

SIMATIC S7-1500, ANALOG INPUT MODULE AI 8 X U/I/RTD/TC, 16 BITS OF RESOLUTION, ACCURACY 0.3 %; 8 CHANNELS IN GROUPS OF 8; 4 CHANNELS FOR RTD MEASURING, COMMON MODE VOLTAGE APPR. 10 V; DIAGNOSIS, PROCESSALARMS INCL. INFEEED ELEMENT, SHIELD CLAMP AND SHIELD TERMINAL



Product type designation	
General information	
HW functional status	E01
Firmware version	V2.0.0
Product function	
• I&M data	Yes; I&M0 to I&M3
Engineering with	
• STEP 7 TIA Portal configurable/integrated as of version	V12 / V12
• STEP 7 configurable/integrated as of version	V5.5 SP3 / -
• PROFIBUS as of GSD version/GSD revision	V1.0 / V5.1
• PROFINET as of GSD version/GSD revision	V2.3 / -
Operating mode	
• MSI	Yes
CiR - Configuration in RUN	
Reparameterization possible in RUN	Yes
Calibration possible in RUN	Yes
Supply voltage	

Rated value (DC)	24 V
permissible range, lower limit (DC)	20.4 V
permissible range, upper limit (DC)	28.8 V
Reverse polarity protection	Yes

#### Input current

Current consumption, max.	240 mA; with 24 V DC supply
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#### Encoder supply

24 V encoder supply	
• Short-circuit protection	Yes
• Output current, max.	53 mA

#### Power

Power available from the backplane bus	0.7 W
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#### Power loss

Power loss, typ.	2.7 W
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#### Analog inputs

Number of analog inputs	8
• For current measurement	8
• For voltage measurement	8
• For resistance/resistance thermometer measurement	4
• For thermocouple measurement	8
permissible input voltage for voltage input (destruction limit), max.	28.8 V
permissible input current for current input (destruction limit), max.	40 mA
Technical unit for temperature measurement adjustable	Yes

#### Input ranges (rated values), voltages

• 1 V to 5 V	Yes
• Input resistance (1 V to 5 V)	100 k $\Omega$
• -1 V to +1 V	Yes
• Input resistance (-1 V to +1 V)	10 M $\Omega$
• -10 V to +10 V	Yes
• Input resistance (-10 V to +10 V)	100 k $\Omega$
• -2.5 V to +2.5 V	Yes
• Input resistance (-2.5 V to +2.5 V)	10 M $\Omega$
• -250 mV to +250 mV	Yes
• Input resistance (-250 mV to +250 mV)	10 M $\Omega$
• -5 V to +5 V	Yes
• Input resistance (-5 V to +5 V)	100 k $\Omega$
• -50 mV to +50 mV	Yes

• Input resistance (-50 mV to +50 mV)	10 MΩ
• -500 mV to +500 mV	Yes
• Input resistance (-500 mV to +500 mV)	10 MΩ
• -80 mV to +80 mV	Yes
• Input resistance (-80 mV to +80 mV)	10 MΩ
<b>Input ranges (rated values), currents</b>	
• 0 to 20 mA	Yes
• Input resistance (0 to 20 mA)	25 Ω; Plus approx. 42 ohms for overvoltage protection by PTC
• -20 mA to +20 mA	Yes
• Input resistance (-20 mA to +20 mA)	25 Ω; Plus approx. 42 ohms for overvoltage protection by PTC
• 4 mA to 20 mA	Yes
• Input resistance (4 mA to 20 mA)	25 Ω; Plus approx. 42 ohms for overvoltage protection by PTC
<b>Input ranges (rated values), thermocouples</b>	
• Type B	Yes
• Input resistance (Type B)	10 MΩ
• Type E	Yes
• Input resistance (Type E)	10 MΩ
• Type J	Yes
• Input resistance (type J)	10 MΩ
• Type K	Yes
• Input resistance (Type K)	10 MΩ
• Type N	Yes
• Input resistance (Type N)	10 MΩ
• Type R	Yes
• Input resistance (Type R)	10 MΩ
• Type S	Yes
• Input resistance (Type S)	10 MΩ
• Type T	Yes
• Input resistance (Type T)	10 MΩ
<b>Input ranges (rated values), resistance thermometer</b>	
• Ni 100	Yes; Standard/climate
• Input resistance (Ni 100)	10 MΩ
• Ni 1000	Yes; Standard/climate
• Input resistance (Ni 1000)	10 MΩ
• LG-Ni 1000	Yes; Standard/climate
• Input resistance (LG-Ni 1000)	10 MΩ
• Pt 100	Yes; Standard/climate
• Input resistance (Pt 100)	10 MΩ
• Pt 1000	Yes; Standard/climate
• Input resistance (Pt 1000)	10 MΩ
• Pt 200	Yes; Standard/climate

• Input resistance (Pt 200)	10 MΩ
• Pt 500	Yes; Standard/climate
• Input resistance (Pt 500)	10 MΩ
<b>Input ranges (rated values), resistors</b>	
• 0 to 150 ohms	Yes
• Input resistance (0 to 150 ohms)	10 MΩ
• 0 to 300 ohms	Yes
• Input resistance (0 to 300 ohms)	10 MΩ
• 0 to 600 ohms	Yes
• Input resistance (0 to 600 ohms)	10 MΩ
• 0 to 6000 ohms	Yes
• Input resistance (0 to 6000 ohms)	10 MΩ
• PTC	Yes
• Input resistance (PTC)	10 MΩ
<b>Thermocouple (TC)</b>	
• Technical unit for temperature measurement	°C/°F/K
<b>Temperature compensation</b>	
— Parameterizable	Yes
— internal temperature compensation	Yes
— external temperature compensation via RTD	Yes
— Compensation for 0 °C reference point temperature	Yes; fixed value can be set
<b>Resistance thermometer (RTD)</b>	
• Technical unit for temperature measurement	°C/°F/K
<b>Cable length</b>	
• shielded, max.	800 m; for U/I, 200 m for R/RTD, 50 m for TC
<b>Analog value generation for the inputs</b>	
<b>Integration and conversion time/resolution per channel</b>	
• Resolution with overrange (bit including sign), max.	16 bit
• Integration time, parameterizable	Yes
• Integration time (ms)	2,5 / 16,67 / 20 / 100 ms
• Basic conversion time, including integration time (ms)	9 / 23 / 27 / 107 ms
— additional conversion time for wire-break monitoring	9 ms (to be considered in R/RTD/TC measurement)
— additional conversion time for resistance measurement	150 ohm, 300 ohm, 600 ohm, Pt100, Pt200, Ni100: 2 ms, 6000 ohm, Pt500, Pt1000, Ni1000, LG-Ni1000, PTC: 4 ms
• Interference voltage suppression for interference frequency f1 in Hz	400 / 60 / 50 / 10 Hz
<b>Smoothing of measured values</b>	

• Parameterizable	Yes
• Step: None	Yes
• Step: low	Yes
• Step: Medium	Yes
• Step: High	Yes

## Encoder

### Connection of signal encoders

• for voltage measurement	Yes
• for current measurement as 2-wire transducer — Burden of 2-wire transmitter, max.	Yes 820 $\Omega$
• for current measurement as 4-wire transducer	Yes
• for resistance measurement with two-wire connection	Yes; Only for PTC
• for resistance measurement with three-wire connection	Yes; All measuring ranges except PTC; internal compensation of the cable resistances
• for resistance measurement with four-wire connection	Yes; All measuring ranges except PTC

### Errors/accuracies

Linearity error (relative to input range), (+/-)	0.02 %
Temperature error (relative to input range), (+/-)	0.005 %/K; with TC type T 0.02 +/- %/K
Crosstalk between the inputs, max.	-80 dB
Repeat accuracy in steady state at 25 °C (relative to input area), (+/-)	0.02 %
Temperature error of internal compensation	+/-6 °C

### Operational error limit in overall temperature range

• Voltage, relative to input area, (+/-)	0.3 %
• Current, relative to input area, (+/-)	0.3 %
• Resistance, relative to input area, (+/-)	0.3 %
• Resistance thermometer, relative to input area, (+/-)	Pt xxx standard: $\pm 1.5$ K, Pt xxx climate: $\pm 0.5$ K, Ni xxx standard: $\pm 0.5$ K, Ni xxx climate: $\pm 0.3$ K
• Thermocouple, relative to input area, (+/-)	Type B: $> 600$ °C $\pm 4.6$ K, type E: $> -200$ °C $\pm 1.5$ K, type J: $> -210$ °C $\pm 1.9$ K, type K: $> -200$ °C $\pm 2.4$ K, type N: $> -200$ °C $\pm 2.9$ K, type R: $> 0$ °C $\pm 4.7$ K, type S: $> 0$ °C $\pm 4.6$ K, type T: $> -200$ °C $\pm 2.4$ K

### Basic error limit (operational limit at 25 °C)

• Voltage, relative to input area, (+/-)	0.1 %
• Current, relative to input area, (+/-)	0.1 %
• Resistance, relative to input area, (+/-)	0.1 %
• Resistance thermometer, relative to input area, (+/-)	Pt xxx standard: $\pm 0.7$ K, Pt xxx climate: $\pm 0.2$ K, Ni xxx standard: $\pm 0.3$ K, Ni xxx climate: $\pm 0.15$ K

- Thermocouple, relative to input area, (+/-)

Type B: > 600 °C ±1.7 K, type E: > -200 °C ±0.7 K, type J: > -210 °C ±0.8 K, type K: > -200 °C ±1.2 K, type N: > -200 °C ±1.2 K, type R: > 0 °C ±1.9 K, type S: > 0 °C ±1.9 K, type T: > -200 °C ±0.8 K

#### 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. 40 dB
- Common mode voltage, max. 10 V
- Common mode interference, min. 60 dB

### Interrupts/diagnostics/status information

#### Alarms

- Diagnostic alarm Yes
- Limit value alarm Yes; two upper and two lower limit values in each case

#### Diagnostic messages

- Diagnostics Yes
- Monitoring the supply voltage Yes
- Wire-break Yes; Only for 1 to 5 V, 4 to 20 mA, TC, R, and RTD
- Overflow/underflow Yes

#### Diagnostics indication LED

- RUN LED Yes; Green LED
- ERROR LED Yes; Red LED
- Monitoring of the supply voltage (PWR-LED) Yes; Green LED
- Channel status display Yes; Green LED
- for channel diagnostics Yes; Red LED
- for module diagnostics Yes; Red LED

### Potential separation

#### Potential separation channels

- between the channels No
- between the channels, in groups of 8
- between the channels and the backplane bus Yes
- between the channels and the supply voltage of the electronics Yes

### Permissible potential difference

- between the inputs (UCM) 20 V DC
- Between the inputs and MANA (UCM) 10 V DC
- between M internally and the inputs 75 V DC/60 V AC (base isolation)

### Isolation

- Isolation tested with 707 V DC (type test)

### Decentralized operation

- Prioritized startup No

## Dimensions

Width	35 mm
Height	147 mm
Depth	129 mm

## Weights

Weight, approx.	310 g
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## Other

Note:	Additional basic error and noise for integration time = 2.5 ms: Voltage: $\pm 250$ mV ( $\pm 0.02\%$ ), $\pm 80$ mV ( $\pm 0.05\%$ ), $\pm 50$ mV ( $\pm 0.05\%$ ); resistance: 150 ohms $\pm 0.02\%$ ; resistance thermometer: Pt100 climate: $\pm 0.08$ K, Ni100 climate: $\pm 0.08$ K; thermocouple: Type B, R, S: $\pm 3$ K, type E, J, K, N, T: $\pm 1$ K
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