

SIPLUS S7-1500 AI 8XU/R/RTD/TC HF 0 ... +60 °C with conformal coating BasedOn: 6ES7531-7PF00-0AB0 . Analog Input Module AI 8 X U/R/RTD/TC HF, 16 Bits of Resolution, Accuracy 0.1%, 8 Channels in groups of 1; common mode Voltage: 30V AC/60V DC, Diagnosis, Processalarms; incl. infeed element, Shield clamp and Shield terminal



General information	
Product type designation	AI 8xU/R/RTD/TC HF
Firmware version	
<ul style="list-style-type: none"> <li>FW update possible</li> </ul>	Yes
Product function	
<ul style="list-style-type: none"> <li>I&amp;M data</li> </ul>	Yes; I&M0 to I&M3
<ul style="list-style-type: none"> <li>Measuring range scalable</li> </ul>	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>PROFIBUS as of GSD version/GSD revision</li> </ul>	V1.0 / V5.1
<ul style="list-style-type: none"> <li>PROFINET as of GSD version/GSD revision</li> </ul>	V2.3 / -
Operating mode	
<ul style="list-style-type: none"> <li>Oversampling</li> </ul>	No
<ul style="list-style-type: none"> <li>MSI</li> </ul>	Yes
CiR – Configuration in RUN	
Reparameterization possible in RUN	Yes

Supply voltage	
Rated value (DC)	24 V
permissible range, lower limit (DC)	20.4 V
permissible range, upper limit (DC)	28.8 V
Reverse polarity protection	Yes
Input current	
Current consumption, max.	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
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</li> </ul>	Yes
<ul style="list-style-type: none"> <li>• Input resistance (-250 mV to +250 mV)</li> </ul>	10 MΩ
<ul style="list-style-type: none"> <li>• -5 V to +5 V</li> </ul>	No
<ul style="list-style-type: none"> <li>• -50 mV to +50 mV</li> </ul>	Yes
<ul style="list-style-type: none"> <li>• Input resistance (-50 mV to +50 mV)</li> </ul>	10 MΩ
<ul style="list-style-type: none"> <li>• -500 mV to +500 mV</li> </ul>	Yes
<ul style="list-style-type: none"> <li>• Input resistance (-500 mV to +500 mV)</li> </ul>	10 MΩ
<ul style="list-style-type: none"> <li>• -80 mV to +80 mV</li> </ul>	Yes
<ul style="list-style-type: none"> <li>• Input resistance (-80 mV to +80 mV)</li> </ul>	10 MΩ

Input ranges (rated values), currents	
• 0 to 20 mA	No
• -20 mA to +20 mA	No
• 4 mA to 20 mA	No
Input ranges (rated values), thermocouples	
• Type B	Yes
• Input resistance (Type B)	10 MΩ
• Type C	Yes
• Input resistance (Type C)	10 MΩ
• 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	Yes
• Input resistance (Type TXK/TXK(L) to GOST)	10 MΩ
Input ranges (rated values), resistance thermometer	
• Cu 10	Yes; Standard/climate
• Input resistance (Cu 10)	10 MΩ
• Cu 10 according to GOST	Yes; Standard/climate
• Input resistance (Cu 10 according to GOST)	10 MΩ
• 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	Yes; Standard/climate
• Input resistance (Pt 10)	10 MΩ
• Pt 10 according to GOST	Yes; Standard/climate
• Input resistance (Pt 10 according to GOST)	10 MΩ
• Pt 50	Yes; Standard/climate
• Input resistance (Pt 50)	10 MΩ
• Pt 50 according to GOST	Yes; Standard/climate
• Input resistance (Pt 50 according to GOST)	10 MΩ
• Pt 100	Yes; Standard/climate
• Input resistance (Pt 100)	10 MΩ
• Pt 100 according to GOST	Yes; Standard/climate
• Input resistance (Pt 100 according to GOST)	10 MΩ
• Pt 1000	Yes; Standard/climate
• Input resistance (Pt 1000)	10 MΩ
• Pt 1000 according to GOST	Yes; Standard/climate
• Input resistance (Pt 1000 according to GOST)	10 MΩ
• Pt 200	Yes; Standard/climate

• Input resistance (Pt 200)	10 MΩ
• Pt 200 according to GOST	Yes; Standard/climate
• Input resistance (Pt 200 according to GOST)	10 MΩ
• Pt 500	Yes; Standard/climate
• Input resistance (Pt 500)	10 MΩ
• Pt 500 according to GOST	Yes; Standard/climate
• Input resistance (Pt 500 according to GOST)	10 MΩ
<b>Input ranges (rated values), resistors</b>	
• 0 to 150 ohms	Yes
• Input resistance (0 to 150 ohms)	10 MΩ
• 0 to 300 ohms	Yes
• Input resistance (0 to 300 ohms)	10 MΩ
• 0 to 600 ohms	Yes
• Input resistance (0 to 600 ohms)	10 MΩ
• 0 to 3000 ohms	No
• 0 to 6000 ohms	Yes
• Input resistance (0 to 6000 ohms)	10 MΩ
<b>Thermocouple (TC)</b>	
<b>Temperature compensation</b>	
— parameterizable	Yes
— internal temperature compensation	Yes
— external temperature compensation via RTD	Yes
— Compensation for 0 °C reference point temperature	Yes; fixed value can be set
— Reference channel of the module	Yes; 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
<b>Cable length</b>	
• shielded, max.	800 m; at U; 200 m at R/RTD/TC
<b>Analog value generation for the inputs</b>	
<b>Integration and conversion time/resolution per channel</b>	
• Resolution with overrange (bit including sign), max.	16 bit
• Integration time, parameterizable	Yes
• Integration time (ms)	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, Ni50, Ni100, Ni120, Ni200, Pt10, Pt50, Pt100, Pt200: 4 ms; 6 kOhm, Ni500, Ni1000, LG-Ni1000, Pt500, Pt1000: 13 ms

<ul style="list-style-type: none"> <li>• Interference voltage suppression for interference frequency f1 in Hz</li> <li>• Basic execution time of the module (all channels released)</li> </ul>	<p>400 / 60 / 50 / 10 Hz</p> <p>Corresponds to the channel with the highest basic conversion time</p>
<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>	<p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p>

## Encoder

<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</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>	<p>Yes</p> <p>No</p> <p>No</p> <p>Yes</p> <p>Yes; All measuring ranges except PTC; internal compensation of the cable resistances</p> <p>Yes; All measuring ranges except PTC</p>

## 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

## Operational error limit in overall temperature range

<ul style="list-style-type: none"> <li>• Voltage, 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>	<p>0.1 %</p> <p>0.1 %</p> <p>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</p> <p>Type B: &gt; 600 °C ±2 K, Type E: &gt; -200 °C ±1 K, Type J: &gt; -210 °C ±1 K, Type K: &gt; -200 °C ±2 K, Type N: &gt; -200 °C ±2 K, Type R: &gt; 0 °C ±2 K, Type S: &gt; 0 °C ±2 K, Type T: &gt; -200 °C ±1 K, Type C: ±4 K, Type TXK/TXK(L): ±1 K</p>
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## Basic error limit (operational limit at 25 °C)

<ul style="list-style-type: none"> <li>• Voltage, relative to input range, (+/-)</li> <li>• Resistance, relative to input range, (+/-)</li> </ul>	<p>0.05 %</p> <p>0.05 %</p>
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- Resistance thermometer, relative to input range, (+/-)
- Thermocouple, relative to input range, (+/-)

Cuxxx Standard:  $\pm 0.3$  K, Cuxxx Klima:  $\pm 0.2$  K, Ptxxx Standard:  $\pm 0.5$  K, Ptxxx Klima:  $\pm 0.2$  K, Nixxx Standard:  $\pm 0.3$  K, Nixxx Klima:  $\pm 0.15$  K  
 Type B:  $> 600$  °C  $\pm 1$  K, Type E:  $> -200$  °C  $\pm 0.5$  K, Type J:  $> -210$  °C  $\pm 0.5$  K, Type K:  $> -200$  °C  $\pm 1$  K, Type N:  $> -200$  °C  $\pm 1$  K, Type R:  $> 0$  °C  $\pm 1$  K, Type S:  $> 0$  °C  $\pm 1$  K, Type T:  $> -200$  °C  $\pm 0.5$  K, Type C:  $\pm 2$  K, Type TXK/TXK(L):  $\pm 0.5$  K

Interference voltage suppression for  $f = n \times (f_1 \pm 1 \%)$ ,  $f_1$  = interference frequency

- Series mode interference (peak value of interference  $<$  rated value of input range), min.
- Common mode voltage, max.
- Common mode interference, min.

80 dB; in the Standard operating mode, 40 dB in the Fast operating mode  
 60 V DC/30 V AC  
 80 dB

### Isochronous mode

Isochronous operation (application synchronized up to terminal)

No

### Interrupts/diagnostics/status information

Diagnostics function

Yes

#### Alarms

- Diagnostic alarm
- Limit value alarm

Yes  
 Yes; two upper and two lower limit values in each case

#### Diagnostic messages

- Monitoring the supply voltage
- Wire-break
- Overflow/underflow

Yes  
 Yes; Only with TC, R, RTD  
 Yes

#### Diagnostics indication LED

- RUN LED
- ERROR LED
- Monitoring of the supply voltage (PWR-LED)
- Channel status display
- for channel diagnostics
- for module diagnostics

Yes; Green LED  
 Yes; Red LED  
 Yes; Green LED  
 Yes; Green LED  
 Yes; Red LED  
 Yes; Red LED

### Potential separation

#### Potential separation channels

- between the channels
- between the channels, in groups of
- between the channels and backplane bus
- between the channels and the power supply of the electronics

Yes  
 1  
 Yes  
 Yes

### Isolation

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
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### Ambient conditions

#### Ambient temperature during operation

• horizontal installation, min.	0 °C
• horizontal installation, max.	60 °C
• vertical installation, min.	0 °C
• vertical installation, max.	40 °C

#### Altitude during operation based on sea level

• Ambient air temperature-barometric pressure-altitude	Tmin ... Tmax at 1080 hPa ... 795 hPa (-1000 m ... +2000 m) // Tmin ... (Tmax - 10K) at 795 hPa ... 658 hPa (+2000 m ... +3500 m) // Tmin ... (Tmax - 20K) at 658 hPa ... 540 hPa (+3500 m ... +5000 m)
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#### Relative humidity

• With condensation, tested in accordance with IEC 60068-2-38, max.	100 %; RH incl. condensation / frost (no commissioning in bedewed state), horizontal installation
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#### Resistance

##### Use in stationary industrial systems

— to biologically active substances according to EN 60721-3-3	Yes; Class 3B2 mold, fungus and dry rot spores (with the exception of fauna); Class 3B3 on request
— to chemically active substances according to EN 60721-3-3	Yes; Class 3C4 (RH < 75%) incl. salt spray according to EN 60068-2-52 (degree of severity 3). The supplied connector covers must remain on the unused interfaces during operation!
— to mechanically active substances according to EN 60721-3-3	Yes; Class 3S4 incl. sand, dust. The supplied connector covers must remain on the unused interfaces during operation!

### Decentralized operation

Prioritized startup	Yes
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### Dimensions

Width	35 mm
Height	147 mm
Depth	129 mm

### 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.
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**last modified:** 10/13/2017