Digital Expansion Modules Specifications

Table A-11 Digital Expansion Modules Order Numbers

Order Number	Expansion Model	Digital Inputs	Digital Outputs	Removable Connector
6ES7 221-1BF22-0XA0	EM 221 Digital Input 8 x 24 VDC	8 x 24 VDC	-	Yes
6ES7 221-1EF22-0XA0	EM 221 Digital Input 8 x 120/230 VAC	8 x 120/230 VAC	-	Yes
6ES7 221-1BH22-0XA0	EM 221 Digital Input 16 x 24 VDC	16 x 24 VDC	-	Yes
6ES7 222-1BD22-0XA0	EM 222 Digital Output 4 x 24 VDC-5A	-	4 x 24 VDC-5A	Yes
6ES7 222-1HD22-0XA0	EM 222 Digital Output 4 x Relays-10A	-	4 x Relay-10A	Yes
6ES7 222-1BF22-0XA0	EM 222 Digital Output 8 x 24 VDC	-	8 x 24 VDC-0.75A	Yes
6ES7 222-1HF22-0XA0	EM 222 Digital Output 8 x Relays	-	8 x Relay-2A	Yes
6ES7 222-1EF22-0XA0	EM 222 Digital Output 8 x 120/230 VAC	-	8 x 120/230 VAC	Yes
6ES7 223-1BF22-0XA0	EM 223 24 VDC Digital Comb 4 Inputs/4 Outputs	4 x 24 VDC	4 x 24 VDC-0.75A	Yes
6ES7 223-1HF22-0XA0	EM 223 24 VDC Digital Comb 4 Inputs/4 Relay Outputs	4 x 24 VDC	4 x Relay-2A	Yes
6ES7 223-1BH22-0XA0	EM 223 24 VDC Digital Comb 8 Inputs/8 Outputs	8 x 24 VDC	8 x 24 VDC-0.75A	Yes
6ES7 223-1PH22-0XA0	EM 223 24 VDC Digital Comb 8 Inputs/8 Relay Outputs	8 x 24 VDC	8 x Relay-2A	Yes
6ES7 223-1BL22-0XA0	EM 223 24 VDC Digital Comb 16 Inputs/16 Outputs	16 x 24 VDC	16 x 24 VDC-0.75A	Yes
6ES7 223-1PL22-0XA0	EM 223 24 VDC Digital Comb 16 Inputs/16 Relay Outputs	16 x 24 VDC	16 x Relay-2A	Yes
6ES7 223-1BM22-0XA0	EM 223 24 VDC Digital Comb 32 Inputs/32 Outputs	32 x 24 VDC	32 x 24 VDC-0.75 A	Yes
6ES7 223-1PM22-0XA0	EM 223 24 VDC Digital Comb 32 Inputs/32 Relay Outputs	32 x 24 VDC	32 x Relay-2 A	Yes

Table A-12 Digital Expansion Modules General Specifications

Order Number	Module Name and Description	Dimensions (mm) (W x H x D)	Weight	Dissipation	VDC Requirements	
					+5 VDC	+24 VDC
6ES7 221-1BF22-0XA0	EM 221 DI 8 x 24 VDC	46 x 80 x 62	150 g	2 W	30 mA	ON: 4 mA/input
6ES7 221-1EF22-0XA0	EM 221 DI 8 x 120/230 VAC	71.2 x 80 x 62	160 g	3 W	30 mA	-
6ES7 221-1BH22-0XA0	EM 221 DI 16 x 24 VDC	71.2 x 80 x 62	160 g	3 W	70 mA	ON: 4 mA/input
6ES7 222-1BD22-0XA0	EM 222 DO 4 x 24 VDC-5A	46 x 80 x 62	120 g	3 W	40 mA	-
6ES7 222-1HD22-0XA0	EM 222 DO 4 x Relays-10A	46 x 80 x 62	150 g	4 W	30 mA	ON: 20 mA/output
6ES7 222-1BF22-0XA0	EM 222 DO 8 x 24 VDC	46 x 80 x 62	150 g	2 W	50 mA	-
6ES7 222-1HF22-0XA0	EM 222 DO 8 x Relays	46 x 80 x 62	170 g	2 W	40 mA	ON: 9 mA/output
6ES7 222-1EF22-0XA0	EM 222 DO 8 x 120/230 VAC	71.2 x 80 x 62	165 g	4 W	110 mA	-
6ES7 223-1BF22-0XA0	EM 223 24 VDC 4 In/4 Out	46 x 80 x 62	160 g	2 W	40 mA	ON: 4 mA/input
6ES7 223-1HF22-0XA0	EM 223 24 VDC 4 In/4 Relays	46 x 80 x 62	170 g	2 W	40 mA	ON: 9 mA/output, 4 mA/input
6ES7 223-1BH22-0AX0	EM 223 24 VDC 8 In/8 Out	71.2 x 80 x 62	200 g	3 W	80 mA	ON: 4 mA/input
6ES7 223-1PH22-0XA0	EM 223 24 VDC 8 In/8 Relays	71.2 x 80 x 62	300 g	3 W	80 mA	ON: 9 mA/output, 4 mA/input
6ES7 223-1BL22-0XA0	EM 223 24 VDC 16 In/16 Out	137.3 x 80 x 62	360 g	6 W	160 mA	ON: 4 mA/input
6ES7 223-1PL22-0XA0	EM 223 24 VDC 16 In/16 Relays	137.3 x 80 x 62	400 g	6 W	150 mA	ON: 9 mA/output, 4 mA/input
6ES7 223-1BM22-0XA0	EM 223 24 VDC 32 In/32 Out	196 x 80 x 62	500 g	9 W	240 mA	ON: 4 mA/input
6ES7 223-1PM22-0XA0	EM 223 24 VDC 32 In/32 Relay	196 x 80 x 62	580 g	13 W	205 mA	ON: 9 mA/output 4 mA/input

Table A-13 Digital Expansion Modules Input Specifications

General	24 VDC Input	120/230 VAC Input (47 to 63 HZ)
Type	Sink/Source (IEC Type 1 sink)	IEC Type I
Rated voltage	24 VDC at 4 mA	120 VAC at 6 mA or 230 VAC at 9 mA nominal
Maximum continuous permissible voltage	30 VDC	264 VAC
Surge voltage (max.)	35 VDC for 0.5 s	-
Logic 1 (min.)	15 VDC at 2.5 mA	79 VAC at 2.5 mA
Logic 0 (max.)	5 VDC at 1 mA	20 VAC or 1 mA AC
Input delay (max.)	4.5 ms	15 ms
Connection of 2 wire proximity sensor (Bero) Permissible leakage current (max.)	1 mA	1 mA AC
Isolation Optical (galvanic, field to logic) Isolation groups	500 VAC for 1 minute See wiring diagram	1500 VAC for 1 minute 1 point
Inputs on simultaneously	All at 55° C (horizontal), All on at 45° C (vertical)	
Cable length (max.) Shielded Unshielded	500 m 300 m	500 m 300 m

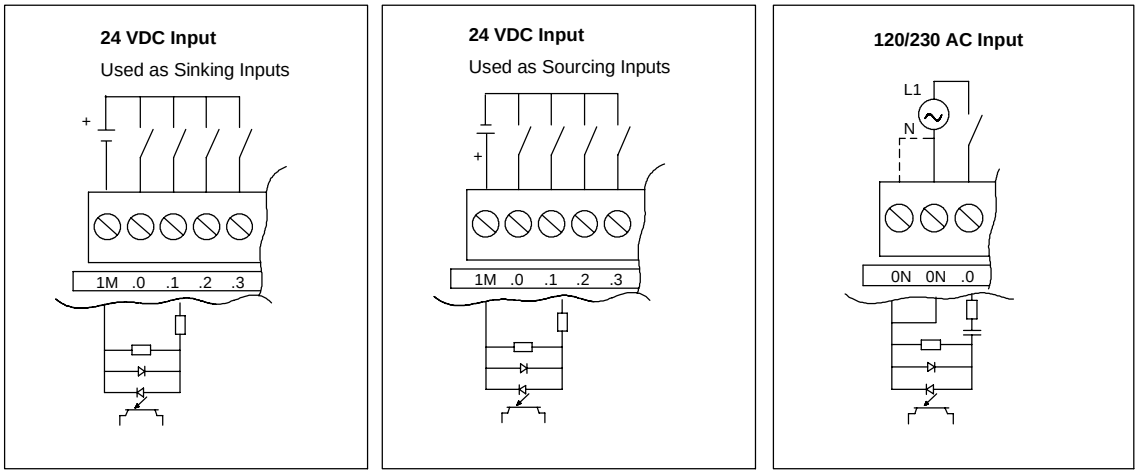


Figure A-7 S7-200 Digital Expansion Modules Inputs

Table A-14 Digital Expansion Modules Output Specifications

General	24 VDC Output		Relay Output		120/230 VAC Output
	0.75 A	5 A	2 A	10 A	
Type	Solid state-MOSFET (Sourcing)		Dry contact		Triac, zero-cross turn-on
Rated voltage	24 VDC		24 VDC or 250 VAC		120/230 VAC
Voltage range	20.4 to 28.8 VDC		5 to 30 VDC or 5 to 250 VAC	12 to 30 VDC or 12 to 250 VAC	40 to 264 VAC (47 to 63 Hz)
24 VDC coil power voltage range	–		20.4 to 28.8 VDC		–
Surge current (max.)	8 A for 100 ms	30 A	5 A for 4 s @ 10% duty cycle	15 A for 4 s @ 10% duty cycle	5 A rms for 2 AC cycles
Logic 1 (min.)	20 VDC		–		L1 (–0.9 V rms)
Logic 0 (max.)	0.1 VDC with 10 K Ω Load	0.2 VDC with 5 K Ω Load	–		–
Rated current per point (max.)	0.75 A	5 A	2.00 A	10 A resistive; 2 A DC inductive; 3 A AC inductive	0.5 A AC[1]
Rated current per common (max.)	10 A	5 A	10 A	10 A	0.5 A AC
Leakage current (max.)	10 μA	30 μA	–		1.1 mA rms at 132 VAC and 1.8 mA rrms at 264 VAC
Lamp load (max.)	5 W	50 W	30 W DC/ 200 W AC[4,5]	100 W DC/ 1000 W AC	60 W
Inductive clamp voltage	L+ minus 48 V	L+ minus 47 V[2]	–		–
On state resistance (contact)	0.3 Ω typical (0.6 Ω max.)	0.05 Ω max.	0.2 Ω max. when new	0.1 Ω max. when new	410 Ω max. when load current is less than 0.05A
Isolation					
Optical (galvanic, field to logic)	500 VAC for 1 minute		–		1500 VAC for 1minute
Coil to logic	–		None		–
Coil to contact	–		1500 VAC for 1 minute		–
Resistance (coil to contact)	–		100 M Ω min. when new		–
Isolation groups	See wiring diagram		See wiring diagram		1 point
Delay Off to On/On to Off (max.)	50 μs / 200 μs	500 μs	–	–	0.2 ms + 1/2 AC cycle
Switching (max.)	–	–	10 ms	15 ms	–
Switching frequency (max.)	–		1 Hz		10 Hz
Lifetime mechanical cycles	–		10,000,000 (no load)	30,000,000 (no load)	–
Lifetime contacts	–		100,000 (rated load)	30,000 (rated load)	–
Output on simultaneously	All at 55° C (horizontal), All at 45° C (vertical)			All at 55 °C (horizontal) with 20A max. module current. All at 45°C (vertical) with 20A max. module current[5]. All at 40 °C (horizontal) with 10A per point	All at 55° C (horizontal), All at 45° C (vertical)
Connecting two outputs in parallel	Yes, only outputs in same group		No		No
Cable length (max.)					
Shielded	500 m		500 m		500 m
Unshielded	150 m		150 m		150 m

1 Load current must be full wave AC and must not be half-wave because of the zero-cross circuitry. Minimum load current is 0.05 A AC. With a load current between 5 mA and 50 mA AC, the current can be controlled, but there is an additional voltage drop due to series resistance of 410 Ohms.

2 If the output overheats due to excessive inductive switching or abnormal conditions, the output point may turn off or be damaged. The output could overheat or be damaged if the output is subjected to more than 0.7 J of energy switching an inductive load off. To eliminate the need for this limitation, a suppression circuit as described in Chapter 3 can be added in parallel with the load. These components need to be sized properly for the given application.

3 The EM 222 DO 4 x Relay has a different FM rating than the rest of the S7-200. This module has a T4 rating, instead of T4A for FM Class I, Division Groups A, B, C, and D Hazardous Locations.

4 Relay lifetime with a lamp load will be reduced by 75% unless steps are taken to reduce the turn-on surge below the surge current rating of the output.

5 Lamp load wattage rating is for rated voltage. Reduce the wattage rating proportionally for voltage being switched (for example 120 VAC – 100 W).



Warning

When a mechanical contact turns on output power to the S7-200 CPU, or any digital expansion module, it sends a “1” signal to the digital outputs for approximately 50 microseconds.

This could cause unexpected machine or process operation which could result in death or serious injury to personnel, and/or damage to equipment.

You must plan for this, especially if you are using devices which respond to short duration pulses.

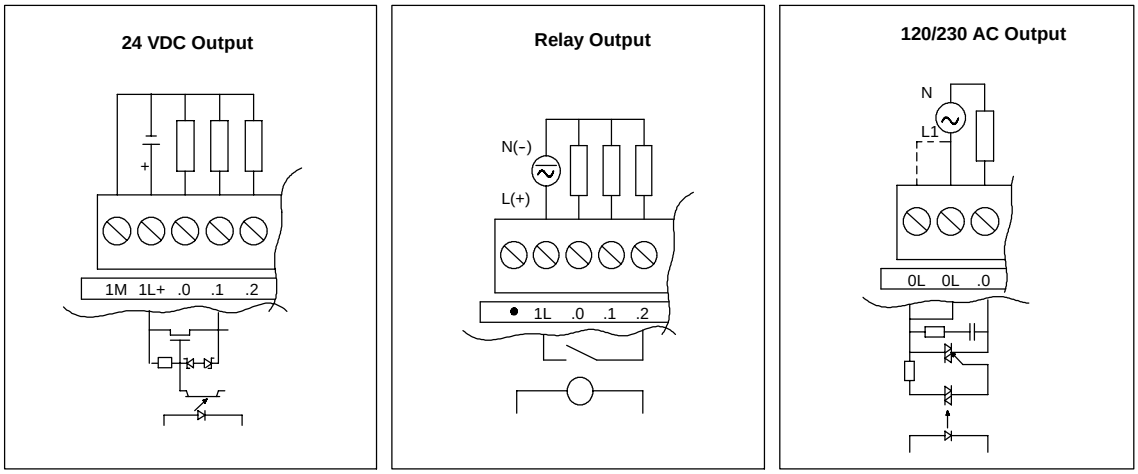


Figure A-8 S7-200 Digital Expansion Modules Outputs

Wiring Diagrams

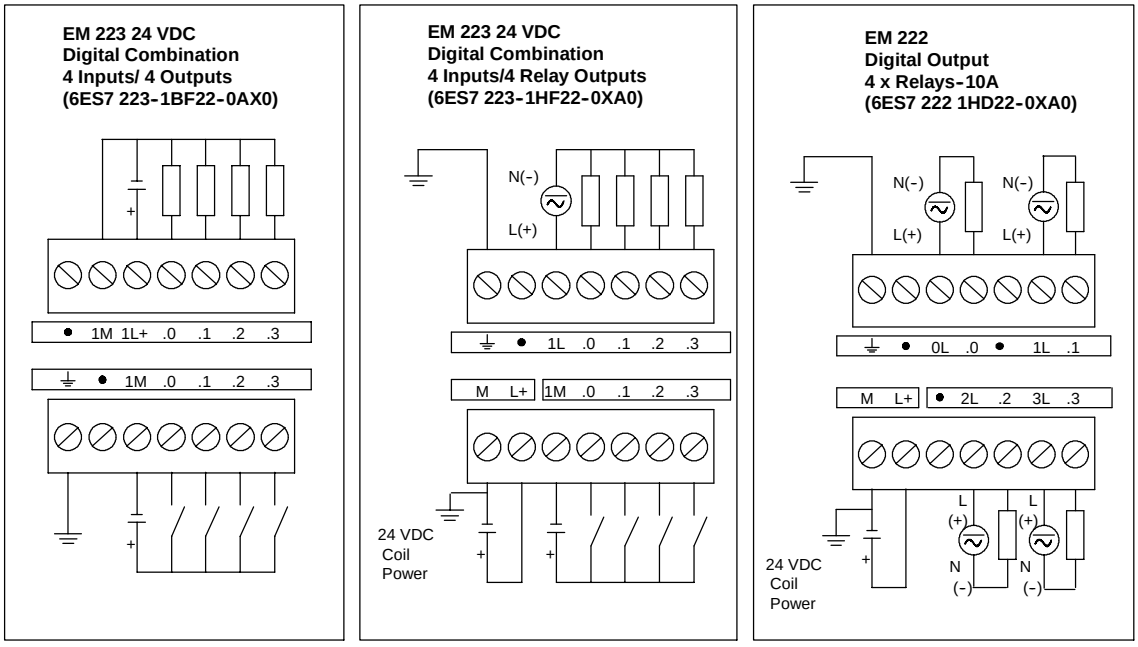


Figure A-9 Wiring Diagrams for EM 222 and EM 223 Expansion Modules