

JIS

JAPANESE INDUSTRIAL STANDARD

**Box-type switchgear
assemblies for low-voltage
distribution purpose**

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In the event of any doubt arising,
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Box-type switchgear assemblies for
low-voltage distribution purpose

C 8480-1995

1. Scope This Japanese Industrial Standard specifies box-type switchgear assemblies for low-voltage distribution purpose (hereafter referred to as "switchgear assemblies") with rated current of 600 A or less and rated short-time withstand current of 22 kA or less, used in electric lines of a.c. 600 V or less at a frequency of 50 Hz or 60 Hz or d.c. 250 V or less. This Standard, however, does not cover those switchgear assemblies which are intended for use in residences.

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

2. The units and numerical values shown in { } in this Standard are based on the traditional units, and are appended for informative reference.

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

- (1) switchgear assembly Such structure that branch overcurrent circuit-breakers (those also serving as switches are included) are assembled on a base plate and then accommodated in a cabinet. Switchgear assemblies providing also main overcurrent circuit-breaker, main switch, branch switch(es), etc. and those providing space for utility meters and current limiter are also included.
- (2) rated voltage of switchgear assembly The voltage which is marked on the nameplate and expressed with the nominal value of supply voltage applied to the busbar.
- (3) rated current of switchgear assembly The current which is marked on the nameplate, and defined as follows:
 - (a) For a switchgear assembly equipped with main overcurrent circuit-breaker, main switch, or main disconnecting device, it is the rated current of such a device.
 - (b) For a switchgear assembly not equipped with main overcurrent circuit-breaker, main switch, or disconnecting device, it is the rated current of the busbar.
- (4) rated continuous service current of switchgear assembly The current which can be safely passed through a switchgear assembly continuously.
- (5) rated current of busbar The current which can be safely passed through a busbar continuously.
- (6) rated current of distribution busbar The current which can be safely passed through a distribution busbar continuously.
- (7) rated current of branch conductor The current which can be safely and continuously passed through a branch conductor, and which is not less than rated current of the branch overcurrent circuit-breaker.

- (8) rated short-time withstand current The upper limit of the current which can be passed through a switchgear assembly for a specified short-time under specified conditions of circuit without any abnormalities.
- (9) box The part of enclosure which covers upper, lower, right and left sides, and rear face of a switchgear assembly.
- (10) front frame The part covering a switchgear assembly front other than the door and protective plate.
- (11) door The part in the front of cabinet which is supported by hinges or the like, and opens and closes.
- (12) protective plate The part which covers the front of switchgear assembly so that opening and closing operations of handles of overcurrent circuit-breaker, switch, etc. are safely performed under the state of door opened, without touching to the live parts.
- (13) cabinet A cabinet is an enclosure which is composed of a box, (b) and (c) given below, or of a box, (a), (b) and (c) given below:
- (a) front frame
 - (b) door
 - (c) protective plate
- (14) base plate The frame or plate on which such apparatus as overcurrent circuit-breaker, switch, etc. are mounted. The base plate may also serve as the rear plate of a box.
- (15) gutter space The space in a cabinet necessary for connection of external wires.
- (16) exposed type A switchgear assembly of such construction that it is installed with a part or all of the box projected from the surface of structure.
- (17) flush mounted type A switchgear assembly of such construction that it is installed with all of the box recessed in the surface of structure.
- (18) rainproof type A switchgear assembly which is not harmfully affected by rainfall within the range of 60° from vertical among those installed and used in an outdoor place exposed to rainwater.
- (19) splash-proof type A switchgear assembly which is not harmfully affected by water splash in any direction among those installed and used in an outdoor place exposed to rainwater.
- (20) multiple-supply type A type of switchgear assembly to be connected with two or more power sources.
- (21) main overcurrent circuit-breaker An overcurrent circuit-breaker which mainly protects the busbar from the overcurrent caused in the busbar. Molded-case circuit-breaker, fuses, residual current and overcurrent operated circuit-breaker are used as the main overcurrent circuit-breaker.
- (22) main switch A switch operated by hand (excluding a disconnecting device) fitted on the power source side of busbar.

- (23) branch overcurrent circuit-breaker An overcurrent circuit-breaker which protects each branch circuit from the overcurrent caused in the circuit. Molded-case circuit-breaker, fuses, residual current and overcurrent operated circuit-breaker are used as the branch overcurrent circuit-breaker.
- (24) branch switch A switch operated by hand fitted to each branch circuit.
- (25) disconnecting device A device other than switches and circuit-breakers to open the electric circuit under no-load state.
- (26) busbar An electric conductor which is installed in a switchgear assembly to feed electricity to two or more branch overcurrent circuit-breakers (including those serving also as switches). The external wires are excluded.
- (27) distribution busbar The branching conductor which connects each group and the main busbar, when the branch overcurrent circuit-breakers are installed in two or more groups.
- (28) branch conductor Electric conductors used for connection between the busbar or distribution busbar and branch overcurrent circuit-breaker or the like.
- (29) separator A structure which is installed for the purpose of preventing contact with different power supply or the like in addition to divide the space in a cabinet.

3. Service conditions

3.1 Standard service conditions

3.1.1 Standard service conditions of indoor switchgear assembly The standard service conditions of indoor switchgear assembly mean the service conditions which comply with every item prescribed below.

- (1) The ambient temperature is not exceeding the range of the maximum 40°C and minimum – 5°C and the average value measured over 24 h does not exceed 35°C.
- (2) The altitude is not exceeding 1000 m.
- (3) The pollution of ambient air due to dust, smoke, corrosive or inflammable gas or vapour and salt mist is negligible.
- (4) The range of relative humidity is 45 % to 80 %. Normally dew is not formed inside the switchgear assembly.
- (5) The influence of vibration resulted from outside or earthquake on the switchgear assembly is negligible.

3.1.2 Standard service conditions of outdoor switchgear assembly The standard service conditions of outdoor switchgear assembly mean the service conditions which comply with every item prescribed below:

- (1) The ambient temperature is not exceeding the range of the maximum 40°C and the minimum – 25°C, and the average value measured over 24 h does not exceed 35°C.
- (2) The altitude is not exceeding 1000 m.

- (3) The pollution of ambient air due to dust, smoke, corrosive or inflammable gas or vapour and salt mist is negligible.
- (4) The relative humidity outside of the switchgear assembly is not specified. However, dew formation, if occur, shall be such a degree that the internal equipment is not affected.
- (5) The ice and snow are negligible.
- (6) The wind pressure does not exceed 1000 Pa (corresponding to wind speed 40 m/s).
- (7) The switchgear assembly is exposed to rainwater, temperature change and direct sunshine.
- (8) The influence of vibration resulted from outside or earthquake on the switchgear assembly is negligible.
- (9) The atmospheric conditions close to those inside ordinary room is maintained inside the switchgear assembly.

3.2 Special service condition The special service condition means special condition which comes under either case prescribed below, and such special conditions shall be especially specified and notified to the manufacturer by the purchaser beforehand.

- (1) Such a case that the ambient temperature, humidity, dew formation and altitude are exceeding those specified in 3.1.
- (2) When the temperature or air pressure changes rapidly.
- (3) When the air contains excess steam, oil vapour, smoke, dust, salt and corrosive substance.
- (4) When there are explosive, inflammable or other harmful gases, or the place may be attacked by such gases.
- (5) When there are especially much ice and snow.
- (6) When the switchgear assembly is exposed to strong electric or magnetic field.
- (7) When the switchgear assembly receives abnormal vibration or shock.
- (8) When the switchgear assembly is transferred being located on a vehicle or the like.

4. Classification The switchgear assemblies are classified as follows:

- (1) Classification by kind of materials for cabinet
 - (a) Metallic switchgear assembly
 - (b) Synthetic resin switchgear assembly
 - (c) Switchgear assembly of mixed metal and synthetic resin
- (2) Classification by installing system
 - (2.1) For indoor use
 - (a) Exposed type
 - (b) Flush mounted type

- (2.2) For outdoor use
 - (a) Rainproof type
 - (b) Splash-proof type
- (3) Classification by existence or non-existence of main overcurrent circuit-breaker or main switch
 - (a) Switchgear assembly without these devices
 - (b) Switchgear assembly with these devices
- (4) Classification by kind of overcurrent circuit-breaker
 - (a) Switchgear assembly employing molded-case circuit-breaker
 - (b) Switchgear assembly employing residual current operated circuit-breaker (providing overcurrent breaking performance)
 - (c) Switchgear assembly employing other overcurrent circuit-breaker
 - (d) Switchgear assembly employing mixed breaking apparatus of (a) to (c)
- (5) Classification by number of power sources
 - (a) Switchgear assembly connected to one power source
 - (b) Switchgear assembly connected to two or more power sources

5. Ratings The ratings of switchgear assembly are as follows:

- (1) For a.c. switchgear assembly
 - (a) Rated voltage, phase system, line system (for busbar)
 - (b) Rated frequency
 - (c) Rated current
 - (d) Rated continuous service current
 - (e) Rated short-time withstand current
- (2) For d.c. switchgear assembly
 - (a) Rated voltage
 - (b) Rated current
 - (c) Rated continuous service current
 - (d) Rated short-time withstand current
- (3) For multiple-supply switchgear assembly The ratings are determined for each power source in accordance with (1) or (2).
- (4) Rated voltage The standard values of rated voltages of switchgear assemblies shall be as given in Table 1.

Table 1. Rated voltage

Unit: V

Phase, line system	Rated voltage	
	A.C.	D.C.
Single phase 2-wire system	100 200	110 220
Single phase 3-wire system	100/200	
Three phase 3-wire system	200 415	
Three phase 4-wire system	100/173 240/415	

- (5) Rated frequency The rated frequency of switchgear assemblies shall be 50 Hz, 60 Hz or 50/60 Hz.
- (6) Rated current The standard values of rated currents of switchgear assemblies shall be as given in Table 2.

Table 2. Rated current

Unit: A

Rated current ⁽¹⁾ (a.c. and d.c.)								
30	40	50	60	75	100	125	150	175
200	225	250	300	350	400	500	600	

Note ⁽¹⁾ For switchgear assemblies providing main overcurrent circuit-breaker or main switch, these values shall be equal to the values of rated currents of such isolating apparatus.

- (7) Rated continuous service current The rated continuous service current of switchgear assemblies shall be 80 % of the rated current.
- (8) Rated short-time withstand current The standard values of rated short-time withstand currents and their maximum crest values shall be as given in Table 3.

Table 3. Rated short-time withstand current

Rated voltage V	Rated short-time withstand current (effective value of a.c. component) kA	Maximum crest value (multiples of rated short-time withstand current)
100 110	5	1.5
173 200	7.5 10	1.7
220 240	14 18 20	2.0
	22	2.1
415	5	1.5
	7.5 10	1.7



6. Performance

6.1 Insulation resistance The insulation resistance shall be not less than 5 MΩ when the test is carried out in accordance with 8.3.

6.2 Dielectric withstand voltage The switchgear assembly shall withstand the test voltage when the test is carried out in accordance with 8.4.

6.3 Sequence When the test of 8.5 is carried out on an apparatus having a circuit to control the main circuit, the specimen shall show normal operation.

6.4 Temperature rise When the test is carried out in accordance with 8.6, the temperature rise of each component shall not exceed the appropriate value given in Table 4. The temperature rise limit, in this case, is based on the limit temperature 40°C of the ambient temperature outside the assembly. However, the temperature rises of accommodated devices and materials other than those prescribed in Table 4 are in accordance with the values specified in the relevant standards for the devices and the materials respectively.

Table 4. Temperature rise

Unit: °C

Portion and component		Temperature rise limit	Maximum permissible temperature
Busbar, distribution busbar and branch conductor		65	105
Joint by tightening of bolt or the like	Bare copper	50	90
	Silver, nickel or tin plating	65	105
Contact	Bare copper	35	75
	Silver or nickel plating	65	105
	Tin plating	50	90
Terminal connected with external conductor by screws or bolts	Bare copper	50	90
	Silver, nickel or tin plating	65	105
Enclosure of cabinet		30	70

6.5 Short-time withstand current The switchgear assembly shall show no deformation, damage or any abnormality detrimental to service when the test is carried out in accordance with 8.7.

6.6 Mechanical strength A switchgear assembly with a box, front frame, door or protective plate made of synthetic resin shall not cause crack or damage detrimental to service, when the test is carried out in accordance with 8.8.

6.7 Resistance to heat A switchgear assembly with a box, front frame, door or protective plate made of synthetic resin shall not cause deformation, blister, crack, etc. detrimental to service, when the test is carried out in accordance with 8.9.