

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"> <li>Rated value (DC)</li> </ul>	24 V; Only required for supplying 2-wire transmitters
<ul style="list-style-type: none"> <li>Reverse polarity protection</li> </ul>	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"> <li>For voltage/current measurement</li> </ul>	16
<ul style="list-style-type: none"> <li>For resistance measurement</li> </ul>	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
<b>Input ranges</b>	
• Voltage	Yes
• Current	Yes
• Thermocouple	Yes
• Resistance thermometer	Yes
• Resistance	Yes
<b>Input ranges (rated values), voltages</b>	
• 1 V to 5 V	Yes
• Input resistance (1 V to 5 V)	1 M $\Omega$
• -1 V to +1 V	Yes
• Input resistance (-1 V to +1 V)	1 M $\Omega$
• -10 V to +10 V	Yes
• Input resistance (-10 V to +10 V)	1 M $\Omega$
• -2.5 V to +2.5 V	Yes
• Input resistance (-2.5 V to +2.5 V)	1 M $\Omega$
• -25 mV to +25 mV	Yes
• Input resistance (-25 mV to +25 mV)	1 M $\Omega$
• -250 mV to +250 mV	Yes
• Input resistance (-250 mV to +250 mV)	1 M $\Omega$
• -5 V to +5 V	Yes
• Input resistance (-5 V to +5 V)	1 M $\Omega$
• -50 mV to +50 mV	Yes
• Input resistance (-50 mV to +50 mV)	1 M $\Omega$
• -500 mV to +500 mV	Yes
• Input resistance (-500 mV to +500 mV)	1 M $\Omega$
• -80 mV to +80 mV	Yes
• Input resistance (-80 mV to +80 mV)	1 M $\Omega$
<b>Input ranges (rated values), currents</b>	
• 0 to 20 mA	Yes
• Input resistance (0 to 20 mA)	50 $\Omega$
• -10 mA to +10 mA	Yes
• Input resistance (-10 mA to +10 mA)	50 $\Omega$
• -20 mA to +20 mA	Yes
• Input resistance (-20 mA to +20 mA)	50 $\Omega$
• 4 mA to 20 mA	Yes
• Input resistance (4 mA to 20 mA)	50 $\Omega$
• -5 mA to +5 mA	Yes
• Input resistance (-5 mA to +5 mA)	50 $\Omega$
<b>Input ranges (rated values), thermocouples</b>	

- 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

<ul style="list-style-type: none"> <li>• Input resistance (0 to 600 ohms)</li> </ul>	1 MΩ
<ul style="list-style-type: none"> <li>• 0 to 6000 ohms</li> </ul>	Yes; Usable up to 5000 Ohm
<ul style="list-style-type: none"> <li>• Input resistance (0 to 6000 ohms)</li> </ul>	1 MΩ
<b>Thermocouple (TC)</b>	
<b>Temperature compensation</b>	
— parameterizable	Yes
— external temperature compensation with Pt100	Yes
— external temperature compensation with compensations socket	Yes
— dynamic reference temperature value	Yes
<b>Characteristic linearization</b>	
<ul style="list-style-type: none"> <li>• parameterizable</li> </ul>	Yes
— for thermocouples	Type B, E, J, K, L, N, R, S, T, U
— for resistance thermometer	Pt100, Pt200, Pt500, Pt1000, Ni100, Ni1000
<b>Cable length</b>	
<ul style="list-style-type: none"> <li>• shielded, max.</li> </ul>	200 m; 50 m with thermocouples and input ranges ≤ 80 mV
<b>Analog value generation for the inputs</b>	
<b>Integration and conversion time/resolution per channel</b>	
<ul style="list-style-type: none"> <li>• Resolution with overrange (bit including sign), max.</li> </ul>	16 bit; 16 / 16 / 16
<ul style="list-style-type: none"> <li>• Integration time, parameterizable</li> </ul>	Yes
<ul style="list-style-type: none"> <li>• Basic conversion time (ms)</li> </ul>	6 / 20,1 / 23,5 ms
<ul style="list-style-type: none"> <li>• Integration time (ms)</li> </ul>	2,5 / 16,7 / 20 ms
<ul style="list-style-type: none"> <li>• Basic conversion time, including integration time (ms)</li> </ul>	
— 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
<ul style="list-style-type: none"> <li>• Interference voltage suppression for interference frequency f1 in Hz</li> </ul>	400 / 60 / 50 Hz
<b>Encoder</b>	
<b>Connection of signal encoders</b>	
<ul style="list-style-type: none"> <li>• for voltage measurement</li> </ul>	Yes; possible
<ul style="list-style-type: none"> <li>• for current measurement as 2-wire transducer</li> </ul>	Yes
<ul style="list-style-type: none"> <li>• for current measurement as 4-wire transducer</li> </ul>	Yes
<ul style="list-style-type: none"> <li>• for resistance measurement with two-wire connection</li> </ul>	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 %;  $\pm 0.3$  % at  $\pm 250$  mV,  $\pm 500$  mV,  $\pm 1$  V,  $\pm 2.5$  V,  $\pm 5$  V, 1 to 5 V,  $\pm 10$  V;  $\pm 0.31$  % at  $\pm 80$  mV;  $\pm 0.32$  % at  $\pm 50$  mV;  $\pm 0.35$  % at  $\pm 25$  mV
- Current, relative to input range, (+/-) 0.3 %; at 0 to 20 mA,  $\pm 5$  mA,  $\pm 10$  mA,  $\pm 20$  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 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 %

### Basic error limit (operational limit at 25 °C)

- Voltage, relative to input range, (+/-) 0.15 %;  $\pm 0.15$  % at  $\pm 250$  mV,  $\pm 500$  mV,  $\pm 1$  V,  $\pm 2.5$  V,  $\pm 5$  V, 1 V to 5 V,  $\pm 10$  V;  $\pm 0.17$  % at  $\pm 80$  mV;  $\pm 0.19$  % at  $\pm 50$  mV;  $\pm 0.23$  % at  $\pm 25$  mV
- Current, relative to input range, (+/-) 0.15 %; at 0 to 20 mA,  $\pm 5$  mA,  $\pm 10$  mA,  $\pm 20$  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, 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 %

## 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
<b>last modified:</b>	12/24/2018