MANUFACTURER DOCUMENT PACKAGE

Manufacturer's Manual

Selected official pages for procurement and maintenance review

PRODUCT BRAND

Siemens

PRODUCT MODEL

6ES7531-7QD00-0AB0

Four-channel universal analog input module. Relevant section pages: 12, 42, 43, 44, 45, 46, 47, 48, 49. Adjacent model text on shared pages is outside this product reference.

OFFICIAL SOURCE

AI 4xU/I/RTD/TC ST (6ES7531-7QD00-0AB0); 09/2016, A5E32366209-AC

Siemens original documentation and product reference

Historical 09/2016 reference. Supply range, current and mass differ from the current catalogue; verify the supplied unit. This excerpt is not installation authorization.

AMIKON PRODUCT SUPPORT

+86-18020776786 INFO@AMIKON.CN

AMIKONG.COM

Amikon Limited prepared this independent reference package. Selected manufacturer pages follow with their original content and pagination visible.

Legal information

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indicates that death or severe personal injury **will** result if proper precautions are not taken.

⚠WARNING

indicates that death or severe personal injury **may** result if proper precautions are not taken.

⚠CAUTION

indicates that minor personal injury can result if proper precautions are not taken.

NOTICE

indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

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Siemens AG
Division Digital Factory
Postfach 48 48
90026 NÜRNBERG
GERMANY

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Preface

Purpose of the documentation

This manual supplements the system manual S7-1500/ET 200MP (https://support.industry.siemens.com/cs/ww/en/view/59191792).

Functions that relate in general to the systems are described in this system manual.

The information provided in this manual and in the system/function manuals supports you in commissioning the systems.

Changes compared to previous version

Compared to the previous version, this manual contains the following change:

Original texts of the license conditions and copyright notes for open-source software are available on the Internet as of 09/2016.

Conventions

The term "CPU" is used in this manual both for the CPUs of the S7-1500 automation system, as well as for interface modules of the ET 200MP distributed I/O system.

Please also observe notes marked as follows:

Note

A note contains important information on the product described in the documentation, on the handling of the product or on the section of the documentation to which particular attention should be paid.

Properties

The module has the following technical properties:

- 4 analog inputs
- Resolution 16 bits including sign
- Voltage measurement type can be set per channel
- Current measurement type can be set per channel
- Resistance measurement type can be set for channel 0 and 2
- Resistance thermometer (RTD) measurement type can be set for channel 0 and 2
- Thermocouple (TC) measurement type can be set per channel
- Configurable diagnostics (per channel)
- Hardware interrupt on limit violation can be set per channel (two low and two high limits per channel)

The module supports the following functions:

Table 2- 1 Version dependencies of the module functions

Function	Firmware version of the module	Configuration software	
		STEP 7 (TIA Portal)	GSD file in STEP 7 (TIA Portal) V12 or higher, or STEP 7 V5.5 SP3 or higher
Firmware update	V1.0.0 or higher	V13 or higher with HSP 0102	X
Calibration in runtime	V1.0.0 or higher	V13 or higher with HSP 0102	X
Identification data I&M0 to I&M3	V1.0.0 or higher	V13 or higher with HSP 0102	X
Parameter assignment in RUN	V1.0.0 or higher	V13 or higher with HSP 0102	X
Module-internal Shared Input (MSI)	V1.0.0 or higher	V13 Update 3 or higher (PROFINET IO only)	X (PROFINET IO only)
Configurable submodules / submodules for Shared Device	V1.0.0 or higher	V13 Update 3 or higher (PROFINET IO only)	X (PROFINET IO only)

You can configure the module with STEP 7 (TIA Portal) and with a GSD file.

Technical specifications

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Technical specifications of the AI 4xU/I/RTD/TC ST

	6ES7531-7QD00-0AB0
General information	
Product type designation	AI 4xU/I/RTD/TC ST
Hardware functional status	FS01
Firmware version	V1.0.0
• FW update possible	Yes
Product function	
I&M data	Yes; I&M0 to I&M3
Scalable measuring range	No
Scalable measured values	No
Measuring range adjustment	No
Engineering with	
STEP 7 TIA Portal can be configured/integrated as of version	V13 / V13.0.2
STEP 7 can be configured/integrated as of version	V5.5 SP3 / -
PROFIBUS as of GSD version/GSD revision	V1.0 / V5.1
PROFINET as of GSD version/GSD revision	V2.3 / -
Operating mode	
Oversampling	No
MSI	Yes
CiR Configuration in RUN	
Parameter assignment in RUN possible	Yes
Calibration in RUN possible	Yes
Supply voltage	
Rated value (DC)	24 V
Valid range, low limit (DC)	20.4 V
Valid range, high limit (DC)	28.8 V
Reverse polarity protection	Yes
Input current	
Current consumption, max.	140 mA; with 24 V DC supply
Encoder supply	
24 V encoder supply	
Short-circuit protection	Yes
Output current, max.	53 mA
Power	
Power consumption from backplane bus	0.7 W

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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
Technical unit for temperature measurement, can be set	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

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Input ranges (rated values), currents	
0 mA to 20 mA	Yes
Input resistance (0 mA to 20 mA)	25 Ω; plus approx. 42 ohm for overvoltage protection by PTC
-20 mA to +20 mA	Yes
Input resistance (-20 mA to +20 mA)	25 Ω; plus approx. 42 ohm for overvoltage protection by PTC
4 mA to 20 mA	Yes
Input resistance (4 mA to 20 mA)	25 Ω; plus approx. 42 ohm 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) according 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

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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 ohm to 150 ohm	Yes
Input resistance (0 ohm to 150 ohm)	10 MΩ
0 ohm to 300 ohm	Yes
Input resistance (0 ohm to 300 ohm)	10 MΩ
0 ohm to 600 ohm	Yes
Input resistance (0 ohm to 600 ohm)	10 MΩ
0 to 3000 Ohm	No
0 ohm to 6000 ohm	Yes
Input resistance (0 ohm to 6000 ohm)	10 MΩ
PTC	Yes
Input resistance (PTC)	10 MΩ

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Thermocouple (TC)	
Temperature compensation	
• Configurable	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
Configurable integration time	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 included in R/RTD/TC measurement)
• Additional conversion time for wire break 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 at interference frequency f1 in Hz	400 / 60 / 50 / 10
Time for offset calibration (per module)	Basic conversion time of the slowest channel
Smoothing of the measured values	
Configurable	Yes
Level: None	Yes
Level: Weak	Yes
Level: Medium	Yes
Level: Strong	Yes
Encoders	
Connection of the signal encoders	
For voltage measurement	Yes
for current measurement as 2-wire transducer	Yes
• Load 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 line resistance
For resistance measurement with four-wire connection	Yes; all measuring ranges except PTC

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Errors/accuracies	
Linearity error (in relation to input range), (+/-)	0.02%
Temperature error (in relation to input range), (+/-)	0.005%/K; for TC typ. T 0.02 +/- %/K
Crosstalk between the inputs, max.	-80 dB
Repeat accuracy in settled state at 25 °C (in relation to input range), (+/-)	0.02%
Temperature errors of internal compensation	+/-6 °C
Operational limit in the entire temperature range	
Voltage in relation to input range, (+/-)	0.3%
Current in relation to input range, (+/-)	0.3%
Resistance in relation to input range, (+/-)	0.3%
Resistance thermometer in relation to input range, (+/-)	0.3%; Ptxxx Standard: ±1.5 K, Ptxxx Climatic: ±0.5 K, Nixxx Standard: ±0.5 K, Nixxx Climatic: ±0.3 K
Thermocouple in relation 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 in relation to input range, (+/-)	0.1%
Current in relation to input range, (+/-)	0.1%
Resistance in relation to input range, (+/-)	0.1%
Resistance thermometer in relation to input range, (+/-)	0.1%; Ptxxx Standard: ±0.7 K, Ptxxx Climatic: ±0.2 K, Nixxx Standard: ±0.3 K, Nixxx Climatic: ±0.15 K
Thermocouple in relation 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
Isochronous mode	
Isochronous mode (application synchronized up to terminal)	No
Interrupts/diagnostics/status information	
Diagnostics function	Yes
Interrupts	
Diagnostic interrupt	Yes
Limit interrupt	Yes; two high limits and two low limits each

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Diagnostics alarms	
Monitoring of supply voltage	Yes
Wire break	Yes; only for 1 ... 5 V, 4 ... 20 mA, TC, R and RTD
Overflow/underflow	Yes
Diagnostics display LED	
RUN LED	Yes; green LED
ERROR LED	Yes; red LED
Monitoring of 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
Electrical isolation	
Electrical isolation of channels	
Between the channels	No
Between the channels, in groups of	4
Between the channels and backplane bus	Yes
Between the channels and 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
Insulation	
Insulation tested with	707 V DC (type test)
Ambient conditions	
Ambient temperature during operation	
Horizontal mounting position, min.	0 °C
Horizontal mounting position, max.	60 °C
Vertical mounting position, min.	0 °C
Vertical mounting position, max.	40 °C
Distributed mode	
Prioritized startup	No

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Dimensions	
Width	25 mm
Height	147 mm
Depth	129 mm
Weights	
Weight, approx.	210 g
Miscellaneous	
Note:	Package includes 40-pin push-in front connector 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 Ohm (±0.02%); resistance thermometer: Pt100 Climatic: ±0.08 K, Ni100 Climatic: ±0.08 K; thermocouple: Type B, R, S: ±3 K, Type E, J, K, N, T: ±1 K