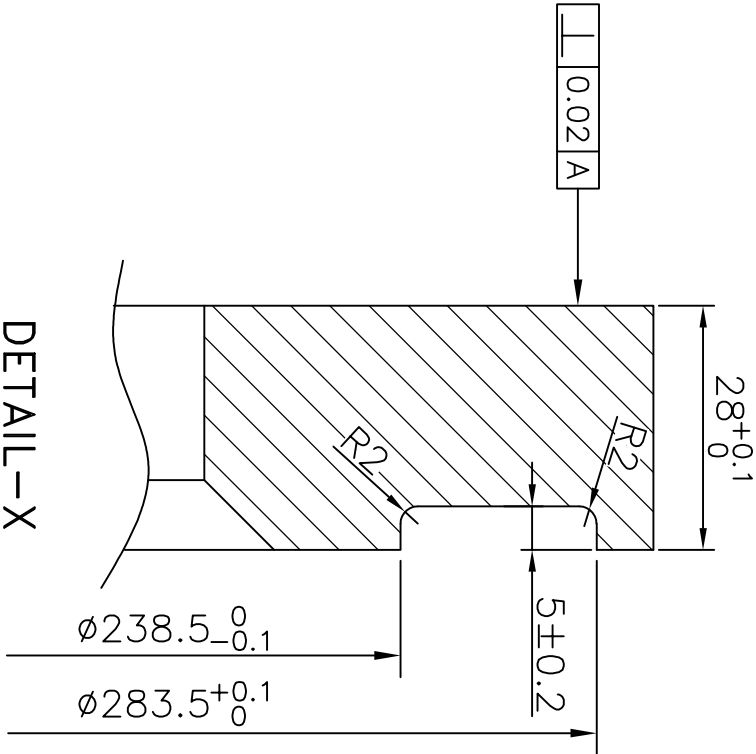
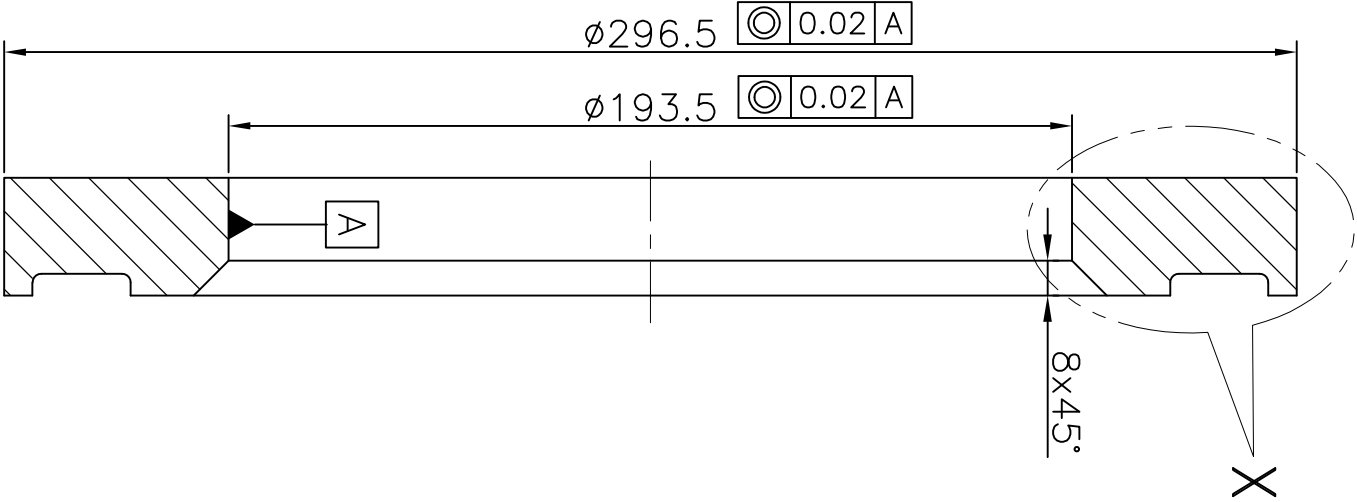
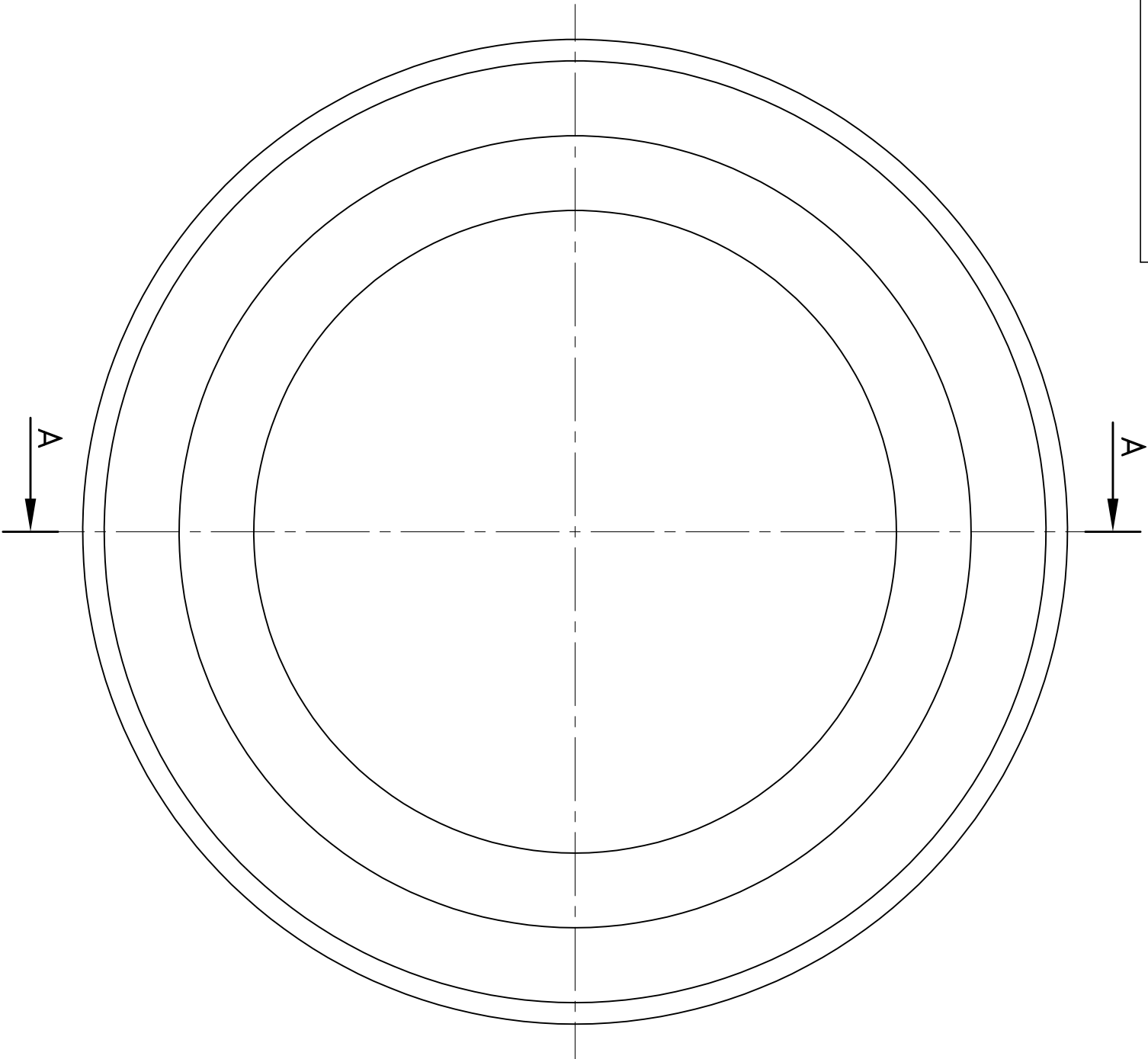


THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED.
IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY.

INVENTORY NO.	SIGN. & DATE	REF. DRG. NO.
---------------	--------------	---------------

FIRST ANGLE PROJECTION
150 50 54 54 3-ON GRD



SECTION-AA

DETAIL-X

NOTE:-
1. MACHINE ALL OVER $\sqrt{32}$ REMOVE SHARP EDGES.

REV.	DATE	ALTERED	CHECKED	APPROVED	ZONE

REV.	DATE	ALTERED	CHECKED	APPROVED	ZONE

REV.	DATE	ALTERED	CHECKED	APPROVED	ZONE

REV.	DATE	ALTERED	CHECKED	APPROVED	ZONE
02	21.09.23				IN SECTION-AA CH. 8X45° ADDED.

REV.	DATE	ALTERED	CHECKED	APPROVED	ZONE
01	05.04.23				WEIGHT 9.06 KG WAS 8.71KG.

REV.	DATE	ALTERED	CHECKED	APPROVED	ZONE

REV.	DATE	ALTERED	CHECKED	APPROVED	ZONE

REV.	DATE	ALTERED	CHECKED	APPROVED	ZONE

001	64 65	75 76 79 25	27 29	001	SHORT CIRCUIT RING	58 59 60	77 29 31 34	45 55 56 58	65 72	71 72	ZONE
VAR 00	REMARKS	VAR. NO.	ITEM NO.	DESCRIPTION	DRAWING NO.	VAR.	TT. NO.	MATL. CODE	UNIT	WT.	QTY.
ADDITIONAL INFORMATION REFERENCE DRG.-44454592005											
STATUS OF DRAWING											
DISTRIBUTION OF PRINTS TME-1, TXM-3, CIM-1, TNX-1,											
TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT											
3-PHASE TRACTION MOTOR											
IM3004AZ											
BHARAT HEAVY ELECTRICALS LTD BHO PAL											
UNTO L. DMS. GR. TM20079 GR M°											
SCALE NTS 9.06											
WEIGHT (K.G.) 9.06											
REF. TO ASSY. DRG. 2 445 45 05 051											
ITEM NO. 002											
NO. OF 00											
NAME SIGN DATE											
A.J.HARA 22.02.23											
K.D. 22.02.23											
APD. 22.02.23											
DRAWING NO. 3 445 45 05 051											
REV. 02											
SHT. NO. 01 NO. OF SHT. 01											



भारत हेवी इलेक्ट्रिकल्स लिमिटेड, भोपाल
(भारत सरकार का उपक्रम)
Bharat Heavy Electricals Limited, Bhopal
(A Government of India Undertaking)
संकर्षण मशीन अभियांत्रिकी प्रभाग
TRACTION MACHINES ENGINEERING DIVISION



Vendor Information for Technical Qualification Requirement

Ref No: TME/PQR/IM3004/SC-Ring-01

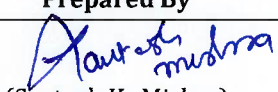
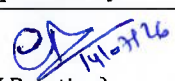
Dated: 14.07.2026

Technical Pre-Qualification requirement of **Short Circuit Ring** is as under:

Sl No	Description	Vendor Comment	
		Complied/N ot Complied	Supporting relevant document to be submitted
01	"Short Circuit Ring" should be exactly a) As per Drawing b) B) As per specification c) Mentioned in the enquiry/NIT	Yes/No	
2	Vendor confirm that all inspection and testing requirements have been studied and will be complied.	Yes/No	
3	Vendor to necessarily have in-house plant and machinery required to manufacture the tendered item.	Yes/No	
4	Testing facility shall be available preferably in-house with vendor for ensuring quality of raw material, in-process and finished product as per specification requirements. All testing facilities have to be duly calibrated. List of outsourced facilities (if used) mat be submitted. Outsourced testing labs/firms should necessarily be NABL accredited.	Yes/No	
5	Manufacturing and testing facilities assessment may be carried out by BHEL at supplier works. Supplier to give confirmation to agree for the same.	Yes/No	
6	Manufacturing/supply experience in preceding 5 years (from tender opening date) of same/similar* item to Indian Railway or OEM of traction machine manufacturer is required.	Yes/No	Un-priced PO copies of same/similar item in preceding 5 year from original enquiry due date & supply proof (Delivery challan/Invoice etc.) of corresponding PO.
7	Vendor should be a manufacturer and not a trader.	YES/NO	

Note:

1. Compliance of all points of T-PQR are mandatory. In absence of compliance of above, vendor's offer is liable to be rejected.
2. Declaration by vendor regarding all information/compliance submitted should be correct in all respect. In case any deviation/false information is revealed later on, BHEL is free to initiate appropriate punitive proceeding as per prevalent process and guidelines of company.
3. (*): Copper alloy Resistance ring/Short circuit ring with outer diameter more than 200mm shall be considered as similar item.

Prepared By	Approved By
 (Santosh Kr Mishra) Sr. Manager/TME	 (V Rawtiya) AGM/TME

BHARAT HEAVY ELECTRICALS LIMITED, BHOPAL

QUALITY ASSURANCE PLAN FOR SHORT CIRCUIT (SC) RING TO BHEL ORDERING SPECIFICATION/DRAWING AS PER PO

QUALITY PLAN NO. – QAP/QTMM/VENDOR QAP/2022-23/ SHORT CIRCUIT (SC) RING REV 00 DTD 10/03/2023
Reference Document- PO DRAWING/SPECIFICATION

Page : 1 of 3

SL. NO	COMPONENT	CHARACTERISTICS	TYPE OF CHECK	QUANTAM OF CHECK		REFEREN CE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	INSPECTION AGENCY	REMARKS
				TP	TP/A					
1)	Raw material	a) Chemical properties b) Oxygen content	TC verification	100%	100%	As per specification	As per specification	MTC	BHEL/TP/A	SOURCES MENTIONED IN SPECIFICATION. RAW MATERIAL TC to be co-related to finished material and to be verified by TP/A
2)	Dimension	Dimension	Measurement	100%	5 Rings per lot (w)	As per drawing & specification	As per drawing & Specification	Supplier record	BHEL/TP/A	
3)	Visual check	Free from any piping, crow feet, indentations, foreign particles or inclusion, surface defect. Twists & entanglements	Visual	100%	5 Rings per lot (w)	As per drawing & specification	As per drawing & specification	Supplier record	BHEL/TP/A	

Prepared By

गजेन्द्र प्रसाद / G.S. RATHORE
उप प्रबंधक / Dy. Manager
व्यू. टी. एम. विभाग / QTM Division
बी.एस.ई.एल., भोपाल / BHEL, BHOPAL

Approved By

गजेन्द्र प्रसाद / G.S. RATHORE
उप प्रबंधक / Dy. Manager
व्यू. टी. एम. विभाग / QTM Division
बी.एस.ई.एल., भोपाल / BHEL, BHOPAL

3



BHARAT HEAVY ELECTRICALS LIMITED, BHOPAL

QUALITY ASSURANCE PLAN FOR SHORT CIRCUIT (SC) RING TO BHEL ORDERING SPECIFICATION/DRAWING AS PER PO

QUALITY PLAN NO. – QAP/QTM/VENDOR QAP/2022-23/ SHORT CIRCUIT (SC) RING REV 00 DTD 10/03/2023
Reference Document- PO DRAWING/SPECIFICATION

Page : 2 of 3

Testing on finished ring	Chemical properties	Testing	one sample per lot at NABL lab	RR	As per specification	As per specification	Supplier record	BHEL/TPIA	NABL LAB tested TC to be verified and co-related by TPIA and submitted to BHEL as per specification.
	Mechanical properties	Testing	one sample per lot At NABL lab	RR	As per specification	As per specification	Supplier record	BHEL/TPIA	2 nos test sample to be furnished to BHEL duly stamped by TPIA as per specification.
	NDT testing: 1) ultrasonic testing/Eddy current testing	Testing	One sample per lot at NABL LAB & 100 % by supplier	1 sample per lot (W)	As per specification	As per specification	Supplier record	BHEL/TPIA	
	Electrical properties a) Electrical Conductivity	Testing	100 %	5 Rings per lot (W)	As per specification	As per specification	Supplier record	BHEL/TPIA	

Prepared By

Approved By

राजेश सिंह राठौर / G.S. RATHORE
उप प्रबंधक / Dy. Manager

बसु, ए.एस. विभाग / QTM Division
बी.एस.ए. एल. भोपाल / BHEL, BHOPAL

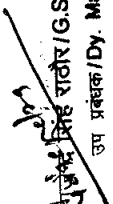
	BHARAT HEAVY ELECTRICALS LIMITED, BHOPAL QUALITY ASSURANCE PLAN FOR SHORT CIRCUIT (SC) RING TO BHEL ORDERING SPECIFICATION/DRAWING AS PER PO
QUALITY PLAN NO. – QAP/QTM/VENDOR QAP/2022-23/ SHORT CIRCUIT (SC) RING REV 00 DTD 10/03/2023 Reference Document- PO DRAWING/SPECIFICATION	
Page : 3 of 3	

5)	Identification vendor name, PO & job serial no., Hardware fitment	Visual	Visual	100%	5 Rings per lot	As per drawing & specification	As per drawing & Specification	Supplier record	BHEL/TPIA	Witness
6)	Packing to avoid transit damage	Visual	Visual	100%	20%	As per drawing & specification	As per drawing & specification	Packing list for each kit box	BHEL/TPIA	Packing to be such that no damages should occur during transit. 1 kit items should be placed in on 1 box

Abbreviations: W-Witness, RR-record review, TPJA-Third party inspection agency, TP=Task performer,

Prepared By

Approved By


 G.S. RATHORE /G.S. RATHORE
 उपा प्रबंधक/Dy. Manager
 कर्म. डी.एम. विभाग /QTM Division
 बी.एच.ई.एल., भोपाल/BHEL, BHOPAL

6

		 PRODUCT STANDARD TME DIVISION, BHOPAL	TM 23610
		TME/2011	PAGE 02 OF 02
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 the interest of the company		5.3 Electrical Properties When tested in accordance with IS:3635, the electrical resistivity should correspond to the following minimum Electrical conductivity of IACS standard. Electrical Conductivity at 20°C 75% IACS minimum 6.0 Test Sample Refer Cl. 3.0 above for sample size and quantity. Such samples to be submitted to BHEL per heat. 7.0 Testing 7.1 Ultrasonic Testing Each SC Ring to be UT Tested as per TM98264 Table-1, Test Range-A & Level-1. 8.0 Test Certificates Following TCs to be enclosed with each lot of finished component to BHEL: 8.1 Raw Material mill TC (per heat) 8.2 Sample size as per Cl. 6.0 (per heat) 8.3 Dimensional Report of the SC Ring (each SC Ring/component) 8.4 Electrical Conductivity (per lot) 8.5 Chemical analysis (per lot) 8.6 Mechanical & Chemical property TC from NABL accredited lab (per lot) 8.6.1 Tensile Strength 8.6.2 0.2% Proof Strength 8.6.3 Elongation 8.6.4 Hardness 8.7 Inspection Reports: 8.7.1 UT Test (Each Ring) 8.7.2 UT Test (1 Ring per lot at NABL accredited lab) **_**	



TME, 2011

PRODUCT STANDARD

TME DIVN. BHOPAL

TM 98264

PAGE 01 OF 05

Procedure for Ultrasonic testing of copper and copper alloys plates

1. Test Objective

The ultrasonic test described in this test specification has the objective of detecting internal material discontinuities ¹⁾ in plates of copper and copper alloys.

2. Scope

This test specification is applicable to sheet rolled or forged plates of copper and copper alloys in thickness of 5-160 mm, whose structure allow this test.

3. Test Levels

Depending on the requirement and type of material, tests can be performed in accordance with three test levels.

In general, and when there are no other agreements, tests are performed in accordance with Level iii). Where there are higher requirements, Levels ii or i may be agreed in so far as it is permitted by material and delivery condition.

Acceptance criteria relating to the various levels are stated in Table 1.

4. Surface Condition

The plate surfaces must be free from scales and impurities, Surface undulation should be so small that the probe can not be properly applied, and that there is no gap of more than 0.5 mm under the probe face in any place.

5. Test Method

In general the pulse echo shall be used, in the longitudinal waves and normal perpendicular incidence.

5.1 Signal Evaluation Methods

5.1.1 Evaluation Using Reference Blocks"

The reference block must be made of the same material and by the same manufacturing process as the plates to be tested. The thickness of the reference block may vary more than $\pm 20\%$ from the nominal thickness of the plate to be tested. A minimum of 3 reference reflectors (flat-bottom holes) shall be drilled from one side of the reference block to a depth of 10, 50 and 90% of the wall thickness (Fig.1). For wall thicknesses to 20 mm nos. only 1 drill hole with a depth of 50% of wall thickness will be adequate.

Revision : 00

Distribution

Qty.

Approved :

Date : 28/11/98

Txm

2

TME

2

Prepared

Checked

Date

Singh

Singh

28/11/98

CONFIDENTIAL
 The information on this document is the property of BHARAT HEAVY ELECTRICALS LTD.
 It must not be used directly or indirectly in any way detrimental to the interest of the company



PRODUCT STANDARD TME DIVN. BHOPAL

TM 98264

TME/2011

PAGE 02 OF 05

The distances between the drill holes and between the drill holes and the edges of the reference block must be greater than the diameter of the probe. For the diameter of the drill holes in accordance with plate thickness see Table 1.

5.1.2 AVG/DGS Method"

Taking into consideration the relevant sound velocities and, evaluation of the reflectors may also be done by the AVG/DGS method.

5.1.3 Half-amplitude method

Large reflectors shall be evaluated by the half-amplitude method (6-db-drop).

6. Requirements for testing equipment

6.1 Test System

The flow detector with the probe must be in accordance with DIN 54126, part 1.

6.2 Probes

For the ultrasonic testing of plates T/A-probes (longitudinal waves) of normal probes (longitudinal waves) shall be used with a frequency of 0.5 to 6 MHz, depending on material, material condition and material thickness. Frequencies with more than 2 MHz shall be used preferably for the verification of flaws near the surface and for testing thin plates.

7. Adjustment of Instruments

7.1 Distance Adjustment

With T/R-probes distance adjustment shall be made on the reference block by means of the backwall echo and the echo from flat-bottomed holes with half wall thickness depth.

With normal probes distance adjustment shall be made with the first and second backwall echos out of the reference block or out of the plate.

7.2 Sensitivity Adjustment

In the reference block method, sensitivity adjustment shall be made according to Fig.1 It has to be checked by measuring the transfer losses that differences in sensitivity between reference block end plate to be tested do not exceed 4 dB.

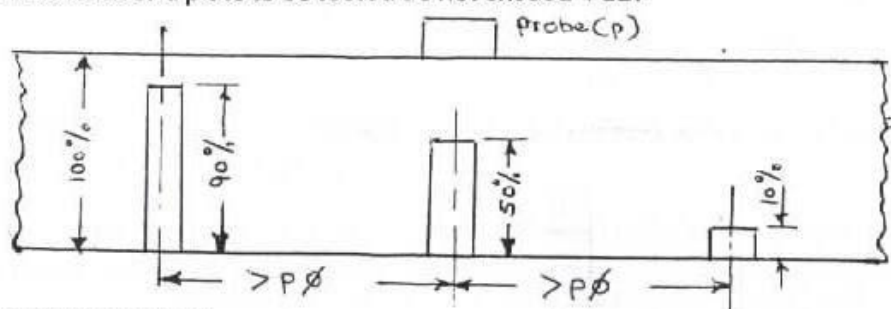


Fig. 1: Reference block



TME, 2011

PRODUCT STANDARD TME DIVN. BHOPAL

TM 98264

PAGE 03 OF 05

With the AVG/DGS Method sensitivity adjustment is made with the backwall echo out of the plate to be tested. The value of necessary increase of sensitivity is taken out of an AVG/DGS diagram, in correspondence to the probe type used and the sound velocity of the material to be tested.

With both methods of adjustment instrument gain shall be set to a level that echos to be registered reach atleast 20% of screen height. Additionally the registration level should be atleast 8dB above noise level.

When these requirements can not be fulfilled, even when selecting the best suited probe producer and purchaser must come to an agreement on the further proceedings.

7.3 Checking Instrument Adjustment

The test system should be checked at regular intervals, and atleast at the beginning and the end of the ultrasonic test.

8. Test Performance

8.1 Procedure

The plates may be tested manually or semi-automatically (mechanized) (DIN 54 126, part 2.) Soundwave incidence is parallel to plate thickness.

In general it is sufficient to test from one surface only, as flaws hidden in the dead zone after initial pulse are detected via drop of the backwall echo, or as a signal behind the first backwall echo.

8.2 Range of Test Range A

The surface of the plate shall be scanned with a matrix of 200 mm distance or with parallel lines of 100 mm distance. The edge zones within a width of 100 mm shall be tested with complete coverage. Complete coverage of this area means an overlapping of scanning paths by $\frac{1}{3}$ of the probe diameter.

Where a registration due to signal is found with a 200 mm matrix scanning of 100 mm line scanning, a circle of 200 mm radius must be tested with complete coverage.

The test range must be state at the time of the order, otherwise the ultrasonic test according to test range A will be applied.

Range B

The surface of the plate shall be scanned with a matrix of 100 mm distance or with parallel lines of 50 mm distance.

The edge comes within a width of 100 mm shall be tested with complete coverage.

Where a registration due to signal is found within the 100 mm matrix scanning or 50 mm line scanning a circle of 100 mm radius must be tested with complete coverage.

COPYRIGHT AND CONFIDENTIAL
 The information on this document is the property of BHARAT HEAVY ELECTRICALS LTD.
 It must not be used directly or indirectly in any way detrimental to the interest of the company



TME, 2011

PRODUCT STANDARD TME DIVN. BHOPAL

TM 98264

PAGE 03 OF 05

With the AVG/DGS Method sensitivity adjustment is made with the backwall echo out of the plate to be tested. The value of necessary increase of sensitivity is taken out of an AVG/DGS diagram, in correspondence to the probe type used and the sound velocity of the material to be tested.

With both methods of adjustment instrument gain shall be set to a level that echos to be registered reach atleast 20% of screen height. Additionally the registration level should be atleast 8dB above noise level.

When these requirements can not be fulfilled, even when selecting the best suited probe producer and purchaser must come to an agreement on the further proceedings.

7.3 Checking Instrument Adjustment

The test system should be checked at regular intervals, and atleast at the beginning and the end of the ultrasonic test.

8. Test Performance

8.1 Procedure

The plates may be tested manually or semi-automatically (mechanized) (DIN 54 126, part 2.) Soundwave incidence is parallel to plate thickness.

In general it is sufficient to test from one surface only, as flaws hidden in the dead zone after initial pulse are detected via drop of the backwall echo, or as a signal behind the first backwall echo.

8.2 Range of Test Range A

The surface of the plate shall be scanned with a matrix of 200 mm distance or with parallel lines of 100 mm distance. The edge zones within a width of 100 mm shall be tested with complete coverage. Complete coverage of this area means an overlapping of scanning paths by $\frac{1}{3}$ of the probe diameter.

Where a registration due to signal is found with a 200 mm matrix scanning of 100 mm line scanning, a circle of 200 mm radius must be tested with complete coverage.

The test range must be state at the time of the order, otherwise the ultrasonic test according to test range A will be applied.

Range B

The surface of the plate shall be scanned with a matrix of 100 mm distance or with parallel lines of 50 mm distance.

The edge comes within a width of 100 mm shall be tested with complete coverage.

Where a registration due to signal is found within the 100 mm matrix scanning or 50 mm line scanning a circle of 100 mm radius must be tested with complete coverage.

COPYRIGHT AND CONFIDENTIAL
 The information on this document is the property of BHARAT HEAVY ELECTRICALS LTD.
 It must not be used directly or indirectly in any way detrimental to the interest of the company



TME/2011

PRODUCT STANDARD TME DIVN. BHOPAL

TM 98264

PAGE 05 OF 05

Table 1 : Acceptance criteria for plates tested ultrasonically

Level	Thickness of plate or reference clock	Equivalent reflector size (ERS) diameter of flat-bottomed holes	BE-drop (Backwall Echo-drop)	Test Range		
	mm	mm	dB	A 200 mm matrix	B 100 mm matrix	C complete coverage
Max. permitted no. of flaw echos per m2 of plate						
i	≤ 10	3	≤ 12	2	4	6
	> 10 - ≤ 20	4				
	> 20 - ≤ 30	5				
	> 30 - ≤ 50	6				
	> 50 - ≤ 70	8				
	> 70 - ≤ 100	10				
	> 100 - ≤ 160	12				
ii	≤ 10	4	≤ 12	2	4	6
	> 10 - ≤ 20	5				
	> 20 - ≤ 30	6				
	> 30 - ≤ 50	8				
	> 50 - ≤ 70	10				
	> 70 - ≤ 100	12				
	> 100 - ≤ 160	18				
iii	≤ 10	5	≤ 12	2	4	6
	> 10 - ≤ 20	6				
	> 20 - ≤ 30	8				
	> 30 - ≤ 50	10				
	> 50 - ≤ 70	12				
	> 70 - ≤ 100	16				
	> 100 - ≤ 160	20				

10. Test Personnel

10.1 Inspectors

Inspectors must possess adequate basic technical knowledge and be able to perform the tests in accordance with the requirements stipulated in this material test application.

10.2 Supervisors

The supervisor must have the adequate knowledge for the task. He must be able to perform the procedures in accordance with the requirements stipulated in this material test specification. Moreover, he is responsible for the necessary training of inspectors and for the correct performance of the testing equipment.

10.3 Qualification of Test Personnel

Qualifications of test personnel should be in accordance with the requirements of DG21P Recommendations for training, qualification, and examination of non-destructive testing inspections (NDT inspections guideline) or the DGZIP Recommendations for the qualification and certification of non-destructive test personnel (qualification guideline)". Purchaser and manufacturer are free to agree on other equivalent qualification guidelines in respect to non-destructive test, personnel.

CONFIDENTIAL
 The information on this document is the property of BHARAT HEAVY ELECTRICALS LTD.
 It must not be used directly or indirectly in any way detrimental to the interest of the company