

SIMATIC S7-1500, Analog input module AI 8xU/I/RTD/TC ST, 16 bit resolution, Accuracy 0.3%, 8 channels in groups of 8, 4 channels for RTD measurement, "Common mode voltage 10 V; diagnostics; Hardware interrupts incl. infeed element, Shield bracket and shield terminal



| General information | |
|---|--------------------|
| Product type designation | AI 8xU/I/RTD/TC ST |
| HW functional status | FS01 |
| Firmware version | V2.0.0 |
| <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"> Measuring range scalable | No |
| <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"> STEP 7 TIA Portal configurable/integrated as of version | V12 / V12 |
| <ul style="list-style-type: none"> STEP 7 configurable/integrated as of version | V5.5 SP3 / - |
| <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 | |
| 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. | 240 mA; with 24 V DC supply |
| Encoder supply | |
| 24 V encoder supply | |
| <ul style="list-style-type: none"> • Short-circuit protection | Yes |
| <ul style="list-style-type: none"> • Output current, max. | 20 mA; Max. 47 mA per channel for a duration < 10 s |
| Power | |
| Power available from the backplane bus | 0.7 W |
| Power loss | |
| Power loss, typ. | 2.7 W |
| Analog inputs | |
| Number of analog inputs | 8 |
| <ul style="list-style-type: none"> • For current measurement | 8 |
| <ul style="list-style-type: none"> • For voltage measurement | 8 |
| <ul style="list-style-type: none"> • For resistance/resistance thermometer measurement | 4 |
| <ul style="list-style-type: none"> • For thermocouple measurement | 8 |
| permissible input voltage for voltage input (destruction limit), max. | 28.8 V |
| permissible input current for current input (destruction limit), max. | 40 mA |
| Technical unit for temperature measurement adjustable | Yes; °C/°F/K |
| Input ranges (rated values), voltages | |
| <ul style="list-style-type: none"> • 0 to +5 V | No |
| <ul style="list-style-type: none"> • 0 to +10 V | No |
| <ul style="list-style-type: none"> • 1 V to 5 V | Yes |
| <ul style="list-style-type: none"> • Input resistance (1 V to 5 V) | 100 kΩ |
| <ul style="list-style-type: none"> • -1 V to +1 V | Yes |
| <ul style="list-style-type: none"> • Input resistance (-1 V to +1 V) | 10 MΩ |
| <ul style="list-style-type: none"> • -10 V to +10 V | Yes |
| <ul style="list-style-type: none"> • Input resistance (-10 V to +10 V) | 100 kΩ |

| | |
|--|--|
| • -2.5 V to +2.5 V | Yes |
| • Input resistance (-2.5 V to +2.5 V) | 10 MΩ |
| • -25 mV to +25 mV | No |
| • -250 mV to +250 mV | Yes |
| • Input resistance (-250 mV to +250 mV) | 10 MΩ |
| • -5 V to +5 V | Yes |
| • Input resistance (-5 V to +5 V) | 100 kΩ |
| • -50 mV to +50 mV | Yes |
| • Input resistance (-50 mV to +50 mV) | 10 MΩ |
| • -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 |
| Input ranges (rated values), currents | |
| • 0 to 20 mA | Yes |
| • Input resistance (0 to 20 mA) | 25 Ω; Plus approx. 42 ohms for overvoltage protection by PTC |
| • -20 mA to +20 mA | Yes |
| • Input resistance (-20 mA to +20 mA) | 25 Ω; Plus approx. 42 ohms for overvoltage protection by PTC |
| • 4 mA to 20 mA | Yes |
| • Input resistance (4 mA to 20 mA) | 25 Ω; Plus approx. 42 ohms for overvoltage protection by PTC |
| Input ranges (rated values), thermocouples | |
| • Type B | Yes |
| • Input resistance (Type B) | 10 MΩ |
| • Type C | No |
| • 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 | No |
| Input ranges (rated values), resistance thermometer | |

- Cu 10
- Cu 10 according to GOST
- Cu 50
- Cu 50 according to GOST
- Cu 100
- Cu 100 according to GOST
- Ni 10
- Ni 10 according to GOST
- Ni 100
- Input resistance (Ni 100)
- Ni 100 according to GOST
- Ni 1000
- Input resistance (Ni 1000)
- Ni 1000 according to GOST
- LG-Ni 1000
- Input resistance (LG-Ni 1000)
- Ni 120
- Ni 120 according to GOST
- Ni 200 according to GOST
- Ni 500
- Ni 500 according to GOST
- Pt 10
- Pt 10 according to GOST
- Pt 50
- Pt 50 according to GOST
- Pt 100
- Input resistance (Pt 100)
- Pt 100 according to GOST
- Pt 1000
- Input resistance (Pt 1000)
- Pt 1000 according to GOST
- Pt 200
- Input resistance (Pt 200)
- Pt 200 according to GOST
- Pt 500
- Input resistance (Pt 500)
- Pt 500 according to GOST

No
No
No
No
No
No
No
No
Yes; Standard/climate
10 MΩ
No
Yes; Standard/climate
10 MΩ
No
Yes; Standard/climate
10 MΩ
No
No
No
No
No
No
No
No
No
No
Yes; Standard/climate
10 MΩ
No
Yes; Standard/climate
10 MΩ
No
Yes; Standard/climate
10 MΩ
No
Yes; Standard/climate
10 MΩ
No
Yes; Standard/climate
10 MΩ
No

Input ranges (rated values), resistors

- 0 to 150 ohms
- Input resistance (0 to 150 ohms)
- 0 to 300 ohms

Yes
10 MΩ
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 |
| 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 |
| Cable length | |
| • shielded, max. | 800 m; for U/I, 200 m for R/RTD, 50 m for TC |
| Analog value generation for the inputs | |
| Integration and conversion time/resolution per channel | |
| • Resolution with overrange (bit including sign), max. | 16 bit |
| • Integration time, parameterizable | Yes |
| • Integration time (ms) | 2,5 / 16,67 / 20 / 100 ms |
| • Basic conversion time, including integration time (ms) | 9 / 23 / 27 / 107 ms |
| — additional conversion time for wire-break monitoring | 9 ms (to be considered in R/RTD/TC measurement) |
| — additional conversion time for resistance measurement | 150 ohm, 300 ohm, 600 ohm, Pt100, Pt200, Ni100: 2 ms, 6000 ohm, Pt500, Pt1000, Ni1000, LG-Ni1000, PTC: 4 ms |
| • Interference voltage suppression for interference frequency f1 in Hz | 400 / 60 / 50 / 10 Hz |
| • Time for offset calibration (per module) | Basic conversion time of the slowest channel |
| 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
- for current measurement as 2-wire transducer
— Burden of 2-wire transmitter, max.
- 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
 Yes
 820 Ω
 Yes
 Yes; Only for PTC

 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; With TC type T 0.02 ± % / 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 | ±6 °C |
| Operational error limit in overall temperature range | |
| • Voltage, relative to input range, (+/-) | 0.3 % |
| • Current, relative to input range, (+/-) | 0.3 % |
| • Resistance, relative to input range, (+/-) | 0.3 % |
| • Resistance thermometer, relative to input range, (+/-) | Ptxxx standard: ±1.5 K, Ptxxx climate: ±0.5 K, Nixxx standard: ±0.5 K, Nixxx climate: ±0.3 K |
| • Thermocouple, relative to input range, (+/-) | Type B: > 600 °C ±4.6 K, type E: > -200 °C ±1.5 K, type J: > -210 °C ±1.9 K, type K: > -200 °C ±2.4 K, type N: > -200 °C ±2.9 K, type R: > 0 °C ±4.7 K, type S: > 0 °C ±4.6 K, type T: > -200 °C ±2.4 K |
| Basic error limit (operational limit at 25 °C) | |
| • Voltage, relative to input range, (+/-) | 0.1 % |
| • Current, relative to input range, (+/-) | 0.1 % |
| • Resistance, relative to input range, (+/-) | 0.1 % |
| • Resistance thermometer, relative to input range, (+/-) | Ptxxx standard: ±0.7 K, Ptxxx climate: ±0.2 K, Nixxx standard: ±0.3 K, Nixxx climate: ±0.15 K |
| • Thermocouple, relative to input range, (+/-) | Type B: > 600 °C ±1.7 K, type E: > -200 °C ±0.7 K, type J: > -210 °C ±0.8 K, type K: > -200 °C ±1.2 K, type N: > -200 °C ±1.2 K, type R: > 0 °C ±1.9 K, type S: > 0 °C ±1.9 K, type T: > -200 °C ±0.8 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. | 40 dB |
| • Common mode voltage, max. | 10 V |
| • Common mode interference, min. | 60 dB |

Isochronous mode

| | |
|---|--|
| Isochronous operation (application synchronized up to terminal) | No |
| Interrupts/diagnostics/status information | |
| Diagnostics function | Yes |
| Alarms | |
| • Diagnostic alarm | Yes |
| • Limit value alarm | Yes; two upper and two lower limit values in each case |
| Diagnostic messages | |
| • Monitoring the supply voltage | Yes |
| • Wire-break | Yes; Only for 1 to 5 V, 4 to 20 mA, TC, R, and RTD |
| • Overflow/underflow | Yes |
| Diagnostics indication LED | |
| • RUN LED | Yes; Green LED |
| • ERROR 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 | No |
| • between the channels, in groups of | 8 |
| • between the channels and backplane bus | Yes |
| • between the channels and the power supply of the electronics | Yes |
| Permissible potential difference | |
| between the inputs (UCM) | 20 V DC |
| Between the inputs and MANA (UCM) | 10 V DC |
| Isolation | |
| Isolation tested with | 707 V DC (type test) |
| 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 |
| Decentralized operation | |
| Prioritized startup | No |
| Dimensions | |
| Width | 35 mm |

| | |
|-----------------------|---|
| Height | 147 mm |
| Depth | 129 mm |
| Weights | |
| Weight, approx. | 310 g |
| Other | |
| Note: | Additional basic error and noise for integration time = 2.5 ms: Voltage: ± 250 mV ($\pm 0.02\%$), ± 80 mV ($\pm 0.05\%$), ± 50 mV ($\pm 0.05\%$); resistance: 150 ohms $\pm 0.02\%$; resistance thermometer: Pt100 climate: ± 0.08 K, Ni100 climate: ± 0.08 K; thermocouple: Type B, R, S: ± 3 K, type E, J, K, N, T: ± 1 K |
| last modified: | 01/29/2018 |