

# Technical specifications of the S7-400 digital input/output modules

Module type		Digital inputs SM 421			
Special features of this module	Module for the acquisition of very fast signals with parameterizable input delay and process alarms; diagnostics	Simple, economically priced module for the acquisition of frequently required signals with high channel density	Direct acquisition of DC and AC voltages at high channel density		Suitable for DC and AC voltage; can be implemented as active high and active low module
Type of voltage	DC		UC		
Input voltage	24 V		120 V	120/230 V	24 to 60 V
Diagnostics capability	■		■		
Interrupt capability	■		■		
Input delay	0,05 ms to 3 ms <sup>1)</sup>	3 ms fixed	<25 ms fixed		0,5 ms to 20 ms <sup>1)</sup>
Number of channels	16	32	32	16	16
Electrical isolation: Number of groups	2	1	4	4	16
Order No. group: 6ES7	421-7BH.	421-1BL.	421-1EL.	421-1FH.	421-7DH.

<sup>1)</sup> parameterizable

Module type		Digital inputs SM 422			
Special features of this module	Simple, economically priced module for standard applications	Simple, economically priced module for standard applications with high channel density	Extensive diagnostics functions; parameterizable substitute values	Electronic switching of high currents and voltages; no wear compared to relay output	Universal relay output group
Type of voltage	DC			AC	Relay
Output voltage	24 V			120/230 V	5-125 V DC
Output current	2 A	0,5 A		2 A	5 A
Diagnostics capability			■	■	
Interrupt capability			■		
Number of channels	16	32	32	16	16
Electrical isolation: Number of groups	2	1	4	4	8
Order No. group: 6ES7	422-1BH.	422-1BL.	422-7BL.	422-1FH.	422-1HH.

# Technical specifications of the S7-400 analog input modules

Module type		Analog inputs SM 431				
Special features of this module	Simple module for current and voltage measurement; high channel density	Universal module for current, voltage and resistance measurement	Universal module covering the most common measurement ranges and therefore greatly simplifying spare parts handling	Very fast analog value conversion with current value encryption; therefore suitable for acquisition of fast signals	Universal module, covering the most common measurement ranges; high resolution and precision; high channel density	High resolution and highly precise measurement of temperatures with thermocouples (TC); available as an option: Plug with integrated temperature compensation; single-channel, electrically isolated
Voltage measuring range Encoders	±1 V 1 to 5 V	±1 V ±10 V 1 to 5 V	± 80 mV ± 250 mV ± 500 mV ±1 V ±2.5 V ±5 V ±10 V 1 to 5 V	±1 V 1 to 5 V ±10 V	±25 mV, ±50 mV, ±80 mV, ±250 mV, ±500 mV, ±1 V, ±2.5 V, ±5 V, ±10 V, 1 to 5 V	
Diagnostics capability						■
Interrupt capability						■
Operating error	≤ ± 1%	< ± 1%	< ± 0,38%	< ± 0,9%	< ± 0,35%	< ± 0,3%
Number of channels	16	8			16	8
Electrical isolation: Number of groups	1	1			1	8
Resolution	12 bits + sign		13 bits + sign		15 bits + sign	
Conversion time per channel (50 Hz)	65 ms	25 ms	23 ms	52 μs <sup>1)</sup>	23 ms	20 ms
Order No. group: 6ES7	431-0HH.	431-1KF0.	431-1KF1.	431-1KF2.	431-7QH.	431-7KF0.

Module type		Analog inputs SM 431				
Special features of this module	Simple module for current and voltage measurement; high channel density	Universal module for current, voltage and resistance measurement	Universal module covering the most common measurement ranges and therefore greatly simplifying spare parts handling	Very fast analog value conversion with current value encryption; therefore suitable for acquisition of faster signals	Universal module, covering the most common measurement ranges; high resolution and precision; high channel density	High resolution and highly precise measurement of temperatures with thermocouples (TC); available as an option: Plug with integrated temperature compensation; single-channel, electrically isolated
Current measuring range Encoders	4 to 20 mA ±20 mA		4 to 20mA 0 to 20mA ±20 mA	4 to 20mA ±20 mA	4 to 20mA 0 to 20mA ±5 mA ±10 mA ±20 mA	4 to 20mA 0 to 20mA ±5 mA ±10 mA ±20 mA ±3.2 mA
Diagnostics capability						■
Interrupt capability						■
Operating error	≤ ± 0,65%	≤ ± 1%	≤ ± 0,35%	≤ ± 0,8%	≤ ± 0,3%	≤ ± 0,5%
Number of channels	16	8			16	8
Electrical isolation: Number of groups	1	1			1	8
Resolution	12 bits + sign		13 bits + sign		15 bits + sign	
Conversion time per channel (50 Hz)	65 ms	25 ms	23 ms	52 μs <sup>1)</sup>	23 ms	20 ms
Order No. group: 6ES7	431-0HH.	431-1KF0.	431-1KF1.	431-1KF2.	431-7QH.	431-7KF0.

<sup>1)</sup> Independent of the set interference frequency suppression

# Technical specifications of the S7-400 analog input modules

Module type	Analog inputs SM 431			
Special features of this module	Universal module for current, voltage and resistance measurement	Universal module covering the most common measurement ranges and therefore greatly simplifying spare parts handling	Very fast analog value conversion with current value encryption; therefore suitable for acquisition of fast signals	Universal module, covering the most common measurement ranges; high resolution and precision; high channel density
Resistance measuring range Encoders	0 - 600 Ω	0 - 48 Ω, 0 to 150 Ω, 0 to 300 Ω, 0 to 600 Ω, 0 to 6000 Ω	0 - 600 Ω	0 - 48 Ω, 0 to 150 Ω, 0 to 300 Ω, 0 to 600 Ω, 0 to 6000 Ω
Diagnostics capability				■
Interrupt capability				■
Operating error	≤ ± 1,25%	≤ ± 0,5%	≤ ± 1%	≤ ± 0,4%
Number of channels	4			8
Electrical isolation: Number of groups	1			1
Resolution	13 bits	14 bits		16 bits
Conversion time per channel (50 Hz)	25 ms	23 ms	52 μs <sup>1)</sup>	23 ms
Order No. group: 6ES7	431-1KF0.	431-1KF1.	431-1KF2.	431-7QH.

Module type	Analog inputs SM 431		
Special features of this module	Universal module covering the most common measurement ranges and therefore greatly simplifying spare parts handling	Universal module, covering the most common measurement ranges; high resolution and precision; high channel density	High resolution and highly precise measurement of temperatures with thermocouples (TC); available as an option: Plug with integrated temperature compensation; single-channel, electrically isolated
Thermocouple types	B, E, N, J, K, L, R, S, T, U		
Diagnostics capability	■		
Interrupt capability	■		
Operating error	≤ ± 14.8K	≤ ± 11.5K	≤ ± 3.5K
Number of channels	8	16	8
Electrical isolation: Number of groups	1		8
Resolution	14 bits	16 bits	
Conversion time per channel (50 Hz)	20/23 ms	6/21/23 ms	–
Order No. group: 6ES7	431-1KF1.	431-7QH.	431-7KF0.

Module type	Analog inputs SM 431		
Special features of this module	Universal module covering the most common measurement ranges and therefore greatly simplifying spare parts handling	Universal module, covering the most common measurement ranges; high resolution and precision; high channel density	High resolution and highly precise measurement of temperatures with the resistance temperature detector (RTD); single-channel, electrically isolated
Resistance thermometer types	Pt 100; 200; 500; 1000 Ni 100; 1000 <sup>2)</sup>	Pt 100; 200; 500; 1000 Ni 100; 1000 <sup>2)</sup>	
Diagnostics capability	■		
Interrupt capability	■		
Operating error	≤ ± 5.7K	≤ ± 4.9K	≤ ± 1K
Number of channels	4	8	
Electrical isolation: Number of groups	1		8
Resolution	14 bits	16 bits	
Conversion time per channel (50 Hz)	20/23 ms	6/21/23 ms	--
Order No. group: 6ES7	431-1KF1.	431-7QH.	431-7KF1.

<sup>1)</sup> Independent of the set interference frequency suppression

<sup>2)</sup> Standard and Climate respectively

# Technical specification of the S7-400 analog output modules, standards and approvals

Module type	Analog outputs SM 432
Special features of this module	Universal analog output module
Voltage	±10 V, 0 to 10 V, 1 to 5 V
Current	±20 mA, 0 to 20 mA, 4 to 20 mA
Diagnostics capability	
Interrupt capability	
Operating error	U: ± 0,5% I: ± 1%
Number of channels	8
Electrical isolation: Number of groups	1
Resolution	12 bits + sign
Conversion time per channel	< 420 µs
Order No. group: 6ES7	432-1HF.

The SIMATIC S7-400 complies with the following national and international standards	The failsafe CPUs comply <i>additionally</i> with the following standards
DIN, EN, IEC	IEC G1508 (SIL3)
CE	EN 954 (Category 4)
UL certificate	NFPA 79-2002, NFPA 85
CSA certificate	UL 1998, UL 508 and UL 991
FM class 1 div. 2; group A, B, C and D, temperature group T4 (≤135 °C)	
GOST	
C-Tick	
EU Directive 94/9/EC (ATEX 100a)	
Shipbuilding certification from <ul style="list-style-type: none"> <li>■ American Bureau of Shipping</li> <li>■ Bureau Veritas</li> <li>■ Det Norske Veritas</li> <li>■ German Lloyd</li> <li>■ Lloyds Register of Shipping</li> </ul>	
Max. permissible environmental temperature: 60 °C for all components	
Earthquake protection	

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