



SIMATIC S7-400, analog input SM 431, isolated 8 AI, resolution 14 bit, U/I/Resistor/Thermocouple/Pt100

Figure similar

Supply voltage	
Load voltage L+	
• Rated value (DC)	24 V; Only required for supplying 2-wire transmitters
• Reverse polarity protection	Yes
Input current	
from load voltage L+ (without load), max.	200 mA; for 8 connected, fully controlled 2-wire transmitters
from backplane bus 5 V DC, max.	600 mA
Power loss	
Power loss, typ.	3.5 W
Analog inputs	
Number of analog inputs	8
• For voltage/current measurement	8
• For resistance measurement	4
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; Permanent
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 MΩ
• -1 V to +1 V	Yes
— Input resistance (-1 V to +1 V)	1 MΩ
• -10 V to +10 V	Yes
— Input resistance (-10 V to +10 V)	1 MΩ
• -2.5 V to +2.5 V	Yes
— Input resistance (-2.5 V to +2.5 V)	1 MΩ
• -250 mV to +250 mV	Yes
— Input resistance (-250 mV to +250 mV)	1 MΩ
• -5 V to +5 V	Yes
— Input resistance (-5 V to +5 V)	1 MΩ
• -500 mV to +500 mV	Yes
— Input resistance (-500 mV to +500 mV)	1 MΩ

<ul style="list-style-type: none"> <li>• -80 mV to +80 mV</li> <li>— Input resistance (-80 mV to +80 mV)</li> </ul>	Yes 1 MΩ
Input ranges (rated values), currents	
<ul style="list-style-type: none"> <li>• 0 to 20 mA</li> <li>— Input resistance (0 to 20 mA)</li> <li>• 4 mA to 20 mA</li> <li>— Input resistance (4 mA to 20 mA)</li> </ul>	Yes 50 Ω Yes 50 Ω
Input ranges (rated values), thermocouples	
<ul style="list-style-type: none"> <li>• Type B</li> <li>— Input resistance (Type B)</li> <li>• Type E</li> <li>— Input resistance (Type E)</li> <li>• Type J</li> <li>— Input resistance (type J)</li> <li>• Type K</li> <li>— Input resistance (Type K)</li> <li>• Type L</li> <li>— Input resistance (Type L)</li> <li>• Type N</li> <li>— Input resistance (Type N)</li> <li>• Type R</li> <li>— Input resistance (Type R)</li> <li>• Type S</li> <li>— Input resistance (Type S)</li> <li>• Type T</li> <li>— Input resistance (Type T)</li> <li>• Type U</li> <li>— Input resistance (Type U)</li> </ul>	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	
<ul style="list-style-type: none"> <li>• Ni 100</li> <li>— Input resistance (Ni 100)</li> <li>• Ni 1000</li> <li>— Input resistance (Ni 1000)</li> <li>• Pt 100</li> <li>— Input resistance (Pt 100)</li> <li>• Pt 1000</li> <li>• Pt 10000</li> <li>• Pt 200</li> <li>— Input resistance (Pt 200)</li> <li>• Pt 500</li> <li>— Input resistance (Pt 500)</li> </ul>	Yes 1 MΩ Yes 1 MΩ Yes 1 MΩ Yes Yes Yes 1 MΩ Yes 1 MΩ
Input ranges (rated values), resistors	
<ul style="list-style-type: none"> <li>• 0 to 48 ohms</li> <li>— Input resistance (0 to 48 ohms)</li> <li>• 0 to 150 ohms</li> <li>— Input resistance (0 to 150 ohms)</li> <li>• 0 to 300 ohms</li> <li>— Input resistance (0 to 300 ohms)</li> <li>• 0 to 600 ohms</li> <li>— Input resistance (0 to 600 ohms)</li> <li>• 0 to 6000 ohms</li> <li>— Input resistance (0 to 6000 ohms)</li> </ul>	Yes 1 MΩ Yes 1 MΩ Yes 1 MΩ Yes 1 MΩ Yes; Usable up to 5000 Ohm 1 MΩ
Thermocouple (TC)	
Temperature compensation	
<ul style="list-style-type: none"> <li>— parameterizable</li> <li>— internal temperature compensation</li> <li>— external temperature compensation with Pt100</li> <li>— external temperature compensation with compensations socket</li> <li>— dynamic reference temperature value</li> </ul>	Yes No Yes Yes Yes
Characteristic linearization	

<ul style="list-style-type: none"> <li>parameterizable <ul style="list-style-type: none"> <li>— for thermocouples</li> <li>— for resistance thermometer</li> </ul> </li> </ul>	Yes Type B, E, J, K, L, N, R, S, T, U Pt100, Pt200, Pt500, Pt1000, Ni100, Ni1000
Cable length	
<ul style="list-style-type: none"> <li>shielded, max.</li> </ul>	200 m; 50 m with thermocouples and input ranges $\leq 80$ mV
<b>Analog value generation for the inputs</b>	
Integration and conversion time/resolution per channel	
<ul style="list-style-type: none"> <li>Resolution with overrange (bit including sign), max.</li> <li>Integration time, parameterizable</li> <li>Basic conversion time (ms)</li> <li>Integration time (ms)</li> <li>Interference voltage suppression for interference frequency f1 in Hz</li> <li>Basic execution time of the module (all channels released)</li> </ul>	14 bit; with activated filtering: 16 bit Yes 20.1 / 23.5 ms 16,7 / 20 ms 50 / 60 Hz 161 ms; 161 / 188 ms
<b>Encoder</b>	
Connection of signal encoders	
<ul style="list-style-type: none"> <li>for voltage measurement</li> <li>for current measurement as 2-wire transducer</li> <li>for current measurement as 4-wire transducer</li> <li>for resistance measurement with two-wire connection</li> <li>for resistance measurement with three-wire connection</li> <li>for resistance measurement with four-wire connection</li> </ul>	Yes; possible Yes Yes Yes; Line resistances are also measured Yes Yes
<b>Errors/accuracies</b>	
Temperature error (relative to input range), (+/-)	0.004 %/K
Operational error limit in overall temperature range	
<ul style="list-style-type: none"> <li>Voltage, relative to input range, (+/-)</li> <li>Current, relative to input range, (+/-)</li> <li>Resistance, relative to input range, (+/-)</li> <li>Resistance thermometer, relative to input range, (+/-)</li> <li>Thermocouple, relative to input range, (+/-)</li> </ul>	0.38 %; $\pm 0.38$ % at $\pm 80$ mV; $\pm 0.35$ % at $\pm 250$ mV, $\pm 500$ mV, $\pm 1$ V, $\pm 2.5$ V, $\pm 5$ V, 1 to 5 V, $\pm 10$ V 0.35 %; $\pm 20$ mA, 0 to 20 mA, 4 to 20 mA 0.5 % 0.5 % TC Type B ( $\pm 14.8$ K), TC Type R ( $\pm 9.4$ K), TC Type S ( $\pm 10.6$ K), TC Type T ( $\pm 2.2$ K), TC Type E ( $\pm 4.0$ K), TC Type J ( $\pm 5.2$ K), TC Type K ( $\pm 7.6$ K), TC Type U ( $\pm 3.5$ K), TC Type L ( $\pm 5.1$ K), TC Type N ( $\pm 5.5$ K)
Basic error limit (operational limit at 25 °C)	
<ul style="list-style-type: none"> <li>Voltage, relative to input range, (+/-)</li> <li>Current, relative to input range, (+/-)</li> <li>Resistance, relative to input range, (+/-)</li> <li>Resistance thermometer, relative to input range, (+/-)</li> <li>Thermocouple, relative to input range, (+/-)</li> </ul>	0.15 %; $\pm 0.15$ % ( $\pm 250$ mV, $\pm 500$ mV, $\pm 1$ V, $\pm 2.5$ V, $\pm 5$ V, 1 to 5 V, $\pm 10$ V); $\pm 0.17$ % ( $\pm 80$ mV) 0.15 %; $\pm 20$ mA, 0 to 20 mA, 4 to 20 mA 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 600 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) 0.3 % TC Type B ( $\pm 8.2$ K), TC Type R ( $\pm 5.2$ K), TC Type S ( $\pm 5.9$ K), TC Type T ( $\pm 1.2$ K), TC Type E ( $\pm 1.8$ K), TC Type J ( $\pm 2.3$ K), TC Type K ( $\pm 3.4$ K), TC Type U ( $\pm 1.8$ K), TC Type L ( $\pm 2.3$ K), TC Type N ( $\pm 2.9$ K)
<b>Interrupts/diagnostics/status information</b>	
Diagnostics function	No
<b>Potential separation</b>	
Potential separation analog inputs	
<ul style="list-style-type: none"> <li>Potential separation analog inputs</li> <li>between the channels</li> <li>between the channels and backplane bus</li> <li>Between the channels and load voltage L+</li> </ul>	Yes; internal/external No Yes Yes
<b>Isolation</b>	
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
<b>Dimensions</b>	
Width	25 mm
Height	290 mm
Depth	210 mm

Weights	
Weight, approx.	500 g
last modified:	8/30/2023 