

With the GPS-time signal receiver 7XV5664 and additional components wide range power supply 7XV5810, mini-star coupler 7XV5450 and Sync-Transceiver 7XV5654 a comprehensive solution for time synchronisation of any number of SIPROTEC protection devices is possible.

A simple PC-Software (included in the scope of delivery) facilitates the setting of the receiver via a RS 232 interface. The transmission of the time signals (telegrams or impulses) takes place, immune to disturbances, via a FO cable to the protection cubicles, where the time signals are electrically converted with the Sync-Transceiver. The standard version can, with the output of special protocols, also be used for the synchronisation of further devices, e.g. Reyrolle ARGUS 1 or SIMEAS Q80. For the SIPROTEC line differential protection 7SD52 or for SIMEAS R-PMU, the special version provides a highly accurate pulse per second. The GPS antenna with 25 m cable to the receiver is included in the scope of delivery. Lightning protection is optionally available.

Features:

- GPS-exterior antenna with wall mounting and 25 m cable RG59, lightning protection is optional
- GPS-antenna input (BNC-plug)
- PC-input, RS232 (9-pol. Sub-D plug) with operating program and 1m connection cable
- 2 optical signal outputs FL1/2 for FO cable 62,5/125 µm and ST-plug for disturbance free transmission of the signals
- Auxiliary voltage 18-60 VDC / optionally with wide range power supply 7XV5810-0AA10 24-250 VDC / 100-230 VAC.
- Aluminium housing for rail mounting.

Standard-Version 7XV5664-0CA00:

- Signal outputs FL1/2: telegrams selectable IRIG-B, DCF77-, NMEA, IEC60870-5-103, second or minute impulses.
- 3D-mode with at least 4 satellites or Fix-mode with at least 1 satellite.

Special-Version 7XV5664-0AA00:

- Signal outputs FL1/2: fixed telegrams
FL 1 = highly accurate second impulse
FL 2 = IRIG-B or DCF77
- Only 3D-mode with at least 4 satellites.

Additional components: optional

- **7XV5664-0LA00** lightning protection to the time signal receiver 7XV5664-0xA00
- **7XV5810-0AA10** wide range power supply: input voltage range 24-250 V DC / 100-230 V AC, output 24 V DC 250 mA
- **7XV5654-0BA00** Sync-Transceiver: 2 x FO-input for 62,5 / 125 µm with ST-plug to 2x electrical 24 V DC / 100 mA
- **7XV5104-xAAXx** bus cable system for the standard version
- **7XV5105-xAAXx** bus cable system for special version



Figure 1: GPS-time signal receiver

The Standard Application “Normal Time”

With the **GPS-time signal receiver 7XV5664-0CA00** all connected protection devices are synchronised to “Normal Time”. In this way, the internal clock of the protection devices is synchronised by a standardised telegram e.g. IRIG-B, DCF77, IEC60870-5-103, NMEA or a minute impulse.

For this purpose the protection devices provide suitable interfaces e.g. SIPROTEC 4 provides Port A.

The antenna is mounted to an outside wall with free sight to the sky and the optional lighting protection is looped into the antenna cable.

The GPS-time signal receiver is mounted close to the antenna, and is either supplied with auxiliary voltage via the optional wide range power supply from the AC mains, or the substation battery.

The transmission of the time telegrams or synchronising impulses takes place, immune to interference, with FO cable to the protection devices distributed in the plant. An extension of the optical star structure can be implemented with the mini star coupler 7XV5450.

For the conversion of the FO signals to 24V signals as required by the SIPROTEC 4 time synchronisation interfaces (Port A), Sync-Transceivers 7XV5654 are implemented.

Detailed application examples may be found in the manual of the Sync-Transceivers 7XV5654.

The SIPROTEC 4 protection devices are connected to the Sync-Transceiver 7XV5654 via “Port A” with the specially designed bus cable system 7XV5104. (see Figure 2).

Note: No bus termination resistance is required here.

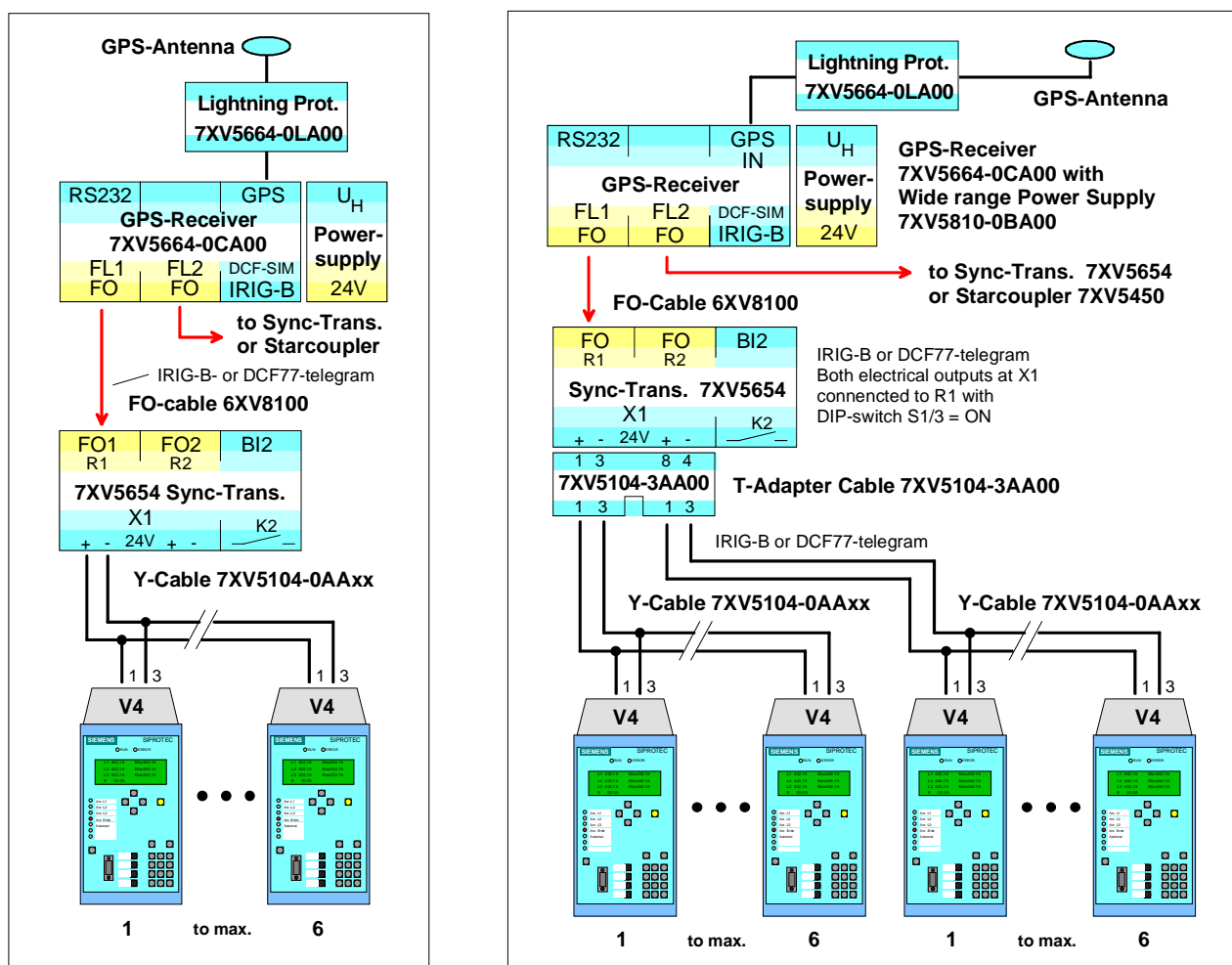


Figure 2: SIPROTEC 4 protection devices with IRIG-B / DCF-time synchronisation

The SIPROTEC Compact Devices, e.g. 7SJ80, 7SK80 or the **Reyrolle Devices ARGUS 1** may be connected to a RS485 bus via their interfaces, the FO converter 7XV5650 and the bus cable system 7XV5103. Synchronization takes place via the IEC60870-5-103 time telegrams of the GPS Receiver. (see Figure 3).

If these protection devices are fitted with FO interfaces, 2 devices may be synchronised directly or as many devices as desired may be synchronised via cascading mini star couplers 7XV5450. A combined operation of SIPROTEC- and Reyrolle-devices with FO or RS485-interfaces is made possible by the implementation of corresponding star couplers 7XV5450 and FO-RS485-converters 7XV5650.

During synchronisation via IEC60870-5-103 time telegrams, the protection device interfaces are cyclically initialised via their IEC-addresses. The internal clock of the devices is synchronized every minute. If a device loses contact to the IEC-Bus, it is re-initialised after no later than 3 minutes and synchronised in the next minute cycle. Using a setting in the operations program, this period of time can be decreased significantly by reducing the address range.

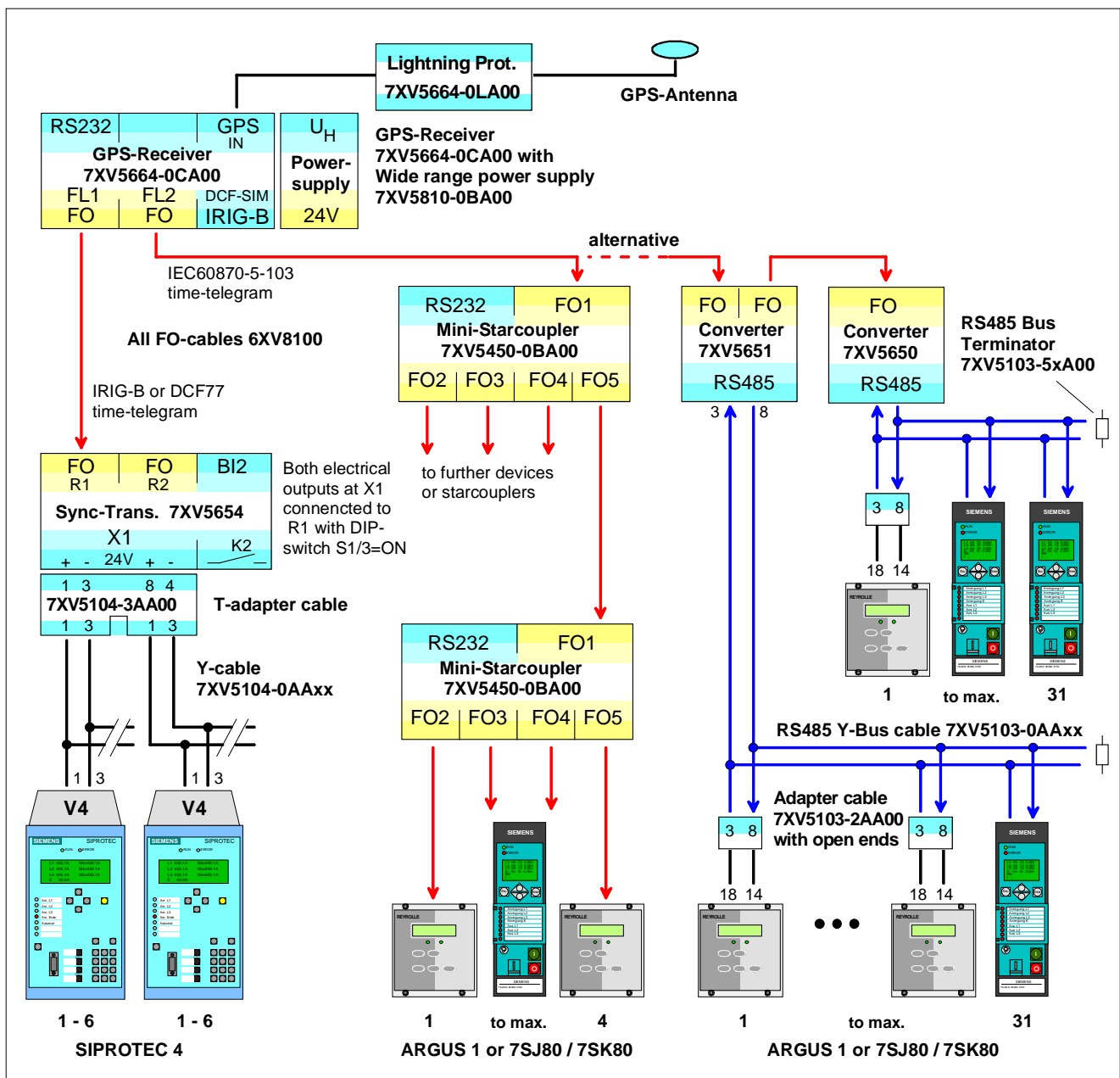


Figure 3: SIPROTEC Compact- and Reyrolle protection devices with IEC60870-5-103-time synchronisation

Note: In the case of a RS485-Bus a bus termination resistance is required by the first and last bus participant. The converter 7XV5650/51 has switchable termination resistances.

All SIPROTEC Protection Devices with internal clock may be synchronised with the minute impulse from the GPS receiver via a binary input. For this purpose the internal clock of the protection device is set at each full minute to the exact beginning of the new minute. A pre-condition for this method is that the internal clock of the protection device is set correctly once, and the auxiliary voltage is buffered against failure. If the time tracking fails for a longer period, the difference between the internal clock of the protection device and the normal time must be smaller than one minute. Summer and winter time must, if desired, be set manually.

Protection devices are fitted with a binary input, which captures the minute impulse using a corresponding voltage (24-60 or wide range 24-250 VDC) and provides this to the internal clock. The distribution of the impulse to the protection devices takes place via a 2 wire bus, which must consist of a screened twisted pair. All devices must be located in the same earthed system, the cable screens must be connected to the housing on both sides.

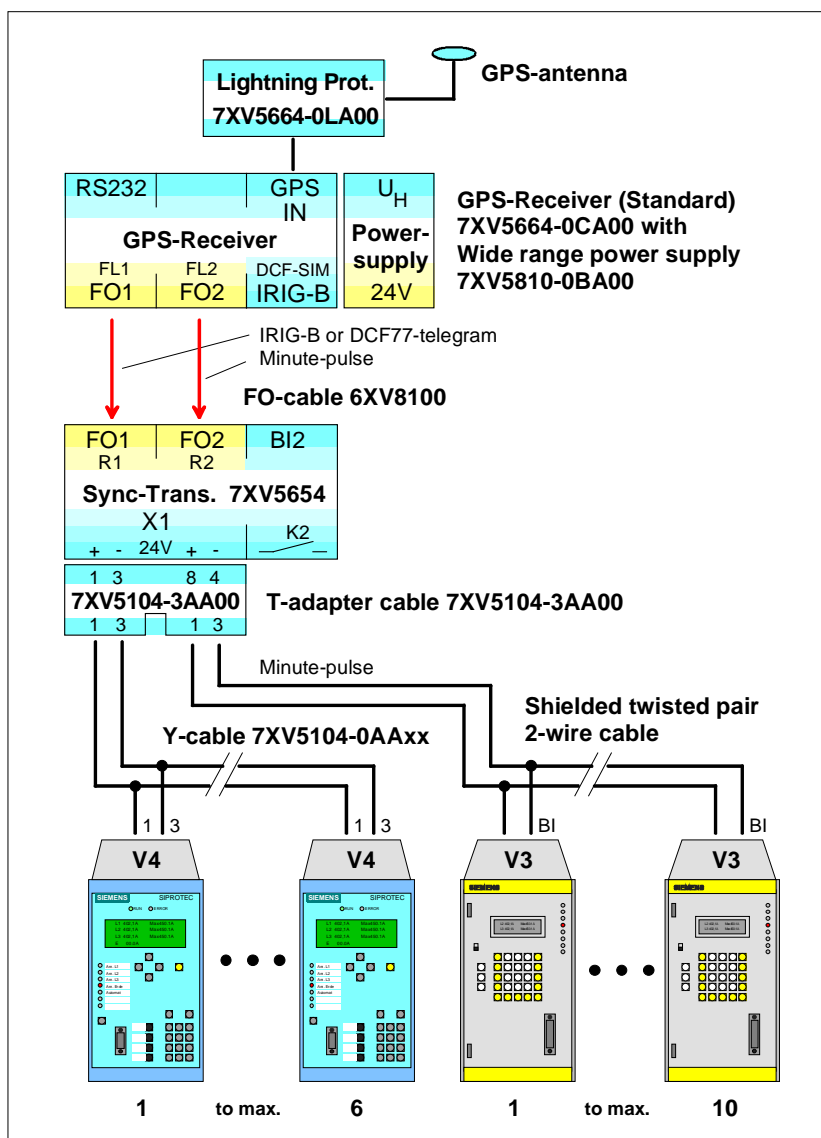


Figure 4: Combined operation of SIPROTEC 3 and 4 devices with different time signals.

If both channels of the GPS-receiver are set to the minute impulse, up to 20 SIPROTEC 3 devices may be connected. Alternatively a coupling of both output channels of the Sync-Transceivers with the DIL-switches S1/3 is possible (see Figure 2 on the right).

Special Application for SIPROTEC Differential Protection and SIMEAS R-PMU (Phasor measurement unit)

The GPS clock **7XV5664-0AA00** is delivered with a special Firmware for the synchronisation of SIPROTEC differential protection devices as well as SIMEAS R-PMU.

Besides the setting of the normal time with IRIG-B or DCF77, a highly exact second impulse for the synchronisation of differential protection devices is provided in this version (see Figure 4). This second impulse is output at FL1, converted by the Sync-Transceiver into electrical signals (24 V) and output to the bus approximately 200 ns later.

The synchronisation of the protection devices with this GPS-pulse per second makes the application of differential protection devices that communicate via communication networks possible. If the protection data interface is applied via communication networks, asymmetrical channel delay times that are too large may occur. Using the highly exact second impulses of the GPS clocks, these asymmetrical channel delay times are detected by the protection device and compensated for, thereby increasing the sensitivity of the measurement.

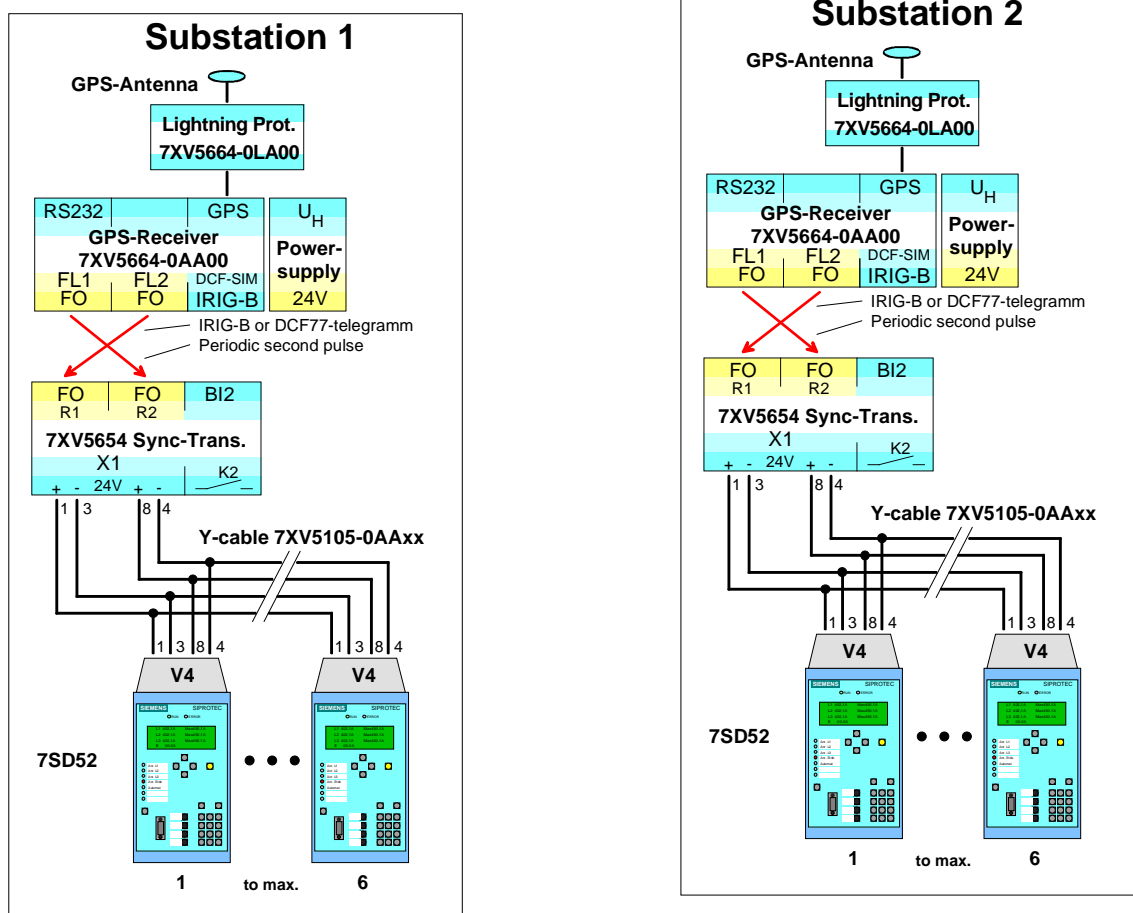


Figure 4: Synchronisation SIPROTEC differential protection

The SIMEAS R-PMU is also synchronised via the highly precise rising edge of the DCF77-telegram at the optical output FL2 (detailed user description in the document "time synchronisation SIMEAS R /SIMEAS R-PMU")

Note: For the synchronisation of SIPROTEC differential protection devices as well as SIMEAS R-PMU only his special GPS-clock 7XV5662-0AA00 has been released at this time.

Note: For the "standard application" the GPS clock 7XV5662-0CA00 should be used, as some settings of the "special clock" cannot be changed (e.g. the second impulse at the optical output FL1).

Selection- and Ordering code

GPS-Timing Signal Receiver	7 X V 5 6 6 4 - 0		A 0 0
GPS-Timing Signal Receiver „ Special-Version “ for the time synchronization of SIPROTEC 4 Differential Prot. Devices or SIMEAS R-PMU (Phasor Measurement Unit), with and 25m coaxial cable, PC software with cable (without wide range power supply unit 7XV5810-0BA00)		A	
GPS-Timing Signal Receiver „ Standard-Version “ for the time synchronization of SIPROTEC 4 Protection Devices, with and 25m coaxial cable, PC software with cable (without wide range power supply unit 7XV5810-0BA00)		C	
Lightning Protection with plugs for connection to the antenna cable		L	

Additional Accessories for Time Synchronisation

Wide range power supply (universal)	7 X V 5 8 1 0 - 0 B A 0 0
Universal supply voltage (48...250VDC ±20%, 60...230VAC ±20%) Output voltage 24 V DC / 6 W, short-circuit proof, alarm contact	

Sync-Transceiver	7 X V 5 6 5 4 - 0 B A 0 0
Sync-Transceiver for conversion of 2 optical timing signals to 24V DC for the time synchronizing interface of SIPROTEC 4 (Port A) 2 optical inputs with ST-plugs and 2 electrical outputs for max. 12 SIPROTEC 4 relays or 20 SIPROTEC 3 relays. Minute or second pulse for special applications is also supported.	

Y-buscable for time synchronizing SIPROTEC 4 (Standard)	7 X V 5 1 0 4 - 0 A A		
Y-bus-cable 2-core screened with 9 pole sub-D connector and metallic housing for clock synchronization SIPROTEC 4			
Length 1 m		0	1
Length 3 m		0	3
Length 5 m		0	5
Length 10 m		1	0

Bus length extension cable (Standard)	7 X V 5 1 0 4 - 1 A A 1 0
Cable for the bus length extension. Copper cable with 2-wires, shielded with 9-pole sub-D plugs. Length 10 m	

Adapter cable to Sync.-Transceiver 7KE6000-8 (Standard)	7 X V 5 1 0 4 - 2 A A 0 0
Adapter cable to Sync.-Transceiver 7KE6000-8Ax. Length 0,3m. Shielded, 2-wires with crimp lugs to 9-pole sub-D plug (female)	

Adapter cable for 2 Busses (Standard)	7 X V 5 1 0 4 - 3 A A 0 0
Adapter cable 2 core screened for Sync-Transceiver 7XV5654-0BA00 for distribution of 2 busses for each 6 SIPROTEC 4 relays	

Y-buscable for time synchronizing SIPROTEC 4 Diff.-Protection and SIMEAS R-PMU (special)	7 X V 5 1 0 5 - 0 A A		
Y-bus-cable 2-core screened with 9 pole sub-D connector and metallic housing for clock synchronization SIPROTEC 4, e.g. 7SD5			
Length 1 m		0	1
Length 3 m		0	3
Length 5 m		0	5
Length 10 m		1	0

Bus length extension cable (special)	7 X V 5 1 0 5 - 1 A A 1 0
Cable for the bus length extension. Copper cable with 4-wires, shielded with 9-pole sub-D plugs. Length 10 m	

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