



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+   |  |
| <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<br>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  |
| <ul style="list-style-type: none"> <li>For voltage/current measurement</li> <li>For resistance measurement</li> </ul>   | 8<br>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  |  |
| <ul style="list-style-type: none"> <li>Voltage</li> <li>Current</li> <li>Thermocouple</li> <li>Resistance thermometer</li> <li>Resistance</li> </ul>  | Yes<br>Yes<br>Yes<br>Yes<br>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>-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<br>1 MΩ<br>Yes<br>1 MΩ<br>Yes<br>1 MΩ<br>Yes<br>1 MΩ<br>Yes<br>1 MΩ<br>Yes |

|  |                            |
|--|----------------------------|
| — Input resistance (-5 V to +5 V)                          | 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 $\Omega$                |
| • 4 mA to 20 mA  | Yes                        |
| — Input resistance (4 mA to 20 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                        |
| • Pt 10000   | Yes                        |
| • 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 M $\Omega$               |
| • 0 to 6000 ohms   | Yes; Usable up to 5000 Ohm |
| — Input resistance (0 to 6000 ohms)                        | 1 M $\Omega$               |
| <b>Thermocouple (TC)</b>                                   |                            |
| <b>Temperature compensation</b>                            |                            |
| — parameterizable  | Yes                        |

|  |  |
|--|--|
| — internal temperature compensation                                    | No   |
| — 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>                          |  |
| <b>Integration and conversion time/resolution per channel</b>          |  |
| • Resolution with overrange (bit including sign), max.                 | 14 bit; with activated filtering: 16 bit   |
| • Integration time, parameterizable                                    | Yes  |
| • Basic conversion time (ms)   | 20.1 / 23.5 ms   |
| • Integration time (ms)  | 16,7 / 20 ms   |
| • Interference voltage suppression for interference frequency f1 in Hz | 50 / 60 Hz   |
| <b>Encoder</b>   |  |
| <b>Connection of signal encoders</b>                                   |  |
| • 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>   |  |
| <b>Operational error limit in overall temperature range</b>            |  |
| • Voltage, relative to input range, (+/-)                              | 0.38 %; ±0.38 % at ±80 mV; ±0.35 % at ±250 mV, ±500 mV, ±1 V, ±2,5 V, ±5 V, 1 to 5 V, ±10 V  |
| • Current, relative to input range, (+/-)                              | 0.35 %; ±20 mA, 0 to 20 mA, 4 to 20 mA   |
| • Resistance, relative to input range, (+/-)                           | 0.5 %  |
| • Resistance thermometer, relative to input range, (+/-)               | 0.5 %  |
| • Thermocouple, relative to input range, (+/-)                         | TC Type B (±14.8 K), TC Type R (±9.4 K), TC Type S (±10.6 K), TC Type T (±2.2 K), TC Type E (±4.0 K), TC Type J (±5.2 K), TC Type K (±7.6 K), TC Type U (±3.5 K), TC Type L (±5.1 K), TC Type N (±5.5 K)   |
| <b>Basic error limit (operational limit at 25 °C)</b>                  |  |
| • Voltage, relative to input range, (+/-)                              | 0.15 %; ±0.15 % (±250 mV, ±500 mV, ±1 V, ±2.5 V, ±5 V, 1 to 5 V, ±10 V); ±0.17% (±80 mV)   |
| • Current, relative to input range, (+/-)                              | 0.15 %; ±20 mA, 0 to 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 600 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 (±8.2 K), TC Type R (±5.2 K), TC Type S (±5.9 K), TC Type T (±1.2 K), TC Type E (±1.8 K), TC Type J (±2.3 K), TC Type K (±3.4 K), TC Type U (±1.8 K), TC Type L (±2.3 K), TC Type N (±2.9 K)   |
| <b>Interrupts/diagnostics/status information</b>                       |  |
| Diagnostics function   | No   |
| <b>Potential separation</b>  |  |
| <b>Potential separation analog inputs</b>                              |  |
| • Potential separation analog inputs                                   | Yes; internal/external   |

- between the channels
- between the channels and backplane bus
- Between the channels and load voltage L+

No  
Yes  
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 |
|-----------------------|---|

#### Dimensions

|        |        |
|--------|--------|
| Width  | 25 mm  |
| Height | 290 mm |
| Depth  | 210 mm |

#### Weights

|                 |       |
|-----------------|-------|
| Weight, approx. | 500 g |
|-----------------|-------|

**last modified:** 3/2/2021 