

BHARAT HEAVY ELECTRICALS LIMITED  
FSIP, JAGDISHPUR

SPECIFICATION NO:  
JP-PS-12-0002/NT

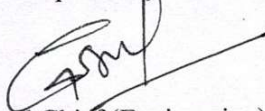
PURCHASE SPECIFICATION

Page 1 of 6

**SPHEROIDAL GRAPHITE IRON CASTINGS**

- |       |                           |  |
|-------|---------------------------|--|
| 1.0   | GENERAL                   | This specification governs the requirements of Spheroidal Graphite Iron Castings. SG Iron Castings, governed by this specification of BHEL FSIP shall generally be in compliance with the provisions of IS-1865:1991 and ASTM A536-84 (Reapproved 1999)  |
| 2.0   | SCOPE                     | All Insulator fittings like Socket Caps and Flanges  |
| 3.0   | CONDITION OF DELIVERY     | The castings shall be supplied in galvanise/ un-galvanised/ as Cast condition as per Purchase order  |
| 4.0   | DIMENSIONS AND TOLERANCES | Shall conform to relevant castings and machine drawings.   |
| 5.0   | MANUFACTURE               |  |
| 5.1   | MELTING                   | Shall be done in an electric furnace   |
| 5.2   | HEAT TREATMENT            |  |
| 5.2.1 | ANNEALING                 | Annealing shall be undertaken if non-homogeneity is observed with respect to Metallurgical Morphology and Mechanical properties. Annealing cycle shall be designed by the vendor and copy of the same shall be furnished to BHEL for scrutiny.   |
| 6.0   | FINISH AND WORKMANSHIP    | The castings shall be properly Fettled, Shot blasted to ensure removal of Fused Sand and Heat treatment scales from the surface. Machining shall also be done if mentioned in the Purchase order. The castings shall clearly bear such letters, figures or marks as specified in the drawing apart from vendor identification mark. Such identification mark shall be incorporated on the Castings after prior approval of BHEL. |

Prepared By



Functional Chief (Engineering)

Approved By



HOD (Engineering)

BHARAT HEAVY ELECTRICALS LIMITED  
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- 7.0 FREEDOM FROM DEFECTS The castings shall be sound, clean and free from Porosity, Blow Holes, Hard spots, Cold shuts, Distortion and other harmful defects. Galvanised items shall be further free from defects such as those mentioned in IS:2629
- 8.0 MECHANICAL PROPERTIES Test Specimen / Sample castings when tested shall conform to the following stipulations.

Table: Mechanical properties measured on test bars from separately Cast test samples.

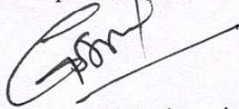
Grade as per IS-1865: 1991	Grades as per ASTM-A536	Tensile strength (min), (N/mm <sup>2</sup> )	0.2% Proof stress min. (N/mm <sup>2</sup> )	% Elongation (min) Lo=3D	For information only	
					Brinell hardness	Predominant constituent of Matrix
SG 500/7	---	500	320	7	160-240	Ferrite + Pearlite
SG 450/10	---	450	310	12	160-210	Ferrite
---	65-45-12	448	310	12	---	Ferrite
SG 400/15	---	400	250	15	130-180	Ferrite
---	60-40-18	414	276	18	---	Ferrite

Note: Test sample for Tensile Test shall be separately Cast test samples fully in compliance with CI 10.1 of IS: 1865:1991

Table :Typical Brinell Hardness Ranges

Grade	Brinell Hardness Range	Predominant Constituent of Matrix
H 200	170-230	Ferrite + Pearlite
H 185	160-210	Ferrite
H 155	130-180	Ferrite

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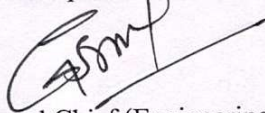
SPECIFICATION NO:  
JP-PS-12-0002/NT

PURCHASE SPECIFICATION

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- 9.0 MICROSTRUCTURE The specimen shall reveal a microstructure as follows :  
Carbon nodules distributed uniformly in a matrix of ferrite or ferrite + pearlite.  
1 sample/heat treatment or 1 sample/ 1000 nos to be checked for microstructure.  
Acceptance norm as per ASTM - A247 and IS: 7754-1975 (Reapproved in 2003)
- 10.0 CHEMICAL COMPOSITION Shall conform to drawings when specified.
- 11.0 TESTS FOR ZINC COATING (Applicable to Galvanized components) Tests for uniformity of Zinc coating and mass of Zinc coating shall done in accordance with FSIP test Procedure JP-TP-10. The component shall withstand minimum six dips of one minute each and mass of Zinc coating shall be 610 gm/m<sup>2</sup> minimum. In case of requirement of higher values for these characteristics the same shall be indicated in the order/ drawing.  
Note: The test for uniformity coating shall not be applicable for items with an overall size more than 200mm x 150mm x 100mm and/ or weight exceeding 4 kg.

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## PURCHASE SPECIFICATION

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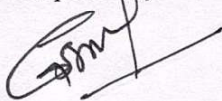
12.0 SELECTION OF SAMPLES Sampling for various tests / inspection shall be as indicated in the table below:

SI No.	Type of Test/Inspection	Sampling plan for supplier while production and BHEL for lot acceptance
1.	Dimensional Check	2 nos per 1000 NOS or part thereof.
2.	Visual & Gauge Inspection	100% visual inspection by Supplier. And samples as per IS:2500 ( Part I ) inspection level II & an AQL of 0.65 % by BHEL
3.	MPI	100% visual inspection by Supplier. And samples as per IS:2500 ( Part I ) inspection level II & an AQL of 0.25 % by BHEL
4.	Mechanical Properties (Ultimate Tensile Strength, 0.2% proof stress, % Elongation)	Tested on one test bar per treatment batch by supplier and one test bar per lot by BHEL. Test samples to be drawn at least one number per treatment (not exceeding 2000 kgs of fettled castings from one heat) Note: 1. Sufficient no. of test bars (preferably 4 nos) from same melt/heat treatment need to be produced to provide for contingencies of discordance of a test or re-tests. 2. Tensile Tests, Evaluation of Nodularity (respectively in accordance with Cl 13.1 and Cl 9.1 of IS: 1865) shall be imposed only at the time of vendor approval and subsequent surveillance checks. Surveillance checks to be carried out once every 6 months irrespective of whether supplies have been effected or not, as long as the vendor is on the PMD) listing -Validity of tests : As per Cl 14.1 of IS:1865; Retest : As per Cl 15 of IS: 1865

\*For bulk supplies only. Detailed check shall be carried out on initial sample to be approved for taking up bulk manufacture.

- i) In case of failure of any tensile test 'retest' can be taken on two additional test bar pertaining to the same batch and both the additional test bars shall pass

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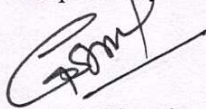
## PURCHASE SPECIFICATION

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- ii) In case a test bar breaks out of the gauge length & 'repeat test' call be taken up on are placement test bar. So also in the event of any defect traceable to the testing conditions or attributable to specimen unsoundness.
- Test to be carried out by ASNT Level II certificate holders only.
  - Gauges will be applicable as per drawing.

SI No.	Type of Test/Inspection	Sampling plan for supplier while production and BHEL for lot acceptance
5.0	Hardness test on Castings	<p>2Nos. per lot</p> <p>Test samples: Hardness tests shall be carried out on actual castings drawn at the rate of</p> <p>A) In case of Socket caps: 4 nos from among the castings (of one drawing type) per treatment / 4 nos from among the castings (of one drawing type) per lot of 1000 nos or part thereof.</p> <p>B) In case of Flanges: 2 nos from among the castings (of one drawing type) per treatment / 2 nos. from among the castings (of one drawing type) per lot of 1000 nos or part thereof.</p> <p>Location of Hardness test samples:</p> <p>A) In Case of Socket caps : On the Socket head and sectioned lip portion</p> <p>B) In case of Flanges : On the hub or web whichever is thicker</p>
6.0	Load test on Castings (for Socket Caps)	4 nos per 1000 with min 1 no. per melt / treatment
7.0	Additional test : Test for deformation	On one sample per melt
8.0	Surface defects (after galvanizing)	IS:2500 (Part I) Inspection level II & and AQL of 0.65%
9.0	Test for Zinc coating	3 nos. per batch of 1000 nos.

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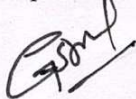
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- |      |                                 |   |
|------|---------------------------------|---|
| 13.0 | INSPECTION AT VENDOR'S PREMISES | BHEL's representative shall have free access to all parts of vendors contract is being executed. The vendor shall offer BHEL's representative all reasonable facilities to convince the latter that the component is being manufactured and furnished in accordance with this specification.  |
| 14.0 | TEST CERTIFICATE                | The supplier shall submit test certificate giving in the following information :<br>a) Purchase Order no.<br>b) Purchasing specification no.<br>c) Suppliers reference and name<br>d) Batch no.<br>e) Consignment identification<br>f) Results of various tests as called for in this specification<br>g) Details of Heat treatment (if any)<br>h) Melt no. details with traceability |
| 15.0 | PACKING AND MARKING             | Castings shall be supplied in lots as defined above. Each lot shall be legibly identified with the following information<br>a) Suppliers' Name<br>b) Purchase Order no.<br>c) Component drawing no.<br>d) Consignment identification<br>e) Lot (or malleablising batch no/identification)<br>f) Quantity  |
| 16.0 | REJECTION                       | Castings not conforming to the above stipulations shall be rejected. Also in the event of the castings proving defective in the course of any further processing the same shall be rejected notwithstanding any previous certification of satisfactory testing and/or inspection.   |

Prepared By



Functional Chief (Engineering)

Approved By



HOD (Engineering)

321970/2021/FSIP R&D UNIT

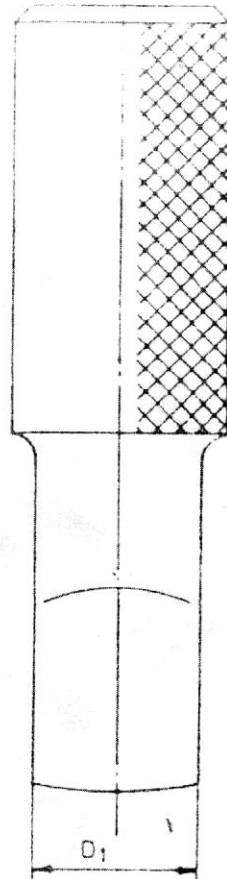
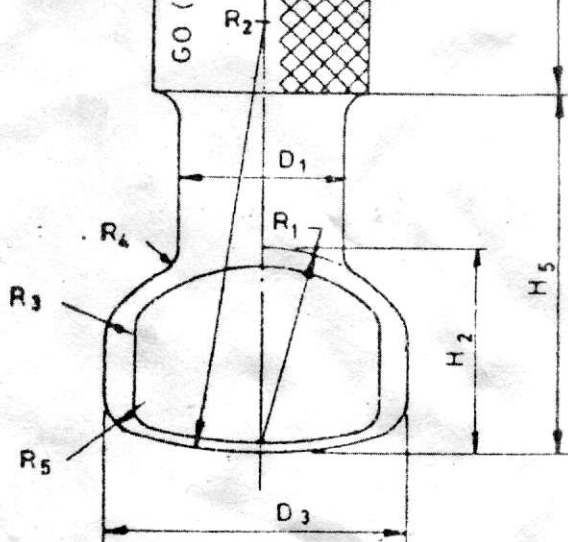
प्रथम को संशोधन / FIRST ANG

26 ± 0.5

2x45

संशोधन REV. 03	दिनांक DATE 4.10.18	संशोधक ALTERED BY A. SINGH	जांचकर्ता CHKD UTKARSH
REF. NO. 2759			

BG : BEFORE GALVANIZING  
 \* DESIGNATION 16 mm B  
 R-TYPE OR 20mm  
 R-TYPE TO BE  
 STAMPED



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स्वामिकार एवं गोपनीय  
 इस प्रलेख में दी गई सूचना भारत हेवी इलेक्ट्रिकल्स लिमिटेड की  
 संपत्ति है। इसका प्रलेख या अपरलेख स्वयं में किसी भी तरह  
 प्रयोग नहीं किया जाए जो कंपनी के हित में हानिकार हो।

DIMENSIONS TO BE CONTROLLED WITHIN  
 LIMITS AS SHOWN  
 MACHINING TOLERANCE ±0.25 mm UNLESS  
 OTHERWISE SHOWN  
 NON-MACHINING TOLERANCE ±0.5 mm

DESIGNA- TION	GAUGE	D <sub>1</sub>	D <sub>3</sub>	H <sub>2</sub> (R-CLIP)	H <sub>5</sub>	R <sub>1</sub>	R <sub>2</sub>	R <sub>3</sub>	R <sub>4</sub>	R <sub>5</sub>
16 mm B	MAX.	19.694	35.002	26.008	40.70	23.254	50.254	3.251	2.753	3.251
	NOM.	19.680	34.988	25.988	40.20	23.244	50.244	3.244	2.760	3.244
	MIN.	19.666	34.974	25.968	39.70	23.234	50.234	3.237	2.767	3.237
	WORN	19.600	34.900	25.900	39.20	23.200	50.200	3.200	2.800	3.200
20 mm	MAX.	23.516	43.030	29.832	50.70	27.266	60.266	6.265	3.242	6.265
	NOM.	23.498	43.010	29.806	50.20	27.253	60.253	6.255	3.251	6.255
	MIN.	23.480	42.990	29.780	49.70	27.240	60.240	6.245	3.260	6.245
	WORN	23.400	42.900	29.700	49.20	27.200	60.200	6.200	3.300	6.200

- NOTES :
1. ALL DIMENSIONS ARE AFTER HARDCHROME PLATING
  2. MATERIAL : OIL HARDENING NON SHRINKING STEEL (OHNS)
  3. HARDNESS : HRC 60 TO 64 (BEFORE HARDCHROME PLATING)
  4. SURFACE TREATMENT : HARCHROME PLATING
  5. SURFACE ROUGHNESS : LESS THAN 4 MICRONS



भारत हेवी इलेक्ट्रिकल्स लिमिटेड, जगदीशपुर, अमेठी  
 BHARAT HEAVY ELECTRICALS LIMITED,  
 JAGDISHPUR, AMETHI

निर्माणकर्ता DRN.	नाम/NAME	हस्ताक्षर/SIGN	दिनांक/DATE	वेरिएट संख्या No. of Var.
जांचकर्ता CHKD	M.K.Sarkar	sd	01.07.87	
स्वीकृतकर्ता APPD	G.Singh	sd	01.07.87	
	R.R.Gond	sd	01.07.87	

विभाग अभियांत्रिकी DEPTT. ENGG.	पैमाना /SCALE N.T.S.	भार कि.गा. WEIGHT (KG)	असेम्बली अभिकल्प का संदर्भ REFER TO ASSLY. DRG.	नग क्रमांक ITEM NO.	नों की संख्या NO. OF ITEMS
कोड/CODE 400		--			

शीर्षक/TITLE GO GAUGE (R - CLIP CAP) FOR SOCKET INTERNAL HEIGHT AND INTERNAL DIAMETER(BEFORE GALVANIZING)	कार्ड कोड CARD CODE	अभिकल्प संख्या/DRAWING NO. 4SK-139	REV. 03
पृष्ठ संख्या/Sheets No.		पृष्ठों की संख्या/No. of Sheets	

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 इस प्रलेख में दी गई सूचना भारत हेवी इलेक्ट्रिकल्स लिमिटेड की  
 संपत्ति है। इसका प्रत्यक्ष या अप्रत्यक्ष रूप में किसी भी तरह  
 प्रयोग नहीं किया जाए जो कंपनी के हित में हानिकार हो।

DIMENSIONS TO BE CONTROLLED WITHIN  
 LIMITS AS SHOWN  
 MACHINING TOLERANCE ±0.25 mm UNLESS  
 OTHERWISE SHOWN  
 NON-MACHINING TOLERANCE ±0.5 mm

संदर्भित अभिकल्प संख्या  
 REFERENCE DRG. NO

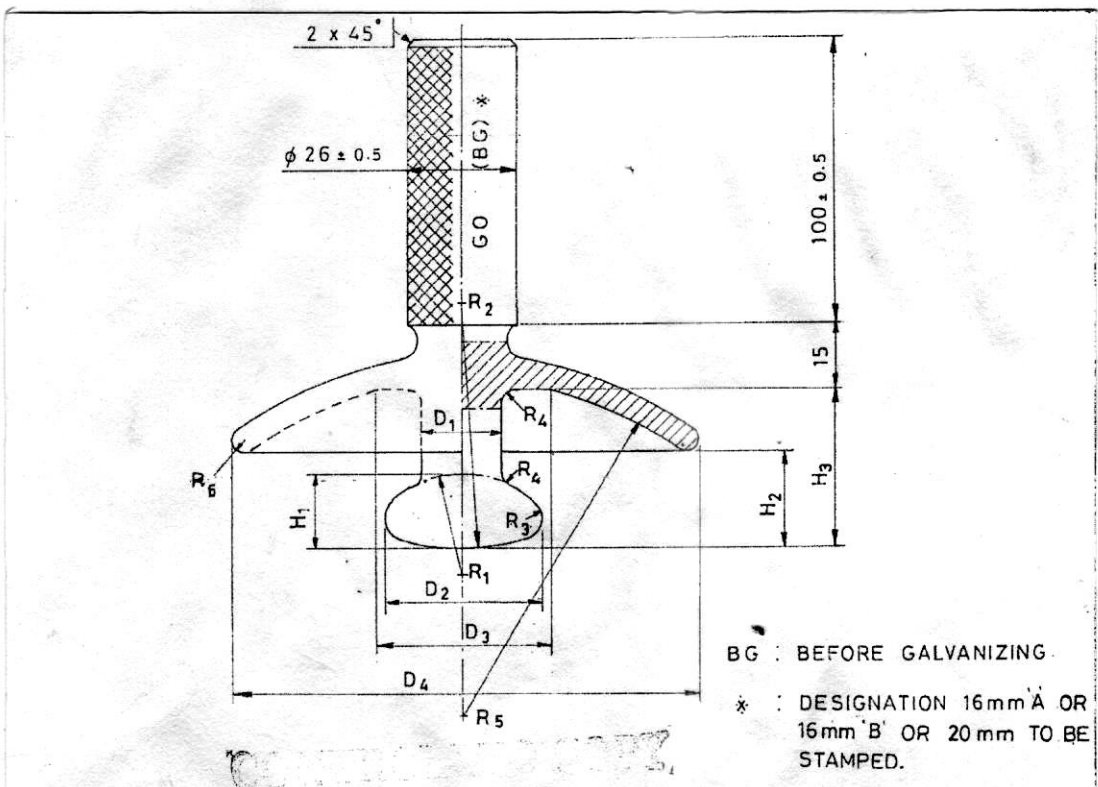
हस्ताक्षर और दिनांक/SIGN & DATE

सामग्री सूची संख्या  
 INVENTORY NO.

संशोधन REV. 02	दिनांक DATE 4.10.18	अभियंता A. SINGH
		अनुमोदित UTKARSH

D. Chauhan

REF. NO. 2760



DESIGNATION	GAUGE	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	H <sub>1</sub>	H <sub>2</sub>	H <sub>3</sub>	R <sub>1</sub>	R <sub>2</sub>	R <sub>3</sub>	R <sub>4</sub>	R <sub>5</sub>	R <sub>6</sub>	
16 mm 'A' & 16 mm 'B'	NEW	MAX.	17.522	33.890	34.926	90.19	13.972	20.686	31.786	23.286	50.286	3.271	2.739	71.90	3.00
		NOM.	17.496	33.850	34.951	89.99	13.936	20.768	31.868	23.268	50.268	3.255	2.752	72.00	2.90
		MIN.	17.470	33.810	34.976	89.79	13.900	20.850	31.950	23.250	50.250	3.239	2.765	72.10	2.80
20 mm	NEW	MAX.	21.550	41.620	45.084	120.55	20.102	25.551	42.151	27.301	60.301	6.045	3.225	89.75	3.65
		NOM.	21.520	41.570	45.123	120.25	20.056	25.676	42.278	27.278	60.278	6.024	3.240	89.90	3.50
		MIN.	21.490	41.520	45.161	119.95	20.010	25.805	42.405	27.255	60.255	6.003	3.255	90.05	3.35
	WORN	21.400	41.400	45.200	119.65	19.900	25.900	42.500	27.200	60.200	5.953	3.300	90.20	3.20	

- NOTES :
- ALL DIMENSIONS ARE AFTER HARDCHROME PLATING
  - MATERIAL : OIL HARDENING NON SHRINKING STEEL (OHNS)
  - HARDNESS : HRC 60 TO 64 (BEFORE HARDCHROME PLATING)
  - SURFACE TREATMENT : HARDCHROME PLATING
  - SURFACE ROUGHNESS : LESS THAN 4 MICRONS

	भारत हेवी इलेक्ट्रिकल्स लिमिटेड, जगदीशपुर, अमेठी BHARAT HEAVY ELECTRICALS LIMITED, JAGDISHPUR, AMETHI	निर्माणाकर्ता DRN.	नाम/NAME	हस्ताक्षर/SIGN	दिनांक/DATE	वेरिफाई संख्या No. of Ver.
		जांचकर्ता CHD	G. Singh	sd	01.07.87	
		स्वीकृतकर्ता APPD	R.R.Gond	sd	01.07.87	

विभाग अभियंत्रिकी DEPTT. ENGG.	पैमाना /SCALE N.T.S.	भार कि.गा. WEIGHT (KG)	असेम्बली अभिकल्प का संदर्भ REFER TO ASSLY. DRG.	नग क्रमांक ITEM NO.	सभी की संख्या NO. OF ITEMS
कोड/CODE 400					

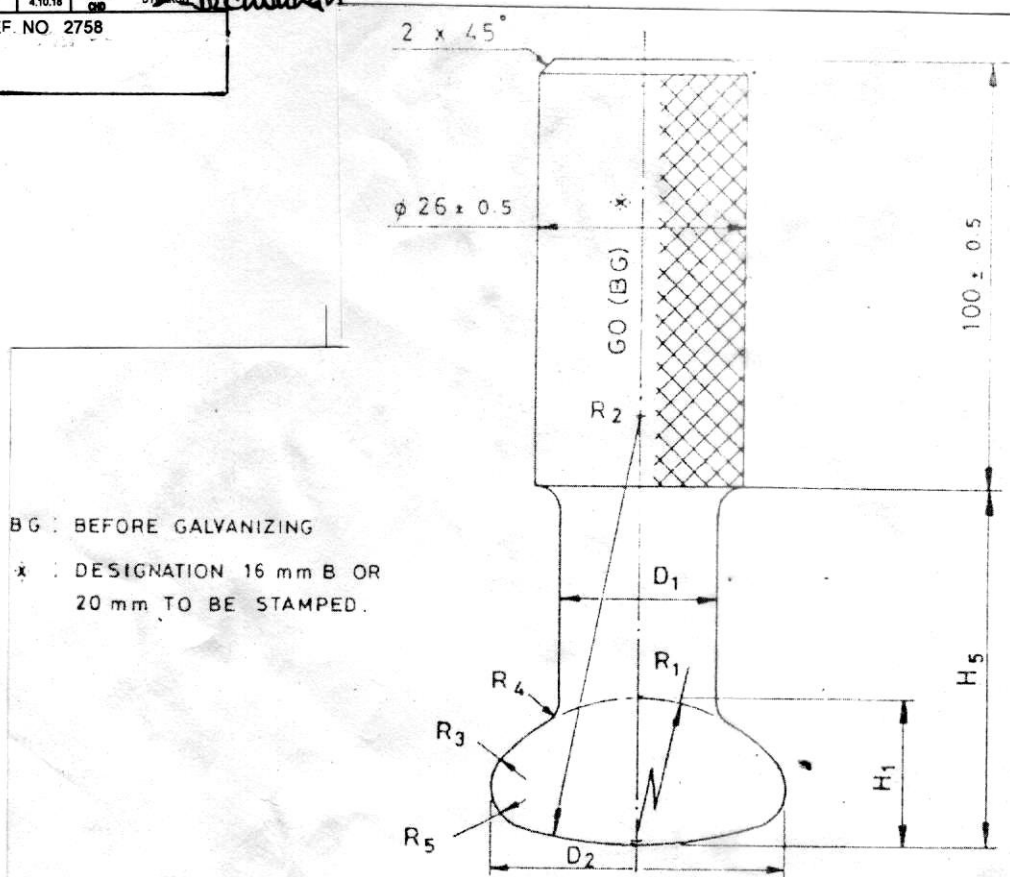
शीर्षक/TITLE <b>HOOK - ON GO GAUGE (BEFORE GALVANIZING)</b>	कार्ड कोड CARD CODE	अभिकल्प संख्या/DRAWING NO. <b>4SK 145</b>	REV. <b>02</b>
पृष्ठ संख्या/Sheets No.		पृष्ठों की संख्या/No. of Sheets	

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DIMENSIONS TO BE CONTROLLED WITHIN LIMITS AS SHOWN MACHINING TOLERANCE ±0.25 mm UNLESS OTHERWISE SHOWN NON-MACHINING TOLERANCE ±0.5 mm

REV. 03	DATE 4.10.18	डिजाइनर/DESIGNED BY	असम्बली/ASSEMBLY
REF. NO 2758		UTKAL BHARAT	



BG : BEFORE GALVANIZING  
 \* : DESIGNATION 16 mm B OR 20 mm TO BE STAMPED.

- NOTES :
1. ALL DIMENSIONS ARE AFTER HARDCHROME PLATING
  2. MATERIAL : OIL HARDENING NON SHRINKING STEEL (OHNS)
  3. HARDNESS : HRC 60 TO 64 (BEFORE HARDCHROME PLATING)
  4. SURFACE TREATMENT : HARDCHROME PLATING
  5. SURFACE ROUGHNESS : LESS THAN 4 MICRONS

DESIGNATION	GAUGE	D1	D2	H1	H5	R1	R2	R3	R4	R5
16 mm B	Maximum	19.694	35.002	17.508	40.7	23.254	50.254	3.251	2.753	3.251
	Nominal	19.680	34.988	17.488	40.2	23.244	50.244	3.244	2.760	3.244
	Minimum	19.666	34.974	17.468	39.7	23.234	50.234	3.237	2.767	3.237
	Worn	19.600	34.900	17.400	39.2	23.200	50.200	3.200	2.800	3.200
20 mm	Maximum	23.516	43.030	21.032	50.7	27.266	60.266	6.265	3.242	5.765
	Nominal	23.498	43.010	21.006	50.2	27.253	60.253	6.255	3.251	5.755
	Minimum	23.480	42.990	20.980	49.7	27.240	60.240	6.245	3.260	5.745
	Worn	23.400	42.900	20.900	49.2	27.200	60.200	6.200	3.300	5.700

संशोधित अभिकल्प संख्या REFERENCE DRG. NO

हस्ताक्षर और दिनांक/SIGN & DATE

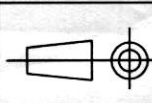
सामग्री सूची संख्या INVENTORY NO.



भारत हेवी इलेक्ट्रिकल्स लिमिटेड, जगदीशपुर, अमेठी  
 BHARAT HEAVY ELECTRICALS LIMITED,  
 JAGDISHPUR, AMETHI

नाम/NAME	हस्ताक्षर/SIGN	दिनांक/DATE	वैरिएंट संख्या No. of Var.
निर्माणकर्ता DRN. M.K.Sarkar	sd	01.07.87	
जांचकर्ता CHD. G.Singh	sd	01.07.87	
स्वीकृतकर्ता APPD. R.R.Gond	sd	01.07.87	

विभाग अभियांत्रिकी DEPTT. ENGG.  
 कोड/CODE 400



पैमाना /SCALE N.T.S.

भार कि.ग्रा. WEIGHT (KG) --

असेम्बली अभिकल्प का संदर्भ REFER TO ASSLY. DRG.

नग क्रमांक ITEM NO.  
 नगों की संख्या NO. OF ITEMS

शीर्षक/TITLE  
**GO GAUGE**  
 FOR SOCKET ENTRY HEIGHT ENTRY WIDTH AND NECK WIDTH (BEFORE GALVANIZING)

कार्ड कोड CARD CODE

अभिकल्प संख्या/DRAWING NO.  
**4SK-146**

REV. 03

पृष्ठ संख्या/Sheets No. पृष्ठों की संख्या/No. of Sheets