



Figure similar

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

General information	
Product type designation	AI 8xU/R/RTD/TC HF
Firmware version	
• FW update possible	Yes
Product function	
• I&M data	Yes; I&M0 to I&M3
• Prioritized startup	Yes
• Measuring range scalable	Yes
• Scalable measured values	No
• Adjustment of measuring range	No
Engineering with	
• 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

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> </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 <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>	Yes 10 MΩ Yes 10 MΩ
Input ranges (rated values), currents	
<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>	No No No
Input ranges (rated values), thermocouples	
<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>	Yes 10 MΩ Yes 10 MΩ Yes 10 MΩ Yes 10 MΩ No Yes 10 MΩ Yes 10 MΩ Yes 10 MΩ Yes 10 MΩ Yes 10 MΩ Yes 10 MΩ Yes 10 MΩ
Input ranges (rated values), resistance thermometer	
<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> <li>• Cu 50 <ul style="list-style-type: none"> <li>— Input resistance (Cu 50)</li> </ul> </li> <li>• Cu 50 according to GOST <ul style="list-style-type: none"> <li>— Input resistance (Cu 50 according to GOST)</li> </ul> </li> </ul>	Yes; Standard/climate 10 MΩ Yes; Standard/climate 10 MΩ Yes; Standard/climate 10 MΩ Yes; Standard/climate 10 MΩ

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

<ul style="list-style-type: none"> <li>• Pt 50 <ul style="list-style-type: none"> <li>— Input resistance (Pt 50)</li> </ul> </li> <li>• Pt 50 according to GOST <ul style="list-style-type: none"> <li>— Input resistance (Pt 50 according to GOST)</li> </ul> </li> <li>• Pt 100 <ul style="list-style-type: none"> <li>— Input resistance (Pt 100)</li> </ul> </li> <li>• Pt 100 according to GOST <ul style="list-style-type: none"> <li>— Input resistance (Pt 100 according to GOST)</li> </ul> </li> <li>• Pt 1000 <ul style="list-style-type: none"> <li>— Input resistance (Pt 1000)</li> </ul> </li> <li>• Pt 1000 according to GOST <ul style="list-style-type: none"> <li>— Input resistance (Pt 1000 according to GOST)</li> </ul> </li> <li>• Pt 200 <ul style="list-style-type: none"> <li>— Input resistance (Pt 200)</li> </ul> </li> <li>• Pt 200 according to GOST <ul style="list-style-type: none"> <li>— Input resistance (Pt 200 according to GOST)</li> </ul> </li> <li>• Pt 500 <ul style="list-style-type: none"> <li>— Input resistance (Pt 500)</li> </ul> </li> <li>• Pt 500 according to GOST <ul style="list-style-type: none"> <li>— Input resistance (Pt 500 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> <p>Yes; Standard/climate</p> <p>10 MΩ</p> <p>Yes; Standard/climate</p> <p>10 MΩ</p> <p>Yes; Standard/climate</p> <p>10 MΩ</p> <p>Yes; Standard/climate</p> <p>10 MΩ</p> <p>Yes; Standard/climate</p> <p>10 MΩ</p> <p>Yes; Standard/climate</p> <p>10 MΩ</p> <p>Yes; Standard/climate</p> <p>10 MΩ</p>
Input ranges (rated values), resistors	
<ul style="list-style-type: none"> <li>• 0 to 150 ohms <ul style="list-style-type: none"> <li>— Input resistance (0 to 150 ohms)</li> </ul> </li> <li>• 0 to 300 ohms <ul style="list-style-type: none"> <li>— Input resistance (0 to 300 ohms)</li> </ul> </li> <li>• 0 to 600 ohms <ul style="list-style-type: none"> <li>— Input resistance (0 to 600 ohms)</li> </ul> </li> <li>• 0 to 3000 ohms</li> <li>• 0 to 6000 ohms <ul style="list-style-type: none"> <li>— Input resistance (0 to 6000 ohms)</li> </ul> </li> <li>• PTC <ul style="list-style-type: none"> <li>— Input resistance (PTC)</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>No</p> <p>Yes</p> <p>10 MΩ</p> <p>Yes</p> <p>10 MΩ</p>
Thermocouple (TC)	
Temperature compensation	
<ul style="list-style-type: none"> <li>— parameterizable</li> <li>— internal temperature compensation</li> </ul>	<p>Yes</p> <p>Yes</p>

— 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
• 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
<b>Smoothing of measured values</b>	
• parameterizable	Yes
• Step: None	Yes
• Step: low	Yes
• Step: Medium	Yes
• Step: High	Yes
<b>Encoder</b>	
<b>Connection of signal encoders</b>	
• 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	Yes
• for resistance measurement with three-wire connection	Yes; All measuring ranges except PTC; internal compensation of the cable resistances
• for resistance measurement with four-wire connection	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> <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 % 0.1 % 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 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
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> <li>Resistance thermometer, relative to input range, (+/-)</li> <li>Thermocouple, relative to input range, (+/-)</li> </ul>	0.05 % 0.05 % 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 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
Interference voltage suppression for $f = n \times (f_1 \pm 1 \%)$ , $f_1$ = interference frequency	
<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>	80 dB; in the Standard operating mode, 40 dB in the Fast operating mode 60 V DC/30 V AC 80 dB
Interrupts/diagnostics/status information	
Diagnostics function	Yes
Alarms	
<ul style="list-style-type: none"> <li>Diagnostic alarm</li> <li>Limit value alarm</li> </ul>	Yes Yes; two upper and two lower limit values in each case
Diagnostic messages	
<ul style="list-style-type: none"> <li>Monitoring the supply voltage</li> <li>Wire-break</li> <li>Overflow/underflow</li> </ul>	Yes Yes; Only with TC, R, RTD Yes
Diagnostics indication LED	
<ul style="list-style-type: none"> <li>RUN LED</li> <li>ERROR LED</li> </ul>	Yes; green LED Yes; red LED

- |  |                |
|--|----------------|
| • Monitoring of the supply voltage (PWR-LED) | Yes; green LED |
| • Channel status display                     | Yes; green LED |
| • for channel diagnostics                    | Yes; red LED   |
| • for module diagnostics                     | Yes; red LED   |

## Potential separation

### Potential separation channels

- |  |     |
|--|-----|
| • between the channels   | Yes |
| • between the channels, in groups of                           | 1   |
| • between the channels and backplane bus                       | Yes |
| • between the channels and the power supply of the electronics | 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; *
<b>Usage in industrial process technology</b>	
— 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)
<b>Remark</b>	
— 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!
<b>Conformal coating</b>	
<ul style="list-style-type: none"> <li>• Coatings for printed circuit board assemblies acc. to EN 61086</li> <li>• Protection against fouling acc. to EN 60664-3</li> <li>• Military testing according to MIL-I-46058C, Amendment 7</li> <li>• Qualification and Performance of Electrical Insulating Compound for Printed Board Assemblies according to IPC-CC-830A</li> </ul>	<p>Yes</p> <p>Yes; Type 1 protection</p> <p>Yes; Discoloration of coating possible during service life</p> <p>Yes; Conformal coating, Class A</p>
<b>Dimensions</b>	
Width	35 mm
Height	147 mm
Depth	129 mm
<b>Weights</b>	
Weight, approx.	290 g
<b>Other</b>	
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>	06/22/2020