



Fig. 13/66 Communication converter for X.21/RS422 and G.703.1

Description

The communication converter CC-XG for coupling to a communication network is a peripheral device linked to the protection device via fiber-optic cables, which enables serial data exchange between two protection relays. A digital communication network is used. The electrical interfaces in the CC-XG for the access to the communication device are selectable as X.21 (64 kbit/s, 128 kbit/s, 256 kbit/s or 512 kbit/s) or G.703.1 (64 kbit/s). At the opposite side, the data are converted by second communication converter so that they can be read by the second device. The communication converters thus allow two protection devices to communicate synchronously and to exchange large data volumes over large distances. Typical applications are the serial protection interfaces of differential protection and distance protection of SIPROTEC 4 devices 7SD52/53, 7SD61, 7SA52, 7SA6, and SIPROTEC 5 devices 7SD8, 7SA8 and 7SL8, where 7XV5662-0AA00 has to be used.

Should asynchronous serial data of differential protection 7SD51 or of the binary signal transducer 7XV5653/7XV5673 be transmitted, the device 7XV5662-0AA00 has to be used (asynchronous from 300 bit/s to 115.2 kbit/s dependent on the baudrate of X.21 or G.703.1 interface). Interference-free connection to the protection device is achieved by means of a multi-mode fiber-optic cable, with ST connectors at the CC-XG. The maximum optical transmission distance is 1.5 km (0.93 mile).

The CC-XG should be mounted or installed respectively near the DCE (data communication equipment) in the same cubicle frame or at least in the same room. The electrically connectable distance should be as short as possible; a few meters are favorable.

The data transfer between the protection devices is realized as a point-to-point connection that is bit-transparent. Data must be exchanged via dedicated communication Channels within the same communication system (not via switching points).

Function overview

- Optical interface with ST connector for connection to the protection unit
- Distance: 1.5 km (0.93 mile) with 62.5/125 μm and 50/125 μm multi-mode FO cable between CC-XG and the protection unit/serial device
- Electrical interface to the communication device via SUB-D connector (X.21, 15 pins, automatic detection and setting to 64, 128, 256 or 512 kbit/s or G.703.1, 9 pins, 64 kbit/s).
- Synchronous and Asynchronous mode now within one device, selectable by push-button.
- Synchronous data exchange for SIPROTEC 4 protection relays 7SD52/53, 7SD61, 7SA52, 7SA6, and all SIPROTEC 5 protection relays e.g. 7SD8, 7SA8 and 7SL8.
- Asynchronous data exchange for 7SD51 protection relay, Binary signal transmitter, 7XV5653/7XV5673 or other devices with asynchronous interface
- Monitoring of:
 - auxiliary supply voltage,
 - X.21: clock signal of communication network; G703.1: Receive dates are on and correspond to the standardized pulse mask.
 - and internal logic
- Fail safe relay (1 changeover contact, SIPROTEC standard)
- Loop test function selectable by push-button
- Wide-range power supply unit (PSU) for DC 24 to 250 V and AC 115 to 230 V

*) in preparation

Applications, functions, technical data

Application

Synchronous serial data exchange between two devices from same type:

SIPROTEC 4 : distance protection with teleprotection and differential protection (7SA52/6,7SD52/53/61); devices have to be equipped with optical module FO5.

SIPROTEC 5 : all device types possible(e.g.7SD8/A8/L8); devices have to be equipped with USART-AD-1FO or USART-AE-2FO.

Asynchronous serial data exchange between two devices from same type:

SIPROTEC 3 : differential protection (7SD51). Binary signal transmitter, SICAM I/O-Unit: I/O Mirror, bidirectional transmission of binary signals e.g. for teleprotection (7XV5653, 7XV5673).

Functions

The protection unit is optically linked to the CC-XG, which makes interference-free data transfer between the CC-XG and the protection unit possible. The communication converter is located close to the communication device. It adapts the FO active interface of the protection relay to the electrical specifications of the communication network interface. The interface types – optionally X.21/RS422 or G.703.1 – can be set by a push-button at the top of the device. The required transmission rate is automatically detected and set by the CC-XG.

Data transfer between the protection units is effected on the basis of a point-to-point connection, furthermore it is a synchronous, bit-transparent transmission via the communication network.

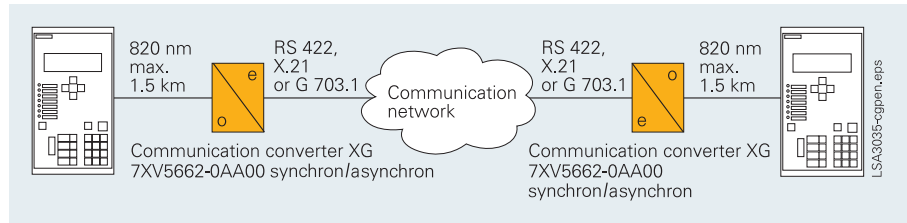


Fig. 13/67 Connection of two protection devices via a communication network linked with 7XV5662-0AA00 in synchronous or asynchronous mode.

Technical data

Rated auxiliary voltage

DC 24 to 250 V	± 20 %
AC 115 to 230 V	± 20 %
Power consumption	Approx. 2,5 W, <9,5 VA

LEDs

4 LEDs	
LED 1	Red: Error and loop mode
LED 2	-Green: the device operates in synchronous mode. -Yellow: the device operates in asynchronous mode.
LED 3	-Green: the device operates in synchronous mode -Yellow: the device operates in asynchronous mode.
LED 4	- Green: The device communicates via the G.703.1 interface. -Yellow: The device communicates via the X.21 interface.

Connectors

Power supply	2-pole screw-type terminal
Alarm/ready contact	3-pole make/break contact
Serial G.703.1 interface	9 pole SUB-D connector for 4-pole receive and transmit line
X.21 interface	15-pin SUB-D connector for electrical X.21/RS422 interface
FO cable	820 nm, 2 ST connectors for Tx/D and Rx/D for 62.5/125 μm multi-mode FO (max. distance to protection unit 1.5 km/0.93 mile)

Housing

Steel sheet housing	Dimensions 188 × 55 × 120 mm (W × H × D)
Weight	Approx. 0.8 kg
Degree of protection	According to EN 60529: IP41
For snap-on mounting onto 35 mm	EN 50022 rail

Operating modes of CC-XG 7XV5662-0AA00

Synchronous operation with	7SA52/6,7SD52/53/61; and all SIPROTEC 5 types possible e.g. 7SD8/A8/L8	
	<i>G.703.1: Interface selectable by push-button</i>	
	Setting in the protection unit	Automatic setting in CC-XG
	64 kbit/s per parameter	64 kbit/s
	<i>X.21/RS422: Interface selectable by push-button</i>	
	Setting in the protection unit	Automatic setting in CC-XG:
64 kbit/s per parameter	64 kbit/s	
128 kbit/s per parameter	128 kbit/s	
256 kbit/s per parameter	256 kbit/s	
512 kbit/s per parameter	256 kbit/s	
Asynchronous operation with	7SD51, 7XV5653/7XV5673 and units with asynchronous serial nterface (no handshake supported, only serial TxD and RxD signals are supported)	
	<i>G.703.1: Interface selectable by push-button</i>	
	Setting in protection unit	Automatic setting in CC-XG
	max. 19.2 kbit/s	64 kbit/s
	<i>X.21/RS422: Interface settable by push-button</i>	
	Setting in protection unit	Automatic setting in CC-XG
	max. 19.2 kbit/s async.	64 kbit/s
	max. 38.4 kbit/s async.	128 kbit/s
	max. 57.6 kbit/s async.	256 kbit/s
	max. 115.2 kbit/s async.	512 kbit/s

Selection and ordering data

Description	Order No.
Communication converter for X.21/RS422/G.703.1 interface Converter to synchronous or asynchronous serial coupling of protection units with optical inputs/ outputs with ST connector to communication devices with electrical X.21/RS422 or G.703.1 interface. Connection to protection unit via FO cable for 62.5/125 µm and 820 nm wavelength, max. distance 1.5 km (0.93 mile), ST connectors Electrical with X.21/RS422 (15-pin SUB-D connector) or G.703.1 (9 pole SUB-D connector) Automatic detection and setting of baud rate. Interface type selectable by push-button. For synchronous operation with 7SD52/53, 7SD61, 7SA52, 7SA6, and all SIPROTEC 5 protection relays e.g. 7SD8, 7SA8 and 7SL8. For asynchronous operation with 7SD51, Binary signal transmitter, 7XV5653/7XV5673 or serial devices	7XV5662 - 0AA00



Fig. 13/68 Communication converter for pilot wires

Description

The communication converter copper (CC-CO) is a peripheral device linked to the protection device which enables serial data exchange between two protection relays. It uses a single pair of copper wires (pilot wire) that may be part of a telecommunications cable or of any other suitable symmetrical communications cable (no PuApin cable). At the opposite side, the data are converted by a second communication converter so that they can be read by the second protection device. The communication converters (master/slave) thus allow two protection devices to communicate synchronously and to exchange large data volumes over considerable distances. Typical applications are the protection interfaces of differential protection and distance protection of the devices 7SD5, 7SD6, 7SA52 and 7SA6, where 7XV5662-0AC00 must be used (synchronous connection with 128 kbit/s). Should asynchronous serial data of differential protection 7SD5 or of the binary signal transducer 7XV5653 be transmitted, the device 7XV5662-0AC01 must be used (asynchronous from 300 bit/s to 38.2 kbit/s).

Interference-free connection to the protection device is achieved by means of a multi-mode fiber-optic cable, with ST connectors at the CC-CO. The maximum optical transmission distance is 1.5 km (0.93 mile). The data transfer between the protection devices is realized as a point-to-point connection that is bit-transparent. Data must be exchanged via dedicated pilot wires, not via switching points.

Function overview

- Optical interface with ST connector for connection to the protection unit
- Distance: 1.5 km with 62.5/125 μm multi-mode FO cable between CC-CO and the protection unit
- Electrical interface to the pilot wire (line) with 2 screw-type terminals. 5 kV isolated
- Synchronous data exchange for 7SD52, 7SD6, 7SA6 and 7SA52 via pilot wire (typ. 15 km) (CC-CO version -0AA00)
- Asynchronous data exchange for 7SD51, 7XV5653 or other units with asynchronous interface (CC-CO version -0AA01) (typ. 15 km)
- Loop test function selectable by jumpers in CC-CO
- Master or slave mode of the CC-CO selectable by jumper (one master and one slave device required at the end of the pilot wire, factory presetting: master mode)
- Wide-range power supply with self-supervision function and alarm contact

Application, functions

Application

The CC-CO can be used for two applications.

One application is the synchronous serial data exchange (converter version – 0AA00) between SIPROTEC 4 differential relays (7SD52, 7SD6) and/or the serial teleprotection between distance relays (7SA6 and 7SA52). The relays have to be equipped with an optical 820 nm plug-in module “FO5”.

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

If the maximum distance between the protection units is longer than spanned by two CC-CO, the converters can be cascaded (see Fig. 13/70). A power supply between the two master units is required. If the isolation level is higher than 5 kV (provided by the pilot wire inputs of the units), external isolation transformers (barrier transformers) can be used on both sides. These transformers offer 20 kV isolation voltage and thus help to avoid hazardous high voltages at the inputs of the CC-CO, which might be induced by a short-circuit from a parallel power line or cable.



Fig. 13/69

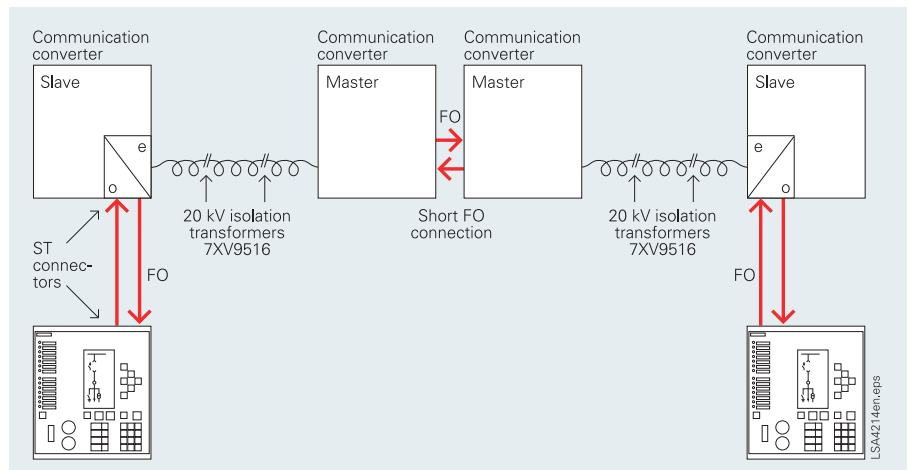


Fig. 13/70

Functions

The protection unit is optically linked to the CC-CO, which makes interference-free data transfer between the CC-CO and the protection unit possible. The communication converter is located close to the pilot wire. It converts serial data of the protection unit into a frequency-modulated signal. This signal is transmitted via one pair of copper wires of a pilot wire/communication line (bi-directional, full duplex operation).

By means of jumpers, one unit is defined as “master” and the other unit as “slave”. In a “training” during commissioning, the electrical characteristics of the pilot wire are measured by pressing a pushbutton, and the CC-COs are tuned to these characteristics.

The measured characteristics are used as parameters that will be adhered to for optimal data transfer. Digital data transfer makes a low insulation level of the pilot wire possible, because no high voltages are produced on the pilot wire during short-circuit conditions.

Data transfer between the protection units is effected on the basis of a point-to-point connection, furthermore it is a synchronous, bit-transparent transmission. Due to the telegram-backed data exchange, mal-operation is ruled out.

Technical data

Rated auxiliary voltage

DC 24 to 250 V	± 20 %
AC 115/230 V	± 20 % without switchover

LEDs

4 LEDs	
LED 1	Red: Line activation
LED 2	Yellow: Line transparent
LED 3	Yellow: Data transfer
LED 5	Green: Power ON

Connectors

Power supply	2-pole screw-type terminal
Alarm/ready contact	3-pole make/break contact
Pilot wire	2-pole for pilot-wire connection 5-kV isolated inputs
FO cable	820 nm, 2 ST connectors for TxD and RxD for 62.5/125 µm multi-mode FO (max. distance to protection unit 1.5 km)

Pushbutton

Measuring and training of parameters of the pilot wire

Housing

Aluminum die-cast housing	Dimensions 188 x 56 x 120 mm (W x H x D)
Weight	Approx. 0.8 kg
Degree of protection	According to EN 60529: IP41
For snap-on mounting onto 35 mm	EN 50022 rail

Operating mode

Synchronous operation with	7XV5662-0AC00 for 7SD52, 7SD6, 7SA52 and 7SA6 Setting in the protection unit: 128 kbit/s per parameter Setting in CC-CO: 128 kbit/s. No setting required
Asynchronous operation with	7XV5662-0AC01 for 7SD51, 7XV5653 and units with asynchronous serial interface (no handshake supported, only serial TxD and RxD signals are supported) Max. baud rate for protection unit: 38.4 kbit/s Max. baud rate for CC-CO 128 kbit/s. No setting required
Max. distance with pilot wire	AWG 22/0.33 mm ² / 51.7 Ω/km: max. 11 km AWG 26/0.13 mm ² / 137 Ω/km: max. 4.5 km Shielded twisted pair (STP) recommended. Max. loop resistance: 1400 Ω Attenuation < 40 dB at 80 kHz

Selection and ordering data

Description	Order No.
Communication converter for pilot wires	7XV5662 - 0AC0 <input type="checkbox"/>
Converter for synchronous or asynchronous serial coupling of protection units with optical inputs/outputs with ST connector to conventional pilot wires. 5-kV isolation of unit analog inputs towards the pilot wires. Connection to protection unit via FO cable for 62.5/125 µm and 820 nm wavelength, max. distance 1.5 km, ST connectors Synchronous serial data 128 kbit/s Asynchronous serial data rate max. 57.2 kbit/s For synchronous operation with 7SD52, 7SD6, 7SA6, 7SA52	0
For asynchronous operation with 7SD51, 7XV5653 for other units	1



Fig. 13/71 Communication converter

Function overview

- Interference-free protection data transfer of two independent serial data signals, selectable either in synchronous or asynchronous mode.
- PC interface for operation of devices at the remote line end.
- Network interface as E1 or T1 format for connection to multiplexer.
- Wide-range power supply from DC 24 V to 250 V and AC 115/230 V with failsafe relay.
- Indication of the data exchange via LED
- Integrated commissioning aid (loop test)

Description

The CC-2M communication converter is used for serial data transmission over long distances via a communication network. It converts synchronous or asynchronous serial 820 nm optical input signals at inputs FO1 and FO2 to a network interface and again returns these signals at the remote terminal via the latter's interfaces. FO1 and FO2 may be configured independently for either synchronous or asynchronous operation, but must be set to the same operating mode at both ends. In synchronous mode, the interface should only be used for exchanging the protection data of the 7SD5/7SD6 differential protection or 7SA52/7SA6 distance protection and is preconfigured for 512 kbit/s. In asynchronous mode, the interface can be used for connection of devices with baud rates between 1.2 to 115.2 kbit/s. A further asynchronous electrical RS232 interface is provided for max. 115.2 kbit/s. It provides for the connection of a serial PC interface with DIGSI and thereby the operations interface to SIPROTEC devices at the remote end. The G.703.6 network interface is provided in the form of 4-way screw terminals and can be configured as a 2-Mbit/s interface with European E1 format or as a 1.544-Mbit/s interface in the American T1 format. All settings of the device are made with jumpers, so that no special PC software is required.

Application

Application

Two protection devices e.g. 7SD52/7SD610 differential protection or 7SA52/7SA6 distance protection, exchange protection data via FO1. Interference-free data exchange is performed via the communication network, the devices being connected synchronously with 512 kbit/s (connection 1; see Fig. 13/72). Protection remote control with DIGSI is connected to FO2 of the converter via a 7XV5450 mini star-coupler. This port provides the serial connection to the other substation with a PC on which DIGSI is installed. In this way, the remote protection devices can be remotely interrogated via FO2 (connection 2). The baud rate is optimally set to 57.6 kbit/s for SIPROTEC 4 devices, so that there is no difference from local operation. The data of the devices on the other substation can be changed and read out during commissioning and operation.

Alternatively, it is possible to connect a substation control system or additional protection data transmission to FO2.

This makes for optimum use of the 1.544/2 Mbit/s transmission channel for two separate serial connections. In addition, an asynchronous serial connection is available via the RS232 interface, which can be used to temporarily operate devices of the other substation with DIGSI.

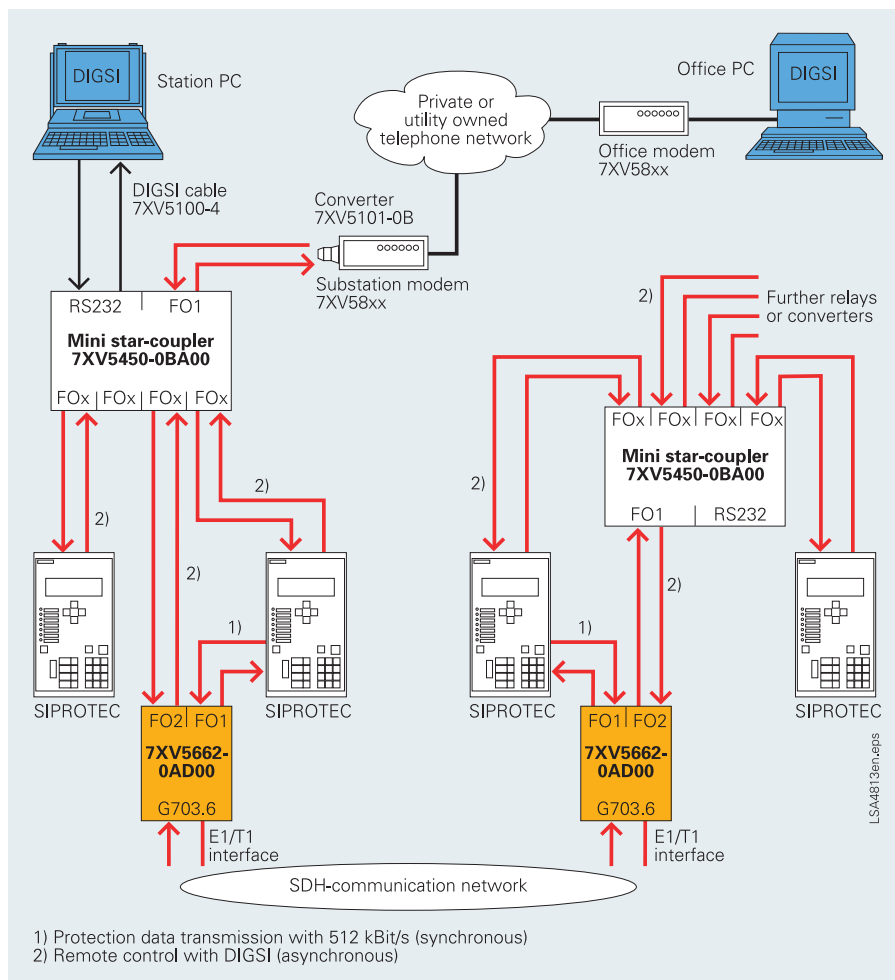


Fig. 13/72 Protection data transmission and remote control of a substation via a communication network

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Technical data

Connections

FO 1 / 2	ST plug / 820 nm for 50/125 µm or 62.5/125 µm multi-mode FO cable (max. 1.5 km)
RS232	For asynchronous connection from 1.2 – 115.21 kbit/s
Power supply	2-pole screw-type terminal
Fail safe relay	3-pole screw-type terminal with NC/NO contact
Network E1/T1	4-pole screw-type terminal

Housing

Aluminium housing 188 × 56 × 120 mm for mounting on 35 mm rail mounting according to EN 50032 weight 0.8 kg. Protection class according to EN 60529: IP41

Power supply

Wide range DC 24 to 250 V and AC 115/230 V, 50/60 Hz

Displays

4 LEDs	
Green	Power supply
Red	Fault alarm
2 yellow	Data transfer

Selection and ordering data

Description	Order No.
<p>Two-channel serial 1.544/2 Mbit/s communication converter</p> <p>Conversion of 2 independent serial FO interfaces with synchronous or asynchronous data to a E1 network interface with 2 Mbit/s (G.703.6) or T1 network interface (1.544 Mbit/s). Two independent serial optical input channels with ST connectors and 820 nm for multi-mode FO cable for a max. of 512 kbit/s / 115.2 kbit/s for synchronous/asynchronous data. An electrical serial RS232 interface with a max. 115.2 kbit/s constructed as a 9-pin SUB-D socket for connection with DIGSI 7XV5104 cable. Connection from multiplexer to the E1/T1 network interface via a 4-poles crew-type terminal. Wide-range power supply of DC 24 V to 250 V and AC 115/230 V. A make/break fail safe contact for power supply faults or interruption of the data connection. All settings are made with jumpers in the device (presetting for E1 and synchronous serial data input).</p>	7XV5662 - 0AD00