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Data sheet 6ES7531-7PF00-0AB0

SIMATIC S7-1500 analog input module AI 8xU/R/RTD/TC HF, 16 bit resolution, up to 21 bit Resolution at RT and TC, accuracy 0.1%, 8 channels in groups of 1; common mode voltage: 30 V AC/60 V DC, Diagnostics; Hardware interrupts Scalable temperature measuring range, thermocouple type C, Calibrate in RUN; 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/R/RTD/TC HF
HW functional status	from FS01
Firmware version	V1.1.0
● FW update possible	Yes
Product function	
● I&M data	Yes; I&M0 to I&M3
● Isochronous mode	No
● Prioritized startup	Yes
● Measuring range scalable	Yes
● Scalable measured values	No
● Adjustment of measuring range	No
Engineering with	
● STEP 7 TIA Portal configurable/integrated from version	V14 / -
● 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.	55 mA; with 19.2 V supply
Power	
Power consumption from the backplane bus	0.85 W
Power loss	
Power loss, typ.	1.9 W
Address area	
Address space per module	

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● Inputs	18 byte
● Outputs	0 byte
Analog inputs	
Number of analog inputs	8; Plus one additional RTD (reference) channel
● For voltage measurement	8; Plus one additional RTD (reference) channel
● For resistance/resistance thermometer measurement	8; Plus one additional RTD (reference) channel
● For thermocouple measurement	8; Plus one additional RTD (reference) channel
permissible input voltage for voltage input (destruction limit), max.	20 V
Constant measurement current for resistance-type transmitter, typ.	150 Ohm, 300 Ohm, 600 Ohm, Cu10, Cu50, Cu100, Ni10, Ni100, Ni120, Ni200, Pt10, Pt50, Pt100, Pt200 climate: 1 mA; 6 kOhm, Ni500, Ni1000, LG-Ni1000, Pt200 standard, Pt500, Pt1000, PTC: 0.25 mA
Technical unit for temperature measurement adjustable	Yes; °C/°F/K
Analog input with oversampling	No
Standardization of measured values	Yes; See manual for details
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
● -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	No
● -20 mA to +20 mA	No
● 4 mA to 20 mA	No
Input ranges (rated values), thermocouples	
● 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

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Input ranges (rated values), resistance thermometer	
● 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

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● 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
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; 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	
Measurement principle	integrating
Integration and conversion time/resolution per channel	
● Resolution with overrange (bit including sign), max.	21 bit; For measuring mode RTC and TC when using the function "Scalable temperature measuring range" (32 bit REAL format); 16 bit for measuring mode R and U; 16 bit for all measuring modes when using the S7 format (16 bit INTEGER)
● 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, Ni100, Ni120, Ni200, Pt10, Pt50, Pt100: 4 ms; 6 kOhm, Ni500, Ni1000, LG-Ni1000, Pt200, 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
Smoothing of measured values	
● Number of smoothing levels	4
● 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	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 %

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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	
● Voltage, relative to input range, (+/-)	0.1 %
● Resistance, relative to input range, (+/-)	0.1 %
● Resistance thermometer, relative to input range, (+/-)	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
● Thermocouple, relative to input range, (+/-)	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)	
● Voltage, relative to input range, (+/-)	0.05 %
● Resistance, relative to input range, (+/-)	0.05 %
● Resistance thermometer, relative to input range, (+/-)	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
● Thermocouple, relative to input range, (+/-)	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 x (f1 +/- 1 %), f1 = interference frequency	
● Series mode interference (peak value of interference < rated value of input range), min.	80 dB; in the Standard operating mode, 40 dB in the Fast operating mode
● Common mode voltage, max.	60 V DC/30 V AC
● Common mode interference, min.	80 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 with TC, R, RTD
● Short-circuit	No
● Group error	No
● Overflow/Underflow	Yes
Diagnostics indication LED	
● RUN LED	Yes; green LED
● ERROR LED	Yes; red LED
● MAINT LED	No
● 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
Permissible potential difference	
between different circuits	60 V DC/30 V AC; insulation rated for 120 V AC basic insulation: between the channels and the supply voltage L+; between the channels and the backplane bus; between the channels
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
Standards, approvals, certificates	
Siemens Eco Profile (SEP)	Siemens EcoTech

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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
Ecological footprint	
● environmental product declaration	Yes
Global warming potential	
— global warming potential, (total) [CO2 eq]	38.6 kg
— global warming potential, (during production) [CO2 eq]	14.4 kg
— global warming potential, (during operation) [CO2 eq]	24.6 kg
— global warming potential, (after end of life cycle) [CO2 eq]	-0.44 kg
Security	
signed firmware update	No
safely removing data	No
data integrity	No
Ambient conditions	
Ambient temperature during operation	
● horizontal installation, min.	-30 °C; From FS02
● horizontal installation, max.	60 °C
● vertical installation, min.	-30 °C; From FS02
● vertical installation, max.	40 °C
Altitude during operation relating to sea level	
● Installation altitude above sea level, max.	2 000 m
Absolute humidity	
● dew point, min.	-60 °C; suitable for dry room applications
Dimensions	
Width	35 mm
Height	147 mm
Depth	129 mm
Weights	
Weight, approx.	290 g
Other	
Note:	please order front connectors (screw-in/push-in) separately

Classifications

	Version	Classification
eClass	16	27-24-22-01
eClass	14	27-24-22-01
eClass	12	27-24-22-01
eClass	9.1	27-24-22-01
eClass	9	27-24-22-01
eClass	8	27-24-22-01
eClass	7.1	27-24-22-01
eClass	6	27-24-22-01
ETIM	10	EC001420
ETIM	9	EC001420
ETIM	8	EC001420
ETIM	7	EC001420
IDEA	4	3562
UNSPSC	15	32-15-17-05

Approvals / Certificates

General Product Approval

Miscellaneous | Manufacturer Declaration | CE EG-Konf. | UKCA | Declaration of Conformity | KC

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General Product Approval

Manufacturer Declaration

China RoHS

EMV

For use in hazardous locations

FM

FM

CCC-Ex

For use in hazardous locations

Type Examination Certificate

Miscellaneous

CCC-Ex

Maritime application

Maritime application

NK / Nippon Kaiji Kyokai

CCS (China Classification Society)

Maritime application

Environment

KR (Korean Register of Shipping)

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