

Bharat Heavy
Electricals Limited
Ceramic Business Unit



Disc Insulators





The Company

Bharat Heavy Electricals Limited is the largest Engineering and Manufacturing Enterprise of its kind in India. It ranks amongst the leading manufacturers of power plant equipment in the world.

BHEL has 14 manufacturing plants, 4 power sector regional centres, 8 service centres, 18 regional offices and over 150 project sites spread all over India and abroad. It offers a wide spectrum of products and services for core sectors like Power Generation, Transmission, Distribution, Industry, Transportation, Oil & Gas, Defence and Non-Conventional Energy Systems.

Ceramic Business Unit

The Ceramic Business Unit (CBU) of BHEL, is a Strategic Business Unit for Ceramics and Systems. This business unit deals with High Tension Insulators, Ceramic Wear Resistant liners, Industrial Ceramic Products and associated Systems. CBU is headquartered at Bangalore and is supported by:

Manufacturing units with "State of the Art" technology for ceramic products, processes and applications at

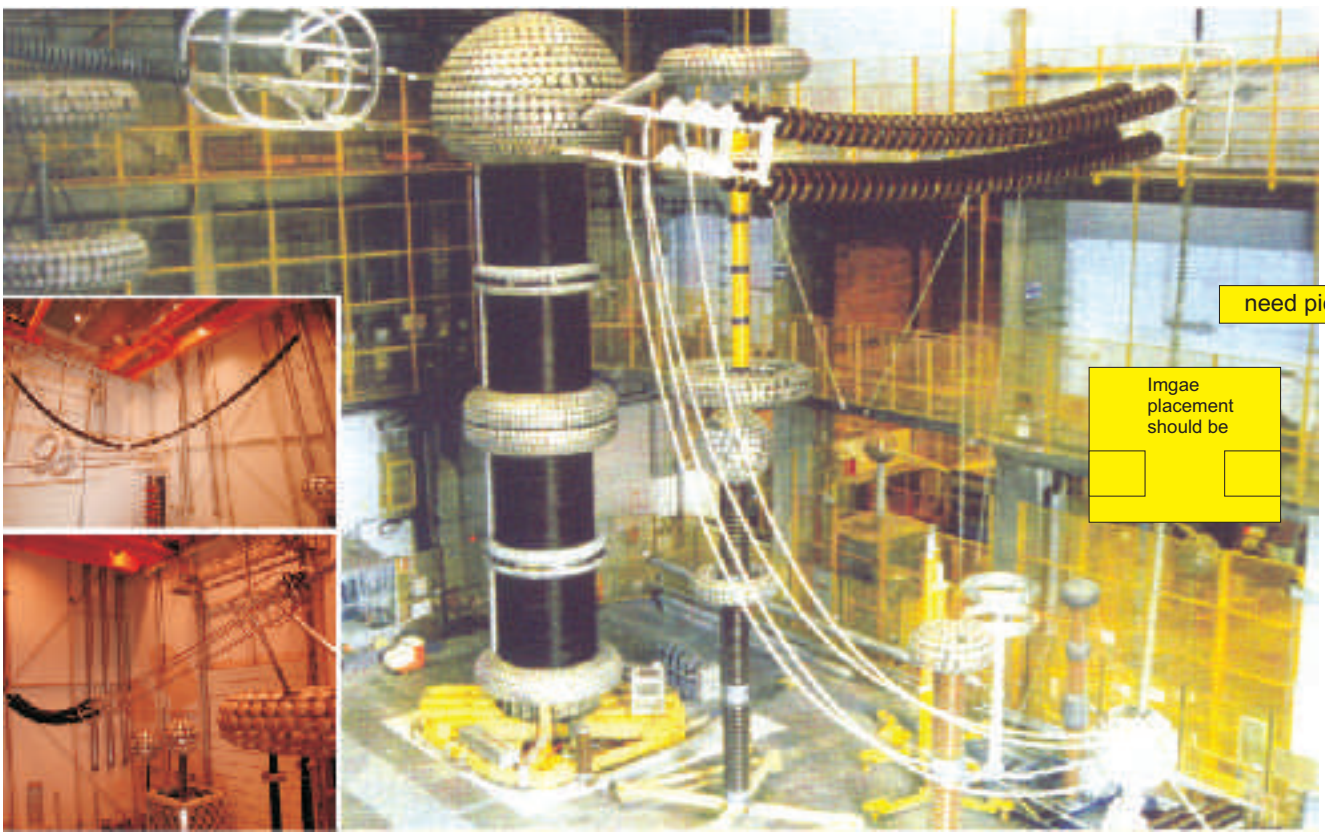
- Electroporcelains Division (EPD), Bangalore
- Insulator Plant (IP), Jagdishpur

Advanced Research and Development facilities for Ceramic products, processes and applications at

- Ceramic Technological Institute (CTI), Bangalore (A Division of Corporate Research & Development, Hyderabad)

Ceramic Products

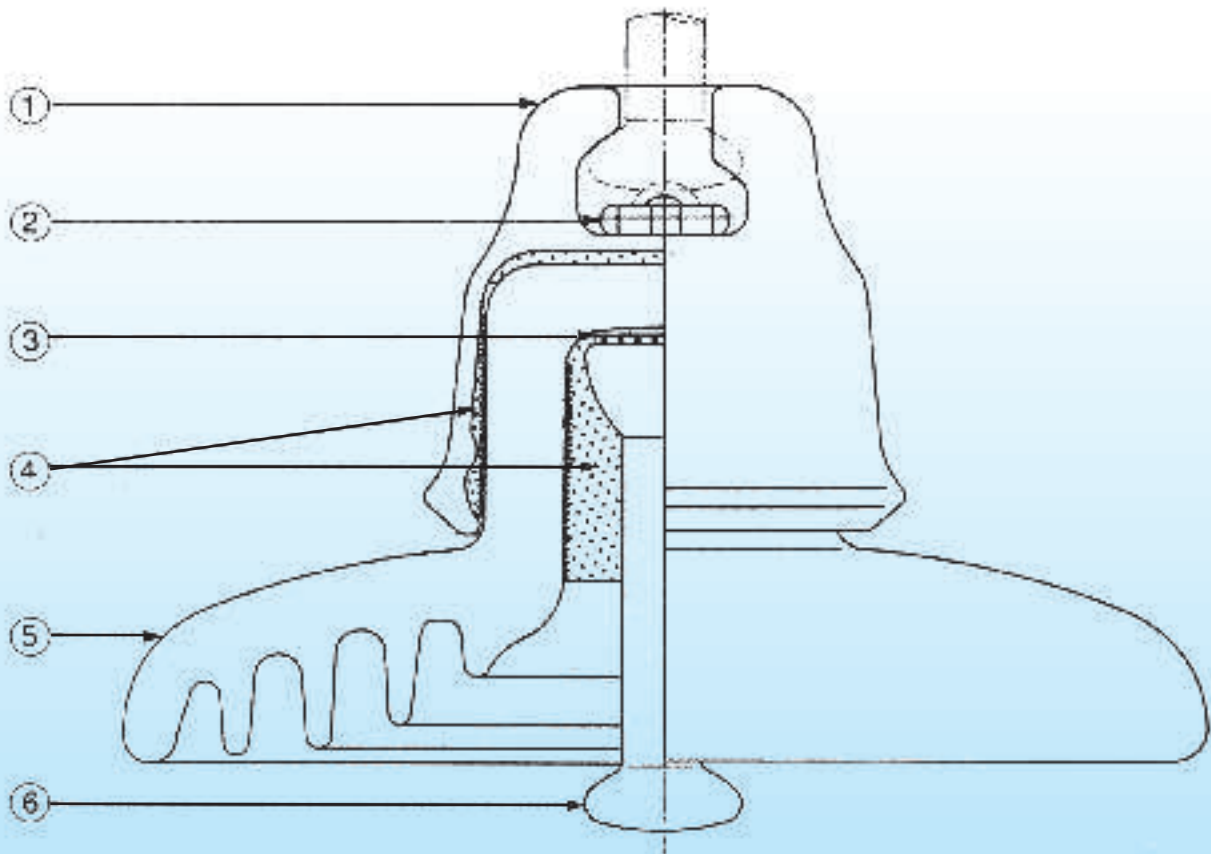
- **High Tension Insulators for Transmission and Distribution lines from 11kV to 800kV**
- Hollow Insulators for Instrument and Power Transformers, Switchgear, Electro Static Precipitators, etc.
- Station Post Insulators for Bus Bars support and for Isolators from 11 kV to 400 kV
- Composite Insulators for Railway Traction and Transmission applications upto 400 kV
- Wear resistant materials for Thermal Power Plant applications, Steel, Coal Washeries, Cement, etc.
- Industrial Ceramic Products for various applications





Salient Features of Disc Insulators

- The head portion of the ball pin and cap are suitably designed so that when the insulator is under tension the stresses are uniformly distributed as compression over the pin hole portion of the shell.
- All surfaces of Porcelain shells and metal parts which come in contact with cement are coated with resilient paint to offset the effect of difference in thermal expansions of these materials.
- The design and manufacture of the insulator is such that the R.I.V. level is much lower than the standards.



Item No.	Description	Material
1	Socket Cap	Spheroidal Graphite Iron
2	Standard Split Pin (Security Clip)	Stainless Steel
3	Cushion	Cork / Synthetic Foam
4	Binding Material	Portland Cement
5	Shell	Porcelain (Brown or Grey)
6	Ball Pin	Forged Steel



Disc Insulators

Manufacturing

Disc insulator shells are manufactured out of special compositions based on quartz or Alumina depending on customer requirements. Carefully selected raw materials are processed and shaped using the wet process. Automatic jiggering machines, form tools for finishing, steam dryers, automatic glazing machines and sophisticated gas fired tunnel kiln ensure quality fired shells.

Routine tests of Hydraulic, temperature cycle and electrical flashover ensure soundness of shells used for assembly of insulators.

Assembly

Carefully selected high strength cement is used to assemble the procelain shells, with SGI caps and forged steel ball pins. The assembled insulators

after steam and water curing are subjected to routine mechanical and electrical flash over tests.

Testing

Reliability of the insulators is ensured through special tests like thermal mechanical performance, steep front wave and power arc tests.

BHEL disc insulators are known for their reliability and more than 50 million insulators are in service in India and abroad. BHEL disc insulators are a class by themselves - acknowledged by internationally reputed laboratories of CESI, Italy; KEMA, Holland; IREQ, Canada; Zkusebnictvi, Czech Republic, STRI, Sweden; CPRI, India and IISc, India.





Discat 1

Technical particulars of HVDC disc insulators

IS/BS/IEC Standard Couplings



Product Identification			CB-12	CB-16	CB-05
1	Porcelain Disc Diameter	mm	280	330	330
2	Unit Spacing	mm	146	170	170
3	Ball & Socket Coupling		16 mm/20 mm	20 mm	20 mm/24 mm
4	Creepage Distance	mm	445	540	540
5	Protected Creepage Distance (90°)	mm	300	350	350
6	Electro-Mechanical Min. Failing Load	kN	70-120	160	210
7	DC-Dry Flashover Voltage	kV	±155	±170	±170
8	DC-Dry Withstand Voltage	kV	±145	±150	±150
9	DC-Wet Flashover Voltage	kV	±65	±70	±70
10	DC-Wet Withstand Voltage	kV	±50	±65	±65
11	Impulse Flashover Voltage	kVp	140	150	150
12	Impulse Withstand Voltage	kVp	130	140	140
13	Power Frequency puncture Voltage (AC)	kV	120	125	130
14	Weight of Unit (Approx)	kg	7.9/8.2	12.0	120.8/13.0



Product Identification			CB-39	CB-42	CB-44	CB-46
1	Porcelain Disc Diameter	mm	380	380	380	380
2	Unit Spacing	mm	195	205	195/205	195/205
3	Ball & Socket Coupling		24 mm	28 mm	24 mm/28 mm	24 mm/28 mm
4	Creepage Distance	mm	640	640	590	590
5	Protected Creepage Distance (90°)	mm	420	420	295	390
6	Electro-Mechanical Min. Failing Load	kN	320	420	320 /420	320/420
7	DC-Dry Flashover Voltage	kV	±175	±175	±175	±175
8	DC-Dry Withstand Voltage	kV	±160	±160	±160	±160
9	DC-Wet Flashover Voltage	kV	±75	±75	±75	±75
10	DC-Wet Withstand Voltage	kV	±70	±70	±70	±70
11	Impulse Flashover Voltage	kVp	155	155	155	155
12	Impulse Withstand Voltage	kVp	45	145	145	145
13	Power Frequency puncture Voltage	kV	140	140	140	140
14	Weight of Unit (Approx)	kg	16.5	17.5	18.5/19.5	17.0/18.0

Ball and Socket parts refer to IS:2486 (Part-II) or BS-3288:Part-3 or IEC-60120. Standard Testing Specification: BSEN-60383-2 or IEC-61325 & 60383

Flashover & withstand Voltages are subject to a variation of 5% for DC Dry, 10% for DC Wet and 8% for Impulse characteristics.



Discat 2

Technical particulars of ANTIFOG disc insulators

IS/BS/IEC Standard Couplings



Product Identification		CB-11	CB-32	CB-15	
1	Porcelain Disc Diameter	mm	255	255	280
2	Unit Spacing	mm	146	146	146
3	Ball & Socket Coupling		16 mm 'B'/20 mm	16 mm 'B'/20 mm	16 mm 'B'/20 mm
4	Creepage Distance	mm	430	440	430
5	Protected Creepage Distance (90°)	mm	280	285	280
6	Electro-Mechanical Min. Failing Load	kN	70-120	70-120	70-120
7	Pf-Dry Flashover Voltage	kV	90	90	90
8	Pf-Dry Withstand Voltage	kV	80	80	80
9	Pf-Wet Flashover Voltage	kV	45	45	50
10	Pf-Wet Withstand Voltage	kV	40	40	45
11	Impulse Flashover Voltage	kVp	125	125	140
12	Impulse Withstand Voltage	kVp	115	115	130
13	Power Frequency puncture Voltage	kV	120	120	120
14	Weight of Unit (Approx)	kg	7.0/7.3	7.0/7.3	8.2/8.5



Product Identification		CB-17	CB-22	
1	Porcelain Disc Diameter	mm	280	280
2	Unit Spacing	mm	146	146
3	Ball & Socket Coupling		16 mm 'B'/20 mm	16 mm 'B'/20 mm
4	Creepage Distance	mm	440	440
5	Protected Creepage Distance (90°)	mm	280	290
6	Electro-Mechanical Min. Failing Load	kN	70-120	70-120
7	Pf-Dry Flashover Voltage	kV	90	90
8	Pf-Dry Withstand Voltage	kV	80	80
9	Pf-Wet Flashover Voltage	kV	50	50
10	Pf-Wet Withstand Voltage	kV	45	45
11	Impulse Flashover Voltage	kVp	130	140
12	Impulse Withstand Voltage	kVp	120	130
13	Power Frequency puncture Voltage	kV	120	130
14	Weight of Unit (Approx)	kg	7.8/8.0	7.8/8.0

Ball and Socket parts refer to IS:2486 (Part-II) or BS-3288:Part-3 or IEC-60120. Standard Testing Specification:IS:731 or BSEN-60383-2 or IEC-60383

Flashover & withstand Voltages are subject to a variation of 5% for PF Dry, 10% for PF Wet and 8% for Impulse characteristics.



Discat 2A

Technical particulars of ANTIFOG disc insulators

IS/BS/IEC Standard Couplings



Product Identification			CB-27	CB-35	CB-13	CB-19
1	Porcelain Disc Diameter	mm	305	305	305	305
2	Unit Spacing	mm	146	146	170	170
3	Ball & Socket Coupling		16 mm 'B'/20 mm	20 mm	20 mm	20 mm
4	Creepage Distance	mm	460	440	475	480
5	Protected Creepage Distance (90°)	mm	300	280	290	310
6	Electro-Mechanical Min. Failing Load	kN	70-120	160	160	160
7	Pf-Dry Flashover Voltage	kV	90	90	90	85
8	Pf-Dry Withstand Voltage	kV	85	85	80	80
9	Pf-Wet Flashover Voltage	kV	55	55	55	50
10	Pf-Wet Withstand Voltage	kV	50	50	50	45
11	Impulse Flashover Voltage	kVp	140	140	140	140
12	Impulse Withstand Voltage	kVp	135	135	135	130
13	Power Frequency puncture Voltage	kV	130	130	130	130
14	Weight of Unit (Approx)	kg	9.1/9.4	9.5	10.5	10.4



Product Identification			CB-33	CB-04	CB-23	CB-40
1	Porcelain Disc Diameter	mm	305	330	330	380
2	Unit Spacing	mm	170	170	170	195
3	Ball & Socket Coupling		20 mm	20 mm / 24 mm	20 mm	24 mm
4	Creepage Distance	mm	480	540	540	600
5	Protected Creepage Distance (90°)	mm	310	360	360	380
6	Electro-Mechanical Min. Failing Load	kN	160	210	160	320
7	Pf-Dry Flashover Voltage	kV	90	90	90	100
8	Pf-Dry Withstand Voltage	kV	80	85	85	90
9	Pf-Wet Flashover Voltage	kV	55	60	60	60
10	Pf-Wet Withstand Voltage	kV	45	55	55	55
11	Impulse Flashover Voltage	kVp	140	145	140	155
12	Impulse Withstand Voltage	kVp	130	135	130	150
13	Power Frequency puncture Voltage	kV	130	130	125	140
14	Weight of Unit (Approx)	kg	10.2	12.8/13.1	12.2	17

Ball and Socket parts refer to IS:2486 (Part-II) or BS-3288:Part-3 or IEC-60120. Standard Testing Specification:IS:731 or BSEN-60383-2 or IEC-60383

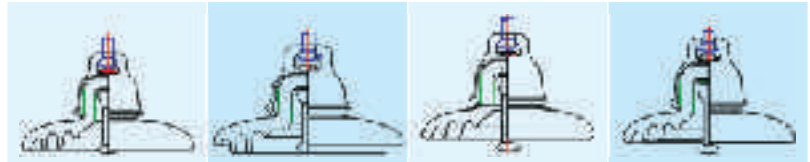
Flashover & withstand Voltages are subject to a variation of 5% for PF Dry, 10% for PF Wet and 8% for Impulse characteristics.



Discat 3

Technical particulars of NORMAL disc insulators

IS/BS/IEC Standard Couplings



Product Identification			CB-03	CB-31	CB-38	CB-02
1	Porcelain Disc Diameter	mm	255	255	255	255
2	Unit Spacing	mm	146	127/140	146	146
3	Ball & Socket Coupling		16 mm/16 mm 'B'	16 mm/16 mm 'B'	16 mm/16 mm 'B'	16 mm 'B'/20 mm
4	Creepage Distance	mm	292	300	295	292/320
5	Protected Creepage Distance (90°)	mm	165	170	175	165/185
6	Electro-Mechanical Min. Failing Load	kN	45	70-100	70/80	70-120
7	Pf-Dry Flashover Voltage	kV	75	75	75	75
8	Pf-Dry Withstand Voltage	kV	70	70/80	70	70
9	Pf-Wet Flashover Voltage	kV	45	45	45	45
10	Pf-Wet Withstand Voltage	kV	40	40	40	40
11	Impulse Flashover Voltage	kVp	120	120	120	120
12	Impulse Withstand Voltage	kVp	110	110	110	110
13	Power Frequency puncture Voltage	kV	120	120	120	120
14	Weight of Unit (Approx)	kg	4.0	5.3	4.4	5.3/5.6



Product Identification			CB-45	CB-30	CB-14
1	Porcelain Disc Diameter	mm	255	255	255
2	Unit Spacing	mm	146	146	146
3	Ball & Socket Coupling		16 mm 'B'/20 mm	20mm	16mm 'B'/20mm
4	Creepage Distance	mm	320	315	340
5	Protected Creepage Distance (90°)	mm	185	190	200
6	Electro-Mechanical Min. Failing Load	kN	70-120	160	70-120
7	Pf-Dry Flashover Voltage	kV	75	75	80
8	Pf-Dry Withstand Voltage	kV	70	70	75
9	Pf-Wet Flashover Voltage	kV	45	45	48
10	Pf-Wet Withstand Voltage	kV	40	40	42
11	Impulse Flashover Voltage	kVp	120	120	120
12	Impulse Withstand Voltage	kVp	110	110	110
13	Power Frequency puncture Voltage	kV	120	120	120
14	Weight of Unit (Approx)	kg	5.3/5.6	7.3	6.4/6.7

Ball and Socket parts refer to IS:2486 (Part-II) or BS-3288:Part-3 or IEC-60120. Standard Testing Specification:IS:731 or BSEN-60383-2 or IEC-60383

Flashover & withstand Voltages are subject to a variation of 5% for PF Dry, 10% for PF Wet and 8% for Impulse characteristics.



Discat 3A

Technical particulars of NORMAL disc insulators

IS/BS/IEC Standard Couplings



Product Identification			CB-01	CB-07	CB-09	CB-29
1	Porcelain Disc Diameter	mm	280	280	280	280
2	Unit Spacing	mm	170	170	146	146
3	Ball & Socket Coupling		20 mm	20 mm	16 mm 'B'/20 mm	20 mm
4	Creepage Distance	mm	350	370	340	370
5	Protected Creepage Distance (90°)	mm	230	260	200	240
6	Electro-Mechanical Min. Failing Load	kN	160	160	70-120	160
7	Pf-Dry Flashover Voltage	kV	80	85	80	80
8	Pf-Dry Withstand Voltage	kV	75	75	75	75
9	Pf-Wet Flashover Voltage	kV	50	50	50	50
10	Pf-Wet Withstand Voltage	kV	45	45	40	45
11	Impulse Flashover Voltage	kVp	125	130	120	130
12	Impulse Withstand Voltage	kVp	120	125	110	120
13	Power Frequency puncture Voltage	kV	125	125	120	125
14	Weight of Unit (Approx)	kg	8.3	8.5	6.7/7.0	8.0



Product Identification			CB-08	CB-20	CB-10	CB-06
1	Porcelain Disc Diameter	mm	280	330	330	380
2	Unit Spacing	mm	170	178/200	195	195/205
3	Ball & Socket Coupling		20 mm/24 mm	24 mm	24 mm	24mm/28 mm
4	Creepage Distance	mm	370	430	470	540
5	Protected Creepage Distance (90°)	mm	230	270	310	360
6	Electro-Mechanical Min. Failing Load	kN	210	190	320	320/420
7	Pf-Dry Flashover Voltage	kV	80	85	85	95
8	Pf-Dry Withstand Voltage	kV	75	80	80	85
9	Pf-Wet Flashover Voltage	kV	50	55	55	55
10	Pf-Wet Withstand Voltage	kV	45	50	50	50
11	Impulse Flashover Voltage	kVp	130	140	140	145
12	Impulse Withstand Voltage	kVp	120	130	130	135
13	Power Frequency puncture Voltage	kV	130	140	140	140
14	Weight of Unit (Approx)	kg	10.2/10.5	12	13.8	15.5/17

Ball and Socket parts refer to IS:2486 (Part-II) or BS-3288:Part-3 or IEC-60120. Standard Testing Specification:IS:731 or BSEN-60383-2 or IEC-60383

Flashover & withstand Voltages are subject to a variation of 5% for PF Dry, 10% for PF Wet and 8% for Impulse characteristics.



Discat 4

Technical particulars of disc insulators

IS/BS/IEC Standard Couplings



Product Identification			CB-03D	CB-03S	CB-03C
1	Porcelain Disc Diameter	mm	255	255	255
2	Unit Spacing	mm	235	145	145
3	Coupling		Dead End	16mm/(clevis)	Tongue & Clevis
4	Creepage Distance	mm	292	292	292
5	Protected Creepage Distance (90o)	mm	165	165	165
6	Electro-Mechanical Min. Failing Load	kN	45	45	45
7	Pf-Dry Flashover Voltage	kV	78	78	78
8	Pf-Dry Withstand Voltage	kV	70	70	70
9	Pf-Wet Flashover Voltage	kV	45	45	45
10	Pf-Wet Withstand Voltage	kV	40	40	40
11	Impulse Flashover Voltage	kVp	120	120	120
12	Impulse Withstand Voltage	kVp	110	110	110
13	Power Frequency puncture Voltage	kV	110	110	110
14	Weight of Unit (Approx)	kg	4.75	4.6	4.2

Discat 5

Technical particulars of AEROFOIL disc insulators

IS/BS/IEC Standard Couplings



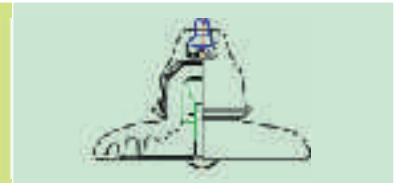
Product Identification			CB-36	CB-21	CB-41	CB-18
1	Porcelain Disc Diameter	mm	325	340	380	380
2	Unit Spacing	mm	146	146	146	156/170
3	Ball & Socket Coupling		16 mm "B"/20 mm	16 mm "B"/20 mm	16 mm "B"/20 mm	20 mm
4	Creepage Distance	mm	285	292	335	335
5	Protected Creepage Distance (90°)	mm	145	160	175	175
6	Electro-Mechanical Min. Failing Load	kN	70-120	70-120	70-120	160
7	Pf-Dry Flashover Voltage	kV	70	70	75	75
8	Pf-Dry Withstand Voltage	kV	60	65	70	70
9	Pf-Wet Flashover Voltage	kV	50	50	55	55
10	Pf-Wet Withstand Voltage	kV	45	45	50	50
11	Impulse Flashover Voltage	kVp	95	110	115	115
12	Impulse Withstand Voltage	kVp	90	100	110	110
13	Power Frequency puncture Voltage	kV	125	125	125	125
14	Weight of Unit (Approx)	kg	6.2/6.4	7.5/7.7	8.2/8.4	9.3



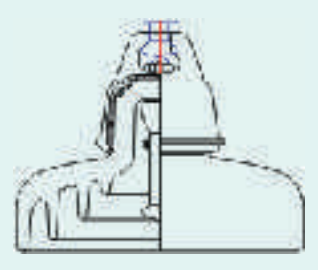
Discat 9

Technical particulars of ANSI STD. disc insulators

ANSI Standard Couplings



Product Identification			CB-02C		CB-02A	
1	Porcelain Disc Diameter	mm/in	254/10		254/10	
2	Unit Spacing	mm/in	146/5 ¾		146/5 ¾	
3	Leakage Distance	mm/in	292/11½		292/11½	
4	Clevis & Tongue Coupling/ Ball & Socket Coupling		Fig No. 4/6 of ANSI*		Type B/Type J of ANSI**	
5	Electro-Mechanical Strength	kg/lb	6800/15000	11400/25000	6800/15000	11400/25000
6	Mechanical Impact Strength	cm.kg/in-lb	63/55	69/60	63/55	69/60
7	Tension Proof Test Load	kg/lb	3400/7500	5700/12500	3400/7500	5700/12500
8	Time Load Test Value	kg/lb	4500/10000	6800/15000	4500/10000	6800/15000
9	Low Frequency Dry Flashover	kV	80		80	
10	Low Frequency Wet Flashover	kV	50		50	
11	Critical Impulse Flashover +ve	kVP	125		125	
12	Critical Impulse Flashover -ve	kVP	130		130	
13	Low Frequency Puncture	kV	110		110	
14	RIV Test Voltage to Ground	kV	10		10	
15	Maximum RIV at 1000 kHz	micro volts	50		50	
16	Weight of Unit (approx)	kg/lb	5.6/12.3		5.3/11.7	

1	Porcelain Disc Diameter	mm/in	254/10		Product Identification CB-11A 
2	Unit Spacing	mm/in	146/5 ¾		
3	Leakage Distance	mm/in	430/17		
4	Ball & Socket Coupling		Type B/Type J of ANSI**		
5	Electro-Mechanical Strength	kg/lb	6800/15000	11400/25000	
6	Mechanical Impact Strength	cm.kg/in-lb	63/55	69/60	
7	Tension Proof Test Load	kg/lb	3400/7500	5700/12500	
8	Time Load Test Value	kg/lb	4500/1000	0 6800/15000	
9	Low Frequency Dry Flashover	kV	90		
10	Low Frequency Wet Flashover	kV	50		
11	Critical Impulse Flashover +ve	kVP	130		
12	Critical Impulse Flashover -ve	kVP	140		
13	Low Frequency Puncture	kV	110		
14	RIV Test Voltage to Ground	kV	10		
15	Maximum RIV at 1000 kHz	micro volts	50		
16	Weight of Unit (approx)	kg/lb	7/15.5		

* Clevis and Tongue parts refer to Class 52.4 and 52.6 Fig. No. 3 of ANSI-C29-2-1992. Standard Testing Specifications: ANSI-C29-1-1988.

** Ball and Socket parts refer to Class 52.3 and 52.5 & checked by gauges to Fig. No. 4, 5 and 6 of ANSI C29.2, 1992. Standard Testing Specification: ANSI C29.1, 1988.

Flashover & Withstand voltages are subject to a variation of 5% for PF Dry and 10% for PF Wet and 8% for Impulse characteristics.



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Efforts are constantly being made to improve the product design and hence the products supplied may differ in minor details from that given in the catalogue.

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