

SIMATIC S5-115U/H/F

Digital input/output modules

Digital output modules

Application



The digital output modules convert the internal signal levels of the programmable controllers into the binary signal levels required externally by the process.

Design

Digital output modules are available with 8, 16 or 32 outputs and for a range of supply voltages (load) and rated load currents. The modules require one slot.

Depending on the version, the modules comprise:

- Green LEDs for indicating signal status
- Short-circuit detection

- Group signalling output for short-circuits (latching relay) with reset input
- Red LEDs for indicating a short-circuit

The signal leads must be connected with front connectors. They can be labelled in the field next to the LEDs.

The module address (byte parameter when programming) is slot-dependent and need therefore not be set on the module.

Principle of operation

The module converts the internal output signals of the programmable controller to the load voltage levels (DC or AC) used to control the process. The output voltage ranges are fixed. A selection of 2 or 3 ranges is available on some modules.

Short-circuit protection

The digital output modules are short-circuit-protected (except for the relay outputs and the DA 457-7 digital output module).

Protection is provided either electronically or by means of fuses. In the DA 451-7 and 453-7 modules, the short-circuit signal is stored via a latching relay contact and indicated by a red LED for each group. In both modules a signal can be reset with a separate 24 V input (RES) or internally by a BASP signal. On the modules protected with fuses, red LEDs also indicate when a fuse has blown.

Parallel connection of outputs

Parallel connection of the outputs is only possible with the relay output modules.

Note

All the digital output modules of the S5-135U/-155U programmable controllers (see Section 4) can be used in the S5-115U with adapter casings.

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Digital output modules (continued)

Technical specifications					
Digital output module	6ES5 441-7LA12	6ES5 451-7LA11	6ES5 451-7LA21	6ES5 453-7LA11	6ES5 453-4UA12
Number of outputs	32	32	32	16	see page 4/40
Galvanic isolation	No	Yes (optocoupler)	Yes (optocoupler)	Yes (optocoupler)	(S5-135U, S5-155U/H)
• In groups of	—	8	8	8	
Supply voltage					
V_{pos} (for load)					
• Rated value	24 V DC	24 V DC	24 V DC	24/48/60 V DC	
• Ripple V_{pp} max.	3.6 V	3.6 V	3.6 V	3.6 V	
• Permissible range (with ripple)	20 ... 30 V	20 ... 30 V	20 ... 30 V	20 ... 75 V	
Value at $t < 0.5$ s max.	35 V	35 V	35 V	87 V	
Output current at "1" signal					
• Rated value	0.5 A	0.5 A	0.5 A	0.5 A	
• Permissible range	5 mA ... 0.5 A	5 mA ... 0.5 A	5 mA ... 0.5 A	5 mA ... 0.5 A	
Lamp load max.	5 W	5 W	5 W	5 W	
Short-circuit protection	Electronic	Electronic	Electronic	Electronic	
Short-circuit display	—	—	1 LED/group with one common group signal	1 LED/group with one common group signal	
Short-circuit group signal output	—	—	Latching relay cont.	Latching relay cont.	
• Permissible load	—	—	100 V DC ; 0.2 mA	100 V DC ; 0.2 mA	
• Switching capacity	—	—	20 W; 35 VA	20 W; 35 VA	
Reset input	—	—	24 V DC	24 V DC	
Inductive surge voltage on circuit interruption (internal) limited to	- 15 V	- 15 V	- 15 V	- 30 V	
Switching frequency					
• Resistive loads max.	100 Hz	100 Hz	100 Hz	100 Hz	
• Lamp loads max.	8 Hz	8 Hz	8 Hz	8 Hz	
• Inductive loads max.	0.5 Hz	0.5 Hz	0.5 Hz	0.5 Hz	
Load factor ¹⁾					
• At 25 °C	100 %	100 %	100 %	100 %	
• At 55 °C	50 %	50 %	50 %	100 %	
Residual current at "0" signal max.	1 mA	1 mA	1 mA	1 mA	
Signal level of the outputs					
• At "0" signal max.	+ 3 V	+ 3 V	+ 3 V	+ 3 V	
• At "1" signal min.	$V_{pos} - 2.5$ V	$V_{pos} - 2.5$ V	$V_{pos} - 2.5$ V	$V_{pos} - 2.5$ V	
Cable length					
• Unshielded max.	600 m (1968 ft)	600 m (1968 ft)	600 m (1968 ft)	600 m (1968 ft)	
• Shielded max.	1000 m (3280 ft)	1000 m (3280 ft)	1000 m (3280 ft)	1000 m (3280 ft)	
Insulation voltage rating (external connections to housing, internal connections, other groups)					
• In acc. with VDE 0160	—	30 V DC	30 V DC	75 V DC	
• Tested with	—	500 V AC	500 V AC	500 V AC	
Current consumption					
• Internal (at 5 V) typ.	10 mA	100 mA	100 mA	50 mA	
• External (at 24 V, no load) typ.	17 mA/group	17 mA/group	17 mA/group	50 mA/group	
Power loss (rated operation) typ.	20 W	20 W	20 W	16 W	
Front connector	46-pin	46-pin	46-pin	24-pin	
Weight approx.	0.7 kg (1.5 lb)	0.7 kg (1.5 lb)	0.7 kg (1.5 lb)	0.7 kg (1.5 lb)	

1) Referred to the sum of the rated currents via an L + supply

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Digital input/output modules

Digital output modules (continued)

Technical specifications						
Digital output module	6ES5 454-7LA12	6ES5 454-7LB11	6ES5 455-7LA11	6ES5 456-7LA11	6ES5 456-7LB11	6ES5 457-7LA11
Number of outputs	16	8	16	16	8	32 (m switch)
Galvanic isolation	Yes (optocoupler)	Yes (optocoupler)	Yes (optocoupler)	Yes (optocoupler)	—	Yes (optocoupler)
• In groups of	4	1	2	4	1	8
Supply voltage						
V_p , V_{pos} (for load)						
• Rated value	24 V DC	24 V DC	48/115 V AC	115/230 V AC	115/230 V AC	5/12/24 V DC
• Frequency	—	—	47 ... 63 Hz	47 ... 63 Hz	47 ... 63 Hz	—
• Ripple V_{pp} max.	3.6 V	3.6 V	—	—	—	2.4 V at 24 V
• Permissible range (with ripple)	20 ... 30 V	20 ... 30 V	40 ... 140V	89 ... 264V	89 ... 264V	4.75 ... 30V
Value at $t < 0.5$ s max.	35 V	35 V	—	—	—	35 V
Output current at "1" signal						
• Rated value	2 A	2 A	2 A/group	1 A	2 A	100 mA
• Permissible range	10 mA ¹⁾ ... 2 A	10 mA ¹⁾ ... 2 A	40 mA ... 2 A	40 mA ... 1 A	40 mA ... 2 A	—
Lamp load max.	10 W	10 W	50/100 W/group	25/50 W	25/50 W	—
Short-circuit protection	Electronic	Fuse (8 · 2.55 A FF)	Fuse (8 · 2.55 A FF)	Fuse (4 · 10 A FF)	Fuse (8 · 6.3 A FF)	None
Short-circuit display	—	8 LEDs	1 LED/group	1 LED/group	8 LEDs	—
Inductive surge voltage on circuit interruption (internal) limited to	– 15 V	– 23 V	—	—	—	– 10 V
Switching frequency						
• Resistive loads max.	100 Hz	100 Hz	10 Hz	10 Hz	10 Hz	10 Hz
• Lamp loads max.	8 Hz	8 Hz	10 Hz	10 Hz	10 Hz	8 Hz
• Inductive loads max.	0.27 Hz	0.27 Hz	10 Hz	10 Hz	10 Hz	2 Hz
Load factor ¹⁾						
• At 25 °C	50 %	100 %	100 %	100 %	100 %	100 %
• At 55 °C	50 %	50 %	100 %	100 %	100 %	100 %
Residual current at "0" signal max.	1 mA	1 mA	1/3 mA	3/5 mA	3/5 mA	100 µA
Signal level of the outputs						
• At "0" signal max.	+ 3 V	+ 3 V	+ 3 V	+ 3 V	+ 3 V	Open collector output
• At "1" signal min.	$V_{pos} - 3$ V	$V_{pos} - 3$ V	$V_{pos} - 7$ V	$V_{pos} - 7$ V	$V_{pos} - 7$ V	
Cable length						
• Unshielded max.	600 m (1968 ft)	600 m (1968 ft)	300 m (984 ft)	300 m (984 ft)	300 m (984 ft)	300 m (984 ft)
• Shielded max.	1000 m (3280 ft)	1000 m (3280 ft)	1000 m (3280 ft)	1000 m (3280 ft)	1000 m (3280 ft)	1000 m (3280 ft)
Insulation voltage rating (external connections to the housing, internal connections, other groups)						
• In acc. with VDE 0160	30 V DC	30 V DC	250 V AC	250 V AC	250 V AC	30 V DC
• Tested with	500 V AC	500 V AC	1500 V AC	1500 V AC	2700 V AC	500 V AC
Current consumption						
• Internal (at 5 V) typ.	50 mA	50 mA	175 mA	70 mA	35 mA	100 mA
• External (at 24 V, no load) typ.	8.5 mA/group	—	—	—	—	4 mA
Power loss (rated operation) typ.	20 W	20 W	16 W	16 W	16 W	6 W
Front connector	24-pin	24-pin	24-pin	24-pin	24-pin	46-pin
Weight approx.	1.1 kg (2.4 lb)	0.8 kg (1.8 lb)	1.1 kg (2.4 lb)	1.1 kg (2.4 lb)	1.1 kg (2.4 lb)	0.7 kg (1.5 lb)

1) Referred to the sum of the rated currents via an L + or L1 supply

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Digital input/output modules

Digital output modules (continued)

Technical specifications

Digital output module	6ES5 458-7LA11 ¹⁾	6ES5 458-7LB11	6ES5 458-7LC11
Number of outputs	16	8	16
Galvanic isolation	Yes (relay contacts) ⁴⁾	Yes (relay contacts) ³⁾	Yes (relay outputs)
• In groups of	1	1	4
Continuous current I_{th}	0.5 A	5 A	5 A
Switching capacity of the contacts			
• Resistive loads max.	10 W/0.5 A/30 V UC	5 A at 250 V AC 2.5 A at 30 V DC	5 A at 250 V AC 5 A at 30 V DC 0.4 A at 110 V DC
• Inductive loads max.	Not permitted	1.5 A at 250 V AC 0.5 A at 30 V DC	1.5 A at 250 V AC 1 A at 30 V DC 0.08 A at 110 V DC
Service life: Switching cycles (VDE 0660, Part 200)	1 · 10 ⁹ (to DC-11)	1.5 · 10 ⁶ (to AC-11) 0.5 · 10 ⁶ (to DC-11)	1.5 · 10 ⁶ (to AC-11) 0.5 · 10 ⁶ (to DC-11)
Short-circuit protection	None	None	None
Switching frequency			
• Resistive loads max.	60 Hz	10 Hz	10 Hz
• Inductive loads max.	Not permitted	10 Hz	2 Hz
Insulation voltage rating (external connections to housing, internal connections, other groups)			
• In acc. with VDE 0160	30 V DC	250 V AC	250 V AC
• Tested with	500 V AC	1500 V AC	1500 V AC
Supply voltage V_{pos}			
• Rated value	24 V DC	24 V DC	24 V DC
• Ripple V_{pp} max.	3.6 V	3.6 V	3.6 V
• Permissible range (with ripple)	20 ... 30 V	20 ... 30 V	20 ... 30 V
Value at $t < 0.5$ s	35 V	35 V	35 V
Current consumption			
• Internal (at 5 V) typ.	50 mA	50 mA	50 mA
• External (at 24 V) typ.	240 mA	200 mA	256 mA
Power loss (rated operation) typ.	5 W	4 W	6.5 W
Front connector	46-pin	24-pin	46-pin
Weight approx.	0.8 kg (1.8 lb)	0.8 kg (1.8 lb)	0.8 kg (1.8 lb)

Ordering data

Order No.	Order No.
Non-floating: 441-7 digital output module for S5-115U/H; 32 outputs, 24V DC; 0.5 A 451-7 digital output module for S5-115U/H/F; 32 outputs, 24V DC; 0.5 A 451-7 digital output module for S5-115U/H; 32 outputs, 24V DC; 0.5 A with short-circuit indication 453-7 digital output module for S5-115U/H; 16 outp., 24/60 V DC; 0.5 A 453-4 digital output module for S5-115U/H/F²⁾; 16 outputs, 24V DC; 2 A 454-7 digital output module for S5-115U/H/F 16 outputs, 24 V DC; 2 A 8 outputs, 24 V DC; 2 A 455-7 digital output module for S5-115U/H; 16 outp., 48/115 V DC; 1 A 456-7 digital output module for S5-115U/H 16 outputs, 115/230 V AC; 1 A for S5-115U/H/F 8 outputs, 115/230 V AC; 1.5 A	457-7 digital output module for S5-115U/H; 32 outputs, 5/24 V DC; 100 mA 458-7 digital output module for S5-115U/H/F 16 relay contact outputs ¹⁾ 30 V UC; 0.5 A 8 relay contact outputs, 250 V AC; 5 A for S5-115U/H 16 relay contact outputs 250 V AC; 5 A, 30 V DC; 5 A The operating instructions are included in the S5-115U manual (see page 3/23) 490 front connector For screw terminals • 24-pin • 46-pin For crimp terminals, 46-pin • With 50 crimp contacts • Without crimp contacts For snap-on clip terminals, 46-pin
6ES5 441-7LA12	6ES5 457-7LA11
6ES5 451-7LA12	6ES5 458-7LA11
6ES5 451-7LA21	6ES5 458-7LB11
6ES5 453-7LA11	6ES5 458-7LC11
6ES5 453-4UA12	
6ES5 454-7LA12	6ES5 490-7LB11
6ES5 454-7LB11	6ES5 490-7LB21
6ES5 455-7LA11	
6ES5 456-7LA11	6ES5 490-7LA11
6ES5 456-7LB11	6ES5 490-7LA21
	6ES5 490-7LC11

1) For new systems the use of the 6ES5 453-4UA12 module is suggested

3) Each contact is jumpered with a varistor (residual current max. 1 mA at 250 V AC)

2) Adapter casing required

4) Reed relay for measuring circuits

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Digital output modules (continued)

Connection diagrams

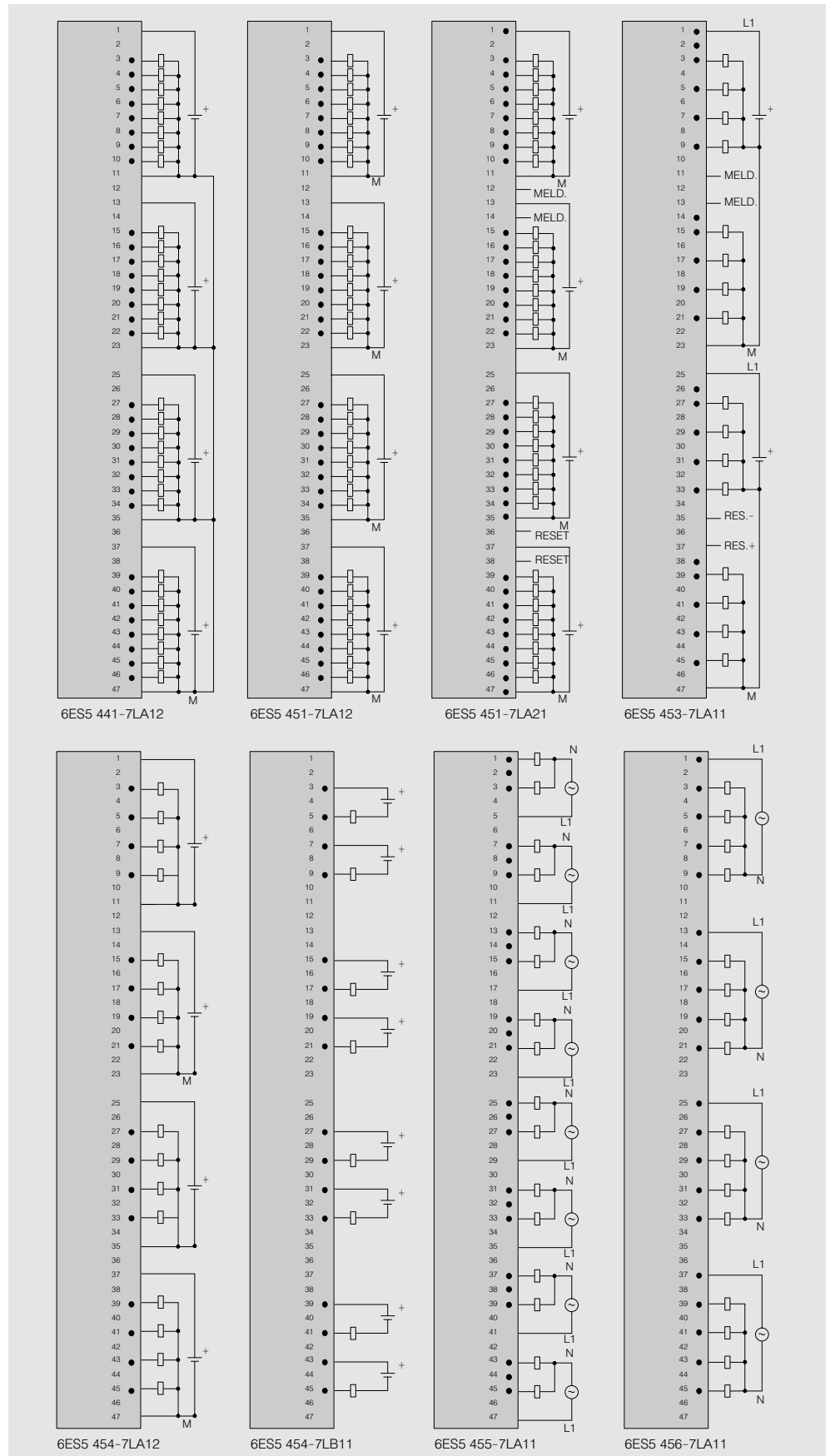


Fig. 3/27 Connection diagrams for digital output modules

SIMATIC S5-115U/H/F

Digital input/output modules

Digital output modules (continued)

Connection diagrams (continued)

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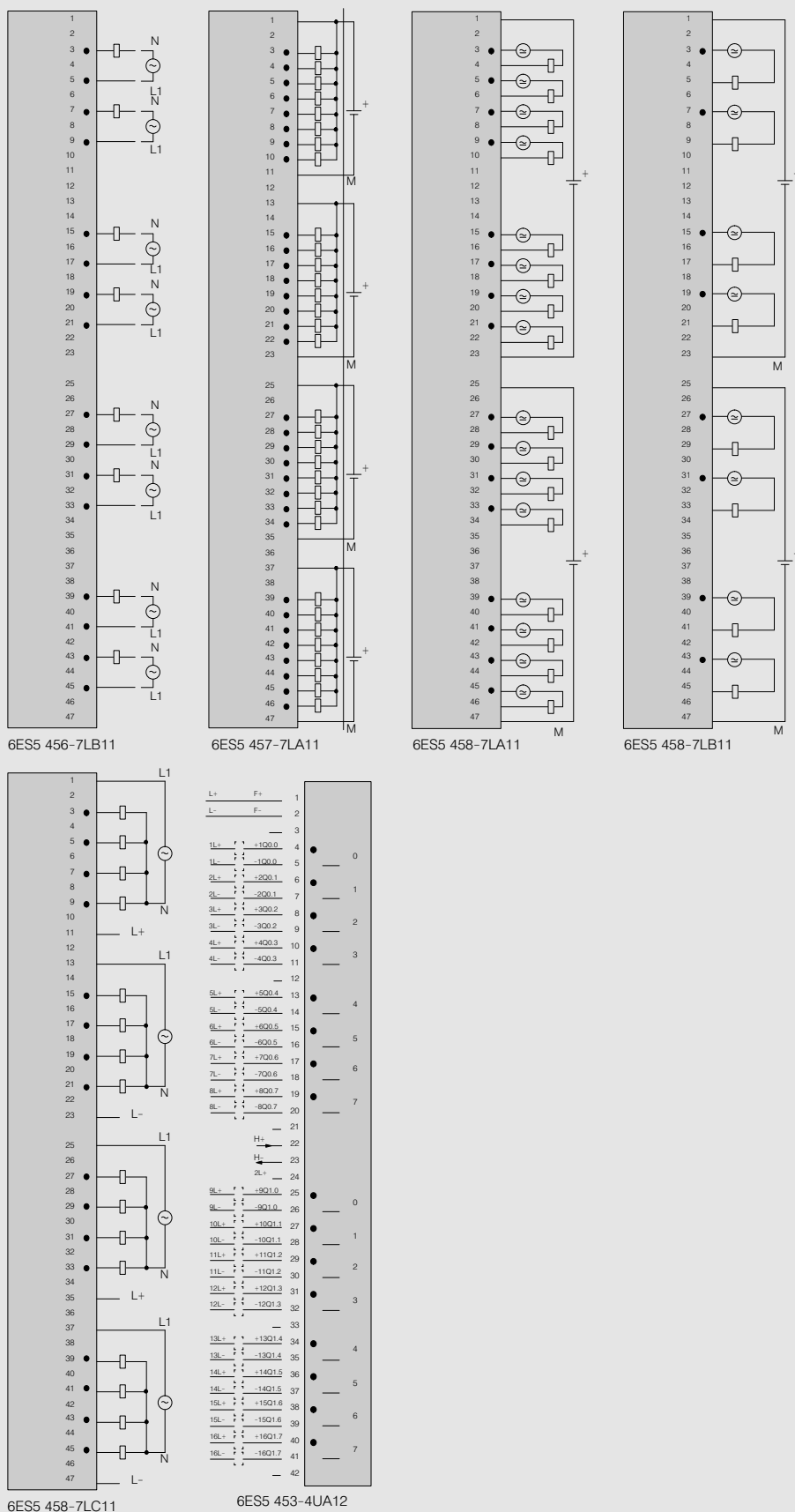


Fig. 3/28 Connection diagrams for digital output modules