

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
Constant measurement current for resistance-type transmitter, typ.	1.67 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	Yes
— Input resistance (Type B)	1 MΩ
• Type E	Yes
— Input resistance (Type E)	1 MΩ
• Type J	Yes
— Input resistance (type J)	1 MΩ
• Type K	Yes
— Input resistance (Type K)	1 MΩ
• Type L	Yes
— Input resistance (Type L)	1 MΩ
• Type N	Yes
— Input resistance (Type N)	1 MΩ
• Type R	Yes
— Input resistance (Type R)	1 MΩ
• Type S	Yes
— Input resistance (Type S)	1 MΩ
• Type T	Yes
— Input resistance (Type T)	1 MΩ
• Type U	Yes
— Input resistance (Type U)	1 MΩ

Input ranges (rated values), resistance thermometer

• Ni 100	Yes
— Input resistance (Ni 100)	1 MΩ
• Ni 1000	Yes
— Input resistance (Ni 1000)	1 MΩ
• Pt 100	Yes
— Input resistance (Pt 100)	1 MΩ
• Pt 1000	Yes
— Input resistance (Pt 1000)	1 MΩ
• Pt 200	Yes
— Input resistance (Pt 200)	1 MΩ
• Pt 500	Yes
— Input resistance (Pt 500)	1 MΩ

Input ranges (rated values), resistors

• 0 to 48 ohms	Yes
— Input resistance (0 to 48 ohms)	1 MΩ
• 0 to 150 ohms	Yes
— Input resistance (0 to 150 ohms)	1 MΩ
• 0 to 300 ohms	Yes
— Input resistance (0 to 300 ohms)	1 MΩ

<ul style="list-style-type: none"> • 0 to 600 ohms <ul style="list-style-type: none"> — Input resistance (0 to 600 ohms) • 0 to 6000 ohms <ul style="list-style-type: none"> — Input resistance (0 to 6000 ohms) 	<p>Yes</p> <p>1 MΩ</p> <p>Yes; Usable up to 5000 Ohm</p> <p>1 MΩ</p>
Thermocouple (TC)	
Temperature compensation	
<ul style="list-style-type: none"> — parameterizable — external temperature compensation with Pt100 — external temperature compensation with compensations socket — dynamic reference temperature value 	<p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p>
Characteristic linearization	
<ul style="list-style-type: none"> • parameterizable <ul style="list-style-type: none"> — for thermocouples — for resistance thermometer 	<p>Yes</p> <p>Type B, E, J, K, L, N, R, S, T, U</p> <p>Pt100, Pt200, Pt500, Pt1000, Ni100, Ni1000</p>
Cable length	
<ul style="list-style-type: none"> • 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	
<ul style="list-style-type: none"> • Resolution with overrange (bit including sign), max. • Integration time, parameterizable • Basic conversion time (ms) • Integration time (ms) • Interference voltage suppression for interference frequency f1 in Hz 	<p>16 bit; 16 / 16 / 16</p> <p>Yes</p> <p>6 / 20,1 / 23,5 ms</p> <p>2,5 / 16,7 / 20 ms</p> <p>400 / 60 / 50 Hz</p>
Encoder	
Connection of signal encoders	
<ul style="list-style-type: none"> • for voltage measurement • for current measurement as 2-wire transducer • for current measurement as 4-wire transducer • for resistance measurement with two-wire connection • for resistance measurement with three-wire connection • for resistance measurement with four-wire connection 	<p>Yes; possible</p> <p>Yes</p> <p>Yes</p> <p>Yes; Line resistances are also measured</p> <p>Yes</p> <p>Yes</p>
Errors/accuracies	
Operational error limit in overall temperature range	

• Voltage, relative to input range, (+/-)	0.3 %; $\pm 0.3\%$ at ± 250 mV, ± 500 mV, ± 1 V, ± 2.5 V, ± 5 V, 1 to 5 V, ± 10 V; $\pm 0.31\%$ at ± 80 mV; $\pm 0.32\%$ at ± 50 mV; $\pm 0.35\%$ 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 %; $\pm 0.3\%$ at 0 to 48 Ohm (4-conductor measurement), 0 to 150 Ohm (4-conductor measurement), 0 to 300 Ohm (4-conductor measurement), 0 to 600 Ohm (4-conductor measurement), 0 to 5000 Ohm (4-conductor measurement, in range of 6000 Ohm); $\pm 0.4\%$ 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 %
• Thermocouple, relative to input range, (+/-)	TC Type B (± 11.5 K), TC Type R (± 7.3 K), TC Type S (± 8.3 K), TC Type T (± 1.7 K), TC Type E (± 3.2 K), TC Type J (± 4.3 K), TC Type K (± 6.2 K), TC Type U (± 2.8 K), TC Type L (± 4.2 K), TC Type N (± 4.4 K)

Basic error limit (operational limit at 25 °C)

• Voltage, relative to input range, (+/-)	0.15 %; $\pm 0.15\%$ at ± 250 mV, ± 500 mV, ± 1 V, ± 2.5 V, ± 5 V, 1 V to 5 V, ± 10 V; $\pm 0.17\%$ at ± 80 mV; $\pm 0.19\%$ at ± 50 mV; $\pm 0.23\%$ 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 %; $\pm 0.15\%$ at 0 to 48 ohms (4-conductor measurement), 0 to 150 ohms (4-conductor measurement), 0 to 300 ohms (4-conductor measurement), 0 to 5000 ohms (4-conductor measurement, in range of 6000 ohms); $\pm 0.3\%$ 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 %
• Thermocouple, relative to input range, (+/-)	TC Type B (± 7.6 K), TC Type R (± 4.8 K), TC Type S (± 5.4 K), TC Type T (± 1.1 K), TC Type E (± 1.8 K), TC Type J (± 2.3 K), TC Type K (± 3.4 K), TC Type U (± 1.7 K), TC Type L (± 2.3 K), TC Type N (± 2.6 K)

Interrupts/diagnostics/status information

Diagnostics function	Yes; Parameterizable
Alarms	
• Diagnostic alarm	Yes; Parameterizable
• Limit value alarm	Yes; Parameterizable
• Hardware interrupt	Yes; Parameterizable
Diagnoses	
• Diagnostic information readable	Yes
Diagnostics indication LED	
• internal fault INTF (red)	Yes
• external fault EXTf (red)	Yes

Potential separation

Potential separation analog inputs

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|--|------------------------|
| • Potential separation analog inputs | Yes; internal/external |
| • between the channels | No |
| • between the channels and backplane bus | Yes |
| • Between the channels and load voltage L+ | Yes |

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
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last modified: 10/13/2020