

SIMATIC S7-400 advanced controller

Analog modules

SM 431 analog input module

Overview



- Analog inputs for the SIMATIC S7-400
- For connection of voltage and current sensors, thermocouples, resistors and resistance thermometers
- Resolution from 13 to 16 bit

Technical specifications

Article number	6ES7431-0HH00-0AB0	6ES7431-1KF20-0AB0	6ES7431-1KF00-0AB0	6ES7431-1KF10-0AB0
	SM431, 16AE, +/-10V, +/-20mA, 4-20mA	SM431, 8AE, U/I/R, 14BIT, 0,416MS ZYKL	SM431, 8AE, U/I/R, 13BIT	SM431, 8AE, U/I/R, 14BIT
Product type designation				
Supply voltage				
Load voltage L+				
• Rated value (DC)	24 V; Only required for supplying 2-wire transmitters	24 V; Only required for supplying 2-wire transmitters	not necessary	24 V; Only required for supplying 2-wire transmitters
• Reverse polarity protection	Yes	Yes		Yes
Input current				
from load voltage L+ (without load), max.	400 mA; for 16 connected, fully controlled 2-wire transmitters	200 mA; for 8 connected, fully controlled 2-wire transmitters		200 mA; for 8 connected, fully controlled 2-wire transmitters
from backplane bus 5 V DC, max.	100 mA	1 000 mA	350 mA	600 mA
Power losses				
Power loss, typ.	2 W	4.9 W	1.8 W	3.5 W
Hardware configuration				
Slots				
• Required slots	1	1	1	1
Analog inputs				
Number of analog inputs	16	8	8	8
• For voltage/current measurement	16	8	8	8
• For resistance measurement		4	4	4
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)	18 V; 18 V continuous, 75 V for 1 ms (mark to space ratio 1:20)	50 V	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	40 mA; Permanent	50 mA; 40 mA continuous	40 mA; Permanent
Input ranges (rated values), voltages				
• 1 V to 5 V	Yes	Yes	Yes	Yes
• -1 V to +1 V	Yes	Yes	Yes	Yes
• -10 V to +10 V	Yes	Yes	Yes	Yes
• -2.5 V to +2.5 V				Yes
• -250 mV to +250 mV				Yes
• -5 V to +5 V				Yes
• -500 mV to +500 mV				Yes
• -80 mV to +80 mV				Yes

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Technical specifications (continued)

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Input ranges (rated values), currents				
• 0 to 20 mA				Yes
• -20 mA to +20 mA	Yes	Yes	Yes	
• 4 mA to 20 mA	Yes	Yes	Yes	Yes
Input ranges (rated values), thermoelements				
• 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
Input ranges (rated values), resistance thermometer				
• Ni 100				Yes
• Ni 1000				Yes
• Pt 100				Yes
• Pt 1000				Yes
• Pt 10000				Yes
• Pt 200				Yes
• Pt 500				Yes
Input ranges (rated values), resistors				
• 0 to 150 ohms				Yes
• 0 to 300 ohms				Yes
• 0 to 48 ohms				Yes
• 0 to 600 ohms		Yes	Yes	Yes
• 0 to 6000 ohms				Yes; Usable up to 5000 ohms
Thermocouple (TC)				
Temperature compensation				
- internal temperature compensation				No
- external temperature compensation with compensations socket				Yes
- external temperature compensation with Pt100				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	200 m	200 m	200 m; 50 m with thermocouples and input ranges <= 80 mV

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Analog value creation				
Integration and conversion time/ resolution per channel				
• Resolution with overrange (bit including sign), max.	13 bit	14 bit; 14 / 14 / 14	13 bit	14 bit; with activated filtering: 16 bits
• Integration time, parameterizable	Yes	Yes	Yes	Yes
• Basic conversion time (ms)	55 / 65 ms	52 µs	23 / 25 ms	20.1 / 23.5 ms
• Integration time (ms)	50 / 60 ms		16,7 / 20 ms	16,7 / 20 ms
• Basic conversion time, including integration time (ms)				
- additional conversion time for wire break monitoring				4,3 ms
- additional conversion time for resistance measurement				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	50 / 60 Hz	none / 400 / 60 / 50 Hz	50 / 60 Hz	50 / 60 Hz
Encoder				
Connection of signal encoders				
• for current measurement as 2-wire transducer		Yes	Yes; with external transmitter supply	Yes
• for current measurement as 4-wire transducer	Yes	Yes	Yes	Yes
• for resistance measurement with two-wire connection		Yes; Line resistances are also measured	Yes; Line resistances are also measured	Yes; Line resistances are also measured
• for resistance measurement with three-wire connection		Yes; Line resistances are also measured	Yes; Line resistances are also measured	Yes
• for resistance measurement with four-wire connection		Yes	Yes	Yes
Errors/accuracies				
Operational limit in overall temperature range				
• Voltage, relative to input area, (+/-)	0.65 %; 1.0 % at 1 to 5 V; 0.65 % at +/-1 V, +/-10 V	0.7 %; +/-0.7 % at +/-1 V; +/-0.9 % at +/-10 V, 1 to 5 V	1 %; +/-1.0 % at +/-1 V; +/-0.6 % at +/-10 V; +/-0.7 % at 1 to 5 V	0.38 %; +/-0.38 % at +/-80 mV; +/-0.35 % at +/-250 mV, +/-500mV, +/-1 V, +/-2.5 V, +/-5 V, 1 to 5 V, +/-10 V
• Current, relative to input area, (+/-)	0.65 %	0.8 %; at +/-20 mA, 4 to 20 mA	1 %; at +/-20 mA, 4 to 20 mA	0.35 %; +/-20 mA, 0 to 20 mA, 4 to 20 mA
• Resistance, relative to input area, (+/-)		1 %	1.25 %; 0 to 500 ohms (4-conductor measurement, in range of 600 ohms)	0.5 %
• Resistance thermometer, relative to input area, (+/-)				0.5 %
Basic error limit (operational limit at 25 °C)				
• Voltage, relative to input area, (+/-)	0.25 %; 0.5 % at 1 to 5 V; 0.25 % at +/-1 V, +/-10 V	0.6 %; 0.6 % at +/-1 V; 0.75 % at +/-10 V, 1 to 5 V	0.7 %; 0.7 % at +/-1 V; 0.4 % at +/-10 V; 0.5 % at 1 to 5 V	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 area, (+/-)	0.25 %; at +/-20 mA, 4 to 20 mA	0.7 %; at +/-20 mA, 4 to 20 mA	0.7 %; at +/-20 mA, 4 to 20 mA	0.15 %; +/-20 mA, 0 to 20 mA, 4 to 20 mA

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• Resistance, relative to input area, (+/-)		0.7 %; 0 to 600 ohms	0.8 %; 0 to 500 ohms (4-conductor measurement, in range of 600 ohms)	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 %
• Resistance thermometer, relative to input area, (+/-)				
Galvanic isolation				
Galvanic isolation analog inputs				
• Galvanic isolation analog inputs	No	Yes; internal / external	Yes; internal / external	Yes; internal / external
• between the channels	No	No	No	No
Permissible potential difference				
between the inputs (UCM)	2 V DC / 2 Vpp AC	8 V AC	30 V AC	120 V AC
Isolation				
Isolation checked with	500 V DC between bus and local ground	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	2120 V DC between bus and analog part; 500 V DC between bus and local ground; 2120 V DC between analog part and local ground	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
Dimensions				
Width	25 mm	25 mm	25 mm	25 mm
Height	290 mm	290 mm	290 mm	290 mm
Depth	210 mm	210 mm	210 mm	210 mm
Weights				
Weight, approx.	500 g	500 g	500 g	500 g

Article number	6ES7431-7QH00-0AB0 SM 431, 16AE, U/I/R/PT100, 16BIT	6ES7431-7KF00-0AB0 SM 431, 8AI, U/I/THERMO, 16BIT	6ES7431-7KF10-0AB0 SM 431, 8AI, RESIST./PT100, 16BIT
Product type designation			
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.	400 mA; for 16 connected, fully controlled 2-wire transmitters	400 mA	400 mA
from backplane bus 5 V DC, max.	700 mA	1 200 mA	650 mA
Power losses			
Power loss, typ.	4.5 W	4.6 W	3.3 W
Hardware configuration			
Slots			
• Required slots	1	1	1

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Technical specifications (continued)

Article number	6ES7431-7QH00-0AB0	6ES7431-7KF00-0AB0	6ES7431-7KF10-0AB0
	SM 431, 16AE, U/I/R/PT100, 16BIT	SM 431, 8AI, U/I/THERMO, 16BIT	SM 431, 8AI, RESIST/PT100, 16BIT
Isolation			
Isolation checked with	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	1500 V DC	1500 V DC
Dimensions			
Width	25 mm	25 mm	25 mm
Height	290 mm	290 mm	290 mm
Depth	210 mm	210 mm	210 mm
Weights			
Weight, approx.	500 g	650 g	650 g

Ordering data

Article No.	Article No.
SM 431 analog output modules	Cover film for labeling strips
16 inputs, non-isolated, 13 bit	Spare part
8 inputs, isolated, 13 bit	Labeling sheets for machine inscription
8 inputs, isolated, 14 bit, with linearization	DIN A4, for printing using laser printer; pack of 10
8 inputs, isolated, 14 bit	petrol
16 inputs, isolated, 16 bit, process interrupt capability	light-beige
8 inputs, isolated, 16 bit, process interrupt capability, for thermocouples (I, U)	yellow
8 inputs, isolated, 16 bit, process interrupt capability, for thermal resistors	red
Front connector	SIMATIC Manual Collection
48-pin	Electronic manuals on DVD, multilingual: LOGO!, SIMADYN, SIMATIC bus components, SIMATIC C7, SIMATIC distributed I/O, SIMATIC HMI, SIMATIC Sensors, SIMATIC NET, SIMATIC PC Based Automation, SIMATIC PCS 7, SIMATIC PG/PC, SIMATIC S7, SIMATIC Software, SIMATIC TDC
• with screw contacts, 1 unit	SIMATIC Manual Collection update service for 1 year
• with screw contacts, 84 units	Current "Manual Collection" DVD and the three subsequent updates
• with spring-loaded terminals, 1 unit	
• with crimp contacts, 1 unit	
• with crimp contacts, 84 units	
1 unit; for 6ES7431-7KF00-0AB0; spare part, included in scope of delivery	
Measuring range module for analog inputs	
1 module for 2 inputs (spare part)	