

GENERAL DIMENSIONAL LIMITS, FITS & TOLERANCES AS PER HY0230261

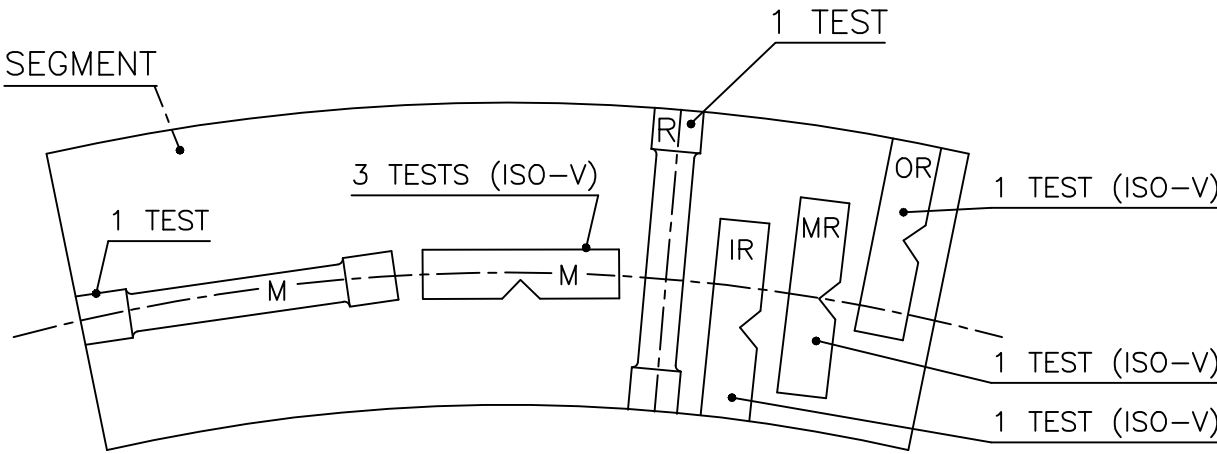


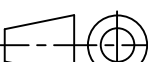
Diagram illustrating a curved structural member with various test points and segments. The member is divided into segments, with labels indicating the number of tests performed on each segment:

- SEGMENT**: Points to the leftmost section of the member.
- 1 TEST**: Points to a test location on the leftmost section.
- 3 TESTS (ISO-V)**: Points to a test location on the middle section, which is marked with an 'M'.
- 1 TEST**: Points to a test location on the rightmost section, which is marked with an 'R'.

M : MEAN DIA R : RADIAL
IR : INNER RADIAL MR : MEAN RADIAL
OR : OUTER RADIAL



1. MATERIAL OF THE FORGING: X8 Cr Mn N18 18K.
2. SPECIFICATION: HY 19372/02 (VAR 18.)
3. SURFACE FINISH OF THE FORGING: $\frac{3.2}{\sqrt{A}}$ (MICRONS C.L.A.)
4. **MECHANICAL PROPERTIES:**
 - 0.2% PROOF STRESS : 1250 N/mm² Min.
 - ELONGATION (L=5d) : 13% Min.
 - REDUCTION IN AREA : 50% Min
 - IMPACT STRENGTH(ISO-V) : 70 J Min.
5. THE DRAWING REFERS TO ROUGH MACHINED RETAINING RING FORGING.
NO ADDITIONAL ALLOWANCES NEED BE GIVEN OVER THOSE SHOWN ABOVE.
6. THE RING WILL BE SUBJECTED TO THE TYPE OF LOAD SHOWN IN THE FIGURE.

THE FOLLOWING CONDITIONS APPLY EXCEPT OTHERWISE STATED. 1. REF. TO HY 0230261 FOR UNSPECIFIED TOLERANCES. 2. CHAMFER M/CD. SHARP EDGES 1.2 TO 1.0 AT 45'. 3. INTERNAL M/CD. CORNER RADII 1 TO 0.7 4. THE SURFACE ROUGHNESS WHEREVER NOT SHOWN SHALL BE TAKEN FROM THE SURFACE ROUGHNESS SHOWN OUT SIDE THE BACK SLASH GIVEN ON THE TOP MOST RIGHT CORNER OF THE DRG.	TYPE OF PRODUCT		TARI 1150-36Q						
	NAME OF CUSTOMER/PROJECT								
		BHARAT HEAVY ELECTRICALS LIMITED HYDERABAD		DRN.	NAME	SIGN.	DATE	NO.OF VAR.	
				CHD.	P.D.NAIDU		07.06.24		NA
				APPD.	K.C.PANDA		07.06.24		
	DEPT. EME		SCALE	WEIGHT (KG)	REF. TO ASSY DRG. NA		ITEM NO. 2	NO.OF ITEMS NA	
	CODE 425		N.T.S	1965					
TITLE			CARD CODE NA	DRAWING NO. 2-136-06-30546			REV. 02		
RETAINING RING FORGING				SHEET NO. 01		NO OF SHEETS 01			

	PLANT PURCHASING SPECIFICATION HYDERABAD		HY19372		
			REV. NO. 02		
			PAGE 1 OF 5		
<u>NON MAGNETIC ALLOY STEEL FORGINGS FOR RETAINING RINGS</u> <u>GR: X 8 CR Mn N 1818K</u>					
1.0 <u>GENERAL:</u> This specification governs the quality requirements of magnetic steel forging grade: X 8 Cr Mn N 1818K. 2.0 <u>APPLICATION:</u> For non-magnetic end retaining rings in Turbogenerators. 3.0 <u>CONDITION OF DELIVERY</u> The forging shall be supplied in heat treated, cold expanded and rough machined condition to the relevant drawing. 4.0 <u>DIMENSIONS AND TOLERANCES:</u> Forging shall have dimensions and tolerances as per ordering drawing. 5.0 <u>MANUFACTURE:</u> The steel for forging shall be made by Electro Slag Remelting (ESR) process or any other processes agreed between the supplier and BHEL. Sufficient discard shall be made from each end of the ingot to ensure freedom from piping and undue segregation. The forging shall receive its hot mechanical work under a press of ample power. The forging shall be cold expanded below 300°C. Hot-cold forming and age hardening permissible. 6.0 <u>HEAT TREATMENT:</u> The forging shall be solution treated before cold expansion and stress-relieved at 340-360°C for minimum 5 hrs. after cold expansion. 7.0 <u>FINISH:</u> The surface finish of the forging shall be as per the ordering drawing. 8.0 <u>FREEDOM FROM DEFECTS:</u> The forging shall be free from cracks, flakes, clusters of fine inclusions and other harmful defects.					
Revisions: Deleted Clause 4.0 'Compliance with standards' of Rev.01 added Cl.16.0 Quality Plan and other clauses renumbered suitably.			Issued : STANDARDS ENGINEERING & IPR COORDINATION DEPARTMENT		
Rev.No. 02	Amd. No.	Reaffirmed:	Prepared:	Approved:	Date:
Dt. OCT. 2010	Dt.	Year	Malts. Engg.	DGM(E&CC)	OCT., 1988.

9.0 CHEMICAL COMPOSITION:

The melt analysis of the steel shall be as given below:

Element	C	Si	Mn	P	S	Cr	N	Al	Ti	V
Min.(%)	-	-	17.5	-	-	17.5	0.50	-	-	-
Max.(%)	0.10	0.80	20.0	0.050	0.015	20.0	-	0.025	< 0.10	0.15

10.0 TEST SAMPLES:

Tangential and radial test samples are to be taken out from the test rings as shown on the ordering drawing. The testing shall be conducted on test pieces cut from segments positioned at 180° apart on the test rings as shown on the drawing. Test samples shall be cut after stress relief annealing.

11.0 MECHANICAL PROPERTIES:

11.1 Mechanical properties on tangential test specimens at room temperatures are given in table 1 for various strength grades. However, the specific strength grade shall be mentioned in the drawing.

Strength Grade	0.2% Proof Stress N/mm ² min.	Elongation % min.	Reduction in area % min.	Charpy Impact strength (ISO-V) J min.
1.	500	39	62	135
2.	550	37	61	130
3.	600	35	60	125
4.	650	32	59	120
5.	700	30	58	110
6.	750	28	57	105
7.	800	26	55	100
8.	850	24	55	95
9.	900	22	54	90
10.	950	20	54	80
11.	1000	18	54	80
12.	1050	18	53	80
13.	1100	17	53	78
14.	1150	16	53	78
15.	1170	15	52	78
16.	1200	14	52	75
17.	1230	14	51	75
18.	1250	13	50	70
19.	1300	12	50	70



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NOTE:- Actual 0.2% Proof Stress values can be higher than specified by not more than 150 N/mm² for strength grades upto 17 (inclusive) and not more than 100N/mm² for strength grades 18 onwards.

11.2 Mechanical properties on the radial specimens shall be as follows:

The retaining rings having 0.2% Proof Stress ≥ 750 N/mm² in tangential direction and the wall thickness 60mm.

- a) 0.2% proof stress = $0.7 \times 0.2\% \text{ proof stress (tangential specified) min (Radial)}$
- b) Elongation (Radial) : $\frac{\text{Elongation (rad. actual)}}{\text{Elongation (tang. Actual)}} = 0.50 \text{ min}$
- c) Reduction in area (Radial) : $\frac{\text{Reduction in area (rad. actual)}}{\text{Reduction in area (tang. Actual)}} = 0.50 \text{ min}$
- d) Charpy impact energy (Radial) = 40 J min. (ISO-Vnotch)

- Note:**
- 1. Tensile test shall be conducted in accordance with IS:1608 or any reputed national standard.
 - 2. Charpy impact test shall be conducted in accordance with IS:1757 or any reputed national standard on 3 ISO-Vnotch samples. The minimum impact strength indicated is average of 3 specimen values. However, one of the three values can be permitted below minimum specified value, but in no case shall be below 2/3rd of the specified minimum. All the three values shall be reported in Test Certificate.
 - 3. In case, reduced ductility values attained. Then the proof is to be produced by the manufacturer that the reason for this is purely due to local impurities which has no effect on the required properties.
 - 4. The remainder test material shall be parted off and supplied along with the forging. This material shall be punched as shown in drawing with identification number and BHEL representative's stamp. The peripheral location of the test rings shall be clearly shown through marking on forging and test rings.

12.0 NON-DESTRUCTIVE TESTS:

- 12.1 Ultrasonic Test:** The forging shall be subjected to ultrasonic examination over the 100% of the surface area as per pulse echo method at 2MHz and 1MHz with 45° angular probe.

DGS method is to be used for interpretation of the indications.

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The scanning shall be

- a) In radial direction
- b) 2 x in circumferential direction at <45° perpendicular to the ring surface
- c) 2 x in axial direction at <45° perpendicular to the ring surface.

Acceptable randomly distributed individual equivalent defect size is 2 mm dia over a registering length of ≤20 mm. Registering length is that at the ends of which the indications fall back from 2 mm to a limiting value of 1.6 mm. The following indications shall be recorded and informed to BHEL for their approval.

- a) All indications with a equivalent reflector size ≥1.6 mm Dia.
- b) All individual flaw indication with attenuated back wall echo of >6 dB
- c) All randomly distributed individual equivalent defect sizes of 1.6 Dia
- d) All indications with line form or surface form both spread as well as local agglomerations, irrespective of the size of individual indications that are contained in agglomerations.

12.2 Dye Penetrate Test: All the surfaces of the forging shall be examined by Dye Penetrate Test. No cracks are permitted.

13.0 NON-MAGNETIC PROPERTIES:

The permeability test shall be carried out as per ASTM A342 (the latest edition) and permeability at 100 oresteds shall be 1.10 max.

14.0 INSPECTION AT SUPPLIER’S WORKS:

BHEL representative shall have free access to all parts of the supplier’s works connected with the manufacture of the material ordered and shall be at liberty to inspect the manufacture at any stage. All the reasonable facilities shall be provided to the representative including labour to satisfy himself that the forging are made to this specification. The supplier shall inform BHEL representative in advance after heat treatment and rough machining of the forging to witness the various tests. BHEL representative shall be present during cutting and marking of the test rings.

15.0 IDENTIFICATION NUMBER:

An identification number shall be given for each forging in purchase order. The number shall be stamped on the front side of the forging and surrounded by oil colour.

16.0 QUALITY PLAN:

16.1 BHEL Hyderabad approved suppliers who have already supplied the forging of same drawing previously shall submit the copy of approved ‘Quality Plan’ along with their technical offer. The same shall be applicable for compliance in case of the release of P.O. by BHEL Hyderabad unless the conditions stipulated in Cl. 16.2 & 16.3 are applicable.

16.2 In case Customer / Project related additional requirements are applicable in the enquiry / tender, vendor may be asked to submit a separate QP including such requirements.

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16.3	In case of new vendors or first time supplies according to drawings mentioned in BHEL enquiry, QP shall be submitted for approval by BHEL.	
17.0	<u>TEST CERTIFICATE:</u>	
17.1	Five copies of test certificate (in English only) shall be supplied. Test certificate shall have the following details. a) HY 19372 Rev.02 b) Identification No. as per cl.15 and Order No. c) Name on a drawing No. of the Forgings. d) Melt No. e) Details of melt analysis and method of steel melting. f) Details of heat treatment with charts. g) Actual results of ultrasonic testing furnishing details such as sensitivity, probe Dia, frequency and direction of probing. h) Results of dye penetrant test. i) Results of mechanical test j) Results of magnetic permeability test.	
17.2	The test certificate shall be signed by the chief of inspection/chief metallurgist of the supplier/s works.	
18.0	<u>PACKING AND MARKING:</u>	
18.1	<u>Packing:</u> The forging shall be suitably packed to withstand for an indefinite time of exposure to all climatic condition without developing any external and internal defects. The forging shall be properly protected.	
18.2	<u>Marking:</u> The following details shall be punched clearly on each forging at the location shown in the drawing and the same shall be encircled by paint. a) HY 19372 Rev.02 b) BHEL Order No. c) Melt No. d) Forging Identification No. e) Drawing No. f) BHEL Inspection Representative's Stamp.	
19.0	<u>REJECTION AND REPLACEMENT:</u> In the event of the forging proving defective in the course of further processing at BHEL, the same shall be rejected notwithstanding any previous acceptance. The supplier shall replace the rejected forging shall be returned after all the commercial conditions are satisfied.	

TECHNICAL PRE-QUALIFICATION REQUIREMENT (PQR) FOR RETAINING RING FORGING / WINDING SUPPORT RING (Material Grade X8CrMnN1818K)

PQR/EME/2024/050

REV NO: 01 DTD 17.06.2026

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S. No	Description of Pre-Qualification Required	Supporting Documents to be submitted	Vendor's Response Compiled (Yes/No)																							
1	Retaining Ring Forging is required to be manufactured through cold expansion. Offer from Bidder having cold expansion facility in-house or its collaborator and satisfying all other requirements given below will be considered. Bidder or its collaborator having cold expansion facility must have manufactured and supplied at least 3 Retaining Ring / Winding Support Ring in material grade X8CrMnN1818K by hot forging + cold expansion process. Out of these Retaining Rings / Winding Support Ring, at least one retaining ring of dimension of Inner Diameter: ≥ 925 mm, Height: ≥ 600 mm must have been manufactured and supplied by vendor in last 7 years from date of enquiry. In support of above, the vendor has to furnish details of 3 latest supplies in the following format: <table><tr><th rowspan="2">Customer Name / Purchase Order details</th><th colspan="3">Dimension (in mm)</th><th rowspan="2">Date of Supply</th></tr><tr><th>Outer Diameter</th><th>Inner Diameter</th><th>Height</th></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr></table>	Customer Name / Purchase Order details	Dimension (in mm)			Date of Supply	Outer Diameter	Inner Diameter	Height																Copy of Purchase Order & its correlated test certificate of at least one Retaining ring / Winding Support ring in material grade X8CrMnN1818K of dimension with Inner Diameter: ≥ 925 mm, Height: ≥ 600 mm is to be submitted. Test certificates shall cover chemical composition, mechanical properties, NDT and dimensional report. In case of outsourcing of cold expansion, bidder to submit their agreement with firm having cold expansion facility.	
Customer Name / Purchase Order details	Dimension (in mm)			Date of Supply																						
	Outer Diameter	Inner Diameter	Height																							
2	Bidder or its collaborator must have in-house cold expansion facility to manufacture Retaining ring of material grade X8CrMnN1818K of enquiry drawing dimension.	Details of in-house cold expansion facility to be submitted.																								
3	a. Vendor to provide details of in-house steel melting facility including Electro Slag Re-melting facility, if available. Past experience of material grade X8CrMnN1818K to be submitted.	Details of in-house steel melting & refining facility to be submitted.																								
	b. In case outsourcing of ingot, vendor to submit details of their source with their steel melting & refining facility including ESR facility. Past experience of material grade X8CrMnN1818K manufactured by sub-vendor to be submitted.	Details of their source to be submitted.																								
4	a. Mechanical & NDT Testing of retaining ring forging after cold expansion and stress relieving shall be done by firm carrying out cold expansion work.	Vendor to confirm																								
	b. For testing mentioned at 4a, testing facility should be available inhouse. In case of outsourcing of testing, vendor to agree to carry out testing at lab duly accredited by National / International lab accreditation agency.	Vendor to confirm																								
5	Complete compliance to specification HY19372 (Latest revision) and drawing as per BHEL enquiry.	Clause by clause acceptance or signed & stamped copies of specification mentioned in BHEL enquiry.																								
6	a) Vendor to furnish QAP that shall be followed during manufacturing. b) Vendor to furnish Manufacturing process plan that shall be followed during manufacturing. c) Vendor to furnish their organization chart.	QAP, Manufacturing process plan and Organization chart duly signed and stamped.																								