



SIMATIC S7-400, SM 431 ANALOG INPUT MODULE OPTIC.  
ISOLATED, 16 AI, 16 BIT RESOLUTION, U//RESIST./  
THERMOEL./PT100,ALARM,DIAGNOST.

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
Hardware configuration	
Slots	
<ul style="list-style-type: none"> <li>required slots</li> </ul>	1
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
Input ranges	
<ul style="list-style-type: none"> <li>Voltage</li> </ul>	Yes
<ul style="list-style-type: none"> <li>Current</li> </ul>	Yes
<ul style="list-style-type: none"> <li>Thermocouple</li> </ul>	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	Yes
• Type E	Yes
• Type J	Yes
• Type K	Yes
• Type L	Yes
• Type N	Yes

• Type R	Yes
• Type S	Yes
• Type T	Yes
• Type U	Yes
<b>Input ranges (rated values), resistance thermometer</b>	
• 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
<b>Input ranges (rated values), resistors</b>	
• 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
• 0 to 48 ohms	Yes
• Input resistance (0 to 48 ohms)	1 MΩ
• 0 to 600 ohms	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
<b>Thermocouple (TC)</b>	
<b>Temperature compensation</b>	
— external temperature compensation with compensations socket	Yes
— external temperature compensation with Pt100	Yes
— dynamic reference temperature value	Yes
<b>Characteristic linearization</b>	
• Parameterizable	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>	
• shielded, max.	200 m; 50 m with thermocouples and input ranges ≤ 80 mV

## Analog value generation

### 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 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	Yes
• for resistance measurement with four-wire connection	Yes

## Errors/accuracies

### Operational error limit in overall temperature range

• Voltage, relative to input area, (+/-)	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 area, (+/-)	0.3 %; at 0 to 20 mA, +/-5 mA, +/-10 mA, +/- 20 mA, 4 to 20 mA
• Resistance, relative to input area, (+/-)	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 600 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 area, (+/-)	0.4 %

Basic error limit (operational limit at 25 °C)

<ul style="list-style-type: none"> <li>• Voltage, relative to input area, (+/-)</li> </ul>	<p>0.15 %; <math>\pm 0.15\%</math> at <math>\pm 250</math> mV, <math>\pm 500</math> mV, <math>\pm 1</math> V, <math>\pm 2.5</math> V, <math>\pm 5</math> V, 1 V to 5 V, <math>\pm 10</math> V; <math>\pm 0.17\%</math> at <math>\pm 80</math> mV; <math>\pm 0.19\%</math> at <math>\pm 50</math> mV; <math>\pm 0.23\%</math> at <math>\pm 25</math> mV</p>
<ul style="list-style-type: none"> <li>• Current, relative to input area, (+/-)</li> </ul>	<p>0.15 %; at 0 to 20 mA, <math>\pm 5</math> mA, <math>\pm 10</math> mA, <math>\pm 20</math> mA, 4 to 20 mA</p>
<ul style="list-style-type: none"> <li>• Resistance, relative to input area, (+/-)</li> </ul>	<p>0.15 %; <math>\pm 0.15\%</math> 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); <math>\pm 0.3\%</math> 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)</p>
<ul style="list-style-type: none"> <li>• Resistance thermometer, relative to input area, (+/-)</li> </ul>	<p>0.3 %</p>

### Interrupts/diagnostics/status information

<b>Alarms</b>	
<ul style="list-style-type: none"> <li>• Diagnostic alarm</li> <li>• Limit value alarm</li> </ul>	<p>Yes; Parameterizable Yes; Parameterizable</p>
<b>Diagnostic messages</b>	
<ul style="list-style-type: none"> <li>• Diagnostics</li> </ul>	<p>Yes; Parameterizable</p>

### Potential separation

<b>Potential separation analog inputs</b>	
<ul style="list-style-type: none"> <li>• Potential separation analog inputs</li> <li>• between the channels</li> </ul>	<p>Yes; internal/external No</p>

### Permissible potential difference

<p>between the inputs (UCM)</p>	<p>120 V AC</p>
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### Isolation

<p>Isolation tested with</p>	<p>2120 V DC between bus and L+/M; 2120 V DC between bus and analog part; 500 V DC between bus and local ground; 707 V DC between analog part and L+/M; 2120 V DC between analog part and local ground; 2120 V DC between L+/M and local ground</p>
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### Dimensions

<p>Width</p>	<p>25 mm</p>
<p>Height</p>	<p>290 mm</p>
<p>Depth</p>	<p>210 mm</p>

### Weights

<p>Weight, approx.</p>	<p>500 g</p>
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**last modified:** 11.06.2015