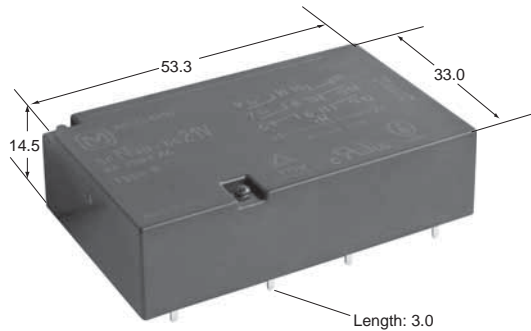


# Panasonic

Low profile safety relay  
with forcibly guided  
double contacts

# SFN4D RELAY



Tolerance  $\pm 0.3$  mm  
Weight approx. 42 g

## FEATURES

- Relay complies with EN 50205, Type B
- Polarized magnet system with snap action function
- Extremely small total power loss
  - Nominal coil power consumption of 390mW
  - Double contacts with low contact resistance, e.g.  $[(6A)^2 \times 2.5m\Omega] \times 4NO = 360mW$
- Relay height, 14.5mm
- Reinforced insulation according to EN 50178
  - between coil-contacts and contacts-contacts
  - rated voltage of the circuits 230 / 400V or 277 / 480Vrms
  - rated impulse voltage of 6kV  $\rightarrow$  clearance  $\geq 5.5$  mm
  - pollution degree 2  $\rightarrow$  creepage distance  $\geq 5.5$  mm

## SPECIFICATIONS

### Contact

Contact configuration (a = normally open / NO, b = normally closed / NC)	4a2b
Contact material	AgSnO <sub>2</sub> , with Au flash
Contact resistance (initial at 6V DC, 1A)	$\leq 30m\Omega$
Typical contact resistance	2.5m $\Omega$
Max. switching capacity	6A/8A <sup>*1</sup> 250V AC
Max. switching voltage	500V AC / DC
Min. switching voltage / min. switching current	Reference 10V / 10mA
Pick-up / drop-out / bounce time (approx. values at U <sub>nominal</sub> )	23 / 6 <sup>*2</sup> / 2ms
Mechanical life	10 <sup>7</sup> ops

### Coil

Operate / release and holding at 20°C (% of U <sub>nominal</sub> ) <sup>*3</sup>	75% / 25% min. 48%
Pick-up/nominal power consumption	219-236 / 390-420mW

### Characteristics

Max. switching frequency (without load)	5Hz
Permissible ambient temperature at nominal power consumption <sup>*3</sup>	-25°C to 92°C
Upper temperature limit	105°C
Test voltage: open contact / contact-contact / contact-coil	2500 / 4000 / 5000V <sub>rms</sub>
Insulation resistance at 500V DC (initial)	10 <sup>9</sup> $\Omega$
Shock resistance (11ms) NO/NC <sup>*4</sup>	20 / 15G
Vibration resistance 10 – 200 Hz (10 – 55 Hz, amplitude 2 mm) <sup>*4</sup>	10G
Degree of protection	RT III <sup>*5</sup>
Unit weight	42g

#### Important: Relay characteristics may be influenced by:

- strong external magnetic fields
- magnetic conductive materials near the relay
- narrow top-to-top mounting (printed surface to printed surface)

\*1 See "ELECTRICAL LIFE (Reference Data)" on page 2.

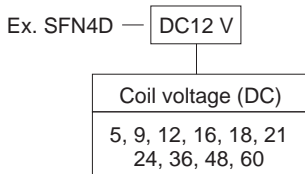
\*2 Without diode

\*3 See also "REFERENCE DATA" on page 3.

\*4 Contact interruption <10 $\mu$ s

\*5 According to EN 61810-1: 2004, table 2

## ORDERING INFORMATION



Notes: 1) Standard packing; Tube: 10 pcs. Case 100 pcs.  
2) Other coil voltage available upon request

**COIL DATA (at 20°C)**

Part number	Coil nominal voltage V DC	Operate voltage* <sup>1</sup> V DC	Release voltage* <sup>1</sup> V DC	Coil resistance Ω (±10%, 20°C)
SFN4D-DC5V	5	3.75	1.25	64.1
SFN4D-DC9V	9	6.75	2.25	207.7
SFN4D-DC12V	12	9.00	3.00	369.2
SFN4D-DC16V	16	12.00	4.00	656.4
SFN4D-DC18V	18	13.5	4.50	830.8
SFN4D-DC21V	21	15.75	5.25	1130.8
SFN4D-DC24V	24	18.00	6.00	1476.9
SFN4D-DC36V	36	27.00	9.00	3085.7
SFN4D-DC48V	48	36.00	12.00	5485.7
SFN4D-DC60V	60	45.00	15.00	8571.4

\*1 Operate and release voltage at different temperatures, see "REFERENCE DATA" on page 3, coil voltage characteristics.

**SWITCHING CAPABILITY**

- Making / breaking capacities according to EN 60947-5-1: 2000, table 4 / 5; AC15: 6A 230V AC / DC13: 6A 24V DC
- Endurance / overload test according to UL 508 16 edition, sections 42 / 43; 6A 250V AC / 6A 24V DC; B300 / R300; File E120782

**ELECTRICAL LIFE (Reference Data)\***

Voltage	Current (A)	Load type	Frequency	Duty cycle	No. of contacts	No. of ops.
230V AC	8	AC 1	0.25Hz	25%	4	85,000
230V AC	6	AC 1	0.25Hz	25%	4	200,000
230V AC	2.5	AC 1	0.25Hz	25%	4	1,500,000
230V AC	60 / 6	AC 15	0.20Hz	20%	3	40,000
24V DC	6	DC 1	0.25Hz	25%	4	2,000,000
250V DC	0.27	DC 13	0.10Hz	10%	4	1,000,000

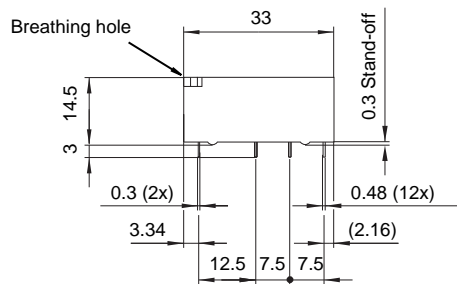
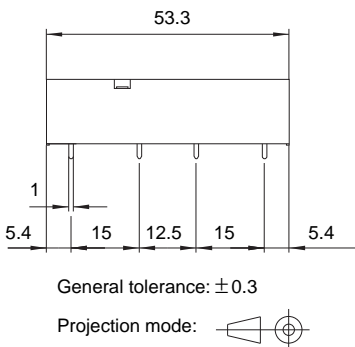
\*Test conditions: Room temperature, breathing hole closed, dielectric strength according to EN61810-1:2004.

**DIMENSIONS**

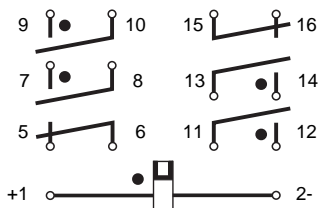
Download [CAD Data](#) from our Web site.

**Outer dimensions**

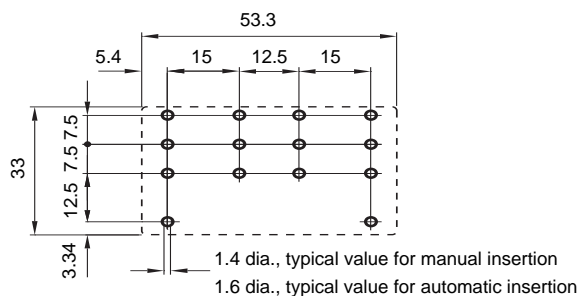
[CAD Data](#)



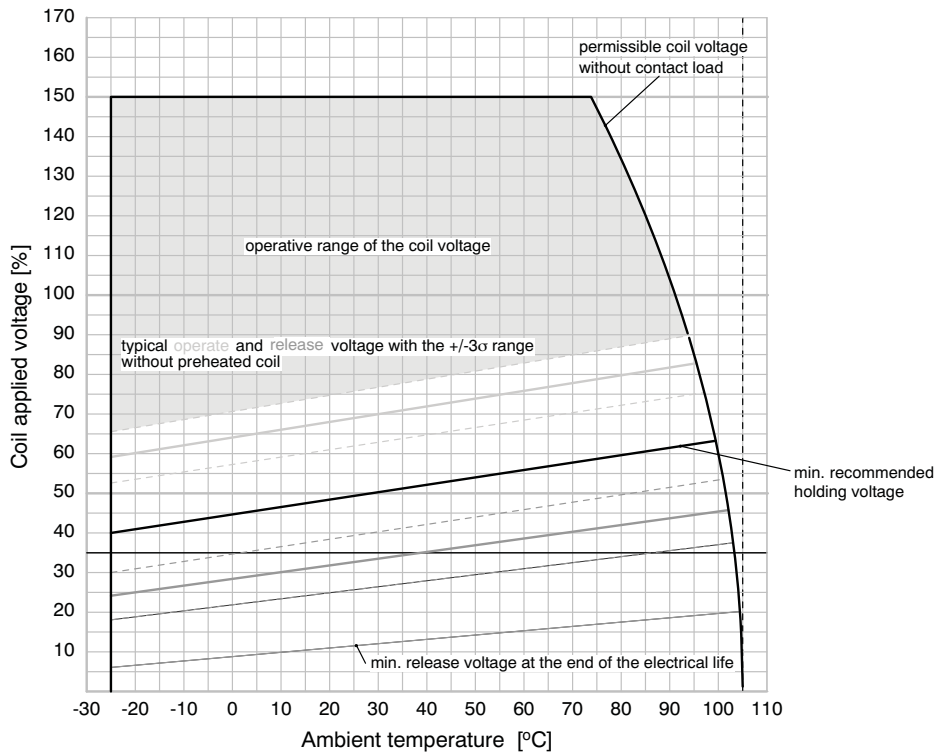
**Schematic (Bottom view)**



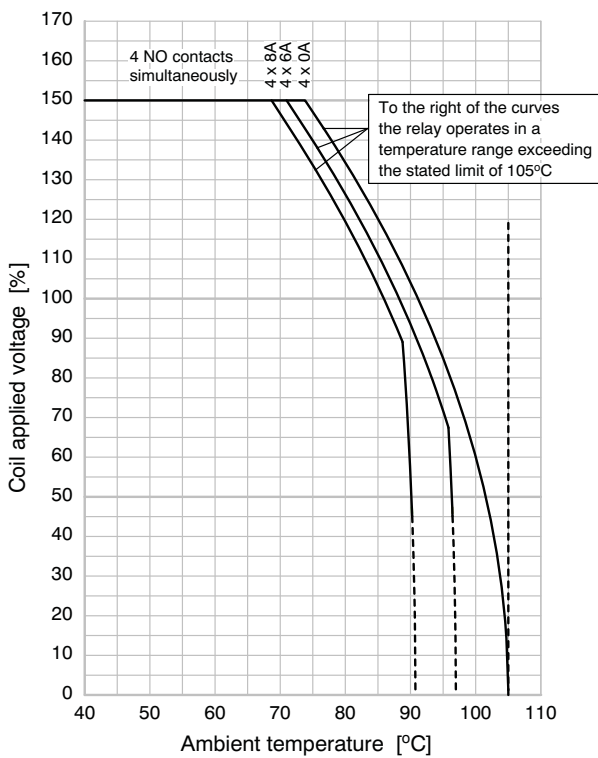
**PC board pattern (Bottom view)**



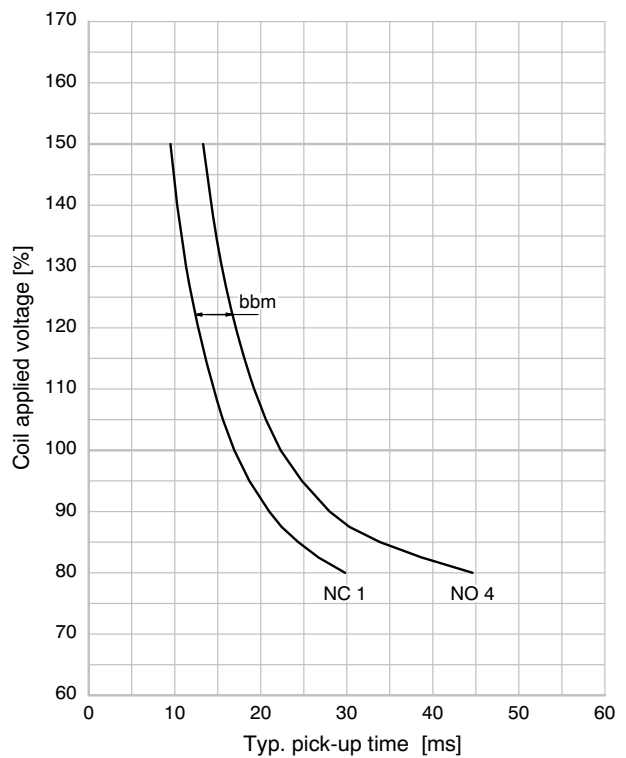
Coil voltage characteristics



Thermic operating range

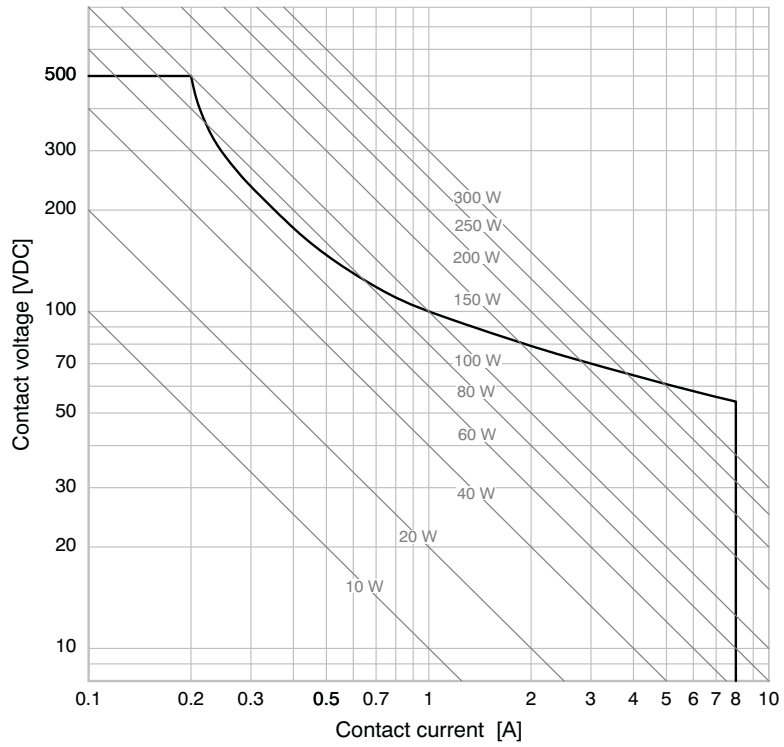


Switching time in relation to coil excitement at 20°C

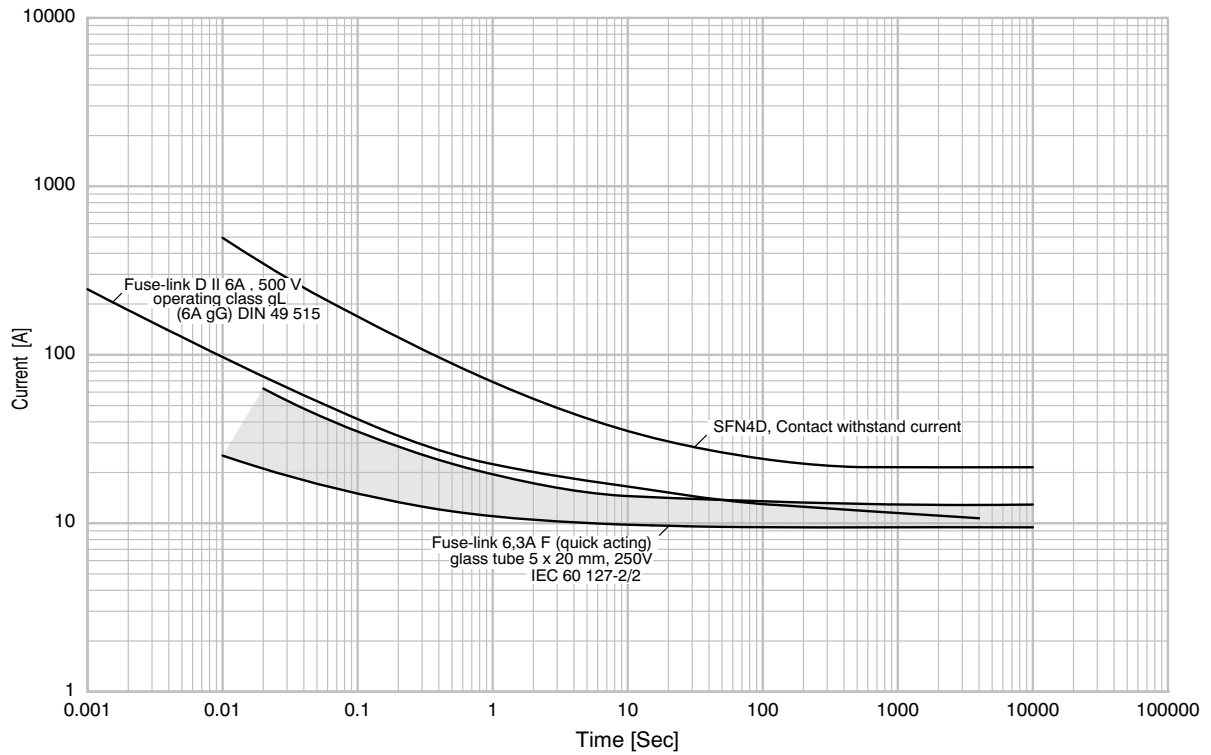


REFERENCE DATA, continued

Load limit curve



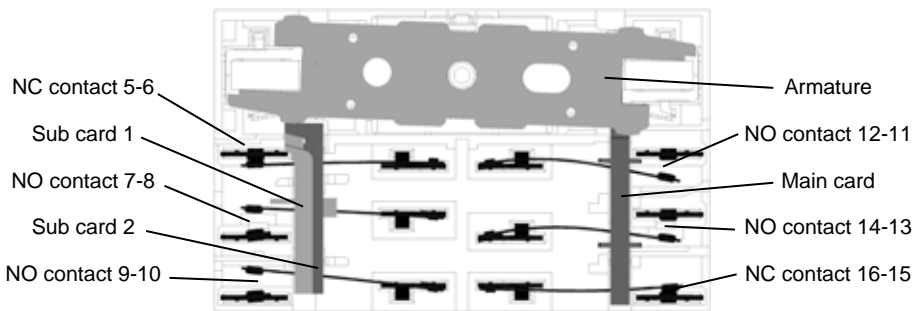
Time / current characteristic



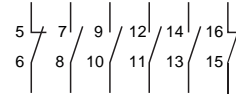
# SFN4D

## APPLICATION NOTES

### The SFN4D Safety Relay



**Remark:**  
Only NC 5-6 monitors  
all NO contacts!



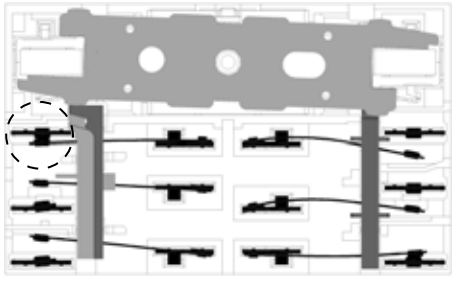
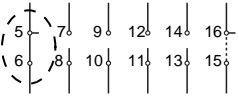
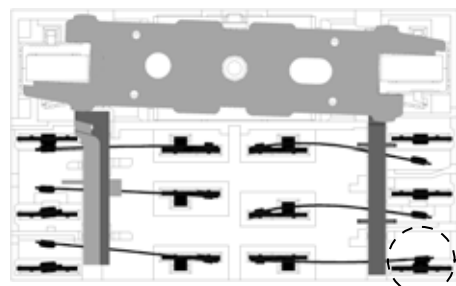
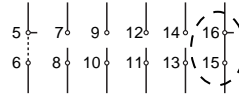
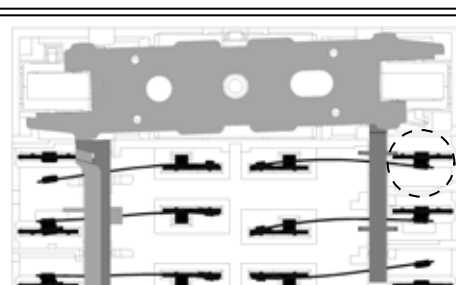
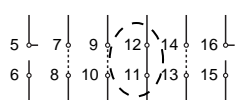
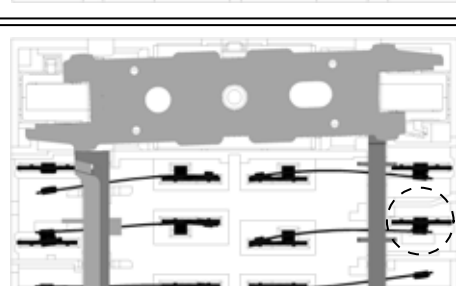
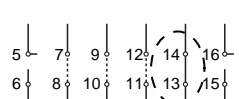
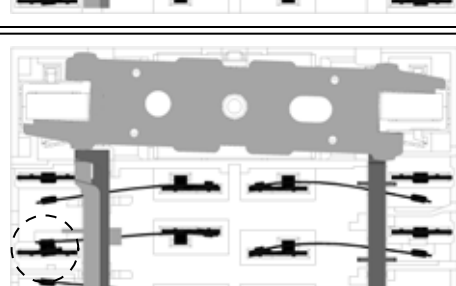
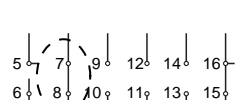
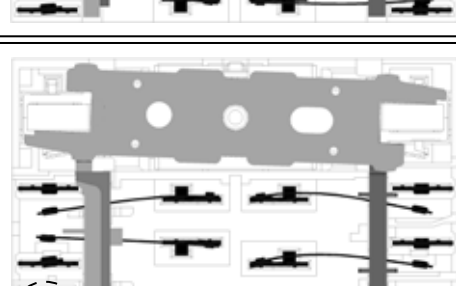
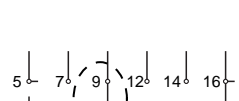
### Legend for interpreting contact conditions

Contact	NC (Normally Closed)				NO (Normally Open)			
	Closed	Fully open	Open	Open or closed	Closed	Fully open	Open	Open or closed
Symbol								
Contact gap	0	Maximum (~1.5mm)	>0.5mm (forcibly guided)	Not defined	0	Maximum (~1.5mm)	>0.5mm (forcibly guided)	Not defined

### The SFN4D under normal operating conditions

Condition	Illustration of Relay State	Condition of Contacts
<ul style="list-style-type: none"> <li>- Coil deenergized.</li> <li>- Armature in deenergized position.</li> <li>- NC contacts closed.</li> <li>- NO contacts have a contact gap of approx. 1.5mm.</li> </ul>		
<ul style="list-style-type: none"> <li>- Coil energized.</li> <li>- Armature in energized position.</li> <li>- NO contacts closed.</li> <li>- NC contacts have a contact gap of approx. 1.5mm.</li> </ul>		

The SFN4D safety relay with welded contacts

Condition	Illustration of Relay State	Condition of Contacts
<ul style="list-style-type: none"> <li>- NC 5-6 welded.</li> <li>- Coil energized.</li> <li>- Armature nearly in deenergized position.</li> </ul>		 <ul style="list-style-type: none"> <li>- All NO contacts are forcibly guided.</li> <li>- The NO contact gaps are min. 0.5mm.</li> <li>- For NC 16-15, the contact condition is not defined.</li> </ul>
<ul style="list-style-type: none"> <li>- NC 16-15 welded.</li> <li>- Coil energized.</li> <li>- Armature nearly in deenergized position.</li> </ul>		 <ul style="list-style-type: none"> <li>- All NO contacts are forcibly guided.</li> <li>- The NO contact gaps are min. 0.5mm.</li> <li>- For NC 5-6, the contact condition is not defined.</li> </ul>
<ul style="list-style-type: none"> <li>- NO 12-11 welded.</li> <li>- Coil deenergized.</li> <li>- Armature nearly in energized position.</li> </ul>		 <ul style="list-style-type: none"> <li>- All (both) NC contacts are forcibly guided.</li> <li>- The NC contact gaps are min. 0.5mm.</li> <li>- For all NO contacts, the contact condition is not defined.</li> </ul>
<ul style="list-style-type: none"> <li>- NO 14-13 welded.</li> <li>- Coil deenergized.</li> <li>- Armature in nearly energized position.</li> </ul>		 <ul style="list-style-type: none"> <li>- All (both) NC contacts are forcibly guided.</li> <li>- The NC contact gaps are min. 0.5mm.</li> <li>- For all NO contacts, the contact condition is not defined.</li> </ul>
<ul style="list-style-type: none"> <li>- NO 7-8 welded.</li> <li>- Coil deenergized.</li> <li>- Armature in deenergized position.</li> </ul>		 <ul style="list-style-type: none"> <li>- <b>NC 16-15 is closed!!</b></li> <li>- <b>All non-welded NO contacts show their max. contact gap.</b></li> <li>- NC 5-6 forcibly guided to the welded contact by sub card 1. The contact gap is min. 0.5mm.</li> </ul>
<ul style="list-style-type: none"> <li>- NO 9-10 welded.</li> <li>- Coil deenergized.</li> <li>- Armature in deenergized position.</li> </ul>		 <ul style="list-style-type: none"> <li>- <b>NC 16-15 is closed!!</b></li> <li>- <b>All non-welded NO contacts show their max. contact gap.</b></li> <li>- NC 5-6 forcibly guided to the welded contact by sub card 2. The contact gap is min. 0.5mm.</li> </ul>

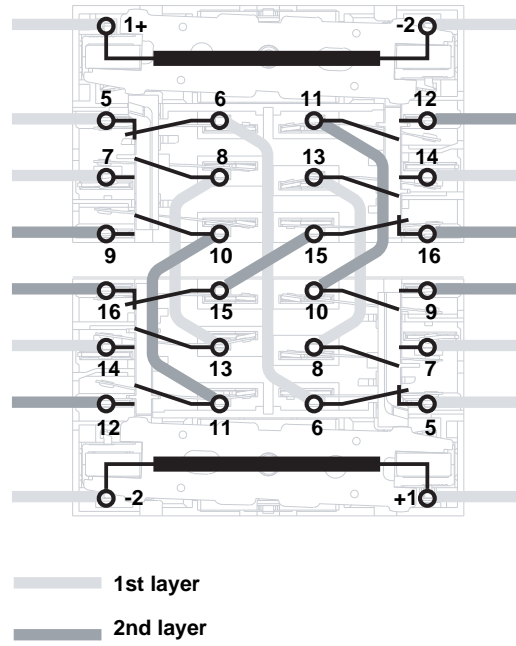
# SFN4D

## Failure modes, application examples

1) Feedback loop, 2) Self-holding circuit, 3) Safety circuit, 4) Auxiliary contacts

<p>1. Self-holding circuit, three safety circuits</p> <p>1) 2) 2) 3) 3) 3) 4)</p>	<p>One contact welded, e.g. NO 9-10 of K1.</p>	<p>Condition of contacts at deenergized coil</p>
<p>2.1. Four safety circuits</p> <p>1) 3) 3) 3) 3) 4)</p> <p>(see wiring example, p. 8)</p>	<p>One contact welded, e.g. NO 9-10 of K1.</p>	<p>Condition of contacts at deenergized coil</p>
<p>2.2. Two safety circuits</p> <p>1) 3) 3) 4)</p> <p>(see wiring example, p. 8)</p>	<p>Both contacts of one path are welded, e.g. NO 7-8 and NO 14-13.</p> <p>A safety circuit needs two paths in this failure mode. The contacts 9-10, 12-11, and 14-13 of K1 interrupt the load.</p>	<p>Condition of contacts at deenergized coil</p>
<p>2.2. Two safety circuits</p> <p>1) 3) 3) 4)</p> <p>(see wiring example, p. 8)</p>	<p>Both contacts of one path are welded, e.g. NO 9-10 and NO 12-11.</p> <p>A safety circuit needs two paths in this failure mode. The contacts 7-8, 12-11, and 14-13 of K1 interrupt the load.</p>	<p>Condition of contacts at deenergized coil</p>

Wiring for application examples 2.1 and 2.2



For Cautions for Use, see [Relay Technical Information](#).



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