SIEMENS

SIMATIC

ET 200S distributed I/O 2/4AI RTD ST analog electronic module (6ES7134-4JB51-0AB0)

Manual

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℗ 09/2008

Preface

Purpose of the manual

This manual supplements the *ET 200S Distributed I/O System* Operating Instructions. General functions for the ET 200S are described in the *ET 200S Distributed I/O System* Operating Instructions.

The information in this document along with the operating instructions enables you to commission the ET 200S.

Basic knowledge requirements

To understand these operating instructions you should have general knowledge of automation engineering.

Scope of the manual

This manual applies to this ET 200S module. It describes the components that are valid at the time of publication.

Recycling and disposal

Thanks to the fact that it is low in contaminants, this ET 200S module is recyclable. For environmentally compliant recycling and disposal of your electronic waste, please contact a company certified for the disposal of electronic waste.

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Properties

1

1.1 2/4AI RTD ST analog electronic module (6ES7134-4JB51-0AB0)

Properties

- 2 inputs (3- and 4-cable connection) / 4 inputs (2-cable connection) for resistance thermometers or resistance measurement
- Input ranges:
  - Resistance thermometers: Pt100 (α = 0,003851); Ni100 (α = 0,00618); resolution 15 bit + sign
  - Resistance measurement: 150 Ω; 300 Ω; 600 Ω, PTC; resolution max. 15 bit + sign
- Isolated from the load voltage L+
- Linearization of the sensor characteristic curves
- Extended temperature range from 0 to 50°C with vertical installation
- supports I&M functions
- compatible with the 2AI RTD ST (6ES7134-4JB50-0AB50). The wiring does not have to be changed. The additional bridges on the terminal module of the 2AI RTD ST (6ES7134-4JB50-0AB50) do not have to be removed.
- Comparison junction for the 2AI TC ST analog electronic module. Channels 0 and 1 have been used as a comparison junction.

3 methods for measuring resistance

- **4-wire connection: Constant current is fed to the resistance thermometers / resistors by means of connections I**C_{+} **and I**C_{-}. The voltage measured at the resistance thermometer / resistor is measured at the connections M+ and M-. This ensures highly accurate measurement results with the four-wire connection.
- **3-wire connection: Constant current is fed to the resistance thermometers / resistors by means of connections I**C_{+} and M-. The voltage arising at the resistance thermometer / resistor is measured at the connections M + and M -. The line resistance of M- is compensated for. This ensures highly accurate measurement results with the three-wire connection.
- **2-wire connection:** Up to 4 resistance thermometers / resistors can be connected simultaneously. No bridges are required on the terminal module. However, you have to expect a loss of accuracy in the measurement results with 2-wire connections

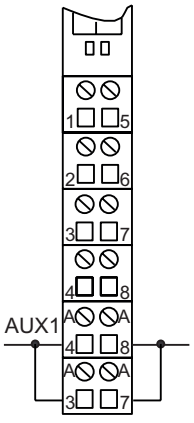
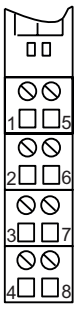
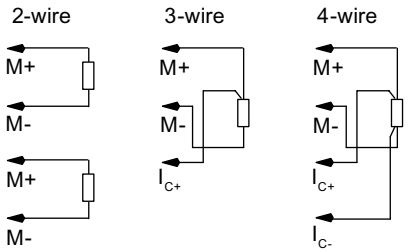
General terminal assignment

Note

Terminals A4, A8, A3, and A7 are only available on certain terminal modules.

2/4AI RTD ST terminal assignment (6ES7134-4JB51-0AB0)				
Terminal	**Assignment**	**Terminal**	**Assignment**	**Notes**
1	M_{0+}	**5**	M_{1+}	• M_{n+}: Measuring line positive, channel n • M_{n-}: Measuring line negative, channel n • I_{Cn+}: Constant current line positive, Channel n • I_{Cn-}: Measuring line negative, Channel n • AUX1: Protective-conductor terminal or potential bus (freely usable up to 230 VAC)
2	M_{0-}	**6**	M_{1-}	
3	M_{2+} / I_{C0+}	**7**	M_{3+} / I_{C1+}	
4	M_{2-} / I_{C0-}	**8**	M_{3-} / I_{C1-}	
A4	AUX1	**A8**	AUX1	
A3	AUX1	**A7**	AUX1	

Usable terminal modules

Usable terminal modules for 2/4AI RTD ST (6ES7134-4JB51-0AB0)		
TM-E15C26-A1 (6ES7193-4CA50-0AA0)	TM-E15C24-01 (6ES7193-4CB30-0AA0)	← Spring terminal
TM-E15S26-A1 (6ES7193-4CA40-0AA0)	TM-E15S24-01 (6ES7193-4CB20-0AA0)	← Screw-type terminal
TM-E15N26-A1 (6ES7193-4CA80-0AA0)	TM-E15N24-01 (6ES7193-4CB70-0AA0)	← Fast Connect
		Connection examples 

Block diagram

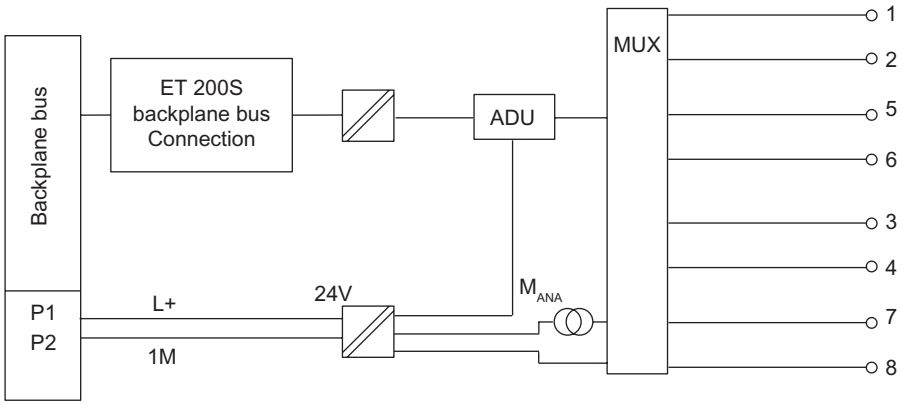


Figure 1-1 2/4AI RTD ST block diagram

2/4AI RTD ST technical specifications (6ES7134-4JB51-0AB0)

Dimensions and weight	
Width (mm)	15
Weight	Approx. 40 g
Module-specific data	
Supports isochronous operation	No
Supports I&M functions	Yes
Number of inputs	2, with 3- and 4-wire connection 4, with 2-wire connection
Cable length	
• Shielded	Max. 200 m
Parameter length	4 bytes, as 6ES7134-4JB50-0AB0 7 bytes, as 6ES7134-4JB51-0AB0
Address space	4 bytes, with 3- and 4-wire connection 8 bytes, with 2-wire connection
Voltages, currents, potentials	
Rated load voltage L+ (from the power module)	24 VDC
• Reverse polarity protection	Yes
Power supply of the transducers	Yes
• Constant-current supply for resistance-type sensors	1.65 mA[1]
• Short-circuit protection	Yes
Electrical isolation	
• Between the channels and backplane bus	Yes
• Between the channels and load voltage L+	Yes
• Between the channels	No

Permissible potential difference		
• Between M_{ANA} and the central grounding point (U_{ISO})	75 VDC / 60 VAC	
Insulation tested	500 VDC	
Current consumption		
• From load voltage L+	Max. 30 mA	
Power dissipation of the module	Typically 0.6 W	
Status, interrupts, diagnostics		
Diagnostics function		
• Group error	Red "SF" LED	
• Diagnostic functions readable	Yes	
Analog value generation		
Measuring principle	Integrative	
Integration and cycle time/resolution per channel:		
• Integration time can be assigned parameters	Yes	
• Interference frequency suppression in Hz	60	50
• Integration time in milliseconds	16,7	20
• Conversion time in ms	67	80
• additional conversion time in ms for diagnosis of wire break in four-wire connections	4	4
• Cycle time in ms	Number of active channels per module x conversion time	
• Resolution (including overshoot range)	Pt100, Ni100/ 15 bits + sign 150 Ω/ 14 bit/ 300 Ω, 600 Ω/ 15 bit PTC[2] / 2 bit	
Suppression of interference, limits of error		
Noise suppression for f = n x (f1 ± 1 %), (f1 = interference frequency)		
• Common-mode interference (U_{SS}) • Series-mode interference (peak interference value < rated value of input range)	Min. 90 dB min. 70 dB	
Crosstalk between the inputs	Min. -50 dB	
Operational limit (in the entire temperature range, with reference to the input range)	± 0,6 %	
Basic error limit (operational limit at 25°C with reference to input range)	± 0,4 %	
Temperature error (with reference to the input range)	±0,005 %/K	
Linearity error (with reference to the input range)	± 0,01 %	
Repeatability (in transient state at 25°C, in relation to input range)	± 0,05 %	

Data for selecting a sensor		
Input range (rated value)/input resistance		
• Resistance-type sensor	150 Ω/min. 2 MΩ 300 Ω/min. 2 MΩ 600 Ω/min. 2 MΩ PTC min 2 MΩ	
• Resistance thermometer	Pt100/min. 2 MΩ Ni100/min. 2 MΩ	
Permitted input voltage (destruction limit)	Max. 9 V	
Connection of the sensors		
• For measuring resistance – 2-wire connection – 3-wire connection – Four-wire connection	 Yes, Yes, internal compensation of line resistances Yes	
Characteristic curve linearization	Yes, parameters can be assigned for Pt100, Ni100	
Smoothing of the measured values	Yes, can be assigned parameters in 4 steps by means of digital filtering	
	Step	**Time constant**
	None	1 x cycle time
	Weak	4 x cycle time
	Medium	32 x cycle time
	Strong	64 x cycle time

[1] with PTC: max. 1.65 mA

[2]In accordance with VDE 0660 Part 302/303, Type A, no diagnostics for overrun/underrun

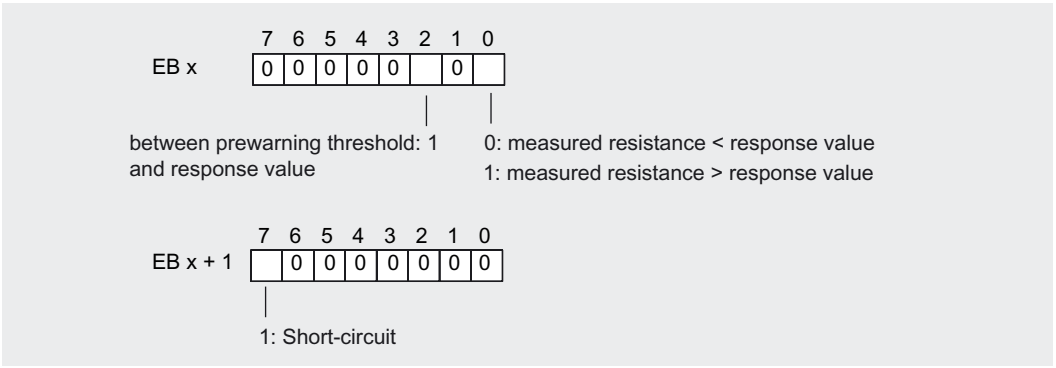
Using PTC resistors

PTCs are suitable for temperature monitoring and as thermal protective devices for complex drives and transformer windings.

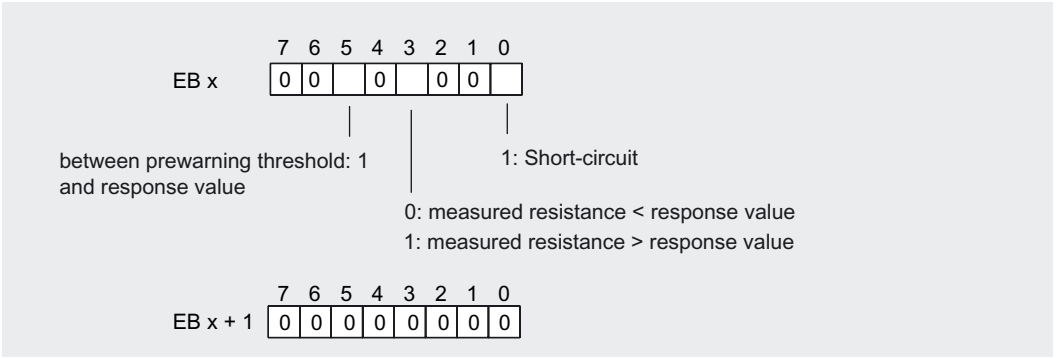
- Select "Two-wire resistor" and "PTC" when configuring:
- Connect the PTC in accordance with the two-wire connection method.
- Apply PTC resistors of type A (PTC thermistors) in accordance with DIN / VDE 0660, part 302.
- If the diagnosis "Overrun/underrun" is enabled, a diagnosis "Lower limit exceeded" indicating a short-circuit is indicated at resistance values < 18 Ω.
- Sensor data for the PTC resistor:

Property	Technical specifications	Remarks
Switching points	**Behavior with rising temperature**	
	< 550 Ω	**Normal range:** • SIMATIC S7: Bit 0 = "0", bit 2 = "0" (in the PII) • SIMATIC S5: Bit 3 = "0", bit 5 = "0" (in the PAE)
	550 Ω to 1650 Ω	**Prewarning range:** • SIMATIC S7: Bit 0 = "0", bit 2 = "1" (in the PII) • SIMATIC S5: Bit 3 = "0", bit 5 = "1" (in the PII)
	> 1650 Ω	**Addressable range:** • SIMATIC S7: Bit 0 = "1", bit 2 = "0" (in the PII) • SIMATIC S5: Bit 3 = "1", bit 5 = "0" (in the PII)
	Behavior with falling temperature	
	> 750 Ω	**Addressable range:** • SIMATIC S7: Bit 0 = "1", bit 2 = "0" (in the PII) • SIMATIC S5: Bit 3 = "1", bit 5 = "0" (in the PII)
	750 Ω to 540 Ω	**Prewarning range:** • SIMATIC S7: Bit 0 = "0", bit 2 = "1" (in the PII) • SIMATIC S5: Bit 3 = "0", bit 5 = "1" (in the PII)
	< 540 Ω	**Normal range:** • SIMATIC S7: Bit 0 = "0", bit 2 = "0" (in the PII) • SIMATIC S5: Bit 3 = "0", bit 5 = "0" (in the PII)
(TNF-5) °C (TNF+5) °C (TNF+15) °C Measuring circuit voltage Voltage on the PTC	max. 550 Ω min. 1330 Ω min. 4000 Ω max. 7.5V	TNF= rated operating temperature

- Assignment in the process input image (PII) in the case of SIMATIC S7



- Assignment in the process input image (PII) in the case of SIMATIC S5

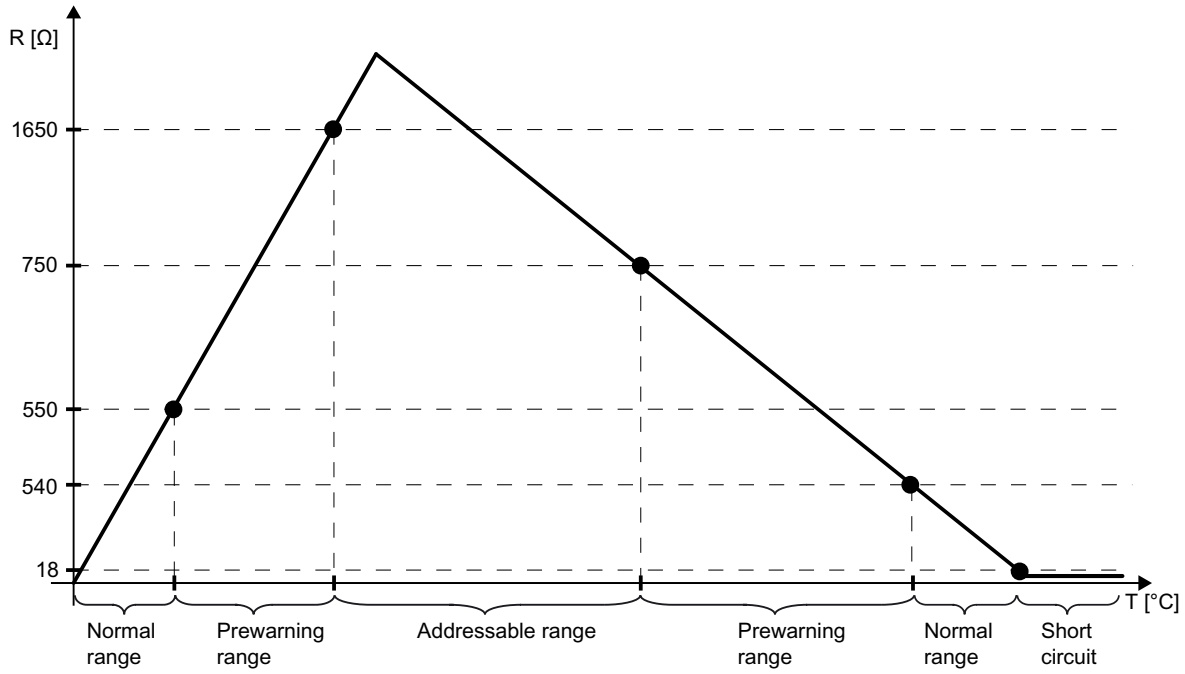


- Notes on programming

NOTICE
Only the bits 0+2 or 3+5 are relevant for the purposes of evaluation in the process input image. You can use bits 0+2 or 3+5 to monitor the temperature of a motor, for example. Bits 0+2 or 3+5 in the process input image does not have a retentive function. Make sure at parameter assignment that motor start-up is controlled (by means of an acknowledgment), for example. Bits 0+2 or 3+5 cannot be set at the same time, but set one after the other. For safety reasons, always evaluate the diagnostic inputs of the 2/4AI RTD ST, because measurement is not possible when the EM is removed, when the power supply to the EM has failed, or in the event of a wire break or short-circuit of the measuring lines.

Example

The diagram below shows the temperature pattern and the switching points belonging to it.



I&M functions

The interface modules identified in the table below (as of order number) can be used to read and write I&M data from the module and for the firmware update:

Interface module	as of order number
IM151-1 STANDARD	6ES7151-1AA05-0AB0
IM151-1 HIGH FEATURE	6ES7151-1BA02-0AB0
IM151-3 PN	6ES7151-3AA22-0AB0
IM151-3 PN HIGH FEATURE	6ES7151-3BA22-0AB0
IM151-3 PN FO	6ES7151-3BB22-0AB0
IM151-7 CPU	6ES7151-7AA20-0AB0

1.2 Compatibility with the predecessor module

Compatible with 2AI RTD ST analog electronic module (6ES7134-4JB50-0AB0)

If you configure the 2/4AI RTD ST (6ES7134-4JB51-0AB0) as predecessor module (6ES7134-4JB50-0AB0), then it behaves as if it is compatible.

The following technical specifications of the 2/4AI RTD ST (6ES7134-4JB51-0AB0) have changed values:

2/4AI RTD ST technical specifications 6ES7134-4JB51-0AB0			**configured as 6ES7134-4JB50-0AB0**	
Conversion time in ms (per module)	60 Hz	50 Hz	60 Hz	50 Hz
	67 ms	80 ms	67 ms	80 ms

Diagnostics data record 1 (DS1)

2AI RTD ST (6ES7134-4JB50-0AB0) plugged in:

- Length of the DS1: 16 bytes
- Number of channels specified in the DS1: 2

2/4AI RTD ST (6ES7134-4JB50-0AB0) plugged in to compatibility mode:

- Length of the DS1: 24 bytes
- Number of channels specified in the DS1: 4

Measuring ranges for measuring resistance

With 2/4AI RTD ST (6ES7134-4JB51-0AB0) there is no undershoot range and underflow with the measuring ranges for the resistors 150 Ω, 300 Ω and 600 Ω.

2/4AI RTD STANDARD with IM151-1 BASIC, IM151-1 COMPACT or IM151-1 FO STANDARD

If you use the electronics module 2/4AI RTD STANDARD with the interface modules IM151-1 BASIC, IM151-1 COMPACT or IM151-1 FO STANDARD, then the electronics module can be operated only as 2AI RTD STANDARD.

Parameters

2

2.1 Parameters

Table 2- 1 Parameters for the 2/4AI RTD ST analog electronic module

Parameter	Range of values	Default setting	Applicability
Group diagnostics	• locking • enabling	locking	Module
Diagnostics: overflow/underflow	• locking • enabling	locking	Module
Diagnostics: Wire break	• disable[1] • Enable	Disable	Channel
Smoothing	• None • Weak • Medium • Strong	None	Channel
Type of measurement	• De-activated • Four-wire resistor • Three-wire resistor • Two-wire resistor • Four-wire thermal resistor • Three-wire thermal resistor • Two-wire thermal resistor	4-wire thermal resistor	Channel
Measurement range	• 150 Ω • 300 Ω • 600 Ω • PTC • Pt100 Climatic • Ni100 Climatic Range • Pt100 Standard • Ni100 Standard	Pt100 Standard	Channel
[1] Wire break diagnostic is disabled if - type of measurement = "deactivated" or measuring range = "PTC" was assigned.			

2.2 Parameter description

Smoothing

The individual measured values are smoothed by digital filtering. The smoothing can be adjusted in four steps, in which the smoothing factor k multiplied with cycle time of the electronic module equals the time constant of the smoothing filter. The higher the smoothing the greater the time constant of the filter.

The following diagrams show the step response with the various smoothing factors depending on the number of subassembly cycles.

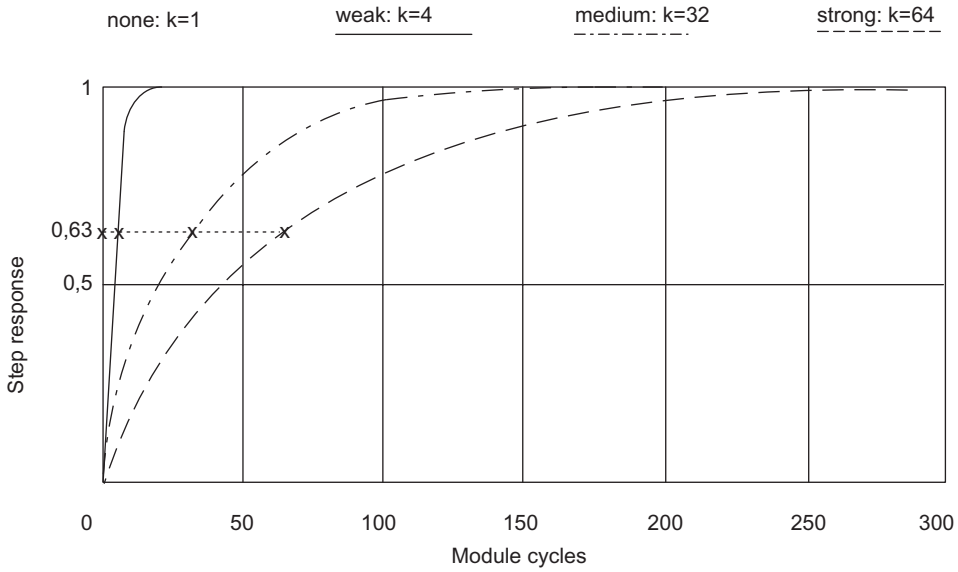


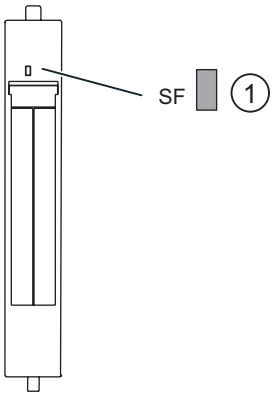
Figure 2-1 Smoothing on the 2AI RTD ST

Diagnostics

3

3.1 Diagnostics using LED display

LED display



① Batch error (red)

Status and error displays

Event (LED)	Cause	Remedy
SF		
On	No configuration or incorrect module plugged in. No load voltage.present There is a diagnostic message.	Check the parameter assignment. Check the load voltage. Evaluate the diagnostics.

3.2 Error types

Analog input module error types

Table 3- 1 Error types

Fault type		Meaning	Remedy
16_D	10000: Configuration error	Module cannot use the parameter for the channel: Inserted module does not match the one configured. Faulty parameter assignment.	Correct the configuration (align actual and preset configuration). Correct the parameter assignment (diagnostics wire break only for the allowed measuring range parameterized).
9_D	01001: Errors	Internal module error (diagnostics message at channel 0 applies to the entire module)	Replace the module.
7_D	00111: Violation of higher limit	Value is above the overshoot range.	Correct the module/actuator tuning.
8_D	01000: Lower value limit fallen below	Value is below the underrange.	Correct the module/actuator tuning.
6_D	00110: Open circuit	Line to the sensor interrupted.	Correct the process wiring.

Analog value representation

4

4.1 Introduction

Electronic modules with analog outputs

With the electronic module with analog inputs, continuously variable signals, such as those occurring in temperature measurement and resistance measurement, can be acquired, evaluated, and converted to digital values for further processing.

4.2 Analog value representation for measuring range with SIMATIC S7

Analog value representation

With the same nominal range, the digitized analog value is the same for input and output values. Analog values are represented in two's complement.

The following table shows the analog value representation for the analog electronic modules.

Table 4- 1 Analog value representation (SIMATIC S7 format)

Resolution	Analog value															
Bit number	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Significance of the bits	S	2^{14}	2^{13}	2^{12}	2^{11}	2^{10}	2^{9}	2^{8}	2^{7}	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}

Sign

The sign (S) of the analog value is always in bit number 15:

- "0" → +
- "1" → –

Analog values

The following table shows the representation of the binary analog values and the corresponding decimal and hexadecimal representation of the units of the analog values.

The table below shows the 11, 12, 13, 14, and 15 bit resolutions + sign. Each analog value is entered left aligned in the ACCU. The bits marked with "x" are set to "0".

Table 4- 2 Analog values (SIMATIC S7 format)

Resolution in bits	Units		Analog value	
	Decimal	Hexadecimal	High byte	Low byte
11+S	16	10_H	S 0 0 0 0 0 0 0	0 0 0 1 x x x x
12+S	8	8_H	S 0 0 0 0 0 0 0	0 0 0 0 1 x x x
13+S	4	4_H	S 0 0 0 0 0 0 0	0 0 0 0 0 1 x x
14+S	2	4_H	S 0 0 0 0 0 0 0	0 0 0 0 0 0 1 x
15 + sign	1	1_H	S 0 0 0 0 0 0 0	0 0 0 0 0 0 0 1

4.3 Measuring ranges

4.3.1 Measuring ranges for resistance thermometer

Introduction

The following tables contain the digitized analog values for the measuring ranges of the analog input modules.

Measured values in the case of a wire break depending on diagnostic being enabled

Table 4- 3 Measured values in the case of a wire break depending on diagnostic being enabled

Format	Parameter assignment	Measured values		Explanation
		Decimal	Hexadecimal	
S7	• "Wire break" diagnostics enabled	32767	$7FFF_H$	• "Open circuit" diagnostics message
	• "Wire break" diagnostics disabled • "Overflow/underflow" diagnostics enabled	-32767	8000_H	• Measured value after leaving the underrange • "Lower limit value undershot" diagnostics message
	• "Wire break" diagnostics disabled • "Overflow/underflow" diagnostics disabled	-32767	8000_H	• Measured value after leaving the underrange

Measuring ranges for resistance thermometer Pt 100 standard

Table 4- 4 SIMATIC S7 format: Measuring ranges Pt 100 standard in °C

Pt 100 Standard in °C (1 digit = 0.1°C)	Units		Range
	Decimal	hexadecimal	
> 1000,0	32767	$7FFF_H$	Overflow
1000,0 : 850,1	10000 : 8501	2710_H : 2135_H	Overshoot range
850,0 : -200,0	8500 : -2000	2134_H : $F830_H$	Rated range
-200,1 : -243,0	-2001 : -2430	$F82F_H$: $F682_H$	Underrange
< -243,0	-32768	8000_H	Underflow

Measuring ranges for resistance thermometer Pt 100 Climate

Table 4- 5 SIMATIC S7 format: Measuring ranges Pt 100 Climate in °C

Pt 100 Climate in °C (1 digit = 0.01°C)	Units		Range
	Decimal	hexadecimal	
> 155,00	32767	$7FFF_H$	Overflow
155,00 : 130,01	15500 : 13001	$3C8C_H$: $32C9_H$	Overshoot range
130,00 : -120,00	13000 : -12000	$32C8_H$: $D120_H$	Nominal range
-120,01 : -145,00	-12001 : -14500	$D11F_H$: $C75C_H$	Underrange
< -145,00	-32768	8000_H	Underflow

Measuring ranges for resistance thermometer Ni 100 Standard

Table 4- 6 SIMATIC S7 format: Measuring ranges Ni 100 Standard in °C

Ni 100 Standard in °C (1 digit = 0.1°C)	Units		Range
	Decimal	hexadecimal	
> 295,0	32767	$7FFF_H$	Overflow
295,0 : 250,1	2950 : 2501	$B86_H$: $9C5_H$	Overshoot range
250,0 : -60,0	2500 : -600	$9C4_H$: $FDA8_H$	Nominal range
-60,1 : -105,0	-601 : -1050	$FDA7_H$: $FBE6_H$	Underrange
< -105,0	-32768	8000_H	Underflow

Measuring ranges for resistance thermometer Ni 100 Climate

Table 4- 7 SIMATIC S7 format: Measuring ranges Ni 100 Climate in °C

Ni 100 Climate in °C (1 digit = 0.01°C)	Units		Range
	Decimal	hexadecimal	
> 295,00	32767	$7FFF_H$	Overflow
295,00 : 250,01	29500 : 25001	$733C_H$: $61A9_H$	Overshoot range
250,00 : -60,00	25000 : -6000	$61A8_H$: $E890_H$	Nominal range
-60,01 : -105,00	-6001 : -10500	$E88F_H$: $D6FC_H$	Underrange
< -105,00	-32768	8000_H	Underflow

4.3.2 Resistance measurement ranges

Measuring ranges for resistive sensors: 150 Ω, 300 Ω, 600 Ω

Table 4- 8 SIMATIC S7 format: Measuring ranges 150 Ω, 300 Ω, 600 Ω

Measuring range 150 Ω	Measuring range 300 Ω	Measuring range 600 Ω	Units		Range
			Decimal	hexadecimal	
> 176.38	> 352,77	> 705,53	32767	$7FFF_H$	Overflow
176,38 : 150,005	352,77 : 300,01	705,53 : 600,02	32511 : 27649	$7EFF_H$: $6C01_H$	Overshoot range
150,00 112,50 : 0,00	300,00 225,00 : 0,00	600,00 450,00 : 0,00	27648 20736 : 0	$6C00_H$ 5100_H : 0_H	Nominal range

4.4 Effect on analog value representation

4.4.1 Effect of the supply voltage and the operating status on analog input values

The input values of the analog modules are dependent on the supply voltage for electronics/encoders and on the operating status of the PLC (CPU of the DP master). The table below shows this dependency..

Table 4- 9 Relationship between the analog input values for the operating status of the PLC (CPU of the DP master) and the supply voltage L+

Operating state of the PLC (CPU of the DP master)		Power supply L+ on ET 200S (power module)	Input value of the electronic module with analog inputs (evaluation possible on the CPU of the DP master)
POWER ON	RUN	L+ present	Process values
			$7FFF_H$ until first conversion after startup, or after assignment of parameters for the module is completed.
		L+ missing	$7FFF_H$
POWER ON	STOP	L+ present	Process value
		L+ missing	$7FFF_H$
POWER OFF	-	L+ present	-
		L+ missing	-

4.4.2 Effect of the value range on the analog input 2AI RTD Standard

The response of the electronic modules with analog inputs depends on the part of the value range in which the input values are located. The table below shows this dependency..

Table 4- 10 Response of the analog modules, depending on the location of the analog input value in the range of values

Measured value within ...	Input value in SIMATIC S7 format	Input value in SIMATIC S5 format
Rated range	Measured value	Measured value
Over-/Undershoot range	Measured value	Measured value
Overflow	$7FFF_H$	End of the overshoot range +1 plus overflow bit
Underflow	8000_H	End of the undershoot range -1 plus overflow bit
prior to parameter assignment, or incorrect parameter assignment	$7FFF_H$	$7FFF_H$

Connecting

5

5.1 Connecting measuring sensors

Introduction

You can connect resistances as measuring sensors to the analog input module.

In this chapter you will find out how to connect the measuring sensors and what to watch for when doing so.

Lines for analog signals

You should use shielded and twisted-pair lines for the analog signals. This reduces the effect of interference. You should ground the shield of the analog lines at both ends of the line. If there are differences in potential between the ends of the line, a compensating current flows via the shield that can interfere with the analog signals. If this is the case, you should only ground the shield at one end of the line.

Analog input modules

In the case of the analog input modules there is electrical isolation:

- Between logic and backplane bus.
- Between load voltage and the channels
  - Isolation: No link between M_{ANA} and the central grounding point (U_{ISO})

Note

Ensure that this potential difference U_{ISO} does not exceed the permitted value.

Abbreviations used

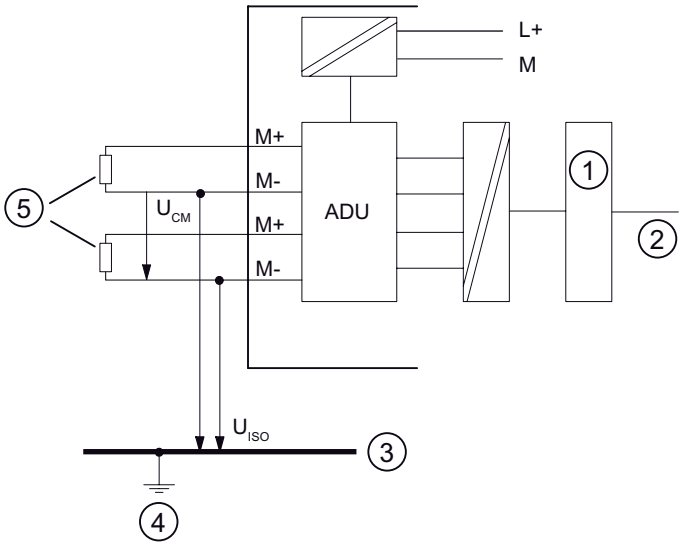
The meanings of the abbreviations in the figures below are as follows:

M +	Measuring line (positive)
M -	Measuring line (negative)
I_C +	Constant-current cable (positive)
I_C -	Constant-current cable (negative)
U_{CM}	Potential difference between inputs
U_{ISO}	Potential difference between M- and central grounding point

Connection of isolated measuring sensors to analog inputs

The isolated measuring sensors are not connected to the local ground potential. They can be floating.

The following figure illustrates the connection of isolated measuring sensors to a floating analog input module:



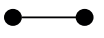
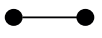
① Logic
② Backplane bus
③ Ground bus
④ Central grounding point
⑤ Isolated measuring sensors

5.2 Wiring unused channels on analog input modules

Rules

Pay attention to the following instructions when wiring unused channels:

- "Disable" unused input channels when setting parameters.
- A disabled channel always returns the value $7FFF_H$.
- The cycle time of the module reduces by 80 ms (e.g. 84 ms) per disabled channel.
- To adhere to the permissible potential differences, you must wire jumpers on the terminal module for the unused channels.

Analog input module	TM connection terminal							
2AI RTD ST	Channel 0				Channel 1			
	1	2	3	4	5	6	7	8
								
2/4AI RTD ST	Channel 0		Channel 2		Channel 1		Channel 3	
	1	2	3	4	5	6	7	8
								

5.3 Using the shield connection

Rules

To prevent interference we recommend the following for analog electronic modules:

- Use shielded wires to the sensors and actuators.
- Lay out the wire shields on the shield connection.
- Connect the shield connection to the ground bus with low impedance.

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