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DRG No.

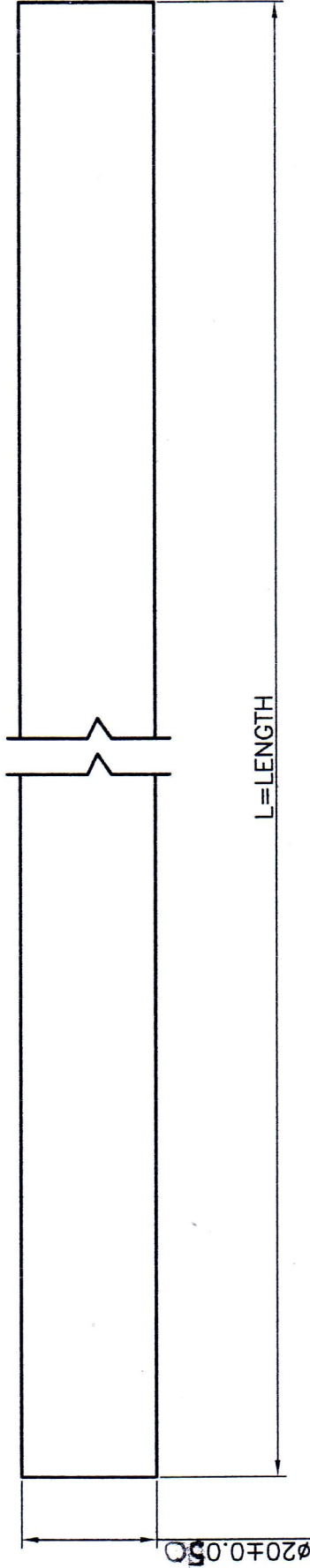
REV

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REF. DRG. No.

SIGN AND DATE

INVENTORY No.



NOTES:

1. MATERIAL SHOULD COMPLY WITH MATERIAL EL/DIVF/FRP LATEST REVISION IN GENERAL.
2. FRP TO BE FREE FROM SURFACE SCRATCHES, BENDS, FLAWS AND DENTS.
3. SHARP CORNERS TO BE ROUNDED OFF TO RADIUS R1.
4. THE FRP ROD SHOULD BE ANSWERED FOR 'GO' & 'NAGO' RING GAUGES (DRG.No 4 SK 2329 LATEST) THROUGH OUT THE LENGTH OF THE ROD.
5. PACKING: a) EACH FRP ROD SHOULD BE WRAPPED WITH 5 mm THICK EXPANDED POLYSTYRENE SHEET FOR EXTRA CUSHIONING.
b) ROD SHOULD BE PACKED IN A WELL SEASONED WOOD FABRICATED CRATE.
c) ALL RELEVANT MARKINGS SHOULD BE LABLED OR PRINTED ON THE CRATE.

EXACT REQUIREMENT OF L=LENGTH WILL BE INDICATED WHILE PLACING PURCHASE ORDER.

PRICE TO BE QUOTED FOR METER LENGTH BASIS.

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BHARAT HEAVY ELECTRICALS LTD.
ELECTROPORCELAINS DIVISION
BANGALORE 560 012

NAME VICHAR S
SIGN
DATE 24.5.2016

DRN
CHD
APPD

SSP
SSP
SSP

REF TO ASSY.DRG

WEIGHT (kg)

0.5

(Approx)

SCALE

N T S

GRADE OF
TOL DIM
C/M/F

DEPT
CODE

ITEM No.

No. OF
ITEMS

REV.

00

DRAWING No.

4 987 20 00011

REV.

00

No. OF SHEETS

SHT.24 SIZE A3 420 x 297

SUPERSEDES DRG. No.

FRP ROD FOR COMPOSITE
LONG ROD INSULATORS
(Dia 20mm)

CARD
CODE

0.5

N T S

DEPT
CODE

ITEM No.

No. OF
ITEMS

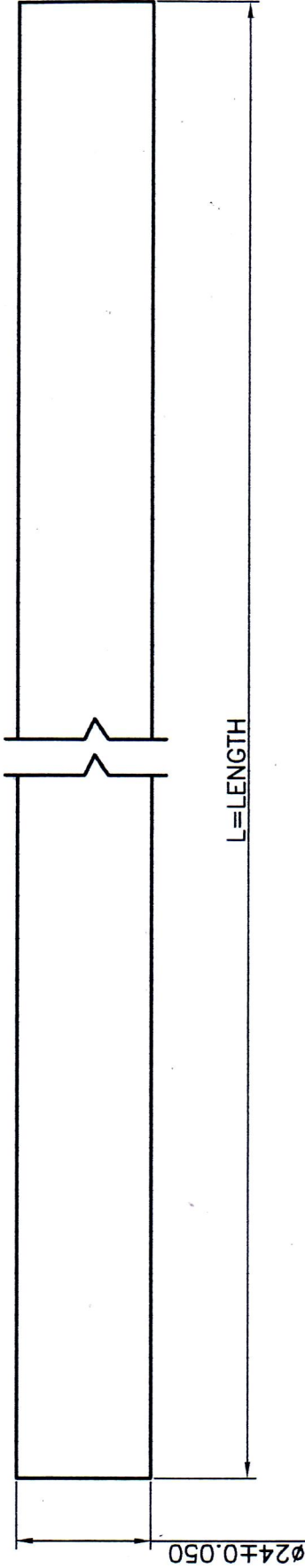
REV.

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DRG No. 4 987 24 00011

REV

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NOTES:

1. MATERIAL SHOULD COMPLY WITH MATERIAL EL/DIV/FRP LATEST REVISION IN GENERAL.
2. FRP TO BE FREE FROM SURFACE SCRATCHES, BENDS, FLAWS AND DENTS.
3. SHARP CORNERS TO BE ROUNDED OFF TO RADIUS R1.
4. BOTH THE ENDS OF ROD SHOULD BE ANSWERED FOR 'GO' & 'NOCO' RING GAUGES (DRG.No 4 SK 2329 LATEST)
5. PACKING: a) EACH FRP ROD SHOULD BE WRAPPED WITH 2 mm THICK EXPANDED POLYSTYRENE SHEET FOR EXTRA CUSHIONING.
b) ROD SHOULD BE PACKED IN A WELL SEASONED WOOD FABRICATED CRATE.
c) ALL RELEVANT MARKINGS SHOULD BE LABELED OR PRINTED ON THE CRATE/BOX.
6. ROD SHOULD BE MANUFACTURED BY VACUUM PULTRUSION METHOD.

EXACT REQUIREMENT OF L=LENGTH WILL BE INDICATED WHILE PLACING PURCHASE ORDER.

PRICE TO BE QUOTED FOR METER LENGTH BASIS.

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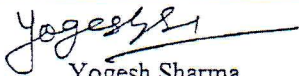
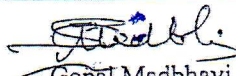
SIGN AND DATE		REF. DRG. No.		INVENTORY No.	
REV	DATE	ALTERED	CHECKED	REV	DATE
DEPT		GRADE OF TOL DIM		SCALE	
CODE		C/A/T		N T S	
BHARAT HEAVY ELECTRICALS LTD.		ELECTROPORCELAINS DIVISION		BANGALORE 560 012	
DRN		NAME		DATE	
CHD		VICHAR S		24.5.2016	
APPD		S S P		24.5.17	
		S S P		24.5.16	
WEIGHT (kg)		REF TO ASSY.DRG		ITEM No.	
0.8				14	
(Approx)				16	
TITLE		CARD CODE		DRAWING No.	
FRP ROD FOR COMPOSITE LONG ROD INSULATORS (Dia 24mm)		4 987 24 00011		REV.	
				00	
				No. OF SHEETS	
				SHT.24 SIZE A3 420 x 297	

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAINS DIVISION
BANGALORE 560 012



Purchase Specification for Fiber Reinforce Plastic (FRP) Rod

SECTION	: 1602
Specification No	: EL/DIVF/FRP/03
Rev No	: 02
Rev Date	: 10.12.2013
Page	: 1 of 2

Sl No	Specification	Requirement		
1	Purpose	To manufacture polymer composite long rod and 25kV railways insulators by Injection molding technique for transmission Line, traction and other applications upto 800 kV & 1200 kV systems by using FRP ROD & HTV Silicone Rubber compound.		
2	Description	Fiber Reinforce Plastic (FRP) rods must be manufactured by pultrusion technique by using Boron free, Electrical grade corrosion resistant (ECR) glass fiber with suitable epoxy resin system to meet following technical requirements. FRP rods must be post cured and cut to the required length using diamond cutting tool. Centre-less grinding must be done of FRP surface. No additional coating is acceptable on the FRP rod surface.		
3.	Technical Requirements:			
Sl No	Test parameter	Supplier min Sample size	Reference standard	Specified Value
3.1	Visual Inspection	100 %	--	Free from Void, crack, deformations, foreign materials, scratches, bends, flaws, dents etc.
3.2	Verification of dimensions	100 %	BHEL Drawing	As per drawing
3.3	Hardness Test (Barcol)	3 Nos / lot	ASTM D 2583	50 minimum
3.4	Specific Gravity	3 Nos / Lot	ASTM D 792	1.9 to 2.1
3.5	Dye Penetration Test	10 Nos per lot	IEC 62217 (Clause no 9.4.1)	No dye shall raise through the specimens before the 15 minutes have elapsed.
3.6	Water absorption Test	3 Nos per lot	IEC 61109 and ASTM D 570	0.1 % Max
3.7	Percentage of glass content	3 Nos / Lot	ASTM D 2584	70 % minimum
PREPARED BY			APPROVED BY	
 Yogesh Sharma Senior Manager / Composite Insulator			 Gopal Madbhavi Senior Manager / CI & NP	

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAINS DIVISION
BANGALORE 560 012



Purchase Specification for Fiber Reinforce Plastic (FRP) Rod	SECTION	: 1602
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3.8	Water diffusion Test	6 Nos / Lot	IEC 62217	During the test no puncture or surface flashover shall occur. The current during the whole test shall not exceed 1mA(r.m.s.).
3.9	Flexural Strength	3 Nos / Lot	ASTM D 790	10,000 Kg/cm ²
3.10	Bend Test (Only for FRP rods dia > 25mm)	1 No/ Lot	--	210 Kgf.m
3.11	Brittle fracture test	1 Nos / 5000 Nos	--	Test is to check the resistance to acid in tensile condition. Minimum 10mm of 1N-HNO ₃ acid thickness around naked rod must be in contact (min. contact rod length = 40mm) with for a duration of 96 hours under 80% of the rated tensile load. Rod must not indicate any sign of crack on its surface during & after 96-hour.
4.	Packing	As per drawing		
5.	Marking	Unique Manufacturer's identification mark (2 characters) must be present on each FRP rod face without altering any drawing dimension.		
6.	Supplier Test Certificate / Report	1. Glass fiber Certificate consisting Boron Free, ECR grade 2. Dimensional & Gauge check report 3. Test reports in line with SI No 3- technical requirements		
7.	Material Safety Data Sheet	Latest MSDS must accompany the supplies.		

PREPARED BY	APPROVED BY
 Yogesh Sharma Senior Manager / Composite Insulator	 Gopal Madbhavi Senior Manager / CI & NP