

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"> FW update possible 	Yes
Product function	
<ul style="list-style-type: none"> I&M data 	Yes; I&M0 to I&M3
<ul style="list-style-type: none"> Prioritized startup 	Yes
<ul style="list-style-type: none"> Measuring range scalable 	Yes
<ul style="list-style-type: none"> Scalable measured values 	No
<ul style="list-style-type: none"> Adjustment of measuring range 	No
Engineering with	
<ul style="list-style-type: none"> PROFIBUS as of GSD version/GSD revision 	V1.0 / V5.1
<ul style="list-style-type: none"> PROFINET as of GSD version/GSD revision 	V2.3 / -
Operating mode	
<ul style="list-style-type: none"> Oversampling 	No
<ul style="list-style-type: none"> 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"> • For voltage measurement • For resistance/resistance thermometer measurement • For thermocouple measurement 	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

• 0 to +5 V	No
• 0 to +10 V	No
• 1 V to 5 V	No
• -1 V to +1 V	Yes
— Input resistance (-1 V to +1 V)	10 MΩ
• -10 V to +10 V	No
• -2.5 V to +2.5 V	No
• -25 mV to +25 mV	Yes
— Input resistance (-25 mV to +25 mV)	10 MΩ
• -250 mV to +250 mV	Yes
— Input resistance (-250 mV to +250 mV)	10 MΩ
• -5 V to +5 V	No
• -50 mV to +50 mV	Yes
— Input resistance (-50 mV to +50 mV)	10 MΩ

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

• 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

- 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

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
- internal temperature compensation

Yes

Yes

- external temperature compensation via RTD
- Compensation for 0 °C reference point temperature
- Reference channel of the module

Yes

Yes; fixed value can be set

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.
- Integration time, parameterizable
- Integration time (ms)
- Basic conversion time, including integration time (ms)
 - additional conversion time for wire-break monitoring
- Interference voltage suppression for interference frequency f1 in Hz
- Basic execution time of the module (all channels released)

16 bit

Yes

Fast mode: 2.5 / 16.67 / 20 / 100 ms, standard mode: 7.5 / 50 / 60 / 300 ms

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

400 / 60 / 50 / 10 Hz

Corresponds to the channel with the highest basic conversion time

Smoothing of measured values

- parameterizable
- Step: None
- Step: low
- Step: Medium
- Step: High

Yes

Yes

Yes

Yes

Yes

Encoder

Connection of signal encoders

- for voltage measurement
- for current measurement as 2-wire transducer
- for current measurement as 4-wire transducer
- for resistance measurement with two-wire connection
- for resistance measurement with three-wire connection
- for resistance measurement with four-wire connection

Yes

No

No

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
Operational error limit in overall temperature range	
<ul style="list-style-type: none"> • Voltage, relative to input range, (+/-) • Resistance, relative to input range, (+/-) • Resistance thermometer, relative to input range, (+/-) • Thermocouple, relative to input range, (+/-) 	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"> • Voltage, relative to input range, (+/-) • Resistance, relative to input range, (+/-) • Resistance thermometer, relative to input range, (+/-) • Thermocouple, relative to input range, (+/-) 	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"> • 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
Interrupts/diagnostics/status information	
Diagnostics function	Yes
Alarms	
<ul style="list-style-type: none"> • Diagnostic alarm • Limit value alarm 	Yes Yes; two upper and two lower limit values in each case
Diagnostic messages	
<ul style="list-style-type: none"> • Monitoring the supply voltage • Wire-break • Overflow/underflow 	Yes Yes; Only with TC, R, RTD Yes
Diagnostics indication LED	
<ul style="list-style-type: none"> • RUN LED • ERROR LED 	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; *
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	Yes
• Protection against fouling acc. to EN 60664-3	Yes; Type 1 protection
• Military testing according to MIL-I-46058C, Amendment 7	Yes; Discoloration of coating possible during service life
• Qualification and Performance of Electrical Insulating Compound for Printed Board Assemblies according to IPC-CC-830A	Yes; Conformal coating, Class A
Dimensions	
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
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