

SIMATIC S7-400, analog input SM 431, isolated 16 AI; resolution 16 bit, U/I/Resistor/Thermocouple/Pt100 , alarm, diagnostics



Figure similar

Supply voltage	
Load voltage L+	
<ul style="list-style-type: none"> Rated value (DC) 	24 V; Only required for supplying 2-wire transmitters
<ul style="list-style-type: none"> Reverse polarity protection 	Yes
Input current	
from load voltage L+ (without load), max.	400 mA; for 16 connected, fully controlled 2-wire transmitters
from backplane bus 5 V DC, max.	700 mA
Power loss	
Power loss, typ.	4.5 W
Analog inputs	
Number of analog inputs	16
<ul style="list-style-type: none"> For voltage/current measurement 	16
<ul style="list-style-type: none"> For resistance measurement 	8
permissible input voltage for voltage input (destruction limit), max.	18 V; 18 V continuous, 75 V for 1 ms (mark to space ratio 1:20)

permissible input current for current input (destruction limit), max.	40 mA
Input ranges	
• Voltage	Yes
• Current	Yes
• Thermocouple	Yes
• Resistance thermometer	Yes
• Resistance	Yes
Input ranges (rated values), voltages	
• 1 V to 5 V	Yes
• Input resistance (1 V to 5 V)	1 M Ω
• -1 V to +1 V	Yes
• Input resistance (-1 V to +1 V)	1 M Ω
• -10 V to +10 V	Yes
• Input resistance (-10 V to +10 V)	1 M Ω
• -2.5 V to +2.5 V	Yes
• Input resistance (-2.5 V to +2.5 V)	1 M Ω
• -25 mV to +25 mV	Yes
• Input resistance (-25 mV to +25 mV)	1 M Ω
• -250 mV to +250 mV	Yes
• Input resistance (-250 mV to +250 mV)	1 M Ω
• -5 V to +5 V	Yes
• Input resistance (-5 V to +5 V)	1 M Ω
• -50 mV to +50 mV	Yes
• Input resistance (-50 mV to +50 mV)	1 M Ω
• -500 mV to +500 mV	Yes
• Input resistance (-500 mV to +500 mV)	1 M Ω
• -80 mV to +80 mV	Yes
• Input resistance (-80 mV to +80 mV)	1 M Ω
Input ranges (rated values), currents	
• 0 to 20 mA	Yes
• Input resistance (0 to 20 mA)	50 Ω
• -10 mA to +10 mA	Yes
• Input resistance (-10 mA to +10 mA)	50 Ω
• -20 mA to +20 mA	Yes
• Input resistance (-20 mA to +20 mA)	50 Ω
• 4 mA to 20 mA	Yes
• Input resistance (4 mA to 20 mA)	50 Ω
• -5 mA to +5 mA	Yes
• Input resistance (-5 mA to +5 mA)	50 Ω
Input ranges (rated values), thermocouples	

- Type B
- Input resistance (Type B)
- Type E
- Input resistance (Type E)
- Type J
- Input resistance (type J)
- Type K
- Input resistance (Type K)
- Type L
- Input resistance (Type L)
- Type N
- Input resistance (Type N)
- Type R
- Input resistance (Type R)
- Type S
- Input resistance (Type S)
- Type T
- Input resistance (Type T)
- Type U
- Input resistance (Type U)

Yes
1 MΩ
Yes
1 MΩ
Yes
1 MΩ
Yes
1 MΩ
Yes
1 MΩ
Yes
1 MΩ
Yes
1 MΩ
Yes
1 MΩ
Yes
1 MΩ
Yes
1 MΩ

Input ranges (rated values), resistance thermometer

- Ni 100
- Input resistance (Ni 100)
- Ni 1000
- Input resistance (Ni 1000)
- Pt 100
- Input resistance (Pt 100)
- Pt 1000
- Input resistance (Pt 1000)
- Pt 200
- Input resistance (Pt 200)
- Pt 500
- Input resistance (Pt 500)

Yes
1 MΩ
Yes
1 MΩ
Yes
1 MΩ
Yes
1 MΩ
Yes
1 MΩ
Yes
1 MΩ

Input ranges (rated values), resistors

- 0 to 48 ohms
- Input resistance (0 to 48 ohms)
- 0 to 150 ohms
- Input resistance (0 to 150 ohms)
- 0 to 300 ohms
- Input resistance (0 to 300 ohms)
- 0 to 600 ohms

Yes
1 MΩ
Yes
1 MΩ
Yes
1 MΩ
Yes

• Input resistance (0 to 600 ohms)	1 MΩ
• 0 to 6000 ohms	Yes; Usable up to 5000 Ohm
• Input resistance (0 to 6000 ohms)	1 MΩ
Thermocouple (TC)	
Temperature compensation	
— parameterizable	Yes
— external temperature compensation with Pt100	Yes
— external temperature compensation with compensations socket	Yes
— dynamic reference temperature value	Yes
Characteristic linearization	
• parameterizable	Yes
— for thermocouples	Type B, E, J, K, L, N, R, S, T, U
— for resistance thermometer	Pt100, Pt200, Pt500, Pt1000, Ni100, Ni1000
Cable length	
• shielded, max.	200 m; 50 m with thermocouples and input ranges ≤ 80 mV
Analog value generation for the inputs	
Integration and conversion time/resolution per channel	
• Resolution with overrange (bit including sign), max.	16 bit; 16 / 16 / 16
• Integration time, parameterizable	Yes
• Basic conversion time (ms)	6 / 20,1 / 23,5 ms
• Integration time (ms)	2,5 / 16,7 / 20 ms
• Basic conversion time, including integration time (ms)	
— additional conversion time for wire-break monitoring	4.3 / 4.3 / 4.3 ms
— additional conversion time for resistance measurement	12 / 40,2 / 47 ms
— additional conversion time for wire-break monitoring and resistance measurement	5,5 ms
• Interference voltage suppression for interference frequency f1 in Hz	400 / 60 / 50 Hz
Encoder	
Connection of signal encoders	
• for voltage measurement	Yes; possible
• for current measurement as 2-wire transducer	Yes
• for current measurement as 4-wire transducer	Yes
• for resistance measurement with two-wire connection	Yes; Line resistances are also measured

- for resistance measurement with three-wire connection
- for resistance measurement with four-wire connection

Yes

Yes

Errors/accuracies

Operational error limit in overall temperature range

- Voltage, relative to input range, (+/-) 0.3 %; ± 0.3 % at ± 250 mV, ± 500 mV, ± 1 V, ± 2.5 V, ± 5 V, 1 to 5 V, ± 10 V; ± 0.31 % at ± 80 mV; ± 0.32 % at ± 50 mV; ± 0.35 % at ± 25 mV
- Current, relative to input range, (+/-) 0.3 %; at 0 to 20 mA, ± 5 mA, ± 10 mA, ± 20 mA, 4 to 20 mA
- Resistance, relative to input range, (+/-) 0.3 %; ± 0.3 % at 0 to 48 Ohm (4-conductor measurement), 0 to 150 Ohm (4-conductor measurement), 0 to 300 Ohm (4-conductor measurement), 0 to 5000 Ohm (4-conductor measurement, in range of 6000 Ohm); ± 0.4 % at 0 to 300 Ohm (3-conductor measurement), 0 to 600 Ohm (3-conductor measurement), 0 to 5000 Ohm (3-conductor measurement, in range of 6000 Ohm);
- Resistance thermometer, relative to input range, (+/-) 0.4 %

Basic error limit (operational limit at 25 °C)

- Voltage, relative to input range, (+/-) 0.15 %; ± 0.15 % at ± 250 mV, ± 500 mV, ± 1 V, ± 2.5 V, ± 5 V, 1 V to 5 V, ± 10 V; ± 0.17 % at ± 80 mV; ± 0.19 % at ± 50 mV; ± 0.23 % at ± 25 mV
- Current, relative to input range, (+/-) 0.15 %; at 0 to 20 mA, ± 5 mA, ± 10 mA, ± 20 mA, 4 to 20 mA
- Resistance, relative to input range, (+/-) 0.15 %; ± 0.15 % at 0 to 48 ohms (4-conductor measurement), 0 to 150 ohms (4-conductor measurement), 0 to 300 ohms (4-conductor measurement, in range of 6000 ohms); ± 0.3 % at 0 to 300 ohms (3-conductor measurement), 0 to 600 ohms (3-conductor measurement), 0 to 5000 ohms (3-conductor measurement, in range of 6000 ohms)
- Resistance thermometer, relative to input range, (+/-) 0.3 %

Interrupts/diagnostics/status information

Alarms

- Diagnostic alarm Yes; Parameterizable
- Limit value alarm Yes; Parameterizable

Diagnostics indication LED

- internal fault INTF (red) Yes
- external fault EXTf (red) Yes

Potential separation

Potential separation analog inputs

- Potential separation analog inputs Yes; internal/external
- between the channels No

Isolation

Isolation tested with	2 120 V DC between bus and L+/M; 2 120 V DC between bus and analog section; 500 V DC between bus and local ground; 500 V DC between analog section and L+/M; 2 120 V DC between analog section and local ground; 2 120 V DC between L+/M and local ground
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Dimensions

Width	25 mm
Height	290 mm
Depth	210 mm

Weights

Weight, approx.	500 g
last modified:	09/11/2019