

INSTALLATION DOCUMENT PACKAGE

Installation Instructions

SIEMENS SIMATIC S7

6DL1134-6JH00-0EH1

AI 16XTC AND 8XRTD INPUT MODULE

Applicable product family: SIMATIC ET 200SP HA distributed I/O

OFFICIAL SOURCE

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ET 200SP HA AI 16xTC/8xRTD 2-/3-/4-wire HA

Equipment Manual

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Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

DANGER

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

WARNING

indicates that death or severe personal injury **may** result if proper precautions are not taken.

CAUTION

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

NOTICE

indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

WARNING

Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

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Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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Preface

Validity of the documentation

This manual describes the following I/O modules:

System family	I/O module	Article number
SIMATIC Distributed I/O System ET 200SP HA	AI 16xTC/8xRTD 2-/3-/4-wire HA	6DL1134-6JH00-0PH1
SIMATIC Distributed I/O System ET 200SP HA	AI 16xTC/8xRTD 2-/3-/4-wire HA	6DL1134-6JH00-0EH1

It supplements the "ET 200SP HA Distributed I/O System" system manual.

Functions that generally relate to the system are described in this manual.

The information in this Product Manual and the System / Function Manuals makes it possible to take the ET 200SP HA into operation.

Conventions

Please also observe notes marked as follows:

Note

A note contains important information on the product described in the documentation, on the handling of the product and on the section of the documentation to which particular attention should be paid.

Changes compared with the previous version

The following is an overview of the key changes in the documentation compared to the previous version:

As of firmware V1.1.0:

- The I/O module can now also provide the process values (analog values) as floating point numbers in IEEE 754 REAL format.

Product overview

4.1 I/O module

Definition

The I/O module AI 16xTC/8xRTD 2-/3-/4-wire HA is an analog input module with 16 inputs for process control.

In addition to the technical specifications, this module has the following properties:

- Automatic compensation of the line resistance with 3-wire connection
- Value status QI

- Reference identification label
- Shield connector

4.3 Terminal blocks

Definition

The terminal blocks provide the process terminals (push-in terminals) for components such as devices to be connected.

Description

The following terminal blocks are available for the I/O module:

Article number	Color	Description
6DL1193-6TP00-0DH1	Lit	
6DL1193-6TP00-0BH1	Dark	
6DL1193-6TP00-0DM1	Lit	For redundant configuration
6DL1193-6TP00-0BM1	Dark	For redundant configuration
6DL1193-6TP00-0DN0	Lit	With additional potential distributors for ground connection of the actuators
6DL1193-6TP00-0BN0	Dark	With additional potential distributors for ground connection of the actuators

Note

Terminal blocks with potential distributors have no integrated temperature sensors (no internal reference junction).

Note

Terminal blocks are not included in the scope of delivery of the I/O module and must be ordered separately.

You can find additional information on the configuration in the system manual.

Terminal

5.1 Pin assignment

Definition

The terminal assignment provides information about the arrangement and marking of the terminals when wiring a connector.

Description

The measurement types for resistance measurement (incl. PTC) and resistance thermal measurement are only possible on Channels 8...15. If a measurement type with 3-wire or 4-wire connection is configured for channel x (x = 8...15), then channel y (y = x-8) must be disabled.

The general terminal assignment is structured as follows:

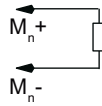
Terminal	Assignment	Terminal	Assignment	Explanations
1	M ₀ +	2	M ₁ +	M _n +: Measuring line positive, channel n M _n -: Measuring line negative, channel n IC _n +: Constant current line positive, channel n IC _n -: Constant current line negative, channel n 1P1: Supply voltage L+ of voltage bus 1P 2P1: Supply voltage L+ of voltage bus 2P 1P2: Ground reference of voltage bus 1P 2P2: Ground reference of the voltage bus 2P
3	M ₀ -	4	M ₁ -	
5	M ₂ +	6	M ₃ +	
7	M ₂ -	8	M ₃ -	
9	M ₄ +	10	M ₅ +	
11	M ₄ -	12	M ₅ -	
13	M ₆ +	14	M ₇ +	
15	M ₆ -	16	M ₇ -	
17	IC ₈ +/M ₈ +	18	IC ₉ +/M ₉ +	
19	IC ₈ -/M ₈ -	20	IC ₉ -/M ₉ -	
21	IC ₁₀ +/M ₁₀ +	22	IC ₁₁ +/M ₁₁ +	
23	IC ₁₀ -/M ₁₀ -	24	IC ₁₁ -/M ₁₁ -	
25	IC ₁₂ +/M ₁₂ +	26	IC ₁₃ +/M ₁₃ +	
27	IC ₁₂ -/M ₁₂ -	28	IC ₁₃ -/M ₁₃ -	
29	IC ₁₄ +/M ₁₄ +	30	IC ₁₅ +/M ₁₅ +	
31	IC ₁₄ -/M ₁₄ -	32	IC ₁₅ -/M ₁₅ -	
1P1	L+	1P2	M	1P1 L+ 24VDC M 1P2 2P1 L+ 24VDC M 2P2 MAX. 10 A
2P1 ¹	L+	2P2	M	

¹ If the module is plugged into a TB45R-P32 terminal block suitable for IO redundancy, the potential at this terminal is 1P3

5.2 Example of connection scheme for RTD 2-wire connection

Example

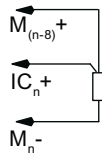
$n = 8 \dots 15$



5.3 Example of connection scheme for RTD 3-wire connection

Example

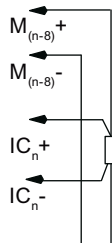
$n = 8 \dots 15$



5.4 Example of connection scheme for RTD 4-wire connection

Example

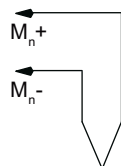
$n = 8 \dots 15$



5.5 Example of connection scheme for TC

Example

$n = 8 \dots 15$

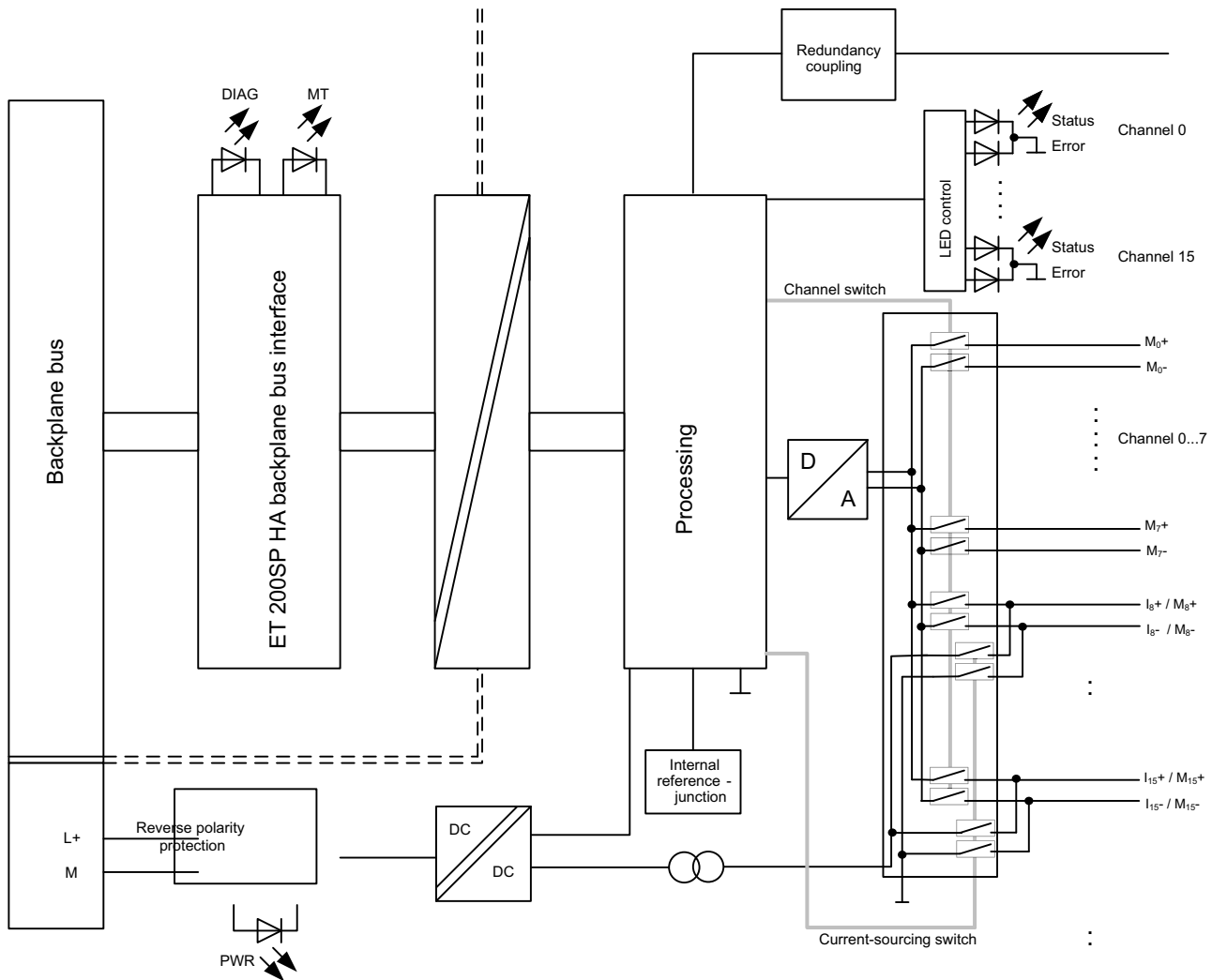


5.6 Schematic circuit diagram

Definition

A block diagram contains the schematic representation of individual function blocks.

Description



Supply voltage L+/M

Connect the supply voltage L+ to the connections L+ and M. An internal protective wiring protects the module against polarity reversal. The I/O module monitors whether the supply voltage L+ is connected and present.

Firmware update

The supply voltage L+ must be applied to the I/O module at the start of a firmware update and during the firmware update.

6.2 Module/channel parameters

Parameters	Value range	Default	Reparameterize in RUN	Efficiency range
Diagnostics wire break (Page 26)	- Enabled - Disabled	Enabled	Yes	Channel
Measurement types and measuring ranges (Page 27)	- Disabled - Voltage - Resistor (2-, 3-, 4-wire connection) - Thermal resistance (2-, 3-, 4-wire connection) - Thermocouple	Thermocouple	Yes	Channel
Measuring range (for measurement type: Disabled) (Page 27)	-	-	Yes	Channel
Measuring range (for measurement type: Voltage) (Page 27)	± 50 mV ± 80 mV ± 250 mV ± 1 V	± 80 mV	Yes	Channel
Measuring range (for measurement type: Resistance) (Page 27)	150 Ω 300 Ω 600 Ω 3 kΩ 6 kΩ - PTC (only for 2-wire connection)	600 Ω	Yes	Channel

Parameters	Value range	Default	Reparameterize in RUN	Efficiency range
Measuring range (for measurement type: Thermal resistor) (Page 27)	- Pt 100 climatic range - Pt 200 climatic range - Pt 500 climatic range - Pt 1000 climatic range - Pt 100 standard range - Pt 200 standard range - Pt 500 standard range - Pt 1000 standard range - Ni 100 climatic range - Ni 120 climatic range - Ni 200 climatic range - Ni 500 climatic range - Ni 1000 climatic range - Ni 100 standard range - Ni 120 standard range - Ni 200 standard range - Ni 500 standard range - Ni 1000 standard range - LG Ni 1000 climatic range - LG Ni 1000 standard range - Cu 10 climatic range (only for 3-wire connection) - Cu 10 standard range (only for 3-wire connection)	Pt 100 standard range	Yes	Channel
Measuring range (for measurement type: Thermocouple) (Page 27)	- Type B (PtRh-PtRh) - Type N (NiCrSi-NiSi) - Type E (NiCr-CuNi) - Type R (PtRh-Pt) - Type S (PtRh-Pt) - Type J (Fe-CuNi) - Type L (Fe-CuNi) - Type T (Cu-CuNi) - Type K (NiCr-NiAl) - Type U (Cu-CuNi) - Type C (WRe-WRe) - Type TXK	Type K (NiCr-NiAl)	Yes	Channel

Article number	6DL1134-6JH00-0EH1
General information	
Product type designation	AI 16 x TC/8 x RTD 2/3/4-wire HA
Firmware version	V1.1
• FW update possible	Yes
Usable terminal block	TB type H1 and M1
Color code for module-specific color identification plate	CC00
Product function	
• I&M data	Yes; I&M0 to I&M3
Engineering with	
• SPPA-T3000 can be configured/integrated from version	V8.0
Redundancy	
• Redundancy capability	Yes; With TB type M1
Supply voltage	
Rated value (DC)	24 V
permissible range, lower limit (DC)	19.2 V
permissible range, upper limit (DC)	28.8 V
Reverse polarity protection	Yes
Input current	
Current consumption, max.	100 mA
Address area	
Address space per module	
• Address space per module, max.	64 byte; + 2 bytes for QI information
Analog inputs	
permissible input voltage for voltage input (destruction limit), max.	5 V
Technical unit for temperature measurement adjustable	Yes; °C/°F/K
Input ranges (rated values), voltages	
• -1 V to +1 V	Yes; 16 bit incl. sign
• Input resistance (-1 V to +1 V)	1 MΩ
• -250 mV to +250 mV	Yes; 16 bit incl. sign
• Input resistance (-250 mV to +250 mV)	1 MΩ
• -50 mV to +50 mV	Yes; 16 bit incl. sign
• Input resistance (-50 mV to +50 mV)	1 MΩ
• -80 mV to +80 mV	Yes; 16 bit incl. sign
• Input resistance (-80 mV to +80 mV)	1 MΩ
Input ranges (rated values), thermocouples	
• Type B	Yes; 16 bit incl. sign
• Input resistance (Type B)	1 MΩ
• Type C	Yes; 16 bit incl. sign

Article number	6DL1134-6JH00-0EH1
- Input resistance (Type C) - Type E - Input resistance (Type E) - Type J - Input resistance (type J) - Type K - Input resistance (Type K) - Type L - Input resistance (Type L) - Type N - Input resistance (Type N) - Type R - Input resistance (Type R) - Type S - Input resistance (Type S) - Type T - Input resistance (Type T) - Type U - Input resistance (Type U) - Type TXK/TXK(L) to GOST - Input resistance (Type TXK/TXK(L) to GOST)	1 MΩ Yes; 16 bit incl. sign 1 MΩ Yes; 16 bit incl. sign 1 MΩ Yes; 16 bit incl. sign 1 MΩ Yes; 16 bit incl. sign 1 MΩ Yes; 16 bit incl. sign 1 MΩ Yes; 16 bit incl. sign 1 MΩ Yes; 16 bit incl. sign 1 MΩ Yes; 16 bit incl. sign 1 MΩ Yes; 16 bit incl. sign 1 MΩ Yes; 16 bit incl. sign 1 MΩ
Input ranges (rated values), resistance thermometer	
- Cu 10 - Input resistance (Cu 10) - Ni 100 - Input resistance (Ni 100) - Ni 1000 - Input resistance (Ni 1000) - LG-Ni 1000 - Ni 120 - Input resistance (Ni 120) - Ni 200 - Input resistance (Ni 200) - Ni 500 - Input resistance (Ni 500) - Pt 100 - Input resistance (Pt 100) - Pt 1000 - Input resistance (Pt 1000) - Pt 200	Yes; 16 bit incl. sign 1 MΩ Yes; 16 bit incl. sign 1 MΩ Yes; 16 bit incl. sign 1 MΩ Yes; 16 bit incl. sign Yes; 16 bit incl. sign 1 MΩ Yes; 16 bit incl. sign 1 MΩ Yes; 16 bit incl. sign 1 MΩ Yes; 16 bit incl. sign 1 MΩ Yes; 16 bit incl. sign 1 MΩ Yes; 16 bit incl. sign

Article number	6DL1134-6JH00-0EH1
- Input resistance (Pt 200) - Pt 500 - Input resistance (Pt 500)	1 MΩ Yes; 16 bit incl. sign 1 MΩ
Input ranges (rated values), resistors	
0 to 150 ohms - Input resistance (0 to 150 ohms) 0 to 300 ohms - Input resistance (0 to 300 ohms) 0 to 600 ohms - Input resistance (0 to 600 ohms) 0 to 3000 ohms - Input resistance (0 to 3000 ohms) 0 to 6000 ohms - Input resistance (0 to 6000 ohms)	Yes; 15 bit 1 MΩ Yes; 15 bit 1 MΩ Yes; 15 bit 1 MΩ Yes; 15 bit 1 MΩ Yes; 15 bit 1 MΩ
Thermocouple (TC)	
Temperature compensation	
- parameterizable - external temperature compensation via RTD - Reference channel of the module - internal comparison point - Reference channel of the group - Number of reference channel groups - fixed reference temperature	Yes Yes Yes Yes; with terminal block H1 and M1 Yes 4 Yes
Cable length	
shielded, max.	200 m; Measurement ranges for thermocouples / voltages: shielded cable length max. 600 m, loop resistance max 8 kΩ; measuring ranges RTD: shielded cable length max. 600 m, cable resistance (single) max. 75 ohms
Analog value generation for the inputs	
Integration and conversion time/resolution per channel	
- Integration time, parameterizable - Interference voltage suppression for interference frequency f1 in Hz - Conversion time (per channel)	Yes; Channel-by-channel, results from the selected interference frequency suppression 16.6 / 50 / 60 Hz, channel-by-channel 60 ms; 180 / 50 ms, results from the selected interference frequency suppression
Smoothing of measured values	
parameterizable	Yes; none, weak, medium, strong, channel-by-channel
Errors/accuracies	
Linearity error (relative to input range), (+/-)	0.01 %; ±0.1 % for resistance thermometers and resistance

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Temperature error (relative to input range), (+/-)	0.0009 %/K; ± 0.005 % / K at thermocouple
Crosstalk between the inputs, min.	50 dB
Repeat accuracy in steady state at 25 °C (relative to input range), (+/-)	0.05 %
Operational error limit in overall temperature range	
• Voltage, relative to input range, (+/-)	0.1 %
• Resistance, relative to input range, (+/-)	0.1 %
Basic error limit (operational limit at 25 °C)	
• Voltage, relative to input range, (+/-)	0.05 %
• Resistance, relative to input range, (+/-)	0.05 %
Interference voltage suppression for $f = n \times (f_1 \pm 1 \%)$, $f_1 =$ interference frequency	
• Series mode interference (peak value of interference < rated value of input range), min.	70 dB
• Common mode voltage, max.	60 V
• Common mode interference, min.	90 dB
Interrupts/diagnostics/status information	
Diagnostics function	Yes
Alarms	
• Limit value alarm	Yes; two upper and two lower limit values in each case
Diagnoses	
• Monitoring the supply voltage	Yes
• Wire-break	Yes; channel by channel
• Overflow/underflow	Yes; channel by channel
Diagnostics indication LED	
• MAINT LED	Yes; Yellow LED
• Monitoring of the supply voltage (PWR-LED)	Yes; green PWR LED
• Channel status display	Yes; green LED
• for channel diagnostics	Yes; red LED
• for module diagnostics	Yes; green/red DIAG LED
Potential separation	
Potential separation channels	
• between the channels	No
• between the channels and backplane bus	Yes
• Between the channels and load voltage L+	Yes
Ambient conditions	
Ambient temperature during operation	
• horizontal installation, min.	-40 °C
• horizontal installation, max.	70 °C
• vertical installation, min.	-40 °C
• vertical installation, max.	60 °C

Article number	6DL1134-6JH00-0EH1
Fire resistance	
Dimensions	
Height	115 mm
Depth	138 mm

Cycle time

The cycle time describes the time slice in which signals from the inputs are acquired and processed.

The cycle time is the sum of the channel processing times (independent of parameter assignment). The maximum processing time of a channel results from an interference frequency suppression of 16.6 Hz:

Measurement type	Processing time per channel
Thermocouple/voltage	194 ms
Thermal resistance/resistance (2-wire connection)	194 ms
Thermal resistance (3-wire connection)	378 ms
Thermal resistance (4-wire connection)	198 ms
Disabled	0 ms

In error-free IO redundancy mode, the cycle time related to a process value increases to: 2×cycle time + 1 ms

Redundancy failover time

At an IO redundancy failover, the update time of process values is delayed once by a time less than or equal to this time.

The maximum redundancy failover time of the I/O module is 50 ms + cycle time.

Operational and basic error limits for resistance thermometers

Error limits for resistance thermometers	
Operational limit (in the entire temperature range, in relation to input range)	Accuracy
• Pt 100, Pt 200, Pt 500, Pt 1000 standard	±1.0 K
• Pt 100, Pt 200, Pt 500, Pt 1000 climatic	± 0.25 K
• Ni 100, Ni 120, Ni 200, Ni 500, Ni 1000 standard and climatic	±0.4 K
• Cu 10	±1.5 K
Basic error limit (operational limit at 25 °C, in relation to input range)	Accuracy
• Pt 100, Pt 200, Pt 500, Pt 1000 standard	± 0.6 K
• Pt 100, Pt 200, Pt 500, Pt 1000 climatic	± 0.13 K
• Ni 100, Ni 120, Ni 200, Ni 500, Ni 1000 standard and climatic	± 0.2 K
• Cu 10	±1.0 K