

**ANNEXURE - C****SPECIFICATION FOR WIRED INSTRUMENT PANEL**

**1.0 APPLICATION:** Designed, manufactured, assembled & wired Instrument Panel. The detail specification is as detailed below:

**2.0 GENERAL REQUIREMENT:**

<b>Sl. No.</b>	<b>BHEL's Requirement</b>	<b>Confirmation/ Compliance By Supplier</b>
2.1	Sheet steel Instrument Panel shall be designed, manufactured, assembled as per drg no. 35216201535-V01, Rev-08 & wired as per wiring diagram to be provided after PO placement with all fitments mounted as per bill of material attached as Annexure - J. Front door punching in .dxf format, Colour shade, Wiring diagram, Scheme, Ferrule Details, OGA & Device label shall be provided by BHEL after PO placement.	
2.2	Equipment's to be mounted inside / front of instrument panel & not in vendor's scope shall be supplied by BHEL as a free issue item inside BHEL factory premises for installation & wiring. Wiring of these equipment shall be done by vendor in line with BHEL scheme/wiring diagram at their works and Termination of wires for these equipment to be done inside BHEL factory premises by vendor's representative.	
2.3	Necessary drawing i.e Rear view of the relays/meter will be provided to vendor to terminate the lugged wires of exact length.	
2.4	Equipment conforming to other internationally accepted standards, which ensure equal or higher quality than the standards mentioned would also be acceptable subject to BHEL approval for same	
2.5	Discrepancy if any, found at any stage among drawings and tender specification shall be brought out to the notice of BHEL for resolution.	
2.6	Deviations, if any shall be clearly brought out. Compliance to each clause of the specification shall be submitted along with the offer, else it will be deemed as complied by the vendor.	
2.7	The offer shall be submitted in 2 separate bids (Technical and price). If found necessary the bidder shall depute his technical representative for discussions and on the spot finalization/ confirmations of technical points at the time of technical bid opening.	
2.8	Vendor shall manufacture a proto-type model of the ordered panel as per specification and offer the same for inspection and routine test by BHEL/Customer's representative at vendor's works or BHEL Bhopal works. Also, stage-wise progress of the panels shall be informed to BHEL for arranging BHEL/ customer's representatives for stage inspection at vendor's works if desired by BHEL	
2.9	AC Auxiliary Power Supply: 240V with + 10 or – 20% variation, 50Hz with +/- 5% variation, effectively earthed system.	
2.10	DC Auxiliary Power Supply: Shall be informed with wiring table/ drg.	
2.11	The Vendor will be held responsible for any damages and/or losses of all and any kind that may occur by not following the specification.	

**3.0 CONSTRUCTION DETAILS:**

<b>Sl. No.</b>	<b>BHEL's Requirement</b>	<b>Confirmation/ Compliance By Supplier</b>
3.1	Design and Dimensions of sheet steel cubicle shall be strictly as per drawing - Instrument Panel (Drg No. 35216201535-V01, Rev-08)	
3.2	Suitable stiffeners shall be provided at the back of front panel to avoid buckling & waviness after cut outs are made and fitments are mounted. PVC troughs shall be provided for neat wiring.	
3.3	Thickness of powder coating shall be minimum 80 microns. Exterior & interior colour shade shall be provided by BHEL along with PO.	
3.4	All ferrous components like internal mounting plates, C channels, fuse panels, brackets etc. shall be painted, same as interior finish, to prevent any kind of rusting or corrosion.	
3.5	Surface treatment shall follow seven tank process. Painting shall be done through process of powder coating with pure polyester base grade A structure finish with UV resistant. Suitable rust resisting primer shall be applied on the interior and exterior surface of steel, which shall be followed by application of an undercoat suitable to serve as base and binder forth finishing coat.	
3.6	All non-ferrous items shall be tin plated.	
3.7	Each and every mounted equipment (including items of BHEL scope) shall have anodised label (front and back) as per the label details provided along with wiring diagram.	
3.8	All the Device labels, Fuse labels etc. shall be in vendor scope and shall be mounted by vendor before dispatch to BHEL. Details of all the labels shall be provided by BHEL	
3.9	Panel interior shall be illuminated by ISI marked LED BULB OF 9 WATT connected to 240V single phase AC supply	
3.10	Vendor to provide all material / items which are in vendor's scope of supply, strictly as per BHEL specifications listed as per Annexure - J. No deviation shall be acceptable.	

**4.0 WIRING DETAILS:**

Sl. No.	BHEL's Requirement	Confirmation/ Compliance By Supplier
4.1	Components which are in switchgear panel (not part of instrument panel) & not in vendor scope like test/service limit switch, CT/VT etc, vendor to terminate the wire and bunch the wire for termination at our switchgear with length specified in wiring table.	
4.2	Terminal blocks (1100 V Grade) shall be clip-on to channel type. TB specification shall be as per Annexure - J & for type of TBs refer wiring diagram which shall be provided during PO placement.	
4.3	All TBs, aux contactors, plug in relays, transducers shall be mounted in C channel by vendor.	
4.4	All wiring inside instrument panel shall be routed through PVC slotted troughs wherever possible.	
4.5	All TBs shall be shrouded <del>type as per Spec SG12907</del> <u>relevant SG</u> <del>by easily removable shrouds made of transparent dielectric material.</del> All TBs shall be provided with PVC markers <u>on both sides</u> as per relevant wiring drawing.	
4.6	Panel wiring for all circuits shall be done with ISI marked 1.5 sq mm, PVC insulated FRLSH, 1100V grade, vermin proof & stranded copper conductor wire conforming to IEC:227, 502 & IS:1554 using solder less crimping tinned insulated copper lugs. Termination shall be such that no strand of a conductor shall left loose or overhanging. CT/PT wiring shall be done with 2.5 sq mm wire terminated through insulated ring type lugs.	
4.7	All the internal wiring shall be securely supported, neatly arranged, readily accessible and connected to equipment terminals and TB's. Wiring gutters & troughs shall be used for this purpose	
4.8	Colour of wires: 1 phase AC circuit (Phase & Neutral): Black DC circuits (Positive & Negative) & Spare Contacts: Grey Earth: Green 3 phase CT & PT circuits: A phase: Red, B phase: Yellow, C phase: Blue and Neutral: Black	
4.9	For identification of wires numbered ferrules with black letter/ digit over white surface at both ends of wire are to be provided. Tubular ferrules is also acceptable. The Ferrule shall read from the terminal outwards on all wires. Ferrule shall be as per wiring diagram.	
4.10	Vendor to specifically note that sequence of wiring termination shall be strictly in line with BHEL wiring tables	
<del>4.11</del>	<del>Box clamp type terminal block suitable for 25sqmm wire shall be provided in each bus PT module. Total qty per Bus PT module shall be 8 Nos.</del>	
<del>4.121</del>	<del>Inside instrument panel all devices shall be labelled with paint using stencil.</del>	
<del>4.132</del>	<del>Supply of any other device / items like TB in place of neutral fuse link is not acceptable.</del>	

**5.0 TESTING AND INSPECTION:**

<b>Sl. No.</b>	<b>BHEL's Requirement</b>	<b>Confirmation/ Compliance By Supplier</b>
<u>5.1</u>	<u>Wired instrument panel shall be inspected by BHEL/BHEL's representative at vendor's works before despatch.</u>	
<u>5.25.1</u>	<p>Panels shall be subjected to the following tests during inspection:</p> <p>a) Functional and sequence tests shall be carried out for all equipment to verify schematic drawing.</p> <p>b) Panel wiring shall be tested for High voltage power frequency withstand test by applying 2.0 kV, 50Hz, between all terminals shorted and earth, for one minute.</p> <p>c) IR value test shall be performed. Panel wiring shall be tested for insulation resistance between all terminals shorted and earth, using a 500V DC Megger for IR value greater than 1 Mega Ohm.</p> <p>d) Verification of wiring as per approved drawings</p>	
<u>5.35.2</u>	Vendor's representative shall be present during testing at BHEL to rectify the defective components of vendor scope and to rectify wiring mistakes, if any.	

**6.0 PACKING AND DESPATCH:**

<b>Sl. No.</b>	<b>BHEL's Requirement</b>	<b>Confirmation/ Compliance By Supplier</b>
6.1	<p>The quality of packing of panels shall provide maximum protection against damage, breakage and pilferage during transport, storage and multiple handling, including handling by e.g. hoisting, lifting devices and forklift trucks.</p> <p>The vendor is responsible for the correct and adequate packing of each unit to avoid transit damage.</p>	

**7.0 LIST OF INPUTS TO BE PROVIDED BY BHEL AFTER PO PLACEMENT:**

- 7.1 Colour Shade
- 7.2 Wiring Diagram
- 7.3 Front door Punching drawing
- 7.4 DC Auxiliary power supply
- 7.5 Device label
- 7.6 Ferrule details
- 7.7 Schemes
- 7.8 OGA (Outline and General Arrangement)





**ANNEXURE - D****SPECIFICATION FOR WIRED INSTRUMENT PANEL**

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3.5	Surface treatment shall follow seven tank process. Painting shall be done through process of powder coating with pure polyester base grade A structure finish with UV resistant. Suitable rust resisting primer shall be applied on the interior and exterior surface of steel, which shall be followed by application of an undercoat suitable to serve as base and binder forth finishing coat.	
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**5.0 TESTING AND INSPECTION:**

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<u>5.15.2</u>	Panels shall be subjected to the following tests during inspection: a) Functional and sequence tests shall be carried out for all equipment to verify schematic drawing. b) Panel wiring shall be tested for High voltage power frequency withstand test by applying 2.0 kV, 50Hz, between all terminals shorted and earth, for one minute. c) IR value test shall be performed. Panel wiring shall be tested for insulation resistance between all terminals shorted and earth, using a 500V DC Megger for IR value greater than 1 Mega Ohm. d) Verification of wiring as per approved drawings	
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**WIRING ITEMS BOM CHART FOR VM12 820W 806MM HEIGHT INSRTUMENT PANEL**  
**MATERIAL SPECIFICATION ( ANNEXURE - J )**

S. No.	Description	Drawing/ Specification	Make (if applicable	Finish /Colour /Type	Quantity/panel (in nos.) Module-1 NTPC Old spec
1	Terminal Block (Feed through type)	SG12907	CE/VDE/UL/CSA /BIS Certificate with CML no.	Polyamide	220
2	End Plate for TB at Sl. No. 1	SG12907	Not applicable	Polyamide	20
3	Horizontal Marker for TB at Sl. No. 1	SG12907	Not applicable		440
4	2 way Shorting Link for TB at Sl. No. 1	SG12907	Not applicable		30
5	3 way Shorting Link for TB at Sl. No. 1	SG12907	Not applicable		20
6	End Stopper for TB at Sl. No. 1	SG12907	Not applicable	Polyamide	8
7	Terminal Block (Non-Disconnecting type)	SG12907	CE/VDE/UL/CSA /BIS Certificate with CML no.	Polyamide	40
8	End Plate for TB at Sl. No. 7	SG12907	Not applicable	Polyamide	4
9	Horizontal Marker for TB at Sl. No. 7	SG12907	Not applicable		80
10	2 way Shorting Link for TB at Sl. No. 7	SG12907	Not applicable		6
11	3 way Shorting Link for TB at Sl. No. 7	SG12907	Not applicable		4
12	End Stopper for TB at Sl. No. 7	SG12907	Not applicable	Polyamide	4
13	Terminal Block (Disconnecting type)	SG12907	CE/VDE/UL/CSA /BIS Certificate with CML no.	Polyamide	40
14	End Plate for TB at Sl. No. 13	SG12907	Not applicable	Polyamide	4
15	Horizontal Marker for TB at Sl. No. 13	SG12907	Not applicable		80
16	2 way Shorting Link for TB at Sl. No. 13	SG12907	Not applicable		25
17	3 way Shorting Link for TB at Sl. No. 13	SG12907	Not applicable		15
18	End Stopper for TB at Sl. No. 13	SG12907	Not applicable	Polyamide	4
19	Din Rail Channel (700 mm long)	45611150134-002	Not applicable	Zinc Plated	4

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S. No.	Description	Drawing/ Specification	Make (if applicable	Finish /Colour /Type	Quantity/panel (in nos.) Module-1 NTPC Old spec
20	PVC Channel	35095001536-012 /SG12201	Not applicable		4
21	Terminal Lugs 1.5 sq mm Flat Pin	SG12986	CE/VDE/UL/CSA /BIS Certificate with CML no.		440
22	Terminal Lugs 1.5 sq mm Round Lug	SG12986	CE/VDE/UL/CSA /BIS Certificate with CML no.		50
23	Terminal Lugs 1.5 sq mm U Lug	SG12986	CE/VDE/UL/CSA /BIS Certificate with CML no.		150
24	Terminal Lugs 2.5 sq mm Flat Pin	SG12986	CE/VDE/UL/CSA /BIS Certificate with CML no.		70
25	Terminal Lugs 2.5 sq mm Round Lug	SG12986	CE/VDE/UL/CSA /BIS Certificate with CML no.		150
26	Terminal Lugs 2.5 sq mm U Lug	SG12986	CE/VDE/UL/CSA /BIS Certificate with CML no.		50
27	PVC Cable 1.5 sq mm Grey	SG12973	FR-LSH Type	IN MTR	400
28	PVC Cable 2.5 sq mm Red	SG12973	FR-LSH Type	IN MTR	80
29	PVC Cable 2.5 sq mm Yellow	SG12973	FR-LSH Type	IN MTR	80
30	PVC Cable 2.5 sq mm Blue	SG12973	FR-LSH Type	IN MTR	80
31	PVC Cable 2.5 sq mm Green	SG12973	FR-LSH Type	IN MTR	40
32	PVC Cable 2.5 sq mm Black	SG12973	FR-LSH Type	IN MTR	100
33	Printed Ferrule for Wiring	suitable for 1.5 & 2.5 sq. mm PVC Cables	Not applicable		1000
34	Cable Tie 100x2.5mm	BS EN 62275:2019	Not applicable		300
35	Cable Tie 200x3.6mm	BS EN 62275:2019	Not applicable		150
36	Cable Tie 300x4.8mm	BS EN 62275:2019	Not applicable		30



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S. No.	Description	Drawing/ Specification	Make (if applicable	Finish /Colour /Type	Quantity/panel (in nos.) Module-1 NTPC Old spec
37	PVC Sleeve for Cable encapsulation	AA 22521	Not applicable	IN MTR	2
38	Gromet 44.4 Dia	AA7240201	Not applicable		1
39	Gromet 25.4	AA7240201	Not applicable		1
40	220VDC, 20 AMPS DIODE PLATE ASSEMBLY	SG12641			1
41	TEST LINK BLOCK, 3-phase, 4 Wire	SG12958			0
42	LOCAL/REMOTE SELECTOR SWITCH (LOCKABLE)	SG12643			0
43	VOLTMETER/AMMETER SELECTOR SWITCH	SG12643			0
44	BREAKER CONTROL SWITCH, TRIP/NEUTRAL/CLOSE	SG12643			0
45	240VAC ON/OFF SWITCH (NON- LOCKABLE)	SG12643			1
46	220V DC ON/OFF SWITCH (NON- LOCKABLE)	SG12643			1
47	220VDC/AC RED COLOUR LED INDICATING LAMP	SG12919	CE/VDE/UL/CSA /BIS Certificate		1
48	220VDC/AC GREEN COLOUR LED INDICATING LAMP	SG12919	CE/VDE/UL/CSA /BIS Certificate		1
49	220VDC/AC CLEAR WHITE COLOUR LED INDICATING LAMP	SG12919	CE/VDE/UL/CSA /BIS Certificate		1
50	220VDC/AC AMBER COLOUR LED INDICATING LAMP	SG12919	CE/VDE/UL/CSA /BIS Certificate		1
51	220VDC/AC BLUE COLOUR LED INDICATING LAMP	SG12919	CE/VDE/UL/CSA /BIS Certificate		1
52	220VDC/AC AMBER COLOUR LED INDICATING LAMP	SG12919	CE/VDE/UL/CSA /BIS Certificate		0
53	220VDC/AC CLEAR WHITE COLOUR LED INDICATING LAMP	SG12919	CE/VDE/UL/CSA /BIS Certificate		0
54	220VDC/AC CLEAR WHITE COLOUR LED INDICATING LAMP	SG12919	CE/VDE/UL/CSA /BIS Certificate		0
55	220VDC/AC AMBER COLOUR LED INDICATING LAMP	SG12919	CE/VDE/UL/CSA /BIS Certificate		0
56	63.5VAC RED COLOUR LED INDICATING LAMP	SG12919	CE/VDE/UL/CSA /BIS Certificate		1
57	63.5VAC YELLOW COLOUR LED INDICATING LAMP	SG12919	CE/VDE/UL/CSA /BIS Certificate		1
58	63.5VAC BLUE COLOUR LED INDICATING LAMP	SG12919	CE/VDE/UL/CSA /BIS Certificate		1
59	PUSH BUTTON WITH BLACK ACTUATOR AND 1NO+1NC CONTACT	SG12925			2

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S. No.	Description	Drawing/ Specification	Make (if applicable	Finish /Colour /Type	Quantity/panel (in nos.) Module-1 NTPC Old spec
60	DOOR SWITCH	SG12956			1
61	ELECTRIC BULB HOLDER FOR PIL	SG12987			1
62	9 WATT LED BULB, 240VAC	SG12983			1
63	220VDC AUX. CONTACTOR WITH 2NO+2NC CONTACTS	SG12928	CE/VDE/UL/CSA /BIS Certificate with CML no.		1
64	24VDC PLUG IN RELAY	SG12647			2
65	Fuse Link for 2Amp as Item 001 of SG12975	SG12975-001	CE/VDE/UL/CSA /BIS Certificate with CML no.		11
66	Fuse Link for 6Amp as Item 003 of SG12975	SG12975-003	CE/VDE/UL/CSA /BIS Certificate with CML no.		6
67	Fuse Link for 16Amp as Item 004 of SG12975	SG12975-004	CE/VDE/UL/CSA /BIS Certificate		4
68	Fuse Link for 32Amp as Item 005 of SG12975	SG12975-005	CE/VDE/UL/CSA /BIS Certificate with CML no.		2
69	Fuse Link for 63Amp as Item 007 of SG12975	SG12975-007	CE/VDE/UL/CSA /BIS Certificate with CML no.		1
70	Fuse Fitting (Base with carrier, coupled with each other) Suitable for fuse link Rating from 2 Amps to 32 Amps as per item 006 of SG12975	SG12975-006	CE/VDE/UL/CSA /BIS Certificate with CML no.		26
71	1 Fuse Holder and 1 Neutral link with Fitting (1-Pole + 1Neutral) (Base with carrier, coupled with each other) suitable for AC fuse link up to 32A as per item 009 of SG12975	SG12975-009	CE/VDE/UL/CSA /BIS Certificate with CML no.		2
72	3 Fuse Holder for 3-phases and 1 Neutral link with Fitting (3-Pole + 1 Neutral) (Base with carrier, coupled with each other) suitable for AC fuse link up to 32A as per item 010 of SG12975	SG12975-010			1
73	1 Fuse Holder and 1 Neutral link with Fitting (1-Pole + 1 Neutral) (Base with carrier, coupled with each other) suitable for AC fuse link up to 63A as per item 011 of SG12975	SG12975-011	CE/VDE/UL/CSA /BIS Certificate with CML no.		1

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S. No.	Description	Drawing/ Specification	Make (if applicable	Finish /Colour /Type	Quantity/panel (in nos.) Module-1 NTPC Old spec
74	240VAC 6A, PIANO TYPE SWITCH FOR HEATER	SG12953			1
75	240VAC 6/16A,3PIN PIANO TYPE SWITCH & SOCKET	SG12955			1
76	Aluminium Anodized device labels to drawing nos. 35611150417-004 for Fuse labels, 35611150417-013 for for Indicating Lamps and 35611150417-005 for relay labels as per total Fuses, ILs, Relays & other Devices.	GR. 19000 OF IS-11857 & PURCHASE SPECIFICATION AA7250111		As per device detail provided after PO Placement (Approx qty $\pm 40$ nos.)	40
77	PVC Cable 4.0 sq mm Black	SG12973	FR-LSH Type	IN MTR	40
78	4 SQ MM TUBULAR TYPE	SG12986			15
79	INSTRUMENT PANEL FABRICATION	35216201535-V01			1

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**WIRING ITEMS BOM CHART FOR VM12 820W 806MM HEIGHT INSRTUMENT PANEL  
MATERIAL SPECIFICATION ( ANNEXURE - K )**

S. No.	Description	Drawing/ Specification	Make (if applicable	Finish /Colour /Type	Quantity/pan el (in nos.) Module-2 Talcher
1	FEED THROUGH TERMINAL BLOCK, LATERAL PUSH IN FIT TYPE AS PER ANN-A IT-001	Annexure-A			230
2	END PLATE FOR FEED TRHOUGH TERMINAL AS PER ANN-A IT-001A	Annexure-A			20
3	HORIZONTAL MARKER FOR FEED THROUGH TERMINAL AS PER ANN-A, IT- 001B	Annexure-A			460
4	TWO WAY SHORTING LINK AS PER ANN-A, IT-001C	Annexure-A			35
5	THREE WAY SHORTING LINK AS PER ANN- A, IT-001D	Annexure-A			25
6	TEST PLUG AS PER ANN-A, IT-001E	Annexure-A			8
7	DISCONNECTING TYPE TERMINAL BLOCK WITH LATERAL PUSH IN FIT TYPE AS PER ANN-A, IT-002	Annexure-A			30
8	END PLATE FOR DISCONNECTING TERMINAL BLOCK AS PER ANN-A IT-002A	Annexure-A			4
9	HORIZONTAL MARKER FOR DISCONNECTING TERMINAL AS PER ANN- A, IT-002B	Annexure-A			60
10	TWO WAY SHORTING LINK AS PER ANN-A, IT-002C	Annexure-A			5
11	THREE WAY SHORTING LINK AS PER ANN- A, IT-002D	Annexure-A			5
12	TEST PLUG AS PER ANN-A, IT-002E	Annexure-A			2
13	FEED THROUGH TERMINAL BLOCK, LATERAL PUSH IN FIT TYPE AS PER ANN-A IT-003	Annexure-A			40
14	END PLATE FOR FEED TRHOUGH TERMINAL AS PER ANN-A IT-003A	Annexure-A			4
15	HORIZONTAL MARKER FOR FEED THROUGH TERMINAL AS PER ANN-A, IT- 003B	Annexure-A			80
16	TWO WAY SHORTING LINK AS PER ANN-A, IT-003C	Annexure-A			25
17	THREE WAY SHORTING LINK AS PER ANN- A, IT-003D	Annexure-A			15
18	TEST PLUG AS PER ANN-A, IT-003E	Annexure-A			4
19	Din Rail Channel (700 mm long)	45611150134-002	Not applicable	Zinc Plated	4
20	PVC Channel	35095001536-012 /SG12201	Not applicable		4
21	Terminal Lugs 1.5 SQ MM TUBULAR TYPE	SG12986	CE/VDE/UL/CSA/ BIS Certificate with CML no.		460
22	Terminal Lugs 1.5 sq mm Round Lug	SG12986	CE/VDE/UL/CSA/ BIS Certificate with CML no.		50

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S. No.	Description	Drawing/ Specification	Make (if applicable	Finish /Colour /Type	Quantity/panel (in nos.) Module-2 Talcher
23	Terminal Lugs 1.5 sq mm U Lug	SG12986	CE/VDE/UL/CSA/ BIS Certificate with CML no.		150
24	Terminal Lugs 2.5 SQ MM TUBULAR TYPE INSULATED	SG12986	CE/VDE/UL/CSA/ BIS Certificate with CML no.		70
25	Terminal Lugs 2.5 sq mm Round Lug	SG12986	CE/VDE/UL/CSA/ BIS Certificate with CML no.		150
26	Terminal Lugs 2.5 sq mm U Lug	SG12986	CE/VDE/UL/CSA/ BIS Certificate with CML no.		50
27	PVC Cable 1.5 sq mm Grey	SG12973	FR-LSH Type	IN MTR	400
28	PVC Cable 2.5 sq mm Red	SG12973	FR-LSH Type	IN MTR	80
29	PVC Cable 2.5 sq mm Yellow	SG12973	FR-LSH Type	IN MTR	80
30	PVC Cable 2.5 sq mm Blue	SG12973	FR-LSH Type	IN MTR	80
31	PVC Cable 2.5 sq mm Green	SG12973	FR-LSH Type	IN MTR	40
32	PVC Cable 2.5 sq mm Black	SG12973	FR-LSH Type	IN MTR	100
33	Printed Ferrule for Wiring	suitable for 1.5 & 2.5 sq. mm PVC Cables	Not applicable		1000
34	Cable Tie 100x2.5mm	BS EN 62275:2019	Not applicable		300
35	Cable Tie 200x3.6mm	BS EN 62275:2019	Not applicable		150
36	Cable Tie 300x4.8mm	BS EN 62275:2019	Not applicable		30
37	PVC Sleeve for Cable encapsulation	AA 22521	Not applicable	IN MTR	2
38	Gromet 44.4 Dia	AA7240201	Not applicable		1
39	Gromet 25.4	AA7240201	Not applicable		1
40	220VDC, 20 AMPS DIODE PLATE ASSEMBLY	SG12641			1
41	TEST LINK BLOCK, 3-phase, 4 Wire	SG12958			0
42	LOCAL/REMOTE SELECTOR SWITCH (LOCKABLE)	SG12643			0
43	VOLTMETER/AMMETER SELECTOR SWITCH	SG12643			0
44	BREAKER CONTROL SWITCH, TRIP/NEUTRAL/CLOSE	SG12643			0
45	240VAC ON/OFF SWITCH (NON- LOCKABLE)	SG12643			1
46	220V DC ON/OFF SWITCH (NON- LOCKABLE)	SG12643			1
47	220VDC/AC RED COLOUR LED INDICATING LAMP	SG12919	CE/VDE/UL/CSA/ BIS Certificate with CML no.		1
48	220VDC/AC GREEN COLOUR LED INDICATING LAMP	SG12919	CE/VDE/UL/CSA/ BIS Certificate with CML no.		1
49	220VDC/AC CLEAR WHITE COLOUR LED INDICATING LAMP	SG12919	CE/VDE/UL/CSA/ BIS Certificate with CML no.		1
50	220VDC/AC AMBER COLOUR LED INDICATING LAMP	SG12919	CE/VDE/UL/CSA/ BIS Certificate with CML no.		1

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S. No.	Description	Drawing/ Specification	Make (if applicable	Finish /Colour /Type	Quantity/panel (in nos.) Module-2 Talcher
51	220VDC/AC BLUE COLOUR LED INDICATING LAMP	SG12919	CE/VDE/UL/CSA/ BIS Certificate with CML no.		1
52	220VDC/AC AMBER COLOUR LED INDICATING LAMP	SG12919	CE/VDE/UL/CSA/ BIS Certificate with CML no.		0
53	220VDC/AC CLEAR WHITE COLOUR LED INDICATING LAMP	SG12919	CE/VDE/UL/CSA/ BIS Certificate with CML no.		0
54	220VDC/AC CLEAR WHITE COLOUR LED INDICATING LAMP	SG12919	CE/VDE/UL/CSA/ BIS Certificate with CML no.		0
55	220VDC/AC AMBER COLOUR LED INDICATING LAMP	SG12919	CE/VDE/UL/CSA/ BIS Certificate with CML no.		0
56	63.5VAC RED COLOUR LED INDICATING LAMP	SG12919	CE/VDE/UL/CSA/ BIS Certificate with CML no.		1
57	63.5VAC YELLOW COLOUR LED INDICATING LAMP	SG12919	CE/VDE/UL/CSA/ BIS Certificate with CML no.		1
58	63.5VAC BLUE COLOUR LED INDICATING LAMP	SG12919	CE/VDE/UL/CSA/ BIS Certificate with CML no.		1
59	PUSH BUTTON WITH BLACK ACTUATOR AND 1NO+1NC CONTACT	SG12925			2
60	DOOR SWITCH	SG12956			1
61	ELECTRIC BULB HOLDER FOR PIL	SG12987			1
62	9 WATT LED BULB, 240VAC	SG12983			1
63	220VDC AUX. CONTACTOR WITH 2NO+2NC CONTACTS	SG12928	CE/VDE/UL/CSA/ BIS Certificate with CML no.		1
64	24VDC PLUG IN RELAY	SG12647			2
65	Fuse Link for 2Amp as Item 001 of SG12975	SG12975-001	CE/VDE/UL/CSA/ BIS Certificate with CML no.		11
66	Fuse Link for 6Amp as Item 003 of SG12975	SG12975-003	CE/VDE/UL/CSA/ BIS Certificate with CML no.		6
67	Fuse Link for 16Amp as Item 004 of SG12975	SG12975-004	CE/VDE/UL/CSA/ BIS Certificate with CML no.		4
68	Fuse Link for 32Amp as Item 005 of SG12975	SG12975-005	CE/VDE/UL/CSA/ BIS Certificate with CML no.		2
69	Fuse Link for 63Amp as Item 007 of SG12975	SG12975-007	CE/VDE/UL/CSA/ BIS Certificate with CML no.		1
70	Fuse Fitting (Base with carrier, coupled with each other) Suitable for fuse link Rating from 2 Amps to 32 Amps as per item 006 of SG12975	SG12975-006	CE/VDE/UL/CSA/ BIS Certificate with CML no.		26

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S. No.	Description	Drawing/ Specification	Make (if applicable	Finish /Colour /Type	Quantity/panel (in nos.) Module-2 Talcher
71	1 Fuse Holder and 1 Neutral link with Fitting (1-Pole + 1Neutral) (Base with carrier, coupled with each other) suitable for AC fuse link up to 32A as per item 009 of SG12975	SG12975-009	CE/VDE/UL/CSA/ BIS Certificate with CML no.		2
72	3 Fuse Holder for 3-phases and 1 Neutral link with Fitting (3-Pole + 1 Neutral) (Base with carrier, coupled with each other) suitable for AC fuse link up to 32A as per item 010 of SG12975	SG12975-010			1
73	1 Fuse Holder and 1 Neutral link with Fitting (1-Pole + 1 Neutral) (Base with carrier, coupled with each other) suitable for AC fuse link up to 63A as per item 011 of SG12975	SG12975-011	CE/VDE/UL/CSA/ BIS Certificate with CML no.		1
74	240VAC 6A, PIANO TYPE SWITCH FOR HEATER	SG12953			1
75	240VAC 6/16A,3PIN PIANO TYPE SWITCH & SOCKET	SG12955			1
76	Aluminium Anodized device labels to drawing nos. 35611150417-004 for Fuse labels, 35611150417-013 for for Indicating Lamps and 35611150417-005 for relay labels as per total Fuses, ILs, Relays & other Devices.	GR. 19000 OF IS-11857 & PURCHASE SPECIFICATION AA7250111		As per device detail provided after PO Placement (Approx qty ±40 nos.)	40
77	PVC Cable 4.0 sq mm Black	SG12973	FR-LSH Type	IN MTR	40
78	4 SQ MM TUBULAR TYPE	SG12986			15
79	INSTRUMENT PANEL FABRICATION	35216201535-V01			1

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## **SCREW-LESS PUSH IN TYPE TERMINAL BLOCKS & ITS ACCESSORIES**

### **1.0 SCOPE**

These standard covers specification and acceptance norms for the screw-less push in fit type terminal blocks for use in Indoor switchgears & relay panels.

**2.0 APPLICABLE STANDARD:** IEC-60947-7-1 & UL certified.

### **3.0 SPECIFICATION:**

#### **3.1 INSULATION MATERIAL**

SL NO	INSULATION MATERIAL	PROPERTIES	COMPLIANCE (YES/ NO)
4	Polyamide 6.6	• Noncorrosive	Yes
		• Abrasion resistant	Yes
		• Impact resistant	Yes
		• Self-extinguishing (FV2 OR VO according to UL94)	Yes
		• Continuous temperature operating range of -35 to +105 deg. C	Yes
		• Dielectric strength - 400 KV / cm	30 KV/mm
		• Resistant to fuels, oils, detergents and adverse climatic condition.	Yes
		• Insulation Resistance >>10M ohms.	
		• Resistant to surface discharge with CTI>600 (IEC-60112)	≥ 600
		• Excellent resistance to micro-organisms, bacteria, enzymes and termites.	Yes

#### **3.2 CONTACT MATERIAL & SURFACE**

SL NO	SPECIFICATION REQUIREMENT	COMPLIANCE (YES/ NO)
1.	Contact material shall be of extra hard electrolytic copper or copper alloy having excellent conductivity & good chemical resistance against corrosion.	Yes
2.	All Current carrying parts of the TB shall be of Non-ferrous material.	Yes
3.	Contact Surface shall be tin/lead or nickel-plated surface for excellent long term protection against corrosion and gas tight connection for consistency of the contact resistance.	Tin plated /Yes
4.	Flatness of base of channel to be done after punching/ bending.	Yes



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TYPE OF TERMINAL BLOCKS & TB ASSEMBLY

ITEM NO		ENQ IT NO.	TYPE OF BLOCK	TECHNICAL REQUIREMENT	COMPLIANCE (YES / NO)
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001		001	2-conductor through terminal block; 35 mm; lateral marker slots; only for DIN 35 x 15 rail; POWER CAGE CLAMP; 35,00 mm <sup>2</sup> ; gray	• TYPE CODE: - 285-135 Technical Specification of: TERMINAL BLOCKS Enq. No.: PO No.:	REV.NO.- 00 Page 3 of 7
001A		002	End plate for Item-001	• Rated Voltage:660 Volts • Rated Current:32Amps Continuous • Max. pitch/thickness of TB : 8mm • Suitable for connecting total <b>two wires</b> of upto 25 sqmm lugged stranded copper conductors with ease. (One in one out) • Push in contact shall be high quality spring steel. • Push in contact shall open automatically when the conductor is pushed in and ensure the required pressure force against the current bar. • The spring shall open by a push button to release wire easily and without direct contact with live parts.	1000 V -Yes 125 A - Yes 16 mm TWO wire up to 35 sq mm Yes Yes No- Push Button is not available. Product is based of 'Power Cage clamp" to be operated by a special operating tool WAGO Cat no. 210-721 No- Push Button is not available. Product is based of 'Power Cage clamp" to be operated by a special operating tool WAGO Cat no. 210-721 Ferrule
001B		003	Horizontal Marker for Item-001	• PVC marker shall have white background. • Each Box/Packet of PVC markers shall contain 100 markers. • Vendor to provide price of 100 markers • Marker numbering shall be provided after PO placement, during manufacturing clearance.	Yes Yes Yes Yes
001C		004	Two-way shorting Link for Item-001	-Tin- or nickel-plated copper -Suitable for shorting two adjacent terminal blocks covered in item-001 above.	Yes
001D		005	Three way Shorting Link for Item-001	-Tin- or nickel-plated copper -Suitable for shorting three adjacent terminal blocks covered in item-001 above.	NA

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Above items (001 to 001D) shall be procured from one vendor based on package wise L1 price

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ITEM NO	ENQ IT NO.	TYPE OF TERMINAL BLOCK	TECHNICAL REQUIREMENT	COMPLIANCE (YES / NO)
002	007	Test plug adapter; 11.6 mm wide; for 4 mm Ø test plugs; gray  <i>Application: For PT/CT circuit.</i>	• <b>TYPE CODE: - 283-404</b>	
			• Rated Voltage:660 Volts	NA
			• Rated Current:20Amps Continuous	NA
			• Max. pitch/thickness of TB : 13mm	NA
			• Suitable for connecting one wires of upto 25 sqmm lugged stranded copper conductors at each end with ease.	NA
			• Push in contact shall be high quality spring steel.	NA
			• Push in contact shall open automatically when the conductor is pushed in and ensure the required pressure force against the current bar.	NA
			• The spring shall open by a push button to release wire easily and without direct contact with live parts.	NA
			• Suitable for both flat and pin/ tubular type lugs	NA
			• Each terminal block shall have provision of at least two shorting at each end.	NA
002A	008	End plate for Item-002	<ul style="list-style-type: none"> <li>Material and color shall be same as that of above terminal blocks.</li> <li>In case end plate is inbuilt in TB then partition plate is to be provided</li> </ul>	NA
002B	009	Horizontal Marker for Item-002 and packet/box quantity	<ul style="list-style-type: none"> <li>PVC marker shall have white background</li> <li>Each Box/Package of PVC markers shall contain 100 markers</li> <li>Vendor to provide price of 100 markers.</li> <li>Marker numbering shall be provided after PO placement, during manufacturing clearance.</li> </ul>	NA
002C	010	Two-way shorting Link for Item-002	<ul style="list-style-type: none"> <li>-Tin- or nickel-plated copper</li> <li>-Suitable for shorting two adjacent terminal blocks covered in item-002 above.</li> </ul>	NA
002D	011	Three-way Shorting Link for Item-002	<ul style="list-style-type: none"> <li>-Tin- or nickel-plated copper</li> <li>-Suitable for shorting three adjacent terminal blocks covered in item-002 above.</li> </ul>	NA
002E	012	Test Plug	Test Plug for 2kV test on above TBs	Yes

Above items (002 to 002E) shall be procured from one vendor based on package wise L1 price

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ITEM NO	ENQ IT NO.	TYPE OF TERMINAL BLOCK	TECHNICAL REQUIREMENT	COMPLIANCE (YES / NO)
003	013	Horizontal Marker for Item-001	<ul style="list-style-type: none"> <li><b>TYPE CODE:- 209-501</b></li> </ul>	
		<i>Application: For AC/DC control wiring.</i>	Rated Voltage:660 Volts	NA
			Rated Current:20Amps Continuous	NA
			Max. pitch/thickness of TB : 8mm	NA
			Suitable for connecting total of upto 25 sqmm lugged stranded copper conductors with ease. (One in Two out)	NA
			Push in contact shall be high quality spring steel.	NA
			Push in contact shall open automatically when the conductor is pushed in and ensure the required pressure force against the current bar.	NA
			The spring shall open by a push button to release wire easily and without direct contact with live parts.	NA
003A	014	End plate for Item-001	<ul style="list-style-type: none"> <li>Material and color shall be same as that of above terminal blocks.</li> <li>In case end plate is inbuilt in TB then partition plate is to be provided</li> </ul>	NA
003B	015	Horizontal Marker for Item-001	<ul style="list-style-type: none"> <li>PVC marker shall have white background</li> <li>Each Box/Package of PVC markers shall contain 100 markers.</li> <li>Vendor to provide price of 100 markers</li> <li>Marker numbering shall be provided after PO placement, during manufacturing clearance.</li> </ul>	Yes Yes  Yes Yes
003C	016	Two way shorting Link for Item-003	<ul style="list-style-type: none"> <li>-Tin or nickel plated copper</li> <li>-Suitable for shorting two adjacent terminal blocks covered in item-003 above.</li> </ul>	NA
003D	017	Three way Shorting Link for Item-003	<ul style="list-style-type: none"> <li>-Tin or nickel plated copper</li> <li>-Suitable for shorting three adjacent terminal blocks covered in item-003 above.</li> </ul>	NA
003E	018	Test Plug	Test Plug for 2kV test on above TBs	NA

Above items (003 to 003E) shall be procured from one vendor based on package wise L1 price

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**4.0 ACCEPTANCE NORMS**

SL. NO.	DESCRIPTION	BIDDERS COMPLIANCE (Yes / No)
1.	Color : GREY for Polyamide	Yes
2.	Type Code: As per P.O / Approved during offer evaluation.	
3.	Uniformity in mounting of TBs in terminal blocks assemblies	Yes
4.	TBs shall be UL certified	Yes

**5.0 TESTING**

SL. NO.	Verification of the following properties based on test certificates from supplier:-	BIDDERS COMPLIANCE (Yes / No)
1.	Insulation Resistance $\geq 10$ M ohms.	
2.	Pull out force as per IEC.	Yes
3.	Resistance to vibration: The TBs shall withstand pull tests under vibration with 12 Hz & 50 Hz frequency and amplitude of 1 mm.	Yes
4.	Rated voltage withstand capability : 660V AC.	1000 V
5.	Surge Voltage (1.2 / 50 micro sec) withstand capability: 8 kV.	Yes
6.	Voltage drop at rated current < 5 milli Volt.	Yes
7.	Temperature rise at rated current < 45 deg. C.	Yes
8.	Insulation inflammability test	Yes

**6.0 GENERAL NOTES:**


SL. NO.	DESCRIPTION	BIDDERS COMPLIANCE (Yes / No)
1.	Specific confirmation against each item technical requirement is to be given, in the absence of which the offer may be rejected.	
2.	Consignment shall be inspected and tested (if required) in BHEL as per testing clauses in point 5.0 above.	
3.	The terminal block shall be suitable for clip-on to channel type (Din Type) and it shall be possible to remove/change any terminal with ease from the stack without affecting the other terminals.	Yes
4.	Insulating Material of all type of terminal blocks offered along with end plates shall be of Polyamide. Material type mixing is not acceptable.	
5.	Particular type of Terminal blocks and associated accessory under procurement shall be of same make and shall be procured from the same source in view of compatibility. Color of all the items shall be same.	Yes
6.	All items of TB's shall be UL certified, certificate in support of same shall be submitted with offer.	2206-1671 not UL approved

Prep. by : Rahul Rajput


Approved by : Murtaza Hussain

Date : 06.03.2024

Date : 06.03.2024

	AMENDMENT -NOTIFICATION		AA 225 21		Rev. No. 01	
			PAGE 1 OF 1			
<p><b>AA 225 21: PVC SLEEVING</b></p> <p>PAGE 3 OF 6; Cl 11.1:</p> <p>Heading of the clause is modified as follows:</p> <p><b>"Cl 11.1 Insulation Resistance (At Room Temperature):"</b></p>						
Please see Instructions on the reverse.						
Ref : Cl. 32.4.47a OF MOM OF MRC-E		Amd No. 01	Approved MRC-E	Issued CORP. R&D	Date 15.01.2003	Cum.Sr.No. A 3382

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		<b>CORPORATE PURCHASING SPECIFICATION</b>		AA 225 21	
				Rev.No. 01	
				PAGE 1 OF 6	
<p style="text-align: center;"><b>PVC SLEEVING</b></p> <p><b>1. GENERAL :</b></p> <p>This specification governs the quality requirements of flexible Polyvinyl Chloride Sleeving for electrical purposes of Temperature Index. 90.</p> <p><b>2. APPLICATION :</b></p> <p>For use in low voltage electrical apparatus upto 600V as lead insulation.</p> <p><b>3. COMPLIANCE WITH NATIONAL STANDARDS:</b></p> <p>There is no Indian Standard covering this type of material. However, assistance has been derived from BS:2848 "Specification for Flexible Insulating Sleeving For Electrical Purposes".</p> <p><b>4. DIMENSIONS AND TOLERANCES :</b></p> <p><b>4.1 Sizes:</b></p> <p>As per Annexure-I.</p> <p><b>4.2 Tolerances:</b></p> <p>As per Annexure-I.</p> <p><b>5. TEST METHODS :</b></p> <p>Unless otherwise specified, the tests shall be conducted in accordance with the relevant methods of BS:2848.</p> <p><b>6. TEST SAMPLES :</b></p> <p>A test sample of 5 metre shall be supplied for testing and approval.</p> <p><b>7. FREEDOM FROM DEFECTS :</b></p> <p>PVC sleeving shall be suitably plasticized and stabilized, shall have smooth surface without any scratches, cracks, blisters and foreign inclusions.</p>					
<b>Revisions:</b> Ref.Lt.No.TSD/SM/420 dt.9.12.97. BHEL,BHOPAL			<b>Approved:</b> INTERPLANT MATERIAL RATIONALISATION COMMITTEE - MRC ( E )		
<b>Rev.No.</b> 01	<b>Amd.No.</b>	<b>Reaffirmed</b>	<b>Prepared</b> HEEP, HARDWAR	<b>Issued</b> CORP. R&D	<b>Dt. of 1st Issue</b> Feb. 80
<b>Dt.</b> 1.2.98	<b>Dt.</b>	<b>Year:</b>			



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## CORPORATE PURCHASING SPECIFICATION



## 8. PHYSICAL PROPERTIES :

## 8.1 Colour:

Unless otherwise specified the colour of the sleeving shall be Black.

## 8.2 Water Absorption:

1.25 percent Maximum.

When tested on a 25 mm long sample after  $24 \pm 1$  hour immersion in water at room temperature.

## 8.3 Shrinkage Test:

10 percent Maximum.

After treatment at  $150 \pm 2^\circ\text{C}$  for 15 minutes.

## 9. MECHANICAL PROPERTIES :

## 9.1 Tensile Strength:

10.2 N/mm<sup>2</sup> Minimum.

## 9.2 Elongation at Break:

25 percent Minimum.

## 9.3 Splitting Test:

Shall pass the test without splitting, when sleeving is dilated by means of a taper mandrel, whose end diameter shall be equivalent to 1.25 times the inside diameter of the sleeving.

## 10. THERMAL PROPERTIES :

## 10.1 Heat Test (Bore dia not exceeding 5 mm): - Appendix I


Shall pass the test without cracking or other deterioration.

## 10.2 Softening Point:-Appendix-II

135°C Minimum.

## 10.3 Soldering Test(For bore 5 mm and less):

Shall pass the test without any splitting.

	<b>CORPORATE PURCHASING SPECIFICATION</b>	<b>AA 225 21</b>
		<b>Rev.No. 01</b>
		<b>PAGE 3 OF 6</b>

10.4 **Self Extinguishing Test:**

- Time of application of Barthel burner to the sample held vertically - 60 sec.
- Period of burning after removal of the flame - 60 sec. Max.
- Total length of sleeving decomposed - 200 mm. Max.

10.5 **Ageing Test (Type test): - Appendix III**

Mean Loss in weight: 3 percent Max.

11. **ELECTRICAL PROPERTIES:**

11.1 **Insulation Resistance:**

8000 Megohms - Minimum.

11.2.1 **At  $82 \pm 2^{\circ}\text{C}$  after one hour:**

100 Megohms - Minimum.

11.2.2 **After Accelerated Damp Heat Treatment(Type Test):**

10,000 Megohms - Minimum.

11.3 **Breakdown Voltage Test: Electric Strength Test:- Appendix-IV**

- At normal temperature

Proof Test: 10 KV/mm of wall thickness for 5 minutes.

- At  $82 \pm 2^{\circ}\text{C}$

Proof Test: 5 KV/mm of wall thickness.

11.4 **Cold Flow Test (Type test) for 5 minutes:**

Shall withstand 8 KV/mm of wall thickness for 5 minutes.

11.5 **Long Term Damp Heat Test (Type test):**

Shall withstand 3000 Volts for one minute.

When tested for Electric Strength as per Cl. 11. 3.

12. **ADDITIONAL TESTS :**

- Mould Growth Test (Type test):**

There shall not be appreciable mould growth on the test specimens.

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## CORPORATE PURCHASING SPECIFICATION



## 2. Corrosion Test (Type test):- Appeendix-V

There shall be no sign of corrosion of the copper wires beyond the slight natural tarnishing which may occur.

## 13. TEST CERTIFICATE :

Unless otherwise specified, three copies of test certificates shall be supplied with each consignment.

in addition, the supplier shall ensure to enclose one copy of the test certificates alongwith their despatch document to facilitate quick reference of the material.

The test certificate shall bear the following information:

AA 22521 (Rev 01): PVC Sleeving.  
BHEL Order No.  
Batch/Lot No.

Test results obtained for Physical, Mechanical, Thermal and Electrical properties and dimensional tolerances as per the specification.

## 14. PACKING AND MARKING :

Sleeving shall be coiled and if specified on the order shall be inflated with air. The package shall be marked as follows:

AA 22521 : PVC Sleeving.  
Manufacturer's/Supplier's Name.  
BHEL Order No.  
Batch/Lot No.  
Nominal Internal Dia.  
Length of the Sleeving.  
Colour.

## 15. REFERRED STANDARDS (Latest Publications Including Amendments):

1. BS: 2848

	CORPORATE PURCHASING SPECIFICATION	AA 225 21
		Rev.No. 01
		PAGE 5 OF 6

APPENDIX - I

**Heat Test:**

A specimen, approximately 100 mm, shall be threaded as a sliding fit on to a longer length of wire of appropriate diameter and wound in a closed helix six times round a steel or aluminium mandrel of diameter equal to the nominal external diameter of the sleeving. The ends shall be secured to prevent uncooling. The specimen shall then be placed in a chamber and maintained at a temperature of  $150 \pm 2^{\circ}\text{C}$  for one hour after which it shall be removed and allowed to return to the room temperature. The sleeving shall exhibit no cracking or other deterioration.

APPENDIX - II

**Test for Softening Point:**

A length of sleeving weighted at one end shall be freely suspended in glycerine bath to a depth of 60 mm. The applied to the sleeving shall be 40 g/mm<sup>2</sup> of the wall cross section. The bath is uniformly heated, the temperature increase being kept at the rate of  $3^{\circ}\text{C}$  per minute. The softening point shall be taken as the temperature at which the sleeving fractures. It shall be not less than  $135^{\circ}\text{C}$ .

APPENDIX - III

**Ageing Test:**

A test piece, 150 mm long, shall be suspended in an air circulating oven maintained at a temperature of  $82 \pm 2^{\circ}\text{C}$  for  $120 \pm 2$  hours and shall then be taken out and allowed to cool to room temperature and reweighted. The loss in weight resulting from the ageing shall be expressed as percentage of the original weight of the sample.

APPENDIX - IV

**Electric Strength Test:**

**At Normal Temperature:**

A length of sleeving with sliding fir flexible bare cable inserted in it shall be immersed in water for 10 minutes with about 25 mm sleeving out of the water at each end. A test voltage of 10000 volts RMS per millimeter of wall thickness of approximately 50 cycles per second shall be applied between the cable and water for 5 minutes. The voltage shall be increased steadily to the required value at a rate consistent with the accuracy of the indicating instrument. There shall be no break-down.

AA 225 21	CORPORATE PURCHASING SPECIFICATION	<div>बीएसईपी BSI</div>
Rev.No. 01		
PAGE 6 OF 6		

At high Temperature:

A length of the sleeving with a sliding fit glexible bare cable inserted in it (ends of the wire projecting not less than 25 mm at each end) shall be wrapped spirally with overlapping metal foil in good contact with the sleeving to within 25 mm from each end. The sample shall be placed in dry heat chamber at a temperature of  $82 \pm 2^{\circ}\text{C}$ . A test voltage of 500 volts RMS per millimeter of wall thickness of sleeving, of approximately 50 cycles per second shall be applied for 5 minutes between the wire and the metal foil. There shall be no break-down.

Appendix-v

Test for Determination of Corrosion of Metal Inserts:

A 75 mm length of the sleeving shall be threaded on to a longer length of clean bright copper wire whose diameter is approximately half than of the internal diameter of the sleeving. The assembly supported horizontally at each end of the wire, shall be heated to  $60 \pm 2^{\circ}\text{C}$  in a ventilated oven for  $200 \pm 2$  hours and then allowed to cool. On examination of the sleeving, there shall be no sign of corrosion of the copper beyond the slight natural transhing which may occur.

ANNEXURE - I

Internal dia.	Tolerance on Internal dia		Wall Thickness	Tolerances on wall thickness	
	Minus mm	Plus mm		Minus mm	Plus mm
0.5	0.10	0.15	0.4	0.05	0.05
0.75	0.10	0.15	0.5	0.05	0.05
1	0.10	0.15	0.5	0.05	0.05
1.5	0.15	0.15	0.5	0.05	0.1
2	0.15	0.15	0.5	0.05	0.1
2.5	0.15	0.15	0.5	0.05	0.1
3	0.15	0.15	0.5	0.05	0.1
3.5	0.15	0.15	0.5	0.05	0.1
4	0.15	0.15	0.5	0.05	0.1
4.5	0.15	0.15	0.5	0.05	0.1
5	0.15	0.15	0.5	0.05	0.1
6	0.15	0.15	0.5	0.05	0.1
7	0.15	0.15	0.65	0.15	0.15
8	0.15	0.15	0.65	0.15	0.15
9	0.15	0.15	0.65	0.15	0.15
10	0.15	0.15	0.65	0.15	0.15
11	0.15	0.15	0.65	0.15	0.15
12	0.15	0.15	0.65	0.15	0.15
13	0.2	0.3	0.85	0.15	0.15
14	0.2	0.3	0.85	0.15	0.15
16	0.2	0.3	0.85	0.15	0.15
18	0.2	0.3	0.85	0.15	0.15
20	0.2	0.3	0.85	0.15	0.15
22	0.2	0.3	1	0.2	0.2
25	0.2	0.3	1	0.2	0.2
30	0.2	0.3	1	0.2	0.2
36	0.2	0.3	1	0.2	0.2
38	0.2	0.3	1	0.2	0.2

	<h1 style="text-align: center;">CORPORATE STANDARD</h1>	AA7240201
		Rev No.02
		PAGE 1 of 2

## GROMMETS RUBBER WITH AND WITHOUT CENTRE HOLE

### 1.0 SCOPE

This standard covers the information as to the designation, material, sizes and dimensional requirements of non-oil resistant rubber grommets with type 2 medium hardness having IRHD of 51 to 65 range.

### 2.0 DEFINITION:

A grommet is a circular resilient moulding with or without a central hole and having two flanges and a groove. The grooves are for location and fixing purpose.

**3.0 DESIGNATION:** A rubber grommet of bore dia 8 type 2 medium hardness range shall be designates as:

#### 3.1 On drawings:

- a) Material specification column : AA7240201
- b) Description column :RBR GROMMET BORE DIA 8 MED

#### 3.2 For placing indents on purchase:

Rubber grommet, bore dia 8 type 2 medium Hardness range (51-65 IRHD) - AA7240201

**3.3 For issuing enquiries and on purchase orders:** While issuing enquiries and purchase orders, a copy of this standard shall be enclosed.

### 4.0 COMPLIANCE WITH NATIONAL STANDARDS:

**4.1 Dimensions, Tolerances, Hardness range, Finish & General requirements:** As per IS:5270-1969, Type 2 medium hardness having IRHD of 51-65 range.

**4.2 Material:** Natural or synthetic rubber as specified in IS:5270

**4.3 Marking:** Each grommet has to be marked with manufacturer's name or trade mark, hardness, type and dimension: A

### 5.0 REFERRED STANDARDS (Latest publications including amendments):

- 1) IS:5270

Revisions:As per Clause 25.04 of MOM of MRC-SMC+RP

**APPROVED:**  
INTERPLANT MATERIAL RATIONALISATION  
COMMITTEE – MRC(SMC+RP)

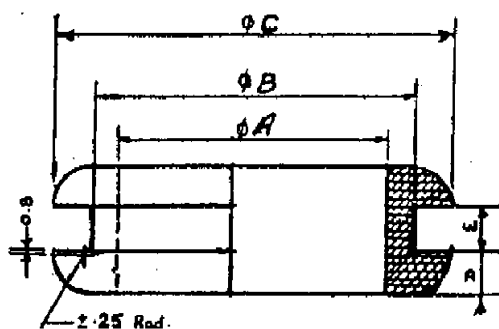
Rev No.02	Amd No.	Reaffirmed	Prepared HEP, Bhopal	Issued Corp.R&D	Dt. of 1 <sup>st</sup> Issue Feb 1986
Dt:15-12-2003	Dt:	Year:2019			

AA7240201

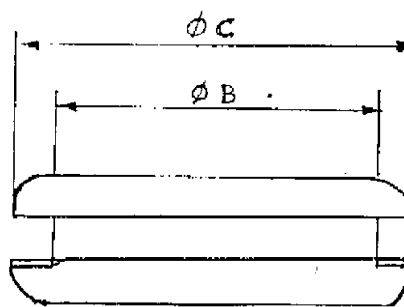
Rev. No.02

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## CORPORATE STANDARD



WITH HOLE



WITHOUT HOLE

Rubber Grommet -Type 2 – Medium

(All dimensions are in mm unless otherwise specified)

BORE DIA 'A' TOLERANCES	GROOVE DIA 'B' TOLERANCES	FLANGE DIA 'C' TOLERANCES	WIDTH OF FLANGE 'D' TOLERANCES	WIDTH OF GROOVE 'E' TOLERANCES	SUB CODE	
					With central hole	Without central hole
0 -0.5	Up-to 19 dia	+0.5 0 For all sizes	+0.5 0 For all sizes	+0.5 0 For all sizes		
0 -1.0	Above 19 dia	+1.0 0 For all sizes	+1.0 0 For all sizes	+1.0 0 For all sizes		
3.0	6.3	9.5	2.4	3.0	015	317
4.7	8.0	11.0	2.4	3.0	023	325
6.3	9.5	12.5	2.4	3.0	031	333
8.0	11.0	16.0	3.0	3.0	040*	341
9.5	12.5	17.5	3.0	3.0	058	350*
11.0	16.0	20.6	3.0	3.0	066	368
12.5	17.5	22.2	3.0	3.0	074	376
14.3	19.0	25.4	3.0	3.0	082	384
16.0	20.6	27.0	3.0	3.0	090	392
17.5	23.8	30.0	3.0	3.0	104	406
19.0	25.4	31.7	3.0	3.0	112	414
22.0	28.4	36.5	4.0	3.0	120	422
25.4	31.7	39.7	4.0	3.0	139	430
28.4	35.0	43.0	4.0	3.0	147	449
31.7	38.0	45.0	4.0	3.0	155	457
35.0	41.2	49.2	4.0	3.0	163	465
38.0	44.4	53.8	4.7	3.0	171	473
44.4	50.8	60.3	4.7	3.0	180*	481
50.8	57.0	66.6	4.7	3.0	198	490*
76.0	81.2	91.2	3.0	3.0	201	503

	<h1 style="text-align: center;">CORPORATE STANDARD</h1>	AA7250111
		Rev No.03
		PAGE 1 of 4

## COMPANY'S MONOGRAM PLATE Ni-Cr-CAST ALUMINIUM BILINGUAL (WITH BORDER)

### 1.0 SCOPE:

1.1 This standard stipulates the requirements for cast aluminum monogram plate depicting company's monogram tor displaying on its product.

1.2 For brass etched monogram, refer Corporate Standard AA7250101.

2.0 **DESIGNATION:**A monogram plate (Cast Aluminum) of nominal size 'A' – 160 mm shall be designated as:

### 2.1 On Drawing

Specification Column– AA7250111

Description Column – CO, MONOGRAM PLATE C.AL, BILINGUAL – 160

### 2.2 On Indents

Company's Monogram plate cast aluminum – Nominal size 160 to AA7250111

### 2.3 On Purchase Order/Enquires

While issuing enquiries/purchase orders enclose a copy each of the standards AA7250111 and AA0401120.

### 3.0 MATERIAL

The monogram plate, shall be made from Aluminum alloy grade A-6-M of IS:617 (AA12352)

### 4.0 COMPLIANCE WITH STANDARDS

#### 4.1 Dimensions

4.1.1 Plate, Borders, Holes etc. shall be as specified in table-1 of this standard.

Revisions: Sizes 750, 1000, 1250 & 1500 mm are added in Table. Note added under Table in Page No.4.

**APPROVED:**  
INTERPLANT MATERIAL RATIONALISATION  
COMMITTEE – MRC(SMC+RP)

Rev No.03	Amd No.	Reaffirmed	Prepared Corp. R&D	Issued Corp.R&D	Dt. of 1 <sup>st</sup> Issue 02-11-1981
Dt:01-09-2017	Dt:	Year:			



AA7250111

Rev. No.03

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**CORPORATE STANDARD**

**4.2** Monogram: As specified in Corporate Standard AA0401120.

**4.3 Finish**

**4.3.1** The monogram plate shall be painted by self etch primer, first.

**4.3.2** Background of Hindi letters बी.एच.ई.एल shall be full glossy white synthetic enamel of stoving type.

**4.3.3** Background of English letters "BHEL" shall be black, wrinkle finish, synthetic stoving enamel.

**4.3.4** Top raised portion i.e. BHEL Hindi & English letters and border shall be bright Nickel Chromium plated Cr IS:1068.

**4.3.5** The monogram plates shall be free from burnt spots, cracks, scratches and peeling of coating etc.

**4.3.6** The inside boundary line in the area of Hindi letter बी.एच.ई.एल shall not be black as mentioned in CL.4.3 of AA0401120.

**5.0 TECHNICAL DELIVERY CONDITION**

As per BHEL standard AA0851412

**6.0 FIXING**

**6.1 Holes**

The counter sunk hole sizes of monogram plate are indicated in Table-1.

**6.2 Screws**

The monogram plate shall be fixed by screws, slotted, counter sunk head precision type A, coarse pitch to AA7122101 or AA7122103.

**6.3** After fixing the screws on the plates slots of head shall be suitably filled with putty and shall be finished with white and black paint so that the appearance of the fasteners merges with the white black background.

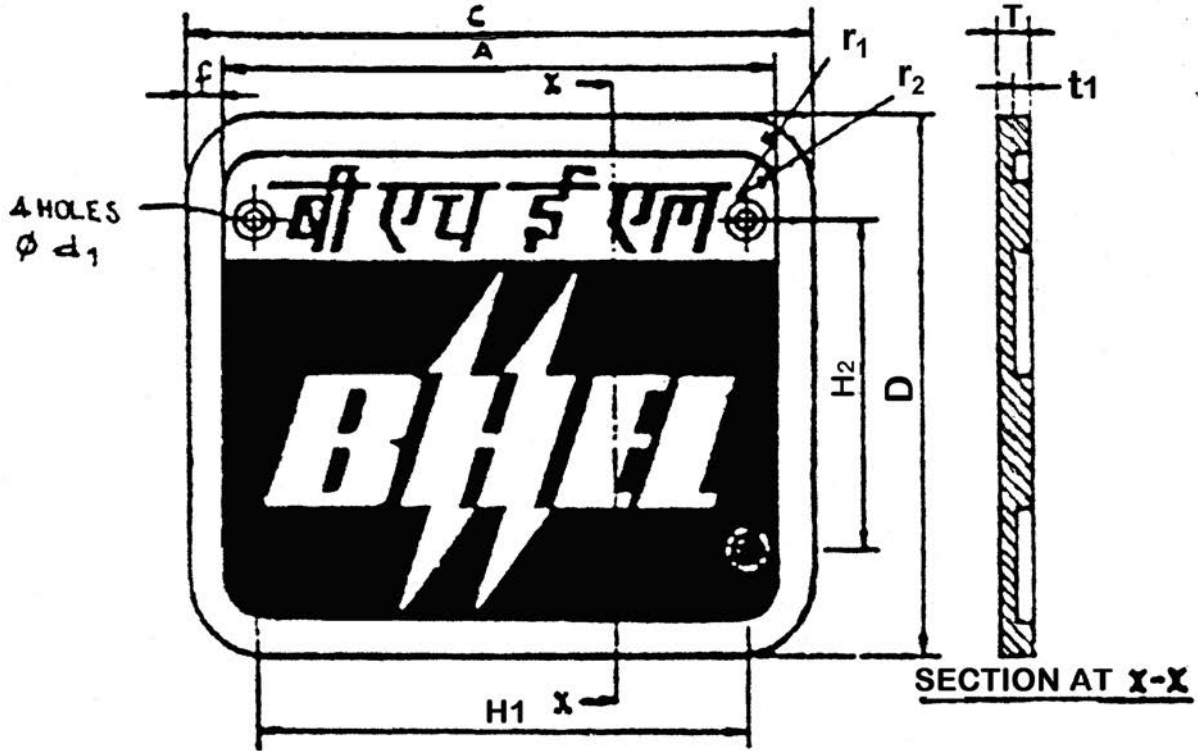
**7.0 REFERRED STANDARDS (Latest publications including Amendments)**

1) AA0401120 2) AA7250101 3) AA12352 4) IS:617

**NOTE:**

- 1) Weights given in Table-1 are approximate and have been calculated on the basis, that aluminum weights  $2.72 \text{ g/cm}^3$
- 2) Sharp edges shall be rounded off.

	<p style="text-align: center;"><b>CORPORATE STANDARD</b></p>	<p>AA7250111</p>
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Rev. No.03

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## CORPORATE STANDARD



TABLE-1

All dimensions are in mm

NOM SIZE A	PLATE								TOL on T & f (±)	Hole Centre Distance		Hole Dia		NOM. SIZE OF FIXING SCREW	Approx. Weight / Piece in kg	SUB CODE
	C	D	TOL. ON C & D	r1	r2	Bor der f	Thickness			Horizontal H <sub>1</sub>	Vertical H <sub>2</sub>	Ød <sub>1</sub>	CSK Dia Ød <sub>2</sub>			
							T	t <sub>1</sub>								
100	113	94	+1 -0	13.5	7	6.5	6.0	2.0	89	58	3.2	6.4	M3	0.17	027	
125	141	118	+1 -0	17	9	8.0	6.0	2.0	111	73	3.2	6.4	M3	0.27	035	
160	181	152	+1 -0	21.5	11	10.5	6.0	2.5	142	93	4.3	8.3	M4	0.45	043	
200	226	189	+1 -0	27	14	13.0	8.0	3.0	180	118	5.3	10.4	M5	0.92	051	
250	282	236	+1.5 -0	33.5	17.5	16.0	8.0	3.0	222	146	5.3	10.4	M5	1.45	060*	
320	362	302	+1.5 -0	44	23	21.0	8.0	3.5	287	190	8.4	16.5	M8	2.38	078	
400	452	378	+2 -0	54	28	26.0	10.0	4.0	356	234	8.4	16.5	M8	4.64	086	
600	678	567	+2 -0	81	42	39.0	10.0	4.0	540	354	8.4	16.5	M8	10.45	094	
750	848	706	+2 -0	101	53	49	10	4.5	666	436	8.4	16.5	M8	16.16		
1000	1130	940	+2.5 -0	135	70	65	12	5	890	582	10.5	18.5	M10	34.42		
1250	1412	1175	+2.5 -0	169	88	81	12	5	1112	730	10.5	18.5	M10	53.75		
1500	1693	1411	+2.5 -0	203	105	98	12	5.5	1333	872	10.5	18.5	M10	77.54		

Note: For large nominal sizes 1000, 1250 and 1500 mm monogram plates, 3 more screws (equidistant) to be used between centres of corner holes, both on width and height of plate.



**BSI Standards Publication**

# Cable management systems — Cable ties for electrical installations

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National foreword

This British Standard is the UK implementation of EN IEC 62275:2019. It is identical to IEC 62275:2018. It supersedes BS EN 62275:2015, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee PEL/213, Cable management.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 December 2019.

Amendments/corrigenda issued since publication

Date	Text affected
<hr/>	

EUROPEAN STANDARD

**EN IEC 62275**

NORME EUROPÉENNE

EUROPÄISCHE NORM

November 2019

ICS 29.120.10; 29.120.99

Supersedes EN 62275:2015 and all of its amendments  
and corrigenda (if any)

English Version

## Cable management systems - Cable ties for electrical installations (IEC 62275:2018)

Systèmes de câblage - Colliers pour installations  
électriques  
(IEC 62275:2018)

Kabelführungssysteme - Kabelbinder für elektrische  
Installationen  
(IEC 62275:2018)

This European Standard was approved by CENELEC on 2018-09-19. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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European Committee for Electrotechnical Standardization  
Comité Européen de Normalisation Electrotechnique  
Europäisches Komitee für Elektrotechnische Normung

**CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels**

## European foreword

The text of document 23A/851A/FDIS, future edition 3 of IEC 62275, prepared by SC 23A "Cable management systems" of IEC/TC 23 "Electrical accessories" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 62275:2019.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2020-05-29
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2022-11-29

This document supersedes EN 62275:2015 and all of its amendments and corrigenda (if any).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For the relationship with EU Directive(s) see informative Annex ZZ, which is an integral part of this document.

## Endorsement notice

The text of the International Standard IEC 62275:2018 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following note has to be added for the standard indicated:

IEC 62275:2013 NOTE Harmonized as EN 62275:2015

Annex ZA  
(normative)

Normative references to international publications  
with their corresponding European publications

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: [www.cenelec.eu](http://www.cenelec.eu).

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60068-2-6	2007	Environmental testing - Part 2-6: Tests - Test Fc: Vibration (sinusoidal)	EN 60068-2-6	2008
IEC 60216-4-1	2006	Electrical insulating materials - Thermal endurance properties - Part 4-1: Ageing ovens - Single-chamber ovens	EN 60216-4-1	2006
IEC 60695-11-5	2016	Fire hazard testing - Part 11-5: Test flames - Needle-flame test method - Apparatus, confirmatory test arrangement and guidance	EN 60695-11-5	2017
ISO 4892-2	2013	Plastics - Methods of exposure to laboratory light sources - Part 2: Xenon-arc lamps	EN ISO 4892-2	2013
ISO 9227	2017	Corrosion tests in artificial atmospheres - Salt spray tests	EN ISO 9227	2017



## Annex ZZ (informative)

### Relationship between this European Standard and the safety objectives of Directive 2014/35/EU [2014 OJ L96] aimed to be covered

This European Standard has been prepared under a Commission's standardization request relating to harmonized standards in the field of the Low Voltage Directive, M/511, to provide one voluntary means of conforming to safety objectives of Directive 2014/35/EU of the European Parliament and of the Council of 26 February 2014 on the harmonization of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits [2014 OJ L96].

Once this standard is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of this standard given in Table ZZ.1 confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding safety objectives of that Directive, and associated EFTA regulations.

**Table ZZ.1 – Correspondence between this European Standard  
and Annex I of Directive 2014/35/EU [2014 OJ L96]**

Safety objectives of Directive 2014/35/EU	Clause(s) / sub-clause(s) of this EN	Remarks / Notes
(1)(a)	Clause 7	
(1)(b)	Clauses 5 and 7	
(1)(c)	Clauses 1, 2, 3, 4 and 6 See also 2c), 3a), 3b) and 3c) below	
(2)(a)		Not applicable. Cable ties do not carry any current, so there is no danger by direct contact. Cable ties are not in contact with live parts, so there is no danger by indirect contact
(2)(b)		Not applicable Cable ties do not carry any current and they cannot produce heat, arcs or radiation.
(2)(c)	Clauses 8, 9 and 10	Emissions, production and/or use of hazardous substances not covered in this standard (but covered in other regulations/standards, e.g. RoHS)
(2)(d)		Not applicable. Cable ties do not carry any current, and therefore insulation is not required
(3)(a)	Clause 9	
(3)(b)	Clauses 9, 10 and 11	
(3)(c)	Clause 11.1	

**WARNING 1** — Presumption of conformity stays valid only as long as a reference to this European Standard is maintained in the list published in the Official Journal of the European Union. Users of this standard should consult frequently the latest list published in the Official Journal of the European Union.

**WARNING 2** — Other Union legislation may be applicable to the product(s) falling within the scope of this standard.



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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**CABLE MANAGEMENT SYSTEMS –  
CABLE TIES FOR ELECTRICAL INSTALLATIONS**

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International Standard IEC 62275 has been prepared by subcommittee 23A: Cable management systems, of IEC technical committee 23: Electrical accessories.

This third edition cancels and replaces the second edition published in 2013. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) consideration of adhesive fixing devices,
- b) revised and updated normative references,
- c) modified definitions for metallic and composite cable ties,
- d) new definitions,
- e) improvement of test procedures,
- f) new figures for typical arrangement of test assembly for fixing devices and for integral fixing devices.

The text of this standard is based on the following documents:

FDIS	Report on voting
23A/851A/FDIS	23A/868/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The following differing practices of a less permanent nature exist in the countries indicated below.

- 6.2.2: additional type classifications are applicable when pre-qualified moulding materials are used (Canada, USA).
- 6.2.3: additional type classifications are applicable when pre-qualified moulding materials are used (Canada, USA).
- 7.3: some marking information is required to be placed on the packaging (Canada, Russia, USA).

In this publication, the following print types are used:

- Requirements proper: in roman type.
- *Test specifications: in italic type.*
- Notes: in smaller roman type.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

## **CABLE MANAGEMENT SYSTEMS – CABLE TIES FOR ELECTRICAL INSTALLATIONS**

### **1 Scope**

This document specifies requirements for metallic, non-metallic and composite cable ties and their associated fixing devices used for the management and support of wiring systems in electrical installations.

Cable ties and associated fixing devices can also be suitable for other applications and where so used, additional requirements can apply.

This document does not contain requirements that evaluate any electrical insulation properties of the cable tie or mechanical protection of the cables provided by the cable tie.

This document contains requirements for the mechanical interface of an adhesive fixing device to a solid surface. It does not consider the mechanical behaviour of the solid surface in itself.

This document does not consider the mechanical interface, for example the mounting screw, of a fixing device other than adhesive to a solid surface.

### **2 Normative references**

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60068-2-6:2007, *Environmental testing – Part 2-6: Tests – Test Fc: Vibration (sinusoidal)*

IEC 60695-11-5:2016, *Fire hazard testing – Part 11-5: Test flames – Needle-flame test method – Apparatus, confirmatory test arrangement and guidance*

IEC 60216-4-1:2006, *Electrical insulating materials – Thermal endurance properties – Part 4-1: Ageing ovens – Single-chamber ovens*

ISO 4892-2:2013, *Plastics – Methods of exposure to laboratory light sources – Part 2: Xenon-arc lamps*

ISO 9227:2017, *Corrosion tests in artificial atmospheres – Salt spray tests*

### **3 Terms and definitions**

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>



### 3.1

#### **cable tie**

band or length of material, employing a locking device, used for bundling or tying groups of cables together, securing and/or supporting the cables

Note 1 to entry: Type 1 and Type 2 cable ties are classified in 6.2.2 and 6.2.3.

Note 2 to entry: In some countries, such as Canada and the United States, additional Type classifications are applicable when prequalified moulding materials are used. See UL 62275/CSA C22.2 No. 62275.

### 3.2

#### **fixing device**

component (such as a block or bracket) specifically designed to secure the cable tie to a mounting surface

### 3.3

#### **metallic component**

component that consists of metal only

Note 1 to entry: A metallic cable tie having a thin non-metallic or organic coating, where the coating does not contribute to the determination of the loop tensile strength, is considered a metallic component

Note 2 to entry: In case of doubt, "as-received condition" tests with and without coating can be carried out.

### 3.4

#### **non-metallic component**

component that consists of non-metallic material only

### 3.5

#### **composite component**

component comprising both metallic and non-metallic materials where both metallic and non-metallic materials contribute to the determination of the loop tensile strength

### 3.6

#### **environmental influence**

effect of corrosive substances or solar radiation, etc.

### 3.7

#### **loop tensile strength**

reference mechanical characteristic of a cable tie with its locking mechanism engaged

### 3.8

#### **locking device**

feature of a cable tie for fixing it in a closed position

### 3.9

#### **low hygroscopic polymer**

polymer having the characteristic of not enabling attraction or holding water greater than 1,0 % by weight of the material from the surrounding environment at 23 °C and 50 % relative humidity

Note 1 to entry: Examples of low hygroscopic polymers include: polypropylene, acetal, ethylene tetrafluoroethylene, ethylene chlorotrifluoroethylene, nylon 12, polyetheretherketone.

### 3.10

#### **equilibrium moisture content**

state at which a polymer neither absorbs or releases moisture when exposed to a surrounding environment of 23 °C and 50 % relative humidity

**3.11**  
**integral assembly**  
component which incorporates a cable tie and a fixing device

**3.12**  
**adhesive fixing device**  
fixing device provided with an adhesive tape specifically designed to secure the cable tie to a mounting surface

**4 General requirements**

A cable tie and a fixing device shall withstand the stresses likely to occur during recommended installation practice and perform under the conditions of classifications in Clause 6 as declared by the manufacturer.

*Compliance is checked by carrying out all the appropriate specified tests.*

NOTE Annex A details the compliance checks to be carried out for cable ties and fixing devices currently complying with IEC 62275:2013 in order to comply with this edition 3.

**5 General notes on tests**

**5.1** Tests according to this document are type tests. Unless otherwise specified, tests are carried out with the cable ties and their associated fixing devices, where available, installed as in normal use according to the manufacturer's instructions.

Unless otherwise specified, requirements and tests for fixing devices also apply to adhesive fixing devices.

NOTE For guidance in determining product types and sample sets, a family of cable ties or fixing devices having material, construction characteristics, and classifications according to Clause 6, in common, are considered of the same product type. Examples for consideration are identical generic material description, material colours, or variable lengths of a cable tie of otherwise similar construction. The sample sets selected for testing from each product type is representative of the extremes of the range (example: shortest and longest), and the minimum performance level obtained for either extreme is determined to be representative of the entire range.

Consideration is given to minor construction variations that can be determined by inspection to have no effect on performance, when determining product types.

**5.2** Unless otherwise specified, tests on non-metallic and composite components shall commence when the samples have been removed from their packaging and then stabilized at a temperature of  $(23 \pm 5) \text{ }^{\circ}\text{C}$  and at a relative humidity of  $(50 \pm 5) \%$ , for a period as indicated in Table 1.

NOTE This stabilization intends to achieve equilibrium of moisture content for all samples before and after further conditioning and testing.

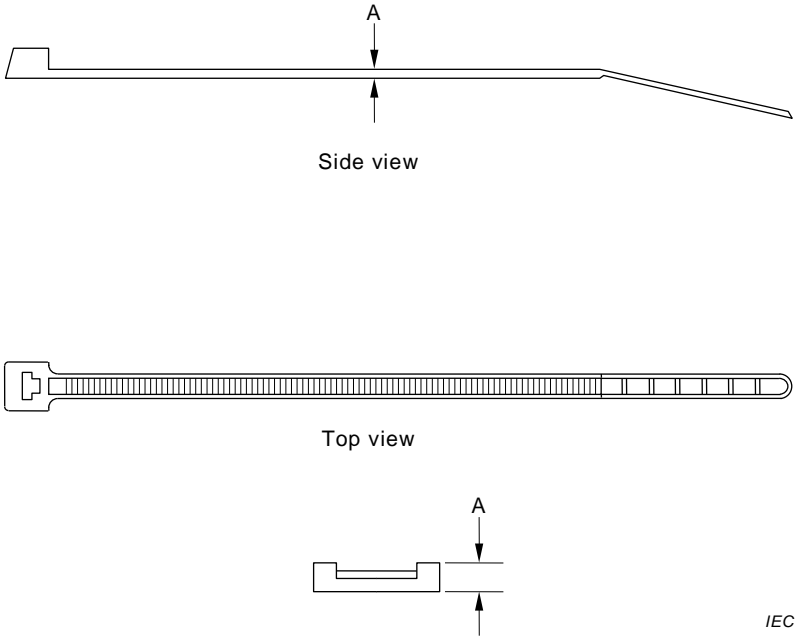
**Table 1 – Stabilization time for samples**

Reference thickness (RT) of device mm	Stabilization time days
$RT \leq 1,2$	$7 \pm 1$
$1,2 < RT \leq 1,4$	$21 \begin{smallmatrix} 0 \\ -7 \end{smallmatrix}$
$1,4 < RT$	$35 \begin{smallmatrix} 0 \\ -7 \end{smallmatrix}$
All thicknesses of materials known to have low hygroscopic characteristics	$2 \pm 1/3$

The reference thickness of a cable tie is measured at the midpoint of the strap. The reference thickness of a fixing device shall be the smallest cross-section in the area that interfaces with the cable tie or as declared by the manufacturer. See Figure 1.

When the equilibrium moisture content for a material at  $(23 \pm 5)^\circ\text{C}$  and  $(50 \pm 5)\%$  relative humidity is determined through a method agreed to by the manufacturer and the testing laboratory, the stabilization time in Table 1 may be reduced when all of the following conditions are met:

- a) the product's moisture content in the as-received condition and after each appropriate conditioning is measured using a calibrated moisture analyzer device;
- b) the samples are subjected to exposure to a constant temperature not exceeding  $50^\circ\text{C}$  and a relative humidity not exceeding  $80\%$ ; and
- c) the product's equilibrium moisture content at  $(23 \pm 5)^\circ\text{C}$  and  $(50 \pm 5)\%$  relative humidity is verified using a calibrated moisture analyzer device. This verification process is repeated until equilibrium is determined.



**Key**

A reference thickness of cable tie

**Figure 1 – Reference thickness for cable ties**

**5.3** Unless otherwise specified, the tests shall be carried out at an ambient temperature of  $(23 \pm 5)^\circ\text{C}$  and with a relative humidity of between  $40\%$  and  $60\%$ .

**5.4** Unless otherwise specified, three new samples are submitted to the tests and the requirements are satisfied if all the tests are met. If only one of the samples does not satisfy a test owing to an assembly or manufacturing fault, that test and any preceding one which may have influenced the results of the test shall be repeated. The tests that follow shall be carried out in the required sequence on another full set of samples, all of which shall comply with the requirements.

**NOTE** The applicant, when submitting the first set of samples, can also submit an additional set of samples which may be necessary if one sample fails. The test station will then without further request test the additional set of samples and will reject only if a further failure occurs. If the additional set of samples is not submitted at the same time, a failure of one sample will entail a rejection.

**5.5** When toxic or hazardous processes are used, due regard shall be taken of the safety of persons within the test area.

**5.6** Unless otherwise specified, the cross-head speed of a tensile machine used during the tests shall be  $(25 \pm 2,5)$  mm/min.

**5.7** Where required for heat ageing, a full draft circulating-air oven as specified in IEC 60216-4-1:2006 shall be used. A portion of the air shall be allowed to re-circulate and a substantial amount of air shall be admitted continuously to maintain the normal air content surrounding the samples. The oven shall be adjusted to achieve more than five complete fresh-air changes per hour.

**5.8** An integral assembly shall be tested as a complete sample. The integral assembly shall be subjected to the conditionings for the cable tie prior to conducting the mechanical strength test for the fixing device in accordance with 9.7.

A fixing device, the performance of which is dependent on the mounting hole size, the thickness of the material sheet to which it is to be mounted, or the mounting orientation declared by the manufacturer in accordance with Table 7, shall comply with all applicable tests when the device is assembled to the minimum and maximum thickness of each mounting surface, in the largest hole size, and in each intended mounting orientation declared by the manufacturer. When it can be determined that a particular mounting orientation represents the most onerous condition, the results of the tests in that orientation may represent all mounting orientations.

An adhesive fixing device, the performance of which is dependent on the mounting surface or the mounting orientation, shall comply with all applicable tests when the device is assembled on the surfaces for which it is intended, and in each intended mounting orientation declared by the manufacturer. When it can be determined that a mounting orientation represents the most onerous condition, the results of the tests in that orientation may represent all mounting orientations.

**5.9** Unless otherwise specified, when conducting the tests on cable ties in Clause 9, the samples shall be installed according to the manufacturer's instructions on a steel or aluminium mandrel which has a diameter A according to Table 2.

If the minimum declared diameter of the cable tie is greater than the diameter of the test mandrel specified in Table 2, then a test mandrel that has the minimum diameter as declared by the manufacturer shall be used.

The width B of the mandrel shall be at least 5 mm greater than the maximum width of the cable tie as shown in Figure 2.

**Table 2 – Test mandrel diameter**

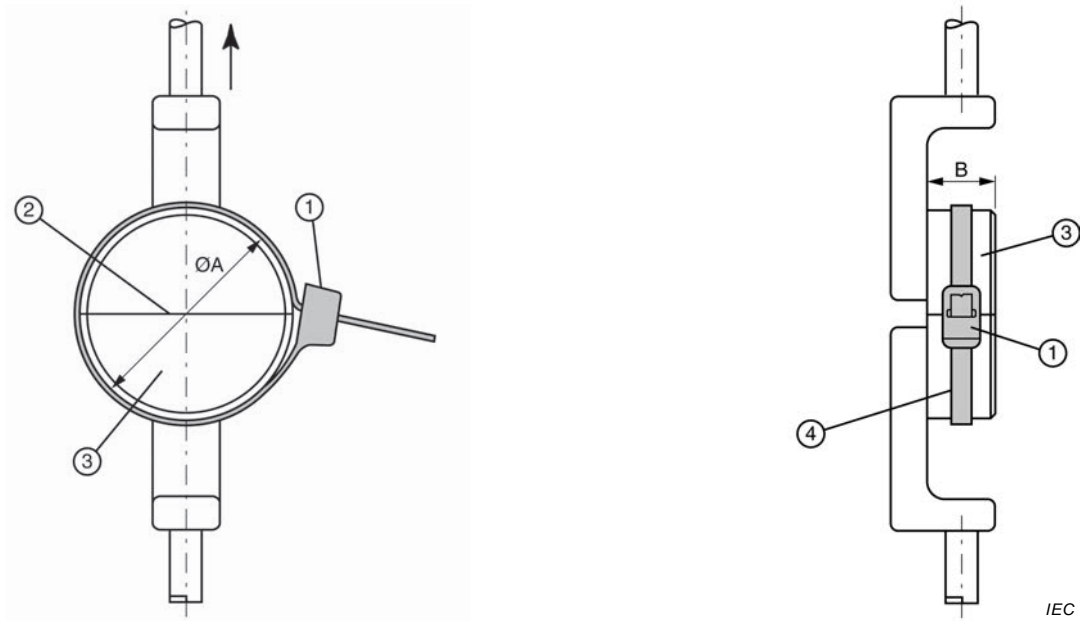
Maximum declared diameter mm	Test mandrel diameter (A) mm
≤ 20	9,5 ± 1
> 20 and ≤ 38	20 ± 2
> 38	38 ± 2

For the loop tensile strength tests, the mandrel shall be split in two equal parts and the cable ties positioned as shown in Figure 2a).

Cable ties having a parallel entry strap shall be mounted to the mandrel as shown in Figure 2b).

The excess end (tail) of the cable tie is permitted to be cut off after assembly, except in the tests where marking is required for the purpose of measurement (see 9.6).

The use of separate steel or aluminium conditioning mandrels is permitted. The conditioning mandrels need not be split but shall have a diameter approximately equivalent to the appropriate test mandrel to allow transfer of the sample to the test mandrel. Conditioned samples shall be carefully transferred to the appropriate test mandrel for carrying out the loop tensile test. Where it has been determined that the transfer of the samples from the conditioning mandrel to a test mandrel has influenced the test results, an additional sample set shall be conditioned and tested.



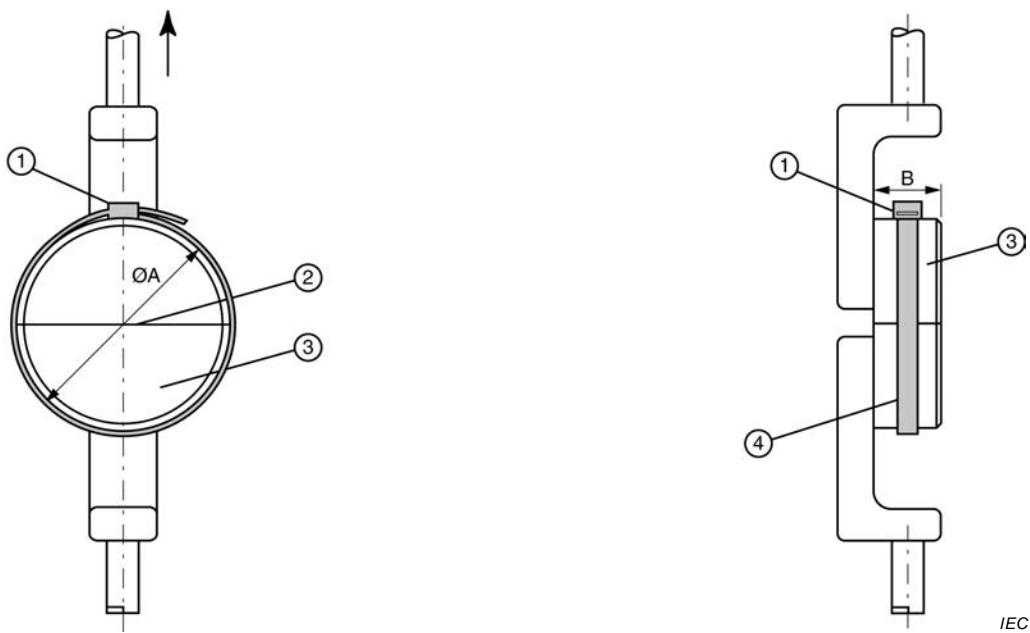
**Key**

- 1 Locking device (head)
- 2 Split line
- 3 Mandrel
- 4 Cable tie
- A Diameter of test mandrel
- B Width of test mandrel

Mandrels shall be made of steel or aluminium and shall be smooth and free of burrs.

Care should be taken that the separation of the two halves of the mandrel remains parallel to the split line.

**Figure 2a) Typical arrangement for cable tie orientation on split mandrel for tensile test – Right angle entry strap**



**Key**

- 1 Locking device (head)
- 2 Split line
- 3 Mandrel
- 4 Cable tie
- A Diameter of test mandrel
- B Width of test mandrel

Mandrels shall be made of steel or aluminium and shall be smooth and free of burrs.

Care should be taken that the separation of the two halves of the mandrel remains parallel to the split line.

**Figure 2b) Typical arrangement for cable tie orientation  
on split mandrel for tensile test – Parallel entry strap**

**Figure 2 – Typical arrangements for cable tie orientation  
on split mandrel for tensile test**

**5.10** Tests for adhesive fixing devices on a stainless steel or aluminium bare panel covers the installation on any bare metal surface and on the following painted metal surfaces:

- enamel;
- epoxy;
- polyester.

The installation on other surfaces requires testing on these materials and painted surfaces.

Unless specified otherwise by the manufacturer, the samples are to be held to the panel for a period of  $5^{+1}_0$  s with a force of  $(50 \pm 5)$  N prior to the start of the prescribed pre-conditioning period or other exposures. Before applying any force, the time recommended by the manufacturer shall be respected.

6 Classification

6.1 According to material

6.1.1 Metallic component

6.1.2 Non-metallic component

6.1.3 Composite component

6.2 According to loop tensile strength for cable ties and mechanical strength for fixing devices

6.2.1 Loop tensile strength for cable ties

As given in Table 3.

Table 3 – Loop tensile strength

Loop tensile strength	
N	
50	530
80	800
130	890
180	1 150
220	1 300
360	2 200
450	

Other values may be declared at the manufacturer's discretion.

NOTE Loop tensile strength does not provide an indication of long-term static load-bearing capabilities.

6.2.2 Type 1 – Retains at least 50 % of declared loop tensile strength for cable ties and mechanical strength for fixing devices after test conditions

NOTE In some countries, such as Canada and the United States, additional type classifications are applicable when pre-qualified moulding materials are used. See UL 62275/CSA C22.2 No.62275.

6.2.3 Type 2 – Retains 100 % declared loop tensile strength for cable ties and mechanical strength for fixing devices after test conditions

NOTE In some countries, such as Canada and the United States, additional type classifications are applicable when pre-qualified moulding materials are used. See UL 62275/CSA C22.2 No.62275.

6.2.4 According to loop tensile strength and mechanical strength of integral assemblies

An integral assembly shall have a single classification type according to 6.2.2 and 6.2.3.

6.3 According to temperature

6.3.1 According to maximum operating temperature for application given in Table 4

Table 4 – Maximum operating temperature for application

Temperature °C
50
60
75
85
105
115
125
150

Additional ratings above 150 °C may be declared in 10 °C increments.

6.3.2 According to minimum operating temperature for application given in Table 5

Table 5 – Minimum operating temperature for application

Temperature °C
0
–5
–15
–25
–40
–60

6.3.3 According to minimum temperature during installation as declared by the manufacturer

6.4 According to contribution to fire for non-metallic and composite cable ties and integral assemblies only

6.4.1 Flame propagating

NOTE Due to the small mass of material, cable ties classified as flame propagating are considered to present only a minor potential contribution in the case of fire.

6.4.2 Non-flame propagating

Metallic cable ties and metallic integral assemblies without a non-metallic coating are considered non-flame propagating.



## 6.5 According to environmental influences

### 6.5.1 According to resistance to ultraviolet light for non-metallic and composite components

#### 6.5.1.1 Not declared

#### 6.5.1.2 Resistant to ultraviolet light

### 6.5.2 According to resistance to corrosion for metallic and composite components

#### 6.5.2.1 Not declared

#### 6.5.2.2 Resistant to corrosion

## 7 Marking and documentation

### 7.1 Each cable tie and fixing device shall be marked with:

- the manufacturer's or responsible vendor's name or trademark, and
- an identifying symbol as defined by the manufacturer.

*Compliance is checked by inspection*

Where it is not possible, for example, due to the small size of a cable tie or fixing device to mark on it the identifying symbol, then this symbol may be marked on the packaging.

NOTE 1 The identifying symbol can be a reference number, letter, etc.

NOTE 2 Marking can be applied, for example, by moulding, pressing, engraving, printing, adhesive labels, etc.

### 7.2 Marking on cable ties, fixing devices and integral assemblies shall be legible, durable and indelible.

Laser marking directly on the product and marking made by moulding, pressing or engraving are not subjected to this test.

*Compliance is checked by inspection, using normal or corrected vision, without additional magnification.*

*The test is made by rubbing the marking for 15 s with a piece of cotton cloth soaked with water and again for 15 s with a piece of cotton cloth soaked with n-hexane 95 % (Chemical Abstracts Service Registry Number, CAS RN, 110-54-3).*

NOTE n-hexane 95 % is available from a variety of chemical suppliers as a high-pressure liquid chromatography (HPLC) solvent.

*When using the liquid specified for the test, precautions as stated in the relative material safety datasheet provided by the chemical supplier shall be taken to safeguard the laboratory technicians.*

*The marking surface to be tested shall be dried after the test with water.*

*Rubbing shall commence immediately after soaking the piece of cotton, applying a compression force of  $(5 \pm 1)$  N at a rate of about one cycle per second (a cycle comprising a forward and backward movement along the length of the marking). For markings longer than 20 mm, rubbing can be limited to a part of the marking, over a path of at least 20 mm length.*

The compression force is applied by means of a test piston which is wrapped with cotton comprising of cotton wool covered by a piece of cotton medical gauze. Test piston is shown in Figure 3.

The test piston shall have the dimensions shown in Figure 3 and shall be made of an elastic material that is inert against the test liquids and has a Shore-A hardness of  $47 \pm 5$  (for example synthetic rubber). When it is not possible to carry out the test on the specimens owing to the shape/size of the product, a suitable piece having the same characteristics as the product can be submitted to the test.

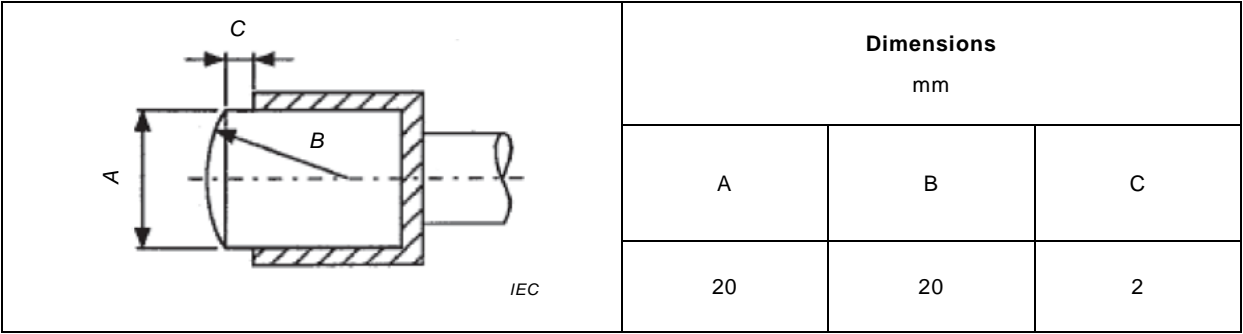


Figure 3 – Test piston for durability test for marking

**7.3** The manufacturer or responsible vendor shall provide in their literature the information according to Table 6.

Table 6 – Literature information

Information	Cable ties	Fixing devices	Integral assemblies
Classification according to material according to 6.1	X	X	X
Loop tensile strength according to 6.2.1	X		X <sup>a</sup>
The manufacturer's declared mechanical strength		X	X <sup>a</sup>
Type designation according to 6.2.2 or 6.2.3	X	X	X
Maximum operating temperature for application according to 6.3.1	X	X	X
Minimum operating temperature for application according to 6.3.2	X	X	X
Minimum temperature during installation according to 6.3.3	X		X
Contribution to fire for non-metallic and composite according to 6.4	X		X
Resistance to ultraviolet light for non-metallic and composite according to 6.5.1	X	X	X
Resistance to corrosion for metallic and composite according to 6.5.2	X	X	X
The maximum and minimum bundle diameter in mm	X		X
The recommended method of installation, including the tool to be used, if any, and the load to be applied	X	X	X
Recommendations on transport and storage	X	X	X
Specific mounting or assembly conditions such as mounting hole sizes, material thicknesses, mounting orientations, etc. according to 5.8		X	X
Material of the surfaces to which the adhesive fixing device is intended to be affixed according to 5.10		X	X
Manufacturer's recommendations for surface preparations, adhesive application temperature range, and curing time prior to loading		X	X
<sup>a</sup> Mechanical strength of the fixing device and loop tensile strength of the cable tie, as declared by the manufacturer.  If the two ratings are the same, a single combined rating may be declared. For example, mechanical strength and loop tensile strength 80 N.  If the two ratings differ, both shall be declared. For example, mechanical strength 40 N, loop tensile strength 80 N.  The declared mechanical strength of the fixing device that is integral to a cable tie shall not exceed the declared value for the loop tensile strength of the cable tie.			

NOTE In the following countries, some marking information in Table 7 is required to be placed on the packaging accompanying the product: CA, US and RU.

*Compliance is checked by inspection.*

8 Construction

The surface of the cable tie or fixing device shall be free from burrs and similar inconsistencies, and edges shall be smooth so as not to damage the cables or to inflict injury to the installer or user.

*Compliance is checked by inspection.*

## 9 Mechanical properties

### 9.1 Requirements

Cable ties, fixing devices and integral assemblies shall withstand the stresses likely to occur during installation and application.

An integral assembly shall comply with the requirements for both the fixing device and the cable tie.

The cable tie shall:

- be capable of fixing the maximum and minimum bundle diameter declared by the manufacturer.

*Compliance is checked by the test according to 9.2;*

- be able to be installed at the minimum temperature declared by the manufacturer.

*Compliance is checked by the test according to 9.3, for cable ties classified according to 6.1.2 and 6.1.3 only;*

- be resistant to the effect of impact forces at the minimum operating temperature declared by the manufacturer.

*Compliance is checked by the test according to 9.4, for cable ties classified according to 6.1.2 and 6.1.3 only;*

- maintain its fixing function at the minimum and maximum application temperature declared by the manufacturer. Metallic cable ties shall maintain their fixing function when exposed to vibration.

NOTE Non-metallic and composite cable ties are considered to be resistant to the effects of vibration.

*Compliance is checked by the relevant tests. For cable ties classified according to 6.2.2, by the tests according to 9.5. For cable ties classified according to 6.2.3, by the tests according to 9.6.*

Cable ties classified according to 6.1.1 are considered only as Type 2 according to 6.2.3.

The fixing device shall maintain its fixing function at the minimum and maximum application temperature as declared by the manufacturer.

*Compliance is determined by the tests according to 9.7.*

### 9.2 Installation test

*The sample shall be installed on a mandrel representing the maximum specified diameter or size and the minimum specified diameter or size to determine that it is able to be installed in the intended manner, as specified by the manufacturer.*

*Moisture stabilization according to 5.2 is not applicable for this test.*

### 9.3 Minimum installation temperature test for cable ties

*If the manufacturer gives no recommendation that the cable tie should be installed immediately after unpacking, in order to maintain the humidity level, non-metallic and composite cable ties shall be dried out for  $(72 \pm 1)$  h at the maximum operating temperature declared by the manufacturer before the following test is carried out. The sample and a steel or aluminium mandrel, which reflects the minimum bundle diameter, shall be placed separately in a cold chamber, the temperature in which shall be maintained at the declared minimum temperature for installation with a tolerance of  $\pm 2$  °C. When the sample has attained this temperature or after 2 h, whichever is the longer period, the sample is installed on the*

*mandrel. After the test, there shall be no sign of disintegration nor shall there be any crack visible to normal or corrected vision.*

*Moisture stabilization according to 5.2 after removal from the cold chamber is not applicable.*

#### **9.4 Minimum operating temperature test for cable ties**

*The test mandrel as specified in 5.9 with the sample installed shall be placed in a cold chamber, the temperature within which shall be maintained at the declared temperature according to Table 5 with a tolerance of  $\pm 2$  °C.*

*Two hours after the cold chamber has recovered to the declared temperature, the sample is removed from the cold chamber and placed on a V-block as shown in Figure 4, with the locking device of the tie placed opposite to the point of impact.*

*Moisture stabilization according to 5.2 after removal from the cold chamber is not applicable.*

*An impact shall be applied on the strap by a free fall hammer ( $12 \pm 2$ ) s after removal of the test assembly from the cold chamber. Compliance with impact applied before 10 s also complies with this test of this document. A typical apparatus is shown in Figure 4.*

*The energy of the hammer shall be as given in Table 7.*

*The sample shall be deemed to have passed the test if, after the test, it has not broken open, nor shall there be any crack visible to normal or corrected vision.*

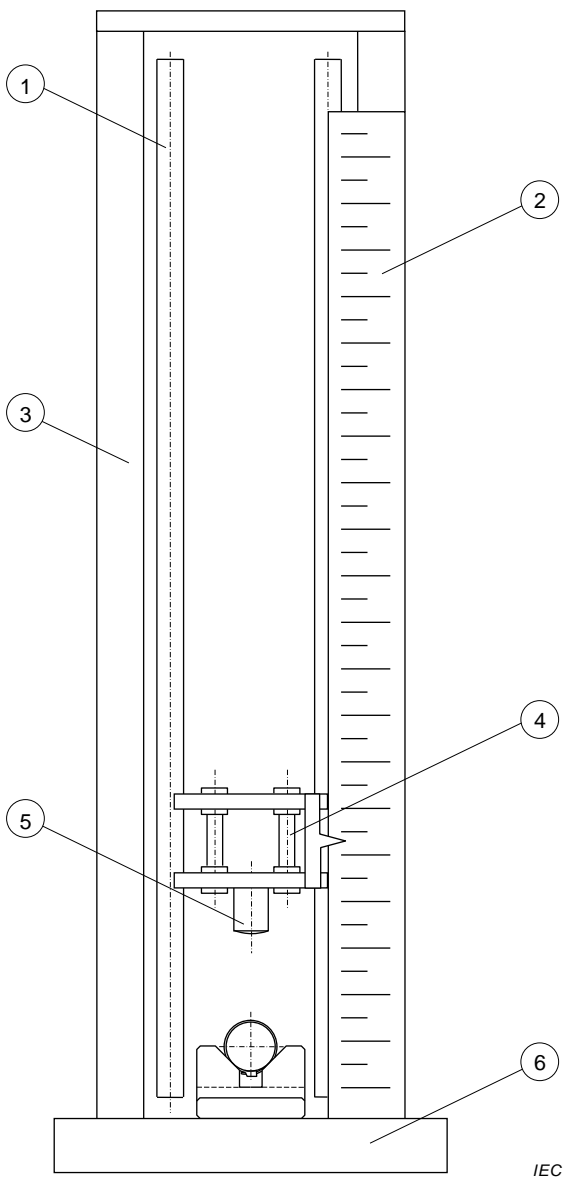


Figure 4a) Test apparatus assembly

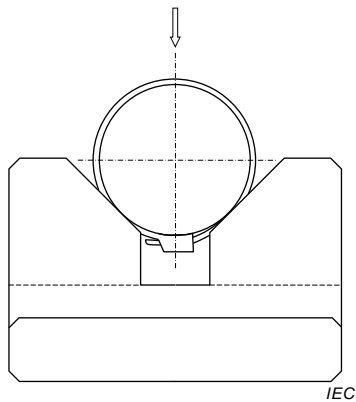


Figure 4b) Test mandrel with supporting V-block

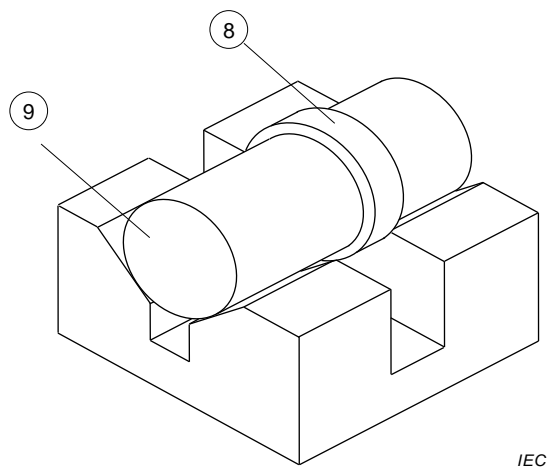


Figure 4c) Position of tie strap

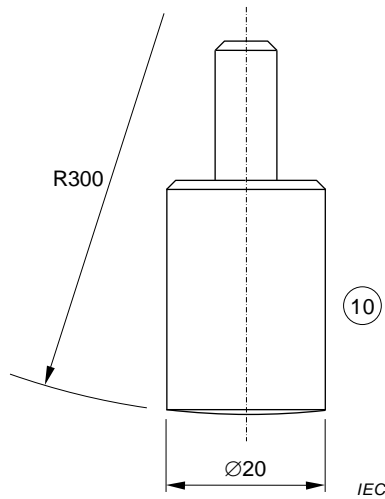


Figure 4d) Hammer details

Key

- 1 Guide rails
- 2 Height scale
- 3 Frame
- 4 Hammer guidance weight carriage
- 5 Hammer
- 6 Rigid base
- 7 Impact direction
- 8 Tie strap
- 9 Position of the test mandrel on mounting fixture (V-block)
- 10 Hammer

The gap in the V-block should be so wide and deep that neither the strap nor the tie locking device are in contact with the V block.

Figure 4 – Test apparatus for cable tie impact test

Table 7 – Energy values of hammer

Minimum declared loop tensile strength N	≤ 80	> 80 to 180	> 180 to 230	> 230 to 540	> 540 to 1 300	> 1 300
Energy J	0,14	0,35	0,7	1	2	5
Equivalent mass kg	0,25	0,25	0,25	0,25	0,5	1,7
Height of fall mm ± 1 %	56	140	280	400	400	300

9.5 Loop tensile strength test for cable ties classified according to 6.2.2

9.5.1 As-received condition

The test is carried out on a new set of ten cable ties. Each sample shall be installed on a test mandrel as specified in 5.9.

Each sample shall be subjected to a tensile pull. No individual value of the measured maximum force shall be less than the loop tensile strength declared according to 6.2.

9.5.2 After heat ageing

The test is carried out on a new set of ten non-metallic or composite\_cable ties. Each sample shall be installed on a test mandrel as specified in 5.9.

Moisture stabilization according to 5.2 before heat ageing is not applicable for this test.

The samples shall be aged in a full draft circulating-air oven with forced air at the maximum declared temperature according to Table 4 increased by (15 ± 1) °C for (1 000<sup>+48</sup><sub>0</sub>) h. Then the samples and the mandrels shall be conditioned according to 5.2.

Each sample shall be subjected to a tensile pull. The maximum force is measured.

No individual value shall be less than 50 % of the loop tensile strength declared according to 6.2.

**9.5.3 After temperature cycling**

*The test is carried out on a new set of ten cable ties. The sample shall be installed on a test mandrel as specified in 5.9. Moisture stabilization according to 5.2 before temperature cycling is not applicable for this test.*

*The test assembly is subjected to the following temperature cycling with transfer between each condition described in list items a) to f), of 4 min to 5 min duration:*

- a) for 120 min to 130 min, the assembly is stored in a full draft circulating-air oven at the maximum operating temperature as declared by the manufacturer according to Table 4 with a tolerance of  $+2^{\circ}\text{C}$ ;*
- b) for 60 min to 70 min, the assembly is then placed in a cold chamber at the minimum temperature for application in normal use as declared by the manufacturer according to Table 5 with a tolerance of  $-2^{\circ}\text{C}$ ;*
- c) condition a) is repeated;*
- d) condition b) is repeated but for  $(18^{+2}_0)$  h;*
- e) the test conditions a) and b) are repeated twice;*
- f) the test assembly consisting of non-metallic and composite components shall be conditioned according to 5.2.*

*After the cycling, there shall be no sign of disintegration nor shall there be any crack visible to normal or corrected vision.*

*Each sample shall be subjected to a tensile pull. The maximum force is measured.*

*No individual value shall be less than 50 % of the loop tensile strength declared according to 6.2.*

**9.6 Loop tensile strength test for cable ties classified according to 6.2.3****9.6.1 As-received condition**

*The test is carried out on a new set of ten cable ties. Each sample shall be installed on a test mandrel as specified in 5.9.*

*Each sample shall be subjected to a tensile pull until the load equivalent to the loop tensile strength declared by the manufacturer is reached. This load is maintained for  $(60^{+5}_0)$  s.*

*Excessive slippage measurements shall be determined by marking each tie across its width 1,6 mm beyond where the strap exits the locking device. A second mark shall then be placed 5,6 mm beyond the first mark for cable ties subjected to a load of 450 N or less, or 7,9 mm beyond the first mark for cable ties subjected to a load greater than 450 N. After the tie has withstood its test load for 1 min and the first mark is still visible, the test shall be terminated. When the slippage is more than 1,6 mm, the tie shall be tested for an additional 5 min. If the second mark moves out of sight within 5 min, the slippage is deemed excessive.*

*The cable tie shall not break and excessive slippage shall not occur as a result of the test.*

**9.6.2 After-heat ageing**

*The test is carried out on a new set of ten non-metallic or composite cable ties. Metallic cable ties are not required to be subjected to this test. Each sample shall be installed on a test mandrel as specified in 5.9. Moisture stabilization according to 5.2 before heat ageing is not applicable for this test. The samples shall be aged in a full draft circulating-air oven with*



forced air at the maximum declared temperature according to Table 4 increased by  $(15 \pm 1) ^\circ\text{C}$  for  $(1\,000^{+48}_0)$  h. Then the samples and the mandrels shall be conditioned according to 5.2.

Each sample shall be subjected to a tensile pull until the load equivalent to the loop tensile strength declared by the manufacturer is reached. This load is maintained for  $(60^{+5}_0)$  s.

The samples shall be deemed to have passed the test if the samples perform according to the requirements in 9.6.1.

### 9.6.3 After temperature cycling

The test is carried out on a new set of ten cable ties. The sample shall be installed on a test mandrel as specified in 5.9. Samples shall be stabilized by being exposed to a temperature of  $(23 \pm 2) ^\circ\text{C}$  and  $(50 \pm 5) \%$  relative humidity between each phase of the cycle for at least 30 min. Moisture stabilization according to 5.2 before temperature cycling is not applicable for this test.

The test assembly is subjected to the following cycling.

- The samples shall be placed in a full draft circulating-air oven at the declared maximum operating temperature of the device for 48 h.
- The samples shall then be placed in a chamber at  $(90 \pm 5) \%$  relative humidity and  $(40 \pm 2) ^\circ\text{C}$  for 48 h.
- The samples shall then be placed in a cold chamber at  $(-35 \pm 2) ^\circ\text{C}$  for 8 h.
- The samples shall then be placed in a full draft circulating-air oven, at the declared maximum operating temperature for 64 h.
- The test assembly consisting of non-metallic and composite components shall be conditioned according to 5.2.

After the cycling, there shall be no sign of disintegration nor shall there be any crack visible to normal or corrected vision.

Each sample shall be subjected to a tensile pull until the load equivalent to the loop tensile strength declared by the manufacturer is reached. This load is maintained for  $(60^{+5}_0)$  s.

The samples shall be deemed to have passed the test if the samples perform according to the requirements in 9.6.1.

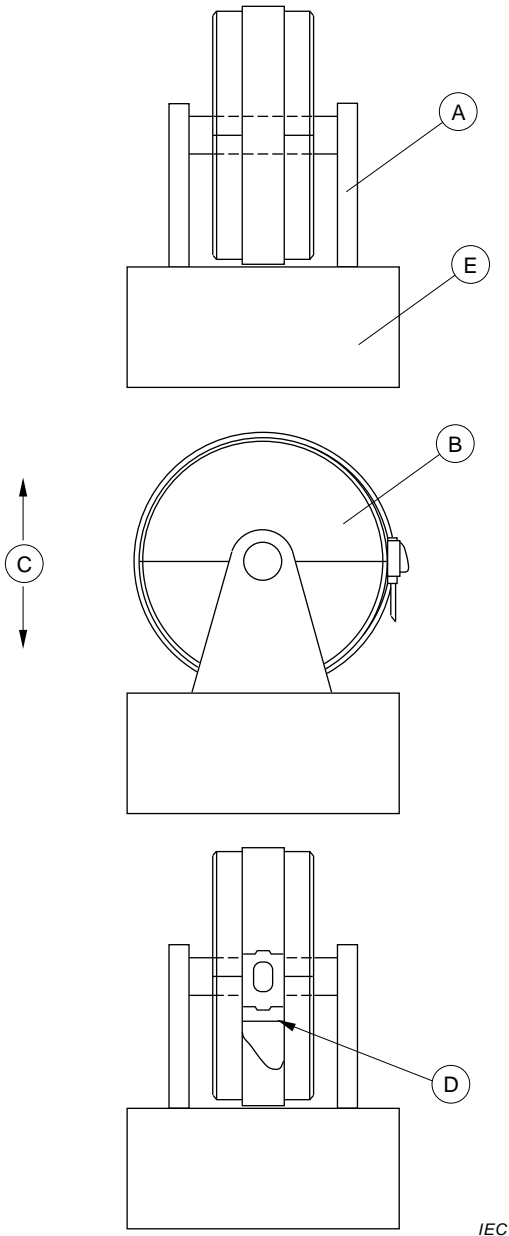
### 9.6.4 After vibration test for metallic cable ties

A minimum of two cable ties shall be installed around separate mandrels as described in 5.9. Each tie then shall be marked across its width adjacent to the strap's entry into the locking device. The ties then shall be subjected to the temperature cycle conditioning in accordance with 9.6.3 but not the loop tensile strength test. Upon completion of this conditioning, the mandrels shall be securely mounted to the vibration table such that the direction of the vibration is parallel to the plane of the circular configuration of the assembled tie. See Figure 5. The mandrels then shall be subjected to the following vibration test in accordance with IEC 60068-2-6:2007:

- frequency range: 10 Hz to 150 Hz, logarithmic ramp and return;
- duration 75 min: 10 sweep cycles, 1 octave/min;
- maximum peak amplitude: 0,35 mm (0,7 mm from peak to peak);
- maximum acceleration: 50 m/s<sup>2</sup>;
- crossover frequency between 58 Hz and 62 Hz.

Each sample shall be subjected to a tensile pull until the load equivalent to the loop tensile strength declared by the manufacturer is reached. This load is maintained for  $(60^{+5}_0)$  s.

The samples shall be deemed to have passed the test if the samples perform according to the requirements in 9.6.1 including the measurement of the slippage from the original reference mark.



- Key**
- A mounting bracket
  - B split mandrel
  - C direction of vibration
  - D reference line scribed on strap
  - E vibration table

Figure 5 – Typical arrangement for the vibration test

## 9.7 Mechanical strength test for fixing devices and integral assemblies

### 9.7.1 As-received condition

*The test is carried out on a new set of ten samples for each product function (loop tensile strength, mechanical strength).*

*The fixing device or the integral assembly shall be fixed to a rigid support according to the manufacturer's instructions. The adhesive fixing device shall be adhered to a rigid panel, according to 5.10.*

*When testing for mechanical strength, the following applies:*

- *For a separately supplied fixing device, an appropriate cable tie shall be assembled to the fixing device.*
- *A separately supplied fixing device and an integral assembly shall be installed on a non-split mandrel according to 5.9. A split mandrel can be used as long as the two parts are linked together to operate as a solid mandrel.*
- *For integral assemblies, the test fixture shall allow for self-alignment of the test load with the integral assembly during the test. In order to achieve self-alignment of the test load, a sliding mounting table shall be used. The sliding mounting table shall be able to move without a significant friction. If during the test the self-alignment does not occur, the test is considered invalid.*
- *Typical arrangements of the test assembly are shown in Figure 6.*
- *For a separately supplied fixing device and for an integral assembly according to 6.2.2, each sample shall be subjected to a tensile pull. No individual value of the measured maximum force shall be less than the declared mechanical strength.*
- *For a separately supplied fixing device and for an integral assembly classified according to 6.2.3, each sample shall be subjected to a tensile pull until the mechanical strength declared by the manufacturer is reached. This load is maintained for  $(60^{+5}_0)$  s.*

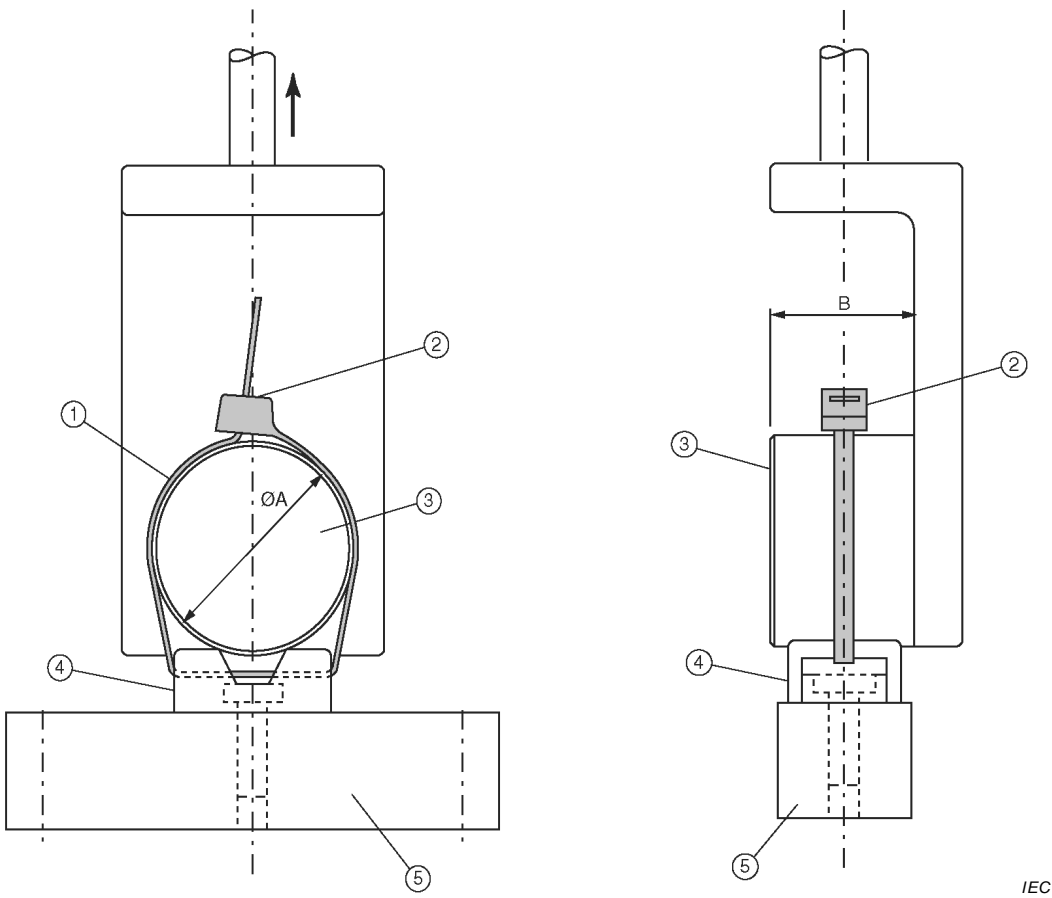
*When testing for loop tensile strength, the following applies:*

- *An integral assembly shall be installed on a split mandrel according to 5.9.*
- *Typical arrangements of the test assembly are shown in Figure 2.*
- *For an integral assembly classified according to 6.2.2, each sample shall be subjected to a tensile pull. No individual value of the measured maximum force shall be less than the declared loop tensile strength.*
- *For an integral assembly classified according to 6.2.3, each sample shall be subjected to a tensile pull until the loop tensile strength declared by the manufacturer is reached. This load is maintained for  $(60^{+5}_0)$  s.*

*After the test, the fixing device or the integral assembly shall show no sign of disintegration nor shall there be any crack visible to normal or corrected vision.*

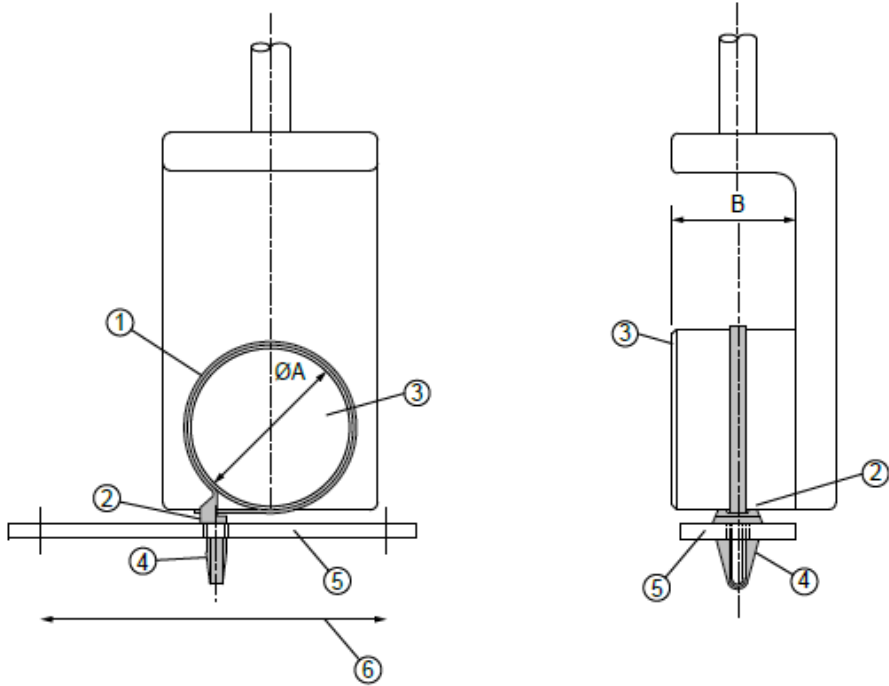
*If during the test*

- *the fixing device or the integral assembly, excluding the adhesive ones, detaches from the rigid support without signs of disintegration, cracking or the like, it is not considered a failure but the test shall be repeated with a more appropriate fixing method;*
- *the adhesive fixing device or the adhesive integral assembly detaches from the rigid support, this is considered a failure.*



- Key**
- 1 cable tie
  - 2 locking device
  - 3 mandrel
  - 4 fixing device
  - 5 rigid support
  - A diameter of test mandrel
  - B width of test mandrel

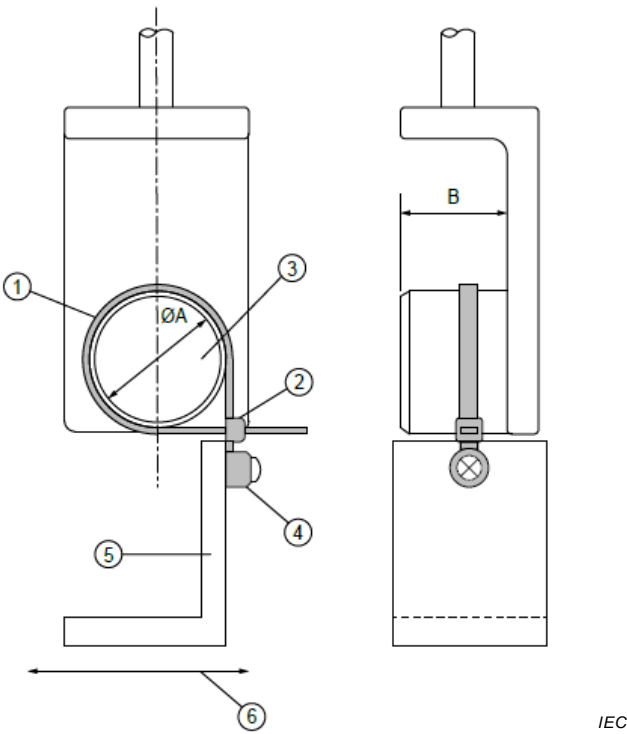
**Figure 6a – Typical arrangement of test assembly  
for separately supplied fixing device**



IEC

- Key**
- 1 cable tie
  - 2 locking device
  - 3 mandrel
  - 4 fixing device
  - 5 rigid support
  - 6 Sliding table allowed to slide in this direction to allow self-alignment under force.
  - A diameter of test mandrel
  - B width of test mandrel

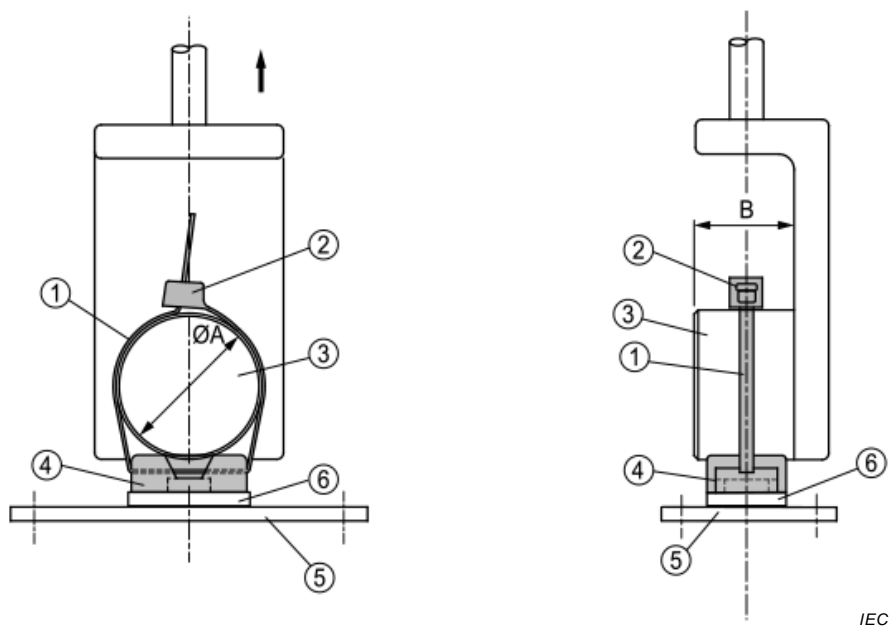
**Figure 6b – Typical arrangement of test assembly  
for an integral push-mount fixing device**



Key

- 1 cable tie
  - 2 locking device
  - 3 mandrel
  - 4 fixing device
  - 5 rigid support
  - 6 Sliding table is allowed to slide in this direction to allow self-alignment under force.
- A diameter of test mandrel
- B width of test mandrel

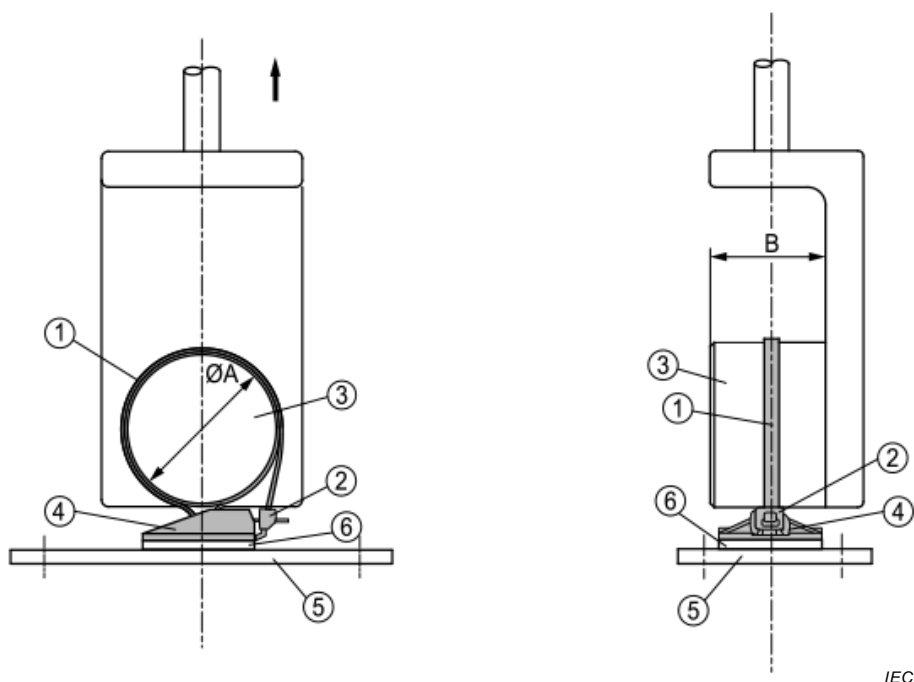
Figure 6c – Typical arrangement of test assembly  
for an integral screw-mount fixing device



**Key**

- 1 cable tie
- 2 locking device
- 3 mandrel
- 4 fixing device
- 5 rigid support
- 6 adhesive layer
- A diameter of test mandrel
- B width of test mandrel

**Figure 6d – Typical arrangement of test assembly  
for separately supplied adhesive fixing device**

**Key**

- 1 cable tie
- 2 locking device
- 3 mandrel
- 4 fixing device
- 5 rigid support
- 6 adhesive layer
- A diameter of test mandrel
- B width of test mandrel

**Figure 6e – Typical arrangement of test assembly  
for an integral adhesive fixing device**

**Figure 6 – Typical arrangement of test assembly  
for fixing devices and for integral fixing devices**

### 9.7.2 After-heat ageing

*The test is conducted on a new set of ten non-metallic and composite samples for each product function (loop tensile strength, mechanical strength). Metallic fixing devices are not required to be subjected to this test.*

*Moisture stabilization according to 5.2 before heat ageing is not applicable for this test.*

*The fixing device or the integral assembly shall be fixed to a rigid support according to the manufacturer's instructions. The adhesive fixing device shall be adhered to a rigid panel, according to 5.10.*

*When testing for mechanical strength, the following applies:*

- *Separately supplied fixing devices shall be aged in a full draft circulating-air oven at the maximum declared temperature according to Table 4 increased by  $(15 \pm 1) ^\circ\text{C}$  for  $1\,000^{+48}_0$  h. Then the fixing device shall be conditioned according to 5.2. An appropriate cable tie shall be assembled to the fixing device and then to a non-split steel or aluminium mandrel according to 5.9.*



- *An integral assembly shall be installed on a non-split mandrel according to 5.9. The assembly shall be aged in a full draft circulating-air oven at the maximum declared temperature according to Table 4 increased by  $(15 \pm 1) ^\circ\text{C}$  for  $1\,000^{+48}_0$  h. Then the assembly shall be conditioned according to 5.2.*
- *For both separately supplied fixing devices and integral assemblies, a split mandrel can be used as long as the two parts are linked together to operate as a solid mandrel.*
- *For integral assemblies, the test fixture shall allow for self-alignment of the test load with the integral assembly during the test. In order to achieve self-alignment of the test load, a sliding mounting table shall be used. The sliding mounting table shall be able to move without a significant friction. If during the test the self-alignment does not occur, the test is considered invalid.*
- *Typical arrangements of the test assembly are shown in Figure 6.*
- *For a separately supplied fixing device and for an integral assembly according to 6.2.2, each sample shall be subjected to a tensile pull. No individual value of the measured maximum force shall be less than 50 % of the declared mechanical strength.*
- *For a separately supplied fixing device and for an integral assembly classified according to 6.2.3, each sample shall be subjected to a tensile pull until the mechanical strength declared by the manufacturer is reached. This load is maintained for  $(60^{+5}_0)$  s.*

*When testing for loop tensile strength, the following applies:*

- *An integral assembly shall be installed on a non-split mandrel according to 5.9. The assembly shall be aged in a full draft circulating-air oven at the maximum declared temperature according to Table 4 increased by  $(15 \pm 1) ^\circ\text{C}$  for  $1\,000^{+48}_0$  h. Then the assembly shall be conditioned according to 5.2.*
- *Typical arrangements of the test assembly are shown in Figure 2.*
- *For an integral assembly classified according to 6.2.2, each sample shall be subjected to a tensile pull. No individual value of the measured maximum force shall be less than 50% of the declared loop tensile strength.*
- *For an integral assembly classified according to 6.2.3, each sample shall be subjected to a tensile pull until the loop tensile strength declared by the manufacturer is reached. This load is maintained for  $(60^{+5}_0)$ s.*

*After the test, the fixing device or the integral assembly shall show no sign of disintegration nor shall there be any crack visible to normal or corrected vision.*

*If during the test*

- *the fixing device or the integral assembly, excluding the adhesive ones, detaches from the rigid support without signs of disintegration, cracking or the like, it is not considered a failure but the test shall be repeated with a more appropriate fixing method.*
- *the adhesive fixing device or the adhesive integral assembly detaches from the rigid support, this is considered a failure.*

### **9.7.3 After temperature cycling**

*The test is carried out on a new set of ten samples for each product function (loop tensile strength, mechanical strength).*

*Moisture stabilization according to 5.2 before temperature cycling is not applicable for this test.*

*The fixing device or the integral assembly shall be fixed to a rigid support according to the manufacturer's instructions. The adhesive fixing device shall be adhered to a rigid panel according to 5.10.*

*When testing for mechanical strength, the following applies:*

- *Separately supplied fixing devices are subjected to the temperature cycling as specified in 9.5.3. An appropriate cable tie shall be assembled to the fixing device and then to a non-split steel or aluminium mandrel according to 5.9.*
- *An integral assembly shall be installed on a non-split mandrel according to 5.9. The assembly shall be subjected to the temperature cycling as specified in 9.5.3.*
- *For both separately supplied fixing devices and integral assemblies a split mandrel can be used as long as the two parts are linked together to operate as a solid mandrel.*
- *For integral assemblies, the test fixture shall allow for self-alignment of the test load with the integral assembly during the test. In order to achieve self-alignment of the test load, a sliding mounting table shall be used. The sliding mounting table shall be able to move without significant friction. If during the test the self-alignment does not occur, the test is considered invalid.*
- *Typical arrangements of the test assembly are shown in Figure 6.*
- *For a separately supplied fixing device and for an integral assembly according to 6.2.2, each sample shall be subjected to a tensile pull. No individual value of the measured maximum force shall be less than 50% of the declared mechanical strength.*
- *For a separately supplied fixing device and for an integral assembly classified according to 6.2.3, each sample shall be subjected to a tensile pull until the mechanical strength declared by the manufacturer is reached. This load is maintained for  $(60^{+5}_0)$  s.*

*When testing for loop tensile strength, the following applies:*

- *An integral assembly shall be installed on a non-split mandrel according to 5.9. The assembly shall be subjected to the temperature cycling as specified in 9.5.3.*
- *Typical arrangements of the test assembly are shown in Figure 2.*
- *For an integral assembly classified according to 6.2.2, each sample shall be subjected to a tensile pull. No individual value of the measured maximum force shall be less than 50 % of the declared loop tensile strength.*
- *For an integral assembly classified according to 6.2.3, each sample shall be subjected to a tensile pull until the loop tensile strength declared by the manufacturer is reached. This load is maintained for  $(60^{+5}_0)$  s.*

*After the test, the fixing device or the integral assembly shall show no sign of disintegration nor shall there be any crack visible to normal or corrected vision.*

*If during the test:*

- *the fixing device or the integral assembly, excluding the adhesive ones, detaches from the rigid support without signs of disintegration, cracking or the like, it is not considered a failure but the test shall be repeated with a more appropriate fixing method.*
- *the adhesive fixing device or the adhesive integral assembly detaches from the rigid support, this is considered a failure.*

## 10 Contribution to fire

Metallic cable ties and integral assemblies with a non-metallic or organic coating, as well as non-metallic and composite cable ties and integral assemblies classified according to 6.4.2 shall have adequate resistance to flame propagation.

*Compliance is checked by the following test:*

*The sample shall be installed on a solid steel or aluminium mandrel with dimensions as specified in 5.9. The cable tie shall be mounted manually without tension. Then, the remaining end of the tie shall be cut away.*

*Using an arrangement as shown in Figure 7, the sample shall be subjected to the needle flame test as specified in IEC 60695-11-5:2016, with the following additional information:*

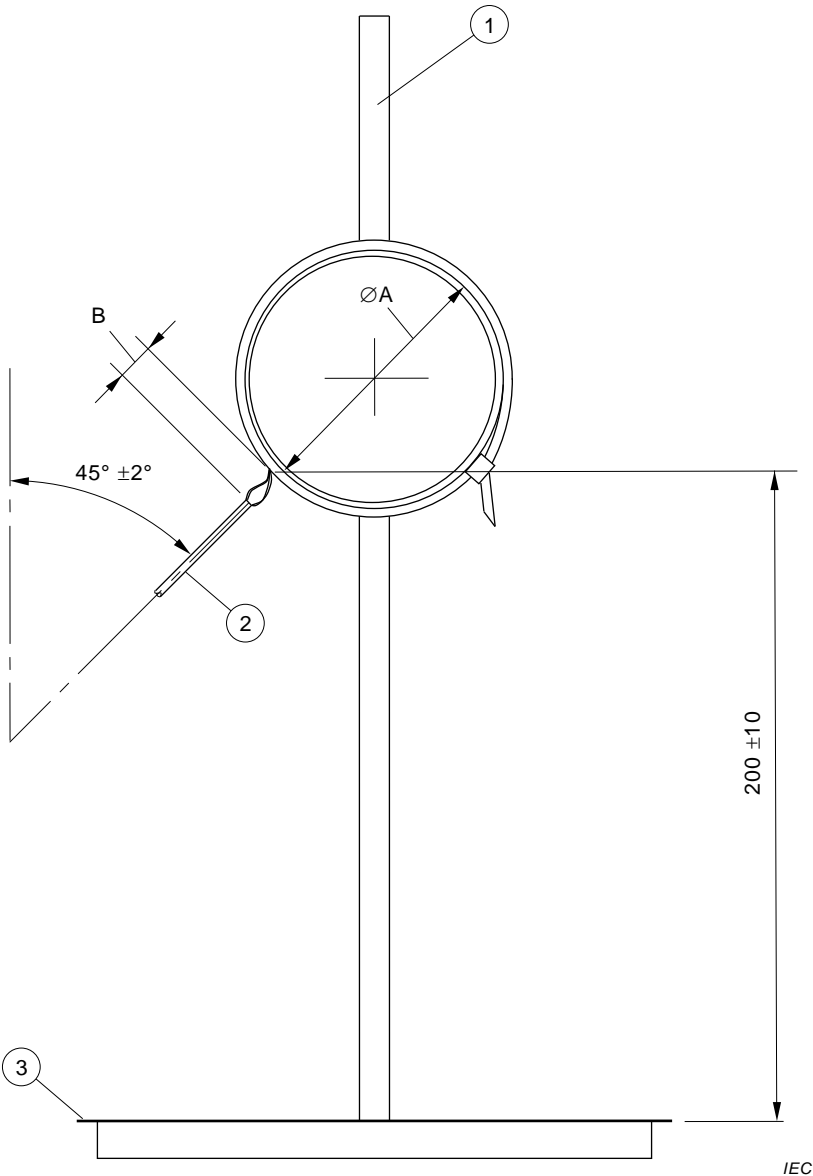
- the flame shall be applied to the face of the sample for a maximum of 30 s or until such time as the sample has separated from the mandrel;*
- the underlying layer shall consist of three layers of tissue paper of dimensions such that product material or broken product falls on it while testing.*

*The sample shall be deemed to have passed the test if:*

- 30 s after the test flame is removed, there is no flaming of the sample, and*
- there is no ignition of the tissue paper.*

*For a metallic cable tie having a non-metallic coating, and classified as non-flame propagating according to 6.4.2, samples having a combination of the minimum coating thickness and minimum metal thickness, and samples having a combination of the maximum coating thickness and minimum metal thickness shall be tested.*

Dimensions in millimetres



**Key**

- 1 stand
- 2 burner
- 3 tissue paper
- A diameter of test mandrel
- B distance between burner and test sample, B = (5 ± 1) mm

When not applied to the sample, the flame height is (12 ± 1) mm measured from a vertical position of the burner.

**Figure 7 – Arrangement for the needle flame test**

**11 Environmental influences**

**11.1 Resistance to ultraviolet light**

**11.1.1** Cable ties and fixing devices classified according to 6.5.1.2 shall be resistant to ultraviolet light.

*Compliance is checked by the following.*

*For cable ties and fixing devices classified according to 6.5.1.2, a set of ten samples installed on a mandrel according to 5.9 shall be subjected to ultraviolet light conditioning according to 11.1.2. When the product is provided in more than one colour, the colour having the heaviest organic pigment loading shall be subjected to this testing. All sets tested are considered representative of the material's entire colour range.*

NOTE In determining the product types and sample set for testing, consideration is given to products coloured red or yellow which are known to have particular critical effects.

*Moisture stabilization according to 5.2 before ultraviolet light exposure is not applicable for this test.*

*Samples shall be mounted on the inside of the ultraviolet light apparatus so that the samples do not touch each other. Mandrels for cable ties shall be positioned in such a way that the cable tie locking device is placed in the position facing the light source. Mandrels to which a fixing device is mounted shall be positioned in such a way that the fixation surface for the cable tie is perpendicular to the light source.*

*If the fixing device, cable tie and mandrel assembly is not able to be mounted as described in the ultraviolet light apparatus, the fixing device is permitted to be separately exposed. After exposure, the samples shall be able to be assembled for conducting the test.*

*After the first 250 h of exposure, and after each subsequent 250 h exposure period, the specimens are to be repositioned in the equipment in order to compensate for exposure variability due to placement with respect to the light source. Repositioning at 200 h intervals is acceptable. See Figure 8 for recommended rotation. Some flexibility in practice is needed due to variations in the samples under test.*

*Periodic repositioning of samples is not necessary if the measured irradiance at positions furthest from the point of maximum irradiance is at least 90 % of the maximum measured irradiance*

**11.1.2** *The samples are to be exposed for 1 000 h to xenon-arc, method A, cycle 1 in accordance with ISO 4892-2:2013. There shall be continuous exposure to light and intermittent exposure to water spray. The cycle shall consist of 102 min without water spray and 18 min with water spray. The apparatus shall operate with a water-cooled or air-cooled xenon-arc lamp, borosilicate glass inner and outer optical filters, a spectral irradiance of 0,51 W/(m<sup>2</sup>·nm) at 340 nm and a blackpanel temperature of (65 ± 3) °C. The irradiance is measured at the rack where the blackpanel is placed. The temperature of the chamber shall be (45 ± 3) °C. The relative humidity in the chamber shall be (50 ± 5) %.*

NOTE In some countries, such as Japan, ultraviolet-light exposure according to ISO 4892-4 is acceptable with specific test parameters.

**11.1.3** *Ultraviolet light conditioning is not required for a metallic cable tie or fixing device or for a metallic cable tie having a non-metallic coating when the non-coated version complies with the requirements in 11.2.*

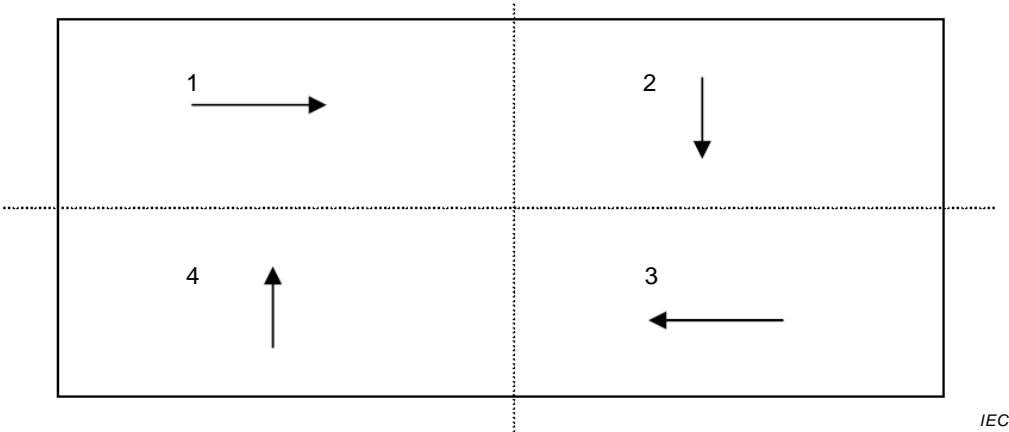
**11.1.4** *Following the exposure in 11.1.2 and stabilization for a period according to 5.2, the following applies.*

*Each sample of a cable tie, a fixing device that is integrally moulded with a cable tie, or a fixing device supplied separately and classified according to 6.2.2, shall be subjected to a tensile pull. No individual value shall be less than 50 % of the loop tensile strength declared according to 6.2 or the declared mechanical strength for a fixing device.*

*Each sample of a cable tie, a fixing device that is integrally moulded with a cable tie, or a fixing device supplied separately and classified according to 6.2.3, shall be subjected to a tensile pull until the load equivalent to the loop tensile strength for a cable tie or mechanical strength for a fixing device declared by the manufacturer is reached. This load is maintained*

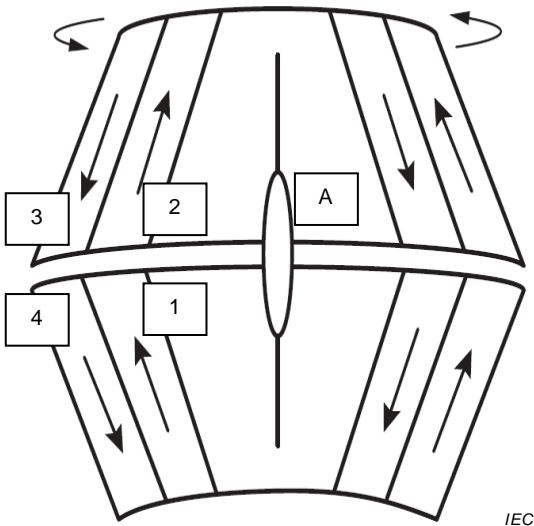
for  $(60^{+5}_0)$  s. The samples shall be deemed to have passed the test if the samples perform according to the requirements in 9.6.1. After the test, there shall be no sign of disintegration nor shall there be any crack visible to normal or corrected vision.

Each sample of a fixing device shall be subjected to a tensile pull until the mechanical strength declared by the manufacturer is reached. This load is maintained for  $(60^{+5}_0)$  s. After the test, there shall be no sign of disintegration nor shall there be any crack visible to normal or corrected vision.



Representative quadrants on flat panel.  
Arrows represent relative position and direction of sample placement, and rotation sequence.

Figure 8a) Static flat panel apparatus



Interior view of sample mounting panels (1 to 4) of typical rotating cylinder facing light source A.  
Arrows represent relative position and direction of sample placement, and rotation sequence.  
The surface of the sample facing the light source should remain constant throughout the full duration of the exposure.

Figure 8b) Cylinder-type apparatus

Figure 8 – Recommended sample repositioning  
for ultraviolet light and water exposure

## 11.2 Resistance to corrosion

Cable ties and fixing devices classified as resistant to corrosion according to 6.5.2.2 shall have adequate resistance to corrosion.

*Compliance is checked by the following test:*

*Moisture stabilization according to 5.2 before salt spray exposure is not applicable for this test.*

*Samples shall be exposed to a neutral salt spray (NSS) in accordance with ISO 9227:2017 for 192 h followed by 12 h at  $(40 \pm 2)$  °C. Samples of non-metallic coated devices shall be subjected to heat age conditioning in accordance with 9.5.2, 9.6.2 or 9.7.2 as appropriate before exposure to the salt spray.*

*The samples shall then be rinsed in demineralized water. Metallic cable ties and fixing devices shall be dried. Composite cable ties and fixing devices shall be stabilized according to 5.2.*

*After the test, the samples shall show no cracks visible to normal or corrected vision. Any traces of rust on sharp edges and a yellowish film may be removed by rubbing. There shall be no red rust visible to normal or corrected vision.*

*Each sample of a composite cable tie classified according to 6.2.2 (Type 1), shall be subjected to the tensile pull according to 9.5.1. No individual value shall be less than 50 % of the loop tensile strength declared according to 6.2.*

*Each sample of a metallic or composite cable tie classified according to 6.2.3 (Type 2), shall be subjected to the tensile pull according to 9.6.1 until the load equivalent to the loop tensile strength declared by the manufacturer is reached. This load shall be maintained for  $(60^{+5}_0)$  s.*

*The samples shall be deemed to have passed the test if the samples perform according to the requirements in 9.6.1.*

*Each sample of a fixing device shall be subjected to the tensile pull according to 9.7.1.*

*After the test, there shall be no sign of disintegration of a fixing device or any crack visible to normal or corrected vision.*

Testing of products constructed of stainless steel having a chromium content of 16 % or more is not required.

A metallic cable tie having a non-metallic coating that is depended upon to provide resistance to corrosion, and that is declared as having resistance to ultraviolet light, shall be subjected to the conditioning in 11.1 followed by the appropriate requirements in 11.2 for metallic cable ties.

The requirements in 11.2 are not applicable for a metallic cable tie with a non-metallic coating when the uncoated version has been determined to meet the requirements in 11.2.

## 12 Electromagnetic compatibility

Products covered by this document are, in normal use, passive with respect to electromagnetic influences (emission and immunity). Therefore, no tests have been specified.



Annex A  
(normative)

Compliance checks to be carried out for cable ties  
and fixing devices currently complying with IEC 62275:2013  
in order to comply with this edition 3

Annex A relates to requirements of IEC 62275 Edition 3 (this document). Table A.1 specifies where compliance checks are required and where compliance checks are not required in order that cable ties and fixing devices can be declared to meet the requirements of this document if they already comply with IEC 62275:2013.

Table A.1 – Required compliance checks

Test reference subclause	Description	Compliance check
Marking and documentation		
7.1	Marking of cable ties and fixing devices	Not required
7.2	Durability and legibility marking	Not required
7.3	Literature declaration	Only required for adhesive fixing devices
Construction		
8	Surface and edges	Not required
Mechanical properties		
9.2	Installation test	Not required
9.3	Minimum installation temperature test for cable ties	Not required
9.4	Minimum operating temperature test for cable ties	Not required
9.5.1	Loop tensile strength test for cable ties classified according to 6.2.2. As-received condition	Not required
9.5.2	Loop tensile strength test for cable ties classified according to 6.2.2. After heat aging	Not required
9.5.3	Loop tensile strength test for cable ties classified according to 6.2.2. After temperature cycling	Not required
9.6.1	Loop tensile strength test for cable ties classified according to 6.2.3. As-received condition	Not required
9.6.2	Loop tensile strength test for cable ties classified according to 6.2.3. After heat aging	Not required
9.6.3	Loop tensile strength test for cable ties classified according to 6.2.3. After temperature cycling	Not required
9.6.4	Loop tensile strength test for cable ties classified according to 6.2.3. After vibration test for metallic cable ties	Not required
9.7.1	Mechanical strength test for fixing devices. As-received condition	Only required for adhesive fixing devices
9.7.2	Mechanical strength test for fixing devices. After heat aging	Only required for adhesive fixing devices
9.7.3	Mechanical strength test for fixing devices. After temperature cycling	Only required for adhesive fixing devices
Contribution to fire		
10	Needle flame test	Not required



Test reference subclause	Description	Compliance check
<b>Environmental influences</b>		
11.1	Resistance to ultraviolet light	Not required
11.2	Resistance to corrosion (for metallic and composite components)	Not required

Bibliography

IEC 62275:2013, *Cable management systems – Cable ties for electrical installations*

UL 62275/CSA C22.2 No. 62275, *Cable management systems – Cable ties for electrical installations*

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**Email:** [subscriptions@bsigroup.com](mailto:subscriptions@bsigroup.com)

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**Tel:** +44 20 8996 7004

**Email:** [knowledgecentre@bsigroup.com](mailto:knowledgecentre@bsigroup.com)

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## BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK

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# PRODUCT STANDARD

## SWITCHGEAR ENGINEERING DIVISION

SG 12201, Rev-04

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### PVC WIRING CHANNELS (DUCTS / CONDUITS)

#### 1.0 SCOPE

This standard covers specification and acceptance norms for the PVC (**Virgin**) wiring channels with cover used for housing of wire bunches in any electrical panel with multiple objectives of protection of wires, wiring time reduction, easy tracing of wires, aesthetic enhancement etc.

#### 2.0 SPECIFICATION

##### 2.1 MATERIAL

High impact, self extinguishing, warp proof rigid **virgin** PVC (Polyvinyl Chloride) having following properties :-

- |                         |                  |
|-------------------------|------------------|
| - Specific gravity      | - 1.4            |
| - Tensile strength      | - 390 Kg / sq.cm |
| - Impact strength       | - 7 Kg / sq.cm   |
| - Elongation            | - 80 %           |
| - Dielectric strength   | - 12 KV / mm     |
| - Softening temperature | - 75 deg. C      |
| - Flammability          | - UL 94 VO       |

##### 2.2 COLOUR – Light Grey

##### 2.3 CONSTRUCTIONAL FEATURES

###### - INTERLOCKING

The interlocking cover and channel design shall provide snap on / off, non slip assembly to prevent vibration slippage.

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APPD.	MAK			PREP	ISSUED	DATE
DATE.	11/12/21					7.9.2000



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### - SIDE WALL SLOTS

The side walls of the channel shall have approx. 8 mm wide open slots (with neck type wire retention feature, so that wires remain in the slots when cover is removed) at pitch of 20 to 25 mm throughout the length.

### - SNAP OFF FINGERS

Side wall fingers created by the open slots shall be snap off type and shall not require and cutting tool.

### - FIXING SLOTS

The channel base shall be provided with fixing slots suitable for M6 screws at pitch of 50 mm throughout the length.

### - FINISH

Both the channel & cover shall have smooth rounded edge, free from burrs.

## 2.4 SIZE

- PVC sheet thickness : Minimum 1 mm.
- Execution length : 1 M (It 01 to 10) \* 0.7 M (It-11 to 13)
- Cross section : As per the following table

ITEM NO	CROSS SECTION W * H (mm)	CODE NO.
01	15 * 25	BP9049119646
02	25 * 40	BP9049119654
03	40 * 40	BP9049119662
04	40 * 60	BP9049119670
05	60 * 60	BP9049119689
06	60 * 80	BP9049119697
07	25 * 30	BP9049119412
08	45 * 45	BP9049118402
09	45 * 60	BP9049118526
10	30 * 45	BP9049118410
11	25 * 40	BP9048106982
12	30 * 45	BP9048106990
13	45 * 60	BP9048107008



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### 3.0 ACCEPTANCE NORMS

#### 3.1 PHYSICAL VERIFICATION

- Colour : Light Grey
- Size – Sheet Thickness : Minimum 1 mm
  - Length : 1 metre or 0.75 metre
  - Cross section : As per requirement
- Fixing slots : Suitable for **M6 hardware** and at pitch of 50 mm through out the length
- Cover : Interlocking and non slipping type with easy snap on/off action.

#### 3.2 TESTING

Verification of the test certificates from supplier

- Tensile strength :  $\geq 390 \text{ Kg / sq.cm}$
- Impact strength :  $\geq 7 \text{ Kg / sq.cm}$
- Specific gravity :  $1.4 \pm 5 \%$
- Flammability : UL 94V0
- Dielectric strength : 12 KV / mm

#### 3.3 ACCEPTANCE TESTS ON SAMPLE (To be selected by BHEL from lot)

In line with acceptance criterion given in attached drawing.

#### NOTES :

1. Suppliers shall furnish compliance report as per the specified acceptance norms.
2. Consignment shall be inspected and tested in BHEL as per the specified acceptance norms.

### 4.0 REFERENCE DRAWING

**Drg. No. 35095001536, Rev-10 enclosed.**

**Revision 04** – Fixing hardware updated, Virgin PVC called, Dielectric Strength updated.




**PRODUCT STANDARD**  
SWITCHGEAR ENGINEERING DIVISION


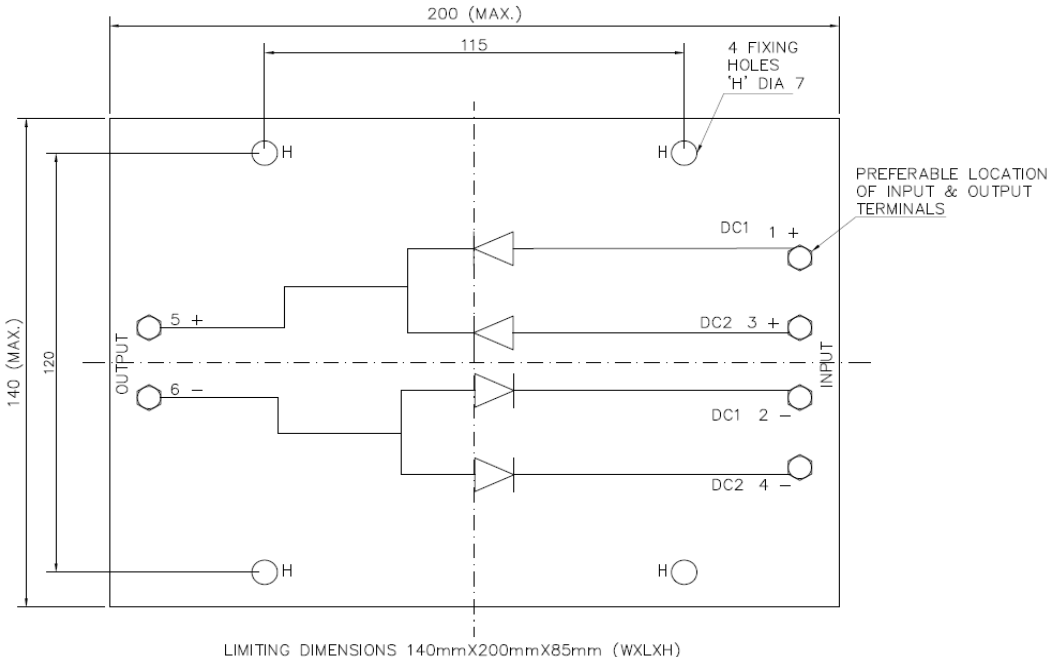
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<b>COPYRIGHT AND CONFIDENTIAL</b>  The information on this document is the property of Bharat Heavy Electricals Limited It must not be used directly or indirectly in any way detrimental to interest of Co.		<p align="center"><b><u>DIODE PLATE ASSEMBLY</u></b></p> <p><b>1.0 SCOPE :</b> This product standard is issued to cover the requirement of diode plate assembly, used for automatic selection of auxiliary DC supply to closing, tripping, spring charging motor, indication circuits etc. in medium voltage switchgears.</p> <p><b>2.0 STOCKING DETAILS:</b>          STOCK CODE : <b>BP9049118186</b></p> <p>APPROXIMATE ANNUAL REQUIREMENT &amp; MINIMUM STOCK QUANTITY ARE TO BE DECIDED &amp; REVIEWED YEARLY, JOINTLY BY PLANNING &amp; ENGINEERING, ON THE BASIS OF CONSUMPTION PATTERN &amp; DELIVERY CYCLE OF THE ITEM.</p> <p><b>3.0 TECHNICAL DETAILS :</b></p> <p><b>CONSTRUCTION:</b> Assembly of Diodes on heat sinks, mounting on a insulating plate (min. 6 mm thick) made-up of fire retardant material like SMC, Bakelite etc.</p> <p><b>NO. OF DIODES :</b> minimum 4 nos. (however exact quantity may be decided by vendor as per his design to meet continuous current and temperature rise requirement)</p> <p><b>RATING OF DIODES :</b> 25A current rated Diodes</p> <p><b>Makes acceptable are Ruttonsha (25HM), Semikron (SKN 20) or Hind rectifier (SXXB26) only.</b></p> <p><b>NO.OF HEAT SINKS :</b> To be decided by supplier based on circuit in Fig.1 &amp; current rating of Diodes below. A top covering transparent sheet (min. thickness 3 mm) made-up of Poly carbonate or fiber-glass shall be provided to avoid accidental touching of <b>220VDC</b>.</p> <p><b>CURRENT RATING OF LOAD :</b> 12A each (Continuous)</p> <p><b>PEAK INVERSE VOLTAGE :</b> &gt; 1200 Volts (of Diodes)</p>						
		REV.	08	PRINTS TO :- Issued Online		APPROVED :-- D.K.DIKSHIT		
		ALTD.	RR	Revised to add plating thickness for hardware		PREPARED	ISSUED	DATE
		APPD.	MAK			VD	SC	10.02.09
		DATE	17.11.18					



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<div>COPYRIGHT AND CONFIDENTIAL</div> <div>The information on this document is the property of Bharat Heavy Electricals Limited It must not be used directly or indirectly in any way detrimental to interest of Co.</div>	<div><div>APPLICATION : The diodes are meant for feeding auxiliary loads of intermittent &amp; momentary nature through 2 separate DC sources. Load shall be fed by one or both sources, depending upon the availability. In case of both sources feeding the load, any circulating currents between sources must be blocked by diodes.</div><div><div>HV WITHSTAND : 2kV for 1min. between terminals (short circuited together) &amp; earth.</div><div>DIMENSIONS &amp; TERMINAL MARKING: Within 200mm L x 140mm W x 85mmH. As per Fig.-1. The terminals shall be suitable for receiving 2.5sqmm wires.</div><div>MOUNTING: Suitable for projection mounting inside switchgear panels.</div><div>Hardware used shall be able to withstand corrosive environment. Zinc plating thickness shall be &gt;= 13 µm.</div></div></div>						
	<div><div>Fig.-1</div></div>						

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<b>COPYRIGHT AND CONFIDENTIAL</b>  The information on this document is the property of Bharat Heavy Electricals Limited It must not be used directly or indirectly in any way detrimental to interest of Co.		<p><b>4.0 STANDARDS :</b>  <b>Safety, EMC Emission and Immunity:</b> As per EN 61010  <b>Enclosure:</b> Protection provided by enclosures as per IEC 60529.</p> <p><b>5.0 TESTING :</b></p> <p>i) <i>On one number prototype, test shall be conducted to verify blocking of circulating currents. Also temperature rise test at 12A current shall be performed &amp; report shall be furnished to BHEL. The limits of temperature rise shall be maximum 35°C over ambient temperature.</i></p> <p>ii) Plating thickness of hardware</p> <p>iii) Functional test for blocking and HV withstand shall be conducted as a routine test on all assemblies and report shall be furnished to BHEL.</p> <p>iv) All the tests shall be done inline with the requirements specified in IS 14901 Part II (latest revision)</p> <p>v) Above test reports shall be furnished for BHEL's review with the technical offer.</p> <p><b>6.0 DOCUMENTS REQUIRED ALONGWITH THE OFFER :</b></p> <ol style="list-style-type: none"> <li>Annexure-I (check list) duly filled in the format enclosed. Offer without duly filled annexure-I may not be evaluated.</li> <li>Dimensional drawings showing overall dimensions, terminal &amp; mounting details.</li> <li>Bill of material giving technical details &amp; make of all components.</li> <li>Test reports as per Clause (5.i &amp; 5.ii)</li> <li>Vendor to submit technical leaflet of diode used &amp; details of heat sink with the technical offer.</li> </ol> <p><b>7.0 ACCEPTANCE CRITERIA :</b></p> <ol style="list-style-type: none"> <li>100% Visual Inspection.</li> <li>Dimensional checks &amp; terminal marking as per Figure-1.</li> <li>Availability of Routine test reports.</li> <li>Test results of temperature rise of max.35°C over ambient.</li> <li>Plating thickness of hardware, min 13µm.</li> </ol> <p><b>8.0 PERFORMANCE GUARANTEE :</b>          Diode plate assemblies shall perform satisfactorily for a period of minimum 24 months after receipt at BHEL Bhopal or 18 months from the date of commissioning, whichever is earlier.</p> <p><b>9.0 DISPATCH &amp; PACKAGING :</b>          Diode plate assemblies shall packed in individual boxes per diode plate to avoid any breakages during transit. Suitable packaging process and material like thermocol etc. to be used to avoid any damage to diode plate during supply of the plates.          Vendor to give 5% extra top covering (free of cost) of the diode plate. In case there is any breakage in transit the same shall be replaced at BHEL works.</p>		



## PRODUCT STANDARD

### SWITCHGEAR ENGINEERING DIVISION

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#### FORMAT FOR CHECK LIST

*Please note that below check list shall be filled and enclosed with the offer. Any offer without duly filled checklist will not be entertained and will be reject technically without any further communication.*


#### ANNEXURE-I


Sl. No.	Parameter	BHEL's Requirement	Confirmation/ Compliance By Supplier
1.	CONSTRUCTION	Assembly of Diodes on heat sinks, mounting on a insulating FR Sheet of SMC or Bakelite plate (min. 6 mm thick).	
2.	NO. OF DIODES	4 nos. (minimum)	
3.	MAKE OF DIODES	SEMIKRON/RUTONSHA/HIND	
4.	NO.OF HEAT SINKS	To be decided by supplier based on circuit in fig.1 & current rating of Diodes required.	
5.	CURRENT RATING OF DIODE CIRCUIT	12A (continuous)	
6.	TYPE OF HEAT SINK	To be mentioned by vendor with calculation	
7.	PEAK INVERSE VOLTAGE	> 1200 Volts	
8.	HV WITHSTAND	2kV for 1min. To be conducted as per <b>IS- 14901 part II</b> & report to be furnished	
09.	LIMITING DIMENSIONS	Within 200mm L x 140mm W x 85mm H	(Indicate actual dimensions)
10.	TERMINAL MARKING	As per Figure-1	
11.	MOUNTING	Projection mounting	
12.	STANDARDS	As per clause no.4.0	
13.	BILL OF MATERIAL	To be enclosed	
14.	CIRCULATING CURRENT BLOCKING TEST	To be conducted & report to be furnished	
15.	TEMPERATURE RISE TEST AT 12A (MAX. RISE 35°)	To be conducted & report to be furnished	
16.	PLATING THICKNESS OF HARWARE VERIFIED	Min 13µm	

Sign & Seal / Date  
Name

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<div><div><div>COPYRIGHT AND CONFIDENTIAL</div><div>The information on this document is the property of Bharat Heavy Electricals Limited It must not be used directly or indirectly in any way detrimental to interest of Co.</div></div><div><div>ANNEXURE-II</div><div>Annexure to be enclosed with Indent of Diode plates.</div><div>Following points to be complied for Diode plates covered under scope of SG12641:</div><div><div>1) Vendor to furnish test results for temperature rise (max.35°C over Ambient temperature) from BHEL TSD/RFM or vendor's own test Lab. The offer will be decided Technically acceptable based of these test result.</div><div>2) Original TCs and invoice copy (from OEM and not older than 3 months from supply date) of mounted diodes shall be given along with consignment, for review and verification of BHEL. Supply shall be liable to be rejected in absence of these documents.</div></div></div></div>			

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<div>ANNEXURE-III</div> <div><i>This annexure shall not be given to vendors</i></div> <div><div>1) Samples of following vendors are approved by BHEL:<div>a) M/s SLS Anand Gujrat</div><div>b) M/s PYE Electro Systems Mandideep M.P.</div><div>c) M/s Rashee Controls Bhopal</div><div>d) M/s Techno Electronics Hyderabad</div></div><div>2) Any new vendor shall be added after sample approval and witness of Temperature rise test by BHEL.</div></div>			
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# PRODUCT STANDARD

## SWITCHGEAR ENGINEERING DIVISION

SG 12643 REV.04

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### SWITCHES

1. **SCOPE:** This product standard is issued as a guideline for stocking of various types of rotary switches used in switchgear panels.
2. **QUALIFYING REQUIREMENT:**  
Offered switch shall have mark of CE/VDE/UL/CSA/BIS with CML no. on it.
3. **GENERAL TECHNICAL REQUIREMENT :**

	<b>Confirmation by Vendors</b>
3.1 All the switches shall be ROTARY TYPE with nylon material.	<b>YES/NO</b>
3.2 In case of lockable switches, key shall be removable in locked position only.	<b>YES/NO</b>
3.3 Switches shall be suitable for mounting on 3.2 mm thick sheet steel panel.	<b>YES/NO</b>
3.4 For all the switches, terminals and screws shall be accessible from back of panel with open terminals.	<b>YES/NO</b>
3.5 For all the switches, unless and otherwise specified, colour of handle and indicating plate shall be black and grey respectively.	<b>YES/NO</b>
3.6 All switches shall comply with relevant clauses of IS : 4064-1978 / IS:6875-1973 in all respect.	<b>YES/NO</b>
3.7 Suppliers to give their offers only in the format given herewith. i.e technical details of offered switches are to be indicated against respective parameters in the table given for each item. Offers in any other format shall not be evaluated.	<b>YES/NO</b>
3.8 Successful bidder shall submit one sample of each variety of switches for BHEL's approval, before taking up bulk manufacturing.	<b>YES/NO</b>
4. **DOCUMENTS TO BE SUBMITTED ALONGWITH THE OFFER :**

4.1 Offer in the specified format.	<b>ENCLOSED/NOT ENCLOSED</b>
4.2 Terminal marking & drilling details for each item.	<b>ENCLOSED/NOT ENCLOSED</b>
4.3 Descriptive literature of the switches alongwith The switch code for each item.	<b>ENCLOSED/NOT ENCLOSED</b>
4.4 Type test reports as per relevant IS to be furnished on demand.	<b>YES/NO</b>
4.5 Vendor to furnish compliance certificate (issued by concerned agency) in support of CE/VDE/UL/CSA/BIS marking with CML no	
5. **ACCEPTANCE CRITERIA :**
  - 5.1 Switch shall have mark of CE/VDE/UL/CSA/BIS with CML no. on it.
  - 5.2 Matching of terminal marking as per specification.
  - 5.3 Dimension of indicating plate as per specification.
  - 5.4 Matching of Labels description on indicating plate as per specification.
  - 5.5 Visual checks for cracks & surface finish for any damage.
6. **TECHNICAL DETAILS : AS INDICATED IN TABLES FOR EACH ITEM**
7. Against item-8, 9, 13, 14, 15 & 16, suppliers to give offer for complete switches with engraved bakelite indicating plates. However, these items shall be supplied without bakelite indicating plates. Inscription details for these plates shall be furnished project wise, as and when required. Vendors to confirm that engraved bakelite indicating plates for these switches shall be furnished within 10 days after receipt of inscription details from BHEL. **YES/NO**
8. For identification of switches against item-8, 9, 13, 14, 15 & 16, (as the switches shall be supplied without indicating plates), suppliers to specifically confirm in their offer that 12 digit material code (BP no.) shall be engraved on the packing case as well as on the body of every individual switch. **YES/NO**

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ALTD.	Arvind	Issued Online	D.K.DIKSHIT		
APPD.	DP		PREPARED	ISSUED	DATE
DATE.	16.03.22		MANISHA HADA	A.P.SINGH	10.03.2007

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# PRODUCT STANDARD

## SWITCHGEAR ENGINEERING DIVISION

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**ITEM-001 : AMMETER SELECTOR SWITCH****STOCK DETAILS :**

BP9049113214 - FOR INDICATING PLATE - 75x75 & DRILLING PLAN DRG.CSA  
BP9049113460 - FOR INDICATING PLATE - 64x80 & DRILLING PLAN DRG.CSAS

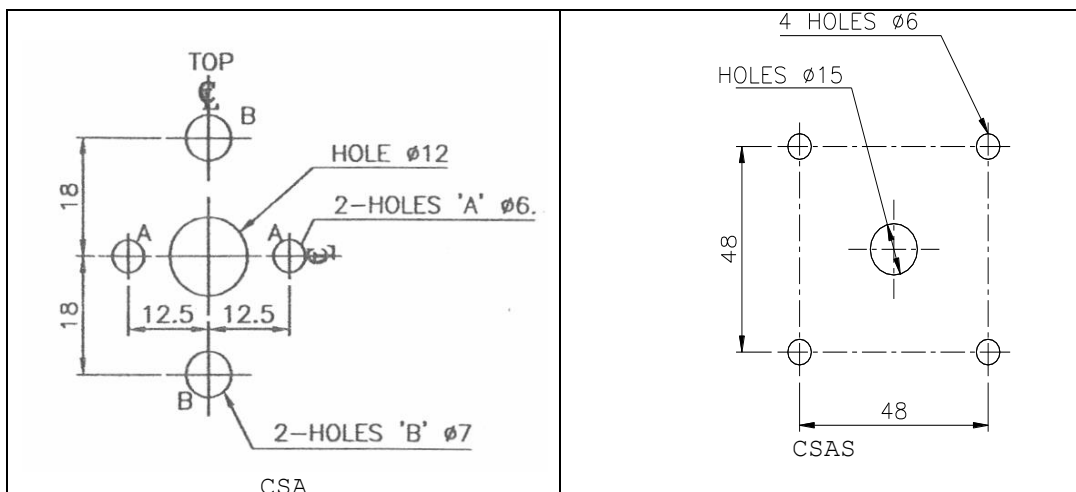
SL. NO.	PARAMETER	BHEL's REQUIREMENT	SUPPLIER'S COMPLIANCE/ CONFIRMATION
1	TYPE	STAYPUT	YES / NO
2	MARKING	CE/VDE/UL/CSA/BIS with CML no.	YES / NO
3	CURRENT RATING	10 A	YES / NO
4	WORKING VOLTAGE	440 VAC, 50Hz.	YES / NO
5	NO.OF POSITIONS	4	YES / NO
6	LOCKING	NOT REQUIRED	YES / NO
7	HANDLE	KNOB TYPE	YES / NO
8	DEGREE OF ROTATION	90 DEGREE	YES / NO
9	INDICATING PLATE SIZE	75x75 or 64x80	Size- _____
10	DRILLING PLAN DRAWING	CSA or CSAS	DP Ref. _____
11	TERMINAL MARKING	5 terminals - R, Y, B, A1, A2	YES / NO
12	MAIN LABEL	AMMETER SWITCH	YES / NO
13	SWITCHING SEQUENCE, LABEL & TERMINAL MARKING		
	POSITION-1	0 DEG. OFF	YES / NO
	POSITION-2	+90 Deg. R	YES / NO
	POSITION-3	180 Deg. Y	YES / NO
	POSITION-4	-90 Deg. B	YES / NO

**NOTES**

1.	The switch shall be ROTARY TYPE with nylon material.	YES / NO
2.	Switch shall be suitable for mounting on 3.2 mm thick sheet steel panel.	YES / NO
3.	Terminals and screws shall be accessible from back of panel with open terminals.	YES / NO
4.	Switch shall comply with relevant clauses of <b>IS:4064-1978 / IS:6875-1973</b> in all respect.	YES / NO
5.	Unless and otherwise specified, colour of handle and indicating plate shall be black and grey respectively.	YES / NO
6.	Type test reports as per relevant IS shall be furnished on demand.	YES / NO

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### ITEM-002 : AMMETER SELECTOR SWITCH (THROUGH TYPE)

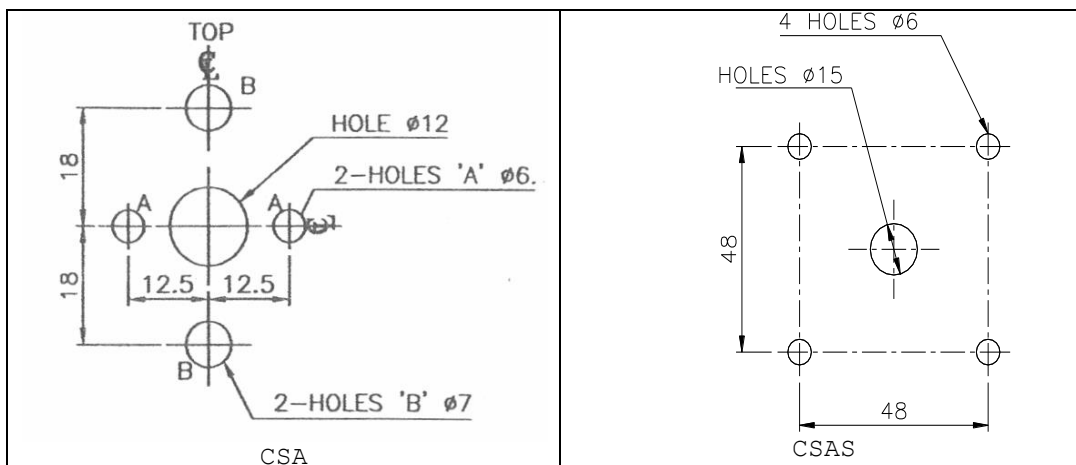
#### STOCK DETAILS :

BP9049113222 - FOR INDICATING PLATE - 75x75 & DRILLING PLAN DRG.CSA  
BP9049113478 - FOR INDICATING PLATE - 64x80 & DRILLING PLAN DRG.CSAS

SL. NO.	PARAMETER	BHEL's REQUIREMENT	SUPPLIER'S COMPLIANCE/ CONFIRMATION
1	TYPE	STAYPUT	YES / NO
2	MARKING	CE/VDE/UL/CSA/BIS with CML no.	YES / NO
3	CURRENT RATING	10 A	YES / NO
4	WORKING VOLTAGE	440 VAC, 50Hz.	YES / NO
5	NO.OF POSITIONS	4	YES / NO
6	LOCKING	NOT REQUIRED	YES / NO
7	HANDLE	KNOB TYPE	YES / NO
8	DEGREE OF ROTATION	90 DEGREE	YES / NO
9	INDICATING PLATE SIZE	75x75 or 64x80	Size-_____
10	DRILLING PLAN DRAWING	CSA or CSAS	DP Ref. _____
11	TERMINAL MARKING	8 terminals - R1,Y1,B1,R2,Y2,B2,A1,A2	YES / NO
12	MAIN LABEL	AMMETER SWITCH	YES / NO
13	SWITCHING SEQUENCE, LABEL & TERMINAL MARKING		
	POSITION-1	0 DEG. OFF	YES / NO
	POSITION-2	+90 Deg. R	YES / NO
	POSITION-3	180 Deg. Y	YES / NO
	POSITION-4	-90 Deg. B	YES / NO

#### NOTES

1.	The switch shall be ROTARY TYPE with nylon material.	YES / NO
2.	Switch shall be suitable for mounting on 3.2 mm thick sheet steel panel.	YES / NO
3.	Terminals and screws shall be accessible from back of panel with open terminals.	YES / NO
4.	Switch shall comply with relevant clauses of <b>IS:4064-1978 / IS:6875-1973</b> in all respect.	YES / NO
5.	Unless and otherwise specified, colour of handle and indicating plate shall be black and grey respectively.	YES / NO
6.	Type test reports as per relevant IS shall be furnished on demand.	YES / NO



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### ITEM-003 : AMMETER SELECTOR SWITCH (LINE CURRENT)

#### STOCK DETAILS :

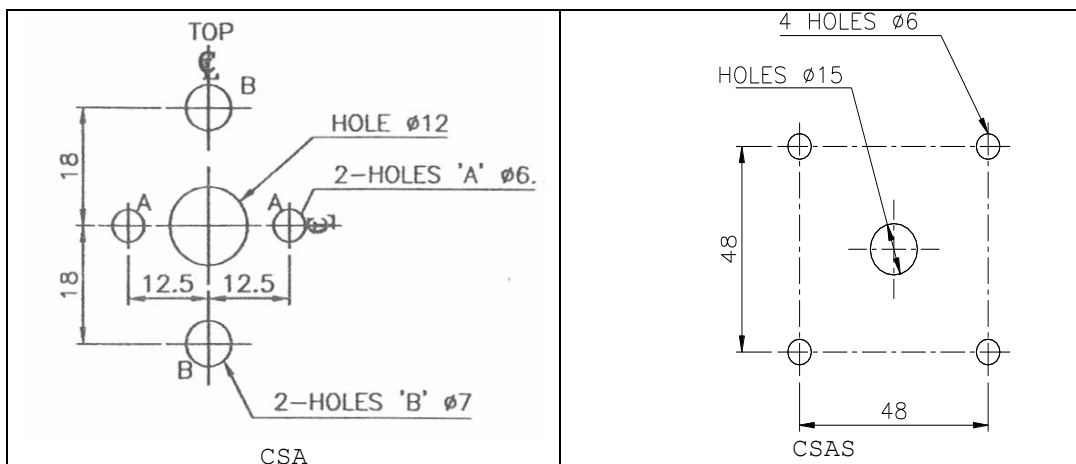
BP9049113435 - FOR INDICATING PLATE - 75x75 &amp; DRILLING PLAN DRG.CSA

BP9049113486 - FOR INDICATING PLATE - 64x80 &amp; DRILLING PLAN DRG.CSAS

SL. NO.	PARAMETER	BHEL's REQUIREMENT	SUPPLIER'S COMPLIANCE/ CONFIRMATION
1	TYPE	STAYPUT	YES / NO
2	MARKING	CE/VDE/UL/CSA/BIS with CML no.	YES / NO
3	CURRENT RATING	10 A	YES / NO
4	WORKING VOLTAGE	440 VAC, 50Hz.	YES / NO
5	NO.OF POSITIONS	6	YES / NO
6	LOCKING	NOT REQUIRED	YES / NO
7	HANDLE	KNOB TYPE	YES / NO
8	DEGREE OF ROTATION	60 DEGREE	YES / NO
9	INDICATING PLATE SIZE	75x75 or 64x80	Size-_____
10	DRILLING PLAN DRAWING	CSA or CSAS	DP Ref. _____
11	TERMINAL MARKING	6 terminals - R, Y, B, L, A1, A2	YES / NO
12	MAIN LABEL	AMMETER SWITCH	YES / NO
13	SWITCHING SEQUENCE, LABEL & TERMINAL MARKING		
	POSITION-1	0 DEG. OFF	YES / NO
	POSITION-2	+60 Deg. R	YES / NO
	POSITION-3	+120Deg. Y	YES / NO
	POSITION-4	180 Deg. OFF	YES / NO
	POSITION-5	-120Deg. B	YES / NO
	POSITION-6	-60 Deg. L	YES / NO

#### NOTES

1.	The switch shall be ROTARY TYPE with nylon material.	YES / NO
2.	Switch shall be suitable for mounting on 3.2 mm thick sheet steel panel.	YES / NO
3.	Terminals and screws shall be accessible from back of panel with open terminals.	YES / NO
4.	Switch shall comply with relevant clauses of <b>IS:4064-1978 / IS:6875-1973</b> in all respect.	YES / NO
5.	Unless and otherwise specified, colour of handle and indicating plate shall be black and grey respectively.	YES / NO
6.	Type test reports as per relevant IS shall be furnished on demand.	YES / NO



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ITEM-004 : VOLTMETER SELECTOR SWITCH (4 POSN.)

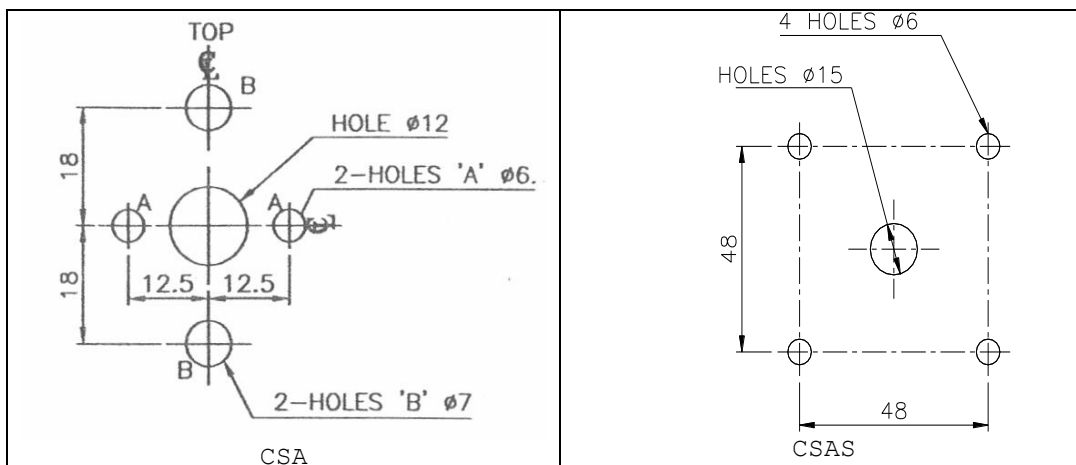
## STOCK DETAILS :

BP9049113230 - FOR INDICATING PLATE - 75x75 & DRILLING PLAN DRG.CSA  
 BP9049113494 - FOR INDICATING PLATE - 64x80 & DRILLING PLAN DRG.CSAS

SL. NO.	PARAMETER	BHEL's REQUIREMENT	SUPPLIER'S COMPLIANCE/ CONFIRMATION
1	TYPE	STAYPUT	YES / NO
2	MARKING	CE/VDE/UL/CSA/BIS with CML no.	YES / NO
3	CURRENT RATING	10 A	YES / NO
4	WORKING VOLTAGE	440 VAC, 50Hz.	YES / NO
5	NO.OF POSITIONS	4	YES / NO
6	LOCKING	NOT REQUIRED	YES / NO
7	HANDLE	KNOB TYPE	YES / NO
8	DEGREE OF ROTATION	90 DEGREE	YES / NO
9	INDICATING PLATE SIZE	75x75 or 64x80	Size-_____
10	DRILLING PLAN DRAWING	CSA or CSAS	DP Ref. _____
11	TERMINAL MARKING	5 terminals - R, Y, B, V1, V2	YES / NO
12	MAIN LABEL	VOLTMETER SWITCH	YES / NO
13	SWITCHING SEQUENCE, LABEL & TERMINAL MARKING		
	POSITION-1	0 DEG. OFF	YES / NO
	POSITION-2	+90 Deg. RY	YES / NO
	POSITION-3	180 Deg. YB	YES / NO
	POSITION-4	-90 Deg. BR	YES / NO

## NOTES

1.	The switch shall be ROTARY TYPE with nylon material.	YES / NO
2.	Switch shall be suitable for mounting on 3.2 mm thick sheet steel panel.	YES / NO
3.	Terminals and screws shall be accessible from back of panel with open terminals.	YES / NO
4.	Switch shall comply with relevant clauses of IS:4064-1978 / IS:6875-1973 in all respect.	YES / NO
5.	Unless and otherwise specified, colour of handle and indicating plate shall be black and grey respectively.	YES / NO
6.	Type test reports as per relevant IS shall be furnished on demand.	YES / NO



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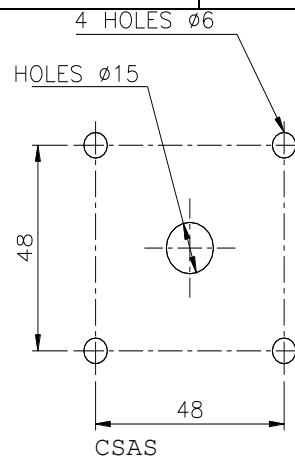
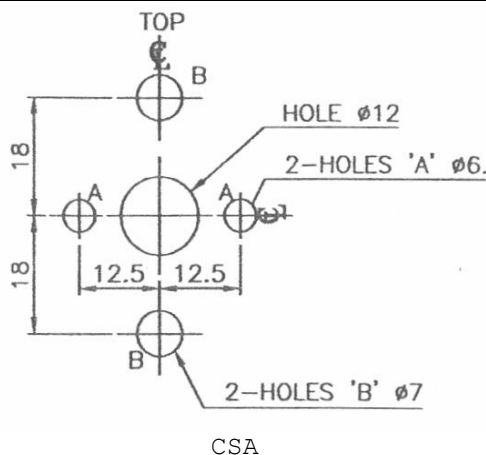
**ITEM-005 : VOLTMETER SELECTOR SWITCH (6 POSN.)****STOCK DETAILS :**

BP9049113249 - FOR INDICATING PLATE - 75x75 & DRILLING PLAN DRG.CSA  
BP9049113508 - FOR INDICATING PLATE - 64x80 & DRILLING PLAN DRG.CSAS

SL. NO.	PARAMETER	BHEL' s REQUIREMENT	SUPPLIER' S COMPLIANCE/ CONFIRMATION
1	TYPE	STAYPUT	YES / NO
2	MARKING	CE/VDE/UL/CSA/BIS with CML no.	YES / NO
3	CURRENT RATING	10 A	YES / NO
4	WORKING VOLTAGE	440 VAC, 50Hz.	YES / NO
5	NO.OF POSITIONS	6	YES / NO
6	LOCKING	NOT REQUIRED	YES / NO
7	HANDLE	KNOB TYPE	YES / NO
8	DEGREE OF ROTATION	60 DEGREE	YES / NO
9	INDICATING PLATE SIZE	75x75 or 64x80	Size-_____
10	DRILLING PLAN DRAWING	CSA or CSAS	DP Ref. _____
11	TERMINAL MARKING	6 terminals - R,Y,B,N,V1,V2	YES / NO
12	MAIN LABEL	VOLTMETER SWITCH	YES / NO
13	SWITCHING SEQUENCE, LABEL & TERMINAL MARKING		
	POSITION-1	0 DEG. RN	YES / NO
	POSITION-2	+60 Deg. YN	YES / NO
	POSITION-3	+120Deg. BN	YES / NO
	POSITION-4	180 Deg. RY	YES / NO
	POSITION-5	-120Deg. YB	YES / NO
	POSITION-6	-60 Deg. BR	YES / NO

**NOTES**

1.	The switch shall be ROTARY TYPE with nylon material.	YES / NO
2.	Switch shall be suitable for mounting on 3.2 mm thick sheet steel panel.	YES / NO
3.	Terminals and screws shall be accessible from back of panel with open terminals.	YES / NO
4.	Switch shall comply with relevant clauses of <b>IS:4064-1978 / IS:6875-1973</b> in all respect.	YES / NO
5.	Unless and otherwise specified, colour of handle and indicating plate shall be black and grey respectively.	YES / NO
6.	Type test reports as per relevant IS shall be furnished on demand.	YES / NO



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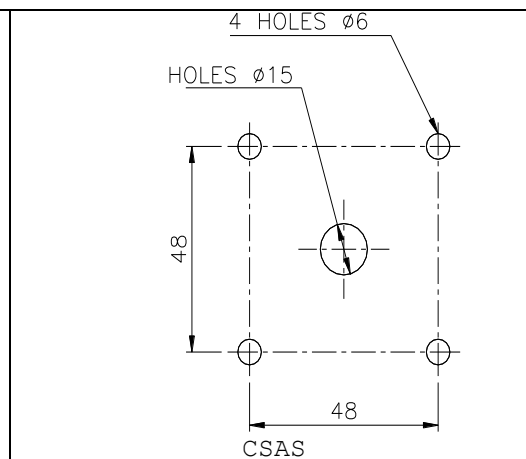
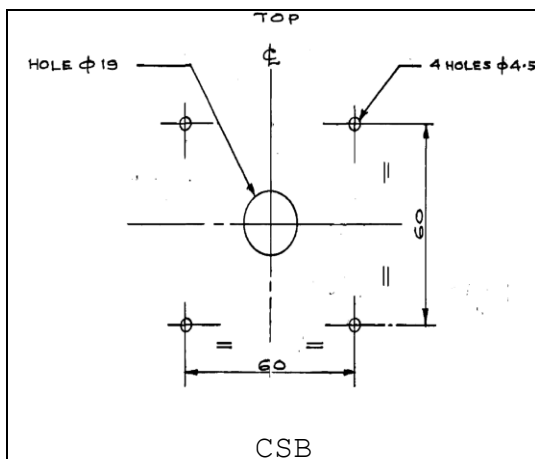
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### ITEM-006 : BREAKER CONTROL SWITCH

#### STOCK DETAILS :

BP9049113257 - FOR INDICATING PLATE - 72.5x72.5 & DRILLING PLAN DRG.CSB  
 BP9049113516 - FOR INDICATING PLATE - 64x80 & DRILLING PLAN DRG.CSAS

SL. NO.	PARAMETER	BHEL's REQUIREMENT	SUPPLIER'S COMPLIANCE/CONFIRMATION
1	TYPE	SPRING RETURN TO NEUTRAL	YES / NO
2	MARKING	CE/VDE/UL/CSA/BIS with CML no.	YES / NO
3	CURRENT RATING	25 A	YES / NO
4	WORKING VOLTAGE	660VAC/DC, 50Hz.	YES / NO
5	NO.OF POSITIONS	3	YES / NO
6	LOCKING	NOT REQUIRED	YES / NO
7	HANDLE	PISTOL GRIP TYPE	YES / NO
8	DEGREE OF ROTATION	60 DEGREE	YES / NO
9	INDICATING PLATE SIZE	72.5x72.5 or 64x80	Size-_____
10	DRILLING PLAN DRAWING	CSB or CSAS	DP Ref. _____
11	TERMINAL MARKING	AS BELOW	YES / NO
12	MAIN LABEL	BREAKER CONTROL SWITCH	YES / NO
13	SWITCHING SEQUENCE, LABEL & TERMINAL MARKING		
	POSITION-1	0DEG. NEUTRAL -	YES / NO
	POSITION-2	+60Deg. CLOSE 2-B, 4-D, 6-F	YES / NO
	POSITION-3	-60Deg. TRIP 1-A, 3-C, 5-E	YES / NO
NOTES			
1.	The switch shall be ROTARY TYPE with nylon material.		YES / NO
2.	Switch shall be suitable for mounting on 3.2 mm thick sheet steel panel.		YES / NO
3.	Terminals and screws shall be accessible from back of panel with open terminals.		YES / NO
4.	Switch shall comply with relevant clauses of IS:4064-1978 / IS:6875-1973 in all respect.		YES / NO
5.	Unless and otherwise specified, colour of handle and indicating plate shall be black and grey respectively.		YES / NO
6.	Type test reports as per relevant IS shall be furnished on demand.		YES / NO



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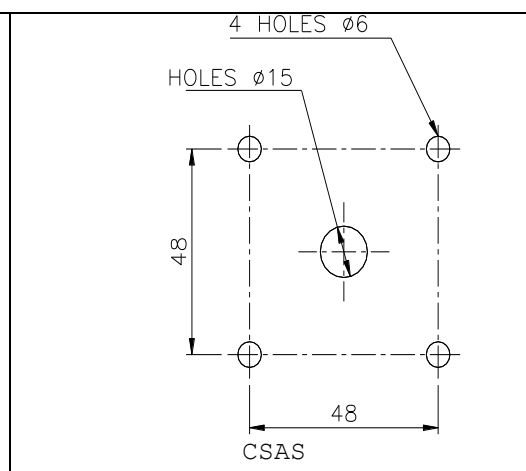
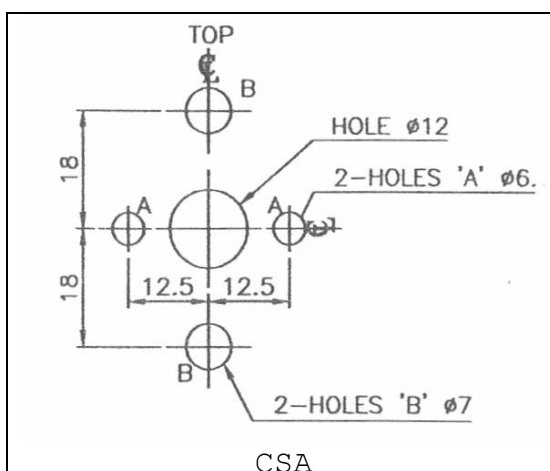
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### ITEM-007 : LOCAL/REMOTE SELECTOR SWITCH (NON LOCKABLE)

#### STOCK DETAILS :

BP9049113427 - FOR INDICATING PLATE - 75x75 & DRILLING PLAN DRG.CSA  
 BP9049113524 - FOR INDICATING PLATE - 64x80 & DRILLING PLAN DRG.CSAS

SL. NO.	PARAMETER		BHEL' s REQUIREMENT		SUPPLIER' S COMPLIANCE/ CONFIRMATION	
1	TYPE		STAYPUT		YES / NO	
2	MARKING		CE/VDE/UL/CSA/BIS with CML no.		YES / NO	
3	CURRENT RATING		25 A		YES / NO	
4	WORKING VOLTAGE		660VAC/DC, 50Hz.		YES / NO	
5	NO.OF POSITIONS		2		YES / NO	
6	LOCKING		NOT REQUIRED		YES / NO	
7	HANDLE		KNOB TYPE		YES / NO	
8	DEGREE OF ROTATION		90 DEGREE		YES / NO	
9	INDICATING PLATE SIZE		75x75 or 64x80		Size-_____	
10	DRILLING PLAN DRAWING		CSA or CSAS		DP Ref. _____	
11	TERMINAL MARKING		AS BELOW		YES / NO	
12	MAIN LABEL		SELECTOR SWITCH		YES / NO	
13	SWITCHING SEQUENCE, LABEL & TERMINAL MARKING					
	POSITION-1	0DEG.	LOCAL	1-A, 3-C, 5-E, 7-G	YES / NO	
	POSITION-2	+90Deg.	REMOTE	2-B, 4-D, 6-F, 8-H	YES / NO	
	POSITION-3	180Deg.	BLOCKED	-	YES / NO	
	POSITION-4	-90Deg.	BLOCKED	-	YES / NO	
NOTES						
1.	The switch shall be ROTARY TYPE with nylon material.				YES / NO	
2.	Switch shall be suitable for mounting on 3.2 mm thick sheet steel panel.				YES / NO	
3.	Terminals and screws shall be accessible from back of panel with open terminals.				YES / NO	
4.	Switch shall comply with relevant clauses of <b>IS:4064-1978 / IS:6875-1973</b> in all respect.				YES / NO	
5.	Unless and otherwise specified, colour of handle and indicating plate shall be black and grey respectively.				YES / NO	
6.	Type test reports as per relevant IS shall be furnished on demand.				YES / NO	



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### ITEM-008 : LOCAL/REMOTE SELECTOR SWITCH (LOCKABLE)

#### STOCK DETAILS :

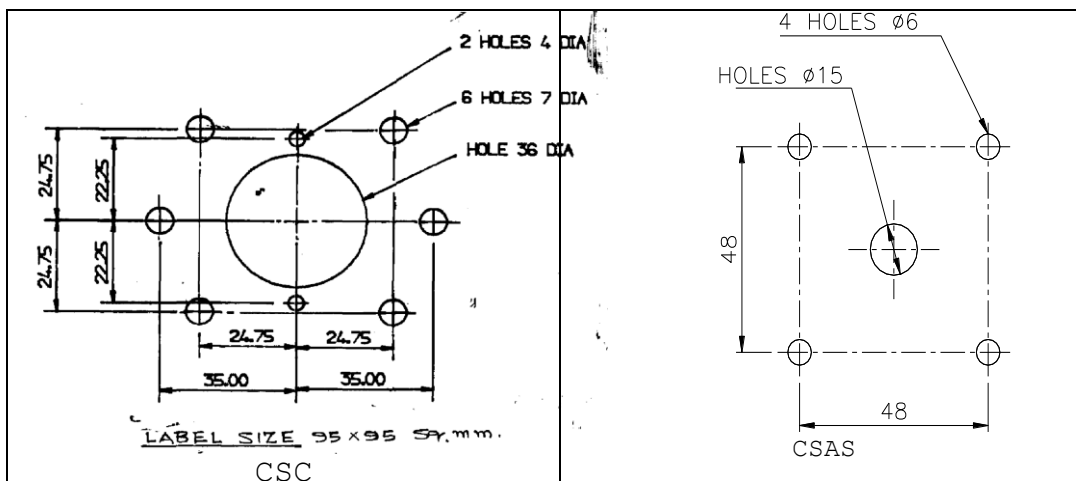
BP9049113265 - FOR INDICATING PLATE - 95x95 & DRILLING PLAN DRG.CSC  
BP9049113532 - FOR INDICATING PLATE - 64x80 & DRILLING PLAN DRG.CSAS

SL. NO.	PARAMETER	BHEL's REQUIREMENT	SUPPLIER'S COMPLIANCE/CONFIRMATION
1	TYPE	STAYPUT	YES / NO
2	MARKING	CE/VDE/UL/CSA/BIS with CML no.	YES / NO
3	CURRENT RATING	25 A	YES / NO
4	WORKING VOLTAGE	660VAC/DC, 50Hz.	YES / NO
5	NO.OF POSITIONS	2	YES / NO
6	LOCKING	REQUIRED IN BOTH POSITIONS	YES / NO
7	HANDLE	TEE TYPE WITH BARREL LOCKING	YES / NO
8	DEGREE OF ROTATION	90 DEGREE	YES / NO
9	INDICATING PLATE SIZE	95x95 or 64x80	Size-_____
10	DRILLING PLAN DRAWING	CSC or CSAS	DP Ref. _____
11	TERMINAL MARKING	AS BELOW	YES / NO
12	MAIN LABEL	*SELECTOR SWITCH	YES / NO
13	SWITCHING SEQUENCE, LABEL & TERMINAL MARKING		
	POSITION-1	0DEG. *LOCAL	1-A, 3-C, 5-E, 7-G YES / NO
	POSITION-2	+90Deg. *REMOTE	2-B, 4-D, 6-F, 8-H YES / NO
	POSITION-3	180Deg. BLOCKED	- YES / NO
	POSITION-4	-90Deg. BLOCKED	- YES / NO

For \*, please refer notes-6 & 7 on sht.01.

#### NOTES

1.	The switch shall be ROTARY TYPE with nylon material.	YES / NO
2.	Switch shall be suitable for mounting on 3.2 mm thick sheet steel panel.	YES / NO
3.	Terminals and screws shall be accessible from back of panel with open terminals.	YES / NO
4.	Switch shall comply with relevant clauses of <b>IS:4064-1978 / IS:6875-1973</b> in all respect.	YES / NO
5.	Unless and otherwise specified, colour of handle and indicating plate shall be black and grey respectively.	YES / NO
6.	Type test reports as per relevant IS shall be furnished on demand.	YES / NO
7.	Key shall be removable in locked position only.	YES / NO
8.	BP code shall be engraved on the switch & its packing case.	YES / NO



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### ITEM-009 : LOCAL/REMOTE/SCADA SELECTOR SWITCH

#### STOCK DETAILS :

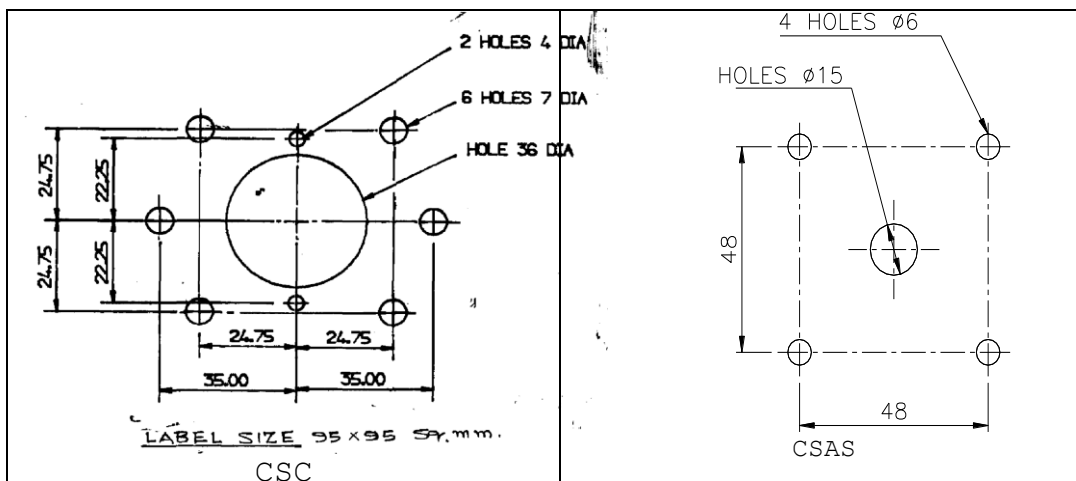
BP9049113273 - FOR INDICATING PLATE - 95x95 & DRILLING PLAN DRG.CSC  
 BP9049113540 - FOR INDICATING PLATE - 64x80 & DRILLING PLAN DRG.CSAS

SL. NO.	PARAMETER	BHEL's REQUIREMENT	SUPPLIER'S COMPLIANCE/CONFIRMATION		
1	TYPE	STAYPUT	YES / NO		
2	MARKING	CE/VDE/UL/CSA/BIS with CML no.	YES / NO		
3	CURRENT RATING	25 A	YES / NO		
4	WORKING VOLTAGE	660VAC/DC, 50Hz.	YES / NO		
5	NO.OF POSITIONS	3	YES / NO		
6	LOCKING	REQUIRED IN BOTH POSITIONS	YES / NO		
7	HANDLE	TEE TYPE WITH BARREL LOCKING	YES / NO		
8	DEGREE OF ROTATION	90 DEGREE	YES / NO		
9	INDICATING PLATE SIZE	95x95 or 64x80	Size-_____		
10	DRILLING PLAN DRAWING	CSC or CSAS	DP Ref. _____		
11	TERMINAL MARKING	AS BELOW	YES / NO		
12	MAIN LABEL	*CONTROL SELECTOR	YES / NO		
13	SWITCHING SEQUENCE, LABEL & TERMINAL MARKING				
	POSITION-1	0DEG.	*LOCAL	1-A, 4-D, 7-G, 10-J	YES / NO
	POSITION-2	+90Deg.	*REMOTE	2-B, 5-E, 8-H, 11-K	YES / NO
	POSITION-3	180Deg.	BLOCKED	-	YES / NO
	POSITION-4	-90Deg.	*SCADA	3-C, 6-F, 9-I, 12-M	YES / NO

For \*, please refer notes-6 & 7 on sht.01.

#### NOTES

1.	The switch shall be ROTARY TYPE with nylon material.	YES / NO
2.	Switch shall be suitable for mounting on 3.2 mm thick sheet steel panel.	YES / NO
3.	Terminals and screws shall be accessible from back of panel with open terminals.	YES / NO
4.	Switch shall comply with relevant clauses of <b>IS:4064-1978 / IS:6875-1973</b> in all respect.	YES / NO
5.	Unless and otherwise specified, colour of handle and indicating plate shall be black and grey respectively.	YES / NO
6.	Type test reports as per relevant IS shall be furnished on demand.	YES / NO
7.	Key shall be removable in locked position only.	YES / NO
8.	BP code shall be engraved on the switch & its packing case.	YES / NO



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### ITEM-010 : MOTOR HEATER SWITCH

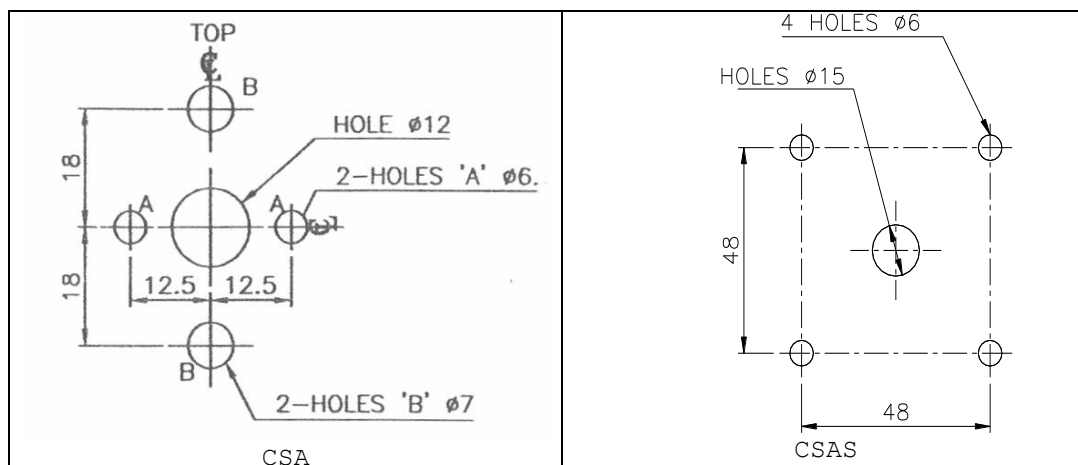
#### STOCK DETAILS :

BP9049113281- FOR INDICATING PLATE - 75x75 & DRILLING PLAN DRG.CSA  
BP9049113559- FOR INDICATING PLATE - 64x80 & DRILLING PLAN DRG.CSAS

SL. NO.	PARAMETER	BHEL's REQUIREMENT	SUPPLIER'S COMPLIANCE/ CONFIRMATION
1	TYPE	STAYPUT	YES / NO
2	MARKING	CE/VDE/UL/CSA/BIS with CML no.	YES / NO
3	CURRENT RATING	16 A	YES / NO
4	WORKING VOLTAGE	240 VAC, 50Hz.	YES / NO
5	NO.OF POSITIONS	2	YES / NO
6	LOCKING	NOT REQUIRED	YES / NO
7	HANDLE	KNOB TYPE	YES / NO
8	DEGREE OF ROTATION	90 DEGREE	YES / NO
9	INDICATING PLATE SIZE	75x75 or 64x80	Size- _____
10	DRILLING PLAN DRAWING	CSA or CSAS	DP Ref. _____
11	TERMINAL MARKING	AS BELOW	YES / NO
12	MAIN LABEL	MOTOR HEATER SUPPLY - MHS	YES / NO
13	SWITCHING SEQUENCE, LABEL & TERMINAL MARKING		
	POSITION-1	0DEG. OFF -	YES / NO
	POSITION-2	+90Deg. ON 1-A, 2-B, 3-C, 4-D	YES / NO
	POSITION-3	180Deg. BLOCKED -	YES / NO
	POSITION-4	-90Deg. BLOCKED -	YES / NO

#### NOTES

1.	The switch shall be ROTARY TYPE with nylon material.	YES / NO
2.	Switch shall be suitable for mounting on 3.2 mm thick sheet steel panel.	YES / NO
3.	Terminals and screws shall be accessible from back of panel with open terminals.	YES / NO
4.	Switch shall comply with relevant clauses of <b>IS:4064-1978 / IS:6875-1973</b> in all respect.	YES / NO
5.	Unless and otherwise specified, colour of handle and indicating plate shall be black and grey respectively.	YES / NO
6.	Type test reports as per relevant IS shall be furnished on demand.	YES / NO



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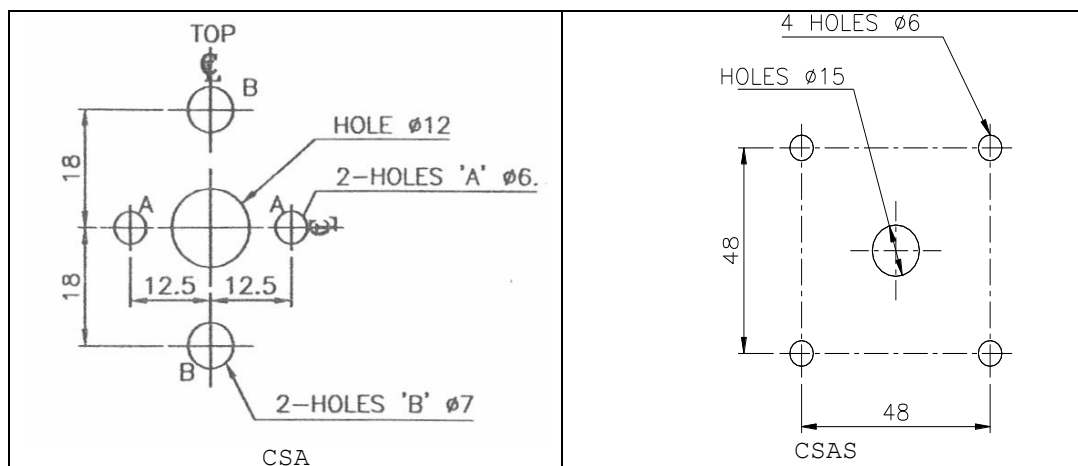
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### ITEM-011 : 240 VAC SUPPLY ON/OFF SWITCH

#### STOCK DETAILS :

BP9049113290- FOR INDICATING PLATE - 75x75 & DRILLING PLAN DRG.CSA  
BP9049113567- FOR INDICATING PLATE - 64x80 & DRILLING PLAN DRG.CSAS

SL. NO.	PARAMETER	BHEL's REQUIREMENT	SUPPLIER'S COMPLIANCE/ CONFIRMATION
1	TYPE	STAYPUT	YES / NO
2	MARKING	CE/VDE/UL/CSA/BIS with CML no.	YES / NO
3	CURRENT RATING	16 A	YES / NO
4	WORKING VOLTAGE	240 VAC, 50Hz.	YES / NO
5	NO.OF POSITIONS	2	YES / NO
6	LOCKING	NOT REQUIRED	YES / NO
7	HANDLE	KNOB TYPE	YES / NO
8	DEGREE OF ROTATION	90 DEGREE	YES / NO
9	INDICATING PLATE SIZE	75x75 or 64x80	Size- _____
10	DRILLING PLAN DRAWING	CSA or CSAS	DP Ref. _____
11	TERMINAL MARKING	AS BELOW	YES / NO
12	MAIN LABEL	240 VAC SUPPLY	YES / NO
13	SWITCHING SEQUENCE, LABEL & TERMINAL MARKING		
	POSITION-1	0DEG. OFF -	YES / NO
	POSITION-2	+90Deg. ON 1-A, 2-B, 3-C, 4-D	YES / NO
	POSITION-3	180Deg. BLOCKED -	YES / NO
	POSITION-4	-90Deg. BLOCKED -	YES / NO
NOTES			
1.	The switch shall be ROTARY TYPE with nylon material.		YES / NO
2.	Switch shall be suitable for mounting on 3.2 mm thick sheet steel panel.		YES / NO
3.	Terminals and screws shall be accessible from back of panel with open terminals.		YES / NO
4.	Switch shall comply with relevant clauses of <b>IS:4064-1978 / IS:6875-1973</b> in all respect.		YES / NO
5.	Unless and otherwise specified, colour of handle and indicating plate shall be black and grey respectively.		YES / NO
6.	Type test reports as per relevant IS shall be furnished on demand.		YES / NO



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# PRODUCT STANDARD

## SWITCHGEAR ENGINEERING DIVISION

SG12643 REV.04

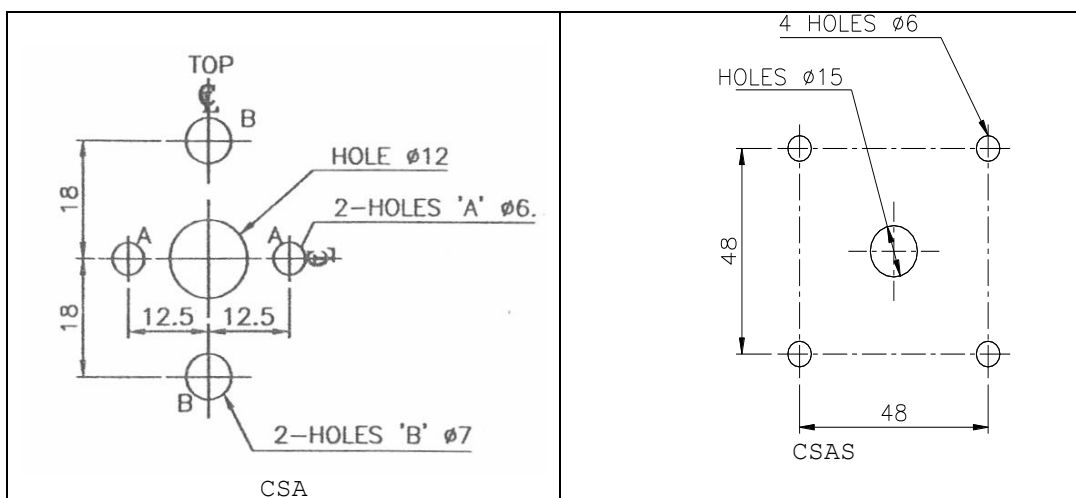
PAGE 13 OF 19

### ITEM-012 : 220 VDC SUPPLY ON/OFF SWITCH

#### STOCK DETAILS :

BP9049113303- FOR INDICATING PLATE - 75x75 & DRILLING PLAN DRG.CSA  
 BP9049113575- FOR INDICATING PLATE - 64x80 & DRILLING PLAN DRG.CSAS

SL. NO.	PARAMETER	BHEL' s REQUIREMENT	SUPPLIER' S COMPLIANCE/ CONFIRMATION
1	TYPE	STAYPUT	YES / NO
2	MARKING	CE/VDE/UL/CSA/BIS with CML no.	YES / NO
3	CURRENT RATING	16 A	YES / NO
4	WORKING VOLTAGE	250 VDC, 50Hz.	YES / NO
5	NO.OF POSITIONS	2	YES / NO
6	LOCKING	NOT REQUIRED	YES / NO
7	HANDLE	KNOB TYPE	YES / NO
8	DEGREE OF ROTATION	90 DEGREE	YES / NO
9	INDICATING PLATE SIZE	75x75 or 64x80	Size-_____
10	DRILLING PLAN DRAWING	CSA or CSAS	DP Ref. _____
11	TERMINAL MARKING	AS BELOW	YES / NO
12	MAIN LABEL	220 VDC SUPPLY	YES / NO
13	SWITCHING SEQUENCE, LABEL & TERMINAL MARKING		
	POSITION-1	0DEG. OFF -	YES / NO
	POSITION-2	+90Deg. ON 1-A, 2-B, 3-C, 4-D	YES / NO
	POSITION-3	180Deg. BLOCKED -	YES / NO
	POSITION-4	-90Deg. BLOCKED -	YES / NO
<b>NOTES</b>			
1.	The switch shall be ROTARY TYPE with nylon material.		YES / NO
2.	Switch shall be suitable for mounting on 3.2 mm thick sheet steel panel.		YES / NO
3.	Terminals and screws shall be accessible from back of panel with open terminals.		YES / NO
4.	Switch shall comply with relevant clauses of <b>IS:4064-1978 / IS:6875-1973</b> in all respect.		YES / NO
5.	Unless and otherwise specified, colour of handle and indicating plate shall be black and grey respectively.		YES / NO
6.	Type test reports as per relevant IS shall be furnished on demand.		YES / NO



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# PRODUCT STANDARD

## SWITCHGEAR ENGINEERING DIVISION

SG12643 REV.04

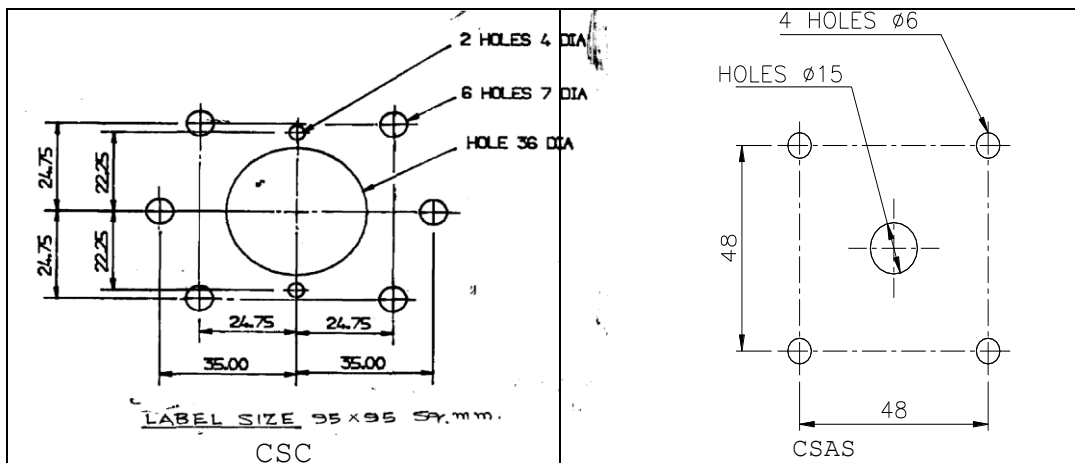
PAGE 14 OF 19

### ITEM-013 : MAIN A.C. SUPPLY SOURCE SELECTOR SWITCH

#### STOCK DETAILS :

BP9049113311 - FOR INDICATING PLATE - 95x95 & DRILLING PLAN DRG.CSC  
BP9049113583 - FOR INDICATING PLATE - 64x80 & DRILLING PLAN DRG.CSAS

SL. NO.	PARAMETER	BHEL's REQUIREMENT	SUPPLIER'S COMPLIANCE/CONFIRMATION
1	TYPE	STAYPUT	YES / NO
2	MARKING	CE/VDE/UL/CSA/BIS with CML no.	YES / NO
3	CURRENT RATING	40 A	YES / NO
4	WORKING VOLTAGE	240 VAC, 50Hz.	YES / NO
5	NO.OF POSITIONS	3	YES / NO
6	LOCKING	REQUIRED IN BOTH POSITIONS	YES / NO
7	HANDLE	TEE TYPE WITH BARREL LOCKING	YES / NO
8	DEGREE OF ROTATION	90 DEGREE	YES / NO
9	INDICATING PLATE SIZE	95x95 or 64x80	Size-_____
10	DRILLING PLAN DRAWING	CSC or CSAS	DP Ref. _____
11	TERMINAL MARKING	AS BELOW	YES / NO
12	MAIN LABEL	*MAIN 240 VAC SUPPLY	YES / NO
13	SWITCHING SEQUENCE, LABEL & TERMINAL MARKING		
	POSITION-1	0DEG. OFF -	YES / NO
	POSITION-2	+90Deg. *SOURCE-1	1-A, 3-C, 5-E, 7-G YES / NO
	POSITION-3	180Deg. BLOCKED -	YES / NO
	POSITION-4	-90Deg. *SOURCE-2	2-B, 4-D, 6-F, 8-H YES / NO
For *, please refer notes-6 & 7 on sht.01.			
NOTES			
1.	The switch shall be ROTARY TYPE with nylon material.		YES / NO
2.	Switch shall be suitable for mounting on 3.2 mm thick sheet steel panel.		YES / NO
3.	Terminals and screws shall be accessible from back of panel with open terminals.		YES / NO
4.	Switch shall comply with relevant clauses of IS:4064-1978 / IS:6875-1973 in all respect.		YES / NO
5.	Unless and otherwise specified, colour of handle and indicating plate shall be black and grey respectively.		YES / NO
6.	Type test reports as per relevant IS shall be furnished on demand.		YES / NO
7.	Key shall be removable in locked position only.		YES / NO
8.	BP code shall be engraved on the switch & its packing case.		YES / NO



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# PRODUCT STANDARD

## SWITCHGEAR ENGINEERING DIVISION

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### ITEM-014 : MAIN D.C. SUPPLY SOURCE SELECTOR SWITCH

#### STOCK DETAILS :

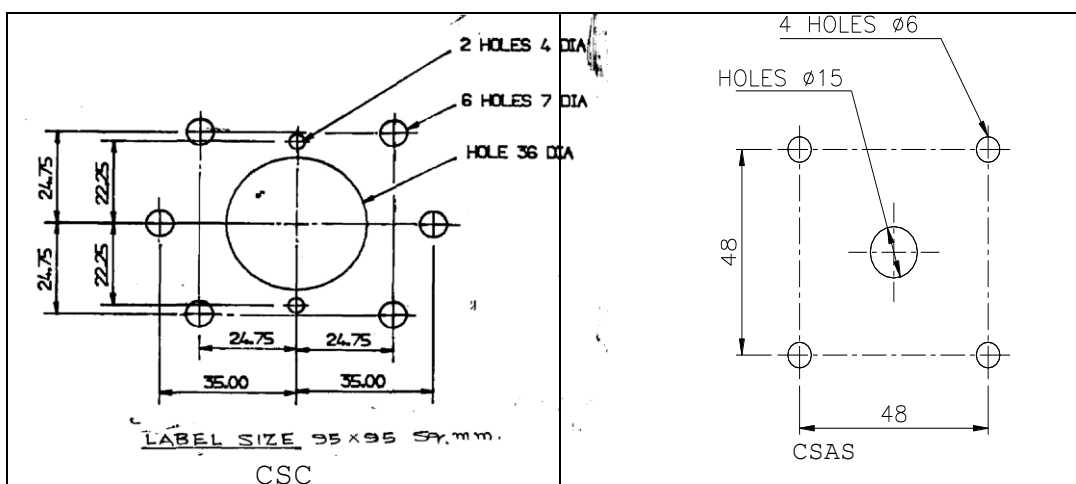
BP9049113320 - FOR INDICATING PLATE - 95x95 & DRILLING PLAN DRG.CSC  
BP9049113591 - FOR INDICATING PLATE - 64x80 & DRILLING PLAN DRG.CSAS

SL. NO.	PARAMETER	BHEL' s REQUIREMENT	SUPPLIER' S COMPLIANCE/ CONFIRMATION
1	TYPE	STAYPUT	YES / NO
2	MARKING	CE/VDE/UL/CSA/BIS with CML no.	YES / NO
3	CURRENT RATING	40 A	YES / NO
4	WORKING VOLTAGE	250 VDC, 50Hz.	YES / NO
5	NO.OF POSITIONS	3	YES / NO
6	LOCKING	REQUIRED IN BOTH POSITIONS	YES / NO
7	HANDLE	TEE TYPE WITH BARREL LOCKING	YES / NO
8	DEGREE OF ROTATION	90 DEGREE	YES / NO
9	INDICATING PLATE SIZE	95x95 or 64x80	Size-_____
10	DRILLING PLAN DRAWING	CSC or CSAS	DP Ref. _____
11	TERMINAL MARKING	AS BELOW	YES / NO
12	MAIN LABEL	*MAIN 220 VDC SUPPLY	YES / NO
13	SWITCHING SEQUENCE, LABEL & TERMINAL MARKING		
	POSITION-1	0DEG. OFF -	YES / NO
	POSITION-2	+90Deg. *SOURCE-1	1-A, 3-C, 5-E, 7-G YES / NO
	POSITION-3	180Deg. BLOCKED -	YES / NO
	POSITION-4	-90Deg. *SOURCE-2	2-B, 4-D, 6-F, 8-H YES / NO

For \*, please refer notes-6 & 7 on sht.01.

#### NOTES

1.	The switch shall be ROTARY TYPE with nylon material.	YES / NO
2.	Switch shall be suitable for mounting on 3.2 mm thick sheet steel panel.	YES / NO
3.	Terminals and screws shall be accessible from back of panel with open terminals.	YES / NO
4.	Switch shall comply with relevant clauses of <b>IS:4064-1978 / IS:6875-1973</b> in all respect.	YES / NO
5.	Unless and otherwise specified, colour of handle and indicating plate shall be black and grey respectively.	YES / NO
6.	Type test reports as per relevant IS shall be furnished on demand.	YES / NO
7.	Key shall be removable in locked position only.	YES / NO
8.	BP code shall be engraved on the switch & its packing case.	YES / NO



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**PRODUCT STANDARD**  
**SWITCHGEAR ENGINEERING DIVISION**

ITEM-015 : 220 VDC SUPPLY MAIN SOURCE ON/OFF SWITCH

**STOCK DETAILS :**

BP9049113338 - FOR INDICATING PLATE - 95x95 & DRILLING PLAN DRG.CSC

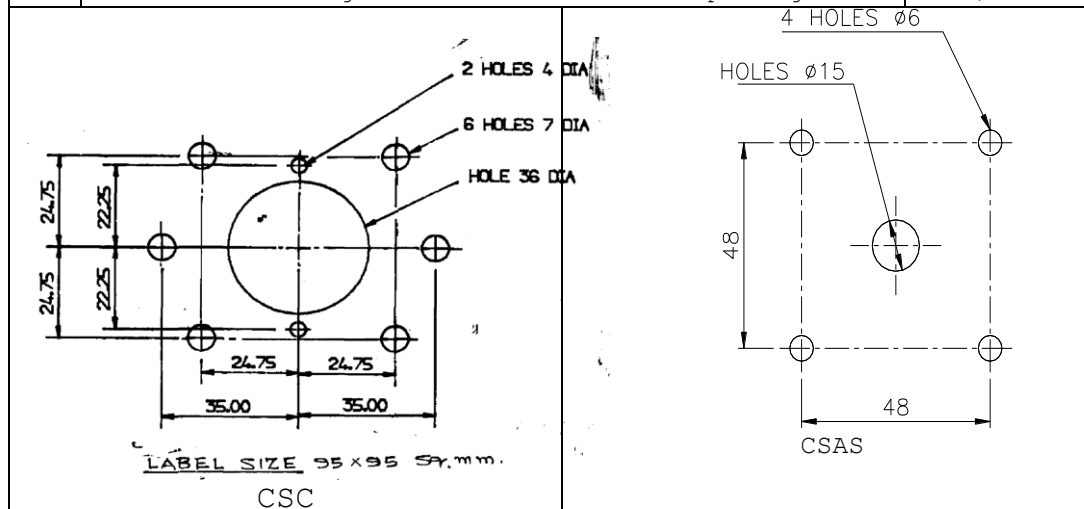
BP9049113605 - FOR INDICATING PLATE - 64X80 & DRILLING PLAN DRG.CSAS

SL. NO.	PARAMETER	BHEL's REQUIREMENT	SUPPLIER'S COMPLIANCE/CONFIRMATION
1	TYPE	STAYPUT	YES / NO
2	MARKING	CE/VDE/UL/CSA/BIS with CML no.	YES / NO
3	CURRENT RATING	40 A	YES / NO
4	WORKING VOLTAGE	250VAC/DC, 50Hz.	YES / NO
5	NO.OF POSITIONS	2	YES / NO
6	LOCKING	REQUIRED IN BOTH POSITIONS	YES / NO
7	HANDLE	TEE TYPE WITH BARREL LOCKING	YES / NO
8	DEGREE OF ROTATION	90 DEGREE	YES / NO
9	INDICATING PLATE SIZE	95x95 or 64x80	Size-_____
10	DRILLING PLAN DRAWING	CSC or CSAS	DP Ref. _____
11	TERMINAL MARKING	AS BELOW	YES / NO
12	MAIN LABEL	*MAIN 220 VDC SUPPLY	YES / NO
13	SWITCHING SEQUENCE, LABEL & TERMINAL MARKING		
	POSITION-1	0DEG. *OFF	- YES / NO
	POSITION-2	+90Deg. *ON	1-A, 2-B, 3-C, 4-D YES / NO
	POSITION-3	180Deg. BLOCKED	- YES / NO
	POSITION-4	-90Deg. BLOCKED	- YES / NO

For \*, please refer notes-6 & 7 on sht.01.

## NOTES

1.	The switch shall be ROTARY TYPE with nylon material.	YES / NO
2.	Switch shall be suitable for mounting on 3.2 mm thick sheet steel panel.	YES / NO
3.	Terminals and screws shall be accessible from back of panel with open terminals.	YES / NO
4.	Switch shall comply with relevant clauses of <b>IS:4064-1978 / IS:6875-1973</b> in all respect.	YES / NO
5.	Unless and otherwise specified, colour of handle and indicating plate shall be black and grey respectively.	YES / NO
6.	Type test reports as per relevant IS shall be furnished on demand.	YES / NO
7.	Key shall be removable in locked position only.	YES / NO
8.	BP codes shall be engraved on the switch & its packing case.	YES / NO



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# PRODUCT STANDARD

## SWITCHGEAR ENGINEERING DIVISION

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**ITEM-016 : SYNCHRONISATION SELECTOR SWITCH****STOCK DETAILS :**

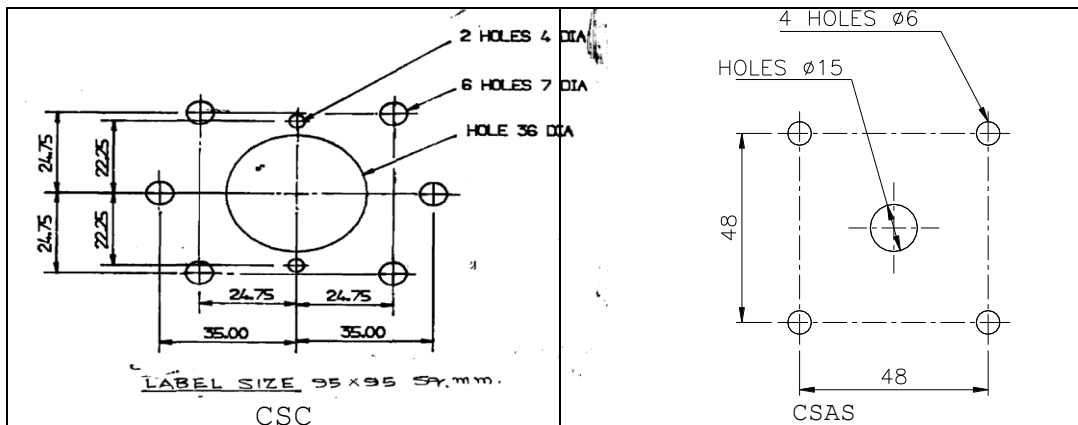
BP9049113346 - FOR INDICATING PLATE - 95x95 & DRILLING PLAN DRG.CSC  
 BP9049113613 - FOR INDICATING PLATE - 64x80 & DRILLING PLAN DRG.CSAS

SL. NO.	PARAMETER	BHEL's REQUIREMENT	SUPPLIER'S COMPLIANCE/ CONFIRMATION		
1	TYPE	STAYPUT	YES / NO		
2	MARKING	CE/VDE/UL/CSA/BIS with CML no.	YES / NO		
3	CURRENT RATING	10 A	YES / NO		
4	WORKING VOLTAGE	240 VAC, 50Hz.	YES / NO		
5	NO.OF POSITIONS	4	YES / NO		
6	LOCKING	REQUIRED IN BOTH POSITIONS	YES / NO		
7	HANDLE	TEE TYPE WITH BARREL LOCKING	YES / NO		
8	DEGREE OF ROTATION	90 DEGREE	YES / NO		
9	INDICATING PLATE SIZE	95x95 or 64x80	Size-_____		
10	DRILLING PLAN DRAWING	CSC or CSAS	DP Ref. _____		
11	TERMINAL MARKING	AS BELOW	YES / NO		
12	MAIN LABEL	*SYNCHRONISATION SELECTOR SWITCH	YES / NO		
13	SWITCHING SEQUENCE, LABEL & TERMINAL MARKING				
	POSITION-1	0DEG.	*SYNC I/C-2	1-A, 4-D, 7-G, 10-J, 13-N	YES / NO
	POSITION-2	+90Deg.	*SYNC I/C-1	2-B, 5-E, 8-H, 11-K, 14-O	YES / NO
	POSITION-3	180Deg.	OFF	-	YES / NO
	POSITION-4	-90Deg.	*SYNC BC	3-C, 6-F, 9-I, 12-M, 15-P	YES / NO

For \*, please refer notes-6 &amp; 7 on sht.01.

**NOTES**

1.	The switch shall be ROTARY TYPE with nylon material.	YES / NO
2.	Switch shall be suitable for mounting on 3.2 mm thick sheet steel panel.	YES / NO
3.	Terminals and screws shall be accessible from back of panel with open terminals.	YES / NO
4.	Switch shall comply with relevant clauses of <b>IS:4064-1978 / IS:6875-1973</b> in all respect.	YES / NO
5.	Unless and otherwise specified, colour of handle and indicating plate shall be black and grey respectively.	YES / NO
6.	Type test reports as per relevant IS shall be furnished on demand.	YES / NO
7.	Key shall be removable in locked position only.	YES / NO
8.	BP code shall be engraved on the switch & its packing case.	YES / NO



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# PRODUCT STANDARD

## SWITCHGEAR ENGINEERING DIVISION

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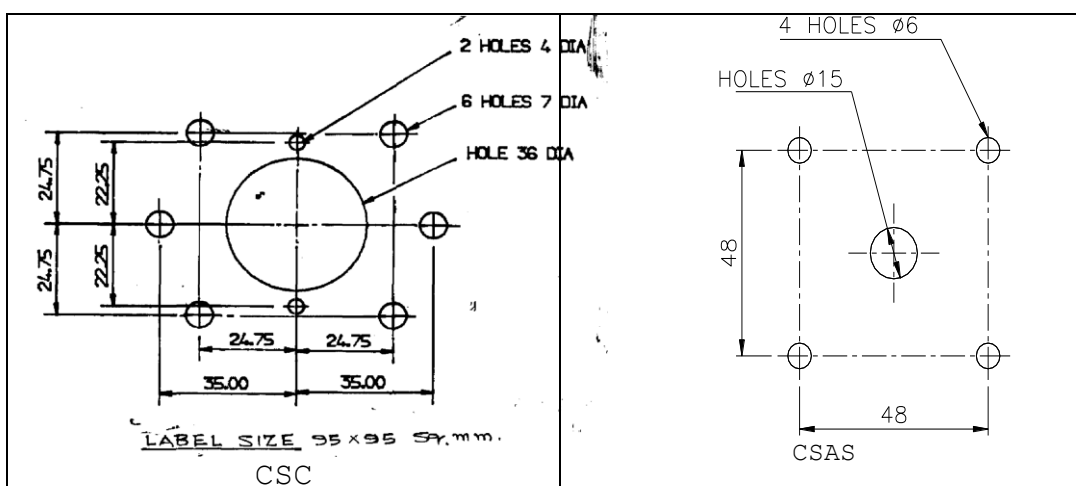
### ITEM-017 : BAKELITE INDICATING PLATE WITH ENGRAVING

#### STOCK DETAILS :

- BP9049119077 - FOR INDICATING PLATE - 95x95 & DRILLING PLAN DRG.CSC  
BP9049119085 - FOR INDICATING PLATE - 64x80 & DRILLING PLAN DRG.CSAS

#### ENGRAVING DETAILS SHALL BE GIVEN IN THE FORMAT BELOW -

SL. NO.	PARAMETER	BHEL's REQUIREMENT	SUPPLIER'S COMPLIANCE/ CONFIRMATION
1	LOCKING	LOCKABLE	YES / NO
2	MARKING	CE/VDE/UL/CSA/BIS with CML no.	YES / NO
3	MAIN LABEL	As per Annexure (projectwise) Refer notes-6 & 7 on sht.01	YES / NO
4	INDICATING PLATE SIZE	95x95 or 64x80	Size- _____
5	DRILLING PLAN DRAWING	CSC or CSAS	DP Ref. _____
6	SWITCHING SEQUENCE, TERMINAL MARKING & LABEL		
	POSITION-1	0DEG.	Refer notes-6&7 on sht.1
	POSITION-2	+90Deg.	Refer notes-6&7 on sht.1
	POSITION-3	180Deg.	Refer notes-6&7 on sht.1
	POSITION-4	-90Deg.	Refer notes-6&7 on sht.1
NOTES			
1.	Suitable for lockable / non lockable switch		YES / NO
2.	Indicating plates are suitable for using alongwith switches supplied against items-8, 9, 13, 14, 15 & 16.		YES / NO
3.	Plates shall be supplied without engraving. However, vendor to take back the plates, whenever required, and supply engraved plates as per the details furnished alongwith the plates, within 15 days.		YES / NO



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# PRODUCT STANDARD

## SWITCHGEAR ENGINEERING DIVISION

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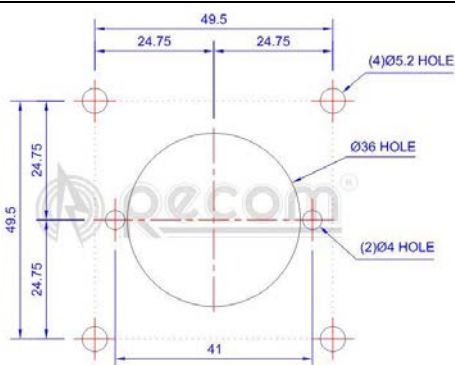
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### ITEM-018 : BREAKER CONTROL SWITCH (LOCKABLE)

#### STOCK DETAILS :

BP9049485081- FOR INDICATING PLATE - 75x75 &amp; DRILLING PLAN DRG.CS-T

SL. NO.	PARAMETER	BHEL's REQUIREMENT	SUPPLIER'S COMPLIANCE/ CONFIRMATION
1	TYPE	SPRING RETURN TO NEUTRAL	YES / NO
2	MARKING	CE/VDE/UL/CSA /BIS with CML no.	YES / NO
3	CURRENT RATING	25 A	YES / NO
4	WORKING VOLTAGE	660VAC/DC, 50Hz.	YES / NO
5	NO.OF POSITIONS	3	YES / NO
6	LOCKING	REQUIRED IN NEUTRAL POSITION	YES / NO
7	HANDLE	PISTOL GRIP TYPE	YES / NO
8	DEGREE OF ROTATION	45/60 DEGREE	YES / NO
9	INDICATING PLATE SIZE	75x75 or 64x80	Size-_____
10	DRILLING PLAN DRAWING	CS-T	DP Ref. _____ (For any other plan, approval to be obtained)
11	TERMINAL MARKING	AS BELOW	YES / NO
12	MAIN LABEL	BREAKER CONTROL SWITCH	YES / NO
13	SWITCHING SEQUENCE, LABEL & TERMINAL MARKING		
	POSITION-1	0DEG.	NEUTRAL - YES / NO
	POSITION-2	+45/60Deg.	CLOSE 2-B, 4-D YES / NO
	POSITION-3	-45/60Deg.	TRIP 1-A, 3-C YES / NO
NOTES			
1.	The switch shall be ROTARY TYPE with nylon material.		YES / NO
2.	Switch shall be suitable for mounting on 3.2 mm thick sheet steel panel.		YES / NO
3.	Terminals and screws shall be accessible from back of panel with open terminals.		YES / NO
4.	Switch shall comply with relevant clauses of <b>IS:4064-1978 / IS:6875-1973</b> in all respect.		YES / NO
5.	Unless and otherwise specified, colour of handle and indicating plate shall be black and grey respectively.		YES / NO
6.	Type test reports as per relevant IS shall be furnished on demand.		YES / NO



CS-T





# PRODUCT STANDARD

## SWITCHGEAR ENGINEERING DIVISION

SG 12647 REV-06

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### PLUG-IN TYPE AUXILIARY RELAY (24V DC) COMPLETE WITH BASE

#### 1 SCOPE & APPLICATION

This product standard covers the requirement of **24V DC** Interposing/coupling relay **K11 & K12** used for application of closing and tripping application of switchgears. These sensitive relays operate on 24V DC command from DDCMIS.

#### 2 APPLICABLE STANDARD

Plug-in-relay - IS 3231

#### 3 TECHNICAL PARAMETERS

SI No	Parameter		Rating
3.1	Coil rating	DC	24V DC
3.2	Contact Arrangement (Min. nos of Contacts)		4 C/O 2NO+2NC
3.3	Coil Burden		=<2.5 watts (max. 2.5 watts)
3.4	Contact rating	Make and carry continuous AC/DC	1250 VA/Watt with maximum of 660 V and 5 Amp
		Breaking Capacity (AC)	1250 VA with maximum of 660V and 5A.
		Breaking Capacity (DC Resistive)	100 Watts with a maximum of 220 V and 5 A
		Breaking Capacity (DC inductive)	50 Watts with a maximum of 220 V and 5 A and maximum time constant 45m sec.
3.5	No. of Operations	Mechanical Test	20 million operations
		Electrical	1 million operations
3.6	Insulation test		2 kV AC 50Hz for 1 min
3.7	Case		Relay shall be fitted with transparent cover with front or rear connection plug in base.
3.8	Mounting		Suitable for 35 mm DIN rail mounting or base mounted.
3.9	Operation indicator		Required
3.10	Special sockets/lugs		If required for wire termination on the relay shall be supplied in adequate qty along with the relay

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REV.	06	PRINTS TO :- Issued Online		APPROVED :-- NNS		
ALTD.	RR	Revised to delete ABB		PREPARED	ISSUED	DATE
APPD.	MAK			MLK	APS	31.01.07
DATE	07.06.16					



## PRODUCT STANDARD

### SWITCHGEAR ENGINEERING DIVISION

SG 12647 REV-06

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#### 4 Acceptance Criteria

- |     |   |
|-----|---|
| 4.1 | Type and No. of auxiliary contacts & auxiliary supply to be matched with order specification. |
| 4.2 | Visual check for defect free plug-in-relay.   |

#### 5 Equivalent Chart


	MAKE	TYPE
5.1	Jyoti make	RE302
5.2	Areva make	VAA11
5.3	Guardian make	11-Series (sensitive version)

#### Checklist to be filled by vendor.

SI No	Parameter		Rating	Compliance of Vendor (YES/NO)
6.1	Coil rating	DC	24V	
		AC(50HZ)	110V, 240V.	
6.2	Contact Arrangement (Min. nos of Contacts)		4 C/O or	
			2NO+2NC.	
6.3	Coil Burden		=<2.5 watts (max. 2.5 watts)	
6.4	Contact rating	Make and carry continuous AC/DC	1250 VA/Watt with maximum of 660 V and 5 Amp	
		Breaking Capacity (AC)	1250 VA with maximum of 660V and 5A.	
		Breaking Capacity (DC Resistive)	100 Watts with a maximum of 220 V and 5 A	
		Breaking Capacity (DC inductive)	50 Watts with a maximum of 220 V and 5 A and maximum time constant 45m sec.	
6.5	No. of Operations	Mechanical Test	20 million operations	
		Electrical	1 million operations	
6.6	Insulation test		2 kV AC 50Hz for 1 min	

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			<b>PRODUCT STANDARD</b> SWITCHGEAR ENGINEERING DIVISION		SG 12647 REV-06														
					PAGE 3 OF 3														
<b>COPYRIGHT AND CONFIDENTIAL</b>  The information on this document is the property of Bharat Heavy Electricals Limited It must not be used directly or indirectly in any way detrimental to interest of Co.	6.7	Case	Relay shall be fitted with transparent cover with front or rear connection plug in base.																
	6.8	Mounting	Suitable for 35 mm DIN rail mounting or base mounted.																
	6.9	Operation indicator	Required																
	6.10	Special sockets/lugs	If required for wire termination on the relay shall be supplied in adequate qty along with the relay																
	<p>Please note that above check list shall be filled and enclosed with the offer. Any offer without duly filled checklist will not be entertained and will be reject technically without any further communication.</p> <p>BP Numbers for various voltage range:</p> <table border="1"> <thead> <tr> <th>S/No.</th> <th>Voltage</th> <th>BP Number</th> <th>Make</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>24V DC</td> <td>BP9049113397</td> <td>M/s Jyoti</td> </tr> <tr> <td>2</td> <td>24V DC</td> <td>BP9049123660</td> <td>M/s Guardian</td> </tr> <tr> <td>3</td> <td>24V DC</td> <td>BP9049123546</td> <td>M/s Areva</td> </tr> </tbody> </table> <p>Note: In case of order, vendor to submit one sample (of relays to be supplied) with order acceptance for physical verification by BHEL, before supply of bulk quantity.</p>				S/No.	Voltage	BP Number	Make	1	24V DC	BP9049113397	M/s Jyoti	2	24V DC	BP9049123660	M/s Guardian	3	24V DC	BP9049123546
S/No.	Voltage	BP Number	Make																
1	24V DC	BP9049113397	M/s Jyoti																
2	24V DC	BP9049123660	M/s Guardian																
3	24V DC	BP9049123546	M/s Areva																



# PRODUCT STANDARD

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### "TERMINAL BLOCKS & ITS ACCESSORIES"

#### 1.0 SCOPE

This standard covers specification and acceptance norms for the terminal blocks for use in Indoor, Outdoor switchgears, OLTC and control & relay panels.

#### 2.0 APPLICABLE STANDARD: IEC-60947-7-1 part-7

#### 3.0 SPECIFICATION :

##### 3.1 INSULATION MATERIAL

SL NO	INSULATION MATERIAL	PROPERTIES	COMPLIANCE (YES/ NO)
1	Polyamide 6.6	<ul style="list-style-type: none"> <li>Non corrosive</li> <li>Abrasion resistant</li> <li>Impact resistant</li> <li>Self extinguishing (FV2 OR VO according to UL94)</li> <li>Continuous temperature operating range of -35 to +105 deg. C</li> <li>Dielectric strength - 400 KV / cm</li> <li>Resistant to fuels, oils, detergents and adverse climatic condition.</li> <li>Insulation Resistance &gt;&gt;10M ohms.</li> <li>Resistant to surface discharge with CTI&gt;600 (IEC-60112)</li> <li>Excellent resistance to micro-organisms, bacteria, enzymes and termites.</li> </ul>	

##### 3.2 CONTACT MATERIAL & SURFACE

SL NO	SPECIFICATION REQUIREMENT	COMPLIANCE (YES/ NO)
1.	Contact material shall be of extra hard electrolytic copper or copper alloy having excellent conductivity & good chemical resistance against corrosion.	
2.	All Current carrying parts of the TB shall be of Non-ferrous material. Spring washers if used shall be of spring steel in view of its better property of spring action.	
3.	Contact Surface shall be tin/lead or nickel plated surface for excellent long term protection against corrosion and gas tight connection for consistency of the contact resistance.	
4.	Screw clamp shall be zinc plated and passivated to provide resistance to corrosion.	
5.	Flatness of base of channel to be done after punching/ bending.	

REV.

10

Major Revision details :

APPROVED :--

ALTD.

AK

NNS

APPD.

DP

Document revised to modify –  
1/ Type code table  
2/ Clause 4.0 (2)

PREPARED

ISSUED

DATE

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## 3.3 TYPE OF TERMINAL BLOCKS &amp; TB ASSEMBLY

ITEM NO	TYPE OF TERMINAL BLOCK	TECHNICAL REQUIREMENT	COMPLIANCE (YES / NO)	BP CODE (POLYAMIDE) (Ref Note 7)
001	Feed through terminal screw clamp  <i>Application: For AC/DC control wiring. (used in Indoor swgr and SAS. )</i>	<ul style="list-style-type: none"> <li>TYPE CODE:- (As per Table-1)</li> <li>Rated Voltage:660 Volts</li> <li>Rated Current:32Amps Continuous</li> <li>Max. pitch/thickness of TB : 8mm</li> <li>Suitable for connecting two wires of upto 2.5 sqmm lugged stranded copper conductors at each end with ease.</li> <li>Screws shall be captive.</li> <li>Suitable for both flat and pin/tubular type lugs</li> </ul>		BP9049120075
001A	End plate for Item-001	Material and color shall be same as that of above terminal blocks.		BP9049120130
001B	Horizontal Marker for Item-001 and packet/box quantity  1 to 10 ( _ nos) 11 to 20 ( _ nos) 21 to 30 ( _ nos) 31 to 40 ( _ nos) 41 to 50 ( _ nos) 51 to 60 ( _ nos) 61 to 70 ( _ nos) 71 to 80 ( _ nos) 81 to 90 ( _ nos) 91 to 100 ( _ nos)	<ul style="list-style-type: none"> <li>PVC marker shall have white background</li> <li>Each Box/Package of PVC markers shall contain 10 Strips of one type. Strip type shall be 1-10, 11-20, 21-30...etc, as mentioned at LHS. Each strip of PVC marker shall contain total 10 markers.</li> <li>One box = 100 markers.</li> </ul> <p><b><u>Strip wise box/package quantity to be mentioned by indenter in item description</u></b></p>		BP9049120164
001C	Top connected Insulated Two way shorting Link for Item-001	-Tin or nickel plated copper -Suitable for shorting two adjacent terminal blocks covered in item-001 above.		BP9049120113
001D	Top connected Insulated Three way Shorting Link for Item-001	-Tin or nickel plated copper -Suitable for shorting three adjacent terminal blocks covered in item-001 above.		BP9049122922
001E	Side connected Insulated Two way shorting Link for Item-001	-Tin or nickel plated copper -Suitable for shorting two adjacent terminal blocks covered in item-001 above.		BP9909128640

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ITEM NO	TYPE OF TERMINAL BLOCK	TECHNICAL REQUIREMENT	COMPLIANCE (YES / NO)	BP CODE (POLYAMIDE) (Ref Note 7)
002	Screw Driver Operated Stud type, <u>non-disconnecting type terminal block</u> with barrel nut to provide test sockets as monitoring points for test plugs.  <i>Application : For AC/DC control supply and relay twisted pair cable termination. (used in Indoor swgr, CRP and SAS. )</i>	<ul style="list-style-type: none"> <li>TYPE CODE:- (As per Table-1)</li> <li>Rated Voltage:660 Volts</li> <li>Rated Current:32Amps Continuous</li> <li>Max. pitch/thickness of TB : 10mm</li> <li>Suitable for connecting two wires of upto 2.5 sqmm lugged stranded copper conductors at each end with ease.</li> <li>Suitable for both Ring &amp; Fork type <b>M3 size</b> lugs</li> </ul>		BP9049120091
002A	End plate for Item-002	Material and color shall be same as that of above terminal blocks.		BP9049120148
002B	Horizontal Marker for Item-002 and packet/box quantity 1 to 10 ( _ nos) 11 to 20 ( _ nos) 21 to 30 ( _ nos) 31 to 40 ( _ nos) 41 to 50 ( _ nos) 51 to 60 ( _ nos) 61 to 70 ( _ nos) 71 to 80 ( _ nos) 81 to 90 ( _ nos)	<ul style="list-style-type: none"> <li>PVC marker shall have white background</li> <li>Each Box/Packet of PVC markers shall contain 10 Strips of one type. Strip type shall be 1-10, 11-20, 21-30...etc, as mentioned at LHS. Each strip of PVC marker shall contain total 10 markers.</li> <li>One box = 100 markers.</li> </ul> <p><b><u>Strip wise box/packet quantity to be mentioned by indenter in item description</u></b></p>		BP9049120172
002C	Insulated Two way open (fork) type Shorting Link for Item-002	Suitable for shorting two adjacent terminal blocks covered in item-002 above.		BP9049120199
002D	Insulated Three way open (Fork) type shorting Link for Item-002	Suitable for shorting three adjacent terminal blocks covered in item-002 above.		BP9049122825
002E	Protective Transparent shroud to cover 4 nos terminal blocks covered at item-002	Quantity shall be doubled incase shroud suitable for 2 terminal blocks is offered.		BP9049123965

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ITEM NO	TYPE OF TERMINAL BLOCK	TECHNICAL REQUIREMENT	COMPLIANCE (YES / NO)	BP CODE (POLYAMIDE) (Ref Note 7)
003	Screw Driver Operated Stud type, disconnecting type terminal block with barrel nut to provide test sockets as monitoring points for test plugs.  <i>Application : For PT/CT circuit. (used in Indoor swgr, CRP and SAS. )</i>	<ul style="list-style-type: none"> <li>TYPE CODE:- (As per Table-1)</li> <li>Rated Voltage:660 Volts</li> <li>Rated Current:32Amps Continuous</li> <li>Max. pitch/thickness of TB : 13mm</li> <li>Shall have sliding link type facility for disconnection without actually removing the wires.</li> <li>Suitable for connecting two wires of upto 4 sqmm lugged stranded copper conductors at each end with ease.</li> <li>Suitable for Ring type or Fork type M4 size lugs</li> </ul>		BP9049120105
003A	End plate for Item-003	Material and color shall be same as that of above terminal blocks.		BP9049120156
003B	Horizontal Marker for Item-003 and packet/box quantity 1 to 10 ( _ nos) 11 to 20 ( _ nos) 21 to 30 ( _ nos) 31 to 40 ( _ nos) 41 to 50 ( _ nos) 51 to 60 ( _ nos) 61 to 70 ( _ nos) 71 to 80 ( _ nos) 81 to 90 ( _ nos)	<ul style="list-style-type: none"> <li>PVC marker shall have white background</li> <li>Each Box/Package of PVC markers shall contain 10 Strips of one type. Strip type shall be 1-10, 11-20, 21-30...etc, as mentioned at LHS. Each strip of PVC marker shall contain total 10 markers.</li> <li>One box = 100 markers.</li> </ul> <p><b><u>Strip wise box/package quantity to be mentioned by indenter in item description</u></b></p>		BP9049120180
003C	Insulated Two way open (fork) type Shorting Link for Item-003	-Suitable for shorting two adjacent terminal blocks covered in item-003 above.		BP9049122841
003D	Insulated Three way open (fork) type shorting Link for Item-003	-Suitable for shorting three adjacent terminal blocks covered in item-003 above.		BP9049122850
003E	Protective Transparent shroud to cover 4 nos terminal blocks covered at item-003	Quantity shall be doubled incase shroud suitable for 2 terminal blocks is offered,		BP9049123981

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ITEM NO	TYPE OF TERMINAL BLOCK	TECHNICAL REQUIREMENT	COMPLIANCE (YES / NO)	BP CODE (POLYAMIDE) (Ref Note 7)
004	Screw Driver Operated Stud type, non-disconnecting type terminal block with barrel nut to provide test sockets as monitoring points for test plugs.  <i>Application: For AC/DC control supply and relay twisted pair cable termination. (used in outdoor swgr, and OLTC )</i>	<ul style="list-style-type: none"> <li>TYPE CODE:- (As per Table-1)</li> <li>Rated Voltage: 660 Volts</li> <li>Rated Current: 32 Amps Continuous</li> <li>Max. pitch/thickness of TB : 13mm</li> <li>Suitable for connecting two wires of upto 2.5 sqmm lugged stranded copper conductors at each end with ease.</li> <li>Suitable for both Ring &amp; Fork type M4 size lugs.</li> </ul>		BP9909128659
004A	End plate for Item-004	Material and color shall be same as that of above terminal blocks.		BP9909128667
004B	Horizontal Marker for Item-004 and packet/box quantity 1 to 10 ( _ nos) 11 to 20 ( _ nos) 21 to 30 ( _ nos) 31 to 40 ( _ nos) 41 to 50 ( _ nos)	<ul style="list-style-type: none"> <li>PVC marker shall have white background</li> <li>Each Box/Package of PVC markers shall contain 10 Strips of one type. Strip type shall be 1-10, 11-20, 21-30...etc, as mentioned at LHS. Each strip of PVC marker shall contain total 10 markers.</li> <li>One box = 100 markers.</li> </ul> <p><u>Strip wise box/package quantity to be mentioned by indenter in item description</u></p>		BP9909128675
004C	Insulated Two way open (fork) type Shorting Link for Item-004	-Suitable for shorting two adjacent terminal blocks covered in item-008 above.		BP9909128683
004D	Protective Transparent shroud to cover 4 nos terminal blocks covered at item-004	Quantity shall be doubled incase shroud suitable for 2 terminal blocks is offered.		BP9909128691

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ITEM NO	TYPE OF TERMINAL BLOCK	TECHNICAL REQUIREMENT	COMPLIANCE (YES / NO)	BP CODE (POLYAMIDE) (Ref Note 7)
005	Feed through terminal spring loaded screw clamp  <i>Application: For AC/DC control wiring. (Non preferred)</i>	<ul style="list-style-type: none"> <li>TYPE CODE:- (As per Table-1)</li> <li>Rated Voltage: 660 Volts</li> <li>Rated Current: 32 Amps Continuous</li> <li>Max. pitch/ thickness of TB : 8mm</li> <li>Suitable for connecting two wires of upto 2.5 sqmm lugged stranded copper conductors at each end with ease.</li> <li>Contact Material shall be of electrolytic copper or copper alloy with tin/nickel plated surface.</li> <li>Screw clamp shall be zinc plated and passivated to provide resistance to corrosion.</li> <li>Spring shall be of high quality austenitic chrome nickle spring steel (CrNi) or equivalent</li> <li>Suitable for hook type lugs</li> </ul>		BP9049120083
005A	End plate for Item-005	Material and color shall be same as that of above terminal blocks.		BP9049122779
005B	Horizontal Marker for Item-005 and packet/box quantity 1 to 10 ( ) nos) 11 to 20 ( ) nos) 21 to 30 ( ) nos) 31 to 40 ( ) nos) 41 to 50 ( ) nos) 51 to 60 ( ) nos) 61 to 70 ( ) nos) 71 to 80 ( ) nos) 81 to 90 ( ) nos) 91 to 100 ( ) nos)	<ul style="list-style-type: none"> <li>PVC marker shall have white background</li> <li>Each Box/Package of PVC markers shall contain 10 Strips of one type. Strip type shall be 1-10, 11-20, 21-30...etc, as mentioned at LHS. Each strip of PVC marker shall contain total 10 markers.</li> <li>One box = 100 markers.</li> </ul> <p><b><u>Strip wise box/package quantity to be mentioned by indenter in item description</u></b></p>		BP9049122795
005C	Front connected Insulated Two way Shorting Link for Item-005	-Tin or nickel plated copper -Suitable for shorting two adjacent terminal blocks covered in item-005 above.		BP9049122817
005D	Front connected Insulated Three way Shorting Link for Item-005	-Tin or nickel plated copper -Suitable for shorting two adjacent terminal blocks covered in item-005 above.		BP9049123949
005E	Side connected Insulated Two way shorting Link for Item-	-Tin or nickel plated copper -Suitable for shorting two adjacent terminal blocks covered in item-005		BP9909128705

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	005	above.		
ITEM NO	TYPE OF TERMINAL BLOCK	TECHNICAL REQUIREMENT	COMPLIANCE (YES / NO)	BP CODE (POLYAMIDE) (Ref Note 7)
006	Shrouded Screw Driver Operated Stud type, Non-Disconnecting type terminal block. <i>Application : For AC/DC control supply and relay twisted pair cable termination. (used in Indoor swgr NTPC jobs)</i>	TYPE: (Refer Table-1) <ul style="list-style-type: none"> <li>Rated Voltage:660 Volts</li> <li>Rated Current:32 Amps Continuous</li> <li>Max. pitch/ thickness of TB : 11mm</li> <li>Suitable for connecting two wires of upto 2.5 sq.mm. lugged stranded copper conductors at each end with ease.</li> <li>Screws/Studs shall be captive.</li> <li>Shall be suitable for ring /fork type lug.</li> </ul>		BP9049127185
006A	End plate for Item-006A	Material and color shall be same as that of above terminal blocks.		BP9049127193
006B	Horizontal Marker for Item-006 and packet/box quantity 1 to 10 ( _ nos) 11 to 20 ( _ nos) 21 to 30 ( _ nos) 31 to 40 ( _ nos) 41 to 50 ( _ nos) 51 to 60 ( _ nos) 61 to 70 ( _ nos) 71 to 80 ( _ nos) 81 to 90 ( _ nos) 91 to 100 ( _ nos)	<ul style="list-style-type: none"> <li>PVC marker shall have white background</li> <li>Each Box/Packet of PVC markers shall contain 10 Strips of one type. Strip type shall be 1-10, 11-20, 21-30...etc, as mentioned at LHS. Each strip of PVC marker shall contain total 10 markers.</li> <li>One box = 100 markers.</li> </ul> <u>Strip wise box/packet quantity to be mentioned by indenter in item description</u>		BP9049127207
006C	Insulated Two way open (fork) type Shorting Link for Item-006	-Tin or nickel plated copper -Suitable for shorting two adjacent terminal blocks covered in item-006 above.		BP9049127215
006D	Insulated Three way open (Fork) type shorting Link for Item-006	-Tin or nickel plated copper -Suitable for shorting three adjacent terminal blocks covered in item-006 above.		BP9049127223





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ITEM NO	TYPE OF TERMINAL BLOCK	TECHNICAL REQUIREMENT	COMPLIANCE (YES / NO)	BP CODE (POLYAMIDE) (Ref Note 7)
007	Shrouded Screw Driver Operated Stud type, disconnecting type terminal block with barrel nut to provide test sockets as monitoring points for test plugs. <i>Application : For PT/CT circuit. (used in Indoor swgr NTPC jobs)</i>	TYPE (Refer Table-1) <ul style="list-style-type: none"> <li>Rated Voltage: 660 Volts</li> <li>Rated Current: 32 Amps Continuous</li> <li>Max. pitch/thickness of TB : 13mm</li> <li>Suitable for connecting two wires of up to 4 sqmm lugged stranded copper conductors at each end with ease.</li> <li>Shall have sliding link type facility for disconnection without actually removing the wires.</li> <li>Screws/Studs shall be captive type.</li> <li>Shall be suitable for ring type lugs</li> </ul>		BP9049127231
007A	End plate for Item-007	Material and color shall be same as that of above terminal blocks.		BP9049127240
007B	Horizontal Marker for Item-007 and packet/box quantity 1 to 10 (___ nos) 11 to 20 (___ nos) 21 to 30 (___ nos) 31 to 40 (___ nos) 41 to 50 (___ nos) 51 to 60 (___ nos) 61 to 70 (___ nos) 71 to 80 (___ nos) 81 to 90 (___ nos) 91 to 100 (___ nos)	<ul style="list-style-type: none"> <li>PVC marker shall have white background</li> <li>Each Box/Package of PVC markers shall contain 10 Strips of one type. Strip type shall be 1-10, 11-20, 21-30...etc, as mentioned at LHS. Each strip of PVC marker shall contain total 10 markers.</li> <li>One box = 100 markers.</li> </ul> <p><u>Strip wise box/package quantity to be mentioned by indenter in item description</u></p>		BP9049127258
007C	Insulated Two way open (fork) type Shorting Link for Item-007	-Tin or nickel plated copper -Suitable for shorting two adjacent terminal blocks covered in item-007 above.		BP9049127266
007D	Insulated Three way open (fork) type Shorting Link for Item-007	-Tin or nickel plated copper -Suitable for shorting three adjacent terminal blocks covered in item-007 above.		BP9049127274
008	BLANK			

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ITEM NO	TYPE OF TERMINAL BLOCK	TECHNICAL REQUIREMENT	COMPLIANCE (YES / NO)	BP CODE (POLYAMIDE) (Ref Note 7)
009	Shrouded Stud type Terminal Block (25 sq.mm)	TYPE (Refer Table-1)		BP9049127330
	<i>Application: For termination of incoming AC/DC power supply cable of swbd. (used in Indoor swgr &amp; CRP)</i>	<ul style="list-style-type: none"> <li>Rated Voltage: 660 Volts</li> <li>Rated Current: 65Amps Continuous</li> <li>Max. pitch/thickness of TB : 20mm</li> <li>Suitable for 25sqmm Conductor</li> <li>Screws/Studs shall be captive type.</li> <li>Shall be suitable for ring type lugs</li> </ul>		
009A	End plate for Item-009A	Material and color shall be same as that of above terminal blocks.		BP9049127347
009B	Horizontal Marker for Item-009 and packet/box quantity 1 to 10 (___ nos) 11 to 20 (___ nos) 21 to 30 (___ nos)	<ul style="list-style-type: none"> <li>PVC marker shall have white background</li> <li>Each Box/Packet of PVC markers shall contain 10 Strips of one type. Strip type shall be 1-10, 11-20, 21-30...etc, as mentioned at LHS. Each strip of PVC marker shall contain total 10 markers.</li> <li>One box = 100 markers.</li> <li><u>Strip wise box/packet quantity to be mentioned by indenter in item description</u></li> </ul>		BP9049127355
010	End stop/clamp with screw	Suitable for channel type mentioned at It-011, 012 & 013		BP9049116531
011	TB mounting slotted DIN Channel (700mm length) as per drg no.45611150134, It-02 (For VM12-820 swgr & Outdoor swgr)	<ul style="list-style-type: none"> <li>Alkaline Zinc plated channel shall be suitable for offered TB's &amp; accessories.</li> <li>Channel shall be Yellow passivated to increase resistance to corrosion.</li> </ul>		BP9049127371
012	TB mounting slotted DIN Channel (1000mm length) as per drg no.45611150134, It-03 (For VM36 swgr +CRP)	<ul style="list-style-type: none"> <li>Alkaline Zinc plated channel shall be suitable for offered TB's &amp; accessories.</li> <li>Channel shall be Yellow passivated to increase resistance to corrosion.</li> </ul>		BP90499114250
013	TB mounting slotted DIN Channel (450 mm length) as per drg no.45611150134, It-04. (For OLTC)	<ul style="list-style-type: none"> <li>Alkaline Zinc plated channel shall be suitable for offered TB's &amp; accessories.</li> <li>Channel shall be Yellow passivated to increase resistance to corrosion.</li> </ul>		BP9909131323





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ITEM NO	TYPE OF TERMINAL BLOCK	TECHNICAL REQUIREMENT	COMPLIANCE (YES / NO)	BP CODE (POLYAMIDE) (Ref Note 7)
014	Terminal blocks Assembly Type-1 (For VM12 swgr)  (Not preferred)	Each Type-1 TB assembly shall be supplied with 80 nos TBs as per Item-001 (TB type shall be as per Table:1) mounted left to right on 1 no. suitable Slotted DIN TYPE TB mounting channel (Item-011), along with the 1 no end plate (item-001A) and 2 nos end stop/clamp (item-010), one on each side. All TBs shall be numbered both sides of TBs from left to right by Horizontal marker (Item-001B).		BP9049124046
015	Terminal blocks Assembly Type-2 (For VM12 swgr)  (Not preferred)	Each Type-2 TB assembly shall be supplied with 20 nos TBs as per item-003 & 30 nos TBs as per item-001 mounted left to right on 1 no. suitable Slotted DIN TYPE TB mounting channel (Item-011), along with the 2 no end plate item-003A and 001A and 2 nos end stop/clamp (item-010) one on each side. All TBs shall be numbered both sides of TBs from left to right by Horizontal marker Item-003B for TBs item-003 & Item-001B for TB item-001. (Item-003 shall be placed first and item-001 thereafter).		BP9049124054
016	Terminal blocks Assembly Type-3 (For VM12 swgr)  (Not preferred)	Each Type-3 TB assembly shall be supplied with 50 nos TBs as per item-001 & 10 nos TBs as per item-002 mounted left to right on 1 no. suitable Slotted DIN TYPE TB mounting channel (Item-011), along with the 2 no end plate item-002A and 003A and and 2 nos end stop/clamp (item-010) i.e one on each side. All TBs shall be numbered both sides of TBs from left to right by Horizontal marker Item-001B for TBs item-001 & Item-002B for TB item-002. (Item-001 shall be placed first and item-002 thereafter).		BP9909128730
017	Terminal blocks Assembly Type-4 (For VM36 swgr)  (Not preferred)	Each Type-4 TB assembly shall be supplied with 100 nos TBs as per Item-001 mounted left to right on 1 no. suitable Slotted DIN TYPE TB mounting channel (item-012), along with the 1 no end plate item-006A and 2 nos end stop/clamp (item-010) i.e one on each side. All TBs shall be numbered both sides of TBs from left to right by Horizontal marker Item-006B.		BP9909128748
018	Terminal blocks Assembly Type-5 (For VM36 swgr)  (Not preferred)	Each Type-5 TB assembly shall be supplied with 30 nos TBs as per item-003 & 40 nos TBs as per item-001 mounted left to right on 1 no. Slotted DIN TYPE TB mounting channel (item-012) along with the 1 no end plate item-001A and 2 nos end stop/clamp (item-010), one on each side. All TBs shall be numbered both sides of TBs from left to right by Horizontal marker Item-003B for TBs item-003 & Item-001B for TB item-001. (Item-003 shall be placed first and item-001 thereafter).		BP9909128756
019	Terminal blocks Assembly Type-6 (For O/D PVN swgr)	Each Type-6 TB assembly shall be supplied with 40 nos TBs as per Item-004 mounted left to right on 1 no. Slotted DIN TYPE TB mounting channel (item-011) along with the 1 no end plate item-004A and 2 nos end stop/clamp (item-010), one on each side. All TBs shall be numbered center of TBs from left to right by Horizontal marker Item-004B. As per drg. 45611150141, it-02, Rev-01		BP9909128764

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ITEM NO	TYPE OF TERMINAL BLOCK	TECHNICAL REQUIREMENT	COMPLIANCE (YES / NO)	BP CODE (POLYAMIDE) (Ref Note 7)
020	Terminal blocks Assembly Type-7 (For O/D PVN swgr)	Each Type-7 TB assembly shall be supplied with 25 nos TBs as per Item-004 mounted left to right on 1 no. Slotted DIN TYPE TB mounting channel (item-011) along with the 1 no end plate item-004A and 2 nos end stop/clamp (item-010), one on each side. All TBs shall be numbered center of TBs from left to right by Horizontal marker Item-004B. As per drg. 45611150141, IT-02, Rev-01.		BP9909128772
021	Terminal blocks Assembly Type-8 (For OLTC)	Each Type-8 TB assembly shall be supplied with 32 nos TBs as per Item-004 mounted left to right on 1 no. Slotted DIN TYPE TB mounting channel (item-013) along with the 1 no end plate item-004A and 2 nos end stop/clamp (item-010), one on each side. All TBs shall be numbered both sides or center of TBs from left to right by Horizontal marker Item-004B from 01 to 32. As per drg. 5670805, Rev-0.		BP9905160264
022	Terminal blocks Assembly Type-9 (For OLTC)	Each Type-7 TB assembly shall be supplied with 32 nos TBs as per Item-004 mounted left to right on 1 no. Slotted DIN TYPE TB mounting channel (item-013) along with the 1 no end plate item-004A and 2 nos end stop/clamp (item-010), one on each side. All TBs shall be numbered both sides or center of TBs from left to right by Horizontal marker Item-004B from 33 to 64. As per drg. 5670805, Rev-0.		BP9905160272
023	TB mounting slotted DIN Channel (625mm length) as per drg no.4561115013 4, IT-01 (For VM700 & GIS)	<ul style="list-style-type: none"> <li>Alkaline Zinc plated channel shall be suitable for offered TB's &amp; accessories.</li> <li>Channel shall be Yellow passivated to increase resistance to corrosion.</li> </ul>		BP9905160280
024	TB mounting DIN Channel (470 mm length) as per drg no.4561115013 4, IT-05 (For GIS swgr)	<ul style="list-style-type: none"> <li>Alkaline Zinc plated channel shall be suitable for offered TB's &amp; accessories.</li> <li>Channel shall be Yellow passivated to increase resistance to corrosion.</li> </ul>		BP9909133636

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### TABLE:1 --:- TYPE / CATALOGUE CODES

(For reference, vendor to ensure that offered TB and accessory meets the specification requirement)

S/N	TYPE OF TERMINAL BLOCKS	ELMEX	CONNECT WELL	Industrial Control	Phoenix Contact
1	FEED THROUGH TERMINAL BLOCK	KUT4BS	CTS4UNC R	TB4US	TB 4 EI
1a	End Plate for It-01	KPX	EP2.5/4UN	EP4US	D-TB 4/10 E
1b	Horizontal Marker for It-01	KN6.5	CA509/K6	TM2.5N	ZB 6
1c	Top connected Insulated Two way shorting Link for It-01	CCLA2.5-2W	CA742/2	IPSL2	FBI 2- 6
1d	Top connected Insulated Three way Shorting Link for Item-01	CCLA2.5-3W	CA742/3	IPSL3	FBI 3- 6
1e	Side connected Insulated Two way shorting Link for Item-01	SLC2.5-2W	CA713/2	IPSL2S	INB 10-6
2	STUD TYPE, NON DISCONNECTING (M3) TERMINAL BLOCK	KAT-M3-10	CSB3/N3U L	TBSS M3UN	RBO 3 SP/SP E
2a	End Plate for It-02	KPS4	EPCBS3U	EPMU	D-RSC 5-E
2b	Horizontal Marker for It-02	KN6.5	CA509/K9	TM2.5N	ZB 8
2c	Insulated Two way open (fork) type Shorting Link for Item-02	ASL1-2W	CA514/15-2	M3ISFL2	EB 2-9
2d	Insulated Three way open (Fork) type shorting Link for Item-02	ASL1-3W	CA514/15-3	M3ISFL3	EB 3-9
2e	Transparent Shroud for It-02	PCCM39 (L=39mm)	CSTSPC2-1	PCM3	AP-RSC
3	STUD TYPE, DISCONNECTING TERMINAL BLOCK	KLTD M4	CBDT4U	TBTD6U	
3a	End Plate for It-03	KPLD4	EPCBDT4U	EPTD6U	
3b	Horizontal Marker for It-03	KN5.5	CA509/K2B4	TM2.5N	
3c	Insulated Two way open (fork) type Shorting Link for Item-03	KDSL4-2W	CA514/2-2	M4IFSL2	
3d	Insulated Three way open (fork) type shorting Link for Item-03	KDSL4-3W	CA514/2-3	M4IFSL3	
3e	Transparent Shroud for It-03	PCD48 (L=48 mm)	601447	PC50	

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S/N	TYPE OF TERMINAL BLOCKS	ELMEX	CONNECT WELL	Industrial Control	Phoenix Contact
4	<b>STUD TYPE, NON DISCONNECTING (M4) TERMINAL BLOCK</b>	KAT M4	<u>CSB4/N4UN</u>	<u>TBSSM4U</u>	RSC 4-SP/SP E
4a	End Plate for It-04	<u>KPS4</u>	<u>EPCBS3U</u>	<u>EPMU</u>	D-RSC 5-E
4b	Horizontal Marker for It-04	<u>KN6.5</u>	<u>CA509/K6</u>	<u>TM2.5N</u>	ZB 8
4c	Insulated Two way open (fork) type Shorting Link for Item-04	<u>KSL4-2W</u>	<u>CA514/2-2</u>	<u>M4IFSL2</u>	EB 2-9
4d	Transparent Shroud for It-04	<u>PCCM52K (L=52mm)</u>	<u>CSTSPC2X</u>	<u>PCM3</u>	AP-RSC
5	<b>FEED THROUGH TERMINAL BLOCK (Spring loaded)</b>	<b>KST 4U WS</b>	<b>CTS4USC</b>	<b>TB4US</b>	<b>TB 4 EI</b>
5a	End Plate for It-05	KPX	EPUSC	EP4US	D-TB 4/10 E
5b	Horizontal Marker for It-05	KN6.5	<u>CA509/K6</u>	<u>TM2.5N</u>	ZB 6
5c	Front connected Insulated Two way Shorting Link for Item-005	CCLA2.5-2W	CA643/2	2.5IPSL2	FBI 2- 6
5d	Front connected Insulated Three way Shorting Link for Item-05	CCLA2.5-3W	CA643/3	2.5IPSL3	FBI 3- 6
5e	Side connected Insulated Two way shorting Link for Item-05	-	-	<u>IPSL2S</u>	INB 2-6
6	<b>SHROUDED STUD TYPE NON DISCONNECTING TERMINAL BLOCK</b>	OAT6	STH3	CTBSSM4U	OTTA 6
6a	End Plate for It-06	OEP6	EPSTH3	<u>EP-CMU</u>	D-OTTA 6
6b	Horizontal Marker for It-06	KN9	CA509/K8	<u>TM2.5N</u>	ZB 10
6c	Insulated Two way open (fork) type Shorting Link for Item-06	OSL6-2W	<u>CA514/15-2</u>	<u>CM4IFSL-2</u>	EB 2-OTTA 6
6d	Insulated Three way open (Fork) type shorting Link for Item-06	OSL6-3W	<u>CA514/15-3</u>	<u>CM4IFSL-3</u>	EB 3-OTTA 6
7	<b>SHROUDED STUD TYPE DISCONNECTING TERMINAL BLOCK</b>	OAT6T	<u>STH4DTNS</u>	CTBTD6U	OTTA 6-T
7a	End Plate for It-07	OEP6T	EPSTH4DT	<u>EP-CTD6U</u>	D-OTTA 6-T
7b	Horizontal Marker for It-07	KN9	CA509K10	<u>TM2.5N</u>	ZB 10
7c	Insulated Two way open (fork) type Shorting Link for Item-07	OSL6-2W	<u>CA514/13-2</u>	CM4IFSL-2	EB 2-OTTA 6
7d	Insulated Three way open (fork) type Shorting Link for Item-07	OSL6-3W	<u>CA514/13-3</u>	CM4IFSL-3	EB 3-OTTA 6
9	<b>SCREW DRIVER OPERATED STUD TYPE, (25SQ.MM ) TERMINAL BLOCK</b>	OAT25	STH6	CTBSSM6U	OTTA 25-M6
9a	End Plate for It-09	OEP25	EPSTH6	EPCMU	D-OTTA 25-M6
9b	Horizontal Marker for It-09	KN17	CA509/K16	<u>TM2.5N</u>	ZB 10
10	End stop/clamp with screw (It-10)	SCKN	CA702	ECU	E/TB

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**4.0 ACCEPTANCE NORMS**

SL. NO.	DESCRIPTION	BIDDERS COMPLIANCE (Yes / No)
1.	Color : GREY for Polyamide	
2.	Type Code: As per P.O / Approved samples during offer evaluation.	
3.	Sequential Marking of TBs in terminal blocks assemblies	
4.	Uniformity in mounting of TBs in terminal blocks assemblies	
5.	All Make Model of TB's shall have mark of <b>CE/VDE/UL/CSA</b>	
6.	Base of channels (It no 11 to 13 & 21) shall be checked for flatness and dimensions as per specification.	

**5.0 TESTING**

SL. NO.	Verification of the following properties based on test certificates from supplier:-	BIDDERS COMPLIANCE (Yes / No)
1.	Insulation Resistance $\geq 10$ M ohms.	
2.	Pull out force as per IEC.	
3.	Resistance to vibration: The TBs shall withstand pull tests under vibration with 12 Hz & 50 Hz frequency and amplitude of 1 mm.	
4.	Rated voltage withstand capability : 660V AC.	
5.	Surge Voltage (1.2 / 50 micro sec) withstand capability: 8 kV.	
6.	Voltage drop at rated current < 5 milli Volt.	
7.	Temperature rise at rated current < 45 deg. C.	
8.	Insulation inflammability test	

**6.0 GENERAL NOTES :**

SL. NO.	DESCRIPTION	BIDDERS COMPLIANCE (Yes / No)
1.	Specific confirmation against each item technical requirement is to be given, in the absence of which the offer may be rejected.	
2.	Offer to be submitted in two bid:- Technical and Price bid.	
3.	Two copies of descriptive leaflets and type test certificates of terminal blocks shall be furnished with the offer.	
4.	Consignment shall be inspected and tested (if required) in BHEL as per testing clauses in point 5.0 above.	
5.	The terminal block shall be suitable for clip-on to channel type (Din Type item-011/012/013) and it shall be possible to remove/change any terminal with ease from the stack without affecting the other terminals.	
6.	Five (5) Samples of terminal blocks along with accessories suitably connected with two lugged wires on each end and one (1) sample of	

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	terminal block assembly as per the specification shall be furnished with the offer for evaluation.	
7.	Insulating Material of all type of terminal blocks offered along with end plates shall be of Polyamide. Material type mixing is not acceptable.	
8.	Terminal blocks in terminal assembly shall be uniformly placed.	
9.	20 nos Terminal assemblies shall be packed in one box. TB assemblies shall be Properly packed to avoid any transit damage. Box shall have provision for easy handling. Proper marking shall be done indicating the Assembly Type, Type code for TB's, Material code, etc. clearly on each box.	
10.	Particular type of Terminal blocks and associated accessory under procurement shall be of same make and shall be procured from the same source in view of compatibility. Color of all the items shall be same.	
11.	All items of TB's shall have mark of <b>CE/VD/UL/CSA</b> , certificate in support of same shall be submitted with offer.	

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### INDICATING LAMPS - LED TYPE

**1.0 Note to suppliers:** Suppliers must fill and submit check list in the format given in Annexure-II alongwith the offer. Offers without completely filled check list shall not be evaluated. {Filament type indicating lamp is required for lamp covered by Sl No. 35}

#### **2.0 OBJECTIVES AND SCOPE :**

This product standard is issued to specify the technical requirements of heavy duty, industrial grade, oil & water tight, corrosion resistant LED type indicating lamps used in switchgears and control and relay panels. This standard shall be used for rate contract purpose or for stocking of indicating lamps. Annexure-I shall be used for selecting colours for different application. Annexure-I also gives information about yearly requirement & min. stock quantity.

#### **3.0 TECHNICAL PARAMETERS :**

- 3.1 **STANDARD :** Must Conform to IS:13947-5 / IEC-60947-5-1.
- 3.2 **Rated Voltages and various colour combinations** shall be as per Annexure - I.
- 3.3 **PANEL CUTOOUT :** Dia.22.5 mm.
- 3.4 **COLOUR IDENTIFICATION :** The lens colour to be same as LED.
- 3.5 **TERMINATION METHOD :** Screw terminals M3.5 size suitable for connecting. 2 Nos. 2.5 sqmm conductor.
- 3.6 **MATERIAL BODY :** Fire retardant. Material to be indicated by vendor.
- ADAPTER/BEZEL :** Fire retardant. Material to be indicated by vendor.
- LENS :** Fire retardant. Material to be indicated by vendor.
- 3.7 **LEDs :** The LEDs should be industrial grade with **built in fuse protection or surge protection and low voltage glow protection circuit.**  
(LVGP voltage values indicated in Annexure-II)
- 3.8 **ILLUMINATION :**  
100 mcd minimum in axial direction.  
(For sl.nos.1 to 19 & 25 to 35 of Annexure-I)  
25 mcd minimum in axial direction.  
(For sl.nos.20 to 24 of Annexure-I)
- 3.9 **OVER VOLTAGE :** The LEDs should be suitable for continuous over voltage of 20% of the rated voltage.
- 3.10 **AGEING :** The LEDs should be subjected to Burn-in-process for 24 hours at 300°C.

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REV.	10	PRINTS TO:-Issued Online	APPROVED –		
ALTD.	RR	Rev 10: Revised to update Make	R.K.Shukla		
APPD.	MAK		PREPARED	ISSUED	DATE
DATE.	01.06.22		NNS	RKK	23.3.00

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3.11 *DIELECTRIC STRENGTH* : 2.5kV for 1 min. between live parts and earth.

3.12 *OPERATING TEMPERATURE* : As per IS.

3.13 *POWER CONSUMPTION MAX* :  
AC : 0.5 VA  
DC : 1.75 W

3.14 *TERMINAL MARKING* : For D.C. lamps (+) & (-).  
For A.C. lamps 'P' and 'N'.  
For A.C./D.C. lamps (+) & (-).  
P & N.

3.15 *INSULATION RESISTANCE* : Min. 50 Mega Ohms when tested with a megger of 500 V D.C.

3.16 *NO. OF LEDS PER LAMP* : No. of LEDs should be sufficient (but in no case less than 2) to meet light output requirement as per clause 3.8 above. Suppliers to clearly indicate exact no. of LEDs used, in offers.

3.17 *CONSTRUCTION* : Flush mounted with rear terminal connection.  
**Non-Barrel type only (Barrel type NOT acceptable)**

~~3.18 MAKE~~ : As per PMD.

3.19 **LED INDICATING LAMPS SHALL BE CLUSTERED TYPE (WITH MIN. 2 NOS. LEDS CHIPS PER LIGHT PREFERABLY CONNECTED IN PARALLEL) AND EACH LED CHIP HAVING DIAMETER NOT LESS THAN 3 MM.**

3.20 **Indicating Lamp Should have the mark of CE/VDE/UL/CSA/BIS with CML NO. Printed on each Lamp.**

### 4.0 TESTS :

4.1 *TYPE TEST* : The lamps should be of proven design for the following type tests in line with applicable standard. Type test reports must be available with the vendors and should be submitted to BHEL on demand-

- i) Temperature Rise Test as per clause 8.3.3.3 of IS
- ii) Dielectric test.
- iii) Insulation Resistance Test.
- iv) Light out put in axial direction.
- v) Wattage consumption.
- vi) Low voltage glow protection test.
- vii) Fire retardant test on LED body and Lens.

A sample of each type of LED, for testing and approval, shall be submitted by vendors to BHEL on demand.

4.2 *ROUTINE TEST* : Routine test reports for the following tests should be submitted alongwith each lot -

- i) Dielectric test.
- ii) Power consumption.
- iii) Light out put test.
- iv) Low voltage glow protection test.



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### 5.0 ACCEPTANCE CRITERIA :

- i) Availability of all routine test certificates as per cl.4.2.
- ii) Visual examination for the defect free surface & finish.
- iii) Color of LED should be same as color of the lens.
- iv) Terminal marking as per clause 3.14 above.
- v) Illumination check for 100mcd
- vi) Guarantee certificate as per clause 6.0
- vii) Indicating Lamp Should have the mark of CE/VDE/UL/CSA/BIS with CML NO. on each Indicating Lamp.

### 6.0 PERFORMANCE GUARANTEE :

Supplier shall guarantee satisfactory performance of LEDs indicating lamps for a period of minimum 24 months after receipt at BHEL Bhopal or 18 months from the date of commissioning, whichever is later

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**ANNEXURE-I**

SL. NO	CODE NO.	VOLTAGE	COLOUR	Approx MIN. STOCK QTY.	APPLICATION
1	BP9049118941	110VDC/AC	RED	50	C.B. CLOSED
2	BP9049118950	110VDC/AC	GREEN	50	C.B. OPEN
3	BP9049118968	110VDC/AC	AMBER	100	D.C. FAIL, AUTO TRIP, SERVICE POSN
4	BP9049118976	110VDC/AC	CLEAR WHITE	60	TRIP CIRCUIT HEALTHY, TEST POSN
5	BP9049118984	110VDC/AC	BLUE	60	SPRING CHARGED
6	BP9049118992	220VDC/AC	RED	150	C.B. CLOSED
7	BP9049119000	220VDC/AC	GREEN	150	C.B. OPEN
8	BP9049119018	220VDC/AC	AMBER	130	D.C. FAIL, AUTO TRIP, SERVICE POSN
9	BP9049919026	220VDC/AC	CLEAR WHITE	100	TRIP CIRCUIT HEALTHY, TEST POSN
10	BP9049119034	220VDC/AC	BLUE	80	SPRING CHARGED
11	BP9049118895	110VAC	RED	30	P.T. R-PHASE HEALTHY
12	BP9049119638	110VAC	YELLOW	30	P.T. Y-PHASE HEALTHY
13	BP9049118933	110VAC	BLUE	30	P.T. B-PHASE HEALTHY
14	BP9049113370	63.5VAC	RED	50	P.T. R-PHASE HEALTHY
15	BP9049113389	63.5VAC	YELLOW	50	P.T. Y-PHASE HEALTHY
16	BP9809125402	63.5VAC	BLUE	50	P.T. B-PHASE HEALTHY
17	BP9049118909	110VDC	GREEN	20	CRP APPLICATION
18	BP9049118917	110VDC	AMBER	20	CRP APPLICATION
19	BP9049118925	110VDC	WHITE	20	CRP APPLICATION
20	BP9049258956	24 - 220 VAC/DC	RED	50	C.B. CLOSED
21	BP9049258972	24 - 220 VAC/DC	GREEN	50	C.B. OPEN
22	BP9049258980	24 - 220 VAC/DC	AMBER	50	D.C. FAIL, AUTO TRIP, SERVICE POSN
23	BP9049258999	24 - 220 VAC/DC	CLEAR WHITE	50	TRIP CIRCUIT HEALTHY, TEST POSN
24	BP9049258964	24V-220VAC/DC	BLUE	50	SPRING CHARGED
25	BP9909124785	30 VDC	RED	50	C.B. CLOSED
26	BP9909124793	30 VDC	GREEN	50	C.B. OPEN
27	BP9909124807	30 VDC	AMBER	50	D.C. FAIL, AUTO TRIP, SERVICE POSN
28	BP9909124815	30 VDC	CLEAR WHITE	50	TRIP CIRCUIT HEALTHY, TEST POSN
29	BP9909124823	30 VDC	BLUE	50	SPRING CHARGED
30	BP9049118795	110V AC	White	10	<b>Filament type lamp for trolley</b>
31	BP9049132260	24 VDC	RED	50	C.B. CLOSED
32	BP9049132278	24 VDC	GREEN	50	C.B. OPEN
33	BP9049132286	24 VDC	AMBER	200	D.C. FAIL, AUTO TRIP, SERVICE POSN
34	BP9049132294	24 VDC	CLEAR WHITE	100	TRIP CIRCUIT HEALTHY, TEST POSN
35	BP9049132308	24 VDC	BLUE	50	SPRING CHARGED

**Note :**

- Yearly requirement shall be decided separately for each financial year jointly by engineering & planning.
- SWM Planning to give feedback on actual consumption so as to update this product standard for yearly requirement.

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**FORMAT FOR CHECK LIST**

(TO BE FILLED &amp; SUBMITTED BY SUPPLIERS ALONGWITH THE OFFERS)

**ANNEXURE-II**

Sl. No.	Parameter	BHEL's Requirement	Compliance (to be filled by suppliers)
1	STANDARD	IS:13947-5 / IEC-60947-5-1	
2	PANEL CUTOUT	Dia.22.5 mm	
3	RATED VOLTAGE	3.1 Specific voltage as per <b>Annexure-I</b> for sl.no. 1-19 & 25-35 3.2 Universal voltage as per <b>Annexure-I</b> for sl.no.20-24	
4	COLOUR IDENTIFICATION	LED and lens color should be same.	
5	TERMINATION METHOD	5.1 Screw terminals M3.5 size 5.2 Suitable for connecting 2 Nos. 2.5 sqmm conductor.	
6	MATERIAL BODY	6.1 Fire retardant. 6.2 Material to be indicated by vendors.	
7	ADAPTER/BEZEL	Suppliers to indicate actual material.	
8	LENS	8.1 Fire retardant. 8.2 Material to be indicated by vendors.	
9	LOW VOLTAGE GLOW PROTECTION	Required- 55V FOR 220VDC/AC LAMPS 55V FOR 110VDC/AC LAMPS 35V FOR 63.5VAC LAMPS	
10	BUILT IN FUSE PROTECTION or SURGE PROTECTION	Required	
11	LIGHT OUT PUT	Minimum - WIDE BAND LED - 100 mcd MINIMUM for sl.nos.(1-19) & (25-35) 25mcd for sl.nos.(20-24)	
12	CONTINUOUS OVER VOLTAGE	25% of the rated voltage	
13	AGEING	Subjected to Burn-in-process for 24 hours at 300°C.	
14	DIELECTRIC STRENGTH	2.5kV for 1 min	
15	OPERATING TEMPERATURE	Suitable up to 70°C	
16	POWER CONSUMPTION MAX.	AC : 0.5 VA DC : 1.75 W	
17	TERMINAL MARKING	As per clause 3.14	
18	Mark Of	CE/VDE/UL/CSA/BIS with CML no.	
19	INSULATION RESISTANCE	Min. 50Mega Ohms when tested with a megger of 500 V D.C.	
20	NO. OF LEDS PER LAMP	Sufficient to meet light output requirement. (Minimum 2 nos.) Suppliers to indicate actual nos.	
21	TYPE	<b>Non barrel type only</b>	
22	DESIGN	<b>LED INDICATING LAMPS SHALL BE CLUSTERED TYPE (WITH MIN. 2 NOS. LEDS CHIPS PER LIGHT PREFERABLY CONNECTED IN PARALLEL) AND EACH LED CHIP HAVING DIAMETER NOT LESS THAN 3 MM.</b>	
23	TYPE TEST REPORT	To be furnished for fire retardant material	
24	ROUTINE TEST REPORTS	To be submitted alongwith the delivery.	

**Note: Supplier's to indicate actual values wherever it differs from those indicated in the table.**

Sign &amp; Seal / Date

Name

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# PRODUCT STANDARD

## SWITCHGEAR ENGINEERING DIVISION

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### SPECIFICATIONS OF PUSH BUTTON ASSEMBLY FOR SWITCHGEAR AND CONTROL PANELS

#### 1.0 SCOPE

This standard covers specification and acceptance norms for the following types of push button assembly for use in Switchgear and Control panels.

Item No.	Material Code	Description
1	BP9048023610	Push button assembly complete with <b>black</b> actuator, holder and 1NO +1NC contact block conforming to General Specification given below.
2	BP9048023602	Push button assembly complete with <b>red</b> actuator, holder and 1NO +1NC contact block conforming to General Specification given below.
3	BP9048023599	Push button assembly complete with <b>green</b> actuator, holder and 1NO +1NC contact block conforming to General Specification given below.
4	BP9048108683	Push button assembly complete with <b>yellow</b> actuator, holder and 1NO +1NC contact block conforming to General Specification given below.
5	BP9048108691	Push button assembly complete with <b>blue</b> actuator, holder and 1NO +1NC contact block conforming to General Specification given below.
6	BP9049118224	<b>Lockable</b> Push button assembly complete with <b>black/red</b> actuator, holder and 1NO +1NC contact block, Spring return to Neutral with key removable in neutral position, conforming to General Specification given below

#### 2.0 General Specification:

- All push button shall comply with IS-4794 & IS/IEC-60947.
- All Push Buttons shall be suitable for flush mounting on panels of thickness 3 mm.
- Degree of Protection shall be not less than IP65 from the front.
- Panel cut-out 22.5 dia.
- Size of dome shall be 23 to 25 mm
- Contact rating shall be 1A at 220VDC & 6A at 240VAC
- Insulation level for contact block shall be at-least 660V AC.
- Terminal Capacity: 2\* 2.5 sq mm wire with lugs.
- All push buttons shall have self-wiping contacts to ensure trouble free operation.
- Offered push buttons shall be CE/VDE/UL/CSA/BIS compliance.
- Packaging of switch should be such that no damage occurs to switch during its handling in transit.
- Approved makes & types of push button
  - Siemens - 3SB500-OA\*01
  - L&T - EMN\*FD1
  - BCH - HEA11\*M
  - Essen denki - PCB2-BA(\*)
  - Teknic - P2AF\*

\*Code with respect to color of actuator.

- Any other vendor if enquired shall furnish samples of each type.

#### 3.0 Acceptance criterion

- Verification of type/make mentioned on the push buttons.
- Verification of smoothness of operation of push button and there shall be no displacement and loosening of contacts.
- Acceptance test shall be carried out as per Clause 7.1.2 of IS4794.
- CE/VDE/UL/CSA/BIS marking on push buttons.

REV.	04	Revision History:-	APPROVED –		
ALTD.	DP	It-06 added. Sl No. 3 of Acceptance criterion added.	DKD		
APPD.	MAK		PREPARED	ISSUED	DATE
DATE.	04.03.19		MH	SC	24-2-07



162254/2024/HEP-SWM20900



# PRODUCT STANDARD

## SWITCHGEAR ENGINEERING DIVISION

SG 12928 REV. 06

PAGE 1 OF 4

### AUXILIARY CONTACTORS

#### 1. SCOPE & APPLICATION :-

This product standard covers the requirement of AC/DC auxiliary contactors used for anti-pumping, DC/AC supply supervision, contact multiplication and voltage selection in switchgears and control panels.

#### 2. APPLICABLE STANDARD :-

Auxiliary contactors - IS/IEC 60947.

#### 3. TECHNICAL PARAMETERS :-


- a. Coil rating (To be specified with the order): Refer Table-I on page
- b. Rated Insulation Voltage . 690V
- c. Terminal marking shall be as per Annexure-A of IS/IEC 60947
- d. Operating life :
 

Mechanical Test	:	20 million operations
Electrical	:	1 million operations
- e. Insulation test - 2.5 kV AC 50Hz for 1min
- f. Installation Position - Horizontal / Vertical
- g. Degree of Protection . IP20 or better
- h. Mounting . Suitable for DIN 35 mm RAIL and as well as 2 holesqpitch.
- i. Offered contactors shall have mark of CE/VDE/UL/CSA (at least one).

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REV.	06	Revision	APPROVED –		
ALTD.	DP	1/Table-1 updated 2/ It-13 added	DKD		
APPD.	MAK	3/ Technical spec updated	PREPARED	ISSUED	DATE
DATE.	04/03/19	4/ Procurement of add-on blocks to be stopped.	RKM	SC	28.04.2008

		<div><div></div><div><b>PRODUCT STANDARD</b> SWITCHGEAR ENGINEERING DIVISION</div></div>		<div>SG 12928 REV. 06</div>	
		<div>PAGE 2 OF 4</div>			
<div><div>COPYRIGHT AND CONFIDENTIAL</div><div>The information on this document is the property of Bharat Heavy Electricals Limited. It must not be used directly or indirectly in any way detrimental to interest of Co.</div></div>		<div><div>4. <u>ACCEPTANCE CRITERIA</u> :</div><div><div>I. Type of contactor (AC/DC) as per Table-I</div><div>II. Auxiliary supply as per Table-I.</div><div>III. Contact requirement as per Table-I.</div><div>IV. Visual check for defect free surface.</div><div>V. CE/VDE/UL/CSA marking.</div><div>VI. Availability of all the routine test certificates as per applicable standards.</div></div><div><div>5. <u>PERFORMANCE GUARANTEE</u> :</div><div>Contactor shall perform satisfactorily for a minimum period of 24 months after receipt at BHEL Bhopal works.</div><div><div>6. <u>NOTES</u> :</div><div>I. Supplier shall furnish compliance of Annexure-I.</div></div></div></div>			



## PRODUCT STANDARD

### SWITCHGEAR ENGINEERING DIVISION

SG 12928 REV. 06

PAGE 3 OF 4

TABLE - I

SL NO.	COIL VOLTAGE	CONTACT DETAILS	BP CODE NO.	SIEMENS	SCHNEIDER	L & T **	ABB	BCH	C & S
1	24 VDC	2 NO+2 NC	BP9049113842	3TH3022-0BB4	CA3KN22BD	CS94029	NL22E-81	D15CR22U3	TCA3-DN22BD
2	30 VDC	2 NO+2 NC	BP9049113850	-	-	-	NF22E-11	-	-
3	48 VDC	2 NO+2 NC	BP9049113869	3TH3022-0BW4D4	CA3KN22ED	-	NL22E-83	D15CR22W3	TCA3-DN22ED
4	110 VDC	2 NO+2 NC	BP9049113877	3TH3022-0BF4	CA3KN22FD	CS94029	NL22E-86	D15CR22A3	TCA3-DN22FD
5	125 VDC	2 NO+2 NC	BP9049113885	-	CA3KN22GD	-	NL22E-87	-	-
6	220 VDC	2 NO+2 NC	BP9049113893	3TH3022-0BM4	CA3KN22MD	CS94029	NL22E-88	D15CR22B3	TCA3-DN22MD
7	110 VAC, 50 Hz	2 NO+2 NC	BP9049113907	3TH3022-0AFO	CA2KN22F7	CS94020	N22E-84	D15CR22A	TCA2-DN22F5
8	240 VAC, 50 Hz	2NO+2NC	BP9049113915	3TH3022-0AP0	CA2KN22U7	CS94020	N22E-80 for 220V	D15CR22K	TCA2-DN22U5
9	220 VDC	8 NO	BP9049113923	3TH3040-0BM4+ 3TX40102A * 4	CA3KN40MD+ LA1KN40	CS94027+ CS94033	NL80E-88	D15CR40B3+ C320KGTR40	TCA3-DN40MD + TAIDN40
10	110 VDC	8 NO	BP9049113931	3TH3040-0BF4+ 3TX40102A * 4	CA3KN40FD+ LA1KN40	CS94027+ CS94033	NL80E-86	D15CR40A3+ C320KGTR40	TCA3-DN40FD + TAIDN40
11	Add on block	1 NO+1NC @	BP9049114482	3TX4010-2A * 1 + 3TX4001-2A * 1	LADN11	CS94031	CA5-10 + CA5-01	C320KGTR11	TA1DN11
12	Add on block	2 NO+2NC @	BP9049114490	3TX4010-2A * 2 + 3TX4001-2A * 2	LADN22	CS94035	CA5-22N	C320KGTR22	TA1DN22
13	220V DC	4NO+2NC	BP9048108985	3TH3022-0BM4 + 3TX4010-2A * 2	CA3KN22MD + LADN20	CS94029 + CS94030	NL22E-88 + CA5-10 (2 Nos)	D15CR22B3 + C320KGTR20	TCA3-DN22MD+ TA1DN20

**Note:-** 1. Add-on block (Front mounting) against item-011 & 012 shall be suitable for fixing on contactors offered against item-001 to 008.  
 2. Type nos. mentioned above is indicative only. Any other type offered shall be subject to sample approval from BHEL during technical evaluation.

\*\* In case of L&T make MX0 contactors, type code remains the same for all voltages. However, vendor to ensure specific coil voltage while supplying.

@ No fresh procurement to be done, stock till exhausted.



# PRODUCT STANDARD

## SWITCHGEAR ENGINEERING

### DIVISION

SG 12928 REV. 06

PAGE 4 OF 4

### FORMAT FOR CHECK LIST

(TO BE FILLED &amp; SUBMITTED BY SUPPLIERS ALONGWITH THE OFFERS)

### ANNEXURE-I

Sl. No.	Parameter	BHEL's Requirement	Confirmation/ Compliance By Supplier
1.	Contactor	As per Table-I	
2.	Type	As per Table-I	
3.	Applicable Standard	IS/IEC 60947	
4.	Contact Arrangement	As per Table-I	
5.	Coil Voltage	As per Table-I	
6.	Contact configuration	As per Table-I	
7.	Add on block is suitable for fixing on contactor Offered.	As per Table-I	
8.	Guarantee as per Clause 5.0	Yes / No	
9.	Technical parameters as per Clause 3.0	Yes / No	
10.	Terminal marking as per Annexure-A of IS/IEC 60947	Yes / No	

Sign & Seal / Date  
Name



1.0 **OBJECTIVE** :-  
This standard covers the requirement of Piano type ON/OFF switches used in switchgears and CRPs.

2.0 **APPLICATION** :-  
This switches were used for making / breaking of Heater circuit ,socket circuit etc.

3.0 **TECHNICAL PARAMETER** :-

STANDARD	VOLTAGE	CURRENT RATING	TYPE TEST	MATERIAL CODE	APPROX. ANNUAL REQUIREMENT
IS:3854	240V AC	6A	2.5KV FOR 1 MIN. BETWEEN TWO TERMINALS	BP9049105069	3000

**Fig-1**

(i) Switch overall dimension shall be within limiting dimensions as indicated above.  
(ii) Switch shall be suitable for fixing in the cutout(Ref Fig-1)

Test certificates shall be furnished meeting technical parameters 3.0.

- (1) Visual Inspection for defect free switch.
- (2) Verifying current and voltage rating as per Technical parameter.
- (3) ISI mark engraving on switch.

REV.	01	PRINTS TO :-		APPROVED –  NNS		
ALTD.	N.M.	SWM-PLG SWE-CE				
APPD.	M.H.N.	SWE-CRP SWM-QC		PREPARED	ISSUED	DATE
DATE.	23.08.2018			HRP	RKK	19.04.01

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# PRODUCT STANDARD

## SWITCHGEAR ENGINEERING DIVISION

SG 12955

PAGE 01 OF 01

### SPECIFICATION OF 6/16 A SOCKET AND SWITCH

#### 1.0 OBJECTIVE :-

This standard covers the requirement of 6 / 16A socket and switch used in switchgears and CRPs.

#### 2.0 APPLICATION :-

This socket and switch is used in SWGR and Control Panels for taking supply required during maintenance at site.

#### 3.0 TECHNICAL PARAMETER :-

The socket and switch shall have ISI marking.

STANDARD	VOLTAGE	CURRENT RATING	TYPE TEST	MATERIAL CODE	APPROX. ANNUAL REQUIREMENT
IS : 3854 & IS:1293	240V AC	6/16 A	2.5KV FOR 1 MIN. BETWEEN TWO TERMINALS	BP9049251404	3000

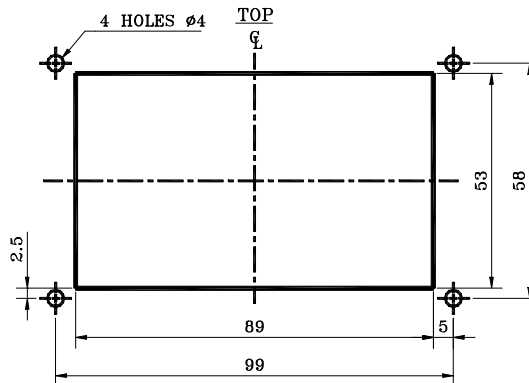
#### 4.0 DIMENSION:- 6 / 16 A switch & socket dimension shall be as per following:

Over all approx. dimension - Width - 118 max.

Height - 70 max.

Depth - 50 max.

Panel cutout and Fixing dimensions as per figure given below :-



#### 5.0 TEST AND TEST REPORTS :-

Test certificates shall be furnished for the test meeting technical parameters 3.0.

#### 6.0 INSPECTION AND ACCEPTANCE NORMS :-

- (1) Visual inspection for defect free switch.
- (2) Verifying current and voltage rating as per technical parameters.
- (3) ISI mark engraving on switch.

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REV.	00	PRINTS TO :-		APPROVED -		
ALTD.		SWM (PLG)	1	N.N.SHENOI		
APPD.		SWE-CE	1			
DATE.		SWE-CRP	1	PREPARED	ISSUED	DATE
		SWM-QC	1	M.P.K	A.P.S	21.3.2002



# PRODUCT STANDARD

## SWITCHGEAR ENGINEERING DIVISION

SG 12956

PAGE 1 OF 1

### SPECIFICATION OF DOOR SWITCH

#### 1.0 OBJECTIVE :-

This standard covers the requirement of Door operated ON / OFF switch used in Switchgears and CRPs.

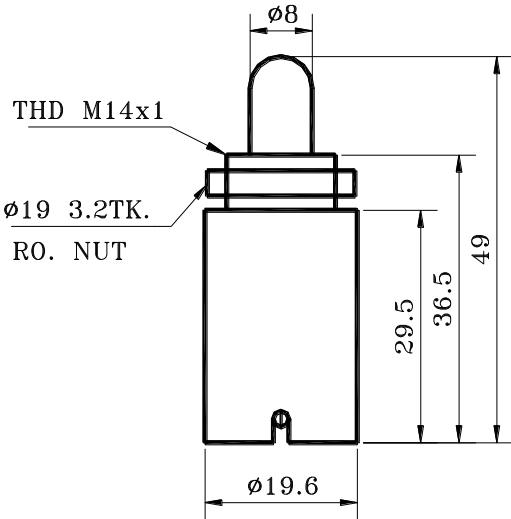
#### 2.0 APPLICATION :-

This switch is used for making / breaking of Interior Illuminator lamp circuit.

#### 3.0 TECHNICAL PARAMETER :-

Voltage rating	- 250 V AC
Current rating	- 0.25 A
Insulation Resistance	- More than 100 m.Ω
Contact resistance	- Less than 20 m.Ω
H.V. test	- 2 KV for 1 minute.
Mechanical endurance	- $1.5 \times 10^5$ Cycles
Electrical endurance	- $1 \times 10^5$ Cycles
Material	- Thermoset plastic
Contact	- Phosphor bronze / brass

#### 4.0 OVERALL DIMENSION :-



Recommended cutout :-  $\phi 14 \pm 0.1$

#### 5.0 TEST & TEST REPORT :-

Test certificate for the ordered lot shall be furnished meeting technical parameters 3.0 above.

#### 6.0 INSPECTION AND ACCEPTANCE NORMS: –

- (1) Visual Inspection for defect free switch.
- (2) Varifying current and voltage rating as per technical parameter

REV.	00	PRINTS TO :-		APPROVED –		
ALTD.		SWM (PLG) SWE-CE SWE-CRP SWM-QC	1	N.N.SHENOI		
APPD.			1	PREP	ISSUED	DATE
DATE.			1			
				M.P.K	A.P.S	22-3-2002

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# PRODUCT STANDARD

## SWITCHGEAR ENGINEERING DIVISION

SG 12958 REV.02

PAGE 1 OF 2

### TEST LINK BLOCK

**1.0 OBJECTIVES AND SCOPE :** This product standard is issued to cover the requirement of Screw Type Test Link block, back connections, projection mounted, suitable for 3 phase, 3 wire/3 phase, 4 wire to be used with ENERGYSMETER/TRIVECTOR Meter.

**2.0 DIMENSION & TERMINAL MARKING DETAILS :** Over all dimensions, cut out dimensions and terminal marking should be as per figure references given in table below against each item-

ITEM NO.	TYPE	TERMINAL MARKING	PANEL C.O DETAILS	STOCK CODE	APP. ANNUAL REQMT.	MIN. STOCK QTY.
1	3Ph, 3 wire	Fig- 1	Fig- 1 A	BP9049251153	Discontinued	
2	3Ph, 4 wire	Fig- 2	Fig- 1 A	BP9049113400	2000	200
3	3Ph, 4 wire	Fig- 2	Fig- 2 A	BP9049113419	Discontinued	

### 3.0 TECHNICAL DETAILS :

- (i) Rating - 10A, 440 V AC, 3 phase, 3 wire/3 phase 4 wire Test link Block
- (ii) Type - Screw type
- (iii) Mounting - Projection mounting with back connections (see Fig on sht 2)
- (iv) Material - Body – Bakelite / Virgin Polycarbonate  
Cover – Bakelite / Virgin Polycarbonate and shall be fixed by metal Knurled knob.  
All current carrying parts shall be of Brass with nickel plating.
- (v) Connection drg - A connection diagram shall be fixed inside the cover
- (vi) Test:-
  - (A) HV Test at 2.5 KV for 1 minute between
    - (1) Body and voltage terminals.
    - (2) Body and current terminals.
    - (3) Voltage and current terminals.
  - (B) Insulation resistance at 500 V DC between various terminals as given in (A) 1,2,3 above
  - (C) Continuity test between
    - (1) Incoming and outgoing voltage terminal
    - (2) Incoming and outgoing current terminal

### 4.0 DOCUMENTS TO BE FURNISHED BY SUPPLIER (1 COPY EACH):

- (i) Dimension and terminal marking drawings shall be furnished along with offer.
- (ii) Test Certificates at the time of dispatch.

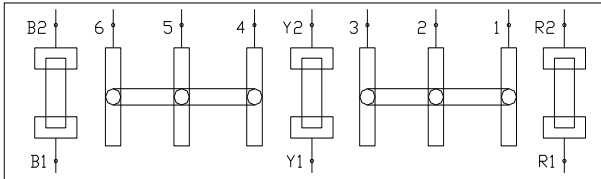
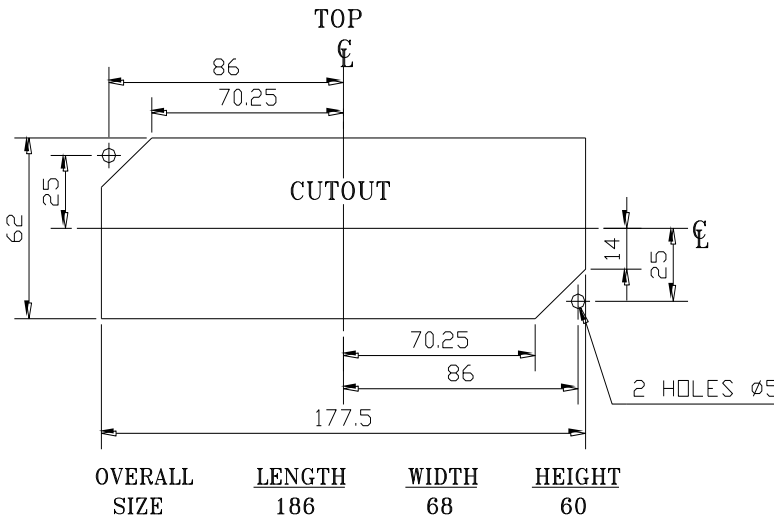
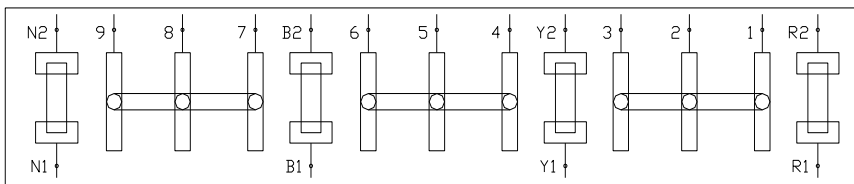
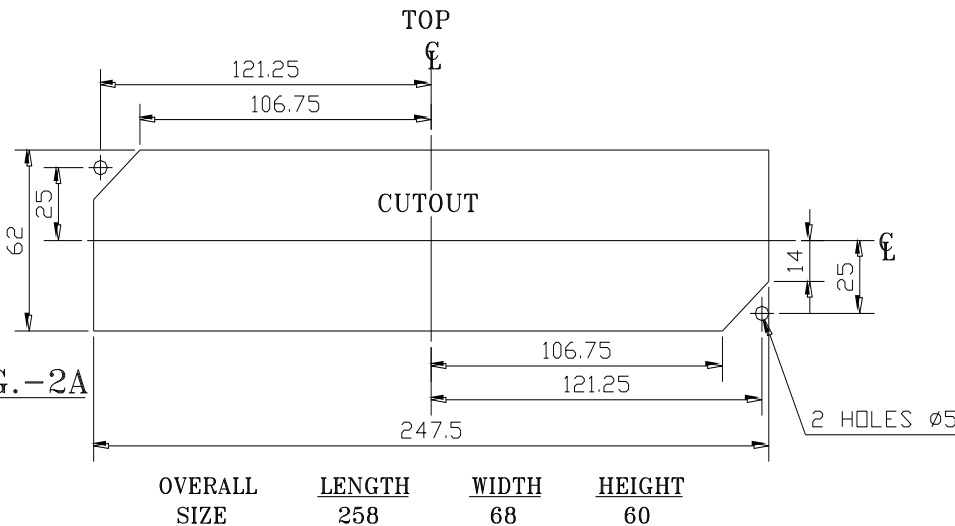
### 5.0 ACCEPTANCE CRITERIA :

- (i) 100% Visual check for cracks & defects free surface finish.
- (ii) Matching of dimension and terminal marking as per figure given in sht.02.
- (iii) Availability of all routine test certificates.

REV.	02	PRINTS TO :-	APPROVED –		
ALTD.	AK	Issued Online	N.N.SHENOI		
APPD.	DP		PREPARED	ISSUED	DATE
DATE.	05.08.22		M.P.K	A.P.S	24.3.2002

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162254/2024/HIP-SWM20900		PRODUCT STANDARD		SG 12958 REV.02																	
BHE		SWITCHGEAR ENGINEERING DIVISION		PAGE 2 OF 2																	
<div><div>FIG.- 1</div><div></div><div>TERMINAL MARKING (LOOKING FROM BACK SIDE)</div><div><div>FIG.- 1A</div><div></div><div><table><tr><td>OVERALL SIZE</td><td>LENGTH</td><td>WIDTH</td><td>HEIGHT</td></tr><tr><td>186</td><td>186</td><td>68</td><td>60</td></tr></table></div></div><div><div>FIG.- 2</div><div></div><div>TERMINAL MARKING (LOOKING FROM BACK SIDE)</div><div><div>FIG.- 2A</div><div></div><div><table><tr><td>OVERALL SIZE</td><td>LENGTH</td><td>WIDTH</td><td>HEIGHT</td></tr><tr><td>258</td><td>258</td><td>68</td><td>60</td></tr></table></div></div></div></div>						OVERALL SIZE	LENGTH	WIDTH	HEIGHT	186	186	68	60	OVERALL SIZE	LENGTH	WIDTH	HEIGHT	258	258	68	60
OVERALL SIZE	LENGTH	WIDTH	HEIGHT																		
186	186	68	60																		
OVERALL SIZE	LENGTH	WIDTH	HEIGHT																		
258	258	68	60																		



**PRODUCT STANDARD**  
SWITCHGEAR ENGINEERING DIVISION

**PAGE 01 OF 02**

## **“Technical Specification for PVC FR –LSH Control Cable”**

## 1.0 SCOPE

This standard covers specification and acceptance norms for the PVC insulated single core un-tinned annealed high conductivity copper wire as Clause 5 of AA28544 type FR –LSH Flame Retardant low smoke cable.


## 2.0 SPECIFICATION & TEST

Sl. no	Specification	Vendor's Compliance	Remarks
1.	<p>PVC insulated single core untinned annealed high conductivity copper wire as Clause 5 type FR- LSH Flame Retardant cable with reduced halogen evolution and smoke for improved fire performance of Category C2 with cable grade 1100 V shall be as per</p> <ul style="list-style-type: none"> <li>BHEL standard AA 28544 Rev no 02 Page 1 to 5</li> <li>IS 694 1990 ( Reaffirmed 2005) Edition 4.4 ( 2007-01)</li> </ul>	Complied/Not Complied	
2.	<p>The mean overall cable diameter upper limit shall be as per IS 694 and shall be written on each bundle along with other data. Vendor shall take care that no bundle with mean overall cable diameter upper limit is more than permitted by IS 694 is supplied to BHEL</p> <ul style="list-style-type: none"> <li>For 4 sq mm cable 4.8 mm</li> <li>For 2.5 sq mm cable 4.2 mm</li> <li>For 1.5 sq mm cable 3.4 mm</li> </ul>	Complied/Not Complied	
3.	<p>In addition to Clause 12 of AA 285 44 Rev No 02 Sheet 1 to 5 Identification, Packing and Marking shall be as per Section 5 (Identification ,Packing and Marking - 17.1 , 17.2 , 17.3, 18.1, 18.2 ) of IS 694</p>	Complied/Not Complied	
4.	<p><b>On every meter of cable</b> vendor to print /emboss as per <b>IS 694</b> clause</p> <ul style="list-style-type: none"> <li>17.2 ( Special cable identification FR-LSH)</li> <li>18.2a ( Reference Standard IS 694)</li> <li>18.2b Manufacturer's name, Brand name or trade mark)</li> <li>18.2 c ( Type of cable and voltage grade)</li> <li>18.2d ( No of cores)</li> <li>18.2.1 ( ISI mark )</li> </ul>	Complied/Not Complied	

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<b>REV.</b>		<b>PRINTS TO :-</b>		<b>APPROVED –</b>		
<b>ALTD.</b>		SWE	1	SC		
<b>APPD.</b>		CEE	1			
		SWM(PLANNING)	1	<b>PREP</b>	<b>ISSUED</b>	<b>DATE</b>
<b>DATE.</b>				PP	APS	26.03.2014

			<b>PRODUCT STANDARD</b> SWITCHGEAR ENGINEERING DIVISION		SG12973
					PAGE 02 OF 02
<b>COPYRIGHT AND CONFIDENTIAL</b> The information on this document is the property of Bharat Heavy Electricals. Limited It must not be used directly or indirectly in any way detrimental to interest of Co.	Sl. no	Test	Vendor's Compliance	Remarks	
	5.	Tests as per Clause 9 and 10 of AA28544 shall be witnessed at NABL accredited independent Government lab by BHEL /third party. Vendor to give 15 days prior intimation to BHEL for inspection/ witness of all above tests. BHEL reserves the right to witness the test.	Complied/Not Complied		
	6.	Type test approval shall be obtained from engineering before supply of 1st lot.	Complied/Not Complied		
	<b>3.0 MATERIAL ACCEPTANCE CRITERIA :-</b>				
	Sl. no	Acceptance Criteria	Remarks		
1	The mean overall cable diameter to be checked & shall be as per IS 694 and shall be written on each bundle along with other data. Upper limit for mean overall cable diameter shall be <ul style="list-style-type: none"> <li>For 4 sq mm cable 4.8 mm</li> <li>For 2.5 sq mm cable 4.2 mm</li> <li>For 1.5 sq mm cable 3.4 mm</li> </ul>				
2.	Following printing /embossing <b>On every meter of cable</b> as per <b>IS 694</b> clause <ul style="list-style-type: none"> <li>17.2 ( Special cable identification FR-LSH)</li> <li>18.2a ( Reference Standard IS 694)</li> <li>18.2b Manufacturer's name, Brand name or trade mark)</li> <li>18.2 c ( Type of cable and voltage grade)</li> <li>18.2d ( No of cores)</li> <li>18.2.1 ( ISI mark)</li> </ul>				
3	Availability of Routine Test Certificates.				
4	Availability of approval letter from engineering for type test.				
5	Visual Inspection for transit damage & cut.				

162254/2024/HEP-SWM20900

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PRODUCT STANDARD

SWITCHGEAR ENGINEERING DIVISION

SG 12975 REV.01

PAGE 1 OF 3

LT FUSE FITTINGS AND HRC FUSE/NEUTRAL LINKS

A. FUSE FITTINGS

Fuse fittings (Panel mounting/Din rail mounting) to be made from high performance self-extinguishable polyester moulding/ flame retardant non-hygroscopic phenolic moulding with a hard gloss surface/SMC molding. The contacts shall be staggered type to provide higher contact area, low power consumption, and lower temperature rise. Base should be easy to mount. The terminal point shall be provided for accommodation of cables of maximum size 10 sq mm and minimum 1.5 sq mm.

These fuse fittings shall be designed to accommodate the 2 to 63 Amp HBC fuse-links and complying to IS13703-1993, IEC-60269, BS: 88-1988.

B. FUSE / NEUTRAL LINKS

High Breaking Capacity (HBC) fuses are required for protection of control-circuit from electromagnetic and thermal stresses which arise under short circuit conditions. Fuse links shall be housed in a ceramic body using granulated quartz and as the arc quenching media. The fuses should have following feature:

- Size of fuse link upto 32A – 10mm dia x 38mm height
- Size of fuse link 63A – 14mm dia x 51mm height
- Fuse fitting shall have Electrical operation indicators for indicating blown fuse indication.
- Certified to BS: 88-1988.
- Strict compliance to performance and dimensional requirements of Indian and international standards: IS 13703/IEC9305/IEC 60269.
- Very low power loss ensures cool running.
- Extremely low let through I²t and cut off currents at short circuits.
- Suitable for 415VAC/250VDCas per IEC.
- All accessible live connection of fuse bases shall be adequately shrouded.
- Knife/Blade type open fuse (L&T TYPE HN/Cooper Bussmann type NH) is not acceptable.
- Shall have CE/VDE/UL/CSA/BIS with CML No. marking. (self certificate not acceptable)
- Offered fuses or its any component /part shall not be from China make.
- A neutral link is a non-fusible metal (Brass or better conducting alloy material) break point in the neutral.

REV.01

ALTD.RR

APPD.MHN

DATE.16.04.2022

REVISION

APPROVED –

P.K.UPADHYAY

PREPARED

ISSUED

DATE


ARPAN / DINESH

V.K.Dixit

22.05.17

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				PAGE 2 OF 3																											
		<b>Fuse application:</b>																													
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**D-1 Documents to be furnished with offer:**

1. 2 copies of technical leaflets.
2. 2 copies of dimensional & mounting details.
3. 2 no. Samples of all items (fuse fitting and Fuse/Neutral link) as per the specification shall be submitted for BHEL evaluation. In absence of samples offer may not be considered for evaluation.
4. Valid certificate for mark of CE/VDE/UL/CSA/BIS with CML no.

**D-2 Documents to be furnished along with equipment:**

1. 2 copies of routine test certificates.
2. 2 copies of guarantee certificate. (The HBC fuse shall be guaranteed satisfactory performance for a minimum period of 24 months after receipt at BHEL Bhopal)

**D-3 Acceptance criteria:**

1. Visual inspection for cracks & surface finish.
2. Matching of type reference IS/IEC marking both on fuse link & fuse holder.
3. Availability of Routine test certificates.
4. Continuity check.
5. Voltage & current rating.
6. **Make-Model shall have mark of CE/VDE/UL/CSA/BIS with CML no.**
7. Vendor to essentially provide P.O. No. / It. No. on individual items for easy traceability.

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### COPPER TERMINAL ENDS INSULATED CABLE LUGS FOR SOLDERLESS CRIMPING TO COPPER CONDUCTORS

#### 1.0 SCOPE

This standard covers insulated copper ends terminals (Solderless crimping type) Ring tongue type, U-Fork type, Flat pin type, Pin type and Snap-on terminals.

#### 2.0 APPLICATION

The insulated copper ends terminals (Solderless crimping type) are used for electrical connection in Switchgear\ Controlgear \ Rectifier control panel wiring.

#### 3.0 CONSTRUCTION / DIMENSIONS

Dimensions and Sizes of the terminal ends with code numbers are given on respective tables. The permissible plus tolerance shall not exceed by more than 5%.

#### 4.0 TECHNICAL REQUIREMENTS

##### MATERIALS

- 4.1 The copper terminals shall be made out of electrolytic/CU-ETP grade annealed high conductivity copper sheets/strips **Annealed** conforming to IS:1897 **Referring to IS:191** having **99.25%** IACS Electrical Conductivity and minimum **99.9%** copper content).
- 4.2 Finish both externally & internally shall be tinned electroplating after stamping. The thickness of the plating shall not be less than 10 microns.
- 4.3 The copper terminals shall be rated for the maximum current carrying capacity for the given size of copper cable. The sharp edges and corners shall be rounded off to radius 0.5 mm.
- 4.4 The metal reinforced / double annealed lugs should have insulating sleeve suitable for 1100V. The **PVC Polypropylene** sleeve used as a insulation over barrel should not crack/torn out during crimping process.
- 4.5 The sleeve shall be designed to have bell mouth shape for cable entry. Hence there should be no chance for cutting of strands during crimping.
- 4.6 The outer surface of the barrel of the copper terminal shall be sleeved with copper strip and over it with heat resistance **Polypropylene /PVC** insulation suitable for continuous operation at 105 degree C.
- 4.7 Lugs must have any of the following certificates: **CE / VDE/ UL/ CSA/ BIS with CML no.**, vendor to furnish valid certificate indicating model / part no. of offered lugs.
- 4.8 Insulation sleeves should have the following colour as per the cable size:

CABLE SIZE (mm sq).	COLOUR OF INSULATION SLEEVE
1.5	RED
2.5	BLUE
4 - 6	YELLOW

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REV.	01	Online Submission	APPROVED –		
ALTD.	AA	Rev Details -	HRP		
APPD.	DP		PREPARED	ISSUED	DATE
DATE.	30/03/2022		RR	MHN	13/07/2021



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- 4.9 The terminal end shall be normalized fully to suit crimping operation. They shall not cracks on microscopic check.

The **Polypropylene**/PVC Sleeve and terminal ends shall be subjected to crimping by standard crimping tools in BHEL The standard tool is shown below:



### 5.0 Tests/Check List :

**Visual examination & dimensional check:** To be checked for dimensions given in tables. The components shall be examined for flaws, rust, cracks harmful for joints.

### 6.0 ACCEPTANCE CRITERIA:

The delivery lot of copper terminals should be accompanied with document certifying the conformity to the followings:

- 1) Pull strength of the crimped terminal is atleast 40 N/sq. mm. The test should be performed on each type of lug to be supplied by the supplier.
- 2) The insulation sleeve of **Polypropylene/PVC make** should be tested at 1100 V.
- 3) Vendor to furnish/supply items only against the BHEL Serial Numbers and BP Code as per the part number accepted by BHEL.

#### **Note:**

- 1) Model/Type nos. are subject to approval from BHEL as per terms & conditions of this specification.

**5) Vendor to provide 5 no. of sample of each item along with the offer in case of any deviation or if asked by BHEL, in the absence of which the offer will be rejected.**



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### 7.0 PACKING AND MARKING :

- 7.1 The copper terminals of same type/model shall be suitably packed in small packages (preferably in batch of 100 lugs per bag) which will then be packed in one big package. The terminal ends shall be suitably packed in cartons to avoid entry of the foreign particles & damage during transit and storage.
- 7.2 Each delivery lot of copper terminals should be accompanied with a document as mentioned in clause 6.0 and including following information.

#### **COPPER TERMINAL ENDS ( CABLE LUG ) : SG12986 Rev 00**

- Size & Type of ends terminal :
- Name of manufacturer and trade mark :
- BHEL Purchase order No.:
- Quantity in each lot. :

### 7.3 Marking : Each lug shall be marked with the following:

- Size & Type of ends terminal :
- Name of manufacturer and trade mark :

### 8.0 Ordering Specification/Designation

#### On Indents :

CABLE LUG TO SERIAL NO. \_\_\_\_\_; BP CODE \_\_\_\_\_ TO PRODUCT SPECIFICATION SG12986

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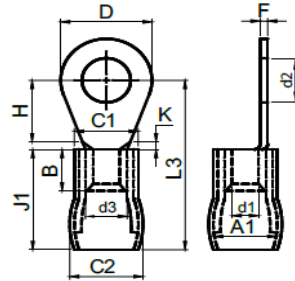
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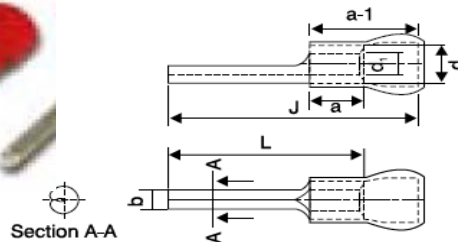
### Type and Classification of Wire Lugs:

#### 8.1.) Insulated Cu Ring Tongue Terminal Ends:



S.no	Size	Bolt	d2	D	F	B	K	H	J1	L3	BHEL STYLE CODE
8.1.1	1.5	M4	4.2	6.0	0.8	5	2	4	10	16	BP9049143610
8.1.2	1.5	M5	5.2	8	0.8	5	2	5	10	17	BP9049143628
8.1.3	2.5	M4	4.4	8.0	0.8	4	2	5	10	17	BP9049143636
8.1.4	2.5	M5	5.2	8	0.8	5	1	5	10	18	BP9049143644
8.1.5	2.5	M6	6.4	10	0.8	5	1	7	10	18	BP9049143652
8.1.6	2.5	M8	8.2	12	0.8	4	1	9	10	21	BP9049143660
8.1.7	2.5	M10	10.2	16	0.8	5	2	10	10	22	BP9049143679
8.1.8	4	M4	4.4	8.0	1.0	5	2	9.2	19	28.2	BP9049143687
8.1.9	4	M5	5.2	8.7	1.2	5.5		9.2	19	28.2	BP9049143695
8.1.10	4	M6	6.4	12	1	6	2	6	15	23	BP9049143709

#### 8.2.) Insulated Pin Type Terminal Ends:



S.no	Size	d1	b	a	L-a	L	d3	J	a-1	BHEL STYLE CODE
8.2.1	1.5	1.6	1.9	5	12	17	4.8	22	10	BP9049143717
8.2.2	2.5	2.3	1.9	5	12	17	5.4	22	10	BP9049143725



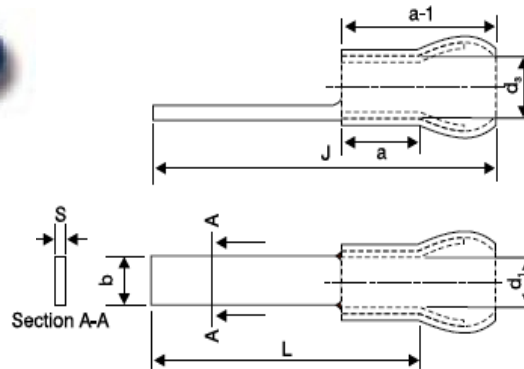
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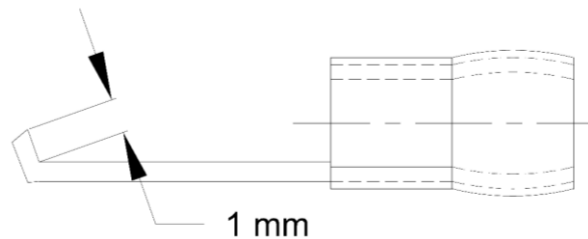
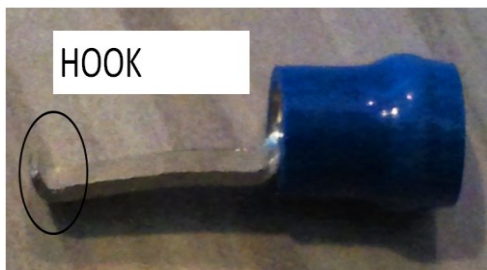
### 8.3) Insulated Flat Pin Type Terminal Ends:



S.no	Size	d1	b	a	L-a	L	s	d3	J	a-1	BHEL STYLE CODE
8.3.1	1.5	1.6	2.8	5	12	17	0.8	4.8	22	10	BP9049143733
8.3.2	2.5	2.3	3.1	5	12	17	0.8	5.4	22	10	BP9049143741
8.3.3	4	2.9	5.1	6	14	20	1.0		25	15	BP9049143750

### 8.4) Insulated Flat Pin Type Terminal Ends with Hook:

- Hook length must be 1 mm with a dimensional tolerance of 10%.



S.no	Size	d1	b	a	L-a	L	s	d3	J	a-1	BHEL STYLE CODE
8.4.1	1.5	1.6	2.8	5	12	17	0.8	4.8	22	10	BP9049143768
8.4.2	2.5	2.3	3.1	5	12	17	0.8	5.4	22	10	BP9049143776
8.4.3	4	2.9	5.1	6	14	20	1.0		25	15	BP9049143784

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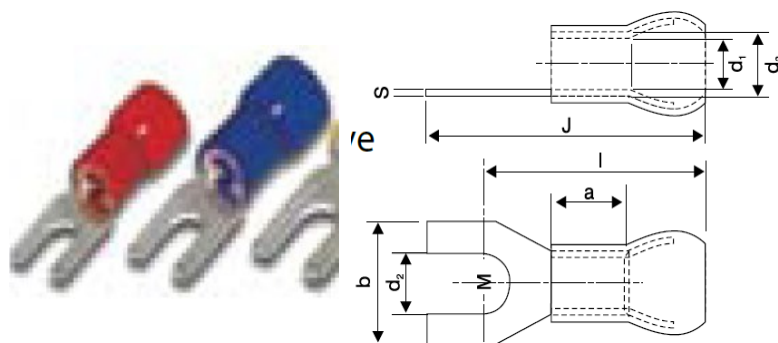
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### 8.5) Insulated Fork Type without Hook:



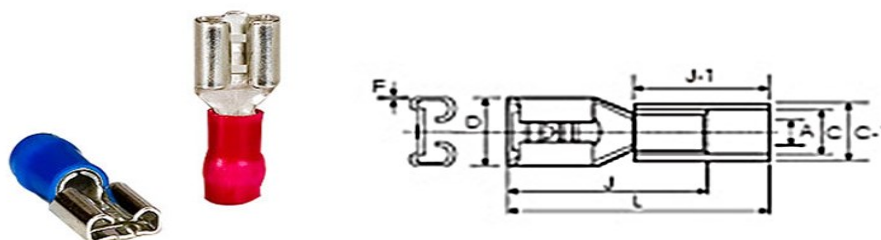
S.no	Size	Bolt	d2	b	s	a	l	J	BHEL STYLE CODE
8.5.1	1.5	M3.0	3.0	6.2	0.8	5	16.8	20	BP9049143792
8.5.2	1.5	M4	4.1	6.5	0.8	5	16	20	BP9049143806
8.5.3	2.5	M3.5	3.5	6.5	0.8	5	16.8	20	BP9049143814
8.5.4	2.5	M4	4.1	6.5	0.8	5	16.8	20	BP9049143822
8.5.5	2.5	M5	5.0	6.0	1.0	6.2	16.2	20	BP9049143830

### 8.6) Insulated Fork Type with Hook.

- Hook length must be 1 mm with a dimensional tolerance of 10%.

S.no	Size	Bolt	d1	d3	d2	b	s	a	l	J	BHEL STYLE CODE
8.6.1	1.5	M3	1.6	3.2	3.6	6.8	0.8	5	15	20	BP9049143849
8.6.2	1.5	M4	1.7	3.3	4.1	7.5	0.8	5	16.5	20	BP9049143857
8.6.3	2.5	M3	2.3	3.9	3.6	6.5	0.8	5	15	20	BP9049143865
8.6.4	2.5	M4	2.3	3.9	4.1	7.7	0.8	5	15	21	BP9049143873
8.6.5	4	M4	3.5	5.5	4.1	8	1	6	22	26	BP9049143881
8.6.6	4	M5	3.5	5.5	5.1	8	1	6	22	26	BP9049143890

### 8.7) Insulated Snap On Terminals:



S.no	Size	D	J	A	C	F	J-1	L	C-1	BHEL STYLE CODE
8.7.1	1.5	7.4	16	1.6	2.4	0.40	10	21	3.6	BP9049143903
8.7.2	2.5	7.4	16	2.6	3.1	0.40	10	21	4.4	BP9049143911



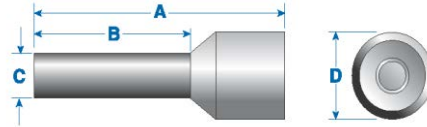
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### 8.8) Insulated Tubular Terminals:



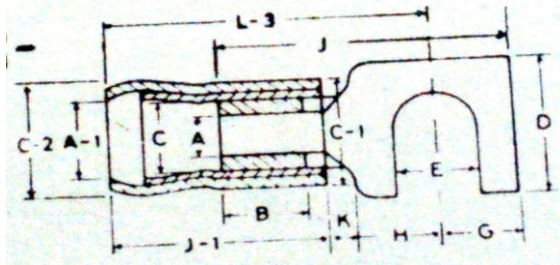
S.no	Size	A	B	C	D	BHEL STYLE CODE
8.8.1	1.5	14	8	2.0	4.0	BP9049143920
8.8.2	2.5	18	12	2.5	4.7	BP9049143938

#### Crimping Tool for above type Lugs(Wire End)

#### Tubular terminal Lugs after crimping :



### 8.9) Copper Square and Side Entry Tongue Terminal ends



S.no	Size	E	A	C	D	B	G	K	H	J	J-1	A-1	C-1	C-2	L-3	BHEL STYLE CODE
8.9	2.5	4	2.3	3.9	7.5	4	3.5	1.5	4.5	13.5	10	4.4	5.2	6	16	-





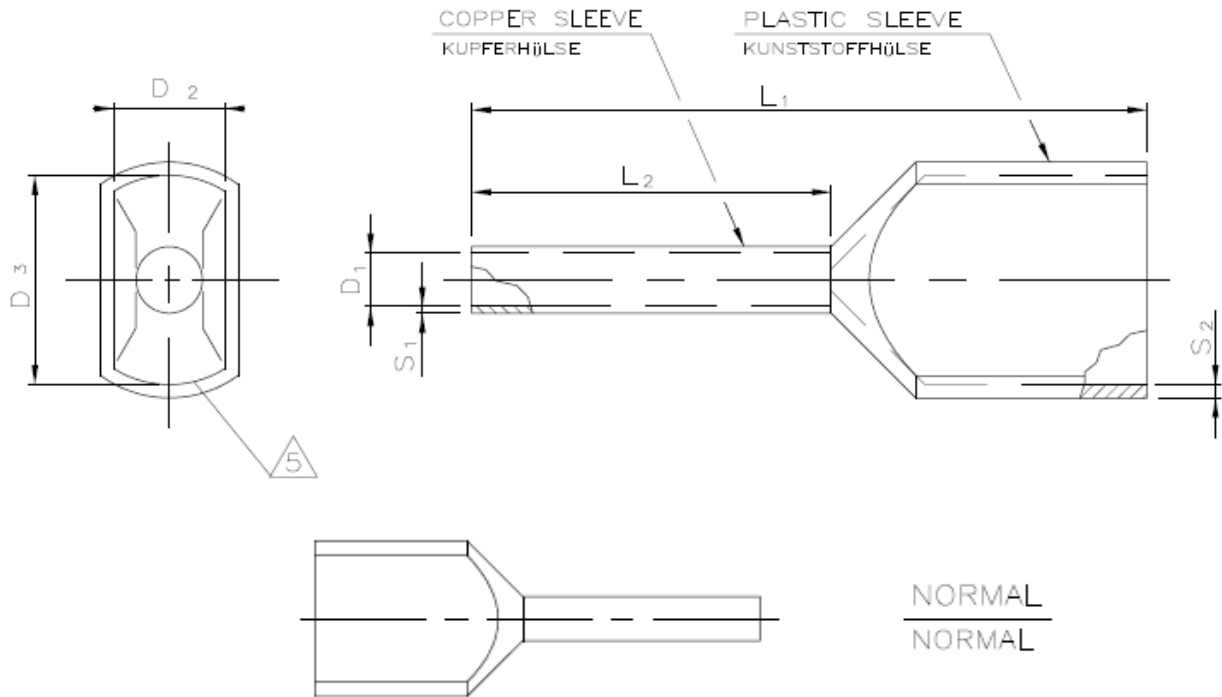
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### 8.10) TWIN TYPE TUBULAR LUG:



Sq. MM	Color	L1/MM	L2/MM	D1/MM	S1/MM	S2/MM	D2/MM	D3/MM
2*1.5	Black	16	8	2.2	0.15	0.30	3.60	6.60
2*2.5		16	8	2.80	0.20	0.30	4.20	7.80

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			PAGE 1 OF 1																													
	<b><u>SPECIFICATION FOR BULB HOLDER</u></b>																															
	<table><tr><th>S.No</th><th>Technical Parameter</th><th>BHEL Requirement</th><th>Vendor Compliance (Yes/No)</th></tr><tr><td>1</td><td>Holder Base</td><td>B22</td><td></td></tr><tr><td>2</td><td>Type of Holder</td><td>Batten</td><td></td></tr><tr><td>3</td><td>Material</td><td>Polycarbonate</td><td></td></tr><tr><td>4</td><td>Wattage</td><td>Upto 100W</td><td></td></tr><tr><td>5</td><td>Rated Voltage</td><td>220-240VAC</td><td></td></tr><tr><td>6</td><td>Sample photograph</td><td></td><td></td></tr></table>					S.No	Technical Parameter	BHEL Requirement	Vendor Compliance (Yes/No)	1	Holder Base	B22		2	Type of Holder	Batten		3	Material	Polycarbonate		4	Wattage	Upto 100W		5	Rated Voltage	220-240VAC		6	Sample photograph	
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		<table><tr><td>REV.</td><td>01</td><td>PRINTS TO :-</td><td colspan="3">APPROVED –</td></tr><tr><td>ALTD.</td><td>RR</td><td>Online Submission</td><td colspan="3">MAK</td></tr><tr><td>APPD.</td><td>MHN</td><td></td><td>PREPARED</td><td>ISSUED</td><td>DATE</td></tr><tr><td>DATE.</td><td>09.06.22</td><td></td><td>RR</td><td>MHN</td><td>16.04.22</td></tr></table>	REV.	01	PRINTS TO :-	APPROVED –			ALTD.	RR	Online Submission	MAK			APPD.	MHN		PREPARED	ISSUED	DATE	DATE.	09.06.22		RR	MHN	16.04.22						
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