

# Automation systems



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# Automation systems

## Introduction

### Overview



SIMATIC PCS 7 automation systems in various designs: Modular S7-400 systems as well as embedded systems (mEC and Microbox system)

Automation systems are available in three different designs for the SIMATIC PCS 7 process control system. The automation performance can therefore be finely scaled within wide limits.

The automation systems offered can be classified as follows:

- Modular systems of the S7-400 series with hardware controller in the versions "Standard", "Fault-tolerant" and "Safety-related"
  - AS 410 automation systems
  - Conventional SIMATIC S7-400 automation systems
- Embedded systems with software controller
  - mEC automation system
  - Microbox automation system

### Application

Automation system with APL	AS 412H	AS 414-3	AS 414-3IE	AS 414H	AS 416-2	AS 416-3	AS 416-3IE	AS 416H	AS 417-4	AS 417H	AS RTX	AS mEC
	AS 410											
Analog value measurements	10	50	100	100	200	400	400	400	500	600	300	300
Digital value measurements	20	160	250	250	450	800	800	800	1 000	1 000	600	600
PID controls	5	35	50	50	75	150	150	150	180	200	200	200
Motors	7	40	75	75	100	200	200	200	350	400	150	150
Valves	7	40	75	75	100	200	200	200	350	400	250	250
SFC	0	15	15	15	40	100	100	100	200	200	100	100
Steps	0	150	150	150	400	1 000	1 000	1 000	2 000	2 000	800	800
Dosing	0	3	3	3	15	25	25	25	50	50	50	50
Digital inputs DI	30	200	350	300	600	1 200	1 200	1 200	1 700	1 800	1 200	1 200
Digital outputs DO	10	60	100	110	200	400	400	400	550	650	400	400
Analog inputs AI	15	100	175	150	300	600	600	600	800	900	600	600
Analog outputs AO	5	30	75	50	100	200	200	200	250	350	200	200
Process objects (PO)	30	200	350	350	600	1 200	1 200	1 200	1 800	2 000	1 200	1 200

Typical mixed configuration limits for SIMATIC PCS 7 automation systems, based on the SIMATIC PCS 7 Advanced Process Library (APL)

#### Note:

The values quoted here are not AS-specific maximum values for the particular item. Instead, they represent a typical distribution of the available total capacity of the AS during mixed operation of all the items of a contiguous block.

The number of process objects is not an absolute value, but depends on the library used as well as on the number and type of blocks used in the application.

**Application** (continued)**Modular automation systems of the S7-400 range**

The rugged automation systems of the S7-400 series are suitable for universal use. They are characterized by high processing and communication performance. The product range offered differs with regard to the area of application as follows:

- **AS 410 automation systems**
  - Preferred systems for new plants with SIMATIC PCS 7 V8.0
  - Suitable for SIMATIC PCS 7 as of V8.0+SP1, including hardware upgrade package (HUP CPU 410-5H)
  - Performance of the general purpose CPU scalable based on the number of process objects

AS type	Features
<b>Standard systems, fault-tolerant and safety-related systems</b>	
AS 410S/H/F/FH	CPU 410-5H Process Automation (1 x or 2 x), interfaces: 1 x PN/IE (2 ports), 1 x DP

- **Conventional SIMATIC S7-400 automation systems**
  - Alternative systems for SIMATIC PCS 7 plants
  - Mainly for plants with predecessor versions of SIMATIC PCS 7 V8.0, for example V7.0/V7.1
  - Scalable based on types of CPU differing in performance

AS type	Features
<b>Standard systems</b>	
AS 414-3	Standard CPU, interfaces: 1 x MPI/DP, 1 x DP, 1 x DP module can be optionally inserted
AS 414-3IE	Standard CPU, interfaces: 1 x PN/IE (2 ports), 1 x MPI/DP, 1 x DP module can be optionally inserted
AS 416-2	Standard CPU, interfaces: 1 x MPI/DP, 1 x DP
AS 416-3	Standard CPU, interfaces: 1 x MPI/DP, 1 x DP, 1 x DP module can be optionally inserted
AS 416-3IE	Standard CPU, interfaces: 1 x PN/IE (2 ports), 1 x MPI/DP, 1 x DP module can be optionally inserted
AS 417-4	Standard CPU, interfaces: 1 x MPI/DP, 1 x DP, 2 x DP module can be optionally inserted

**More information****Catalog information**

- For detailed information and ordering data for AS 410 automation systems, refer to the following catalog section "Modular S7-400 Systems".
- For detailed information and ordering data for the SIMATIC PCS 7 AS mEC RTX automation system, see the section "Embedded systems", "mEC automation system" below.
- For detailed information and ordering data for the SIMATIC PCS 7 AS RTX automation system, see the section "Embedded systems", "Microbox automation system" below.
- For ordering data for conventional SIMATIC S7-400 automation systems, see the extra catalog section "Previous versions" under SIMATIC PCS 7 V7.0 and SIMATIC PCS 7 V7.1 (available as a separate PDF document on the Internet).

AS type	Features
<b>Fault-tolerant and safety-related systems</b>	
AS 412H/F/FH	H-CPU (1 x or 2 x), interfaces: 1 x PN/IE (2 ports), 1 x MPI/DP, 1 x DP
AS 414H/F/FH	H-CPU (1 x or 2 x), interfaces: 1 x PN/IE (2 ports), 1 x MPI/DP, 1 x DP
AS 416H/F/FH	H-CPU (1 x or 2 x), interfaces: 1 x PN/IE (2 ports), 1 x MPI/DP, 1 x DP
AS 417H/F/FH	H-CPU (1 x or 2 x), interfaces: 1 x PN/IE (2 ports), 1 x MPI/DP, 1 x DP

**Embedded automation systems**

The SIMATIC PCS 7 AS mEC RTX and SIMATIC PCS 7 AS RTX embedded automation systems are low-price, compact systems for the lower and medium performance ranges. They are particularly suitable for small applications, especially at plant level and as OEM products, e.g. in package units.

Both systems have exceptional physical properties, but differ with regard to design and expandability.

- SIMATIC PCS 7 AS mEC RTX
  - S7-300 design
  - Centrally expandable with up to 8 S7-300 I/O modules
  - PROFINET IO interface for connection to ET 200M distributed remote I/O stations
- SIMATIC PCS 7 AS RTX
  - Microbox design
  - Routing-capable PROFIBUS DP interface for connecting ET 200M, ET 200iSP, ET 200S and ET 200pro distributed remote I/O stations and intelligent field and process devices to PROFIBUS DP/PA

# Automation systems

## S7-400 modular systems

### Overview

With the rugged all-round system AS 410, the SIMATIC PCS 7 process control system for the first time offers an exclusive automation system from the SIMATIC S7-400 series, which can be used in all domains due to its versatility. For specific requirements, you can configure it as a:

- Standard AS 410S automation system
- Fault-tolerant AS 410H automation system
- Safety-related AS 410F/FH automation system

With its high-performance hardware and optimized V8.0 firmware, the innovative CPU 410-5H Process Automation of the AS 410 covers the entire spectrum of conventional AS 412 to AS 417 automation systems. Its automation performance can be flexibly scaled based on the number of SIMATIC PCS 7 process objects (PO).

System expansion cards are available for

- 100 PO
- 500 PO
- 1 000 PO
- 1 600 PO
- $\geq 2\,000$  PO (PO 2k+)

The type reduction to a single CPU offers numerous advantages. It significantly simplifies selection and configuration of the automation system as well as spare part inventory and plant expansion.

#### Note:

The configuration of the CPU 410-5H Process Automation of the AS 410 and the loading of the user blocks is only possible with SIMATIC PCS 7 engineering software as of V8.0+SP1 (including hardware upgrade package HUP CPU 410-5H).

### Design

Similar to all SIMATIC PCS 7 automation systems of the S7-400 series, AS 410 automation systems are available as "AS bundles" as follows:

- Individual components bundled per system in one delivery
- Pre-assembled and tested complete systems (no extra charge compared to delivery of individual components)

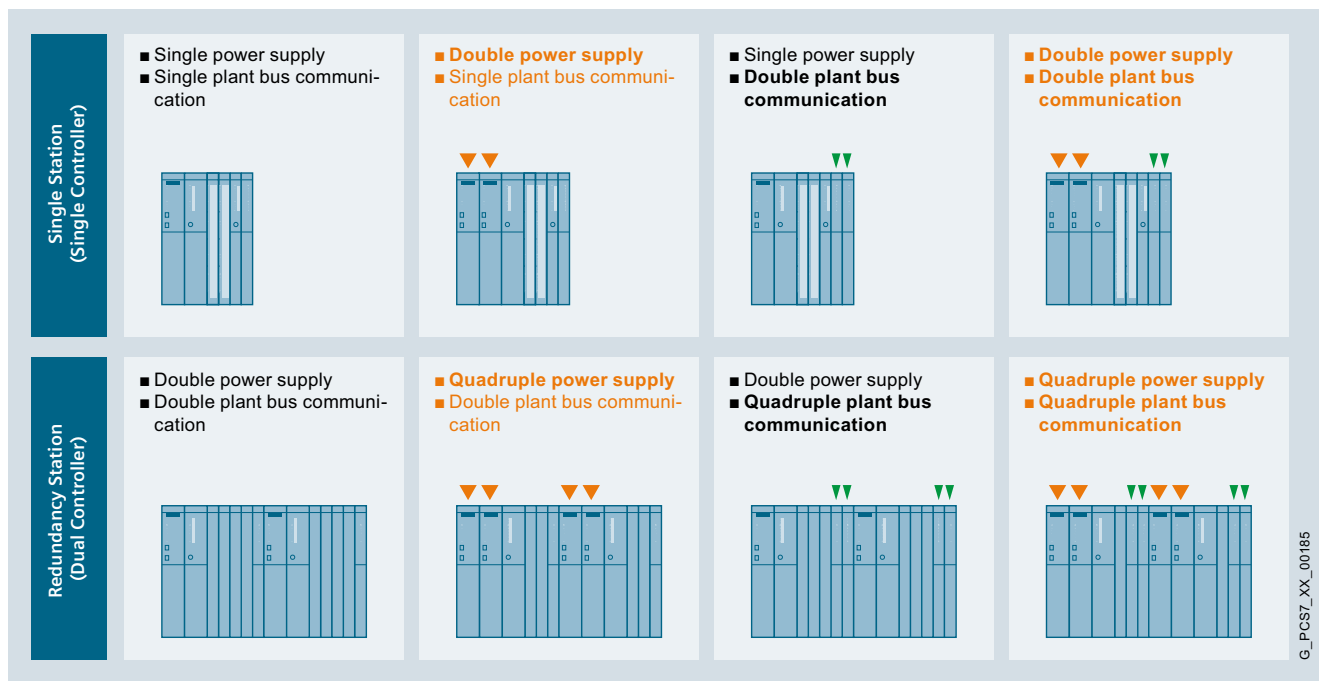
With a SIMATIC PCS 7 Industry Library Runtime license and a SIMATIC PCS 7 AS Runtime license, the AS bundles are equipped for 100 process objects (PO). Building on this, the number of process objects can be increased with cumulative AS Runtime licenses for 100, 1 000 or 10 000 POs.

The configuration of the AS bundles and their order numbers can be defined by selecting pre-configured ordering units. System-specific ordering configurations are available in tabular form for this purpose in the sections "Standard automation systems", "Fault-tolerant automation systems" and "Safety-related automation systems".

For interactive configuration of AS bundles, two online configurators are also available in the Industry Mall ([www.siemens.com/industrymall](http://www.siemens.com/industrymall)):

- SIMATIC PCS 7 AS 410 Single Station configurator
- SIMATIC PCS 7 AS 410 Redundancy Station configurator

### Flexible and scalable availability



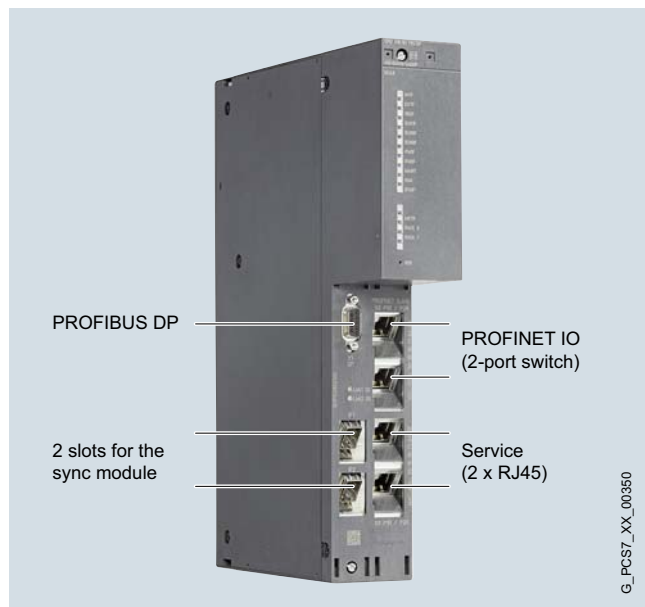
### Design (continued)

A particular characteristic of the modular S7-400 systems is the flexible and scalable availability of various components.

For a SIMATIC PCS 7 AS Single Station of the AS 410 type, you have the option of specifically increasing the availability by implementing a redundant configuration of the power supply or the Industrial Ethernet communications module, and combining these measures.

Even the AS Redundancy Station of the AS 410 type with its redundant CPUs offers significantly higher availability. It operates according to the 1oo2 principle, in which a switch is made from the active subsystem to the standby system in the event of a fault. Starting from here, you can double the power supply or the Industrial Ethernet communications module for each subsystem, and combine these measures.

### CPU 410-5H Process Automation



CPU 410-5H Process Automation

The CPU 410-5H Process Automation is the heart of standard automation systems, as well as the fault-tolerant and safety-related AS 410 automation systems. Expansion cards for 100 PO, 500 PO, 1 000 PO, 1 600 PO and  $\geq 2\ 000$  PO (PO 2k+) can be used to increase their performance in a user-defined manner to up to approximately 2 600 PO.

As shown in the figure, CPU 410-5H Process Automation is equipped with a PROFINET IO interface (2-port switch) for up to 250 I/O devices and a PROFIBUS DP interface for up to 96 PROFIBUS DP slaves. Two integrated slots allow the synchronization of two redundant subsystems via sync modules and sync cables (FOC).

CPU 410-5H Process Automation supports NTP as well as S7 time synchronization.

Other features include:

- Integrated 48 MB load memory and 16 MB RAM each for program and data
- Cycle time up to 10 ms/9 process tasks
- Total number of I/Os (on PROFIBUS DP and PROFINET IO) approx. 7 500 (16 KB each for inputs and outputs)
- Additional protection of the circuit board with coating (conformal coating)
- High-precision time stamping
- Recessed RESET button
- Preset hardware parameters (PCS 7 skinning)

For detailed information about CPU 410-5H Process Automation, see "Technical specifications".

### I/O connection via PROFIBUS DP

The distributed process I/O can be integrated into a PROFIBUS DP segment either directly or via a lower-level fieldbus (PROFIBUS PA or FOUNDATION Fieldbus H1). For details on this, see sections "PROFIBUS DP", "PROFIBUS PA" and "FOUNDATION Fieldbus H1" in the "Communication" chapter 11.

PROFIBUS DP segments with distributed process I/O can be operated on a PROFIBUS DP interface in the CPU and on additive CP 443-5 Extended PROFIBUS DP interfaces. You can configure up to 4 individual or redundant CP 443-5 Extended PROFIBUS DP interfaces for an automation system using the configurators for SIMATIC PCS 7 automation systems in the Industry Mall as well as in the catalog sections "Standard automation systems", "Fault-tolerant automation systems" and "Safety-related automation systems".

You can additionally implement further PROFIBUS interfaces using separately ordered CP 443-5 Extended PROFIBUS DP interfaces. According to the manual, up to 10 CP 443-5 Extended interfaces can be operated in one automation system.

### I/O connection via PROFINET IO

You can easily and efficiently connect AS 410 automation systems to remote I/O stations via the PROFINET IO interface integrated in the CPU 410-5H Process Automation, for example, to remote ET 200M I/O stations (see also the "PROFINET" section in the "Communication" chapter, page 11/50). PROFINET IO interfaces made available by additive communication modules of the CP 443-1 type cannot be used.

# Automation systems

## S7-400 modular systems

### Technical specifications

#### CPU 410-5H Process Automation

General information	
Firmware version	V8.0
Engineering with	SIMATIC PCS 7 V8.0+SP1 + HUP CPU 410-5H
Degree of protection	IP20
Version	Conformal coating
Power supply	
Supply voltage	5 V DC from SV system
Input current	
• From backplane bus, 5 V DC max.	1.7 A
• From interface 5 V DC, max.	90 mA
Power loss, typical	7.5 W
Memory	
RAM	
• For program	16 MB
• For data	16 MB
Load memory, integrated	48 MB
Buffering with battery	Yes, all data
CPU performance	
Clock	450 MHz (multiprocessor system)
Average processing time of APL typicals	Approx. 110 µs
PCS 7 process objects, can be set with system expansion card	Up to approx. 2 600
Process tasks	
Cyclic interrupts (can be set from 10 ms to 5 s)	9

I/O	
Total number of I/Os	Approx. 7 500 (16 KB inputs/outputs)
Number of I/Os per DP interface	Approx. 3 800 (8 KB inputs/outputs)
Number of I/Os per PN interface	Approx. 3 800 (8 KB inputs/outputs)
Communication	
Number of S7 connections	120
Alarm_8P	10 000 (max. 80 000 messages)
Interfaces	
• X1: PROFIBUS DP	1 x up to 12 Mbps, 9-pin Sub-D socket
• X5: PROFINET IO with 2 ports	2 x 10/100 Mbps, RJ45
• X8: Service	2 x RJ45
• IF1: Sync module slot (redundant systems)	Sync module 1
• IF2: Sync module slot (redundant systems)	Sync module 2
Electromagnetic compatibility (EMC)	
Emission of radio interference acc. to EN 55011	Limit class A, for use in industrial areas
Climatic conditions	
Temperature	
• Operation	0 ... 60 °C
Relative humidity	
• Operation	0 to 95%, without condensation
Standards, specifications, approvals	
CE mark	Yes
cULus	Yes
CSA approval	Yes
FM approval	Yes
ATEX approval	Yes
Dimensions and weights	
Dimensions (W x H x D in mm)	50 x 290 x 219
Weight	approx. 1.1 kg

### Accessories

#### Backup batteries

Lithium backup batteries of type AA with 2.3 Ah are used in the power supply modules of all SIMATIC PCS 7 automation systems of the S7-400 range (AS bundles). Since lithium batteries are relatively flammable, more rigorous transport and storage regulations apply to them.

To avoid subjecting the AS bundles to these more rigorous transport and storage regulations, the backup batteries must be ordered and delivered separately (order no. 6ES7971-0BA00).

The following backup batteries are required, depending on the configuration of the AS bundles:

- SIMATIC PCS 7 AS Single Station with
  - 1 power supply module: 2 units
  - 2 redundant power supply modules: 4 units
- SIMATIC PCS 7 AS Redundancy Station with
  - 2 power supply modules: 4 units
  - 2 x 2 redundant power supply modules: 8 units

**Overview**

Standard AS 410S automation system

The AS 410S modular standard automation systems are suitable for general use. These are always your first choice if high availability through redundancy and safety-related functions are not relevant for the application.

In the range from 100 to approx. 2 600 PO, their performance can be customized to meet the task at hand using expansion cards (for more information, see the previous section of the catalog "Modular S7-400 systems").

An AS 410S is also the base system for a fault-tolerant (AS 410H) or a safety-related automation system (AS 410F, AS 410FH). Your decision for the AS 410S is therefore not final, you can remain flexible. If the task changes, the automation system can be used differently at any time and the target system can be expanded accordingly.

**Design****Individual configuration of AS bundles**

The equipment of the standard automation systems as well as their order numbers can be individually compiled by selecting pre-configured ordering units.

Typical combinations can be selected from tables in the section "Selection and ordering data". The complete range is available to you via the SIMATIC PCS 7 AS 410 Single Station online configurator in the Industry Mall ([www.siemens.com/industrymall](http://www.siemens.com/industrymall)).

**I/O connection via PROFIBUS DP**

Several PROFIBUS DP segments with distributed process I/Os can be operated on one standard automation system. A PROFIBUS DP interface is already integrated in the CPU 410-5H Process Automation. Using the configurator in the Industry Mall or in the selection and ordering data, up to four more PROFIBUS DP interfaces can be configured via additional PROFIBUS DP interfaces CP 443-5.

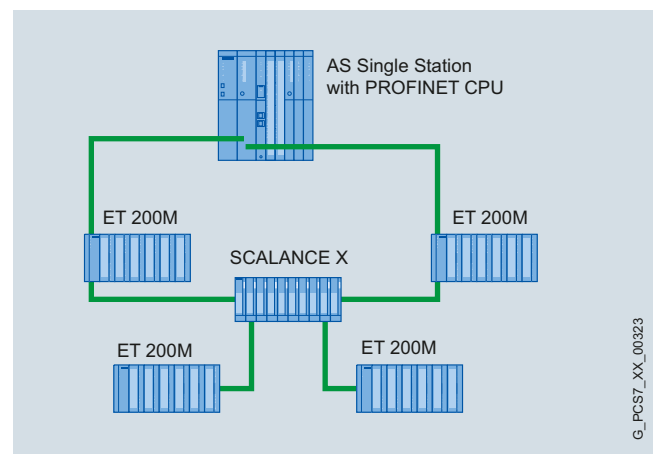
**I/O connection via PROFINET IO**

Standard automation systems AS 410S can only be connected to remote I/O stations, for example, ET 200M remote I/O stations via the PROFINET interface (2-port switch) integrated in CPU 410-5H Process Automation (see also the "PROFINET" section in the "Communication" chapter, page 11/50).

The availability of the I/O devices can be increased by a ring topology with media redundancy (MRP). If the transmission link in the ring is interrupted at a given location, for example, due to a break in the ring cable or the failure of a station, the redundancy manager, e.g. the CPU, immediately activates the alternative communication path.

**Industrial Ethernet (IE) plant bus communication**

If the PROFINET interface integrated in the CPU is not used for PROFINET IO, it can also be used for the connection to the Industrial Ethernet plant bus. Otherwise, the AS 410S standard automation system can be connected to the Industrial Ethernet plant bus via a CP 443-1 communication module. The availability of the plant bus communication can be increased with a second communication module.



Example for PROFINET IO communication with media redundancy

**Redundant power supply**

If you have two separate power supply networks for your plant, you can increase the availability of the AS 410S standard automation systems by using two redundant power supplies.

**Runtime licenses**

With a SIMATIC PCS 7 Industry Library Runtime license and a SIMATIC PCS 7 AS Runtime license, the AS bundle is equipped for 100 process objects (PO). The number of process objects can be extended by additional Runtime licenses for 100, 1 000 or 10 000 POs. The process objects of additional Runtime licenses can be added to process objects which already exist. The number and type (e.g. 100 or 1000) of additional Runtime licenses are irrelevant with regard to the implementable quantity framework.

# Automation systems

## S7-400 modular systems

### Standard automation systems

#### Ordering data

	Order no.
<b>AS 410S</b> CPU 410-5H with PROFIBUS DP and PROFINET IO interface 32 MB RAM (16 MB each for program and data) with SIMATIC PCS 7 AS Runtime license for 100 PO and SIMATIC PCS 7 Industry Library Runtime license	<b>6ES7654-</b> C 0 - F
<b>Type of delivery</b> • Individual components, not pre-assembled • Pre-assembled and tested	5 6
<b>System expansion card</b> • System expansion card 100 PO • System expansion card 500 PO • System expansion card 1 000 PO • System expansion card 1 600 PO • System expansion card PO 2k+ (≥ 2 000)	J L N P Q
<b>Additive Industrial Ethernet interfaces<sup>1)</sup></b> • Without CP 443-1 • 1 x CP 443-1 • 2 x CP 443-1	0 3 4
<b>Racks</b> • UR2 (9 slots), aluminum <sup>1)</sup> • UR2 (9 slots), steel <sup>1)</sup> • UR1 (18 slots), aluminum • UR1 (18 slots), steel	3 4 5 6
<b>Power supply (without backup batteries)</b> • 1 x PS 407, 10 A for 120/230 V AC/DC • 1 x PS 407, 10 A for 120/230 V AC/DC, optional redundancy • 1 x PS 407, 20 A for 120/230 V AC/DC • 2 x PS 407, 10 A for 120/230 V AC/DC, redundant • 1 x PS 405, 10 A for 24 V DC • 1 x PS 405, 10 A for 24 V DC, optional redundancy • 1 x PS 405, 20 A for 24 V DC • 2 x PS 405, 10 A for 24 V DC, redundant	B C D E G H J K
<b>Additive PROFIBUS DP interfaces<sup>1)</sup></b> • Without CP 443-5 Extended • 1 x CP 443-5 Extended • 2 x CP 443-5 Extended • 3 x CP 443-5 Extended • 4 x CP 443-5 Extended	0 1 2 3 4

<sup>1)</sup> Up to 5 CPs (Industrial Ethernet/PROFIBUS) can be plugged into the UR2 rack with a single power supply, or up to 3 with a redundant power supply.

#### Order No.

#### Individual components

Individual components for AS 410S standard automation systems	Order No.
<b>CPU 410-5H Process Automation</b> 32 MB RAM integrated (16 MB each for program and data); module occupies 2 slots	<b>6ES7410-5HX08-0AB0</b>
<b>CPU 410-5H Process Automation 100 PO Bundle</b> CPU bundle, consisting of CPU 410-5H Process Automation and system expansion card for 100 PO	<b>6ES7654-5CJ00-0XF0</b>
<b>CPU 410-5H Process Automation 500 PO Bundle</b> CPU bundle, consisting of CPU 410-5H Process Automation and system expansion card for 500 PO	<b>6ES7654-5CL00-0XF0</b>
<b>CPU 410-5H Process Automation 1 000 PO Bundle</b> CPU bundle, consisting of CPU 410-5H Process Automation and system expansion card for 1 000 PO	<b>6ES7654-5CN00-0XF0</b>
<b>CPU 410-5H Process Automation 1 600 PO Bundle</b> CPU bundle, consisting of CPU 410-5H Process Automation and system expansion card for 1 600 PO	<b>6ES7654-5CP00-0XF0</b>
<b>CPU 410-5H Process Automation PO 2k+ Bundle</b> CPU bundle, consisting of CPU 410-5H Process Automation and system expansion card for PO 2k+ (≥ 2 000)	<b>6ES7654-5CQ00-0XF0</b>
<b>CP 443-1</b> Communication module for connecting SIMATIC S7-400 to Industrial Ethernet through TCP/IP, ISO, and UDP; PROFINET IO Controller, MRP; integrated real-time switch ERTEC with two ports; 2 x RJ45 interface; S7 communication, open communication (SEND/RECEIVE) with FETCH/WRITE, with or without RFC 1006, DHCP, SNMP V2, diagnostics, multicast, access protection over IP access list, initialization over LAN 10/100 Mbps with electronic manual on DVD	<b>6GK7443-1EX30-0XE0</b>
<b>CP 443-5 Extended</b> Communications processor for connection of SIMATIC S7-400 to PROFIBUS as DP master or for S7 communication, for increasing the number of DP lines, for data set routing with SIMATIC PDM and for 10-ms time stamp, electronic manual on CD; module occupies 1 slot	<b>6GK7443-5DX05-0XE0</b>



Ordering data	Order No.	Order No.
<b>PS 407 power supply module; 10 A</b> 120/230 V AC/DC; 5 V DC/10 A, 24 V DC/1 A; with battery compartment for 2 backup batteries, module occupies 2 slots	6ES7407-0KA02-0AA0	<b>Backup battery</b> Type AA, 2.3 Ah 6ES7971-0BA00
<b>PS 407 power supply module; 10 A, optional redundancy</b> 120/230 V AC/DC; 5 V DC/10 A, 24 V DC/1 A; with battery compartment for 2 backup batteries, module occupies 2 slots	6ES7407-0KR02-0AA0	<b>Aluminum UR1 rack</b> 18 slots 6ES7400-1TA11-0AA0
<b>PS 407 power supply module; 20 A</b> 120/230 V AC/DC; 5 V DC/20 A, 24 V DC/1 A; with battery compartment for 2 backup batteries, module occupies 2 slots	6ES7407-0RA02-0AA0	<b>Aluminum UR2 rack</b> 9 slots 6ES7400-1JA11-0AA0
<b>PS 405 power supply module; 10 A</b> 24 V DC; 5 V DC/10 A, 24 V DC/1 A; with battery compartment for 2 backup batteries, module occupies 2 slots	6ES7405-0KA02-0AA0	<b>Steel UR1 rack</b> 18 slots 6ES7400-1TA01-0AA0
<b>PS 405 power supply module; 10 A, optional redundancy</b> 24 V DC; 5 V DC/10 A, 24 V DC/1 A; with battery compartment for 2 backup batteries, module occupies 2 slots	6ES7405-0KR02-0AA0	<b>Steel UR2 rack</b> 9 slots 6ES7400-1JA01-0AA0
<b>PS 405 power supply module; 20 A</b> 24 V DC; 5 V DC/20 A, 24 V DC/1 A; with battery compartment for 2 backup batteries, module occupies 2 slots	6ES7405-0RA02-0AA0	<b>Runtime licenses for SIMATIC PCS 7 automation systems</b> (can be added to existing licenses)
		<b>SIMATIC PCS 7 AS Runtime license</b> Independent of language, floating license for 1 user • Delivery form package (without SIMATIC PCS 7 Software Media Package) License key USB stick, certificate of license - 100 PO - 1 000 PO - 10 000 PO • Delivery form online (without SIMATIC PCS 7 Software Media Package) License key download, online certificate of license <u>Note:</u> E-mail address required! - 100 PO - 1 000 PO - 10 000 PO
		6ES7653-2BA00-0XB5 6ES7653-2BB00-0XB5 6ES7653-2BC00-0XB5
		6ES7653-2BA00-0XH5 6ES7653-2BB00-0XH5 6ES7653-2BC00-0XH5

# Automation systems

## S7-400 modular systems

### Fault-tolerant Automation Systems

#### Overview



Redundancy Station AS 410H

Fault-tolerant automation systems are used to reduce the risk of production failures. The higher investment costs for fault-tolerant automation systems are frequently negligible compared to the costs resulting from production failures. The higher the costs of a production failure, the more worthwhile it is to use a fault-tolerant system.

The SIMATIC PCS 7 fault-tolerant automation systems can be used on their own in a plant configuration, or together with standard and safety-related automation systems.

#### Design

The AS 410H, which consists of two redundant, electrically isolated subsystems, can be mounted on a UR2-H compact rack with a split backplane bus or on two separate racks (UR1 or UR2). The configuration in two racks has the advantage that the redundant subsystems are spatially separated (for example, by a fire-proof wall) and can be located far apart from each other. Depending on the sync modules used, distances from 10 m to 10 km are possible between the two subsystems. As a result of the electrical isolation, the system is also resistant to EMC interference.

#### Individual configuration of AS bundles

The equipment of the fault-tolerant automation systems as well as their order numbers can be individually defined by selecting pre-configured ordering units.

Typical combinations can be selected from tables in the section "Selection and ordering data". The complete range for selection is available via the SIMATIC PCS 7 AS 410 Redundancy Station online configurator in the Industry Mall ([www.siemens.com/industrymall](http://www.siemens.com/industrymall)).

#### Ordering information:

- For an AS 410H redundant configuration based on two AS Single Stations (AS 410S), you additionally require 4 sync modules (up to 10 m or up to 10 km) and 2 fiber-optic sync cables. The selection depends on the distance between the two AS Single Stations.
- FO sync cables longer than 1 m must always be ordered separately (2 cables required in each case).

#### I/O connection via PROFIBUS DP

The distributed process I/O can be integrated into a PROFIBUS DP segment either directly or via a lower-level fieldbus (PROFIBUS PA or FOUNDATION Fieldbus H1).

Several PROFIBUS DP segments with distributed process I/Os can be operated on an AS 410H fault-tolerant automation system. A PROFIBUS DP interface is integrated in each of the two CPUs 410-5H Process Automation. Using the online configurator in the Industry Mall or in the selection and ordering data, up to four more PROFIBUS DP interfaces can be configured for each redundant subsystem with additive CP 443-5 PROFIBUS DP interfaces.

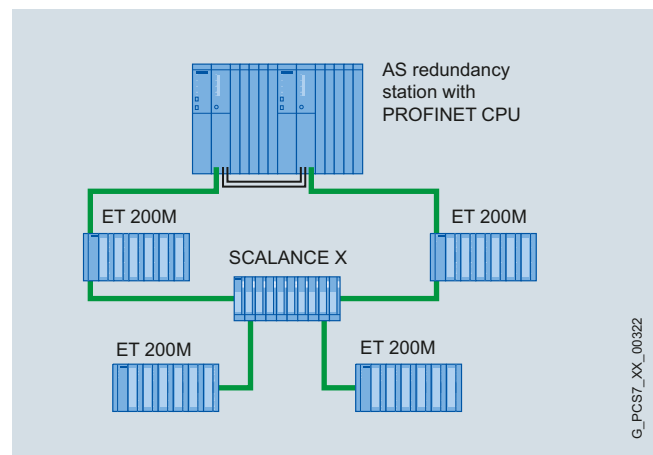
With redundant PROFIBUS DP lines, the process I/Os can be connected to an AS 410H as follows:

- ET 200M remote I/Os stations with two IM 153-2 High Feature interface modules on a special bus module
- ET 200iSP remote I/Os stations with two IM 152-1 on a special terminal module
- Field devices on the PROFIBUS PA over a PA link to two redundant IM 153-2 High Feature interface modules
- Field devices on the FOUNDATION Fieldbus H1 via an FF link with two redundant IM 153-2 FF interface modules
- Non-redundant PROFIBUS DP devices, e.g. ET 200S or ET 200pro remote I/O stations per Y-Link

#### I/O connection via PROFINET IO

Fault-tolerant AS 410H automation systems can be connected via PROFINET IO with remote I/O stations, for example, ET 200M remote I/O stations. Only the PROFINET interfaces integrated in the CPUs can be used for this on the automation system.

The maximum availability with minimum error reaction times is achieved by the AS 410H when used in conjunction with system redundancy of the I/O devices. System redundancy refers to a type of PROFINET IO communication in which each I/O device establishes a communication link to each of the two CPUs of an AS 410H over the topological network. Then, the failure of a CPU does not automatically lead to failure of the connected I/O devices.



PROFINET IO communication with system redundancy

G\_PCS7\_XX\_00322

#### Design (continued)

##### Industrial Ethernet (IE) plant bus communication

If the PROFINET interface integrated in the CPUs of the AS 410H is not used for PROFINET IO, it can also be used for the connection to the Industrial Ethernet plant bus. Otherwise, the two subsystems of the AS 410H can be connected to the plant bus via one CP 443-1 communication module each.

The plant bus can be implemented in the form of a ring structure, which can also be configured with redundant architecture if the availability requirements are high. When there are two redundant rings it makes sense to use two communications processors in each case and to distribute their connections between the two rings (4-way connection). Double faults such as failure of the switch on ring 1 with simultaneous interruption of the bus cable on ring 2 can thus be tolerated.

##### Runtime licenses

With SIMATIC PCS 7 Industry Library Runtime and the SIMATIC PCS 7 AS Runtime license, the automation systems are equipped with 100 process objects (PO) on delivery. The number of process objects can be extended by additional Runtime licenses for 100, 1 000 or 10 000 POs. The process objects of additional Runtime licenses can be added to process objects which already exist. The number and type (e.g. 100 or 1000) of additional Runtime licenses are irrelevant.

#### Ordering data

	Order no.					
<b>AS 410H (Redundancy Station)</b> 2 x CPU 410-5H with PROFIBUS DP and PROFINET IO interface 32 MB RAM (16 MB each for program and data) with SIMATIC PCS 7 AS Runtime license for 100 PO and SIMATIC PCS 7 Industry Library Runtime license	6ES7654-					
	C			-		F
<b>Type of delivery</b>						
• Individual components, not pre-assembled	5					
• Pre-assembled and tested	6					
<b>System expansion card</b>						
• System expansion card 100 PO		J				
• System expansion card 500 PO		L				
• System expansion card 1 000 PO		N				
• System expansion card 1 600 PO		P				
• System expansion card PO 2k+ (≥ 2 000)		Q				
<b>Sync modules and cables</b>						
• 2 x 2 sync modules for distances up to 10 m and 2 x FO sync cable, 1 m			3			
• 2 x 2 sync modules for up to 10 km and 2 x FO sync cable, 1 m, for testing			4			
<b>Additional Industrial Ethernet interfaces<sup>1)</sup></b>						
• Without CP 443-1				0		
• 1 x CP 443-1				3		
• 2 x CP 443-1				4		
<b>Racks</b>						
• 1 x UR2-H (2 x 9 slots), aluminum <sup>1)</sup>					1	
• 1 x UR2-H (2 x 9 slots), steel <sup>1)</sup>					2	
• 2 x UR2 (9 slots), aluminum <sup>1)</sup>					3	
• 2 x UR2 (9 slots), steel <sup>1)</sup>					4	
<b>Power supply (without backup batteries)</b>						
• 2 x PS 407, 10 A for 120/230 V AC/DC						B
• 2 x PS 407, 10 A for 120/230 V AC/DC, optional redundancy						C
• 2 x PS 407, 20 A for 120/230 V AC/DC						D
• 2 x 2 PS 407, 10 A for 120/230 V AC/DC, redundant						E
• 2 x PS 405, 10 A for 24 V DC						G
• 2 x PS 405, 10 A for 24 V DC, optional redundancy						H
• 2 x PS 405, 20 A for 24 V DC						J
• 2 x 2 PS 405, 10 A for 24 V DC, redundant						K
<b>Additional PROFIBUS DP interfaces<sup>1)</sup></b>						
• Without CP 443-5 Extended						0
• 2 x 1 CP 443-5 Extended						1
• 2 x 2 CP 443-5 Extended						2
• 2 x 3 CP 443-5 Extended						3
• 2 x 4 CP 443-5 Extended						4

<sup>1)</sup> In configurations with UR2/UR2-H racks, up to 5 CPs (Industrial Ethernet/PROFIBUS) can be configured with a single power supply, or up to 3 CPs for each subsystem with a redundant power supply.

# Automation systems

## S7-400 modular systems

### Fault-tolerant Automation Systems

#### Ordering data

#### Order No.

#### Order No.

#### Individual components

Ordering data	Order No.	Ordering data	Order No.
<b>Individual components of the fault-tolerant SIMATIC PCS 7 AS 410H automation systems</b>		<b>CP 443-1</b> Communication module for connecting SIMATIC S7-400 to Industrial Ethernet through TCP/IP, ISO and UDP; PROFINET IO Controller, MRP; integrated real-time switch ERTEC with 2 ports; 2 x RJ45 interface; S7 communication, open communication (SEND/RECEIVE) with FETCH/WRITE, with or without RFC 1006, DHCP, SNMP V2, diagnostics, multicast, access protection over IP access list, initialization over LAN 10/100 Mbps with electronic manual on DVD	<b>6GK7443-1EX30-0XE0</b>
<b>CPU 410-5H Process Automation</b> 32 MB RAM integrated (16 MB each for program and data); module occupies 2 slots	<b>6ES7410-5HX08-0AB0</b>	<b>CP 443-5 Extended</b> Communications processor for connection of SIMATIC S7-400 to PROFIBUS as DP master or for S7 communication, for increasing the number of DP lines, for data set routing with SIMATIC PDM and for 10-ms time stamp, electronic manual on CD; module occupies 1 slot	<b>6GK7443-5DX05-0XE0</b>
<b>CPU 410-5H Process Automation 100 PO Bundle</b> CPU bundle, consisting of CPU 410-5H Process Automation and system expansion card for 100 PO	<b>6ES7654-5CJ00-0XF0</b>	<b>PS 407 power supply module; 10 A</b> 120/230 V AC/DC; 5 V DC/10 A, 24 V DC/1 A; with battery compartment for 2 backup batteries, module occupies 2 slots	<b>6ES7407-0KA02-0AA0</b>
<b>CPU 410-5H Process Automation 500 PO Bundle</b> CPU bundle, consisting of CPU 410-5H Process Automation and system expansion card for 500 PO	<b>6ES7654-5CL00-0XF0</b>	<b>PS 407 power supply module; 10 A, optional redundancy</b> 120/230 V AC/DC; 5 V DC/10 A, 24 V DC/1 A; with battery compartment for 2 backup batteries, module occupies 2 slots	<b>6ES7407-0KR02-0AA0</b>
<b>CPU 410-5H Process Automation 1 000 PO Bundle</b> CPU bundle, consisting of CPU 410-5H Process Automation and system expansion card for 1 000 PO	<b>6ES7654-5CN00-0XF0</b>	<b>PS 407 power supply module; 20 A</b> 120/230 V AC/DC; 5 V DC/20 A, 24 V DC/1 A; with battery compartment for 2 backup batteries, module occupies 2 slots	<b>6ES7407-0RA02-0AA0</b>
<b>CPU 410-5H Process Automation 1 600 PO Bundle</b> CPU bundle, consisting of CPU 410-5H Process Automation and system expansion card for 1 600 PO	<b>6ES7654-5CP00-0XF0</b>	<b>PS 405 power supply module; 10 A</b> 24 V DC; 5 V DC/10 A, 24 V DC/1 A; with battery compartment for 2 backup batteries, module occupies 2 slots	<b>6ES7405-0KA02-0AA0</b>
<b>CPU 410-5H Process Automation PO 2k+ Bundle</b> CPU bundle, consisting of CPU 410-5H Process Automation and system expansion card for PO 2k+ (≥ 2 000)	<b>6ES7654-5CQ00-0XF0</b>	<b>PS 405 power supply module; 10 A, optional redundancy</b> 24 V DC; 5 V DC/10 A, 24 V DC/1 A; with battery compartment for 2 backup batteries, module occupies 2 slots	<b>6ES7405-0KR02-0AA0</b>
<b>Sync set</b> For coupling two redundant CPUs, for distances up to <ul style="list-style-type: none"> <li>• 10 m, consisting of 4 sync modules for up to 10 m and 2 fiber-optic sync cables, 1 m each</li> <li>• 10 km, consisting of 4 sync modules for up to 10 km Note: please order fiber-optic sync cables (2 units) in the required length separately.</li> </ul>	<b>6ES7656-7XX30-0XE0</b>  <b>6ES7656-7XX40-0XE0</b>	<b>PS 405 power supply module; 20 A</b> 24 V DC; 5 V DC/20 A, 24 V DC/1 A; with battery compartment for 2 backup batteries, module occupies 2 slots	<b>6ES7405-0RA02-0AA0</b>
<b>Sync module</b> For coupling two redundant CPUs; 2 modules required for each CPU; for distances up to <ul style="list-style-type: none"> <li>• 10 m</li> <li>• 10 km</li> </ul>	<b>6ES7960-1AA06-0XA0</b> <b>6ES7960-1AB06-0XA0</b>	<b>PS 405 power supply module; 20 A</b> 24 V DC; 5 V DC/20 A, 24 V DC/1 A; with battery compartment for 2 backup batteries, module occupies 2 slots	<b>6ES7405-0RA02-0AA0</b>
<b>Sync cable (fiber-optic cable)</b> For connecting two redundant CPUs, 2 cables required for each redundant automation system <ul style="list-style-type: none"> <li>• 1 m</li> <li>• 2 m</li> <li>• 10 m</li> </ul> Other lengths	<b>6ES7960-1AA04-5AA0</b> <b>6ES7960-1AA04-5BA0</b> <b>6ES7960-1AA04-5KA0</b>  On request		

Ordering data	Order No.		Order No.
<b>Backup battery</b> Type AA, 2.3 Ah	6ES7971-0BA00	<b>Runtime licenses for SIMATIC PCS 7 automation systems</b> (can be added to existing licenses)	
<b>Aluminum UR1 rack</b> 18 slots	6ES7400-1TA11-0AA0	<b>SIMATIC PCS 7 AS Runtime license</b> Independent of language, floating license for 1 user	
<b>Aluminum UR2 rack</b> 9 slots	6ES7400-1JA11-0AA0	• Delivery form package (without SIMATIC PCS 7 Software Media Package) License key USB stick, certificate of license	
<b>Aluminum UR2-H rack</b> For split central controllers; 2 x 9 slots	6ES7400-2JA10-0AA0	- 100 PO	6ES7653-2BA00-0XB5
<b>Steel UR1 rack</b> 18 slots	6ES7400-1TA01-0AA0	- 1 000 PO	6ES7653-2BB00-0XB5
<b>Steel UR2 rack</b> 9 slots	6ES7400-1JA01-0AA0	- 10 000 PO	6ES7653-2BC00-0XB5
<b>Steel UR2-H rack</b> For split central controllers; 2 x 9 slots	6ES7400-2JA00-0AA0	• Delivery form online (without SIMATIC PCS 7 Software Media Package) License key download, online certificate of license <u>Note:</u> E-mail address required!	
		- 100 PO	6ES7653-2BA00-0XH5
		- 1 000 PO	6ES7653-2BB00-0XH5
		- 10 000 PO	6ES7653-2BC00-0XH5
		<b>Y-Link</b>	
		<b>Y-Link</b> For connection of devices with only 1 PROFIBUS DP interface to a redundant automation system	6ES7197-1LA11-0XA0

## Options

### Y-Link

- Bus coupler for transition from a redundant PROFIBUS DP master system to a single-channel PROFIBUS DP master system
- For connection of devices with only one PROFIBUS DP interface to the redundant PROFIBUS DP master system

The Y-link comprises:

- Two IM 153-2 High Feature interface modules for extended temperature range
- One Y coupler including RS 485 repeater
- One BM IM157 (IM/IM) bus module for two IM 153-2 High Feature modules, for extended temperature range
- One BM Y coupler bus module

Evaluation of the Y-Link diagnostics (and hence indirectly of the connected DP standard slaves) is supported by driver blocks.

# Automation systems

## S7-400 modular systems

### Safety-related automation systems

#### Overview



AS Single Station AS 410F

Safety-related automation systems are used for critical applications where a fault could endanger life or result in damage to the plant or the environment. These F/FH systems also referred to as "fail-safe automation systems" detect both faults in the process and their own internal faults in association with the safety-related F modules of the ET 200 distributed I/O systems or fail-safe transmitters connected directly via the fieldbus. They automatically transfer the plant to a safe state in the event of a fault.

#### Design

The PROFIsafe profile allows safety-related communication between the automation system (controller) and the process I/O via both PROFIBUS and PROFINET. The decision for choosing either PROFINET IO or the PROFIBUS DP/PA fieldbuses has a significant influence on the architecture of the safety-related system.

For information on the safety-related design versions with PROFIBUS DP/PA and PROFINET IO, refer to the section "Introduction" in the "Safety Integrated for Process Automation" chapter 15.

The safety-related SIMATIC PCS 7 automation systems are based either on the hardware of the AS 410S standard automation system (F systems) or the hardware of the AS 410H fault-tolerant automation system (FH systems) which have been supplemented with safety functions using S7 F systems.

In accordance with the design variant, they are categorized as:

- **AS Single Station AS 410F** with only one CPU (safety-related)
- **AS Redundancy Station AS 410FH** with two redundant CPUs (safety-related and fault-tolerant)

The availability can be flexibly increased with a redundant design for the power supply or the Industrial Ethernet communications module (for details, see the section "Modular S7-400 systems" under "Flexible and scalable availability").

All AS 410F/FH systems are TÜV-certified and comply with the safety requirements up to SIL 3 according to IEC 61508.

In these systems with multitasking capability, several programs can be executed simultaneously in one CPU – basic process control (BPCS) applications or also safety-related applications. The programs are reaction-free, i.e. faults in BPCS applications have no effect on safety-related applications, and vice versa. Special tasks with very short response times can also be implemented.

The redundant FH systems operating according to the 1-out-of-2 principle consist of two subsystems of identical design. These are electrically isolated from each other to achieve optimum EMC, and are synchronized with each other via fiber-optic cables. A bumpless switchover is made from the active subsystem to the standby subsystem in the event of a fault. The two subsystems can be present in the same rack or separated by up to 10 km. The spatial separation provides additional security in the case of extreme influences in the environment of the active subsystem, e.g. resulting from a fire.

The redundancy of the FH systems is only used to increase the availability. It is not relevant to processing of the safety functions and the associated fault detection.

**Design** (continued)**Individual configuration of AS bundles**

The configuration of the safety-related automation systems and their order numbers can be defined by selecting pre-configured ordering units.

Typical combinations for the respective system can be selected using tables in the section "Selection and ordering data". These are divided into:

- AS Single Station AS 410F with one CPU
- AS Redundancy Station AS 410FH with two redundant CPUs, mounted on one common rack (UR2-H) or two separate racks (UR2)

The complete range for selection is available using two correspondingly structured online configurators in the Industry Mall ([www.siemens.com/industrymall](http://www.siemens.com/industrymall)):

- SIMATIC PCS 7 AS 410 Single Station configurator
- SIMATIC PCS 7 AS 410 Redundancy Station configurator

System expansion cards including an S7 F systems Runtime license should be selected here for safety-related AS 410 F/FH automation systems.

FO sync cables longer than 1 m must always be ordered separately (2 cables required in each case).

The components suitable for engineering the safety-related applications can be ordered in the chapter 15 "Safety Integrated for Process Automation":

- S7 F Systems  
F programming tool with F block library for programming safety-related user programs on the engineering system
- SIMATIC Safety Matrix  
Convenient safety lifecycle tool for configuration, operation and servicing

**I/O connection via PROFIBUS DP**

The distributed process I/O can be integrated into a PROFIBUS DP segment either directly or via a lower-level PROFIBUS PA fieldbus. Several PROFIBUS DP segments with distributed process I/Os can be operated on an AS 410F/FH automation system.

A PROFIBUS DP interface is already integrated in each CPU 410-5H Process Automation. Using the online configurator in the Industry Mall or in the selection and ordering data, up to four additional PROFIBUS DP interfaces can be configured with additive CP 443-5 PROFIBUS DP interfaces for each AS 410F as well as for each subsystem of the AS 410FH.

Connection of the process I/Os to two redundant PROFIBUS DP lines of an FH system (AS Redundancy Station) is carried out as described in the section "Fault-tolerant automation systems".

The FOUNDATION Fieldbus (FF) H1 and the FF devices are not supported by Safety Integrated for Process Automation.

**I/O connection via PROFINET IO**

Safety-related AS 410F/FH automation systems can be connected via PROFINET IO with remote I/O stations, for example, ET 200M remote I/O stations. Only the PROFINET interface (2-port switch) integrated in the CPU can be used for this on the automation system. For additional information, refer to section "Introduction" in the "Safety Integrated for Process Automation" chapter 15.

**Communication over the plant bus**

If the PROFINET interface integrated in the CPU of the safety-related automation systems is not used for PROFINET IO, it is available for connection to the Industrial Ethernet plant bus. Otherwise, the AS 410F and the two subsystems of the AS 410FH can be connected to the plant bus via one CP 443-1 communication module each.

The plant bus can be implemented in the form of a ring structure, which can also be configured with redundant architecture if the availability requirements are high. When there are two redundant rings, it makes sense to use two communication modules per AS (AS 410F) or AS subsystem (AS 410FH) and to distribute their connections over the two rings (4-way connection). Double faults such as failure of the switch on ring 1 with simultaneous interruption of the bus cable on ring 2 can thus be tolerated.

**Runtime licenses**

In the factory state, safety-related automation systems come with a SIMATIC PCS 7 AS Runtime license for 100 process objects (PO), SIMATIC PCS 7 Industry Library Runtime and the S7 F systems RT license. The 100 POs of the SIMATIC PCS 7 AS Runtime license can be expanded by additional Runtime licenses for 100, 1 000 or 10 000 POs. The process objects of additional Runtime licenses can be added to process objects which already exist. The number and type (e.g. 100 or 1000) of additional Runtime licenses are irrelevant.

# Automation systems

## S7-400 modular systems

### Safety-related automation systems

#### Ordering data

	Order no.						
<b>AS 410F (Single Station)</b> CPU 410-5H with PROFIBUS DP and PROFINET IO interface 32 MB RAM (16 MB each for program and data) with SIMATIC PCS 7 AS Runtime license for 100 PO and SIMATIC PCS 7 Industry Library Runtime license	6ES7654-						
	C	0	-	F			
<b>Type of delivery</b>							
• Individual components, not pre-assembled	5						
• Pre-assembled and tested	6						
<b>System expansion card</b>							
• System expansion card 100 PO including S7 F systems Runtime license	A						
• System expansion card 500 PO including S7 F systems Runtime license	C						
• System expansion card 1 000 PO including S7 F systems Runtime license	E						
• System expansion card 1 600 PO including S7 F systems Runtime license	F						
• System expansion card PO 2k+ (≥ 2 000) including S7 F systems Runtime license	G						
<b>Additional Industrial Ethernet interfaces<sup>1)</sup></b>							
• Without CP 443-1		0					
• 1 x CP 443-1		3					
• 2 x CP 443-1		4					
<b>Racks</b>							
• UR2 (9 slots), aluminum <sup>1)</sup>			3				
• UR2 (9 slots), steel <sup>1)</sup>			4				
• UR1 (18 slots), aluminum			5				
• UR1 (18 slots), steel			6				
<b>Power supply (without backup batteries)</b>							
• 1 x PS 407, 10 A for 120/230 V AC/DC				B			
• 1 x PS 407, 10 A for 120/230 V AC/DC, optional redundancy				C			
• 1 x PS 407, 20 A for 120/230 V AC/DC				D			
• 2 x PS 407, 10 A for 120/230 V AC/DC, redundant				E			
• 1 x PS 405, 10 A for 24 V DC				G			
• 1 x PS 405, 10 A for 24 V DC, optional redundancy				H			
• 1 x PS 405, 20 A for 24 V DC				J			
• 2 x PS 405, 10 A for 24 V DC, redundant				K			
<b>Additional PROFIBUS DP interfaces<sup>1)</sup></b>							
• Without CP 443-5 Extended						0	
• 1 x CP 443-5 Extended						1	
• 2 x CP 443-5 Extended						2	
• 3 x CP 443-5 Extended						3	
• 4 x CP 443-5 Extended						4	

<sup>1)</sup> Up to 5 CPs (Industrial Ethernet/PROFIBUS) can be plugged into the UR2 rack with a single power supply, or up to 3 with a redundant power supply.

	Order no.						
<b>AS 410FH (Redundancy Station)</b> 2 x CPU 410-5H with PROFIBUS DP and PROFINET IO interface 32 MB RAM (16 MB each for program and data) with SIMATIC PCS 7 AS Runtime license for 100 PO and SIMATIC PCS 7 Industry Library Runtime license	6ES7654-						
	C	0	-	F			
<b>Type of delivery</b>							
• Individual components, not pre-assembled	5						
• Pre-assembled and tested	6						
<b>System expansion card</b>							
• 2 x system expansion card 100 PO including S7 F systems Runtime license	A						
• 2 x system expansion card 500 PO including S7 F systems Runtime license	C						
• 2 x system expansion card 1 000 PO including S7 F systems Runtime license	E						
• 2 x system expansion card 1 600 PO including S7 F systems Runtime license	F						
• 2 x system expansion card PO 2k+ (≥ 2 000) including S7 F systems Runtime license	G						
<b>Sync modules and cables</b>							
• 2 x 2 sync modules for distances up to 10 m and 2 x FO sync cable, 1 m			3				
• 2 x 2 sync modules for up to 10 km and 2 x FO sync cable, 1 m, for testing			4				
<b>Additional Industrial Ethernet interfaces<sup>1)</sup></b>							
• Without CP 443-1			0				
• 2 x CP 443-1			3				
• 2 x 2 CP 443-1			4				
<b>Racks</b>							
• 1 x UR2-H (2 x 9 slots), aluminum <sup>1)</sup>						1	
• 1 x UR2-H (2 x 9 slots), steel <sup>1)</sup>						2	
• 2 x UR2 (9 slots), aluminum <sup>1)</sup>						3	
• 2 x UR2 (9 slots), steel <sup>1)</sup>						4	
<b>Power supply (without backup batteries)</b>							
• 2 x PS 407, 10 A for 120/230 V AC/DC						B	
• 2 x PS 407, 10 A for 120/230 V AC/DC, optional redundancy						C	
• 2 x PS 407, 20 A for 120/230 V AC/DC						D	
• 2 x PS 407, 10 A for 120/230 V AC/DC, redundant						E	
• 2 x PS 405, 10 A for 24 V DC						G	
• 2 x PS 405, 10 A for 24 V DC, optional redundancy						H	
• 2 x PS 405, 20 A for 24 V DC						J	
• 2 x 2 PS 405, 10 A for 24 V DC, redundant						K	
<b>Additional PROFIBUS DP interfaces<sup>1)</sup></b>							
• Without CP 443-5 Extended							0
• 2 x 1 CP 443-5 Extended							1
• 2 x 2 CP 443-5 Extended							2
• 2 x 3 CP 443-5 Extended							3
• 2 x 4 CP 443-5 Extended							4

<sup>2)</sup> In configurations with UR2/UR2-H racks, up to 5 CPs (Industrial Ethernet/PROFIBUS) can be configured with a single power supply, or up to 3 CPs for each subsystem with a redundant power supply.



Ordering data	Order No.	Order No.
<b>Individual components</b>		
<b>Individual components of the safety-related SIMATIC PCS 7 automation systems AS 410F and AS 410FH</b>		
<b>S7 F Systems RT License</b> For processing safety-related application programs, for one AS 410F/FH system each	6ES7833-1CC00-6YX0	
<b>CPU 410-5H Process Automation</b> 32 MB RAM integrated (16 MB each for program and data); module occupies 2 slots	6ES7410-5HX08-0AB0	
<b>CPU 410-5H Process Automation 100 PO Bundle</b> CPU bundle, consisting of CPU 410-5H Process Automation and system expansion card for 100 PO	6ES7654-5CJ00-0XF0	
<b>CPU 410-5H Process Automation 500 PO Bundle</b> CPU bundle, consisting of CPU 410-5H Process Automation and system expansion card for 500 PO	6ES7654-5CL00-0XF0	
<b>CPU 410-5H Process Automation 1 000 PO Bundle</b> CPU bundle, consisting of CPU 410-5H Process Automation and system expansion card for 1 000 PO	6ES7654-5CN00-0XF0	
<b>CPU 410-5H Process Automation 1 600 PO Bundle</b> CPU bundle, consisting of CPU 410-5H Process Automation and system expansion card for 1 600 PO	6ES7654-5CP00-0XF0	
<b>CPU 410-5H Process Automation PO 2k+ Bundle</b> CPU bundle, consisting of CPU 410-5H Process Automation and system expansion card for PO 2k+ (≥ 2 000)	6ES7654-5CQ00-0XF0	
<b>Sync set</b> For coupling two redundant CPUs, for distances up to <ul style="list-style-type: none"> <li>• 10 m, consisting of 4 sync modules for up to 10 m and 2 fiber-optic sync cables, 1 m each</li> <li>• 10 km, consisting of 4 sync modules for up to 10 km</li> </ul> Note: please order fiber-optic sync cables (2 units) in the required length separately.	6ES7656-7XX30-0XE0  6ES7656-7XX40-0XE0	
<b>Sync module</b> For coupling two redundant CPUs, 2 modules required for each CPU, for distances up to <ul style="list-style-type: none"> <li>• 10 m</li> <li>• 10 km</li> </ul>	6ES7960-1AA06-0XA0 6ES7960-1AB06-0XA0	
<b>Sync cable (fiber-optic cable)</b> For connecting two redundant CPUs, 2 cables required for each redundant automation system <ul style="list-style-type: none"> <li>• 1 m</li> <li>• 2 m</li> <li>• 10 m</li> </ul> Other lengths	6ES7960-1AA04-5AA0 6ES7960-1AA04-5BA0 6ES7960-1AA04-5KA0  On request	
<b>CP 443-1</b> Communication module for connecting SIMATIC S7-400 to Industrial Ethernet through TCP/IP, ISO and UDP; PROFINET IO Controller, MRP; integrated real-time switch ERTEC with 2 ports; 2 x RJ45 interface; S7 communication, open communication (SEND/RECEIVE) with FETCH/WRITE, with or without RFC 1006, DHCP, SNMP V2, diagnostics, multicast, access protection over IP access list, initialization over LAN 10/100 Mbps with electronic manual on DVD		6GK7443-1EX30-0XE0
<b>CP 443-5 Extended</b> Communication module for connection of SIMATIC S7-400 to PROFIBUS as DP master or for S7 communication, for increasing the number of DP lines, for data set routing with SIMATIC PDM and for 10-ms time stamp, electronic manual on CD; module occupies 1 slot		6GK7443-5DX05-0XE0
<b>PS 407 power supply module; 10 A</b> 120/230 V AC/DC; 5 V DC/10 A, 24 V DC/1 A; with battery compartment for 2 backup batteries, module occupies 2 slots		6ES7407-0KA02-0AA0
<b>PS 407 power supply module; 10 A, optional redundancy</b> 120/230 V AC/DC; 5 V DC/10 A, 24 V DC/1 A; with battery compartment for 2 backup batteries, module occupies 2 slots		6ES7407-0KR02-0AA0
<b>PS 407 power supply module; 20 A</b> 120/230 V AC/DC; 5 V DC/20 A, 24 V DC/1 A; with battery compartment for 2 backup batteries, module occupies 2 slots		6ES7407-0RA02-0AA0
<b>PS 405 power supply module; 10 A</b> 24 V DC; 5 V DC/10 A, 24 V DC/1 A; with battery compartment for 2 backup batteries, module occupies 2 slots		6ES7405-0KA02-0AA0
<b>PS 405 power supply module; 10 A, optional redundancy</b> 24 V DC; 5 V DC/10 A, 24 V DC/1 A; with battery compartment for 2 backup batteries, module occupies 2 slots		6ES7405-0KR02-0AA0
<b>PS 405 power supply module; 20 A</b> 24 V DC; 5 V DC/20 A, 24 V DC/1 A; with battery compartment for 2 backup batteries, module occupies 2 slots		6ES7405-0RA02-0AA0

# Automation systems

## S7-400 modular systems

### Safety-related automation systems

Ordering data	Order No.		Order No.
<b>Backup battery</b> Type AA, 2.3 Ah	6ES7971-0BA00	<b>Runtime licenses for SIMATIC PCS 7 automation systems</b> (can be added to existing licenses)	
<b>Aluminum UR1 rack</b> 18 slots	6ES7400-1TA11-0AA0	<b>SIMATIC PCS 7 AS Runtime license</b> Independent of language, floating license for 1 user	
<b>Aluminum UR2 rack</b> 9 slots	6ES7400-1JA11-0AA0	<ul style="list-style-type: none"> <li>• Delivery form package (without SIMATIC PCS 7 Software Media Package) License key USB stick, certificate of license               <ul style="list-style-type: none"> <li>- 100 PO</li> <li>- 1 000 PO</li> <li>- 10 000 PO</li> </ul> </li> </ul>	<b>6ES7653-2BA00-0XB5</b> <b>6ES7653-2BB00-0XB5</b> <b>6ES7653-2BC00-0XB5</b>
<b>Aluminum UR2-H rack</b> For split central controllers; 2 x 9 slots	6ES7400-2JA10-0AA0	<ul style="list-style-type: none"> <li>• Delivery form online (without SIMATIC PCS 7 Software Media Package) License key download, online certificate of license <b>Note:</b> E-mail address required!               <ul style="list-style-type: none"> <li>- 100 PO</li> <li>- 1 000 PO</li> <li>- 10 000 PO</li> </ul> </li> </ul>	<b>6ES7653-2BA00-0XH5</b> <b>6ES7653-2BB00-0XH5</b> <b>6ES7653-2BC00-0XH5</b>
<b>Steel UR1 rack</b> 18 slots	6ES7400-1TA01-0AA0	<b>AS 410F/FH Engineering</b> See chapter "Safety Integrated for Process Automation", S7 F Systems, page 15/5	
<b>Steel UR2 rack</b> 9 slots	6ES7400-1JA01-0AA0	<b>Y-Link</b>	
<b>Steel UR2-H rack</b> For split central controllers; 2 x 9 slots	6ES7400-2JA00-0AA0	<b>Y-Link</b> For connection of devices with only one PROFIBUS DP interface to a redundant automation system	<b>6ES7197-1LA11-0XA0</b>

















