SIEMENS

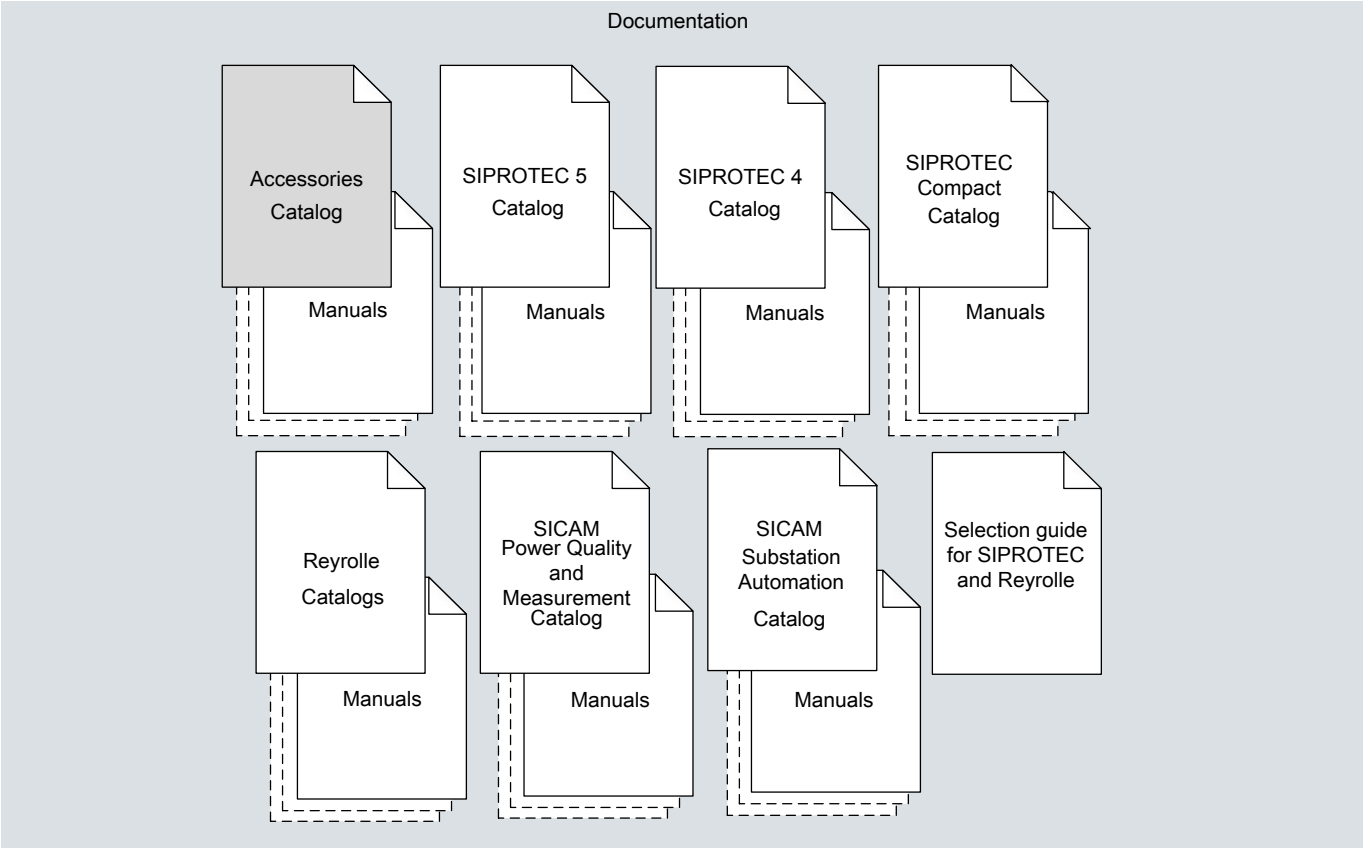
Accessories

Protection, Substation Automation, Power Quality and Measurement

Catalog · Edition 1.0

siemens.com/accessories

Documentation Overview



Accessories Catalog

This catalog provides an overview and description of the accessories of the products for protection, station automation and power quality and measurement.

SIPROTEC 5 Catalog

The catalog describes the features for the SIPROTEC 5 system and device specific properties such as scope of functions, hardware and applications.

SIPROTEC 4 Catalog

This catalog describes the features of the device series SIPROTE 4.

SIPROTEC Compact Catalog

This catalog describes the features of the SIPROTEC Compact series and presents the available devices and their application possibilities.

Reyrolle Catalogs*

The Reyrolle catalogs describe the features such as functionality, hardware and applications.

SICAM Power Quality and Measurement Catalog

The catalog describes the features such as functional range, hardware and applications of the Power Quality devices.

SICAM Substation Automation Catalog

This catalog describes the features such as functionality, hardware and applications of the substation automation devices.

Selection Guide SIPROTEC and Reyrolle

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

Manuals

The manuals describe, among others, the operation, installation and technical data of the devices.

* in preparation

Accessories Protection, station automation, power quality and measurement

Catalog - Edition 1.0

MANAGEMENT SYSTEM CERTIFICATION
DNV·GL
ISO 9001 = ISO 14001
OHSAS 18001

The products and systems described in this catalog are manufactured and sold according to a certified management system (acc. to ISO 9001, ISO 14001 and BS OHSAS 18001).

Content

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 Digital Grid products – protection devices, station automation equipment and devices for network quality and measurement.

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.

- **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**

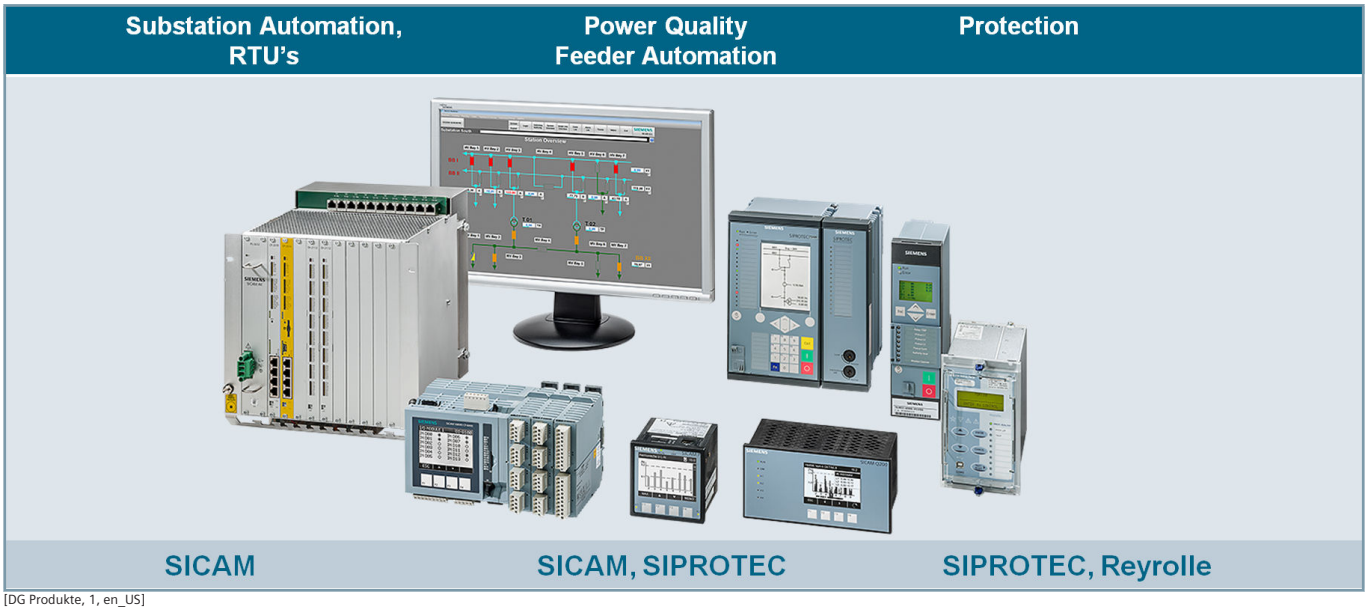
  RTD units

- **Test Equipment**

  Switches for testing protection devices

- **Time Synchronization**

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



[DG Produkte, 1, en_US]

Figure 1/1 Digital Grid Product Portfolio

Introduction

1

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General

Description

The voltage-transformer circuit breaker protects the secondary side of voltage transformers which 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.

- **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.

[ph_3RV16, 1, --_--]

Figure 2.1/1 Voltage-Transformer Circuit Breaker – 3RV16

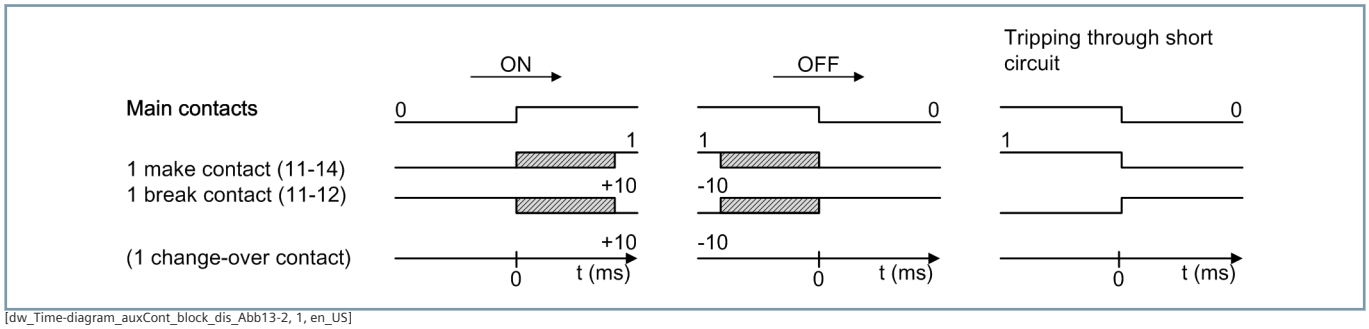
To avoid this unwanted tripping, special auxiliary contacts with a time-based assignment to the main contacts of the miniature circuit breaker (see Technical data) are required. The distance protection is blocked via these auxiliary contacts so that unwanted tripping is avoided.
The distance protection 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.

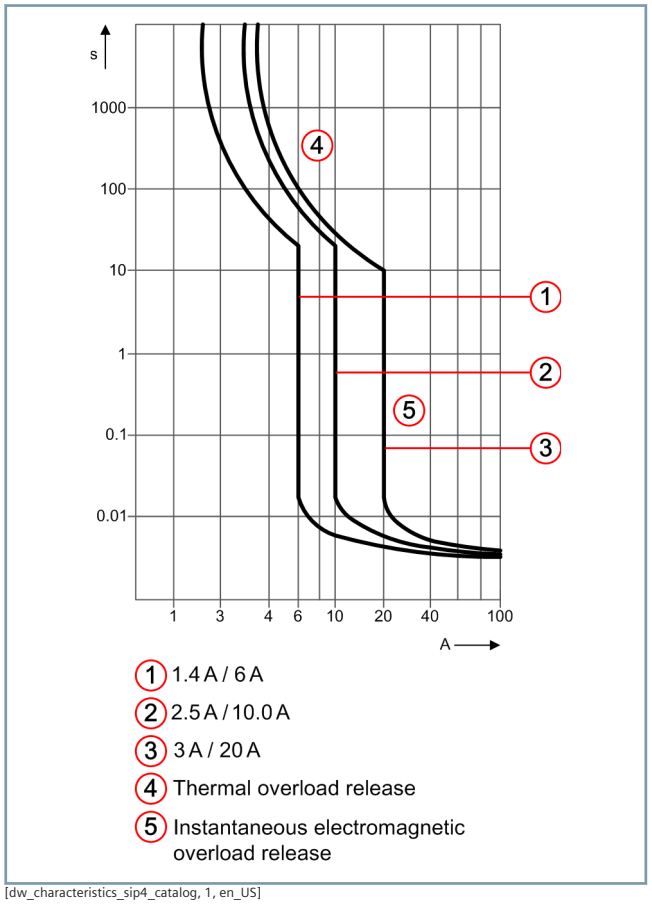
Performance properties

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, 1, en_US]

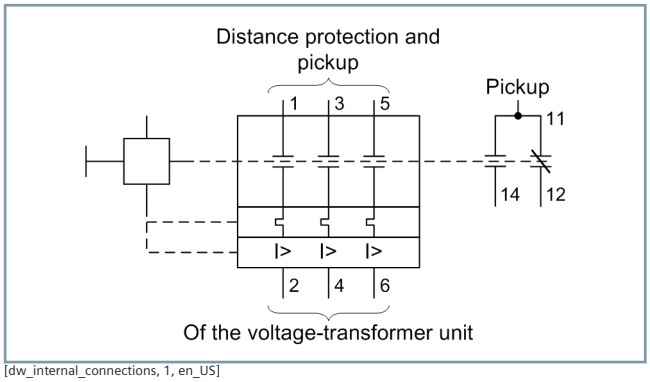
Figure 2.1/2 Timing Diagram for the Auxiliary Switch for blocking the Distance Protection



[dw_characteristics_sip4_catalog, 1, en_US]

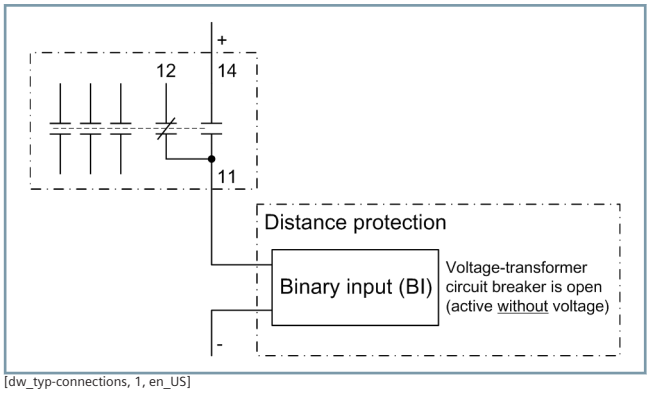
Figure 2.1/3 Characteristic Curves

Connections



[dw_internal_connections, 1, en_US]

Figure 2.1/4 Inside Connections



[dw_typ-connections, 1, en_US]

Figure 2.1/5 Typical Connections

Note: When connecting the voltage-transformer circuit breaker via the break contact, the binary input of the distance protection (Siemens 7SA xxx) should be set to "active without voltage." The correct wiring is also monitored with this connection type.

Voltage-Transformer Circuit Breaker – 3RV16 – Technical Data

Technical Data

Surface Mounting
Snap-on mounting to 35-mm DIN rail or screw mounting

2.1

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 mm^2) 2 × (0.75 to 2.5 mm^2) (max. 4 mm^2)		
Fine wire with bootlace ferrule	2 × (0.5 to 1.5 mm^2) 2 × (0.75 to 2.5 mm^2)		
Stranded wire	2 × (0.5 to 1.5 mm^2) 2 × (0.75 to 2.5 mm^2) (max. 4 mm^2)		

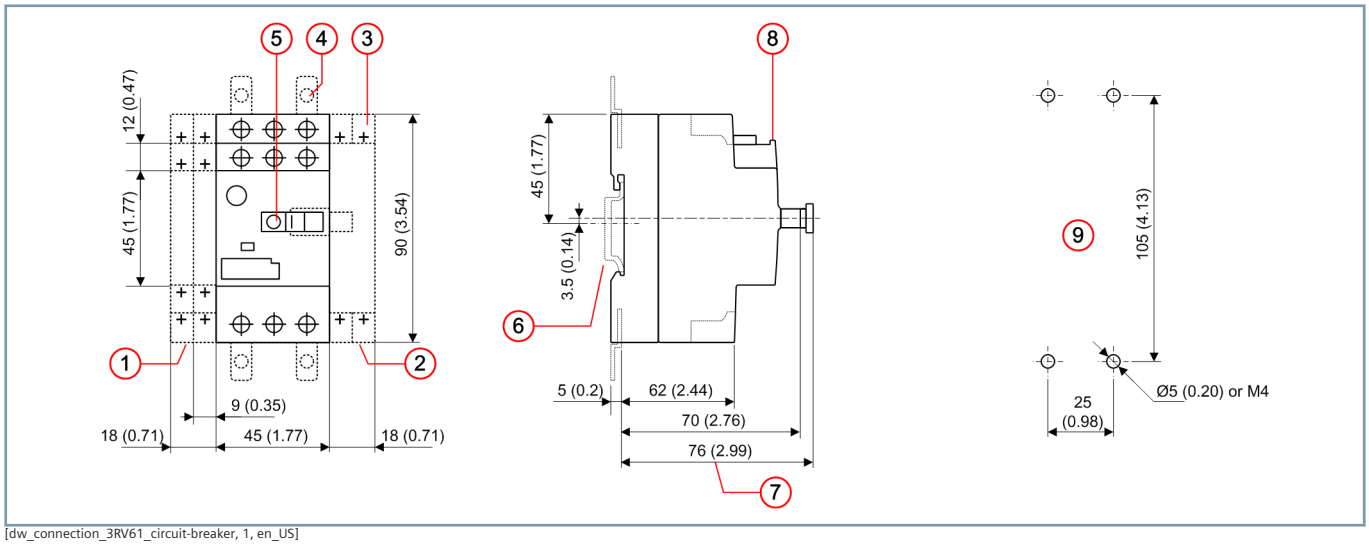
Auxiliary switch for blocking the distance protection		
With defined time-dependent assignment for blocking the distance protection	1 change-over contact, electronically compatible (suitable as 1 make contact or 1 break contact)	
Rated operating current I_E/rated operating voltage V_E	AC-14 AC-14 DC-13 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		
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

Dimensioned Drawings



[dw_connection_3RV61_circuit-breaker, 1, en_US]

Figure 2.1/6 Voltage-Transformer Circuit Breaker – 3RV16

(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

Selection and Ordering Data

Description	Versions	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							

Description

The following 4AM auxiliary current transformers are available:

- **Matching transformer**

  Multi-tap auxiliary current transformer for matching to different current transformer ratios

- **Input and matching transformers**

  Input and matching transformers for phase-segregated busbar differential protection

- **3-phase cumulative input current transformer (summation current transformer)**

  3-phase cumulative input current transformer for busbar differential protection

- **Auxiliary transformer for transformer-fed trip circuits**

  Auxiliary transformer for transformer-fed trip coils in stations without battery supply.

Applications

You can find additional information and product features of transformers in *Table 2.2/1*.

[4AM, 1, --_--]

Figure 2.2/1 Auxiliary Current Transformer 4AM – left Picture without Varistor, right Picture with Varistor

Auxiliary Current Transformer 4AM

Application	Note	Climate requirements according to previous standard DIN 40040	Product features
Matching transformer	Multi-tap auxiliary current transformer for matching to different current transformer ratios 4AM51 70-7AA: Standard version, primary for transformer differential protection 4AM52 72-2AA: Version with double thermal load rating, for example, for connecting to wide-range transformer (rated data for uninterrupted duty: 2 × I_N) 4AM52 72-3AA: Version with higher saturation factor (primarily for busbar differential protection). Larger over-current factor due to higher voltages	HKG HKG HKG	Several transformation ratios may be selected using terminal connections (next page) f_N = 45 to 60 Hz
Input and matching transformers	Input and matching transformers for phase-segregated busbar differential protection 4AM51 20-1DA: For 1 A transformers 4AM51 20-2DA: For 5 A transformers [1)]	HKG HKG	f_N = 45 to 60 Hz with varistor
3-phase cumulative input current transformer (summation current transformer)	3-phase cumulative input current transformer for busbar differential protection (for the 7SS60, 7UT6, among others) 4AM51 20-3DA: For 1 A transformers 4AM51 20-4DA: For 5 A transformers for line differential protection (for the 7SD600, among others) 4AM49 30-6DB: For 5 A 4AM49 30-7DB: For 1 A	HKG HKG HKG HKG	f_N = 45 to 60 Hz with varistor f_N = 45 to 60 Hz with varistor
Auxiliary transformer for transformer-fed trip circuits	Auxiliary transformer for transformer-fed trip coils in stations without battery supply. 4AM5065-2CB00: For 1 A transformers 4AM5070-8AB00: For 5 A transformers Suitable for trip coils with $I_N \leq 0.5$ A or 1 A, $V_N \leq 40$ V or 20 V, P ≤ 20 VA.	HKD HKD	Unlike for transformers, no defined rated power or class accuracy is required, f_N = 45 to 60 Hz
Climate requirements: HKG = –25 °C to +125 °C, relative humidity: max. 75%; annual average < 65% on 60 days per year up to 85% (evenly distributed over the year); condensation not allowed HKD = –25 °C to +125 °C, relative humidity: max. 90%; annual average < 80% on 30 days per year up to 100% (evenly distributed over the year); condensation allowed			

Table 2.2/1 Overview

(1) Type 4AM51 20-4DA recommended if increased thermal rating is required.

Order No. and Technical Data

Order no.			Windings of the auxiliary current transformers								Weight, ca.
	Number of windings		A B 1	C D 2	E F 7	G H 16	I K L M 6 6 12	Y Z 1736			
4AM49 30-6DB00-0AN2	Max. current, continuous	A	28	28	28	28	6.5	0.2			1.9 kg
	Max. voltage	V	0.23	0.46	0.69	1.38	(5.6)	400			
	Number of windings		A B 5	C D 10	E F 15	G H 30	I K L M 30 30 60	Y Z 1736			
4AM49 30-7DB00-0AN2	Max. current, continuous	A	4.5	4.5	4.5	4.5	1.2	0.2			2 kg
	Max. voltage	V	1.15	2.3	3.5	7	(20)	400			
	Number of windings (relative to each other)		A B 1	C D 2	E F 7	G H 16	I K 1	L M 2	N O 7	P Q 16	
4AM51 70-7AA00-0AN2	Rated current I_N [1]	A	5	5	5	1	5	5	5	1	3.6 kg
	Max. voltage	V	2	4	14	32	2	4	14	32	
4AM52 72-2AA00-0AN2	Rated current I_N [1]	A	10	10	10	2	10	10	10	2	5.4 kg
	Max. voltage	V	2	4	14	32	2	4	14	32	
4AM52 72-3AA00-0AN2	Rated current I_N [1]	A	5	5	5	1	5	5	5	1	5.4 kg
	Max. voltage	V	4	8	28	64	4	8	28	64	
4MA50 65-2CB00-0AN2	Rated current I_N [1]	A	1	1	1	1					2.9 kg
	Number of windings		K_a L_a 110	K_b L_b 110	K_c L_c 110	K_d L_d 110	Primary side				
	Number of windings		88 k_a l_a		88 k_b l_b		Secondary circuit				
	Rated current I_N [1]	A	1.25		1.25						
4MA50 70-8AB00-0AN2	Rated current I_N [1] (A)	A	5	5	5	5					2.9 kg
	Number of windings		K_a L_a 22	K_b L_b 22	K_c L_c 22	K_d L_d 22	Primary side				
	Number of windings		88 k_a l_a		88 k_b l_b		Secondary circuit				
	Rated current I_N [1]	A	1.25		1.25						
	Number of windings		A B C 1 2		D E F 4 8		G H I 16 32		Y Z 500		
4AM51 20-1DA00-0AN2	Max. current, continuous	A	6.8		6.8		6.8		0.85		3.6 kg
	Max. voltage	V	0.4	0.8	1.6	3.2	6.4	12.5	200		
4AM51 20-2DA00-0AN2	Max. current, continuous	A	26		26		Not installed		0.85		3.6 kg
	Max. voltage	V	0.4	0.8	1.6	3.2			200		
	Number of windings		A B 3	C D 6	E F 9	G H 18	I K 24	L M 36	N O 90	Y Z 500	
4AM51 20-3DA00-0AN2	Max. current, continuous	A	4	4	4	4	4	4	2	0.85	3.6 kg
	Max. voltage	V	1.2	2.4	3.6	7.2	9.6	14.4	36	200	
	Number of windings		A B 1	C D 2	E F 3	G H 4	I K 6	L M 8	N O 12	Y Z 500	
4AM51 20-4DA00-0AN2	Max. current, continuous	A	17.5	17.5	17.5	17.5	17.5	17.5	8	0.85	3.6 kg
	Max. voltage	V	0.4	0.8	1.2	1.6	2.4	3.2	4.8	200	

[1] Thermal rating with simultaneous load on all windings: 1.2 x I_N/continuous; 10 x I_N/10 s; 25 I_N/1 s

Winding Circuits

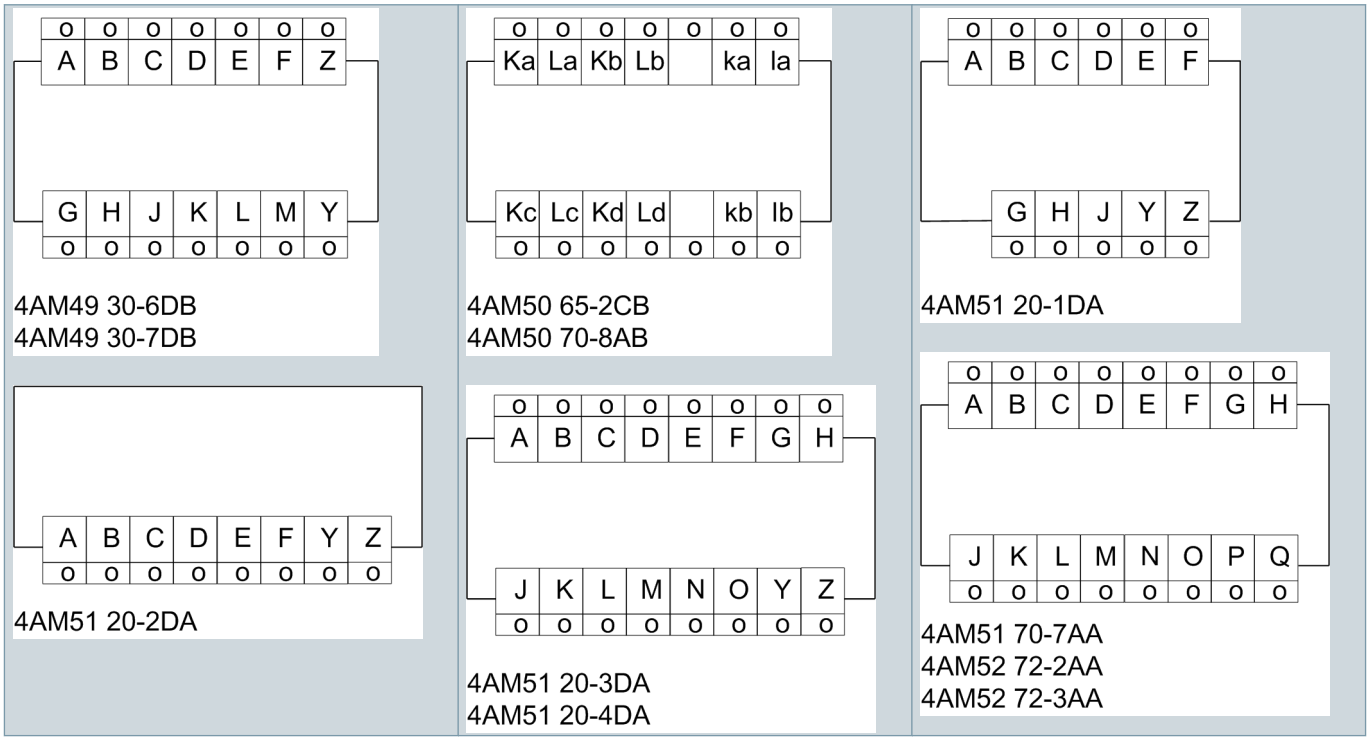
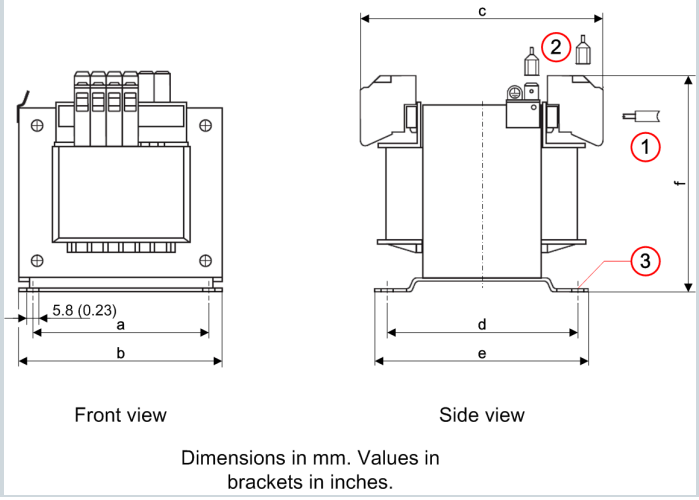


Table 2.2/2 Winding Circuits

Dimensioned Drawings



Type	a	b*)	c*)	d	e*)	f*)
4AM5065/	84/	99/	106/	86.5/	104.5/	105/
4AM5070	3.31	3.90	4.17	3.4	4.11	4.13
4AM5170	84/	99/	120/	86.5/	104.5/	105/
	3.31	3.90	4.72	3.41	4.11	4.13
4AM5272	90/	123/	116/	85/	103/	123/
	3.54	4.84	4.57	3.35	4.06	4.84

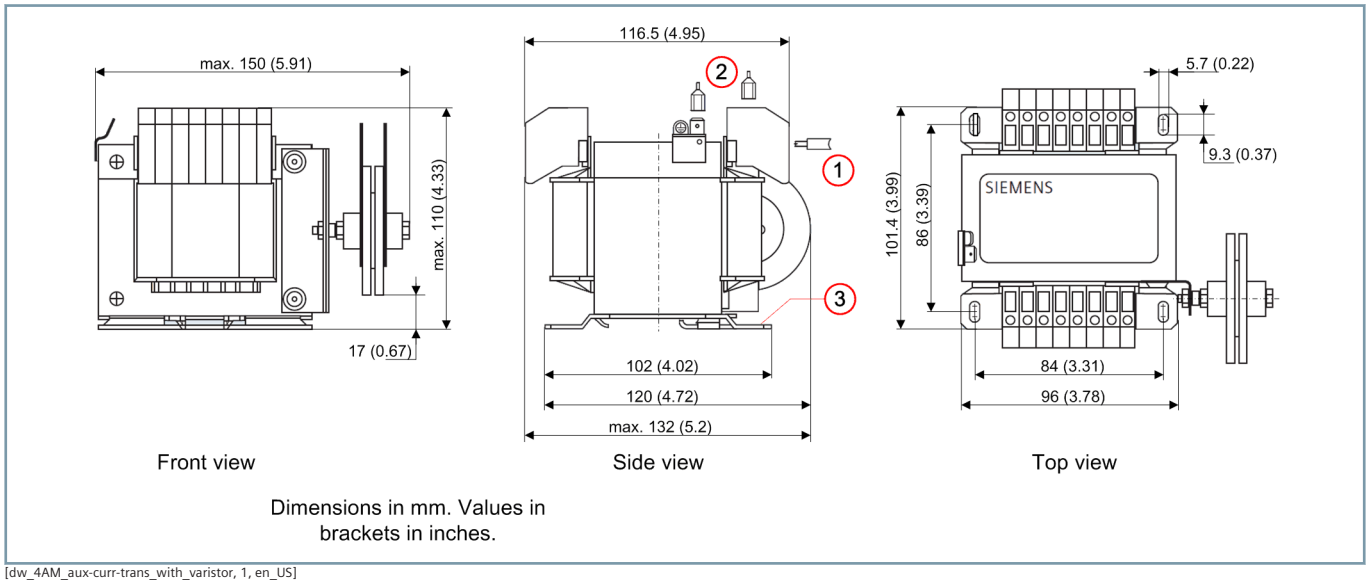
*) Maximum

Table 2.2/3 Auxiliary Transformers 4AM50, 4AM5170, 4AM52 without Varistor – Front View/Side View

(1) Terminal 8WA9200; SIEMENS cross-section: Single wire 0.5 mm² to 6 mm²; fine wire 0.5 mm² to 4 mm²; rated current: 21 A; number of terminals depends on design

(2) Flat connector German Industry Norm 46244-A6.3-0.8

(3) Mounting frame for DIN rail mounting



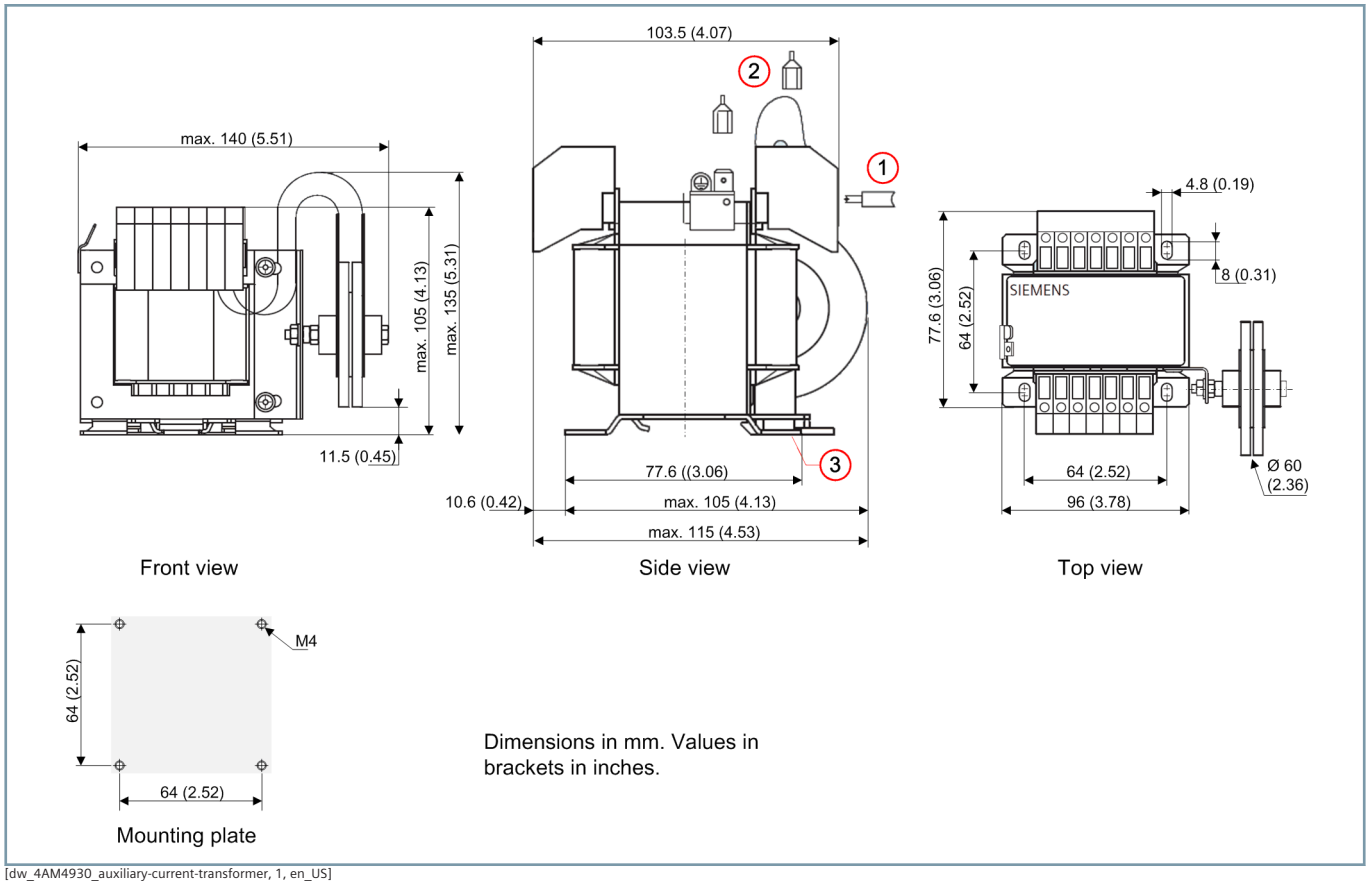
[dw_4AM_aux-curr-trans_with_varistor, 1, en_US]

Figure 2.2/2 Auxiliary Transformer 4AM5120 with Varistor – Front View/Side View

(1) Terminal 8WA9200; SIEMENS cross-section: Single wire 0.5 mm² to 6 mm²; fine wire 0.5 mm² to 4 mm²; rated current: 21 A; number of terminals depends on design

(2) Flat connector German Industry Norm 46244-A6.3-0.8

(3) Mounting frame for DIN rail mounting



[dw_4AM4930_auxiliary-current-transformer, 1, en_US]

Figure 2.2/3 Auxiliary Transformer 4AM4930

Selection and Ordering Data

Description	Versions	Order no.																
Transformer		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
		4	A	M	□	□	□	□	-	□	□	□	0	0	-	0	A	N	2
Auxiliary transformer for transformer-fed trip circuits					▲	▲	▲	▲		▲	▲	▲							
					|	|	|	|		|	|	|							
For circuit breaker tripping (for example, for 7SJ45)	For current transformers with I_r = 1 A				5	0	6	5		2	C	B							
	For current transformers with I_r = 5 A				5	0	7	0		8	A	B							
Input and matching transformers					|	|	|	|		|	|	|							
For transformer differential protection (for example, for 7UT6)	For current transformers with I_N=5 A, 1xI_N, 2V per winding				5	1	7	0		7	A	A							
	For current transformers with I_N=5 A, 2xI_N, 2V per winding				5	2	7	2		2	A	A							
For busbar protection (for example, for 7SS60)	For current transformers with I_N=5 A, 1xI_N, 4V per winding				5	2	7	2		3	A	A							
	For current transformers with I_r = 1 A				5	1	2	0		1	D	A							
	For current transformers with I_r = 5 A				5	1	2	0		2	D	A							
3-phase cumulative input current transformer (summation current transformer)					|	|	|	|		|	|	|							
For line differential protection	For current transformers with I_r = 5 A				4	9	3	0		6	D	B							
	For current transformers with I_r = 1 A				4	9	3	0		7	D	B							
For busbar protection (for example, for 7SS60, 7UT6)	For current transformers with I_r = 1 A				5	1	2	0		3	D	A							
	For current transformers with I_r = 5 A				5	1	2	0		4	D	A							

Voltage Controller – 6GC – 6GC61

Description

The digital voltage controller 6CG61 represents a series of voltage controllers in a completely new design from the Maschinenfabrik Reinhausen (MR). The product line TAPCON® performs tasks such as measurement, control and voltage control, all in one device. From simple control tasks to complicated open-loop controls (for example, for phase shifter transformers), the devices from the TAPCON® series are suited to all applications. The voltage controllers combine comprehensive know-how with maximum customer benefits, coupled with the reliability of all MR products.

The basic equipment of the 6CG61 voltage controller includes a clear display showing the power-system voltage and tap changer position. With this, no other displays are necessary in the control cabinet. All connections use terminal plug-in technology. The wiring and testing of the device is substantially simplified.

Parallel control of transformers running in parallel according to the principle of minimum circulating reactive current or running in parallel according to the step synchronization method. By using a digital bus system, 2 groups with up to 6 participants can be controlled in parallel using the standard device without additional devices. As an option, it is possible to measure the system topology in a multi-busbar system. In this case, the controllers automatically detect which transformers are running in parallel operation. No additional devices are necessary for this either. Programmable inputs and outputs can be connected or assigned by the customer for further processing. This saves wiring work.

Functions

The 6CG61 voltage controller assumes the control of motor-operated step transformers. Apart from control tasks, the voltage controller provides additional functions such as:

- Linear and integral control response
- Individually adjustable time delay
- Variable bandwidth of 0.5% to 9%
- Operating modes:
  - Local
  - Remote
- Control modes:
  - Manual
  - Automatic
- Option of telecontrol parameterization using Ethernet (TAPCONTROL)
- Undervoltage and overcurrent blocking
- Fast step down mode in the event of overvoltage
- Compensation of voltage drops on the line (Line Drop Compensation)
- Compensation of voltage variations in a meshed system (Z compensation)

[ph_6GC61 - Voltage Controller, 1, --_--]

Figure 2.3/1 Voltage Controller 6GC61

- Digital inputs and outputs can be programmed individually by the customer locally
- Additional displays using LEDs outside the display for freely selectable functions
- Display of all measured values such as voltage, current, active power, apparent power or reactive power, power factor (cos φ)
- 3 different set point values can be selected:
  - Per 4–20 mA analog signal
  - Per analog signal using a series of transition contacts
  - Per digital signal via binary, BCD or Gray code
- Plug-in terminals make it easy to connect cables
- Additional digital inputs and outputs for parameterization as desired by the customer
- Running up to 6 transformers in parallel in 2 groups using the following methods:
  - Master/Follower
  - Minimizing Circulating Reactive Current
- NORMset mode for simple commissioning of the voltage controller

	RS232 electrical	RS485 electrical	RJ45 electrical	ST connector, optical	LC connector, optical
TAPCONTROL	X	X	X	X	
DNP3 (Level 2)	X	X	X	X	
Modbus ASCII	X	X		X	
Modbus RTU	X	X	X	X	
IEC 60870-5-101	X	X		X	
IEC 60870-5-103	X	X		X	
IEC 61850			X		X

Selection and Ordering Data

Description	Versions	Order no.																				
TAPCON 230 Basic/Pro/Expert		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16		Short code	
Digital controller 6GC61		6	G	C	6	1	□	□	-	□	□	□	□	□		□	□	□	□			
Application: Voltage control of transformers							▲	▲		▲	▲	▲	▲	▲		▲	▲	▲	▲			
Functions: Integrated transformer-tap display, measuring functions (V, I, P, Q, S, cos phi, phi, I sin phi, f), recorder function, statistics function (total number of the circuit, circuits per stage), programmable inputs and outputs, limiting value monitoring (>V, <V, >I), programmable rated values of V and I Equipment: Display: 128x128 LCD module, negative, blue background, white LED, 9 freely programmable LEDs, status LED, life contact, navigation keys, function keys, parameterization software TAPCON-trol ®, USB converter for visualization/ parameterization	*Housing; binary inputs and outputs*						|	|		|	|	|	|	|		|	|	|	|				
	Sheet steel surface-mounting housing with transparent cover; 8 BI, 7 BO, 1 life contact						1	|		|	|	|	|	|		|	|	|	|				
	Additional auxiliary voltage output AUX DC OUT							|		|	|	|	|	|		|	|	|	|				
	Without							0		|	|	|	|	|		|	|	|	|				
	Additional auxiliary voltage 70 to 210 VDC for signaling voltage [2]							1		|	|	|	|	|		|	|	|	|				
	Supply voltage (power supply, signaling voltage)									|	|	|	|	|		|	|	|	|				
	110 to 350 VAC/88 to 265 VDC (standard)									1	|	|	|	|		|	|	|	|				
	Design structure (plug-in terminal connection "EASY cable")										|	|	|	|		|	|	|	|				
	Panel flush mounting										A	|	|	|		|	|	|	|				
	Wall mounting with flat iron surface mounting										B	|	|	|		|	|	|	|				
	DIN rail clip										C	|	|	|		|	|	|	|				
	Region-specific default settings, function versions and default language settings											|	|	|		|	|	|	|				
	German											A	|	|		|	|	|	|				
	English											B	|	|		|	|	|	|				
	French											C	|	|		|	|	|	|				
	Spanish											D	|	|		|	|	|	|				
	Russian											E	|	|		|	|	|	|				
	Italian											F	|	|		|	|	|	|				
	Portuguese											G	|	|		|	|	|	|				
	Communication interfaces												|	|		|	|	|	|				
	No interface												0	|		|	|	|	|				
	CI map (communication interface)												9	|		|	|	|	|		L	□	□
	IEC-61850 board (communication interface) + tap position measurement													|		|	|	|	|		▲	▲	▲
	No interface													0		|	|	|	|		|	|	|
	IEC 61850, electrical RJ45 and optical fiber LC connector 1310 nm [1]													1		|	|	|	|		Next page		
	Measured value memory expansion															|	|	|	|				
	None															0	|	|	|				
	Tap position measurement																|	|	|				
	No function																A	|	|				
	Digital signal via binary-coded decimal code, Gray code, dual code																B	|	|				
	Analog 4–20 mA signal																C	|	|				
	Analog signal using a series of transition contacts																D	|	|				
	Row of make contacts (external module) (definition of the tap position necessary)																Z	|	|		P	1	Y

(1) Unavailable if Pos. 11 = 9

(2) Pos. 7 can be ordered only if Pos. 14 = B or greater

Voltage Controller – 6GC – 6GC61 – Selection and Ordering Data

Description	Versions	Order no.																						
TAPCON 230 Basic/Pro/Expert		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16		Short code			
Digital controller 6GC61		6	G	C	6	1	□	□	-	□	□	□	□	□		□	□	□	□		L	□	□
													▲					▲	▲			▲	▲
	Remote setting of a set point values												|					|	|			|	|
	No function												|					A	|			|	|
	4–20 mA [1]												|					B	|			|	|
	Series of transition contacts [1]												|					C	|			|	|
	Accessories optical fiber adaptor cable												|						|			|	|
	None												|						0				|	|
	Adaptor cable for optical fiber connection LC to ST												|						1				|	|
	Communication interfaces												|										|	|
	No interface												0											|	|
	CI map (communication interface)												9											|	|
	Electrical, RS232/RS485																							1	|
	Electrical, RJ45/ Ethernet																							2	|
	Optical fiber SMA plug, 850 nm																							3	|
	Optical fiber SMA plug, 660 nm																							4	|
	Optical fiber ST connector, 850 nm																							5	|
	Optical fiber ST connector, 660 nm																							6	|
	Available communication protocols + tap position measurement (Pos. 14)																								|
	IEC 60870-5-101 [2]																								A
	IEC 60870-5-103 [2]																								B
	DNP3																								D
	Modbus ASCII [2] [3]																								E
	Modbus RTU [3]																								F
	TAPCON-trol® (visualization software)																								G

(1) Pos. 15 only in connection with digital tap position measurement, Pos. 14

(2) Cannot be ordered with Pos. 11 L2x

(3) Not Modbus TCP

Description

The 6CG64 digital voltage controller represents the next generation of voltage controllers from the Maschinenfabrik Reinhausen (MR). The new TAPCON® voltage controller is based on the new ISM® technology offering maximum flexibility even in terms of future requirements.

Equipped with the latest features of communication engineering, the 6GC64 supports all the established protocols and even offers the possibility of a redundant connection via Ethernet.

In doing so, the growing requirements placed on operational and data security were considered and ensured by the implementation of role-based user authorization and encrypted communication connections.

The innovative operating concept of the 6GC64 provides intuitive user guidance. Maximum support is provided by features such as an integrated wizard for guided initial commissioning, the 6GC64 Interactive Launch Assist (TILA).

The basic equipment of the 6GC6 voltage controller includes a fully graphical 5.7" color display, navigation via rotary control, and web-based visualization according to the HTML 5 Standard, all of which provide optimal user friendliness directly on the device as well as remotely..

Besides simple control tasks, the 6GC64 also supports complex special applications such as the control of three-winding transformers, transformer banks, phase shifters and shunt reactors.

The modular system allows you to precisely match the performance spectrum of the controller to your requirements.

Parallel control of transformers using the principle of minimum circulating reactive current or running in parallel according to the step synchronization method. Using a digital bus system or IEC 61850 GOOSE communication.

Functions

The 6GC64 voltage controller assumes the control of motor-operated step transformers. Apart from control tasks, the voltage controller provides additional functions such as:

- Operating modes:
  - Local
  - Remote
- Control modes:
  - Manual
  - Automatic
- Tap position measurement
  - Digital, analog
  - Voltage control
  - Line compensation (R-X or Z compensation)
  - Parallel operation of up to 16 transformers (methods: Master/Follower; Auto synchronization or circulating reactive current)
  - Power Factor parallel running method

Optional functions

- Customer-specific network topology
- Control of three-winding transformers
- Running a bank of single-phase transformers in parallel

[ph_6GC64_Voltage Controller, 1, --_--]

Figure 2.3/2 Voltage controller 6GC64

- Contract specific programming
- Measurement data memory function with graphical representation
- Phase shifter applications (control of active power, reactive power or phase angle)
- TAPCON Personal Logic Editor

Monitoring functions

- Bandwidth monitoring
- Switching interval monitoring (for higher, lower and total switching operations)
- Function monitoring
- Switching direction control
- Adjustable tap limits
- Several adjustable limiting values for all analog values including hysteresis

Communication

- IEC 60870-5-101/103 (optional), slave & master IEC 60870-5-104, server & client
- DNP 3, slave & master Modbus ASCII/remote terminal unit/ TCP, server & client
- IEC 61850 edition 1 and 2, server & client
- Dual port Ethernet connection with redundancy protocols RSTP and PRP (IEC 62439-3 edition 2.0, 2012-07)

Security

- User management and access protection according to BDEW or North American Electric Reliability Corporation

Programming tool

- Creation of individual functions (according to IEC 61131)

Interface languages

- German, English, French, Spanish, Italian, Portuguese, Russian, Chinese, Korean

Selection and Ordering Data

Description	Versions	Order no.																					Short code		
TAPCON ISM		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16						
Digital controller 6GC64		6	G	C	6	4	□	□	-	□	□	□	□	□		□	□	□	□						
Application: Voltage control of transformers							▲	▲		▲	▲	▲	▲	▲		▲	▲	▲	▲						
Functions: 19" rack standard, 1 set point value, user I/O, RJ45, RS232, RS485	*Housing; binary inputs and outputs*						|	|		|	|	|	|	|		|	|	|	|					
Current transformer I_n:1/5 A (changeable via software)	19" housing 1/1 (84TE), 1ph measurement						1	|		|	|	|	|	|		|	|	|	|					
	19" panel flush mounting housing, 1/1 (84TE), 1ph measurement						2	|		|	|	|	|	|		|	|	|	|					
	19" housing 1/1 (84TE), 3ph measurement						3	|		|	|	|	|	|		|	|	|	|					
	19" panel flush mounting housing, 1/1 (84TE), 3ph measurement						4	|		|	|	|	|	|		|	|	|	|					
	Auxiliary voltage (power supply, signaling voltage; switching threshold of the binary inputs)							|		|	|	|	|	|		|	|	|	|					
	85 to 265 VAC/VDC							1		|	|	|	|	|		|	|	|	|					
	23 to 63 VDC							2		|	|	|	|	|		|	|	|	|					
	85 to 265 VAC/VDC threshold Binary inputs 170 V							3		|	|	|	|	|		|	|	|	|					
	23 to 63 VDC, threshold binary inputs 170 V							4		|	|	|	|	|		|	|	|	|					
	Analog inputs/outputs									|	|	|	|	|		|	|	|	|					
	No analog module									0	|	|	|	|		|	|	|	|					
	Analog module 1									1	|	|	|	|		|	|	|	|					
	Analog module 2									2	|	|	|	|		|	|	|	|					
	Analog module 3									3	|	|	|	|		|	|	|	|					
	Analog module 4									4	|	|	|	|		|	|	|	|					
	Remote setting of a set point value via digital and analog input										|	|	|	|		|	|	|	|					
	3 set point values digital										A	|	|	|		|	|	|	|					
	5 set point values digital										B	|	|	|		|	|	|	|					
	1 set point value analog *1										C	|	|	|		|	|	|	|					
	TAPCON Dynamic Setpoint Control										D	|	|	|		|	|	|	|					
	1 set point value digital										E	|	|	|		|	|	|	|					
	Set point value in binary-coded decimal code										F	|	|	|		|	|	|	|					
	3x TAPCON Dynamic Setpoint Control If Pos. 9=C then Pos. 8 must be at least =1										G	|	|	|		|	|	|	|					
	Language setting/documentation											|	|	|		|	|	|	|					
	German											A	|	|		|	|	|	|					
	English											B	|	|		|	|	|	|					
	French											C	|	|		|	|	|	|					
	Spanish											D	|	|		|	|	|	|					
	Russian											E	|	|		|	|	|	|					
	Italian											F	|	|		|	|	|	|					
	Portuguese											G	|	|		|	|	|	|					
	Korean											H	|	|		|	|	|	|					
	Chinese											J	|	|		|	|	|	|					
	Interface for telecontrol parameterization												|	|		|	|	|	|					
	None												|	0		|	|	|	|					
	Electrical, RJ45/ Ethernet												|	1		|	|	|	|					
	Optical fiber, 1310 nm												|	2		|	|	|	|					
	Optical fiber, 1310 nm Only if communication interface Pos. 11 = L8												|	3		|	|	|	|					

Description	Versions	Order no.																		Short code		
TAPCON ISM		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16				
Digital controller 6GC64		6	G	C	6	4	□	□	-	□	□	□	□	□		□	□	□	□		L	□	□
													▲			▲	▲	▲	▲			▲	▲
	Communication interfaces												|			|	|	|	|			|	|
	No interface												0			|	|	|	|			|	|
	CI map (communication interface)												9			|	|	|	|			|	|
	Electrical, RS232															|	|	|	|			1	|
	Electrical, RS485															|	|	|	|			2	|
	Electrical RJ45/Ethernet															|	|	|	|			3	|
	Optical fiber SMA plug, 850 nm															|	|	|	|			4	|
	Optical fiber SMA plug, 660 nm															|	|	|	|			5	|
	Optical fiber ST connector, 850 nm															|	|	|	|			6	|
	Optical fiber ST connector, 660 nm															|	|	|	|			7	|
	Optical fiber LC connector, 1310 nm															|	|	|	|			8	|
	Optical fiber LC connector PRP protocol, 1310 nm															|	|	|	|			9	|
	Optical fiber LC connector HSR protocol, 1310 nm															|	|	|	|			0	|
	Available communication protocols															|	|	|	|				|
	IEC 60870-5-101															|	|	|	|				A
	IEC 60870-5-103															|	|	|	|				B
	IEC 60870-5-104															|	|	|	|				D
	DNP3															|	|	|	|				E
	Modbus TCP															|	|	|	|				F
	Modbus RTU															|	|	|	|				G
	IEC 61850 Standard															|	|	|	|				H
	IEC 61850 Expert + Goose															|	|	|	|				J
	Tap position measurement															|	|	|	|				
	None															0	|	|	|				
	Digital binary-coded decimal code															1	|	|	|				
	Analog signal 4–20 mA [1]															2	|	|	|				
	Analog signal 0–10 V [1]															5	|	|	|				
	Series of transition contacts [1]															6	|	|	|				
	Decadic row of contacts [2]															7	|	|	|				
	DUAL															8	|	|	|				
	Row of make contacts (external module) (definition of the tap position necessary) If Pos. 13=2 to 6 then Pos. 8 must be at least =1															9	|	|	|		N	1	Y
	Measured value memory expansion																|	|	|				
	None																A	|	|				
	With measured value memory																B	|	|				
	Parallel running																	|	|				
	CAN-BUS including connector																	A	|				
	Goose																	B	|				
	Without parallel running																	C	|				
	Parallel running with UK TAPP Stagger with off limit monitoring																	D	|				

(1) An analog channel is present at Pos. 8

(2) Constraint: Brief specification L4-9 PRP switch/protocol converter or analog module may be selected

Description	Versions	Order no.																						
TAPCON ISM		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16		Short code		
Digital controller 6GC64		6	G	C	6	4	□	□	-	□	□	□	□	□		□	□	□	□		L	□	□
																			▲				
	Special functions																		|				
	None																		1				
	Running a bank in parallel [1) 2)]																		2				
	Cross-monitoring [1)]																		3				
	Three-winding transformer [1)2)]																		4				
	TAPGUARD																		5				
	BCD tap position output [1)]																		6				
	Network topology master [1)] (Overview of the system topology required)																		7				
	Network topology client [1)] (Overview of the system topology required)																		8				
	TAPCON Personal Logic Editor																		9		R	0	A

(1) Constraint: Brief specification L4-9 PRP switch/protocol converter or analog module may be selected

(2) Constraint: Only in conjunction with IEC 61850 LxH

Description

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 quick-operating relay with suppressor diode

Bistable quick-operating relay with eight change-over contacts, mounting in flush-mounting frame of type 7XP9010-1 for rear cabling, with screws or in an assembly frame of type 7XP9012-0 for front cabling with screws.

Benefits

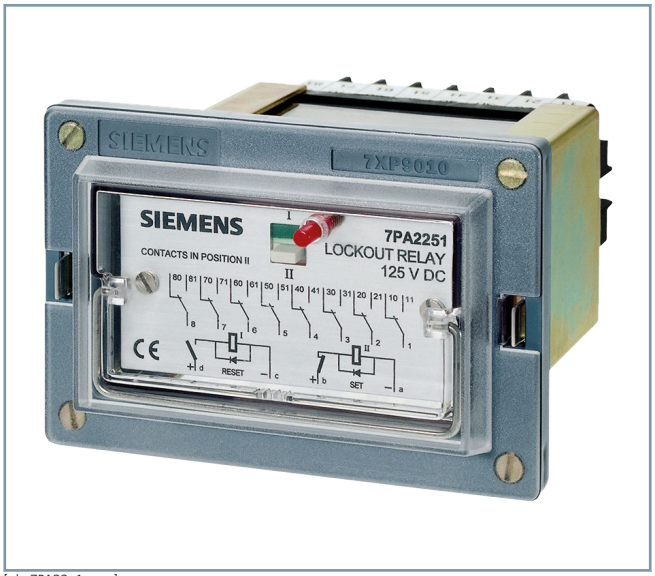
Tested according to IEC, EN, IEEE standards and bearing the CE marking.

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, 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, generating 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.



[ph_7PA22, 1, --_--]

Figure 2.4/1 Auxiliary Relay 7PA22

Technical Data

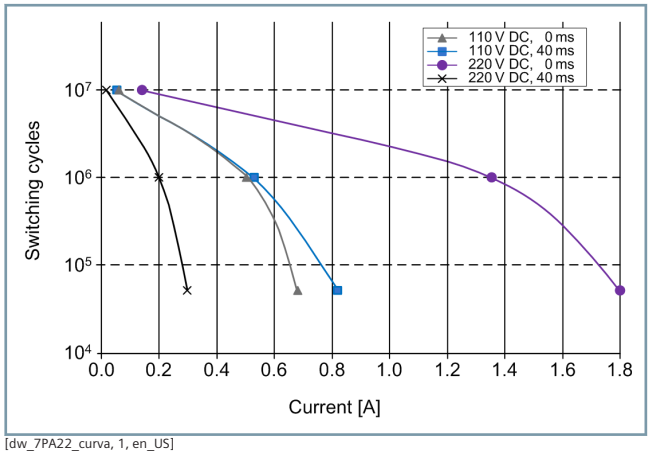
The reset button may not be depressed for longer than
20 seconds when the auxiliary voltage is applied to the SET coil.

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

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, 1, en_US]

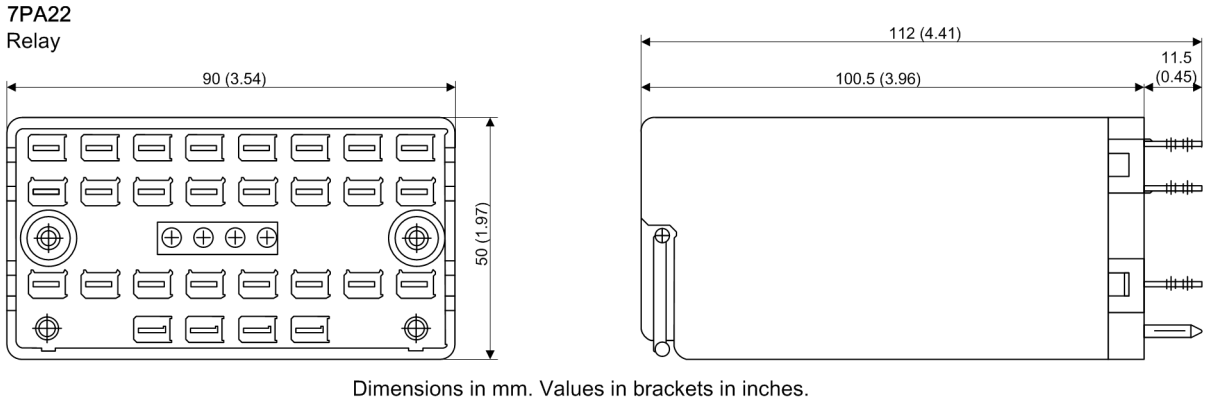
Figure 2.4/2 Diagram

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

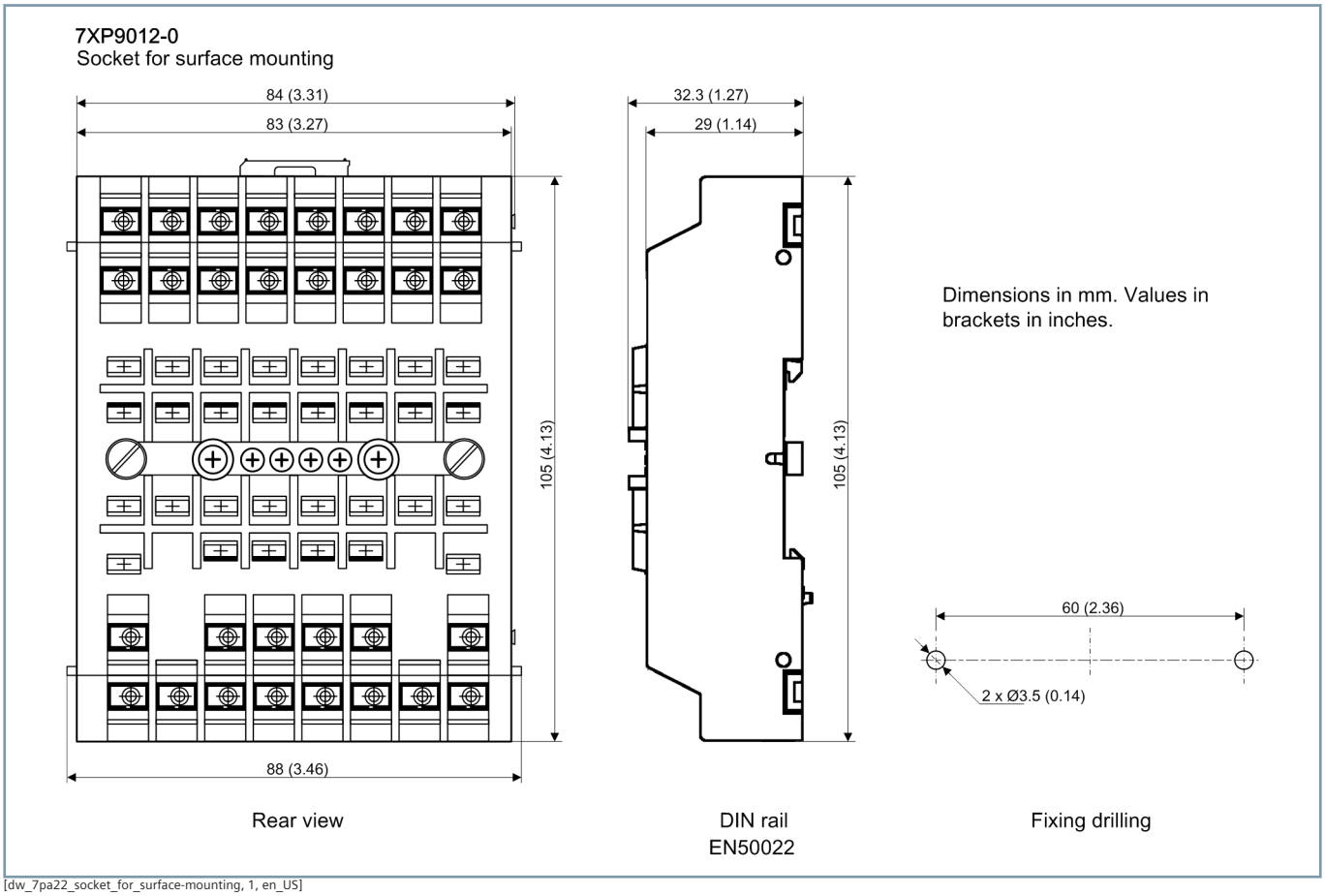
Weights and packaging	
7PA22	600 g
7XP9010	400 g
Carton	150 x 124 x 84 mm

Dimensions and Connections



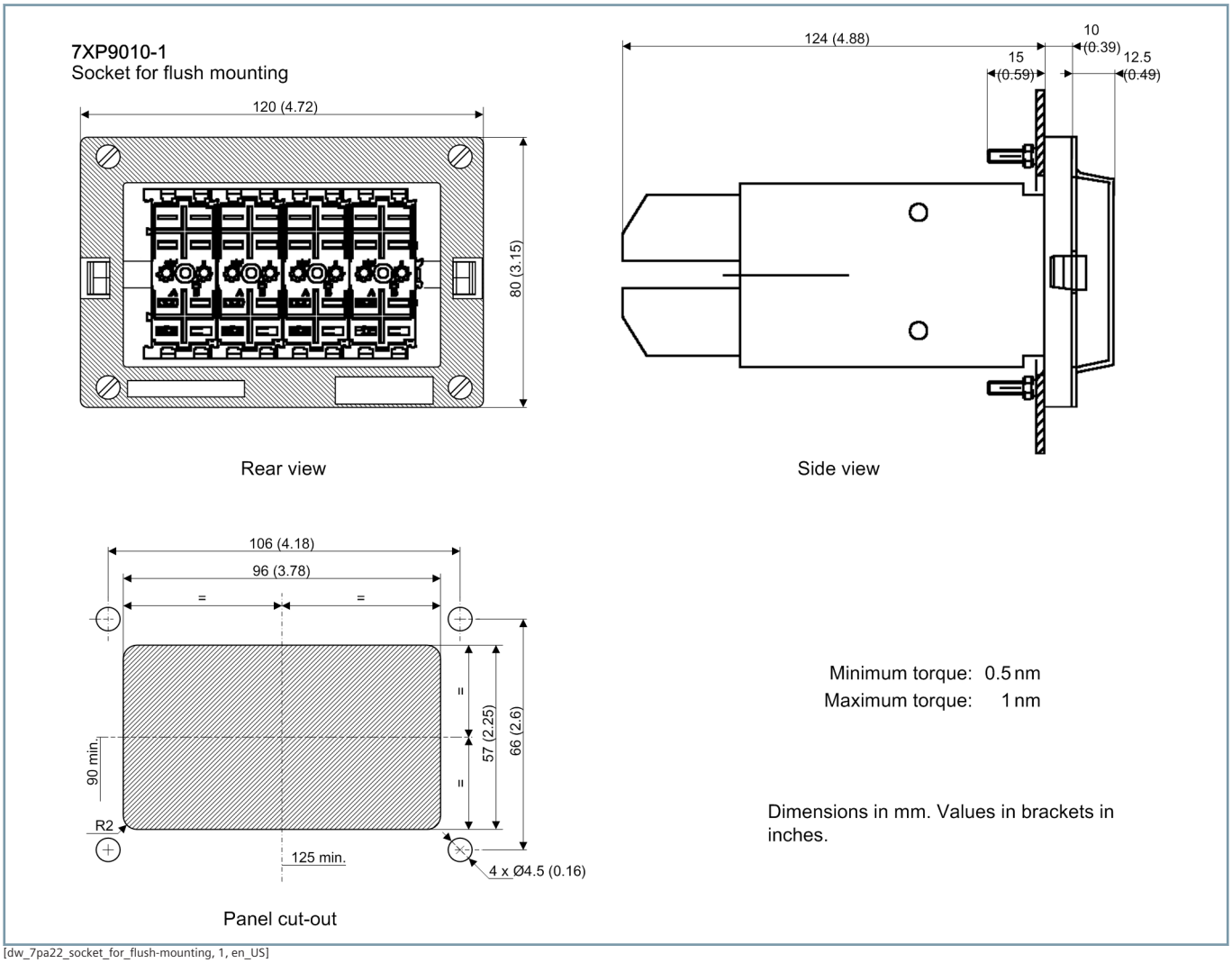
[dw_7pa22_dimensions_and_panel-mounting-cutout, 1, en_US]

Dimensions and Installation Dimensions



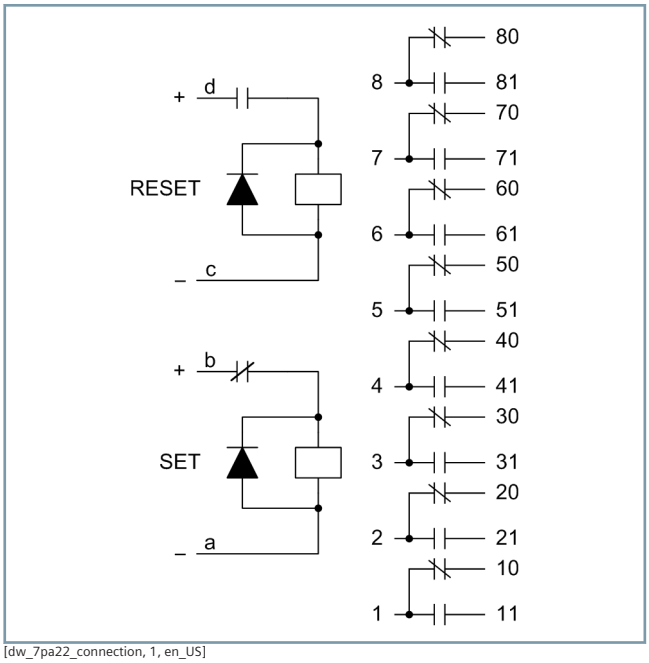
[dw_7pa22_socket_for_surface-mounting, 1, en_US]

Figure 2.4/3 Surface-Mounting Base



[dw_7pa22_socket_for_flush-mounting, 1, en_US]

Figure 2.4/4 Flush-Mounting Base



[dw_7pa22_connection, 1, en_US]

Figure 2.4/5 Connections 7PA22 – Contacts shown in RESET Position

Selection and Ordering Data

Description	Versions	Order no.															
		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
Bistable quick-operating relay with 8 change-over contacts		7	P	A	2	2	□	1	-	□									
							▲			▲									
Rated voltage							|			|									
	24 VDC						1			|									
	60 VDC						2			|									
	110 VDC						3			|									
	220 VDC						4			|									
	125 VDC						5			|									
	30 VDC						6			|									
	48 VDC						8			|									
Base										|									
	Without base									0									
	With 7XP9010-1 base									1									
Base as spare part																			
	Installation	7	X	P	9	0	1	0	-	1									
	Surface Mounting	7	X	P	9	0	1	2	-	0									

Bistable Quick-Operating Relay – 7PA – 7PA23

Description

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.

Benefits

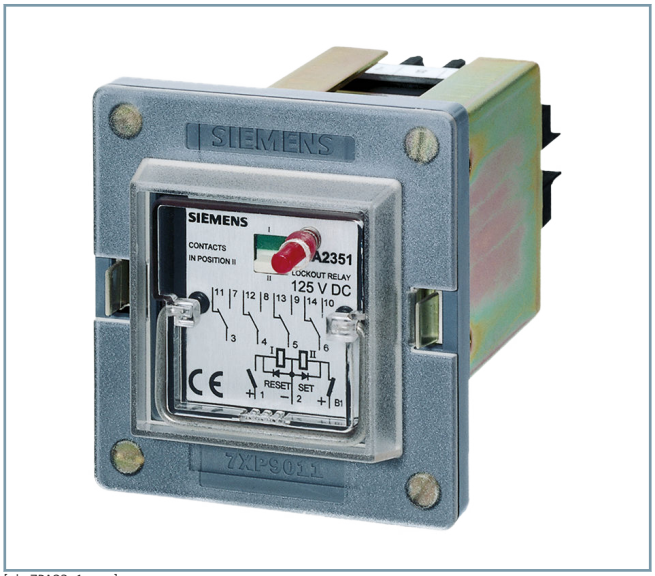
Tested according to IEC, EN, IEEE standards and bearing the CE marking.

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, 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, generating 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.



[ph_7PA23, 1, --_--]

Figure 2.4/6 Auxiliary Relay 7PA2351

Technical Data

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

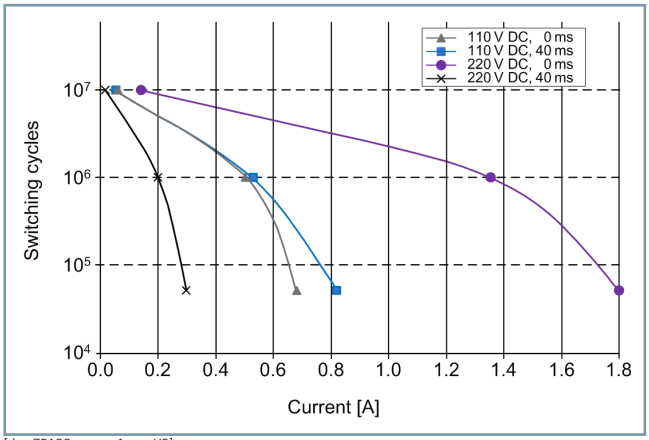
Rated voltage and internal consumption		
V_N (VDC)	Voltage range (VDC)	Internal consumption for switching
24	19 to 26	≤17 W
30	24 to 33	
48	38.5 to 53	
60	48 to 66	
110	88 to 121	
125	100 to 137	
220	176 to 242	

Pre-arcing time	< 10 ms

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]

Breaking power for 10^5 switching cycles				
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, 1, en_US]

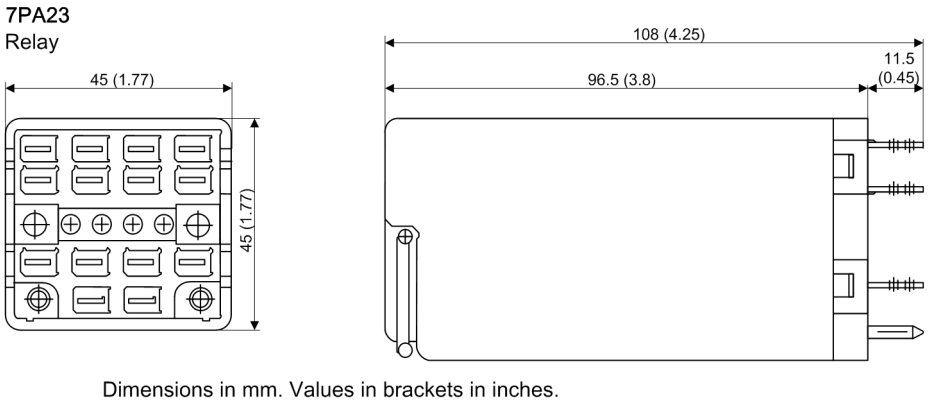
Figure 2.4/7 Diagram

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

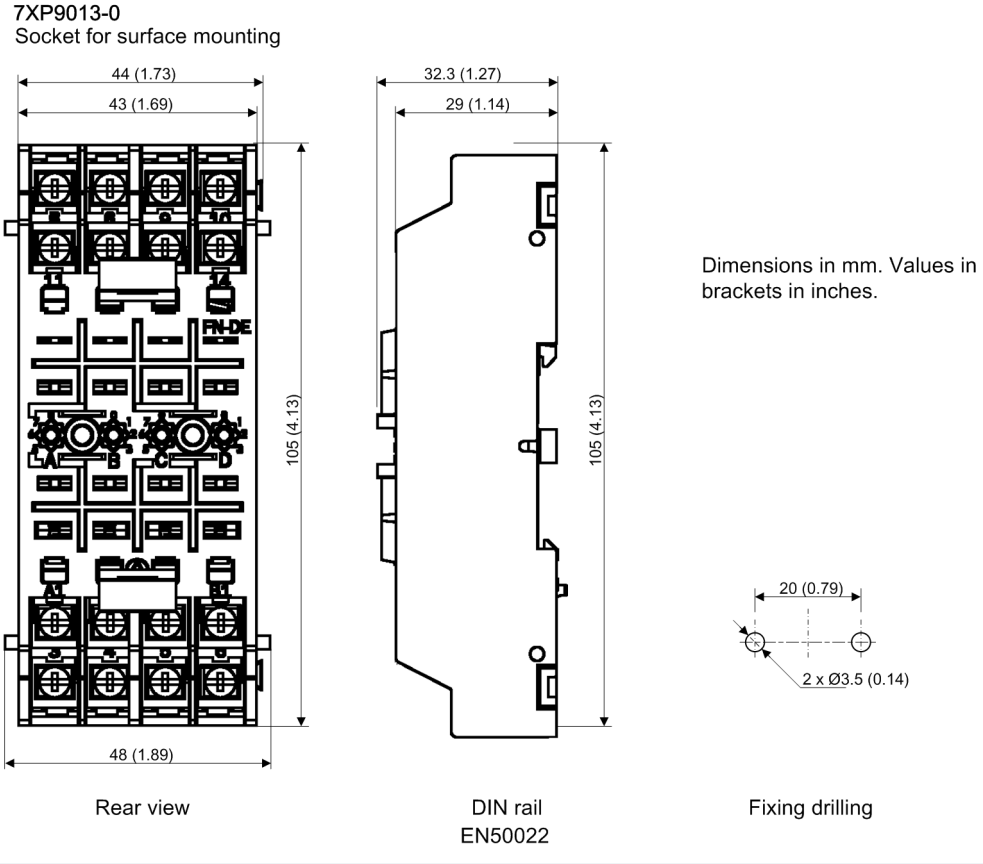
Weights and packaging	
7PA23	300 g
7XP9011	300 g
Carton	145 x 79 x 84 mm

Dimensions and Connections



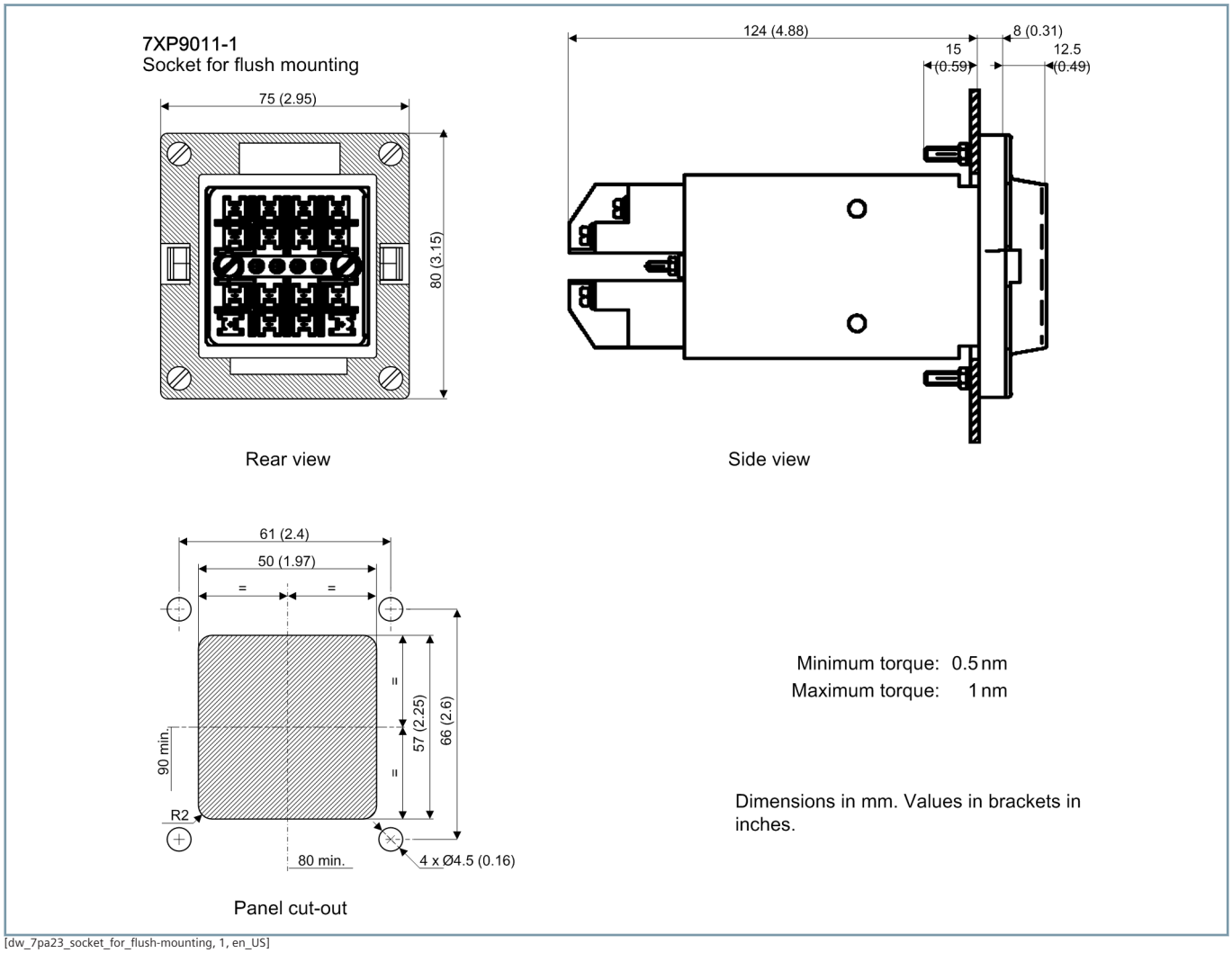
[dw_7pa23_dimensions_and_panel-mounting-cutout, 1, en_US]

Figure 2.4/8 Dimensions and Installation Dimensions



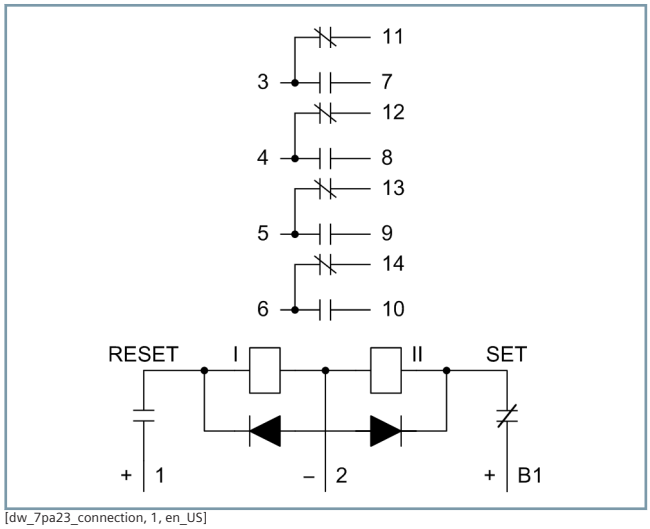
[dw_7pa23_27_30-1phs_socket_for_surface-mounting, 1, en_US]

Figure 2.4/9 Surface-Mounting Base



[dw_7pa23_socket_for_flush-mounting, 1, en_US]

Figure 2.4/10 Flush-Mounting Base



[dw_7pa23_connection, 1, en_US]

Figure 2.4/11 Connections 7PA23 – Contacts shown in RESET Position

Bistable Quick-Operating Relay – 7PA – 7PA23 – Selection and Ordering Data

Selection and Ordering Data

Description	Versions	Order no.															
		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
Bistable quick-operating relay with 4 change-over contacts		7	P	A	2	3	□	1	-	□									
							▲			▲									
Rated voltage							|			|								
	24 VDC						1			|									
	60 VDC						2			|									
	110 VDC						3			|									
	220 VDC						4			|									
	125 VDC						5			|									
	30 VDC						6			|									
	48 VDC						8			|									
Base										|									
	Without base									0									
	With 7XP9011-1 base									1									
Base as spare part																			
	Installation	7	X	P	9	0	1	1	-	1									
	Surface Mounting	7	X	P	9	0	1	3	-	0									

Description

Monostable relay with eight change-over contacts

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

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

[ph_7PA26, 1, --_--]

Figure 2.5/1 Auxiliary Relay 7PA2642

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 V	3.6 and 9 V
48	33.6 to 60	144	16.8 and 26.4 V	7.5 and 17 V
60	42 to 75	115	21 and 33 V	9 and 21 V
110/125	77 to 156	63	38.5 and 60.5 V	16.5 and 38.5 V
220	154 to 275	31	77 and 121 V	33 and 77 V

(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.

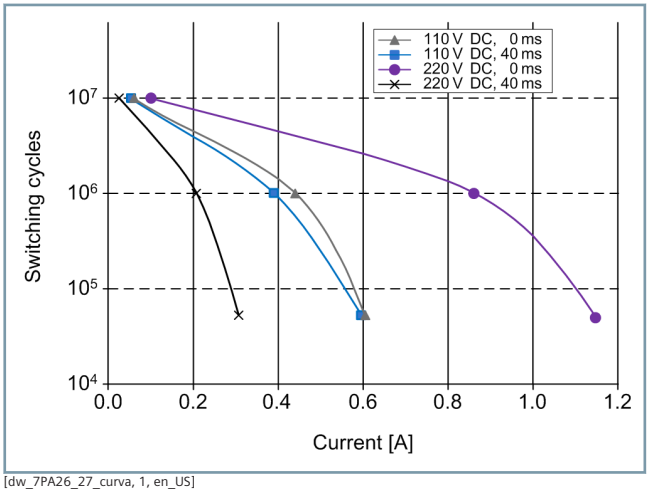
Rated voltage and internal consumption 7PA26 ☐21					
V_N (VDC)	Voltage range (VDC)	Internal consumption (mA)		Excitation voltage (VDC) between 1)	De-excitation voltage (VDC) between 1)
		Standard [mA]	Peak		
24/30	19 to 33	66	0.8 A/20 ms	16 and 19 V	9 and 14 V
48	38.4 to 52.8	32		23.8 and 33.6 V	14.4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

(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, 1, en_US]

Figure 2.5/2 Diagram

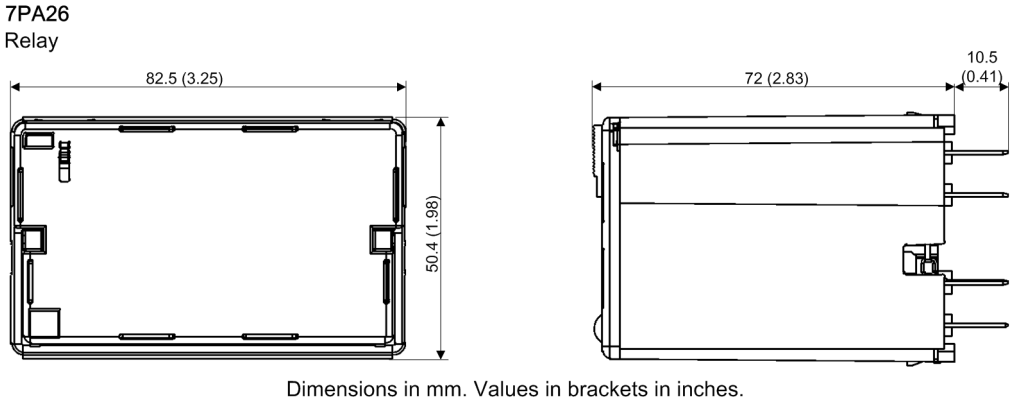
V_{max}, open-circuited contact	250 VDC/400 VAC
Mechanical endurance	10^7 switching cycles
Operating temperature	-25 °C +70 °C
Storage temperature	-40 °C +85 °C
Max. humidity	93%/40 °C

Weights and packaging	
7PA26	500 g
Carton	150 x 124 x 84 mm
7XP9010-3	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

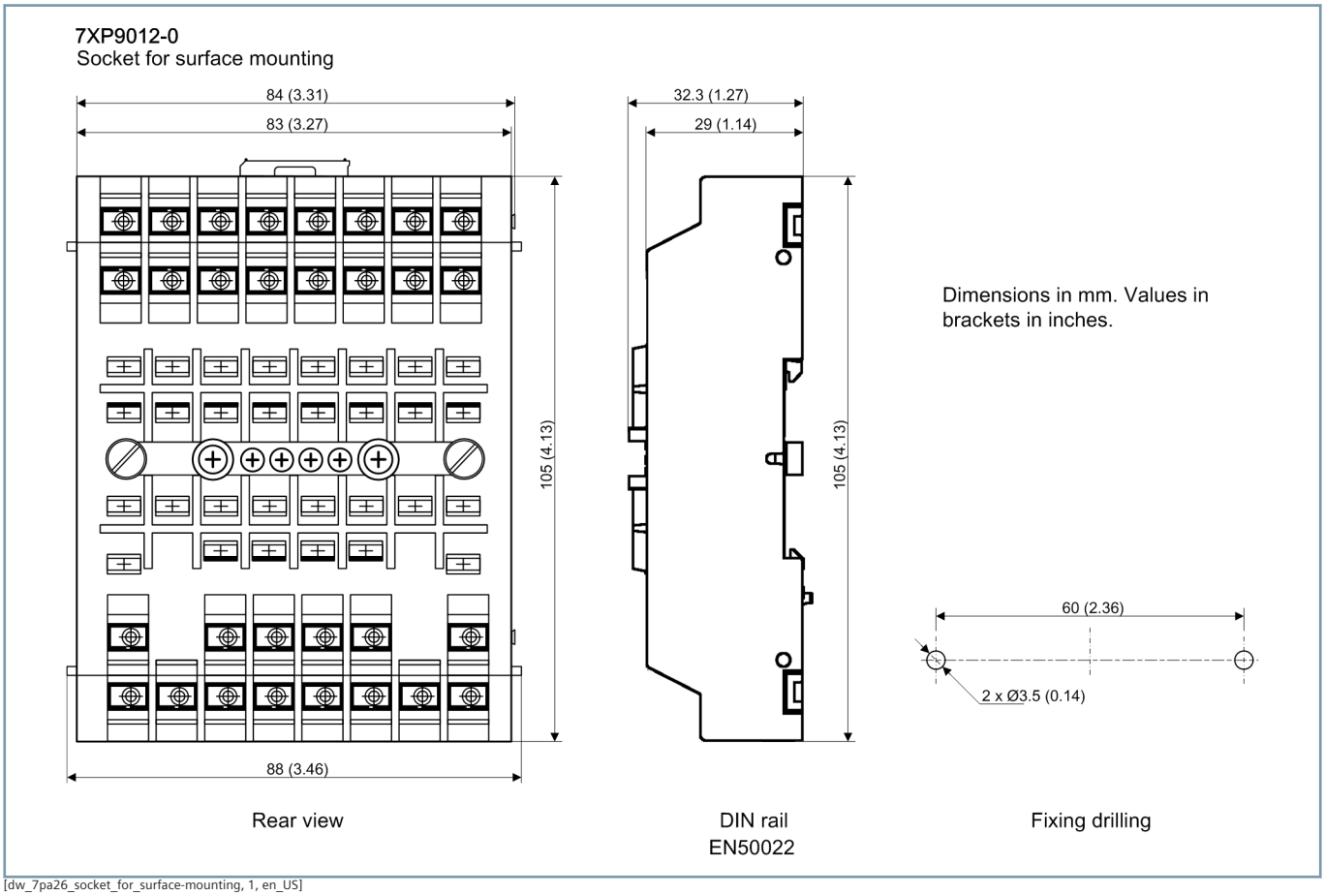
EMC Tests	
High-frequency test: Test level: 1 MHz, 400 imp/s, 2 s Common mode: 2.5 kV Differential mode: 1 kV	**EN 60255-22-1**
Fast transient bursts Test level: 4 kV, 2.5 kHz, 1 min•2 kV, 5 kHz, 1 min	**EN 61000-4-4**
Energy surge voltages 8/20 µs. (current) - 1.2/50 µs. (voltage) - 8/20 µs. (current)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

Dimensions and Connections



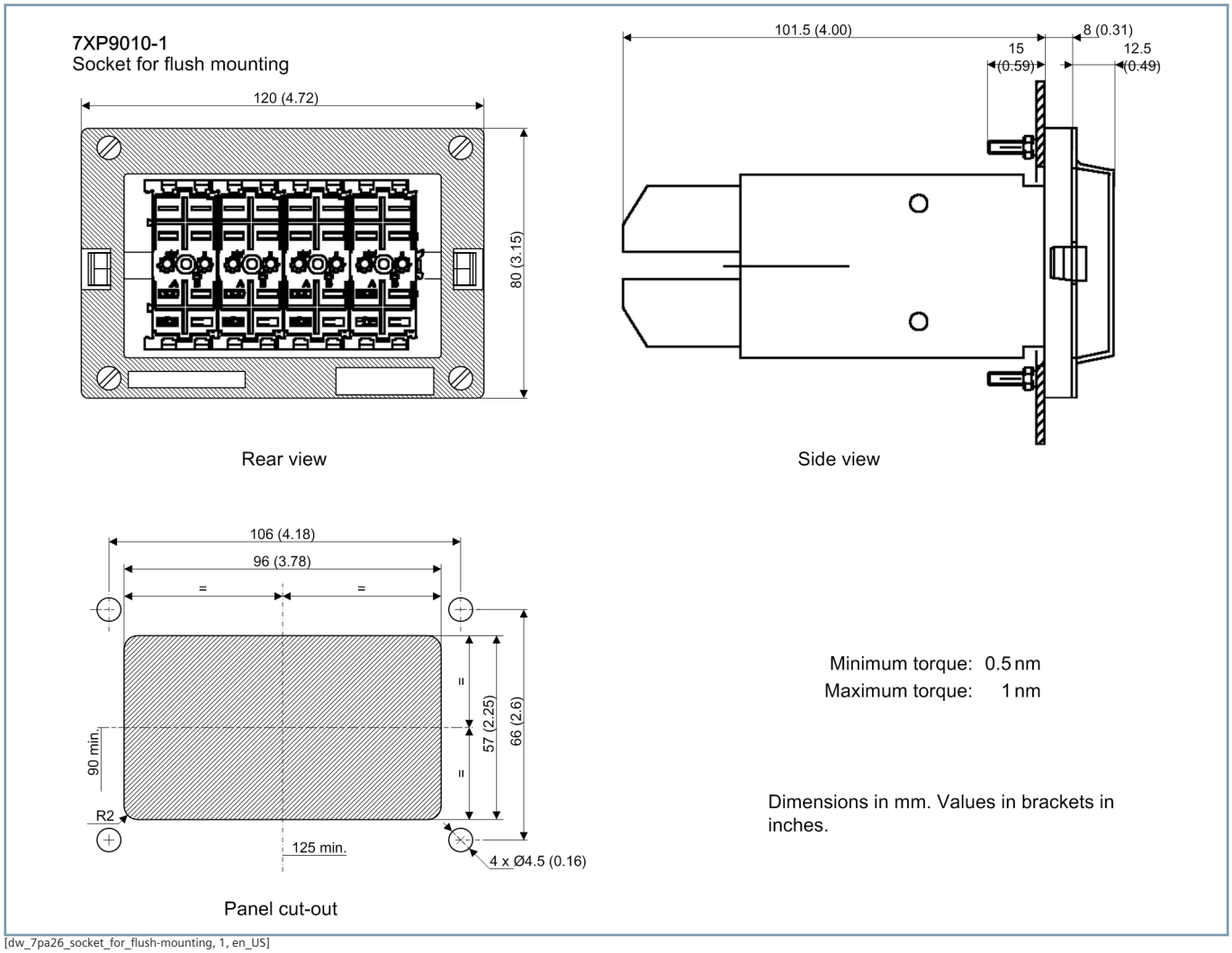
[dw_7pa26_dimensions_and_panel-mounting-cutout, 1, en_US]

Figure 2.5/3 Dimensions and Installation Dimensions



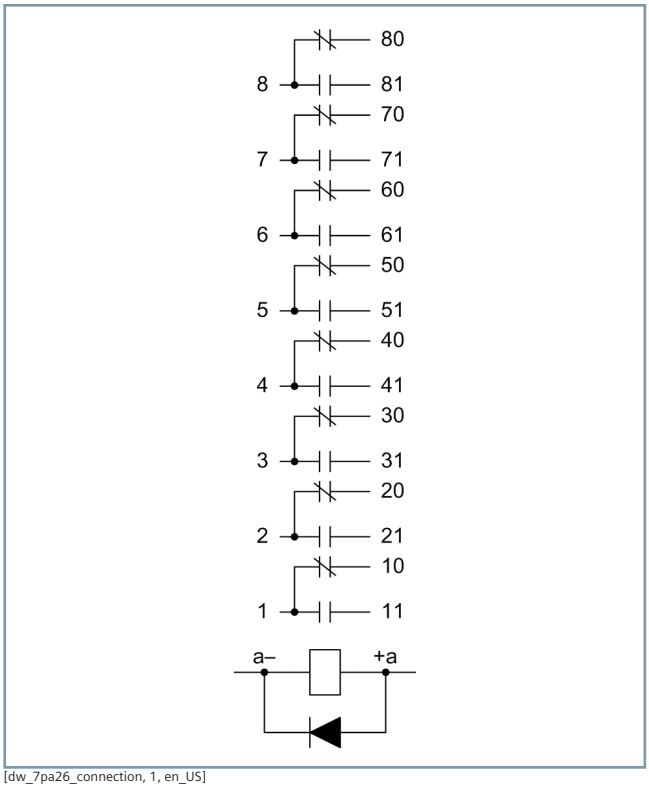
[dw_7pa26_socket_for_surface-mounting, 1, en_US]

Figure 2.5/4 Surface-Mounting Base – 7XP9012-0



[dw_7pa26_socket_for_flush-mounting, 1, en_US]

Figure 2.5/5 Flush-Mounting Base – 7XP9010-3



[dw_7pa26_connection, 1, en_US]

Figure 2.5/6 Connections 7PA26

Selection and Ordering Data

Description	Versions	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							|			|						|			
	24/30 VDC						1			|						|			
	60 VDC						2			|						|			
	110/125 VDC						3			|						|			
	220 VDC						4			|						|			
	48 VDC						8			|						|			
	Standard, 20 ms									0						|			
	Fast-acting, 10 ms									1						|			
Base																|			
	Without base															0			
	With base 7XP9010-3 (flush mounting)															1			
	With base 7XP9012-0 (surface mounting)															2			

Monostable Relay – 7PA – 7PA27

Description

Monostable relay with four change-over contacts.

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

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

[ph_7PA27, 1, --_--]

Figure 2.5/7 Monostable Quick-Operating Relay 7PA2732

Technical Data

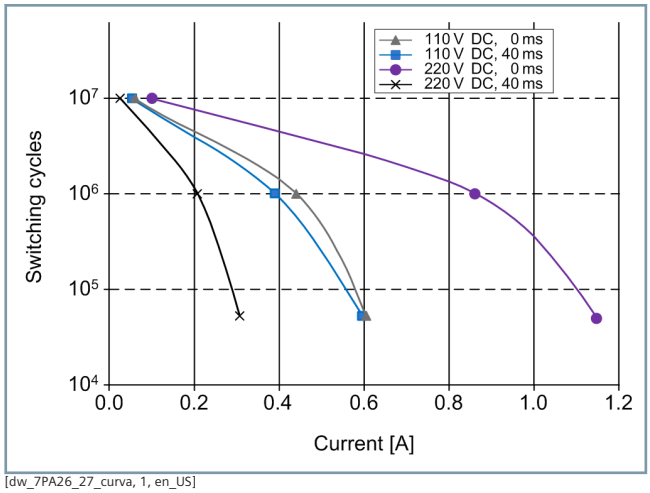
Rated voltage and internal consumption					
V_N (VDC)	Voltage range (VDC)	Internal consumption (mA)		Excitation voltage (VDC) between [1]	De-excitation voltage (VDC) between [1]
		Standard [mA]	Peak		
24/30	19 to 36	42	1 A/20 ms	16 and 19 V	9 and 14 V
48	38.4 to 52.8	32		28.8 and 33.6 V	14.4 and 21.6 V
60	42 to 72	18		36 and 42 V	18 and 27 V
110/125	77 to 150	8	0.3 A/20 ms	65 and 77 V	38 and 55 V
220	154 to 264	6		132 and 154 V	66 and 99 V

(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.

Pre-arcing time	
For excitation	10 A
For de-excitation	<40 ms

Contacts	
Continuous current	<8 ms
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 diagram				



[dw_7PA26_27_curva, 1, en_US]

Figure 2.5/8 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

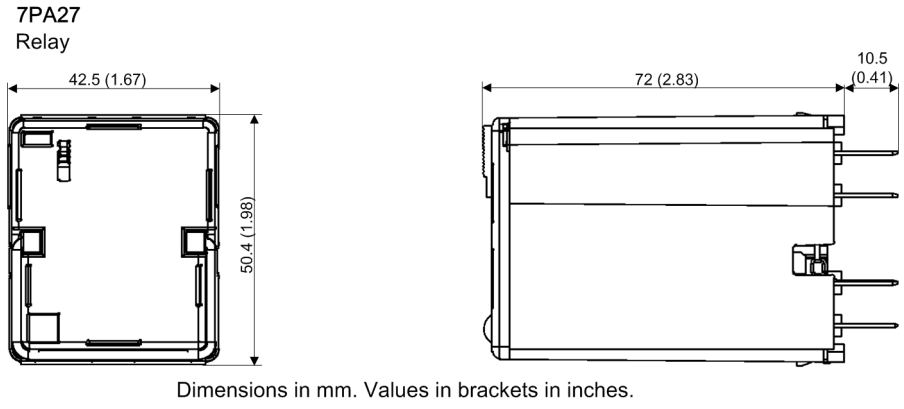
Weights and packaging	
7PA27	250 g
Carton	125 x 79 x 84 mm
7XP9011-2	300 g
7XP9013-0	110 g

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**

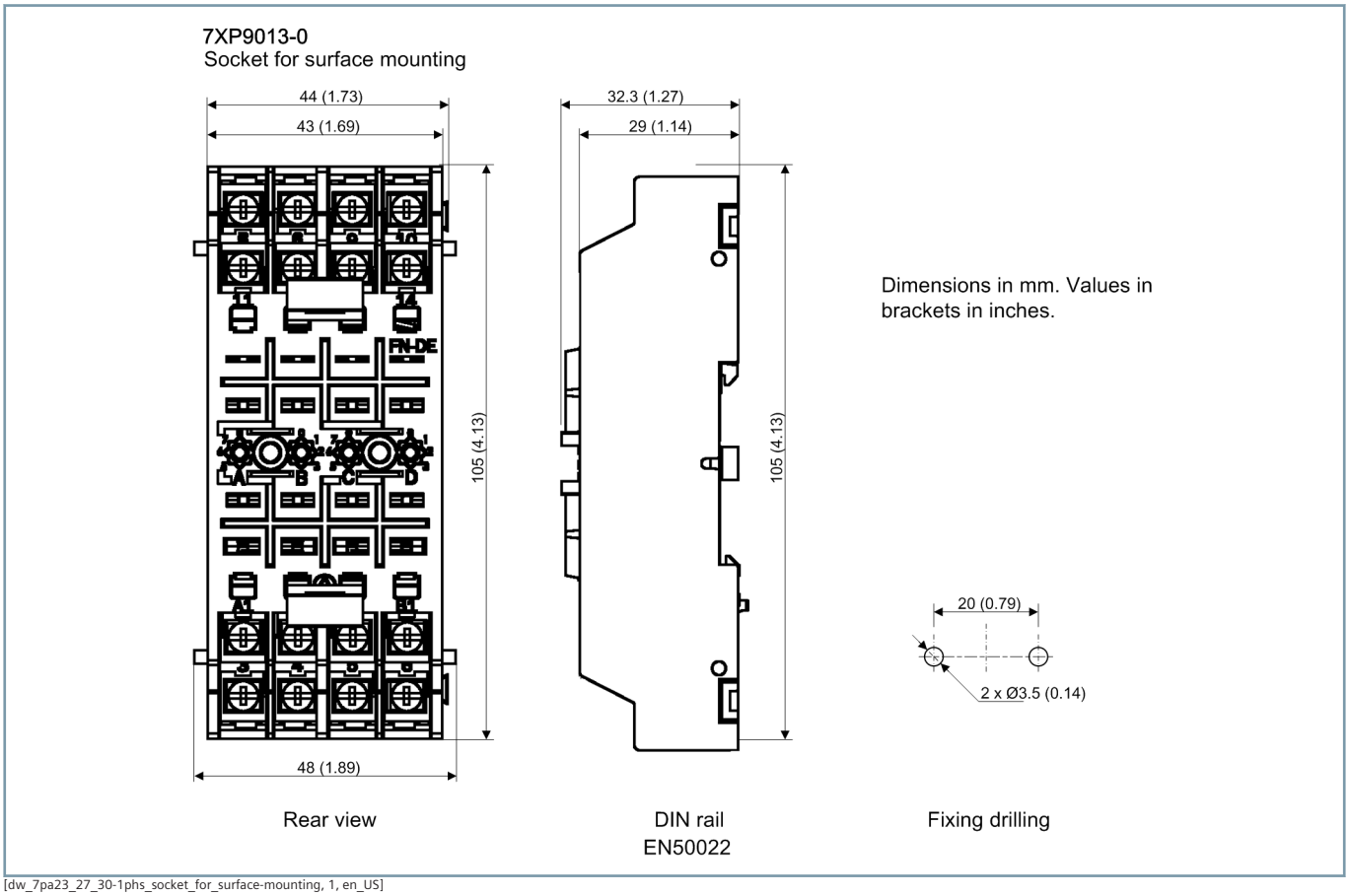
EMC Tests	
Energy surge voltages 8/20 µs. (current) - 1.2/50 µs. (voltage) - 8/20 µs. (current) Common mode: 2 kV - differential mode: 1 kV	**EN 61000-4-5**
Radiated HF field interference, amplitude-modulated: Test level: 80-1000 MHz, 10 V/m, 80% AM (1 kHz)	**EN 61000-4-3**
Radiated HF field interference, 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**
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**

Dimensions and Connections



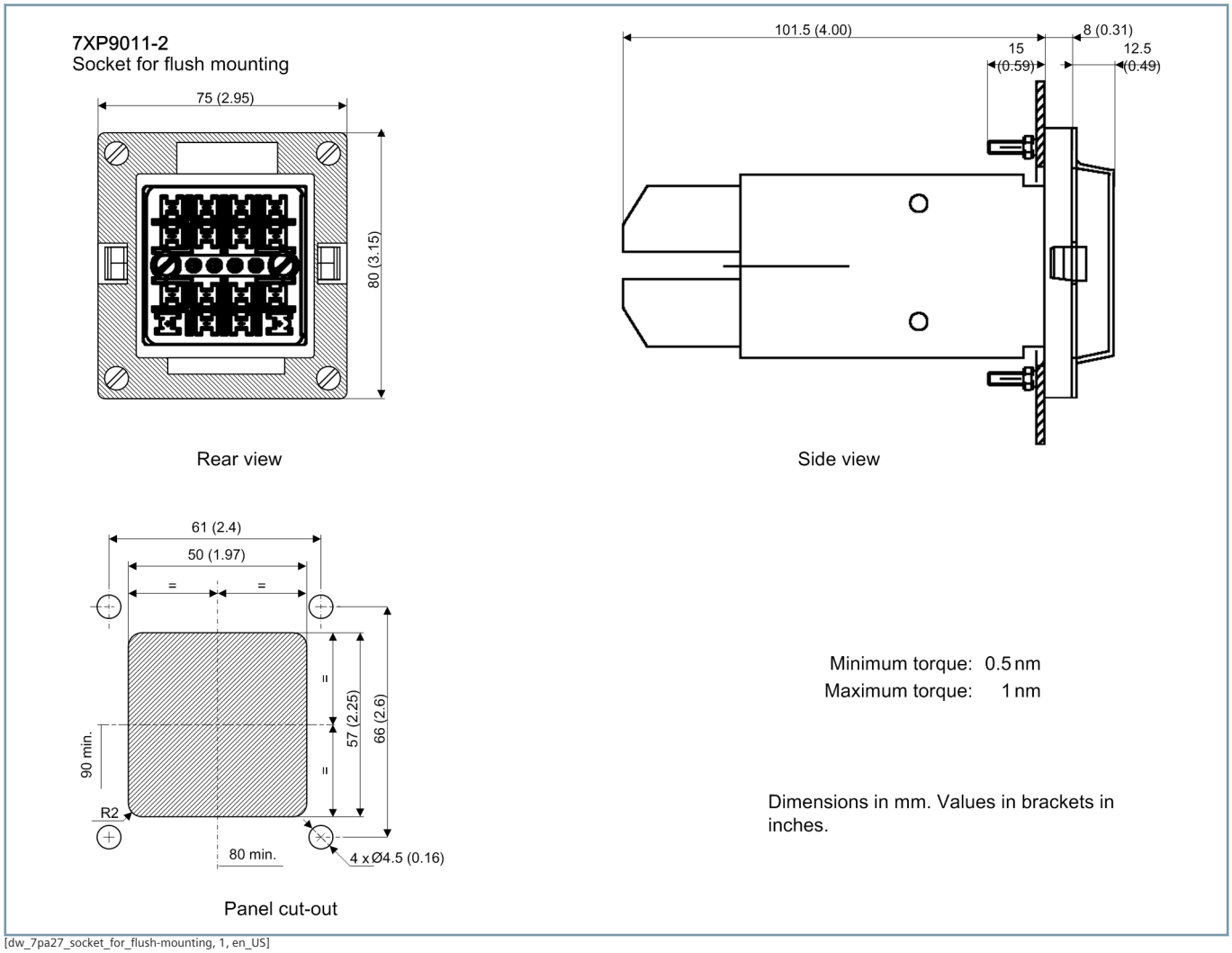
[dw_7pa27_dimensions_and_panel-mounting-cutout, 1, en_US]

Figure 2.5/9 Dimensions



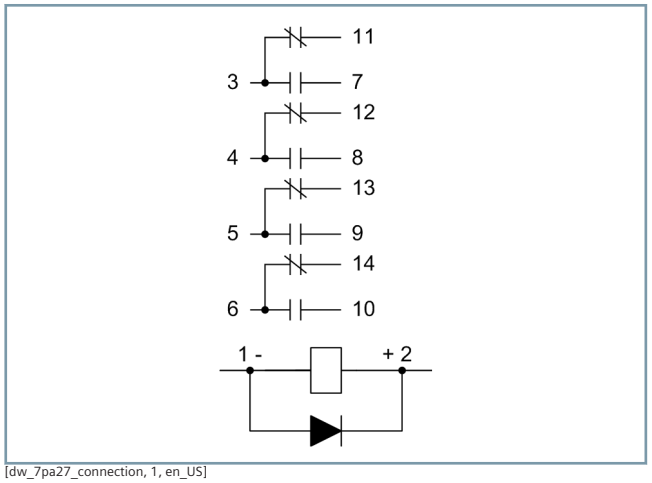
[dw_7pa23_27_30-1phs_socket_for_surface-mounting, 1, en_US]

Figure 2.5/10 Surface-Mounting Base



[dw_7pa27_socket_for_flush-mounting, 1, en_US]

Figure 2.5/11 Flush-Mounting Base



[dw_7pa27_connection, 1, en_US]

Figure 2.5/12 Connections 7PA27

Selection and Ordering Data

Description	Versions	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							|									|			
	24/30 VDC						1									|			
	60 VDC						2									|			
	110/125 VDC						3									|			
	220 VDC						4									|			
	48 VDC						8									|			
Base																|			
	Without base															0			
	With base 7XP9011-2 (flush mounting)															1			
	With base 7XP9013-0 (surface mounting)															2			

Trip-Circuit Supervision Relay – 7PA – 7PA30 1-phase

Description

The 7PA3032 relay is used to monitor the trip circuit of circuit breakers with a 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 very well 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 under 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 the trip coil cannot malfunction. Proper operation is signaled via a green LED.

[ph_7PA30-1, 1, --_--]

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

Technical Data

Rated voltage and internal consumption				
V_N (VDC)	Voltage range (VDC)	Internal consumption (mA)	Impedance per phase (kΩ)	De-excitation voltage (VDC) between
24/30	18 to 33	32	20	12 and 18 V
48	38.5 to 52.5		44	29 and 34 V
60	45 to 66	18		36 and 42 V
110/125	82.5 to 137.5		94	66 and 77 V
220	165 to 242	13	200	132 and 154 V

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

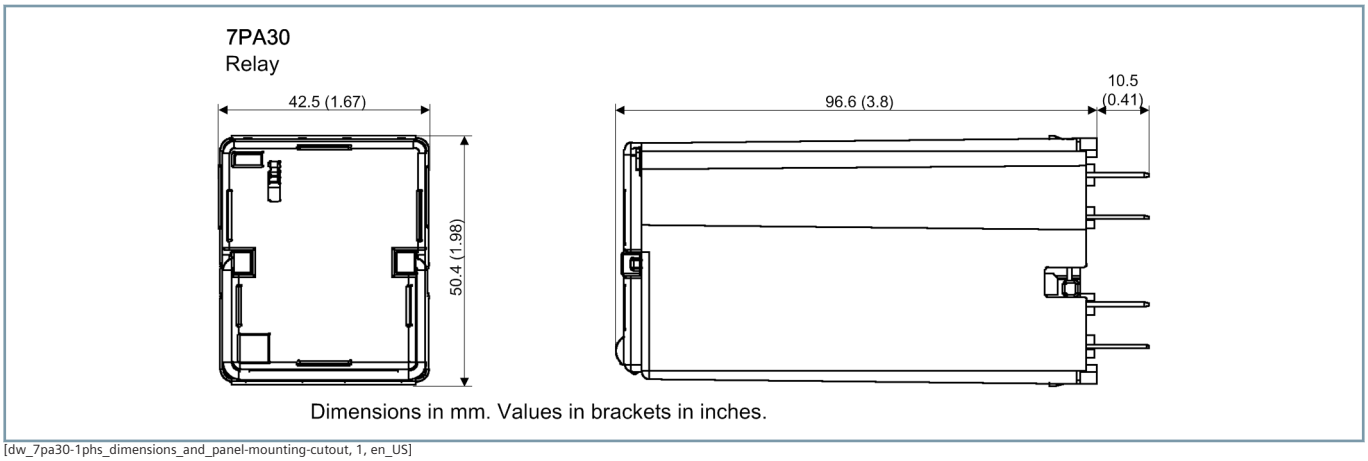
Weights and packaging	
7PA30 1-phase	100 g
Carton	145x78x71 mm.
7XP9011-0	300 g
7XP9013-0	110 g

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

Design guidelines	
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

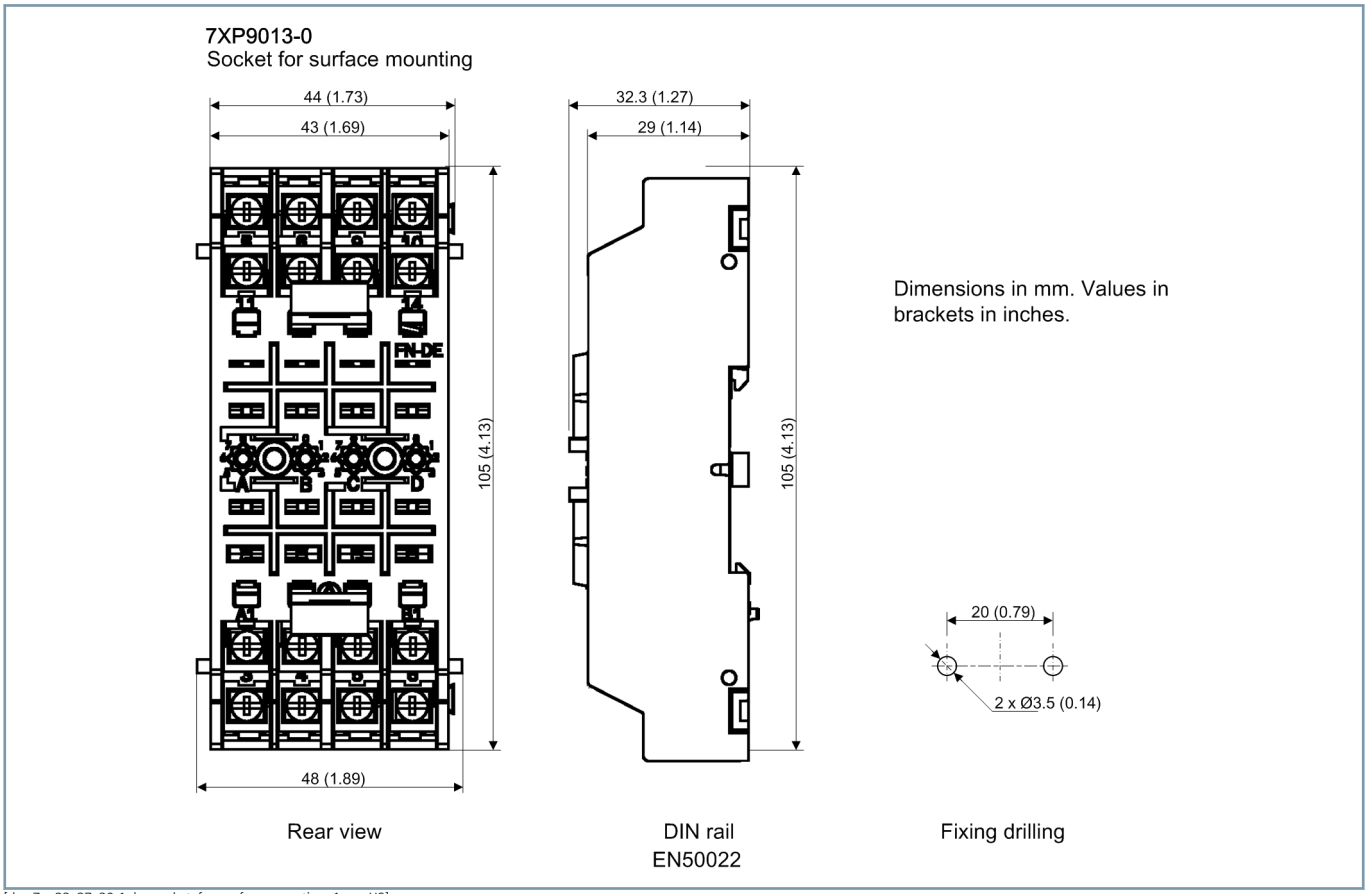
EMC Tests	
High-frequency test: Test level: 1 MHz, 400 imp/s, 2 s Common mode: 2.5 kV Differential mode: 1 kV	**EN 60255-22-1**
Fast transient bursts Test level: 4 kV, 2.5 kHz, 1 min•2 kV, 5 kHz, 1 min	**EN 61000-4-4**
Energy surge voltages 8/20 µs. (current) - 1.2/50 µs. (voltage) - 8/20 µs. (current)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

Dimensions and Connections



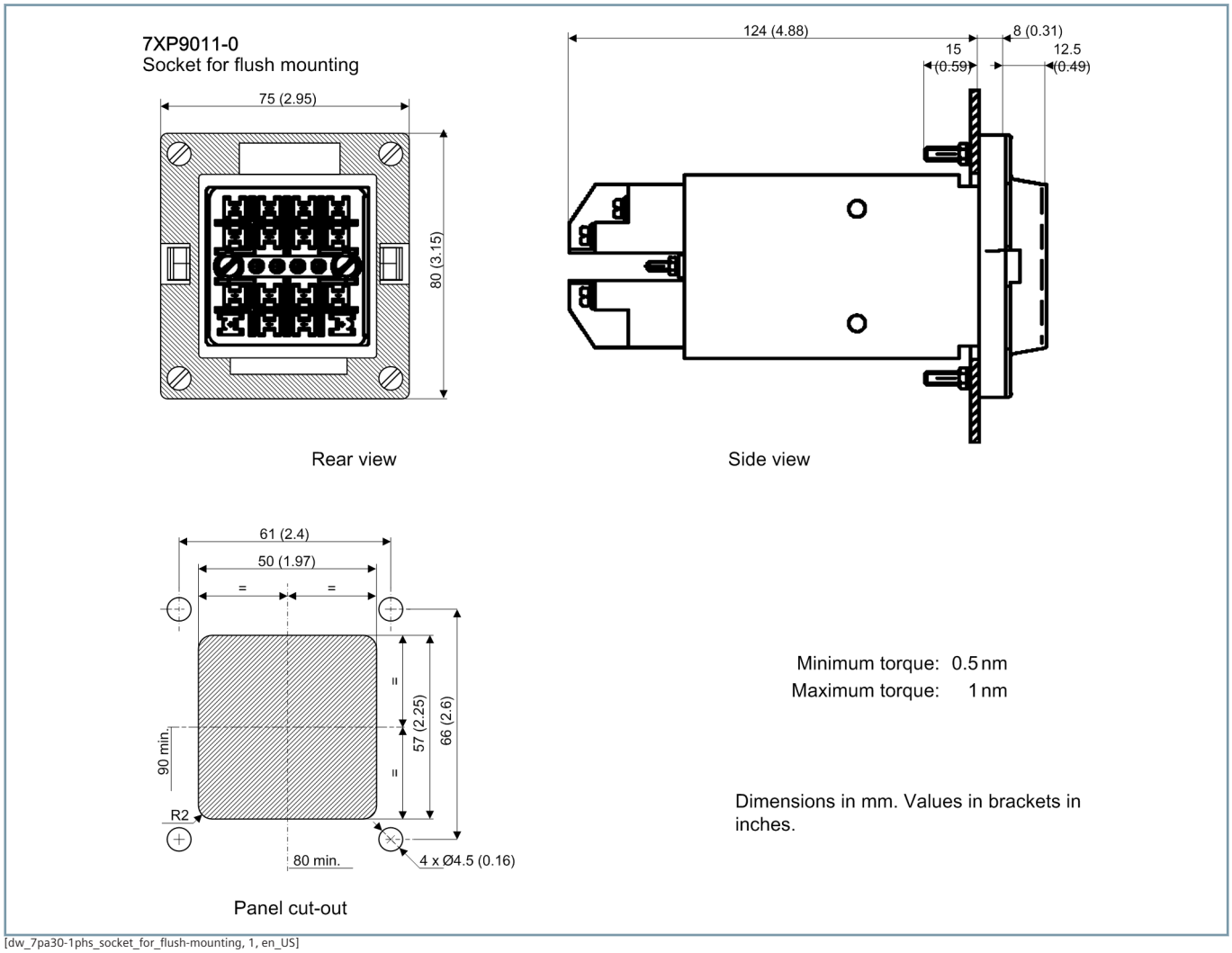
[dw_7pa30-1phs_dimensions_and_panel-mounting-cutout, 1, en_US]

Figure 2.6/2 Dimensions and Installation Dimensions



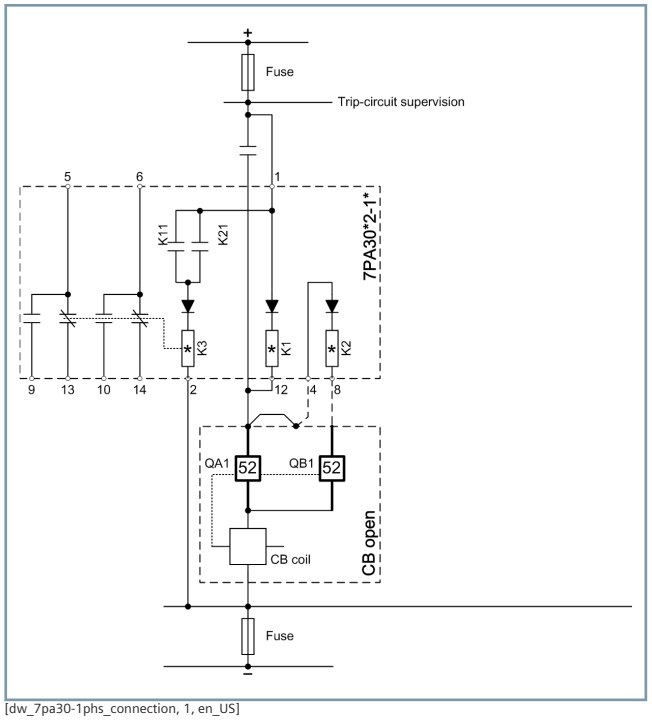
[dw_7pa23_27_30-1phs_socket_for_surface-mounting, 1, en_US]

Figure 2.6/3 Surface-Mounting Base



[dw_7pa30-1phs_socket_for_flush-mounting, 1, en_US]

Figure 2.6/4 Flush-Mounting Base



[dw_7pa30-1phs_connection, 1, en_US]

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

Selection and Ordering Data

Description	Versions	Order no.															
		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
1-phase trip-circuit supervision with 2 change-over contacts		7	P	A	3	0	□	2	-	□	A	A	0	0	-	□			
							▲			▲						▲			
Rated voltage							|			|						|			
	24/30 VDC						1			|						|			
	60 VDC						2			|						|			
	110/125 VDC						3			|						|			
	220 VDC						4			|						|			
	48 VDC						8			|						|			
Number of phases										|						|			
	1-phase									1						|			
Base																|			
	Without base															0			
	With base 7XP9011-0 (flush mounting)															1			
	With base 7XP9013-0 (surface mounting)															2			

Trip-Circuit Supervision Relay – 7PA – 7PA30 3-phase

Description

The 7PA30*23 relay is used to monitor the trip circuit of circuit breakers with three 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 very well 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 under 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 the trip coil cannot malfunction.

Proper operation is signaled via a green LED.

[ph_7PA30-3, 1, --_--]

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

Technical Data

Rated voltage and internal consumption				
V_N (VDC)	Voltage range (VDC)	Internal consumption (mA)	Impedance per phase (kΩ)	De-excitation voltage (VDC) between
24/30	18 to 33	32	20	12 and 18 V
48	36 to 52.8	35	44	29 and 34 V
60	45 to 66	18	44	36 and 42 V
110/125	82.5 to 137.5	18	94	66 and 77 V
220	165 to 242	13	200	132 and 154 V

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

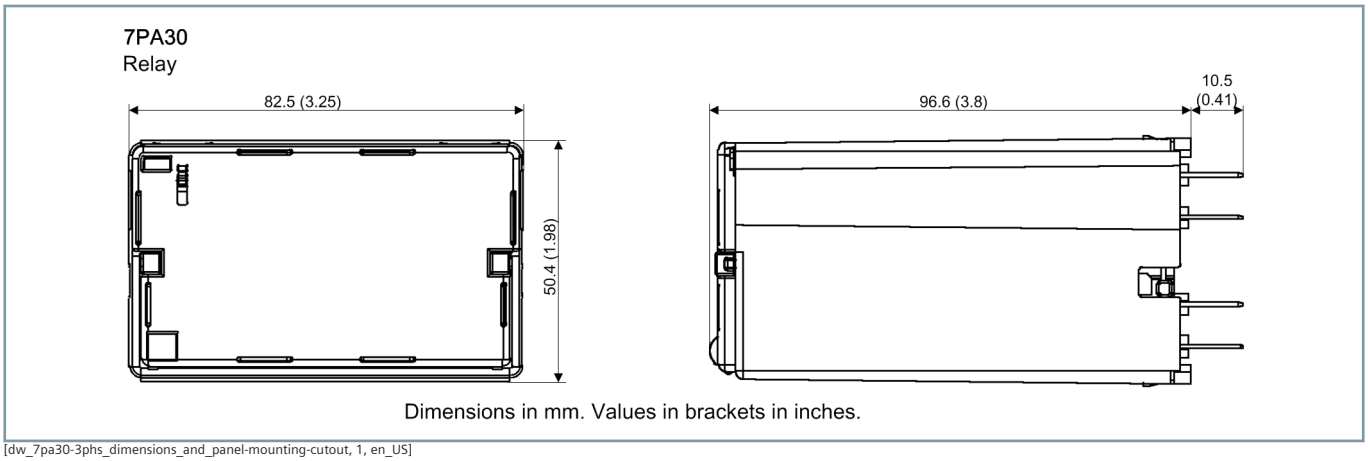
Weights and packaging	
7PA30 3-phase	165 g
Carton	150x124x84 mm
7XP9010-4	400 g
7XP9012-0	225 g

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

Design guidelines	
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

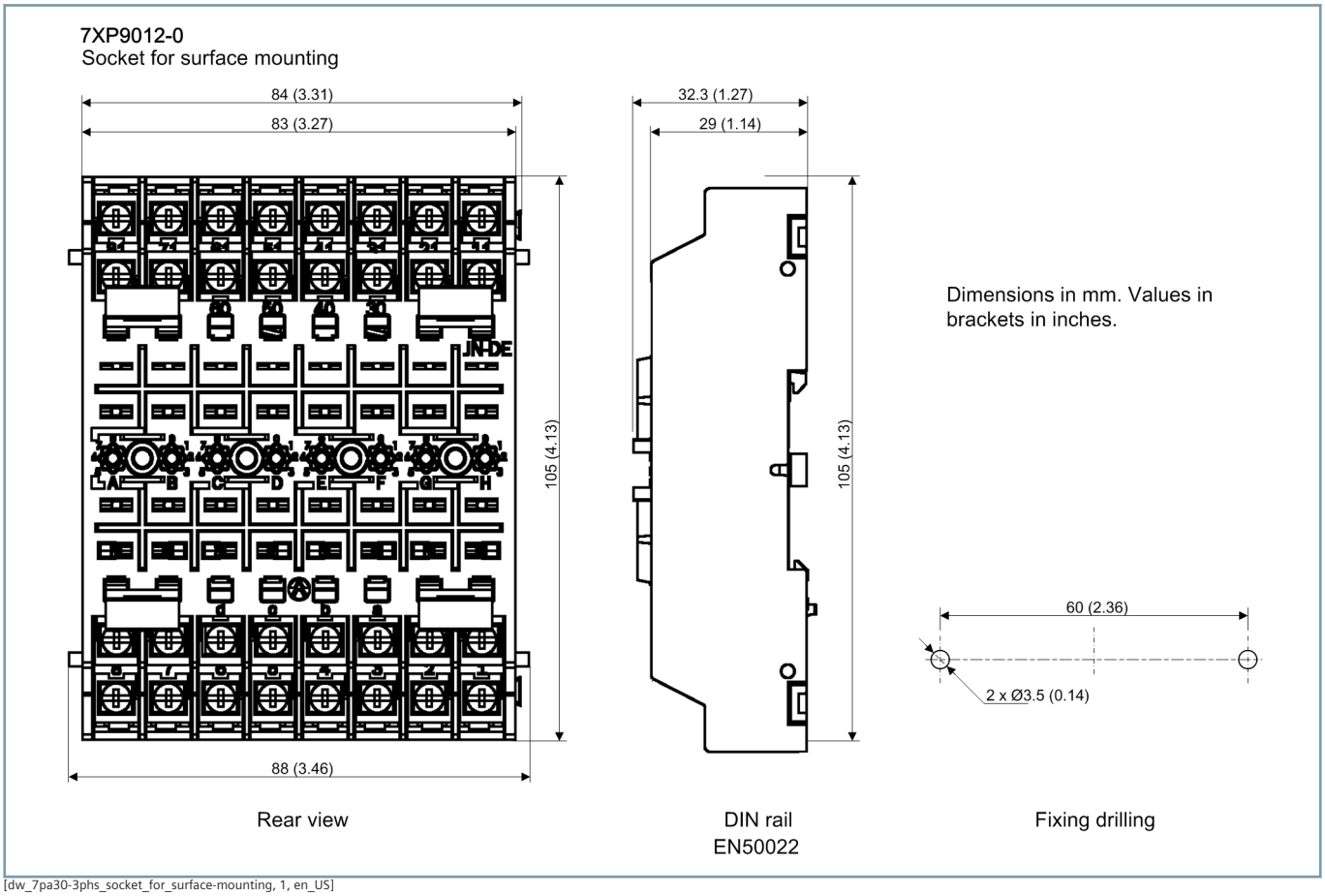
EMC Tests	
High-frequency test: Test level: 1 MHz, 400 imp/s, 2 s Common mode: 2.5 kV Differential mode: 1 kV	**EN 60255-22-1**
Fast transient bursts Test level: 4 kV, 2.5 kHz, 1 min•2 kV, 5 kHz, 1 min	**EN 61000-4-4**
Energy surge voltages 8/20 µs. (current) - 1.2/50 µs. (voltage) - 8/20 µs. (current)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

Dimensions and Connections



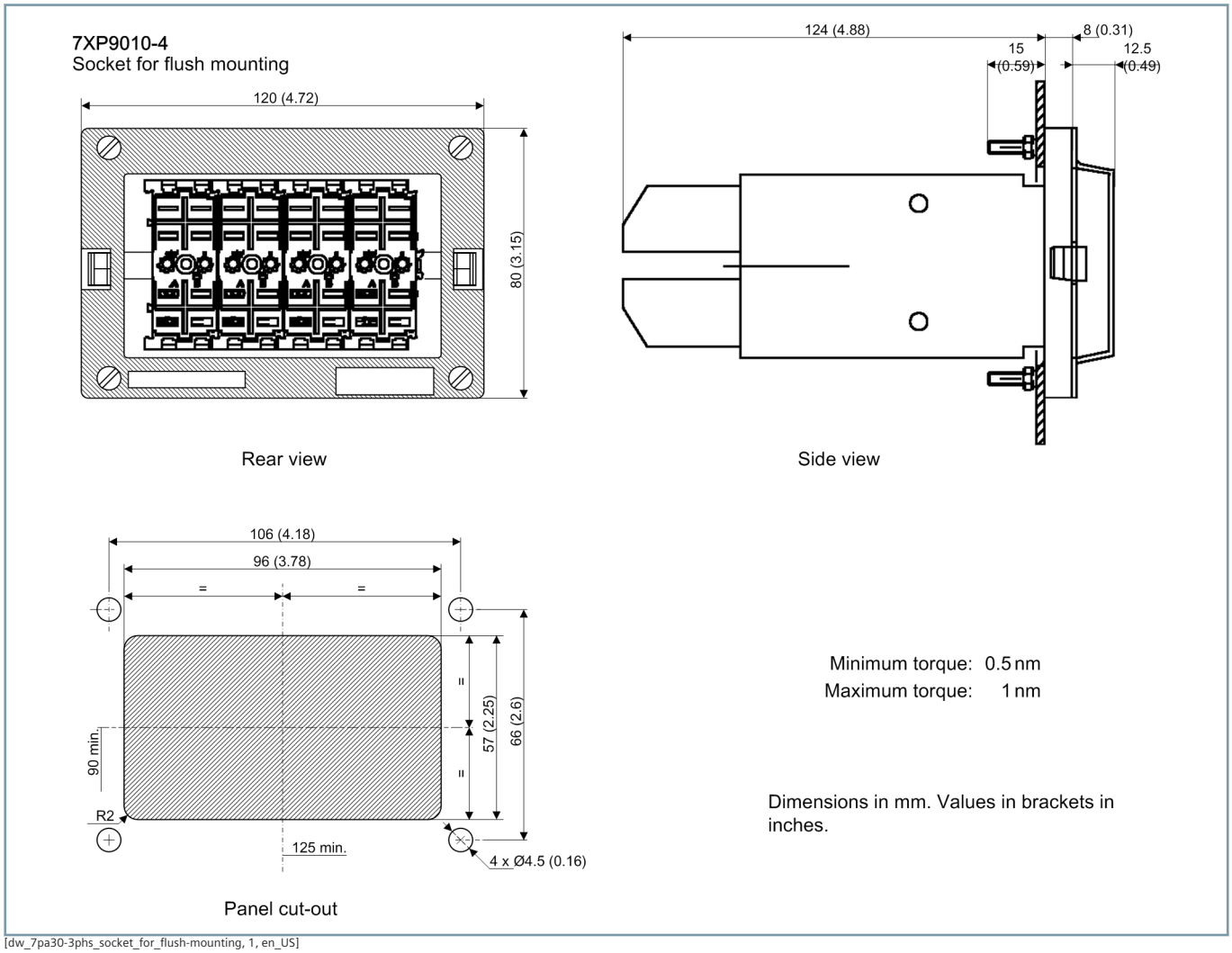
[dw_7pa30-3phs_dimensions_and_panel-mounting-cutout, 1, en_US]

Figure 2.6/7 Dimensions and Installation Dimensions



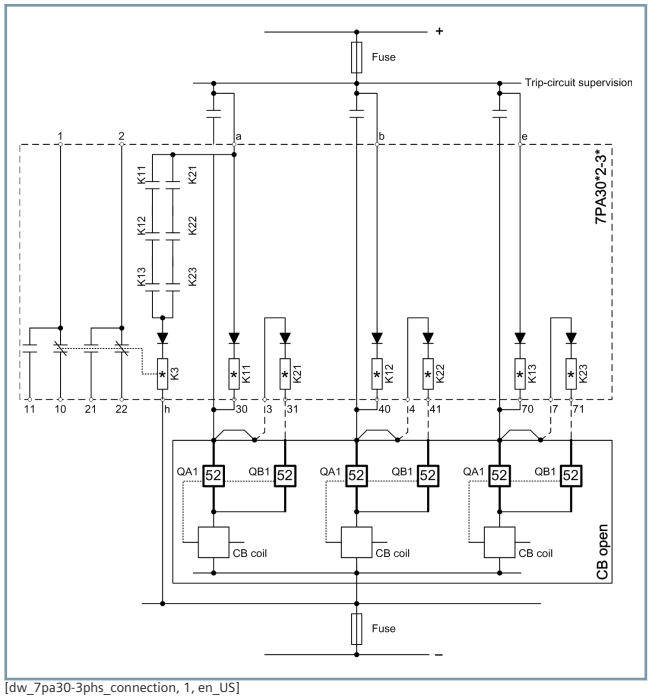
[dw_7pa30-3phs_socket_for_surface-mounting, 1, en_US]

Figure 2.6/8 Surface-Mounting Base



[dw_7pa30-3phs_socket_for_flush-mounting, 1, en_US]

Figure 2.6/9 Flush-Mounting Base



[dw_7pa30-3phs_connection, 1, en_US]

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

Selection and Ordering Data

Description	Versions	Order no.																
		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
3-phase trip-circuit supervision with 2 change-over contacts		7	P	A	3	0	□	2	-	□	A	A	0	0	-	□			
							▲			▲						▲			
Rated voltage							|			|						|			
	24/30 VDC						1			|						|			
	60 VDC						2			|						|			
	110/125 VDC						3			|						|			
	220 VDC						4			|						|			
	48 VDC						8			|						|			
Number of phases										|						|			
	3-phase									3						|			
Base																|			
	Without base															0			
	With base 7XP9010-4 (flush mounting)															1			
	With base 7XP9012-0 (surface mounting)															2			

Signal Relay – 7TS16 – Technical Data

Description

The relay is a versatile signal relay with four inputs for signals. It has four local LED displays and four output contacts with auto-reset that can be used in SCADA control systems. In addition, there are two 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 2.7/1 Signal Relay 7TS16

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

Contacts	
Switching power ON	15 A/4 s/110 VDC
Switching capacity OFF	0.3 A/110 VDC

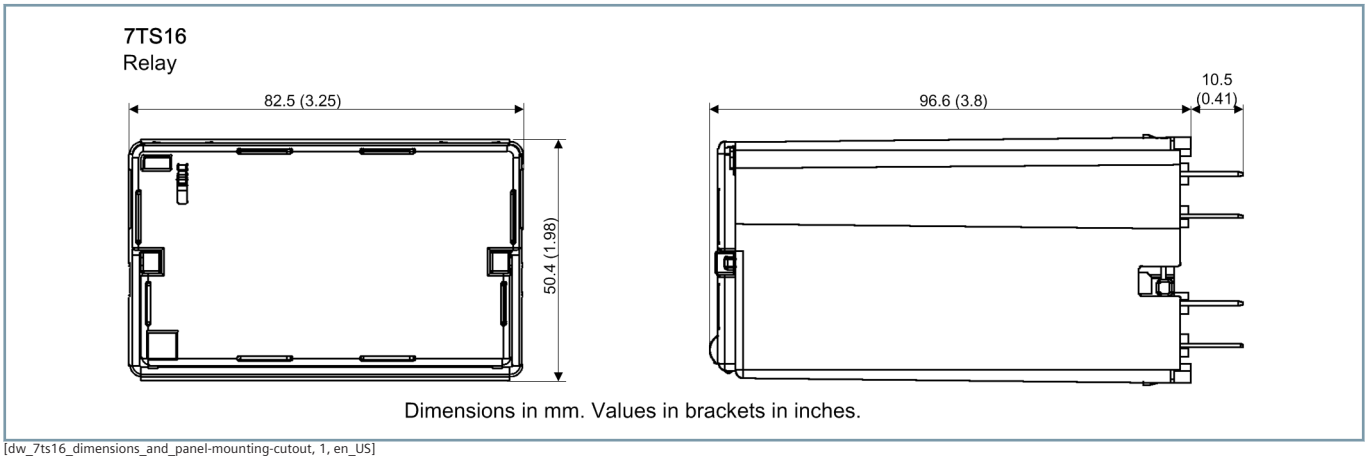
Weights and packaging	
7TS16	165 g
Carton	150x124x84 mm
7XP9010-2	400 g
7XP9012-0	225 g

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

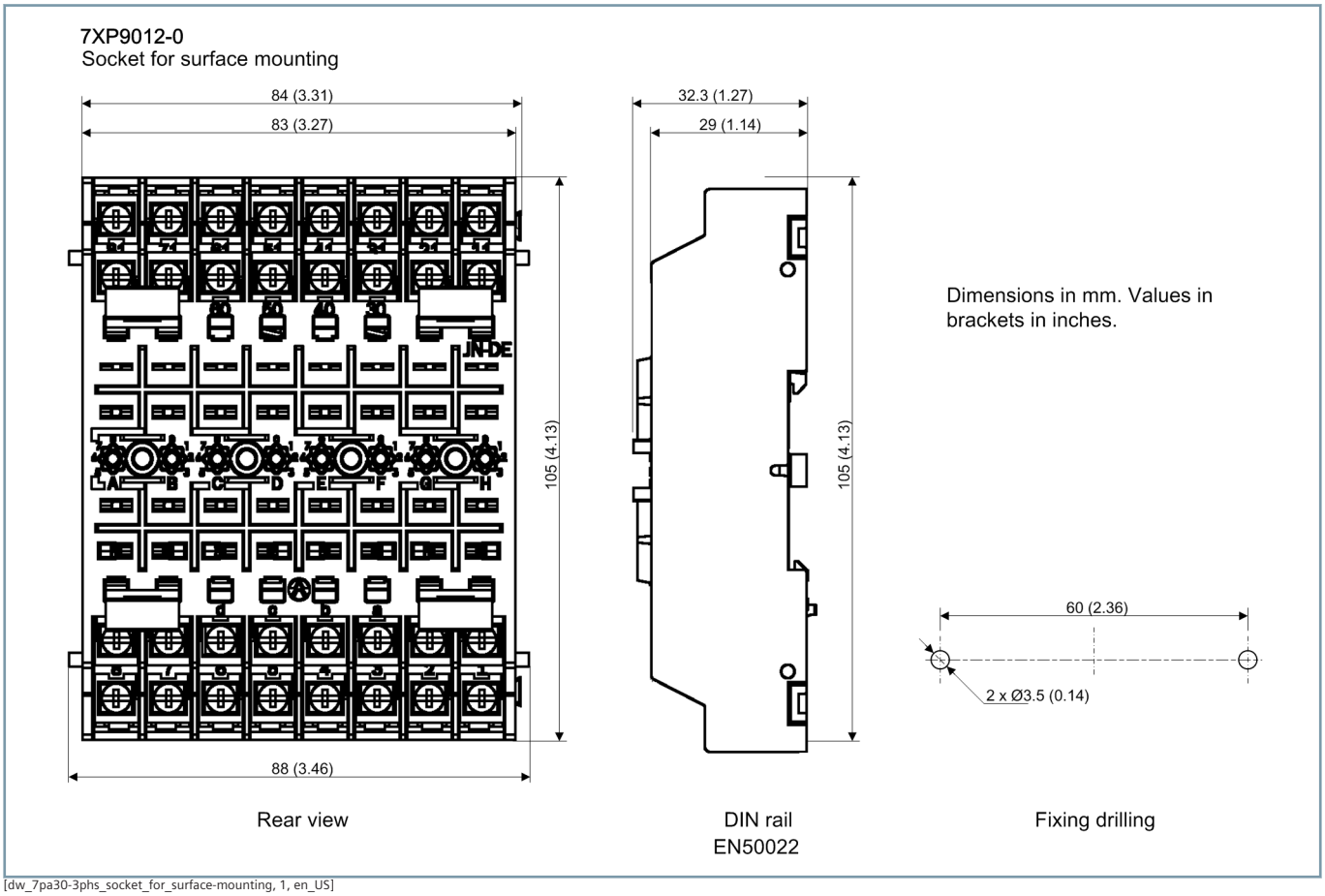
EMC tests	Standard
Immunity, industrial environment	IEC 61000-6-2 EN 61000-6-2
1 MHz immunity test	IEC 60255-22-1 / 1 kV / 2.5 kV
Emitted interference, industrial environment	IEC 61000-6-4 EN 61000-6-4 EN 55011/Class A

Dimensions and Connections



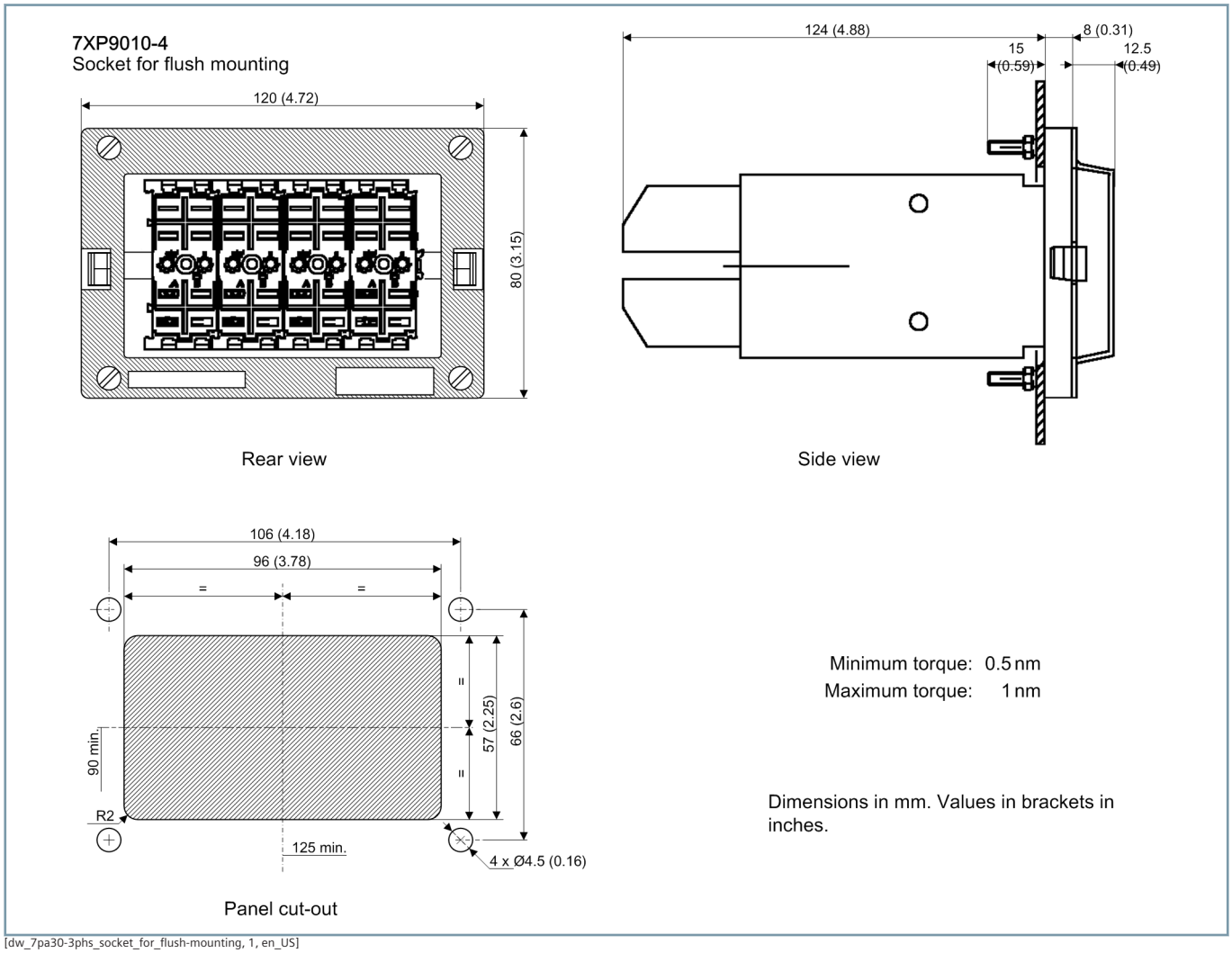
[dw_7ts16_dimensions_and_panel-mounting-cutout, 1, en_US]

Figure 2.7/2 Dimensions



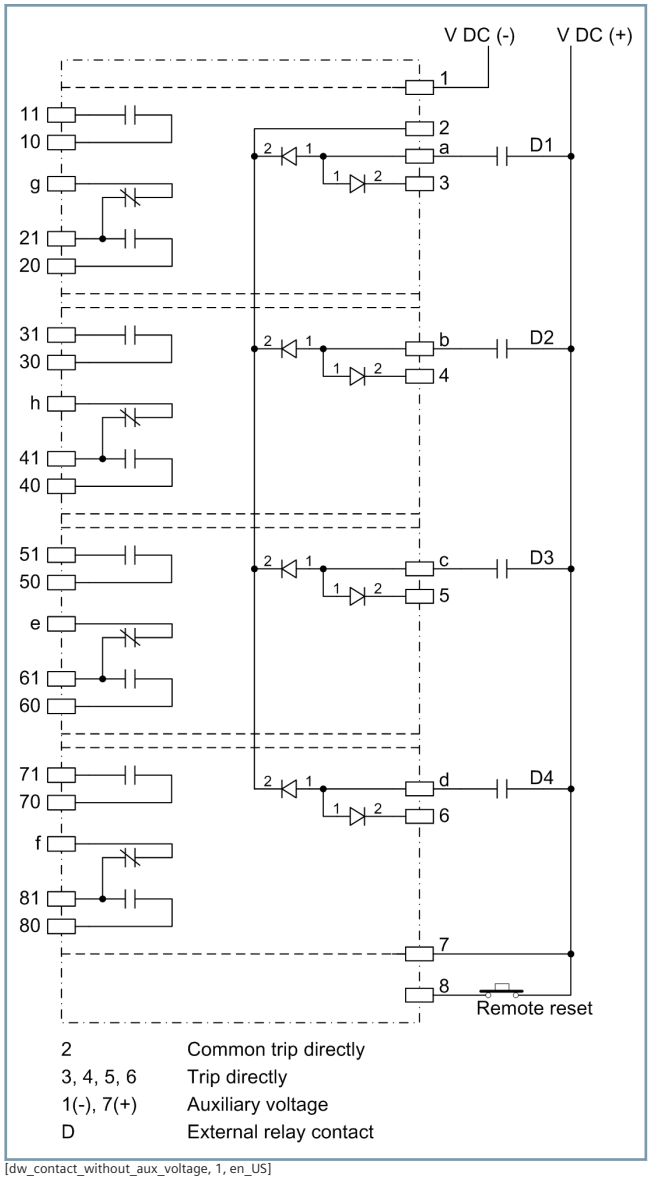
[dw_7pa30-3phs_socket_for_surface-mounting, 1, en_US]

Figure 2.7/3 Surface-Mounting Base



[dw_7pa30-3phs_socket_for_flush-mounting, 1, en_US]

Figure 2.7/4 Flush-Mounting Base



[dw_contact_without_aux_voltage, 1, en_US]

Figure 2.7/5 Connection Diagram – Contacts shown without Auxiliary Voltage in the Relay

Selection and Ordering Data

Description	Versions	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							|									|			
	24/30 VDC						1									|			
	110/125 VDC						3									|			
	220 VDC						4									|			
Base																|			
	Without base															0			
	With base 7XP9010-2 (flush mounting)															1			
	With base 7XP9012-0 (surface mounting)															2			

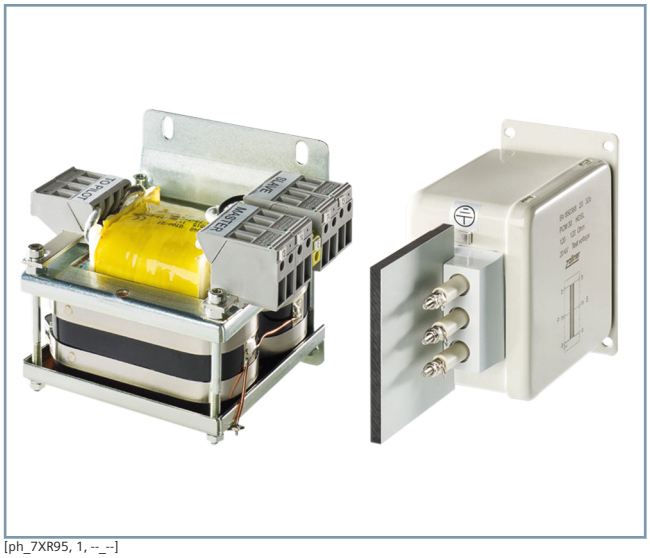
Isolating Transformer – 7XR95

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 humidity: max. 75%; annual average < 65% on 60 days per year up to 85% (evenly distributed over the year); condensation not allowed



[ph_7XR95, 1, --_--]

Figure 2.8/1 Isolating Transformer 7XR9516 (left), Isolating Transformer 7XR9515 (right)

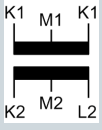
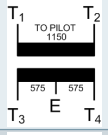
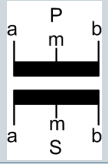
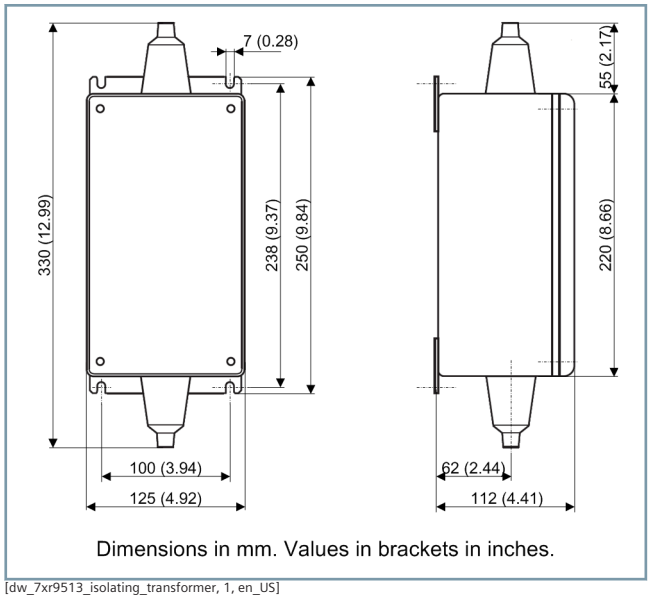
Order no.		Windings of the auxiliary current transformers		Weight, ca.
7XR9 513	Isolating transformer for line differential protection with 1 pair of pilot wires		Isolating transformer 1:1, max. 550 V 0.4 A continuous, 3 A 10 s, 10 A 1 s Test voltage 20 kV, 50 Hz, 1 min HKG	5 kg
7XR9 515	Isolating transformer 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	Isolating transformer 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 2.8/1 Overview

Selection and Ordering Data

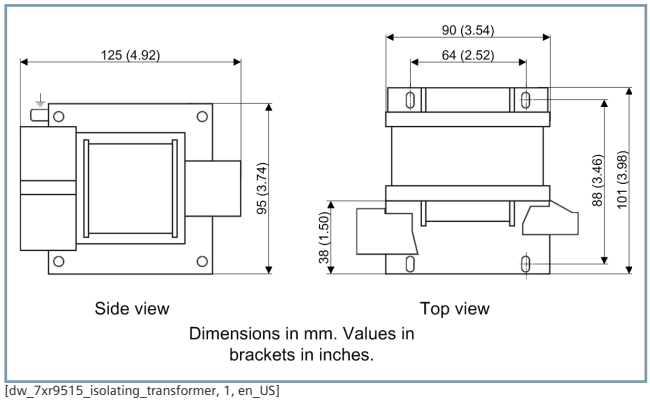
Description	Versions	Order no.											
		1	2	3	4	5	6	7		8	9	10	11	12
Isolating transformer														
For line differential protection	Insulation voltage: 20 kV	7	X	R	9	5	1	3						
	Insulation voltage: 5 kV	7	X	R	9	5	1	5						
For the communication converter 7XV5662-0AC00 (for example, for the 7SD61, 7SD52, 7SA6, 7SA522)	Insulation voltage: 20 kV	7	X	R	9	5	1	6						

Dimensioned Drawings



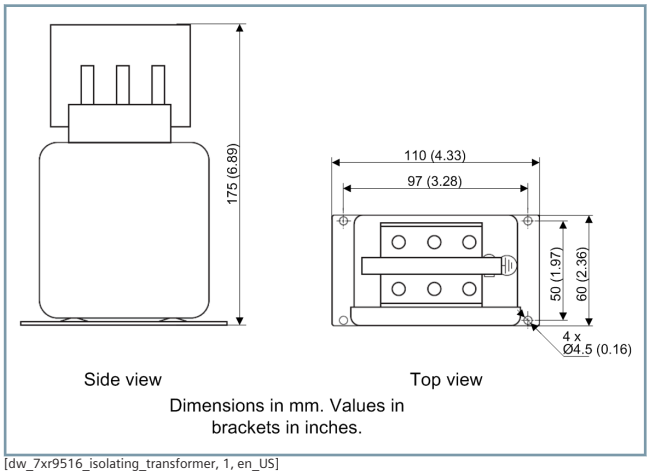
[dw_7xr9513_isolating_transformer, 1, en_US]

Figure 2.8/2 Isolating Transformer 7XR9513



[dw_7xr9515_isolating_transformer, 1, en_US]

Figure 2.8/3 Isolating Transformer 7XR9515 – Side View/Top View



[dw_7xr9516_isolating_transformer, 1, en_US]

Figure 2.8/4 Isolating Transformer 7XR9516 – Side View/Top View

SIEMENS

www.siemens.com/accessories

Communication

Fiber-Optic Cable – 6XV8100/6XV8200

Overview

- Plastic optical fiber duplex indoor cable
- Glass optical fiber duplex outdoor cable
- Glass optical fiber duplex indoor cable
- Glass optical fiber duplex outdoor cable for MTRJ connectors
- Glass optical fiber duplex indoor cable for MTRJ connectors
- Glass optical fiber duplex indoor cable
- Optical fiber set

These f optical fiber lines are intended for use in industrial systems and not for general/public buildings. They have not been evaluated in terms of the Construction Products Regulation (EU No. 305/2011).

You can find the selection and order data for fiber-optic cables in the following tables

[6XV8100, 1, --_--]

Figure 3.1/1 Fiber-Optic Cables

Selection and Ordering Data

Description	Versions	Order no.																
		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
Plastic optical fiber duplex indoor cable		6	X	V	8	1	0	0	-	0	D	A	☐	1	-	0	A	☐	☐
													▲				▲	▲	▲
PE insulated, diameter = 2.2 mm, black, Good resistance to oil, gasoline, acids and bases, Cables for the simple connection of loads, For connections in the control cabinet, Cable type L46916-U2- U19, V-2 x 1S980/1000PE	*Connectors*												|				|	|	|
	FSMA connectors at each end												2				|	|	|
	ST connectors at each end												4				|	|	|
	One end, FSMA connectors; other end, ST connectors												5				|	|	|
																	|	|	|
	10 metre lengths																|	|	|
	Length 0 m +																A	|	|
	Length 10 m +																B	|	|
	Length 20 m +																C	|	|
	Length 30 m +																D	|	|
	Length 40 m +																E	|	|
	Length 50 m +																F	|	|
																		|	|
	Length 0,5 m																	A	5
	Length 1,0 m																	B	0
	Length 1,5 m																	B	5
	Length 2,0 m																	C	0
	Length 2,5 m																	C	5
	Length 3,0 m																	D	0
	Length 3,5 m																	D	5
	Length 4,0 m																	E	0
	Length 5,0 m																	F	0
	Length 6,0 m																	G	0
	Length 7,0 m																	H	0
	Length 8,0 m																	J	0
	Length 9,0 m																	K	0

Fiber-Optic Cable – 6XV8100/6XV8200 – Selection and Ordering Data

Selection and Ordering Data

Description	Versions	Order no.																
		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
Glass optical fiber duplex outdoor cable		6	X	V	8	1	0	0	-	0	B	D	□	□	-	□	□	□	□
													▲	▲		▲	▲	▲	▲
2 breakout elements,	*Connectors*												|	|		|	|	|	|
Fiber type: glass, 62.5/125 um,	Without												0	1		|	|	|	|
Halogen-free and flame-resistant,	1 end pre-assembled with an FSMA connector												1	1		|	|	|	|
Nonmetallic rodent protection,	Both ends pre-assembled with FSMA connectors												2	1		|	|	|	|
Outer diameter: 9.2 mm, black,	Pre-assembled with ST and LC connectors												3	1		|	|	|	|
Inner diameter: 2.5 mm, orange,	Both ends pre-assembled with ST connectors												4	1		|	|	|	|
Suitable for indoor and outdoor use	Prefabricated with FSMA and ST connectors												5	1		|	|	|	|
(Base material: AT-VHBH 2G62,5/125)	Both ends prefabricated with LC connectors												6	1		|	|	|	|
Length selection:	Both ends prefabricated with FC/PC connectors												7	1		|	|	|	|
Increment is 10 m up to 490 m	1 end prefabricated with FC/PC connector, other end with LC connector												8	1		|	|	|	|
Increment is 50 m from 500 m on	1 end prefabricated with ST connector, other end with SC connector												1	2		|	|	|	|
Custom lengths upon request from the supplier	*100 meter lengths*															|	|	|	|
	Length: 0 m +															0	|	|	|
	Length: 100 m +															1	|	|	|
[1)]For this version, add the short identifier "N1A" to the order number.	Length: 200 m +															2	|	|	|
	Length: 300 m +															3	|	|	|
	Length: 400 m +															4	|	|	|
	Length: 500 m +															5	|	|	|
	Length: 600 m +															6	|	|	|
	Length: 700 m +															7	|	|	|
	Length: 800 m +															8	|	|	|
	Length: 900 m +														[1)]	9	|	|	|
	10 meter lengths																|	|	|
	Length: 0 m +																A	|	|
	Length: 10 m +																B	|	|
	Length: 20 m +																C	|	|
	Length: 30 m +																D	|	|
	Length: 40 m +																E	|	|
	Length: 50 m +																F	|	|
	Length: 60 m +																G	|	|
	Length: 70 m +																H	|	|
	Length: 80 m +																J	|	|
	Length: 90 m +																K	|	|
	1 meter lengths																	|	|
	Length: 0 m +																	A	|
	Length: 1 m +																	B	|
	Length: 2 m +																	C	|
	Length: 3 m +																	D	|
	Length: 4 m +																	E	|
	Length: 5 m +																	F	|
	Length: 6 m +																	G	|
	Length: 7 m +																	H	|
	Length: 8 m +																	J	|
	Length: 9 m +																	K	|
	1000 meter lengths																		|
	Length: 0 m +																		0
	Length: 1000 m +																		1
	Length: 2000 m +																		2

Selection and Ordering Data

Description	Versions	Order no.																
		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
Glass optical fiber duplex indoor cable		6	X	V	8	1	0	0	-	0	B	E	□	□	-	□	□	□	0
													▲	▲		▲	▲	▲	
2 breakout elements,	*Connectors*												|	|		|	|	|	
Fiber type: glass, 62.5/125 um,	Without												0	1		|	|	|	
Halogen-free and flame-resistant,	1 end pre-assembled with an FSMA connector												1	1		|	|	|	
Outer diameter: 2.8 x 4.5 mm, orange	1 end prefabricated with FSMA connector, other end with SC connector												1	2		|	|	|	
Inner diameter: 1.7 mm, orange, number printing	1 end prefabricated with FSMA connector, other end with LC connector												1	3		|	|	|	
For indoor use	Both ends prefabricated with LC connectors												1	4		|	|	|	
(Base material: I-VHH 2x1xG62.5/125)	1 end prefabricated with FSMA connector, other end with FC/PC connector												1	5		|	|	|	
Length selection:	1 end prefabricated with ST connector, other end with SC connector												1	6		|	|	|	
Increment is 1 m up to 49 m	1 end prefabricated with ST connector, other end with LC connector												1	7		|	|	|	
Increment is 10 m from 50 m on	1 end prefabricated with ST connector, other end with E2000 connector												1	8		|	|	|	
Custom lengths upon request from the supplier													|	|		|	|	|	
[1] Please note: For this version, add the short identifier "N1A" to the order number.	Both ends pre-assembled with FSMA connectors												2	1		|	|	|	
	1 end pre-assembled with ST connector												3	1		|	|	|	
	Both ends pre-assembled with ST connectors												4	1		|	|	|	
	1 end prefabricated with FSMA connector, other end with ST connector												5	1		|	|	|	
	1 end prefabricated with FSMA/K connector, other end with ST connector												6	1		|	|	|	
	Both ends prefabricated with FSMA/K connectors												7	1		|	|	|	
	Both ends prefabricated with FC/PC connectors												8	1		|	|	|	
													|	|		|	|	|	
	Both ends pre-assembled with SC connector, crossed												2	2		|	|	|	
	Both ends prefabricated with E2000 connectors												2	3		|	|	|	
	1 end prefabricated with FC/PC connector, other end with LC connector												2	4		|	|	|	
	1 end prefabricated with SC connector, other end with LC connector												2	5		|	|	|	
	1 end prefabricated with ST connector, other end with FC/PC connector												2	6		|	|	|	
	Both ends prefabricated with ST connectors and angled optical fiber												2	7		|	|	|	
	100 meter lengths															|	|	|	
	Length: 0 m +															0	|	|	
	Length: 100 m +															1	|	|	
	Length: 200 m +															2	|	|	
	Length: 300 m +															3	|	|	
	Length: 400 m +															4	|	|	
	Length: 500 m +															5	|	|	
	Length: 600 m +															6	|	|	
	Length: 700 m +															7	|	|	
	Length: 800 m +															8	|	|	
	Length: 900 m +														[1]	9	|	|	
Continued on next page																	|	|	

Fiber-Optic Cable – 6XV8100/6XV8200 – Selection and Ordering Data

Description	Versions	Order no.																
		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
Glass optical fiber duplex indoor cable		6	X	V	8	1	0	0	-	0	B	E	☐	☐	-	☐	☐	☐	0
Continued																	▲	▲	
																	|	|	
	10 meter lengths																|	|	
	Length: 0 m +																A	|	
	Length: 10 m +																B	|	
	Length: 20 m +																C	|	
	Length: 30 m +																D	|	
	Length: 40 m +																E	|	
	Length: 50 m +																F	|	
	Length: 60 m +																G	|	
	Length: 70 m +																H	|	
	Length: 80 m +																J	|	
	Length: 90 m +																K	|	
	1 meter lengths																	|	
	Length: 0 m +																	A	
	Length: 1 m +																	B	
	Length: 2 m +																	C	
	Length: 3 m +																	D	
	Length: 4 m +																	E	
	Length: 5 m +																	F	
	Length: 6 m +																	G	
	Length: 7 m +																	H	
	Length: 8 m +																	J	
	Length: 9 m +																	K	

Selection and Ordering Data

Description	Versions	Order no.																
		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
Glass optical fiber duplex outdoor cable for MTRJ connectors		6	X	V	8	1	0	0	-	0	B	F	☐	1	-	☐	☐	☐	☐
													▲			▲	▲	▲	▲
Optical fiber duplex outdoor cable for data,	*Connectors*												|			|	|	|	|
2 breakout elements, fiber Glass, 62.5/125 um,	1 end prepared for MTRJ connector, other end for FSMA/K connector												1			|	|	|	|
Halogen-free and flame-resistant,	1 end prepared for MTRJ connector, other end for ST connector												2			|	|	|	|
Nonmetallic rodent protection,	Both ends prepared for MTRJ connectors												3			|	|	|	|
Outer diameter: 8.3 mm, black,																|	|	|	|
Inner diameter: 1.8 mm, orange,	*100 meter lengths*															|	|	|	|
Suitable for indoor and outdoor use	Length: 0 m +															0	|	|	|
(Base material: AT-VHBH 2G62.5/125)	Length: 100 m +															1	|	|	|
Length selection:	Length: 200 m +															2	|	|	|
Increment is 10 m up to 490 m	Length: 300 m +															3	|	|	|
Increment is 50 m from 500 m on	Length: 400 m +															4	|	|	|
Custom lengths upon request from the supplier	Length: 500 m +															5	|	|	|
	Length: 600 m +															6	|	|	|
	Length: 700 m +															7	|	|	|
	Length: 800 m +															8	|	|	|
[1] Please note: For this version, add the short identifier "N1A" to the order number.	Length: 900 m +														[1]	9	|	|	|
	10 meter lengths																|	|	|
	Length: 0 m +																A	|	|
	Length: 10 m +																B	|	|
	Length: 20 m +																C	|	|
	Length: 30 m +																D	|	|
	Length: 40 m +																E	|	|
	Length: 50 m +																F	|	|
	Length: 60 m +																G	|	|
	Length: 70 m +																H	|	|
	Length: 80 m +																J	|	|
	Length: 90 m +																K	|	|
	1 meter lengths																	|	|
	Length: 0 m +																	A	|
	Length: 1 m +																	B	|
	Length: 2 m +																	C	|
	Length: 3 m +																	D	|
	Length: 4 m +																	E	|
	Length: 5 m +																	F	|
	Length: 6 m +																	G	|
	Length: 7 m +																	H	|
	Length: 8 m +																	J	|
	Length: 9 m +																	K	|
	1000 meter lengths																		|
	Length: 0 m +																		0
	Length: 1000 m +																		1
	Length: 2000 m +																		2

Fiber-Optic Cable – 6XV8100/6XV8200 – Selection and Ordering Data

Selection and Ordering Data

Description	Versions	Order no.																
		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
Glass optical fiber duplex indoor cable for MTRJ connectors		6	X	V	8	1	0	0	-	0	B	G	☐	1	-	☐	☐	☐	0
													▲			▲	▲	▲	
2 breakout elements,	*Connectors*												|			|	|	|	
Fiber type: glass, 62.5/125 um,	1 end prepared for MTRJ connector, other end for FSMA/K connector												1			|	|	|	
Halogen-free and flame-resistant,	1 end prepared for MTRJ connector, other end for ST connector												2			|	|	|	
Outer diameter: 2.8 x 4.5 mm, orange	Both ends prepared for MTRJ connectors, physically crossed												3			|	|	|	
Inner diameter: 1.8 mm, orange,	1 end prepared for MTRJ connector, other end for SC connector												4			|	|	|	
Inner diameter: 1.7 mm, orange,	1 end prepared for MTRJ connector, other end for LC connector												5			|	|	|	
number printing. For indoor use	Both ends prepared for MTRJ connectors, physically uncrossed												6			|	|	|	
(Base material: I-VHH 2x1xG62.5/125)																|	|	|	
Length selection:	*100 meter lengths*															|	|	|	
Increment is 1 m up to 49 m	Length: 0 m +															0	|	|	
Increment is 10 m from 50 m on	Length: 100 m +															1	|	|	
Custom lengths upon request from the supplier	Length: 200 m +															2	|	|	
	Length: 300 m +															3	|	|	
[1] Please note: For this version, add the short identifier "N1A" to the order number.	Length: 400 m +															4	|	|	
	Length: 500 m +															5	|	|	
	Length: 600 m +															6	|	|	
	Length: 700 m +															7	|	|	
	Length: 800 m +															8	|	|	
	Length: 900 m +														[1]	9	|	|	
	10 meter lengths																|	|	
	Length: 0 m +																A	|	
	Length: 10 m +																B	|	
	Length: 20 m +																C	|	
	Length: 30 m +																D	|	
	Length: 40 m +																E	|	
	Length: 50 m +																F	|	
	Length: 60 m +																G	|	
	Length: 70 m +																H	|	
	Length: 80 m +																J	|	
	Length: 90 m +																K	|	
	1 meter lengths																	|	
	Length: 0 m +																	A	
	Length: 1 m +																	B	
	Length: 2 m +																	C	
	Length: 3 m +																	D	
	Length: 4 m +																	E	
	Length: 5 m +																	F	
	Length: 6 m +																	G	
	Length: 7 m +																	H	
	Length: 8 m +																	J	
	Length: 9 m +																	K	

Selection and Ordering Data

Description	Versions	Order no.																
		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
Glass optical fiber duplex indoor cable for MTRJ connectors		6	X	V	8	1	0	0	-	0	C	F	☐	☐	-	☐	☐	☐	0
													▲	▲		▲	▲	▲	
2 breakout elements,	*Connectors*												|	|		|	|	|	
Fiber type: glass, E9/125 um,	Without												0	1		|	|	|	
Halogen-free and flame-resistant,	1 end pre-assembled with ST connector, other end with SC connector												1	1		|	|	|	
Outer size diameter = 3.9 x 6.8 mm, yellow,	1 end prefabricated with ST connector, other end with LC connector												1	2		|	|	|	
Inner size diameter = 2.8 mm, red + green, number printing	1 end prefabricated with FC/PC connector, other end with SC connector												2	1		|	|	|	
For indoor use/differential protection	1 end pre-assembled with ST connector												3	1		|	|	|	
(Base material: I-VHH 2x1xE9/125)	Both ends pre-assembled with ST connectors												4	1		|	|	|	
Length selection:	Both ends prefabricated with LC connectors												5	1		|	|	|	
Increment is 1 m up to 49 m	1 end pre-assembled with FC/PC connector												6	1		|	|	|	
Increment is 10 m from 50 m on	Both ends prefabricated with FC/PC connectors												7	1		|	|	|	
Custom lengths upon request from the supplier	1 end pre-assembled with FC/PC connector, other end with ST connector												8	1		|	|	|	
													|	|		|	|	|	
[1] Please note: For this version, add the short identifier "N1A" to the order number.	1 end pre-assembled with E2000 connector												1	3		|	|	|	
	1 end prefabricated with E2000 connector, other end with ST connector												1	4		|	|	|	
	1 end prefabricated with E2000/APC 8° connector, other end with ST connector												1	5		|	|	|	
	1 end prefabricated with FC/PC connector, other end with LC connector												1	6		|	|	|	
	1 end prefabricated with SC connector, other end with LC connector												1	7		|	|	|	
	Both ends prefabricated with SC connectors												1	8		|	|	|	
													|	|		|	|	|	
	1 end prefabricated with DIN connector, other end with LC connector												2	2		|	|	|	
	1 end prefabricated with SC/APC 9° connector, other end with LC connector												2	3		|	|	|	
	1 end prefabricated with SC/APC 9° connector, other end with ST connector												2	4		|	|	|	
	1 end prefabricated with E2000/APC 8° connector, other end with ST connector												2	5		|	|	|	
	100 meter lengths															|	|	|	
	Length: 0 m +					1										0	|	|	
	Length: 100 m +															1	|	|	
	Length: 200 m +															2	|	|	
	Length: 300 m +															3	|	|	
	Length: 400 m +															4	|	|	
	Length: 500 m +															5	|	|	
	Length: 600 m +															6	|	|	
	Length: 700 m +															7	|	|	
	Length: 800 m +															8	|	|	
	Length: 900 m +														[1]	9	|	|	
Continued on next page																	|	|	

Description	Versions	Order no.																
		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
Glass optical fiber duplex outdoor cable for MTRJ connectors		6	X	V	8	1	0	0	-	0	C	F	☐	☐	-	☐	☐	☐	0
Continued																	▲	▲	
																	|	|	
	10 meter lengths																|	|	
	Length: 0 m +																A	|	
	Length: 10 m +																B	|	
	Length: 20 m +																C	|	
	Length: 30 m +																D	|	
	Length: 40 m +																E	|	
	Length: 50 m +																F	|	
	Length: 60 m +																G	|	
	Length: 70 m +																H	|	
	Length: 80 m +																J	|	
	Length: 90 m +																K	|	
	1 meter lengths																	|	
	Length: 0 m +																	A	
	Length: 1 m +																	B	
	Length: 2 m +																	C	
	Length: 3 m +																	D	
	Length: 4 m +																	E	
	Length: 5 m +																	F	
	Length: 6 m +																	G	
	Length: 7 m +																	H	
	Length: 8 m +																	J	
	Length: 9 m +																	K	

Selection and Ordering Data

Description	Versions	Order no.																	
		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
Optical fiber set		6	X	V	8	2	0	0	-	0	A	A	0	0	-	0	A	A	0
For connecting devices with FSMA Connector sockets to existing optical fiber structures with ST sockets. Contains: GLASS OPTICAL FIBER DUPLEX indoor cable (1 m) 6XV8100-0BE51-0AB0 FSMA/ST and 2 FSMA/FSMA bus couplers For devices of the old hardware version with FSMA connector sockets Application for optical components: • 7XV5450 Mini Star Coupler • 7XV5550 active mini star coupler • 7XV5652 optical fiber–RS232 • 7XV5650/51 optical fiber–RS485 and applications for SIMEAS components 7KE6000-8A: • SIMEAS HUB • SIMEAS sync transceiver with FSMA connection • SIMEAS Ethernet transceiver with FSMA connection																			

Description

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

Overview

- Ethernet Y-adaptor cable – 7KE6000-8GDx
- Connecting cable for current channels – 7KE6000-8GAx
- Connecting cable for voltage channels – 7KE6000-8GBx
- Connecting cable for binary inputs – 7KE6000-8GCx
- Ethernet Patch Cable, double shielded (SFTP), LAN Connector at both Ends – 7KE6000-8GDx
- Ethernet Patch Cable, double shielded (SFTP), crossed, LAN Connector at both Ends – 7KE6000-8GEx

[ph_7KE6000, 1, --_--]

Figure 3.2/1 Ethernet Patch Cable

Ethernet Patch Cable – 7KE6000 – Ordering and Selection Data

Selection and Ordering Data

Description	Versions	Order no.																				
		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16	Short code		
Ethernet Y-adaptor		7	K	E	6	0	0	0	-	8	G	**D**	0	0	-	0	B	A	2			
1 LAN connector – 2 LAN sockets 0.2 m for cascading devices with integrated switch function, for example, 7XV567																						
Connecting cable for current channels		7	K	E	6	0	0	0	-	8	G	**A**	0	0	-	0	□	□	□	-	□	□	□
Line, 8-wire, 2.5 mm²																	▲	▲	▲		▲	▲	▲
For 4 current channels	Without packaging																A	|	|		|	|	|
Please note:	With end sleeves on one end																B	|	|		|	|	|
Minimum order length: 2 m	With end sleeves on both ends																C	|	|		|	|	|
																		|	|		|	|	|
	Without core marking and tagging																	A	|		|	|	|
	With core marking and tagging																	B	|		|	|	|
																			|		|	|	|
	Length: 2 m																		2		|	|	|
	Length: 3 m																		3		|	|	|
	Length: 4 m																		4		|	|	|
	Length: 5 m																		5		|	|	|
	Length: 6 m																		6		|	|	|
	Length: 7 m																		7		|	|	|
	Length: 8 m																		8		|	|	|
	Length: 9 m																		9		R	1	A
	Special lengths (specify length in plain text)																		9		R	1	Y
Connecting cable for voltage channels		7	K	E	6	0	0	0	-	8	G	**B**	0	0	-	0	□	□	□	-	□	□	□
Line, 8-wire, 0.75 mm²																	▲	▲	▲		▲	▲	▲
For 4 voltage channels	Without packaging																A	|	|		|	|	|
Please note:	With end sleeves on one end																B	|	|		|	|	|
Minimum order length: 2 m	With end sleeves on both ends																C	|	|		|	|	|
																		|	|		|	|	|
	Without core marking and tagging																	A	|		|	|	|
	With core marking and tagging																	B	|		|	|	|
																			|		|	|	|
	Length: 2 m																		2		|	|	|
	Length: 3 m																		3		|	|	|
	Length: 4 m																		4		|	|	|
	Length: 5 m																		5		|	|	|
	Length: 6 m																		6		|	|	|
	Length: 7 m																		7		|	|	|
	Length: 8 m																		8		|	|	|
	Length: 9 m																		9		R	1	A
	Special lengths (specify length in plain text)																		9		R	1	Y

Selection and Ordering Data

Description	Versions	Order no.																					
		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16	Short code			
Connecting cable for binary inputs		7	K	E	6	0	0	0	-	8	G	**C**	0	0	-	0	□	□	□	-	□	□	□
Line, 32-wire, 0.25 mm^2																	▲	▲	▲		▲	▲	▲
Please note: Minimum order length: 2 m	Without packaging																A	|	|		|	|	|
	With end sleeves on one end																B	|	|		|	|	|
	With end sleeves on both ends																C	|	|		|	|	|
																		|	|		|	|	|
	Without core marking and tagging																	A	|		|	|	|
	With core marking and tagging																	B	|		|	|	|
																			|		|	|	|
	Length: 2 m																		2		|	|	|
	Length: 3 m																		3		|	|	|
	Length: 4 m																		4		|	|	|
	Length: 5 m																		5		|	|	|
	Length: 6 m																		6		|	|	|
	Length: 7 m																		7		|	|	|
	Length: 8 m																		8		|	|	|
	Length: 9 m																		9		R	1	A
	Special lengths (specify length in plain text)																		9		R	1	Y
Ethernet patch cable, double shielded (SFTP), LAN connectors at both ends		7	K	E	6	0	0	0	-	8	G	**D**	0	□	-	□	A	A	□				
SIMEAS ↔ HUB														▲		▲			▲				
HUB ↔ 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	□				
HUB ↔ HUB														▲		▲			▲				
SIMEAS R ↔ 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				

Serial DIGSI Cable – 7XV5100

Description/Overview

Serial RS232 communication cables (wire/optical fiber)

- 7XV5100-0/BB – PC/PG, 25-pole, to the 25-pole protection device
  The serial connecting cable connects a serial 25-pole PC interface (for example, COM1) or a PG 685 interface to a protection device with a 25-pole user interface.
- 7XV5100-1 – PG 750 to 25-pole protection device
  The serial connecting cable connects a serial 25-pole PG 750 interface with a connector plug to a protection device with a 25-pole user interface.
- 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.
- 7XV5100-3 – PG 750 (COM2) to the 1604 plotter
  The serial connecting cable connects a serial 9-pole PG 750 interface COM2 to a 1604 plotter with HP emulation with a 25-pole connector plug.
- 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 was 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.
- 7XV5100-4 – (/BB) Other applications
  The following devices have the same pin assignment as the protection device with the 9-pole interface and can also be connected to a PC or laptop computer using this cable.
  – (Mini) star coupler 7XV5300, 7XV5450
  – Active mini star coupler 7XV5550
  – RS232-optical fiber converter 7XV5652
- 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.
- 7XV5100-4A – PC/PG, 9-pole, to the local interface of the 7XV5500 channel switch
  The serial connecting cable connects the PC to the local interface of the 7XV5500 channel switch.
- 7XV5100-5 – PC / PG, 25-pole, to the 9-pole protection device
- 7XV5100-6 – serial RS232 cable with a galvanic separation via the fiber-optic cable
  These cables connect the PC to the protection device in an isolated manner with extremely high noise immunity via fiber-opticopticral cables. The RS232 level is converted to light using what are known as "self-sufficient units" without an additional power supply by using the auxiliary voltage from the data signals. To do this, the interface of the connected device (even a laptop computer running on batteries) must supply at least +/- 5 V signals. Baud rates up to 115 kB are then possible.

[ph_7XV5100, 1, --_--]

Figure 3.3/1 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.

Selection and Ordering Data

Description	Versions	Order no.											
		1	2	3	4	5	6	7		8	9	10	11	12
Copper connecting cable between														
	Laptop computer/PC/9-pole socket and protection device/25-pole plug, length: 3 m	7	X	V	5	1	0	0	-	2				
	Laptop computer/PC/9-pole socket and protection device/9-pole plug, length: 3 m	7	X	V	5	1	0	0	-	4				
	Laptop computer/PC/25-pole socket and protection device/9-pole plug, length: 3 m	7	X	V	5	1	0	0	-	5				
	RS232/RS485 converter/25-pole connector and protection device/single wire ring cable protection, length: 1 m	7	X	V	5	1	0	0	-	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	7	X	V	5	1	0	0	-	8	H			

RS485 Bus System – 7XV5103

Description

The RS485 bus is a cost-effective half-duplex communications bus which is not only used for the monitoring and control of industrial plants but, thanks to its high immunity, 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 shielded twisted-pair cable (STP). Under ideal conditions, the bus may 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.

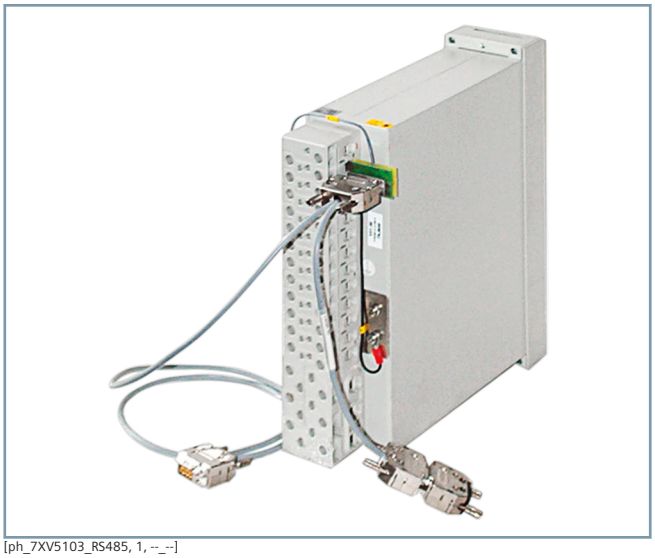
The bus system with 9-pole D-SUB connectors has been used in systems with SIPROTEC protection devices, 7XV5 converters, and central units for a long time. The individual devices are connected directly using a special Y-cable or a suitable adaptor cable for devices with different termination methods.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

With some SIPROTEC devices, the serial signals are routed to the RJ45 sockets on the communication module, as for example in 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



[ph_7XV5103_RS485, 1, --_--]

Figure 3.4/1 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

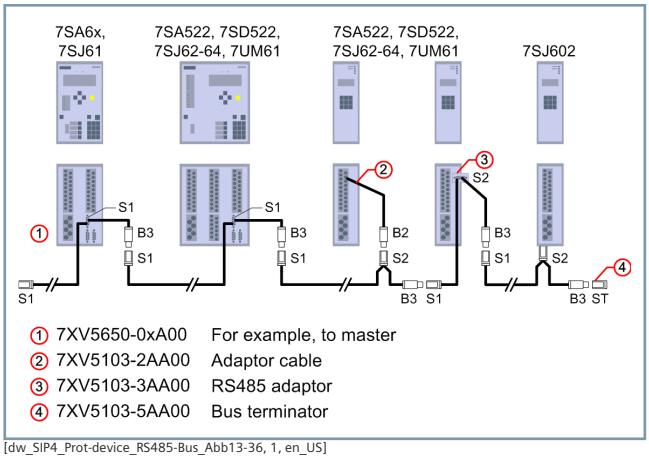
The bus system with 9-pole D-SUB connector plugs

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

Application Examples

Example 1

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 to 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.



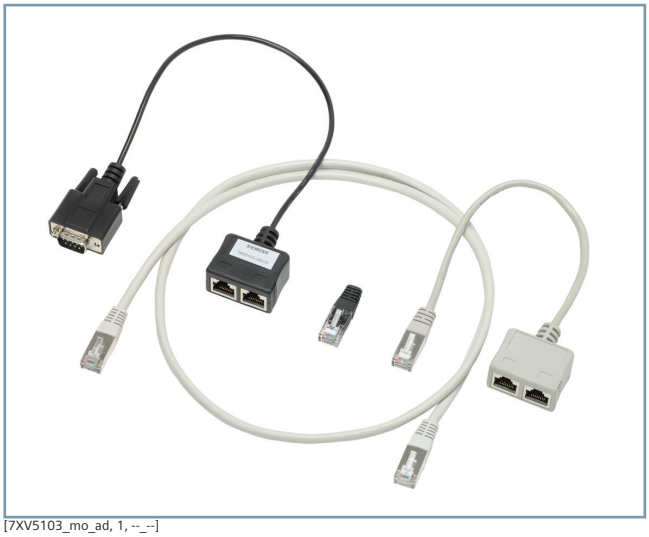
[dw_SIP4_Prot-device_RS485-Bus_Abb13-36, 1, en_US]

Figure 3.4/2 SIPROTEC Protection Devices on the RS485 Bus

Bus System with RJ45 Patch Cables

The bus system with RJ45 plugs was developed especially for SIPROTEC devices for communication modules with serial RJ45 plugs and is built using cost-effective double shielded CAT 5 patch cables.

The individual devices are connected to the two redundant buses via two 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 3.4/3 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 interfaces 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 optical fiber 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 optical fiber 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.

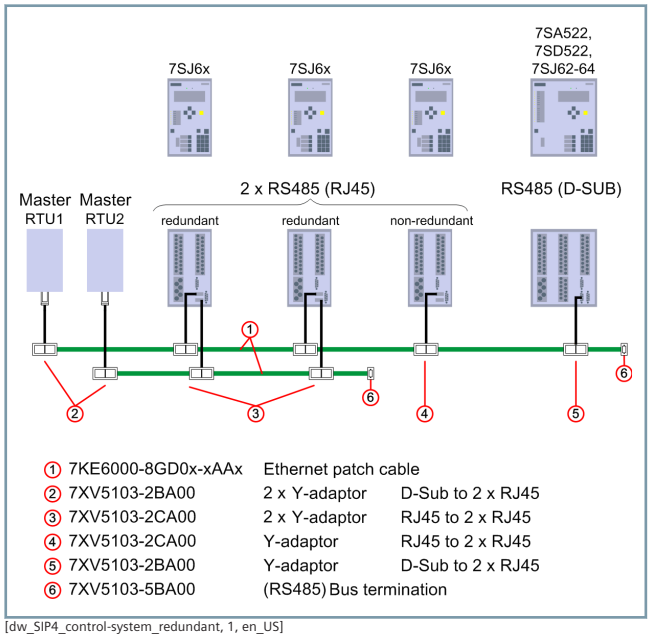
Only double-shielded CAT 5 patch cables (for example, 7KE6000) may be used as bus cables. The maximum bus length must not exceed 800 m.

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 may 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 may be active at a timein each bus and only one slave may respond.

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



[dw_SIP4_control-system_redundant, 1, en_US]

Figure 3.4/4 Connection of a SIPROTEC 4 to a (redundant) Control System

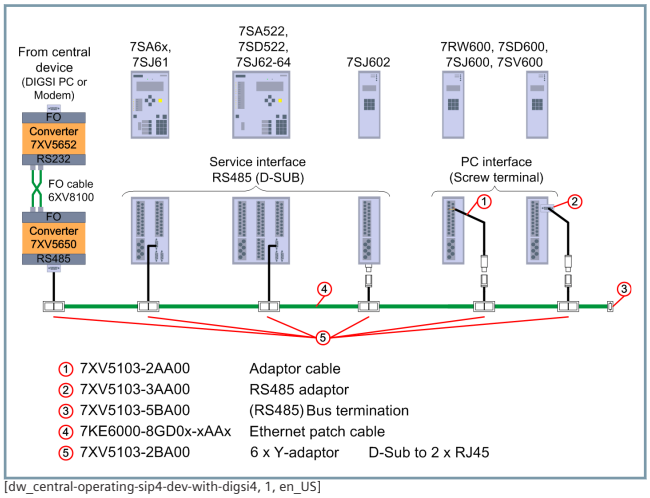
The RS485 bus cable system using patch cables (CAT 5) was developed as a cost-effective alternative to the previous 7XV5103 systems with D-SUB connector plugs. The advantages are the global use of patch cables and the compact dimensions of the RJ45 plug. This allows a redundant IEC 60870-5-103 interface 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 two 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, two Y-adaptors are necessary for each SIPROTEC 4 device.

After the last device, the bus is terminated using a 7XV5103-5AA00 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, 1, en_US]

Figure 3.4/5 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 previous 7XV5103 systems with D-SUB connector plugs. The advantages are the global use of patch cables and the compact dimensions of the RJ45 plug.

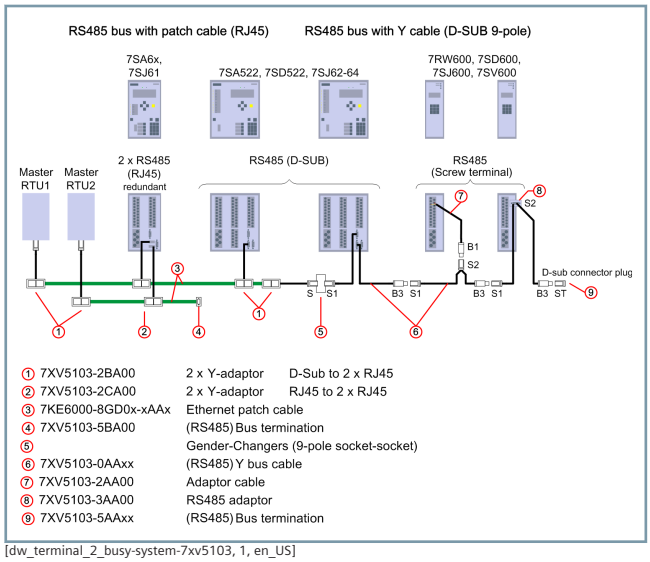
The 7XV5103-2BA00 Y-adaptor makes it possible to implement an RS485 bus using patch cables and to connect various SIPROTEC devices with RS485 interfaces. The Y-adaptors have two parallel RJ45 sockets to implement the buses. The approx. 20 cm long connecting cable to the device has one RJ45 plug with 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 7XV5103-5AA00 bus termination plug.

Example 4: Connecting two 7XV5103 Bus Systems



[dw_terminal_2_busy-system-7xv5103, 1, en_US]

Figure 3.4/6 Connecting two 7XV5103 Bus Systems

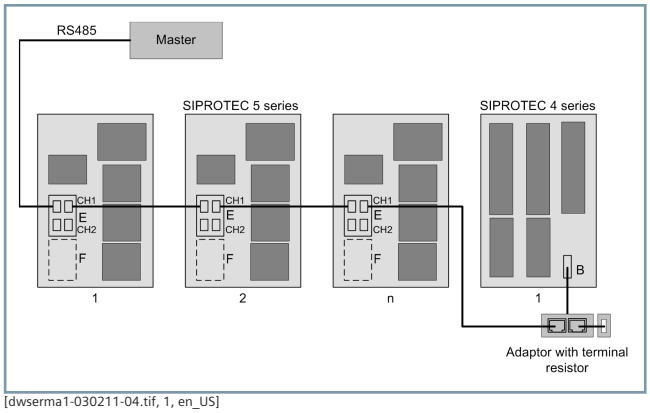
The 7XV5103-2BA00 Y-adaptor makes it possible to configure an RS485 bus using RJ45 patch cables and to connect SIPROTEC devices with an RS485 interface via a D-SUB connector plug.

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

Example 5: Connecting the SIPROTEC 5 series with devices of 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 note 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.



[dwserma1-030211-04.tif, 1, en_US]

Figure 3.4/7 Cabling example SIP4 und SIP 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

RS485 Bus System – 7XV5103 – Selection and Ordering Data

Selection and Ordering Data

Description	Versions	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	-	0	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 adaptor	For compact protection devices for terminal installation to 7RW600, 7SS601, 7SV60 from screw terminals to 9-pole D-SUB plug (socket)									3	A			
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

Description

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

Applications

If 7SA or 7SD 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 7XV5461-0Bx00 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 3.5/1 10-dB Attenuator

Distance	Module/device	Attenuator required	Comments
24 km	C53207A 351D655 1 / 7XV5461-0BG00	No	No constraint
60 km	C53207A 351D656 1 / 7XV5461-0BH00	At s < 25 km	-
100 km	C53207A 351D657 1 / 7XV5461-0BJ00	At s < 50 km	-
170 km	No module / 7XV5461-0BM00	At s < 100 km	Required or damage to the optical receivers

Selection and Ordering Data

Description	Versions	Order no.											
		1	2	3	4	5	6	7		8	9	10	11	12
Optical attenuators (minimum order: 2)		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 7SD / 7SA or 7XV5461 repeater. 10-dB optical attenuation to avoid overdriving over short distances. LC duplex connection														
Connection kit for optical fiber infrastructure		7	X	V	5	1	0	7	-	0	B	B	0	0
For connecting EN100-O (+) with LC duplex plugs to existing optical fiber structures with ST plugs. Contains: 2 patch cables with LC/ST connectors, 62.5 µm/125 µm, length: 1 m, 4 ST/ST couplers														

7XV5450 Mini Star Coupler

Description

The mini star coupler multiplies one optical signal received at its input to up to four outputs. A signal received at one of the outputs is transmitted via the input interface to a central controller or to an upstream mini star coupler or converter.

As the mini star coupler does not transmit selectively to individual outputs, data is transmitted using protocols with unambiguous DTE addressing so that all devices can "hear" a central query but only the addressed device response to the query (for example, IEC 60870-5-103 or DIGSI 4). Furthermore, different time synchronization information can be transmitted to SIPROTEC 3/4/5.

Data is transmitted transparently in full-duplex operation. An RS232 interface is provided on each mini star coupler for direct serial communication with DTEs. As long as this interface is used, the optical input interface to the central controller is blocked.

Cascading several mini star couplers replaces the 7XV5300 star coupler.

Benefits

- 1 optical input and up to 4 optical outputs
- Maximum distance: 1.5 km at 62.5/125 µm, multimode optical fiber
- Several mini star couplers can be cascaded.
- RS232 interface for local access
- Baud rate for optical fiber: max. 1.5 mBd, Baud rate for RS232: max. 115 kBd
- Protocol transparency
- Non-flickering light: Can be switched to light ON/light OFF
- Wide-range Power Supply Unit with Self Monitoring and Signaling Contact
- Optical ST connector

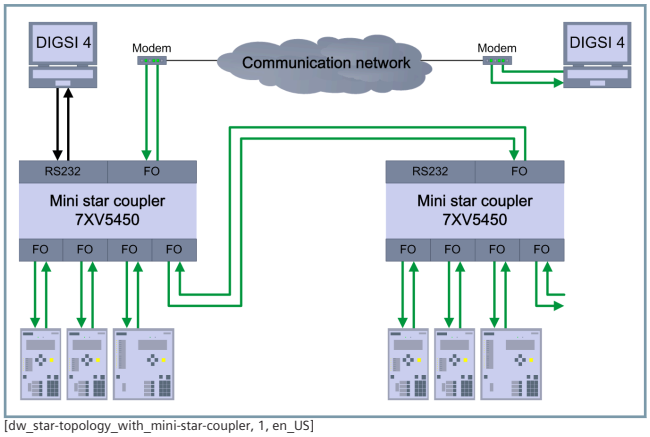
Applications

SIPROTEC devices can be centrally operator or remotely queried via optical interfaces with DIGSI 4 using the mini star coupler. The component may be cascaded so that star topologies or ring topologies can be configured. A ring structure ensures that all 4 outputs are used. The mini star coupler has a local RS232 socket. By connecting a PC via this interface and using the 7XV5100-4 cable, the optical input is separated to avoid a data collision due to a local access and remote access at the same time.

[ph_7XV5450_W3, 1, --_--]

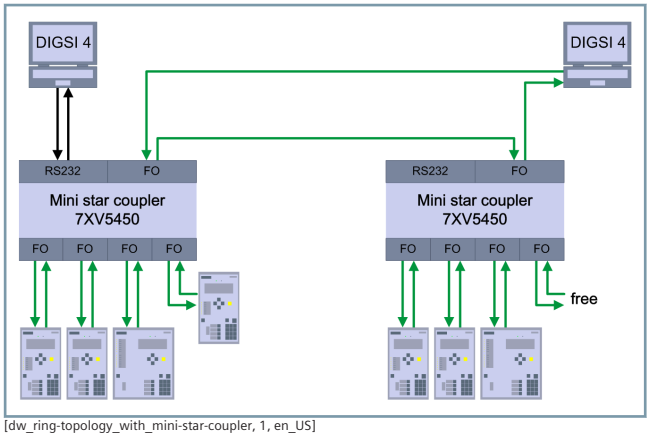
Figure 3.6/1 7XV5450 Mini Star Coupler

Application Examples



[dw_star-topology_with_mini-star-coupler, 1, en_US]

Figure 3.6/2 Star Topology using Mini Star Couplers



[dw_ring-topology_with_mini-star-coupler, 1, en_US]

Figure 3.6/3 Ring Structure using Mini Star Couplers

Technical Data

Rated auxiliary voltage	
24 to 250 VDC and 60 to 230 VAC	± 20% without switchover

Current consumption	
Approx. 0.25 to 0.4 A	

LEDs	
3 LEDs	
Green	Operating voltage OK
Yellow	Receiving data
Yellow	Transmitting data

Connector plug	
Power supply	2-pole Phoenix screw terminal
Fiber-Optic Cables	Multimode optical fiber with ST connectors
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

Surface Mounting

The 7XV5450 mini star coupler 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	Versions	Order no.												
		1	2	3	4	5	6	7		8	9	10	11	12
Optical mini star coupler		7	X	V	5	4	5	0	-	0	B	A	0	0
For centrally operating 4 Siemens V3/V4 protection devices with DIGSI V3/V4, as well as For the transmission of serial communication and time synchronization information for V3/V4/V5. 1 optical input and 4 optical outputs, can be cascaded, auxiliary voltage: 24 to 250 VDC and 110 to 220 VAC with fault alarm relay, connection of protection devices, PC or modem using optical fiber, 820 nm, ST connectors, for DIN rail mounting.														

Two-Channel Serial optical Repeater – 7XV5461 – Up to 40 km

Description

The optical repeater exchanges serial optical signals over long distances via only 1 singlemode glass fiber-optic serial cable. 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 may 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, may 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

- Two 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 connector for distances up to 40 km using a singlemode fiber-optic cable at 9/125 µm
- Wide-range power supply unit of 24 to 250 VDC and 115 to 230 VAC with alarm relay
- Display of the data traffic via LED
- Integrated commissioning aids

Applications

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

The connection to the protection device is provided interference-proof by means of a fibreoptic connection. The maximum optical transmission distance between the protection device and FO-Repeater is specified to 1.5 km, when a 62.5/125 µm or 50/125 µm fibre-optic cable is used.

The FO-Repeater supports easy commissioning of the entire communications path. The loops for port 1/2 can be activated for commissioning so that the input signals are mirrored on the respective port. The repeater has a relay contact to output a "device ready" signal (DR) and has also a wide range power supply unit covering the entire normal DC and AC auxiliary voltage range.

Until now, two FO cables are required for the bidirectional transmission of protection signals. With the repeater with integrated wavelength multiplexer one FO cable is sufficient.

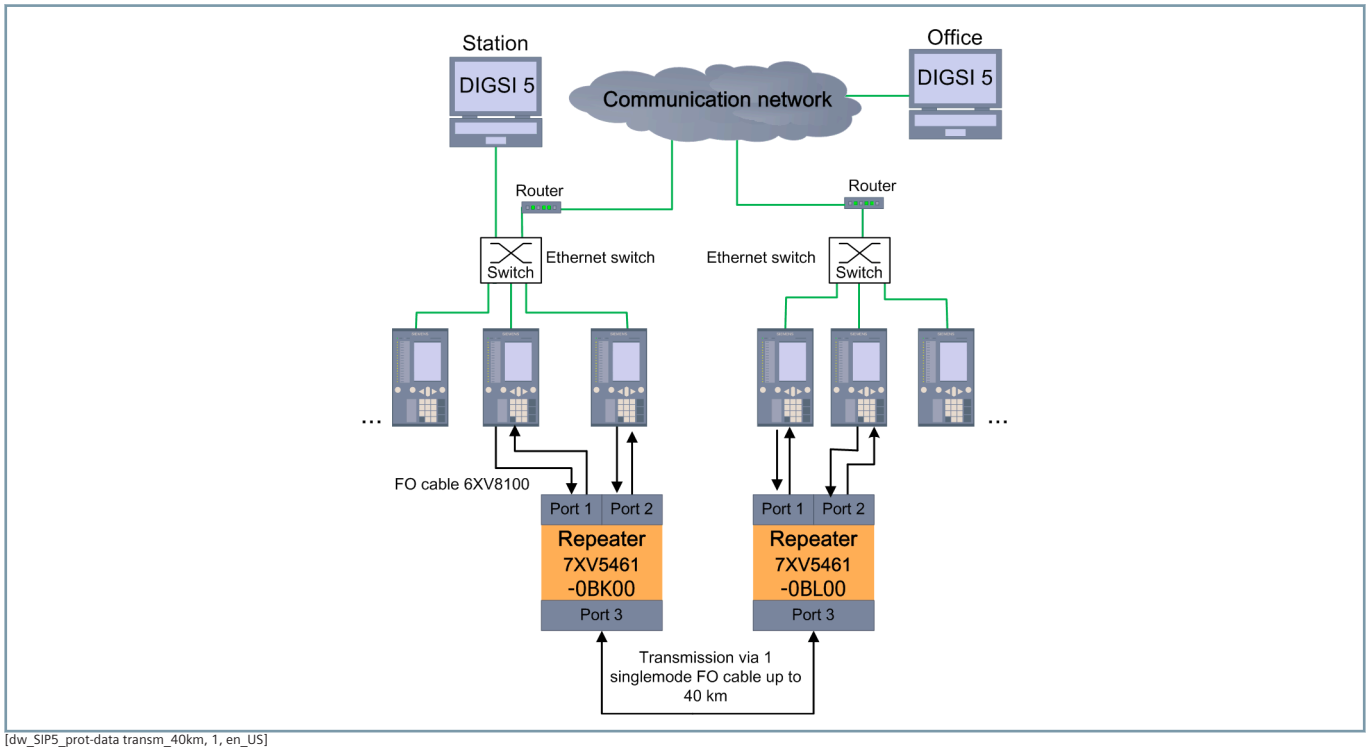
[ph_7XV5461_W3, 1, --_--]

Figure 3.7/1 Optical Repeater with Integrated Multiplexer with 1300 nm/1550 nm Wavelength for 1 Singlemode Fiber-Optic Cable

Via port 2 it is possible to connect substation control devices, RTU or additional protection data transmissions. This makes for optimum use of the long-distance foptic cable for two separate serial connections for transmitting serial data between 300 bit/s and 4.096 Mbps.

Application Example with SIPROTEC 5 and DIGSI 5

Figure 3.7/2 shows the interference-free data exchange of SIPROTEC 5 protection devices, e.g. 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, 1, en_US]

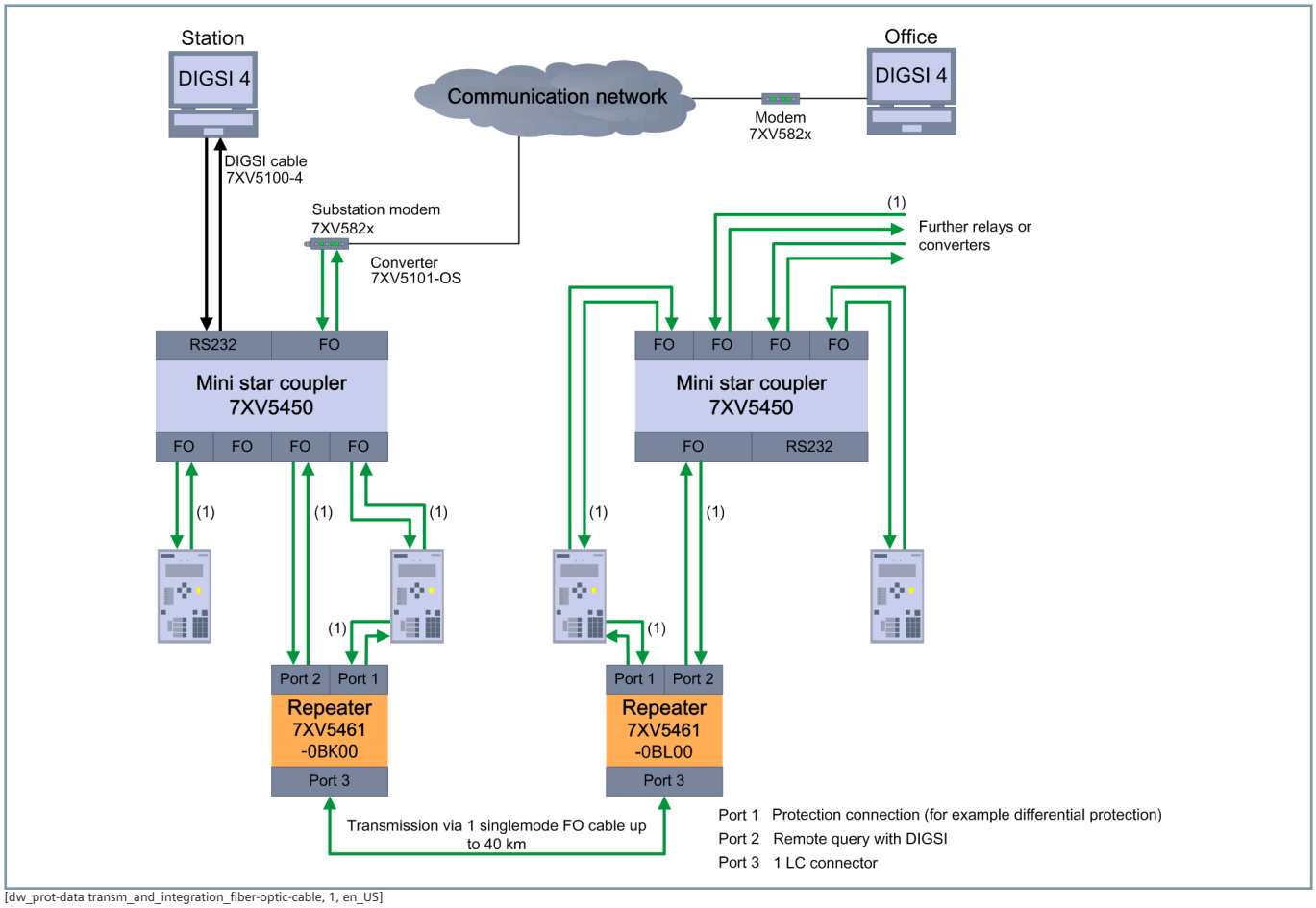
Figure 3.7/2 Transfer of Protection Data Signals of SIPROTEC 5 Devices via Single Mono-Mode FO Cable and DIGSI 5 Access via Ethernet (Note: Devices 7XV5461-0BK00 and 7XV5461-0BL00 must be Used in Pairs)

Application Example with SIPROTEC 4 and DIGSI 4

(see *Figure 3.7/3*)

Two protection devices, for example, differential protection 7SD52/7SD610 or distance protection 7SA52/7SA6, exchange information via port 1 (Po1). Data is exchanged interference-free using an optical singlemode fiber-optic cable covering a distance of up to 40 km. A protection remote control with DIGSI 4 is connected to port 2 of the repeater using a mini star coupler 7XV5450. A serial connection to other switchgear is established via this port using a PC with DIGSI 4 installed. The remote protection devices can be queried remotely via port 2.

The baud rate is optimally set to 57.6 Kbps so that there are no differences from local control. When commissioning and during operation, the data of the devices can be changed or read from the other switchgear.



[dw_prot-data transm_and_integration_fiber-optic-cable, 1, en_US]

Figure 3.7/3 Protection Data Transmission and Remote Control/Integration using one Singlemode Fiber-Optic Cable (Note: The 7XV5461-0BK00 and 7XV5461-0BL00 Devices must be used in Pairs.)

(1) Multimode fiber-optic cable with ST connectors (6XV8100)

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 singlemode 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

Selection and Ordering Data

Description	Versions	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	B	☐	0	0
												▲		
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	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		
	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		
Note: The -0BK00 and -0BL00 versions must be used in pairs.														

3.7

Two-Channel Serial optical Repeater – 7XV5461 – Up to 170 km

Description

The optical repeater transmits serial optical signals over long distances via duplex singlemode 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 4.096 Mbps. Synchronous and asynchronous signals may be connected. In this way, two 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, may 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 LC duplex connector in the wavelengths of 1300 nm/1550 nm for connection of a duplex singlemode fiber-optic cable. Using port 3, there are three 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.

[ph_7XV5461_W3, 1, --_--]

Figure 3.7/4 Optical Repeater with Wide-range Power Supply Unit

Benefits

- Two 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 connector 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 unit of 24 to 250 VDC and 115 to 230 VAC with alarm relay
- Display of the data traffic via LED
- Integrated commissioning aids

Applications

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

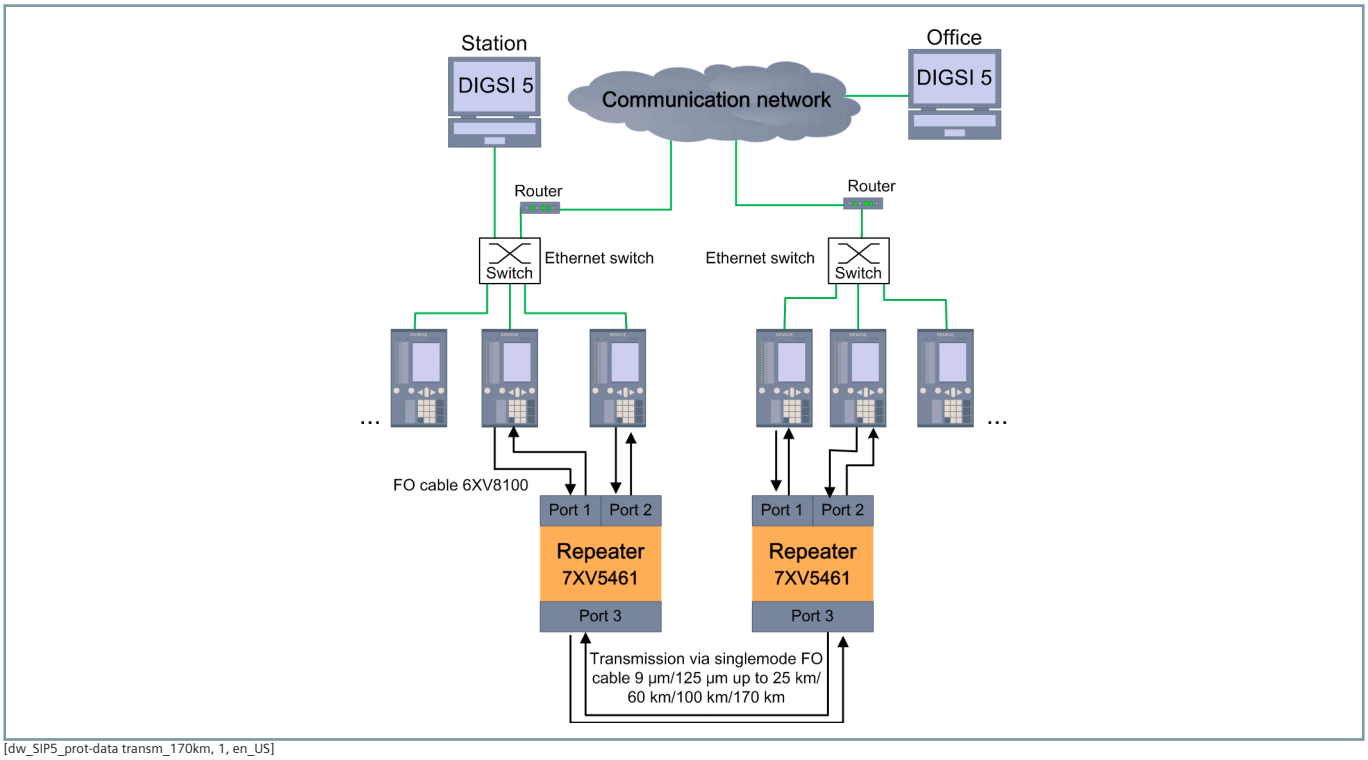
The connection to the protection device is provided interference-proof by means of a fibreoptic connection. The maximum optical transmission distance between the protection device and FO-Repeater is specified to 1.5 km, when a 62.5/125 µm or 50/125 µm fibre-optic cable is used.

The FO-Repeater supports easy commissioning of the entire communications path. The loops for port 1/2 can be activated for commissioning so that the input signals are mirrored on the respective port. The repeater has a relay contact to output a “device ready” signal (DR) and has also a wide range power supply unit covering the entire normal DC and AC auxiliary voltage range.

Via port 2 it is possible to connect substation control devices, or additional protection data transmissions. This makes for optimum use of the long-distance foptic cable for two separate serial connections for transmitting serial data between 300 bit/s and 4.096 Mbps.

Application Example with SIPROTEC 5 and DIGSI 5

Figure 3.7/5 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.



[dw_SIP5_prot-data transm_170km, 1, en_US]

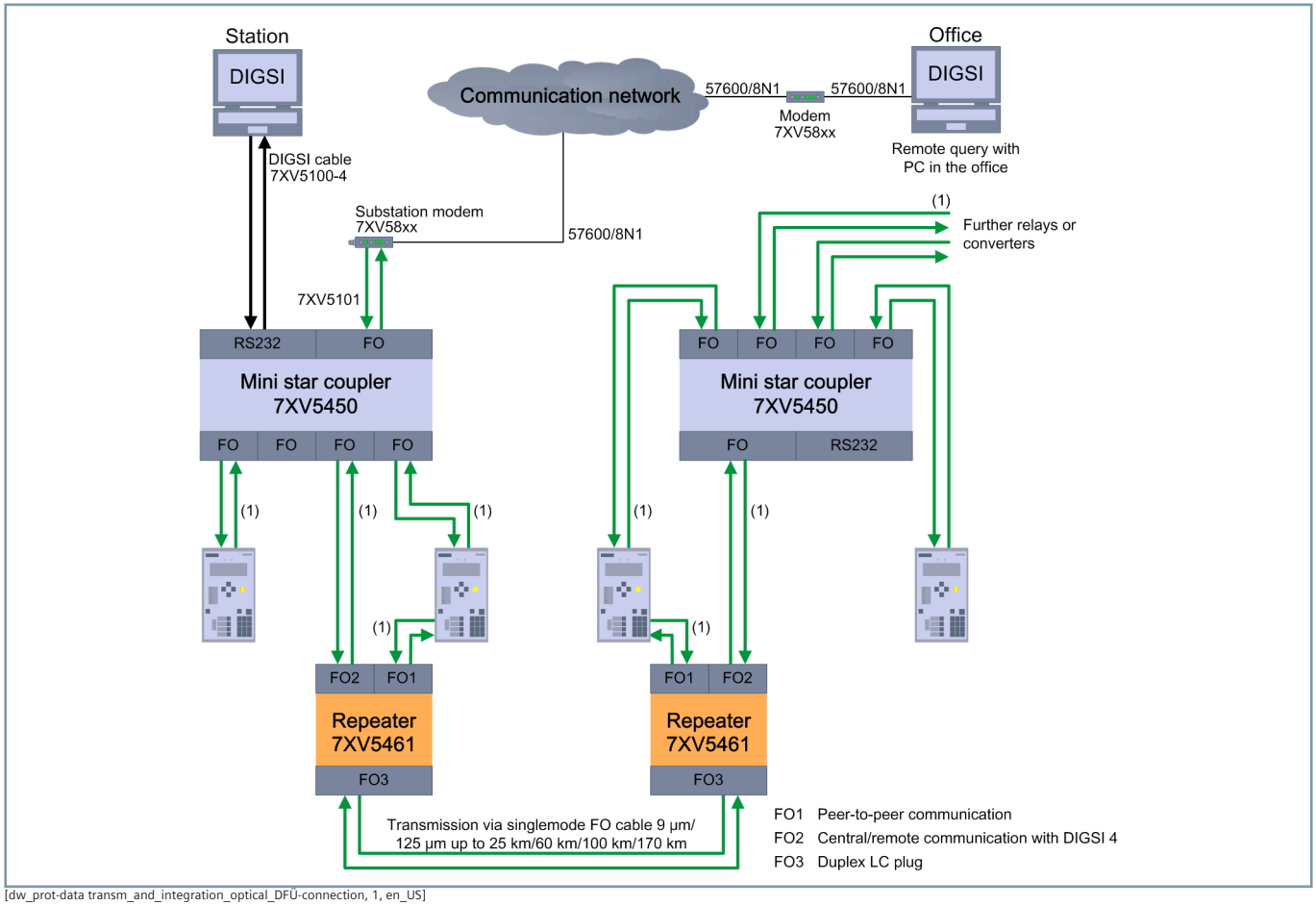
Figure 3.7/5 Transfer of Protection Data Signals of SIPROTEC 5 Devices via Duplex-Mono-Mode FO Cable and DIGSI 5 Access via Ethernet

Two-Channel Serial optical Repeater – 7XV5461 – Up to 170 km

Application

The protection devices (for example, differential protection 7SD5/7SD6 or distance protection 7SA52/7SA6) exchange information via port 1. Data is exchanged interference-free using an duplex mono mode fiber-optic cable covering a distance of 170 km. A protection remote control with DIGSI 4 is connected to port 2 of the repeater using a mini star coupler 7XV5450. A serial connection to other switchgear is established via this port using a PC with DIGSI 4 installed. The protection devices of the remote switchgear can be queried from a distance via port 2. The baud rate is optimally set to 57.6 Kbps so that there are no differences from local control.

When commissioning and during operation, the data of the device can be changed or read from the other switchgear.



[dw_prot-data transm_and_integration_optical_DFÜ-connection, 1, en_US]

Figure 3.7/6 Protection Data Transmission and Remote Control of Switchgear via an optical dial-up Network Connection

(1) Multimode fiber-optic cable with ST connectors (6XV8100)

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 multimode 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

Selection and Ordering Data

Description	Versions	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	B	☐	0	0
												▲		
For converting/amplifying multimode optical fiber, 50/125 µm or 62.5/125 µm (82 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 Unit, 24 to 250 VDC and 115/230 VAC 1 fault signaling contact for auxiliary voltage faults or loss of data connection	1300 nm/for transmission distances up to 24 km											G		
	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		
Note: Repeaters can only be used in pairs.														

Two-Channel Serial optical Repeater – 7XV5461 – Up to 8 km

Description

The optical repeater 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 may be connected. In this way, two 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).

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, may be connected to ports 1 and 2 via duplex multimode fiber-optic cables for distances of up to 1.5 km. These signals are transmitted to port 3 via the single LC duplex connector in the wavelengths of 1300 nm for connection of a duplex multimode fiber-optic cable. There are two 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.

[ph_7XV5461_W3, 1, --_--]

Figure 3.7/7 Optical Repeater with Wide-range Power Supply Unit

Benefits

- Two 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 connector for distances of up to 4 km/8 km using 50/125 µm/61.5/125 µm
- Wide-range power supply unit of 24 to 250 VDC and 115 to 230 VAC with alarm relay
- Display of the data traffic via LED
- Integrated commissioning aids with loop test option.

Applications

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

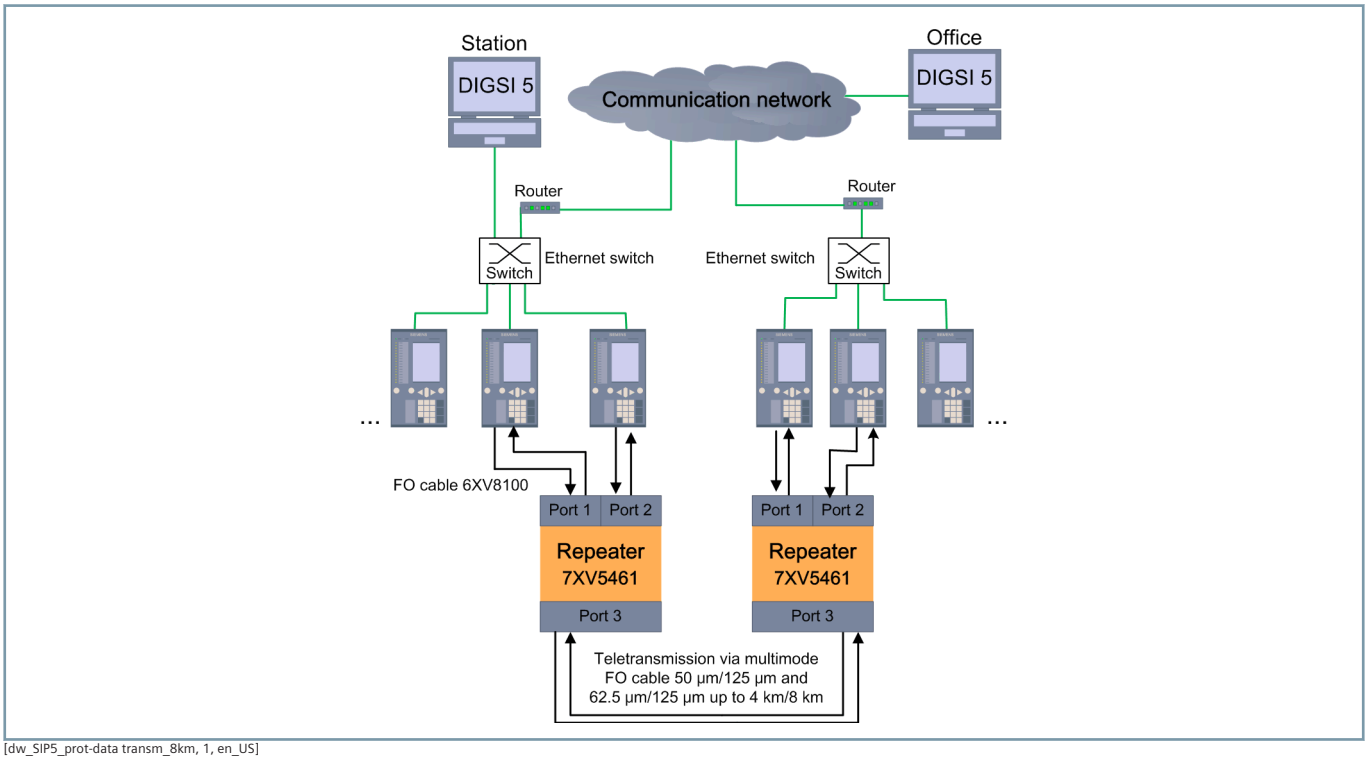
The connection to the protection device is provided interference-proof by means of a fibreoptic connection. The maximum optical transmission distance between the protection device and FO-Repeater is specified to 1.5 km, when a 62.5/125 µm or 50/125 µm fibre-optic cable is used.

The FO-Repeater supports easy commissioning of the entire communications path. The loops for port 1/2 can be activated for commissioning so that the input signals are mirrored on the respective port. The repeater has a relay contact to output a "device ready" signal (DR) and has also a wide range power supply unit covering the entire normal DC and AC auxiliary voltage range.

Via port 2 it is possible to connect substation control devices, or additional protection data transmissions. This makes for optimum use of the long-distance foptic cable for two separate serial connections for transmitting serial data between 300 bit/s and 4.096 Mbps.

Application Example with SIPROTEC 5 and DIGSI 5

Figure 3.7/8 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, 1, en_US]

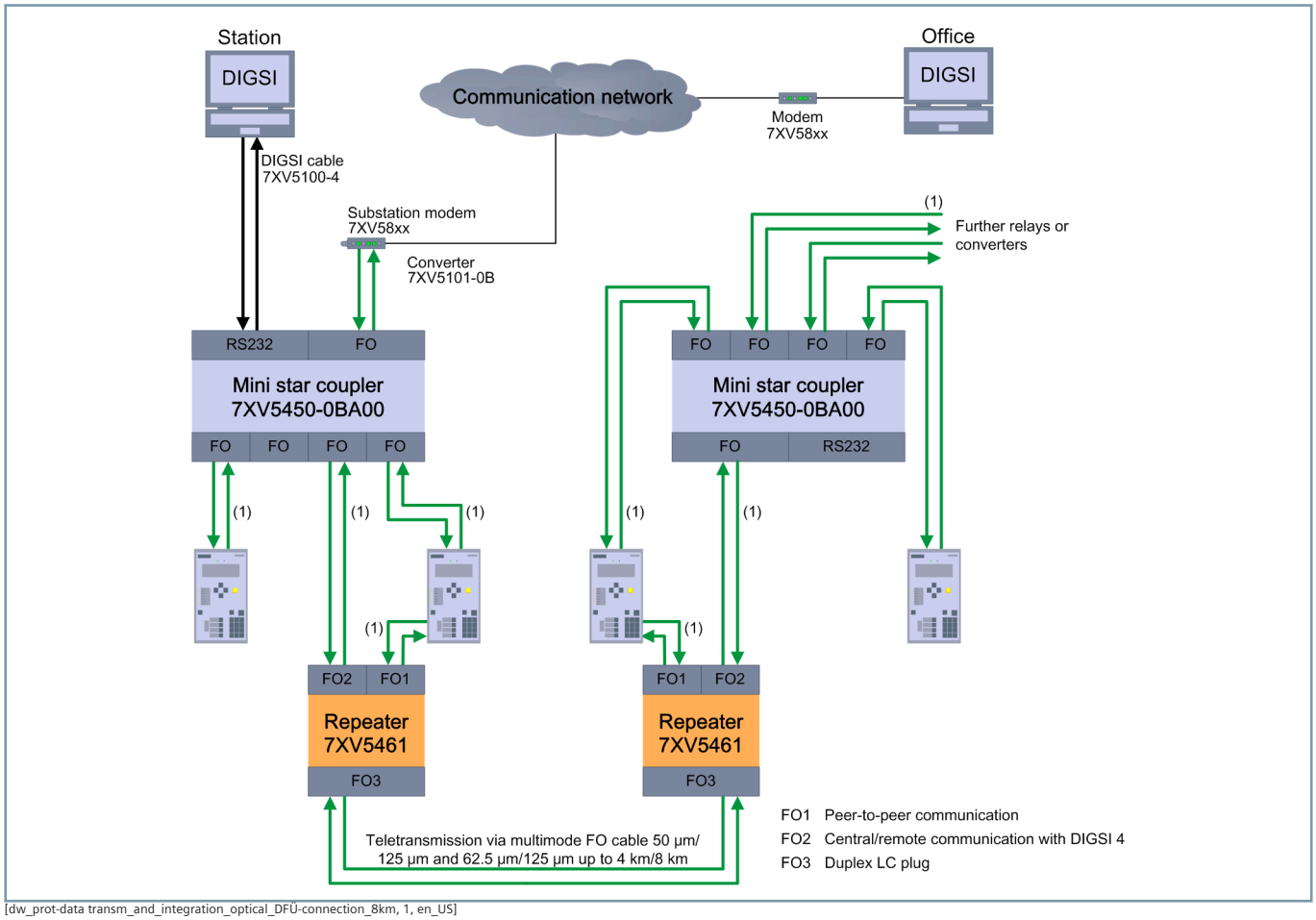
Figure 3.7/8 Transfer of Protection Data Signals of SIPROTEC 5 Devices via Duplex-Multi-Mode FO Cable and DIGSI 5 Access via Ethernet

Two-Channel Serial optical Repeater – 7XV5461 – Up to 8 km

Application Example with SIPROTEC 4 and DIGSI 4

Two protection devices (for example, differential protection 7SD52/7SD610 or distance protection 7SA52/7SA6) exchange information via port 1. Data is exchanged interference-free using an optical duplex multimode fiber-optic cable up to a distance of 4 to 8 km. A protection remote control with DIGSI 4 is connected to port 2 of the repeater using a mini star coupler 7XV5450. A serial connection to the other switchgear is established via this port using a PC with DIGSI 4 installed. The protection devices of the remote switchgear can be queried from a distance via port 2. The baud rate is optimally set to 57.6 Kbps so that there are no differences from local control.

When commissioning and during operation, the data of the device can be changed or read from the other switchgear. As an alternative, substation automation technology 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 two separate serial connections to transmit data between 300 bit/s and 4.096 Mbps.



[dw_prot-data transm_and_integration_optical_DFÜ-connection_8km, 1, en_US]

Figure 3.7/9 Protection Data Transmission and Remote Control of Switchgear via an optical dial-up Network Connection

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 multimode 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

Selection and Ordering Data

Description	Versions	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	B	☐	0	0
												▲		
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 Unit, 24 to 250 VDC and 115/230 VAC 1 fault signaling contact for auxiliary voltage faults or loss of data connection	1300 nm/LC connector/4 km, multimode											F		
	1300 nm/LC connector/8 km, multimode											E		

3.7

RS485 Optical Fiber Converter – 7XV5650/51

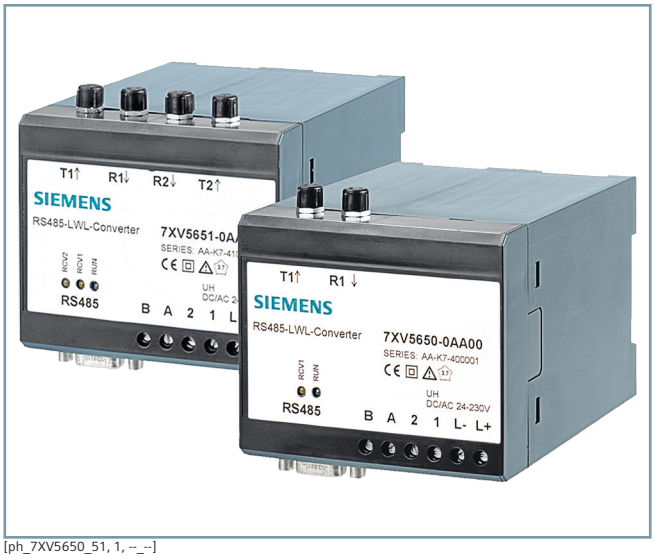
Description

The RS485 optical fiber converter 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. 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 so that it operates 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.

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 Unit with Self Monitoring and Alarm Relay.

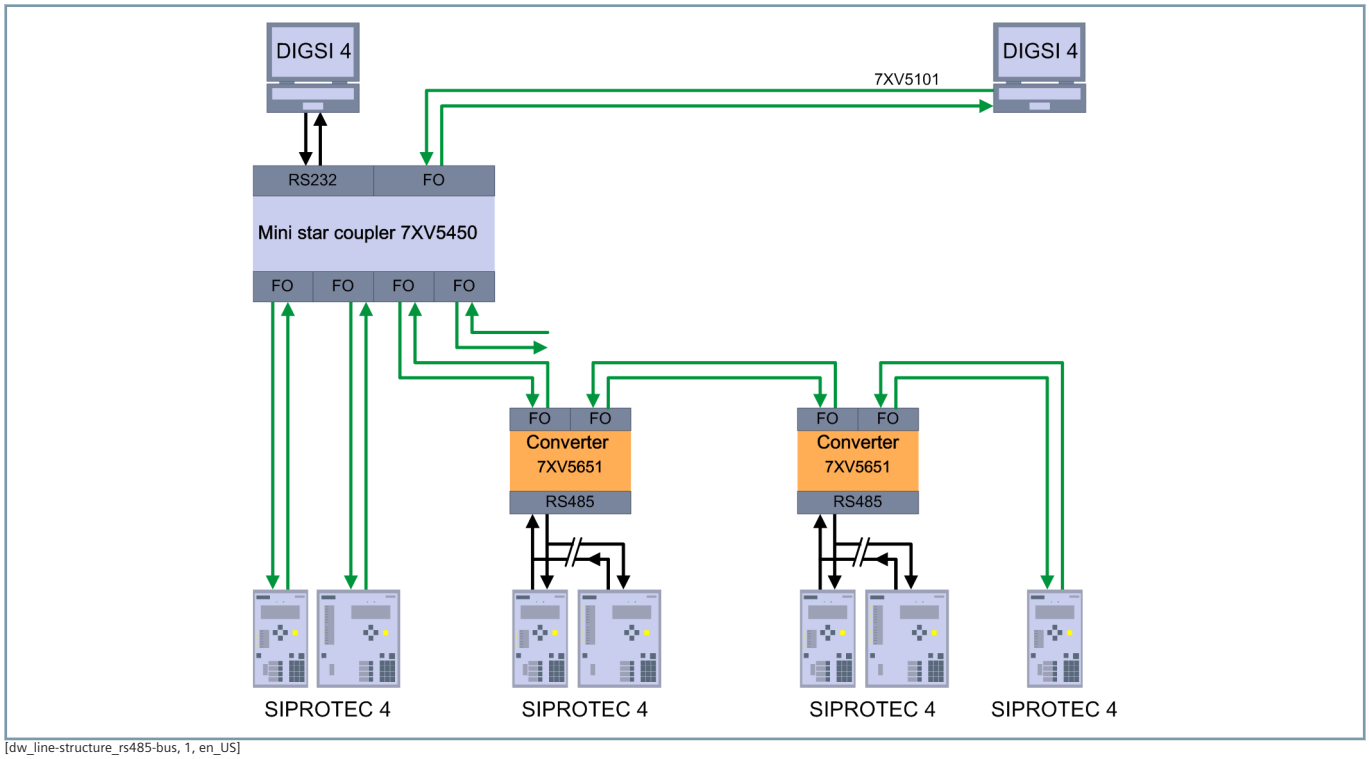


[ph_7XV5650_51, 1, --_--]

Figure 3.8/1 RS485 Optical Fiber Converter

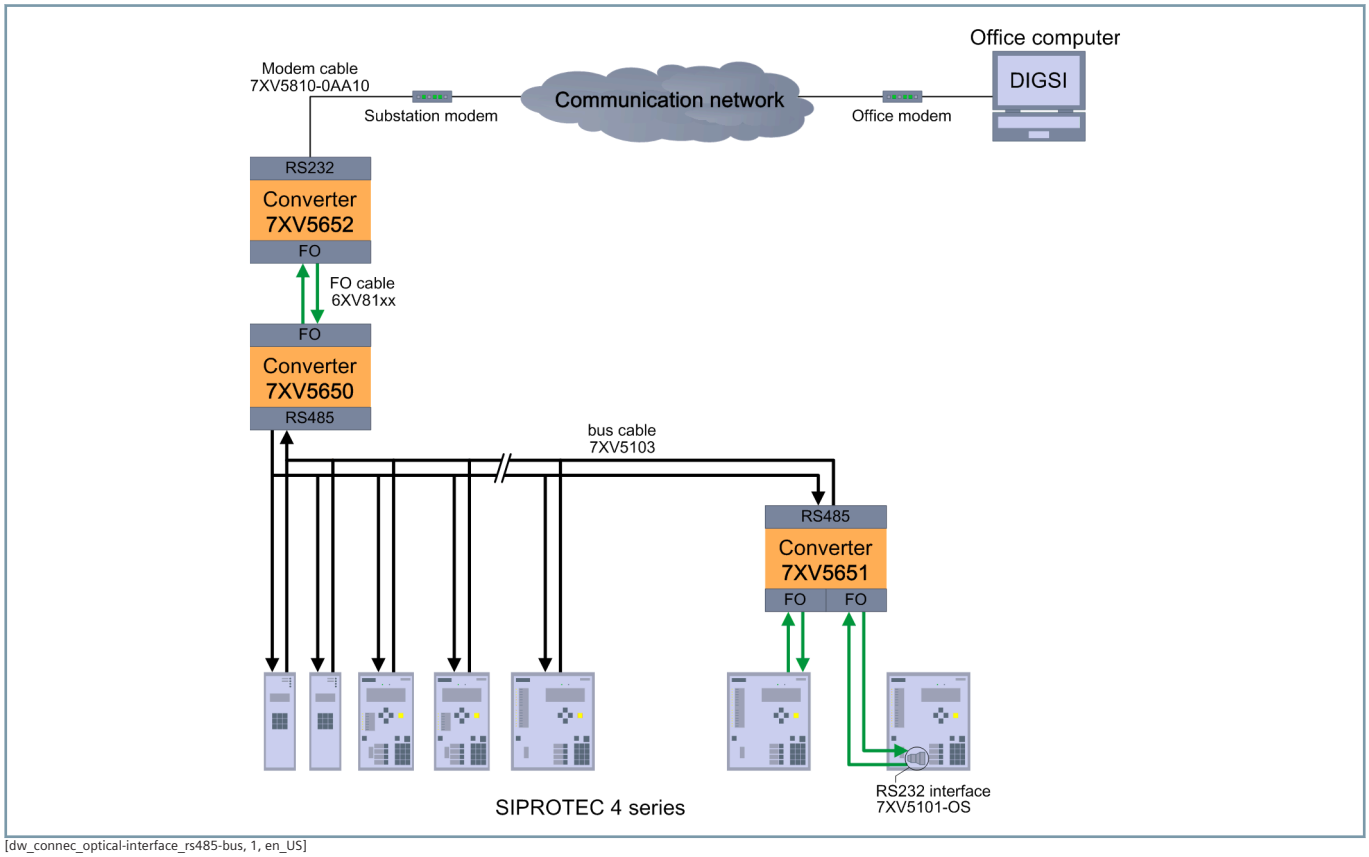
Application

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, 1, en_US]

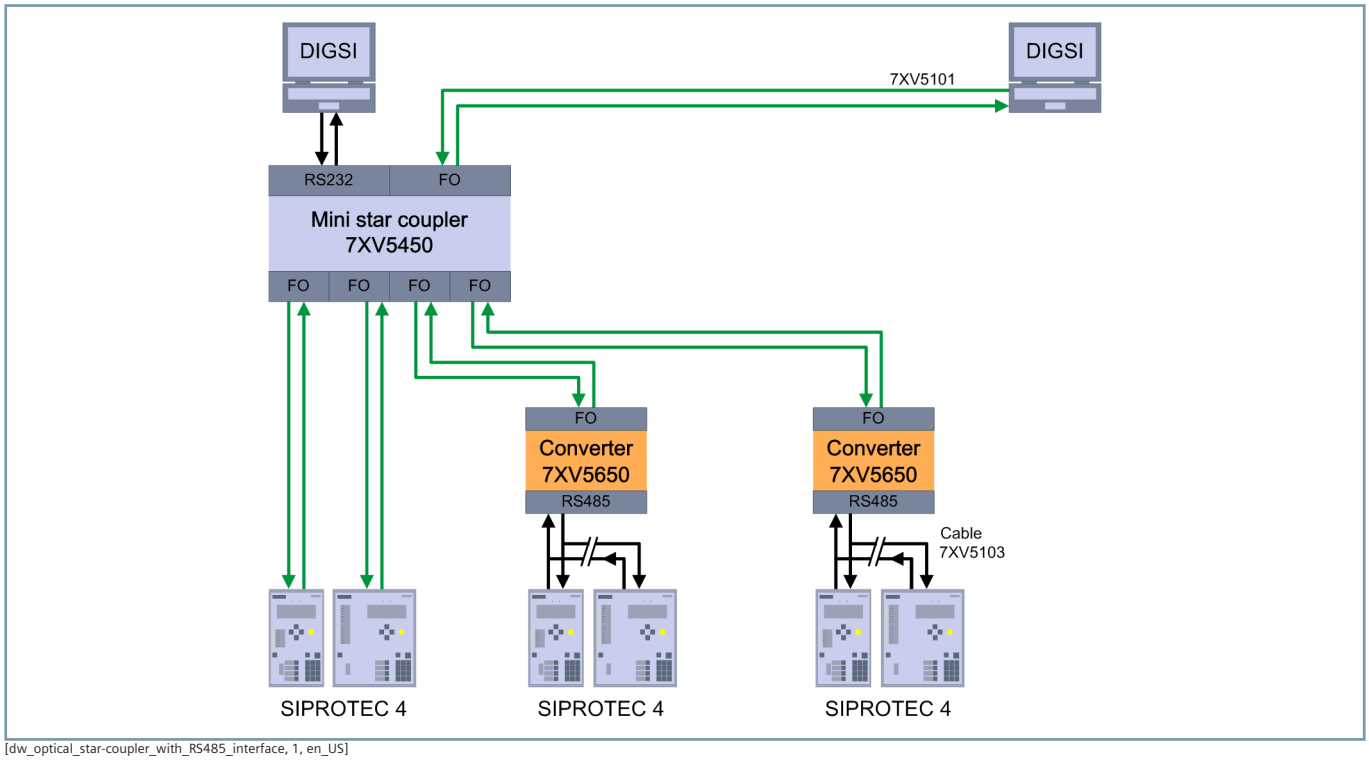
Figure 3.8/2 Optical linear Structure with connected RS485 Interfaces



[dw_connec_optical-interface_rs485-bus, 1, en_US]

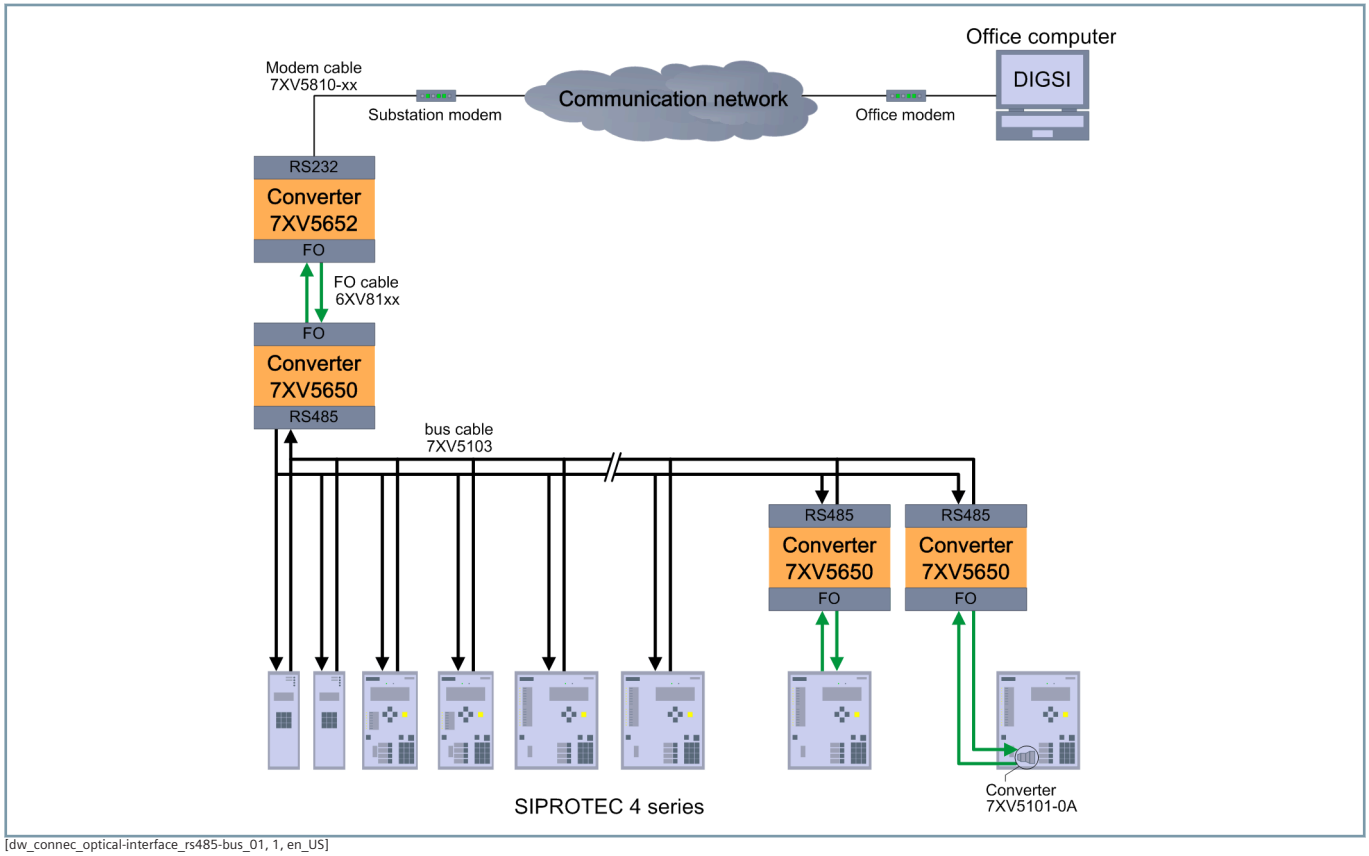
Figure 3.8/3 Connecting Optical Interfaces to an RS485 Bus

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, 1, en_US]

Figure 3.8/4 Optical Star Structure with connected RS485 Interfaces



[dw_connec_optical-interface_rs485-bus_01, 1, en_US]

Figure 3.8/5 Connecting Optical Interfaces to an RS485 Bus

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.

Technical Data

Rated auxiliary voltage	
24 to 250 VDC and 60 to 230 VAC	± 20% without switchover

Current consumption	
About 0.2 to 0.3 A	

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
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

Selection and Ordering Data

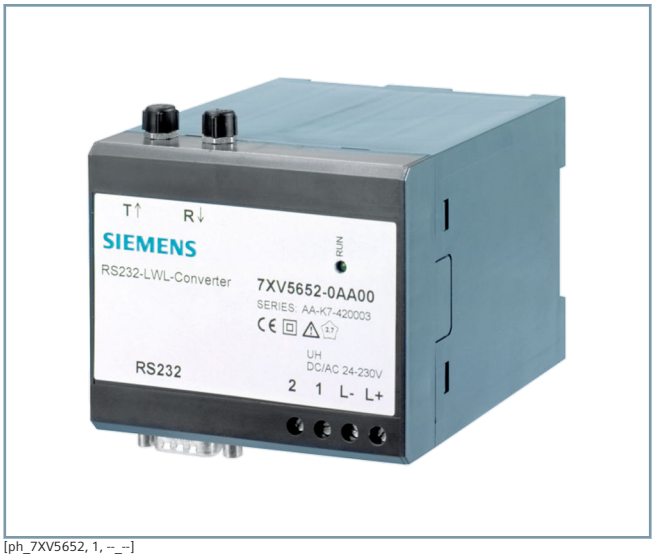
Description	Versions	Order no.																
		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
Converter, optical fiber 820 nm to RS485		7	X	V	5	6	5	□	-	0	B	A	0	0					
Converter with one RS485 interface and 2 optical fiber ST sockets (receive and transmit) Not suitable for PROFIBUS Linear structure from 9.6 Kbps to 115 Kbps Auxiliary voltage, 24 to 250 VDC and 110/230 VAC without switchover Connecting protection devices with an RS485 interface using 9-pole D-SUB connector plugs or screw terminals Connecting PC via modem, via optical fiber 820 nm, via ST connectors for optical fiber 62.5/125 µm for DIN rail mounting, plastic case								▲											
	1-channel							0											
	2-channel							1											

RS232 Optical Fiber Converter – 7XV5652

Description

The RS232 optical fiber converter 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. 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.

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



[ph_7XV5652, 1, --_--]

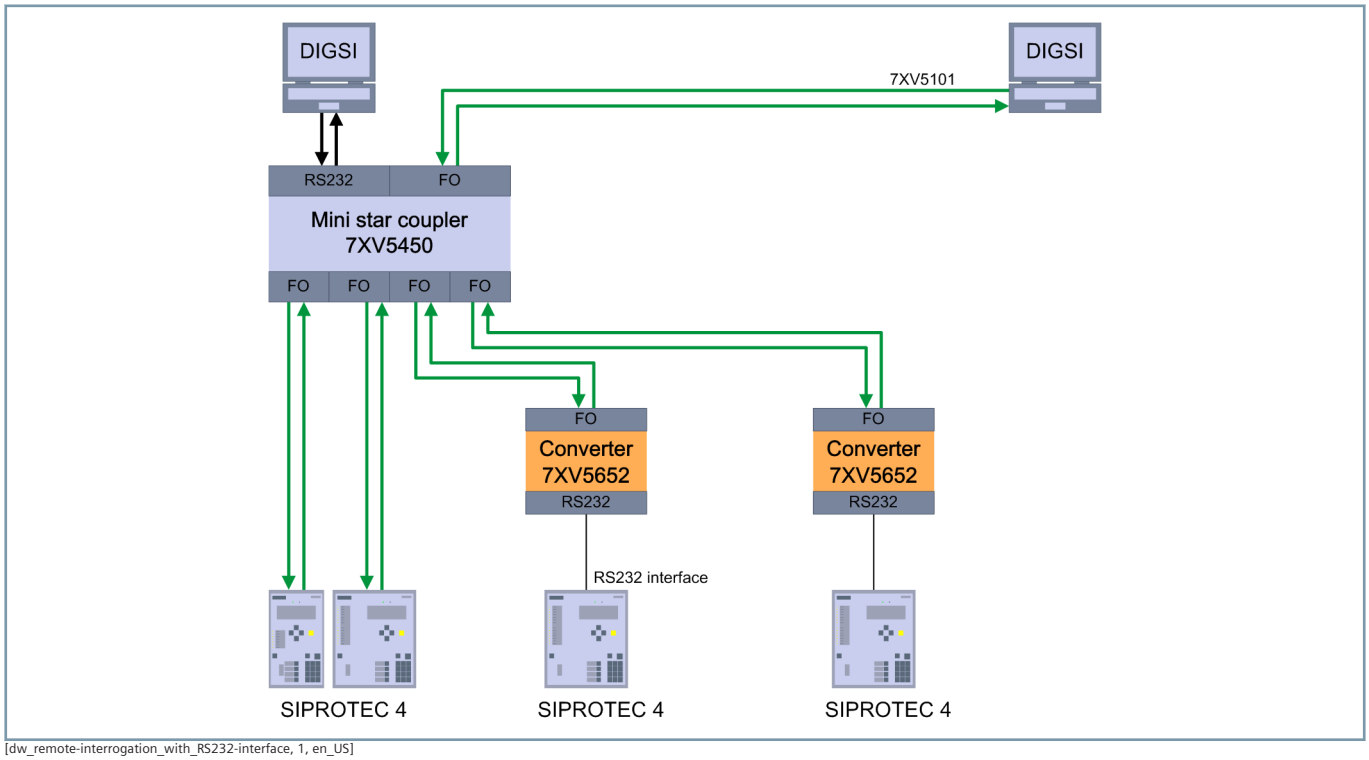
Figure 3.9/1 RS232 Optical Fiber Converter

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 Unit with Self Monitoring and Signaling Contact
- Supports the serial TxD and RxD lines of the RS232 interface. Handshake lines 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, 1, en_US]

Figure 3.9/2 Remote Query with the RS232 Interface

Technical Data

Rated auxiliary voltage	
24 to 250 VDC and 60 to 230 VAC	± 20% without switchover

Current consumption	
Approx. 0.1 to 0.2 A	

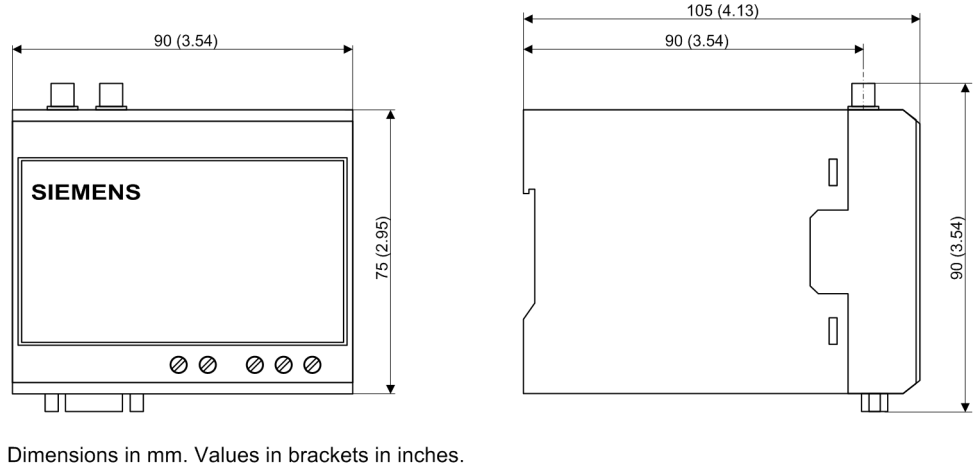
LEDs	
1 LED	
Green	Operating voltage OK

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

Dimensioned Drawing



[dw_Dimension_7XV5652-0AA00, 1, en_US]

Figure 3.9/3 Converter Device for DIN Rail Mounting

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.

RS232 Optical Fiber Converter – 7XV5652 – Selection and Ordering Data

Selection and Ordering Data

Description	Versions	Order no.															
		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
RS232 Optical Fiber Converter – 7XV5652		7	X	V	5	6	5	2	-	0	B	A	0	0					
Auxiliary voltage, 24 to 250 VDC and 110/220 VAC with alarm relay, Connection for RS232 interface via 9-pole D-SUB connector plug, signals up to 115 kBd Connection, optical fiber 820 nm, via ST connector For DIN rail mounting																			

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 the serial data exchange between two 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 for other partners by a second communication converter so that they can be read by a second device. Using the communication converters, two protection devices can communicate synchronously with each other and, while doing this, 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 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, dependent 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 work via reserved communication channels in the same communications system.

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
- 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;

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

Figure 3.10/1 Communication Converter 7XV5662-0AA00 for X.21/ RS422 and G.703.1

  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 for 24 to 250 VDC and 115 to 230 VAC.

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:

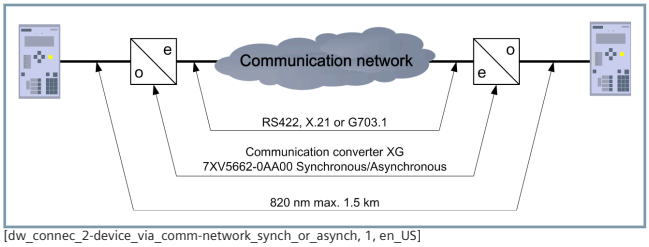
- SIPROTEC 4: Distance protection with a binary permissive overreach transfer trip scheme and differential protection (7SA52/6,7SD52/53/61); devices must be equipped with the optical module FO5.
- SIPROTEC 5: All device types are possible (such as 7SD8/A8/ L8); devices must be equipped with the optical module USART-AD-1FO or USART-AE-2FO.

Communication Converter – 7XV5662 – 0AA

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

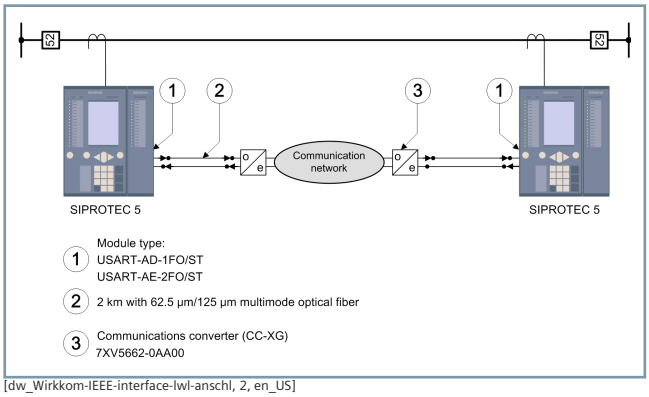
- SIPROTEC 3: Differential protection (7SD51).
- Binary Signal Transducer , SICAM I/O unit (7XV5653, 7XV5673): Point-to-point transmission of binary signals, for example, for serial permissive overreach transfer trip scheme logic in distance protection.

Application Examples



[dw_connec_2-device_via_comm-network_synch_or_asynch, 1, en_US]

Figure 3.10/2 Connection of Two Protection Devices via a Communication Network linked with 7XV5662-0AA00 in Synchronous or Asynchronous Mode



[dw_Wirkkom-IEEE-interface-lwl-anschl, 2, en_US]

Figure 3.10/3 Protection Communication via a Communication Network with X21 or G703.1 (64 kbps / G703.6 (2Mbit)) Interface

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.

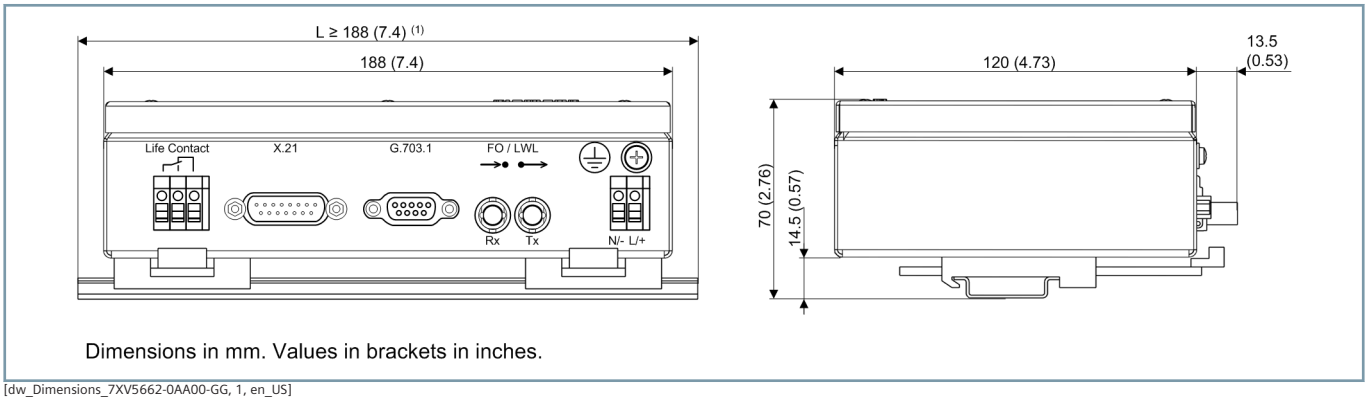
Connections	
Power supply	2-pole screw terminal
Signaling/standby contact	3-pole make contact/break contact
Serial G.703.1 interface	9-pole D-SUB socket for the 4-pole receive and transmission line
X.21 interface	15-pole D-SUB connector plug for the electrical X.21/RS422 interface
Fiber-Optic Cables	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
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

Operating modes of the communication converter 7XV5662-0AA00		
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

Dimensioned Drawing



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

Figure 3.10/4 Dimensions of the Communication Converter, Front and Side View

Selection and Ordering Data

Description	Versions	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													

Description

The communication converter copper (CC-CC) is a peripheral device connected to the protection device which enables the serial data exchange between two line differential protection devices. For this, one single pair of copper wires (pilot wires) is used. It may 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 (master/slave), two protection devices can communicate synchronously with each other and, while doing this, exchange a large amount of data over long distances.

Typical applications are the protection interfaces of the differential protection and of the distance protection of the SIPROTEC 4/5 device series with which the 7XV5662-0AC00 must be used (synchronous connection at 128 Kbps). If asynchronous serial data of the 7SD5 differential protection or the 7XV5653 binary signal transducer is to be transmitted, the 7XV5662-0AC01 device is to be used (asynchronous, from 300 bit/s to 38.2 Kbps).

The protection device is connected in an interference-free manner via a multimode fiber-optic cable pre-assembled with ST connectors at the CC-CC 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-CC 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 for the SIPROTEC 4 devices 7SD52, 7SD6, 7SA6 and 7SA52 and for the SIPROTEC 5 devices e.g. 7SD8, 7SA8 and 7SL8 via pilot wire (CC-CC version -0AA00)
- Asynchronous data exchange for the 7SD51, 7XV5653 or other devices with an asynchronous interface (CC-CC version -0AA01)
- Loop test function can be selected using jumpers in the CC-CC
- Master or slave operation of the CC-CC can be selected using a jumper (1 master and 1 slave device and the end of the pilot wire required; default setting: Master operation)
- Wide-range Power Supply Unit with Self Monitoring and Signaling Contact

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).

[ph_7XV5662-0AC00, 1, --_--]

Figure 3.10/5 Communication Converter 7XV5662-0AC00 for Pilot Wires

Using jumpers, one device is defined as the Master and the other device as the Slave In a "training" session during commissioning, the electrical properties of the pilot wires are measured by pressing a push-button 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.

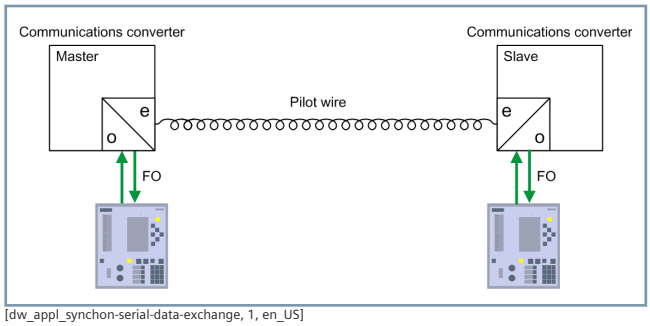
The data between the protection devices is transmitted on the basis of a point-to-point connection; in addition, it is a synchronous, bit-transparent transmission. Thanks to the telegram-buffered data exchange, an operating error cannot occur.

Applications

The communication converter can be used for two applications. One application is the synchronous, serial data exchange (converter version: 0AA00) between SIPROTEC 4/5 differential protection devices (7SD52, 7SD6, 7SD8 und 7SL8) and/or the serial permissive overreach transfer trip scheme logic between SIPROTEC 4/5 distance protections (7SA6, 7SA52 und 7SA8). The protection devices must be equipped with an optical 820 nm plug-in module LWL5.

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

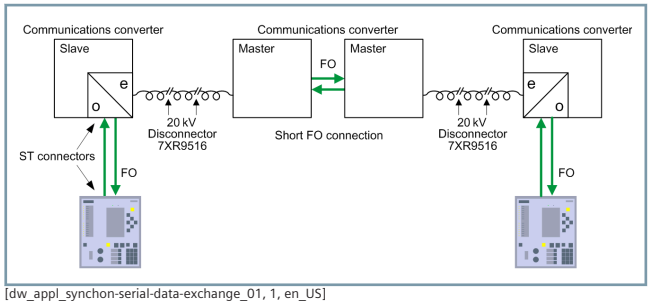
Application Examples



[dw_appl_synchon-serial-data-exchange, 1, en_US]

Figure 3.10/6 Application Example 1: Typical design of a communication path

If the maximum distance between protection devices is greater than can be spanned by two CC-CCs, the converters can be cascaded (see application example 2). A power supply is needed between the two master 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-CCs that could be caused by a short circuit of a parallel high-power line.



[dw_appl_synchon-serial-data-exchange_01, 1, en_US]

Figure 3.10/7 Application Example 2: Cascading of communication converters

Technical Data

Rated auxiliary voltage	
24 to 250 VDC	± 20%
115 V to 230 VAC	± 20% without switchover

4 LEDs	
LED 1	Red: Line activation
LED 2	Yellow: Line transparent
LED 3	Yellow: Data Transfer
LED 4	Green: Voltage ON

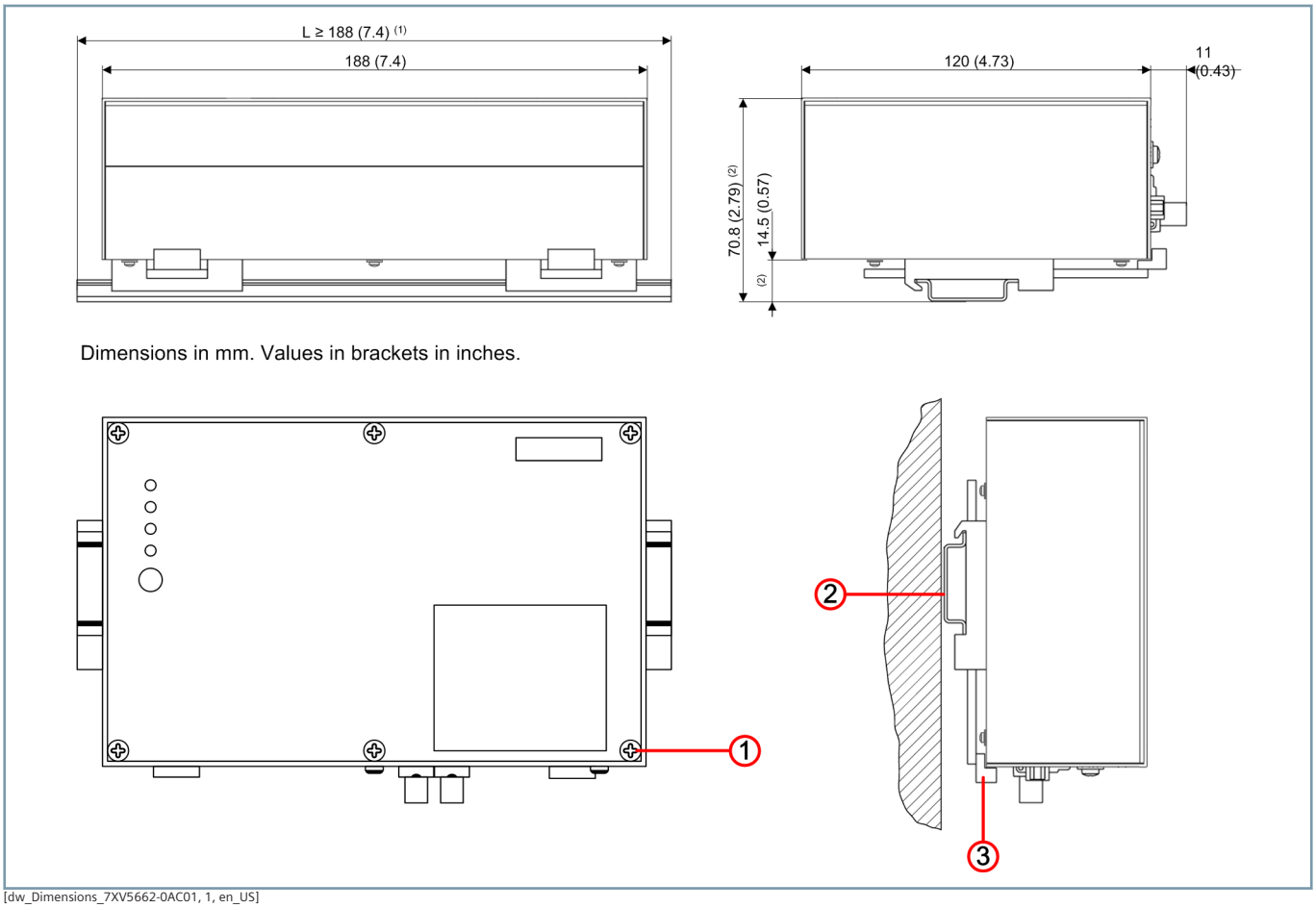
Connections	
Power supply	2-pole screw terminal
Signaling/standby contact	3-pole make contact/break contact
Pilot wire	2-pole for the pilot wire connection 5-kV insulated inputs
Fiber-Optic Cables	820 nm, 2 ST connectors for T×D and R×D for 62.5/125 µm multimode fiber-optic cables (max. distance to the protection device: 1.5 km)

Push-button
Measurement and "training" of the parameters for the pilot wire

Housing	
Cast aluminum housing	Dimensions: 188×56×120 mm (W×H×D)
Weight	About 0.8 kg
Degree of protection	according to EN 60529: IP41
for snap-on mounting	to 35-mm DIN rail according to EN 60715

Operating mode	
Synchronous operation with	7XV5662-0AC00 for the 7SD52, 7SD6, 75A52 and 7SA6
	Settings in the protection device: 128 Kbps per parameter
	Settings in the CC-CC: 128 Kbps No setting required
Asynchronous operation with	7XV5662-0AC01 for the 7SD51, 7XV5653 and devices with asynchronous serial interface (handshake not supported, only serial TxD and RxD signals are supported)
	max. baud rate for the protection device: 38.4 Kbps
	max. baud rate for the CC-CC: 128 Kbps
	No setting required
Max. distance with pilot wire	AWG 22/0.32 mm^2/51.7 Ω/km: max. 8 km
	AWG 19/0.65 mm^2/27 Ω/km: max. 12.1 km
	Shielded twisted pair (STP) recommended. Max. loop impedance: 1400 Ω
	Attenuation < 40 dB at 80 Hz

Dimensioned Drawing



[dw_Dimensions_7XV5662-0AC01, 1, en_US]

Figure 3.10/8 Dimensions of the CC-CC

Selection and Ordering Data

Description	Versions	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	☐
														▲
Converter for synchronous or asynchronous serial coupling of protection devices with optical input and ST connectors.	For synchronous operation with 7SA52,7SA6,7SD52/53/61, all SIPROTEC 5 device types possible, like the 7SD8/A8/L8													0
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	For asynchronous operation with 7SD51, 7XV5653, 7XV5673 and other devices with an asynchronous serial interface													1

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 two independent serial data signals, selectable either in synchronous or asynchronous operation.
- PC interface for device operation at the opposite end.
- Network interface in format E1 or T1 for connection to a multiplexer
- Wide-range Power Supply Unit, 24 to 250 VDC and 115 to 230 VAC with fail-safe Relay
- Display of data exchange via an LED
- Integrated commissioning aid (loop test)

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

Figure 3.10/9 Communication Converter 7XV5662-0AD00 – G.703.6

Communication Converter – 7XV5662 – 0AD – Technical Data

Technical Data

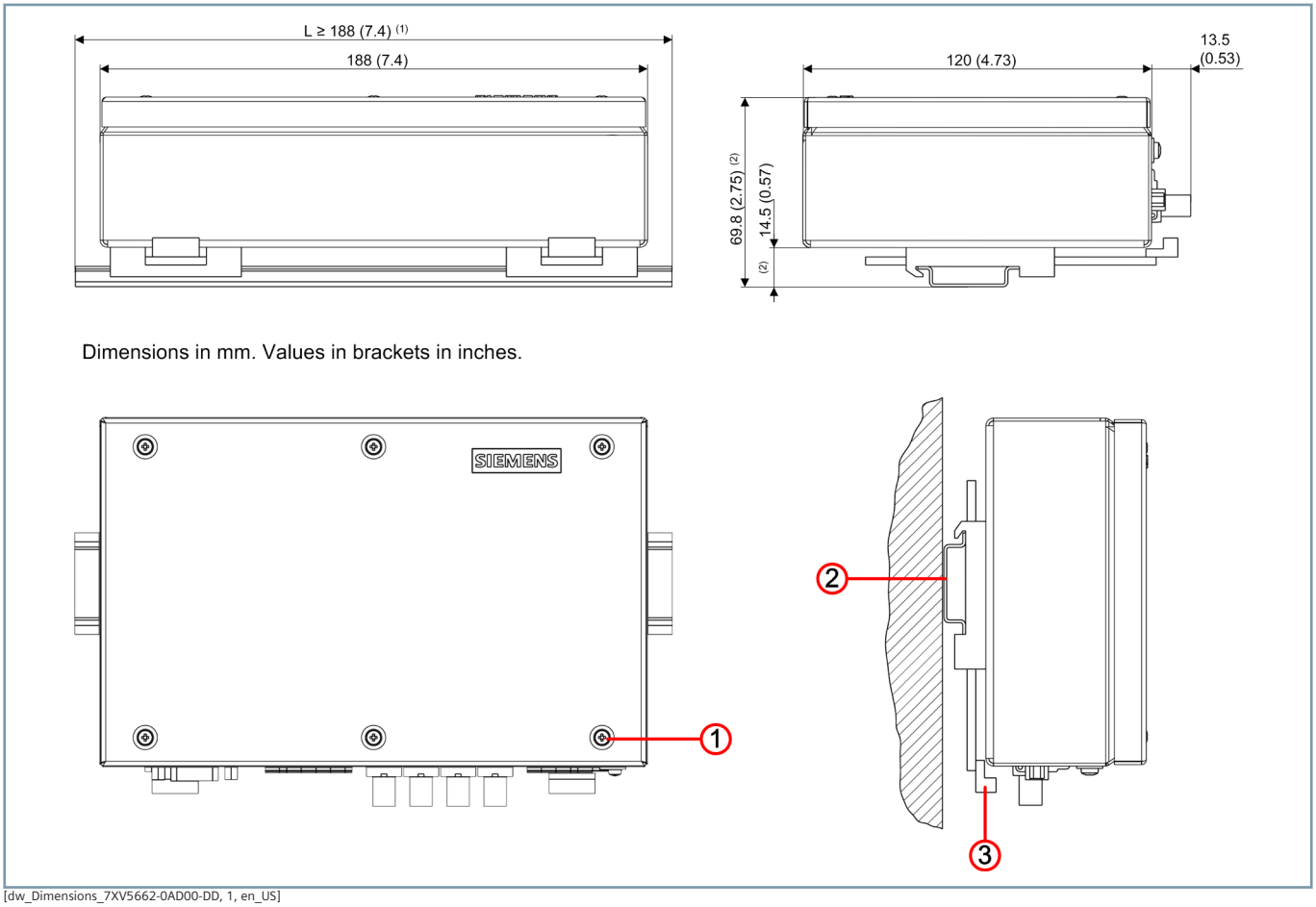
Connections	
Optical fiber 1/2	ST connector / 820 nm for 50 / 125 µm or 62.5 / 125 µm multimode fiber-optic cable (max. 1.5 km)
RS232	for asynchronous connection from 1.2 to 115.21 Kbps
Power supply	2-pole screw terminal
Fail-safe relay	3-pole screw terminal with break contact/make contact
Network E1/T1	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

Dimensioned Drawing



[dw_Dimensions_7XV5662-0AD00-DD, 1, en_US]

Figure 3.10/10 Dimensions: Communication Converter 7XV5662-0AD

Selection and Ordering Data

Description	Versions	Order no.											
		1	2	3	4	5	6	7		8	9	10	11	12
Two-channel serial communication converter		7	X	V	5	6	6	2	-	0	A	D	0	☐
														▲
Two 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	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

USB RS485 Converter Cable – 7XV5710

Description

The USB converter cable, with its special pin assignment, enables a temporary connection of up to 31 Siemens protection devices with an electrical RS485 interface to a PC with a USB interface for the 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.

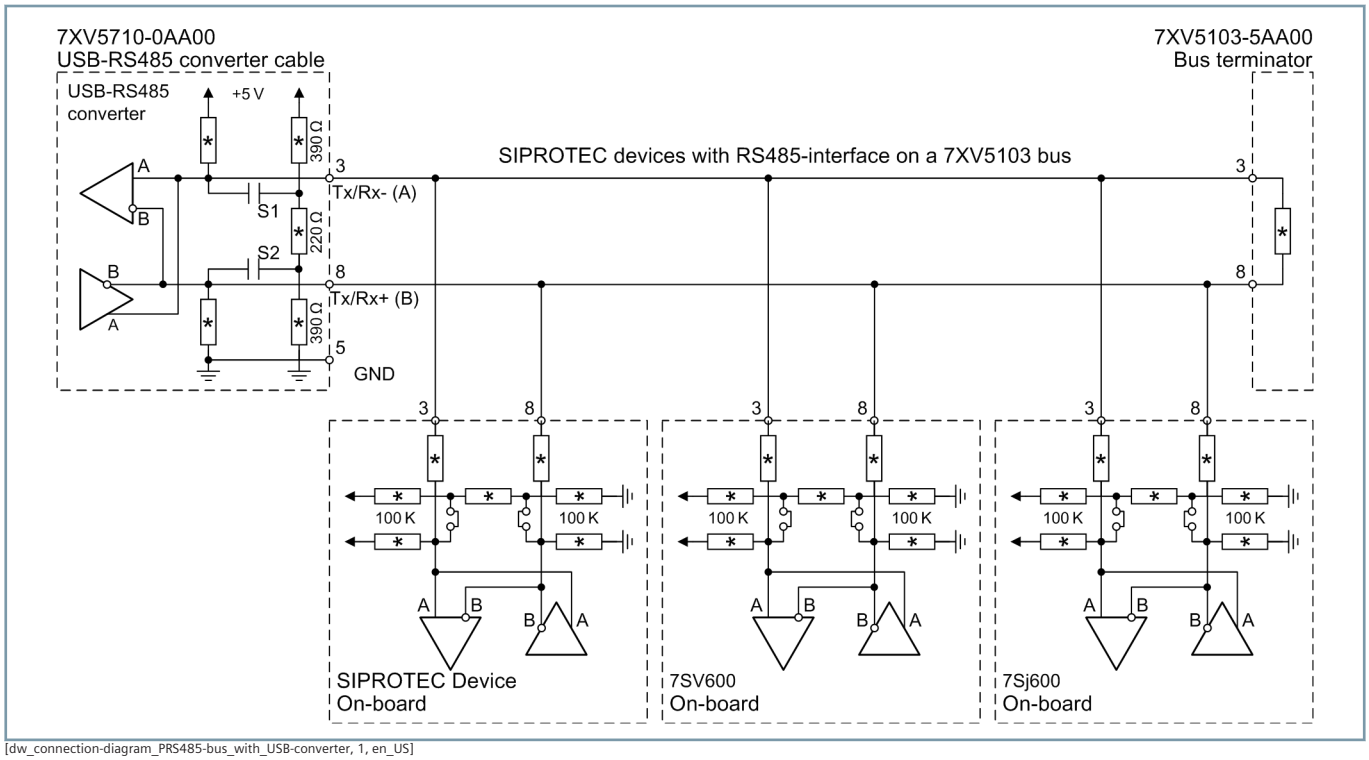
Benefits

- 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).

[ph_7XV5710, 1, --_--]

Figure 3.11/1 USB RS485 Converter Cable 7XV5710

Applications



[dw_connection-diagram_PRS485-bus_with_USB-converter, 1, en_US]

Figure 3.11/2 RS485 Bus with USB Converter Cable 7XV5710 and several SIPROTEC Devices (Block Diagram)

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

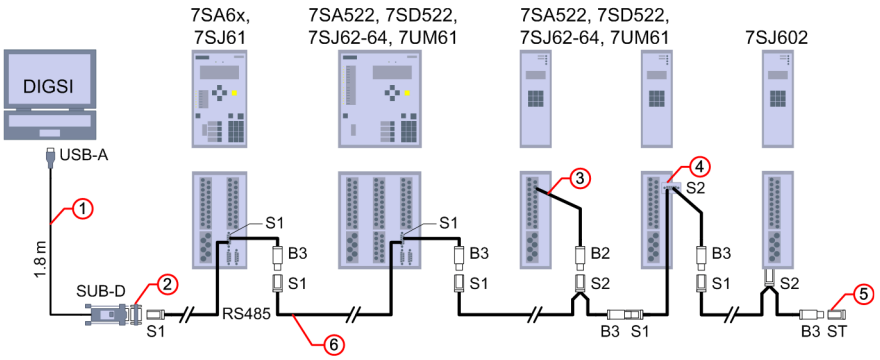
The RS485 bus is a two-conductor bus (half-duplex) and up to 32 devices (participants) can exchange their data on the bus according to the master/slave principle. All devices are connected to the bus in series (not in the star or ring topology). A 220-ohm load resistor is connected to the first and last 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 3.11/2*).

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) Converter
② Gender-Changers (9-pole Bu-Bu)
③ 7XV5103-2AA00 Adaptor cable
④ 7XV5103-3AA00 RS485 adaptor
⑤ 7XV5103-5AA00 Bus terminator
⑥ 7XV5103-0AAxx Y bus cable (S1, S2, B3)

[dw_central_operation_via_RS485-Bus, 1, en_US]

Figure 3.11/3 Central Operation via the RS485 Bus

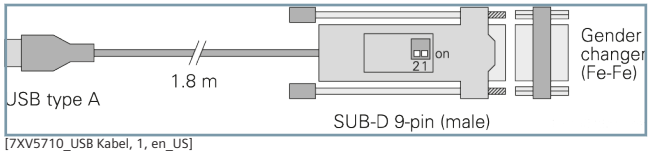
Several SIPROTEC 3 and 4 protection devices can be centrally operatedvia their interface with DIGSI using the USB converter cable 7XV5710. There are corresponding cables and adaptors for SIPROTEC devices for the various connection types. You can find additional information in catalog sheet 7XV5103. SIPROTEC 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 3.11/3*).

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*

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 Pin 8	– Pin 3 = 390 Ω – Pin 8 = 220 Ω – Pin 5 = 390 Ω
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)	
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	



[7XV5710_USB Kabel, 1, en_US]

Figure 3.11/4 USB Converter Cable with Plug. Factory Setting: S1 + S2 ON = Load Resistor active Dimensions: 75 × 32 × 15 (L × W × H)

USB RS485 Converter Cable – 7XV5710 – Selection and Ordering Data

Selection and Ordering Data

Description	Versions	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 primary switch mode wide range power supply unit offers an extremely broad input voltage range and is thus suitable for universal applications. The power supply unit is used for low-power consumers (output power: 6 W) that require a power failure stored-energy time in excess of 50 ms. The output is short-circuit-proof and stable at no load.

The output voltage is monitored and displayed using an indicator LED. If the output voltage drops by 10%, a relay contact opens and the LED goes out.

Benefits

- Universal supply voltage
  DC 48 to 250 V ±20%, AC 60 bis 230 V ±20%
- Monitored output voltage with LED and isolated relay
- The output is short-circuit-proof and stable at no load
- Power system failure bridging (t > 50 ms)
- Overvoltage category III

Functions

The wide-range power supply unit in the plastic case is a permanently wired and tested functional unit. It has a snap-on fastener for a 35-mm DIN rail according to DIN EN 60715. The auxiliary power supply, the electrical consumer, and the supervisory relay can be connected at the screw terminals. The devices contain no silicone, are halogen-free and flame-resistant (UL94-V0).

Applications

The wide-range power supply unit is designed for use in industrial applications and in residential areas (residences, businesses and commercial areas, small enterprises) and meets the following requirements:

Field of Application	Requirements	
	Emitted interference	Immunity
Industry	EN 60255-26	EN 60255-26
Residential area	EN 60255-26	EN 60255-26

[ph_7XV5810, 1, --_--]

Figure 3.12/1 Wide-range Power Supply Unit

Wide-range Power Supply Unit – 7XV5810 – 0BA –Technical Data

Technical Data

Structural design	
Housing for DIN rail mounting with ventilation slots for passive cooling	Plastic EG45-TBS (UL94-V0)
Dimensions	(WxHxD) 45 mm x 75 mm x 105 mm
Weight	approx. 200 g
Degree of protection	according to EN60529
Housing	IP20 plastic
Terminals	IP20
Insulation of the circuits • Input/output • Input/relay • Relay/output	Overvoltage category III • 5.2 kVDC • 3.7 kVAC/5.2 kVDC • 3.7 kVAC/5.2 kVDC

Input	
Connection	2-pol. terminal
Rated input voltage	
Direct Voltage	**48** to 250 VDC ±20 %
Alternating voltage	60 to 230 VAC ± 20% / 45 to 65 Hz
EXPANDED RANGE:	24 to 48 VDC ± 20%, only for an output current of max. 125 mA!
Protection class	II
Power consumption	at $V_H = V_{HN}$; typical value
Direct Voltage	**10 W**
Alternating voltage	**10 VA**
EFFICIENCY LEVEL	> 60% AT RATED LOAD
Internal fuse, cannot be replaced	1.25 A, time-lag

Output	
Connection	2-pol. terminal
Rated output voltage	24 VDC +/- 10%
Rated output current	250 mA
Short-circuit behavior:	Permanent short-circuit-proof
Power failure bridging	Min. 50 ms at rated load
Output voltage status display	1 green RUN LED

Relay contact	
Relays	Standard relay 1 break contact isolated
Connection	2-pol. terminal
Max. contact voltage	300 VDC/250 VAC
Max. switching power	50 bis 270 W (voltage-dependent), 2000 VA
Max. continuous current	5 A, (30 A for 0.5 s)

Permissible climate conditions	
Temperature during operation	-5 °C bis +55 °C
Temperature during storage (With factory packaging)	-25 °C to +70 °C
Temperature during transportation (With factory packaging)	-25 °C to +70 °C
Humidity	10% bis 93% (condensation not permissible)
Atmospheric pressure during operation	0 to 3000 above mean sea level

Assembly	
Mounting to horizontal 35-mm DIN rail A clearance of at least 100 mm must be maintained both above and below the device.	DIN rail according to EN 60715
Connection via screw terminals	0.5 mm^2 to 2.5 mm^2 Recommended stripping length: 5 mm
External fuse	15 A
External disconnecting device (switch) necessary	

Regulation	
Security	EN 61010-1
Emitted interference	EN 60255-26
Immunity	EN 60255-26

Selection and Ordering Data

Description	Versions	Order no.															
		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
Wide-range Power Supply Unit		7	X	V	5	8	1	0	-	0	☐	A	0	0					
	24 V / 6 W										B								
	5 V / 3 W										C								

Wide-range Power Supply Unit – 7XV5810 – 0CA

Description

The primary switch mode wide range power supply unit offers an extremely broad input voltage range and is thus suitable for universal applications. The power supply unit is used for low-power consumers (output power: up to 3 W) that require a power failure stored-energy time in excess of 50 ms. The output is short-circuit-proof and stable at no load.

The output voltage is monitored and displayed using an indicator LED. If the output voltage drops by 10%, a relay contact opens and the LED goes out.

Benefits

- Universal supply voltage
  DC 26 to 250 V ±20%, AC 60 bis 230 V ±20%
- Monitored output voltage with LED and isolated relay
- The output is short-circuit-proof and stable at no load
- Power system failure bridging (t > 50 ms)
- Overvoltage category III

Functions

The wide-range power supply unit in the plastic case is a permanently wired and tested functional unit. It has a snap-on fastener for a 35-mm DIN rail according to DIN EN 60715. The auxiliary power supply, the electrical consumer, and the supervisory relay can be connected at the screw terminals. The devices contain no silicone, are halogen-free and flame-resistant (UL94-V0).

Applications

The wide-range power supply unit is designed for use in industrial applications and in residential areas (residences, businesses and commercial areas, small enterprises) and meets the following requirements:

Field of Application	Requirements	
	Emitted interference	Immunity
Industry	EN 60255-26	EN 60255-26
Residential area	EN 60255-26	EN 60255-26

[ph_7XV5810, 1, --_--]

Figure 3.12/2 Wide-range Power Supply Unit

Technical Data

Structural design	
Housing for DIN rail mounting with ventilation slots for passive cooling	Plastic EG45-TBS (UL94-V0)
Dimensions	(WxHxD) 45 mm x 75 mm x 105 mm
Weight	approx. 200 g
Degree of protection	according to EN 60529
Housing	IP20 plastic
Terminals	IP20
Insulation of the circuits • Input/output • Input/relay • Relay/output	Overvoltage category III • 5.2 kVDC • 3.7 kVAC/5.2 kVDC • 3.7 kVAC/5.2 kVDC

Input	
Connection	2-pol. terminal
Rated input voltage	
Direct Voltage	**24** to 250 VDC ±20 %
Alternating voltage	60 to 230 VAC ± 20% / 45 to 65 Hz
Protection class	II
Power consumption	at $V_H = V_{HN}$; typical value
Direct Voltage	**5 W**
Alternating voltage	**5 VA**
EFFICIENCY LEVEL	> 60% AT RATED LOAD
Internal fuse, cannot be replaced	1.25 A, time-lag

Output	
Connection	2-pol. terminal
Rated output voltage	**5 VDC** +/- 10%
Rated output current	**600 mA**
Short-circuit behavior:	Permanent short-circuit-proof
Power failure bridging	Min. 50 ms at rated load
Output voltage status display	1 green RUN LED

Relay contact	
Relays	Standard relay 1 break contact isolated
Connection	2-pol. terminal
Max. contact voltage	300 VDC/250 VAC
Max. switching power	50 bis 270 W (voltage-dependent), 2000 VA
Max. continuous current	5 A, (30 A for 0.5 s)

Permissible climate conditions	
Temperature during operation	-5 °C bis +55 °C
Temperature during storage (With factory packaging)	-25 °C to +70 °C
Temperature during transportation (With factory packaging)	-25 °C to +70 °C
Humidity	10% bis 93% (condensation not permissible)
Atmospheric pressure during operation	0 to 3000 above mean sea level

Wide-range Power Supply Unit – 7XV5810 – 0CA –Technical Data

Assembly	
Mounting to horizontal 35-mm DIN rail A clearance of at least 100 mm must be maintained both above and below the device.	DIN rail according to EN 60715
Connection via screw terminals	0.5 mm^2 to 2.5 mm^2 Recommended stripping length: 5 mm
External fuse External disconnecting device (switch) necessary	15 A

Regulation	
Security	EN 61010-1
Emitted interference	EN 60255-26
Immunity	EN 60255-26

Selection and Ordering Data

Description	Versions	Order no.															
		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
Wide-range Power Supply Unit		7	X	V	5	8	1	0	-	0	☐	A	0	0					
	24 V / 6 W										B								
	5 V / 3 W										C								

Description

The Managed Industrial Ethernet network access points SCALANCE X-200RNA (Redundant Network Access) with HSR functionality (High-availability Seamless Redundancy protocol according to IEC 62439-3) are used to connect up to two non-HSR-capable terminal devices or network segments to a ring-shaped HSR network structure. They can also be used for the simple and redundant transition from HSR to PRP (Parallel Redundancy Protocol) network structures.

- Participant or network connection depending on the port characteristic of the devices, electrical or optical
- Media redundancy by transmitting telegrams twice in ring networks
- High system availability thanks to simultaneous transmission of telegrams via two paths in the ring
- No reconfiguration times of the ring network in the event of an error thanks to double transmission of the telegrams in the ring
- Simple and redundant coupling of HSR and PRP network structures
- Redundant 24 VDC voltage supply or wide-range power supply unit, depending on the device model
- SNMP access, integrated web server and automatic e-mail send function for remote diagnostics and signaling over the network

Benefits

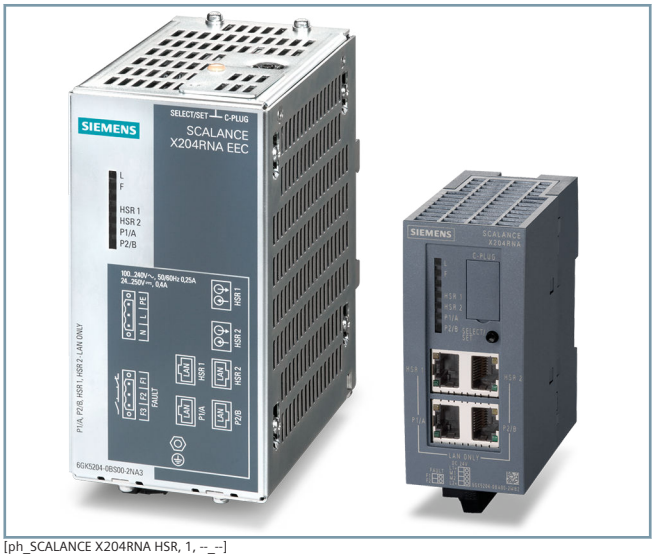
- Ideal solution for building Industrial Ethernet networks with high network availability (seamless media redundancy due to parallel data transmission in parallel network structures)
- Seamless data transmission in ring network structures for high-availability systems (for example, process automation)
- Fast, simple diagnosis via the LED on the device, using an integrated web server or using the signaling contact
- Integration of the SCALANCE X-200RNA network access points into existing network management infrastructure using SNMP access
- Simple commissioning without mandatory configuration
- Device replacement without PG by using the removable storage medium C-PLUG for saving the configuration data

Applications

The Industrial Ethernet network access points SCALANCE X-200RNA with HSR functionality facilitate the cost-effective connection of non-HSR-capable terminal devices to ring networks requiring high availability. The devices with IP 20 degree of protection are designed for use in the control cabinet.

Product Versions:

- Network access point in plastic case with electrical ports
  - SCALANCE X204RNA
    for connection of up to two non-HSR-capable terminal devices to ring networks with four electrical ports
- Network access point in a metal case with electrical and optical ports and a wide-range power supply unit for use in extended environmental conditions
  - SCALANCE X204RNA EEC



[ph_SCALANCE X204RNA HSR, 1, --_--]

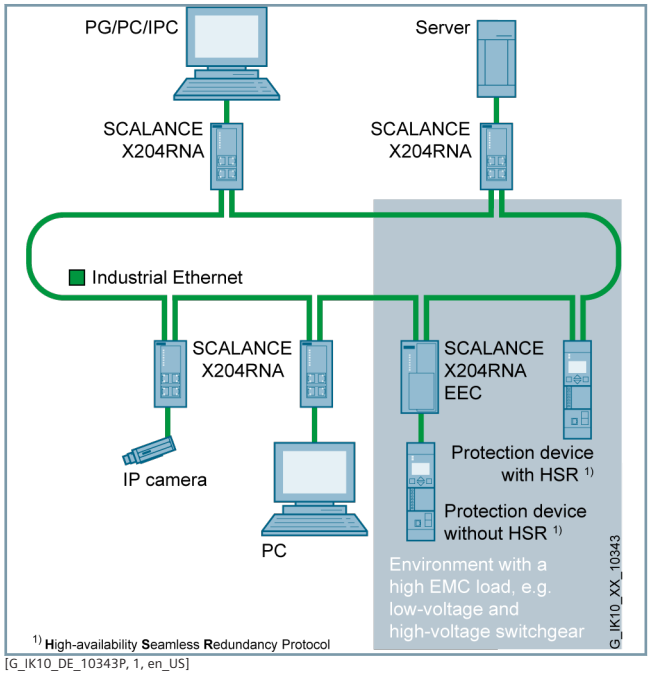
Figure 3.13/1 SCALANCE X204RNA HSR

for connection of up to two non-HSR-capable terminal devices to ring networks with two electrical terminal-device ports and two optical/electrical combination ports for network connection

  - SCALANCE X204RNA EEC
    with configurable functionality (PRP or HSR) for connection of up to two non-HSR-capable terminal devices to ring networks with two electrical terminal-device ports and two optical/electrical combination ports for network connection

Product features:

- Device diagnosis via LED (power, link status, data traffic)
- Remote diagnostics via signaling contact (signal mask can be set on-site via push-button), SNMP protocol and web browser possible
- The SCALANCE X204RNA EEC with its expanded environmental conditions is suitable for use in power switching and distribution systems (IEC 61850-3, IEEE 1613)



[G_IK10_DE_10343P, 1, en_US]

Figure 3.13/2 Seamless Ring Network with HSR Redundancy Method

Additional information

Other devices and versions in the IK PI catalog.

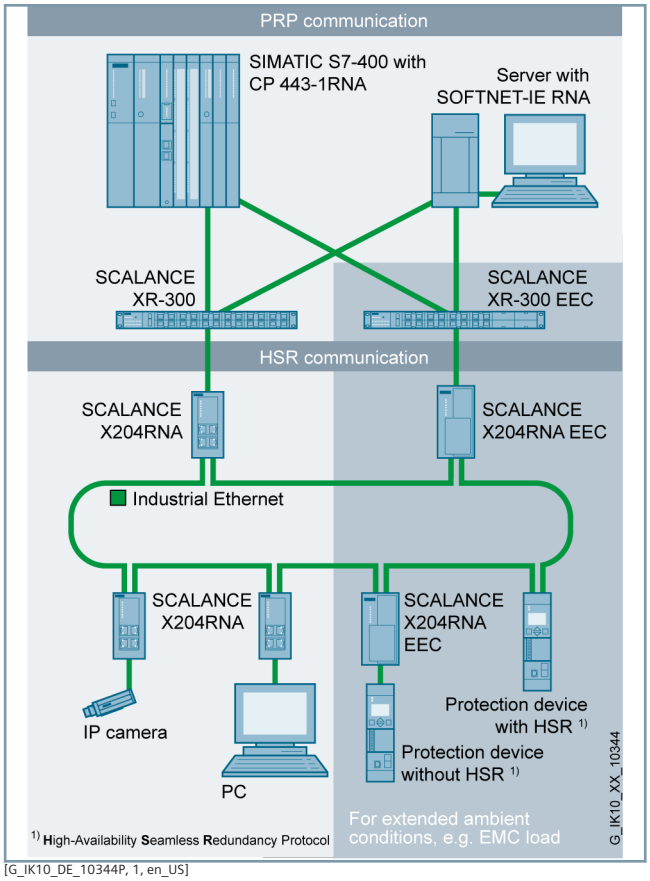
You will find more information about Redundant Network Access under *http://www.siemens.de/rna*

The SIMATIC NET Selection Tool and the TIA Selection Tool are available to provide support in selecting Industrial Ethernet switches and configuring the modular versions:

Online version: *http://www.siemens.de/snst*

Offline version: *http://www.siemens.de/snst-download*

TIA Selection Tool: *http://www.siemens.de/tia-selection-tool*



[G_IK10_DE_10344P, 1, en_US]

Figure 3.13/3 Redundant Transition from Ring HSR Network Structure to parallel PRP Network Structure using SCALANCE X204RNA

Description	Order no.																
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
SCALANCE X204RNA for PRP networks	6	G	K	5	2	0	4	-	0	B	A	0	0	-	2	K	B	2
SCALANCE X204RNA EEC for PRP networks	6	G	K	5	2	0	4	-	0	B	S	0	0	-	3	L	A	3
SCALANCE X204RNA EEC for HSR and PRP networks	6	G	K	5	2	0	4	-	0	B	S	0	0	-	3	P	A	3
SFP pluggable transceiver																		
SFP991-1 (multimode, glass up to 3 km)	6	G	K	5	9	9	1	-	1	A	D	0	0	-	8	A	A	0
SFP991-1LH+ (single mode, glass up to 70 km, LH+)	6	G	K	5	9	9	1	-	1	A	E	0	0	-	8	A	A	0
SFP991-1LD (single mode, glass up to 26 km)	6	G	K	5	9	9	1	-	1	A	F	0	0	-	8	A	A	0
CP 443-1RNA	6	G	K	7	4	4	3	-	1	R	X	0	0	-	0	X	E	0
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																	E	

Table 3.13/1 Selection and Ordering Data

SCALANCE X204RNA – PRP

Description

The Managed Industrial Ethernet network access points SCALANCE X-200RNA (Redundant Network Access) with PRP functionality (Parallel Redundancy Protocol according to IEC 62439-3) are used to connect up to two non-PRP-capable terminal devices or network segments to parallel networks.

- Participant or network connection depending on the port characteristic of the devices, electrical or optical
- Media redundancy due to double transmission of telegrams into two parallel separate networks
- High system availability thanks to telegram transmission via two separate networks at the same time.
- Reconfiguration times in a partial network do not affect the propagation time because the telegrams are transmitted into two separate networks (seamless redundancy)
- Redundant 24 VDC voltage supply or wide-range power supply unit, depending on the device model
- SNMP access, integrated web server and automatic e-mail send function for remote diagnostics and signaling over the network

Benefits

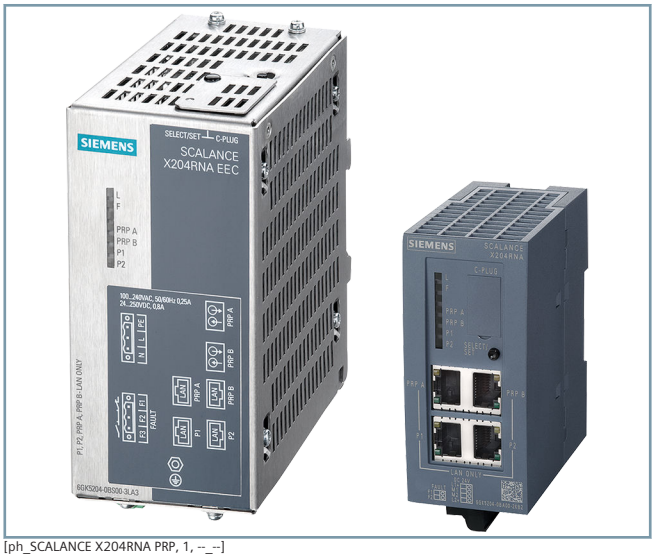
- Ideal solution for building Industrial Ethernet networks with high network availability (seamless media redundancy due to parallel data transmission in parallel network structures)
- The reconfiguration time of a partial network does not affect the telegram transmission
- Fast, simple diagnosis via the LED on the device, using an integrated web server or using the signaling contact
- Integration of the SCALANCE X-200RNA network access points into existing network management infrastructure using SNMP access
- Simple commissioning without mandatory configuration
- Device replacement without PG by using the removable storage medium C-PLUG for saving the configuration data

Applications

The Industrial Ethernet network access points SCALANCE X-200RNA facilitate the cost-effective connection of non-PRP-capable terminal devices to parallel, separate networks requiring high availability. The devices with IP 20 degree of protection are designed for use in the control cabinet.

Product Versions

- Network access point in plastic case with electrical ports
  - SCALANCE X204RNA



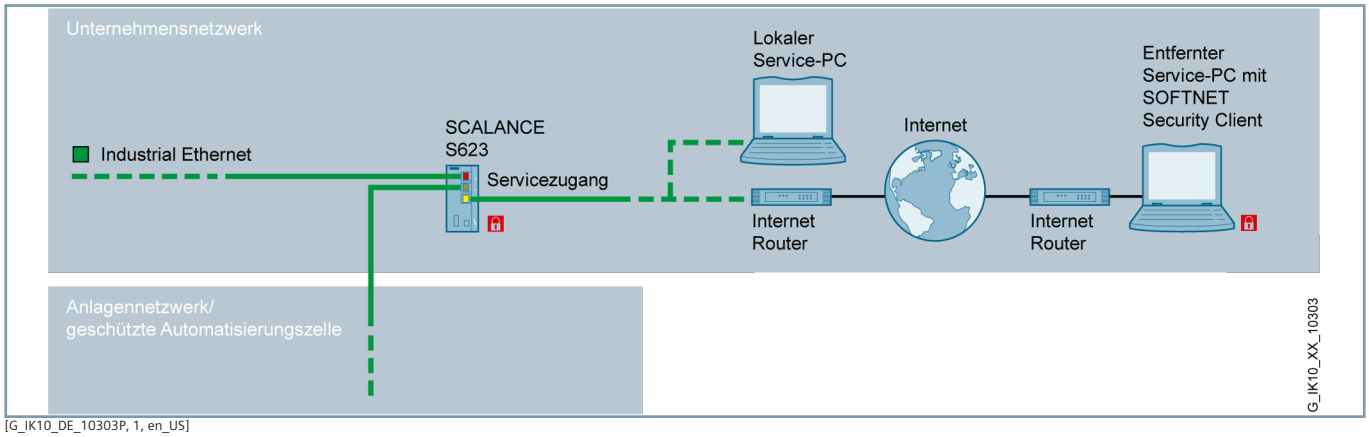
[ph_SCALANCE X204RNA PRP, 1, --_--]

Figure 3.13/4 SCALANCE X204RNA PRP

  for connection of up to two non-PRP-capable terminal devices to redundant networks with four electrical ports
- Network access point in a metal case with electrical and optical ports and a wide-range power supply unit for use in extended environmental conditions
  - SCALANCE X204RNA EEC
    for connection of up to two non-PRP-capable terminal devices to redundant networks with two electrical terminal-device ports and two optical/electrical combination ports for network connection
  - SCALANCE X204RNA EEC
    with configurable functionality (PRP or HSR) for connection of up to two non-HSR-capable terminal devices to ring networks with two electrical terminal-device ports and two optical/electrical combination ports for network connection

Product features:

- Device diagnosis via LED (power, link status, data traffic)
- Remote diagnostics via signaling contact (signal mask can be set on-site via push-button), SNMP protocol and web browser possible
- The SCALANCE X204RNA EEC with its expanded environmental conditions is suitable for use in power switching and distribution systems (IEC 61850-3, IEEE 1613)



[G_IK10_DE_10303P, 1, en_US]

Figure 3.13/5 Seamless parallel Networks with the PRP Redundancy Method

Additional information

Other devices and versions in the IK PI catalog.

Cable system technology:

You will find more information on the SIMATIC NET cable system family under: *www.siemens.de/fastconnect*

Selection Tool:

The SIMATIC NET Selection Tool and the TIA Selection Tool are available to provide support in selecting SCALANCE X devices and configuring the modular versions:

- *http://www.siemens.com/snst-standalone*
- *http://www.siemens.com/tia-selection-tool-standalone*
- *http://www.siemens.com/tstcloud*

SCALANCE X204RNA – PRP – Selection and Ordering Data

Description	Order no.																
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
SCALANCE X204RNA for PRP networks	6	G	K	5	2	0	4	-	0	B	A	0	0	-	2	K	B	2
SCALANCE X204RNA EEC for PRP networks	6	G	K	5	2	0	4	-	0	B	S	0	0	-	3	L	A	3
SCALANCE X204RNA EEC for HSR and PRP networks	6	G	K	5	2	0	4	-	0	B	S	0	0	-	3	P	A	3
SFP pluggable transceiver																		
SFP991-1 (multimode, glass up to 3 km)	6	G	K	5	9	9	1	-	1	A	D	0	0	-	8	A	A	0
SFP991-1LH+ (single mode, glass up to 70 km, LH+)	6	G	K	5	9	9	1	-	1	A	E	0	0	-	8	A	A	0
SFP991-1LD (single mode, glass up to 26 km)	6	G	K	5	9	9	1	-	1	A	F	0	0	-	8	A	A	0
CP 443-1RNA	6	G	K	7	4	4	3	-	1	R	X	0	0	-	0	X	E	0
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																	E	

Table 3.13/2 Selection and Ordering Data

Description

All devices of an Ethernet network can be protected against unauthorized access using the security modules of the SCALANCE S family SCALANCE S612 and SCALANCE S623 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.

- Security module for protecting automation networks and security during data exchange between automation systems
- Inspection and filtering of the data traffic via the integrated Stateful Inspection 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, industrial design of the devices (for example, expanded temperature range, redundant power supply)
- Simple and clearly structured configuration: All SIMATIC NET security products can be integrated and diagnosed using the Security Configuration Tool (SCT)
- No changes or adaptations to the existing network structure, applications or network users are necessary because SCALANCE S can be operated not just as a router but also as a bridge.
- 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 without constraints using any provider
- Increased availability possible via redundant security of automation cells or ring topologies

Benefits

- Protection of industrial automation networks against unauthorized access. If necessary, creation of a DMZ (protected zone) is possible (S623) to exchange data with other networks without having to allow direct access to the production network.
- By implementing the cell protection concept:
  - 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
  - Reducing the risk by using network segmentation (by forming secure communication islands)
  - Communication security possible from and to the automation cells
- Specific access rights can be assigned not just to devices but also to users by means of user-specified firewall rules
- Universal network diagnostics by integrating into IT infrastructures and network management systems via SNMP
- Remote access security via the Internet. Even dynamic IP addresses can be used with PPPoE and DynDNS.

[ph_SCALANCE S Security Modules, 1, --_--]

Figure 3.14/1 SCALANCE S Security Modules

- 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 possible into ring structures and FO networks (SCALANCE S627-2M)

Applications

The security modules can be operated not just in bridge mode but also in router mode. As a result, they can also be used directly at IP subnetwork borders Secure remote access over the Internet or via GPRS/UMTS/LTE is possible using the GPRS/UMTS/LTE routers of the SCALANCE M800 series.

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

Firewall

SCALANCE S602

- Protects network segments against unauthorized access via Stateful Inspection firewall
- Ghost mode for protecting individual, and even varying devices via dynamic reading of the IP address.
- Connection via 10/100/1000 Mbps ports

Firewalls and VPN gateways

SCALANCE S612

- Protects network segments against unauthorized access via Stateful Inspection firewall
- Up to 128 VPN tunnels can be operated at the same time
- Connection via 10/100/1000 Mbps ports

SCALANCE S615

- Protects network segments against unauthorized access via Stateful Inspection firewall
- Up to 20 VPN tunnels can be operated at the same time
- Connection via 10/100 Mbps ports
- Connection to SINEMA Remote Connect via VPN

SCALANCE S623

- Protects network segments against unauthorized access via Stateful Inspection firewall
- Up to 128 VPN tunnels can be operated at the same time
- Connection via 10/100/1000 Mbps ports
- Additional RJ45 DMZ port (DMZ: demilitarized zone) for secure connection, for example, by remote maintenance modems, laptops or an additional network. This yellow port is secured by firewalls towards the red or green port and can also terminate VPNs.
- Redundant protection of automation cells using router and firewall redundancies and standby coupling of the redundant device via the yellow port.

SCALANCE S627-2M

- Protects network segments against unauthorized access via Stateful Inspection firewall
- Up to 128 VPN tunnels can be operated at the same time
- Connection via 10/100/1000 Mbps ports
- Additional RJ45 DMZ port (DMZ: demilitarized zone) for secure connection, for example, by remote maintenance modems, laptops or an additional network. This yellow port is secured by firewalls towards the red or green port and can also terminate VPNs.
- Redundant protection of automation cells using router and firewall redundancies, standby operation of the redundant device,and status comparison of the firewalls using the synchronization line between the yellow ports.
- Two additional slots for one 2-port media module (see SCALANCE X300) each for direct integration into ring structures and FO networks with two additional switched red or green ports per module
- Bridging of longer lines or existing 2-wire lines (for example, PROFIBUS) by using the media modules MM992-2VD (Variable Distance).

Additional information

You will find more information on this here: *http://www.siemens.de/industrialsecurity*

Cable system technology:

You will find more information on the SIMATIC NET cable system family under: *www.siemens.de/fastconnect*

Selection Tool:

The SIMATIC NET Selection Tool and the TIA Selection Tool are available to provide support in selecting SCALANCE X devices and configuring the modular versions:

- *http://www.siemens.com/snst-standalone*
- *http://www.siemens.com/tia-selection-tool-standalone*
- *http://www.siemens.com/tstcloud*

Description	Order no.																
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
SCALANCE S602	6	G	K	5	6	0	2	–	0	B	A	1	0	–	2	A	A	3
SCALANCE S612	6	G	K	5	6	1	2	–	0	B	A	1	0	–	2	A	A	3
SCALANCE S615	6	G	K	5	6	1	5	–	0	B	A	1	0	–	2	A	A	3
SCALANCE S623	6	G	K	5	6	2	3	–	0	B	A	1	0	–	2	A	A	3
SOFTNET Security Client V4 (for 32/64 Bit Windows 7 Professional, Ultimate)	6	G	K	1	7	0	4	–	1	V	W	0	4	–	0	A	A	0
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																	E	

Table 3.14/1 Selection and Ordering Data

SOFTNET-IE RNA – Description

Description

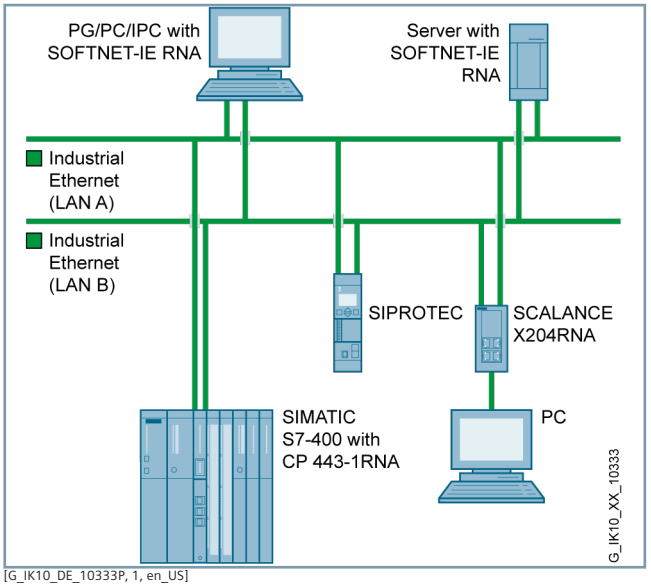
- SOFTNET-IE RNA (Redundant Network Access) is the software for connecting a PC to PRP-capable (Parallel Redundancy Protocol according to IEC 62439-3)
- High system availability by transmitting telegrams twice in two parallel separate networks
- Reconfiguration times in a partial network do not affect the propagation time because the telegrams are transmitted into two separate networks (seamless redundancy)
- Integration into network management systems with SNMP support
- Configuration tools are part of the scope of supply of the communication software

Benefits

- Increases the availability of the PC application by building Industrial Ethernet networks with high network availability (seamless media redundancy due to parallel data transmission in parallel networks)
- High availability of the entire system
- No additional programming effort required on the PC
- Secures investments by using existing applications and offering flexible application options
- Simple integration into existing network management systems thanks to diagnostic data access via SNMP as a standard interface

Applications

The software package SOFT-IE RNA facilitates the cost-effective connection of PCs with two network interfaces to parallel separate networks requiring high availability.



[G_IK10_DE_10333P, 1, en_US]

Figure 3.15/2 Parallel PRP Network Structure with SOFTNET-IE RNA and SCALANCE X204RNA

[SOFTNET-IE RNA, 1, --_--]

Figure 3.15/1 SOFTNET-IE RNA

Description	Order no.																
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
SOFTNET-IE RNA software for connecting PCs to PRP-capable networks with integrated SNMP, runtime software, software and electronic manual on CD-ROM, license key on a USB stick, Class A																		
SOFTNET-IE RNA V8.1 For 32-bit Windows XP; German/English • Single license for one installation	6	G	K	1	7	1	1	-	1	E	W	0	8	-	1	A	A	0
SOFTNET-IE RNA V8.2 for 32-bit/64-bit Windows 7 Professional/Ultimate; for 64-bit Windows 2008 Server R2; German/English • Single license for one installation	6	G	K	1	7	1	1	-	1	E	W	0	8	-	2	A	A	0
Software Update Service for one year, with automatic extension; Prerequisite: current software version	6	G	K	1	7	1	1	-	1	E	W	0	0	-	3	A	L	0
Upgrade From V8.1 to 8.2 • Single license for one installation	6	G	K	1	7	1	1	-	1	E	W	0	0	-	3	A	E	0

Table 3.15/1 Selection and Ordering Data

SCALANCE M87x Mobile Wireless Router – Description

Overview

- EDGE/HSPA+/LTE 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+
- High security thanks to IPSec-based VPN functionality and firewall
- Savings of configuration time thanks to SCALANCE S security modules using coordinated VPN configuration
- Can be used globally with GSM Quadband technology and UMTS as well as LTE Pentaband technology (keep the country-specific approvals in mind!)

Functions

Interfaces

- 1 digital input and 1 digital output each for signaling faults and outages
- Sturdy plastic case for DIN rail mounting
- 2 Ethernet ports for Industrial Ethernet
- Diagnostics LEDs for modem status, field strength, connection check, VPN status, and DI/DO channels
- Connection to the 24-VDC supply voltage
- 1x SMA antenna connection for 2G/3G antenna

Mobile wireless standards supported

- 874-2: 2G (Global System for Mobile Communications, General Packet Radio Service, Economic Dispatch)
- 874-3: 2G (GSM, GPRS, EDGE) / 3G (UMTS, HSPA+)
- 876-3: 2G (GSM, GPRS, EDGE) / 3G (UMTS, HSPA+, CDMA2000, EV-DO)
- 876-4: 2G (GSM, GPRS, EDGE) / 3G (UMTS, HSPA+) / 4G (LTE)

Protocols

- DNS, DynDNS, no-ip

Management

- Web interface for configuration and management
- CLI for configuration and management
- SNMP and MIBs, TRAPS are supported

[ph_SCALANCE_M87x, 1, --_--]

Figure 3.16/1 SCALANCE M874-2 / SCALANCE M874-3 / SCALANCE M876-3 / SCALANCE M876-4

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

Diagnosis and Logging

- SysLog is supported
- Expanded event management with alerting by e-mail, SMS, DO
- Log Table

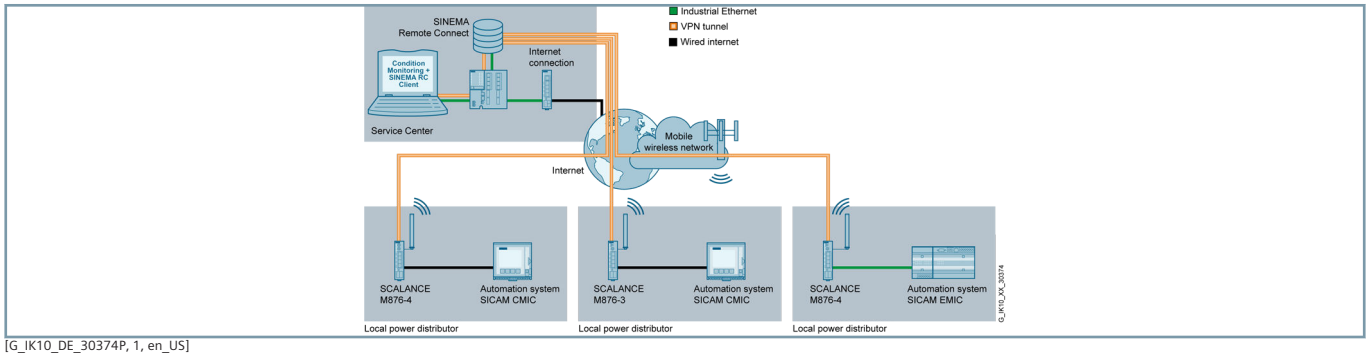
Time Synchronization

- Network Time Protocol (NTP) is supported
- Simple Network Time Protocol (SNTP) is supported

Applications

- The SCALANCE M874 can be used universally. Due to its type of construction and electrical properties, the router is primarily suited to use in the industrial sector
- Global remote programming and maintenance via mobile wireless
- Energy-saving designs of systems, for example, by status-dependent 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, 1, en_US]

Figure 3.16/2 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 here:*http://siemens.de/remote-networks*

Country approvals:

You can always find the current country approvals and country-specific constraints at the following link: *http://www.siemens.de/mobilfunkzulassungen*

Cable system technology:

You will find more information on the SIMATIC NET cable system family under: *www.siemens.de/fastconnect*

Selection Tool:

The SIMATIC NET Selection Tool and the TIA Selection Tool are available to provide support in selecting SCALANCE X devices and configuring the modular versions:

- *http://www.siemens.com/snst-standalone*
- *http://www.siemens.com/tia-selection-tool-standalone*
- *http://www.siemens.com/tstcloud*

SCALANCE M87x Mobile Wireless Router – Selection and Ordering Data

Description	Order no.																
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
SCALANCE M874-2	6	G	K	5	8	7	4	-	2	A	A	0	0	-	2	A	A	2
SCALANCE M874-3	6	G	K	5	8	7	4	-	3	A	A	0	0	-	2	A	A	2
SCALANCE M876-3	6	G	K	5	8	7	6	-	3	A	A	0	0	-	2	A	A	2
SCALANCE M876-4	6	G	K	5	8	7	6	-	4	A	A	0	0	-	2	A	A	2
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																	E	

Table 3.16/1 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:

- Phone 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 monitoring and controlling remotely connected substations
- Secure, simple access to the systems from any point in the worldHigh availability of the entire system
- Simple, cost-effective migration from classic remote communication to IP-based remote communication
- Wide field of application from remote service to remote control thanks to transparent IP communication
- Optimal connection of identical machines with identical local subnetworks (for example, for series machine manufacturers and OEMs)
- Simple integration into industrial systems with existing infrastructure
- Extremely simple connection of terminal devices (for example, SCALANCE S615) and SINEMA Remote Connect client (little IT knowhow necessary)

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 SCALANCE S615
  - Routing support
  - NAT support for mapping locally identical subnetworks
  - NAT support for mapping dedicated local IP addresses
  - Support of multiple subnetworks downstream of a SCALANCE S615

[ph_SINEMA Remote Connect, 1, --_--]

Figure 3.17/1 SINEMA Remote Connect

Key Plug SINEMA RC

- Connecting SINEMA RC and support during commissioning:
  - Auto-configuration interface for simple connection configuration of SCALANCE S615

SINEMA Remote Connect client

- Supported operating systems:
  - Windows 7 Ultimate, Enterprise, Professional SP1 (32-bit and 64-bit)
  - Windows 8.1 Pro (64 bit)
- Phone 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:

- System and machine manufacturing
- Power distribution/substations (municipal utility)
- Logistics/harbor logistics

- ITS/transport companies
- Water & waste water (municipal utility, etc.)

Product Versions

The SINEMA Remote Connect management platform is divided into the following products:

- SINEMA Remote CONNECT Virtual Appliance V1.0
  - 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 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 SINEMA RC
  - With the Key-Plug SINEMA RC, connecting to the SINEMA RC via the auto-configuration interface of the SCALANCE S615 is enabled. In this way, the configuration of the connections from the SCALANCE S615 to the SINEMA Remote Connect is simple and quick.
- Supported hardware
  - When the SINEMA Remote Connect is released for delivery, only the security LAN router SCALANCE S615 is supported for connecting to SINEMA RC at first. Other products of the SCALANCE M800 series (for example, SCALANCE M874/M876) will also be given the possibility of connecting in the future via a firmware update.

Additional information

You can find more information on the topic of remote networks on the Internet at: *http://www.siemens.de/remote-networks*

You can find more information on the topic of industrial security on the Internet at: *http://www.siemens.de/industrialsecurity*

Description	Order no.																
	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
SINEMA RC Virtual Appliance V1.0 Up to 4 VPN connections including SINEMA RC Client; documentation on DVD, license key on a USB stick; 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 64 Upgrade by 64 VPN connections; license only, no software	6	G	K	1	7	2	2	-	1	J	H	0	1	-	0	B	V	0
SINEMA RC UPGRADE 256 Upgrade by 256 VPN connections, license only, no software	6	G	K	1	7	2	2	-	1	M	H	0	1	-	0	B	V	0
SINEMA RC UPGRADE 1024 Upgrade by 1024 VPN connections; license only, no software	6	G	K	1	7	2	2	-	1	Q	H	0	1	-	0	B	V	0
SINEMA RC client V1.0 OpenVPN client for connection to SINEMA Remote Connect; documentation on DVD, license key on a USB stick; 2 languages (German, English); single license for one installation	6	G	K	1	7	2	1	-	1	X	G	0	1	-	0	A	A	0
Accessories																		
SCALANCE S615 Industrial security module for protecting devices and networks in automation technology and for securing industrial communication using VPN and firewall; address translation (NAT/NAPT); connection to SINEMA RC; 5-port switch; 1 x digital input, 1 x digital output	6	G	K	5	6	1	5	-	0	A	A	0	0	-	2	A	A	2
KEY-PLUG SINEMA RC Removable medium for enabling connection to SINEMA Remote Connect for S615, for simple device replacement in the event of a fault and adopting configuration data	6	G	K	5	9	0	8	-	0	P	B	0	0					

Table 3.17/1 Selection and Ordering Data

Mobile Network Antenna – Description

Description

Remote antennas increase reliability of wireless connections by optimizing receiving and transmission of the signals.

- Use for routers, modems and communication processors for the mobile wireless standards GSM/GPRS (2G), UMTS (3G), LTE (4G)
- Coordinated assortment of 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

Functions

Wireless coverage is optimized for the application using remote antennas. This provides a reliable wireless connection in industrial applications.

Applications

Remote antennas optimize the transmission and reception conditions and make it possible to use remote network products in many industrial applications. Besides antennas that provide a directional radiation pattern, the wireless coverage is concentrated approximately in the form of a disk around the antenna with an omnidirectional antenna. As a result, improving the quality of the wireless connection is achieved in both types of construction.

Application 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

[P_IK10_XX_02151P, 1, --_--]

Figure 3.18/1 Mobile Network Antennas

Description	Versions	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	V	H	☐	0					
													▲						
	1 m												1						
	2 m												2						
	5 m												5						
SIMATIC NET Antenna QMA/N-Connect Male/Female Flexible Connection Cable		6	X	V	1	8	7	5	-	5	V	H	1	0					
	Flexible adaptor cable, pre-assembled with two QMA/N-Connect male/female connectors, 1 m																		
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 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, two 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 coupler; two 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																		

Description

The RUGGEDCOM RS900 family consists of multiple utility grade, fully managed Ethernet switches, specifically designed to operate reliably in electrically harsh and climatically demanding environments. They provide a high level of immunity to electro-magnetic interference and heavy electrical surges typical of environments found on plant floors or in curbside traffic control cabinets. An operating temperature range of –40 °C to +85 °C (–40 °F to +185 °F) allows all of them to be placed in almost any location.

Benefits

- Avoid downtime with products designed to be reliable in harsh environments
- Support for different power sources and extended voltage ranges save power input conversion costs and infrastructure
- Use any available or planned fiber infrastructure with flexible uplink options
- Use Fast Ethernet or Gigabit Ethernet variations based on need

Functions

- Multiple port configurations available with both copper and fiber optics and speeds up to 1 Gbit/s
- Fiber optic versions are available with multimode and single-mode optical transceivers with different interfaces (LC, SC, SFP)
- 24 VDC, 48 VDC, or high-power (88 to 300 VDC/85 to 264 VAC) 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
- Available as a version with Power-over-Ethernet (POE) support
- Available as a version with for protection against strong jets of water (IP66) and temporary immersion in water (IP67)

Product Variants

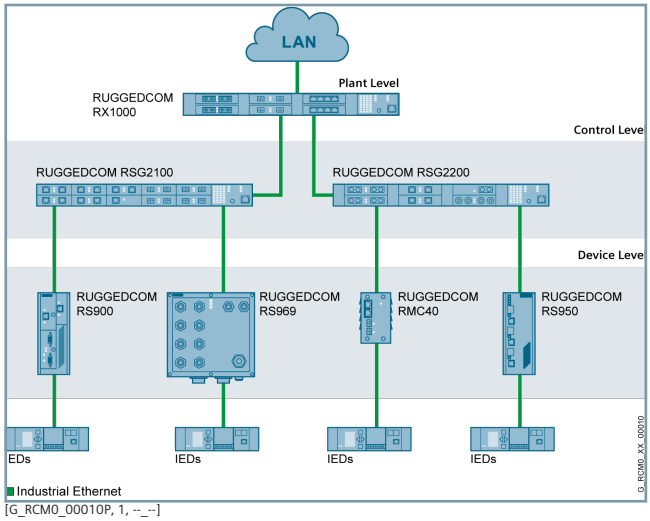
- RUGGEDCOM RS900
  - 9-port managed Ethernet switch with fiber-optic uplinks and 256-bit encryption
- RUGGEDCOM RS900NC
  - 9-port managed Ethernet switch with fiber-optic uplinks, non export controlled version
- RUGGEDCOM RS900G
  - 10-port managed Ethernet switch with gigabit fiber-optic uplinks and 256-bit encryption
- RUGGEDCOM RS900GNC
  - 10-port managed Ethernet switch with gigabit fiber-optic uplinks, non export controlled version
- RUGGEDCOM RS900GP
  - 10-port managed Ethernet switch with 8 Power over Ethernet (POE) ports, 2ˆGigabit uplinks and 256-bit encryption

[P_RCM0_XX_00041P, 1, --_--]

Figure 3.19/1 RUGGEDCOM RS900

- RUGGEDCOM RS900GPNC
  - 10-port managed Ethernet switch with 8 Power over Ethernet (POE) ports, 2 Gigabit uplinks, non export controlled version
- RUGGEDCOM RS940G
  - 8-port managed Gigabit Ethernet switch with 2 optional fiber-optic ports and 256-bit encryption
- RUGGEDCOM RS940GNC
  - 8-port managed Gigabit Ethernet switch with 2 optional fiber-optic ports, non export controlled version
- RUGGEDCOM RSG920P
  - 20-port managed Gigabit Ethernet switch with 4 Gigabit SFP ports, 4 PoE+ ports and 256-bit encryption
- RUGGEDCOM RSG920PNC
  - 20-port managed Gigabit Ethernet switch with 4 Gigabit SFP ports, 4 PoE+ ports , non export controlled version
- RUGGEDCOM M969
  - MIL-STD and IP66/67-rated, 10-port managed Ethernet switch including two fiber-optic ports and 256-bit encryption
- RUGGEDCOM M969GNC
  - MIL-STD and IP66/67-rated, 10-port managed Ethernet switch including two fiber-optic ports , non export controlled version

Application Example



[G_RCM0_00010P, 1, --_--]

Figure 3.19/2 RUGGEDCOM RS900 family products are typically used for device level connectivity to end devices

Further information

To assist in selecting the right RUGGEDCOM products as well as configuration of variants, the RUGGEDCOM Selector is available at: *http://www.siemens.com/ruggedcom-selector*

RUGGEDCOM RSx – RS900 / M900 managed – Selection and Ordering Data

Description	Variants	Order no.																	
		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16	
RUGGEDCOM RS900																				
The RUGGEDCOM RS900 is a 9-port utility grade, fully managed Ethernet switch; up to 9 Ports: 6 base 10/100baseTX ports with option for 3 additional fiber or copper ports; industry standard fiber optical connectors: LC, SC, ST, MTRJ multimode and single-mode optical transceivers; long haul optics allow distances up to 90 km	RUGGEDCOM RS900NC (non – export controlled)	6	G	K	6	0	9	0	-	0	A	S	1	.	-	0	.	A	.	
	RUGGEDCOM RS900 (export controlled)	6	G	K	6	0	9	0	-	0	A	S	2	.	-	0	.	A	.	
RUGGEDCOM RS900G																				
The RUGGEDCOM RS900G is a utility grade, fully managed Ethernet switch providing dual fiber optical Gigabit Ethernet ports and 8 Fast Ethernet copper ports; 56 or 128-bit encryption; 2 - Fiber Optical Gigabit Ethernet Ports (1000BaseX); 8 - Fast Ethernet Ports (10/100BaseTX); multiple fiber connector types (LC, SC, SFP Pluggable Optics); Long haul optics allow Gigabit distances up to 70 km	RUGGEDCOM RS900GNC (non – export controlled)	6	G	K	6	0	9	0	-	0	G	S	1	.	-	.	.	.	.	
	RUGGEDCOM RS900G (export controlled)	6	G	K	6	0	9	0	-	0	G	S	2	.	-	.	.	.	.	
RUGGEDCOM RS900GP																				
The RUGGEDCOM RS900GP is a utility grade, fully managed Ethernet switch providing dual fiber optical Gigabit Ethernet ports and 8 Fast Ethernet Power-over-Ethernet copper ports; 56 or 128-bit encryption; Supports PoE and PoE+ on all copper ports; 2 - Fiber Optical Gigabit Ethernet Ports (1000BaseX); 8 - Fast Ethernet Ports (10/100BaseTX); multiple fiber connector types (LC, SC, SFP Plug-gable Optics); Long haul optics allow Gigabit distances up to 70 km	RUGGEDCOM RS900GPNC (non – export controlled)	6	G	K	6	0	9	0	-	0	P	S	1	0	-	0	.	A	.	
	RUGGEDCOM RS900GP (export controlled)	6	G	K	6	0	9	0	-	0	P	S	2	0	-	0	.	A	.	
RUGGEDCOM RS940G																				
RUGGEDCOM RS940G is a utility grade, fully managed Ethernet switch providing 6 or 8 ports of Gigabit Ethernet. 6 10/100/1000BaseTX triple speed copper ports are standard; 2 gigabit fiber or copper ports can be added. 56 or 128-bit Encryption; 6-10/100/1000BaseTX Triple Speed Copper Ports Standard; Optional 2 additional 1000LX SFP Pluggable Gigabit Fiber; 2-10/100/1000BaseTX copper ports	RUGGEDCOM RS940GNC (non – export controlled)	6	G	K	6	0	9	4	-	0	G	S	1	.	-	.	.	.	.	
	RUGGEDCOM RS940G (export controlled)	6	G	K	6	0	9	0	-	0	G	S	2	.	-	.	.	.	.	
RUGGEDCOM RSG920P																				
RUGGEDCOM RSG920P is a fully managed Ethernet switch with 128-bit Encryption and 20 non-blocking Gigabit Ethernet ports; support for 4 SFP modules and 4 PoE + ports; 40 Deg. C. to + 85 Deg. C. oper-ating temperature (fanless)	RUGGEDCOM RSG920PNC (non – export controlled)	6	G	K	6	0	9	2	-	0	P	S	1	.	-	0	.	A	.	-Z A00+B00 +C00+D 00
	RUGGEDCOM RSG920P (export controlled)	6	G	K	6	0	9	2	-	0	P	S	2	.	-	0	.	A	.	-Z A00+B00 +C00+D 00
RUGGEDCOM M969																				

Description	Variants	Order no.																		
The RUGGEGCOM M969 is a MIL-STD hardened, fully managed Ethernet switch providing dual fiber optical Ethernet ports, 8 Fast Ethernet copper ports in a MIL-STD 901D rated package, 56 or 128-bit encryption; fiber-optic Ethernet Ports (100BaseX and 1000BaseX) with: IP66/IP67 rated fiber-optic connectors (type LC); 8-Fast Ethernet ports (10/100BaseTX) with: IP66/IP67 rated M12 D-code connectors or IP66/IP67 rated shrouded RJ45 style connectors	RUGGEDCOM M969NC (non – export controlled)	6	G	K	6	0	9	6	-	8	M	S	1	.	-	.	E	.	1	
	RUGGEDCOM M969G (export controlled)	6	G	K	6	0	9	6	-	8	M	S	1	.	-	.	E	.	1	

Description

The RUGGEDCOM RSG2100 is a utility grade, fully managed, modular Ethernet switch, specifically designed to operate reliably in electrically harsh and climatically demanding utility substation and industrial environments.

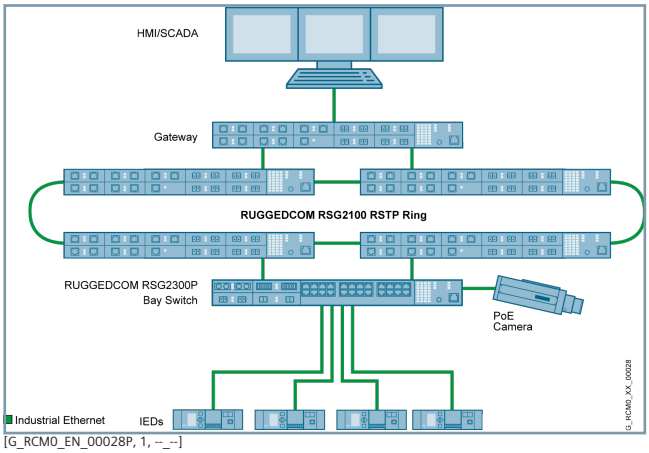
Benefits

- Suitable for usage in electric power, transportation and industrial applications due to a utility grade design with immunity against EMI and heavy electrical surges
- Build-to-order design ensures flexibility in tailoring the device configuration to unique needs
- Suitable for usage in harsh environments with the minimal risk of mechanical failures due to an operating temperature from -40 to +85 °C without fans
- Dual redundant power supplies ensure a reliable and maintenance-free connection to power
- Optional Power-over-Ethernet version available with the ability to power and connect up to 4 end-devices where AC power is unavailable or locally cost prohibitive

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

Application Example



[G_RCM0_EN_00028P, 1, --_--]

Figure 3.19/4 RSTP Ring with the RUGGEDCOM RSG2100

[P_RCM0_XX_00250P, 1, --_--]

Figure 3.19/3 RUGGEDCOM RSG2100

Further information

To assist in selecting the right RUGGEDCOM products as well as configuration of variants, the RUGGEDCOM Selector is available at: *http://www.siemens.com/ruggedcom-selector*

Description	Variants	Order no.																
		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
RUGGEDCOM RSG2100																			
The RUGGEDCOM RSG2100NC 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 70 km; multiple connector types (ST, MTRJ, LC, SC, RJ45, Micro-D)	RUGGEDCOM RSG2100NC (non – export controlled)	6	G	K	6	0	2	1	-	0	A	S	1	.	-	.	.	.	.
	RUGGEDCOM RSG2100 (export controlled)	6	G	K	6	0	2	1	-	0	A	S	2	.	-	.	.	.	.
RUGGEDCOM RSG2100P																			
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 RSG2100PNC (non – export controlled)	6	G	K	6	0	2	1	-	0	P	S	1	.	-	.	.	.	.
	RUGGEDCOM RSG2100P (export controlled)	6	G	K	6	0	2	1	-	0	P	S	2	.	-	.	.	.	.
RUGGEDCOM M2100																			
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 70 km; multiple connector types (ST, MTRJ, LC, SC, RJ45, Micro-D)	RUGGEDCOM M2100NC (non – export controlled)	6	G	K	6	0	2	1	-	0	M	S	1	.	-	.	.	.	.
	RUGGEDCOM M2100 (export controlled)	6	G	K	6	0	2	1	-	0	M	S	2	.	-	.	.	.	.

Description

The RUGGEDCOM RSG2200 product family consists of multiple utility grade, fully managed, modular Gigabit Ethernet switches, specifically designed to operate reliably in electrically harsh and climatically demanding utility substation and industrial environments.

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
- Build-to-order design ensures flexibility in tailoring the device configuration to unique needs
- Suitable for usage in harsh environments with the minimal risk of mechanical failures due to an operating temperature from -40 to +85 °C without fans
- Dual redundant power supplies ensure a reliable and maintenance-free connection to power

Features

- Up to 9 Gigabit 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, bidirectional single strand) 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
- Available as a version with IEEE 1588 v2 and IRIG-B conversion
- Available as a version with MIL-STD Ratings

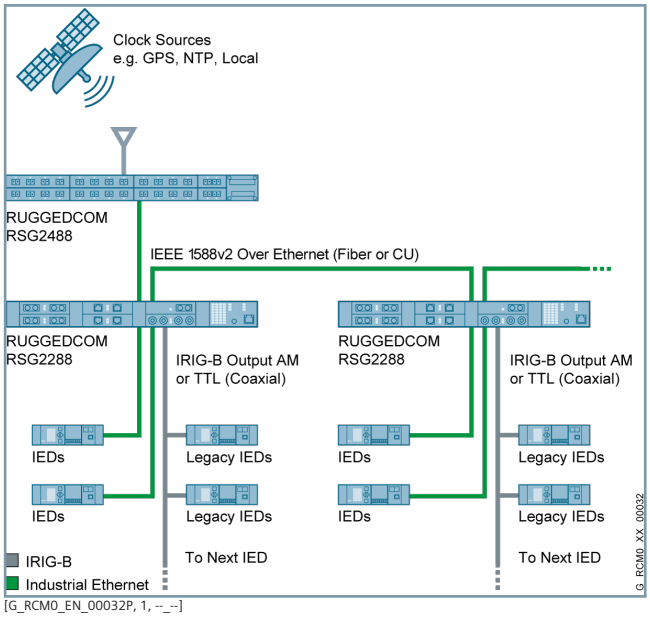
Product Variants

- RUGGEDCOM RSG2200
  - 9-port modular managed Gigabit Ethernet switch with 256-bit encryption
- RUGGEDCOM RSG2200NC
  - 9-port modular managed Gigabit Ethernet switch, non export controlled version
- RUGGEDCOM RSG2288
  - 9-port modular managed Gigabit Ethernet switch with IEEE 1588 v2 and IRIG-B conversion and 256-bit encryption
- RUGGEDCOM RSG2288NC
  - 9-port modular managed Gigabit Ethernet switch with IEEE 1588 v2 and IRIG-B conversion, non export controlled version
- RUGGEDCOM M2200
  - 9-port modular MIL-STD managed Gigabit Ethernet switch with 256-bit encryption
- RUGGEDCOM M2100NC
  - 9-port modular MIL-STD managed Gigabit Ethernet switch, non export controlled version

[P_RCM0_XX_00076P, 1, --_--]

Figure 3.19/5 RUGGEDCOM RSG2200

Application Example



[G_RCM0_EN_00032P, 1, --_--]

Figure 3.19/6 The RUGGEDCOM RSG2288 uses IEEE 1588v2 to synchronize both new and legacy IEDs over Ethernet and IRIG-B

Further information

To assist in selecting the right RUGGEDCOM products as well as configuration of variants, the RUGGEDCOM Selector is available at: *http://www.siemens.com/ruggedcom-selector*

Description	Variants	Order no.																
		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
RUGGEDCOM RSG2200																			
The RUGGEDCOM RSG2200 is a utility grade, fully managed modular Gigabit Ethernet switch; up to 9-Gigabit Ethernet ports copper and/or fiber; up to 9 100FX fiber Fast Ethernet ports; 2 port modules for tremendous flexibility; multimode, single-mode; non-blocking, store and forward switching; long haul optics allow Gigabit distances up to 70 km; multiple connector types (LC, SC, SFP, GBIC)	RUGGEDCOM RSG2200NC (non – export controlled)	6	G	K	6	0	2	2	-	0	A	S	1	.	-	.	.	.	.
	RUGGEDCOM RSG2200 (export controlled)	6	G	K	6	0	2	2	-	0	A	S	2	.	-	.	.	.	.
RUGGEDCOM RSG2288																			
The RUGGEDCOM RSG2288 is a utility grade, fully managed modular Gigabit Ethernet switch; up to 9-Gigabit Ethernet ports copper and/or fiber; up to 9 100fx Fiber Fast Ethernet ports; 2 port modules for tremendous flexibility; multimode, single-mode; non-blocking, store and forward switching; long haul optics allow Gigabit distances up to 70 km; multiple connector types (LC, SC, SFP, GBIC)	RUGGEDCOM RSG2288NC (non – export controlled)	6	G	K	6	0	2	2	-	8	A	S	1	.	-	.	.	.	.
	RUGGEDCOM RSG2288 (export controlled)	6	G	K	6	0	2	2	-	8	A	S	2	.	-	.	.	.	.
RUGGEDCOM M2200																			
The RUGGEDCOM M2200NC is a MIL-STD hardened, fully managed, modular Gigabit Ethernet switch; up to 9-Gigabit Ethernet ports copper and/or fiber; 2 port modules for tremendous flexibility; supports multimode and single-mode fiber; non-blocking, store and forward switching; supports LC connectors for fiber, Micro-D connectors for copper	RUGGEDCOM M2200NC (non – export controlled)	6	G	K	6	0	2	2	-	0	M	S	1	.	-	.	.	.	.
	RUGGEDCOM M2200 (export controlled)(non – export controlled)	6	G	K	6	0	2	2	-	0	M	S	2	.	-	.	.	.	.

Description

The RUGGEDCOM RSG2300 product family consists of a utility grade, fully managed, 32-port managed Ethernet switch with 4 modular Gigabit uplink ports.

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
- Build-to-order design ensures flexibility in tailoring the device configuration to unique needs
- Suitable for usage in harsh environments, the fan-less cooling design eliminates mechanical failures and scheduled maintenance, reducing operating costs.
- Dual redundant power supplies ensure a reliable and maintenance-free connection to power
- Optional Power-over-Ethernet version available with the ability to power and connect up to 4 end-devices where AC power is unavailable or locally cost prohibitive

Features

- 24 Fast Ethernet ports - copper
- Optional: up to 4x 1000LX Gigabit Ethernet ports (copper and/or fiber) and up to 8x 100FX fiber Fast Ethernet ports
- Non-blocking, store and forward switching
- Supports many types of fiber (multimode, single-mode, bidirectional single strand) 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
- Available as a version with up to 4x 10/100BaseTX 802.3af-compliant ports
- Available as a version with MIL-STD ratings

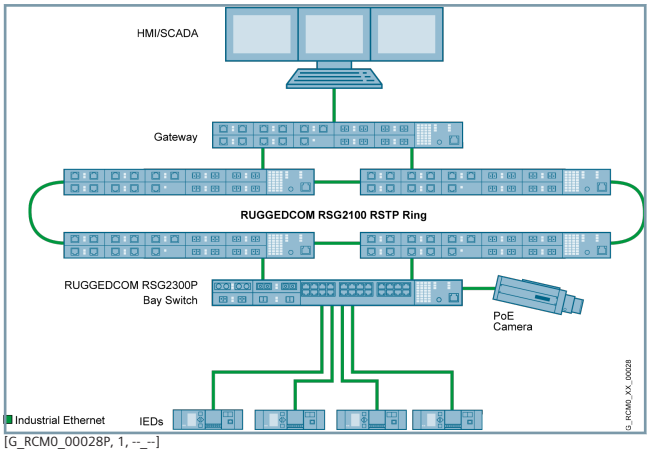
Product Variants

- RUGGEDCOM RSG2300
  - 32-port managed Ethernet switch with Gigabit uplinks and 256-bit encryption
- RUGGEDCOM RSG2300NC
  - 32-port managed Ethernet switch with Gigabit uplinks, non export controlled version
- RUGGEDCOM RSG2300P
  - 32-port managed Ethernet switch with Power over Ethernet, Gigabit uplinks and 256-bit encryption
- RUGGEDCOM RSG2300PNC
  - 32-port managed Ethernet switch with Power over Ethernet, Gigabit uplinks, non export controlled version

[P_RCM0_XX_00076P, 1, --_--]

Figure 3.19/7 RUGGEDCOM RSG2300

Application Example



[G_RCM0_00028P, 1, --_--]

Figure 3.19/8 The RUGGEDCOM RSG2300P can be used to connect a large number of devices and can also be used to connect devices by Power-over-Ethernet (PoE)

Further information

To assist in selecting the right RUGGEDCOM products as well as configuration of variants, the RUGGEDCOM Selector is available at: *http://www.siemens.com/ruggedcom-selector*

Description	Variants	Order no.-																
		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
RUGGEDCOM RSG2300																			
The RUGGEDCOM RSG2300 is a utility grade, fully managed, modular Ethernet switch; 24 10/100TX copper ports optional; up to 4 1000LX Gigabit Ethernet ports (copper and/or fiber) and up to 8 100FX fiber Fast Ethernet ports; 2 port modules for tremendous flexibility; non-blocking, store and forward switching; multimode, single-mode; long haul optics allow distances up to 90 km; multiple connector types (ST, MTRJ, LC, SC)	RUGGEDCOM RSG2300NC (non – export controlled)	6	G	K	6	0	2	3	-	0	A	S	1	.	-	.	.	.	.
	RUGGEDCOM RSG2300 (export controlled)	6	G	K	6	0	2	3	-	0	A	S	2	.	-	.	.	.	.
RUGGEDCOM RSG2300P																			
The RUGGEDCOM RSG2300 is a utility grade, fully managed, modular Ethernet switch; 2 x 10/100baseTX 802.3af (PoE) compliant Ethernet ports, with the option to add an additional 2 PoE ports, up to 6 additional Ethernet ports including 10baseFL/ 100baseFX/1000baseX fiber and 10/100/1000baseTX copper port combinations	RUGGEDCOM RSG2300PNC (non – export controlled)	6	G	K	6	0	2	3	-	0	P	S	1	.	-	.	.	.	.
	RUGGEDCOM RSG2300P (export controlled)	6	G	K	6	0	2	3	-	0	P	S	2	.	-	.	.	.	.

RUGGEDCOM RSx – RSG2488 managed

Description

The RUGGEDCOM RSG2488 is the first 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
- Future-proof due to support of modern IEEE 1588 time synchronization features
- Suitable for usage in harsh environments with the minimal risk of mechanical failures due to an operating temperature from -40 to +85 °C without fans
- Hot swappable, cable-free dual redundant smart power supplies ensure a convenient, reliable and maintenance-free connection to power

Features

- Up to 28 Gigabit Ethernet ports – copper and/or fiber in 19" 1U rack-mount
- Fully modular with 2/4 port field-replaceable Ethernet 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

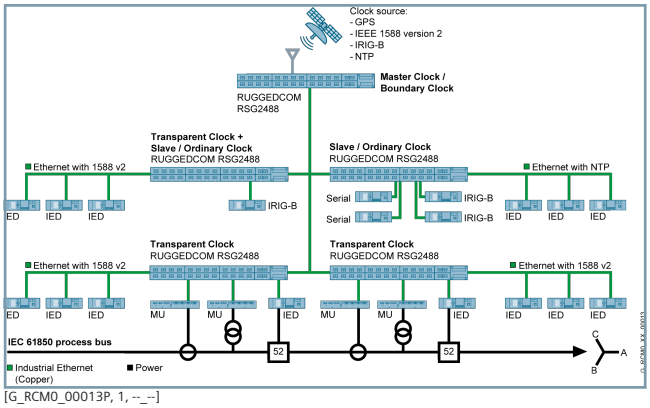
Product Variants

- RUGGEDCOM RSG2488
  - 28-port modular managed Gigabit switch with 256-bit Encryption
- RUGGEDCOM RSG2488NC
  - 28-port modular managed Gigabit switch, non export controlled version

[P_RCM0_XX_00038P, 1, --_--]

Figure 3.19/9 RUGGEDCOM RSG2488

Application Example



[G_RCM0_00013P, 1, --_--]

Figure 3.19/10 IEEE 1588v2 time synchronization with RUGGEDCOM RSG2488 as Master Clock/Boundary Clock and Transparent Clock

Further information

To assist in selecting the right RUGGEDCOM products as well as configuration of variants, the RUGGEDCOM Selector is available at: *http://www.siemens.com/ruggedcom-selector*

Description	Variants	Order no.																
		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
RUGGEDCOM RSG2488																			
The RUGGEDCOM RSG2488NC 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)	RUGGEDCOM RSG2488NC non – export controlled)	6	G	K	6	0	2	4	-	8	G	S	2	.	-	.	.	.	.
	RUGGEDCOM RSG2488 (export controlled)	6	G	K	6	0	2	4	-	8	G	S	2	.	-	.	.	.	.

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

- Industrially hardened serial device server with an integrated, fully managed Ethernet switch
- Flexible Ethernet ports with high performance and throughput switching
- Rugged rated for reliability in harsh environment
- Rugged Operation System (ROS) features to support simple plug and play operations
- Multiple management tools for interfaces, monitoring, and diagnostics

Features

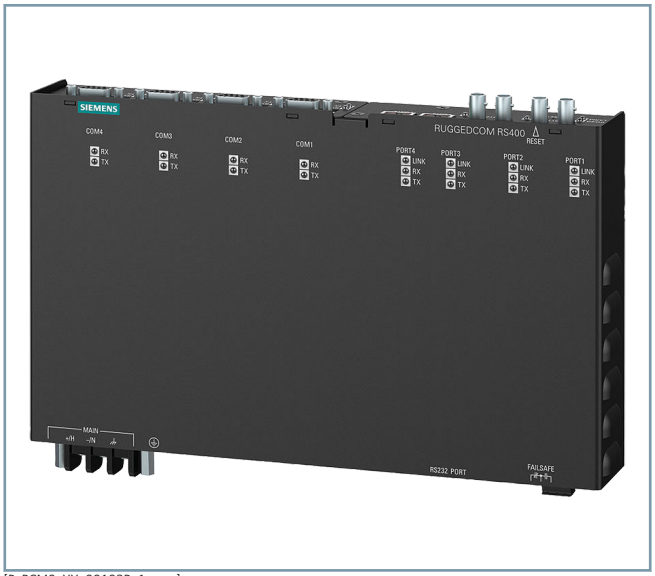
- Fully compliant EIA/TIA RS485, RS422, RS232 serial ports (software selectable)
- Different types of serial connectors DB9, RJ45 or Phoenix style connectors
- Integrated Ethernet switch – up to 4 ports
- 10/100BaseTX, 10BaseFL, 100BaseFX options
- Enables transmitting from serial data over an IP network
- Non-blocking, store and forward switching
- 24 VDC, 48 VDC, or high-power (88 to 300 VDC/85 to 264 VAC) 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
- RUGGEDCOM RS400NC
  - Serial device server with integrated fully managed Ethernet switch, non export controlled version

Further information

To assist in selecting the right RUGGEDCOM products as well as configuration of variants, the RUGGEDCOM Selector is available at: *http://www.siemens.com/ruggedcom-selector*



[P_RCM0_XX_00103P, 1, --_--]

Figure 3.19/11 RUGGEDCOM RS400

Description	Variants	Order no.																
		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
RUGGEDCOM RS400																			
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	RUGGEDCOM RS400NC (non – export controlled)	6	G	K	6	0	4	0	-	0	A	T	1	.	-	0	.	A	.
	RUGGEDCOM RS400 (export controlled)	6	G	K	6	0	4	0	-	0	A	T	2	.	-	0	.	A	.

RUGGEDCOM RSx – RS401

Description

The RUGGEDCOM RS401 is a utility grade serial device server with an integrated, fully managed Ethernet switch, designed to operate reliably in harsh and climatically demanding environments. Based on the popular RUGGEDCOM RS400 server, the RUGGEDCOM RS401 includes all the same functionality, including an integrated 4-port serial server, 4-port managed Ethernet switch, and an optional V.90 modem. In addition, the RUGGEDCOM RS401 features a more compact design that is particularly suited for panel-mount locations or installations with tight space restrictions. The RUGGEDCOM RS401 is an ideal device to connect and "IP-enable" legacy serial devices or IEDs for Ethernet network connectivity.

Benefits

- Rugged serial device server with an integrated, fully managed Ethernet switch, particularly suited for panel mounting or installations with tight space restrictions
- Flexible Ethernet ports with high performance and throughput switching.
- Rugged rated for reliability in harsh environments
- Rugged Operating System (ROS) features to support simple plug and play operations
- Multiple management tools for interfaces, monitoring, and diagnostics

Features

- Fully compliant EIA/TIA RS485, RS422, RS232 serial ports (software selectable)
- Different types of serial connectors DB9, RJ45 or Phoenix style connectors
- Integrated Ethernet switch – up to 4 ports
- 10/100BaseTX, 10BaseFL, 100BaseFX options
- Enables transmitting from serial data over an IP network
- Non-blocking, store and forward switching
- 24 VDC, 48 VDC, or high-power (88 to 300 VDC/85 to 264 VAC) options for worldwide operability
- For use at ambient temperatures from –40 °C to +85 °C without the use of fans

Product Variants

- RUGGEDCOM RS401
  - Compact serial device server with integrated fully managed Ethernet switch with 256-bit encryption
- RUGGEDCOM RS401NC
  - Compact serial device server with integrated fully managed Ethernet switch, non export controlled version

Further information

To assist in selecting the right RUGGEDCOM products as well as configuration of variants, the RUGGEDCOM Selector is available at: *http://www.siemens.com/ruggedcom-selector*

[P_RCM0_XX_00102P, 1, --_--]

Figure 3.19/12 RUGGEDCOM RS401

Description	Variants	Order no.																
		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
RUGGEDCOM RS401																			
The RUGGEDCOM RS401 is a utility grade, serial device server with an integrated, fully managed, Ethernet switch, designed to operate reliably in electrically harsh and climatically demanding environment; compact design: 4 port serial server: 4 port managed Ethernet switch and an optional V.90 modem	RUGGEDCOM RS401NC (non – export controlled)	6	G	K	6	0	4	0	-	1	A	T	1	.	-	0	.	A	.
	RUGGEDCOM RS401 (export controlled)	6	G	K	6	0	4	0	-	1	A	T	2	.	-	0	.	A	.

Description

The RUGGEDCOM RS416 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 a modular design that can support IEEE 1588 and IRIG-B time synchronization, up to 16 serial ports, and up to 4 Ethernet ports, the RUGGEDCOM RS416 is able to interconnect and synchronize multiple types of intelligent electronic devices (IEDs).

Benefits

- Modular serial device server with an integrated fully managed Ethernet switch, and the supports of IEEE1588 and IRIG-B time synchronization
- Flexible Ethernet port options with Power over Ethernet (PoE) functionality
- Rugged rated for reliability in harsh environment
- Rugged Operating System (ROS) features to support simple plug and play operation.
- Multiple management tools for interfaces, monitoring, and diagnostics

Features

- Serial device server with modular design which allows for 4, 8, 12, or 16 serial ports
- Software selectable EIA/TIA RS232, RS485, RS422 serial ports with IRIG-B outputs
- Different types of serial connectors DB9, RJ45 or Serial fiber interface (ST)
- Integrated Ethernet switch – up to 4 ports
- Support for copper and fiber ports
- Fiber optics for either single-mode or multimode available
- Different 10/100BaseTX, 10BaseFL or 100BaseFX options
- Enables transmitting serial data over an IP network
- Non-blocking, store and forward switching
- 24 VDC, 48 VDC, or high-power (88 to 300 VDC / 85 to 264 VAC) options for worldwide operability
- For use at ambient temperatures from –40 °C to +85 °C without the use of fans
- Version available with up to 4 Power over Ethernet (PoE) ports fully compatible with 802.3af-powered devices

Product Variants

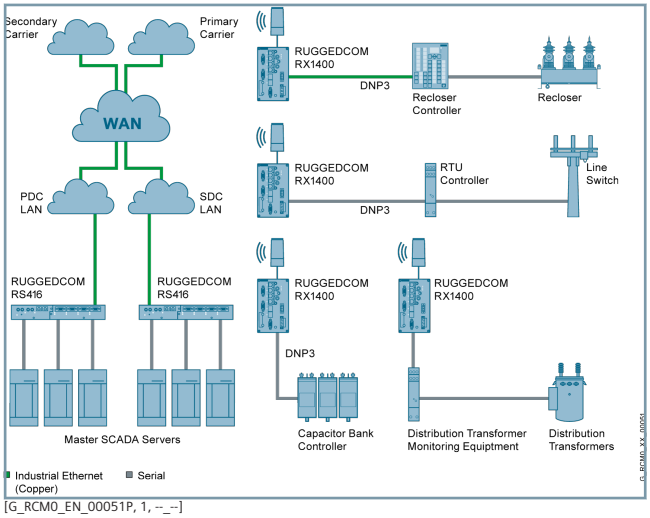
- RUGGEDCOM RS416
  - Serial device server/integrated 4-port managed Ethernet switch with IEEE 1588 v2 & IRIG-B conversion and 256-bit encryption
- RUGGEDCOM RS416NC
  - Serial device server/integrated 4-port managed Ethernet switch with IEEE 1588 v2 & IRIG-B conversion, non export controlled version

[P_RCM0_XX_00104P, 1, --_--]

Figure 3.19/13 RUGGEDCOM RS416

- RUGGEDCOM RS416P
  - Serial device server/integrated 4-port managed Ethernet Power over Ethernet switch with IEEE 1588 v2 & IRIG-B conversion and 256-bit encryption
- RUGGEDCOM RS416PNC
  - Serial device server/integrated 4-port managed Ethernet Power over Ethernet switch with IEEE 1588 v2 & IRIG-B conversion , non export controlled version

Application Example



[G_RCM0_EN_00051P, 1, --_--]

Figure 3.19/14 Distribution automation feeder devices – connecting master SCADA servers through the RUGGEDCOM RS416 as serial device server

Further information

To assist in selecting the right RUGGEDCOM products as well as configuration of variants, the RUGGEDCOM Selector is available at: *http://www.siemens.com/ruggedcom-selector*

Beschreibung	Varianten	Bestell-Nr.																
		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
RUGGEDCOM RS416																			
The RUGGEDCOM RS416 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; up to 16 serial ports and up to 4 Ethernet ports, Copper or Fiber options; supports IEEE 1588 v2; non-blocking, store and forward switching	RUGGEDCOM RS416NC (non – export controlled)	6	G	K	6	0	4	1	-	6	A	T	1	.	-	.	.	.	.
	RUGGEDCOM RS416 (export controlled)	6	G	K	6	0	4	1	-	6	A	T	2	.	-	.	.	.	.
RUGGEDCOM RS416P																			
The RUGGEDCOM RS416P 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; up to 16 serial ports and up to 4 Ethernet ports with PoE (802.3af); copper or fiber options; supports IEEE 1588 v2; non-blocking, store and forward switching	RUGGEDCOM RS416PNC (non – export controlled)	6	G	K	6	0	4	1	-	6	P	T	1	.	-	.	.	.	.
	RUGGEDCOM RS416P (export controlled)	6	G	K	6	0	4	1	-	6	P	T	2	.	-	.	.	.	.

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

- Products developed and rated for harsh environments. Meets IEC 61850-3 and IEEE 1613 specifications.
- Flexible power supply options allow the product to be used with different power sources.
- High voltage AC and DC power input allows product use without need for a separate power supply converter.
- Flexible fiber uplink options allow data transmission to various distances based on requirement
- Offers DIN as well as panel or wall mount options to accommodate different deployment scenarios

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
- Supports many types of fiber (multimode, single-mode) with multiple connector types (ST, MTRJ, LC, SC)
- Enables transmitting serial data over an IP network
- 24 VDC, 48 VDC, or high-power (88 to 300 VDC/85 to 264 VAC) 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
- RUGGEDCOM RS910NC
  - Compact serial device server with 2 serial ports and 3 Copper or Fiber Fast Ethernet ports; managed Ethernet switch and 56-bit encryption

Further information

To assist in selecting the right RUGGEDCOM products as well as configuration of variants, the RUGGEDCOM Selector is available at: *http://www.siemens.com/ruggedcom-selector*

[P_RCM0_XX_00095P, 1, --_--]

Figure 3.19/15 RUGGEDCOM RS910

Description	Variants	Order no.																
		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
RUGGEDCOM RS910																			
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)	RUGGEDCOM RS910NC (non – export controlled)	6	G	K	6	0	9	1	-	0	A	T	1	.	-	0	.	A	.
	RUGGEDCOM RS910 (export controlled)	6	G	K	6	0	9	1	-	0	A	T	2	.	-	0	.	A	.

RUGGEDCOM RSx – RS950 RNA managed

Description

The RUGGEDCOM RS950G is an IEC 62439-3 Redundancy Box (RedBox), supporting both High Availability Seamless Redundancy (HSR) and Parallel Redundancy Protocol (PRP). The RS950G provides the ultimate in network reliability from any network fault. This is achieved by simultaneously transmitting duplicate packets on independent routes through the network to provide complete path redundancy at the data link layer.

Benefits

- Prevents downtimes during faults situations by providing complete redundancy of data communication
- Support for different power sources and extended voltage ranges save power input conversion costs and infrastructure
- SFP support allows different distances without changing products or even cables in some situations

Functions

- 3 configurable copper or fiber ports
  - 1 pair of IEC 62439-3 Ethernet ports (HSR or PRP)
  - 1 Access port for standard IEEE 802.3 Ethernet devices
- SFP pluggable fiber transceiver with 100FX or 1000LX/SX options
- 24 VDC, 48 VDC, or High-voltage (88 to 300 VDC/85 to 264 VAC) power supply options for worldwide operability
- Operational temperatures from –40 °C to +85 °C with no fans
- Web-based, Telnet, CLI management interfaces

Product Variants

- RUGGEDCOM RS950G
  - Managed HSR/PRP redundancy box with 256-bit encryption
- RUGGEDCOM RS950GNC
  - Managed HSR/PRP redundancy box, non export controlled version

Further information

To assist in selecting the right RUGGEDCOM products as well as configuration of variants, the RUGGEDCOM Selector is available at: *http://www.siemens.com/ruggedcom-selector*

[P_RCM0_XX_00273P, 1, --_--]

Figure 3.19/16 RUGGEDCOM RS950G

Description	Variants	Order no.																
		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
RUGGEDCOM RS950G																			
The RUGGEDCOM RS950G is an IEC 62439-3 PRP HSR redundancy box (RedBox). Two IEC 62439 HSR/ PRP Ethernet ports; one access port for standard IEEE 802.3 Ethernet devices; all Ethernet ports support copper or fiber media SFP pluggable fiber transceiver with 100FX or 1000LX/SX; triple speed copper 10/100/1000 TX (disabled when SFP present); RS232 console port LED status indicators	RUGGEDCOM RS950GNC (non-export controlled)	6	G	K	6	0	9	5	-	0	G	S	1	.	-	0	.	A	0
	RUGGEDCOM RS950G (export controlled)	6	G	K	6	0	9	5	-	0	G	S	2	.	-	0	.	A	0

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. The RUGGEDCOM RMC30 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.

Der RUGGEDCOM RMC30 ist ein Serial-to-Ethernet-Server mit 2 Ports für den Einsatz im Energieversorgungsbereich, der speziell für den Betrieb in elektrisch rauen und klimatisch anspruchsvollen Umgebungen entwickelt wurde. Der RUGGEDCOM RMC30 bietet gleichzeitig einen RS232-Port sowie einen RS485/422-Port an, die sich auf einem schraubbaren Klemmenblock befinden. Durch den Ethernet-Port (10BaseT) werden sowohl die Autonegotiation als auch die Autocrossover-Erkennung unterstützt und damit die Verkabelung erleichtert. Die netzwerkbasierte Konfiguration erfolgt entweder über den integrierten Web- oder Telnetserver auf einfache und intuitive Weise.

[P_RCM0_XX_00088P, 1, --_--]

Figure 3.20/1 RUGGEDCOM RMC30

Benefits

- Exceeds IEC 61850-3 and IEEE 1613 standards for communication equipment in electric power substations.
- Saves CAPEX due to re-use of legacy serial end-device in modern Ethernet networks
- Management functions allowing for easy troubleshooting and reduced OPEX
- Product designed for harsh environments with longer life time
- No need for additional power supply reducing CAPEX for worldwide applications

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
- Convert Modbus RTU to Modbus TCP
- 24 VDC, 48 VDC, or high-power (88 to 300 VDC/85 to 264 VAC) 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 with 128-bit encryption
- RUGGEDCOM RMC30NC
  - Serial device server, non export controlled version

Further information

To assist in selecting the right RUGGEDCOM products as well as configuration of variants, the RUGGEDCOM Selector is available at: *http://www.siemens.com/ruggedcom-selector*

Description	Variants	Order no.																
		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
RUGGEDCOM RMC30																			
RUGGEDCOM RMC30NC 2-port Serial-to-Ethernet server	RUGGEDCOM RMC30NC	6	G	K	6	0	0	3	-	0	A	C	1	.	-	.	.	.	.
	RUGGEDCOM RMC30	6	G	K	6	0	0	3	-	0	A	C	2	.	-	.	.	.	.

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

- Exceeds IEC 61850-3 and IEEE 1613 standards for communication equipment in electric power substations
- Saves CAPEX due to re-use of existing infrastructure without the need to exchange key components
- Reduced OPEX due to simple plug and play operation
- Product designed for harsh environments with longer life time
- No need for additional power supply reducing CAPEX for worldwide applications

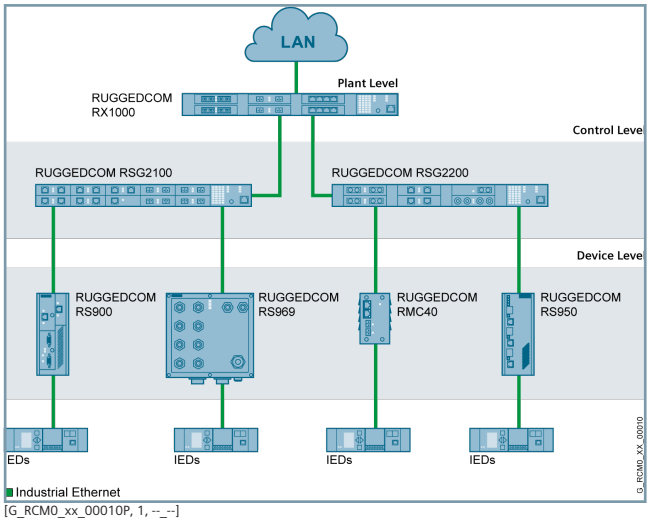
Features

- Multiple port configurations available
  - 2x 10/100TX ports + 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
- 24 VDC, 48 VDC, or high-power (88 to 300 VDC/85 to 264 VAC) options for worldwide operability
- For use at ambient temperatures from –40 °C to +85 °C without the use of fans
- Ethernet medai and speed converter with 4 ports

[P_RCM0_XX_00089P, 1, --_--]

Figure 3.20/2 RUGGEDCOM RMC40

Application Example



[G_RCM0_xx_00010P, 1, --_--]

Figure 3.20/3 The RUGGEDCOM RMC40 is used to provide speed conversion at the device level.

Further information

To assist in selecting the right RUGGEDCOM products as well as configuration of variants, the RUGGEDCOM Selector is available at: *http://www.siemens.com/ruggedcom-selector*

Description	Variants	Order no.																
		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
RUGGEDCOM RMC40																			
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; configurations: 2 ports 10/100TX + 1 port 100FX (SC/ST); 2 ports 10/100TX + 2 ports 100FX (MTRJ/LC) or 4 ports 10/100TX	RUGGEDCOM RMC40	6	G	K	6	0	0	4	-	0	A	C	0	.	-	.	.	.	.

Description

The RUGGEDCOM RMC8388 is a utility-grade time converter that has been specifically designed to operate in electrically harsh and climatically demanding environments. The RUGGEDCOM RMC8388 offers time conversion between IRIG-B and IEEE 1588. Simple and intuitive network based configuration using either the built in Web or Telnet server makes setup a breeze.

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 lower cabling and maintenance costs by allowing customers to migrate to Ethernet thereby allowing modernization of the data and timing network but still accommodating IRIG-B based source or destination devices. It is compatible with existing RUGGEDCOM timing solutions such as the RSG2288 and the RSG2488.

Benefits

- Compact time conversion between IRIG-B and IEEE 1588 allows migration to newer technology and still supports existing equipment with no performance degradation
- Rugged rated for reliability in harsh environments
- Extreme flexibility to accommodate multiple ports, power supply and mounting options
  Einfacher Plug-&-Play-Betrieb verringert Betriebskosten
- Rugged Operating System (ROS) features to support simple plug and play operations
- Cyber security functions to protect communications

Features

- IRIG-B Formats Supported: B000 – B007, B120 – B127
- Ethernet Ports Options: 100TX (RJ45) or 100FX (LC)
- PPx: Allows a configurable PPS timer to trigger a signal every x seconds up to once in 24 hours
- Provides flexible power supply options for most mains voltages, including 24 VDC, 48 VDC or high-power (88 to 300 VDC/85 to 264 VAC) 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

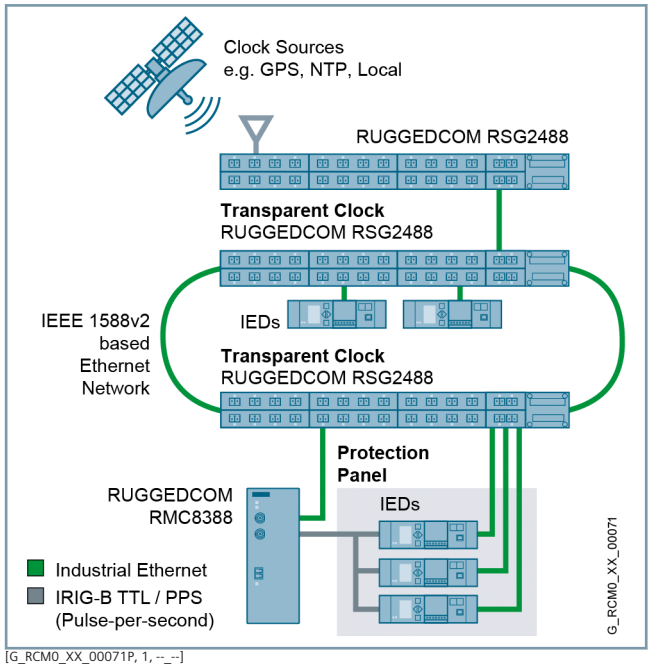
Product Variants

- RUGGEDCOM RMC8388
  - Serial device server with 256-bit encryption
- RUGGEDCOM RMC8388NC
  - erial device server, non export controlled version

[P_RCM0_XX_00386P, 1, --_--]

Figure 3.20/4 RUGGEDCOM RMC8388

Application Example



[G_RCM0_XX_00071P, 1, --_--]

Figure 3.20/5 The RUGGEDCOM RMC8388 enables legacy IEDs to connect to an existing modern Ethernet network supporting IEEE 1588v2 without the need for a separate PPS time synchronization network.

Further information

To assist in selecting the right RUGGEDCOM products as well as configuration of variants, the RUGGEDCOM Selector is available at: *http://www.siemens.com/ruggedcom-selector*

Description	Variants	Order no.																
		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
RUGGEDCOM RMC8000																			
	RUGGEDCOM RMC8388NC	6	G	K	6	0	8	3	-	8	A	C	1	.	-	.	.	.	.
	RUGGEDCOM RMC8388	6	G	K	6	0	8	3	-	8	A	C	2	.	-	.	.	.	.

Description

The RUGGEDCOM RM1224 is a small form-factor industrial 4G cellular router with integrated switch, which enables secure and cost effective connections to and from remote applications.

Benefits

- Economical industrial graded cellular modem designed for space-saving integration in the cabinet
- Two antenna connectors for reliable wireless transmission
- Supports SINEMA Remote Conntent
- Built-in Digital I/O which enables push-button VPN connectivity
- Robust plastic housing which fulfills a critical safety requirement in order to avoid using grounding in Mid & Low Voltage installations

Features

- 4 copper fast Ethernet ports
- Available with LTE-Modem for Europe and North America
- 2 SMA antenna connectors for MIMO and diversity
- Digital in/out (I/O)
- Redundant Power Supply Inputs 24 VDC
- For use at ambient temperatures from –40 °C to +70 °C without the use of fans

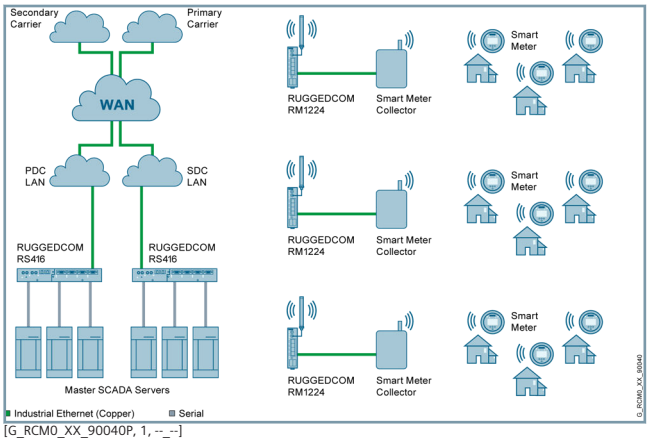
Product Variants

- RUGGEDCOM RM1224
  - Small form-factor industrial Ethernet-switch and TCP/IP router with LTE WAN option

[P_RCM0_XX_00390P, 1, --_--]

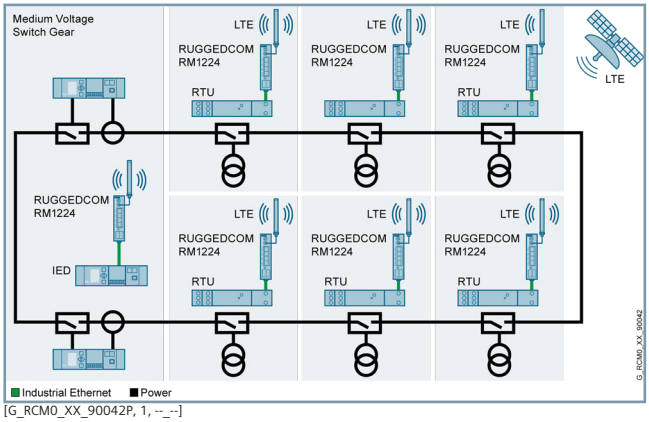
Figure 3.20/6 RUGGEDCOM RM12224

Application Examples



[G_RCM0_XX_90040P, 1, --_--]

Figure 3.20/7 The RUGGEDCOM RM1224 with LTE-support provides a high bandwidth connection for large amounts of Smart Meter data



[G_RCM0_XX_90042P, 1, --_--]

Figure 3.20/8 Mobile wireless connection of intelligent secondary distribution substations (Ring Main Units) and modern smart apparatus to control centers for monitoring, remote control and power-flow control

Further information

To assist in selecting the right RUGGEDCOM products as well as configuration of variants, the RUGGEDCOM Selector is available at: *http://www.siemens.com/ruggedcom-selector*

RUGGEDCOM RMx – RM1224 – Selection and Ordering Data

Description	Variants	Order no.																
		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
RUGGEDCOM RM1224																			
The RUGGEDCOM RM1224 is a small form-factor industrial Ethernet-switch and TCP/IP router with 4 copper Ethernet ports, 1 digital I/O, and cellular LTE modem.	RUGGEDCOM RM1224-EU	6	G	K	6	1	0	8	-	4	A	M	0	0	-	2	B	A	2
	RUGGEDCOM RM1224-NAM	6	G	K	6	1	0	8	-	4	A	M	0	0	-	2	D	A	2

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 multi-device solutions 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, hardened PC, cloud interface 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 2G/3G provides a high bandwidth, reliable interface that allows customers to avoid/defer expensive fiber installations

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 100ákm
- Optional GPS input available
- Available with and without LTE-Modem for Europe, North America and Asia Pacific, Fully integrated, +/-12 to 24, +/-48 VDC or HI power suppliesy
- WLAN option (Access Point or Client) with variety of international wireless approvals
- Built-in Virtual Processing Engine (VPE) for edge computing(customer application hosting)
- Optional Integrated MindConnect software to allow secure direct connection to MindSphere
- For use at ambient temperatures from –40 °C to +85 °C without the use of fans
- Two antenna connectors for reliable LTE or 3G cellular transmission connections
- Serial interface to support backward compatibility with deployed devices
- Cyber Security
  - Integrated router/firewall/VPN
  - Stateful firewall with NAT
  - Full IPSec Virtual Private Networking
  - VPN with 3DES, AES128, AES256 support
  - RUGGEDCOM CROSSBOW SAC 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
- WAN-Protocols
  - Frame relay RFC 1490 or RFC 1294

[P_RCM0_XX_00327P, 1, --_--]

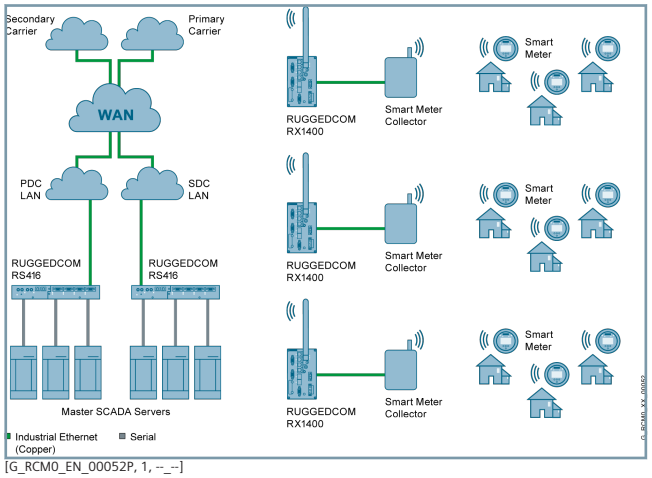
Figure 3.21/1 RUGGEDCOM RX1400

  - 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
  - Traffic and access control
  - NTP Client and Server
  - IP Multicast Routing
  - DCHP Agent (Option 82 Capable)
  - MPLS edge routing

Product Variants

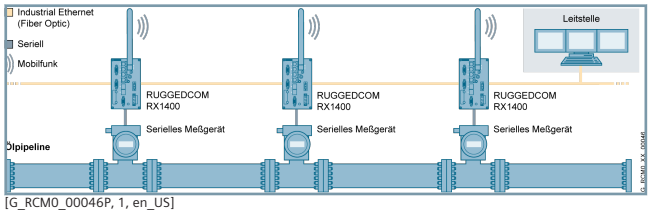
- RUGGEDCOM RX1400
  - Small form-factor industrial Ethernet-switch and TCP/IP router with LTE and fiber optic WAN options

Application Examples



[G_RCM0_EN_00052P, 1, --_--]

Figure 3.21/2 The RUGGEDCOM RX1400 with LTE-support provides a high bandwidth connection for the large amounts of Smart Meter data



[G_RCM0_00046P, 1, en_US]

Figure 3.21/3 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

Further information

To assist in selecting the right RUGGEDCOM products as well as configuration of variants, the RUGGEDCOM Selector is available at: *http://www.siemens.com/ruggedcom-selector*

Description	Variants	Order no.																
		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
RUGGEDCOM RX1400																			
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	RUGGEDCOM RX1400	6	G	K	6	0	1	4	-	0	A	M	2	.	-	.	.	.	.

SIEMENS

www.siemens.com/accessories

Machine Protection

4NC – Miniature Current Transformer – Selection and Ordering Data

Description

4NCs 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.

[4NC, 1, --_--]

Figure 4.1/1 4NC – Miniature Current Transformer

Selection and Ordering Data

Description	Versions	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	0
(400 A/5 A), can be used over short distances (burden > 5 VA) In the event the burden > 5 VA, inquire further at the head office or the KS063 of the Ritz company														

Description

The 7XT33 is a 20-Hz generator to generate 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. As the supply voltage, an alternating voltage or a direct voltage may be used.

Functions

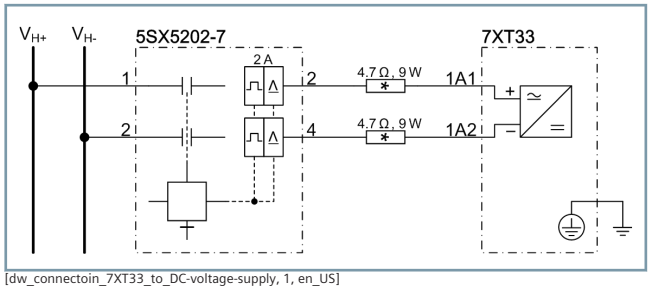
The 7XT33 has a wide-range power supply unit. The auxiliary voltage of this unit in normal operation is assured by connection to a voltage transformer having an output voltage of 3 x 100/110 VAC (50 Hz/60 Hz). Optionally, the device can also be powered with an auxiliary DC voltage (10 to 220 VDC) in uninterrupted duty (see the connection example). In addition, it is possible to supply power to the device, for example for a standstill test, using single-phase alternating voltage (100 to 230 VAC). The auxiliary voltage of about 28 VDC, obtained from two 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). To implement 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.

Connection Example



[dw_connectoin_7XT33_to_DC-voltage-supply, 1, en_US]

Figure 4.2/2 Interface of the 7XT33 to a DC Power Supply via a 2 A Miniature Circuit Breaker

[7XT33, 1, --_--]

Figure 4.2/1 20-Hz Generator 7XT33

20 Hz Generator – 7XT33 – Technical Data

Technical Data

Auxiliary voltage		
Rated auxiliary AC voltage $V_{H\sim}$	3x (100/110 V~), 50/60 Hz	1x (110 bis 230 V~), 50/60 Hz
Permissible voltage ranges	80 to 130 V~	80 to 265 V~
or as an alternative		
Rated auxiliary DC voltage V_{H-}	110 to 220 V–	
Permissible voltage ranges	88 to 253 V–	
Power consumption on 8 Ω impedance ≤ 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!	

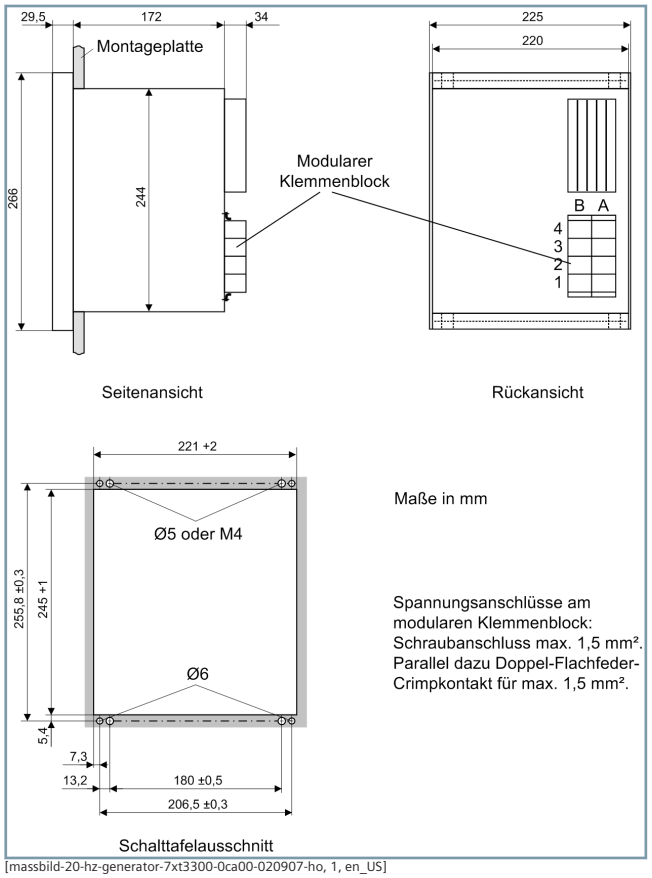
Blocking input	
Connections (2A1 to 2A3)	
Operating shaft	can be changed using jumpers
- for rated voltages 24/48/60 V	approx. 16 V
- for rated voltages 110/125/220/250 V	approx. 70 V
Permissible voltage, continuous	300 V–

Signal relay		
Connections (3A1 to 3A3)		
Switching power	ON; OFF	20 W/VA
Contact voltage		250 V–
Permissible current	ON	5 V
	OFF	1 V

Test voltage	2.8 kB, direct voltage

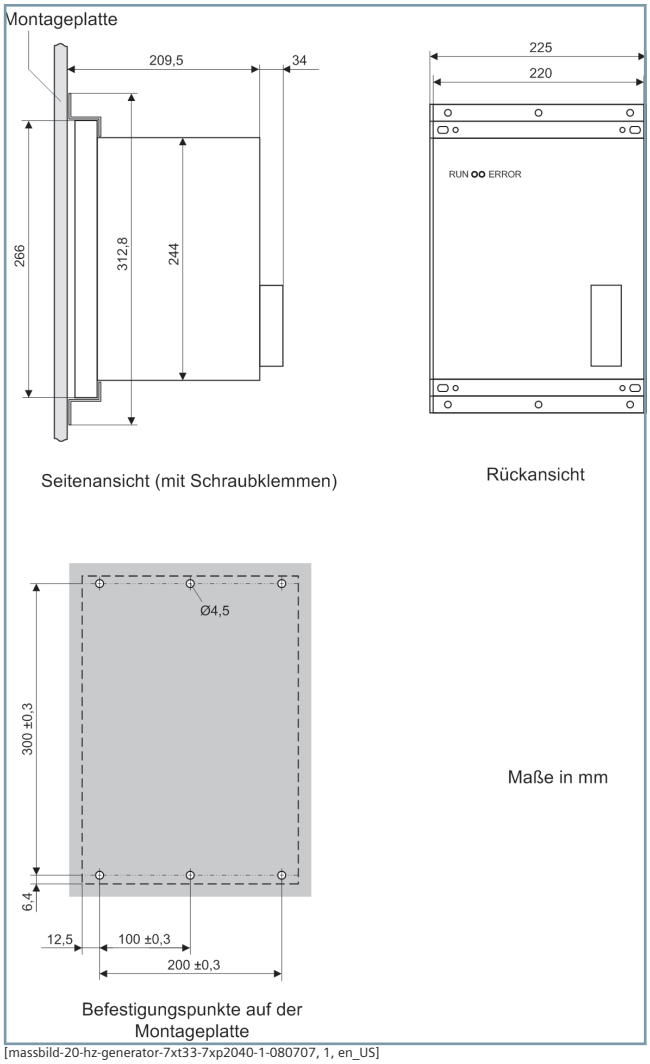
Permissible ambient temperatures	
at R_B< 5Ω	≤ 40°C
at R_B> 5Ω	≤ 55°C
Note: At maximum power output, the device generates internal power dissipation of about 20 W. To ensure unimpeded removal of the internal power dissipation, the clearance to other devices or side walls must be at least 100 mm. For this reason, the device is to always be installed at the bottom of the cabinet.	

Dimensioned Drawings



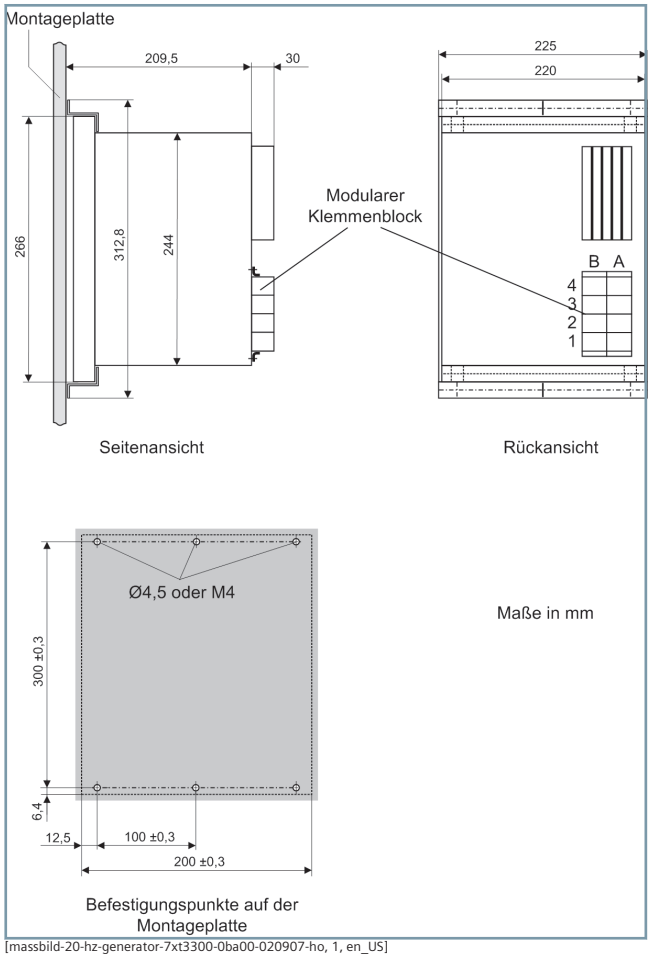
[massbild-20-hz-generator-7xt3300-0ca00-020907-ho, 1, en_US]

Figure 4.2/3 Dimensional Drawing, 20-Hz Generator 7XT3300-0CA00 for Switch Panel or Cabinet Flush Mounting



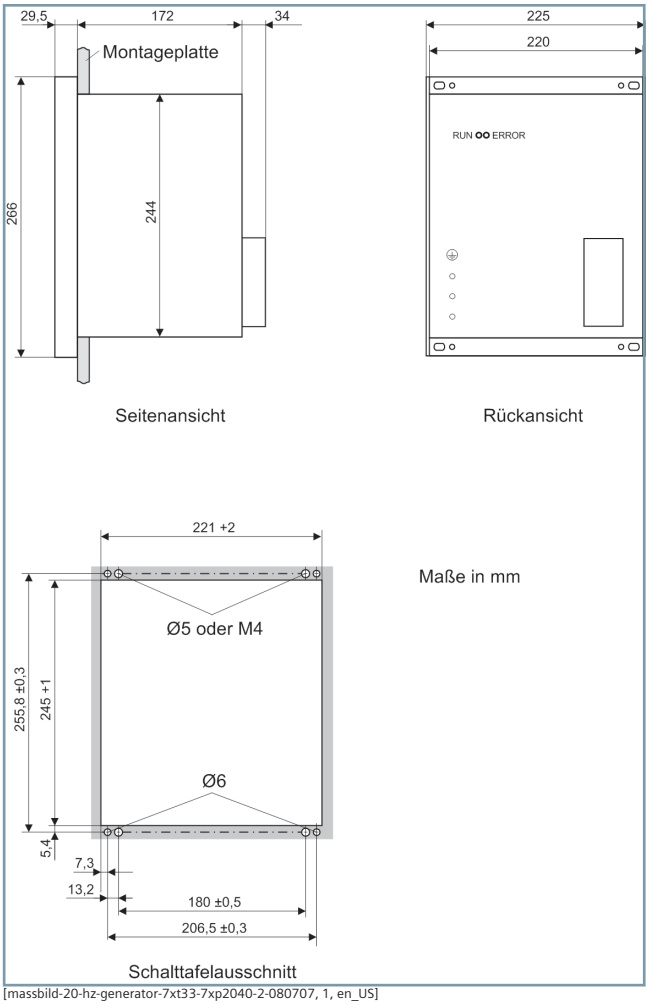
[massbild-20-hz-generator-7xt33-7xp2040-1-080707, 1, en_US]

Figure 4.2/4 Dimensional Drawing, 20-Hz Generator 7XT3300-0CA00/DD for Switch Panel or Cabinet Flush Mounting



[massbild-20-hz-generator-7xt3300-0ba00-020907-ho, 1, en_US]

Figure 4.2/5 Dimensional Drawing, 20-Hz Generator 7XT3300-0BA00 for Panel Surface Mounting



[massbild-20-hz-generator-7xt33-7xp2040-2-080707, 1, en_US]

Figure 4.2/6 Dimensional Drawing, 20-Hz Generator 7XT3300-0BA00/DD for Panel Surface Mounting

Selection and Ordering Data

Description	Versions	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			
Band-pass filter, 20 Hz, for housing 7XP20	for panel surface mounting					4					B			
	for panel flush mounting					4					C			

20-Hz Band-Pass 7XT34

Description

The 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

The 20-Hz band-pass filter 7XT34 is used in combination with the 20-Hz generator 7XT33, in the machine protection 7UM62 and the generator protection 7UM85.

In this process, the 20-Hz generator is the source for 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.

[7XT34, 1, --_--]

Figure 4.3/1 20-Hz Band-Pass 7XT34

Technical Data

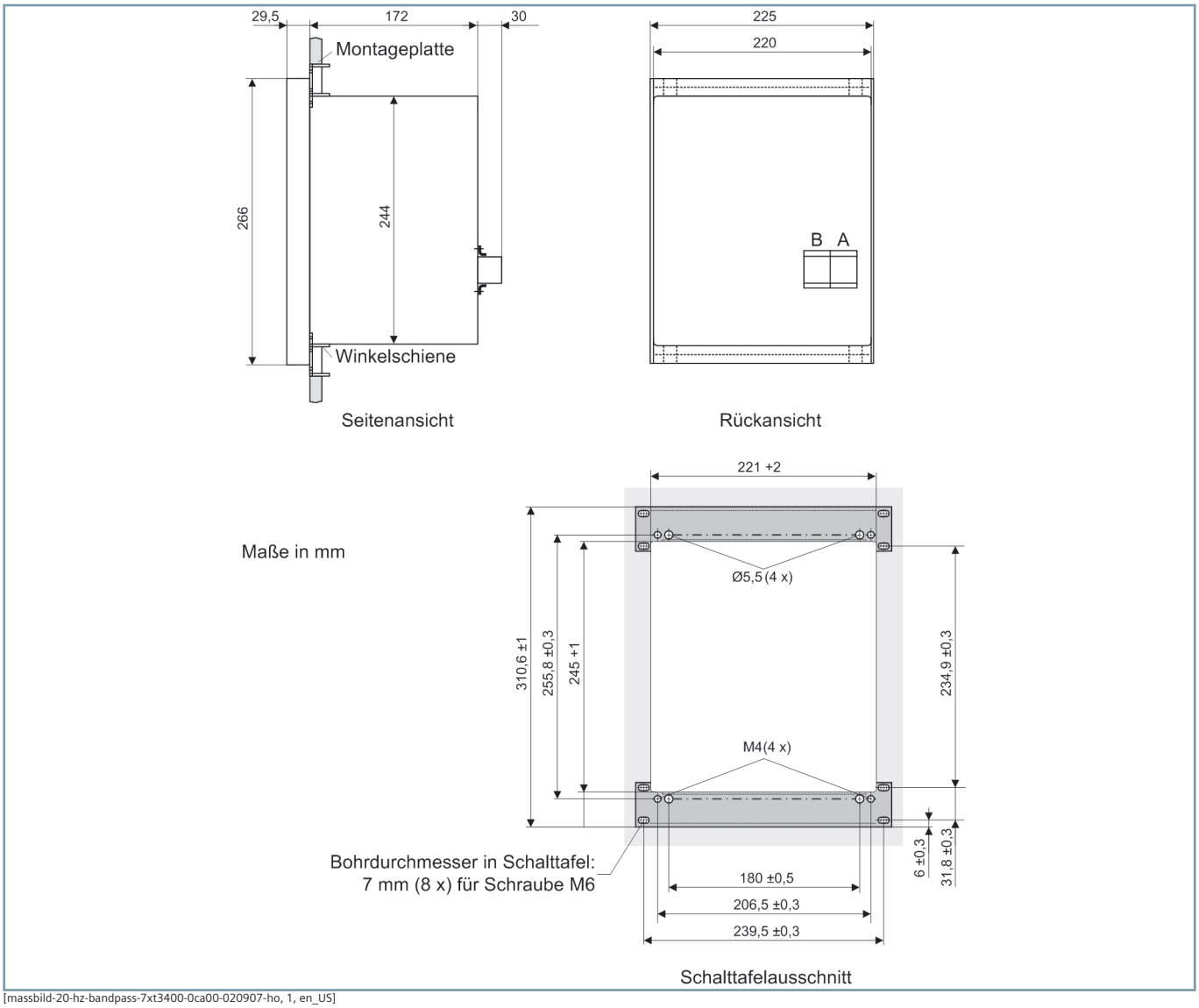
Load rating of the 7XT34 device		
Connections (1B1 to 1B4)		
Superimposed alternating voltage, continuous	55 VAC	
Superimposed alternating voltage, transient	550 VAC for ≤ 30 s	
Frequency of the	≥ 45 Hz	
Alternating voltage, current-carrying capacity, continuous	3.25 A AC	
Test voltage	2.8 kVDC	

Load rating of the resistive voltage divider	
Permissible voltage, continuous	55 VAC
Permissible voltage, transient	550 VAC for ≤ 30 s
Test voltage	2.8 kVDC

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 may 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.	

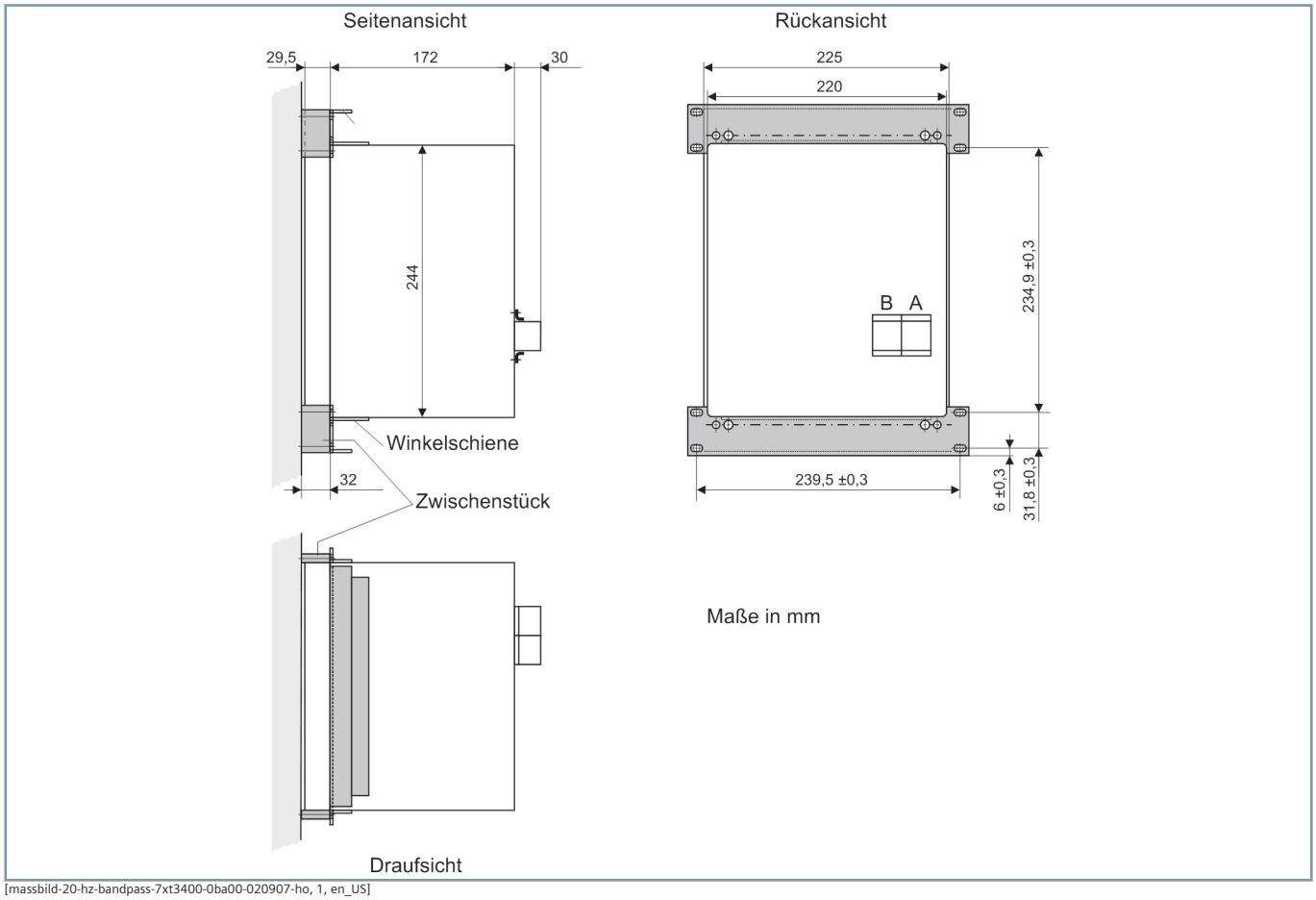
Degree of protection according to IEC 60529	
For equipment	IP20
For personal protection	IP2x with standard terminals
For personal protection	IP1x with ring-type lug terminal

Dimensioned Drawings



[massbild-20-hz-bandpass-7xt3400-0ca00-020907-ho, 1, en_US]

Figure 4.3/2 7XT34 Housing for Panel Flush Mounting or Cabinet Flush Mounting



[massbild-20-hz-bandpass-7xt3400-0ba00-020907-ho, 1, en_US]

Figure 4.3/3 Dimensional Drawing, 20-Hz Band-Pass 7XT3400-0BA00 for Panel Surface Mounting

20-Hz Band-Pass 7XT34 – Selection and Ordering Data

Selection and Ordering Data

Description	Versions	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			
Band-pass filter, 20 Hz, for housing 7XP20	for panel surface mounting					4					B			
	for panel flush mounting					4					C			

Description

The 7XT71 is an injection unit used together with the 7XR6004 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. In fault-free operation, (R_{erd}≈ 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, --_--]

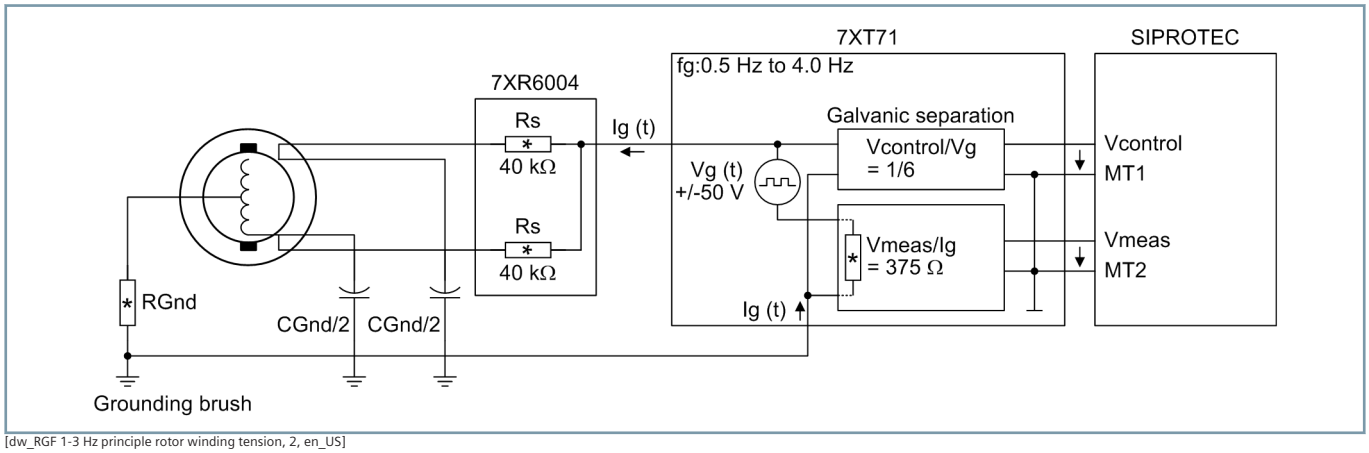
Figure 4.4/1 Injection Unit 7XT71

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 7XR6003), 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-resistance measurement shunt R_M. The voltage tapped via the measurement shunt and the control voltage are 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_RGF 1-3 Hz principle rotor winding tension, 2, en_US]

Figure 4.4/2 Circuitry Principles of the Rotor Winding Voltage Injection

R_E fault resistance

C_E rotor ground capacitance

R_V dropper 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

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%
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
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

Dimensioned Drawings

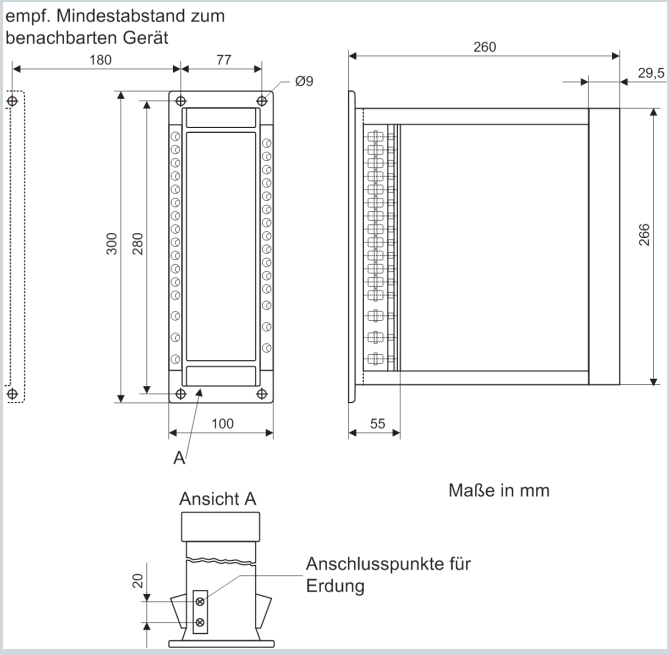


Figure 4.4/3 Dimensional Drawing, Injection Unit 7XT7100-0BA00 for Panel Surface Mounting

With

Power connections (terminals 1 to 6): Not used in the 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

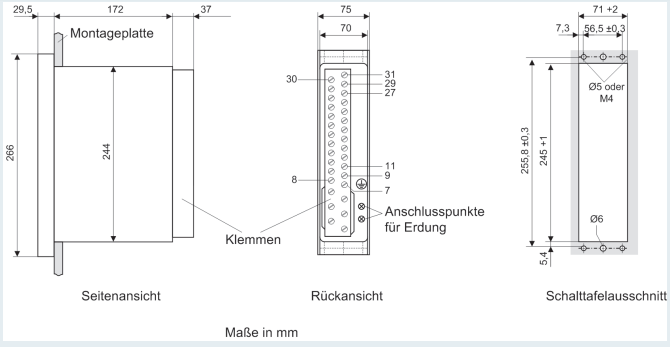


Figure 4.4/4 Dimensional Drawing, Injection Unit 7XT7100-0EA00 for Panel Flush Mounting

With

Power connections (terminals 1 to 6):

Not used in the 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

Selection and Ordering Data

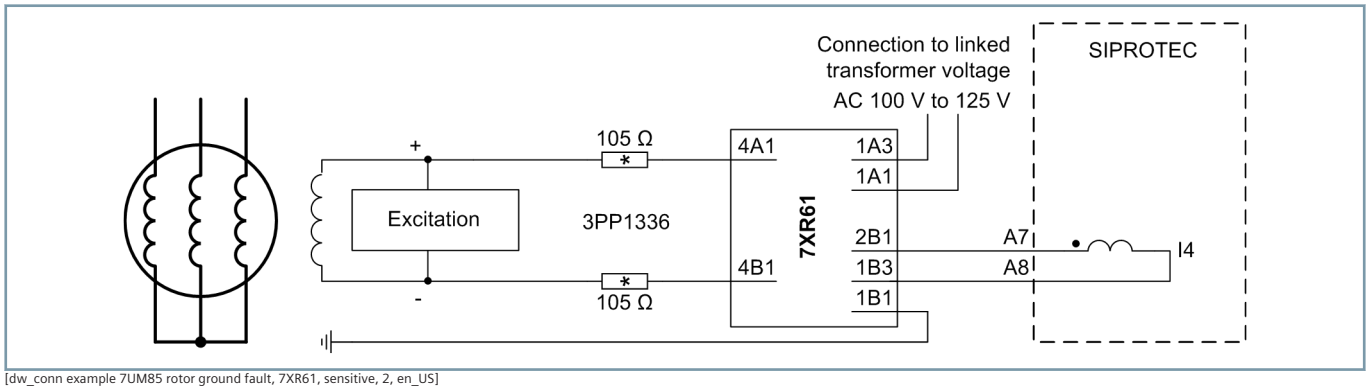
Description	Versions	Order no.											
		1	2	3	4	5	6	7		8	9	10	11	12
Injection unit		7	X	T	7	1	0	0	-	0	☐	A	0	0
for rotor ground-fault protection	for panel surface mounting										B			
(0.5 to 4 Hz) 7XT71, in housing 7XP20	for panel flush mounting										E			

Description

The 7XR61 is a coupling unit for the rotor ground-fault protection with 50 Hz/60 Hz coupling into the SIPROTEC 7UM6 In addition, a 3PP1336-0DZ is necessary.

[7XR61, 1, --_--]

Figure 4.5/1 Coupling Unit 7XR61



[dw_conn example 7UM85 rotor ground fault, 7XR61, sensitive, 2, en_US]

Figure 4.5/2 Connection Example for Generators: Rotor Sensitive Ground-Fault Protection with the 7XR61 additional Device for Coupling the Voltage of the Rotor Circuit at the Rated Frequency during Realization with the Sensitive Ground-Current Input

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~

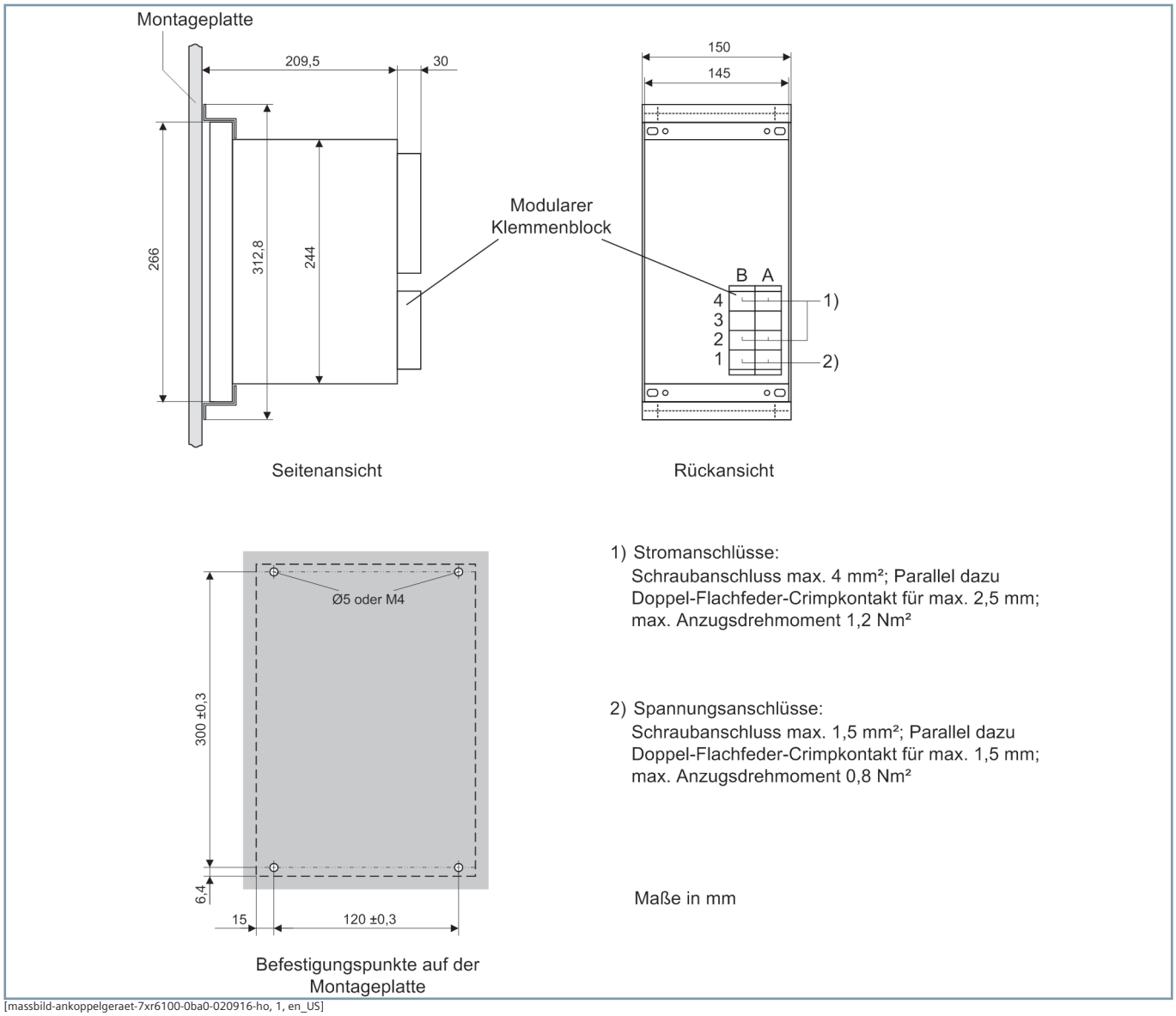
Load rating of the capacitive coupling circuit	
Connections (4A1 to 4B1)	
permissible voltage, continuous	3.15 kV–
RMS voltage	60 V ~ (≤ 300 Hz)
RMS current	≤ 0.2 A~(1) continuous
Test voltage	4.7 kV– for ≤ 2 s

4.5

(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 used instead.

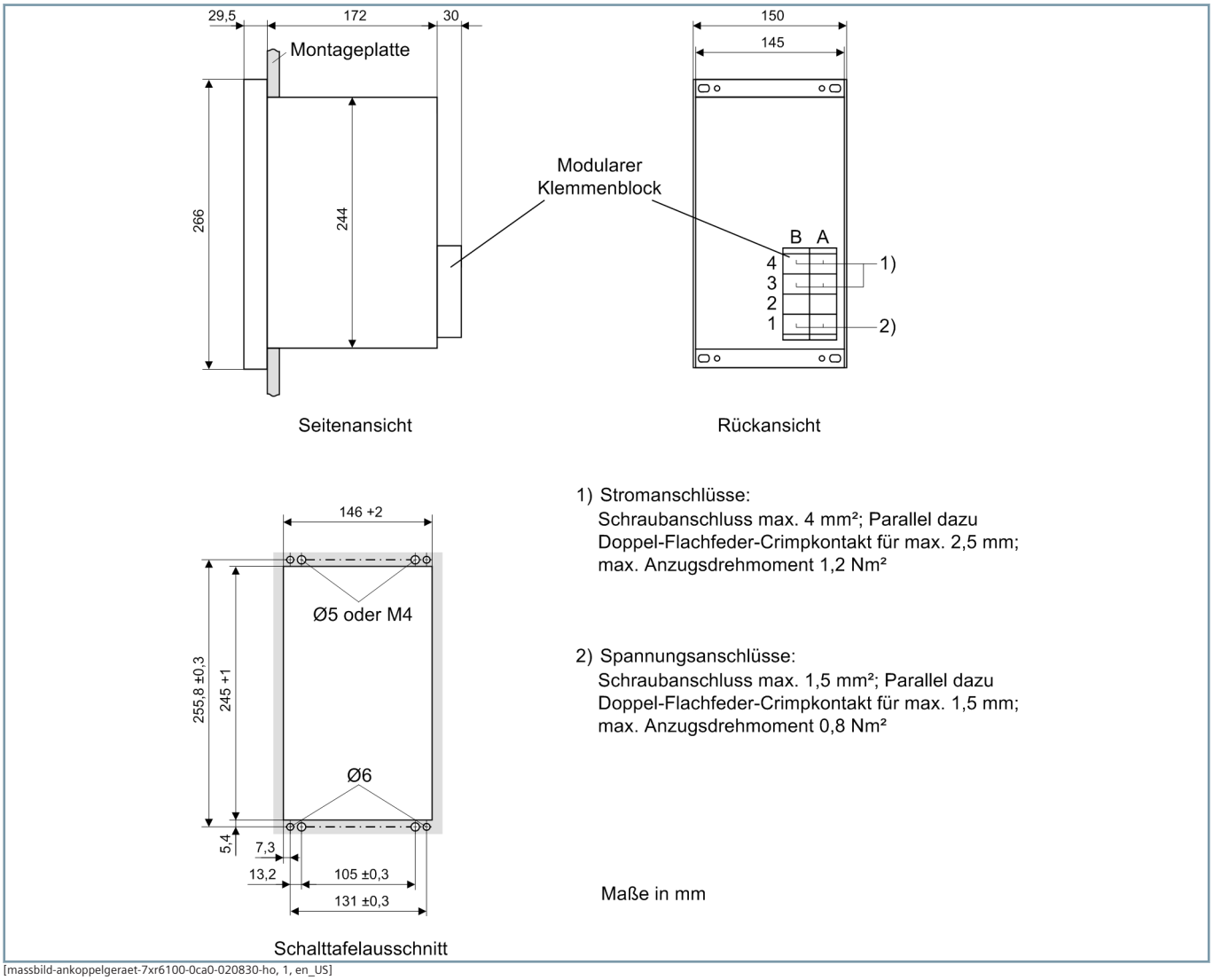
Output load rating	
(Short circuit on 4A1 and 4B1)	
continuous	100 mA (without reactor)
Output (1B1 to 1B3)	175 mA (with reactor), max. 1 hour
Output (1B1 to 1B4)	230 mA, max. 0.5 Hours

Dimensioned Drawings



[massbild-ankoppelgeraet-7xr6100-0ba0-020916-ho, 1, en_US]

Figure 4.5/3 Dimensional Drawing Coupling Unit 7XR6100-0BA0 in Panel Surface Mounting Housing



[massbild-ankoppelgeraet-7xr6100-0ca0-020830-ho, 1, en_US]

Figure 4.5/4 Dimensional Drawing Coupling Unit 7XR6100-0CA0 in Panel Flush Mounting Housing

Selection and Ordering Data

Description	Versions	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			

Description

The 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

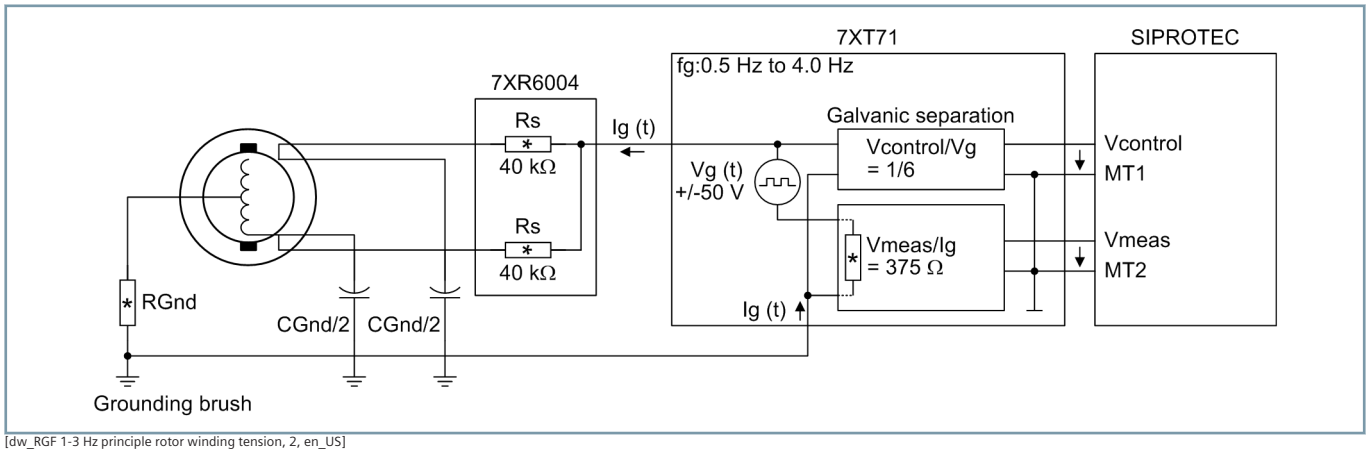
The rotor ground-fault protection operates with a direct voltage of about 50 V that, depending on the settings, reverses polarity roughly 1 to 4 times per second. This voltage injection into the rotor circuit at V_g is generated in the injection unit 7XT71 Via the resistor unit 7XR6004 (or 7XR6003), 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-resistance measurement shunt R_M. The voltage tapped via the measurement shunt and the control voltage are 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 4.6/1 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.



[dw_RGF 1-3 Hz principle rotor winding tension, 2, en_US]

Figure 4.6/2 Circuitry Principles of the Rotor Winding Voltage Injection

R_E fault resistance

C_E rotor ground capacitance

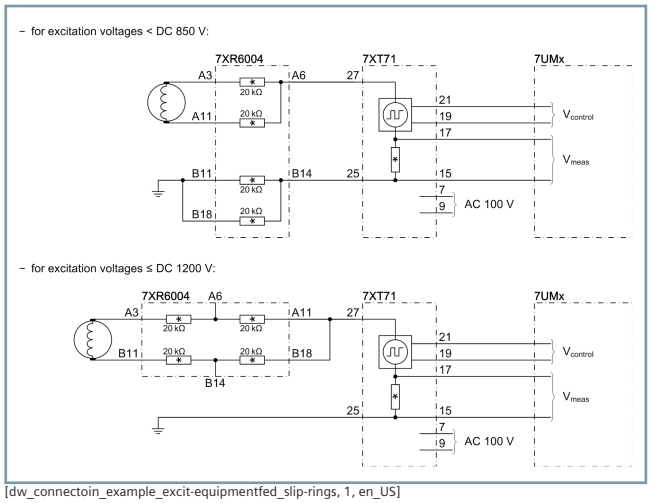
R_V dropper resistor

V_g square-wave voltage from the 7XT71

I_g current flowing from the 7XT71 to ground via the rotor

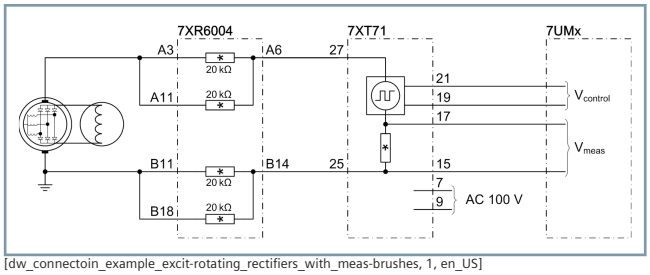
f_g square-wave frequency of the 7XT71

Connection Examples



[dw_connectoin_example_excit-equipmentfed_slip-rings, 1, en_US]

Figure 4.6/3 Connection Example when Supplying the Excitation Winding via Slip Rings



[dw_connectoin_example_excit-rotating_rectifiers_with_meas-brushes, 1, en_US]

Figure 4.6/4 Connection Example when Exciting via Rotating Rectifiers with Measurement Brushes

4.6

Technical Data

Rated power loss	
20 kΩ power resistors	P_{70}=45 W
3.3 kΩ test resistor	P_{70}=7.5 W

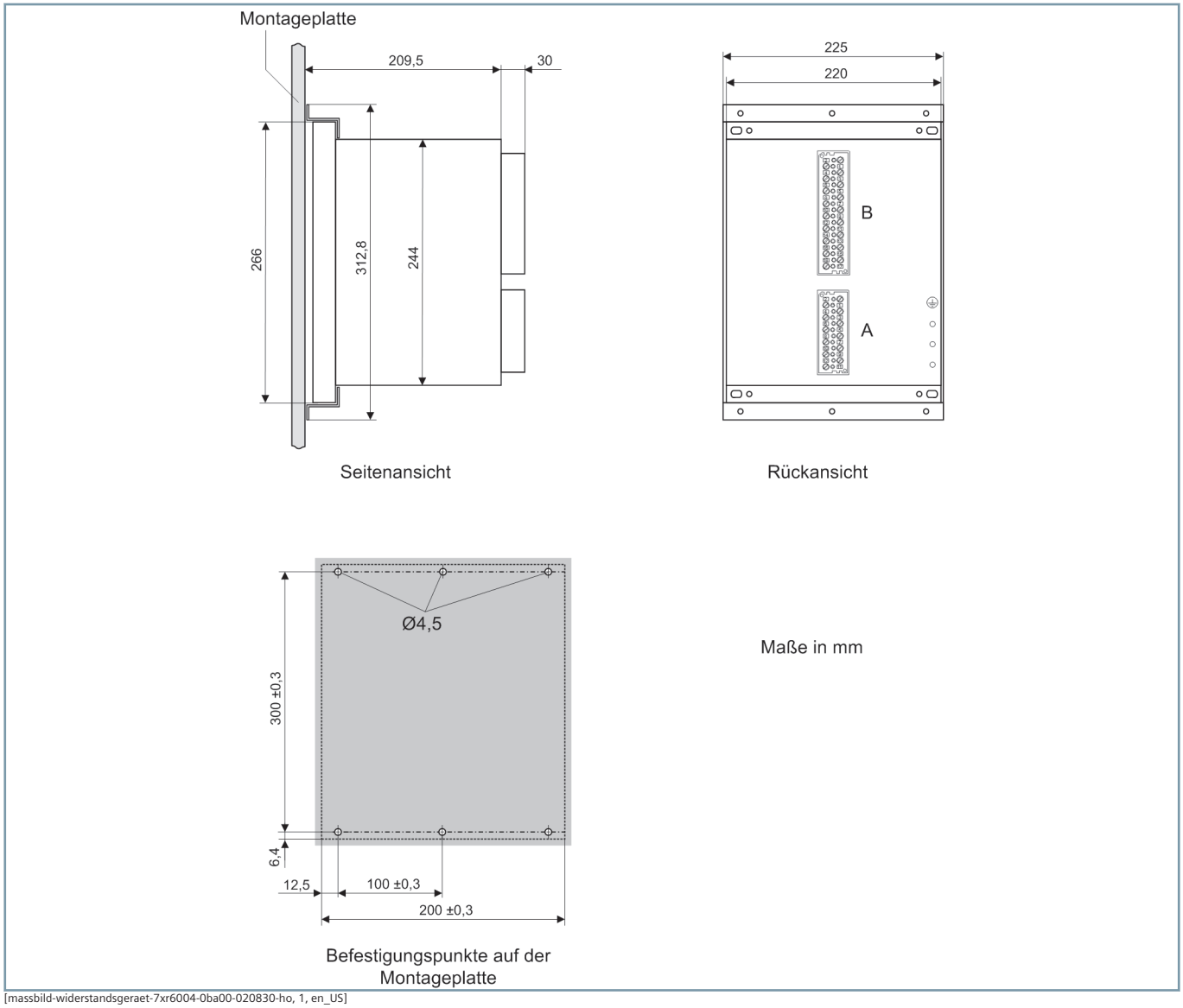
Load rating of the 20 kΩ power resistors	
When using 2 resistors corresponds to an input voltage of	9 W, continuous 425 V
When using 4 resistors corresponds to an input voltage of	4.5 W, continuous 300 V
transient	4-times the continuous load rating for a maximum of 10 s
dynamic	900 W for max. 10 ms

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

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
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.	

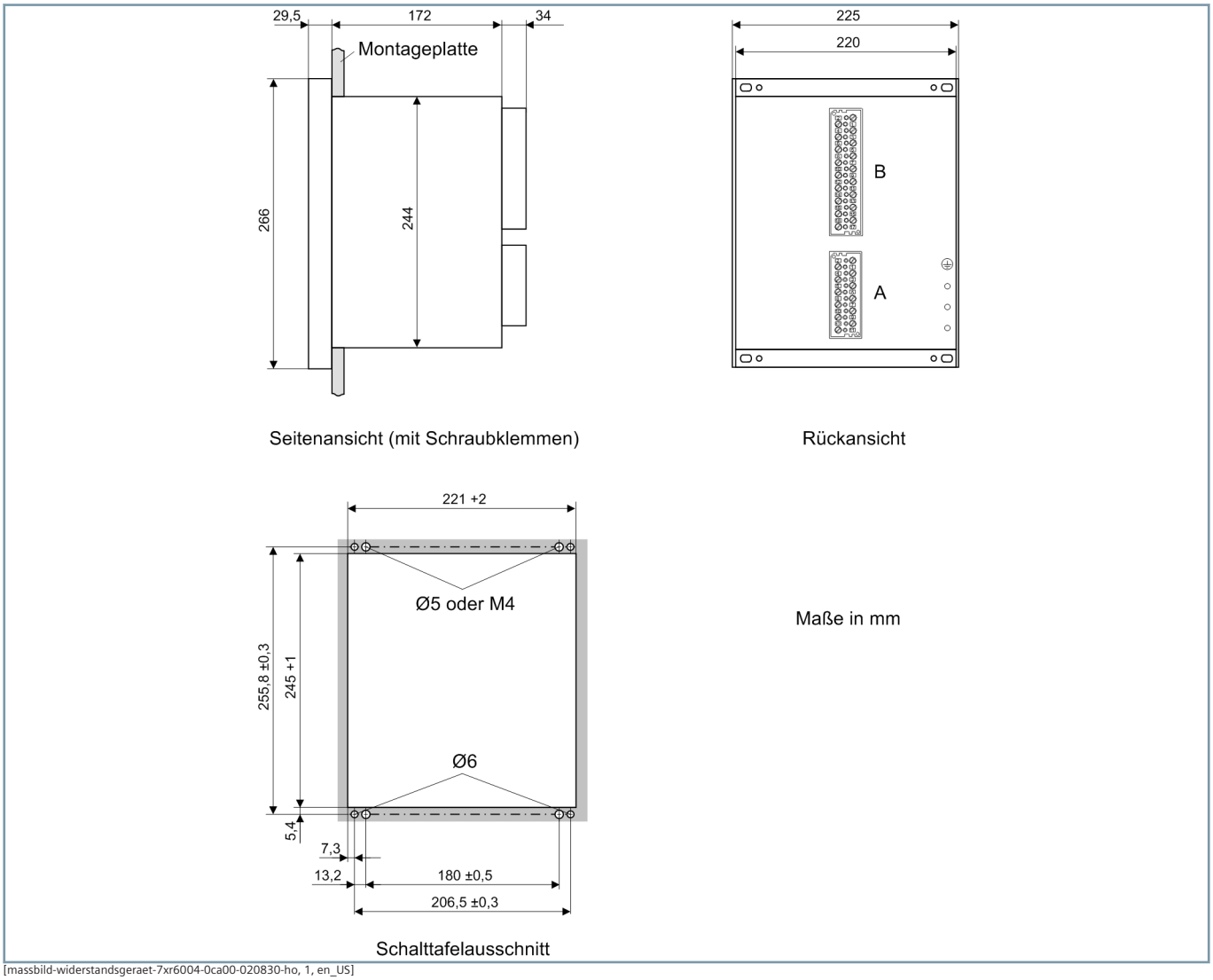
Degree of protection according to IEC 60529	
For equipment	IP 20
For personal protection	IP 2x with covering cap in place

Dimensioned Drawings



[massbild-widerstandsgeraet-7xr6004-0ba00-020830-ho, 1, en_US]

Figure 4.6/5 Dimensional Drawing Resistor Unit 7XR6004-0BA00 in Panel Surface Mounting Housing



[massbild-widerstandsgeraet-7xr6004-0ca00-020830-ho, 1, en_US]

Figure 4.6/6 Dimensional Drawing Resistor Unit 7XR6004-0CA00 for Panel or Cabinet Flush Mounting

Selection and Ordering Data

Description	Versions	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			

Description

The 3PP1326 is a device with wire resistors as a voltage divider (divider ratio is 10:1 or 20:1) for coupling the excitation voltage into the underexcitation protection in the SIPROTEC 7UM62.

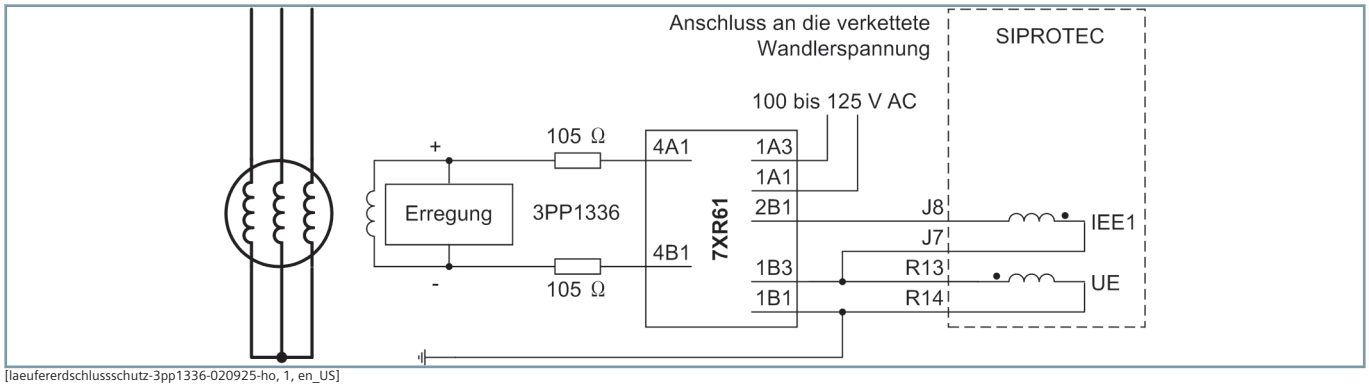
The 3PP1336 is a device with wire resistors for the stator ground fault or rotor ground fault protection with 50 Hz/ 60 Hz coupling.

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 on a grounding transformer.

In the -0DC version, the device has two 105 Ω resistors and is used as a dropper resistor for the rotor ground-fault protection with 50 Hz/60 Hz coupling in the SIPROTEC 7UM6.

[3PP13_, 1, --_--]

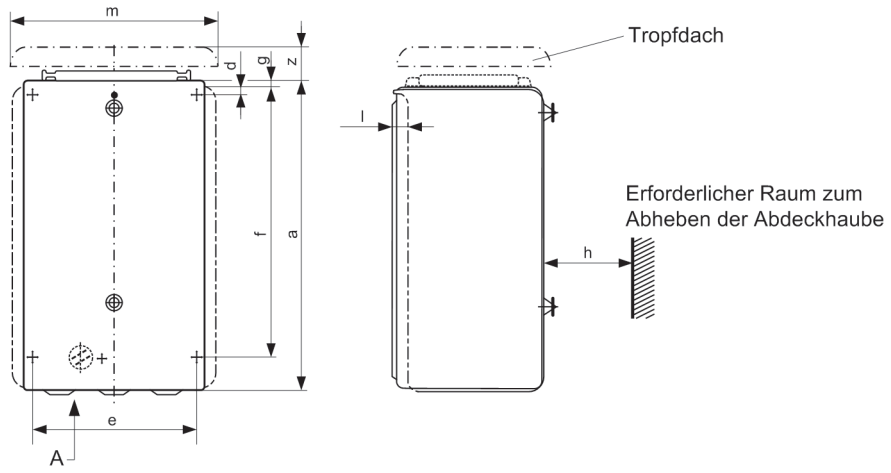
Figure 4.7/1 Voltage Dividers 3PP1326 and 3PP1336



[laeufererdschlussschutz-3pp1336-020925-ho, 1, en_US]

Figure 4.7/2 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

Dimensioned Drawings



3PP1 in Schutzart IP 20 (mit Tropfdach IP23)

Typ	a	b	c	d	e	f	g	h	i	k	l	m	z
3PP1 32	267	187	3 x 16	7	160	230	10	110	50	30	10	196	33
3PP1 33	267	187	3 x 16	7	160	230	10	146	50	30	10	196	33

[massbilder-3pp13-020830-ho, 1, en_US]

Figure 4.7/3 Dimensional Drawings, 3PP13

Note:

3PP132: for the voltage divider 3PP1326-0BZ-K2Y (20: 10: 1)

3PP133: for the voltage divider 3PP1336-1CZ-K2Y (5: 2: 1) for the dropper resistor 3PP1336-0DZ-K2Y

Selection and Ordering Data

Description	Versions	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														

SIEMENS

www.siemens.com/accessories

Devices for Input/Output Signals

Description

The transducer measures binary signals from contacts via two binary inputs and transmits them without interference using fiber-optic cables to the second transducer. The indications or signals received in this second transducer are output via its contacts. The two contacts can be used as command contacts. The transducer is equipped with independent and bidirectional binary inputs (2) and contact outputs (2). The transducer is designed for use in switchgear. Highly reliable, telegram-buffered serial data transmission takes place between the transducers. Transmission errors and outage of the data connection are indicated using a signaling contact, that is, permanent monitoring of the power supply and the data connection is integrated in the transducer.

Benefits

- 2 galvanically separated binary inputs (24 to 250 VDC)
- 2 galvanically separated command contacts
- Fast remote trip via a serial point-to-point connection of up to 115 kBd/12 ms.
- Telegram-buffered interference-free transmission using fiber-optic cable
- Permanent monitoring and display of the data connection
- Radius: approx. 3 km via multimode fiber-optic cable, 62.5/125 µm
- Transmission of up to 170 km via singlemode fiber-optic cable with repeater 7XV5461
- Transmission via communication networks and dedicated lines and pilot wires with communication converters 7XV5662-0AC01
- Wide-range power supply unit with self monitoring and alarm relay.

Application Examples

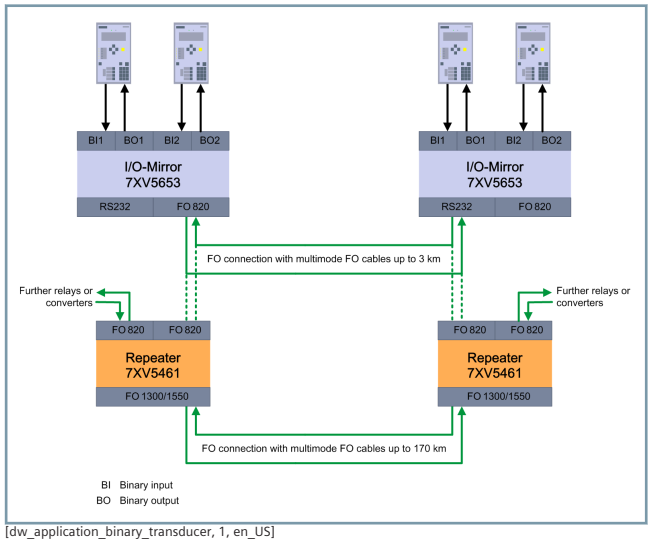
The binary signal transducer detects binary signals at two binary inputs and transmits them via fiber-optic cable to a second transducer that outputs the signals via contacts. Distances of about 3 km can be handled directly using multimode fiber-optic cables. For distances up to 170 km, the repeater 7XV5461 using singlemode fiber-optic cable is available (*Figure 5.1/2*). With two transducers connected to the 7XV5461, up to four binary signals can be transmitted. One application is the phase-segregated intertripping.

With a communication converter, the transducer can be connected to different types of communication connections. Modern digital N x 64 Kbps networks can be used.

Existing pilot wires can also be used for data exchange between protection devices. The data to be exchanged are bidirectional signals, intertrip signals and other information.

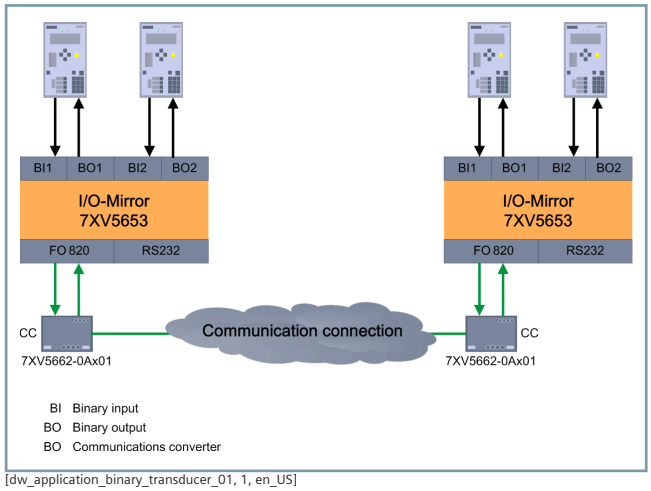
[7XV5653, 1, --_--]

Figure 5.1/1 Binary Signal Transducer 7XV5653



[dw_application_binary_transducer, 1, en_US]

Figure 5.1/2 Application Example 1



[dw_application_binary_transducer_01, 1, en_US]

Figure 5.1/3 Application Example 3

Technical Data

Rated auxiliary voltage	
24 to 250 VDC and 60 to 230 VAC	± 20% without switchover

Current consumption	
Approx. 0.15 to 0.25 A	

LEDs	
6 LEDs	
1 x green	Operating voltage OK
2 x yellow	Contact ½ active
2 x yellow	Command relay ½ active
1 x red	Alarm

Connector plug	
Power supply	2-pole Phoenix screw terminal
Fiber-Optic Cables	820 nm, ST connector
Binary inputs	4-pole Phoenix screw terminal
Signaling contact	2-pole Phoenix screw terminal

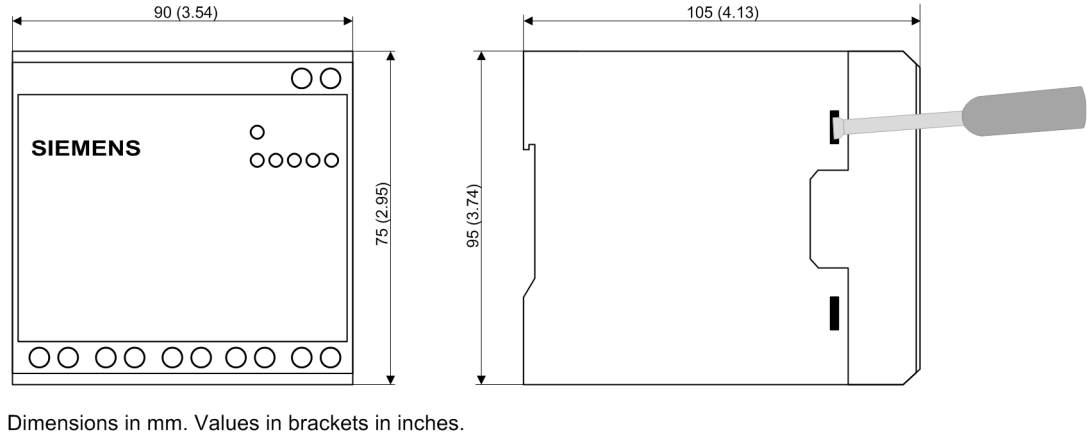
Non-flickering light	
Can be switched to light ON/OFF	Using jumpers

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

Surface Mounting

The transducer has a housing with snap-one mounting for 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.

Dimensioned Drawing



[dw_Dimension_7XV5653-0BA00, 1, en_US]

Figure 5.1/4 Dimensions, Binary Signal Transducer 7XV5653

Selection and Ordering Data

Description	Versions	Order no.											
		1	2	3	4	5	6	7		8	9	10	11	12
Optical binary signal/command transmission		7	X	V	5	6	5	3	-	0	B	A	0	0

Description	Versions	Order no.
Serial for 62.5 µm/125 µm multimode optical fiber up to 3 km Auxiliary voltage, 24 to 250 VDC and 110/220 VAC with 2 binary inputs, 2 binary outputs, Connection of the binary signal/command relay using a terminal Glass optical fiber connection for 62.5/125 µm multi-mode optical fiber using ST connectors For DIN rail mounting		
Note: For transmission using singlemode fiber, the 7XV5461 is also needed. For transmission using two-wire control line, the 7XV5662-0AC01 is needed.		

Description

The SICAM I/O-Unit 7XV5673 is a binary input/output device that was developed for substations and for industrial sectors with increased environmental demands. The SICAM I/O-Unit permits a transmission from binary inputs to binary outputs locally or over large distances. It can be used for protective applications, such as overcurrent protection, signal comparison, distance protection with signal connection, or as I/O extension in substation automation systems.

Binary inputs	• 6 robust EMC-hardened binary inputs • 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 V to 250 V ± 20 % and AC 100 V to 230 V, 45 Hz to 65 Hz
RJ45 Ethernet connection	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 2ˆSICAM 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 triggering 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 easily be set 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:
  - Extension of the substation controllers via binary inputs and outputs with standard protocols.

[ph_SICAM IO_Unit, 1, --_--]

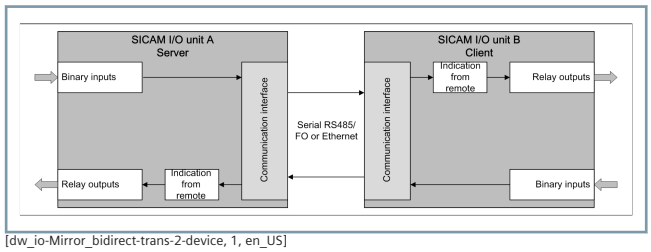
Figure 5.2/1 SICAM I/O-Unit 7XV5673

  - Detection and output of binary states via substation controllers by means of 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 SICAMc0160I/O-Units, for example, for separation between different voltage levels.

Applications

Binary signal transmitter

If the SICAM I/O-Unit is used as a binary signal transmitter to *Figure 5.2/2*, there is a bidirectional transfer of binary signals of exactly 2 units at any one time. The transmission takes place between server and client unit 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, 1, en_US]

Figure 5.2/2 Binary Signal Transmitter, Bidirectional Transmission between 2 Units

Extension of the communication route

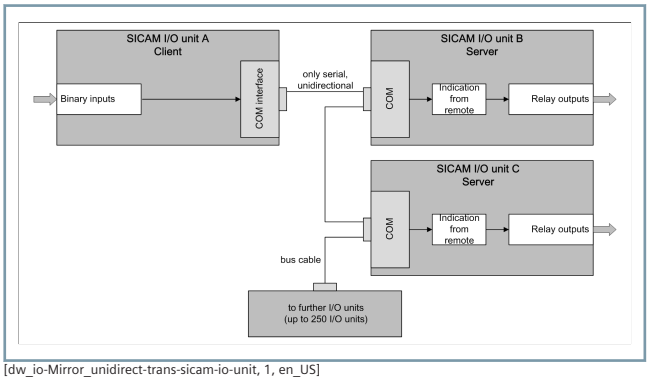
An extension of the transmission distance is possible.

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 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 5.2/3*, 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 for cascading.



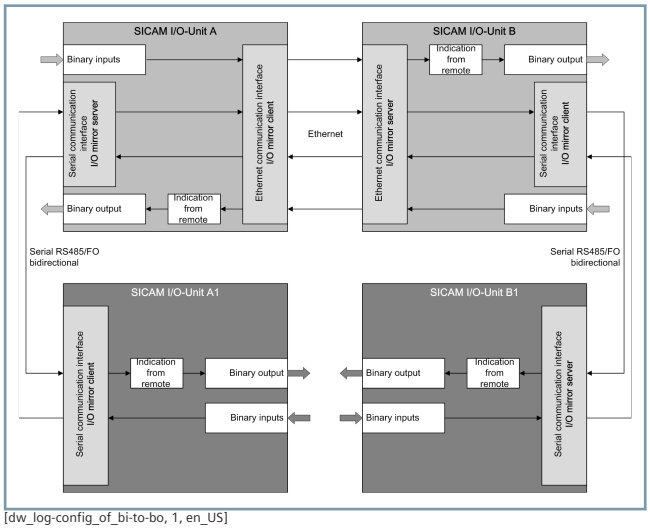
[dw_io-Mirror_unidirect-trans-sicam-io-unit, 1, en_US]

Figure 5.2/3 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 5.2/4*.



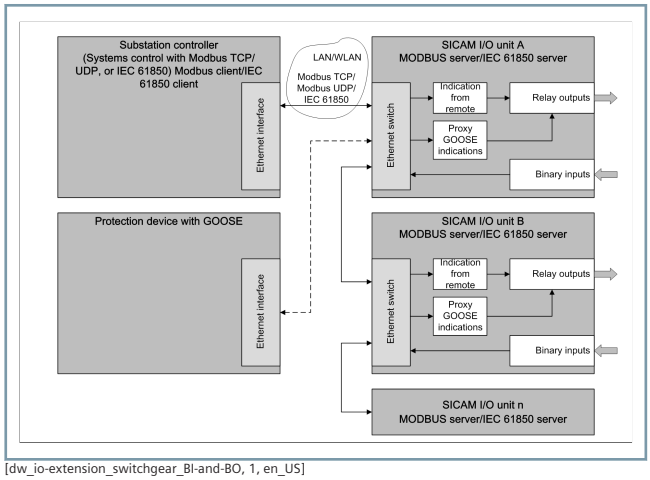
[dw_log-config_of_bi-to-bo, 1, en_US]

Figure 5.2/4 Logical Structure of 2 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

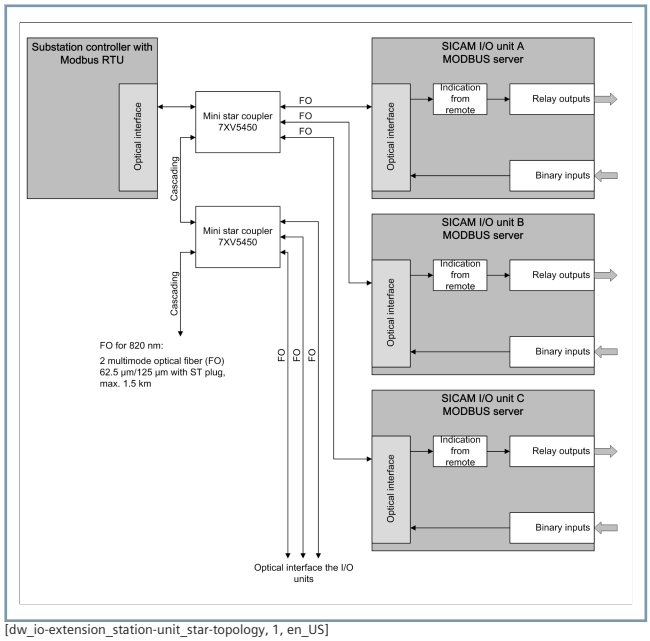
The SICAM I/O-Unit is used as I/O extension in accordance with *Figure 5.2/5*. Binary signals are exchanged between a substation controller of the automation substation as Modbus or IEC 61850 client, such as SICAM PAS/SCC, SICAM RTUs or Spectrum Power CC or a protection device, such as SIPROTEC with 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, 1, en_US]

Figure 5.2/5 I/O Extension of Switchgear with Binary Inputs and Outputs

Instead of an Ethernet network, a serial connection with the Modbus RTU protocol can also be used. The connection can be made by an RS485 bus line or an optical star network.



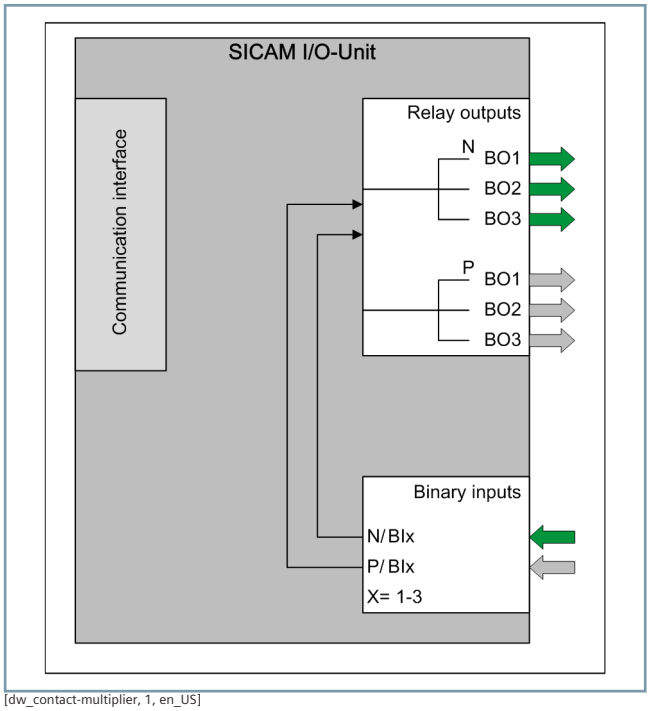
[dw_io-extension_station-unit_star-topology, 1, en_US]

Figure 5.2/6 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 5.2/7*).

- 1 binary signal at up to 6 relay outputs
- Several binary signals to several relay outputs that can be assigned by the user
- Different voltage levels for inputs and outputs in a wide voltage range to isolate different voltage levels



[dw_contact-multiplier, 1, en_US]

Figure 5.2/7 Contact Duplicator

5.2

Applications for the Teletransmission of Binary Signals

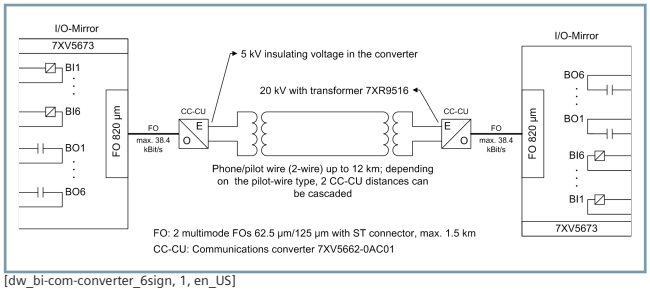
Binary signal transmission via 2-wire copper line with locking

The Figure *Figure 5.2/8* shows the optical fiber connection of a SICAM I/O-Unit to a communication converter 7XV5662-0AC01, that establishes connection via pilot wires. Only one 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.



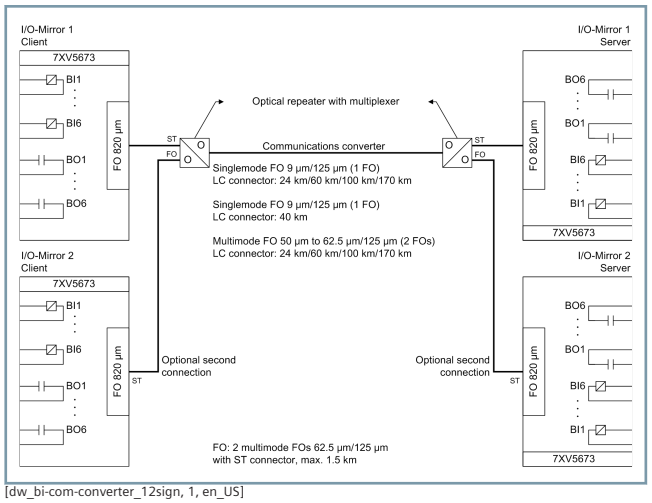
[dw_bi-com-converter_6sign, 1, en_US]

Figure 5.2/8 Binary Signal Exchange of 6 Signals via a Pilot Wire Connection

Binary signal exchange via long optical fiber connections

Figure *Figure 5.2/9* shows the optical fiber connection of a SICAM I/O-Unit to a serial optical repeater 7XV5461-0B_00, that establishes a connection to multimode or singlemode 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.

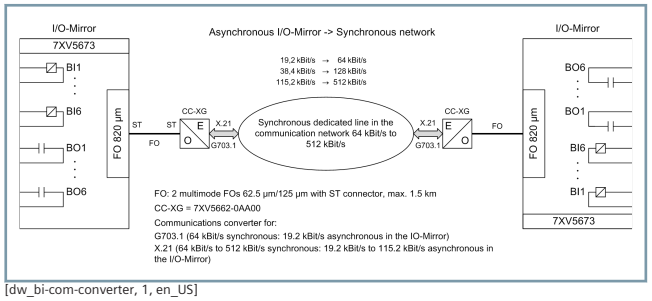


[dw_bi-com-converter_12sign, 1, en_US]

Figure 5.2/9 Binary Signal Exchange of Up to 12 Signals via Long Optical Fiber Connections

Transmission of binary signals via communication networks by means of a G.703.1/X.21 interface

Figure *Figure 5.2/10* shows the optical connection of a SICAM I/O-Unit to a communication converter (KU-XG) 7XV5662-0AA00, that establishes a connection with a multiplexer with a 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.



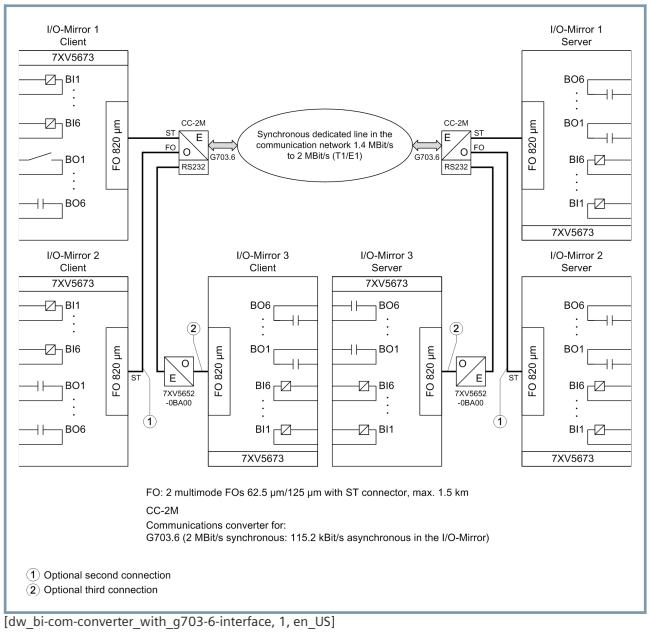
[dw_bi-com-converter, 1, en_US]

Figure 5.2/10 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 by means of a G.703.6 interface

Figure *Figure 5.2/11* 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 communication 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 an optical fiber 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.



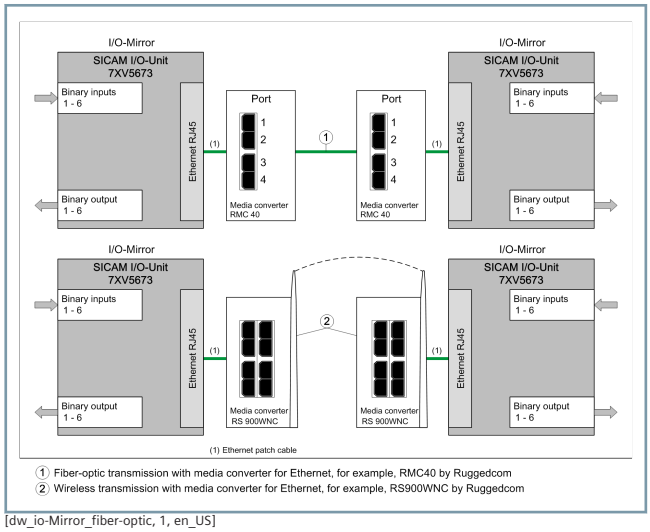
[dw_bi-com-converter_with_g703-6-interface, 1, en_US]

Figure 5.2/11 Binary Signal Exchange with G.703.6 Interface via a Communication Network

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

Figure *Figure 5.2/12* 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, 1, en_US]

Figure 5.2/12 Binary Signal Transmission via Optical Fiber or Wireless Connection; Connection via the Integrated Ethernet Interface to External Transmission Devices

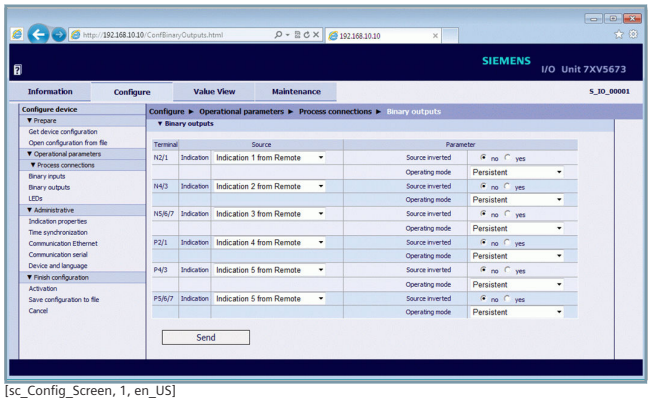
Typical applications can be found in the internet *www.siemens.com/sicam-io* -> Downloads.

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 5.2/13* shows the user interface. In the same way, operational logs and commissioning aids are supported by the web 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.

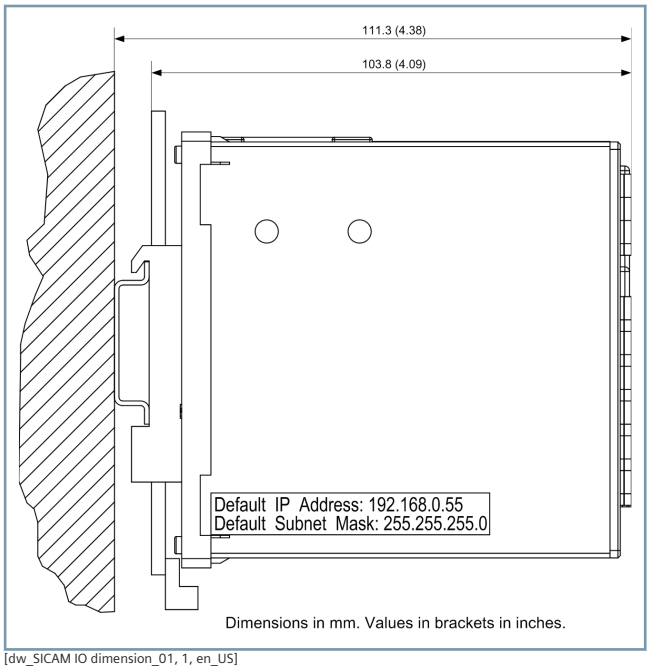
As soon as the IEC 61850 GOOSE configuration is completed, the SICAM I/O mapping tool reads the corresponding SCD file and generates the binary IEC 61850 parameter set, which can be uploaded via HTML.



[sc_Config_Screen, 1, en_US]

Figure 5.2/13 Configuration Screen of the SICAM I/O Unit in the Web Browser

Dimensional Drawing



[dw_SICAM IO dimension_01, 1, en_US]

Figure 5.2/14 Dimensions SICAM I/O-Unit 7XV5673

Selection and Ordering Data

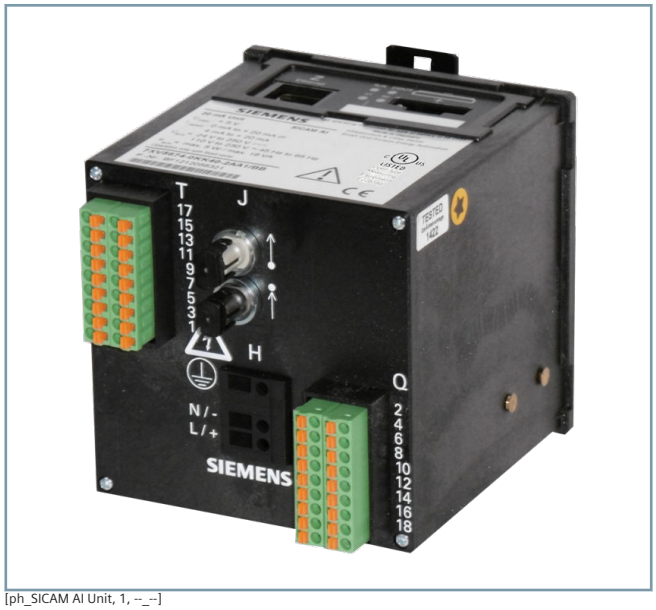
Description	Variants	Order no.																
		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
SICAM I/O-Unit		7	X	V	5	6	7	3	-	0	J	J	□	0	-	□	A	A	1
													▲			▲			
Device type	*Serial interface and communication protocol*												|			|			
DIN rail device IP20; Dimensions 96 mm x 96 mm x 100 mm (WxHxD); Power supply: DC 24 V to 240 V, AC 100 V to 230 V; Integrated web server for parameterization; Ethernet interface RJ45 connector; Integrated switch function; CE and UL approval	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			
Inputs and outputs 6 binary inputs with selectable threshold voltage 6 relay outputs (4 make contacts, 2 change-over contacts)	Ethernet interface with Modbus TCP/UDP, binary signal transmission or IEC 61850 server (GOOSE and reporting/MMS)															2			
Accessories	Y-cable	7	K	E	6	0	0	0	-	8	G	D	0	0	-	0	B	A	2

5.2 **Table 5.2**/1 SICAM I/O-Unit Selection and Ordering Information

Description

The SICAM AI-Unit 7XV5674 is an analog input unit (20-mA). Energy supply companies use it in the field of substations and in the industrial section at increased environmental demands. Besides analog signal input, the SICAM AI-Unit can average and compress the measured data, and monitor and signal parameterized limit values. Measured values and messages can be transferred to a protection device, an SICAM I/O-Unit, or to a substation or power systems 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 20-mA extension and a local or remote automation unit.

Inputs	Twelve 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 5.3/1 SICAM AI-Unit 7XV5674

Benefits

- Wide application range (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-s, 1-min, 1-h, 24-h averaging in the unit. This on-site compression reduces the data volume that is to be transferred and processed (this makes handling mass data possible)
  - Independent on-site automation and monitoring unit with signaling of parameterized out-of-limit condition 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), IEC61850, 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 a web browser. No special parameterization software necessary
- 4 LEDs for different parameterizable messages/alarms
- 4 freely parameterizable group indications
- Battery-backed real-time clock and message logs (can be exported as .csv)
- Binary message and alarm stamp exact to 1 ms
- Simulation of input signals for easier system 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 network control system)
- DMS (Distribution Management System)
- EMS systems (Energy Management)
- GIS (Gas-insulated switchgear) – gas pressure monitoring
- Other industrial processes
- Modernization of old systems: Automation/interface to old 20-mA technology (such as fault location output 7SA511/513)

The currents from the connected transducers (such as temperature, pressure or position sensors) can be transferred via the supporting communication protocols to other automation processes for further processing (such as visualization). See also *Figure 5.3/2*.

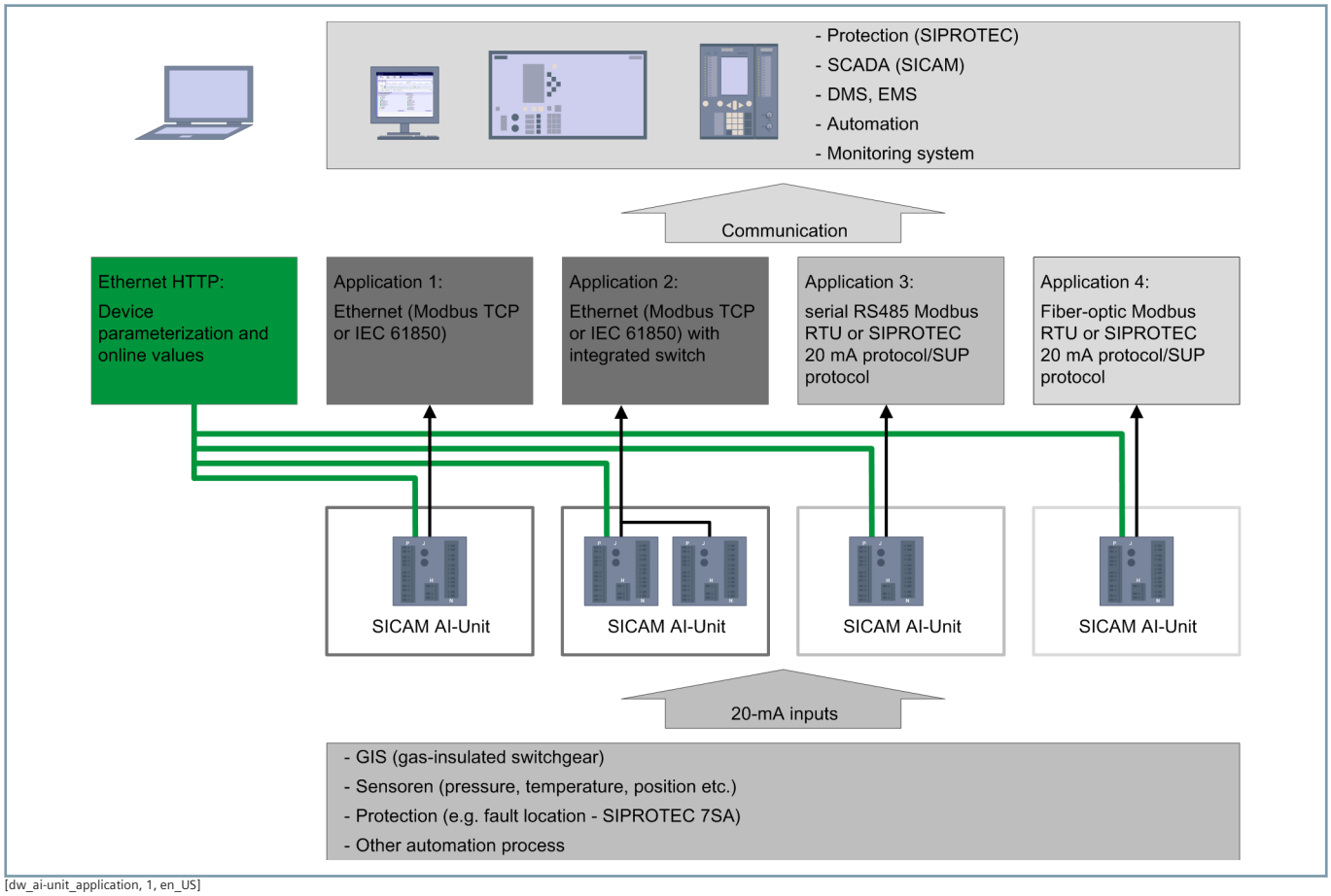
The DC inputs of the SICAM AI-Unit can be parameterized for the following ranges:

- 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 in the internet
www.siemens.com/sicam-ai -> Downloads.



[dw_ai-unit_application, 1, en_US]

Figure 5.3/2 Application Example

Measured quantities

The SICAM A/I-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 unit, and be transferred via communication protocols, together with messages (such as out-of-limit conditions).

Limit settings

Up to 16 limit violations of current measured values in both directions can be set via the menu automation functions. Out-of-limit conditions of the upper and lower range of values can be indicated as 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
  - Without serial interface
  - With RS485 interface
  - With optical interface
- Communication with existing RS485 or optical 820 nm interface
  - With Modbus RTU protocol and SIPROTEC RTU 20 mA protocol/SUP (Slave Unit protocol)

The serial interface supports the following functions:

- Transmission of measured data
- Transmission of messages
- Time synchronization via Modbus RTU

Upon selection of 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 A/I-Unit needs the date and time for all time-relevant processes. In communication with peripheral devices, this guarantees 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 not available)

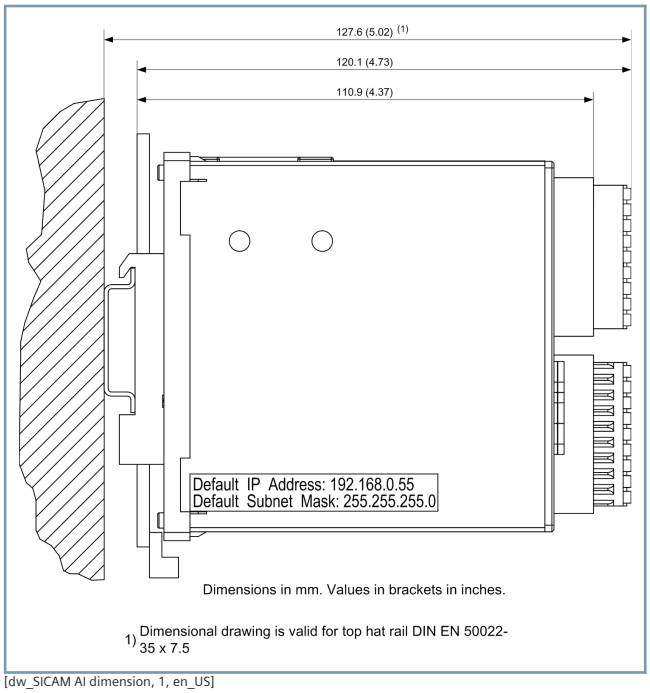
LED indications

The SICAM A/I-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 an web browser. Internet Explorer 6 (or higher) is required for this.

Dimensional Drawing



[dw_SICAM AI dimension, 1, en_US]

Figure 5.3/3 Dimensions SICAM AI-Unit 7XV5674

5.3

Selection and Ordering Data

Description	Variants	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
Device Type													▲			▲			
DIN rail device, IP20; twelve 20-mA inputs for example, SIPROTEC/SICAM devices; dimensions: 96 mm x 96 mm x 100 mm (W x H x D); power supply: DC 24 V 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	*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																			
The following components can be obtained as an option:																			
	Y-cable	7	K	E	6	0	0	0	-	8	G	D	0	0	-	0	B	A	2
	Ethernet patch cable (CAT6) RS485 cable for SIPROTEC devices	6	X	V	1	8	3	0	-	0	E								
	RS485 bus connector plug for SIPROTEC devices	6	E	S	7	9	7	2	-	0	X	A	0						
		6	E	S	7	9	7	2	-	0	B	B	4	2	-	0	X	A	0
Order information about prefabricated optical fiber cables can be found in the internet in the SIPROTEC download section at *www.siemens.com/siprotec* -> Downloads/SIPROTEC accessories, 6XV81xx																			

Table 5.3/1 SICAM AI-Unit Selection and Ordering Iinformation

SIEMENS

www.siemens.com/accessories

Temperature Measurement

RTD Unit – 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, 24 to 250 VDC and 115/230 VAC, 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 6.1/1 RTD Unit TR1200 7XV5662-6AD10

Benefits

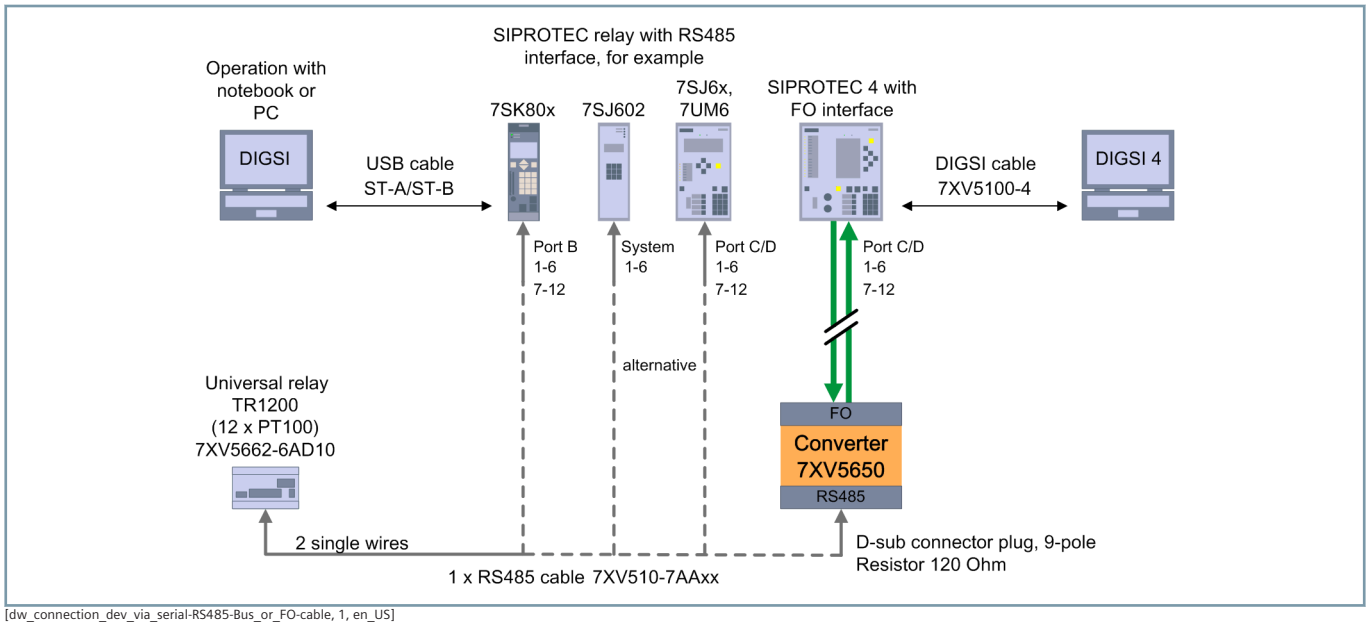
- 3-digit temperature display
- 12 inputs for temperature sensors, 1 to 12 sensors can be connected
- Pt 100 thermocouples for 2-wire or 3-wire technology
- 1 fault relay (electrically isolated change-over contact)
- RS485 interface (ZIEHL standard protocol and Modbus RTU protocol)
- LEDs indicate the 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, 24 to 240 VAC/VDC
- Snap-on mounting to 35-mm DIN rail according to EN 60715.

Applications

Communication over the RS485 bus

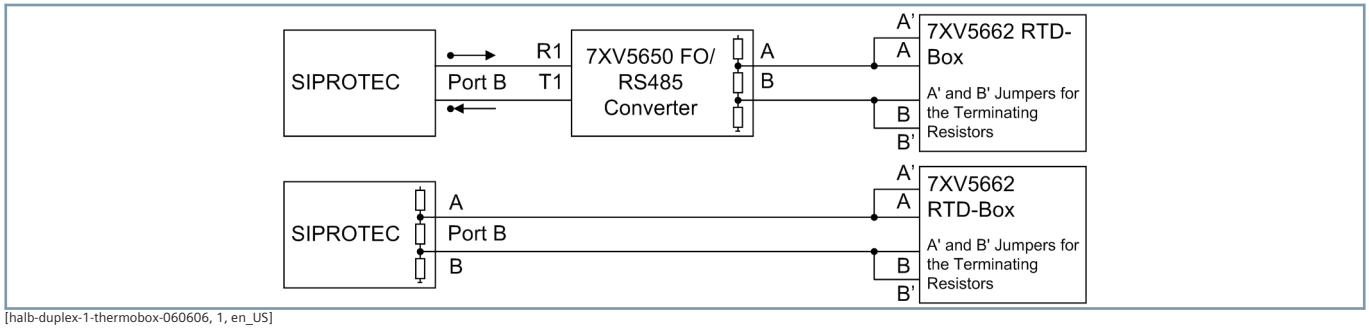
The RTD unit TR1200 is connected to a SIPROTEC 4 protection device with temperature function (for example, 7SJ6, 7UT6, 7UM6) or the Compact protection 7SK80 with serial RS485 interface (port B) via the RS485 interface. The special cable 7XV5103-7AAxx is used for connection. The RTD unit is connected to a SIPROTEC 5 device according to *Figure 6.1/2*). You can find detailed information at *www.siemens.com/siprotec*

Connection Examples



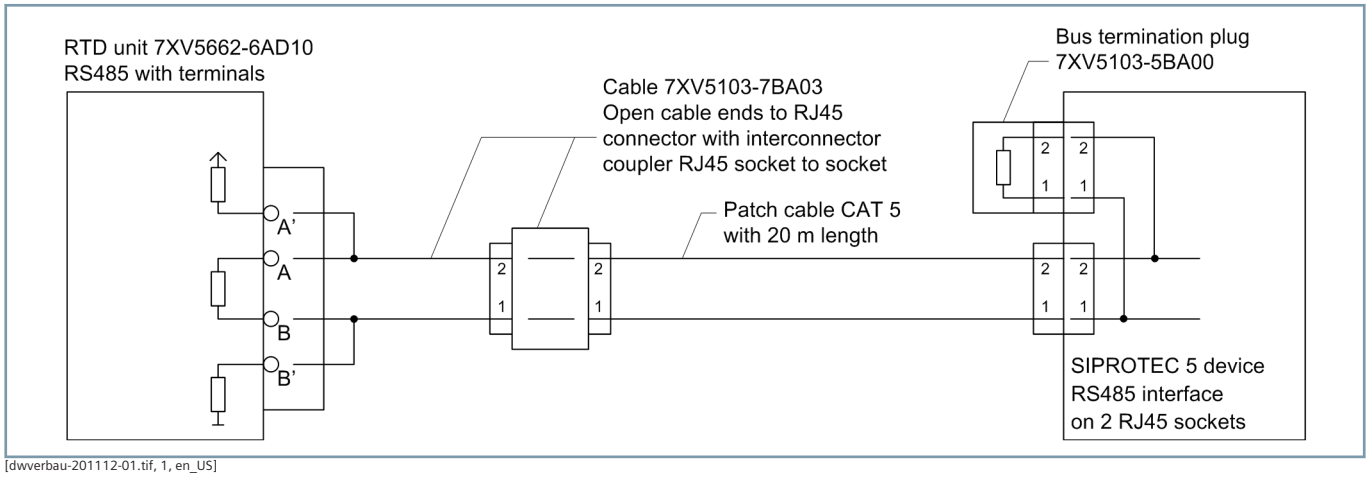
[dw_connection_dev_via_serial-RS485-Bus_or_FO-cable, 1, en_US]

Figure 6.1/2 Connection of Devices using a Serial RS485 Bus or Fiber-Optic Cable



[halb-duplex-1-thermobox-060606, 1, en_US]

Figure 6.1/3 SIPROTEC 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 6.1/4 Connection Example of the RTD Unit to a SIPROTEC 5 Device

RTD Unit – 7XV5662 – 6AD10 – Technical Data

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)	
Contact service life, mechanical		1×10^7 switching cycles	
Contact service life, electrical		1×10^5 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
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

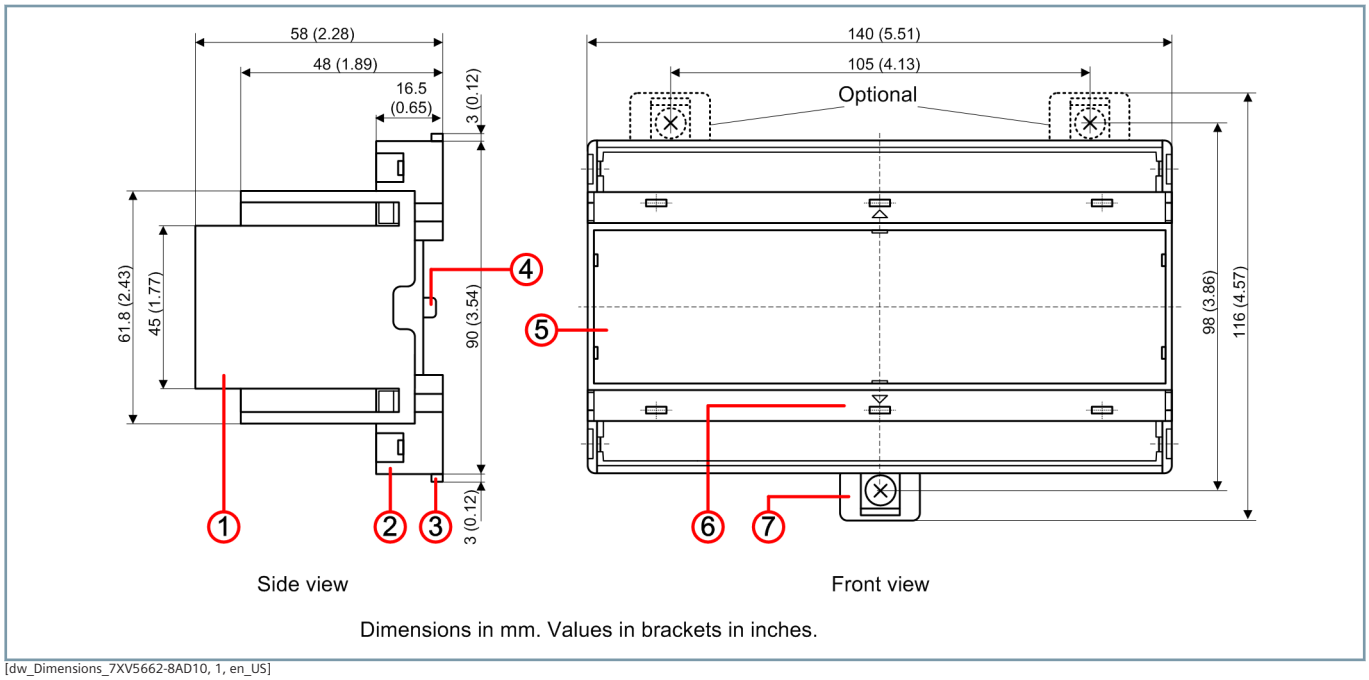
RS485 interface	
Device address	0 to 96
Baud rate	4800, 9600, 19200 bit/s
Parity	N, O, E (no, odd, even)

RS485 interface	
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
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

Dimensioned Drawing



[dw_Dimensions_7XV5662-8AD10, 1, en_US]

Figure 6.1/5 Dimensions, RTD Unit 7XV5662-6AD10

Selection and Ordering Data

Description	Versions	Order no.											
		1	2	3	4	5	6	7		8	9	10	11	12
Temperature measuring device (RTD unit)		7	X	V	5	6	6	2	-	6	A	D	1	0
For SIPROTEC 4, SIPROTEC Compact and all SIPROTEC 5 devices (except 7SS85, 7VK87, 7KE85) With 12 temperature sensors Pt100 (1); with RS485 interface for DIN rail mounting	24 to 250 VAC/VDC													
RS485 copper cable	see *Selection and Ordering Data, Page 92*	7	X	V	5	1	0	3	-	7				

(1) Replaces one or two 7XV5662-2AD10 or 7XV5662-5AD10.

Description

The universal relay TR800 Web has 8 measuring or sensor inputs and can measure 8 temperatures using Pt 100 (Ni100 and Ni120) elements. The measured values 1 to 6 can be transmitted per protocol to SIPROTEC 4 devices with temperature function. Two universal relays with a total of 12 measuring inputs can be connected.

The connection uses a serial RS485 interface (see *Figure 6.1/9*). 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.

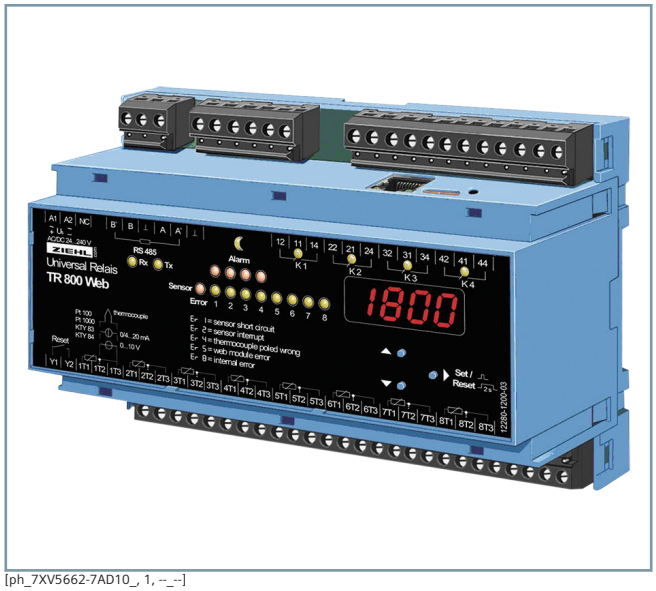
For the motor protection SIPROTEC 7SK80, the connection can also use the Ethernet interface if the system interface is (already) used (see *Figure 6.1/7* and *Figure 6.1/8*). The universal relay is operated and configured via the Ethernet interface using a web browser. Support is provided for 3-wire 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 (0/4 to 20 mADC and 0 to 10 VDC) 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, 24 to 250 VDC and 115/230 VAC, 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
  - 0 to 10 VDC, 0/4 to 20 mADC
  - 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)
- Universal power supply unit, 24 to 240 VAC/VDC
- Integrated Web server for configuration, reading measured data, e-mail alarms to user management, data and alarm logging



[ph_7XV5662-7AD10_, 1, --_--]

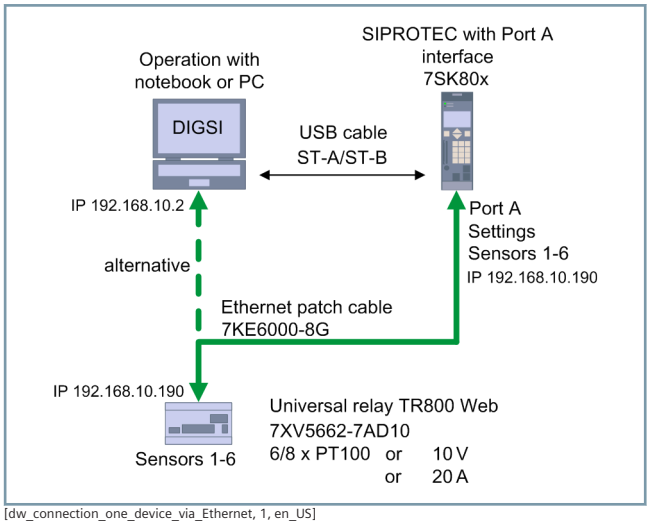
Figure 6.1/6 Universal Relay / RTD Unit TR800 7XV5662-7AD10

- Time-dependent control (day/night)
- Real-time clock with synchronization via the time server.

Application Examples

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 six temperature values (*Figure 6.1/7*).



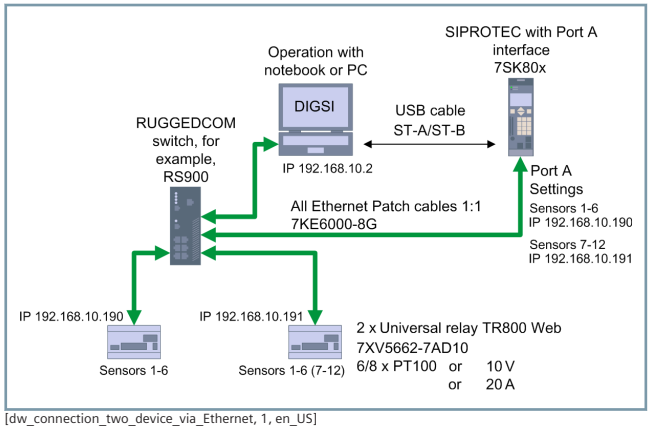
[dw_connection_one_device_via_Ethernet, 1, en_US]

Figure 6.1/7 Connecting a Device via the Ethernet

Communication with two TR800 Webs over the Ethernet interface

If two 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 two 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 two TR800 Webs and the protection device can be used in parallel during normal operation and data can be read from them (*Figure 6.1/8*).



[dw_connection_two_device_via_Ethernet, 1, en_US]

Figure 6.1/8 Connecting two Devices via the Ethernet

Communication over the RS485 bus

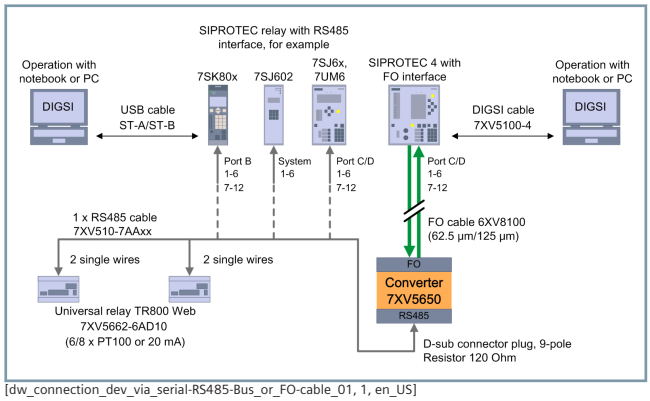
6.1

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.

Three operating modes are available for various applications. All three 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, 1, en_US]

Figure 6.1/9 Connection via the Serial RS485 Bus or Fiber-Optic Cable

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, ⅒ 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
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
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)

Temperature Measurement

RTD Unit – 7XV5662 – 7AD10 – Technical Data

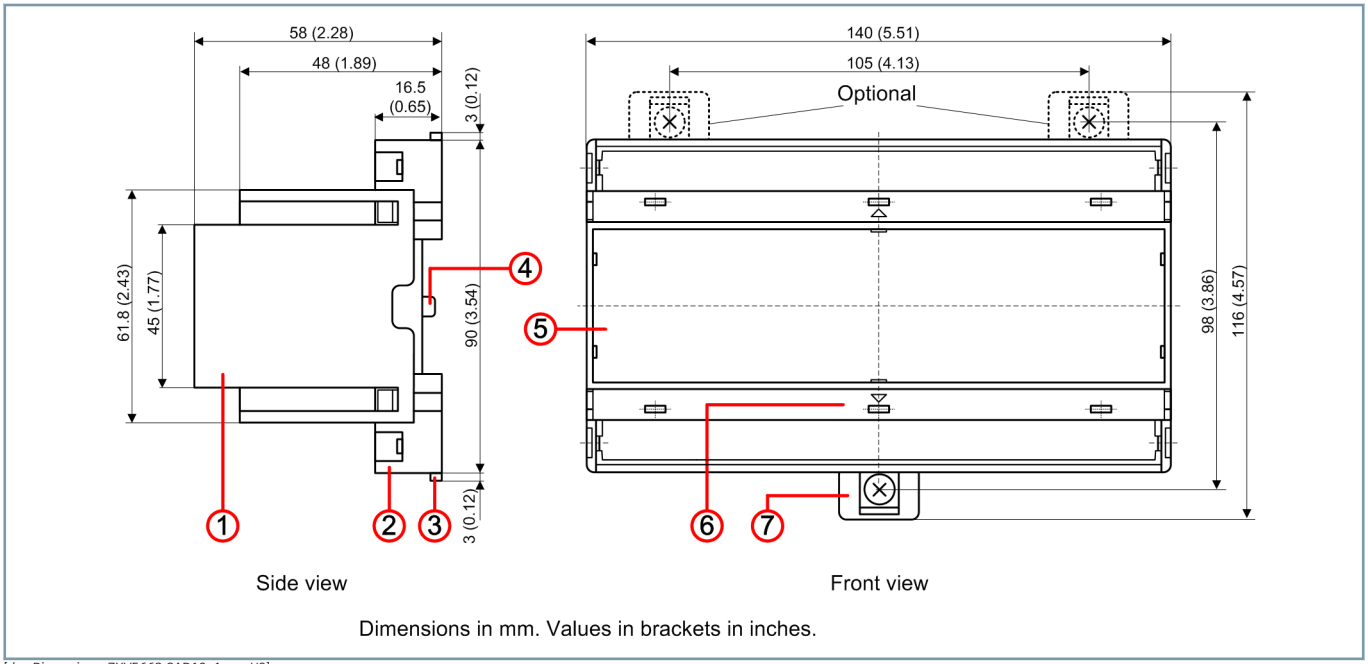
Sensor connection					
Measuring cycle/measurement time (for 8 measurands)	< 3 s				
Pt100, Pt1000 according to EN 60751:					
	Measuring range °C		Short circuit, ohms	Open circuit, ohms	Sensor resistance + line resistance, ohms
Sensor	min.	max.	<	>	> max.
Pt 100	-199	860	15	400	500
Pt 1000	-199	860	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%
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 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

Dimensioned Drawing



[dw_Dimensions_7XV5662-8AD10, 1, en_US]

Figure 6.1/10 Dimensions, RTD Unit 7XV5662-7AD10

Selection and Ordering Data

Description	Versions	Order no.											
		1	2	3	4	5	6	7		8	9	10	11	12
Temperature measuring device (RTD unit)		7	X	V	5	6	6	2	-	7	A	D	1	0
For SIPROTEC 4, SIPROTEC Compact and all SIPROTEC 5 devices (except 7SS85, 7VK87, 7KE85) With 6/8 Pt100 temperature sensors [1] or 6/8 20 mA analog inputs; RS485 interface or electrical Ethernet interface; for DIN rail mounting For each protection device, 2 units can be used.	24 to 250 VAC/VDC													
Note: also see the cost-effective next generation 7XV5674 for 20 mA applications														

RTD Unit – 7XV5662 – 8AD10

Description

The RTD unit TR1200 IP 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 TR1200 IP 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. The SIPROTEC 7SK80 supports with its integrated temperature function.

The measured values are output to the protection device via the Ethernet network using RJ45 plugs.

Note: The SIPROTEC 4 system interface with an EN100 module does not support temperature measurement by the RTD unit TR1200 IP.

Benefits

- 3-digit display for the temperature of 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 (for example, 7SK80) support this function. The EN100 module in the SIPROTEC 4 devices does not support the TR1200 IP.
- 1 alarm relay (1 change-over contact)
- Electrical 10 Mbps Ethernet interface (RTD IP protocol from ZIEHL or MODBUS IP protocol)
- Display, configuration, simulation and firmware update via a web browser
- Mozilla Firefox 3.5 and Microsoft Internet Explorer 8.0 were tested
- LEDs for measurement assignment, faults, relay status and Ethernet interface
- Code lock against changing the set point values
- Wide-range Power Supply Unit 24 to 240 VAC/VDC
- Distributor housing for panel flush mounting, 8 HP, depth: 55 mm
- Mounting on 35-mm DIN rail according to EN 60715

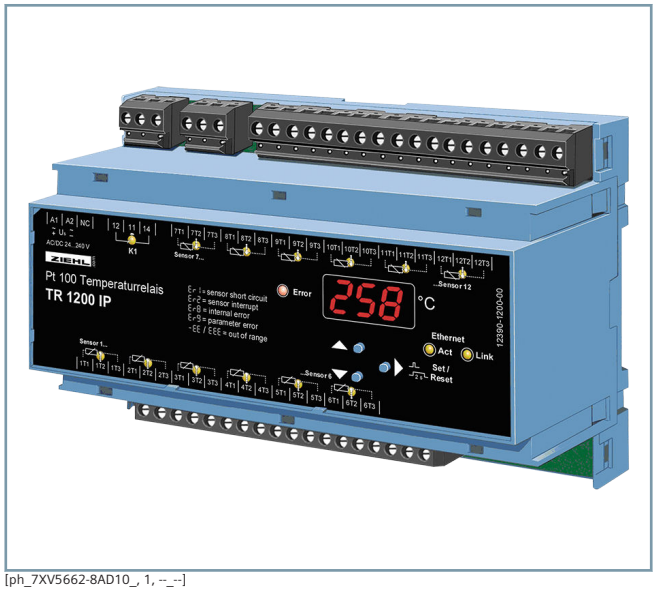
Application Examples

Measurement of up to 12 measured values with an RTD unit TR1200 IP

For measuring up to 12 measured values, an RTD unit TR1200 IP is connected directly to the protection device (for example, 7SK80x/port A) via a double-shielded CAT 5 patch cable (1:1 or crossed).

The protection device is parameterized with DIGSI 4 on a laptop computer using the USB front interface.

The TR1200 IP 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.

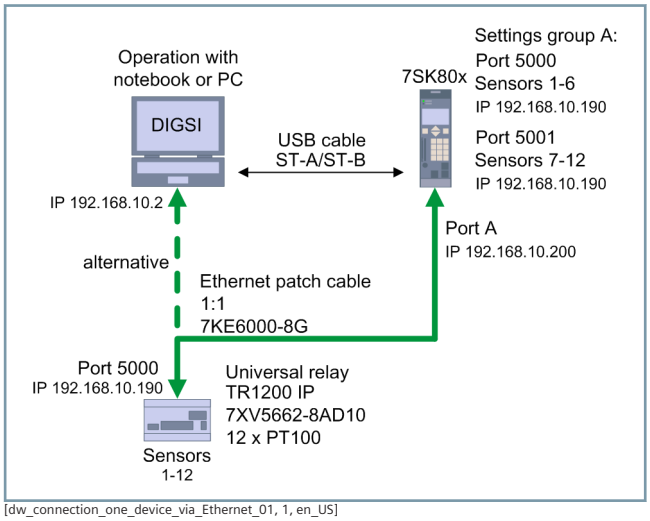


[ph_7XV5662-8AD10_, 1, --_--]

Figure 6.1/11 RTD Unit TR1200 IP (Ethernet) 7XV5662-8AD10

Tip: If, during commissioning, a commercially available switch is temporarily used with 3 patch cables, the protection device and the TR1200 IP can be set in parallel using a PC and DIGSI 4.

You can find detailed information at *www.siemens.com/siprotec*



[dw_connection_one_device_via_Ethernet_01, 1, en_US]

Figure 6.1/12 Connecting a Device via the Ethernet

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
Isolation voltage	2000 VAC

Relay/output			
Quantity		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, ⅒ hp. 3.0 FLA C 300 D 300 1 A, 240 VAC	
Rated operating current I_E	AC 15 DC 13	I_E = 1 A I_E = 2 A I_E = 2 A I_E = 0.2 A I_E = 0.1 A	V_E = 400 V V_E = 250 V V_E = 24 V V_E = 125 V V_E = 250 V
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 2 × 10^5 switching cycles at 250 VAC / 3 A 6 × 10^5 switching cycles at 250 VAC / 1 A	

Temperature measurement	
Measurement time, sensor	0.25 to 3 s (depending on the number of sensors)
Measurement time, sensor	0.25 to 30 s (each 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 The measured values must be converted in the evaluation device.					
	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
Tolerance		± 0.5% of the measurement ± 1 K			
Sensor current		≤ 0.8 mA			
Temperature drift		< 0.04 °C			

Ethernet interface	
Transmission rate	10 Mbps
IP address	Standard: 192.182.1.100, adjustable
Subnet mask	Standard: 255.255.255.0, adjustable
UDP port	Standard: 5000 (5001), adjustable

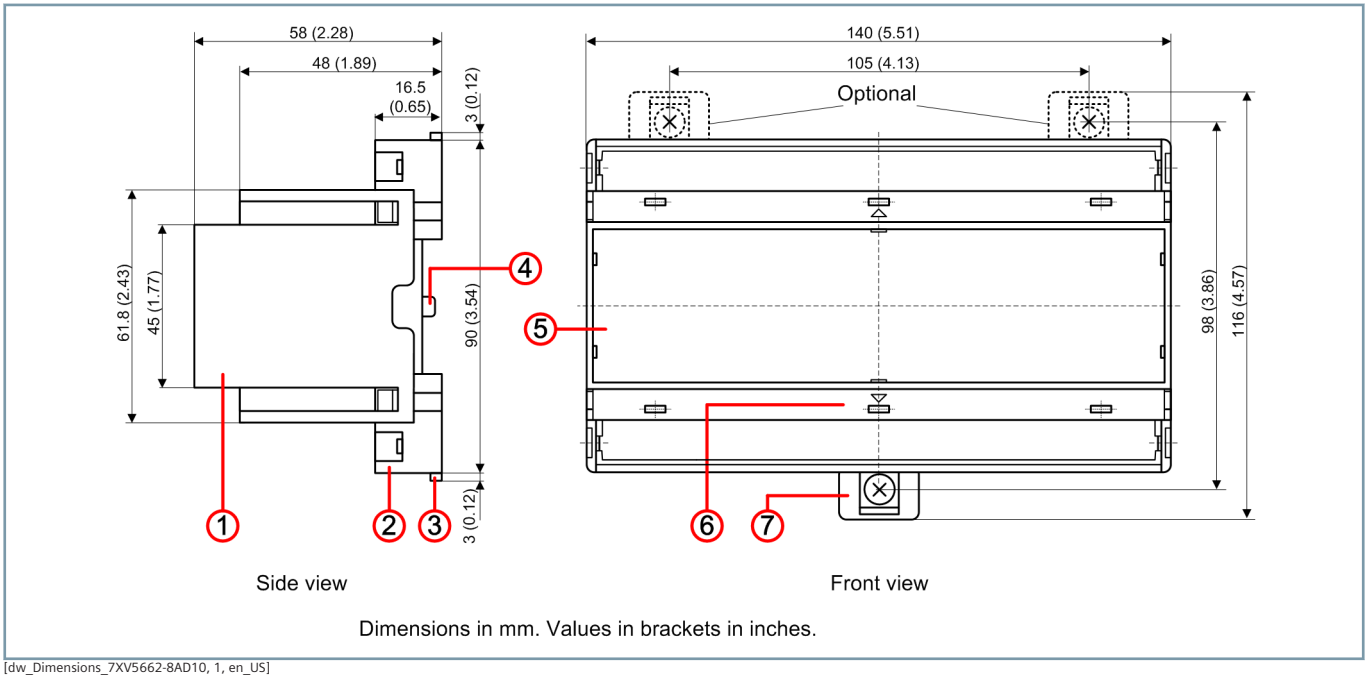
Ethernet interface	
Max. cable length	20 m when using a CAT 5 patch cable
Max. response time, RTD/Modbus	< 700 µs

Test conditions	
According to	EN 61010-1
Rated surge immunity	4000 V
Surge category	III
Degree of pollution	2
Rated insulation voltage V_i	300 V
Operational time	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 61000-6-4
Galvanic separation of control voltage – measuring input	3820 VDC
Ethernet – control voltage – measuring input	500 VDC

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
Flush mounting	any
Fastening	Snap-on mounting to 35-mm DIN rail according to EN 60715 or screw fixing(with 2 additional angle brackets)
Weight	about 350 g

6.1

Dimensioned Drawing



[dw_Dimensions_7XV5662-8AD10, 1, en_US]

Figure 6.1/13 Dimensions, RTD Unit 7XV5662-7AD10

Selection and Ordering Data

Description	Versions	Order no.											
		1	2	3	4	5	6	7		8	9	10	11	12
Temperature measuring device (RTD unit)		7	X	V	5	6	6	2	-	8	A	D	1	0
For SIPROTEC 4, SIPROTEC Compact and all SIPROTEC 5 devices (except 7SS85, 7VK87, 7KE85) With 12 temperature sensors Pt100 [1)] SIPROTEC 7SK80 port A (Ethernet, RJ45) Mounting on a DIN rail	24 to 250 VAC/VDC													
Note: Not compatible with the SIPROTEC 4 EN100 printed circuit board assembly														

(1) Replaces one or two 7XV5662-2AD10 or 7XV5662-5AD10

RTD Unit – 7XV5662 – 8AD10 – Selection and Ordering Data

SIEMENS

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Test Equipment

Test Equipment

Test Switch – 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 without open neutral point for two transformer cores or separate ground-fault transformer
- For feeder protection with a open neutral point
- For feeder protection with a open neutral point and independently switchable trip and transformer circuits
- For three-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)

[ph_7XV75, 1, --_--]

Figure 7.1/1 Test Switch 7XV75

7.1

Technical Data

Test switch	
Auxiliary voltage V_n	400 VAC
Rated operating current I_n	6 A
Max. test current	150 A for 1 s 60 A for 10 s

Mechanical version	
Metal housing	7XP20
Dimensions	⅙ × 19" width
Weight	Approximately 3.4 kg

Selection and Ordering Data

Description	Versions	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-circuited neutral point for feeder protection								0		|			
	with 16-pole Harting plug							|		0				
	with banana plugs							|		1				
With open-circuited neutral point for feeder protection								1		|				
	with 16-pole Harting plug							|		0				
	with banana plugs							|		1				
For 3-winding-transformer								2		|				
	with 16-pole Harting plug							|		0				
	with banana plugs							|		1				
Without open-circuited neutral point for two current transformer cores or separate ground fault								3		|				
	with 16-pole Harting plug							|		0				
	with banana plugs							|		1				
Without open-circuited neutral point for feeder protection								6		|				
	with 4 current transformer inputs and 4 voltage transformer inputs							|		|				
	with 16-pole Harting plug							|		|				
Without open-circuited neutral point for feeder protection with additional make and break contacts								7		|				
	with 16-pole Harting plug							|		0				
	with banana plugs							|		1				
With open-circuited neutral point, independently switching trip input circuit								8		|				
	with 16-pole Harting plug									0				
	with banana plugs									1				
Connecting cable 7XV6201 for test switch 7XV75 with 2 m cable														
	with 16-pole Harting plug and 17 insulated banana 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				

Test Switch – 7XV75 – Technical Data

SIEMENS

www.siemens.com/accessories

Time Synchronization

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 the 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.

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 Alternative: Connection to system 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

[ph_SNTP-Master_Server_7SC80_, 1, --_--]

Figure 8.1/1 SNTP Master Server 7SC80

- 1 life contact
  - Change-over contact
- Power supply unit/battery voltage
  - Input voltage 24/48 VDC, 60 – 250 VDC and 110 – 230 VAC ±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).

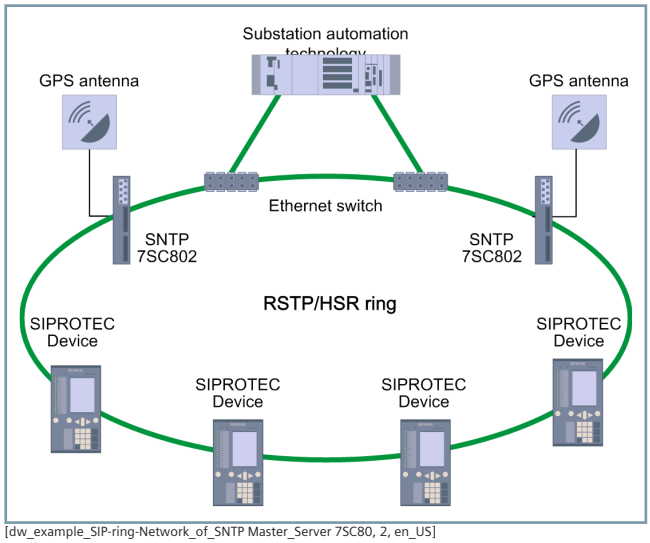
Application

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 interface are used, EMC effects are eliminated, even for 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, use of the previous 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, 2, en_US]

Figure 8.1/2 Sample Configuration of a Redundant Integration of a 7SC80 SNTP Server in an Optical SIPROTEC Ring Feeder

SNTP Master/Server – 7SC8021 – Selection and Ordering Data

Selection and Ordering Data

Description	Versions	Order no.																						
		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16		Short code		
SNTP Server with GPS receiver (optical/electrical)		7	S	C	8	0	2	1	-	☐	A	B	9	7	-	3	F	N	0		L	☐	☐
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.	*Auxiliary voltage (power supply)*								▲													▲	▲
	60 V to 250 VDC, 115 VAC, 230 VAC								1													|	|
	24 V/48 VDC								2													|	|
	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
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																							

Description	Versions	Order no.																
		1	2	3	4	5	6	7		8	9	10	11	12	13	14	15	16
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/U																		

Description

The 7XV5104 is a 2-wire shielded bus system for synchronizing standard time at port A (24 V connection) in SIPROTEC protection devices. Only the 24 V input of the interfaces is supported.

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.

Benefits

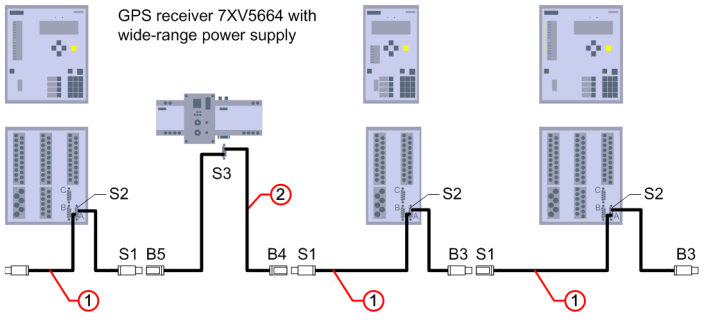
- Optoelectrical solution for SIPROTEC 4/5 devices with IRIG-B interface (port A)
- Direct connection of SIPROTEC 4/5 devices with IRIG-B interface to the sync transceiver 7XV5654
- Adaptor/cable for cascading and adapting to other converters
- 4 cable lengths can be ordered, from 1 m to 10 m
- 2-wire, 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 within buildings.

[ph_RS485 bus system, 1, --_--]

Figure 8.2/1 RS485 Bus System

Application Examples

The 9-pole male connector of the Y-bus cable S1 always comes from the radio -controlled clock or the sync transceiver and connects to the first and following devices on the bus via the 1, 3, 5 or 10 m long cable and the 9-pole male connector. There is a 9-pole socket B3 (on a 2 x 10 m long cable) on the connector S2. This can be used to extend the bus. 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. Typical applications are described in the manual for the sync transceiver 7XV5654.

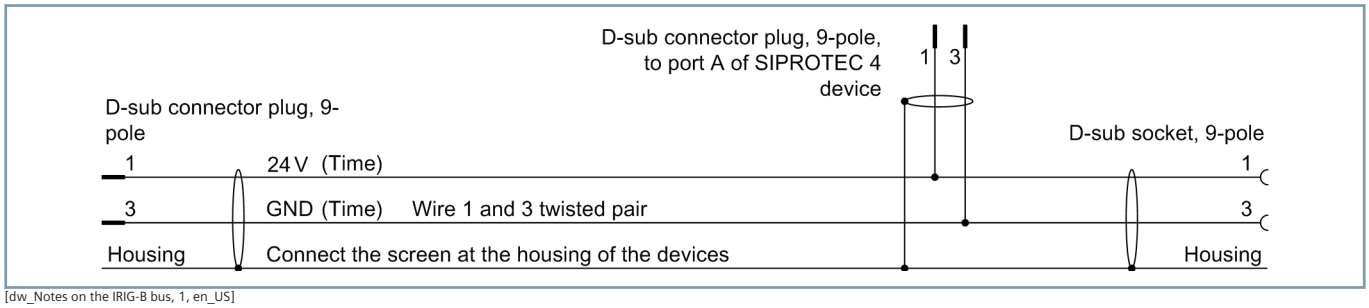


[dw_12_SIP4-devices_IRIG-B-bus_via_pref_y-bus-cable, 1, en_US]

Figure 8.2/2 Example: Connection of a maximum of twelve SIPROTEC 4 Devices to the IRIG-B Bus using a pre-assembled Y Bus Cable

Time Synchronization

Bus Cable for Time Synchronization – 7XV51 – 7XV5104



[dw_Notes on the IRIG-B bus, 1, 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	Versions	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 4 – 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 4 – time synchronization bus (2-wire)										|			|	|					
	Length: 10 m									1			1	0					
Adaptor cable for SIPROTEC 4 – time synchronization bus										|			|	|					
	Length: 0.3 m									2			0	0					
T adaptor cable for 2 buses										3			0	0					
	T adaptor cable for time synchronization converter 7XV5654-0BA00 Connector X1 splits into buses to 6 devices each																		

8.2

Description

The 7XV5105 is a 4-wire shielded bus system for synchronizing standard time with a second pulse at port A (24 V connection) in SIPROTEC protection devices. The additional highly accurate second pulse is needed only for synchronizing two line differential protection devices via GPS.

The evaluation of fault records, operational and fault indications requires an absolute 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 and the second pulse at the same time.

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 2 x 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
- 4 cable lengths can be ordered, from 1 m to 10 m
- Shielded and twisted four-wire cable with 9-pole D-SUB connectors

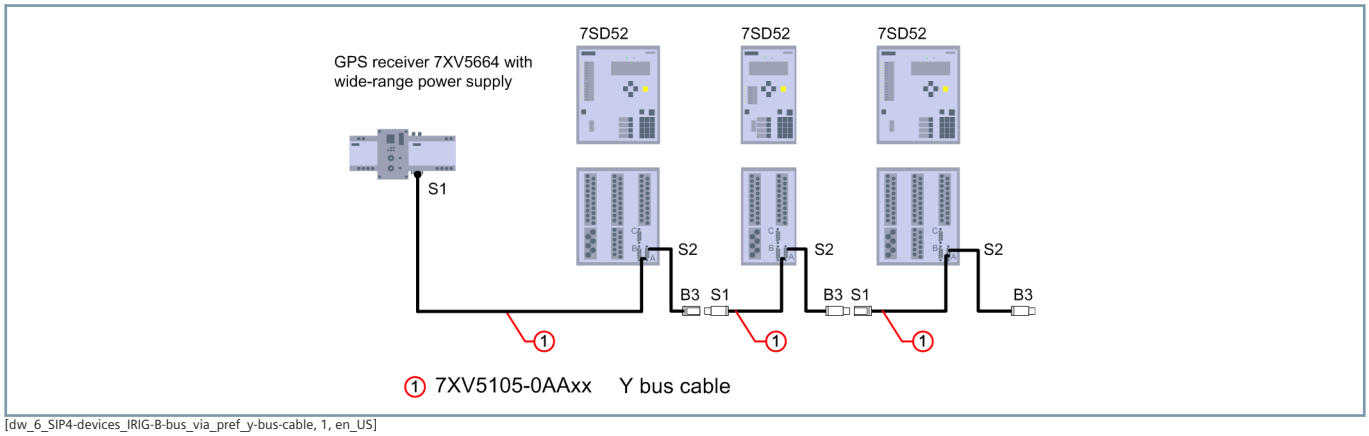
[ph_RS485 bus system, 1, --_--]

Figure 8.2/3 Y-cable 7XV5105

- Metal connector housing with compact dimensions, with fastening screw and strain relief for the cable connections
- Maximum length of the electrical bus is 2 x 10 m within buildings.

Application Examples

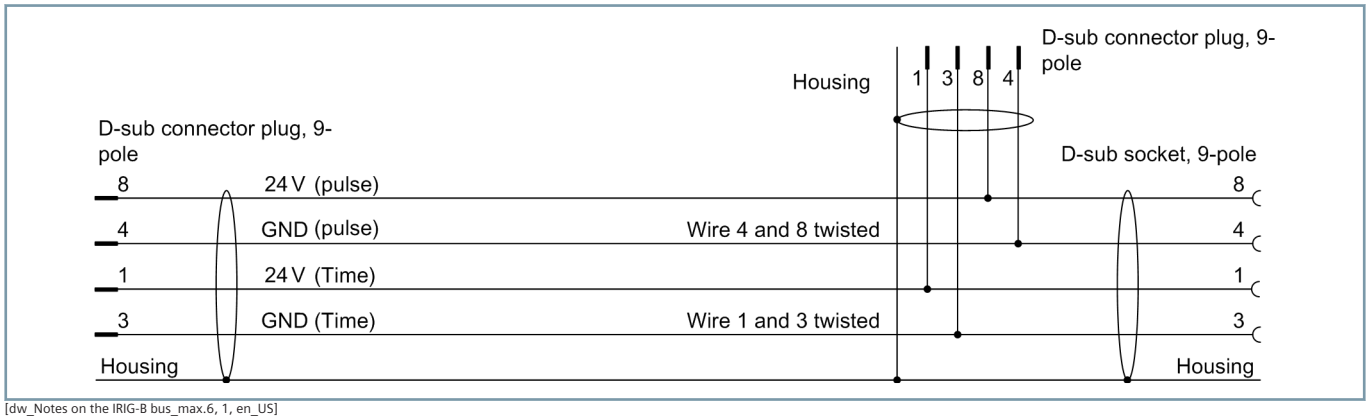
The 9-pole male connector of the Y-bus cable S1 always comes from the radio-controlled clock or the sync transceiver and connects to the first and following bus devices via the 1, 3, 5 or 10 m long cable and the 9-pole male connector. There is a 9-pole socket B3 (on a 2 x 10 m long cable) on the connector S2. This can be used to extend the bus. If more than six SIPROTEC 4/5 devices are to be connected to the radio clock, up to 4 sync transceivers 7XV5654 can be connected, each with six 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, 1, en_US]

Figure 8.2/4 Example: Connection of a maximum of six SIPROTEC 4 protection devices 7SD5 to the IRIG-B bus using a prefabricated Y bus cable

Bus Cable for Time Synchronization – 7XV51 – 7XV5105



[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. 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	Versions	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 the time synchronization bus of the GPS extension of line differential protection 7SD52 (4-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 the time synchronization bus of the GPS extension of line differential protection 7SD52 (4-wire)	Length: 10 m									1			1	0

Description

The GPS time synchronization unit (time-signal receiver) 7XV5664-1 provides a complete solution, with the additional components of the mini star coupler 7XV5450, sync transceiver 7XV5654, 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.

[ph_gps, 1, --_--]

Figure 8.3/1 GPS Time Synchronization Unit 7XV5664-1

Benefits

- Time receiver with an integrated, high-precision clock and high-grade free running behavior. Accuracy: ± 250 ns
- Special hardware and firmware developed and adapted specifically for the high-precision synchronization of SIPROTEC and SIMEAS devices Type test according to 2004/108/EC, 2006/95/EC, 93/68/ EEC and EN61010-1:2010, CAT II, 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 with wall-mounting holder and 50 m RG58 cable (BNC/N connector)
- Lightning protection with 5 m RG58 cable (N connector)
- Alarm relay (1 change-over contact, SIPROTEC standard)
- Auxiliary voltage, 100 to 240 VDC/VAC (50/60 Hz)
- Operating program with connecting cable, 3 m, PC interface RS232 (9-pole D-SUB connector)
- Aluminum housing for DIN rail mounting.

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, 24 VDC/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, 24 VDC/maximum 20 mA to a terminal

[Time_synch_comp, 1, --_--]

Figure 8.3/2 Additional Component

8.3

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 D-sub 9.

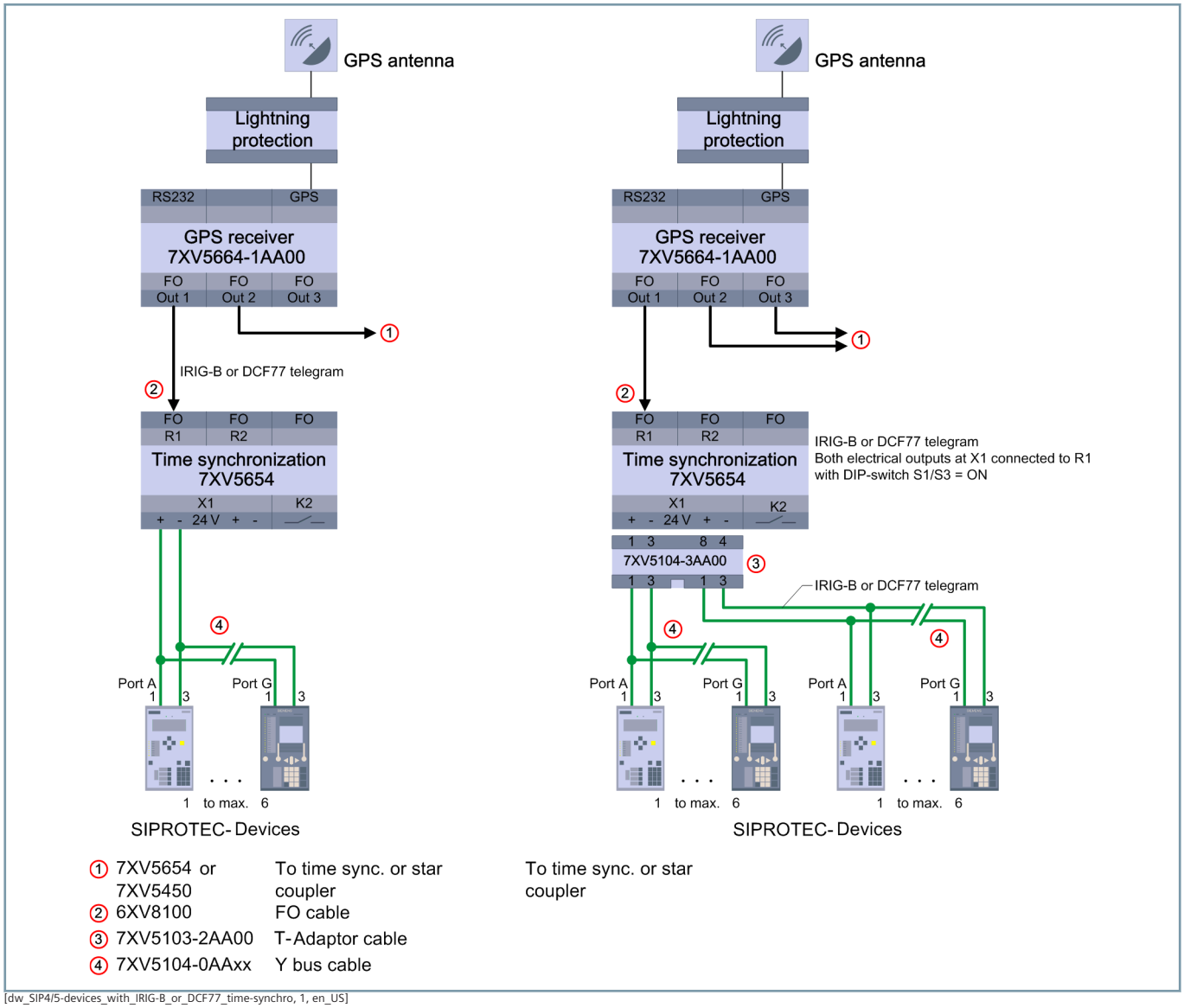
The time telegrams or synchronization pulses are transmitted without interference from the three optical outputs to the protection devices distributed within the system using optical fibers.

The optical star structure can be extended using mini star couplers 7XV5450. 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 8.3/3*).

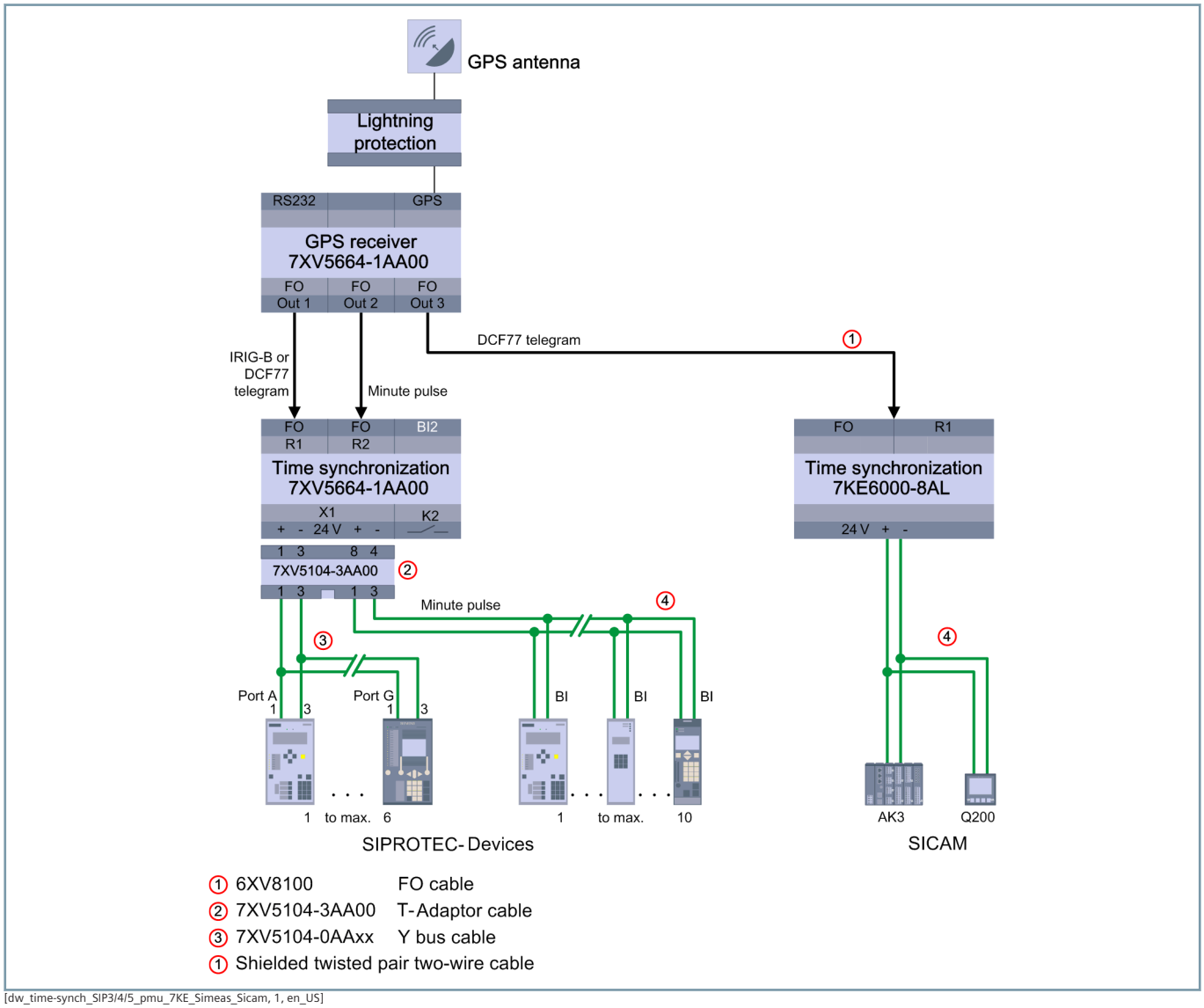
Note: In this case, no bus load resistor is needed.



[dw_SIP4/5-devices_with_IRIG-B_or_DCF77_time-synchro, 1, en_US]

Figure 8.3/3 SIPROTEC 4/5 Protection Device with IRIG-B or DCF77 Time Synchronization

Joint Time Synchronization, SIPROTEC Protection Devices 3/4/5/PMU, 7KE85, SIMEAS R-PMU, SICAM Q80 V3



[dw_time-synch_SIP3/4/5_pmu_7KE_Simeas_Sicam, 1, en_US]

Figure 8.3/4 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 three different telegrams or pulses for the time synchronization of devices, even in parallel, using its three optical channels. The connection of the various device models to the system is shown in *Figure 8.3/4*.

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. 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	Versions	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	A	☐	0					
especially for precise synchronization of SIMEAS R-PMU V4, differential protection applications, SIPROTEC 5 PMU and 7KE85 as well as for time synchronization of SIPROTEC 3/4/5 and PQ devices such as SICAM Q80 V3 and SIMEAS R (sync unit replacement). Time receiver with high-precision, integrated clock, with GPS antenna, lightning protection and 50 m (+5 m) RG58 cable. 3 programmable optical outputs (high-precision pulse, IRIG-B, DCF77) with ST connector for 50/125 µm or 62.5/125 µm, 850 nm multimode fiber. With alarm relay, DIN rail mounting, parameterization software and cable	Auxiliary voltage, 100 to 240 VDC/AC (50/60 Hz)												0						
	100 to 240 VDC/AC (50/60 Hz)												1						

CE conformity
This product complies with the directive of the Council of the European Communities on harmonization of the laws of the Member States relating to electromagnetic compatibility (EMC Directive 2014/30/EU) and concerning electrical equipment for use within specified voltage limits (Low Voltage Directive 2014/35/EU).

This conformity has been proved by tests performed according to the Council Directive in accordance with the generic standard EN 61000-6-5 (for EMC directive) and with the product standard EN 62586-1 (for Low Voltage Directive) by Siemens AG.

The device is designed and manufactured for application in an industrial environment.

The product conforms with the international standards of EN 62586 and the German standard VDE 0415.

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