



TSD6206A

## PLANT PURCHASING SPECIFICATION BHOPAL

BP 19381

Rev No. 02

PAGE 1 OF 6

SUPERSEDES  
BP 19381 Rev.01

### NON-MAGNETIC CORROSION RESISTANT STEEL FORGINGS Gr. X 8 CrMn N18 18K

#### 1) GENERAL :

This specification governs the quality of forged and cold expanded, non-magnetic, corrosion resistant, steel forgings for Gr: X8CrMn N18 18K variety.

#### 2) APPLICATION :

For manufacture of cap ring forgings of AC motors.

#### 3) CONDITION OF DELIVERY :

Forged and cold expanded to achieve mechanical properties mentioned in Cl. 11.

Forgings shall be supplied in the rough machined the stress relived condition, unless otherwise specified.

Our order shall specify the strength category (0.2% Rp Proof Stress) required.

#### 4) COMPLIANCE WITH NATIONAL STANDARDS :

There is no Indian Standard covering this type of material.

#### 5) DIMENSIONAL AND TOLERANCE :

The dimension of the forgings shall be as stated on the drawing or order. If the order/drawing calls for finished dimensions, the forgings are to be delivered with all side machining allowances of 3 to 4 mm to this finished dimensions after rough machining. The surface roughness shall be maximum R2=6 µm for the non-destructive test, clause 12.

#### 6) MANUFACTURE :

Material shall be manufactured from killed steel.

Revision :

Reviewed &amp; No Tech. Change

Issued by :

STANDARDS AND MATERIALS GROUP  
TECHNICAL SERVICES DEPTMENT

Rev.02

Date : 25.01.2020

Date of first Issue : Nov 87

COPYRIGHT AND CONFIDENTIAL

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 be interest of the company



TSD 6207A

# PLANT PURCHASING SPECIFICATION BHOPAL

BP 19381

Rev No. 02

PAGE 2 OF 6

## 7) HEAT TREATMENT :

The material is to be forged and cold expanded within 300°C. A hot cold deformation is not permissible. No age-hardening is permitted. The forgings are to be stress-relieved, at least 5 hours at 350°C ± 20°C K after the cold expansions.

## 8) FREEDOM FROM DEFECTS :

The forgings shall be sound, clean and free from cracks, flakes, seams, segregations, harmful non-metallic inclusions other defects.

## 9) CHEMICAL COPOSITION :

The chemical composition of the steel shall be as follows :

Element	Percentage	
	Minimum	Maximum
Carbon	-	0.12
Silicon	-	0.80
Manganese	17.50	20.00
Phosphorus	-	0.05
Sulphur	-	0.015
Chromium	17.50	20.00
Nitrogen	0.40	-

## 10) TEST SAMPLES :

One tangential test samples shall be selected per heat treatment batch, per consignment for mechanical properties. Tangential samples area to be taken from the forged specimen from the center of the wall thickness after the last heat treatment.

## 11) MECHANICAL PROPERTIES :

### 11.1 Tensile :

When tested in accordance with IS:1608/DIN 50145 & 50125 the test pieces shall show, the properties given in the table below :

### 11.2 Impact value :

Charpy-ISO-V-Notch when tested in accordance with IS: 1498/DIN 50115 the test pieces shall show the properties given in the table below, mean of three tests shall be taken.



TSD 6207A

# PLANT PURCHASING SPECIFICATION BHOPAL

BP 19381

Rev No. 02

PAGE 3 OF 6

*0.2% Proof Stress N/mm <sup>2</sup> Min	% Elongation 5.65√So GL, Min	Reduction in Area Percent Min	Charpy Impact Value –ISO-V- Notch "J" Min.
550	37	61	130
600	35	60	125
650	32	59	120
700	30	58	110
750	28	57	105
800	26	55	100
850	24	54	95
900	22	53	90
950	20	52	80
1000	18	51	75

**\*Note :**

1. Strength category (0.2% Rp) shall be specified in the order.
2. The measured 0.2% proof stress is permissible to exceed the required minimum value by 150 N/mm<sup>2</sup> maximum.
3. The tensile Strength shall be mentioned for information in Test certificate.

**12. NON DESTRUCTIVE EXAMINATION :****12.1 Ultrasonic Examination :**

The ultrasonic testing shall be performed on 100% of the external surface with a standard test probe in radial direction and width 45 deg. Angular probe, twice in periphery direction and twice in axial direction. Test frequency shall be 1 or 2 MHz. The desired surface finish shall be less than or equal to 6 µm.

**Note :**

With the calibrator attenuator, the back-wall or edge echo is adjusted to 100% screen height and then increase the gain by 12 dB. Any texture noise / grass echoes appearing should not exceed 20% of screen height.

The ultrasonic testing shall be performed as per BHEL Corporate Standard AA 085 01 18 and the following shall be the unacceptable defects (category I of AA 085 01 18).

- a) Cracks, flakes, seams and laps.
- b) Defects giving indication larger than that from a 2 mm diameter equivalent flaw
- c) Groups of defects with maximum indication less than that from a 2 mm diameter equivalent flaw which cannot be separated at testing sensitivity if the back-echo is reduce to less than 70x.



TSD 6207A

## PLANT PURCHASING SPECIFICATION BHOPAL

BP 19381

Rev No. 02

PAGE 4 OF 6

- D) Defects giving indications of 1 and 2 mm diameter equivalent flaws separated by a distance less than four times the size of the larger of the adjacent flaws.

### 12.1 Liquid Dye penetration Examination

Liquid dye penetrate test is to be carried out in 100% surface of the forgings to examine freedom from cracks as per DIN 54152 part I and the indications are to be recorded and marked on the forging.

### 12.2 Liquid Dye penetration Examination

Liquid dye penetrate test is to be carried out in 100% surface of the forgings to examine freedom from cracks as per DIN 54152 part I and the indications are to be recorded and marked on the forging.

### 13 INSPECTION AT SUPPLIER'S WORKS :

Whenever specified tests and inspection are to be conducted in the presence of BHEL's representative.

BHEL representative shall have free access at all times while the work on the contract is being performed to all parts of the manufactures works. The manufacture shall offer BHEL's representative all reasonable facilities, without charge to satisfy the later that the material is being furnished in accordance with this specification.

The manufacture shall prepare and provide necessary test specimens for testing to be carried out at his premises. If facilitate are not available at his work the manufacturer shall make necessary arrangements for carrying out the prescribed tests elsewhere.

The manufacture shall notify BHEL in advance about readiness of the material for inspection and testing. BHEL reserves the right to test the material at BHEL's works and the final acceptance of the material shall be based on these test results.

### 14 REWORK :

Repair or elimination of insignificant defects not be carried out without the prior permission of BHEL.



TSD 6207A

## PLANT PURCHASING SPECIFICATION BHOPAL

BP 19381

Rev No. 02

PAGE 5 OF 6

### 15. TEST CERTIFICATE :

Three copies of test certificates shall be supplied, unless otherwise stated on the order in the 'test certificate' proforma annexed to this specification, (Annexure-I).

In addition, the supplier shall ensure to enclose one copy of the test certificate along with their dispatch documents to facilitate quick clearance of material.

### 16. PACKING AND MARKING :

Forgings shall be suitably packed to prevent corrosion & damage during transit.

Machine surfaces shall be properly protected with anti-corrosive compounds.

Each package or forgings (when supplied separately) shall be legibly marked with paint with the following information:-

BP 19381: Non-magnetic Corrosion resistance steel forgings Gr:X8CrMnN18 18K.

BHEL Order No.

Drawing No. (on the inner surface)

Consignment or identification No.

Batch No.

Weight

Supplier's Name.

### 17. REJECTION AND REPLACEMENT :

If the forging does not comply with the requirements of this specification during receipt inspection at BHEL or if any defect is found during the course of preparation, machining, testing or erection such forging shall be rejected notwithstanding any previous certification. of satisfactory testing and/or inspection.

The manufacturer shall undertake to replace the rejected forgings at his own cost and the rejected forgings shall be taken back by the supplier after fulfilling the commercial terms and conditions.



TSD 6207A

# PLANT PURCHASING SPECIFICATION BHOPAL

BP 19381

Rev No. 02

PAGE 6 OF 6

## Recommended Test Certificate Format For Forgings

### Annexure-1

#### Supplier's Name and Address

1. Customer:	0. Reduction Ratio	1. Ingot/Bloom
2. TC No. & Date:	10. Batch No.:	7. Blooms/Blanks
3. PO No.:	11. Heat/Heat No.:	
4. Process of Manufacturing:	12. Spec. No.:	
5. Decarburization Process:	13. Test Bar Size & No.	
6. Forging Method:	14. Supplier of (the ingot/bloom)	
7. BHEL's Reference for Approval of Bloom		
8. Discard Top V Bottom %		
15. FORGINGS COVERED BY TEST CERTIFICATE		
S No.	Drawing No. & Item No.	Description
		Quantity & Weight
16. CHEMICAL COMPOSITION (PERCENT)		
Element	C	Si
As Per Spec	Min.	Mn
Specs	Max.	S
Actual Values		P
17. HEAT TREATMENT (To be accompanied by Recorder Chart, Whenever called for)		
Condition	Heating Rate, °C/hr.	Temp. °C
		Soaking Time, Hrs.
		Cooling Rate, °C/hr.
		Cooling Medium
18. MECHANICAL PROPERTIES		
	T.S. N/mm <sup>2</sup>	Y.S. 0.2% Proof N/mm <sup>2</sup>
As Per Spec	Min.	% Elongation 5.65 (SS) GL
Specs	Max.	% R.A. (M.T.L.)
Actual Values		Hardness BH4 (HRC.3 values)
		Impact Value Joules
		Angle of bend
		Dist. of mandrel
		Result
19. SURFACE FINISH (When called for in the order/dwg.)		
20. DIMENSIONAL INSPECTION		
21. NON-DESTRUCTIVE TESTS		
Non-destructive Test	Acceptance level	Instrument used
Ultrasonic		Range
Radiographic		Results
Dye penetrant		Any other detail
Magnetic Particle		
22. METALLOGRAPHIC EXAMINATION (To be conducted if called for and photo micrographs to be attached along with a report)		
Location of Sample	Etchant used	Magnification
		Constituent observed
		Relative %
Microstructure	Macroetch	Inclusion Rating
23. OTHER TESTS IF ANY (MICROSCOPIC SULPHUR PRINTS, ETC.)		
24. IDENTIFICATION OF FORGINGS AS PER PURCHASE SPEC.		
We hereby certify that the items mentioned above have been tested and inspected in our presence and are found to be in accordance with drawings, specifications and purchase order.		
SIGNATURE, NAME & SEAL OF THE INSPECTING OFFICER		
DATE		
SIGNATURE, NAME & SEAL OF THE CHIEF OF QUALITY CONTROL/ CHIEF METALLURGIST OF THE SUPPLIER		
DATE		
INSTRUCTIONS		
a) Details of all heat treatment processes carried out should be furnished sequentially in 17		
b) Test certificates should be furnished as per Purchase order and specifications, in A4 size preferably (if transparent paper)		
c) All the entries including signature should be in black colour ink.		
d) If testing is done by third agencies, the original TCs shall be furnished.		
e) The actual TC may occupy more than one A4 size paper, if needed, to facilitate filing up of details.		