

MANUFACTURER DOCUMENT PACKAGE

Manufacturer's Manual

Selected official pages for procurement and maintenance review

PRODUCT BRAND

Siemens

PRODUCT MODEL

6ES7332-5HB81-0AB0

Extended-Environment Analog Output Module. Relevant section pages: 28, 29, 30, 219, 220, 221, 222, 223, 224, 225. Adjacent model text on shared pages is outside this product reference.

OFFICIAL SOURCE

S7-300 and M7-300 Programmable Controllers Module Specifications; Edition 2, EWA 4NEB 710 6067-02 01; historical document
Original Siemens manual supplied in the authorized local document pack; public source URL not confirmed.

Historical Siemens outdoor specification explicitly maps 5HB81 to standard 5HB01 technical data, with the outdoor environmental exceptions retained on source pages 28-30. Adjacent product text is excluded.

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Amikon Limited prepared this independent reference package. Selected manufacturer pages follow with their original content and pagination visible.

SIMATIC

S7-300 and M7-300 Programmable Controllers Module Specifications

Reference manual

This manual is part of the following documentation packages with order nos:

S7-300 Programmable Controller:

6ES7 398-8AA03-8BA0

ET 200M Distributed I/O Device:

6ES7 153-1AA00-8BA0

EWA 4NEB 710 6067-02 01

Edition 2

Preface, Contents

General Technical Specifications

Power Supply Modules

Digital Modules

Analog Modules

Other Signal Modules

Interface Modules

RS 485 Repeater

SIMATIC TOP connect

SIMATIC TOP connect TPA

Appendices

Parameter Sets for Signal Modules

Diagnostics Data of the Signal Modules

Dimension Drawings

Spare Parts and Accessories for S7-300 Modules

Guidelines for Handling Electrostatic Sensitive Devices (ESD)

List of Abbreviations

Glossary, Index

1

2

3

4

5

6

7

8

9

A

B

C

D

E

F

Safety Guidelines

This manual contains notices which you should observe to ensure your own personal safety, as well as to protect the product and connected equipment. These notices are highlighted in the manual by a warning triangle and are marked as follows according to the level of danger:



Danger

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



Warning

indicates that death, severe personal injury or substantial property damage **can** result if proper precautions are not taken.



Caution

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

Note

draws your attention to particularly important information on the product, handling the product, or to a particular part of the documentation.

Qualified Personnel

Only **qualified personnel** should be allowed to install and work on this equipment. Qualified persons are defined as persons who are authorized to commission, to ground, and to tag circuits, equipment, and systems in accordance with established safety practices and standards.

Correct Usage

Note the following:



Warning

This device and its components may only be used for the applications described in the catalog or the technical descriptions, and only in connection with devices or components from other manufacturers which have been approved or recommended by Siemens.

This product can only function correctly and safely if it is transported, stored, set up, and installed correctly, and operated and maintained as recommended.

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Disclaimer of Liability

We have checked the contents of this manual for agreement with the hardware and software described. Since deviations cannot be precluded entirely, we cannot guarantee full agreement. However, the data in this manual are reviewed regularly and any necessary corrections included in subsequent editions. Suggestions for improvement are welcomed.

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Technical data subject to change.

Preface

Purpose

The information contained in this manual will enable you to look up operator actions, function descriptions and the technical specifications of the signal modules, power supply modules and interface modules of the S7-300.

How to configure, assemble and wire these modules in an S7-300, M7-300 or ET 200M system is described in the installation manuals for each system.

Audience

This manual describes the modules of the S7-300 which are used in the S7-300, M7-300 and ET 200M systems. It includes data sheets for the signal modules, power supply modules and interface modules of the S7-300.

Modifications Since the Last Version

The following modifications have been made since the last version of the “Module Data” reference manual:

- new is Chapter 1.7 “SIMATIC Outdoor Modules” for use under extended environmental conditions
- new is Chapter 9 “SIMATIC TOP connect TPA”
- the following signal modules have been added:
 - SM 321; DI 32 x 120 VAC
 - SM 322; DO 32 x 120 VAC/1.0 A
 - SM 322; DO 8 x Rel. 230 VAC/5 A
 - SM 331; AI 8 x 16 Bit
 - SM 332; AO 4 x 16 Bit
 - SM 334; AI 4/AO 2 x 12 Bit
 - SM 338 POS input module

Note: You can recognize the previous version of this “Module Data” reference manual by the number EWA 4NEB 710 6067-0x in the footer.

The current number is: EWA 4NEB 710 6067-0x 01.

1.7 SIMATIC Outdoor Modules

SIMATIC outdoor modules are modules that can be used under extended environmental conditions. Extended environmental conditions means:

- operation possible at temperatures from – 25 °C to + 60 °C
- occasional, brief condensation permitted
- increased mechanical stress permissible

Comparison with “standard” modules

The functional scope and technical specifications for the SIMATIC outdoor modules correspond to those of the “standard” modules.

The climatic and mechanical environmental conditions as well as the methods used to test them have changed.

The SIMATIC outdoor modules have their own Order Numbers (see Table 1–1)

Configuring in STEP 7

Do you have a STEP 7 version in which the SIMATIC outdoor modules are not in the hardware catalog?

Simply configure your system with the corresponding “standard” modules (see Table 1-2).

Modules

Table 1-2 lists all modules which satisfy the extended environmental conditions.

The Order No. of the corresponding "standard" module has additionally been included in the Table as a configuring aid. Refer to these "standard" modules for a detailed description and technical specifications.

Table 1-2 Modules for extended environmental conditions

Module	SIMATIC outdoor module for use under extended environmental conditions	"Standard" modules
	as of order no.	
IM 153-1	6ES7 153-1AA 82 -0XB0	6ES7 153-1AA02-0XB0
IM 153-2 FO	6ES7 153-2AB 80 -0XB0	6ES7 153-2AB00-0XB0
CPU 315-2 DP	6ES7 315-2AF 82 -0AB0	6ES7 315-2AF02-0AB0
CPU 312	6ES7 312-5AC 81 -0AB0	6ES7 312-5AC01-0AB0
CPU 314	6ES7 314-1AE 83 -0AB0	6ES7 314-1AE03-0AB0
CPU 314 IFM	6ES7 314-5AE 83 -0AB0	6ES7 314-5AE03-0AB0
IM 365	6ES7 365-0BA 81 -0AA0	6ES7 365-0BA01-0AA0
SM 321 digital input module; SM 321; DI 16 × 24 VDC SM 321; DI 32 × 24 VDC SM 321; DI 16 × 24 VDC SM 321; DI 8 × 120/230 VAC	6ES7 321-1BH 81 -0AA0 6ES7 321-1BL 80 -0AA0 6ES7 321-7BH 80 -0AA0 6ES7 321-1FF 81 -0AA0	6ES7 321-1BH01-0AA0 6ES7 321-1BL00-0AA0 6ES7 321-7BH00-0AB0 6ES7 321-1FF01-0AB0
SM 322 digital output module; SM 322; DO 16 × 24 VDC/0.5 A SM 322; DO 8 × Rel. 230 VAC/5 A SM 322; DO 32 × 24 VDC/0.5 A SM 322; DO 8 × 120/230 VAC/2 A	6ES7 322-1BH 81 -0AA0 6ES7 322-1HF 80 -0AA0 6ES7 322-1BL 80 -0AA0 6ES7 322-1FF 81 -0AA0	6ES7 322-1BH01-0AA0 6ES7 322-1HF10-0AA0 6ES7 322-1BL00-0AA0 6ES7 322-1FF01-0AA0
SM 323 digital I/O module; DI8/DO8 × 24 VDC/0.5 A	6ES7 323-1BH 80 -0AA0	6ES7 323-1BH00-0AA0
SM 331 analog input module; AI 2 × 12 Bit	6ES7 331-1KB 81 -0AB0	6ES7 331-1KB01-0AB0
SM 332 analog output module; AO 2 × 12 Bit	6ES7 332-5HB 81 -0AB0	6ES7 332-5HB01-0AB0
SM 334 analog I/O module; AI4/AO 2 × 12 Bit	6ES7 334-0KE 80 -0AB0	6ES7 334-0KE00-0AB0
FEPROM 64 kByte memory card	6ES7 951-0KF 80 -0AA0	6ES7 951-0KF00-0AA0
FEPROM 32 kByte memory card	6ES7 951-0KE 80 -0AA0	6ES7 951-0KE00-0AA0
FEPROM 16 kByte memory card	6ES7 951-0KD 80 -0AA0	6ES7 951-0KD00-0AA0
Bus connector	6ES7 972-0BAx0-0XA0 6ES7 972-0BBx0-0XA0	

Climatic environmental conditions

The SIMATIC outdoor modules for extended environmental conditions may be used under the following climatic conditions:

Installation category: According to IEC 721 3-3, Class 3K5.

Environmental conditions	Range of application	Remarks
Temperature: Horizontal installation Vertical installation	–25 °C to 60 °C –25 °C to 40 °C	–
Relative humidity	From 5 to 95 %	Occasional, brief condensation , corresponds to relative humidity (RH) class 2 to IEC 1131-2
Atmospheric pressure	1080 to 795 hPa	Corresponds to a height of –1000 to 2000 m
Pollutant concentration (to IEC 721 3-3; class 3C3)	SO ₂ : < 0.5 ppm; Relative humidity < 60 % H ₂ S: < 0.1 ppm; Relative humidity < 60 %	Test: 10 ppm; 4 days 1 ppm; 4 days

Mechanical environmental conditions

Installation category: to IEC 721 3-3, class 3M4.

Testing of mechanical conditions

The table below provides information on the type and scope of the mechanical condition tests for SIMATIC outdoor modules.

Test for ...	Test standard	Remarks
Vibration	Vibration test to IEC 68 Part 2-6 (sinusoidal)	Mode of vibration: Frequency sweeps with a sweep rate of 1 octave/minute. 2 Hz ≤ f ≤ 9 Hz, const. amplitude 3.5 mm 10 Hz ≤ f ≤ 150 Hz, const. acceleration 1 g Period of vibration: 10 frequency sweeps per axis in each of the 3 perpendicular axes
Shock	Shock test to IEC 68 Part 2-27	Type of shock: Semi-sinusoidal Shock intensity: 15 g peak value, 11 ms duration Shock direction: 3 shocks, each in +/- direction in each of the perpendicular axes

4.8.1 Characteristic Features and Technical Specifications of the Analog Output Module SM 332; AO 2 × 12 Bit

Order No.

6ES7 332-5HB01-0AB0

Characteristic Features

The analog output module SM 332; AO 2 × 12 Bit has the following characteristic features:

- 2 output in 2 channels groups
- The individual output channels can be programmed as
 - voltage outputs
 - current outputs
- Resolution 12 bits
- Programmable diagnostics
- Programmable diagnostics interrupt
- Programmable substitute value output
- Galvanic isolation to CPU and load voltage

Note

When switching on and off the rated load voltage (L+), wrong intermediate values can be present at the output for approx. 10 ms.

Terminal Connection Diagram

Figure 4-26 shows the module view and the block diagram of the analog output module SM 332; AO 2 × 12 Bit. You will find the detailed technical specifications of the analog output module on the following pages.

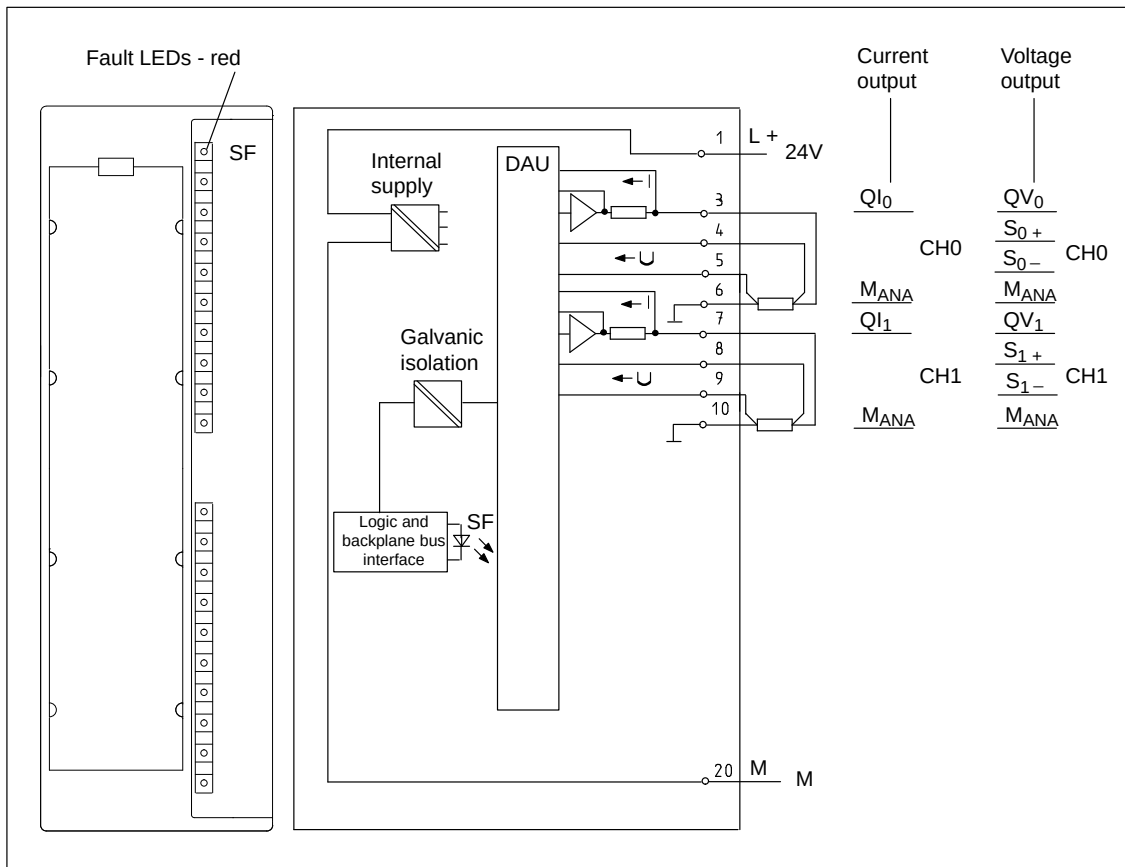


Figure 4-26 Module View and Block Diagram of the Analog Output Module SM 332; AO 2 × 12 Bit

Dimensions and Weight		Noise Suppression and Error Limits	
Dimensions W × H × D	40 × 125 × 120 mm (1.56 × 4.88 × 4.68 in.)	Crosstalk between outputs	> 40 dB
Weight	approx. 220 g (7.7 oz.)	Operational limit (in the total temperature range, referred to output range)	
Module-Specific Data		- Voltage output ± 0.5 % - Current output ± 0.6 %	
Number of outputs	2	Basic error (operational limit at 25 °C, referred to output range)	
Length of cable (shielded)	max. 200 m (218 yd.)	- Voltage output ± 0.2 % - Current output ± 0.3 %	
Voltages, Currents, Potentials		Status, Interrupts, Diagnostics	
Rated load voltage L+	24 VDC	Interrupts	
Reverse polarity protection	Yes	Diagnostics alarm	Programmable
Galvanic isolation		Diagnostics functions	Programmable
between channels and backplane bus	Yes	System fault display on module	Red LED (SF)
between channels and load voltage L+	Yes	Diagnostics information read-out	Possible
Permiss. potential difference			
between S– and M_{ANA} (U_{CM})	3 VDC		
between M_{ANA} and the M_{internal} (U_{ISO})	75 VDC 60 VAC		
Isolation tested with	600 VDC		
Current drawn			
from backplane	max. 60 mA		
from load voltage L+ (without load)	max. 135 mA		
Power losses of the module	typ. 3 W		
Analog Value Generation			
Resolution (incl. overrange)			
± 10 V; ± 20 mA; 4 to 20 mA; 1 to 5 V	11 bits + sign		
0 to 10 V; 0 to 20 mA	12 bits		
Conversion time per channel	max. 0.8 ms		
Setting time			
for resistive load	0.1 ms		
for capacitive load	3.3 ms		
for inductive load	0.5 ms		
Injection of substitute values	Yes, programmable		

Actuator Selection Data	
Output ranges (nominal values)	
• Voltage	$\pm 10\text{ V}$ 0 to 10 V 1 to 5 V
• Current	$\pm 20\text{ mA}$ 0 to 20 mA 4 to 20 mA
Impedance (in nominal output range)	
• with voltage outputs	min. 1 k Ω
– capacitive load	max. 1 μF
• with current outputs	max. 500 Ω
– at $U_{\text{CM}} < 1\text{ V}$	max. 600 Ω
– inductive load	max. 10 mH
Voltage output	
• Short-circuit protection	Yes
• Short-circuit current	max. 25 mA
Current output	
• Open-circuit voltage	max. 18 V
Destruction limit for voltages/currents connected from outside	
• Voltage at outputs to M_{ANA}	max 18 V continuously; 75 V for max. 1 s (duty factor 1:20)
• Current	max. DC 50 mA
Connection of actuators	
• Voltage output	
2-wire connection	Possible
4-wire connection (measuring leads)	Possible
• Current output	
2-wire connection	Possible

4.8.2 Starting Up the Analog Output Module SM 332; AO 2 × 12 Bit

Parameter Assignment

The functions of the analog output module SM 332; AO 2 × 12 Bit are set as follows:

- with *STEP 7* (see also *STEP 7 User Manual*) or
- in the user program by means of SFCs (see *STEP 7 System and Standard Functions Reference Manual*).

Note

If you modify output ranges when the analog output module SM 332; AO 2 × 12 Bit is in operation, intermediate values may appear at the output!

Default Settings

The analog output module has default settings for the type of output, diagnostics, interrupts, etc. (see Table 4-20).

These default settings are valid, if you have not re-initialized the module with *STEP 7*.

Parameter Assignment

You can configure each output channel of the SM 332; AO 2 × 12 Bit individually.

Advantage: You can assign individual parameters for each output channel.

When you configure with SFCs in the user program, the parameters are assigned to channel groups. Each output channel of the analog output module SM 332; AO 2 × 12 Bit is then assigned to one channel group, i.e. output channel 0 = channel group 0 (see Fig. A-3 in Appendix A).

Unused Output Channels

To make sure that unused output channels of the analog output module SM 332; AO 2 × 12 Bit are dead, you must deactivate them and leave them open.

Deactivate an output channel using the “Output” parameter block of *STEP 7* (see Section 4.3.4).

4.8.3 Output Ranges of the Analog Output Module SM 332; AO 2 × 12 Bit

Analog Outputs

You can use the outputs as:

- Voltage outputs
- Current outputs

You make the output settings channel-group-wise, using *STEP 7*.

Output Ranges

Set the various output ranges for the voltage and/or current outputs with *STEP 7*.

Table 4-43 lists all the possible output ranges of the analog output module SM 332; AO 2 × 12 Bit.

Table 4-43 Output Ranges of the Analog Output Module SM 332; AO 2 × 12 Bit

Selected Type of Output	Description	Output Range
Voltage	You will find the digital analog values in Section 4.1.3 in the voltage output range	1 to 5 V 0 to 10 V ± 10 V
Current	You will find the digital analog values in Section 4.1.3 in the current output range	0 to 20 mA 4 to 20 mA ± 20 mA

Default Setting

The default settings of the module are output type “voltage” and output range “± 10 V”. You can use this output type with this output range without changing the parameters of the SM 332; AO 2 × 12 Bit with *STEP 7*.

Wire-Break Check

The analog output module SM 332; AO 2 × 12 Bit carries out a wire-break check only for current outputs.

Short-Circuit Check

The analog output module SM 332; AO 2 × 12 Bit carries out a short-circuit check only for voltage outputs.

Substitute Values

You can parameterize the SM 332; AO 2 × 12 Bit for the CPU operating mode STOP as follows: Output Substitute Values (default: 0 mA/0 V) or Hold Last Value.

For the output ranges 4 to 20 mA and 1 to 5 V you must set the substitute value E500_H in order for the output to remain de-energized (see Tables 4-17 and 4-18).

4.9 Analog Output Module SM 332; AO 4 × 16 Bit

Order No.

6ES7 332-7ND00-0AB0

Characteristic Features

The analog output module SM 332; AO 4 × 16 Bit has the following characteristic features:

- 4 outputs in 4 channel groups
- The individual output channels can be programmed as:
 - Voltage outputs
 - Current outputs
- Resolution of 16 bits
- Programmable diagnostics
- Programmable diagnostics interrupt
- Programmable substitute value output
- Galvanic isolation to CPU and analog output channel
- Galvanic isolation analog output channel-to-channel
- Galvanic isolation analog output and L+, M
- Galvanic isolation CPU and L+, M