

OFFICIAL DOCUMENT PACKAGE

Manufacturer's Manual

Amikon cover with selected official Siemens technical pages

SIEMENS SIMATIC S7 Y-LINK

6ES7654-7HY00-0XA0

SIMATIC S7 BUS MODULE FOR ONE Y-COUPLER

Selected official pages retain the original technical tables, ratings, notes and pagination.

OFFICIAL SOURCE

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Selected original pages: 16, 55-58, 81, 95-96, 116, 251, 253, 255, 290, 292

This technical extract does not replace the complete equipment and system manuals. Check the installed hardware and project before use.

Connection of PA field devices to PROFINET IO

To connect PA field devices to PROFINET IO, use the SIMATIC CFU PA instead of the DP/PA link. You can find information on this in the commissioning manual: SIMATIC Distributed I/O SIMATIC Compact Field Unit (CFU) (<https://support.industry.siemens.com/cs/ww/en/view/109776629>)

Range of validity of these operating instructions

These operating instructions apply to the following products:

Table 2-1 Article numbers for the hardware components of the gateways

Component	Product	Article number
Interface module		
• IM 153-2OD	PROFIBUS DP interface module for extended temperature range	6ES7153-2BA70-0XB0
DP/PA coupler		
• FDC 157	DP/PA coupler	6ES7157-0AC85-0XA0
• FDC 157-0 Ex [ia]	DP/PA coupler Ex [ia]	6ES7157-0AD82-0XA0
Y-coupler		
• Y-coupler	Connects PROFIBUS DP redundant to PROFIBUS DP single (only possible in the Y-Link)	6ES7197-1LB00-0XA0
Bus modules		
• BM PS/IM	Bus module to accommodate one power supply PS and one interface module IM	6ES7195-7HA00-0XA0
• BM PS/IM SIPLUS extreme	Bus module for extended ambient conditions to accommodate one power supply PS and one interface module IM	6AG1195-7HA00-2XA0
• BM IM/IM	Bus module to accommodate two interface modules IM	6ES7195-7HD10-0XA0
• BM IM/IM Outdoor	Bus module for extended ambient conditions to accommodate two interface modules IM	6ES7195-7HD80-0XA0
• BM FDC	Bus module to accommodate one DP/PA coupler	6ES7195-7HF80-0XA0
• BM FDC/FDC (redundant)	Bus module to accommodate two DP/PA couplers (redundant)	6ES7195-7HG80-0XA0
• BM Y-coupler	Bus module to accommodate one Y-coupler	6ES7654-7HY00-0XA0
Active field distributors		
• AFDiSD (Active Field Distributor Intrinsic Safety with extended Fieldbus Diagnostic)	Active field distributor with extended fieldbus diagnostics for up to 6 PA field devices	6ES7655-5DX60-1BB0
• AFD4	Active field distributor for up to 4 PA field devices	6ES7157-0AG81-0XA0
• AFD4 (FM)	Active field distributor with FM approval for up to 4 PA field devices	6ES7655-5DX40-1AA1
• AFD4 Railmount	Active field distributor for up to 4 PA field devices, installation in enclosure required	6ES7655-5DX40-2AA0
• AFD8	Active field distributor for up to 8 PA field devices	6ES7157-0AG82-0XA0

For information on current components, the required software, and compatibility with predecessor components, refer to the section:

Compatibility overview (Page 279)

4.4 Use of the Y-link

4.4.1 Y coupler

Configuration

The Y-coupler is an integral part of the Y-link and is not configured separately.

Configuration options and restrictions

Technical specifications Y coupler (6ES7197-1LB00-0XA0) (Page 262)

Property	Note
Devices on the Y-coupler	Connection of DP standard slaves
Power supply	The Y-coupler is supplied via the backplane bus.
Transmission rate	45.45 kbps to 12 Mbps
Termination of the lower-level DP master system	Active terminating resistor (bus terminator)

4.4.2 Use of the Y-link

Use case

The Y-link creates a gateway between a redundant PROFIBUS DP and a non-redundant PROFIBUS DP.

The Y-link consists of a redundant PROFIBUS DP interface module and a Y-coupler.

The following figure shows the integration of the Y-link into the system.

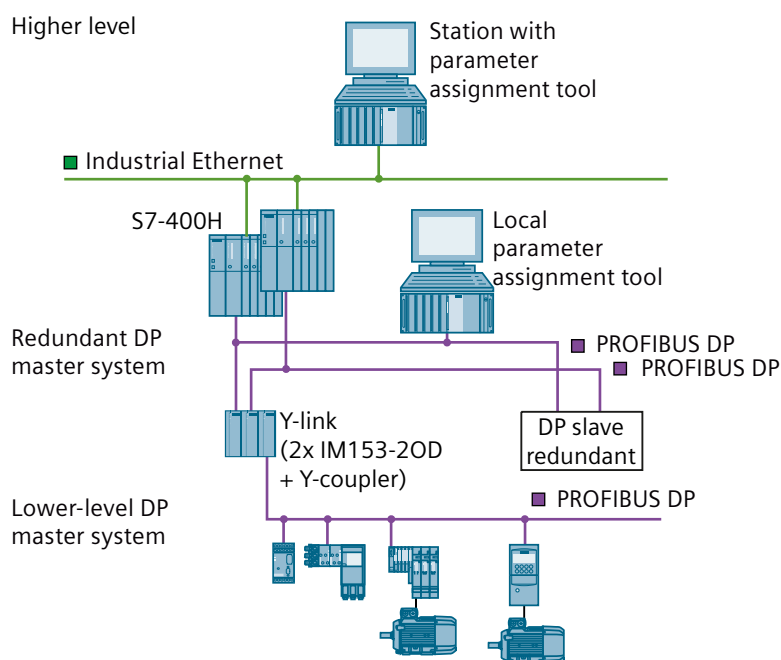


Figure 4-6 Integration of the Y-link into the system landscape

The Y-link is intended for the following applications:

- Redundancy mode, for example on S7-400H
- Use as DPV0 or DPV1 slave: DPV0 and DPV1 modes (Page 59)

Note

Installation notes

- In the Y-link, the S7 backplane bus connects the PROFIBUS DP interface module to the Y-link.
- Impermissible installation:
 - Cascading Y-links
 - DP/PA links in the Y-link

Configuration options and restrictions

A redundant DP master system can be extended by a singular PROFIBUS segment by Y-links as follows:

Property	Values	Note
Number of Y-links on a DP master system	Max. 126 bus nodes are permissible in a DP master system.	
Number of Y-couplers in the Y-link	1	Only one Y-coupler can be operated in each Y-link.
Number of nodes in the lower-level DP master system	Max. 64	The sum of the slots is limited in each case (236 minus the number of DP slaves).

Property	Values	Note
Maximum length of frames: • Configuration data • Parameter assignment data • Diagnostic data • I/O data	244 bytes each	The following message frames of the Y-link are derived from the frame contents of the lower-level PA field devices: • The configuration frame • The user data frames
Direct data exchange and isochronous mode	-	Not possible in the lower-level DP master system

Configuration

The Y-link can be configured with *STEP 7* V5.4 or higher.

When *STEP 7* calculates the bus parameters, the connected nodes on the lower-level DP master system as well as the Y-link itself are taken into account.

Operating mode of the DP slave

The parameters of the operating mode of the DP slaves in the lower-level DP master system are assigned from the S7 400H via the Y-link.

User data of the Y-link

The DP user data frame of the Y-link depends on the number of configured DP slaves.

- It comprises the data blocks of the configured DP slaves arranged one after the other.
- The data blocks are sorted in ascending order of DP address.

Failure and return of a DP slave

- If a DP slave fails, the associated input data in the user data frame of the Y-link is reset first. The corresponding information is then entered into the diagnostics frame.
- After return of the DP slave, corresponding information is entered in the diagnostics frame. Almost at the same time, the valid input data of the DP slave is available again in the user data frame of the Y-link.

Diagnostics data of the DP slaves

The processing of the diagnostic frames of DP slaves depends on the setting of the operating mode of the PROFIBUS DP interface module:
DPV0 and DPV1 modes (Page 59)

Communication connections from the PG / PC to the DP slaves

Up to 10 communication connections to DP slaves from a PG / PC can be established simultaneously via the Y-link.

Communication connections can only be passed on from the S7-400H to the lower-level DP master system. After a changeover of the active channel from one PROFIBUS DP interface

4.4 Use of the Y-link

module to the other, all communication connections from the PG / PC to the DP slaves are maintained.

Mounting

5.1 Mounting rules

Follow the PNO PROFIBUS mounting guideline:

PROFIBUS User Organization (<https://www.profibus.com/downloads>)

Mounting position

The following modules can be installed vertically or horizontally:

- PROFIBUS DP interface module IM 153-2OD
- DP/PA coupler
- Y-coupler



WARNING

Open equipment

The devices are open equipment. This means that they may only be mounted in enclosures, cabinets, or electrical service rooms that can only be accessed by using a key or a tool. Only authorized personnel may have access to the enclosures, cabinets or electrical service rooms.

Mounting system

The modules are mounted on rails for the S7 assembly system. Free space of 40 mm must be maintained above and below the modules for trouble-free mounting.

You can find additional information on the setup and mounting in the operating instructions SIMATIC ET 200M Distributed I/O Device (<https://support.industry.siemens.com/cs/ww/en/view/1142798>).

Installation location

The DP/PA coupler (FDC 157-0 and FDC 157 Ex [ia]) or the DP/PA link with DP/PA coupler Ex [ia] can be operated in Zone 2 hazardous areas if they are installed in a suitable enclosure.

5.4 Installing the Y-Link

5.4.1 Mounting the Y link

Installation with bus modules

The Y-link must always be configured with bus modules.

Required components

- Rail for installation with active bus modules ("Rail for module replacement in runtime")
- 2x PROFIBUS DP interface module (IM 153-2OD)
- Bus module BM IM/IM
- Y-coupler
- Bus module BM Y-coupler

Typical installation

The following figure shows the typical design of a Y-Link with two PS 307 power supplies with the front doors open.

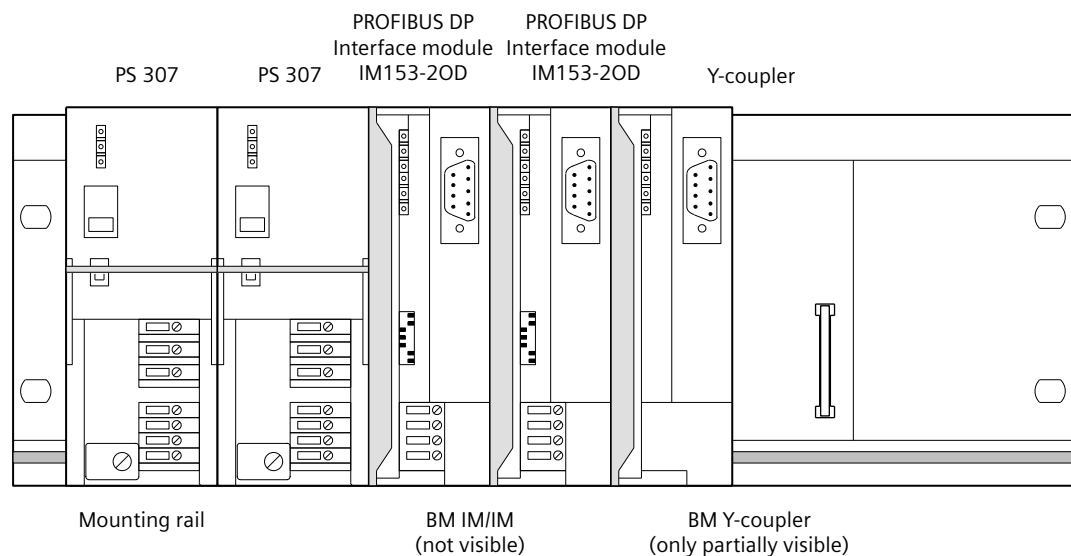
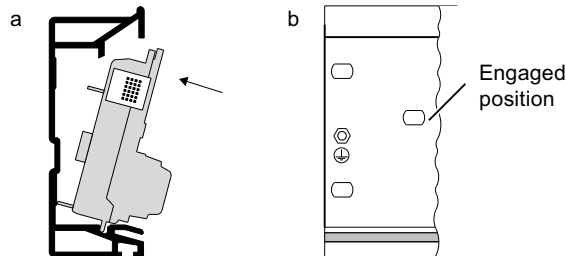


Figure 5-3 Typical installation of the Y-link

Installing bus modules and modules

1. Hook the lower edge of the BM IM/IM bus module into the rail, press it into the rail (a) and slide it to the left up to the engagement position (b).
If you are using the 530 mm rail and position the BM IM/IM in the engaged position on the right, you can install two additional PS 307; 2A or one PS 307; 5A to the left of the bus module.



2. Hang the BM Y-coupler bus module on the rail and press it down into the rail.
3. Push the bus modules together so that the module connections are in contact.
4. Insert the two PROFIBUS DP interface modules into the BM IM/IM bus module.
5. Insert the Y-coupler into the BM Y-coupler bus module. Use the guides on the side of the bus modules for this.
6. Screw down the modules. This also fixes the bus modules to the rail.

Removing and inserting modules

Removal and insertion of modules during operation is possible on S7-400H in redundant mode. The following particularities must be noted for this:

- Removal and insertion of a PROFIBUS DP interface module is only allowed in the de-energized state. For this purpose, the 24 V DC supply of the PROFIBUS DP interface module must be switched off. To avoid a failure of the lower-level master system, the Y-link should be set up with independently switchable power supplies for the two PROFIBUS DP interface modules (e.g. by using two power supply modules).
- There is no restriction on removing and inserting the Y-coupler, but it causes the nodes connected to it to fail.

Removing bus modules and modules

To remove the Y-link, proceed in the reverse order.

If the device is already in operation, then turn off the 24 V DC supplies before disassembly.

See also

Accessories for PROFIBUS DP (Page 293)

6.6 Connecting Y link

Connections of the Y-link

The figure below shows all the connections you must establish from and to the Y-link:

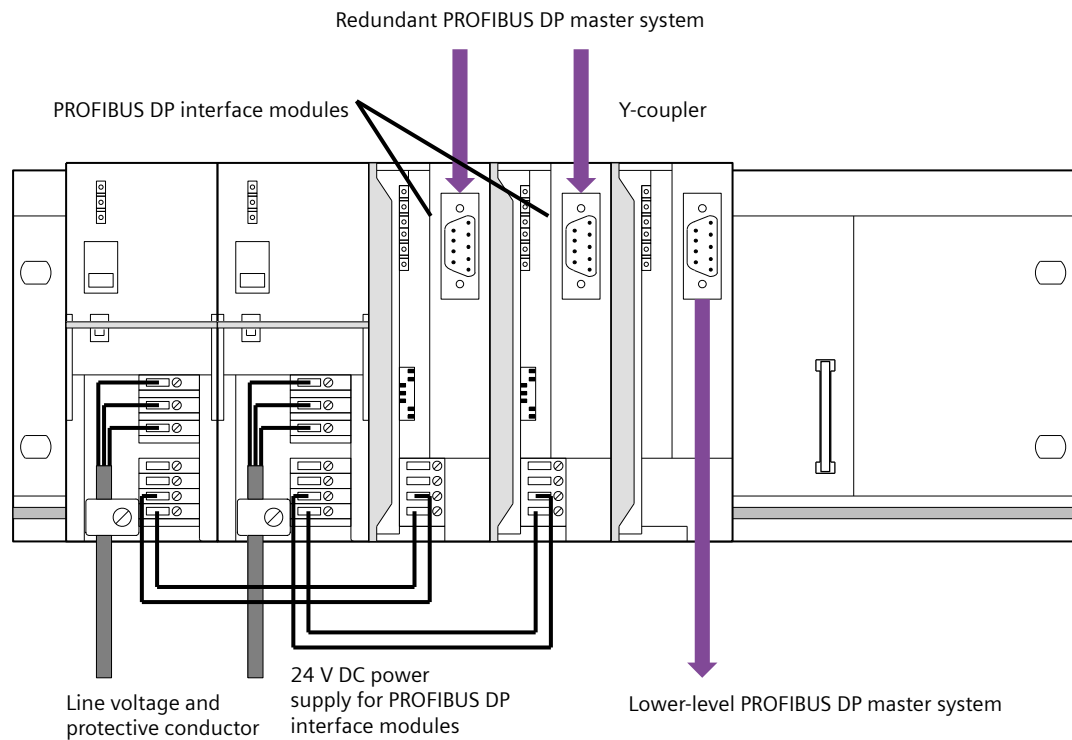


Figure 6-9 Connections of the Y-link

Power supply

In the Y-link, power supplies are required for both PROFIBUS DP interface modules.

PROFIBUS DP

The following PROFIBUS DP connections are required in the Y-link:

- To the S7-400H at both PROFIBUS DP interface modules
- To the lower-level DP master system on the Y-coupler

Bus terminating resistors

The Y-coupler has no integrated bus terminating resistors. If the Y-coupler is arranged at the beginning or end of a bus segment, you must also connect in the bus terminating resistors on the bus connector.

12.1.11 Shipping and storage conditions

Transport and Storage of Modules

With regard to their transport and storage conditions, the described components exceed the requirements according to IEC 61131, Part 2. The following specifications apply to modules transported and stored in the original packaging.

Table 12-6 Transport and storage conditions

Type of condition	Permitted range
Free fall (in transport packaging)	≤ 0.3 m
Temperature	from -40 °C to + 70 °C
Atmospheric pressure	from 1080 to 660 hPa (corresponds to an altitude of -1000 to 3500 m)
Relative humidity	of 10 to 95 %, without condensation
Sinusoidal vibrations according to IEC 60068-2-6	5 to 9 Hz: 3.5 mm 9 to 150 Hz: 9.8 m/s ²
Shock according to IEC 60068-2-29	250 m/s ² , 6 ms, 1000 shocks

12.1.12 Mechanical and climatic ambient conditions for operation

Conditions of use

The described components are designed for use in a fixed, sheltered location. The operating conditions exceed the requirements of IEC 61131 Part 2.

The described components meet the conditions of application of the climate class 3K22 according to EN IEC 60721-3-3.

In the associated die-cast aluminum enclosure, the devices meet the chemical resistance of class C3 according to ISO 9223.

Checking mechanical ambient conditions

The following table provides information on the type and scope of checks regarding mechanical ambient conditions.

Table 12-8 Checking Mechanical Environmental Conditions

Checking for	Test standard	Comments
Vibrations	Vibration test in compliance with IEC 60068 Part 2-6 Part (sine)	Type of vibration: Frequency sweeps with a sweep rate of 1 octave/minute. $5 \text{ Hz} \leq f \leq 9 \text{ Hz}$, constant amplitude 3.5 mm $9 \text{ Hz} \leq f \leq 150 \text{ Hz}$, constant acceleration 1g Period of oscillation: 10 frequency sweeps per axis in each of the 3 axis which are vertical to each other.
Shock	Shock test in accordance with IEC 60068 Part 2-29	Type of shock: half-sine Strength of shock: 15g peak value, 11 ms duration Shock direction: 3 shocks each in +/- direction in each of the 3 axes that are vertical to each other

Climatic environmental conditions

The described components can be used in the following climatic ambient conditions:

Table 12-9 Temperature: Horizontal mounting Vertical mounting

Permissible range	Comments	Article number
- From 0 °C to 60 °C (horizontal mounting position) - From 0 °C to 40 °C (vertical mounting position)	IM 153-2 OD ¹⁾	6ES7153-2BA70-0XB0
	Y-coupler	6ES7197-1LB00-0XA0
	Bus module BM IM/IM	6ES7195-7HD10-0XA0
	Bus module BM Y-coupler	6ES7654-7HY00-0XA0
- From -25 °C to 60 °C (horizontal mounting position) - From -25 °C to 40 °C (vertical mounting position)	IM 153-2 OD	6ES7153-2BA70-0XB0
	DP/PA coupler FDC157-0	6ES7157-0AC85-0XA0
	DP/PA coupler Ex [ia]	6ES7157-0AD82-0XA0
	Bus module BM IM/IM	6ES7195-7HD80-0XA0
	Bus module BM FDC	6ES7195-7HF80-0XA0
	Bus module BM FDC/FDC (redundant)	6ES7195-7HG80-0XA0

¹⁾ The temperature range applies to the combination of components.

12.1.13 Specifications for insulation tests, protection class and degree of protection

Test voltages

The insulation stability is tested with the following voltages during product testing:

Table 12-14 Test voltages

Circuits with a rated voltage of U_e relative to other circuits or ground	Test voltage
$0 \text{ V} < U_e \leq 50 \text{ V}$	DC 600 V, 1 s

Protection class

Protection class I in compliance with IEC 61140; this means that a grounding terminal to the rail is required!

Protection against foreign bodies and water

Degree of protection IP 20 according to IEC 60529; that is protection against contact with standard probes.

There is no protection from penetration by water.

12.1.14 Rated voltage

Rated voltage for operation

The described components work with a rated voltage of 24 V DC.
The tolerance range extends from 20.4 V DC to 28.8 V DC.

Exception: active field distributors AFD4 / AFD4 (FM) / AFD4 Railmount / AFD8 / AFDiSD:

The active field distributors operate from a nominal voltage of 16 V DC.
The tolerance range extends from 16 to 32 V DC.

A.3 Article numbers

A.3.1 Components

Components

Table A-4 Article numbers for the hardware components of the gateways

Hardware components	Product	Article number	Outdoor use
Interface module			
IM 153-2OD	PROFIBUS DP interface module for extended temperature range supports the "Extended fieldbus diagnostics (EFD)" function	6ES7153-2BA70-0XB0	YES
DP/PA couplers			
FDC 157	DP/PA couplers	6ES7157-0AC85-0XA0	YES
FDC 157-Ex [ia]	DP/PA coupler Ex	6ES7157-0AD82-0XA0	YES
Y-coupler			
Y-coupler	Via DP redundant after DP single)	6ES7197-1LB00-0XA0	No
Bus modules			
BM PS/IM	Bus module to accommodate one PS power supply and one PROFIBUS DP interface module.	6ES7195-7HA00-0XA0	No
BM PS/IM SIPLUS extreme	Bus module for extended ambient conditions to accommodate one PS power supply and one PROFIBUS DP interface module.	6AG1195-7HA00-2XA0	YES
BM IM/IM	Bus module to accommodate two PROFIBUS DP interface modules	6ES7195-7HD10-0XA0	No
BM IM/IM Outdoor	Bus module for extended ambient conditions to accommodate two PROFIBUS DP interface modules	6ES7195-7HD80-0XA0	YES
BM FDC	Bus module to accommodate one DP/PA coupler	6ES7195-7HF80-0XA0	YES
BM FDC/FDC (redundant)	Bus module to accommodate two DP/PA couplers (redundant)	6ES7195-7HG80-0XA0	YES
BM Y-coupler	Bus module to accommodate one Y-coupler	6ES7654-7HY00-0XA0	No
Active field distributor			
AFDiSD (Active Field Distributor intrinsic Safety with extended Fieldbus-Diagnostic)	Active field distributor with extended fieldbus diagnostics for up to 6 PA field devices	6ES7655-5DX60-1BB0	YES
AFD4	Active field distributor for up to 4 PA field devices	6ES7157-0AG81-0XA0	YES
AFD4 (FM)	Active field distributor with FM approval for up to 4 PA field devices	6ES7655-5DX40-1AA1	YES

Table A-8 Article numbers: Redundant DP/PA link

Installation variant	Product	Article number	Outdoor use ¹⁾
Redundant DP/PA link (Max. 5 DP/PA coupler - take into consideration the required number of bus modules BM FDC, etc.)	• 2 x IM 153-2OD	• 6ES7153-2BA70-0XB0	-
	• 1 x BM IM/IM (or BM IM/IM Outdoor)	• 6ES7195-7HD10-0XA0 • 6ES7195-7HD80-0XA0	• No • YES
	• FDC 157 or • FDC 157-Ex [ia]	• 6ES7157-0AC85-0XA0 or • 6ES7157-0AD82-0XA0	- -
	• BM FDC or • BM FDC/FDC (redundant)	• 6ES7195-7HF80-0XA0 or • 6ES7195-7HG80-0XA0	- -

¹⁾ Only the component that enables (YES) or prevents (No) outdoor use is marked for the installation variant.

Table A-9 Article numbers for Y-link

Hardware components	Products	Article number	Outdoor use
Complete package Y-link: • 2 x PROFIBUS DP interface module IM 153-2OD • 1 x bus module BM IM/IM • 1 x Y-coupler • 1 x bus module BM Y-coupler	Complete package for installation of a Y-link consisting of the following products:	6ES7197-1LA12-0XA0	No
	2 x IM 153-2OD		
	1 x BM IM/IM		
	1 x Y-coupler		
	1 x BM Y-coupler		

Table A-10 Article numbers for accessories for installation

Component	Article number
Mounting rail for the "Module replacement in run-time" function • 482.6 mm • 530 mm • 620 mm • 2000 mm	6ES7195-1GA00-0XA0 6ES7195-1GF30-0XA0 6ES7195-1GG30-0XA0 6ES7195-1GC00-0XA0
Bus connector for S7 mounting rail (included with each DP/PA coupler)	6ES7390-0AA00-0AA0
Covers (included are 4 backplane bus covers and 1 bus module cover)	6ES7195-1JA00-0XA0
Sealing plugs for unused connections on the AF-DiSD (10 pieces)	6ES7157-0AG80-1XA1