SIEMENS

SIMATIC S5

Analog Input Modules

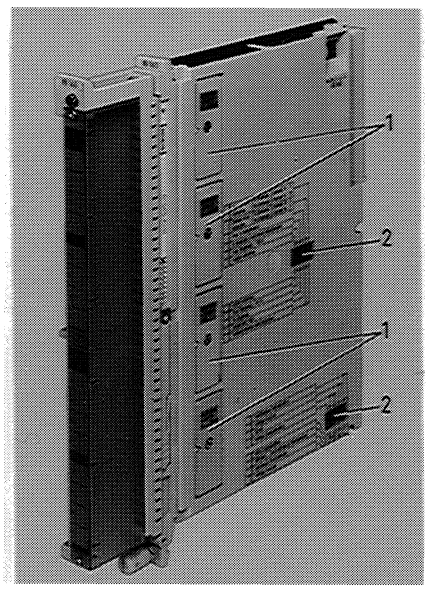
6ES5460-4UA1.
6ES5463-4U.1.
6ES5465-4UA1.

Analog Output Modules

6ES5470-4U.1.

Instructions

C79000-B8576-C300-06



1 Range submodules
2 Mode switch

Fig. 1 Analog input module 6ES5465-4UA11

Type of module	Number of inputs	Electrical isolation/groups	Order no. of the module	Range submodules (4 channels)	Order No. of the range submodule	Technical data on page
Analog input and submodules	8 16/8	Yes/8 inputs referred to 0 V and between each other No/none	6ES5460-4UA11 -4UA12 6ES5465-4UA11 -4UA12	50/500 mV/Pt 100 12.5/50/500mV/Pt100 50/500 mV/Pt 100 ±1 V ±10 V ±20 mA 4 to 20 mA ±5 V 4 to 20 mA/4-wire transducer	6ES5498-1AA11 6ES5498-1AA11 6ES5498-1AA11 6ES5498-1AA21 6ES5498-1AA31 6ES5498-1AA41 6ES5498-1AA51 6ES5498-1AA61 6ES5498-1AA71	5-1 5-6 5-14 5-19
Analog input	4	Yes/4 inputs referred to 0 V and between each other	6ES5463-4UA11 -4UA12 -4UB11 -4UB12	Ranges 1 V, 10 V, 20 mA, 4 to 20 mA		5-11
	Outputs			Output range		
Analog output	8 8 8	Yes/8 outputs referred to 0 V Yes/8 outputs referred to 0 V Yes/8 outputs referred to 0 V	6ES5470-4UA11 -4UA12 6ES5470-4UB11 -4UB12 6ES5470-4UC11 -4UC12	±10 V/0 to 20 mA ±10 V 1 to 5 V/4 to 20 mA		5-25 5-25 5-25

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scanned one after the other by the STEP-5 program via the bus, using word instructions. The analog input module 463 thus occupies an address area of 8 bytes.

The measured values of the channels are stored under subaddresses ADB 0 to 2 as shown in the following table.

Module address					Subaddress			
					0	0	0	high-order byte, channel 0
					0	0	1	low-order byte, channel 0
					0	1	0	high-order byte, channel 1
					0	1	1	low-order byte, channel 1
					1	0	0	high-order byte, channel 2
					1	0	1	low-order byte, channel 2
					1	1	0	high-order byte, channel 3
					1	1	1	low-order byte, channel 3
ADB 7	ADB 6	ADB 5	ADB 4	ADB 3	ADB 2	ADB 1	ADB 0	

The module address is set via a switch fitted on the module cover (see Chapter 1.3 and 3.1).

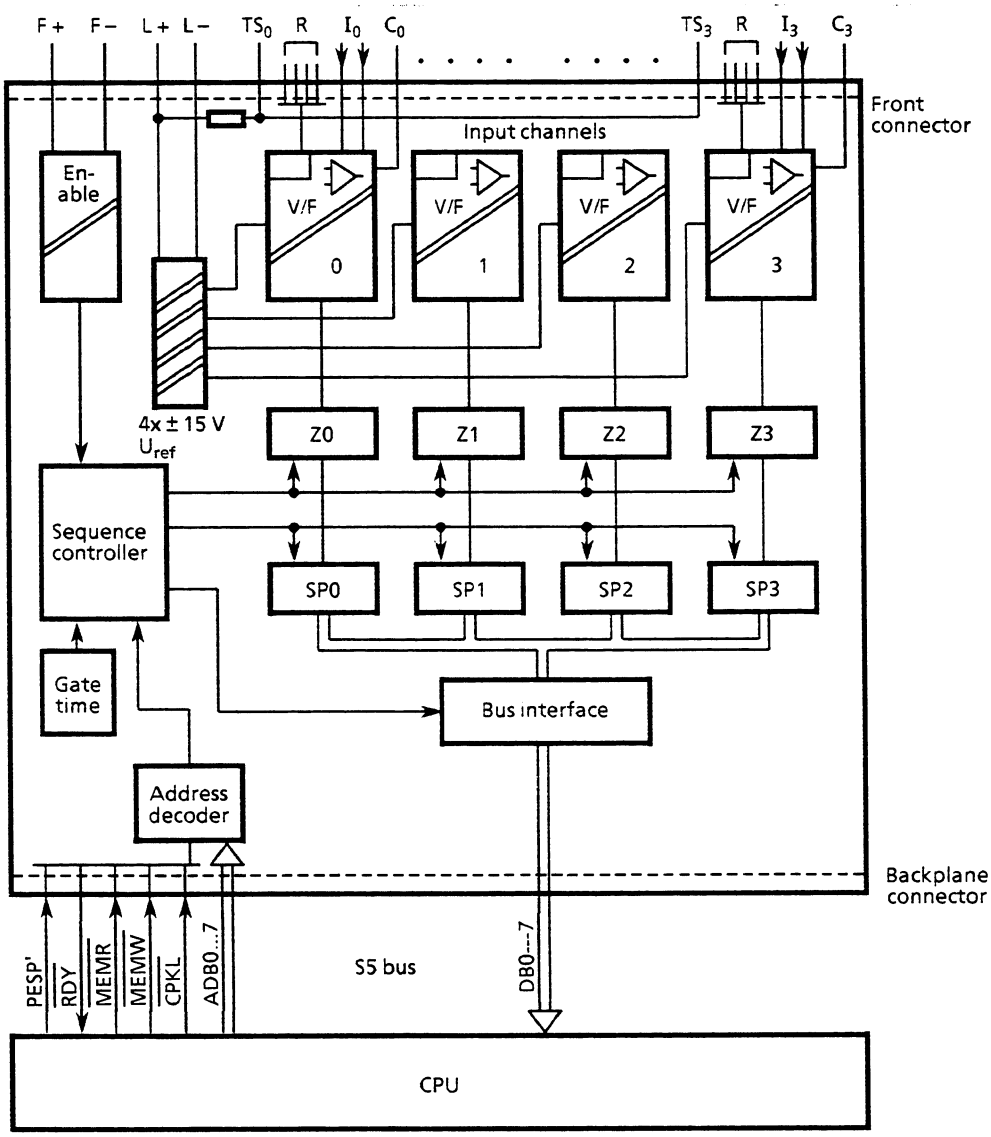
The analog input converts the analog value into the following data format as two's complement:

VZ	2^{10}	2^9	2^8	2^7	2^6	2^5	2^4

High-order byte

2^3	2^2	2^1	2^0	0	0	0	]

Low-order byte



$C_{0...3}$	Common input (reference potential of inputs 0 to 3)	$TS_{0...3}$	Transducer supply (supply for 2-wire transducer of inputs 0 to 3)
$I_{0...3}$	Inputs 0 to 3	V/F	Voltage/frequency converter
R	Range		
Sp	Memory	Z	Counter

Fig. 4 Block diagram of analog input module 463

1.4 Function of the Enable Inputs

An enable circuit is provided on the modules of the U series. By means of the enable inputs, certain modules can be interlocked or individual modules can be switched off while the CC is in operation.

Analog input/output modules are activated by applying an external voltage of 24 V to the inputs F+/F-. If no voltage is applied to F+/F-, no acknowledgement is output by the modules. With analog output modules, the analog value which has been output last remains stored.

With -4U.12-type modules, this enable function can be switched off by removing a plug-in jumper. Then the modules will be activated by request of the bus, irrespective of the voltage applied to F+/F-.

When the front connector is withdrawn from the front of the module the voltage to the enable inputs is lost. The module is switched off and sends no further acknowledgement signal. This means that the CC sets an acknowledgement delay bit (QVZ) (time-out).

Examples of the uses of the enable inputs:

- Switching off individual parts of a process; that means that analog outputs of different modules can be operated from a common load current supply and still be activated separately.

- The load voltage of individual modules can be monitored without additional effort. Reactions to load voltage failure can then be programmed in the QVZ organization block.

Please note the following design factors:

Switch on: The voltage on the enable inputs of the I/O modules must be present within 100 ms of switching the PC on.

Switch off: After switching off the PC the voltage on the enable inputs of the I/O modules must be present for as long as the internal 5 V is provided.
However, you need to switch off the 24-V load current supply for the analog output modules together with the PC. If the power supply is still applied to the modules and the PC is switched off, the analog output values might drift. (In this case, the analog sample-and-hold elements of the outputs are not updated any more since the 5 V supplied to the modules by the bus is missing.)

Please note the following when switching off the CC and devices supplying the enable inputs:

1.5 Pin Assignments of the Backplane Connector

	b	z
2	0 V	+5 V
4	PESP'	
6	ADB 0	CPKL
8	ADB 1	MEMR
10	ADB 2	MEMW
12	ADB 3	RDY
14	ADB 4	DB 0
16	ADB 5	DB 1
18	ADB 6	DB 2
20	ADB 7	DB 3
22	ADB 8	DB 4
24	ADB 9	DB 5
26	ADB 10	DB 6
28	ADB 11	DB 7
30		
32	0 V	

ADB	Address bus
CPKL	CPU ready signal
DB	Data bus (bidirectional)
MEMR	Memory read (read signal)
MEMW	Memory write (write signal)
PESP'	Memory I/O selection signal
RDY	Ready (acknowledgement signal)

1.6 General Technical Data

Address range	128 to 255 (0 to 255)
Supply voltage L+	
- rated value	24 V
- ripple U_{pp}	3,6 V
- permissible range (including ripple)	20 to 30 V
- reference potential	L- = M = 0 V
Voltage for the floating enable inputs (with ...-4UA12: only necessary when enable jumper is plugged in)	F+ = + 24 V F- = 0 V
Line lengths for	
- analog input modules with rated input range of ±12.5 mV and ±50 mV	Max. 50 m with cables which are shielded and segregated from power cables (see Section 2.3.)
- analog input modules with rated input range of ±500 mV/±1/±5/±10 V/±20 mA, 4 to 20 mA and Pt 100	Max. 200 m, shielded
- analog output modules	Max. 200 m, shielded
Temperature range	
- operating temperature	0 to 60°C
- storage and shipping temp.	-40 to 70°C

2 Assembly

2.1 Removing and Inserting Modules

The design of the modules and front connectors is such that the modules can be removed and inserted whilst the programmable controller or extension unit is in operation, without faults occurring when exchanging data with the neighboring modules (see also Chapter 1.3.1).

Applies only to analog input/output modules ...-4UA12:
If you insert or remove modules without an enable jumper during operation, this may lead to faults of the S5 peripheral bus.

Be sure not to remove or insert the front connector or the module without an enable jumper during operation.

A module is replaced as follows:

Detach the upper retaining rail on the subrack and swivel it upwards and out.

The front connector can be pressed out of the female connector of the module by slackening a screw in the upper part of the front connector. Contacts F+ and F- of the enable input at the upper end of the front connector are thus opened first. The module is disconnected from the S5 bus.

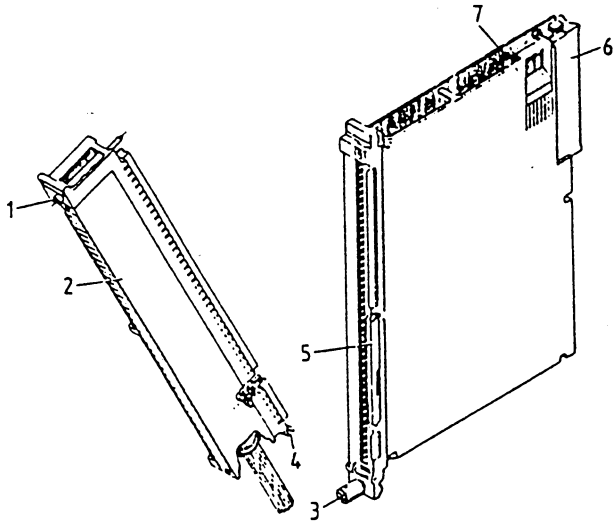
Applies only to 6ES5 ...-4UA12: When the enable jumper is removed the enable voltage is no longer effective and the module is **not** enabled by the bus.

The front connector can now be swivelled out and lifted out of the lower catch. The width of the catch is also a coding arrangement to prevent the front connector from being plugged into the wrong modules. (The front connectors with 115/240-V-AC wiring, for instance, cannot be plugged into analog or 24/60-V-DC modules.)

The module is released by turning a locking bolt by 90 degrees on the lower end of the module.

The module can be pulled out of the subrack by means of a swivel-mounted grip.

Modules are inserted in the reverse order.

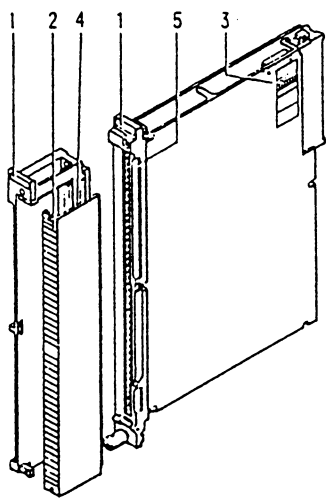


1 Screw
2 Front connector
3 Locking bolt
4 Catch
5 Grip
6 Backplane connector
7 Enable jumper
(only with ...-4UA12)

Fig. 6 Module with front connector

2.2 Module Identification Labelling

The module and CPU are supplied with labels for marking the modules and front connectors; the labels are affixed as shown in Fig. 7.



1 Label with module address under which the module is addressed by the STEP-5 program
2 Marking strip with the reference number (MLFB no.) of the module; space to tick the output status of the module and to mark the channels
3 Label with the module address and markings for the required settings of the addressing switch
4 Marking strip for the terminal assignments or connection diagrams (strip in the cover of the front connector)
5 Type label

Fig. 7 Identification and labelling of modules

2.3 Installation Guidelines

Wiring of the supply and signal lines which are connected to the programmable controllers and front connectors of the modules, must be implemented in accordance with VDE specifications 0110 and 0160.

The line shields must be connected with clamps to a shield rail in the vicinity of the front connector; this rail is connected to the casing of the controller at low impedance.

Detailed instructions relating to the power supply, cabinet arrangement, cabinet ventilation, cabinet wiring and protective measures can be found in the "Installation Guidelines" (Ref. no. C79000-B8576-C452) and must be observed.

5.3 Analog Input Module 6ES5 463-4UA11/-4UA12 and 463-4UB11/-4UB12

5.3.1 Technical Data

Rated input range (adjustable on front connector)	-0.05 to +1 V -0.5 to +10 V -1 to +20 mA +4 to 20 mA for 2-wire transd. +4 to 20 mA for 4-wire transd.
Number of inputs	4 voltage/current inputs
Measured-value representation	11 bits (two's complement) 1024 units in rated range
Overdriving range	100% (with full accuracy)
Fault signal on overflow	Yes (when overdrive is 50% or more)
Measuring principle	Integrating
Conversion principle	Voltage/frequency conversion
Electrical isolation	Yes; between 4 inputs and M and between the inputs
Permissible potential difference between reference potentials of sensors and module (U_{CM}) and between the sensors (channels)	Max. 25 V AC/60 V DC
Power supply	
- digital section from system bus	5 V $\pm$ 5%; typ. 150 mA
- analog section from load voltage	24 V, approx. 150 mA
- module enable F+/F-	24 V; approx. 7 mA
Integration time	
- 463-4UA11/-4UA12	20 ms at 50 Hz
- 463-4UB11/-4UB12	$16^2/_3$ ms at 60 Hz
Coding time per measured value	
- 463-4UA11/-4UA12	20 ms at 50 Hz
- 463-4UB11/-4UB12	$16^2/_3$ ms at 60 HZ
Cycle time for 4 measured values (max. delay time of measured-value acquisition)	
- 463-4UA11/-4UA12	20 ms at 50 Hz
- 463-4UB11/-4UB12	$16^2/_3$ ms at 60 Hz
Input impedance for input ranges	
- 1 V	> 10 Mohms
- 10 V	90 kohms
- 20 mA	50 ohms
- 4 to 20 mA	62.5 ohms

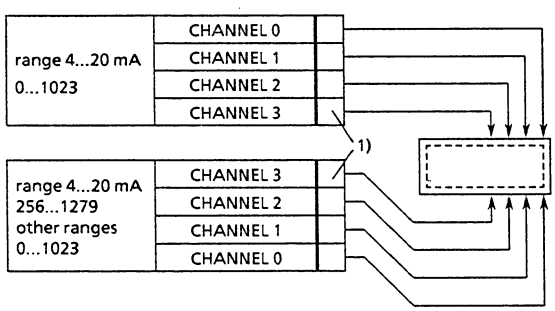
Max. permissible input voltage without destruction	±30 V; 75 V for 1 ms max. and duty factor 1:10
Noise suppression for	
- common-mode interference	≥ 80 db (f = 0 to 50 kHz)
- differential-mode interference	≥ 40 dB ($U_{St|r} \leq 0.1 * U_N$) measurement range, referred to the peak value
Error, referred to rated value	
- linearity	$\pm 5 \times 10^{-4}$
- tolerance	±1 unit
- temperature error	0.6×10^{-4}/K
Insulation voltage according to VDE 0160	Between inputs and ground point and between inputs: tested with 500 V AC
Impulse voltage test acc. to IEC 266-4	Between inputs and L-: U_s = 1 kV; 1.2/50 µs

5.3.2 Selecting the Data Format for the Range of 4 to 20 mA

When using the 4- to 20-mA inputs data representation can be selected either from 0 to 1023 bits or from 256 to 1279 bits by pressing the corresponding switch. In this case, different data formats can be selected for each of the four input channels.

When using the voltage or 0- to 20-mA inputs the corresponding switches remain in the "Off" position.

Labelling of the switches on the module cover



- Switch position "On" (pressed)

1) These fields are provided to mark the selected switch position

5.3.3 Connecting Sensors

The sensors are connected to the analog input module via shielded cables with a maximum length of 200 m. If these measuring cables are laid separately from power cables, the permissible length can be increased to 500 m.

Voltage sensors, current sensors, 2-wire and 4-wire transducers can be connected in any combination as required. Four short-circuit-proof supply terminals are provided on the front connector for the connection of 2-wire transducers.

Caution: When using 2-wire transducers the reference potential (common input) of these channels must be connected to L-. The electrical isolation between the channels and the supply voltage L+/L- is thus inactivated.

Remember that the module's bus interface is activated with 24 V applied to the enable pins F+ and F- on the front connector.

5.3.4 Pin Assignments of the Front Connector

