



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; Delivery including 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
• FW update possible	Yes
Product function	
• I&M data	Yes; I&M0 to I&M3
• Isochronous mode	No
• Prioritized startup	No
• Measuring range scalable	No
• Scalable measured values	No
• Adjustment of measuring range	No
Engineering with	
• STEP 7 TIA Portal configurable/integrated from version	V12 / V12
• STEP 7 configurable/integrated from version	V5.5 SP3 / -
• PROFIBUS from GSD version/GSD revision	V1.0 / V5.1
• PROFINET from GSD version/GSD revision	V2.3 / -
Operating mode	
• Oversampling	No
• 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)	19.2 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	
• Short-circuit protection	Yes
• Output current, max.	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

• 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
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
<b>Input ranges (rated values), voltages</b>	
• 0 to +5 V	No
• 0 to +10 V	No
• 1 V to 5 V	Yes
— Input resistance (1 V to 5 V)	100 kΩ
• -1 V to +1 V	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
<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 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
<b>Input ranges (rated values), resistance thermometer</b>	
• 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
<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 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

<ul style="list-style-type: none"> <li>• Integration time (ms)</li> </ul>	2,5 / 16,67 / 20 / 100 ms
<ul style="list-style-type: none"> <li>• Basic conversion time, including integration time (ms) <ul style="list-style-type: none"> <li>— additional conversion time for wire-break monitoring</li> <li>— additional conversion time for resistance measurement</li> </ul> </li> </ul>	9 / 23 / 27 / 107 ms 9 ms (to be considered in R/RTD/TC measurement) 150 ohm, 300 ohm, 600 ohm, Pt100, Pt200, Ni100: 2 ms, 6000 ohm, Pt500, Pt1000, Ni1000, LG-Ni1000, PTC: 4 ms
<ul style="list-style-type: none"> <li>• Interference voltage suppression for interference frequency <math>f_1</math> in Hz</li> </ul>	400 / 60 / 50 / 10 Hz
<ul style="list-style-type: none"> <li>• Time for offset calibration (per module)</li> </ul>	Basic conversion time of the slowest channel
<b>Smoothing of measured values</b>	
<ul style="list-style-type: none"> <li>• parameterizable</li> </ul>	Yes
<ul style="list-style-type: none"> <li>• Step: None</li> </ul>	Yes
<ul style="list-style-type: none"> <li>• Step: low</li> </ul>	Yes
<ul style="list-style-type: none"> <li>• Step: Medium</li> </ul>	Yes
<ul style="list-style-type: none"> <li>• Step: High</li> </ul>	Yes
<b>Encoder</b>	
<b>Connection of signal encoders</b>	
<ul style="list-style-type: none"> <li>• for voltage measurement</li> </ul>	Yes
<ul style="list-style-type: none"> <li>• for current measurement as 2-wire transducer <ul style="list-style-type: none"> <li>— Burden of 2-wire transmitter, max.</li> </ul> </li> </ul>	Yes 820 $\Omega$
<ul style="list-style-type: none"> <li>• for current measurement as 4-wire transducer</li> </ul>	Yes
<ul style="list-style-type: none"> <li>• for resistance measurement with two-wire connection</li> </ul>	Yes; Only for PTC
<ul style="list-style-type: none"> <li>• for resistance measurement with three-wire connection</li> </ul>	Yes; All measuring ranges except PTC; internal compensation of the cable resistances
<ul style="list-style-type: none"> <li>• for resistance measurement with four-wire connection</li> </ul>	Yes; All measuring ranges except PTC
<b>Errors/accuracies</b>	
Linearity error (relative to input range), (+/-)	0.02 %
Temperature error (relative to input range), (+/-)	0.005 %/K; With TC type T 0.02 $\pm$ % / 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	$\pm 6$ °C
<b>Operational error limit in overall temperature range</b>	
<ul style="list-style-type: none"> <li>• Voltage, relative to input range, (+/-)</li> </ul>	0.3 %
<ul style="list-style-type: none"> <li>• Current, relative to input range, (+/-)</li> </ul>	0.3 %
<ul style="list-style-type: none"> <li>• Resistance, relative to input range, (+/-)</li> </ul>	0.3 %
<ul style="list-style-type: none"> <li>• Resistance thermometer, relative to input range, (+/-)</li> </ul>	Ptxxx standard: $\pm 1.5$ K, Ptxxx climate: $\pm 0.5$ K, Nixxx standard: $\pm 0.5$ K, Nixxx climate: $\pm 0.3$ K
<ul style="list-style-type: none"> <li>• Thermocouple, relative to input range, (+/-)</li> </ul>	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
<b>Basic error limit (operational limit at 25 °C)</b>	
<ul style="list-style-type: none"> <li>• Voltage, relative to input range, (+/-)</li> </ul>	0.1 %
<ul style="list-style-type: none"> <li>• Current, relative to input range, (+/-)</li> </ul>	0.1 %
<ul style="list-style-type: none"> <li>• Resistance, relative to input range, (+/-)</li> </ul>	0.1 %
<ul style="list-style-type: none"> <li>• Resistance thermometer, relative to input range, (+/-)</li> </ul>	Ptxxx standard: $\pm 0.7$ K, Ptxxx climate: $\pm 0.2$ K, Nixxx standard: $\pm 0.3$ K, Nixxx climate: $\pm 0.15$ K
<ul style="list-style-type: none"> <li>• Thermocouple, relative to input range, (+/-)</li> </ul>	Type B: $> 600$ °C $\pm 1.7$ K, type E: $> -200$ °C $\pm 0.7$ K, type J: $> -210$ °C $\pm 0.8$ K, type K: $> -200$ °C $\pm 1.2$ K, type N: $> -200$ °C $\pm 1.2$ K, type R: $> 0$ °C $\pm 1.9$ K, type S: $> 0$ °C $\pm 1.9$ K, type T: $> -200$ °C $\pm 0.8$ K
<b>Interference voltage suppression for <math>f = n \times (f_1 \pm 1 \%)</math>, <math>f_1 =</math> interference frequency</b>	
<ul style="list-style-type: none"> <li>• Series mode interference (peak value of interference <math>&lt;</math> rated value of input range), min.</li> </ul>	40 dB
<ul style="list-style-type: none"> <li>• Common mode voltage, max.</li> </ul>	10 V
<ul style="list-style-type: none"> <li>• Common mode interference, min.</li> </ul>	60 dB
<b>Interrupts/diagnostics/status information</b>	
Diagnostics function	Yes
<b>Alarms</b>	
<ul style="list-style-type: none"> <li>• Diagnostic alarm</li> </ul>	Yes
<ul style="list-style-type: none"> <li>• Limit value alarm</li> </ul>	Yes; two upper and two lower limit values in each case
<b>Diagnoses</b>	
<ul style="list-style-type: none"> <li>• Monitoring the supply voltage</li> </ul>	Yes
<ul style="list-style-type: none"> <li>• Wire-break</li> </ul>	Yes; Only for 1 to 5 V, 4 to 20 mA, TC, R, and RTD
<ul style="list-style-type: none"> <li>• Overflow/underflow</li> </ul>	Yes
<b>Diagnostics indication LED</b>	

• 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
<b>Potential separation</b>	
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
<b>Permissible potential difference</b>	
between the inputs (UCM)	20 V DC
Between the inputs and MANA (UCM)	10 V DC
<b>Isolation</b>	
Isolation tested with	707 V DC (type test)
<b>Standards, approvals, certificates</b>	
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
<b>product functions / security / header</b>	
data integrity	No
<b>Ambient conditions</b>	
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
<b>Dimensions</b>	
Width	35 mm
Height	147 mm
Depth	129 mm
<b>Weights</b>	
Weight, approx.	310 g
<b>Other</b>	
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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