

JIS

JAPANESE INDUSTRIAL STANDARD

**Terminal blocks for
industrial and similar use**

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In the event of any doubt arising,
the original Standard in Japanese is to be final authority.

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Terminal blocks for industrial and similar use

C 2811-1995

1. Scope This Japanese Industrial Standard specifies terminal blocks for industrial and similar use, to be used for electric circuit of not more than a.c. 600 V (frequency 50 Hz or 60 Hz) or d.c. 600 V (hereafter referred to as "terminal blocks").

Above-mentioned terminal block means an assembly of conductive metal fittings having wire connecting part and insulator to hold them for the purpose of connection, branch or relaying of wires, mainly used for interior of electric control apparatus, control board, switch board or the like.

Remarks 1. For the following terminal blocks, however, this Standard does not apply.

- (1) Article having switching function, disconnecting function or fuse.
- (2) Article exclusively used for electronic equipment or communication apparatus.
- (3) Article for the purpose to connect aluminium wire.
- (4) Article of special construction to be used for a specific apparatus or device.

2. The standards cited in this Standard are given in Attached Table 1.

3. The International Standards corresponding to this Standard are given below.

IEC 947-1 (1988) Low-voltage switchgear and controlgear
Part 1: General rules

IEC 947-7-1 (1989) Low-voltage switchgear and controlgear
Part 7: Ancillary equipment
Section One - Terminal blocks
for copper conductors

2. Definitions For the purpose of this Standard, the following principal definitions apply:

- (1) screw type terminal block Generic name of terminal block of such construction that screws are used for wire connection. There are screw terminal block, stud terminal block, clamp terminal block and push tightening terminal block, according to the shape of wire connecting part.
- (2) screw terminal block A terminal block of such construction that the connection is made by tightening wire or crimp-style terminal with lower face of terminal screw head, directly or through washer, etc.

- (3) stud terminal block A terminal block of such construction that the connection is made by tightening wire or crimp-style terminal with nuts screwed in the stud which is fixed to conductive metal fittings or insulator, directly or through washers, etc.
- (4) clamp terminal block A terminal block of such construction that the wire is inserted between a conductive metal fitting and clamp, and tightened with pushing force of the clamp to perform the connection.
- (5) push tightening terminal block A terminal block of such construction that the wire is inserted into a hollow cylindrical conductive metal fitting and tightened with end of screw screwed in the conductive metal fitting directly or through a strap metal to perform connection.
- (6) tab terminal block A terminal block so constructed that the connection is made by using flat quick-connect terminal.
- (7) lug terminal block A terminal block having lugs, to which connection is made by soldering.
- (8) wrapping terminal block A terminal block having pins, on which wires are wrapped to perform the connection.
- (9) screwless type terminal block A terminal block of such construction that the wire is inserted between the conductive metal fitting and the spring, and connected by means of the pressure of the spring directly or through a strap metal.
- (10) rated insulation voltage The voltage taken as the basis of insulation design of terminal block, which satisfies the required insulation distance and withstand voltage.
- (11) rated applicable wire The maximum size (expressed in sectional area mm^2 or diameter mm) of wire which can be connected to the terminal block, and satisfies the thermal, mechanical and electrical performances.

3. Standard service condition The standard service conditions shall be as prescribed below, and terminal blocks shall be used under these conditions, unless otherwise specified. Provided that the atmospheric condition does not cause freezing or dew formation of terminal.

- (1) Ambient temperature: -5°C to 40°C
- (2) Relative humidity: 45 % to 85 %
- (3) Altitude: 2000 m or below

4. Classification Terminal blocks are classified as given in Table 1, according to the shape of wire connecting part.

Table 1. Classification of terminal blocks

Classification		Applicable sub-clause for definition	Shape of wire connecting part
Screw type terminal block	Screw terminal block	2. (2)	Attached Fig. 1 (1)
	Stud terminal block	2. (3)	Attached Fig. 1 (2)
	Clamp terminal block	2. (4)	Attached Fig. 1 (3)
	Push tightening terminal block	2. (5)	Attached Fig. 1 (4)
Tab terminal block		2. (6)	Attached Fig. 1 (5)
Lug terminal block		2. (7)	Attached Fig. 1 (6)
Wrapping terminal block		2. (8)	Attached Fig. 1 (7)
Screwless type terminal block		2. (9)	Attached Fig. 1 (8)

5. Ratings

5.1 Rated insulation voltage The rated insulation voltage shall be as follows:

a.c. or d.c. 250 V, 600 V

5.2 Rated applicable wire The rated applicable wire shall be expressed in nominal sectional area or diameter of the wire and shall be as given in Table 2.

Table 2. Rated applicable wires

Stranded wire	mm ²	0.5	0.75	1.25	2	3.5	5.5	8	14	22	38	60	100
		150	200	250	325								
Solid wire	mm	0.5	0.8	1	1.2	1.6	2						

6. Performances

6.1 Temperature rise When the specimen is tested by 8.3, temperature rise of conductive metal fittings shall be not more than 45°C, provided that the limit of ambient temperature is 40°C.

6.2 Insulation resistance When the specimen is tested by 8.4, insulation resistance of each part shall be not less than 20 MΩ.

6.3 Commercial frequency withstand voltage When the commercial frequency withstand voltage test is made by 8.5, the terminal block shall withstand the test voltage.

6.4 (Lightning) impulse withstand voltage When the (lightning) impulse withstand voltage test is made by 8.6, the terminal block shall withstand the test voltage.

6.5 Short-time current When the short-time current test is made by 8.7, the terminal block shall be free from damage of insulation and any trouble detrimental to service. The voltage drop measured before the test shall not exceed 3.2 mV and that after the test shall not exceed 150 % of the value measured before the test.

6.6 Heat cycle

6.6.1 When the screw type terminal block is tested by 8.8.1, the temperature rise of conductive metal fittings at 125th cycle shall be not more than the measured value at 25th cycle plus 8°C.

6.6.2 When the screwless type terminal block is tested by 8.8.2, it shall be free from damage of insulation and any trouble detrimental to service, and the value of voltage drop at completion of 200th cycle shall be not more than 1.5 times the measured value at completion of 25th cycle or shall not exceed 4.8 mV.

6.7 Voltage drop When the voltage drop test is made as specified in 8.9, the voltage drop before the test shall be not more than 3.2 mV and that after the test shall not exceed 150 % of the value measured before the test.

6.8 Strength When the strength test is made by 8.10, there shall be no harmful mechanical damage due to deformation, breakage, etc. on each part.

6.9 Resistance to vibration When the resistance to vibration test is made by 8.11, there shall be no loosening of screw, rivet or the like, damage of insulation nor other harmful damage.

6.10 Resistance to shock When the resistance to shock test is made by 8.12, there shall be no loosening of screw, rivet or the like, damage of insulation nor other harmful damage.

6.11 Resistances to cold and heat When the resistances to cold and heat test is made by 8.13, there shall be no loosening of screw, rivet or the like, damage of insulation, nor other harmful damage, and the test specimen shall satisfy the provisions of 6.2 and 6.3.

6.12 Resistance to damp heat When the resistance to damp heat test is made by 8.14, there shall be no loosening of screw, rivet or the like, damage of insulation, nor other harmful damage, the insulation resistance shall be not less than 5 MΩ and the test specimen shall satisfy the provision of 6.3.

7. Construction

7.1 Construction in general The terminal block shall be made of materials of superior quality, be correct in the shape, be robust, and comply with the following requirements:

- (1) The terminal block can be easily and surely mounted on the electrical machinery and apparatus.
- (2) Connection of wire shall be easy and sure.
- (3) Each pole can be marked with terminal mark.
- (4) Number of engaged threads of screw for each part shall be 2 or more. For the screw of 8 mm or more in diameter, however, the length of engaged threads shall be 40 % or more of the screw diameter.
- (5) Suitable locking means shall be provided for the part likely to become loose.
- (6) Joints clamped with screw, rivet or the like for passing current shall not be clamped together with such insulating materials liable to shrink as moulded synthetic resin inserted between them.
- (7) The part liable to produce rust or corrosion shall be subjected to plating or other rust preventive treatment.

7.2 Materials The materials of each part of a terminal block shall comply with the following requirements:

- (1) The copper or copper alloys specified in JIS H 3100 or at least equivalent in electrical and mechanical properties shall be used for conductive part.
- (2) When synthetic resin is employed as the insulating materials, the test same as that specified in 5.24.1 of JIS K 6911 shall be carried out and the materials considered noncombustible or self-distinguishable as specified in the same JIS shall be used. The resin shall also withstand the temperature of conductive parts sufficiently.
- (3) Steel treated deterrent to rusting, stainless steel or copper alloys shall be used as the metallic materials for the parts other than current carrying parts.

The terminal screw intended to pass current directly shall be of copper alloys.

7.3 Dimensions

7.3.1 Insulation distance The clearances and creepage distances shall be those specified in the space for pollution degree 3 of Table 6 or Table 7 in JIS C 0704, and those specified in the column of pollution degree 3 of Table 8 or Table 9 of 4.3 in the same JIS. In this case, the determination of insulation distance shall be carried out while the rated applicable wires are being connected.

7.3.2 Nominal diameter of terminal screw The nominal diameter of terminal screw used for screw terminal block and stud terminal block shall be as given in Table 3, correlating with the rated applicable wire.

Table 3. Nominal diameter of terminal screw

Rated applicable wire						Nominal diameter of terminal screw mm		
Stranded wire mm ²			Solid wire mm					
0.5	0.75	1.25	0.5	0.8	1	3	3.5	4
2			1.2	1.6		3.5	4	
3.5	5.5		2			4	5	
8	14		—			5	6	
22			—			6	8	
38	60		—			8	10	
100	150		—			10	12	
200			—			12		
250	325		—			16		

7.3.3 Dimensions of male tab The dimensions of male tab of tab terminal block shall be adaptable to the flat quick-connect terminal shown in Table 4 correlating with the rated applicable wire, and the basic sizes shall comply with Attached Table 2 specified in JIS C 2809.

Table 4. Flat quick-connect terminal

Rated applicable wire mm ²	Series of flat quick-connect terminal mm
0.5 to 1.25	2.8
0.5 to 1.25	4.8
0.75 to 2.0	6.3

7.3.4 Range of connectable wires The terminal blocks for rated applicable wire of 38 mm² or less shall be capable of connecting wires of the range given in Table 5.