

SIMATIC S7-1500 Analog input module AI 4xU/I/RTD/TC ST, 16 bit resolution, Accuracy 0.3%, 4 channels in groups of 4; 2 channels for RTD measurement; Common mode voltage 10 V; Diagnostics; Hardware interrupts; Delivery including push-in front connector, infeed element, shield bracket, and shield terminal



General information	
Product type designation	AI 4xU/I/RTD/TC ST
HW functional status	FS01
Firmware version	V1.0.0
<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>Prioritized startup</li> </ul>	No
<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 from version</li> </ul>	V13 / V13.0.2
<ul style="list-style-type: none"> <li>STEP 7 configurable/integrated from version</li> </ul>	V5.5 SP3 / -
<ul style="list-style-type: none"> <li>PROFIBUS from GSD version/GSD revision</li> </ul>	V1.0 / V5.1
<ul style="list-style-type: none"> <li>PROFINET from GSD version/GSD revision</li> </ul>	V2.3 / -
Operating mode	
<ul style="list-style-type: none"> <li>Oversampling</li> </ul>	No

- MSI

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. 140 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. 2.3 W

### Analog inputs

Number of analog inputs 4

- For current measurement 4

- For voltage measurement 4

- For resistance/resistance thermometer measurement 2

- For thermocouple measurement 4

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

Analog input with oversampling No

Standardization of measured values No

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

- 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 — Input resistance (-1 V to +1 V)	Yes 10 MΩ
• -10 V to +10 V — Input resistance (-10 V to +10 V)	Yes 100 kΩ
• -2.5 V to +2.5 V — Input resistance (-2.5 V to +2.5 V)	Yes 10 MΩ
• -25 mV to +25 mV	No
• -250 mV to +250 mV — Input resistance (-250 mV to +250 mV)	Yes 10 MΩ
• -5 V to +5 V — Input resistance (-5 V to +5 V)	Yes 100 kΩ
• -50 mV to +50 mV — Input resistance (-50 mV to +50 mV)	Yes 10 MΩ
• -500 mV to +500 mV — Input resistance (-500 mV to +500 mV)	Yes 10 MΩ
• -80 mV to +80 mV — Input resistance (-80 mV to +80 mV)	Yes 10 MΩ

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

• 0 to 20 mA — Input resistance (0 to 20 mA)	Yes 25 Ω; Plus approx. 42 ohms for overvoltage protection by PTC
• -20 mA to +20 mA — Input resistance (-20 mA to +20 mA)	Yes 25 Ω; Plus approx. 42 ohms for overvoltage protection by PTC
• 4 mA to 20 mA — Input resistance (4 mA to 20 mA)	Yes 25 Ω; Plus approx. 42 ohms for overvoltage protection by PTC

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

• Type B — Input resistance (Type B)	Yes 10 MΩ
• Type C	No
• Type E — Input resistance (Type E)	Yes 10 MΩ
• Type J — Input resistance (type J)	Yes 10 MΩ
• Type K — Input resistance (Type K)	Yes 10 MΩ
• Type L	No
• Type N — Input resistance (Type N)	Yes 10 MΩ
• Type R — Input resistance (Type R)	Yes 10 MΩ
• Type S — Input resistance (Type S)	Yes 10 MΩ

• Type T	Yes
— Input resistance (Type T)	10 MΩ
• Type U	No
• 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	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	No
<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
• Time for offset calibration (per module)	Basic conversion time of the slowest channel
<b>Smoothing of measured values</b>	
• parameterizable	Yes

- Step: None
- Step: low
- Step: Medium
- Step: High

Yes  
Yes  
Yes  
Yes

## Encoder

### Connection of signal encoders

- 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

### Operational error limit in overall temperature range

- Voltage, relative to input range, (+/-)
- Current, relative to input range, (+/-)
- Resistance, relative to input range, (+/-)
- Resistance thermometer, relative to input range, (+/-)
- Thermocouple, relative to input range, (+/-)

0.3 %  
0.3 %  
0.3 %  
0.3 %; Ptxxx standard: ±1.5 K, Ptxxx climate: ±0.5 K, Nixxx standard: ±0.5 K, Nixxx climate: ±0.3 K  
0.3 %; 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

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

- Voltage, relative to input range, (+/-)
- Current, relative to input range, (+/-)
- Resistance, relative to input range, (+/-)
- Resistance thermometer, relative to input range, (+/-)
- Thermocouple, relative to input range, (+/-)

0.1 %  
0.1 %  
0.1 %  
0.1 %; Ptxxx standard: ±0.7 K, Ptxxx climate: ±0.2 K, Nixxx standard: ±0.3 K, Nixxx climate: ±0.15 K  
0.1 %; 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

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	4
• between the channels and backplane bus	Yes
• between the channels and the power supply of the electronics	Yes

### Isolation

Isolation tested with	707 V DC (type test)
-----------------------	----------------------

### 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
---	--

### Dimensions

Width	25 mm
Height	147 mm
Depth	129 mm

### Weights

Weight, approx.	210 g
-----------------	-------

### Other

Note:	Supplied incl. 40-pole push-in front connectors. 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; thermoelement: Type B, R, S: $\pm 3$ K, type E, J, K, N, T: $\pm 1$ K
-------	---

last modified:	06/22/2020
----------------	------------