SIEMENS

SIMATIC

S7-300
S7-300 Module data

Equipment Manual

General technical data 1

Power supply modules 2

Digital modules 3

Principles of analog value processing 4

Principles of analog modules 5

Analog modules 6

Other signal modules 7

Interface modules 8

Parameter sets of signal modules A

Diagnostics data of signal modules B

Dimensional drawings C

Spare parts and accessories for S7-300 modules D

Directive on handling Electrostatic-Sensitive Devices (ESD) E

Service & support F

Safety-relevant symbols G

Continued on next page

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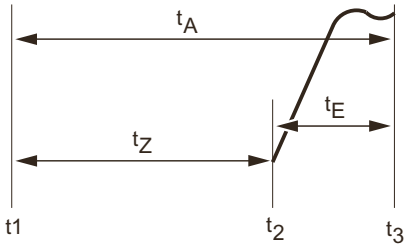
S7-300
S7-300 Module data

Equipment Manual

Response time

The worst case response time (t_1 to t_3), i.e. the time expiring between the input of digital output values to internal memory, and the signal settling time at the analog output, may be equivalent to the total of cycle time plus settling time.
The worst case scenario is given, when the analog channel has been converted immediately before a new output value is transferred, and is not converted again until all other channels have been converted (cycle time.)

Overview of the settling time and response time of analog output modules



t_A Response time
t_C tC = Cycle time, equivalent to n x conversion time (n = active channels)
t_S Settling time
t_1 new digital output value is set
t_2 Output value is applied and converted
t_3 specified output value is reached

5.7 Programming analog modules

Introduction

The properties of analog modules may differ. The module properties can be programmed.

Programming tools

You program analog modules in *STEP 7*. Always program the module while the CPU is in STOP mode.
After you defined all parameters, download these from your PG to the CPU. The CPU transfers the parameters to the relevant analog modules at the STOP → RUN transition.
Also, position the measuring range modules of the module as required.

Static and dynamic parameters

Parameters are organized by static and dynamic properties.
Set the static parameters while the CPU is in STOP, as described earlier.

You can also modify dynamic parameters in the active user program using SFCs. However, the parameters set in *STEP 7* will be applied again after a RUN → STOP, STOP → RUN transition of the CPU.

Parameters	configurable using	CPU operating state
static	PG (STEP 7 HW CONFIG)	STOP
dynamic	PG (STEP 7 HW CONFIG)	STOP
	SFC 55 in the user program	RUN

See also

Programmable parameters (Page 290)

5.7.1 Parameters of analog input modules

Parameters of analog input modules

For information on parameters supported by specific analog modules, refer to the chapter dealing with the relevant module.
The defaults apply if you have not set any parameters in **STEP 7**.

5.8 Diagnostics of analog modules

Programmable and non-programmable diagnostic messages

We distinguish between programmable and non-programmable diagnostic messages.
You only obtain programmable diagnostic messages if you have enabled diagnostics at the relevant parameters. Program these functions in the "Diagnostics" parameter block in *STEP 7*.
The the analog module always provides non-programmable diagnostic messages, irrespective of the enable state of diagnostic functions.

Reactions to a diagnostic message in *STEP 7*

Actions initiated by diagnostic messages:

- The diagnostic message is written to the diagnostics buffer of the analog module, and is then passed to the CPU.
- The error LED on the analog module is lit.
- When "Enable Diagnostics Interrupt" is set in STEP 7, the system triggers a diagnostic interrupt and calls OB82.

Reading diagnostic messages

You can read detailed diagnostic messages in the user program using SFCs.

Viewing the cause of error

You can view the cause of the error in the module diagnostics data in *STEP 7* (refer to the *STEP 7* Online Help.)

Diagnostic message included in the measured value of analog input modules

All analog input modules return the measured value $7FFF_H$ as a reaction to errors, irrespective of parameter settings. This measured value indicates either overflow, error, or a disabled channel.

Diagnostic message using the SF LED

Diagnostics-capable analog modules indicate errors by means of their SF LED (group error LED). The SF LED lights up when the analog module has generated a diagnostic message. It goes dark after all error states are cleared.

See also

Programming analog modules (Page 244)

5.8.1 Diagnostics messages of analog input modules

Overview of the diagnostics messages of analog input modules

The table below provides an overview of the diagnostics messages of analog input modules.

Table 5-44 Diagnostics messages of analog input modules

Diagnostics message	LED	Scope of diagnostics	programmable
External load voltage missing	SF	Module	no
Configuration / programming error	SF	Channel	yes
Common-mode error	SF	Channel	yes
Wirebreak	SF	Channel	yes
Underflow	SF	Channel	yes
Overflow	SF	Channel	yes

5.8.2 Diagnostic messages of analog output modules

Overview of the diagnostic messages of analog output modules

The table below provides an overview of the diagnostic messages of analog output modules.

Table 5-45 Diagnostic messages of analog output modules

Diagnostic message	LED	Scope of diagnostics	programmable
External load voltage missing	SF	Module	no
Configuration / programming error	SF	Channel	yes
Short-circuit to M*	SF	Channel	yes
Wire-break*	SF	Channel	yes

* Not with the SM 332, AO 4 x 16 bit, isochrone

NOTE

The detection of errors which are indicated in programmable diagnostic messages requires appropriate configuration of the analog module in *STEP 7*.

5.8.3 Causes of error and troubleshooting at analog input modules

Overview of the causes of error and troubleshooting at analog input modules

Table 5-46 Diagnostics messages of analog input modules, causes of error and troubleshooting

Diagnostics message	Possible cause of error	To correct or avoid errors
External load voltage missing	Load voltage L+ of module missing	Connect supply L+
Configuration / programming error	Faulty parameters transferred to module	Check the measuring range module
		Program the module
Common-mode error	Potential difference C_{MV} between inputs M- and the reference potential of measuring circuit (M_{ANA} out of limits)	Connect M- with M_{ANA}
Wirebreak	Resistance of transducer circuit too high	Use a different type of sensor, or modify the wiring, for example, using a larger conductor cross-section.
	Open circuit between module and sensor	Connect the cable
	Channel not connected (open)	Disable the channel group ("measuring method" parameter)
		Wire the channel
Underflow	Input value below undershoot range; possible cause of error: wrong measuring range setting	program a different measuring range
	polarity reversal of the sensor wiring in the measuring ranges 4 to 20 mA and 1 to 5 V	Check the connections
Overflow	Input value exceeds overshoot range	program a different measuring range

5.8.4 Causes of error and troubleshooting at analog output modules

Overview of the causes of error and troubleshooting routines at analog output modules

Table 5-47 Diagnostics messages of analog output modules, causes of error and troubleshooting

Diagnostics message	Possible cause of error	To correct or avoid errors
External load voltage missing	Load voltage L+ of module missing	Connect supply L+
Configuration / programming error	Faulty parameters transferred to module	Assign new module parameters
Short-circuit to M	Overload at output	Eliminate overload
	Short-circuit at output Q_V to M_{ANA}	Eliminate the short-circuit
Wirebreak	Actuator impedance too high	Use a different type of actuator, or modify the wiring using cables with a larger conductor cross-section
	Wire-break between the module and actuator	Connect the cable
	Channel not used (open)	Disable the channel group ("output type" parameter)

5.9 Interrupts of analog modules

Introduction

This section describes the interrupt response of analog modules. Always distinguish between the following interrupts:

- Diagnostic interrupt
- Hardware interrupt

Note that certain analog modules do not support interrupts, or are only partially capable of "handling" the interrupts described below. For information on modules which support interrupt functionality, refer to their technical data.

Description of the *STEP 7* blocks

For detailed information on the OBs and SFCs mentioned below, refer to the *STEP 7* Online Help.

Enabling interrupts

There are no default interrupt settings, that is, interrupts are disabled if not set accordingly. Program the interrupt enable parameter in *STEP 7*.

Diagnostic interrupt

Incoming error events (initial occurrence) and outgoing error events (error is cleared) are reported by means of diagnostic interrupt, if this interrupt is enabled.

The CPU interrupts user program execution in order to process diagnostic interrupt OB82.

You can call SFC51 or 59 in OB82 in the user program to view details of diagnostics data output by the module.

Diagnostics data remain consistent until the program exits OB82. The program acknowledges the diagnostic interrupt at the module when it exits OB82.

Hardware interrupt with "high or low limit exceeded" trigger

Define a working range by setting a high and low limit. If the process signal (for example, the temperature) overshoots this working range, the module triggers a hardware interrupt, provided the interrupt is enabled.

The CPU interrupts user program execution in order to execute hardware interrupt OB40.

In the user program of OB 40, you can define the reaction of the automation system to the violation of limits.

The program acknowledges the diagnostic interrupt at the module when it exits OB40.

NOTE

Note: the system does not generate a hardware interrupt if your limit setting exceeds the overshoot or undershoot range.

Structure of the start information variable OB40_POINT_ADDR of OB 40

The channel at which a specific limit is exceeded is logged to the OB40_POINT_ADDR variable in the start information of OB40. The diagram below shows the bit assignment of DWORD 8 in local data.

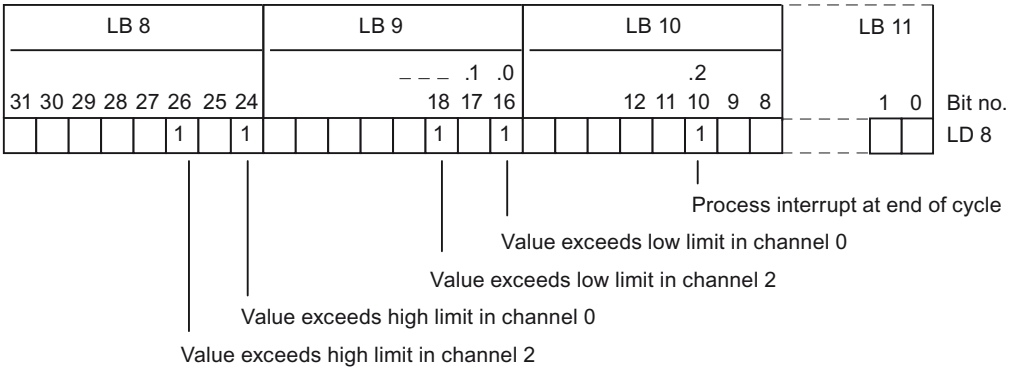


Figure 5-7 Start information of OB40: which limits event has triggered a hardware interrupt

Hardware interrupt triggered by "End of cycle reached"

You can synchronize a process with the cycle of the analog input module by programming a hardware interrupt trigger at the end of the cycle.

One cycle comprises the conversion of the measured values of all active channels of the analog input module. The module processes the channels in successive order. After all measured values were successfully converted, the module outputs an interrupt to the CPU in order to report new measured values at its channels.

You can always use this interrupt to download the actual converted analog values.

- Notes on programming

NOTE

Only bits 0 and 2 in the process image input are relevant for evaluation. You can use bits 0 and 2 to monitor the temperature of a motor, for example.

Bits 0 and 2 in the process image input cannot be saved. When assigning parameters, make sure that the motor, for example, starts up in a controlled manner (by means of an acknowledgment).

Bits 0 and 2 can never be set at the same time; they are set one after the other.

Using silicon temperature sensors

Silicon temperature sensors are commonly used to detect temperatures in motors.

- When assigning the parameters, select measurement type "thermoresistor" and measuring range "KTY83/110" or "KTY84/130".
- Connect the temperature sensor (see "Terminal diagram for resistance measurement").

Use temperature sensors which comply with the Product Specifications published by Philips Semiconductors.

- KTY83 series (KTY83/110)
- KTY84 series (KTY84/130)

Also take note of the accuracy of the temperature sensors.

The temperature is specified in 0.1 degrees C, 0.1 degrees K, and/or 0.1 degrees F, see section Representation of the values for analog input channels (Page 218).

6.7 Analog input module SM 331; AI 8 x 12 bit;(6ES7331-7KF02-0AB0)

6.7.1 Analog input module SM 331; AI 8 x 12 bit;(6ES7331-7KF02-0AB0)

Order number

6ES7331-7KF02-0AB0

Properties

- 8 inputs in 4 channel groups
- Programmable measurement type at each channel group
  - Voltage
  - Current
  - Resistance
  - Temperature
- Programmable resolution at each channel group (9/12/14 bits + sign)
- Any measuring range selection per channel group
- Programmable diagnostics and diagnostic interrupt

- Programmable limit value monitoring for 2 channels
- Programmable hardware interrupt when limit is exceeded
- Electrically isolated to CPU and load voltage (not for 2-wire transducers)

Resolution

The resolution of measured values is directly dependent of the selected integration time. In other words, the longer the integration time for an analog input channel, the higher the resolution of a measured value.

Diagnostics

For information on diagnostics messages at the "group diagnostics" parameter, refer to chapter Diagnostic messages of analog input modules.

Hardware interrupts

Hardware interrupts for channel groups 0 and 1 can be programmed in *STEP 7*. However, set a hardware interrupt only for the first channel of a channel group, that is, either at channel 0, or at channel 2

Terminal assignment

The diagrams below show various wiring options The input impedance depends on the setting of the measuring range module, see table *Measurement types and ranges*.

Wiring: Voltage measurement

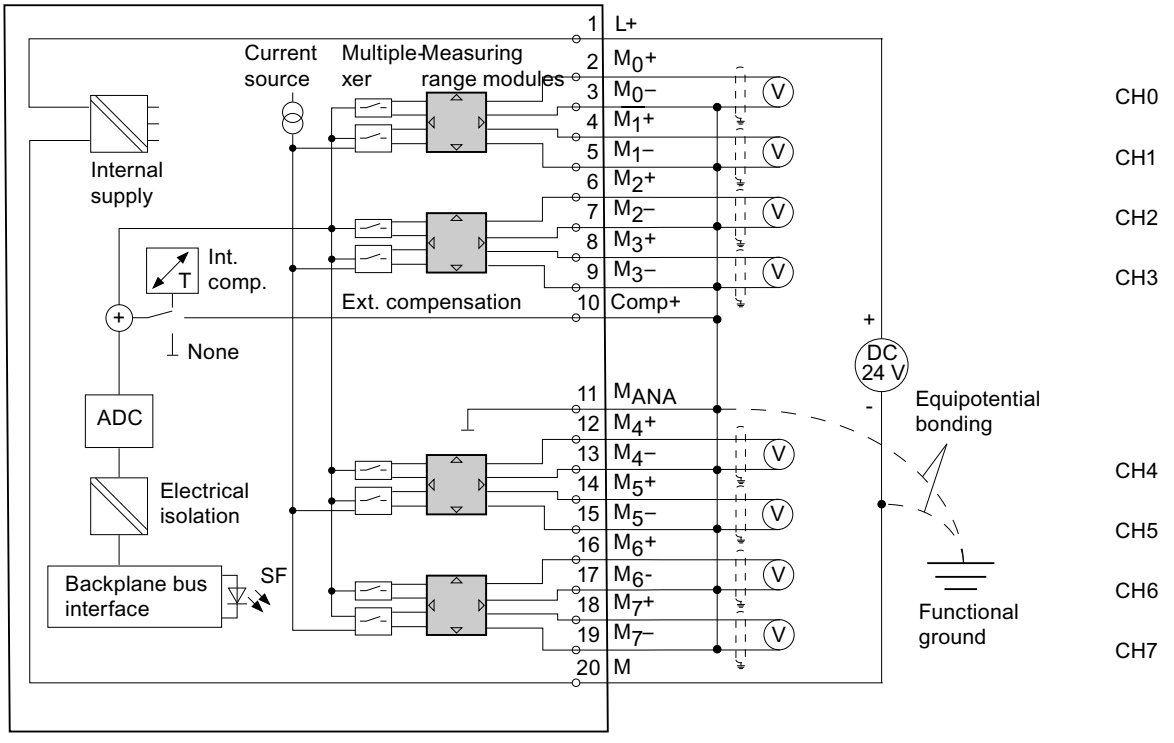


Figure 6-13 Block diagram and wiring diagram

Measuring range module settings

Measuring range	Measuring range module setting
± 80 mV ± 250 mV ± 500 mV ± 1,000 mV	A
± 2.5 V ± 5 V 1 V to 5 V ± 10 V	B

Wiring: 2-wire and 4-wire transducers for current measurement

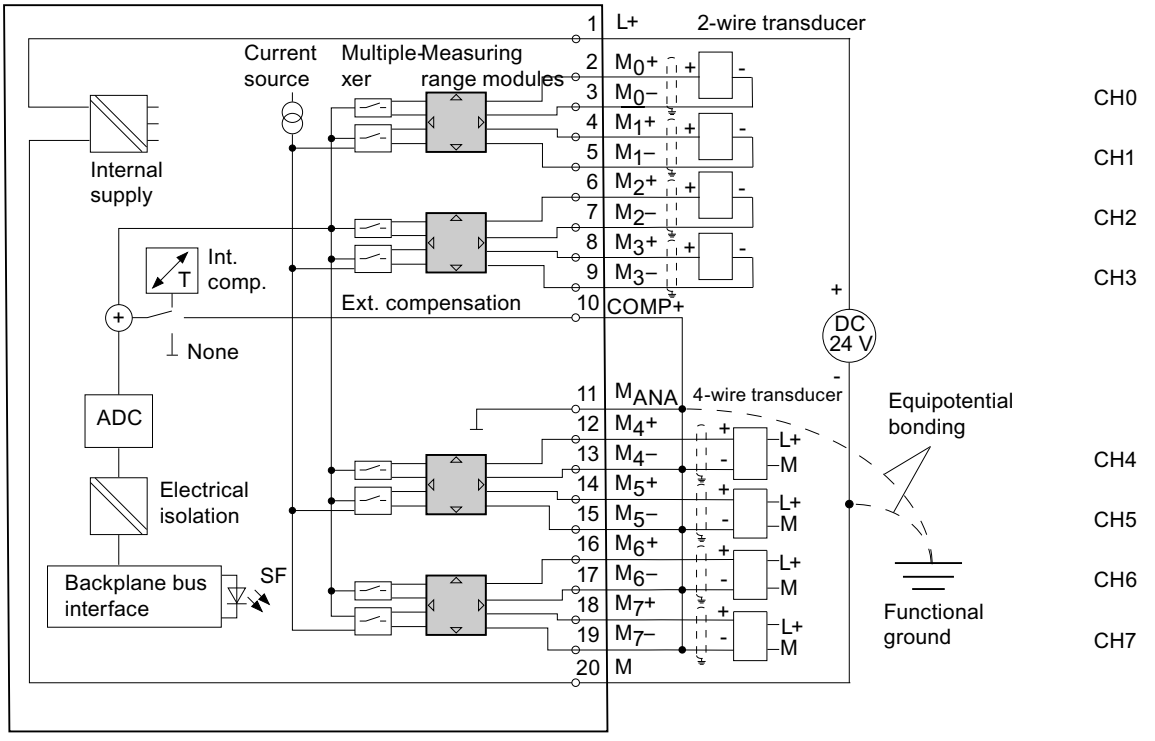


Figure 6-14 Block diagram and wiring diagram

NOTE

The interconnection between M_{ANA} and M- (terminals 11, 13, 15, 17, 19) is not required when using grounded 4-wire transducers with non-isolated supply.

Measuring range module settings

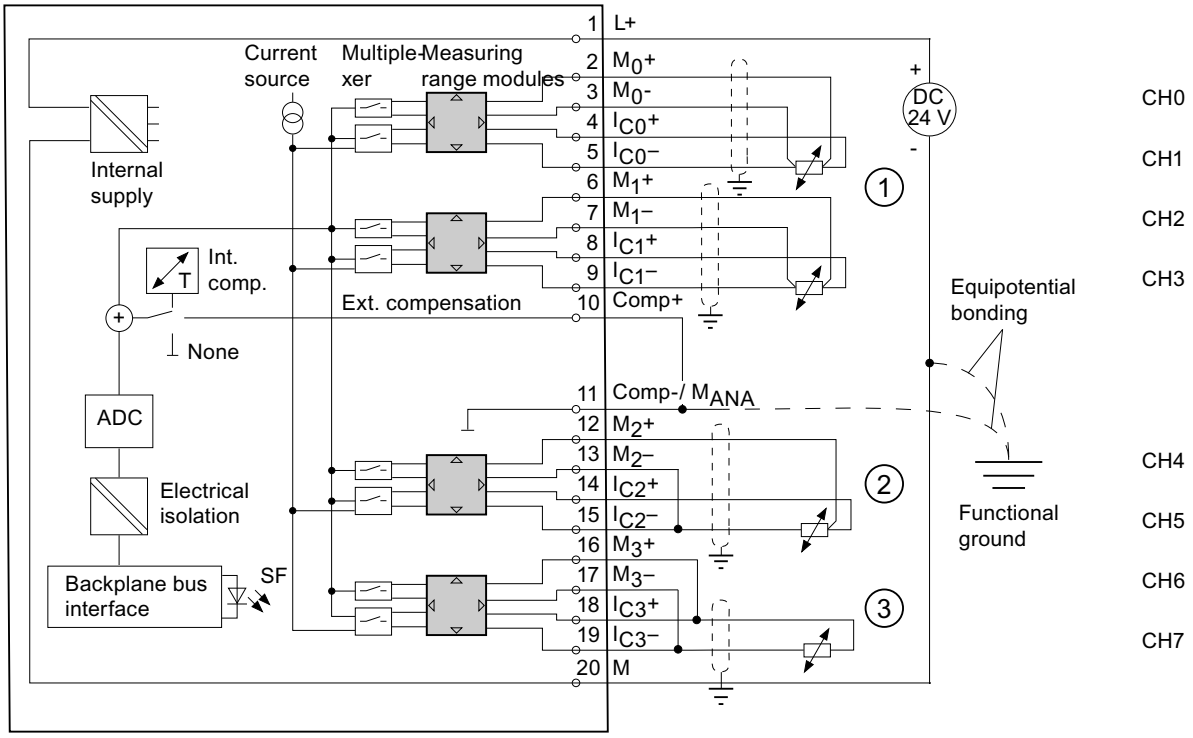
Measuring range		Measuring range module setting
2-wire transducer	4 mA to 20 mA	D
4-wire transducer	± 3.2 mA ± 10 mA 0 mA to 20 mA 4 mA to 20 mA ± 20 mA	C

⚠ CAUTION

Measuring range module in "Current" position

Any voltage measurement will destroy the measuring range module if "current" measuring mode is set.

Wiring: 2-, 3- and 4-wire connection of resistance transducers or thermoresistors



① 4-wire connection
② 3-wire connection, no compensation for line resistors
③ 2-wire connection, no compensation for line resistors

Figure 6-15 Block diagram and wiring diagram

Measuring range module settings

Measuring range		Measuring range module setting
150 Ω 300 Ω 600 Ω		A
Thermoresistor (linear, 4-wire connection) (temperature measurement) RTD-4L	Pt 100 Klima Ni 100 Klima Pt 100 Standard Ni 100 Standard	A

NOTE

- "Resistance measurement" is only available at one channel per group. The "2nd" channel of the group is used accordingly for current measuring mode (I_C). The "1st" channel of the group returns the measured value. The "2nd" channel of the group is assigned the default overflow value "$7FFF_H$."
- There is no compensation of the line resistance with a 2 and 3-wire connection.

Wiring: Thermocouples with external compensation

Insert a bridge between Comp+ and M_{ANA} when using the internal compensation.

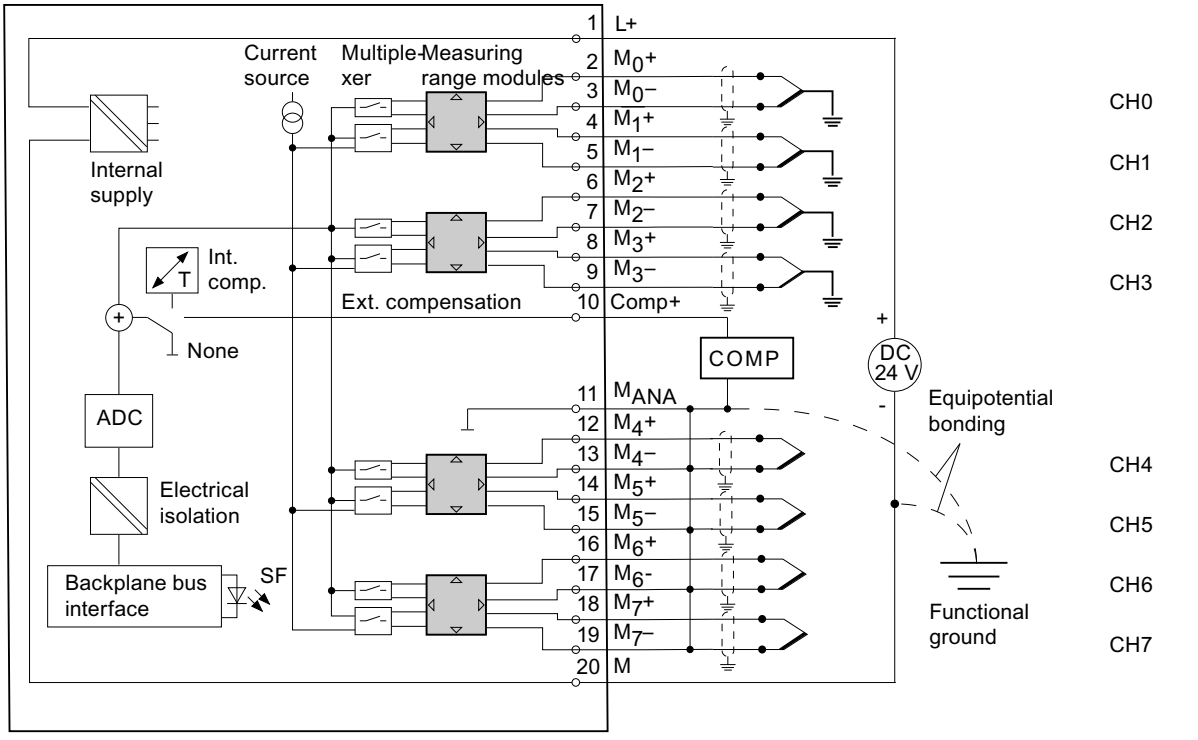


Figure 6-16 Block diagram and wiring diagram

Measuring range module settings

Measuring range		Measuring range module setting
Thermocouple TC-I (internal comparison) (thermal voltage measurement) Linearization is ignored	Type N [NiCrSi-NiSi] Type E [NiCr-CuNi] Type J [Fe-CuNi] Type K [NiCr-Ni] Type L [Fe-CuNi]	A
Thermocouple TC-E (external comparison) (thermo-voltage measurement) Linearization is ignored		
Thermocouple (linear, internal comparison) (temperature measurement) TC-IL	Type N [NiCrSi-NiSi] Type E [NiCr-CuNi] Type J [Fe-CuNi] Type K [NiCr-Ni] Type L [Fe-CuNi]	A
Thermocouple (linear, external comparison) (temperature measurement) TC-EL		

NOTE

- An interconnection of M- and M_{ANA} is prohibited when using grounded thermocouples. In this case, you must ensure that low-resistance equipotential bonding is in place so that the permitted common-mode voltage is not exceeded.
- Interconnect M- and M_{ANA} when using non-grounded thermocouples

Technical specifications

Technical specifications	
Dimensions and weight	
Dimensions W x H x D (mm)	40 x 125 x 117
Weight	approx. 250 g
Module-specific data	
Supports isochronous mode	No
Number of inputs • with resistive transducers	8 4
Cable length • shielded	max. 200 m max. 50 m at 80 mV and with thermocouples
Voltages, currents, electrical potentials	
Rated electronics supply voltage L + • Reverse polarity protection	24 V DC Yes
Transducer power supply • Supply current • short circuit-proof	 max. 60 mA (per channel) Yes
Constant current for resistive transducers	typ. 1.67 mA (pulsed)

Technical specifications				
Electrical isolation • between channels and the backplane bus • between channels and electronics power supply – Not for 2-wire transducers	Yes Yes			
Maximum potential difference • between inputs and M_{ANA} (V_{CM}) – at signal = 0 V • between inputs (V_{CM})	typ. 2.5 V DC (> 2.3 V DC) typ. 2.5 V DC (> 2.3 V DC)			
Isolation test voltage	500 V DC			
Current consumption • from the backplane bus • from load voltage L+	max. 50 mA max. 30 mA (without 2-wire transducer)			
Power loss of the module	typ. 1 W			
Generation of analog values				
Measuring principle	Integrating			
Integration/conversion time/resolution (per channel)				
• programmable	Yes			
• Integration time in ms	2.5	$16^2/_3$	20	100
• Basic conversion time, including the integration time in ms	3	17	22	102
Additional conversion time for resistance measurement, in ms or	1	1	1	1
additional conversion time for wire-break monitoring in ms or	10	10	10	10
additional conversion time for resistance measurements **and** wire-break monitoring in ms	16	16	16	16
• Resolution in bits (including overrange)	9 bits	12 bits	12 bits	14 bits
• Interference frequency suppression at interference frequency f1 in Hz	400	60	50	10
• Basic execution time of the module in ms (all channels enabled)	24	136	176	816
Measured value smoothing	none			
Interference frequency suppression, error limits				
Interference frequency suppression at F = n (f1 ± 1 %), (f1 = interference frequency)				
• Common mode interference (V_{CM} < 2.5 V) • Seriesmode interference (peak interference value < rated input range)	> 70 dB > 40 dB			
Crosstalk between inputs	> 50 dB			
Operational limit (across entire temperature range, relative to the measurement range end value in the selected input range)				
• Voltage input	80 mV 250 mV to 1,000 mV 2.5 V to 10 V		± 1 % ± 0.6 % ± 0.8 %	
• Current input	3.2 mA to 20 mA		± 0.7 %	
• Resistance	150 Ω; 300Ω; 600 Ω		± 0. 7 %	

Technical specifications		
• Thermocouple	Types E, N, J, K, L	± 1. 1 %
• Resistance thermometer	Pt 100/Ni 100	± 0. 7 %
	Pt 100 Klima	± 0. 8 %
Basic error limit (operational limit at 25 °C, relative to the measurement range end value in the selected input range)		
• Voltage input	80 mV 250 mV to 1,000 mV 2.5 V to 10 V	± 0.7 % ± 0.4 % ± 0.6 %
• Current input	3.2 mA to 20 mA	± 0.5 %
• Resistance	150 Ω; 300 Ω; 600 Ω	± 0.5 %
• Thermocouple	Types E, N, J, K, L	± 0.7 %
• Resistance thermometer	Pt 100/Ni 100	± 0.5 %
	Pt 100 Klima	± 0.6 %
Temperature error (relative to input range)	± 0.005%/K	
Linearity error (relative to input range)	± 0.05 %	
Repeat accuracy (in settled state at 25 °C, relative to input range)	± 0.05 %	
Temperature error of internal compensation	± 1 %	
Status, interrupts, diagnostics		
Interrupts • Limit interrupt • Diagnostic interrupt	programmable Channels 0 and 2 programmable	
Diagnostic functions • Group error display • Reading diagnostics information	programmable red LED (SF) supported	
Encoder selection data		
Input ranges (rated values) / input impedance		
• Voltage	± 80 mV ± 250 mV ± 500 mV ± 1,000 mV ± 2.5 V ± 5 V 1 V to 5 V ± 10 V	10 MΩ 10 MΩ 10 MΩ 10 MΩ 100 kΩ 100 kΩ 100 kΩ 100 kΩ
• Current	± 3.2 mA ± 10 mA ± 20 mA 0 mA to 20 mA 4 mA to 20 mA	25 Ω 25 Ω 25 Ω 25 Ω 25 Ω
• Resistance	150 Ω 300 Ω 600 Ω	10 MΩ 10 MΩ 10 MΩ
• Thermocouples	Types E, N, J, K, L	10 MΩ
• Resistance thermometer	Pt 100, Ni 100	10 MΩ

Technical specifications	
Maximum voltage at voltage input (destruction limit)	max. 20 V, continuous 75 V for the duration of max. 1 s (duty factor 1:20)
Maximum current at current input (destruction limit)	40 mA
Wiring of the signal transmitters	using a 20-pin front connector
• for voltage measurement	supported
• for current measurement as 2-wire transducer as 4-wire transducer	 supported supported
• For thermoresistor/resistance measurement with 2-wire connection	 Supported, cable resistances are not compensated
with 3-wire connection	Supported, cable resistances are not compensated
with 4-wire connection	Supported, cable resistances are compensated
• Load of the 2-wire transducer	max. 820 Ω
Characteristics linearization • for thermocouples	programmable Types E, N, J, K, L
• for resistance thermometers	Pt 100 (Standard and Klima range) Ni 100 (Standard and Klima range)
Temperature compensation • Internal temperature compensation	programmable supported
• External temperature compensation with compensating box	supported
• Compensation for 0 °C reference junction temperature	supported
• Technical unit of temperature measurement	degrees Centigrade

See also

Diagnostics messages of analog input modules (Page 246)

6.7.2 Measurement types and ranges

Introduction

Module SM 331; AI 8 x 12 Bit has measuring range modules

The measurement type and range is configured at the "measuring range" parameter in *STEP 7*.

The default setting of the module is "voltage" measurement with "± 10V" range. You can use these default settings without having to program the SM 331; AI 8 x 12 Bit in *STEP 7*.

Measuring range modules

You may have to change the position of the measuring range modules to suit the measurement type and range (see the chapter *Setting the measuring types and ranges of analog input channels*). The necessary settings are also available on the module's imprint. Mark the position of the measuring range module on the front door (see figure).

Range:

A	B
C	D

Measurement types and ranges

Table 6-18 Measurement types and ranges

Selected type of measurement	Measuring range (type of sensor)	Measuring range module settings
Voltage V	± 80 mV ± 250 mV ± 500 mV ± 1000 mV	A
	± 2.5 V ± 5 V 1 V to 5 V ± 10 V	B
Thermocouple TC-I (internal comparison) (thermal voltage measurement) Linearization is ignored	Type N [NiCrSi-NiSi] Type E [NiCr-CuNi] Type J [Fe-CuNi] Type K [NiCr-Ni] Type L [Fe-CuNi]	A
Thermocouple TC-E (external comparison) (thermovoltage measurement) Linearization is ignored		
Thermocouple (linear, internal comparison) (temperature measurement) TC-IL	Type N [NiCrSi-NiSi] Type E [NiCr-CuNi] Type J [Fe-CuNi] Type K [NiCr-Ni] Type L [Fe-CuNi]	A
Thermocouple (linear, external comparison) (temperature measurement) TC-EL		
Current (2-wire transducer) 2DMU	4 mA to 20 mA	D
Current (4-wire transducer) 4DMU	± 3.2 mA ± 10 mA 0 mA to 20 mA 4 mA to 20 mA ± 20 mA	C
Resistance (4-wire connection) R-4L	150 Ω 300 Ω 600 Ω	A
Thermoresistor (linear, 4-wire connection) (temperature measurement) RTD-4L	Pt 100 Klima Ni 100 Klima Pt 100 Standard Ni 100 Standard	A

Channel groups

The channels of SM 331; AI 8 x 12 Bit are arranged in four groups of two channels. You can assign parameters only to one channel group.
SM 331; AI 8 x 12 Bit is equipped with one measuring range module per channel group.

The table below shows the relevant configuration of channel groups. The channel group number is required to program SFC parameters in the user program.

Table 6-19 Assignment of SM 331; AI 8x12 bit channels to channel groups

Channels ...	...form one channel group each
Channel 0	Channel group 0
Channel 1	
Channel 2	Channel group 1
Channel 3	
Channel 4	Channel group 2
Channel 5	
Channel 6	Channel group 3
Channel 7	

See also

Programming analog modules (Page 244)
Diagnostics messages of analog input modules (Page 246)

6.7.3 Programmable parameters

Introduction

For information on programming analog modules, refer to the chapter Programming analog modules (Page 244).

Parameters

Table 6-20 Overview of the parameters for SM 331; AI 8 x 12 Bit

Parameters	Range of values	Default	Parameter type	Scope
Enable • Diagnostics interrupt • Process interrupt when limit exceeded	yes/no yes/no	no no	dynamic	Module
Process interrupt trigger • High limit • Low limit	May be restricted by the measuring range from 32511 to - 32512 from - 32512 to 32511	-	dynamic	Channel
Diagnostics • Group diagnostics • with line continuity check	yes/no yes/no	no no	static	Channel group
Measurement • Measurement type	disabled Voltage V 4DMU current (4-wire transducer) 2DMU current (2-wire transducer) R-4L resistance (4-wire connection) RTD-4L thermoresistor (linear, 4-wire connection)	V		

Parameters	Range of values	Default	Parameter type	Scope
	TC-I thermocouple (internal comparison) TC-E thermocouple (external comparison) TC-IL thermocouple (internal comparison) TC-EL thermocouple (linear, external comparison)		dynamic	Channel or channel group
• Measuring range	See the table *Measurement types and ranges*	± 10 V		
• Noise suppression	400 Hz; 60 Hz; 50 Hz; 10 Hz	50 Hz		

6.7.4 Additional information on SM 331; AI 8 x 12 Bit

Unused channels

As certain programmed inputs may remain unused due to the channel group configuration, make allowances for the special features of these inputs outlined below in order to be able to use the diagnostics functions at these used channels:

- **Voltage measurement (except 1 V to 5V)** and for thermocouples: Short-circuit unused channels and connect these with M_{ANA}. This optimizes interference immunity of the analog input module. Set the "disabled" value at the "measurement type" parameter for unused channels. This setting reduces module cycle times. Also short-circuit the COMP input if this is not used.
- **Measuring range 1 V to 5 V:** wire the used and unused inputs of the same channel group in parallel.
- **Current measurement, 2-wire transducer:** There are two options of wiring the channel circuit.

  a) Open unused input; channel group diagnostics disabled. If you were to enable diagnostics, the analog module would trigger a single diagnostic interrupt, and light up its SF LED.

  b) Loading the unused input using a 1.5 kΩ to 3.3 kΩ resistor. This allows you to enable diagnostics for this channel group.
- **Current measurement 4 mA to 20 mA, 4-wire transducer:** wire the unused inputs of the same channel group in series.

All channels deactivated

If you disable **all** input channels of the module and enable diagnostics at the parameters of SM 331; AI 8 x 12 Bit, the module does **not** report "external auxiliary voltage missing."

Line continuity check for the 4 mA to 20 mA measuring range

If you configured a measuring range of 4 mA to 20 mA, and **enabled the line continuity check**, the analog input module logs a wire-break event to diagnostics data when the current drops below 3.6 mA.

The module also triggers a diagnostics interrupt if this function is enabled in the program.

A wire break can only be signaled by means of the lit SF LED and the diagnostic bytes must be evaluated in the user program if diagnostics interrupts are disabled.

Spare parts and accessories for S7-300 modules

D

Spare parts

The table below lists the S7-300 parts you can order separately or later.

Table D-1 Accessories and spare parts

S7-300 parts	Order number
Bus connector	6ES7390-0AA00-0AA0
Connection comb between power supply and CPU (older generation, before 2003)	6ES7390-7BA00-0AA0
Labeling strips for • Modules with 20-pin front connector: – (petrol) – (light beige) – (yellow) – (red)	 6ES7392-2AX00-0AA0 6ES7392-2BX00-0AA0 6ES7392-2CX00-0AA0 6ES7392-2DX00-0AA0
Labeling strips for • Modules with 40-pin front connector: – (petrol) – (light beige) – (yellow) – (red)	 6ES7392-2AX10-0AA0 6ES7392-2BX10-0AA0 6ES7392-2CX10-0AA0 6ES7392-2DX10-0AA0
• Instructions for printing labeling strips using print templates	On the Internet (http://www.siemens.com/automation/service&support) Entry ID: 11978022
Slot number plate	6ES7912-0AA00-0AA0
Front connector 20-pin • Screw terminal technology (1 unit) • Screw technology (100 units) • Spring clamp technology (1 unit) • Spring clamp technology (100 units)	 6ES7392-1AJ00-0AA0 6ES7392-1AJ00-1AB0 6ES7392-1BJ00-0AA0 6ES7392-1BJ00-1AB0
Front connector 40-pin • Screw technology (1 unit) • Screw technology (100 units) • Spring clamp technology (1 unit) • Spring clamp technology (100 units)	 6ES7392-1AM00-0AA0 6ES7392-1AM00-1AB0 6ES7392-1BM01-0AA0 6ES7392-1BM01-1AB0
Front connector for 2 ribbon cable connections • screw terminal technology • Spring clamp technology	 6ES7921-3AB00-0AA0 6ES7921-3AA00-0AA0
Front connector for 4 ribbon cable connections • Spring clamp technology	 6ES7921-3AA20-0AA0