

Enquiry items along with quantities:

It. No.	Size & Item description	Technical requirement	Quantity in kg
1	90mm Dia X 3000mm – 6000mm LG.	1.5% Ni-Cr-Mo hot rolled, hardened and tempered steel round bars to material spec. AA10501 Rev14. UT to be carried out as per BHEL spec. AA0850118 (Acceptance Category 2). Tolerance on dia +2.5% / -0.0 of diameter. Straightness within 3 mm/ metre. Material TC covering all the chemical and mechanical properties as per BHEL specification shall be furnished along with supply. All other details as per spec. AA10501 Rev14.	28600
2	100mm Dia X 3000mm – 6000mm LG.		22000
TOTAL			50600 kg

Quantity variation as per below:

For item 1 - Supplies quantity are to be restricted between 28600 kg & 23400 kg.

For item 2 - Supplies quantity are to be restricted between 22000 kg & 18000 kg.

Pre-qualification criteria:

Sl. No.	Description of pre-qualification requirement	Vendor Response	
		Complied (YES / NO)	Supporting Documents required to accept compliance
1	Manufacturer of steel round bar/their authorized representative.		Relevant Certificate of being Manufacturer (for manufacturer not registered with BHEL) / authorization letter with validity (for authorized representative). Firm name, address, email and contact no. etc. from whom bars has been supplied to be furnished.
2	Vendors should have experience of Manufacturing, Material testing & supplying HT STEEL ROUND BAR (1.5% Nickel-Chromium-Molybdenum Hot rolled/forged Steel Bars, Gr: 40Ni6Cr4Mo3 in Hardened and Tempered condition) or comparable standard as per our requirement, during last 7 years (ending last day of month previous to the one in which NIT is published)		Purchase order, Mill test certificate. In case of authorized dealer, relevant documents of their OEM shall also be considered.
3	Company shall be certified with ISO 9001 or equivalent. In case of authorized representative, Valid ISO certificate of manufacturer is required.		Valid certificate to be submitted.

Note:

1. BHEL has right to verify information / confirmation furnished by asking additional documents, proof etc.

ALL THE ABOVE POINT WISE PRE-QUALIFICATION REQUIREMENT ARE TO BE NECESSARILY ACCEPTED BY THE BIDDERS FOR THEIR OFFERS TO BE CONSIDERED FAILING WHICH OFFERS SHALL BE REJECTED.

MAKE IN INDIA format

MAKE IN INDIA format (to be filled by OeMs of the participating bidders)

BHARAT HEAVY ELECTRICALS LIMITED, BHOPAL
MATERIAL MANAGEMENT – STEEL DIVISION

For this Procurement, Government of India Public Procurement (Preference to Make in India), Order 2017 with its amendments and subsequent Orders issued by the respective nodal ministries shall be applicable even if issued after issue of this NIT but before finalization of contract/PO/WO against this NIT.

*As per the Provisions of this order, please submit **a self-certification complying with the conditions below on company letterhead duly signed by competent authority.***

I, hereby declare on behalf of M/s. that we are participating in the Enquiry No. floated by BHEL, Bhopal (MP), India and shall comply with following:

1. Public Procurement (Preference to Make in India), Order 2017 *with its amendments* and subsequent Orders issued by the respective nodal ministries shall be applicable even if issued after issue of this NIT but before finalization of contract/PO/WO against this NIT.

- (a) A supplier will be treated as **Class-I Local Suppliers**, if the items quoted by bidder have local content equal to or more than 50%.
- (b) '**Local Content**' means the amount of value added in India, which shall be total value of item quoted (excluding net domestic indirect taxes) minus the value of imported content in the item (including all custom duties) as a proportion of the total value, **in percent**.

2. I hereby declare that our firm qualifies as **Class-I Local Suppliers**.

a. The Local Content in the items quoted under this Enquiry is Percent

b. Details of location(s) in India where this value addition shall be done, is/are as follows:

(a)

(b)

(c)

(.....)

For M/s.

(Seal & Sign)

Annexure-1

DECLARATION (To be given by Bidder)

GeM Bid No.....

Item Description:

With reference to above reference bid, we M/s..... (Bidder's Name)
confirm/declare the following.

1. Quoted Make-.....
2. We are OEM or Reseller -
3. Valid OEM Authorization certificate with OEM's Contact Details attached (In case of reseller)
- Yes / NA
4. We confirm Nil deviation from GeM bid document (NIT).

Note:

1. OEM details such as name, designation, address, e-mail Id and Phone number required to be furnished along with the technical bid. (also refer ATC clause).
2. Commercial Deviation/deviation in delivery shown separately or found hidden in the offer, will not be taken cognizance of.

(Vendor's Seal & Sign)

STANDARD QUALITY PLAN

QAP NO:		QAX/TH/1780		REV. 00		Date: 15/01/2025					
CUSTOMER:		BHEL BHOPAL				VENDOR NAME: as per BHEL PO ()					
DESCRIPTION MATERIALS:		1.5% Ni-Cr-Mo HOT ROLLED/ FORGED STEEL BARS -H&T									
SPECIFICATION		AA10501		Rev. No.		14					
PI/ENQ NO/PO NO		120140004		Date:							
Sr. No.	Characteristics	Class	Quantum of check	Reference Document	Acceptance Norm	Type of record	Inspection Agency			Remarks	
							P	W	V		
01	Identification of test sample	Maj	1 sample/melt/heat batch	AA 10501	As per spec	TC	2	1		Refer note 1	
02	Chemical composition	Maj	Each melt	AA 10501	As per spec	TC	2	1		Refer note 1	
03	Mechanical properties (Tensile strength, Yield, Elongation, hardness etc.	Maj	Each Heat Batch	AA 10501	As per spec	TC	2	1		Refer note 1	
04	Heat Treatment	Maj	100% of each lot/Melt	AA 10501	As per spec	TC	2		1		
05	Ultrasonic Test (Dia 40 mm & above)	Maj	100% of Bars	ASTM A388/ BHEL spec	As per spec	TC	2	1		10% Witness by BHEL TPIA	
06	Visual Examination	Mai	100% of each Lot/Melt	AA 10501	Free From surface defect & shall be smooth	TC	2	1		10 % Witness by TPIA	
07	Dimensional Inspection	Maj	10% of each lot/Melt	AA 10501	As per Spec	TC	2	1			
08	Stamping & Marking	Maj	100% of Bars	AA 10501	As per spec		2	1		Hard Punch of PO number, heat number	
09	Documentation: TC & Inspection Report	Maj	Verification	AA10501	As per spec		2			TC & Reports Endorsed by TPIA	

Note:

1) For Trader:

In the absence of original correlated MTC: material to be tested to ensure both chemical & mechanical properties at Govt. Approved Lab / BHEL TSD / manufacturer's lab having calibrated instruments (duly approved by NABL / NABL appointed agency). Sample for check test shall be drawn in consultation with BHEL-IA from each heat & production lot.

In presence of original co-related MTC: No chemical and mechanical testing is required, record of the same duly endorsed by BHEL-IA with respect to original one to be furnished.

For OEM:

Original Correlated MTC is to be furnished along with supply. No chemical and mechanical testing is required, record of the same to be duly endorsed by BHEL-IA.

2) All other technical requirements as specified in Spec. AA-10501 Rev.14 need to be ensured

3) BHEL reserves the right to perform sample testing at the time of receipt of material inside BHEL.

Legends: Maj = Major, V= Verification, P=Perform, W=Witness, TC= Test Certificate. 1=BHEL/BHEL appointed TPIA, 2=Vendor/Sub Vendor

NIMESH

SHAH Prepared By

Digitally signed by NIMESH SHAH
DN: cn=NIMESH SHAH, o=BHEL,
ou=HEP, BHOPAL,
email=shah.nimesh@bhel.co.in
Date: 2025.01.15 14:30:30
पुनः निरीक्षण - भारी विद्युत / Quality Control-STM
श्री एच ई एल., भोपाल / BHEL, BHOPAL

Approved By: *Sachin Kumar*
सचिन कुमार / SACHIN KUMAR
उप प्रबंधक / Dy. Manager
एस. टी. एम. विभाग / S.T.M Division
श्री एच.ई.एल., भोपाल / B.H.E.L., BHOPAL



CORPORATE PURCHASING SPECIFICATION

AA10501

Rev No. 14

PAGE 1 of 4

1.5% NICKEL-CHROMIUM-MOLYBDENUM HOT ROLLED/FORGED STEEL BARS- H & T

1.0 GENERAL:

This specification governs the quality requirements of 1.5% Nickel-Chromium-Molybdenum Hot rolled/forged Steel Bars, Gr: 40Ni6Cr4Mo3 in Hardened and Tempered condition.

2.0 APPLICATION:

For the manufacture of bolts, studs and various components of machines.

3.0 CONDITION OF DELIVERY:

Hot Rolled / Forged; Hardened and tempered.

Note: Sizes up to 100mm in hot rolled
>100 to 180mm in hot rolled or forged
above 180mm in forged

The ends of bars shall be reasonably square and true.

The bars shall be supplied in straight lengths without twists and bends.

4.0 COMPLIANCE WITH NATIONAL STANDARDS:

The material shall comply with the requirements of the following National standard and also meet the requirements of this specification.

IS: 5517 – 1993 Gr: 40Ni6Cr4Mo3, Type: J
Hardened & Tempered

Steels for Hardening and Tempering -
Specification

5.0 DIMENSIONS AND TOLERANCES:

5.1 Sizes: Bars shall be supplied to the dimensions specified on the order.

5.1.1 Length: Unless otherwise specified, hot rolled bars shall be supplied in 3 to 6 metres length or in multiples with maximum 10%, shorts down to 1 metre.

Forged bars shall be supplied in lengths of 1.5 to 3.0 metres

Revisions: Revised as per email dt 18.12.08 from Shri Gopal Bhatt from Bhopal.			APPROVED: INTERPLANT MATERIAL RATIONALISATION COMMITTEE – MRC(S&GPS)		
Rev No.14	Amd No.	Reaffirmed	Prepared	Issued	Dt. of 1 st Issue
Dt:18-12-2008	Dt:	Year:2020	11 HEP, Bhopal	Corp.R&D	April, 1977

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It must not be used directly or indirectly in any way detrimental to the Interest of the company.



AA10501

Rev No. 14

PAGE 2 of 4

CORPORATE PURCHASING SPECIFICATION



5.2 Tolerance:

5.2.1 Hot rolled bars: The bars shall not vary from specified diameter or distance across flats by more than $\pm 2\frac{1}{2}$ %.

5.2.2 Forged bars: The tolerance on the forged bars shall be as follows.

<u>Diameter, mm</u>	<u>Tolerance, mm</u>
---------------------	----------------------

50 mm to 175 mm	+ 8.0 mm
-----------------	----------

Above 175 mm	+ 12.5 mm
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Note: (Hot rolled & forged bars).

Insignificant surface defects in the form of dent and ripple marks are permissible provided their depth does not exceed half the tolerance on each size.

6.0 MANUFACTURE:

Material shall be manufactured from fully killed steel.

7.0 HEAT TREATMENT:

The recommended heat treatment is as follows:

Harden in oil / water from a temperature of 830 – 850°C.

Temper at a suitable temperature between 550 – 660°C.

8.0 FREEDOM FROM DEFECTS:

The bars shall be sound, straight and free from internal and surface defects, such as seams, laps, cracks or any other defects which may impair the end use.

9.0 CHEMICAL COMPOSITION:

The melt analysis of steel and the permissible variation in the composition of the finished product from the melt analysis shall be as follows:

Element	Melt analysis percent		Permissible variation, percent, in product analysis
	Min.	Max.	
Carbon	0.35	0.45	± 0.02
Silicon	0.10	0.35	± 0.03
Manganese	0.40	0.70	± 0.04
Nickel	1.25	1.75	± 0.05
Chromium	0.90	1.30	± 0.05
Molybdenum	0.20	0.35	± 0.03
Sulphur	---	0.035	+ 0.005
Phosphorus	---	0.035	+ 0.005



CORPORATE PURCHASING SPECIFICATION

AA10501

Rev No.14

PAGE 3 of 4

10.0 TEST SAMPLES:

10.1 One sample shall be taken from each melt for chemical analysis.

10.2 One sample shall be taken from each heat treatment batch for testing of mechanical properties. Test pieces for mechanical tests shall be taken in the longitudinal direction of the piece.

For ruling section up to & including 40mm, the test piece shall be machined coaxially from the test bars. For ruling section above 40mm the longitudinal axis shall be at least 12.5 mm from surface of the test bars.

Test methods for determining mechanical properties shall be as per IS: 1598 (For IZOD impact test)/IS: 1757 (For impact test in ISO-V Charpy) and IS: 1608 (For tensile test) or any other reputed International Standard.

10.3 For ruling section above 200mm, tensile test samples can be taken in tangential or transverse direction.

11.0 MECHANICAL PROPERTIES (In Hardened and Tempered Condition):

Ruling section, mm	Tensile strength, N/mm ²	0.2%PS/YS N/mm ² min	%E 5.65√S ₀ min	* IZOD impact J, min	Hardness ** BHN
up to 30	1200, min	1000	10	30 (25)	360 – 420
> 30 to = 63	1100 – 1250	880	11	41 (35)	330 – 390
> 63 to = 100	1000 – 1150	800	13	48 (42)	300 – 350
>100 to = 150	900 – 1050	700	15	55 (50)	270 – 300
>150	800 – 950	600	16	55 (50)	240 – 285

* Average of 3 samples applicable for sizes above 16 mm ruling section only. Values in bracket are in ISO - V Charpy.

** Hardness shall be reported for information only.

12.0 ULTRASONIC TEST:

12.1 Each bar above 100 mm shall be tested ultrasonically in accordance with BHEL standard AA0850118 to ensure freedom from internal defects.

The norms of acceptance shall be as per category 2 of the above standard.

12.2 **Optional tests:** If specified on order, each bar > 40 to 100 mm shall be tested ultrasonically in accordance with BHEL standard AA0850118 to ensure freedom from internal defects and the norms of acceptance shall be as per category 2.

AA10501

Rev No. 14

PAGE 4 of 4

CORPORATE PURCHASING SPECIFICATION



13.0 TEST CERTIFICATES:

Three copies of test certificates shall be supplied, unless otherwise stated on the order. In addition, the supplier shall ensure to enclose one copy of the test certificate along with their dispatch documents to facilitate quick clearance of the material.

The test certificate shall bear the following information:

BHEL References:

AA10501, Rev.No.14: 1.5% Nickel-Chromium-Molybdenum Hot Rolled/Forged Steel Bars- H&T
BHEL order No,

Supplier's References:

Name:

Identification No:

Melt No:

Details of heat treatment:

Result of Tests:

Dimensional inspection.

Results of chemical analysis, mechanical and & Ultrasonic tests.

14.0 PACKING AND MARKING

The bars shall be suitably packed in bundles to prevent corrosion and damage during transit.

Each bar equal to or greater than 50 mm in diameter or of equivalent cross sectional area shall be stamped with 'AA10501' and melt number on the side near the end or on the face.

Bars below 50 mm shall be bundled together and tied with wire at 3 to 4 places along the length of the bars.

A metal label shall be securely attached to each bundle and shall bear the following information:

AA10501: 1.5% Nickel-Chromium-Molybdenum Hot Rolled/Forged Steel Bars- H & T.

BHEL Order No.:

Consignment/Identification No.:

Melt No.:

Size and Weight:

Supplier's Name:

15.0 REFERRED STANDARDS (Latest Publications Including Amendments):

1. IS: 1598

2. IS: 1608

3. IS: 1757

4. IS: 5517

5. AA0850118



AMENDMENT - NOTIFICATION

AA 085 01 18 REV.No. 01

PAGE 1 OF 1

AA 085 01 18:ULTRASONIC TESTING CLASSIFICATION AND ACCEPTANCE STANDARDS FOR STEEL FORGINGS, BILLETS AND BLOOMS

1.0 PAGE 1 OF 6; Cl 1.0 SCOPE:

Last sentence of the para is modified as follows:

"This standard does not apply to austenitic steel forgings for which AA 085 01 19 may be referred to."

2.0 Cl 3.2 Sensitivity:

Title of the left hand column of the table is modified as "Frequency, MHz" in place of Frequency range, MHz.

3.0 PAGE 2 OF 6; Cl 5.0 COUPLANT:

Last line is modified as "or water shall be used."

4.0 Cl 6.1: Eight line is modified as follows:

"shall not exceed 150mm/second. The following techniques"

Please see instructions on the reverse.

Ref:	Amd. No.	Approved	Issued	Date	Com. Sr. No.
01	01	WG-NDT	CORP. R&D	15.1.96	A 1822



CORPORATE STANDARD

AA 085 01 18.

REV.No. 01

PAGE 1 OF 6

**ULTRASONIC TESTING, CLASSIFICATION AND ACCEPTANCE
STANDARDS FOR STEEL FORGINGS, BILLETS AND BLOOMS**

1.0 SCOPE:

This standard deals with the ultrasonic testing of steel forgings, billets and blooms. The procedure covers pulse echo direct contact manual ultrasonic flaw detection technique. This standard does not apply to austenitic steel forgings.

2.0 PERSONNEL REQUIREMENT:

Personnel performing non-destructive examination and evaluation shall be qualified to the recommended practice SNT - TC - 1A or any other recognised practice.

3.0 EQUIPMENT CHARACTERISTICS:**3.1 Frequency range:**

The ultrasonic equipment shall be suitable for operating at frequencies within the range of 0.5 to 6 MHz.

3.2 Sensitivity:

The sensitivity of the equipment shall be tested to ensure that the number of full screen back wall echo is not less than that given below, when the appropriate probe is placed on the metalised surface of plastic insert of the Indian Standard reference block (IS:4904)/IIW block.

<u>Frequency range, MHz</u>	<u>Min.No. of full screen back echoes</u>
1	5
2	4
4 to 6	2

3.3 Resolution:

The resolution of the equipment and probe combined shall be such as to show separately indications of the three grooves in the IIW - VI block.

Revision:

Cl.9.4 OF MOM OF WG(NDT)

Approved:INTERPLANT STANDARDIZATION
COMMITTEE - (WG-NDT)

Rev.No. 01

Amd.No.

Reaffirmed 17

Prepared
CFFPIssued
CORP. R&D

Dt. of 1st issue

Jan '80

Dt. Jan '95

Dt.

Year:


HARDWAR

INSTRUCTIONS

**Changes to be incorporated in the controlled copies
for "AMENDMENT -- NOTIFICATION".**

- a) The "AMD. No." of this "Amendment Notification" shall be recorded against the sheet / clause, being amended, on the margin.
- b) This, "Amendment Notification" shall be filed over the concerned preface sheet of the Specification / or First sheet of the standard or over the previous Amendment, if any.

15

AA 085 01 18	CORPORATE STANDARD	
REV.No. 01		
PAGE 2 OF 6		

4.0 SURFACE CONDITION:

The test surface shall be free from loose scales, rust and such other extraneous material that would interfere with the ultrasonic energy transmission. In case of machined surface, it is desirable to have a surface finish of 6.25 microns or better. A gramophone record type of finish and tear produced by machining tools shall be avoided since these give rise to spurious echoes and cause probe wear.

5.0 COUPLANT:

To ensure adequate transmission of ultrasonic energy between the probe and the test object, a suitable couplant having good wetting characteristics such as oil, grease, water, glycerine or cellulose paste shall be used.

6.0 TESTING TECHNIQUE:

6.1 Selection of testing technique shall be made after giving due consideration to the method of manufacture and shape of the object tested. Testing technique should be such that each and every part of the object volume is scanned at least once. Successive scans shall overlap a minimum of 15% of the probe width. Uniform contact shall be maintained between probe and object and scanning speed shall not exceed 100 mm/ second. The following techniques are considered to be minimum for providing adequate coverage.

6.2 Scanning Scheme (Solid And Hollow Forgings):
Complete length of the forging shall be scanned radially from sides / cylindrical surface through 360° using longitudinal wave probe. Whenever practicable the forging shall be scanned in axial direction also. Hollow forgings, and when necessary, solid forgings also shall be scanned using appropriate shear wave probes to detect axial and radial cracks. Hollow forgings are the forgings made hollow on the press by punching or ring rolling operation.

6.3 Solid Rectangular Forgings, Billets And Blooms:
Complete length of the object shall be scanned from two adjacent faces and whenever practicable one end face using longitudinal wave probe.

6.4 Radial cracks on round sections which can not be detected by normal testing method may be subjected to other crack detection methods such as MPI.

7.0 SCANNING:

7.1 Probes and Frequency:
Overall scanning shall be done using 2 MHz nominal, 20-25 mm diameter probes except when large grain size and path length make it necessary to use a lower frequency. Smaller probes may be used when necessary. However, for forgings intended for backing material for white metal lined bearings, the examination shall be carried out by 4 MHz probes.

	CORPORATE STANDARD	AA 085 01 18
REV.No. 01		
PAGE 3 OF 6		

7.2 Time Base Calibration:
The time base shall be calibrated using a calibration block or a known dimension of forging under examination.

7.3 Sensitivity:

7.3.1 When Calibrated Attenuator Is Not Available:
Reference sensitivity of equipment shall be set such that the maximum acceptable defect equivalent flat bottomed hole in the test block is equal to 75% of the full screen height. Testing shall be carried out at the highest sensitivity possible.

7.3.2 When Calibrated Attenuator Is Available:
The sensitivity of the equipment during scanning shall be set 6 dB more than the sensitivity required to give a full screen height echo from the maximum acceptable size of defect.

Note: The above sensitivity level adjustment is purely for scanning purposes. Once a defect is encountered, the sensitivity shall be brought down to estimate the size of defect for evaluation of the material under test.

8.0 ESTIMATION OF FLAW SIZE:

8.1 Large Size Flaws:
The size of large flaws can be estimated by moving the probe in all directions and plotting the midpoint of the probe when echo falls to 50 percent or 6 dB.

8.2 Small Size Flaws:

8.2.1 When Calibrated Attenuator Is Not Available:

8.2.1.1 The size of the flaw may be estimated by comparing with the echoes of the flat bottomed holes at appropriate depths in a test block of ultrasonically similar material.

8.2.1.2 The size of the flaw may also be estimated by moving probe successively in all the four directions at right angles to each other and plotting the mid point of the probe when echo height falls to 50% or 6 dB. Due allowance shall also be made for beam spread, depth and orientation of flaw and diameter of the forging if the scanning is done from the curved surface.

8.2.2 When Calibrated Attenuator Is Provided With The Equipment:
The size of the flaw (smaller than the beam spread) can be estimated accurately in millimetres of equivalent circular flaw with the help of Krautkramer's DGS (Distance - gain - size) diagram. Method of estimating flaw size using a DGS diagram is given in Annexure - A.

AA 085 01 18	CORPORATE STANDARD	
REV.No. 01		
PAGE 4 OF 6		

9.0 CLASSIFICATION OF FORGINGS, BILLETS AND BLOOMS:

9.1 Forgings, billets and blooms are classified into the following five categories depending upon the defect size admissibility for the purpose of ultrasonic testing:

Category

Unacceptable defects

- | | |
|---|--|
| 1 | (i) Cracks, flakes, seams & laps.
(ii) Defects giving indication larger than that from a 2 mm diameter equivalent flaw.
(iii) 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 reduced to less than 70%.
(iv) Defects giving indications of 1 to 2 mm diameter equivalent flaw separated by a distance less than four times the size of the larger of the adjacent flaws. |
| 2 | (i) Cracks, flakes, seams & laps.
(ii) Defects giving indication larger than that from a 4 mm diameter equivalent flaw.
(iii) Groups of defects with maximum indication less than that from a 4 mm diameter equivalent flaw which cannot be separated at testing sensitivity if the back echo is reduced to less than 50%.
(iv) Defects giving indications of 2 to 4 mm diameter equivalent flaw separated by a distance less than four times the size of the larger of the adjacent flaws. |
| 3 | (i) Cracks, flakes, seams & laps.
(ii) Defects giving indication larger than that from a 6 mm diameter equivalent flaw.
(iii) Groups of defects with maximum indication less than that from a 6 mm diameter equivalent flaw which cannot be separated at testing sensitivity if the back echo is reduced to less than 40%.
(iv) Defects giving indications of 3 to 6 mm diameter equivalent flaw separated by a distance less than four times the size of the larger of the adjacent flaws. |
| 4 | (i) Cracks, flakes, seams & laps.
(ii) Defects giving indication larger than that from a 10 mm diameter equivalent flaw.
(iii) Groups of defects with maximum indication less than that from a 10 mm diameter equivalent flaw which cannot be separated at testing sensitivity if the back echo is reduced to less than 20%. |

	CORPORATE STANDARD	AA 085 01 18
REV.No. 01		
PAGE 5 OF 6		

(iv) Defects giving indications of 5 to 10 mm diameter equivalent flaw separated by a distance less than four times the size of the larger of the adjacent flaws.

5

(i) Cracks, flakes, seams & laps.

(ii) Defects giving indication larger than that from a 15 mm diameter equivalent flaw.

(iii) Groups of defects with maximum indication less than that from a 15 mm diameter equivalent flaw which cannot be separated at testing sensitivity if the back echo is reduced to less than 10%.

Note: Loss of back wall echo not attributable to the presence of defects or geometry and exceeding the limits mentioned in item (iii) of each category of unacceptable defects shall be a cause for rejection.

ANNEXURE - A

The equivalent flaw size curves of the DGS diagram is prepared by plotting the amplitude in decibels from a series of circular reflectors with increasing distance from the probe in water and so the graph incorporates only the loss in water. When it is found that the attenuation in the material under test is more (this can be checked using back echo curve of DGS diagram), this shall be taken into account while calculating the flaw size. Corrections will not be required for majority of heat treated forgings when tested with 2-4 MHz probes.

A step by step method of estimating flaw size using universal DGS diagram is given below:

(a) Adjust the depth range of the equipment to the required depth.

(b) Adjust the back echo to 70% of screen height from a defect free area parallel wall of the material under test or ultrasonically similar test block and note the dB value (A) on the calibrated gain control.

(c) Mark on the back echo curve of the diagram, the back wall of the distance in terms of near field in millimetres in the case of universal DGS diagram.

(d) Move the probe to the defective area and get the maximum defect echo. Read off the flaw depth. Increase the gain with the calibrated gain control until echo height reaches 70% of screen height. Note the attenuator reading in dB (B).

(e) Calculate the gain (G) in dB by subtracting 'A' from 'B'. Count off the gain 'G' downwards from the marked point on the back echo curve, and then move horizontally to intersect the vertical line from the base line corresponding to the flaw depth 'D' in terms of near field in the case of universal diagram.

CORPORATE STANDARD



- (f) Note the equivalent flow size curve passing through the above point. Multiply the reduce^d flaw dimension (S) of the curve by the probe diameter to give the equivalent flow size in millimetres.

ANGEXURL - A

KRAUTKRAMER'S DGS DIAGRAM

