

SIPLUS S7-1500 AI 8XU/R/RTD/TC HF 0 ... +60°C with conformal coating based on 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: 30 V AC/60 V DC, "Diagnosis, Process alarms;" incl. infeed element, Shield clamp and Shield terminal



Figure similar

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>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>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
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
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## Power

Power available from the backplane bus	0.85 W
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## Power loss

Power loss, typ.	1.9 W
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## Analog inputs

Number of analog inputs	8; Plus one additional RTD (reference) channel
<ul style="list-style-type: none"> <li>• For voltage measurement</li> <li>• For resistance/resistance thermometer measurement</li> <li>• For thermocouple measurement</li> </ul>	8; Plus one additional RTD (reference) channel 8; Plus one additional RTD (reference) channel 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> <li>• 0 to +10 V</li> <li>• 1 V to 5 V</li> <li>• -1 V to +1 V</li> <li>• Input resistance (-1 V to +1 V)</li> <li>• -10 V to +10 V</li> <li>• -2.5 V to +2.5 V</li> <li>• -25 mV to +25 mV</li> <li>• Input resistance (-25 mV to +25 mV)</li> <li>• -250 mV to +250 mV</li> <li>• Input resistance (-250 mV to +250 mV)</li> <li>• -5 V to +5 V</li> <li>• -50 mV to +50 mV</li> <li>• Input resistance (-50 mV to +50 mV)</li> </ul>	No No No Yes 10 MΩ No No Yes 10 MΩ Yes 10 MΩ No Yes 10 MΩ
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• -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	No
• -20 mA to +20 mA	No
• 4 mA to 20 mA	No
<b>Input ranges (rated values), thermocouples</b>	
• 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
<b>Input ranges (rated values), resistance thermometer</b>	
• 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
• PTC	Yes
• Input resistance (PTC)	10 MΩ
<b>Thermocouple (TC)</b>	
<b>Temperature compensation</b>	
— parameterizable	Yes
— internal temperature compensation	Yes
— external temperature compensation via RTD	Yes
— Compensation for 0 °C reference point temperature	Yes; fixed value can be set
— Reference channel of the module	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

<ul style="list-style-type: none"> <li>• Integration time (ms)</li> </ul>	Fast mode: 2.5 / 16.67 / 20 / 100 ms, standard mode: 7.5 / 50 / 60 / 300 ms
<ul style="list-style-type: none"> <li>• Basic conversion time, including integration time (ms) <ul style="list-style-type: none"> <li>— additional conversion time for wire-break monitoring</li> </ul> </li> </ul>	Fast mode: 4 / 18 / 22 / 102 ms; Standard mode: 9 / 52 / 62 / 302 ms 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> </ul>	400 / 60 / 50 / 10 Hz
<ul style="list-style-type: none"> <li>• Basic execution time of the module (all channels released)</li> </ul>	Corresponds to the channel with the highest basic conversion time

Smoothing of measured values	
<ul style="list-style-type: none"> <li>• parameterizable</li> </ul>	Yes
<ul style="list-style-type: none"> <li>• Step: None</li> </ul>	Yes
<ul style="list-style-type: none"> <li>• Step: low</li> </ul>	Yes
<ul style="list-style-type: none"> <li>• Step: Medium</li> </ul>	Yes
<ul style="list-style-type: none"> <li>• Step: High</li> </ul>	Yes

### Encoder

Connection of signal encoders	
<ul style="list-style-type: none"> <li>• for voltage measurement</li> </ul>	Yes
<ul style="list-style-type: none"> <li>• for current measurement as 2-wire transducer</li> </ul>	No
<ul style="list-style-type: none"> <li>• for current measurement as 4-wire transducer</li> </ul>	No
<ul style="list-style-type: none"> <li>• for resistance measurement with two-wire connection</li> </ul>	Yes
<ul style="list-style-type: none"> <li>• for resistance measurement with three-wire connection</li> </ul>	Yes; All measuring ranges except PTC; internal compensation of the cable resistances
<ul style="list-style-type: none"> <li>• for resistance measurement with four-wire connection</li> </ul>	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
Operational error limit in overall temperature range	
<ul style="list-style-type: none"> <li>• Voltage, relative to input range, (+/-)</li> </ul>	0.1 %
<ul style="list-style-type: none"> <li>• Resistance, relative to input range, (+/-)</li> </ul>	0.1 %
<ul style="list-style-type: none"> <li>• Resistance thermometer, relative to input range, (+/-)</li> </ul>	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

<ul style="list-style-type: none"> <li>• Thermocouple, relative to input range, (+/-)</li> </ul>	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>	
<ul style="list-style-type: none"> <li>• Voltage, relative to input range, (+/-)</li> </ul>	0.05 %
<ul style="list-style-type: none"> <li>• Resistance, relative to input range, (+/-)</li> </ul>	0.05 %
<ul style="list-style-type: none"> <li>• Resistance thermometer, relative to input range, (+/-)</li> </ul>	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
<ul style="list-style-type: none"> <li>• Thermocouple, relative to input range, (+/-)</li> </ul>	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>	
<ul style="list-style-type: none"> <li>• Series mode interference (peak value of interference &lt; rated value of input range), min.</li> </ul>	80 dB; in the Standard operating mode, 40 dB in the Fast operating mode
<ul style="list-style-type: none"> <li>• Common mode voltage, max.</li> </ul>	60 V DC/30 V AC
<ul style="list-style-type: none"> <li>• Common mode interference, min.</li> </ul>	80 dB
<b>Isochronous mode</b>	
Isochronous operation (application synchronized up to terminal)	No
<b>Interrupts/diagnostics/status information</b>	
Diagnostics function	Yes
<b>Alarms</b>	
<ul style="list-style-type: none"> <li>• Diagnostic alarm</li> </ul>	Yes
<ul style="list-style-type: none"> <li>• Limit value alarm</li> </ul>	Yes; two upper and two lower limit values in each case
<b>Diagnostic messages</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

- between the channels and backplane bus
- between the channels and the power supply of the electronics

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

## Ambient conditions

Ambient temperature during operation

- horizontal installation, min. 0 °C; = Tmin (incl. condensation/frost)
- horizontal installation, max. 60 °C; = Tmax
- vertical installation, min. 0 °C; = Tmin
- vertical installation, max. 40 °C; = Tmax

Altitude during operation relating to sea level

- Installation altitude above sea level, max. 5 000 m
- Ambient air temperature-barometric pressure-altitude Tmin ... Tmax at 1 140 hPa ... 795 hPa (-1 000 m ... +2 000 m) // Tmin ... (Tmax - 10 K) at 795 hPa ... 658 hPa (+2 000 m ... +3 500 m) // Tmin ... (Tmax -20 K) at 658 hPa ... 540 hPa (+3 500 m ... +5 000 m)

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

Resistance

Coolants and lubricants

- Resistant to commercially available coolants and lubricants Yes; Incl. diesel and oil droplets in the air

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 acc. to EN 60068-2-52 (severity degree 3); \*
- to mechanically active substances according to EN 60721-3-3 Yes; Class 3S4 incl. sand, dust, \*

Use on ships/at sea

- to biologically active substances according to EN 60721-3-6 Yes; Class 6B2 mold and fungal spores (excluding fauna); Class 6B3 on request
- to chemically active substances according to EN 60721-3-6 Yes; Class 6C3 (RH < 75 %) incl. salt spray acc. to EN 60068-2-52 (severity degree 3); \*
- to mechanically active substances according to EN 60721-3-6 Yes; Class 6S3 incl. sand, dust; \*

Usage in industrial process technology

- Against chemically active substances acc. to EN 60654-4 Yes; Class 3 (excluding trichlorethylene)

— Environmental conditions for process, measuring and control systems acc. to ANSI/ISA-71.04

Yes; Level GX group A/B (excluding trichlorethylene; harmful gas concentrations up to the limits of EN 60721-3-3 class 3C4 permissible); level LC3 (salt spray) and level LB3 (oil)

#### Remark

— Note regarding classification of environmental conditions acc. to EN 60721, EN 60654-4 and ANSI/ISA-71.04

\* The supplied plug covers must remain in place over the unused interfaces during operation!

#### Conformal coating

- Coatings for printed circuit board assemblies acc. to EN 61086
- Protection against fouling acc. to EN 60664-3
- Military testing according to MIL-I-46058C, Amendment 7
- Qualification and Performance of Electrical Insulating Compound for Printed Board Assemblies according to IPC-CC-830A

Yes; Class 2 for high availability

Yes; Type 1 protection

Yes; Discoloration of coating possible during service life

Yes; Conformal coating, Class A

#### Dimensions

Width	35 mm
Height	147 mm
Depth	129 mm

#### Weights

Weight, approx.	290 g
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#### 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:**

11/25/2019