



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> <li>Reverse polarity protection</li> </ul>	24 V; Only required for supplying 2-wire transmitters 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> <li>For resistance measurement</li> </ul>	16 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	
<ul style="list-style-type: none"> <li>Voltage</li> <li>Current</li> <li>Thermocouple</li> <li>Resistance thermometer</li> <li>Resistance</li> </ul>	Yes Yes Yes Yes Yes
Input ranges (rated values), voltages	
<ul style="list-style-type: none"> <li>1 V to 5 V                             <ul style="list-style-type: none"> <li>Input resistance (1 V to 5 V)</li> </ul> </li> <li>-1 V to +1 V                             <ul style="list-style-type: none"> <li>Input resistance (-1 V to +1 V)</li> </ul> </li> <li>-10 V to +10 V                             <ul style="list-style-type: none"> <li>Input resistance (-10 V to +10 V)</li> </ul> </li> <li>-2.5 V to +2.5 V                             <ul style="list-style-type: none"> <li>Input resistance (-2.5 V to +2.5 V)</li> </ul> </li> <li>-25 mV to +25 mV                             <ul style="list-style-type: none"> <li>Input resistance (-25 mV to +25 mV)</li> </ul> </li> <li>-250 mV to +250 mV                             <ul style="list-style-type: none"> <li>Input resistance (-250 mV to +250 mV)</li> </ul> </li> <li>-5 V to +5 V</li> </ul>	Yes 1 MΩ Yes 1 MΩ Yes 1 MΩ Yes 1 MΩ Yes 1 MΩ 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
— Input resistance (Type B)	1 M $\Omega$
• Type E	Yes
— Input resistance (Type E)	1 M $\Omega$
• Type J	Yes
— Input resistance (type J)	1 M $\Omega$
• Type K	Yes
— Input resistance (Type K)	1 M $\Omega$
• Type L	Yes
— Input resistance (Type L)	1 M $\Omega$
• Type N	Yes
— Input resistance (Type N)	1 M $\Omega$
• Type R	Yes
— Input resistance (Type R)	1 M $\Omega$
• Type S	Yes
— Input resistance (Type S)	1 M $\Omega$
• Type T	Yes
— Input resistance (Type T)	1 M $\Omega$
• Type U	Yes
— Input resistance (Type U)	1 M $\Omega$
<b>Input ranges (rated values), resistance thermometer</b>	
• Ni 100	Yes
— Input resistance (Ni 100)	1 M $\Omega$
• Ni 1000	Yes
— Input resistance (Ni 1000)	1 M $\Omega$
• Pt 100	Yes
— Input resistance (Pt 100)	1 M $\Omega$
• Pt 1000	Yes
— Input resistance (Pt 1000)	1 M $\Omega$
• Pt 200	Yes
— Input resistance (Pt 200)	1 M $\Omega$
• Pt 500	Yes
— Input resistance (Pt 500)	1 M $\Omega$
<b>Input ranges (rated values), resistors</b>	
• 0 to 48 ohms	Yes
— Input resistance (0 to 48 ohms)	1 M $\Omega$
• 0 to 150 ohms	Yes
— Input resistance (0 to 150 ohms)	1 M $\Omega$
• 0 to 300 ohms	Yes
— Input resistance (0 to 300 ohms)	1 M $\Omega$
• 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>	
Temperature compensation	
— parameterizable	Yes
— external temperature compensation with Pt100	Yes
— external temperature compensation with compensations socket	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
<b>Analog value generation for the inputs</b>	
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
• Interference voltage suppression for interference frequency f1 in Hz	400 / 60 / 50 Hz
<b>Encoder</b>	
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	Yes
• for resistance measurement with four-wire connection	Yes
<b>Errors/accuracies</b>	
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 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 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 %; ±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), 0 to 5000 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 %
• 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
<b>Alarms</b>	
• Diagnostic alarm	Yes; Parameterizable
• Limit value alarm	Yes; Parameterizable
• Hardware interrupt	Yes; Parameterizable
<b>Diagnoses</b>	
• Diagnostic information readable	Yes
<b>Diagnostics indication LED</b>	
• internal fault INTF (red)	Yes
• external fault EXTF (red)	Yes

### Potential separation

<b>Potential separation analog inputs</b>	
• 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:** 3/2/2021 