

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



General information	
Product type designation	AI 8xU/I/RTD/TC ST
HW functional status	FS01
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	
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
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
<ul style="list-style-type: none"> <li>• Input resistance (-1 V to +1 V)</li> </ul>	10 MΩ
<ul style="list-style-type: none"> <li>• -10 V to +10 V</li> </ul>	Yes
<ul style="list-style-type: none"> <li>• Input resistance (-10 V to +10 V)</li> </ul>	100 kΩ

• -2.5 V to +2.5 V	Yes
• Input resistance (-2.5 V to +2.5 V)	10 M $\Omega$
• -25 mV to +25 mV	No
• -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 M $\Omega$
• -500 mV to +500 mV	Yes
• Input resistance (-500 mV to +500 mV)	10 M $\Omega$
• -80 mV to +80 mV	Yes
• Input resistance (-80 mV to +80 mV)	10 M $\Omega$
<b>Input ranges (rated values), currents</b>	
• 0 to 20 mA	Yes
• Input resistance (0 to 20 mA)	25 $\Omega$ ; Plus approx. 42 ohms for overvoltage protection by PTC
• -20 mA to +20 mA	Yes
• Input resistance (-20 mA to +20 mA)	25 $\Omega$ ; Plus approx. 42 ohms for overvoltage protection by PTC
• 4 mA to 20 mA	Yes
• Input resistance (4 mA to 20 mA)	25 $\Omega$ ; Plus approx. 42 ohms for overvoltage protection by PTC
<b>Input ranges (rated values), thermocouples</b>	
• Type B	Yes
• Input resistance (Type B)	10 M $\Omega$
• Type C	No
• Type E	Yes
• Input resistance (Type E)	10 M $\Omega$
• Type J	Yes
• Input resistance (type J)	10 M $\Omega$
• Type K	Yes
• Input resistance (Type K)	10 M $\Omega$
• Type L	No
• Type N	Yes
• Input resistance (Type N)	10 M $\Omega$
• Type R	Yes
• Input resistance (Type R)	10 M $\Omega$
• Type S	Yes
• Input resistance (Type S)	10 M $\Omega$
• Type T	Yes
• Input resistance (Type T)	10 M $\Omega$
• 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

**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
<b>Encoder</b>	
<b>Connection of signal encoders</b>	

- for voltage measurement
- for current measurement as 2-wire transducer  
— Burden of 2-wire transmitter, max.
- for current measurement as 4-wire transducer
- for resistance measurement with two-wire connection
- for resistance measurement with three-wire connection
- for resistance measurement with four-wire connection

Yes  
 Yes  
 820 Ω  
 Yes  
 Yes; Only for PTC  
  
 Yes; All measuring ranges except PTC; internal compensation of the cable resistances  
 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
<b>Interrupts/diagnostics/status information</b>	
Diagnostics function	Yes
<b>Alarms</b>	
• Diagnostic alarm	Yes
• Limit value alarm	Yes; two upper and two lower limit values in each case
<b>Diagnostic messages</b>	
• 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
<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>	
<b>Potential separation channels</b>	
• 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>Ambient conditions</b>	
<b>Ambient temperature during operation</b>	
• horizontal installation, min.	0 °C
• horizontal installation, max.	60 °C
• vertical installation, min.	0 °C
• vertical installation, max.	40 °C
<b>Decentralized operation</b>	
Prioritized startup	No
<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
<b>last modified:</b>	04/26/2018