



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

TSB : 046

Rev. 05

SHEET No. 01 of 01

HEXAGONAL HEAD SCREW

1. Component : Hexagonal Head Screw
2. Material Code : 21 017 049 0000
3. Application : Used in Wall Deslagger for mounting SQ-'D' Limit Switch with limit switch mount.
4. Specification : Hexagonal Head Screw 1/4" – 20 UNC, 3/4" long (OVER ALL) cadmium plated.
Material : Steel conforming to property class 8.8 according to IS:1367–1967.
5. Inspection : Inspection to be carried out by BHEL Inspectors at BHEL works – For dimensions as per specification above.
6. Quantity : 2 nos. per wall Deslagger.
7. Spares : 5% extra to be added as manufacturing reserve
8. Packing : To be packed and despatched in card board boxes
9. Approximate weight : 0.006 kg/piece

Rev:05 Dt.20/09/2008.

HEX. HEAD SCREW WAS HEX. HEAD CAP SCREW.

Prepared (K.SRIDHARAN)

Date:
20 / 09 / 2008.

Approved (S. NATARAJAN)



PLANT STANDARD

HPBP TIRUCHIRAPALLI

BPS: 41201

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Based on IS: 1366-1982

SLOTTED CHEESE HEAD SCREWS

1.0 SCOPE

Covers the requirements of Slotted Cheese Head Screws in the size range M1.6 to M10.

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: 1366 in respect of requirements not covered in this standard	

2.1 Referred Standards (Only the relevant parts of 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

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3.0 DESIGNATION

A Grade A Slotted Cheese Head Screw to this standard of thread size M6 and nominal length 30mm 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 : 4120106030
- iv) Material Code column : 4120106030

3.2 Ordering Description

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

Cheese Head Screw M6x30 IS: 1366-4.8

4.0 ADDITIONAL INFORMATION

4.1 Property class 6.6 is also acceptable

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

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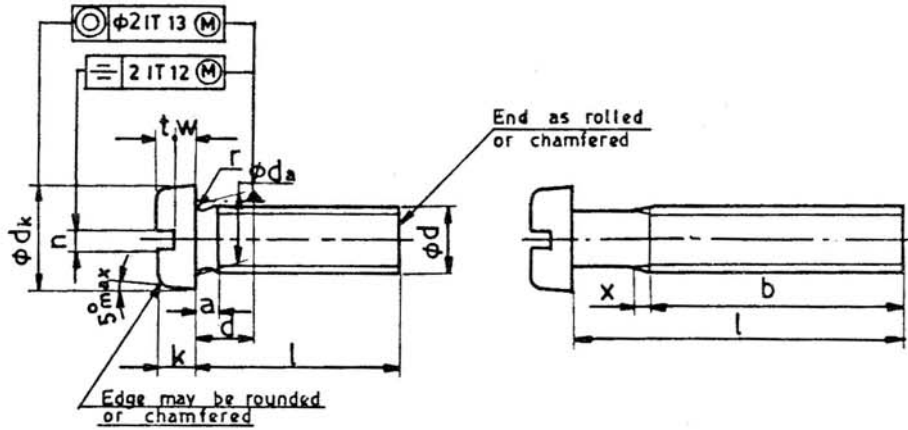


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HPB1

TABLE 1 DIMENSIONS OF HEAD SCREWS

(All dimensions are in mm)



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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
	Min	1	1.3	2	2.6	3.3	3.9	5	6
k	Max	0.86	1.16	1.86	2.46	3.12	3.6	4.7	5.7
	Min	0.6	0.7	1	1.51	1.51	1.91	2.31	2.5
n	Max	0.46	0.56	0.86	1.26	1.26	1.66	2.06	2.5
	Min	0.1	0.1	0.1	0.2	0.2	0.25	0.4	0.4
r	Max	0.4	0.55	0.8	1.1	1.3	1.6	2	2.4
	Min	0.35	0.45	0.8	1.1	1.3	1.6	2	2.4

Note:

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

TABLE PREFERRED LENGTH-SIZE COMBINATION
FOR SLOTTED HEX HEAD SCREWS

(All dimensions are in millimetres)

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 line are threaded up to the head ($b=l-a$)
2. Sizes in brackets are non-preferred.
3. Preferred lengths are in between the stepped bold lines.
4. For stocked sizes refer BPS components book-let.
5. Weights are given in Kg. per 1000 numbers only.



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BPS: 41202

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Based on IS: 2269-1981

HEXAGON SOCKET HEAD CAP SCREWS

1.0 SCOPE

Covers the requirements of Hexagon 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 (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: 2269 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: 2269 Specification for hexagon socket head cap screws
- IS: 2614 Methods for sampling of fasteners
- IS: 4218 ISO Metric screw threads

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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:

- i) Material specification column : IS: 2269
- ii) Description column : SCRU CAP SOC GR A -3.8-M10x60
- iii) Drawing Number column : 4120210060
- iv) 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 cadmium plated hexagon socket head cap screws, refer BPS: 41242.

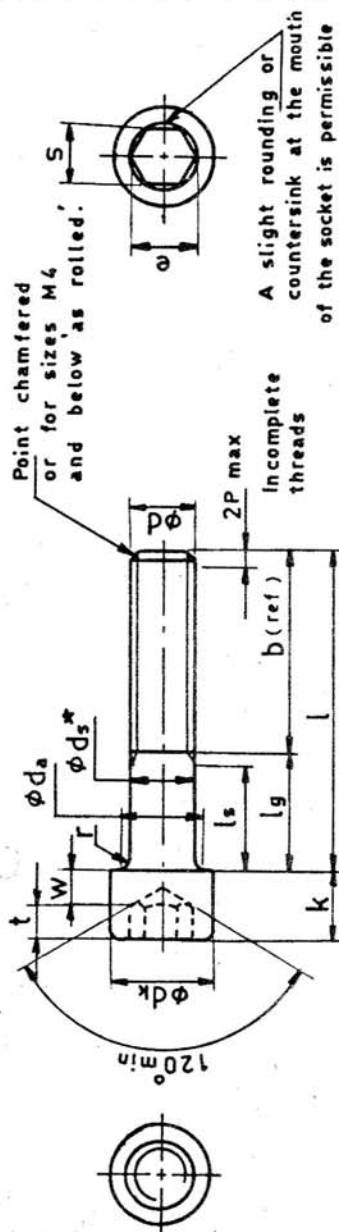
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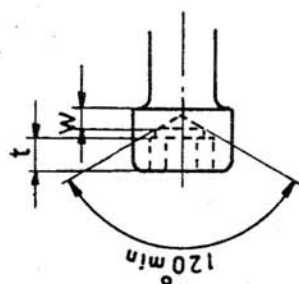
HEXAGON SOCKET HEAD CAP SCREWS

(Figure)

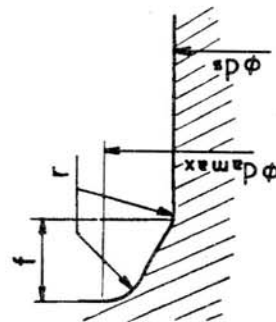


d_s^* Applies to positive value of l_s

Bottom edge of head may be rounded or chamfered to d_w but in every case must be deburred.



PERMISSIBLE ALTERNATE FORM OF SOCKET



MAXIMUM UNDER HEAD FILLET

$$f_{Max} = 1.7 r_{Max}$$

$$r_{Max} = \frac{d_a - d_s}{2}$$



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TABLE 1 - DIMENSIONS FOR HEXAGON SOCKET HEAD CAP SCREWS
(All dimensions in millimetres)

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	Ref	20	22	24	28	32	36	44	52	60	72
d _k	* Max	7.0	8.5	10.0	13	16	18	24	30	36	45
	** Max	7.22	8.72	10.22	13.27	16.27	18.27	24.33	30.33	36.39	45.39
	Min	6.78	8.28	9.78	12.73	15.73	17.73	23.67	29.67	35.61	44.61
d _a	Max	4.7	5.7	6.8	9.2	11.2	14.2	18.2	22.4	26.4	33.4
d _g h13	Max	4	5	6	8	10	12	16	20	24	30
	Min	3.82	4.82	5.82	7.78	9.78	11.73	15.73	19.67	23.67	29.67
e	Min	3.44	4.58	5.72	6.86	9.15	11.43	16.00	19.44	21.73	25.15
	Max	0.60	0.60	0.68	1.02	1.02	1.87	1.87	2.04	2.04	2.89
k h13/h14	Max	4	5	6	8	10	12	16	20	24	30
	Min	3.82	4.82	5.70	7.64	9.64	11.57	15.57	19.48	23.48	29.48
r	Min	0.2	0.2	0.25	0.4	0.4	0.6	0.6	0.8	0.8	1.0
	Max	3	4	5	6	8	10	14	17	19	22
s h13	Min	2.52	3.02	4.02	5.02	8.025	10.025	14.032	17.05	19.065	22.065
	Max	2.58	3.071	4.084	5.084	8.175	10.127	14.159	17.216	19.275	22.275
	Min	1.3	2	2.5	3	4	6	8	10	12	15.5
v	Max	0.3	0.4	0.5	0.6	1	1.2	1.6	2	2.4	3
d _w	Min	5.07	6.53	8.03	9.38	15.53	17.23	23.17	28.87	34.81	43.61
	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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**TABLE 2 - PREFERRED LENGTH SIZE COMBINATIONS FOR
HEXAGON SOCKET HEAD CAP SCREWS**

(All dimensions in millimetres)

size d	size d													
	1			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

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Note:

- Preferred lengths are in between the stepped bold lines.
- For stocked sizes and weights refer BPS components book-let.
- Lengths above the dotted line are threaded to the head within $3 \times \text{Pitch}$. Lengths below the dotted line have values l_g and l_s according to the following formulae:
 $l_g \text{ Max} = l_{\text{Nom}} - b \text{ ref.}$
 $l_s \text{ Min} = l_g \text{ Max} - 5P.$

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BPS: 41205

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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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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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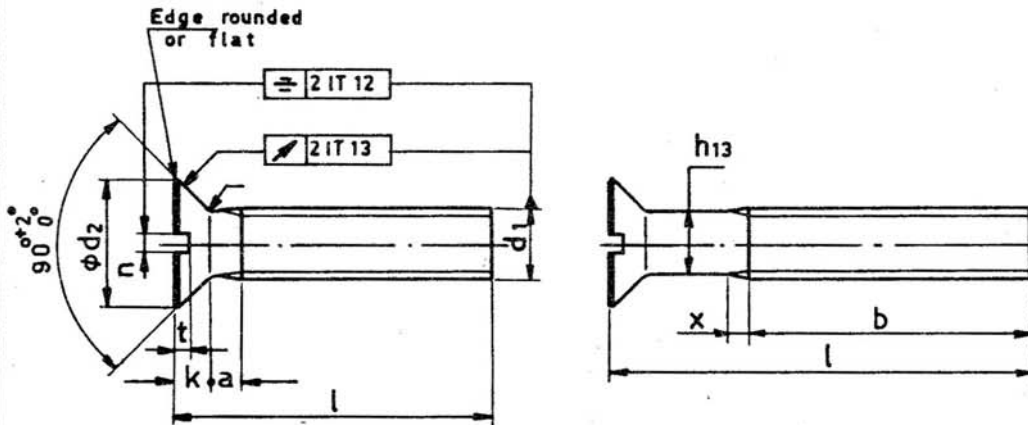
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TABLE-1 DIMENSIONS FOR SLOTTED COUNTERSUNK HEAD SCREWS



(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	35.38
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

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.

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

(All dimensions are in mm)

Nominal length 1 Js 15	Thread size d								
	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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BPS: 41222

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Based on IS: 1363(Part 2)-1984

HEXAGON HEAD SCREWS-PRODUCT GRADE C

(Property Class 4.6)

1.0 SCOPE

Covers the requirements for Hexagon Head Screws of product grade C in the size range M5 to M24.

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	C
	Indian Standard	IS: 1367(Part 2)
Thread	Pitch	Coarse
	Tolerance	8g
	Indian Standard	IS: 4218(Part 3,5 & 6)
Material	Steel	
Mechanical properties	Property class	4.6
	Indian Standard	IS: 1367(Part 3)
Sampling and Acceptability	Indian Standard	IS: 2614
General requirements	Screws shall comply with IS: 1363 in respect of requirements not covered in this standard	

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

IS: 1363 Specification for hexagon head bolts, screws & nuts (Part 2) of product grade C. Part 2 Hexagon head screws.

IS: 1367 Technical supply conditions for threaded steel fasteners

IS: 2614 Methods for sampling of fasteners

IS: 4219 ISO Metric screw threads

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3.0 DESIGNATION

A Grade C Hexagon Head Screw to this standard of thread size M12 and nominal length 60mm shall be designated as:

3.1 On Drawings:

- i) Material Specification column: IS: 1363
- ii) Description column : SCRU HEX GR C 4.6 -M12x60
- iii) Drawing Number column : 4122212060
- iv) Material Code column : 4122212060

3.2 Ordering Description

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

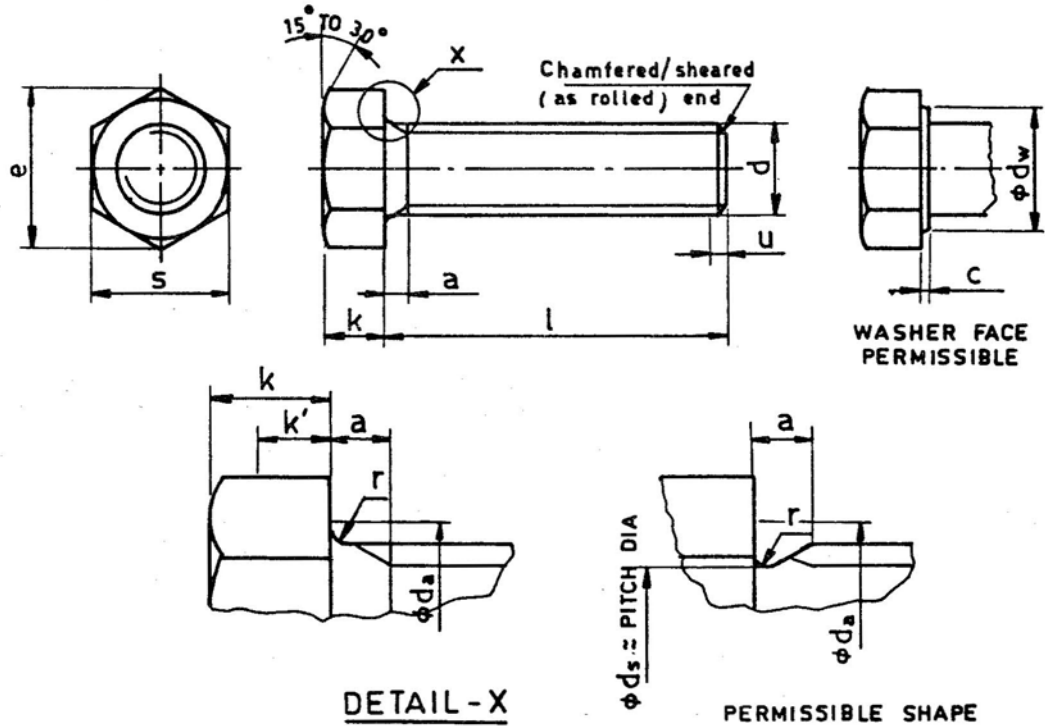
Hexagon Head Screw M12x60 IS: 1363(Part 2)-4.6

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TABLE 1 DIMENSIONS FOR HEXAGON HEAD SCREWS



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(All dimensions are in mm)

Thread size d	M5	M6	M8	M10	M12	M16	M20	M24
Pitch P	0.8	1	1.25	1.5	1.75	2	2.5	3
* a Max	3.2	4	5	6	7	8	10	12
c Max	0.5	0.5	0.6	0.6	0.6	0.8	0.8	0.8
da Max	6	7.2	10.2	12.2	14.7	18.7	24.4	28.4
d _w Min	6.7	8.7	11.4	14.4	16.4	22	27.7	33.2
e Min	8.63	10.89	14.20	17.59	19.85	26.17	32.95	39.55
	Nom	3.5	4	5.3	6.4	7.5	10	12.5
k Min	3.12	3.62	4.92	5.95	7.05	9.25	11.6	14.1
	Max	3.88	4.38	5.68	6.85	7.95	10.75	15.9
k' Min	2.2	2.5	3.45	4.2	4.95	6.5	8.1	9.9
r Min	0.2	0.25	0.4	0.6	0.6	0.6	0.8	0.8
s Max	8	10	13	16	18	24	30	36
	Min	7.64	9.64	12.57	15.57	17.57	23.16	29.16

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

* a Min not less than 1P.

k'=Effective gauging height.



PLANT STANDARD

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**TABLE 2 PREFERRED LENGTH-SIZE COMBINATIONS
FOR HEXAGON HEAD SCREWS**

(All dimensions are in mm)

Nominal length l			Thread size d							
Nom	Min	Max	M5	M6	M8	M10	M12	M16	M20	M24
10	9.10	10.90		4.4						
12	11.10	12.90								
16	15.10	16.90		5.5	11.2	20.8				
20	18.95	21.05			12.3	23.2				
25	23.95	26.05		7.4	14.3	25.9	37.3	71.3		
30	28.95	31.05			16.3		41			
35	33.75	36.25			18.3	31		85		
40	38.75	41.25					49.9	92.2		
45	43.75	46.25				38.5		100	167	264
50	48.75	51.25		14			58.7	108		
55	53.5	56.5						115	196	
60	58.5	61.5					68.2		208	
65	63.5	66.5							213	324
70	68.5	71.5								
(75)	73.5	76.5						138		
80	78.5	81.5								
90	88.25	91.75								
100	98.25	101.75					83.4			463
(110)	108.25	111.75						203		
(125)	123	127					92.9			

WEIGHTS

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Note:

- Sizes in brackets are non-preferred. (Not covered by IS:1363 - Part 2)
- Preferred lengths are in between the stepped bold lines.
- Weights are given in Kg per 1000 numbers only.
- For stocked sizes refer BPS components book-let.



PLANT STANDARD

HPBP TIRUCHIRAPALLI

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Based on IS:1364 (Part 2)-1983

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

1.0 SCOPE

Covers the requirements of 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 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

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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.

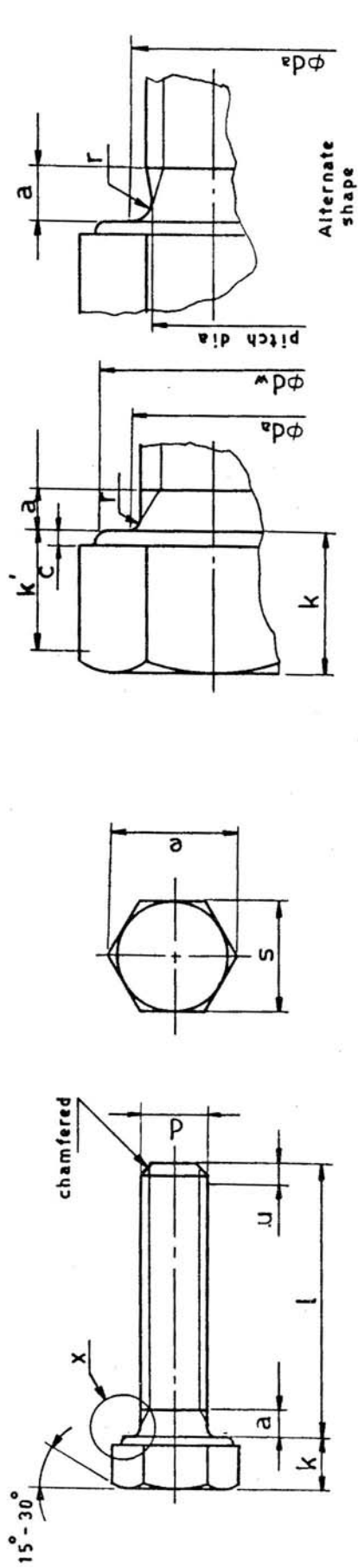
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TABLE - 1 DIMENSIONS FOR HEXAGON HEAD SCREWS



u according to CE of IS:1368. 'Dimensions of ends of bolts and screws'.
 k' = Effective gauging height.

DETAIL - X

(All dimensions are in mm)

Thread size d	a*		c		da		dw		e		+		k		k'		r		s		
	Max	Min	Max	Min	++	+	++	+	++	+	++	Max	Min	++	+	++	Max	Min	++	+	
M6	3	0.15	0.5	6.8	8.9	8.7	11.05	10.89	3.85	4.15	3.76	4.24	2.63	0.25	10	9.78	9.64				
M8	3.75	0.15	0.6	9.2	11.6	11.4	14.38	14.20	5.15	5.45	5.06	5.54	3.54	0.4	13	12.73	12.57				
M10	4.5	0.15	0.6	11.2	14.6	14.4	17.77	17.59	6.22	6.58	6.11	6.69	4.28	0.4	16	15.73	15.57				
M12	5.25	0.15	0.6	13.7	16.6	16.4	20.03	19.85	7.32	7.68	7.21	7.79	5.05	0.6	18	17.73	17.57				
M16	6	0.2	0.8	17.7	22.5	22	26.75	26.17	9.82	10.18	9.71	10.29	6.8	0.6	24	23.67	23.16				

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



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**TABLE - 2 PREFERRED LENGTH-SIZE COMBINATIONS
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			38.2		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					

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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 book-let.



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Based on IS:1364(Part 3)-83

HEXAGON NUTS, PRODUCT GRADE A

(Property Class 8)

1.0 SCOPE

Covers the requirements of Hexagon Nuts in the size range M3 to M16.

2.0 SPECIFICATION AND REFERENCE STANDARDS

Dimensions and preferred sizes		Table 1 of this standard
Tolerance	Product grade	A
	Indian Standard	IS: 1367 (Part 2)
Thread	Pitch	Coarse
	Tolerance	6H
	Indian Standard	IS: 4218(Part 3,5 & 6)
Material	Steel	
Mechanical properties	Property class	8
	Indian Standard	IS: 1367 (Part 6)
Sampling and Acceptability	Indian Standard	IS: 2614
General requirements	Nuts 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 Specification for Hexagon Head Bolts, Screws & Nut (Part 3) of product grade A & B: Part 3 Hexagon Nuts.

IS: 1367 Technical supply conditions for threaded steel fasteners

IS: 2614 Method of sampling fasteners

IS: 4218 ISO metric screw threads

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3.0 DESIGNATION

A Grade A Hexagon Nut to this standard of thread size M6 shall be designated as:

3.1 On Drawings:

- i) Material Specification column: IS: 1364
- ii) Description column : NUT HEX GR A 8-M6
- iii) Drawing Number column : 4132006000
- iv) Material Code column : 4132000006

3.2 Ordering Description

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

Hex Nut M6 IS: 1364 (Part 3) - 8

4.0 ADDITIONAL INFORMATION

- 4.1 For nuts of thread size M20 to M48x3, product grade B, refer BPS: 41301.
- 4.2 For Cadmium plated nuts, refer BPS: 41360

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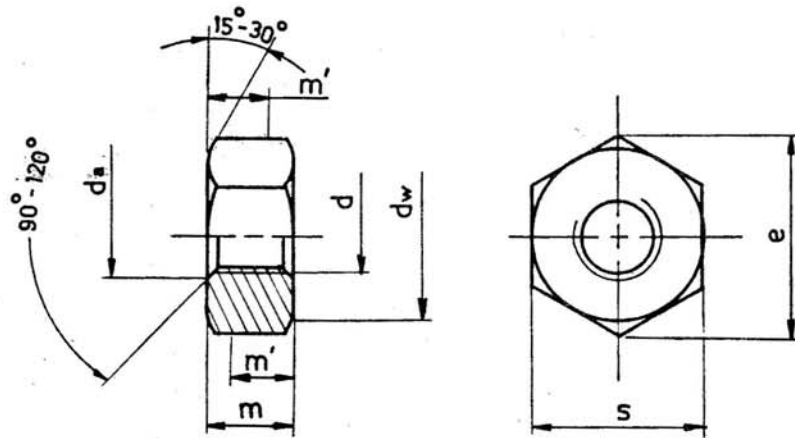
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TABLE 1 DIMENSIONS FOR HEXAGON NUTS



m' = Effective gauging height

(All dimensions are in millimetres)

Thread size d	d_a		d_w Min	e Min	m		m' Min	s		Weight
	Min	Max			Max	Min		Max	Min	
M3	3	3.45	4.6	6.01	2.4	2.15	1.72	5.5	5.32	0.4
M4	4	4.6	5.9	7.66	3.2	2.9	2.32	7	6.78	0.9
M5	5	5.75	6.9	8.79	4.7	4.4	3.52	8	7.78	
M6	6	6.75	8.9	11.05	5.2	4.9	3.92	10	9.78	2.5
M8	8	8.75	11.6	14.38	6.8	6.44	5.15	13	12.73	6.0
M10	10	10.8	14.6	17.77	8.4	8.04	6.43	16	15.73	11.6
M12	12	13.0	16.6	20.03	10.8	10.37	8.30	18	17.73	17.9
M16	16	17.3	22.5	26.75	14.8	14.1	11.28	24	23.67	33.5

NOTE:

- Weights are given in Kg per 1000 numbers only.
- For stocked sizes refer BPS components booklet.

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PLANT STANDARD

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BPS: 41405

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Based on IS: 3063-1972

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 AND REFERENCE STANDARDS

Dimensions and tolerances	Table 1 of this standard
Material	Suitable spring steel of tensile strength 700 MN/m ² Min. according to IS: 4072
Mechanical properties	Hardness 43-50 HRC
Finish	Natural finish
Sampling and 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

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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 orders, 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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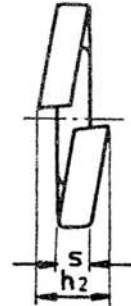
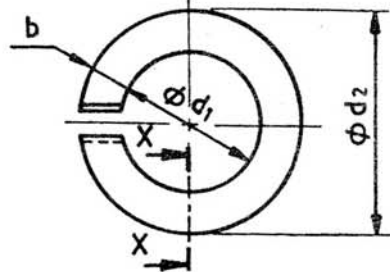
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TABLE 1 - DIMENSIONS FOR SPRING WASHERS



$h_2 = 2s$

SECTION XX

(All dimensions in millimetres)

Nom size	d_1		d_2 Max	b		s		r Nom	Weight	For bolt/ screw size
	Basic	Tol \pm		Basic	Tol \pm	Basic	Tol \pm			
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	44.30	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	67.30	M36
(39)	39.5	1.2	61.2	10.0	0.25	6.0	0.2	1.6	71.70	(M39)
42	42.5	1.2	68.2	12.0	0.25	7.0	0.25	2.0	111.00	M42
(45)	45.5	1.2	71.2	12.0	0.25	7.0	0.25	2.0	117.00	(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 Components booklet

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BPS: 41406

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Based on IS: 2016-1967

MACHINED WASHERS

1.0 SCOPE

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

2.0 SPECIFICATION AND REFERENCE 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 standard	

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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BPS: 41406

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3.0 DESIGNATION

A machined washer to this standard for bolt/screw size M10 shall be designated as:

3.1 On Drawings

- i) Material Specification column: IS: 2016
- ii) Description column : WASHER MCD 10
- iii) Drawing Number column : 4140610000
- iv) 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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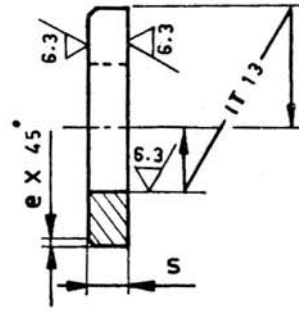
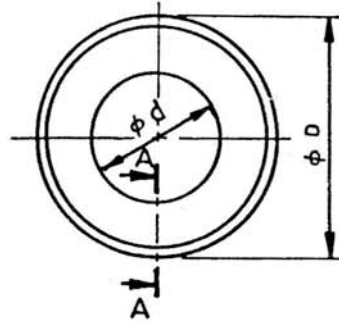
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EPS: 41406

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TABLE 1 - DIMENSIONS FOR MACHINED WASHERS



SECTION AA

(All dimensions are in millimetres)

d H12	D		s		e Nom	For bolt/ screw size	Weight
	Basic	Tol	Basic	Tol			
1.7	4	0 -0.3	0.3	+0.1 -0.1	0.1	M1.6	
2.2	5	0 -0.3	0.3	+0.1 -0.1	0.1	M2	
3.2	7	0 -0.3	0.5	+0.1 -0.1	0.2	M3	
4.3	9	0 -0.3	0.8	+0.1 -0.1	0.3	M4	0.3
5.3	10	0 -0.3	1.0	+0.1 -0.1	0.4	M5	
6.4	12.5	0 -0.4	1.6	+0.2 -0.2	0.6	M6	1.1
8.4	17	0 -0.4	1.6	+0.2 -0.2	0.6	M8	
10.5	21	0 -0.5	2	+0.2 -0.2	0.6	M10	4
13	24	0 -0.5	2.5	+0.3 -0.3	0.6	M12	6.2
17	30	0 -0.5	3	+0.3 -0.3	0.6	M16	11.1
21	37	0 -0.8	3	+0.3 -0.3	1.0	M20	16.7
25	44	0 -0.8	4	+0.3 -0.3	1.0	M24	31.7
(28)	50	0 -0.8	4	+0.3 -0.3	1.0	(M27)	41.7
31	56	0 -1.0	4	+0.3 -0.3	1.0	M30	52.9
(34)	60	0 -1.0	5	+0.6 -0.6	1.0	(M33)	

NOTE:

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

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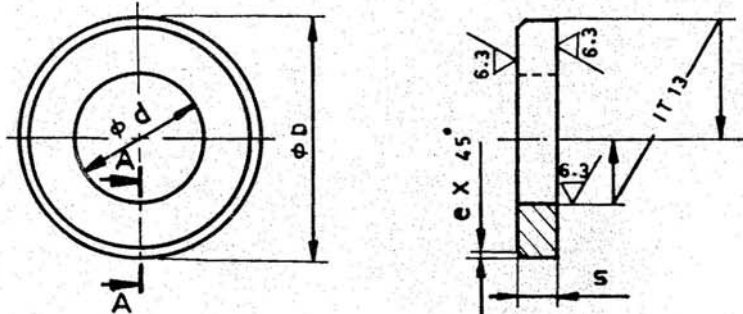
HPBP TIRUCHIRAPALLI

BPS: 41406

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TABLE 1 - DIMENSIONS FOR MACHINED WASHERS (Contd.)

12.5 / (6.3)



SECTION AA

(All dimensions are in millimetres)

d H12	D		s		e Nom	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:

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- For stocked sizes refer BPS Components booklet.

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PLANT STANDARD

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BPS 41408

Rev. No. 02

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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 IS 2016 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.

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Dt.

Year

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HPBP TIRUCHIRAPPALLI

BPS 41408

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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

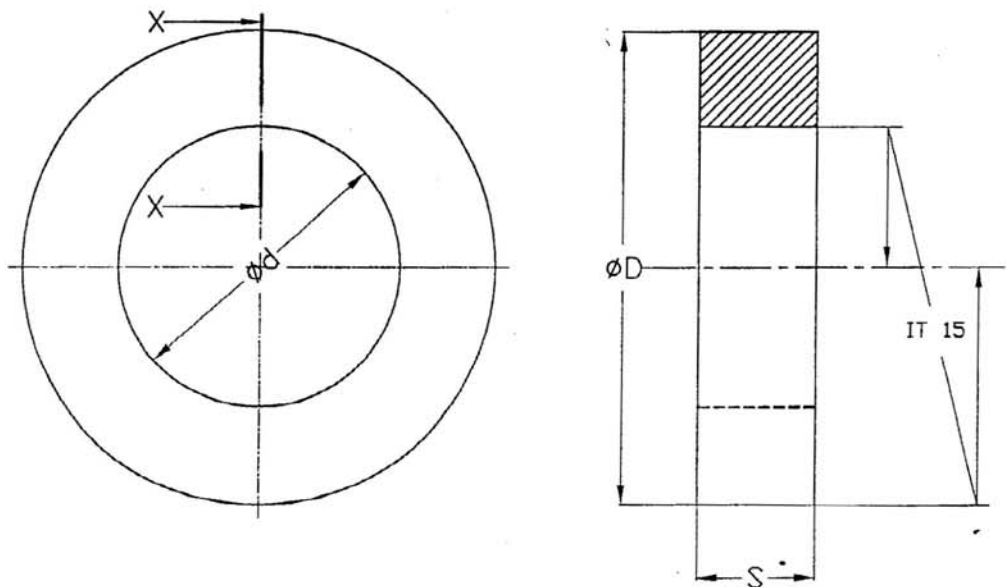


Table - 1

(All dimensions are in millimetres)

Size $\varnothing d$	$\varnothing D$ 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: 41411

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Based on IS: 5370-1969

PLAIN WASHERS - TYPE A

(Outside diameter \approx 3 x Inside diameter)

1.0 SCOPE

Covers the requirements for plain washers with outside diameter approximately equal to thrice inside diameter, type A (unmachined) in the size range 2.5 to 23 mm

2.0 SPECIFICATION AND REFERENCE 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: 5370 in respect of requirements not covered in this standard.	

2.1 Referred standards (Only the current versions are applicable)

IS: 5369 General requirements for plain washers and lock washers

IS: 5370 Specifications for plain washers with outside diameter \approx 3 x inside diameter

IS: 6821 Methods for sampling non-threaded fasteners

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3.0 DESIGNATION

A plain washer to this standard for bolt/screw size M16 shall be designated as:

3.1 On Drawings

- i) Material Specification column : IS: 5370-A
- ii) Description column : WASHER PLAIN A 16
- iii) Drawing Number column : 4141116000
- iv) Material Code column : 4141100016

3.2 Ordering Description

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

Washer A 17* IS: 5370-Steel

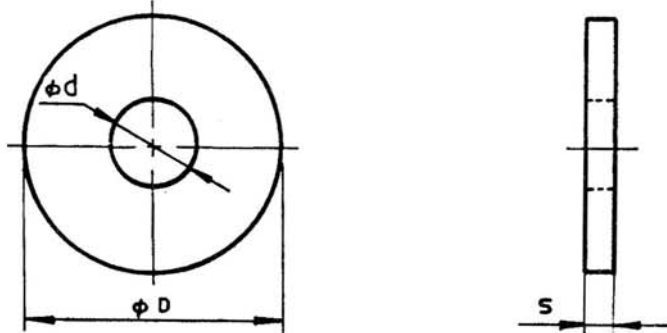
4.0 ADDITIONAL INFORMATION

- *4.1 While preparing Ordering Description, only the actual hole size (corresponding to bolt/screw size) shall be filled-in referring the Table.
- 4.2 Copies of this standard shall be enclosed alongwith the purchase order for size 23mm (suitable for M22).
- 4.3 For cadmium plated plain washers refer BPS:41451.

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TABLE 1 - DIMENSIONS FOR PLAIN WASHERS


(All dimensions in millimetres)

Nominal size d	D	s	For bolt/screw size	Weight
(2.5)	7	0.8	(M2.2)	
3.2	9	0.8	M3	
4.3	12	1.0	M4	
5.3	15	1.6	M5	
6.4	18	1.6	M6	
8.4	25	2.0	M8	6.8
10.5	30	2.5	M10	
13.0	40	3.0	M12	21.3
17.0	50	3.0	M16	37.8
21.0	60	4.0	M20	
23.0	68	4.0	(M22)	126.0

NOTE:

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

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PLANT STANDARD

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BPS: 41412

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Based on IS: 6735-1972

SPRING WASHERS

(For Screws with Cylindrical Head)

1.0 SCOPE

Covers the requirements for single coil square section spring washers in the size range 2 to 48mm.

2.0 SPECIFICATION AND REFERENCE STANDARDS

Dimensions and Tolerances	Table 1 of this standard	
Material	Suitable spring steel of IS: 4072 tensile strength 700 MPa	
Mechanical properties	Hardness 43-50 HRC	
Finish	Natural finish	
Sampling and Acceptability	Indian standard	IS: 6821
General requirements	Washers shall comply with IS: 6735 in respect of requirements not covered in this standard.	

2.1 Referred Standards (Only the current versions are applicable)

- IS: 4072 Specification for steel for Spring Washers
IS: 6735 Specification for spring washers for screws with cylindrical head
IS: 6821 Methods for sampling non-threaded fasteners

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3.0 DESIGNATION

A spring washer to this standard for bolt/screw size M12 shall be designated as:

3.1 On Drawings

- i) Material Specification column: IS: 6735
- ii) Description column : WASHER SPRING (CYL HD) SQ 12
- iii) Drawing Number column : 4141212000
- iv) Material Code column : 4141200012

3.2 Ordering Description

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

Spring Washer 12 IS: 6735

4.0 ADDITIONAL INFORMATION

- 4.1 These washers can be used for right hand threaded fasteners only.
- 4.2 These washers are intended for use with cylindrical head screws in counterbores application.

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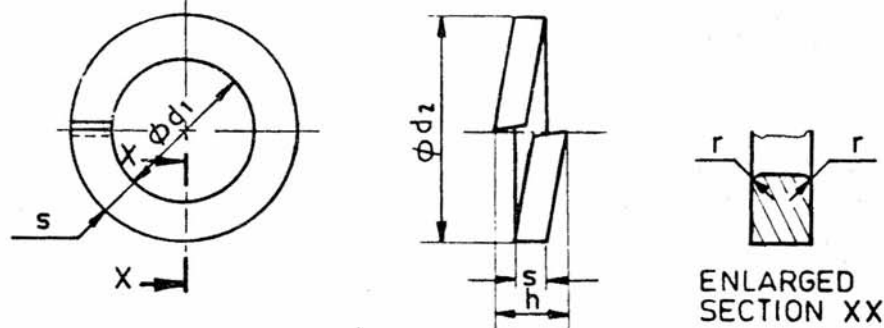
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BPS: 41412

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TABLE 1 - DIMENSIONS FOR SPRING WASHERS



(All dimensions are in millimetres)

Nom size	d1		d2 Max	h		s Nom	r		Weight	For bolt/screw size
	Nom	Tol (+)		Min	Max		Tol (+)	Nom		
2	2.1	0.3	3.4	1.2	1.40	0.9	0.1	0.1	0.033	M2
3	3.1	0.3	5.6	2	2.36	1	0.1	0.2	0.105	M3
4	4.1	0.3	7	2.4	2.83	1.2	0.1	0.2	0.195	M4
5	5.1	0.3	8.8	3.2	3.78	1.6	0.1	0.2	0.370	M5
6	6.1	0.4	9.9	3.2	3.78	1.6	0.1	0.3	0.425	M6
8	8.1	0.4	12.7	4	4.72	2	0.1	0.5	1.05	M8
10	10.2	0.5	16.0	5	5.9	2.5	0.15	0.8	1.96	M10
12	12.2	0.5	18.0	5	5.9	2.5	0.15	0.8	2.28	M12
16	16.2	0.8	24.4	7	8.25	3.5	0.2	1.0	5.94	M16
20	20.2	1.0	30.6	9	10.6	4.5	0.2	1.0	12.30	M20
24	24.5	1.0	35.9	10	11.8	5	0.2	1.6	18.10	M24
(27)	27.5	1.0	39.9	10	11.8	5	0.2	1.6	20.60	(M27)
30	30.5	1.2	44.2	12	14.2	6	0.2	1.6	32.0	M30
(33)	33.5	1.2	47.2	12	14.2	6	0.2	1.6	35.0	(M33)
36	36.5	1.2	52.3	14	16.5	7	0.25	1.6	52.5	M36
(39)	39.5	1.2	54.1	14	16.5	7	0.25	1.6	56.1	(M39)
42	42.5	1.2	60.3	16	18.9	8	0.25	2	80.0	M42
(45)	46.0	1.5	64.0	16	18.9	8	0.25	2	85.3	(M45)
48	49.0	1.5	67.0	16	18.9	8	0.25	2	90.0	M48

NOTE:

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

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BPS: 41501

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Based on IS: 2048-1983

PARALLEL KEYS - TYPE A

1.0 SCOPE

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

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	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 requirements not covered in this standard	

2.1 Referred Standards (Only the current versions are applicable)

IS: 2048 Specification for parallel keys and keyways

IS: 6821 Methods for sampling non-threaded fasteners

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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:

- i) Material Specification column: IS: 2048-A
- ii) Description column : KEY PRL RND END 12x8x56
- iii) Drawing Number column : 4150108056
- iv) 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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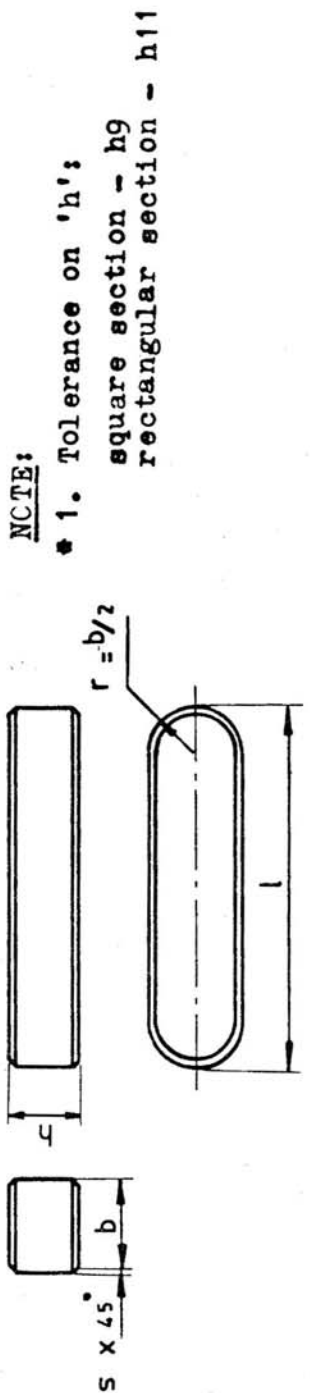
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TABLE 1 - DIMENSIONS FOR PARALLEL KEYS



(All dimensions are in millimetres)

WIDTH	b	2	3	4	5	6	8	10	12	14	16	18	20	22	25	28	32	36	40	45	50	56	63	70	80	90	100																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
TOL ON b	h9	0	-0.025	0	-0.030	0	-0.036	0	-0.043	0	-0.052	0	-0.062	0	-0.074	0	-0.087	0	-0.100	0	-0.110	0	-0.130	0	-0.160	0	-0.200	0	-0.250	0	-0.300	0	-0.360	0	-0.400	0	-0.450	0	-0.500	0	-0.560	0	-0.630	0	-0.700	0	-0.800	0	-0.900	0	-1.000	0	-1.100	0	-1.200	0	-1.400	0	-1.600	0	-1.800	0	-2.000	0	-2.500	0	-3.000	0	-3.600	0	-4.000	0	-4.500	0	-5.000	0	-5.600	0	-6.300	0	-7.000	0	-8.000	0	-9.000	0	-10.000	0	-11.000	0	-12.000	0	-14.000	0	-16.000	0	-18.000	0	-20.000	0	-25.000	0	-30.000	0	-36.000	0	-40.000	0	-45.000	0	-50.000	0	-56.000	0	-63.000	0	-70.000	0	-80.000	0	-90.000	0	-100.000	0	-110.000	0	-120.000	0	-140.000	0	-160.000	0	-180.000	0	-200.000	0	-250.000	0	-300.000	0	-360.000	0	-400.000	0	-450.000	0	-500.000	0	-560.000	0	-630.000	0	-700.000	0	-800.000	0	-900.000	0	-1000.000	0	-1100.000	0	-1200.000	0	-1400.000	0	-1600.000	0	-1800.000	0	-2000.000	0	-2500.000	0	-3000.000	0	-3600.000	0	-4000.000	0	-4500.000	0	-5000.000	0	-5600.000	0	-6300.000	0	-7000.000	0	-8000.000	0	-9000.000	0	-10000.000	0	-11000.000	0	-12000.000	0	-14000.000	0	-16000.000	0	-18000.000	0	-20000.000	0	-25000.000	0	-30000.000	0	-36000.000	0	-40000.000	0	-45000.000	0	-50000.000	0	-56000.000	0	-63000.000	0	-70000.000	0	-80000.000	0	-90000.000	0	-100000.000	0	-110000.000	0	-120000.000	0	-140000.000	0	-160000.000	0	-180000.000	0	-200000.000	0	-250000.000	0	-300000.000	0	-360000.000	0	-400000.000	0	-450000.000	0	-500000.000	0	-560000.000	0	-630000.000	0	-700000.000	0	-800000.000	0	-900000.000	0	-1000000.000	0	-1100000.000	0	-1200000.000	0	-1400000.000	0	-1600000.000	0	-1800000.000	0	-2000000.000	0	-2500000.000	0	-3000000.000	0	-3600000.000	0	-4000000.000	0	-4500000.000	0	-5000000.000	0	-5600000.000	0	-6300000.000	0	-7000000.000	0	-8000000.000	0	-9000000.000	0	-10000000.000	0	-11000000.000	0	-12000000.000	0	-14000000.000	0	-16000000.000	0	-18000000.000	0	-20000000.000	0	-25000000.000	0	-30000000.000	0	-36000000.000	0	-40000000.000	0	-45000000.000	0	-50000000.000	0	-56000000.000	0	-63000000.000	0	-70000000.000	0	-80000000.000	0	-90000000.000	0	-100000000.000	0	-110000000.000	0	-120000000.000	0	-140000000.000	0	-160000000.000	0	-180000000.000	0	-200000000.000	0	-250000000.000	0	-300000000.000	0	-360000000.000	0	-400000000.000	0	-450000000.000	0	-500000000.000	0	-560000000.000	0	-630000000.000	0	-700000000.000	0	-800000000.000	0	-900000000.000	0	-1000000000.000	0	-1100000000.000	0	-1200000000.000	0	-1400000000.000	0	-1600000000.000	0	-1800000000.000	0	-2000000000.000	0	-2500000000.000	0	-3000000000.000	0	-3600000000.000	0	-4000000000.000	0	-4500000000.000	0	-5000000000.000	0	-5600000000.000	0	-6300000000.000	0	-7000000000.000	0	-8000000000.000	0	-9000000000.000	0	-10000000000.000	0	-11000000000.000	0	-12000000000.000	0	-14000000000.000	0	-16000000000.000	0	-18000000000.000	0	-20000000000.000	0	-25000000000.000	0	-30000000000.000	0	-36000000000.000	0	-40000000000.000	0	-45000000000.000	0	-50000000000.000	0	-56000000000.000	0	-63000000000.000	0	-70000000000.000	0	-80000000000.000	0	-90000000000.000	0	-100000000000.000	0	-110000000000.000	0	-120000000000.000	0	-140000000000.000	0	-160000000000.000	0	-180000000000.000	0	-200000000000.000	0	-250000000000.000	0	-300000000000.000	0	-360000000000.000	0	-400000000000.000	0	-450000000000.000	0	-500000000000.000	0	-560000000000.000	0	-630000000000.000	0	-700000000000.000	0	-800000000000.000	0	-900000000000.000	0	-1000000000000.000	0	-1100000000000.000	0	-1200000000000.000	0	-1400000000000.000	0	-1600000000000.000	0	-1800000000000.000	0	-2000000000000.000	0	-2500000000000.000	0	-3000000000000.000	0	-3600000000000.000	0	-4000000000000.000	0	-4500000000000.000	0	-5000000000000.000	0	-5600000000000.000	0	-6300000000000.000	0	-7000000000000.000	0	-8000000000000.000	0	-9000000000000.000	0	-10000000000000.000	0	-11000000000000.000	0	-12000000000000.000	0	-14000000000000.000	0	-16000000000000.000	0	-18000000000000.000	0	-20000000000000.000	0	-25000000000000.000	0	-30000000000000.000	0	-36000000000000.000	0	-40000000000000.000	0	-45000000000000.000	0	-50000000000000.000	0	-56000000000000.000	0	-63000000000000.000	0	-70000000000000.000	0	-80000000000000.000	0	-90000000000000.000	0	-100000000000000.000	0	-110000000000000.000	0	-120000000000000.000	0	-140000000000000.000	0	-160000000000000.000	0	-180000000000000.000	0	-200000000000000.000	0	-250000000000000.000	0	-300000000000000.000	0	-360000000000000.000	0	-400000000000000.000	0	-450000000000000.000	0	-500000000000000.000	0	-560000000000000.000	0	-630000000000000.000	0	-700000000000000.000	0	-800000000000000.000	0	-900000000000000.000	0	-1000000000000000.000	0	-1100000000000000.000	0	-1200000000000000.000	0	-1400000000000000.000	0	-1600000000000000.000	0	-1800000000000000.000	0	-2000000000000000.000	0	-2500000000000000.000	0	-3000000000000000.000	0	-3600000000000000.000	0	-4000000000000000.000	0	-4500000000000000.000	0	-5000000000000000.000	0	-5600000000000000.000	0	-6300000000000000.000	0	-7000000000000000.000	0	-8000000000000000.000	0	-9000000000000000.000	0	-10000000000000000.000	0	-11000000000000000.000	0	-12000000000000000.000	0	-14000000000000000.000	0	-16000000000000000.000	0	-18000000000000000.000	0	-20000000000000000.000	0	-25000000000000000.000	0	-30000000000000000.000	0	-36000000000000000.000	0	-40000000000000000.000	0	-45000000000000000.000	0	-50000000000000000.000	0	-56000000000000000.000	0	-63000000000000000.000	0	-70000000000000000.000	0	-80000000000000000.000	0	-90000000000000000.000	0	-100000000000000000.000	0	-110000000000000000.000	0	-120000000000000000.000	0	-140000000000000000.000	0	-160000000000000000.000	0	-180000000000000000.000	0	-200000000000000000.000	0	-250000000000000000.000	0	-300000000000000000.000	0	-360000000000000000.000	0	-400000000000000000.000	0	-450000000000000000.000	0	-500000000000000000.000	0	-560000000000000000.000	0	-630000000000000000.000	0	-700000000000000000.000	0	-800000000000000000.000	0	-900000000000000000.000	0	-1000000000000000000.000	0	-1100000000000000000.000	0	-1200000000000000000.000	0	-1400000000000000000.000	0	-1600000000000000000.000	0	-1800000000000000000.000	0	-2000000000000000000.000	0	-2500000000000000000.000	0	-3000000000000000000.000	0	-3600000000000000000.000	0	-4000000000000000000.000	0	-4500000000000000000.000	0	-5000000000000000000.000	0	-5600000000000000000.000	0	-6300000000000000000.000	0	-7000000000000000000.000	0	-8000000000000000000.000	0	-9000000000000000000.000	0	-10000000000000000000.000	0	-11000000000000000000.000	0	-12000000000000000000.000	0	-14000000000000000000.000	0	-16000000000000000000.000	0	-18000000000000000000.000	0	-20000000000000000000.000	0	-25000000000000000000.000	0	-30000000000000000000.000	0	-36000000000000000000.000	0	-40000000000000000000.000	0	-45000000000000000000.000	0	-50000000000000000000.000	0	-56000000000000000000.000	0	-63000000000000000000.000	0	-70000000000000000000.000	0	-80000000000000000000.000	0	-90000000000000000000.000	0	-100000000000000000000.000	0	-110000000000000000000.000	0	-120000000000000000000.000	0	-140000000000000000000.000	0	-160000000000000000000.000	0	-180000000000000000000.000	0	-200000000000000000000.000	0	-250000000000000000000.000	0	-300000000000000000000.000	0	-360000000000000000000.000	0	-400000000000000000000.000	0	-450000000000000000000.000	0	-500000000000000000000.000	0	-560000000000000000000.000	0	-630000000000000000000.000	0	-700000000000000000000.000	0	-800000000000000000000.000	0	-900000000000000000000.000	0	-1000000000000000000000.000	0	-1100000000000000000000.000	0	-1200000000000000000000.000	0	-1400000000000000000000.000	0	-1600000000000000000000.000	0	-1800000000000000000000.000	0	-2000000000000000000000.000	0	-2500000000000000000000.000	0	-3000000000000000000000.000	0	-3600000000000000000000.000	0	-4000000000000000000000.000	0	-4500000000000000000000.000	0	-50000000000000000



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TABLE 2 - PREFERRED LENGTH-SIZE COMBINATION FOR PARALLEL KEYS

(All dimensions in millimetres)

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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TABLE 2 - PREFERRED LENGTH-SIZE COMBINATION FOR PARALLEL KEYS (CONTN.)
(All dimensions in millimetres)

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 booklet
- 3 Preferred lengths are in between the stepped bold lines



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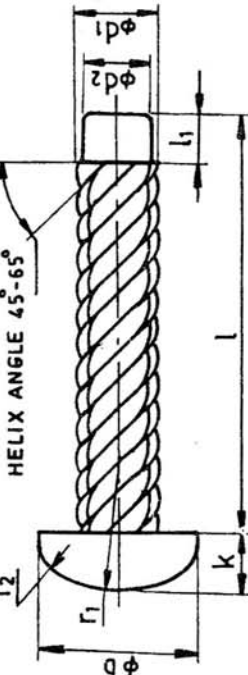
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TABLE 1 - DIMENSIONS AND PREFERRED LENGTH - SIZE COMBINATION FOR HAMMER DRIVE SCREWS

(All dimensions in millimetres)



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 .

- 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.

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



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Based on IS: 2393-1980

CYLINDRICAL PINS

1.0 SCOPE

Covers the requirements for Cylindrical Pins in the diameter range 1.5 to 50mm.

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	Steel C30 (or) Free cutting steel (or) Suitable steel with stipulated tensile strength	IS: 5517 IS: 4431
Mechanical properties	Tensile strength 500 N/mm ² Min.	
Sampling	Indian standard	IS: 6821
General requirements	Pins shall comply with IS: 2393 in respect of requirements not covered in this standard.	

2.1 Referred Standards (Only the current versions are applicable)

- IS: 2393 Specifications for cylindrical pins
- IS: 4431 Carbon and carbon manganese free cutting steel.
- IS: 5517 Steels for hardening and tempering
- IS: 6821 Methods for sampling non-threaded fasteners

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3.0 DESIGNATION

A Cylindrical Pin to this standard of nominal diameter 6mm and nominal length 40mm shall be designated as:

3.1 On Drawings:

- i) Material Specification column: IS: 2393 - m6
- ii) Description column : PIN CYL RND END 6x40
- iii) Drawing Number column : 4170206040
- iv) Material Code column : 4170206040

3.2 Ordering Description

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

Cylindrical Pin 6 m6x40 IS: 2393

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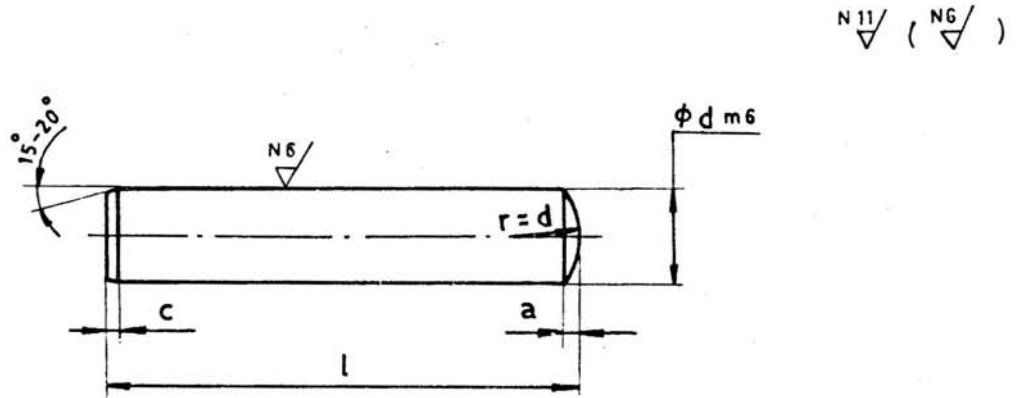
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TABLE 1 - DIMENSIONS FOR CYLINDRICAL PINS



(All dimensions are in millimetres)

Nom dia d m6	1.5	2.0	2.5	3.0	4.0	5.0	6.0	8.0	10	12	16	20	25	30	40	50
a ≈	0.2	0.25	0.3	0.4	0.5	0.63	0.8	1.0	1.2	1.6	2.0	2.5	3	4	5	6.3
c ≈	0.3	0.35	0.4	0.5	0.63	0.80	1.2	1.6	2.0	2.5	3.0	3.6	4	5	6.3	8

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TABLE 2 - PREFERRED LENGTH SIZE COMBINATION FOR CYLINDRICAL PINS

(All dimensions are in millimetres)

NOMINAL LENGTH 'l' js15	Diameter d																
	1.5	2.0	2.5	3.0	4.0	5.0	6.0	8.0	10	12	16	20	25	30	40	50	
4																	
5																	
6																	
8																	
10					1.0												
12																	
14			0.8				3.3										
16																	
20																	
25							5.3										
30																	
35							7.7										
40					3.7												
45																	
50																	
55								21.9									
60																	
65								24.6									
70																	
75																	
80									48.4								
90																	
100																	
110																	
120																	
130																	
140																	
150																	
160																	
170																	
180																	
190																	
200																	

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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.