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## Data sheet 6ES7531-7KF00-0AB0



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; Delivery including infeed element, shield bracket and shield terminal: Front connector (screw terminals or push-in) to be ordered separately

| | |
|---|---|
| **General information** | |
| Product type designation | AI 8xU/I/RTD/TC ST |
| HW functional status | FS04 |
| Firmware version | V2.0.0 |
| ● FW update possible | Yes |
| Product function | |
| ● I&M data | Yes; I&M0 to I&M3 |
| ● Isochronous mode | No |
| ● Prioritized startup | No |
| ● Measuring range scalable | No |
| ● Scalable measured values | No |
| ● Adjustment of measuring range | No |
| Engineering with | |
| ● STEP 7 TIA Portal configurable/integrated from version | V12 / V12 |
| ● STEP 7 configurable/integrated from version | V5.5 SP3 / - |
| ● 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** | |
| Rated value (DC) | 24 V |
| permissible range, lower limit (DC) | 19.2 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 | |
| ● Short-circuit protection | Yes |
| ● 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 |


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|---|---|
| ● For current measurement | 8 |
| ● For voltage measurement | 8 |
| ● For resistance/resistance thermometer measurement | 4 |
| ● 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 |
| Constant measurement current for resistance-type transmitter, typ. | 150 Ohm, 300 Ohm, 600 Ohm, Pt100, Pt200, Ni100: 1.25 mA; 6 000 Ohm, Pt500, Pt1000, Ni1000, LG-Ni1000: 0.625 mA; PTC: 0.472 mA |
| 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 | Yes |
| — Input resistance (1 V to 5 V) | 100 kΩ |
| ● -1 V to +1 V | Yes |
| — Input resistance (-1 V to +1 V) | 10 MΩ |
| ● -10 V to +10 V | Yes |
| — 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 | No |


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|---|---|
| ● Cu 10 according to GOST | No |
| ● Cu 50 | No |
| ● Cu 50 according to GOST | No |
| ● Cu 100 | No |
| ● Cu 100 according to GOST | No |
| ● Ni 10 | No |
| ● Ni 10 according to GOST | No |
| ● Ni 100 | Yes; Standard/climate |
| — Input resistance (Ni 100) | 10 MΩ |
| ● Ni 100 according to GOST | No |
| ● Ni 1000 | Yes; Standard/climate |
| — Input resistance (Ni 1000) | 10 MΩ |
| ● Ni 1000 according to GOST | No |
| ● LG-Ni 1000 | Yes; Standard/climate |
| — Input resistance (LG-Ni 1000) | 10 MΩ |
| ● Ni 120 | No |
| ● Ni 120 according to GOST | No |
| ● Ni 200 according to GOST | No |
| ● Ni 500 | No |
| ● Ni 500 according to GOST | No |
| ● Pt 10 | No |
| ● Pt 10 according to GOST | No |
| ● Pt 50 | No |
| ● Pt 50 according to GOST | No |
| ● Pt 100 | Yes; Standard/climate |
| — Input resistance (Pt 100) | 10 MΩ |
| ● Pt 100 according to GOST | No |
| ● Pt 1000 | Yes; Standard/climate |
| — Input resistance (Pt 1000) | 10 MΩ |
| ● Pt 1000 according to GOST | No |
| ● Pt 200 | Yes; Standard/climate |
| — Input resistance (Pt 200) | 10 MΩ |
| ● Pt 200 according to GOST | No |
| ● Pt 500 | Yes; Standard/climate |
| — Input resistance (Pt 500) | 10 MΩ |
| ● Pt 500 according to GOST | No |
| Input ranges (rated values), resistors | |
| ● 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 |
| 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 |


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|---|---|
| ● 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 | Yes |
| ● for current measurement as 2-wire transducer | Yes |
| — Burden of 2-wire transmitter, max. | 820 Ω |
| ● for current measurement as 4-wire transducer | Yes |
| ● for resistance measurement with two-wire connection | Yes; Only for PTC |
| ● 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; 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 x (f1 +/- 1 %), f1 = 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 |
| **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 |
| Diagnoses | |
| ● 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 | |


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| ● 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) |
| **Standards, approvals, certificates** | |
| Suitable for applications according to AMS 2750 | Yes; Declaration of Conformity, see online support entry 109757262 |
| Suitable for applications according to CQI-9 | Yes; Based on AMS 2750 E |
| **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 relating to sea level | |
| ● Installation altitude above sea level, max. | 5 000 m; Restrictions for installation altitudes > 2 000 m, see manual |
| **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 (±0.02%), ±80 mV (±0.05%), ±50 mV (±0.05%); resistance: 150 ohms ±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 |

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