MANUFACTURER DOCUMENT PACKAGE

Manufacturer's Manual

Selected official pages for procurement and maintenance review

PRODUCT BRAND

Siemens

PRODUCT MODEL

6ES7288-5AE01-0AA0

SB AE01 Analog Input Board. Relevant section pages: 822, 823, 838, 839, 840. Adjacent model text on shared pages is outside this product reference.

OFFICIAL SOURCE

S7-200 SMART System Manual; V2.5, 01/2020, A5E03822230-AI

Siemens original documentation and product reference

Historical V2.5 (01/2020) reference, not a complete installation guide. Accuracy temperature scope differs from V2.8. Only AE01 data apply; adjacent models and general +/-1.25 V / 4-20 mA columns are excluded.

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

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.

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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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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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Table A- 113 Connector pin locations for AM06 4 x Analog Inputs / 2 x Analog Outputs (6ES7288-3AM06-0AA0)

Pin	X10 (gold)	X11 (gold)	X12 (gold)
1	L+ / 24 V DC	No connection	No connection
2	M / 24 V DC	No connection	No connection
3	Functional Earth	No connection	No connection
4	AI 0+	AI 2+	AQ 0M
5	AI 0-	AI 2-	AQ 0
6	AI 1+	A1 3+	AQ 1M
7	AI 1-	A1 3-	AQ 1

A.4.4 Step response of the analog inputs

Table A- 114 Step response (ms), 0 to full-scale measured at 95%

Smoothing selection (sample averaging)	Noise reduction/rejection frequency (Integration time selection)			
	400 Hz (2.5 ms)	60 Hz (16.6 ms)	50 Hz (20 ms)	10 Hz (100 ms)
None (1 cycle): No averaging	4 ms	18 ms	22 ms	100 ms
Weak (4 cycles): 4 samples	9 ms	52 ms	63 ms	320 ms
Medium (16 cycles): 16 samples	32 ms	203 ms	241 ms	1200 ms
Strong (32 cycles): 32 samples	61 ms	400 ms	483 ms	2410 ms
Sample time				
• 4 AI x 13 bits	• 0.625 ms	• 4.17 ms	• 5 ms	• 25 ms
• 8 AI x 13 bits	• 1.25 ms	• 4.17 ms	• 5 ms	• 25 ms

A.4.5 Sample time and update times for the analog inputs

Table A- 115 Sample time and update time

Rejection frequency (Integration time)	Sample time	Module update time for all channels	
		4-channel SM	8-channel SM
400 Hz (2.5 ms)	• 4-channel SM: 0.625 ms • 8-channel SM: 1.250 ms	0.625 ms	1.250 ms
60 Hz (16.6 ms)	4.170 ms	4.17 ms	4.17 ms
50 Hz (20 ms)	5.000 ms	5 ms	5 ms
10 Hz (100 ms)	25.000 ms	25 ms	25 ms

A.4.6 Measurement ranges of the analog inputs for voltage and current (SB and EM)

Table A- 116 Analog input representation for voltage (SB and EM)

System		Voltage Measuring Range				
Decimal	Hexadecimal	±10 V	±5 V	±2.5 V	±1.25 V	
32767	7FFF[1]	11.851 V	5.926 V	2.963 V	1.481 V	Overflow
32512	7F00					
32511	7EFF	11.759 V	5.879 V	2.940 V	1.470 V	Overshoot range
27649	6C01					
27648	6C00	10 V	5 V	2.5 V	1.250 V	Rated range
20736	5100	7.5 V	3.75 V	1.875 V	0.938 V	
1	1	361.7 µV	180.8 µV	90.4 µV	45.2 µV	
0	0	0 V	0 V	0 V	0 V	
-1	FFFF					
-20736	AF00	-7.5 V	-3.75 V	-1.875 V	-0.938 V	
-27648	9400	-10 V	-5 V	-2.5 V	-1.250 V	
-27649	93FF					Undershoot range
-32512	8100	-11.759 V	-5.879 V	-2.940 V	-1.470 V	
-32513	80FF					Underflow
-32768	8000	-11.851 V	-5.926 V	-2.963 V	-1.481 V	

[1] 7FFF can be returned for one of the following reasons: overflow (as noted in this table), before valid values are available (for example immediately upon a power up), or if a wire break is detected.

Table A- 117 Analog input representation for current (SB and EM)

System		Current measuring range		
Decimal	Hexadecimal	0 mA to 20 mA	4 mA to 20 mA	
32767	7FFF	23.70 mA	22.96 mA	Overflow
32512	7F00			
32511	7EFF	23.52 mA	22.81 mA	Overshoot range
27649	6C01			
27648	6C00	20 mA	20 mA	Nominal range
20736	5100	15 mA	16 mA	
1	1	723.4 nA	4 mA + 578.7 nA	
0	0	0 mA	4 mA	
-1	FFFF			Undershoot range
-4864	ED00	-3.52 mA	1.185 mA	
-4865	ECFF			Underflow
-32768	8000			

A.7 Analog signal boards

A.7.1 SB AE01 analog input specifications

Table A- 142 General specifications

Technical data	SB Analog 1 x Input (SB AE01)
Article number	6ES7288-5AE01-0AA0
Dimensions W x H x D (mm)	35 x 52.2 x 16
Weight	20 grams
Power dissipation	0.4 W
Current consumption (5 V DC)	50 mA (5 V and 3.3 combined)
Current consumption (24 V DC)	None

Table A- 143 Analog inputs

Technical data		SB Analog 1 x input (SB AE01)
Number of inputs		1
Type		Voltage or current (differential)
Range		±10 V, ±5 V, ±2.5 V, or 0 to 20 mA
Resolution		11 bits + sign bit (voltage mode) 11 bits (current mode)
Full scale range (data word)		-27,648 to 27,648
Accuracy (25 °C / 0 to 50 °C)		Voltage mode: ±0.3 % / ±0.6 % of full scale Current mode: ±0.3 % / ±0.6 % of full scale
Overshoot/undershoot range (data word)		Voltage: 27,649 to 32,511 / -27,649 to -32,512 Current: 27,649 to 32,511 / -4864 to 0 (Refer to Analog input representation for voltage and Analog input representation for current (Page 823).)
Overflow/underflow (data word)		Voltage: 32,512 to 32,767 / -32,513 to -32,768 Current: 32,512 to 32,767 / -4,865 to -32,768 (Refer to Analog input representation for voltage and Analog input representation for current (Page 823).)
Maximum withstand voltage / current		±35 V / ±40 mA
Smoothing		None, weak, medium, or strong (Refer to Analog input response times for step response time (Page 822).)
Noise rejection		400, 60, 50, or 10 Hz
Measuring principle common mode rejection		40 dB, DC to 60 Hz rejection
Operational signal range (signal plus common mode voltage)		Signal plus common mode voltage must be less than +35 V and greater than -35 V
Input impedance		
	Differential mode	220 KΩ (voltage) / 250 Ω (current)
	Common mode	55 KΩ (voltage) / 55 Ω (current)

Technical data	SB Analog 1 x input (SB AE01)
Isolation (field side to logic)	None
Cable length (meters)	100 m twisted and shielded

Table A- 144 Diagnostics

Model	SB Analog 1 x input (SB AE01)
Overflow/underflow	Yes
24 V DC low voltage	None

SB AE01 wiring current transducers

Wiring current transducers are available as 2-wire transducers and 4-wire transducers as shown below.

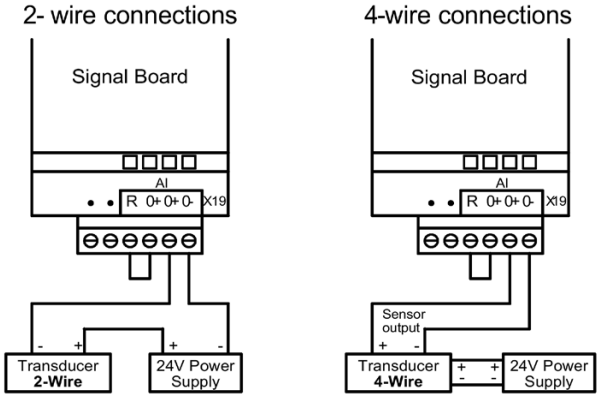


Table A- 145 Wiring diagram for the SB AE01 Analog 1 x Input (6ES7288-5AE01-0AA0)

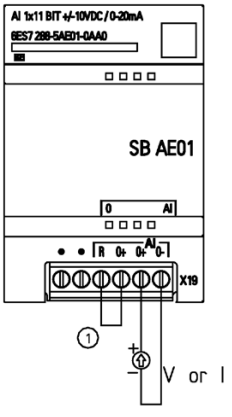
SB AE01 - SB Analog Input 1 x Input (6ES7288-5AE01-0AA0)	
	① Connect "R" and "0+" for current applications. Note: Connectors must be gold. See Appendix F, Spare parts and other hardware for article number.

Table A- 146 Connector pin locations for SB AE01 Analog Input 1 x Input (6ES7288-5AE01-0AA0)

Pin	X19
1	No connection
2	No connection
3	AI R
4	AI 0+
5	AI 0+
6	AI 0-

A.7.2 SB AQ01 analog output specifications

Table A- 147 General specifications

Technical data	SB Analog 1 x Output (SB AQ01)
Article number	6ES7288-5AQ01-0AA0
Dimensions W x H x D (mm)	35 x 52.2 x 16
Weight	17.4 grams
Power dissipation	1.5 W
Current consumption (5 V DC)	15 mA
Current consumption (24 V DC)	40 mA (no load)

Table A- 148 Analog outputs

Technical data	SB Analog 1 x Output (SB AQ01)
Number of outputs	1
Type	Voltage or current
Range	±10 V, 0 to 20 mA
Resolution	Voltage: 11 bits + sign Current: 11 bits
Full scale range (data word) Refer to the output ranges for voltage and current.	-27,648 to 27,648 (-10 V to 10 V) 0 to 27,648 (0 to 20 mA)
Accuracy (25 °C / 0 to 55 °C)	±0.5% / ±1%
Settling time (95% of new value)	Voltage: 300 µs (R), 750 µs (1 µF) Current: 600 µs (1mH), 2 ms (10 mH)
Load impedance	Voltage: ≥ 1000 ohms Current: ≤ 600 ohms
Output behavior in STOP	Last value, substitute value (default value 0)
Isolation (field side to logic)	None
Cable length (max.), in meters	10 m twisted and shielded