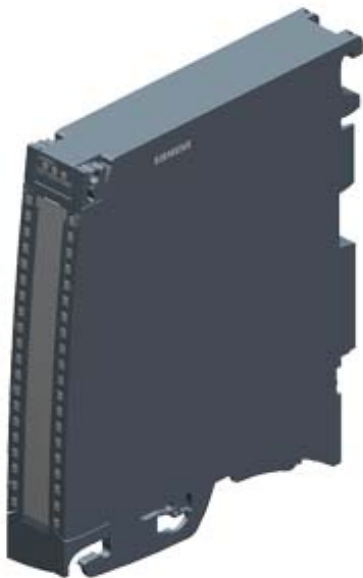




SIMATIC S7-1500, ANALOG IN-/OUTPUT MODULE
AI4XU/I/R/RTD/TC; 4 CHANNELS IN GROUPS OF 4
PROCESSALARMS; DIAGNOSIS AQ2XU/I; 2 CHANNELS IN
GROUPS OF 2; SUBSTITUTE VALUE; DIAGNOSIS; COMMON-
MODE-VOLTAGE APPR. 10V; 16BIT; ACCURACY 0.3% INCL.
FRONT CONNECTOR PUSH IN, FEEDING ELEMENT, SHIELDING
ELE- MENT, SHIELDING CLAMP

General information	
Hardware product version	E01
Firmware version	V1.0.0
Product function	
• I&M data	Yes; I&M0 to I&M3
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	
• MSI	Yes
• MSO	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.	200 mA; with 24 V DC supply
Encoder supply	
24 V encoder supply	
• short-circuit protection	Yes
• Output current, max.	61 mA
Power	
Power available from the backplane bus	0.7 W
Power losses	
Power loss, typ.	3.3 W
Analog inputs	
Number of analog inputs	4
Number of analog inputs with current measurement	4
Number of analog inputs for voltage measurement	4
Number of analog inputs for resistance/resistance thermometer measurement	2
Number of analog inputs with 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 adjustable	Yes
Input ranges (rated values), voltages	
• 1 to 5 V	Yes
• Input resistance (1 to 5 V)	100 k Ω
• -1 V to +1 V	Yes
• Input resistance (-1 V to +1 V)	10 M Ω
• -10 V to +10 V	Yes
• Input resistance (-10 V to +10 V)	100 k Ω

• -2.5 V to +2.5 V	Yes
• Input resistance (-2.5 V to +2.5 V)	10 MΩ
• -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 to +20 mA	Yes
• Input resistance (-20 to +20 mA)	25 Ω; Plus approx. 42 ohms for overvoltage protection by PTC
• 4 to 20 mA	Yes
• Input resistance (4 to 20 mA)	25 Ω; Plus approx. 42 ohms for overvoltage protection by PTC

Input ranges (rated values), thermoelements

• Type B	Yes
• Input resistance (Type B)	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 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

Input ranges (rated values), resistance thermometer

• Ni 100	Yes; Standard/climate
• Input resistance (Ni 100)	10 MΩ
• Ni 1000	Yes; Standard/climate
• Input resistance (Ni 1000)	10 MΩ
• LG-Ni 1000	Yes; Standard/climate
• Input resistance (LG-Ni 1000)	10 MΩ
• Pt 100	Yes; Standard/climate
• Input resistance (Pt 100)	10 MΩ
• Pt 1000	Yes; Standard/climate
• Input resistance (Pt 1000)	10 MΩ
• Pt 200	Yes; Standard/climate
• Input resistance (Pt 200)	10 MΩ
• Pt 500	Yes; Standard/climate
• Input resistance (Pt 500)	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 6000 ohms	Yes
• Input resistance (0 to 6000 ohms)	10 MΩ
• PTC	Yes
• Input resistance (PTC)	10 MΩ
Thermocouple (TC)	
• Technical unit for temperature measurement	°C/°F/K
Temperature compensation	
— Parameterizable	Yes
— internal temperature compensation	Yes
— Compensation for 0 °C reference point temperature	Yes; fixed value can be set
Resistance thermometer (RTD)	
• Technical unit for temperature measurement	°C/°F/K
Cable length	
• Cable length, shielded, max.	800 m; for U/I, 200 m for R/RTD, 50 m for TC
Analog outputs	

Number of analog outputs	2
Voltage output, short-circuit protection	Yes
Voltage output, short-circuit current, max.	24 mA
Current output, no-load voltage, max.	22 V
Cycle time (all channels), min.	3.2 ms; ± 0.5 ms, regardless of the number of activated channels
Output ranges, voltage	
• 0 to 10 V	Yes
• 1 to 5 V	Yes
• -10 to +10 V	Yes
Output ranges, current	
• 0 to 20 mA	Yes
• -20 to +20 mA	Yes
• 4 to 20 mA	Yes
Connection of actuators	
• for voltage output two-wire connection	Yes
• for voltage output four-wire connection	Yes
• for current output two-wire connection	Yes
Load impedance (in rated range of output)	
• with voltage outputs, min.	1 k Ω ; 0.5 k Ω at 1 to 5 V
• with voltage outputs, capacitive load, max.	1 μ F
• with current outputs, max.	750 Ω
• with current outputs, inductive load, max.	10 mH
Cable length	
• Cable length, shielded, max.	800 m; for current, 200 m for voltage
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
• Basic conversion time, including integration time, ms	9 / 23 / 27 / 107 ms
— additional conversion time for wire break monitoring	9 ms
— 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
Smoothing of measured values	

• Parameterizable	Yes
• Step: None	Yes
• Step: low	Yes
• Step: Medium	Yes
• Step: High	Yes

Analog value generation for the outputs

Integration and conversion time/resolution per channel

• Resolution with overrange (bit including sign), max.	16 bit
• Conversion time (per channel)	0.5 ms

Settling time

• for resistive load	1.5 ms
• for capacitive load	2.5 ms
• for inductive load	2.5 ms

Encoder

Connection of signal encoders

• for voltage measurement	Yes
• for current measurement as 2-wire transducer — Burden of 2-wire transmitter, max.	Yes 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 area), (+/-)	0.02 %
Output ripple (based on output area, bandwidth 0 to 50 kHz), (+/-)	0.02 %
Linearity error (relative to output range), (+/-)	0.15 %
Temperature error (relative to output range), (+/-)	0.002 %/K
Crosstalk between the outputs, max.	-100 dB
Repeat accuracy in steady state at 25 °C (relative to output area), (+/-)	0.05 %

Temperature error of internal compensation	+/-6 °C
Operational limit in overall temperature range	
• Voltage, relative to input area, (+/-)	0.3 %
• Current, relative to input area, (+/-)	0.3 %
• Resistance, relative to input area, (+/-)	0.3 %
• Resistance thermometer, relative to input area, (+/-)	0.3 %; Pt xxx standard: ±1.5 K, Pt xxx climate: ±0.5 K, Ni xxx standard: ±0.5 K, Ni xxx climate: ±0.3 K
• Thermocouple, relative to input area, (+/-)	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
• Voltage, relative to output area, (+/-)	0.3 %
• Current, relative to output area, (+/-)	0.3 %
Basic error limit (operational limit at 25 °C)	
• Voltage, relative to input area, (+/-)	0.1 %
• Current, relative to input area, (+/-)	0.1 %
• Resistance, relative to input area, (+/-)	0.1 %
• Resistance thermometer, relative to input area, (+/-)	0.1 %; Pt xxx standard: ±0.7 K, Pt xxx climate: ±0.2 K, Ni xxx standard: ±0.3 K, Ni xxx climate: ±0.15 K
• Thermocouple, relative to input area, (+/-)	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
• Voltage, relative to output area, (+/-)	0.2 %
• Current, relative to output area, (+/-)	0.2 %
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	
Substitute values connectable	Yes
Alarms	
• Diagnostic alarm	Yes
• Limit value alarm	Yes; two upper and two lower limit values in each case
Diagnostic messages	

• Diagnostics	Yes
• Monitoring the supply voltage	Yes
• Wire break	Yes; only for input type 1 ... 5 V, 4 ... 20 mA, TC, R, RTD and output type current
• Short circuit	Yes; Only for output type "voltage"
• 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
Galvanic isolation	
Galvanic isolation analog inputs	
• between the channels	No
• between the channels and the backplane bus	Yes
• between the channels and the load voltage L+	Yes
Galvanic isolation analog outputs	
• between the channels	No
• between the channels and the backplane bus	Yes
• between the channels and the load voltage L+	Yes
Permissible potential difference	
between the inputs (UCM)	20 V DC
between inputs and MANA (UCM)	10 V DC
between M internally and the outputs	75 V DC/60 V AC (base isolation)
between M internally and the inputs	75 V DC/60 V AC (base isolation)
between S- and MANA (UCM)	+/- 8 V
Isolation	
Isolation checked with	707 V DC (type test)
Decentralized operation	
Prioritized startup	No
Dimensions	
Width	25 mm
Height	147 mm
Depth	129 mm

Weights	
Weight, approx.	250 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 ($\pm 0.02\%$), ± 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; thermoelement: Type B, R, S: ± 3 K, type E, J, K, N, T: ± 1 K
last modified:	02.10.2014