

Bus bar support

Technical Terms of Delivery



IRAN TRANSFO STANDARD
Iran Transformer Research Institute

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FOREWORD

Iran Transfo Standard consists of a series of standards which are prepared on the basis of valid International standards, in conformity with Iran Transfo's technical requirements.

The initial draft has been prepared in Iran Transformer Research Institute (ITRI) which is also responsible to issue the final documents approved by professional committees in the form of ITS standards. It should be mentioned that all departments of Iran Transfo Co. are obligated to apply the issued ITS Standards.

All users must be assured that the latest edition of this standard will be used. The latest edition of ITS standards is also available on the ITRI web site:

<http://research.iran-transfo.com>

About this standard:

The present standard has been approved in Iran Transfo Co.'s Mechanical Equipment Committee by:

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1 Scope

This technical terms of delivery applied to bus bar supports that be used in air type transformer bus ducts or supporting for neutral connection to ground on transformer. Ceramic, Epoxy resin and silicon rubber with composite core are types of Bus bar supports commonly used for outdoor and indoor services.

2 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

A post insulator is intended to give rigid support to a live part which is to be insulated from earth and from another live part.

The whole or part of the material composing the post insulator consists of organic material.

- **Bus bar support (Post insulator)**

A bus bar support is intended to give rigid support to a live part which is to be insulated from earth and from another live part.

- **Resin bus bar support (Epoxy resin type)**

A bus bar support is intended to give rigid support to a live part which is to be insulated from earth and from another live part.

- **Ceramic material bus bar support (Ceramic type)**

Ceramic material bus bar support, with external metal fittings, having an internal ceramic barrier produced and fired integrally in each post insulator unit.

- **Composite bus bar support (Silicon rubber type)**

Bus bar support consisting of a solid load bearing cylindrical insulating core, a housing and end fittings attached to the insulating core.

- **Core**

Central insulating part of an insulator which provides the mechanical characteristics.

- **Housing**

External part of insulator for providing expected creep distance and protecting core from environmental effects. Ceramic, epoxy resin and silicon rubber are common materials that used for Housing.

- **End fitting**

Integral component or formed part of an insulator, intended to connect it to the supporting structure, or to a conductor, or to an item of equipment, or to another insulator.

Note: Where the end fitting is metallic, the term "metal fitting" is normally used.

- **Creepage distance**

Shortest distance or the sum of the shortest distance along the surface of an insulator between two conductive parts which normally have the operating voltage between them.

- **Unified specific creepage distance (USCD)**

Creepage distance of an insulator divided by the maximum operating voltage across the insulator (for AC systems usually the highest voltage for equipment $U_m/\sqrt{3}$) which is generally expressed in mm/kV and specified as a minimum value.

- **Highest voltage for equipment (U_m)**

The values of the highest voltage for equipment, defined in IEC 60038, in kilovolts.

- **Mechanical failing load**

The maximum load reached when a bus bar support tested under the prescribed conditions of test.

3 Designation code and Dimensions

Designation for bus bar support is according to the following code.

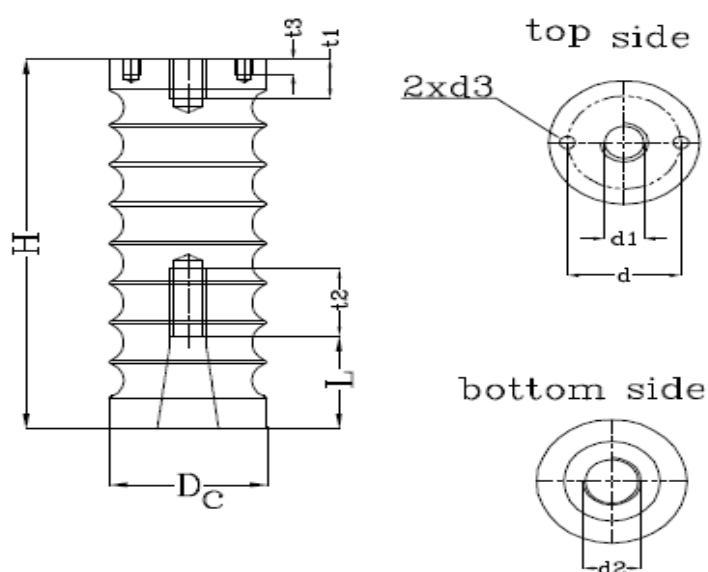
Bus bar support- ITS-ME02-03-Type- Description Code

Table 1: Description Code

	Description Code
Epoxy resin type	R-60, R-75, R-125, R170
Ceramic type	C-75, C-125, C-170, C-250
Silicon rubber type	S-75, S-125, S-170, S-250

3.1 Epoxy resin type

Epoxy resin insulators are suitable for indoor use. This type of insulators categorized according to table 2 and table 3 that shown below.

**Figure 1: Epoxy resin type- overall view and dimensions****Table 2: Epoxy resin type bus bar insulator- electrical and mechanical properties**

Designation	Highest voltage for equipment kv	Lighting impulse withstand voltage kv	Power frequently withstand voltage, dry kv	Minimum creepage distance mm	Failing load bending		Maximum distance on deflection between 20% and 50% of the specified failing load mm
					$P_0(N)$	$P_{50}(N)$ $(P_{50} = P_0 \frac{H}{H+50})$	
R-60	7.2	60	28	110	4000	2600	1.5
R-75	12	75	38	160	4000	2900	2
R-125	24	125	50	380	4000	3200	3.2
R-170	36	170	70	500	6000	5100	5

Table 3: Epoxy resin type bus bar insulator- Dimensions and tolerances in mm

Designation	H	$D_c(\text{max})$	D	d_1	d_2	d_3	L	t1	t2	t3
R-60	95^{+5}_{-0}	85	46	M12	M12	M6	15	18	25	15
R-75	130^{+5}_{-0}	105	66	M12	M16	M10	20	18	30	20
R-125	210^{+5}_{-0}	125	66	M12	M16	M10	35	18	30	20
R-170	300^{+5}_{-0}	140	66	M16	M24	M10	60	25	40	20

3.2 Ceramic type

Ceramic type insulators are suitable outdoor use. This type of insulators categorized according to table 4 and table 5 that shown below.

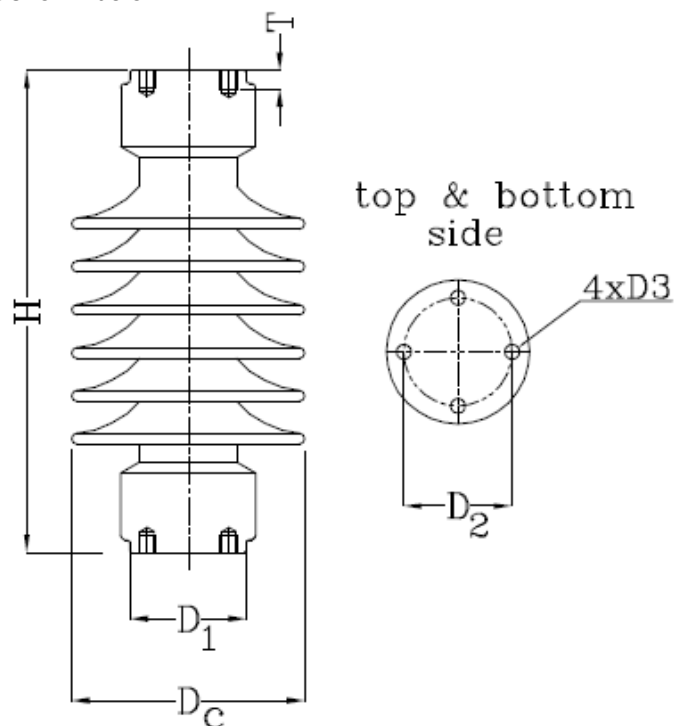
**Figure 2: Ceramic type- overall view and dimensions**

Table4: Ceramic type bus bar insulator- electrical and mechanical properties

Designation	Highest voltage for equipment kv	Lightening impulse withstand voltage kv	Power frequently withstand voltage, wet kv	Minimum creepage distance mm	Minimum bending load kN
C-75	12	75	28	300	4
C-125	24	125	50	600	4
C-170	36	170	70	900	4
C-250	52	250	95	1300	4

Table 5: Ceramic type bus bar insulator- Dimensions and tolerances in mm

Designation	H	$D_c(\text{max})$	D_1	D_2	D_3	T(min)
C-75	215 \pm 2	190	108 \pm 2	76	M12	15
C-125	305 \pm 2	230	108 \pm 2	76	M12	15
C-170	445 \pm 2	245	108 \pm 2	76	M12	15
C-250	560 \pm 2	255	165 \pm 2	127	M16	22

3.3 Silicon rubber type

Silicon rubber type insulators are suitable for outdoor use. This type of insulators categorized according to table 6 and table 7 that shown below.

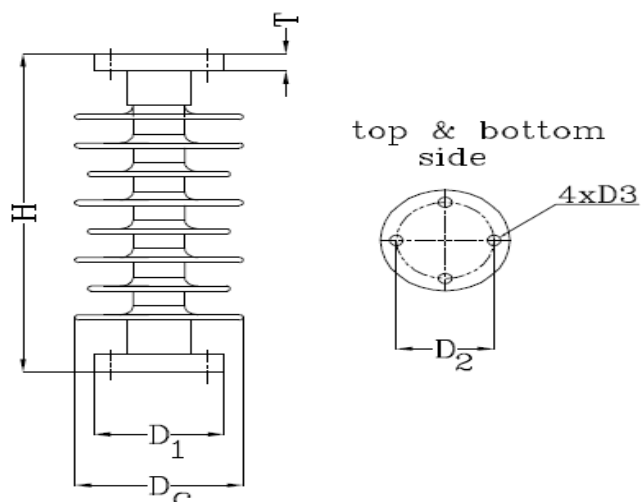
**Figure 3: Silicon rubber type- overall view and dimensions**

Table6: Silicon rubber type bus bar insulator- electrical and mechanical properties

Designation	Highest voltage for equipment kV	Lightning impulse withstand voltage kV	Power frequency withstand voltage, wet kV	Minimum creepage distance mm	Minimum bending load kN
S-75	12	75	28	300	4
S-125	24	125	50	600	4
S-170	36	170	70	900	4
S-250	52	250	95	1300	4

Table 7: Silicon rubber type bus bar insulator- Dimensions and tolerances in mm

Designation	H	$D_c(\text{max})$	D_1	D_2	D_3	T(min)
S-75	215±2	220	108 ±2	76	M12	12
S-125	305 ±2	220	108 ±2	76	M12	12
S-170	445 ±2	220	108 ±2	76	M12	12
S-250	560 ±2	220	165 ±2	127	M16	15

4 Values which characterized a bus bar support

A bus bar support is characterized by the following values, where applicable

- The specified dry lightning impulse withstand voltage.
- The specified dry power frequency withstand voltage (for indoor insulating only).
- The specified wet power frequency withstand voltage (for outdoor insulating only).
- The specified failing load(s).
- The specified significant dimension, including creep distance

5 Metal fitting

End fittings are often used at the ends of the insulating body to transmit mechanical loads.

For Ceramic type and Silicon rubber type, the fitting materials should be metal, hot dip galvanized according IEC60383-1.

6 Electrical characteristics

Each bus bar support is designated for specified lightning impulses withstand voltage based on the standardized values given IEC publication 60071-1.

7 Mechanical characteristics

Bus bar insulators are standardized in mechanical strength classes based on values of the specified failing load in the bending test.

8 Dimensional characteristics

The following dimension characteristics are specified:

- Overall height.
- Maximum nominal diameter of the insulating part.
- Fixing arrangement.
- Tolerances.
- Minimum creep distance (for outdoor post insulators only).

9 Tests

The tests must be performed according:

- IEC 60168 for outdoor cylindrical post insulators of ceramic material and with external metal fittings.
- IEC 60660 for indoor post insulators of organic material and with internal metal fittings.
- IEC 62231 for composite station post insulators.

10 Packaging and labelling

Each bus bar insulator shall be cleaned before packing. The bus bar insulators shall be protected against dirt and mechanical damages.

Each packing shall be identified by attached labelling and marked with following data:

- Manufacturer name
- Purchaser code number
- Type of bus bar support
- Quantity

11 Normative References

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For undated references, the latest edition of the referenced document applies.

IEC 60273

Characteristics of indoor and outdoor post insulators for systems with nominal voltages greater than 1000 V

IEC 62231-1

Composite station post insulators for substations with AC voltages greater than 1000 V up to 245 KV

IEC 60168

Tests on indoor and outdoor post insulators of ceramic material or glass for systems with nominal voltages greater than 1000 V

IEC 60660

Tests on indoor post insulators of organic material for systems with nominal voltages greater than 1000 V up to but not including 300 KV

IEC 62231

Composite station post insulators for substations with AC voltages greater than 1000 V up to 245 KV- Definitions, test methods and acceptance criteria