

MANUFACTURER DOCUMENT PACKAGE

Manufacturer's Manual

Selected official specification and thermocouple pages

SIEMENS SIMATIC

6ES7288-3AT08-0AA1

S7-200 SMART G2 EM AT08 THERMOCOUPLE MODULE

The following original Siemens pages contain the exact AT08 ordering number, specifications, wiring, supported thermocouple types, and update-time information with original pagination retained.

REFERENCE PACKAGE

S7-200 SMART G2 System Manual, 03/2026

OFFICIAL DOCUMENT

A5E55110929-AB

Deletion Wizard

- PROFINETSTEP 7-Micro/WIN SMART (Version 3.2) no longer provides the legacy RPOFINET wizard.
- **Text Display:** STEP 7-Micro/WIN SMART (Version 3.2) no longer provides **Text Display** Wizard for configuring the TD400.
When you use STEP 7-Micro/WIN SMART (Version 3.2) to open a project created in a lower version that contains a **Text Display** configuration, the program remains usable. However, it is not possible to add new configurations or modify existing ones.

1.2.2 What's new in S7-200 SMART V3.1?

Full support for S7-200 SMART G2 modules

The ST32 supports connection of up to 16 expansion modules.

Module type	Module description	Article number
CPU	CPU ST32 (DC/DC/DC)	6ES7288-1ST32-0AA0
Signal board	SB RS485/RS232 (SB CM01)	6ES7288-5CM01-0AA1
Expansion module	EM Digital 16 x Inputs (EM DE16)	6ES7288-2DE16-0AA1
	EM Digital 16 x Outputs Transistor (EM QT16)	6ES7288-2QT16-0AA1
	EM Analog 4 x Inputs (EM AE04)	6ES7288-3AE04-0AA1
	EM Analog 4 x Outputs (EM AQ04)	6ES7288-3AQ04-0AA1
	EM Analog 8 x Inputs (EM AE08)	6ES7288-3AE08-0AA1
	EM Analog 4 x Inputs / Analog 2 x Outputs (EM AM06)	6ES7288-3AM06-0AA1
	EM RTD 4 x 16 bit (EM AR04)	6ES7288-3AR04-0AA1
	EM TC 8 x 16 bit (EM AT08)	6ES7288-3AT08-0AA1

Migrate

Migrate (Page 145): STEP 7-Micro/WIN SMART V3 (Version 3.1) allows you to migrate your STEP 7-Micro/WIN SMART (Version 2.8) or STEP 7-Micro/WIN SMART V3 (Version 3.0) projects and configurations to the S7-200 SMART G2 series.

During the project migration process, the CPU used in the original project will be migrated to ST32 by default; the signal board (SB) will be migrated to the signal board of the same name in the S7-200 SMART G2 series. If there is no signal board of the same name, its configuration will be cleared; The expansion module (EM) will be automatically replaced with S7-200 SMART G2 expansion module (EM) according to the matching rules.

Trace

The trace function (Page 184) is used to monitor and record variable values in a program in real time.

A.5 Thermocouple expansion modules (EMs)

A.5.1 EM AT08 thermocouple specifications

Table A-38 General specifications

Model	EM AT08 AI 8 x 16 bit TC
Part number	6ES7288-3AT08-0AA1
Dimensions W x H x D (mm)	15 x 118 x 74.5
Weight	79 g
Power consumption	0.525 W
Current consumption (SM Bus)	105 mA

Table A-39 Analog inputs

Model	EM AT08 AI 8 x 16 bit TC	
Number of inputs	8	
Range	See Thermocouple selection table.	
Nominal range (data word)		
Overrange/underrange (data word)		
Overflow/underflow (data word)		
Resolution	Temperature	0.1 °C / 0.1 °F
	Voltage	15 bits plus sign
Maximum withstand voltage	± 35 V	
Noise rejection	For the selected filter setting 85 dB (10 Hz/50 Hz/60 Hz/400 Hz)	
Common mode rejection	greater than 120 dB	
Impedance	≥ 10 MΩ	
Isolation	Field side to logic	707 V DC
Channel to channel isolation	120 V AC	
Resolution	See Thermocouple selection table.	
Repeatability	±0.05% FS	
Measuring principle	Integrating	
Module update time	See Filter selection table.	
Cold junction error	±2.5 °C	
Cable length (meters)	100 m to sensor max.	
Wire resistance	100 Ω max.	

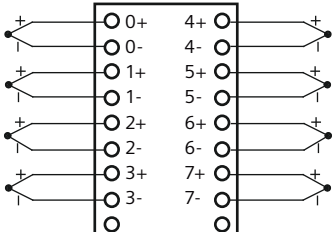
Table A-40 Diagnostics

Model	EM AT08 AI 8 x 16 bit TC
Overflow/underflow ¹	x
Wire break ²	x

- ¹ The overflow, underflow and low voltage diagnostic alarm information will be reported in the analog data values even if the alarms are disabled in the module configuration.
- ² When wire break alarm is disabled and an open wire condition exists in the sensor wiring, the module may report random values.

The EM AT08 Thermocouple (TC) analog expansion module measures the value of voltage connected to the module inputs. The temperature measurement type can be either "Thermocouple" or "Voltage".

- "Thermocouple": The value will be reported in degrees multiplied by ten (for example, 25.3 degrees will be reported as decimal 253).
- "Voltage": The nominal range full scale value will be decimal 27648.

EM AT08 RTD thermocouple 8-point 16-bit (6ES7288-3AT08-0AA1)										
	DC input terminal									
	Signals	AI 0+/ TC	AI 0-/T C	AI 1+/T C	AI 1-/T C	AI 2+/T C	AI 2-/T C	AI 3+/T C	AI 3-/T C	
	Pin number	1	3	5	7	9	11	13	15	17
	Pin number	2	4	6	8	10	12	14	16	18
	Signals	AI 4+/ TC	AI 4-/T C	AI 5+/T C	AI 5-/T C	AI 6+/T C	AI 6-/T C	AI 7+/T C	AI 7-/T C	

Note

Unused analog inputs should be shorted.

Thermocouples are formed whenever two dissimilar metals are electrically bonded to each other. A voltage is generated that is proportional to the junction temperature. This voltage is small; one microvolt could represent many degrees. Measuring the voltage from a thermocouple, compensating for extra junctions, and then linearizing the result forms the basis of temperature measurement using thermocouples.

When you connect a thermocouple to the EM AT08 Thermocouple module, the two dissimilar metal wires are attached to the module at the module signal connector. The place where the two dissimilar wires are attached to each other forms the sensor thermocouple.

Two more thermocouples are formed where the two dissimilar wires are attached to the signal connector. The connector temperature causes a voltage that adds to the voltage from the sensor thermocouple. If this voltage is not corrected, then the temperature reported will deviate from the sensor temperature.

Cold junction compensation is used to compensate for the connector thermocouple. Thermocouple tables are based on a reference junction temperature, usually zero degrees Celsius. The cold junction compensation compensates the connector to zero degrees Celsius. The cold junction compensation restores the voltage added by the connector thermocouples. The temperature of the module is measured internally, and then converted to a value to be

A.5 Thermocouple expansion modules (EMs)

added to the sensor conversion. The corrected sensor conversion is then linearized using the thermocouple tables.

For optimum operation of the cold junction compensation, the thermocouple module must be located in a thermally stable environment. Slow variation (less than 0.1 °C/minute) in ambient module temperature is correctly compensated within the module specifications. Air movement across the module will also cause cold junction compensation errors.

If better cold junction error compensation is needed, an external iso-thermal terminal block may be used. The thermocouple module provides for use of a 0 °C referenced or 50 °C referenced terminal block.

The ranges and accuracy for the different thermocouple types supported by the EM AT08 Thermocouple expansion module are shown in the table below.

Table A-41 EM AT08 thermocouple selection table

Type	Under range minimum ¹	Nominal range low limit	Nominal range high limit	Over range maximum ²	Normal range ^{3,4} accuracy @ 25 °C	Normal range ^{1,2} accuracy -20 °C to 60 °C
J	-210.0 °C	-150.0 °C	1200.0 °C	1450.0 °C	±0.6 °C	±1.2 °C
K	-270.0 °C	-200.0 °C	1372.0 °C	1622.0 °C	±0.7 °C	±1.5 °C
T	-270.0 °C	-200.0 °C	400.0 °C	540.0 °C	±0.7 °C	±1.5 °C
E	-270.0 °C	-200.0 °C	1000.0 °C	1200.0 °C	±0.6 °C	±1.2 °C
R & S	-50.0 °C	100.0 °C	1768.0 °C	2019.0 °C	±1.0 °C	±2.5 °C
B	0.0 °C	200.0 °C	800.0 °C	--	±2.0 °C	±3.5 °C
	--	800.0 °C	1820.0 °C	1820 °C	±1.0 °C	±2.3 °C
N	-270.0 °C	-200.0 °C	1300.0 °C	1550.0 °C	±1.0 °C	±1.6 °C
C	0.0 °C	100.0 °C	2315.0 °C	2500.0 °C	±0.7 °C	±2.7 °C
TXK/XK(L)	-200.0 °C	-150.0 °C	800.0 °C	1050 °C	±0.6 °C	±1.2 °C
Voltage	-32512	-27648 -80mV	27648 80mV	32511	±0.05%	±0.1%

¹ Thermocouple values below the under-range minimum value are reported as -32768.

² Thermocouple values above the over-range maximum value are reported as 32767.

³ Internal cold junction error is ±2.5 °C for all ranges. This error must be added to the error values in this table. The module requires at least 30 minutes of warm-up time to meet this specification.

Note

Thermocouple channel

Each channel on the Thermocouple expansion module can be configured with a different thermocouple type (selectable in the software during configuration of the module).

Table A-42 Noise reduction and update times for the EM AT08 thermocouple

Rejection frequency selection	Integral time	8 Channel module update time (seconds)
400 Hz (2.5 ms)	10 ms ¹	0.286
60 Hz (16.6 ms)	16.67 ms	0.446

Rejection frequency selection	Integral time	8 Channel module update time (seconds)
50 Hz (20 ms)	20 ms	0.526
10 Hz (100 ms)	100 ms	2.450

- ¹ To maintain module resolution and accuracy when 400 Hz rejection is selected, the integration time is 10 ms. This selection also rejects 100 Hz and 200 Hz noise.

It is recommended for measuring thermocouples that a 100 ms integration time be used. The use of smaller integration times will increase the repeatability error of the temperature readings.

Note

After power is applied, the module performs internal calibration for the analog-to-digital converter. During this time the module reports a value of 32767 on each channel until valid data is available on that channel. Your user program may need to allow for this initialization time. Because the configuration of the module can vary the length of the initialization time, you should verify the behavior of the module in your configuration. If required, you can include logic in your user program to accommodate the initialization time of the module.

Representation of analog values for Thermocouple Type J

A representation of the analog values of thermocouples type J is shown in the table below.

Table A-43 Representation of analog values for Thermocouple Type J

Type J in °C	Function units		Type J in °F	Function units		Range
	dec	Hexadecimal		dec	Hexadecimal	
> 1450.0	32767	7FFF	> 2642.0	32767	7FFF	Overflow
1450.0	14500	38A4	2642.0	26420	6734	High limit violated
:	:	:	:	:	:	
1200.1	12001	2EE1	2192.2	21922	55A2	Rated range
1200.0	12000	2EE0	2192.0	21920	55A0	
:	:	:	:	:	:	Low limit violated
-150.0	-1500	FA24	-238.0	-2380	F6B4	
-150.1	-1501	FA23	-238.2	-2382	F6B2	Low limit violated
:	:	:	:	:	:	
-210.0	-2100	F7CC	-346.0	-3460	F27C	Underflow ¹
< -210.0	-32768	8000	< -346.0	-32768	8000	

¹ Faulty wiring (for example, polarity reversal, or open inputs) or sensor error in the negative range (for example, wrong type of thermocouple) may cause the thermocouple module to signal underflow.