



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 infed 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
- Cu 50
- Cu 50 according to GOST
- Cu 100
- Cu 100 according to GOST
- Ni 10
- Ni 10 according to GOST
- Ni 100
  - Input resistance (Ni 100)
- Ni 100 according to GOST
- Ni 1000
  - Input resistance (Ni 1000)
- Ni 1000 according to GOST
- LG-Ni 1000
  - Input resistance (LG-Ni 1000)
- Ni 120
- Ni 120 according to GOST
- Ni 200 according to GOST
- Ni 500
- Ni 500 according to GOST
- Pt 10
- Pt 10 according to GOST
- Pt 50
- Pt 50 according to GOST
- Pt 100
  - Input resistance (Pt 100)
- Pt 100 according to GOST
- Pt 1000
  - Input resistance (Pt 1000)
- Pt 1000 according to GOST
- Pt 200
  - Input resistance (Pt 200)
- Pt 200 according to GOST
- Pt 500
  - Input resistance (Pt 500)
- Pt 500 according to GOST

No

No

No

No

No

No

No

Yes; Standard/climate

10 MΩ

No

Yes; Standard/climate

10 MΩ

No

Yes; Standard/climate

10 MΩ

No

No

No

No

No

No

No

No

Yes; Standard/climate

10 MΩ

No

Yes; Standard/climate

10 MΩ

No

Yes; Standard/climate

10 MΩ

No

Yes; Standard/climate

10 MΩ

No

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

- 0 to 150 ohms
  - Input resistance (0 to 150 ohms)
- 0 to 300 ohms
  - Input resistance (0 to 300 ohms)
- 0 to 600 ohms
  - Input resistance (0 to 600 ohms)
- 0 to 3000 ohms
- 0 to 6000 ohms
  - Input resistance (0 to 6000 ohms)
- PTC
  - Input resistance (PTC)

Yes

10 MΩ

Yes

10 MΩ

Yes

10 MΩ

No

Yes

10 MΩ

Yes

10 MΩ

#### Thermocouple (TC)

##### Temperature compensation

- parameterizable
- internal temperature compensation
- external temperature compensation via RTD
- Compensation for 0 °C reference point temperature
- Reference channel of the module

Yes

Yes

Yes

Yes; fixed value can be set

Yes

#### Cable length

- shielded, max.

800 m; for U/I, 200 m for R/RTD, 50 m for TC

#### Analog value generation for the inputs

##### Integration and conversion time/resolution per channel

- Resolution with overrange (bit including sign), max.
- Integration time, parameterizable

16 bit

Yes

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>Integration time (ms)</li> <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> <li>Interference voltage suppression for interference frequency <math>f_1</math> in Hz</li> <li>Time for offset calibration (per module)</li> </ul>        | 2,5 / 16,67 / 20 / 100 ms<br>9 / 23 / 27 / 107 ms<br>9 ms (to be considered in R/RTD/TC measurement)<br>150 ohm, 300 ohm, 600 ohm, Pt100, Pt200, Ni100: 2 ms, 6000 ohm, Pt500, Pt1000, Ni1000, LG-Ni1000, PTC: 4 ms<br>400 / 60 / 50 / 10 Hz<br>Basic conversion time of the slowest channel                                                                                                                    |
| <b>Smoothing of measured values</b>                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <ul style="list-style-type: none"> <li>parameterizable</li> <li>Step: None</li> <li>Step: low</li> <li>Step: Medium</li> <li>Step: High</li> </ul>                                                                                                                                                                                                                                                                                                                      | Yes<br>Yes<br>Yes<br>Yes<br>Yes                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Encoder</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Connection of signal encoders</b>                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <ul style="list-style-type: none"> <li>for voltage measurement</li> <li>for current measurement as 2-wire transducer <ul style="list-style-type: none"> <li>— Burden of 2-wire transmitter, max.</li> </ul> </li> <li>for current measurement as 4-wire transducer</li> <li>for resistance measurement with two-wire connection</li> <li>for resistance measurement with three-wire connection</li> <li>for resistance measurement with four-wire connection</li> </ul> | Yes<br>Yes<br>820 $\Omega$<br>Yes<br>Yes; Only for PTC<br>Yes; All measuring ranges except PTC; internal compensation of the cable resistances<br>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> <li>Current, relative to input range, (+/-)</li> <li>Resistance, relative to input range, (+/-)</li> <li>Resistance thermometer, relative to input range, (+/-)</li> <li>Thermocouple, relative to input range, (+/-)</li> </ul>                                                                                                                                                    | 0.3 %<br>0.3 %<br>0.3 %<br>Ptxxx standard: $\pm 1.5$ K, Ptxxx climate: $\pm 0.5$ K, Nixxx standard: $\pm 0.5$ K, Nixxx climate: $\pm 0.3$ K<br>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> <li>Current, relative to input range, (+/-)</li> <li>Resistance, relative to input range, (+/-)</li> <li>Resistance thermometer, relative to input range, (+/-)</li> <li>Thermocouple, relative to input range, (+/-)</li> </ul>                                                                                                                                                    | 0.1 %<br>0.1 %<br>0.1 %<br>Ptxxx standard: $\pm 0.7$ K, Ptxxx climate: $\pm 0.2$ K, Nixxx standard: $\pm 0.3$ K, Nixxx climate: $\pm 0.15$ K<br>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 &lt; rated value of input range), min.</li> <li>Common mode voltage, max.</li> <li>Common mode interference, min.</li> </ul>                                                                                                                                                                                                                                                | 40 dB<br>10 V<br>60 dB                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Interrupts/diagnostics/status information</b>                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Diagnostics function                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Yes                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Alarms</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <ul style="list-style-type: none"> <li>Diagnostic alarm</li> <li>Limit value alarm</li> </ul>                                                                                                                                                                                                                                                                                                                                                                           | Yes<br>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> <li>Wire-break</li> <li>Overflow/underflow</li> </ul>                                                                                                                                                                                                                                                                                                                                         | Yes<br>Yes; Only for 1 to 5 V, 4 to 20 mA, TC, R, and RTD<br>Yes                                                                                                                                                                                                                                                                                                                                                |
| <b>Diagnostics indication LED</b>                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                 |

|                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                              |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• RUN LED</li> <li>• ERROR LED</li> <li>• Monitoring of the supply voltage (PWR-LED)</li> <li>• Channel status display</li> <li>• for channel diagnostics</li> <li>• for module diagnostics</li> </ul>    | Yes; green LED<br>Yes; red LED<br>Yes; green LED<br>Yes; green LED<br>Yes; red LED<br>Yes; red LED                                                                                                                                                                                           |
| <b>Potential separation</b>                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                              |
| Potential separation channels                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                              |
| <ul style="list-style-type: none"> <li>• between the channels</li> <li>• between the channels, in groups of</li> <li>• between the channels and backplane bus</li> <li>• between the channels and the power supply of the electronics</li> </ul> | No<br>8<br>Yes<br>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>                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                              |
| signed firmware update                                                                                                                                                                                                                           | No                                                                                                                                                                                                                                                                                           |
| data integrity                                                                                                                                                                                                                                   | No                                                                                                                                                                                                                                                                                           |
| <b>Ambient conditions</b>                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                              |
| Ambient temperature during operation                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                              |
| <ul style="list-style-type: none"> <li>• horizontal installation, min.</li> <li>• horizontal installation, max.</li> <li>• vertical installation, min.</li> <li>• vertical installation, max.</li> </ul>                                         | -25 °C; From FS08<br>60 °C<br>-25 °C; From FS08<br>40 °C                                                                                                                                                                                                                                     |
| Altitude during operation relating to sea level                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                              |
| <ul style="list-style-type: none"> <li>• Installation altitude above sea level, max.</li> </ul>                                                                                                                                                  | 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: ±250 mV (±0.02%), ±80 mV (±0.05%), ±50 mV (±0.05%); resistance: 150 ohms ±0.02%; resistance thermometer: Pt100 climate: ±0.08 K, Ni100 climate: ±0.08 K; thermocouple: Type B, R, S: ±3 K, type E, J, K, N, T: ±1 K |

last modified:

4/25/2024 