



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	Yes; Standard/climate
— Input resistance (Cu 50)	10 MΩ
• Cu 50 according to GOST	Yes; Standard/climate
— Input resistance (Cu 50 according to GOST)	10 MΩ
• Cu 100	Yes; Standard/climate
— Input resistance (Cu 100)	10 MΩ
• Cu 100 according to GOST	Yes; Standard/climate
— Input resistance (Cu 100 according to GOST)	10 MΩ
• Ni 10	Yes; Standard/climate
— Input resistance (Ni 10)	10 MΩ
• Ni 10 according to GOST	Yes; Standard/climate
— Input resistance (Ni 10 according to GOST)	10 MΩ
• Ni 100	Yes; Standard/climate
— Input resistance (Ni 100)	10 MΩ
• Ni 100 according to GOST	Yes; Standard/climate
— Input resistance (Ni 100 according to GOST)	10 MΩ
• Ni 1000	Yes; Standard/climate
— Input resistance (Ni 1000)	10 MΩ
• Ni 1000 according to GOST	Yes; Standard/climate
— Input resistance (Ni 1000 according to GOST)	10 MΩ
• LG-Ni 1000	Yes; Standard/climate
— Input resistance (LG-Ni 1000)	10 MΩ
• Ni 120	Yes; Standard/climate
— Input resistance (Ni 120)	10 MΩ
• Ni 120 according to GOST	Yes; Standard/climate
— Input resistance (Ni 120 according to GOST)	10 MΩ
• Ni 200	Yes; Standard/climate
— Input resistance (Ni 200)	10 MΩ
• Ni 200 according to GOST	Yes; Standard/climate
— Input resistance (Ni 200 according to GOST)	10 MΩ
• Ni 500	Yes; Standard/climate
— Input resistance (Ni 500)	10 MΩ
• Ni 500 according to GOST	Yes; Standard/climate
— Input resistance (Ni 500 according to GOST)	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> </ul>	Yes
<ul style="list-style-type: none"> <li>Wire-break</li> </ul>	Yes; Only with TC, R, RTD
<ul style="list-style-type: none"> <li>Overflow/underflow</li> </ul>	Yes
<b>Diagnostics indication LED</b>	
<ul style="list-style-type: none"> <li>RUN LED</li> </ul>	Yes; green LED
<ul style="list-style-type: none"> <li>ERROR LED</li> </ul>	Yes; red LED
<ul style="list-style-type: none"> <li>Monitoring of the supply voltage (PWR-LED)</li> </ul>	Yes; green LED
<ul style="list-style-type: none"> <li>Channel status display</li> </ul>	Yes; green LED
<ul style="list-style-type: none"> <li>for channel diagnostics</li> </ul>	Yes; red LED
<ul style="list-style-type: none"> <li>for module diagnostics</li> </ul>	Yes; red LED
<b>Potential separation</b>	
<b>Potential separation channels</b>	
<ul style="list-style-type: none"> <li>between the channels</li> </ul>	Yes
<ul style="list-style-type: none"> <li>between the channels, in groups of</li> </ul>	1
<ul style="list-style-type: none"> <li>between the channels and backplane bus</li> </ul>	Yes
<ul style="list-style-type: none"> <li>between the channels and the power supply of the electronics</li> </ul>	Yes
<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> </ul>	0 °C
<ul style="list-style-type: none"> <li>horizontal installation, max.</li> </ul>	60 °C
<ul style="list-style-type: none"> <li>vertical installation, min.</li> </ul>	0 °C
<ul style="list-style-type: none"> <li>vertical installation, max.</li> </ul>	40 °C
<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
-------	--

<b>last modified:</b>	10/13/2020
-----------------------	------------