

AMIKON TECHNICAL DOCUMENTATION

Manufacturer's Manual

Siemens 6ES7921-5AK20-0AA0

Analog Front Connector Module

RANGE	I/O	CABLE	ROLE
SIMATIC TOP connect	Analog, 40-pole	4 x 16-pole IDC	Front connector

01

ORIGINAL MANUFACTURER REFERENCE

SIMATIC TOP connect for S7-1500 and ET200MP, Siemens AG, April 2014. This independently prepared Amikon package contains selected original manufacturer pages at their original size and aspect ratio. Siemens page numbers, safety notices, colors and diagrams are retained.

02

SELECTED CONTENT

- Safety and wiring preparation: original pages 2, 7 and 19-23.
- Connector preparation and cabling procedure: original pages 26-30.
- Analog module selection and terminal mapping: original pages 36, 43 and 44.
- Signal shield connections: original pages 45-47.
- Exact-model dimension drawing and circuit diagram: original pages 74 and 91.

Full original Siemens manual - complete context and cross-references

Historical wiring reference: do not infer current electrical limits from this edition. Verify the installed hardware and current Siemens documentation before field work. This package is not a new manufacturer-issued manual.



SIMATIC TOP connect for S7-1500 and ET200MP

Manual

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Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

DANGER

indicates that death or severe personal injury **will** result if proper precautions are not taken.

WARNING

indicates that death or severe personal injury **may** result if proper precautions are not taken.

CAUTION

indicates that minor personal injury can result if proper precautions are not taken.

NOTICE

indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

WARNING

Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

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Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

Safety notes

Warning

When electrical devices are operated, parts of these devices will necessarily carry dangerous voltages.

If these devices are not correctly handled/operated, this can result in death or severe injury as well as significant material damage.

Only appropriately qualified personnel may work on or in the vicinity of this device.

This device can only function correctly and safely if it is transported, stored, set up and installed correctly.

Before installation or maintenance work can begin, the system's main switch must be switched off and measures taken to prevent it being switched on again.

If this instruction is not followed, touching live parts can result in death or serious injury.

Connecting

4.1 Safety regulations

Introduction

When used in plants or systems, SIMATIC TOP connect system cabling is subject to special rules and regulations in line with the area of application.

This section provides an overview of the most important rules for connecting SIMATIC TOP connect.

Rules and regulations governing the integration of the S7-1500 into a plant or system can also be found under "Rules and regulations" in the S7-1500 system manual (<http://support.automation.siemens.com/WW/view/en/59191792>).

Specific application

Please observe the safety and accident prevention regulations that apply to specific applications, for example, the machinery directives.

Supply voltage

Please note the following points about line voltage:

- For stationary plants and systems without an all-pole line disconnecter, there must be a disconnecter unit (all-pole) fitted in the building installation.
- Any fluctuation/deviation in the line voltage from the rated value must be within the permitted tolerance for all S7-1500 electric circuits.

24 V DC supply

Please note the following points for 24 V DC supply:

- Power supplies for 24 V DC must have secure electrical isolation in accordance with IEC 60364-4-41.
- Surge arrestors must be fitted to protect against lightning and overvoltage.

You will find components for lightning and overvoltage protection in the "Designing interference-free controllers" function manual (<http://support.automation.siemens.com/WW/view/en/59193566>).

Protection from electric shock

The S7-1500 automation system mounting rail must be connected (conductive connection) to the protective conductor to prevent electric shock.

Protection from external electrical interference

The following section details the points to note to prevent electrical interference and faults:

- You must make sure that each plant or system fitted with an S7-1500 is connected to a protective conductor with a sufficient cross-section to deal with electromagnetic interference.
- For supply, signal and bus cables, you must make sure that the cables are correctly routed and installed.
- For signal and bus cables, you must make sure that an open circuit or crossover will not result in undefined plant or system states.

Reference

Further information is available in the "Designing interference-free controllers" function manual.

4.2 Wiring rules

The table below sets out the wiring rules for connecting the I/O module supply voltage to the terminal module or front connector module.

For information on push-in connections, please see Connecting the connecting cable and supply voltage to the front connector module (Page 27).

Table 4- 1 Wiring rules

Wiring rules for ...	Terminal module		Front connector module	
	Push-in system	Screw-type terminal	Push-in system	Screw-type terminal
Connectable cable cross-sections				
Solid cables	No			
Flexible cables				
... Without end sleeve	0.2 to 2.5 mm ²		0.5 to 1.5 mm ²	0.5 to 2.5 mm ²
... With end sleeve In accordance with DIN 46228/1	0.2 to 2.5 mm ²	0.5 to 2.5 mm ² (2.5 mm ² with crimp in accordance with EN 60947-1)	0.25 to 1.5 mm ²	0.25 to 1.5 mm ²
... With end sleeve In accordance with DIN 46228/4 with plastic collar	0.2 to 2.5 mm ²		0.25 to 0.75 mm ²	0.25 to 1.5 mm ²
Number of cables per connection	Combination of 1 or 2 conductors to make up the cross-sections specified above (in total) in one end sleeve.			
Max. diameter of insulation			3.1 mm	3.1 mm
Stripped length of the cables				
... Without insulating collar			8 + 1 mm	10 mm
... With insulating collar			8 + 1 mm	10 mm
Blade of the screwdriver	0.6 x 3.5	0.6 x 3.5	SD 0.6 x 3.5 DIN 5264	SD 0.6 x 3.5 DIN 5264
Tightening torque for connecting the cables		0.4 Nm		0.4 Nm

See also

Connecting the connecting cable and supply voltage to the front connector module (Page 27)

4.3 Connecting components

Introduction



WARNING

Risk of electrocution

Touching live parts can result in death or serious injury.

Before you connect a module, make sure that it is disconnected from the power supply.

The procedure for connecting the front connector modules is basically the same as for the standard front connectors. The connection of standard front connectors is described in detail in the S7-1500 system manual under "Connecting" (<http://support.automation.siemens.com/WW/view/en/59191792>).

Before connecting the front connector modules, read the following sections of the S7-1500 system manual:

- Wiring front connectors for I/O modules without shield connection element
- Preparing and wiring front connectors for I/O modules without shield connection element
- Wiring front connectors for I/O modules with shield connection element
- Preparing front connectors for I/O modules with shield connection element
- Bringing the front connector into final position

Abbreviations used

The meanings of the abbreviations in the figures below are as follows:

AI	Analog input module
BR	Potential bridges
M	Connection for ground
L+	Connection for supply voltage
Mn	Measuring input, channel n
ICn+/ICn-	Current output power supply, thermal resistance (RTD), channel n
Un+/Un-	Voltage input, channel n
In+/In-	Current input, channel n
COMP+/COMP-	Compensation input
IComp+/IComp-	Current output power supply, compensation
UV	Feed voltage at channel for 2-wire transducer
UCM	Potential difference between reference points of the measuring inputs / the analog ground MANA
UIISO	Potential difference between reference points of the measuring inputs and the central grounding point
MANA	Reference point of the analog ground

Wiring sequence

Step	Action		See section
1	Prepare the connecting cable	Assembling the round-sheath ribbon cable	Assembling the round-sheath ribbon cable (Page 24)
		Round-sheath ribbon cable already assembled	–
2	Wiring the front connector module		Wiring the front connector module (Page 26)
3	Connecting the connecting cable to the terminal module		Connecting the connecting cable and supply voltage to the front connector module (Page 27)
4	Wire the terminal module inputs and outputs		Connecting the connecting cable to the terminal module (Page 31)

See also

Assembling the round-sheath ribbon cable (Page 24)

Wiring the front connector module (Page 26)

Connecting the connecting cable and supply voltage to the front connector module (Page 27)

Connecting the connecting cable to the terminal module (Page 31)

7. Latch the cable grip ③ on the connector into place.

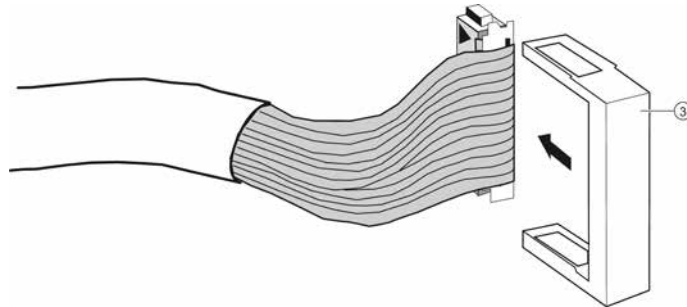


Figure 4-3 Fitting the strain relief

8. Repeat steps 3 – 5 to connect the round-sheath cable connector to the "lower connector, front connector module" and the "upper connector, front connector module" connection ends.

4.3.2 Wiring the front connector module

Introduction

This section explains how to wire the front connector modules.

Note

Please also read Wiring SIMATIC TOP connect to the I/O modules (Page 33) for special connection examples and the criteria for selecting front connector modules.

Functions of the front connector module

The front connector module is used to connect the connecting cable to the I/O module. The supply voltage cables for the modules can also be connected to the front connector module.

See also

Wiring SIMATIC TOP connect to the I/O modules (Page 33)

4.3.3 Connecting the connecting cable and supply voltage to the front connector module

Requirements

- Supply voltages are switched off
- Cables have been prepared in line with the terminal system used; see the wiring rules under Wiring rules (Page 21).

Connecting the connecting cable to the front connector module

WARNING

Risk of electrocution

Touching live parts can result in death or serious injury.

Before you connect a module, make sure that it is disconnected from the power supply.

Note

The example here shows the connection of a 16-pin connecting cable to the front connector module.

Follow the same procedure as applicable for 50-pin connecting cables.

1. Switch off the load current supply.
2. Lift up the front flap of the I/O module until it snaps into place.

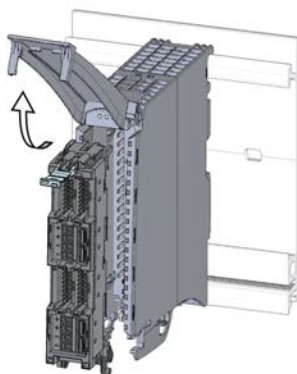


Figure 4-4 Front flap of the I/O module open (example)

3. Place the front connector in the pre-wiring position. This is done by fitting the bottom of the front connector into the I/O module and swiveling up the front connector until it latches into place.

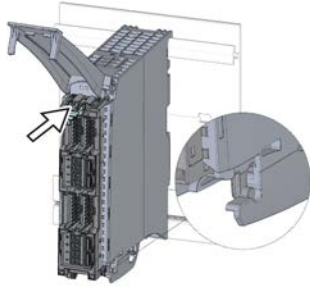


Figure 4-5 Front connector module in the pre-wiring position (example)

Note

In this position, the front connector module is still protruding from the I/O module (see figure above). The front connector module and I/O module are not yet electrically connected.

The pre-wiring position makes it easy to wire the front connector module.

4. If required, connect the cables for the I/O module supply voltage to the front connector module.
5. Connect the connecting cables to the front connector module.

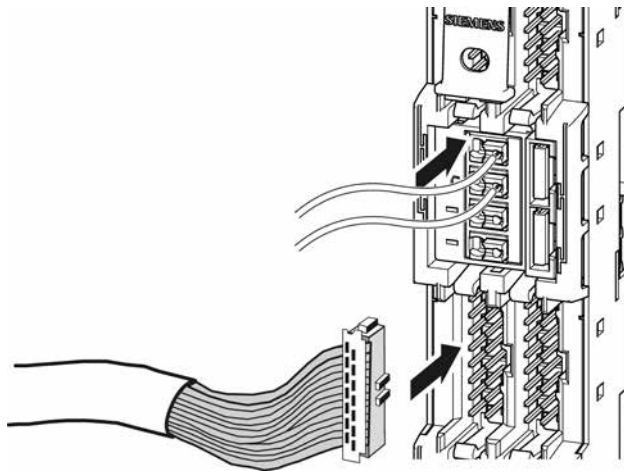


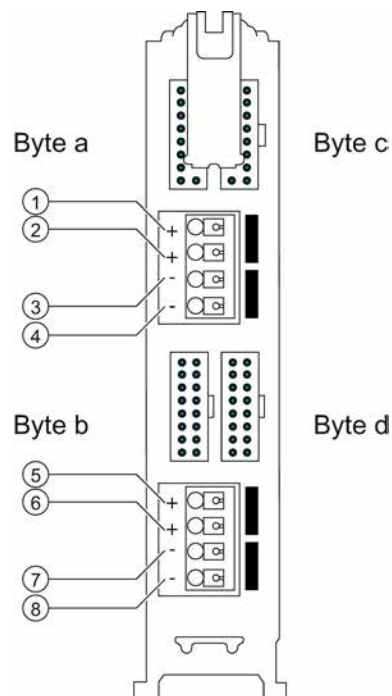
Figure 4-6 Connecting the supply voltage cables and connecting cables to the front connector module (example)

Note

Make sure that you follow the correct assignment when connecting the supply voltage cables for the I/O module and connecting cables to the front connector module:

- The assignment of supply voltage cables to connecting cable connections
- The assignment of connecting cable connections to the address bytes of the module

The correct assignment is set out in the diagram and key below.



Number	Connection to	Assigned byte
①	Supply voltage +	a
②	Supply voltage +	c
③	Supply voltage -	a
④	Supply voltage -	c
⑤	Supply voltage +	b
⑥	Supply voltage +	d
⑦	Supply voltage -	b
⑧	Supply voltage -	d

6. With push-in terminal: Insert the wire fitted with end sleeve into the duct.
7. When using a round-sheath ribbon cable:
Twist down each connecting cable by 90° and give it one turn.
8. Insert the strain relief (cable tie) provided for the cabling into the front connector module.
The strain relief holds the cabling (supply voltage cables and connecting cables) in the cable storage space of the I/O module.

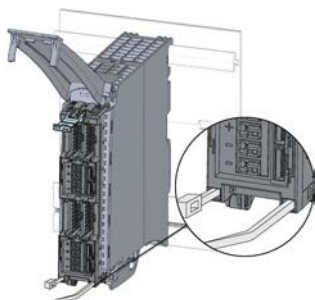


Figure 4-7 Fitted strain relief (example)

9. Run the connecting cables and the cables for the I/O module supply voltage down and out of the I/O module.

See also

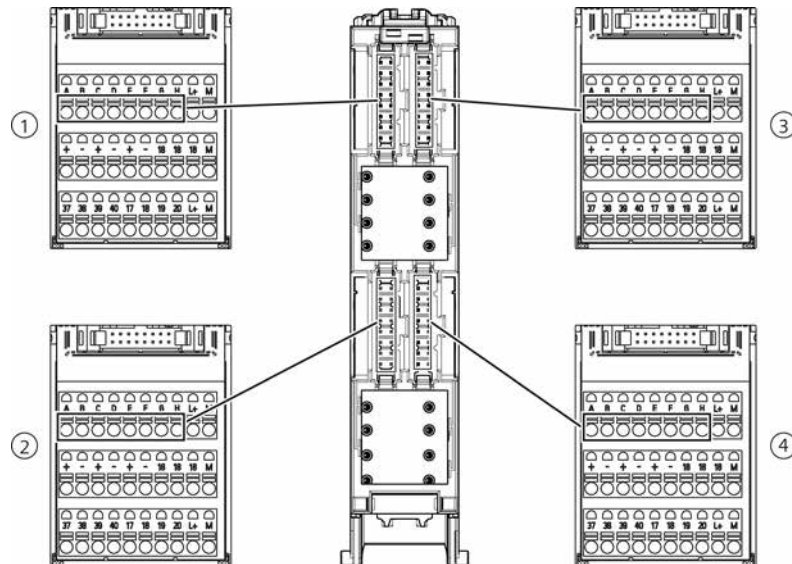
Wiring rules (Page 21)

5.1 SIMATIC TOP connect components and selection guide

Front connector module for ...	...I/O modules, connectable with...	TP1		TP2	TP3		TPF	TPS	TPA	TPRi 230 V	TPRi 110 V	TPRo	TPOo
		With out LED	With LED	Without LED	With out LED	With LED	LED fuse	LED switch	With out LED	With LED	With LED	With LED	With LED
Front connector module 6ES7921-5AD00-0AA0 6ES7921-5AJ00-0AA0	DQ 8 x 24 VDC/2A HF 6ES7522-1BF00-0AB0			X									
Front connector module 6ES7921-5AK20-0AA0	AI 8 x U/I/RTD/TC ST 6ES7531-7KF00-0AB0								X				
	AI 8 x U/I HS 6ES7531-7NF10-0AB0								X				
	AQ 4 x U/I ST 6ES7532-5HD00-0AB0								X				
	AQ 8 x U/I ST 6ES7532-5HF00-0AB0								X				

5.4 Note on connecting analog I/O modules

Up to four analog terminal modules can be connected to the 40 clamping points of an analog I/O module. Two terminal modules can be connected to each side of the I/O module.



The alphabetically labeled clamping points of the analog terminal module are connected to the numbered clamping points of the I/O module as shown in the table below.

5.4 Note on connecting analog I/O modules

Clamping points					
Terminal module ①	Terminal module ②	I/O module, left	I/O module, right	Terminal module ③	Terminal module ④
A		1	21	A	
B		2	22	B	
C		3	23	C	
D		4	24	D	
E		5	25	E	
F		6	26	F	
G		7	27	G	
H		8	28	H	
	A	9	29		A
	B	10	30		B
	C	11	31		C
	D	12	32		D
	E	13	33		E
	F	14	34		F
	G	15	35		G
	H	16	36		H
		17	37		
		18	38		
		19	39		
		20	40		

Notes

Clamping points 17 to 20 and 37 to 40 of the I/O module are also labeled 17 to 20 and 37 to 40 on the analog terminal module.

Clamping points L+; M; +; -; of the analog terminal module are auxiliary terminals and are not connected to the I/O module.

There is an electrical connection between all clamping points with the same designation (labeling) on the analog terminal module (multiplication terminal).

5.5 Shield connection of the signal cables

Shield connection options

There are two options for grounding the signal cable shield:

- At the I/O module with the shield connection element of the front connector/front connector module; see S7-1500 function manual, Connections, Front connectors (<http://support.automation.siemens.com/WW/view/en/59191792>) for the I/O modules.
- At the terminal module directly with a shield plate; see the description below.

Attaching the shield plate to the terminal module

The shield plate is used to connect the shield.

1. Position the shield plate on the back of the terminal module with the gaps in the shield plate fitted over the corresponding parts on the terminal module.

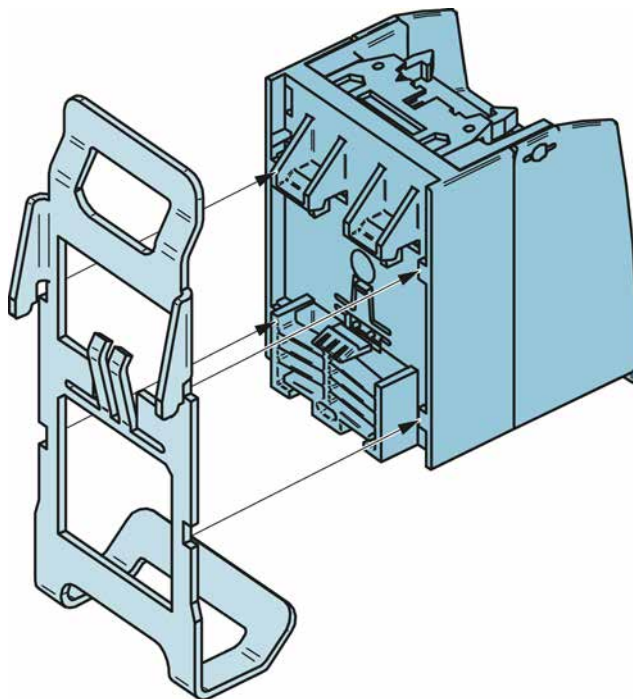


Figure 5-1 Fit the shield plate over the back of the terminal module (example)

5.5 Shield connection of the signal cables

2. Push the shield plate up against the terminal module and up.

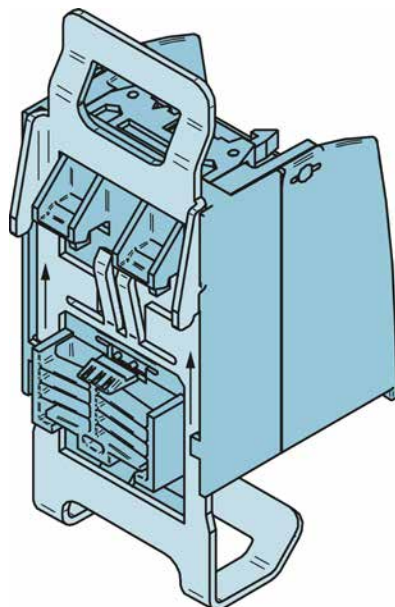


Figure 5-2 Position shield plate and push up

3. Check that the latch ① has fully engaged.
The latch holds the shield plate in the correct position.

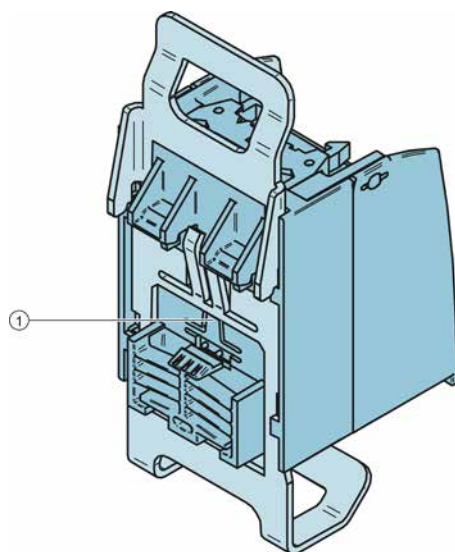


Figure 5-3 Shield plate with latch engaged

4. Mount the terminal module with attached shield plate on the standard mounting rail.
The shield plate connects the terminal module to the grounded mounting rail.
5. Position the shield of the signal cables with the shield connection terminals on the shield plate.

Connecting the connecting cable to the shield at the front connector module

The connecting cables have two pre-prepared points for shield connection. These points are protected by a protective sheath (shrink-on sheath) on delivery, which will need to be removed at the required place.

Which shield connection point you need depends on the location of the connection in the front connector module. For connection in the upper position, use the shield connection point shown in ①. For connection in the upper position, use the shield connection point shown in ②.

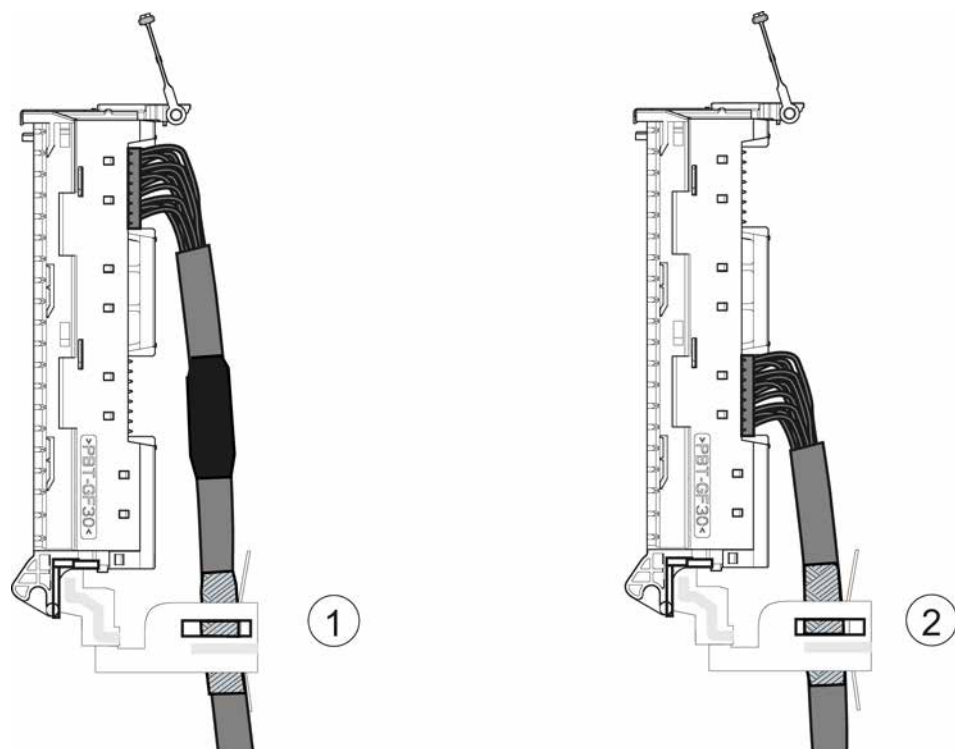


Figure 5-4 Shield connection in different connection positions

Procedure

1. Uncover the cable sheath by removing the protective sheath (shrink-on sheath) at the required place.
2. Push the shield clamp over the connecting cable shield.
3. Connect the connecting cable to the front connector module.
4. Push the shield clamp up over the shield clip to connect the cable shield

Front connector module 6ES7921-5AK20-0AA0

8-bit, for analog modules

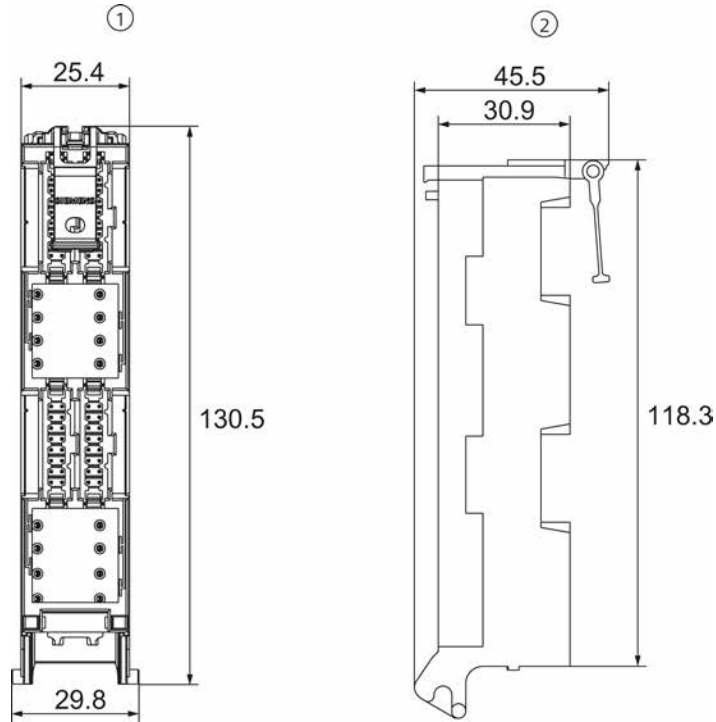


Figure A-3 6ES7921-5AK20-0AA0

Front connector module 6ES7921-5AK20-0AA0

For analog I/O modules

Front connector module for connecting 4 x 16-pin connecting cables

Article number

6ES7921-5AK20-0AA0

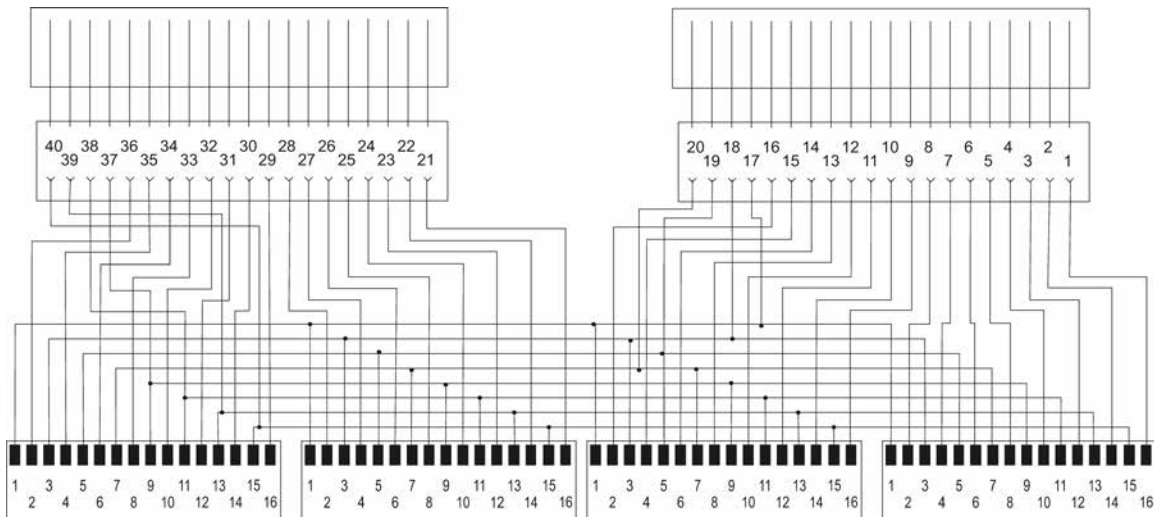


Figure B-3 6ES7921-5AK20-0AA0