



SIMATIC S7-400, analog input SM 431, non-isolated 16 AI, resolution 13 bit, +/-10 V, +/-20 mA, 4 - 20 mA 20 ms conversion time

Figure similar

Supply voltage	
Load voltage L+	
<ul style="list-style-type: none"> Rated value (DC) 	24 V; Only required for supplying 2-wire transmitters
<ul style="list-style-type: none"> Reverse polarity protection 	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.	100 mA
Power loss	
Power loss, typ.	2 W
Analog inputs	
Number of analog inputs	16
<ul style="list-style-type: none"> For voltage/current measurement 	16
permissible input voltage for voltage input (destruction limit), max.	20 V; 20 V DC permanent, 75 V DC for max. 1 s (duty factor 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"> Voltage 	Yes
<ul style="list-style-type: none"> Current 	Yes
<ul style="list-style-type: none"> Thermocouple 	No
<ul style="list-style-type: none"> Resistance thermometer 	No
<ul style="list-style-type: none"> Resistance 	No
Input ranges (rated values), voltages	
<ul style="list-style-type: none"> 1 V to 5 V 	Yes
<ul style="list-style-type: none"> — Input resistance (1 V to 5 V) 	100 kΩ
<ul style="list-style-type: none"> -1 V to +1 V 	Yes
<ul style="list-style-type: none"> — Input resistance (-1 V to +1 V) 	10 MΩ
<ul style="list-style-type: none"> -10 V to +10 V 	Yes
<ul style="list-style-type: none"> — Input resistance (-10 V to +10 V) 	100 kΩ
Input ranges (rated values), currents	
<ul style="list-style-type: none"> -20 mA to +20 mA 	Yes
<ul style="list-style-type: none"> — Input resistance (-20 mA to +20 mA) 	50 Ω
<ul style="list-style-type: none"> 4 mA to 20 mA 	Yes
<ul style="list-style-type: none"> — Input resistance (4 mA to 20 mA) 	50 Ω
Cable length	
<ul style="list-style-type: none"> shielded, max. 	200 m
Analog value generation for the inputs	
Integration and conversion time/resolution per channel	

• Resolution with overrange (bit including sign), max.	13 bit
• Integration time, parameterizable	Yes
• Basic conversion time (ms)	55 / 65 ms
• Integration time (ms)	50 / 60 ms
• Interference voltage suppression for interference frequency f1 in Hz	50 / 60 Hz
• Basic execution time of the module (all channels released)	1 040 ms; 880 / 1 040 ms

Encoder

Connection of signal encoders

• for voltage measurement	Yes; possible
• for current measurement as 4-wire transducer	Yes

Errors/accuracies

Temperature error (relative to input range), (+/-)

0.01 %/K

Operational error limit in overall temperature range

• Voltage, relative to input range, (+/-)	0.65 %; 1.0 % at 1 to 5 V; 0.65 % at ±1 V, ±10 V
• Current, relative to input range, (+/-)	0.65 %

Basic error limit (operational limit at 25 °C)

• Voltage, relative to input range, (+/-)	0.25 %; 0.5% at 1 to 5 V; 0.25% at ±1 V, ±10 V
• Current, relative to input range, (+/-)	0.25 %; at ±20 mA, 4 to 20 mA

Interrupts/diagnostics/status information

Diagnostics function

No

Potential separation

Potential separation analog inputs

• Potential separation analog inputs	No
• between the channels	No
• between the channels and backplane bus	No
• Between the channels and load voltage L+	No

Isolation

Isolation tested with

500 V AC/707 V DC, type test

Dimensions

Width

25 mm

Height

290 mm

Depth

210 mm

Weights

Weight, approx.

500 g

Classifications

	Version	Classification
eClass	14	27-24-22-01
eClass	12	27-24-22-01
eClass	9.1	27-24-22-01
eClass	9	27-24-22-01
eClass	8	27-24-22-01
eClass	7.1	27-24-22-01
eClass	6	27-24-22-01
ETIM	9	EC001420
ETIM	8	EC001420
ETIM	7	EC001420
IDEA	4	3562
UNSPSC	15	32-15-17-05

Approvals / Certificates

General Product Approval



[Miscellaneous](#)

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[KC](#)

General Product Approval	EMV	For use in hazardous locations		
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[Metrological Approval](#)



For use in hazardous locations				Maritime application	
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Maritime application	
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SIMATIC S7-400, analog input SM 431, isolated 8 AI, resolution 13 bit, U/I/Resistor

Figure similar

Supply voltage	
Load voltage L+	
<ul style="list-style-type: none"> Rated value (DC) 	not necessary
Input current	
from backplane bus 5 V DC, max.	350 mA
Power loss	
Power loss, typ.	1.8 W
Analog inputs	
Number of analog inputs	8
<ul style="list-style-type: none"> For voltage/current measurement 	8
<ul style="list-style-type: none"> For resistance measurement 	4
permissible input voltage for voltage input (destruction limit), max.	50 V
permissible input current for current input (destruction limit), max.	50 mA; 40 mA continuous
Constant measurement current for resistance-type transmitter, typ.	1.67 mA
Input ranges	
<ul style="list-style-type: none"> Voltage 	Yes
<ul style="list-style-type: none"> Current 	Yes
<ul style="list-style-type: none"> Thermocouple 	No
<ul style="list-style-type: none"> Resistance thermometer 	No
<ul style="list-style-type: none"> Resistance 	Yes
Input ranges (rated values), voltages	
<ul style="list-style-type: none"> 1 V to 5 V — Input resistance (1 V to 5 V) 	Yes 200 kΩ
<ul style="list-style-type: none"> -1 V to +1 V — Input resistance (-1 V to +1 V) 	Yes 200 kΩ
<ul style="list-style-type: none"> -10 V to +10 V — Input resistance (-10 V to +10 V) 	Yes 200 kΩ
Input ranges (rated values), currents	
<ul style="list-style-type: none"> -20 mA to +20 mA — Input resistance (-20 mA to +20 mA) 	Yes 80 Ω
<ul style="list-style-type: none"> 4 mA to 20 mA — Input resistance (4 mA to 20 mA) 	Yes 80 Ω
Input ranges (rated values), resistors	
<ul style="list-style-type: none"> 0 to 600 ohms — Input resistance (0 to 600 ohms) 	Yes usable up to 500 ohms
Cable length	
<ul style="list-style-type: none"> shielded, max. 	200 m

Analog value generation for the inputs

Integration and conversion time/resolution per channel	
• Resolution with overrange (bit including sign), max.	13 bit
• Integration time, parameterizable	Yes
• Basic conversion time (ms)	23 / 25 ms
• Integration time (ms)	16,7 / 20 ms
• Interference voltage suppression for interference frequency f1 in Hz	50 / 60 Hz
• Basic execution time of the module (all channels released)	200 ms; 184 / 200 ms

Encoder

Connection of signal encoders	
• for voltage measurement	Yes; possible
• for current measurement as 2-wire transducer	Yes; with external transmitter supply
• 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; Line resistances are also measured
• for resistance measurement with four-wire connection	Yes

Errors/accuracies

Temperature error (relative to input range), (+/-)	0.02 %/K; ±0.02 %/K in impedance measuring range; ±0.007 % in all other measuring ranges
Operational error limit in overall temperature range	
• Voltage, relative to input range, (+/-)	1 %; ±1.0 % at ±1 V; ±0.6 % at ±10 V; ±0.7 % at 1 to 5 V
• Current, relative to input range, (+/-)	1 %; at ±20 mA, 4 to 20 mA
• Resistance, relative to input range, (+/-)	1.25 %; 0 to 500 ohms (4-conductor measurement, in range of 600 ohms)
Basic error limit (operational limit at 25 °C)	
• Voltage, relative to input range, (+/-)	0.7 %; 0.7% at ±1 V; 0.4% at ±10 V; 0.5% at 1 to 5 V
• Current, relative to input range, (+/-)	0.7 %; at ±20 mA, 4 to 20 mA
• Resistance, relative to input range, (+/-)	0.8 %; 0 to 500 ohms (4-conductor measurement, in range of 600 ohms)

Interrupts/diagnostics/status information

Diagnostics function	No
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Potential separation

Potential separation analog inputs	
• Potential separation analog inputs	Yes; internal/external
• between the channels	No
• between the channels and backplane bus	Yes

Isolation

Isolation tested with	2 120 V DC between bus and analog part; 500 V DC between bus and local ground; 2 120 V DC between analog part 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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Classifications

	Version	Classification
eClass	14	27-24-22-01
eClass	12	27-24-22-01
eClass	9.1	27-24-22-01
eClass	9	27-24-22-01
eClass	8	27-24-22-01
eClass	7.1	27-24-22-01
eClass	6	27-24-22-01
ETIM	10	EC001420
ETIM	9	EC001420
ETIM	8	EC001420
ETIM	7	EC001420
IDEA	4	3562

Approvals / Certificates

General Product Approval



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General Product Approval

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For use in hazardous locations

Maritime application



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Maritime application



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Maritime application

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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"> Rated value (DC) 	24 V; Only required for supplying 2-wire transmitters
<ul style="list-style-type: none"> 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
<ul style="list-style-type: none"> For voltage/current measurement 	8
<ul style="list-style-type: none"> 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	
<ul style="list-style-type: none"> Voltage 	Yes
<ul style="list-style-type: none"> Current 	Yes
<ul style="list-style-type: none"> Thermocouple 	Yes
<ul style="list-style-type: none"> Resistance thermometer 	Yes
<ul style="list-style-type: none"> Resistance 	Yes
Input ranges (rated values), voltages	
<ul style="list-style-type: none"> 1 V to 5 V <ul style="list-style-type: none"> Input resistance (1 V to 5 V) 	Yes 1 MΩ
<ul style="list-style-type: none"> -1 V to +1 V <ul style="list-style-type: none"> Input resistance (-1 V to +1 V) 	Yes 1 MΩ
<ul style="list-style-type: none"> -10 V to +10 V <ul style="list-style-type: none"> Input resistance (-10 V to +10 V) 	Yes 1 MΩ
<ul style="list-style-type: none"> -2.5 V to +2.5 V <ul style="list-style-type: none"> Input resistance (-2.5 V to +2.5 V) 	Yes 1 MΩ
<ul style="list-style-type: none"> -250 mV to +250 mV <ul style="list-style-type: none"> Input resistance (-250 mV to +250 mV) 	Yes 1 MΩ
<ul style="list-style-type: none"> -5 V to +5 V <ul style="list-style-type: none"> Input resistance (-5 V to +5 V) 	Yes 1 MΩ
<ul style="list-style-type: none"> -500 mV to +500 mV <ul style="list-style-type: none"> Input resistance (-500 mV to +500 mV) 	Yes 1 MΩ

<ul style="list-style-type: none"> ● -80 mV to +80 mV — Input resistance (-80 mV to +80 mV) 	<p>Yes</p> <p>1 MΩ</p>
Input ranges (rated values), currents	
<ul style="list-style-type: none"> ● 0 to 20 mA — Input resistance (0 to 20 mA) ● 4 mA to 20 mA — Input resistance (4 mA to 20 mA) 	<p>Yes</p> <p>50 Ω</p> <p>Yes</p> <p>50 Ω</p>
Input ranges (rated values), thermocouples	
<ul style="list-style-type: none"> ● 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) 	<p>Yes</p> <p>1 MΩ</p>
Input ranges (rated values), resistance thermometer	
<ul style="list-style-type: none"> ● Ni 100 — Input resistance (Ni 100) ● Ni 1000 — Input resistance (Ni 1000) ● Pt 100 — Input resistance (Pt 100) ● Pt 1000 ● Pt 10000 ● Pt 200 — Input resistance (Pt 200) ● Pt 500 — Input resistance (Pt 500) 	<p>Yes</p> <p>1 MΩ</p> <p>Yes</p> <p>1 MΩ</p> <p>Yes</p> <p>1 MΩ</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>1 MΩ</p> <p>Yes</p> <p>1 MΩ</p>
Input ranges (rated values), resistors	
<ul style="list-style-type: none"> ● 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 — Input resistance (0 to 600 ohms) ● 0 to 6000 ohms — Input resistance (0 to 6000 ohms) 	<p>Yes</p> <p>1 MΩ</p> <p>Yes</p> <p>1 MΩ</p> <p>Yes</p> <p>1 MΩ</p> <p>Yes</p> <p>1 MΩ</p> <p>Yes; Usable up to 5000 Ohm</p> <p>1 MΩ</p>
Thermocouple (TC)	
Temperature compensation	
<ul style="list-style-type: none"> — parameterizable — internal temperature compensation — external temperature compensation with Pt100 — external temperature compensation with compensations socket — dynamic reference temperature value 	<p>Yes</p> <p>No</p> <p>Yes</p> <p>Yes</p> <p>Yes</p>
Characteristic linearization	

<ul style="list-style-type: none"> parameterizable <ul style="list-style-type: none"> — for thermocouples — for resistance thermometer 	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"> shielded, max. 	200 m; 50 m with thermocouples and input ranges ≤ 80 mV
Analog value generation for the inputs	
Integration and conversion time/resolution per channel	
<ul style="list-style-type: none"> Resolution with overrange (bit including sign), max. Integration time, parameterizable Basic conversion time (ms) Integration time (ms) Interference voltage suppression for interference frequency f_1 in Hz Basic execution time of the module (all channels released) 	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
Encoder	
Connection of signal encoders	
<ul style="list-style-type: none"> for voltage measurement for current measurement as 2-wire transducer for current measurement as 4-wire transducer for resistance measurement with two-wire connection for resistance measurement with three-wire connection for resistance measurement with four-wire connection 	Yes; possible Yes Yes Yes; Line resistances are also measured Yes Yes
Errors/accuracies	
Temperature error (relative to input range), (+/-)	0.004 %/K
Operational error limit in overall temperature range	
<ul style="list-style-type: none"> Voltage, relative to input range, (+/-) Current, relative to input range, (+/-) Resistance, relative to input range, (+/-) Resistance thermometer, relative to input range, (+/-) Thermocouple, 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 0.35 %; ± 20 mA, 0 to 20 mA, 4 to 20 mA 0.5 % 0.5 % 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)
Basic error limit (operational limit at 25 °C)	
<ul style="list-style-type: none"> Voltage, relative to input range, (+/-) Current, relative to input range, (+/-) Resistance, relative to input range, (+/-) Resistance thermometer, relative to input range, (+/-) Thermocouple, 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) 0.15 %; ± 20 mA, 0 to 20 mA, 4 to 20 mA 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) 0.3 % 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)
Interrupts/diagnostics/status information	
Diagnostics function	No
Potential separation	
Potential separation analog inputs	
<ul style="list-style-type: none"> Potential separation analog inputs between the channels between the channels and backplane bus Between the channels and load voltage L+ 	Yes; internal/external 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
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Classifications

	Version	Classification
eClass	14	27-24-22-01
eClass	12	27-24-22-01
eClass	9.1	27-24-22-01
eClass	9	27-24-22-01
eClass	8	27-24-22-01
eClass	7.1	27-24-22-01
eClass	6	27-24-22-01
ETIM	10	EC001420
ETIM	9	EC001420
ETIM	8	EC001420
ETIM	7	EC001420
IDEA	4	3562
UNSPSC	15	32-15-17-05

Approvals / Certificates

General Product Approval

[Miscellaneous](#)



[China RoHS](#)



[KC](#)

General Product Approval EMV For use in hazardous locations

[Metrological Approval](#)



[EM](#)

For use in hazardous locations Maritime application



[Type Examination Certificate](#)



Maritime application



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Maritime application

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SIMATIC S7-400, analog input SM 431, isolated 8 AI, resolution 14 bit, U/I/Resistor
8 AI, cycle time 0.416 ms

Figure similar

Supply voltage	
Load voltage L+	
<ul style="list-style-type: none"> Rated value (DC) 	24 V; Only required for supplying 2-wire transmitters
<ul style="list-style-type: none"> 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.	1 000 mA
Power loss	
Power loss, typ.	4.9 W
Analog inputs	
Number of analog inputs	8
<ul style="list-style-type: none"> For voltage/current measurement 	8
<ul style="list-style-type: none"> 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	
<ul style="list-style-type: none"> Voltage 	Yes
<ul style="list-style-type: none"> Current 	Yes
<ul style="list-style-type: none"> Thermocouple 	No
<ul style="list-style-type: none"> Resistance thermometer 	No
<ul style="list-style-type: none"> Resistance 	Yes
Input ranges (rated values), voltages	
<ul style="list-style-type: none"> 1 V to 5 V 	Yes
<ul style="list-style-type: none"> — Input resistance (1 V to 5 V) 	10 MΩ
<ul style="list-style-type: none"> -1 V to +1 V 	Yes
<ul style="list-style-type: none"> — Input resistance (-1 V to +1 V) 	10 MΩ
<ul style="list-style-type: none"> -10 V to +10 V 	Yes
<ul style="list-style-type: none"> — Input resistance (-10 V to +10 V) 	100 kΩ
Input ranges (rated values), currents	
<ul style="list-style-type: none"> -20 mA to +20 mA 	Yes
<ul style="list-style-type: none"> — Input resistance (-20 mA to +20 mA) 	50 Ω
<ul style="list-style-type: none"> 4 mA to 20 mA 	Yes
<ul style="list-style-type: none"> — Input resistance (4 mA to 20 mA) 	50 kΩ
Input ranges (rated values), resistors	
<ul style="list-style-type: none"> 0 to 600 ohms 	Yes
Cable length	

• shielded, max.	200 m	
Analog value generation for the inputs		
Integration and conversion time/resolution per channel		
• Resolution with overrange (bit including sign), max.	14 bit; 14 / 14 / 14	
• Integration time, parameterizable	Yes	
• Basic conversion time (ms)	52 µs	
• Interference voltage suppression for interference frequency f1 in Hz	none / 400 / 60 / 50 Hz	
• Time constant of the input filter	15 µs	
• Basic execution time of the module (all channels released)	0.42 ms	
Encoder		
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; Line resistances are also measured	
• for resistance measurement with four-wire connection	Yes	
Errors/accuracies		
Temperature error (relative to input range), (+/-)	0.03 %/K	
Operational error limit in overall temperature range		
• Voltage, relative to input range, (+/-)	0.7 %; ±0.7 % at ±1 V; ±0.9 % at ±10 V, 1 to 5 V	
• Current, relative to input range, (+/-)	0.8 %; at ±20 mA, 4 to 20 mA	
• Resistance, relative to input range, (+/-)	1 %	
Basic error limit (operational limit at 25 °C)		
• Voltage, relative to input range, (+/-)	0.6 %; 0.6 % at ±1 V; 0.75 % at ±10 V, 1 to 5 V	
• Current, relative to input range, (+/-)	0.7 %; at ±20 mA, 4 to 20 mA	
• Resistance, relative to input range, (+/-)	0.7 %; 0 to 600 ohms	
Interrupts/diagnostics/status information		
Diagnostics function	No	
Potential separation		
Potential separation analog inputs		
• 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 analog section; 500 V DC between bus and local ground; 500 V DC between analog part and L+/M; 2 120 V DC between analog part 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	
Classifications		
	Version	Classification
eClass	14	27-24-22-01
eClass	12	27-24-22-01
eClass	9.1	27-24-22-01
eClass	9	27-24-22-01
eClass	8	27-24-22-01
eClass	7.1	27-24-22-01
eClass	6	27-24-22-01
ETIM	9	EC001420
ETIM	8	EC001420
ETIM	7	EC001420

IDEA	4	3562
UNSPSC	15	32-15-17-05

Approvals / Certificates

General Product Approval



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General Product Approval	EMV	For use in hazardous locations
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RCM



RCM



RCM



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For use in hazardous locations	Maritime application
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RINA



RMRS

Maritime application

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SIMATIC S7-400, analog input SM 431, 8 AI, resolution 16 bit, U/I/Thermocouple, isolated with single routing, diagnostics, alarm, 20 ms conversion time

Figure similar

Input current	
from backplane bus 5 V DC, max.	1 200 mA
Power loss	
Power loss, typ.	4.6 W
Analog inputs	
Number of analog inputs	8
• For voltage/current measurement	8
permissible input voltage for voltage input (destruction limit), max.	35 V; 35 V continuous, 75 V for max. 1 s (mark to space ratio 1:20)
permissible input current for current input (destruction limit), max.	32 mA
Input ranges	
• Voltage	Yes
• Current	Yes
• Thermocouple	Yes
• Resistance thermometer	No
• Resistance	No
Input ranges (rated values), voltages	
• 1 V to 5 V	Yes
— Input resistance (1 V to 5 V)	> 2 000 ohms
• -1 V to +1 V	Yes
• -10 V to +10 V	Yes
• -100 mV to +100 mV	Yes
• -2.5 V to +2.5 V	Yes
• -20 mV to +20 mV	Yes
• -250 mV to +250 mV	Yes
• -5 V to +5 V	Yes
• -50 mV to +50 mV	Yes
• -500 mV to +500 mV	Yes
• -80 mV to +80 mV	Yes
Input ranges (rated values), currents	
• 0 to 20 mA	Yes
• -10 mA to +10 mA	Yes
• -20 mA to +20 mA	Yes
• -3.2 mA to +3.2 mA	Yes
• 4 mA to 20 mA	Yes
— Input resistance (4 mA to 20 mA)	50 Ω
• -5 mA to +5 mA	Yes
Input ranges (rated values), thermocouples	
• Type B	Yes

— Input resistance (Type B)	> 2 000 ohms
• Type E	Yes
• Type J	Yes
• Type K	Yes
• Type L	Yes
• Type N	Yes
— Input resistance (Type N)	> 2 000 ohms
• Type R	Yes
• Type S	Yes
• Type T	Yes
• Type U	Yes
Thermocouple (TC)	
Temperature compensation	
— connection for compensating the cold junction	6ES7431-7KF00-6AA0
— parameterizable	Yes
— internal temperature compensation	Yes
— external temperature compensation with compensations socket	Yes
— dynamic reference temperature value	Yes
Characteristic linearization	
• parameterizable	Yes
— for thermocouples	Type B, E, J, K, L, N, R, S, T, U
Cable length	
• shielded, max.	200 m
Analog value generation for the inputs	
Integration and conversion time/resolution per channel	
• Resolution with overrange (bit including sign), max.	16 bit
• Integration time, parameterizable	Yes
• Basic conversion time (ms)	10 / 16,7 / 20 / 100
• Integration time (ms)	2,5 / 16,7 / 20 / 100
• Interference voltage suppression for interference frequency f1 in Hz	400 / 60 / 50 / 10 Hz
Encoder	
Connection of signal encoders	
• for voltage measurement	Yes; possible
• for current measurement as 4-wire transducer	Yes
• for resistance measurement with four-wire connection	Yes
Errors/accuracies	
Operational error limit in overall temperature range	
• Voltage, relative to input range, (+/-)	0.3 %
• Current, relative to input range, (+/-)	0.5 %
Basic error limit (operational limit at 25 °C)	
• Voltage, relative to input range, (+/-)	0.1 %
• Current, relative to input range, (+/-)	0.17 %
Interrupts/diagnostics/status information	
Diagnostics function	Yes; Parameterizable
Alarms	
• Diagnostic alarm	Yes; Parameterizable
• Limit value alarm	Yes
• Hardware interrupt	Yes; Parameterizable
Diagnoses	
• Diagnostic information readable	Yes; possible
Potential separation	
Potential separation analog inputs	
• Potential separation analog inputs	Yes; internal/external
• between the channels	Yes
• between the channels and backplane bus	Yes
Isolation	
Isolation tested with	1 500 V DC
Dimensions	
Width	25 mm

Height	290 mm
Depth	210 mm
Weights	
Weight, approx.	650 g

Classifications			
		Version	Classification
	eClass	14	27-24-22-01
	eClass	12	27-24-22-01
	eClass	9.1	27-24-22-01
	eClass	9	27-24-22-01
	eClass	8	27-24-22-01
	eClass	7.1	27-24-22-01
	eClass	6	27-24-22-01
	ETIM	9	EC001420
	ETIM	8	EC001420
	ETIM	7	EC001420
	IDEA	4	3562
	UNSPSC	15	32-15-17-05

Approvals / Certificates

General Product Approval



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[Metrological Approval](#)

General Product Approval **EMV** **For use in hazardous locations**

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For use in hazardous locations **Maritime application**



[Type Examination Certificate](#)



Maritime application



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SIMATIC S7-400, analog input SM 431, 8 AI, resolution 16 bit, resistor/PT100/Ni100 isolated, diagnostics alarm, 20 ms conversion time

Figure similar

Input current	
from backplane bus 5 V DC, max.	650 mA
Power loss	
Power loss, typ.	3.3 W
Analog inputs	
Number of analog inputs	8
• For resistance measurement	8
permissible input voltage for voltage input (destruction limit), max.	35 V; 35 V continuous, 75 V for max. 1 s (mark to space ratio 1:20)
Constant measurement current for resistance-type transmitter, typ.	1 mA
Input ranges	
• Voltage	No
• Current	No
• Thermocouple	No
• Resistance thermometer	Yes
• Resistance	Yes
Input ranges (rated values), resistance thermometer	
• Ni 100	Yes
— Input resistance (Ni 100)	> 10 000 ohms
• Ni 1000	Yes; Different characteristics selectable: Europe/U.S.
— Input resistance (Ni 1000)	> 10 000 ohms
• Pt 100	Yes
— Input resistance (Pt 100)	> 10 000 ohms
• Pt 1000	Yes
— Input resistance (Pt 1000)	> 10 000 ohms
• Pt 200	Yes
— Input resistance (Pt 200)	> 10 000 ohms
• Pt 500	Yes
— Input resistance (Pt 500)	> 10 000 ohms
Characteristic linearization	
• parameterizable	Yes
— for resistance thermometer	Pt100, Pt200, Pt500, Pt1000, Ni100, Ni1000; different characteristics selectable (Europe/U.S.)
Cable length	
• shielded, max.	200 m; 50 m with thermocouples and input ranges ± 80 mV
Analog value generation for the inputs	
Integration and conversion time/resolution per channel	
• Resolution with overrange (bit including sign), max.	16 bit
• Integration time, parameterizable	Yes

• Basic conversion time (ms)	8 / 23 / 25 ms
• Integration time (ms)	20 ms at 50 Hz (entire module incl. wire break)
• Interference voltage suppression for interference frequency f1 in Hz	none/ 60 / 50 Hz
• Basic execution time of the module (all channels released)	8 ms; 8 / 23 / 25 ms

Encoder

Connection of signal encoders

• 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

• Resistance thermometer, relative to input range, (+/-)	±1 °C
--	-------

Basic error limit (operational limit at 25 °C)

• Resistance thermometer, relative to input range, (+/-)	±0,2 °C
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Interrupts/diagnostics/status information

Diagnostics function	Yes; Parameterizable
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Alarms

• Diagnostic alarm	Yes; Parameterizable
• Limit value alarm	Yes
• Hardware interrupt	Yes; Parameterizable

Diagnoses

• Diagnostic information readable	Yes; possible
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Potential separation

Potential separation analog inputs

• Potential separation analog inputs	Yes; internal/external
• between the channels	No
• between the channels and backplane bus	Yes

Isolation

Isolation tested with	500 V DC
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Dimensions

Width	25 mm
Height	290 mm
Depth	210 mm

Weights

Weight, approx.	650 g
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Classifications

	Version	Classification
eClass	14	27-24-22-01
eClass	12	27-24-22-01
eClass	9.1	27-24-22-01
eClass	9	27-24-22-01
eClass	8	27-24-22-01
eClass	7.1	27-24-22-01
eClass	6	27-24-22-01
ETIM	10	EC001420
ETIM	9	EC001420
ETIM	8	EC001420
ETIM	7	EC001420
IDEA	4	3562
UNSPSC	15	32-15-17-05

Approvals / Certificates

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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"> Rated value (DC) 	24 V; Only required for supplying 2-wire transmitters
<ul style="list-style-type: none"> Reverse polarity protection 	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"> For voltage/current measurement 	16
<ul style="list-style-type: none"> For resistance measurement 	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"> Voltage 	Yes
<ul style="list-style-type: none"> Current 	Yes
<ul style="list-style-type: none"> Thermocouple 	Yes
<ul style="list-style-type: none"> Resistance thermometer 	Yes
<ul style="list-style-type: none"> Resistance 	Yes
Input ranges (rated values), voltages	
<ul style="list-style-type: none"> 1 V to 5 V <ul style="list-style-type: none"> Input resistance (1 V to 5 V) 	1 MΩ
<ul style="list-style-type: none"> -1 V to +1 V <ul style="list-style-type: none"> Input resistance (-1 V to +1 V) 	1 MΩ
<ul style="list-style-type: none"> -10 V to +10 V <ul style="list-style-type: none"> Input resistance (-10 V to +10 V) 	1 MΩ
<ul style="list-style-type: none"> -2.5 V to +2.5 V <ul style="list-style-type: none"> Input resistance (-2.5 V to +2.5 V) 	1 MΩ
<ul style="list-style-type: none"> -25 mV to +25 mV <ul style="list-style-type: none"> Input resistance (-25 mV to +25 mV) 	1 MΩ
<ul style="list-style-type: none"> -250 mV to +250 mV <ul style="list-style-type: none"> Input resistance (-250 mV to +250 mV) 	1 MΩ
<ul style="list-style-type: none"> -5 V to +5 V <ul style="list-style-type: none"> Input resistance (-5 V to +5 V) 	1 MΩ

- -50 mV to +50 mV
 - Input resistance (-50 mV to +50 mV) 1 M Ω
- -500 mV to +500 mV
 - Input resistance (-500 mV to +500 mV) 1 M Ω
- -80 mV to +80 mV
 - Input resistance (-80 mV to +80 mV) 1 M Ω

Input ranges (rated values), currents

- 0 to 20 mA
 - Input resistance (0 to 20 mA) 50 Ω
- -10 mA to +10 mA
 - Input resistance (-10 mA to +10 mA) 50 Ω
- -20 mA to +20 mA
 - Input resistance (-20 mA to +20 mA) 50 Ω
- 4 mA to 20 mA
 - Input resistance (4 mA to 20 mA) 50 Ω
- -5 mA to +5 mA
 - Input resistance (-5 mA to +5 mA) 50 Ω

Input ranges (rated values), thermocouples

- Type B
 - Input resistance (Type B) 1 M Ω
- Type E
 - Input resistance (Type E) 1 M Ω
- Type J
 - Input resistance (type J) 1 M Ω
- Type K
 - Input resistance (Type K) 1 M Ω
- Type L
 - Input resistance (Type L) 1 M Ω
- Type N
 - Input resistance (Type N) 1 M Ω
- Type R
 - Input resistance (Type R) 1 M Ω
- Type S
 - Input resistance (Type S) 1 M Ω
- Type T
 - Input resistance (Type T) 1 M Ω
- Type U
 - Input resistance (Type U) 1 M Ω

Input ranges (rated values), resistance thermometer

- Ni 100
 - Input resistance (Ni 100) 1 M Ω
- Ni 1000
 - Input resistance (Ni 1000) 1 M Ω
- Pt 100
 - Input resistance (Pt 100) 1 M Ω
- Pt 1000
 - Input resistance (Pt 1000) 1 M Ω
- Pt 200
 - Input resistance (Pt 200) 1 M Ω
- Pt 500
 - Input resistance (Pt 500) 1 M Ω

Input ranges (rated values), resistors

- 0 to 48 ohms
 - Input resistance (0 to 48 ohms) 1 M Ω
- 0 to 150 ohms
 - Input resistance (0 to 150 ohms) 1 M Ω
- 0 to 300 ohms
 - Input resistance (0 to 300 ohms) 1 M Ω
- 0 to 600 ohms
 - Input resistance (0 to 600 ohms) 1 M Ω
- 0 to 6000 ohms
 - Input resistance (0 to 6000 ohms) Yes; Usable up to 5000 Ohm

— Input resistance (0 to 6000 ohms)	1 MΩ
Thermocouple (TC)	
Temperature compensation	
— parameterizable	Yes
— external temperature compensation with Pt100	Yes
— external temperature compensation with compensations socket	Yes
— dynamic reference temperature value	Yes
Characteristic linearization	
● parameterizable	Yes
— for thermocouples	Type B, E, J, K, L, N, R, S, T, U
— for resistance thermometer	Pt100, Pt200, Pt500, Pt1000, Ni100, Ni1000
Cable length	
● shielded, max.	200 m; 50 m with thermocouples and input ranges ≤ 80 mV
Analog value generation for the inputs	
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
Encoder	
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
Errors/accuracies	
Temperature error (relative to input range), (+/-)	0.004 %/K
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
Alarms	
● Diagnostic alarm	Yes; Parameterizable
● Limit value alarm	Yes; Parameterizable
● Hardware interrupt	Yes; Parameterizable

Diagnoses	
• Diagnostic information readable	Yes
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
• 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

Dimensions	
Width	25 mm
Height	290 mm
Depth	210 mm

Weights	
Weight, approx.	500 g

Classifications			
		Version	Classification
	eClass	14	27-24-22-01
	eClass	12	27-24-22-01
	eClass	9.1	27-24-22-01
	eClass	9	27-24-22-01
	eClass	8	27-24-22-01
	eClass	7.1	27-24-22-01
	eClass	6	27-24-22-01
	ETIM	9	EC001420
	ETIM	8	EC001420
	ETIM	7	EC001420
	IDEA	4	3562
	UNSPSC	15	32-15-17-05

Approvals / Certificates

General Product Approval



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General Product Approval	EMV	For use in hazardous locations		
Metrological Approval				
	RCM	RCM	RCM	ATEX
				
				IECEX

For use in hazardous locations	Maritime application
EM	
	
CCC	
	
IECEX	
Type Examination Certificate	
	
ATEX	

Maritime application



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