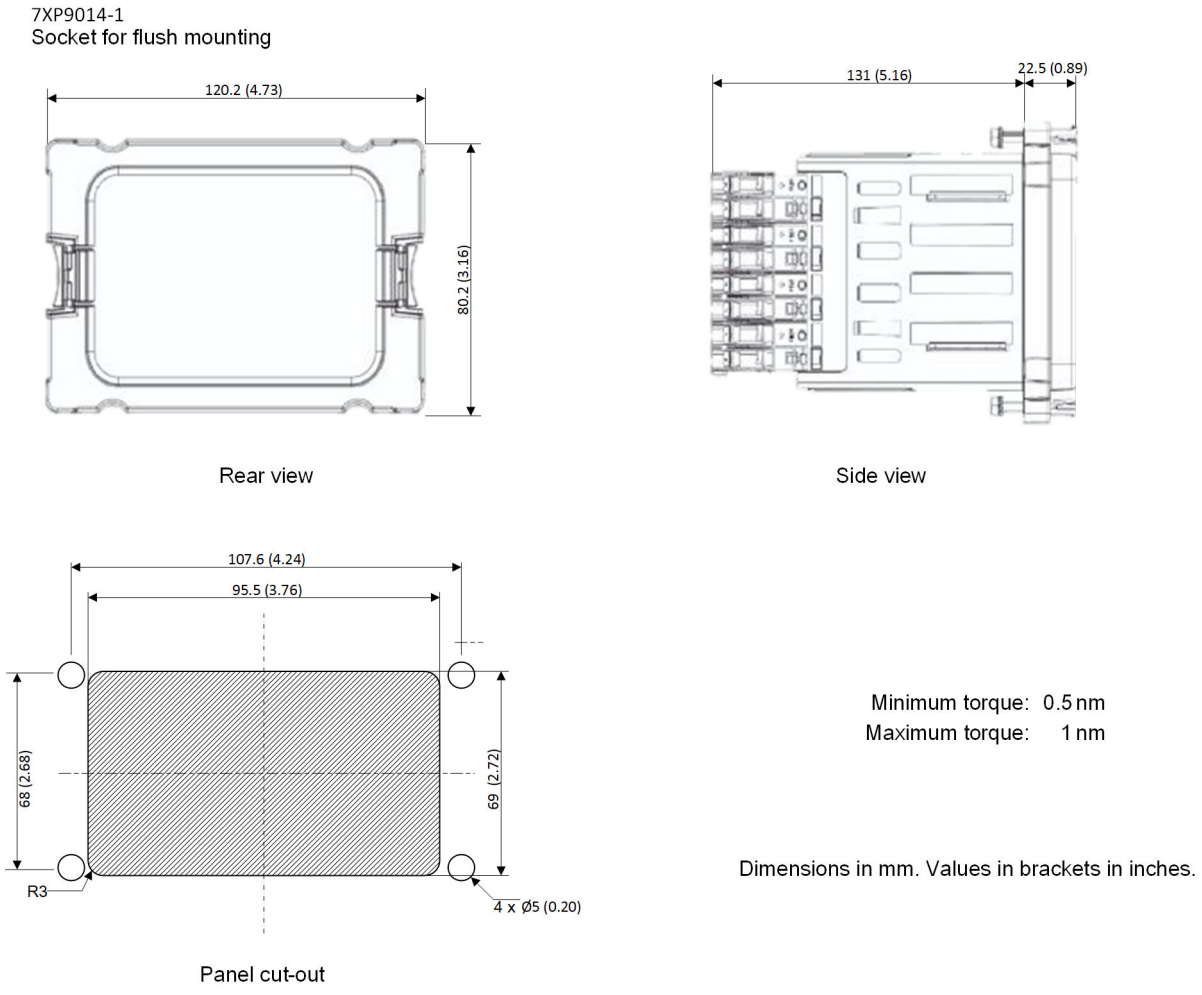
[dw_7pa22_dimensions_and_panel-mounting-cutout, 2, en_US]

Figure 2.1/2 Dimensions and Installation Dimensions



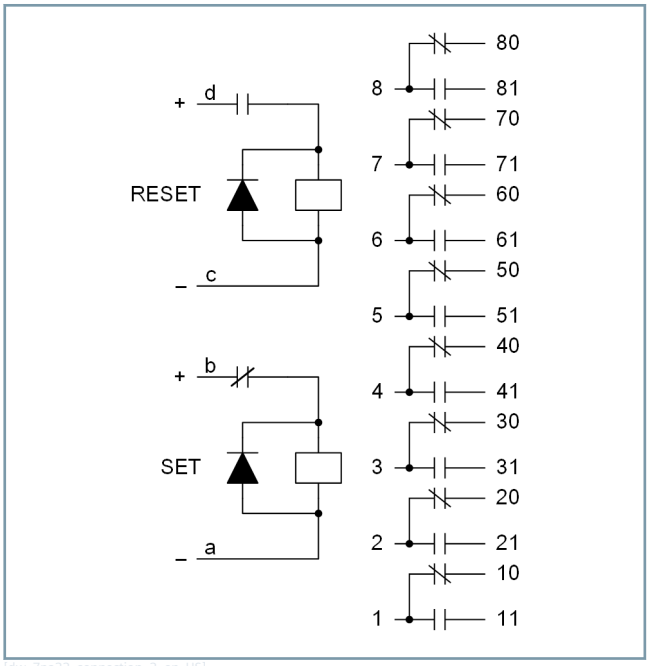
[dw_7pa22_socket_for_surface-mounting, 2, en_US]

Figure 2.1/3 Surface-Mounting Base



[dw_7pa22_socket_for_flush-mounting, 3, en_US]

Figure 2.1/4 Flush-Mounting Base



[dw_7pa22_connection, 2, en_US]

Figure 2.1/5 Connections 7PA22 – Contacts shown in SET Position

Technical Data

The reset button may not be depressed for longer than 20 seconds when the auxiliary voltage is applied to the SET coil.

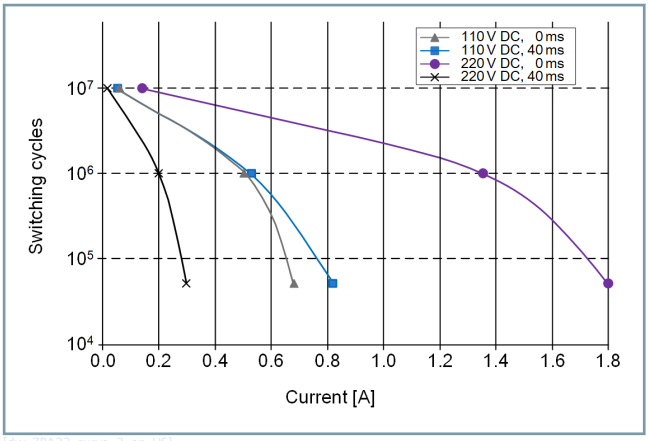
Rated voltage and internal consumption		
V_N (VDC)	Voltage range (VDC)	Internal consumption for switching
24	19 to 26	≤45 W
30	24 to 33	
48	38.5 to 53	
60	48 to 66	
110	88 to 121	
125	100 to 137	
220	176 to 242	

Pre-arcing time	< 10 ms

The operational state of the reset/set coil is low/de-energized <40 % Vn and high/energized >60 % Vn.

Contacts	
Continuous current	10 A
Overload capability	80 A/200 ms 150 A/10 ms
Breaking power	40 A/0.5 s, 110 VDC

Breaking power for 10^5 switching cycles				
	Not inductive		Inductive, 40 ms	
VDC	1 contact [A]	2 contacts in series [A]	1 contact [A]	2 contacts in series [A]
24	14.5	>20	9.7	>20
48	7.65	>20	3.5	>20
60	5.1	>20	2.3	>20
125	1.2	3.75	0.55	3.75
220	0.65	1.4	0.28	0.58
For details, refer to diagram				



[dw_7PA22_curva, 2, en_US]

Figure 2.1/6 Diagram

V_{max}, open-circuited contact	250 VDC/400 VAC
Mechanical endurance	10^7 switching cycles
Operating temperature	-40 °C +70 °C
Max. humidity	93%/40 °C
Seismic load according to **IEEE501** ZPA	3 g/33 Hz

Design guidelines	
Electrical tests according to	**IEC 60255**
Insulation	2 kV/50 Hz/1 min
Surge immunity	5 kV/1.2/50 µs
Insulation resistance	> 2000 MOhm/500 VDC
Flame resistance	**IEC 60692-2-1**
Plastics	**UL94**: V0 **IEC 60695**: 850 °C/30 s
Protection class	**IEC 60529, EN60529**
Relays	IP40
Flush-mounting base	IP10
Surface-Mounting Base	IP10
Environmental conditions	**IEC 60255-7**
Heat test - Relays in operation - Relays not in operation	**IEC 60068-2-2** +70 °C/96 h +55 °C/96 h
Air humidity, cyclical	**IEC 60068-2-30**: +55 °C/12 h
Cold test, 100 cycles	**IEC 60068-2-1**
Relays not in operation	-10 °C/2 h
Thermal aging	**IEC 60255-7**
At rated voltage (V_N)	55 °C/1440 h

Auxiliary Relays

Bistable Fast-Acting Lockout Relay – 7PA22

Weights and packaging	
7PA22	600 g
7XP9014-1	400 g

Weights and packaging	
7XP9012-0	225 g
Carton	150 x 124 x 84 mm

2.1 **Selection and Ordering Data**

Description	Order no.																
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
Bistable fast-acting auxiliary relay with 8 change-over contacts	7	P	A	2	2	□	1	-	□									
						▲			▲									
Rated voltage						|			|								
DC 24 V						1			|									
DC 60 V						2			|									
DC 110 V						3			|									
DC 220 V						4			|									
DC 125 V						5			|									
DC 30 V						6			|									
DC 48 V						8			|									
Without base									0									
Base																		
Flush Mounting	7	X	P	9	0	1	4	-	1									
Surface Mounting	7	X	P	9	0	1	2	-	0									
5 x retaining bracket for auxiliary relay with surface mounting base (1 required for each relay/ surface mounting base)	.	.	.	.	.	.	.	.		A	Y	R	:	E	2	9		

Description

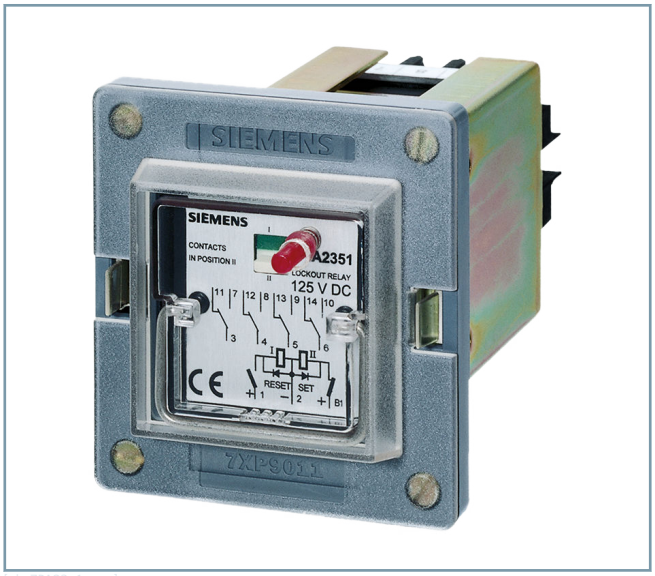
7PA23 is a bistable fast-acting auxiliary relay with 4 change-over contacts.

Due to their quality, reliability, and their structure, these relays are suitable for applications requiring high reliability and availability, as for example power plants, switchgear, railroad systems and industrial plants. Typical examples for this are the petrochemical industry, chemical industry, cement industry, and rolling mills.

The relays comply with IEC, EN, IEEE standards (type testing and routine testing) and bear the CE marking.

The sturdy switch contacts distinguish themselves with a high switching capacity, overload capacity and continuous current capacity which provides perfect insulation. The direct control of high-voltage and medium-voltage systems is possible.

Their high degree of protection and the transparent cover ensure reliable operation under tropical environmental conditions and/or use in salty sea air.



[ph_7PA23_1, --_--]

Figure 2.1/7 Auxiliary Relay 7PA2351

Benefits

Tested according to IEC, EN, IEEE standards and bearing the CE marking.

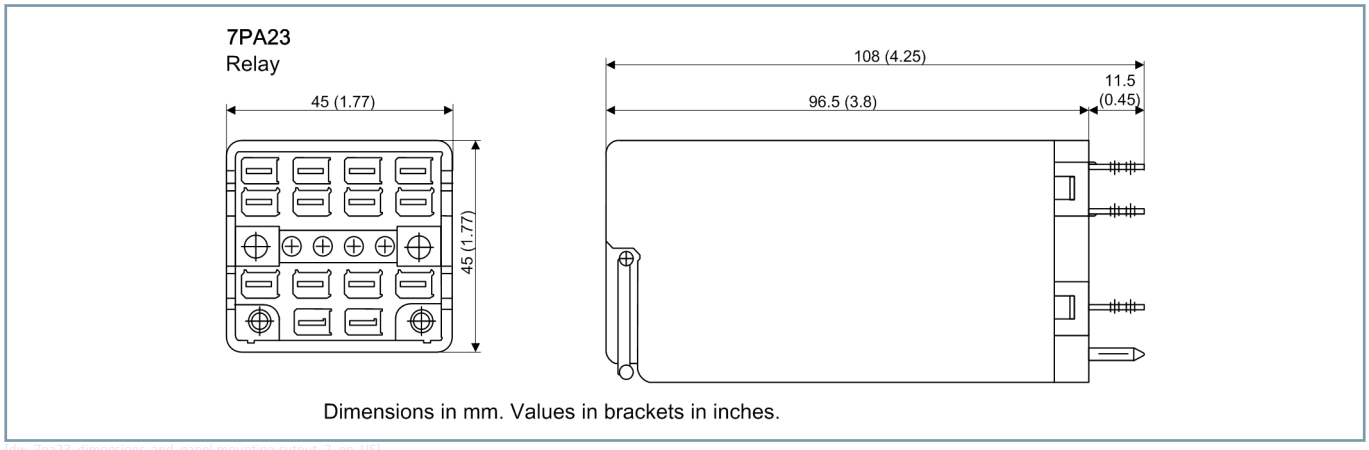
No continuous internal consumption. Position display on the front. Mechanical reset button.

Position memory with two stable positions (for example, open/closed, automatic/manual, local/remote). Mechanically sturdy contacts, high insulation resistance, high making and breaking power, and a high continuous current, enable direct switching in high-voltage and medium-voltage systems. The high degree of protection and the transparent cover ensure absolute reliability during operation within a wide temperature range, and in a tropical or salty environment.

Applications

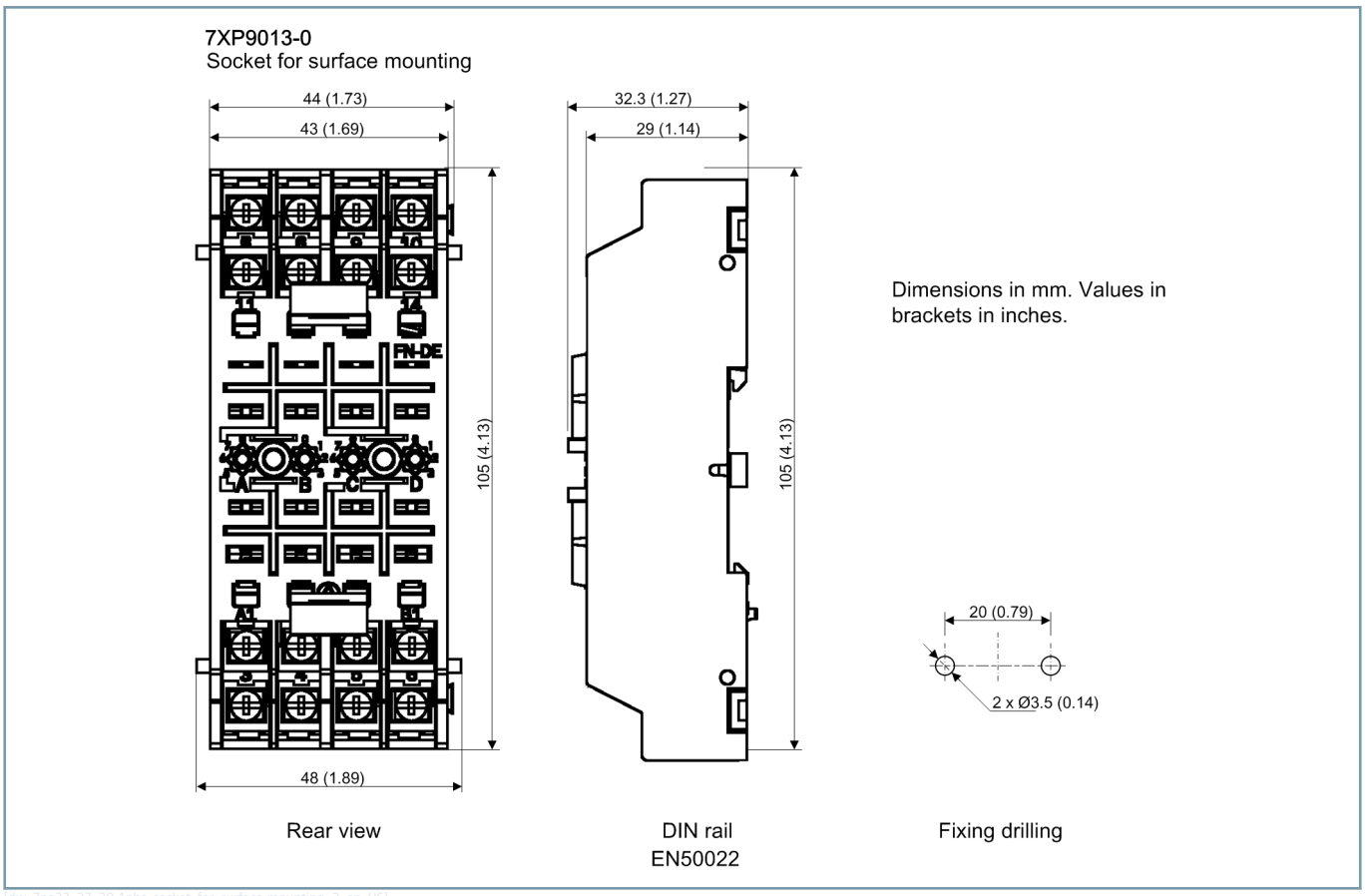
The design, quality and high durability of the relays ensure reliable usability under highly demanding conditions such as in power plants, generator stations, transformer stations and railroads. They are suitable for use in energy systems and process control systems for large-scale industry applications, the petrochemical sector, steel and cement factories, and many more.

Dimensions and Connections



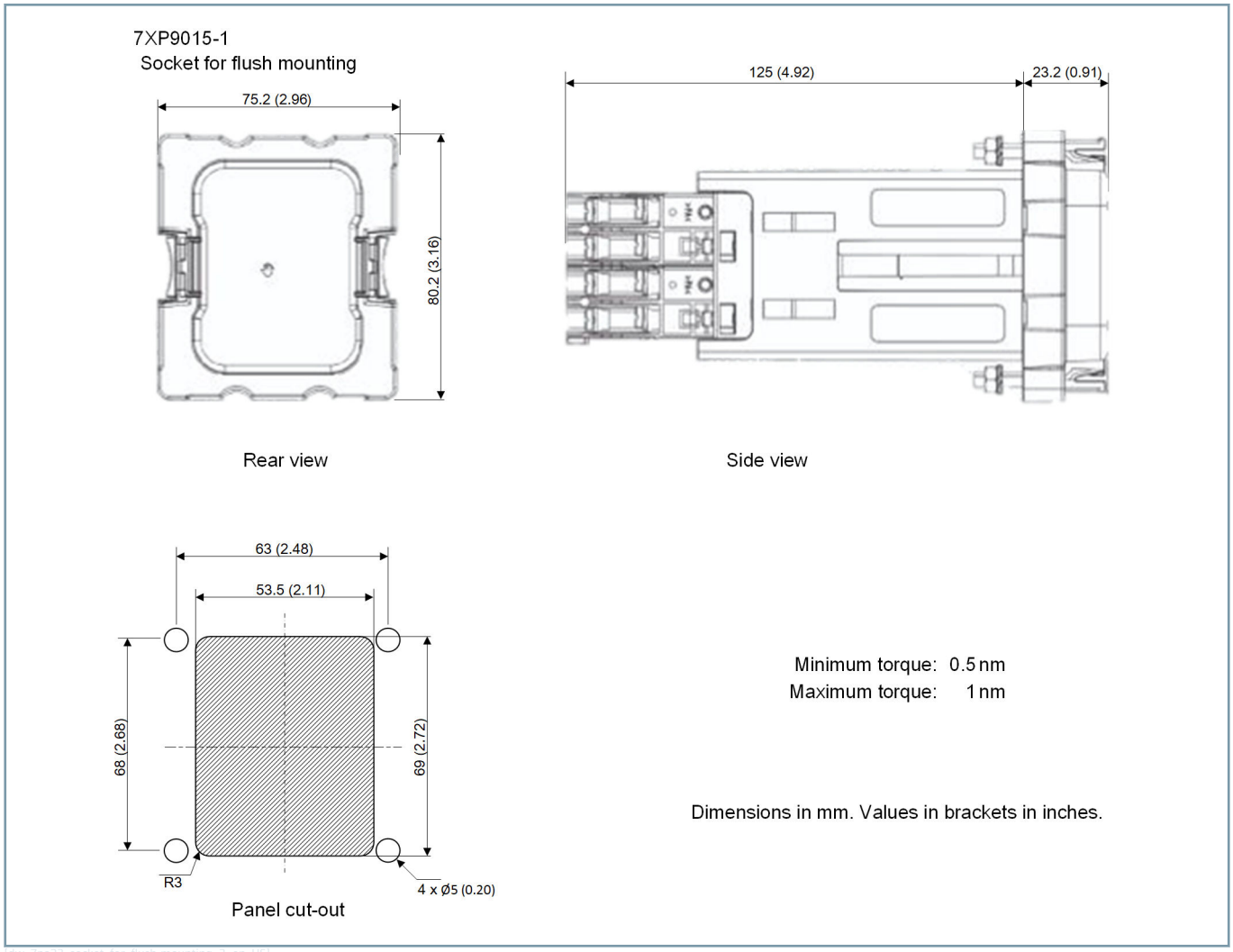
[dw_7pa23_dimensions_and_panel-mounting-cutout, 2, en_US]

Figure 2.1/8 Dimensions and Installation Dimensions



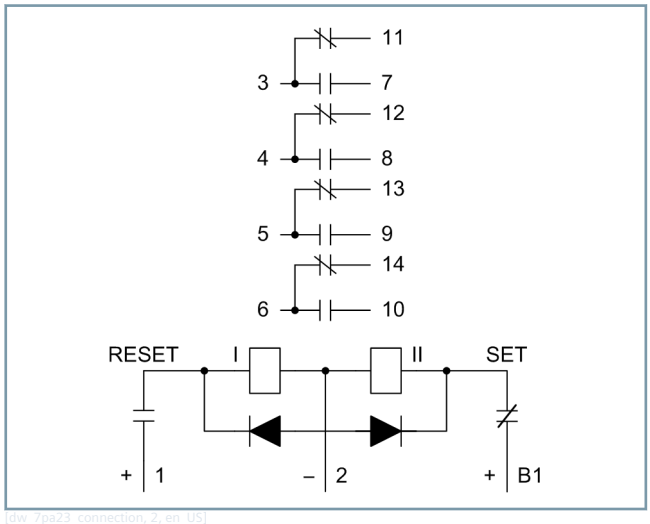
[dw_7pa23_27_30-1phs_socket_for_surface-mounting, 2, en_US]

Figure 2.1/9 Surface-Mounting Base



[dw_7pa23_socket_for_flush-mounting_3, en_US]

Figure 2.1/10 Flush-Mounting Base



[dw_7pa23_connection, 2, en_US]

Figure 2.1/11 Connections 7PA23 – Contacts shown in SET Position

Technical Data

The reset button may not be depressed for longer than 20 seconds when the auxiliary voltage is applied to the SET coil.

Rated voltage and internal consumption		
V_N (VDC)	Voltage range (VDC)	Internal consumption for switching
24	19 to 26	≤17 W
30	24 to 33	
48	38.5 to 53	
60	48 to 66	
110	88 to 121	
125	100 to 137	
220	176 to 242	

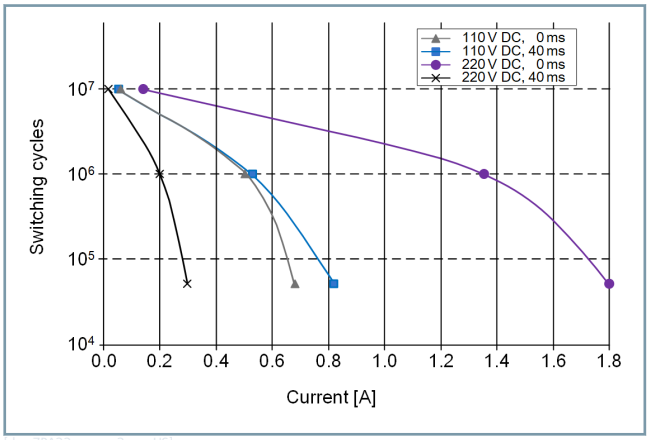
Pre-arcing time	< 10 ms

Bistable Fast-Acting Lockout Relay – 7PA23

The operational state of the reset/set coil is low/de-energized <40 % Vn and high/energized >60 % Vn.

Contacts	
Continuous current	10 A
Overload capability	80 A/200 ms 150 A/10 ms
Switching power	40 A/0.5 s, 110 VDC

Breaking power for 10^5 switching cycles				
	Not inductive		Inductive, 40 ms	
VDC	1 contact [A]	2 contacts in series [A]	1 contact [A]	2 contacts in series [A]
24	14.5	>20	9.7	>20
48	7.65	>20	3.5	>20
60	5.1	>20	2.3	>20
125	1.2	3.75	0.55	3.75
220	0.65	1.4	0.28	0.58
For details, refer to diagram				



[dw_7PA22_curva, 2, en_US]

Figure 2.1/12 Diagram

V_{max}, open-circuited contact	250 VDC/400 VAC
Mechanical endurance	10^7 switching cycles
Operating temperature	-40 °C +70 °C
Max. humidity	93%/40 °C
Seismic load according to **IEEE501** ZPA	3 g/33 Hz

Design guidelines	
Electrical tests according to	**IEC 60255**
Insulation	2 kV/50 Hz/1 min
Surge immunity	5 kV/1.2/50 µs
Insulation resistance	> 2000 MOhm/500 VDC
Flame resistance	**IEC 60692-2-1**
Plastics	**UL94**: V0 **IEC 60695**: 850 °C/30 s
Protection class	**IEC 60529, EN60529**
Relays	IP40
Flush-mounting base	IP10
Surface-Mounting Base	IP10
Environmental conditions	**IEC 60255-7**
Heat test - Relays in operation - Relays not in operation	**IEC 60068-2-2** +70 °C/96 h +55 °C/96 h
Air humidity, cyclical	**IEC 60068-2-30**: +55 °C/12 h
Cold test, 100 cycles	**IEC 60068-2-1**
Relays not in operation	-10 °C/2 h
Thermal aging	**IEC 60255-7**
At rated voltage (V_N)	55 °C/1440 h

Weights and packaging	
7PA23	300 g
7XP9015-1	300 g
7XP9013-0	110 g
Carton	145 x 79 x 84 mm

Selection and Ordering Data

Description	Order no.																
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
Bistable fast-acting auxiliary relay with 4 change-over contacts	7	P	A	2	3	□	1	-	□									
						▲			▲									
Rated voltage						|			|									
DC 24 V						1				|								
DC 60 V						2				|								
DC 110 V						3				|								
DC 220 V						4				|								
DC 125 V						5				|								
DC 30 V						6				|								
DC 48 V						8				|								
Without base									0									
Base																		
Flush Mounting	7	X	P	9	0	1	5	-	1									
Surface Mounting	7	X	P	9	0	1	3	-	0									
5 x retaining bracket for auxiliary relay with surface mounting base (1 required for each relay/ surface mounting base)	.	.	.	.	.	.	.	.		A	Y	R	:	E	3	1		

Monostable Relay – 7PA26

Description

7PA26 is a monostable relay with 8 change-over contacts.

The relay has been tested according to IEC and EN standards and has the CE marking.

Benefits

Mechanically sturdy contacts, high insulation resistance, high making and breaking power, and a high continuous current enable direct switching in high-voltage and medium-voltage systems.

Applications

The design, quality and high durability of the relays ensure reliable usability under highly demanding conditions such as in power plants, generator stations, transformer stations and railroads.

They are suitable for use in energy systems and process control systems for large-scale industry applications, the petrochemical sector, steel and cement factories, and many more.

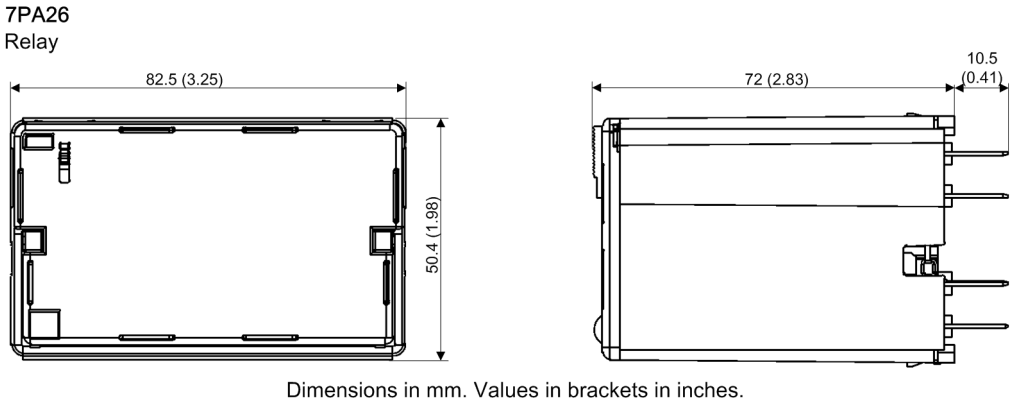


[pti_7PA26, 1, --_--]

Figure 2.2/1 Auxiliary Relay 7PA2642

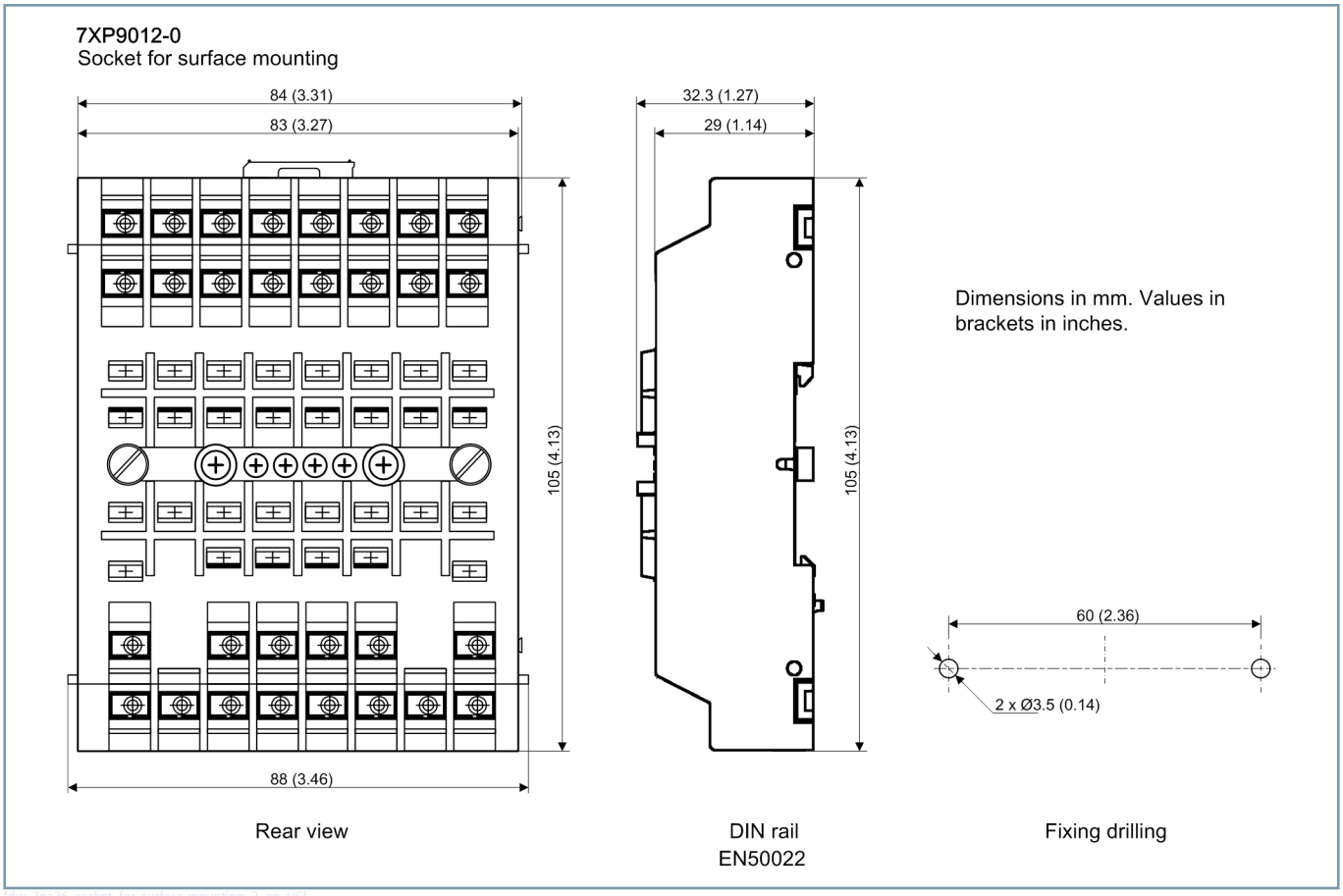
For the fast-acting relay types, the excitation is indicated by an LED.

Dimensions and Connections



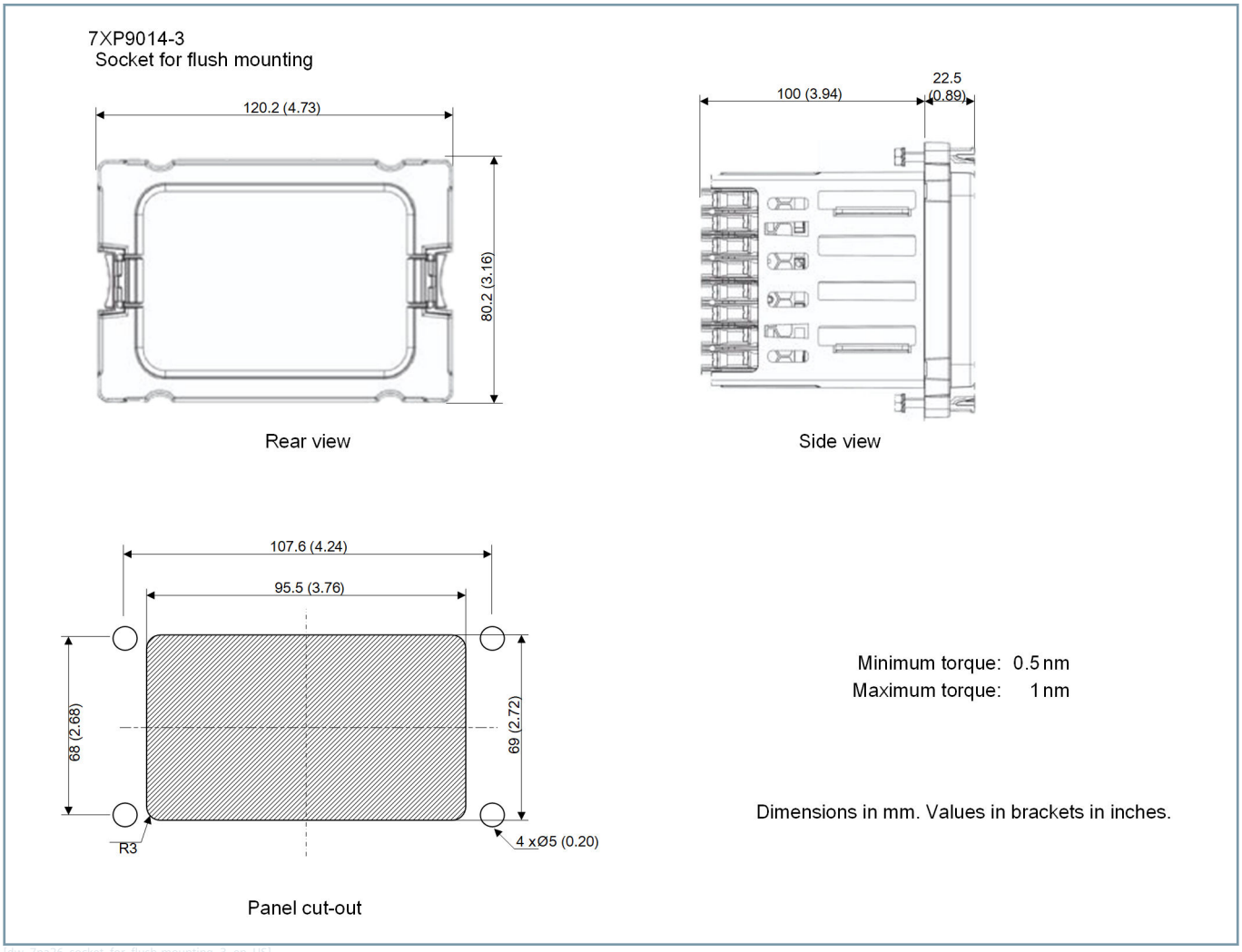
[dw_7pa26_dimensions_and_panel-mounting-cutout, 2, en_US]

Figure 2.2/2 Dimensions and Installation Dimensions



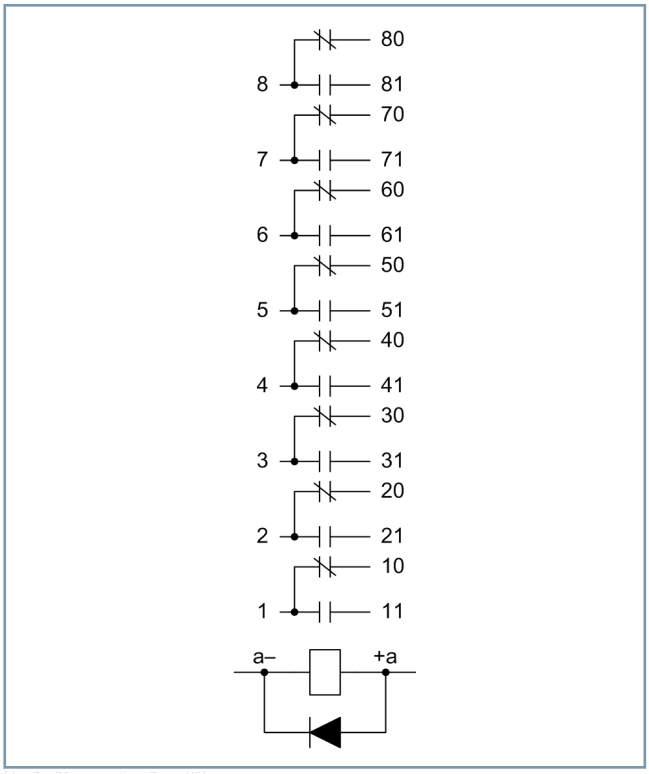
[dw_7pa26_socket_for_surface-mounting, 2, en_US]

Figure 2.2/3 Surface-Mounting Base – 7XP9012-0



[dw_7pa26_socket_for_flush-mounting, 3, en_US]

Figure 2.2/4 Flush-Mounting Base



[dw_7pa26_connection, 2, en_US]

Figure 2.2/5 Connections 7PA26

Technical Data

Rated voltage and internal consumption 7PA26 ☐20				
V_N (VDC)	Voltage range (VDC)	Internal consumption (mA)	Excitation voltage (VDC) between 1)	De-excitation voltage (VDC) between 1)
24/30	17 to 37	288	8.4 and 13.2	3.6 and 9
48	33.6 to 60	144	16.8 and 26.4	7.5 and 17
60	42 to 75	115	21 and 33	9 and 21
110/125	77 to 156	63	38.5 and 60.5	16.5 and 38.5
220	154 to 275	31	77 and 121	33 and 77

(1) Excitation and de-excitation voltages for the 7PA26*20 are specified for an ambient temperature of 23 °C and a cold relay. These values change with temperature.

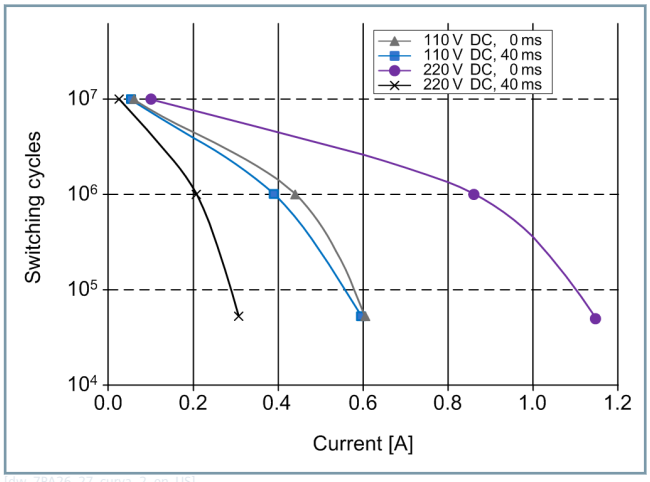
Rated voltage and internal consumption 7PA26 ☐21					
V_N (VDC)	Voltage range (VDC)	Internal consumption (mA)		Excitation voltage (VDC) between 1)	De-excitation voltage (VDC) between 1)
		Standard [mA]	Peak		
24/30	19 to 33	66	0.8 A/20 ms	16 and 19	9 and 14
48	38.4 to 52.8	32		23.8 and 33.6	14.4 and 21.6
60	48 to 66	28		36 and 42	18 and 27
110/125	88 to 137	13	0.3 A/20 ms	66 and 77 V	38 and 42 V
220	176 to 242	8		132 and 154	66 and 99

(1) Excitation and de-excitation voltages for the 7PA26*21 are specified for an ambient temperature of 23 °C and a cold relay. These values change with temperature.

Pre-arcing time	
For excitation	
7PA26 ☐20	<20 ms
7PA26 ☐21	<10 ms
For de-excitation	< 40 ms

Contacts	
Continuous current	10 A
Overload capacity	80 A/200 ms 200 A/10 ms
Switching power	40 A/0.5 s, 110 VDC

Breaking power for 10^5 switching cycles				
	Not inductive		Inductive, 40 ms	
VDC	1 contact [A]	2 contacts in series [A]	1 contact [A]	2 contacts in series [A]
24	18	>20	8.1	>20
48	6.9	>20	3.3	18
60	3.4	>20	1.85	13
125	0.9	4	0.47	2
220	0.55	1.5	0.24	0.43
For details, refer to diagram				



[dw_7PA26_27_curva, 2, en_US]

Figure 2.2/6 Diagram

Monostable Relay – 7PA26

V_{max}, open-circuited contact	250 VDC/400 VAC
Mechanical endurance	10^7 switching cycles
Operating temperature	-25 °C +70 °C
Storage temperature	-40 °C +85 °C
Max. humidity	93%/40 °C

Weights and packaging	
7PA26	500 g
Carton	150 x 124 x 84 mm
7XP9014-3	400 g
7XP9012-0	225 g

Design guidelines	
Electrical tests according to	**IEC 60255-27**
Insulation	2 kV/50 Hz/1 min
Surge immunity	5 kV/1.2/50 µs
Insulation resistance	> 100 MΩ/500 VDC
Flame resistance	
Plastics	**UL94**: V0
Protection class	**IEC 60529, EN60529**
Relays	IP40
Flush-mounting base	IP10
Surface-Mounting Base	IP10
Environmental conditions	**IEC 60068-2**
Dry cold, in operation	-25 °C
Dry heat, in operation	+70 °C
Storage and transportation	-25 °C + 85 °C

EMC Tests	
High-frequency test: Test level: 1 MHz, 400 imp/s, 2 s Common mode: 2.5 kV Differential mode: 1 kV	**EN 60255-22-1**
Fast transient bursts Test level: 4 kV, 2.5 kHz, 1 min•2 kV, 5 kHz, 1 min	**EN 61000-4-4**
Energy surge voltages 8/20 µs. (current) - 1.2/50 µs. (voltage) - 8/20 µs. (current) Common mode: 2 kV - differential mode: 1 kV	**EN 61000-4-5**

EMC Tests	
Radiated HF field interference, amplitude-modulated: Test level: 80-1000 MHz, 10 V/m, 80% AM (1 kHz)	**EN 61000-4-3**
Radiated HF field interference, pulse-modulated: Test level: 900 ±5 MHz, 10 V/m, 50% (200 Hz) 1.89 GHz ±10 MHz, 10 V/m, 50% (200 Hz)	**EN 61000-4-3**
Line-conducted HF amplitude-modulated: Test level: 0.15-80 MHz, 10 V, 80% AM (1 kHz)	**EN 61000-4-6**
Electrostatic discharge test: Test level: Contact ±15 kV, air mode ±15 kV	**EN 61000-4-2**
Magnetic Field with Energy Frequency Test level: 100 A/m 1 min•1000 A/m 1 s.	**EN 61000-4-8**
Emitted interference tests: Test level: Cover: 30-230 MHz, 40 dB (µV/m) (quasi peak) - 10 m 230-1000 MHz, 47 dB (µV/m) (quasi peak) - 10 m Power supply: 0.15-0.5 MHz, 79 dB (µV) (quasi peak)/66 dB average 0.5-5 MHz, 73 dB (µV) (quasi peak)/60 dB average 5-30 MHz, 73 dB (µV) (quasi peak)/60 dB average	**EN 55011 Class A**

Selection and Ordering Data

Description	Order no.															
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
Monostable relay with 8 change-over contacts	7	P	A	2	6	□	2	-	□	A	A	0	0	-	□			
						▲			▲						▲			
Rated voltage						|			|						|			
DC 24/30 V						1				|						|			
DC 60 V						2				|						|			
DC 110/125 V						3				|						|			
DC 220 V						4				|						|			
DC 48 V						8				|						|			
Standard, 20 ms									0							|			
Fast-acting, 10 ms									1							|			
Without base															0			
Base																		
Flush Mounting							7	X	P	9	0	1	4	-	3			
Surface Mounting							7	X	P	9	0	1	2	-	0			
5 x retaining bracket for auxiliary relay with surface mounting base (1 required for each relay/ surface mounting base)	.	.	.	.	.	.	.	.		A	Y	R	:	E	4	5		

2.2

Description

7PA27 is a monostable relay with 4 change-over contacts.

The relay has been tested according to IEC and EN standards and has the CE marking.

Applications

The design, quality and high durability of the relays ensure reliable usability under highly demanding conditions such as in power plants, generator stations, transformer stations and railroads.

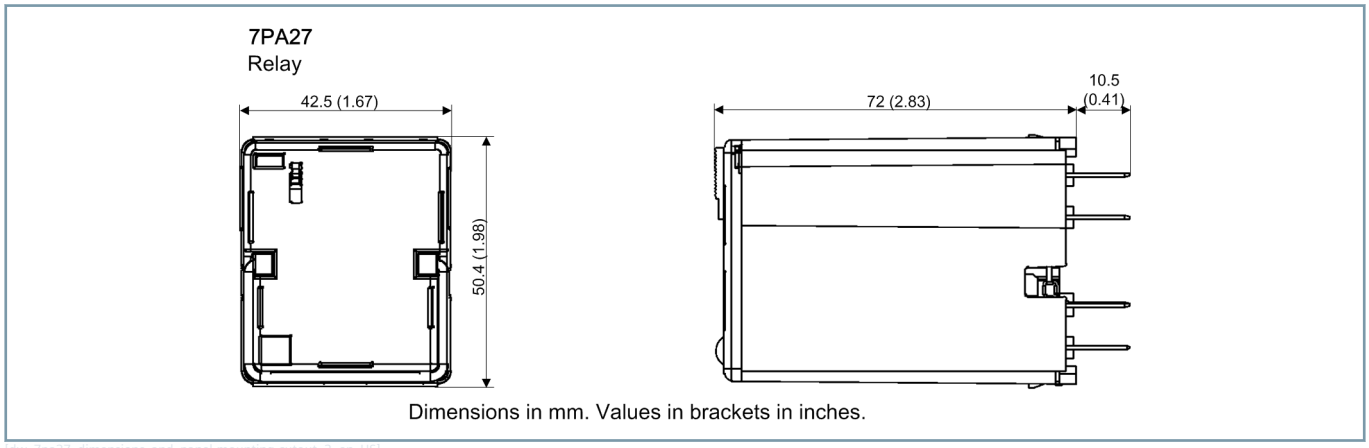
They are suitable for use in energy systems and process control systems for large-scale industry applications, the petrochemical sector, steel and cement factories, and many more. Mechanically sturdy contacts, high insulation resistance, high making and breaking power, and a high continuous current enable direct switching in high-voltage and medium-voltage systems. Additionally the excitation is indicated by an LED.



[pti_7PA27, 1, --_--]

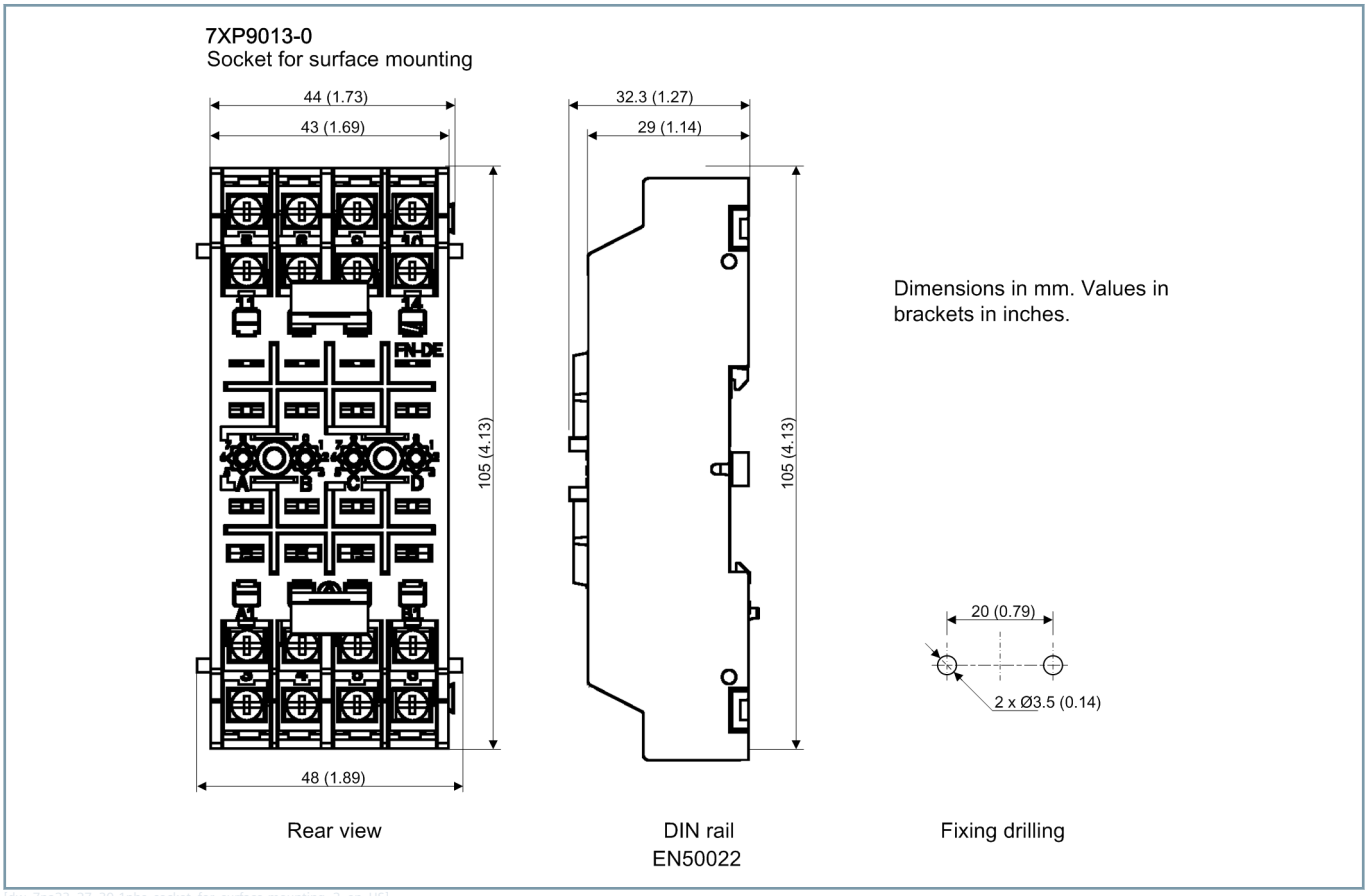
Figure 2.2/7 Monostable Fast-Acting Relay 7PA2732

Dimensions and Connections



[dw_7pa27_dimensions_and_panel-mounting-cutout, 2, en_US]

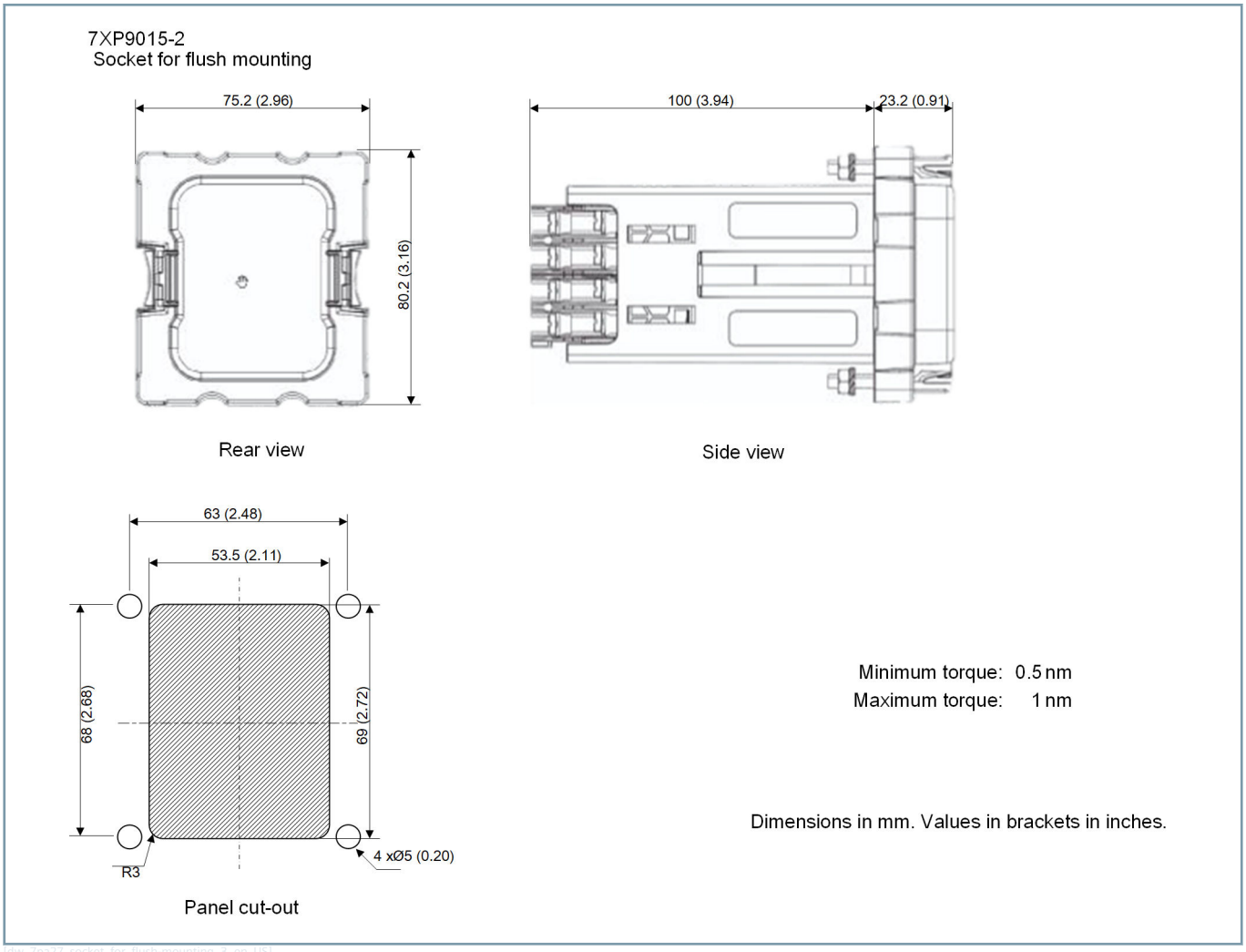
Figure 2.2/8 Dimensions



[dw_7pa23_27_30-1phs_socket_for_surface-mounting, 2, en_US]

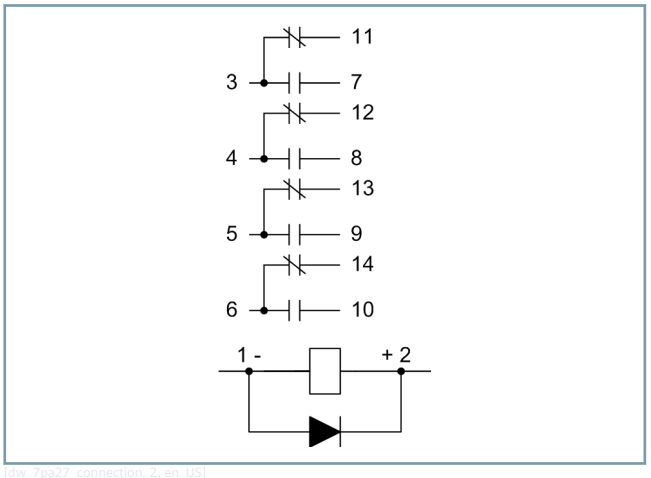
Figure 2.2/9 Surface-Mounting Base

2.2



[dw_7pa27_socket_for_flush-mounting, 3, en_US]

Figure 2.2/10 Flush-Mounting Base



[dw_7pa27_connection, 2, en_US]

Figure 2.2/11 Connections 7PA27

Technical Data

Rated Voltage and Internal Consumption					
V_N (VDC)	Voltage Range (VDC)	Internal Consumption (mA)		Excitation Voltage (VDC) between [1]	De-Excitation Voltage (VDC) between [1]
		Standard [mA]	Peak		
24/30	19 to 36	42	1 A/20 ms	16 and 19	9 and 14
48	38.4 to 52.8	32		28.8 and 33.6	14.4 and 21.6
60	42 to 72	18		36 and 42	18 and 27

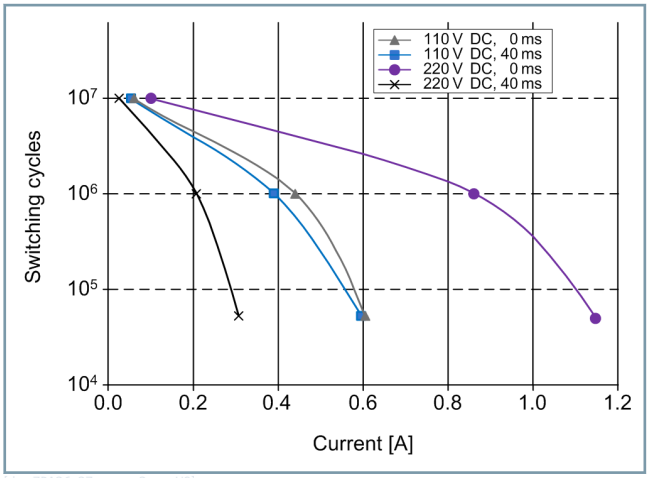
1 Excitation and de-excitation voltages for the 7PA26*20 are specified for an ambient temperature of 23°C and cold relay. These values change with temperature.

Rated Voltage and Internal Consumption					
110/125	77 to 150	8	0.3 A/20 ms	65 and 77	38 and 55
220	154 to 264	6		132 and 154	66 and 99

Pre-Arcing Time	
For excitation	<8 ms
For de-excitation	<40 ms

Contacts	
Continuous current	<10 A
Overload capability	80 A/200 ms 200 A/10 ms
Switching power	40 A/0.5 s, 110 VDC

Breaking Power for 10^5 Switching Cycles				
	Not inductive		Inductive, 40 ms	
VDC	1 contact (A)	2 contacts in series (A)	1 contact (A)	2 contacts in series (A)
24	18	>20	8.1	>20
48	6.9	>20	3.3	18
60	3.4	>20	1.85	13
125	0.9	4	0.47	2
220	0.55	1.05	0.24	0.43
For details, refer to *Figure 2.2/12*				



[dw_7PA26_27_curva, 2, en_US]

Figure 2.2/12 Diagram

V_{max}, open-circuited contact	250 VDC/400 VAC
Mechanical endurance	10^7 switching cycles
Operating temperature	-25 °C +55 °C
Storage temperature	-40 °C +85 °C
Max. humidity	93 %/40 °C

Weights and Packaging	
7PA27	250 g
Carton	125 x 79 x 84 mm

Weights and Packaging	
7XP9015-3	300 g
7XP9013-0	110 g

Design guidelines	
Electrical tests according to	**IEC 60255-27**
Insulation	2 kV/50 Hz/1 min
Surge immunity	5 kV/1.2/50 µs
Insulation resistance	> 100 MΩ/500 VDC
Flame resistance	
Plastics	**UL94**: V0
Protection class	**IEC 60529, EN60529**
Relays	IP40
Flush-mounting base	IP10
Surface-Mounting Base	IP10
Environmental conditions	**IEC 60068-2**
Dry cold, in operation	-25 °C
Dry heat, in operation	+70 °C
Storage and transportation	-25 °C + 85 °C

EMC Tests	
High-frequency test: Test level: 1 MHz, 400 imp/s, 2 s Common mode: 2.5 kV Differential mode: 1 kV	**EN 60255-22-1**
Fast transient bursts Test level: 4 kV, 2.5 kHz, 1 min•2 kV, 5 kHz, 1 min	**EN 61000-4-4**
Energy surge voltages 8/20 µs. (current) - 1.2/50 µs. (voltage) - 8/20 µs. (current) Common mode: 2 kV - differential mode: 1 kV	**EN 61000-4-5**
Radiated HF field interference, amplitude-modulated: Test level: 80-1000 MHz, 10 V/m, 80% AM (1 kHz)	**EN 61000-4-3**
Radiated HF field interference, pulse-modulated: Test level: 900 ±5 MHz, 10 V/m, 50% (200 Hz) 1.89 GHz ±10 MHz, 10 V/m, 50% (200 Hz)	**EN 61000-4-3**
Line-conducted HF amplitude-modulated: Test level: 0.15-80 MHz, 10 V, 80% AM (1 kHz)	**EN 61000-4-6**
Electrostatic discharge test: Test level: Contact ±15 kV, air mode ±15 kV	**EN 61000-4-2**

EMC Tests	
Magnetic Field with Energy Frequency Test level: 100 A/m 1 min•1000 A/m 1 s.	**EN 61000-4-8**
Emitted interference tests: Test level: Cover: 30-230 MHz, 40 dB (µV/m) (quasi peak) - 10 m 230-1000 MHz, 47 dB (µV/m) (quasi peak) - 10 m Power supply: 0.15-0.5 MHz, 79 dB (µV) (quasi peak)/66 dB average 0.5-5 MHz, 73 dB (µV) (quasi peak)/60 dB average 5-30 MHz, 73 dB (µV) (quasi peak)/60 dB average	**EN 55011 Class A**

Selection and Ordering Data

Description	Order No.																
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
Monostable quick-operating relay with 4 change-over contacts	7	P	A	2	7	□	2	-	0	A	A	0	0	-	□			
						▲									▲			
Rated voltage						|								|			
DC 24/30 V						1									|			
DC 60 V						2									|			
DC 110/125 V						3									|			
DC 220 V						4									|			
DC 48 V						8									|			
Without base															0			
Base																		
Flush Mounting							7	X	P	9	0	1	5	-	2			
Surface Mounting							7	X	P	9	0	1	3	-	0			
5 x retaining bracket for auxiliary relay with surface mounting base (1 required for each relay/ surface mounting base)	.	.	.	.	.	.	.	.		A	Y	R	:	E	4	0		

Description

7TS16 is a versatile signal relay with 4 inputs for signals. It has 4 local LED displays and 4 output contacts with auto-reset that can be used in SCADA control systems. In addition, there are 2 diode circuits.

A local or remote-control reset is possible via a separate input. The reset must not be permanently switched.

Benefits

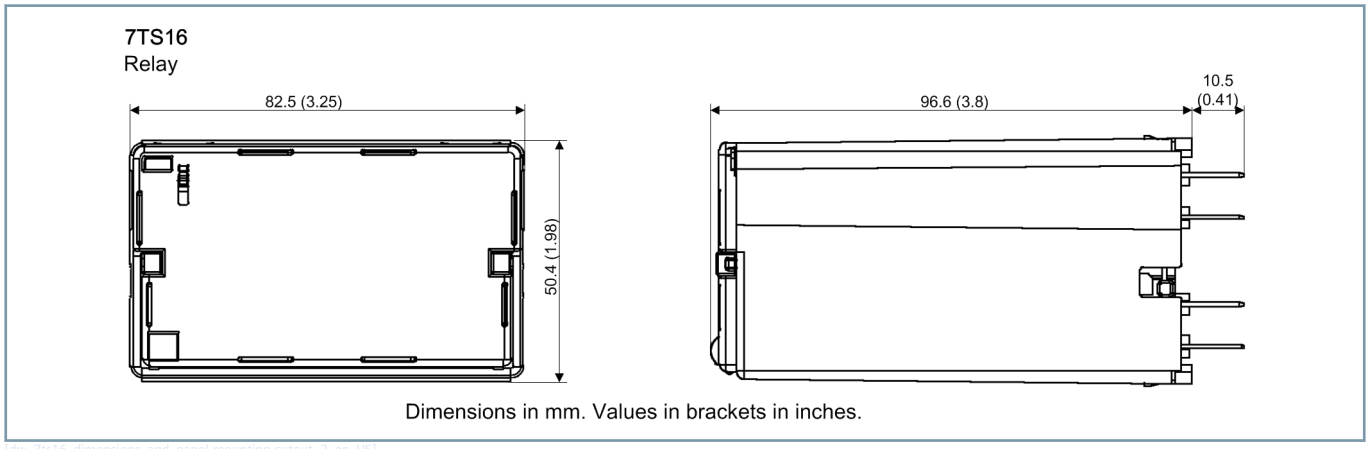
- High durability and functional guarantee
- Tests according to the latest standards: IEC, EN and with the CE marking.



[ph_7TS16, 1, --_--]

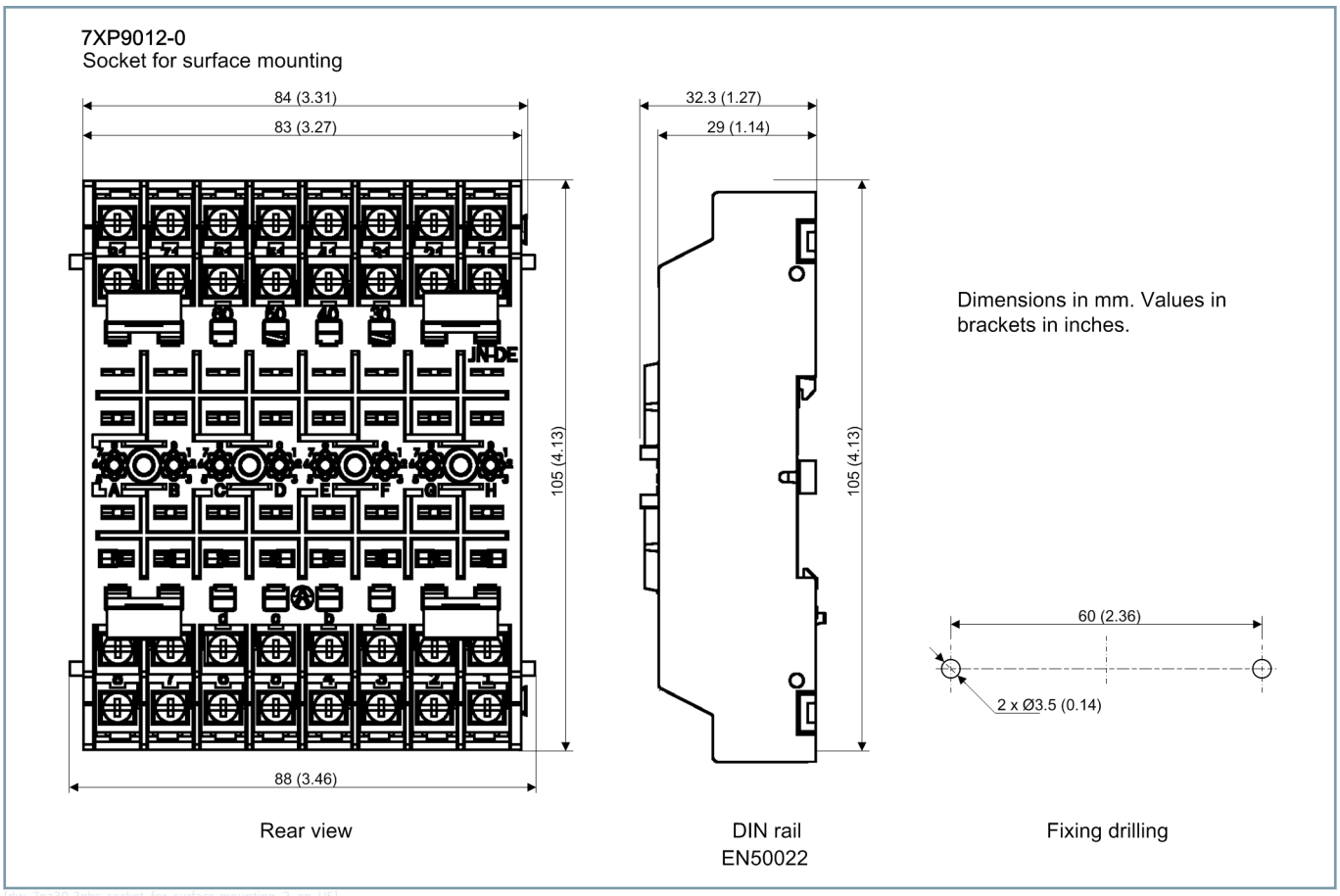
Figure 2.3/1 Signal Relay 7TS16

Dimensions and Connections



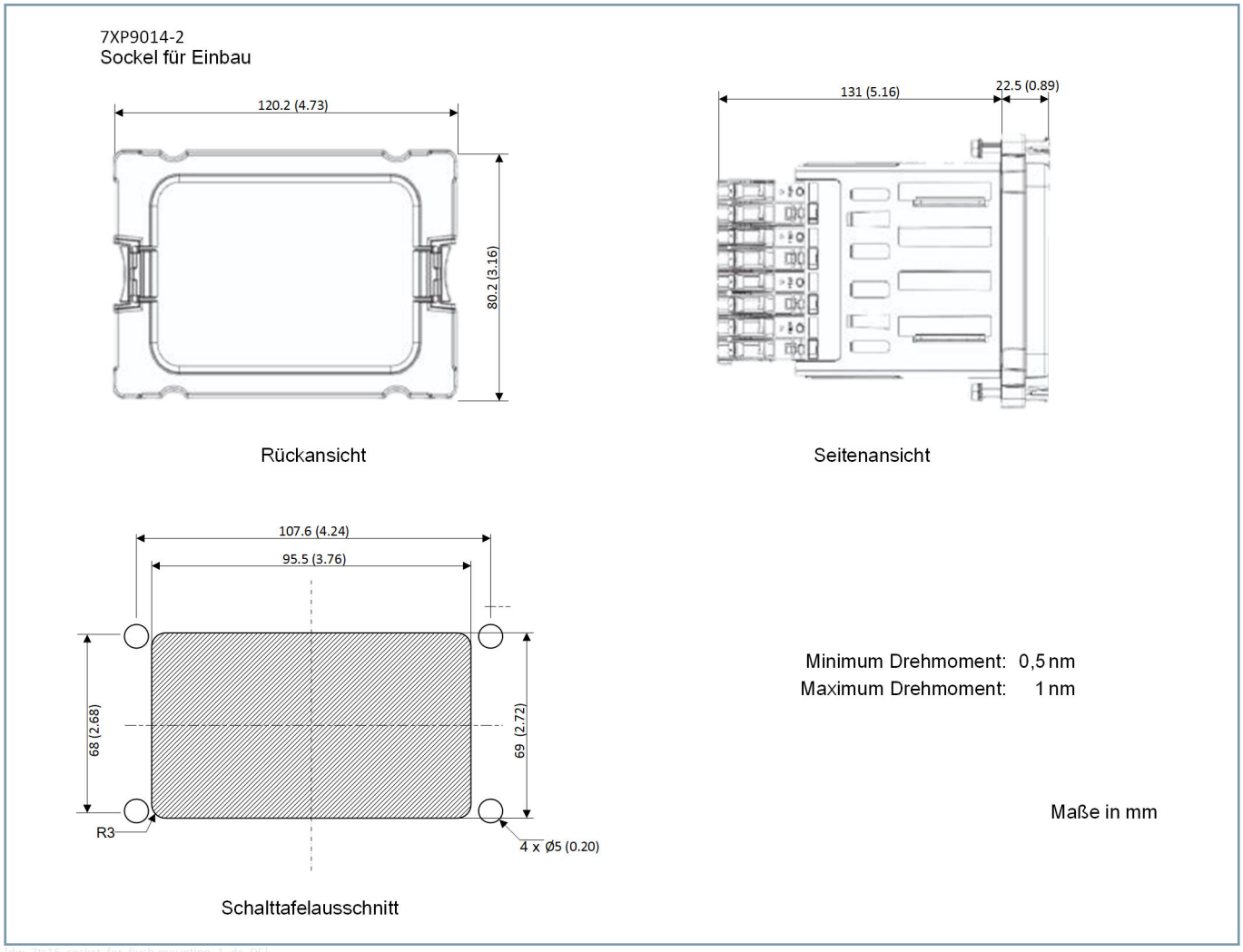
[dw_7ts16_dimensions_and_panel-mounting-cutout, 2, en_US]

Figure 2.3/2 Dimensions



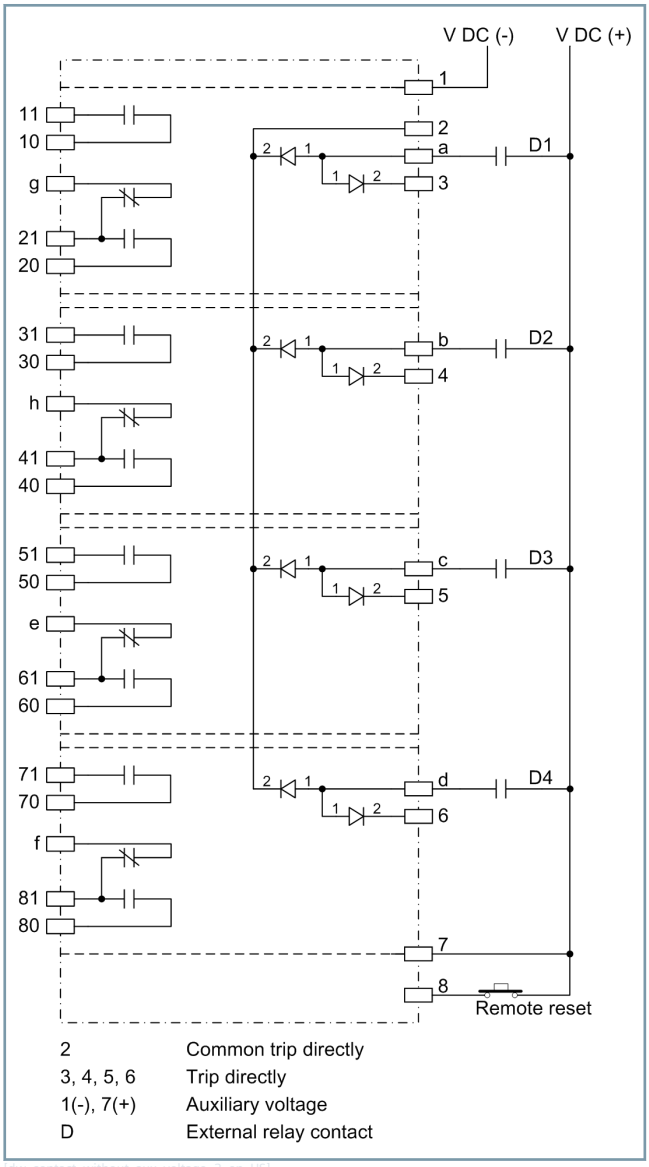
[dw_7pa30-3phs_socket_for_surface-mounting, 2, en_US]

Figure 2.3/3 Surface-Mounting Base



[dw_7ts16_socket_for_flush-mounting, 1, de_DE]

Figure 2.3/4 Flush-Mounting Base



[dw_contact_without_aux_voltage, 2, en_US]

Figure 2.3/5 Connection Diagram – Contacts shown without Auxiliary Voltage in the Relay

Technical Data

Rated voltage and internal consumption			
V_N (VDC)	Voltage range (VDC)	Excitation voltage (VDC)	De-excitation voltage (VDC)
24/30	17 to 33	13.5 to 17	> 6
110/125	77 to 137.5	60 to 77	> 35
220	154 to 242	103 to 154	> 65

Operating temperature	-10 °C +55 °C
Storage temperature	-30 °C +70 °C
Max. humidity	93%/40 °C
Pre-arcing time	<5 ms

Internal consumption				
V_N	Per switching procedure	During monitoring	For permanent, continuous switching	For set LEDs
24/30	1 A/3 ms	0.5	21	1
110/125	3 A/3 ms	2	8	3
220	4 A/3 ms	3.5	6.5	5

Display	4 LEDs, stored until reset

Inputs	4 alarm/switch inputs
	Input for remote reset
	Push-button for local reset

Monostable outputs:	A direct output via diode, 2.5 A
Each for alarm/switch input:	An isolated change-over contact
	An isolated make contact
	A common output via diode (2.5 A; V_{max} 220 VDC)

Contacts	
Continuous current	8 A
Overload capacity	15 A
Switching power ON	15 A/4 s/110 VDC
Switching capacity OFF	0.3 A/110 VDC

Weights and packaging	
7TS16	165 g
Carton	150x124x84 mm
7XP9014-2	400 g
7XP9012-0	225 g

Design guidelines	
Electrical tests according to	**IEC 60255-27**
Insulation	2 kV/50 Hz/1 min
Surge immunity	5 kV/1.2/50 µs
Insulation resistance	> 100 MΩ/500 VDC
Flame resistance	
Plastics	**UL94**: V0
Protection class	**IEC 60529, EN60529**
Relays	IP40
Flush-mounting base	IP10
Surface-Mounting Base	IP10
Environmental conditions	**IEC 60068-2**
Dry cold, in operation	-10 °C
Dry heat, in operation	+55 °C
Storage and transportation	-30 °C +70 °C

EMC Tests

EMC tests	Standard
Immunity, industrial environment	IEC 61000-6-2 EN 61000-6-2

1 MHz immunity test	IEC 60255-22-1 / 1 kV / 2.5 kV
Emitted interference, industrial environment	IEC 61000-6-4 EN 61000-6-4 EN 55011/Class A

Selection and Ordering Data

Description	Order No.															
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
Signal relay with 4 LEDs	7	T	S	1	6	□	2	-	0	A	A	0	0	-	□			
						▲									▲			
Rated voltage						|								|			
DC 24/30 V						1									|			
DC 110/125 V						3									|			
DC 220 V						4									|			
Without base															0			
Base																		
Flush Mounting							7	X	P	9	0	1	4	-	2			
Surface Mounting							7	X	P	9	0	1	2	-	0			
5 x retaining bracket for auxiliary relay with surface mounting base (1 required for each relay/ surface mounting base)	.	.	.	.	.	.	.	.		A	Y	R	:	E	4	7		

Auxiliary Relay – 7PG11

Description

The 7PG111 and 7PG112 AR (auxiliary relay) range of electro-mechanical relays are available with up to eight self, hand or electrically reset contacts. They can be supplied with various combinations of contact, flag and reset arrangements.

AR relays are voltage operated from either AC or DC supplies. Relays may be built with or without a flag indicator.

Features

Type AR relays are a range of electro-mechanical relays with up to 8 contacts and complying to BS142. They can be supplied in most combinations of contact, flag and reset arrangements. They are used wherever there is a need for additional contacts.

The relays are identified by a series of numbers and letters which define important relay features.

The following comments are provided as a guide to the various features of type AR relays.

AR - XX1	Up to 8 self reset contacts, in any combination of normally open or normally closed as required.
AR - XX2	Up to 8 self reset contacts, in any combination of normally open or normally closed as required.
AR - XX3	Electrical and hand set contacts supplied with a contact reset mechanism in the relay case cover.
AR - XX4	Hand and self reset contacts, can be supplied with 2 hand reset contacts and a maximum of 4 self reset contacts. All the contacts may be either normally open or normally closed.
AR - XX6	Electrical reset contacts with optional self reset flag.
AR - XX3 and XX6	Reset coils are short time rated, we recommend that reset circuits include a normally open (cut-off) contact

First digit	Second digit - Type of flag		Third digit - Type of contact reset	
Number of identical elements	0	No flag	1	Self
	1	Hand reset	2	Hand
	2	Hand reset reverse acting	3	Electrical and hand
	3	Self reset	4	Hand and self
	4	Self reset reverse acting	6	Electrical

Table 2.4/1 Relay features

The AR901 has 4 user available contacts and has been designed for a specific function to be used in conjunction with the 7SR23 DAD high impedance protection relay to act as a CT shorting relay.



[Reyrolle Product Catalogue, 7PG11, 1, =_=]

Figure 2.4/1 7PG11 auxiliary relay

Benefits

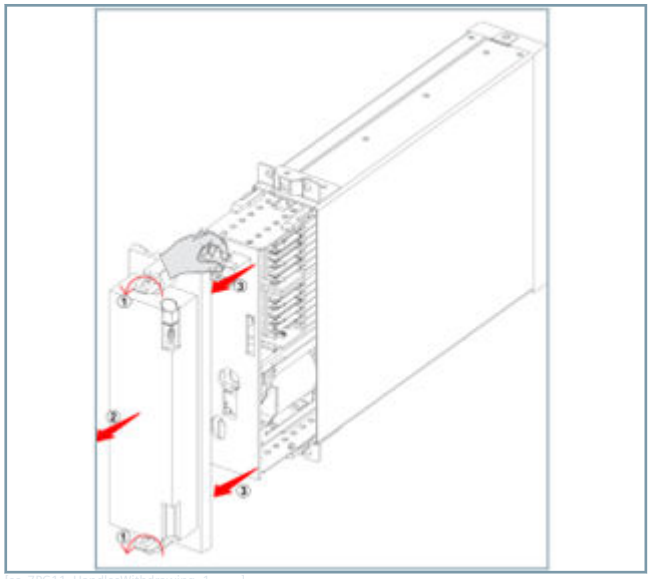
- Robust design for a long, reliable service life
- Supplied in a draw-out type case
- Various combinations of coils, contacts, operation indicator flags can be specified
- Consistent positive action

Hardware construction

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

The rear connection comprises of M4 screw terminals suitable for ring type crimps.

The chassis of the device can be withdrawn from the case by pulling the handles on the top and bottom.



[sc_7PG11_HandlesWithdrawing, 1, --_--]

Figure 2.4/2 Withdrawing device using handles

Earthing terminal

The case earth stud should be solidly earthed to the panel earth before any connections to the device rear terminal. Located at the top rear of the case is a case earth stud as shown in *Figure 2.4/3*, this must be connected to the main panel earth.

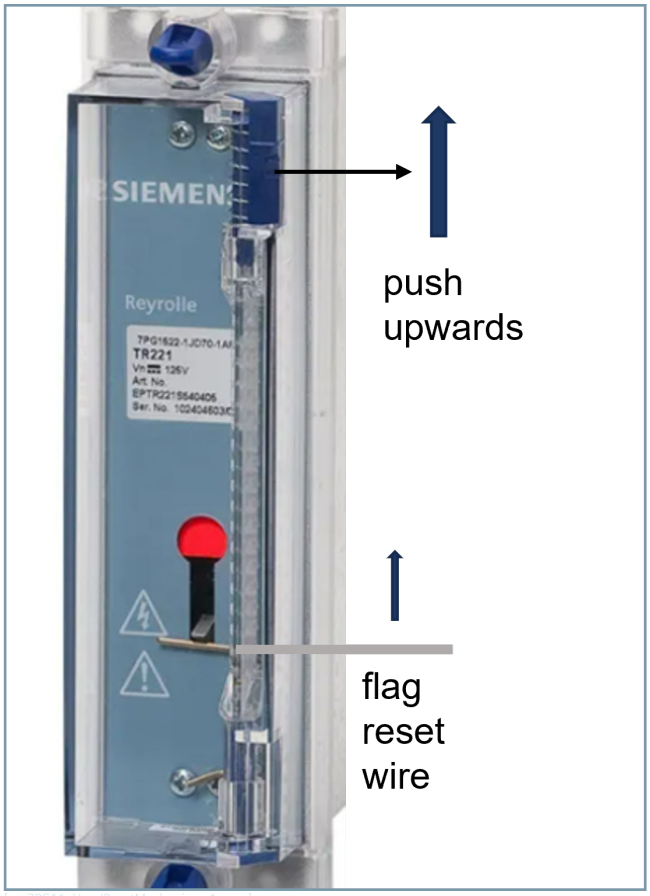


[sc_7PG11_EarthingTerminal, 1, --_--]

Figure 2.4/3 Case earth stud

Hand reset mechanism

Pull the blue handle upwards to slide the mechanism in an upwards direction with the flag reset wire at the bottom.



[sc_7PG11_HandResetMechanism, 1, --_--]

Figure 2.4/4 Hand reset mechanism

Relay information

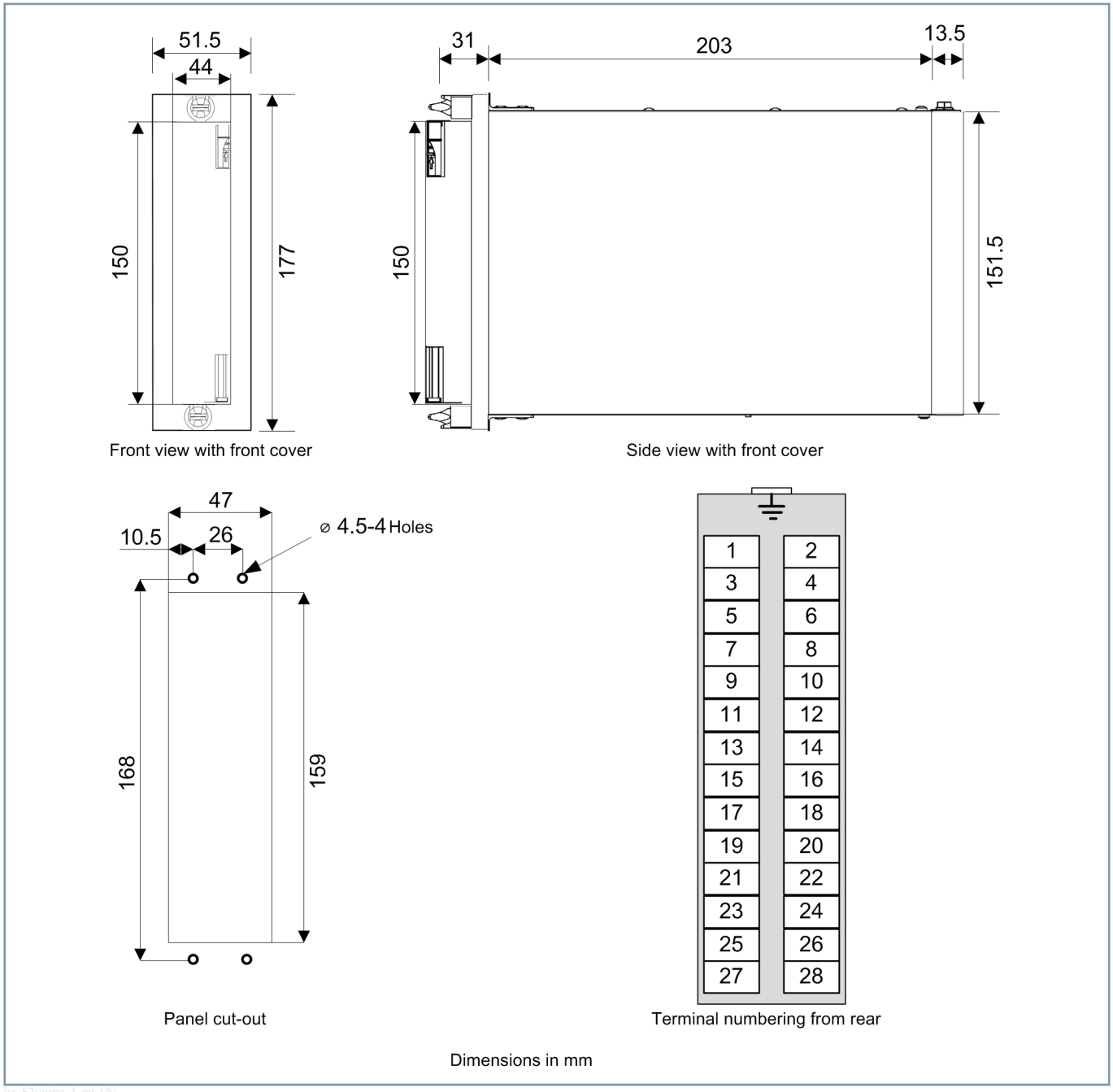
The device fascia displays the MLFB order code, serial number, and device identification reference.

	Electrical Hazard
	Refer to device documentation
	Waste Electrical and Electronic Equipment Directive (WEEE)
CE	European CE marking
EAC	Guideline for the Eurasian Market
UK CA	United Kingdom (UK) conformity-assessed marking

Connection diagrams

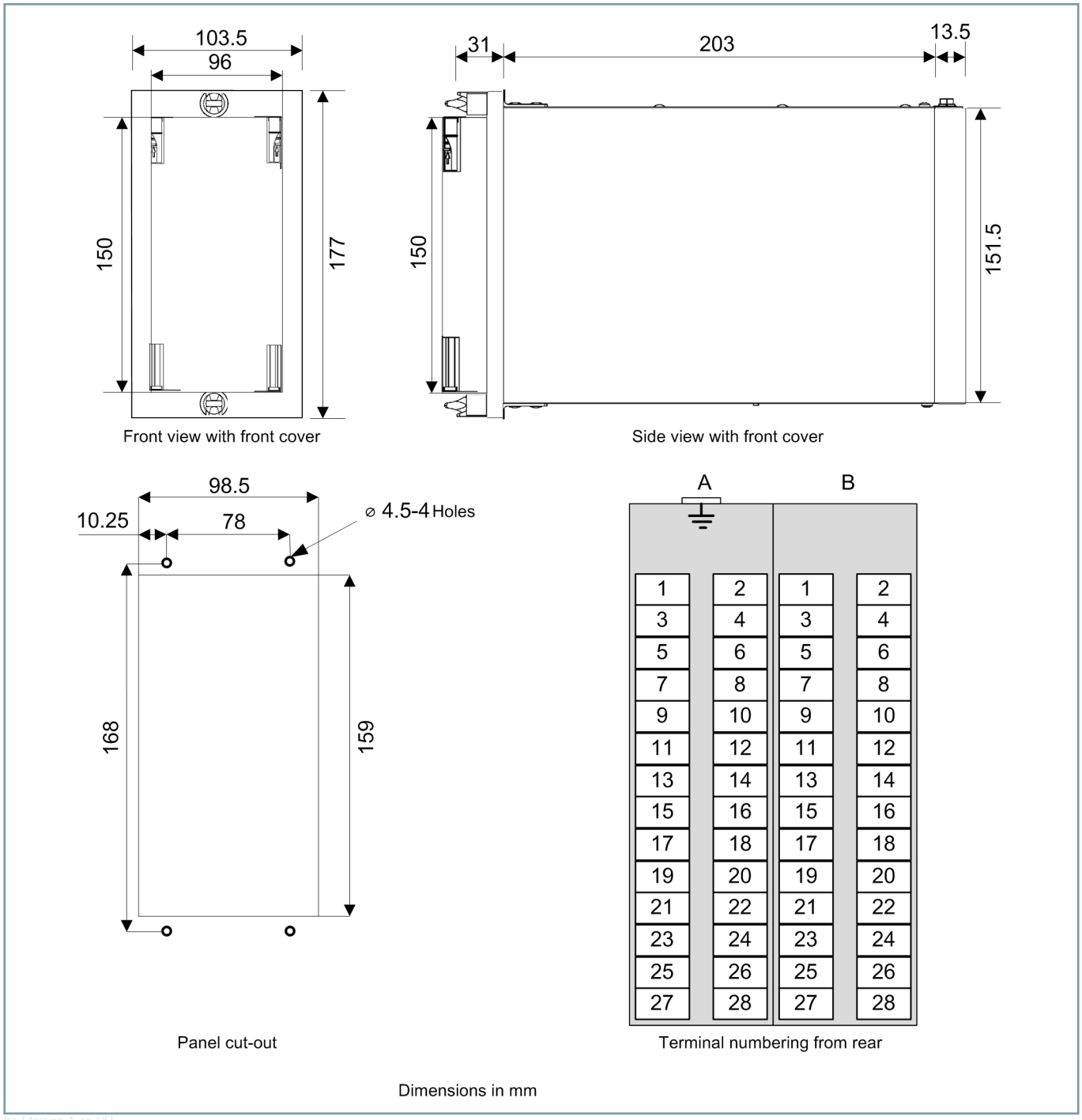
Please refer to the Siemens website for the connection diagrams.

Dimension drawings



[sc_E2casing, 1, en_US]

Figure 2.4/5 E2 case



[sc_E4casing, 1, en_US]

Figure 2.4/6 E4 case

Technical data

Inputs and outputs

Rated voltage (Vn)	
AC	63.5, 110, 220, 240 V
DC	12, 24, 30, 50, 125, 240 V

Operating range	
AC	80 % to 110 % of rated voltage
DC	70 % to 115 % of rated voltage

Burden	
3 to 5 W/VA depending upon voltage rating	Dependent on rating. Rectified AC relays nominal power factor = 0.96

Output contacts

Make and carry continuously	AC 1250 VA or DC 1250 W within the limits of 660 V and 5 A
Make and carry for 3 seconds	AC 7500 VA or DC 7500 W within the limits of 660 V and 30 A
Breaking capacity (≤ 5 A and ≤ 250 V): AC resistive DC resistive DC inductive	 1250 VA 100 W 50 W L/R = 40 ms
Minimum number of operations	1000 at maximum load
Minimum recommended load	0.5 Watt limits 10 mA or 5 V

Electrical tests

Insulation

IEC 60255-5 RMS levels for 1 minute

Between contacts to earth and to the coil	2.0 kV
Between any case terminal and earth	2.0 kV
Between case terminals of independent circuits	2.0 kV
Across normally open contacts	1.0 kV

Transient overvoltage

IEC 60255-5

Between all terminals and earth or between any two independent circuits without damage or flash-over	5 kV 1.2/50 µs 0.5 J

Mechanical

Vibration (Sinusoidal)

IEC 255-21-1	The relays meet the requirements of Class 1 for vibration response and endurance
BS142 section 2.1 category S2	Relays will withstand a 20G shock or impact on the panel without operating

Shock bump

IEC 255-21-2	Class 1 severity
BS142, sub-section 1.5.2. (1989)	Class 1 severity

Mechanical life

Durability	In excess of 10,000 operations with the contact rating at a rate of 600 operations per hour

Environmental

Temperature

IEC 60068-2-1/IEC 60068-2-2 and BS2011 (1977)

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

Humidity

IEC 60068-2-30

Operational test	56 days at 40°C and 95 % RH

Ip ratings

Type	Level
Installed with cover	IP 5X

Performance

Instantaneous operating time	
Typically	25 ms
Range	10 ms to 50 ms

Ordering information - 7PG111 auxiliary relay (AR101, AR103)

Product description	Order no.																	
	1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16
Auxiliary relay (AR101, AR103)	7	P	G	1	1	1	0	-	□	□	□	□	0	-	0	A	□	□
									|	|	|	|					|	|
Single element, no flag, size E2, AC or DC voltage operated relay									|	|	|	|					|	|
									|	|	|	|					|	|
Contact operation									|	|	|	|					|	|
Self reset contacts									1	|	|	|						|	|
Hand and electrical reset contacts									3	|	|	|						|	|
										|	|	|						|	|
Contact arrangement – NO										|	|	|						|	|
0 NO										A	|	|						|	|
1 NO										B	|	|						|	|
2 NO										C	|	|						|	|
3 NO										D	|	|						|	|
4 NO										E	|	|						|	|
5 NO										F	|	|						|	|
6 NO										G	|	|						|	|
7 NO										H	|	|						|	|
8 NO										J	|	|						|	|
											|	|						|	|
Contact arrangement – NC											|	|						|	|
0 NC											A	|						|	|
1 NC											B	|						|	|
2 NC											C	|						|	|
3 NC											D	|						|	|
4 NC											E	|						|	|
5 NC											F	|						|	|
6 NC											G	|						|	|
7 NC											H	|						|	|
8 NC											J	|						|	|
												|						|	|
Number of contacts [2]												|						|	|
Two												0						|	|
Four												1						|	|
Six												3						|	|
Eight												5						|	|
																		|	|
Voltage rating																		|	|
DC 12 V																		A	|
DC 24 V																		B	|
DC 30 V																		C	|
DC 50 V																		D	|
DC 60 V																		E	|
DC 125 V																		F	|
DC 220 V																		G	|
DC 240 V																		H	|
AC 63.5 V																		J	0

2.4

2 The number of contacts must match the selected contact arrangement

Auxiliary Relay – 7PG11

Product description	Order no.		
AC 110 V		K	0
AC 220 V		L	0
AC 240 V		M	0
			|
Back EMF suppression diode			|
Not fitted			0
Fitted			1

Ordering information - 7PG111 auxiliary relay (AR111, AR112)

Product description	Order no.																
	1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16
Auxiliary relay (AR111, AR112)	7	P	G	1	1	1	1	-	□	□	□	□	0	-	0	A	□	□
									|	|	|	|					|	|
Single element, hand reset flag, size E2, AC or DC voltage operated relay									|	|	|	|					|	|
									|	|	|	|					|	|
Contact operation									|	|	|	|					|	|
Self reset contacts									1	|	|	|						|	|
Hand reset contacts									2	|	|	|						|	|
										|	|	|						|	|
Contact arrangement – NO										|	|	|						|	|
0 NO										A	|	|						|	|
1 NO										B	|	|						|	|
2 NO										C	|	|						|	|
3 NO										D	|	|						|	|
4 NO										E	|	|						|	|
5 NO										F	|	|						|	|
6 NO										G	|	|						|	|
7 NO										H	|	|						|	|
8 NO										J	|	|						|	|
											|	|						|	|
Contact arrangement – NC											|	|						|	|
0 NC											A	|						|	|
1 NC											B	|						|	|
2 NC											C	|						|	|
3 NC											D	|						|	|
4 NC											E	|						|	|
5 NC											F	|						|	|
6 NC											G	|						|	|
7 NC											H	|						|	|
8 NC											J	|						|	|
												|						|	|
Number of contacts [3]												|						|	|
Two												0						|	|
Four												1						|	|
Six												3						|	|
Eight												5						|	|
																		|	|
Voltage rating																		|	|
DC 12 V																		A	|
DC 24 V																		B	|
DC 30 V																		C	|
DC 50 V																		D	|
DC 60 V																		E	|
DC 125 V																		F	|
DC 220 V																		G	|
DC 240 V																		H	|
AC 63.5 V																		J	0

3 The number of contacts must match the selected contact arrangement

Auxiliary Relays

Auxiliary Relay – 7PG11

Product description	Order no.		
AC 110 V		K	0
AC 220 V		L	0
AC 240 V		M	0
			|
Back EMF suppression diode			|
Not fitted			0
Fitted			1

Ordering information - 7PG111 auxiliary relay (AR112SB)

Product description	Order no.																	
	1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16
Auxiliary relay (AR112SB)	7	P	G	1	1	1	1	-	2	□	□	□	4	-	0	A	□	□
										|	|	|					|	|
Single element, hand reset flag, hand reset contacts, size E2, DC voltage operated relay with series break contact to reduce relay burden to zero after operation										|	|	|					|	|
										|	|	|					|	|
Contact arrangement – NO										|	|	|					|	|
0 NO										A	|	|					|	|
1 NO										B	|	|					|	|
2 NO										C	|	|					|	|
3 NO										D	|	|					|	|
4 NO										E	|	|					|	|
5 NO										F	|	|					|	|
6 NO										G	|	|					|	|
7 NO										H	|	|					|	|
											|	|					|	|
Contact arrangement – NC											|	|					|	|
0 NC											A	|						|	|
1 NC											B	|						|	|
2 NC											C	|						|	|
3 NC											D	|						|	|
4 NC											E	|						|	|
5 NC											F	|						|	|
6 NC											G	|						|	|
7 NC											H	|						|	|
8 NC											J	|						|	|
												|						|	|
Number of contacts [4]												|						|	|
Two												0						|	|
Four												1						|	|
Six												3						|	|
Eight												5						|	|
																		|	|
Voltage rating																		|	|
DC 12 V																		A	|
DC 24 V																		B	|
DC 30 V																		C	|
DC 50 V																		D	|
DC 60 V																		E	|
DC 125 V																		F	|
DC 220 V																		G	|
DC 240 V																		H	|
AC 63.5 V																		J	0
AC 110 V																		K	0
AC 220 V																		L	0
AC 240 V																		M	0
																			|
Back EMF suppression diode																			|
Not fitted																			0
Fitted																			1

4 The number of contacts must match the selected contact arrangement

Ordering information - 7PG111 auxiliary relay (AR113)

Product description	Order no.																	
	1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16
Auxiliary relay (AR113)	7	P	G	1	1	1	1	-	3	□	□	□	0	-	0	A	□	□
										|	|	|					|	|
Single element, hand reset flag, hand and electrical reset contacts, size E2, AC or DC voltage operated relay										|	|	|					|	|
										|	|	|					|	|
Contact arrangement – NO										|	|	|					|	|
0 NO										A	|	|					|	|
1 NO										B	|	|					|	|
2 NO										C	|	|					|	|
3 NO										D	|	|					|	|
4 NO										E	|	|					|	|
5 NO										F	|	|					|	|
6 NO										G	|	|					|	|
7 NO										H	|	|					|	|
8 NO										J	|	|					|	|
											|	|					|	|
Contact arrangement – NC											|	|					|	|
0 NC											A	|						|	|
1 NC											B	|						|	|
2 NC											C	|						|	|
3 NC											D	|						|	|
4 NC											E	|						|	|
5 NC											F	|						|	|
6 NC											G	|						|	|
7 NC											H	|						|	|
8 NC											J	|						|	|
												|						|	|
Number of contacts [5]												|						|	|
Four												1						|	|
Six												3						|	|
Eight												5						|	|
																		|	|
Voltage rating																		|	|
DC 12 V																		A	|
DC 24 V																		B	|
DC 30 V																		C	|
DC 50 V																		D	|
DC 60 V																		E	|
DC 125 V																		F	|
DC 220 V																		G	|
DC 240 V																		H	|
AC 63.5 V																		J	0
AC 110 V																		K	0
AC 220 V																		L	0
AC 240 V																		M	0
																			|
Back EMF suppression diode																			|
Not fitted																			0
Fitted																			1

5 The number of contacts must match the selected contact arrangement

Ordering information - 7PG111 auxiliary relay (AR211, AR212)

Product description	Order no.																	
	1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16
Auxiliary relay (AR211, AR212)	7	P	G	1	1	2	1	-	□	□	□	□	0	-	0	□	□	□
									|	|	|	|				|	|	|
Two element, hand reset flag, AC or DC voltage operated relay									|	|	|	|				|	|	|
									|	|	|	|				|	|	|
Contact operation									|	|	|	|				|	|	|
Self reset contacts									1	|	|	|					|	|	|
Hand reset contacts									2	|	|	|					C	|	|
										|	|	|					|	|	|
Contact arrangement – NO										|	|	|					|	|	|
0 NO										A	|	|					|	|	|
1 NO										B	|	|					|	|	|
2 NO										C	|	|					|	|	|
3 NO										D	|	|					|	|	|
4 NO										E	|	|					|	|	|
5 NO										F	|	|					|	|	|
6 NO										G	|	|					|	|	|
											|	|					|	|	|
Contact arrangement – NC											|	|					|	|	|
0 NC											A	|						|	|	|
1 NC											B	|						|	|	|
2 NC											C	|						|	|	|
3 NC											D	|						|	|	|
4 NC											E	|						|	|	|
5 NC											F	|						|	|	|
6 NC											G	|						|	|	|
												|						|	|	|
Number of contacts[6]												|						|	|	|
Two												0						A	|	|
Four												1						C	|	|
Six												3						C	|	|
																		|	|	|
Housing size																		|	|	|
Case size E2 (4U high)																		A	|	|
Case size E4 (4U high)																		C	|	|
																			|	|
Voltage rating																			|	|
DC 12 V																			A	|
DC 24 V																			B	|
DC 30 V																			C	|
DC 50 V																			D	|
DC 60 V																			E	|
DC 125 V																			F	|
DC 220 V																			G	|
DC 240 V																			H	|
AC 63.5 V																			J	0
AC 110 V																			K	0

2.4

6 The number of contacts must match the selected contact arrangement

Auxiliary Relays

Auxiliary Relay – 7PG11

Product description	Order no.		
AC 220 V		L	0
AC 240 V		M	0
			|
Back EMF suppression diode			|
Not fitted			0
Fitted			1

Ordering information - 7PG111 auxiliary relay (AR212SB)

Product description	Order no.																	
	1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16
Auxiliary relay (AR212SB)	7	P	G	1	1	2	1	-	2	□	□	□	4	-	0	C	□	□
										|	|	|					|	|
Two element, hand reset flag, hand reset contacts, size E4, DC voltage operated relay with series break contact to reduce relay burden to zero after operation										|	|	|					|	|
										|	|	|					|	|
Contact arrangement – NO										|	|	|					|	|
0 NO										A	|	|					|	|
1 NO										B	|	|					|	|
2 NO										C	|	|					|	|
3 NO										D	|	|					|	|
4 NO										E	|	|					|	|
5 NO										F	|	|					|	|
											|	|					|	|
Contact arrangement – NC											|	|					|	|
0 NC											A	|						|	|
1 NC											B	|						|	|
2 NC											C	|						|	|
3 NC											D	|						|	|
4 NC											E	|						|	|
5 NC											F	|						|	|
6 NC											G	|						|	|
												|						|	|
Number of contacts [7]												|						|	|
Two												0						|	|
Four												1						|	|
Six												3						|	|
																		|	|
Voltage rating																		|	|
DC 12 V																		A	|
DC 24 V																		B	|
DC 30 V																		C	|
DC 50 V																		D	|
DC 60 V																		E	|
DC 125 V																		F	|
DC 220 V																		G	|
DC 240 V																		H	|
AC 63.5 V																		J	0
AC 110 V																		K	0
AC 220 V																		L	0
AC 240 V																		M	0
																			|
Back EMF suppression diode																			|
Not fitted																			0
Fitted																			1

2.4

7 The number of contacts must match the selected contact arrangement

Ordering information - 7PG111 auxiliary relay (AR221)

Product description	Order no.																	
	1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16
Auxiliary relay (AR221)	7	P	G	1	1	2	2	-	1	□	□	□	0	-	0	□	□	□
										|	|	|				|	|	|
Two element, hand reset reverse acting flag, self reset contacts, AC or DC voltage operated relay										|	|	|				|	|	|
										|	|	|				|	|	|
Contact arrangement – NO										|	|	|				|	|	|
0 NO										A	|	|				|	|	|
1 NO										B	|	|				|	|	|
2 NO										C	|	|				|	|	|
3 NO										D	|	|				|	|	|
4 NO										E	|	|				|	|	|
5 NO										F	|	|				|	|	|
6 NO										G	|	|				|	|	|
											|	|				|	|	|
Contact arrangement – NC											|	|				|	|	|
0 NC											A	|					|	|	|
1 NC											B	|					|	|	|
2 NC											C	|					|	|	|
3 NC											D	|					|	|	|
4 NC											E	|					|	|	|
5 NC											F	|					|	|	|
6 NC											G	|					|	|	|
												|					|	|	|
Number of contacts [8]												|					|	|	|
Two												0					A	|	|
Four												1					C	|	|
Six												3					C	|	|
																	|	|	|
Housing size																	|	|	|
Case size E2 (4U high)																	A	|	|
Case size E4 (4U high)																	C	|	|
																		|	|
Voltage rating																		|	|
DC 12 V																		A	|
DC 24 V																		B	|
DC 30 V																		C	|
DC 50 V																		D	|
DC 60 V																		E	|
DC 125 V																		F	|
DC 220 V																		G	|
DC 240 V																		H	|
AC 63.5 V																		J	0
AC 110 V																		K	0
AC 220 V																		L	0
AC 240 V																		M	0
																			|
Back EMF suppression diode																			|
Not fitted																			0
Fitted																			1

8 The number of contacts must match the selected contact arrangement

Ordering information - 7PG111 auxiliary relay (AR131, AR136)

Product description	Order no.																	
	1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16
Auxiliary relay (AR131, AR136)	7	P	G	1	1	1	3	-	1	□	□	□	0	-	0	A	□	□
										|	|	|					|	|
Single element, self reset flag, size E2, AC or DC voltage operated relay										|	|	|					|	|
										|	|	|					|	|
Contact operation										|	|	|					|	|
Self reset contacts										|	|	|					|	|
										|	|	|					|	|
Contact arrangement – NO										|	|	|					|	|
0 NO										A	|	|					|	|
1 NO										B	|	|					|	|
2 NO										C	|	|					|	|
3 NO										D	|	|					|	|
4 NO										E	|	|					|	|
5 NO										F	|	|					|	|
6 NO										G	|	|					|	|
											|	|					|	|
Contact arrangement – NC											|	|					|	|
0 NC											A	|						|	|
1 NC											B	|						|	|
2 NC											C	|						|	|
3 NC											D	|						|	|
4 NC											E	|						|	|
5 NC											F	|						|	|
6 NC											G	|						|	|
												|						|	|
Number of contacts [9]												|						|	|
Two												0						|	|
Four												1						|	|
Six												3						|	|
																		|	|
Voltage rating																		|	|
DC 12 V																		A	|
DC 24 V																		B	|
DC 30 V																		C	|
DC 50 V																		D	|
DC 60 V																		E	|
DC 125 V																		F	|
DC 220 V																		G	|
DC 240 V																		H	|
AC 63.5 V																		J	0
AC 110 V																		K	0
AC 220 V																		L	0
AC 240 V																		M	0
																			|
Back EMF suppression diode																			|
Not fitted																			0
Fitted																			1

9 The number of contacts must match the selected contact arrangement

Ordering information - 7PG111 auxiliary relay (AR133)

Product description	Order no.																	
	1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16
Auxiliary relay (AR133)	7	P	G	1	1	1	3	-	3	□	□	□	0	-	0	A	□	□
										|	|	|					|	|
Single element, self reset flag, hand and electrical reset contacts, size E2, AC or DC voltage operated relay										|	|	|					|	|
										|	|	|					|	|
Contact arrangement – NO										|	|	|					|	|
0 NO										A	|	|					|	|
1 NO										B	|	|					|	|
2 NO										C	|	|					|	|
3 NO										D	|	|					|	|
4 NO										E	|	|					|	|
5 NO										F	|	|					|	|
6 NO										G	|	|					|	|
7 NO										H	|	|					|	|
8 NO										J	|	|					|	|
											|	|					|	|
Contact arrangement – NC											|	|					|	|
0 NC											A	|						|	|
1 NC											B	|						|	|
2 NC											C	|						|	|
3 NC											D	|						|	|
4 NC											E	|						|	|
5 NC											F	|						|	|
6 NC											G	|						|	|
7 NC											H	|						|	|
8 NC											J	|						|	|
												|						|	|
Number of contacts [10]												|						|	|
Two												0						|	|
Four												1						|	|
Six												3						|	|
Eight												5						|	|
																		|	|
Voltage rating																		|	|
DC 12 V																		A	|
DC 24 V																		B	|
DC 30 V																		C	|
DC 50 V																		D	|
DC 60 V																		E	|
DC 125 V																		F	|
DC 220 V																		G	|
DC 240 V																		H	|
AC 63.5 V																		J	0
AC 110 V																		K	0
AC 220 V																		L	0
AC 240 V																		M	0
																			|
Back EMF suppression diode																			|

10 The number of contacts must match the selected contact arrangement

Product description	Order no.
Not fitted	0
Fitted	1

Ordering information - 7PG111 auxiliary relay (AR231)

Product description	Order no.																	
	1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16
Auxiliary relay (AR231)	7	P	G	1	1	2	3	-	1	□	□	□	0	-	0	□	□	□
										|	|	|				|	|	|
Two element, self reset flag, self reset contacts, AC or DC voltage operated relay										|	|	|				|	|	|
										|	|	|				|	|	|
Contact arrangement – NO										|	|	|				|	|	|
0 NO										A	|	|				|	|	|
1 NO										B	|	|				|	|	|
2 NO										C	|	|				|	|	|
3 NO										D	|	|				|	|	|
4 NO										E	|	|				|	|	|
											|	|				|	|	|
Contact arrangement – NC											|	|				|	|	|
0 NC											A	|					|	|	|
1 NC											B	|					|	|	|
2 NC											C	|					|	|	|
3 NC											D	|					|	|	|
4 NC											E	|					|	|	|
												|					|	|	|
Number of contacts[11]												|					|	|	|
Two												0					A	|	|
Four												1					C	|	|
																	|	|	|
Housing size																	|	|	|
Case size E2 (4U high)																	A	|	|
Case size E4 (4U high)																	C	|	|
																		|	|
Voltage rating																		|	|
DC 12 V																		A	|
DC 24 V																		B	|
DC 30 V																		C	|
DC 50 V																		D	|
DC 60 V																		E	|
DC 125 V																		F	|
DC 220 V																		G	|
DC 240 V																		H	|
AC 63.5 V																		J	0
AC 110 V																		K	0
AC 220 V																		L	0
AC 240 V																		M	0
																			|
Back EMF suppression diode																			|
Not fitted																			0
Fitted																			1

[11] The number of contacts must match the selected contact arrangement

Description

The 7PG15 TR relay has a range of multi-contact attracted armature relays designed to both IEC 255-5 and BS142 standards. A wide range of models are available to meet the requirements of the electric supply industry.

- Low burden, TR1 series, 7PG151
  Type TR1 relays are suitable for application for tripping and auxiliary duties where immunity to capacitance discharge is not required. These relays are not intended for use with current operated series follower relays.
- High burden, TR2 series, 7PG152
  High burden relays with immunity to capacitance discharge currents. They are also suitable for certain applications where they are remote from the initiation signal.
  A high burden also permits reliable operation of current operated series repeat relays. TR relays can be provided with an instantaneous or time-delayed cut-off.
- Low burden relay, TR312, 7PG153
  Designed to meet the requirements of NGC (CEGB) specification P15, this is an electrically reset relay (no flag indicator) with additional terminals in the economy circuit to enable a direct connection to the DC supply.
  This arrangement allows a reduction in the break duty of the initiating contact. TR312 is designed for use with protection relays having output contacts with a low break duty, e.g. reed relays.
- Switching relay, TR431, 7PG154
  Designed to meet the requirements of NGC TDM 5/11, this is an electrically reset relay with an (IN/OUT) flag indicator which follows the contact operation. These relays are intended to switch protection and auto reclose equipment in and out of service when controlled over pilot wires from a remote point. The relay is designed to have immunity to AC voltages to prevent maloperation of the relay due to induced voltages on interconnecting cables. They are intended to operate from a remote DC 50 V battery with a pilot loop resistance of up to 200 Ω.
- Special purpose relays, TR9 series, 7PG156
  This designation identifies TR relays designed to meet a special purpose e.g. TR901 is a high burden repeat relay, a type TR231 with a 2 position flag indicator used as a plant follower relay for circuit breakers and disconnectors.

Benefits

The benefits of the High Speed Trip Relay are:

- High speed, high burden, positive action, and instantaneous cutoff.
- The 7PG15 trip relay can be used with the Trip Circuit Supervision relay (7PG17, XR250 to XR351) to monitor and supervise the integrity of the trip circuit with coil supervision terminal.
- Supplied in a draw-out type case.
- Robust design for a long, reliable service life.
- The trip relay coil may be supervised using a trip relay supervision relay (7PG17, XR151).



[sc_7PG15_profile, 1, --_--]

Operate coil cut off

- Economy – After initial operation the burden of the relay is automatically reduced to a low economy level.
- Instantaneous – After initial operation the burden of the relay automatically switches out. An internal heavy duty contact is arranged to open circuit the operate coil when operated.
- Time delay cut off – Where instantaneous cut-off relays are utilized a normally closed contact opens the operating coil circuit and so the burden is reduced to zero instantaneously. A time delay circuit has been introduced on various 7PG15 variants for occasions where another series operating element requires a longer operating time.

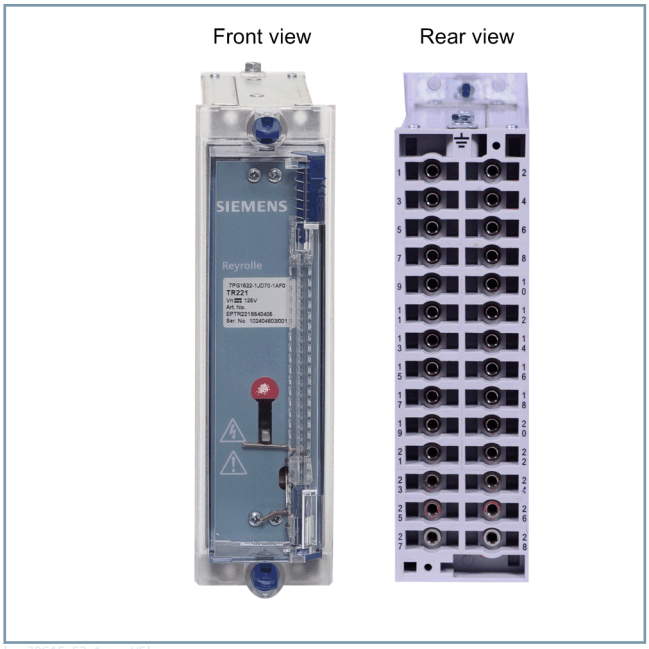
Contacts

- Self reset – Contact is in the operate position whilst the relay operate coil is energized.
- Hand reset – Contact is in the operated position by a mechanical latch that is released by the reset mechanism.
- Electrical reset – Contact is in the operated position by a mechanical latch that is released by energizing the reset coil.

Hardware construction

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

The rear connection comprises of M4 screw terminals suitable for ring type crimps.



[sc_7PG15_E2, 1, en_US]

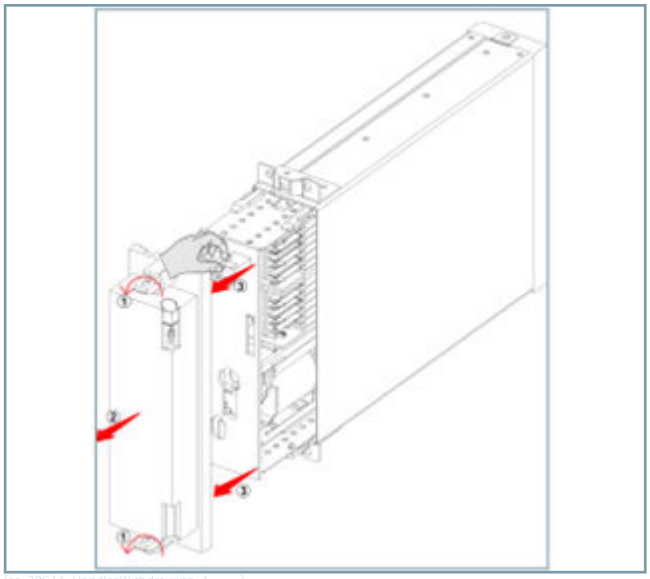
Figure 2.5/1 Size E2



[sc_7PG15_E4, 1, en_US]

Figure 2.5/2 Size E4

The chassis of the device can be withdrawn from the case by pulling the handles on the top and bottom.



[sc_7PG11_HandlesWithdrawing, 1, –, –]

Figure 2.5/3 Withdrawing device using handles

Earthing terminal

The case earth stud should be solidly earthed to the panel earth before any connections to the device rear terminal. Located at the top rear of the case is a case earth stud as shown in *Figure 2.4/3*, this must be connected to the main panel earth.

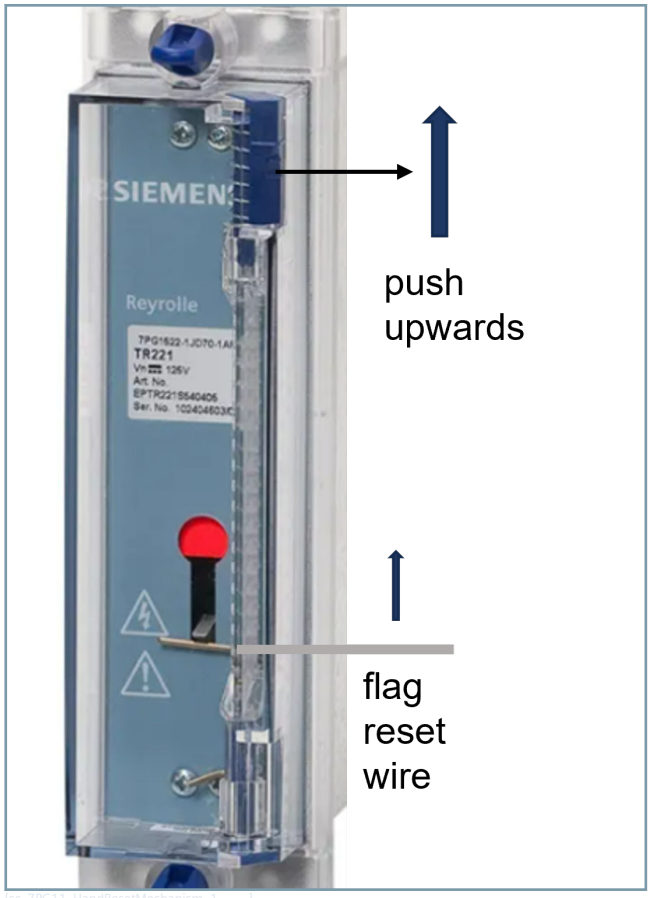


[sc_7PG11_EarthingTerminal, 1, –, –]

Figure 2.5/4 Case earth stud

Hand reset mechanism

Pull the blue handle upwards to slide the mechanism in an upwards direction with the flag reset wire at the bottom.



[sc_7PG11_HandResetMechanism, 1, --_--]

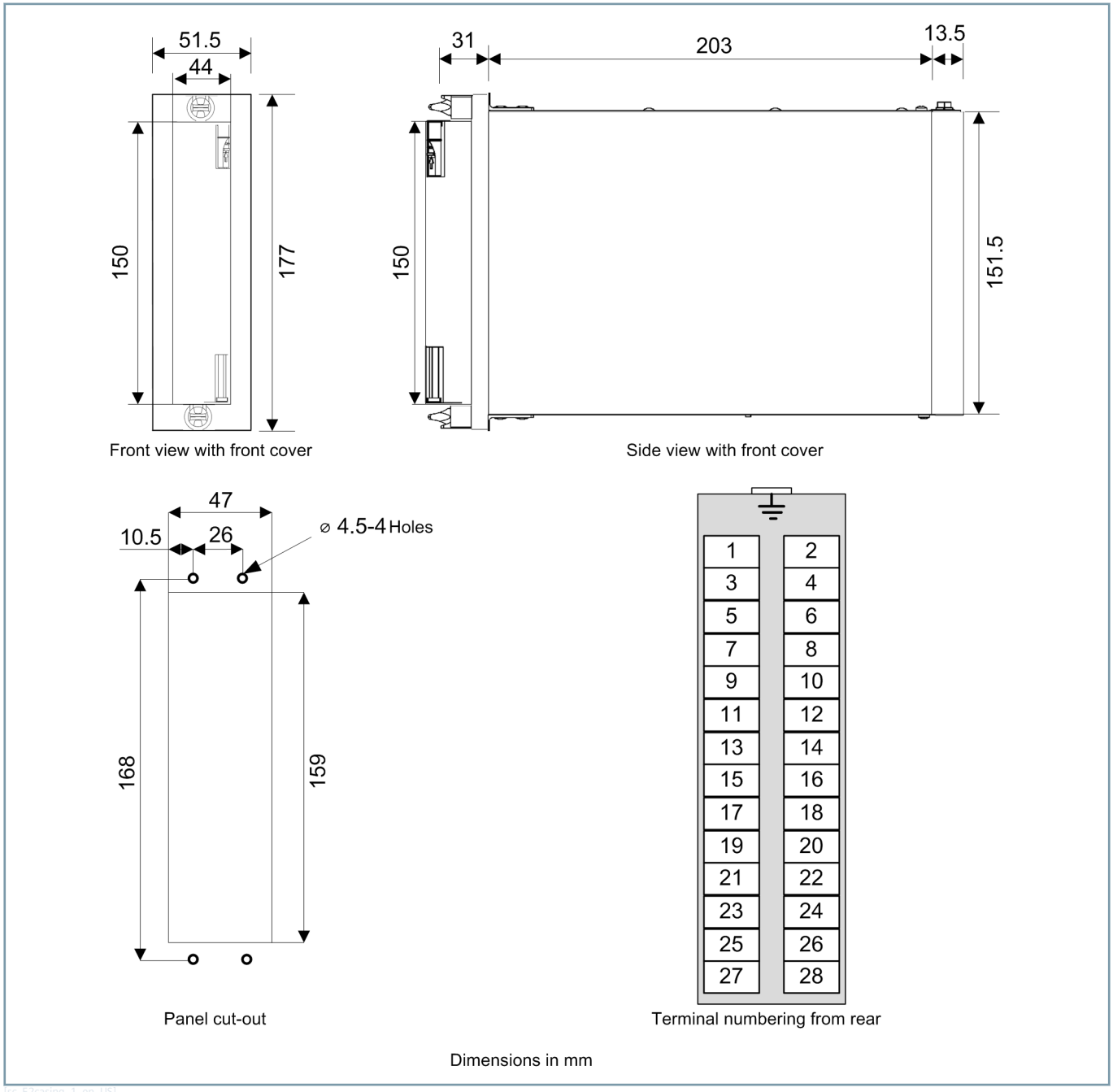
Figure 2.5/5 Hand reset mechanism

Relay information

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

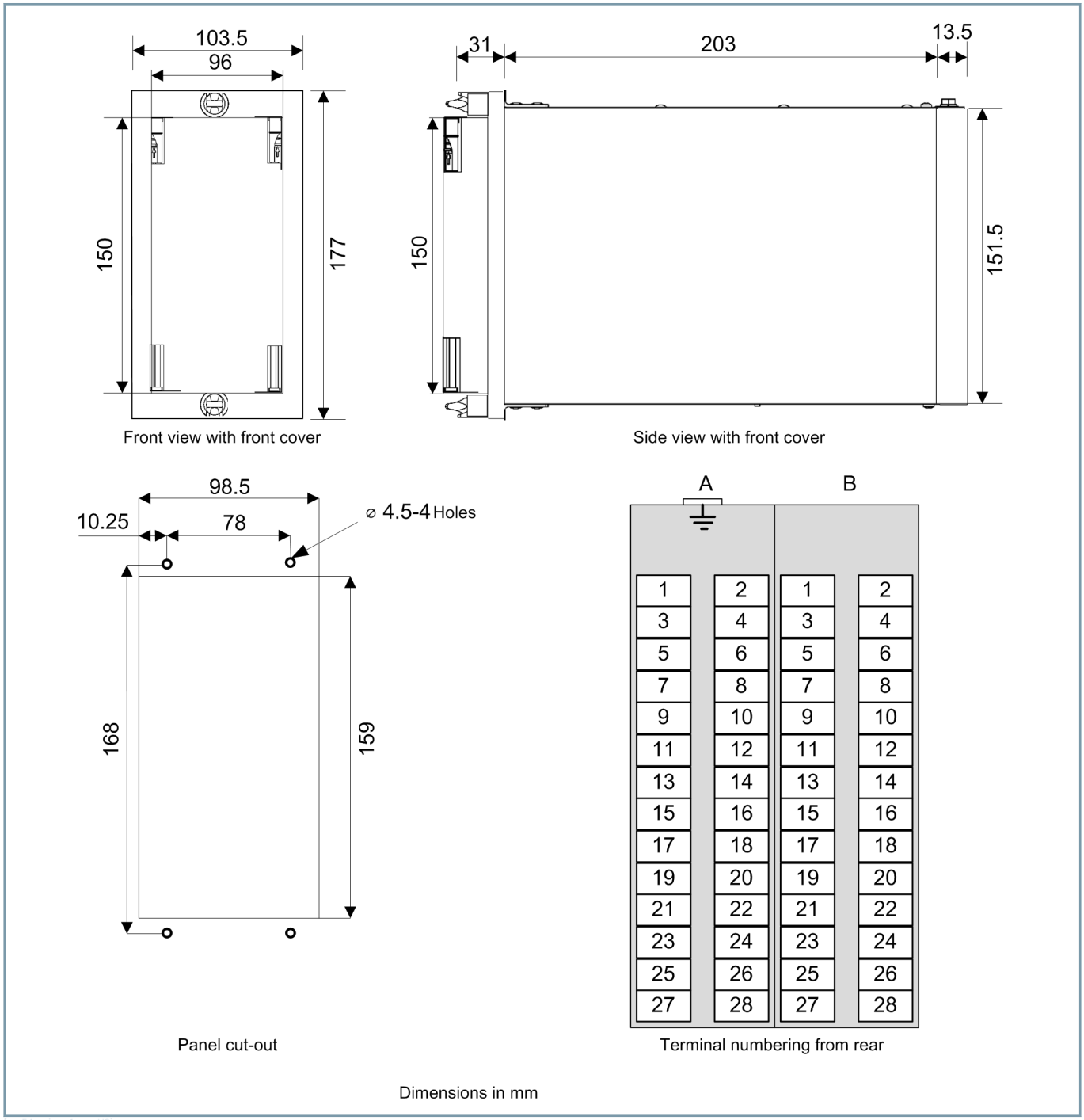
	Electrical Hazard
	Refer to device documentation
	Waste Electrical and Electronic Equipment Directive (WEEE)
CE	European CE marking
EAC	Guideline for the Eurasian Market
UK CA	United Kingdom (UK) conformity-assessed marking

Dimension drawings



[sc_E2casing, 1, en_US]

Figure 2.5/6 E2 case



[sc_E4casing, 1, en_US]

Figure 2.5/7 E4 case

Connection diagrams

Please refer to the Siemens website for the connection diagrams.

Technical data

Indication of conformity

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

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

RoHS directive 2011/65/EU is met using the standard EN 50581. The device has been designed and produced for industrial use.

General technical data

Parameter	Value
Operate time	10 ms at rated voltage
Rated voltage V_{rated}	DC 24 V, DC 30 V, DC 48 V, DC 125 V, DC 240 V [12]
Operating range	50 % to 120 % of rated voltage [13] [14]

Nominal burdens

	Burden (W)	
Rated voltage	TR1	TR2
DC 30 V	43	43
DC 48 V	46	52
DC 125 V	47	127
Reset coil	50	50

NOTE

Relays with economy circuits reduce to approximately 7 W after operation.

Contact ratings

Make and carry continuously	AC 1250 VA or DC 1250 W within limits of 660 V and 5 A
Make and carry for 3 s	AC 7500 VA or DC 7500 W within limits of 660 V and 30 A
Break	AC 1250 VA or DC 100 W (resistive) or DC 50 W (inductive) within limits of 250 V and 5 A
Indication	TR1 and TR2 relays have a hand reset mechanical flag indicator. TR4 and TR9 relays have a self reset flag indicator.

Mechanical tests

Test	Reference	Requirement
Vibration	IEC 60255-21-1	Class I
Shock and bump	IEC 60255-21-2 and BS142, 1.5.2 (1989)	Class I

Electrical tests

Test	Standard
Insulation resistance	IEC 60255-4, 5 kV 1.2/50 µs waveform 2 kV RMS 50 Hz for 1 min (2.5 kV for 1 s) between all terminals and earth. IEC 60255-5 and BS142, 1 kV RMS 50 Hz for 1 min across make contacts.

Climatic environmental tests

Temperature

IEC 60068-2-1/IEC 60068-2-2 and BS2011 (1977)

Ambient operating temperature	-10 °C to +55 °C
Storage temperature (non-operational)	-25 °C to +70 °C

Humidity

IEC 60068-2-30

Damp heat test, cyclic	56 days at 40 °C and 95 % relative humidity

Ip ratings

Type	Level
Installed with cover	IP 5X

12 DC 24 V and DC 240 V ratings are not part of ESI 48-4.

13 Operating coils of self-reset and economy cut-off relays are rated at 120 % of rated voltage. All other operate and reset coils are short time rated well in excess of the operating time of their cut-off contacts. Self-reset relays will reset at not less than 5 % rated voltage.

14 The operating range for the 20 contact TR212 device is 70 % to 110 % of rated voltage (Starting with product code 7PG1521-2XX80).

Ordering information – 7PG15

Product description	Order number																	
	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16
Trip relay (TR112)	7	P	G	1	5	1	1	–	2	□	□	□	0	–	1	C	□	0
										|	|	|					|	
Low burden, self reset contacts, economy cut-off, hand reset flag, size E4, tripping relay										|	|	|					|	
										|	|	|					|	
Contact arrangement – Make contact										|	|	|					|	
1 Make contact										B	G	|					|	
2 Make contact										C	|	|					|	
3 Make contact										D	|	|					|	
4 Make contact										E	|	|					|	
5 Make contact										F	|	|					|	
6 Make contact										G	|	|					|	
7 Make contact										H	|	|					|	
8 Make contact										J	D	|					|	
9 Make contact										K	C	|					|	
10 Make contact										L	B	|					|	
11 Make contact										M	A	|					|	
											|	|					|	
Contact arrangement – Break Ccntact											|	|					|	
0 Break contact											A	|					|	
1 Break contact											B	|					|	
2 Break contact											C	|					|	
3 Break contact											D	|					|	
4 Break contact											E	|					|	
5 Break contact											F	|					|	
6 Break contact											G	|					|	
7 Break contact											H	|					|	
8 Break contact											J	|					|	
9 Break contact											K	|					|	
												|					|	
Number of contacts [15]												|					|	
7												4					|	
11												7					|	
																	|	
Voltage rating																	|	
DC 24 V																	B	
DC 30 V																	C	
DC 50 V																	D	
DC 125 V																	F	
DC 240 V																	H	

15 The number of contacts must match the selected contact arrangement.

High Speed Trip Relay – 7PG15

Ordering information – 7PG15

Product description	Order number																	
	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16
Trip relay (TR121)	7	P	G	1	5	1	2	–	1	□	□	□	0	–	1	A	□	0
										|	|	|					|	
Low burden, hand reset contacts, instantaneous cut-off, hand reset flag, size E2, tripping relay										|	|	|					|	
										|	|	|					|	
Contact arrangement – Make contact										|	|	|					|	
2 Make contact										C	|	|					|	
3 Make contact										D	|	|					|	
4 Make contact										E	|	|					|	
5 Make contact										F	|	|					|	
6 Make contact										G	|	|					|	
7 Make contact										H	|	|					|	
8 Make contact										J	D	|					|	
9 Make contact										K	C	|					|	
10 Make contact										L	B	|					|	
11 Make contact										M	A	|					|	
											|	|					|	
Contact arrangement – Break contact											|	|					|	
0 Break contact											A	|					|	
1 Break contact											B	|					|	
2 Break contact											C	|					|	
3 Break contact											D	|					|	
4 Break contact											E	|					|	
5 Break contact											F	|					|	
6 Break contact											G	|					|	
7 Break contact											H	|					|	
8 Break contact											J	|					|	
9 Break contact											K	|					|	
												|					|	
Number of contacts [16]												|					|	
7												4					|	
11												7					|	
																	|	
Voltage rating																	|	
DC 24 V																	B	
DC 30 V																	C	
DC 50 V																	D	
DC 125 V																	F	
DC 240 V																	H	

16 The number of contacts must match the selected contact arrangement.

Ordering information – 7PG15

Product description	Order number																	
	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16
Trip relay (TR212, TR214 (6 and 10 contact))	7	P	G	1	5	2	1	–	□	□	□	□	0	–	1	□	□	0
									|	|	|	|				|	|	
High burden, self reset contacts, hand reset flag, tripping relay									|	|	|	|				|	|	
									|	|	|	|				|	|	
Operating coil cut-off									|	|	|	|				|	|	
Economy									2	|	|	|				|	|	
Economy and 2 s delay on reset									4	|	|	|				C	|	
										|	|	|				|	|	
Contact arrangement – Make contact										|	|	|				|	|	
1 Make contact										B	F	|				|	|	
2 Make contact										C	|	|				|	|	
3 Make contact										D	|	|				|	|	
4 Make contact										E	|	|				|	|	
5 Make contact										F	|	|				|	|	
6 Make contact										G	|	|				|	|	
7 Make contact										H	D	|				|	|	
8 Make contact										J	C	|				|	|	
9 Make contact										K	B	|				|	|	
10 Make contact										L	A	|				|	|	
											|	|				|	|	
Contact arrangement – Break contact											|	|				|	|	
0 Break contact											A	|				|	|	
1 Break contact											B	|				|	|	
2 Break contact											C	|				|	|	
3 Break contact											D	|				|	|	
4 Break contact											E	|				|	|	
5 Break contact											F	|				|	|	
6 Break contact											G	|				|	|	
7 Break contact											H	|				|	|	
8 Break contact											J	|				|	|	
												|				|	|	
Number of contacts [17]												|				|	|	
6												3				|	|	
10												6				|	|	
Housing size																|	|	
Case size E2 (4U high)																A	|	
Case size E4 (4U high)																C	|	
																	|	
Voltage rating																	|	
DC 24 V																	B	
DC 30 V																	C	
DC 50 V																	D	
DC 125 V																	F	
DC 240 V																	H	

2.5

17 The number of contacts must match the selected contact arrangement.

Ordering information – 7PG15

Product description	Order number																	
	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16
Trip relay (TR212 (20 contact))	7	P	G	1	5	2	1	–	2	□	□	8	0	–	1	C	F	0
										|	|							
High burden, self reset contacts, economy cut-off, 20 contact, hand reset flag, size E4, DC 125 V voltage rating, tripping relay										|	|							
										|	|							
Contact arrangement – Make contact										|	|							
10 Make contact										L	|							
11 Make contact										M	|							
12 Make contact										N	|							
13 Make contact										P	|							
14 Make contact										Q	|							
15 Make contact										R	|							
16 Make contact										S	|							
17 Make contact										T	|							
18 Make contact										U	|							
19 Make contact										V	|							
20 Make contact										W	|							
											|							
Contact arrangement – Break contact											|							
0 Break contact											A							
1 Break contact											B							
2 Break contact											C							
3 Break contact											D							
4 Break contact											E							
5 Break contact											F							
6 Break contact											G							
7 Break contact											H							
8 Break contact											J							
9 Break contact											K							
10 Break contact											L							

Ordering information – 7PG15

Product description	Order number																	
	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16
Trip relay (TR221)	7	P	G	1	5	2	2	–	1	□	□	□	0	–	1	A	□	0
										|	|	|					|	
High burden, hand reset contacts, instantaneous cut-off, hand reset flag, size E2, tripping relay										|	|	|					|	
										|	|	|					|	
Contact arrangement – Make contact										|	|	|					|	
3 Make contact										D	|	|					|	
4 Make contact										E	|	|					|	
5 Make contact										F	|	|					|	
6 Make contact										G	|	|					|	
7 Make contact										H	|	|					|	
8 Make contact										J	D	|					|	
9 Make contact										K	C	|					|	
10 Make contact										L	B	|					|	
11 Make contact										M	A	|					|	
											|	|					|	
Contact arrangement – Break contact											|	|					|	
0 Break contact											A	|					|	
1 Break contact											B	|					|	
2 Break contact											C	|					|	
3 Break contact											D	|					|	
4 Break contact											E	|					|	
5 Break contact											F	|					|	
6 Break contact											G	|					|	
7 Break contact											H	|					|	
8 Break contact											J	|					|	
												|					|	
Number of contacts [18]												|					|	
7												4					|	
11												7					|	
																	|	
Voltage rating																	|	
DC 24 V																	B	
DC 30 V																	C	
DC 50 V																	D	
DC 125 V																	F	
DC 240 V																	H	

18 The number of contacts must match the selected contact arrangement.

Ordering information – 7PG15

Product description	Order number																	
	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16
Trip relay (TR223)	7	P	G	1	5	2	2	–	3	□	□	□	0	–	1	C	□	0
										|	|	|					|	
High burden, hand reset contacts, 40 ms/60 ms delay before cut-off, hand reset flag, size E4, tripping relay										|	|	|					|	
										|	|	|					|	
Contact arrangement – Make contact										|	|	|					|	
3 Make contact										D	|	|					|	
4 Make contact										E	|	|					|	
5 Make contact										F	|	|					|	
6 Make contact										G	|	|					|	
7 Make contact										H	|	|					|	
8 Make contact										J	D	|					|	
9 Make contact										K	C	|					|	
10 Make contact										L	B	|					|	
11 Make contact										M	A	|					|	
											|	|					|	
Contact arrangement – Break contact											|	|					|	
0 Break contact											A	|					|	
1 Break contact											B	|					|	
2 Break contact											C	|					|	
3 Break contact											D	|					|	
4 Break contact											E	|					|	
5 Break contact											F	|					|	
6 Break contact											G	|					|	
7 Break contact											H	|					|	
8 Break contact											J	|					|	
												|					|	
Number of contacts [19]												|					|	
7												4					|	
11												7					|	
																	|	
Voltage rating																	|	
DC 24 V																	B	
DC 30 V																	C	
DC 50 V																	D	
DC 125 V																	F	
DC 240 V																	H	

2.5

19 The number of contacts must match the selected contact arrangement.

Ordering information – 7PG15

Product description	Order number																	
	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16
Trip relay (TR231)	7	P	G	1	5	2	3	–	1	□	□	□	0	–	1	A	□	0
										|	|	|					|	
High burden, electrical reset contacts, instantaneous cut-off, hand reset flag, size E2, tripping relay										|	|	|					|	
										|	|	|					|	
Contact arrangement – Make contact										|	|	|					|	
0 Make contact										A	|	|					|	
1 Make contact										B	|	|					|	
2 Make contact										C	|	|					|	
3 Make contact										D	|	|					|	
4 Make contact										E	|	|					|	
5 Make contact										F	|	|					|	
6 Make contact										G	|	|					|	
7 Make contact										H	D	|					|	
8 Make contact										J	C	|					|	
9 Make contact										K	B	|					|	
10 Make contact										L	A	|					|	
											|	|					|	
Contact arrangement – Break contact											|	|					|	
0 Break contact											A	|					|	
1 Break contact											B	|					|	
2 Break contact											C	|					|	
3 Break contact											D	|					|	
4 Break contact											E	|					|	
5 Break contact											F	|					|	
6 Break contact											G	|					|	
7 Break contact											H	|					|	
8 Break contact											J	|					|	
												|					|	
Number of contacts [20]												|					|	
6												3					|	
10												6					|	
																	|	
Voltage rating																	|	
DC 24 V																	B	
DC 30 V																	C	
DC 50 V																	D	
DC 125 V																	F	
DC 240 V																	H	

20 The number of contacts must match the selected contact arrangement.

Ordering information – 7PG15

Product description	Order number																	
	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16
Trip relay (TR241 (6 and 10 contact))	7	P	G	1	5	2	4	–	1	□	□	□	0	–	1	□	□	0
										|	|	|				|	|	
High burden, hand and electrical reset contacts, instantaneous cut-off, hand reset flag, tripping relay										|	|	|				|	|	
										|	|	|				|	|	
Contact arrangement – Make contact										|	|	|				|	|	
2 Make contact										C	|	|				|	|	
3 Make contact										D	|	|				|	|	
4 Make contact										E	|	|				|	|	
5 Make contact										F	|	|				|	|	
6 Make contact										G	|	|				|	|	
7 Make contact										H	D	|					|	|	
8 Make contact										J	C	|					|	|	
9 Make contact										K	B	|					|	|	
10 Make contact										L	A	|					|	|	
											|	|				|	|	
Contact arrangement – Break contact											|	|				|	|	
0 Break contact											A	|					|	|	
1 Break contact											B	|					|	|	
2 Break contact											C	|					|	|	
3 Break contact											D	|					|	|	
4 Break contact											E	|					|	|	
5 Break contact											F	|					|	|	
6 Break contact											G	|					|	|	
7 Break contact											H	|					|	|	
8 Break contact											J	|					|	|	
												|					|	|	
Number of contacts [21]												|					|	|	
6												3					|	|	
10												6					|	|	
																	|	|	
Housing size																	|	|	
Case size E2 (4U high)																	A	|	
Case size E4 (4U high)																	C	|	
																		|	
Voltage rating																		|	
DC 24 V																		B	
DC 30 V																		C	
DC 50 V																		D	
DC 125 V																		F	
DC 240 V																		H	

21 The number of contacts must match the selected contact arrangement.

Ordering information – 7PG15

Product description	Order number																	
	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16
Trip relay (TR241 (20 contact))	7	P	G	1	5	2	4	–	1	□	□	8	0	–	1	C	□	0
										|	|						|	
High burden, hand and electrical reset contacts, instantaneous cut-off, 20 contact, hand reset flag, size E4, tripping relay										|	|						|	
										|	|						|	
Contact arrangement – Make contact										|	|						|	
0 Make contact										A	|						|	
2 Make contact										C	|						|	
10 Make contact										L	|						|	
11 Make contact										M	|						|	
12 Make contact										N	|						|	
13 Make contact										P	|						|	
14 Make contact										Q	|						|	
15 Make contact										R	|						|	
16 Make contact										S	|						|	
17 Make contact										T	|						|	
18 Make contact										U	|						|	
19 Make contact										V	|						|	
20 Make contact										W	|						|	
											|						|	
Contact arrangement – Break contact											|						|	
0 Break contact											A						|	
1 Break contact											B						|	
2 Break contact											C						|	
3 Break contact											D						|	
4 Break contact											E						|	
5 Break contact											F						|	
6 Break contact											G						|	
7 Break contact											H						|	
8 Break contact											J						|	
9 Break contact											K						|	
10 Break contact											L						|	
18 Break contact											U						|	
20 Break contact											W						|	
																	|	
Voltage rating																	|	
DC 50 V																	D	
DC 125 V																	F	

2.5

Ordering information – 7PG15

Product description	Order number																	
	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16
Trip relay (TR243)	7	P	G	1	5	2	4	–	3	□	□	□	0	–	1	C	F	0
										|	|	|						
High burden, hand and electrical reset contacts, 40 ms/60 ms delay before cut-off, hand reset flag, size E4, DC 125 V voltage rating, tripping relay										|	|	|						
										|	|	|						
Contact arrangement – Make contact										|	|	|						
2 Make contact										C	|	|						
3 Make contact										D	|	|						
4 Make contact										E	|	|						
5 Make contact										F	|	|						
6 Make contact										G	|	|						
7 Make contact										H	D	|						
8 Make contact										J	C	|						
9 Make contact										K	B	|						
10 Make contact										L	A	|						
											|	|						
Contact arrangement – Break contact											|	|						
0 Break contact											A	|						
1 Break contact											B	|						
2 Break contact											C	|						
3 Break contact											D	|						
4 Break contact											E	|						
5 Break contact											F	|						
6 Break contact											G	|						
7 Break contact											H	|						
8 Break contact											J	|						
												|						
Number of contacts [22]												|						
6												3						
10												6						

22 The number of contacts must match the selected contact arrangement.

Ordering information – 7PG15

Product description	Order number																	
	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16
Trip relay (TR901)	7	P	G	1	5	6	3	–	1	□	□	6	0	–	3	A	□	0
										|	|						|	
High burden, electrical reset contacts, instantaneous cut-off, 10 contact, self reset flag (OPEN/ CLOSED), size E2, repeat relay										|	|						|	
										|	|						|	
Contact arrangement – Make contact										|	|						|	
2 Make contact										C	J						|	
3 Make contact										D	H						|	
4 Make contact										E	G						|	
5 Make contact										F	F						|	
6 Make contact										G	E						|	
7 Make contact										H	D						|	
8 Make contact										J	C						|	
9 Make contact										K	B						|	
10 Make contact										L	A						|	
											|						|	
Contact arrangement – Break contact											|						|	
0 Break contact											A						|	
1 Break contact											B						|	
2 Break contact											C						|	
3 Break contact											D						|	
4 Break contact											E						|	
5 Break contact											F						|	
6 Break contact											G						|	
7 Break contact											H						|	
8 Break contact											J						|	
																	|	
Voltage rating																	|	
DC 50 V																	D	
DC 125 V																	F	

Auxiliary Relays

High Speed Trip Relay – 7PJ15

Description

The 7PJ1521 and 7PJ1524 high speed trip relay is a multi-contact attracted armature relay designed to IEC 60255.

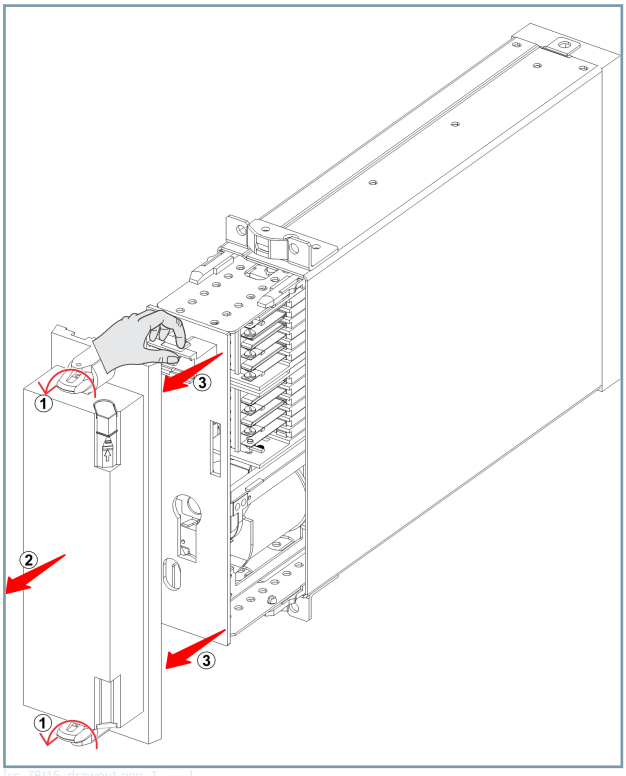
High burden relays with immunity to capacitance discharge currents. They are also suitable for certain applications where they are remote from the initiation signal.

A high burden also permits reliable operation of current operated series repeat relays. TR relays can be provided with an instantaneous or time-delayed cut-off.

Benefits

The features of the high speed trip relay are:

- High speed, high burden, positive action, and instantaneous cutoff
- The 7PJ15 series high burden trip relay can be used with trip circuit supervision relay (Siemens Reyrolle 7PJ13) having a supervision current of ≤ 3 mA to monitor and supervise the integrity of the trip circuit with coil supervision terminal
- It is supplied in a draw-out type case



[sc_7PJ15_drawout-gen, 1, –_–]

- The relay has a robust design for a long, reliable service life

Dimension drawings

This section displays the different dimensional views of a high speed trip relay.



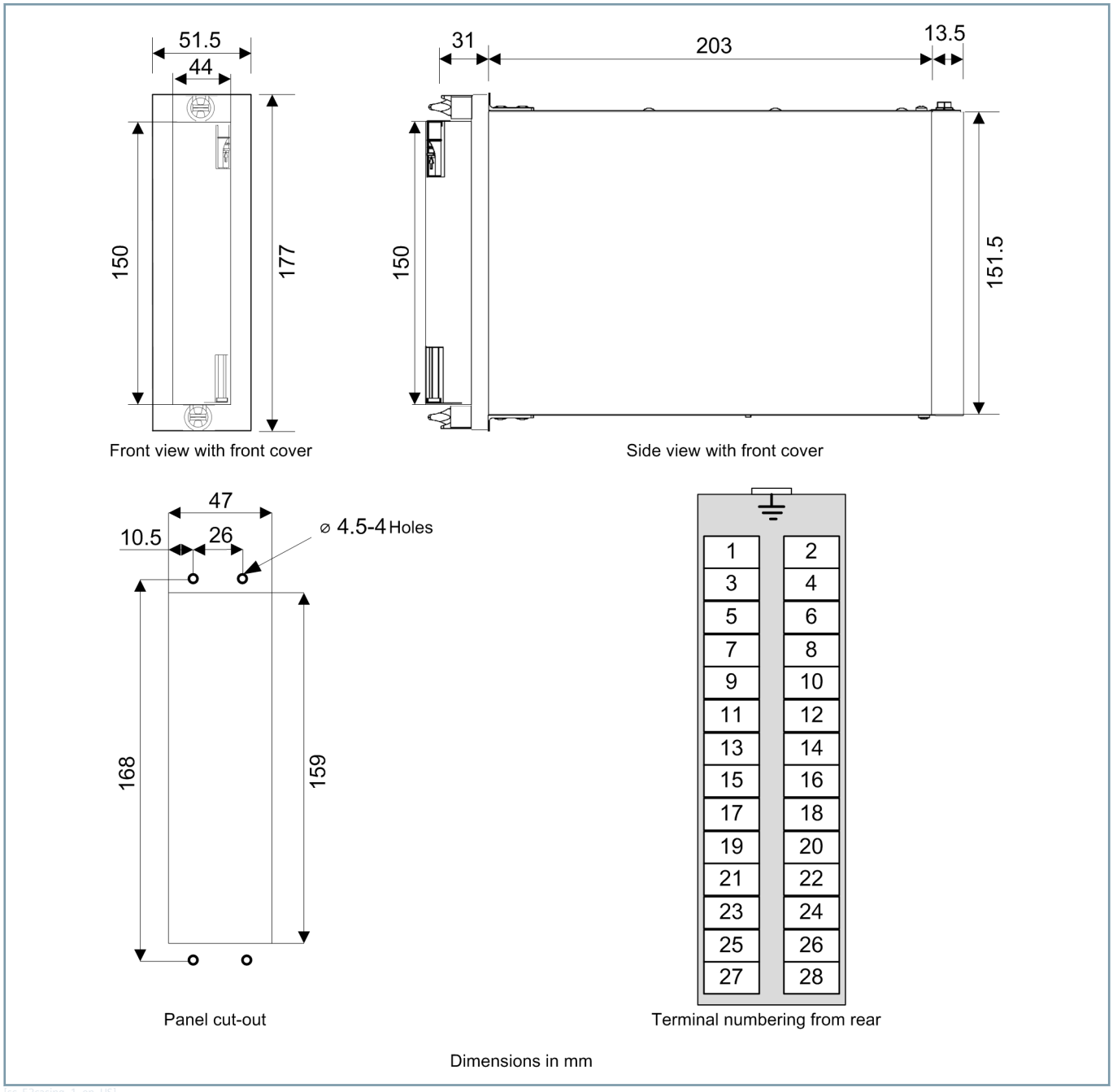
[7PJ15_FrontView, 1, –_–]

Applications

The high speed trip relay type 7PJ15 is mainly used for all types of control and protection circuits in power stations and industrial applications, where a higher grade of reliability and high contact rating is stipulated. The 7PJ15 relay acts as a high speed element and contact multiplication in tripping and signaling circuits of protective relays.

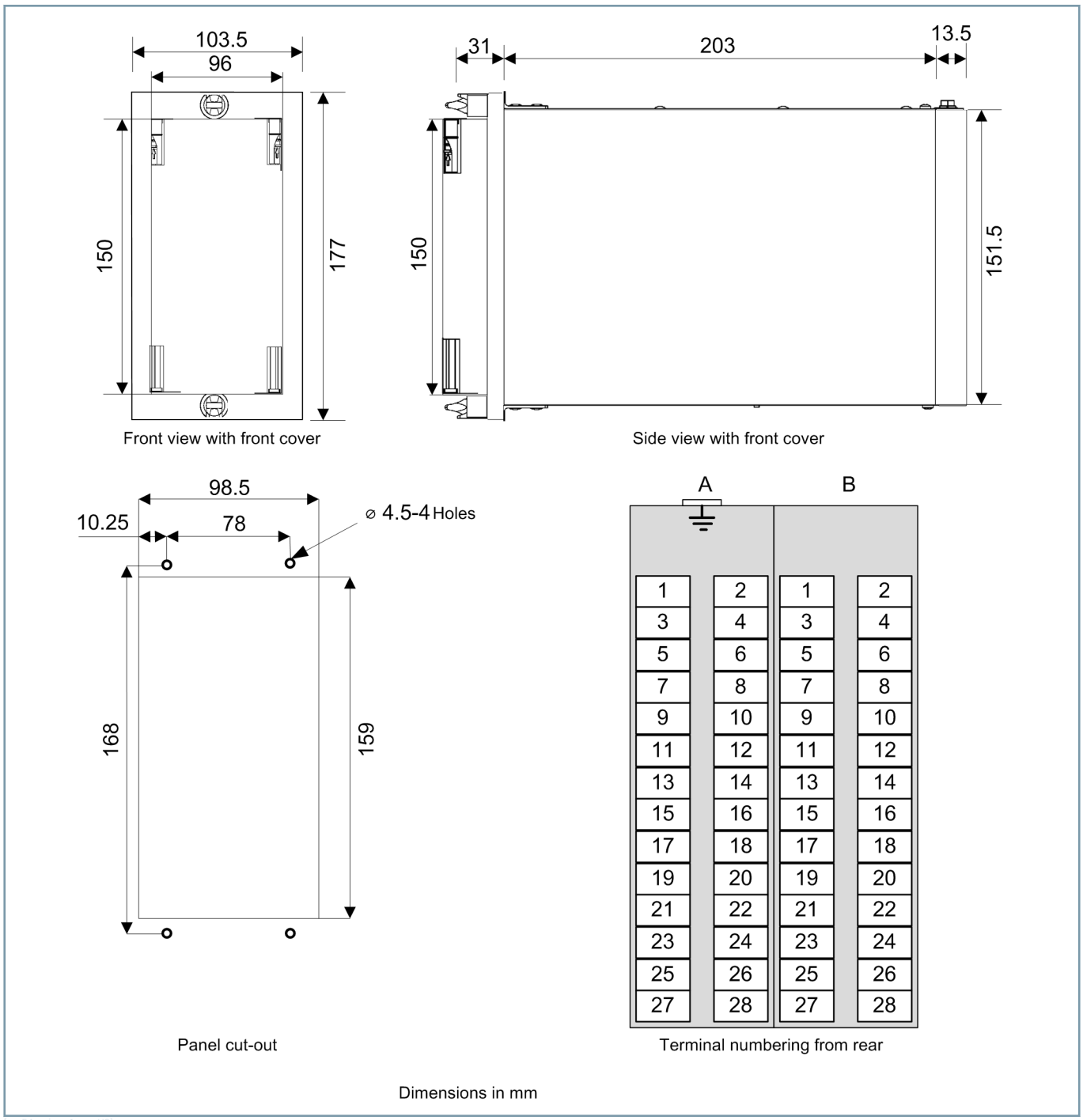
The high speed trip relay is used in the following applications:

- Tripping of multiple circuit-breakers
- Tripping and lock out application of feeder and transformer circuit-breakers
- Control signaling and interlocking
- Inter tripping and remote tripping interface for SCADA



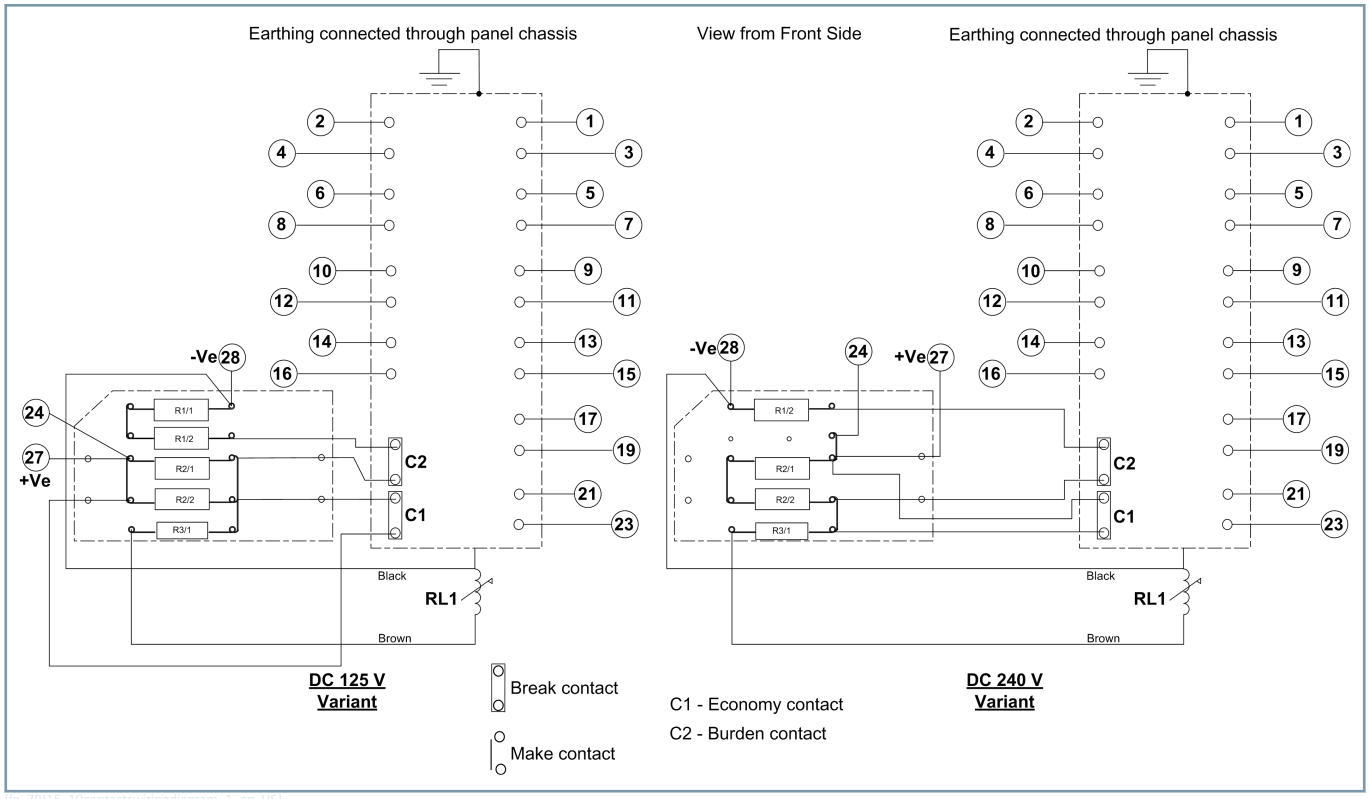
[sc_E2casing, 1, en_US]

Figure 2.5/8 E2 case



[sc_E4casing, 1, en_US]

Figure 2.5/9 E4 case



[lo_7PJ15_10contactswiringdiagram, 1, en_US]

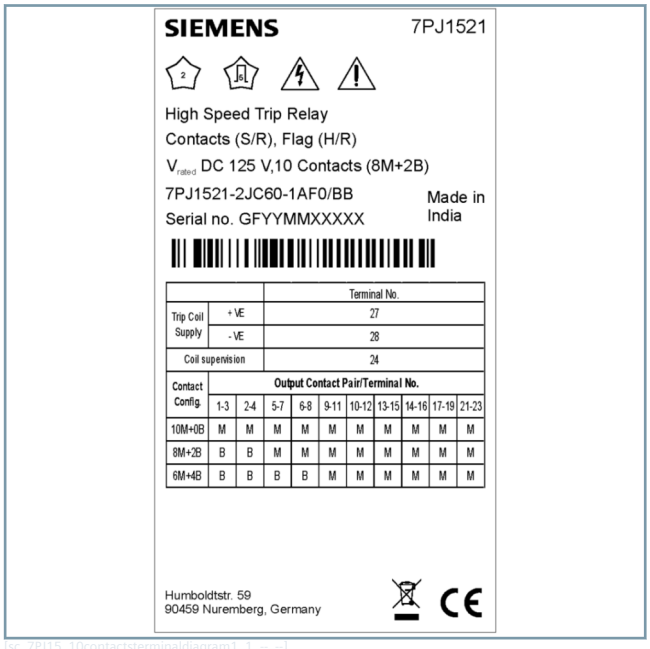
Figure 2.5/10 7PJ1521 (10 contacts self reset trip relay) wiring diagram

Trip coil supply	+ ve	27								
	- ve	28								
Coil supervision		24								
Contact configuration		Output contact pair/terminal number								
		1–3	2–4	5–7	6–8	9–11	10–12	13–15	14–16	17–19	21–23
10M + 0B		M	M	M	M	M	M	M	M	M	M
8M + 2B		B	B	M	M	M	M	M	M	M	M
6M + 4B		B	B	B	B	M	M	M	M	M	M

Table 2.5/1 7PJ1521 (10 contacts self reset trip relay) terminal details

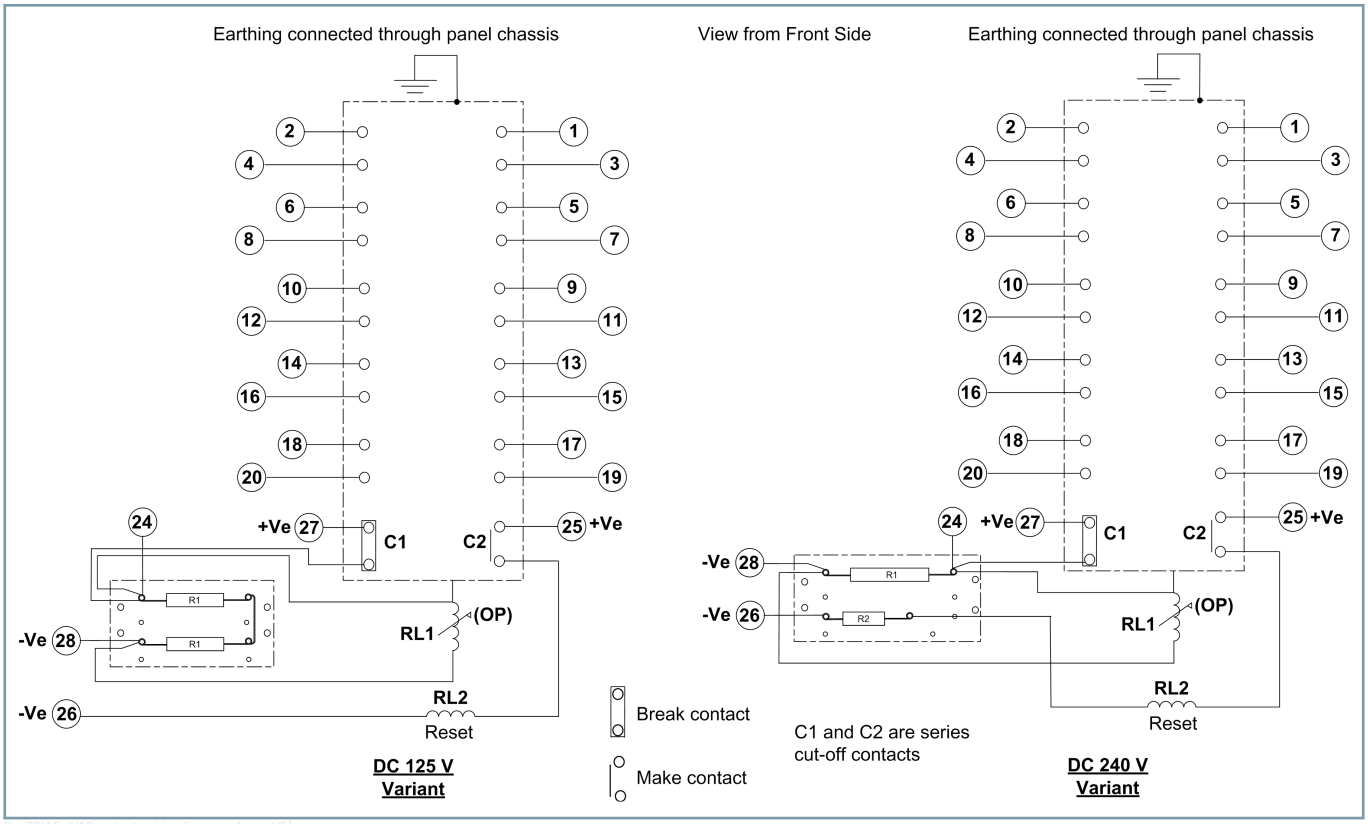
DC 125 V relay	R1-2X 100R, 12 W R2-2X 3.9K, 12 W R3-1X 270R, 6 W
DC 240 V relay	R1-1X 470R, 12 W R2-1X 2.2K, 12 W R2-1X 4.7K, 12 W R3-1X 270R, 6 W

Table 2.5/2 7PJ1521 (10 contacts self reset trip relay) resistor details



[sc_7PJ15_10contactsterminaldiagram1, 1, "_"]

Figure 2.5/11 7PJ1521 (10 contacts self reset trip relay) terminal diagram



[io_7PJ15_6/10contactswiringdiagram, 1, en_US]

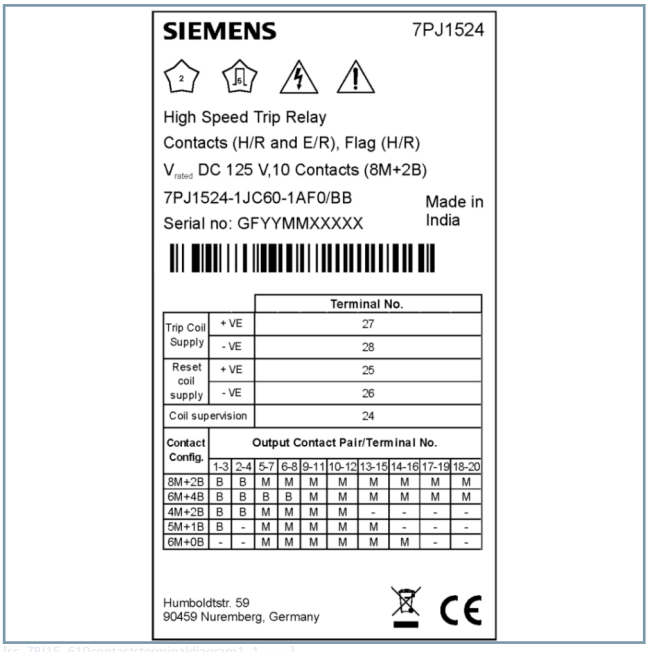
Figure 2.5/12 7PJ1524 (6/10 contacts hand reset and electrical reset trip relay) wiring diagram

Trip coil supply	+ ve	27									
	- ve	28									
Reset coil supply	+ ve	25									
	- ve	26									
Coil supervision		24									
Contact configuration		Output contact pair/terminal number									
		1–3	2–4	5–7	6–8	9–11	10–12	13–15	14–16	17–19	18–20
8M + 2B		B	B	M	M	M	M	M	M	M	M
6M + 4B		B	B	B	B	M	M	M	M	M	M
4M + 2B		B	B	M	M	M	M	–	–	–	–
5M + 1B		B	–	M	M	M	M	M	–	–	–
6M + 0B		–	–	M	M	M	M	M	M	–	–

Table 2.5/3 7PJ1524 (6/10 contacts hand reset and electrical reset trip relay) terminal details

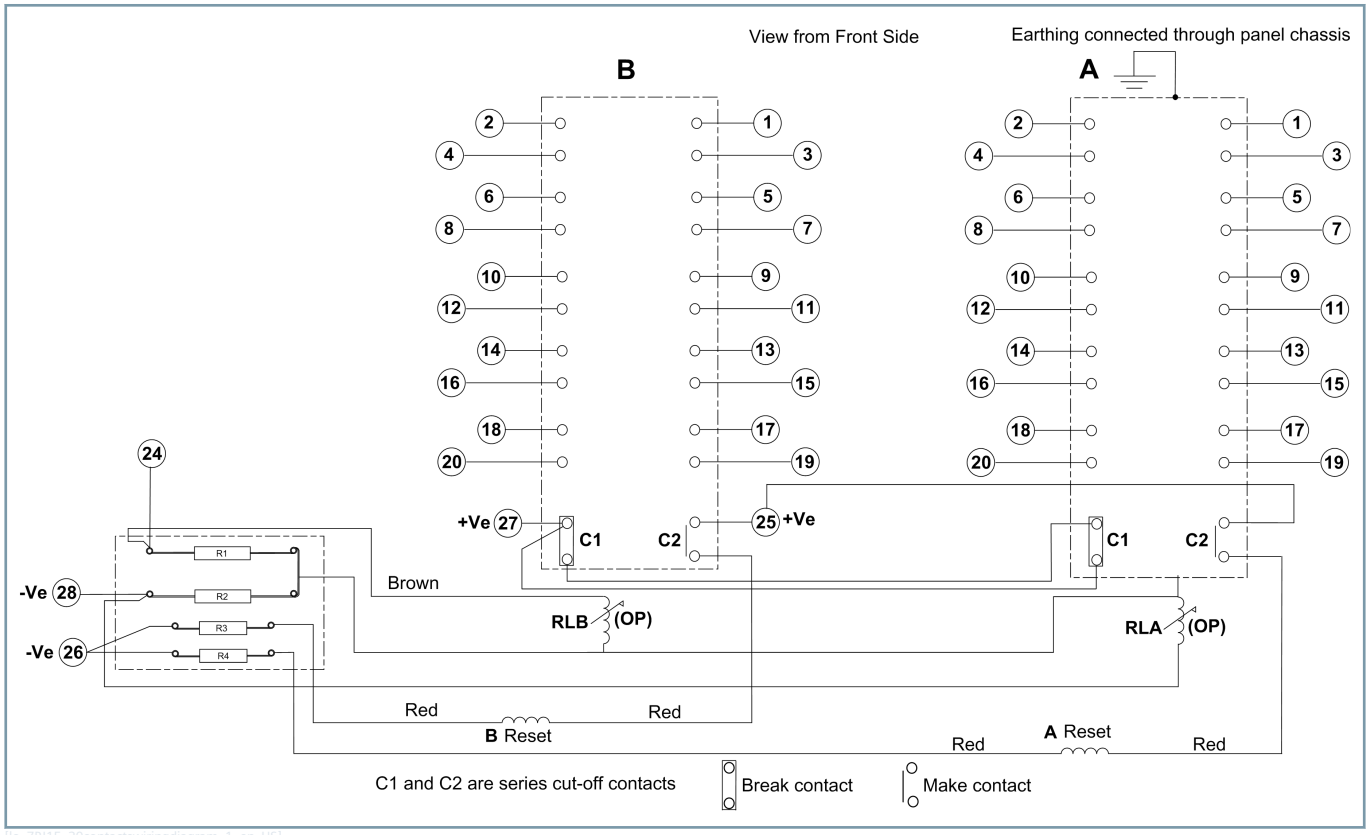
DC 125 V relay	R1-2X 100R
DC 240 V relay	R1-1X 470R, 14 W R2-1X 470R, 3 W

Table 2.5/4 7PJ1524 (6/10 contacts hand reset and electrical reset trip relay) resistor details



[sc_7PJ15_610contactsterminaldiagram1, 1, –_–]

Figure 2.5/13 7PJ1524 (6/10 contacts hand reset and electrical reset trip relay) terminal diagram



[io_7PJ15_20contactswiringdiagram, 1, en_US]

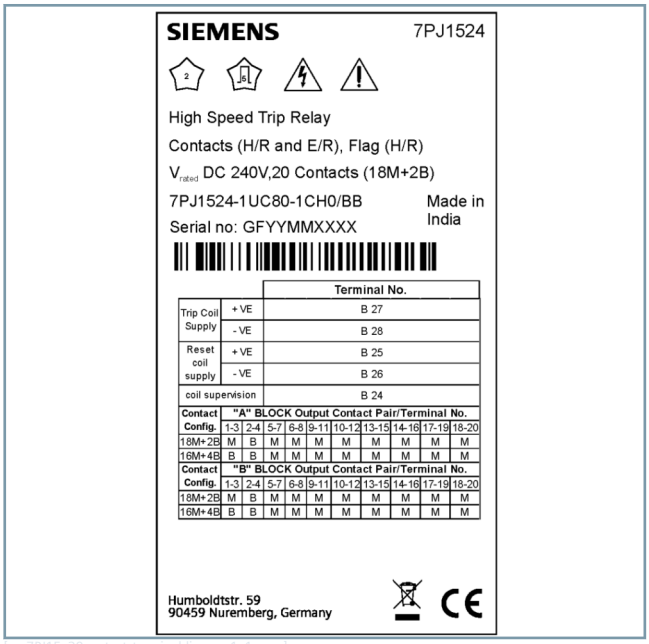
Figure 2.5/14 7PJ1524 (20 contacts hand reset and electrical reset trip relay) terminal diagram

Trip coil supply	+ ve	B 27									
	- ve	B 28									
Reset coil supply	+ ve	B 25									
	- ve	B 26									
Coil supervision		B 24									
Contact configuration		"A" block output contact pair/terminal number									
		1–3	2–4	5–7	6–8	9–11	10–12	13–15	14–16	17–19	18–20
18M + 2B		M	B	M	M	M	M	M	M	M	M
16M + 4B		B	B	M	M	M	M	M	M	M	M
Contact configuration		"B" block output contact pair/terminal number									
		1–3	2–4	5–7	6–8	9–11	10–12	13–15	14–16	17–19	18–20
18M + 2B		M	B	M	M	M	M	M	M	M	M
16M + 4B		B	B	M	M	M	M	M	M	M	M

Table 2.5/5 7PJ1524 (20 contacts hand reset and electrical reset trip relay) terminal details

DC 125 V relay	No resistor
DC 240 V relay	R1&R2 – 470R, 14 W R3&R4 – 470R, 3 W

Table 2.5/6 7PJ1524 (20 contacts hand reset and electrical reset trip relay) resistor details



[sc_7PJ15_20contactsterminaldiagram1, 1, --_--]

Figure 2.5/15 7PJ1524 (20 contacts hand reset and electrical reset trip relay) terminal diagram

2.5

Technical data

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

Indication of conformity

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

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

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

General technical data

Parameter	Value
Operating time	10 ms at rated voltage V_{rated}
Reset time	< 20 ms at rated voltage V_{rated} (electrical reset)
Drop-off time	< 20 ms (self reset)

Parameter	Value
Rated voltage V_{rated}	DC 125 V, DC 240 V [23]
Operating range	50 % to 120 % of rated voltage V_{rated} [24]
Permissible current for coil supervision	3 mA maximum
Contact reset arrangement (7PJ1521)	Self
Contact reset arrangement (7PJ1524)	Hand and Electrical
Flag reset arrangement	Hand

7PJ1521 nominal burden (Self reset)

	Operate coil burden (W)	
Rated voltage	Nominal burden (W) to operate	Burden (W) after operation of economy circuit
DC 125 V	≤ 150	≤ 10
DC 240 V	≤ 180	≤ 10

7PJ1524 nominal burden (Hand and electrical reset)

	Operate coil burden (W)	
Rated voltage	10 Contacts	20 Contacts
DC 125 V	≤ 150	≤ 180
DC 240 V	≤ 180	≤ 180
	Reset coil burden (W)	
Rated voltage	10 Contacts	20 Contacts
DC 125 V	≤ 50	≤ 70
DC 240 V	≤ 70	≤ 150

Contact ratings

Make and carry continuously	AC 1250 VA or DC 1250 W within limits of 660 V and 5 A	
Short time	AC 30 A or DC 30 A for 0.5 s	
Make and carry for 3 s	AC 7500 VA or DC 7500 W within limits of 660 V and 30 A	
Limiting making capacity (L/R ≤ 40 ms)	1000 W within limits of 250 V	
Limiting breaking capacity		
AC resistive	1250 VA	V/I = 250/5
DC resistive	100 W	V/I = 48/2.09; 110/0.91; 250/0.4
DC inductive (L/R ≤ 40 ms)	50 W	V/I = 48/1.042; 110/0.454; 250/0.2

23 10 contacts - DC 240 V, 20 contacts - DC 125 V and DC 240 V, product variants are not part of the ENA TS 48-4.

24 Operating coils of self-reset and economy cut-off relays are rated at 120 % of rated voltage. All other operate and rest coils are short time rated well in excess of the operating time of their cut-off contacts. Self-reset relays will reset at not less than 5 % rated voltage.

Electrical endurance	10,000 operations
Switching rate	600 operations per hour

Mechanical tests

Test	Reference	Requirement
Vibration	IEC 60255-21-1	Response and endurance Class I
Shock and bump	IEC 60255-21-2	Shock response and withstand Class I Bump Class I
Seismic	IEC 60255-21-3	Class I
Degree of protection	IEC 60529	IP50 – Front IP10 – Rear

Electrical tests

Test	Standard
Insulation resistance	IEC 60255-27 [25] Insulation resistance > 100 MΩ at DC 500 V Between all terminals and earth Between coil terminals and contacts
Impulse voltage withstand	IEC 60255-27 [25] 5 kV, 1.2/50 µs, 0.5 J 5 +ve, -ve pulses Between all terminals and earth Between coil terminals and contacts
High voltage (Dielectric)	IEC 60255-27 [25] 2 kV, 50 Hz@1 min Between all terminals and earth Between coil terminals and contacts AC 1 kV, 50 Hz @ 1 min across make contacts
Thermal withstand continuous [26]	IEC 60255-6 1.2 V_{rated}
Functional performance	IEC 60255-1
Maximum allowable temperature	IEC 60255-6 Maximum temperature limit + 100 °C
AC ripple on DC supply	IEC 61000-4-17 Withstand 15 % AC ripple on DC
Power frequency magnetic field	IEC 61000-4-8 Level 4, 30 A/m applied continuously 300 A/m applied for 3 s
Damped oscillatory magnetic field value	IEC 61000-4-10, Level 5 0.1 and 1.0 MHz,100 A/m
Impulse magnetic field immunity test	IEC 61000-4-9, Level 5 1000 A/m, +/- 5 pulses
Immunity to capacitance discharge	ENA TS 48-4 Issue 4 2010 Refer to general technical data[23].

Product safety test

Test	Standard
Clearances and creepage distances	IEC 60255-27
IP rating	
Impulse voltage	
AC or DC dielectric voltage	
Insulation resistance	
Protective bonding continuity	
Protective bonding resistance	
Flammability of insulating materials, components and fire enclosures	
Single fault condition	
Mechanical resistance to shock and impact	IEC 61010-1
Protection against electric shock	
Protection against the spread of fire	
Equipment temperature limits and resistance to heat	

Climatic environmental tests

Temperature

IEC 60068-2-1/IEC 60068-2-2/IEC 60068-2-14/IEC 60255-1

Ambient operating temperature	-10 °C to +55 °C
Storage temperature (non-operational)	-25 °C to +70 °C
Change of temperature	Cyclic: 3 h at -10 °C to 3 h at +55°C Number of cycles: 5

Humidity

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

Damp heat test, cyclic	6 days at +25 °C to +55 °C (12 h + 12 h cycle) and 93 % relative humidity
Damp heat steady state test	10 days at +40 °C and 95 % humidity
Maximum altitude of operation	Up to 2000 m

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

26 Applicable for self reset type trip relays

Installation category

Installation category (overvoltage category)	Class III

Pollution

Pollution degree	2

Ordering information – 7PJ1524

Product description	Order number																
	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16
High speed trip relay	7	P	J	1	5	2	4	–	1	□	□	□	0	–	1	□	□	0
High speed trip, high burden with contact type (hand reset and electrical reset) and hand reset flag						|	|		|	|	|	|	|		|	|	|	
						|	|		|	|	|	|	|		|	|	|	
TR – tripping						|	|		|	|	|	|	|		|	|	|	
TR2: High burden						2	|		|	|	|	|	|		|	|	|	
							|		|	|	|	|	|		|	|	|	
Contact operation							|		|	|	|	|	|		|	|	|	
Hand and electrical reset contacts							4		|	|	|	|	|		|	|	|	
									|	|	|	|	|		|	|	|	
Operating coil cut-off									|	|	|	|	|		|	|	|	
Instantaneous									1	|	|	|	|		|	|	|	
										|	|	|	|		|	|	|	
Contact arrangement – Make contact										|	|	|	|		|	|	|	
4 Make contact										E	C	6	|		|	|	|	
5 Make contact										F	B	6	|		|	|	|	
6 Make contact										G	A	6	|		|	|	|	
6 Make contact										G	E	6	|		|	|	|	
8 Make contact										J	C	6	|		|	|	|	
16 Make contact										S	E	8	|		|	|	|	
18 Make contact										U	C	8	|		|	|	|	
											|	|	|		|	|	|	
Contact arrangement – Break contact											|	|	|		|	|	|	
0 Break contact											A	|	|		|	|	|	
1 Break contact											B	|	|		|	|	|	
2 Break contact											C	|	|		|	|	|	
4 Break contact											E	|	|		|	|	|	
												|	|		|	|	|	
Number of contacts [27]												|	|		|	|	|	
6/10												6	|		|	A	|	
20												8	|		|	C	|	
													|		|	|	|	
Contact type													|		|	|	|	
Make contact (standard)/Break contact (standard)													0		|	|	|	
															|	|	|	
Type of flag															|	|	|	
Hand reset flag															1	|	|	
																|	|	
Housing size																|	|	
Case size E2 (4U high)																A	|	
Case size E4 (4U high)																C	|	
																	|	
Voltage rating																	|	

27 The number of contacts must match the selected contact arrangement.

Product description	Order number		
DC 125 V		F	
DC 240 V		H	

Ordering information – 7PJ1521

Product description	Order number																
	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16
High speed trip relay	7	P	J	1	5	2	1	–	2	□	□	6	0	–	1	A	□	0
High speed trip, high burden with contact type (self reset) and hand reset flag						|	|		|	|	|	|	|		|	|	|	
						|	|		|	|	|	|	|		|	|	|	
TR – tripping						|	|		|	|	|	|	|		|	|	|	
TR2: High burden, EB2						2	|		|	|	|	|	|	|		|	|	|	
							|		|	|	|	|	|	|		|	|	|	
Contact operation							|		|	|	|	|	|	|		|	|	|	
Self reset contacts							1		|	|	|	|	|	|		|	|	|	
									|	|	|	|	|	|		|	|	|	
Operating coil cut-off									|	|	|	|	|	|		|	|	|	
Economy									2	|	|	|	|	|		|	|	|	
										|	|	|	|	|		|	|	|	
Contact arrangement – Make contact										|	|	|	|	|		|	|	|	
6 Make contact										G	E	|	|	|		|	|	|	
8 Make contact										J	C	|	|	|		|	|	|	
10 Make contact										L	A	|	|	|		|	|	|	
											|	|	|	|		|	|	|	
Contact arrangement – Break contact											|	|	|	|		|	|	|	
0 Break contact											A	|	|	|		|	|	|	
1 Break contact											B	|	|	|		|	|	|	
2 Break contact											C	|	|	|		|	|	|	
4 Break contact											E	|	|	|		|	|	|	
												|	|	|		|	|	|	
Number of contacts [28]												|	|	|		|	|	|	
6/10												6	|	|		|	|	|	
													|	|		|	|	|	
Contact type													|	|		|	|	|	
Make contact (standard)/Break contact (standard)													0	|		|	|	|	
															|	|	|	
Type of flag															|	|	|	
Hand reset flag															1	|	|	
																|	|	
Housing size																|	|	
Case size E2 (4U high)																A	|	
																	|	
Voltage rating																	|	
DC 125 V																	F	
DC 240 V																	H	

2.5

28 The number of contacts must match the selected contact arrangement.

Description

The 7PA30 1-phase relay is used to monitor the trip circuit of circuit breakers with 1 trip coil.

The trip circuit wiring is supervised from the positive supply to the negative supply whilst the circuit breaker is open or closed.

Applications

Due to the design and quality of the relays, their high durability and functional reliability, the relays are ideally suited for application in critical control systems and ensure proper monitoring of the entire trip circuit.

The high degree of protection ensures absolute reliability during operation within a wide temperature range, even in harsh environmental conditions.

The relay has been tested according to IEC, EN and IEEE standards. It bears the CE marking.

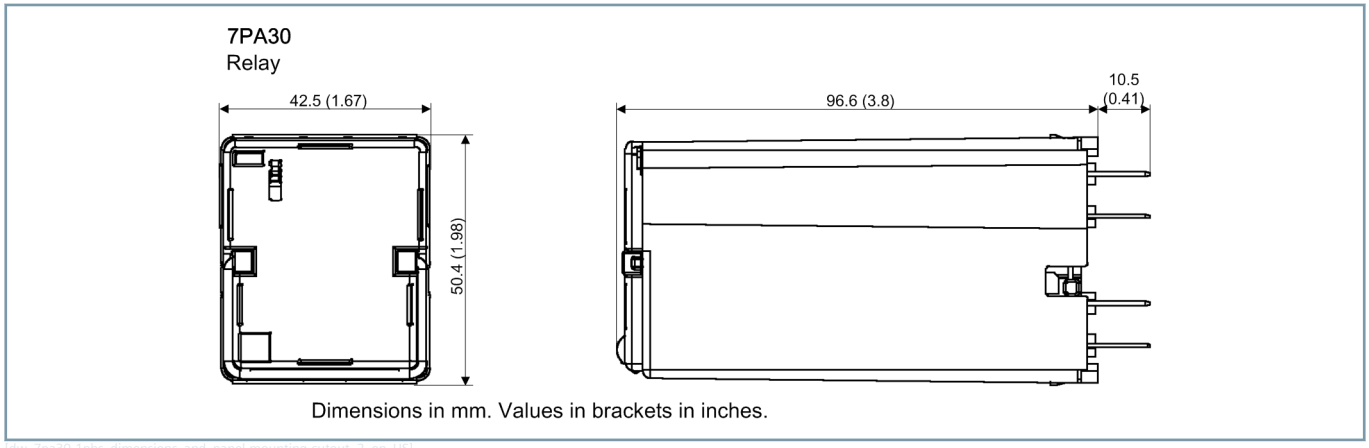
The monitoring current is always less than 1.4 mA and ensures that there can be no failure of the trip coil. Proper operation is signaled via a green LED.



[pti_7PA30-1, 1, --_--]

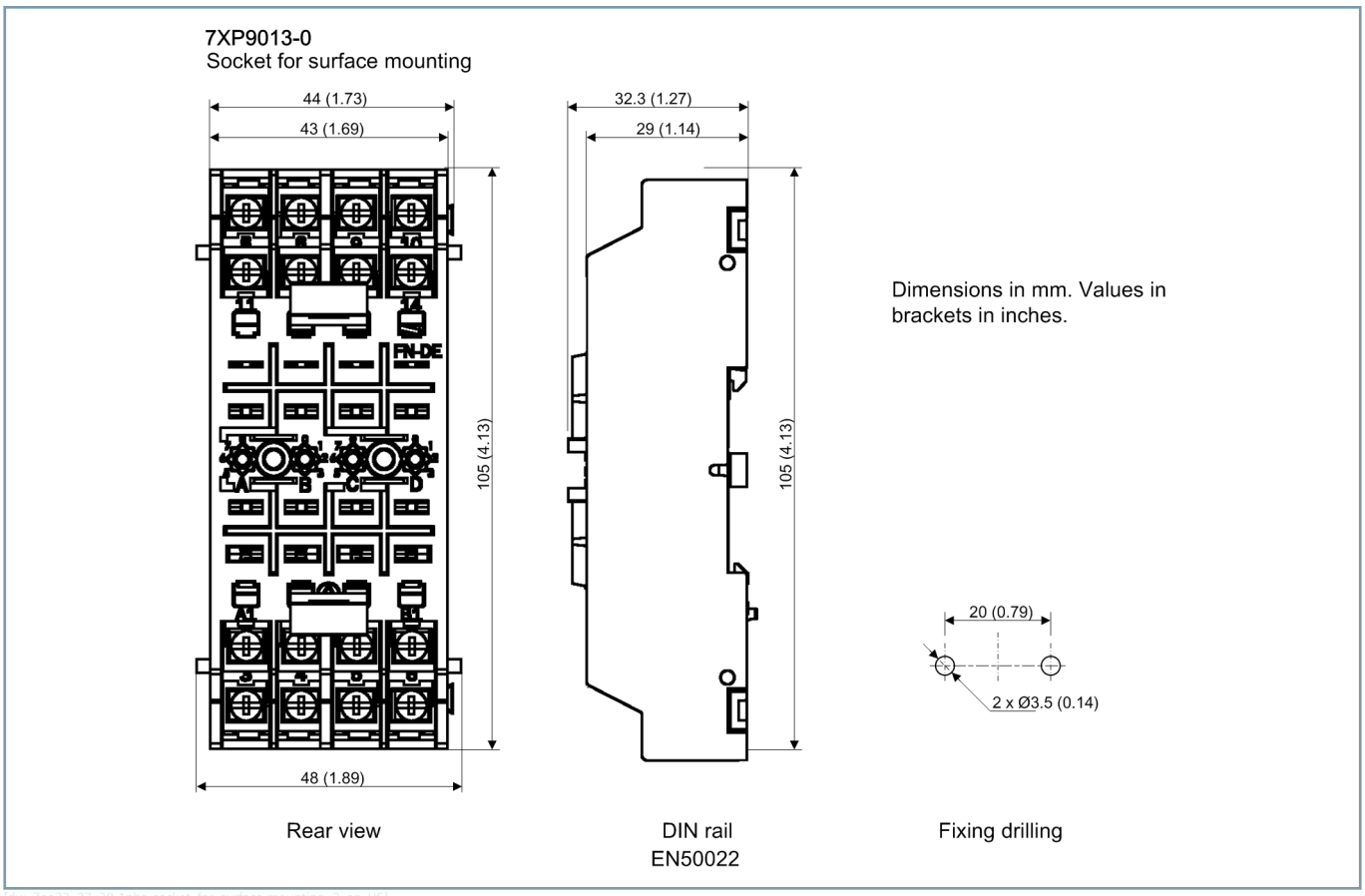
Figure 2.6/1 1-Phase Trip-Circuit Supervision Relay 7PA3032

Dimensions and Connections



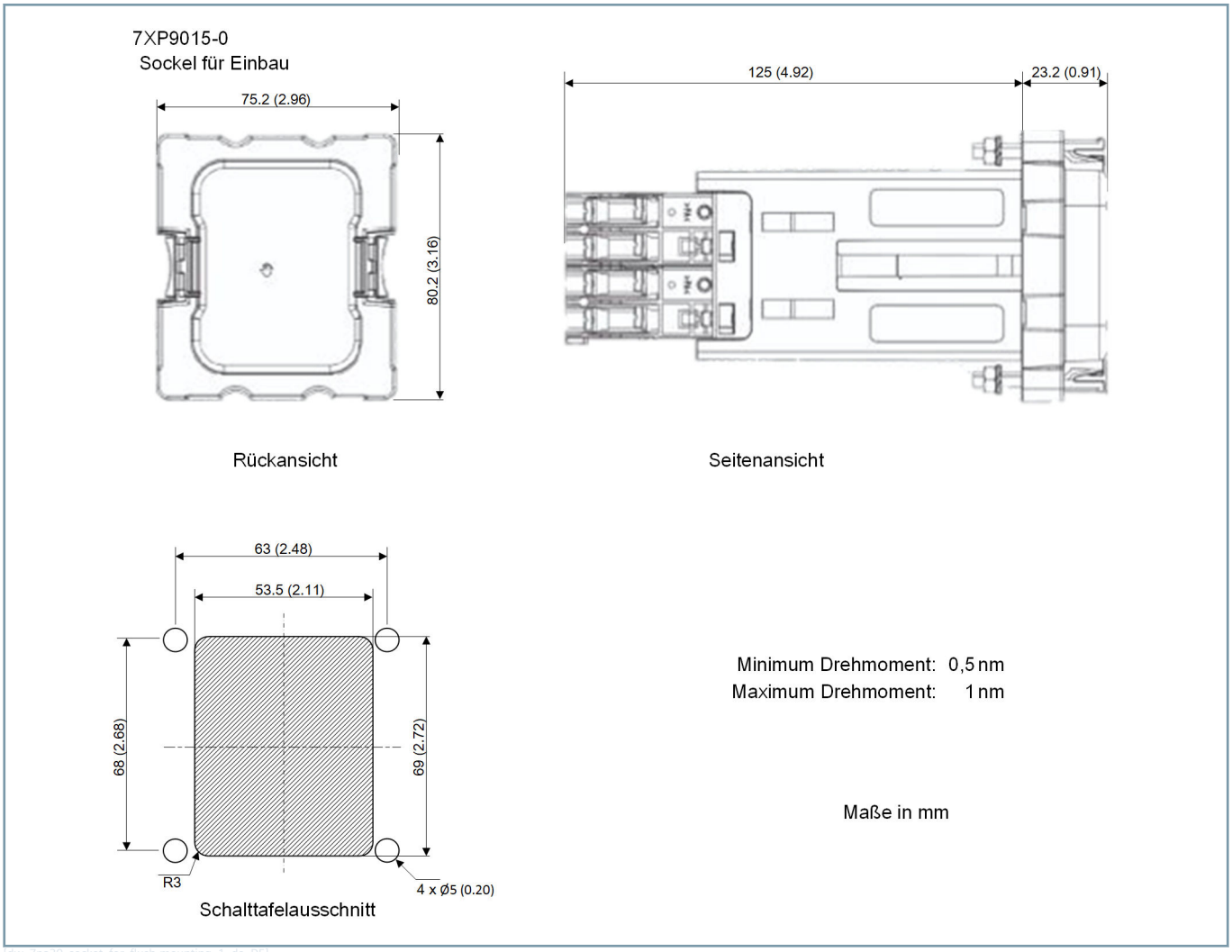
[dw_7pa30-1phs_dimensions_and_panel-mounting-cutout, 2, en_US]

Figure 2.6/2 Dimensions and Installation Dimensions



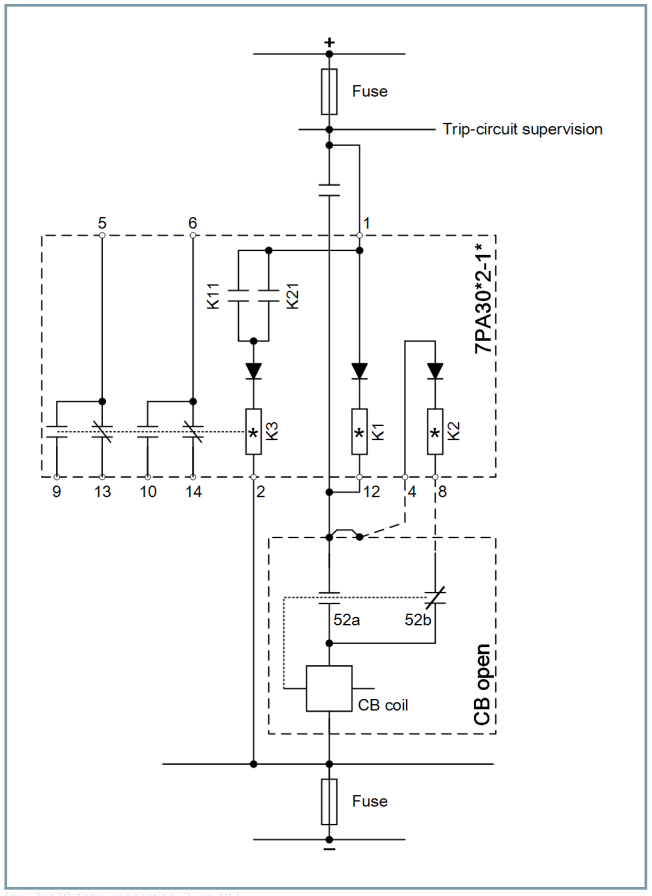
[dw_7pa23_27_30-1phs_socket_for_surface-mounting, 2, en_US]

Figure 2.6/3 Surface-Mounting Base



[dw_7pa30_socket_for_flush-mounting, 1, de_DE]

Figure 2.6/4 Flush-Mounting Base



[dw_7pa30-1phs_connection, 2, en_US]

Figure 2.6/5 Connections – Contacts for a de-energized Relay

Technical Data

Rated Voltage and Internal Consumption		
V_N (VDC)	Voltage range (VDC)	Internal consumption (mA)
24/30	18 to 33	32
48	38.5 to 52.5	
60	45 to 66	18
110/125	82.5 to 137.5	
220	165 to 242	13

Pre-arcing time for excitation	> 500 ms

Contacts	
Continuous current	8 A
Overload capability	15 A
Switching power	15 A/4 s/ 110 VDC
Breaking power	0.3 A/110 VDC

V_{max}, open-circuited contact	250 VDC/400 VAC
Mechanical endurance	10^7 switching cycles
Operating temperature	-10 °C +55 °C
Storage temperature	-30 °C +70 °C
Max. humidity	93%/40 °C

Weights and packaging	
7PA30 1-phase	100 g
Carton	145x78x71 mm.
7XP9015-0	300 g
7XP9013-0	110 g

Design guidelines	
Electrical tests according to	**IEC 60255-27**
Insulation	2 kV/50 Hz/1 min
Surge immunity	5 kV/1.2/50 µs
Insulation resistance	> 100 MΩ/500 VDC
Flame resistance	
Plastics	**UL94**: V0
Protection class	**IEC 60529, EN60529**
Relays	IP40
Flush-mounting base	IP10
Surface-Mounting Base	IP10
Environmental conditions	**IEC 60068-2**
Dry cold, in operation	-10 °C
Dry heat, in operation	+55 °C
Storage and transportation	-30 °C +70 °C

EMC Tests	
High-frequency test: Test level: 1 MHz, 400 imp/s, 2 s Common mode: 2.5 kV Differential mode: 1 kV	**EN 60255-22-1**
Fast transient bursts Test level: 4 kV, 2.5 kHz, 1 min•2 kV, 5 kHz, 1 min	**EN 61000-4-4**
Energy surge voltages 8/20 µs. (current) - 1.2/50 µs. (voltage) - 8/20 µs. (current) Common mode: 2 kV - differential mode: 1 kV	**EN 61000-4-5**
Radiated HF field interference, amplitude-modulated: Test level: 80-1000 MHz, 10 V/m, 80% AM (1 kHz)	**EN 61000-4-3**
Radiated HF field interference, pulse-modulated: Test level: 900 ±5 MHz, 10 V/m, 50% (200 Hz) 1.89 GHz ±10 MHz, 10 V/m, 50% (200 Hz)	**EN 61000-4-3**
Line-conducted HF amplitude-modulated: Test level: 0.15-80 MHz, 10 V, 80% AM (1 kHz)	**EN 61000-4-6**
Electrostatic discharge test: Test level: Contact ±15 kV, air mode ±15 kV	**EN 61000-4-2**

EMC Tests	
Magnetic Field with Energy Frequency Test level: 100 A/m 1 min•1000 A/m 1 s.	**EN 61000-4-8**
Emitted interference tests: Test level: Cover: 30-230 MHz, 40 dB (µV/m) (quasi peak) - 10 m 230-1000 MHz, 47 dB (µV/m) (quasi peak) - 10 m Power supply: 0.15-0.5 MHz, 79 dB (µV) (quasi peak)/66 dB average 0.5-5 MHz, 73 dB (µV) (quasi peak)/60 dB average 5-30 MHz, 73 dB (µV) (quasi peak)/60 dB average	**EN 55011 Class A**

Selection and Ordering Data

Description	Order No.															
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
1-phase Trip-circuit supervision relay with 2 change-over contacts	7	P	A	3	0	□	2	-	□	A	A	0	0	-	□			
						▲			▲						▲			
Rated voltage						|			|						|			
DC 24/30 V						1				|						|			
DC 60 V						2				|						|			
DC 110/125 V						3				|						|			
DC 220 V						4				|						|			
DC 48 V						8				|						|			
Number of phases									|						|			
1-phase									1						|			
Without base															0			
Base																		
Flush Mounting							7	X	P	9	0	1	5	-	0			
Surface Mounting							7	X	P	9	0	1	3	-	0			
5 x retaining bracket for auxiliary relay with surface mounting base (1 required for each relay/ surface mounting base)	.	.	.	.	.	.	.	.		A	Y	R	:	E	4	3		

Trip-Circuit Supervision Relay – 7PA30 3-phase

Description

The 7PA30 3-phase relay is used to monitor the trip circuit of circuit breakers with 3 phase-segregated trip coils.

The trip circuit wiring is supervised from the positive supply to the negative supply whilst the circuit breaker is open or closed.

Applications

Due to the design and quality of the relays, their high durability and functional reliability, the relays are ideally suited for application in critical control systems and ensure proper monitoring of the entire trip circuit.

The high degree of protection ensures absolute reliability during operation within a wide temperature range, even in harsh environmental conditions.

The relay has been tested according to IEC, EN and IEEE standards. It bears the CE marking.

The monitoring current is less than 1.4 mA and ensures that there can be no failure of the trip coil.

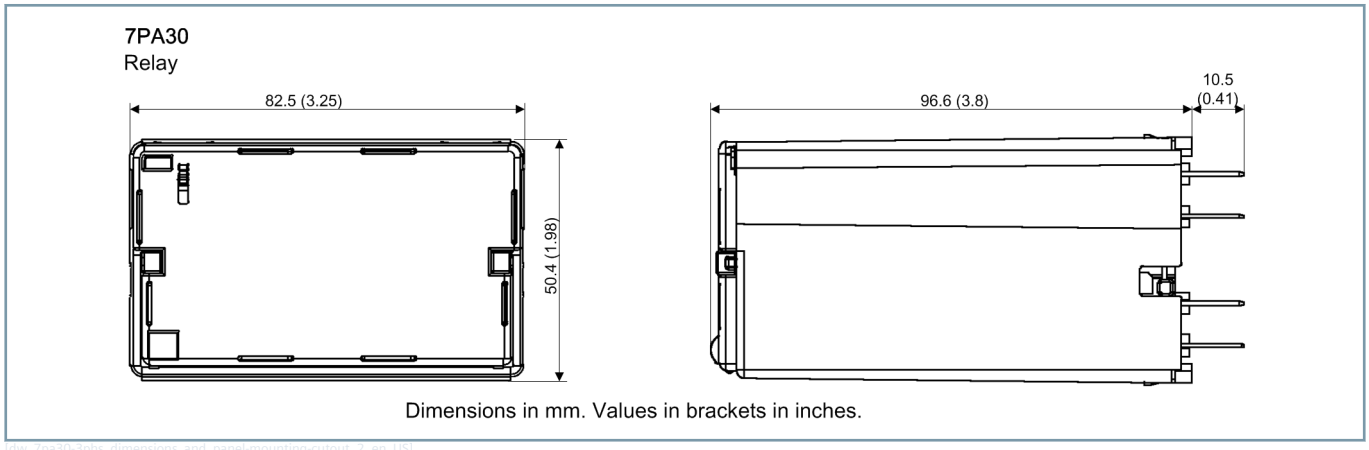
Proper operation is signaled via a green LED.



[ptl_7PA30-3, 1, --_--]

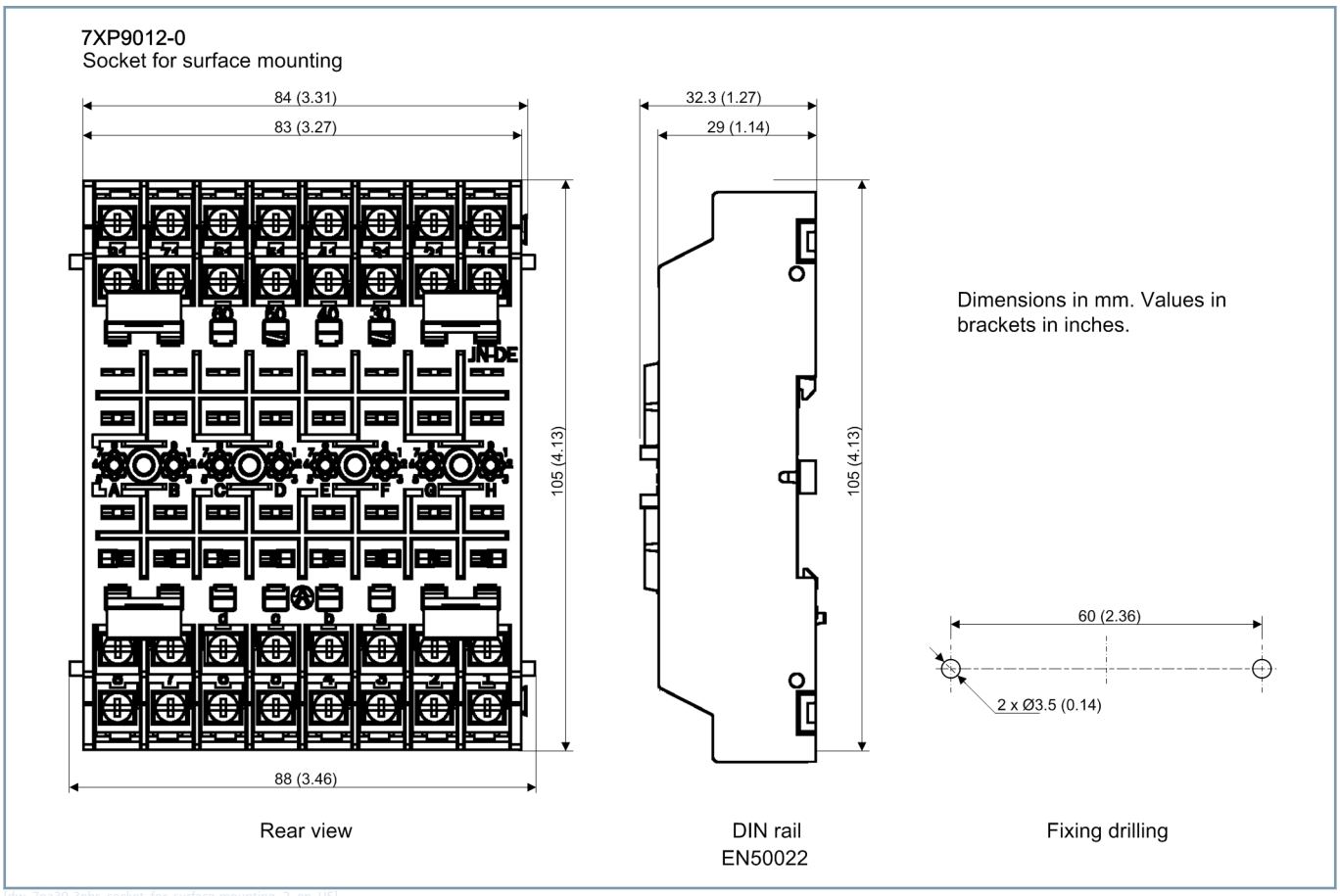
Figure 2.6/6 3-Phase Trip-Circuit Supervision Relay 7PA3042-3AA00

Dimensions and Connections



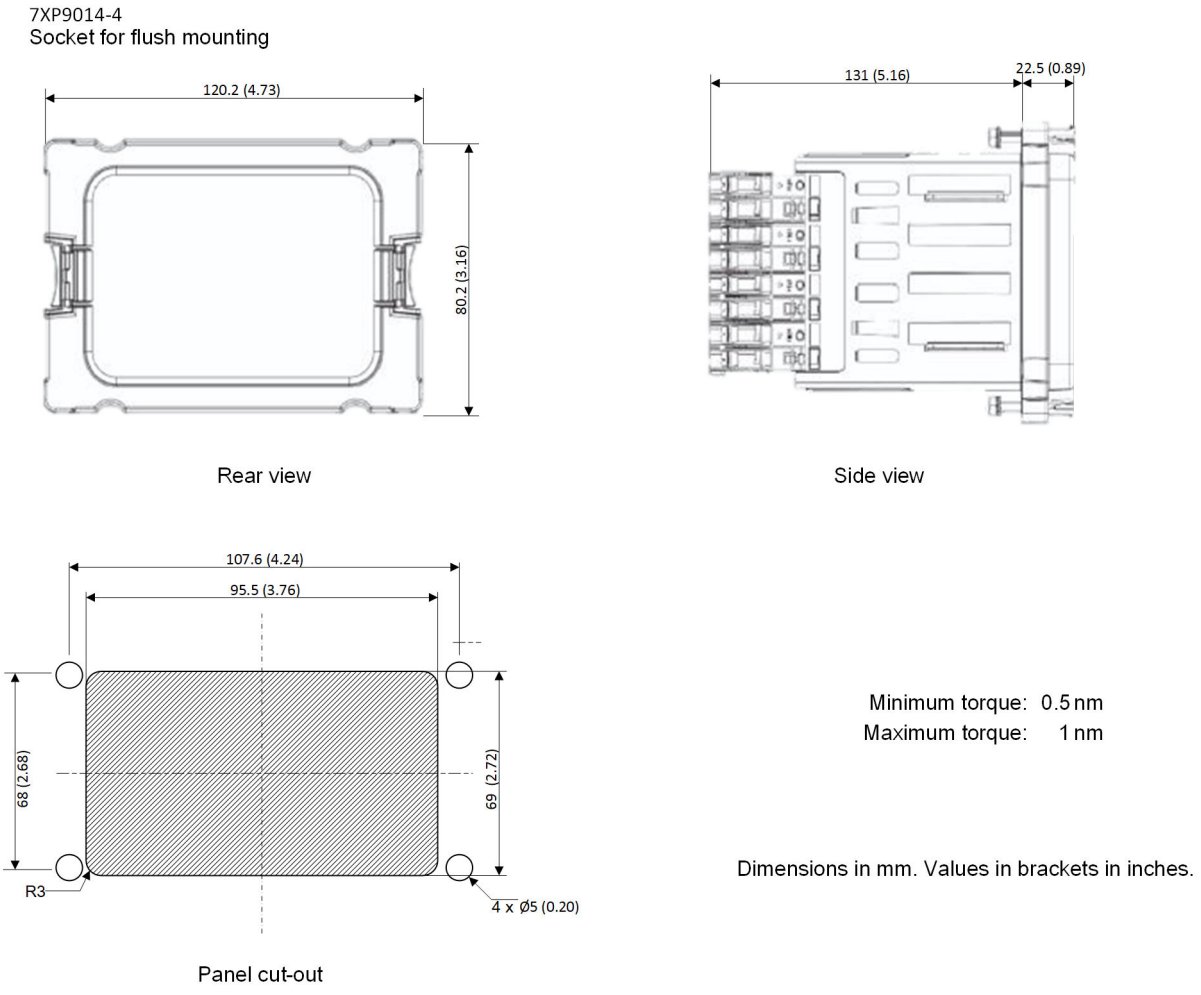
[dw_7pa30-3phs_dimensions_and_panel-mounting-cutout, 2, en_US]

Figure 2.6/7 Dimensions and Installation Dimensions



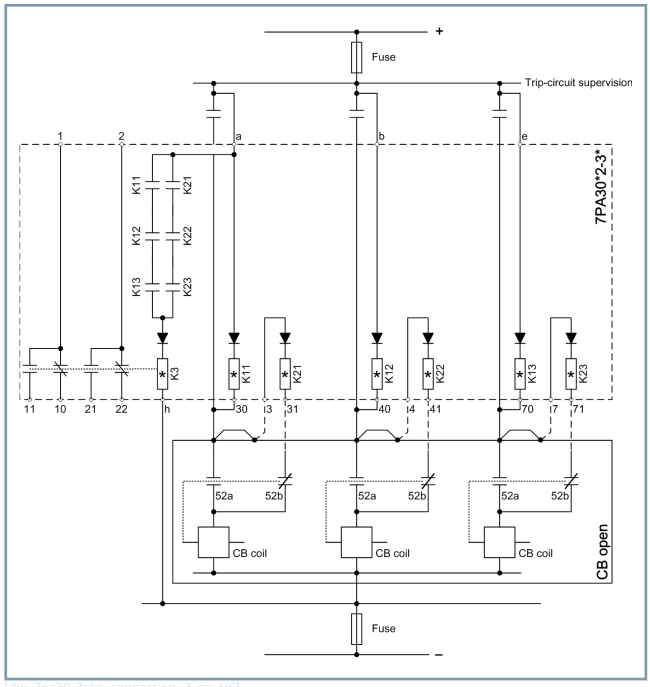
[dw_7pa30-3phs_socket_for_surface-mounting, 2, en_US]

Figure 2.6/8 Surface-Mounting Base



[dw_7pa30_3ph_socket_for_flush-mounting, 1, en_US]

Figure 2.6/9 Flush-Mounting Base



[dw_7pa30-3phs_connection, 2, en_US]

Figure 2.6/10 Connections - Contacts shown for a De-Energized Relay

Technical Data

Rated Voltage and Internal Consumption		
V_N (VDC)	Voltage range (VDC)	Internal consumption (mA)
24/30	18 to 33	32
48	36 to 52.8	35
60	45 to 66	18
110/125	82.5 to 137.5	18
220	165 to 242	13

Pre-arcing time for excitation	> 500 ms

Contacts	
Continuous current	8 A
Overload capability	15 A
Switching power	15 A/4 s/ 110 VDC
Breaking power	0.3 A/110 VDC

V_{max}, open-circuited contact	250 VDC/400 VAC
Mechanical endurance	10^7 switching cycles
Operating temperature	-10 °C +55 °C
Storage temperature	-30 °C +70 °C
Max. humidity	93%/40 °C

Weights and packaging	
7PA30 3-phase	165 g
Carton	150x124x84 mm

Weights and packaging	
7XP9014-4	400 g
7XP9012-0	225 g

Design guidelines	
Electrical tests according to	**IEC 60255-27**
Insulation	2 kV/50 Hz/1 min
Surge immunity	5 kV/1.2/50 µs
Insulation resistance	> 100 MΩ/500 VDC
Flame resistance	
Plastics	**UL94**: V0
Protection class	**IEC 60529, EN60529**
Relays	IP40
Flush-mounting base	IP10
Surface-Mounting Base	IP10
Environmental conditions	**IEC 60068-2**
Dry cold, in operation	-10 °C
Dry heat, in operation	+55 °C
Storage and transportation	-30 °C +70 °C

EMC Tests	
High-frequency test: Test level: 1 MHz, 400 imp/s, 2 s Common mode: 2.5 kV Differential mode: 1 kV	**EN 60255-22-1**
Fast transient bursts Test level: 4 kV, 2.5 kHz, 1 min•2 kV, 5 kHz, 1 min	**EN 61000-4-4**
Energy surge voltages 8/20 µs. (current) - 1.2/50 µs. (voltage) - 8/20 µs. (current) Common mode: 2 kV - differential mode: 1 kV	**EN 61000-4-5**
Radiated HF field interference, amplitude-modulated: Test level: 80-1000 MHz, 10 V/m, 80% AM (1 kHz)	**EN 61000-4-3**
Radiated HF field interference, pulse-modulated: Test level: 900 ±5 MHz, 10 V/m, 50% (200 Hz) 1.89 GHz ±10 MHz, 10 V/m, 50% (200 Hz)	**EN 61000-4-3**
Line-conducted HF amplitude-modulated: Test level: 0.15-80 MHz, 10 V, 80% AM (1 kHz)	**EN 61000-4-6**
Electrostatic discharge test: Test level: Contact ±15 kV, air mode ±15 kV	**EN 61000-4-2**

EMC Tests	
Magnetic Field with Energy Frequency Test level: 100 A/m 1 min•1000 A/m 1 s.	**EN 61000-4-8**
Emitted interference tests: Test level: Cover: 30-230 MHz, 40 dB (µV/m) (quasi peak) - 10 m 230-1000 MHz, 47 dB (µV/m) (quasi peak) - 10 m Power supply: 0.15-0.5 MHz, 79 dB (µV) (quasi peak)/66 dB average 0.5-5 MHz, 73 dB (µV) (quasi peak)/60 dB average 5-30 MHz, 73 dB (µV) (quasi peak)/60 dB average	**EN 55011 Class A**

Selection and Ordering Data

Description	Order No.															
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
3-phase Trip-Circuit Supervision Relay with 2 change-over contacts	7	P	A	3	0	□	2	-	□	A	A	0	0	-	□			
						▲			▲						▲			
Rated voltage						|			|						|			
DC 24/30 V						1				|						|			
DC 60 V						2				|						|			
DC 110/125 V						3				|						|			
DC 220 V						4				|						|			
DC 48 V						8				|						|			
Number of phases									|						|			
3-phase									3						|			
Without base															0			
Base																		
Flush Mounting							7	X	P	9	0	1	4	-	4			
Surface Mounting							7	X	P	9	0	1	2	-	0			
5 x retaining bracket for auxiliary relay with surface mounting base (1 required for each relay/ surface mounting base)	.	.	.	.	.	.	.	.		A	Y	R	:	E	4	7		

Description

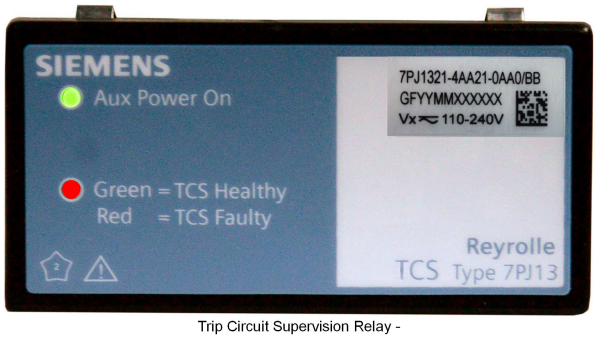
The 7PJ13 Trip Circuit Supervision Relay is an electronic-circuit based relay. The relay is a member of Siemens Reyrolle protection devices product family. It is used to monitor and supervise the integrity of a circuit-breaker's trip coil and other wiring circuits.

The 7PJ13 is connected with a circuit-breaker to monitor the trip circuit positions (make or break). The 7PJ13 generates a trip circuit failure alarm, either if the trip circuit supply is disconnected or if the trip circuit connection is changed to an open circuit. Trip circuit continuity is measured by supplying the supervision current of 0.7 mA to 1.5 mA and sensing the flow of current with two opto-couplers. The circuit-breaker contact indicates the status of the relay whether the circuit-breaker is in a make position or a break position.

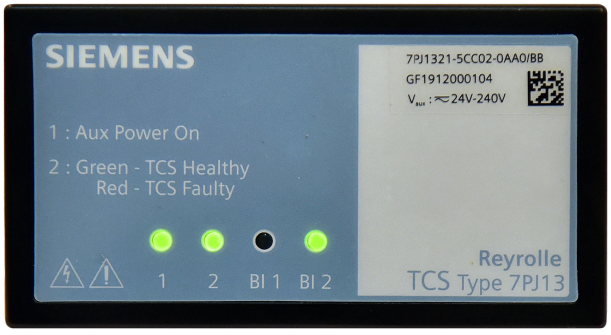
The 7PJ13 is available in 2 variants depending on the auxiliary voltage range. The front panel of the 7PJ13 comprises of a dual colored LED to indicate the status of process.

The optional conformal coating of the PCB assemblies provides protection against harmful environmental influences such as extreme humidity, corrosive gases and aggressive dust.

Outputs	2 Changeover
Housing	Size 106 mm x 58 mm x 118 mm (Width x Height x Depth), panel mounting, non draw-out
Indication	Auxiliary Power On LED • Green = Aux Power On Trip circuit supervision LED • Green = TCS Healthy • Red = TCS Faulty For **MLFB 7PJ1321-5CC02-0xA0** only Binary Input 1 LED and Binary Input 2 LED • Green = ON • No indication = OFF
Universal auxiliary voltage range	MLFB 7PJ1321-5AA21-0AA0 • AC 24 V to 240 V/DC 24 V to 240 V MLFB 7PJ1321-4AA21-0AA0 • AC 110 V to 240 V/ DC 110 V to 240 V MLFB 7PJ1321-5CC02-0AA0 • AC 24 V to 240 V/DC 24 V to 240 V
Burden	Maximum burden upto 4 W or 9 VA
Universal supervision voltage range	MLFB 7PJ1321-5AA21-0AA0 • DC 18 V to 265 V MLFB 7PJ1321-4AA21-0AA0 • DC 18 V to 265 V MLFB 7PJ1321-5CC02-0xA0 • AC 40 V to 240 V/DC 40 V to 240 V



Trip Circuit Supervision Relay -
(MLFB 7PJ1321-5AA21-0AA0/7PJ1321-4AA21-0AA0)



Trip Circuit Supervision Relay -
(MLFB 7PJ1321-5CC02-0xA0)

[dw_7PJ13v1-v2_FrontViews, 2, --_--]

Benefits

- A compact design 108 mm x 56 mm (Width x Height)
- Flush mounting moulded case.
- Continuous supervision of trip circuit in pre-closed condition, post-closed condition, and latched trip condition.
- Detect and indicate auxiliary voltage loss and circuit failure in supervised circuits.
- Indicates operational status by a single LED with dual color.
- The relay with MLFB 7PJ1321-5CC02-0xA0 displays status of binary inputs with LED indication.
- Depending on relay selection, the contacts available are 2 contacts or 2 make contact + 2 break contact.
- The relay complies with IEC 60255 standards.

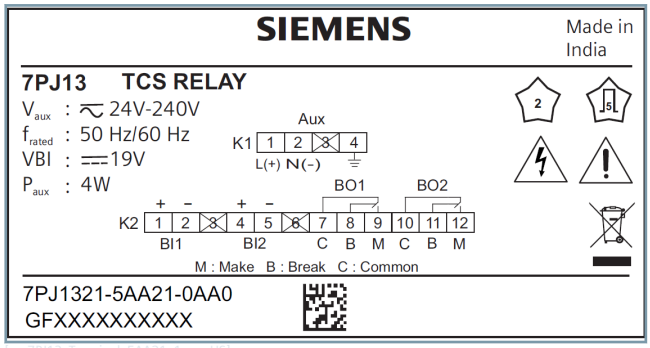
Applications

The 7PJ13 Trip Circuit Supervision Relay is used in the following field applications:

- The relay is used for supervising and monitoring activities. The trip circuit wiring is supervised from the positive supply to the negative supply when the circuit-breaker is in a make position or a break position.
- The relay is used for detecting and generating a circuit-breaker alarm, if the trip circuit supply has failed.
- The relay is used to generate an alarm if the trip signal is received but the circuit-breaker fails to operate.
- The binary outputs can be wired on to a numerical protection relay to indicate the faulted circuit to remote SCADA.

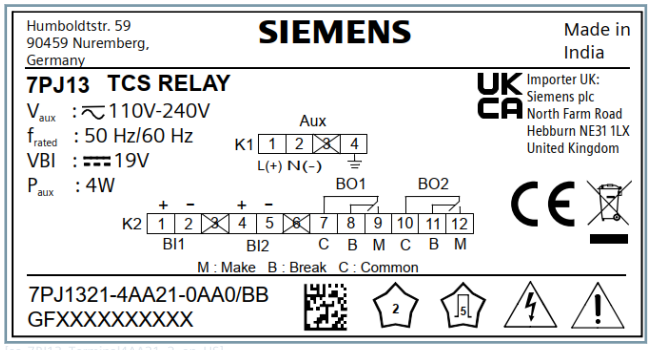
Connection diagrams

The terminal diagram is located on top of the 7PJ13 trip circuit supervision relay housing and displays the terminal numbers and terminals.



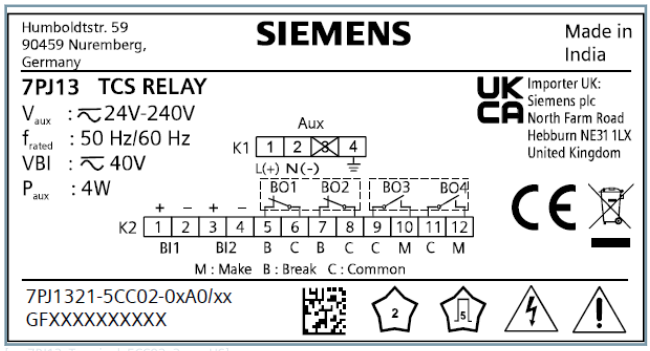
[sc_7PJ13_Terminal_5AA21, 1, en_US]

Figure 2.6/11 Terminal details (for MLFB 7PJ1321-5AA21-0AA0) of 7PJ13 trip circuit supervision relay



[sc_7PJ13_Terminal4AA21, 2, en_US]

Figure 2.6/12 Terminal details (for MLFB 7PJ1321-4AA21-0AA0) of 7PJ13 trip circuit supervision relay



[sc_7PJ13_Terminal_5CC02, 3, en_US]

Figure 2.6/13 Terminal details (for MLFB 7PJ1321-5CC02-0xA0) of 7PJ13 trip circuit supervision relay

Terminal number	Terminal name	Description
K1-1	L (+)	Auxiliary voltage positive
K1-2	N (-)	Auxiliary voltage negative
K1-3	–	Not connected
K1-4	⏚	Earth

Table 2.6/1 Auxiliary terminals specification

Terminal number	Terminal name	Description
K2-1	BI 1 +	Binary input 1 positive
K2-2	BI 1 -	Binary input 1 negative
K2-3	–	Not connected
K2-4	BI 2 +	Binary input 2 positive
K2-5	BI 2 -	Binary input 2 negative
K2-6	–	Not connected
K2-7	BO 1-COM	Common
K2-8	BO 1-B	Binary output 1 break contact
K2-9	BO 1-M	Binary output 1 make contact
K2-10	BO 2-COM	Common
K2-11	BO 2-B	Binary output 2 break contact
K2-12	BO 2-M	Binary output 2 make contact

Table 2.6/2 Binary terminals specification [MLFB 7PJ1321-5AA21-0AA0/ MLFB 7PJ1321-4AA21-0AA0]

Terminal number	Terminal name	Description
K2-1	BI 1 +	Binary input 1 positive
K2-2	BI 1 -	Binary input 1 negative
K2-3	BI 2 +	Binary input 2 positive
K2-4	BI 2 -	Binary input 2 negative
K2-5	BO 1-B	Binary output 1 break contact
K2-6	BO 1-COM	Common
K2-7	BO 2-B	Binary output 2 break contact
K2-8	BO 2-COM	Common
K2-9	BO 3-COM	Common
K2-10	BO 3-M	Binary output 3 make contact
K2-11	BO 4-COM	Common
K2-12	BO 4-M	Binary output 4 make contact

Table 2.6/3 Binary terminals specification [MLFB 7PJ1321-5CC02-0xA0]

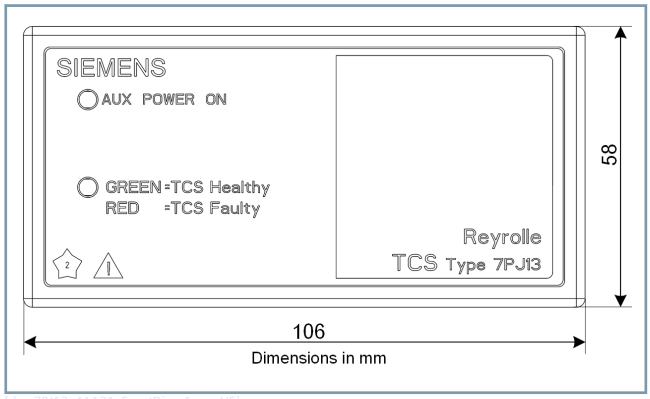
Mounting instructions

A trip circuit supervision relay comprises of spring type mounting clamps, which enables easy installation. To mount the trip circuit supervision relay, the following requirements should be satisfied:

- Cut a hole in the panel with a measurement of 92 mm x 45 mm (Width x Height)
- Carry out all of the required internal wiring connections
- Install the trip circuit supervision relay into the panel and lock with the clamps

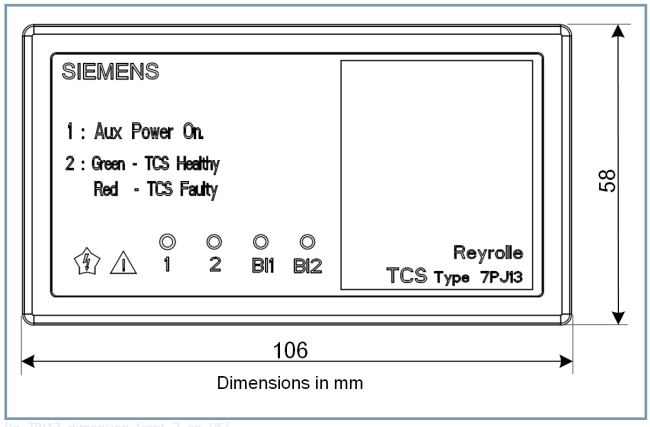
Dimension drawings

This section displays the different dimensional views of a trip circuit supervision relay.



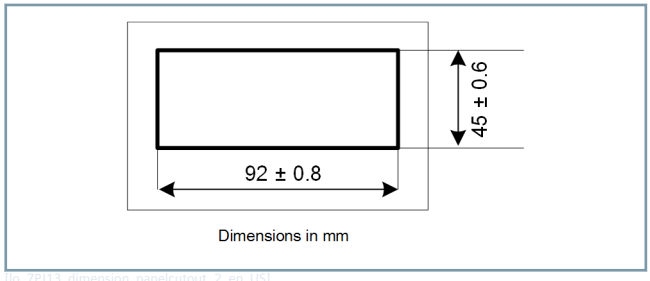
[dw_7PJ13_4AA21_FrontDim, 1, en_US]

Figure 2.6/14 Front view [MLFB 7PJ1321-5AA21-0AA0 and MLFB 7PJ1321-4AA21-0AA0]



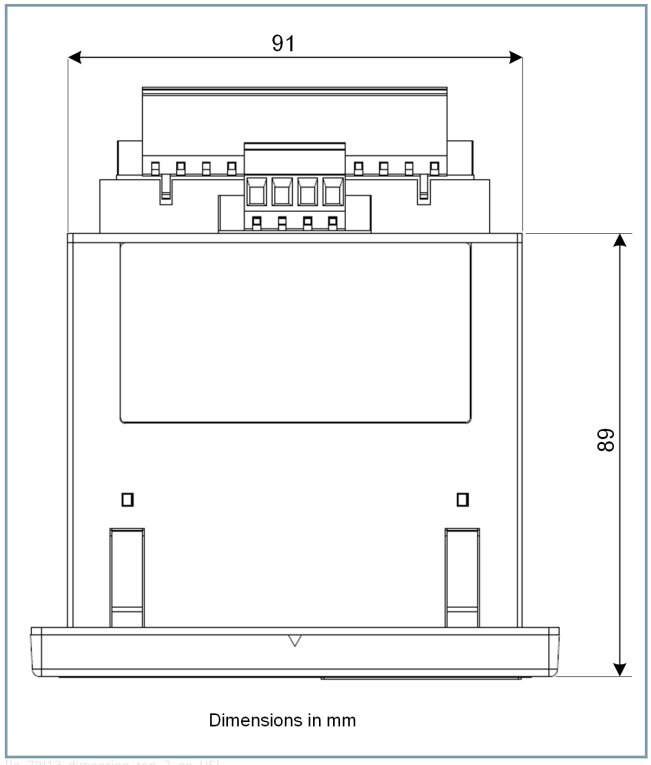
[lo_7PJ13_dimension_front, 2, en_US]

Figure 2.6/15 Front view [MLFB 7PJ1321-5CC02-0xA0]



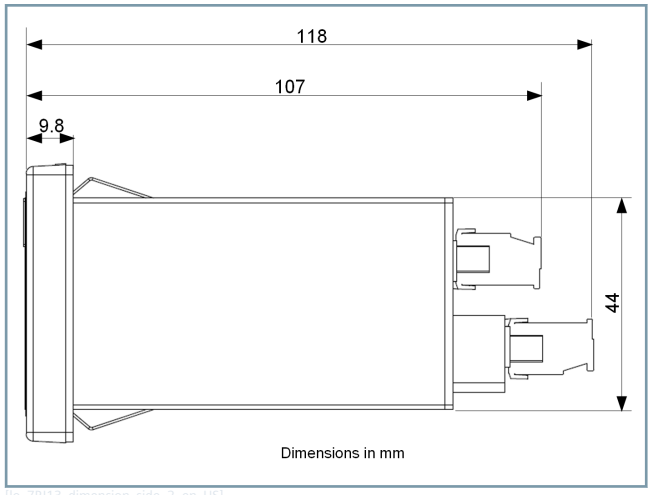
[lo_7PJ13_dimension_panelcutout, 2, en_US]

Figure 2.6/16 Panel cut-out view



[lo_7PJ13_dimension_top, 2, en_US]

Figure 2.6/17 Top view



[lo_7PJ13_dimension_side, 2, en_US]

Figure 2.6/18 Side view

Technical data

Indication of conformity

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

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

RoHS directive 2011/65/EU is met using the standard EN 50581. The device has been designed and produced for industrial use.

NOTE

Product CE certified for MLFBs:
7PJ1321-4AA21-0AA0 and 7PJ1321-5CC02-0xA0

General technical data

Power supply

Parameter	Value
Auxiliary voltage range V_{rated}	DC 24 V to 240 V/AC 24 V to 240 V [29] DC 110 V to 240 V/ AC 110 V to 240 V [29]
Auxiliary voltage operating range	80 % to 110 %
Input power consumption	< 4 W/ 9 VA

Binary inputs

Parameter	Value	
BI threshold/operating voltage	**BI voltage rating**	**BI operating range**
	DC 19 V	DC 18 V to 265 V
	AC 40 V/DC 40 V	AC 40 V to 265 V/DC 40 V to 265 V
Input power consumption	< 1 W/VA	
Current for operation	0.9 mA to 3 mA	
Isolation	AC 2 kV	

Binary outputs

Parameter	Value	
Operate time	> 500 ms and < 800 ms	
Reset time	< 100 ms	
Mechanical life (loaded)	10 000 operations (at rated current of resistive load)	
Number of contacts	2 change-over contacts, Selectable 2 make contacts + 2 break contacts (As per MLFB selection)	
Contact details	Rated voltage	AC 250 V DC 250 V
	Contact current rating: Continuous Short time	 AC 5 A/DC 5 A AC 30 A/DC 30 A for 0.2 s
	Make and carry for 0.5 s	AC 10 A
	Make and carry for 3 s	AC 8 A
	Break	Breaking capacity for DC with circuit time-constant L/R < 40 ms, at 48 V/110 V/ 220 V 0.7 A/ 0.25 A/0.15 A
Limiting making capacity: (L/R ≤ 40 ms)	1000 W	

Installation category

Parameter	Value
Installation category (overvoltage category)	Class III

Pollution

Parameter	Value
Pollution degree	2

External interfaces

Parameter	Value
Power supply (1 make contact)	Header: 4 Pin Cabling-type: standard wire, unshielded, max. 2.5 mm²
Binary inputs (2 make contacts) and contact outputs (2 make contacts)	Header: 12 Pin Cabling-type: standard wire, unshielded, max. 2.5 mm²

29 Based on ordering option

Mechanical tests

Test	Standard
Degree of protection	IEC 60529, IP54 front IP20 rear
Vibration	IEC 60255-21-1, Response and endurance, Class I
Shock and bump	IEC 60255-21-2, Shock response and withstand, Class I Bump, class I
Seismic	IEC 60255-21-3, Class I
Contact performance	IEC 60255-1, (Ref: Std IEC 61810-1)

Electrical tests

Test	Standard
Insulation resistance	IEC 60255-27 [30] Insulation resistance > 100 MΩ at DC 500 V Test duration: > 5 s (Between any terminal and earth, independent circuits)
Impulse voltage withstand	IEC 60255-27 [30] 5 kV, 1.2/50 µs, 0.5 J 5 +ve, -ve pulses (Between all terminals and case earth and any 2 independent circuits)
AC dielectric voltage	IEC 60255-27 [30] AC 2 kV RMS for 1 min (Between any terminal and earth, independent circuits) AC 1 kV RMS for 1 min (across make contacts)
Slow damped oscillatory wave	IEC 60255-26 **Common-mode:** Test voltage: 2.5 kV peak voltage **Differential mode:** Test voltage: 1.0 kV peak voltage Test duration: 2 s Source impedance: 200 Ω Voltage oscillation frequency: 1 MHz Repetition frequency: 400 Hz
Electrostatic discharge	IEC 60255-26 8 kV air discharge 6 kV contact discharge
Electrical fast transient or burst	IEC 60255-26 Test level: zone A Test severity amplitude: ± 4 kV Repetition frequency: 5 kHz
Surge immunity	IEC 60255-26 Test level: zone B Line to line: 0.5 kV, 1 kV Line to earth: 0.5 kV, 1 kV, 2 kV Front time/time to half-value: 1.2/50 µs Source impedance: 2 Ω
Radiated immunity	IEC 60255-26 80 MHz to 1.0 GHz and 1.4 GHz to 2.7 GHz Field strength: 10 V/m (RMS) Amplitude modulated: 80 % AM (1 kHz)
Conducted radio frequency interference	IEC 60255-26 150 kHz to 80 MHz, 10 V_{RMS} , dwell time: 0.5 s
Power frequency magnetic field	IEC 60255-26 30 A/m applied 1 min, 300 A/m applied for 3 s
Radiated emissions	IEC 60255-26 and CISPR 11
Conducted emissions	IEC 60255-26 and CISPR 32
Functional performance	IEC 60255-1
Gradual shutdown/start-up test	IEC 60255-26 Shut down/start up ramp 60 s Power off 5 min
Power frequency immunity test [31]	IEC 60255-26 Test level: zone B

30 All aspects of IEC 60255-5 have been covered under IEC 60255-27.

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

Test	Standard
Pulse magnetic field test	IEC 61000-4-9 1000 A/m, 5 +ve and 5 -ve
Damped oscillatory magnetic field value	IEC 61000-4-10 0.1 and 1.0 MHz, 100 A/m

Product safety test

Test	Reference
Clearances and creepage distances	IEC/EN 60255-27: Edition 2 ≥ 4 mm
IP rating	IEC/EN 60255-27: Edition 2 IP54 (front side) IP20 (rear side)
Impulse voltage	IEC/EN 60255-27: Edition 2 5 kV, 5 +ve, 5 -ve pulses
AC dielectric voltage	IEC/EN 60255-27: Edition 2 AC 2 kV, 50 Hz, 1 min
Insulation resistance	IEC/EN 60255-27: Edition 2 DC 500 V, > 5 s, > 100 MΩ
Protective bonding resistance	IEC/EN 60255-27: Edition 2 < AC 12 V/DC 12 V, 1 min, < 0.1 Ω
Protective bonding continuity	IEC/EN 60255-27: Edition 2
Flammability	IEC/EN 60255-27: Edition 2
Single fault condition	IEC/EN 60255-27: Edition 2
Mechanical resistance to shock and impact	IEC 61010-1: Edition 3 Clause number 8

Test	Reference
Protection against electric shock	IEC 61010-1: Edition 3 Clause number 6
Protection against the spread of fire	IEC 61010-1: Edition 3 Clause number 9
Equipment temperature limits and resistance to heat	IEC 61010-1: Edition 3 Clause number 10

Climatic environmental tests

Temperature

IEC 60068-2-1/IEC 60068-2-2/IEC 60255-1/IEC 60068-2-14

Ambient operating temperature	-10 °C to +55 °C
Storage temperature (non-operational)	-25 °C to +70 °C
Change of temperature test	-10 °C to +55 °C

Humidity

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

Damp heat test, cyclic	+25 to 55 °C, RH > 93 % RH (6 cycles) At lower temperature, 93 %, ± 3 % RH At upper temperature, 93 %, ± 3 % RH
Damp heat test, steady state	10 days at 93 ± 3 % RH, +40 °C

Ordering information – 7PJ13

Product description	Order number																	
	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16
Trip circuit supervision relay	7	P	J	1	3	2	1	–	□	□	□	□	□	–	0	□	A	0
					|	|	|		|	|	|	|	|			|		
Relay type					|	|	|		|	|	|	|	|			|		
Trip circuit supervision relay					3	|	|		|	|	|	|	|			|		
						|	|		|	|	|	|	|			|		
Number of binary inputs						|	|		|	|	|	|	|			|		
Element 2						2	|		|	|	|	|	|			|		
							|		|	|	|	|	|			|		
Contact reset type							|		|	|	|	|	|			|		
Self reset							1		|	|	|	|	|			|		
									|	|	|	|	|			|		
Auxiliary voltage range									|	|	|	|	|			|		
AC 110 V to 240 V/ DC 110 V to 240 V									4	A	|	|	|			|		
AC 24 V to 240 V/DC 24 V to 240 V									5	|	|	|	|			|		
										|	|	|	|			|		
Contact arrangement – Make contact										|	|	|	|			|		
0 Make contact										A	A	2	|			A		
2 Make contact										C	C	0	|			A/B		
											|	|	|			|		
Contact arrangement – Break contact											|	|	|			|		
0 Break contact											A	2	|			|		
2 Break contact											C	0	|			|		
												|	|			|		
Contact arrangement – Change-over contact												|	|			|		
2 Change-over contact												2	1			|		
0 Change-over contact												0	2			|		
													|			|		
Binary input range													|			|		
DC 18 V to 265 V, threshold DC 19 V													1			|		
AC 40 V to 240 V/DC 40 V to 240 V, threshold AC/DC 40 V													2			|		
																|		
Conformal coating																|		
Standard version – No conformal coating on printed circuit boards																A		
Conformal coating on printed circuit boards																B		

Available MLFBs:

- 7PJ1321-4AA21-0AA0 and 7PJ1321-5CC02-0xA0 are released only for Global region.
- 7PJ1321-5AA21-0AA0 is released for India region

Trip-Circuit Supervision Relay – 7PG17-XR250 to XR351

Description

Type XR relays are developments for specific applications of the type AR relay range. They are electro-mechanical relays with a consistent positive action, a long service life and complying with the appropriate requirements of IEC 255 and BS142. Models XR250/251 have two attracted armature elements, XR350/351 have three. These relays incorporate a time delay on de-energisation to keep the relay in an operated condition during temporary reductions in the battery voltage.

- Low burden
- Versatile design, can provide pre-close supervision
- Consistent positive action

Supervision for the trip circuit breaker is desirable as a means of ensuring the integrity to the trip circuit.

There are differing requirements for monitoring a trip circuit, supervision of the trip with the circuit breaker closed, supervision with the circuit breaker open and closed and pre-closing supervision. These XR relays are designed to meet all of these requirements and in particular the requirements of BEBS S15 schemes H4 and H7.

XR250 and XR251

- Circuit breaker closed supervision will initiate an alarm and provide indication with the circuit closed for failure of the trip supply, open circuit trip coil, an open circuit in the trip circuit wiring and if the trip coil should fail to respond to a trip command.

XR350 and XR351

- Continuous supervision with the circuit breaker in the open and closed positions and in compliance with the scheme requirements of BEBS S15 scheme H7.
  XR350 and XR351 relays also have a contact for pre-closing supervision, where a circuit breaker is prevented from being closed if trip relays have not been reset. BEBS S15 scheme H7 is applicable to trip circuit voltages of DC 30 V, 50 V, 125 V, and 240 V.

Benefits

- A robust design for a long, reliable service life
- Supplied in a draw-out type case
- Various combinations of coils, contacts, and operation indicator flags can be specified
- Options are also available for operate and reset modes

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

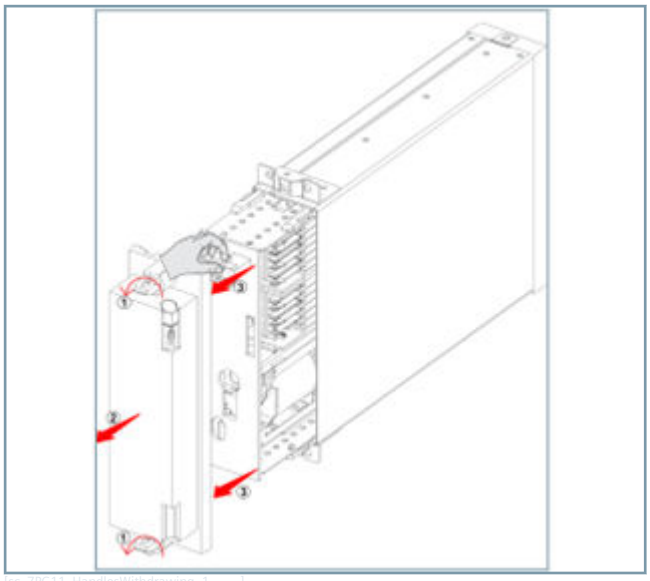
The rear connection comprises of M4 screw terminals suitable for ring type crimps.

The chassis of the device can be withdrawn from the case by pulling the handles on the top and bottom.



[sc_7PG17_E3Angle, 1, --_--]

Figure 2.6/19 7PG17 trip circuit supervision relay



[sc_7PG11_HandlesWithdrawing, 1, --_--]

Figure 2.6/20 Withdrawing device using handles

Earthing terminal

The case earth stud should be solidly earthed to the panel earth before any connections to the device rear terminal. Located at the top rear of the case is a case earth stud as shown in *Figure 2.4/3*, this must be connected to the main panel earth.

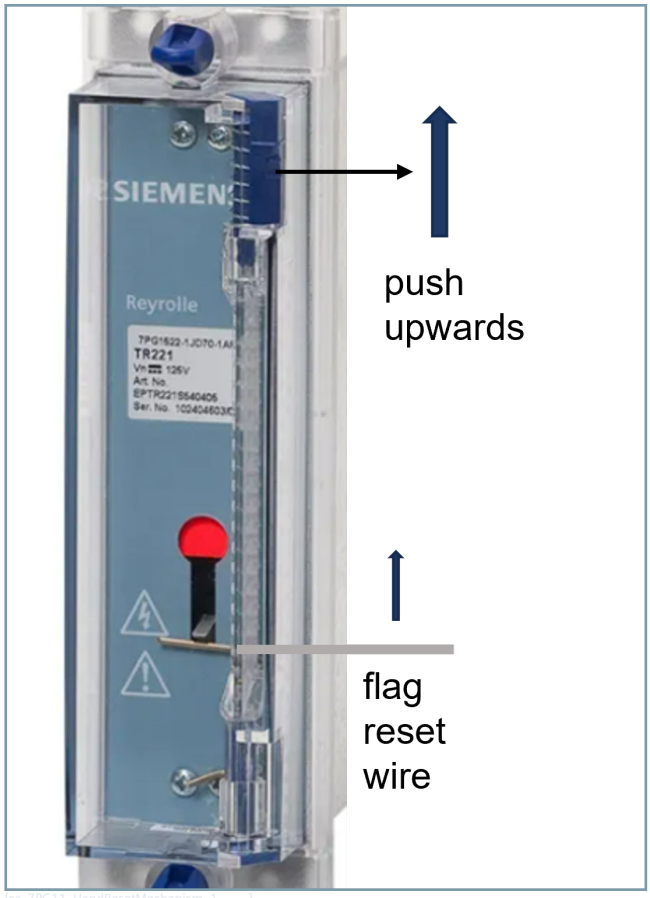


[sc_7PG11_EarthingTerminal, 1, --_--]

Figure 2.6/21 Case earth stud

Hand reset mechanism

Pull the blue handle upwards to slide the mechanism in an upwards direction with the flag reset wire at the bottom.



[sc_7PG11_HandResetMechanism, 1, --_--]

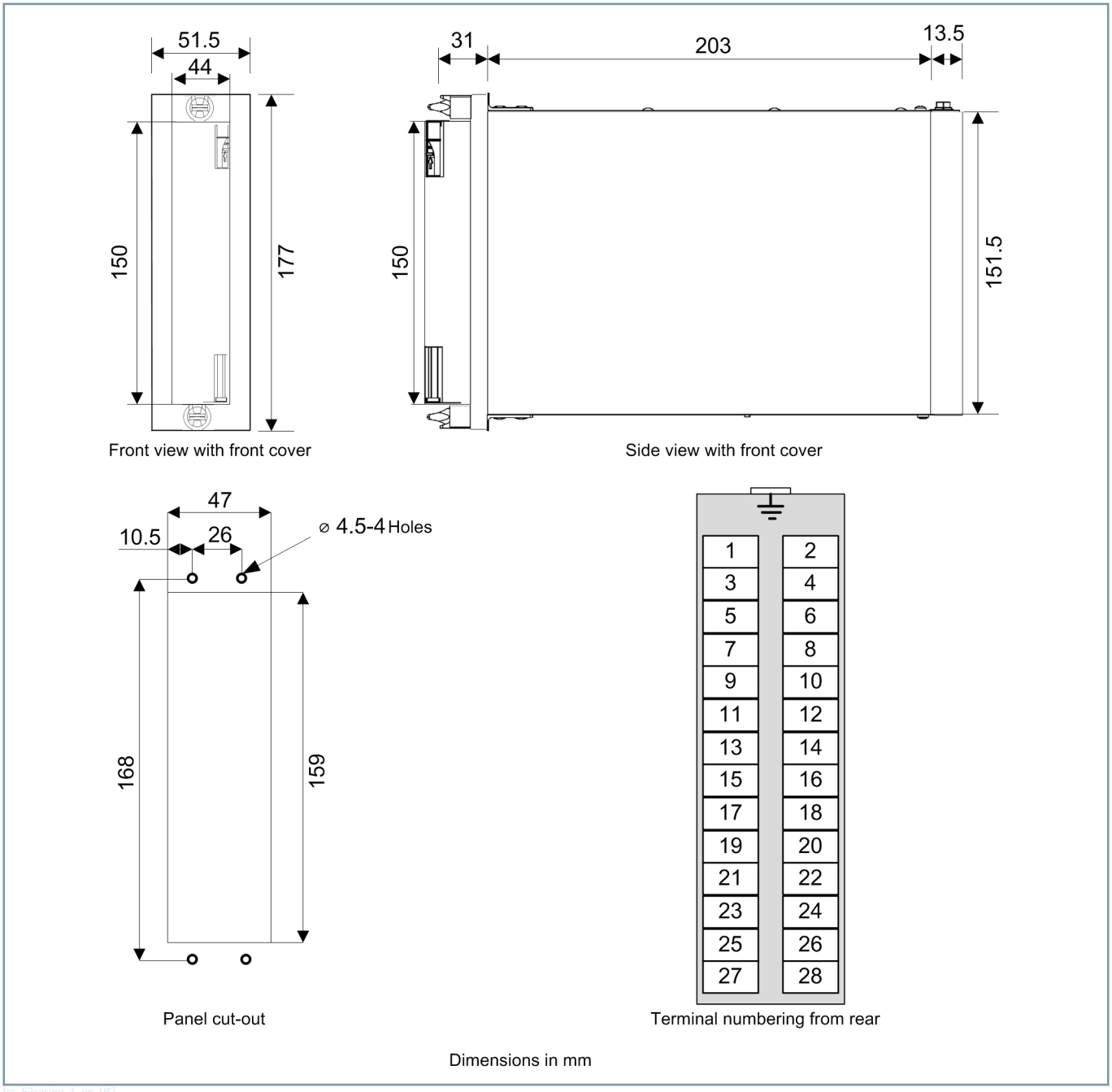
Figure 2.6/22 Hand reset mechanism

Relay information

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

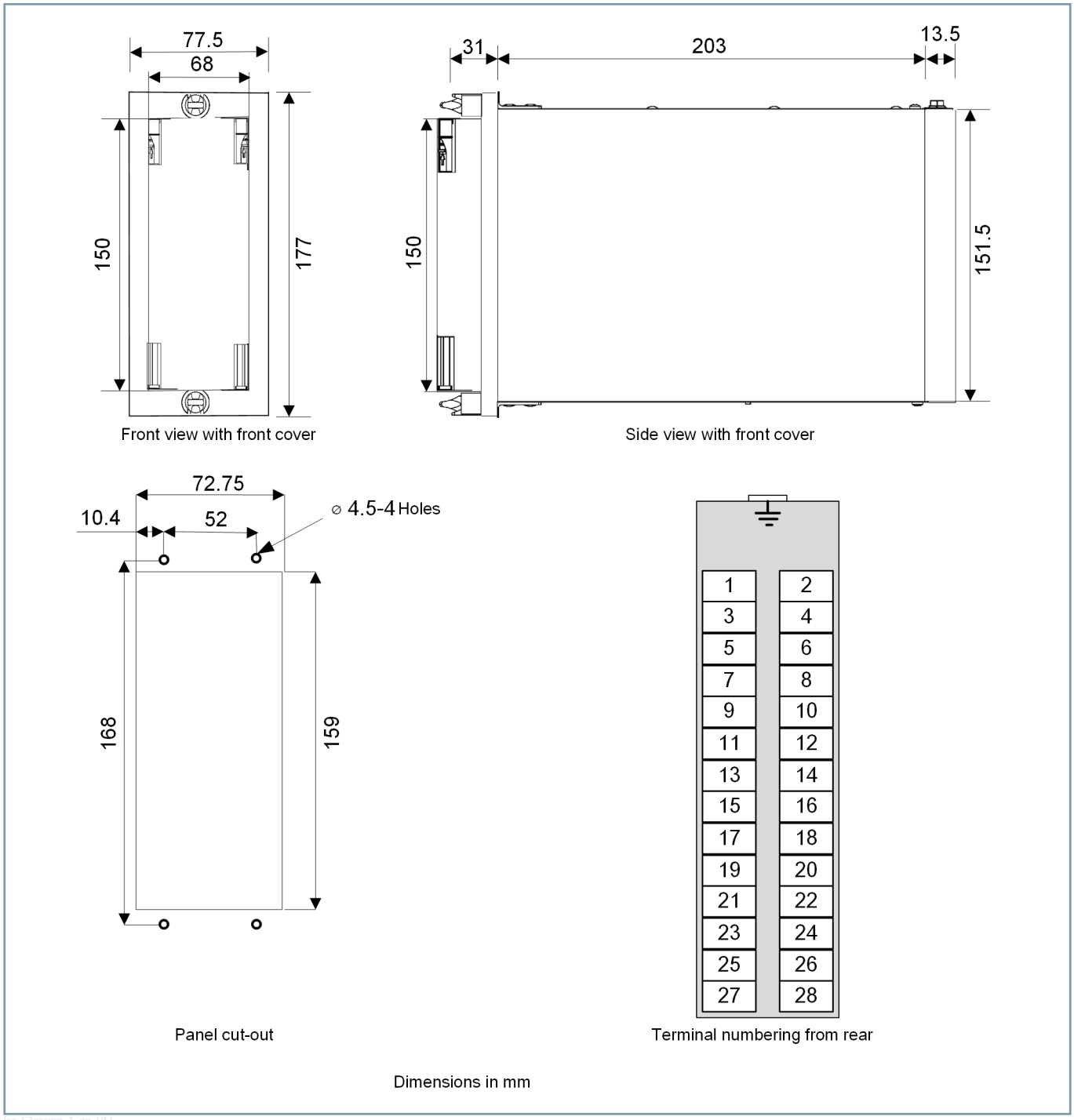
	Electrical Hazard
	Refer to device documentation
	Waste Electrical and Electronic Equipment Directive (WEEE)
CE	European CE marking
EAC	Guideline for the Eurasian Market
UK CA	United Kingdom (UK) conformity-assessed marking

Dimension drawings



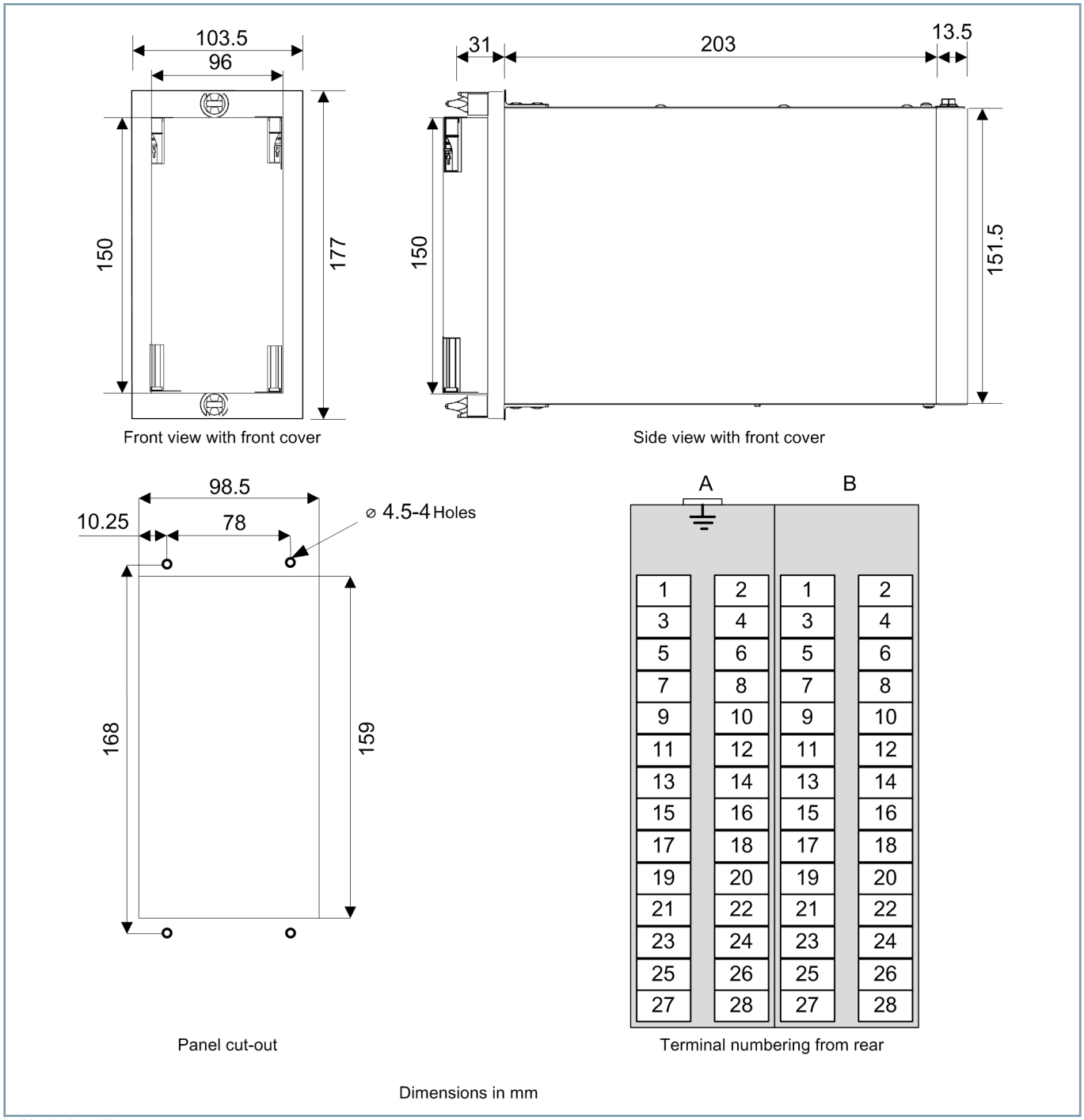
[sc_E2casing, 1, en_US]

Figure 2.6/23 Size E2



[sc_E3casing, 1, en_US]

Figure 2.6/24 Size E3



[sc_E4casing, 1, en_US]

Figure 2.6/25 Size E4

Connection Diagrams

dsffsd

Technical Data

7PG17 (XR250 and XR350)

Rated voltage V_n	DC 30 V, 50 V, 125 V and 220 V
Operating range	80 % to 120 % of V_n
Reset time	400 ms when supply is switched from V_n to off

Burden

H7 scheme relay burdens are typically:

Rated voltage	Trip circuit condition		Alarm circuit
	CB open	CB closed	
DC 50 V	- -	- -	2 W
DC 125 V	1 W	2 W	4 W
DC 240 V	2 W	4 W	9 W

Thermal Withstand 1.15 V_n continuous

Indication

A flag indicator shows when the relay is de- energised.

Self reset flag XR250 and XR350.

Hand reset flag XR251 and XR351.

Contact arrangements

Alarm output - 4 contacts in any combination of normally open and normally closed. Pre-closing supervision, XR350 and XR351, 1 normally open contact.

Contact rating

Make and carry continuously: AC 1250 VA or DC 1250 W with limits of 660 V and 5 A.

Make and carry for 3 seconds: AC 7500 VA or DC 7500 W with limits of 660 V and 30 A.

Break: AC 1250 VA or DC 7500 W resistive, or 50 W inductive (L/R = 0.04) DC with limits of 250 V and 5 A.

Environmental

Temperature

IEC 68-2-1 & 2

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

Humidity

IEC 68-2-3

56 days at 95 % RH and 40°C.

Vibration

IEC 255-21-1

The relays meet the requirements of Class 1 for vibration response and endurance.

Shock and bump

IEC 255-21-2

The relays meet the requirements of IEC 255-21-2 and BS142, sub-section 1.5.2. (1989) with respect to shock and bump testing for class 1 severity.

Operational/mechanical life

The relays will withstand in excess of 10,000 operations with the contact rating at a rate of 600 operations per hour.

Insulation IEC 255-5

Relays will withstand: 5 kV peak, 1.2/50 µs, 0.5 J between all terminals and case earth and between adjacent terminals 2 kV_{RMS} 50 Hz for 1 minute between all case terminals connected together, the case earth and between independent circuits 1 kV_{RMS} 50 Hz for 1 minute between normally open contacts.

Coil and resistor data

Voltage	R1	R2	R3	R4
DC 30 V	-	-	100	100
DC 50 V	-	-	350	350
DC 125 V	2000	-	3300	3300
DC 240 V	7000	-	10300	10300

R1 and R2 are fitted in the 'C' coil circuit.

R3 and R4 are fitted in the 'A' and 'B' coil circuits respectively.

Ordering information - 7PG17 trip circuit supervision relay (XR250, XR251)

Product description	Order no.																	
	1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16
Trip circuit supervision relay (XR250, XR251)	7	P	G	1	7	5	2	-	□	□	□	1	0	-	□	B	□	0
									|	|	|				|		|	
Two element, self reset contacts, 4 contact, size E3, trip circuit supervision relay									|	|	|				|		|	
									|	|	|				|		|	
Type of flag									|	|	|				|		|	
Hand reset flag									1	|	|				|		|	
Self reset flag									3	|	|				|		|	
										|	|				|		|	
Contact arrangement – NO										|	|				|		|	
0 NO										A	|				|		|	
1 NO										B	|				|		|	
2 NO										C	|				|		|	
3 NO										D	|				|		|	
4 NO										E	|				|		|	
											|				|		|	
Contact arrangement – NC											|				|		|	
0 NC											A				|		|	
1 NC											B				|		|	
2 NC											C				|		|	
3 NC											D				|		|	
4 NC											E				|		|	
															|		|	
Voltage rating															|		|	
DC 30 V[32]															2		|	
DC 50 V[32]															3		|	
DC 125 V[32]															4		|	
DC 240 V[32]															5		|	
																	|	
Voltage rating (Alarm)																	|	
DC 30 V																	C	
DC 50 V																	D	
DC 125 V[32]																	E	
DC 240 V[32]																	F	

2.6

32 Supplied with external resistors

Ordering information - 7PG17 trip circuit supervision relay (XR350, XR351)

Product description	Order no.																	
	1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16
Trip circuit supervision relay (XR350, XR351)	7	P	G	1	7	5	3	-	□	□	□	1	0	-	□	B	□	0
									|	|	|				|		|	
Three element, self reset contacts, 4 contact, size E3, trip circuit supervision relay									|	|	|				|		|	
									|	|	|				|		|	
Type of flag									|	|	|				|		|	
Hand reset flag									1	|	|				|		|	
Self reset flag									3	|	|				|		|	
										|	|				|		|	
Contact arrangement – NO										|	|				|		|	
0 NO										A	|				|		|	
1 NO										B	|				|		|	
2 NO										C	|				|		|	
3 NO										D	|				|		|	
4 NO										E	|				|		|	
											|				|		|	
Contact arrangement – NC											|				|		|	
0 NC											A				|		|	
1 NC											B				|		|	
2 NC											C				|		|	
3 NC											D				|		|	
4 NC											E				|		|	
															|		|	
Voltage rating[33]															|		|	
DC 30 V[34]															2		|	
DC 50 V[34]															3		|	
DC 125 V[34]															4		|	
DC 240 V[34]															5		|	
																	|	
Voltage rating (Alarm)																	|	
DC 30 V																	C	
DC 50 V																	D	
DC 125 V[34]																	E	
DC 240 V[34]																	F	

33 Voltage rating for both trip coils

34 Supplied with external resistors (2 x 3k3 and 1 x 2k resistors)

Auxiliary Relays

AC/DC Supervision Relay – 7PJ14

Description

The 7PJ14 AC/DC supervision relay is a relay used for detecting the loss of the alternating or direct current supply. The relay is a member of the Siemens Reyrolle protection devices product family and is an electronic device.

The supply supervision schemes typically require a low operating current, and the ability to initiate a time-delayed output for remote monitoring along with local visual flag indication to indicate if the supply is lost.

Under normal operating condition, the 7PJ14 relay is energised and the normally closed contacts are held open. If the supply is disconnected, the 7PJ14 relay provides a visual flag indication and the normally closed binary output contacts are de-energised and can be used for remote monitoring.

The 7PJ14 requires minimal operating current and includes a drop-off delay. These features keep the relay in the operating condition during a temporary decrease in the battery voltage. For example, during a busbar fault when the trip relays operate simultaneously, this avoids any spurious alarms being generated.

The 7PJ14 is available in 8 variants with different threshold values based on the supply voltage that needs to be monitored and flag indication options. The front panel of the 7PJ14 comprises 1 single color LED for power status, 1 dual colored LED for supervision status, and 1 flag indicator.

The status LED and flag indicator provide visual indication of the supervision state. If the auxiliary supply and supervision supply is available, the flag indicator can be reset manually using the reset button or it can automatically reset itself via the self-reset option, depending on the chosen variant.

The optional conformal coating of the PCB assemblies provides protection against harmful environmental influences such as extreme humidity, corrosive gases, and aggressive dust.

Type of device	Electronic circuit relay
Housing	Size 106 mm x 58 mm x 118 mm (Width x Height x Depth), surface/flush mounting, non-draw–out
LED indications	**Auxiliary power On LED** • Green = Auxiliary power On **Supply supervision status LED** • Green = Healthy status • Red = Faulty status
Flag indication	Black = Healthy status Red = Faulty status
Auxiliary voltage range	AC 24 V to 240 V DC 24 V to 240 V
Burden	< 4 W or 9 VA



Outputs	2 (NO) make contacts and 2 (NC) break contacts
BI supervision voltage based selection range	7PJ1411-5CC01-0xA0, 7PJ1412-5CC01-0xA0 • Threshold DC 24 V 7PJ1411-5CC02-0xA0, 7PJ1412-5CC02-0xA0 • Threshold DC 48 V 7PJ1411-5CC03-0xA0, 7PJ1412-5CC03-0xA0 • Threshold AC/DC 110 V 7PJ1411-5CC04-0xA0, 7PJ1412-5CC04-0xA0 • Threshold AC/DC 220 V

Benefits

- A compact design 106 mm x 58 mm (Width x Height)
- Surface/flush mounting molded case
- Continuous supervision of supervised supply by keeping the output contacts in a pickup condition
- Able to detect and indicate auxiliary supply failures in supervised circuits
- Indicates operating state by a single LED with dual color and flag indicator
- LED indications for auxiliary voltage and supervision voltage
- The relay complies with IEC 60255 standards

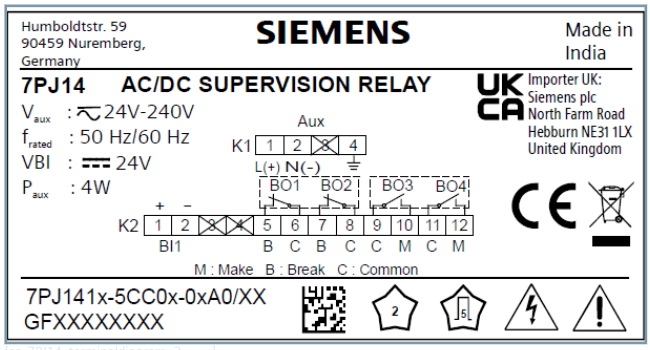
Applications

The 7PJ14 AC/DC supervision relay is used in the following field applications:

- The relay is used for supervising and monitoring the voltage of a station battery in protection systems
- If the alternating or direct current supply fails then the relay generates an alarm
- The binary outputs can be wired to a digital protection device or RTU to indicate the faulty circuit to remote SCADA

Connection diagrams

The terminal diagram is on top of the 7PJ14 AC/DC supervision relay housing and displays the terminal numbers and terminals.



[sc_7PJ14_terminaldiagram, 2, --_--]

Figure 2.7/1 Terminal details for AC/DC supervision relay

Terminal number	Terminal name	Description
K1-1	L (+)	Auxiliary voltage positive
K1-2	N (-)	Auxiliary voltage negative
K1-3	–	Not connected
K1-4	⏚	Ground

Table 2.7/1 Binary input and binary output specifications

Terminal number	Terminal name	Description
K2-1	BI 1 +	Binary input 1 positive
K2-2	BI 2 -	Binary input 1 negative
K2-3	–	Not connected
K2-4	–	Not connected
K2-5	BO 1-B	Binary output 1 break contact
K2-6	BO 1-C	Common
K2-7	BO 2-B	Binary output 2 break contact
K2-8	BO 2-C	Common
K2-9	BO 3-C	Common
K2-10	BO 3-M	Binary output 3 make contact
K2-11	BO 4-C	Common
K2-12	BO 4-M	Binary output 4 make contact

Table 2.7/2 Binary input and binary output specifications

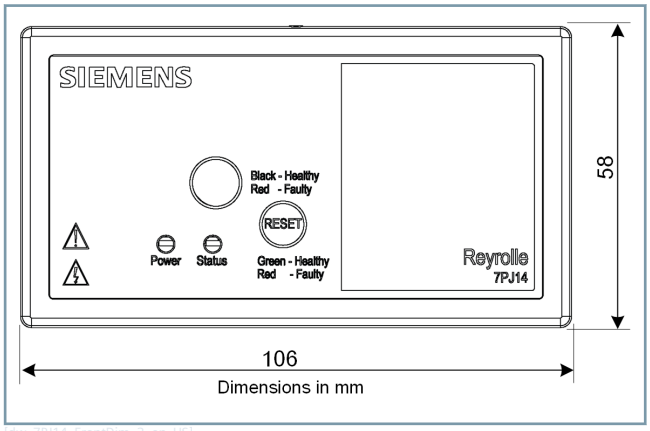
Assembly instructions

The AC/DC supervision relay comprises of spring type assembly clamps, which enables easy installation. To mount the relay, the following requirements must be satisfied:

- Carry panel cut out with a measurement of 92 mm x 45 mm (Width x Height)
- Carry out all of the required internal wiring connections
- Install the relay into the panel and lock with the clamps

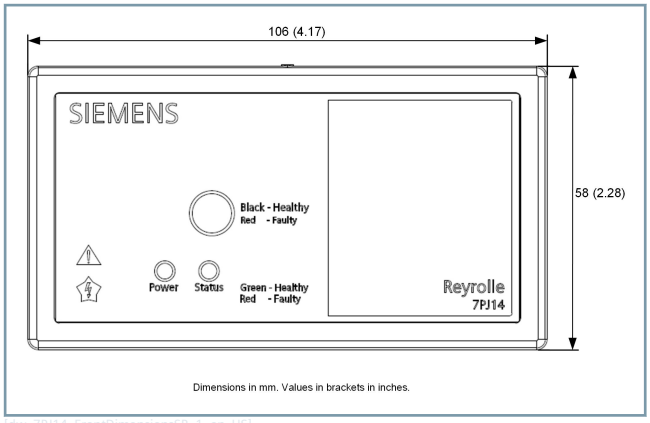
Dimension drawings

This section displays the different dimensional views of a AC/DC supervision relay.



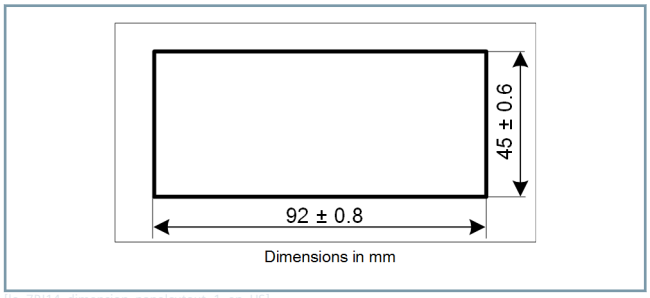
[dw_7PJ14_FrontDim, 2, en_US]

Figure 2.7/2 Front view (Hand reset)



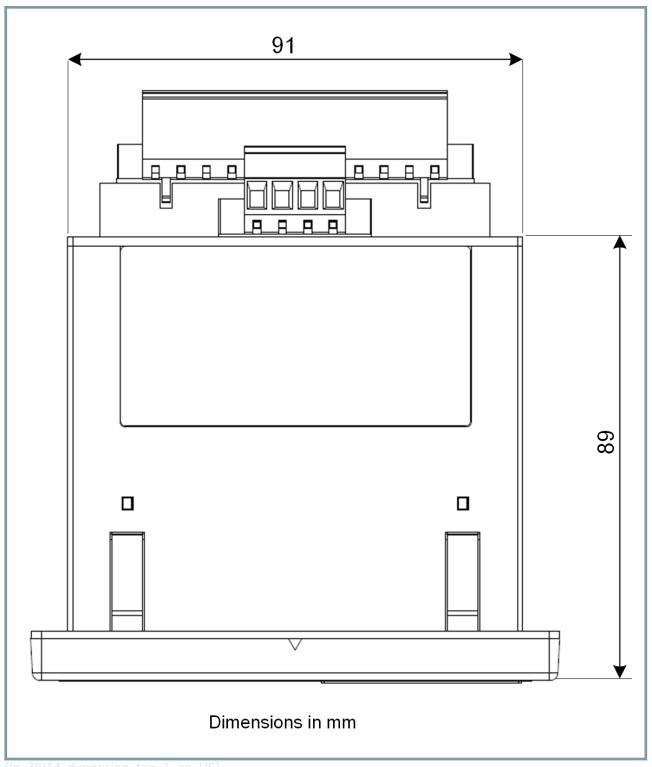
[dw_7PJ14_FrontDimensionsSR, 1, en_US]

Figure 2.7/3 Front view (Self reset)



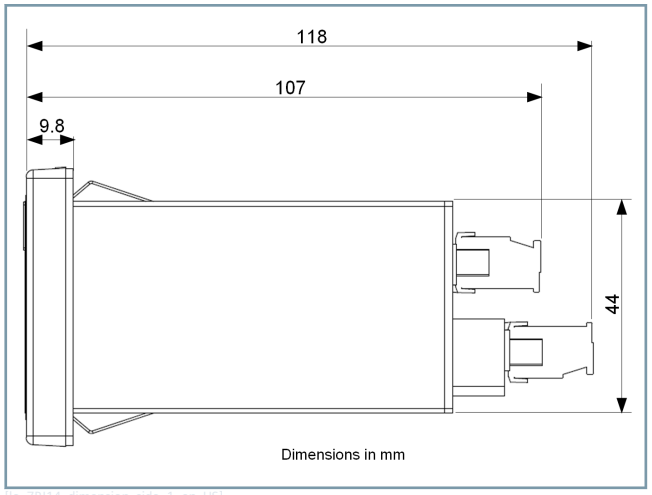
[to_7PJ14_dimension_panelcutout, 1, en_US]

Figure 2.7/4 Panel cut out view



[io_7PJ14_dimension_top, 1, en_US]

Figure 2.7/5 Top view



[io_7PJ14_dimension_side, 1, en_US]

Figure 2.7/6 Side view

Technical data

Indication of conformity

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

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

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

General technical data

Power supply

Parameter	Value
Auxiliary-voltage range V_{rated}	DC 24 V to 240 V/AC 24 V to 240 V
Auxiliary-voltage operating range	80% to 110%
Input power consumption	< 4 W/ 9 VA
Allowable super imposed AC component	15% of direct voltage
Max interruption time (collapse to zero)	≤ 20 ms (AC/DC 19.2 V)

Binary inputs

Parameter	Value
BI operating voltage	DC 24 V, DC 48 V, AC/DC 110 V, AC/DC 220 V
Input power consumption	< 1 W/VA
Current for operation	2 mA to 4 mA (typical) 5 mA maximum
Isolation	AC 2 kV

Operating voltage	Value
DC 24 V, DC 48 V, DC 110 V, DC 220 V AC 110 V, AC 220 V	Pickup voltage: < 70% of V_{BI}
DC 110 V, DC 220 V	Drop-off voltage: > 50% of V_{BI}

Operating voltage	Value
DC 24 V, DC 48 V	Drop-off voltage: > 45% of V_{BI}
AC 110 V, AC 220 V	Drop-off voltage: > 40% of V_{BI}

Parameter	Value
Reset time	> 200 ms and < 400 ms DC 24 V, DC 48 V, DC 110 V, DC 220 V, AC 110 V, AC 220 V
Operate time	< 100 ms DC 24 V, DC 48 V, DC 110 V, DC 220 V
Operate time	< 110 ms AC 110 V, AC 220 V

LED indications

Indicator	Status
Power LED – ON	Green color – Auxiliary supply is available
Power LED – OFF	No color – Auxiliary supply is not available
Status LED	Green color – AC/DC Healthy (supervision status is healthy)
	Red color – AC/DC Faulty (supervision status is faulty)
Bi-stabel flag indicator	Black color – AC/DC Healthy (supervision status is healthy)
	Red color – AC/DC Faulty (supervision status is faulty)

Binary outputs

Parameter	Value	
Mechanical life (loaded)	10 000 operations	
Number of contacts	2 make contacts + 2 break contacts	
Reset type	Self reset	
Contact details	Contact voltage	AC 250 V DC 250 V
	Contact current rating: Continuous Short time for 0.2 s	 AC 5 A/DC 5 A AC 30 A/DC 30 A
	Make and carry for 0.5 s	AC 10 A
	Make and carry for 3 s	AC 8 A
	Limiting making capacity: (L/R ≤ 40 ms)	1000 W

Installation category

Parameter	Value
Installation category (overvoltage category)	Class III

Pollution

Parameter	Value
Degree of pollution	2

External interfaces

Parameter	Value
Power supply	Header: 4 Pin Cabling type: standard wire, unshielded, max. 2.5 mm²
Binary inputs and binary outputs	Header: 12 Pin Cabling type: standard wire, unshielded, max. 2.5 mm²

Recommended terminal lugs specifications

Terminal lugs	Type/cable specifications
Auxiliary supply	Insulated tin plated crimp pin connector, 2.6 mm² to 6.6 mm², 12 AWG to 10 AWG, Torque required is 0.5 Nm to 0.6 Nm Manufacturer/part number: End sleeve 3D-8011H or equivalent
Binary input/binary output	Insulated tin plated crimp pin connector, 2.6 mm² to 6.6 mm², 12 AWG to 10 AWG, Torque required is 0.5 Nm to 0.6 Nm Manufacturer/part number: End sleeve 3D-8011H or equivalent

Mechanical tests

Test	Standard
Degree of protection	IEC 60529, IP54 front IP20 rear
Vibration	IEC 60255-21-1, Response and endurance, Class I
Shock and bump	IEC 60255-21-2, Shock response and withstand, Class I Bump, class I

Test	Standard
Seismic	IEC 60255-21-3, Class I
Contact performance	IEC 60255-1, (Reference standard: IEC 61810-1)

Electrical tests

Test	Standard
Insulation resistance	IEC 60255-27 [35] Insulation resistance > 100 MΩ at DC 500 V Test duration: > 5 s (Between any terminal and ground, independent circuits)
Impulse voltage withstand	IEC 60255-27 [35] 5 kV, 1.2/50 µs, 0.5 J 5 +ve pulses, 5 -ve pulses (Between all terminals and case ground and any 2 independent circuits)
AC dielectric voltage	IEC 60255-27 [35] AC 2 kV RMS for 1 min (Between any terminal and ground, independent circuits) AC 1 kV RMS for 1 min (across make contacts)
Slow damped oscillatory wave	IEC 60255-26 **Common-mode:** Test voltage: 2.5-kV peak voltage **Differential mode:** Test voltage: 1.0-kV peak voltage Test duration: 2 s Source impedance: 200 Ω Voltage oscillation frequency: 1 MHz Repetition frequency: 400 Hz
Electrostatic discharge	IEC 60255-26 8-kV air discharge 6-kV contact discharge
Electrical fast transient or burst	IEC 60255-26 Test level: zone A Test severity amplitude: ± 4 kV Repetition frequency: 5 kHz
Surge immunity	IEC 60255-26 Test level: zone A Phase-to-phase: 0.5 kV, 1 kV, 2 kV Phase-to-ground: 0.5 kV, 1 kV, 2 kV, 4 kV Front time/time to half-value: 1.2/50 µs Source impedance: 2 Ω
Radiated immunity	IEC 60255-26 80 MHz to 1.0 GHz and 1.4 GHz to 2.7 GHz Field strength: 10 V/m (RMS) Amplitude modulated: 80% AM (1 kHz)
Conducted high frequency interference	IEC 60255-26 150 kHz to 80 MHz, 10 V_{rms}, dwell time: 1.0 s
Power frequency magnetic field	IEC 60255-26 30 A/m applied 1 min, 300 A/m applied for 3 s
Radiated emissions	IEC 60255-26 and CISPR 11
Conducted emissions	IEC 60255-26 and CISPR 32
Functional performance	IEC 60255-1
Gradual shutdown/start-up test	IEC 60255-26 Shut down/start up ramp 60 s Power off 5 min
Power frequency immunity test [36]	IEC 60255-26 Test level: zone A
Pulse magnetic field test	IEC 61000-4-9 1000 A/m, 5 +ve and 5 -ve
Damped oscillatory magnetic field value	IEC 61000-4-10 0.1 MHz and 1.0 MHz, 100 A/m

Product safety test

Test	Reference
Clearances and creepage distances	IEC/EN 60255-27: Edition 2 ≥ 4 mm
IP rating	IEC/EN 60255-27: Edition 2 IP54 (front side) IP20 (rear side)
Impulse voltage	IEC/EN 60255-27: Edition 2 5 kV, 5 +ve, 5 -ve pulses
AC dielectric voltage	IEC/EN 60255-27: Edition 2 AC 2 kV, 50 Hz, 1 min

35 All aspects of IEC 60255-5 have been covered under IEC 60255-27.

36 The DC binary input ports interfacing with cables whose total length is more than 10 m, must have a multi-core twisted shielded cable for providing immunity against high level of power frequency interferences.

Test	Reference
Insulation resistance	IEC/EN 60255-27: Edition 2 DC 500 V, > 5 s, > 100 MΩ
Protective bonding resistance	IEC/EN 60255-27: Edition 2 < AC 12 V/DC 12 V, 1 min, < 0.1 Ω
Protective bonding continuity	IEC/EN 60255-27: Edition 2
Flammability	IEC/EN 60255-27: Edition 2
Single fault condition	IEC/EN 60255-27: Edition 2
Mechanical resistance to shock and impact	IEC 61010-1: Edition 3 Clause number 8
Protection against electric shock	IEC 61010-1: Edition 3 Clause number 6
Protection against the spread of fire	IEC 61010-1: Edition 3 Clause number 9
Equipment temperature limits and resistance to heat	IEC 61010-1: Edition 3 Clause number 10

Climatic environmental tests

Temperature

IEC 60068-2-1/IEC 60068-2-2/IEC 60255-1/IEC 60068-2-14

Ambient operating temperature	-10 °C to +55 °C
Storage temperature (non-operational)	-25 °C to +70 °C
Change of temperature test	-10 °C to +55 °C

Humidity

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

Damp heat test, cyclic	+25 °C to 55 °C, Relative Humidity (RH) > 93 % RH (6 cycles) At lower temperature, 93 %, ± 3 % RH At upper temperature, 93 %, ± 3 % RH
Damp heat test, steady state	10 days at 93 ± 3 % RH, +40 °C

Auxiliary Relays

AC/DC Supervision Relay – 7PJ14

Ordering information – 7PJ14

Product description	Order number																	
	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16
AC/DC supervision relay	7	P	J	1	4	1	□	–	□	□	□	0	□	–	0	□	A	0
Single binary input, self reset contact, number of LEDs: 2, size 106 mm x 58 mm x 118 mm (Width x Height x Depth)							|		|	|	|		|			|		
							|		|	|	|		|			|		
Flag reset mechanism							|		|	|	|		|			|		
Hand reset							1		|	|	|		|			|		
Self reset							2		|	|	|		|			|		
									|	|	|		|			|		
Auxiliary voltage range									|	|	|		|			|		
AC 24 V to 240 V/DC 24 V to 240 V									5	|	|		|			|		
										|	|		|			|		
Contact arrangement – Make (NO) contact										|	|		|			|		
2 (NO) make contact										C	|		|			|		
											|		|			|		
Contact arrangement – Break (NC) contact											|		|			|		
2 (NC) break contact											C		|			|		
													|			|		
Binary input threshold													|			|		
DC 24 V													1			|		
DC 48 V													2			|		
AC/DC 110 V													3			|		
AC/DC 220 V													4			|		
																|		
Conformal coating																|		
Standard version – No conformal coating on printed circuit boards																A		
Conformal coating on printed circuit boards																B		

Description

Type XR relays are developments for specific applications of the type AR relay range. They are electro-mechanical relays with long service life and complying with the appropriate requirements of IEC 255 and BS 142. These relays have a low operating current, specific settings and time delayed drop-off. This latter feature is to keep the relay in the operated condition during temporary reductions in the battery voltage, such as those which occur just prior to a fuse blowing or during a busbar fault when many trip relays operate simultaneously. Healthy circuits therefore do not give spurious alarms and the relay effected by the fuse failure provides the alarm and indication necessary for accurate maintenance attention.

Application

Types XR152 and XR153 relays are designed to comply with CEGB and other specification for protection supervision requirements and the monitoring of DC voltage supplies. These applications require relays with low operating current, visual indication and the ability to initiate a remote alarm. Both these relays have mechanical flag indicators which show on de-energization, self reset on the XR152 and hand reset on the XR153.

- Low burden
- Versatile design
- Consistent positive action

Benefits

- A robust design for a long, reliable service life
- Supplied in a draw-out type case
- Various combinations of coils, contacts, and operation indicator flags can be specified

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

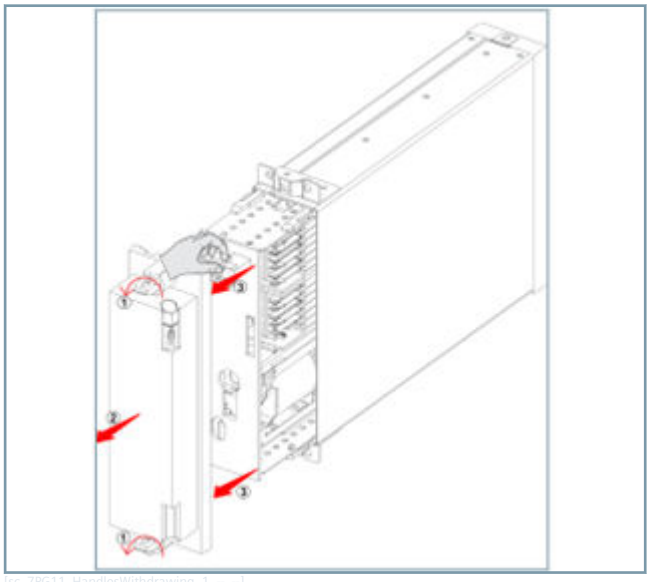
The rear connection comprises of M4 screw terminals suitable for ring type crimps.

The chassis of the device can be withdrawn from the case by pulling the handles on the top and bottom.



[Reyrolle Product Catalogue, 7PG17 Supply Supervision Relay, 1, --_--]

Figure 2.8/1 7PG17 supply supervision relay



[sc_7PG11_HandlesWithdrawing, 1, --_--]

Figure 2.8/2 Withdrawing device using handles

Earthing terminal

The case earth stud should be solidly earthed to the panel earth before any connections to the device rear terminal. Located at the top rear of the case is a case earth stud as shown in *Figure 2.4/3*, this must be connected to the main panel earth.

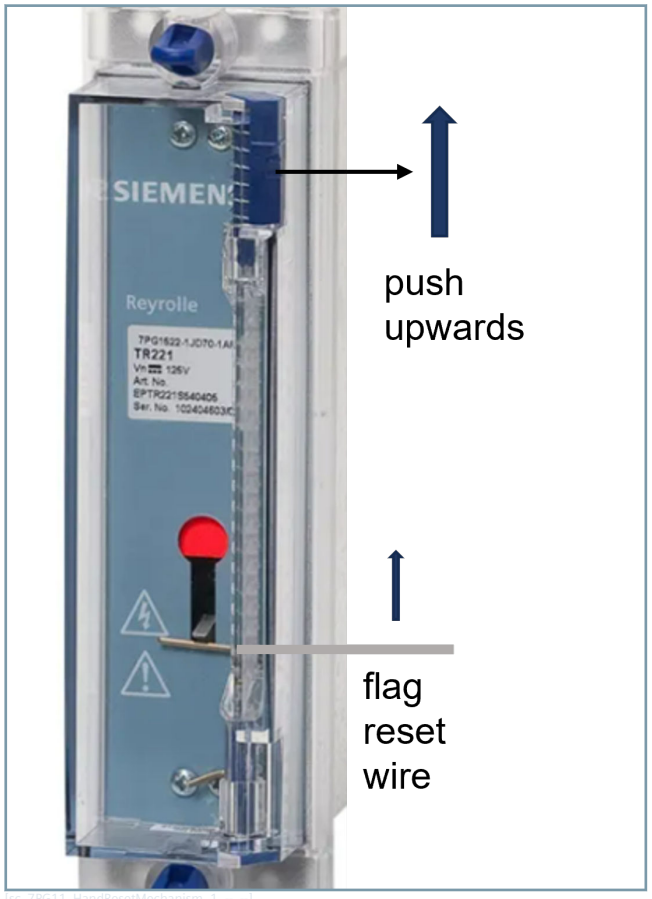


[sc_7PG11_EarthingTerminal, 1, --_--]

Figure 2.8/3 Case earth stud

Hand reset mechanism

Pull the blue handle upwards to slide the mechanism in an upwards direction with the flag reset wire at the bottom.



[sc_7PG11_HandResetMechanism, 1, --_--]

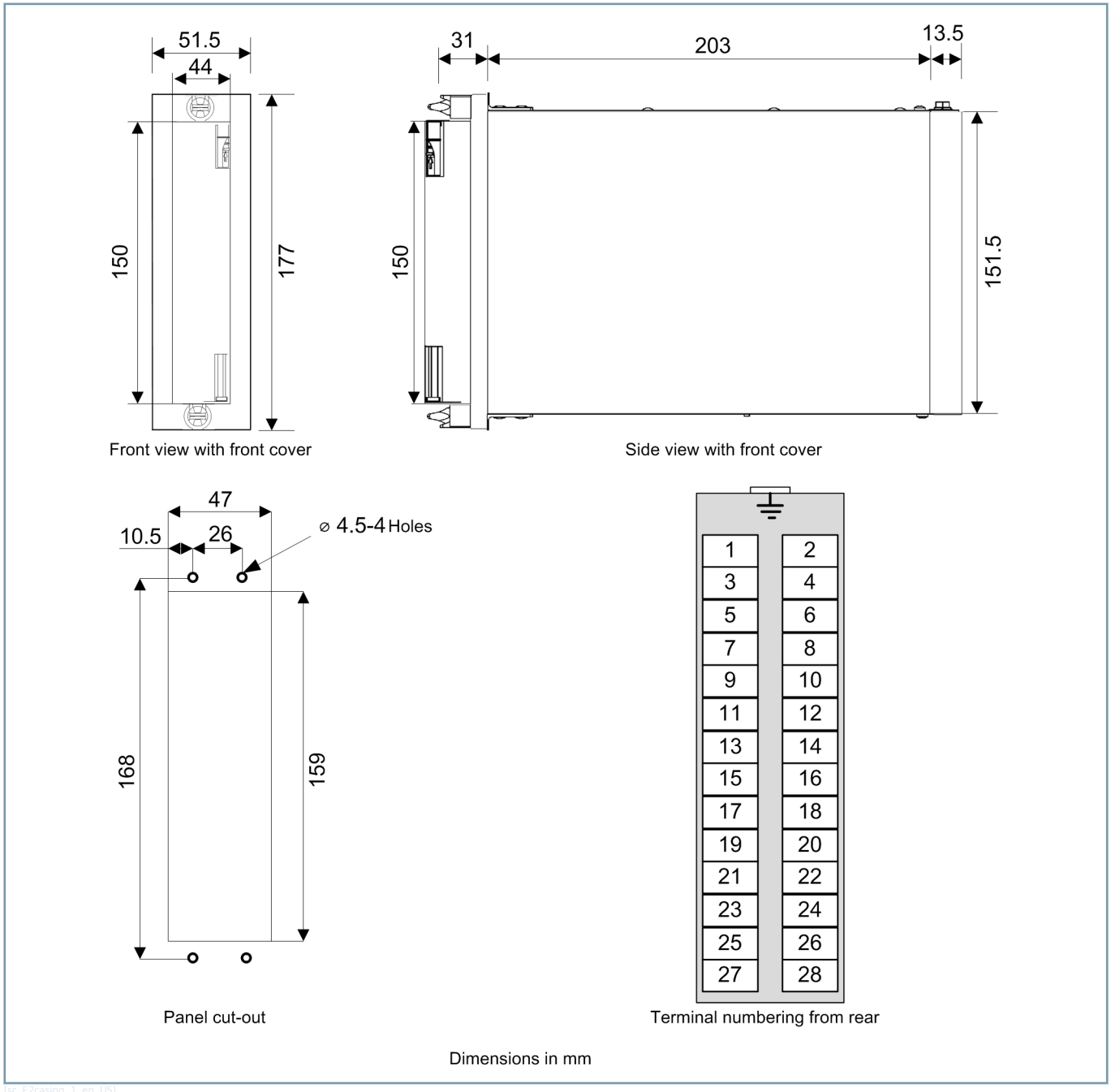
Figure 2.8/4 Hand reset mechanism

Relay information

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

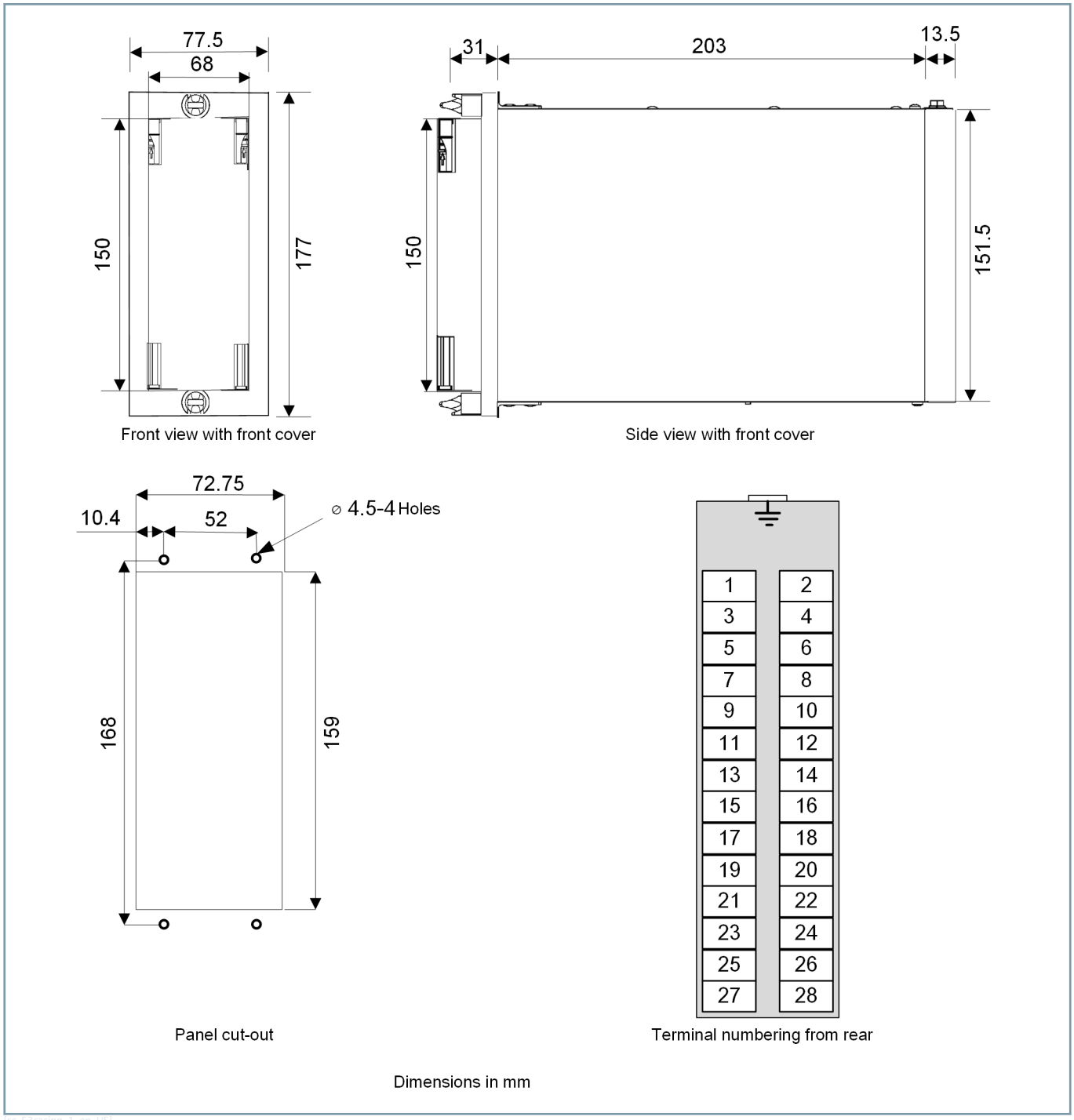
	Electrical Hazard
	Refer to device documentation
	Waste Electrical and Electronic Equipment Directive (WEEE)
CE	European CE marking
EAC	Guideline for the Eurasian Market
UK CA	United Kingdom (UK) conformity-assessed marking

Dimension drawings



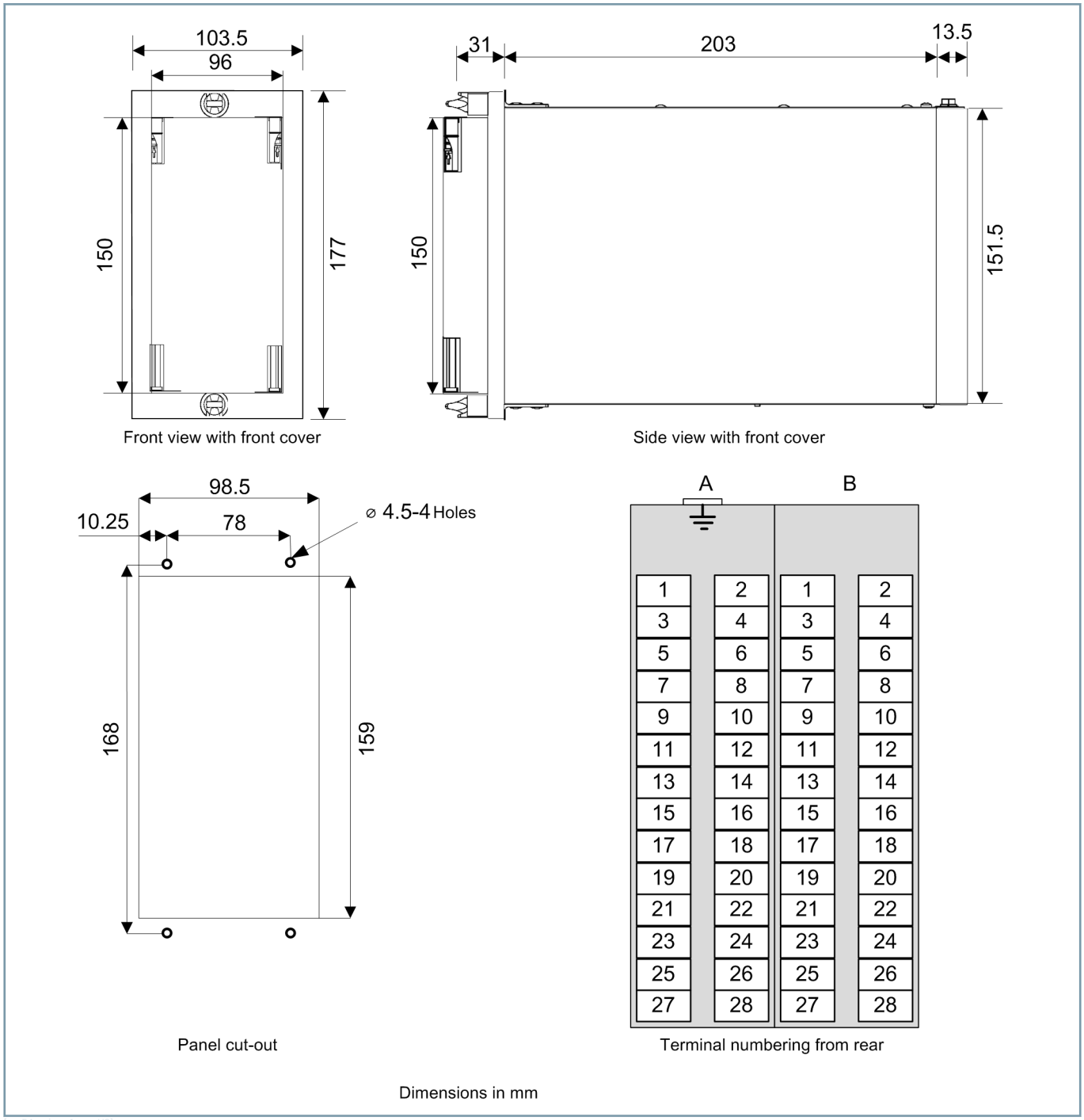
[sc_E2casing, 1, en_US]

Figure 2.8/5 Size E2



[sc_E3casing, 1, en_US]

Figure 2.8/6 Size E3



[sc_E4casing, 1, en_US]

Figure 2.8/7 Size E4

Connection Diagrams

dsffsd

Supply Supervision Relay – 7PG17-XR152 and XR153

Technical Data

7PG17 (XR152 and XR153)

Rated voltage V_n	DC 24 V, 30 V, 50 V, 60 V, 125 V and 220 V
Settings	Pick-up 70 % of rated voltage Drop-off not less than 26 % of V_n
Reset time	No less than 100 ms when supply is switched from 100 % to 26 % of V_n.
Operating current	10 mA nominal. (17 mA for 24 V and 30 V ratings)
Burden	0.4 W at DC 24 V, 1.25 W at DC 125 V
Thermal withstand	1.15 V_n continuously
Indication	A flag indicator shows when the relay is de-energised XR152 self reset flag XR153 hand reset flag

Contact arrangements

2 or 4 contacts in any combination of normally open and normally closed.

Contact rating - Make and carry continuously: AC 1250 VA or DC 1250 W with limits of 660 V and 5 A. Make and carry for 3 seconds: AC 7500 VA or DC 7500 W with limits of 660 V and 30 A.

Break

AC 1250 VA or DC 100 W resistive, or 50 W inductive (L/R = 0.04) DC with limits of 250 V.

Environmental information

Temperature

IEC 68-2-1 & 2

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

Humidity

IEC 68-2-3

56 days at 95 % RH and 40°C.

Vibration

IEC 255-21-1

The relays meet the requirements of Class 1 for vibration response and endurance.

Shock and bump

IEC 255-21-2

The relays meet the requirements of IEC 255-21-2 and BS142, sub-section 1.5.2.

(1989) with respect to shock and bump testing for class 1 severity.

Mechanical life

The relays will withstand in excess of 10,000 operations with the contact rating at a rate of 600 operations per hour.

Insulation

IEC 255-5

Relays will withstand: 5 kV peak, 1.2/50 µs, 0.5 J between all terminals and case earth and between adjacent terminals. 2 kV_{RMS} 50 Hz for 1 minute between all case terminals connected together and the case earth and between independent circuits. 1 kV_{RMS} 50 Hz for 1 minute between normally open contacts.

Ordering information - 7PG17 supply supervision relays (XR152, XR153)

Product description	Order no.																	
	1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16
Supply supervision relays (XR152, XR153)	7	P	G	1	7	4	1	-	□	□	□	1	0	-	□	A	A	0
									|	|	|				|			
Single element, self reset contacts, 4 contact, size E2, DC supply supervision relay									|	|	|				|			
									|	|	|				|			
Type of flag									|	|	|				|			
Hand reset flag									1	|	|				|			
Self reset flag									3	|	|				|			
										|	|				|			
Contact arrangement – NO										|	|				|			
0 NO										A	|				|			
1 NO										B	|				|			
2 NO										C	|				|			
3 NO										D	|				|			
4 NO										E	|				|			
											|				|			
Contact arrangement – NC											|				|			
0 NC											A				|			
1 NC											B				|			
2 NC											C				|			
3 NC											D				|			
4 NC											E				|			
															|			
Voltage rating															|			
DC 24 V															1			
DC 30 V															2			
DC 50 V															3			
DC 125 V															4			
DC 240 V															5			

Trip Relay Supervision Relay – 7PG17-XR151

Description

Type XR relays are developments for specific applications of the type AR relay range. They are electro-mechanical relays with long service life and complying with the appropriate requirements of IEC 255 and BS 142. These relays have a low operating current, specific settings and time delayed drop-off. This latter feature is to keep the relay in the operated condition during temporary reductions in the battery voltage, such as those which occur just prior to a fuse blowing or during a busbar fault when many trip relays operate simultaneously.

Application

Type XR151 relays are designed to allow the supervision of a trip relay operating coil, supply and associated wiring. This application requires relays with low operating current, visual indication and the ability to initiate a remote alarm. XR151 has a mechanical flag indicator which shows on de-energization, either self reset or hand reset.

Low burden and consistent operation, positive action. Suitable for operating with high burden trip relays (EB2) only.

Exact burden and operating current dependent upon application.

Benefits

- A robust design for a long, reliable service life
- Supplied in a draw-out type case
- Various combinations of coils, contacts, and operation indicator flags can be specified

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

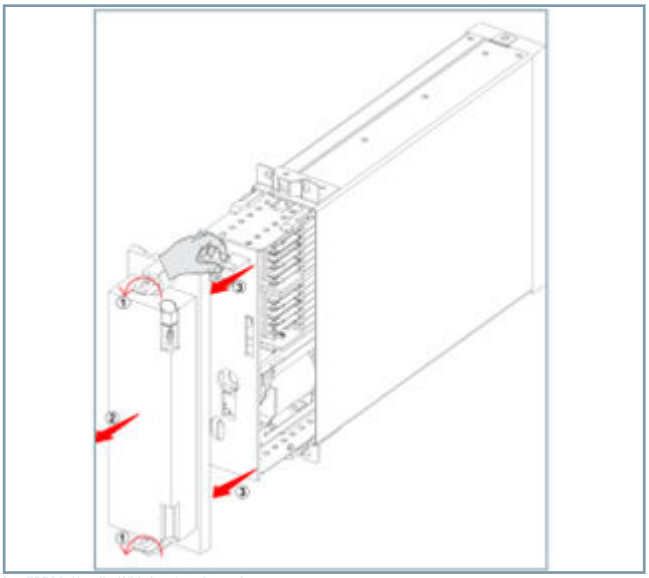
The rear connection comprises of M4 screw terminals suitable for ring type crimps.

The chassis of the device can be withdrawn from the case by pulling the handles on the top and bottom.



[Reyrolle Product Catalogue, 7PG17 Supervision Relay, 1, –_–]

Figure 2.9/1 7PG17 trip relay supervision relay



[sc_7PG11_HandlesWithdrawing, 1, –_–]

Figure 2.9/2 Withdrawing device using handles

Earthing terminal

The case earth stud should be solidly earthed to the panel earth before any connections to the device rear terminal. Located at the top rear of the case is a case earth stud as shown in *Figure 2.4/3*, this must be connected to the main panel earth.

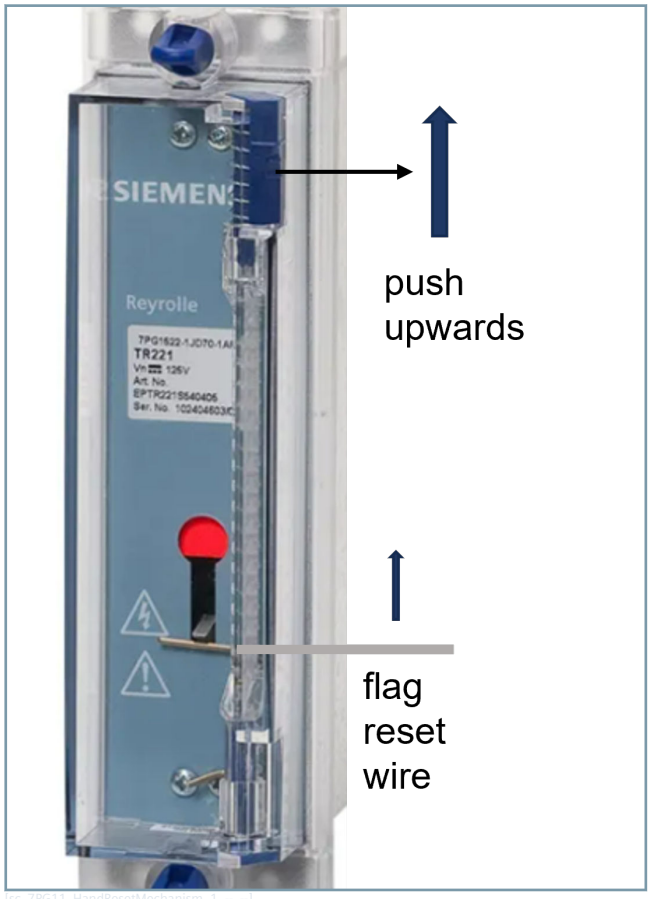


[sc_7PG11_EarthingTerminal, 1, --_--]

Figure 2.9/3 Case earth stud

Hand reset mechanism

Pull the blue handle upwards to slide the mechanism in an upwards direction with the flag reset wire at the bottom.



[sc_7PG11_HandResetMechanism, 1, --_--]

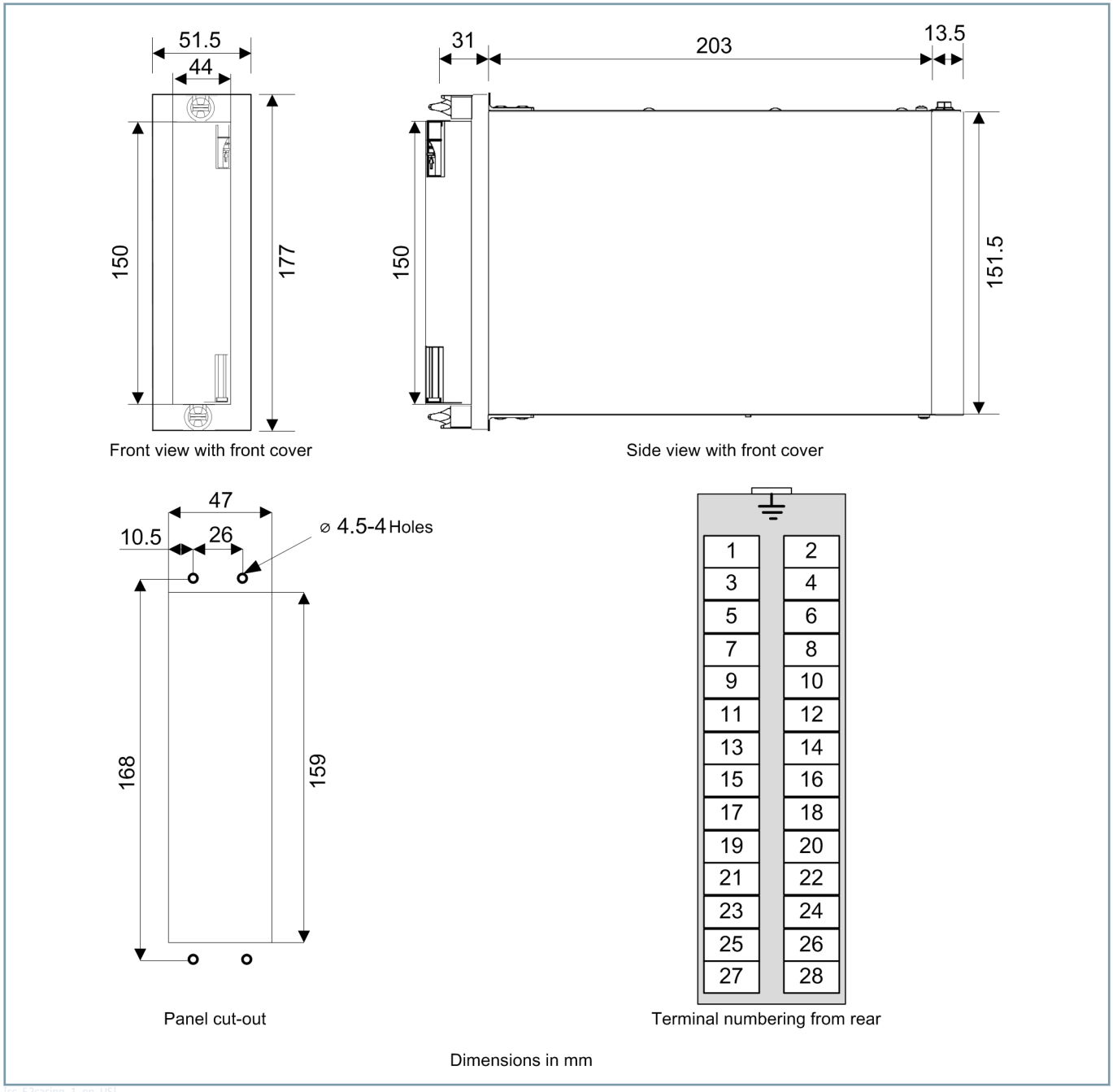
Figure 2.9/4 Hand reset mechanism

Relay information

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

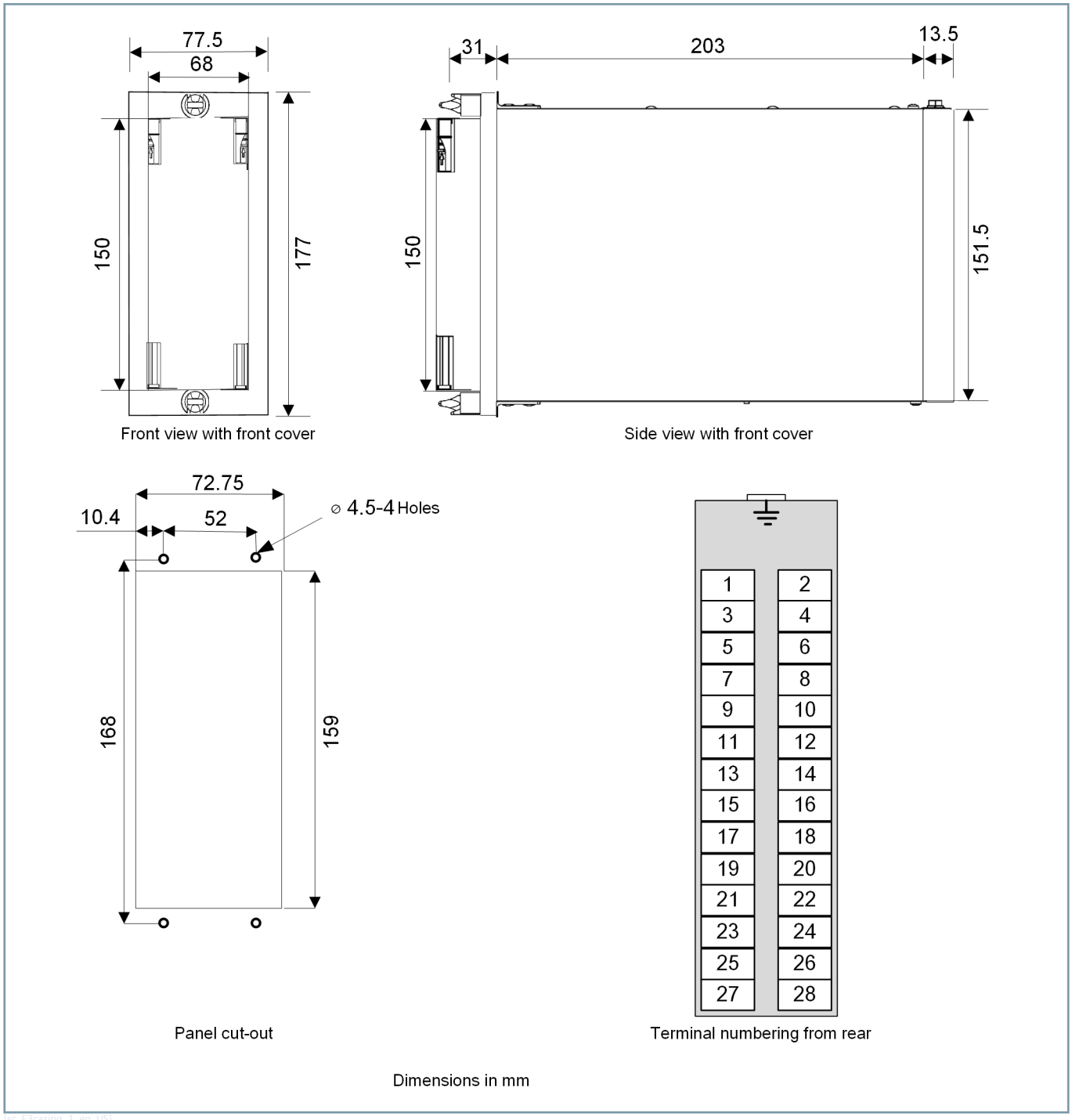
	Electrical Hazard
	Refer to device documentation
	Waste Electrical and Electronic Equipment Directive (WEEE)
CE	European CE marking
EAC	Guideline for the Eurasian Market
UK CA	United Kingdom (UK) conformity-assessed marking

Dimension drawings



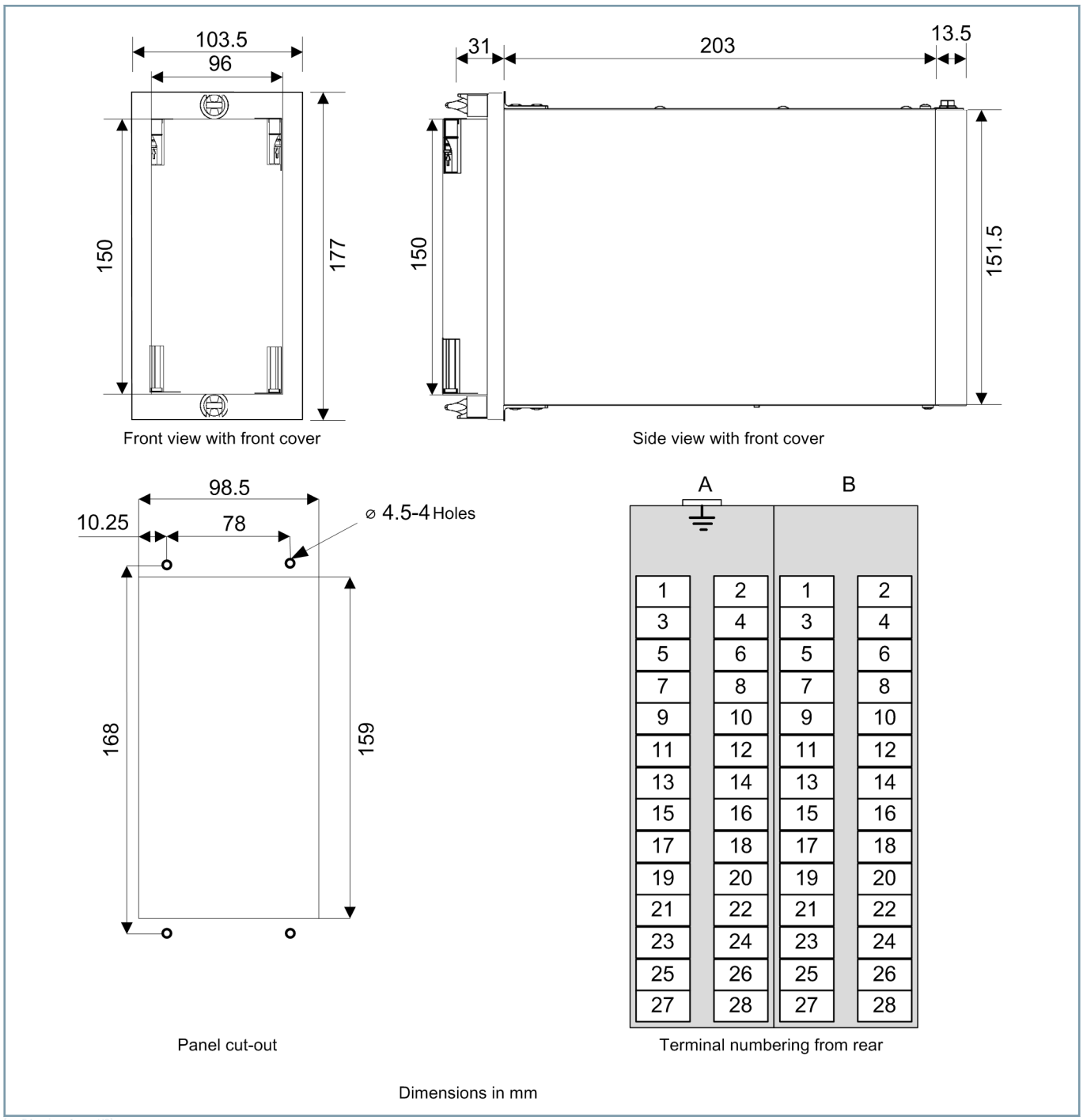
[sc_E2casing, 1, en_US]

Figure 2.9/5 Size E2



[sc_E3casing, 1, en_US]

Figure 2.9/6 Size E3



[sc_E4casing, 1, en_US]

Figure 2.9/7 Size E4

Connection Diagrams

dsffsd

Technical Data

7PG17 (XR151)

Rated voltage V_n	125 V
Settings	Pick-up: 70 % of V_n Drop-off: not less than 26 % of V_n
Reset time	No less than 100 ms when supply is switched from 100 % to 26 % of V_n.

Operating current	Less than 20 mA.
Burden	Less than 2.5 W
Thermal Withstand	1.15 V_n continuously
Indication	A self or hand reset flag indicator shows when the relay is de-energised.

Contact arrangements

4 contacts in any combination of normally open or normally closed.

Contact rating

Make and carry continuously: AC 1250 VA or DC 1250 W with limits of 660 V and 5 A.

Make and carry for 3 seconds: AC 7500 VA or DC 7500 W with limits of 660 V and 30 A.

Break

AC 1250 VA or DC 100 W resistive, or 50 W inductive (L/R = 0.04) DC with limits of 250 V.

Environmental information

Temperature

IEC 68-2-1 & 2

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

Humidity

IEC 68-2-3

56 days at 95 % RH and 40°C.

Vibration

IEC 255-21-1

The relays meet the requirements of Class 1 for vibration response and endurance.

Shock and bump

IEC 255-21-2

The relays meet the requirements of IEC 255-21-2 and BS142, sub-section 1.5.2. (1989) with respect to shock and bump testing for class 1 severity.

Mechanical life

The relays will withstand in excess of 10,000 operations with the contact rating at a rate of 600 operations per hour.

Insulation

IEC 255-5

Relays will withstand: 5 kV peak, 1.2/50 µs, 0.5 J between all terminals and case earth and between adjacent terminals. 2 kV_{RMS} 50 Hz for 1 minute between all case terminals connected together and the case earth and between independent circuits. 1 kV_{RMS} 50 Hz for 1 minute between normally open contacts.

Ordering information - 7PG17 trip relay supervision relay (XR151)

Product description	Order no.																	
	1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16
Trip relay supervision relay (XR151)	7	P	G	1	7	5	1	-	□	□	□	1	0	-	4	A	A	0
									|	|	|							
Single element, self reset contacts, 4 contact, DC 125 V voltage rating, size E2, trip supervision relay									|	|	|							
									|	|	|							
Type of flag									|	|	|							
Hand reset flag									1	|	|							
Self reset flag									3	|	|							
										|	|							
Contact arrangement – NO										|	|							
0 NO										A	|							
1 NO										B	|							
2 NO										C	|							
3 NO										D	|							
4 NO										E	|							
											|							
Contact arrangement – NC											|							
0 NC											A							
1 NC											B							
2 NC											C							
3 NC											D							
4 NC											E							

Description

Interposing relays are used for remote control of switchgear and associated equipment over pilot wires or cross-site cables. Type XR205 and XR206 are two element versions of the XR105 and XR106 respectively with the same performance. Type XR relays are developments for specific applications from the type AR (7PG11) relay range. They are electro-mechanical relays with a consistent positive action, a long service life and complying with BS142.

Type XR105 has no flag indicator, an XR106 has a flag indicator and an XR107 has a hand reset flag.

XR105 and XR106 have self-reset contacts and an XR107 has hand reset contacts.

Both types are available with a suppression diode across the coil to reduce the effects of the back emf which occurs on switch-off.

Application

Types XR105/XR106/XR107 are intended for the remote control of switchgear and associated equipment over pilot wires with a maximum resistance of 200 Ω. These relays are designed so that they are not susceptible to certain AC voltage levels which may be induced onto the pilots wires.

Benefits

- A robust design for a long, reliable service life
- Supplied in a draw-out type case
- Various combinations of coils, contacts, and operation indicator flags can be specified

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

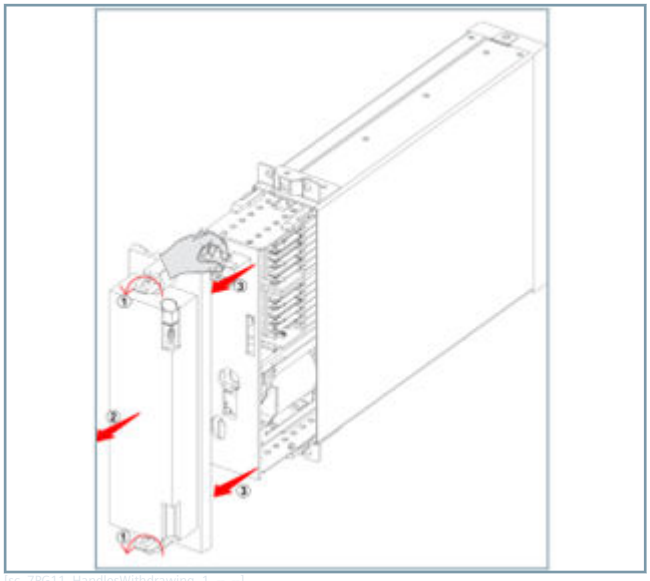
The rear connection comprises of M4 screw terminals suitable for ring type crimps.

The chassis of the device can be withdrawn from the case by pulling the handles on the top and bottom.



[Reyrolle Product Catalogue, 7PG17 Interposing Relay, 1, –_–]

Figure 2.10/1 7PG17 interposing relay



[sc_7PG11_HandlesWithdrawing, 1, –_–]

Figure 2.10/2 Withdrawing device using handles

Earthing terminal

The case earth stud should be solidly earthed to the panel earth before any connections to the device rear terminal. Located at the top rear of the case is a case earth stud as shown in *Figure 2.4/3*, this must be connected to the main panel earth.

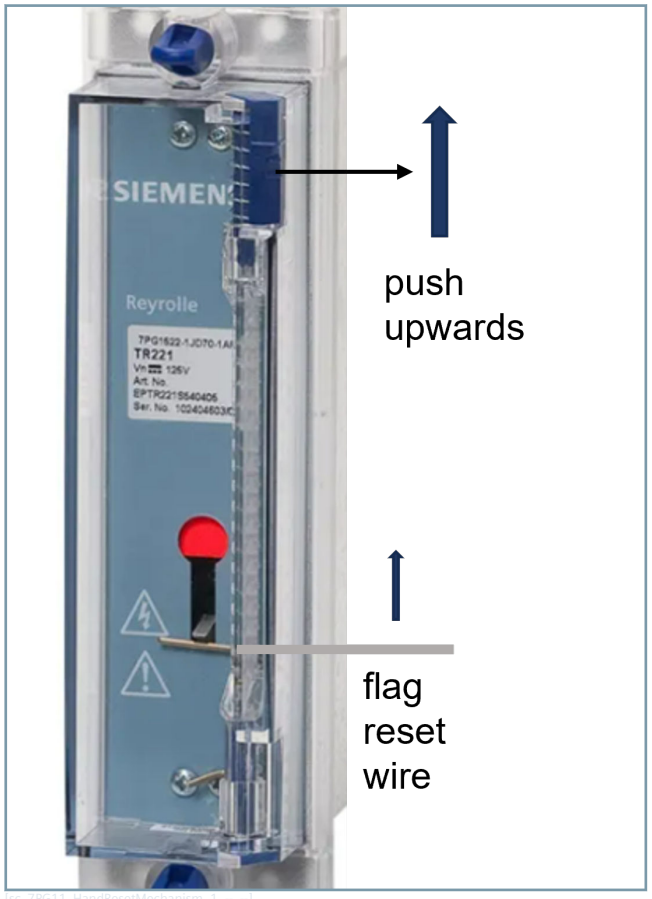


[sc_7PG11_EarthingTerminal, 1, –_–]

Figure 2.10/3 Case earth stud

Hand reset mechanism

Pull the blue handle upwards to slide the mechanism in an upwards direction with the flag reset wire at the bottom.



[sc_7PG11_HandResetMechanism, 1, --_--]

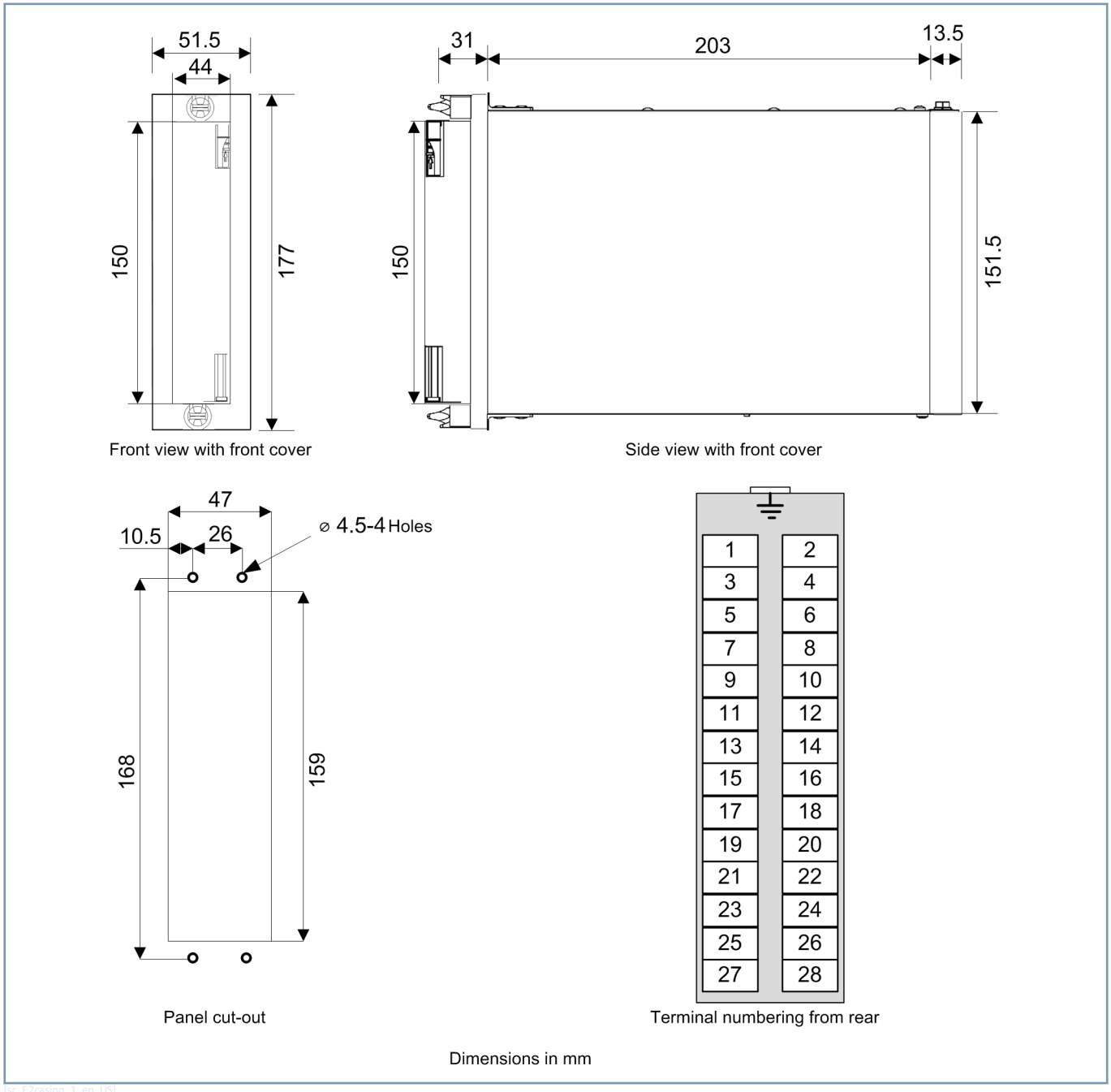
Figure 2.10/4 Hand reset mechanism

Relay information

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

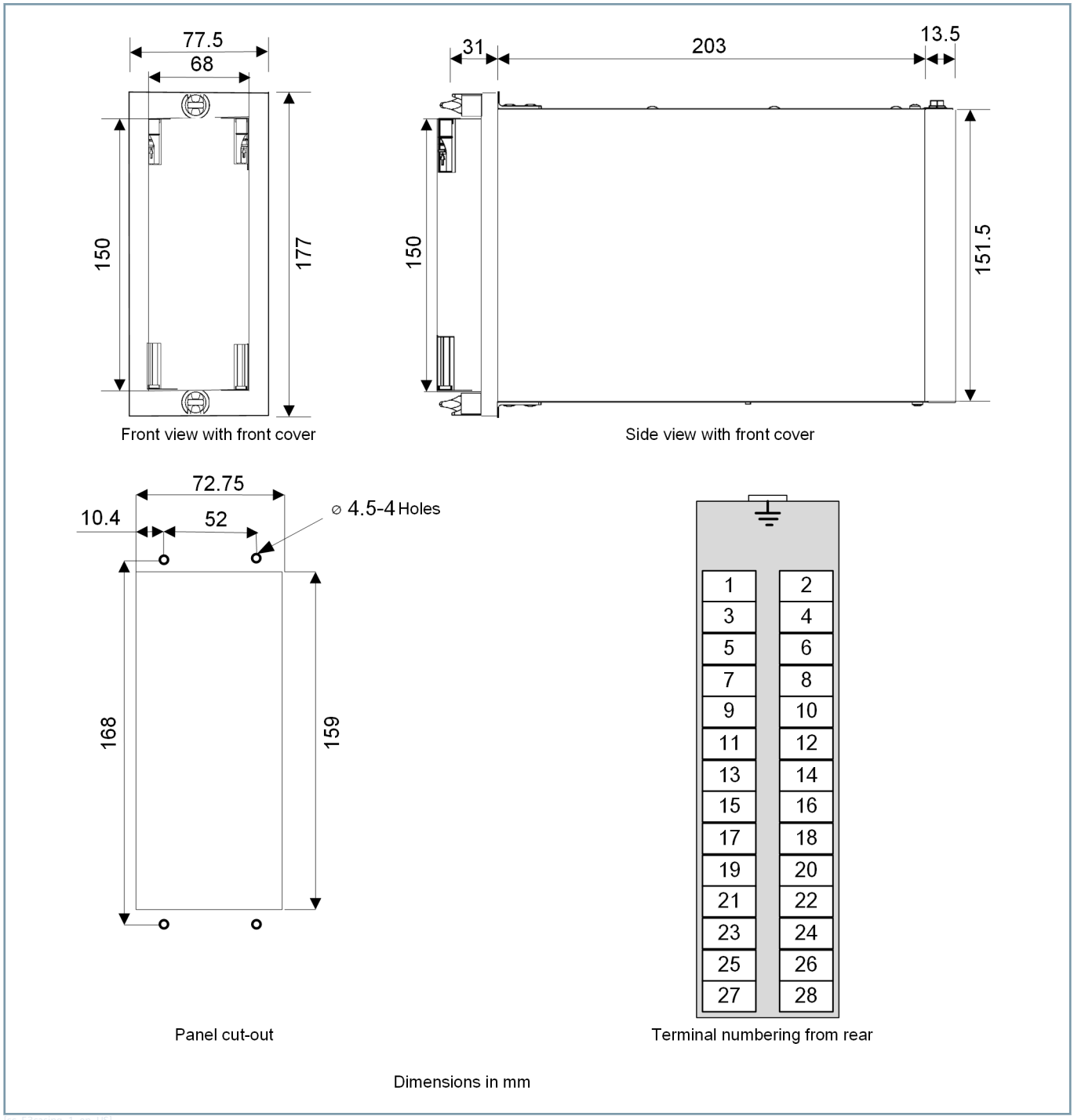
	Electrical Hazard
	Refer to device documentation
	Waste Electrical and Electronic Equipment Directive (WEEE)
CE	European CE marking
EAC	Guideline for the Eurasian Market
UK CA	United Kingdom (UK) conformity-assessed marking

Dimension drawings



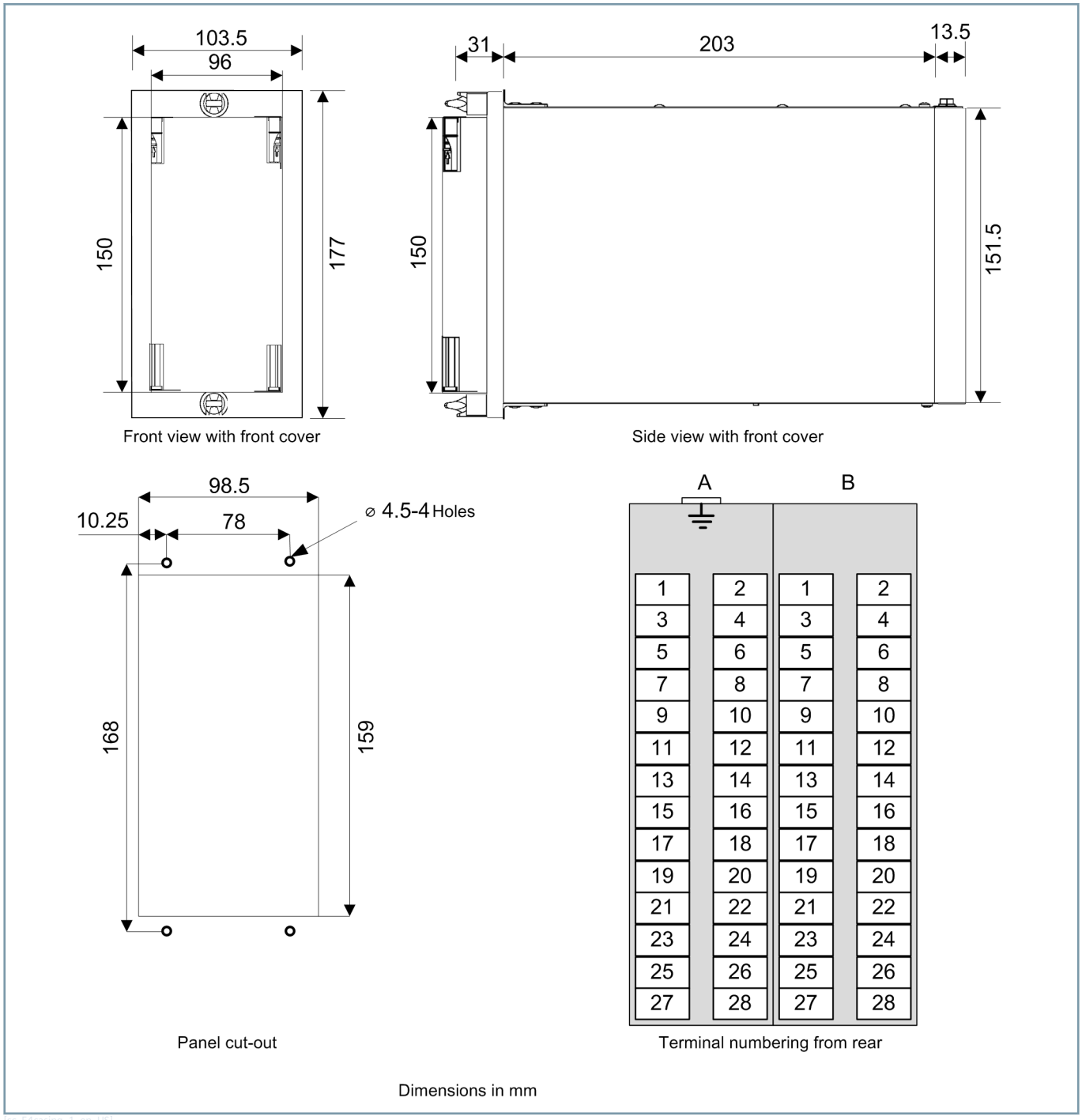
[sc_E2casing, 1, en_US]

Figure 2.10/5 Size E2



[sc_E3casing, 1, en_US]

Figure 2.10/6 Size E3



[sc_E4casing, 1, en_US]

Figure 2.10/7 Size E4

Technical Data

7PG17 (XR105, XR106 and XR107, XR205 and XR206)

External resistor required for DC 125 V operation. Operating range: With zero pilot resistance 78 to 125 % of nominal rated voltage

With a maximum pilot loop resistance of 200 Ω 92 to 125 % of nominal rated voltage. Burden: Typically 3.7 W for a relay with 4 normally open contacts.

AC rejection

For a DC 48 V rated relay, typically AC 110 V 50 Hz. Operating time: For a relay rated DC 48 V with 4 normally open contacts

at rated voltage typically 30 ms. With 200 Ω pilot resistance less than 80 ms. Reset time is less than 35 ms.

Contacts

2 normally open, 4 normally open or 2 normally open and 2 normally closed, self reset on XR105 and XR106.

Hand reset on XR107.

Normal duty, contact ratings. Make and carry continuously AC 1250 VA or DC 1250 W within the limits of 660 V and 5 A.

Make and carry for 3 seconds: AC 7500 VA or DC 7500 W within the limits of 660 V and 30 A.

Break: AC 1250 VA or DC 100 W (resistive) or 50 W (inductive). L/R = 0.04, DC within the limits of 250 V and 5 A.

Temperature

In service:	-10°C to 55°C
Storage	-25°C to 70°C

Mechanical durability

Vibration, relays comply with BS142, Section 2.1 Category S2.

Shock, relays will withstand a 20G shock or impact on the panel without operating. Operational/mechanical life, relays will withstand in excess of 10,000 operations with the contact rating stated.

Normally closed contact location (Epsilon case terminal numbers)				
	1 to 3	2 to 4	5 to 7	6 to 8
1 NC		NC		
2 NC	NC	NC		
3 NC	NC	NC		NC
4 NC	NC	NC	NC	NC

Ordering information - 7PG17 XR105, XR106 and XR107 interposing relays

Product description	Order no.																	
	1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16
7PG17 XR105, XR106 and XR107	7	P	G	1	7	3	□	-	□	□	□	□	0	-	□	A	A	□
							|		|	|	|	|			|			|
Size E2, interposing control relay (XR105, XR106, XR107)							|		|	|	|	|			|			|
							|		|	|	|	|			|			|
Number of elements							|		|	|	|	|			|			|
Single element, self reset contacts							1		|	|	|	|			|			|
Single element, hand reset contacts							3		|	|	|	|			|			|
									|	|	|	|			|			|
Type of flag									|	|	|	|			|			|
No flag									0	|	|	|			|			|
Hand reset flag									1	|	|	|			|			|
										|	|	|			|			|
Contact arrangement – NO										|	|	|			|			|
0 NO										A	|	|			|			|
1 NO										B	|	|			|			|
2 NO										C	|	|			|			|
3 NO										D	|	|			|			|
4 NO										E	|	|			|			|
											|	|			|			|
Contact arrangement – NC											|	|			|			|
0 NC											A	|			|			|
1 NC											B	|			|			|
2 NC											C	|			|			|
3 NC											D	|			|			|
4 NC											E	|			|			|
												|			|			|
Number of contacts [37]												|			|			|
Two												0			|			|
Four												1			|			|
															|			|
Voltage rating															|			|
DC 24 V															1			|
DC 30 V															2			|
DC 50 V															3			|
DC 125 V[38]															4			|
																		|
Back Emf suppression diode																		|
Not fitted																		0
Fitted																		1

2.10

37 Number of contacts must match selected contact arrangement

38 Supplied with resistor VCE:2101H10152 (1500 Ohm) for wiring in series with the coil

Trip Circuit Supervision Resistors – 7PG1753

Description

The 7PG1753 trip circuit supervision devices and protection relays provide the trip circuit supervision function. Trip circuit supervision circuits are derived from UK ENA S15 standard schemes H4, H5, H6 and H7.

7PG1753 trip circuit supervision devices (XR250 and XR251) with DC 125 V voltage rating always supplied with 2 x 3.3 k Ω (410A13288) and 1 x 2 k Ω (410A13213) resistors and use the following external resistors:

Voltage	R1	R2	R3	R4
DC 30 V	–	–	100	100
DC 50 V	–	–	350	350
DC 125 V	2000	–	3300	3300
DC 240 V	7000	–	10300	10300

Table 2.11/1 Coil and resistor data

Dimension drawings

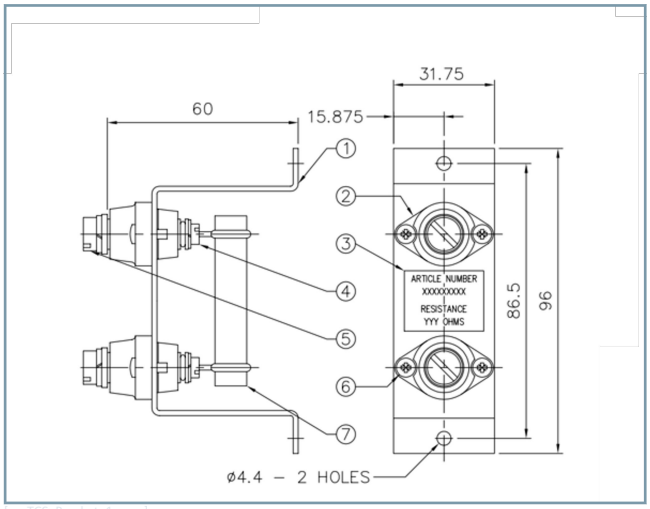


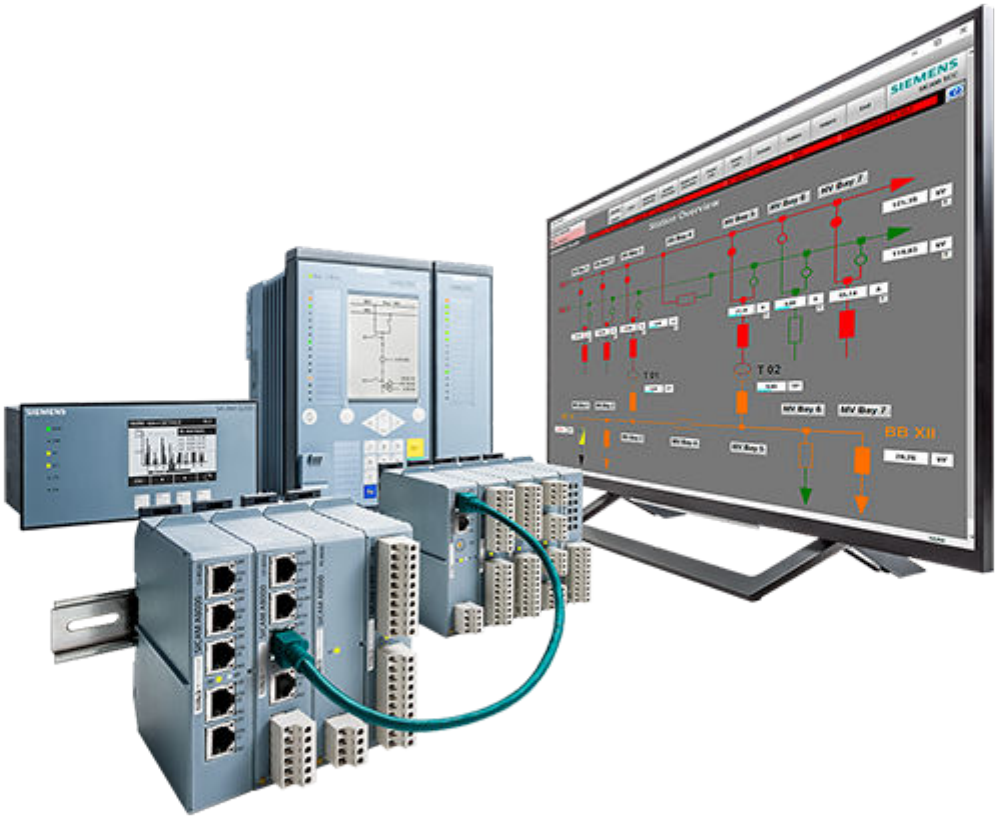
Figure 2.11/1 TCS resistor with bracket

Ordering information - TCS resistors

Resistors AW1602 and 5 %, 17 W	
2300 Ω	VCE: 410A12727
2000 Ω	VCE: 410A13213
3300 Ω	VCE: 410A13288
350 Ω	VCE: 410A15941
1500 Ω	VCE: 410A24322
3100 Ω	VCE: 410A19819
4000 Ω	VCE: 410A23204
10300 Ω	VCE: 410A24319

Resistors	
7000 Ω	VCE: 410A19820

Resistors W24	
100 Ω	VCE: 410A24277
4700 Ω	VCE: 410A24291


SIEMENS
T 02
BB XII

6GK19/6XV18

Description

- Used for optical Industrial Ethernet, PROFINET and PROFIBUS networks
- Rugged design for industrial applications both indoors and outdoors
- Halogen-free design for use in buildings
- Trailing cable for special applications with forced motion control
- High interference immunity as not sensitive to electromagnetic interference
- Available pre-assembled
- Extensive range of UL approvals

Benefits

- Simple laying of cables;
  - pre-assembled cables
  - no grounding problems
  - very light fiber-optic cables
- Tap-proof;
  - no radiation from cable
- Silicone-free;
  - therefore suitable for use in the automotive industry (for example in paint shops)

Applications

Marine duplex FOC SIENOPYR

Halogen-free, non-crush, flame-retardant, marine-approved fiberoptic cable for permanent installation on ships and offshore platforms, both indoors and on open deck. Sold by the meter.

Fiber-optic indoor cable

Halogen-free fiber-optic cable, non-crush, flame-retardant, for installation inside buildings (e.g. in production halls and in building automation). Supplied in fixed lengths, pre-assembled with four ST/BFOC connectors.

Standard FOC/FRNC cable

Fiber-optic cables for the following application areas indoors and outdoors:

- For routing above ground
- For installation inside buildings



[sc_GlassFiberOpticCables, 1, —_–]

Figure 3.1/1 Example of a Fiber Optic Cable

Sold by the meter and in fixed lengths, pre-assembled with four ST/BFOC, four SC or four LC connectors.

Fiber-optic trailing cable

Fiber-optic cables for the special application of forced motion control, such as in continuously moving machine parts (cable carrier applications) indoors and outdoors.

Two cable variants are available for this application:

- FO trailing cable; Cable for high mechanical stress, PUR protective jacket, UL approval
- FO trailing cable GP (General Purpose); Cable for low mechanical stress, PVC protective jacket, UL approval

Sold by the meter and in fixed lengths, pre-assembled with four ST/BFOC, four SC or four LC connectors.

Fiber-optic outdoor/rugged cable

Waterproof cable (lengthwise and sideways) for use outdoors with non-metallic protection against rodents, for direct routing underground. Sold by the meter and in fixed lengths, pre-assembled with four ST/BFOC, four SC or four LC connectors.

Note: Special tools and trained personnel are required for pre-assembling glass fiberoptic cables.

Selection and Ordering Data

Description	Order no.												
	1	2	3	4	5	6	7		8	9	10	11	12
Glass optical fiber cable	6	X	V	1	8	2	0	-	☐	☐	☐	☐	☐
									▲	▲	▲	▲	▲
Standard fiber-optic cable (62.5/125/900/OM1), segmentable[39]									|	|	|	|	|
Multimode cable, sold by the meter; max. delivery unit 2000 m; minimum order quantity 20 m									5	A	|	|	|
Preferred lengths pre-assembled with 4 BFOC connectors (1 m to 300 m)[40]									5	B	|	|	|
Lengths:									|	|	|	|	|
1 m									|	|	H	1	0
2 m									|	|	H	2	0
3 m									|	|	H	3	0
4 m									|	|	H	4	0
5 m									|	|	H	5	0
10 m									|	|	N	1	0
15 m									|	|	N	1	5
20 m									|	|	N	2	0
30 m									|	|	N	3	0
40 m									|	|	N	4	0
50 m									|	|	N	5	0
55 m									|	|	N	5	5
60 m									|	|	N	6	0
65 m									|	|	N	6	5
70 m									|	|	N	7	0
75 m									|	|	N	7	5
80 m									|	|	N	8	0
100 m									|	|	T	1	0
120 m									|	|	T	1	2
130 m									|	|	T	1	3
150 m									|	|	T	1	5
200 m									|	|	T	2	0
250 m									|	|	T	2	5
300 m									|	|	T	3	0
Flexible fiber-optic trailing cable (62.5/125/1400/OM1), segmentable[39]									|	|	|	|	|
Multimode cable, sold by the meter; max. delivery unit 2000 m; minimum order quantity 20 m									6	A	|	|	|
Preferred lengths pre-assembled with 4 BFOC connectors (1 m to 50 m)									6	B	|	|	|
Lengths:									|	|	|	|	|
1 m									|	|	H	1	0
2 m									|	|	H	2	0
3 m									|	|	H	3	0
5 m									|	|	H	5	0
10 m									|	|	N	1	0
15 m									|	|	N	1	5
20 m									|	|	N	2	0
30 m									|	|	N	3	0
50 m									|	|	N	5	0
Indoor fiber-optic cable (62.5/125/900/OM1), segmentable[39]									|	|	|	|	|
Multimode cable, sold by the meter; max. delivery unit 2000 m; minimum order quantity 20 m									7	A	|	|	|

39 Special tools and trained personnel are required for pre-assembling glass fiber-optic cables

40 Special fiber-optic cables, lengths and accessories available on request

Cables – Glass Fiber Optic Cables

Description	Order no.												
Preferred lengths pre-assembled with 4 BFOC connectors (0.5 m to 100 m)									7	B	|	|	|
Lengths:									|	|	|	|	|
0.5 m									|	|	H	0	5
1 m									|	|	H	1	0
2 m									|	|	H	2	0
3 m									|	|	H	3	0
5 m									|	|	H	5	0
10 m									|	|	N	1	0
15 m									|	|	N	1	5
20 m									|	|	N	2	0
25 m									|	|	N	2	5
50 m									|	|	N	5	0
75 m									|	|	N	7	5
100 m									|	|	T	1	0
Glass optical fiber cable	6	X	V	1	8	3	0	-	☐	☐	☐	☐	☐
									▲	▲	▲	▲	▲
SIENOPYR marine duplex fiberoptic cable; (62.5/125/900/OM1)									|	|	|	|	|
Fiber-optic cable for routing on ships and offshore platforms Multimode cable, sold by the meter; max. delivery unit 1000 m, minimum order quantity 20 m									0	N	H	1	0
Glass optical fiber cable	6	X	V	1	8	4	3	-	☐	☐	☐	☐	☐
									▲	▲	▲	▲	▲
FO FRNC cable GP (2E9/125/900/OS2) segmentable[39]									|	|	|	|	|
Single-mode cable with 2 fibers, sold by the meter; max. delivery unit 2000 m; minimum order quantity 20 m									2	E	|	|	|
Preferred lengths; pre-assembled at both ends with 2 LC duplex connectors for connecting MRB85536M									7	E	|	|	|
Lengths:									|	|	|	|	|
50 m						8	3	-	7	E	N	5	0
FO robust cable GP (4E9/125/900/OS2) segmentable[39]									|	|	|	|	|
Single-mode cable with 4 fibers, sold by the meter; max. delivery unit 2000 m; minimum order quantity 20 m									2	R	|	|	|
Glass optical fiber cable	6	X	V	1	8	7	3	-	☐	☐	☐	☐	☐
									▲	▲	▲	▲	▲
FO standard cable GP (50/125/1400/0M2++) segmentable[39]									|	|	|	|	|
Multimode cable, sold by the meter; max. delivery unit 1000 m; minimum order quantity 20 m									2	A	|	|	|
Preferred lengths pre-assembled with 4 BFOC connectors (0.5 m to 300 m)[40]									3	A	|	|	|
Preferred lengths pre-assembled with 2 LC duplex plugs (1 m to 300 m)[40]									5	A	|	|	|
Preferred lengths pre-assembled with 4 SC plugs (0.5 m to 300 m)[40]									6	A	|	|	|
Lengths:									|	|	|	|	|
0.5 m									|	|	H	0	5
1 m									|	|	H	1	0
2 m									|	|	H	2	0
3 m									|	|	H	3	0
5 m									|	|	H	5	0
10 m									|	|	N	1	0
15 m									|	|	N	1	5
20 m									|	|	N	2	0
30 m									|	|	N	3	0
40 m									|	|	N	4	0
50 m									|	|	N	5	0
80 m									|	|	N	8	0
100 m									|	|	T	1	0
150 m									|	|	T	1	5
200 m									|	|	T	2	0

Description	Order no.									
300 m							T	3	0
FO FRNC cable (50/125/1400/OM2++) segmentable[39]										
Multimode cable, sold by the meter; max. delivery unit 1000 m; minimum order quantity 20 m						2	B			
FO trailing cable (50/125/1400/OM2++) segmentable[39]										
Multimode cable, sold by the meter; max. delivery unit 1000 m; minimum order quantity 20 m						2	C			
Preferred lengths pre-assembled with 4 BFOC connectors (3 m to 100 m)[40]						3	C			
Preferred lengths pre-assembled with 2 LC duplex plugs (5 m to 20 m)[40]						5	C			
Preferred lengths pre-assembled with 4 SC plugs (3 m to 100 m)[40]						6	C			
Lengths:										
3 m							H	3	0
5 m							H	5	0
10 m							N	1	0
20 m							N	2	0
50 m							N	5	0
100 m							T	1	0
FO trailing cable GP (50/125/1400/OM2++) segmentable[39]										
Multimode cable, sold by the meter; max. delivery unit 1000 m; minimum order quantity 20 m						2	D			
Preferred lengths pre-assembled with 4 BFOC connectors (3 m to 100 m)[40]						3	D			
Preferred lengths pre-assembled with 4 SC plugs (3 m to 100 m)[40]						6	D			
Lengths:										
3 m							H	3	0
5 m							H	5	0
10 m							N	1	0
20 m							N	2	0
50 m							N	5	0
100 m							T	1	0
FO FRNC cable (50/125/900/OM4) segmentable[39]										
Multimode cable, sold by the meter; max. delivery unit 1000 m; minimum order quantity 20 m						2	E			
Preferred lengths pre-assembled at both ends with 2 LC duplex connectors for connecting MRB85536M[40]						4	F			
Lengths:										
50 m	8	3	-			4	F	N	5	0
FO flexible cable (50/125/900 OM4)										
Multimode cable, sold by the meter; max. delivery unit 1000 m; minimum order quantity 20 m						2	F			
FO ground cable (50/125/1400/OM2++) segmentable[39]										
Multimode cable, sold by the meter; max. delivery unit 2000 m; minimum order quantity 20 m						2	G			
Preferred lengths pre-assembled with 4 BFOC connectors (100 m to 300 m)[40]						3	G			
Preferred lengths pre-assembled with 4 SC plugs (100 m to 300 m)[40]						6	G			
Lengths:										
100 m							T	1	0
200 m							T	2	0
300 m							T	3	0
FO robust cable GP (50/125/900/OM2++) segmentable[39]										
Multimode cable, sold by the meter; max. delivery unit 2000 m; minimum order quantity 20 m						2	R			
Preferred lengths pre-assembled with 2 LC duplex plugs (1 m to 150 m)[40]						5	R			
Lengths:										
1 m							H	1	0
2 m							H	2	0
3 m							H	3	0
10 m							N	1	0
30 m							N	3	0
50 m							N	5	0

Cables – Glass Fiber Optic Cables

Description	Order no.				
100 m	|	|	T	1	0
150 m	|	|	T	1	5

Description	Order no.																
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
Accessories	6	G	K	1	9	0	1	-	0	☐	☐	☐	0	-	☐	A	☐	0
										▲	▲	▲	|		▲	|	▲	|
Multimode FO BFOC connector set										|	|	|	|		|	|	|	|
For FO standard cable (50/125/1400), FO ground cable (50/125/1400), flexible FO trailing cable, INDOOR FO cable (62.5/125/900), 20 units										D	A	2	|		0	|	A	|
Multimode FO LC duplex plug										|	|	|	|		|	|	|	|
LC duplex plug (10 units) for INDOOR FO cable (62.5/125/900), FO robust cable GP (50/125/900), FO standard cable (62.5/125/900)										R	B	1	|		2	|	B	|

6XV1843

Description

- Patch cables, available as pre-assembled cables (in lengths of 1 m, 2 m, and 3 m)
- 2-core patch cables for directly connecting active network components in the control cabinet
- Small cable diameter for easy laying of cables
- Easy connection of active network components with different fiber-optic interfaces by means of patch cords with two types of connectors

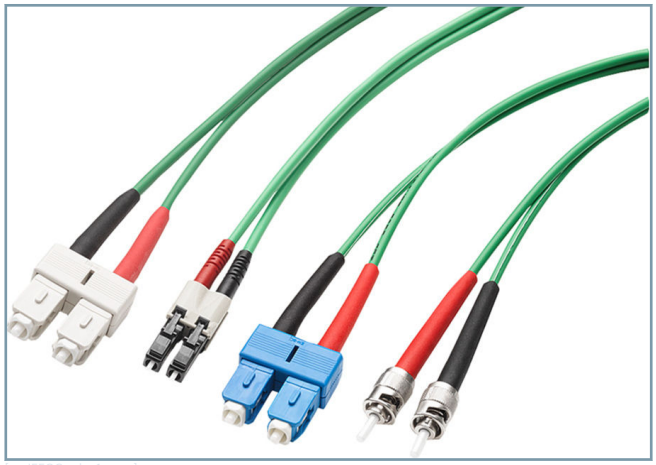
Benefits

- Quick and error-free commissioning thanks to pre-assembled, factory- tested FO patch cables
- Simple cable laying in the control cabinet due to small cable diameter
- Silicone-free, therefore suitable for use in the automotive industry (for example on paint lines)
- Easy connection of active network components with various fiberoptic connection methods in the control cabinet

Functions

The flexibility of the cable ensures easy installation, for example in a control cabinet, or to connect equipment in a control room. The length of an IE FO TP Cord is 1 m.

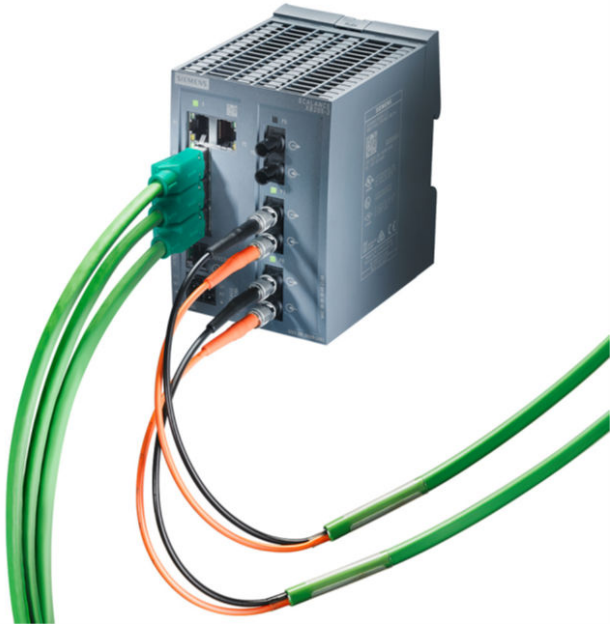
Cable variants with different fiber-optic connectors are used for the easy connecting of devices to various fiber-optic interfaces.



[sc_IEFOCords, 1, –_–]

Figure 3.1/2 Example of IE FO Cords

Applications



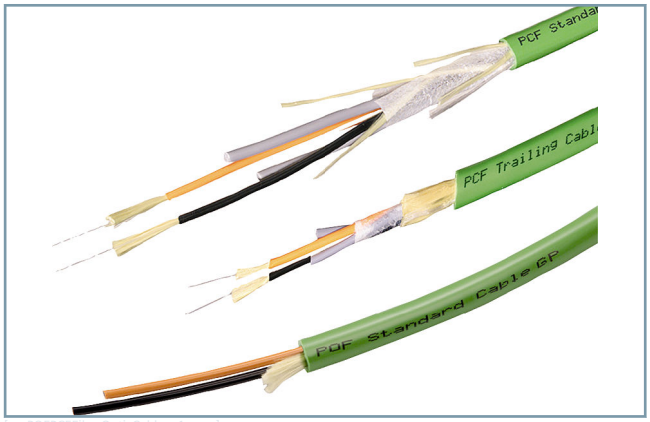
Selection and Ordering Data

Description	Order no.																
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
IE FO Cords	6	X	V	1	8	4	3	-	5	☐	H	☐	0	-	0	☐	☐	0
										▲	|	▲	|		|	▲	▲	|
Multimode										|	|	|	|		|	|	|	|
MM FO cord SC/SC, with two SC duplex connectors, 1 m										E	|	1	|		|	C	C	|
MM FO cord SC/BFOC, with one SC duplex connector and two BFOC connectors, 1 m										E	|	1	|		|	C	B	|
MM FO cord SC/LC, with one SC duplex connector and one LC duplex connector, 1 m										E	|	1	|		|	C	A	|
MM FO cord LC/LC, with two LC duplex connectors, 1 m										E	|	1	|		|	A	A	|
MM FO cord LC/LC, with two LC duplex connectors, 2 m										E	|	2	|		|	A	A	|
MM FO cord LC/LC, with two LC duplex connectors, 3 m										E	|	3	|		|	A	A	|
MM FO cord BFOC/LC, with two BFOC connectors and one LC duplex connector, 1 m										E	|	1	|		|	A	B	|
MM FO cord BFOC/LC, with two BFOC connectors and one LC duplex connector, 2 m										E	|	2	|		|	A	B	|
MM FO cord BFOC/LC, with two BFOC connectors and one LC duplex connector, 3 m										E	|	3	|		|	A	B	|
Single-mode										|	|	|	|		|	|	|	|
SM FO cord SC/SC, with two SC duplex connectors, 1 m										F	|	1	|		|	C	C	|
SM FO cord SC/BFOC, with one SC duplex connector and two BFOC connectors, 1 m										F	|	1	|		|	C	B	|
SM FO cord SC/LC, with one SC duplex connector and one LC duplex connector, 1 m										F	|	1	|		|	C	A	|
SM FO cord LC/LC, with two LC duplex connectors, 1 m										F	|	1	|		|	A	A	|
SM FO cord LC/LC, with two LC duplex connectors, 2 m										F	|	2	|		|	A	A	|
SM FO cord LC/LC, with two LC duplex connectors, 3 m										F	|	3	|		|	A	A	|
SM FO cord BFOC/LC, with two BFOC connectors and one LC duplex connector, 1 m										F	|	1	|		|	A	B	|
SM FO cord BFOC/LC, with two BFOC connectors and one LC duplex connector, 2 m										F	|	2	|		|	A	B	|
SM FO cord BFOC/LC, with two BFOC connectors and one LC duplex connector, 3 m										F	|	3	|		|	A	B	|

6XV1861/74

Description

- Electrical isolation of Industrial Ethernet/PROFINET devices
- Protection of the transmission link against electromagnetic interference
- Up to 50 m cable length with POF fiber-optic cables and up to 100 m with PCF fiber-optic cables
- Rugged fiber-optic standard cables, designed for industrial applications
- Extensive range of UL approvals



[sc_POFPCFFiberOpticCables, 1, --_--]

Figure 3.1/3 Example of POF and PCF Fiber-Optic Cables

Cables – POF and PCF Fiber-Optic Cables

Product Type	Order Number	Product Description	Cross-sectional Image	Number of FO Cores/per FOC Cable	Version of the FO Conductor Fiber	Bending Radius	Ambient Temperature	Fire Behaviour	Radiological Resistance to UV Radiation	Halogen-Free	Silicon-Free	UL Approval	RoHS Conformity
POF standard cable GP (980/1000)	6XV1874-2A	Sold by the meter, minimum order 20 m, max. length 500 m		2	POF FOC 980/1000 µm	150 mm	-30 to +70 °C	Flame resistant	No	No	Yes	Yes	Yes
POF trailing cable (980/1000)	6XV1874-2B	Sold by the meter, minimum order 20 m, max. length 500 m		2	POF FOC 980/1000 µm	55 mm	-20 to +70 °C	Flame resistant	Yes	No	Yes	Yes	Yes
PCF standard cable GP (200/230)	6XV1861-2A	Splittable, UL approval, without connector, sold by the meter, minimum order 20 m, max. length 2000 m		2	Step index fiber 200/230 µm	105 mm	-40 to +90 °C	Flame resistant	Yes	No	Yes	Yes	Yes
PCF trailing cable (200/230)	6XV1861-2C	Splittable, without connector, sold by the meter, minimum order 20 m, max. length 2000 m		2	Step index fiber 200/230 µm	175 mm	-25 to +75 °C	Flame retardant	Yes	No	Yes	No	Yes
PCF trailing cable GP (200/230)	6XV1861-2D	Plittable, UL approval, without connector, sold by the meter, minimum order 20 m, max. length 2000 m		2	Step index fiber 200/230 µm	175 mm	-25 to +75 °C	Flame resistant	Yes	No	Yes	Yes	Yes

Benefits

- POF and PCF fiber-optic cables can be pre-assembled on site
- Easy connector assembly on site
- Time savings on start-up thanks to pre-assembled cables
- Protection of the transmission link against electromagnetic interference
- Tap-proof, because the cable does not radiate

Applications

SIMATIC NET POF and PCF fiber-optic cables are used to construct optical indoor PROFINET and Industrial Ethernet networks. Devices with integrated optical interface (SC RJ connection technology) include SCALANCE X200-4P IRT, SCALANCE X201-3P IRT, SCALANCE X202-2P IRT and SIMATIC ET 200SP, for example.

POF and PCF FOC can be easily assembled on site with SC RJ plugs. The maximum cable length between two devices is 50 m for POF and 100 m for PCF fiber-optic cables.

Selection and Ordering Data

Description	Order no.									
	1	2	3	4	5	6	7		8	9
POF and PCF Fiber-Optic Cables	6	X	V	1	8	☐	☐	-	2	☐
						▲	▲		|	▲
PCF standard cable GP 200/230 Standard cable, segmentable, sold by the meter; max. delivery unit 1000 m; minimum order quantity 20 m						6	1		|	A
PCF trailing cable 200/230 Trailing cable, segmentable, sold by the meter; max. delivery unit 1000 m, minimum order quantity 20 m						6	1		|	C
PCF trailing cable GP 200/230 Trailing cable, segmentable, sold by the meter; max. delivery unit 2000 m; minimum order quantity 20 m						6	1		|	D
POF standard cable GP 980/1000 POF standard cable for fixed routing indoors with PVC sheath; sold by the meter; max. delivery unit 1000 m, minimum order quantity 20 m						7	4		|	A
POF trailing cable 980/1000 POF trailing cable for use in cable carriers, with rugged PUR sheath; sold by the meter; max. delivery unit 1000 m, minimum order quantity 20 m						7	4		|	B

Description	Order no.																
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
Accessories	6	G	K	1	9	0	0	-	0	☐	☐	0	0	-	0	A	☐	0
										▲	▲	|	|		|	|	▲	|
IE SC RJ POF plug Screw connector for on-site assembly on POF FOC (1 pack = 20 units)										M	B	|	|		|	|	C	|
IE SC RJ POF plug PRO Screw connector for on-site assembly on POF FOC (1 pack = 1 unit)										M	B	|	|		|	|	A	|
Termination kit SC RJ POF plug Assembly case for on-site assembly of SC RJ plugs, comprising a stripping tool, Kevlar cutters, microscope, grinding paper, grinding base										M	L	|	|		|	|	A	|
IE SC RJ POF refill set Refill set for termination kit SC RJ POF plug consisting of grinding paper and grinding base (set of 5)										M	N	|	|		|	|	A	|
IE SC RJ PCF plug Screw connector for on-site assembly on PCF FOC (1 pack = 10 units)										N	B	|	|		|	|	C	|
IE SC RJ PCF plug PRO Screw connector for on-site assembly on PCF FOC (1 pack = 1 unit)										N	B	|	|		|	|	A	|
Termination kit SC RJ PCF plug Assembly case for on-site assembly of SC RJ plugs, comprising a stripping tool, buffer stripping tool, Kevlar cutters, fiber breaking tool, microscope										N	L	|	|		|	|	A	|

7KE6000

Description

Ethernet patch cable 7KE6000, double shielded (SFTP) and LAN connector at both ends.

Cable Overview

- Ethernet Y-adaptor cable (7KE6000-8GD)
- Ethernet patch cable, double shielded (SFTP), with LAN connector at both ends (7KE6000-8GD)
- Ethernet patch cable, double shielded (SFTP), crossed, LAN connector at both ends (7KE6000-8GE)

You can find the selection and order data for Ethernet patch cables on the following pages.



[ph_7KE6000, 1, --_--]

Figure 3.1/4 Example of an Ethernet Patch Cable

Selection and Ordering Data

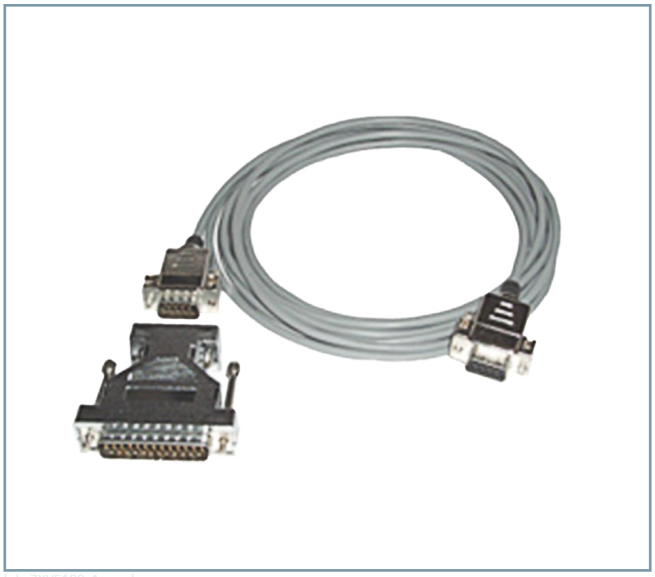
Description	Order no.																				
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16	Short code		
Ethernet patch cable, double shielded (SFTP), LAN connectors at both ends	7	K	E	6	0	0	0	-	8	G	**D**	0	☐	-	☐	A	A	☐			
Device ↔ Switch Switch ↔ PC													▲		▲			▲			
													|		|			|			
Length: 0.5 m													0		0			5			
Length: 1 m													0		1			0			
Length: 2 m													0		2			0			
Length: 3 m													0		3			0			
Length: 5 m													0		5			0			
Length: 10 m													1		0			0			
Length: 15 m													1		5			0			
Length: 20 m													2		0			0			
Ethernet patch cable, double shielded (SFTP), crossed, LAN connector at both ends	7	K	E	6	0	0	0	-	8	G	**E**	0	☐	-	☐	A	A	☐			
Switch ↔ Switch Device ↔ PC													▲		▲			▲			
													|		|			|			
Length: 0.5 m													0		0			5			
Length: 1 m													0		1			0			
Length: 2 m													0		2			0			
Length: 3 m													0		3			0			
Length: 5 m													0		5			0			
Length: 10 m													1		0			0			
Length: 15 m													1		5			0			
Length: 20 m													2		0			0			

7XV5100

Description/Overview

Serial RS232 communication cables (wire/optical fiber)

- 7XV5100-2 – PC/PG to 25-pole protection device
  The serial connecting cable connects a serial 9-pole PC interface with a male connector (for example, COM1) or a PG interface to a protection device with a 25-pole user interface.
- 7XV5100-4 – (/BB) PC/PG, 9-pole, to the 9-pole protection device (DIGSI 4 cable)
  The serial connecting cable (DIGSI 4 cable) connects a serial 9-pole PC interface with a male connector (for example, COM1) or a PG interface to a protection device with a 9-pole user interface.
  The following devices have such an interface: 7SJ531, 7SJ602 and all SIPROTEC 4 devices such as 7SA522, 7SA6x, 7SJ61/62/63, and 6MD6x
  The shielding has been changed in the 7XV5100-0 cable, version/BB. The cable shield is no longer connected to "GND" but instead to the connector housings at both ends.
- 7XV5100-8H – 9/25-pole adaptor to the 7XV5100-4 cable
  If this 9/25-pole adaptor is connected to the 9-pole male connector of the 7XV5100-4 (/BB) cable, protection devices with a 25-pole user interface can also be connected to the PC/laptop computer using this cable.
- 7XV5100-5 – PC / PG, 25-pole, to the 9-pole protection device
  The serial connecting cable connects a serial 25-pole PC interface with a male connector (for example, COM1) to a protection device with a 9-pole user interface. The following devices have such an interface: 7SJ531, 7SJ602 and all SIPROTEC 4 devices, for example the 7SA522, 7SA6x, 7SJ61/62/63, and 6MD6x.



[ph_7XV5100, 1, –_–]

Figure 3.1/5 7XV5100 Serial DIGSI 4 Cable

Applications

Application note for the 7XV5100-4 – (/BB) PC/PG, 9-pole, to the 9-pole protection device (DIGSI 4 cable)

If the 9/25-pole adaptor is connected to the 9-pole male connector of the 7XV5100-4 cable, protection devices with a 25-pole user interface can also be connected to the PC/laptop computer using this cable.

3.1

Selection and Ordering Data

Description	Order no.												
	1	2	3	4	5	6	7		8	9	10	11	12
Copper connecting cable between	7	X	V	5	1	0	0	-	☐	☐			
									▲	▲			
									|	|			
Laptop computer/PC/9-pole socket and protection device/25-pole plug, length: 3 m									2	|			
Laptop computer/PC/9-pole socket and protection device/9-pole plug, length: 3 m									4	|			
Laptop computer/PC/25-pole socket and protection device/9-pole plug, length: 3 m									5	|			
RS232/RS485 converter/25-pole connector and protection device/single wire ring cable protection, length: 1 m									7	|			
Plug adaptor, 9-pole socket/25-pole connector to the DIGSI 7XV5100-4 cable (9-pole) for the protection unit with 25-pole interface at the front									8	H			

7XV5710

Description

The USB converter cable 7XV5710 with its special pin assignment, enables the temporary connection of up to 31 Siemens protection devices with an electrical RS485 interface to a PC with a USB interface for direct or central control using DIGSI 4.

The converter is connected directly to the PC via the standard USB connector (type A). The RS485 connector (9-pole D-sub male) can be connected directly to SIPROTEC 4 devices with RS485 interface modules. To connect individual compact devices with the RS485 interface to terminals, the adaptor 7XV5103-2AA00 or -3AA00 is needed. The converter can also be connected to the bus system 7XV5103 using the included gender changer (Bu-Bu) enabling communication with all devices connected to the bus. As the cable has a switchable bus termination, it can be connected at one of the ends or even in the middle of the bus. The converter is supplied with power via the USB interface of the PC.



[pti_7XV5710, 1, --_--]

Figure 3.1/6 USB RS485 Converter Cable 7XV5710

Benefits

- Compact connector housing
- USB 2.0/1.1 interface type A
- RS485 interface 9-pole D-sub
- Max. bus length: 800 m
- Load resistors, connectible
- Baud rates: 300 Bd to 115 kBd
- Data Transfer Display (Data LED)
- Protocol transparency (not for PROFIBUS)
- Power supply via the USB connector (no galvanic separation)
- Compatible with the 7XV5103 bus system (with the 9-pole Bu/Bu gender changer)

Data Transfer

Before using the converter cable for the first time, a USB driver must be installed from the included CD. The driver creates a new virtual COM port that can then be selected in the application used, for example, DIGSI 4. The converter works on the master/slave principle in the half-duplex process.

In the idle state, the USB interface is inactive and the RS485 interface is set to receive. For communication, the PC, operating as the master, sends its data to the USB interface which, in turn, sends the data from the converter to the RS485 interface to the protection device (slave). After this, the RS485 interface is again set to receive. Data coming from the protection are now transferred by the converter in the other direction to the USB interface and to the PC. A data LED indicates when data transmission is active.

Connection of the Compact Devices using Terminals (without the Bus Cable 7XV5103)

A shielded and twisted cable (STP) is to be used for the RS485 bus. The conductor cross-section must be suitable for terminating with ring-type lugs or D-SUB connectors. The protection devices are connected to the bus in series (not in star or ring topology). The individual wires protruding from the screen should be kept as short as possible.

The screen is to be connected at both ends to the housing ground. A 220-ohm load resistor is connected to the last protection device between the data circuits A and B.

Connecting the RS485 Bus

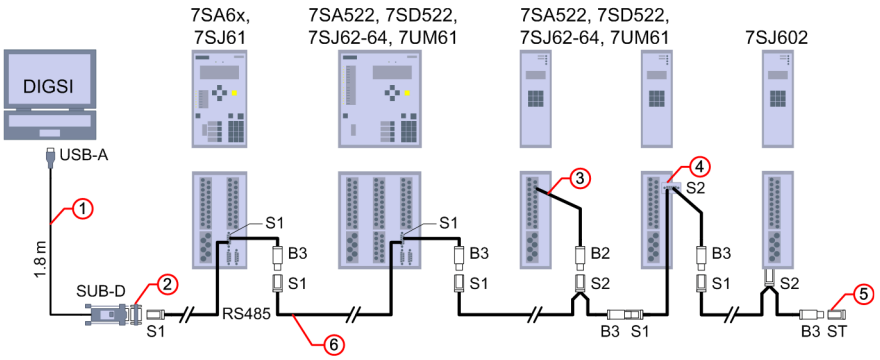
The RS485 bus is a two-conductor bus (half-duplex) and up to 32 devices (participants) can exchange their data on the bus according to the master/slave principle. All devices are connected to the bus in series (not in the star or ring topology). A 220-ohm load resistor is connected to the first and last device between Pin 3 (A) and Pin 8 (B), regardless of whether this is a master or slave device.

The SIPROTEC protection devices are preferably connected to the bus has slave devices downstream of a master, for example, RS484 converter 7XV5710 or 7XV5650/51. With these converters (1st device), the load resistor can be implemented using DIL switches (S1, S2) via additional pull-up/pull-down resistors. The low-resistance pull-up/pull-down resistors are absolutely necessary in various SIPROTEC bus applications, that is, the use of other converters might cause problems.

In the protection devices, the load resistor may only be activated in the last device on the bus and, to do this, the specially provided jumpers are to be used. If this is not possible in the device, an external load resistor, for example, 7XV5103-5AA00, is to be inserted after the last device (see *Figure 3.1/8*).

In this example, the load resistors of the converter cable are active (factory setting); the load resistors which some of the protection devices have remain inactive. The bus is terminated after the last device using the bus termination connector 7XV5103-5AA00 or an external resistor (220 ohms). If the last protection device has a load resistor that can be connected, this can also be activated to terminate the bus.

Application Example



① 7XV5710-0AA00 USB to Serial (RS485) adaptor cable
② Gender-Changers (9-pole socket-socket)
③ 7XV5103-2AA00 Adaptor cable
④ 7XV5103-3AA00 RS485 adaptor
⑤ 7XV5103-5AA00 Bus termination
⑥ 7XV5103-0AAxx Y bus cable (S1, S2, B3)

[dw_central_operation_via_RS485-Bus, 3, en_US]

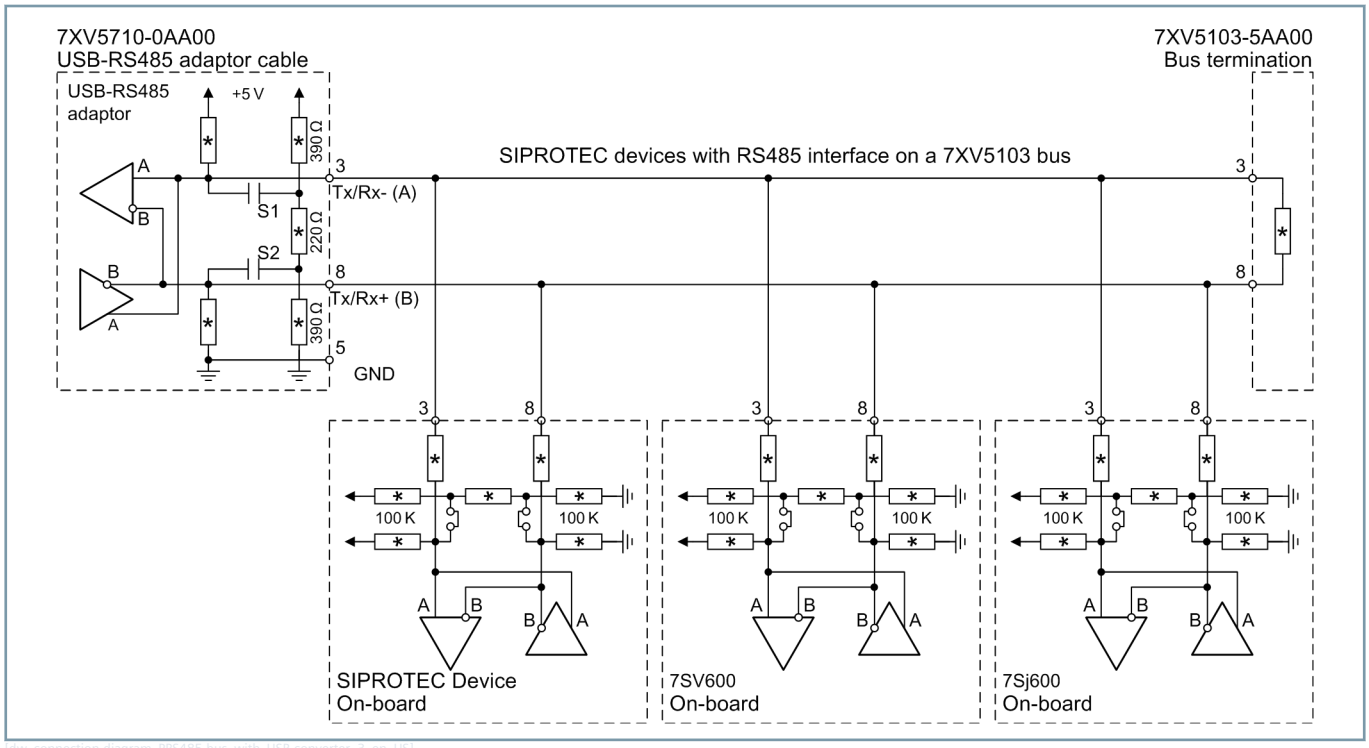
Figure 3.1/7 Central Operation via the RS485 Bus

Several SIPROTEC 3 and 4 protection devices can be centrally operatedvia their interface with DIGSI using the USB converter cable 7XV5710. There are corresponding cables and adaptors for SIPROTEC devices for the various connection types. You can find additional information in catalog sheet 7XV5103. SIPROTEC 4 devices with an RS485 interface can be directly connected and operated with DIGSI 4.

To connect individual compact protection devices with the RS485 interface to terminals, the adaptor cable 7XV5103-2AA00 or the adaptor 7XV5103-3AA00 is needed (see *Figure 3.1/7*).

The converter cable may only be used temporarily because it lacks galvanic separation. For permanent use, the optical fiber converters7XV5652 and 7XV5650/51 should be used. The optical fiber conductor provides complete galvanic separation between the PC and the SIPROTEC devices. You will find appropriate applications under: *www.siprotec.com/accessories/7XV56*

Applications



[dw_connection-diagram_PRS485-bus_with_USB-converter, 3, en_US]

Figure 3.1/8 RS485 Bus with USB Converter Cable 7XV5710 and several SIPROTEC Devices (Block Diagram)

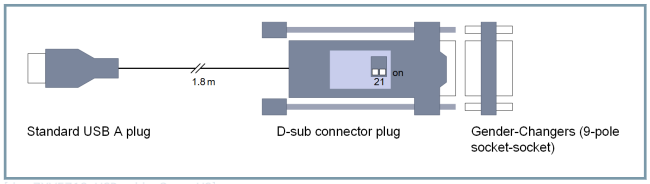
Technical Data

Product	USB converter cable 7XV5710-0AA00
Driver	on the included CD or on the Internet under: www.siprotec.com/accessories/7XV5710
Installation	Plug & Play
Cable length	1.8 m
USB interface	virtual COM port
Connection 1	USB 2.0 (1.1) plug A
Connection 1 Pin-assignment	Connector type A, Pin 1 – Vcc Pin 2 – D- Pin 3 – D+ Pin 4 – GND
Connection 2	D-SUB 9-pole male connector with fastening screws
Connection 2 Pin-assignment	Pin 3 – Tx / Rx (A) Pin 5 – GND Pin 8 – Tx / Rx+ (B) All other pins are not connected (nc)
Load resistor	Selectable (S1, S2 ON = load resistor selected)
	+ 5 V – Pin 3 = 390 Ω Pin 3 – Pin 8 = 220 Ω Pin 8 – Pin 5 = 390 Ω

Product	USB converter cable 7XV5710-0AA00	
Connection 2 protection	Receiver:	± 15 kV Human Body Model ± 6 kV IEC 1000-4-2, contact discharge ± 12 kV IEC 1000-4-2, air discharge
	Permitted:	up to 128 receivers on the bus, true fail-safe receiver, -7 V to +12 V common mode operation Temperature protection against an output short circuit
	Driver:	± 9 kV Human Body Model rise rate limited for healthy data transmission, –7 V to +12 V common mode operation
	Current limiting Thermal disconnection for driver overload protection	
Handshake	No	
TX / RX-switchover	automatic	
Serial data transmission	half-duplex 2-wire	
Power supply	+5 V via the USB (max. 80 mA) The module logs in to the USB at 96 mA max. 38 mA ready (converter on, no data transmission) max. 80 mA full-duplex, 4-wire operation (max. transmission rate)	

Cables – USB-RS485 Converter Cable

Product	USB converter cable 7XV5710-0AA00
Serial transmission rates	300, 1200, 2400, 4800, 9600, 19,200, 38,400, 57,600, 115,200 bits/s
Status display	Tx and Rx – 3 mm LED red
Operating temperature	–5 to +70 °C
Driver software	Windows 98, Windows 98 State Estimator, Windows 2000, ME, XP, Vista 32 / 64, Windows 7 32 / 64. No administrator rights required
Approval	CE compliant / RoHS compliant
Application	No permanent installation for SIPROTEC devices



[dw_7XV5710_USB-cable, 2, en_US]

Figure 3.1/9 USB Converter Cable with Plug. Factory Setting: S1 + S2 ON = Load Resistor active Dimensions: 75 × 32 × 15 (L × W × H)

You can find additional technical data in the manual under: *www.siemens.com/accessories*

Selection and Ordering Data

Description	Order no.															
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
USB – RS485 converter cable	7	X	V	5	7	1	0	-	0	A	A	0	0					
1.8 m (without galvanic separation) for connecting up to 31 SIPROTEC 4 devices with RS485 interface to PC/laptop computer with USB 1.1/2.0 interface, also for SICAM P																		

Description

The RS485 bus is a cost-effective half-duplex communications bus that is not only used for the monitoring and control of industrial plants, but, thanks to its high immunity, is also increasingly employed by utilities for SCADA and protection applications in switchgear. Protocols such as DIGSI, IEC 60870-5-103, DNP3, and Modbus up to 115 Kbps are used between one master and up to 31 slave devices, using a shielded twisted-pair cable (STP). Under ideal conditions, the bus can be up to 1000 m long. This requires the correct bus configuration, the use of suitable cables and connections, and the right bus termination. Devices with different termination methods require special adaptors to achieve the maximum possible immunity. The RS485 bus systems 7XV5103 are optimized in this respect for our instrumentation, control, and power-system protection product family.

There are a 2 different RS485 bus systems under the order identifier 7XV5103.

When assembling the required components for an RS485 bus, the respective application examples in this document can be used as a guide.

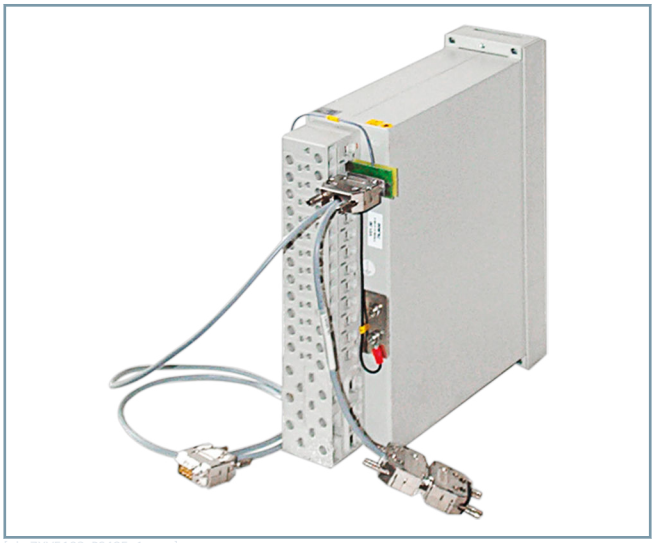
The bus system with 9-pole D-sub connectors has long been used in systems with SIPROTEC protection devices, 7XV5 converters, and central units. The individual devices are connected directly using a special Y-cable or a suitable adaptor cable for devices with different termination methods. The bus terminates in a 9-pole D-sub bus termination plug with an integrated 220-ohm resistor.

In some SIPROTEC devices, the serial signals are routed to the RJ45 sockets on the communication module, as, for example, in the case of the redundant IEC 60870-5-103 module. There, the bus is constructed using double-shielded CAT 5 patch cables. The individual devices are connected to the 2 redundant buses using 2 special Y-adaptor cables each. The buses terminate at one RJ45 bus termination connector each with a 120-ohm resistor.

Using the 7XV5103-2BA00 Y-adaptor cable, it is also possible to combine both bus systems with the different device interfaces or to combine the two systems.

Benefits

- For data transmission up to 115 Kbps (for example, DIGSI 4, IEC 60870-5-103, DNP3)
- Variable bus topology with shielded cables of different lengths
- Metalized, shielded connector housings with reduced flush-mounting depth and strain relief
- Bus termination with terminators and integrated resistor
- Connection of the SIPROTEC 4 protection device to the redundant IEC 60870-5-103 interface via a Y-adaptor cable and RJ45 plug
- Connection of the SIPROTEC 4 protection devices to the RS485 interface and D-sub connector plug directly or via a Y-adaptor cable
- Connection to miscellaneous RS485 converters, for example, the 7XV5650/51



[pti_7XV5103_RS485, 1, --_--]

Figure 3.2/1 RS485 Bus Cable System 7XV5103

- It is possible to combine both bus systems.
- The maximum length of the bus within one common grounding system is 1000 m.

Keep in mind that this system may not be used for PROFIBUS DP. This has its own bus system using components suitable for PROFIBUS.

Applications

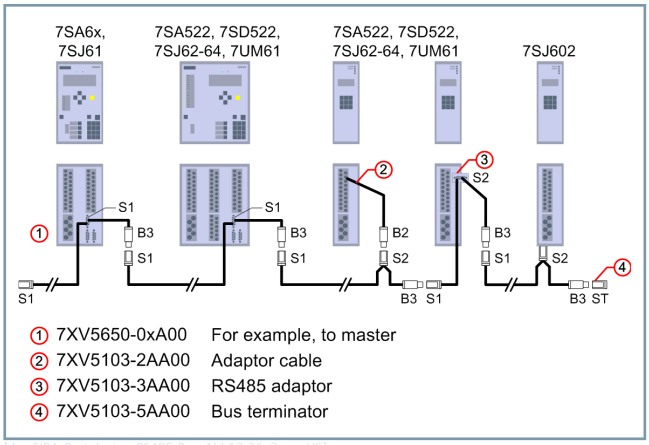
The bus system with 9-pole D-sub connector plugs

The bus system with 9-pole D-sub bus termination plugs has long been used in systems with SIPROTEC protection devices, 7XV5 converters, and central units from Siemens. Individual devices and devices with different connection types are connected directly via special Y-cables or suitable adaptor cables. The bus terminates in a 9-pole D-sub bus termination plug with an integrated 220-ohm resistor.

Application Examples

Example 1: SIPROTEC Protection Devices on the RS485 Bus

The 9-pole male connector of the S1 Y-bus cable always comes from the master and connects to the slaves via a 1, 3, 5 or 10 m long cable and a 9-pole S2 male connector. The S2 connector is equipped with a 20-centimeter long cable and a 9-pole B3 socket to extend the bus. The compact protection devices are directly connected with the B2 socket or an RS485 adaptor 7XV5103-3AA00 via the adaptor cable 7XV5103-2AA00. After the last device, a terminator 7XV5103-5AA00 is connected using a B3 plug to terminate the bus.



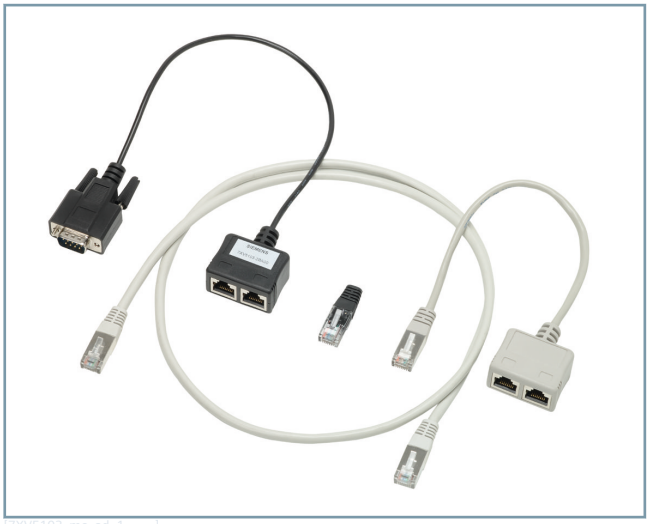
[dw_SIP4_Prot-device_RS485-Bus_Abb13-36, 2, en_US]

Figure 3.2/2 SIPROTEC Protection Devices on the RS485 Bus

Bus System with RJ45 Patch Cables

The bus system with RJ45 plugs has been developed specifically for SIPROTEC devices for communication modules with serial RJ45 plugs and is made using cost-effective double shielded CAT 5 patch cables.

The individual devices are connected to the 2 redundant buses via 2 special Y-adaptor cables each. The buses terminate with one RJ45 bus termination plug having an integrated 120-ohm resistor.



[7XV5103_mo_ad, 1, --_--]

Figure 3.2/3 Bus System with RJ45 Patch Cables

Technical Data

- Cost-effective bus topology using shielded patch cables (CAT 5) with RJ45 plugs
- Cable lengths from 0.5 to 20 m (7KE6000-8G)
- Connecting SIPROTEC 4 protection devices to redundant IEC 60870-5-103 interfaces using Y-adaptor with RJ45 plugs
- Connecting SIPROTEC 4 protection devices to RS485 interface via a Y-cable to the D-sub connector plug
- Adaptors/cables for compact protection devices
- Metalized plug housings with strain relief of the cable connections
- Compact plugs
- Data transmission up to 115 Kbps (for example, DIGSI, IEC 60870-5/Association of German Power Plants)
- Maximum extension of the bus to 800 m within one common ground system
- Bus termination with terminators and integrated 120-ohm resistor
- Connection to the fiber-optic RS485 converter 7XV5650 or the bus system with D-sub connector plugs via Y-adaptors.

Notes on configuring the RS485 bus system (see Application examples 2 and 3)

The housings of all devices connected to the bus must be rigidly grounded via one common ground to prevent hazardous ground currents from flowing via the cable shields

Longer distances, especially into a different building with its own grounding system, should be handled preferably using fiber-optic cables via converters (for example, 7XV5650/51).

The RS485 bus must be linear. This means that there must be no feeders from the bus (for example, a terminal block) to the connected bus devices. This would create a star topology and have a negative effect on functionality.

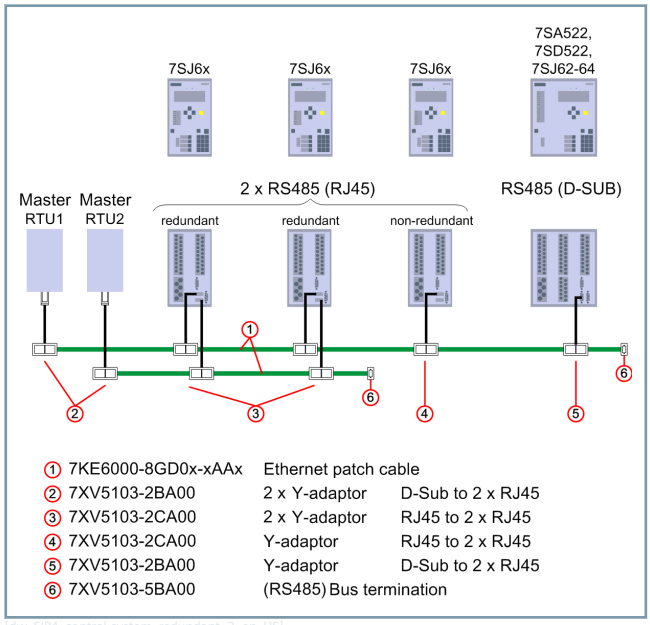
Only double-shielded CAT 5 patch cables (for example, 7KE6000) can be used as bus cables. The maximum bus length must not exceed 800 m.

The bus must be terminated at the first device (usually the master) and at the last device using a bus load resistor to avoid interference due to reflection. No other load resistors can be installed between these terminations.

Since all devices, a maximum of 32 (including the master), pick up everything on the RS485 bus, all these devices on the bus must be set to the same baud rate and the same data format. All slaves must have different device addresses.

Within the system, only one master can be active at a time in each bus and only one slave can respond.

Example 2: Connection of a SIPROTEC 4 to a (Redundant) Control System



[dw_SIP4_control-system_redundant, 2, en_US]

Figure 3.2/4 Connection of a SIPROTEC 4 to a (Redundant) Control System

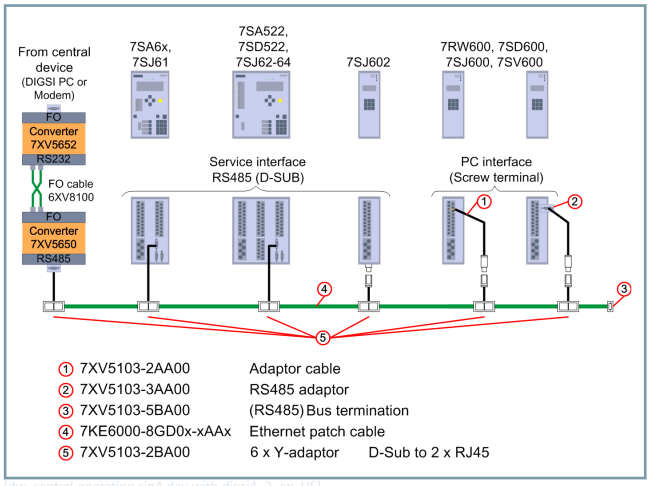
The RS485 bus cable system using patch cables (CAT 5) was developed as a cost-effective alternative to the earlier 7XV5103 systems with D-sub connector plugs. The advantages are the global use of patch cables and the compact dimensions of the RJ45 plug. This allows a redundant IEC 60870-5-103 interface with a single interface module within a SIPROTEC 4 device.

Two different Y-adaptors make it possible to implement an RS485 bus using patch cables and connection to devices with RS485 interfaces and different types of interface connections. Both Y-adaptors have 2 parallel RJ45 sockets to implement the buses. The approx. 20 cm long connecting cable to the device has either one RJ45 or one D-sub connector plug.

Devices with D-sub connector plugs (for example, master RTU, 7XV5650/51, SIPROTEC 4 devices with D-sub are connected using the 7XV5103-2BA00 Y-adaptor. Devices with RJ45 plugs, such as the SIPROTEC 4 with redundant IEC 60870-5-103 interface, are connected using the 7XV5103-2CA00 Y-adaptor. For the redundant bus system, 2 Y-adaptors are necessary for each SIPROTEC 4 device.

After the last device, the bus is terminated using a 7XV5103-5BA00 bus termination plug. For the redundant bus system, a bus load resistor is needed for each bus.

Example 3: Central Operation of SIPROTEC 4 Devices with DIGSI 4



[dw_central-operating-sip4-dev-with-digsi4, 2, en_US]

Figure 3.2/5 Central Operation of SIPROTEC 4 Devices with DIGSI 4

The RS485 bus cable system using patch cables (CAT 5) was developed as a cost-effective alternative to the earlier 7XV5103 systems with D-sub connector plugs. The advantages are the global use of patch cables and the compact dimensions of the RJ45 connector.

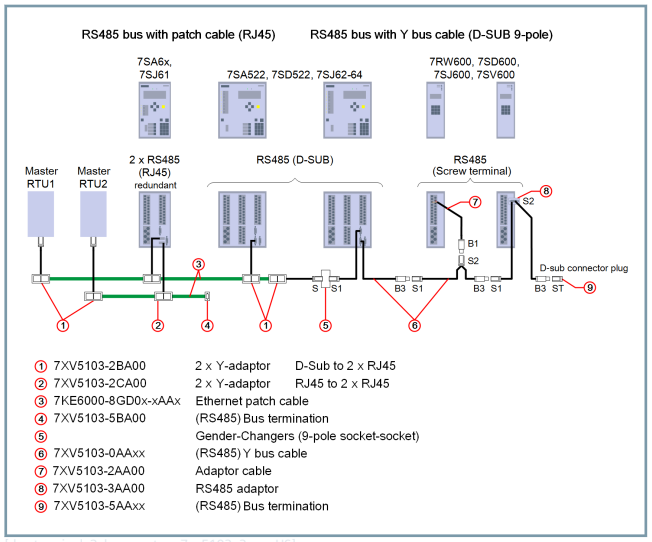
The 7XV5103-2BA00 Y-adaptor makes it possible to implement an RS485 bus using patch cables and to connect various SIPROTEC devices with RS485 interfaces. The Y-adaptors have 2 parallel RJ45 sockets to implement the buses. The approx. 20 cm long connecting cable to the device has one RJ45 plug with the corresponding pin assignment.

Devices with an RS485 interface and D-sub connector plugs (7XV5650/51, SIPROTEC 4 devices with D-sub) are connected using the 7XV5103-2BA00 Y-adaptor.

Devices with an RS485 interface on screw plugs require an additional adaptor for 9-pole D-sub connector plugs to single-conductor cables, for example, 7XV5103-2AA00 or 7XV5103-3AA00.

After the last device, the bus is terminated using a 7XV5103-5BA00 bus termination plug.

Example 4: Connecting two 7XV5103 Bus Systems



[dw_terminal_2_busy-system-7xv5103, 3, en_US]

Figure 3.2/6 Connecting two 7XV5103 Bus Systems

The 7XV5103-2BA00 Y-adaptor makes it possible to configure an RS485 bus using RJ45 patch cables and to connect SIPROTEC devices with an RS485 interface via a D-sub connector plug.

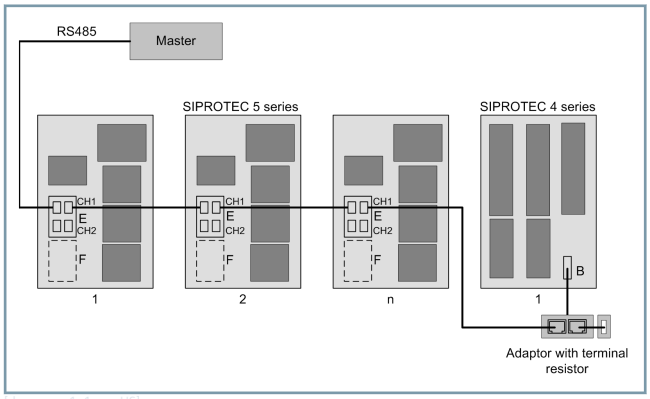
Using an additional gender-changer (socket-socket) makes it possible to connect an RS485 bus using a 7XV5103-0AAxx Y bus cable instead of a SIPROTEC device.

Example 5: Connecting the SIPROTEC 5 Series to Devices from the SIPROTEC 4 Series

Serial electrical RS485 connections of devices in the SIPROTEC 5 series can be cabled with low-cost Ethernet patch cables. Special bus cables and adaptors are not needed.

Pay attention to the following if you include devices from the SIPROTEC 4 series in the connection:

The RS485 interface in devices of the SIPROTEC 4 series is a D-sub 9 connection with a connected terminal resistor. If you connect devices from the SIPROTEC 5 series with devices from the SIPROTEC 4 series, then use a Y adaptor with the order designation 7XV5103-2BA00. Complete the connection on the last device with a terminal resistor. For the SIPROTEC 5 device, use a terminal resistor with the order designation RS485 terminator 7XV5103-5BA00.



[dw_serma1, 1, en_US]

Figure 3.2/7 Cabling Example SIPROTEC 4 and SIPROTEC 5, Communication with a Single Master Using an RS485 Bus

Technical Data and Summary

- Direct connection to SIPROTEC 4 protection devices with RS485 interface via an RS485 optical fiber converter 7XV5650/51
- Adaptors/cables for compact protection devices with RS485 interface to terminals
- 4 cable lengths from 1 to 10 m
- Shielded twisted-pair cable (STP) with 9-pole D-SUB connector plug
- Metalized, shielded connector housings with reduced flush-mounting depth and strain relief
- Data transmission up to 115 Kbps (for example, DIGSI, IEC 60870-5/Association of German Power Plants)
- The maximum length of the bus within one common grounding system is 1000 m.
- Bus termination with terminators and integrated 220-ohm resistor

Selection and Ordering Data

Description		Order No.											
7XV5103 cables and adaptors are not suitable for PROFIBUS applications or PROFIBUS cabling		1	2	3	4	5	6	7		8	9	10	11	12
RS485-Y copper connecting cable		7	X	V	5	1	0	3	-	0	A	A	☐	☐
													▲	▲
													|	|
For connecting a device with 9-pole D-sub plug (socket) and extension of the bus (9-pole socket), 2-wire, shielded	Length: 1 m												0	1
	Length: 3 m												0	3
	Length: 5 m												0	5
	Length: 10 m												1	0
RS485 bus extension cable		7	X	V	5	1	0	3	-	1	A	A	☐	☐
													▲	▲
													|	|
Length: 10 m													1	0
Length: 20 m													2	0
Length: 30 m													3	0
Length: 40 m													4	0
Length: 50 m													5	0
Adaptors		7	X	V	5	1	0	3	-	☐	☐	A	0	0
										▲	▲			
										|	|			
RS485 adaptor	for devices with RS485 interface on screw terminals to 9-pole D-sub connector plug (socket), 2-wire, shielded, length: 0.3 m									2	A			
Y-adaptor cables	for devices with RS485 interface and D-sub connector plug to 2 x RJ45 socket for flush-mounting sockets of an RS485 bus with patch cables, 2-wire, twisted, shielded 1 x D-sub male, 9-pole, to 2 x RJ45 socket, 8-pole, length: 0.3 m									2	B			
	for devices with RS485 interface and RJ45 connector plug to 2 x RJ45 socket plugs to build an RS485 bus with patch cables, 2 x 2-wire, twisted, shielded 1 x RJ45 male, 8-pole, to 2 x RJ45 socket, 8-pole, length: 0.3 m									2	C			
RS485-bus termination	With an internal 220-ohm resistor between pins 3 and 8									5	A			
	With an internal 120-ohm resistor between pins 1 and 2, 1 x RJ45 male plug, 8-pole									5	B			
RS485 copper cable		7	X	V	5	1	0	3	-	7	A	A	☐	☐
													▲	▲
													|	|
For the connection between the 7XV5662-xAD10 RTD unit and SIPROTEC 4 devices (port C or port D with RS485 interface) 7UT6, 7SJ6, 7UM62	Length: 5 m												0	5
	Length: 25 m												2	5
	Length: 50 m												5	0
RS485 copper connecting cable for connecting the 7XV5662-xAD10 RTD unit to SIPROTEC 5	2-wire, shielded, with RJ45 bus coupler, socket/ socket	7	X	V	5	1	0	3	-	7	B	A	0	3

3.2

10 dB Attenuator – 7XV5107

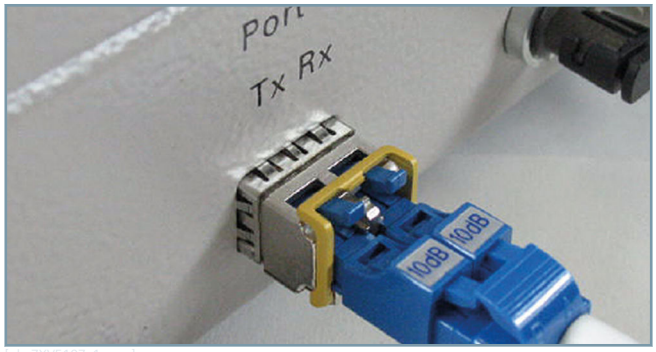
Description

Attenuators are components connected in the signal path to reduce the amplitude of the signal.

Applications

If SIPROTEC devices with protection-interface communication are used over distances (s) shorter than specified in the Technical Data, the transmission power must be reduced with optical attenuators. The same applies to the 7XV5461-0Cx00 devices.

To continue using the duplex LC plug, both attenuators are installed at one end of the optical wide area network connection.



[ph_7XV5107, 1, --_--]

Figure 3.3/1 10 dB Attenuator 7XV5107

Distance	Module/device	Attenuator required	Comments
24 km	C53207A 351D655 1/7XV5461-0CG00	No	No constraint
60 km	C53207A 351D656 1/7XV5461-0CH00	No	No constraint
100 km	C53207A 351D657 1/7XV5461-0CJ00	At s < 50 km	-
170 km	No module/7XV5461-0CM00	At s < 100 km	Required or damage to the optical receivers

Selection and Ordering Data

Description	Order no.												
	1	2	3	4	5	6	7		8	9	10	11	12
Optical attenuators (minimum order: 2 pc)	7	X	V	5	1	0	7	-	0	A	A	0	0
2 optical attenuators for single-mode optical fibers for the protection interface of SIPROTEC 5 or 7XV5461 repeater. 10-dB optical attenuation to avoid overdriving over short distances. LC duplex connection													

Description

The optical repeater 7XV5461 using a duplex singlemode fiber-optic cable transmits serial optical signals over long distances. It converts serial optical 820 nm signals at port 1 and port 2 in the range of 300 bit/s up to 4.096 Mbps. Synchronous and asynchronous signals can be connected. In this way, 2 independent, serial 820 nm inputs with ST connectors are available and these can be multiplexed onto port 3. 2 devices with an optical 820 nm interface, such as the line differential protection devices of the SIPROTEC 4/5 series or the 7XV5652 RS232/820 nm converter, can be connected to ports 1 and 2 via duplex multimode optical fiber for distances of up to 1.5 km. These signals are transmitted to port 3 via the single duplex LC plug in wavelengths of 1300 nm/1550 nm for the connection of a duplex singlemode fiber-optic cable. Using port 3, there are 3 options for max. 25 km (1300 nm)/60 km (1300 nm) and 100 km/170 km (1550 nm) optical fiber lengths. The device can be connected to all battery voltages and AC voltage sources. To support commissioning, loops can be activated for port 1/2 so that the input signals are reflected at the respective port.

Benefits

- 2 independent multiplexed 820 nm ports with ST connectors for max. 1.5 km via 50/125 µm and 62.5/125 µm duplex multimode fiber-optic cables
- Transmission rate of the serial ports 1/2 of 300 bit/s up to 4.096 Mbps. Automatic baud rate matching to synchronous and asynchronous serial signals; no settings necessary
- Powerful 1300 nm/1550 nm port with duplex LC plug for distances up to 24 km/60 km/100 km/170 km using a duplex singlemode fiber-optic cable at 9/125 µm
- Wide-range power supply of DC 24 V to 250 V and AC 115 V to 230 V with alarm relay
- Display of the data traffic via LED
- Integrated commissioning aids

Applications

The typical application area for the FO repeater is protection-interface communication for SIPROTEC 4/5 differential and distance protection. Furthermore, serial data from the 7XV5 device series can be transmitted over long distances.



[ph_7XV5461_W3, 2, --_--]

Figure 3.4/1 Optical Repeater with Wide-range Power Supply Unit

The conntection to the protection device is provided interference-proof with a fibre-optic connection. The maximum transmission distance between the protection device and the FO repeater is specified at 1.5 km when using a 62.5/125 µm fiber-optic cable or a 50/125 µm fiber-optic cable.

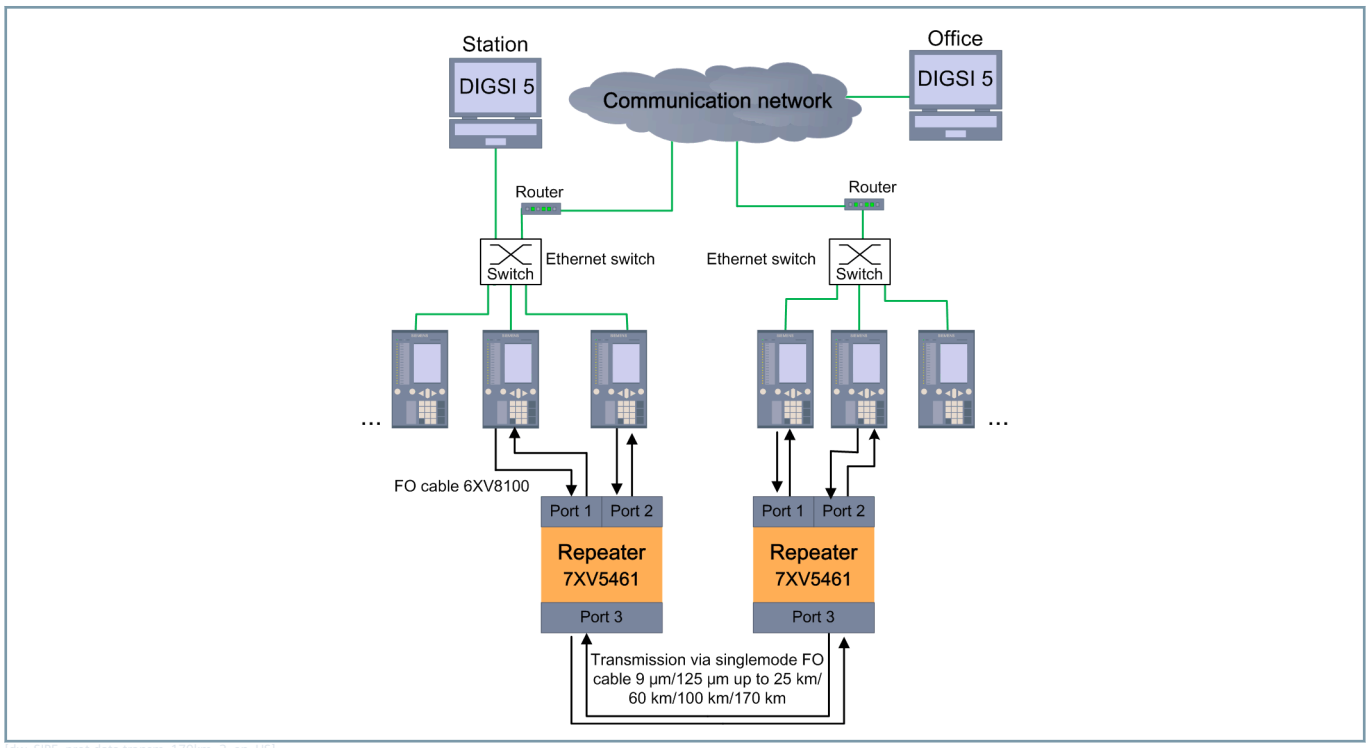
The FO repeater supports easy commissioning of the entire communication path. For commissioning, loops can be activated for port 1/2 so that the input signals are reflected at the respective port. The FO repeater has a relay contact to issue a “device ok” indication (DOK), and is equipped with a wide-ranging power supply unit that covers the entire normal DC and AC auxiliary voltage range.

Power system control or additional protection-data transmissions can be connected via port 2. As a result, the long-distance optical fiber is put to optimal use for 2 separate serial connections to transmit data between 300 bit/s and 4.096 Mbps.

Application Example with SIPROTEC 5 and DIGSI 5

Figure 3.4/2 shows the interference-free data exchange of SIPROTEC 5 protection devices, e.g. line differential protection 7SD8 or distance protection 7SL8, via duplex mono-mode Fiber Optic cable up to a distance of 170 km and the DIGSI 5 access via Ethernet.

2-Channel Serial Optical Repeater – 7XV5461 up to 170 km



[dw_SIP5_prot-data transm_170km, 2, en_US]

Figure 3.4/2 Transfer of Protection Data Signals of SIPROTEC 5 Devices via Duplex-Mono-Mode FO Cable and DIGSI 5 Access via Ethernet

Technical Data

Connections	
Ports 1/2	ST connectors for 820 nm, for 50/125 µm and for 62.5/125 µm multimode fiber-optic cable
Port 3	Duplex LC plug for 1300 nm, for 50/125 µm/62.5/125 µm multi-mode fiber-optic cable
Screw terminals	2-pole screw terminals for auxiliary voltage 3-pole make contact/break contact for an alarm relay

Housing
Aluminum housing, 188 x 56 x 100 mm for mounting to 35-mm DIN rail according to EN 50032.
Weight: 0.8 kg. Degree of protection according to EN 60529: IP41

Power supply
Wide range 24 to 250 VDC, without switch-over 115/230 VAC

Displays	
4 LEDs	
Green	Power supply
Red	Alarm relay
2 × yellow	Data exchange

You can find additional technical data in the manual under:
www.siemens.com/accessories

Selection and Ordering Data

Description	Order no.												
	1	2	3	4	5	6	7		8	9	10	11	12
Optical repeater for singlemode optical fiber	7	X	V	5	4	6	1	-	0	C	☐	0	0
											▲		
											|		
1300 nm/LC connector/for transmission distances up to 24 km											G		

Description	Order no.			
1300 nm/LC connector/for transmission distances up to 60 km		H		
1550 nm/LC connector/for transmission distances up to 100 km		J		
1550 nm/LC connector/for transmission distances up to 170 km		M		
For converting/amplifying multimode optical fiber, 50/125 µm or 62.5/125 µm (820 nm), to singlemode optical fiber, 9/125 µm, for serial data from 300 bit/s to 4.096 Mbps 2 independent serial optical input channels with ST connectors and 820 nm for multimode optical fiber, permissible path attenuation of the 820 nm path is 8 dB (approx. 1.5 km with 62.5/125 µm fiber). Wide-range power supply, DC 24 V to 250 V and AC 115/230 AC 1 fault signaling contact for auxiliary voltage faults or loss of data connection				

NOTE

Repeaters can only be used in pairs.

7XV5461-0Cx00 are compatible with the previous versions 7XV5461-0Bx00.

2-Channel Serial Optical Repeater – 7XV5461 up to 40 km

Description

The optical repeater 7XV5461 exchanges serial optical signals via one singlemode fiber-optic cable over long distances. It converts serial optical 820 nm signals at port 1 and port 2 in the range of 300 bit/s up to 4.096 Mbps up to 1300/1550 nm for 1 singlemode fiber-optic cable.

Synchronous or asynchronous signals can be connected to port 1/2. In this way, 2 independent, serial 820 nm inputs with ST connectors are available and these can be multiplexed onto port 3. Two devices with an optical 820 nm interface, such as the line differential protection devices of the SIPROTEC 4/5 series or the 7XV5652 RS232/820 nm converter, can be connected to ports 1 and 2 via multimode fiber-optic cables for distances of up to 1.5 km. These signals are transmitted to port 3 via the single LC connector in the wavelengths of 1300 nm/1550 nm for connection of singlemode fiber-optic cables of up to 40 km.

The device can be connected to DC battery voltages or AC voltage sources. To support commissioning, loops can be activated for port 1/2 so that the input signals are reflected at each port to support commissioning of the optical fiber connections.

Benefits

- 2 independent multiplexed 820 nm ports 1/2 with ST connectors for max. 1.5 km over 50/125 µm and 62.5/25 µm multimode fiber-optic cables
- Transmission rate of the serial ports 1/2 of 300 bit/s up to 4.096 Mbps. Automatic baud rate matching to synchronous and asynchronous serial signals; no settings necessary
- Powerful 1300 nm/1550 port with single LC plug for distances up to 40 km using a singlemode fiber-optic cable at 9/125 µm
- Wide-range power supply of DC 24 V to 250 V and AC 115 V to 230 V with alarm relay
- Display of the data traffic via LED
- Integrated commissioning aids

Applications

The typical application area for the FO repeater is the protection-interface communication for SIPROTEC 4/5 line differential and distance protection devices. Furthermore, serial data of the 7XV5 device series can be transmitted over long distances.

The connection to the protection device is provided interference-proof via a fibre-optic connection. The maximum transmission distance between the protection device and the FO repeater is specified at 1.5 km when using a 62.5/125 µm fiber-optic cable or a 50/125 µm fiber-optic cable.



Figure 3.4/3 Optical Repeater with Integrated Multiplexer with 1300 nm/1550 nm Wavelength for 1 Singlemode Fiber-Optic Cable

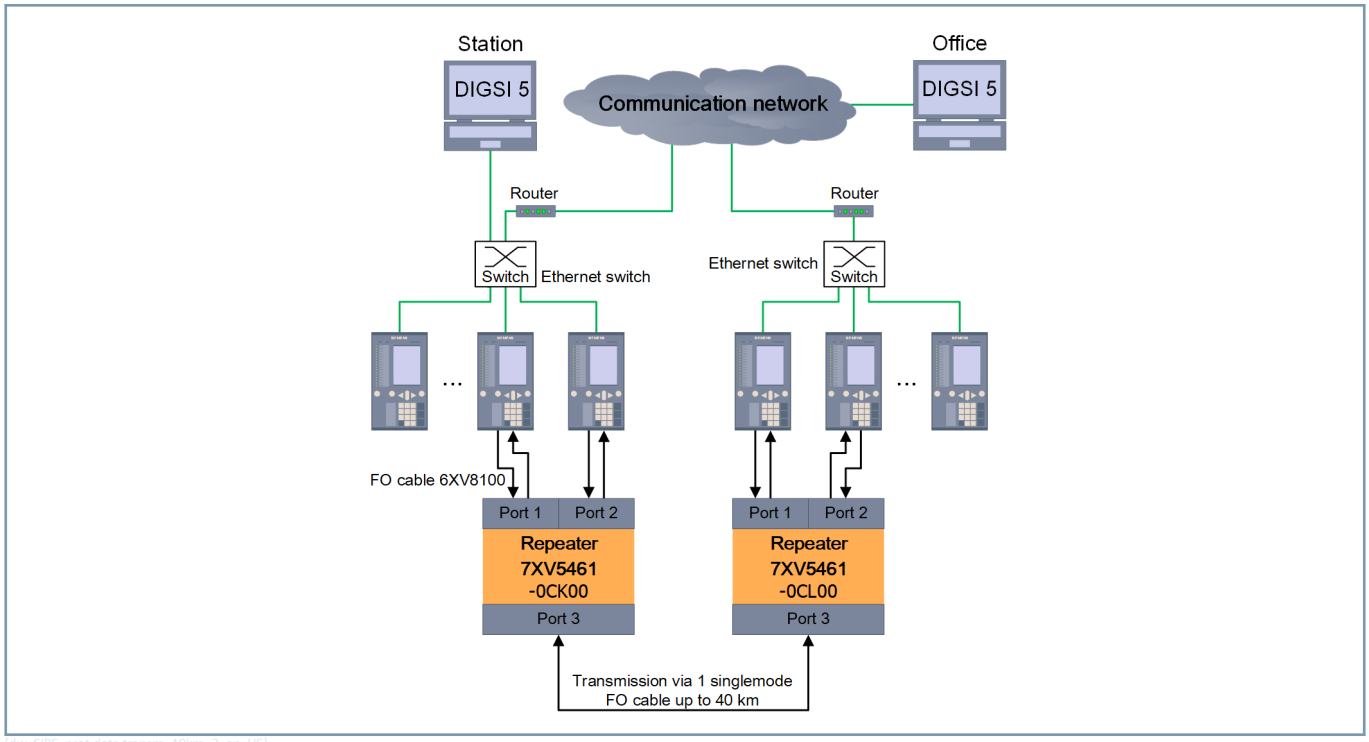
The FO repeater supports easy commissioning of the entire communication path. For commissioning, loops can be activated for port 1/2 so that the input signals are reflected at the respective port. The FO repeater has a relay contact to issue a "device ok" indication (DOK), and is equipped with a wide-range power supply unit that covers the entire normal DC and AC auxiliary voltage range.

Until now, 2 fiber-optic cables were needed for the bidirectional transmission of protection signals. Using the repeater with integrated wavelength multiplexer, one fiber-optic cable is sufficient.

Substation automation technology, telecontrol engineering, or additional protection data transmissions can be connected via port 2. As a result, the long-distance optical fiber is put to optimal use for 2 separate serial connections to transmit serial data between 300 bit/s and 4.096 Mbps.

Application Example with SIPROTEC 5 and DIGSI 5

Figure 3.4/4 shows the interference-free data exchange of SIPROTEC 5 protection devices, e.g. line differential protection 7SD8 or distance protection 7SL8, is via single mono-mode Fiber Optic cable up to a max. distance of 40 km and the DIGSI 5 access via Ethernet.



[dw_SIP5_prot-data transm_40km, 3, en_US]

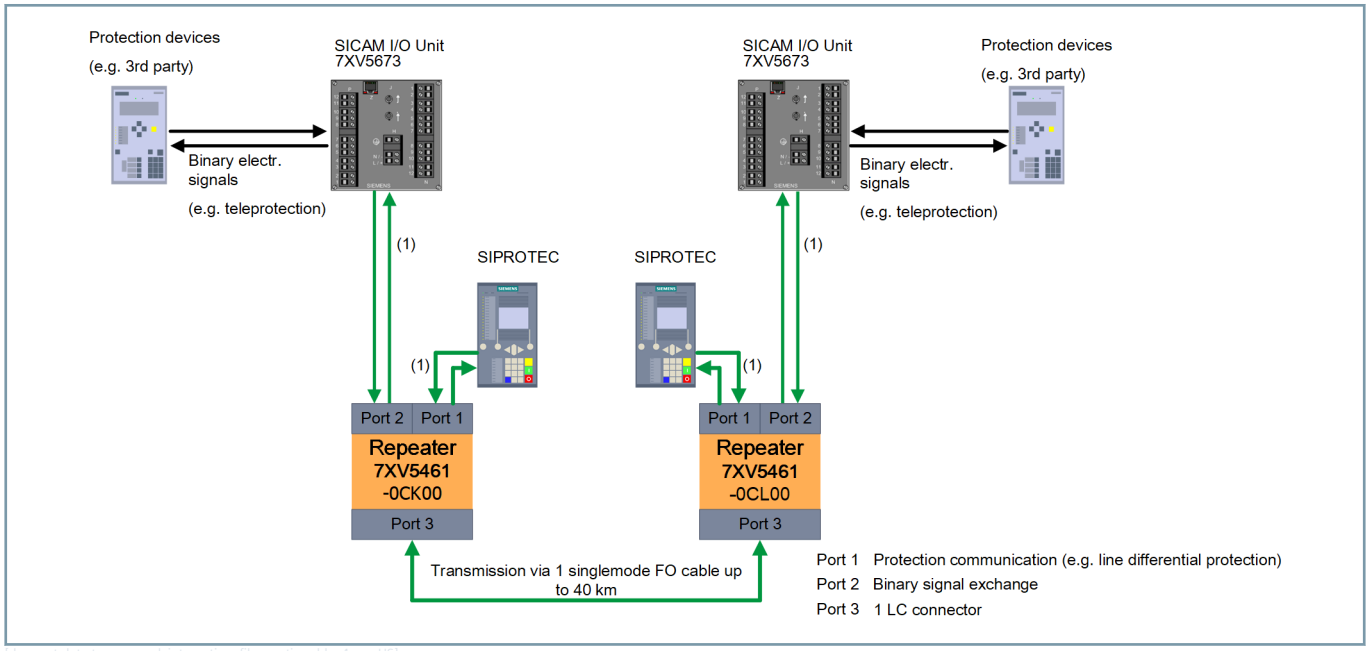
Figure 3.4/4 Transfer of Protection Data Signals of SIPROTEC 5 Devices via Single Mono-Mode FO Cable and DIGSI 5 Access via Ethernet (Note: Devices 7XV5461-0CK00 and 7XV5461-0CL00 must be Used in Pairs)

Application Example with SIPROTEC 5 and SICAM IO unit

(see *Figure 3.4/5*)

Binary protection signals (e.g. 3rd party devices) can be transmitted using the SICAM IO unit 7XV5673 in addition to SIPROTEC 4/5 line differential protection communication. Data is exchanged interference-free using an optical single-mode fiber-optical cable covering a distance of up to 40 km.

2-Channel Serial Optical Repeater – 7XV5461 up to 40 km



[dw_prot-data transm_and_integration_fiber-optic-cable, 4, en_US]

Figure 3.4/5 Protection Data Transmission Using One Singlemode Fiber-Optic Cable (Note: The 7XV5461-0CK00 and 7XV5461-0CL00 Devices must be used in Pairs.)

(1) Multimode fiber-optic cable with ST connectors (6XV18)

Technical Data

Connections	
Ports 1 / 2	ST connectors for 820 nm, for 50/125 µm and for 62.5/125 µm multimode fiber-optic cable
Port 3	Single LC connector for 1300 nm/ 1550 nm, for 9/125 µm single-mode fiber-optic cable
Screw terminals	2-pole screw terminals for auxiliary voltage 3-pole make contact/break contact for an alarm relay

Housing
Interference-resistant aluminum housing, 188 x 56 x 120 mm for mounting to 35-mm DIN rail according to EN 50032.
Weight: 0.8 kg. Degree of protection according to EN 60529: IP41

Power supply
Wide-range: 24 to 250 VDC or 115 / 230 VAC

Displays	
4 LEDs	
Green	Power supply
Red	Alarm relay
2 × yellow	Data traffic display

You can find additional technical data in the manual under: *www.siemens.com/accessories*

Selection and Ordering Data

Description	Order No.												
	1	2	3	4	5	6	7		8	9	10	11	12
Optical repeater for asynchronous and synchronous coupling	7	X	V	5	4	6	1	-	0	C	☐	0	0
											▲		
											|		
1550 nm/LC single connector/permissible attenuation: 25 dB (0.45 dB/km) for radii up to 40 km via a fiber-optic cable											K		

Description	Order No.			
1300 nm/LC single connector/permissible attenuation: 25 dB (0.45 dB/km) for radii up to 40 km via a fiber-optic cable	L			
For converting/amplifying multimode optical fiber, 50/125 µm or 62.5/125 µm (820 nm), to singlemode optical fiber, 9/125 µm, for serial data from 300 bit/s to 4.096 Mbps				
2 independent serial optical input channels with ST connectors for 820 nm and multimode optical fiber				
1 optical output at 1300 nm or 1550 nm with an LC connector for singlemode optical fiber				
Permissible path attenuation of the 820 nm multimode connection is 8 dB (approx. 1.5 km).				
Permissible path attenuation of the 1300 nm or 1550 nm singlemode connection: see order option				
Wide-range voltage supply/auxiliary voltage: 24 to 250 VDC or 115/230 VAC				
1 fault signaling contact for auxiliary voltage faults or loss of data connection				
LEDs for display of data transmission				
Data transmission in 2 directions from 2 optical ports using singlemode optical fiber				

NOTE

The -0CK00 and -0CL00 versions must be used in pairs.

NOTE

7XV5461-0Cx00 are compatible with the previous versions 7XV5461-0Bx00.

2-Channel Serial Optical Repeater – 7XV5461 up to 8 km

Description

The optical repeater 7XV5461 duplex multimode fiber-optic cable transmits serial optical signals over long distances via a duplex multimode fiber-optic cable. It converts serial optical 820 nm signals at port 1 and port 2 in the range of 300 bit/s up to 1.5 Mbps up to 1300 for duplex multimode fiber-optic cable. Synchronous and asynchronous signals can be connected. In this way, 2 independent, serial 820 nm inputs with ST connectors are available and these can be multiplexed onto port 3. It supports a transmit signal (Tx) and a receive signal (Rx) (no RTS/CTS handshake signals).

2 devices with an optical 820 nm interface, such as the line differential protection device of the SIPROTEC 4/5 series or the 7XV5652 RS232/820 nm converter, can be connected to ports 1 and 2 via multimode fiber-optic cables for distances of up to 1.5 km. These signals are transmitted to port 3 via the single duplex LC plug in wavelengths of 1300 nm for the connection of a duplex multimode fiber-optic cable. There are 2 options for port 3 for fiber-optic cable lengths of a maximum of 4 km (1300 nm) and 8 km (1300 nm). The device can be connected to all battery voltages and AC voltage sources. To support commissioning, loops can be activated for port 1/2 so that the input signals are reflected at the respective port.

Benefits

- 2 independent multiplexed 820 nm ports with ST connectors for max. 1.5 km via 50/125 µm and 62.5/125 µm duplex multimode fiber-optic cables
- Transmission rate of the serial ports 1/2 of 300 bit/s up to 1.5 Mbps. Automatic baud rate matching to synchronous and asynchronous serial signals; no settings necessary
- Powerful 1300 nm port with duplex LC plug for distances of up to 4 km/8 km using 50/125 µm/61.5/125 µm
- Wide-range power supply of DC 24 V to 250 V and AC 115 V to 230 V with alarm relay
- Display of the data traffic via LED
- Integrated commissioning aids with loop test option.

Applications

The typical application area for the FO repeater is the protection-interface communication for SIPROTEC 4/5 differential and distance protection devices. Furthermore, serial data from the 7XV5 device series can be transmitted over long distances.



[ph_7XV5461_W3, 2, --_--]

Figure 3.4/6 Optical Repeater with Wide-range Power Supply Unit

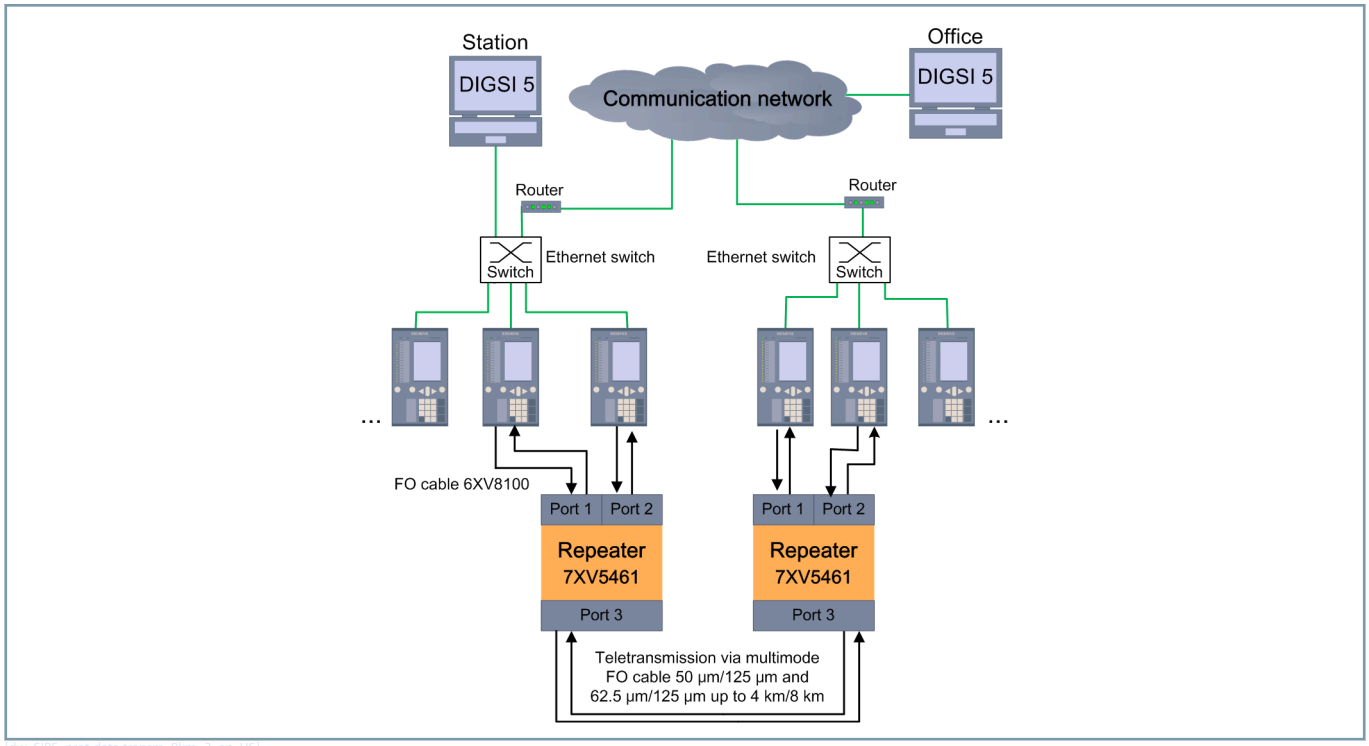
The connection to the protection device is provided interference-proof via a fibre-optic connection. The maximum transmission distance between the protection device and the FO repeater specified at 1.5 km when using a 62.5/125 µm fiber-optic cable or a 50/125 µm fiber-optic cable.

The FO repeater supports easy commissioning of the entire communication route. For commissioning, loops can be activated for port 1/2 so that the input signals are reflected at the respective port. The FO repeater has a relay contact to issue a "device ok" indication (DOK), and is equipped with a wide-ranging power supply that covers the entire normal DC and AC auxiliary voltage range.

Power-system control or additional protection data transmissions can be connected via port 2. As a result, the long-distance optical fiber is put to optimal use for 2 separate serial connections to transmit data between 300 bit/s and 4.096 Mbps.

Application Example with SIPROTEC 5 and DIGSI 5

Figure 3.4/7 shows the interference-free data exchange of SIPROTEC 5 protection devices, e.g. line differential protection 7SD8 or distance protection 7SL8, via duplex multi-mode Fiber Optic cable up to a distance of 4 km to 8 km and the DIGSI 5 access via Ethernet.



[dw_SIP5_prot-data transm_8km, 2, en_US]

Figure 3.4/7 Transfer of Protection Data Signals of SIPROTEC 5 Devices via Duplex-Multi-Mode FO Cable and DIGSI 5 Access via Ethernet

Technical Data

Connections	
Ports 1/2	ST connectors for 820 nm, for 50/125 µm and for 62.5/125 µm multimode fiber-optic cable
Port 3	Duplex LC plug for 1300 nm, for 50/125 µm / 62.5/125 µm multi-mode fiber-optic cable
Screw terminals	2-pole screw terminals for auxiliary voltage 3-pole make contact/break contact for an alarm relay

Housing
Aluminum housing, 188 x 56 x 100 mm for mounting to 35-mm DIN rail according to EN 50032.
Weight: 0.8 kg. Degree of protection according to EN 60529: IP41

Power supply
Wide range 24 to 250 VDC, without switch-over 115 to 230 VAC

Displays	
4 LEDs	
Green	Power supply
Red	Alarm relay
2 × yellow	Data traffic display

You can find additional technical data in the manual under:
www.siemens.com/accessories

Selection and Ordering Data

Description	Order No.											
	1	2	3	4	5	6	7		8	9	10	11	12
Optical repeater for multimode optical fiber	7	X	V	5	4	6	1	-	0	C	☐	0	0
											▲		
											|		
1300 nm/LC connector/4 km, multimode											G		

2-Channel Serial Optical Repeater – 7XV5461 up to 8 km

Description	Order No.			
1300 nm/LC connector/8 km, multimode		H		
For converting/amplifying multimode optical fiber, 50/125 µm or 62.5/125 µm (820 nm), to multimode optical fiber for serial data from 300 bit/s to 1.5 Mbps 2 independent serial optical input channels with ST connectors and 820 nm for multimode optical fiber, permissible path attenuation of the 820 nm path is 8 dB (approx. 1.5 km with 62.5/125 µm fiber). Wide-range power supply, DC 24 V to 250 V and AC 115/230 V 1 fault signaling contact for auxiliary voltage faults or loss of data connection				

7XV5650/51

Description

The RS485 optical fiber converter 7XV5650/51 makes it possible to connect up to 31 devices via a bus-capable electrical RS485 interface. It creates an optical connection to a central controller or a star coupler.

Benefits

- Baud rate: 9.6 to 115 kBd
- Topologies:
  7XV5650: Optical star structure
  7XV5651: Optical linear structure
- Protocol transparency
- Non-flickering light:
  Can be switched to light ON/light OFF
- Radius: 1.5 km at 62.5/125 µm, fiber-optic cable
- 120 Ω load resistor for the RS485 bus, activated/deactivated via DIP switches
- Wide-range power supply with self monitoring and alarm relay

Applications

The converter was developed for use in switchgear for interference-free transmission of serial data with transmission rates between 9.6 and 115.2 kBd via multimode fiber-optic cable.

The 7XV5651 converter is designed to operate as a T-coupler. That is, data can be distributed linearly allowing cost-effective optical bus systems to be built. The 7XV5650 version was designed for star topologies via optical fiber connections.

Optical Fiber Converter 7XV565x-0CA00

The following improvements are planned for the functional follow-up model ... -0CA00:

- Increased EMC (incl. new standards), adaptation for SIPROTEC 5
- Higher temperature ranges



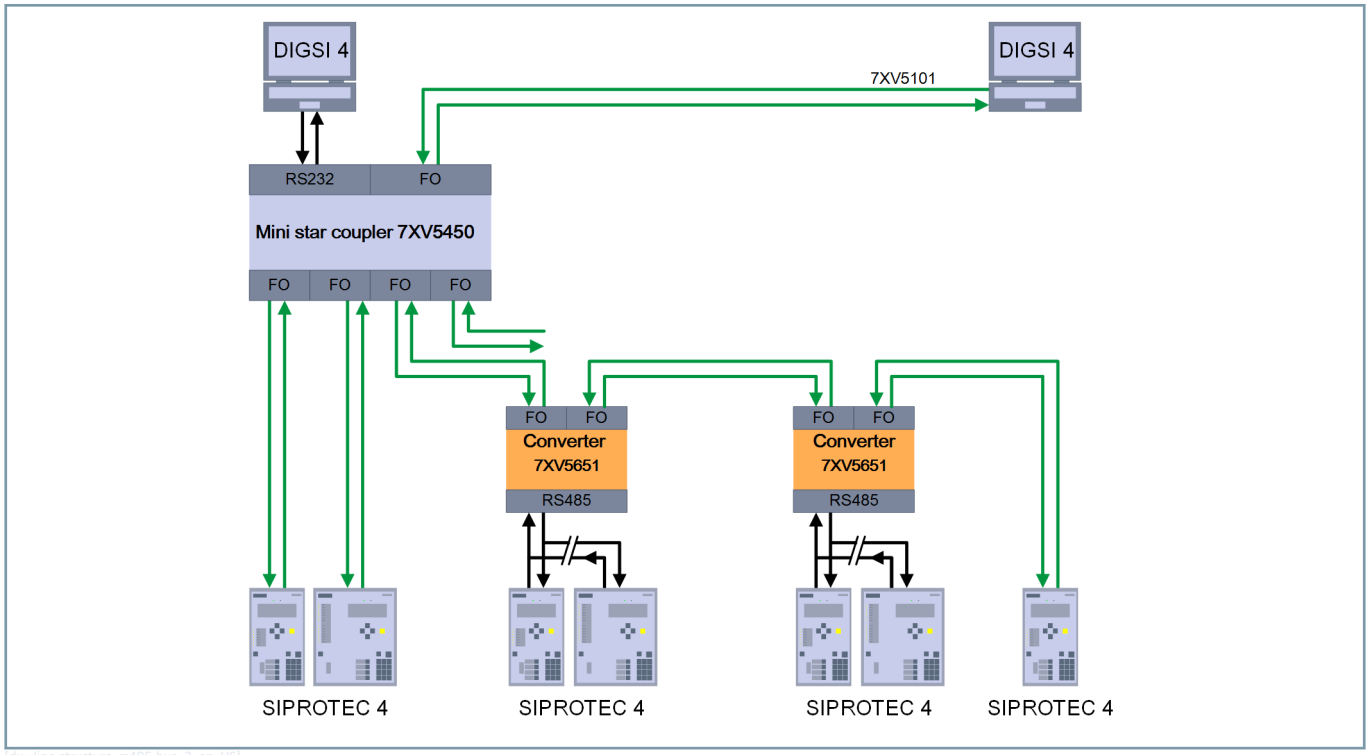
[ph_7XV5650_51, 2, --_--]

Figure 3.5/1 RS485 Optical Fiber Converter

- Additional UL approval
- Metal housing (KU-2M basis) in place of plastic
- Other form factor; converter size the same as CC-2M
- Grounded housing
- Switchable signal relay/GOK (3 terminals)
- Ring redundancy expansion for 2-channel version
- Additional LED to display power/error

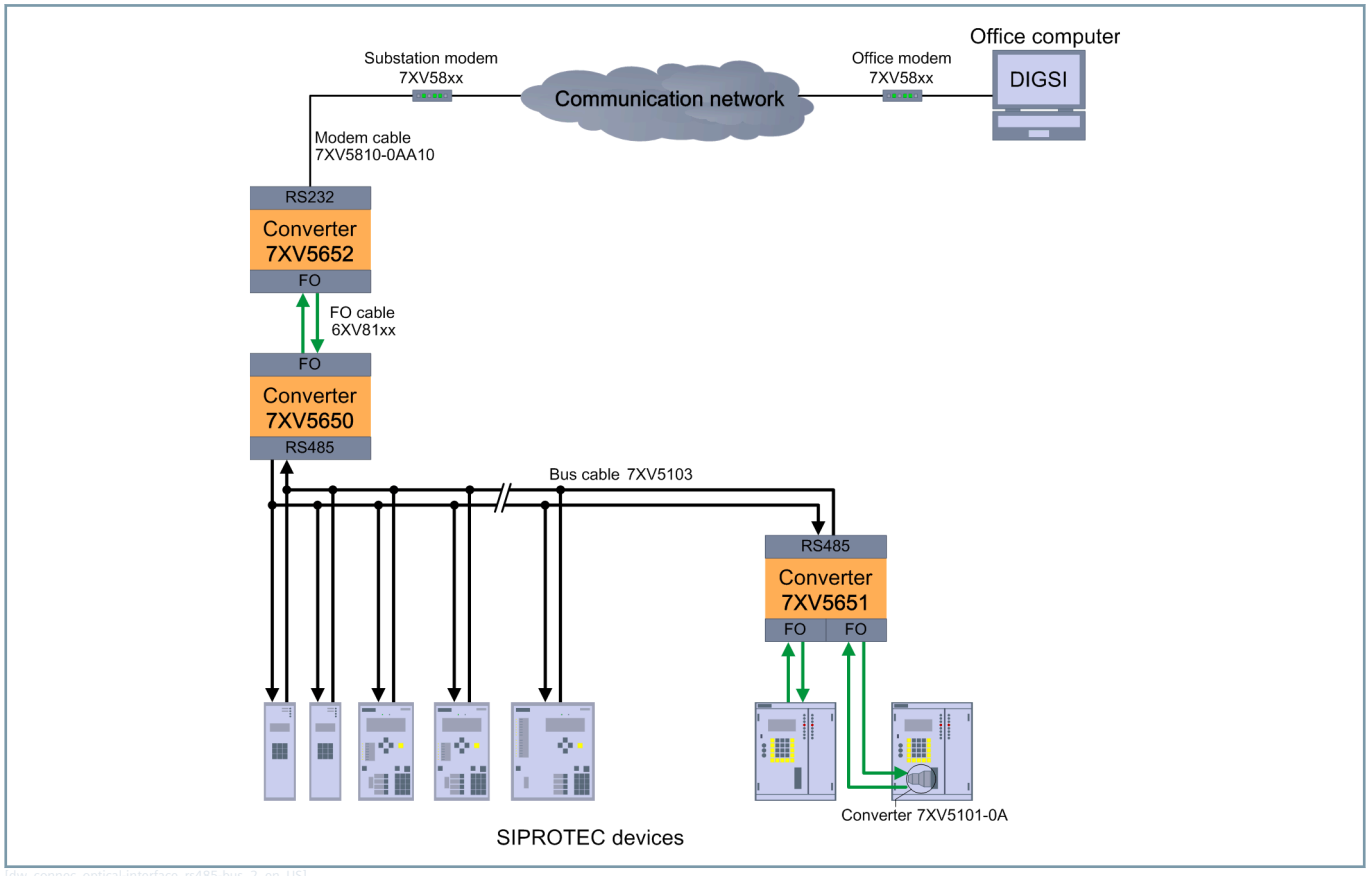
Application

The converters can be used in an optical linear structure or in an optical star structure. Use in an optical linear structure allows interference-free connection of devices using fiber-optic cables; for indoor installation, a cost-effective RS485 bus may be used.



[dw_line-structure_rs485-bus, 3, en_US]

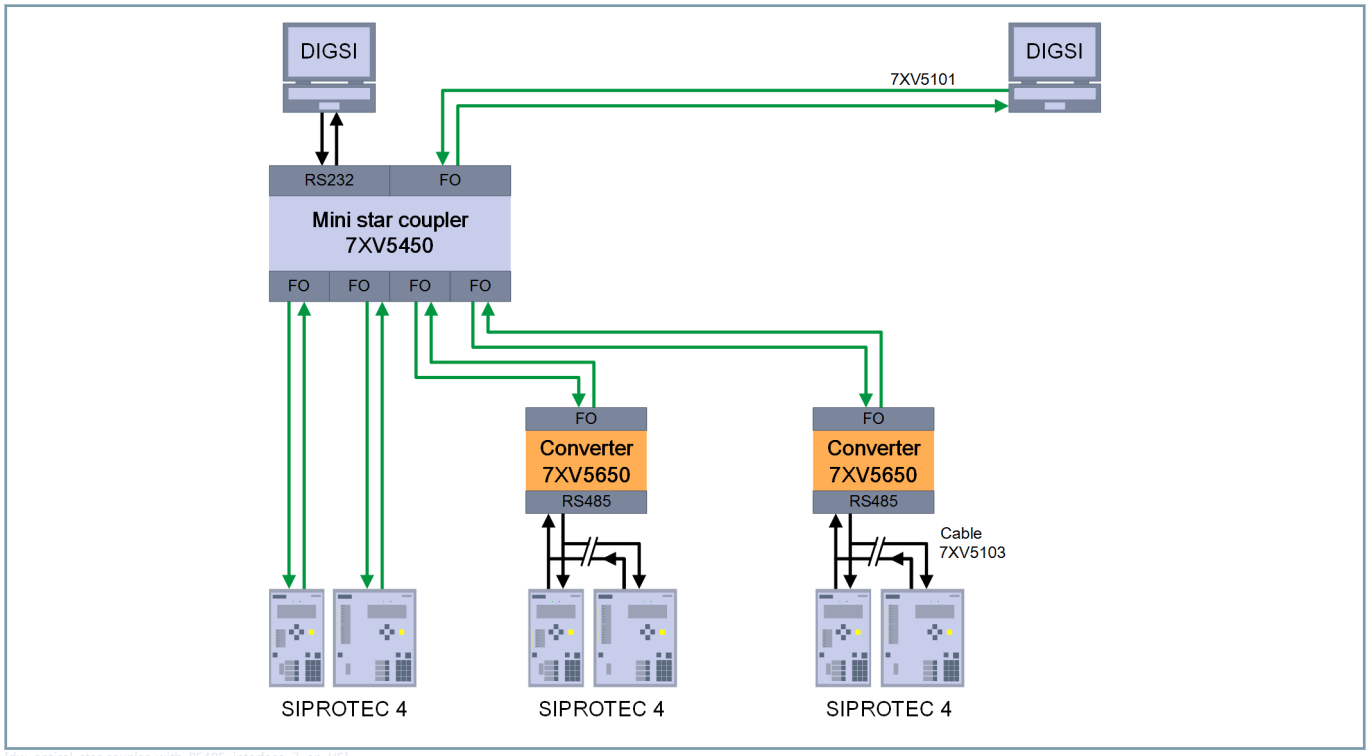
Figure 3.5/2 Optical linear Structure with connected RS485 Interfaces



[dw_connec_optical-interface_rs485-bus, 2, en_US]

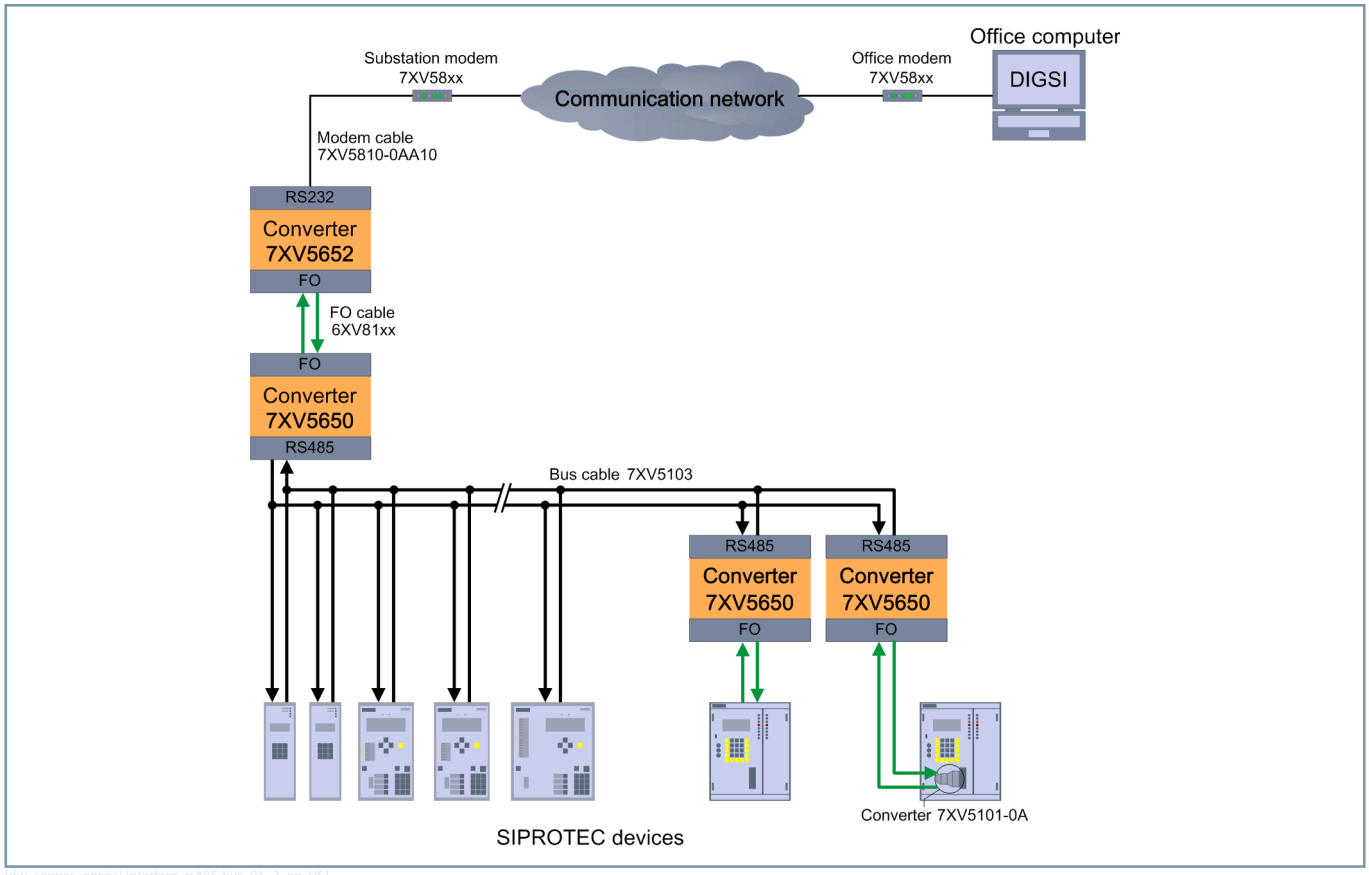
Figure 3.5/3 Connecting Optical Interfaces to an RS485 Bus

Several devices with an optical interface and DIGSI or IEC 60870-5-103 protocol can be connected to an existing RS485 bus topology. Within one system, the data format and the baud rate must be set to the same values.



[dw_optical_star-coupler_with_RS485_interface, 3, en_US]

Figure 3.5/4 Optical Star Structure with connected RS485 Interfaces



[dw_connec_optical-interface_rs485-bus_01, 2, en_US]

Figure 3.5/5 Connecting Optical Interfaces to an RS485 Bus

Technical Data

Auxiliary Voltage	
Rated input voltage	
• Direct voltage	DC 24 V to 250 V ± 20 %
• Alternating voltage	AC 60 V to 230 V ± 20 % / 45 to 65
Internal fuse	1.25 A slow-blow (soldered)
Protection class	III
Power consumption	For rated voltage (typical value)
• Direct voltage	3 W
• Alternating voltage	2.5 W; 3.5 VA

LEDs	
3 LEDs	
Green	Operating voltage OK
Yellow	Data reception via optical fiber channel 1
Yellow	Data reception via optical fiber channel 2 (7XV5651 only) Transmitting data

Connector Plug	
Power supply	2-pole Phoenix screw terminal
Fiber-optic cables	820 nm, ST connector

Connector Plug	
RS485	9-pole D-sub socket 2-pole Phoenix screw terminal
Signaling contact	2-pole Phoenix screw terminal

Non-Flickering Light	
Can be switched to light ON/OFF	

Housing
Plastic case, EG90, dark gray; 90×75×105 mm (W×H×D) for snap-on mounting to 35-mm DIN rail according to EN 60715

You can find additional technical data in the manual at:
www.siemens.com/accessories

You can find additional technical data in the manual under:
www.siemens.com/accessories

Surface Mounting

The converter has a housing for snap-on mounting to a 35-mm DIN rail according to EN 60715. Auxiliary voltage can be provided via screw connections. The fiber-optic cables are connected using ST connectors. The device contains no silicone or halogen and is very flame-resistant.

Selection and Ordering Data

Description	Order no.												
	1	2	3	4	5	6	7		8	9	10	11	12
Converter, optical fiber 820 nm to RS485	7	X	V	5	6	5	☐	–	0	C	A	0	0
							▲						
							|						
Converter with one RS485 interface and 2 optical fiber ST sockets (receive and transmit) 1 optical channel Not suitable for PROFIBUS Linear structure up to 115 Kbps Auxiliary voltage, DC 24 V to 250 V and AC 110/230 V without switchover Connecting protection devices or RTU with an RS485 interface using 9-pole D-sub connector plugs Connecting PC via modem using optical fiber 820 nm, via ST connectors for optical fiber 62.5 µm DIN rail mounting, metal housing							0						
Converter with one RS485 interface and 4 optical fiber ST sockets (2 times receive and transmit) 2 optical channels Not suitable for PROFIBUS With RTU ring redundancy Linear structure up to 115 Kbps Auxiliary voltage, DC 24 V to 250 V and AC 110/230 V Connecting protection devices with an RS485 interface using 9-pole D-sub connector plugs 4 fiberglass connections for 62.5/125 µm Multimode optical fiber using ST connectors DIN rail mounting, metal housing							1						

7XV5652

Description

The RS232 optical fiber converter 7XV5652 converts serial RS232 full duplex signals to optical fiber transmission signals. It has one optical fiber channel each for the transmit and receive directions and an RS232 interface isolated for 2 kV. As a result, the converter can be connected directly to the serial interface of SIPROTEC devices.

Benefits

- Serial baud rates up to 115 kBd
- Not necessary to set the baud rate
- Protocol transparency
- Non-flickering light: Can be switched to light ON/OFF
- Radius: 3 km at 62.5/125 µm, fiber-optic cable
- Wide-range power supply with self monitoring and signaling contact
- Supports the serial TxD and RxD lines of the RS232 interface. Handshake lines are not supported.

Applications

It is designed for use in switchgear and enables the galvanically separated, interference-free transmission of serial signals to a central controller, a star coupler, or a PC.



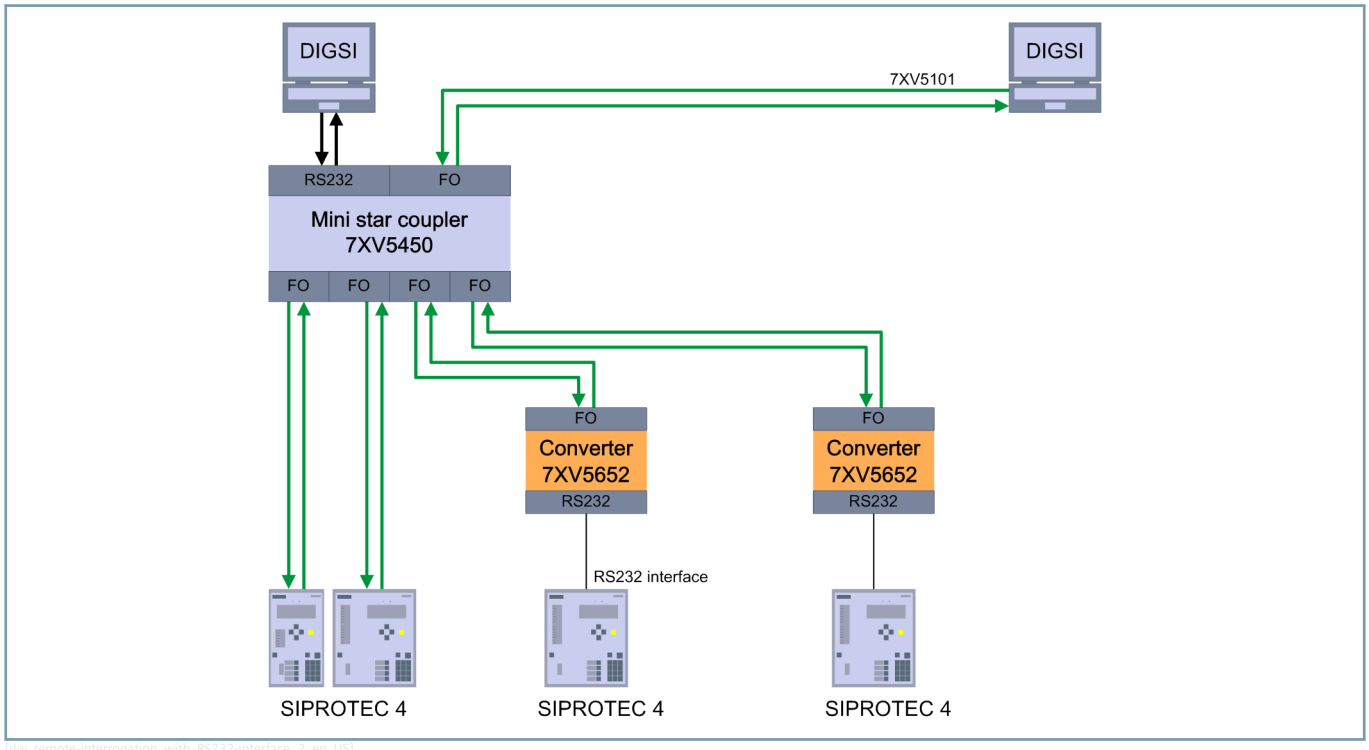
[ph_7XV5652, 2, –_–]

Figure 3.5/6 RS232 Optical Fiber Converter

The converter supports the conversion of serial TxD (transmit) and RxD (receive) signals to an optical output. Handshake signals are not supported.

Application

Using the serial RS232 optical fiber converter, an existing RS232 interface on a SIPROTEC protection device can be upgraded to an optical 820 nm interface to connect the device to other optical components for central and remote queries using DIGSI. Another application is the coupling between a line differential protection and a communication network having electrical RS232 inputs. The connection between the communication space containing the converter and the protection device is established in an interference-free manner via multimode fiber-optic cable.



[dw_remote-interrogation_with_RS232-interface, 2, en_US]

Figure 3.5/7 Remote Query with the RS232 Interface

Optical Fiber Converter 7XV565x-0CA00

The following improvements are planned for the functional follow-up model ... -0CA00:

- Increased EMC (incl. new standards), adaptation for SIPROTEC 5
- Higher temperature ranges
- Additional UL approval
- Metal housing (KU-2M basis) in place of plastic
- Other form factor; converter size the same as CC-2M
- Grounded housing
- Switchable signal relay/GOK (3 terminals)
- Ring redundancy expansion for 2-channel version
- Additional LED to display power/error

Technical Data

Auxiliary voltage	
Rated input voltage	
• Direct voltage	DC 24 V to 250 V ± 20 %
• Alternating voltage	AC 60 V to 230 V ± 20 % / 45 to 65
Protection class	III
Power consumption	For rated voltage (typical value)
• Direct voltage	3 W
• Alternating voltage	2.5 W; 3.5 VA

LEDs	
1 LED	
Green	Operating voltage OK

Connector Plug	
Power supply	2-pole Phoenix screw terminal
Fiber-optic cables	820 nm, ST connector
RS232	9-pole D-sub socket
Signaling contact	2-pole Phoenix screw terminal

Non-Flickering Light	
Can be switched to light ON/OFF	Using jumpers

Housing
Plastic case, EG90, dark gray; 90×75×105 mm (W×H×D) for snap-on mounting to 35-mm DIN rail according to EN 60715

You can find additional technical data in the manual at:
www.siemens.com/accessories

You can find additional technical data in the manual under:
www.siemens.com/accessories

Surface Mounting

The converter has a housing for snap-on mounting to a 35-mm DIN rail according to EN 60715. Auxiliary voltage can be provided via screw connections. The fiber-optic cables are connected using ST connectors. The device contains no silicone or halogen and is very flame-resistant.

Selection and Ordering Data

Description	Order No.												
	1	2	3	4	5	6	7		8	9	10	11	12
Converter, optical fiber according to RS232 up to 115 kBd	7	X	V	5	6	5	2	–	0	C	A	0	0
Auxiliary voltage, DC 24 V to 250 V and AC 110/230 V with alarm relay													
Connection for RS232 interface via 9-pole D-sub connector plug													
Connection, optical fiber 820 nm, via ST connector													
DIN rail mounting, metal housing													

7XV5662-0AA

Description

The communication converter for interfacing to a communication network is a peripheral device connected to the protection device via optical fiber. This peripheral device enables serial data exchange between 2 protection devices. This exchange takes place via a digital communication network. The electrical interfaces for the access of the communication converter to the communication device are optionally X.21 (64 Kbps, 128 Kbps, 256 Kbps or 512 Kbps) or G.703.1 (64 Kbps). The data is converted at the partner by a second communication converter, such that they can be read by the second device. Using the communication converters, 2 protection devices can communicate synchronously with each other and, while doing so, exchange a large amount of data over long distances. Typical applications are serial protection interfaces of differential protection and of distance protection in the SIPROTEC 4 devices 7SD52/53, 7SD61, 7SA52, 7SA6, and all SIPROTEC 5 devices such as the 7SD8, 7SA8, and 7SL8, where 7XV5662-0AA00 must be used.

If asynchronous serial data of the differential protection 7SD51 or the 7XV5653/7XV5673 binary signal transducer are to be transmitted, the 7XV5662-0AA00 device is to be used (asynchronous, from 300 bit/s to 115.2 Kbps, depending on the baud rate of the X.21 or G.703.1 interface).

The protection device is connected in an interference-free manner via a multimode fiber-optic cable pre-assembled at the communication converter with ST connectors. The maximum optical transmission distance is 1.5 km. The 7XV5662-0AA00 is to be mounted or installed near the communication device or data circuit terminating equipment in the same cabinet or at least in the same room. The maximum electrical transmission distance should be kept as short as possible, a few meters are favorable.

The data transfer between the protection devices represents a point-to-point connection that is bit-transparent. The data exchange must take place via reserved communication channels in the same communications system.

3.5

Benefits

- Optical interface with ST connector for connection to the protection device
- Radius: 1.5 km at 62.5/125 µm and 50/125 µm multimode fiber-optic cable between the communication converter and protection device/serial device
- Electrical interface to the communication device via D-sub connector plugs (X.21, 15-pole, automatic setting to 64, 128, 256 or 512 Kbps or G.703.1, 9-pole, 64 Kbps)
- Synchronous and asynchronous data exchange mode can be selected in one device by push-button
- Synchronous data exchange with the SIPROTEC 4 devices 7SD52/53, 7SD61, 7SA52, 7SA6, and all SIPROTEC 5 devices such as the 7SD8, 7SA8, and 7SL8



[ph_7XV5662-0AA00, 1, --_--]

Figure 3.5/8 Communication Converter 7XV5662-0AA00 for X.21/ RS422 and G.703.1

- Asynchronous data exchange for the protection device 7SD51, binary signal transducer, 7XV5653/7XV5673 or other devices with an asynchronous interface
- Monitoring of:
  - Auxiliary voltage,
  - X21: Clock signal of the communication network; G703.1: Receive data is present and corresponds to the standard pulse mask
  - and internal logic
- Alarm relay (1 change-over contact, SIPROTEC standard)
- Loop test can be selected via push-button
- Wide-range power supply unit of DC 24 V to 250 V and AC 115 V to 230 V with alarm relay

Functions

The protection device is optically connected to the communication converter, which enables interference-free data transmission between the communication converter and the protection device. The communication converter is located close to the communication device. It matches the optical active interface of the protection device to the electrical data of the communication network interface. The interface types – optionally X.21/ RS422 or G.703.1 – can be set with a push-button on the enclosure cover.

The device detects the necessary transmission rate automatically.

The data between the protection devices is transmitted on the basis of a point-to-point connection; in addition, a synchronous, bit-transparent transmission is possible via the communication network.

Applications

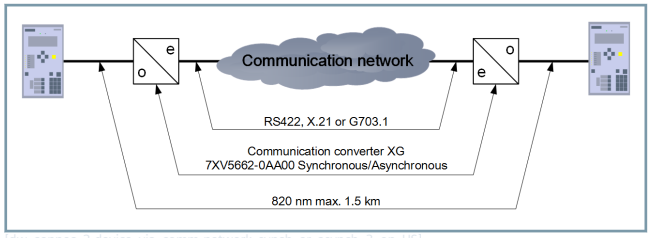
Synchronous serial data exchange between two devices of the same type:

- SIPROTEC 4: Distance protection with a binary permissive overreach transfer trip scheme and differential protection (7SA52/6,7SD52/53/61); devices must be equipped with the optical module LWL5.
- SIPROTEC 5: All device types are possible (such as 7SD8/A8/L8); devices must be equipped with the optical module USART-AD-1FO or USART-AE-2FO.

Asynchronous serial data exchange between 2 devices of the same type:

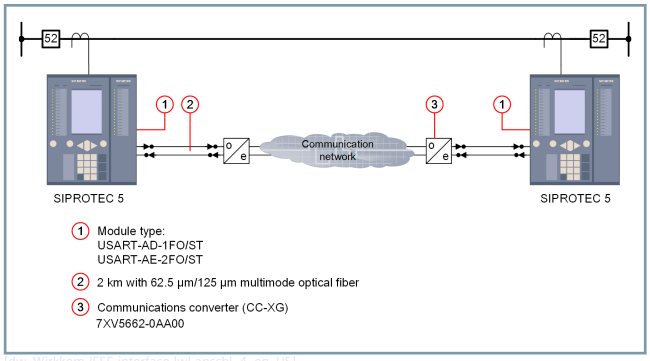
- SIPROTEC 3: Differential protection (7SD51).
- Binary Signal Transducer, SICAM I/O unit (7XV5653, 7XV5673): Point-to-point transmission of binary signals, for example, for serial permissive overreach transfer trip scheme logic in distance protection.

Application Examples



[dw_connec_2-device_via_comm-network_synch_or_asynch, 3, en_US]

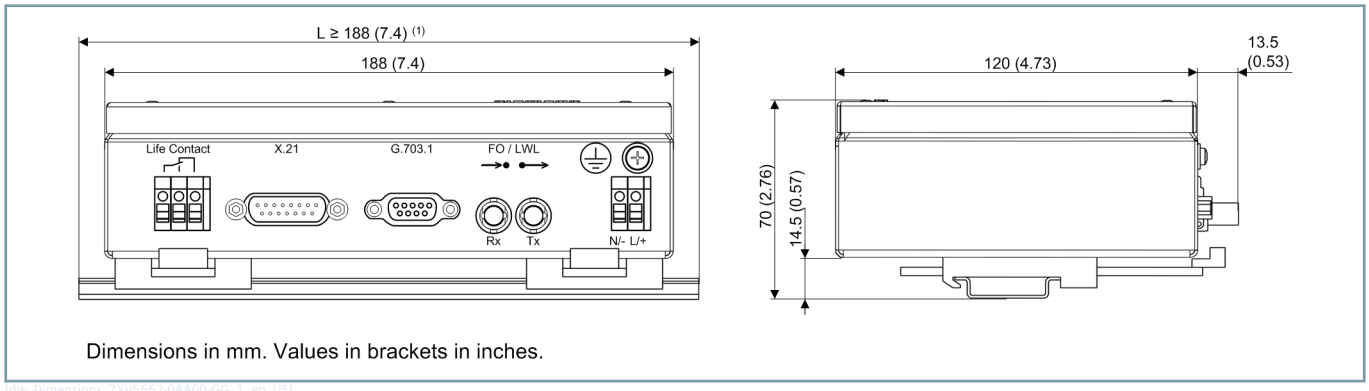
Figure 3.5/9 Connection of Two Protection Devices via a Communication Network linked with 7XV5662-0AA00 in Synchronous or Asynchronous Mode



[dw_Wirkkom-IEEE-interface-lwl-anschl, 4, en_US]

Figure 3.5/10 Protection Communication via a Communication Network with X21 or G703.1 (64 kbps / G703.6 (2Mbit)) Interface

Dimensioned Drawing



[dw_Dimensions_7XV5662-0AA00-GG, 1, en_US]

Figure 3.5/11 Dimensions of the Communication Converter, Front and Side View

Technical Data

Rated auxiliary voltage	
24 to 250 VDC	± 20%
115 V to 230 VAC	± 20%
Consumption	approx. 2.5 W; < 9.5 VA

4 LEDs	
LED 1	Red: Error or loop mode
LED 2	LED 2 "TxD" signals the transmit data coming from the network interfaces and transmitted to the protection device as optical fiber-T. Operation color "green": Device is operating in synchronous mode Operation color "yellow": Device is operating in asynchronous mode
LED 3	LED 3 "RxD" signals the receive data (optical fiber-R) coming from the protection device and to be transmitted to the network interface. Operation color "green": Device is operating in synchronous mode Operation color "yellow": Device is operating in asynchronous mode
LED 4	The "Power On" LED signals that the auxiliary voltage is connected. Operation color "green": The device communicates via the G703 interface. Operation color "yellow": The device communicates via the X21 interface.

Connections	
Power supply	2-pole screw terminal
Signaling/standby contact	3-pole make contact/break contact
Serial G.703.1 interface	9-pole D-SUB socket for the 4-pole receive and transmission line
X.21 interface	15-pole D-SUB connector plug for the electrical X.21/RS422 interface
Fiber-Optic Cables	820 nm, 2 ST connectors for T×D and R×D for 62.5/125 µm multimode optical fiber (max. distance to the protection device: 1.5 km)

Housing	
Sheet steel housing	Dimensions: 188×55×120 mm (W×H×D)
Weight	About 0.8 kg

Housing	
Degree of protection	according to EN 60529: IP41
for snap-on mounting	to 35-mm DIN rail according to EN 60715

Operating modes of the communication converter 7XV5662-0AA00		
Synchronous operation with	7SA52/6,7SD52/53/61; and all SIPROTEC 5 device types such as the 7SD8/A8/L8	
	G.703.1: Interface selectable by push-button	
	Settings in the protection device	Automatic settings in the CC-XG
	64 Kbps per parameter	64 Kbps
	X.21/ RS422: Interface selectable by push-button	
	Settings in the protection device	Automatic settings in the CC-XG
	64 Kbps per parameter	64 Kbps
	128 Kbps per parameter	128 Kbps
	256 Kbps per parameter	256 Kbps
	512 Kbps per parameter	512 Kbps
Asynchronous operation with	7SD51, 7XV5653/7XV5673 and devices with asynchronous serial interface (handshake not supported, only serial TxD and RxD signals are supported)	
	G.703.1: Interface selectable by push-button	
	Settings in the protection device	Automatic settings in the CC-XG
	max. 19.2 Kbps	64 Kbps
	X.21/ RS422: Interface selectable by push-button	
	Settings in the protection device	Automatic settings in the CC-XG
	max. 19.2 Kbps asynchronous	64 Kbps
	max. 38.4 Kbps asynchronous	128 Kbps
	max. 57.6 Kbps asynchronous	256 Kbps
	max. 115.2 Kbps asynchronous	512 Kbps

You can find additional technical data in the manual under:
www.siemens.com/accessories

Selection and Ordering Data

Description		Order no.											
		1	2	3	4	5	6	7		8	9	10	11	12
Communication converter for X.21/RS422/G.703.1		7	X	V	5	6	6	2	-	0	A	A	0	0
Converter for synchronous or asynchronous serial coupling of protection devices with optical input Output to communication devices with electrical X.21/RS422 or G.703.1 interface Connection to protection devices via fiber-optic cable at 62.5/125 µm and 820 nm wavelength, max. distance: 1.5 km ST connector, electrical with X.21/RS422 (15-pole D-SUB connector) or G.703.1 (9-pole D-SUB connector) Automatic baud rate detection, Synchronous or asynchronous operation selectable via push-button	For synchronous operation with 7SA52,7SA6,7SD52/53/61, all SIPROTEC 5 device types possible, like the 7SD8/A8/L8 For asynchronous operation with 7SD51, 7XV5653, 7XV5673 and other devices with an asynchronous serial interface													

7XV5662-0AC

Description

The communication converter, copper (CC-CO) is a peripheral device connected to the protection device, which enables serial data exchange between 2 line differential protection devices. For this, one single pair of copper wires (pilot wires) is used. It can be part of a telecommunication cable or another suitable symmetrical communication cable (not a Pupin cable). The data is converted at the partner by a second communication converter such that they can be read by the second protection device. Using the communication converters (Main Unit/Secondary Unit), 2 protection devices can communicate synchronously with each other and, while doing so, exchange a large amount of data over long distances.

Typical applications are the serial protection interfaces of differential protection and of distance protection in the SIPROTEC 4/5 device series, where 7XV5662-0AC02 must be used (128 kBit/s synchronous connection). If asynchronous serial data of the 7SD5 differential protection or the 7XV5653 binary signal transducer is to be transmitted, the 7XV5662-0AC03 device is to be used (asynchronous, from 300 bit/s to 38.2 kBit/s).

The protection device is connected in an interference-free manner via a multimode fiber-optic cable pre-assembled with ST connectors at the CC-CO end. The maximum optical transmission distance is 1.5 km. The data transfer between the protection devices represents a point-to-point connection that is bit-transparent. The data exchange must operate over reserved pilot wires, not via central offices.

Benefits

- Optical interface with ST connectors for connection to the protection device
- Radius: 1.5 km at 62.5/125 µm, multimode fiber-optic cable between CC-CO and the protection device
- Pilot wire radius: typically: 12 km; cascaded: 12 km + 12 km = 24 km
- Electrical interface to the pilot wire (line) with 2 screw terminals; 5 kV insulated
- Synchronous data exchange with the SIPROTEC 4 devices 7SD52, 7SD53, 7SD61, 7SA52, 7SA6, and all SIPROTEC 5 devices such as the 7SD8, 7SA8, and 7SL8 to pilot wire (CC-CO version -0AC02)
- Asynchronous data exchange for the 7SD51, 7XV5653, or other devices with an asynchronous interface (CC-CO version -0AC03)
- Loop test function can be selected using jumpers in the CC-CO
- Main Unit or Secondary Unit operation of the CC-CO can be selected using a jumper (1 Main Unit and 1 Secondary Unit at the end of the pilot wire required; default setting: Main Unit operation)
- Wide-range power-supply unit with self-monitoring and signaling contact



[ph_7XV5662-0AC00, 2, --_--]

Figure 3.5/12 Communication Converter 7XV5662-0AC02 for Pilot Wires

Functions

The protection device is optically connected to the communication converter, which enables interference-free data transmission between the communication converter and the protection device. The communication converter is located close to the pilot wire It converts serial data from the protection device into a frequency-modulated signal. This signal is transmitted via a pair of copper wires of a pilot wire/communication line (bidirectional, full duplex).

Using jumpers, one device is defined as the Main Unit and the other device as the Secondary Unit. In a "training" session during commissioning, the electrical properties of the pilot wires are measured by pressing a Reset key and the communication converters are set to these properties.

The measured properties are used as parameters that must be maintained for optimal data transmission. The digital data transmission enables a low degree of insulation on the pilot wires because no high voltages are created on the pilot wires under short-circuit conditions.

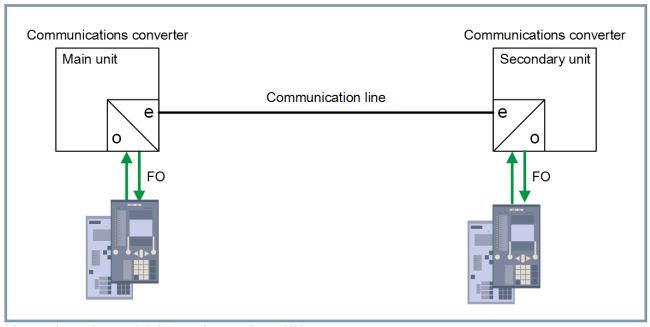
The data between the protection devices is transmitted on the basis of a point-to-point connection; in addition, it is a synchronous, bit-transparent transmission. Thanks to the telegram-buffered data exchange, an operating error cannot occur.

Applications

The communication converter can be used for 2 applications. One application is synchronous, serial data exchange (converter version: 0AC02) between SIPROTEC 4/5 differential protection devices (7SD52, 7SD6, 7SD8, and 7SL8) and/or serial permissive overreach transfer trip scheme logic between SIPROTEC 4/5 distance protection devices (7SA6, 7SA52, and 7SA8). The protection devices must be equipped with an optical 820 nm FO5 plug-in module or USART-AD-1FO or USART-AE-2FO.

Another application is the transmission of asynchronous serial data via pilot wires to the line differential protection device 7SD51 or the binary signal transmitter 7XV5653. Other serial devices can also be used.

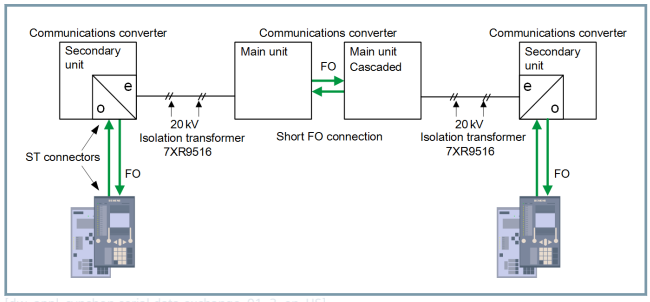
Application Examples



[dw_appl_synchon-serial-data-exchange, 3, en_US]

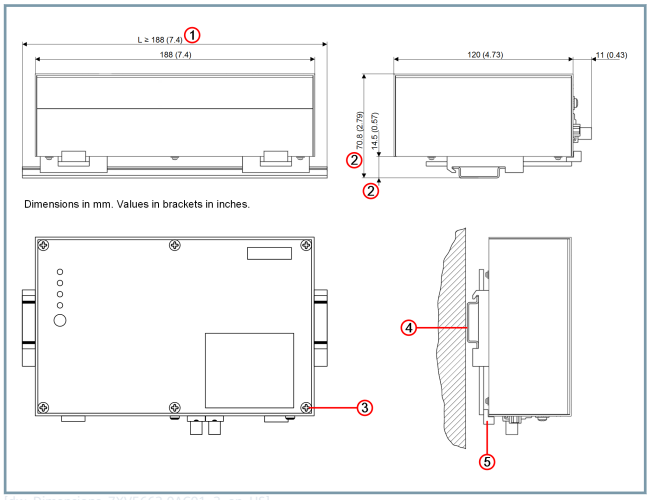
Figure 3.5/13 Application Example 1: Typical Design of a Communication Path

If the maximum distance between protection devices is greater than can be spanned by 2 CC-COs, the converters can be cascaded (see application example 2). A power supply is needed between the 2 Main Unit devices. If the insulation degree is greater than 5 kV (through the pilot wire inputs of the devices), external isolating transformers can be used at both ends. These isolating transformers provide 20 kV of isolation voltage and help to avoid dangerously high voltages at the inputs of the CC-COs that could be caused by a short circuit of a parallel high-power line.



[dw_appl_synchon-serial-data-exchange_01, 3, en_US]

Figure 3.5/14 Application Example 2: Cascading of CC-COs



[dw_Dimensions_7XV5662-0AC01, 2, en_US]

Figure 3.5/15 Dimensions CC-CO

(1) Minimum length of the DIN rail

(2) Applies to the DIN EN 60715 rail; TH 35 x 7.5

(3) Phillips screw

(4) A DIN rail mounted on the wall (not included in the scope of supply)

(5) Release device

Supply Voltage via a Wide-Range Power-Supply Unit

Auxiliary voltage – direct voltage	DC 24 V to 250 V
Permissible voltage range	DC 19 V to 300 V
Power consumption	< 4 W
Permissible AC ripple voltage, Peak-peak	≤ 12 % at the rated voltage, IEC 60255-1
Stored-energy time for outage/ short circuit of the auxiliary voltage	≥ 50 ms

Auxiliary voltage – alternating voltage	AC 110 V to 230 V, 50 Hz/60 Hz
Permissible voltage range	AC 99 V to 253 V
Power consumption	< 10 VA
Connection	2-pole screw terminal

Signal Relay (DOK)(Life Contact)

Contact	1 change-over contact
Switching power	
– ON	1000 W, 1000 VA
– OFF	30 VA; 40 W ohmic
Contact voltage	250 V
Permissible current per contact	5 A continuously, 30 A for 0.5 s

Unsuitable for isolating supply voltages	
Connection	3-pole screw terminal

Terminals for Auxiliary Voltage (DOK)(Life Contact), and Line

Rated line cross-section	0.2 mm^2 to 2.5 mm^2 solid, 0.25 mm^2 to 1.5 mm^2 with boot-lace ferrule
Stripped length	9 mm
Tightening torque	0.4 Nm to 0.5 Nm

Internal Fuses

Not interchangeable	T 1.6 A at AC 250 V acc. to IEC 60127
Not interchangeable, secondary	F 2 A at AC 125 V acc. to UL 248-14

You can find additional technical data in the manual under:
www.siemens.com/accessories

Selection and Ordering Data

Description	Order no.												
	1	2	3	4	5	6	7		8	9	10	11	12
Communication converter for pilot wires	7	X	V	5	6	6	2	-	0	A	C	0	☐
													▲
													|
For synchronous operation with 7SA52,7SA6,7SD52/53/61, all SIPROTEC 5 device types possible, like the 7SD8/A8/L8													2
For asynchronous operation with 7SD51, 7XV5653, 7XV5673 and other devices with an asynchronous serial interface													3
Converter for synchronous or asynchronous serial coupling of protection devices with optical input and ST connectors. For conventional two-wire control lines 5-kV isolation of the devices' analog outputs from the two-wire control lines. Connection to the protection device via fiber-optic cable at 62.5/125 µm and 820 nm wavelength max. distance: 1.5 km, ST connectors synchronous serial transmission rate: 128 Kbps Asynchronous serial transmission rate: max. 38.4 Kbps													

7XV5662-0AD

Description

The communication converter CC-2M is used for serial data transmission over long distances via a communication network. It converts synchronous or asynchronous serial signals from an optical 820-nm input to the inputs LWL1 and LWL2 to a network interface and transmits these signals back via the interfaces of the remote terminal unit. LWL1 and LWL2 can have their parameters set independently for either synchronous or asynchronous operation. However, both ends must be set to the same operating mode.

In synchronous operation, the interface should be used only for the exchange of protection data from the SIPROTEC 4/5 differential protection 7SD5/7SD6/7SD8 or from the SIPROTEC 4/5 distance protection 7SA52/7SA6/7SA8/7SL8. Their default setting is for 512 Kbps.

In asynchronous operation, the interface can be used for connecting devices with baud rates between 1.2 and 115.2 Kbps. Another asynchronous electrical RS232 interface is available for a maximum of 115.2 Kbps. It is used to connect a serial PC interface with DIGSI and thus as the operational interface to SIPROTEC devices at the opposite end.

The G.703.6 network interface is designed as a 4-pole screw terminal and can be configured as a 2-Mbps interface according to the European format E1 or as a 1.544-Mbps interface in the American format T1.

All device settings are made using jumpers so that no special PC software is necessary.

Benefits

- Interference-free protection data transmission from 2 independent serial data signals, selectable either in synchronous or asynchronous operation.
- PC interface for device operation at the opposite end

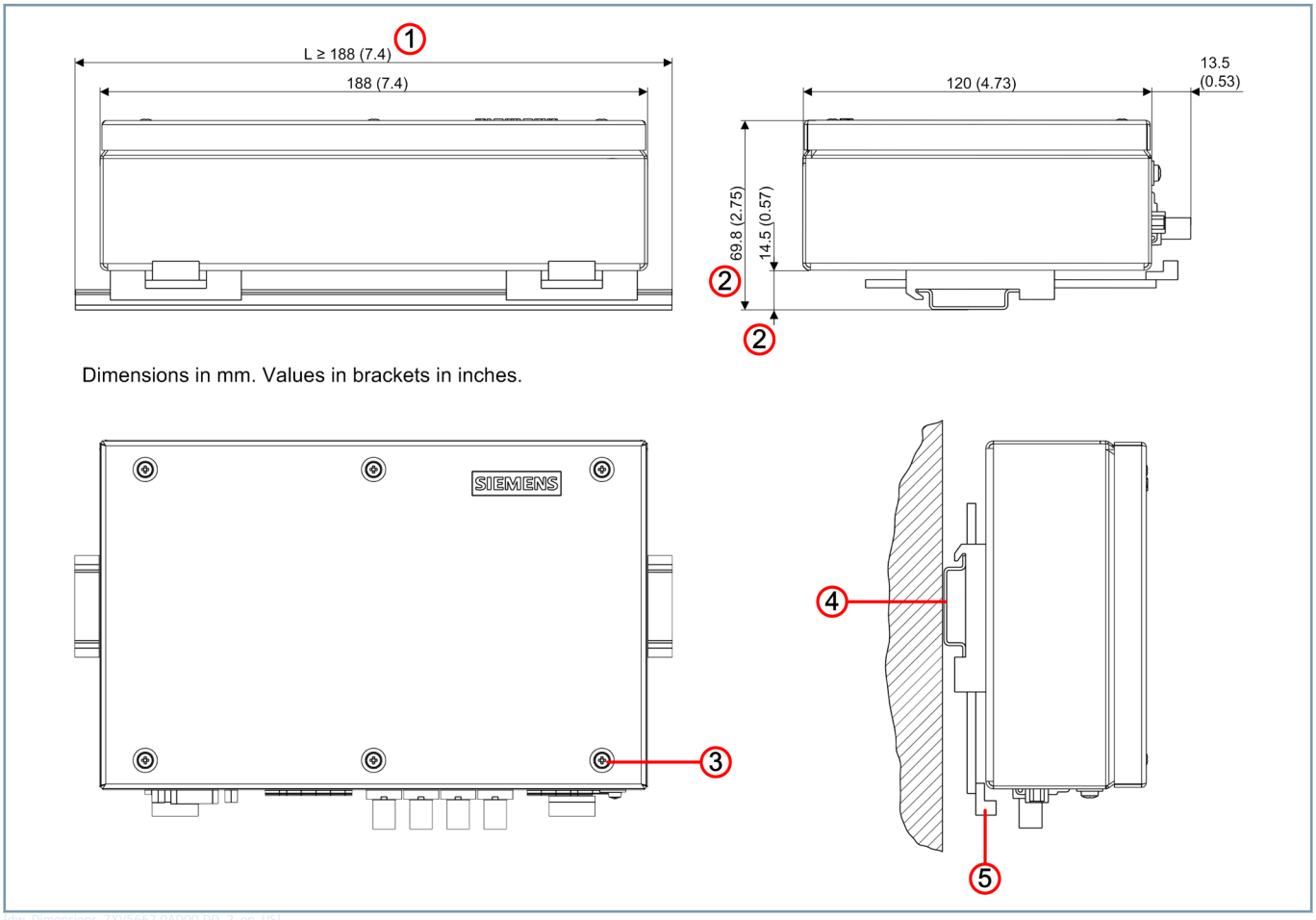


[ph_7XV5662-0AD00, 1, --_--]

Figure 3.5/16 Communication Converter 7XV5662-0AD00 – G.703.6

- Network interface in format E1 or T1 for connection to a multiplexer
- Wide-range power-supply unit of DC 24 V to 250 V and AC 115 V to 230 V with fail-safe relay
- Display of data exchange via an LED
- Integrated commissioning aid (loop test)

Dimensional Drawing



[dw_Dimensions_7XV5662-0AD00-DD; 2; en_US]

Figure 3.5/17 Dimensions: Communication Converter 7XV5662-0AD

3.5

(1) Minimum DIN-rail length

(2) The dimensional drawing applies to the DIN EN 60715 DIN rail; TH 35 x 7.5

(3) Phillips screw

(4) A DIN rail mounted on the wall (not included in the scope of supply)

(5) Release device

Technical Data

Connections	
Optical fiber 1/2	ST connector / 820 nm for 50 / 125 µm or 62.5 / 125 µm multimode fiber-optic cable (max. 1.5 km)
RS232	for asynchronous connection from 1.2 to 115.21 Kbps
Power supply	2-pole screw terminal

Connections	
Fail-safe relay	3-pole screw terminal with break contact/ make contact
Network E1/T1	4-pole screw terminal or BNC connector

Housing	
Aluminum housing	188×56×120 mm for mounting to 35-mm DIN rail according to EN 50032
Weight	0.8 kg
Degree of protection	according to EN 60529: IP41

Power supply
Wide-range Power Supply Unit, 24 to 250 VDC and 115/230 VAC, 50/60 Hz

4 LEDs	
Green	Power supply
Red	Fault display
2 × yellow	Data Transfer

You can find additional technical data in the manual under:
www.siemens.com/accessories

Selection and Ordering Data

Description	Order no.											
	1	2	3	4	5	6	7		8	9	10	11	12
2-channel serial communication converter	7	X	V	5	6	6	2	-	0	A	D	0	☐
													▲
													|
Connection from the multiplexer to the E1/T1 network interface via 4-pole screw terminal													0
Connection from the multiplexer to the E1/T1 network interface via BNC connector													1
2 independent serial optical input channels with ST connectors for 820 nm, for multimode optical fiber, for max. 512/115.2 Kbps for synchronous/asynchronous data. 1 electrical serial RS232 interface with max. 115.2 Kbps designed as 9-pole D-SUB socket for connection to DIGSI cable 7XV5100 Wide-range Power Supply Unit, 24 to 250 VDC and 115/230 VAC 1 current signaling contact for auxiliary voltage faults or loss of data connection LED for data transmission display All settings via jumpers in the device (configured for E1) and synchronous serial optical fiber inputs For synchronous operation with 7SA52,7SA6,7SD52/53/61, all SIPROTEC 5 device types possible, like the 7SD8/A8/L8 For asynchronous operation with 7SD51, 7XV5653, 7XV5673 and other devices with an asynchronous serial interface													

Description

The RUGGEDCOM RS900 is a rugged, small form factor Layer 2 Fast Ethernet switch. Designed to operate reliably in electrically harsh and climatically demanding environments, it provides a high level of immunity to electromagnetic interference and heavy electrical surges typical of the environments found in electric substations, on plant floors, or in curbside and wayside control cabinets.

Benefits

- Field proven, cost effective compact switch reduces acquisition based CAPEX, as well as OPEX through the very low rate of unscheduled maintenance visits.
- Opex costs further reduced due to elimination of planned maintenance requirements through a design that uses no moving parts or fans.
- Use any available or planned fiber infrastructure with flexible uplink options.

Functions

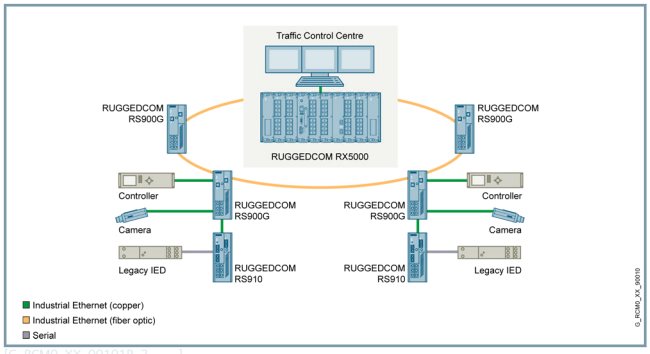
- 3 factory configurable ports supporting Fast Ethernet copper or 100 Mbit fiber optic interface options (MTRJ, SC, ST, LC connectors)
- 6 Copper (10/100BASE-TX, RJ45) ports
- Fully integrated power supply
  - Universal high-voltage input: AC 85 V to 264 V /DC 88 V to 300 V
  - Medium-voltage DC input: DC 48 V Nennspannung (DC 36 V to 72 V)
  - Low-voltage DC input DC 24 V nominal voltage (DC 10 V to36 V)
- Non-blocking store and forward switching
- For use at ambient temperatures from –40°C to +85°C without the use of fans



[P_RCM0_XX_00041P, 2, --_--]

Figure 3.6/1 RUGGEDCOM RS900

Application Example



[G_RCM0_XX_00101P, 2, --_--]

Figure 3.6/2 RUGGEDCOM RS900G in a fiber optic ring connecting multiple field devices

3.6

Selection and Ordering Data

Description	Order no.																
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
RUGGEDCOM RS900	6	G	K	6	0	9	0	-	0	A	S	2	.	-	0	.	A	.
RUGGEDCOM RS900 is a 9-port, industrially hardened, fully managed Ethernet switch supporting 6 Fast Ethernet RJ45 ports and up to 3 Fast Ethernet Fiber ports available over multiple fiber connector types and distances.																		
Selection and ordering data for RUGGEDCOM accessories: *Further Information*																		

Table 3.6/1 Selection and Ordering Data

Description

The RUGGEDCOM RS900G is a rugged, small form factor Layer 2 Fast Ethernet switch with Gigabit uplinks. Designed to operate reliably in electrically harsh and climatically demanding environments, it provides a high level of immunity to the electromagnetic interference and heavy electrical surges typical of environments found in electric substations, on plant floors, or in curbside and wayside control cabinets.

Benefits

Cost effective, highly reliable, field proven compact switch reduces CAPEX costs on initial acquisition and OPEX costs by very low rate of unscheduled maintenance visits.

Functions

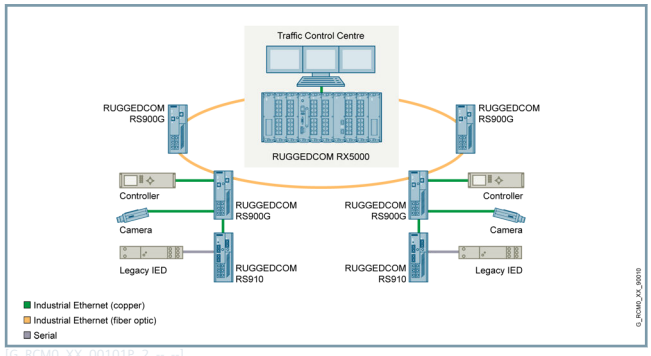
- 2 factory configurable ports supporting SFPs or an array of Gigabit fiber optic interfaces
- 8 Copper (10/100BASE-TX, RJ45) ports
- Fully integrated power supply
  - Universal high-voltage input: AC 100 V to 240 V / DC 100 V to 300 V
  - Medium-voltage DC input: DC 48 V (DC 36 V to 72 V)
  - Low-voltage DC input : DC 24 V (DC 10 V to 36 V)
- Non-blocking store and forward switching
- For use at ambient temperatures from –40 °C to +85 °C without the use of fans



[RS900G, 1, --_--]

Figure 3.6/3 RUGGEDCOM RS900G

Application Example



[G_RCM0_XX_00101P, 2, --_--]

Figure 3.6/4 RUGGEDCOM RS900G in a fiber optic ring connecting multiple field devices

3.6

Selection and Ordering Data

Description	Order no.																
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
RUGGEDCOM RS900G	6	G	K	6	0	9	0	-	0	G	S	2	.	-	0	.	A	.
The RUGGEDCOM RS900G is a rugged, fully managed Ethernet switch providing dual fiber optic Gigabit Ethernet ports and 8 Fast Ethernet copper ports; 2 Fiber Optic Gigabit Ethernet Ports (1000BaseX); 8 Fast Ethernet Ports (10/100BaseTX); Multiple fiber connector types (LC, SC, SFP Pluggable Optics); Bi-directional single strand fiber support; Long haul optics allow Gigabit distances up to 70 km																		
Selection and ordering data for RUGGEDCOM accessories: *Further Information*																		

Table 3.6/2 Selection and Ordering Data

Description

The RUGGEDCOM RS900GP is a rugged, small form factor Layer 2 switch with Power-over-Ethernet (PoE) capability. Designed to operate reliably in electrically harsh and climatically demanding environments, it provides a high level of immunity to the electromagnetic interference and heavy electrical surges typical of environments found on plant floors or in curbside and wayside control cabinets.

Benefits

- High PoE port density to meet the growing demand for Ethernet in roadside and wayside cabinets without the need for multiple devices.
- Power over Ethernet ports (PoE+) reduce cabling costs and simplify camera, radio and peripheral device connectivity by supplying power and Ethernet in one cable.
- Use any available or planned fiber infrastructure with flexible uplink options.

Functions

- 2 factory configurable ports supporting SFP, copper RJ-45, Micro-D, and an array of Gigabit fiber optic interfaces
- 8 Copper (10/100BASE-TX, RJ45) ports each supporting PoE+ (30 Watts per port) per IEEE 802.3at
- Powered by the external PoE supply (DC 45 V to 57 V) for a streamlined power configuration
- Non-blocking store and forward switching
- For use at ambient temperatures from –40 °C to +85 °C without the use of fans



Figure 3.6/5 RUGGEDCOM RS900GP

Application Example

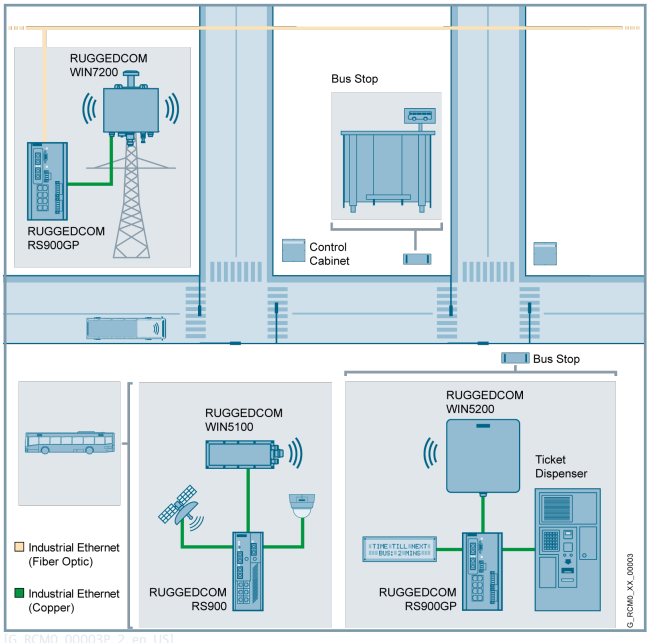


Figure 3.6/6 RUGGEDCOM RS900GP connecting devices in transportation networks

Selection and Ordering Data

Description	Order no.																
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
RUGGEDCOM RS900GP	6	G	K	6	0	9	0	-	0	P	S	2	.	-	0	.	A	.
The RUGGEDCOM RS900GP is a utility grade, fully managed Ethernet switch providing dual fiber optic or copper Gigabit Ethernet ports and 8 Fast Ethernet copper ports; 8 Fast Ethernet Ports (10/100BaseTX) all 802.3af/802.3at compliant PoE; Up to 2 Fiber Optic Gigabit Ethernet Ports (100/1000BaseX); Up to 2 10/100/1000 BaseTX ports; Multiple fiber connector types (LC, SC,ST, SFP)																	
Selection and ordering data for RUGGEDCOM accessories: *Further Information*																	

Table 3.6/3 Selection and Ordering Data

Description

The RUGGEDCOM RSG910C and RSG908C are compact all Gigabit, IEEE 1588 compatible Ethernet switches. The RSG910C supports 4 Gigabit SFP uplink ports and 6 10/100/1000TX copper ethernet ports while the RSG908C supports 4 Gigabit SFP uplink ports and 4 multimode fiber 100FX ports with LC connectors. Both products come with an integrated DIN rail mount and front-facing interfaces for easy installation in space-limited areas. They offer redundant power inputs for both DC and high voltage AC/DC applications, eliminating a single point of failure. Designed to operate in harsh environments with widely varying climatic and environmental conditions, these devices can be used for precise time synchronization in the Electric Power industry; for high-bandwidth applications such as video streaming in the Transportation industry and for time-critical applications such as drilling automation, SCADA (Supervisory Control and Data Acquisition) and RTU (Remote terminal unit) solutions for wellhead automation, pipeline monitoring, compression or pumping stations in the oil & gas industry.

Benefits

- Reduce maintenance costs by combining precision timing information and data communications onto a single network due to the support of IEEE 1588.
- SFP uplink ports allow for in-field modification at any time allowing deployment flexibility for varying customer needs.
- The redundant power supply inputs allow for continuous safe and reliable operations even during single power supply failures, diminishing the risk of revenue and data loss.

Features

- 4 Fiber optic (100BASE-FX, LC) or 6 Copper (10/100/1000BASE-X, RJ45) ports
- Industry standard connectors: SFP, LC and/or RJ45
- Fully integrated power supply with redundant power inputs
  - Universal high-voltage dual inputs: AC 100 V to 240 V / DC 100 V to 300 V
  - Universal low-voltage DC dual inputs with nominal voltages: DC 12 V, DC 24 V, DC 48 V (DC 10 V to 60 V)
- Non-blocking store and forward switching
- For use at ambient temperatures from –40 °C to +85 °C; without the use of fans

Product Variants

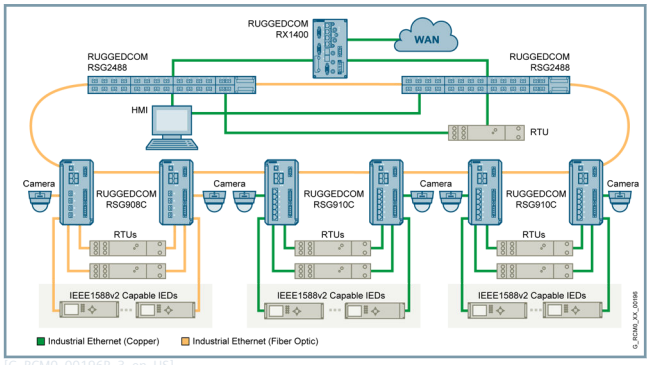
- RUGGEDCOM RSG910C
  - The RUGGEDCOM RSG910C is a compact Gigabit IEEE 1588 compatible Ethernet switch, providing 4 Gigabit SFP ports and 6 Gigabit copper ports.
- RUGGEDCOM RSG908C
  - The RUGGEDCOM RSG908C is a compact Gigabit IEEE 1588 compatible Ethernet switch, providing 4 Gigabit SFP ports and 4 100FX multimode fiber optic ports with LC connectors.



[RSG910C, 1, --_--]

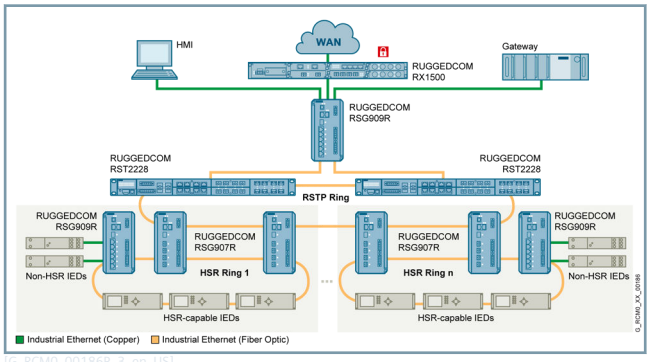
Figure 3.6/7 RUGGEDCOM RSG910C and RSG908C

Application Examples



[G_RCM0_00196P, 3, en_US]

Figure 3.6/8 RUGGEDCOM RSG908C and RSG910C provides a mix of fiber optic and copper ports for IEDs and other edge equipment



[G_RCM0_00186P, 3, en_US]

Figure 3.6/9 RUGGEDCOM HSR Coupling Switch with IEEE1588

Selection and Ordering Data

Description	Order no.																
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
RUGGEDCOM RSG908C	6	G	K	6	4	9	0	-	8	C	B	.	.	-	.	.	.	.
RUGGEDCOM RSG908C is an 8 port rugged fully managed Ethernet switch featuring integrated IEEE 1588 support for use in harsh industrial environments. The product has 4x 1 Gbit/s SFP slots and 4x 100 Mbit/s multimode LC ports (max 2 km). -40 °C to +85 °C operating temperature (fanless).																		
RUGGEDCOM RSG910C	6	G	K	6	4	9	1	-	0	C	B	.	.	-	.	.	.	.
RUGGEDCOM RSG910C is a 10 port rugged fully managed Ethernet switch featuring integrated IEEE 1588 support for use in harsh industrial environments. The product has 4x 1 Gbit/s SFP slots and 6x 10/100/1000 Mbit/s RJ45 Ethernet ports. -40 °C to +85 °C operating temperature (fanless).																		
Selection and ordering data for RUGGEDCOM accessories: *Further Information*																		

Table 3.6/4 Selection and Ordering Data

Description

The RUGGEDCOM RSG920P is a rugged, high density, small form factor Layer 2 switch with Power-over-Ethernet (PoE) capability for cabinets with high Ethernet port and bandwidth requirements, specifically designed to operate reliably in electrically harsh and climatically demanding environments. It provides a high level of immunity to electromagnetic interference and heavy electrical surges typical of environments found on plant floors or in curbside and wayside control cabinets.

Benefits

- High port density to meet the growing demand for Ethernet in roadside and wayside cabinets without the need for multiple devices.
- Power over Ethernet ports (PoE+) reduce cabling costs and simplify camera, radio and peripheral device connectivity by supplying power and Ethernet in one cable.
- Small form factor provides the capacity of a 19" switch in space constrained environments.
- USB console & MicroSD Card slot for easy in field configuration and upgrade.
- Use any available or planned fiber infrastructure with flexible uplink options
- Use Fast Ethernet or Gigabit Ethernet based on need.

Features

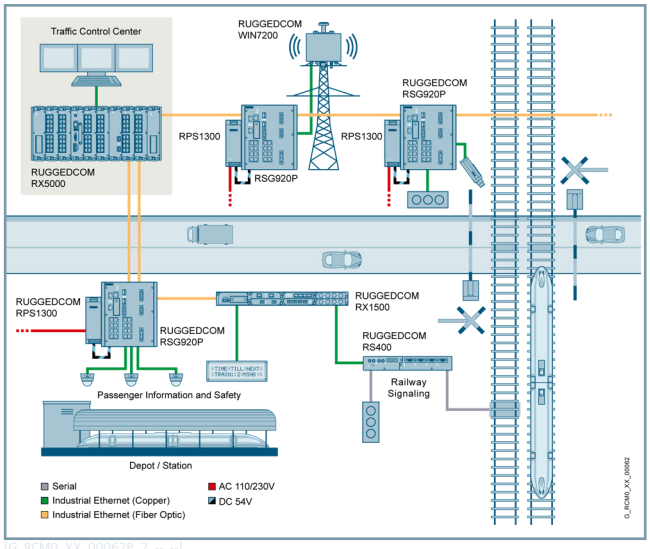
- 4 SFP uplink ports supporting 100 Megabit and 1 Gigabit speeds
- 16 Copper (10/100/1000BASE-X, RJ45) ports
- 4 PoE+ ports supporting up to 30 Watts per port (IEEE 802.3at)
- Low power (DC 9 V to 60 V), or high-power (DC 100 V to 300 V/ AC 88 V to 264 V) options for worldwide operability
- Non-blocking store and forward switching
- For use at ambient temperatures from –40 °C to +85 °C without the use of fans



[RSG920P, 1, –_–]

Figure 3.6/10 RUGGEDCOM RSG920P

Application Example



[G_RCM0_XX_00062P, 2, –_–]

Figure 3.6/11 RUGGEDCOM RSG920P connecting devices in multimodal transportation networks

Selection and Ordering Data

Description	Order no.																
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
RUGGEDCOM RSG920P	6	G	K	6	0	9	2	-	0	P	S	2	.	-	0	.	A	.
RUGGEDCOM RSG920P is a fully managed Ethernet switch with 20 non-blocking Gigabit Ethernet ports; support for 4 SFP modules and 4 PoE ports; -40 °C to +85 °C operating temperature (fanless)																		
Selection and ordering data for RUGGEDCOM accessories: *Further Information*																		

Table 3.6/5 Selection and Ordering Data

Description

The RUGGEDCOM RST916C and RST916P are rugged, fully managed 10 Gigabit Ethernet compact switches for use in harsh industrial environments and are ideal for applications that require high bandwidths and can easily accommodate for future network expansions. These compact Layer 2 switches feature Gigabit Ethernet and IEEE 1588v2 Precision Time Protocol support for the creation of a future-proof network with support for IEEE 1588 time synchronization.

Benefits

- High port density to provide reliable connectivity for high bandwidth applications in electric power substations, transportation systems, oil & gas installations, and other critical infrastructure industries
- Reduced maintenance costs by combining precision timing information and data communications onto a single network due to the support of IEEE 1588
- Ideal for space constrained cabinets due to their compact form factor
- Redundant power supply inputs allow for continuous safe and reliable operations even during single power supply failures, reducing the risk of revenue and data loss

Features

RUGGEDCOM RST916C and RST916P

- 16 port Compact managed Gigabit IEEE 1588 compatible Ethernet switch, with ROS (Rugged Operating System) and an array of cybersecurity features
- Fully integrated power supply with redundant power inputs
- Universal high-voltage with dual inputs: AC 100 V to AC 240 V/DC 100 V to DC 300 V
- Universal low-voltage DC with dual inputs for nominal voltages: DC 12 V, DC 24 V, DC 48 V (DC 10 to 60 V)
- For use at ambient temperatures from -40 °C to +85 °C without the use of fans

Additional features of the RUGGEDCOM RST916P

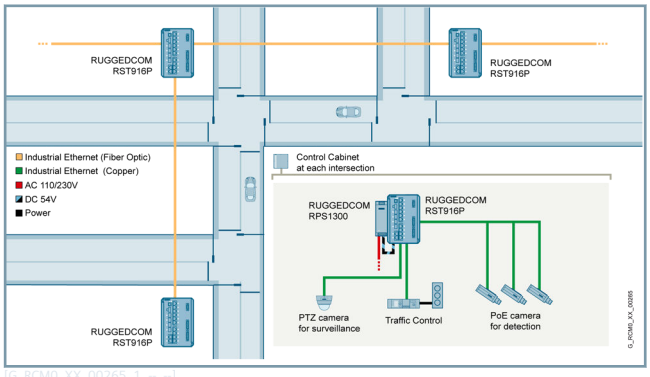
- 10 x integrated 60 W PoE++ ports and a total PoE power budget of 420 W
- Redundant PoE power inputs for fault tolerant applications
- Powered by the external PoE supply (DC 52 to 57 V) for a streamlined power configuration



[RST916_1, –_–]

Figure 3.6/12 RUGGEDCOM RST916C and RST916P

Application Example



[G_RCM0_XX_00265, 1, –_–]

Figure 3.6/13 Connectivity for smart intersections with RUGGEDCOM RST916P

Selection and Ordering Data

Description	Order no.																
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
RUGGEDCOM RST916C	6	G	K	6	4	9	1	-	6	C	D	.	.	-	.	.	.	.
RUGGEDCOM RST916C is a 16 port fully managed 10 G Ethernet switch featuring integrated IEEE 1588 support for use in harsh industrial environments. The product has 4x 1/10 Gbit/s SFP+ slots and 12x 10/100/1000 Mbit/s RJ45 ports; -40 °C to +85 °C operating temperature (fanless).																	
RUGGEDCOM RST916P	6	G	K	6	4	9	1	-	6	P	D	.	.	-	.	.	.	.

Description	Order no.
RUGGEDCOM RST916P is a 16 port fully managed 10 G Ethernet switch featuring integrated 60 W PoE++ ports and a power budget of 420 W for use in harsh industrial environments. The product has 4x 1/10 Gbit/s SFP+ slots and 12x 10/100/1000 Mbit/s RJ45 ports, 10x of which are PoE++ capable; -40 °C to +85 °C operating temperature (fanless).	
Selection and ordering data for RUGGEDCOM accessories: *Further Information*	

Table 3.6/6 Selection and Ordering Data

Description

The RUGGEDCOM RSG2100, RSG2100P and M2100 are utility grade, fully managed, modular Ethernet switches, specifically designed to operate reliably in electrically harsh and climatically demanding utility substation and industrial environments.

Benefits

- Its utility grade design helps with immunity against EMI and heavy electrical surges which allows the devices to be used in harsh electric power, transportation and industrial applications.
- The Build-to-order design ensures flexibility in tailoring the device configuration to unique needs which allows for reduced capital expenses .
- Suitable for usage in harsh environments with the minimal risk of mechanical failures due to an operating temperature from -40 °C to +85 °C without fans.
- Dual redundant power supplies ensure a reliable and maintenance-free connection to power, reducing downtime (RSG2100 only).

Features

- Up to 3 Gigabit Ethernet ports and 16 Fast Ethernet ports - copper and/or fiber
- 2 port modules for tremendous flexibility
- Store and forward switching
- Supports many types of fiber (multimode, single mode) with multiple connector types (ST, MTRJ, LC, SC, SFP)
- Fully integrated, dual-redundant (optional) high-voltage and low-voltage power supplies
- For use at ambient temperatures from –40 °C to +85 °C without the use of fans
- RSG2100P version consists of 4 fixed 10/100BaseTX 802.3af (PoE) compliant Ethernet ports
- M2100 version has MIL-STD ratings

Product Variants

- RUGGEDCOM RSG2100

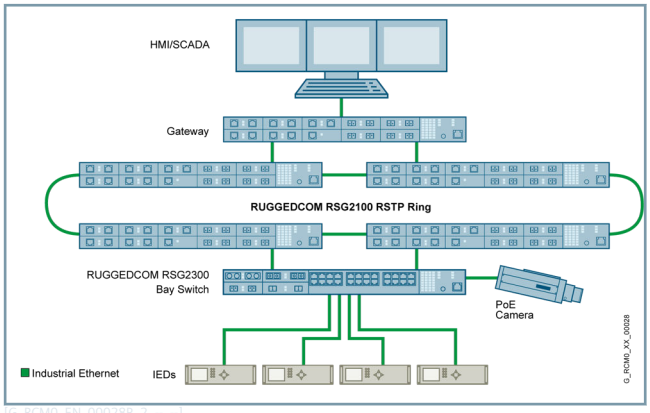


[P_RCM0_XX_00250P, 2, –_–]

Figure 3.6/14 RUGGEDCOM RSG2100

  - 19-port modular managed Ethernet switch with Gigabit uplinks
- RUGGEDCOM RSG2100P
  - Modularer Managed Ethernet-Switch mit 19 Ports, Gigabit-Uplinks und festen 10/100BaseTX / 802.3af-konformen PoE-fähigen Ethernet-Ports
- RUGGEDCOM M2100
  - 19-port modular MIL-STD managed Ethernet switch with Gigabit uplinks

Application Example



[G_RCM0_EN_00028P, 2, –_–]

Figure 3.6/15 RSTP Ring with the RUGGEDCOM RSG2100

Selection and Ordering Data

Description	Order no.																
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
RUGGEDCOM RSG2100	6	G	K	6	0	2	1	-	0	A	S	□						
												▲						
												|						
RUGGEDCOM RSG2100 (is subject to export controls)												2	.	-	.	.	.	.
The RUGGEDCOM RSG2100 is a utility grade, fully managed Ethernet switch; up to 3-Gigabit Ethernet ports copper and/or fiber; up to 16-Fast Ethernet ports copper and/or fiber; 2 port modules for tremendous flexibility; non-blocking, store and forward switching; supports many types of fiber (multimode, single-mode, bi-directional single strand); long haul optics allow Gigabit distances up to 115 km; multiple connector types (ST, MTRJ, LC, SC, RJ45, Micro-D)																		
RUGGEDCOM RSG2100P	6	G	K	6	0	2	1	-	0	P	S	□						
												▲						
												|						
RUGGEDCOM RSG2100P (is subject to export controls)												2	.	-	.	.	.	.
The RUGGEDCOM RSG2100P is a utility grade, Power-Over-Ethernet (PoE) enabled, fully managed, modular Ethernet switch; PoE: 4 x 10/100baseTX 802.3af compliant ports; up to 3-Gigabit Ethernet ports copper and/or fiber; up to 16-fast Ethernet ports copper and/or fiber; 2 port modules for tremendous flexibility; non-blocking, store and forward switching; supports many types of fiber (multimode, single-mode); multiple connector types (ST, MTRJ, LC, SC, RJ45, Micro-D)																		
RUGGEDCOM M2100	6	G	K	6	0	2	1	-	0	M	S	□						
												▲						
												|						
RUGGEDCOM M2100 (is subject to export controls)												2	.	-	.	.	.	.
The RUGGEDCOM M2100 is a MIL-STD hardened, fully managed, modular, Ethernet switch; up to 3-Gigabit Ethernet ports copper and/or fiber; up to 16-fast Ethernet ports copper and/or fiber; 2 port modules for tremendous flexibility; non-blocking, store and forward switching; supports many types of fiber (multimode, single-mode, bi-directional single strand); long haul optics allow Gigabit distances up to 115 km; multiple connector types (ST, MTRJ, LC, SC, RJ45, Micro-D)																		
Selection and ordering data for RUGGEDCOM accessories: *Further Information*																		

Table 3.6/7 Selection and Ordering Data

Description

The RUGGEDCOM RSG2488 is utility grade, field upgradable, non-blocking 28 Gigabit port layer 2 switch with hot-swappable dual redundant power supplies.

Benefits

- Suitable for usage in electric power, transportation and industrial applications due to a utility grade design with immunity against EMI and heavy electrical surges.
- Field replaceable modules and build-to-order design ensures seamless servicing and tremendous flexibility in tailoring the device configuration, reduces both upfront capital expenses and maintenance costs.
- Future-proof due to support of modern IEEE 1588 time synchronization features and modular design which allows the device to accommodate network growth and technology changes.
- Suitable for usage in harsh environments with minimal risk of failures due to an operating temperature from -40 °C to +85 °C without fans.
- Hot swappable, cable-free dual redundant smart power supplies ensure a convenient, reliable and maintenance free connection to power, reducing MTTR and therefore maintenance expense.

Features

- Up to 28 Gigabit Ethernet ports – copper and/or fiber in 19" 1U rack-mount
- Fully modular with 2/4 port field-replaceable media modules for tremendous flexibility
- Support for media modules with 100FX or 1000SX fiber-optic ports
- Optional PTP Module provides GPS time source and IRIG-B in/out
- Supports IEEE 1588 (PTP), SNTP, IRIG-B. It can convert time between all of these formats
- Non-blocking, store and forward switching
- Supports many types of fiber (multimode, single-mode, bidirectional single strand) with multiple connector types (LC, SC, SFP, ST)
- Hot swappable, dual-redundant (optional), load sharing, high-voltage and low-voltage power supplies
- For use at ambient temperatures from –40 °C to +85 °C; without the use of fans



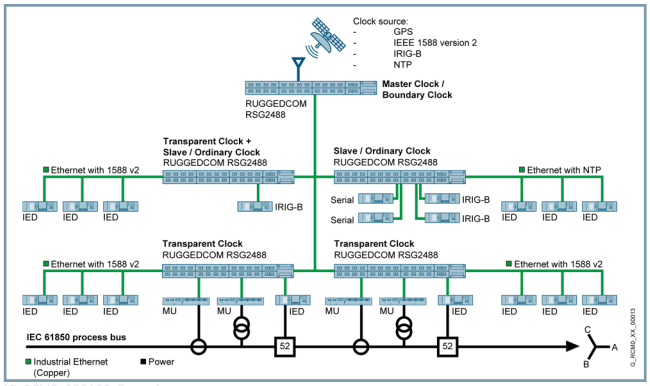
[P_RCM0_XX_00038P, 1, –_–]

Figure 3.6/16 RUGGEDCOM RSG2488

Product Variants

- RUGGEDCOM RSG2488
  - 28-port modular managed Gigabit switch

Application Example



[G_RCM0_00013P, 2, –_–]

Figure 3.6/17 IEEE 1588v2 time synchronization with RUGGEDCOM RSG2488 as Master Clock/Boundary Clock and Transparent Clock

Selection and Ordering Data

Description	Order no.																
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
RUGGEDCOM RSG2488	6	G	K	6	0	2	4	-	8	G	S	2	.	-	.	.	.	.
The RUGGEDCOM RSG2488 is a rugged rated fully managed Ethernet switch; up to 28 non-blocking ports; configured as: 10/100/1000TX copper, 100FX or 1000SX fiber; support six 4-port modules plus two 2-port modules; mixture of fiber-optic or copper Gigabit ports with up to 28 Gig Ethernet ports; –40 °C to +85 °C operating temperature (fanless)																		
Selection and ordering data for RUGGEDCOM accessories: *Further Information*																		

Table 3.6/8 Selection and Ordering Data

Description

The RUGGEDCOM RST2228 and RST2228P are high port density field modular 19" Layer 2 rack switches with 10 Gbit/s uplinks and support for IEEE 1588. The RST2228P supports power-over-Ethernet according to IEEE 802.3at/bt.

Benefits

- Future-proof Ethernet switch with high port density to minimize capital expense by reducing the number of layer 2 switching devices needed.
- Field-modular media modules with RJ45, FastConnect, Power-over-Ethernet, LC & SFP interfaces and build-to-order design ensures seamless servicing and tremendous flexibility in tailoring the device configuration resulting in lower operating expenses.
- Suitable for usage in electric power, transportation and oil & gas applications due to a utility grade design with immunity against EMI and heavy electrical surges.
- Future-proof due to support of modern IEEE 1588 time synchronization features and modular construction that allows network traffic growth to be accommodated by changing only the modules.
- Suitable for usage in harsh environments with the minimal risk of mechanical failures due to an operating temperature from -40 °C to +85 °C without fans.

Features

- Up to 28 Ethernet ports – 4 x 1000BASE-X/10GBASE-X integrated uplinks and up to 24 x 10/100/1000BASE-X ports
- 6 slots for 4-port Media Modules for tremendous flexibility
- Media modules with 4 x 10/100/1000 Mbit/s RJ45, Siemens FastConnect cabling system support, 100/1000 Mbit/s SFP interfaces and 100FX LC interfaces supporting multimode fiber optics up to 2 kilometers
- Support for up to 24 Power-over-Ethernet (PoE) interfaces according to IEEE 802.3at/bt (draft) with up to 60W/port and a total power budget of 500W distributed over all PoE ports
- Supports precision timing according to IEEE 1588 (transparent clock)
- Non-blocking, store and forward switching
- Dual-redundant (optional), load sharing power supplies
- For use at ambient temperatures from –40 °C to +85 °C; without the use of fans

Product Variants

- RUGGEDCOM RST2228
  - 28-port field modular managed layer 2 Gbit/s switch with 10 Gbit/s uplinks supporting IEEE 1588
- RUGGEDCOM RST2228P
  - 28-port field modular managed layer 2 Gbit/s switch with 10 Gbit/s uplinks supporting IEEE 1588 and Power-over-Ethernet according to IEEE 802.3at/bt

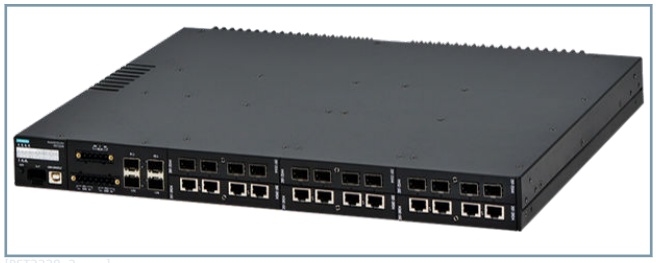


Figure 3.6/18 RUGGEDCOM RST2228 and RUGGEDCOM RST2228P

Application Example

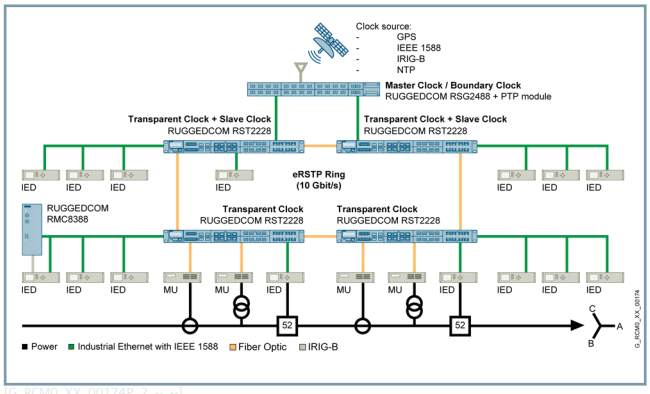


Figure 3.6/19 RUGGEDCOM RST2228 with IEEE 1588 V2 and hardware time stamping

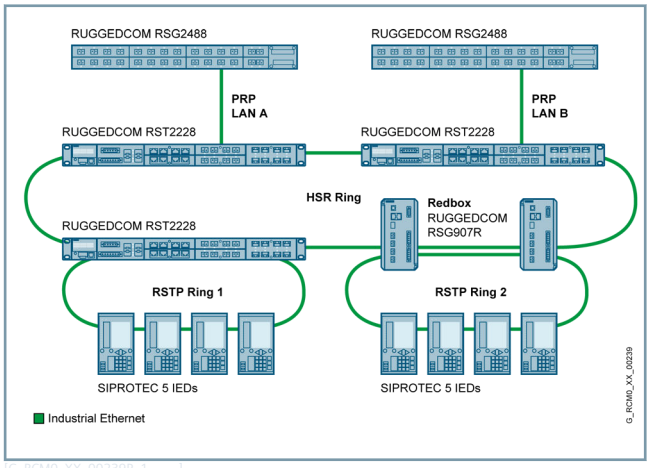


Figure 3.6/20 RUGGEDCOM RST2228 with the RNA module - Complete redundancy protection for mission-critical GOOSE messages and control commands, to avoid single points of failure

Selection and Ordering Data

Description	Order no.																
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
RUGGEDCOM RST2228	6	G	K	6	2	2	2	-	6	A	B	.	.	-	.	.	.	.
RUGGEDCOM RST2228 is a field modular, fully managed Layer 2 Ethernet switch with 4 x 1/10 Gbit/s and 24 x 100/1000 Mbit/s non-blocking ethernet ports. Support for up to six 4-port media modules with RJ45, SFP or LC interfaces; -40 °C ... +85 °C operating temperature (fanless)																		
RUGGEDCOM RST2228P	6	G	K	6	2	2	2	-	6	P	B	.	.	-	.	.	.	.
RUGGEDCOM RST2228P is a field modular, fully managed Layer 2 Ethernet switch with 4 x 1/10 Gbit/s and 24 x 100/1000 Mbit/s non-blocking ethernet ports supporting Power-over-Ethernet. Support for up to six 4-port media modules with RJ45, SFP or LC interfaces; -40 °C ...+85 °C operating temperature (fanless)																		
RUGGEDCOM RMM2972-2RNA	6	G	K	6	2	9	7	-	8	S	B	0	0	-	2	A	A	0
RUGGEDCOM RMM2972-2RNA, Media Module for RUGGEDCOM RST2228/P, to support HSR/PRP functions, port A and B, 2 x 100/1000 Base-X SFPs (SFPs are not included)																		
RUGGEDCOM RMM2972M-4SFP	6	G	K	6	2	9	7	-	2	S	M	0	0	-	4	A	A	0
Media Module for RUGGEDCOM RST2228, RST2228P to support IEEE 802.1AE MACsec functionality, 4 x SFP-slot, Supporting 100BASE-FX, 1000BASE-X SFPs, SFPs are not included.																		
RUGGEDCOM RMM2973M-4RJ45	6	G	K	6	2	9	7	-	3	R	M	0	0	-	4	A	B	0
Media Module for RUGGEDCOM RST2228, RST2228P to support IEEE 802.1AE MACsec functionality, 4 x RJ45, 10/100/1000 BASE-TX.																		
Additional ordering data for RUGGEDCOM RST2228P modules																		
Selection and ordering data for RUGGEDCOM accessories: *Further Information*																		

Table 3.6/9 Selection and Ordering Data

Description

The RUGGEDCOM RST2428P is a 28-port, field modular 19 inch Layer 2 rack switch with 10 Gbps uplinks, compliant with PTP IEEE 1588v2. It supports a suite of basic L3 routing protocols; including static unicast and multicast(54) routing, OSPFv2, VRRPv3 and more, imparting greater flexibility over standard Layer 2 switches for modern digital substation networks.

Benefits

- Future-proof Ethernet switching platform with high port density minimizes capital expenses by reducing the number of devices on the network.
- Field-modular media modules with RJ45, FastConnect, Power-over-Ethernet, SFP interfaces and build-to-order design ensures seamless servicing and tremendous flexibility in tailoring the device configuration resulting in lower operating expenses.
- Its utility grade design helps with immunity against EMI and heavy electrical surges which allows the devices to be used in harsh electric power, transportation and industrial applications.
- Support of modern IEEE 1588 time synchronization features and modular construction allows network traffic growth to be accommodated by changing only the modules.
- Suitable for usage in harsh environments with the minimal risk of failure due to an operating temperature from -40 °C to +85 °C without the use of fans.

Features

- Ethernet ports
  - 4 x 1000BASE-X/10GBASE-X uplink, 4 x 1000BASE-X/10GBASE-X via SFP+ module
  - Up to 24 x 10/100/1000BASE-X ports
  - 4-port line modules for added flexibility
  - Industry standard connectors: RJ45, LC, and SFP
  - Copper, single, and multi-mode optical transceivers
- Engineered for modern digital substation applications
  - Precision timing: IEEE 1588v2 with hardware time stamping and support for transparent clock (TC), boundary clock (BC), ordinary clock (OC), and grand master clock (GMC)[41] modes
  - Redundancy protocols: RSTP, eRSTP, MSTP, STP, MRP, HSR/PRP[41] and link aggregation
- RUGGEDCOM CLP
  - Removable storage media port to easily save and reuse all configuration data

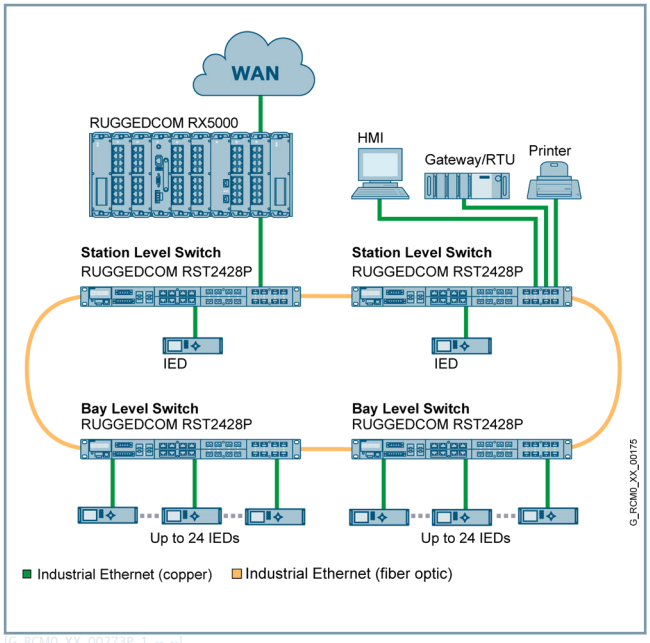


[RST2428P, 1, --_--]

Figure 3.6/21 RUGGEDCOM RST2428P

- Universal power supply options
  - Hot swappable dual redundant power supplies
  - Universal high-voltage range: 88 – 300 V DC or 85 – 264 V AC
  - Screw or pluggable terminal blocks for reliable, maintenance-free connections
  - CSA/UL 62368 safety approved to +85 °C
  - Low-voltage power supply options 12 V DC (10.5 – 15 V DC), 24 V DC (13 – 36 V DC), and 48 V DC (36 – 72 V DC)
- Power-over-Ethernet (PoE)
  - Up to 24 PoE ports supporting IEEE 802.3at/bt/af and 500 W shared power budget per switch at up to 60 W per port

Application Example



[G_RCM0_XX_00273P, 1, --_--]

Figure 3.6/22 High-density LAN switch for modern digital substation applications

41

Selection and Ordering Data

Description	Order no.																
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
RUGGEDCOM RST2428P	6	G	K	6	2	4	2	-	6	P	A	.	.	-	.	.	.	.
The RUGGEDCOM RST2428P is a field modular, fully managed Layer 2 Ethernet switch with up to 28 non-blocking interfaces. Standard four, expandable to eight, 1/10 Gbps SFP+ uplink ports. Supports up to six 4-port hot swappable media modules with RJ45, SFP/SFP+, LC, FC, and PoE interfaces. Configurations allow for up to twenty-four 100/1000 Mbps, or four 1/10 Gbps SFP+ and up to twenty 100/1000 Mbps ports. Dual redundant hot swappable power supply modules. Support for Power-over-Ethernet and IEEE 1588. Operating temperature of -40 to +85 °C (fanless).																	
Selection and ordering data for RUGGEDCOM accessories: *Further Information*																		

Table 3.6/10 Selection and Ordering Data

Description

The RUGGEDCOM RX1500 product family is a utility grade multi-service platform available in various 19" rack-mounted and DIN/panel mounted form factors. The RUGGEDCOM RX1500 family's design using hot swappable line modules and power supplies, allows customers to select among WAN, serial and Ethernet options even after the product has been deployed in the network. This, along with extended temperature range operation and enhanced immunity to surge voltages, electrostatic discharge and electromagnetic interference, make it ideally suited for electric power utilities, industrial control networks, railways and traffic control systems.

Benefits

- Enables integration of network functions with universal connectivity: Ethernet, 2G, 3G, 4G/LTE with dual-SIM support.
- Provides fastest time to repair and re-configure, with its modular, hot-swappable design.
- Universal networking feature-set, including security, routing, and switching, all in in one platform.
- One design for all installations: Five form factors for different installation environments.
- Seamless integration with RUGGEDCOM APE, providing advanced additional network security and processing.

Features

- General device features:
  - Hot swappable, field replaceable line modules and power supplies
- RUGGEDCOM RX1524:
  - Up to 24 ports 100FX
  - Up to 24 ports 10/100TX
  - Up to 12 ports 10FL/100SX
  - Up to 8 ports Gigabit Ethernet
  - Up to 24 serial ports
  - Up to 2 APE1808 application hosting modules
- RUGGEDCOM RX1536:
  - Up to 36 ports 100FX
  - Up to 36 ports 10/100TX
  - Up to 18 ports 10FL/100SX
  - Up to 4 ports Gigabit Ethernet
  - Up to 36 serial ports
  - Up to 2 APE1808 application hosting modules
- RUGGEDCOM RX1510:
  - Up to 24 ports 100FX
  - Up to 24 ports 10/100TX
  - Up to 12 ports 10FL/100SX
  - Up to 8 ports Gigabit Ethernet
  - Up to 24 serial ports
- RUGGEDCOM RX1511:
  - Up to 12 ports 100FX
  - Up to 12 ports 10/100TX
  - Up to 6 ports10FL/100SX



Figure 3.6/23 RUGGEDCOM RX1500 Model Series

  - Up to 4 ports Gigabit Ethernet
  - Up to 12 serial ports
- RUGGEDCOM RX1512:
  - Up to 12 ports 100FX
  - Up to 12 ports10/100TX
  - Up to 6 ports10FL/100SX
  - Up to 4 ports Gigabit Ethernet
  - Up to 12 serial ports
- Power supply
  - RUGGEDCOM RX1524, RX1510:
    - Modular dual and hot-swappable power supply
    - Input voltage range of DC 24 V, DC 48 V, DC 88 V to 300 V and AC 85 V to 264 V for worldwide operability
  - RUGGEDCOM RX1536, RX1511:
    - Modular single power Supply
    - Input voltage range of DC 24 V, DC 48 V, DC 88 V to 300 V and AC 85 V to 264 V for for worldwide operability
  - RUGGEDCOM RX1512:
    - Input voltage range of DC 11 V to 72 V
    - - Fully integrated power supply (no external adaptors)
    - - CSA/UL 60950 safety approved to +85 °C on all units
- Cybersecurity
  - Integrated router/firewall/VPN
  - Stateful firewall with NAT
  - Full IPsec Virtual Private Networking
  - VPN with 3DES, AES128, AES256 support
  - RUGGEDCOM CROSSBOW for NERC CIP Cyber Security compliance
  - RADIUS centralized password management
  - Multi-level passwords
  - SSH/SSL encryption
  - Enable/disable ports, MAC based port security
  - VLAN (802.1Q) to segregate and secure network traffic
  - SNMPv3 encrypted authentication and access security
  - Optional Check Point Firewall and IPS (See RUGGEDCOM APE Module)

- WAN Ports and Protocol
  - Frame relay (RFC 1490 or RFC 1294), PPP, PPPoE, and GPS
  - PAP, CHAP, MS-CHAP, and MS-CHAP2 authentication
  - GOOSE messaging Support
  - Cellular, GSM, Edge, HSPA, 2G, 3G, and 4G/LTE with duel-SIM support
  - Up to 4 ports T1/E1 (channelized) (Not compatible with RX1524 and RX1536)
  - Up to 4 ports E1 75 Ohms via BNC (Not compatible with RX1524 and RX1536)
- IP
  - Routing: OSPF, BGP, IS-IS, RIPv
  - VRRP redundancy with one-second failover
  - Traffic and access control
  - NTP Client and Server
  - IP Multicast Routing
  - DCHP Agent (Option 82 Capable)
  - MPLS edge routing
- Reliability in harsh environments
  - Immunity to EMI and high voltage electrical transients
  - Meets IEEE 1613 (electric utility substations)
  - Exceeds IEC 61850-3 (electric utility substations)
  - Exceeds IEC 61800-3 (variable speed drive systems)
  - Exceeds IEC 61000-6-2 (generic industrial environment)
  - Exceeds NEMA TS-2 (traffic control equipment)
  - 40 °C to +85 °C operating temperature (no fans)
  - Fail-safe output relay: for critical failure or error alarming
  - 18 AWG galvanized steel enclosure and 19" rack-mount adapter

Product Variants

- RUGGEDCOM RX1524
  - Modular (up to 4 modules) utility grade 19" rack-mountable Multi-Service Platform with enhanced IPsec performance and dual redundant power supply modules
- RUGGEDCOM RX1536
  - Modular (up to 6 modules) utility grade 19" rack-mountable Multi-Service Platform with enhanced IPsec performance
- RUGGEDCOM RX1510
  - Modular utility grade layer 2 and layer 3 switch and router in a compact form factor
- RUGGEDCOM RX1511
  - Modular utility grade layer 2 and layer 3 switch and router in a compact form factor
- RUGGEDCOM RX1512
  - Modular utility grade layer 2 and layer 3 switch and router in a compact form factor

Application Examples

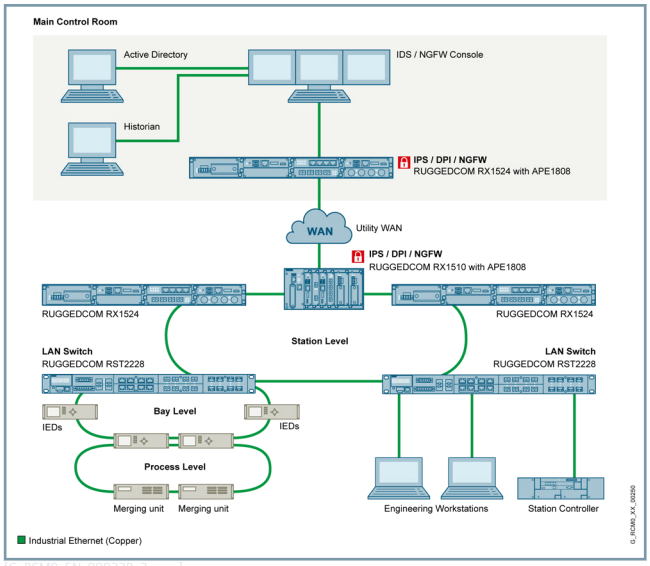


Figure 3.6/24 Use case: Substation all-in-one switch/router/gateway

RUGGEDCOM Application Processing Engine (APE) for the RX1500 family

This compact, yet powerful application processing engine provides a standards-based platform for installing commercially available applications such as cyber threat detection and prevention tools, application-level firewalls, network logging, intrusion sensors, secure remote access, and network management.

- Features an Intel Quad-core CPU and x86_64 architecture, running on either Linux or Windows OS
- Eliminates the need for additional specialized security appliances or external industrial PCs in your OT network.



Figure 3.6/25 RUGGEDCOM APE1808 for the RX1500 family

Selection and Ordering Data

Description	Order no.																
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
RUGGEDCOM RX1524	6	G	K	6	0	1	5	-	0	C	M	2	.	-	.	.	.	.
The RUGGEDCOM RX1524 is a universal layer-2 and layer-3 switch and router with 2 x power supply (Hot-Swap capable); line modules that can be replaced on-site, including the RUGGEDCOM APE1808 module, which can include third party applications; up to 24x 100FX ports; up to 24x 10/100TX ports; up to 8x Gigabit Ethernet ports; up to 12x 10FL/100SX ports, mobile communications (EVDO/HSPA/4G/LTE); up to 24x RS232/422/485																		
RUGGEDCOM RX1536	6	G	K	6	0	1	5	-	0	D	M	2	.	-	.	.	.	.
The RUGGEDCOM RX1536 is a universal layer-2 and layer-3 switch and router with 1 x power supply; line modules that can be replaced on-site, including the RUGGEDCOM APE1808 module, which can include third party applications; up to 36x 100FX ports; up to 36x 10/100TX ports; up to 4x Gigabit Ethernet ports; up to 18x 10FL/100SX ports, mobile communications (EVDO/HSPA/4G/LTE); up to 36x RS232/422/485																		
RUGGEDCOM RX1510	6	G	K	6	0	1	5	-	1	A	M	2	.	-	.	.	.	.
The RUGGEDCOM RX1500 series includes switches and routers for layer-2 and layer-3 for use in the energy supply area. 2x power-supply units (Hot-Swap capable); line modules that can be replaced on-site; up to 24x 100FX ports; up to 24x 10/100TX ports; up to 8x Gigabit Ethernet ports; up to 12x 10FL/100SX ports, up to 4x T1/E1 ports; mobile communications (EVDO/HSPA/4G/LTE); up to 24x RS232/422/485 ports																		
RUGGEDCOM RX1511	6	G	K	6	0	1	5	-	1	B	M	2	.	-	.	.	.	.
The RUGGEDCOM RX1511 series includes compact layer-2 and layer-3 switches and routers for use in the energy supply area. 1x power-supply unit; line modules that can be replaced on-site; up to 12x 10/100BaseTX ports; up to 4x Gigabit Ethernet ports; up to 12x 100BaseFX ports; up to 6x 10FL/100SX ports; pluggable fiberglass port; up to 4x T1/E1 ports; mobile communications (EVDO/HSPA/4G/LTE); up to 12x RS232/422/485 ports																		
RUGGEDCOM RX1512	6	G	K	6	0	1	5	-	1	C	M	2	.	-	.	.	.	.
The RUGGEDCOM RX1512 series includes compact layer-2 and layer-3 switches and routers for use in the energy supply area. 1x fixed power-supply unit, 11 to 72 VDC; line modules that can be replaced on-site; up to 12x 10/100BaseTX ports; up to 4x Gigabit ports; up to 12x 100BaseFX ports; up to 6x 10FL/100SX ports; pluggable fiberglass port; up to 4x T1/E1 ports; mobile communications (EVDO/HSPA/4G/LTE); up to 12x RS232/422/485 ports																		
RUGGEDCOM APE1808NOZ	6	G	K	6	0	1	5	-	0	S	A	.	.	-	.	.	.	.
RUGGEDCOM APE1808NOZ Application Processing Engine Line Module, Atom x5-E3940, 8GB RAM, 80GB eMMC, DisplayPort, uSD, USB, pre-installed with Nozomi Guardian operating system, feature extensions are available to enhance Guardian's already built-in asset discovery and Intrusion Detection System (IDS) capabilities.																		
Additional ordering data for RUGGEDCOM APE1808NOZ																		
Professional Services																		
Selection and ordering data for RUGGEDCOM accessories: *Further Information*																		

Table 3.6/11 Selection and Ordering Data

Description

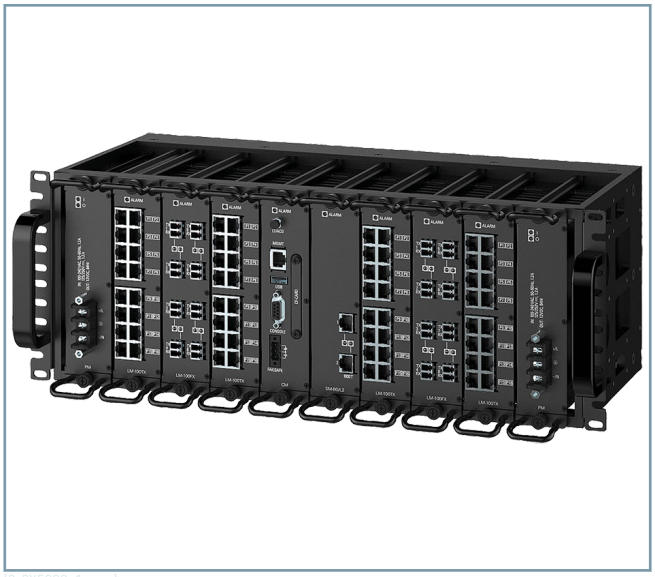
The RUGGEDCOM RX5000 and MX5000 are high-density Ethernet routing and switching platforms designed to operate in harsh environments. These integrated switch and routers can withstand high levels of electromagnetic interference, radio frequency interference, and a wide temperature range of –40 °C to +85 °C. This platform is designed to meet the challenging climatic and environmental demands found in utility, industrial, and military grade networks.

Benefits

- RUGGEDCOM RX5000:
  - Up to two 10 Gigabit uplinks
  - Up to 26 Gigabit ports
  - Up to 96 10/100TX copper ports
  - Up to 48 100FX optical ports
  - Long-reach optics for distances up to 90 km
- RUGGEDCOM MX5000:
  - Up to 48x 10/100TX MicroD copper ports
  - Up to 48x 100FX optical ports
  - Up to 2 Gigabit Ethernet ports
  - Long-reach optics for distances up to 90 km
- Power supplies
  - Modular, redundant power supplies
  - Universal high voltage ranges: DC 88 V to 300 V or AC 85 V to 264 V
- Reliability in harsh environments
  - Immunity to EMI and high voltage electrical transients
  - Meets IEEE1613 (electric utility substations)
  - Exceeds IEC61850-3 (electric utility substations)
  - Exceeds IEC61800-3 (variable speed drive Systems)
  - Exceeds IEC61000-6-2 (generic industrial Environment)
  - Exceeds NEMA TS-2 (traffic control Equipment)
- -40 °C to +85 °C operating temperature (no fans)
- Conformal coated printed circuit boards (optional)

Product Variants

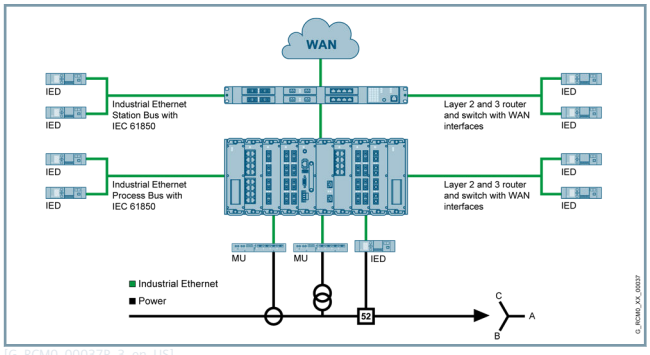
- RUGGEDCOM RX5000
  - Modular high-density routing and switching platform
- RUGGEDCOM MX5000
  - Modular high-density routing and switching platform, designed to operate in the most demanding environments
- RUGGEDCOM MX5000RE
  - Rugged enclosure with modular high-density routing and switching platform, designed to operate in the most demanding environments



[P_RX5000, 1, --_--]

Figure 3.6/26 RUGGEDCOM RX5000 and RUGGEDCOM MX5000

Application Example



[G_RCM0_00037P_3_en_US]

Figure 3.6/27 The RUGGEDCOM Multi-service platform is used to connect IEDs with a Wide Area Network (WAN)

Selection and Ordering Data

Description	Order no.																
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
RUGGEDCOM RX5000	6	G	K	6	0	5	0	-	0	A	M	2	.	-	.	.	.	
The RUGGEDCOM RX5000 is a high-density routing and switching platform. Up to 96 10/100TX + 2 10/100/1000T copper ports; up to 48 100FX optical ports; up to 2 Gigabit Ethernet ports; long-reach optics for distances of up to 90 km																		
RUGGEDCOM RM5000	6	G	K	6	0	5	0	-	0	M	M	2	.	-	.	.	.	1
The RUGGEDCOM MX5000 is an MIL-STD high-density routing and switching platform, designed to operate in the most demanding environments. The RUGGEDCOM MX5000 can withstand high levels of electromagnetic interference, radio frequency interference and a wide temperature range of -40 °C to +85 °C; up to 48 10/100TX MicroD Up to 96 10/100TX RJ45 ports; up to 48 100FX optical ports; up to 2 Gigabit Ethernet ports; long-reach optics for distances of up to 90 km																		
Selection and ordering data for RUGGEDCOM accessories: *Further Information*																		

Table 3.6/12 Selection and Ordering Data

RUGGEDCOM Redundancy Box (HSR/PRP) – RUGGEDCOM RS900R Series

Description

The RUGGEDCOM RSG907R and RSG909R are compact Gigabit IEEE 1588 compatible Ethernet switches supporting High Availability Seamless Redundancy (HSR) and Parallel Redundancy Protocol (PRP) according to IEC 62439-3. The RSG907R supports 3 RNA(Redundant Network Access) ports (SFP) and 4 SAN (Singly Attached Node) fiber optic ports (LC). The RSG909R supports 3 RNA ports (SFP) and 6 SAN copper ports (RJ45).

Benefits

- Avoid revenue loss by mitigating the risk of communication disruptions and downtime with a redundant fault tolerant network supporting HSR and/o PRP.
- SFP ports allow for in-field modification at any time allowing deployment flexibility for varying customer needs.
- The redundant power supply inputs allow for continuous safe and reliable operations even during single power supply failures, diminishing the risk of revenue and data loss
- Reduce maintenance costs by combining precision timing information and data communications onto a single network due to the support of IEEE 1588.

Features

- Support of HSR and PRP according to IEC 62439-3
- 3 x RNA Ethernet ports according to IEC 62439-3 (1000BASE-X)
- 4 Fiber optic (100BASE-FX, LC) or 6 Copper (10/100/1000BASE-X, RJ45) SAN ports
- Industry standard connectors: SFP, LC and/or RJ45
- Fully integrated power supply with redundant power input
  - Universal high-voltage dual inputs: AC 100 V to 240 V / DC 100 V to 300 V
  - Universal low-voltage DC dual inputs with nominal voltages: DC 12 V, DC 24 V, DC 48 V (DC 10 V to 60 V)
- Supports precision timing according to IEEE 1588 (transparent clock, ordinary clock)
- Non-blocking store and forward switching
- For use at ambient temperatures from –40 °C to +85 °C; without the use of fans

Product Variants

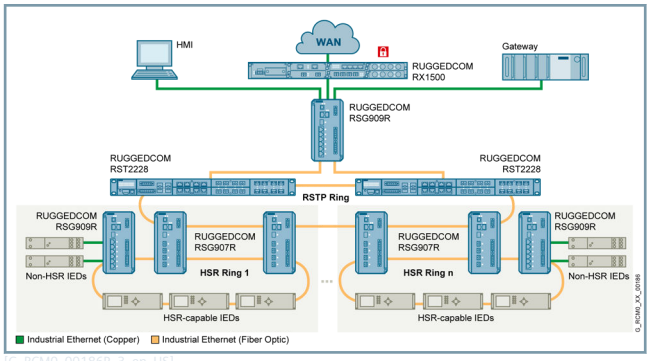
- RUGGEDCOM RSG907R
  - A 7-port compact high density switch with 3 RNA ports supporting HSR and PRP according to IEC 62439-3 and 4 SAN fiber optic ports.
- RUGGEDCOM RSG909R
  - A 9 port compact high density switch with 3 RNA ports supporting HSR and PRP according to IEC 62439-3 and 6 SAN copper ports.



[P_RSG900R, 1, –_–]

Figure 3.7/1 RUGGEDCOM RSG907R

Application Example



[G_RCM0_00186P, 3, en_US]

Figure 3.7/2 Two RUGGEDCOM RSG907R / RSG909R in each HSR bay ring for redundant coupling with PRP station level LANs

Selection and Ordering Data

Description	Order no.																
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
RUGGEDCOM RSG907R	6	G	K	6	4	9	0	-	7	R	B	.	.	-	.	.	.	.
RUGGEDCOM RSG907R is a 7 port industrially hardened, fully managed Ethernet switch featuring an integrated HSR/PRP RedBox for use in harsh industrial environments. The product has 3x 1 Gbit/s SFP slots and 4x 100 Mbit/s multimode LC ports (max 2 km). -40 °C to +85 °C operating temperature (fanless).																		
RUGGEDCOM RSG909R	6	G	K	6	4	9	8	-	0	R	B	.	.	-	.	.	.	.
RUGGEDCOM RSG909R is a 9 port industrially hardened, fully managed Ethernet switch featuring an integrated HSR/PRP RedBox for use in harsh industrial environments. The product has 3x 1 Gbit/s SFP slots and 6x 10/100/1000 Mbit/s RJ45 Ethernet ports. -40 °C to +85 °C operating temperature (fanless).																		
Selection and ordering data for RUGGEDCOM accessories: *Further Information*																		

Table 3.7/1 Selection and Ordering Data

RUGGEDCOM Multiprotocol Router – RUGGEDCOM RX1400

Description

The RUGGEDCOM RX1400, thanks to its compact form factor and multi-function capability, offers a cost saving solution for large scale deployments by avoiding the need for multiple devices to achieve the needed interface, switching, routing and application hosting capabilities.

Benefits

- CAPEX avoidance: through using a single box solution to replace multiple functionalities such as an L2 switch, L3 router, serial server, WLAN Access Point, WLAN client, LTE/3G modem, Fiber optic converter, firewall, MPLS end point, and GPS location devices.
- OPEX avoidance: by having multiple functionalities housed in a single box, training and operating expenses are reduced.
- CAPEX avoidance: the LTE (4G) Interface with Rollback to 3G provides a high bandwidth, reliable interface that allows customers to avoid/defer expensive fiber installations.
- Its utility grade design helps with immunity against EMI and heavy electrical surges which allows the devices to be used in harsh electric power, transportation and industrial applications.
- Suitable for usage in harsh environments with the minimal risk of failure due to an operating temperature from -40 °C to +85 °C without the use of fans.

Features

- 4 copper Fast Ethernet ports and 2 Gigabit or 100Mbps Small Form-Factor Pluggable (SFP) slots
- Support for multimode and single-mode SFPs for distances ranging from 500 meters up to 100 km
- Optional GPS input available
- Optional 3G / LTE-Modems for Europe, North America and Asia Pacific
- Fully integrated, DC +/-12 V to 24 V, DC +/- 48 V or HI power supplies
- Available WLAN option (WiFi Access Point or Client) with variety of international wireless approvals
- Reliable operation at ambient temperatures from -40 °C to +85 °C without the use of fans
- Two antenna connectors for reliable LTE or 3G cellular connections
- Serial interface to support backward compatibility with deployed devices
  - Cybersecurity
  - Integrated router/firewall/VPN
  - Stateful firewall with NAT
  - Full IPSec Virtual Private Networking
  - VPN with 3DES, AES128, AES256 support
  - RADIUS centralized password management
  - Multi-level passwords
  - SH/SSL encryption
  - VLAN (802.1Q) to segregate and secure network traffic
  - SNMPv3 encrypted authentication and access security



[P_RCM0_XX_00327P, 1, --_--]

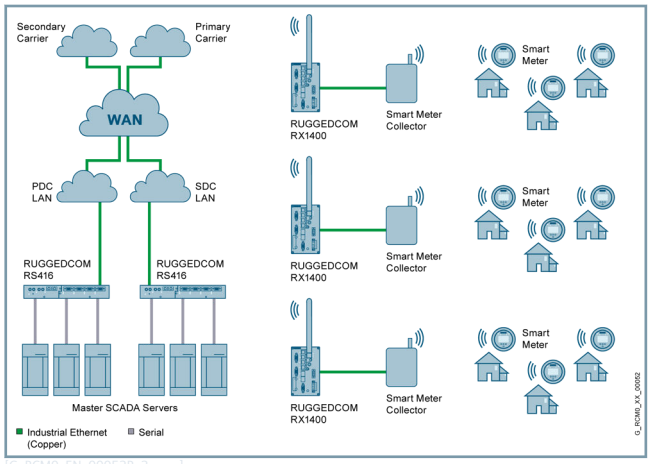
Figure 3.8/1 RUGGEDCOM RX1400

- WAN-Protocols
  - Frame relay RFC 1490 or RFC 1294
  - PPP RFC 1661, 1332, 1321, 1334, PAP, CHAP Authentication
  - GOOSE messaging Support
- IP
  - Routing: OSPF, BGP, IS-IS, RIPv
  - VRRP redundancy with one-second failover
  - NTP Client and Server
  - Traffic and access control
  - IP Multicast Routing
  - DCHP Agent (Option 82 Capable)
  - MPLS edge routing

Product Variants

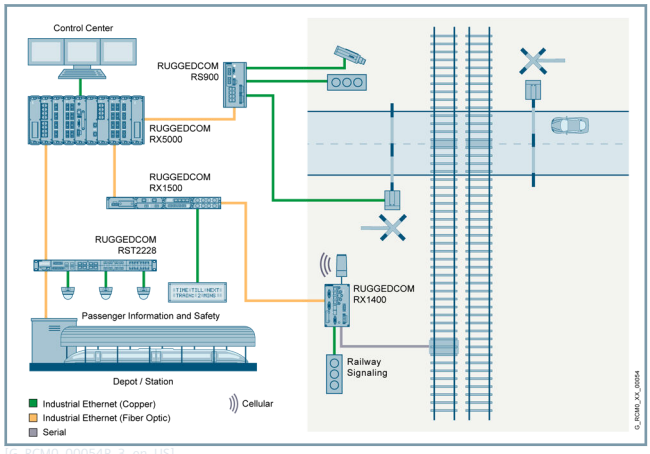
- RUGGEDCOM RX1400
  - Small form-factor industrial Ethernet-switch and TCP/IP router with LTE and fiber optic WAN options

Application Examples



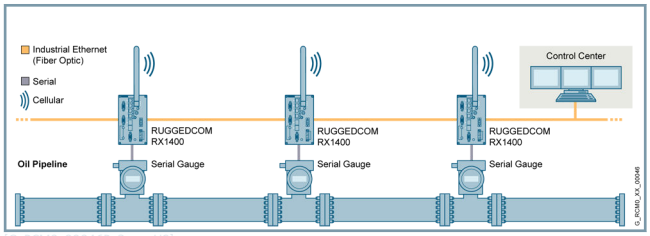
[G_RCM0_EN_00052P, 2, --_--]

Figure 3.8/2 The RUGGEDCOM RX1400 with LTE-support provides a high bandwidth connection for the large amounts of Smart Meter data



[G_RCM0_00054P, 3, en_US]

Figure 3.8/3 Redundant connection to end-devices used in conjunction with signaling and monitoring when wireline backhaul is combined with cellular connectivity. Serial ports ensure legacy device support



[G_RCM0_00046P, 3, en_US]

Figure 3.8/4 Using the serial ports of the RUGGEDCOM RX1400 to connect to serial gauges enables communication with the Control Center via fiber optics and a cellular network

Selection and Ordering Data

Description	Order no.															
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
RUGGEDCOM RX1400	6	G	K	6	0	1	4	-	0	A	M	2	.	-	.	.	.	.
The RUGGEDCOM RX1400 is a rugged small form-factor industrial Ethernet-switch and TCP/IP router with 4 copper Gigabit Ethernet ports, 2 DB9 serial ports and 2 SFP-Slots. Optionally equipped with LTE modem, WLAN AP or Client, SFPs and GPS/GLONASS support																		
Selection and ordering data for RUGGEDCOM accessories: *Further Information*																		

Table 3.8/1 Selection and Ordering Data

RUGGEDCOM Media Converter – RUGGEDCOM RMC40

Description

The RUGGEDCOM RMC40 is a 4-port unmanaged Ethernet switch that provides both copper-to-fiber media conversion as well as 10Mbps to 100Mbps speed conversion. The RUGGEDCOM RMC40 can be used in place of traditional copper-to-fiber media converters with the added ability to convert speed from 10Mbps to 100Mbps. With dual fiber optics, daisy chaining of Ethernet enabled devices can easily be accomplished. For the most demanding of systems, a dual-redundant fiber optic connection can be created for a device that only offers a single 10/100TX port.

Benefits

- IEC 61850-3 and IEEE 1613 standards compliant to support communications in mission critical verticals such as electric power substations.
- Saving CAPEX thanks to the media conversion capability between existing infrastructures.
- Reduced OPEX due to simple plug and play unmanaged operations.
- Product designed to address harsh environments with extended temperature ranges.
- No need for external power supply, reducing CAPEX for worldwide applications.

Features

- Multiple port configurations available
  - 2x 10/100TX-Port + 1x 100FX-Port (SC/ST)
  - 2x 10/100TX-Port + 2x 100FX-Port (MTRJ/LC)
  - 4x 10/100TX-Ports
- Multimode and single-mode optical transceivers including long-haul optics supporting distances from 20 km to 90 km.
- Industry standard fiber-optic connectors: LC, SC, ST, MTRJ
- Non-blocking, store and forward switching with only 10 µs latency for high network throughput
- DC 24 V, DC 48 V, or high-power (DC 88 V to 300 V/ AC 85 V to 264 V) options for worldwide operability
- For use at ambient temperatures from –40 °C to +85 °C without the use of fans

Product Variants

- RUGGEDCOM RMC40



Figure 3.9/1 RUGGEDCOM RMC40

– 4-port Ethernet media and speed converter

Application Example

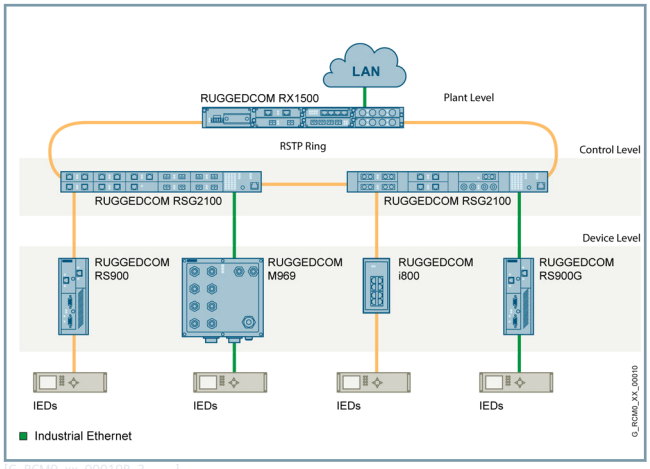


Figure 3.9/2 The RUGGEDCOM RMC40 is used to provide speed conversion at the device level.

3.9

Selection and Ordering Data

Description	Order no.																
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
RUGGEDCOM RMC40	6	G	K	6	0	0	4	-	0	A	C	0	.	-	.	.	.	.
The RUGGEDCOM RMC40 is a 4-port unmanaged Ethernet switch that provides both copper-to-fiber media conversion as well as 10 Mbps to 100 Mbps speed conversion; configurations: 2 ports 10/100TX + 1 port 100FX (SC/ST); 2 ports 10/100TX + 2 ports 100FX (MTRJ/LC) or 4 ports 10/100TX																		
Selection and ordering data for RUGGEDCOM accessories: *Further Information*																		

Table 3.9/1 Selection and Ordering Data

Description

The RUGGEDCOM RMC8388 is a time converter for use in the energy supply area, which has been specially developed for operation in electrically hostile and climatically challenging environments. RUGGEDCOM RMC8388 offers time conversion between IEEE 1588 and IRIG-B. The network-based configuration is simple and intuitive, either via the integrated web server or subnet server.

The RUGGEDCOM RMC8388 offers the following time conversion modes:

- IEEE 1588 V2 -> IRIG-B TTL/PPS, IRIG-B AM
- IRIG-B AM -> IEEE 1588 V2

This product helps reduce cabling and maintenance costs, by enabling customers to migrate to an Ethernet-based timing distribution; this modernizes the data and timing network by including IRIG-B-based source and target devices. It is compatible with existing RUGGEDCOM 1588 products, such as RSG2488, RST2228, RSG910C, RSG909R, RSG908C and RSG907R.

Benefits

- Avoidance of capital expenditure by enabling the continued use of non-1588-compatible IEDs after the transition to a 1588-based timing solution.
- Built-in reliability in hostile environments reduces the demand for expensive maintenance.
- The elimination of dedicated timing networks reduces maintenance costs and increases timing availability.
- Shared operating system (ROS) with other RUGGEDCOM Layer-2 products reduces or eliminates the need to retrain technical personnel.
- No external power supply needed, therefore lower capital expenditure for global applications.

Product features

- Cyber security functions for communication protection
- Supported IRIG-B formats: B000 – B007, B120 – B127
- Ethernet port options 100TX (RJ45) or 100FX (LC)
- PPx: Enables a configurable PPS timer to trigger a signal once every x seconds, up to once per 24 hours
- Flexible power supply options with 24 VDC, 48 VDC or high voltage (88 VDC to 300 VDC / 85 VAC to 264 VAC) for global operation
- For operating temperatures of -40°C to +85°C; fan-free operation
- Various management interfaces: Web-based, Telnet, command lines

Product Variants

- RUGGEDCOM RMC8388

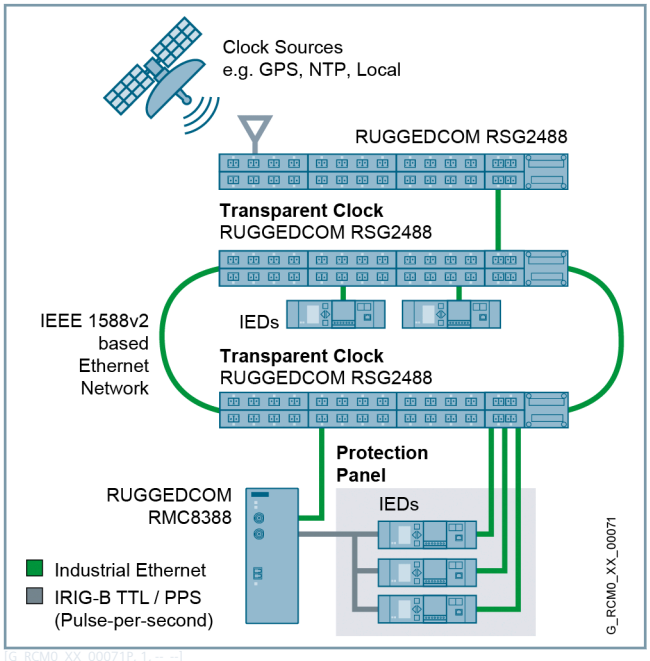


[P_RMC8000, 1, --_--]

Figure 3.9/3 RUGGEDCOM RMC8388

– Utility-grade time converter

Application Example



[G_RCM0_XX_00071P, 1, --_--]

Figure 3.9/4 The RUGGEDCOM RMC8388 enables legacy IEDs to connect to a modern Ethernet network supporting IEEE 1588v2 without the need for a separate PPS time synchronization network.

Selection and Ordering Data

Description		Order no.																
		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
RUGGEDCOM RMC8388		6	G	K	6	0	8	3	-	8	A	C	2	.	-	.	.	.	.
Accessories																			
Console Cable	Cable DB-9 Female to Male, 2 m	6	G	K	6	0	0	0	-	8	D	U	0	0	-	0	A	A	0
Power Cable w/o lugs	Power cable with NEMA 5-15P plug without lugs for pluggable terminal blocks, 6 ft.	6	G	K	6	0	0	0	-	8	B	B	0	0	-	0	A	A	0
DIN Mounting Kit		6	G	K	6	0	0	0	-	8	H	U	0	0	-	0	A	A	0
Panel Mounting Kit		6	G	K	6	0	0	0	-	8	M	G	0	0	-	0	A	A	0
RJ45 Dust Covers Kit	8 RJ45 Dust covers for RUGGEDCOM Products	6	G	K	6	0	0	0	-	8	H	T	0	1	-	0	C	A	0
Selection and ordering data for RUGGEDCOM accessories: *Further Information*																			

Table 3.9/2 Selection and Ordering Data

Description

The RUGGEDCOM RS400 is a utility grade, serial device server with an integrated, fully managed Ethernet switch, designed to operate reliably in electrically harsh and climatically demanding environments. Featuring an integrated 4-port serial server, a 4-port managed Ethernet switch, and an optional V.90 modem, the RUGGEDCOM RS400 is able to interconnect multiple types of intelligent electronic devices (IEDs) that have different methods of communication. Using the RUGGEDCOM RS400 results in fewer connectivity devices, reducing overall system costs, and also extends the useful life of existing legacy IEDs, minimizing capital expenditure for new equipment.

Benefits

- Reduced CAPEX resulting from fewer connectivity devices to be deployed.
- Protected CAPEX due to extended useful life of legacy IEDs when transitioning to Ethernet based communications.
- Managed switch supports features to support a full array of intelligent functionality for high network availability and manageability.
- Product designed to address harsh environments with extended temperature ranges.
- No need for external power supply, reducing CAPEX for world-wide applications with HI and LO options.

Features

- Fully compliant EIA/TIA RS485, RS422, RS232 serial ports (software selectable)
- DB9-, RJ45-, Phoenix style connectors
- Integrated Ethernet switch – up to 4 ports
- 10/100BaseTX, 10BaseFL, 100BaseFX options
- Transmit serial data over an IP network
- Non-blocking, store and forward switching
- DC 24 V, DC 48 V, or high-power (DC 88 V to 300 V/ AC 85 V to 264 V) options for worldwide operability
- For use at ambient temperatures from –40 °C to +85 °C without the use of fans

Product Variants

- RUGGEDCOM RS400
  - Serial device server with integrated fully managed Ethernet switch with 256-bit encryption

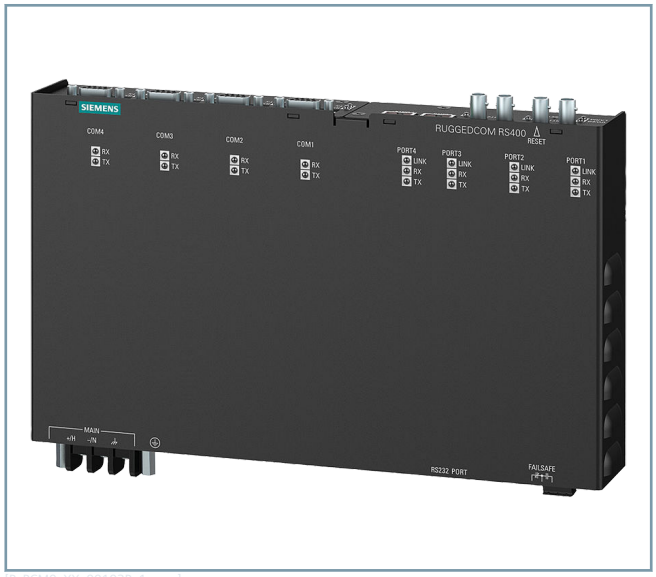


Figure 3.10/1 RUGGEDCOM RS400

Application example

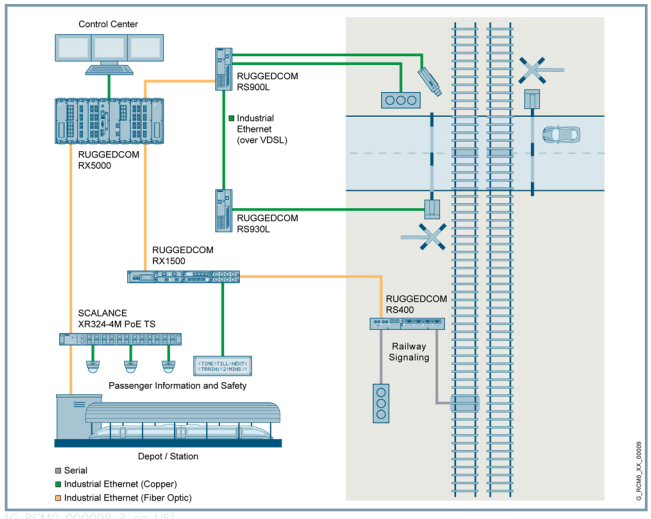


Figure 3.10/2 Intelligent Traffic Systems - wayside infrastructure using the RUGGEDCOM RS400 to connect legacy devices to an Ethernet infrastructure

Selection and Ordering Data

Description	Order no.																
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
RUGGEDCOM RS400	6	G	K	6	0	4	0	-	0	A	T	2	.	-	0	.	A	.
The RUGGEDCOM RS400 is a utility grade, serial device server with an integrated, fully managed, Ethernet switch, designed to operate reliably in electrically harsh and climatically demanding environments; 4 port serial server, 4 port managed Ethernet switch and an optional V.90 modem																		
Selection and ordering data for RUGGEDCOM accessories: *Further Information*																		

Table 3.10/1 Selection and Ordering Data

Description

The RUGGEDCOM RS910 is a utility grade, serial device server with an integrated, fully managed Ethernet switch, designed to operate reliably in electrically harsh and climatically demanding environments. The RUGGEDCOM RS910 is able to interconnect multiple types of intelligent electronic devices (IEDs) that have different methods of communication. Using the RUGGEDCOM RS910 results in fewer connectivity devices, reducing overall system costs, and also extends the useful life of existing legacy IEDs, minimizing capital expenditure for new equipment.

Benefits

- Reduced CAPEX resulting from fewer connectivity devices to be deployed.
- CAPEX avoidance due to extending useful life of legacy IEDs while transitioning to an Ethernet based communications network.
- Managed switch features support a full array of intelligent functionality for high network availability and manageability.
- Product designed to address harsh environments with extended temperature ranges.
- No need for external power supply, reducing CAPEX for world-wide applications with HI and LO options.

Features

- Serial device server with 2 serial port interfaces RS485/RS422/RS232 (DB9 or RJ45 connectors)
- Optional fiber serial interface with ST connectors
- Support for Modbus TCP, DNP3, TIN serial protocols
- Integrated managed Ethernet switch – up to 3 ports, fiber and/or copper
- Supports many types of fiber (multimode, single-mode) with multiple connector types (ST, MTRJ, LC, SC)
- Enables transmitting serial data over an IP network
- DC 24 V, DC 48 V, or high-power (DC 88 V to 300 V/AC 85 V to264 V) options for worldwide operability
- For use at ambient temperatures from –40 °C to +85 °C without the use of fans

Product Variants

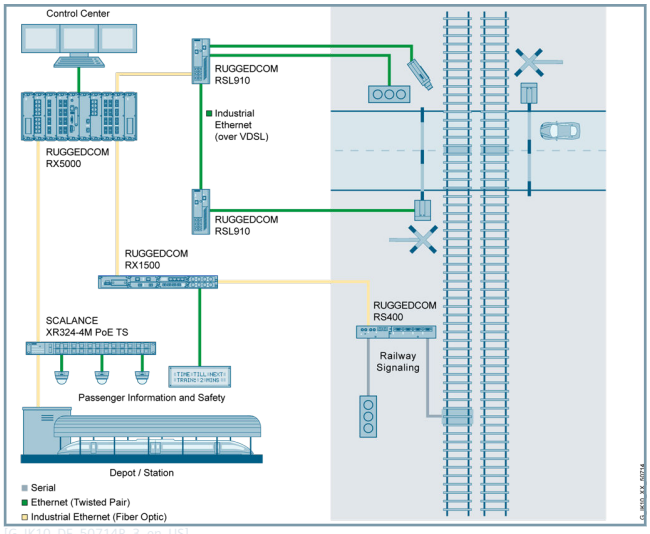
- RUGGEDCOM RS910
  - Compact serial device server with 2 serial ports and 3 Copper or Fiber Fast Ethernet ports; managed Ethernet switch and 256-bit encryption



[P_RS910, 2, _ _]

Figure 3.10/3 RUGGEDCOM RS910

Application Example



[G_IK10_DE_50714P, 3, en_US]

Figure 3.10/4 Intelligent Traffic Systems - wayside infrastructure using the RUGGEDCOM RS910 to connect legacy devices to an Ethernet infrastructure

Selection and Ordering Data

Description	Order no.															
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
RUGGEDCOM RS910	6	G	K	6	0	9	1	-	0	A	T	2	.	-	0	.	A	.
The RUGGEDCOM RS910 is a utility grade serial device server with an integrated, fully managed, Ethernet switch, designed to operate reliably in electrically harsh and climatically demanding environments; 2 serial ports (RS485/ RS422/RS232) and/or up to 3 Ethernet ports (copper or fiber); multimode, single-mode; multiple connector types (ST, MTRJ, LC, SC)																		
Selection and ordering data for RUGGEDCOM accessories: *Further Information*																		

Table 3.10/2 Selection and Ordering Data

Description

The RUGGEDCOM RMC30 is a utility grade, 2-port Serial-to-Ethernet server that has been specifically designed to operate in electrically harsh and climatically demanding environments. It offers both an RS232 port and an RS485/422 port simultaneously via a solid screw down terminal block. The 10Base-T Ethernet port supports both auto-negotiation and auto-crossover detection and simplifies cabling. Simple and intuitive network based configuration using either the built in Web or Telnet server makes setup a breeze.

Benefits

- IEC 61850-3 and IEEE 1613 standards compliant to support communications in mission critical verticals such as electric power substations.
- Saving CAPEX thanks to the media conversion capability between existing infrastructures.
- Reduced OPEX thanks to simple plug and play operations.
- Product designed to address harsh environments with extended temperature ranges.
- No need for external power supply, reducing CAPEX for world-wide applications.
- Multiple port options available to provide customers great flexibility for a variety of use scenarios.

Features

- Serial ports: 1x RS232 and 1x RS422/485 port
- Ethernet ports: 1x 10BaseTX
- Transmit serial data over an IP network
- Support for Modbus TCP, DNP 3, TIN serial protocols
- DC 24 V, DC 48 V, or high-power (DC 88 V to 300 V/ AC 8 V to 264 V) options for worldwide operability
- For use at ambient temperatures from –40 °C to +85 °C without the use of fans
- Multiple management interfaces : Web-based, Telnet, CLI management interfaces

Product Variants

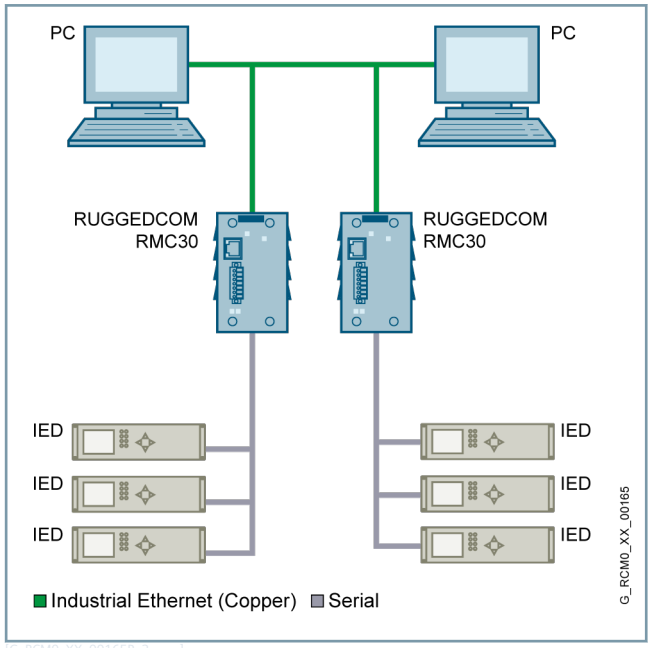
- RUGGEDCOM RMC30
  - Serial device server, export controlled version



[P_RCM0_XX_00088P, 1, --_--]

Figure 3.10/5 RUGGEDCOM RMC30

Application Example



[G_RCM0_XX_00165P, 2, --_--]

Figure 3.10/6 Using the RMC30 that allows communicating virtually any serial device with Ethernet in a simple and reliable network connectivity.

Selection and Ordering Data

Description		Order no.																
		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
RUGGEDCOM RMC30																			
RUGGEDCOM RMC30 2-port Serial-to-Ethernet server	RUGGEDCOM RMC30	6	G	K	6	0	0	3	-	0	A	C	2	.	-	.	.	.	.
Selection and ordering data for RUGGEDCOM accessories: *Further Information*																			

Table 3.10/3 Selection and Ordering Data

Description

RUGGEDCOM CROSSBOW is an enterprise level solution for managing and securing remote maintenance access to field devices in compliance with the NERC CIP standards. RUGGEDCOM CROSSBOW provides cyber-secure local and remote user access and management of all Intelligent Electronic Devices and their associated files.

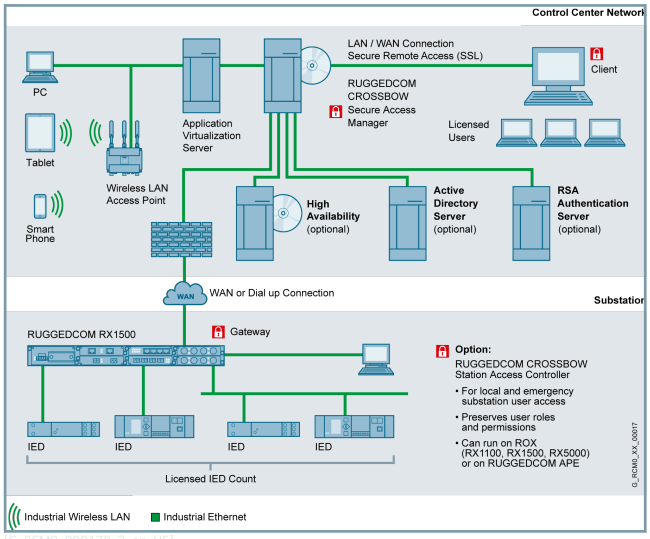
Benefits

- Provides a strong foundation to enable compliance to NERC CIP & IEC-62443 in the areas of remote IED access, activity logging and data privacy.
- Secure remote access capabilities saves costly field visits and truck rolls.
- User access can be revoked in external strong authentication system (AD, RSA, Radius), no need for costly and time consuming password changes in all devices.
- Labor intensive automated tasks can be automated saving time and expense, such as password, firmware, and configuration management.
- Device event records can be extracted and stored without the need for additional substation hardware and associated maintenance and patching requirements.
- Optional Asset Discovery & Management automates network asset discovery saving time and expense associated with device inventory.

Features

- Secure, role based remote access
- Authenticate users against IT systems
- Automate user login
- Manage device passwords and configurations
- Compare device configurations and firmware against known approved versions
- Automated file retrieval and storage
- Control, log, and report user access and activity

Application Example



[G_RCMO_00017P, 2, en_US]

Figure 3.11/1 RUGGEDCOM CROSSBOW – System Architecture

Selection and Ordering Data

Description		Order no.																
		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
RUGGEDCOM CROSSBOW Software-Installer		6	G	K	6	0	0	0	-	2	B	A	☐	0	-	0	A	A	0
													▲						
													|						
RUGGEDCOM CROSSBOW Server/CAM Software	Software installers for CROSSBOW Server, Client, and CAMs												0						
RUGGEDCOM CROSSBOW SAC Software	Software installers for CROSSBOW Station Access Controller (both Windows and ROX variants)												1						
Professional Services																			
Selection and ordering data for RUGGEDCOM accessories: *Further Information*																			

Table 3.11/1 Selection and Ordering Data

Mobile Wireless Routers Scalance M – Routers for Wireless IP Communications

Overview

- EDGE/HSPA+/LTE/5G router for wireless IP communication of Industrial Ethernet-based automation devices using cellular networks
- Integrated security functions with firewall
- NAT/network applications/1:1 NAT
- Both VPN servers and VPN clients
- A variety of tunnel protocols available: IPsec, OpenVPN
- User-specific login

Benefits

- Monitoring and control of wirelessly connected telecontrol substations with low investment and operating costs
- Reducing travel costs or telephone fees using remote programming and remote diagnostics via mobile wireless service
- Convenient diagnostics via terminal clients and short download times due to the high speed of HSPA+/LTE/5G
- High security thanks to IPsec-based VPN functionality and firewall
- Can be used globally with GSM Quadband technology, UMTS, as well as LTE Pentaband and 5G technology (keep the countryspecific approvals in mind!). For SCALANCE MUM853-1 5G router only: eSIM support and GPS tracking possible

Functions

Interfaces

- 1 digital input and 1 digital output each for signaling faults and outages
- 4 Ethernet ports for Industrial Ethernet
- Diagnostics LEDs for modem status, field strength, connection check, VPN status, and DI/DO channels
- 2/4x SMA antenna connection for 2G/3G/4G/5G antenna

Mobile wireless standards supported

- SCALANCE 876-4: 2G (GSM ,GPRS, EDGE) / 3G (UMTS, HSPA+) / 4G (LTE)
- SCALANCE MUM853-1 (3G (UMTS, HSPA+) / 4G (LTE) / 5G

Management

- Web interface for configuration and management
- CLI for configuration and management
- SNMP and MIBs, TRAPS are supported

Security and Routing

- Secure data transmission using encryption and secure identification (authentication) of the communication users by the application of VPN (IPsec, OpenVPN). Several VPN tunnels are possible at the same time.
- Login and firewall function for specific assignment and checking of access rights.
- Routing and port forwarding by NAT, NAPT and 1:1 NAT are supported.

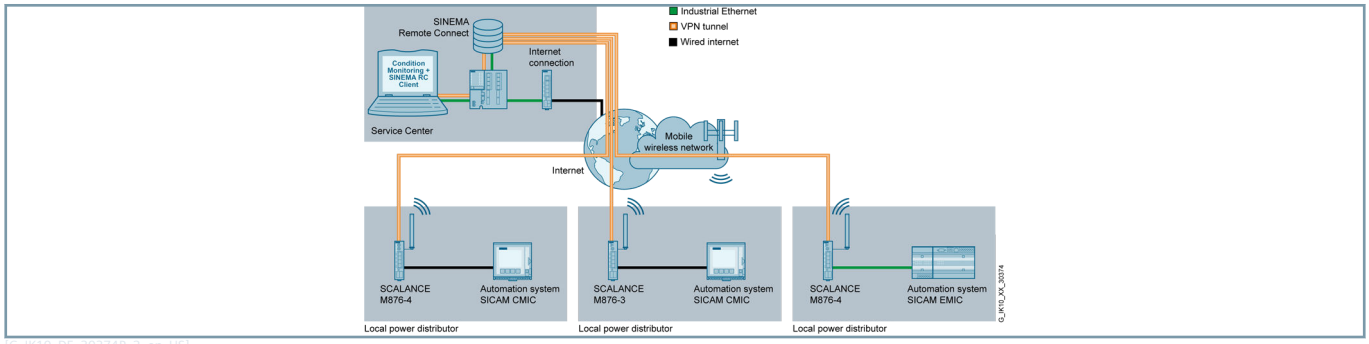


[pn_SCALANCE_M87x, 2, --_--]

Figure 3.12/1 SCALANCE M876-4/SCALANCE MUM853-1

Applications

- The SCALANCE Industrial Routers can be used universally. Due to their type of construction and electrical properties, the routers are primarily suited to use in the industrial sector
- Worldwide remote programming and maintenance via mobile wireless
- Energy-saving designs of systems, for example, by statusdependent rotational speed control of pumps in satellite stations
- Control and monitoring of
  - Wastewater treatment plants, water treatment
  - Oil and gas supplies
  - District heating
  - Power distribution
  - Pump stations
  - Traffic and transportation
  - Buildings
  - Wind power and photovoltaic systems
- Connecting mobile participants, with central monitoring and control



[G_IK10_DE_30374P, 2, en_US]

Figure 3.12/2 Transparent Transportation of Telecontrol Protocols, for example, IEC 60870-5-104, in the Energy Automation Environment

Additional information

You can find additional information on remote networks at: *http://siemens.com/remote-networks*

Country approvals:

You can always find the current country approvals and country-specific constraints at the following link: *http://www.siemens.com/mobilenetwork-approvals*

Cable system technology:

You will find more information on the SIMATIC NET cable system family under: *http://www.siemens.com/fastconnect*

Selection Tool:

For support with selecting SCALANCE network components, see the TIA Selection Tool:

- *http://www.siemens.com/tia-selection-tool*

Selection and Ordering Data

Description	Order no.															
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
SCALANCE M876-4	6	G	K	5	8	7	6	-	4	A	A	1	0	-	2	B	A	2
SCALANCE MUM853-1	6	G	K	5	8	5	3	-	2	E	A	1	0	-	2	A	A	1
IE FC RJ45 plug connector 180 RJ45 plug connector for Industrial Ethernet with sturdy metal case and integrated cutting terminal contacts for connecting industrial Ethernet FC installation cables, with 180° cable output for network components and CPs/CPUs with industrial Ethernet connection	6	G	K	1	9	0	1	-	1	B	B	1	0	-	2	A	☐	0
																	▲	
																	|	
1 package = 1 unit																	A	
1 package = 10 unit																	B	
1 package = 50 unit																	B	

Table 3.12/1 Selection and Ordering Data

PROFIBUS/MPI Router SCALANCE M804PB – Router for PROFIBUS/MPI Systems

Description

The SCALANCE M804PB is a compact Industrial Ethernet router with 1x RS 485 interface for a cost-effective and reliable connection of PROFIBUS/MPI systems. The protection against unauthorized access and the security of the data transfer are increased by the integrated security functions firewall and VPN (IPsec and, for connecting to SINEMA Remote Connect, OpenVPN).

Widely distributed PROFIBUS/MPI-based plant segments and terminal devices can be generically accessed via the SCALANCE M804PB. In addition, access to PROFIBUS/MPI programmable controllers is also possible from the local Ethernet interface. The devices can be connected via the TIA Portal or SIMATIC STEP 7. The PROFIBUS/MPI interface is activated using the free TIA Portal Cloud Connector software and is then available in the TIA Portal as of V15 and SIMATIC STEP 7 as of V5.6. Please note that a TIA Portal Cloud Connector version >= 1.1 SP2 is required for this. As of TIA Portal Version 15 SP1, a more current version of the TIA Portal Cloud Connector is installed which is also compatible with the SCALANCE M804PB. The SCALANCE M804PB is suitable for use in remote programming and remote diagnostics, as well as remote maintenance (Teleservice) and network segmentation. The connection to SINEMA RC via the autoconfiguration interface (can be enabled with the KEY-PLUG SINEMA RC) also allows the easy configuration of a connection to SINEMA Remote Connect.

The KEY-PLUG is inserted in the PLUG slot of the SCALANCE M804PB. It also supports the tried-and-tested C-PLUG functionality. The SCALANCE M804PB has IP20 degree of protection and also has a redundant power supply connection.



[P_IK10_XX_02399, 1, – –]

Figure 3.13/1 SCALANCE M804PB

Selection and Ordering Data

Description		Order no.																
		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
SCALANCE M804PB[42]		6	G	K	5	8	0	4	-	0	A	P	0	0	-	2	A	A	2
Compact Industrial Ethernet router with 1x RS 485 interface for the cost-effective and reliable connection of PROFIBUS/MPI systems; with integrated firewall and VPN with IPsec (OpenVPN for connecting SINEMA RC); 2 x RJ45 ports, 1x RS 485 interface PROFIBUS/ MPI																			
Accessories																			
C-PLUG	Removable data storage medium for simple replacement of devices in the event of a fault; for storing configuration or engineering and application data; can be used for SIMATIC NET products with C-PLUG slot	6	G	K	1	9	0	0	-	0	A	B	1	0					
SCALANCE CLP 2 GB	Removable data storage medium for simple device replacement in case of failure, for recording configuration data, can be used in the following products with CLP slot	6	G	K	1	9	0	0	-	0	U	B	0	0	-	0	A	A	0
KEY-PLUG SINEMA RC	Removable data storage medium for enabling connection to SINEMA Remote Connect for simple device replacement if a fault occurs, and for storing configuration data	6	G	K	5	9	0	8	-	0	P	B	0	0					

42 Please note country approvals under: *http://www.siemens.com/mobilenetwork-approvals*

Description		Order no.																	
CLP SINEMA RC	Removable data storage medium for enabling the connection to SINEMA Remote Connect for SCALANCE MUM85X with CLP slot for simple device replacement in case of failure and for recording of configuration data	6	G	K	5	9	0	8	-	0	U	A	0	0	-	0	A	A	0
SCALANCE M desktop pedestal	SCALANCE M-800 desktop pedestal for table mounting for SCALANCE M812 / M816 / M874-x / M876-x / S615	6	G	K	5	8	9	8	-	8	M	D	0	0					

Table 3.13/1 Selection and Ordering Data

Mobile Wireless Antennas – For Wireless Connections

Description

Mobile wireless antennas are used to optimize the reception and emission of signals for the respective application. This increases the reliability of the mobile wireless connections.

- Use for routers, modems, and communication processors for the mobile wireless standards GSM/GPRS (2G), UMTS (3G), LTE (4G) and (5G)
- Coordinated assortment of omnidirectional and directional antennas for different applications, both indoors and outdoors

Benefits

- Cost-effective connection to devices in remote, difficult to access or volatile environments
- Building a reliable mobile wireless infrastructure using remote antennas, even if mobile wireless devices are installed, for example, in the control cabinet

Examples:

- Telecontrol applications, for example, in water treatment and wastewater treatment plants, oil and gas applications, railroad use or public transportation
- Teleservice applications, for example, in machine manufacturing
- Additional applications, for example, automation of energy distribution networks (Smart Grid), video surveillance



Figure 3.14/1 Mobile Wireless Antennas

You can find all information, including detailed product information and the ordering information, online in the Industry Mall: *https://mall.industry.siemens.com/mall*

Selection and Ordering Data

Description	Order no.																
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
2G/3G/4G antenna ANT896-4MA	6	G	K	5	8	9	6	-	4	M	A	0	0	-	0	A	A	3
Omnidirectional antenna for GSM (2G), UMTS (3G), and LTE (4G) networks; omnidirectional characteristic; can be rotated radially with additional joint; with SMA plug for direct assembly on the device; antenna gain 2dBi; IP54																		
2G/3G/4G antenna ANT896-4ME	6	G	K	5	8	9	6	-	4	M	E	0	0	-	0	A	A	0
Omnidirectional antenna for GSM (2G), UMTS (3G), and LTE (4G) networks; omnidirectional characteristic; with N-Female plug for recessed mounting indoors and outdoors; antenna gain 3dBi; IP66																		
2G/3G/4G antenna ANT794-4MR	6	N	H	9	8	6	0	-	1	A	A	0	0					
Omnidirectional antenna GSM (2G), UMTS (3G), and EU-wide LTE (4G) networks; omnidirectional; weather-resistant for indoors and outdoors; 5 m connecting cable permanently attached to the antenna; SMA plug; incl. mounting bracket, screws, dowels																		
3G/4G/5G antenna ANT897-4MA	6	G	K	5	8	9	7	-	4	M	A	0	0	-	0	A	A	3
Mobile wireless antenna for public 3/4/5G mobile wireless networks and private 5G networks worldwide; omnidirectional characteristic; 600 to 5000 MHz; antenna gain: 1 to 2 dBi, incl. SMA male connector, IP5																		
3G/4G/5G antenna ANT897-4ME	6	G	K	5	8	9	7	-	4	M	E	0	0	-	0	A	A	0
Antenna for public 3/4/5G mobile wireless networks and private 5G networks worldwide; omnidirectional characteristic; 600 to 6000 MHz; antenna gain: 2 to 6 dBi, incl. N-Connect female connector, IP65; wall or tower mounting, incl. mounting bracket																		

Table 3.14/1 Selection and Ordering Data

Antenna Accessories

Description		Order no.																
		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
SIMATIC NET Antenna N-Connect Male/Male Flexible Connection Cable																			
Flexible connection cable for connecting an RCoax cable or an antenna to a SCALANCE W/M device; pre-assembled with two N-Connect male connectors		6	X	V	1	8	7	5	-	5	A	☐	☐	0					
												▲	▲						
												|	|						
	1 m											H	1						
	2 m											H	2						
	5 m											H	5						
	10 m											N	1						
Flexible connection cable for connecting an RCoax cable or an antenna to a SCALANCE W/M device; pre-assembled with two N-Connect male connectors, suitable for railroad applications		6	X	V	1	8	7	5	-	5	S	H	☐	0					
													▲						
													|						
	1 m												1						
	2 m												2						
	5 m												5						
SIMATIC NET Antenna N-Connect/SMA Male/Male Flexible Connection Cable																			
Flexible connection cable for connecting an antenna to a SCALANCE M-800 device; pre-assembled with one N-Connect male and one SMA male connector		6	X	V	1	8	7	5	-	5	L	☐	☐	0					
												▲	▲						
												|	|						
	0.3 m											E	3						
	1 m											H	1						
	2 m											H	2						
	5 m											H	5						
Flexible connection cable for connecting an antenna to a SCALANCE M-800 device; pre-assembled with one N-Connect male and one SMA male connector, suitable for railroad applications		6	X	V	1	8	7	5	-	5	U	H	☐	0					
													▲						
													|						
	1 m												1						
	2 m												2						
	5 m												5						
Lightning Protector LP798-1N		6	G	K	5	7	9	8	-	2	L	P	0	0	-	2	A	A	6
Lightning protection with N/N female/female connector, IP67 (-40°C to +85°C), frequency range: 0 to 6 GHz																			
SIMATIC NET N-Connect/N-Connect Female/Female Panel Feedthrough		6	G	K	5	7	9	8	-	2	P	P	0	0	-	2	A	A	6
Panel feedthrough for wall thicknesses up to a maximum of 4.5 mm, 2 N-Connect female connectors																			
SIMATIC NET N-Connect Male/Male Coupler		6	G	K	5	7	9	8	-	0	C	P	0	0	-	1	A	A	0
HF bus coupler; 2 N-Connect male connectors																			
SIMATIC NET SMA/SMA Angle Adaptor		6	G	K	5	8	9	8	-	1	C	V	0	0	-	4	A	A	0
Angle adaptor, SMA/SMA male/female																			
We offer a wide range of accessories for various applications. You can find an overview of further products at: *https://mall.industry.siemens.com/mall/de/WW/Catalog/Products/10022025?tree=CatalogTree*																			

Table 3.14/2 Selection and Ordering Data

Description

Industrial Security Appliances SCALANCE S are used to protect devices and networks in automation engineering as well as industrial communication.

They are characterized by the following features, amongst others:

- Implementation of a cell protection concept and support during implementation of the Siemens security concept Defense in Depth
- Inspection and filtering of the data traffic via the integrated firewall and consequently:
  - Protection against incorrect operation
  - Prevention of unauthorized access
  - Avoidance of malfunctions and communication overload
- Authentication of communication users and encryption of data transmission using VPN and providing protection of the communication against spying and manipulation
- Sturdy, industry-compliant design of the devices
- Simple and clearly structured configuration:
  With the TIA portal, all SIMATIC NET security products can be configured and diagnosed from a central location
- The security of communication is independent of the protocol (for example, PROFINET or other Ethernet-based field bus solutions)
- Secure remote access via the Internet is possible using any provider

Benefits

- Protection of industrial automation networks against unauthorized access and creation of a DMZ (protected zone) is possible to exchange data with other networks without having to allow direct access to the production network
- Implementation of a flexible cell protection concept provides:
  - Protection of any Ethernet-based automation devices and systems that do not have their own security functions
  - Protection of several devices at the same time
  - Reduction of the risk of network incidents and unauthorized network access by forming secure communication islands (network segmentation)
  - Backup of communication to and from the automation cells
- Universal network diagnostics by integrating into IT infrastructures and network management systems via SNMP (for example SINEC NMS)
- Remote access security via the Internet. Even dynamic IP addresses can be used with PPPoE and DDNS.
- Easy integration into existing networks without reconfiguring end users or creating new IP subnetworks
- Device replacement without PG by using the removable storage medium C-PLUG for saving the configuration data
- Direct integration in fiber optic networks is possible (SCALANCE SC632-2C, SC636-2C, SC642-2C, SC646-2C)



[P_IK10_XX_2327, 1, --_--]

Figure 3.15/1 SCALANCE S

Applications

SCALANCE S industrial security appliances can protect all devices of an Ethernet network against unauthorized access. They also protect data transmission between devices or network segments (for example, automation cells) against data manipulation and spying, and can be used for secure remote access via the Internet.

Secure remote access via the Internet or via 2G/3G/4G are possible in connection with the industry routers of the SCALANCE M-800 product line.

SCALANCE S is optimized for use in the automation environment and in the industrial sector and fulfills the special requirements of automation engineering such as easy upgrading of existing systems, simple installation and minimum downtimes in the event of a fault.

Product Versions

Industrial Firewall Appliances:

- SCALANCE SC622-2C
  - Protects network segments against unauthorized access via Stateful Inspection firewall
  - Used for network separation according to PROFIsafe
  - Connection via 2x Ports, electrical with RJ45 (10/100/1000 Mbit/s) and 2x Combo Ports, electrically with RJ45 (10/100/1000 Mbit/s) or optically with SFPs (1000 Mbit/s)
  - Firewall data throughput up to 750 Mbit/s
  - Connection to SINEMA Remote Connect via VPN
- SCALANCE SC626-2C
  - Protects network segments against unauthorized access via Stateful Inspection firewall
  - Used for network separation according to PROFIsafe
  - Connection via 6x Ports, electrical with RJ45 (10/100/1000 Mbit/s) and 2x Combo Ports, electrically with RJ45 (10/100/1000 Mbit/s) or optically with SFPs (1000 Mbit/s)
  - Firewall data throughput up to 750 Mbit/s
  - Connection to SINEMA Remote Connect via VPN
- SCALANCE SC632-2C
  - Protects network segments against unauthorized access via Stateful Inspection firewall
  - Connection via 2x Combo Port, electrically with RJ45 (10/100/1000 Mbit/s) or optically with SFPs (100 Mbit/s or 1000 Mbit/s)
  - Firewall data throughput up to 600 Mbit/s
  - Connection to SINEMA Remote Connect via VPN
- SCALANCE SC636-2C
  - Protects network segments against unauthorized access via Stateful Inspection firewall
  - Connection via 4x Port, electrically with RJ45 (10/100/1000 Mbit/s) and 2x Combo Port, electrically with RJ45 (10/100/1000 Mbit/s) or optically with SFPs (100 Mbit/s or 1000 Mbit/s)
  - Firewall data throughput up to 600 Mbit/s
  - Connection to SINEMA Remote Connect via VPN

Industrial VPN Appliances:

- SCALANCE S615
  - Protects network segments against unauthorized access via Stateful Inspection firewall
  - Simultaneous operation of up to 20 VPN tunnels is possible
  - Connection via 5x port, electrically with RJ45 (10/100 megabit/s)
  - Firewall data throughput up to 100 Mbit/s
  - VPN data throughput up to 35 Mbit/s
  - Connection to SINEMA Remote Connect via VPN
- SCALANCE SC642-2C
  - Protects network segments against unauthorized access via Stateful Inspection firewall
  - Simultaneous operation of up to 200 VPN tunnels is possible
  - Connection via 2x Combo Port, electrically with RJ45 (10/100/1000 Mbit/s) or optically with SFPs (100 Mbit/s or 1000 Mbit/s)
  - Firewall data throughput up to 600 Mbit/s
  - VPN data throughput up to 120 Mbit/s
  - Connection to SINEMA Remote Connect via VPN
- SCALANCE SC646-2C
  - Protects network segments against unauthorized access via Stateful Inspection firewall
  - Simultaneous operation of up to 200 VPN tunnels is possible
  - Connection via 4x Port, electrically with RJ45 (10/100/1000 Mbit/s) and 2x Combo Port, electrically with RJ45 (10/100/1000 Mbit/s) or optically with SFPs (100 Mbit/s or 1000 Mbit/s)
  - Firewall data throughput up to 600 Mbit/s
  - VPN data throughput up to 120 Mbit/s
  - Connection to SINEMA Remote Connect via VPN

You can find more information on SCALANCE S at: *http://www.siemens.com/securityappliance*

For support with selecting SCALANCE network components, see the TIA Selection Tool:

- *http://www.siemens.com/tia-selection-tool*

Selection and Ordering Data

Description		Order no.																
		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
SCALANCE SC622-2C		6	G	K	5	6	2	2	–	2	G	S	0	0	–	2	A	C	2
Industrial Security Appliance; for protection of devices and networks in discrete manufacturing and the process industry for protection of the industrial communication with firewall; further functions: network separation according to PROFIsafe; address conversion (NAT/NAPT); connection to SINEMA RC; 2x combo port electrical or optical; 10/100/1000 Mbit/s RJ45 or 1000 Mbit/s SFP																			
SCALANCE SC626-2C		6	G	K	5	6	2	6	–	2	G	S	0	0	–	2	A	C	2
Industrial Security Appliance; for protection of devices and networks in discrete manufacturing and the process industry for protection of the industrial communication with firewall; further functions: network separation according to PROFIsafe; address conversion (NAT/NAPT); connection to SINEMA RC; 4x ports electrical 10/100/1000 Mbps RJ45 and 2x combo port electrical or optical; 10/100/1000 Mbps RJ45 or 1000 Mbps SFP																			
SCALANCE SC632-2C		6	G	K	5	6	3	2	–	2	G	S	0	0	–	2	A	C	2
Industrial Security Appliance; for protecting devices and networks in discrete manufacturing and the process industry for securing industrial communication with firewall; additional functions: Address translation (NAT/NAPT); 2x combo port, electrical with RJ45 (10/100/1000 Mbps) or optically with SFPs (100 Mbps or 1000 Mbps)																			
SCALANCE SC636-2C		6	G	K	5	6	3	6	–	2	G	S	0	0	–	2	A	C	2
Industrial Security Appliance; for protecting devices and networks in discrete manufacturing and the process industry for securing industrial communication with firewall; additional functions: Flexible security zones, address translation (NAT/NAPT); 4x electrical with RJ45 (10/100/1000 Mbps) and 2x combo port, electrical with RJ45 (10/100/1000 Mbps) or optical with SFPs (100 Mbps or 1000 Mbps)																			
SCALANCE SC642-2C		6	G	K	5	6	4	2	–	2	G	S	0	0	–	2	A	C	2
Industrial Security Appliance; for protecting devices and networks in discrete manufacturing and the process industry for securing industrial communication with firewall and VPN; additional functions: Address translation (NAT/NAPT); 2x combo port, electrical with RJ45 (10/100/1000 Mbps) or optically with SFPs (100 Mbps or 1000 Mbps)																			
SCALANCE SC646-2C		6	G	K	5	6	4	6	–	2	G	S	0	0	–	2	A	C	2
Industrial Security Appliance; for protecting devices and networks in discrete manufacturing and the process industry for securing industrial communication with firewall and VPN; additional functions: Flexible security zones, address translation (NAT/NAPT); 4x electrical with RJ45 (10/100/1000 Mbps) and 2x combo port, electrical with RJ45 (10/100/1000 Mbps) or optical with SFPs (100 Mbps or 1000 Mbps)																			
SCALANCE S615		6	G	K	5	6	1	5	–	0	A	A	0	0	–	2	A	A	2
LAN router; for protection of devices/networks in automation technology and for protection of industrial communication by means of VPN and firewall; further functions: address conversion (NAT/NAPT), connection to SINEMA RC, 5-port switch, 1x dig. input, 1x digital output																			
Accessories																			
C-PLUG	Removable data storage medium for simple replacement of devices in the event of a fault; for storing configuration or engineering and application data; can be used for SIMATIC NET products with C-PLUG slot	6	G	K	1	9	0	0	–	0	A	B	1	0					
KEY-PLUG SINEMA RC	Removable data storage medium for enabling connection to SINEMA Remote Connect for simple device replacement if a fault occurs, and for storing configuration data	6	G	K	5	9	0	8	–	0	P	B	0	0					
SFP plug-in transceiver		6	G	K	5	9	9	1	–	1	☐	☐	☐	0	–	8	A	A	0
											▲	▲	▲						
											|	|	|						
SFP991-1, 1x 100 Mbps LC port, optical (multimode, glass), up to 5 km											A	D	0						
SFP991-1LD, 1x 100 Mbps LC port, optical (single-mode, glass), up to 26 km											A	F	0						
SFP991-1LH+, 1x 100 Mbps LC port, optical (single-mode, glass), up to 70 km											A	E	0						
SFP991-1ELH200, 1x 100 Mbps LC port, optical (single-mode, glass), up to 200 km											A	E	3						
SFP992-1, 1x 1000 Mbps LC port, optical (multimode, glass), up to 750 km											A	L	0						
SFP992-1+, 1x 1000 Mbps LC port, optical (multimode, glass), up to 2000 m											A	G	0						
SFP992-1LD 1x 1000 Mbps optical LC port (single-mode, glass), up to 10 km											A	M	0						
SFP992-1LH, 1x 1000 Mbps optical LC port (single-mode, glass), up to 40 km											A	N	0						
SFP992-1LH+, 1x 1000 Mbps LC port, optical (single-mode, glass), up to 70 km											A	P	0						
SFP992-1ELH 1x 1000 Mbps optical LC port (single-mode, glass), up to 120 km											A	Q	0						

Table 3.15/1 Selection and Ordering Data

Description

The management platform for remote networks, SINEMA Remote Connect, is a server application for secure connection establishment between users, widely distributed systems and machines. SINEMA Remote Connect facilitates the management and establishment of tunnel connections (VPN). Secure remote maintenance can then be performed via the TIA portal, for example. Direct access to the company network incorporating the machine to be maintained is avoided. The participants who are to communicate with one another "meet" at a neutral location, the SINEMA Remote Connect. There, the identity of the participants is determined using certificate exchange before they can access the company network.

Additional features of SINEMA Remote Connect are:

- Address book function with SINEMA RC client
- Simple to issue rights via the user-friendly web interface
- Auto configuration of Siemens routers and for the SINEMA RC client

Benefits

- Low investment and operating costs for operator control and monitoring of remotely connected substations
- Secured and simple dialup into the plants from any location in the world
- Simple and low-cost migration from classical remote communication to IP-based remote communication
- Wide range of applications from remote service to remote control on the basis of transparent IP communication
- Easy integration into existing infrastructure
- Extremely simple connection of terminal devices via auto configuration (e.g. SCALANCE S615, M-800, SC-600 and selected SIMATIC CPs) and SINEMA Remote Connect Client (minimal IT expertise required)
- More flexible assignment of rights, avoidance of operating errors during remote maintenance by unauthorized personnel due to individual access restriction

Functions

SINEMA Remote Connect

- Management of devices and users:
  - User management with the configuration of rights
  - Device and user management with group administration
- Connection management:
  - Establishing of encrypted connections using OpenVPN
  - Establishing of permanent or event-based connections (using wake-up SMS or a signal at the digital input)
- Connecting subnetworks downstream of the industrial routers (e.g. SCALANCE S or M)
  - Routing support
  - NAT support for mapping locally identical subnetworks
  - NAT support for mapping dedicated local IP addresses



[pti_SINEMA Remote Connect, 2/, =_=]

Figure 3.16/1 SINEMA Remote Connect

  - Support of multiple subnetworks behind an industrial router SCALANCE M or an Industrial Security Appliance S615 or SC-600
  - User-defined access rights for dedicated access to specific IP addresses in subnetworks

KEY-PLUG SINEMA RC

- Connecting SINEMA RC and support during commissioning:
  - Auto configuration interface for simple connection configuration of industrial routers SCALANCE M oder S615

SINEMA Remote Connect Client

- Address book:
  - List view of all devices assigned to one user
- SIMATIC Teleservice
  - Selection of a device to perform a teleservice in the SIMATIC environment
- Proxy server:
  - For communication with networks behind a proxy server infrastructure
- Support of HTTPS and SOCKS proxy servers
- Auto configuration interface:
  - For simple configuration of a connection to SINEMA Remote Connect
- Tunnel encryption:
  - OpenVPN

Applications

SINEMA Remote Connect is suitable for use in industrial and industry-oriented areas:

Global remote programming and maintenance (Remote Service) for example of:

- Plant and machine building
- Power distribution/substations (municipal utility)
- Logistics/harbor logistics
- ITS/transport companies
- Water & waste water (municipal utility, etc.)

Product Variants

The SINEMA Remote Connect management platform is divided into the following products:

- SINEMA Remote Connect Virtual Appliance
  - The SINEMA RC Virtual Appliance contains the basic software package SINEMA RC for establishing 4 VPN connections. It also contains the SINEMA RC Client software.
- SINEMA Remote Connect upgrade-license
  - With the SINEMA RC upgrade licenses, the number of available VPN connections for users and devices can be increased.
- SINEMA Remote Connect Client
  - The SINEMA Remote Connect Client is an open VPN client for optimal connection to SINEMA RC.
- KEY-PLUG and CLP SINEMA RC
  - With the plugs connecting to the SINEMA RC via the auto configuration interface of the industrial routers SCALANCE M and S615 is enabled. In this way, the configuration of the connections of these devices to the SINEMA Remote Connect is simple and quick.
- Supported hardware
  - Industrial routers SCALANCE M, Industrial Security Appliances SCALANCE S615 and SC-600, selected SIMATIC CPs and compact SIMATIC RTU's.
- SINEMA Remote Connect as a Service
  - SINEMA Remote Connect aaS offers components of SINEMA Remote Connect as a cloud service which is hosted and maintained by Siemens. The offer includes a cloud instance with an installed current version of SINEMA Remote Connect Server which is maintained and serviced by Siemens. Since all required licenses are included, SINEMA Remote Connect as a Service is an all-in-one solution which allows simple and safe remote access for teleservice and remote maintenance.

Additional information

You can find all information, including detailed product information and ordering information, online in the Industry Mall: *https://siemens.com/mall-sinema-remote-connect*

You can find more information on the topic of remote networks on the Internet at: *http://www.siemens.com/remote-networks*

You can find more information on the topic of industrial security on the Internet at: *http://www.siemens.com/industrialsecurity*

Selection and Ordering Data

Description	Order no.																
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
SINEMA RC Virtual Appliance Up to 4 VPN connections including SINEMA RC Client; documentation on DVD, license key; 2 languages (German, English); single license for one installation	6	G	K	1	7	2	0	-	1	A	H	0	1	-	0	B	V	0
SINEMA RC UPGRADE OSD 64+ Upgrade by 64-1024 VPN connections; license only, OSD (online software delivery)	6	G	K	1	7	2	2	-	1	V	H	0	1	-	0	B	K	0
SINEMA RC Client OSD OpenVPN client for connection to SINEMA Remote Connect; OSD (online software delivery), license key; 2 languages (German, English); single license for one installation	6	G	K	1	7	2	1	-	1	X	G	0	3	-	0	A	K	0
Accessories																		
KEY-PLUG SINEMA RC Removable medium for enabling connection to SINEMA Remote Connect for industry router, for simple device replacement in the event of an error and adopting configuration data	6	G	K	5	9	0	8	-	0	P	B	0	0					
CLP SINEMA RC Removable data storage medium for enabling the connection to SINEMA Remote Connect for SCALANCE MUM85X with CLP slot for simple device replacement in case of failure and for recording of configuration data	6	G	K	5	9	0	8	-	0	U	A	0	0	-	0	A	A	0
Hosting and maintenance by Siemens; SINEMA Remote Connect Server; 64 VPN licenses, 10 client licenses, 5 Edge app client licenses, REST API	6	G	K	1	8	0	0	-	0	A	A	0	0	-	7	C	A	0
Hosting and maintenance by Siemens; SINEMA Remote Connect Server; 256 VPN licenses, 30 client licenses, 20 Edge app client licenses, REST API	6	G	K	1	8	0	0	-	0	A	A	0	0	-	7	C	A	1
Hosting and maintenance by Siemens; SINEMA Remote Connect Server; 1024 VPN licenses, 60 client licenses, 50 Edge app client licenses, REST API	6	G	K	1	8	0	0	-	0	A	A	0	0	-	7	C	A	2

Table 3.16/1 Selection and Ordering Data

Description

SINEMA Remote Connect as a Service offers the components of SINEMA Remote Connect as a cloud service, which is hosted and maintained by Siemens. The offer includes a cloud instance with a current version of SINEMA Remote Connect Server already installed. Since all necessary licenses are included, SINEMA Remote Connect as a Service is an all-in-one solution that provides easy and secure remote access for teleservice and remote maintenance.

Benefits

In addition to the benefits and straightforwardness of the tried-and-tested SINEMA Remote Connect solution, SINEMA Remote Connect as a Service offers you further advantages:

- No effort required for installation and maintenance of the SINEMA Remote Connect Server
- You do not need to worry about updates and versions. Siemens will always update your SINEMA Remote Connect Server on your cloud instance to the latest version.
- Only one contract fee for your remote access solution: plannable costs and investment protection
- Quick setup of your cloud instance and your SINEMA Remote Connect Server
- Maximum availability through the use of a proven cloud operator



[ph_SINEMA Remote Connect as a Service, 1, --]

Figure 3.16/2 SINEMA Remote Connect as a Service

- Compliant with the latest cyber security standards
- Customer-specific DNS name with the following domain extension: https://"customer-name".sinema-rc.siemens.cloud

Selection and Ordering Data

Description		Order no.																	
		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
SINEMA Remote Connect as a Service - S Hosting and maintenance of the SINEMA Remote Connect Server by Siemens. Included licenses: • 64 VPN licenses • 10 client licenses • 5 Edge app client licenses • REST API		6	G	K	1	8	0	0	-	0	A	A	0	0	-	7	C	A	0
SINEMA Remote Connect as a Service - M Hosting and maintenance of the SINEMA Remote Connect Server by Siemens. Included licenses: • 256 VPN licenses • 30 client licenses • 20 Edge app client licenses • REST API		6	G	K	1	8	0	0	-	0	A	A	0	0	-	7	C	A	1
SINEMA Remote Connect as a Service - L Hosting and maintenance of the SINEMA Remote Connect Server by Siemens. Included licenses: • 1024 VPN licenses • 60 client licenses • 50 Edge app client licenses • REST API		6	G	K	1	8	0	0	-	0	A	A	0	0	-	7	C	A	2
Accessories																			
KEY-PLUG SINEMA RC Removable data storage medium for enabling connection to SINEMA Remote Connect for SCALANCE M800 and S615, for simple device replacement in the event of a fault, and for storing configuration data		6	G	K	5	9	0	8	-	0	P	B	0	0					
SCALANCE M industrial routers																			
PROFIBUS/MPI router	SCALANCE M804PB	6	G	K	5	8	0	4	-	0	A	P	0	0	-	2	A	A	2
SCALANCE M826-2 SHDL router		6	G	K	5	8	2	6	-	2	A	B	0	0	-	2	A	B	2
SCALANCE M876 4G mobile wireless router	SCALANCE M876-4	6	G	K	5	8	7	6	-	4	A	A	1	0	-	2	B	A	2
SCALANCE MUM 5G mobile wireless router	SCALANCE MUM853-1	6	G	K	5	8	5	3	-	2	E	A	1	0	-	2	A	A	1
	SCALANCE MUM856-1	6	G	K	5	8	5	6	-	2	E	A	1	0	-	3	A	A	1
SCALANCE S industrial security appliances																			
SCALANCE S615		6	G	K	5	6	1	5	-	0	A	A	0	0	-	2	A	A	2
SCALANCE SC622-2C		6	G	K	5	6	2	2	-	2	G	S	0	0	-	2	A	C	2
SCALANCE SC632-2C		6	G	K	5	6	3	2	-	2	G	S	0	0	-	2	A	C	2
SCALANCE SC636-2C		6	G	K	5	6	3	6	-	2	G	S	0	0	-	2	A	C	2
SCALANCE SC642-2C		6	G	K	5	6	4	2	-	2	G	S	0	0	-	2	A	C	2
SCALANCE SC646-2C		6	G	K	5	6	4	6	-	2	G	S	0	0	-	2	A	C	2
Communication processors (CPs)																			
SIMATIC CP 1243-1		6	G	K	7	2	4	3	-	1	B	X	3	0	-	0	X	E	0
SIMATIC CP 1243-7 LTE1)	CP 1243-7 LTE EU Frequencies in European band: 700, 1700 MHz	6	G	K	7	2	4	3	-	7	K	X	3	0	-	0	X	E	0
	CP 1243-7 LTE US Frequencies in North American band: 800, 1800, 2600 MHz	6	G	K	7	2	4	3	-	7	S	X	3	0	-	0	X	E	0
SIMATIC CP 1543SP-1		6	G	K	7	5	4	3	-	6	W	X	0	0	-	0	X	E	0
SIMATIC CP 1243-1		6	G	K	7	2	4	3	-	1	B	X	3	0	-	0	X	E	0
SIMATIC CP 1542SP-1 IRC		6	G	K	7	5	4	2	-	6	V	X	0	0	-	0	X	E	0
SIMATIC RTU3000C																			
SIMATIC RTU3011C		6	N	H	3	1	1	2	-	0	B	B	0	0	-	0	X	X	0
SIMATIC RTU3051C		6	N	H	3	1	1	2	-	5	B	B	0	0	-	0	X	X	0

Table 3.16/2 Selection and Ordering Data

3.17

Description

Communication networks are of crucial importance for automation solutions. SIMATIC NET represents a varied supply of modular building blocks that help resolve pending communication tasks efficiently.

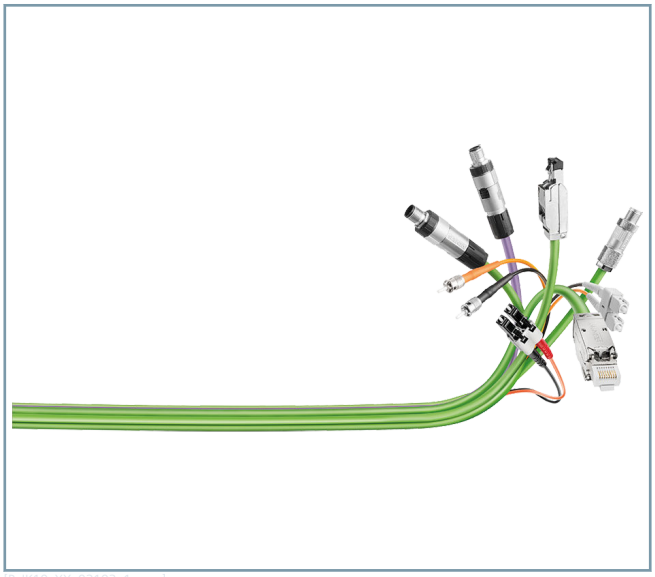
Passive Power-System Components - Cable System Technology

Powerful and consistent communication networks are the basis for efficient automation. Industrial Ethernet is the proven technology to meet these challenges. SIMATIC NET from Siemens relies on Industrial Ethernet and includes everything you need to implement maximum efficiency industrial networks and bus systems: powerful, future-proof power-system components for reliable use in hostile industrial environments, a cable system for quick assembly on-site, fast redundancy for fail-safe operation as well as a reporting concept for continuous monitoring of the power-system components.

Particularly high demands are set for assembly of the cable system in the industrial environment. With FastConnect, Siemens is offering a system that can meet all these requirements: On-site assembly – simple, quick, and healthy.

FastConnect - The Complete System

With FastConnect, Siemens has developed a well thought-out quick-assembly system of cables, plug connectors, and assembly tools for fast and healthy surface mounting or changes on-site. FastConnect is available for Industrial Ethernet/PROFINET and PROFIBUS, for RJ45, M12, or Sub-D/RS-485. And in the meantime also for optical fiber: ST/BFOC, SC RJ, and LC for different lengths. FastConnect optical fiber makes the impossible possible!



[P_IK10_XX_02103, 1, – –]

Figure 3.17/1 Industrial Ethernet – Cable System Technology

You can find more information at:

- *www.siemens.com/fastconnect*
- *www.siemens.com/mall-verkabelungstechnik*

Selection and Ordering Data

Description		Order no.												
		1	2	3	4	5	6	7		8	9	10	11	12
Installation cable for 4-wire cabling (2 x 2)		6	X	V	1	8	4	0	-	2	A	H	1	0
4-wire, shielded TP installation cable for connection to IE FC outlet RJ45/IE FC RJ45 plug. Sold by the meter: Delivery unit max. 1000 m, minimum order quantity: 20 m														
IE FC TP standard cable GP 2 x 2 (PN Type A, AWG22, Cat5e)		6	X	V	1	8	4	0	-	2	A	☐	☐	0
												▲	▲	
												|	|	
Rigid TP cable for universal use, sold by the meter	20 m											H	2	
	50 m											N	5	
	100 m											T	1	
	200 m											T	2	
	500 m											T	5	
	1000 m											U	1	
IE FC TP flexible cable GP 2 x 2 (PN Type B, AWG22, Cat5e)	Flexible cable for occasional movement, sold by the meter, minimum order quantity: 20 m	6	X	V	1	8	7	0	-	2	B			
IE FC TP trailing cable GP 2 x 2 (PN Type C, AWG22, Cat5e)	For drag chain use, sold by the meter, minimum order quantity: 20 m	6	X	V	1	8	7	0	-	2	D			
IE FC TP trailing cable GP pre-assembled with two IE FC RJ45 Plug 180	Length 1 m, other lengths on request Note: M12 connecting cables, see *www.siemens.com/fastconnect*	6	X	V	1	8	7	1	-	5	B	H	1	0
IE FC TP robust standard cable GP 2 x 2 (PN Type A, AWG22, Cat5e)	TPE coating, fixed installation for connection to FC RJ45 plug/FC outlet RJ45; sold by the meter, minimum order quantity: 20 m	6	X	V	1	8	4	1	-	2	A			
IE FC TP robust flexible cable GP 2 x 2 (PN Type B, AWG22, Cat5e)	TPE coating, with flexible cores, for connection to FC RJ45 plug/FC outlet RJ45; sold by the meter, minimum order quantity: 20 m	6	X	V	1	8	4	1	-	2	B			
IE FC TP trailing cable 2 x 2 (PN Type C, AWG22, Cat5e)	TP installation cable, 4-wire, for use in highly flexible applications (torsion); sold by the meter, minimum order quantity: 20 m TP installation cable for cable tray applications, 4-wire, shielded CAT. 5	6	X	V	1	8	4	0	-	3	A	H	1	0
IE ground cable 2 x 2	Underground cable, 4-wire, shielded; sold by the meter, minimum order quantity: 20 m	6	X	V	1	8	7	1	-	2	G			
IE FC TP robust food cable GP 2 x 2 (PN Type C, AWG22, Cat5e)	TP installation cable for use in the food and beverage industry, 4-wire; sold by the meter, minimum order quantity: 20 m	6	X	V	1	8	8	1	-	2	A			
IE FC TP marine cable 2 x 2 (PN Type B, AWG22, Cat5e)	Certified for shipbuilding, sold by the meter, minimum order quantity: 20 m	6	X	V	1	8	4	0	-	4	A	H	1	0
IE FC TP food cable 2 x 2 (PN Type C, AWG22, Cat5e)	TP installation cable for use in the food and beverage industry, sold by the meter, delivery unit max. 1000 m, minimum order quantity: 20 m	6	X	V	1	8	7	1	-	2	L			
IE FC TP festoon cable 2 x 2 (PN Type B, AWG22, Cat5e)	(PROFINET TYPE B), TP installation cable for festoon cabling, min. 5 million bending cycles, sold by the meter, delivery unit max. 1000 m, minimum order quantity: 20 m	6	X	V	1	8	7	1	-	2	S			
IE FC TP FRNC cable GP 2 x 2 (PN Type B, AWG22, Cat5e)	(PROFINET TYPE B), shielded, halogen-free TP installation cable for connection to IE FC outlet RJ45/IE FC RJ45 plug for occasional movement, sold by the meter; delivery unit max. 1000 m, minimum order quantity: 20 m	6	X	V	1	8	7	1	-	2	F			
IE TP torsion cable 2 x 2 (PN Type C, AWG22, Cat5e)	Highly flexible cable for robot use, sold by the meter	6	X	V	1	8	7	0	-	2	F			
You can find more information at: *https://support.industry.siemens.com*														

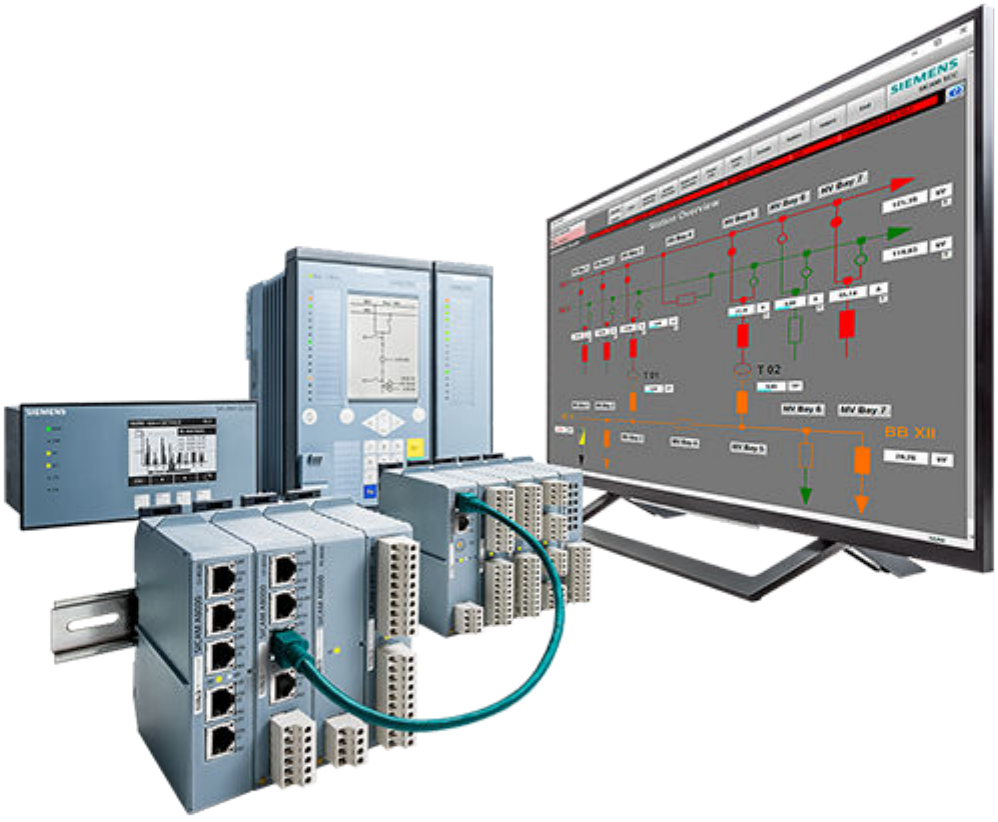
Table 3.17/1 Extract of Selection and Ordering Data

Selection and Ordering Data

3.17

Description		Order no.																
		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
Power-system components for 8-wire cabling (4 x 2)		6	X	V	1	8	7	8	-	2	□								
											▲								
											|								
IE FC TP standard cable 4 x 2 (PN Type C, AWG24, Cat6A)	8-wire rigid FC TP installation cable (CAT 6) for universal use, sold by the meter, delivery unit max. 1000 m, minimum order quantity: 20 m										A								
IE FC TP flexible cable 4 x 2 (PN Type C, AWG24, Cat6A)	Cord for occasional movement, sold by the meter										B								
IE FC TP trailing cable GP 4 x 2, (PN Type C, AWG24, Cat6A)	AWG 24, for connection to IE FC RJ45 plug 4 x 2, AWG24, sold by the meter, delivery unit max. 1000 m, minimum order quantity 20 m										C								
IE ground cable 4 x 2, (PN Type C, AWG24, Cat6A)	Underground extension cable, CAT6A, 8-wire, shielded, cable for connection to IE FC RJ45 plug 4 x 2, AWG24, sold by the meter, delivery unit max. 1000 m, minimum order quantity 20 m										G								
IE FC TP FRNC cable GP 4x2 (PN Type C, AWG24, Cat6A)	For connection with IE FC RJ45 Plug 4x2; 8 wires										F								
IE connecting cable RJ45-180/RJ45-180		6	X	V	1	8	7	8	-	5	B	□	□	□					
												▲	▲	▲					
												|	|	|					
Pre-assembled IE FC FRNC cable GP 4x2 (AWG24, Cat6A) with 2 IE FC RJ45 plugs 180 4 x 2 Lengths: 2 m to 30 m Note: For M12 connecting cables, see Industry Mall	IE FC FRNC cable 4 x 2, 2 m											H	2	0					
	IE FC FRNC cable 4 x 2, 3 m											H	3	0					
	IE FC FRNC cable 4 x 2, 5 m											H	5	0					
	IE FC FRNC cable 4 x 2, 10 m											N	1	0					
	IE FC FRNC cable 4 x 2, 15 m											N	1	5					
	IE FC FRNC cable 4 x 2, 20 m											N	2	0					
	IE FC FRNC cable 4 x 2, 25 m											N	2	5					
	IE FC FRNC cable 4 x 2, 30 m											N	3	0					
TP Cord RJ45/RJ45 Patch Cord (Cat6A, 1m)		6	X	V	1	8	7	0	-	□	□	H	1	0					
Note: For further lengths see Industry Mall										▲	▲								
										|	|								
Jacket colour green										3	Q								
Jacket colour red										4	R								
Jacket colour yellow										4	G								
Jacket colour blue										4	B								
Jacket colour grey										4	U								
IE FC RJ45 plug 4x2	Industrial Ethernet FastConnect RJ45 plug 180 4x 2, RJ45 plug connector; (10/100/1000/10000 Mbit/s) with sturdy metal housing and FC connectivity technique, Cat6A, for IE FC cable 4 x 2 (AWG24); 180° cable	6	G	K	1	9	0	1	-	1	B	B	1	2	-	2	A	A	0
IE FC RJ45 plug 2x2	Industrial Ethernet FastConnect RJ45 plug 180 2x 2, RJ45 plug connector (10/100 Mbit/s) with sturdy metal housing and FC connectivity technique, Cat5e, for IE FC cable 2x 2; 180° cable	6	G	K	1	9	0	1	-	1	B	B	1	0	-	2	A	A	0
You can find information on other cables (such as PCF, POF, or glass optical fibers, Industrial Twisted Pairs, energy cables) – assembled or sold by the meter – and the corresponding plug connectors at: *http://www.siemens.com/fastconnect* or at: *https://support.industry.siemens.com*. For customized cables please send your enquiry to cabling.industry@siemens.com.																			

Table 3.17/2 Selection and Ordering Data


SIEMENS
T 02
BB XII

Power Supply

LOGO!Power

Description

The miniature power supply units in the same design as the LOGO!8 modules offer great performance in the smallest space. Efficiency has been improved across the entire load range, and the low power losses in no-load operation ensure efficient operation. The wide-range input for single-phase networks as well as connection with direct voltage networks, the wide operating temperature range, comprehensive certifications as well as switch-on behavior optimized for capacitive loads makes them suitable for universal use. These reliable power supplies with their flat, stepped profile can be used extremely flexibly in numerous applications such as in distribution boards, for example.

To further increase 24 V availability, the 24 V LOGO!Power power supply units can be combined with **DC-UPS**, **redundancy** and **selectivity modules**.

Benefits

- Low structural width with minimum of 18 mm to maximum of 72 mm, thus requiring very little space in the control cabinet or distribution board
- Increased energy efficiency through high efficiency up to 90 % across the entire service range and ERP-compliant. No-load power dissipation of < 0.3 W
- Global use due to operating temperature range from -25 °C to +70 °C and international certificates
- Load monitoring thanks to real-time measurement of the output current without disconnecting the cable, i.e. without interrupting the DC supply
- Flexible mounting with standard rail or wall mounting in different installation positions
- Broad portfolio including 11 devices with DC 5 V, 12 V, 15 V and 24 V up to 100 watts (new: 12 V/0.9 A and 24 V/0.6 A)
- Flexible operation in all standard single-phase supply networks thanks to wide-range input of AC 100 V to 240 V without switchover and operation on DC networks with DC 110 V to 300 V
- Reliability due to problem-free connection of loads with high inrush currents thanks to power reserve when starting up as well as constant current in the event of overload



[P_KT01_XX_01789P, 1, —_]

Figure 4.1/1 LOGO!Power, 1-phase, 24 V, 0,6 A

Selection and Ordering Data

Description	Order no.																
LOGO!Power, 1-phase	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
LOGO!POWER 5 V	6	E	P	3	3	1	☐	-	6	S	B	0	0	-	0	A	Y	0
							▲											
							|										
3 A Stabilized power supply Input: AC 100 V to240 V Output: DC 5 V/3 A							0											
6.3 A Stabilized power supply Input: AC 100 V to 240 V Output: DC 5 V/6.3 A							1											
LOGO!POWER 12 V	6	E	P	3	3	2	☐	-	6	S	B	0	0	-	0	A	Y	0
							▲											
							|										
0.9 A Stabilized power supply Input: AC 100 V to 240 V Output: DC 12 V/0.9 A							0											
1.9 A Stabilized power supply Input: AC 100 V to 240 V Output: DC 12 V/1.9 A							1											
4.5 A Stabilized power supply Input: AC 100 to 240 V Output: DC 12 V/4.5 A							2											
LOGO!POWER 15 V	6	E	P	3	3	2	☐	-	6	S	B	1	0	-	0	A	Y	0
							▲											
							|										
1.9 A Stabilized power supply Input: AC 100 V to 240 V Output: DC 15 V/1.9 A							1											
4 A Stabilized power supply Input: AC 100 V to 240 V Output: DC 15 V/4 A							2											
LOGO!POWER 24 V	6	E	P	3	3	3	☐	-	6	S	B	0	0	-	0	A	Y	0
							▲											
							|										
0.6 A Stabilized power supply Input: AC 100 V to 240 V Output: DC 24 V/0.6 A							0											
1.3 A Stabilized power supply Input: AC 100 V to 240 V Output: DC 24 V/1.3 A							1											
2.5 A Stabilized power supply Input: AC 100 V to 240 V Output: DC 24 V/2.5 A							2											
4 A Stabilized power supply Input: AC 100 V to 240 V Output: DC 24 V/4 A							3											
For further devices and designs, see Catalog KT 10.1.																		

Table 4.1/1 Selection and Ordering Data

Description

The SITOP PSU6200 product family is the new standard power supply for customers with high technical requirements regarding reliability, efficiency and integration. It is suitable for many fields of application, particularly in the industrial environment, such as series machine building. The SITOP PSU6200 represents the state-of-the-art and takes the SITOP product portfolio into new dimensions of efficiency.

The slim and excellent design of the PSU6200 family combined with the push-in terminals means easy installation and wiring. The power supply units in this product family are all-rounders featuring a long service life and absolute reliability.

The high efficiency of up to 96 % guarantees resource-saving energy consumption.

To further increase the 24 V availability, the SITOP PSU6200 power supplies can be combined with buffer, DC UPS, redundancy and selectivity modules.

Benefits

Product highlights of the product line

- Diagnostics monitor[43]
  - LED display for DC OK, utilization (<30 %, >30 %, >60 %, >90 %) and remaining life time
- SITOP diagnostic interface (SDI)[43]
  - Provision of important operating parameters (e.g. output current/voltage, overload, temperature status, undervoltage and overvoltage detection at output, operating hours, device settings, etc.)
- Switchable output characteristic[43]
  - Constant current: Power supply not switched off immediately in the event of overload
  - Parallel operation: Uniform load sharing between power supply units connected in parallel for longer service life in every scenario
- Rugged input
  - Active PFC (Power Factor Correction)[43] for lower reactive and inrush current and protection against mains pulses
  - Optimized protection of the input circuit
  - Wide-range input
  - DC capability of 1-phase devices
  - Continuous operation possible on 2 phases of 3-phase devices
- Coordinated product family
  - For 12 V, 24 V and 48 V applications of varying power requirements
  - 24 V versions for NEC Class 2 and Ex protection applications
- Narrow overall width
  - For direct side-by-side mounting without lateral clearance requirements
  - Visually attractive design (IF Design Award 2019)



[P_KT01_XX_01890, 1, --_--]

Figure 4.2/1 SITOP PSU6200, 1-phase, 24 V/10 A

- Push-in connection system
  - Easy, time-saving installation without need for tools
  - Additional minus terminal[43] (grounding) for wiring according to PELV (Protected Extra Low Voltage)
- High overload capability[44]
  - Power reserves in case of overload 150 % extra power for 5 s/min
  - Continuous 120 % rated current up to 45 °C ambient temperature

43 from 24 V/10 A and 12 V/12 A

44 from 24 V/5 A and 12 A/7 A

Selection and Ordering Data

Description	Order no.																
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
SITOP PSU6200, 1-phase	6	E	P	3	3	☐	☐	-	7	☐	B	0	0	-	☐	A	X	0
						▲	▲			▲					▲			
						|	|			|					|			
DC 12 V/2 A						2	1			S					0			
DC 12 V/7 A						2	3			S					0			
DC 12 V/12 A						2	4			S					3			
DC 24 V/1.3 A						3	1			S					0			
DC 24 V/2.5 A						3	2			S					0			
DC 24 V/3.7 A						3	3			L					0			
DC 24 V/5 A						3	3			S					0			
DC 24 V/10 A						3	4			S					3			
DC 24 V/20 A						3	6			S					3			
DC 24 V/40 A						3	7			S					3			
DC 48 V/5 A						4	4			S					3			
DC 48 V/10 A						4	6			S					3			

Table 4.2/1 Selection and Ordering Data

Selection and Ordering Data

Description	Order no.																
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
SITOP PSU6200, 3-phase	6	E	P	3	4	☐	☐	-	7	S	B	0	0	-	☐	A	X	0
						▲	▲								▲			
						|	|							|			
DC 24 V/5 A						3	3								0			
DC 24 V/10 A						3	4								3			
DC 24 V/20 A						3	6								3			
DC 24 V/40 A						3	7								3			
DC 48 V/5 A						4	4								3			
DC 48 V/10 A						4	6								3			
DC 48 V/20 A						4	7								3			

Table 4.2/2 Selection and Ordering Data

SITOP PSU – PSU8600

Description

As a unique power supply system with network integration, SITOP PSU8600 sets new standards in industrial power supplies. It can be fully integrated into Totally Integrated Automation (TIA) and networked via OPC UA and SITOP Manager with automation systems from different manufacturers.

The comprehensive functions offer new possibilities, and the online diagnostics increase the reliability of the power supply. Voltage and current response thresholds can be set individually for each output of the power supply system, and selective monitoring of each output for overload allows fast fault location. Depending on requirements, more modules from the modular system can be added without wiring work, for example to buffer against power failures in the second, minute or hour range, or for increasing the number of outputs.

SITOP PSU8600 can be easily configured in the TIA Portal: From the product selection through the network integration to the parameter assignment.

Comprehensive diagnostic and maintenance information is available via PROFINET. It can be evaluated directly in SIMATIC S7 and visualized in SIMATIC WinCC. Remote monitoring is also possible via the integrated web server. Optimal support is also provided for energy management of plant or machines: From the acquisition of energy data from individual outputs, the specific activation and deactivation of outputs via PROFIenergy, to direct integration in power management systems.

The integrated OPC UA server also allows direct integration into automation applications with OPC UA clients made by different manufacturers, e.g. of controllers or PCs. The power supply system can be both configured and diagnosed via the open interface, e.g. via SITOP Manager.

Benefits

- Space and cost savings through up to 36 integrated outputs with selective monitoring (no need for one or more additional selectivity modules)
- Individually parameterizable outputs (elimination of an additional power supply unit, e.g. for 5 V, 12 V or 15 V)
- Compensation for power losses can be set separately for each output
- Narrow width without lateral installation clearances
- Low temperature rise in the control cabinet due to very high efficiency
- Depending on requirements, modular expansion without wiring work (additional outputs, buffer module, UPS module)
- Reliable operation by bridging power failures in the second, minute or hour range
- Two integrated Ethernet/PROFINET or Ethernet/IP ports (no external switch required)
- Integrated web server
- Integrated OPC UA server for open, multi-vendor communication Integrierter OPC UA Server
- Complete integration in TIA requires less time and reduces costs during configuration (TIA Portal) and in operation



[PSU_8600_1, --_--]

Figure 4.2/2 SITOP PSU8600, 3-phase, 24 V/20 A

- SIMATIC S7 function blocks for easy integration in STEP 7 user programs
- Fast integration in operator control and monitoring with WinCC faceplates
- Direct integration in SIMATIC PCS 7 via SITOP library
- Easy configuration and monitoring via SITOP Manager
- Preventive maintenance reduces downtimes
- Energy savings during breaks through targeted switching of outputs
- Easy integration in energy management systems (PROFIenergy protocol)
- Variant with EtherNet/IP interface (2 ports), integrated in the Rockwell Automation Studio 5000 design software

Selection and Ordering Data

Description	Order no.																
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
SITOP PSU8600	6	E	P	3	□	3	□	-	8	□	B	□	0	-	2	□	Y	0
					▲		▲			▲		▲				▲		
					|		|			|		|				|		
24 V/20 A/4x5 A, Stabilized power supply Input: AC 100 V to AC 240 V, DC 110 V to DC 220 V Output: DC 24 V/20 A/4x5 A with PN/IE connection, Web server integrated, OPC UA server integrated					3		6			M		0				C		
24 V/20 A/4x5 A PN, Stabilized power supply Input: 3 AC 400 V to AC 500 V Output: DC 24 V/20 A/4x5 A with PN/IE connection, Web server integrated, OPC UA server integrated					4		6			M		0				C		
24 V/20 A PN, Stabilized power supply Input: 3 AC 400 V to AC 500 V Output: DC 24 V/20 A with PN/IE connection, Web server integrated, OPC UA server integrated					4		6			S		0				A		
24 V/40 A/4x10 A PN, Stabilized power supply Input: 3 AC 400 V to AC 500 V Output: DC 24 V/40 A/4x10 A with PN/IE connection, Web server integrated, OPC UA server integrated					4		7			M		0				C		
24 V/40 A/4x10 A EIP, Stabilized power supply Input: 3 AC 400 V to AC 500 V Output: DC 24 V/40 A/4x10 A with Ethernet/IP connection					4		7			M		1				C		
24 V/20 A PN, Stabilized power supply Input: 3 AC 400 V to AC 500 V Output: DC 24 V/40 A with PN/IE connection, Web server integrated, OPC UA server integrated					4		7			S		0				A		
SITOP BUF8600	6	E	P	4	2	9	□	-	8	H	B	□	0	-	0	X	Y	0
							▲					▲						
							|					|					
4 s Buffer module for PSU8600. Buffer capacity 4 s/40 A with dual-layer capacitators maintenance-free							3					0						
10 s Buffer module for PSU8600. Buffer capacity 10 s/40 A with double-layer capacitors maintenance-free							5					0						
100 ms Buffer module for PSU8600. Buffer capacity 100 ms/40 A with electrolytic capacitors maintenance-free							7					0						
300 ms Buffer module for PSU8600. Buffer capacity 300 ms/40 A with electrolytic capacitors maintenance-free							7					1						
SITOP UPS8600 UPS module for PSU8600 Nominal voltage: DC 48 V Buffer power: 960 W Charging power: 120 W, 60 W (switchable)	6	E	P	4	1	9	7	-	8	A	B	0	0	-	0	X	Y	0
SITOP BAT8600	6	E	P	4	1	4	□	-	8	□	B	0	0	-	0	X	Y	0
							▲			▲								
							|			|							
LiFePO4 battery module for UPS8600 DC 48 V/264 Wh energy storage: mainten.-free lithium iron-phosph. batteries							3			J								
Pb battery module for UPS8600 DC 48 V/380 Wh energy storage: mainten.-free lead batteries							5			G								
SITOP CNX8600	6	E	P	4	4	3	□	-	8	X	B	0	0	-	0	□	Y	0
							▲									▲		
							|								|		
4x5 A Extension module for PSU8600; Output: DC 24 V/4x5 A							6									C		
8x2,5 A Extension module for PSU8600; Output: DC 24 V/8x2.5 A							6									D		
4x10 A Extension module for PSU8600; Output: DC 24 V/4x10 A							7									C		

Table 4.2/3 Selection and Ordering Data

SITOP PSU – PSU8400

Description

The SITOP PSU8400 3AC, 24 V/20 A and 40 A three-phase power supply unit has an IO-Link interface and a display on the front of the device. The display enables easy and comfortable setting and diagnostics on site. Through the IO-Link interface the user is offered comprehensive parameterization possibilities as well as diagnostics information for further processing in higher-level automation systems.

The very high efficiency of up to 96 % and the associated low thermal loss is one of the reasons for the very compact design. The robust wide-range input enables worldwide connection and the high static and dynamic overload capability ensures the reliable supply of high current loads.

Power supply units can be connected in parallel to increase performance or for the redundancy purposes. A synchronization cable ensures even current distribution between the power supply units to increase the service life.

To increase the 24 V availability, the power supply units can be combined with buffer, DC UPS, redundancy and selectivity modules.

Benefits

- Stabilized-power supply with output DC 24 V/20 A or 40 A
- 4-digit alphanumerical display with operating buttons on the front of the device
- Integrated communications interface IO-Link
- Full device integration in TIA:
  - Engineering in SIMATIC STEP 7 in TIA Portal (e.g. network integration via IO-Link master, device parameterization via IODD and SIMATIC PCT)
  - IODD description makes all parameterization functions, diagnostics and operating information of the SITOP PSU8400 usable via IO-Link
  - Integration in STEP 7 user programs through function blocks for SIMATIC S7-300/400/1200/1500
  - Integration in operator control and monitoring with SIMATIC WinCC faceplates (also including WinCC Unified)
- Support of energy management: Measurement of current and voltage of the output
- Hibernation can be activated via IO-Link
- Robust wide-range input 3 AC 400 to 500 V, continuous 2-phase operation possible
- DC capability of the input for use with DC 500-550 V supply networks
- Setting range of the output voltage 22 to 28 V
- Power reserve 120 % up to 45 °C ambient temperature
- Dynamic overload capability 150 % for 5 s/min and 300 % for 25 ms/min
- Efficiency of up to 96 %
- 3 LED displays for the operating status
- Control contact for even current distribution in parallel operation



Figure 4.2/3 SITOP PSU8400, 3-phase, 24 V/20 A and 40 A

- Signaling contact for "24 V OK" - configurable with further operating states via IO-Link
- Dimensions 59/99 mm x 145 mm x 125 mm (W x H x D)
- Range of ambient temperature -40 °C to +70 °C
- Comprehensive certifications

Selection and Ordering Data

Description	Order no.																
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
SITOP PSU8400	6	E	P	3	4	3	☐	-	8	S	B	0	0	-	4	A	Y	0
							▲											
							|										
24 V/20 A, Stabilized power supply Input: AC 400 V to AC 500 V 3 AC Output: DC 24 V/20 A with IO link connection							6											
24 V/40 A, Stabilized power supply Input: AC 400 V to AC 500 V 3 AC Output: DC 24 V/40 A with IO link connection							7											

Table 4.2/4 Selection and Ordering Data

SITOP PSU – PSU8200

Description

The single-phase, two-phase and three-phase SITOP PSU8200 units are the technology power supplies for demanding solutions. They offer maximum functionality for use in complex plants and machines. The wide-range input allows a connection to almost any electrical power system worldwide and ensures a high degree of safety even if there are large voltage fluctuations. They offer outstanding overload characteristics: Power boost delivers up to three-times the rated current for short periods of time, and with extra power of 150 %, loads with high power consumption can be connected without any problems. And in the event of an overload, you can choose between constant current or automatic restart. The extremely high efficiency keeps energy consumption and heat buildup in the control cabinet low, and the compact metal enclosure also saves space.

To further increase the 24 V availability, the SITOP PSU8200 power supplies can be combined with **buffer, DC UPS, redundancy** and **selectivity modules**.



[P_KT01_XX_01551P, 1, --_--]

Figure 4.2/4 SITOP PSU8200, 1-phase, 24 V/5 A

Benefits

- 1-phase, DC 24 V/5 A, 10 A, 20 A, 40 A
- 1- and 2-phase, DC 24 V/5 A, 10 A
- 3-phase, DC 24 V/20 A, 40 A, 36 V/13 A and 48 V/10 A, 20 A
- Extremely slim design – no lateral installation clearances required
- Power boost with 3 times rated current (for 25 ms) for tripping protective devices
- Extra power with 1.5 times rated current (5 s/min) for brief functional overload
- Selectable short-circuit response between constant current and restart
- Symmetrical load distribution can be selected for parallel operation
- Operating state on 3 LEDs
- Extremely high efficiency up to 94 %
- Wide temperature range from -25 °C to +70 °C
- Comprehensive certifications, such as cULus and DNV

Selection and Ordering Data

Description	Order no.																
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
SITOP PSU8200, 1-phase																		
24 V/5 A Stabilized power supply Input: AC 120/230 V Output: DC 24 V/5 A	6	E	P	3	3	3	3	-	8	S	B	0	0	-	0	A	Y	0
24 V/10 A Stabilized power supply Input: AC 120/230 V Output: DC 24 V/10 A	6	E	P	3	3	3	4	-	8	S	B	0	0	-	0	A	Y	0
24 V/20 A Stabilized power supply Input: AC 120 V/230 V Output: DC 24 V/20 A	6	E	P	1	3	3	6	-	3	B	A	1	0					
24 V/40 A Stabilized power supply Input: AC 120/230 V Output: DC 24 V/40 A	6	E	P	3	3	3	7	-	8	S	B	0	0	-	0	A	Y	0
SITOP PSU200M, 1- and 2-phase																		
24 V/5 A Stabilized power supply Input: AC 120 V to 230 V/230 V to 500 V Output: DC 24 V/5 A	6	E	P	1	3	3	3	-	3	B	A	1	0					
24 V plus 5 A Stabilized power supply Input: AC 120 V to 230 V/230 V to 500 V Output: DC 24 V/5 A Option for with protective varnish	6	E	P	1	3	3	6	-	3	B	A	1	0	-	8	A	C	0
24 V/10 A Stabilized power supply Input: AC 120 V to 230 V/230 V to 500 V Output: DC 24 V/10 A	6	E	P	1	3	3	4	-	3	B	A	1	0					
24 V plus 10 A Stabilized power supply Input: AC 120 V to 230 V/230 V to 500 V Output: DC 24 V/10 A Option for with protective varnish	6	E	P	1	3	3	4	-	3	B	A	1	0	-	8	A	B	0
SITOP PSU8200, 3-phase	6	E	P	3	4	□	□	-	8	S	B	□	0	-	0	A	Y	0
						▲	▲					▲						
						|	|					|					
24 V/20 A Stabilized power supply Input: 3 AC 400 V to 500 V Output: DC 24 V/20 A						3	6					0						
24 V/40 A Stabilized power supply Input: 3 AC 400 V to 500 V Output: DC 24 V/40 A						3	7					0						
36 V/13 A Stabilized power supply Input: 3 AC 400 V to 500 V Output: DC 36 V/13 A						4	6					1						
48 V/10 A Stabilized power supply Input: 3 AC 400 V to 500 V Output: DC 48 V/10 A						4	6					0						
48 V/20 A Stabilized power supply Input: 3 AC 400 V to 500 V Output: DC 48 V/20 A						4	7					0						

Table 4.2/5 Selection and Ordering Data

Description

A power supply unit on its own cannot guarantee fault-free 24 V supply. Power failures, extreme variations in the mains voltage, or a faulty load can bring plant operation to a standstill and cause high costs. The add-on modules offer everything from extensive protection against interference on the primary and secondary side right up to complete all-round protection.

The SITOP redundancy modules are the optimal extension for all power supplies to ensure additional protection from failure of the control voltage. The redundancy module decouples the feeding power supply units and, in case of failure of one unit, the other one automatically takes over the DC supply. SITOP RED1200 redundancy modules compensate for the missing signal function when power supplies with diagnostic signals are used. If a fault occurs, the signal from the defective power supply remains off. The error message is still generated. The rugged RED1200 add-on modules decouple power supply units with output voltages from 10 to 58 V.

Benefits

- High safety of the control voltage due to redundant design
- Power is reliably supplied even when a power supply fails
- Compact redundancy modules for power supplies up to 40 A
- Redundancy module 24 V/NEC Class 2 with limiting to 100 VA
- SITOP PSE202U 24 V: Diagnostic message via LED and signaling contacts with adjustable switching thresholds
- SITOP RED1200 12 V, 24 V, 48 V: Compact and high dielectric strength

The SITOP PSE201U and SITOP BUF1200 buffer modules bridge short-term power failures in a range of seconds. The PSE201U buffer module can be used with 24 V power supply units of the SITOP PSU8200, PSU6200 and SITOP smart product lines, the BUF1200 buffer module with the 24 V power supply units of all SITOP product lines. The buffers modules are equipped with maintenance-free capacitors as energy storage units and automatically take over the 24 V power supply in case of a line voltage failure.

The SITOP DC UPS modules offer protection in the event of extended power failures. The maintenance-free DC UPS with capacitors supplies reliable 24 V up to the minute range and the DC UPS with battery modules supplies reliable 24 V up to the hour range.

Benefits

- About 80% of the power system faults in Germany last less than 100 ms; these 80% can be bridged with a buffer module without disturbance
- Inexpensive protection against power failure up to seconds
- Support of the power supply unit in case of short-term increased power demand
- High load current up to 40 A
- Connection to the power supply unit only via two lines
- Short charging times
- Long service life
- Parallel connection of multiple buffer modules possible
- Fast mounting onto top hat DIN rail and simple wiring



[P_KT01_XX_01305P, 2, --_--]

Figure 4.3/1 SITOP RED1200 Redundancy Module 2 x 10 A

Selection and Ordering Data

Description	Order no.															
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
SITOP BUF1200	6	E	P	4	2	3	1	-	7	H	B	0	0	-	0	A	X	0
SITOP BUF1200 buffer module Buffer time 300 ms at 40 A depending on load current																		
SITOP PSE201U	6	E	P	1	9	6	1	-	3	B	A	0	1	-	0	A	X	0
SITOP PSE201U buffer module Buffer time 200 ms to 40 A depending on load current																		
SITOP RED1200	6	E	P	4	3	4	☐	-	7	R	B	0	0	-	0	A	X	0
							▲											
							|										
Redundancy module Input/output:DC 12 V, 24 V, 48 V/20 A Suitable for decoupling two SITOP power supplies with a maximum of 10 A output current each							6											
Redundancy module Input/output:DC 12 V, 24 V, 48 V/40 A Suitable for decoupling two SITOP power supplies with a maximum of 20 A output current each							7											
Redundancy module Input/output:DC 12 V, 24 V, 48 V/40 A Suitable for decoupling two SITOP power supplies with a maximum of 40 A output current each							8											
SITOP PSE202U	6	E	P	1	9	6	☐	-	☐	B	A	☐	☐	-	0	A	X	0
							▲		▲			▲	▲					
							|		|			|	|				
Redundany module Input/output:DC 24 V/40 A Suitable for decoupling two SITOP power supplies with a maximum of 20 A output current each							1		3			2	1					
Redundany module Input/output: DC 24 V/NEC Class 2 Suitable for decoupling two SITOP power supplies output power limited to < 100 VA							2		2			0	0					
Redundany module Input/output: DC 24 V/10 A suitable for decoupling two SITOP power supplies with a maximum of 5 A output current each							4		2			0	0					

Table 4.3/1 Selection and Ordering Data

Description

SITOP selectivity modules are the optimum enhancement for all power supplies designed to distribute the load current to several feeders and to monitor it. Overload and short-circuit in one or more feeders is reliably detected and signaled.

The electronics permit brief current peaks caused, for example, by high inrush currents, but disconnect feeders in the event of an extended overload. This is ensured even on high-resistance lines and in the case of "creeping" short-circuits. In such cases, miniature circuit breakers fail to trip, or trip too late, even if the power supply unit could deliver the required tripping current. The SITOP add-on module continues to supply the intact feeders with 24 V or 48 V, without any interruption and totally reaction-free – features which avoid a potential total system failure.

Signaling can be carried out via common signaling for all selectivity modules. SITOP PSE200U is available in variants with common or single-channel signaling. The signaling of the SITOP SEL1200/1400 can be switched between common signaling and channel-specific diagnostics. The SITOP SEL1600 selectivity system also communicates bidirectionally via IO-Link and can also be parameterized via this point-to-point interface.

Benefits

- Reliable detection of overload or short-circuit in the 24 V circuit
- Safe tripping regardless of line resistance
- Switching characteristic for standard protection and high inrush currents (SEL1200)
- Current-limiting characteristic for increased fuse protection requirements (SEL1400, PSE200U)
- Switching characteristic with short current limiting and high inrush current (SEL1600)
- Either 4 or 8 load feeders per module with individually adjustable response threshold
  - 4 outputs 24 V, adjustable, 0.5 to 3 A or 3 – 10 A (PSE200U)
  - 4 outputs 24 V, adjustable, 2 to 10 A (SEL1200, SEL1400)
  - 4 outputs 24 V, adjustable, 0.5 to 10 A (SEL1600)
  - 8 outputs 24 V, adjustable, 1 to 5 A or 2 – 10 A (SEL1200, SEL1400)
  - 4 outputs 48 V, adjustable, 1 to 10 A (SEL1200)
- Common signaling contact or single-channel diagnostics for voltage, current, set threshold value, and if applicable reason for switch off (SEL1200, SEL1400)
- Common signaling contact or bidirectional IO-Link interface for extensive diagnostics and settings of each output (SEL1600)



[P_KT01_XX_01939, 2, ~_~]

Figure 4.3/2 SITOP Selectivity Modules

- Common signaling contact or single-channel signaling for output state (PSE200U)
- Voltage measuring points for output currents (1 V = 1 A), disconnection of load circuit is not required (PSE200U)
- Versions with power limitation of the outputs to 100 VA according to NEC Class 2 (PSE200U)
- Evaluation via free SIMATIC S7 function blocks (S7-1500/1200/400/300) and faceplates for SIMATIC Comfort Panels for SITOP SEL1200 and SITOP SEL1400
- Full device integration in TIA of SITOP SEL1600
- Evaluation via free SIMATIC S7 function blocks (S7-1500/1200/400/300) or SIMOTION function blocks for SITOP PSE200U modules with single-channel message
- Simple configuration thanks to individual setting of maximum current for every output using potentiometers (SEL1200/1400, PSE200U) or display (SEL1600 basic module)
- 3-color LEDs for fast on-site fault localization or via display (SEL1600 basic module)
- Remote reset possible from a central location
- Simple commissioning thanks to manual switch on/off of outputs
- Sequential connection of feeders to reduce total inrush current
- Sealable transparent cover over adjusters for currents and times protects against maladjustment
- Library for visualization in SIMATIC PCS 7

Selection and Ordering Data

Description	Order no.																
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
SITOP select	6	E	P	1	9	6	1	-	2	B	A	0	0					
Selectivity module, 4-channel Input: DC 24 V Output: DC 24 V/10 A per output. Adjustable response threshold 2 A to 10 A																		
SITOP SEL1200	6	E	P	4	4	□	□	-	7	F	B	0	0	-	3	□	X	0
						▲	▲									▲		
						|	|								|		
Selectivity module, 4-channel, switching Input: DC 24 V Output: DC 24 V/10 A per output. Adjustable response threshold 2 A to 10 A						3	7									C		
Selectivity module, 8-channel, switching Input: DC 24 V Output: DC 24 V/5 A per output. Adjustable response threshold 1 A to 5 A						3	7									D		
Selectivity module, 8-channel, switching Input: DC 24 V Output: DC 24 V/10 A per output. Adjustable response threshold 2 A to 10 A						3	8									D		
Selectivity module, 4-channel, switching Input: DC 48 V Output: DC 48 V/10 A per output. Adjustable response threshold 1 A to 10 A						4	8									C		
SITOP SEL1400	6	E	P	4	4	3	□	-	7	E	B	0	0	-	3	□	X	0
							▲									▲		
							|								|		
Selectivity module, 4-channel, limiting Input: DC 24 V Output: DC 24 V/10 A per output. Adjustable response threshold 2 A to 10 A							7									C		
Selectivity module, 8-channel, limiting Input: DC 24 V Output: DC 24 V/5 A per output. Adjustable response threshold 1 A to 5 A							7									D		
Selectivity module, 8-channel, limiting Input: DC 24 V Output: DC 24 V/10 A per output. Adjustable response threshold 2 A to 10 A							8									D		
SITOP SEL1600	6	E	P	4	4	3	7	-	8	F	B	0	0	-	□	C	Y	0
															▲			
															|			
4x10 A IOL basic module, 4-channel, Input: DC 24 V/40 A Output: DC 24 V/4x 10 A, setting range: 0.5 to 10 A with IO-Link interface															4			
4x10 A expansion module, 4-channel Input: DC 24 V/40 A Output: DC 24 V/4x 10 A, setting range: 0.5 to 10 A incl. connection set 6EP4990-8KK00-0XU0															0			
SITOP PSE200U	6	E	P	1	9	6	1	-	2	B	A	□	1					
												▲						
												|						
SITOP PSE200U 3 A Selectivity module, 4-channel Input: DC 24 V Output: DC 24 V/3 A per output. Adjustable response threshold 0.5 A to 3 A	With common alarm signal 6EP1961-2BA11											1						
	With single-channel signaling											3						
SITOP PSE200U 3 A NEC Class 2 Selectivity module, 4-channel Input: DC 24 V Output: DC 24 V/3 A per output. Adjustable response threshold 0.5 A to 3 A	With common alarm signal 6EP1961-2BA51											5						
	With single-channel signaling											6						
SITOP PSE200U 10 A Selectivity module, 4-channel Input: DC 24 V Output: DC 24 V/10 A per output. Adjustable response threshold 3 A to 10 A	With common alarm signal 6EP1961-2BA21											2						
	With single-channel signaling											4						

Table 4.3/2 Selection and Ordering Data

Description

SITOP 24 V power supplies can be expanded with a SITOP UPS500 uninterruptible DC power supply (DC UPS) for bridging short-term power failures in the order of minutes. In PC-based automation solutions, the highly capacitive double-layer capacitors of the SITOP UPS500 supply enough energy to safeguard operating and application data and close software applications in a defined manner. You can increase the buffer times using SITOP PSU501S expansion modules (up to 3).

- 24 V buffering for a few minutes to allow data to be backed up and applications to be closed
- Absolutely maintenance-free
- Long lifetime, even at high temperatures
- High ambient temperatures up to+60 °C
- Short charging times
- No ventilation is required since no gas is emitted
- Distributed applications possible without control cabinet
- Software tool, free of charge, for easy configuring and integrating in PC-based systems



[P_KT01_XX_01079P, 1, --_-]

Figure 4.4/1 SITOP UPS500S 15 A, 2.5 kWs

Selection and Ordering Data

Description	Order no.												
	1	2	3	4	5	6	7		8	9	10	11	12
SITOP UPS500S	6	E	P	1	9	3	3	-	2	E	C	□	1
												▲	
												|	
Maintenance free uninterruptible power supply with USB interface Basic device 2.5 kWs Input: DC 24 V Output: DC 24 V/15 A												4	
Maintenance free uninterruptible power supply with USB interface Basic device 5 kWs Input: DC 24 V Output: DC 24 V/15 A												5	
SITOP UPS501S	6	E	P	1	9	3	5	-	5	P	G	0	1
Expansion module 5 kWs for UPS500S (2.5 kWs, 5 kWs)													

Table 4.4/1 Selection and Ordering Data

Description

By combining one SITOP UPS1600 DC UPS module with at least one BAT1600 battery module or one CAS1600 capacitor module and a SITOP power supply unit, longer power failures can be bridged without any interruption. The intelligent battery management automatically detects the BAT1600 or CAS1600 energy storage unit, ensures optimized temperature specific charging and continuous monitoring. The compact DC UPS modules have overload capability, for example, to supply the inrush current of industrial PCs. In stand-alone mode, they support starting from the battery.

The DC UPS communicates openly over a USB or Ethernet/PROFINET port. It is easily integrated into the PC or PLC environment over the two Ethernet/PROFINET ports. Total integration in TIA provides user-friendly engineering in the TIA Portal and is supported with ready-to-use function blocks for S7 user programs and WinCC faceplates for fast visualization.

SITOP Manager supports easy monitoring and configuration of PC systems, e.g. shutdown of multiple PCs in accordance with the master-slave principle.

The UPS1600 modules with Ethernet/PROFINET ports have an OPC UA server with which the DC UPS can communicate with both PCs and PLCs, even from different manufacturers, thanks to the open communication standard. Parameter assignment and the diagnostics of the uninterruptible power supply are possible via the open interface. The integrated web server supports remote monitoring of the DC UPS.

- 24 V buffering with BAT1600 battery modules for a few hours for the purpose of continuing processes
- Frequent 24 V buffering with maintenance-free CAS1600 capacitor modules to resume processes or for shutting down industrial PCs
- Open communication over USB or two Ethernet/PROFINET ports
- High-performance DC UPS modules in space-saving, slim design
- High overload capability for mains and buffering operation
- Starting from the battery module supports stand-alone mode, e.g. for starting generators
- Easy configuration thanks to automatic detection of battery modules
- High reliability and availability due to monitoring of the operational readiness, battery feeder, aging and charging status
- Battery-saving charging due to temperature-specific charging characteristic
- Defined shutdown of several PCs or controllers on one UPS (versions with Ethernet/PROFINET



[P_KT01_XX_01453P, 2, --_--]

Figure 4.4/2 SITOP UPS1600 24 V/10 A Ethernet/PROFINET and SITOP BAT1600 2.5 Ah LiFePO4

- Remote monitoring via integrated web server (versions with Ethernet/PROFINET)
- Time-saving engineering in PC-based systems via SITOP Manager (versions with Ethernet/PROFINET)
- Integrated OPC UA server facilitates flexible, multi-vendor communication with other systems (versions with Ethernet/PROFINET)
- Full integration in TIA saves time and costs during the planning stage and in operation (versions with Ethernet/PROFINET)
- User-friendly engineering in the TIA Portal
- SIMATIC S7 function blocks for easy integration in STEP 7 user programs
- Fast integration in operator control and monitoring with WinCC faceplates
- Direct integration in SIMATIC PCS 7 via SITOP library

Selection and Ordering Data

Description	Order no.																
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
SITOP UPS1600	6	E	P	4	1	3	☐	-	3	A	B	0	0	-	☐	A	Y	0
							▲								▲			
							|							|			
24 V/10 A uninterrupted power supply Input: DC 24 V Output: DC 24 V/10 A							4								0			
24 V/10 A USB uninterrupted power supply with USB interface Input: DC 24 V Output: DC 24 V/10 A							4								1			
24 V/10 A Ethernet/PROFINET uninterrupted power supply with Ethernet/PROFINET interface/OPC UA Server/ Webserver Input: DC 24 V Output: DC 24 V/10 A							4								2			
24 V/20 A uninterrupted power supply Input: DC 24 V Output: DC 24 V/20 A							6								0			
24 V/20 A USB uninterrupted power supply with USB interface Input: DC 24 V Output: DC 24 V/20 A							6								1			
24 V/20 A Ethernet/ PROFINET uninterrupted power supply with Ethernet/PROFINET interface/OPC UA Server/ Webserver Input: DC 24 V Output: DC 24 V/20 A							6								2			
24 V/40 A uninterrupted power supply Input: DC 24 V Output: DC 24 V/40 A							7								0			
24 V/40 A USB uninterrupted power supply with USB interface Input: DC 24 V Output: DC 24 V/40 A							7								1			
24 V/40 A Ethernet/PROFINET uninterrupted power supply with Ethernet/PROFINET interface/OPC UA Server/ Webserver Input: DC 24 V Output: DC 24 V/40 A							7								2			

Table 4.4/2 Selection and Ordering Data

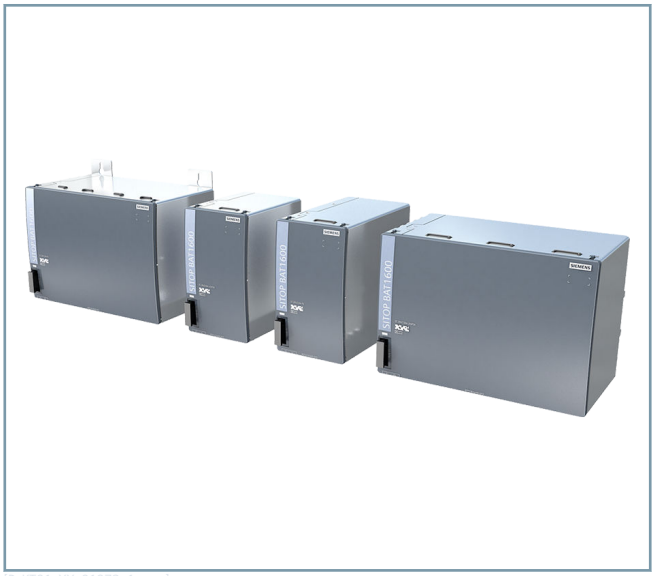
Description

The intelligent UPS1600 battery management charges the BAT1600 with the optimum temperature-controlled charging characteristics and monitors the status (operating data and diagnostic information) of the connected battery modules via the energy storage link. For longer buffer times, up to six battery modules can be connected in parallel. These can be mounted onto a DIN rail or directly to the wall.

Benefits

BAT1600 family for SITOP UPS1600 DC UPS modules

- Five batteries with different technologies and applications; 2.5 Ah & 7 Ah LiFePO, 3.2 Ah to 38 Ah lead gel batteries
- The capacity can be expanded by parallel switching of the batteries. Up to six batteries are supported
- Smart communication (Energy Storage Link - ESL) is responsible for battery management to achieve optimum performance
- Three-color status LED for easier commissioning
- State of Health (SOH) calculation for batteries



[P_KT01_XX_01972, 1, --_--]

Figure 4.4/3 SITOP BAT1600 Family

- SITOP BAT1600 2.5 Ah Li, 3.2 Ah Pb, and 7.5 Ah Li mountable on DIN rail
- SITOP BAT1600 2.5 Ah Li and 3.2 Ah Pb have the same footprint as SITOP UPS1100 1.2 Ah Pb

The table shows the maximum buffer times for the SITOP BAT 1600 battery modules for different load currents

Product Trade Name	SITOP BAT1600	SITOP BAT1600	SITOP BAT1600	SITOP BAT1600	SITOP BAT1600
Type of Power Supply	24 V/3.2 Ah	24 V/2.5 Ah LiFePO	24 V/12 Ah	24 V/7.5 Ah LiFePo	24 V/38 Ah
Article No.	6EP4133-0GA00-0AY0	6EP4132-0JA00-0AY0	6EP4135-0GE00-0AY0	6EP4134-0JA00-0AY0	6EP4137-0GE00-0AY0
Load Current	Buffer Times[45]				
1 A	1 h 40 min	2 h 9 min	8 h 30 min	6 h 28 min	30 h
2 A	50 min	1 h 13 min	4 h 20 min	3 h 39 min	16 h 40 min
3 A	30 min	51 min	2 h 40 min	2 h 33 min	11 h 20 min
4 A	20 min	39 min	1 h 50 min	1 h 57 min	8 h
6 A	10 min	27 min	1 h 20 min	1 h 20 min	5 h
8 A	6 min	20 min	50 min	61 min	3 h 40 min
10 A	4 min	16 min	40 min	49 min	2 h 50 min
12 A	2 min	14 min	30 min	41 min	2 h
14 A	1 min	12 min	25 min	35 min	1 h 50 min
16 A	< 1 min	-	20 min	31 min	1 h 40 min
20 A	-	-	15 min	25 min	1 h 15 min
30 A	-	-	6 min	17 min	45 min
40 A	-	-	3 min	13 min	30 min

Table 4.4/3 Overview Battery Modules

45 Calculation of the buffer times is based on the discharge period of new and completely charged battery modules with a battery temperature of not less than +25 °C until shutdown of the DC UPS (min. 20 V). Buffer times for additional values can be determined using the SITOP Selection Tool

Selection and Ordering Data

Description	Order no.																					
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16		20	21	22	23
SITOP BAT1600	6	E	P	4	1	3	☐	-	0	☐	☐	0	0	-	0	A	Y	0	-	☐	☐	☐	☐
							▲			▲	▲									▲	▲	▲	▲
							|			|	|								|	|	|	|
SITOP BAT1600 battery module 2.5 Ah, LiFePO	Lithium battery for SITOP UPS1600 DC UPS module						2			J	A									|	|	|	|
	For air-freight suitable version with 30% loading						2			J	A									Z	A	0	3
SITOP BAT1600 battery module 7.5 Ah, LiFePO	Lithium battery for SITOP UPS1600 DC UPS module						4			J	A									|	|	|	|
	For air-freight suitable version with 30% loading						4			J	A									Z	A	0	3
SITOP BAT1600 battery module 3.2 Ah, Pb Lead-acid rechargeable battery for SITOP UPS1600 DC UPS module							3			G	A												
SITOP BAT1600 battery module 12 Ah, Pb Lead-acid rechargeable battery for SITOP UPS1600 DC UPS module							5			G	E												
SITOP BAT1600 battery module 38 Ah, Pb Lead-acid rechargeable battery for SITOP UPS1600 DC UPS module							7			G	E												

Table 4.4/4 Selection and Ordering Data

Description

Due to their maintenance-free capacitor technology, the SITOP CAS1600 capacitor modules feature high cycle stability, a short recharge time, a high load current and a wide temperature range. The capacitor modules CAS1600 SuCAP 0.3 Ah and 0.5 Ah are based on double-layer capacitors (super caps) with a very long service life. SITOP CAS1600 LiCAP 1.3 Ah is based on lithium hybrid technology, which combines the advantages of double-layer capacitors and batteries and has a very high energy density. For longer buffer times, up to four capacitor modules can be connected in parallel.

Benefits

CAS1600 family for SITOP UPS1600 DC UPS modules

- The capacity can be expanded by parallel switching of the capacitor modules. Up to four modules are supported
- Smart communication (Energy Storage Link - ESL) is responsible for energy storage management to achieve optimum performance
- Three-color status LED for easier commissioning



Figure 4.4/4 SITOP CAS1600 Family

- State of Health (SOH) calculation for capacitors
- Mounting of CAS1600 SuCAP via DIN rail or wall mounting kit
- Wall mounting of CAS1600 LiCAP via keyholes
- SITOP UPS1600 as of FW 2.6, SITOP Manager as of V1.3

The table shows the maximum buffer times and the carge times for the SITOP CAS1600 capacitor modules

SITOP CAS1600: Buffer and Charge Times @25 °C			
	SuCAP 0.3 Ah	SuCAP 0.5 Ah	LiCAP 1.3 Ah
Load Current (A)	Buffer Times		
0.5	6 min 30 s	13 min 22 s	1 h 18 min 58 s
1	3 min 52 s	7 min 58 s	47 min 2 s
2	2 min 6 s	4 min 22 s	25 min 50 s
3	1 min 26 s	2 min 59 s	17 min 45 s
4	1 min 5 s	2 min 16 s	13 min 30 s
6	43.5 s	1 min 31 s	9 min 5 s
8	32.5 s	1 min 8 s	6 min 49 s
10	25.5 s	54.5 s	5 min 27 s
12	21 s	45 s	4 min 30 s
14	18 s	38.5 s	3 min 50 s
16	14.5 s	33.5 s	3 min 20 s
20	12 s	26.5 s	2 min 38 s
30	7 s	17 s	1 min 41 s
40	5 s	12 s	1 min 10 s

Table 4.4/5 Overview Capacitor Modules

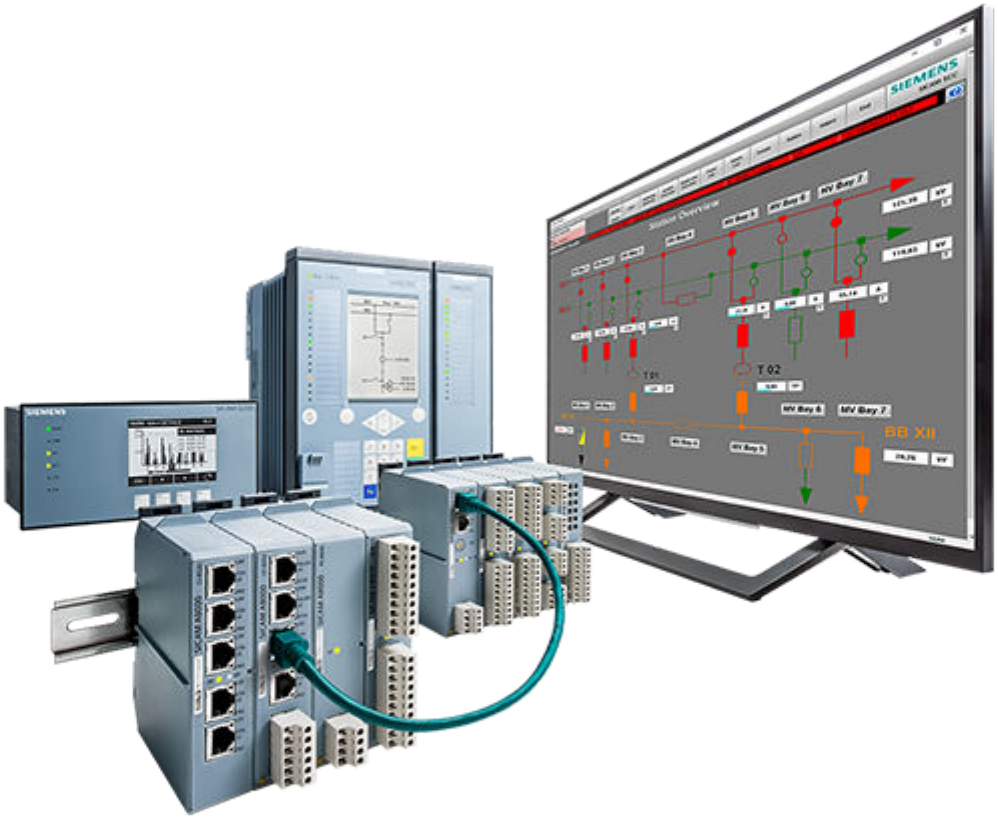
Charge Current	Charge Times (Ui ≥ 24 V)		
UPS1600 10 A (3 A)	4 min	4 min 20 s	21 min 40 s
UPS1600 20 A (4 A)	1 min 50 s	3 min 20 s	17 min 30 s
UPS1600 40 A (5 A)	1 min 25 s	2 min 15 s	14 min

Table 4.4/5 Overview Capacitor Modules

Selection and Ordering Data

Description	Order no.																
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
SITOP CAS1600	6	E	P	4	1	3	□	-	0	H	A	0	0	-	0	A	Y	0
							▲											
							|										
SITOP CAS1600 capacitor modules, DC 24 V, 0.3 Ah							4											
SITOP CAS1600 capacitor modules, DC 24 V, 0.5 Ah							5											
SITOP CAS1600 capacitor modules, DC 24 V, 1.3 Ah							6											

Table 4.4/6 Selection and Ordering Data


SIEMENS
T 02
BB XII

Miniature Current Transformers – 4NC for 100% Stator Ground-Fault Protection

Description

4NC are miniature current transformers with a transformation ratio of 400 A/5 A for 100 % stator ground-fault protection (20 Hz trip initiation) in the SIPROTEC 7UM62 and SIPROTEC 7UM85 devices.



[KSO_63, 1, --_--]

Figure 5.1/1 Low Voltage Transformer KSO 63 from Ritz

Selection and Ordering Data

Description	Order No.											
	1	2	3	4	5	6	7		8	9	10	11	12
Current transformer	4	N	C	5	2	2	5	-	2	C	E	2	1
(400 A/5 A), can be used over short distances (burden < 5 VA)													
In the event that the burden is > 5 VA													
Request further information from the head office or the **Ritz KSO 63 indoor window-type current transformer**													

Description

The 7XT33 is a 20-Hz generator for generating a square-wave voltage of about 26 V. The maximum power consumption is < 100 VA. The 20-Hz generator is required for the 100 % stator ground-fault protection in the SIPROTEC 7UM62 and 7UM85 devices. As the supply voltage, an alternating voltage or a direct voltage may be used.

Functions

The 7XT33 has a wide-range power supply unit. The auxiliary voltage of this unit in normal operation is assured by connection to a voltage transformer having an output voltage of 3 x 100/AC 110 V (50 Hz/60 Hz). Optionally, the device can also be powered with an auxiliary voltage (DC 10 V to 220 V) in uninterrupted duty (see the connection example). In addition, it is possible to supply power to the device, for example for a standstill test, using 1-phase alternating voltage (AC 100 V to 230 V). The auxiliary voltage of about DC 28 V, obtained from 2 DC/DC converters (main and auxiliary power supply units) is converted by a full-wave bridge circuit driven by a single-chip controller into a symmetrical, rectangular output voltage at a frequency of 20 Hz and a voltage of about 25 V. Proper operation of the device is indicated by a green light-emitting diode, one on the front and one on the back.

In addition to controlling the output stage, the controller monitors the device functions.

Applications

The 20-Hz generator 7XT33 is used in combination with the band-pass filter 7XT34 in machine protection (7UM62/7UM85). For the implementation of 100 % stator ground-fault protection, it is the source of voltage injection into the generator neutral point. Voltage injection can be performed by connecting the 7XT33 and the 7XT34 to the load resistance of a grounding or neutral-point transformer. The function of the 100 % stator ground-fault protection detects ground faults in the stator winding of generators connected to the electrical power system via a generator transformer. The protection operating with the 7XT33 detects ground faults in the entire area of the winding, including the machine neutral point. The employed measuring principle operates without being influenced by the mode of the generator and also makes it possible to measure during generator standstill.

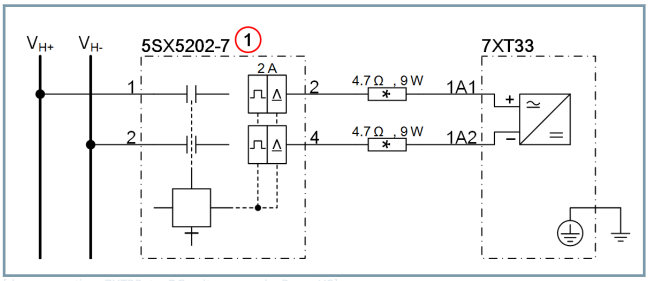


[7XT33, 1, --_--]

Figure 5.2/1 20-Hz Generator 7XT33

5.2

Connection Example

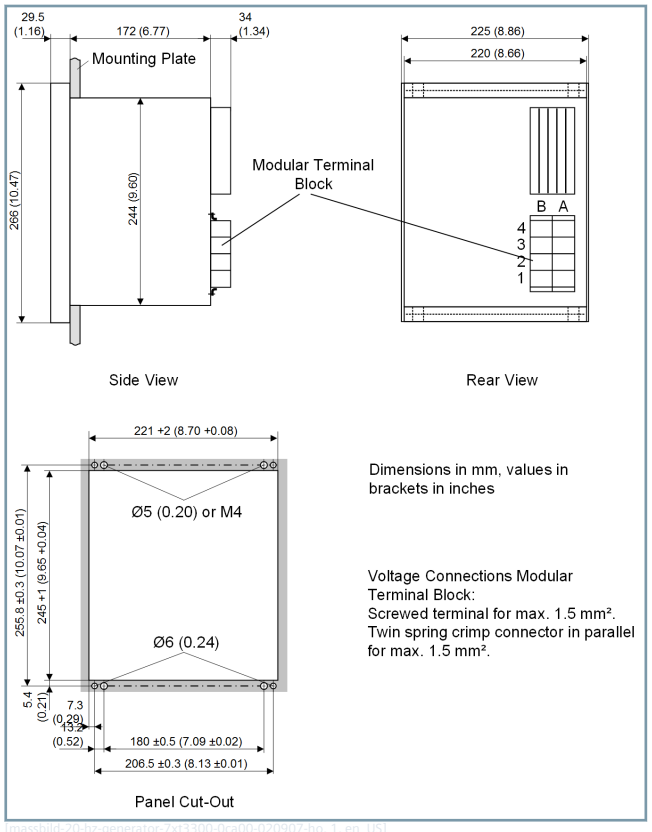


[dw_connection_7XT33_to_DC-voltage-supply, 3, en_US]

Figure 5.2/2 Interface of the 7XT33 to a DC Power Supply via a 2 A Miniature Circuit Breaker

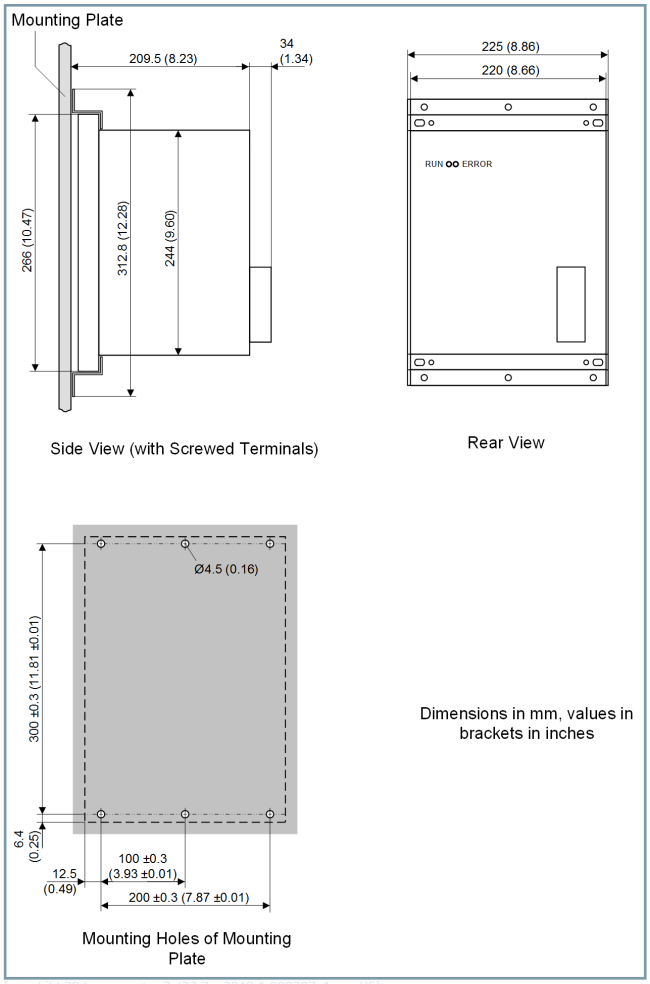
(1) Follow-up model = 5SY5202-7 T70MM in place of T55MM

Dimensioned Drawings



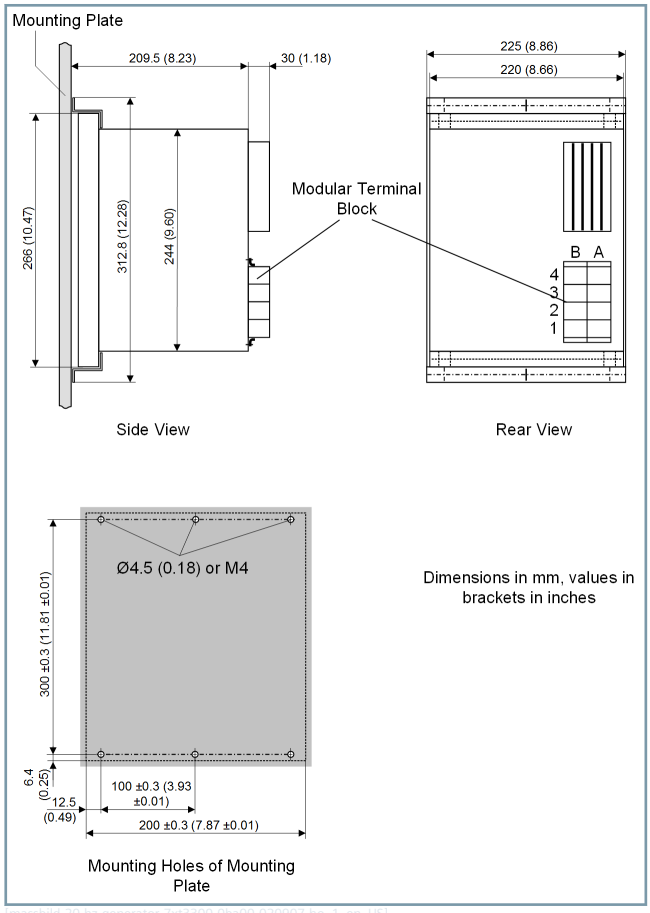
[massbild-20-hz-generator-7xt3300-0ca00-020907-ho, 1, en_US]

Figure 5.2/3 Dimensions of the 7XT33 in the Surface-Mounting Version



[massbild-20-hz-generator-7xt33-7xp2040-1-080707, 1, en_US]

Figure 5.2/4 Dimensions of the 7XT33 Switch Panel or Cabinet Flush Mounting



[massbild-20-hz-generator-7xt3300-0ba00-020907-ho, 1, en_US]

Figure 5.2/5 Dimensional Drawing, 20-Hz Generator 7XT3300-0BA00 for Panel Surface Mounting

Technical Data

Auxiliary Voltage		
Rated auxiliary AC voltage V_H	3x (AC 100 V to 110 V), 50/60 Hz	1x (AC 110 V to 230 V), 50/60 Hz
Permissible voltage ranges	AC 80 V to 130 V	AC 80 V to 265 V
or as an alternative		
Rated auxiliary DC voltage V_H	DC 110 V to 220 V	

Auxiliary Voltage	
Permissible voltage ranges	DC 88 V to 253 V
Power consumption on 8 Ωimpedance ≤ 110 VA	

20-Hz Output Voltage	
Connections (4A1 to 4A3)	
Output voltage	Approx. 25 V, square wave, 20 Hz ± 0.2 Hz
Output load rating, continuous	75 VA
Note: If the input voltage rises slowly, the output voltage is ensured only after about 1 minute!	

Blocking Input	
Connections (2A1 to 2A3)	
Operating shaft	Can be changed using jumpers
- For rated voltages 24/48/60 V	Approx. 16 V
- For rated voltages 110/125/220/250 V	Approx. 70 V
Permissible voltage, continuous	DC 300 V

Signal Relay		
Connections (3A1 to 3A3)		
Switching power	ON; OFF	20 W/VA
Contact voltage		DC 250 V
Permissible current	ON	5 V
	OFF	1 V

Test Voltage	2.8 kB, direct voltage

Permissible Ambient Temperatures	
At R_B< 5Ω	≤ 40°C
At R_B> 5Ω	≤ 55°C
Note: At maximum power output, the device generates internal power dissipation of about 20 W. To ensure unimpeded removal of the internal power dissipation, the clearance to other devices or side walls must be at least 100 mm. For this reason, the device is to always be installed at the bottom of the cabinet.	

Selection and Ordering Data

Description		Order No.												
		1	2	3	4	5	6	7		8	9	10	11	12
Accessories for 100 % stator ground-fault protection		7	X	T	3	☐	0	0	-	0	☐	A	0	0
						▲					▲			
						|					|			
20-Hz generator in housing 7XP20	For panel surface mounting					3					B			
	For panel flush mounting					3					C			

20 Hz Band-Pass – 7XT34 100% Stator Ground-Fault Protection

Description

7XT34 is a 20-Hz band-pass filter. It filters the square-wave voltage of the 20-Hz generator (7XT33) and protects it in the event of ground faults at maximum residual voltage. At 20 Hz, the series resistance is 8 Ω, and at rated frequency (50/60 Hz), it is more than 100 Ω. In addition, the device contains a voltage divider to reduce the measured residual voltage (divider ratio is 5:2 or 5:1) to a grounding or neutral-point transformer. The external divider 3PP1336-1CZ is not used.

Functions

The function of the 100 % stator ground-fault protection detects ground faults in the stator winding of generators connected to the electrical power system via a generator transformer. The protection operating with the 7XT33 and the 7XT34 detects ground faults in the entire area of the winding, including the machine neutral point. The employed measuring principle operates without being influenced by the mode of the generator and also makes it possible to measure during generator standstill.

Applications

5.3

The 20-Hz band-pass filter 7XT34 is used in combination with the 20-Hz generator 7XT33, in the machine protection 7UM62 and 7UM85 devices.

In this process, the 20-Hz generator is the source of voltage injection into the generator neutral point to realize 100 % stator ground-fault protection.

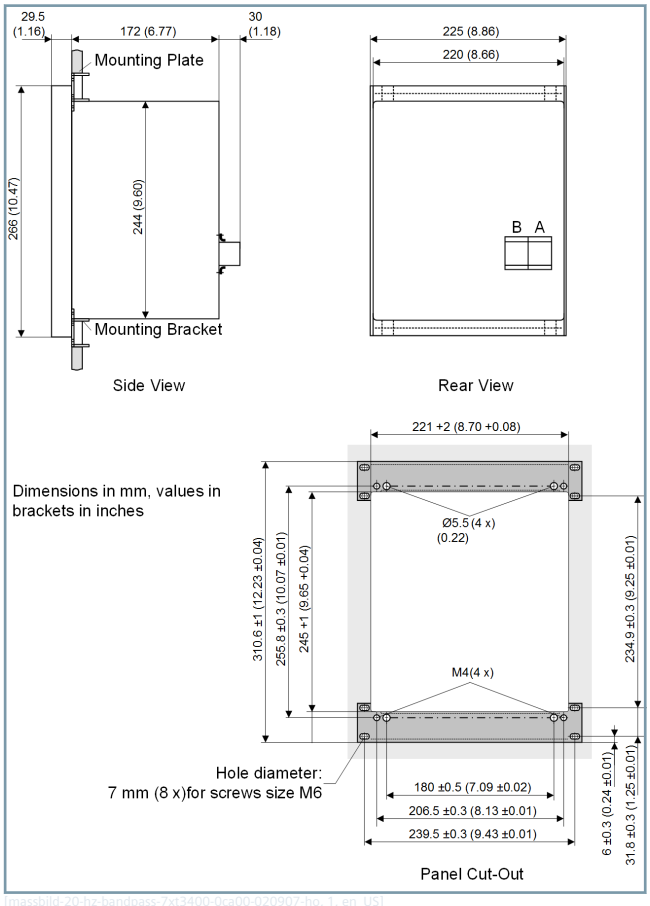
Voltage injection can be performed, for example, by connecting the 7XT33 and the 7XT34 to the load resistance of a grounding or neutral-point transformer.



[sc_7XT34-device, 1, --_--]

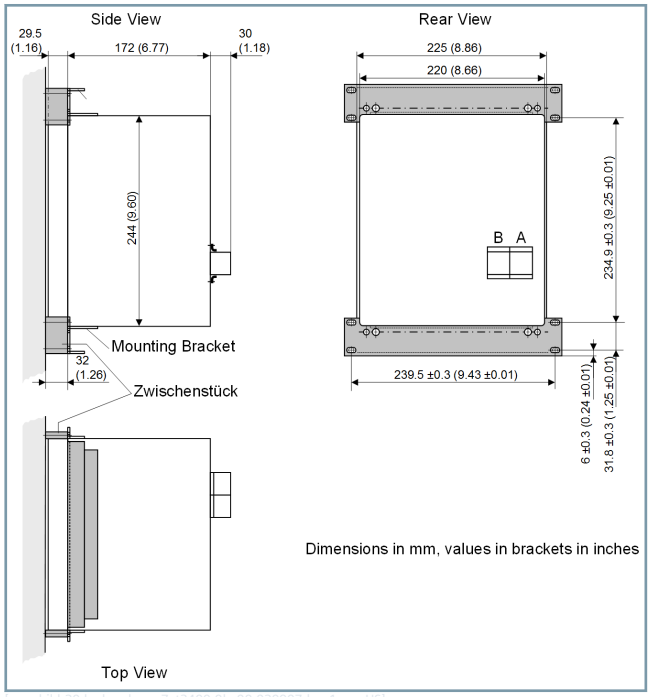
Figure 5.3/1 20-Hz Band-Pass 7XT34

Dimensioned Drawings



[massbild-20-hz-bandpass-7xt3400-0ca00-020907-ho, 1, en_US]

Figure 5.3/2 7XT34 Housing for Panel Flush Mounting or Cabinet Flush Mounting



[massbild-20-hz-bandpass-7xt3400-0ba00-020907-ho, 1, en_US]

Figure 5.3/3 Dimensional Drawing, 20-Hz Band-Pass 7XT3400-0BA00 for Panel Surface Mounting

Technical Data

Load Rating of the 7XT34 Device	
Connections (1B1 to 1B4)	
Superimposed alternating voltage, continuous	AC 55 V

Load Rating of the 7XT34 Device	
Superimposed alternating voltage, transient	AC 550 V for ≤ 30 s
Frequency of the superimposed alternating voltage	≥ 45 Hz
Alternating voltage, current-carrying capacity, continuous	AC 3.25 A
Test voltage	DC 2.8 kV

Load Rating of the Resistive Voltage Divider	
Permissible voltage, continuous	AC 55 V
Permissible voltage, transient	AC 550 V for ≤ 30 s
Test voltage	DC 2.8 kV

Ambient Temperature	
At R_B < 5 Ω	≤ 40 °C
At R^B > 5 Ω	≤ 55 °C
An internal power dissipation of up to 75 W can occur in the device with the minimum load resistance R_B.	
To ensure unimpeded removal of the internal power dissipation, the clearance to other devices or side walls must be at least 100 mm. Install this device always at the bottom of the cabinet.	

Degree of Protection acc. to IEC 60529	
For equipment	IP20
For personal protection	IP2x with standard terminals
For personal protection	IP1x with ring-type lug terminal

5.3

Selection and Ordering Data

Description		Order No.												
		1	2	3	4	5	6	7		8	9	10	11	12
Accessories for 100 % stator ground-fault protection		7	X	T	3	☐	0	0	-	0	☐	A	0	0
						▲					▲			
						|					|			
Band-pass filter, 20 Hz, for housing 7XP20	For panel surface mounting					4					B			
	For panel flush mounting					4					C			

Injection Unit – 7XT71 for Rotor Ground-Fault Protection

Description

7XT71 is an injection unit used together with the 7XR6004 or 7XR8004 for the **1- to 3-Hz rotor ground-fault protection** in the SIPROTEC 7UM62. A low-frequency square-wave voltage of about +/- 50 V is injected into the rotor circuit. As the supply voltage, an alternating voltage or a direct voltage may be used.

Applications

In the case of large generators, a high sensitivity is necessary for the rotor ground-fault protection. Not only must the influence of the rotor ground capacitance be eliminated to the maximum possible degree, the signal-to-noise ratio with respect to the harmonics (for example, the 6th harmonic) of the excitation machine must be increased.

For this type of machine protection, the injection unit 7XT71, in conjunction with the resistor unit 7XR6004 and the multi functional machine protection 7UM62 or generator protection 7UM85 is used in the SIPROTEC family. This combination of devices ensures sensitive rotor ground-fault protection by continuously monitoring the rotor ground resistance. Starting with hardware version /DD, up to 2 devices 7UM62 or 7UM85 can be connected to the injection unit 7XT71. In this way, the protection function can be assigned to two protection groups and a greater functional redundancy can be achieved.

The square-wave generator of the injection unit 7XT71 produces a low-frequency square-wave voltage of about ±50 V. This voltage can be set from 0.5 Hz to 4.0 Hz in 0.5-Hz increments in the device using a DIP switch. The square-wave voltage is supplied via the resistor unit 7XR6004 between the rotor winding of a generator and the grounding brushes.

The square-wave voltage injected into the rotor winding results in a constant charge reversal on the rotor ground capacitance. The ground current is detected via the measuring circuit in the injection unit 7XT71 and injected, galvanically separated, into the measuring input of the SIPROTEC 7UM62 or SIPROTEC 7UM85 devices. In fault-free operation, ($R_{erd} \approx$ infinite), the rotor ground current is virtually zero after the ground capacitance is charged. In the event of a fault, fault resistance and series resistance of the resistor unit 7XR6004, as well as the supplying voltage, determine the stationary current.

At the same time, the polarity reversal generated by the square-wave voltage in the injection unit 7XT71 (square-wave voltage and frequency) is measured and fed to the control input of the 7UM62/7UM85 in the form of control signals after being galvanically separated.

The rotor ground circuit is monitored for an open circuit in the 7UM62/7UM85 by evaluation of the rotor ground current during polarity reversals.

The sensitivity of the rotor ground-fault protection is designed so that fault resistances up to 80 kΩ are detected.

The auxiliary voltage is conditioned for the printed circuit board assemblies of the device using an AC/DC wide-range power supply unit in the injection unit 7XT71.



[7XT71_1_--_--]

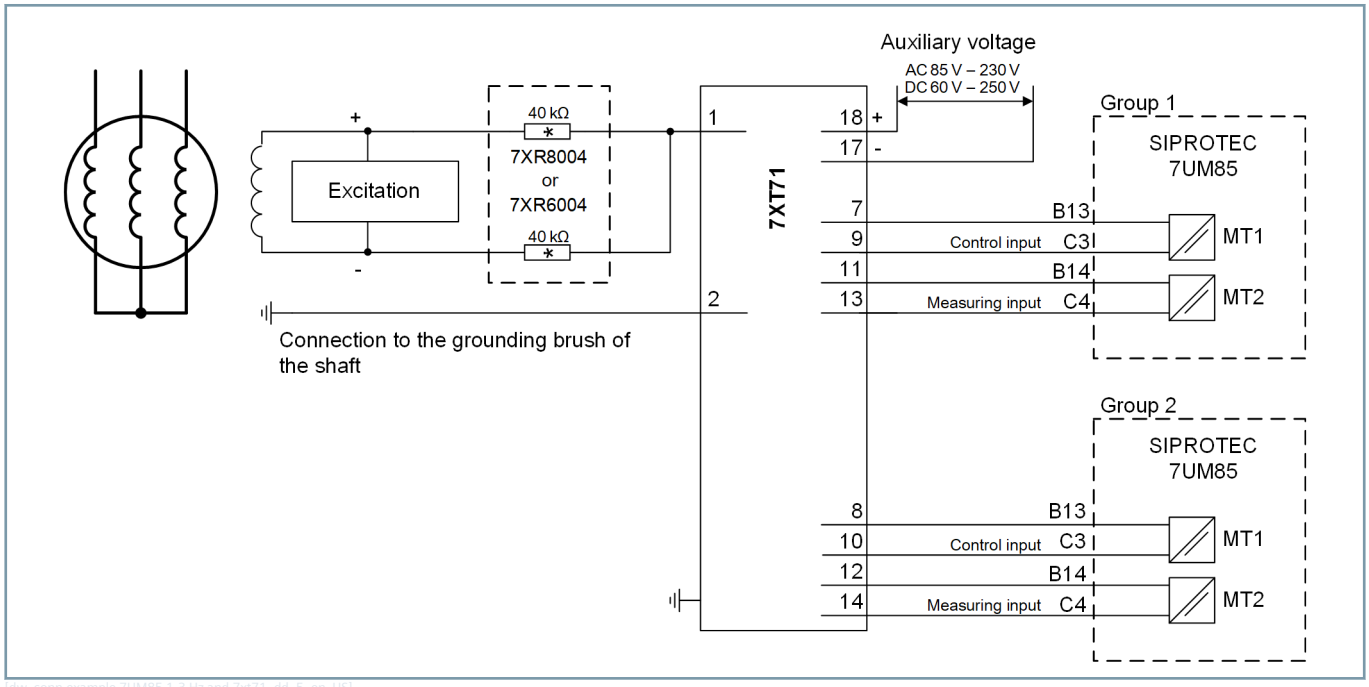
Figure 5.4/1 Injection Unit 7XT71

Function Description

The rotor ground-fault protection operates with a direct voltage of about 50 V that, depending on the settings, reverses polarity roughly 1 to 4 times per second. This voltage injection into the rotor circuit at V_g is generated in the injection unit 7XT71 via the resistor unit 7XR6004 (or 7XR8004), this voltage is injected symmetrically via high-impedance resistors to the excitation circuit and, at the same time, connected to the grounding brush (ground potential) via a low-impedance measurement shunt R_M. The voltage tapped via the measurement shunt and the control voltage is injected into the protection by means of the measuring transducer. The control voltage is proportional to the injected 50 V voltage V_g in amplitude and frequency. The flowing rotor ground current is reflected in the measuring voltage.

The direct voltage V_g drives, during every polarity reversal, a charging current Ig through the resistor unit into the ground capacitance of the excitation circuit. This current results in a proportional voltage drop V_{meas} in the measurement shunt of the injection unit. After charging the rotor ground capacitance, the charging current becomes zero. If a rotor ground fault is present, a ground current flows continuously. The magnitude is determined by the fault resistance.

By using a low-frequency square-wave voltage as the residual voltage, the influence of the ground capacitance is eliminated and at the same time the signal-to-noise ratio for the interference frequencies is correspondingly large due to the excitation machine.



[dw_conn example 7UM85 1-3 Hz and 7xt71, dd, 5, en_US]

Figure 5.4/2 Circuitry Principles of the Rotor Winding Voltage Injection

R_E Fault resistance

C_E Rotor ground capacitance

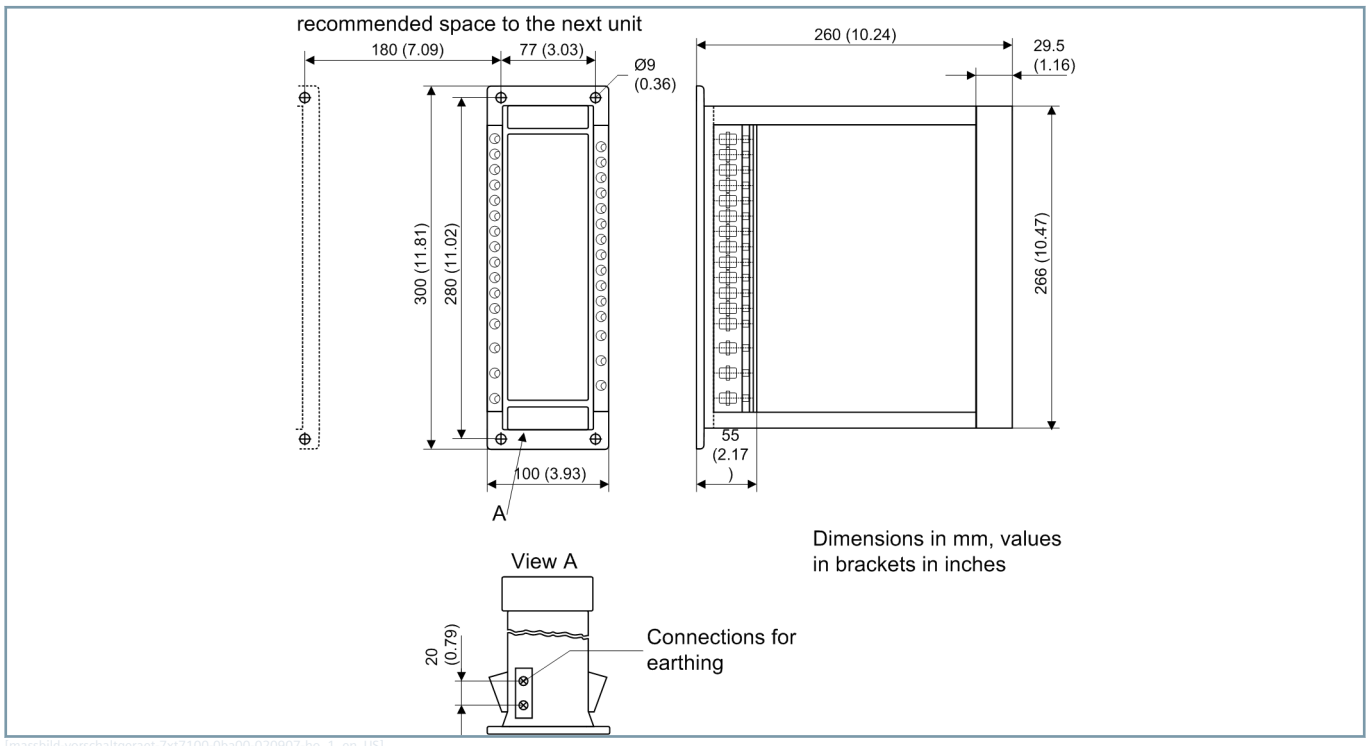
R_V Series resistor

V_g Square-wave voltage from the 7XT71

I_g Current flowing from the 7XT71 to ground via the rotor

f_g Square-wave frequency of the 7XT71

Dimensional Drawings



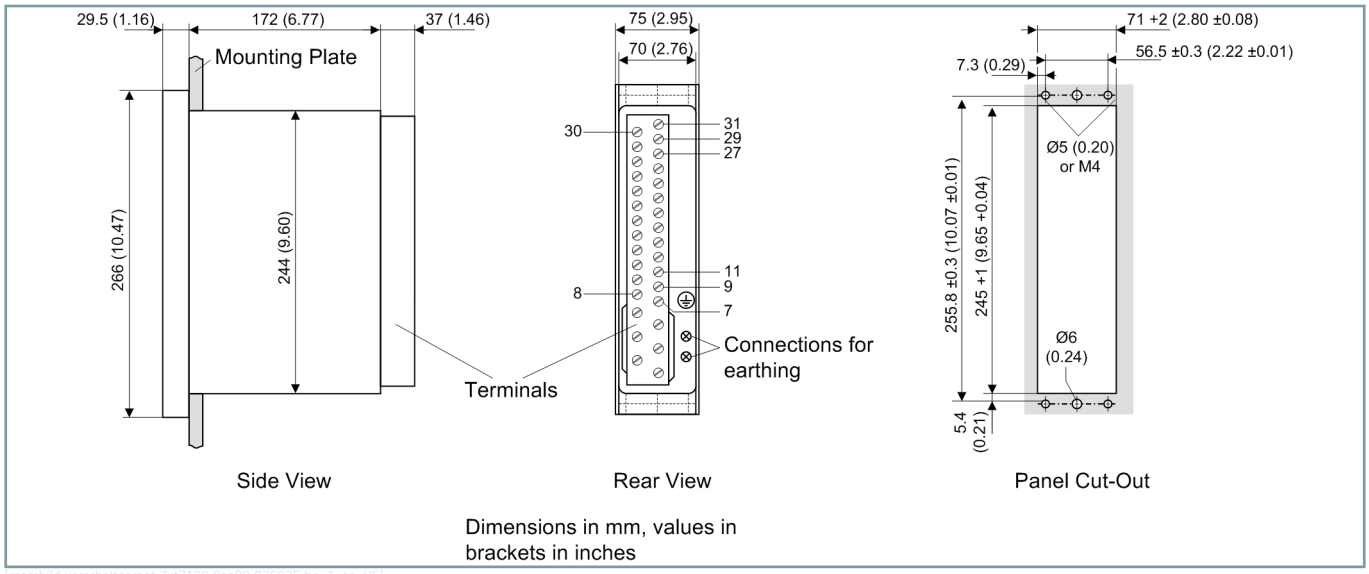
[massbild-vorschaltgeraet-7xt7100-0ba00-020907-ho, 1, en_US]

Figure 5.4/3 Dimensional Drawing, Injection Unit 7XT7100-0BA00 for Panel Surface Mounting

With

- Power connections (terminals 1 to 6):
  Not used in 7XT71
- Control connections (terminals 7 to 31):
  Insulated ring-type lug: for 4 mm bolts, max. outer diameter: 9 mm
- Type:
  For example, PIDG from Tyco Electronics AMP for copper wire cross-sections of 1.0 mm^2 to 2.6 mm^2
- AWG 17 to 13
- Stripped copper cable direct:
  Cross-sections from 0.5 to 2.6 mm^2
- AWG 20 to 13
- For stranded wire:
  Terminal lug necessary, max. tightening torque: 1.8 Nm

Dimensional Drawings



[massbild-vorschaltgeraet-7xt7100-0ea00-020925-ho, 1, en_US]

Figure 5.4/4 Dimensional Drawing, Injection Unit 7XT7100-0EA00 for Panel Flush Mounting

With

- Power connections (terminals 1 to 6):
  Not used in 7XT71
- Control connections (terminals 7 to 31)
- Screw terminal (ring-type lug):
  For 4 mm bolts, max. outer diameter: 9 mm
- Type:
  For example, PIDG from Tyco Electronics AMP for copper wire cross-sections of 1.0 mm^2 to 2.6 mm^2
- AWG 17 to 13
- Parallel to this, double flat-spring crimp contact:
  For copper wire cross-sections of 0.5 mm^2 to 2.5 mm^2
- AWG 20 to 13
- Max. tightening torque: 1.8 Nm

Technical Data

Auxiliary voltage, direct voltage; terminal 17 (-) and 18 (+)	
Rated Auxiliary DC voltage	60 V to 250 V
Permissible range of the rated auxiliary DC voltage	48 V to 300 V
Superimposed alternating voltage, peak-peak	≤ 12% at the rated voltage, IEC 60255-11
Power consumption	< 6 W
Stored-energy time for outage/short circuit of the auxiliary direct voltage	≥ 50 ms
Recommended external protection	Miniature circuit breaker 6 A, Characteristic C according to IEC 60898

Auxiliary voltage, alternating voltage; terminals 17 (N) and 18 (L)	
Rated Auxiliary AC voltage	60 V to 250 V
Permissible range of the rated auxiliary AC voltage	48 V to 285 V
Power frequency	45 Hz to 65 Hz
Power consumption	< 10 VA
Stored-energy time for outage/short circuit of the auxiliary direct voltage	≥ 50 ms
Recommended external protection	Miniature circuit breaker 6 A, Characteristic C according to IEC 60898

Signaling voltages/currents at the terminals	
Terminal 1 (V_{output}A) and terminal 2 (V_{output}B)	
Output voltage V_{output}A/B	± 50 V ± 10%
Output current at V_{output}A/B	< ± 20 V
Maximum output current at V_{output}A/B	< ± 2 mA, short-circuit proof
Terminals 8, 10 ($V_{Control}$1) and 7, 9 ($V_{Control}$2)	
Output voltage $V_{Control}$1/2	< ± 15 V
Maximum output current at $V_{Control}$1/2	< ± 2 mA, short-circuit proof
Terminals 12, 14 (V_{meas}1) and 11, 13 (V_{meas}2)	
Output voltage V_{meas}1/2	< ± 15 V
Maximum output current at V_{meas}1/2	< ± 2 mA, short-circuit proof

Settings	
Output frequency of V_{output}A/B (setting using DIP switch)	
Setting range	0.5 to 4.0 Hz ±5%

Injection Unit – 7XT71 for Rotor Ground-Fault Protection

Settings	
Settings	0.5 Hz, 1.0 Hz, 1.5 Hz, 2.0 Hz, 2.5 Hz, 3.0 Hz, 3.5 Hz, 4.0 Hz
Factory setting	1.5 Hz

Design structure	
Housing	7XP20, 1/6 19" housing
Dimensions (W x H x D)	
7XT7100-0BA00	312.8 mm x 75.0 mm x 243.5 mm with Z angles and junction block
7XT7100-0EA00	266.0 mm x 75.0 mm x 235.5 mm with junction block
Weight	
7XT7100-0BA00	2.3 kg
7XT7100-0EA00	2.1 kg

Design structure	
Degree of protection according to EN 60529 (flush-mounting version)	
Front	IP51
Housing and terminals	IP20
Degree of protection according to EN 60529 (surface-mounting version)	
Device	IP20

Electrical Inspections	
Standards	IEC 60255-26 (product standards) IEEE Std C37.90 For more standards, see the individual tests

Selection and Ordering Data

Description		Order no.											
		1	2	3	4	5	6	7		8	9	10	11	12
Injection unit		7	X	T	7	1	0	0	-	0	☐	A	0	0
											▲			
											|			
for rotor ground-fault protection (0.5 to 4 Hz) 7XT71, in housing 7XP20	for panel surface mounting										B			
	for panel flush mounting										E			

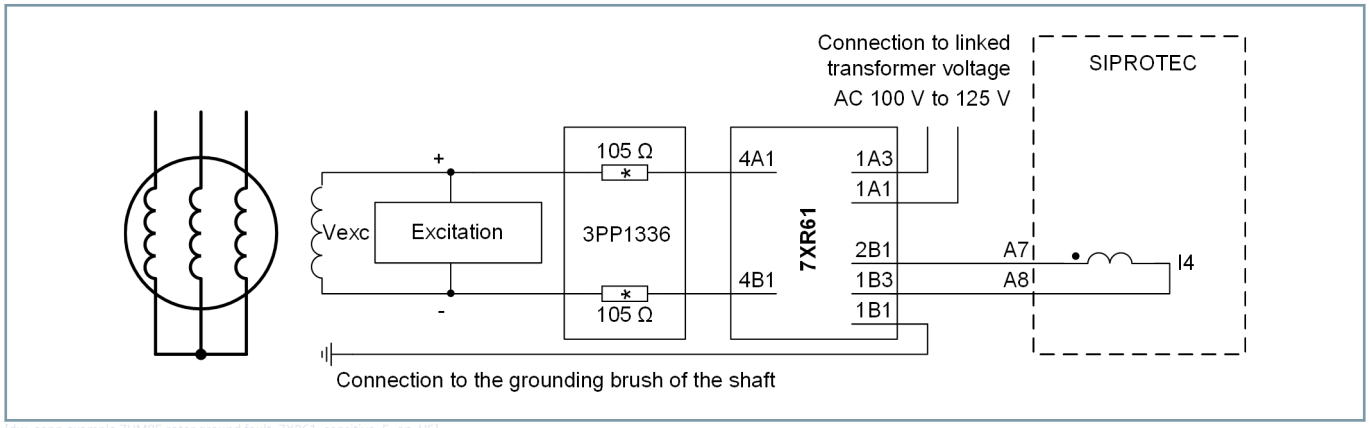
Description

7XR61 is a coupling unit for the rotor ground-fault protection with **50-Hz/60-Hz coupling** into the SIPROTEC 7UM6 device. In addition, a 3PP1336-0DZ is necessary.



[7XR61, 1, --_--]

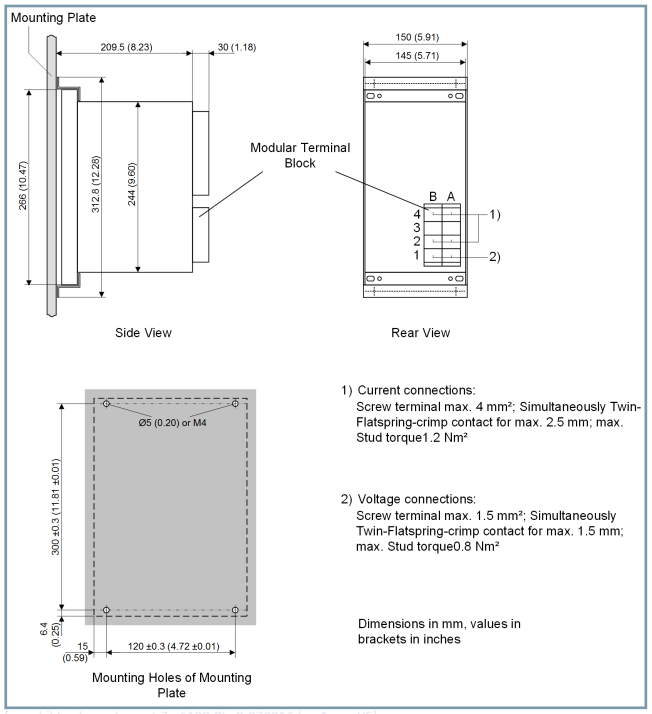
Figure 5.5/1 Coupling Unit 7XR61



[dw_conn example 7UM85 rotor ground fault, 7XR61, sensitive, 5, en_US]

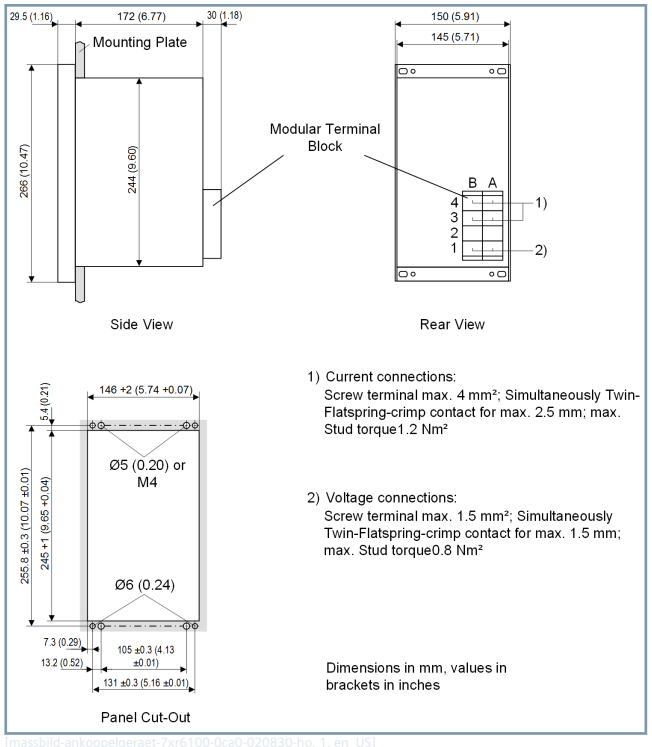
Figure 5.5/2 Connection Example for Generators: Rotor Sensitive Ground-Fault Protection with the 7XR61 Additional Device for Voltage Interference of the Rotor Circuit at the Rated Frequency during Implementation with the Sensitive Ground-Current Input

Dimensioned Drawings



[massbild-ankoppelgeraet-7xr6100-0ba0-020916-ho, 1, en_US]

Figure 5.5/3 Dimensional Drawing Coupling Unit 7XR6100-0BA0 in Panel Surface Mounting Housing



[massbild-ankoppelgeraet-7xr6100-0ca0-020830-ho, 1, en_US]

Figure 5.5/4 Dimensional Drawing Coupling Unit 7XR6100-0CA0 in Panel Flush Mounting Housing

Technical Data

Limiting values for inputs and outputs

Auxiliary Voltage		
Rated auxiliary AC voltage $V_{H\sim}$	100 to 125 V~, 50/60 Hz	230 V ~, 50/60 Hz
Permissible voltage ranges	80 to 144 V~	176 to 265 V~

Load Rating of the Capacitive Coupling Circuit	
Connections (4A1 to 4B1)	
Permissible voltage, continuous	3.15 kV–
RMS voltage	60 V ~ (≤ 300 Hz)
RMS current	≤ 0.2 A~(1) continuous
Test voltage	4.7 kV– for ≤ 2 s

(1) Do not use the internal resistors if the continuous currents are higher. These are then short circuited, and the external resistor unit 3PP1336-0DZ-0130002 is used instead.

Output Load Rating	
(Short circuit on 4A1 and 4B1)	
Continuous	100 mA (without reactor)
Output (1B1 to 1B3)	175 mA (with reactor), max. 1 hour
Output (1B1 to 1B4)	230 mA, max. 0.5 Hours

Selection and Ordering Data

Description		Order No.											
		1	2	3	4	5	6	7		8	9	10	11	12
Coupling unit		7	X	R	6	1	0	0	-	0	☐	A	0	0
											▲			
											|			
for rotor ground-fault protection 50/60 Hz	For panel surface mounting										B			
	For panel flush mounting										C			

5.5

Coupling Unit – 7XR81 for Rotor Ground-Fault Protection (50 Hz/60 Hz)

Description

The new coupling unit 7XR81 is used as a required accessory for rotor ground-fault protection in 7UM62/7UM85 machine protection devices. This device substitutes the earlier coupling unit 7XR6100-0*A00 and the series resistor 3PP1336-0DZ in one device.

Benefits

- Tried and tested SIPROTEC 5 design
- Coupling unit and series resistor in one device

Functions

The new coupling unit 7XR81 is used as a required accessory for **rotor ground-fault protection (I_{RE}>, f_n)** (ANSI 64R) in conjunction with the SIPROTEC 7UM85:

- Monitors the rotor circuit of electrical synchronous machines (generator, motor) for a ground fault
- Monitors the rotor circuit of asynchronous machines for a ground fault if the rotor circuit is accessible via a slip ring
- Processes a warning (high-impedance fault) and tripping (low-impedance fault) by activating at least 2 stages
- Detects faults by injecting a rated-frequency voltage into a rotor circuit and monitoring the rotor ground current



[ph_7XR8100, 1, –_–]

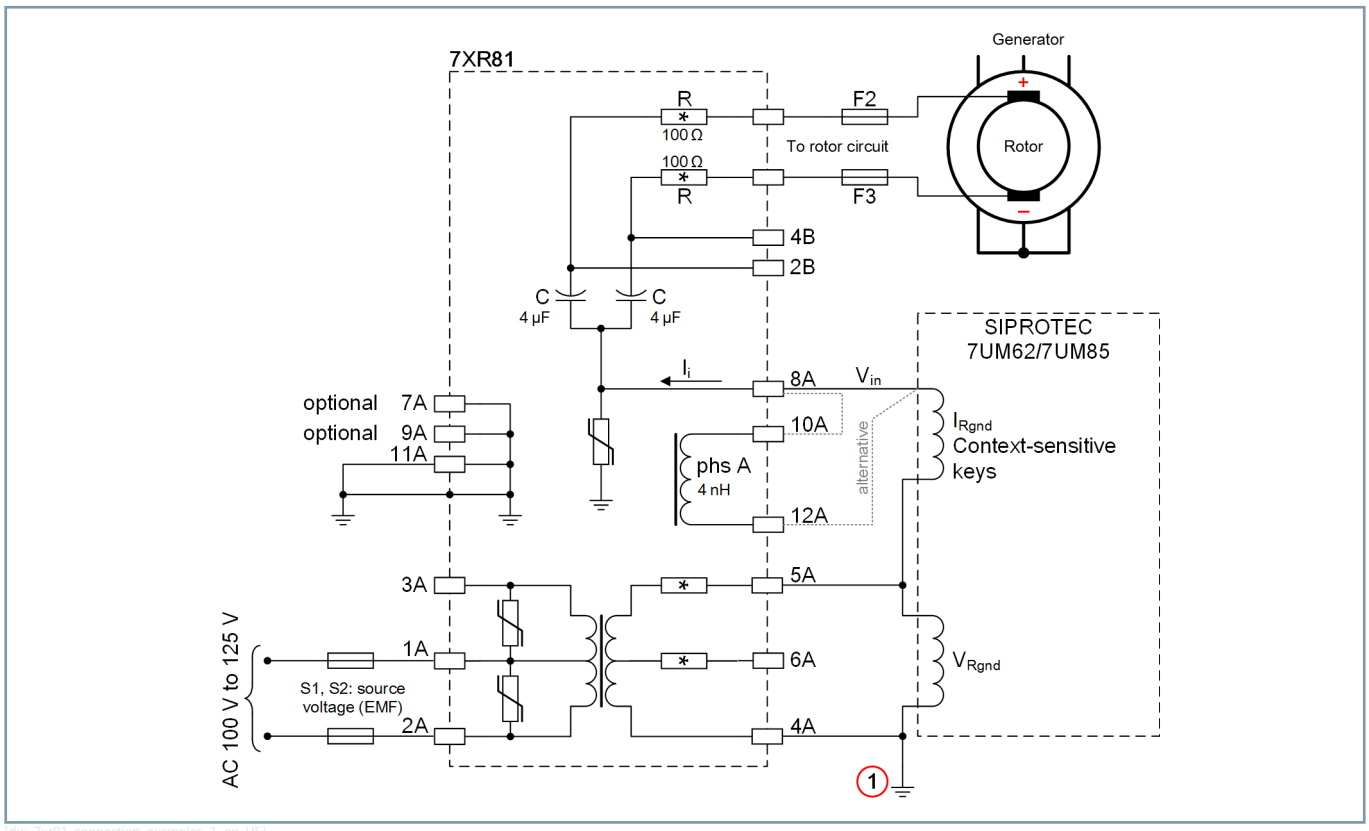
Figure 5.5/5 Coupling Unit 7XR81



[ph_7XR8100_W9, 1, –_–]

Figure 5.5/6 Rear View/Mechanical Design of the 7XR81

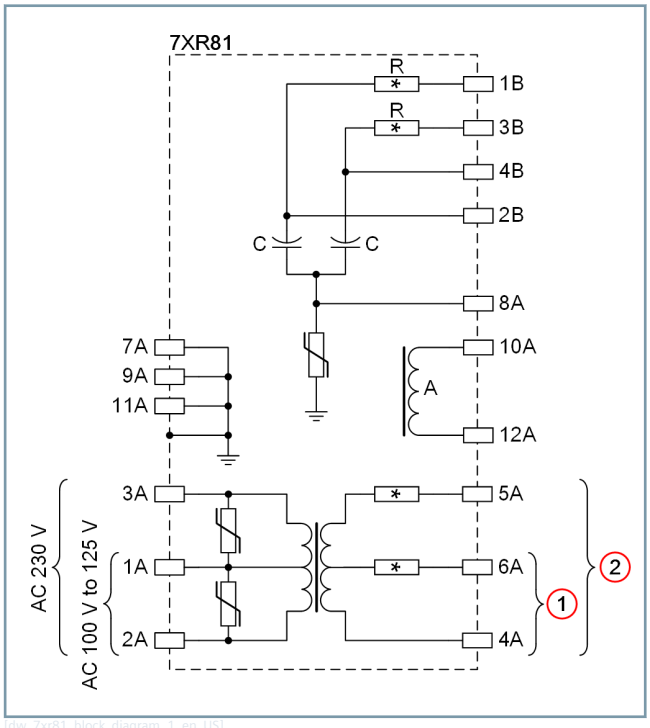
Connection Example



[dw_7xr81_connection_examples, 1, en_US]

Figure 5.5/7 Connection Example for 7XR81

You can find additional information on commissioning the coupling unit in the user manual for the protection relay 7UM62/7UM85.



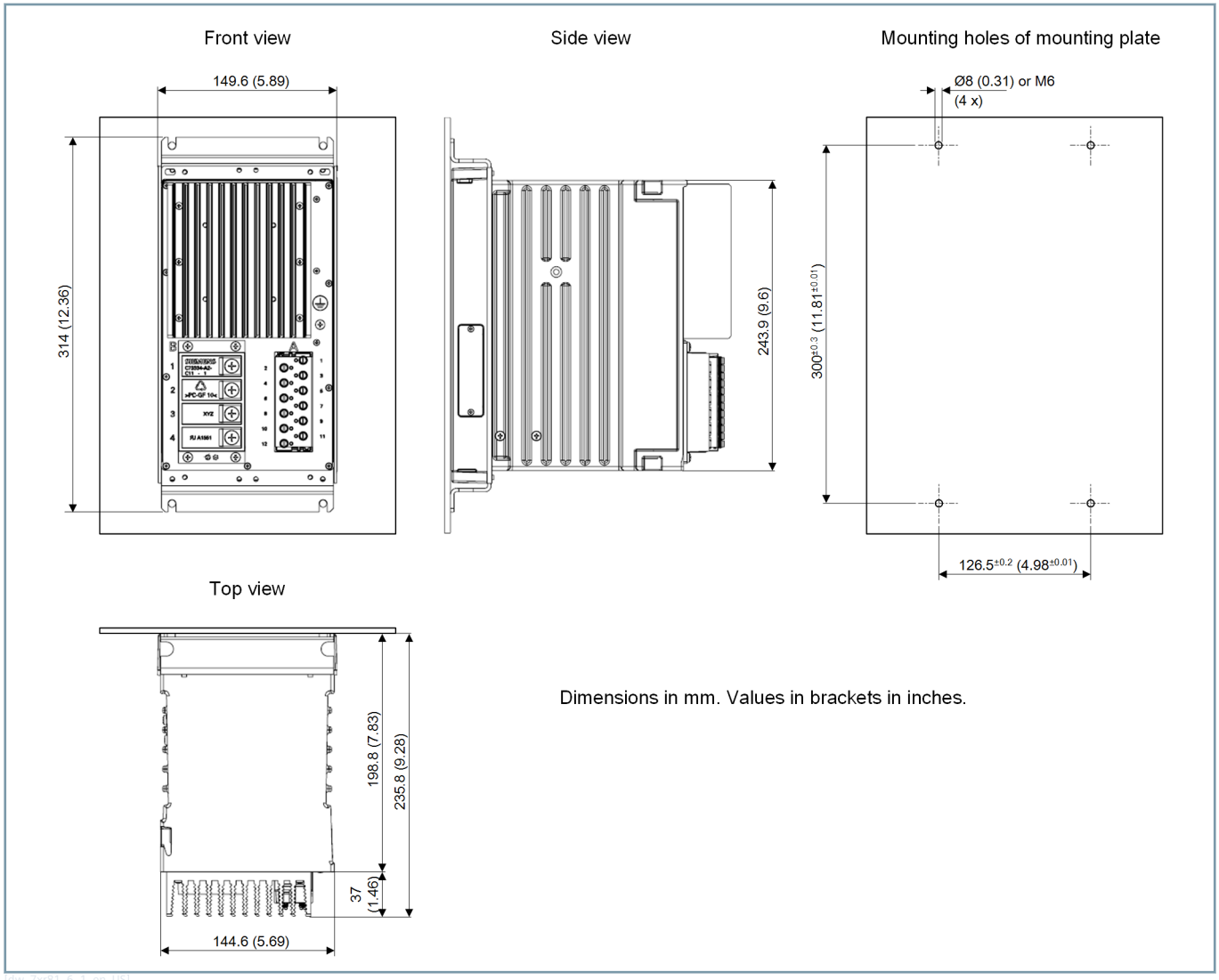
[dw_7xr81_block_diagram, 1, en_US]

Figure 5.5/8 Block Diagram of the 7XR81

(1) AC 39 V to 49 V for AV 100 V to 125 V between terminal 1A and 2A
AC 43 V for AC 230 V between terminal 1 A and 3 A

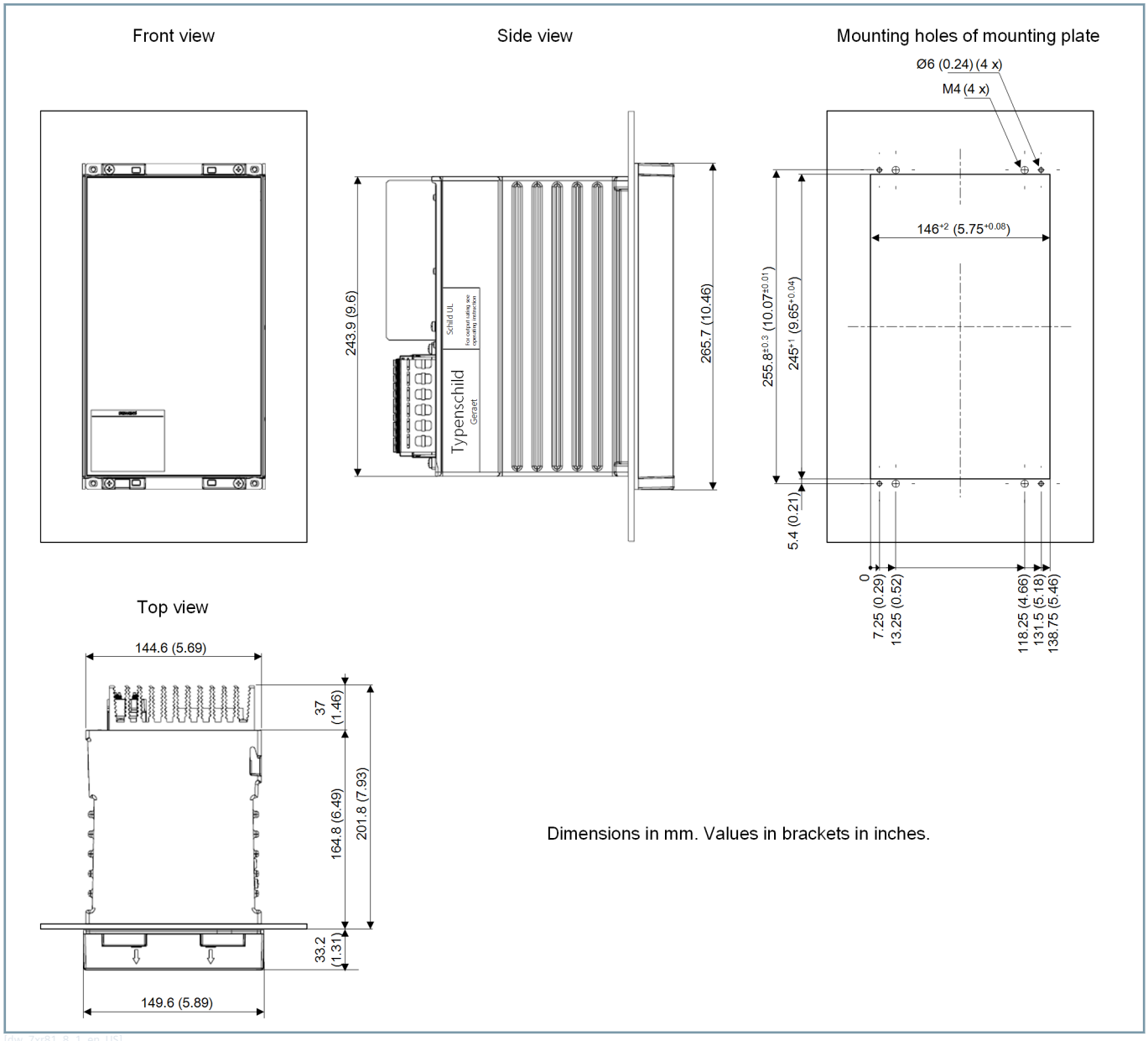
(2) AC 58 V to 74 V for AC 100 V to 125 V between terminal 1 A and 2 A
AC 64 V for AC 230 V between terminal 1 A and 3 A

Dimensional Drawings



[dw_7xr81_6, 1, en_US]

Figure 5.5/9 7XR81 Surface Mounting Dimensions



[dw_7xr81_8, 1, en_US]

Figure 5.5/10 7XR81 Flush Mounting Dimensions

Auxiliary Voltage and Output Power

	Terminals 1A to 2A	**Terminals 2A to 3A**
Rated auxiliary voltage	100 V to 125 V AC, 50 Hz/60 Hz (1)	230 V AC, 50 Hz/60 Hz (2)
Permissible auxiliary voltage	80 V to 144 V AC, 45 Hz to 65 Hz	176 V to 265 V AC, 45 Hz to 6 5 Hz
	Terminals 4A to 6A	**Terminals 4A to 5A**
Nominal output voltage	39 V to 49 V AC for (1) 43 V AC for (2)	58 V to 74 V AC for (1) 64 V AC for (2)

Coupling Unit – 7XR81 for Rotor Ground-Fault Protection (50 Hz/60 Hz)

Continuous output current (1B to 3B shorted to ground, without choke L1)	100 mA	
Output current for max. 30 minutes (1B to 3B shorted to ground, with choke L1) Recovery time 60 min Max. power consumption 22 W	175 mA	200 mA

Load rating of the capacitive coupling circuit

	Terminals 1B – 3B
Max. permissible continuous voltage	1000 V DC + 250 V peak value (max. 300 Hz)[46]
Max. permissible continuous current	500 mA RMS[46]
Max. dissipated power	60 W

You can find additional routing information and technical data in the **SIPROTEC, coupling unit for generator protection manual** or at *www.siemens.com/accessories*.

Selection and Ordering Data

Description		Order No.												
		1	2	3	4	5	6	7		8	9	10	11	12
Coupling unit		7	X	R	8	1	0	0	-	0	☐	A	0	0
											▲			
											|			
for rotor ground-fault protection 50/60 Hz	Housing for panel **surface mounting** with screw connections										B			
	Housing for panel **flush mounting** with screw connections										C			

5.5

46 The RMS voltage and current over the resistors R1 (2x 100 Ω) must be measured to avoid exceeding 50 W of power dissipation.

Description

7XR6004 is a resistor unit with 4 x 20 kΩ resistors for interfacing the **1- to 3-Hz rotor ground-fault protection** in the SIPROTEC 7UM62.

Function Description

The rotor ground-fault protection operates with a direct voltage of about 50 V that, depending on the settings, reverses polarity roughly 1 to 4 times per second. This voltage injection into the rotor circuit at V_g is generated in the injection unit 7XT71 via the resistor unit 7XR6004 (or 7XR8004), this voltage is injected symmetrically via high-impedance resistors to the excitation circuit and, at the same time, connected to the grounding brush (ground potential) via a low-impedance measurement shunt R_M. The voltage tapped via the measurement shunt and the control voltage is injected into the protection by means of the measuring transducer. The control voltage is proportional to the injected 50 V voltage V_g in amplitude and frequency.

The flowing rotor ground current is reflected in the measuring voltage.

The direct voltage V_g drives, during every polarity reversal, a charging current Ig through the resistor unit into the ground capacitance of the excitation circuit. This current results in a proportional voltage drop V_{meas} in the measurement shunt of the injection unit. After charging the rotor ground capacitance, the charging current becomes zero. If a rotor ground fault is present, a ground current flows continuously. The magnitude is determined by the fault resistance.

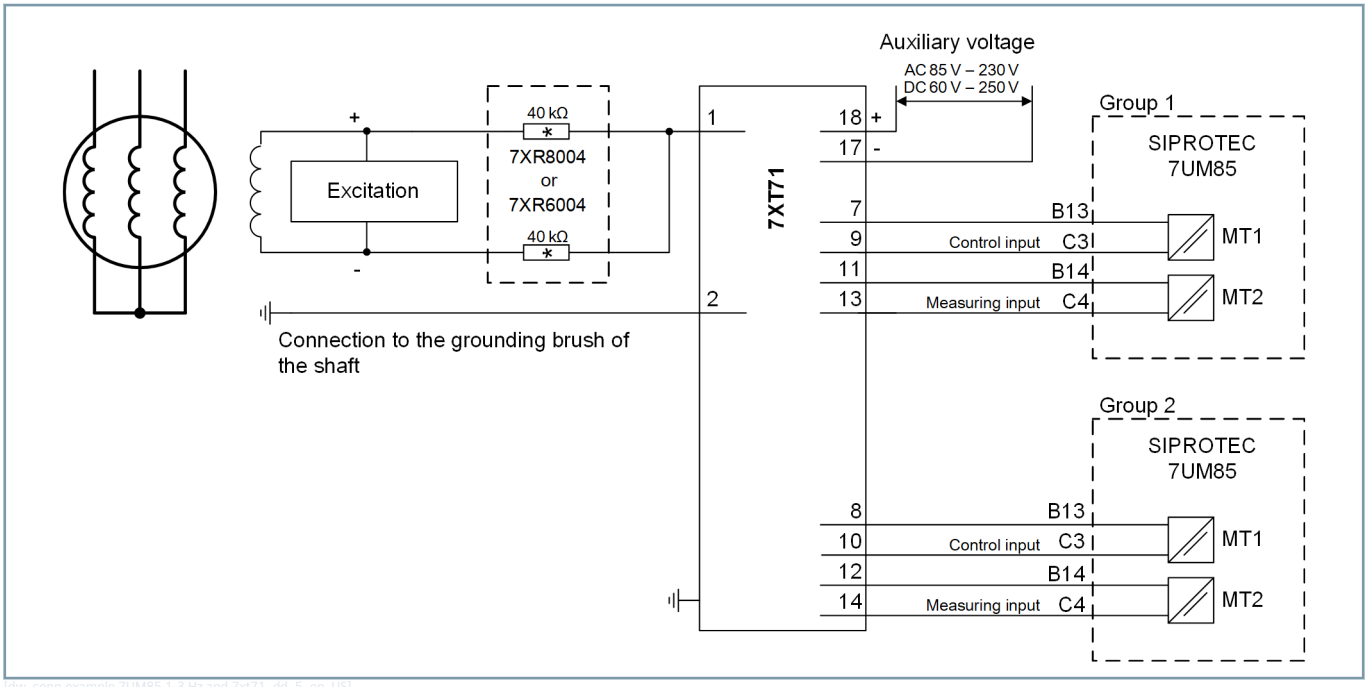


[7XR6004, 1, --_--]

Figure 5.6/1 Resistor Unit – 7XR6004

By using a low-frequency square-wave voltage as the residual voltage, the influence of the ground capacitance is eliminated and at the same time the signal-to-noise ratio for the interference frequencies is correspondingly large due to the excitation machine.

5.6



[dw_conn example 7UM85 1-3 Hz and 7xt71, dd, 5, en_US]

Figure 5.6/2 Circuitry Principles of the Rotor Winding Voltage Injection

R_E Fault resistance

C_E Rotor ground capacitance

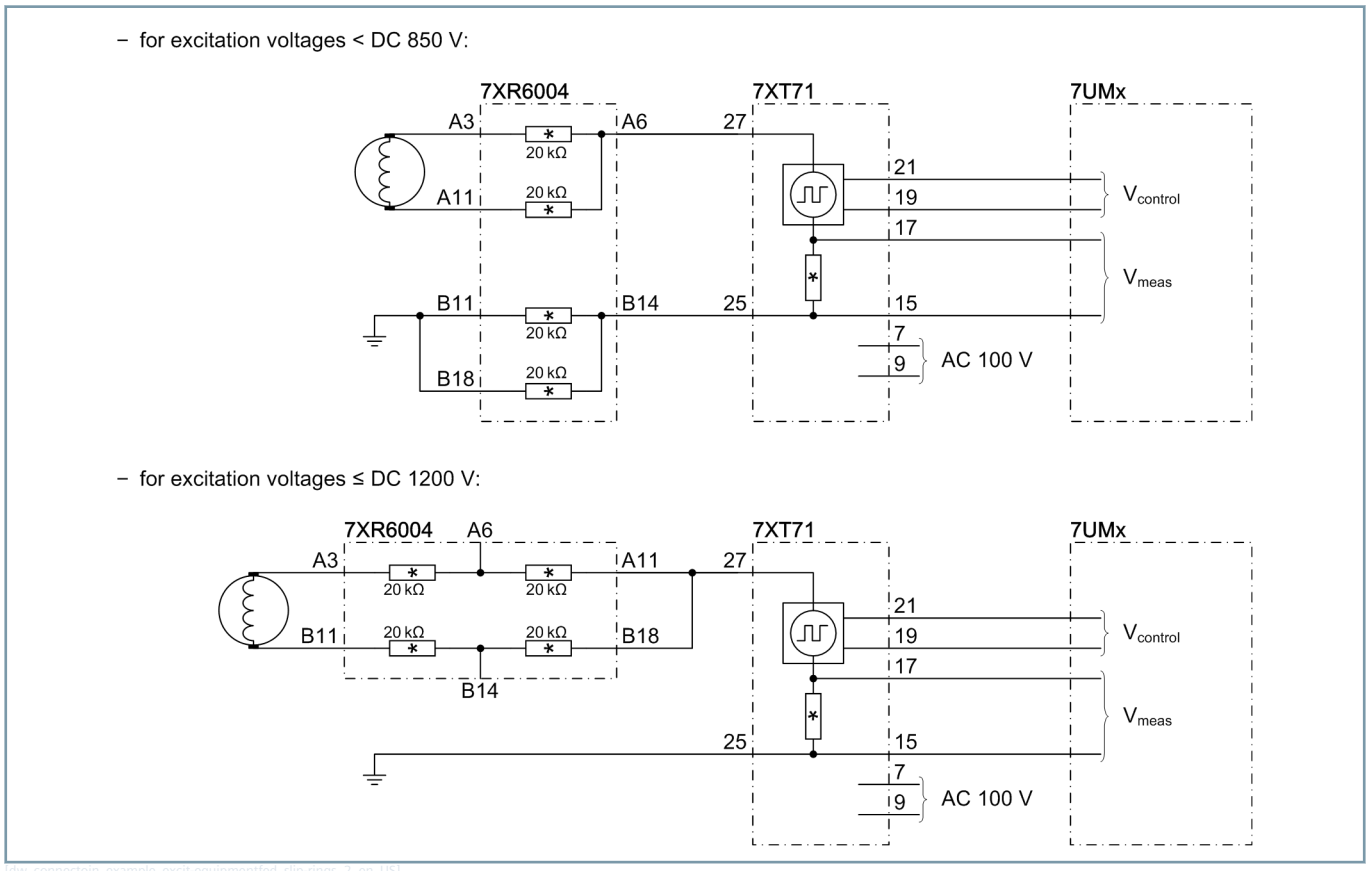
R_V Series resistor

V_g Square-wave voltage from the 7XT71

I_g Current flowing from the 7XT71 to ground via the rotor

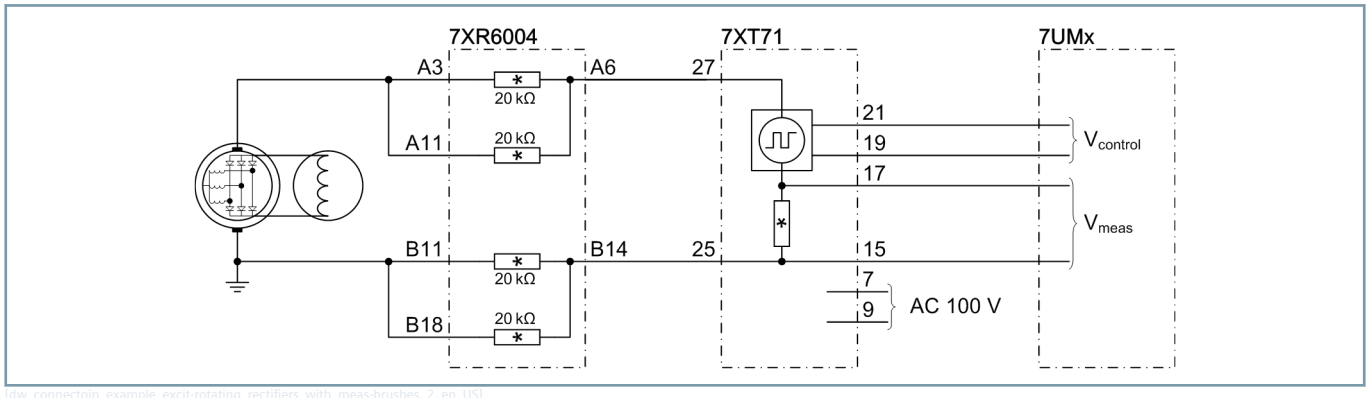
f_g Square-wave frequency of the 7XT71

Connection Examples



[dw_connectoin_example_excit-equipmentfed_slip-rings, 2, en_US]

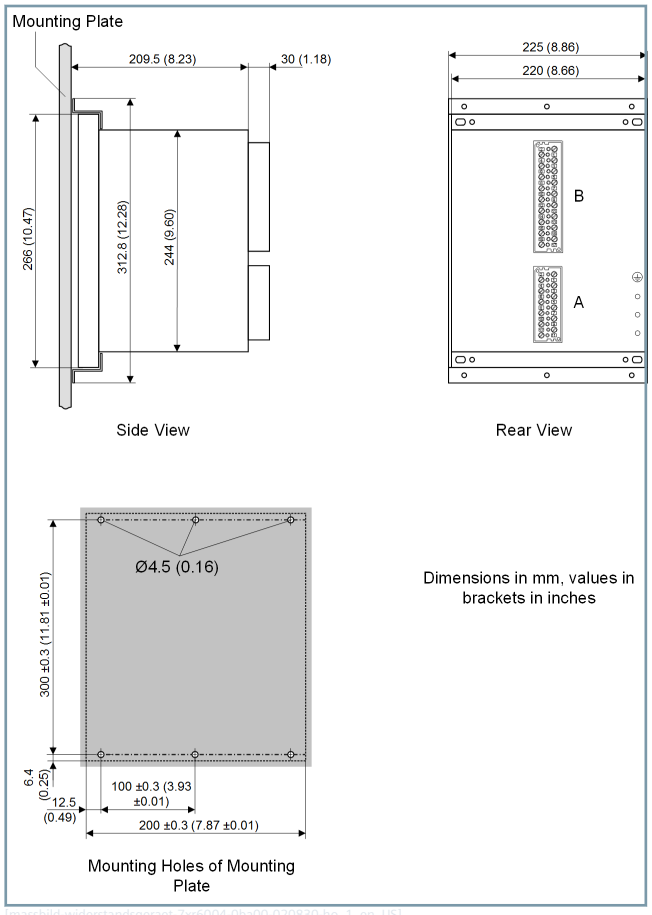
Figure 5.6/3 Connection Example when Supplying the Excitation Winding via Slip Rings



[dw_connectoin_example_excit-rotating_rectifiers_with_meas-brushes, 2, en_US]

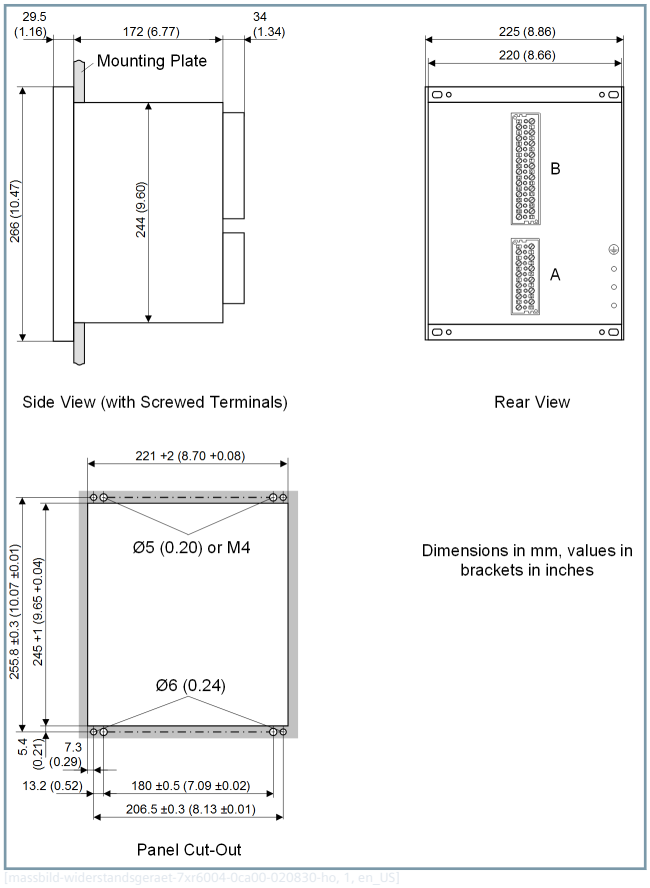
Figure 5.6/4 Connection Example when Exciting via Rotating Rectifiers with Measurement Brushes

Dimensioned Drawings



[massbild-widerstandsgeraet-7xr6004-0ba00-020830-ho, 1, en_US]

Figure 5.6/5 Dimensional Drawing Resistor Unit 7XR6004-0BA00 in Panel Surface Mounting Housing



[massbild-widerstandsgeraet-7xr6004-0ca00-020830-ho, 1, en_US]

Figure 5.6/6 Dimensional Drawing Resistor Unit 7XR6004-0CA00 for Panel or Cabinet Flush Mounting

5.6

Technical Data

Rated power loss	
20 kΩ power resistors	P_{70}=45 W
3.3 kΩ test resistor	P_{70}=7.5 W

Load rating of the 20 kΩ power resistors	
When using 2 resistors	9 W, continuous
corresponds to an input voltage of	425 V
When using 4 resistors	4.5 W, continuous
corresponds to an input voltage of	300 V
transient	4-times the continuous load rating for a maximum of 10 s
dynamic	900 W for max. 10 ms

Insulation tests	
Voltage test (routine test)	5.5 kV RMS value (1 min), 50/60 Hz
Surge immunity test (type test)	10 kV (peak); 1.2 µs/50 µs; 3 positive and 3 negative impulses at intervals of 5 s

Resistor Unit – 7XR6004 for Rotor Ground-Fault Protection

Temperatures	
Recommended temperature during operation	-5 °C bis +55 °C
Temporary permitted limit temperatures during operation	-20 °C bis +70 °C
Limiting temperature during storage	-25 °C to +55 °C

Temperatures	
Limiting temperature during transport	-25 °C to +70 °C
Storage and transport using factory packaging!	
To ensure unimpeded removal of the heat loss generated in the device, a clearance to other devices or sheet metal of at least 100 mm must be maintained above the device and 50 mm below the device.	

Degree of protection according to IEC 60529	
For equipment	IP 20
For personal protection	IP 2x with covering cap in place

Selection and Ordering Data

Description		Order No.											
		1	2	3	4	5	6	7		8	9	10	11	12
Resistance-coupling unit		7	X	R	6	0	0	4	-	0	☐	A	0	0
											▲			
											|			
for rotor ground-fault protection	For panel surface mounting										B			
(1 to 3 Hz) in 7XP20	For panel flush mounting										C			

5.6

Description

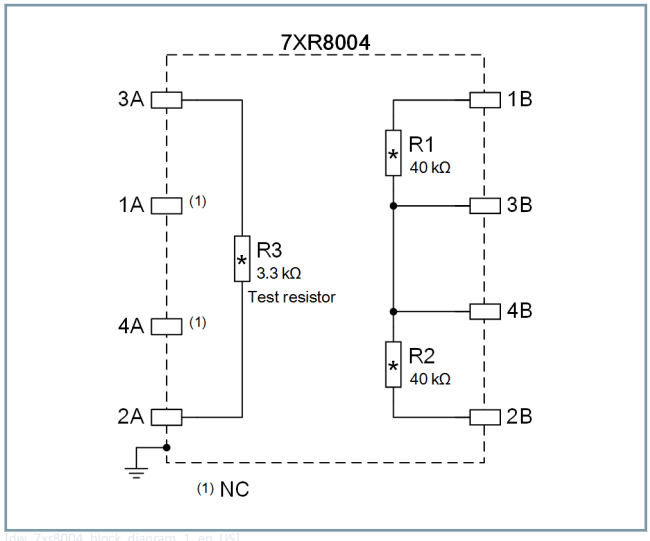
The resistance-coupling unit 7XR8004 is used as a required accessory, together with the generator protection devices 7XT71 (1 Hz to 3 Hz) and the machine protection devices 7UM62/7UM85 for 1-Hz to 3-Hz rotor ground-fault protection. The device substitutes the earlier resistor unit 7XR6004-0*A00 and allows excitation voltages to be reached at smaller sizes.

Functions

The rotor ground-fault protection operates with a direct voltage of about 50 V that, depending on the settings, reverses polarity roughly 1 to 4 times per second.

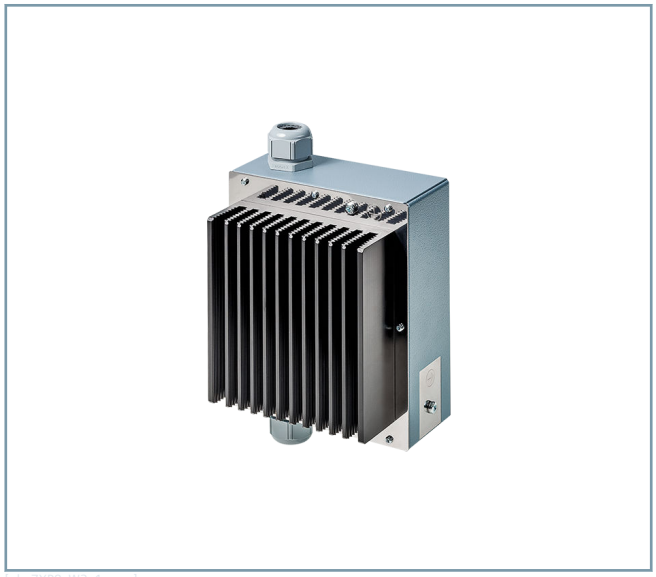
This voltage injection into the rotor circuit at V_g is generated in the injection unit 7XT71 Via the resistor unit 7XR8004, this voltage is injected symmetrically via high-impedance resistors to the excitation circuit, and, at the same time, is connected to the grounding brush (ground potential) via a low-impedance measurement shunt RM. The voltage tapped via the measurement shunt and the control voltage are injected into the protection with the measuring transducer. The control voltage is proportional to the injected 50 V voltage V_g in amplitude and frequency. The flowing rotor ground current is reflected in the measuring voltage.

The direct voltage V_g, during every polarity reversal, drives a charging current I_g through the resistor unit into the ground capacitance of the excitation circuit. This current results in a proportional voltage drop V_{meas} in the measurement shunt of the injection unit. After charging the rotor ground capacitance, the charging current becomes zero. If a rotor ground fault is present, a ground current flows continuously. The magnitude is determined by the fault resistance.



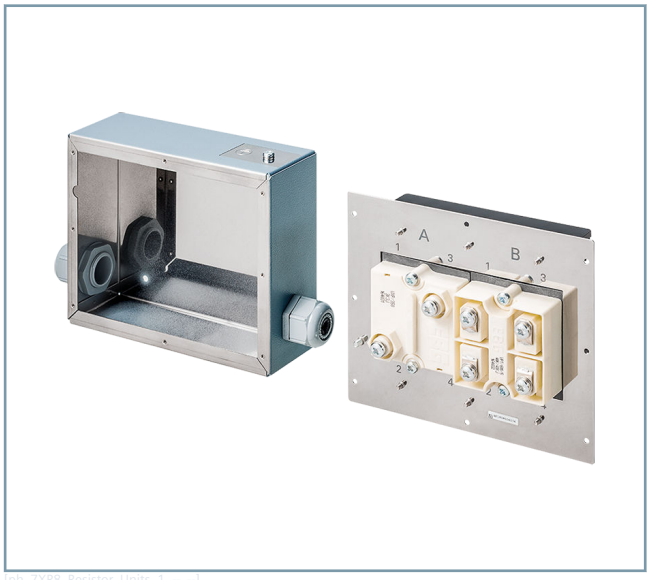
[dw_7xr8004_block_diagram, 1, en_US]

Figure 5.7/2 Basic Circuit Diagram 7XR8004



[ph_7XR8_W3, 1, –_–]

Figure 5.7/1 Resistance-Coupling Unit 7XR8004

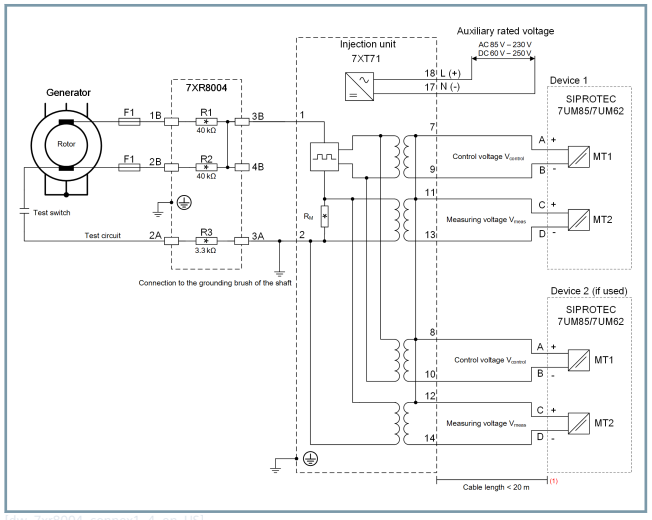


[ph_7XR8_Resistor_Units, 1, –_–]

Figure 5.7/3 Resistance-Coupling Unit 7XR8004 Connection Terminals

5.7

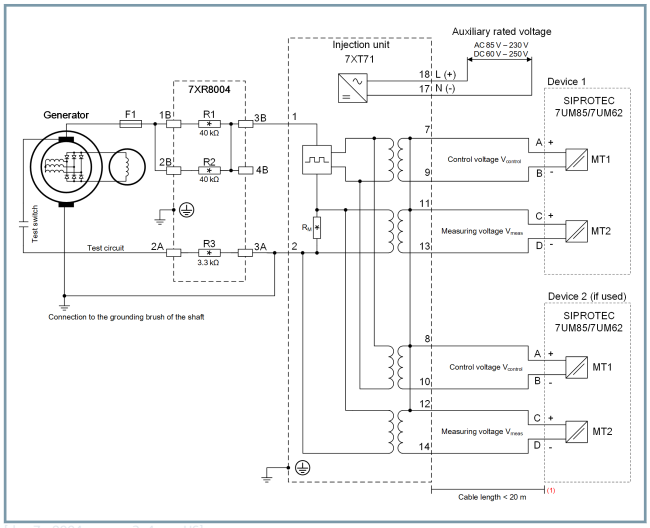
Resistance-Coupling Unit – 7XR8004 for Rotor Ground-Fault Protection



[dw_7xr8004_connex1, 4, en_US]

Figure 5.7/4 Connection Example for Excitation fed via Slip Rings

(1) The distance between 7XT71 and 7UM85/7UM62 should be as short as possible (to be installed in the same panel). The connections in between shall be laid closely together and twisted or a screened cable should be used.

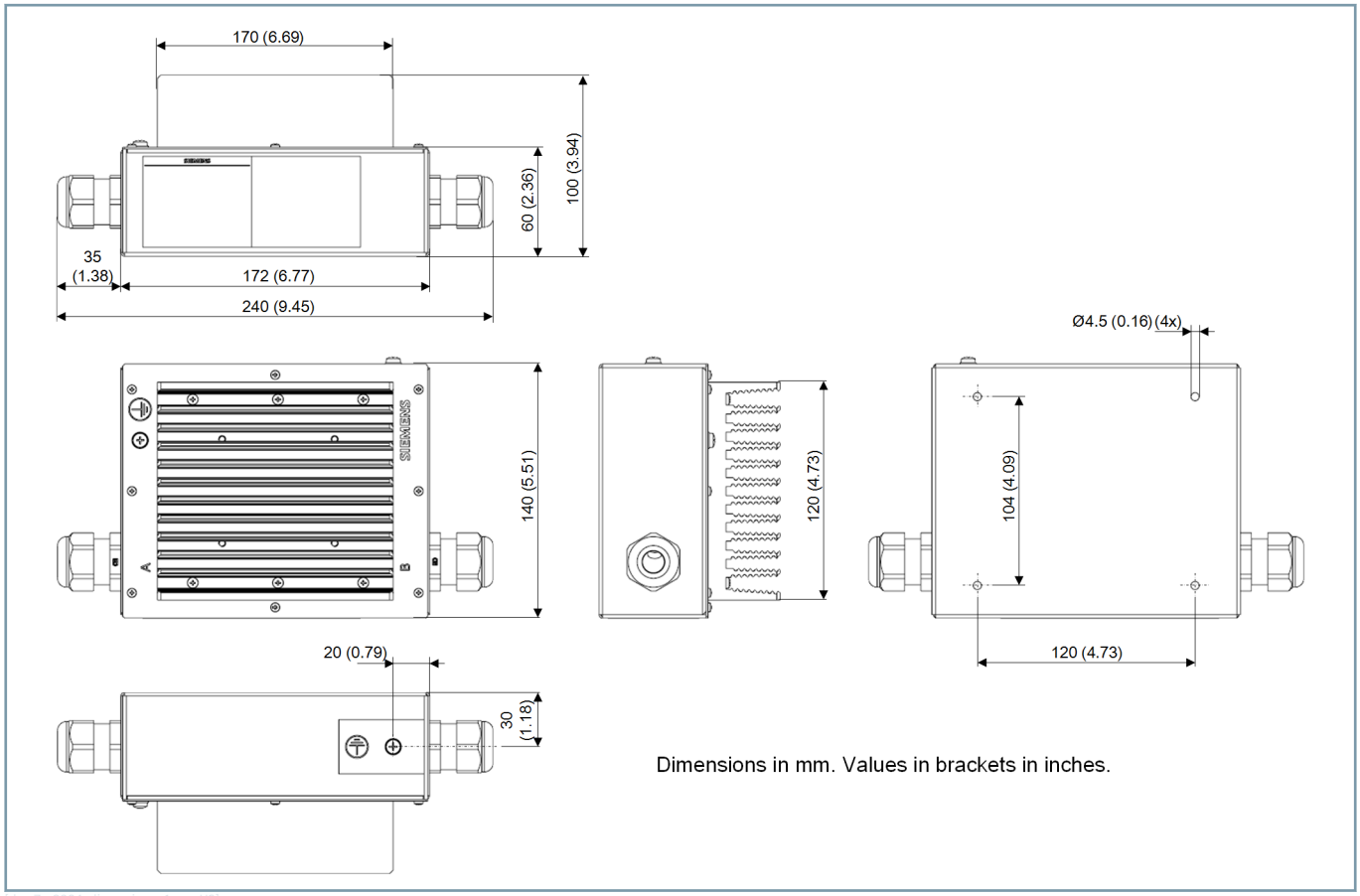


[dw_7xr8004_connex2, 4, en_US]

Figure 5.7/5 Connection Example for Excitation via Rotating Rectifiers

(1) The distance between 7XT71 and 7UM85/7UM62 should be as short as possible (to be installed in the same panel). The connections in between shall be laid closely together and twisted or a screened cable should be used.

Dimensional Drawings



[dw_7xr8004_dimensions, 1, en_US]

Figure 5.7/6 Panel Surface Mounting 7XR8004

Load rating of the capacitive coupling circuit

The 7XR8004 replaces the old 7XR6004. The electrical design stayed mostly the same, but only one connection option is supported (2 x 40 kΩ). The following points are changed/ improved:

- The terminals are designed to support higher excitation voltages, to satisfy the safety requirements and future higher excitation voltages.
- The resistors R1/R2 are dimensioned to allow using the configuration of a maximal excitation voltage (U_{cV}) of DC 2000 V:

  $P_{Rtotal} = U_{cV}^2 / R_{total} = (2000\ V)^2 / 80\ k\Omega = 50\ W$

Description	Value
Max. permissible continuous voltage (2 x 40 kΩ between terminal 1B and 2B)	2000 V RMS (3500 V_{p-p})
Max. continuous dissipated power (R1 + R2)	50 W

Description	Value
Max. permissible continuous voltage (3.3 kΩ between terminal 2A and 3A)	600 V DC
Max. dissipated power (R3) Recovery time 20 min	110 W **(max. 1 min)**
Max. total dissipated power Recovery time 20 min	160 W **(max. 1 min)**

You can find additional routing information and technical data in the **SIPROTEC, coupling unit for generator protection manual** or at *www.siemens.com/accessories*.

Selection and Ordering Data

Description	Order No.												
	1	2	3	4	5	6	7		8	9	10	11	12
Resistance-coupling unit	7	X	R	8	0	0	4	-	0	☐	A	0	0
										▲			
										|			
Housing for panel **surface mounting** with screw connections										B			

5.7

Voltage Divider – 3PP1326/36

Description

The **3PP1326** is a device with wire resistors as voltage dividers (divider ratio is 10:1 or 20:1) for coupling the excitation voltage into the underexcitation protection in the SIPROTEC 7UM62.

The **3PP1336** is a device with wire resistors for the stator ground-fault or rotor ground-fault protection with 50 Hz/60 Hz coupling.

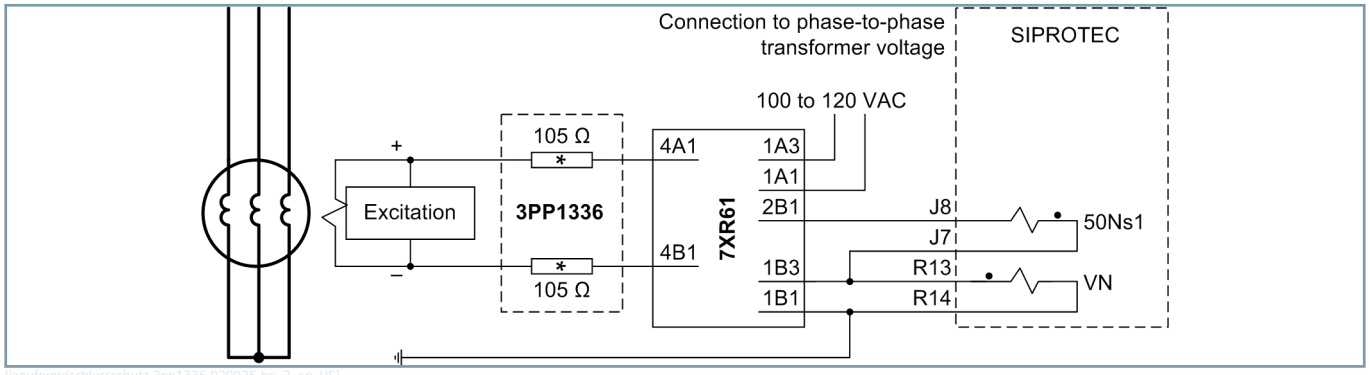
In the -1CZ version, the device is used as a voltage divider (divider ratio is 5:1) for coupling the residual voltage into the stator ground-fault protection of a SIPROTEC 7UM6 device. It is used when the residual voltage is measured in a grounding transformer.

In the -0DZ version, the device has two 105 Ω resistors and is used as a series resistor for the rotor ground-fault protection with 50 Hz/60 Hz coupling in the SIPROTEC 7UM6.



[3PP13_, 1, --]

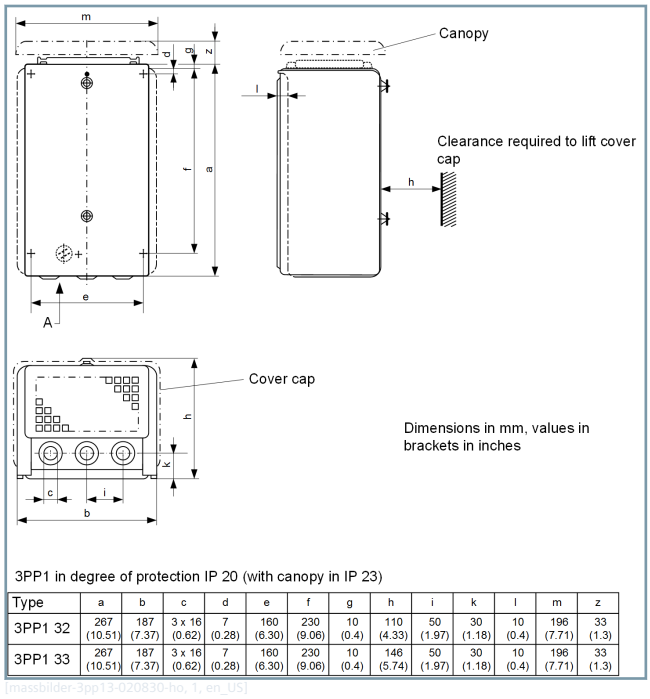
Figure 5.8/1 Voltage Dividers 3PP1326 and 3PP1336



[laeufererdschlussschutz-3pp1336-020925-ho, 2, en_US]

Figure 5.8/2 **Connection Example:** Rotor Ground-Fault Protection with 7XR61 Add-On Device for Voltage Injection of Rotor Circuit with Rated-Frequency Voltage and with 3PP1336 Dropper Resistor

Dimensional Drawings



3PP1 in degree of protection IP 20 (with canopy in IP 23)

Type	a	b	c	d	e	f	g	h	i	k	l	m	z
3PP1 32	267 (10.51)	187 (7.37)	3 x 16 (0.62)	7 (0.28)	160 (6.30)	230 (9.06)	10 (0.4)	110 (4.33)	50 (1.97)	30 (1.18)	10 (0.4)	196 (7.71)	33 (1.3)
3PP1 33	267 (10.51)	187 (7.37)	3 x 16 (0.62)	7 (0.28)	160 (6.30)	230 (9.06)	10 (0.4)	146 (5.74)	50 (1.97)	30 (1.18)	10 (0.4)	196 (7.71)	33 (1.3)

[massbilder-3pp13-020830-ho, 1, en_US]

Figure 5.8/3 Dimensional Drawings, 3PP13

Note:

- 3PP132: for voltage divider 3PP1326-0BZ-K2Y (20: 10: 1)
- 3PP133: for voltage divider 3PP1336-1CZ-K2Y (5: 2: 1) for the series resistor 3PP1336-0DZ-K2Y

Selection and Ordering Data

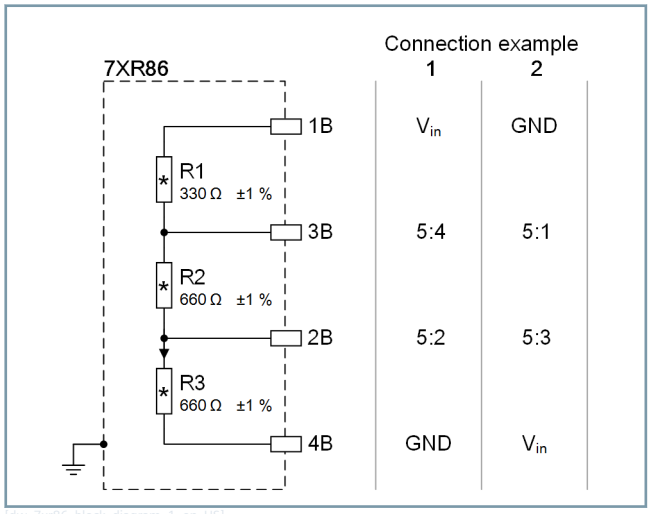
Description		Order no.												
		1	2	3	4	5	6	7		8	9	10	Short code	
Wire resistor GR 3, IP20		3	P	P	1	3	3	6	-	0	D	Z	K	2	Y
Series resistor for rotor ground-fault protection (2 x 105 Ω)	6 cylinders Group: 013002 as a load resistor														
Wire resistor GR 3, IP20		3	P	P	1	3	3	6	-	0	C	Z	K	2	Y
for stator ground fault protection (divider ratio is 5:1)	4 cylinders Group: 013001 as a load resistor														
Wire resistor GR 2, IP20		3	P	P	1	3	2	6	-	0	B	Z	K	2	Y
for underexcitation protection (divider ratio is 20:1)	3 cylinders Group: 012009 as a load resistor														

Voltage Divider – 7XR86 for Stator Ground-Fault Protection

Description

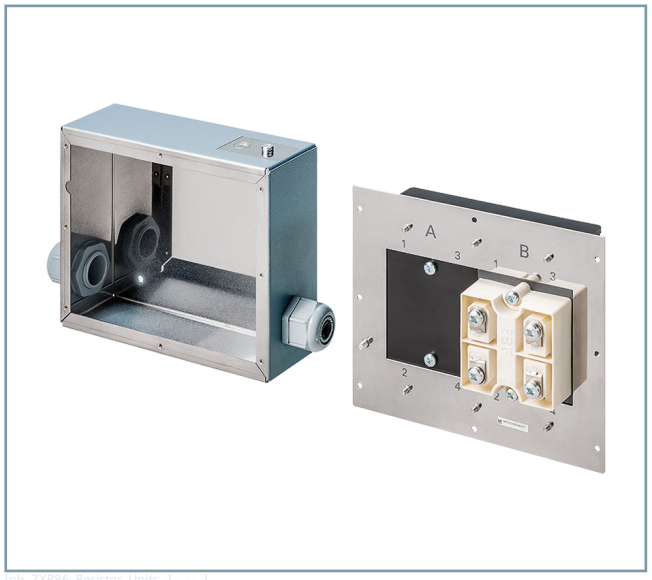
The coupling unit 7XR86 is used for stator ground-fault protection (90 %) in 7UM62/7UM85 machine protection devices. The device substitutes the earlier resistor unit 3PP1336-1CZ-K2Y (5:1, 5:2 voltage divider). 7XR86 and 7XR8004 have an identical design.

Only 7XR8004 resistances are substituted. The voltage divider is required for grounding or point transformer applications with a higher secondary voltage than 200 V (for example, 500 V) of the max. voltage (for example, 100 V) for the voltage inputs of the protection device.



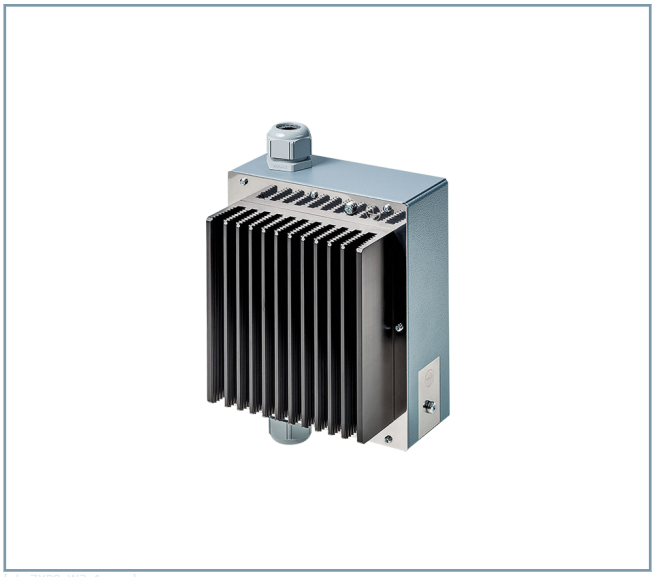
[dw_7xr86_block_diagram, 1, en_US]

Figure 5.8/5 Basic Circuit Diagram of the New 7XR86



[ph_7XR86_Resistor_Units, 1, --_--]

Figure 5.8/6 7XR86 Coupling Unit Connection Terminals



[ph_7XR8_W3, 1, --_--]

Figure 5.8/4 Coupling Unit 7XR86

Dimensional Drawing

See *Figure 5.7/6* Panel Surface Mounting 7XR8004

Load Rating of the Voltage Divider

	Terminals 1B – 4B
Max. permissible continuous voltage	55 V AC Continuous output power 2 W
Max. permissible voltage (60 s)	550 V AC
Max. dissipated power	185 W (max. 60 s, recovery time 600 s)

You can find additional routing information and technical data in the **SIPROTEC, coupling unit for generator protection manual** or at *www.siemens.com/accessories*.

Selection and Ordering Data

Description		Order No.											
		1	2	3	4	5	6	7		8	9	10	11	12
Coupling unit		7	X	R	8	6	0	0	-	0	☐	A	0	0
											▲			
											|			
for stator ground-fault protection	Housing for panel **surface mounting** with screw connections										B			

5.8

Voltage Divider – 7XR87 for Underexcitation Protection

Description

The coupling unit 7XR87 is used for interfacing the excitation voltage generator to the direct current measurement inputs of the 7UM62/7UM85 machine protection devices. Various voltage divider ratios can be converted with the 7XR87 as an additional criterion for underexcitation protection.

This allows the protection device to be optimally adjusted to different excitation voltages. The coupling unit also receives components for reducing harmonic components and transients from the excitation circuit. This device substitutes the earlier 3PP1326-0BZ-K2Y (divider ratio 10:1, 20:1).

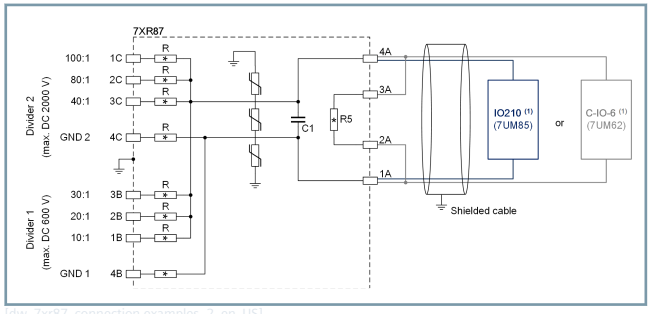
The 7XR87 replaces the 3PP1326 voltage divider. The electrical design was changed compared to the 3PP1326 in order to provide additional divider ratios for higher excitation voltages.

The device provides 6 different voltage dividers ordered in 2 groups with 3 dividers each:

- **Divider 1**: 10:1, 20:1, and 30:1 for a maximum input voltage of DC 600 V
- **Divider 2**: 40:1, 80:1, and 100:1 for a maximum input voltage of DC 2000 V

A capacitor (C1) provides, in combination with the input resistors, a low pass filter for attenuating the ripple of the excitation voltage.

The resistor R5 provides the necessary impedance adaptation for using the C-IO-6 of the SIPROTEC 4 7UM6x protection relay. For the IO210 of the SIPROTEC 5 7UM85, do not connect the resistor R5 (see connection example below).



[dw_7xr87_connection examples, 2, en_US]

Figure 5.8/8 7XR87 Connection Example

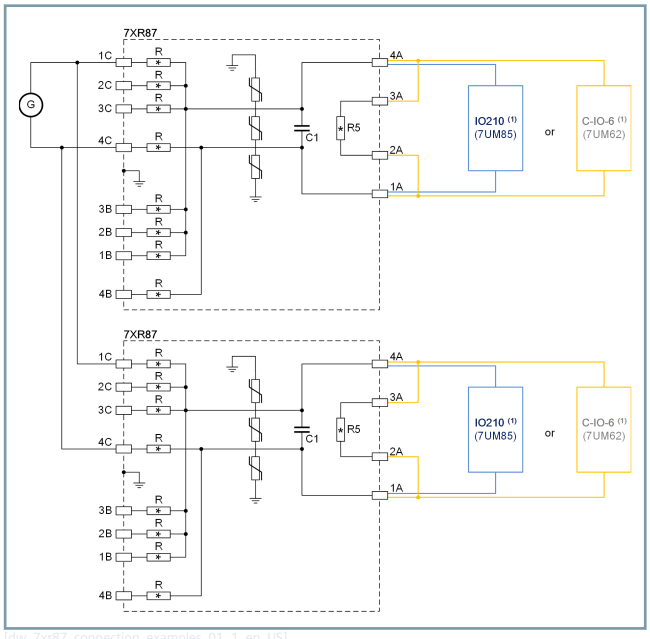
The excitation voltage has to be connected between GND1 or GND2 and the required divider ratio. Use only 1 of the 6 voltage dividers at once.

Only 1 protection relay can be connected at the output. If redundancy is needed, connect two 7XR87 units to the excitation voltage of the generator, see example below.



[ph_7XR87_W3, 1, --_--]

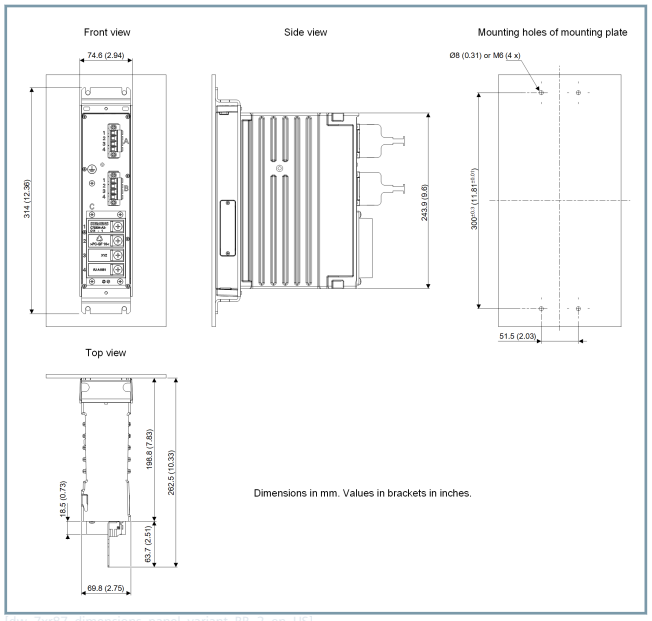
Figure 5.8/7 Coupling Unit 7XR87



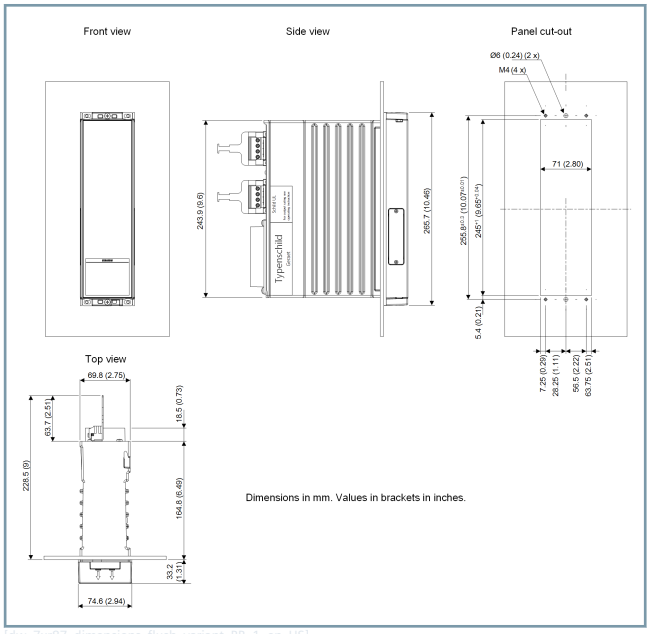
[dw_7xr87_connection_examples_01, 1, en_US]

Figure 5.8/9 7XR87 Redundancy Example

Dimensional Drawings



[dw_7xr87_dimensions_panel_variant_BB, 2, en_US]



[dw_7xr87_dimensions_flush_variant_BB, 1, en_US]

Figure 5.8/10 7XR87 Flush Mounting Dimensions

Load Rating of the Voltage Divider

Description	Value
Max. permissible continuous voltage	2000 V DC (Terminal C); 1000 V DC (UL Rating) 600 V DC (Terminal B)
Max. dissipated power	3.5 W

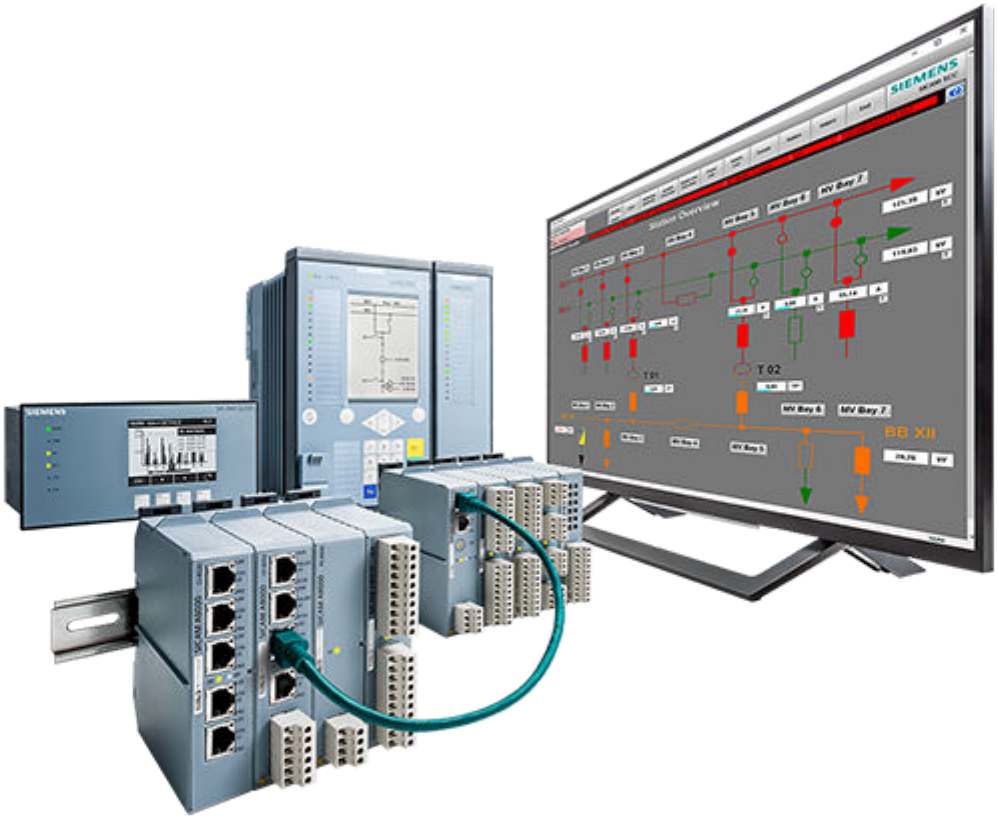
5.8

You can find additional routing information and technical data in the **SIPROTEC, coupling unit for generator protection manual** or at *www.siemens.com/accessories*.

Selection and Ordering Data

Description		Order No.												
		1	2	3	4	5	6	7		8	9	10	11	12
Coupling unit		7	X	R	8	7	0	0	-	0	☐	A	0	0
											▲			
											|			
for underexcitation protection	Housing for panel **surface mounting** with screw connections										B			
	Housing for panel **flush mounting** with screw connections										C			

Voltage Divider – 7XR87 for Underexcitation Protection


SIEMENS
T 02
BB XII

High Impedance Protection Accessories

Auxiliary Units – 7XG15 and 7PG1110-7AE10

Description

7XG15 high impedance component box

High impedance protection operates on the differential current-balance principle. In each zone, the current transformers of the incoming and outgoing circuits are connected together and form a current balance group.

A relay is connected at a convenient point to form a spill circuit. An internal fault upsets the current balance and causes the relay to operate. The system employs one or more relay elements with sensitive current setting and low operating burden.

An external series resistor is used to give each relay element the voltage setting required to ensure stability under through fault conditions. This is the setting or stabilizing resistor.

The resistance of the setting resistor should be sufficient to ensure the effective setting voltage exceeds the voltage developed by a through fault with one CT fully saturated.

The current setting of the 7SR23 may be adjusted to achieve the desired primary operating current.

Non-linear resistors (e.g. Metrosils) are used to protect the relay components, the insulation of secondary wiring and current transformers, by suppressing high voltage peaks which may otherwise be developed by the current transformer secondary winding under internal fault conditions.

Resistors and non-linear resistors are fitted on a per phase basis.

The resistors and non-linear resistors may be fitted as discrete components; however the high impedance component box 7XG15 contains these items within a 4U high, size E6 relay enclosure.

7PG1110-7AE10 CT shorting relay

CT Ssupervision and shorting: Unbalance in any current-balance group due to an open-circuited current transformer, the primary of which is carrying load current, produces a voltage across the relay circuit. This causes a spill current to flow and leads to instability of the protection. This condition is monitored using a sensitive element, either within the main protection relay or as a stand alone device.

CT supervision is especially recommended for protections applied to High Voltage switchgear and for schemes at all voltages where current transformers are switched to accommodate different busbar arrangements.



[sc_7SR23_Auxiliary, 1, --_--]

Figure 6.1/1 7XG15 and 7PG1110-7AE10

When an unbalance is detected, the alarm element is used to operate a suitably rated CT shorting relay, which will prevent any protection maloperation. The relay is arranged to short circuit the CT secondary wiring, diverting current from the protection relay and preventing its operation.

The 7PG1110-7AE10 (AR901) CT shorting relay is such a device, its contacts are rated to carry in excess of 50 A for three seconds, which is suitable for the majority of installations.

This relay is supplied in a 4U, size E2 relay enclosure.

Applications

Auxiliary units for high impedance busbar and auto transformer protection.

Used in conjunction with the 7SR23 high impedance protection relay, the high impedance component box 7XG15 and its associated CT shorting relay 7PG1110-7AE10 provides a complete, panel mounted solution for the provision of high impedance protection.

Features of the system include: CT supervision using elements within the 7SR23.

Provision of test points on the front panel of the component box.

CT shorting on the detection of a CT fault, and whenever a protection operation occurs. This limits the dissipation of the resistor and metrosil networks within the protection panel.

Connection diagrams

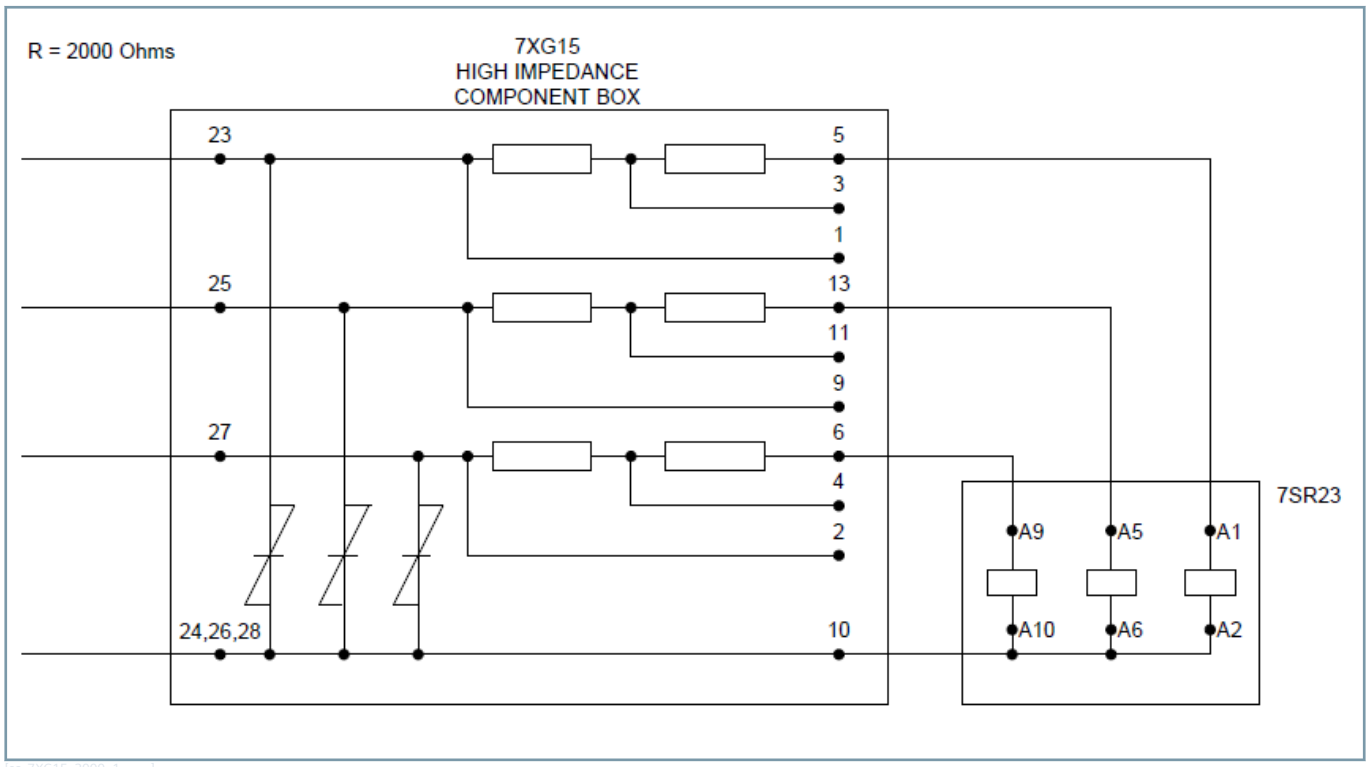


Figure 6.1/2 7XG15 high impedance component box - 2000 Ohms

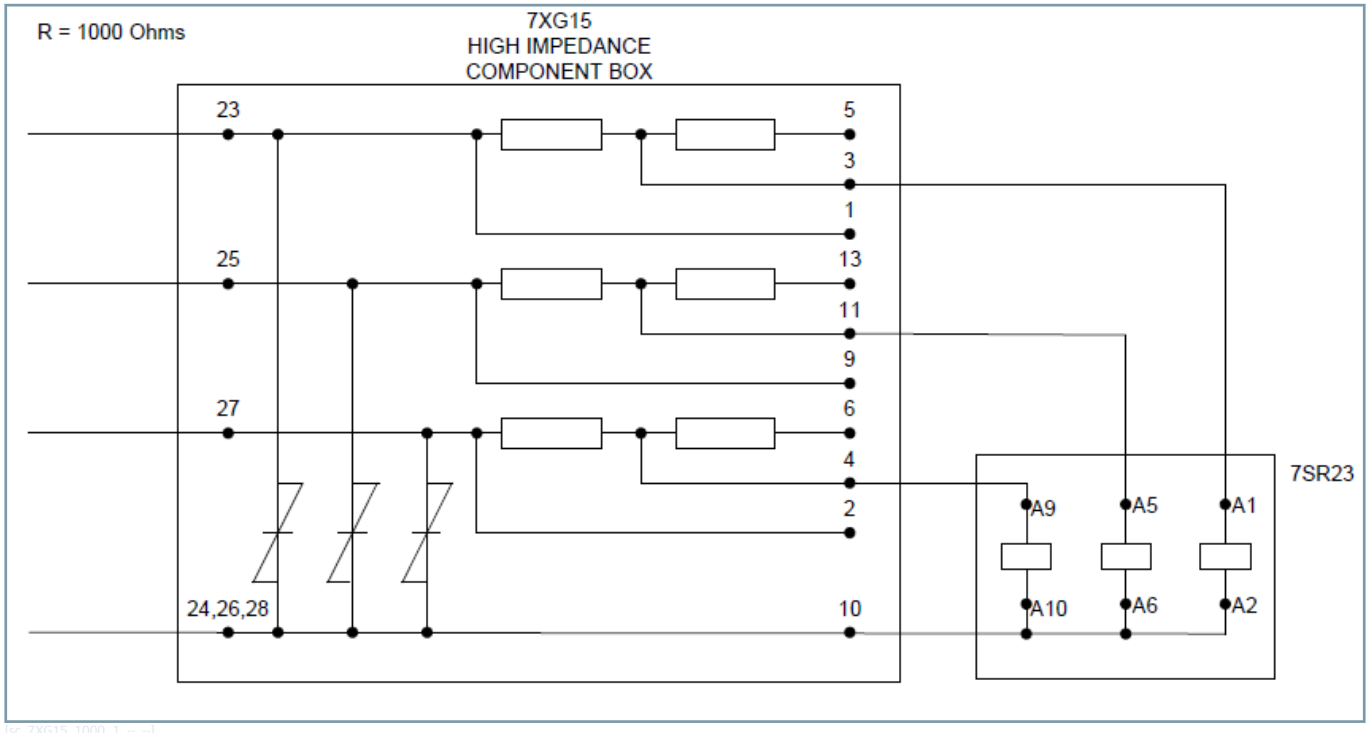


Figure 6.1/3 7XG15 high impedance component box - 1000 Ohms

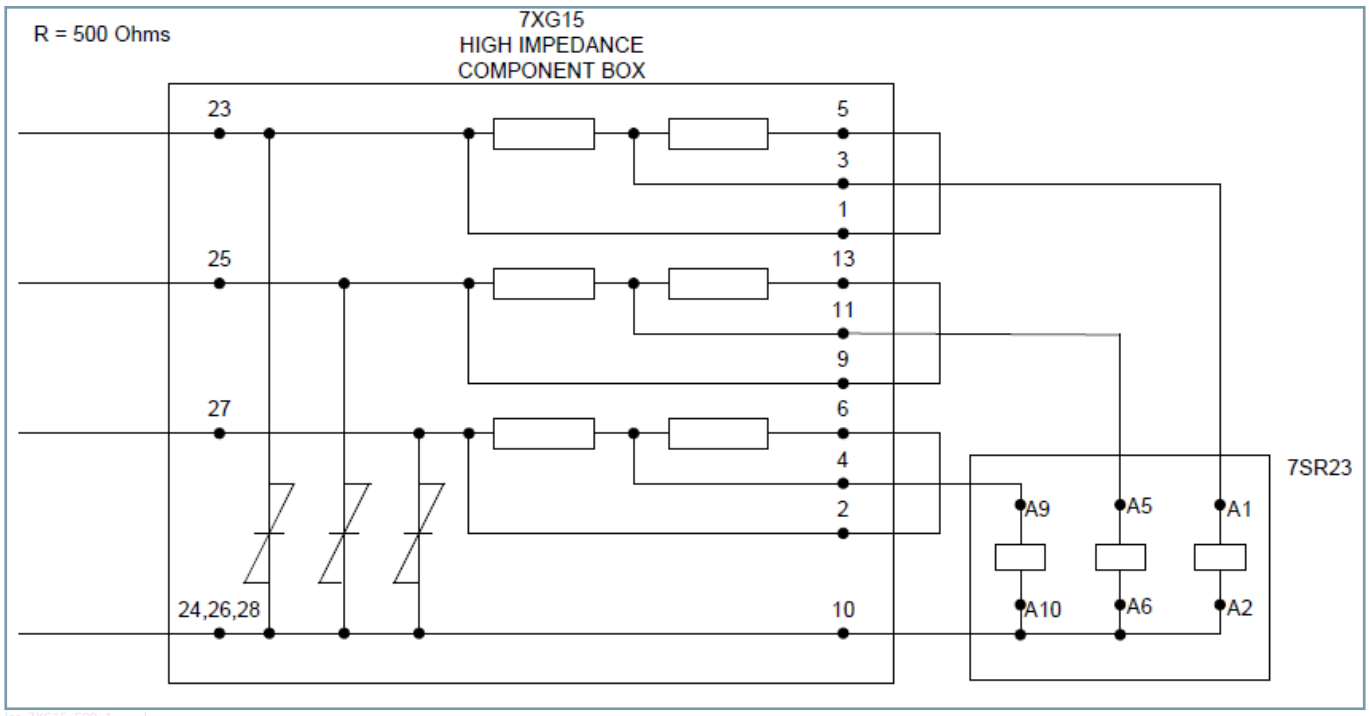


Figure 6.1/4 7XG15 high impedance component box - 500 Ohms

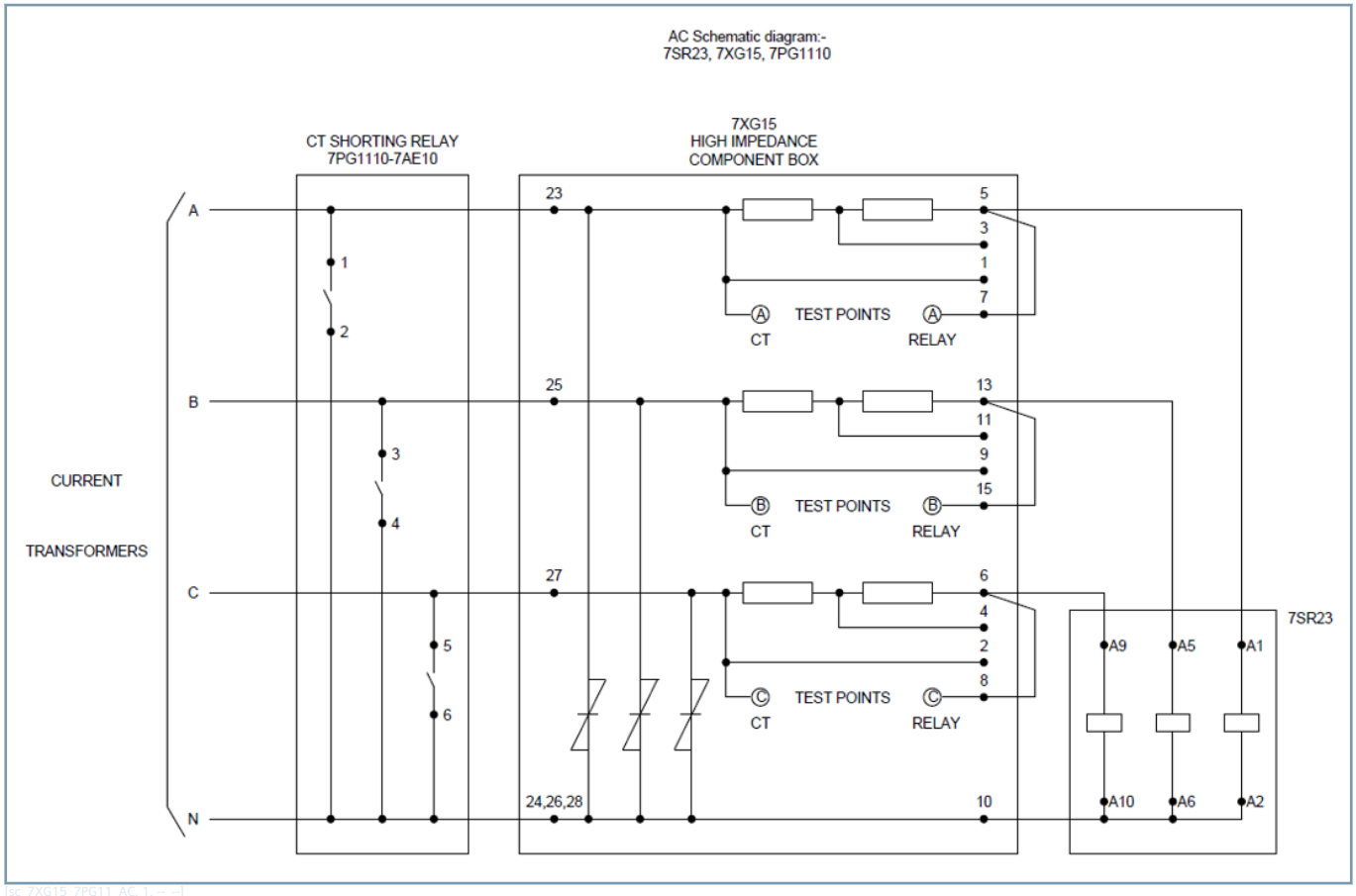


Figure 6.1/5 7SR23, 7XG15, 7PG1110 AC schematic diagram

NOTE

7SR23 DAD connections to the 7XG15 unit are correct for a setting resistance of 2000 Ohms. These connections must be varied on the 7XG15 unit where the alternative values of 1000 or 500 Ohms are required for a given application.

The CT shorting relay and the 7XG15 unit are both fitted with case shorting contacts. In the event that either device is withdrawn, the current transformers are automatically short circuited and indication is given by the 7SR23.

The 7XG15 unit is designed to be used in conjunction with the 7PG11 CT shorting relay. Do not use the 7XG15 unit without a CT shorting relay, or with alternative scheme connections.

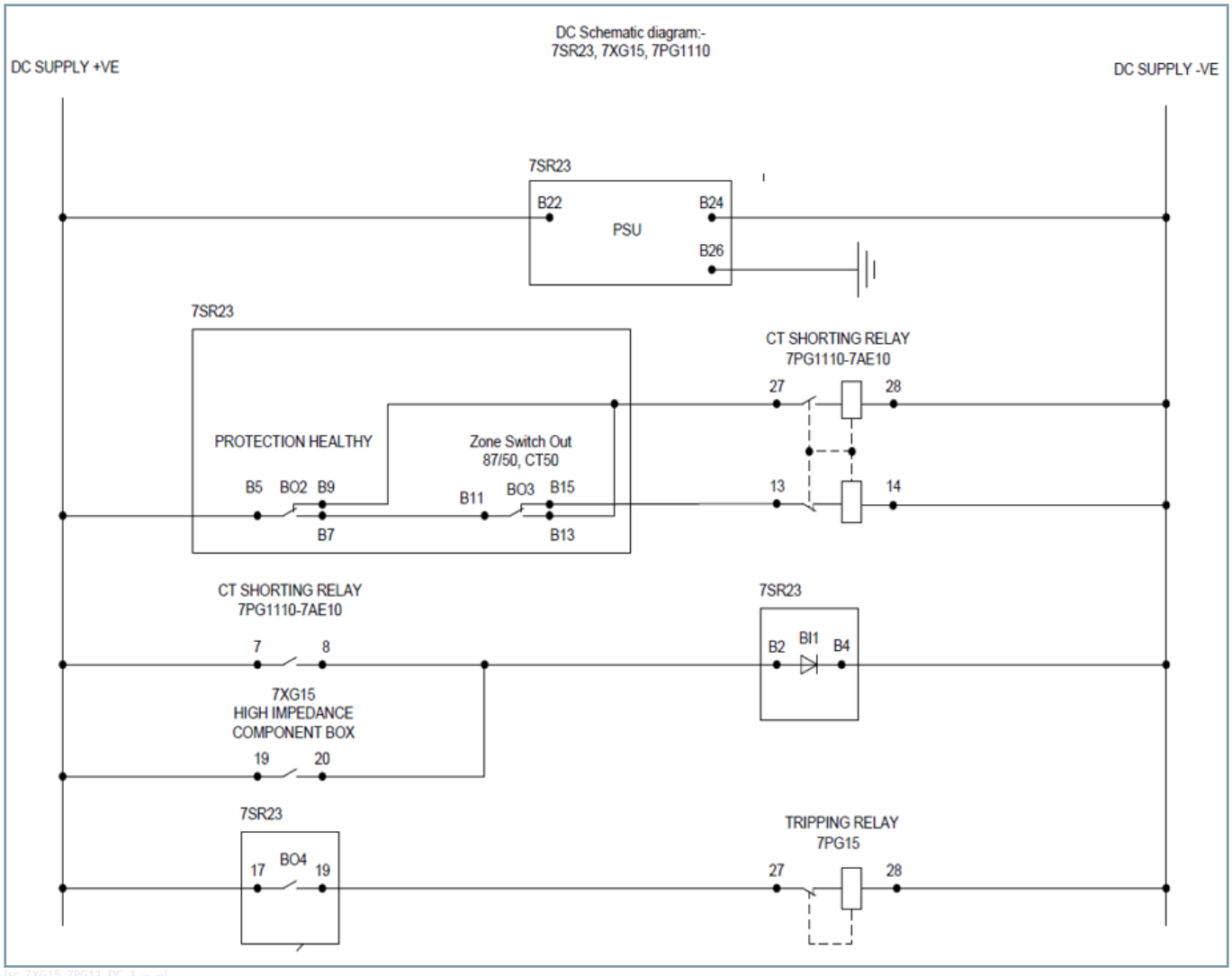


Figure 6.1/6 7SR23, 7XG15, 7PG1110 DC schematic diagram

NOTE

The rated DC voltage of the CT shorting relay and the 7SR23 DAD (power supply and binary inputs) must be compatible with the available auxiliary supply.

On the 7SR23, binary input 1 must be suitably mapped to provide a self –reset LED indication that the CT shorting relay is operated, and the protection is temporarily out of service (until the CT shorting relay resets).

The CT shorting relay and the 7XG15 unit are both fitted with case shorting contacts. In the event that either device is withdrawn, the current transformers are automatically short circuited and indication is given by the 7SR23.

Binary outputs on the 7SR23 are to be mapped as indicated. This is to allow automatic operation of the CT shorting relay as required by the scheme.

BO3 must be configured as hand reset. The protection is reset from the keypad on the 7SR23, this will also reset the CT shorting relay and indication.

CB trip is to be via a latched trip relay.

Technical data

7XG15	
Stabilising resistor values	2000, 1000, or 500 Ω
Non-linear resistor	C = 1000, B = 0.22 to 0.25
Pressure tests	2 kV for 1 minute between phases, and all circuits to earth
Shock, bump, vibration, and seismic tests	IEC 60255-21-1,2,3

7PG1110-7AE10	
Make and carry for 3 s	50 A
Break	300 VA within the limits of 250 V and 5 A

Cases

Modular Cases	
7PG1110-7AE10 relay	E2
7XG15 high impedance component box	E6

Determination of stability

The stability of a current balance scheme using a high impedance relay circuit depends upon the relay voltage setting being greater than the maximum voltage which can appear across the relay under a given through fault condition.

This maximum voltage can be determined by means of a simple calculation which makes the following assumptions

- One current transformer is fully saturated making its excitation impedance negligibl.
- The resistance of the secondary winding of the saturated CT together with the leads connecting it to the relay circuit terminals constitutes the only burden in parallel with the relay
- The remaining current transformers maintain their ratio

Thus the required relay operating voltage is given by:

$$V_S \geq I_F (R_{CT} + R_L) \cdot T$$

[fo_function87GHApplication&SettingsFunction1, 1, en_US]

Where:

V_s = Relay circuit setting voltage

R_L = The largest value of pilot loop resistance between the CT and the relay circuit terminals.

R_{CT} = The secondary winding resistance of the CT.

I_F = The CT secondary current corresponding to the maximum steady-state through-fault current of the protected equipment.

T = Turns ratio of all current transformers (Primary turns/Secondary turns)

Method of establishing the value of relay setting resistors.

To give the required voltage setting the relay operating level is adjusted by means of an external series resistor as follows:

$$R_{STAB} = \frac{V_S}{I_S}$$

[fo_function87GHApplication&SettingsFunction4, 1, en_US]

Where:

R_{STAB} = Resistance of the stabilising resistor

V_s = Relay circuit setting voltage

I_s = Relay setting current

Fault setting

The fault setting of a current –balance protection using a high impedance relay circuit can be calculated in the usual manner. It should, however, be noted that because the operating voltage of the relay circuit is relatively high, the excitation currents of the CTs in parallel with the relay may comprise a large portion of the fault setting.

Thus, if I_s = the relay setting current, and I1, I2, I3 etc are the excitation currents of the CTs at the setting voltage, and T is the CT turns ratio then Primary Operating Current = (I_s +I1+I2+I3)xT

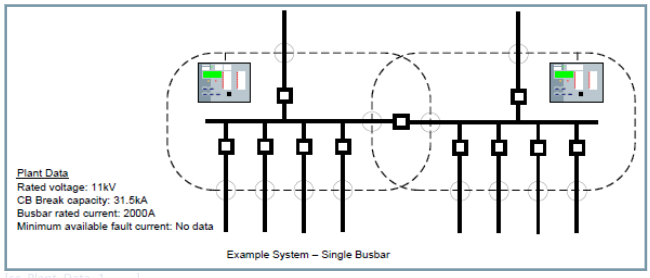
Current transformer requirements

The basic requirements are:

- All CTs should have identical turns ratios
- The knee point voltage of the current transformers should be at least twice the relay setting voltage. The knee point voltage is expressed as the voltage applied to the secondary circuit of a current transformer which when increased by 10 % causes the magnetising current to increase by 50 %.
- The current transformers should be of the low leakage reactance type to IEC 60044 class PX. Generally most modern current transformers are of this type and there should be no difficulty in meeting this requirement. Low leakage reactance current transformers have a jointless core with the secondary winding evenly distributed along the whole length of the magnetic circuit, and the primary conductor passes through the centre of the core.

See also the 7SR23 relay manual, applications section. (Chapter 7, Section 3)

Example: 3-pole differential busbar protection



[sc_Plant_Data, 1, --_--]

Setting requirements

Assigned through fault current (rated stability limit) = 31.5 kA

(CB break capacity)

Required Fault Setting (Primary Operate Current)

- Approximately 50 % of busbar rating, or
- 10 to 30 % of minimum fault current available, or
- As specified by the user

From the supplied plant data a primary operate current (POC) of 1000 A is chosen.

CT and connection details	
Turns ratio (T)	1/2000
Voltage knee point (V_K)	600 V
Magnetising current (I_{mag}) @ V_K	100 mA
CT secondary resistance (R_{CT})	10 Ω
CT lead loop resistance (R_L)	0.15 Ω max

7SR23 relay	
87/50-1 Element	Enabled
87/50-1 Current setting	0.365 A
87/50-1 Delay setting	0 s
CT50 Element	Enabled
CT50 Setting	0.02 A
CT50 Delay	3 s

Auxiliary component box	
R_{STAB}	500 Ω
Metrosil	75 mm, c = 1000

Control scheme settings for 7SR23	
Protection healthy	BO2
87/50-1 Operated	BO3
CT50 Operated	BO3
Zone switch out	BO3
BI 1 Operated	L8
Self reset LED	L8 (L8 to be marked as " CT Shorting Relay Operated ")
BO3 Minimum operate time	5 s

High Impedance Protection Accessories

Auxiliary Units – 7XG15 and 7PG1110-7AE10

Ordering information - 7PG111 auxiliary relay (AR901)

Product description	Order no.																	
	1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16
Auxiliary relay (AR901)	7	P	G	1	1	1	0	-	7	A	E	1	0	-	0	A	□	0
						|	|		|	|	|	|	|		|	|	|	|
DC voltage operated relay						|	|		|	|	|	|		|	|	|	|
Number of elements						|	|		|	|	|	|		|	|	|	|
Single element						1	|		|	|	|	|	|		|	|	|	|
							|		|	|	|	|	|		|	|	|	|
Type of flag							|		|	|	|	|		|	|	|	|
No flag							0		|	|	|	|		|	|	|	|
									|	|	|	|		|	|	|	|
Contact operation									|	|	|	|		|	|	|	|
CT shorting contacts									7	|	|	|	|		|	|	|	|
										|	|	|	|		|	|	|	|
Contact arrangement – NO										|	|	|	|		|	|	|	|
0 NO										A	|	|	|		|	|	|	|
											|	|	|		|	|	|	|
Contact arrangement – NC											|	|	|		|	|	|	|
4 NC											E	|	|		|	|	|	|
												|	|		|	|	|	|
Number of contacts												|	|		|	|	|	|
Four												1	|		|	|	|	|
													|		|	|	|	|
Contact type													|		|	|	|	|
NO (Standard)/NC (Standard)													0		|	|	|	|
															|	|	|	|
Time delay															|	|	|	|
No additional time delay															0	|	|	|
																|	|	|
Housing size																|	|	|
Case size E2 (4U high)																A	|	|
																	|	|
Voltage rating																	|	|
DC 30 V																	C	|
DC 50 V																	D	|
DC 125 V																	F	|
DC 240 V																	H	|
																		|
Back EMF suppression diode																		|
Not fitted																		0

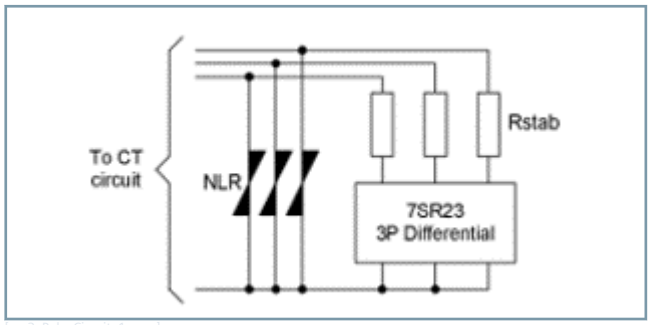
Ordering information - 7XG15 high impedance component box

Product description	Order no.																
	1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16
Component box	7	X	G	1	5	2	0	-	3	A	A	0	0	-	0	D	A	0
						|	|		|	|						|		
Setting resistor and metrosil unit for 7SR23 **High impedance protection**						|	|		|	|						|		
Disc size, number of phases						|	|		|	|						|		
Three inch, single phase						2	|		|	|							|		
							|		|	|							|		
B value							|		|	|							|		
0.22 to 0.25							0		|	|								|		
									|	|							|		
C value									|	|							|		
1000									3	|								|		
										|								|		
Resistors										|								|		
2000/1000/500 Ohm										A								|		
Case size E6 (4U high)																		D		

Description

The stability of the high impedance differential protection scheme is ensured because the applied operate voltage setting is greater than the maximum voltage that can appear across the relay circuit under through fault conditions. An external series stabilising resistor (R_{STAB}) is installed to provide a relay circuit operate voltage above that required to guarantee stability.

For more information on the calculating of stabilising resistor value, you can find detailed calculations in the 7SR23 device manual.

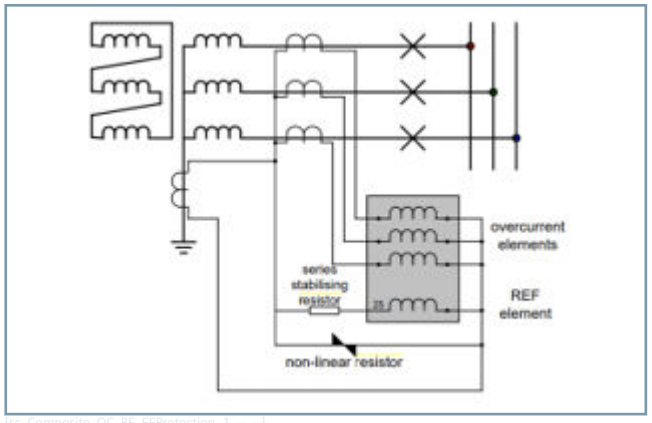


[sc_3_Pole_Circuit, 1, --_--]

Figure 6.2/1 3-pole differential relay circuit

Restricted Earth Protection (REF); an external stabilising resistor in series connected with a relay current circuit to limit the overvoltage developed across the high impedance components during internal faults to a 'safe' voltage level and stability.

For more information on the calculating of stabilising resistor value, you can find detail calculations in the device manuals.



[sc_Composite_OC_RE_EFProtection, 1, --_--]

Figure 6.2/2 Composite overcurrent and restricted earth fault protection



[sc_Resistors_Bracket, 1, --_--]

Figure 6.2/3 Resistors with bracket

Ordering information - protection resistors

18 W power rating resistors	
5 Ω	VCE: 2101H10050
100 Ω	VCE: 2101H10101

18 W power rating resistors	
1000 Ω	VCE: 2101H10102
1500 Ω	VCE: 2101H10152

Table 6.2/1 Wire wound resistors complete with bracket

30 W power rating resistors	
3000 Ω	VCE: 2103C99044

Table 6.2/2 Resistors 10 % adjustable with mountings

40 W power rating resistors	
60 Ω	VCE: 2103C99038
250 Ω	VCE: 2103C91053

Table 6.2/2 Resistors 10 % adjustable with mountings

45 W power rating resistors	
1500 Ω	VCE: 2103C91093

Table 6.2/2 Resistors 10 % adjustable with mountings

60 W power rating resistors	
480 Ω	VCE: 2103C91127
2000 Ω	VCE: 2103C91161
2700 Ω	VCE: 2103C91142

Table 6.2/2 Resistors 10 % adjustable with mountings

90 W power rating resistors	
90 Ω	VCE: 2103C91149
470 Ω	VCE: 2103C91162
500 Ω	VCE: 2103C91164
600 Ω	VCE: 2103C99043
1000 Ω	VCE: 2103C91083
1150 Ω	VCE: 2103C91051
1800 Ω	VCE: 2103C99046
2000 Ω	VCE: 2103C91135
2750 Ω	VCE: 2103C91022
4700 Ω	VCE: 2103C91153
8000 Ω	VCE: 2103C91141

Table 6.2/2 Resistors 10 % adjustable with mountings

130 W power rating resistors	
250 Ω	VCE: 2103C91139
2750 Ω	VCE: 2103C91035
6000 Ω	VCE: 2103C91138
6800 Ω	VCE: 2103C91160
10000 Ω	VCE: 2103C91144

Table 6.2/2 Resistors 10 % adjustable with mountings

150 W power rating resistors	
550 Ω	VCE: 2103C91133

Table 6.2/2 Resistors 10 % adjustable with mountings

180 W power rating resistors	
47 Ω	VCE: 2103C91151
220 Ω	VCE: 2103C91152
300 Ω	VCE: 2103C91128
500 Ω	VCE: 2103C91129
1000 Ω	VCE: 2103C91130
1500 Ω	VCE: 2103C91131
1800 Ω	VCE: 2103C91158
2000 Ω	VCE: 2103C91159
2300 Ω	VCE: 2103C91134
2700 Ω	VCE: 2103C91125
3000 Ω	VCE: 2103C91132
4000 Ω	VCE: 2103C91146
6500 Ω	VCE: 2103C91145
15000 Ω	VCE: 2103C91154

Table 6.2/2 Resistors 10 % adjustable with mountings

220 W power rating resistors	
15 Ω	VCE: 2103C91067
170 Ω	VCE: 2103C91147
220 Ω	VCE: 2103C91156
250 Ω	VCE: 2103C91157
350 Ω	VCE: 2103C91163
22000 Ω	VCE: 2103C91155

Table 6.2/2 Resistors 10 % adjustable with mountings

320 W power rating resistors	
820 Ω	VCE: 2103C91148
1150 Ω	VCE: 2103C91050
2700 Ω	VCE: 2103C91143

Table 6.2/2 Resistors 10 % adjustable with mountings

380 W power rating resistors	
300 Ω	VCE: 2103C91150

Table 6.2/2 Resistors 10 % adjustable with mountings

90 W power rating resistors	
35 Ω	VCE: 2103C91124
100 Ω	VCE: 2103C99047
800 Ω	VCE: 2103C91126

Table 6.2/3 Resistors 5 % adjustable with mountings

180 W power rating resistors	
10000 Ω	VCE: 2103C99054

Table 6.2/3 Resistors 5 % adjustable with mountings

320 W power rating resistors	
250 Ω	VCE: 2103C91137
1000 Ω	VCE: 2103C91068

Table 6.2/3 Resistors 5 % adjustable with mountings

45 W power rating resistors	
100 Ω	VCE: 2103C91120
500 Ω	VCE: 2103C91014
1000 Ω	VCE: 2103C91008
2500 Ω	VCE: 2103C91165

Table 6.2/4 Resistors 10 % adjustable with reverse mountings

90 W power rating resistors	
4500 Ω	VCE: 2103C91117

Table 6.2/4 Resistors 10 % adjustable with reverse mountings

130 W power rating resistors	
200 Ω	VCE: 2103C91003
300 Ω	VCE: 2103C91004
620 Ω	VCE: 2103C91005
2700 Ω	VCE: 2103C91006
7500 Ω	VCE: 2103C91123

Table 6.2/4 Resistors 10 % adjustable with reverse mountings

150 W power rating resistors	
1000 Ω	VCE: 2103C91122

Table 6.2/4 Resistors 10 % adjustable with reverse mountings

45 W power rating resistors	
50 Ω	VCE: 2103C91116

Table 6.2/5 Resistors 5 % adjustable with reverse mountings

130 W power rating resistors	
1000 Ω	VCE: 2103C91108
1250 Ω	VCE: 2103C91099
1500 Ω	VCE: 2103C91106
3000 Ω	VCE: 2103C91095
4000 Ω	VCE: 2103C91096

Table 6.2/5 Resistors 5 % adjustable with reverse mountings

180 W power rating resistors	
9000 Ω	VCE:2103C91113
10000 Ω	VCE:2103C91115

Table 6.2/5 Resistors 5 % adjustable with reverse mountings

High Impedance Protection Accessories

Metrosils – Metrosil 7XG14

Description

Metrosil is a semi-conducting material with the property that its electrical resistance depends on the applied voltage. Resistors made from Metrosil are thus termed "voltage dependent resistors" or varistors.

Metrosil varistors are made by mixing silicon carbide with ceramic binder, pressing in a mould to the required shape, usually a disc, then firing at a high temperature, in closely controlled conditions. After firing , the faces of the disc are metal sprayed to give good electrical contact, and connection is made by either clamping the disc between the metal plates, or (in smaller sizes) by soldering wires to the metal sprayed faces.

Metrosil specification

By varying the composition and processing conditions involved in the manufacture of Metrosil discs, a broad spectrum of electrical characteristics can be achieved.

Metrosil identification

Each Metrosil resistor type is identified by a series of letters and numbers, thus: A-B/C/D/E, where:

- A refers to the nominal disc diameter in inches
  - 37 = 0.37 inches (10 mm)
  - 100 = 1.00 inches (25 mm)
  - 175 = 1.75 inches (45 mm)
  - 300 = 3.00 inches (75 mm)
  - 600 = 6.00 inches (150 mm)
- B refers to the type of disc
  - A = annular
  - P = plain
  - E = embossed
  - D = dished
- C refers to the type of mounting and number of discs per assembly
  - S = Standard stud mounting
  - F = Standard stud mounting with cooling fins (300-A)
  - ES = stud mounting electronic type (100-A and 175-A)
  - W = Wired disc
- D indicates the type of connection in the assembly
  - S = all discs in series
  - P = all discs in parallel
  - I = all discs insulated from each other
  - CT = centre tapped
  - E is the electrical specification number

Item D may be omitted for single disc assemblies and items C and D will not be needed for loose discs.

Example: 300-A/S3/P/860 specifies three 3 inch (75 mm) diameter annular discs stud mounted and connected in parallel, each disc to specification no. 860.

Series 300-A and 600-A

This data sheet describes the largest Metrosil voltage dependent resistor discs, having diameters up to 150 mm. The product range is concentrated on two basic discs: the 300-A, an annual disc with our outer diameter of 75 mm; and the 600-A, with outer diameter of 150 mm. In addition a range of 400-A (100 mm) series discs is available to special order.



[sc_7XG14; 1, --_--]

Figure 6.3/1 7XG14 Metrosil non-linear resistor for high impedance schemes

Both 300-A and 600-A types are supplied discs assemblies. The standard assembly utilities a central stud which holds the discs and their contact plates as necessary for connections, and the whole assembly is carefully tightened to a torque which gives good electrical contract without damaging the discs.

Applications

Most of the applications of Metrosil make use of its nonlinear properties to provide an "electric safety valve" for protecting equipment and insulation from the effects of overvoltages.

Protection of field coils, contactor coils, relay coils and solenoids.

When an inductive DC current is broken suddenly, there is a transient rise in voltage across the inductance which can be 10 to 20 times the supply voltage and may damage insulation or circuit components. The source of this overvoltage is the energy which is stored in the magnetic field of the inductance at the moment of switching off.

It is therefore essential to provide some means for this energy to dissipate itself harmlessly. This can be achieved by connecting a discharge resistor across the inductive coil. At the instant when the circuit is broken, the current, briefly held constant by the inductance of the coil, is diverted through the resistor and rapidly decays to zero. The voltage across the coil is therefore limited to the voltage necessary to pass the coil current through the resistor, the value of which is so chosen that the voltage is a safe one. This transient voltage reduction is illustrated by the oscillograms. If an ordinary linear resistor is used and it is permanently connected across the coil, there will be a continuous waste of power at normal voltage. If the resistor is inserted just before the circuit is broken, additional contacts and wiring will be required. A Metrosil resistor on the other hand can be permanently connected across the coil, and yet will consume at normal voltages only a fraction of the power taken by the ordinary resistor.

Metrosil discharge resistors can be supplied for all AC and DC voltages and for use with almost any inductive device such as contactor, clutch and brake coils, relay coils and solenoids, electromagnets and the fields of motors, generators and alternators of all sizes.

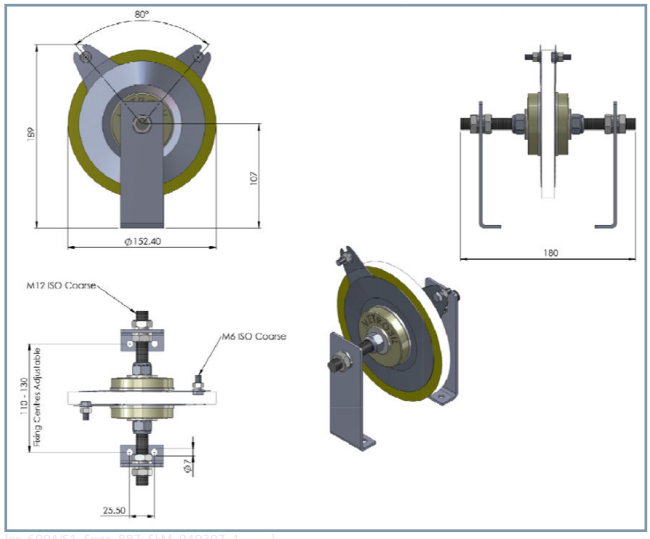
Dimension drawings

Single phase	
MLFB No.	**Reference and drawing**
7XG1430-3AA00-0AA0	600A/S1 Spec 887 SkM 940307
7XG1410-3AA00-0AA0	300A/S1 Spec 646 SkM 900926
7XG1410-2AA00-0AA0	300A/S1 Spec 3198 SkM 900926
7XG1410-1AA00-0AA0	300A/S1 Spec 431 SkM 900926
7XG1430-1AA00-0AA0	600A/S1 Spec 256 SkM 940307
7XG1430-2AA00-0AA0	600A/S1 Spec 1088 SkM 940307

Table 6.3/1 Reference table

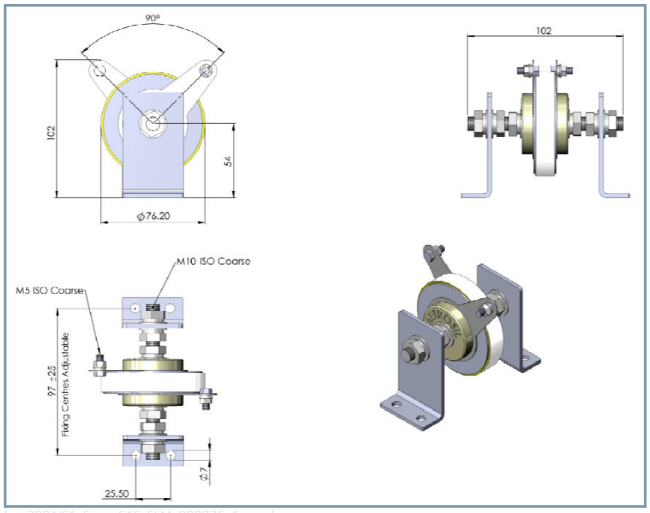
Three phase	
MLFB No.	**Reference and drawing**
7XG1440-3AA00-0AA0	600A/S3/I Spec 887 A3_3398410
7XG1420-3AA00-0AA0	300A/S3/I Spec 3063 SkM 800730
7XG1420-2AA00-0AA0	300A/S3/I Spec 3152 SkM 800730
7XG1420-1AA00-0AA0	300A/S3/I Spec 1030 SkM 800730 but 152 mm stud length
7XG1440-1AA00-0AA0	600A/S3/I Spec 802 A3_3398410
7XG1440-2AA00-0AA0	600A/S3/I Spec 1195 A3_3398410

Table 6.3/1 Reference table



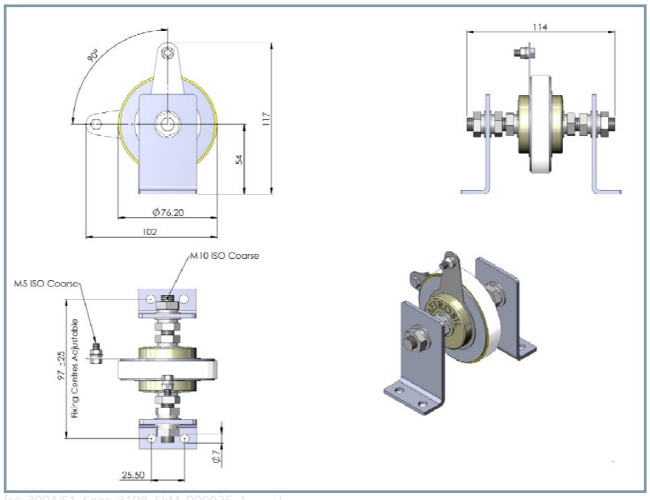
[sc_600A/S1_Spec_887_SkM_940307, 1, –_–]

Figure 6.3/2 600A/S1 Spec 887 SkM 940307



[sc_300A/S1_Spec_646_SkM_900926, 1, –_–]

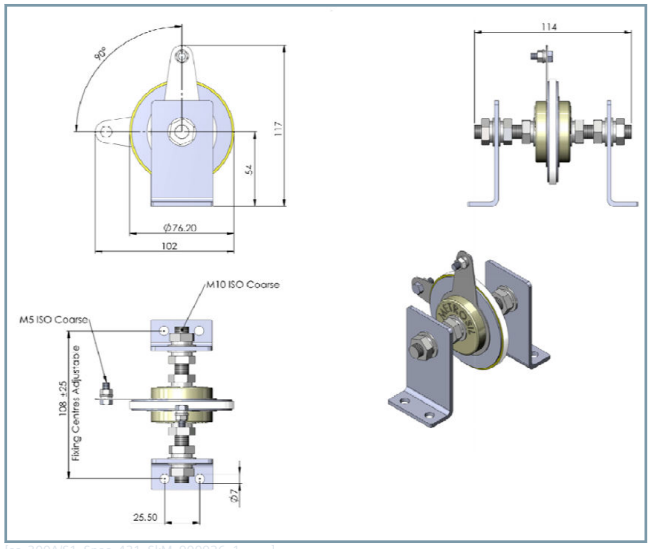
Figure 6.3/3 300A/S1 Spec 646 SkM 900926



[sc_300A/S1_Spec_3198_SkM_900926, 1, –_–]

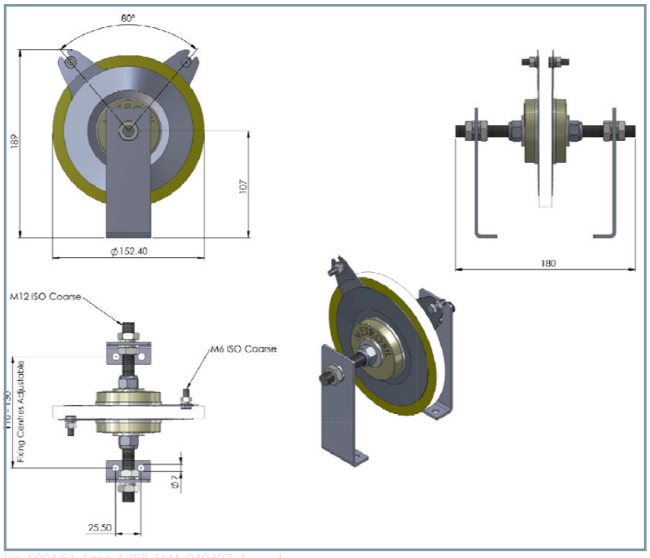
Figure 6.3/4 300A/S1 Spec 3198 SkM 900926

6.3



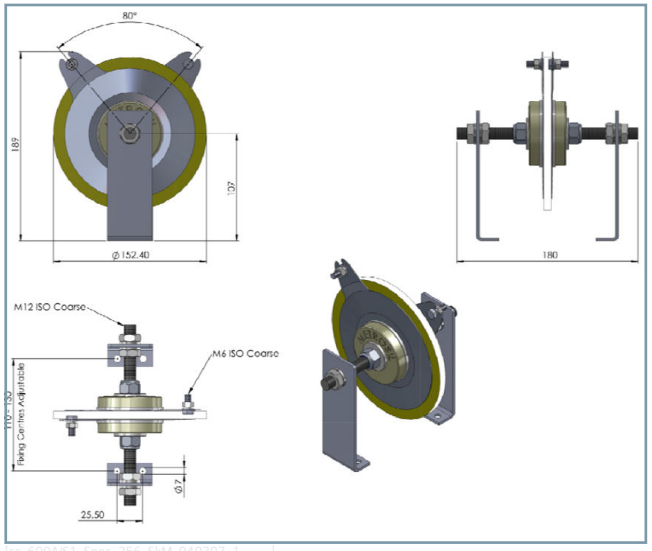
[sc_300A/S1_Spec_431_SkM_900926; 1; –_–]

Figure 6.3/5 300A/S1 Spec 431 SkM 900926



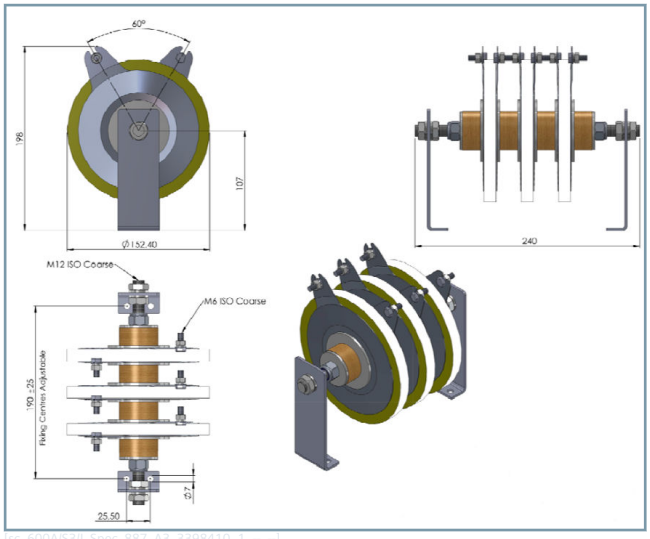
[sc_600A/S1_Spec_1088_SkM_940307; 1; –_–]

Figure 6.3/7 600A/S1 Spec 1088 SkM 940307



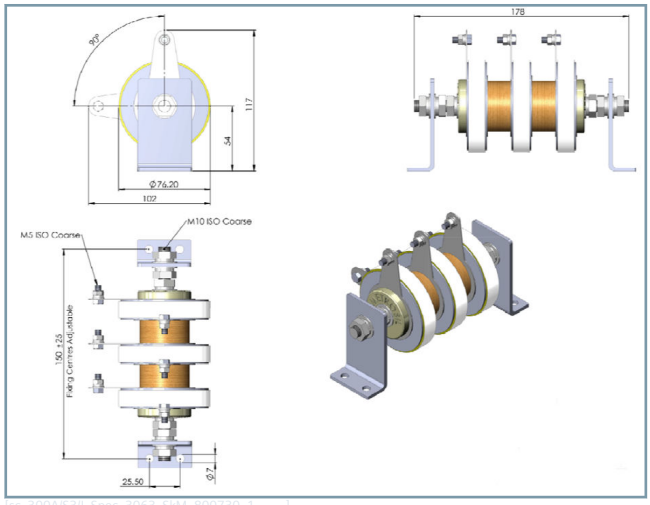
[sc_600A/S1_Spec_256_SkM_940307; 1; –_–]

Figure 6.3/6 600A/S1 Spec 256 SkM 940307



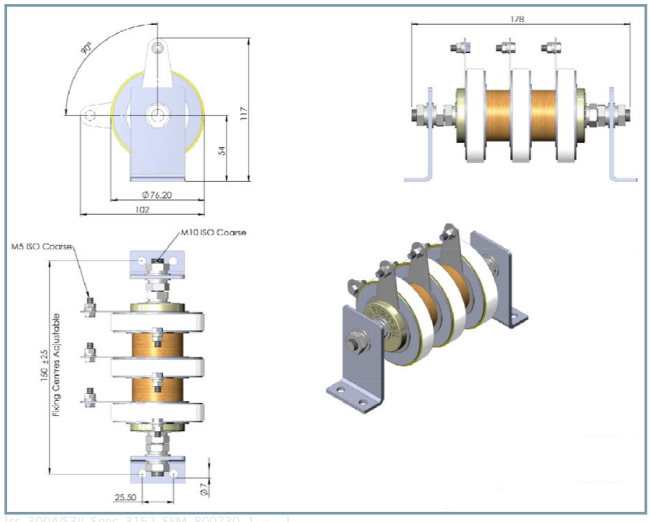
[sc_600A/S3/I_Spec_887_A3_3398410; 1; –_–]

Figure 6.3/8 600A/S3/I Spec 887 A3 3398410



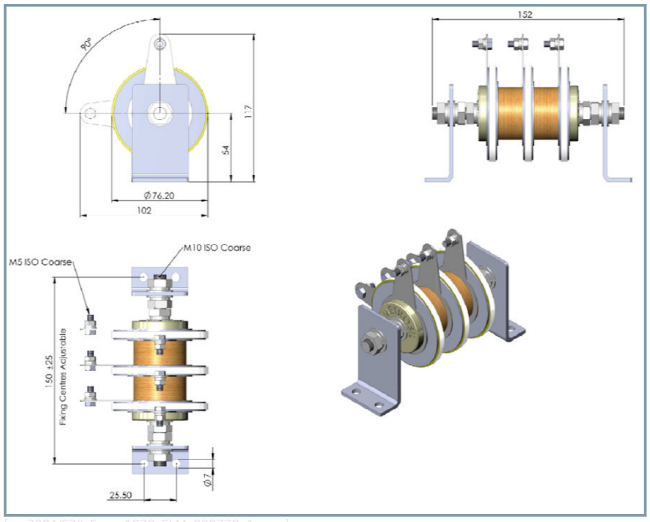
[sc_300A/S3/I_Spec_3063_SkM_800730, 1, --_--]

Figure 6.3/9 300A/S3/I Spec 3063 SkM 800730



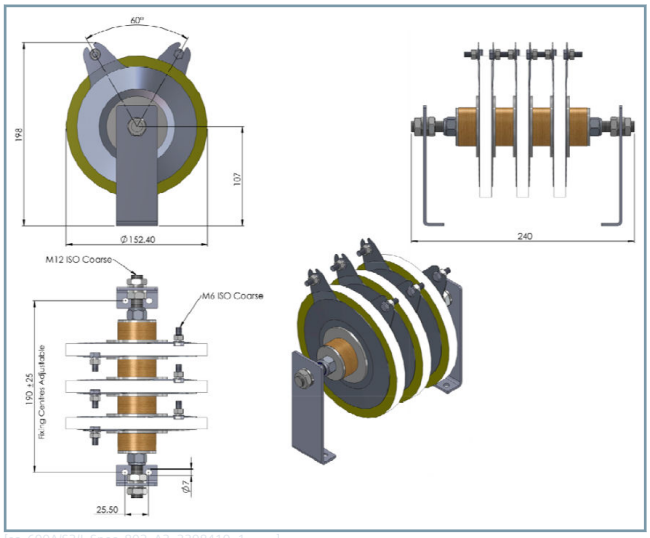
[sc_300A/S3/I_Spec_3152_SkM_800730, 1, --_--]

Figure 6.3/10 300A/S3/I Spec 3152 SkM 800730



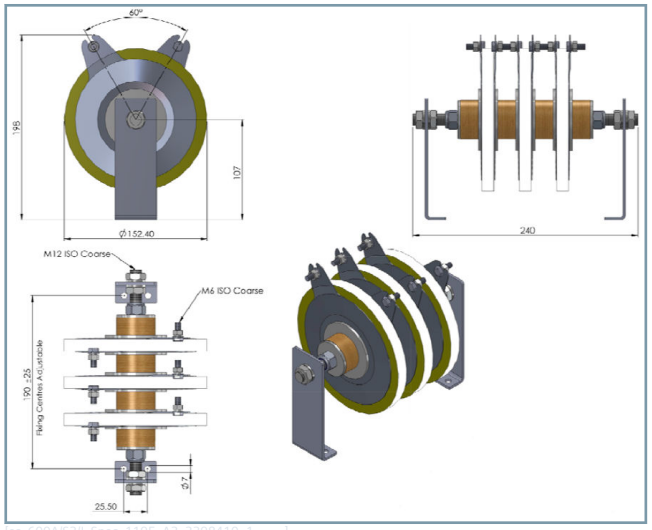
[sc_300A/S3/I_Spec_1030_SkM_800730, 1, --_--]

Figure 6.3/11 300A/S3/I Spec 1030 SkM 800730 but 152 mm stud length



[sc_600A/S3/I_Spec_802_A3_3398410, 1, --_--]

Figure 6.3/12 600A/S3/I Spec 802 A3 3398410

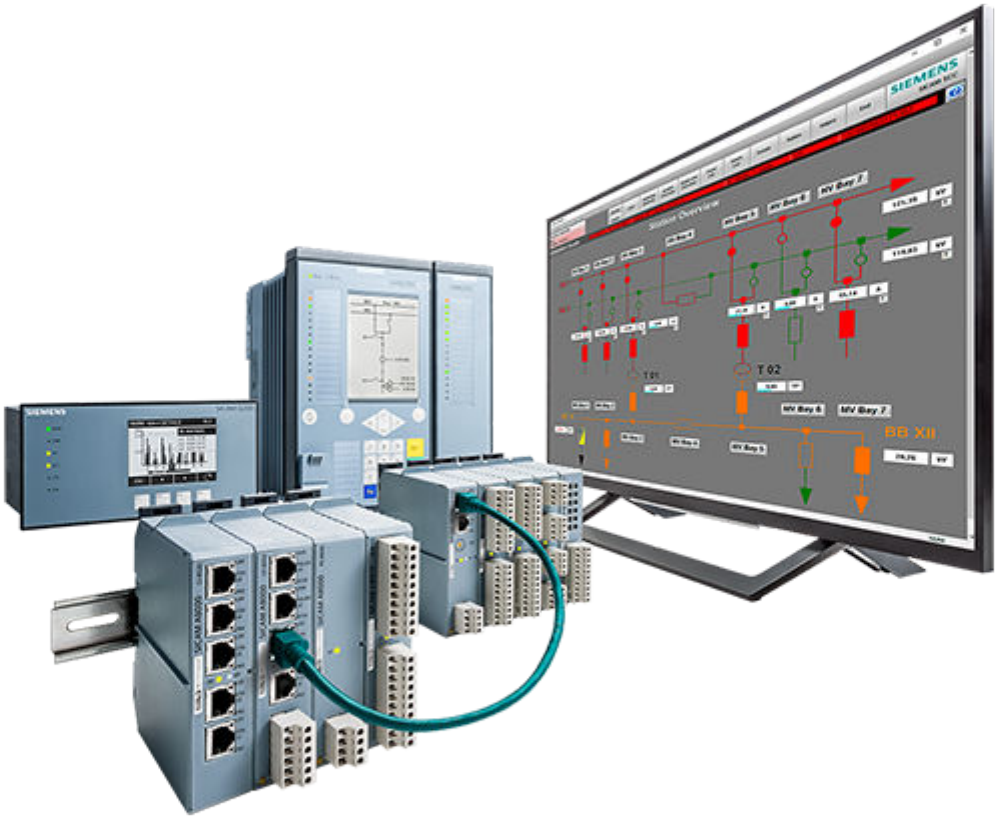


[sc_600A/S3/I_Spec_1195_A3_3398410, 1, --_--]

Figure 6.3/13 600A/S3/I Spec 1195 A3 3398410

Ordering information - 7XG14 Metrosil

Product description	Order no.																	
	1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	16	18
Non-linear resistor for high impedance schemes	7	X	G	1	4	□	□	-	□	A	A	0	0	-	0	A	A	0
						|	|		|									
Disc size, number of phases						|	|		|									
3 inch, single phase						1	|		|									
3 inch, 3 phase						2	|		|									
6 inch, single phase						3	|		|									
6 inch, 3 phase						4	|		|									
							|		|									
B value							|		|									
0.22 to 0.25							0		|										
									|										
C value									|										
450									1										
900									2										
1000									3										


SIEMENS
T 02
BB XII

SICAM I/O-Unit – 7XV5673

Description

The SICAM I/O-Unit 7XV5673 is a binary input/output device that has been developed for substations and industrial sectors with increased environmental demands. The SICAM I/O-Unit permits transmission from binary inputs to binary outputs locally or over large distances. It can be used for protection applications, such as overcurrent protection, permissive overreach transfer trip scheme, distance protection with signal connection, or as I/O extension in substation automation systems.

Binary inputs	• 6 robust EMC-hardened binary inputs • The pickup threshold can be set to DC 19 V, DC 88 V, or DC 176 V for different rated voltages of the station battery
Binary outputs	• 6 command relay outputs • Secure contact status after loss of connection, set by the user
Signal/alarm outputs	4 LEDs
Wide-range power supply unit	DC 24 to 250 V ± 20 % and AC 100 V to 230 V, 45 Hz to 65 Hz
Electrical RJ45 Ethernet interface	Cascading many devices without additional cost by using the integrated switch
Serial fiber-optic interface (optional)	ST connector, 820 nm for multimode optical fiber 62.5/125 µm, typical range: 2000 m with optical fiber 62.5 µm/125 µm, baud rate: 1.2 Kbps to 187.5 Kbps, set by software
Communication protocols	• IEC 61850 (GOOSE, MMS, Reporting) for the connection to protective and substation controllers • Modbus TCP or Modbus RTU for connection to a substation controller • Modbus UDP for point-to-point connection between 2 SICAM I/O-Units • SNTP for time synchronization
Time synchronization	• External time synchronization via Ethernet NTP • External time synchronization via Fieldbus with communication protocol Modbus RTU, Modbus TCP, or Modbus UDP
Housing	IP20, DIN rail

Functions

All types of binary signals from switching devices/protective procedures (such as trip commands, switch position signals, fault and status messages) are reliably recognized via binary inputs. This information can be transferred via contacts directly on this SICAM I/O-Unit or via communication connections to other SICAM I/O-Units or substation automation systems. Secured telegrams are used for communication via Ethernet or serial connections. The parameters of the SICAM I/O-Units can be set easily via a standard Web browser on the PC that is connected via the Ethernet interface.

The SICAM I/O-Unit can for example, be used as:

- Binary signal transmitter (BST): Point-to-point transmission of binary signals between 2 SICAM I/O-Units via Ethernet or a serial connection. Signal inputs and outputs can be assigned by the user.
- I/O extension:
  - Detection and output of binary states via substation controllers with the standard protocols Modbus RTU, Modbus TCP, or IEC 61850
  - Extension for protection devices of the compact classes SIPROTEC 7SJ80 and SIPROTEC 7SK80 by connection to their low-cost Ethernet interface (port A)
- Contact duplicator: Transmission of signals via one or more binary inputs by means of relay contacts of the same SICAM I/O-Units, for example for separation between different voltage levels



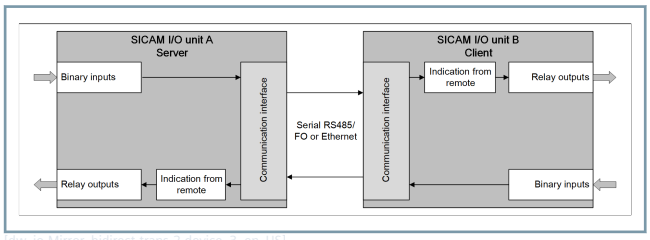
[ph_SICAM IO_Unit, 1, _ _]

Figure 7.1/1 SICAM I/O-Unit 7XV5673

Applications

Binary signal transmitter

If the SICAM I/O-Unit is used as a binary signal transmitter to *Figure 7.1/2*, there is a bidirectional transfer of binary signals of exactly 2 units at any one time. The transmission takes place between server and client device via serial connections (option) or via Ethernet networks. Via the relay output contacts, voltages of up to AC/DC 250 V and currents of up to AC/DC 5 A can be switched. The pickup threshold of the binary inputs can be set by the user on different levels. The user can assign signal inputs and outputs as required.



[dw_io-Mirror_bidirect-trans-2-device, 3, en_US]

Figure 7.1/2 Binary Signal Transmitter, Bidirectional Transmission between 2 Units

Extension of the communication route

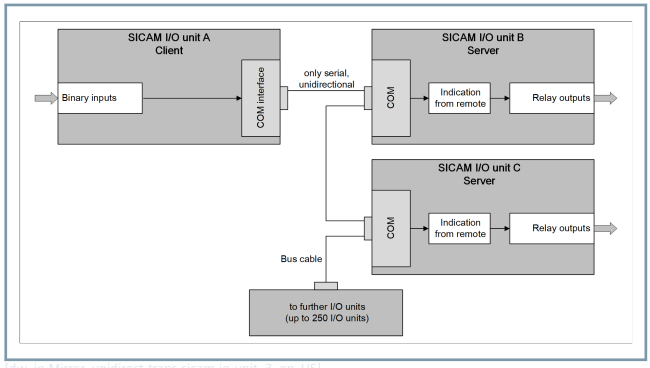
An extension of the communication route is possible.

The following devices can be used:

- With serial optical repeater 7XV5461, scalable up to 170 km
- Optical fiber connection also with mini star coupler 7XV5450, CM-0822 or RS485/optical fiber converter 7XV5650
- With different communication converters 7XV5662 (pilot wires, X.21/G.703.1 and G.703.6)
- Media converter for Ethernet RMC (Ruggedcom)
- Wireless transmission RS 900WNC (Ruggedcom)

Unidirectional binary signal transmission

When you use SICAM I/O-Units for unidirectional binary signal transmission to *Figure 7.1/3* then the units transfer binary signals in one direction from a client unit to several server units. In this application, the transmission takes place exclusively in one direction. Input signals (max. 6) are transmitted from the left device to the output contacts of one or more devices on the right side. The serial ports of the I/O-Unit can be electrical or serial. Alternatively, you may use RS485/optical fiber converters 7XV5650 and mini star couplers 7XV5450 or CM-0822 for cascading.



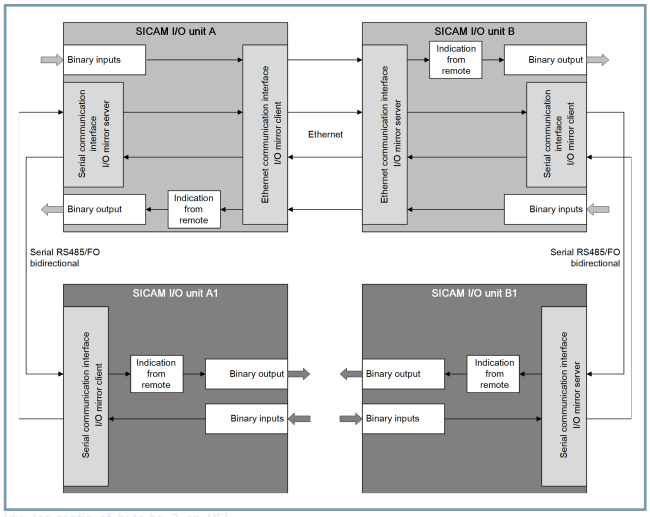
[dw_io-Mirror_unidirect-trans-sicam-io-unit, 3, en_US]

Figure 7.1/3 Binary Signal Transmitters, Unidirectional Transmission from One SICAM I/O-Unit to Several SICAM I/O Units

Binary signal transmitters with gateway function

The application shows 2 separate bidirectional binary signal transmissions. The main application is the following constellation:

- Due to EMC environments, one SICAM I/O-Unit is to be installed, for example, in the switch bay and connected via a serial optical fiber.
- The optical fiber arrives in a central communication room and is to be converted to electrical Ethernet. This is implemented via SICAM I/O-Units as a serial gateway server. The logic structure is described in *Figure 7.1/4*.



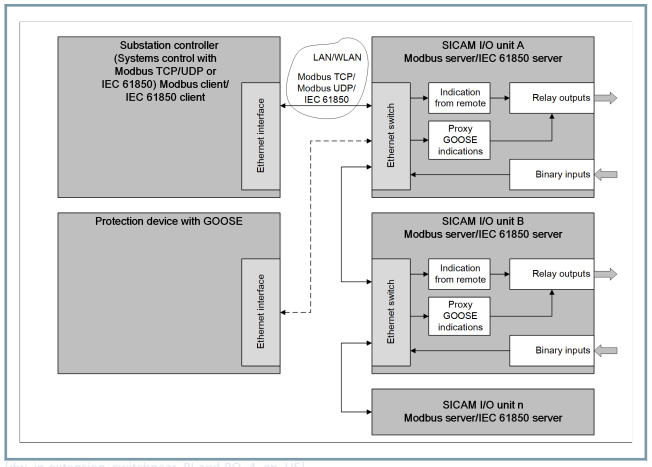
[dw_log-config_of_bi-to-bo, 3, en_US]

Figure 7.1/4 Logical Structure of Two Separate Binary Signal Transfers from Binary Input (BI) to Binary Output (BO) between Corresponding SICAM I/O Units A1 and B1, Using the Gateway Function of the Units A and B

In this structure, only the pair A-B and the pair A1-B1 exchange the states of their binary inputs to the binary outputs. Here, the SICAM I/O-Units A1 and B1 use the gateway function of devices A and B.

I/O extension of protection devices or direct connection to a station control or power systems control via Ethernet. Protocols: IEC 61850 GOOSE/Reporting/MMS, Modbus TCP/UDP

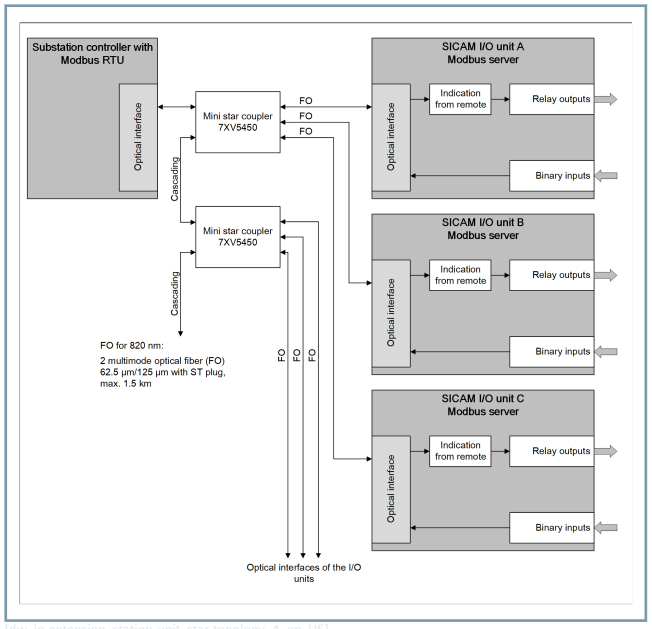
The SICAM I/O-Unit is used as I/O extension in accordance with *Figure 7.1/5*. Binary signals are exchanged between a substation controller of the automation substation as Modbus or IEC 61850 client, such as SICAM 8 or Spectrum Power - CC or a protection device, such as SIPROTEC with GOOSE, SIPROTEC Compact (also directly, proprietary) and the SICAM I/O-Units via an Ethernet network. If the integrated switch in the SICAM I/O-Unit is used, the devices can be operated in a line without an additional external switch.



[dw_io-extension_switchgear_BI-and-BO, 4, en_US]

Figure 7.1/5 I/O Extension of Switchgear with Binary Inputs and -Outputs

Instead of an Ethernet network, a serial connection with the protocol Modbus RTU can also be used. The connection can be made by an RS485 bus line or an optical star topology.



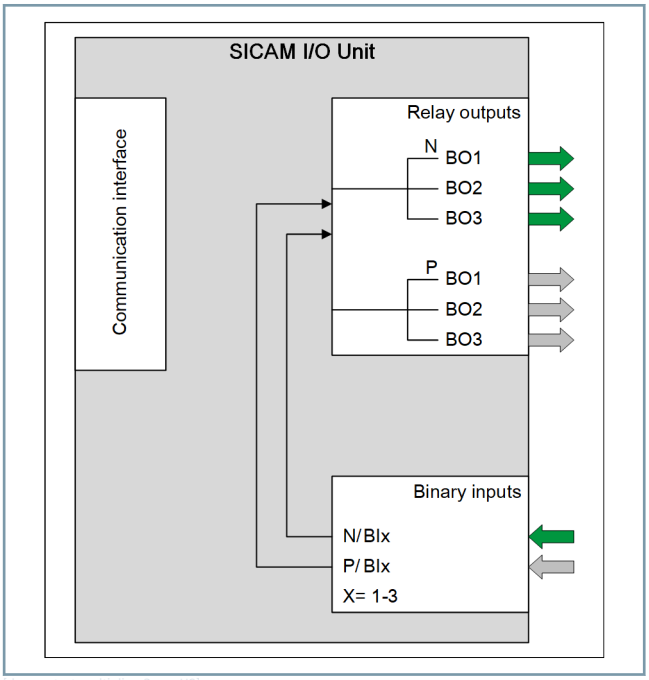
[dw_io-extension_station-unit_star-topology, 4, en_US]

Figure 7.1/6 I/O Extension for the Connection to the Substation Controller with Serial, Optical Star Topology

Contact duplicator

Input signals at one or more binary inputs can be allocated to binary outputs of the local unit (*Figure 7.1/7*).

- 1 binary signal at up to 6 relay outputs
- Several binary signals to several relay outputs that can be assigned
- Different voltage levels for inputs and outputs in a wide voltage range to isolate different voltage levels



[dw_contact-multiplier, 3, en_US]

Figure 7.1/7 Contact Duplicator

Applications for the Teletransmission of Binary Signals

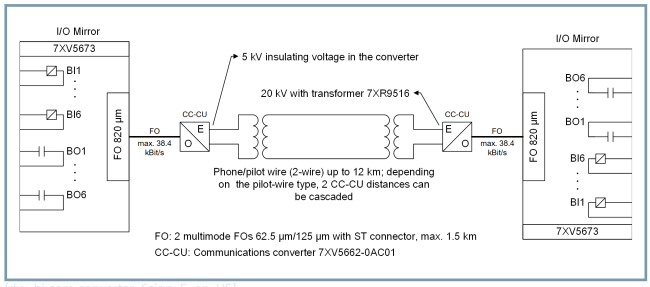
Binary Signal Transmission via Two-Wire Copper Line with Locking

Figure 7.1/8 shows the optical fiber connection of a SICAM I/O-Unit to a communication converter 7XV5662-0AC03, that establishes a connection via pilot wires. Only 1 pair is required for bidirectional signal exchange.

An additional isolating transformer allows 20 kV isolation of the pilot wire connection.

A maximum of 6 individual binary signals can be transmitted bidirectionally via the pilot wires. The additional time delay that is caused by the transmission via the communication converter and the pilot wires is less than 1 ms.

A typical application is the permissive overreach transfer trip scheme of a directional overcurrent protection via pilot wires. In this case, the independent overcurrent protection is connected to the SICAM I/O-Unit via contacts and binary inputs and directional signals are transmitted.



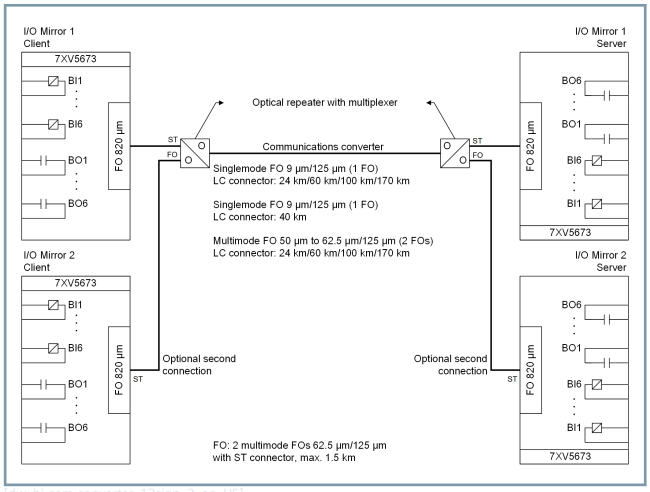
[dw_bi-com-converter_6sign, 5, en_US]

Figure 7.1/8 Binary Signal Exchange of 6 Signals via a Pilot Wire Connection

Binary Signal Exchange via Long Optical Fiber Connections

Figure 7.1/9 shows the optical fiber connection of a SICAM I/O-Unit to a serial optical repeater 7XV5461-0B_00, which establishes a connection to multi-mode or single-mode fiber-optic cables. With this application, a radius of up to 170 km can be attained without additional amplifiers.

A maximum of 12 binary signals can be exchanged via long optical fiber connections because the repeater allows the connection of 2 SICAM I/O-Units.

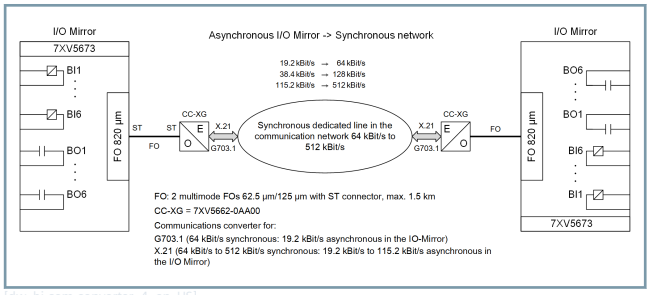


[dw_bi-com-converter_12sign, 3, en_US]

Figure 7.1/9 Binary Signal Exchange of Up to 12 Signals via Long Optical Fiber Connections

Transmission of Binary Signals via Communication Networks with a G.703.1-/X.21 Interface

Figure 7.1/10 shows the optical connection of a SICAM I/O-Unit to a communication converter (KU-XG) 7XV5662-0AA00, which establishes a connection with a multiplexer with G.703.1 or X.21 interface. In this way, this communication converter can be used to transmit the signals via a communication network. The average time delay in the network and the signal quality are monitored by the SICAM I/O-Unit. Furthermore, a connection loss is displayed. In this case, the state of the binary outputs can be set by the user to a secure state depending on the application. A maximum of 6 individual binary signals can be transmitted bidirectionally via the communication network.



[dw_bi-com-converter, 4, en_US]

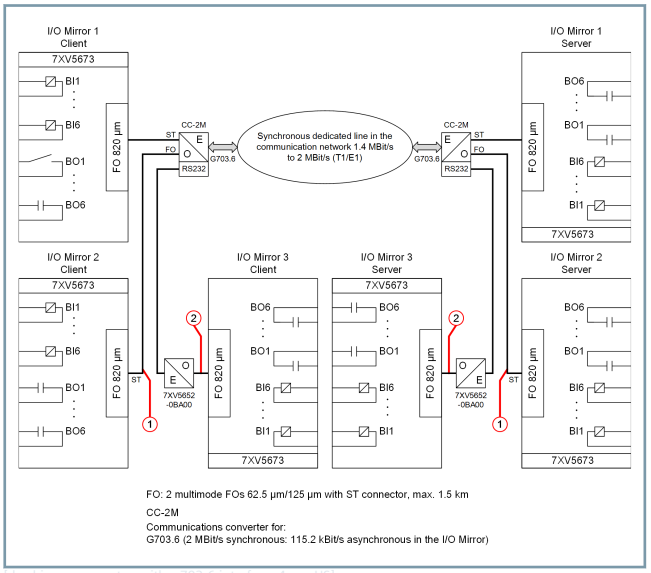
Figure 7.1/10 Binary Signal Exchange via a Communication Converter with a G.703.1-/X.21 Interface via a Communication Network

Transmission of Binary Signals via Communication Networks with a G.703.6 Interface

The application (*Figure 7.1/11*) shows the optical fiber connection of 1 to 3 SICAM I/O-Units to a communication converter KU-2M 7XV5662-0AD00, which establishes a connection to a multiplexer with a G.703.6 interface (1.44 Kbps/2 megabits/s, E1/T1).

A maximum of 18 individual binary signals can be transmitted bidirectionally via the communication network. The communica-

tion converter KU-2M has 2 optical interfaces and one electrical RS232 interface. 2 SICAM I/O-Units can be connected directly with the KU-2M via a fiber-optic cable. At the RS232 interface you can connect another SICAM I/O-Unit via an optoelectronic converter 7XV5652. With the use of all input interfaces (2 optical fibers, 1 RS232) of the KU-2M, a maximum of 18 signals can be bidirectionally exchanged.



[dw_bi-com-converter_with_g703-6-interface, 4, en_US]

Figure 7.1/11 Binary Signal Exchange with G.703.6 Interface via a Communication Network

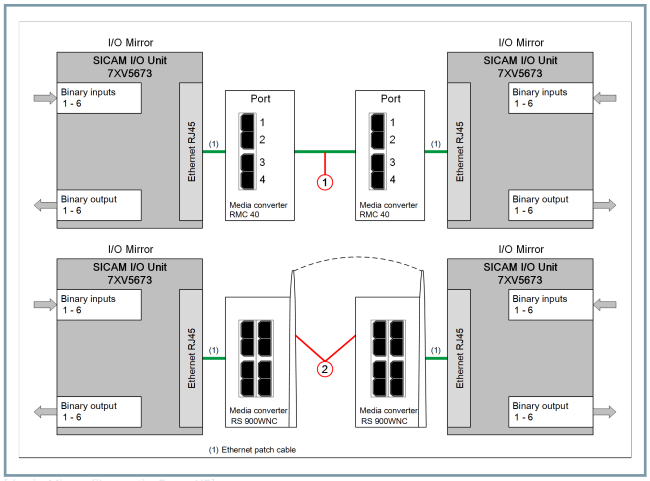
(1) Optional 2nd connection

(2) Optional 3rd connection

For dial-up network connections via Ethernet, media converters or Ethernet networks are used. The SICAM I/O-Unit supports IP address settings and settings for a standard gateway. The electrical Ethernet interface of the SICAM I/O-Unit is connected with one media converter or switch that transmits the signals of the devices via dial-up network connections with Ethernet. The average time delay in the network is measured by the SICAM I/O-Unit.

Binary Signal Transfer via Optical Fibers or Wireless Connection

The application (*Figure 7.1/12*) shows the electrical connection of a binary signal transmitter (BST) SICAM I/O-Unit 7XV5673 to Ethernet-based transmission units via patch cables that establish a connection via optical fibers or a wireless connection at the trunk line end. The connection could also be made via switches with long-distance modules or via IP networks.



[dw_io-Mirror_fiber-optic, 5, en_US]

Figure 7.1/12 Binary Signal Transmission via Optical Fiber or Wireless Connection; Connection via the Integrated Ethernet Interface to External Transmission Devices

(1) Optical-fiber transmission with media converter for Ethernet, for example RMC40 from Ruggedcom

(2) Wireless power transmission with media converter for Ethernet, for example RS900WNC from Ruggedcom

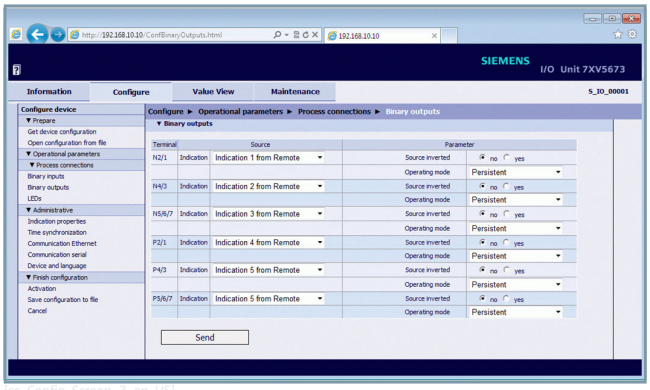
Typical application examples can be found in the Internet *www.siemens.com/sicam-io* -> Downloads.

Device Configuration

The SICAM I/O-Unit is equipped with an integrated Web server that simplifies the settings with the help of a standard Internet Web browser (Microsoft Internet Explorer). *Figure 7.1/13* shows the user interface. In the same way, operational logs and commissioning aids are supported by the browser such as display of the actual state of the inputs and outputs.

The SICAM I/O mapping tool is used to configure the IEC 61850 GOOSE.

As soon as the IEC 61850 GOOSE configuration is completed, the SICAM I/O mapping tool reads the corresponding SCD file and generates the binary IEC 61850 parameter set, which can be uploaded via HTML.



[sc_Config_Screen, 3, en_US]

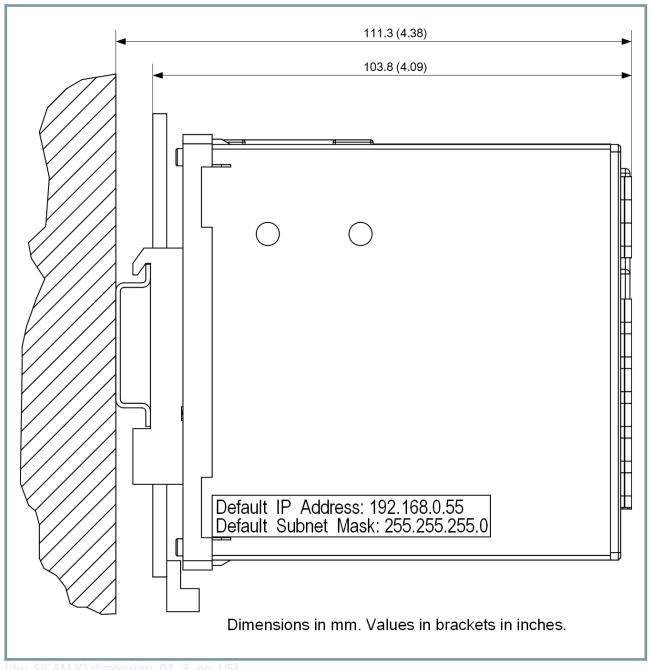
Figure 7.1/13 Configuration Screen of the SICAM I/O-Unit in the Web Browser

Selection and Ordering Data

Description	Order No.															
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
SICAM I/O-Unit	7	X	V	5	6	7	3	–	0	J	J	□	0	–	□	A	A	1
												▲			▲			
Serial Interface and Communication Protocol												|			|			
Without serial communication												0			|			
RS485 – Modbus RTU, binary signal transmission												1			|			
Optical, 820 nm – Modbus RTU, binary signal transmission												2			|			
Ethernet Interface and Communication Protocol															|			
Ethernet interface with Modbus TCP/UDP, binary signal transmission															1			
Ethernet interface with Modbus TCP/UDP, binary signal transmission, and IEC 61850 server (GOOSE and reporting/MMS)															2			
Accessories																		
Y-bus cable (required for using the internal switch/cascading)	7	K	E	6	0	0	0	–	8	G	D	0	0	–	0	B	A	2
Device Type																		
DIN rail device IP20;																		
Dimensions 96 mm x 96 mm x 100 mm (W x H x D);																		
Power supply: DC 24 to 240 V, AC 100 V to 230 V;																		
Integrated Web server for parameterization; Ethernet interface RJ45 connector; integrated switch function; CE and UL approved																		
Inputs/Outputs																		
6 binary inputs with selectable threshold voltage;																		
6 relay outputs (4 make contacts, 2 change-over contacts)																		

Table 7.1/1 SICAM I/O-Unit Selection and Ordering Data

Dimensional Drawing



[dw_SICAM IO dimension_01, 3, en_US]

Figure 7.1/14 Dimensions SICAM I/O-Unit 7XV5673

SICAM AI-Unit – 7XV5674

Description

The SICAM AI-Unit 7XV5674 is an analog input device (20 mA) that is used by power utilities in the field of substations and in the industrial sector where there are increased environmental demands. Besides analog signal input, the SICAM AI-Unit can compress the measured data by demand calculation, and can monitor and signal parameterized limiting values. Measured values and messages can be transferred to a protection device, to a SICAM I/O-Unit, or to a substation or power-system control for process automation. Interoperable standard protocols IEC 61850 GOOSE, Reporting/MMS, and Modbus RTU/TCP/UDP are used here. The SICAM AI-Unit is thus a practical external 20mA extension and a local or remote automation unit.

Inputs	12 x 20 mA for direct current measurements (in accordance with IEC 60688)
Insulated housing	96 mm x 96 mm x 100 mm (W x H x D) Assembly on a DIN rail
Degree of protection	IP20
Approval	CE and UL



[ph_SICAM AI Unit, 1, --_--]

Figure 7.2/1 SICAM AI-Unit 7XV5674

Benefits

- Wide field of application (SCADA, protection and automation processes) from swift and protected real-time applications to continuous long-term acquisition (24-h value):
  - Current measured value every 642 ms
  - 10 sec, 1 min, 1 hr, 24 hr demand calculation in the device. This on-site compression reduces the data volume that is to be transferred and processed (making handling mass data possible)
  - Independent on-site automation and monitoring unit with signaling of the parameterized limit violation conditions in the unit
- Connection to serial interfaces or Ethernet interfaces of SIPROTEC 4 or SIPROTEC 5 devices
- Connection to all protection and bay devices via IEC 61850-GOOSE messages and IEC 61850 reporting
- Compact and robust design (-25°C to 70°C operating temperature)
- Flexible communication options (Ethernet, optical fiber or RS485 electrical)
- Modbus RTU/TCP, SIPROTEC 20-mA, serial or Ethernet connection to SIPROTEC 5 devices via SUP protocol
- Precise process measurement (0.2% with reference conditions)
- Time synchronization via NTP (support of 2 time servers, fieldbus (Modbus RTU/TCP), IEC 61850, PC, internal RTC
- Cost saving with integrated Ethernet switch permits a chain structure to be built up (cascading with Y adaptor 7KE6000-8GD00-0BA2)
- Web server for parameterization with an IWeb browser. No special parameterization software necessary
- 4 LEDs for different parameterizable messages/alarms
- 4 freely parameterizable group indications
- Battery-backed real-time clock (RTC) and message logs (can be exported as .csv)
- Binary message and alarm stamp exact to 1 ms
- Simulation of input signals for easier system commissioning (IBS)
- Comparison of redundant measured data from different SICAM AI - units is possible due to the simultaneous start of the average value window generation
- Integrated communication and device supervision

Applications

The SICAM AI-Unit supports various applications. It can be used in the following sections for the acquisition of DC field signals:

- Power system protection
- SCADA (station and power systems control)
- DMS (Distribution Management System)
- EMS (Energy Management System)
- GIS (Gas-insulated switchgear) – gas pressure monitoring
- Other industrial processes
- Modernization of old plants: Automation/interface to old 20 mA technology (for example, 7SA511/513 issuing the fault location)

The currents from the connected transducers (such as temperature, pressure or position sensors) can be transferred via the supporting communication protocols automation processes for further processing (such as visualization). See also *Figure 7.2/2*.

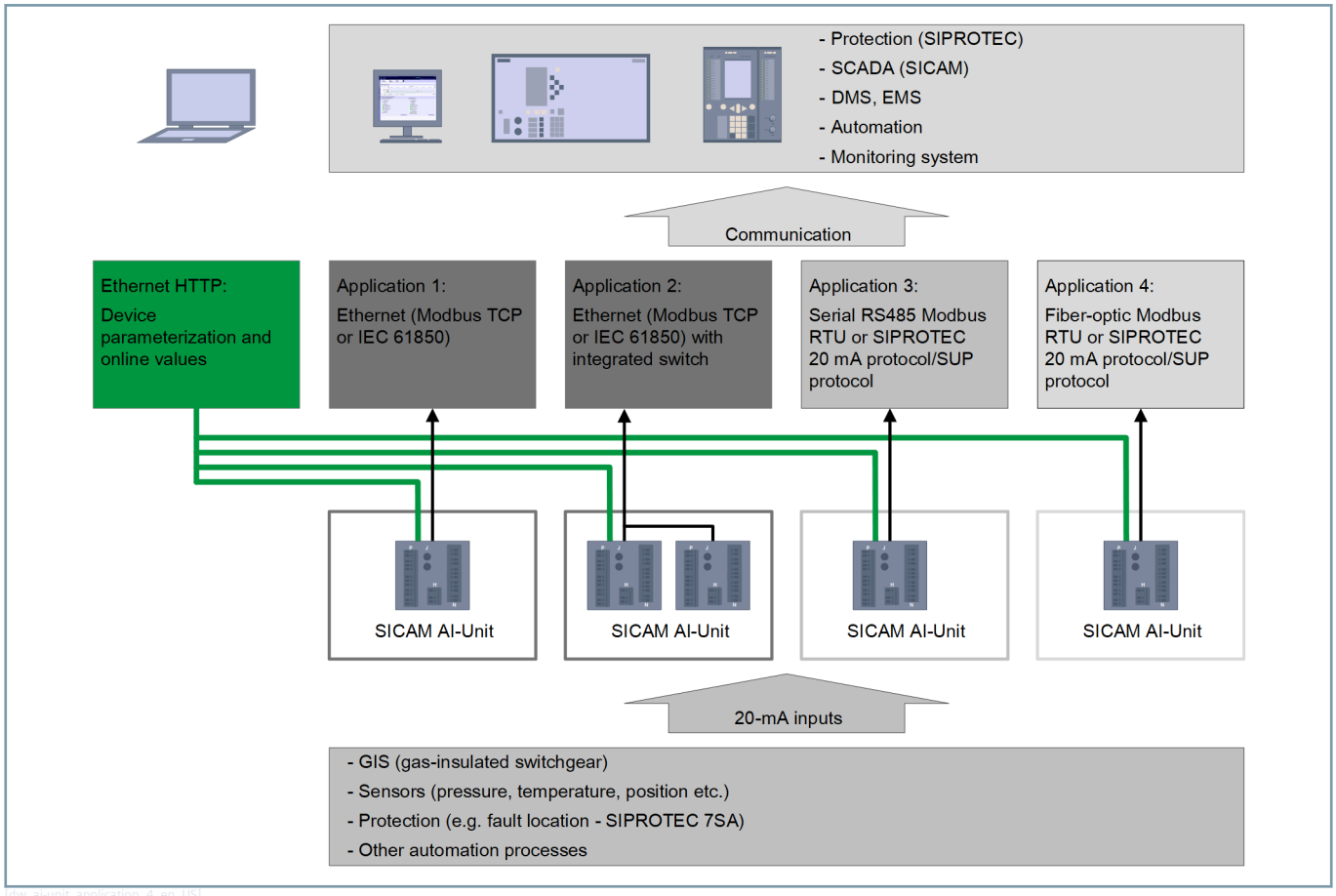
The DC inputs of the SICAM AI-Unit can be parameterized for the following ranges:

- 0 mA to 20 mADC
- 4 mA to 20 mADC

The measuring accuracy is 0.2% of the rated current (20 mA) at reference conditions. Under environmental influence (including EMC), the measuring accuracy is 1.0% of the rated current (20 mA).

With the integrated Web server, parameterization is carried out by means of HTML pages with the use of a Web browser.

Typical applications can be found on the Internet *www.siemens.com/sicam-ai* -> Downloads



{dw_ai-unit_application, 4, en_US}

Figure 7.2/2 Application Example

Measured quantities

The SICAM AI-Unit permits only direct current to be measured. The measurement cycles on both PCB assemblies are carried out at the same time. A complete measuring cycle via 6 channels takes 642 ms. The measurement of a channel takes 107 ms and is repeated after 642 ms. Using the Internet browser, the measured current, 10 second, minute, hour, and day average values of all channels can directly be viewed and measured by the device, and transferred via communication protocols, together with messages (such as limit violation conditions).

Limit settings

Up to 16 limit violations of current measured values in both directions can be set via the **automation functions** menu. Limit violation conditions of the upper and lower range of values can be indicated as an individual or group indication on 3 LEDs. The parameters of 4 group indications can be set, wherein each indication can be assigned up to 16 logically linked single-point indications.

Communication

To communicate with the substation controller / protection device and the other peripheral devices, the SICAM input measuring device has an Ethernet interface and optionally a serial interface (RS485 or optical).

The ordering options for communication via Ethernet are:

- With integrated Ethernet switch: Modbus TCP protocol
- With integrated Ethernet switch: Modbus TCP protocol **and** IEC 61850 protocol

The following functions are supported via Ethernet:

- Connection to SIPROTEC 5 devices via SUP (Slave Unit Protocol)
- Device parameterization
- Transmission of measured data
- Transmission of messages
- Time synchronization via NTP

- Communication protocols Modbus TCP and IEC 61850 (reporting and GOOSE)
- Integrated Ethernet switch

With the Ethernet switch integrated in the device, further network components can be cascaded via a Y-cable and hence also included in an available network with IEC 61850 or a further Ethernet protocol.

- Serial interface
  - With RS485 interface
  - With optical interface
- Communication with existing RS485 or optical 820 nm interface
  - With the Modbus RTU protocol and SIPROTEC RTU protocol 20 mA/SUP (Slave Unit Protocol)

The serial interface supports the following functions:

- Transmission of measured data
- Transmission of messages
- Time synchronization via Modbus RTU

When selecting the serial interface, either Modbus RTU or the SIPROTEC RTU 20 mA/SUP (Slave Unit Protocol) communication protocol can be used.

Time synchronization

During operation, the SICAM AI-Unit needs the date and time for all time-relevant processes. In communication with peripheral devices, this ensures a uniform time base and allows correct time stamping of the process data.

The following types of time synchronization can be carried out:

- External time synchronization via Ethernet NTP (preferred)
- External time synchronization via Fieldbus with communication protocol Modbus RTU
- Internal time synchronization via RTC (Real-Time Clock) – if external time synchronization is unavailable

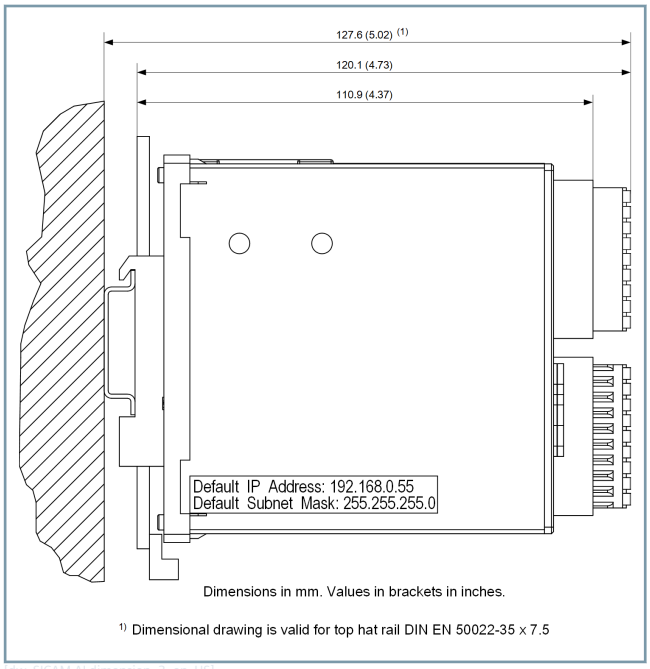
LED indications

The SICAM AI-Unit automatically monitors communication connections and the functions of its hardware/software/firmware components. The LEDs on the top of the housing signal the current state of the device. They can be parameterized for individual or group indication.

Parameterization

No special software is required for parameterization. Parameter setting is carried out by the computer via HTML pages and a Web browser. Internet Explorer 6 (or higher) is necessary for this purpose.

Dimensional Drawing



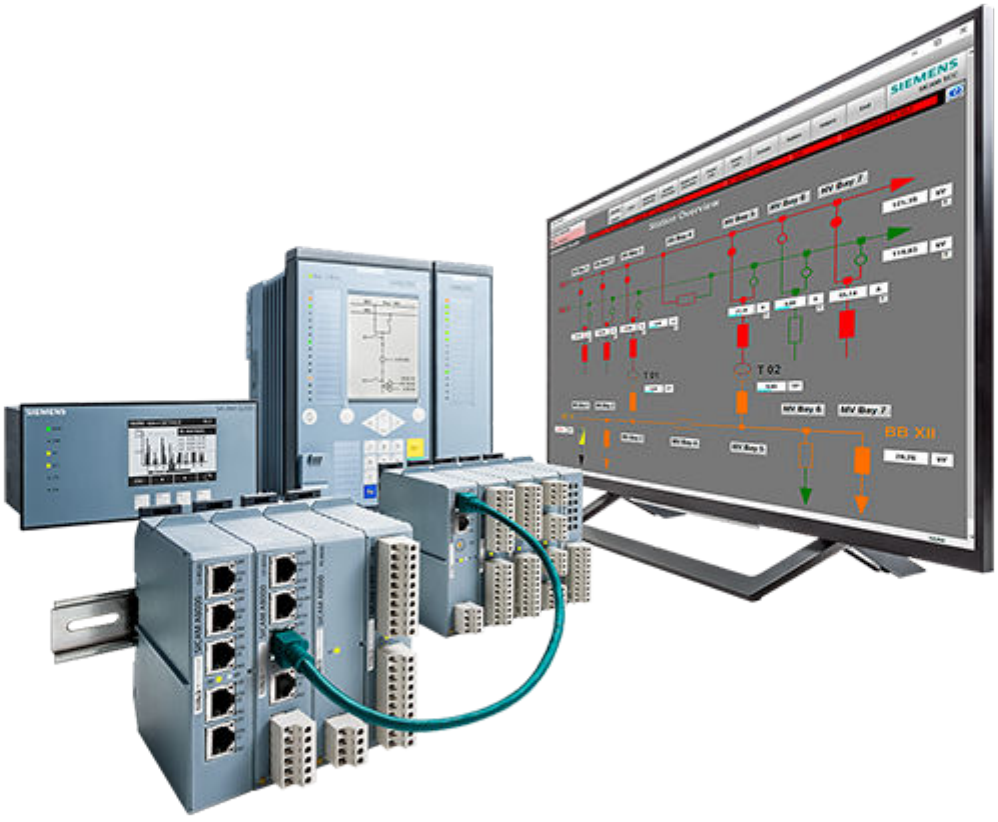
{dw_SICAM AI dimension, 3, en_US}

Figure 7.2/3 Dimensions of the SICAM AI-Unit 7XV5674

Selection and Ordering Data

Description	Order no.															
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
SICAM AI-Unit	7	X	V	5	6	7	4	–	0	K	K	□	0	–	□	A	A	1
												▲			▲			
Serial Interface and Communication Protocol												|			|			
Without serial communication												0			|			
RS485 – Serial Modbus RTU and SIPROTEC 20 mA protocol/point-to-point connection												3			|			
FO 820 nm, ST connector – serial Modbus RTU and SIPROTEC 20 mA protocol/point-to-point connection												4			|			
Ethernet Interface and Communication Protocol															|			
Ethernet interface with Modbus TCP															1			
Ethernet interface with Modbus TCP and IEC 61850 server (GOOSE and reporting/MMS)															2			
Accessories																		
Y-bus cable (required for using the internal switch/cascading)	7	K	E	6	0	0	0	–	8	G	D	0	0	–	0	B	A	2
Device Type DIN rail device, IP20; 12 x 20-mA inputs for example SIPROTEC-/SICAM units; Dimensions: 96 mm x 96 mm x 100 mm (WxHxD); Power supply: DC 24 to 240 V, AC 100 V to 230 V; Ethernet interface, RJ45 connector; integrated switch function; integrated Web server for parameterization; CE and UL approved																		

Table 7.2/1 SICAM AI-Unit Selection and Ordering Data


SIEMENS
T 02
BB XII

RTD Unit TR1200 – 7XV5662-6AD10

Description

The RTD unit TR1200 can measure up to 12 temperatures with 12 measuring inputs. It supports 2-wire and 3-wire Pt 100 sensors. For 2-wire operation, the measured line resistance can be compensated with an appropriate setting. For commissioning purposes, the temperature measurement can be simulated.

The measured value is output to the protection device compatible with the TR600 using the bus cable 7XV5103-7AAxx via an RS485 bus.

All settings are made using three push-buttons on the front panel. Input can be inhibited by means of a code.

The TR1200 has a wide-range power supply unit, DC 24 V to 250 V and AC 115/230 V, and an alarm relay. A sensor interruption or a sensor short is reported and transmitted to the SIPROTEC device via protocol.



[ph_7XV5662-6AD10_, 1, --]

Figure 8.1/1 RTD Box TR1200 – 7XV5662-6AD10

Benefits

- 3-digit temperature display
- 12 inputs for temperature sensors, 1 to 12 sensors can be connected
- Pt 100 thermocouples for 2-wire or 3-wire technology
- 1 fault relay (electrically isolated change-over contact)
- RS485 interface (ZIEHL standard protocol and Modbus RTU protocol)
- LEDs indicate the measuring channel, fault condition, relay function and RS485 activity
- A code lock prevents parameter manipulation
- TR600-compatible (to replace 1 TR600 with 6 connected sensors)
- Universal power supply unit, AC/DC 24 V to 240 V
- Snap-on mounting to 35-mm DIN rail according to EN 60715

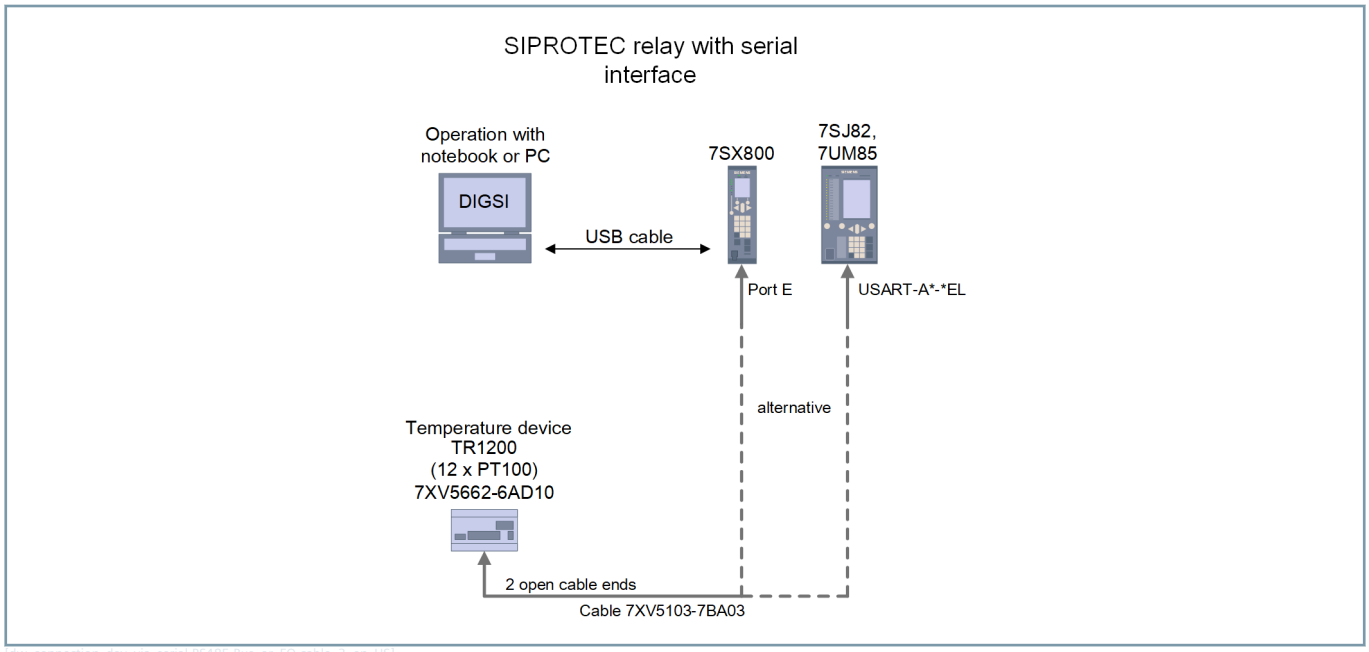
Applications

Communication over the RS485 bus

The RTD unit TR1200 is connected to a SIPROTEC 4 protection device with temperature function (for example, 7SJ6, 7UT6, 7UM6) or the Compact protection 7SK80 with serial RS485 interface (port B) via the RS485 interface. The special cable 7XV5103-7AAxx is used for connection. The RTD unit is connected to a SIPROTEC 5 device according to *Figure 8.1/4*). You can find detailed information at *www.siemens.com/siprotec*.

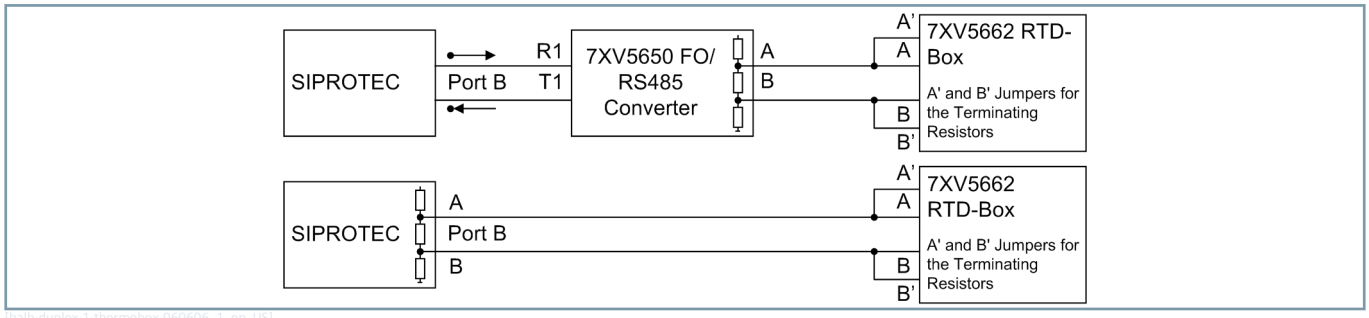
The RTD unit can be connected to a Reyrolle 5 (7SR5) device and used with the **`49TS Temperature Sensor Supervision`** function. For further details see the 7SR5 Device Manual.

Connection Examples



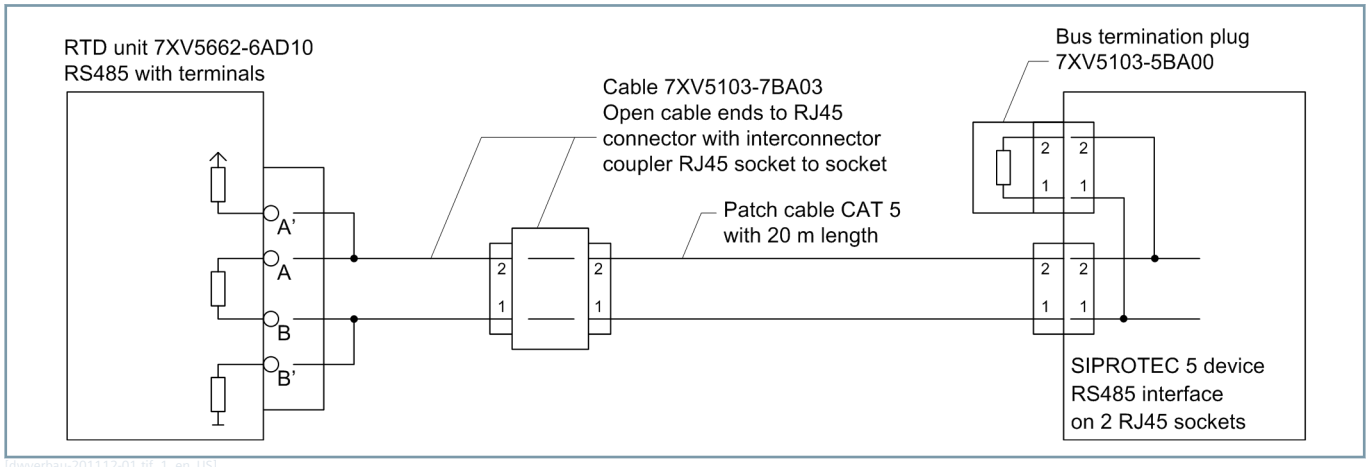
[dw_connection_dev_via_serial-RS485-Bus_or_FO-cable, 3, en_US]

Figure 8.1/2 Connection of Devices using a Serial RS485 Bus



[halb-duplex-1-thermobox-060606, 1, en_US]

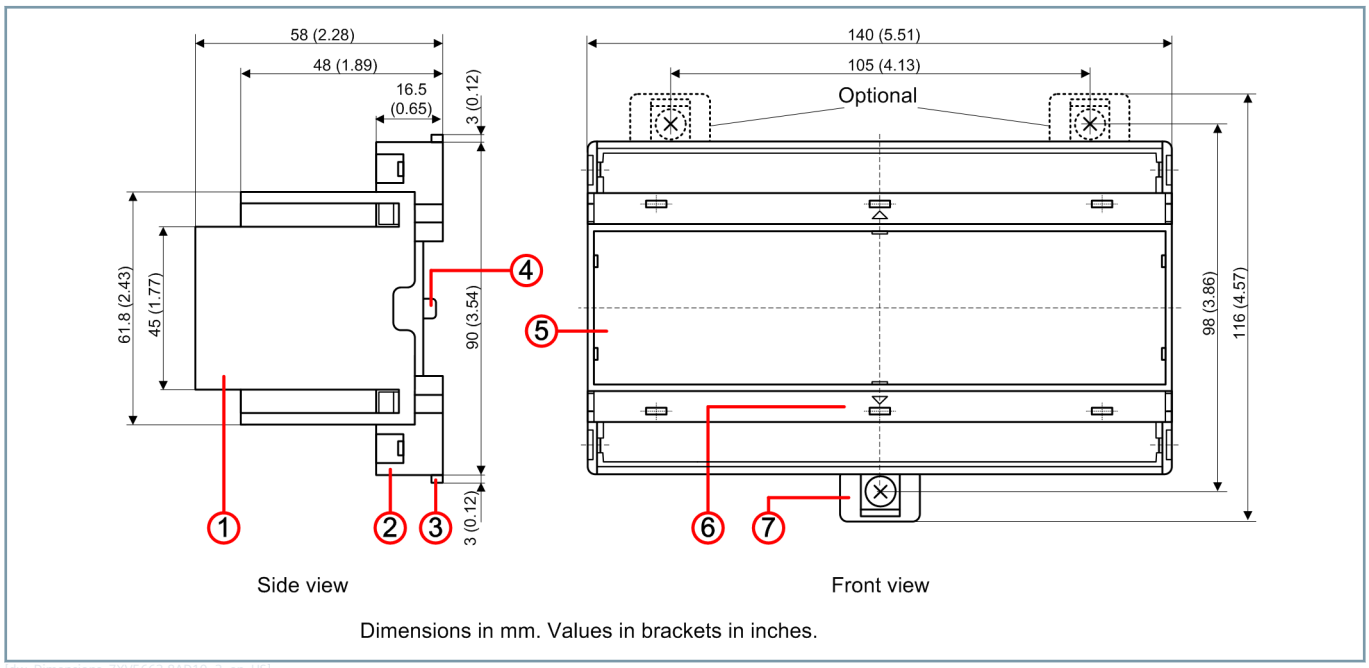
Figure 8.1/3 SIPROTEC 4 Compact Connection Example – Half-Duplex Operation with an RTD Unit (top: Optical version (2 optical fibers); bottom: RS485 Version. Optional Ethernet via Port A (EN100–LC)



[dwverbau-201112-01.tif, 1, en_US]

Figure 8.1/4 Connection Example of the RTD Unit to a SIPROTEC 5 Device

Dimensioned Drawing



[dw_Dimensions_7XV5662-8AD10, 2, en_US]

Figure 8.1/5 Dimensions, RTD Unit 7XV5662-6AD10

Technical Data

Rated auxiliary voltage	
Auxiliary voltage V_H	24 to 240 VAC/VDC, 0/45 to 65 Hz, < 5 VA
Tolerance	20.4 to 297 VDC, 20 to 264 VAC

Relay/output			
Quantity		1 change-over contact (CO)	
Contact voltage		max. 415 VAC	
Switched current		max. 5 A	
Switching power		max. 2000 VA (resistive load) max. 120 W at 24 VDC	
Reduction factor at cos φ = 0.7		0.5	
Electrical rated data V_L:		250 VAC, 3 A, general purpose D300 1 A, 240 VAC	
Rated operating current I_E	AC 15 DC 13	I_E = 2 A I_E = 2 A I_E = 0.2 A I_E = 0.1 A	V_E = 250 V V_E = 24 V V_E = 125 V V_E = 250 V
Recommended fuse		3.5 A (gL)	

Relay/output	
Contact service life, mechanical	1 × 10^7 switching cycles
Contact service life, electrical	1 x 10^5 switching cycles at 250 VAC/5 A

Sensor connections	
Quantity	24 to 240 VAC/VDC, 0/45 to 65 Hz, < 5 VA
Measuring cycle/measurement time	20.4 to 297 VDC, 20 to 264 VAC
Measuring cycle/line resistance	0.25 to 30 s (each measuring cycle of a sensor)
Measuring range	–199 to 850 °C
Resolution	1 °C
Accuracy	± 0.5% of the measured value ± 1 K
Sensor current	≤ 0.8 mA
Temperature drift	< 0.04 °C
Short circuit	< 15 ohm
Open circuit	> 400
Sensor resistance + line resistance	max. 500 ohms

RS485 interface	
Device address	0 to 96
Measuring cycle/measurement time	20.4 to 297 VDC, 20 to 264 VAC
Measuring cycle/line resistance	0.25 to 30 s (each measuring cycle of a sensor)
Measuring range	–199 to 850 °C

RS485 interface	
Resolution	1 °C
Accuracy	± 0.5% of the measured value ± 1 K
Sensor current	≤ 0.8 mA
Temperature drift	< 0.04 °C
Short circuit	< 15 ohm
Open circuit	> 400
Sensor resistance + line resistance	max. 500 ohms

RS485 interface	
Device address	0 to 96
Baud rate	4800, 9600, 19200 bit/s
Parity	N, O, E (no, odd, even)
Max. cable length	1000 m at 19200 bit/s
Serial protocol	serial RTD protocol Ziehl/SIPROTEC, detailed protocol description in the manual

Test conditions	
According to	EN 61010-1
Rated surge immunity	4000 V
Overvoltage category	III
Degree of pollution	2
Rated insulation voltage V_I	300 V
Operational time	100%
Permissible ambient temperature	-20 °C bis +65 °C EN 60068-2-2, dry heat
Galvanic separation	Power supply – measuring inputs 3820 VDC
No galvanic separation	RS 485-interface – measuring inputs

Test conditions	
EMC Tests	EN 61326-1
EMC test for emitted interference	EN 61000-4-3
Fast transient bursts	EN 61000-4-4 ± 4 kV Pulse 5/50 ns, f = 5 kHz, t = 15 ms, T = 300 ms
Energy surge voltages (SURGE)	IEC 61000-4-5 ± 1 pulse: 1.2/50 µs (8/20 µs)
Electrostatic discharge test	IEC 61000-4-2 ± 4 contact discharge, ± 8 kV air discharge

Housing	
Housing type	V8, distribution panel mounting
Dimensions (W x H x D)	140 × 90 × 58 mm
Depth/width	55 mm / 8 HPs
Line termination, single conductor	1 × 1.5 mm^2 each
Braided conductor with end sleeve	1 × 1.0 mm^2 each
Tightening torque for terminal screw	0.5 Nm
Degree of protection of the housing/ terminal	IP30/IP20
Vertical/horizontal mounting	optional
Fastening	Snap-on mounting to 35-mm DIN rail according to EN 60715 or screw fixing(with 2 additional angle brackets)
Weight	about 370 g

Selection and Ordering Data

Description	Order no.												
	1	2	3	4	5	6	7		8	9	10	11	12
Temperature measuring device (RTD unit) TR1200	7	X	V	5	6	6	2	-	6	A	D	1	0
With 12 temperature sensors Pt100, RS485 interface, mounting on DIN rail, wide range power supply AC/DC 24 V to 240 V For SIPROTEC 5 (except 7SS85, 7VK87, 7KE85), SIPROTEC 5 Compact, SIPROTEC 4 Compact, SIPROTEC 4 protection relays													

RTD Unit TR800Web – 7XV5662-7AD10

Description

The universal relay TR800 Web has 8 measuring or sensor inputs and can measure 8 temperatures using Pt 100 elements (Ni100 and Ni120). The measured values 1 to 6 can be transmitted by protocol to SIPROTEC 4 devices with temperature function. 2 universal relays with a total of 12 measuring inputs can be connected.

The connection uses a serial RS485 interface (see *Figure 8.2/4*). The TR800 is protocol-compatible with the TR600 (7XV5662-3AD10, 7XV5662-5AD10) to the serial RS485 interface and transfers the 6 temperatures in the same format. In this mode, the TR800 can replace the TR600.

The serial RS485 interface can be connected to a Reyrolle 5 (7SR5) device and used with the **`49TS Temperature Sensor Supervision`** function. For further details see the 7SR5 Device Manual.

For the motor protection SIPROTEC 7SK80, the connection can also use the Ethernet interface if the system interface is (already) used (see *Figure 8.2/2* and *Figure 8.2/3*). The universal relay is operated and configured via the Ethernet interface using a web browser. Support is provided for 3-wire thermocouples. For the 2-wire connection, the measured line resistance can be compensated by a software setting. In addition, temperatures can be simulated to test the temperature function in SIPROTEC devices.

As an alternative to temperature sensors, 8 analog values (DC 0/4 mA to 20 mA and DC 0 V to 10 V) can be measured The output can be scaled and the units (°C, V, A, %) can be adapted in the TR800. The RTD protocol in temperature format is used for transmission to the SIPROTEC device and six of the 8 analog sensor values are available there. With two TR800s, 12 values are available. Accordingly, for example, 5.5 mA is transmitted using the temperature value 55 and can be displayed either as a temperature in the SIPROTEC device or queried as a threshold value with respect to limits. This allows further processing of analog values in SIPROTEC devices with temperature function or the transmission of these values to systems control (for example, SICAM PAS). In the SIPROTEC 6MD66 bay controller (starting with V4.8), all 8 measuring inputs are available.

The TR800 has a wide-range power supply unit, DC 24 V to 250 V and AC 115/230 V, and an alarm relay. A sensor interruption or a sensor short is reported and transmitted to the SIPROTEC device via protocol.

Benefits

- 8 measuring inputs:
  - Pt 100, Pt 1000 in 2-wire or 3-wire technology
  - KTY 83 or KTY 84
  - Thermocouple types B, E, J, K, L, N, R, S, T
  - DC 0 V to 10 V, DC 0/4 mA to 20 mA
  - Resistance: 500 ohms, resistance: 30 kOhms
- 4 relay outputs (all as isolated change-over contacts)
- Ethernet interface (http, https, UDP, Modbus, Bonjour, UpNP, SNMP)
- RS485 interface (ZIEHL standard protocol and Modbus RTU protocol)



[ph_7XV5662-7AD10_, 1, --]

Figure 8.2/1 Universal Relay/RTD Box TR800

- Universal power supply unit, AC/DC 24 V to 240 V
- Integrated Web server for configuration, reading measured data, e-mail alarms to user management, data and alarm logging
- Time-dependent control (day/night)
- Real-time clock with synchronization via the time server.

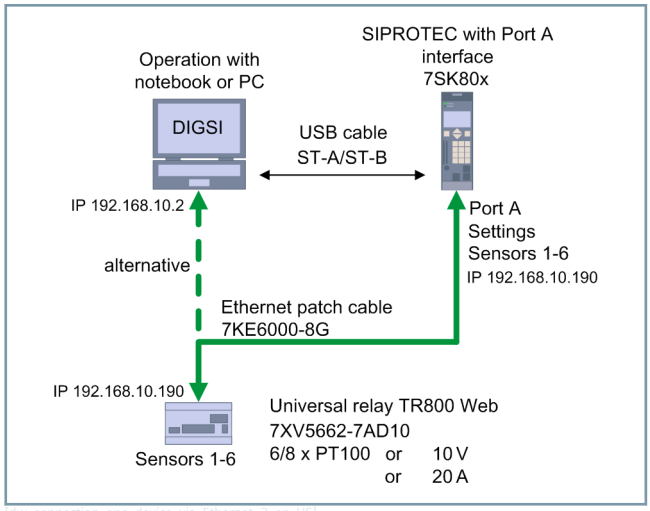
Application Examples

NOTE

The TR800 Web can only be used with SIPROTEC 4 or SIPROTEC 4 Compact devices.

Communication with a TR800 Web over the Ethernet interface

If a universal relay TR800 is sufficient for measured-value acquisition, this relay can be connected directly to the protection device (for example, 7SK80x/port A) by means of a CAT 5 patch cable. The TR800 Web is set in advance in the Web browser on a PC using the same cable. A TR800 can be queried by two or more SIPROTEC devices. The IP address and the UDP port of the TR800 can be set in the SIPROTEC device. In this way, a SIPROTEC device can use the temperatures 1 to 3 and another device can use the temperatures 3 to 6 for further processing, however, each device reads all 6 temperature values (*Figure 8.2/2*).



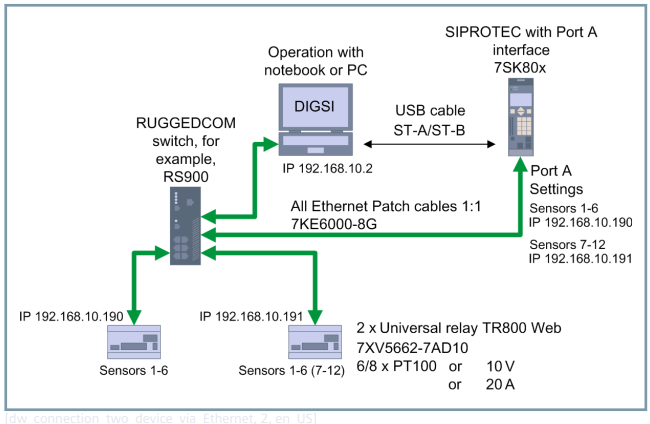
[dw_connection_one_device_via_Ethernet, 2, en_US]

Figure 8.2/2 Connecting a Device via the Ethernet

Communication with 2 TR800 Webs over the Ethernet interface

If 2 TR800s are used for measured-value acquisition on large engines, a switchgear-compatible switch (for example, RUGGEDCOM RS900 or Hirschmann RSR20) must be used. The switch, the 2 TR800 Web relays, the protection device and the control PC, connected via the patch cable (1:1), form their own subnetwork or are part of a larger Ethernet network.

DIGSI 4 and the Web browser may run in parallel on the control PC. Accordingly, one of the 2 TR800 Webs and the protection device can be used in parallel during normal operation and data can be read from them (*Figure 8.2/3*).



[dw_connection_two_device_via_Ethernet, 2, en_US]

Figure 8.2/3 Connecting 2 Devices via the Ethernet

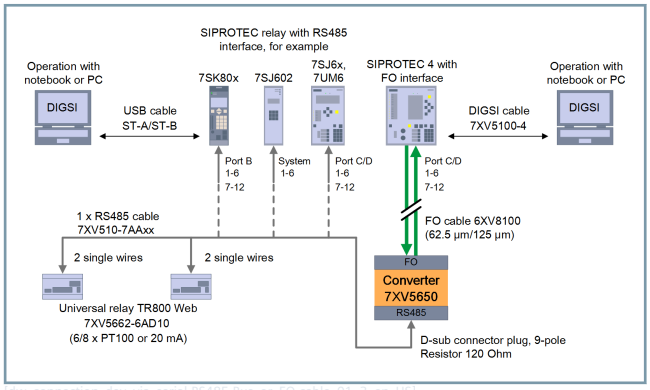
Communication over the RS485 bus

One or two TR800s can be connected to a SIPROTEC 4 device with temperature function (7SJ6, 7UT6, 7UM6) or the Compact device SIPROTEC 7SK80 via the RS485 interface.

The special cables 7XV5103-7AAxx are used for connection. In the case of remote measuring points, a connection can also be established via a multimode optical fiber and the converter 7XV5650.

3 operating modes are available for various applications. All 3 types are compatible with the RTD unit TR600 with 6 measuring inputs. The operating mode is set using the RS485 address of the TR800 Web.

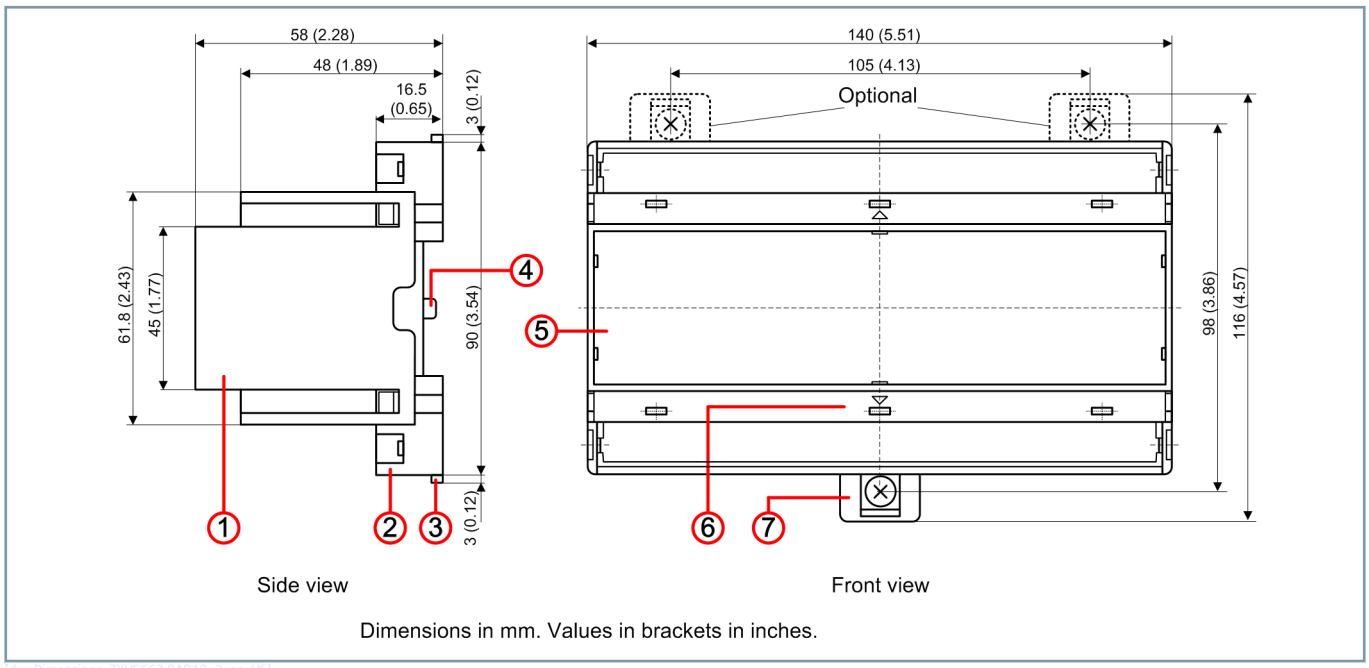
You can find detailed information at *www.siemens.com/siprotec*



[dw_connection_dev_via_serial-RS485-Bus_or_FO-cable_01, 3, en_US]

Figure 8.2/4 Connection via the Serial RS485 Bus or Fiber-Optic Cable

Dimensioned Drawing



[dw_Dimensions_7XV5662-8AD10, 2, en_US]

Figure 8.2/5 Dimensions, RTD Unit 7XV5662-7AD10

Technical Data

Rated auxiliary voltage	
Auxiliary voltage V_H	24 to 240 VAC/VDC, 0/45 to 120 Hz, < 4 W, < 8 VA
Tolerance	20.4 to 297 VDC, 20 to 264 VAC
Isolation voltage	2000 VAC

Relay/output			
Quantity		4 x 1 change-over contact	
Contact voltage		max. 415 VAC	
Switched current		max. 5 A	
Switching power		max. 2000 VA (resistive load) max. 120 W at 24 VDC	
Reduction factor at cos φ = 0.7		0.5	
Electrical rated data V_L:		250 VAC, 3 A, general purpose AC 240 V, ¼ hp. 2.9 FLA 120 VAC, ½₀ hp. 3.0 FLA A C 300 D 300 1 A, 240 VAC	
Rated operating current I_E	AC 15 DC 13	I_E = 3 A I_E = 2 A I_E = 0.2 A I_E = 0.1 A	V_E = 250 V V_E = 24 V V_E = 125 V V_E = 250 V

Relay/output	
Recommended fuse	3.5 A (gL)
Contact service life, mechanical	1 × 10^7 switching cycles
Contact service life, electrical	1 x 10^5 switching cycles at 250 VAC/6 A

Real-time clock	
	Buffer for 7 days Continuous synchronization is possible via the SNTP protocol to the Ethernet interface

Test conditions	
According to	EN 61010-1
Rated surge immunity	4000 V
Degree of pollution	2
Rated insulation voltage V_i	300 V
Operational time	100%
Permissible ambient temperature	-20 °C bis +65 °C EN 60068-2-1, dry heat
Earthquake safety EN 60068-2-6	2 to 25 Hz, ± 1.6 mm 25 to 150 Hz, 5 g
Galvanic separation	Ethernet-measuring input: min. 500 VDC
No galvanic separation	RS 485-interface – measuring inputs
EMC Tests	EN 61326-1
EMC test for emitted interference	EN 61000-4-3

Test conditions	
Fast transient bursts	EN 61000-4-4 ± 4 kV Pulse 5/50 ns, f = 5 kHz, t = 15 ms, T = 300 ms
Energy surge voltages (SURGE)	IEC 61000-4-5 ± 1 pulse: 1.2/50 µs (8/20 µs)
Electrostatic discharge test	IEC 61000-4-2 ± 4 contact discharge, ± 8 kV air discharge
Ethernet connection	10/100 megabit Auto-MDIX (no crossover cable required)

Sensor connection					
Measuring cycle/measurement time (for 8 measurands)	< 3 s				
Pt100, Pt1000 according to EN 60751:					
	Measuring range °C		Short circuit, ohms	Open circuit, ohms	Sensor resistance + line resistance, ohms
Sensor	min.	max.	<	>	> max.
Pt 100	-199	860	15	400	500
Pt 1000	-199	860	150	4000	4100
If Ni100 or Ni120 sensors are connected, the SIPROTEC device handles conversion. The TR800 is configured for Pt100 sensors.					
Accuracy	± 0.5 % of the measured value ± 0.5 K				
Sensor current	≤ 0.6 mA				
Temperature drift	< 0.04 °C				

Voltage/current input			
	Input impedance	Max. input signal	Accuracy of the end value
0 – 10 V	12 kΩ	27 V	0.1%

Voltage/current input			
0/4–20 mA	8 kΩ	100 mA	0.5%
Temperature drift		< 0.02% / K	

Resistance measurement	
Accuracy 0.0 to 500.0 Ω	0.2% of the measured value ± 0.5 Ω
Accuracy 0 to 30.00 kΩ	0.5 % of the measured value ± 2 Ω
Sensor current	≤ 0.6 mA

Housing	
Housing type	V8, distribution panel mounting
Dimensions (W x H x D)	140 × 90 × 58 mm
Depth/width	55 mm / 8 HPs
Line termination, single conductor	1 × 1.5 mm² each
Braided conductor with end sleeve	1 × 1.0 mm² each
Tightening torque for terminal screw	0.5 Nm
Degree of protection of the housing/ terminal	IP30/IP20
Vertical/horizontal mounting	optional
Fastening	Snap-on mounting to 35-mm DIN rail according to EN 60715 or screw fixing(with 2 additional angle brackets)
Weight	about 370 g

Selection and Ordering Data

Description	Order no.												
	1	2	3	4	5	6	7		8	9	10	11	12
Temperature measuring device (RTD unit) TR800Web	7	X	V	5	6	6	2	-	7	A	D	1	0
With 8 temperature sensors PT100, RS485 or Ethernet interface, DIN rail mounting, wide range power supply AC/DC 24 V to 240 V. Can only be used with SIPROTEC 4 Compact and SIPROTEC 4 relays, for each relay 2 units can be used.													



NOTE

Consider 7XV5674 for 20 mA applications

RTD Unit TR1200IP – 7XV5662-8AD10

Description

The RTD unit TR1200IP has 12 sensor inputs and can thus measure up to 12 temperatures using Pt100 sensors.

Support is provided for 3-wire sensors For 2-wire operation, the measured line resistance can be compensated with an appropriate setting.

All settings on the TR1200IP can be made using 3 push-buttons on the front of the device or in a web browser (for example, Internet Explorer).

For Ni100 or Ni120 sensors, the measured values must be converted in the protection device, which is supported by the SIPROTEC protection devices.

The measured values are output to the protection device via the Ethernet network using the RJ45 port.

Note: The temperature measurement with the RTD unit TR1200IP is not compatible with the SIPROTEC 4 EN100 module.

Benefits

- 10 MBit/s electrical Ethernet interface (Ziehl RTD, Modbus TCP protocol, or SUP (slave unit protocol) for SIPROTEC connection)
- IEC 61850 GOOSE protocol according to IEC 61850, edition 2
- Up to 5 simultaneous Modbus TCP or SUP Ethernet connections
- Automatic Modbus disconnect if communication drops out for more than 10 s
- 3-digit display for temperature at a maximum of 12 measuring points
- 12 sensor inputs; 1 to 12 sensors may be connected
- Pt100 in 2-wire or 3-wire technology; if connecting Ni100 or Ni120, conversion to the correct temperature is necessary in the evaluation device; SIPROTEC devices support this function.
- 1 alarm relay (1 change-over contact)
- Display, configuration, simulation and firmware update via a web browser
- LEDs for measurement assignment, faults, relay status and Ethernet interface
- Code lock against changing the set point values
- Wide range power supply unit AC/DC 24 V to 240 V
- Distributor housing for panel flush mounting, depth: 55 mm
- Mounting on 35 mm DIN rail according to EN 60715

Application Examples

Measurement of up to 12 measured values with an RTD unit TR1200IP

For measuring up to 12 temperature values, an RTD unit TR1200IP is connected directly to the protection device (for example, 7SK80x/port A) via a double-shielded CAT 5 patch cable (1:1 or crossed).



[ph_7XV5662-8AD10_, 1, --]

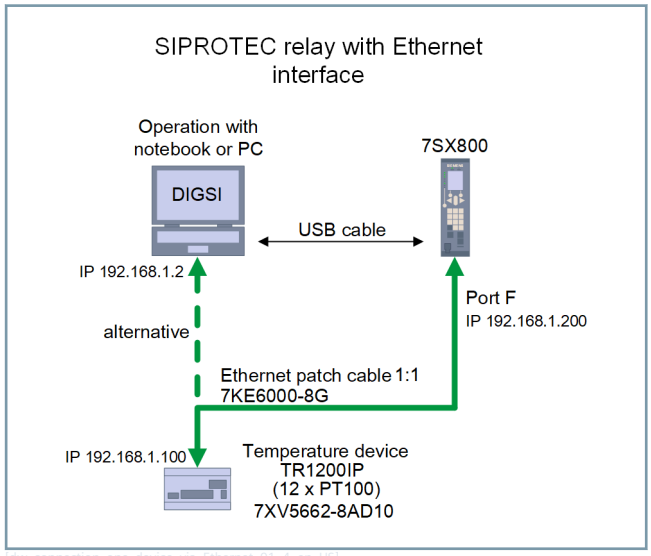
Figure 8.3/1 RTD Unit TR1200IP (Ethernet) 7XV5662-8AD10

The protection device is parameterized with DIGSI on a laptop computer using the USB front interface.

The TR1200IP RTD unit is set with the front push-buttons or in a web browser on a laptop computer via the Ethernet interface. To do this, the patch cable must be moved from the protection device to a laptop computer.

Tip: If, during commissioning, a commercially available switch is temporarily used with 3 patch cables, the protection device and the TR1200IP can be set in parallel using a PC and DIGSI.

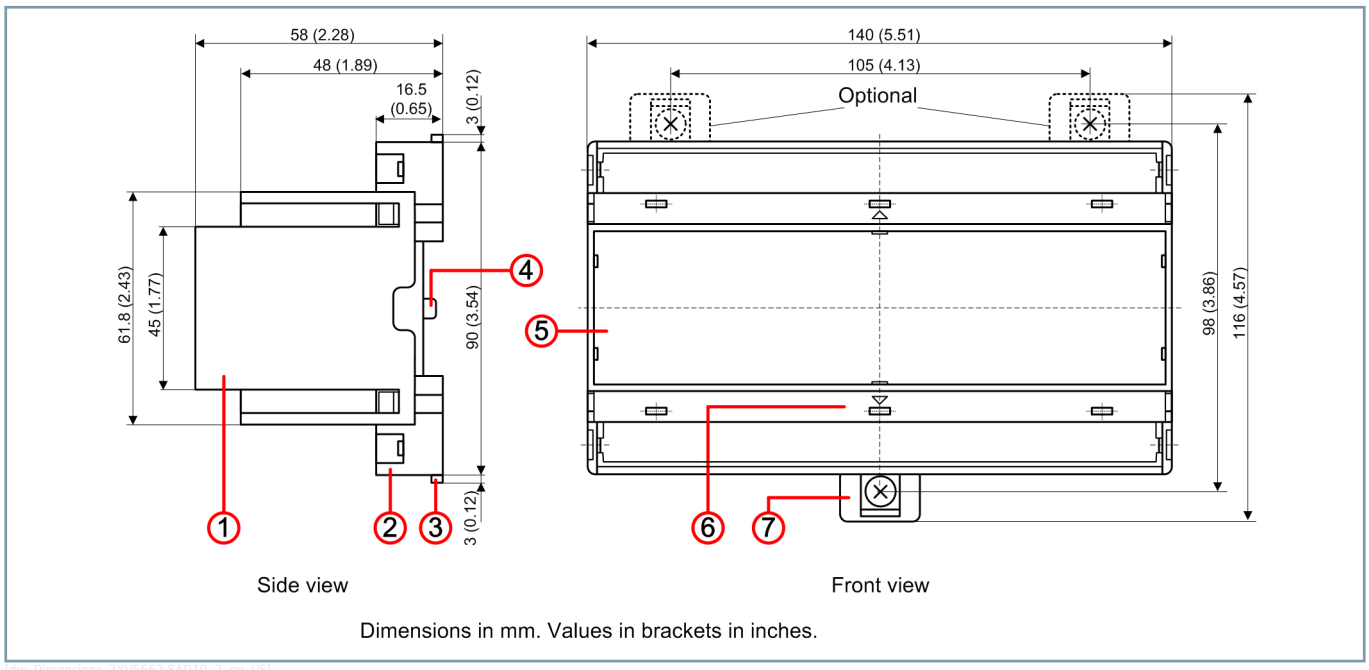
You can find detailed information at *www.siemens.com/siprotec*



[dw_connection_one_device_via_Ethernet_01, 4, en_US]

Figure 8.3/2 Connecting a Device via the Ethernet

Dimensioned Drawing



[dw_Dimensions_7XV5662-8AD10, 2, en_US]

Figure 8.3/3 Dimensions, RTD Unit 7XV5662-8AD10

Technical Data

Rated auxiliary voltage	
Auxiliary voltage V_H	AC/DC 24 V to 240 V, 50/65 Hz, < 3 W, < 10 VA
Tolerance	DC 20.4 V to 297 V/AC 20 V to 264 V, 50/60 Hz

Relay/output			
Quantity		1 change-over contact	
Contact voltage		max. AC 415 V	
Switched current		max. 5 A	
Switching power		max. 1250 VA (resistive load) max. 120 W at DC 24 V	
UL electrical ratings		AC 250 V, 5 A AC 240 V, ½ hp. AC 120 V, ¼ hp. B 300	
Rated operational current I_e	AC 15 DC 13	I_e = 3 A I_e = 2 A I_e = 0.2 A I_e = 0.1 A	U_e = 250 V U_e = 24 V U_e = 125 V U_e = 250 V
Recommended fuse		3.5 A (gL)	

Relay/output	
Contact endurance, mechanical	3×10^7 switching cycles
Contact endurance, electrical	1×10^5 switching cycles at AC 250 V/6 A 6×10^5 switching cycles at AC 250 V/1 A

Temperature measurement	
Measurement time, sensor	0.25 s to 3 s (depending on the number of sensors)
Measurement time, line resistance	0.25 s to 30 s (per measuring cycle of a sensor)
Measuring range	-199 °C bis 850 °C
Resolution	1 °C

Sensor connection					
12 × Pt100 according to EN 60751, the connection of Ni100 and Ni120 sensors is possible Conversion of the measured values must be performed in the evaluation unit.					
	Measuring range °C		Short circuit, Ohm	Open circuit, Ohm	Sensor & line resistance, Ohm
Sensor	min.	max.	<	>	max.
Pt100	-199	860	15	400	500
Tolerance		± 0.5% of the measurement ± 1 K			
Sensor current		≤ 0.8 mA			
Temperature drift		< 0.04 °C/K			

RTD Unit TR1200IP – 7XV5662-8AD10

Ethernet interface	
Transfer rate	10 MBit/s
IP address	Standard: 192.182.1.100, adjustable
Subnet mask	Standard: 255.255.255.0, adjustable
UDP port	Standard: 5000 (5001), adjustable
GOOSE protocol	IEC 61850, edition 2
Max. cable length	20 m when using a CAT 5 patch cable
Max. response time, RTD/Modbus	< 700 µs

Test conditions	
According to	EN 61010-1
Rated impulse withstand voltage/U_{imp}	4000 V
Surge category	III
Pollution degree	2
Rated insulation voltage U_i	300 V
On-load factor	100%
Permissible ambient temperature during operation	-20 °C bis +65 °C EN 60068-2-2, dry heat
Electromagnetic compatibility – immunity	EN 61000-6-2
EMC – emitted interference	EN 61000-6-3

Test conditions	
Galvanic separation of auxiliary voltage – measuring input	DC 3820 V
Ethernet – auxiliary voltage – measuring input	DC 500 V

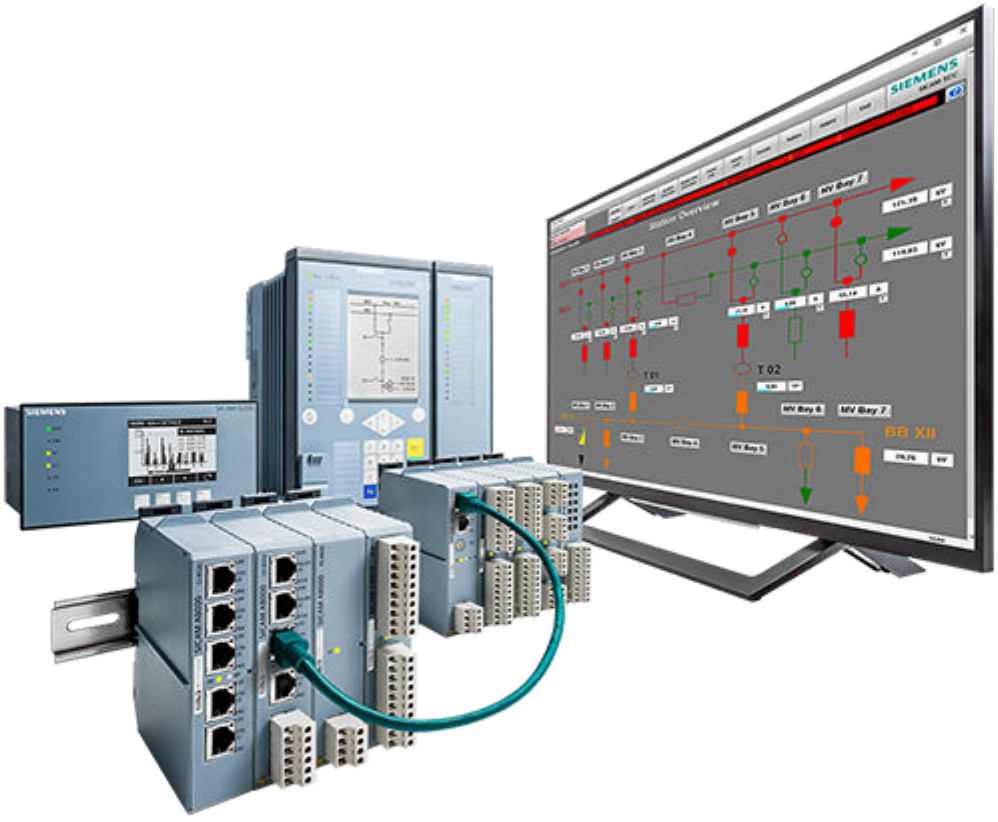
Housing	
Housing type	V8, panel flush mounting
Dimensions (W x H x D)	140 × 90 × 58 mm
Depth/width	55 mm / 8 HPs
Cable connection, single wire	1 × 1.5 mm² each
Finely stranded with end sleeve	1 × 1.0 mm² each
Tightening torque of terminal screw	0.5 Nm
Degree of protection of the housing/ terminal	IP30/IP20
Mounting position	any
Mounting	Snap-on mounting on 35 mm DIN rail according to EN 60715 or screw fixing(with 2 additional bars)
Weight	approx. 350 g

Selection and Ordering Data

Description	Order no.												
	1	2	3	4	5	6	7		8	9	10	11	12
Temperature measuring device (RTD unit) TR1200IP	7	X	V	5	6	6	2	-	8	A	D	1	0
With 12 temperature sensors Pt100, RJ45 interface socket, mounting on DIN rail, wide range power supply AC/DC 24 V to 240 V. For SIPROTEC 5 (except 7SS85, 7VK87, 7KE85), SIPROTEC 5 Compact-protection relays or SIPROTEC 4 Compact 7SK80, port A (Ethernet, RJ45).													

NOTE

Not compatible with SIPROTEC 4 EN100 module


SIEMENS
T 02
BB XII

9.1

Description

The arc protection function detects arcs in switchgear via optical sensors. These sensors will detect direct and reflected flash light within a specific detection range(purely optical and fastest way). This arc flashlight activates optic sensors.

Detection of arcs takes place either optically only or optionally using an additional current criterion in order to prevent an over function. The arc protection function uses a self-monitoring circuit. This circuit monitors the optical arc sensors and the fiber-optic cables.

The arc flash sensors are connected to the SIPROTEC 5 device via an ARC-CD-3FO module or Reyrolle 5 device with the D order code on the 10th digit of mlfb code 7SR5xxx-xxDxx-xAA0.

Optic sensitivity of sensors can be edited and set to trigger the light intensity level for light detection threshold from protection device settings parameters.

Benefits

The arc flash protection cares for an extremely fast trip avoiding additional damage of the assets and, even more important, for the safety of personal. Thus, the resulting arcs can be detected reliably and quickly. The protection device can trip correspondingly quickly and without time delays. This increases safety of personnel.

Applications

Within an air insulated switchgear, the optic sensors are placed in such a way that arcs in the busbar compartment, the circuit breaker compartment, and the cable connection department are reliably detected. Up to 3 optical point or line sensors can be connected to the protection relay module.

Point sensors

Point sensors detect flashlight of arc faults in the control cabinets of the air-insulated system part. The point sensors can be ordered with line lengths from 3 m to 35 m. Line cable is connected to protection device module at one end and on the other end sensor with light sensitive part.

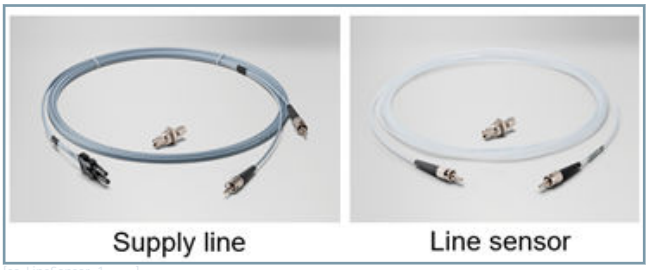


[sc_PointSensor, 1, _ _]

Figure 9.1/1 Point sensor P1X

Line sensors

Depending on the application, the line sensor can be installed over long sections, such as along the busbar. If the switchgear design allows, the line sensor can also pass through the breaker compartment and the feeder cable connection compartment, in addition to the busbar compartment. Line sensors detect arcs along the entire sensor length from 5 m to 40 m. Line sensors are connected via a supply line to the arc protection module of protection relay. The supply line can be ordered in lengths from 3 m to 10 m.



[sc_LineSensor, 1, _ _]

Figure 9.1/2 Line Sensor P1X

Inputs for Optical Sensors for Arc Protection (via Module ARC-CD-3FO)

Connector type	AVAGO AFBR-4526Z
Number of transceivers	3
Fiber type	Plastic Optical Fiber (POF) 1 mm
Receiver	
Maximum	-10 dBm ± 2 dBm
Minimum	-40 dBm ± 2 dBm
Spectrum	400 nm to 1100 nm
Attenuation	In the case of plastic optical fibers, you can expect a path attenuation of 0.2 dB/m. Additional attenuation comes from the plug and sensor head.
Optical budget[47]	Minimal 25 dB
Analog sampling rate	16 kHz
ADC type	10-bit successive approximation
Transmitter	
Type	LED
Wavelength	λ = 650 nm
Transmitter power	Minimum 0 dBm Maximum 2 dBm
Numerical aperture	0.5 [48]
Signal rate connection test	1 pulse per second
Pulse duration connection test	11 µs

47 All values in combination with sensors approved by Siemens.

48 Numerical aperture (NA = sin θ (launch angle))

Selection and ordering information – Optic arc sensors

Accessories	Article per packaging unit	Order no. (short designation)
Point sensor with line length of 3 m	1	P1X19
Point sensor with line length of 4 m	1	P1X28
Point sensor with line length of 5 m	1	P1X37
Point sensor with line length of 7 m	1	P1X277
Point sensor with line length of 10 m	1	P1X46
Point sensor with line length of 15 m	1	P1X55
Point sensor with line length of 20 m	1	P1X64
Point sensor with line length of 35 m	1	P1X82
Line sensor, length 5 m	1	P1X107
Line sensor, length 10 m	1	P1X116
Line sensor, length 20 m	1	P1X125
Line sensor, length 30 m	1	P1X134
Line sensor, length 40 m	1	P1X143
Supply line for line sensors 3 m	1	P1X152
Supply line for line sensors 5 m	1	P1X161
Supply line for line sensors 10 m	1	P1X170

Table 9.1/1 Accessories

ReyArc 7XG35

Description

The Reyrolle 7XG35 arc protection device is used in conjunction with P1X optical sensors to provide arc fault protection for medium or low voltage air insulated switchgear. Direct and reflected light produced by arcing faults is rapidly detected resulting in high speed operation. The P1X sensors are connected to the Reyrolle 7XG35 device via fiber optic cables. Integral self-supervision functionality monitors the Reyrolle 7XG35 device, the optical arc sensors and the fiber-optic connecting cables. An optional overcurrent check function can be used to provide secure 2-out-of-2 tripping criteria.

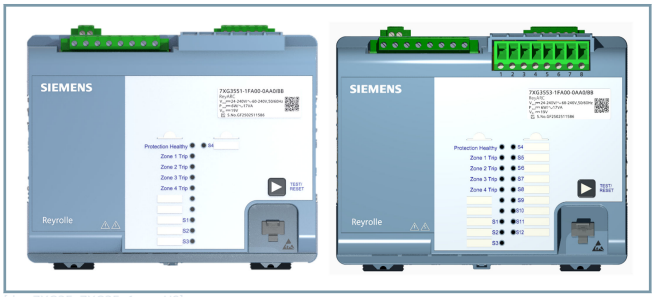
Benefits

- High speed fault detection, fast operating time with <2 ms light only and <7 ms light and current check
- Selective tripping provided by zone configuration
- Up to four zones of protection
- Suitable for new switchgear or as a retrofit upgrade to existing installations
- Easy configuration using the Reydisp Evolution PC tool via USB C interface:
  - Free of charge Reydisp Evolution PC tool
  - Online and offline device configuration
- Fast operation time reduces the risk of personnel injury and minimises equipment damage
- Cost-effective arc protection solution or protection upgrade
- Data storage features: 100 events and 5 fault data records with time stamping
- Real-time status of sensors, inputs, outputs and measured currents
- Straightforward installation:
  - Compact housing
  - DIN rail mounting
  - Detachable wiring connections

Functions

The Reyrolle 7XG35 device supports the following functions:

- Arcing faults detected using P1X 'Point' or 'Line' optical sensors
- Continuous self-supervision of the device and connected optical sensors
- Four high-speed binary outputs
- LEDs provide clear indication of operation and alarms
- Optional CT inputs for phase and earth fault current check functionality 50AFD/50GAFD
- Tripping can be based on arc flash or dual criteria operation: Arc flash and overcurrent
- CT supervision (60 CTS)
- Circuit breaker failure supervision (CBF)
- Wide range power supply DC 24 to 240 V and AC 60 to 240 V – single ordering variant



[dw_7XG35_7XG35, 1, en_US]

Figure 9.2/1 Reyrolle 7XG35 arc protection device

Applications

In metal-clad air insulated switchgear the light sensors are positioned such that arcing faults in the busbar, circuit breaker and the cable termination compartments etc. are reliably detected.

The Reyrolle 7XG35 device is typically located in the switchgear control cabinet.

Up to 12 optical sensors (point or line) can be connected to the Reyrolle 7XG35 device.

The Reyrolle 7XG35 and optical sensors can be installed in new switchgear and provide a straightforward retrofit solution to existing switchgear installations to improve safety and protection performance.

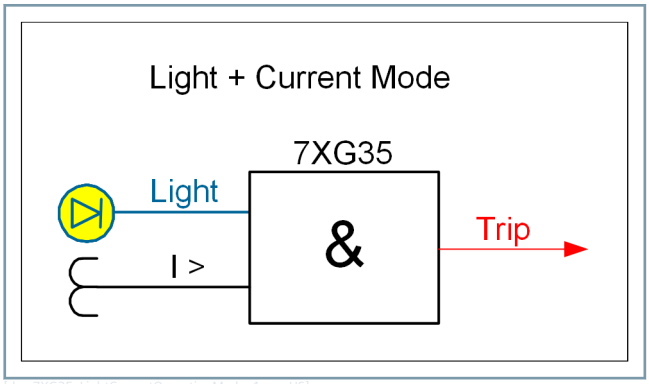
Product variants

The Reyrolle 7XG35 is available with 3 variants. The devices are summarized below:

Product code	Configuration
7XG3551-1FA00-0AA0	4 AFD sensor inputs
7XG3552-1FA00-0AA0	4 AFD sensor inputs + 4 CT current inputs
7XG3553-1FA00-0AA0	12 AFD sensor inputs + 4 CT current inputs

Light and current operation mode

Reyrolle 7XG35 devices have both AFD and optional current inputs. To provide operational security trip operation can be based on detection of two criteria – an arc flash and the flow of phase overcurrent or earth fault current. Overcurrent protection ensures the relay does not trip for other sources of light, while the light sensors ensure the device does not trip for an external fault.



[dw_7XG35_LightCurrentOperationMode_1, en_US]

Figure 9.2/2 Light and current operation mode

Data acquisition and recording

- Event records
  - Up to 100 events are stored and are shown to 1 ms accuracy
- Fault records
  - The last 5 fault records are stored and provide clear information on the fault type

Reydisp Evolution Software – Parameterization

The Reydisp Evolution PC engineering tool is used with the Reyrolle 7XG35 device. The device is parameterized and event/fault logs are viewed using a PC connection to the USB-C interface port.

Reydisp Evolution including Reyrolle 7XG35 application templates can be downloaded directly from the Siemens webpage.

Circuit breaker failure supervision (CBF)

Circuit breaker failure protection can be initiated from a device zone trip signal following a time delay. This can be configured to operate a binary output wired to initiate back-up tripping.

60CTS CT supervision

Open or short circuited CTs will not allow correct fault detection or stability measurement. Open circuited CTs may cause damaging over-voltages. The current from each phase's current transformer is monitored. An alarm will be raised if one or two of the three input currents fall below the CT supervision current setting for more than the set delay.

Self monitoring

The device internal supervision monitors the power supply and internal circuitry. The protection healthy LED is illuminated steady green when the device is healthy. If a device fault is detected the LED is illuminated red.

The optical arc sensors and fiber-optic cables are also supervised. Test signals are transmitted to the arc sensors. An amber LED indicates a sensor defect.

Zone tripping

Selective zone tripping provides discriminative tripping for all switchgear arrangements. Arc sensor inputs and high-speed binary outputs are configured clear arc faults in affected zones only.

Instruments and meters

- Primary and secondary phases/earth current
- Status of binary inputs (BI), binary outputs (BO, HSBO)
- AFD inputs – received light levels
- Zone trip and AFD counters

LED indications

The device has LEDs for user indications and can be configured by the user for self or hand reset. Users are able to edit and download an LED template available from the Siemens website.

The LED indications are for:

- Device/sensor healthy status
- 4 red LEDs for zone trip outputs
- Up to 12 LEDs for arc sensor operation and supervision
- 2 user-programmable red LEDs can be assigned by a user using the Reydisp Evolution tool output matrix

Binary outputs (BO, HSBO)

4 user configurable high speed binary outputs (HSBO) can be used for tripping commands and can be assigned to specific protection zones.

1 user configurable binary output (BO) with a change-over contact. This is assigned to the device supervision function by default.

Binary input (BI)

The DC 19 V binary input can be user assigned to signals such as circuit breaker position, remote trip, external light detection, etc.

Arc flash detection sensors

The Reyrolle 7XG35 has either 4 or 12 P1X series arc sensor inputs. Each input is compatible with a point or line sensor, a mixture of sensor types can be used.

Each protected switchgear compartment can be equipped with an arc sensor.

Point sensors

Point sensors are available with fibre optic cable lengths from 3 m to 35 m. The F.O. cable is connected to the Reyrolle 7XG35 using a plug-in connector.



[sc_PointSensor, 1, --_--]

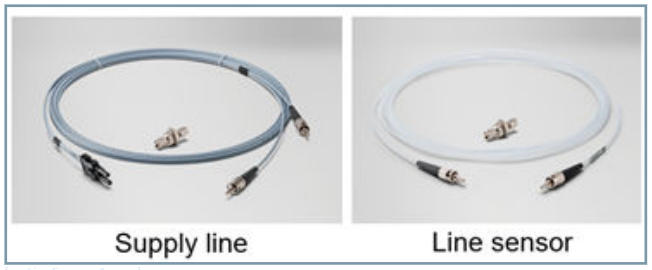
Figure 9.2/3 Point sensor P1X

Line sensors

Line sensors are used in larger enclosures such as the busbar compartment, or if the switchgear design allows can be routed through the CB and cable connection compartments etc. The

sensor consists of a fiber with a transparent coating. It detects arcs along the entire sensor length (5 m to 40 m).

Line sensors are connected via a supply line to the arc protection module of the Reyrolle 7XG35 using a plug-in connector. The supply line can be ordered in lengths from 3 m to 10 m.

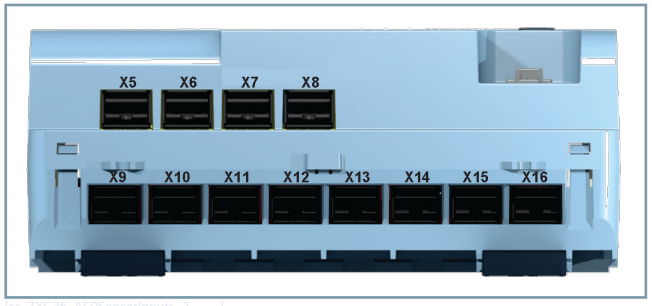


[sc_LineSensor, 1, --_--]

Figure 9.2/4 Line sensor P1X

Reyrolle 7XG35 AFD inputs for optical sensors

Each AFD input connects to a twin fibre optic cable (transmit / receive).



[sc_7XG35_AFDSensorInputs, 2, --_--]

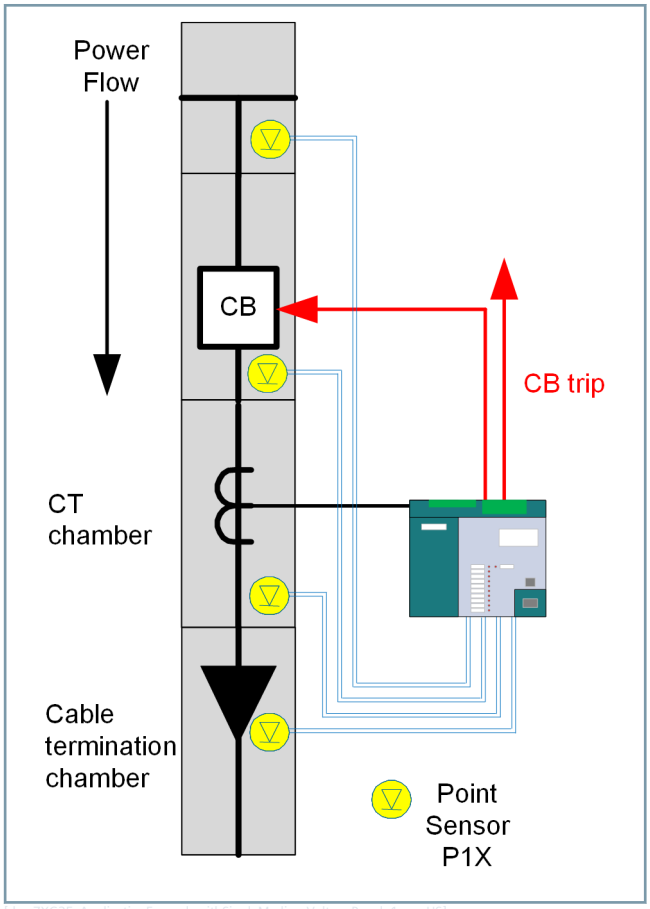
Figure 9.2/5 AFD sensor inputs

Application example

Light sensors are installed in each switchgear compartment e.g. busbar, circuit breaker, CT chamber, and cable termination. Each sensor is connected to a Reyrolle 7XG35 AFD input (X5, X6, X7, and X8). Each AFD sensor input is mapped to a high speed binary output for CB tripping.

The circuit current transformer is connected to the device CT inputs.

The operating mode can be set to Light Only or Light and Current mode.

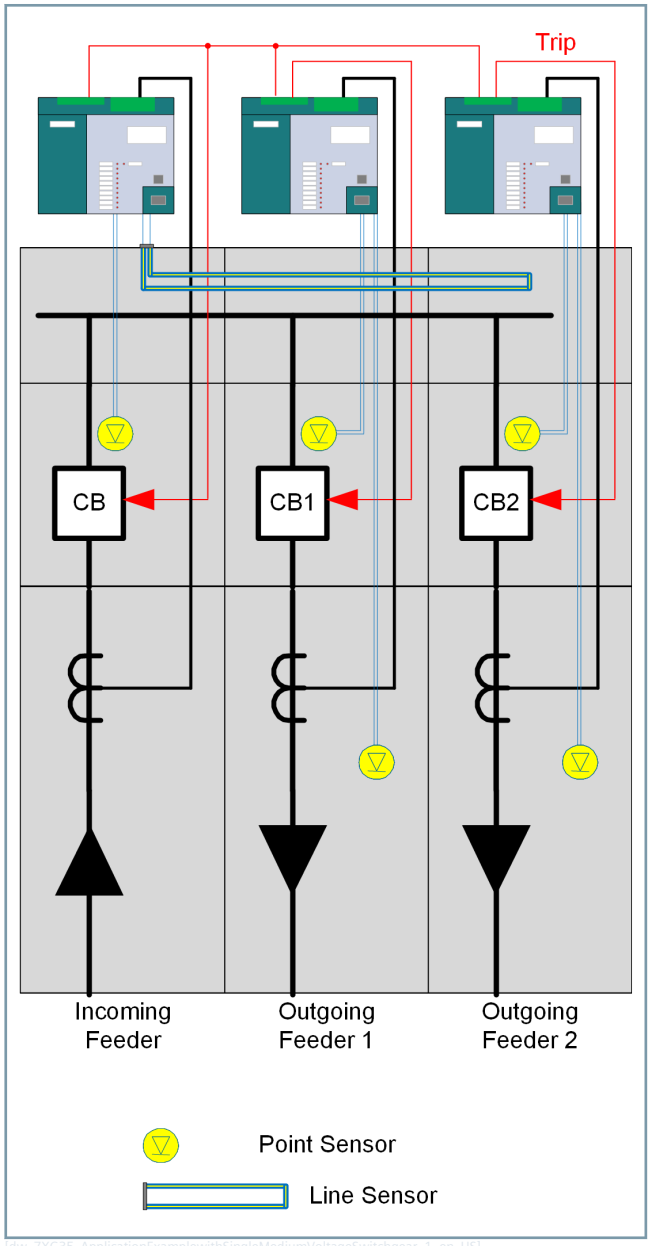


[dw_7XG35_ApplicationExamplewithSingleMediumVoltagePanel, 1, en_US]

Figure 9.2/6 Application example with single medium voltage panel

When an arcing fault occurs a trip output is issued to the relevant circuit breaker, dependent on the location of the arc fault. The Reyrolle 7XG35 can be used in switchgear with several enclosures, an example is shown in *Figure 9.2/7*. This installation includes a combination of point and line sensors. Point sensors are fitted into the cable compartment and circuit breaker compartment. Line sensors are run through several busbar panels.

This allows the location of the arcing fault to be determined and the correct CB to be tripped. Selective tripping will disconnect the minimum amount of plant to isolate the faulted section.



[dw_7XG35_ApplicationExamplewithSingleMediumVoltageSwitchgear, 1, en_US]

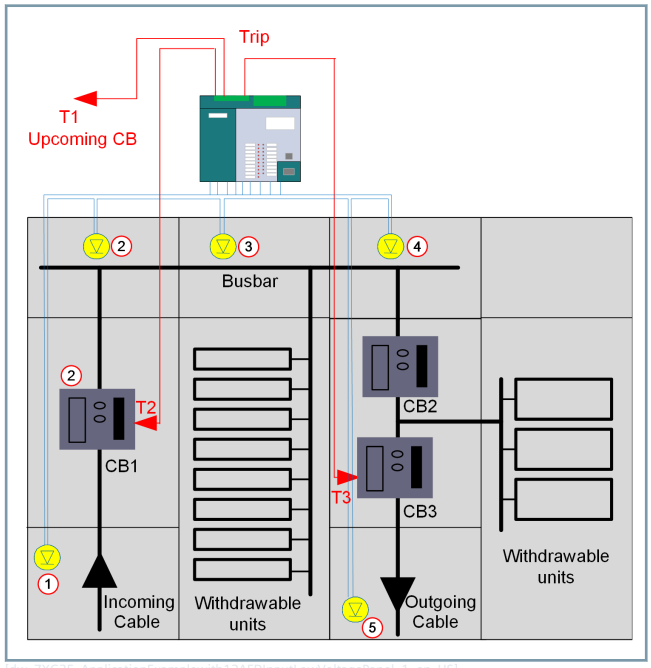
Figure 9.2/7 Application example with single medium voltage switchgear

Figure 9.2/8 shows an application with a 12 AFD input 7XG35 device in a low voltage panel. The busbar is positioned horizontally at the top and the cable connections are at the bottom for incoming and outgoing circuits. Sensors are located in the busbar and cable compartments to detect arc faults and send trip signals to dedicated circuit breakers. In this application, isolated and closed parts like CBs and withdrawable units are not monitored for arc protection. Check your panel type and requirements when designing an arc protection scheme.

Sensor 1 in the cable compartment protects the cable compartment as Zone-1 and sends trip signal to upcoming CB feeding the panel.

Sensors 2, 3, and 4 are in the busbar compartment for Zone-2 protection and sends trip signal to CB1.

Sensor 5 in the cable compartment and protects cable compartment as Zone-3 by tripping CB3.



[dw_7XG35_ApplicationExamplewith12AFDInputLowVoltagePanel, 1, en_US]

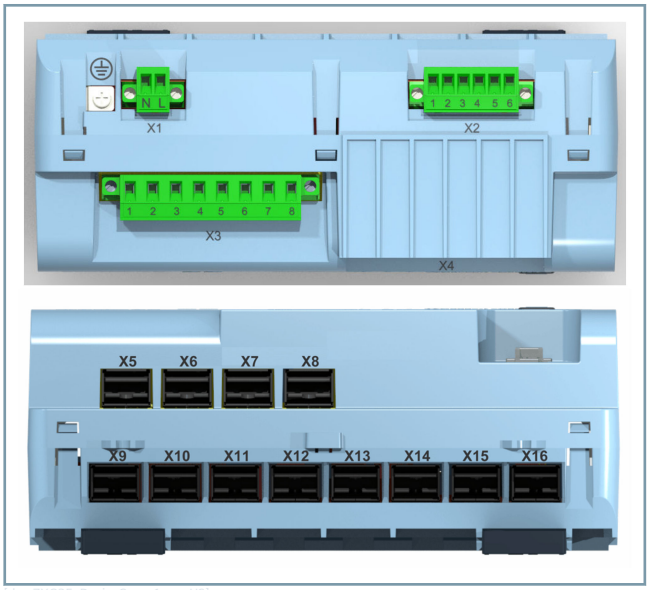
Figure 9.2/8 Application example with 12 AFD inputs

Sensors	Zone	HSBO	CB
1	Zone 1	1 (T1)	Upcoming CB
2, 3, 4	Zone 2	2 (T2)	CB1
5	Zone 3	3 (T3)	CB3

Hardware construction

The devices are housed in a polycarbonate case suitable for mounting on a standard 35 x 15 mm DIN rail. No special tools are required for device installation.

Electrical connectors are located on the top of the devices and optical (AFD sensor) connectors are on the bottom to prevent dirt dropping into the optical inputs if the dust protection caps are not fitted.



[dw_7XG35_DeviceCase, 1, en_US]

Figure 9.2/9 Device case

Screw type terminal blocks are suitable for flat type screwdrivers with a 3 mm blade.

Terminal blocks

- X1: Auxiliary power supply DC 24 to 240 V and AC 60 V to 240 V
- X2: 1 binary input and 1 change-over contact binary output
- X3: 4 high speed binary output (HSBO) contacts configured as self or hand reset (latched). The outputs can be used to directly trip the circuit breaker.
- X4: Fitted on devices with CT inputs, 1 A/5 A
- X5 to X16: Arc flash sensor input (X5 to X8 for 4 AFD input devices)



The case earth stud should be solidly connected to the panel earth with a cable of minimum diameter 2.5 mm².

Figure 9.2/10 Earthing terminal

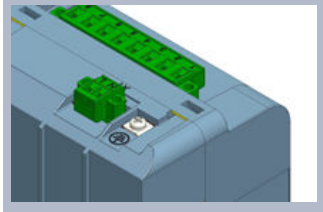
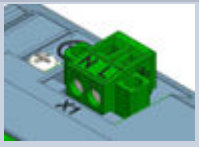


Figure 9.2/11 Case earth stud



X1 terminal auxiliary power supply: DC 24 to 240 V and AC 60 V to 240 V voltage ratings.

Figure 9.2/12 Auxiliary power



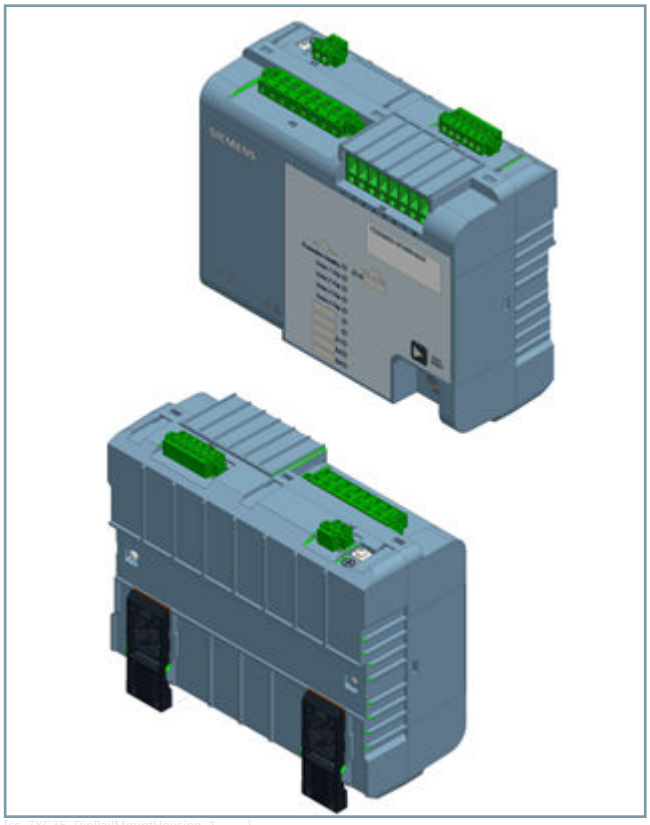
Figure 9.2/13 Test/Reset button

Pressing the LED Test/Reset push-button on the front fascia for 2 s resets the indication LEDs and the latched (hand reset) binary outputs.



Figure 9.2/14 USB port

The USB type C front interface on the front fascia is for parameterization and Reydisp tool device configuration. The configuration file is transferred via the USB-C interface. Stored device data/logs could be read and transferred to the PC. The front USB port cover provides environmental protection.



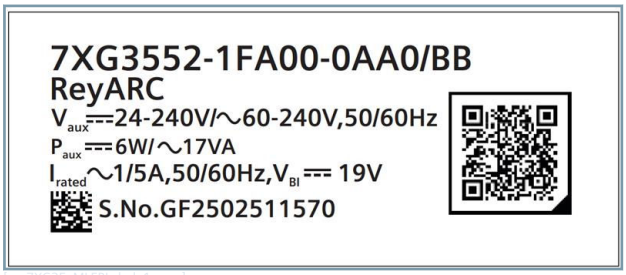
[sc_7XG35_DinRailMountHousing, 1, _en_]

Figure 9.2/15 DIN rail mount housing

Relay information

The device is identified by 3 labels located on the front and sides of the device.

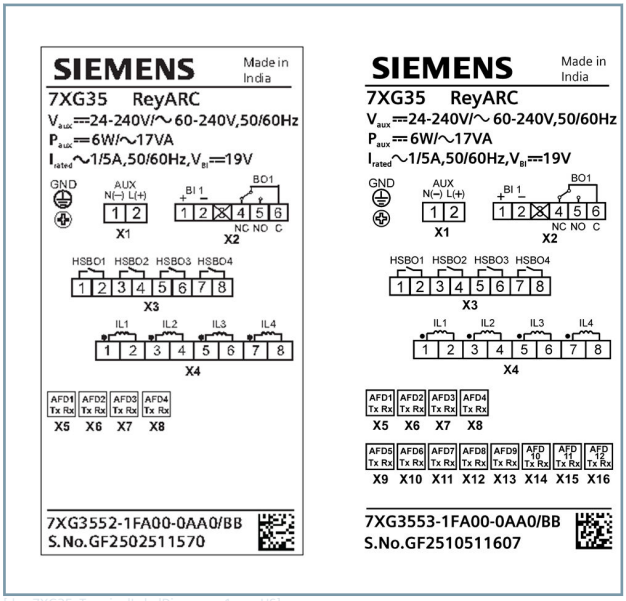
- The front label displays the MLFB complete order code for hardware, product family, product version, serial number, nominal auxiliary supply voltage ratings, current input ratings with CT input devices, binary input threshold voltage, and device identification reference. The QR code will display a web page containing detailed product information and documentation.



[sc_7XG35_MLFBLabel, 1, --_--]

Figure 9.2/16 MLFB label

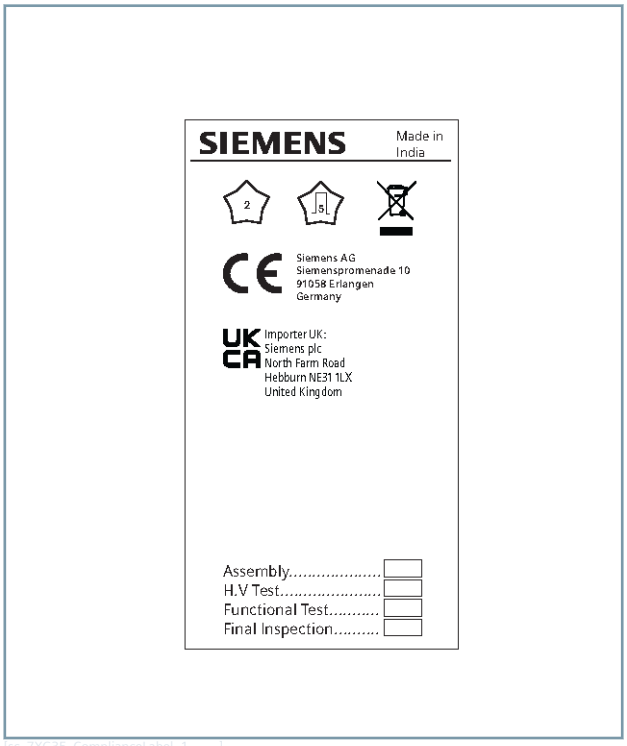
- The diagram label displays terminal numbers and device ratings



[dw_7XG35_TerminalLabelDiagrams, 1, en_US]

Figure 9.2/17 Terminal diagram label

- The compliance label includes information for electrical safety and conformity



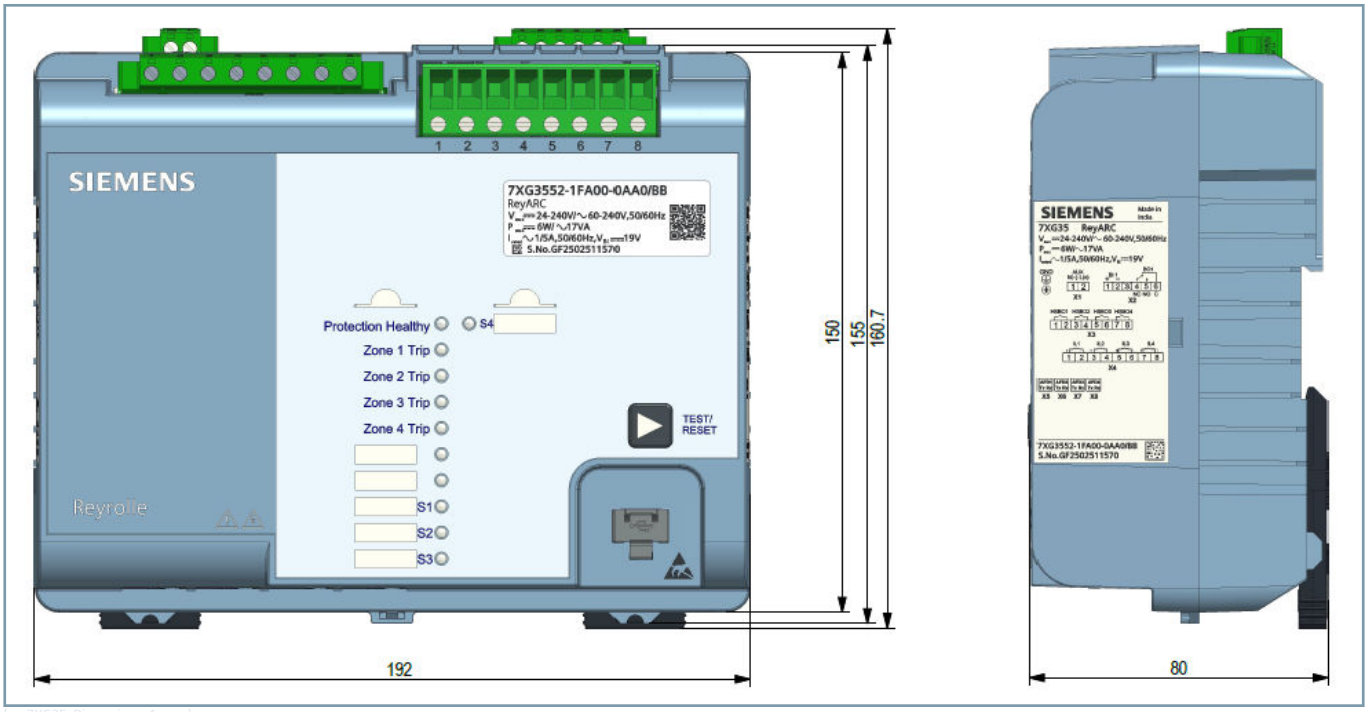
[sc_7XG35_ComplianceLabel, 1, --_--]

Figure 9.2/18 Compliance label

In the following table you can find explanations and definitions of symbols:

	Electrical Hazard
	Refer to device documentation
	Waste Electrical and Electronic Equipment Directive (WEEE)
CE	European CE marking
UK CA	United Kingdom (UK) conformity-assessed marking
5	5 kV impulse voltage test (type test) in compliance with Class III

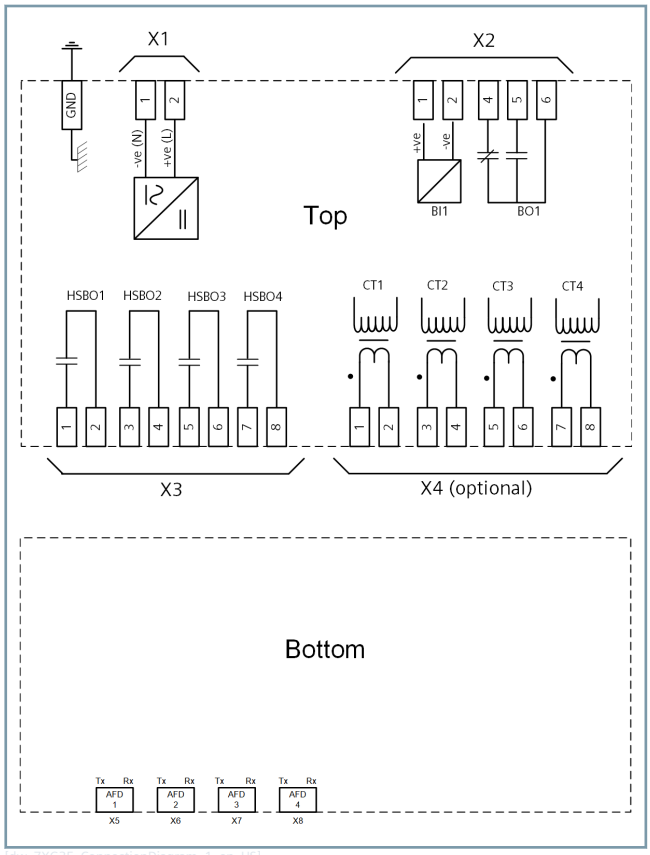
Dimension drawings



[sc_7XG35_Dimensions, 1, --_--]

Figure 9.2/19 7XG35 dimensions in mm

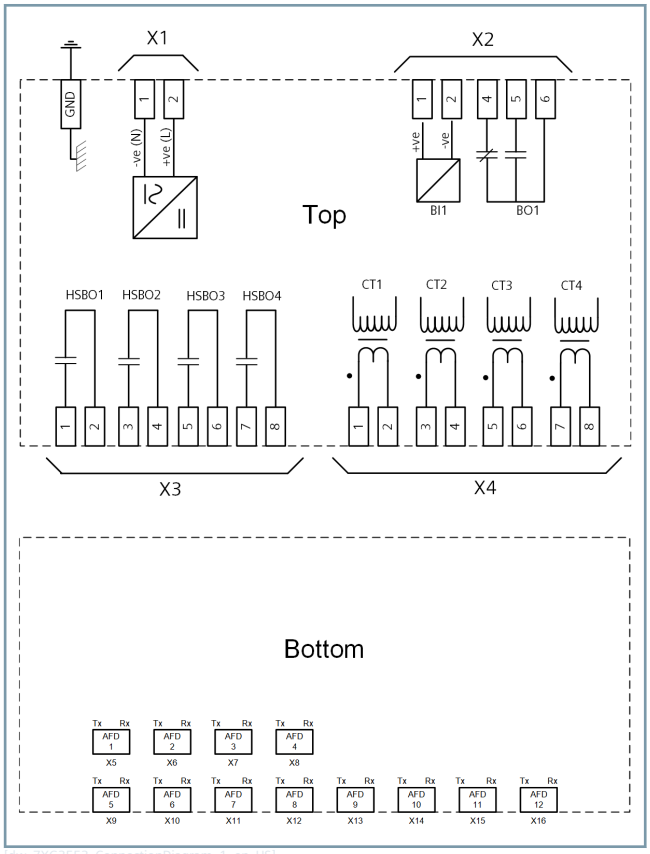
Connection diagrams



[dw_7XG35_ConnectionDiagram, 1, en_US]

Figure 9.2/20 Reyrolle 7XG3551 and 7XG3552 connection diagram

AFD Arc flash detector input
BI Binary input
BO Binary output
HSBO High speed binary output
AUX Auxiliary power supply



[dw_7XG3553_ConnectionDiagram, 1, en_US]

Figure 9.2/21 Reyrolle 7XG3553 connection diagram

AFD Arc flash detector input
BI Binary input
BO Binary output
HSBO High speed binary output
AUX Auxiliary power supply

Technical data

Auxiliary power supply

Parameter	Value
Rated auxiliary voltage	AC 60 V to 240 V/DC 24 V to 240 V
Tolerance	-20 % to +10 %
Rated frequency	50 Hz/60 Hz
Allowable alternating component in DC (ripple)	≤15 % of DC voltage
Typical power consumption (DC)	< 6 W
Typical power consumption (AC)	< 17 VA
Inrush current	65 A for 600 µs maximum
Maximum interruption time (collapse to 0)	≤ 20 ms (DC 19.2 V) ≤ 20 ms (AC 48 V)

9.2

Current inputs

Parameter		Value
Quantity		3 x phase and 1 x earth (ground)
Rated current I_{rated}		1 A or 5 A
Measuring range		0.1 · I_{rated} to 12 I_{rated} (Phase) 0.05 I_{rated} to 4 I_{rated} (Earth)
Instrumentation accuracy		± 10 % or ± 2 % I_{rated}
Frequency		50 Hz (47.5 Hz to 52.5 Hz) 60 Hz (57 Hz to 63 Hz)
Thermal withstand	Continuous	4 I_{rated}
	Short time 1 s	500 A
	10 ms	1250 A
Burden		≤ 0.03 VA (1 A phase and earth element) ≤ 0.2 VA (5 A phase and earth element)

Terminal blocks

Terminal description	Specifications
Grounding terminal	Ground the equipment at the grounding terminal • Insulated ring terminal, M3 stud size, conductor cross-section 2.5 mm², 14 AWG to 10 AWG • Manufacturer/part number: RS Stock No. 613-9334 or equivalent • Tightening torque: 0.5 Nm to 0.6 Nm
X1: Auxiliary power supply	• DC 24 V to 240 V, AC 60 V to 240 V, 50 Hz/60 Hz; tolerance: -20 % to +10 % • Connection type: screw connection with tension sleeve • Bootlace ferrule, insulated, conductor cross-section 2.5 mm², 8 mm • Manufacturer: Weidmueller, Mfr., part no. 9019160000 or equivalent • Tightening torque: 0.4 Nm to 0.5 Nm
X2: 1 binary input and 1 binary output	1 binary input (pin 1, 2) and 1 binary output for supervision contact (pin 4, 5, 6) • Connection type: screw connection with tension sleeve • Bootlace ferrule, insulated, conductor cross-section 2.5 mm², 8 mm • Manufacturer: Weidmueller, Mfr., part no. 9019160000 or equivalent • Tightening torque: 0.5 Nm to 0.6 Nm
X3: 4 high-speed binary output	• Connection type: screw connection with tension sleeve • Bootlace ferrule, insulated, conductor cross-section 2.5 mm², 8 mm • Manufacturer: Weidmueller, Mfr., part no. 9019160000 or equivalent • Tightening torque: 0.5 Nm to 0.6 Nm
X4: 4 current inputs	• Connection type: front screw connection • Bootlace ferrule, insulated, conductor cross-section 2.5 mm² to 4 mm² • Manufacturer: Weidmueller, Mfr., part no. 9019170000 for 2.5 mm² and ENER, Mfr., part no. ENEVN 4009 for 4 mm² or equivalent • Tightening torque: 0.6 Nm
X5-X8: Arc flash detector sensor inputs (X5-X16 for 7XG3553)	• The device supports arc sensor (both the Siemens P1X point sensor and Siemens P1X line sensor) for connection to these inputs • Ambient temperature for arc sensors: -40 °C to +85 °C (-40 °F to +185 °F) • Ensure that the arc flash detector sensor input dust cover is in place when the arc sensor is not connected to the inputs
Front communication port	USB, type C • Communication port for Reydisp Evolution PC tool

Binary outputs

Parameter		Value
Quantity		1
Operating voltage	Maximum	AC 250 V/DC 250 V
	Minimum	AC 0 V/DC 0 V
Contact operate time		8 ms typical
Release time		≤ 9 ms typical
Making capacity		≥ 1000 W at L/R ≤ 40 ms
Contact current	Continuous	5 A
	Short time duty cycle (DC 250 V)	30 A, 200 ms On, 15 s Off
Breaking capacity	DC inductive	30 W at L/R = 40 ms
	DC resistive	75 W
	AC recistive	1250 VA
Mechanical/electrical endurance	Unloaded cycles	≥ 10000
	Making cycles	≥ 1000
	Breaking cycles	≥ 1000
	Operations per minute, full load	≤ 6

High speed binary outputs

Parameter		Value
Quantity		4
Operating voltage	Maximum	AC 240 V/DC 250 V
	Minimum	AC 3 V/DC 3 V
Contact operate time		≤ 1 ms
Release time		≤ 9 ms
Making capacity		≥ 1000 W at L/R ≤ 40 ms
Contact current	Continuous	5 A
	Short time duty cycle (AC 240 V/DC 250 V)	30 A, 200 ms On, 15 s Off
Breaking capacity	DC inductive	30 W at L/R = 40 ms
	DC resistive	75 W
	AC recistive	1250 VA
	AC inductive	30 VA at power factor of 0.3
Mechanical/electrical endurance	Unloaded cycles	≥ 10000
	Making cycles	≥ 1000
	Breaking cycles	≥ 1000
	Operations, full load	≤ 10 per second make, 6 per minute break

Binary inputs

Parameter		Value
Quantity		1
BI threshold		DC 19 V
BI operating range		DC 19 V to 264 V
Current for operation		0.6 mA to 3.5 mA
Pickup delay		User selectable 0 ms to 600000 ms (600 s)
Dropout delay		User selectable 0 ms to 600000 ms (600 s)
DC performance (DC 24 V)	Reset/operate voltage ratio	≥ 95 %
	Response time	< 7 ms
	Response time when programmed to energize a high speed binary output (which includes output relay operation)	< 9 ms
	Drop off time	< 9 ms

Arc flash detector inputs

Parameter	Value
Connector type	AVAGO AFBR-4526Z
Number of sensor connections	Up to 4 sensors – point sensor or line sensor (Siemens P1X series)
Fiber type	Polymer Optical Fiber (POF) 1 mm

Parameter			Value
Receiver	Type = point (default)		-20 dBm ± 2 dBm
	Type = line (default)		-31.5 dBm ± 2 dBm
	Type = point/line (custom)		(-34 dBm to -11 dBm) ± 2 dBm
	Spectrum		400 nm to 1100 nm
	Attenuation		For polymer optical fibers a path attenuation of 0.2 dB/m is typical. Additional attenuation comes from the plug and the sensor head.
	Optical budget[49]		Minimal 25 dB
	Analog sampling rate		5 kHz
	ADC type		12 bit successive approximation
Transmitter	Wavelength		λ = 650 nm
	Transmitter power	Maximum	2 dBm
		Minimum	0 dBm
	Numerical aperture		0.5[50]
	Signal rate connection test		1 pulse per 1.666 s
	Loop integrity test pulse width		11 µs

Arc flash detection

Parameter		Value
Reference (50AFD)	I_{set} setting	0.1 · I_{rated} to 6 · I_{rated}, Δ 0.1 · I_{rated}
	I applied current (for operate time)	0 · I_{set} (switched) to 2 · I_{set} (switched)
Reference (50GAFD)	I_{set} setting	0.05 · I_{rated} to 2 · I_{rated}, Δ 0.01 · I_{rated}
	I applied current (for operate time)	0 · I_{set} (switched) to 2 · I_{set} (switched)
Reference (AFD Zone)	Zone n element	Enable/Disable
	Zone n operating mode	Light only Light and current
Reference (AFD Input Config)	AFDn	Enable/Disable
	AFDn sensor type	Point/Line
	AFDn threshold	Point/Line/-34 dBm to -11 dBm

49 All values in combination with sensors approved by Siemens

50 Numerical aperture (NA = sin θ [launch angle]

9.2

50 AFD and 50GAFD

Parameter		Value
Operate and reset level	Operating level I_{op}	I_{set} ± 10 % or ± 2 % I_{rated}
	Reset level	≥ 90 % I_{op}
	Repeatability	± 5 %
	Variation IEC 60255-1	-10 °C to +55 °C ≤ 5 %
	f_{rated} ± 5 %	≤ 5 % or 1 % I_{rated}
AFD zone operate and reset time	Operate time using HSBO (t_{op}) Operate mode: Light only	Typically 1 ms, < 2 ms
	Operate time using HSBO (t_{op}) Operate mode: Light and current	Typically 3.5 ms, < 7 ms
	Reset time (light)	≤ 30 ms
	Reset time (current)	≤ 60 ms

Circuit breaker failure supervision (CBF)

Parameter		Value
Operate and reset level	Operating level I_{op}	100 % I_{set}, ± 10 % or ± 2 % I_{rated}
	Reset level	< 100 % I_{op}, ± 10 % or ± 2 % I_{rated}
	Variation -10 °C to +55 °C	≤ 5 % or 1 % I_{rated}
	f_{rated} ± 5 %	≤ 5 % or 1 % I_{rated}
CBF Delay (t_{delay})		50 ms to 5000 ms step of 5 ms
CBF I setting (phase)		0.1 to 0.5 I_n, Δ 0.01
		0.5 to 2 I_n, Δ 0.05
CBF I4 setting (earth)		0.05 to 0.5 I_n, Δ 0.01
		0.5 to 2 I_n, Δ 0.05
CBF Zone n		Enable Disable
Zone n criteria		Light only Current only Light & current
t_{basic}		< 20 ms
Operate time (t_{op}) Operate mode: all modes		t_{delay} ± 1 % or ± 20 ms
Disengaging time		< 30 ms

60CTS CT supervision

Parameter		Value
Operate and reset level	CT failed current level I_{op}	100 % I_{set}, ± 10 % or ± 2 % I_{rated}
	Reset level	90 % I_{op}, ± 10 % or ± 2 % I_{rated}
	Variation -10 °C to +55 °C	≤ 5 % or 1 % I_{rated}
	f_{rated} ± 5 %	≤ 5 % or 1 % I_{rated}
Element basic operating time t_{basic}		40 ms ± 20 ms
Operate time following delay t_{op}		t_{basic} + t_{delay} ± 1 % or ± 20 ms
60 CTS Setting		0.05 to 2 · I_{rated}, Δ 0.05 · I_{rated}
60CTS Delay		0.03 s to 100 s, Δ 0.01 s 100 s to 600 s, Δ 1 s

Mechanical

Vibration – Sinusoidal (IEC 60255-21-1 Class 1)

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

Shock and bump (IEC 60255-21-2 Class 1)

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 1)

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

IP ratings (IEC 60259)

Type	Level
Enclosure	IP 20

Product safety

Protection class

Type	Level
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	AC 1.0 kV RMS for 1 min
Across open contacts	

Transient overvoltage – Impulse voltage withstand (IEC 60255-27)

Type	Level
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)

Type	Level
Insulation resistance at DC 500 V	> 100 MΩ

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 10 m, quasi-peak
30 MHz to 230 MHz	40 dB (µV/m)
230 MHz to 1 GHz	47 dB (µV/m)

Radiated immunity (IEC 60255-26)

Type	Level
80 MHz to 2700 MHz	10 V/m
2.7 GHz to 6 GHz	3 V/m
80 MHz, 160 MHz, 380 MHz, 450 MHz, 900 MHz, 1850 MHz, 2150 MHz	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
Spot frequency: 27 MHz and 68 MHz	10 V/m
Sweep frequency: 150 kHz to 80 MHz	10 V/m

Burst immunity (IEC 60255-26 Zone A)

Type	Level	Variation
Aux power, I/O and earth	4 kV, 5 kHz	≤ 10 %

Slow damped oscillatory wave/HF disturbance (IEC 60255-26, 1 MHz)

Type	Level	Variation
Aux power, I/O, common (longitudinal) mode	2.5 kV	≤ 10 %
Aux power, I/O, differential (transverse) mode	1.0 kV	

Slow damped oscillatory wave/HF disturbance (IEC 61000-4-18, 100 kHz)

Type	Level	Variation
Aux power, I/O, common (longitudinal) mode	2.5 kV	≤ 10 %
Aux power, I/O, differential (transverse) mode	1.0 kV	

Fast damped oscillatory wave (IEC 60255-26: 3 MHz, 10 MHz, and 30 MHz)

Type	Level	Variation
Aux power, I/O, common (longitudinal) mode	2.0 kV	≤ 10 %

Surge immunity (IEC 60255-26 Zone A)

Type	Level	Variation
Aux power and I/O: between all terminals and earth	4 kV	≤ 10 %
Aux power and I/O: between any two independent circuits	2 kV	

Ring wave immunity test (IEC 61000-4-12)

Type	Level
Common mode	4 kV
Differential mode	2 kV

Power frequency disturbance (IEC 60255-26 zone A)

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

Magnetic field with power frequency (IEC 60255-26 zone A)

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

Pulse magnetic field (IEC 61000-4-9 level 5)

Type	Level
1000 A/m	Magnetic field strength for short duration 1 s to 3 s

Damped oscillatory magnetic field immunity (IEC 61000-4-10 level 5)

Type	Level
100 A/m	0.1 MHz and 1 MHz

Climatic tests

Temperature (IEC 60068-2-1/2/14, IEC 60255-1)

Parameter	Value
Operating range	-10 °C to +55 °C
Storage range	-25 °C to +70 °C
Change of temperature	-10 °C to +55 °C

Humidity (IEC 60068-2-78, IEC 60068-2-30, and IEC 60255-1)

Parameter	Value
Cyclic temperature with humidity	+25 °C at 95 % RH and +55 °C at 95 % RH (6 days)
Damp heat steady state	+40 °C at 95 % RH (10 days)

Ordering information – Reyrolle 7XG35 arc protection device

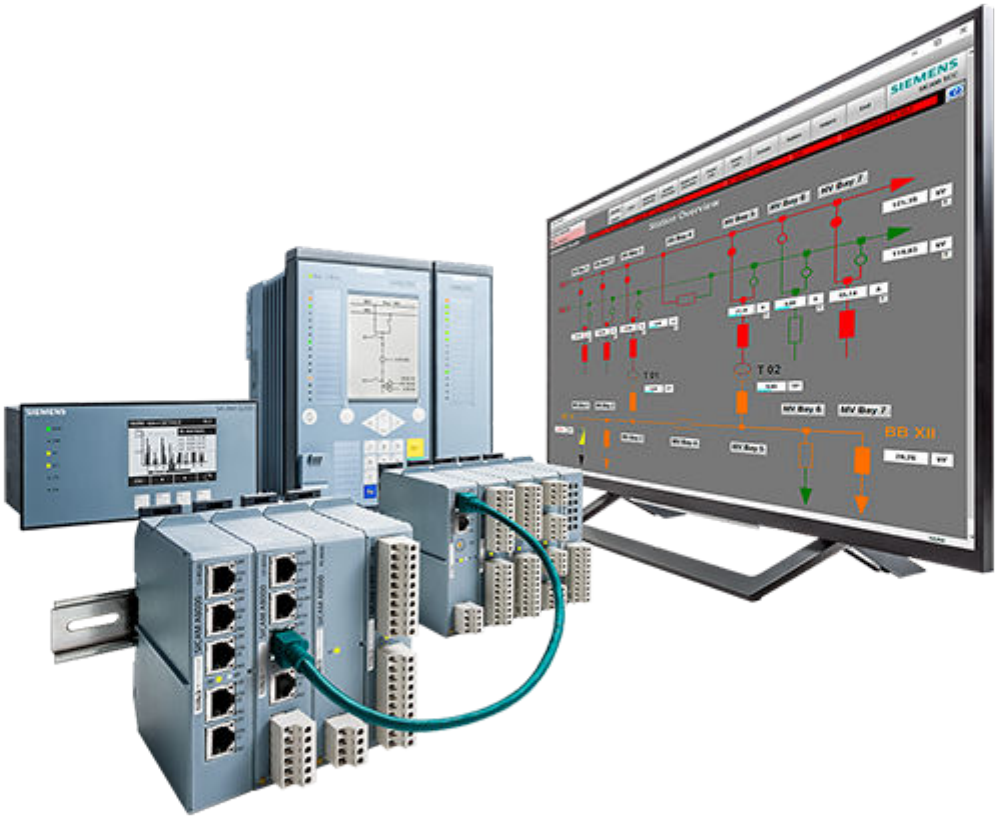
Product description	Order no.																	
	1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16
ReyArc	7	X	G	3	5	5	□	-	1	F	A	0	0	-	0	A	A	0
							|										
Arc flash protection device, DIN rail mount, DC 24 V to DC 240 V, AC 60 V to AC 240 V, 50/60 Hz, 4 HSBO/1 BI/1 BO							|											
Sensor and current inputs							|											
4 Arc sensor inputs							1											
4 Arc sensor inputs + 4 current inputs							2											
12 Arc sensor inputs + 4 current inputs							3											

Selection and ordering information – Optic arc sensors

Accessories	Article per packaging unit	Order no. (short designation)
Point sensor with line length of 3 m	1	P1X19
Point sensor with line length of 4 m	1	P1X28
Point sensor with line length of 5 m	1	P1X37
Point sensor with line length of 7 m	1	P1X277
Point sensor with line length of 10 m	1	P1X46
Point sensor with line length of 15 m	1	P1X55
Point sensor with line length of 20 m	1	P1X64
Point sensor with line length of 35 m	1	P1X82
Line sensor, length 5 m	1	P1X107
Line sensor, length 10 m	1	P1X116
Line sensor, length 20 m	1	P1X125
Line sensor, length 30 m	1	P1X134
Line sensor, length 40 m	1	P1X143
Supply line for line sensors 3 m	1	P1X152
Supply line for line sensors 5 m	1	P1X161
Supply line for line sensors 10 m	1	P1X170

Table 9.2/1 Accessories

ReyArc 7XG35


SIEMENS
T 02
BB XII

Test Switch/Test Block – 7XV75

Description

The test switch 7XV75 is used to test protection devices, including the transformer circuits and command contacts. Using the switches on the front, the current and voltage inputs and the circuits of the protection device to be tested are disconnected and connected to the front side. Using these plug connectors, currents and voltages can be supplied using test equipment and the various commands and indications can be tested.

Benefits

The following versions are available in a flush-mounting housing:

- For feeder protection without open neutral point
- For feeder protection without open neutral point and with additional contacts
- For feeder protection with no open neutral point for 2 transformer cores or separate ground-fault transformer
- For feeder protection with an open neutral point
- For feeder protection with an open neutral point and independently switchable trip and transformer circuits
- For 3-winding transformer differential protection
- For feeder protection without open neutral point, with a 4th current-transformer input and a 4th voltage-transformer input (3-stage test switch)

Applications

The following variants are available in a flush-mounting housing:

- For feeder protection without open neutral point
- For feeder protection without open neutral point and with additional contacts
- For feeder protection without open neutral point for 2 current-transformer cores or separate ground-fault current transformers



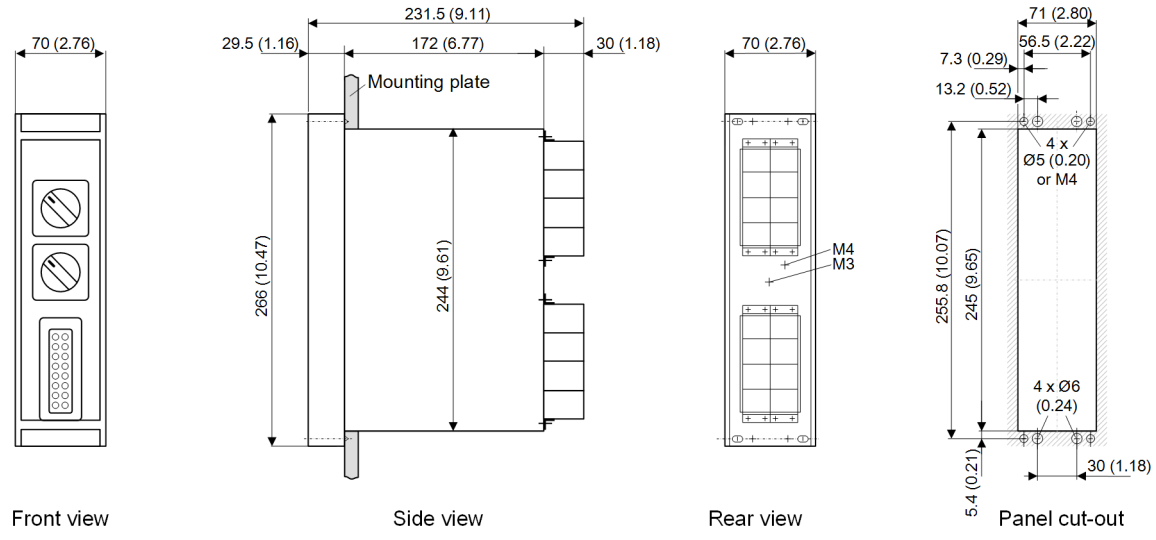
[ph_7XV75_1, –_–]

Figure 10.1/1 Test Switch 7XV75

- For feeder protection with an open neutral point
- For feeder protection with an open neutral point and independently switchable trip and transformer circuits
- For 3-winding transformer differential protection
- For feeder protection without open neutral point, with 4th current transformer and 4th voltage-transformer input (3-stage test switch)

The test device can be used with auxiliary voltages in the range of AC/DC 24 V to 250 V. Therefore, there is no longer any need to select between different power-supply models.

Dimensional Drawing



[dw_7XV75-test-switch_dimensional_drawings, 1, en_US]

Technical Data

General device data	
Rated operating voltage Vn	AC/DC 250 V
Rated operating current In	Max 5 A for all circuits
Test current capacity for 1 s	150 A for CT circuits
Test current capacity for 10 s	60 A for CT circuits
Continuous current	20 A for CT circuits
Overvoltage category, IEC 60255-27	III
Operating Altitude	Max 2000 m
Minimum admissible atmospheric pressure	783.8 hPA
Degree of pollution	2
Protection	Class 1

Electrical Tests	
Insulation tests	IEC 60255-27, Edition 2.0
Voltage test (routine test and type test)	2.5 kV; 50 Hz

Electrical Tests	
Impulse voltage test (type test)	5 kV (peak value); 1.2/50 µs; 0.5 J;
All circuits, class III	3 positive and 3 negative impulses at intervals of 5 s
Insulation resistance measurement	DC 500 V, For 1 min, ≥100 Ohm

Construction	
Metal case	7XP20
Dimension	1/6 of 19"wide
Weight	approx. 3.4 kg
Protection type acc. to IEC 60529	
With closed cover	IP40
With open cover	IP20
For operator protection	IP2x for terminals

Selection and Ordering Data

Description	Order no.												
	1	2	3	4	5	6	7		8	9	10	11	12
Test switch combination in a 7XP20 housing for panel flush mounting	7	X	V	7	5	0	☐	–	☐	C	A	0	0
							▲		▲				
Without open neutral point for feeder protection							0		|				
With 16-pole Harting plug							|		0				
With 16 insulated 4-mm plugs (not for 7XV7506)							|		1				
With open neutral point for feeder protection							1		|				
With 16-pole Harting plug							|		0				
With 16 insulated 4-mm plugs							|		1				
For 3-winding transformer							2		|				
With 16-pole Harting plug							|		0				
With 16 insulated 4-mm plugs							|		1				
Without open neutral point for 2 current-transformer cores or separate ground fault							3		|				
With 16-pole Harting plug							|		0				
With 16 insulated 4-mm plugs							|		1				
Without open neutral point for feeder protection							6		|				
With 4 current-transformer inputs and 4 voltage-transformer inputs							|		|				
With 16-pole Harting plug							|		|				
Without open neutral point for feeder protection with additional make and break contacts							7		|				
With 16-pole Harting plug							|		0				
With 16 insulated 4-mm plugs							|		1				
With open neutral point, independently switching trip input circuit							8		|				
With 16-pole Harting plug									0				
With 16 insulated 4-mm plugs									1				
Connecting cable 7XV6201 for test switch 7XV75 with 2 m cable													
With 16-pole Harting plug and 17 insulated plugs, 4 mm with core marking and tagging	7	X	V	6	2	0	1	–	5				
With 16-pole Harting plug and 17 end sleeves with core marking and tagging	7	X	V	6	2	0	1	–	6				

Description

The 7XG222 range of test blocks, housed within an Epsilon enclosure, offers facilities for monitoring and secondary injection testing of power system protection schemes in conjunction with the appropriate multi-fingered test plug.

The 2RMLG test block has 14 pairs of spring loaded contacts which are linked to a terminal block positioned at the rear of the enclosure.

The 2RMLG07 is coded to only accept the 2RMLB-R7 test plug which has connection terminals 21, 23, 25, and 27, internally.

The 2RMLG08 is coded to only accept the 2RMLB-R8 test plug which has internal pairs 1 and 3, 5 and 7, 9 and 11, and 15 and 17, shorted together internally.

The 2RMLG09 is coded to only accept the 2RMLB-R9 test plug which has terminals 1-3-5-7, 9-11, 17-19 & 21-23-25-27 shorted together internally.

Each pair of contacts is normally closed completing the circuit through the test block when the associated protection equipment is in use.

For testing purposes the test block can be accessed by removing the front cover. The 2RMLG01 has a metallic probe attached to the front cover assembly which when withdrawn open circuits the 2 contacts at position 13 and 14.

The main DC auxiliary supply to the protection scheme or relay can be wired to this circuit to prevent inadvertent tripping of the protection circuit after removal of the cover and during the test procedure.

The 2RMLG02/07/08/09 do not include the above facility and contacts 13 and 14 are normally closed. These contacts must not be used for current circuits, as the relevant contact finger on the 2RMLB-R test plug is shorter in this position.

The short test finger in position 13 and 14 on the 2RMLB-R will open contacts 13 and 14 in the test block after the other fingers have made contact in all other positions.

It is important that the sockets in the test plug which correspond to the current transformer secondary windings are linked prior to the test plug being inserted into the test block.

This will ensure that the current transformer secondary windings are short circuited prior to disconnection from the protection scheme or relay. If the DC auxiliary supply is to be used during testing it can be linked using the sockets in the test plug.

Operation of the contacts can be monitored by connecting the test equipment to the protection scheme or relay with the even



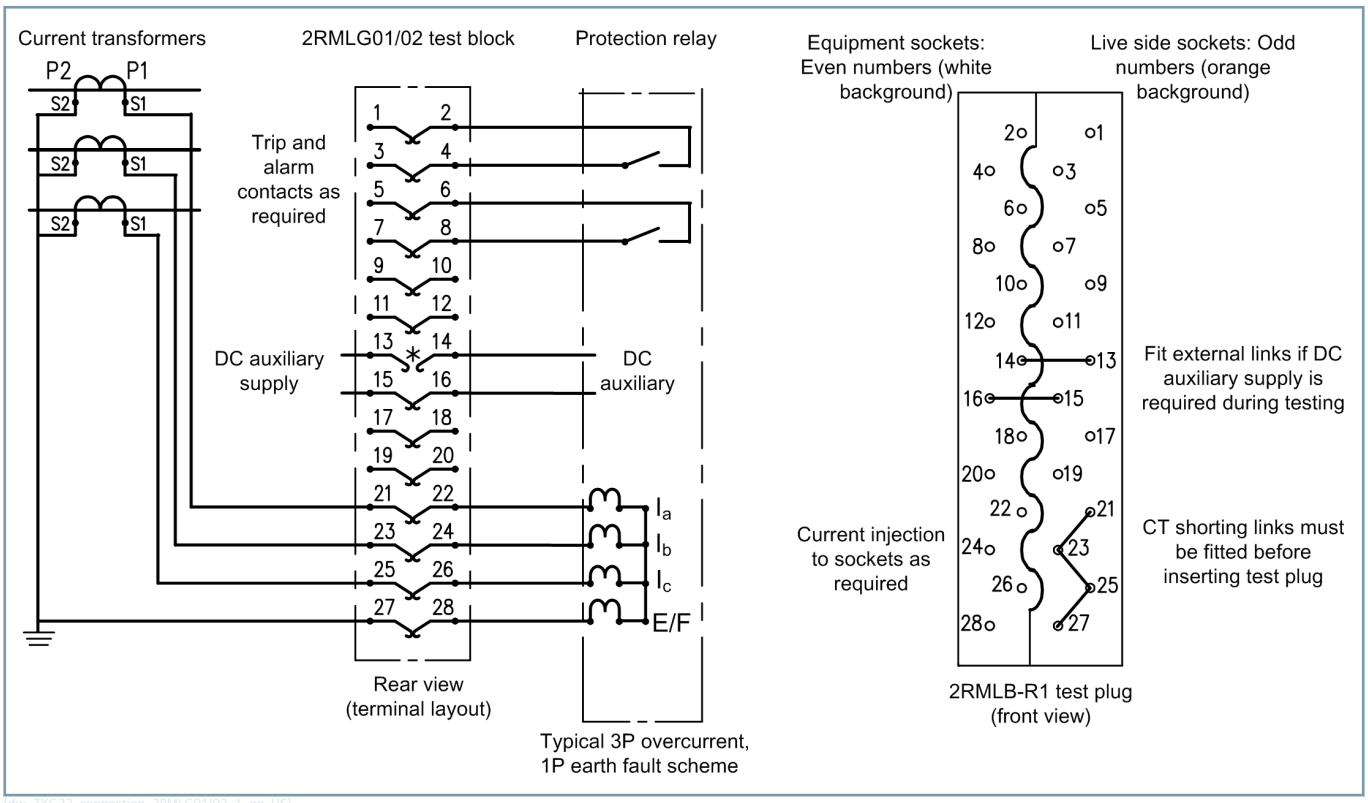
numbered sockets of the test plug. If a number of 2RMLG test blocks are connected to a relay it is recommended that the DC supply be routed through each of them to safeguard against inadvertent operation.

Benefits

The features of the test block are:

- Finger safe design
- Finger safe test leads
- Various scheme configurations
- Retention fixings on test plugs
- 7XG222 suitable for vertical or horizontal mounting
- Standard 4U case design
- Coded test plugs prevent incorrect insertion

Connection diagrams



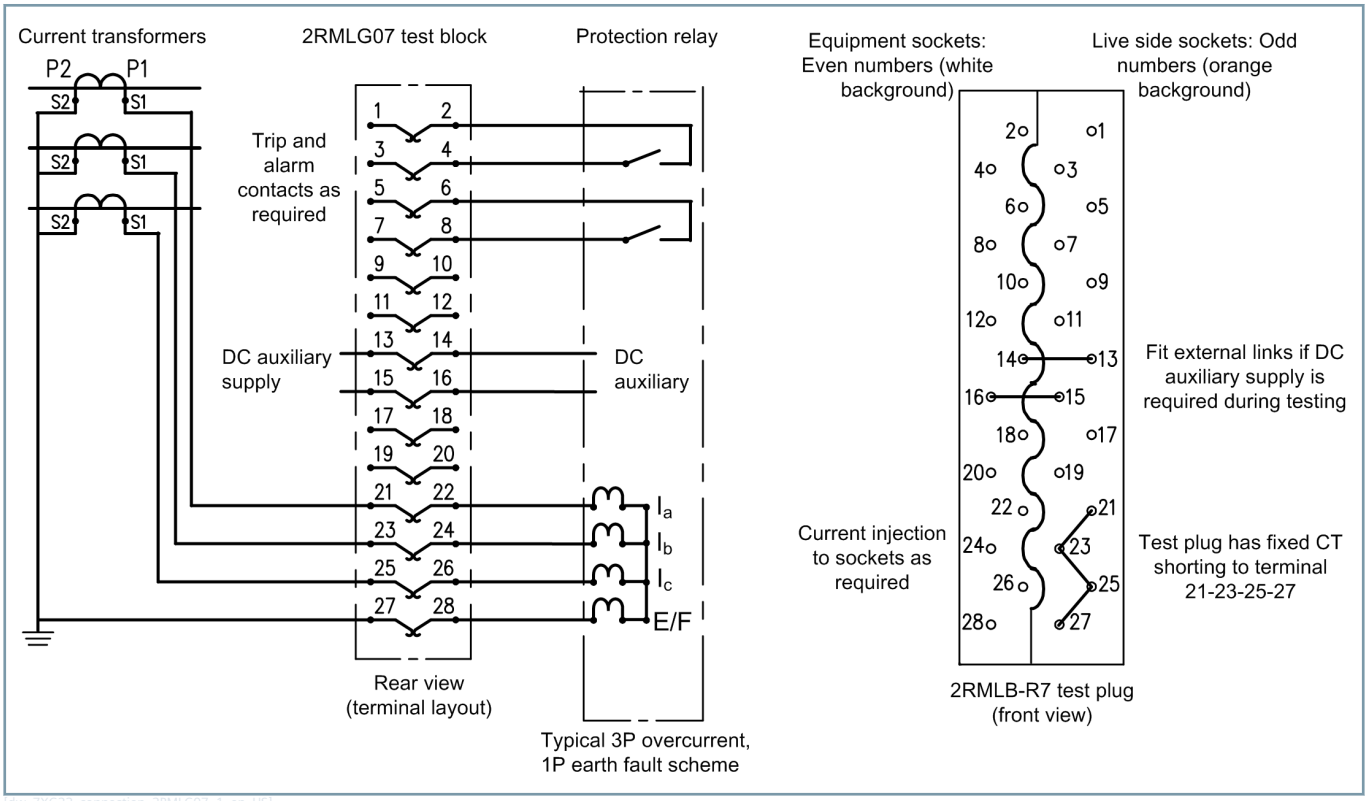
[dw_7XG22_connection_2RMLG01/02, 1, en_US]

Figure 10.1/2 Typical application of the 2RMLG01/2RMLG02 test block and 2RMLB-R1 test plug

NOTE

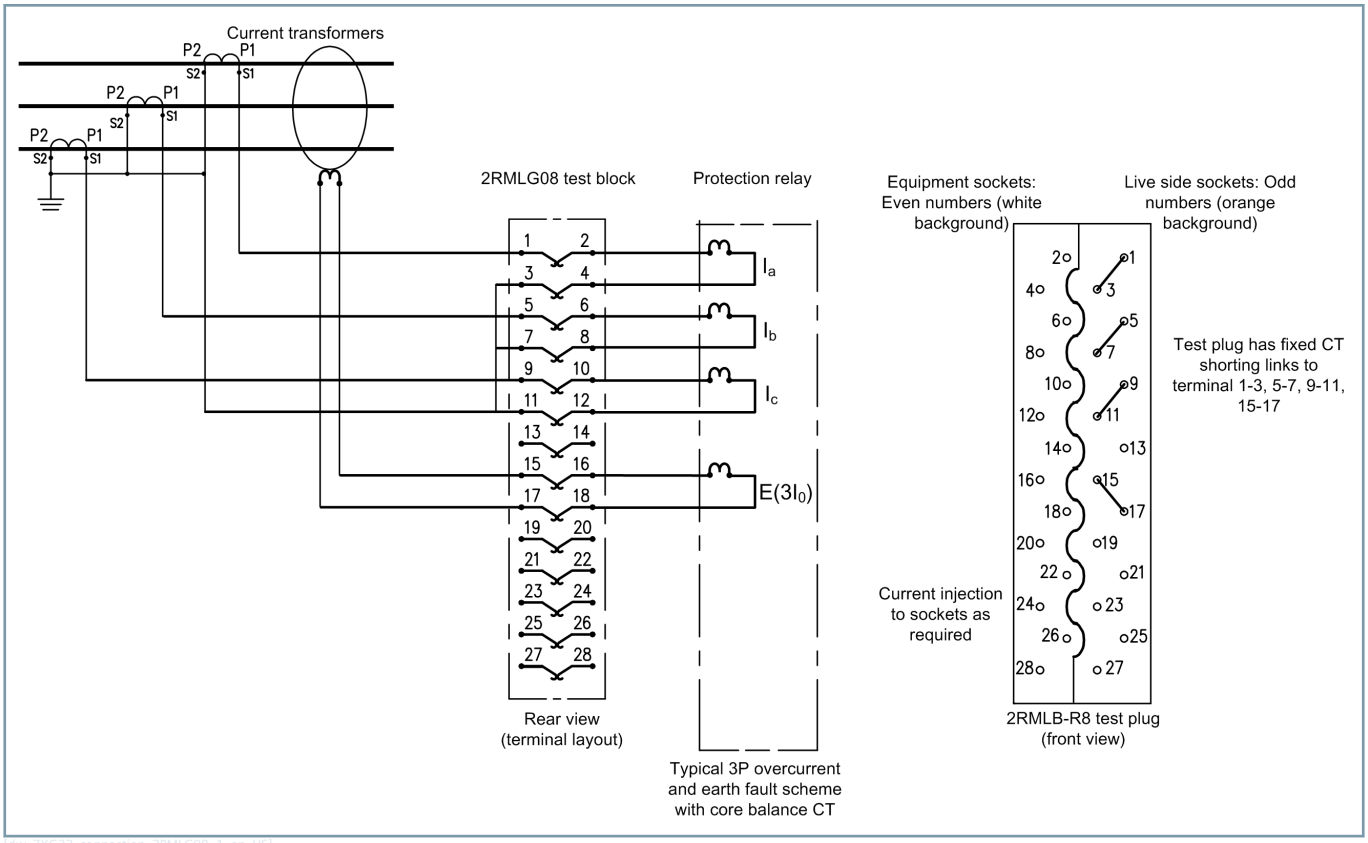
2RMLG01 13/14 open cct when cover is removed and all other positions are connected.

2RMLG02 13/14 connected as in the same way as other positions.



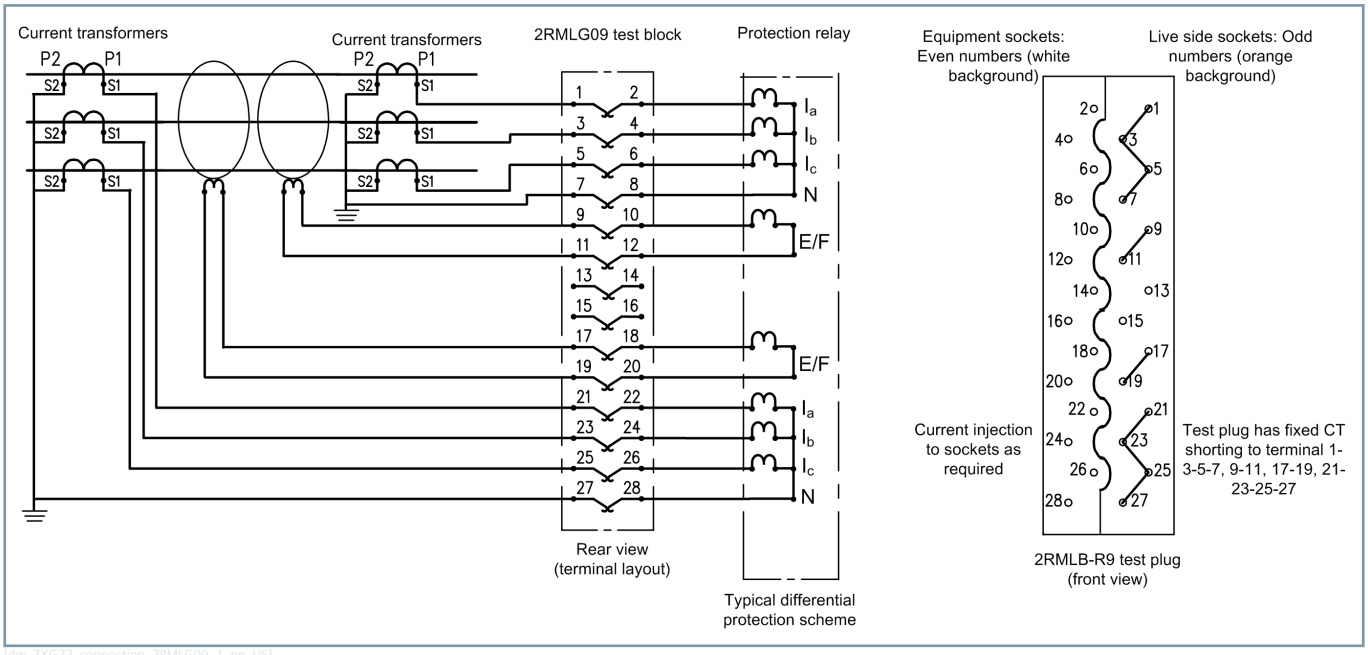
[dw_7XG22_connection_2RMLG07, 1, en_US]

Figure 10.1/3 Typical application of the 2RMLG07 test block and 2RMLB-R7 test plug



[dw_7XG22_connection_2RMLG08, 1, en_US]

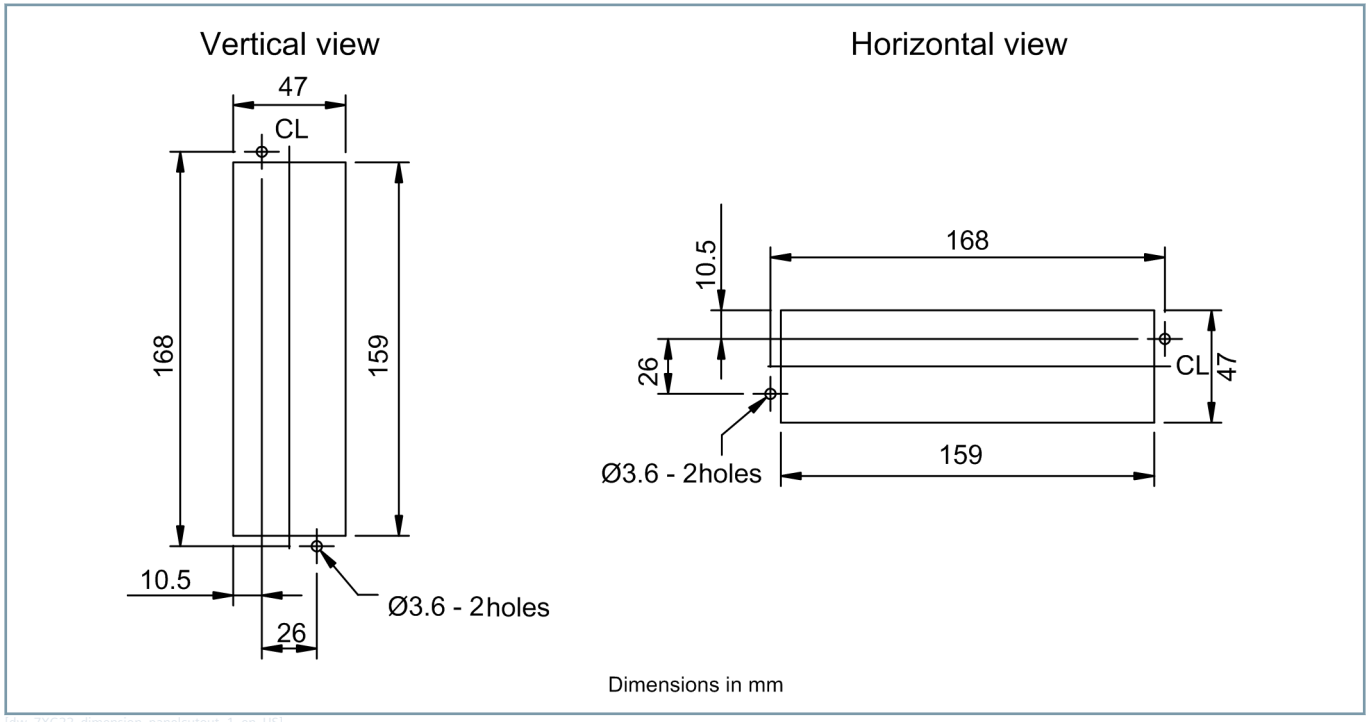
Figure 10.1/4 Typical application of the 2RMLG08 test block and 2RMLB-R8 test plug



[dw_7XG22_connection_2RMLG09, 1, en_US]

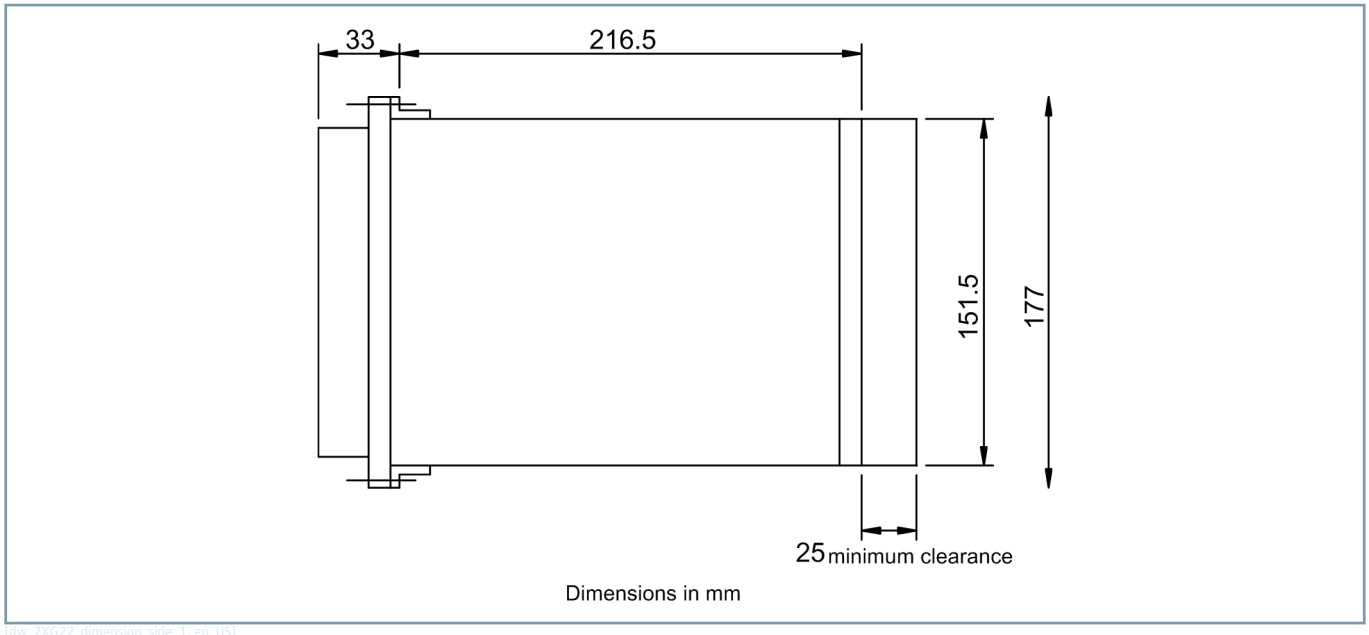
Figure 10.1/5 Typical application of the 2RMLG09 test block and 2RMLB-R9 test plug

Dimension drawings



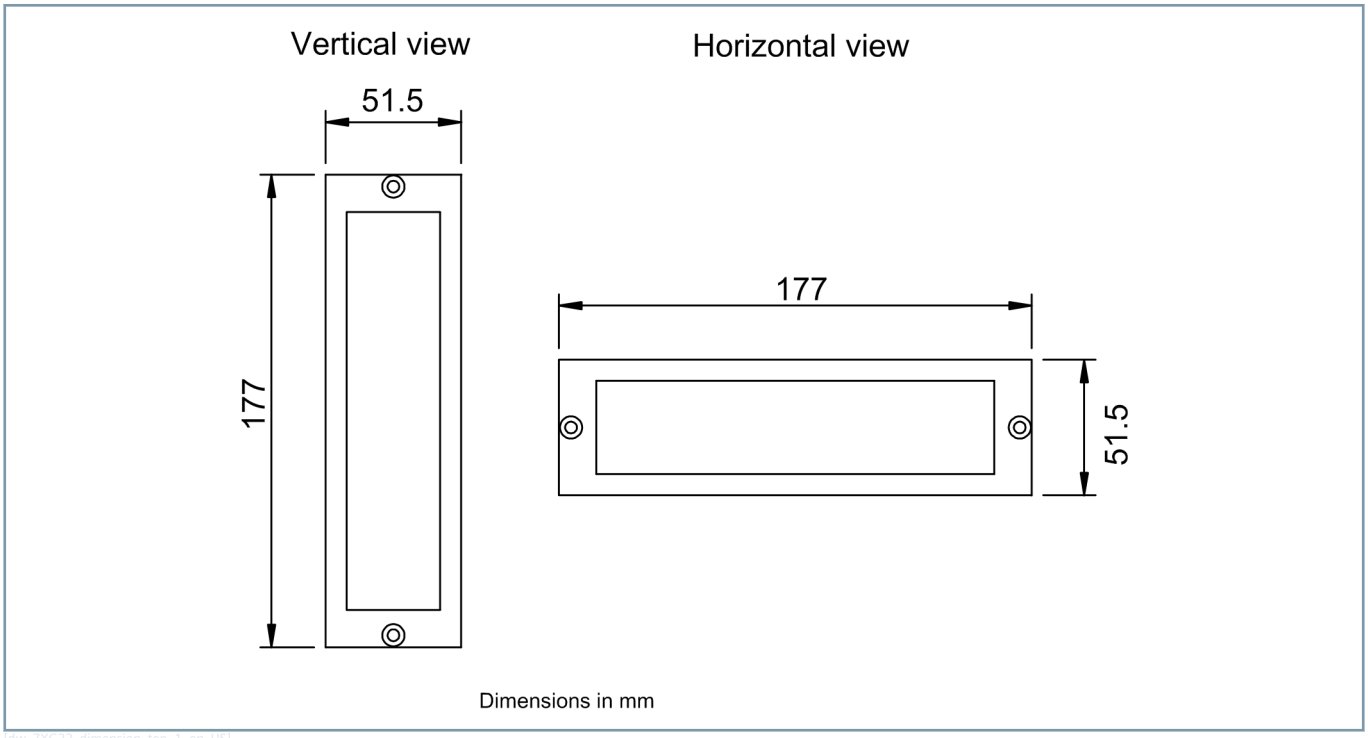
[dw_7XG22_dimension_panelcutout, 1, en_US]

Figure 10.1/6 Panel cut-out view



[dw_7XG22_dimension_side, 1, en_US]

Figure 10.1/7 Side view (Vertical) top view (Horizontal)



[dw_7XG22_dimension_top, 1, en_US]

Figure 10.1/8 Front view

NOTE

The Ø3.6 holes are for M4 thread forming (trilobular) screws. These are supplied as standard and are suitable for use in ferrous/aluminum panels 1.6 mm thick and above. For other panels, holes to be M4 clearance (typically Ø4.5) and relays mounted using M4 machine screws, nuts and lockwashers (supplied in panel fixing kit).

Technical data

Indication of conformity

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

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

RoHS directive 2011/65/EU is met using the standard EN 50581. The device has been designed and produced for industrial use.

EMC compliance

89/336/EEC	These products have been classified as electromagnetically benign and are therefore excluded from the European Community EMC Directive. (89/336/EEC)

General technical data

High voltage withstand

IEC 60255-5

2RMLG 01/02/07/08/09	5 kV_{RMS} for 1 minute between all case terminals connected together and the case earth terminal.
	5 kV_{RMS} for 1 minute between any contact pair and either adjacent alternate contact pair, provided the intermediate contact pair is not used.
	2 kV_{RMS} for 1 minute between any contact pair and either adjacent contact pair.
2RMLG 01 only	1 kV_{RMS} for 1 minute between terminals 13 and 14 when the cover is removed (e.g. opening the auxiliary supply or trip circuit).
2RMLB-R1	As 2RMLG 01 plus 2 kV_{RMS} for 1 minute between incoming and outgoing contacts when inserted.
2RMLB-R7	As above with the exception of terminals 21, 23, 25, and 27 which are permanently shorted together.
2RMLB-R8	As above with the exception of terminal pairs 1-3, 5-7, 9-11, and 15-17 which are permanently shorted together as pairs.
2RMLB-R9	As above with the exception of terminal pairs 1-3-5-7, 9-11, 17-19, and 21-23-25-27 which are permanently shorted together in groups.

Transient overvoltage

IEC 60255-27

2RMLG 01/02/07/08/09	5 kV impulse between all case terminals connected together and the case earth terminal.
	5 kV impulse between any contact pair and either adjacent alternate contact pair, provided the intermediate contact pair is not used.
	2 kV impulse between any contact pair and either adjacent contact pair.
2RMLG 01 only	2 kV impulse between terminals 13 and 14 when the cover is removed (e.g. opening the auxiliary supply or trip circuit).
2RMLB-R1	As 2RMLG 01 plus 2 kV impulse between incoming and outgoing contacts when inserted.
2RMLB-R7	As above with the exception of terminals 21, 23, 25, and 27 which are permanently shorted together.
2RMLB-R8	As above with the exception of terminal pairs 1-3, 5-7, 9-11, and 15-17 which are permanently shorted together as pairs.
2RMLB-R9	As above with the exception of terminal pairs 1-3-5-7, 9-11, 17-19, and 21-23-25-27 which are permanently shorted together in groups.

Current and voltage withstand

2RMLG 01/02/07/08 2RMLBR1-R9	All contact circuits rated at 20 A continuously or 400 A for 1 s, AC or DC.
	AC 300 V/DC 300 V maximum service voltage.

Mechanical tests

Test	Standard
Vibration	IEC 60255-21-1, Response and endurance, Class 2

Climatic environmental tests

Temperature

IEC 60068-2-1/IEC 60068-2-2/IEC 60255-6

Ambient operating temperature	-10 °C to +55 °C
Storage temperature (non-operational)	-25 °C to +70 °C

Humidity

IEC 60068-2-3

Damp heat test, steady state	56 days at 93 % RH and +40 °C

Enclosure protection (2RMLG only)

IEC 60529

IP50 (dust protected)

Test Equipment

Test Switch/Test Block – 7XG22 2RMLG

Ordering information – 7XG222

Product description	Order number																
	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16
Test modules (2RMLG)	7	X	G	2	2	2	0	–	□	□	A	0	0	–	0	A	A	0
				|	|	|			|	|								
Category				|	|	|			|	|								
Ancillary equipment				2	|	|			|	|								
					|	|			|	|								
Ancillary equipment					|	|			|	|								
Modular case test components					2	|			|	|								
						|			|	|								
Test component type						|			|	|								
Test modules (2RMLG)						2			|	|									
									|	|									
Component type									|	|									
Test module (2RMLG01)									1	|										
Test module without open circuit facility between terminals 13 and 14 when cover removed (2RMLG02)									2	|										
Test module with automatic CT shorting (2RMLG07)									3	|										
Test module with automatic CT shorting (2RMLG08)									4	|										
Test module with automatic CT shorting (2RMLG09)									5	|										
										|										
Mounting										|										
E2 case vertical										A										
E2 case horizontal										B										

10.1

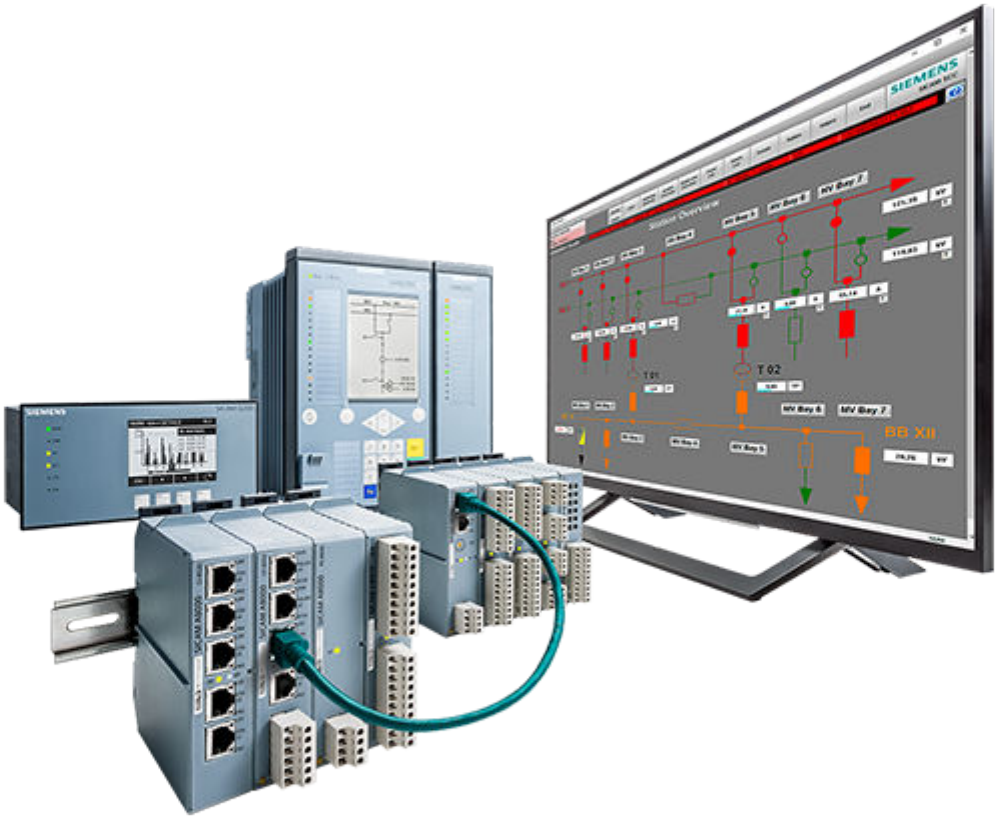
Ordering information – 7XG2241

Product description	Order number																
	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16
Test plugs (2RMLB-R)	7	X	G	2	2	4	1	–	□	A	A	0	0	–	0	A	A	0
				|	|	|	|		|										
Category				|	|	|	|		|									
Ancillary equipment				2	|	|	|		|									
					|	|	|		|									
Ancillary equipment					|	|	|		|									
Modular case test components					2	|	|		|									
						|	|		|									
Test component type						|	|		|									
Test plugs (2RMLB-R)						4	1		|										
									|										
Component type									|										
Multi finger test plug complete with leads (2RMLB-R1)									1										
Multi finger test plug complete with leads and internal shorting links (2RMLB-R7)									3										
Multi finger test plug complete with leads and internal shorting links (2RMLB-R8)									4										
Multi finger test plug complete with leads and internal shorting links (2RMLB-R9)									5										

UK manufacture test modules, E2 size	
2RMLG01 test block with trip isolation contact	VCE: 2993H10060D
2RMLG02 test block with no isolation contact	VCE: 2993H10063D
2RMLG07 test block with CT shorting	VCE: 2993H10067D
2RMLG08 test block without trip isolation	VCE: 2993H10080D
2RMLG09 test block for 2RMLB-S9 test plug	VCE: 2993H10085D

Accessories for 2RMLG	
2RMLG cover for 2RMLG01 (with probe)	VCE: 2993G50002
2RMLG cover for 2RMLG02	VCE: 2993G50008

Test Switch/Test Block – 7XG22 2RMLG


SIEMENS
T 02
BB XII

Time Synchronization

SNTP Master/Server – 7SC8021

Description

The hardware version of the 7SC80 integrates an SNTP server and a GPS module.

In this way, the first switchgear-compatible SNTP server with GPS receiver is available for precise time synchronization for all SIPROTEC 4/Compact/5 protection devices and all other SNTP-compatible devices, for example SIPROTEC 7KE85/SICAM P/Q/T or third-party devices. The few configuration settings necessary (for example, the IP address) are made using DIGSI 4.

With an additional 12 binary inputs and 8 binary outputs

The communications redundancy protocols RSTP/PRP/HSR and the IEC 61850 protocol are fully supported. In this way, the SNTP server with optical Ethernet interfaces can be operated directly in SIPROTEC ring networks.

A GPS antenna kit with antenna, antenna mount and 25 m cable is available separately.



[ph_SNTP-Master_Server_7SC80_, 1, --_--]

Figure 11.1/1 SNTP Master Server 7SC80

Functions

- An external GPS antenna kit with a flat-roof/wall mounting bracket, 25 m cable RG59 and BNC/SMB adaptor cable is available separately
- GPS antenna input (SMB plug)
- USB port for configuration using DIGSI 4
- Equipped as standard with 2 electrical Ethernet ports RJ45
- Redundant connection with active standby operation
- Can be optionally equipped with 2 optical Ethernet interfaces
- Remote operation possible, up to 24 km using singlemode interfaces
- Full support of redundant ring structures with the RSTP/PRP/HSR protocols
- Stainless steel housing for surface mounting
- Satisfies the EMC requirements in switchgear
- Expanded temperature range: -50 °C to +85 °C
- Robust with respect to high GOOSE loads in IEC 61850 networks
- Can be used as a central data collector, for example, to record GOOSE messages
- Supports IEC 61850 Edition 1 and Edition 2
- Integration in IEC 61850 systems control (with a maximum of 6 clients)
- Integration into DIGSI 4 IEC 61850 System Configurator Alternatively: Connection to systems control via DNP IP protocol
- Additional use for automation functions (Continuous Function Chart)
- Remote access
- Optimized for use together with SIPROTEC devices and DG products

Equipment features

- 12 binary inputs
  - 8 and 4 inputs each, connected to common potential
- 8 binary outputs
  - All relays can be configured as desired
- 1 life contact
  - Change-over contact
- Optional display can be removed with/without connecting cable
- Power supply unit/battery voltage
  - Input voltage DC 24/48 V, DC 60 V to 250 V and AC 110 V to 230 V ± 20 %
- Ethernet interface RJ45
  - 2 x 100 Mbps
- Optical interface (optional)
  - LC connector, 1300 nm for multimode optical fiber, 50/62.5 µm type Radius: 4 km
  - LC connector, 1300 nm for singlemode optical fiber 9 µm type Radius: 24 km
- USB interface
  - for configuration using DIGSI 4
- SMB plug
  - for connection of an active GPS antenna, 5 V supply voltage, max. 50 mA
- Housing
  - Stainless steel housing IP40 for surface mounting, back-up battery can be replaced from outside
- EMC
  - EMC capability according to SIPROTEC protection devices

Applications

All devices connected via Ethernet can be synchronized to the millisecond using the 7SC80 SNTP time server via the SNTP

protocol (Simple Network Time Protocol). Either the standardized UTC time or the local time is transmitted. For these applications, all (protection) devices need a suitable Ethernet interface, for example port B for SIPROTEC 4 (EN100 module).

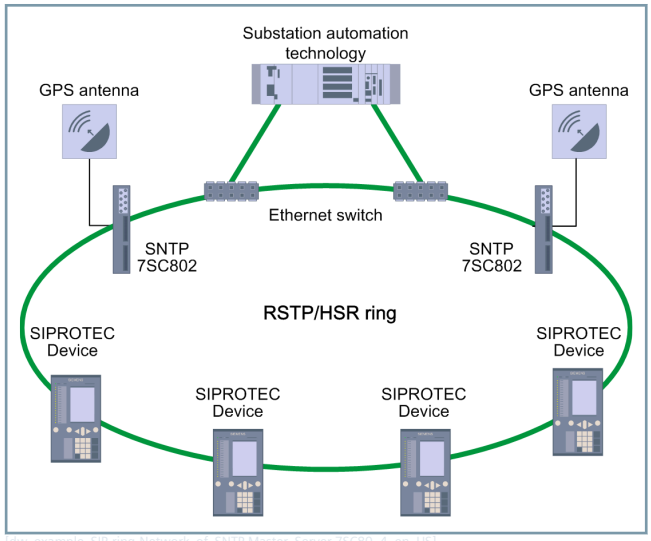
Application

The GPS antenna is mounted outdoors without obstructions towards the sky. The SNTP server is installed near the GPS antenna and is usually supplied with power via the same auxiliary voltage as used for the protection devices.

If optical Ethernet interfaces are used, EMC effects are eliminated, even in the case of longer distances between the SNTP server and the protection devices.

An accuracy of ±1 ms is achieved in SIPROTEC networks when using the 7SC80 SNTP server. It is not necessary to establish a separate network for time synchronization.

Using the 7SC80 in redundant time-server projects is also possible. Integration into DIGSI 4 projects can be carried out using the complete 7SC80 parameter set, and the use of the earlier SNTP.ICD files is not necessary in this case. For the individual protection devices, set "EthernetNTP" as the time source. Local time settings, for example, switchover between standard time and daylight saving time or a time offset should also be kept in mind.



[dw_example_SIP-ring Network_of_SNTP Master_Server 7SC80, 4, en_US]

Figure 11.1/2 Sample Configuration of a Redundant Integration of a 7SC80 SNTP Server in an Optical SIPROTEC Ring Feeder

Selection and Ordering Data

Description	Order no.																			Short code		
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16				
SNTP protocol server with GPS receiver (optical/electrical)	7	S	C	8	0	2	1	-	☐	☐	B	9	7	-	3	F	N	0		L	☐	☐
Auxiliary voltage (power supply)									▲	▲											▲	▲
									|	|											|	|
DC 60 V to 250 V, AC 115 V, AC 230 V									1	|											|	|
DC 24 V/48 V									2	|											|	|
Design structure										|											|	|
Surface mounting variant without HMI										A											|	|
Surface mounting/flush mounting variant with HMI										B											|	|
Surface mounting variant with detached HMI										C											|	|
Protocols																					|	|
IEC 61850 (EN100)																					0	|
DNP/IEC 61850																					2	|
System interface																						|
100 mbit Ethernet, electrical, RJ45 plug																						R
100 mbit Ethernet, switch, optical, 2 x LC connector, multimode																						S
100 mbit Ethernet, optical, 2 x LC connector, singlemode, 24 km																						T
For precise time synchronization for all SIPROTEC protection devices and all other (S)NTP-compatible devices, for example SIPROTEC 7KE85/SICAM P/Q/T or third-party devices. Configuration is performed using DIGSI 4. With an additional 12 binary inputs and 8 binary outputs. Supports the Ethernet redundancy protocols RSTP, PRP, HSR and IEC 61850 Edition 1 and 2. The time server can be operated directly in SIPROTEC ring networks using the optical Ethernet module. It is designed for the increased requirements of switchgear. It is delivered without a GPS antenna or cable, please order the GPS antenna kit (7XV5663-0AA00) and, optionally, the indirect lightning protection (7XV5664- 0LA00) separately.																						
GPS antenna	7	X	V	5	6	6	3	-	0	A	A	0	0									
For (S)NTP server (master) with GPS receiver, consisting of: GPS antenna with flat-roof and wall mounting bracket, 25 m antenna cable RG59B/U, 1 m adaptor cable, BNC-SMB																						
Indirect lightning protection	7	X	V	5	6	6	4	-	0	L	A	0	0									
For switchgear-compatible (S)NTP server 7SC8021 with 2 BNC connectors for cable RG58/V																						

Bus Cable for Time Synchronization – 7XV5104

Description

7XV5104 is a 2-wire shielded bus system for standard time synchronization at port A (24 V connection) in SIPROTEC protection devices. Only the 24 V input of the interfaces is supported. For SIPROTEC 5 Compact, the 7XV5104 bus cable is connected to port E via an IRIG-B adapter cable 7XX8310-0CG00.

The evaluation of fault records, operational and fault indications requires determination of the absolute time with an accuracy of milliseconds. The SIPROTEC 4/5 devices have an internal quartz-based clock that deviates from standard time after a while. For this reason, radio -controlled clocks are used for precise synchronization; they synchronize the clocks in the devices using time signals or protocols such as DCF77 or IRIG-B.

All of these devices are connected in parallel to an electrical bus so that they all receive the time information at the same time at port A. The SIPROTEC 4/5 devices can be connected directly to the sync transceiver 7XV5654 via their IRIG-B interface with the help of the prefabricated bus cables and adaptors **7XV5104**. If the prefabricated cables are used, the length of the electrical bus is a maximum of 2 x 10 m.



[ph_RS485 bus system, 1, --_--]

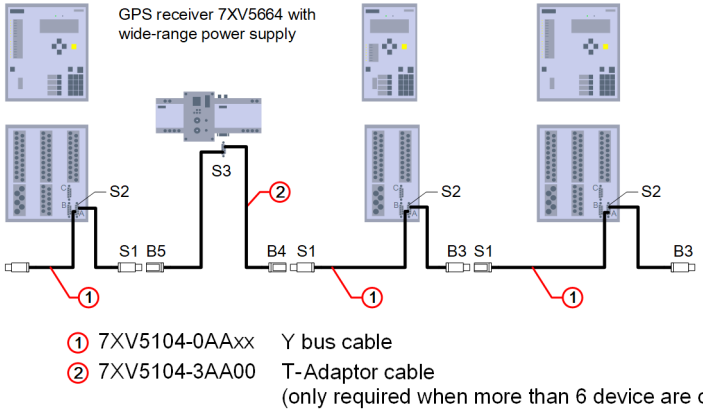
Figure 11.2/1 RS485 Bus System

Benefits

- Optoelectrical solution for SIPROTEC 4/5 devices with IRIG-B interface (port A). Port E for SIPROTEC 5 Compact.
- Direct connection of SIPROTEC 4/5 devices with IRIG-B interface to the sync transceiver 7XV5654
- Adaptor/cable for cascading and adapting to other converters
- 4 cable lengths can be ordered, from 1 m to 10 m
- 2-wire twisted and shielded cable with 9-pole D-sub connectors
- Metal connector housing with fastening screws and strain relief for the cable connections
- Compact dimensions of the connectors
- Maximum length of the electrical bus is 20 m (or 2 x 10 m if the sync transceiver is operated in channel pairing mode together with the T-adaptor 7XV5654; Use only within buildings.

Application Examples

The 9-pin male connector S1 of the first Y-bus cable is connected to the time signal source (radio-controlled clock with sync transceiver) and forwards the time signals to the associated device via the 1, 3, 5, or 10 m long cable and the 9-pin male connector S2. A 9-pin female connector B3 is additionally led out at the connector S2 on a 20 cm long cable, in order to be able to cascade further Y-cables and devices. If more than six SIPROTEC 4/5 devices are to be connected to the sync transceiver 7XV5654, the adaptor 7XV5104-3AA00 splits the connection X1 of the sync transceiver into two buses with a maximum of six devices each. The connection of more than 2 x six protection devices requires signal replication using an intermediate ministerial coupler that can control up to 5 sync transceivers, each with 6 protection devices. Typical applications are described in the manual for the sync transceiver 7XV5654.

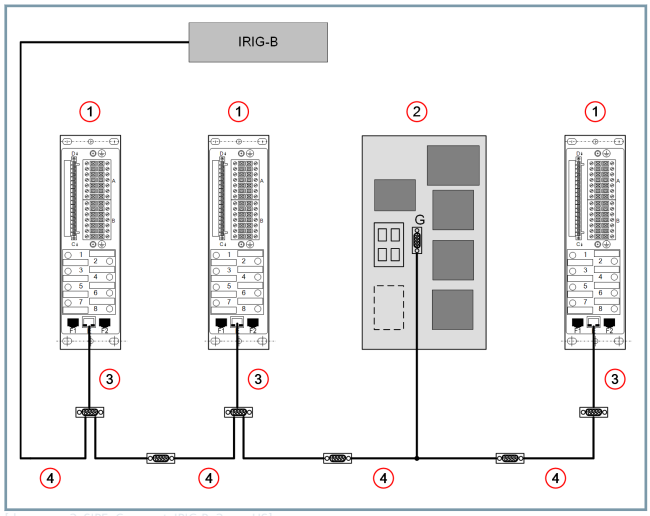


[dw_12_SIP4-devices_IRIG-B-bus_via_pref_y-bus-cable, 2, en_US]

Figure 11.2/2 Example: Connection of a maximum of twelve SIPROTEC 4 Devices to the IRIG-B Bus using a pre-assembled Y Bus Cable

Wiring Examples for SIPROTEC 5 Compact Devices with IRIG B for Time Synchronization

The serial interface in the SIPROTEC 5 Compact device can be used for IRIG-B time synchronization. The separately available time-synchronization bus cable 7XV5104-0AAxx and the IRIG-B adapter cable 7XX8310-0CG00 are required to connect to the SIPROTEC 5 Compact devices.



[dw_sema2_SIP5_Compact_IRIG-B, 2, en_US]

Figure 11.2/3 Communication with IRIG B for Time Synchronization

(1) SIPROTEC 5 Compact device

(2) SIPROTEC 5 device

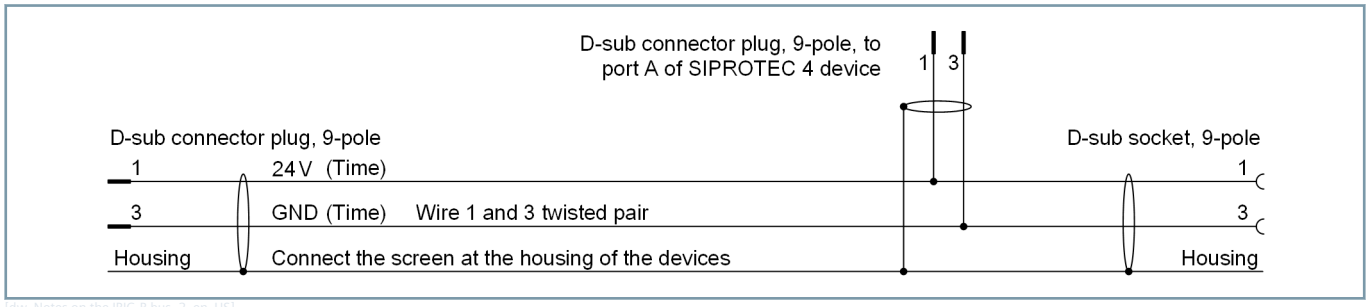
(3) IRIG-B adapter cable 7XX8310-0CG00

(4) Time-synchronization bus cable 7XV5104-0AAxx

NOTE

The IRIG-B connection cannot be used in parallel with another serial protocol.

The IRIG-B adapter cable 7XX8310-0CG00, in particular the D-Sub connection, must be protected against mechanical stresses (tension or vibration) by suitable relief measures. Avoid sharp bendings when connecting the RJ45 plug.



[dw_Notes on the IRIG-B bus, 2, en_US]

Notes about the IRIG-B bus

In this system solution, only the time synchronization inputs of the SIPROTEC 4/5 devices for 24 VDC are used. The 7XV5105 cable for the synchronization of differential protection devices has an additional second pulse. The housing of all bus participants must be grounded at both ends according to specifications as otherwise hazardous ground-potential currents may flow via the bus cable shield.

Selection and Ordering Data

Description	Order no.															
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
	7	X	V	5	1	0	4	-	☐	A	A	☐	☐					
Y bus cable for SIPROTEC relays – time synchronization bus (2-wire)									▲			▲	▲					
									|			|	|					
Length: 1 m									0			0	1					
Length: 3 m									0			0	3					
Length: 5 m									0			0	5					
Length: 10 m									0			1	0					
Extension cable for SIPROTEC relays – time synchronization bus (2-wire)									|			|	|					
Length: 10 m									1			1	0					
Adaptor cable for SIPROTEC relays – time synchronization bus (2-wire)									|			|	|					
Length: 0.3 m									2			0	0					
T adaptor cable for 2 buses If more than 6 devices are to be connected to the sync-transceiver XV5654-0BA00, the adapter splits connection X1 into two buses to connect maximum 6 devices each Length: 2 x 0.3 m									3			0	0					
IRIG B adaptor cable for SIPROTEC 5 Compact	X	8	3	1	0				0	C	G	0	0					

Description

7XV5105 is a 4-wire shielded bus system for standard time synchronization with second pulse on port A (24 V connection) in SIPROTEC protection devices. The additional high-precision second pulse is needed only for synchronizing 2 line differential protection devices via GPS.

The evaluation of fault records and operational and fault indications requires a real-time stamp with an accuracy of milliseconds. The differential protection devices have an internal quartz-based internal clock that the protection device normally uses for synchronization. In special applications, GPS radio clocks are used to synchronize the differential protection devices 7SD5 to the absolute time. These clocks transmit a set clock telegram together with a second pulse that is accurate to the millisecond, so that the transmission time can be measured precisely both in the transmit and in the receive direction. All devices in each of these systems are connected in parallel via an electrical bus so that all devices receive the time information or the second pulse simultaneously

The devices 7SD5/7SD8 can be connected directly to the sync transceiver 7XV5654 via their IRIG-B interface (port A) with the help of the pre-assembled bus cable 7XV5105. If the pre-assembled cables are used, the length of the electrical bus is a maximum of 10 m.

Benefits

- Optoelectrical solution for SIPROTEC 4/5 differential protection devices with, for example, 7SD5 IRIG-B interface (port A)
- Direct connection of protection devices 7SD5 via the IRIG-B interface to the sync transceiver 7XV5654
- Simultaneous transmission of the set clock telegram and second pulse
- Adaptor/cable for cascading and adapting to other converters
- 4 cable lengths can be ordered, from 1 m to 10 m
- Shielded and twisted four-wire cable with 9-pole D-sub connectors
- Metal connector housing with compact dimensions, with fastening screw and strain relief for the cable connections
- Maximum length of the electrical bus is 1 x 20 m; Use only within buildings.

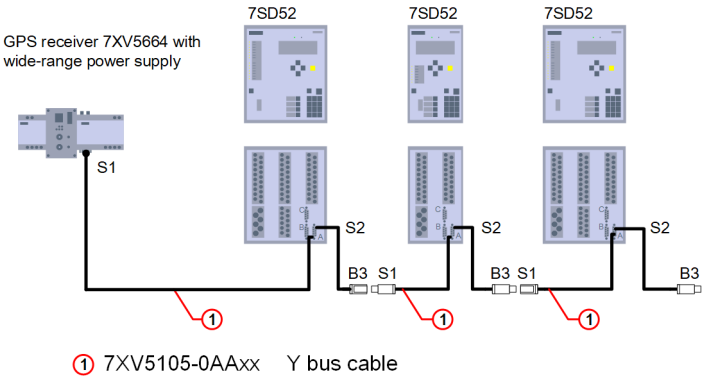


[ph_RS485 bus system, 1, --_--]

Figure 11.2/4 Y-Cable 7XV5105

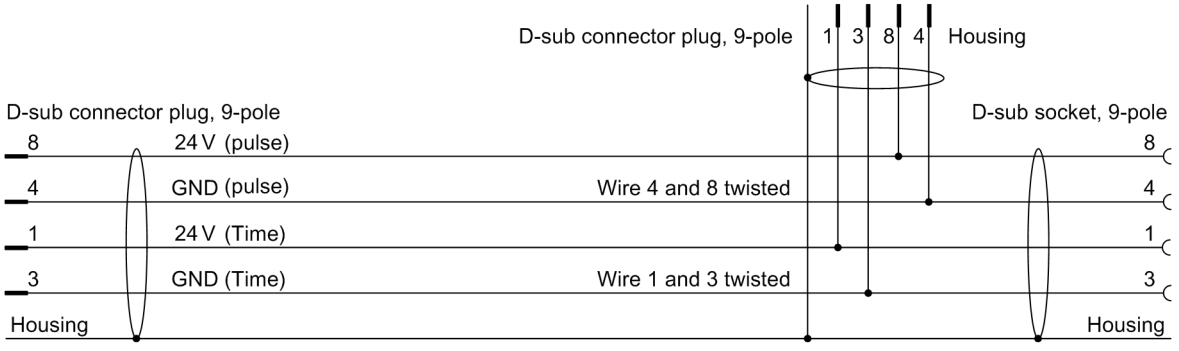
Application Examples

The 9-pin male connector S1 of the first Y-bus cable is connected to the time signal source (radio-controlled clock with sync transceiver) and forwards the time signals to the associated device via the 1, 3, 5, or 10 m long cable and the 9-pin male connector S2. A 9-pin female connector B3 is additionally led out at the connector S2 on a 20 cm long cable, in order to be able to cascade further Y-cables and devices. If more than six SIPROTEC 4/5 devices are to be connected to the sync transceiver 7XV5654, the adaptor 7XV5104-3AA00 splits the connection X1 of the sync transceiver into two buses with a maximum of six devices each. The connection of more than 2 x six protection devices requires signal replication using an intermediate ministerial coupler that can control up to 5 sync transceivers, each with 6 protection devices. Typical applications are described in the manual for the sync transceiver 7XV5654.



[dw_6_SIP4-devices_IRIG-B-bus_via_pref_y-bus-cable, 2, en_US]

11.2 **Figure 11.2**/5 Example: Connection of a maximum of six SIPROTEC 4 protection devices 7SD5 to the IRIG-B bus using a prefabricated Y bus cable



[dw_Notes on the IRIG-B bus_max.6, 1, en_US]

Notes about the IRIG-B bus

In this system solution, only the time synchronization inputs (port A) of the SIPROTEC 4/5 protection devices for 24 VDC are used. Two-wire cables 7XV5104 are used for the time synchronization of SIPROTEC 4/5 protection devices without an additional second pulse.

Selection and Ordering Data

Description	Order no.												
	1	2	3	4	5	6	7		8	9	10	11	12
Y bus cable	7	X	V	5	1	0	5	-	☐	A	A	☐	☐
									▲			▲	▲
For GPS time synchronization with second pulse of SIPROTEC 4/5 line differential protection relays (4-wire)									1			1	1
Length: 1 m									0			0	1
Length: 3 m									0			0	3
Length: 5 m									0			0	5
Length: 10 m									0			1	0
Extension cable									1			1	1
For GPS time synchronization with second pulse of SIPROTEC 4/5 line differential protection relays (4 wires)									1			1	1
Length: 10 m									1			1	0

Description

The GPS time synchronization unit 7XV5664-1 (time signal receiver) provides a complete solution, with the additional components of the mini star coupler 7XV5450 or CM-0822, sync transceiver 7XV5654, and pre-assembled cables and adaptors, for the time synchronization of any number of SIPROTEC protection devices.

Optical fiber can be used to transmit time signals (telegrams or pulses) without interference even over greater distances and in electromagnetically polluted environments. In this case, the optical signals are converted in the sync transceiver into electrical signals on the bus (< 200 ns later). The output of different protocols such as IRIG-B or DCF77 makes it also possible to synchronize other devices such as SIMEAS R/R PMU or the SICAM Q80 V3 besides synchronizing SIPROTEC devices.

The GPS antenna is mounted to an exterior wall or on a roof without obstructions towards the sky. The lightning protection should be mounted near the antenna and is looped into the antenna line. The GPS time synchronization unit is supplied with auxiliary voltage from the alternating current power system or the station battery.

Simple PC software makes it possible to set the GPS time synchronization unit via an RS232 interface.

Benefits

- Time receiver with an integrated, high-precision clock and high-grade free running behavior.
- Special hardware and firmware developed and adapted specifically for the high-precision synchronization of SIPROTEC and SIMEAS devices Type test according to 2014/30/EU, 2014/35/EU, 2014/53/EU, 2011/65/EU, 2015/863/EU and EN 62368-1, Poll. 2.
- 3 programmable optical outputs with ST connector for 50/125 or 62.5/125 µm, 850 nm multimode optical fiber for interference-free transmission of the signals/telegrams
- Telegram selection (even simultaneously): IRIG-B (B003+4, B006+7,IEEE1344, AFNOR,C37.118). DCF77 in UTC or local time (daylight saving time). DCF77 modified for SIMEAS R V3. Second and minute pulse (high-precision)
- GPS outdoor antenna
- Wall-mounting holder and 50 m RG58 cable (BNC/N connector)
- Lightning protection with 5 m RG58 cable (N connector)
- Fail-safe relay (1 change-over contact, SIPROTEC standard)
- Auxiliary voltage, DC/AC 100 V to 240 V (50/60 Hz)
- Auxiliary voltage, DC/AC 19 V to 72 V
- Operating program with connecting cable, 3 m, PC interface RS232 (9-pole D-sub connector)
- Aluminum housing for DIN rail mounting.



[ph_gps, 2, --]

Figure 11.3/1 GPS Time Synchronization Unit 7XV5664-1

Optional Scope of Delivery

- 7XV5654-0BA00
  Sync transceiver:
  2 x optical-fiber input for 62.5/125 µm with ST connectors to 2 x electrical, DC 24 V/maximum 50 mA per channel
- 7XV5104-xAAxx
  Bus cable system for synchronization of clock time
- 7XV5105-xAAxx
  Bus cable system for synchronization using a second pulse
- 7KE6000-8AK or -8AL
  SIMEAS sync transceiver:
  1 x optical-fiber input for 62.5/125 µm with ST connectors to 1 x electrical, DC 24 V/maximum 20 mA to a terminal



[Time_synch_comp, 1, --]

Figure 11.3/2 Components in the 7XV5664-1 Scope of Delivery

11.3

Application Examples

Time synchronization of the SIPROTEC 4 and SIPROTEC 5 protection devices

The internal time of all connected protection devices is synchronized using the GPS time synchronization unit 7XV5664-1. The internal clock of the protection devices is updated using the standardized telegram (IRIG-B, DCF77). IRIG-B C37.118 should be preferred for use with SIPROTEC 5.

The SIPROTEC 4 and SIPROTEC 5 protection devices have special interfaces for time synchronization as standard: SIPROTEC 4 port A, SIPROTEC 5 port G.

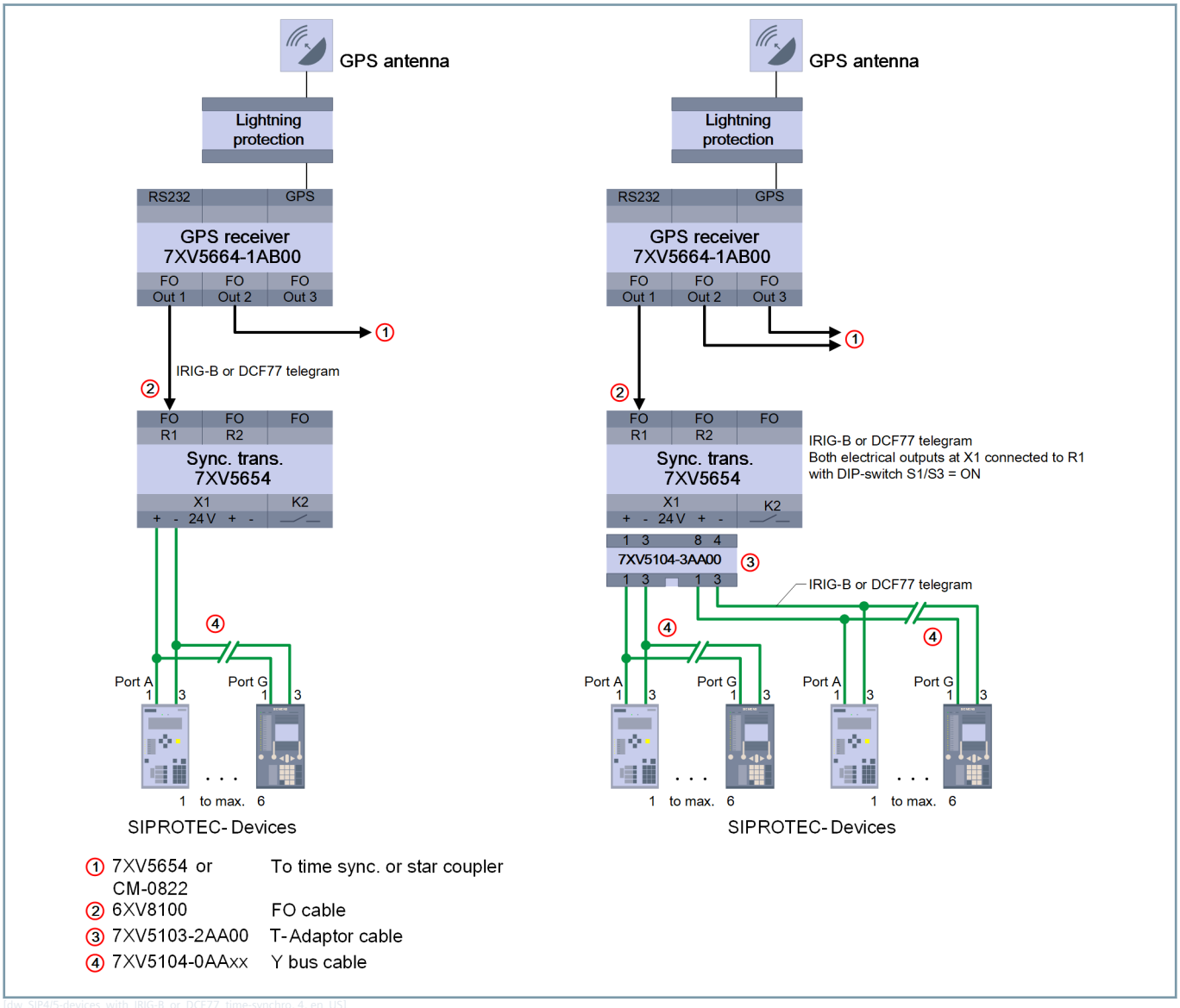
The time telegrams or synchronization pulses are transmitted without interference from the three optical outputs to the protection devices distributed within the system using optical fibers.

The optical star structure can be extended using mini star couplers 7XV5450 or CM-0822. Sync transceivers 7XV5654 are used to convert the light signals into 24 VDC signals for the SIPROTEC time synchronization interfaces.

You can find detailed application examples in the manual of the sync transceiver 7XV5654.

The SIPROTEC 4 and SIPROTEC 5 protection devices are connected to the sync transceiver 7XV5654 using the specially pre-assembled bus cable system 7XV5104 (see *Figure 11.3/3*).

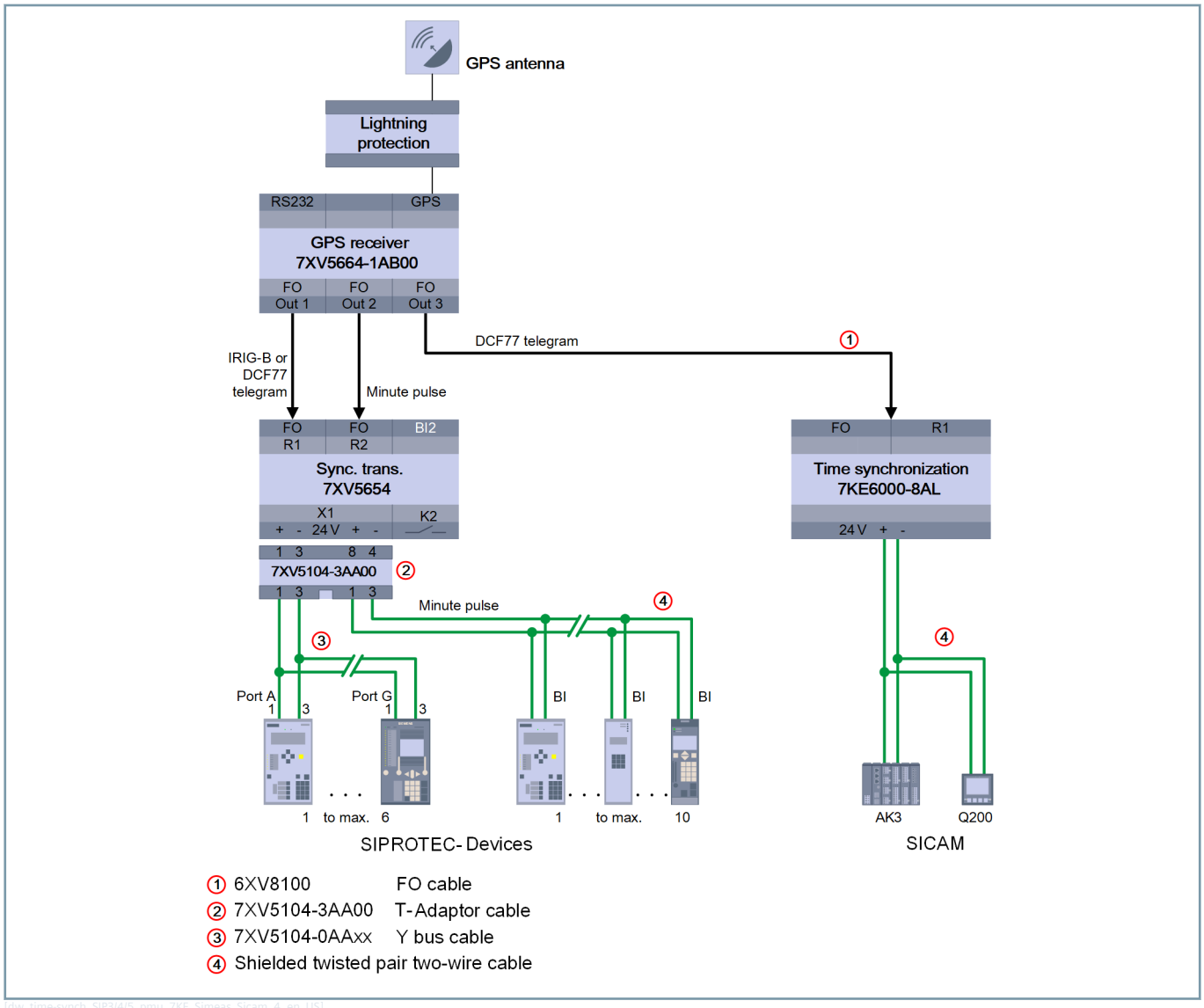
Note: In this case, no bus load resistor is needed.



[dw_SIP4/5-devices_with_IRIG-B_or_DCF77_time-synchro, 4, en_US]

Figure 11.3/3 SIPROTEC 4/5 Protection Device with IRIG-B or DCF77 Time Synchronization

Joint Time Synchronization of SIPROTEC Protection Devices, 7KE85, SIMEAS R-PMU, SICAM Q80 V3



[dw_time-synch_SIP3/4/5_pmu_7KE_Simeas_Sicam, 4, en_US]

Figure 11.3/4 Joint Time Synchronization of SIPROTEC Protection Devices 3/4/5/PMU, 7KE85, SIMEAS R-PMU, SICAM Q80 V3 Using Different Time Signals

If stored indications, measured values and fault records with a time stamp from different devices are to be compared, time synchronization of all devices is absolutely necessary. This can be ensured only by using a central clock that can synchronize, with high precision, all the devices installed in the system with different synchronization interfaces. The GPS time synchronization unit 7XV5664-1 can handle these requirements. The GPS time synchronization unit can output 3 different telegrams or pulses for the time synchronization of devices, even in parallel, using its 3 optical channels. The connection of the various device models to the system is shown in *Figure 11.3/4*.

Properties

Many clocks available on the market do offer signals/protocols such as IRIG-B Signal C37.118. However, these usually do not have the required high-precision properties with regard to the transmission behavior for time. The GPS clock 7XV5664-1, with its special hardware and firmware, has been especially developed and adapted for the high-precision synchronization of SIPROTEC and SIMEAS devices.

The SIPROTEC 4 and SIPROTEC 5 devices are synchronized at port A or D-sub 9, respectively, via the optical output Out 1 of the GPS receiver, channel R1 of the sync transceiver, the T adaptor, and the bus cable system 7XV5104. Here, a choice can be made between the IRIG-B or DCF77 telegrams. Both telegrams can be used for the time synchronization of devices.

If the PMU function (Phasor Measurement Unit) is used in the SIPROTEC 5 devices or the SIPROTEC 5 fault recorder 7KE85, the device are also connected via the 2-wire cable 7XV5104.

GPS Time Synchronization Unit – 7XV5664-1

The PMU function is only synchronized using the IRIG-B C37.118 telegram.

The GPS time synchronization unit 7XV5664-1 outputs this IRIG-B C37.118 telegram with a higher quality because of its high-precision properties and this forms a basis for the PMU applications of SIPROTEC and SIMEAS.

You can find more detailed information on the applications in the device manuals and application documentation.

The SIMEAS R-PMU V4 (Phasor Measurement Unit) is synchronized using the high-precision rising edge of the DCF77 telegram at the optical output (for example, FO Out 3). The sync transceiver 7XV5654 or the converter 7KE6000-8AK/L is used to convert the optical signals into electrical signals.

The SIMEAS R V3 is synchronized using the modified DCF77 telegram. A synchronization box (7KE6000-8HA*) is not needed when using the GPS clock 7XV5664-1. The sync transceiver 7XV5654 or the converter 7KE6000-8AK/L is used to convert the optical signals into electrical signals.

The SICAM Q80 V3 is synchronized using the rising edge of the DCF77 telegram at the optical output (for example, FO Out 3). The converter 7KE6000-8AK/L is used to convert the optical signals into electrical signals.

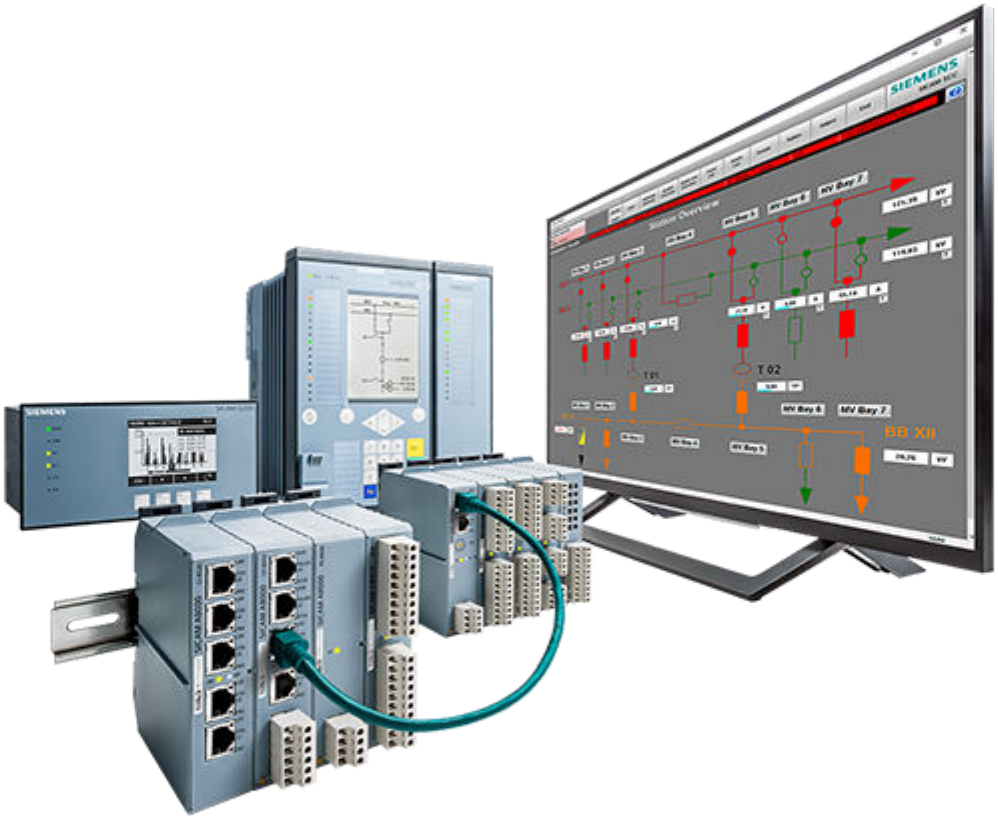
You can find a more detailed application description in the Power Quality & Measurements downloads in the document entitled: "Application description, time synchronization SIMEAS R/SIMEAS R-PMU."

All SIPROTEC protection devices with an internal clock (for example, SIPROTEC V3 and SIPROTEC Compact) can be synchronized using a binary input and the minute pulse from the GPS time synchronization unit. To do this, the internal clock of the protection device is set exactly to the start of the new minute at every complete minute. A condition for this method is that the internal clock of the protection device was properly set once and the auxiliary voltage is buffered against outage. If the clock update does not occur for a longer period of time, the difference between the internal clock of the protection device and the current time of day must be less than one minute. The change between daylight saving and standard time must be performed manually (if desired).

The protection devices are equipped with a binary input that detects the minute pulses by applying appropriate voltage (24 to 60 V or, for the wide range, 24 to 250 VDC) and then provides these pulses to the internal clock. The pulse is distributed to the protection devices via a 2-wire bus to be implemented using shielded twisted cables. All devices must be connected to a grounding system, the cable shields are connected at both ends to the housing.

Selection and Ordering Data

Description	Order no.																
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
GPS time synchronization unit	7	X	V	5	6	6	4	-	1	A	B	☐	0					
												▲						
												|						
Auxiliary voltage, DC/AC 100 V to 240 V (50/60 Hz)												0						
Auxiliary voltage DC 19 to 72 V												1						
Especially for precise time synchronization of SIPROTEC 5 PMU, differential protection applications, and 7KE85. Also for normal time synchronization applications using DCF77 or IRIG-B. Time receiver with high-precision integrated clock, using GNSS (GPS and Galileo). Including GPS antenna, lightning protection, and 50 m (+5 m) RG58 cable. 3 programmable optical outputs (high-precision pulse per second, IRIG-B, DCF77) with ST connector for 50/125 µm or 62.5/125 µm, 850 nm multimode fiber. With fail-safe relay, DIN rail mounting, and setting software per download including RS232-cable.																	


SIEMENS
T 01
T 02
BB XII

Voltage-Transformer Circuit Breaker – 3RV16

Description

The 3RV16 voltage-transformer circuit breaker protects the secondary circuit of voltage transformers that are used to connect protection devices to a voltage-dependent pickup. The miniature circuit breaker is used for distance protection using underimpedance pickup. Special auxiliary contacts reliably prevent the underimpedance pickup from tripping the distance protection if only one fault has occurred on the voltage transformer line.

The miniature circuit breaker for the voltage transformer can also be used to reliably isolate the distance protection device from the voltage transformer. In this case, the special auxiliary contacts also prevent an uncontrolled trip of the distance protection.

Other fuses are not necessary. A "Fuse Failure Monitor" (FFM) is also not necessary.

The miniature circuit breakers are snapped onto a 35-mm DIN rail as per EN 60715. The miniature circuit breakers can be connected using plug-in terminals. The miniature circuit breaker for voltage transformers also has 2 auxiliary contacts (usually 1 make contact + 1 break contact). When closing, contact is made via the make contact of the control switch later than via the main contacts. When opening, the auxiliary circuits open at the same time as the main circuits, if not earlier. This setting prevents generating an undesired trip command caused by the opening of the miniature circuit breaker via the underimpedance pickup of the distance protection device. The auxiliary voltage for blocking the voltage-dependent pickup (underimpedance) must always be routed via the make contacts 11 to 14.

Functions

- The auxiliary contact of the 3RV16 prevents the distance protection from tripping via the underimpedance pickup in the event of a fault in the voltage transformer circuits.
- The operate time of the electromagnetic overcurrent protection is as short as few milliseconds.

Applications

Protection of the secondary circuits of voltage transformers for connecting protection devices with a voltage-dependent pickup.

Special features

The voltage-transformer circuit breaker is largely equivalent to the miniature circuit breaker 3RV1, SIRIUS, size S00. In order to reliably prevent unwanted tripping of the distance protection, two particular product features are taken into consideration.

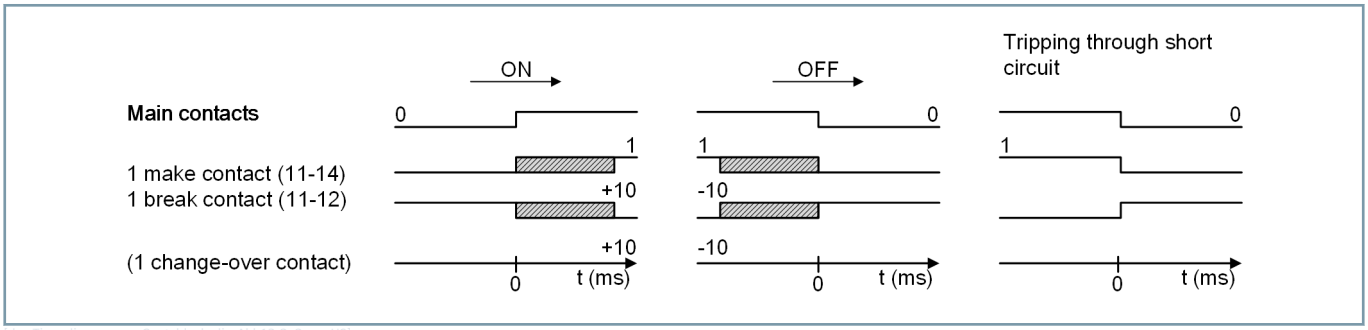


Figure 12.1/1 Voltage-Transformer Circuit Breaker – 3RV16

- Auxiliary switch for blocking the distance protection
  If the voltage-transformer circuit breaker trips or is switched off, the main contacts of the miniature circuit breaker are opened. The distance protection would interpret a low impedance incorrectly as a fault and this would lead to an immediate, undesired disconnection within a few milliseconds.
  To avoid this unwanted tripping, special auxiliary contacts with a time-based assignment to the main contacts of the miniature circuit breaker (see Technical data) are required. The distance protection is blocked via these auxiliary contacts so that unwanted tripping is avoided.
  The distance protection device is blocked via an auxiliary switch with 1 change-over contact which is permanently installed in the voltage-transformer circuit breaker. This change-over contact can be used as 1 make contact (11 to 14) or 1 break contact (11 to 12). These auxiliary contacts have a high contact stability at minimum rated operating currents of I_e/AC-15 ≥ 0.5 mA at 230 V, meaning that they are also suitable for today's electronic distance protection devices.
  For indication functions, laterally attachable auxiliary switches from the SIRIUS series may be used. However, these cannot be used for blocking the distance protection device.
- Impedance via the main contacts
  Only small currents flow via the main contacts of the voltage-transformer circuit breaker. To ensure reliable operation of the distance protection, the resistance of the main contacts must be minimal and remain virtually constant over the entire service life of the miniature circuit breaker.
  This is realized using suitable contacts and contact materials for the voltage-transformer circuit breaker 3RV16.

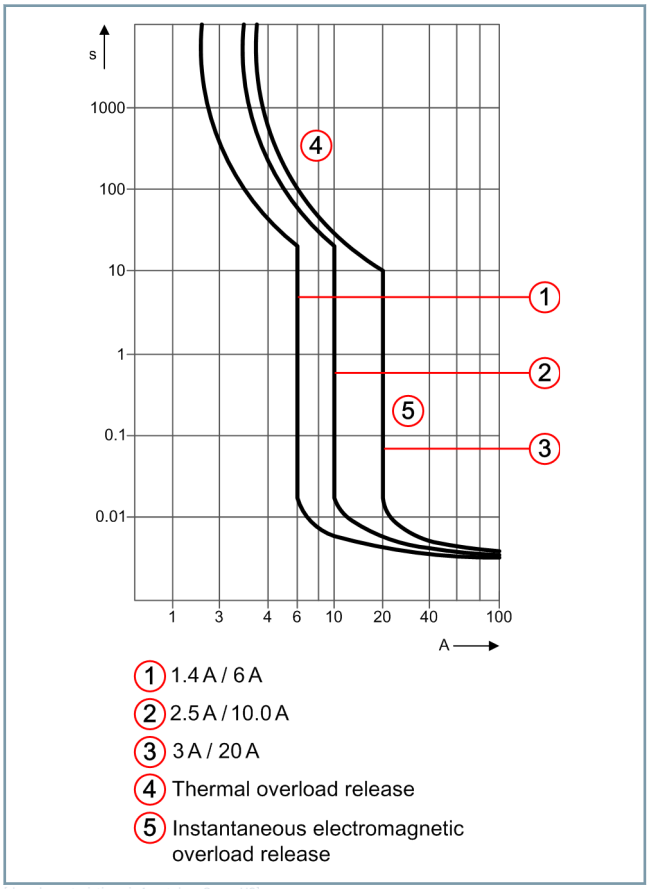
Performance properties

The specified operate curves of the thermal overload release (a) correspond to the average value of the scatter band when cold. At operational temperature, these times are reduced to about 25% of the specified values. The characteristic curves shown below are basic principle drawings.



[dw_Time-diagram_auxCont_block_dis_Abb13-2, 2, en_US]

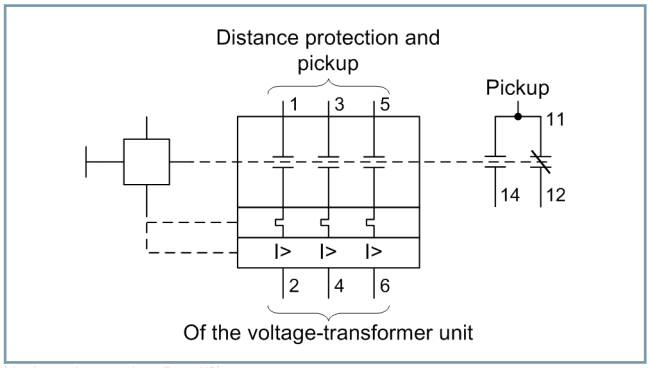
Figure 12.1/2 Timing Diagram for the Auxiliary Switch for blocking the Distance Protection



[dw_characteristics_sip4_catalog, 2, en_US]

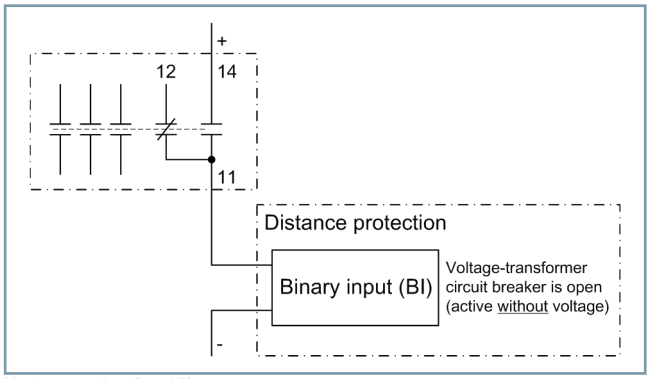
Figure 12.1/3 Characteristic Curves

Connections



[dw_internal_connections, 2, en_US]

Figure 12.1/4 Inside Connections

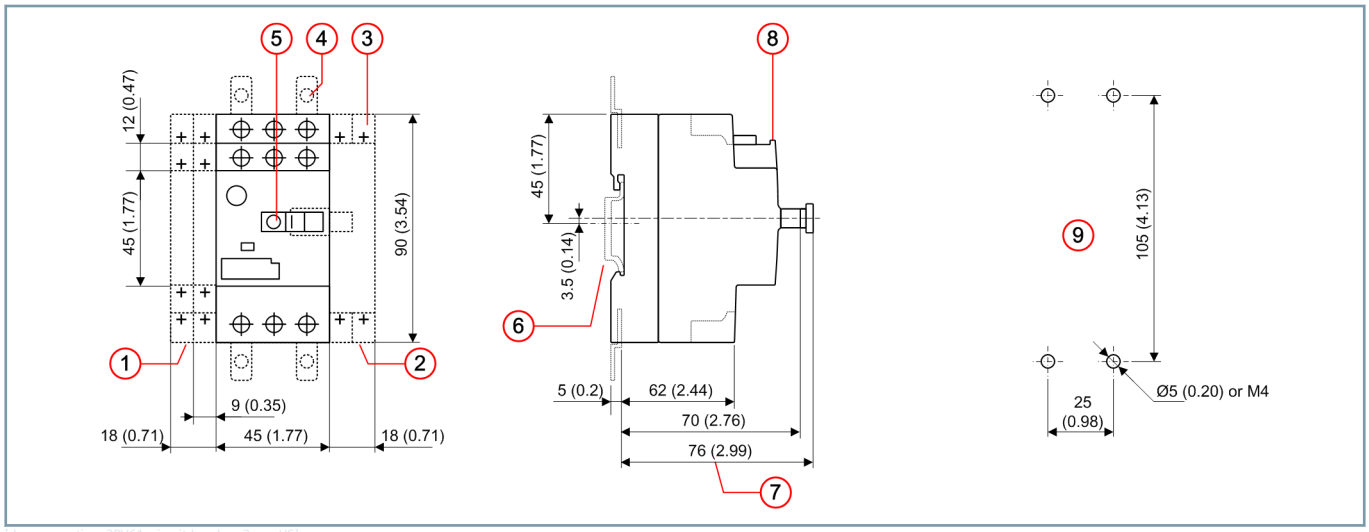


[dw_typ-connections, 2, en_US]

Figure 12.1/5 Typical Connections

Note: When connecting the voltage-transformer circuit breaker via the break contact, the binary input of the distance protection (Siemens 7SAxx) should be set to "active without voltage." The correct wiring is also monitored with this connection type.

Dimensioned Drawings



[dw_connection_3RV61_circuit-breaker, 2, en_US]

Figure 12.1/6 Voltage-Transformer Circuit Breaker – 3RV16

12.1

(1) Auxiliary switch, 2-pole, arranged laterally

(2) Auxiliary switch, 4-pole, arranged laterally

(3) Auxiliary release

(4) Auxiliary switch, transverse

(5) Connection for screw fixing

(6) Only with under-voltage release combined with a leading auxiliary switch

(7) Drilling diagram

(8) Can be interlocked with a lock in the OFF position, angular diameter: 3.5 to 4.5 mm

Technical Data

Surface Mounting
Snap-on mounting to 35-mm DIN rail or screw mounting

Conductor cross sections, main circuits, 1 or 2 conductors			
Type	3RV1611-		
	1AG14	1CG14	1DG14
Terminal type	Screw terminal		
Screw terminal	Prozidriv, size 2		
Single-wire	2 × (0.5 to 1.5 mm²) 2 × (0.75 to 2.5 mm²) (max. 4 mm²)		
Fine wire with bootlace ferrule	2 × (0.5 to 1.5 mm²) 2 × (0.75 to 2.5 mm²)		
Stranded wire	2 × (0.5 to 1.5 mm²) 2 × (0.75 to 2.5 mm²) (max. 4 mm²)		

Auxiliary switch for blocking the distance protection		
With defined time-dependent assignment for blocking the distance protection	1 change-over contact, electronically compatible (suitable as 1 make contact or 1 break contact)	
Rated operating current I_E/rated operating voltage V_E	AC-14 AC-14 DC-13 DC-13	0.5 A/V_E 250 V 1 A/V_E 125 V 0.27 A/V_E 250 V 0.44 A/V_E 125 V

Short-circuit protection for the auxiliary circuit	
Fuse, gL/gG	max. 10 A
Miniature circuit breaker, characteristic curve C	max. 6 A

General technical data			
Type	3RV1611-		
	1AG14	1CG14	1DG14
Rated current	1.4	2.5	3
Permissible ambient temperature Storage/transportation Operation	–50 to +80 °C –20 to +60 °C (up to 70 °C possible with reduced current)		
Rated operating voltage V_E	400 V		

General technical data			
Rated frequency	16.7 to 60 Hz		
Rated insulation voltage V_i	690 V		
Short-circuit breaking capacity at 400 VAC, short-circuit proof up to	50 kA		
Current setting for thermal overload release	1.4 A	2.5 A	3 A
Pickup value of the instantaneous electromagnetic overcurrent protection	6 ± 20%	10.5 ± 20%	20 ± 20%
Operate time of the instantaneous electromagnetic overcurrent protection	6 ms at 12 A	6 ms at 20 A	6 ms at 40 A
Disconnection service life:			
Short-circuit current I_p	Max. short-circuit disconnections		
≤ 0.1 kA	≤ 10		
0.1 to 2 kA	≤ 3		
2 kA to 50 kA	1		

General technical data	
Internal resistance - when cold - when warm	> 0.25 Ω ± 6.5% > 0.30 Ω ± 6.5%
Impact resistance according to IEC 60068, part 2-27	15 g
Degree of protection according to IEC 60529	IP 20
Protection against electric shock according to DIN VDE 0106 part 100	Finger-safe
Service life - mechanical - electrical	Switching cycles 10,000 10,000
Permissible position of use	any

Selection and Ordering Data

12.1

Description	Order no.															
	1	2	3	4	5	6	7		8	9	10	11	12	13	14	15	16
Voltage-Transformer Circuit Breaker – 3RV16	3	R	V	1	6	1	1	-	1	□	G	1	4				
										▲							
With 1 auxiliary contact, 1 change-over contact										|							
1.4/6 A										A							
2.5/10.5 A										C							
3/20 A										D							
Laterally mountable auxiliary switch, 1 make contact/break contact	3	R	V	1	9	0	1	-	1	A							

Isolating Transformer – 7XR95

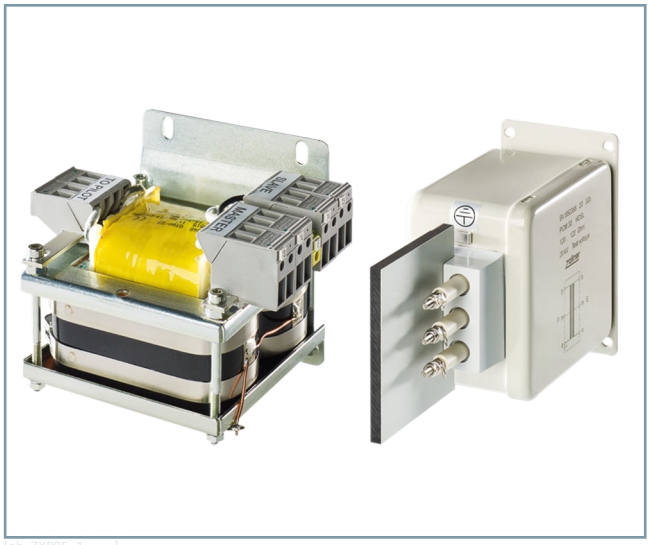
Description

7XR95 is an isolating transformer for pilot wire differential protection.

The isolating transformer provides galvanic separation between the pilot wires and the relay.

Climate requirements according to previous standard DIN 40040:

HKG = -25 °C to +125 °C, relative air humidity: max. 75%; annual average < 65 % on 60 days per year up to 85 % (evenly distributed over the year); condensation not permitted



[phi_7XR95, 1, --_--]

Figure 12.2/1 Isolating Transformer 7XR9516 (left), Isolating Transformer 7XR9515 (right)

12.2

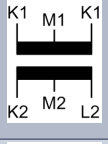
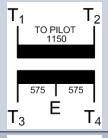
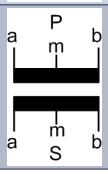
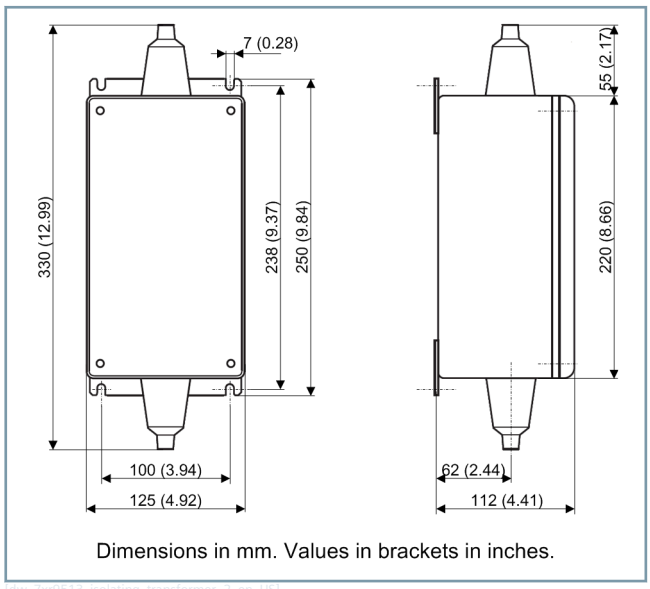
Order no.	Isolating transformer	Windings of the auxiliary current transformers		Weight, ca.
7XR9 513	for line differential protection with 1 pair of pilot wires		Isolating transformer 1:1, max. 550 V 0.4 A continuous, 3 A 10 s, 10 A 1 s **Test voltage 20 kV**, 50 Hz, 1 min HKG	5 kg
7XR9 515	for differential power protection with 1 pair of pilot wires		Isolating transformer 1:1, max. 450 V **Test voltage 5 kV**, 50 Hz, 1 min HKG	2 kg
7XR9 516	for communication converter (for 7SA and 7SD, among others)		Isolating transformer 1:1, max. test voltage: 20 kV, 50 Hz, 1 min	1.4 kg

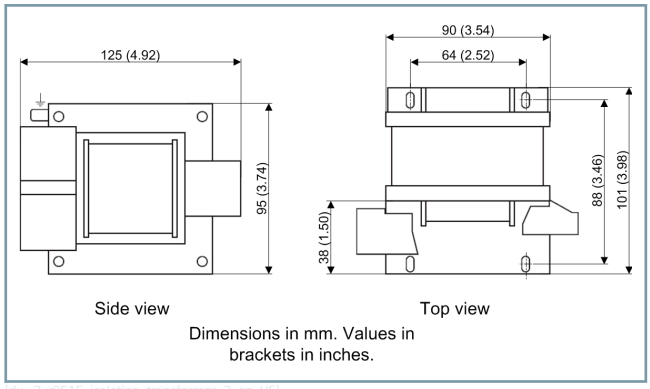
Table 12.2/1 Overview of the Isolating Transformer

Dimensioned Drawings



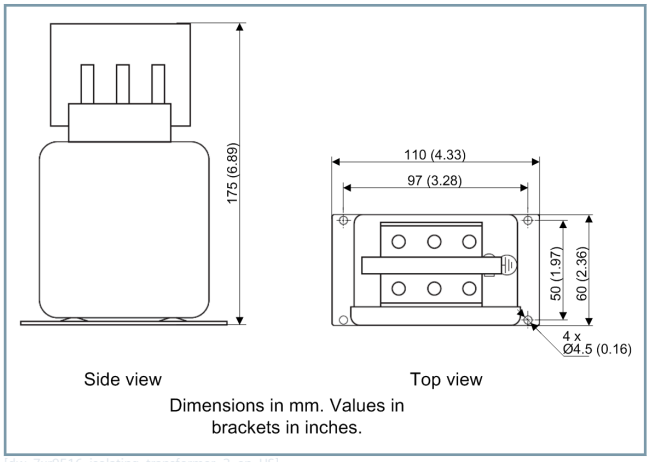
[dw_7xr9513_isolating_transformer, 2, en_US]

Figure 12.2/2 Isolating Transformer 7XR9513



[dw_7xr9515_isolating_transformer, 2, en_US]

Figure 12.2/3 Isolating Transformer 7XR9515 – Side View/Top View



[dw_7xr9516_isolating_transformer, 2, en_US]

Figure 12.2/4 Isolating Transformer 7XR9516 – Side View/Top View

12.2

Selection and Ordering Data

Description		Order No.											
		1	2	3	4	5	6	7		8	9	10	11	12
Isolating transformer		7	X	R	9	5	1	□						
								▲						
								|						
For line differential protection	Insulation voltage: 20 kV							3						
	Insulation voltage: 5 kV							5						
For communication converters 7XV5662-0AC0; for example for 7SD61, 7SD52, 7SA6, 7SA522	Insulation voltage: 20 kV							6						

Description

A common use of digital relay binary inputs is to provide indication of alarm or fault conditions e.g. transformer Buchholz Gas or Buchholz Surge conditions. The binary inputs can be mapped to LED(s), waveform storage trigger, and binary outputs.

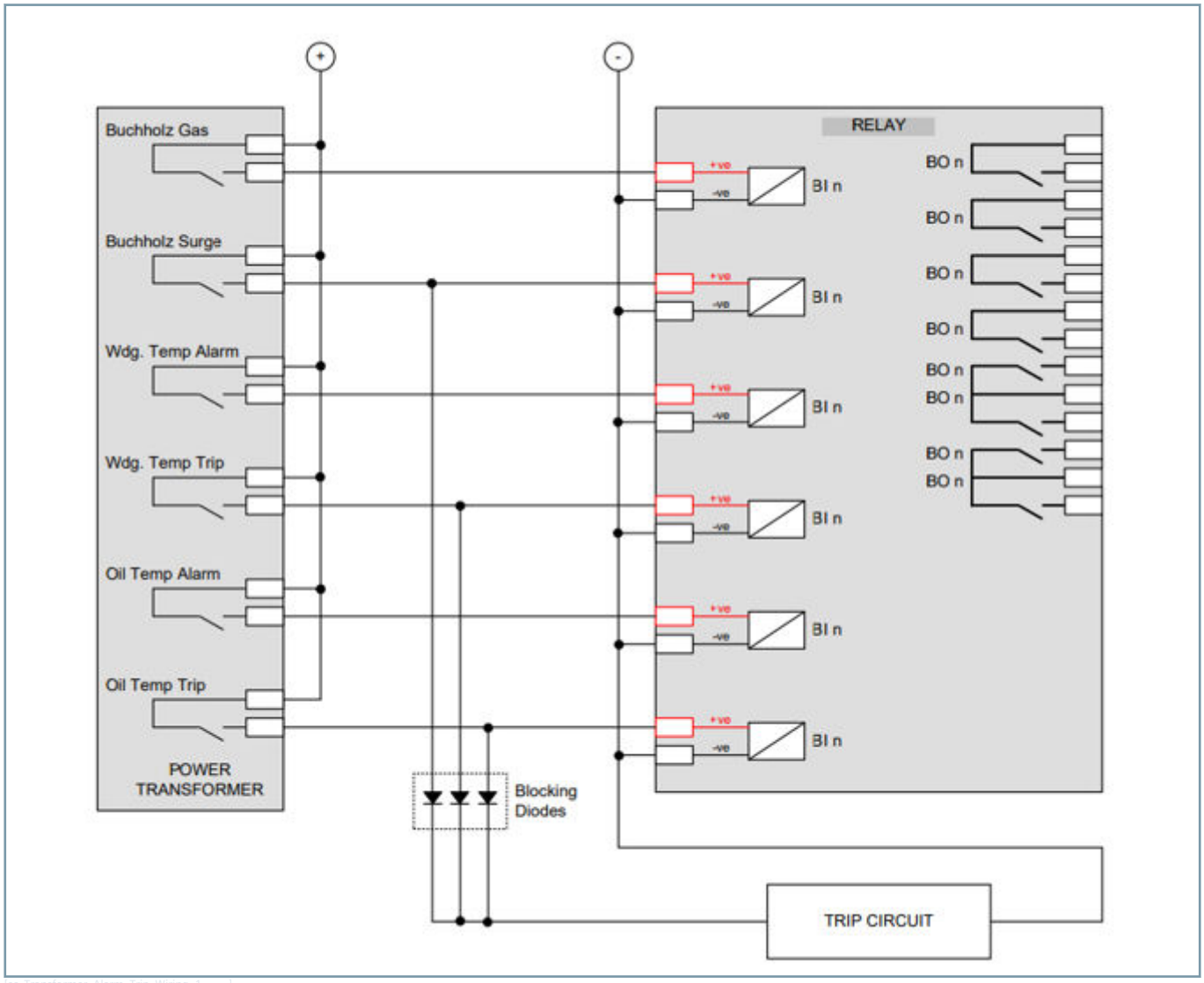
The inputs can also be mapped as 'General Alarms' – this allows user defined text to be displayed on the LCD when the BI is energised. Inputs used in this way are programmed using:

INPUT CONFIG > INPUT MATRIX > General Alarm n – Assigned to BI

INPUT CONFIG > GENERAL ALARMS > General Alarm n – 16 character string

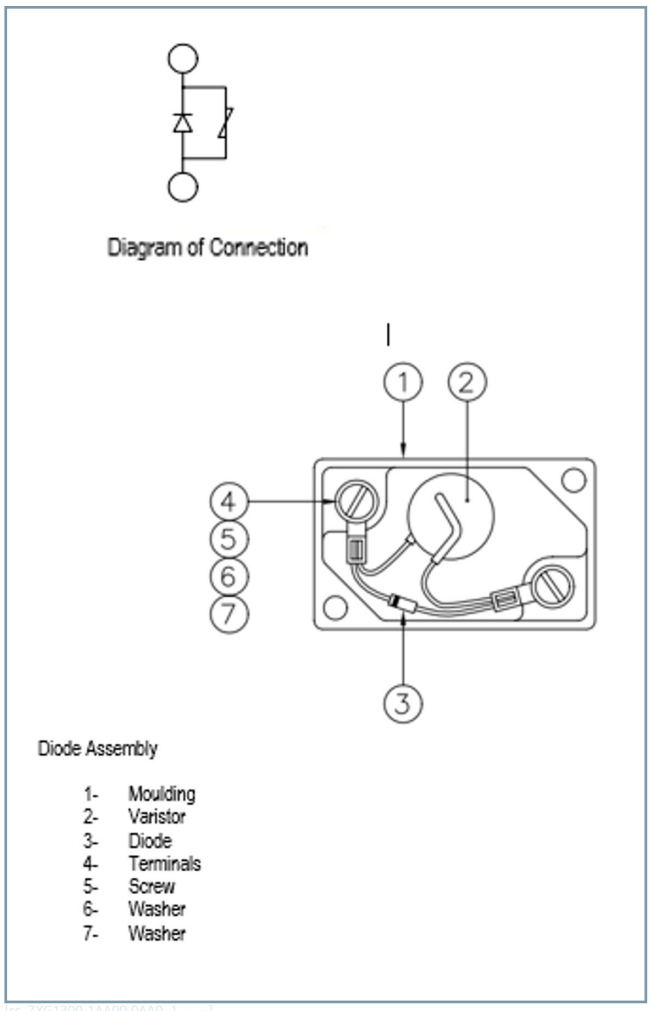
Where transformer outputs require high speed tripping, such as a Buchholz Surge, these should be wired to a binary input to provide LED indication and also have a parallel connection wired to directly trip the circuit via a blocking diode, see *Figure 12.3/1*.

Connection diagrams and dimension drawings



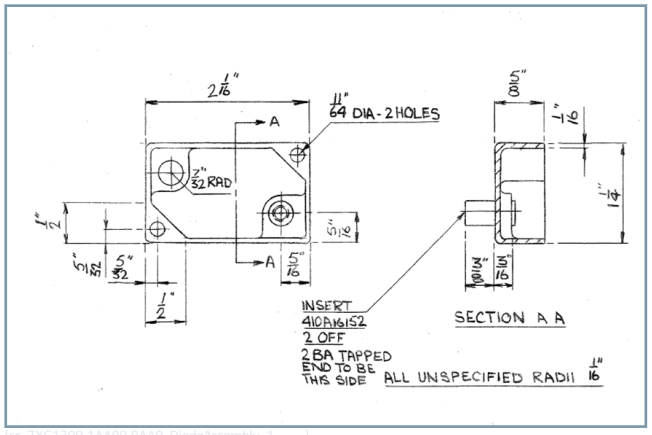
[sc_Transformer_Alarm_Trip_Wiring, 1, --_--]

Figure 12.3/1 Example of transformer alarm and trip wiring



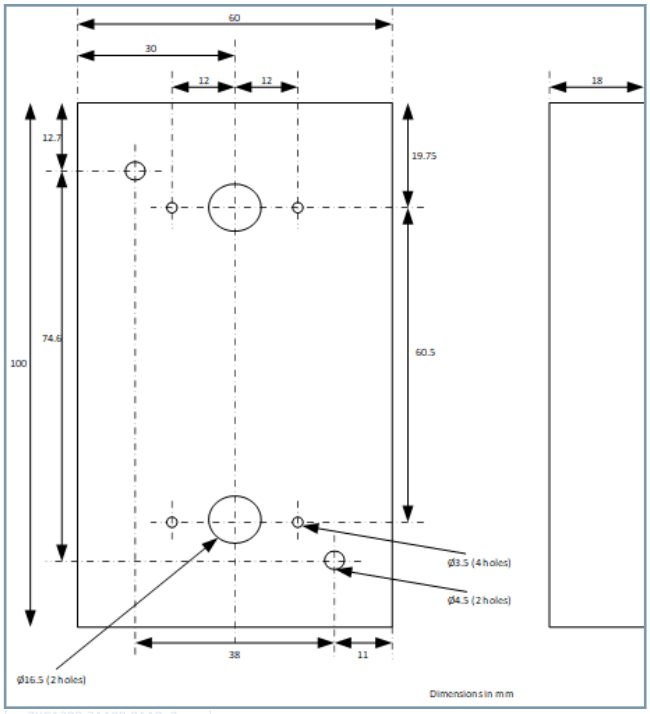
[sc_7XG1300-1AA00-0AA0, 1, --_--]

Figure 12.3/2 7XG1300-1AA00-0AA0 - Accessories for protection resin encapsulated blocking diode incorporating Metrosil over-voltage protection (750 MA)



[sc_7XG1300-1AA00-0AA0_DiodeAssembly, 1, --_--]

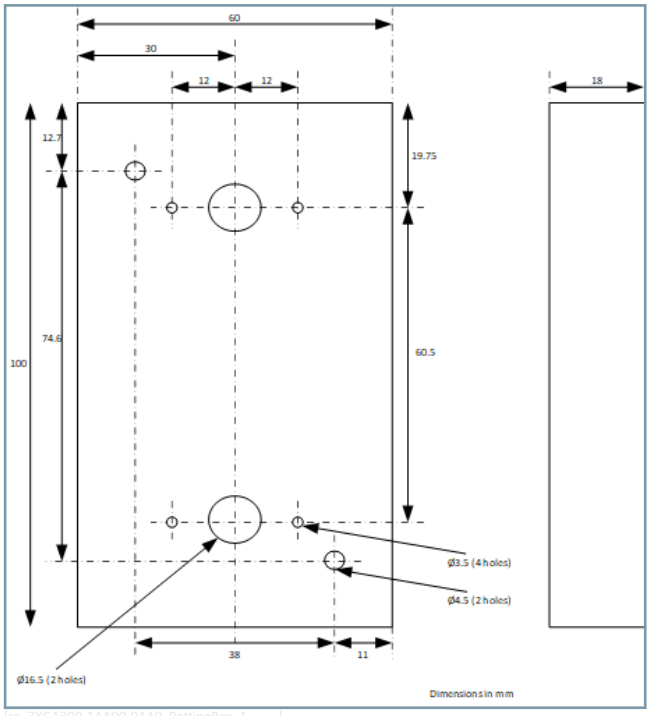
Figure 12.3/3 Moulding for diode assembly



[sc_7XG1300-2AA00-0AA0, 2, --_--]

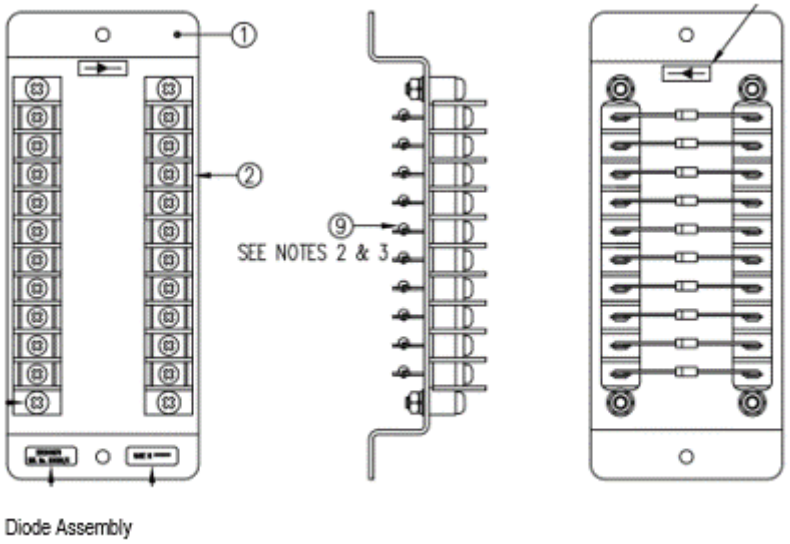
Figure 12.3/4 7XG1300-2AA00-0AA0 - Accessories for protection resin encapsulated blocking diode incorporating Metrosil over-voltage protection (6 A)

12.3



[sc_7XG1300-1AA00-0AA0_PottingBox, 1, --_--]

Figure 12.3/5 Potting box for diode assembly



[sc_7XG1300-3AA00-0AA0, 1, --_--]

Figure 12.3/6 7XG1300-3AA00-0AA0 - Accessories for protection diode assembly - 10 way (1 A)

Description

The digital relay binary inputs have a low minimum operate current and may be set for instantaneous operation. Consideration should be given to the likelihood of maloperation due to capacitance current. Capacitance current can flow through the BI for example if an earth fault occurs on the DC circuits associated with the relay.

The binary inputs will be less likely to maloperate if they:

- Have both the positive and negative switched (double-pole switched)
- Do not have extensive external wiring associated with them e.g. if the wiring is confined to the relay room

Where a digital relay binary input is both used to influence a control function (e.g. provide a tripping function) and it is considered to be susceptible to maloperation the external circuitry can be modified to provide immunity to such disturbances.

Connection diagrams

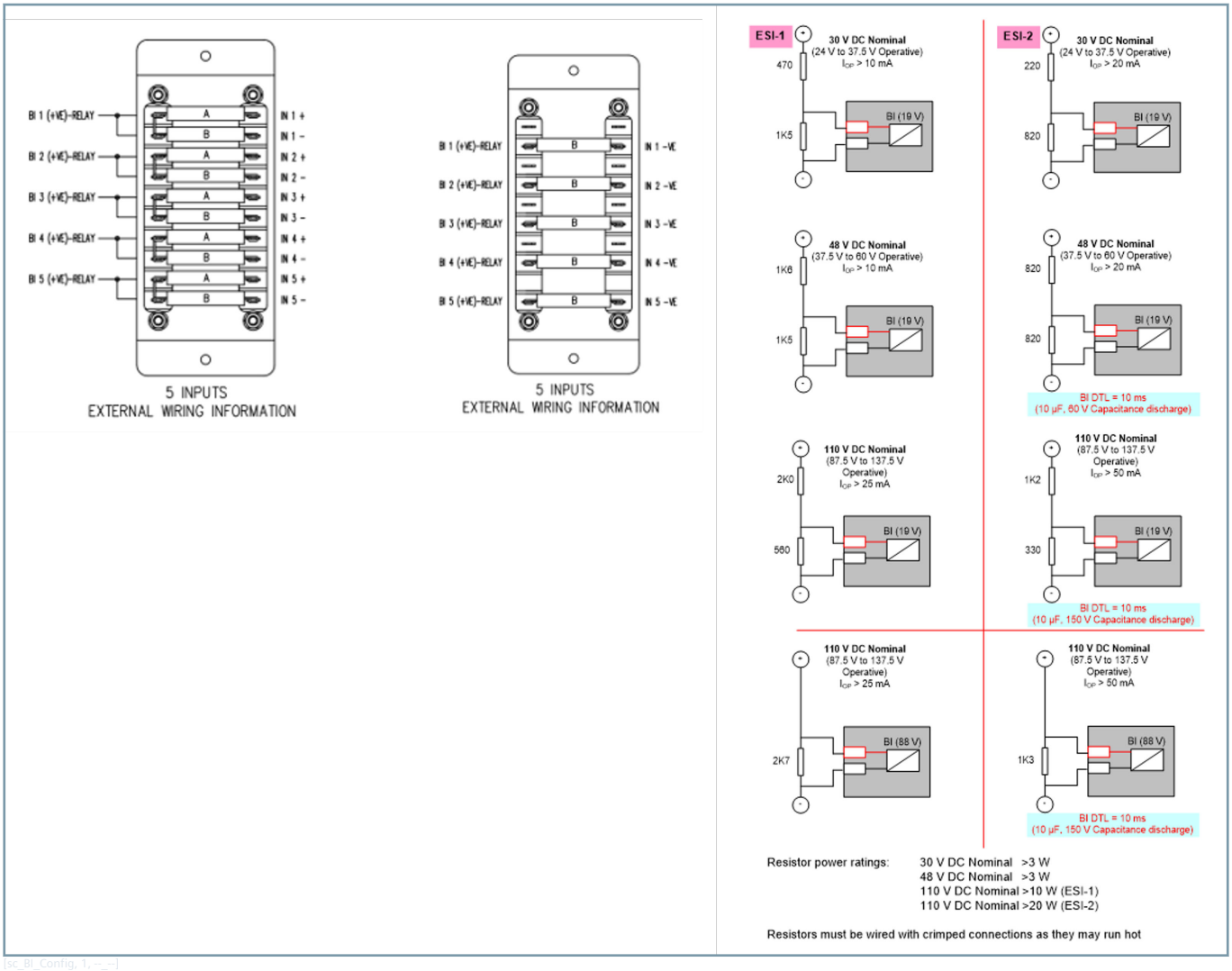
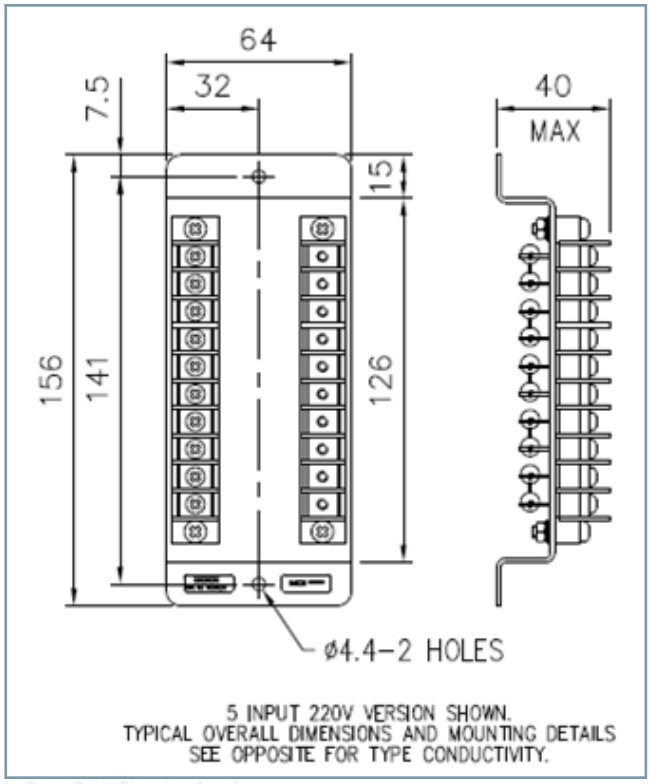


Figure 12.4/1 Binary input configurations providing compliance with EATS 48-4 Classes ESI 1 and ESI 2



[sc_DropperResistorDimensions, 1, --_--]

Figure 12.4/2 Dimension drawing for dropper resistors

12.4

Ordering information - dropper resistors

DC 30 V nominal, BI 19 V	
A:470/B:1500 Ω (Low burden)	VCE: 2435H90001
A:220/B:820 Ω (High burden)	VCE: 2435H90004
DC 48 V nominal, BI 19 V	
A:1600/B:1500 Ω (Low burden)	VCE: 2435H90002
A:820/B:820 Ω (High burden)	VCE: 2435H90005
DC 110 V nominal, BI 19 V	
A:2K/B:560 Ω (Low burden)	VCE: 2435H90003
A:1K2/B:330 Ω (High burden)	VCE: 2435H90007
DC 110 V nominal, BI 88 V	
A:NA/B:1300 Ω (High burden)	VCE: 2435H90008
A:NA/B:2700 Ω (Low burden)	VCE: 2435H90006

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	A	A	0
					|	|						|					
Fiber optic data communication port inserts					1	1							0					
Terminal plug for RS485 wiring (3-way)					1	3							0					
IP2x Terminal block cover (x10)					1	8							0					
Fascia lever securing screw (plastic) – BB hardware (7SR5)					6	1							0					
Hinged cover for fascia LED label					6	2							0					
Maintenance front cover S6 (155 x 177 x 20 mm)					6	3							1					
Maintenance front cover S8 (206 x 177 x 20 mm)					6	3							2					
Maintenance front cover S12 (309 x 177 x 20 mm)					6	3							6					

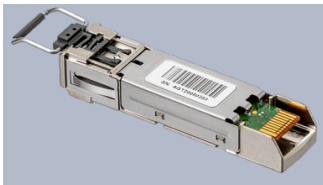


Figure 12.4/3 Fiber optic data communication port inserts

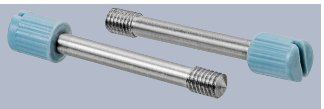


Figure 12.4/4 Fascia lever securing screw (plastic)

Table 12.4/1 Photographs of the 7SR5 spares and accessories

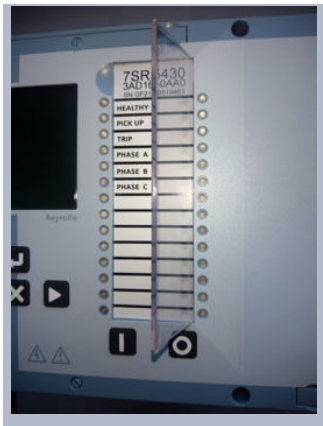


Figure 12.4/5 Hinged cover for fascia LED label



Figure 12.4/6 Terminal block cover fitted to device

Table 12.4/1 Photographs of the 7SR5 spares and accessories

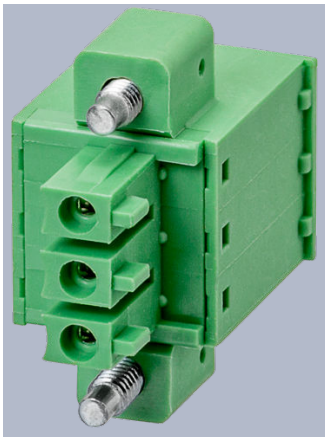


Figure 12.4/7 Terminal plug for RS485 wiring (3-way)



Figure 12.4/8 Terminal block cover

Table 12.4/1 Photographs of the 7SR5 spares and accessories

Ordering Information – Reyrolle Spares

Cover Assembly	
E2 Cover Assembly (No Reset), Epsilon Case	VCE: E2C0
E2 Cover Assembly (With Reset) Epsilon Case	VCE: E2CR
E3 Cover Assembly (No Reset)	VCE: E3C0
E3 Cover Assembly (RH Reset)	VCE: E3CRR
E4 Cover Assembly (7SR1)	VCE: 2436G10001
E4 Cover Assembly (No Reset)	VCE: 2995G10018
E4 Cover Assembly (No Reset)	VCE: E4C0
E4 Cover Assembly (LH/LH Reset), Epsilon Case	VCE: E4CRB
E4 Cover Assembly (2 Push Reset)	VCE: E4CD02
E6 Cover Assembly (LH Reset), Epsilon Case	VCE: E6CRL

Device Case with Front Cover	
E2 Case (Basic W/Reset), Epsilon Case	VCE: E2B01/FS03/CR
E4 Case (No Reset), Epsilon Case	VCE: E4B01/F01/C0
E4 Case for B75/B74 relay (No Reset), Epsilon Case	VCE: E4B01/F01/C0

Miscellaneous Accessories	
XR Terminal Block Kit	VCE: 2995D10025/XR
Relay Mounting screw Kit	VCE: 2995G10046
Rear Terminal Fixing Kit - Epsilon	VCE: 2995G10047

Indication of conformity

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

This conformity has been proved by tests performed according to the Council Directive in accordance with the product standard EN 60255-26 (for EMC directive), the standard EN IEC 63000 (for RoHS directive), and with the product standard EN 60255-27 (for Low Voltage Directive) by Siemens.

The device is designed and manufactured for application in an industrial environment.

The product conforms with the international standards of IEC 60255 and the German standard VDE 0435.

Disclaimer of Liability

Subject to changes and errors. The information given in this document only contains general descriptions and/or performance features which may not always specifically reflect those described, or which may undergo modification in the course of further development of the products. The requested performance features are binding only when they are expressly agreed upon in the concluded contract.

Copyright

Copyright © Siemens AG 2026.

The disclosure, duplication, distribution and editing of this document, or utilization and communication of the content are not permitted, unless authorized in writing. All rights, including rights created by patent grant or registration of a utility model or a design, are reserved.

Trademarks

SIPROTEC, DIGSI, SIGRA, SIGUARD, SICAM, and MindSphere are trademarks of Siemens. Any unauthorized use is prohibited.

OpenSSL

This product includes software developed by the OpenSSL Project for use in OpenSSL Toolkit (*http://www.openssl.org/*).

This product includes software written by Tim Hudson (*tjh@cryptsoft.com*).

This product includes cryptographic software written by Eric Young (*eay@cryptsoft.com*).

1,2,3 ...

3PP1326/36 288
3RV16 382
4NC 262
7KE6000 147
7PA22 8
7PA23 13
7PA26 18
7PA27 24
7PA30 1-phase 81
7PA30 3-phase 86
7PG11 34
7PG15 53
7PG17-XR105, XR106 and XR107, XR205 and XR206 127
7PG17-XR151 120
7PG17-XR152 and XR153 113
7PG17-XR250 to XR351 98
7PG1110-7AE10 296
7PG1753 134
7PJ13 91
7PJ14 106
7PJ15 70
7SC8021 370
7SR5 Spares 393
7TS16 29
7XG14 308
7XG15 296
7XG22 2RMLG 359
7XR61 273
7XR81 276
7XR86 290
7XR87 292
7XR95 386
7XR6004 281
7XR8004 285
7XT33 263
7XT34 266
7XT71 268
7XV75 356
7XV5100 148
7XV5103 153
7XV5104 372
7XV5105 375
7XV5107 158
7XV5461 up to 8 km 166
7XV5461 up to 40 km 162
7XV5461 up to 170 km 159
7XV5650/51 169
7XV5652 174
7XV5662-0AA 176
7XV5662-0AC 180
7XV5662-0AD 183
7XV5662-6AD10 326
7XV5662-7AD10 330
7XV5662-8AD10 334
7XV5664-1 377
7XV5673 314
7XV5674 320
7XV5710 149
100% Stator Ground-Fault Protection 263, 266

B

BAT1600 257

C

Communication Networking 236

D

Diodes 388
Dropper Resistors 391

L

LOGO!Power 240

M

Mobile Wireless Antennas 226

N

Network Protection 228

P

Protection Resistors 304
PSU6200 242
PSU8200 248
PSU8400 246
PSU8600 244

R

Remote Network Management 231
Reyrolle Device Accessories 394
Rotor Ground-Fault Protection 268
Router for PROFIBUS/MPI Systems 224
Router for Wireless IP Communications 222
RUGGEDCOM CROSSBOW 221
RUGGEDCOM RMC30 219
RUGGEDCOM RMC40 212
RUGGEDCOM RMC8388 213
RUGGEDCOM RS400 215
RUGGEDCOM RS900 186
RUGGEDCOM RS900G 187

RUGGEDCOM RS900GP 188
RUGGEDCOM RS900R Series 208
RUGGEDCOM RS910 217
RUGGEDCOM RSG900C 190
RUGGEDCOM RSG920P 192
RUGGEDCOM RSG2100 195
RUGGEDCOM RSG2488 197
RUGGEDCOM RSGT916P 193
RUGGEDCOM RST916C 193
RUGGEDCOM RST2000 Series 199
RUGGEDCOM RST2428P 201
RUGGEDCOM RX1400 210
RUGGEDCOM RX1500 203
RUGGEDCOM RX5000/MX5000 206

S

Selectivity Modules 252
Sensors for SIPROTEC 5 and Reyrolle 5 338
SINEMA Remote Connect as a Service 234
SITOP Add-on Modules 250
SITOP CAS1600 259
Stator Ground-Fault Protection 290

T

Trip-circuit supervision relay 85
Trip-Circuit Supervision Relay 90

U

Underexcitation Protection 292
UPS500 254
UPS1600 255

Published by
Siemens AG

Smart Infrastructure
Electrification & Automation
Mozartstrasse 31c
91052 Erlangen, Germany

For more information, please contact
Phone: +49 9131 1743072
Email: support.ea.si@siemens.com
Web: siemens.com

For the U.S. published by
Siemens Industry Inc.

3617 Parkway Lane
Peachtree Corners, GA 30092
United States

We create technology to transform the everyday, for everyone. Our world is changing at an unprecedented rate. Demographic change, urbanization, glocalization, environmental change, resource efficiency, and digitalization are presenting new challenges and opportunities.

Siemens Smart Infrastructure addresses these topics by combining the real and the digital worlds.

Our technology transforms infrastructure, across buildings, electrification, and grids, at speed and scale, enabling collaborative ecosystems to accelerate our customers' digital journey to become more competitive, more resilient, and more sustainable.

siemens.com/smart-infrastructure

Article no. SIEA-C10001-00-7600-8 (Status 07.2026)

Subject to changes and errors. The information given in this document only contains general descriptions and/or performance features which may not always specifically reflect those described, or which may undergo modification in the course of further development of the products. The requested performance features are binding only when they are expressly agreed upon in the concluded contract.
All product designations may be trademarks or product names of Siemens AG or other companies whose use by third parties for their own purposes could violate the rights of the owners.

©Siemens 2026