

SIMATIC S7-1500, analog input module AI 8xU/I/RTD/TC ST, 16 bit resolution, accuracy 0.3%, 8 channels in groups of 8, 4 channels for RTD measurement, common mode voltage 10 V; Diagnostics, hardware interrupts Incl. infeed element, shield bracket and shield terminal: Front connector (screw terminals or push-in) to be ordered separately



General information	
Product type designation	AI 8xU/I/RTD/TC ST
HW functional status	FS04
Firmware version	V2.0.0
<ul style="list-style-type: none"> <li>FW update possible</li> </ul>	Yes
Product function	
<ul style="list-style-type: none"> <li>I&amp;M data</li> </ul>	Yes; I&M0 to I&M3
<ul style="list-style-type: none"> <li>Measuring range scalable</li> </ul>	No
<ul style="list-style-type: none"> <li>Scalable measured values</li> </ul>	No
<ul style="list-style-type: none"> <li>Adjustment of measuring range</li> </ul>	No
Engineering with	
<ul style="list-style-type: none"> <li>STEP 7 TIA Portal configurable/integrated as of version</li> </ul>	V12 / V12
<ul style="list-style-type: none"> <li>STEP 7 configurable/integrated as of version</li> </ul>	V5.5 SP3 / -
<ul style="list-style-type: none"> <li>PROFIBUS as of GSD version/GSD revision</li> </ul>	V1.0 / V5.1
<ul style="list-style-type: none"> <li>PROFINET as of GSD version/GSD revision</li> </ul>	V2.3 / -
Operating mode	
<ul style="list-style-type: none"> <li>Oversampling</li> </ul>	No
<ul style="list-style-type: none"> <li>MSI</li> </ul>	Yes

CiR – Configuration in RUN	
Reparameterization possible in RUN	Yes
Calibration possible in RUN	Yes
Supply voltage	
Type of supply voltage	DC
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
Encoder supply	
24 V encoder supply	
<ul style="list-style-type: none"> <li>Short-circuit protection</li> </ul>	Yes
<ul style="list-style-type: none"> <li>Output current, max.</li> </ul>	20 mA; Max. 47 mA per channel for a duration < 10 s
Power	
Power available from the backplane bus	0.7 W
Power loss	
Power loss, typ.	2.7 W
Analog inputs	
Number of analog inputs	8
<ul style="list-style-type: none"> <li>For current measurement</li> </ul>	8
<ul style="list-style-type: none"> <li>For voltage measurement</li> </ul>	8
<ul style="list-style-type: none"> <li>For resistance/resistance thermometer measurement</li> </ul>	4
<ul style="list-style-type: none"> <li>For thermocouple measurement</li> </ul>	8
permissible input voltage for voltage input (destruction limit), max.	28.8 V
permissible input current for current input (destruction limit), max.	40 mA
Constant measurement current for resistance-type transmitter, typ.	150 Ohm, 300 Ohm, 600 Ohm, Pt100, Pt200, Ni100: 1.25 mA; 6 000 Ohm, Pt500, Pt1000, Ni1000, LG-Ni1000: 0.625 mA; PTC: 0.472 mA
Technical unit for temperature measurement adjustable	Yes; °C/°F/K
Input ranges (rated values), voltages	
<ul style="list-style-type: none"> <li>0 to +5 V</li> </ul>	No
<ul style="list-style-type: none"> <li>0 to +10 V</li> </ul>	No
<ul style="list-style-type: none"> <li>1 V to 5 V</li> </ul>	Yes
<ul style="list-style-type: none"> <li>Input resistance (1 V to 5 V)</li> </ul>	100 kΩ
<ul style="list-style-type: none"> <li>-1 V to +1 V</li> </ul>	Yes

• Input resistance (-1 V to +1 V)	10 MΩ
• -10 V to +10 V	Yes
• Input resistance (-10 V to +10 V)	100 kΩ
• -2.5 V to +2.5 V	Yes
• Input resistance (-2.5 V to +2.5 V)	10 MΩ
• -25 mV to +25 mV	No
• -250 mV to +250 mV	Yes
• Input resistance (-250 mV to +250 mV)	10 MΩ
• -5 V to +5 V	Yes
• Input resistance (-5 V to +5 V)	100 kΩ
• -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

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

• 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

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

• Type B	Yes
• Input resistance (Type B)	10 MΩ
• Type C	No
• 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 L	No
• 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
• Type TXK/TXK(L) to GOST	No
Input ranges (rated values), resistance thermometer	
• Cu 10	No
• Cu 10 according to GOST	No
• Cu 50	No
• Cu 50 according to GOST	No
• Cu 100	No
• Cu 100 according to GOST	No
• Ni 10	No
• Ni 10 according to GOST	No
• Ni 100	Yes; Standard/climate
• Input resistance (Ni 100)	10 MΩ
• Ni 100 according to GOST	No
• Ni 1000	Yes; Standard/climate
• Input resistance (Ni 1000)	10 MΩ
• Ni 1000 according to GOST	No
• LG-Ni 1000	Yes; Standard/climate
• Input resistance (LG-Ni 1000)	10 MΩ
• Ni 120	No
• Ni 120 according to GOST	No
• Ni 200 according to GOST	No
• Ni 500	No
• Ni 500 according to GOST	No
• Pt 10	No
• Pt 10 according to GOST	No
• Pt 50	No
• Pt 50 according to GOST	No
• Pt 100	Yes; Standard/climate
• Input resistance (Pt 100)	10 MΩ
• Pt 100 according to GOST	No
• Pt 1000	Yes; Standard/climate
• Input resistance (Pt 1000)	10 MΩ
• Pt 1000 according to GOST	No
• Pt 200	Yes; Standard/climate
• Input resistance (Pt 200)	10 MΩ
• Pt 200 according to GOST	No
• Pt 500	Yes; Standard/climate
• Input resistance (Pt 500)	10 MΩ
• Pt 500 according to GOST	No
Input ranges (rated values), resistors	

• 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 3000 ohms	No
• 0 to 6000 ohms	Yes
• Input resistance (0 to 6000 ohms)	10 MΩ
• PTC	Yes
• Input resistance (PTC)	10 MΩ
<b>Thermocouple (TC)</b>	
<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
— Reference channel of the module	Yes
<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
• Time for offset calibration (per module)	Basic conversion time of the slowest channel
<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 Ω
• 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 range), (+/-)	0.02 %
Temperature error of internal compensation	±6 °C
<b>Operational error limit in overall temperature range</b>	
• Voltage, relative to input range, (+/-)	0.3 %
• Current, relative to input range, (+/-)	0.3 %
• Resistance, relative to input range, (+/-)	0.3 %
• Resistance thermometer, relative to input range, (+/-)	Ptxxx standard: ±1.5 K, Ptxxx climate: ±0.5 K, Nixxx standard: ±0.5 K, Nixxx climate: ±0.3 K
• Thermocouple, relative to input range, (+/-)	Type B: > 600 °C ±4.6 K, type E: > -200 °C ±1.5 K, type J: > -210 °C ±1.9 K, type K: > -200 °C ±2.4 K, type N: > -200 °C ±2.9 K, type R: > 0 °C ±4.7 K, type S: > 0 °C ±4.6 K, type T: > -200 °C ±2.4 K
<b>Basic error limit (operational limit at 25 °C)</b>	
• Voltage, relative to input range, (+/-)	0.1 %
• Current, relative to input range, (+/-)	0.1 %
• Resistance, relative to input range, (+/-)	0.1 %
• Resistance thermometer, relative to input range, (+/-)	Ptxxx standard: ±0.7 K, Ptxxx climate: ±0.2 K, Nixxx standard: ±0.3 K, Nixxx climate: ±0.15 K
• Thermocouple, relative to input range, (+/-)	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
<b>Interference voltage suppression for <math>f = n \times (f_1 \pm 1 \%)</math>, <math>f_1</math> = interference frequency</b>	
• 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

### Isochronous mode

Isochronous operation (application synchronized up to terminal) No

### Interrupts/diagnostics/status information

Diagnostics function Yes

#### Alarms

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

#### Diagnostic messages

- 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 backplane bus Yes
- between the channels and the power supply of the electronics Yes

### Permissible potential difference

between the inputs (UCM) 20 V DC

Between the inputs and MANA (UCM) 10 V DC

### Isolation

Isolation tested with 707 V DC (type test)

### Standards, approvals, certificates

Suitable for applications according to AMS 2750 Yes; Declaration of Conformity, see online support entry 109757262

Suitable for applications according to CQI-9 Yes; Based on AMS 2750 E

### Ambient conditions

#### Ambient temperature during operation

- horizontal installation, min. 0 °C

- horizontal installation, max. 60 °C
- vertical installation, min. 0 °C
- vertical installation, max. 40 °C

#### Altitude during operation relating to sea level

- Installation altitude above sea level, max. 5 000 m; Restrictions for installation altitudes > 2 000 m, see manual

#### Decentralized operation

Prioritized startup No

#### Dimensions

Width 35 mm  
 Height 147 mm  
 Depth 129 mm

#### Weights

Weight, approx. 310 g

#### 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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