SIEMENS

Data sheet 6ES7531-7QD00-0AB0

SIMATIC S7-1500 Analog input module AI 4xU/I/RTD/TC ST, 16 bit resolution, Accuracy 0.3%, 4 channels in groups of 4; 2 channels for RTD measurement; Common mode voltage 10 V; Diagnostics; Hardware interrupts; Delivery including push-in front connector, infeed element, shield bracket, and shield terminal

General information	
Product type designation	AI 4xU/I/RTD/TC ST
HW functional status	From FS01
Firmware version	V1.0.0
● 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	V13 / V13.0.2
● 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.	165 mA
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.	2.3 W
Analog inputs	
Number of analog inputs	4

● For current measurement	4
● For voltage measurement	4
● For resistance/resistance thermometer measurement	2
● For thermocouple measurement	4
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
Analog input with oversampling	No
Standardization of measured values	No
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 U	No

● Type TXK/TXK(L) to GOST	No
Input ranges (rated values), resistance thermometer	
● Cu 10	No
● 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	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	No
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
● 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
note regarding accuracy	at temperatures below 0 °C, the figures for operating error and temperature error are doubled
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, (+/-)	0.3 %; 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, (+/-)	0.3 %; 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, (+/-)	0.1 %; 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, (+/-)	0.1 %; 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	
● 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	4
● 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)
product functions / security / header	
data integrity	No
Ambient conditions	
Ambient temperature during operation	
● horizontal installation, min.	-25 °C; From FS03
● horizontal installation, max.	60 °C
● vertical installation, min.	-25 °C; From FS03
● 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	25 mm
Height	147 mm
Depth	129 mm
Weights	
Weight, approx.	210 g
Other	
Note:	Supplied incl. 40-pole push-in front connectors. 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; thermoelement: Type B, R, S: ±3 K, type E, J, K, N, T: ±1 K

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