



SIMATIC S7-1500 analog input module AI 8xU/R/RTD/TC HF, 16 bit resolution, up to 21 bit Resolution at RT and TC, accuracy 0.1%, 8 channels in groups of 1; common mode voltage: 30 V AC/60 V DC, Diagnostics; Hardware interrupts Scalable temperature measuring range, thermocouple type C, Calibrate in RUN; 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/R/RTD/TC HF |
| HW functional status   | FS01               |
| Firmware version   | V1.1.0             |
| <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>Isochronous mode</li> </ul>                                       | No                 |
| <ul style="list-style-type: none"> <li>Prioritized startup</li> </ul>                                    | Yes                |
| <ul style="list-style-type: none"> <li>Measuring range scalable</li> </ul>                               | Yes                |
| <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> | V14 / -            |
| <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   |                    |

- Oversampling
- MSI

No  
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. | 55 mA; with 24 V DC supply |
|---------------------------|----------------------------|

### Power

|  |        |
|--|--------|
| Power available from the backplane bus | 0.85 W |
|--|--------|

### Power loss

|                  |       |
|------------------|-------|
| Power loss, typ. | 1.9 W |
|------------------|-------|

### Analog inputs

|   |  |
|---|--|
| Number of analog inputs   | 8; Plus one additional RTD (reference) channel   |
| <ul style="list-style-type: none"> <li>• For voltage measurement</li> </ul>                           | 8; Plus one additional RTD (reference) channel   |
| <ul style="list-style-type: none"> <li>• For resistance/resistance thermometer measurement</li> </ul> | 8; Plus one additional RTD (reference) channel   |
| <ul style="list-style-type: none"> <li>• For thermocouple measurement</li> </ul>                      | 8; Plus one additional RTD (reference) channel   |
| permissible input voltage for voltage input (destruction limit), max.                                 | 20 V   |
| Constant measurement current for resistance-type transmitter, typ.                                    | 150 Ohm, 300 Ohm, 600 Ohm, Cu10, Cu50, Cu100, Ni10, Ni100, Ni120, Ni200, Pt10, Pt50, Pt100, Pt200 climate: 1 mA; 6 kOhm, Ni500, Ni1000, LG-Ni1000, Pt200 standard, Pt500, Pt1000, PTC: 0.25 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>                          | No    |
| <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>                      | No    |
| <ul style="list-style-type: none"> <li>• -2.5 V to +2.5 V</li> </ul>                    | No    |
| <ul style="list-style-type: none"> <li>• -25 mV to +25 mV</li> </ul>                    | Yes   |
| <ul style="list-style-type: none"> <li>— Input resistance (-25 mV to +25 mV)</li> </ul> | 10 MΩ |

|  |   |
|--|---|
| <ul style="list-style-type: none"> <li>• -250 mV to +250 mV <ul style="list-style-type: none"> <li>— Input resistance (-250 mV to +250 mV)</li> </ul> </li> <li>• -5 V to +5 V</li> <li>• -50 mV to +50 mV <ul style="list-style-type: none"> <li>— Input resistance (-50 mV to +50 mV)</li> </ul> </li> <li>• -500 mV to +500 mV <ul style="list-style-type: none"> <li>— Input resistance (-500 mV to +500 mV)</li> </ul> </li> <li>• -80 mV to +80 mV <ul style="list-style-type: none"> <li>— Input resistance (-80 mV to +80 mV)</li> </ul> </li> </ul>   | <p>Yes</p> <p>10 MΩ</p> <p>No</p> <p>Yes</p> <p>10 MΩ</p> <p>Yes</p> <p>10 MΩ</p> <p>Yes</p> <p>10 MΩ</p>   |
| <b>Input ranges (rated values), currents</b>   |   |
| <ul style="list-style-type: none"> <li>• 0 to 20 mA</li> <li>• -20 mA to +20 mA</li> <li>• 4 mA to 20 mA</li> </ul>  | <p>No</p> <p>No</p> <p>No</p>   |
| <b>Input ranges (rated values), thermocouples</b>  |   |
| <ul style="list-style-type: none"> <li>• Type B <ul style="list-style-type: none"> <li>— Input resistance (Type B)</li> </ul> </li> <li>• Type C <ul style="list-style-type: none"> <li>— Input resistance (Type C)</li> </ul> </li> <li>• Type E <ul style="list-style-type: none"> <li>— Input resistance (Type E)</li> </ul> </li> <li>• Type J <ul style="list-style-type: none"> <li>— Input resistance (type J)</li> </ul> </li> <li>• Type K <ul style="list-style-type: none"> <li>— Input resistance (Type K)</li> </ul> </li> <li>• Type L</li> <li>• Type N <ul style="list-style-type: none"> <li>— Input resistance (Type N)</li> </ul> </li> <li>• Type R <ul style="list-style-type: none"> <li>— Input resistance (Type R)</li> </ul> </li> <li>• Type S <ul style="list-style-type: none"> <li>— Input resistance (Type S)</li> </ul> </li> <li>• Type T <ul style="list-style-type: none"> <li>— Input resistance (Type T)</li> </ul> </li> <li>• Type TXK/TXK(L) to GOST <ul style="list-style-type: none"> <li>— Input resistance (Type TXK/TXK(L) to GOST)</li> </ul> </li> </ul> | <p>Yes</p> <p>10 MΩ</p> <p>Yes</p> <p>10 MΩ</p> <p>Yes</p> <p>10 MΩ</p> <p>Yes</p> <p>10 MΩ</p> <p>Yes</p> <p>10 MΩ</p> <p>No</p> <p>Yes</p> <p>10 MΩ</p> <p>Yes</p> <p>10 MΩ</p> <p>Yes</p> <p>10 MΩ</p> <p>Yes</p> <p>10 MΩ</p> <p>Yes</p> <p>10 MΩ</p> <p>Yes</p> <p>10 MΩ</p> |
| <b>Input ranges (rated values), resistance thermometer</b>   |   |
| <ul style="list-style-type: none"> <li>• Cu 10 <ul style="list-style-type: none"> <li>— Input resistance (Cu 10)</li> </ul> </li> <li>• Cu 10 according to GOST <ul style="list-style-type: none"> <li>— Input resistance (Cu 10 according to GOST)</li> </ul> </li> </ul>   | <p>Yes; Standard/climate</p> <p>10 MΩ</p> <p>Yes; Standard/climate</p> <p>10 MΩ</p>   |

|   |                                |
|---|--------------------------------|
| • Cu 50<br>— Input resistance (Cu 50)   | Yes; Standard/climate<br>10 MΩ |
| • Cu 50 according to GOST<br>— Input resistance (Cu 50 according to GOST)     | Yes; Standard/climate<br>10 MΩ |
| • Cu 100<br>— Input resistance (Cu 100)                                       | Yes; Standard/climate<br>10 MΩ |
| • Cu 100 according to GOST<br>— Input resistance (Cu 100 according to GOST)   | Yes; Standard/climate<br>10 MΩ |
| • Ni 10<br>— Input resistance (Ni 10)   | Yes; Standard/climate<br>10 MΩ |
| • Ni 10 according to GOST<br>— Input resistance (Ni 10 according to GOST)     | Yes; Standard/climate<br>10 MΩ |
| • Ni 100<br>— Input resistance (Ni 100)                                       | Yes; Standard/climate<br>10 MΩ |
| • Ni 100 according to GOST<br>— Input resistance (Ni 100 according to GOST)   | Yes; Standard/climate<br>10 MΩ |
| • Ni 1000<br>— Input resistance (Ni 1000)                                     | Yes; Standard/climate<br>10 MΩ |
| • Ni 1000 according to GOST<br>— Input resistance (Ni 1000 according to GOST) | Yes; Standard/climate<br>10 MΩ |
| • LG-Ni 1000<br>— Input resistance (LG-Ni 1000)                               | Yes; Standard/climate<br>10 MΩ |
| • Ni 120<br>— Input resistance (Ni 120)                                       | Yes; Standard/climate<br>10 MΩ |
| • Ni 120 according to GOST<br>— Input resistance (Ni 120 according to GOST)   | Yes; Standard/climate<br>10 MΩ |
| • Ni 200<br>— Input resistance (Ni 200)                                       | Yes; Standard/climate<br>10 MΩ |
| • Ni 200 according to GOST<br>— Input resistance (Ni 200 according to GOST)   | Yes; Standard/climate<br>10 MΩ |
| • Ni 500<br>— Input resistance (Ni 500)                                       | Yes; Standard/climate<br>10 MΩ |
| • Ni 500 according to GOST<br>— Input resistance (Ni 500 according to GOST)   | Yes; Standard/climate<br>10 MΩ |

- Pt 10
  - Input resistance (Pt 10)
- Pt 10 according to GOST
  - Input resistance (Pt 10 according to GOST)
- Pt 50
  - Input resistance (Pt 50)
- Pt 50 according to GOST
  - Input resistance (Pt 50 according to GOST)
- Pt 100
  - Input resistance (Pt 100)
- Pt 100 according to GOST
  - Input resistance (Pt 100 according to GOST)
- Pt 1000
  - Input resistance (Pt 1000)
- Pt 1000 according to GOST
  - Input resistance (Pt 1000 according to GOST)
- Pt 200
  - Input resistance (Pt 200)
- Pt 200 according to GOST
  - Input resistance (Pt 200 according to GOST)
- Pt 500
  - Input resistance (Pt 500)
- Pt 500 according to GOST
  - Input resistance (Pt 500 according to GOST)

Yes; Standard/climate  
10 MΩ

Yes; Standard/climate  
10 MΩ

Yes; Standard/climate  
10 MΩ

Yes; Standard/climate  
10 MΩ

Yes; Standard/climate  
10 MΩ

Yes; Standard/climate  
10 MΩ

Yes; Standard/climate  
10 MΩ

Yes; Standard/climate  
10 MΩ

Yes; Standard/climate  
10 MΩ

Yes; Standard/climate  
10 MΩ

Yes; Standard/climate  
10 MΩ

Yes; Standard/climate  
10 MΩ

Yes; Standard/climate  
10 MΩ

Yes; Standard/climate  
10 MΩ

Yes; Standard/climate  
10 MΩ

Yes; Standard/climate  
10 MΩ

**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  | 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; 9th channel that can be used as a genuine 9th RTD channel regardless of the parameterization of the other channels, or that can be used for compensation in the case of TC measurement  |
| Cable length   |  |
| • shielded, max.   | 800 m; at U; 200 m at R/RTD/TC   |
| Analog value generation for the inputs                                 |  |
| Integration and conversion time/resolution per channel                 |  |
| • Resolution with overrange (bit including sign), max.                 | 21 bit; For measuring mode RTC and TC when using the function "Scalable temperature measuring range" (32 bit REAL format); 16 bit for measuring mode R and U; 16 bit for all measuring modes when using the S7 format (16 bit INTEGER) |
| • Integration time, parameterizable                                    | Yes  |
| • Integration time (ms)  | Fast mode: 2.5 / 16.67 / 20 / 100 ms, standard mode: 7.5 / 50 / 60 / 300 ms  |
| • Basic conversion time, including integration time (ms)               | Fast mode: 4 / 18 / 22 / 102 ms; Standard mode: 9 / 52 / 62 / 302 ms   |
| — additional conversion time for wire-break monitoring                 | Thermocouples, 150 Ohm, 300 Ohm, 600 Ohm, Cu10, Cu50, Cu100, Ni10, Ni100, Ni120, Ni200, Pt10, Pt50, Pt100: 4 ms; 6 kOhm, Ni500, Ni1000, LG-Ni1000, Pt200, Pt500, Pt1000: 13 ms   |
| • Interference voltage suppression for interference frequency f1 in Hz | 400 / 60 / 50 / 10 Hz  |
| • Basic execution time of the module (all channels released)           | Corresponds to the channel with the highest basic conversion time  |
| Smoothing of measured values   |  |
| • parameterizable  | Yes  |
| • Step: None   | Yes  |
| • Step: low  | Yes  |
| • Step: Medium   | Yes  |
| • Step: High   | Yes  |
| Encoder  |  |
| Connection of signal encoders  |  |
| • for voltage measurement  | Yes  |
| • for current measurement as 2-wire transducer                         | No   |
| • for current measurement as 4-wire transducer                         | No   |

- for resistance measurement with two-wire connection
- for resistance measurement with three-wire connection
- for resistance measurement with four-wire connection

Yes

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 |
| 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                                | ±1,5 °C   |

|   |  |
|---|--|
| <b>Operational error limit in overall temperature range</b> |  |
| • Voltage, relative to input range, (+/-)                   | 0.1 %  |
| • Resistance, relative to input range, (+/-)                | 0.1 %  |
| • Resistance thermometer, relative to input range, (+/-)    | Cuxxx Standard: ±0.5 K, Cuxxx Klima: ±0.5 K, Ptxxx Standard: ±1 K, Ptxxx Klima: ±0.5 K, Nixxx Standard: ±0.5 K, Nixxx Klima: ±0.3 K  |
| • Thermocouple, relative to input range, (+/-)              | Type B: > 600 °C ±2 K, Type E: > -200 °C ±1 K, Type J: > -210 °C ±1 K, Type K: > -200 °C ±2 K, Type N: > -200 °C ±2 K, Type R: > 0 °C ±2 K, Type S: > 0 °C ±2 K, Type T: > -200 °C ±1 K, Type C: ±4 K, Type TXK/TXK(L): ±1 K |

|  |  |
|--|--|
| <b>Basic error limit (operational limit at 25 °C)</b>    |  |
| • Voltage, relative to input range, (+/-)                | 0.05 %   |
| • Resistance, relative to input range, (+/-)             | 0.05 %   |
| • Resistance thermometer, relative to input range, (+/-) | Cuxxx Standard: ±0.3 K, Cuxxx Klima: ±0.2 K, Ptxxx Standard: ±0.5 K, Ptxxx Klima: ±0.2 K, Nixxx Standard: ±0.3 K, Nixxx Klima: ±0.15 K   |
| • Thermocouple, relative to input range, (+/-)           | Type B: > 600 °C ±1 K, Type E: > -200 °C ±0.5 K, Type J: > -210 °C ±0.5 K, Type K: > -200 °C ±1 K, Type N: > -200 °C ±1 K, Type R: > 0 °C ±1 K, Type S: > 0 °C ±1 K, Type T: > -200 °C ±0.5 K, Type C: ±2 K, Type TXK/TXK(L): ±0.5 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.                                      | 80 dB; in the Standard operating mode, 40 dB in the Fast operating mode |
| • Common mode voltage, max.   | 60 V DC/30 V AC   |
| • Common mode interference, min.  | 80 dB   |

### Interrupts/diagnostics/status information

|                      |  |
|----------------------|--|
| Diagnostics function | Yes  |
| <b>Alarms</b>        |  |
| • Diagnostic alarm   | Yes  |
| • Limit value alarm  | 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>  | <p>Yes</p> <p>Yes; Only with TC, R, RTD</p> <p>Yes</p>  |
| <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>    | <p>Yes; green LED</p> <p>Yes; red LED</p> <p>Yes; green LED</p> <p>Yes; green LED</p> <p>Yes; red LED</p> <p>Yes; red LED</p>   |
| <b>Potential separation</b>  |   |
| <b>Potential separation channels</b>   |   |
| <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> | <p>Yes</p> <p>1</p> <p>Yes</p> <p>Yes</p>   |
| <b>Permissible potential difference</b>  |   |
| between different circuits   | 60 V DC/30 V AC; insulation rated for 120 V AC basic insulation: between the channels and the supply voltage L+; between the channels and the backplane bus; between the channels   |
| <b>Isolation</b>   |   |
| Isolation tested with  | 2 000 V DC between the channels and the supply voltage L+; 2 000 V DC between the channels and the backplane bus; 2 000 V DC between the channels; 707 V DC (type test) between the supply voltage L+ and the backplane bus |
| <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>Ambient conditions</b>  |   |
| <b>Ambient temperature during operation</b>  |   |
| <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>   | <p>0 °C</p> <p>60 °C</p> <p>0 °C</p> <p>40 °C</p>   |
| <b>Dimensions</b>  |   |
| Width  | 35 mm   |
| Height   | 147 mm  |
| Depth  | 129 mm  |

## Weights

Weight, approx.

290 g

## Other

Note:

for the R/RDT three-wire measurement, the conductor compensation is made alternating with the measurement; this then requires two module cycles for a measured value

**last modified:**

09/03/2020