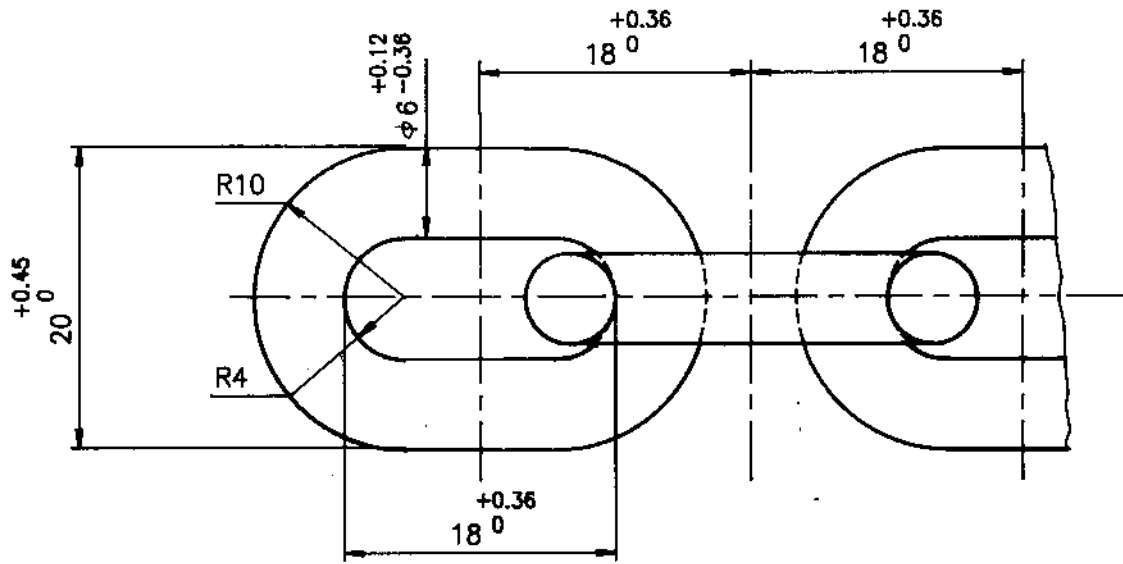



ELECTRICALS LTD. it must not be used directly or indirectly in any way detrimental to the interest of the company.

REV	DATE	ALTERED
		CHECKED



**NOTE:-**

1. MATERIAL , HEATTREATMENT AND MANUFACTURING AS PER IS2429 PART I GR.L(3)
2. MAX. SAFE WORKING LOAD 490Kg
3. MATERIAL TO BE SUPPLIED WITH RUST PREVENTING OIL APPLIED ON THE CHAIN
4. THE WEIGHT GIVEN IN THE COLUMN IS FOR ONE METRE LENGTH

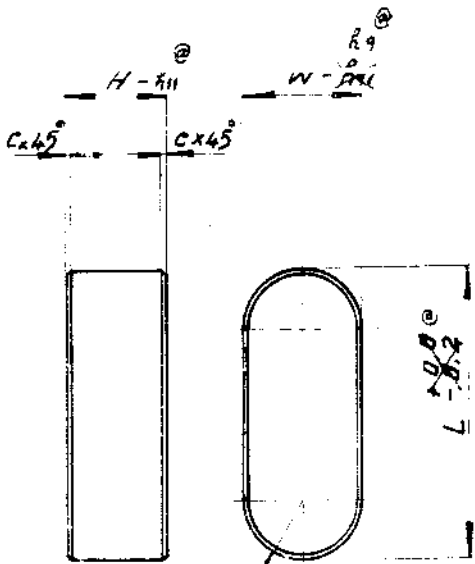
		53 013 014	-	H & T	10	0.79			
NO OFF	DESCRIPTION	MATL CODE	MATL SPECN	HEAT TREATMENT	SCRAP SORT	NET WT (KG)	GROSS WT (KG)	DRAWING NO	ITEM No
 <b>BHARAT HEAVY ELECTRICALS LTD.</b> UNIT: HIGH PRESSURE BOILER PLANT. TIRUCHIRAPALLI 620014.				DRN	NAME		SIGN	DATE	NO. OF VAR.
				CHD	T.R.R.MURTHY		<i>T.R.R.</i>	18/94	
				APPD	N.DHANAPAL		<i>M. Dhanapal</i>	18/94	
					AV.NATHAN		<i>A.V. Nathan</i>	18/94	
DEPT VL	GRADE OF UNTOL. DIM	SCALE	WEIGHT (KG).	REFERENCE INFORMATION				NO. OF ITEM	
CODE 320	q / M / P	NTS	0.79	CAD:C490549					
TITLE				CARD CODE	DRAWING NO.			REV	
WELDED LINK CHAIN				U 01	4-V-A620-90549				

1	DATE	ALTERED	M. J. ...
	13.7.78	CHECKED	John
ZONE SL NO 3 INCLUDED.			
2	DATE	ALTERED	K.M. HARDON
	27.6.78	CHECKED	R. KRISHNAMOOR
SL NOS 4, 5 INCLUDED.			
4	DATE	APPD.	
	13-07-85	ALTRD.	
SL No. 6 INCLUDED			

3.2 ✓

DIAMETER OVER UP TO AND INCLUDING	h 9	h 11
6 - 10	+0.000 -0.036	+0.000 -0.090

TOLERANCE ON L	
UP TO 28 mm	+0.0 -0.2
32 mm TO 80 mm	+0.0 -0.3
90 mm AND ABOVE	+0.0 -0.5



SL No.	NEW DRG. NO.	OLD DRG. NO.	SPECN.	RAW MATERIAL	SIZE	WEI (KG)	L	W	H	C	R	DIMENSION	FINI SHEET WE (MP)	APPLICABLE TYPE NO.
1	4-V-2282-04226	-	ASTM A182-F6 A-479-418	15024252	16 x 30	0.05	25	8	9	0.25	4	0.01	2282	
2	4-V-2286-04226	-	ASTM A182-F6 A-479-418	15024252	16 x 25	0.04	20	8	9	0.25	4	0.01	2285, 2283, 2310	
3	4-V-2661-04226	-	ASTM A182-F6 BMEQ-45	15024252	16 x 25	0.05	25	10	8	0.25	5	0.016	2661, 2662	
4	4-V-1128-04226	-	ASTM A182-F6 BMEQ-45	5024252	18	0.18	100	10	8	0.5	5	0.03	1128	
5	4-V-2673-04226	-	ASTM A182-F6 BMEQ-45	5024252	30	0.36	30	10	9	0.5	5	0.04	2511	
6	4-V-2899-04226	-	ASTM A182-F6	024 254	45	0.136	45	12	8	0.5	6	0.05	2899, 2898	

NOTE: 1. HEAT TREAT TO 200 TO 250 BHN

DATE	03.12.81	ALTRD.	D. DEVASAHAYAM
CHD.	V. BABU	IN SL. NO	3, 4 & 5 MATL. BMEQ-45 CHANGED TO ASTM A182-F6

SL. No.	ITEM No.	MATERIAL SPECN.	TREATMENT	SCRAP SORT	TYPE OF CERTIFICAT
		A-479-418 ASTM A182-F6	HAR 50	60	CERTIFY

FIRST ANGLE	SCALE	DRAWN	TOTAL WT. (KG)
		M. M. HARDON	
		CHECKED	TYPE
		APPROVED	
ALL DIMENSIONS IN MILLIMETRES		DATE	NEW/OLD DRG. No.
		9.5.78	

**CAUTION**

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05-230

**TITLE**  
**PARALLEL KEY**

DRAWING No. 4-1-0000-04226-04

REVISION

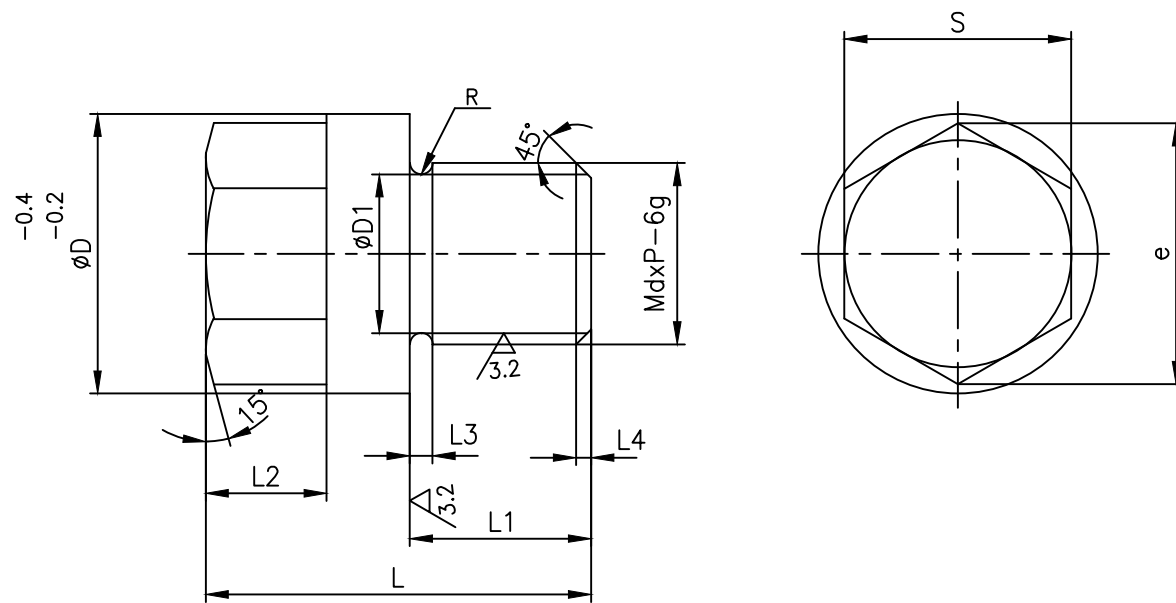
DRAWING NO. 3-V-0000-06413

12.5 / 3.2

SL.No.	DRAWING NUMBER	COMPONENT CODE	RAW MATL DETAILS				WT(KG)		DIMENSIONS											REMARKS
			SIZE	MATL.SPECN	MATL. CODE	SCRAP SORT	GROSS	NET	MdxP-6g	$\frac{-0.4}{-0.2}$ $\phi D$	$\phi D1$	e	S	L	L1	L2	L3	L4	R	
01	3-V-5144-06413/02	93 100 677 0000	$\phi 40 \times 60$	A193-B7,QT CERTIFY	15 039 116	20	0.59	0.27	M24X2	37	21	34.6	30	51	24	16	3	2	1.5	-
02	3-V-5150-06413/02	93 100 678 0000	$\phi 50 \times 70$		15 039 197	20	1.11	0.33	M30X2	43	27	41.6	36	62	30	19	3	2	1.5	-
03	3-V-5152-06413/02	93 100 748 0000	$\phi 36 \times 50$		15 039 088	20	0.40	0.14	M20X1.5	30	16.5	28	24	40	20	13	3	2	1.5	-
04	3-V-5186-06413/02	93 104 802 0000	$\phi 32 \times 46$	A182-F6a Cl.3 HARDENED& TEMPERED CERTIFY	-	40	0.29	0.14	M20X1.5	30	16.5	28	24	40	20	13	3	2	1.5	3"-300C
05	3-V-5188-06413/02	93 104 803 0000	$\phi 40 \times 57$		-	40	0.56	0.27	M24X2	37	21	34.6	30	51	24	16	3	2	1.5	4"&6"-300C
06	3-V-5189-06413/02	93 104 804 0000	$\phi 45 \times 68$		-	40	0.85	0.33	M30X2	43	27	41.6	36	62	30	19	3	2	1.5	8"-300C
07	3-V-1447-06413/02	93 106 479 0000	$\phi 50 \times 55$	A193-B7,QT CERTIFY	15 039 197	20	0.88	0.30	M30X1.5	43	27	41.6	36	46	14	19	3	2	1.5	-
08	3-V-5199-06413/02	93 106 844 0000	$\phi 32 \times 46$	A182-F316, SH CERTIFY	-	46	0.29	0.14	M20X1.5	30	16.5	28	24	40	20	13	3	2	1.5	-
09	3-V-5196-06413/02	93 106 845 0000	$\phi 40 \times 57$		-	46	0.56	0.27	M24X2	37	21	34.6	30	51	24	16	3	2	1.5	-
10	3-V-Z001-06413/02	93 106 846 0000	$\phi 50 \times 70$		-	46	1.08	0.3	M30X2	43	27	41.6	36	62	30	19	3	2	1.5	-
11	3-V-Z113-06413	93 204 759 0000	$\phi 56 \times 67$	SA182 F60, SH CERTIFY	-	46	1.3	0.27	M24X2	37	21	34.6	30	51	24	16	3	2	1.5	4"-150C

NOTES

- UNSPECIFIED SHRAP CORNERS TO BE CHAMFERED TO 0.5X45°.
- HARDNESS - 26 TO 32 HRC FOR B7 MATL.



REV	DATE	ALTERED	R.P.SINGH
09	19.06.19	CHD & APPD	SSK & KRS
SL. No. 11 INCLUDED			

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SL No.	DESCRIPTION	MATL CODE	MATL SPECN	HEAT TREATMENT	SCRAP SORT	NET WT (kg)	GROSS WT (kg)	DRAWING No	ITEM No
	TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT		CS						
	<b>BHARAT HEAVY ELECTRICALS LTD.,</b> UNIT: HIGH PRESSURE BOILER PLANT. TIRUCHIRAPALLI-620014.								
		DRN	R.P.SINGH	SIGN		DATE	06.10.18	NO.OF VAR.	
		CHD	S.SATHEES			06.10.18			
	APPD	K.RAJASEKARAN			06.10.18				
	DEPT	VL		SCALE		WEIGHT (KG).	REFERENCE INFORMATION		NO. OF ITEMS
	CODE	320							
	TITLE	PLUG		CARD CODE	U 01	DRAWING NO.	3-V-0000-06413	REV	09

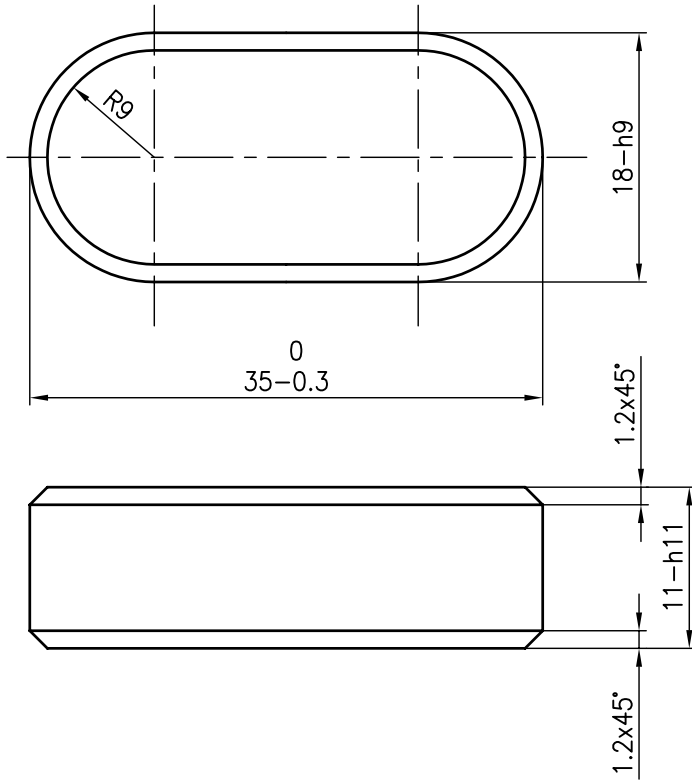
FOR TOLERANCES OF UNTOLERANCED DIMENSIONS

ALL DIMENSIONS ARE IN MILLIMETRES.  
DURING MANUFACTURE REFER RELEVANT QCP/QP

REV	DATE	ALTERED
		CHD & APPD

3.2/

18-h9	0 -0.043
11-H11	0 -0.110



**NOTE:**

HARDNESS REQUIRED IS 220 TO 270 BHN.

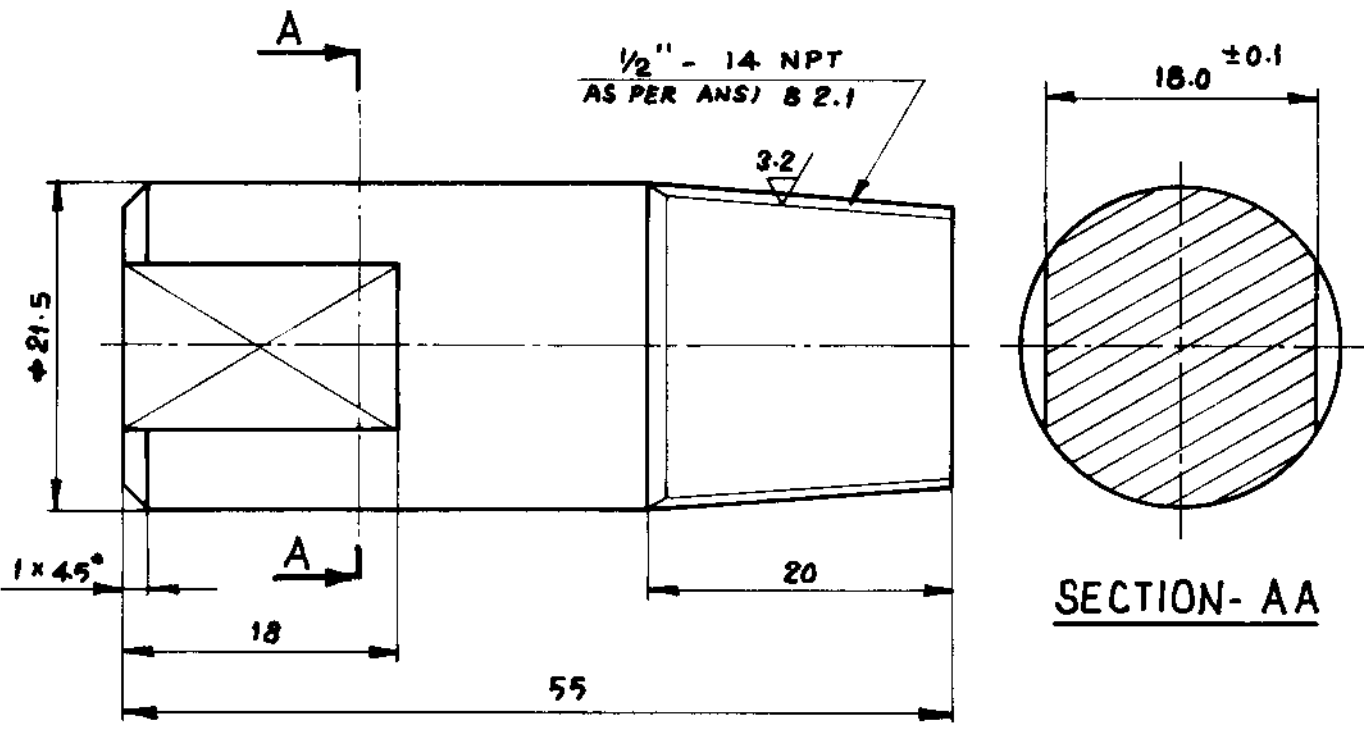
COMP.CODE: 931108190000

	ø30x40		IS1875 CL.4 CERTIFY	NR	10	0.20	0.67		
NO OFF	DESCRIPTION	MATL CODE	MATL SPECN	HEAT TREATMENT	SCRAP SORT	NET WT (kg)	GROSS WT (kg)	DRAWING No	ITEM No
				DRN NAME V.BAIRAVAN CHD R.L.NARAYANAN APPD M.RAJAKUMAR		SIGN		DATE 12.4.03 12.4.03 12.4.03	NO.OF VAR
DEPT VL			SCALE	WEIGHT (KG).	REFERENCE INFORMATIONS				NO. OF ITEMS
CODE			NTS		C426442				
TITLE PARALLEL KEY					CARD CODE U 01	DRAWING NO. 4-V-NC08-26442			REV 0

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6.3 / 3.2



SECTION- AA

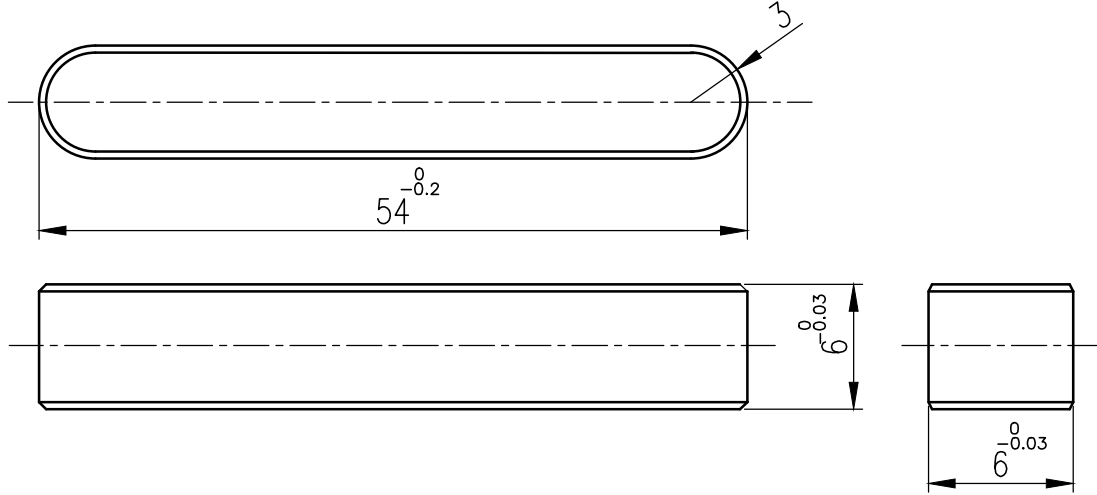


01	BAR $\phi$ 22 X 60	15339 343	SA 105	NORMALISED	10	0.15	0.18	33116 502-0000 4-V-M305-06587	
NO. OF PIECES	DESCRIPTION	MATL. CODE	FINAL MATERIAL	HEAT TREATMENT	SCRAP SORT	NET Wt (kg)	GROSS Wt (kg)	COMPONENT CODE DRAWING No.	
REMARKS				TOTAL NET Wt (kg)					
NTS	SCALE	DRAWN	<i>M. Ganesan</i>	ALTERATIONS		DATE	SIGNATURE	ALTERATION INDEX	
		CHECKED							
		APPROVED	N. NAGARAJAN. <i>N.N.</i>						
		STDS. OFFICER		TRANS. COPY NO.					
		DATE	14-11-90						
 33-116		TYPE <b>PLUG</b>		GROUP		OLD DRG. DRAWING NO.		NEW DRG. <b>4-V-M305-06587</b>	

ALL DIMENSIONS ARE IN MILLIMETRES.

FOR TOLERANCES OF UNTOLERANCED DIMENSIONS DURING MANUFACTURE REFER RELEVANT QCP/QP


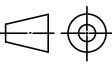
REV	DATE	ALTERED
		CHD & APPD



NOTES:

1. KEY IS PARALLEL & TYPE 'A' OF IS:2048.
2. KEY SHOULD COMPLY TO STANDARD IS:2048.
3. FOR SAMPLING METHOD IS:6821 TO BE FOLLOWED.
4. FOR QUALITY REQUIREMENTS REFER APPLICABLE LATEST QUALITY PROCEDURE.

PART CODE: 963536461000

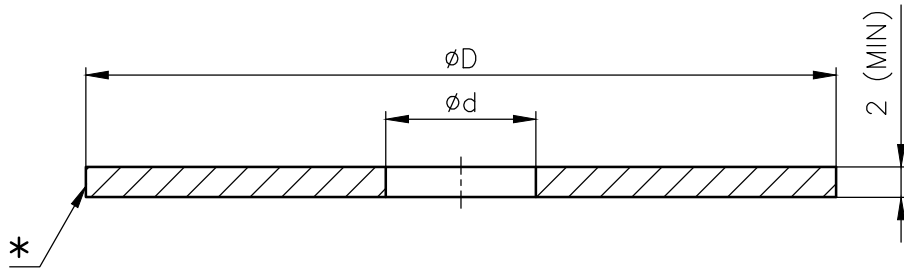
01	PARALLEL KEY (TYPE 'A') (6X6X54)	-	-	-	-	0.015	-	-	-	
NO OFF	DESCRIPTION	MATL CODE	MATL SPECN	HEAT TREATMENT	SCRAP SORT	NET WT (kg)	GROSS WT (kg)	DRAWING No	ITEM No	
 <b>BHARAT HEAVY ELECTRICALS LTD.,</b> UNIT: HIGH PRESSURE BOILER PLANT. TIRUCHIRAPALLI 620014.					DRN	NAME J.SANKAR		SIGN J.S	DATE 01.10.20	NO.OF VAR
					CHD	J.SANKAR		J.S	01.10.20	
					APPD	R.RAKESH		R.R	01.10.20	
DEPT SB CODE 330		SCALE NTS	WEIGHT (KG). 0.015	REFERENCE INFORMATION				NO. OF ITEMS		
TITLE PLAIN KEY (TYPE A)				CARD CODE U 01	DRAWING NO. 4-20-201-03669				REV 00	

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REV	DATE	ALTERED	R.ANITHA
01	06.01.17	CHD & APPD	SSK & KRS

FOR TYPE NO N248 & F503 DIMENSIONS  
ø71 WAS ø74



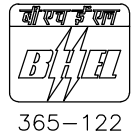
**NOTES: -**

- \* 1. APPLY RED ENAMEL PAINT ON OUTSIDE DIAMETER.
- 2. MATERIAL - STAINLESS STEEL
- 3. SURFACE FINISH: 12.5 MICRONS OR BETTER.

08	4-V-F503-27192/01	96 465 696 0000	71	13	0.07			
07	4-V-N790-27192	96 465 695 0000	51	17	0.03			
06	4-V-N628-27192	96 465 694 0000	52	21	0.03			
05	4-V-N645-27192	96 465 693 0000	87	21	0.09			
04	4-V-N248-27192/01	96 465 692 0000	71	17	0.06			
03	4-V-N244-27192	96 465 691 0000	87	17	0.09			
02	4-V-S837-27192	96 465 690 0000	87	9	0.09			
01	4-V-S833-27192	96 465 689 0000	51	9	0.03			

SL No.	DRAWING No.	COMP.CODE	øD	ød	NET WT(KG)			
			DIMENSIONS					

NO OFF	DESCRIPTION	MATL CODE	MATL SPECN	HEAT TREATMENT	SCRAP SORT	NET WT (kg)	GROSS WT (kg)	DRAWING No	ITEM No
--------	-------------	-----------	------------	----------------	------------	-------------	---------------	------------	---------



**BHARAT HEAVY ELECTRICALS LTD.,**  
UNIT: HIGH PRESSURE BOILER PLANT.  
TIRUCHIRAPALLI 620014.

DRN	NAME	SIGN	DATE	NO.OF VAR
CHD	M.SELVAM		28.08.15	
APPD	M.SRINIVASAN		28.08.15	

DEPT VL	/		SCALE	WEIGHT (KG).	REFERENCE INFORMATIONS	NO. OF ITEMS
CODE			NTS	REF. TABLE		

TITLE	CARD CODE	DRAWING NO.	REV
INDICATOR RING	U 01	4-V-0000-27192	01



# PLANT STANDARD

HPBP TIRUCHIRAPALLI

BPS: 41229

PAGE 1 OF 4

Based on IS: 4190-1967

## EYE BOLTS WITH COLLAR

(Product grade C)

### 1.0 SCOPE

Covers the requirements of eye bolts with collar in the size range M10 to M48x3.

### 2.0 SPECIFICATION AND REFERENCE STANDARDS

Dimensions	Table 1 of this standard	
Safe working load	Table 2 of this standard	
Tolerance	Product grade	C
	Indian Standard	IS: 1367 (Part 2)
Thread	Pitch	Table 1 of this standard
	Tolerance	6g
	Indian Standard	IS: 4218 (Part 3, 5 & 6)
Material	Steel to class 2 of IS: 1875	
Manufacture, marking, mechanical properties and tests	As specified in IS: 4190	
Sampling and Acceptability	Indian Standard	IS: 2614
General requirements	Eye bolts shall comply with IS: 4190 in respect of requirements not covered in this standard	

### 2.1 Referred Standards (Only the relevant parts of current versions are applicable)

IS: 1367 Technical supply conditions for threaded steel fasteners

IS: 1875 Specification for carbon steel billets, blooms and slabs for forgings

IS: 2614 Methods for sampling of fasteners

REVISIONS

DATE

APPROVED

STANDARDS SECTION  
ENGINEERING AND DEVELOPMENT CENTRE  
HPBP TIRUCHIRAPALLI

PREPARED

H P B P TIRUCHY

ISSUED

STANDARDS  
ENGG

DATE

DEC 1986

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# PLANT STANDARD

HPBP TIRUCHIRAPALLI

BPS: 41229

PAGE 2 OF 4

IS: 4190 Specification for eye bolts with collars  
IS: 4218 ISO metric screw threads

## 3.0 DESIGNATION

A Grade C eye bolt with collar to this standard of thread size M12 shall be designated as:

### 3.1 On drawings:

- i) Material specification column: IS: 4190
- ii) Description column : BOLT EYE COL GR C - M12
- iii) Drawing Number column : 4122912000
- iv) Material code column : 4122900012

3.2 For placing indents, issuing enquiries and on purchase order, the Ordering Description given below shall be followed.

Eye bolt M12 IS: 4190-C

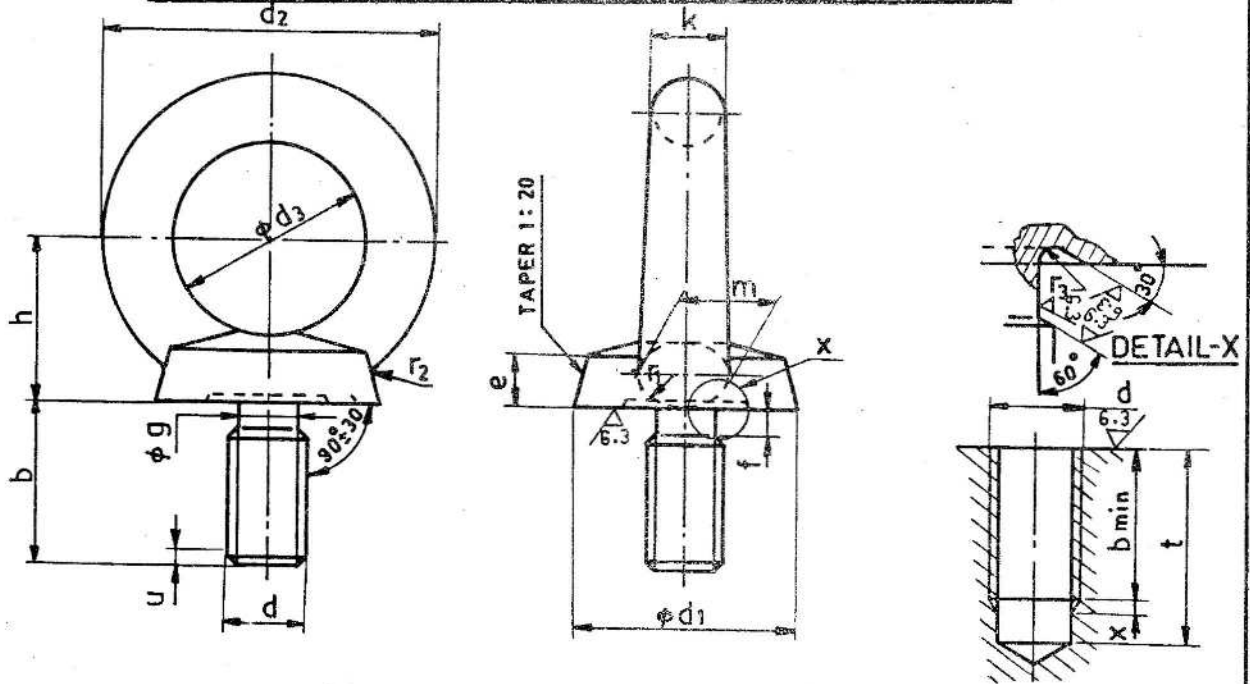
## 4.0 ADDITIONAL INFORMATION

4.1 Test certificates according to IS: 4190 shall be obtained along with each supply.

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**TABLE 1 DIMENSIONS FOR EYE BOLTS WITH COLLAR**


(All dimensions are in mm)

Thread size	d	M10	M12	M16	M20	M24	M30	M36x3	M48x3
b (js15)	Max	18.35	22.42	28.92	30.42	38.50	45.50	55.60	70.60
	Min	17.65	21.58	27.58	29.58	37.50	44.50	54.40	69.40
d1 (js16)	Max	25.65	30.65	35.80	40.80	50.80	65.95	75.95	101.10
	Min	24.35	29.35	34.20	39.20	49.20	64.05	74.05	98.90
d2 (js16)	Max	45.80	54.95	63.95	72.95	91.10	109.10	127.25	167.75
	Min	44.20	53.05	62.05	71.05	88.90	106.90	124.75	164.75
d3 (js16)	Max	25.65	30.65	35.80	40.80	50.80	60.75	70.95	91.10
	Min	24.35	29.35	34.20	39.20	49.20	59.05	69.05	88.90
e	Nom	8	10	12	14	18	22	26	35
f	Nom	3	3	3	4	5	6	8	8
g (h16)	Max	7.70	9.30	13.00	16.00	19.00	24.00	30.00	40.00
	Min	6.80	8.40	11.90	14.90	17.70	22.70	28.70	38.40
h (js16)	Max	22.65	26.65	30.65	35.80	45.80	55.95	65.95	86.10
	Min	21.35	25.35	29.35	34.20	44.20	54.05	64.05	83.90
k* (js16)	Max	10.45	12.55	14.55	16.55	20.65	24.65	28.65	33.30
	Min	9.55	11.45	13.45	15.45	19.35	23.35	27.35	37.20
m (js16)	Max	12.55	14.55	16.55	19.65	24.65	28.65	32.80	46.80
	Min	11.45	13.45	15.45	18.35	23.35	27.35	31.20	45.20
r1	Nom	5	5	6	7	9	11	13	18
r2	Nom	4	6	6	8	12	15	18	22
r3	Nom	1	2	2	2	2	3	3	4
t	Min	24	29	35	38	47	55	66	83
Weight		150	200	300	500		1700		

**Note:**

- x according to IS:1368-'Dimensions of screw thread run-outs and under cuts.
- u according to CE of IS:1369-'Dimensions of ends of bolts and screws.
- Weights are given in Kg per 1000 numbers only.
- For stocked sizes refer RPS components book-let.

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# PLANT STANDARD

HPBP TIRUCHIRAPALLI

BPS: 41229

PAGE 4 OF 4

**TABLE 2 SAFE WORKING LOAD FOR EYE-BOLTS WITH COLLAR**

(Maximum safe working load 'W' on the sling hook in Kgs)

Thread size d	Direction of sling legs on eye bolts with collar	
	Single	Double
M10	150	—
M12 ✓	220	—
M16	380	—
M20	570	—
M24	1050	1000
M30	1700	1800
M36x3 ✓	2500	2600
M48x3	5200	5200

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DEC 1986



# PLANT STANDARD

HPBP TIRUCHIRAPALLI

BPS:41501

PAGE : 1 OF 5

Based on IS: 2048

## PARALLEL KEYS - TYPE-A

### 1.0 SCOPE:

Covers the requirements for keys with bolt ends round (type A)

### 2.0 SPECIFICATION AND REFERENCES STANDARDS

Dimensions and tolerances	Table 1 of this standard	
Preferred length and Size combination	Table 2 of this standard	
Material	Steel of tensile strength not less than 600 MPa	
Finish	Natural finish	
Sampling and Acceptability	Indian standard	IS: 6821
General requirements	Keys shall comply with IS :2048 in respect of requirement not covered in this standards	

### 2.1 Referred standards (only the current version are applicable)

IS: 2048 Specification for parallel keys and keyways

IS: 6821 Methods for sampling non-threaded fasteners

Revisions			Approved Standing Committee		
Rev. No.	Amd. No.	Reaffirmed	Prepared	Issued	Dt of 1st Issue
Dt.	Dt.	Year	Standards	Standards	06.11.2013

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# PLANT STANDARD

HPBP TIRUCHIRAPALLI

BPS:41501

PAGE : 2 OF 5

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## 3.0 DESIGNATION:

A parallel key to this standard of width 12mm, height 8mm and length 56mm shall be designated as:

## 3.1 On Drawings:

- 1) material specification column : IS: 2048-A
- 2) Description column : KEY PRL RND END 12X8X56
- 3) Drawing number column : 4150108056
- 4) Material code column : 4150112056

## 3.2 Ordering Description:

For placing indents, issuing enquiries and on purchase order, the ordering Description given below shall be followed:

parallel key A 12x8x56

## 4.0 ADDITIONAL INFORMATION:

- 4.1 for keyways to these keys refer IS: 2048 or AA 023 15 08.

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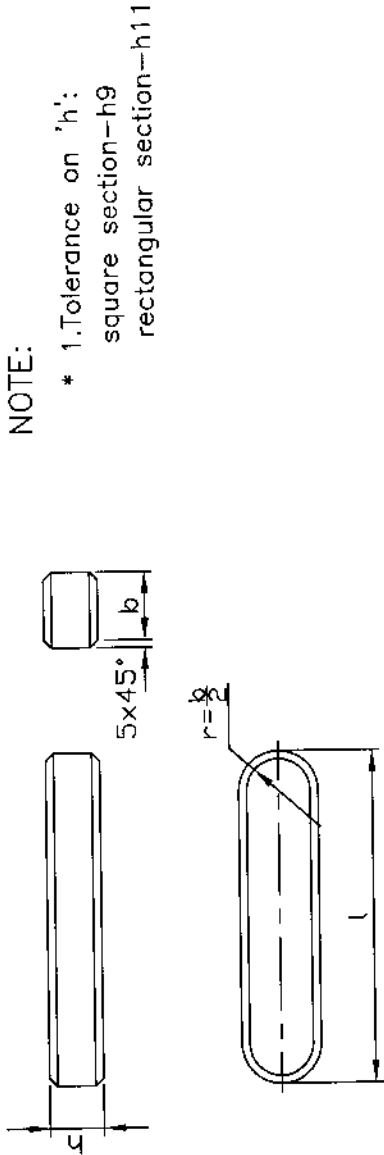
## HPBP TIRUCHIRAPALLI

BPS:41501

PAGE : 3 OF 5

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**TABLE 1 – DIMENSIONS FOR PARALLEL KEYS**



ALL DIMENSIONS ARE IN MILLIMETRES

WIDTH	b										H9																			
	2	3	4	5	6	7	8	8	9	10	11	12	14	14	16	18	20	22	25	28	32	36	40	45	50	56	63	70	80	90
TOL ON b	-0.025										-0.036																			
TOL ON h	-0.030										-0.043																			
TOL ON h* see note-1	-0.025										-0.090																			
s	Min	0.160										0.110																		
	Max	0.25										0.130																		
RANGE OF KEY LENGTH 'l'	Min	0.25										0.080																		
	Max	0.40										0.160																		

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**PLANT STANDARD**

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BPS:41501

PAGE : 4 OF 5

**TABLE 2 - PREFERRED LENGTH-SIZE COMBINATION FOR PARALLEL KEYS**

(ALL DIMENSIONS ARE IN MILLIMETERS)

Preferred length (l)	2x2	3x3	4x4	5x5	6x6	8x7	10x8	12x8	14x9	16x10	18x11	20x12	22x14	25x14
10														
12			1.402											
14														
16														
18														
20				3.709	5.286		13.1							
22														
25				4.719		10.245			21.6					
28			3.412											
32					8.676			22.16						
36										41.0				
40					7.639	10.936			36.63		56.7	66.0		
45						19.045								
50										58.49				
56					15.436									
63									59.33					
70														
80									76.13					205.3
90														
100														
110														
125														
140														

**WEIGHTS**

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BPS:41501

PAGE : 5 OF 5

**TABLE 2-- PREFERRED LENGTH-SIZE COMBINATION FOR PARALLEL KEYS (CONT.)**

(ALL DIMENSIONS ARE IN MILLIMETERS)

Preferred length (l)	22X14	25X14	28X16	32X18	36X20	40X22	45X25	50X28	56X32	63X32	70X36	80X40	90X45	100X50
63														
70														
80		205.3												
90														
100														
110														
125														
140														
160														
180														
200														
220														
250														
280														
320														
360														
400														

WEIGHTS

**NOTE:**

1. weights are given in kg per 1000 numbers only.
2. for stocked sizes refer BPS components book-let.
3. Preferred length are in between the stepped bold lines.

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# PLANT STANDARD

HPBP TIRUCHIRAPALLI

BPS: 41704

PAGE 1 OF 4

Based on IS: 549-1974

## SPLIT PINS

### 1.0 SCOPE

Covers the requirements for Split Pins in the diameter range 0.6 to 20mm.

### 2.0 SPECIFICATION AND REFERENCE STANDARDS

Dimensions and tolerances	Table 1 of this standard	
Preferred length and size combination	Table 2 of this standard	
Material	Mild Steel Wire (Half round)	
Finish	Bright self colour finish	
Sampling and Acceptability	Indian Standard	IS: 6821
General requirements	Pins shall comply with IS: 549 in respect of requirements not covered in this standard	

### 2.1 Referred Standards (Only the current versions are applicable)

IS: 549 Specification for Split Pins.

IS: 6821 Methods for sampling non-threaded fasteners

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# PLANT STANDARD

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BPS: 41704

PAGE 2 OF 4

## 3.0 DESIGNATION

A Split Pin to this standard of nominal diameter 5mm and nominal length 56mm shall be designated as:

## 3.1 On Drawings:

- i) Material Specification column: IS: 549
- ii) Description column : PIN SPLIT 5x56
- iii) Drawing Number column : 4170405056
- iv) Material Code column : 4170450056

## 3.2 Ordering Description

For placing indents, issuing enquiries and on purchase order, the Ordering Description given below shall be followed.

Split Pin 5x56 IS: 549

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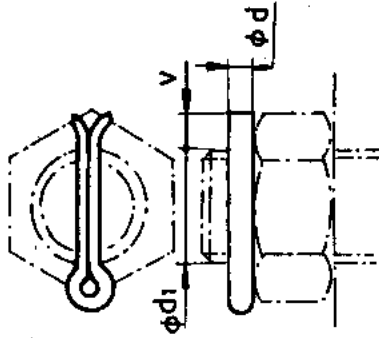
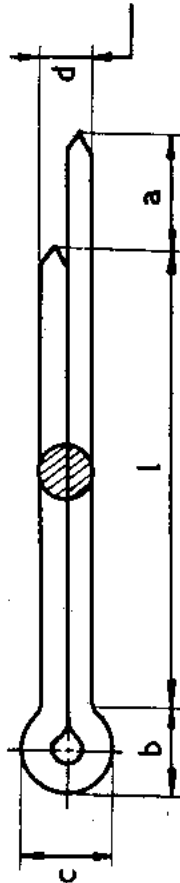
# PLANT STANDARD

HPBP TIRUCHIRAPALLI

BPB: 41704

PAGE 3 OF 4

**TABLE 1 - DIMENSIONS FOR SPLIT PINS**  
(All dimensions in millimetres)



Dimensions	0.6	0.8	1.0	1.2	1.6	2.0	2.5	3.2	4.0	5.0	6.3	8.0	10	13	16	20
Nominal size	0.6	0.8	1.0	1.2	1.6	2.0	2.5	3.2	4.0	5.0	6.3	8.0	10	13	16	20
d	Max	0.5	0.7	0.9	1.0	1.4	2.3	2.9	3.7	4.6	5.9	7.5	9.5	12.4	15.4	19.3
	Min	0.4	0.6	0.8	0.9	1.3	1.7	2.1	3.5	4.4	5.7	7.3	9.3	12.1	15.1	19.0
a	Max	1.6	1.6	1.6	2.5	2.5	2.5	3.2	4.0	4.0	4.0	4.0	6.3	6.3	6.3	6.3
	≈	2.0	2.4	3.0	3.0	3.2	4.0	5.0	6.4	8.0	10	12.6	16	26	32	40
c	Max	1.0	1.4	1.8	2.0	2.8	3.6	4.6	5.8	7.4	11.8	15	19	24.8	30.8	38.6
	Min	0.9	1.2	1.6	1.7	2.4	3.2	4.0	5.1	6.5	10.3	13.1	16.6	21.7	27.0	33.8
Corres-ponding dia-meter d1	Over	--	2.5	3.5	4.5	5.5	7.0	9.0	11	14	20	27	39	56	80	120
	Up to	2.5	3.5	4.5	5.5	7.0	9.0	11	14	20	27	39	56	80	120	170
v	Over	--	2	3	4	5	6	8	9	12	17	23	29	44	69	110
	Up to	2	3	4	5	6	8	9	12	17	23	29	44	69	110	160
		3	3	4	5	6	6	8	8	10	12	14	16	20	25	32



# PLANT STANDARD

HPBP TIRUCHIRAPALLI

BPS: 41704

PAGE 4 OF 4

**TABLE 2 - PREFERRED LENGTH-SIZE COMBINATION  
FOR SPLIT PINS**  
(All dimensions in millimetres)

l Nom ±½ IT 17	Nominal size															
	0.6	0.8	1.0	1.2	1.6	2.0	2.5	3.2	4.0	5.0	6.3	8.0	10	13	16	20
4																
5																
6																
8																
10																
12																
14																
16						0.4										
18																
20																
22																
25									2.7							
28																
32										5.5						
36									3.6							
40										6.5						
45									4.6		11.4					
50																
56									5.6	8.4	13.4					
63										9.2						
71											17.2					
80																
90																
100																
112																
125																
140																
160																
180																
200																
224																
250																
280																

**NOTE:**

- 1 Weights are given in kg per 1000 numbers only
- 2 For stocked sizes refer BPS components booklet
- 3 Preferred lengths are in between the stepped bold lines

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# PLANT STANDARD

HPBP TIRUCHIRAPALLI

BPS: 41709

PAGE 1 OF 4

Based on IS: 7368-1974

## GROOVED TAPER PINS

### 1.0 SCOPE

Covers the requirements for grooved taper pins in the diameter range 1.5 to 25mm.

### 2.0 SPECIFICATION AND REFERENCE STANDARDS

Dimensions and tolerances	Table 1 of this standard	
Preferred length and size combination	Table 2 of this standard	
Material	Cold drawn steel bar of grade 40 C 8	IS: 1570 (Part II)
Finish	Natural finish	
Sampling and Acceptability	Indian Standard	IS: 6821
General requirements	Pins shall comply with IS: 7368 in respect of requirements not covered in this standard	

### 2.1 Referred Standards (Only the current versions are applicable)

- IS: 1570 Schedules for wrought steels (Part II) Part II Carbon steels (unalloyed steels)
- IS: 6821 Methods for sampling non-threaded fasteners
- IS: 7368 Specifications for grooved taper pins

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# PLANT STANDARD

HPBP TIRUCHIRAPALLI

BPS: 41709

PAGE 2 OF 4

## 3.0 DESIGNATION

A Grooved Taper Pin to this standard of nominal diameter 3mm and nominal length 24mm shall be designated as:

## 3.1 On Drawings:

- i) Material Specification column: IS: 7368
- ii) Description column : PIN GROOVED TAPER 3x24
- iii) Drawing Number column : 4170903024
- iv) Material Code column : 4170903024

## 3.2 Ordering Description

For placing indents, issuing enquiries and on purchase order, the Ordering Description given below shall be followed.

Grooved Taper Pin 3x24 IS: 7368

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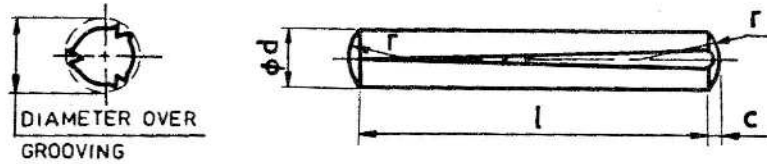
# PLANT STANDARD

HPBP TIRUCHIRAPALLI

BPS: 41709

PAGE 3 OF 4

**TABLE 1 - DIMENSIONS FOR GROOVED TAPER PINS**



NOMINAL DIAMETER	d	1.5	2	2.5	3	4	5	6	8	10	12	(13)	14	16	20	25	
Tol		h <sub>9</sub>					h <sub>11</sub>										
C max		0.23	0.3	0.4	0.45	0.6	0.75	0.9	1.2	1.5	1.8	2	2	2.5	3	4	
r APPROX		1.6	2	2.5	3	4	5	6	8	10	12	12	16	16	20	25	
LENGTH	Tol on l	DIAMETER OVER GROOVING															
4	+0.3	1.63	2.20	3.25	4.30	5.30	6.30	8.35	10.40	12.40	13.45	14.45	16.55	20.60	25.60		
5																	
6																	
8	+0.5	1.60	2.15	2.65	3.20	4.25	5.25	6.25	8.30	10.35	12.30	13.40	14.40	16.50			
10																	
12																	
(14)																	
16																	
(18)																	
20	+0.8																
(22)																	
24																	
(26)																	
28																	
(30)																	
32																	
36																	
40																	
(45)																	
50																	
(55)																	
60																	
(65)																	
70																	
80																	
90																	
100																	
(110)																	
120																	
TOLERANCE ON DIAMETER OVER GROOVING		+0.05	± 0.05									± 0.10					

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# PLANT STANDARD

HPBP TIRUCHIRAPALLI

BPS: 41709

PAGE 4 OF 4

**TABLE 1 - PREFERRED LENGTH-SIZE COMBINATION  
FOR GROOVED TAPER PINS**

(All dimensions are in millimetres)

Nom length 'l'	Diameter d														
	1.5	2.0	2.5	3.0	4.0	5.0	6.0	8.0	10	12	(13)	14	16	20	25
4															
5															
6															
8															
10	0.1														
12															
(14)															
16															
(18)															
20							4.4								
(22)															
24				1.3											
(26)															
28															
(30)															
32						4.9									
36															
40															
(45)															
50															
(55)															
60															
(65)															
70															
80															
90															
100															
(110)															
120															

**WEIGHTS**

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**NOTE:**

1. Sizes in brackets are non preferred
2. Weights are given in kg per 1000 numbers only
3. Preferred lengths are in between the stepped bold lines
4. For stocked sizes refer to BPS components booklet.



# PLANT STANDARD

HPBP TIRUCHIRAPALLI

BPS: 41711

PAGE 1 OF 4

Based on IS: 5988-1970

## SPRING DOWEL SLEEVES (Light Pattern)

### 1.0 SCOPE

Covers the requirements for Light Pattern Spring Dowel Sleeves in the diameter range 2 to 50mm.

### 2.0 SPECIFICATION AND REFERENCE STANDARDS

Dimensions and tolerances	Table 1 of this standard	
Preferred lengths size combination	Table 2 of this standard	
Tolerance on lengths	Acc. to Table 4 of IS:5988	
Material	Spring steel 55Si2Mn90	IS: 1570
Mechanical properties	Hardness 445-515 HV Tensile strength 150-190 kgf/mm <sup>2</sup>	
General requirements	Spring dowel sleeves shall comply with IS: 5988 in respect of requirements not covered in this standard	

### 2.1 Referred Standards (Only the current versions are

IS: 1570 Schedules for wrought steels

IS: 5988 Specification for spring dowel sleeves

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# PLANT STANDARD

HPBP TIRUCHIRAPALLI

BPS: 41711

PAGE 2 OF 4

## 3.0 DESIGNATION

A Spring Dowel Sleeve to this standard of nominal diameter 3mm and nominal length 20mm shall be designated as:

### 3.1 On Drawings:

- i) Material Specification column: IS: 5988
- ii) Description column : PIN SPRING LIGHT 3x20
- iii) Drawing Number column : 4171103020
- iv) Material code column : 4171103020

### 3.2 Ordering Description

For placing indents, issuing enquiries and on purchase order, the Ordering Description given below shall be followed.

Spring Dowel Sleeve Light 3x20 - IS: 5988

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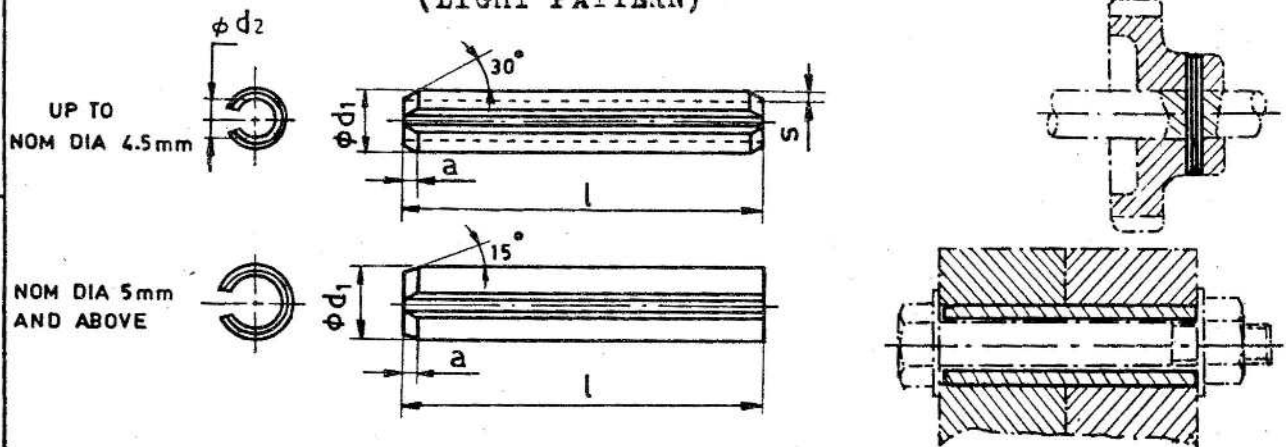
# PLANT STANDARD

HPBP TIRUCHIRAPALLI

BPS: 41711

PAGE 3 OF 4

**TABLE 1 - DIMENSIONS FOR SPRING DOWEL SLEEVES  
(LIGHT PATTERN)**



(All dimensions in millimetres)

Nom dia	s	a	Before fitting			For bolt size	Corresponding washer size (IS:2016)
			d <sub>1</sub>	Tol on d <sub>1</sub>	d <sub>2</sub>		
2	0.2	0.35	2.3	+0.1	1.9	--	--
2.5	0.25	0.45	2.8		2.3	--	--
3	0.3	0.5	3.3	+0.2	2.7	--	--
3.5	0.35	0.6	3.8		3.1	--	--
4	0.5	0.7	4.4		3.4	--	--
4.5	0.5	0.8	4.8		3.8	M3	3.2
5	0.5	1.6	5.4	+0.3	4.4	--	--
6	0.75	1.6	6.4		4.9	M4	4.3
7	0.75	1.6	7.5		6.0	M5	5.3
8	0.75	2	8.5		7.0	M6	6.4
10	1	2	10.5		8.5	--	--
11	1	2	11.5		9.5	M8	8.4
12	1	2	12.5		10.5	--	--
13	1.25	2	13.5		11.0	M10	10.5
14	1.5	2	14.5	11.5	--	--	
16	1.5	2	16.5	13.5	M12	13	
18	1.75	2	18.5	+0.4	15.0	M14	15
20	2	2	20.5		16.5	--	--
21	2	2	21.5		17.5	M16	17
23	2	3	23.5		19.5	M18	19
25	2	3	25.5		21.5	M20	21
28	2.5	3	28.5		23.5	M22	23
30	2.5	3	30.5		25.5	M24	25
35	3.5	3	35.5		28.5	M27	28
40	4	4	40.5		32.5	M30	31
45	4	4	45.5		37.5	M36	37
50	5	4	50.5	40.5	M39	40	

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# PLANT STANDARD

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BPS: 41711

PAGE 4 OF 4

TABLE 2 - PREFERRED LENGTH-SIZE COMBINATION FOR  
SPRING DOWEL SLEEVES

(All dimensions are in millimetres)

NOM LEN- GTH 'l'	Nominal diameter																						
	2	2.5	3	3.5	4	4.5	5	6	7	8	10	11	12	13	14	16	18	20	25	28	40	50	
4																							
5																							
6																							
8																							
10																							
12		0.1																					
14																							
16																							
18																							
20			0.2																				
22																							
24																							
26																							
28																							
30																							
32		0.2																					
36																							
40																							
45																							
50																							
55																							
60																							
65																							
70																							
75																							
80																							
85																							
90																							
95																							
100																							
120																							
140																							
160																							
180																							
200																							

**WEIGHTS**

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**NOTE:**

1. Preferred lengths are in between the stepped bold lines
2. Weights are given in kg per 1000 numbers only
3. For stocked sizes refer BPS components booklet.





# PLANT STANDARD

HPBP TIRUCHIRAPPALLI

BPS 41201

Rev. No. 00

PAGE 01 of 03

## SLOTTED CHEESE HEAD SCREWS

(AS PER IS: 1366 - 1982)

**1.0 SCOPE:** Covers the requirement of Slotted Cheese Head Screws in the size range M1.6 to M10

### 2.0 SPECIFICATION AND REFERENCE STANDARDS

MATERIAL	STEEL
DIMENSION AND PREFERRED SIZES	FIG 1 & TABLE 1 OF THIS STANDARD
PREFERRED LENGTH, SIZE COMBINATION	TABLE 2 OF THIS STANDARD
THREAD	PITCH - COARSE, TOLERANCE - 6g, STANDARD IS: 4218 PART - 3,5&6
MECHANICAL PROPERTIES	CLASS 4.8, AS PER IS:1367 PART-3
TOLERANCE	PRODUCT GRADE- A, AS PER IS:1367 PART-2
SAMPLING AND ACCEPTIBILITY	IS:2614
GENERAL REQUIREMENTS	SCREWS SHALL COMPLY WITH IS: 1366 IN RESPECT OF REQUIREMENTS NOT COVERED IN THIS STANDARD.

### 2.1 Referred standards (Only current versions are applicable)

IS: 1366	Specification for Slotted Cheese Head Screws.
IS: 1367	Technical supply conditions for threaded steel fasteners.
IS: 2614	Methods for sampling of fasteners.
IS: 4218	ISO Metric screw threads.

### 3.0 Designation

A Grade A Slotted cheese head screw to this standard of thread size M6 and nominal length 30 mm shall be designated as:

#### 3.1 On Drawings

i) Material Specification column	IS: 1366
ii) Description column	SCRU SLT CHS GR. A 4.8 M6x30
iii) Drawing number column	BPS 41201
iv) Material Code Column	412010603000

#### 3.2 Order Description

For placing indents, issuing enquiries and on purchase order, ordering description given below shall be followed.

**Cheese Head Screw M6x30 IS: 1366 – 4.8**

Revisions

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STANDARDS SECTION  
ITSS, HPBP, TIRUCHIRAPPALLI

Rev. No.00

Amd. No.

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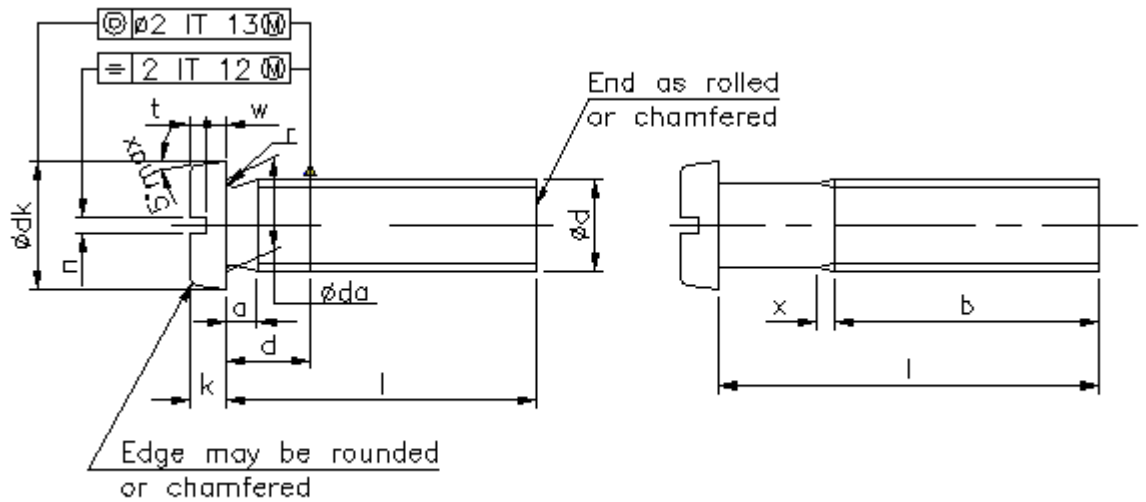
### 4.0 ADDITIONAL INFORMATION

4.1 Property class 6.6 is also acceptable.

4.2 For Cadmium plated slotted cheese head screws, refer BPS: 41241.

**FIG. 1 DIMENSION FOR SLOTTED CHEESE HEAD SCREWS**

(All dimensions are in millimeters)



(Table 1. All dimensions are in millimeters)

Thread Size d		M1.6	M2	M3	M4	M5	M6	M8	M10
b	Max	25.7	25.8	26	39.4	39.6	40	40.5	41
	Min	25	25	25	38	38	38	38	38
dk	Max	3	3.8	5.5	7	8.5	10	13	16
	Min	2.86	3.62	5.32	6.78	8.28	9.78	12.73	15.73
da	Max	2	2.6	3.6	4.7	5.7	6.8	9.2	11.2
k	Max	1	1.3	2	2.6	3.3	3.9	5	6
	Min	0.86	1.16	1.86	2.46	3.12	3.6	4.7	5.7
n	Max	0.6	0.7	1	1.51	1.51	1.91	2.31	2.81
	Min	0.46	0.56	0.86	1.26	1.26	1.66	2.06	2.56
r	Min	0.1	0.1	0.1	0.2	0.2	0.25	0.4	0.4
t	Min	0.4	0.55	0.8	1.1	1.3	1.6	2	2.4
w	Min	0.35	0.45	0.8	1.1	1.3	1.6	2	2.4

**NOTE:**

1. Shank dia~ pitch dia = Major dia permissible.
2. a and x according to IS: 1369 'Dimensions for screw thread run outs and undercuts'.
3. Thread run when chamfered shall be according to IS: 1368 "Dimensions for ends of bolts and screws".



# PLANT STANDARD

HPBP TIRUCHIRAPPALLI

BPS 41201

Rev. No. 00

PAGE 03 of 03

Table 2 – Preferred length – size combinations for slotted cheese head screws  
(All dimensions are in millimeters)

Nominal Length 'l'			Thread Size d							
Nom	Max	Min	M1.6	M2	M3	M4	M5	M6	M8	M10
2	2.2	1.8								
2.5	2.7	2.3								
3	3.2	2.8								
4	4.3	3.7								
5	5.3	4.7								
6	6.3	5.7								
8	8.3	7.7								
10	10.3	9.7				0.7	1.3			
12	12.4	11.6							4.1	
(14)	14.4	13.6								
16	16.4	15.6								
20	20.5	19.5					2.2		5.5	
25	25.5	24.5				1.5				
30	30.5	29.5							7.3	
35	35.5	34.5								
40	40.5	39.5								
45	45.5	44.5								
50	50.5	49.5								
55	56	54				4.6				
60	61	59								
(65)	66	64				5.4				
70	71	69								
80	81	79								

**NOTE:**

1. Screws with nominal length above the dotted stepped lines are threaded up to the head (b=1-a)
2. Sizes in brackets are non-preferred.
3. Preferred lengths are between the bold stepped lines.
4. Weights are given in kg per 1000 numbers only.
5. For stocked sizes refer BPS components book-let.



# PLANT STANDARD

HPBP TIRUCHIRAPALLI

BPS:41202

PAGE : 1 OF 5

Based on IS: 2269

## HEXAGONAL SOCKET HEAD CAP SCREWS

### 1.0 SCOPE:

Covers the requirements of Hexagonal Socket Head Cap Screws in the size range M3 to M30.

### 2.0 SPECIFICATION AND REFERENCE STANDARDS

Dimensions and preferred sizes		Table 1 of this standard
Preferred length-Size combination		Table 2 of this standard
Tolerance	Product grade	A
	Indian standard	IS: 1367(part2)
Thread	Pitch	Coarse
	Tolerance	6g
	Indian standard	IS: 4218(part3,5&6)
Material		Steel
Mechanical Properties	Property class	8.8
	Indian standard	IS: 1367(part3)
Sampling and Acceptability	Indian standard	IS: 2614
General requirements	Screw shall comply with IS :2269 in respect of requirement not covered in this standards	

### 2.1 Referred standards (only the relevant parts of current version are applicable)

IS: 1367 Technical supply conditions for threaded steel fasteners

IS: 2269 Specification for hexagon socket head cap screws

IS: 2614 Method for sampling of fasteners

IS: 4218 ISO Metric screw threads

Revisions			Approved Standing Committee		
Rev. No.	Amd. No.	Reaffirmed	Prepared	Issued	Dt of 1st Issue
Dt.	Dt.	Year	Standards	Standards	06.11.2013

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BPS:41202

PAGE : 2 OF 5

### 3.0 DESIGNATION:

A Grade A Hexagon Socket Head Cap Screw to this standard of thread size M10 and nominal length 60mm shall be designated as:

### 3.1 On Drawings:

- 1) material specification column : IS: 2269
- 2) Description column : SCRU CAP SOC GR A -8.8-M10X60
- 3) Drawing number column : 4120210060
- 4) Material code column : 4120210060

### 3.2 Ordering Description:

For placing indents, issuing enquiries and on purchase order, the ordering Description given below shall be followed:

Hexagon Socket Head Cap Screw M10X60-IS: 2269-8.8

### 4.0 ADDITIONAL INFORMATION:

- 4.1 Property class 10.9 is also acceptable
- 4.2 Cap screws supplied with knurled heads are acceptable
- 4.3 For cadium plated hexagon socket head cap screws, refer BPS: 41242.

Revisions			Approved  Engg.Deupt.Manager		
Rev. No.	Amd. No.	Reaffirmed	Prepared	Issued	Dt of 1st Issue
Dt.	Dt.	Year	Standards /EDC	Standards /EDC	

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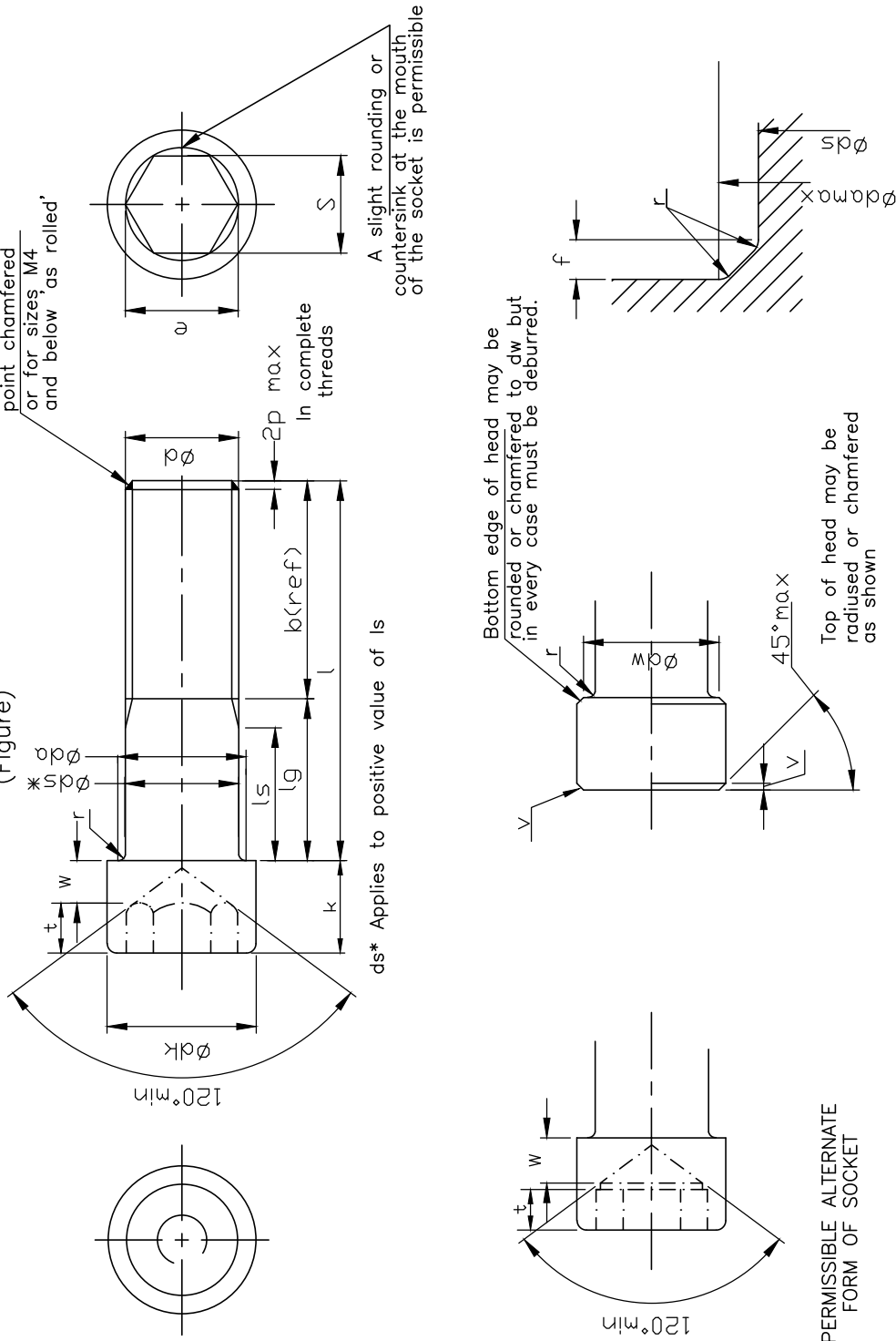
HPBP TIRUCHIRAPALLI

BPS:41202

PAGE : 3 OF 5

**HEXAGONAL SOCKET HEAD CAP SCREWS**

(Figure)



$$F \text{ max} = 1.7 r \text{ max}$$

$$r \text{ max} = \frac{da-ds}{2}$$

MAXIMUM UNDER HEAD FILLET

Revisions			Approved		
			Engg.Deupt.Manager		
Rev. No.	Amd. No.	Reaffirmed	Prepared	Issued	Dt of 1st Issue
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# PLANT STANDARD

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BPS:41202

PAGE : 4 OF 5

**TABLE 1 – DIMENSIONS FOR HEXAGON SOCKET HEAD CAP SCREWS**  
(ALL DIMENSIONS ARE IN MILLIMETERS)

Thread size d	M3	M4	M5	M6	M8	M10	M12	M16	M20	M24	M30
pitch p	0.5	0.7	0.8	1.0	1.25	1.5	1.75	2.0	2.5	3.0	3.5
b	18	20	22	24	28	32	36	44	52	60	72
dk	* Max	7.0	8.5	10.0	13	16	18	24	30	36	45
	** Max	5.68	7.22	8.72	10.22	16.27	18.27	24.33	30.33	36.39	45.39
	Min	5.32	6.78	8.28	9.78	12.73	17.73	23.67	29.67	35.61	44.61
da	3.6	4.7	5.7	6.8	9.2	11.2	14.2	18.2	22.4	26.4	33.4
d <sub>s</sub> h13	Max	3	4	5	6	10	12	16	20	24	30
	Min	2.86	3.82	4.82	5.82	7.78	11.73	15.73	19.67	23.67	29.67
e	2.87	3.44	4.58	5.72	6.86	9.15	11.43	16.00	19.44	21.73	25.15
f	Max	0.51	0.60	0.68	1.02	1.02	1.87	1.87	2.04	2.04	2.89
k h13/h14	Max	3	4	5	6	10	12	16	20	24	30
	Min	2.86	3.82	4.82	5.70	7.64	11.57	15.57	19.48	23.48	29.48
r	Min	0.1	0.2	0.25	0.4	0.4	0.6	0.6	0.8	0.8	1.0
s h13	Norm	2.5	3	4	5	6	10	14	17	19	22
	Min	2.52	3.02	4.02	5.02	6.02	10.025	14.032	17.05	19.065	22.065
	Max	2.58	3.071	4.084	5.084	6.14	10.127	14.159	17.216	19.275	22.275
t	Min	1.3	2	2.5	3	4	6	8	10	12	15.5
v	Max	0.3	0.4	0.5	0.6	0.8	1.2	1.6	2	2.4	3
d <sub>w</sub>	Min	5.07	6.53	8.03	9.38	12.33	17.23	23.17	28.87	34.81	43.61
w	Min	1.15	1.4	1.9	2.3	3.3	4.8	6.8	8.6	10.4	13.1

\* For plain head tol h13

\*\* For knurled heads tol ± IT13

@ e Min= 1.14 s Min

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# PLANT STANDARD

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BPS:41202

PAGE : 5 OF 5

TABLE 2- PREFERRED LENGTH SIZE COMBINATION FOR  
HEXAGON SOCKET HEAD CAP SCREWS  
(ALL DIMENSIONS ARE IN MILLIMETERS)

size d			M3	M4	M5	M6	M8	M10	M12	M16	M20	M24	M30
Nom	Min	Max											
2.5	2.30	2.70											
3	2.80	3.20											
4	3.76	4.24											
5	4.76	5.24											
6	5.76	6.24											
8	7.71	8.29				4.4							
10	9.71	10.29											
12	11.65	12.35				5.1	9.5						
16	15.65	16.35			2.8	5.8	11.1						
20	19.58	20.42				6.5	12.7	21.3	32.4				
25	24.58	25.42						23.8					
30	29.58	30.42				8.8		26.3	41.1	81.7			
35	34.5	35.5					18.4		43.2				
40	39.5	40.5				10.9		32.7		100			
45	44.5	45.5					22.2	35.8	53.8		188		
50	49.5	50.5							57.9		182.2		
55	54.4	55.6					26.0						
60	59.4	60.6				13.2		44.9			224		
65	64.4	65.6							70.2				
70	69.4	70.6									266		
80	79.4	80.6						57.1			272		
90	89.3	90.7											
100	99.3	100.7											
110	109.3	110.7											
120	119.3	120.7											
130	129.2	130.8											
140	139.2	140.8											
150	149.2	150.8											
160	159.2	160.8											
180	179.2	180.8											

WEIGHTS

NOTE:

1. Preferred length are in between the stepped bold lines.
2. For stocked sizes and weights refer BPS components book-let.
3. Lengths above the dotted line are threaded to the head within 3xpitch lengths below the dotted line have values lg and ls according to the following

formulas:

$$lg \text{ Max} = l \text{ Nom} - b \text{ ref.}$$

$$ls \text{ Min} = lg \text{ Max} - 5P.$$

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# PLANT STANDARD

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BPS: 41205

PAGE 1 OF 4

Based on IS: 1365-1978

## SLOTTED COUNTERSUNK HEAD SCREWS

### 1.0 SCOPE

Covers the requirements of Slotted Countersunk Head Screws in the size range M3 to M20.

### 2.0 SPECIFICATION AND REFERENCE STANDARDS

Dimensions and preferred sizes	Table 1 of this standard	
Preferred length-size combination	Table 2 of this standard	
Tolerance	Product grade	A
	Indian Standard	IS: 1367 (Part 2)
Thread	Pitch	Coarse
	Tolerance	6g
	Indian Standard	IS: 4218 (Part 3, 5 & 6)
Material	Steel	
Mechanical properties	Property class	4.8
	Indian Standard	IS: 1367 (Part 3)
Sampling and Acceptability	Indian Standard	IS: 2614
General requirements	Screws shall comply with IS: 1365 in respect of requirements not covered in this standard	

### 2.1 Referred Standards (Only the relevant parts of current versions are applicable).

- IS: 1365 Specification for slotted countersunk head screws
- IS: 1367 Technical supply conditions for threaded steel fasteners
- IS: 2614 Methods for sampling of fasteners
- IS: 4218 ISO Metric screw threads

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BPS: 41205

PAGE 2 OF 4

## 3.0 DESIGNATION

A Grade A Slotted Countersunk Head Screw to this standard of thread size M6 and nominal length 12mm shall be designated as:

### 3.1 On Drawings:

- i) Material Specification column: IS: 1365
- ii) Description column : SCRU SLT CSK GR A 4.8 M6x12
- iii) Drawing Number column : 4120506012
- iv) Material Code column : 4120506012

### 3.2 Ordering Description

For placing indents, issuing enquiries and on purchase order, the Ordering Description given below shall be followed.

Countersunk Screw M6x12-IS: 1365-4.8

## 4.0 ADDITIONAL INFORMATION

4.1 Property class 6.6 is also acceptable.

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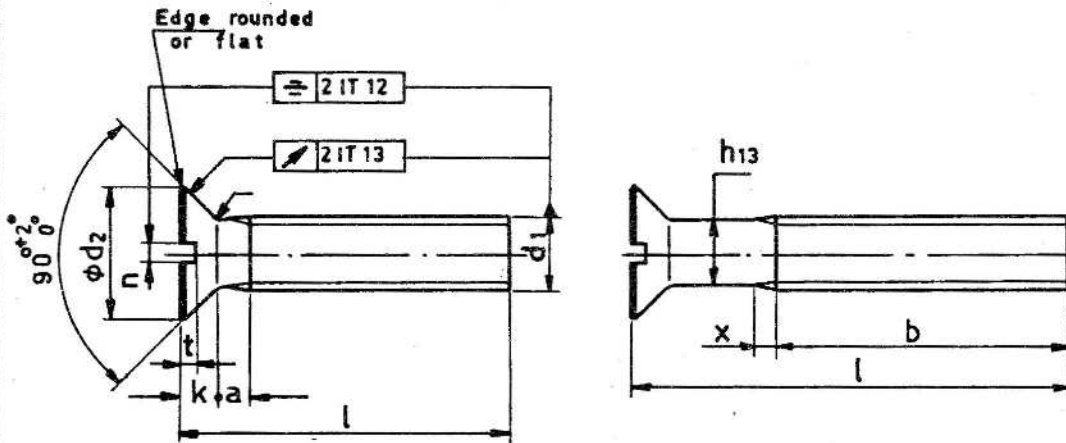
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BPS: 41205

PAGE 3 OF 4

**TABLE-1 DIMENSIONS FOR SLOTTED COUNTERSUNK HEAD SCREWS**



(All dimensions are in mm)

Thread size	d	M3	M4	M5	M6	M8	M10	M12	M16	M20
d2	Nom	5.6	7.5	9.2	11	14.5	18	22	29	36
	Max	5.60	7.50	9.20	11.0	14.5	18.0	22.0	29.0	36.0
	Min	5.30	7.19	8.84	10.57	14.07	17.57	21.48	28.48	35.3
k	Max	1.65	2.2	2.5	3	4	5	6	8	10
n	Nom	0.8	1.0	1.2	1.6	2	2.5	3	4	5
	Max	1.0	1.2	1.51	1.91	2.31	2.81	3.31	4.37	5.3
	Min	0.86	1.06	1.26	1.66	2.06	2.56	3.06	4.07	5.0
t	Max	0.85	1.1	1.35	1.6	2.1	2.6	3.0	4.0	5
	Min	0.6	0.8	1.0	1.2	1.6	2	2.4	3.2	4
r	≈	0.3	0.4	0.5	0.6	0.8	1.0	1.2	1.6	2
b	+2P	19	22	25	28	34	40	46	58	70

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**Note:**

1. a and x according to IS: 1369 - 'Dimensions of screw thread run-outs and under-cuts.'
2. Shank diameter ≈ pitch diameter = major diameter.
3. Chamfered end is also permitted.



# PLANT STANDARD

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BPS: 41205

PAGE 4 OF 4

**TABLE 2 PREFERRED LENGTH-SIZE COMBINATION FOR SLOTTED CSK SCREWS**

(All dimensions are in mm)

Nominal length 1 js 15	Thread size $\phi$								
	M3	M4	M5	M6	M8	M10	M12	M16	M20
5									
6		0.8							
8									
10		1.1							
12				2.8					
14									
16									
(18)									
20			2.9	4.2					
22									
25									
(28)									
30						18.4	27.4		
(32)									
35					15.1				
40						23.4		66.7	
45									
50							49.6		
55				12.8	25.7				
60								103	
(65)								109.7	
70								118	
80									
90									
100									
110									
120									
130									
140									
150									
160									
170									
180									
190									
200									

WEIGHTS

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**Note:**

1. Screws with lengths above the dotted line are threaded up to the head.
2. Sizes in brackets are non-preferred.
3. Preferred lengths are in between the stepped bold lines.
4. Weights are given in Kg per 1000 numbers only.
5. For stocked sizes refer BPS components book-let.

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# PLANT STANDARD

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BPS: 41216

PAGE 1 OF 4

Based on IS: 1364 (Part 2) - 1983

## HEXAGON HEAD SCREWS, PRODUCT GRADES A & B

(Property Class 6.8)

### 1.0 SCOPE

Covers the requirements of Hexagon Head Screws in the size range M20 to M30.

### 2.0 SPECIFICATION AND REFERENCE STANDARDS

Dimensions and preferred sizes	Table 1 of this standard	
Preferred length-size combination	Table 2 of this standard	
Tolerance	Product grade	A - for products with $d \leq M24$ and $l \leq 10d$ or 150mm whichever is shorter B - for products with $d > M24$ or $l > 10d$ or 150mm whichever is shorter
	Indian Standard	IS: 1367(Part 2)
Thread	Pitch	Coarse
	Tolerance	6g
	Indian Standard	IS: 4218(Part 3, 5 & 6)
Material	Steel	
Mechanical properties	Property class	6.8
	Indian Standard	IS: 1367 (Part 3)
General requirements	Screws shall comply with IS: 1364 in respect of requirements not covered in this standard	
Sampling and Acceptability	Indian Standard	IS: 2614

2.1 Referred Standards (Only the relevant parts of the current versions are applicable)

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PAGE 2 OF 4

IS: 1364 Specification for hexagon head bolts, screws & nuts (Part 2) of product grade A&B. Part 2 Hexagon screws.

IS: 1367 Technical supply conditions for threaded steel fasteners

IS: 2614 Methods for sampling of fasteners

IS: 4218 ISO Metric screw threads

## 3.0 DESIGNATION

A Grade A Hexagon Head Screw to this standard of thread size M20 and nominal length 60mm shall be designated as:

### 3.1 On Drawings:

- i) Material Specification column : IS: 1364
- ii) Description column : SCRU HEX GR A 6.8-M20x60
- iii) Drawing Number column : 4121620060
- iv) Material Code column : 4121620060

### 3.2 Ordering Description

For placing indents, issuing enquiries and on purchase order, the Ordering Description given below shall be followed.

Hexagon head screw M20x60 IS:1364 (Part 2) - 6.8

## 4.0 ADDITIONAL INFORMATION

4.1 Property class 6.6 is also acceptable.

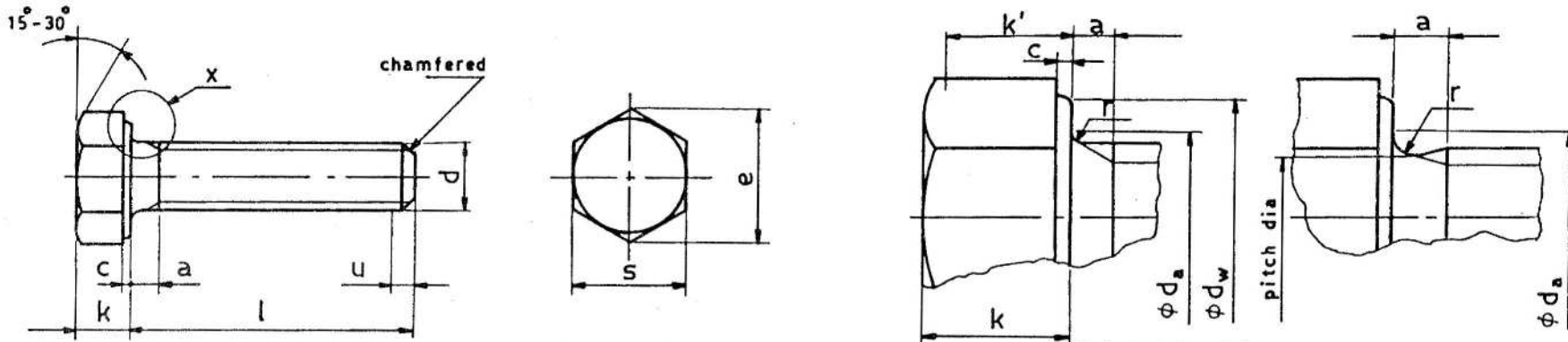
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**TABLE-1 DIMENSIONS FOR HEXAGON HEAD SCREWS**



u - according to 'CE' of IS:1368 - 'Dimensions of ends of bolts and screws'.

DETAIL - X  
k' = Effective gauging height.

Alternate shape

(All dimensions are in mm)

Thread size d	a*	c		da	dw Min		e Min		k				k'	r	s		
		Min	Max		+	++	+	++	+		++				Max	Min	
									Min	Max	Min	Max				Min	Max
M20	7.5	0.2	0.8	22.4	28.2	27.7	33.53	32.95	12.28	12.72	12.15	12.85	8.5	0.8	30	29.67	29.16
M24	9	0.2	0.8	26.4	33.6	33.2	39.98	39.55	14.78	15.22	14.65	15.35	10.3	0.8	36	35.38	35
M30	10.5	0.2	0.8	33.4	42.7	42.7	50.85	50.85	18.7	Nom	18.28	19.12	12.8	1	46	45	45

\* a Min - Not less than 1P (Pitch)  
+ for  $l \leq 10d$  or 150mm  
++ for  $l > 10d$  or 150mm



**PLANT STANDARD**  
HPBP TIRUCHIRAPALLI

BPS: 41216

PAGE 3 OF 4



# PLANT STANDARD

HPBP TIRUCHIRAPALLI

BPS: 41216

PAGE 4 OF 4

**TABLE-2 PREFERRED LENGTH-SIZE COMBINATIONS  
FOR HEXAGON HEAD SCREWS  
(All dimensions are in mm)**

Nom	Nominal length 'l'				Thread size d		
	≤10d or 150mm		>10d or 150mm		M20	M24	M30
	Min	Max	Min	Max			
6	5.76	6.24					
8	7.71	8.29					
10	9.71	10.29					
12	11.65	12.35					
16	15.65	16.35					
20	19.58	20.42					
25	24.58	25.42					
30	29.58	30.42					
35	34.5	35.5	33.75	36.25	151		
40	39.5	40.5	38.75	41.25	162		
45	44.5	45.5	43.75	46.25			
50	49.5	50.5	48.75	51.25	184	278	
55	54.4	55.6	53.5	56.5			
60	59.4	60.6	58.5	61.5	211	827.6	
65	64.4	65.6	63.5	66.5			
70	69.4	70.6	68.5	71.5		357	
80	79.4	80.6	78.5	81.5			
90	89.3	90.7	88.25	91.75			
100	99.3	100.7	98.25	101.75		463	

WEIGHTS

**Note:**

1. Preferred lengths are in between the stepped bold lines.
2. Weights are given in Kg per 1000 numbers only.
3. For stocked sizes refer BPS components book-let.

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# PLANT STANDARD

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BPS: 41235

PAGE 1 OF 3

Based on IS: 6094-1981

## HEXAGON SOCKET SET SCREWS WITH CUP POINT

(Product grade A, Property class 45H)

### 1.0 SCOPE

Covers the requirements of hexagon socket set screws in the size range M3 to M16.

### 2.0 SPECIFICATION AND REFERENCE STANDARDS

Dimensions and preferred sizes	Table 1 of this standard	
Preferred length-size combination	Table 1 of this standard	
Tolerance	Product grade	A
	Indian Standard	IS: 1367 (Part 2)
Thread	Pitch	Coarse
	Tolerance	5g6g
	Indian Standard	IS: 4218 (Part 3 & 5)
Material	Steel	
Mechanical properties	Property class	45H
	Indian Standard	IS: 1367 (Part 5)
Sampling and Acceptability	Indian Standard	IS: 2614
General requirements	Set screws shall comply with IS: 6094 in respect of requirements not covered in this standard	

### 2.1 Referred Standards (Only the relevant parts of current versions are applicable)

IS: 1367 Technical supply conditions for threaded steel fasteners

IS: 2614 Methods for sampling of fasteners

IS: 4218 ISO metric screw threads

IS: 6094 Specification for hexagon socket set screws

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REVISIONS

DATE

APPROVED

STANDARDS SECTION  
ENGINEERING AND DEVELOPMENT CENTRE  
HPBP TIRUCHIRAPALLI

PREPARED

HPBP TIRUCHY

ISSUED  
STANDARDS  
ENGG

DATE

DEC 1986



# PLANT STANDARD

HPBP TIRUCHIRAPALLI

BPS: 41235

PAGE 2 OF 3

## 3.0 DESIGNATION

A Grade A hexagon socket set screw to this standard of thread size M10 and nominal length 30mm shall be designated as:

### 3.1 On drawings:

- i) Material specification column: IS: 6094
- ii) Description column : SCRU SET SOC CP A 45H M10x30
- iii) Drawing Number column : 4123510030
- iv) Material code column : 4123510030

### 3.2 Ordering Description

For placing indents, issuing enquiries and on purchase order, the Ordering Description given below shall be followed.

Hexagon socket set screw M10x30 IS: 6094-CP\*

## 4.0 ADDITIONAL INFORMATION

- 4.1 Property class 12.9 is also acceptable.
- 4.2 Set screws with knurled cup point are also acceptable.
- 4.3 For Cadmium plated set screws, refer BPS: 41275.
- \*4.4 The old type designation for 'CP' (cup point) was 'A'.

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**PLANT STANDARD**  
H P B P TIRUCHIRAPALLI

BPS : 41238

PAGE : 1 OF 4

Based on IS: 1364 (PART-2)

HEXAGON HEAD SCREWS, PRODUCT GRADE A  
(Property Class 8.8)

1.0 SCOPE

Covers the requirements for Hexagon head screws in the size range M6 to M16.

2.0 SPECIFICATION AND REFERENCE STANDARDS

Dimensions and preferred sizes		Table 1 of this standard
Preferred length size combination		Table 2 of this standard
Tolerance	Product grade	A
	Indian Standard	IS: 1367 (PART 2)
Thread	Pitch	Coarse
	Tolerance	6g
	Indian Standard	IS: 4218 (Part 3,5 & 6)
Material		Steel
Mechanical properties	Property class	8.8
	Indian Standard	IS: 1367 (PART 3)
Sampling and Acceptability	Indian Standard	IS: 2614
General requirements		Screws shall comply with IS: 1364 in respect of requirements not covered in this standard

2.1 Referred standards (only the relevant parts of current versions are applicable)

IS: 1364 Specifications for hexagon head bolts, screws & nuts of (Part2) product grade A&B, Part 2 Hexagon screws.

IS: 1367 Technical supply conditions for threaded steel fasteners.

IS: 2614 Methods for sampling for fasteners.

IS: 4218 ISO Metric screw threads.

Revisions			Approved		
Rev. No.	Amd. No.	Reaffirmed	Prepared HPBP TIRUCHY	Issued STANDARDS ENGG.	Dt of 1st Issue
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# PLANT STANDARD

H P B P TIRUCHIRAPALLI

BPS : 41238

PAGE : 2 OF 4

## 3.0 DESIGNATION

A grade A Hexagon head screw to this standard of thread size M16 and Nominal length 35mm shall be designated as:

## 3.1 On drawings:

- i) Material specification column : IS: 1364
- ii) Description column : SCRU HEX. GR. A 8.8 M16x35
- iii) Drawing Number column : 4123816035
- iv) Material code column : 4123816035

## 3.2 Ordering description

For placing indents, issuing enquiries and on purchase order, the Ordering Description given below shall be followed.

Hexagon head screw M16x35 IS: 1364 (Part 2) – 8.8.

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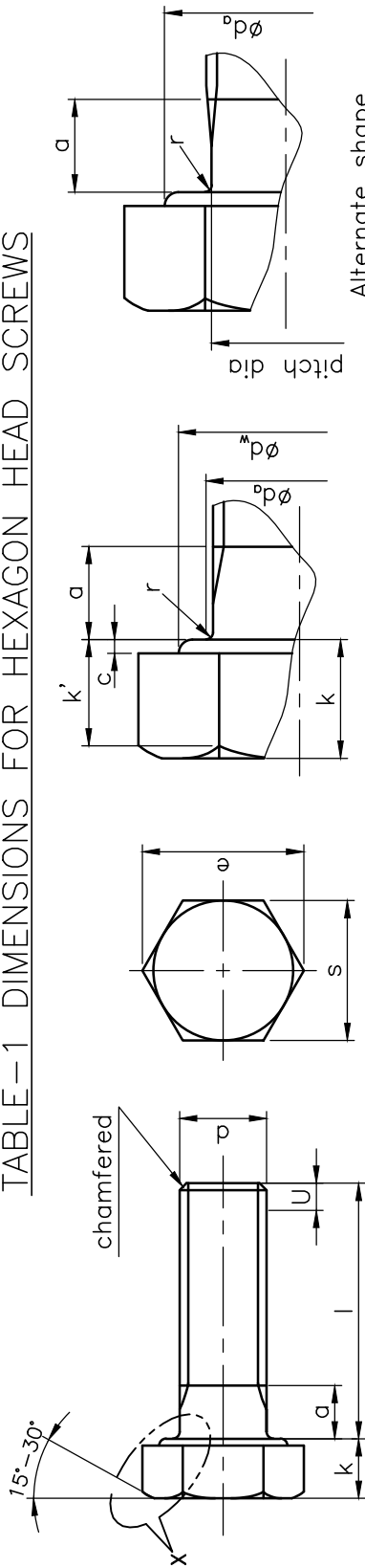
**PLANT STANDARD**

H P B P TIRUCHIRAPALLI

BPS : 41238

PAGE : 3 OF 4

**TABLE-1 DIMENSIONS FOR HEXAGON HEAD SCREWS**



Alternate shape

k' = Effective gauging height.

DETAIL-X

u according to CE of IS: 1368. 'Dimensions of ends of bolts and screws'.

(All dimensions are in mm)

Thread size d	a* Max.	c		da Max.	dw Min.	e		k		k' Min.	r Min.	s		
		Min.	Max.			Min.	Max.	Min.	Max.					
M6	3	0.15	0.5	6.8	8.9	8.7	11.05	3.85	4.15	2.63	0.25	10	9.78	9.64
M8	3.75	0.15	0.6	9.2	11.6	11.4	14.38	5.15	5.45	3.54	0.4	13	12.73	12.57
M10	4.5	0.15	0.6	11.2	14.6	14.4	17.77	6.22	6.58	4.28	0.4	16	15.73	15.57
M12	5.25	0.15	0.6	13.7	16.6	16.4	20.03	7.32	7.68	5.05	0.6	18	17.73	17.57
M16	6	0.2	0.8	17.7	22.5	22	26.75	9.82	10.18	6.8	0.6	24	23.67	23.16

\* a Min - not less than 1P (Pitch); + for 1 ≤ 10d or 150mm; ++ for 1 > 10d or 150mm.

Revisions			Approved		
Rev. No.	Amd. No.	Reaffirmed	Prepared HPBP TIRUCHY	Issued STANDARDS ENGG.	Dt of 1st Issue
Dt.	Dt.	Year			



**PLANT STANDARD**  
H P B P TIRUCHIRAPALLI

BPS : 41238

PAGE : 4 OF 4

TABLE-2 PREFERRED LENGTH SIZE COMBINATION  
FOR HEXAGON HEAD SCREWS

(All dimensions are in mm)

Nom.	Length 'l'				Thread size d				
	≤ 10d or 150mm		>10d or 150mm		M6	M8	M10	M12	M16
	Min.	Max.	Min.	Max.					
6	5.76	6.24							
8	7.71	8.29							
10	9.71	10.29							
12	11.65	12.35				10			
16	15.65	16.35					21.4		
20	19.58	20.42			6.3	12.5	23.4		
25	24.58	25.42				14.3	25.9	37	
30	29.58	30.42					28.9	41	78.4
35	34.5	35.5	33.75	36.25				45.4	85.1
40	39.5	40.5	38.75	41.25				49.9	92.2
45	44.5	45.5	43.75	46.25			38.20		100
50	49.5	50.5	48.75	51.25					108
55	54.4	55.6	53.5	56.5					
60	59.4	60.6	58.5	61.5					123
65	64.4	65.6	63.5	66.5					
70	69.4	70.6	68.5	71.5					
80	79.4	80.6	78.5	81.5					
90	89.3	90.7	88.25	91.75					
100	99.3	100.7	98.25	101.75					

WEIGHTS

Note:

1. Preferred lengths are in between the stepped bold lines.
2. Weights are given in kg. per 1000 numbers only.
3. For stocked sizes refer BPS components book-let.

Revisions				Approved		
Rev. No.	Amd. No.	Reaffirmed	Prepared	Issued	Dt of 1st Issue	
Dt.	Dt.	Year	HPBP TIRUCHY	STANDARDS ENGG.		

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# PLANT STANDARD

HPBP TIRUCHIRAPALLI

BPS : 41405

PAGE 1 of 3

Based on IS : 3063

## SPRING WASHERS - TYPE B

### 1.0 SCOPE

COVERS THE REQUIREMENTS FOR SINGLE COIL RECTANGULAR SECTION SPRING WASHERS, TYPE-B (WITH FLAT ENDS) IN THE SIZE RANGE 2 TO 100mm

### 2.0 SPECIFICATION & REFERENCE STANDARDS

DIMENSIONS & TOLERANCES	TABLE-1 OF THIS STANDARD
MATERIAL	SUITABLE SPRING STEEL OF TENSILE STRENGTH 700 MN/m <sup>2</sup> Min. ACCORDING TO IS: 4072
MECHANICAL PROPERTIES	HARDNESS 43-50 HRC
FINISH	NATURAL FINISH
SAMPLING & ACCEPTABILITY	ACCORDING TO IS:6821
GENERAL REQUIREMENTS	WASHERS SHALL COMPLY WITH IS:3063 IN RESPECT OF REQUIREMENTS NOT COVERED IN THIS STANDARD

### 2.1 REFERRED STANDARDS (ONLY THE CURRENT VERSIONS ARE APPLICABLE)

IS:3063 SINGLE COIL RECTANGULAR SECTION SPRING WASHERS FOR BOLTS, NUTS AND SCREWS.

IS:4072 STEEL FOR SPRING WASHERS.

IS:6821 METHODS FOR SAMPLING NON-THREADED FASTENERS.

Revisions			Approved Standing Committee		
Rev. No.	Amd. No.	Reaffirmed	Prepared Standards	Issued Standards	Dt of 1st Issue 06.11.2013
Dt.	Dt.	Year			

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# PLANT STANDARD

HPBP TIRUCHIRAPALLI

BPS : 41405

PAGE 2 of 3

Based on IS : 3063

## 3.0 DESIGNATION

A SPRING WASHER TO THIS STANDARD FOR BOLT/SCREW SIZE M6 SHALL BE DESIGNATED AS

## 3.1 ON DRAWINGS -

- i) MATERIAL SPECIFICATION COLUMN : IS:3063-B
- ii) DESCRIPTION COLUMN : WASHER SPRING SC 6
- iii) DRAWING NUMBER COLUMN : 4140506000
- iv) MATERIAL CODE COLUMN : 4140500006

## 3.2 ORDERING DESCRIPTION

FOR PLACING INDENTS, ISSUING ENQUIRIES AND ON PURCHASE ORDER, THE ORDERING DESCRIPTION GIVEN BELOW SHALL BE FOLLOWED

SPRING WASHER B6 IS:3063

## 4.0 ADDITIONAL INFORMATION

4.1 FOR CADMIUM PLATED SPRING WASHERS REFER BPS:41445

4.2 THESE WASHERS CAN BE USED FOR RIGHT HAND THREADED FASTENERS ONLY

4.3 FOR SCREWS WITH CYLINDRICAL HEADS INTENDED FOR USE IN COUNTER BORES, REFER SPRING WASHERS TO BPS:41412

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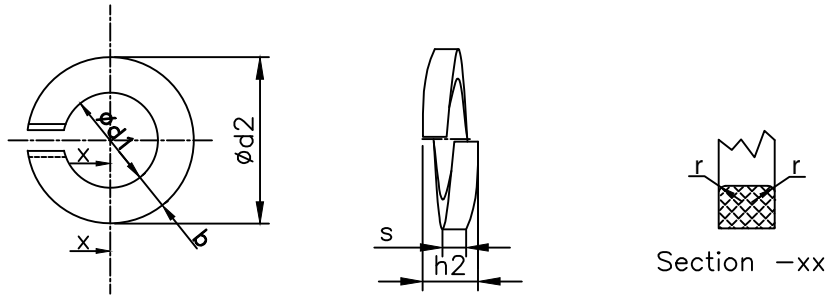
**PLANT STANDARD**  
HPBP TIRUCHIRAPALLI

BPS : 41405

PAGE 3 of 3

**TABLE-1 – DIMENSIONS FOR SPRING WASHERS**

Based on IS : 3063



$h=2s$

All Dimensions are in millimeters

Nominal Size	d1		d2 Max	b		s		r Nom	Weight	For Bolt / Screw Size
	Basic	Tol		Basic	Tol±	Basic	Tol±			
2	2.1	0.3	4.4	0.9	0.1	0.5	0.1	0.1	0.033	M2
3	3.1	0.3	6.2	1.3	0.1	0.8	0.1	0.2	0.112	M3
4	4.1	0.3	7.6	1.5	0.1	0.9	0.1	0.2	0.18	M4
5	5.1	0.3	9.2	1.8	0.1	1.2	0.1	0.2	0.36	M5
6	6.1	0.4	11.8	2.5	0.15	1.6	0.1	0.3	0.83	M6
8	8.2	0.4	14.8	3.0	0.15	2.0	0.1	0.5	1.60	M8
10	10.2	0.6	18.1	3.5	0.2	2.2	0.15	0.5	2.53	M10
12	12.2	0.8	21.1	4.0	0.2	2.5	0.15	1.0	3.82	M12
16	16.2	0.8	27.4	5.0	0.2	3.5	0.2	1.0	8.91	M16
20	20.2	1.0	33.6	6.0	0.2	4.0	0.2	1.0	15.20	M20
24	24.5	1.0	40.0	7.0	0.25	5.0	0.2	1.6	26.20	M24
(27)	27.5	1.0	43.0	7.0	0.25	5.0	0.2	1.6	28.70	(M27)
30	30.5	1.2	48.2	8.0	0.25	6.0	0.2	1.6	44.3	M30
(33)	33.5	1.2	55.2	10.0	0.25	6.0	0.2	1.6	63.00	(M33)
36	36.5	1.2	58.2	10.0	0.25	6.0	0.2	1.6	67.3	M36
(39)	39.5	1.2	61.2	10.0	0.25	6.0	0.2	1.6	71.7	(M39)
42	42.5	1.2	68.2	12.0	0.25	7.0	0.25	2.0	111	M42
(45)	45.5	1.2	71.2	12.0	0.25	7.0	0.25	2.0	117	(M45)
48	49.0	1.5	75.0	12.0	0.25	7.0	0.25	2.0	123	M48
52	53.0	1.5	83.0	14.0	0.25	8.0	0.25	2.0	182	M52
56	57.0	1.5	87.0	14.0	0.25	8.0	0.25	2.0	193	M56
60	61.0	1.5	91.0	14.0	0.25	8.0	0.25	2.0	203	M60
64	65.0	1.5	95.0	14.0	0.25	8.0	0.25	2.0	218	M64
72	73.0	1.5	103.0	14.0	0.25	8.0	0.25	2.0	240	M72
76	77.0	1.5	109.0	14.0	0.25	8.0	0.25	2.0	253	M76
80	81.0	1.5	111.0	14.0	0.25	8.0	0.25	2.0	262	M80
90	91.0	1.5	121.0	14.0	0.25	8.0	0.25	2.0	290	M90
100	101.0	1.5	131.0	14.0	0.25	8.0	0.25	2.0	318	M100

**NOTE:--**

1. WEIGHTS ARE GIVEN IN KG/1000 NUMBERS ONLY
2. SIZES IN BRACKETS ARE NON-PREFERRED
3. FOR STOCKED SIZES, REFER BPS COMPONENT BOOKLET

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# PLANT STANDARD

## HPBP TIRUCHIRAPALLI

BPS:41406

PAGE 1 of 4

Based on IS: 2016

### 1.0 SCOPE: MACHINED WASHERS

Covers the requirements for machined washers in the size range 1.7 to 155mm.

### 2.0 SPECIFICATION AND REFERENCES STANDARDS

Dimensions and tolerances	Table 1 of this standard	
Material	Suitable Steel	
Finish	Natural finish	
Sampling and Acceptability	Indian standard	IS: 6821 & IS: 5369
General requirements	Washers shall comply with IS: 2016 in respect of requirements not covered in this standards	

### 2.1 Referred standards (only the current versions are applicable).

- IS: 2016 Specification for Plain washers
- IS: 5369 General requirements for plain washers and lock washers
- IS: 6821 Methods for sampling non-threaded fasteners

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Revisions		Approved <b>STANDARDS SECTION</b> ENGINEERING AND DEVELOPMENT CENTER HPBP TIRUCHIRAPALLI			
Rev. No.	Amd. No.	Reaffirmed	PREPARED HPBP TIRUCHY	Issued Standards /EDC	Dt of 1st Issue
Dt.	Dt.	Year			



## PLANT STANDARD

HPBP TIRUCHIRAPALLI

BPS: 41406

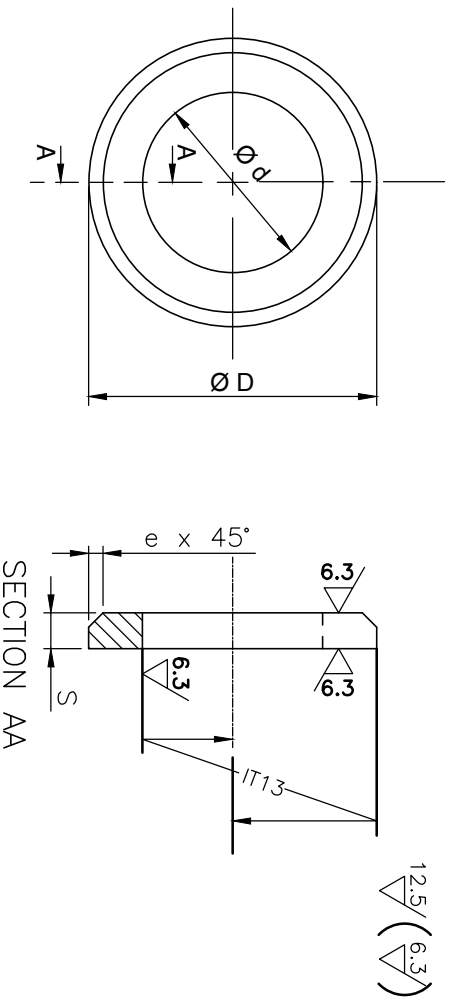
PAGE 2 of 4

- 3.0 DESIGNATION  
A machined washers to this standard for bolt/screw size M10 shall be designated as:
- 3.1 On Drawings
- 1) Material Specification column : IS: 2016
  - 2) Description Column : WASHER MCD 10
  - 3) Drawing Number column : 4140610000
  - 4) Material code Column : 4140600010
- 3.2 Ordering Description  
For placing indents, issuing enquiries and on Purchase order, the Ordering Description given below shall be followed:  
Machined Washer 10. 5\* IS: 2016 – steel
- 4.0 ADDITIONAL INFORMATION
- 4.1 These washers can be used for product grades A and B of general purpose bolts and screws.
- \*4.2 While preparing ordering Description only the actual hole size (corresponding to bolt/screw size) shall be filled in referring to Table.

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TABLE 1 – DIMENSION FOR MACHINED WASHERS



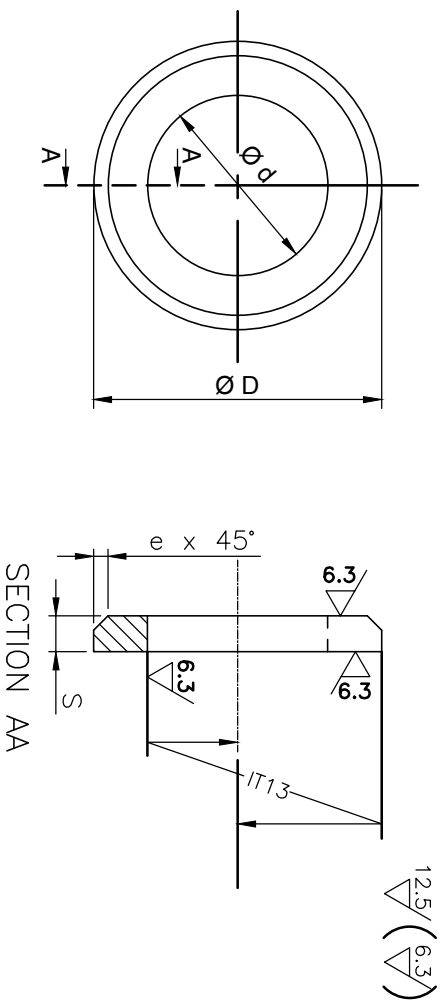
(All dimension are in millimeters)

d H12	D		S		e	For bolt/ screw size	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	
3.2	7	0 -0.3	0.5	±0.1	0.2	M3	
4.3	9	0 -0.3	0.8	±0.1	0.3	M4	0.3
5.3	10	0 -0.3	1.0	±0.1	0.4	M5	
6.4	12.5	0 -0.4	1.6	±0.2	0.6	M6	1.1
8.4	17	0 -0.4	1.6	±0.2	0.6	M8	
10.5	21	0 -0.5	2	±0.2	0.6	M10	4
13	24	0 -0.5	2.5	±0.3	0.6	M12	6.2
17	30	0 -0.5	3	±0.3	0.6	M16	11.1
21	37	0 -0.8	3	±0.3	1.0	M20	16.7
25	44	0 -0.8	4	±0.3	1.0	M24	31.7
(28)	50	0 -0.8	4	±0.3	1.0	(M27)	41.7
31	56	0 -1.0	4	±0.3	1.0	M30	52.9
(34)	60	0 -1.0	5	±0.6	1.0	(M33)	

**NOTE:**

- Sizes in brackets are non-preferred.
- Weights are given in kg per 1000 numbers only.
- For stocked sizes refer BPS components booklet.

TABLE 1 – DIMENSION FOR MACHINED WASHERS (Contd.)



(All dimension are in millimeters)

d H12	D		S		e	For bolt/ screw size	weight
	Basic	Tol	Basic	Tol			
37	66	0 -1.0	5	±0.6	1.6	M36	89.9
(40)	72	0 -1.0	6	±0.6	1.6	(M39)	
43	78	0 -1.0	7	±1.0	1.6	M42	180
(46)	85	0 -1.5	7	±1.0	1.6	(M45)	243
50	92	0 -1.5	8	±1.0	1.6	M48	291
(54)	98	0 -1.5	8	±1.0	1.6	(M52)	
58	105	0 -1.5	9	±1.0	1.6	M56	
(62)	110	0 -1.5	9	±1.0	2.0	(M60)	
66	115	0 -1.5	9	±1.0	2.0	M64	486.5
74	125	0 -1.8	10	±1.0	2.0	M72	
82	140	0 -1.8	12	±1.2	2.5	M80	
93	160	0 -1.8	12	±1.2	3.0	M90	
104	175	0 -1.8	14	±1.2	3.0	M100	
(124)	210	0 -2	16	±1.2	3.0	(M120)	
(155)	250	0 -2	18	±1.2	4.0	(M150)	

NOTE:

1. Sizes in brackets are non-preferred.
2. Weights given are in kg per 1000 numbers only.
3. For stocked sizes refer BPS components booklet.



# PLANT STANDARD

HPBP TIRUCHIRAPPALLI

BPS 41408

Rev. No. 02

PAGE 1 OF 2

## PUNCHED WASHERS - TYPE A

### 1.0 SCOPE

Covers the requirements for punched washers Type A in the size range 61 to 78 mm.

### 2.0 SPECIFICATION AND REFERENCE STANDARDS

<i>Dimensions and tolerances</i>	Figure 1 and Table 1 of this standard	
<i>Material</i>	Suitable steel	
<i>Finish</i>	Natural finish	
<i>Sampling and acceptability</i>	Indian Standard	IS 6821 and IS 5369
<i>General Requirements</i>	Washers shall comply with <b>IS 2016</b> in respect of requirements not covered in this standard.	

### 2.1 Referred Standards (Only current versions are applicable)

IS 2016	Specification for plain washers.
IS 5369	General requirements for plain washers and lock washers.
IS 6821	Methods for sampling non-threaded fasteners.

### 3.0 DESIGNATION

A punched washer of size 61 to this standard for bolt/screw size M56 shall be designated as :

### 3.1 On Drawings

i) Material Specification column	:	.....
ii) Description column	:	PUNCHED WASHER A 61
iii) Drawing Number column	:	BPS 41408
iv) Material Code column	:	4140800056

### 3.2 Ordering Description

For placing indents, issuing enquiries and on purchase order, ordering description given below shall be followed (typical examples).

Punched Washer A61 to BPS 41408

Revisions 02

Brought upto date

Approved

STANDARDS SECTION  
CONTRACT ENGINEERING AND CO-ORDINATION  
HPBP, TIRUCHIRAPPALLI

Rev. No. 02

Amd. No.

Reaffirmed

Prepared

Issued

Dt of 1st Issue

Dt. JUNE 1997

Dt.

Year

STANDARDS

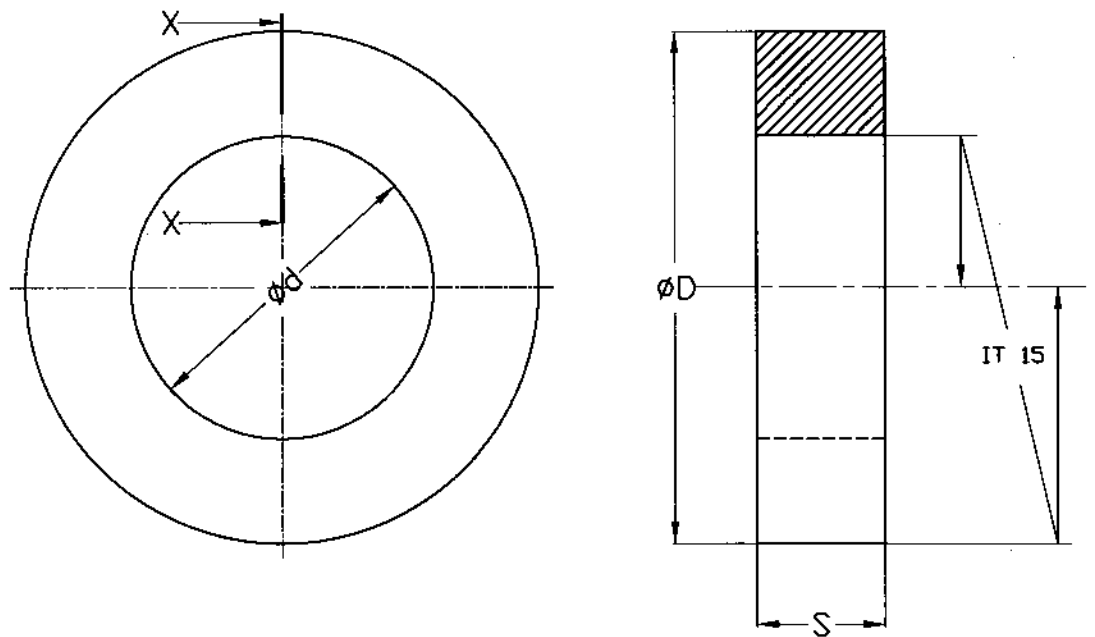
STANDARDS

DEC 1986

## 4.0 ADDITIONAL INFORMATION

- 4.1 These washers can be used with Product Grade C general purpose bolts and screws.
- 4.2 Copies of this standard shall be enclosed alongwith the purchase order.

**Figure - 1**



**Table - 1**

(All dimensions are in millimetres)

Size $\phi d$	$\phi D$ Nom	s Nom	For bolt/screw size	Weight
61	105	9.0	M56	405.0
78	122	10.0	M72	543.0

### NOTE :

1. Weights are given in Kg per 1000 numbers.





# PLANT STANDARD

HPBP TIRUCHIRAPALLI

BPS: 41601

PAGE 1 OF 3

Based on IS: 7519-1974

## HAMMER DRIVE SCREWS

### 1.0 SCOPE

Covers the requirements for hammer drive screws in the nominal size range 1.5mm to 6mm (Screw No. 00 to 14).

### 2.0 SPECIFICATION AND REFERENCE STANDARDS

Dimensions and preferred sizes	Table 1 of this standard	
Preferred length-size combination	Table 1 of this standard	
Thread	As specified in IS: 7519	
Material	Suitable steel	
Manufacture and mechanical properties	Screws to be suitably hardened so that when driven in to steel plates of hardness 128/171 HV or cast iron plates, shall produce mating threads without shearing of the threads on the screws or breaking the screws	
Sampling and Acceptability	Indian Standard	IS: 2614
General requirements	Hammer drive screws shall comply with IS: 7519 in respect of requirements not covered in this standard	

### 2.1 Referred standards (Only the current versions are applicable)

IS: 2614 Methods for sampling of fasteners

IS: 7519 Specification for hammer drive screws

### 3.0 DESIGNATION

3. Hammer drive screw to this standard of nominal size 3mm (screw No. 4) and nominal length 6.4mm shall be designated as

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# PLANT STANDARD

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BPS 41601

PAGE 2 OF 3

### 3.1 On drawings:

- i) Material specification column: IS: 7519
- ii) Description column : SCRU HAMMER NS 3x6.4
- iii) Drawing Number column: 4160103006
- iv) Material code column : 4160104006

### 3.2 Ordering Description

For placing indents, issuing enquiries and on purchase orders, the Ordering Description given below shall be followed.

Screw No. 4x6.4 - IS: 7519

### 4.0 ADDITIONAL INFORMATION

- 4.1 While preparing ordering description, the exact screw No. & length shall be taken from Table for the appropriate BPS code and material code.
- 4.2 These hammer drive screws are used for permanent fastening of name plates, rating plates and similar parts to iron, brass, aluminium castings and phenol formoldehyde plastics. These screws may be used only in material that is thick enough (should normally be more than screw dia) to permit a sufficient engagement of the threads for satisfactory fastening.
- 4.3 The recommended mating hole sizes for hammer drive screws are tabulated below based on IS: 7519.

SCREW NO.	MATING HOLE DIA IN MM (TOL H11)	
	THIN SHEET METAL, NON FERROUS CASTINGS, PHENOL	CAST IRON, THICK SHEET METAL
00	1.30	1.40
0	1.65	1.75
2	2.20	2.30
4	2.55	2.70
6	3.10	3.30
8	3.70	3.90
10	4.10	4.30
12	4.80	5.00
14	5.50	5.80

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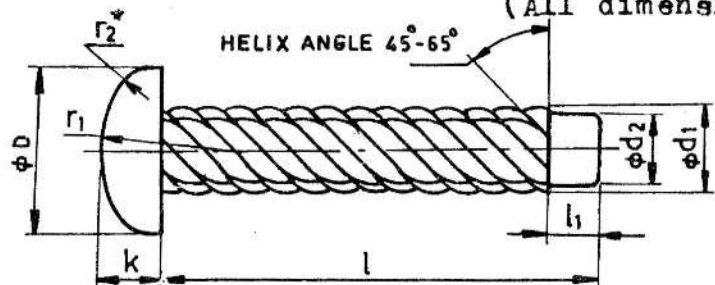
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**TABLE 1 - DIMENSIONS AND PREFERRED LENGTH - SIZE COMBINATION FOR HAMMER DRIVE SCREWS**

(All dimensions in millimetres)



**NOTE:**

1. Weights are given in kg per 1000 numbers only.
2. For stocked sizes refer BPS components booklet.
3. Preferred lengths in between the stepped bold lines.

The shape of the head shall closely approximate to a half ellipse.

\* Radius  $r_2$  struck off, underside of head should blend with diameter  $D$  and radius  $r_1$ .

NOM SIZE	SCREW No.	DIAMETER $d_1$		DIAMETER OF HEAD $D$		HEIGHT OF HEAD $k$		HEAD RADIUS $r_1$	DIAMETER OF PILOT $d_2$		NUMBER OF THREAD STARTS	NOM LENGTH ( $l$ )									
												2.4	3.2	4.0	4.8	6.4	8.0	9.5	12.5	16.0	19.0
												$\pm 0.4$					$\pm 0.8$				
												$l$ Min									
		Max	Min	Max	Min	Max	Min	Nom	Max	Min		0.50	0.90	1.20	1.60	2.00					
1.5	00	1.52	1.45	2.51	2.29	0.88	0.66	2.30	1.25	1.17	6										
2	0	1.90	1.83	3.23	3.00	1.24	1.04	3.00	1.60	1.52	6				0.2						
2.5	2	2.54	2.46	4.12	3.71	1.75	1.50	3.80	2.11	2.03	8										
3	4	2.95	2.85	5.36	4.90	2.18	1.91	5.00	2.44	2.34	7				0.5						
3.5	6	3.56	3.45	6.60	6.10	2.62	2.31	6.25	2.95	2.85	7										
4	8	4.24	4.12	7.85	7.29	3.05	2.72	7.44	3.45	3.35	8					1.6					
4.5	10	4.62	4.50	9.12	8.48	3.48	3.12	8.71	3.84	3.71	8										
5.2	12	5.38	5.23	10.36	9.70	3.89	3.53	9.91	4.50	4.39	8										
6	14	6.15	5.99	11.62	10.90	4.32	3.94	11.12	5.13	5.03	9										

**WEIGHTS**



**PLANT STANDARD**  
HPBP TIRUCHIRAPALLI

BPS: 41601  
PAGE 3 OF 3

DEC 1986



# PLANT STANDARD

HPBP TIRUCHIRAPALLI

BPS: 41902

PAGE 1 OF 4

Based on IS: 3075-1965

## EXTERNAL CIRCLIPS (Type A, Light Series)

### 1.0 SCOPE

Covers the requirements for Light Series External Circlips (type A), suitable for shaft diameter range 8 to 300mm.

### 2.0 SPECIFICATION AND REFERENCE STANDARDS

Dimensions and tolerances	Table 1 of this standard	
Material	High Carbon Steel C80	IS: 1570 Part II
Mechanical properties	(Hardness after tempering)	
		<u>Min</u> <u>Max</u>
	Upto and including 38mm	480HV    558HV
	Above 38mm upto 200mm	440HV    510HV
	Above 200mm	392HV    453HV
Finish	Sharp edges shall be removed, free from burrs, cracks, laminations and other defects. Chemically or thermally blackened.	
Sampling and Acceptability	Indian Standard	IS: 6821
General requirements	Circlips shall comply with IS: 3075 in respect of requirements not covered in this standard.	

### 2.1 Referred Standards (Only the current versions are applicable)

IS: 1570 Part II	Schedule for wrought steels Part II Carbon steels (unalloyed steels)
IS: 3075	Dimensions for circlips
IS: 6821	Methods for sampling non-threaded fasteners.

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# PLANT STANDARD

HPBP TIRUCHIRAPALLI

BPS: 41902

PAGE 2 OF 4

## 3.0 DESIGNATION

A Circlip to this standard suitable for shaft diameter 20mm shall be designated as:

### 3.1 On Drawings:

- i) Material Specification column : IS: 3075-A
- ii) Description column : CIRCLIP LIGHT A 20
- iii) Drawing Number column : 4190202000
- iv) Material Code column : 4190200020

### 3.2 Ordering Description

For placing indents, issuing enquiries and on purchase order, the Ordering Description given below shall be followed.

Circlip A 20x1.2\* IS: 3075

## 4.0 ADDITIONAL INFORMATION

- \*4.1 While preparing Ordering Description, the corresponding thickness for shaft diameter shall be filled in referring from Table.

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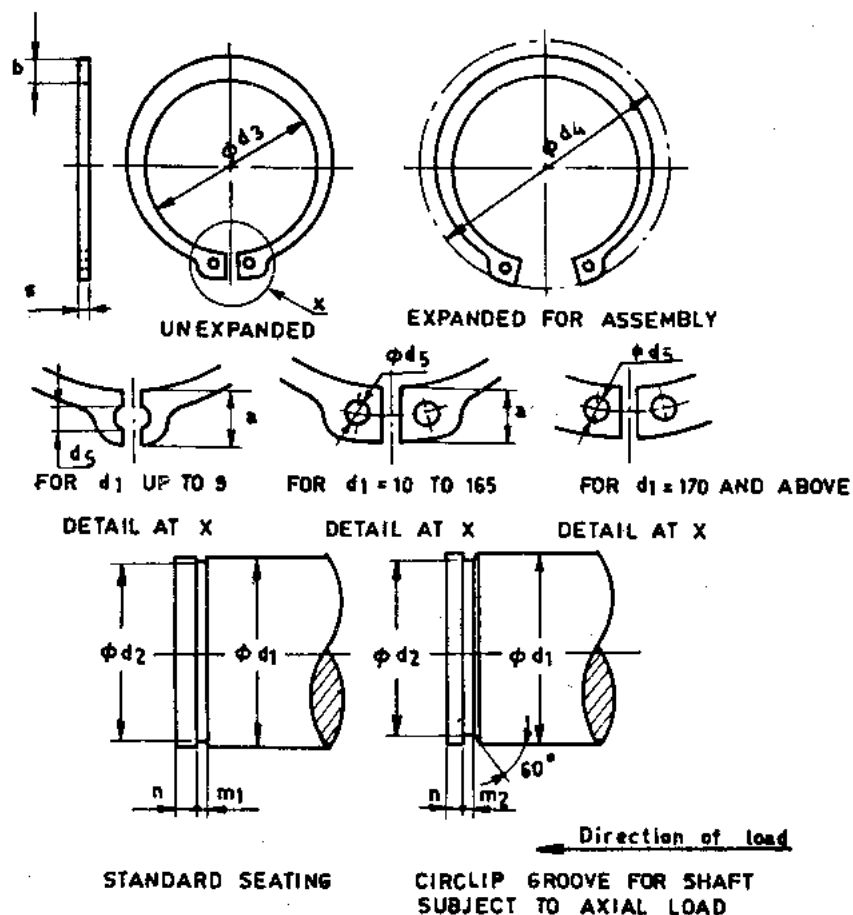
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PAGE 3 OF 4

**TABLE 1 - DIMENSIONS FOR INTERNAL CIRCLIPS, TYPE B - LIGHT SERIES**



(All dimensions in millimetres)

Bore dia $d_1$	Circlip							Bore groove					Axial force kgf
	s Min	a Max	b	$d_3$	Tol on $d_3$	$d_4$ Com- pres- sed	$d_5$ Min	$d_2$	Tol on $d_2$	$m_1$ H13	$m_2$ Min	n Min	
8	0.8	3.2	1.5	7.4	+0.09	15.2	1.2	7.6	h11	0.9	1.0	0.6	120
9			1.7	8.4	-0.18	16.4	1.2	8.6					138
10		3.3	1.8	9.3	+0.15 -0.30	17.6	1.5	9.6					153
12	1.0	3.5	1.8	11.0	+0.18 -0.36	19.6	1.7	11.5	h11	1.1	1.2	0.75 0.9 1.1 1.2	230
14			2.1	12.9		22.0		13.4					325
15			2.2	13.8		23.2		14.3					400
16			2.2	14.7		24.4		15.2					490
19	1.2	3.9	2.5	17.5		27.8		18.0				1.5	725
20			2.6	18.5		29.0		19.0					770
22			2.8	20.5		31.4		21.0					845
24			3.0	22.2		33.8		22.9					h12
25	3.0	23.2	34.8	23.9	1060								
28	3.2	25.9	38.4	26.6	1500								
30	1.5	5.0	3.5	27.9	+0.21 -0.42	41.0	2.5	28.6	h12	1.6	1.7	2.1 2.6 3.0	1620
32			3.6	29.6		43.4		30.3					2100
35			3.9	32.2		47.2		33.0					2670

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**PRODUCT ENGINEERING / V & SB  
TECHNICAL DELIVERY CONDITIONS FOR  
SUBDELIVERY COMPONENTS OF SOOT BLOWERS**

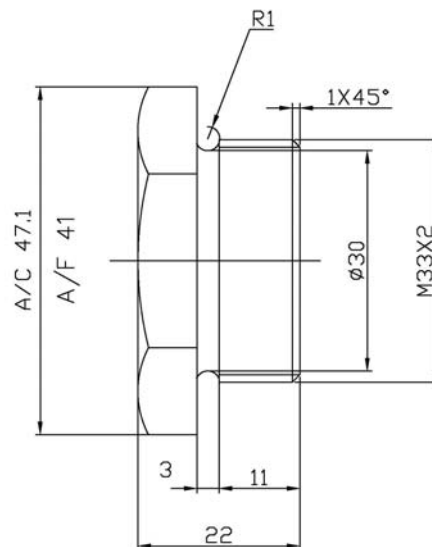
TSB : 064

Rev. 02

SHEET No. 01 of 01

**PLASTIC SCREW PLUG**

- 1.0 Component : Plastic Screw Plug.  
1.1 Material Code : 96 353 337 0000  
1.2 Application : It is used in Terminal Box of wall Deslagger for plugging the cable entry.  
2.0 Specification : Hex head Plastic Screw Plug. M33 x 2.  
2.1 Material : STYRON  
2.2 Dimensions : As per sketch shown below.  
3.0 Quantity : 4 Nos. per wall deslagger.  
4.0 Inspection : Inspection to be carried out by BHEL Inspectors at BHEL works, for dimensions, material etc.,  
5.0 Packing : To be packed and dispatched in card board boxes.  
6.0 Weight : No.01 kg/piece.



Rev:02 Dt.01/10/2011

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Prepared (J SANKAR)

Checked & Approved (K.SRIDHARAN)





**Product: CARBON & ALLOY STEEL FASTENERS (STUDS, BOLTS & NUTS) FOR VALVES, OIL FIELD EQUIPMENT (OFE) AND OTHER APPLICATIONS**

Revision Record: 00: 17.01.90: First issue. Rev: 01:21.06.90 Editorial corrections. Rev 02:21.04.91 TC for studs/bolts added. Rev 03: 04.04.96: Annexure I amended. CI 3.3.3 & 5.3 modified. Rev 04:20.10.96: NDT, Acid pickling added & re-written. Rev 05: 28.04.98: CI 3 modified to include MPI, certificate modified & CI 7.4 deleted. Rev 06:15.06.99: Title, CI 1 to 5 & 7.1 modified. CI 7.2 changed to CI 7.3. CI 7.3 changed to 7.4 and modified. CI 7.2 Galvanizing added. Test certificate sample format modified.  
Rev 07: 15/06/2017: TDC: 5:166 for CS & AS Nuts has been merged with this TDC. Totally revised in line with changed requirements and Xylan coating requirements added.  
Rev 08: 14/09/2019: CI 1.0, 2.0, 3.0, 4.0, 5.0 modified in line with API 6A 21<sup>st</sup> Ed 2018 Errata 1 and for better clarity.  
Rev.09: 19/02/2021: Latest version of the referred Standards/Specifications indicated throughout TDC; Cl.2.0 iid added; Cl.4.1 added; Annexure-1 modified;

## 1.0 MATERIAL SPECIFICATIONS:

All the codes, standards, specifications, drawings & procedures, etc., referred in this TDC shall be of latest revision as on the date of Purchase Order, unless specified otherwise.

Studs/Bolts - Alloy Steel	:	ASME SA 193-19 /ASTM A 193-20 Gr B7, B7M & B16.
Nuts - Carbon Steel	:	ASME SA 194-19 /ASTM A 194-20A Gr 2H & 2HM
Alloy Steel	:	ASME SA 194-19 /ASTM A 194-20A Gr 4 & 7
Additional Requirements	:	As listed below (Supplementary to the above material specifications)
Size and Quantity	:	As per Purchase Order (PO) & Applicable Drawing

## 2.0 GENERAL REQUIREMENTS:

- i. This TDC is applicable for Valves, OFE (API 6A 21<sup>st</sup> Ed 2018 Errata 3 Addendum 1 & API 16C 2<sup>nd</sup> Ed 2015 Addendum 1 Errata 4) and other applications including NACE MR0175 / ISO 15156:2015 Parts 1, 2 & 3. The products shall be manufactured to the relevant requirements specified in the applicable drawings, specifications, PO & this TDC.
- ii. Studs / Bolts / Nuts used for OFE application:
  - a. Studs / Bolts / Nuts shall be qualified and manufactured in accordance with BSL 1 of API 20E. The qualification & requalification records as per API 20E Ed 2017 Addendum 2 shall be maintained by the Supplier. The supplier shall prepare Manufacturing Process Specification(MPS) to include as a minimum allowable levels for all Studs/Bolts/Nuts manufacturing parameters including process control variables and heat treatment parameters as per API 20E Ed 2017 Addendum 2 and this TDC.
  - b. Raw material shall be fully wrought. Reduction ratio based on starting material diameter shall be a minimum of 4:1. The steel shall conform to the respective material specifications. Intentional addition of Boron is not allowed. All elements intentionally added to the heat shall be reported in the Test Certificate.
  - c. Furnace calibration shall be in accordance with API 6A 21<sup>st</sup> Ed 2018 Annex M; SAE AMS 2750 Rev.F; or SAE AMS H6875 Rev.C. For induction or direct resistant heat treatment, calibration shall be in accordance with manufacturer's written procedure. For forging furnaces, calibration shall be in accordance with manufacturer's written procedure
  - d. Heat lot:
    - Batch furnace: bolting or raw material of a single heat and diameter, heat treated together as a single austenitizing, quenching, tempering, and stress-relieving charge.
    - Continuous furnace: bolting or raw material of a single heat and diameter heat treated without interruption in a continuous charge
- iii. Nuts shall be hot/cold forged or manufactured from hot rolled/cold drawn bars. If made from





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hexagonal bars, 100% MT is to be done on bars as per ASTM E709-15 to ensure freedom from surface/sub-surface defects.

- iv. Hot rolled & cold drawn bars, if used (for studs/bolts or nuts), shall be machined at least 2 mm (minimum) in radius (i.e. 4 mm in diameter) to remove the seams completely. After machining, at least 10% of the bars shall be tested by MPI as per ASTM E709-15 to ensure freedom from surface/sub-surface defects.
- v. Heat treatment of finished studs/bolts shall be carried as per the material specification requirements for corresponding grades. For heat treatment of finished components, salt bath or controlled atmosphere furnace shall be used. After heat treatment, the threads shall be thoroughly cleaned to remove all deposits. If acid pickling is done for cleaning, it shall be as per Cl. 6 (v) of this TDC.
- vi. Cadmium Plating (Cl 6 (i) of this TDC), Electroplating (Cl 6 (ii) of this TDC) and/or Xylan Coating (Cl 6 (iii) of this TDC) shall be done on the fasteners if specified in Drawing/PO. For all other cases, rust preventive coating (Cl 6 (iv) of this TDC) shall be done.

**3.0 CHEMICAL, MECHANICAL PROPERTIES & NDE:**

- i. Mill certificate from steel manufacturer for conformance to chemistry heat-wise shall be submitted. Additionally, product analysis shall be done on one sample/heat by the stud/bolt/nut manufacturer. Methods and practices for chemical analysis shall be in accordance with ASTM A 751-20.
- ii. The microstructure and macrostructure shall conform to the requirements of the respective material specifications.
- iii. **Tensile Testing for Studs/Bolts:** One tensile test/heat/size/ HT batch shall be carried out in the finished heat treated condition as per SA / A 193 and shall meet the material specification requirements for corresponding grades.
- iv. **Hardness Testing for Studs/Bolts:**

Hardness testing, including specimen preparation, shall be performed in accordance with ASTM A 370-20 including Annex A3, except that testing shall also be in conformance with ASTM E10-18 or ASTM E18-20.

- a) **For ASME SA 193-19 / ASTM A 193-20 Gr B7 & B16:** Hardness check shall be carried out on finished stud/ bolt as per ASME SA 193-19 / ASTM A 193-20, at least on 10% of the finished studs/bolts.  
Gr B7: Hardness: 25 to 34 HRC or 253 to 319 HBW.  
Gr B16: Hardness: 25 to 35 HRC or 253 to 321 HBW.
- b) **For ASME SA 193-19 / ASTM A 193-20 Gr B7M:**  
Hardness check on 100% of studs/bolts as per SA193.  
Gr B7M: Hardness: 94 to 99 HRB or 201 to 235 HBW.

**v. Mechanical Testing for Nuts:**

- a) **For ASME SA 194-19 / ASTM A 194-20A Gr 2H, Gr 4, & Gr 7:**  
Hardness check on finished nuts shall be as per ASME SA 194-19 / ASTM A 194-20A (including quantum of testing).  
Gr 4: Hardness: 24 to 35 HRC or 248 to 327 HBW.  
Gr 2H & Gr 7: Hardness: 24 to 34 HRC or 248 to 319 HBW.
- b) **For ASME SA 194-19 / ASTM A 194-20A Gr 2HM:**  
Hardness check on 100% of finished nuts shall be carried out as per ASME SA 194-19 /





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ASTM A 194-20A.  
Gr 2HM: Hardness: 159 to 235 HBW.

- c) **Proof load test shall be done as per ASME SA 194-19 / ASTM A 194-20A for all grades of nuts** and shall meet the requirements of corresponding grades of the material specification.
- d) After final heat treatment, sample nuts shall be heat treated as per Table 1 and meet the corresponding hardness requirements.

**Table 1.**

Grade	Temperature (°C)	Soaking Time (Hr)	Cooling	Minimum Hardness (HBW) at room temperature
2H	540	24	Slow Cool	179
2HM	540	24	Slow Cool	159
4, 7	590	24	Slow Cool	201

- e) **Cone Stripping Test:** This test shall be performed as per ASME SA 194-19 / ASTM A 194-20A in case of visible surface discontinuities. On such cases Proof load shall be as per ASME SA 194-19 / ASTM A 194-20A.
- vi. **NDE:**  
Magnetic particle inspection shall be carried out as per ASTM E709-15 in at least 10% of the finished studs/bolts of all grades. Cracks, linear indications (length  $\geq$  3 times its width) are unacceptable.

#### 4.0 SAMPLING INSPECTION:

All inspection shall be in accordance with relevant drawing or BPS (Boiler Plant Standard), PO, this TDC and ASME SA 193-19 / ASTM A 193-20 for studs/bolts and ASME SA 194-20 / ASTM A 194-20A for nuts. The threads shall be checked with calibrated ring gauges for studs/bolts & plug gauges for nuts in the final heat treated condition for black variety and *prior to* final plated/coated condition for the cadmium plated/electroplated/ xylan coated items.

Visual, dimensional checks and their acceptance shall be as per applicable drawing and ASME SA 193-19 / ASTM A 193-20 for studs/bolts & ASME SA 194-20 / ASTM A 194-20A for nuts.

#### 4.1 Gauging Requirements for Xylan along with Zinc Coated Fasteners

- i. **Studs**
- No under sizing is allowed
  - Prior to Xylan and Zinc Coating, Class 2A Gauge to be used for inspection
  - After coating, No Gauge inspection is required
- ii. **Nut**
- Under sizing is allowed to maximum of 0.2mm in the internal diameter of threads
  - Prior to under sizing, Class 2B Gauge to be used for inspection
  - After under sizing, a gauge having an allowance as per Class 2B along with 0.2mm under sizing allowance to be made and inspected thereof
- iii. **Assembly of Stud and Nut**
- Free run of nut over stud to be ensured
  - No play is allowed
  - After free run of nut over stud, Xylan coating should not get peeled off.

#### 5.0 MARKING & PACKING:

- Punch/emboss each finished component with applicable material grade (B7/ B7M/ B16 for studs/bolts; 2H/2HM/4/7 for nuts) and supplier's emblem. Studs/bolts of grade B7M and nuts of Gr 2HM shall have a line under the grade symbol.
- Punch/emboss serial number also in B7M studs/bolts and Gr 2HM nuts in addition to the above, to correlate with hardness. Protect the threaded ends with plastic end caps. Pack in wooden





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box/ gunny bag of convenient size for easy handling and transportation. Mark quantity in each box/gunny bag.

- iii. In addition to the above, studs / Bolts / Nuts for OFE applications shall be marked with unique heat lot identification and followed by "20E1". Each piece 1 in. nominal diameter and larger shall be marked. For studs / Bolts / Nuts less than 1 in. nominal diameter, the studs / Bolts / Nuts shall be securely containerized to maintain heat lot identification and traceability. Multiple heat lots shall not be mixed in a single container. Containers used in the processing, storing, and shipping of studs / Bolts / Nuts not individually marked shall be clearly labeled with all marking information required by the relevant material specifications and API 20E Ed 2017 Addendum 2.

## 6.0 SPECIAL REQUIREMENTS:

### i. CADMIUM PLATING:

- Clean the fasteners to make them free from rust, grease, oil, scale, etc., before plating. When pickling is considered essential, it shall be done as per Cl 6 (v) of this TDC.
- Apply Cadmium Plating to the specified thickness on specified areas. Thickness shall be measured on 5% of the PO quantity of fasteners.
- After plating, bake the parts at 175°C to 205°C for a minimum period of 3 hours. The elapsed time between plating and baking shall not exceed 8 hours.
- Apply a Chromate Conversion coating after plating and baking.

### ii. ELECTROPLATING OF ZINC CHROMATE:

- Clean the fasteners to make them free from rust, grease, oil, scale, etc., by suitable organic solvents/ hand tool methods before electroplating. Then, pickling shall be done as per Cl 6 (v) of this TDC.
- The fasteners shall then be electroplated as per the method and to the minimum coating thickness specified in the applicable drawing. Thickness shall be measured on 5% of the PO quantity of fasteners.
- All electroplated parts (regardless of strength level) shall be baked within 2 hours after plating at 375 °F–425 °F (191 °C–218 °C) for 8 hours minimum at temperature

### iii. XYLAN COATING:

- Clean the fasteners by blast cleaning to Sa2.5 to make them free from rust, grease, oil, scales, etc., before xylan coating.
- The fasteners shall then be xylan coated as per the requirements and to the minimum coating thickness specified in the applicable drawing.
- Tests for Xylan Coating:**

The following test shall be carried out on Xylan coated fasteners and results to be reported in the Test certificate (in addition to the Test Certificate for the fastener material and other inspections requirements):

#### i) Thickness measurement:

Dry film thickness of Xylan coating to be measured using a magnetic induction or Eddy current type electronic gauge and the reading shall meet the drawing/PO requirement for thickness of coating of Xylan 1070. The thickness measurements shall be made in accordance with ASTM D7091-20. Thickness shall be measured on 5% of the PO quantity of fasteners.

#### ii) Cure Test:

This test method is for ensuring the completeness of cure of Xylan 1070 coating by evaluating the resistance of the cured coating to a solvent known to attack uncured film. The testing method shall be as per Whitford test method 115B (as recommended by the Xylan coating supplier).

**Acceptance criteria:** No white precipitate or stain shall be available after the test.

#### iii) Adhesion Test using Cross-hatch and Cello Tape:





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Test as per ASTM D3359-17 Method B for measuring Adhesion by Tape Test.  
**Acceptance Criteria:** No loss of adhesion (5B Classification).

**iv) Salt Spray Test:**

Xylan coated fasteners should pass a minimum requirement of 500 hours of salt spray test as per ASTM B117-19. Certificate of compliance for meeting the salt spray test requirements shall be provided.

**iv. RUST PREVENTIVE FLUIDS/COATING REQUIREMENTS:**

- a) Clean the fasteners to make them free from rust, grease, oil, scale, etc., by hand tool/ manual cleaning method.
- b) Apply one coat of rust preventive fluid, of any of the following brands of the suppliers (Table 2), to obtain dry film thickness of 20 microns minimum:

**Table 2. Rust Preventive Fluid/Coatings Brands**

SI No	Brand/Chemical	Supplier Name and Address
1	BONITA-RPF	M/s Bonita Chemicals, 64, Industrial Estate, Nunhai, Agra-282 006
2	CHAMPION-RPF	M/s Guardian Chemicals, 8, Rajaji Ind st, West Lake Area, Nungambakkam, Madras-600 034
3	ECONOL RPF (non-drying type)	M/s Process Aids, Bangalore
4	TECTYL 506	M/s Plastipeel Chemicals and Plastics (P) Ltd, Thane-400 604
5	TRPF	M/s Sundaram Paints Pvt. Ltd., Thanjavur-613 004
6	TRPF	M/s Solar Paints, Pudukkotai.
7	WICOR-P	M/s Western India Paint and Color Co P. Ltd, Madras-600 017

Use of any other brand/chemical shall be done with the prior approval of BHEL.

**v. ACID PICKLING:**

- a) Wherever pickling done, it shall be done using Hydrochloric acid of 5-10% concentration for a period of 5 to 10 minutes at room temperature with suitable inhibitor.
- b) After pickling thorough rinsing shall be carried out with water to remove acid residues & further DM water rinsing. After thorough rinsing with DM water, the rinsing shall not show any red color (free acidity) when tested with methyl orange indicator.

**7.0 CERTIFICATION:**

The manufacturer shall provide Test Certificates (TC) duly countersigned by the Authorized Inspecting Authority nominated by BHEL in P.O. (if specified) along with raw material TC from Steel Maker. *The applicable versions of the referred Codes, Standards and Specifications shall be reported in the Test Certificates and NDE reports.* Manufacturer's TC shall contain the following details as per the sample format attached as Annexure-1 to this TDC:

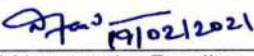
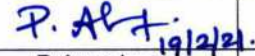
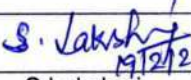
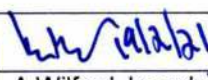
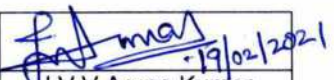
- i. BHEL PO No & PO Date
- ii. Technical Delivery Condition (TDC) No & its Revision No, Drawing & its revision no
- iii. Melt/Heat No, Serial No (if applicable)
- iv. Raw Material TC Number and Date
- v. Chemical and Mechanical properties for Studs/Bolts and Nuts *including the location and orientation of test specimens*
- vi. Heat treatment details (temperature, time, cooling medium, etc.)
- vii. *NDE reports with NDE Personnel qualification records, all relevant NDE operating parameters and NDE Results with reference and acceptance criteria*
- viii. Type of Surface coating & its coating thickness – Cadmium Plating, Chromate conversion coating, Electroplating, Xylan Coating, Rust preventive coating, etc.
- ix. Test methods and results on Xylan Coating
- x. Baking details for cadmium plating, electroplating & Xylan coating
- xi. Manufacturers' identification mark
- xii. Certify soundness & confirmation to PO requirements.



BHEL – Tiruchirappalli - 620014, India.  
Quality Assurance Department  
TECHNICAL DELIVERY CONDITIONS

DOC No: TDC:5:164 Rev: 09  
Effective Date: 19/02/2021  
Page: 6 of 7

Product: CARBON & ALLOY STEEL FASTENERS (STUDS, BOLTS & NUTS) FOR VALVES, OIL FIELD EQUIPMENT (OFE) AND OTHER APPLICATIONS

 19/02/2021	 19/2/21	 19/2/21		 19/02/2021
N Nagamuthu Pandian	P Arun kumar	S Lakshmi	A Wilfred Joseph	J V V Aruna Kumar
Manager/QA	DM / Valves Engg	DGM/QA	AGM / Valves/MM	SDGM / QA
Prepared By	Reviewed By			Approved By





Product: CARBON & ALLOY STEEL FASTENERS (STUDS, BOLTS & NUTS) FOR VALVES, OIL FIELD EQUIPMENT (OFE) AND OTHER APPLICATIONS

**Annexure-1. Test certificate for Studs/Bolts & Nuts– Sample format**

TC No:	Date:
Customer :	PO No./ Amd :
TDC No./Rev.:	DC No. :
Product :	Drg. No./Rev :
Description : (Spec, dia, pitch, length)	Thread Spec. :
Quantity :	
<u>Requirement</u> :	<u>Records/ Observation</u>
Size of bar - Before machining :	
- After machining :	
Type of furnace used for hardening :	

<b>TDC Clause no.</b>	Raw Material mill TC No: Melt/Heat Number:	TC Date: Reduction Ratio:
<b>2.0 &amp; 3.0</b>	<b>a) Heat Treatment Details:</b> Hardening Temperature: °C; Soaking time: Cooling Medium: Tempering Temperature: °C; Soaking time: Cooling Medium: <b>b) Additional Tempering for Nuts (after final tempering):</b> Temperature: °C; Soaking time: Cooling Medium:	
<b>3.0</b>	<b>a) Product analysis for chemistry</b>	
	<b>Report No &amp; Date:</b>	
	Spec	C Mn P S Si Cr Mo V Ni Others
	Min.	
	Max.	
	Actual	
	<b>b) Tensile test after H &amp; T and final drying (Finished heat treated condition) – For Studs/Bolts</b>	
		UTS (MPa) YS (MPa) %Elongation %Red in Area
	Reqd/Spec Value	
	Test result	
	Spec Value Test result Remarks	
	c) Hardness Test Result (for Studs/Bolts, Nuts):	
	d) Hardness Test Result (for Nuts after 24 hrs of tempering):	
	e) Proof load (kN) for nuts & result	
	f) Result of Cone Stripping test for nuts	
	g) NDE Result for Studs/Bolts:	
<b>4.0</b>	Visual and dimensional checking as per applicable drawing for studs/bolts & nuts:	
<b>5.0</b>	Punching details (identification): End cap for threaded portion:	
<b>6.0</b>	<b>a) Type of coating:</b> Cadmium Plating /Chromate Conversion / Electroplating/ Xylan /Rust preventive coating (Tick applicable coating) <b>Coating thickness/DFT:</b>	
	<b>b) Tests for Xylan Coating</b>	
	<b>Results</b>	
	<b>c) Pickling Acid:</b> Concentration: Drying after pickling. Temperature: °C; Soaking time:	

This is to certify that the above results are correct and the parts meet specification and PO requirements.

Signature with date Supplier: In-charge of Quality	Signature with date BHEL / Authorized Inspection Agency
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Note: Additional Sheets may be attached, if required.



# भारत हेवी इलेक्ट्रिकल्स लिमिटेड

(भारत सरकार का उपक्रम)

इंडस्ट्रियल वाल्वस प्लांट

## Bharat Heavy Electricals Limited

(A Govt. of India Undertaking)

### Industrial Valves Plant

#### Quality Assurance Plan for Fasteners\*:

NUT, BOLT (INCL EYE BOLT, LIFTING EYE BOLT), STUD

BHE:QAP:FAS:02

Dt: 15.03.2019

SN	Stage of inspection	Inspection type		Ref doc	Quantum of check	Format of Record	Agency	
							M	BHEL/TPIA
1	Raw material	Chemical/Mechanical properties		Material test certificate	100%	MTC report	V	V
2	Finished product	Chemical Analysis	Chemical composition	Material specification in drg	one sample per heat	Annex 1 of TDC	P	W
		Mechanical Properties	Tensile strength	Material specification in drg	one sample per heat	Annex 1 of TDC	P	W
			Mechanical testing for nut		10% or 20 nos hardness check at manufacturer end, one sample each type per heat for TPIA or BHEL**			
			Hardness					
		Dimension	As per drawing, Thread with GO/ NO GO Gauge	Material drg/BPS	10% or 20 nos/type.	Inspection report	P	P
		Visual	Free from burrs, physical damages		100%	Annex 1 of TDC	P	P
		MPI	ASTM E709	As per procedure	10% or 20 nos/type.	MPI report	P	W
Marking/Identification	Material grade/supplier name or symbol	As per PO/Drawing/TDC	10%	Annex 1 of TDC	P	W		

*Vid*  
15/03/19  
(MKS/WHK)

*S. R. Kanungo*  
15/03/19  
(Cannr Sh)

*S. R. Kanungo*  
15/03/19  
S.R. Kanungo





# भारत हेवी इलेक्ट्रिकल्स लिमिटेड

(भारत सरकार का उपक्रम)

इंडस्ट्रियल वाल्वस प्लांट

## Bharat Heavy Electricals Limited




(A Govt. of India Undertaking)

### Industrial Valves Plant

3	Rust preventive oil		As per TDC:5:164	100%	Annex 1 of TDC	P	W
	Packing	Packed in wooden/cardboard box with layer to layer cushioning material.		10%	Annex 1 of TDC	P	W
	Test certificate	MTC			Annex 1 of TDC	P	V

M-Manufacturer, V-Verification, W-Witness, P-Perform

- \* QAP IS PREPARED TO MEET REQUIREMENT OF TDC:5:164 (latest),.PLS REFER IT, IN CASE OF AMBIGUITY ARISES.
- \*\* TPIA/BHEL MAY INCREASE SAMPLE QTY UP TO 10%.

 15/03/19 <b>Vikas Kumar</b> Sr. Engr / QM Prepared	 15/03/19 <b>Samir Shandilya</b> Sr Mgr/ QM &HSE Reviewed	 15/03/19 <b>S R Kenny</b> AGM/QM, HSE, Engg, TEC & SM) Approved
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