



CORPORATE STANDARD

AA 712 51 04

Rev. No. 07

PAGE 1 OF 3

SCREWS, GRUB, SLOTTED, TYPE-C (CONICAL ENDS), PRODUCT Gr:A, COARSE PITCH, STEEL, PROPERTY CLASS 4.8 (M12 - M24)

1.0 DESIGNATION:

A product Gr:A, slotted, steel, grub screw conical end (Type-C), thread M12, length 30mm, coarse pitch and conforming to property class 4.8 shall be designated as:

1.1 On drawings:

- i) Material specification column : AA 712 51 04.
- ii) Description column : SCRU GRB SLT C A M12X30 - 4.8

1.2 On indents:

Screw grub C A M12X30 - 4.8: AA 712 51 04

1.3 For issuing enquiries and on purchase orders:

While issuing enquiries and purchase orders, enclose a copy of this BHEL standard.

2.0 COMPLIANCE WITH STANDARDS:

2.1 Dimensions, Tolerances and General Requirements:

As per BHEL standard AA 712 51 04

2.2 Mechanical properties:

Material shall conform to properties given against class 4.8, as specified in Table-3 of IS:1367, Part 3

2.3 Threads:

Pitch-coarse to IS:4218, Part 2
Tolerance quality - Medium.
Tolerance class 6g.

2.4 Identification Marking:

As stated in clause-9 of IS:1367, Part 3

2.5 Finish: Plated as specified in BHEL order.

Revisions : As per Cl. 29.4 of 29th MOM
of WG-F

APPROVED :

**INTERPLANT
STANDARDIZATION COMMITTEE (WG-F)**

Rev. No. 07

Amd.No.

Prepared

Issued

Dt. of 1st Issue

Dt: 15.04.2011


Dt :

Year :

HARDWAR

Corp. R&D

December, 1976

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3.0 NOTE:

3.1 Length and diameter combination (refer Table-1 on page 3 of 3) between the bold lines should only be used

3.2 For screw threads, general (Metric) refer to BHEL standard AA 023 18 00

3.3 For tolerance grade, position and class refer to BHEL standard AA 023 02 01

3.4 For sizes less than M12, refer to BHEL standard AA 7125103

3.5 Screws to this standard would be unplated, divisions wishing to have plated screws would have to get them plated.

3.6 Weights given in this standard are for general reference only and are not meant for commercial transactions.

3.7 When fasteners are to be tested with in BHEL, sampling and acceptance plan as per IS:1367, Part 17

4.0 REFERRED STANDARDS (Latest publications including amendment):

1) IS:1367, Pt 3& Pt 17	2) IS:4218, Pt 2	3) AA 023 02 01
4) AA 023 18 00	5) AA 0231852	6) AA 7125103


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1. Corporate Sub-Code Numbers are shown in the table 1
2. Weights have been shown in kg. per 1000 Nos.
3. For ends refer AA 0231852.

TABLE-1

All Dimensions in mm

[illegible]

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EXPLANATORY NOTE:

This standard was first issued in January 1977 and was based on IS:2388-71 and reaffirmed in 1991 for dimensions, tolerances and general requirements. Subsequently many changes have been agreed upon at International and IPSC level and were reflected in revised version of IS:1367 “Technical supply condition of threaded fasteners”.

Since the IS:2388 has been withdrawn, therefore the following changes have been made in the corporate standard AA712 51 04 :

- Reference of the IS:2388 has been deleted from clause 2.1 of the standard.
- Clause 1.3, 2.1 and 2.4 have been modified accordingly.
- Clause 4.0 has been modified.



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AA7123125

Rev. No. 05

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SCREWS, CAP, HEXAGON SOCKET THIN HEAD, PRODUCT GR. A, COARSE PITCH, STEEL, PROPERTY CLASS 8.8 (M3 - M24)

1 DESIGNATION

A Product Gr: A Hex socket thin head, cap steel screw of thread M12, length 30 mm, coarse pitch, and conforming to property class 8.8 shall be designated as:

1.1 On drawings

- i) Material specification column: AA7123125
- ii) Description column: SCRU CAP SOC TH HD A M12 X 30 - 8.8

1.2 On indents

Screw Cap Hexagon socket thin head A M12 X 30 - 8.8; AA7123125

1.3 For issuing enquiries and on purchase orders

While issuing enquiries and purchase orders, a copy of this standard shall be enclosed.

2 COMPLIANCE WITH STANDARDS

2.1 Dimensions, Tolerances & General Requirements

As per DIN 7984 - 2009

2.2 Mechanical properties

To conform to property Class 8.8, as specified in table 3 of IS 1367, Part 3

2.3 Threads

Pitch-coarse to IS 4218, Part 2

Tolerance quality - Medium

Tolerance class - 6g

2.4 Identification Marking

As stated in clause 9 of IS 1367, Part 3 except for sizes up to M10

2.5 Surface Discontinuity

As per DIN 7984 or IS 1367, Part 9

2.6 Finish

Plated as specified in BHEL order

Revisions:
As per clause 34.2.A) of MOM of MRC-F

APPROVED:
INTERPLANT MATERIAL RATIONALISATION
COMMITTEE – MRC (F)

Rev. No. 05

Amd. No.

Reaffirmed

Prepared
HEP, Bhopal

Issued
Corp. R&D

Dt. of 1st Issue
01-09-1983

Dt: 25-10-2016

Dt:

Year:

AA7123125

Rev. No. 05

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CORPORATE STANDARD**3 NOTE**

- 3.1** Length and diameter combination (refer Table 3 on page 5 of 5) between the bold lines should only be used.
- 3.2** For screw threads, general (Metric) refer to BHEL standard AA0231800.
- 3.3** For tolerance grade, position and class refer to BHEL standard AA0230201.
- 3.4** Weights given in this standard are for general reference only and are not meant for commercial transactions.
- 3.5** When fasteners are to be tested with in BHEL, the following sampling and acceptance plan shall be as per IS 1367, Part 17.

4 REFERRED STANDARDS (Latest publications including amendments)

- 1) IS 1367 Part 3, 9 & 17
- 2) IS 4218 Part 2
- 3) AA0230201
- 4) AA0231800

EXPLANATORY NOTE

The following changes have been made in this revision

- In Clause 2.1, Year of DIN is modified as DIN 7984-2009
- Clause 2.2 & 2.3 year of reference removed.



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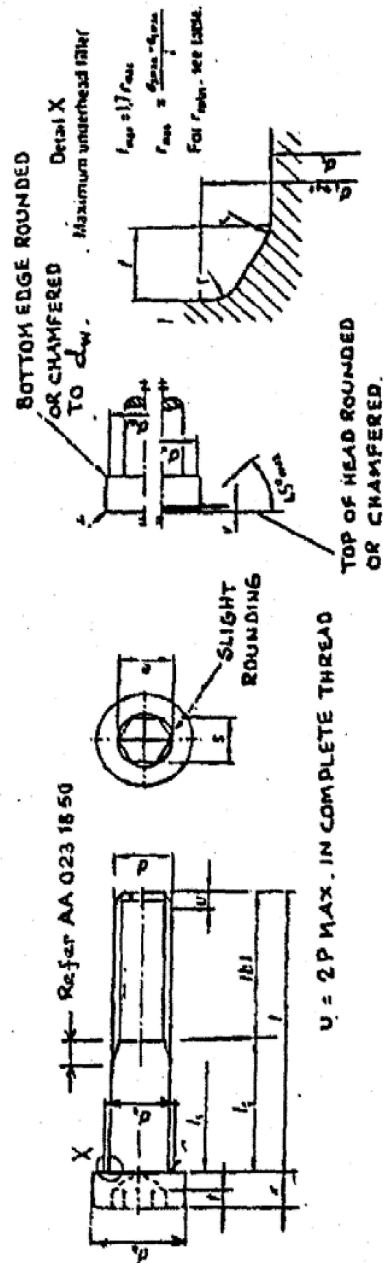


Table 1

(All dimensions are in mm)

Thread Size d	Thread Length b	d _k Nom.	d _a Max.	d _w Min.	e Min.	f Max.	k Nom.	r Min.	s Nom.	t Nom.	v Max.
M3	12	5.5	3.6	4.84	2.3	0.51	2	0.1	2	1.5	0.3
M4	14		4.7	6.20	2.87	0.6	2.8	0.2	2.5	2.3	0.4
M5	16	8.5	5.7	7.7	3.44	0.6	3.5	0.2	3	2.3	0.5
M6	18	10	6.8	9.2	4.58	0.68	4	0.25	4	3	0.6
M8	22	13	9.2	12.03	5.72	1.02	5	0.4	5	3.8	0.8
M10	26	16	11.2	15.03	8.01	1.02	6	0.4	7	4.5	1
M12	30	18	13.7	17.03	9.15	1.87	7	0.6	8	5	1.2
M16	38	24	17.7	22.83	13.72	1.87	9	0.6	12	5.5	1.6
M20	46	30	22.4	28.83	16	2.04	11	0.8	14	7.5	2
M24	54	36	26.4	34.61	19.44	2.04	13	0.8	17	8	2.4

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Table 2 – SHANK LENGTH

Nom. Length (l)	M3		M4		M5		M6		M8		M10		M12		M16		M20		M24	
	I_s (Min.)	I_g (Max.)	I_s (Min.)	I_g (Max.)	I_s (Min.)	I_g (Max.)	I_s (Min.)	I_g (Max.)	I_s (Min.)	I_g (Max.)	I_s (Min.)	I_g (Max.)	I_s (Min.)	I_g (Max.)	I_s (Min.)	I_g (Max.)	I_s (Min.)	I_g (Max.)	I_s (Min.)	I_g (Max.)
5	-	1.5																		
6	-	1.5	-	2.1																
8	-	1.5	-	2.1		2.4														
10	-	1.5	-	2.1	-	2.4	-	3												
12	-	1.5	-	2.1	-	2.4	-	3	-	3.75										
16	-	1.5	-	2.1	-	2.4	-	3	-	3.75		4.5								
20	5.5	8	-	2.1	-	2.4	-	3	-	3.75	-	4.5	-	5.25						
25			7.5	11	-	2.4	-	3	-	3.75	-	4.5	-	5.25						
30					10	14	7	12	-	3.75	-	4.5	-	5.25	-	6				
35							12	17	6.75	13	-	4.5	-	5.25	-	6				
40							17	22	11.75	18	6.5	14	-	5.25	-	6	-	7.5		
45									16.75	23	11.5	19	-	5.25	-	6	-	7.5		
50									21.75	28	16.5	24	11.25	20	-	6	-	7.5	-	9
60									31.75	38	26.5	34	21.25	30	12	22	-	7.5	-	9
70											36.5	44	31.25	40	22	32	11.5	24	-	9
80													41.25	50	32	42	21.5	34	-	9
90																	31.5	44	21	36
100																	41.5	54	31	46



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Note:

- 1) Corporate sub code numbers are shown below
- 2) Weights have been shown in kg per 1000 Nos.

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1374301/2023/HERF-TXM20500ION - NOTIFICATION

AA 085 01 31 Rev.No.02

AA 085 01 31: PROCEDURE FOR LIQUID PENETRANT EXAMINATION

This standard is "Reaffirmed 1998."

Please see instructions on the reverse

Ref:	Approved	Issued	Date	Cum.Sl.No.
Cl: 13.6.20 OF MOM OF WG-NDT	WG-NDT	CORP.R&D	15.12.98	R 2440

1374301/2023/HEP-TXM20500

**AMENDMENT -- NOTIFICATION**

AA 085 01 31 REV.02

PAGE 1 OF 1

AA 085 01 31: PROCEDURE FOR LIQUID PENETRANT EXAMINATIONCl.1.3: This clause should be modified as below:

"This standard confirms substantially with ASTM E165 and ASME code Section V, Article 6."

REF:

Cl.8.12 of MOM OF WG(NDT)

AMD. NO.

01

APPROVED

WG(NDT)

ISSUED

Corp.R&D

DATE

June '93

CUM.SR.NO.

A 1279



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PROCEDURE FOR LIQUID PENETRANT EXAMINATION

1.0 SCOPE:

1.1 This standard details the procedure for liquid penetrant examination of non-porous ferrous and non-ferrous and non-metallic materials such as ceramics, plastics, glass, etc.

1.2 Typical surface discontinuities detectable by this method are cracks, seams, laps, cold shuts, porosity, laminations, etc.

1.3 This standard conforms substantially with ASTM E 165 - 1980 (Reapproved 1983) and ASME code section V, Article 6.

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 DESCRIPTION:

In principle a liquid penetrant is applied to the surface to be examined and allowed to enter discontinuities, excess penetrant removed, the part dried and a developer applied. The developer functions both as a blotter to absorb penetrant that has been trapped in discontinuities and as a contrasting back ground to enhance the visibility of penetrant indications.

4.0 APPROVED METHODS & MATERIALS:

4.1 Either a colour contrast or fluorescent penetrant method may be used. Any one of the following penetrants shall be used:

- (a) Solvent Removable
- (b) Post Emulsifying
- (c) Water Washable

4.2 For nickel base alloys and/or for stainless steel materials used in nuclear components the penetrant materials, cleaner, penetrant developer, etc., used shall not contain sulphur or halogen above 1% by weight.

4.3 Selection of liquid penetrant material shall be from the same family (brand). Inter-mixing of family of liquid penetrant materials is not allowed.

5.0 PROCEDURE:

5.1 Surface Preparation:

Revisions :

Cl.7.10 of MOM of WG(NDT)

INTERPLANT
STANDARDIZATION COMMITTEE - WG
(NDT)

Rev. No.

02

Rev. Date

NOV. '92

Revised:

CORP. R&D

Prepared

CORP. R&D

Issued

CORP. R&D

Date

Issue:
SEP. '79



5.1.1 Surface preparation by grinding or machining or other method may be employed where surface irregularities may mask indications of unacceptable discontinuities.

5.1.2 The surface to be examined and all adjacent areas within at least 25 mm shall be dry and free from any dirt, lint, scale, rust, welding flux, weld spatter, grease, oil or other extraneous matter that could obscure surface openings or otherwise interfere with examination.

5.1.3 The surface to be examined shall be cleaned with detergents, organic solvents, descaling solutions or paint removers. Degreasing and ultrasonic cleaning may be employed to increase cleaning efficiency. Cleaning method employed is an important part of the examination procedure. Cleaning solvents shall meet the requirements of Cl.4.2

Caution: Blasting with shot or dull sand, rotofinishing, buffing, wire brushing the soft material or machining with dull tools shall not be used as they maypeen the discontinuities at the surface.

5.2 Drying:

Drying, after cleaning the surface to be examined, shall be accomplished by normal evaporation or with forced hot air, as appropriate. A minimum period of time shall be established to ensure that the cleaning solution has evaporated prior to application of the penetrant.

5.3 Application Of Penetrants:

5.3.1 The penetrant shall be applied by dipping, brushing or spraying. If the penetrant is applied by spraying using compressed air type apparatus, filters shall be placed at the air inlet to preclude contamination of penetrant by oil, water or dirt sediment that may have collected in the lines. Spraying should only be performed in a booth equipped with exhaust system.

5.3.2 The length of penetration time is critical and depends upon the material being inspected, the process through which it has passed and the type of discontinuities expected. The recommended penetration time is given in Table 1.

5.3.3 The temperature of the penetrant and the surface of the part to be examined shall not be below 10°C(50°F) nor above 50°C(125°F) throughout the examination period. Local heating or cooling is permitted provided the temperatures remain in the range of 10 to 50°C during the examination. Where it is not practical to comply with these temperature limitations, other temperatures and times shall be used provided the procedures are qualified as described in Annexure-1.

5.4 Removal Of Excess Penetrant:

After the penetration time specified in the procedure has elapsed, any penetrant remaining on the surface shall be removed, taking care to minimise removal of penetrant from discontinuities.



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5.4.1 Postemulsifying Penetrants:

The emulsifier shall be applied by spraying or dipping. The emulsifying time shall not exceed 5 minutes. After emulsification, the mixture shall be removed by water spray.

5.4.2 Solvent Removable Penetrants:

Excess penetrant shall be removed by wiping with a cloth or absorbent paper repeating the operation until most traces of penetrants have been removed. The remaining traces shall be removed by wiping the surface lightly with cloth or absorbent paper moistened with solvent.

Caution: Care shall be taken to avoid excess solvent as this may remove penetrants from discontinuities. Flushing the surface with solvent following the application of the penetrant and prior to developing is prohibited.

5.4.3 Water Washable Penetrants:

Excess water washable penetrant shall be removed with a water spray. The water pressure shall not exceed 0.35 N/mm² (50 Psi) and the water temperature shall not exceed 43.3°C (110°F).

5.5 Drying:

Surface shall be dried before the application of developer.

- 5.5.1 a) If postemulsifying or water washable method is used, the surface shall be dried by blotting with clean materials or by using circulating warm air, provided the temperature of the surface is not raised above 50°C (125°F).
- b) For solvent removable method, the surface may be dried by normal evaporation, blotting, wiping or forced air.

5.6 Application Of Developer:

The developer shall be applied as soon as possible after the removal of the excess penetrant. Two types of developer, dry or wet, shall be used with fluorescent penetrant. With colour contrast penetrants, only wet developer shall be used.

5.6.1 Application Of Dry Developer:

Dry developer shall be applied by a soft brush, a hand operated powder bulb or a powder gun or other means provided the powder is dusted evenly over the entire surface being examined.

5.6.2 Application Of Wet Developer

Prior to applying suspension type wet developer to the surface, the developer must be thoroughly agitated to ensure adequate dispersion of suspended particles.

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(a) Aqueous Developer Application:

Aqueous developer may be applied to either a wet or dry surface. It shall be applied by dipping, spraying or other means provided a thin coating is obtained over the entire surface being examined. Drying time may be decreased by using warm air, provided the surface temperature of the part is not raised above 50°C.

(b) Non-aqueous Developer Application:

Non-aqueous developer shall be applied only on a dry surface. It shall be applied by spraying, except where safety or restricted access preclude it. Under such conditions developer may be applied by brushing. Drying shall be by normal evaporation.

6.0 EXAMINATION:

Observe the surface during the application of the developer to detect nature of any indications which tend to bleed out profusely. Final examination shall be done between 7 minutes at the earliest and 30 minutes at the latest after application of the developer. The nature of discontinuities corresponding to the indications shall be defined depending upon the method of setting, appearance, direction, shape and dimensions of the same. If the bleed out does not alter the examination results, longer periods are permitted. If the surface to be examined is large enough to preclude complete examination within the prescribed time the surface shall be examined in increments.

6.1 Colour Contrast Penetrants (Visible Dye Penetrants):

6.1.1 With colour contrast penetrants the developer forms a reasonably uniform coating. Surface discontinuities are indicated by bleeding out of the penetrant which is normally of a deep red colour. Indication with a light pink colour may indicate excessive cleaning. Inadequate cleaning may leave an excessive background making interpretation difficult.

6.1.2 Adequate illumination is required to ensure no loss of the sensitivity in the examination. Examination shall be done under natural or suitable light (illumination level shall be in the order of 500 LUX).

6.2 Fluorescent Penetrants:

Examination of the surface shall be carried out with a high intensity black light in a darkened area or booth. Black light shall have a wave length of 3650 Å°. The bulbs shall be allowed to warm up for not less than 5 minutes prior to use in the examination. The black light intensity shall be at least of 800 µW/cm² on the surface of the part being examined and the light source being kept at a distance of at least 375 mm from the surface being examined. The operator should allow his eyes to become accustomed to the darkness of the inspection booth for at least 5 minutes before inspecting the parts. He should avoid looking directly into the black light and also avoid going from the darkness to



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the light and back again without allowing sufficient time for his eyes to adjust to the darkness. The intensity shall be measured at least once every 8 hours and whenever the work station is changed.

7.0 EVALUATION OF INDICATIONS & INTERPRETATION:

7.1 As the developer dries to a smooth, even white coating, indications will appear at the locations of discontinuities. Depth of surface discontinuities may be correlated with the richness of colour and speed of bleeding out. However, localised surface imperfections such as may occur from machining marks or surface conditions may produce similar indications which are non-relevant.

7.2 Usually, a crack or similar opening will show a line and light cracks or partially welded lap will show a broken line. Gross porosity may produce large indications covering an entire area. Very fine porosity is indicated by random dots.

7.3 Any non-relevant indication shall be regarded as a defect until the indication is either eliminated by surface conditioning or it is Proved non-relevant by other NDT methods.

7.4 Linear indications are those indications in which the length is more than three times the width. Rounded indications are indications which are circular or elliptical with the length less than three times the width.

7.5 All indications shall be evaluated in terms of the acceptance standards of the referencing documents.

8.0 ACCEPTANCE STANDARDS:

8.1 For castings - Refer Corporate Standard AA 085 01 32.

8.2 For Austenitic Forgings - Refer Corporate Standard AA 085 01 30.

8.3 For Welds - Refer Corporate Standard AA 085 01 29.

9.0 POST EXAMINATION CLEANING:

Surfaces examined shall be cleaned after evaluation of the test with dry cotton rag with or without water rinse.

TABLE - 1 (Clause 5.3.2)

Suggested Penetration Time For Post-emulsified And Solvent Removable Penetrants

Material	Form	Type of discontinuity	*Penetration time (min.)
Aluminium	Castings	Porosity	5
		Cold shut	5
	Extrusions &	Laps	10
	Forgings	Lack of fusion	5
	Welds	Porosity	5
	All forms	Cracks	10

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TABLE - 1 (Clause 5.3.2) Contd.

Material	Form	Type of discontinuity	*Penetration time (min.)
Magnesium	Castings	Porosity	5
		Cold shut	5
	Extrusions &	Laps	10
	Forgings	Lack of fusion	10
	Welds	Porosity	10
	All forms	Cracks	10
Steel	Castings	Porosity	10
		Cold shut	10
	Extrusions &	Laps	10
	Forgings	Lack of fusion	20
	Welds	Porosity	20
	All forms	Cracks	20
Brass & Bronze	Castings	Porosity	5
		Cold shut	5
	Extrusions &	Laps	10
	Forgings	Lack of fusion	10
	Brazed parts	Porosity	10
	All forms	Cracks	10
Plastics	All forms	Cracks	5
Glass	All forms	Cracks	5
Carbide tipped tools	All forms	Lack of fusion	5
		Porosity	5
		Crack	20
Titanium & high temperature alloys	All forms		20 to 30
Ceramic	All forms	Cracks	5
		Porosity	5

* For lower temperatures, penetration time should be increased.

ANNEXURE - 1 (Clause 5.3.3)

PROCEDURE FOR NON-STANDARD TEMPERATURES

A.1 General:

When it is not practical to conduct a liquid penetrant examination within the temperature range of 15.6 to 51.6°C (60 to 125°F), the examination procedure at the proposed lower or higher temperature range requires qualification. This shall require the use of a quench cracked aluminium block, which is designated as 'Liquid Penetrant Comparator Block'.



A.2 Liquid Penetrant Comparator Block:

The liquid penetrant comparator block shall be made of aluminum, ASTM B209, Type 2024 or SB-211. Type 2024, 10 mm (3/8 in.) thick, and shall have approximate face dimensions of 50 mm x 75 mm (2 in. x 3 in.). At the centre of each face, an area approximately 25 mm in diameter shall be marked with a 510°C (950°F) temperature indicating crayon or paint. The marked area shall be heated with a blow torch, a Bunsen burner or similar device to a temperature between 510°C (950°F) and 524°C (975°F). The specimen shall then be immediately quenched in cold water which produces a network of the fine cracks on each face. The block shall then be dried by heating to approximately 149°C (300°F). After cooling, the block shall be cut into two halves. One half of the specimen shall be designated block 'A' and the other block 'B' for identification in subsequent processing. Figure 1 illustrates the comparator blocks "A" and "B". As an alternate to cutting the block in half to make blocks "A" and "B", separate blocks 50 mm x 75 mm (2 in. x 3 in.) can be made using the heating and quenching technique as described above. Two comparator blocks with closely matched crack patterns may be used. The blocks shall be marked "A" and "B".

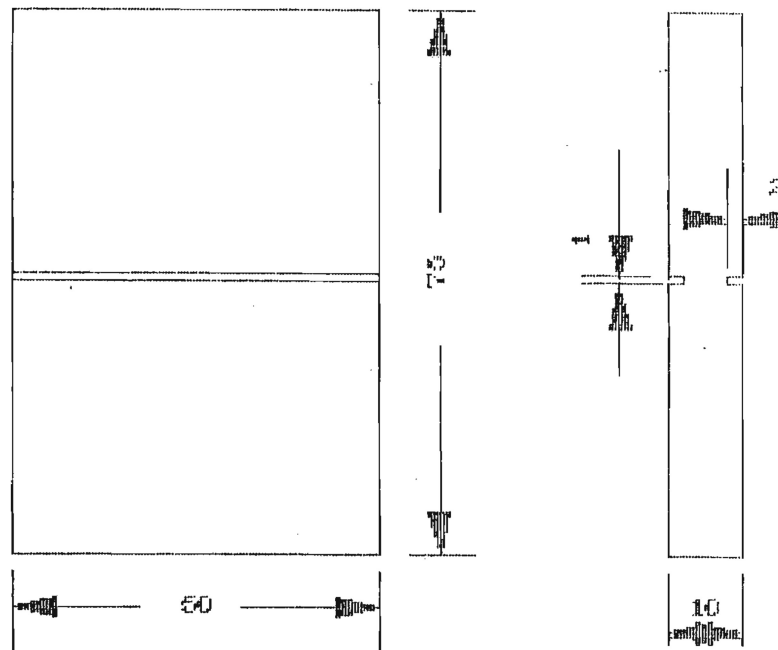
A.3 Comparator Application:

- (a) If it is desired to qualify a liquid penetrant examination procedure at a temperature of less than 15.6°C (60°F) the proposed procedure shall be applied to block "B" after the block and all materials have been cooled and held at the proposed examination temperature until the comparison is completed. A standard procedure which has previously been demonstrated as suitable for use shall be applied to block "A" in the 15.6 to 51.6°C (60 to 125°F) temperature range. The indications of cracks shall be compared between blocks "A" and "B". If the indications obtained under the proposed condition on block "B" are essentially the same as obtained on block "A" during examination at 15.6 to 51.6°C (60 to 125°F), the proposed procedure shall be considered qualified for use.
- (b) If the proposed temperature for the examination is above 51.6°C (125°F), block "B" shall be held at this temperature throughout the examination. The indication of cracks shall be compared as described in T-647.3(a) while block "B" is at the proposed temperature and block "A" is at the 15.6 to 51.6°C (60 to 125°F) temperature range.
- (c) A procedure qualified at a temperature lower than 15.6°C (60°F) shall be qualified from that temperature to 15.6°C (60°F).
- (d) To qualify a Procedure for temperatures above 51.6°C (125°F), the upper and lower temperature limits shall be established and the procedure qualified at these temperatures.
- (e) As an alternate to the requirements of (a) and (b) when using color contrast penetrants, it is permissible to use a single comparator block for the standard and non-standard temperatures and to make the comparison by photography.


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- (f) When the single comparator block and photographic technique is used, the processing details (as applicable) described in (a) and (b) above shall apply. The block shall be thoroughly cleaned between the two processing steps. Photographs shall be taken after processing at the nonstandard temperature and then after processing at the standard temperature. The indication of cracks shall be compared between the two photographs. The same criteria for qualification as (a) above shall apply.
- (g) Identical photographic techniques shall be used to make the comparison photographs.

**FIGURE: 1-LIQUID PENETRANT COMPARATOR BLOCK**

The information contained in this document is the property of BHARAT HEAVY ELECTRICALS LIMITED. It must not be used directly or indirectly in any way detrimental to the interests of the company.

	AMENDMENT -NOTIFICATION		AA 085 01 32	Rev.N0.00
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<p><u>AA 085 01 32: EVALUATION AND ACCEPTANCE STANDARD FOR LIQUID PENETRANT EXAMINATION OF CASTINGS</u></p> <p><u>PAGE 2 OF 2: CI 4.0 ACCEPTANCE STANDARDS:</u></p> <p>In the table, title of the column 3 (Unacceptable defects) is modified as "<u>Linear defects</u>"</p> <p>Please see Instructions on the reverse.</p>				
Ref: CI. 12.8.7 OF MOM OFWG(NDT)	Amd No 01	Approved WG-NDT	Issued CORP. R&D	Date 01.03.99
				Cum.Sr.No A 2516



EVALUATION AND ACCEPTANCE STANDARD FOR LIQUID PENETRANT EXAMINATION OF CASTINGS

1.0 SCOPE:

1.1 This standard is applicable for Liquid Penetrant examination of castings.

1.2 The procedure adopted for this examination is as per Corporate Standard AA 085 01 31

2.0 DEFINITION OF INDICATIONS:

2.1 Circular indications are those, more or less elliptical with major axis not more than three times the minor axis.

2.2 Linear indications are those, having length in excess of three times the average width.

2.3 In-line indications are those, in group of three or more indications aligned side by side in line with intervening gaps of less than 2mm measured edge to edge.

3.0 EVALUATION OF INDICATIONS:

3.1 Defects which occur as mechanical discontinuities at the surface will be indicated by the bleeding out of the penetrant, however, localised surface imperfections such as may occur from machining marks or surface conditions may produce similar indications which are not relevant to the detection of defects.

3.2 Any indication which is suspected to be non-relevant is to be considered relevant till it is proved otherwise.

3.3 Relevant indications are those which result from mechanical discontinuities. Linear indications are those indications in which the length is more than three times the width. Rounded indications are those indications which are circular or elliptical with the length less than three times the width.

3.4 Indications measuring less than 1.5mm across shall not be taken into consideration unless they are clustered in group of more than 4 Nos. with intervening gap of less than the largest dimensions of adjacent flaws. Such clusters shall be evaluated as single defect.

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Revision

Approved :

INTERPLANT NON-
DESTRUCTIVE TESTING COMMITTEE

Date

Prepared

Issued

Date

Corp. R&D

CORP : R & D

10 SEPT 79



4.0 ACCEPTANCE STANDARDS:

Castings are classified into four levels, as details below, according to the size and number of flaws permissible.

Level	No. of acceptable indications per 100 sq. cm. surface area of length not exceeding 25cm.	Unacceptable defects.
I	2 Nos. of 3mm circular indication.	Crack and hot tears.
II	3 Nos. of 3mm circular indication. One 5mm circular or linear indication.	-do-
III	3 Nos. of 3mm circular indication. 2 Nos. of 4mm circular indication. One 6mm circular or linear indication. One in-line indication of 10mm maximum length.	-do-
IV	4 Nos. of 3mm circular indication. 3 Nos. of 4mm circular indication. 2 Nos. of 8mm circular or linear indication. One in-line indication of 15mm maximum length.	-do-

Note: The minimum permissible distance between any two or more acceptable individual flaws shall not be less than the major dimension of the larger flaw.



CORPORATE STANDARD

AA7161001

Rev. No. 04

PAGE 1 of 3

WASHERS, MACHINED, STEEL

1 DESIGNATION

A machined washer of size 8.4 mm made of steel shall be designated as:

1.1 On drawings

- i) Material specification column: AA7161001
- ii) Description column: WASHER MCD 8.4-ST

1.2 On indents

Washer Machined 8.4 – Steel: AA7161001

1.3 For issuing enquiries and on purchase orders

While issuing enquiries and purchase orders, delete BHEL standard number from the above description and add the information given under clause 2.

2 COMPLIANCE WITH STANDARDS

2.1 Dimensions, Tolerances and General requirements

As per IS: 2016-1967, Table-1

2.2 Material

Steel as stated in IS: 2016

2.3 Finish

Plated as specified in BHEL order.

3 NOTE

- 3.1 For machined washers of brass, refer to BHEL standard AA7161002
- 3.2 For machined washers of copper, refer to BHEL standard AA7161004
- 3.3 Washers to this standard would be unplated, divisions wishing to have plated washers would have
- 3.4 For general requirements of washers, refer BHEL standard AA0230408
- 3.5 Weights given in this standard are for general reference only and are not meant for commercial transactions.
- 3.6 When fasteners are to be tested with in BHEL, the following sampling and acceptance plan based on IS: 6821 (Table-2) shall be followed for physical properties.

LOT SIZE	SAMPELE SIZE	ACCEPTANCE NOS.
Up to 1000	5	0
1001-3000	8	0
3003-10000	13	0
10001-35000	20	0
Over 35000	32	1

Revisions: As per clause 29.4 of MOM of WG-F

APPROVED:

INTERPLANT MATERIAL RATIONALISATION
COMMITTEE – MRC (F)

Rev. No. 04

Amd. No.

Reaffirmed

Prepared

Issued

Dt. of 1st Issue

Dt: 15-04-2011

Dt:

Year: 2019

HPEP, Hyderabad

Corp. R&D

01-01-1977

AA7161001

Rev. No. 04

PAGE 2 of 3

CORPORATE STANDARD**4 REFERRED STANDARDS (Latest publications including amendment)**

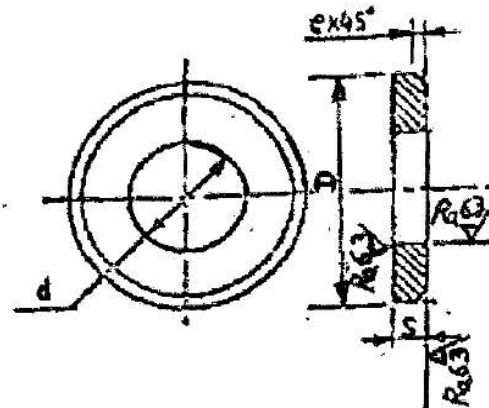
- 1) IS: 6821
- 2) AA0230408
- 3) AA7161002
- 4) AA7161004

EXPLANATORY NOTE

This standard was first issued in January 1977. The standard was based on IS:2016-1967 for dimensions, tolerances and general requirements. Subsequently many changes have been agreed upon at International & IPSC level and were reflected in IS: 2016-1967.

There is no change in IS: 2016-1967. This standard has been reviewed and brought up to date.

- Clause 3.6 “Sampling plan” for washers has been modified in line with IS: 6821
- Clause 4.0 has been modified accordingly.





CORPORATE STANDARD

AA7161001

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Note:

- 1) Corporate sub codes are shown in Table
- 2) Weights have been shown in kg per 1000 Nos.

Table 1

All dimensions in mm.

Size Nom. d h12	Outside diameter D		Thickness S		e nom	for bolt or screw size	Sub-code	Weight
	Basic	Tol.	Basic	Tol.				
1.7	4	+0 -0.3	0.3	±0.1	0.1	M1.6		
2.2	5	+0 -0.3	0.3	±0.1	0.1	M2	170	
2.7	6.5	+0 -0.3	0.5	±0.1	0.2	M2.5	161	
3.2	7	+0 -0.3	0.5	±0.1	0.2	M3	013	0.11
4.3	9	+0 -0.3	0.8	±0.1	0.3	M4	021	0.29
5.3	10	+0 -0.3	1	±0.1	0.4	M5	030	0.42
6.4	12.5	+0 -0.4	1.6	±0.2	0.6	M6	048	1.08
8.4	17	+0 -0.4	1.6	±0.2	0.6	M8	056	2.07
10.5	21	+0 -0.5	2	±0.2	0.6	M10	064	3.98
13	24	+0 -0.5	2.5	±0.3	0.6	M12	072	6.16
17	30	+0 -0.5	3	±0.3	0.6	M16	080	11.17
21	37	+0 -0.8	3	±0.3	1	M20	099	16.7
25	44	+0 -0.8	4	±0.3	1	M24	102	31.78
31	56	+0 -1.0	4	±0.3	1	M30	110	52.95
37	66	+0 -1.0	5	±0.6	1.6	M36	129	89.99
43	78	+0 -1.0	7	±1	1.6	M42	137	180.3
50	92	+0 -1.5	8	±1	1.6	M48	145	291.26
58	105	+0 -1.5	9	±1	1.6	M56	188	421.8
66	115	+0 -1.5	9	±1	2	M64	153	486.45



CORPORATE STANDARD

AA7123123

Rev. No. 07

PAGE 1 of 3

SCREWS, CAP, HEXAGON SOCKET HEAD, PRODUCT GR. A, COARSE PITCH, STEEL, PROPERTY CLASS 12.9 (M3 - M36)

1 DESIGNATION

A hexagon socket head, cap screw of nominal size M10, length 30mm, coarse pitch, product grade A and of property class 12.9 shall be designated as:

1.1 On drawings

- i) Material specification column: AA7123123
- ii) Description column: SCRU CAP SOCK A M10 X 30 – 12.9

1.2 On indents

Screw Hex socket head, cap A M10 X 30 – 12.9: AA7123123

1.3 For issuing enquiries and on purchase orders

While issuing enquiries and purchase orders, delete BHEL standard number from above description and add the information given under clause 2.

2 COMPLIANCE WITH STANDARDS

2.1 Dimensions, Tolerances & General Requirements

As per IS: 2269 - 2006

2.2 Mechanical properties

To conform to property class 12.9, as specified in table 3 of IS: 1367, Part 3

2.3 Threads

Pitch-coarse to IS: 4218, Part 2
Tolerance quality: Medium
Tolerance class: 5g - 6g

2.4 Identification Marking

As stated in clause 9 of IS: 1367, Part 3 (except for sizes up to M10)

2.5 Surface Discontinuity

As per IS: 1367, Part 9

2.6 Finish

Plated as specified in BHEL order.

Revisions: As per Clause. 29.1.2 of 29th MOM of WG-F

APPROVED:

INTERPLANT MATERIAL RATIONALISATION COMMITTEE – MRC (F)

Rev. No. 07

Amd. No.

Reaffirmed

Prepared
HEP, Bhopal

Issued
Corp. R&D

Dt. of 1st Issue
01-01-1977

Dt: 15-04-2011

Dt:

Year: 2019

AA7123123

Rev. No. 07

PAGE 2 of 3

CORPORATE STANDARD**3 NOTE**

- 3.1** Length and diameter combination (refer Table 1) between the bold lines should only be used.
- 3.2** Sizes to the left side of the dotted lines are threaded to the head within 3P.
- 3.3** For screw threads, general (Metric) refer to BHEL standard AA0231800
- 3.4** For tolerance grade, position and class refer to BHEL standard AA0230201
- 3.5** Screws to this standard would be unplated, divisions wishing to have plated screws would have to get them plated.
- 3.6** Weights given in this standard are for general reference only and are not meant for commercial transactions.
- 3.7** The screws to this standard can also be supplied with diamond / straight knurling on the external side of head.
- 3.8** When fasteners are to be tested with in BHEL, the sampling and acceptance plan shall be as per IS:1367, Part 17

4 REFERRED STANDARDS (Latest publications including amendment)

- 1) IS: 1367, Part 3, 9 & 17
- 2) IS: 4218, Part 2
- 3) AA0230201
- 4) AA0231800
- 5) AA0231850

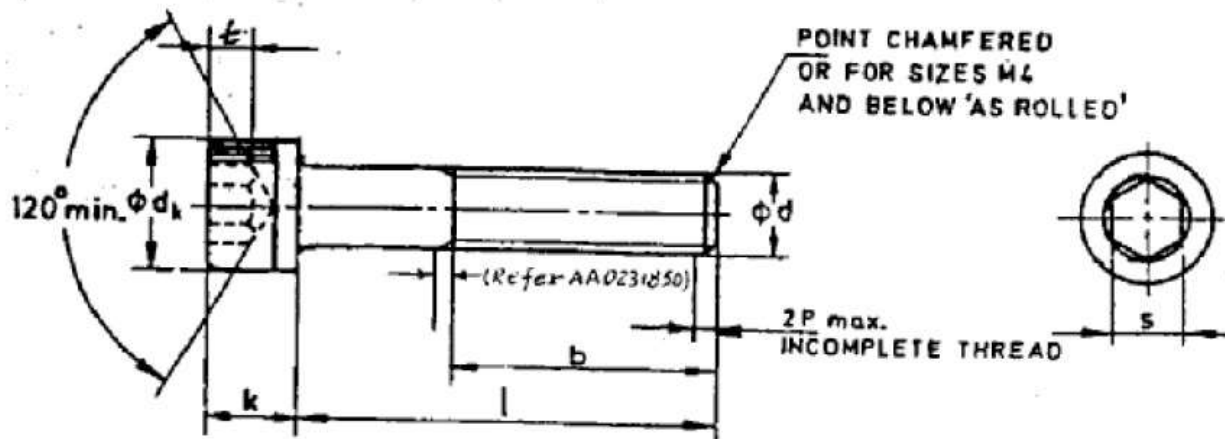


FIG. 1



CORPORATE STANDARD

AA7123123

Rev. No. 07

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Table 1

All dimensions are in mm

Note:

- 1) Corporate sub-code numbers only are shown in Table 1
- 2) Weights have been shown in kg per 1000 Nos.
- 3) For threaded runout refer AA0231850
- 4) Lengths above the thick dashed line are threaded to the headed within 3P

Size Nom. φd	Head		Socket		Threaded length for ref. σ	NOM LENGTH (L)																													
	Tks Max.	Dia. Max.	Across Flats Max	Depth Min. t		5	6	8	10	12	16	20	25	30	35	40	45	50	55	60	65	70	75	80	90	100	110	120	130	140	150	160	180	200	
M 3	3	5.68	2.56	1,3	18	Sub-code																													
	2.86	5.32	2.52			Weight																													
M 4	4	7.22	3.08	2	20	Sub-code					387																								
	3.86	6.78	3.02			Weight																													
M 5	5	8.72	4.095	2,5	22	Sub-code			409		417																								
	4.82	8.28	4.02			Weight																													
M 6	6	10.22	5.095	3	24	Sub-code				018	026	034	042	050		063		077																	
	5.7	9.78	5.02			Weight		5.03	5.73	8.53	7.64	8.75		10.09	12.2																				
M 8	8	13.27	6.095	4	28	Sub-code					395	085	093	373	107	115		123			131														
	7.64	12.73	6.02			Weight						13.1	15.1	17.1	190	21			24.9			30.9													
M 10	10	16.27	8.115	5	32	Sub-code					140	158	166	433	174	441	182	450	190	204				212	468										
	9.64	15.73	8.025			Weight						22.5	25	28	31	34.7	37.3	40.3	43.4	46.5	49.5				55.7	58.9									
M 12	12	18.27	10.115	6	36	Sub-code					476	220	239		247	255	263				271	484				492									
	11.57	17.73	10.025			Weight						32.1	36	39.6		48.5	52.9	57.4				70.7	73.7												
M16	16	24.33	14.142	8	44	Sub-code						280			299		301						310			328									
	15.57	23.67	14.032			Weight							81.1			94.8	110.7							150			189								
M 20	20	30.33	17.23	10	52	Sub-code									336		344																		
	19.48	29.67	17.05			Weight										186	188.4							250											
M 24	24	36.39	19.275	12	60	Sub-code												506		514			522		530	549					557				
	23.48	35.61	19.065			Weight															333			363		435									
M 30	30	45.39	22.275	15,5	72	Sub-code																			565	573				581					
	28.48	44.61	22.065			Weight																													
M 36	36	54.46	27.275	19	84	Sub-code																													
	35.3	53.54	27.065			Weight																													



CORPORATE PURCHASING SPECIFICATION

AA10119

Rev No. 15

PAGE 1 of 2

STRUCTURAL STEEL - WELDABLE QUALITY (PLATES, SECTIONS, STRIPS, FLATS AND BARS)

ORDERING DESCRIPTION

1.0 GENERAL:

The material shall conform to IS 2062 – 2011, E250-Gr.BR (with mandatory Impact Test) or DIN EN 10025-2:2005, Gr. S275JR and comply with following additional requirements.

2.0 APPLICATION:

For general engineering purposes, suitable for welding.

3.0 CONDITION OF DELIVERY:

3.1 Bars & Sections shall be supplied in Hot rolled in straight lengths without twists and bends.

3.2 The material shall be supplied as per IS: 2062 – 2011, E250 Gr.BR (with mandatory Impact Test) or as per DIN EN 10025-2:2005 Gr. 275JR.

3.3 Any other additional requirement as per BHEL Purchase order.

4.0 DIMENSIONS AND TOLERANCES:

4.1 Sizes:

Material shall be supplied to the dimensions specified in BHEL Order.

4.2 Tolerances:

The tolerances on hot rolled material shall comply with IS: 1852 or any other equivalent national standard.

4.3 Straightness for hot rolled bars:

Unless otherwise specified, the permissible deviation in straightness shall not exceed 5 mm in any 1000 mm length.

5.0 TEST SAMPLES:

The selection of test pieces for all tests like Chemical, Mechanical etc. shall be as per IS: 2062, E250-Gr.BR or DIN EN 10025-2, Gr. S275JR.

Revisions:

Clause No. 1, 3, 5 & 8 revised (as per MOM of 38th MRC meeting), Clause 10 added

APPROVED:

INTERPLANT MATERIAL RATIONALISATION
COMMITTEE – MRC(S&GPS)

Rev No.15

Amd No.

Reaffirmed

Prepared

Issued

Dt. of 1st Issue

Dt:11-03-2014

Dt:

Year:

HPEP, Hyderabad

Corp.R&D

June, 1976

AA10119

Rev No. 15

PAGE 2 of 2

CORPORATE PURCHASING SPECIFICATION



6.0 ULTRASONIC EXAMINATION:

Plates shall be ultrasonically examined in accordance with BHEL standard AA0850120 (or ASTM-A435) as detailed below and shall comply with the acceptance standards specified therein.

6.1 For plates above 40 mm thick:

Shall be ultrasonically examined unless when otherwise specified in order.

7.0 TEST CERTIFICATES:

Unless otherwise specified, three copies of test certificates shall be supplied.

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:

AA10119 - Rev.No.15/ IS: 2062-Gr: BR (with mandatory Impact test) or DIN EN 10025-2, Gr. S275JR,

BHEL order No.

Melt No, Size & Quantity, Batch No with heat treatment details, Results of Chemical analysis,

Mechanical tests & NDT, Supplier's name, Identification No, TC No, Signature of Competent Authority, etc.

8.0 PACKING AND MARKING:

Plates shall be transported suitably to avoid damage during transit.

Each plate shall be marked with Melt No. Material grade and specification, BHEL Order No, Supplier's Name Identification No, Size & weight, on any one corner and encircled with paint preferably of white colour.

9.0 REJECTION AND REPLACEMENT

If the material does not comply with the requirements of this specification during receipt inspection at BHEL or if any defect is found during further processing of material, BHEL reserves the right to reject the whole consignment and the supplier shall replace the material free of cost. The rejected material shall be taken back by the supplier after fulfilling the commercial terms and conditions.

10.0 REFERRED STANDARDS (Latest publications including amendments):

1) IS: 1852

2) ASTM - A435

3) AA0850120



TME 2019

PRODUCT STANDARD

TME DIVISION, BHOPAL

TM 12548

Rev. No. 01

PAGE 01 OF 04

Specification for Identification Marking of Traction Machines Components

1.0 Scope: This specification governs the requirements for identification marking of all components of traction machines (except electrical items, hardwares & bearings) either manufactured in-house or outsourced in raw material, semi-finished or fully finished condition.

2.0 Identification marking of components: The component manufacturer shall provide the identification marking depending upon the type of component (raw material/semi-finished castings, raw material/semi-finished forgings & fabricated components, fully finished components or sheet metal components) manufactured by it as per guidelines given below:-

A) CASTED COMPONENTS:

Sl. No.	Condition of supply	Identification marking requirement
1.	Castings/ semi-finished castings	<p>a) Method of marking in castings: Each casting shall be embossed & punched on un-machined surface/ etched on machined surface legibly and indelibly with following details:-</p> <p>i) Supplier's name initial , Heat no. ← To be embossed. (Example: SAIL/341)</p> <p>ii) xxxxx , MM-YY ← To be embossed/punched on cast surface or etched on machined surface.</p> <p style="margin-left: 40px;">4 digits of date of manufacturing in MM-YY format</p> <p style="margin-left: 40px;">Manufacturer's unique job serial no.</p> <p>(Example: 00345/0319)</p> <p>b) Method of marking in semi-finished castings: Each casting shall be embossed & punched on un-machined surface/ etched on machined surface legibly and indelibly with following details:-</p> <p>i) Supplier's name initial , Heat no. ← To be embossed. (Example: SAIL/341)</p> <p>ii) xxxxx , MM-YY ← To be embossed/punched on cast surface or etched on machined surface.</p> <p style="margin-left: 40px;">4 digits of date of manufacturing in MM-YY format</p> <p style="margin-left: 40px;">Manufacturer's unique job serial no.</p> <p>(Example: 00345/0319)</p> <p>c) Size & location: For size and location of identification marks, supplier to take prior approval from BHEL unless otherwise specified in the drawing.</p>

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Rev. No. 01

Distribution

Prepared

Checked

Approved


Date: 16/03/2019

TME - 2 MNX - 1
TXM - 1 TAM - 1
QTM - 1

(Signature)
(J. Kumar)

(Signature)
(R. Chaudhry)

(Signature)
(M. Verma)

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				Rev. No. 01
				PAGE 02 OF 04
2.	Machined castings on labour basis	a) Method of marking after finish machining: i) When embossed marking is not removed: In case the embossed marking is not removed during finish machining of the component, the component shall be punched with following details below the already existing embossed marking:- Supplier's name intial , xxxxx , MM-YY <div style="margin-left: 150px;"> <div style="display: inline-block; width: 100px; border-bottom: 1px solid black;"></div> <div style="display: inline-block; width: 100px; border-bottom: 1px solid black;"></div> <div style="display: inline-block; width: 100px; border-bottom: 1px solid black;"></div> </div> <div style="margin-left: 150px;"> <div style="display: inline-block; width: 100px; border-bottom: 1px solid black;"></div> <div style="display: inline-block; width: 100px; border-bottom: 1px solid black;"></div> </div> <div style="margin-left: 150px;"> <div style="display: inline-block; width: 100px; border-bottom: 1px solid black;"></div> </div>		
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3.	Fully finished casted components	a) Method of marking in finished components: i) When embossed marking is not removed during machining: Each component shall be embossed & punched on un-machined surface/ etched on machined surface legibly and indelibly with following details:- Supplier's name initial , Heat no. ← To be embossed/already embossed. (Example: SAIL/341) xxxxx , MM-YY ← To be embossed/punched. <div style="margin-left: 150px;"> <div style="display: inline-block; width: 100px; border-bottom: 1px solid black;"></div> <div style="display: inline-block; width: 100px; border-bottom: 1px solid black;"></div> </div> <div style="margin-left: 150px;"> <div style="display: inline-block; width: 100px; border-bottom: 1px solid black;"></div> </div>		
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ii) When embossed marking is removed during machining: In case the component is machined all over & the embossed marking is removed, the same shall be re-punched on fully finished component. Date of finish machining in MM-YY format & manufacturer's details shall be punched below the above punched marking as per details given below:-

Supplier's name initial , xxxxx , MM-YY

4 digits of date of manufacturing in MM-YY format

Manufacturer's unique job serial no.

(Example: SAIL/341) ← To be punched.

ABCD/00345/0319 ← To be punched.

b) Size & location: For size and location of identification marks, supplier to take prior approval from BHEL unless otherwise specified in the drawing.

B) FORGING / FABRICATED COMPONENTS:

1. Raw material/ semi-finished forgings and fabricated components

a) Method of marking in forgings & fabrications: Each component shall be punched legibly and indelibly with following details:-

Supplier's name initial , xxxxx , MM-YY , xxx

Heat no.

4 digits of date of manufacturing (forging/fabrication) in MM-YY format

Manufacturer's unique job serial no.

(Example: SAIL/00345/0319/341)

b) Size & location: For size and location of identification marks, supplier to take prior approval from BHEL unless otherwise specified in the drawing.

2. Machined forgings/ fabrications on labour basis

a) Method of marking after finish machining:

i) When punched marking is not removed: In case the punched marking is not removed during finish machining of the component, the component shall be punched with following details below the already existing punched marking:-

Supplier's name initial , xxxxx , MM-YY

4 digits of date of manufacturing in MM-YY format

Manufacturer's unique job serial no.

(Example: SAIL/00345/0319/341) ← Already punched.

ABCD/00345/0319 ← To be punched.



TME 2019

PRODUCT STANDARD**TME DIVISION, BHOPAL****TM 12548****Rev. No. 01****PAGE 04 OF 04**

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		<p>ii) When punched marking is removed: In case the component is machined all over & the punched marking is removed, the same shall be re-punched on fully finished component. Date of finish machining in MM-YY format & manufacturer's details shall be punched below the above punched marking as per details given below:-</p> <p>Supplier's name initial , xxxxx , MM-YY</p> <div style="margin-left: 150px;"> <div style="margin-left: 100px;">4 digits of date of manufacturing in MM-YY format</div> <div style="margin-left: 100px;">Manufacturer's unique job serial no.</div> </div> <p>(Example: SAIL/00345/0319/341) ← To be punched.</p> <p style="margin-left: 100px;">ABCD/00345/0319 ← To be punched.</p> <p>b) Size & location: For size and location of identification marks, supplier to take prior approval from BHEL unless otherwise specified in the drawing.</p>
3.	Fully finished forged/fabricated components	<p>a) Method of marking in finished components: Each component shall be punched on un-machined surface/ etched on machined surface legibly and indelibly with following details:-</p> <p>Supplier's name initial / xxxxx / MM-YY / xxx</p> <div style="margin-left: 150px;"> <div style="margin-left: 100px;">Heat no.</div> <div style="margin-left: 100px;">4 digits of date of manufacturing in MM-YY format</div> <div style="margin-left: 100px;">Manufacturer's unique job serial no.</div> </div> <p>(Example: SAIL/00345/0319/341)</p> <p>b) Size & location: For size and location of identification marks, supplier to take prior approval from BHEL unless otherwise specified in the drawing.</p>
C) SHEET METAL COMPONENTS:		
1.	Sheet metal components	<p>a) Method of marking: Each component shall be etched or punched as the case may be legibly with following details:-</p> <p>Supplier's name initial , xxxxx , MM-YY</p> <div style="margin-left: 150px;"> <div style="margin-left: 100px;">4 digits of date of manufacturing in MM-YY format</div> <div style="margin-left: 100px;">Manufacturer's unique job serial no.</div> </div> <p>(Example: SAIL/00345/0319)</p> <p>b) Size & location: For etching/painting and size & location of identification marks, supplier to take prior approval from BHEL unless otherwise specified in the drawing.</p>