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SIEMENS

SIMATIC

S7-300 Automation System, Hardware and Installation: CPU 312IFM - 318-2 DP

Installation Manual

This manual is part of the documentation package with the order number:
6ES7398-8FA10-8BA0

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A5E00203919-01

Guide to the S7-300 Documentation

In this Chapter

you will find a guide to the documentation for the S7-300.

Selecting and configuring

Table 2-1 Influence of the ambient conditions on the automation system (AS)

Information on ...	is available in ...
What provisions do I have to make for PLC installation space?	Chapter *Configuring; Mounting dimensions of modules,* and *Mounting; mounting the rail*, in the *Installation Manual*
How do environmental conditions influence the PLC?	*Appendix of the Installation Manual*

Table 2-2 Electrical isolation

Information on ...	is available in ...
Which modules can I use if electrical isolation is required between sensors/actuators?	Chapter *Configuring; Electrical assembly, protective measures and grounding, in the Installation Manual* Reference Manual *Module Data*
When do I need to isolate the potential of individual components? How do I wire that?	Chapter *Configuring; Electrical assembly, protective measures and grounding, in the Installation Manual* Chapter *Wiring, in the Installation Manual*
When do I need to isolate the potential of specific stations? How do I wire that?	Chapter *Configuring; Configuring a subnet, in the Installation Manual* Chapter *Wiring, in the Installation Manual*

Table 2-3 Communication between sensors/actuators and the automation system

Information on ...	is available in ...
Which module is suitable for my sensor/actuator?	for CPU: in applicable *CPU Data* Reference Manual for signal modules: *Module Data* Reference Manual
How many sensors/actuators can I connect to the module?	for CPU: in applicable *CPU Data* Reference Manual for signal modules: *Module Data* Reference Manual
To connect my sensors/actuators to the PLC, how do I wire the front connector ?	Chapter *Wiring; Wiring front connectors, in the Installation Manual*
When do I require expansion modules (EM), and how are they connected?	Chapter *Configuring, optional expansions and networking, in the Installation Manual*
How do I mount modules in module racks / on profile rails?	Chapter *Mounting; Mounting modules on a rail, in the Installation Manual*

Table 2-4 Use of centralized and decentralized peripherals

Information on ...	is available in ...
Which range of modules do I want to use?	for local I/O / expansion modules (EMs): *Module Data* Reference Manual for distributed I/Os / PROFIBUS DP: Manual of the relevant I/O device, e.g. *Manual ET 200B*

Table 2-5 Configuration consisting of the central processing unit (CPU) and expansion modules (EMs)

Information on ...	is available in ...
Which rack / rail is best suited to my application?	Chapter *Configuring, in the Installation Manual*
Which Interface modules (IM) do I need to connect EMs to the CPU?	Chapter *Configuring, Arranging modules on multiple racks, in the Installation Manual*
What is the right power supply (PS) for my application?	Chapter *Configuring, in the Installation Manual*

Table 2-6 CPU performance

Information on ...	is available in ...
Which memory concept is best suited for my application?	in applicable *CPU Data* Reference Manual
How do I insert and remove Micro Memory Cards?	Chapter *Commissioning; Removing/Installing Micro Memory Cards, in the Installation Manual*
Which CPU meets my requirements on performance ?	*Instruction list*; Reference Manual *CPU Data*
How fast is the response / processing time of the CPU?	in applicable *CPU Data* Reference Manual
Which technological functions are implemented?	*Technological functions* Manual
How can I use these technological functions?	*Technological functions* Manual

Table 2-7 Communication

Information on ...	is available in ...
Which principles do I have to take into account?	*Communication with SIMATIC* Manual
Which options and resources are available on the CPU ?	in applicable *CPU Data* Reference Manual
How do I optimize communication with the help of communication processors (CPs)?	the respective manual
Which type of communication network is best suited to my application?	Chapter *Configuring; Configuring a subnet, in the Installation Manual* *Communication with SIMATIC* Manual
How do I network the individual components?	Chapter *Configuring* and *wiring, in the Installation Manual*

Table 2-8 Software

Information on ...	is available in ...
Which software do I require for my S7-300 system?	Chapter *Technical Specification*; applicable *CPU Data* Reference Manual

Table 2-9 Supplementary features

Information on ...	is available in ...
How do I implement operator control and monitoring? (Human Machine Interface)	for text-based display units: the relevant device manual for OPs: the relevant device manual for WinCC: the relevant device manual
How can I integrate process control modules?	for PCS 7: the respective device manual
What options are offered by redundant and fail-safe systems?	Manual *S7-400H - Redundant Systems*; Manual *Fail-safe Systems*

Installation Order

In this Chapter

We will show you the sequence of steps you must follow to install your SIMATIC-S7 system.

We shall then go on to explain the basic rules that you should follow, and how you can modify an existing system.

Procedure for installing an S7-300 system

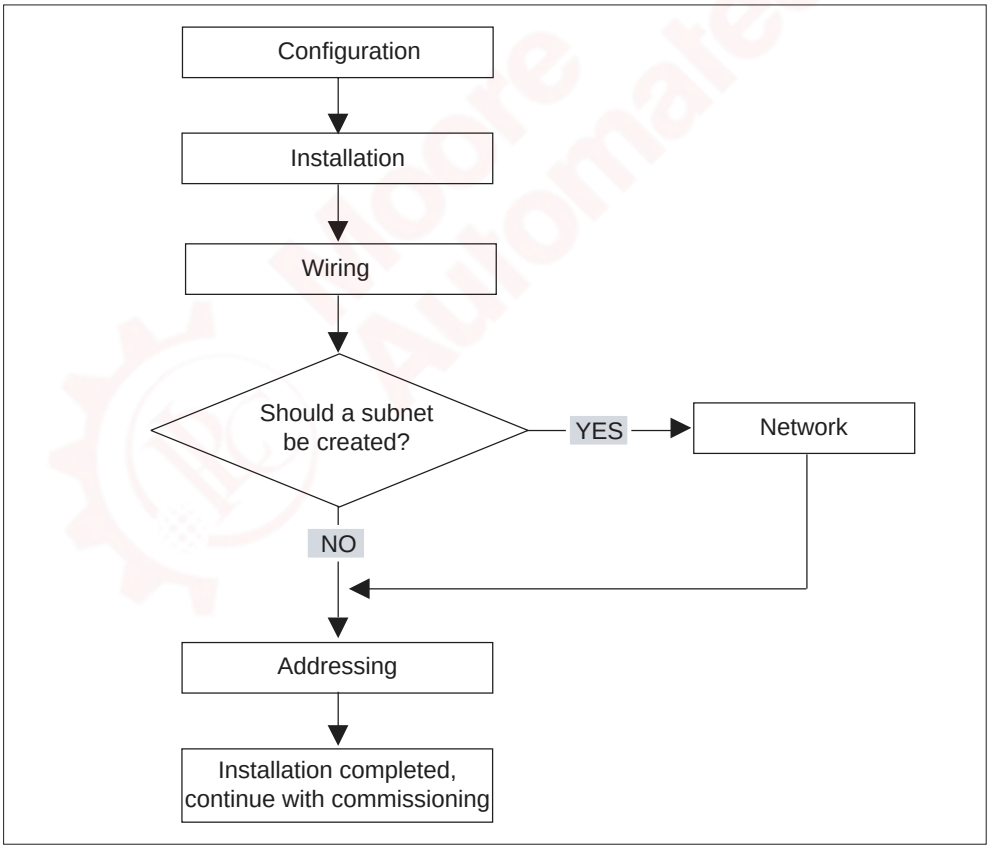


Figure 3-1 Installing an S7 system

Basic rules for trouble-free operation of S7

An S7 system can be used in many different ways, so we can only provide basic rules for the electrical and mechanical installation in this section.

You must at least keep to these basic rules if you want your S7 system to operate correctly.

Modifying the structure of an existing S7 system

If you want to modify the configuration of an existing system at a later time, proceed using the steps indicated above.

Note

If you want to install a signal module at a later time, consult the relevant information for the respective module.

Cross-reference

Also note the description of your specific module in the *SIMATIC S7-300 PLCs* manual and the *Module Data Reference Manual*.

S7-300 Modules

Which modules can you use to create an S7-300?

An S7-300 consists of several modules. The following diagram illustrates a possible configuration:

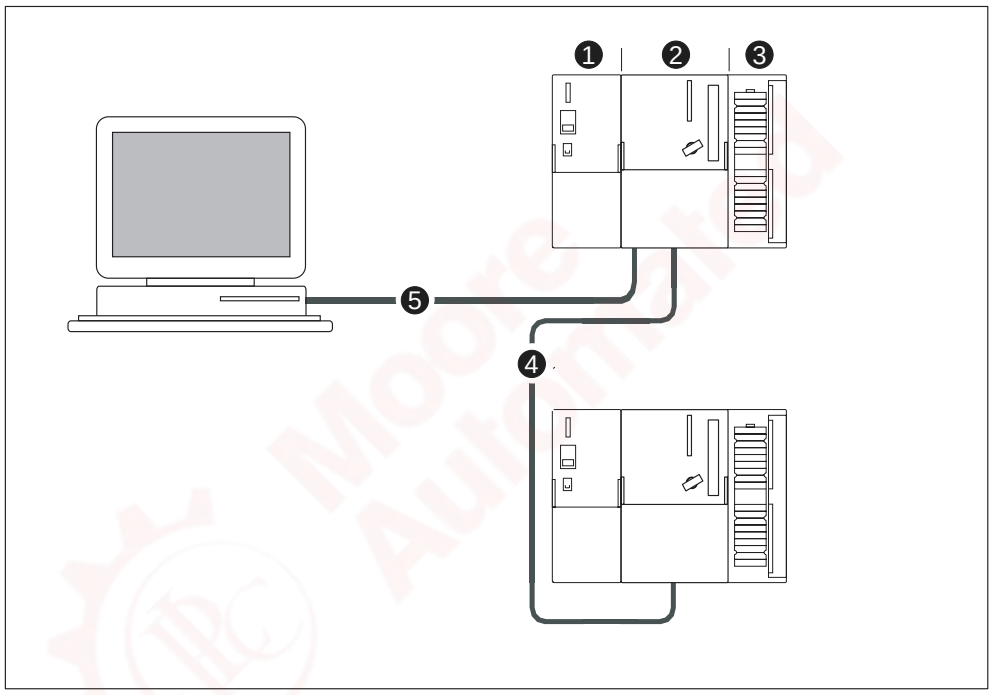


Figure 4-1 Example configuration: S7-300 components

The diagram illustrates under number	the following modules of an S7-300
(1)	Power supply
(2)	Central processing unit
(3)	Signal module
(4)	PROFIBUS bus cable
(5)	Cable for connecting a programming device (PG)

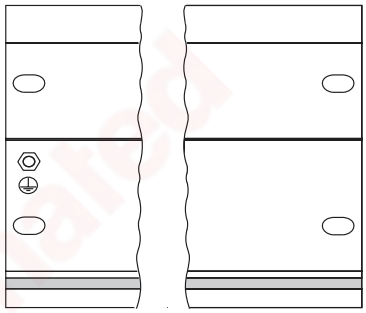
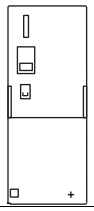
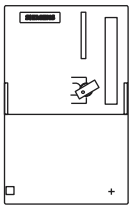
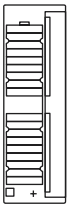
A programming device (PG) is used to program the S7-300 PLC. Use a PG cable to connect the PG and the CPU.

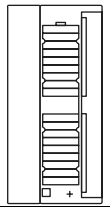
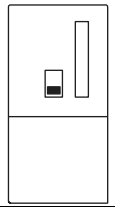
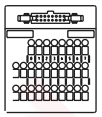
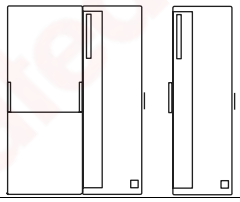
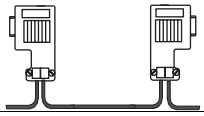
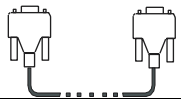
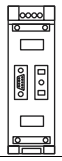
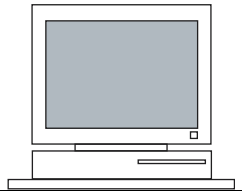
Several S7-300 CPUs can communicate with one another and with other SIMATIC S7 PLCs via the PROFIBUS cable. You can connect several S7-300s using a PROFIBUS bus cable.

S7-300 Modules

There is a whole range of components available for creating and using an S7-300. The table below shows the major modules and their functions.

Table 4-1 Components of an S7-300:

Components	Function	Illustration
Mounting rail (rack) Accessory: Shielding contact element	This is the rack for an S7-300	
Power supply (PS)	This converts the line voltage (120/230 VAC) to 24 VDC operating voltage and is used to supply the S7-300 and 24 VDC load circuits	
CPU Accessory: Front connectors (for CPUs with integrated peripherals)	This runs the user program, provides a 5 V supply to the S7-300 backplane bus and communicates with other MPI network nodes via the MPI interface. In addition, a CPU can also be a DP master or a DP slave in a PROFIBUS subnet.	 CPUs 312 IFM to 318-2 DP
Signal modules (SM) (Digital input modules, digital output modules, digital I/O modules, analog input modules, analog output modules, analog I/O modules) Accessory: Front connectors	They match different process signal levels to the S7-300.	

Components	Function	Illustration
Function modules (FM) Accessory: Front connectors	These perform time-critical and memory-intensive process signal processing tasks, such as positioning or regulation.	
Communication processor (CP). Accessory: Connecting cable	This performs communication for the CPU, e.g. CP 342-5 DP connection to PROFIBUS DP	
SIMATIC TOP connect Accessory: Front connector module with ribbon cable terminals	Use for wiring the digital I/O modules	
Interface module (IM) Accessory: Connecting cable	Connects the individual rows in an S7-300	
PROFIBUS cable with bus connector	Connect the nodes of an MPI or PROFIBUS subnet to one another	
PG cable	Connects a PG/PC to a CPU	
RS485 Repeater	Used to amplify the signals in an MPI or PROFIBUS subnet and for coupling segments of an MPI or PROFIBUS subnet	
Programming device (PG) or PC with the STEP 7 software package	You will need a PG to configure, set parameters, program and test your S7-300	

Configuring

5.1 Summary of the Content

In this Chapter

we will provide you with all the information you need

- Mechanical configuration of an S7-300
- Electrical configuration of an S7-300
- Considerations for networking

Further information on networking

For information on network topics we recommend the *Communication with SIMATIC* Manual. This manual contains important notes on networking for SIMATIC professionals as well as the basics for newcomers.

Cross-reference

Information on ambient conditions is in the Appendix: see *Ambient Conditions*

Information on special protective measures is in the Appendix: see *Electrical Protective Measures*

5.2 Basic Principles of Planning

Important information about planning

Warning

Open equipment
The modules that make up an S7-300 are regarded as open equipment. This means that you must always install the S7-300 in a cubicle, cabinet or electrical control room that can only be accessed using a key or tool. Only trained or authorized personnel are allowed access to such cubicles, cabinets or electrical operating rooms.

Caution

Depending on the field of application, the operation of an S7-300 in a plant or system is defined by special rules and regulations . Note the safety and accident prevention regulations relating to specific applications, e.g. machine protection directives. This chapter and the appendix *General rules and regulations on S7-300 operation* provide an overview of the most important rules you need to consider when integrating an S7-300 into a plant or a system.

Central unit (CU) and expansion module (EM)

An S7-300 PLC consists of a central unit (CU) and – if required – one or multiple expansion modules (EMs).

The rack containing the CPU is referred to as the central unit (CU). Racks equipped with modules form the expansion modules (EMs) connected to the system's CU.

When should I use expansion modules?

You can use EMs if the number of CU slots is insufficient for your application.

When using EMs, you might require further power supply modules in addition to the extra racks and interface modules (IM). When using interface modules you must ensure compatibility of the partner stations.

Module racks

The rack for your S7-300 is a rail. You can use this rail to mount all modules of your S7-300 system.

Horizontal and vertical installation

You can mount an S7-300 either vertically or horizontally. The following ambient air temperatures are permitted:

- Vertical installation: from 0 °C to 40 °C
- Horizontal installation: from 0 °C to 60 °C.

Always install the CPU and power supply on the left or at the bottom.

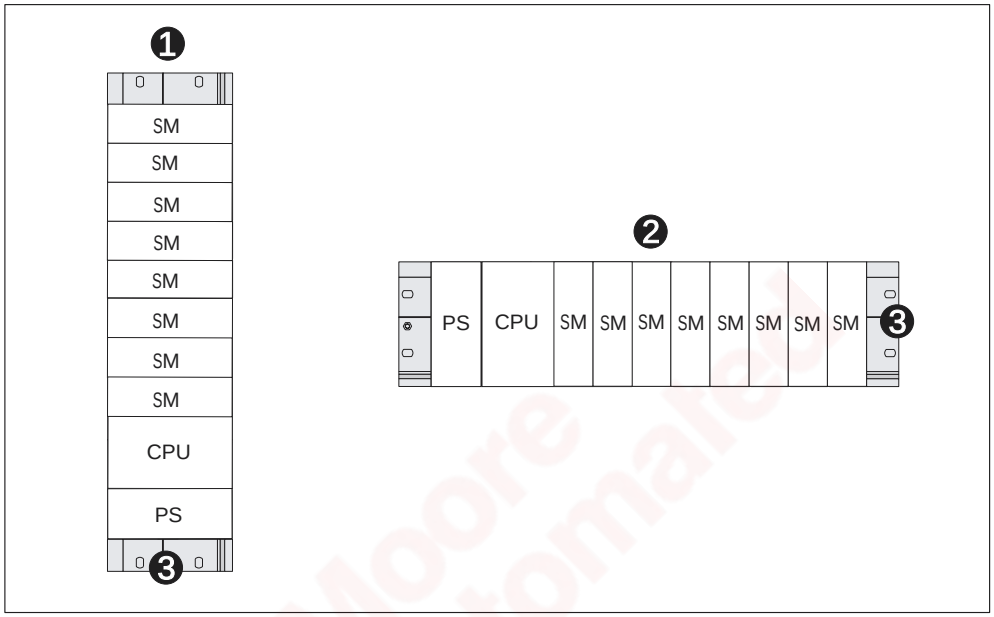


Figure 5-1 Horizontal and vertical installation

The diagram illustrates under number	
(1)	Vertical installation of an S7-300
(2)	Horizontal installation of an S7-300
(3)	Rail

Further information

- the selection and dimensions of rails (racks) can be found in Chapter *Module dimensions*.
- connections and interfaces (IMs) are found in Chapter *Arranging modules on multiple racks*.
- the most important rules on S7-300 operation are found in the Appendix *General rules and regulations on S7-300 operation*.

5.3 Component Dimensions

Length of the rails

The following rails are available.

Table 5-1 Rails - overview

Rail length	Usable length for modules	Order No.
160 mm	120 mm	ES7 390-1AB60-0AA0
482.6 mm	450 mm	ES7 390-1AE80-0AA0
530 mm	480 mm	ES7 390-1AF30-0AA0
830 mm	780 mm	ES7 390-1AJ30-0AA0
2,000 mm	cut to length if required.	ES7 390-1BC00-0AA0

In contrast to other rails, the 2-meter rail is not equipped with any mounting holes. These must be drilled, allowing optimal adaptation of the 2-meter rail to your application.

Installation dimensions of modules

Table 5-2 Module width

Module	Width
Power supply PS 307, 2 A	50 mm
Power supply PS 307, 5 A	80 mm
Power supply PS 307, 10 A	200 mm
CPU	The installation dimensions are listed in the Technical Data section of your *CPU Data Reference Manual*.
Analog I/O modules	40 mm
Digital I/O modules	40 mm
Simulator module SM 374	40 mm
Interface modules IM 360 and IM 365	40 mm
Interface module IM 361	80 mm

- Module height: 125 mm
- Module height with **shielding contact element**: 185 mm
- Maximum mounting depth: 130 mm
- Maximum mounting depth with open hinged front panel (CPU): 180 mm

Dimensions of other modules such as CPs, FMs etc. are found in the relevant manuals.

Shielding contact element

The direct contact between the shielding contact element and the rail enables you to connect all shielded cables of your S7 modules to ground.

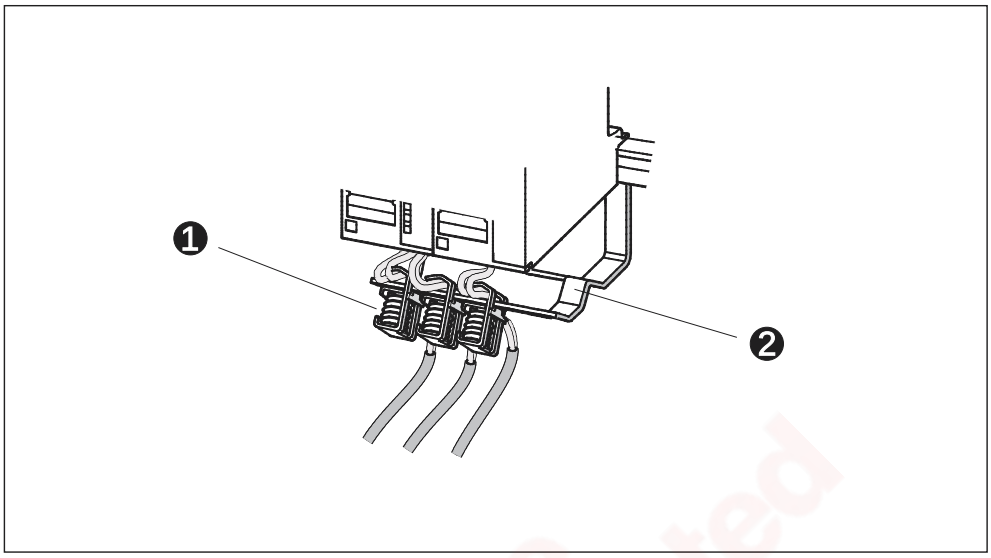


Figure 5-2 Shielding contact element

The diagram illustrates under number	
(1)	the shielding terminals
(2)	the retaining bracket

Mount the bracket (Order No. 6ES5 390-5AA0-0AA0) to the rail using the two screw bolts.

If you use a shielding contact element, the specified dimensions apply from the lower edge of the module.

- Width of the shielding contact element: 80 mm
- Number of mountable shielding terminals per shielding contact element: max 4

Table 5-3 Shielding terminals - overview

Cable with shielding diameter	Shielding terminal order no.
Cable shielding diameter 2 mm to 6 mm	6ES7 390–5AB00–0AA0
Cable shielding diameter 3 mm to 8 mm	6ES7 390-5BA00-0AA0
Cable shielding diameter 4 mm to 13 mm	6ES7 390-5CA00-0AA0

Required clearances

You must maintain the clearance shown in the figure in order to provide sufficient space to install the modules and to dissipate the heat generated by the modules.

This figure illustrates the clearances between multiple racks, as well as between nearby equipment, cable channels, cabinet walls, etc.

For example, if you wire your modules using a cable duct, the clearance between the bottom edge of the shielding contact element and the cable duct must be 40 mm.

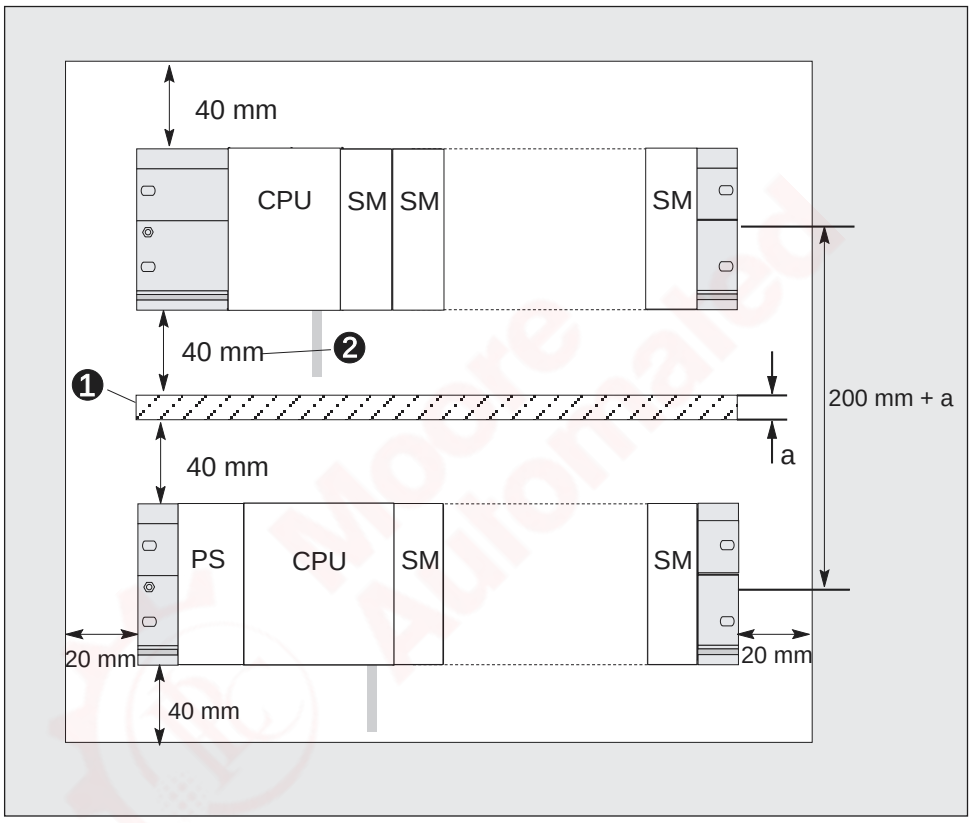


Figure 5-3 Clearance

The diagram illustrates under number	
(1)	Wiring using a cable duct
(2)	Clearance between cable channel and bottom edge of shielding contact element must be 40 mm

Cross-reference

You will find information on how to install an S7-300 in the chapter entitled *Installation.*

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