

SIMATIC S7-1200

Digital modules

SM 1221 digital input modules

Overview



- Digital inputs as supplement to the integral I/O of the CPUs
- For flexible adaptation of the controller to the relevant task
- For subsequent expansion of the system with additional inputs

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Technical specifications

	6ES7 221-1BF32-0XB0 SM 1221 DI 8x24 VDC	6ES7 221-1BH32-0XB0 SM 1221 DI 16x24 VDC
Supply voltage		
24 V DC	Yes	Yes
permissible range, upper limit (DC)	28.8 V	28.8 V
Input current		
from backplane bus 5 V DC, max.	105 mA	130 mA
Digital inputs		
• from load voltage L+ (without load), max.	4 mA; per channel	4 mA; per channel
Output voltage		
Power supply to the transmitters		
• present	Yes	Yes
Power losses		
Power loss, typ.	1.5 W	2.5 W
Digital inputs		
Number/binary inputs	8	16
• In groups of	2	4
Input characteristic curve acc. to IEC 61131, Type 1	Yes	Yes
Number of simultaneously controllable inputs		
• all mounting positions		
- up to 40 °C, max.	8	16
• horizontal installation		
- up to 40 °C, max.	8	16
- up to 50 °C, max.	8	16
• vertical installation		
- up to 40 °C, max.	8	16
Input voltage		
• Type of input voltage		DC
• Rated value, DC	24 V	24 V

Technical specifications (continued)

	6ES7 221-1BF32-0XB0 SM 1221 DI 8x24 VDC	6ES7 221-1BH32-0XB0 SM 1221 DI 16x24 VDC
Input current • for signal "0", max. (permissible quiescent current) • for signal "1", min. • for signal "1", typ.	1 mA 2.5 mA 4 mA; Typical	1 mA 2.5 mA 4 mA; Typical
Input delay (for rated value of input voltage) • for standard inputs - Parameterizable • for interrupt inputs - Parameterizable	Yes; 0.2, 0.4, 0.8, 1.6, 3.2, 6.4, and 12.8 ms, selectable in groups of four Yes	Yes; 0.2, 0.4, 0.8, 1.6, 3.2, 6.4, and 12.8 ms, selectable in groups of four Yes
Cable length • Cable length, shielded, max. • Cable length unshielded, max.	500 m 300 m	500 m 300 m
Interrupts/diagnostics/ status information		
Alarms • Alarms • Diagnostic alarm	Yes Yes	Yes Yes
Diagnostic messages • Diagnostic functions • Monitoring the supply voltage	Yes Yes	Yes Yes
Diagnostics indication LED • for status of the inputs • for maintenance • Status indicator digital input (green)	Yes Yes Yes	Yes Yes Yes
Galvanic isolation Galvanic isolation digital inputs • between the channels, in groups of	2	4
Degree and class of protection IP20	Yes	Yes
Standards, approvals, certificates		
CE mark	Yes	Yes
CSA approval		Yes
C-TICK	Yes	Yes
FM approval	Yes	Yes
Marine approval		Yes
Climatic and mechanical conditions for storage and transport Climatic conditions for storage and transport • Free fall - Drop height, max. (in packaging) • Temperature - Permissible temperature range • Air pressure acc. to IEC 60068-2-13 - Permissible air pressure	0.3 m; five times, in dispatch package -40 °C to +70 °C 1080 to 660 hPa	0.3 m; five times, in dispatch package -40 °C to +70 °C 1080 to 660 hPa

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Digital modules

SM 1221 digital input modules

Technical specifications (continued)

	6ES7 221-1BF32-0XB0 SM 1221 DI 8x24 VDC	6ES7 221-1BH32-0XB0 SM 1221 DI 16x24 VDC
Mechanical and climatic conditions during operation		
Climatic conditions in operation		
• Temperature		
- Min.		-20 °C
- max.		60 °C
- Permissible temperature change	5°C to 55°C, 3°C / minute	5°C to 55°C, 3°C / minute
Connection method		
required front connector	Yes	Yes
Mechanics/material		
Type of housing (front)		
• Plastic	Yes	Yes
Dimensions		
Width	45 mm	45 mm
Height	100 mm	100 mm
Depth	75 mm	75 mm
Weight		
Weight, approx.	170 g	210 g

Ordering data

	Order No.		Order No.
SM 1221 digital input signal module		S7-1200 automation system, System Manual	
8 inputs, 24 V DC, isolated, current sourcing/sinking	6ES7 221-1BF32-0XB0	For SIMATIC S7-1200 and STEP 7 Basic	
16 inputs, 24 V DC, isolated, current sourcing/sinking	6ES7 221-1BH32-0XB0	German	6ES7 298-8FA30-8AH0
Extension cable for two-tier configuration	6ES7 290-6AA30-0XA0	English	6ES7 298-8FA30-8BH0
for connecting digital/analog signal modules; length 2 m		French	6ES7 298-8FA30-8CH0
Terminal block (spare part)		Spanish	6ES7 298-8FA30-8DH0
for 8/16-channel digital signal modules		Italian	6ES7 298-8FA30-8EH0
with 7 screws, tin-plated; 4 pcs.	6ES7 292-1AG40-0XA0	Chinese	6ES7 298-8FA30-8KH0
Front flap set (spare part)		S7-1200 automation system, Easy Book	
for 8/16-channel signal modules	6ES7 291-1BA30-0XA0	Brief instructions	
		German	6ES7 298-8FA30-8AQ0
		English	6ES7 298-8FA30-8BQ0
		French	6ES7 298-8FA30-8CQ0
		Spanish	6ES7 298-8FA30-8DQ0
		Italian	6ES7 298-8FA30-8EQ0
		Chinese	6ES7 298-8FA30-8KQ0

Overview



- Digital inputs as a supplement to the integral I/O of SIMATIC S7-1200 CPUs
- Can be plugged directly into the CPU

Technical specifications

	6ES7 221-3AD30-0XB0 SB 1221 4xDI 5VDC 200kHz	6ES7 221-3BD30-0XB0 SB 1221 4xDI 24VDC 200kHz
Input current from backplane bus 5 V DC, typ.	50 mA	50 mA
Output voltage Power supply to the transmitters • Supply current, max.	4 mA; per channel	4 mA; per channel
Power losses Power loss, typ.	1 W	1 W
Digital inputs Number/binary inputs • In groups of	4; Current-sourcing 1	4; Current-sourcing 1
Input characteristic curve acc. to IEC 61131, Type 1	Yes	
Input characteristic curve acc. to IEC 61131, Type 2		Yes
Number of simultaneously controllable inputs • all mounting positions - up to 40 °C, max.	4	4
Input voltage • Rated value, DC • for signal "0" • for signal "1"	5 V 0 to 1 V 2 to 6 V	24 V 0 to 5 V 15 to 30 V
Input current • for signal "0", max. (permissible quiescent current) • for signal "1", min. • for signal "1", typ.	3 mA 6 mA	2 mA 5.8 mA 14 mA
Input delay (for rated value of input voltage) • for standard inputs - Parameterizable - at "0" to "1", max. • for interrupt inputs - Parameterizable • for counter/technological functions - Parameterizable	Yes; 0.2, 0.4, 0.8, 1.6, 3.2, 6.4, and 12.8 ms, selectable in groups of four 2 µs Yes Yes	Yes; 0.2, 0.4, 0.8, 1.6, 3.2, 6.4, and 12.8 ms, selectable in groups of four 2.5 µs Yes Yes
Cable length • Cable length, shielded, max.	50 m; Shielded, twisted wire pair	50 m; Standard input: 500 m, high-speed counters: 50 m

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Digital modules

SB 1221 digital input modules

Technical specifications (continued)

	6ES7 221-3AD30-0XB0 SB 1221 4xDI 5VDC 200kHz	6ES7 221-3BD30-0XB0 SB 1221 4xDI 24VDC 200kHz
Interrupts/diagnostics/ status information		
Alarms • Alarms	Yes	Yes
Diagnostic messages • Diagnostic functions	Yes	Yes
Diagnostics indication LED • for status of the inputs	Yes	Yes
Degree and class of protection		
IP20	Yes	Yes
Standards, approvals, certificates		
Marine approval according to Germanischer Lloyd	Yes	Yes
Climatic and mechanical conditions for storage and transport		
Climatic conditions for storage and transport		
• Free fall - Drop height, max. (in packaging)	0.3 m; five times, in dispatch package	0.3 m; five times, in dispatch package
• Temperature - Permissible temperature range	-40 °C to +70 °C	-40 °C to +70 °C
• Air pressure acc. to IEC 60068-2-13 - Permissible air pressure	1080 to 660 hPa	1080 to 660 hPa
Mechanical and climatic conditions during operation		
Climatic conditions in operation		
• Temperature - Permissible temperature range	0 °C to 55 °C horizontal installation 0 °C to 45 °C vertical installation	0 °C to 55 °C horizontal installation 0 °C to 45 °C vertical installation
Mechanics/material		
Type of housing (front) • Plastic	Yes	Yes
Dimensions		
Width	38 mm	38 mm
Height	62 mm	62 mm
Depth	21 mm	21 mm
Weight		
Weight, approx.	40 g	40 g

Ordering data	Order No.		Order No.
SB 1221 digital input signal boards		S7-1200 automation system, Easy Book	
4 inputs, 5 V DC, 200 kHz	6ES7 221-3AD30-0XB0	Brief instructions	
4 inputs, 24 V DC, 200 kHz	6ES7 221-3BD30-0XB0	German	6ES7 298-8FA30-8AQ0
Terminal block (spare part)		English	6ES7 298-8FA30-8BQ0
for signal board		French	6ES7 298-8FA30-8CQ0
with 6 screws, gold-plated; 4 pcs.	6ES7 292-1BF30-0XA0	Spanish	6ES7 298-8FA30-8DQ0
S7-1200 automation system, System Manual		Italian	6ES7 298-8FA30-8EQ0
for SIMATIC S7-1200 and STEP 7 Basic		Chinese	6ES7 298-8FA30-8KQ0
German	6ES7 298-8FA30-8AH0		
English	6ES7 298-8FA30-8BH0		
French	6ES7 298-8FA30-8CH0		
Spanish	6ES7 298-8FA30-8DH0		
Italian	6ES7 298-8FA30-8EH0		
Chinese	6ES7 298-8FA30-8KH0		

SIMATIC S7-1200

Digital modules

SM 1222 digital output modules

Overview



- Digital outputs as supplement to the integral I/O of the CPUs
- For flexible adaptation of the controller to the relevant task
- For subsequent expansion of the system with additional outputs

Technical specifications

	6ES7 222-1BF32-0XB0 SM 1222 DQ 8x24 VDC	6ES7 222-1BH32-0XB0 SM 1222 DQ 16x24 VDC	6ES7 222-1HF32-0XB0 SM 1222 DQ 8xRelay	6ES7 222-1HH32-0XB0 SM 1222 DQ 16xRelay	6ES7 222-1XF32-0XB0 SM 1222 DQ 8x relay changeover contact
Supply voltage					
permissible range, lower limit (DC)					5 V
permissible range, upper limit (DC)					30 V
Input current					
from backplane bus 5 V DC, max.	120 mA	140 mA	120 mA	135 mA	140 mA
Digital inputs					
• from load voltage L+ (without load), max.			11 mA/relay coil	11 mA/relay coil	16.7 mA/relay coil
Power losses					
Power loss, typ.	1.5 W	2.5 W	4.5 W	8.5 W	5 W
Digital inputs					
Number/binary inputs					0
Digital outputs					
Number/binary outputs	8	16	8	16	8
• In groups of	1	1	2	1	1
Functionality/short-circuit strength	No; to be provided externally	No; to be provided externally	No; to be provided externally	No; to be provided externally	No; to be provided externally
Limitation of inductive shutdown voltage to	typ. (L+) -48 V	typ. (L+) -48 V			
Switching capacity of the outputs					
• with resistive load, max.	0.5 A	0.5 A	2 A	2 A	2 A
• on lamp load, max.	5 W	5 W			
Output voltage					
• Rated value (AC)					5 to 250 V AC
• Rated value (DC)					5 to 30 V DC
• for signal "0", max.	24 V	24 V			
	0.1 V; with 10 kOhm load	0.1 V; with 10 kOhm load			
• for signal "1", min.	20 V DC	20 V DC			

Technical specifications (continued)

	6ES7 222-1BF32-0XB0 SM 1222 DQ 8x24 VDC	6ES7 222-1BH32-0XB0 SM 1222 DQ 16x24 VDC	6ES7 222-1HF32-0XB0 SM 1222 DQ 8xRelay	6ES7 222-1HH32-0XB0 SM 1222 DQ 16xRelay	6ES7 222-1XF32-0XB0 SM 1222 DQ 8x relay changeover contact
Output current					
• for signal "1" rated value	0.5 A	0.5 A	2 A	2 A	2 A
• for signal "1" permissible range, max.					
• for signal "0" residual current, max.	10 µA	10 µA			
Output delay with resistive load					
• "0" to "1", max.	50 µs	50 µs	10 ms	10 ms	10 ms
• "1" to "0", max.	200 µs	200 µs	10 ms	10 ms	10 ms
Aggregate current of outputs (per group)					
• horizontal installation					
- up to 50 °C, max.	4 A; Current per mass	8 A	10 A	10 A	2 A; Current per mass
Relay outputs					
• Number of relay outputs			8	16	8
• Rated input voltage of relay coil L+ (DC)			24 V	24 V	24 V
• Number of operating cycles, max.			mechanically 10 million, at rated load voltage 100,000	mechanically 10 million, at rated load voltage 100,000	mechanically 10 million, at rated load voltage 100,000
• Switching capacity of contacts					
- with inductive load, max.	0.5 A	0.5 A	2 A	2 A	2 A
- on lamp load, max.	5 W	5 W			
- Switching frequency/contacts/at ohmic load/maximum	0.5 A	0.5 A	2 A	2 A	2 A
Cable length					
• Cable length, shielded, max.	500 m	500 m	500 m	500 m	500 m
• Cable length unshielded, max.	150 m	150 m	150 m	150 m	150 m
Interrupts/diagnostics/status information					
Alarms					
• Alarms	Yes	Yes	Yes	Yes	Yes
• Diagnostic alarm	Yes	Yes	Yes	Yes	Yes
Diagnostic messages					
• Diagnostic functions	Yes	Yes	Yes	Yes	Yes
• Monitoring the supply voltage	Yes	Yes	Yes	Yes	
Diagnostics indication LED					
• For status of the outputs	Yes	Yes	Yes	Yes	Yes
• for maintenance	Yes	Yes	Yes	Yes	Yes
• Status indicator digital output (green)	Yes	Yes	Yes	Yes	Yes
Galvanic isolation					
Galvanic isolation digital outputs					
• between the channels			Relay	Relay	Relay
• between the channels, in groups of	1	1	2	4	1
• between the channels and the backplane bus	500 V AC	500 V AC	1500 V AC for 1 minute	1500 V AC for 1 minute	1500 V AC for 1 minute
Permissible potential difference					
between different circuits			750 V AC for 1 minute	750 V AC for 1 minute	750 V AC for 1 minute

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Digital modules

SM 1222 digital output modules

Technical specifications (continued)

	6ES7 222-1BF32-0XB0 SM 1222 DQ 8x24 VDC	6ES7 222-1BH32-0XB0 SM 1222 DQ 16x24 VDC	6ES7 222-1HF32-0XB0 SM 1222 DQ 8xRelay	6ES7 222-1HH32-0XB0 SM 1222 DQ 16xRelay	6ES7 222-1XF32-0XB0 SM 1222 DQ 8x relay changeover contact
Degree and class of protection					
IP20	Yes	Yes	Yes	Yes	Yes
Standards, approvals, certificates					
CE mark	Yes	Yes	Yes	Yes	Yes
CSA approval	Yes	Yes	Yes	Yes	Yes
C-TICK	Yes	Yes	Yes	Yes	Yes
FM approval	Yes	Yes	Yes	Yes	Yes
Marine approval	Yes	Yes	Yes	Yes	Yes
Climatic and mechanical conditions for storage and transport					
Climatic conditions for storage and transport					
• Free fall					
- Drop height, max. (in packaging)	0.3 m; five times, in dispatch package	0.3 m; five times, in dispatch package	0.3 m; five times, in dispatch package	0.3 m; five times, in dispatch package	0.3 m; five times, in dispatch package
• Temperature					
- Permissible temperature range	-40 °C to +70 °C	-40 °C to +70 °C	-40 °C to +70 °C	-40 °C to +70 °C	-40 °C to +70 °C
• Air pressure acc. to IEC 60068-2-13					
- Permissible air pressure	1080 to 660 hPa	1080 to 660 hPa	1080 to 660 hPa	1080 to 660 hPa	1080 to 660 hPa
Mechanical and climatic conditions during operation					
Climatic conditions in operation					
• Temperature					
- Min.	-20 °C	-20 °C	-20 °C	-20 °C	-20 °C
- max.	60 °C	60 °C	60 °C	60 °C	60 °C
- Permissible temperature change	5°C to 55°C, 3°C / minute	5°C to 55°C, 3°C / minute	5°C to 55°C, 3°C / minute	5°C to 55°C, 3°C / minute	5°C to 55°C, 3°C / minute
Connection method					
required front connector	Yes	Yes	Yes	Yes	Yes
Mechanics/material					
Type of housing (front)					
• Plastic	Yes	Yes	Yes	Yes	Yes
Dimensions					
Width	45 mm	45 mm	45 mm	45 mm	45 mm
Height	100 mm	100 mm	100 mm	100 mm	100 mm
Depth	75 mm	75 mm	75 mm	75 mm	75 mm
Weight					
Weight, approx.	180 g	220 g	190 g	260 g	310 g

Ordering data	Order No.	Order No.
SM 1222 digital output signal module 8 outputs, 24 V DC; 0.5 A, 5 W, isolated 16 outputs, 24 V DC; 0.5 A, 5 W, isolated 8 relay outputs, 5 ... 30 V DC / 5 ... 250 V AC, 2 A, 30 W DC / 200 W AC 8 relay outputs, change-over contact, 5 ... 30 V DC / 5 ... 250 V AC, 2 A, 30 W DC / 200 W AC 16 relay outputs, 5 ... 30 V DC / 5 ... 250 V AC, 2 A, 30 W DC / 200 W AC	6ES7 222-1BF32-0XB0 6ES7 222-1BH32-0XB0 6ES7 222-1HF32-0XB0 6ES7 222-1XF32-0XB0 6ES7 222-1HH32-0XB0	Terminal block (spare part) for 8/16-channel digital signal modules with 7 screws, tin-plated; 4 pcs. 6ES7 292-1AG30-0XA0 Front flap set (spare part) for 8/16-channel signal modules 6ES7 291-1BA30-0XA0 S7-1200 automation system, System Manual for SIMATIC S7-1200 and STEP 7 Basic German 6ES7 298-8FA30-8AH0 English 6ES7 298-8FA30-8BH0 French 6ES7 298-8FA30-8CH0 Spanish 6ES7 298-8FA30-8DH0 Italian 6ES7 298-8FA30-8EH0 Chinese 6ES7 298-8FA30-8KH0 S7-1200 automation system, Easy Book Brief instructions German 6ES7 298-8FA30-8AQ0 English 6ES7 298-8FA30-8BQ0 French 6ES7 298-8FA30-8CQ0 Spanish 6ES7 298-8FA30-8DQ0 Italian 6ES7 298-8FA30-8EQ0 Chinese 6ES7 298-8FA30-8KQ0
Extension cable for two-tier configuration for connecting digital/analog signal modules; length 2 m	6ES7 290-6AA30-0XA0	

SIMATIC S7-1200

Digital modules

SB 1222 digital output modules

Overview



- Digital outputs as a supplement to the integral I/O of SIMATIC S7-1200 CPUs
- Can be plugged directly into the CPU

Technical specifications

	6ES7 222-1AD30-0XB0 SB 1222 4xDQ 5VDC 200kHz	6ES7 222-1BD30-0XB0 SB 1222 4xDQ 24VDC 200kHz
Input current from backplane bus 5 V DC, typ.	50 mA	50 mA
Output voltage Power supply to the transmitters • Supply current, max.	4 mA; per channel	4 mA; per channel
Power losses Power loss, typ.	1 W	1 W
Digital outputs Number/binary outputs • In groups of	4; MOSFET, solid-state (current-sinking/current-sourcing) 1	4; MOSFET, solid-state (current-sinking/current-sourcing) 1
Functionality/short-circuit strength	No	No
Switching capacity of the outputs • with resistive load, max.	0.1 A	0.1 A
Load resistance range • upper limit	5 Ω	10 Ω
Output voltage • Rated value (DC) • for signal "0", max. • for signal "1", min. • for signal "1", max.	5 V 0.4 V L+ (-0.5 V) 6 V	24 V 0.1 V; with 10 kOhm load 20 V
Output current • for signal "1" rated value • for signal "1" permissible range, max. • for signal "0" residual current, max.	0.1 A 0.11 A	0.1 A 10 μA
Cable length • Cable length, shielded, max.	50 m	50 m

Technical specifications (continued)

	6ES7 222-1AD30-0XB0 SB 1222 4xDQ 5VDC 200kHz	6ES7 222-1BD30-0XB0 SB 1222 4xDQ 24VDC 200kHz
Interrupts/diagnostics /status information		
Alarms		
• Alarms	Yes	Yes
Diagnostic messages		
• Diagnostic functions	Yes	Yes
Diagnostics indication LED		
• For status of the outputs	Yes	Yes
Degree and class of protection		
IP20	Yes	Yes
Standards, approvals, certificates		
Marine approval according to Germanischer Lloyd	Yes	Yes
Climatic and mechanical conditions for storage and transport		
Climatic conditions for storage and transport		
• Free fall		
- Drop height, max. (in packaging)	0.3 m; five times, in dispatch package	0.3 m; five times, in dispatch package
• Temperature		
- Permissible temperature range	-40 °C to +70 °C	-40 °C to +70 °C
• Air pressure acc. to IEC 60068-2-13		
- Permissible air pressure	1080 to 660 hPa	1080 to 660 hPa
Mechanical and climatic conditions during operation		
Climatic conditions in operation		
• Temperature		
- Permissible temperature range	0 °C to 55 °C horizontal installation 0 °C to 45 °C vertical installation	0 °C to 55 °C horizontal installation 0 °C to 45 °C vertical installation
Mechanics/material		
Type of housing (front)		
• Plastic	Yes	Yes
Dimensions		
Width	38 mm	38 mm
Height	62 mm	62 mm
Depth	21 mm	21 mm
Weight		
Weight, approx.	40 g	40 g

SIMATIC S7-1200

Digital modules

SB 1222 digital output modules

Ordering data

SB 1222 digital output signal boards

4 outputs, 5 V DC, 0.1 A, 200 kHz

6ES7 222-1AD30-0XB0

4 outputs, 24 V DC, 0.1 A, 200 kHz

6ES7 222-1BD30-0XB0

Terminal block (spare part)

for signal board

with 6 screws, gold-plated; 4 pcs.

6ES7 292-1BF30-0XA0

S7-1200 automation system, System Manual

for SIMATIC S7-1200 and STEP 7 Basic

German

6ES7 298-8FA30-8AH0

English

6ES7 298-8FA30-8BH0

French

6ES7 298-8FA30-8CH0

Spanish

6ES7 298-8FA30-8DH0

Italian

6ES7 298-8FA30-8EH0

Chinese

6ES7 298-8FA30-8KH0

S7-1200 automation system, Easy Book

Brief instructions

German

6ES7 298-8FA30-8AQ0

English

6ES7 298-8FA30-8BQ0

French

6ES7 298-8FA30-8CQ0

Spanish

6ES7 298-8FA30-8DQ0

Italian

6ES7 298-8FA30-8EQ0

Chinese

6ES7 298-8FA30-8KQ0

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Overview



- Digital inputs and outputs as supplement to the integral I/O of the CPUs
- For flexible adaptation of the controller to the relevant task
- For subsequent expansion of the system with additional inputs and outputs

Technical specifications

	6ES7 223-1BH32-0XB0 SM 1223 DI 8x24 VDC, DQ 8x24 VDC	6ES7 223-1BL32-0XB0 SM 1223 DI 16x24 VDC, DQ 16x24 VDC	6ES7 223-1PH32-0XB0 SM 1223 DI 8x24 VDC, DQ 8xRelay	6ES7 223-1PL32-0XB0 SM 1223 DI 16x24 VDC, DQ 16xRelay	6ES7 223-1QH32-0XB0 SM 223 120/230 V AC DIx8/DQx8 RLY
Supply voltage 24 V DC	Yes	Yes	Yes	Yes	Yes
permissible range, lower limit (DC)		20.4 V			20.4 V
permissible range, upper limit (DC)	28.8 V	28.8 V	28.8 V	28.8 V	28.8 V
Input current from backplane bus 5 V DC, max.	145 mA	185 mA	145 mA	180 mA	120 mA
Digital inputs • from load voltage L+ (without load), max.	4 mA; per channel	4 mA; per channel	4 mA/input 11 mA/relay	4 mA/input 11 mA/relay	
Output voltage Power supply to the transmitters • present	Yes	Yes	Yes	Yes	Yes
Power losses Power loss, typ.	2.5 W	4.5 W	5.5 W	10 W	7.5 W
Digital inputs Number/binary inputs • In groups of	8 2	16 2	8 2	16 2	8 4
Input characteristic curve acc. to IEC 61131, Type 1	Yes	Yes	Yes	Yes	Yes
Number of simultaneously controllable inputs • all mounting positions - up to 40 °C, max.	8	16	8	16	8
• horizontal installation - up to 40 °C, max.	8	16	8	16	8
- up to 50 °C, max.	8	16	8	16	8
• vertical installation - up to 40 °C, max.	8	16	8	16	8

SIMATIC S7-1200

Digital modules

SM 1223 digital input/output modules

Technical specifications (continued)

	6ES7 223-1BH32-0XB0 SM 1223 DI 8x24 VDC, DQ 8x24 VDC	6ES7 223-1BL32-0XB0 SM 1223 DI 16x24 VDC, DQ 16x24 VDC	6ES7 223-1PH32-0XB0 SM 1223 DI 8x24 VDC, DQ 8xRelay	6ES7 223-1PL32-0XB0 SM 1223 DI 16x24 VDC, DQ 16xRelay	6ES7 223-1QH32-0XB0 SM 223 120/230 V AC DIx8/DQx8 RLY
Input voltage • Type of input voltage • Rated value, DC • for signal "0" • for signal "1"	24 V	DC 24 V 5 V DC at 1 mA 15 V DC at 2.5 mA	24 V	24 V	AC
Input current • for signal "0", max. (permissible quiescent current) • for signal "1", min. • for signal "1", typ.	1 mA 2.5 mA 4 mA; Typical	1 mA 2.5 mA 4 mA; Typical	1 mA 2.5 mA 4 mA; Typical	1 mA 2.5 mA 4 mA; Typical	1 mA 2.5 mA 9 mA; Typical
Input delay (for rated value of input voltage) • for standard inputs - Parameterizable • for interrupt inputs - Parameterizable	Yes; 0.2, 0.4, 0.8, 1.6, 3.2, 6.4, and 12.8 ms, selectable in groups of four Yes	Yes; 0.2, 0.4, 0.8, 1.6, 3.2, 6.4, and 12.8 ms, selectable in groups of four Yes	Yes; 0.2, 0.4, 0.8, 1.6, 3.2, 6.4, and 12.8 ms, selectable in groups of four Yes	Yes; 0.2, 0.4, 0.8, 1.6, 3.2, 6.4, and 12.8 ms, selectable in groups of four Yes	Yes; 0.2, 0.4, 0.8, 1.6, 3.2, 6.4, and 12.8 ms, selectable in groups of four Yes
Cable length • Cable length, shielded, max. • Cable length unshielded, max.	500 m 300 m	500 m 300 m	500 m 300 m	500 m 300 m	500 m 300 m
Digital outputs Number/binary outputs • In groups of	8 1	16 1	8 2	16 4	8 4
Functionality/short-circuit strength	No; to be provided externally	No; to be provided externally	No; to be provided externally	No; to be provided externally	No; to be provided externally
Limitation of inductive shutdown voltage to	L+ (-48 V)	L+ (-48 V)			
Switching capacity of the outputs • with resistive load, max. • on lamp load, max.	0.5 A 5 W	0.5 A 5 W	2 A	2 A	2 A
Output voltage • Rated value (DC) • for signal "0", max. • for signal "1", min.	24 V 0.1 V; with 10 kOhm load 20 V DC	24 V 0.1 V; with 10 kOhm load 20 V DC			
Output current • for signal "1" permissible range, max. • for signal "0" residual current, max.	0.5 A 10 µA	0.5 A 10 µA	2 A	2 A	2 A
Output delay with resistive load • "0" to "1", max. • "1" to "0", max.	50 µs 200 µs	50 µs 200 µs	10 ms 10 ms	10 ms 10 ms	10 ms 10 ms
Aggregate current of outputs (per group) • horizontal installation - up to 50 °C, max.	4 A; Current per mass	8 A; Current per mass	10 A; Current per mass	8 A; Current per mass	8 A; Current per mass

Technical specifications (continued)

	6ES7 223-1BH32-0XB0 SM 1223 DI 8x24 VDC, DQ 8x24 VDC	6ES7 223-1BL32-0XB0 SM 1223 DI 16x24 VDC, DQ 16x24 VDC	6ES7 223-1PH32-0XB0 SM 1223 DI 8x24 VDC, DQ 8xRelay	6ES7 223-1PL32-0XB0 SM 1223 DI 16x24 VDC, DQ 16xRelay	6ES7 223-1QH32-0XB0 SM 223 120/230 V AC DIx8/DQx8 RLY
Relay outputs					
<ul style="list-style-type: none"> Number of relay outputs Rated input voltage of relay coil L+ (DC) Number of operating cycles, max. 			8 24 V	16 24 V	8 24 V
<ul style="list-style-type: none"> Switching capacity of contacts <ul style="list-style-type: none"> with inductive load, max. on lamp load, max. Switching frequency/contacts/ at ohmic load/maximum 	0.5 A 5 W 0.5 A	0.5 A 5 W 0.5 A	2 A 2 A	2 A 2 A	2 A 2 A
Cable length					
<ul style="list-style-type: none"> Cable length, shielded, max. Cable length unshielded, max. 	500 m 150 m	500 m 150 m	500 m 150 m	500 m 150 m	500 m 150 m
Interrupts/diagnostics/ status information					
Alarms					
<ul style="list-style-type: none"> Alarms Diagnostic alarm 	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
Diagnostic messages					
<ul style="list-style-type: none"> Diagnostic functions Monitoring the supply voltage 	Yes Yes	Yes	Yes Yes	Yes Yes	Yes
Diagnostics indication LED					
<ul style="list-style-type: none"> for status of the inputs For status of the outputs for maintenance Status indicator digital output (green) Status indicator digital input (green) 	Yes Yes Yes Yes Yes	Yes Yes Yes Yes Yes	Yes Yes Yes Yes Yes	Yes Yes Yes Yes Yes	Yes Yes Yes Yes Yes
Galvanic isolation					
Galvanic isolation digital inputs					
<ul style="list-style-type: none"> between the channels, in groups of 	2	2	2	2	2
Galvanic isolation digital outputs					
<ul style="list-style-type: none"> between the channels between the channels, in groups of between the channels and the backplane bus 	1 500 V AC	1 500 V AC	Relay 2 1500 V AC for 1 minute	Relay 4 1500 V AC for 1 minute	Relay 2 1500 V AC for 1 minute
Permissible potential difference between different circuits					
			750 V AC for 1 minute	750 V AC for 1 minute	750 V AC for 1 minute
Degree and class of protection					
IP20	Yes	Yes	Yes	Yes	Yes
Standards, approvals, certificates					
CE mark	Yes	Yes	Yes	Yes	Yes
CSA approval	Yes		Yes	Yes	Yes
C-TICK	Yes	Yes	Yes	Yes	Yes
FM approval	Yes	Yes	Yes	Yes	Yes
Marine approval	Yes		Yes	Yes	Yes

SIMATIC S7-1200

Digital modules

SM 1223 digital input/output modules

Technical specifications (continued)

	6ES7 223-1BH32-0XB0 SM 1223 DI 8x24 VDC, DQ 8x24 VDC	6ES7 223-1BL32-0XB0 SM 1223 DI 16x24 VDC, DQ 16x24 VDC	6ES7 223-1PH32-0XB0 SM 1223 DI 8x24 VDC, DQ 8xRelay	6ES7 223-1PL32-0XB0 SM 1223 DI 16x24 VDC, DQ 16xRelay	6ES7 223-1QH32-0XB0 SM 223 120/230 V AC DIx8/DQx8 RLY
Climatic and mechanical conditions for storage and transport Climatic conditions for storage and transport					
• Free fall - Drop height, max. (in packaging)	0.3 m; five times, in dispatch package	0.3 m; five times, in dispatch package	0.3 m; five times, in dispatch package	0.3 m; five times, in dispatch package	0.3 m; five times, in dispatch package
• Temperature - Permissible temperature range	-40 °C to +70 °C	-40 °C to +70 °C	-40 °C to +70 °C	-40 °C to +70 °C	-40 °C to +70 °C
• Air pressure acc. to IEC 60068-2-13 - Permissible air pressure	1080 to 660 hPa	1080 to 660 hPa	1080 to 660 hPa	1080 to 660 hPa	1080 to 660 hPa
Mechanical and climatic conditions during operation Climatic conditions in operation					
• Temperature - Min. - max.	-20 °C 60 °C	-20 °C 60 °C	-20 °C 60 °C	-20 °C 60 °C	-20 °C 60 °C
- Permissible temperature change	5°C to 55°C, 3°C / minute	5°C to 55°C, 3°C / minute	5°C to 55°C, 3°C / minute	5°C to 55°C, 3°C / minute	5°C to 55°C, 3°C / minute
Connection method required front connector	Yes	Yes	Yes	Yes	Yes
Mechanics/material Type of housing (front)					
• Plastic	Yes	Yes	Yes	Yes	Yes
Dimensions					
Width	45 mm	70 mm	45 mm	70 mm	45 mm
Height	100 mm	100 mm	100 mm	100 mm	100 mm
Depth	75 mm	75 mm	75 mm	75 mm	75 mm
Weight Weight, approx.	210 g	310 g	230 g	350 g	230 g

Ordering data	Order No.	Order No.
SM 1223 digital input/output signal module 8 inputs, 24 V DC, IEC type 1 current sinking; 8 24 V DC transistor outputs, 0.5 A, 5 W 16 inputs, 24 V DC, IEC type 1 current sinking; 16 24 V DC transistor outputs, 0.5 A, 5 W 8 inputs, 24 V DC, IEC type 1 current sinking; 8 relay outputs, 5 ... 30 V DC/5 ... 250 V AC, 2 A, 30 W DC/200 W AC 16 inputs, 24 V DC, IEC type 1 current sinking; 16 relay outputs, 5 ... 30 V DC/5 ... 250 V AC, 2 A, 30 W DC/200 W AC 8 inputs, 120/230 V AC; 8 relay outputs, 5 ... 30 V DC/5 ... 250 V AC, 2 A, 30 W DC/200 W AC	6ES7 223-1BH32-0XB0 6ES7 223-1BL32-0XB0 6ES7 223-1PH32-0XB0 6ES7 223-1PL32-0XB0 6ES7 223-1QH32-0XB0	Front flap set (spare part) for 8/16-channel signal modules 6ES7 291-1BA30-0XA0 for 32-channel signal modules 6ES7 291-1BB30-0XA0 S7-1200 automation system, System Manual for SIMATIC S7-1200 and STEP 7 Basic German 6ES7 298-8FA30-8AH0 English 6ES7 298-8FA30-8BH0 French 6ES7 298-8FA30-8CH0 Spanish 6ES7 298-8FA30-8DH0 Italian 6ES7 298-8FA30-8EH0 Chinese 6ES7 298-8FA30-8KH0 S7-1200 automation system, Easy Book Brief instructions German 6ES7 298-8FA30-8AQ0 English 6ES7 298-8FA30-8BQ0 French 6ES7 298-8FA30-8CQ0 Spanish 6ES7 298-8FA30-8DQ0 Italian 6ES7 298-8FA30-8EQ0 Chinese 6ES7 298-8FA30-8KQ0
Extension cable for two-tier configuration for connecting digital/analog signal modules; length 2 m	6ES7 290-6AA30-0XA0	
Terminal block (spare part) for 8/16-channel digital signal modules with 7 screws, tin-plated; 4 pcs.	6ES7 292-1AG40-0XA0	

SIMATIC S7-1200

Digital modules

SB 1223 digital input/output modules

Overview



- Digital inputs and outputs as supplement to the integral I/O of the SIMATIC S7-1200 CPUs
- Can be plugged direct into the CPU

Technical specifications

	6ES7 223-0BD30-0XB0 SB 1223 DI2x24 VDC, DO 2x24 VDC	6ES7 223-3AD30-0XB0 SB 1223 2xDI / 2xDQ 5VDC 200kHz	6ES7 223-3BD30-0XB0 SB 1223 2xDI / 2xDQ 24VDC 200kHz
Supply voltage			
permissible range, lower limit (DC)	20.4 V		
permissible range, upper limit (DC)	30 V		
Input current			
from backplane bus 5 V DC, typ.	50 mA	50 mA	50 mA
Output voltage			
Power supply to the transmitters			
• Supply current, max.	4 mA; per channel	4 mA; per channel	4 mA; per channel
Power losses			
Power loss, typ.	1 W	1 W	1 W
Digital inputs			
Number/binary inputs	2; Current-sinking	2; Current-sourcing	2; Current-sourcing
• In groups of	1	1	1
Input characteristic curve acc. to IEC 61131, Type 1	Yes	Yes	Yes
Number of simultaneously controllable inputs			
• all mounting positions			
- up to 40 °C, max.	2	2	2
Input voltage			
• Type of input voltage	DC		
• Rated value, DC	24 V	5 V	24 V
• for signal "0"	0 to 5 V	0 to 1 V	0 to 5 V
• for signal "1"	15 to 30 V	2 to 6 V	15 to 30 V
Input current			
• for signal "0", max. (permissible quiescent current)	1 mA	3 mA	2 mA
• for signal "1", min.		6 mA	5.8 mA
• for signal "1", typ.	0.5 A		14 mA

Technical specifications (continued)

	6ES7 223-0BD30-0XB0 SB 1223 DI2x24 VDC, DQ 2x24 VDC	6ES7 223-3AD30-0XB0 SB 1223 2xDI / 2xDQ 5VDC 200kHz	6ES7 223-3BD30-0XB0 SB 1223 2xDI / 2xDQ 24VDC 200kHz
Input delay (for rated value of input voltage)			
• for standard inputs			
- Parameterizable	Yes; 0.2, 0.4, 0.8, 1.6, 3.2, 6.4, and 12.8 ms, selectable in groups of four	Yes; 0.2, 0.4, 0.8, 1.6, 3.2, 6.4, and 12.8 ms, selectable in groups of four	Yes; 0.2, 0.4, 0.8, 1.6, 3.2, 6.4, and 12.8 ms, selectable in groups of four
- at "0" to "1", max.	2 µs	2 µs	2.5 µs
- at "1" to "0", max.	10 µs		
• for interrupt inputs			
- Parameterizable	Yes	Yes	Yes
• for counter/technological functions			
- Parameterizable	Yes	Yes	Yes
Cable length			
• Cable length, shielded, max.	500 m	50 m	Standard input: 500 m, high-speed counters: 50 m
• Cable length unshielded, max.	300 m		
Digital outputs			
Number/binary outputs	2; MOSFET, solid-state (current-sinking/current-sourcing)	2; MOSFET, solid-state (current-sinking/current-sourcing)	2; MOSFET, solid-state (current-sinking/current-sourcing)
• In groups of	1	1	1
Functionality/short-circuit strength	No	No	No
Switching capacity of the outputs			
• with resistive load, max.	0.5 A	0.1 A	0.1 A
• on lamp load, max.	5 W		
Load resistance range			
• upper limit	0.6 Ω	5 Ω	10 Ω
Output voltage			
• Rated value (DC)	24 V	5 V	24 V
• for signal "0", max.	0.1 V; with 10 kOhm load	0.4 V	0.1 V; with 10 kOhm load
• for signal "1", min.	20 V	L+ (-0.5 V)	20 V
• for signal "1", max.		6 V	
Output current			
• for signal "1" rated value	0.5 A	0.1 A	0.1 A
• for signal "1" permissible range, max.		0.11 A	
• for signal "0" residual current, max.	10 µA		10 µA
Cable length			
• Cable length, shielded, max.	500 m	50 m	50 m
• Cable length unshielded, max.	150 m		
Interrupts/diagnostics/ status information			
Alarms			
• Alarms	Yes	Yes	Yes
Diagnostic messages			
• Diagnostic functions	Yes	Yes	Yes
Diagnostics indication LED			
• for status of the inputs	Yes	Yes	Yes
• For status of the outputs	Yes	Yes	Yes
Degree and class of protection			
IP20	Yes	Yes	Yes
Standards, approvals, certificates			
Marine approval according to Germanischer Lloyd	Yes	Yes	Yes

SIMATIC S7-1200

Digital modules

SB 1223 digital input/output modules

Technical specifications (continued)

	6ES7 223-0BD30-0XB0 SB 1223 DI2x24 VDC, DQ 2x24 VDC	6ES7 223-3AD30-0XB0 SB 1223 2xDI / 2xDQ 5VDC 200kHz	6ES7 223-3BD30-0XB0 SB 1223 2xDI / 2xDQ 24VDC 200kHz
Climatic and mechanical conditions for storage and transport Climatic conditions for storage and transport			
• Free fall - Drop height, max. (in packaging)	0.3 m; five times, in dispatch package	0.3 m; five times, in dispatch package	0.3 m; five times, in dispatch package
• Temperature - Permissible temperature range	-40 °C to +70 °C	-40 °C to +70 °C	-40 °C to +70 °C
• Air pressure acc. to IEC 60068-2-13 - Permissible air pressure	1080 to 660 hPa	1080 to 660 hPa	1080 to 660 hPa
Mechanical and climatic conditions during operation Climatic conditions in operation			
• Temperature - Permissible temperature range	0 °C to 55 °C horizontal installation 0 °C to 45 °C vertical installation	0 °C to 55 °C horizontal installation 0 °C to 45 °C vertical installation	0 °C to 55 °C horizontal installation 0 °C to 45 °C vertical installation
Mechanics/material Type of housing (front)			
• Plastic	Yes	Yes	Yes
Dimensions			
Width	38 mm	38 mm	38 mm
Height	62 mm	62 mm	62 mm
Depth	21 mm	21 mm	21 mm
Weight Weight, approx.	40 g	40 g	40 g

Ordering data

SB 1223 digital input/output signal boards

2 inputs, 24 V DC, IEC type 1 current sinking; 2 24 V DC transistor outputs, 0.5 A, 5 W; can be used as HSC at up to 30 kHz

6ES7 223-0BD30-0XB0

2 inputs, 5 V DC, 200 kHz
2 outputs 5 V DC, 0.1 A, 200 kHz

6ES7 223-3AD30-0XB0

2 inputs, 24 V DC, 200 kHz
2 outputs 24 V DC, 0.1 A, 200 kHz

6ES7 223-3BD30-0XB0

Terminal block (spare part)

for signal board
with 6 screws, gold-plated; 4 pcs.

6ES7 292-1BF30-0XA0

S7-1200 automation system, System Manual

for SIMATIC S7-1200 and STEP 7 Basic

German

6ES7 298-8FA30-8AH0

English

6ES7 298-8FA30-8BH0

French

6ES7 298-8FA30-8CH0

Spanish

6ES7 298-8FA30-8DH0

Italian

6ES7 298-8FA30-8EH0

Chinese

6ES7 298-8FA30-8KH0

S7-1200 automation system, Easy Book

Brief instructions

German

6ES7 298-8FA30-8AQ0

English

6ES7 298-8FA30-8BQ0

French

6ES7 298-8FA30-8CQ0

Spanish

6ES7 298-8FA30-8DQ0

Italian

6ES7 298-8FA30-8EQ0

Chinese

6ES7 298-8FA30-8KQ0

Overview



- Analog inputs for SIMATIC S7-1200
- With extremely short conversion times
- For connecting analog sensors without additional amplifiers
- For solving even more complex automation tasks

Technical specifications

	6ES7 231-4HD32-0XB0	6ES7 231-4HF32-0XB0	6ES7 231-5ND32-0XB0
Supply voltage 24 V DC	Yes		Yes
Input current Current consumption, typ.	45 mA		65 mA
from backplane bus 5 V DC, typ.	80 mA		80 mA
Power losses Power loss, typ.	1.5 W		1.8 W
Analog inputs Number of analog inputs	4; Current or voltage differential inputs	8; Current or voltage differential inputs	4; Current or voltage differential inputs
permissible input frequency for current input (destruction limit), max.	± 35 V	± 35 V	± 35 V
permissible input voltage for voltage input (destruction limit), max.	35 V	35 V	35 V
permissible input current for voltage input (destruction limit), max.	40 mA	40 mA	40 mA
permissible input current for current input (destruction limit), max.	40 mA	40 mA	40 mA
Cycle time (all channels) max.	625 µs	625 µs	625 µs
Input ranges • Voltage • Current	Yes; ±10 V, ±5 V, ±2.5 V Yes; 4 to 20 mA, 0 to 20 mA	Yes; ±10 V, ±5 V, ±2.5 V Yes; 4 to 20 mA, 0 to 20 mA	Yes; ±10 V, ±5 V, ±2.5 V o. ±1.25 V Yes; 4 to 20 mA, 0 to 20 mA
Input ranges (rated values), voltages • -1.25 V to +1.25 V • -10 V to +10 V • Input resistance (-10 V to +10 V) • -2.5 V to +2.5 V • Input resistance (-2.5 V to +2.5 V) • -5 V to +5 V • Input resistance (-5 V to +5 V)	Yes ≥9 MOhm Yes ≥9 MOhm Yes ≥9 MOhm	Yes ≥9 MOhm Yes ≥9 MOhm Yes ≥9 MOhm	Yes Yes ≥9 MOhm Yes ≥9 MOhm Yes ≥9 MOhm
Input ranges (rated values), currents • 0 to 20 mA • Input resistance (0 to 20 mA) • 4 to 20 mA	Yes 280 Ω Yes	Yes	Yes Yes

SIMATIC S7-1200

Analog modules

SM 1231 analog input modules

Technical specifications (continued)

	6ES7 231-4HD32-0XB0	6ES7 231-4HF32-0XB0	6ES7 231-5ND32-0XB0
Analog value creation			
Integrations and conversion time/ resolution per channel			
• Resolution with overrange (bit including sign), max.	12 bit; + sign	12 bit; + sign	15 bit; + sign
• Integration time, parameterizable	Yes	Yes	Yes
• Interference voltage suppression for interference frequency f1 in Hz	40 dB, DC to 60 V for interference frequency 50 / 60 Hz	40 dB, DC to 60 V for interference frequency 50 / 60 Hz	40 dB, DC to 60 V for interference frequency 50 / 60 Hz
Smoothing of measured values			
• Parameterizable	Yes	Yes	Yes
• Step: None	Yes	Yes	Yes
• Step: low	Yes	Yes	Yes
• Step: Medium	Yes	Yes	Yes
• Step: High	Yes	Yes	Yes
Errors/accuracies			
Temperature error (relative to input area)	25 °C ±0.1 % to 55 °C ±0.2 % total measurement range	25 °C ±0.1 % to 55 °C ±0.2 % total measurement range	25 °C ±0.1 % / ±0.3% total measurement range
Basic error limit (operational limit at 25 °C)			
• Voltage, relative to input area	+/- 0,1 %	+/- 0,1 %	+/- 0,1 %
• Current, relative to input area	+/- 0,1 %	+/- 0,1 %	+/- 0,1 %
Interference voltage suppression for f = n x (f1 +/- 1%), f1 = interference frequency			
• common mode voltage, max.	12 V	12 V	12 V
Interrupts/diagnostics/ status information			
Alarms			
• Alarms	Yes	Yes	Yes
• Diagnostic alarm	Yes	Yes	Yes
Diagnostic messages			
• Diagnostic functions	Yes	Yes	Yes
• Monitoring the supply voltage	Yes	Yes	Yes
• Wire break	Yes	Yes	Yes
Diagnostics indication LED			
• for status of the inputs	Yes	Yes	Yes
• for maintenance	Yes	Yes	Yes
Galvanic isolation			
Galvanic isolation analog outputs			
• between the channels and the power supply of the electronics	No	No	No
Degree and class of protection			
IP20	Yes	Yes	Yes
Standards, approvals, certificates			
CE mark	Yes	Yes	Yes
CSA approval	Yes	Yes	Yes
C-TICK	Yes	Yes	Yes
FM approval	Yes	Yes	Yes
Marine approval	Yes	Yes	Yes

Technical specifications (continued)

	6ES7 231-4HD32-0XB0	6ES7 231-4HF32-0XB0	6ES7 231-5ND32-0XB0
Climatic and mechanical conditions for storage and transport			
Climatic conditions for storage and transport			
• Free fall			
- Drop height, max. (in packaging)	0.3 m; five times, in dispatch package	0.3 m; five times, in dispatch package	0.3 m; five times, in dispatch package
• Temperature			
- Permissible temperature range	-40 °C to +70 °C	-40 °C to +70 °C	-40 °C to +70 °C
• Air pressure acc. to IEC 60068-2-13			
- Permissible air pressure	1080 to 660 hPa	1080 to 660 hPa	1080 to 660 hPa
Mechanical and climatic conditions during operation			
Climatic conditions in operation			
• Temperature			
- Min.	-20 °C	-20 °C	-20 °C
- max.	60 °C	60 °C	60 °C
• Air pressure acc. to IEC 60068-2-13			
- Permissible air pressure	1080 to 795 hPa	1080 to 795 hPa	1080 to 795 hPa
• Pollutant concentrations			
- SO ₂ at RH < 60% without condensation	SO ₂ : < 0.5 ppm; H ₂ S: < 0.1 ppm; RH < 60% condensation-free	SO ₂ : < 0.5 ppm; H ₂ S: < 0.1 ppm; RH < 60% condensation-free	SO ₂ : < 0.5 ppm; H ₂ S: < 0.1 ppm; RH < 60% condensation-free
Connection method			
required front connector	Yes	Yes	Yes
Mechanics/material			
Type of housing (front)			
• Plastic	Yes	Yes	Yes
Dimensions			
Width	45 mm	45 mm	45 mm
Height	100 mm	100 mm	100 mm
Depth	75 mm	75 mm	75 mm
Weight			
Weight, approx.	180 g	180 g	180 g

SIMATIC S7-1200

Analog modules

SM 1231 analog input modules

Ordering data	Order No.		Order No.
SM 1231 analog input signal module 4 analog inputs, $\pm 10V$, $\pm 5V$, $\pm 2.5V$, or 0 ... 20 mA, 16 bits 4 analog inputs, $\pm 10V$, $\pm 5V$, $\pm 2.5V$, or 0 ... 20 mA, 12 bits + sign 8 analog inputs, $\pm 10V$, $\pm 5V$, $\pm 2.5V$, or 0 ... 20 mA, 12 bits + sign	6ES7 231-5ND32-0XB0 6ES7 231-4HD32-0XB0 6ES7 231-4HF32-0XB0	S7-1200 automation system, System Manual for SIMATIC S7-1200 and STEP 7 Basic German English French Spanish Italian Chinese	 6ES7 298-8FA30-8AH0 6ES7 298-8FA30-8BH0 6ES7 298-8FA30-8CH0 6ES7 298-8FA30-8DH0 6ES7 298-8FA30-8EH0 6ES7 298-8FA30-8KH0
Extension cable for two-tier configuration for connecting digital/analog signal modules; length 2 m	6ES7 290-6AA30-0XA0	S7-1200 automation system, Easy Book Brief instructions German English French Spanish Italian Chinese	 6ES7 298-8FA30-8AQ0 6ES7 298-8FA30-8BQ0 6ES7 298-8FA30-8CQ0 6ES7 298-8FA30-8DQ0 6ES7 298-8FA30-8EQ0 6ES7 298-8FA30-8KQ0
Terminal block (spare part) for 8/16-channel analog signal modules with 7 screws, gold-plated; 4 pcs.	6ES7 292-1BG30-0XA0		
Front flap set (spare part) for 8/16-channel signal modules	6ES7 291-1BA30-0XA0		

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Overview

- Analog input module for the SIMATIC S7-1200
- With extremely short conversion times
- For the connection of analog sensors without additional amplifiers
- For the solution of more complex automation tasks as well
- Can be plugged directly into the CPU

Technical specifications

6ES7 231-4HA30-0XB0 SB1231 AI 1x12 BIT		6ES7 231-4HA30-0XB0 SB1231 AI 1x12 BIT	
Supply voltage 24 V DC	Yes	Analog value creation Measurement principle	integrating
Input current from backplane bus 5 V DC, typ.	55 mA	Integrations and conversion time/ resolution per channel	
Power losses Power loss, typ.	0.4 W	• Resolution with overrange (bit including sign), max.	11 bit; + sign
Analog inputs Number of analog inputs	1; Current or voltage differential inputs	• Integration time, parameterizable	Yes
permissible input frequency for current input (destruction limit), max.	± 35 V	• Interference voltage suppression for interference frequency f1 in Hz	40 dB, DC to 60 Hz
permissible input voltage for voltage input (destruction limit), max.	35 V	Smoothing of measured values	
permissible input current for voltage input (destruction limit), max.	40 mA	• Parameterizable	Yes
permissible input current for current input (destruction limit), max.	40 mA	• Step: None	Yes
Cycle time (all channels) max.	156.25 µs; 400 Hz suppression	• Step: low	Yes
Input ranges		• Step: Medium	Yes
• Voltage	Yes; ±10 V, ±5 V, ±2.5 V	• Step: High	Yes
• Current	Yes; 0 to 20 mA	Errors/accuracies	
• Thermocouple	No	Temperature error (relative to input area)	25 °C ±0.3% to 55 °C ±0.6% total measurement range
• Resistance thermometer	No	Interrupts/diagnostics/ status information	
• Resistance	No	Alarms	
Input ranges (rated values), voltages		• Alarms	Yes
• -10 V to +10 V	Yes	• Diagnostic alarm	Yes
• Input resistance (-10 V to +10 V)	≥9 MOhm	Diagnostic messages	
• -2.5 V to +2.5 V	Yes	• Diagnostic functions	Yes
• Input resistance (-2.5 V to +2.5 V)	≥9 MOhm	• Wire break	No
• -5 V to +5 V	Yes	Diagnosics indication LED	
• Input resistance (-5 V to +5 V)	≥9 MOhm	• for status of the inputs	Yes
Input ranges (rated values), currents		• for maintenance	Yes
• 0 to 20 mA	Yes	Degree and class of protection	
• Input resistance (0 to 20 mA)	≥ 250 ohms	IP20	Yes
		Standards, approvals, certificates	
		CE mark	Yes
		C-TICK	Yes
		FM approval	Yes

SIMATIC S7-1200

Analog modules

SB 1231 analog input modules

Technical specifications (continued)

6ES7 231-4HA30-0XB0 SB1231 AI 1x12 BIT		6ES7 231-4HA30-0XB0 SB1231 AI 1x12 BIT	
Climatic and mechanical conditions for storage and transport Climatic conditions for storage and transport <ul style="list-style-type: none"> • Free fall <ul style="list-style-type: none"> - Drop height, max. (in packaging) • Temperature <ul style="list-style-type: none"> - Permissible temperature range • Air pressure acc. to IEC 60068-2-13 <ul style="list-style-type: none"> - Permissible air pressure 		0.3 m; five times, in dispatch package -40 °C to +70 °C 1080 to 660 hPa	Connection method required front connector Yes
Mechanical and climatic conditions during operation Climatic conditions in operation <ul style="list-style-type: none"> • Temperature <ul style="list-style-type: none"> - Permissible temperature range • Air pressure acc. to IEC 60068-2-13 <ul style="list-style-type: none"> - Permissible air pressure • Pollutant concentrations <ul style="list-style-type: none"> - SO2 at RH < 60% without condensation 		0 °C to 55 °C horizontal installation 0 °C to 45 °C vertical installation 1080 to 795 hPa SO2: < 0,5 ppm; H2S: < 0,1 ppm; RH < 60% condensation-free	Mechanics/material Type of housing (front) <ul style="list-style-type: none"> • Plastic Yes
		Dimensions Width Height Depth	38 mm 62 mm 21 mm
		Weight Weight, approx.	35 g

Ordering data

Order No.	Order No.
SB 1231 analog input signal board 1 analog input, ±10 V with 12 bits or 0 ... 20 mA with 11 bits	6ES7 231-4HA30-0XB0
Terminal block (spare part) for signal board with 6 screws, gold-plated; 4 pcs.	6ES7 292-1BF30-0XA0
S7-1200 automation system, System Manual for SIMATIC S7-1200 and STEP 7 Basic	6ES7 298-8FA30-8AH0 6ES7 298-8FA30-8BH0 6ES7 298-8FA30-8CH0 6ES7 298-8FA30-8DH0 6ES7 298-8FA30-8EH0 6ES7 298-8FA30-8KH0
S7-1200 automation system, Easy Book Brief instructions German English French Spanish Italian Chinese	6ES7 298-8FA30-8AQ0 6ES7 298-8FA30-8BQ0 6ES7 298-8FA30-8CQ0 6ES7 298-8FA30-8DQ0 6ES7 298-8FA30-8EQ0 6ES7 298-8FA30-8KQ0

Overview



- Analog outputs for SIMATIC S7-1200
- With extremely short conversion times
- For connecting analog actuators without additional amplifiers
- For solving even more complex automation tasks

Technical specifications

	6ES7 232-4HB32-0XB0 SM 1232 AQ 2x14 bit	6ES7 232-4HD32-0XB0 SM 1232 AQ 4 x 14bit
Supply voltage 24 V DC	Yes	Yes
Input current Current consumption, typ. from backplane bus 5 V DC, typ.	45 mA 80 mA	45 mA 80 mA
Power losses Power loss, typ.	1.5 W	1.5 W
Analog inputs Number of analog inputs	0	
Thermocouple (TC) • Temperature compensation - Parameterizable	No	No
Analog outputs Number of analog outputs	2; Current or voltage	4; Current or voltage
Output ranges, voltage • -10 to +10 V	Yes	Yes
Output ranges, current • 0 to 20 mA	Yes	Yes
Load impedance (in rated range of output) • with voltage outputs, min. • with current outputs, max.	1 000 Ω 600 Ω	1 000 Ω 600 Ω
Analog value creation Measurement principle	Differential	Differential
Integrations and conversion time/ resolution per channel • Resolution (incl. overrange) • Integration time, parameterizable • Interference voltage suppression for interference frequency f1 in Hz	Voltage: 14 bits; Current : 13 bits Yes 40 dB, DC to 60 V for interference frequency 50 / 60 Hz	Voltage: 14 bits; Current : 13 bits Yes 40 dB, DC to 60 V for interference frequency 50 / 60 Hz

SIMATIC S7-1200

Analog modules

SM 1232 analog output modules

Technical specifications (continued)

	6ES7 232-4HB32-0XB0 SM 1232 AQ 2x14 bit	6ES7 232-4HD32-0XB0 SM 1232 AQ 4 x 14bit
Errors/accuracies		
Temperature error (relative to output area)	25 °C ±0.3% to 55 °C ±0.6% total measurement range	25 °C ±0.3% to 55 °C ±0.6% total measurement range
Basic error limit (operational limit at 25 °C)		
• Voltage, relative to output area	+/- 0,3 %	+/- 0,3 %
• Current, relative to output area	+/- 0,3 %	+/- 0,3 %
Interference voltage suppression for $f = n \times (f_1 \pm 1\%)$, f_1 = interference frequency		
• common mode voltage, max.	12 V	12 V
Interrupts/diagnostics/ status information		
Alarms		
• Alarms	Yes	Yes
• Diagnostic alarm	Yes	Yes
Diagnostic messages		
• Diagnostic functions	Yes	Yes
• Monitoring the supply voltage	Yes	Yes
• Wire break	Yes	Yes
• Short circuit	Yes	Yes
Diagnostics indication LED		
• For status of the outputs	Yes	Yes
• for maintenance	Yes	Yes
Degree and class of protection		
IP20	Yes	Yes
Standards, approvals, certificates		
CE mark	Yes	Yes
C-TICK	Yes	Yes
FM approval	Yes	Yes
Climatic and mechanical conditions for storage and transport		
Climatic conditions for storage and transport		
• Free fall		
- Drop height, max. (in packaging)	0.3 m; five times, in dispatch package	0.3 m; five times, in dispatch package
• Temperature		
- Permissible temperature range	-40 °C to +70 °C	-40 °C to +70 °C
• Air pressure acc. to IEC 60068-2-13		
- Permissible air pressure	1080 to 660 hPa	1080 to 660 hPa
Mechanical and climatic conditions during operation		
Climatic conditions in operation		
• Temperature		
- Min.	-20 °C	-20 °C
- max.	60 °C	60 °C
• Air pressure acc. to IEC 60068-2-13		
- Permissible air pressure	1080 to 795 hPa	1080 to 795 hPa
• Pollutant concentrations		
- SO ₂ at RH < 60% without condensation	SO ₂ : < 0.5 ppm; H ₂ S: < 0.1 ppm; RH < 60% condensation-free	SO ₂ : < 0.5 ppm; H ₂ S: < 0.1 ppm; RH < 60% condensation-free

Technical specifications (continued)

	6ES7 232-4HB32-0XB0 SM 1232 AQ 2x14 bit	6ES7 232-4HD32-0XB0 SM 1232 AQ 4 x 14bit
Connection method required front connector	Yes	Yes
Mechanics/material Type of housing (front) • Plastic	Yes	Yes
Dimensions Width	45 mm	45 mm
Height	100 mm	100 mm
Depth	75 mm	75 mm
Weight Weight, approx.	180 g	180 g

Ordering data

Ordering data	Order No.	Ordering data	Order No.
SM 1232 analog output signal module 2 analog outputs, ±10 V with 14 bits or 0 ... 20 mA with 13 bits 4 analog outputs, ±10 V with 14 bits or 0 ... 20 mA with 13 bits	6ES7 232-4HB32-0XB0 6ES7 232-4HD32-0XB0	S7-1200 automation system, System Manual for SIMATIC S7-1200 and STEP 7 Basic German English French Spanish Italian Chinese	6ES7 298-8FA30-8AH0 6ES7 298-8FA30-8BH0 6ES7 298-8FA30-8CH0 6ES7 298-8FA30-8DH0 6ES7 298-8FA30-8EH0 6ES7 298-8FA30-8KH0
Terminal block (spare part) for 8/16-channel analog signal modules with 7 screws, gold-plated; 4 pcs.	6ES7 292-1BG30-0XA0	S7-1200 automation system, Easy Book Brief instructions German English French Spanish Italian Chinese	6ES7 298-8FA30-8AQ0 6ES7 298-8FA30-8BQ0 6ES7 298-8FA30-8CQ0 6ES7 298-8FA30-8DQ0 6ES7 298-8FA30-8EQ0 6ES7 298-8FA30-8KQ0
Extension cable for two-tier configuration for connecting digital/analog signal modules; length 2 m	6ES7 290-6AA30-0XA0		
Front flap set (spare part) for 8/16-channel signal modules	6ES7 291-1BA30-0XA0		

SIMATIC S7-1200

Analog modules

SB 1232 analog output modules

Overview



- Analog output for the SIMATIC S7-1200
- Can be plugged direct into the CPU

Technical specifications

	6ES7 232-4HA30-0XB0 SB 1232 1x AO
Input current from backplane bus 5 V DC, typ.	15 mA
Output voltage Power supply to the transmitters • Supply current, max.	25 mA
Power losses Power loss, typ.	1.5 W
Analog outputs Number of analog outputs	1
Cycle time (all channels) max.	Voltage: 300 μ S (R), 750 μ S (1 μ F) Current: 600 ms (1 mH); 2 ms (10 mH)
Output ranges, voltage • -10 to +10 V	Yes
Output ranges, current • 0 to 20 mA	Yes
Load impedance (in rated range of output) • with voltage outputs, min. • with current outputs, max.	1 000 Ω 600 Ω
Cable length • Cable length, shielded, max.	10 m; Shielded, twisted wire pair
Analog value creation Measurement principle	Differential
Integrations and conversion time/ resolution per channel • Resolution (incl. overrange)	V/12 bits, I/11 bits
Smoothing of measured values • Parameterizable	Yes
Errors/accuracies Temperature error (relative to output area)	25°C \pm 0.5% bis 55°C \pm 1%
Interrupts/diagnostics/ status information Alarms • Alarms	Yes
Diagnostic messages • Diagnostic functions	Yes
Diagnostics indication LED • For status of the outputs	Yes

	6ES7 232-4HA30-0XB0 SB 1232 1x AO
Degree and class of protection IP20	Yes
Standards, approvals, certificates CE mark	Yes
C-TICK	Yes
FM approval	Yes
Climatic and mechanical conditions for storage and transport Climatic conditions for storage and transport • Free fall - Drop height, max. (in packaging)	0.3 m; five times, in dispatch package
• Temperature - Permissible temperature range	-40 °C to +70 °C
• Air pressure acc. to IEC 60068-2-13 - Permissible air pressure	1080 to 660 hPa
Mechanical and climatic conditions during operation Climatic conditions in operation • Temperature - Permissible temperature range	0 °C to 55 °C horizontal installation 0 °C to 45 °C vertical installation
• Pollutant concentrations - SO ₂ at RH < 60% without condensation	SO ₂ : < 0.5 ppm; H ₂ S: < 0.1 ppm; RH < 60% condensation-free
Mechanics/material Type of housing (front) • Plastic	Yes
Dimensions Width	38 mm
Height	62 mm
Depth	21 mm
Weight Weight, approx.	40 g

SIMATIC S7-1200

Analog modules

SB 1232 analog output modules

Ordering data	Order No.		Order No.
SB 1232 analog output signal board 1 analog output, ± 10 V with 12 bits or 0 ... 20 mA with 11 bits	6ES7 232-4HA30-0XB0		
Terminal block (spare part) for signal board with 6 screws, gold-plated; 4 pcs.	6ES7 292-1BF30-0XA0		
S7-1200 automation system, System Manual for SIMATIC S7-1200 and STEP 7 Basic German English French Spanish Italian Chinese	6ES7 298-8FA30-8AH0 6ES7 298-8FA30-8BH0 6ES7 298-8FA30-8CH0 6ES7 298-8FA30-8DH0 6ES7 298-8FA30-8EH0 6ES7 298-8FA30-8KH0	S7-1200 automation system, Easy Book Brief instructions German English French Spanish Italian Chinese	6ES7 298-8FA30-8AQ0 6ES7 298-8FA30-8BQ0 6ES7 298-8FA30-8CQ0 6ES7 298-8FA30-8DQ0 6ES7 298-8FA30-8EQ0 6ES7 298-8FA30-8KQ0

SIMATIC S7-1200

Analog modules

SM 1234 analog input/output modules

Overview



- Analog inputs and outputs for the SIMATIC S7-1200
- With extremely short conversion times
- For connecting analog actuators and sensors without additional amplifiers
- For solving even more complex automation tasks

Technical specifications

6ES7 234-4HE32-0XB0 SM 1234 A I4x13 bit AQ 2x14 bit	
Supply voltage 24 V DC	Yes
Input current Current consumption, typ.	60 mA
from backplane bus 5 V DC, typ.	80 mA
Power losses Power loss, typ.	2 W
Analog inputs Number of analog inputs	4; Current or voltage differential inputs
permissible input frequency for current input (destruction limit), max.	± 35 V
permissible input voltage for voltage input (destruction limit), max.	35 V
permissible input current for voltage input (destruction limit), max.	40 mA
permissible input current for current input (destruction limit), max.	40 mA
Cycle time (all channels) max.	625 µs
Input ranges • Voltage • Current • Thermocouple • Resistance thermometer • Resistance	Yes; ±10 V, ±5 V, ±2.5 V Yes; 0 to 20 mA No No No
Input ranges (rated values), voltages • -10 V to +10 V • Input resistance (-10 V to +10 V) • -2.5 V to +2.5 V • Input resistance (-2.5 V to +2.5 V) • -5 V to +5 V • Input resistance (-5 V to +5 V)	Yes ≥9 MOhm Yes ≥9 MOhm Yes ≥9 MOhm

6ES7 234-4HE32-0XB0 SM 1234 A I4x13 bit AQ 2x14 bit	
Input ranges (rated values), currents • 0 to 20 mA • Input resistance (0 to 20 mA)	Yes 280 Ω
Thermocouple (TC) • Temperature compensation - Parameterizable	No
Analog outputs Number of analog outputs	2; Current or voltage
Output ranges, voltage • -10 to +10 V	Yes
Output ranges, current • 0 to 20 mA	Yes
Load impedance (in rated range of output) • with voltage outputs, min. • with current outputs, max.	1 000 Ω 600 Ω
Analog value creation Measurement principle	Differential
Integrations and conversion time/ resolution per channel • Resolution (incl. overrange) • Integration time, parameterizable • Interference voltage suppression for interference frequency f1 in Hz	Voltage: 14 bits; Current : 13 bits Yes 40 dB, DC to 60 V for interference frequency 50 / 60 Hz
Smoothing of measured values • Parameterizable • Step: None • Step: low • Step: Medium • Step: High	Yes Yes Yes Yes Yes

Technical specifications (continued)

	6ES7 234-4HE32-0XB0 SM 1234 A I4x13 bit AQ 2x14 bit
Errors/accuracies	
Temperature error (relative to input area)	25 °C ±0.1 % to 55 °C ±0.2 % total measurement range
Temperature error (relative to output area)	25 °C ±0.3% to 55 °C ±0.6% total measurement range
Basic error limit (operational limit at 25 °C)	
• Voltage, relative to input area	+/- 0,1 %
• Current, relative to input area	+/- 0,1 %
• Voltage, relative to output area	+/- 0,3 %
• Current, relative to output area	+/- 0,3 %
Interference voltage suppression for $f = n \times (f_1 \pm 1\%)$, $f_1 =$ interference frequency	
• common mode voltage, max.	12 V
Interrupts/diagnostics/status information	
Alarms	
• Alarms	Yes
• Diagnostic alarm	Yes
Diagnostic messages	
• Diagnostic functions	Yes
• Monitoring the supply voltage	Yes
• Wire break	Yes
• Short circuit	Yes
Diagnostics indication LED	
• for status of the inputs	Yes
• For status of the outputs	Yes
• for maintenance	Yes
Galvanic isolation	
Galvanic isolation analog outputs	
• between the channels and the power supply of the electronics	No
Degree and class of protection	
IP20	Yes
Standards, approvals, certificates	
CE mark	Yes
C-TICK	Yes
FM approval	Yes

	6ES7 234-4HE32-0XB0 SM 1234 A I4x13 bit AQ 2x14 bit
Climatic and mechanical conditions for storage and transport	
Climatic conditions for storage and transport	
• Free fall	
- Drop height, max. (in packaging)	0.3 m; five times, in dispatch package
• Temperature	
- Permissible temperature range	-40 °C to +70 °C
• Air pressure acc. to IEC 60068-2-13	
- Permissible air pressure	1080 to 660 hPa
Mechanical and climatic conditions during operation	
Climatic conditions in operation	
• Temperature	
- Permissible temperature range	0 °C to 55 °C horizontal installation 0 °C to 45 °C vertical installation
• Air pressure acc. to IEC 60068-2-13	
- Permissible air pressure	1080 to 795 hPa
• Pollutant concentrations	
- SO ₂ at RH < 60% without condensation	SO ₂ : < 0.5 ppm; H ₂ S: < 0.1 ppm; RH < 60% condensation-free
Connection method	
required front connector	Yes
Mechanics/material	
Type of housing (front)	
• Plastic	Yes
Dimensions	
Width	45 mm
Height	100 mm
Depth	75 mm
Weight	
Weight, approx.	220 g

SIMATIC S7-1200

Analog modules

SM 1234 analog input/output modules

Ordering data	Order No.		Order No.
SM 1234 analog input/output signal module 4 analog inputs, ±10 V, ±5 V, ±2.5 V, or 0 ... 20 mA, 12 bits + sign; 2 analog outputs, ±10 V with 14 bits or 0 ... 20 mA with 13 bits	6ES7 234-4HE32-0XB0	S7-1200 automation system, System Manual for SIMATIC S7-1200 and STEP 7 Basic German English French Spanish Italian Chinese	6ES7 298-8FA30-8AH0 6ES7 298-8FA30-8BH0 6ES7 298-8FA30-8CH0 6ES7 298-8FA30-8DH0 6ES7 298-8FA30-8EH0 6ES7 298-8FA30-8KH0
Terminal block (spare part) for 8/16-channel analog signal modules with 7 screws, gold-plated; 4 pcs.	6ES7 292-1BG30-0XA0	S7-1200 automation system, Easy Book Brief instructions German English French Spanish Italian Chinese	6ES7 298-8FA30-8AQ0 6ES7 298-8FA30-8BQ0 6ES7 298-8FA30-8CQ0 6ES7 298-8FA30-8DQ0 6ES7 298-8FA30-8EQ0 6ES7 298-8FA30-8KQ0
Extension cable for two-tier configuration for connecting digital/analog signal modules; length 2 m	6ES7 290-6AA30-0XA0		
Front flap set (spare part) for 8/16-channel signal modules	6ES7 291-1BA30-0XA0		

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Overview

- For the convenient recording of temperatures with great accuracy
- 7 common thermocouple types can be used
- Also for the measurement of analog signals with a low level (± 80 mV)
- Can easily be retrofitted to existing plant

Technical specifications

	6ES7 231-5QD30-0XB0 SM1231 TC 4x16 bit	6ES7 231-5QF30-0XB0 SM 1231 TC 8x16bit
Supply voltage 24 V DC	Yes	Yes
Input current Current consumption, typ.	40 mA	80 mA
from backplane bus 5 V DC, typ.	80 mA	80 mA
Power losses Power loss, typ.	1.5 W	1.5 W
Analog inputs Number of analog inputs	4; Thermocouples	8; Thermocouples
permissible input frequency for current input (destruction limit), max.	± 35 V	± 35 V
Technical unit for temperature measurement adjustable	Degrees Celsius/degrees Fahrenheit	Degrees Celsius/degrees Fahrenheit
Input ranges • Thermocouple	Yes; J, K, T, E, R, S, N, C, TXK/XK(L); voltage range: +/-80 mV	Yes; J, K, T, E, R, S, N, C, TXK/XK(L); voltage range: +/-80 mV
Input ranges (rated values), voltages • -80 mV to +80 mV	Yes	Yes
Input ranges (rated values), thermoelements • Type C • Type E • Type J • Type K • Type N • Type R • Type S • Type T • Type TXK/TXK(L) to GOST	Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes	Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes
Thermocouple (TC) • permissible input voltage for voltage input (destruction limit), max. • Temperature compensation - Parameterizable	+ -35V No	+ -35V No
Analog value creation Measurement principle	integrating	integrating
Integrations and conversion time/ resolution per channel • Resolution with overrange (bit including sign), max. • Integration time, parameterizable • Interference voltage suppression for interference frequency f1 in Hz	15 bit; + sign No 85 dB at 50 / 60 / 400 Hz	15 bit; + sign No 85 dB at 50 / 60 / 400 Hz

SIMATIC S7-1200

Analog modules

SM 1231 thermocouple modules

Technical specifications (continued)

	6ES7 231-5QD30-0XB0 SM1231 TC 4x16 bit	6ES7 231-5QF30-0XB0 SM 1231 TC 8x16bit
Analog value generation (in isochronous mode) Smoothing of measured values • Parameterizable	Yes	Yes
Errors/accuracies cold connection point		+/-1.5 °C
Temperature error (relative to input area)	25 °C ±0.1 % to 55 °C ±0.2 % total measurement range	25 °C ±0.1 % to 55 °C ±0.2 % total measurement range
Interference voltage suppression for $f = n \times (f_1 \pm 1\%)$, $f_1 =$ interference frequency • Common mode interference, min.	120 dB	120 dB
Interrupts/diagnostics/ status information Alarms • Alarms • Diagnostic alarm	Yes Yes	Yes Yes
Diagnostic messages • Diagnostic functions • Monitoring the supply voltage • Wire break	Yes; Can be read out Yes Yes	Yes; Can be read out Yes Yes
Diagnostics indication LED • for status of the inputs • for maintenance	Yes Yes	Yes Yes
Degree and class of protection IP20	Yes	Yes
Standards, approvals, certificates CE mark	Yes	Yes
C-TICK	Yes	Yes
FM approval	Yes	Yes
Climatic and mechanical conditions for storage and transport Climatic conditions for storage and transport • Free fall - Drop height, max. (in packaging) • Temperature - Permissible temperature range • Air pressure acc. to IEC 60068-2-13 - Permissible air pressure	0.3 m; five times, in dispatch package -40 °C to +70 °C 1080 to 660 hPa	0.3 m; five times, in dispatch package -40 °C to +70 °C 1080 to 660 hPa

Technical specifications (continued)

	6ES7 231-5QD30-0XB0 SM1231 TC 4x16 bit	6ES7 231-5QF30-0XB0 SM 1231 TC 8x16bit
Mechanical and climatic conditions during operation		
Climatic conditions in operation		
• Temperature		
- Permissible temperature range	0 °C to 55 °C horizontal installation 0 °C to 45 °C vertical installation	0 °C to 55 °C horizontal installation 0 °C to 45 °C vertical installation
• Air pressure acc. to IEC 60068-2-13		
- Permissible air pressure	1080 to 795 hPa	1080 to 795 hPa
• Pollutant concentrations		
- SO ₂ at RH < 60% without condensation	SO ₂ : < 0.5 ppm; H ₂ S: < 0.1 ppm; RH < 60% condensation-free	SO ₂ : < 0.5 ppm; H ₂ S: < 0.1 ppm; RH < 60% condensation-free
Connection method		
required front connector	Yes	Yes
Mechanics/material		
Type of housing (front)		
• Plastic	Yes	Yes
Dimensions		
Width	45 mm	45 mm
Height	100 mm	100 mm
Depth	75 mm	75 mm
Weight		
Weight, approx.	180 g	220 g

Ordering data

Ordering data	Order No.	Ordering data	Order No.
SM 1231 thermocouple module		S7-1200 automation system, System Manual	
4 inputs +/- 80 mV, resolution 15 bits + sign, thermocouple types J, K, S, T, R, E, N	6ES7 231-5QD30-0XB0	for SIMATIC S7-1200 and STEP 7 Basic	
8 inputs +/- 80 mV, resolution 15 bits + sign, thermocouple types J, K, T, E, R, S, N, C, TXK/XK(L)	6ES7 231-5QF30-0XB0	German	6ES7 298-8FA30-8AH0
Accessories		English	6ES7 298-8FA30-8BH0
Terminal block (spare part)		French	6ES7 298-8FA30-8CH0
for 8/16-channel analog signal modules		Spanish	6ES7 298-8FA30-8DH0
with 7 screws, gold-plated; 4 pcs.	6ES7 292-1BG30-0XA0	Italian	6ES7 298-8FA30-8EH0
Extension cable for two-tier configuration		Chinese	6ES7 298-8FA30-8KH0
for connecting digital/analog signal modules; length 2 m	6ES7 290-6AA30-0XA0	S7-1200 automation system, Easy Book	
Front flap set (spare part)		Brief instructions	
for 8/16-channel signal modules	6ES7 291-1BA30-0XA0	German	6ES7 298-8FA30-8AQ0
		English	6ES7 298-8FA30-8BQ0
		French	6ES7 298-8FA30-8CQ0
		Spanish	6ES7 298-8FA30-8DQ0
		Italian	6ES7 298-8FA30-8EQ0
		Chinese	6ES7 298-8FA30-8KQ0

SIMATIC S7-1200

Analog modules

SB 1231 thermocouple signal boards

Overview

- For the convenient recording of temperatures with great accuracy
- 1 input with 16-bit resolution
- Common thermocouple types can be used
- Also for the measurement of analog signals with a low level (± 80 mV)
- Can easily be retrofitted to existing plant
- Can be plugged directly into the CPU

Technical specifications

6ES7 231-5QA30-0XB0 SB1231 AI 1xTC		6ES7 231-5QA30-0XB0 SB1231 AI 1xTC	
Supply voltage 24 V DC	Yes	Analog value generation (in isochronous mode) Smoothing of measured values • Parameterizable	Yes
Input current Current consumption, typ.	5 mA	Errors/accuracies Temperature error (relative to input area)	25 °C ± 0.1 % to 55 °C ± 0.2 % total measurement range
from backplane bus 5 V DC, typ.	20 mA	Interference voltage suppression for $f = n \times (f_1 \pm 1\%)$, $f_1 =$ interference frequency • Common mode interference, min.	120 dB
Power losses Power loss, typ.	0.5 W	Interrupts/diagnostics/ status information Alarms • Alarms • Diagnostic alarm	Yes Yes
Analog inputs Number of analog inputs	1; Thermocouples	Diagnostic messages • Diagnostic functions • Wire break	Yes; Can be read out Yes
permissible input frequency for current input (destruction limit), max.	± 35 V	Diagnostics indication LED • for status of the inputs • for maintenance	Yes Yes
Technical unit for temperature measurement adjustable	Degrees Celsius/ degrees Fahrenheit	Degree and class of protection IP20	Yes
Input ranges • Thermocouple	Yes; J, K; voltage range ± 80 mV	Standards, approvals, certificates CE mark	Yes
Input ranges (rated values), voltages • -80 mV to +80 mV	Yes	C-TICK	Yes
Input ranges (rated values), thermoelements • Type J • Input resistance (type J) • Type K • Input resistance (Type K)	Yes 1200°C Yes 1372°C	FM approval	Yes
Thermocouple (TC) • permissible input voltage for voltage input (destruction limit), max. • Temperature compensation - Parameterizable	+35V No	Climatic and mechanical conditions for storage and transport Climatic conditions for storage and transport • Free fall - Drop height, max. (in packaging)	0,3 m; five times, in dispatch package
Analog value creation Measurement principle	integrating	• Temperature - Permissible temperature range • Air pressure acc. to IEC 60068-2-13 - Permissible air pressure	-40 °C to +70 °C 1080 to 660 hPa
Integrations and conversion time/ resolution per channel	15 bit; + sign		
• Resolution with overrange (bit including sign), max. • Integration time, parameterizable • Interference voltage suppression for interference frequency f_1 in Hz	No 85 dB at 10 / 50 / 60 / 400 Hz		

Technical specifications (continued)

	6ES7 231-5QA30-0XB0 SB1231 AI 1xTC	6ES7 231-5QA30-0XB0 SB1231 AI 1xTC
Mechanical and climatic conditions during operation		
Climatic conditions in operation		
• Temperature		
- Permissible temperature range	0 °C to 55 °C horizontal installation 0 °C to 45 °C vertical installation	
• Air pressure acc. to IEC 60068-2-13		
- Permissible air pressure	1080 to 795 hPa	
• Pollutant concentrations		
- SO ₂ at RH < 60% without condensation	SO ₂ : < 0.5 ppm; H ₂ S: < 0.1 ppm; RH < 60% condensation-free	
Connection method		
required front connector		Yes
Mechanics/material		
Type of housing (front)		Yes
• Plastic		
Dimensions		
Width		38 mm
Height		62 mm
Depth		21 mm
Weight		
Weight, approx.		35 g

Ordering data

Ordering data	Order No.	Ordering data	Order No.
SB 1231 thermocouple signal board	6ES7 231-5QA30-0XB0	S7-1200 automation system, Easy Book	
1 input +/- 80 mV, resolution 15 bits + sign, thermocouples type J, K		Brief instructions	
Accessories		German	6ES7 298-8FA30-8AQ0
Terminal block (spare part)		English	6ES7 298-8FA30-8BQ0
for signal board		French	6ES7 298-8FA30-8CQ0
with 6 screws, gold-plated; 4 pcs.	6ES7 292-1BF30-0XA0	Spanish	6ES7 298-8FA30-8DQ0
S7-1200 automation system, System Manual		Italian	6ES7 298-8FA30-8EQ0
for SIMATIC S7-1200 and STEP 7 Basic		Chinese	6ES7 298-8FA30-8KQ0
German	6ES7 298-8FA30-8AH0		
English	6ES7 298-8FA30-8BH0		
French	6ES7 298-8FA30-8CH0		
Spanish	6ES7 298-8FA30-8DH0		
Italian	6ES7 298-8FA30-8EH0		
Chinese	6ES7 298-8FA30-8KH0		

SIMATIC S7-1200

Analog modules

SM 1231 RTD signal modules

Overview

- For the convenient recording of temperatures with great accuracy
- 4 inputs
- Most popular resistance temperature detectors can be used
- Can easily be retrofitted to existing installation

Technical specifications

	6ES7 231-5PD30-0XB0 SM1231 RTD 4x16bit	6ES7 231-5PF30-0XB0 SM 1231 RTD 8x16bit
Supply voltage 24 V DC	Yes	Yes
Input current Current consumption, typ.	40 mA	90 mA
from backplane bus 5 V DC, typ.	80 mA	80 mA
Power losses Power loss, typ.	1.5 W	1.5 W
Analog inputs Number of analog inputs	4; Resistance thermometer	8; Resistance thermometer
permissible input frequency for current input (destruction limit), max.	± 35 V	± 35 V
Technical unit for temperature measurement adjustable	Degrees Celsius/degrees Fahrenheit	Degrees Celsius/degrees Fahrenheit
Input ranges • Resistance thermometer	Yes; Resistance-type transmitter: Pt10, Pt50, Pt100, Pt200, Pt500, Pt1000, Ni100, Ni120, Ni200, Ni500, Ni1000, Cu10, Cu50, Cu100, LG-Ni1000	Yes; Resistance-type transmitter: Pt10, Pt50, Pt100, Pt200, Pt500, Pt1000, Ni100, Ni120, Ni200, Ni500, Ni1000, Cu10, Cu50, Cu100, LG-Ni1000
• Resistance	Yes; 150 Ω, 300 Ω, 600 Ω	Yes; 150 Ω, 300 Ω, 600 Ω
Input ranges (rated values), resistance thermometers • Cu 10	Yes	Yes
• Input resistance (Cu 10)	10 Ω	10 Ω
• Ni 100	Yes	Yes
• Input resistance (Ni 100)	100 Ω	100 Ω
• Ni 1000	Yes	Yes
• Input resistance (Ni 1000)	1 000 Ω	1 000 Ω
• LG-Ni 1000	Yes	Yes
• Input resistance (LG-Ni 1000)	1 000 Ω	1 000 Ω
• Ni 120	Yes	Yes
• Input resistance (Ni 120)	120 Ω	120 Ω
• Ni 200	Yes	Yes
• Input resistance (Ni 200)	200 Ω	200 Ω
• Ni 500	Yes	Yes
• Input resistance (Ni 500)	500 Ω	500 Ω
• Pt 100	Yes	Yes
• Input resistance (Pt 100)	100 Ω	100 Ω
• Pt 1000	Yes	Yes
• Input resistance (Pt 1000)	1 000 Ω	1 000 Ω
• Pt 200	Yes	Yes
• Input resistance (Pt 200)	200 Ω	200 Ω
• Pt 500	Yes	Yes
• Input resistance (Pt 500)	500 Ω	500 Ω
Input ranges (rated values), resistors • 0 to 150 ohms	Yes	Yes
• 0 to 300 ohms	Yes	Yes
• 0 to 600 ohms	Yes	Yes
Thermocouple (TC) • Temperature compensation - Parameterizable	No	No

Technical specifications (continued)

	6ES7 231-5PD30-0XB0 SM1231 RTD 4x16bit	6ES7 231-5PF30-0XB0 SM 1231 RTD 8x16bit
Analog value creation		
Measurement principle	integrating	integrating
Integrations and conversion time/ resolution per channel		
• Resolution with overrange (bit including sign), max.	15 bit; + sign	15 bit; + sign
• Integration time, parameterizable	No	No
• Interference voltage suppression for interference frequency f1 in Hz	85 dB at 50 / 60 / 400 Hz	85 dB at 10 / 50 / 60 / 400 Hz
Errors/accuracies		
cold connection point		+/-1.5 °C
Temperature error (relative to input area)	25 °C ±0.1 % to 55 °C ±0.2 % total measurement range	25 °C ±0.1 % to 55 °C ±0.2 % total measurement range
Interference voltage suppression for f = n x (f1 +/- 1%), f1 = interference frequency		
• Common mode interference, min.	120 dB	120 dB
Interrupts/diagnostics/ status information		
Alarms		
• Alarms	Yes	Yes
• Diagnostic alarm	Yes	Yes
Diagnostic messages		
• Diagnostic functions	Yes; Can be read out	Yes; Can be read out
• Monitoring the supply voltage	Yes	Yes
• Wire break	Yes	Yes
Diagnostics indication LED		
• for status of the inputs	Yes	Yes
• for maintenance	Yes	Yes
Degree and class of protection		
IP20	Yes	Yes
Standards, approvals, certificates		
CE mark	Yes	Yes
C-TICK	Yes	Yes
FM approval	Yes	Yes
Climatic and mechanical conditions for storage and transport		
Climatic conditions for storage and transport		
• Free fall		
- Drop height, max. (in packaging)	0.3 m; five times, in dispatch package	0.3 m; five times, in dispatch package
• Temperature		
- Permissible temperature range	-40 °C to +70 °C	-40 °C to +70 °C
• Air pressure acc. to IEC 60068-2-13		
- Permissible air pressure	1080 to 660 hPa	1080 to 660 hPa

SIMATIC S7-1200

Analog modules

SM 1231 RTD signal modules

Technical specifications (continued)

	6ES7 231-5PD30-0XB0 SM1231 RTD 4x16bit	6ES7 231-5PF30-0XB0 SM 1231 RTD 8x16bit
Mechanical and climatic conditions during operation		
Climatic conditions in operation		
• Temperature		
- Permissible temperature range	0 °C to 55 °C horizontal installation 0 °C to 45 °C vertical installation	0 °C to 55 °C horizontal installation 0 °C to 45 °C vertical installation
• Air pressure acc. to IEC 60068-2-13		
- Permissible air pressure	1080 to 795 hPa	1080 to 795 hPa
• Pollutant concentrations		
- SO ₂ at RH < 60% without condensation	SO ₂ : < 0.5 ppm; H ₂ S: < 0.1 ppm; RH < 60% condensation-free	SO ₂ : < 0.5 ppm; H ₂ S: < 0.1 ppm; RH < 60% condensation-free
Connection method		
required front connector	Yes	Yes
Mechanics/material		
Type of housing (front)		
• Plastic	Yes	Yes
Dimensions		
Width	45 mm	70 mm
Height	100 mm	100 mm
Depth	75 mm	75 mm
Weight		
Weight, approx.	220 g	220 g

Ordering data

Ordering data	Order No.	Order No.
SM 1231 RTD signal module		
4 inputs for resistance temperature detectors Pt10/50/100/200/500/1000, Ni100/120/200/500/1000, Cu10/50/100, LG-Ni1000; resistance 150/300/600 Ohm, resolution 15 bits + sign	6ES7 231-5PD30-0XB0	
8 inputs for resistance temperature detectors Pt10/50/100/200/500/1000, Ni100/120/200/500/1000, Cu10/50/100, LG-Ni1000; resistance 150/300/600 Ohm, resolution 15 bits + sign	6ES7 231-5PF30-0XB0	
Accessories		
Terminal block (spare part)		
for 8/16-channel analog signal modules		
with 7 screws, gold-plated; 4 pcs.	6ES7 292-1BG30-0XA0	
Extension cable for two-tier configuration		
for connecting digital/analog signal modules; length 2 m	6ES7 290-6AA30-0XA0	
Front flap set (spare part)		
for 8/16-channel signal modules	6ES7 291-1BA30-0XA0	
S7-1200 automation system, System Manual		
for SIMATIC S7-1200 and STEP 7 Basic		
German		6ES7 298-8FA30-8AH0
English		6ES7 298-8FA30-8BH0
French		6ES7 298-8FA30-8CH0
Spanish		6ES7 298-8FA30-8DH0
Italian		6ES7 298-8FA30-8EH0
Chinese		6ES7 298-8FA30-8KH0
S7-1200 automation system, Easy Book		
Brief instructions		
German		6ES7 298-8FA30-8AQ0
English		6ES7 298-8FA30-8BQ0
French		6ES7 298-8FA30-8CQ0
Spanish		6ES7 298-8FA30-8DQ0
Italian		6ES7 298-8FA30-8EQ0
Chinese		6ES7 298-8FA30-8KQ0

Overview

- For the convenient recording of temperatures with great accuracy
- 1 input with 16-bit resolution
- Common resistance-type temperature detectors can be used
- Can easily be retrofitted to existing plant
- Can be plugged directly into the CPU

Technical specifications

6ES7 231-5PA30-0XB0 SB1231 AI 1xRTD		6ES7 231-5PA30-0XB0 SB1231 AI 1xRTD	
Supply voltage 24 V DC	Yes	Errors/accuracies Temperature error (relative to input area)	25 °C ±0.1 % to 55 °C ±0.2 % total measurement range
Input current Current consumption, typ.	5 mA	Interference voltage suppression for $f = n \times (f_1 \pm 1\%)$, $f_1 =$ interference frequency	120 dB
from backplane bus 5 V DC, typ.	20 mA	• Common mode interference, min.	
Power losses Power loss, typ.	0.5 W	Interrupts/diagnostics/ status information Alarms	Yes Yes
Analog inputs Number of analog inputs	1; Resistance thermometer	• Alarms	
permissible input frequency for current input (destruction limit), max.	± 35 V	• Diagnostic alarm	Yes Yes
Technical unit for temperature measurement adjustable	Degrees Celsius/ degrees Fahrenheit	Diagnostic messages	Yes; Can be read out Yes
Input ranges		• Diagnostic functions	
• Resistance thermometer	Yes; Platinum (Pt)	• Wire break	Yes
• Resistance	Yes; 150 Ω, 300 Ω, 600 Ω	Diagnostic indication LED	Yes Yes
Input ranges (rated values), voltages		• for status of the inputs	
• Input resistance (-80 mV to +80 mV)	>= 10 MOhm	• for maintenance	
Input ranges (rated values), resistance thermometers		Degree and class of protection IP20	Yes
• Pt 100	Yes	Standards, approvals, certificates CE mark	Yes
• Input resistance (Pt 100)	100 Ω	C-TICK	Yes
• Pt 1000	Yes	FM approval	Yes
• Input resistance (Pt 1000)	1 000 Ω	Climatic and mechanical conditions for storage and transport Climatic conditions for storage and transport	0.3 m; five times, in dispatch package
• Pt 200	Yes	• Free fall	
• Input resistance (Pt 200)	200 Ω	- Drop height, max. (in packaging)	
• Pt 500	Yes	• Temperature	-40 °C to +70 °C
• Input resistance (Pt 500)	500 Ω	- Permissible temperature range	
Input ranges (rated values), resistors		• Air pressure acc. to IEC 60068-2-13	1080 to 660 hPa
• 0 to 150 ohms	Yes	- Permissible air pressure	
• 0 to 300 ohms	Yes		
• 0 to 600 ohms	Yes		
Thermocouple (TC)			
• Temperature compensation - Parameterizable	No		
Analog value creation Measurement principle	integrating		
Integrations and conversion time/ resolution per channel			
• Resolution with overrange (bit including sign), max.	15 bit; + sign		
• Integration time, parameterizable	No		
• Interference voltage suppression for interference frequency f_1 in Hz	85 dB at 10 / 50 / 60 / 400 Hz		

SIMATIC S7-1200

Analog modules

SB 1231 RTD signal boards

Technical specifications (continued)

	6ES7 231-5PA30-0XB0 SB1231 AI 1xRTD	6ES7 231-5PA30-0XB0 SB1231 AI 1xRTD
Mechanical and climatic conditions during operation		
Climatic conditions in operation		
• Temperature		
- Permissible temperature range	0 °C to 55 °C horizontal installation 0 °C to 45 °C vertical installation	
• Air pressure acc. to IEC 60068-2-13		
- Permissible air pressure	1080 to 795 hPa	
• Pollutant concentrations		
- SO ₂ at RH < 60% without condensation	SO ₂ : < 0.5 ppm; H ₂ S: < 0.1 ppm; RH < 60% condensation-free	
		Connection method
		required front connector
		Yes
		Mechanics/material
		Type of housing (front)
		• Plastic
		Yes
		Dimensions
		Width
		38 mm
		Height
		62 mm
		Depth
		21 mm
		Weight
		Weight, approx.
		35 g

Ordering data

Ordering data	Order No.	Ordering data	Order No.
SB 1231 RTD signal board	6ES7 231-5PA30-0XB0	Accessories	
1 input for resistance temperature sensors Pt 100, Pt 200, Pt 500, Pt 1000, resolution 15 bits + sign		Terminal block (spare part)	
		for signal board	
		with 6 screws, gold-plated; 4 pcs.	6ES7 292-1BF30-0XA0
		S7-1200 automation system, System Manual	
		for SIMATIC S7-1200 and STEP 7 Basic	
		German	6ES7 298-8FA30-8AH0
		English	6ES7 298-8FA30-8BH0
		French	6ES7 298-8FA30-8CH0
		Spanish	6ES7 298-8FA30-8DH0
		Italian	6ES7 298-8FA30-8EH0
		Chinese	6ES7 298-8FA30-8KH0
		S7-1200 automation system, Easy Book	
		Brief instructions	
		German	6ES7 298-8FA30-8AQ0
		English	6ES7 298-8FA30-8BQ0
		French	6ES7 298-8FA30-8CQ0
		Spanish	6ES7 298-8FA30-8DQ0
		Italian	6ES7 298-8FA30-8EQ0
		Chinese	6ES7 298-8FA30-8KQ0