



SIMATIC S7-1500,  
 ANALOG INPUT MODULE AI 8 X U/I/RTD/TC,  
 16 BITS OF RESOLUTION, ACCURACY 0.3 %;  
 8 CHANNELS IN GROUPS OF 8;  
 COMMON MODE VOLTAGE APPR. 10 V;  
 DIAGNOSIS,  
 PROCESSALARMS INCL. INFEED ELEMENT,  
 SHIELD CLAMP AND SHIELD TERMINAL

General information	
Hardware product version	E01
Firmware version	V2.0.0
Product function	
I&M data	Yes ; I&M0 to I&M3
Engineering with	
STEP 7 TIA Portal configurable/integrated as of version	V12 / V12
STEP 7 configurable/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
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
<b>Input current</b>	
Current consumption, max.	240 mA ; with 24 V DC supply
<b>Encoder supply</b>	
24 V encoder supply	
Short-circuit protection	Yes
Output current, max.	53 mA
<b>Power</b>	
Power available from the backplane bus	0.7 W
<b>Power loss</b>	
Power loss, typ.	2.7 W
<b>Analog inputs</b>	
Number of analog inputs	8
Number of analog inputs with current measurement	8
Number of analog inputs for voltage measurement	8
Number of analog inputs for resistance/resistance thermometer measurement	4
Number of analog inputs with 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
Technical unit for temperature measurement adjustable	Yes
<b>Input ranges (rated values), voltages</b>	
1 to 5 V	Yes
Input resistance (1 to 5 V)	100 k $\Omega$
-1 V to +1 V	Yes
Input resistance (-1 V to +1 V)	10 M $\Omega$
-10 V to +10 V	Yes
Input resistance (-10 V to +10 V)	100 k $\Omega$
-2.5 V to +2.5 V	Yes
Input resistance (-2.5 V to +2.5 V)	10 M $\Omega$
-250 mV to +250 mV	Yes
Input resistance (-250 mV to +250 mV)	10 M $\Omega$
-5 V to +5 V	Yes
Input resistance (-5 V to +5 V)	100 k $\Omega$
-50 mV to +50 mV	Yes
Input resistance (-50 mV to +50 mV)	10 M $\Omega$
-500 mV to +500 mV	Yes
Input resistance (-500 mV to +500 mV)	10 M $\Omega$
-80 mV to +80 mV	Yes

Input resistance (-80 mV to +80 mV)	10 MΩ
<b>Input ranges (rated values), currents</b>	
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
<b>Input ranges (rated values), thermocouples</b>	
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
<b>Input ranges (rated values), resistance thermometers</b>	
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
<b>Input ranges (rated values), resistors</b>	
0 to 150 Ohm	Yes
Input resistance (0 to 150 Ohm)	10 MΩ
0 to 300 Ohm	Yes
Input resistance (0 to 300 Ohm)	10 MΩ
0 to 600 Ohm	Yes
Input resistance (0 to 600 Ohm)	10 MΩ
0 to 6000 Ohm	Yes
Input resistance (0 to 6000 Ohm)	10 MΩ
PTC	Yes
Input resistance (PTC)	10 MΩ
<b>Thermocouple (TC)</b>	
Technical unit for temperature measurement	°C/°F/K
<b>Temperature compensation</b>	
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
<b>Resistance thermometer (RTD)</b>	
Technical unit for temperature measurement	°C/°F/K
<b>Cable length</b>	
Cable length, shielded, max.	800 m ; for U/I, 200 m for R/RTD, 50 m for TC
<b>Analog value generation</b>	
<b>Integration and conversion time/resolution per channel</b>	
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
<b>Smoothing of measured values</b>	
parameterizable	Yes
Step: None	Yes
Step: low	Yes
Step: Medium	Yes

Step: High	Yes
<b>Encoder</b>	
<b>Connection of signal encoders</b>	
for voltage measurement	Yes
for current measurement as 2-wire transducer	Yes
Burden of 2-wire transmitter, max.	820 $\Omega$
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
<b>Errors/accuracies</b>	
Linearity error (relative to input range), (+/-)	0.02 %
Temperature error (relative to input range), (+/-)	0.0050 %/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 %
Temperature error of internal compensation	+/-6 °C
<b>Operational error limit in overall temperature range</b>	
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, (+/-)	Pt xxx standard: $\pm 1.5$ K, Pt xxx climate: $\pm 0.5$ K, Ni xxx standard: $\pm 0.5$ K, Ni xxx climate: $\pm 0.3$ K
Thermocouple, relative to input area, (+/-)	Type B: > 600 °C $\pm 4.6$ K, type E: > -200 °C $\pm 1.5$ K, type J: > -210 °C $\pm 1.9$ K, type K: > -200 °C $\pm 2.4$ K, type N: > -200 °C $\pm 2.9$ K, type R: > 0 °C $\pm 4.7$ K, type S: > 0 °C $\pm 4.6$ K, type T: > -200 °C $\pm 2.4$ K
<b>Basic error limit (operational limit at 25 °C)</b>	
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, (+/-)	Pt xxx standard: $\pm 0.7$ K, Pt xxx climate: $\pm 0.2$ K, Ni xxx standard: $\pm 0.3$ K, Ni xxx climate: $\pm 0.15$ K
Thermocouple, relative to input area, (+/-)	Type B: > 600 °C $\pm 1.7$ K, type E: > -200 °C $\pm 0.7$ K, type J: > -210 °C $\pm 0.8$ K, type K: > -200 °C $\pm 1.2$ K, type N: > -200 °C $\pm 1.2$ K, type R: > 0 °C $\pm 1.9$ K, type S: > 0 °C $\pm 1.9$ K, type T: > -200 °C $\pm 0.8$ K
<b>Interference voltage suppression for <math>f = n \times (f_1 \pm 1 \%)</math>, <math>f_1</math> = interference frequency</b>	
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
<b>Interrupts/diagnostics/status information</b>	

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 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 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 channels	
between the channels	No
between the channels, in groups of	8
between the channels and the backplane bus	Yes
between the channels and the supply voltage of the electronics	Yes
Permissible potential difference	
between the inputs (UCM)	20 V DC
between inputs and MANA (UCM)	10 V DC
between M internally and the inputs	75 V DC/60 V AC (base isolation)
Isolation	
Isolation tested with	707 V DC (type test)
Decentralized operation	
Prioritized startup	No
Dimensions	
Width	35 mm
Height	147 mm
Depth	129 mm
Weights	
Weight, approx.	310 g
Other	

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**Note:**

Additional basic error and noise for integration time = 2.5 ms:  
Voltage:  $\pm 250$  mV ( $\pm 0.02\%$ ),  $\pm 80$  mV ( $\pm 0.05\%$ ),  $\pm 50$  mV ( $\pm 0.05\%$ );  
resistance:  $150$  ohms  $\pm 0.02\%$ ; resistance thermometer: Pt100  
climate:  $\pm 0.08$  K, Ni100 climate:  $\pm 0.08$  K; thermocouple: Type B, R,  
S:  $\pm 3$  K, type E, J, K, N, T:  $\pm 1$  K

Status

Jul 14, 2014