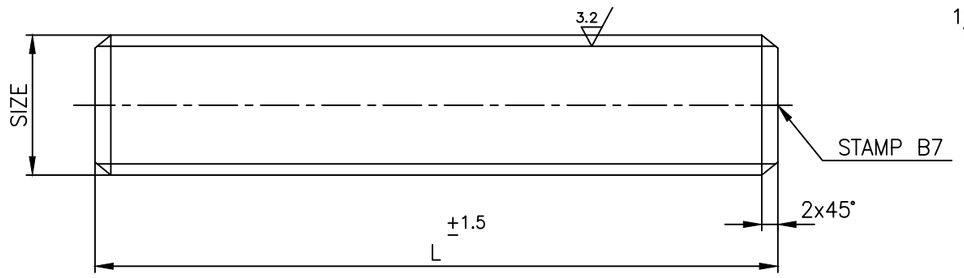
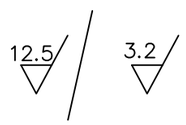
ALL DIMENSIONS ARE IN MILLIMETRES. FOR TOLERANCES OF UNTOLERANCED DIMENSIONS DURING MANUFACTURE REFER RELEVANT QCP / QP.

DRAWING NO. 3-V-0000-06875

SL.No	DRAWING No.	MATERIAL	MATL. CODE	SIZE	L	WEIGHT IN Kgs.	SIZE/RATING
01	3-V-N073-06875/02	ASTM A193 B7, HT, CERTIFY	964562670000	1/2"-13UNC-2A	68	0.07	2"-150
02	3-V-N081-06875/02		964562680000	1/2"-13UNC-2A	80	0.08	2"-300
03	3-V-N025-06875/02		964562690000	5/8"-11UNC-2A	86	0.13	3"-150
04	3-V-N001-06875/02		964562700000	5/8"-11UNC-2A	94	0.15	4"-150 6"-150
05	3-V-N009-06875/02		964562710000	5/8"-11UNC-2A	105	0.16	8"-150 3",4"-300
06	3-V-N017-06875/02		964562720000	5/8"-11UNC-2A	118	0.18	6"-300
07	3-V-N057-06875/02		964562730000	3/4"-10UNC-2A	112	0.25	10"-150
08	3-V-N041-06875/02		964562740000	3/4"-10UNC-2A	120	0.27	12"-150
09	3-V-N089-06875/02		964562750000	3/4"-10UNC-2A	133	0.30	8"-300
10	3-V-N065-06875/02		964562760000	1"-8UNC-2A	158	0.63	10"-300
11	3-V-N105-06875/02		964562770000	1.1/8"-8UN-2A	180	0.91	12"-300
12	3-V-N106-06875/02		964562780000	1.1/8"-8UN-2A	140	0.71	12"-300
13	3-V-N224-06875/02		964562290000	1"-8UNC-2A	170	0.71	20"-150
14	3-V-1387-06875/02		964564270000	1"-8UNC-2A	135	0.54	16"-150
15	3-V-N204-06875/02		964564280000	3/4"-10UNC-2A	105	0.25	6"-150
16	3-V-N206-06875/02	ASTM A193 B7, HT, CERTIFY	964564290000	7/8"-9UNC-2A	115	0.35	10"-150
17	3-V-N207-06875/02		964564300000	7/8"-9UNC-2A	125	0.38	12"-150
18	3-V-N212-06875/02		964564560000	7/8"-9UNC-2A	150	0.45	8"-300
19	3-V-F505-06875/01		964566800000	1.1/4"-8UN-2A	215	1.34	8"-600
20	3-V-F506-06875/01		964566810000	1.1/8"-8UN-2A	220	1.41	10"-600
21	3-V-F507-06875/02		964566820000	1.1/4"-8UN-2A	250	1.74	12"-600
22	3-V-N361-06875/01		964567040000	1.1/4"-8UN-2A	150	0.94	24"-150& 16"-300
23	3-V-N437-06875/01		964567430000	1.3/8"-8UN-2A	190	1.44	20"-300
24	3-V-N847-06875		964536630000	1.1/4"-8UN-2A	195	1.23	28"-150
25	3-V-N848-06875		964536640000	1.3/8"-8UN-2A	210	1.58	30"-150
26	3-V-N827-06875		964536650000	1.1/2"-8UN-2A	220	1.96	32"-150
27	3-V-N846-06875/01		964536660000	1.3/4"-8UN-2A	240	2.9	36"-150
28	3-V-NE97-06875		964653420000	1.1/2"-8UN-2A	260	2.32	26"-300
29	3-V-NK44-06875		964659010000	1.5/8"-8UN-2A	270	2.84	28"-300
30	3-V-NK45-06875		964659050000	2"-8UN-2A	275	4.38	28"-600
31	3-V-P788-06875		964659130000	1.3/8"-8UN-2A	235	1.59	14"-600





NOTE:-

FOR QUALITY REQUIREMENTS REFER LATEST APPLICABLE TDC:5:164

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

REV	DATE	ALTERED		REV	DATE	ALTERED	
14	12.06.19	CHD & APPD	R.P.SINGH SSK & KRS	13	08.12.18	CHD & APPD	R.P.SINGH SSK & KRS
		SL.No 31 INCLUDED.				SL.No 29 & 30 INCLUDED.	

TYPE OF PRODUCT
OR NAME OF
CUSTOMER/PROJECT

BHARAT HEAVY ELECTRICALS LTD.,
UNIT: HIGH PRESSURE BOILER PLANT.
TIRUCHIRAPALLI-620014.
365-121

	NAME	SIGN	DATE	NO.OF VAR.
DRN	V.BAIRAVAN		31.12.09	
CHD	S.SATHEESHKUMAR		31.12.09	
APPD	K.RAJASEKARAN		31.12.09	

DEPT	SCALE	WEIGHT (KG).	REFERENCE INFORMATIONS	NO. OF ITEMS
VL	N T S		CAD .3-V-0000-06875-0-0	
CODE 320				

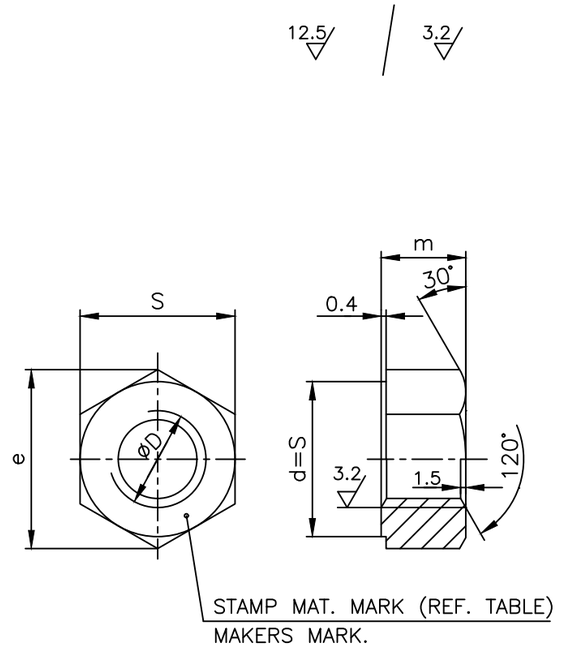
TITLE	CARD CODE	DRAWING NO.	REV
STUD	U 01	3-V-0000-06875	14

Size A3

ALL DIMENSIONS ARE IN MILLIMETRES. FOR TOLERANCES OF UNTOLERANCED DIMENSIONS DURING MANUFACTURE REFER RELEVANT QCP / QP.

DRAWING NO. 3-V-0000-06876

SL. No.	DRAWING No.	COMP. CODE	MATL. SPECN.	S		e		m		øD	MATL. MARK	NET WT. (Kg.)
				MAX.	MIN.	MAX.	MIN.	MAX.	MIN.			
01	3.V.N073.06876/03	96 456 279	ASTM A194 – 2H, CERTIFY	22.22	21.59	25.65	24.61	12.80	11.79	1/2"–13 UNC –2B	2H	0.02
02	3.V.N025.06876/03	96 456 280		26.97	26.19	31.17	29.85	16.03	14.91	5/8"–11 UNC –2B	2H	0.03
03	3.V.N057.06876/03	96 456 281		31.75	30.78	36.65	35.10	19.25	18.03	3/4"–10 UNC –2B	2H	0.08
04	3.V.N065.06876/03	96 456 282		41.28	40.01	47.65	45.62	25.70	24.28	1"–8 UNC –2B	2H	0.17
05	3.V.N105.06876/03	96 456 283		46.02	44.60	53.16	50.85	29.93	27.41	1.1/8"–8 UN –2B	2H	0.27
06	3.V.N206.06876/02	96 456 431		36.52	35.41	42.16	40.37	22.47	21.16	7/8"–9 UNC –2B	2H	0.11
07	3.V.N204.06876/02	96 456 453	SA 307 Gr.B CERTIFY	31.75	30.78	36.65	35.10	19.25	18.03	3/4"–10 UNC –2B	307 B	0.08
08	3.V.N207.06876/02	96 456 454		36.52	35.41	42.16	40.37	22.47	21.16	7/8"–9 UNC –2B	307 B	0.11
09	3.V.F505.06876/01	96 456 683	ASTM A194 – 2H, CERTIFY	50.8	49.23	58.65	56.11	31.78	30.15	1.1/4"–8 UN –2B	2H	0.22
10	3.V.N848.06876	96 453 667		55.57	53.8	64.16	61.37	35.0	33.27	1.3/8"–8 UN –2B	2H	0.42
11	3.V.N827.06876	96 453 668		60.33	58.42	69.65	66.59	38.23	36.40	1.1/2"–8 UN –2B	2H	0.52
12	3.V.N846.06876/01	96 453 669		69.85	67.61	80.65	77.09	44.68	42.65	1.3/4"–8 UN –2B	2H	0.81
13	3.V.NK44.06876	96 465 904		65.07	63.02	75.15	71.84	41.45	39.53	1.5/8"–8 UN –2B	2H	0.68
14	3.V.NK45.06876	96 465 906		79.37	76.84	91.64	87.61	51.13	48.90	2"–8 UN –2B	2H	1.36



RETRACED WITH REV. 09 ON 26.11.18

NOTE:

1. FOR QUALITY REQUIREMENTS REFER LATEST APPLICABLE STANDARD(TDC:5:164).

REV	DATE	ALTERED R.P.SINGH
09	26.11.18	CHD & APPD SSK & KRS
		SL. No.13 & 14 INCLUDED.

–	–	–	–	–	–	–	–	–	–
NO OFF	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

BHARAT HEAVY ELECTRICALS LTD.,
UNIT: HIGH PRESSURE BOILER PLANT.
TIRUCHIRAPALLI-620014.
365–121

	NAME	SIGN	DATE	NO.OF VAR.
DRN	M.SRINIVASAN		22.04.96	
CHD	N.DHANAPAL		22.04.96	
APPD	A.VISWANATHAN		22.04.96	

DEPT	SCALE	WEIGHT (KG).	REFERENCE INFORMATIONS	NO. OF ITEMS
VL	NTS	REF. TABLE	CAD: C306876	
CODE 320				

TITLE	CARD CODE	DRAWING NO.	REV
HEX NUT	U 01	3–V–0000–06876	09

Size A3

ALL DIMENSIONS ARE IN MILLIMETRES. FOR TOLERANCES OF UNTOLERANCED DIMENSIONS DURING MANUFACTURE REFER RELEVANT QCP / QP.

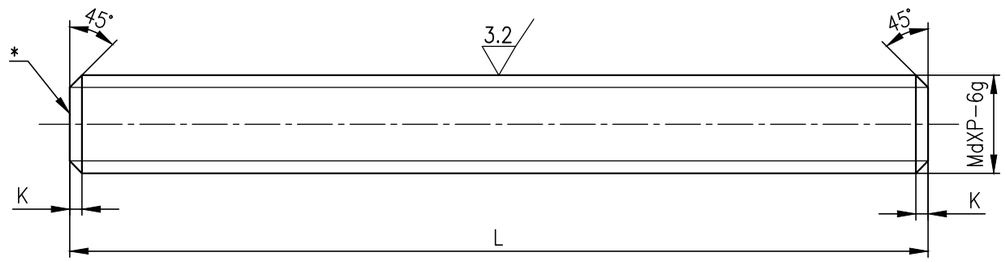
DRAWING NO. 3-V-0000-25897

12.5 / 3.2

SL.NO.	DRAWING NO.	COMP. CODE	MATL. SPECN.		DIMENSIONS			NET WT. (IN KGS.)
				Md	P	L	K	
1.	3-V-0001-25897/01	964658350000	ASTM A193-B8M CL.2, CERTIFY	M10	1.5	55	2	0.034
2.	3-V-0002-25897/01	964658360000		M16	2	55	2.5	0.087
3.	3-V-0003-25897/01	964658310000		M20	2.5	130	2.5	0.320
4.	3-V-0004-25897/01	964658320000		M20	2.5	150	2.5	0.370
5.	3-V-0005-25897/01	964658340000		M27	3	180	2.5	0.809
6.	3-V-0006-25897/02	964658330000		M30	3.5	185	2.5	1.027
7.	3-V-0007-25897/01	964658930000		M24	3	150	2.5	0.55
8.	3-V-0008-25897/01	964658940000		M33	3.5	220	2.5	1.5

NOTES :

1. * PUNCH MATERIAL MARK B8M FOR A193 – B8M
2. QUALITY REQUIREMENTS SHALL BE AS PER LATEST APPLICABLE QUALITY WORK INSTRUCTION.



REV	DATE	ALTERED	REV	DATE	ALTERED
03	26.06.20	R.P.SINGH CHD & APPD SAMEER & SSK	02	13.11.19	R.P.SINGH CHD & APPD SAMEER & SSK
	MATL. SPECIFICATION UPDATED.			M30 PITCH 3.5 WAS 3.	

NO OFF	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

BHARAT HEAVY ELECTRICALS LTD.
UNIT: HIGH PRESSURE BOILER PLANT.
TIRUCHIRAPALLI 620014.
365-121

	NAME	SIGN	DATE	NO.OF VAR.
DRN	R.P.SINGH		27.03.18	
CHD	S.SATHEES		27.03.18	
APPD	K.RAJASEKARAN		27.03.18	

DEPT	SCALE	WEIGHT (KG).	REFERENCE INFORMATIONS	NO. OF ITEMS
VL	NTS			
CODE 320				

TITLE	CARD CODE	DRAWING NO.	REV
STUD	U 01	3-V-0000-25897	03

Size A3

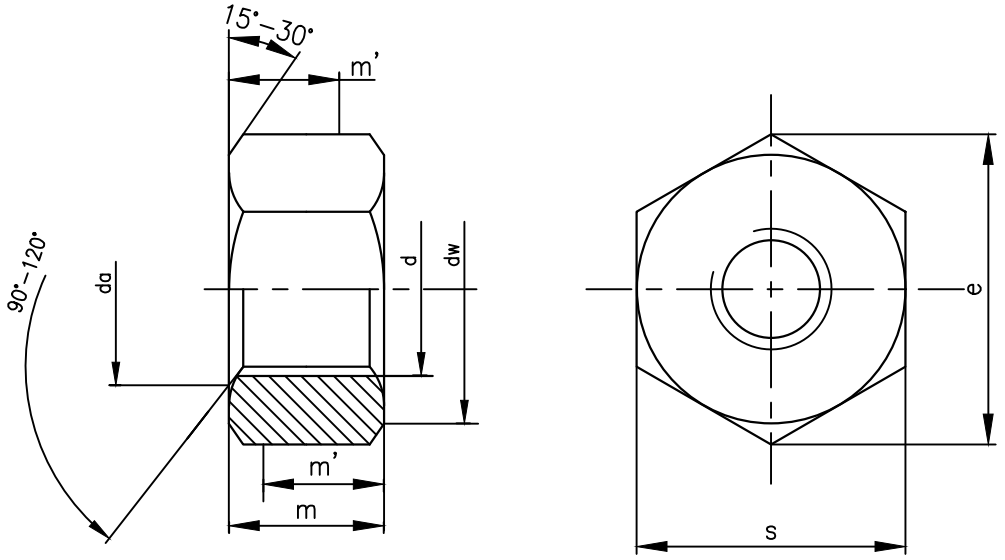
ALL DIMENSIONS ARE IN MILLIMETRES.

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

REV	DATE	ALTERED	REV	DATE	ALTERED
01	29.10.18	CHD & APPD SSK & KRS			CHD & APPD

MATERIAL SPECIFICATION
CHANGED FROM B8MA TO Gr.8M

GROUP No. 0006 & 0007 ADDED



NOTE:– FOR OTHER DIMENSIONS/DETAILS REFER IS:1364.

MATERIAL CODE	DRAWING NO	Thread Size d	da Min	da Max	dw Min	e Min	m Max	m Min	m' Min	S Max	S Min	WEIGHT
964658380000	4–V–0001–27368	M10	10	10.8	14.6	17.77	10	9.64	7.7	16	15.73	0.0108
964658390000	4–V–0002–27368	M20	20	21.6	27.7	32.95	20.7	19.40	15.5	30	29.16	0.0645
964658400000	4–V–0003–27368	M27	27	29.16	38	45.2	24.7	22.6	18.1	41	40	0.185
964658410000	4–V–0004–27368	M30	30	32.4	42.7	50.85	30.7	29.10	23.3	46	45	0.253
964658440000	4–V–0005–27368	M12	12	13.0	16.6	20.03	12	11.57	9.30	18	17.73	0.0165
964658970000	4–V–0006–27368	M33	33	35.6	46.6	55.37	33	31.4	25.1	50	49	0.30
964658960000	4–V–0007–27368	M24	24	25.9	33.2	39.55	24.2	22.9	18.3	36	35	0.11

NO OF	DESCRIPTION	MATL CODE	MATL SPECN	HEAT TREATMENT	SCRAP SORT	NET WT (kg)	GROSS WT (kg)	DRAWING No	ITEM No
	HEXAGON NUT		ASTM A194 Gr.8M, CERTIFY						

BHARAT HEAVY ELECTRICALS LTD.,
UNIT: HIGH PRESSURE BOILER PLANT.
TIRUCHIRAPALLI 620014.
365-122

	NAME	SIGN	DATE	NO. OF VAR
DRN	R.P.SINGH		16.04.18	
CHD	S.SATHEES		16.04.18	
APPD	K.RAJASEKARAN		16.04.18	

DEPT		SCALE	WEIGHT (KG).	REFERENCE INFORMATIONS	NO. OF ITEMS
VL		NTS	REFER TABULATION	– – –	
CODE 320					

TITLE	CARD CODE	DRAWING NO.	REV
HEX NUT	U 01	4–V–0000–27368	01

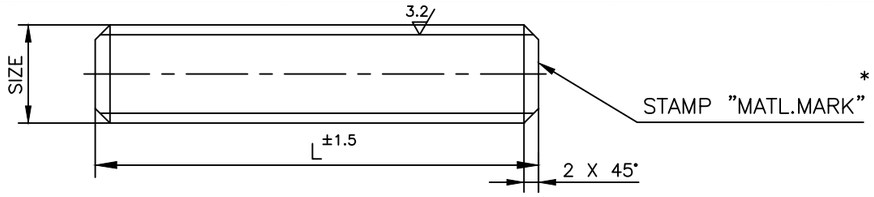
Size A4

ALL DIMENSIONS ARE IN MILLIMETRES. FOR TOLERANCES OF UNTOLERANCED DIMENSIONS DURING MANUFACTURE REFER RELEVANT QCP / QP.

DRAWING NO. 3-V-0000-23248

12.5 / 3.2

SL.No	DRAWING No.	MATERIAL	MATL. CODE	SIZE	L	WEIGHT IN Kgs.	MATL. MARK*
01	3-V-F522-23248/01	ASTM A193 Gr. B16	96 456 882 0000	7/8"-9UNC-2A	150	0.45	B16
02	3-V-F523-23248/01		96 456 883 0000	3/4"-10UNC-2A	133	0.30	B16
03	3-V-F524-23248/01		96 456 884 0000	1"-8UNC-2A	170	0.71	B16
04	3-V-F525-23248/01		96 456 885 0000	1.1/4"-8UN-2A	215	1.34	B16
05	3-V-F526-23248/01		96 456 886 0000	1.1/8"-8UN-2A	220	1.41	B16
06	3-V-F527-23248/02		96 456 887 0000	1.1/4"-8UN-2A	250	1.74	B16
07	3-V-0001-23248/01	ASTM A193-B8M CL.2, CERTIFY	96 465 635 0000	1/2"-13UNC-2A	80	0.08	B8M
08	3-V-0002-23248/01		96 465 636 0000	5/8"-11UNC-2A	86	0.13	B8M
09	3-V-0003-23248/01		96 465 637 0000	5/8"-11UNC-2A	105	0.16	B8M
10	3-V-0004-23248/01		96 465 638 0000	5/8"-11UNC-2A	118	0.18	B8M
11	3-V-0005-23248/01		96 465 639 0000	3/4"-10UNC-2A	120	0.26	B8M
12	3-V-0006-23248/01		96 465 640 0000	3/4"-10UNC-2A	133	0.29	B8M
13	3-V-0007-23248/01		96 465 641 0000	7/8"-9UNC-2A	150	0.45	B8M
14	3-V-0008-23248/01		96 465 642 0000	1"-8UNC-2A	135	0.53	B8M
15	3-V-0009-23248/01		96 465 643 0000	1"-8UNC-2A	158	0.62	B8M
16	3-V-0010-23248/01		96 465 644 0000	1"-8UNC-2A	170	0.67	B8M
17	3-V-0011-23248/01		96 465 645 0000	1.1/8"-8UN-2A	180	0.90	B8M
18	3-V-0012-23248/01		96 465 646 0000	1.1/4"-8UN-2A	215	1.32	B8M
19	3-V-0013-23248/01		96 465 647 0000	1.1/4"-8UN-2A	250	1.54	B8M
20	3-V-0014-23248/01		96 465 769 0000	7/8"-9UNC-2A	120	0.36	B8M
21	3-V-0016-23248/01		96 465 830 0000	1.1/8"-8UN-2A	140	0.87	B8M
22	3-V-0015-23248		96 465 794 0000	1/2"-13UNC-2A	95	0.09	B8M
23	3-V-F933-23248		96 465 938 0000	1.1/8"-8UN-2A	220	1.41	B8M
24	3-V-0017-23248	ASTM A193 Gr. B7M	96 465 854 0000	1/2"-13UNC-2A	80	0.08	B7M
25	3-V-0018-23248		96 465 855 0000	5/8"-11UNC-2A	86	0.13	B7M
26	3-V-0019-23248		96 465 856 0000	5/8"-11UNC-2A	105	0.16	B7M
27	3-V-0020-23248		96 465 857 0000	5/8"-11UNC-2A	118	0.18	B7M
28	3-V-0021-23248		96 465 858 0000	3/4"-10UNC-2A	120	0.26	B7M
29	3-V-0022-23248		96 465 859 0000	3/4"-10UNC-2A	133	0.29	B7M
30	3-V-0023-23248		96 465 860 0000	7/8"-9UNC-2A	150	0.45	B7M
31	3-V-0024-23248		96 465 861 0000	1"-8UNC-2A	135	0.53	B7M
32	3-V-0025-23248		96 465 862 0000	1"-8UNC-2A	158	0.62	B7M
33	3-V-0026-23248		96 465 863 0000	1"-8UNC-2A	170	0.67	B7M
34	3-V-0027-23248		96 465 864 0000	1.1/8"-8UN-2A	180	0.90	B7M
35	3-V-0028-23248		96 465 865 0000	1.1/4"-8UN-2A	215	1.32	B7M
36	3-V-0029-23248		96 465 866 0000	1.1/4"-8UN-2A	250	1.54	B7M
37	3-V-0030-23248		96 465 867 0000	7/8"-9UNC-2A	120	0.36	B7M
38	3-V-0031-23248		96 465 868 0000	1.1/8"-8UN-2A	140	0.87	B7M



NOTE

01. FOR QUALITY REQUIREMENTS: REFER LATEST APPLICABLE PROCEDURE.

REV	DATE	ALTERED		REV	DATE	ALTERED	
08	22.02.21	CHD & APPD	R.P.SINGH SAMEER & SSK	07	26.06.20	CHD & APPD	R.P.SINGH SAMEER & SSK
	3-V-F933-23248 INCLUDED.				FOR SL. No. 07 TO 21 MATL. SPECIFICATION UPDATED. 3-V-0015-23248 INCLUDED.		

NO OF	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

REDRAWN WITH REV.5 ON 26.03.18

365-121

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

	NAME	SIGN	DATE	NO.OF VAR.
DRN	M.SRINIVASAN		18.05.98	
CHD	K.S.RAMAN		18.05.98	
APPD	N.NAGARAJAN		18.05.98	

DEPT	SCALE	WEIGHT (KG).	REFERENCE INFORMATIONS	NO. OF ITEMS
VL	NTS	REF.TABLE	B16 & B7M CAD :C323248	
CODE 320				

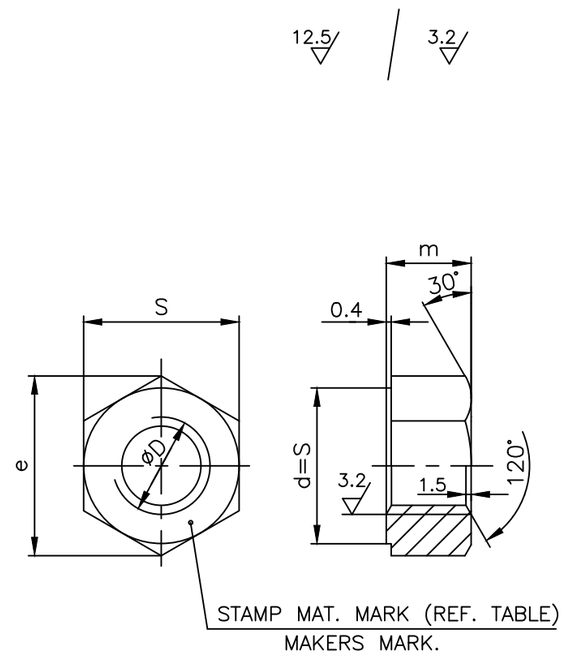
TITLE	CARD CODE	DRAWING NO.	REV
STUD	U 01	3-V-0000-23248	08

Size A3

ALL DIMENSIONS ARE IN MILLIMETRES. FOR TOLERANCES OF UNTOLERANCED DIMENSIONS DURING MANUFACTURE REFER RELEVANT QCP / QP.

DRAWING NO. 3-V-0000-23249

SL. No.	DRAWING No.	COMP. CODE	MATL. SPECN.	S		e		m		øD	MATL. MARK	NET WT. (Kg.)
				MAX.	MIN.	MAX.	MIN.	MAX.	MIN.			
01	3-V-F522-23249/02	96 456 888 0000	ASTM A194 – Gr.7	36.52	35.41	42.16	40.37	22.47	21.16	7/8"-9 UNC -2B	GR.7	0.11
02	3-V-F523-23249/02	96 456 889 0000	ASTM A194 – Gr.7	31.75	30.78	36.65	35.10	19.25	18.03	3/4"-10 UNC -2B	GR.7	0.08
03	3-V-F524-23249/02	96 456 890 0000	ASTM A194 – Gr.7	41.28	40.01	47.65	45.62	25.70	24.28	1"-8 UNC -2B	GR.7	0.17
04	3-V-F525-23249/02	96 456 891 0000	ASTM A194 – Gr.7	50.80	49.23	58.65	56.11	31.78	30.15	1.1/4"-8 UN -2B	GR.7	0.27
05	3-V-F526-23249/02	96 456 892 0000	ASTM A194 – Gr.7	46.02	44.60	53.16	50.85	29.93	27.41	1.1/8"-8 UN -2B	GR.7	0.22
06	3-V-0001-23249	96 465 648 0000	ASTM A194 – Gr.8M	22.22	21.59	25.65	24.61	12.80	11.79	1/2"-13 UNC -2B	GR.8M	0.02
07	3-V-0002-23249	96 465 649 0000	ASTM A194 – Gr.8M	26.97	26.19	31.17	29.85	16.03	14.91	5/8"-11 UNC -2B	GR.8M	0.03
08	3-V-0003-23249	96 465 650 0000	ASTM A194 – Gr.8M	31.75	30.78	36.65	35.10	19.25	18.03	3/4"-10 UNC -2B	GR.8M	0.08
09	3-V-0004-23249	96 465 651 0000	ASTM A194 – Gr.8M	36.52	35.41	42.16	40.37	22.47	21.16	7/8"-9 UNC -2B	GR.8M	0.11
10	3-V-0005-23249	96 465 652 0000	ASTM A194 – Gr.8M	41.28	40.01	47.65	45.62	25.70	24.28	1"-8 UNC -2B	GR.8M	0.17
11	3-V-0006-23249	96 465 653 0000	ASTM A194 – Gr.8M	46.02	44.60	53.16	50.85	29.93	27.41	1.1/8"-8 UN -2B	GR.8M	0.22
12	3-V-0007-23249	96 465 654 0000	ASTM A194 – Gr.8M	50.80	49.23	58.65	56.11	31.78	30.15	1.1/4"-8 UN -2B	GR.8M	0.27
13	3-V-0008-23249	96 465 847 0000	ASTM A194 – Gr.2HM	22.22	21.59	25.65	24.61	12.80	11.79	1/2"-13 UNC -2B	GR.2HM	0.02
14	3-V-0009-23249	96 465 848 0000	ASTM A194 – Gr.2HM	26.97	26.19	31.17	29.85	16.03	14.91	5/8"-11 UNC -2B	GR.2HM	0.03
15	3-V-0010-23249	96 465 849 0000	ASTM A194 – Gr.2HM	31.75	30.78	36.65	35.10	19.25	18.03	3/4"-10 UNC -2B	GR.2HM	0.08
16	3-V-0011-23249	96 465 850 0000	ASTM A194 – Gr.2HM	36.52	35.41	42.16	40.37	22.47	21.16	7/8"-9 UNC -2B	GR.2HM	0.11
17	3-V-0012-23249	96 465 851 0000	ASTM A194 – Gr.2HM	41.28	40.01	47.65	45.62	25.70	24.28	1"-8 UNC -2B	GR.2HM	0.17
18	3-V-0013-23249	96 465 852 0000	ASTM A194 – Gr.2HM	46.02	44.60	53.16	50.85	29.93	27.41	1.1/8"-8 UN -2B	GR.2HM	0.22
19	3-V-0014-23249	96 465 853 0000	ASTM A194 – Gr.2HM	50.80	49.23	58.65	56.11	31.78	30.15	1.1/4"-8 UN -2B	GR.2HM	0.27
20	3-V-0015-23249	96 465 940 0000	ASTM A194 – Gr.8M	55.57	53.8	64.16	61.37	35.0	33.27	1.3/8"-8 UN -2B	GR.8M	0.42



NOTE:

1. FOR QUALITY REQUIREMENTS REFER LATEST APPLICABLE QUALITY PROCEDURE.
2. SUITABLE OIL PRESERVATIVE SHALL BE APPLIED.

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

REV	DATE	ALTERED	R.P.SINGH
05	03.03.21	CHD & APPD	SAMEER & SSK

SL. No. 20 INCLUDED.

TYPE OF PRODUCT
OR NAME OF
CUSTOMER/PROJECT

365-121

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

	NAME	SIGN	DATE	NO.OF VAR.
DRN	M.SRINIVASAN		22.04.96	
CHD	N.DHANAPAL		23.04.96	
APPD	A.VISWANATHAN		23.04.96	

DEPT	SCALE	WEIGHT (KG).	REFERENCE INFORMATIONS	NO. OF ITEMS
VL	NTS	REF. TABLE	CAD: F323249	
CODE 320				

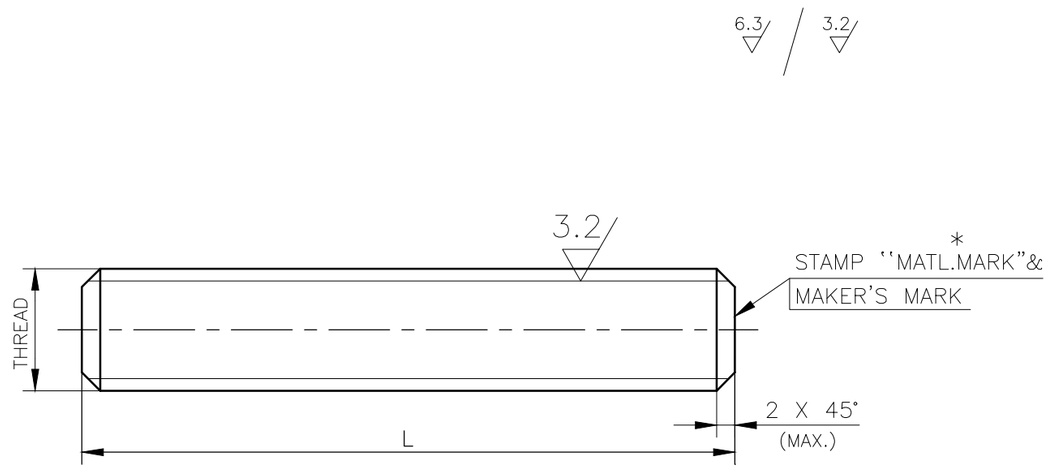
TITLE	CARD CODE	DRAWING NO.	REV
HEX NUT	U 01	3-V-0000-23249	05

Size A3

ALL DIMENSIONS ARE IN MILLIMETRES. FOR TOLERANCES OF UNTOLERANCED DIMENSIONS DURING MANUFACTURE REFER RELEVANT QCP / QP.

DRAWING NO. 3-V-0000-95180

SL.No	DRAWING No.	MATERIAL CODE	MATERIAL SPECN.	DIMENSIONS		MATERIAL MARK *	FINISHED WEIGHT(Kgs.)	SIZE/RATING
				THREAD	L			
01.	3-V-M357-95180/02	96 456 481 0000	ASTM A320 Gr.L7,HT, CERTIFY	5/8"-11UNC-2A	105	L7	0.164	4"/300C
02.	3-V-M358-95180/02	96 456 482 0000		5/8"-11UNC-2A	118	L7	0.184	6"/300C
03.	3-V-M359-95180/02	96 456 483 0000		3/4"-10UNC-2A	133	L7	0.298	8"/300C
04.	3-V-N228-95180/01	96 456 525 0000	ASTM A193 -B16,QT, CERTIFY	5/8"-11UNC-2A	105	B16	0.164	4"/300C
05.	3-V-N229-95180/01	96 456 526 0000		5/8"-11UNC-2A	118	B16	0.184	6"/300C
06.	3-V-N230-95180/01	96 456 527 0000		3/4"-10UNC-2A	133	B16	0.298	8"/300C
07.	3-V-N306-95180/01	96 456 570 0000		5/8"-11UNC-2A	94	B16	0.146	6"/150C & 4"/150C
08.	3-V-N305-95180/01	96 456 571 0000		3/4"-10UNC-2A	112	B16	0.251	10"/150C
09.	3-V-N304-95180/01	96 456 572 0000		1"-8UNC-2A	158	B16	0.629	10"/300C
10.	3-V-N309-95180/01	96 456 573 0000		1 1/8"-8UNC-2A	180	B16	0.910	12"/300C
11.	3-V-N301-95180/01	96 456 574 0000		1/2"-13UNC-2A	68	B16	0.068	2"/150C
12.	3-V-N262-95180/01	96 456 575 0000		1/2"-13UNC-2A	80	B16	0.080	2"/300C
13.	3-V-N292-95180/01	96 456 576 0000		5/8"-11UNC-2A	86	B16	0.134	3"/150C
14.	3-V-N266-95180/01	96 456 577 0000		3/4"-10UNC-2A	120	B16	0.269	12"/150C
15.	3-V-N363-95180/01	96 456 616 0000	ASTM A193 -B8,SH, CERTIFY	1/2"-13UNC-2A	80	B8	0.080	2"/300C
16.	3-V-N364-95180/01	96 456 617 0000		5/8"-11UNC-2A	105	B8	0.164	3"/300C
17.	3-V-N204-95180/01	96 456 659 0000	SA307-Gr.B CERTIFY	3/4"-10UNC-2A	106	Gr.B	0.25	6"/150C
18.	3-V-N211-95180/01	96 456 660 0000		3/4"-10UNC-2A	125	Gr.B	0.27	6"/300C
19.	3-V-N622-95180/01	96 456 790 0000	ASTM A193 -B16,QT, CERTIFY	1 1/8"-8UN-2A	140	B16	0.7	14"/300C
20.	3-V-C537-95180/01	96 456 802 0000		1 5/8"-8UN-2A	300	B16	3.3	12"/900C
21.	3-V-C538-95180/01	96 456 803 0000		2"-8UN-2A	390	B16	6.3	14"/900C
22.	3-V-M768-95180/01	96 456 851 0000	ASTM A320 Gr.L7,HT, CERTIFY	5/8"-11UNC-2A	86	L7	0.13	3"/150C
23.	3-V-M769-95180/01	96 456 852 0000		5/8"-11UNC-2A	94	L7	0.15	4"/150C & 6"/150C
24.	3-V-NG10-95180	96 465 375 0000	ASTM A193 B16, QT CERTIFY	1 1/8"-8UN-2A	200	B16	0.98	20"/300C
25.	3-V-NH84-95180	96 465 628 0000		1 1/2"-8UN-2A	220	B16	1.96	32"/150C
26.	3-V-H972-95180	96 600 039 0000		1/2"-13UNC-2A	95	B16	0.09	1/2"/3000C



NOTE

01. FOR QUALITY REQUIREMENTS REFER LATEST APPLICABLE QUALITY PROCEDURE.
02. SUITABLE RUST PREVENTIVE COATING SHALL BE APPLIED AFTER MACHINING.

DRAWING REDRAWN WITH REV.13 ON 06.06.2016

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

REV	DATE	ALTERED	B.AJITH KUMAR
13	06.06.16	CHD & APPD	MS & KRS

SL.NO: 26 INCLUDED

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT: CS

BHARAT HEAVY ELECTRICALS LTD.,
UNIT: HIGH PRESSURE BOILER PLANT.
TIRUCHIRAPALLI-620014.
365-121

	NAME	SIGN	DATE	NO.OF VAR.
DRN	T.R.R.MURTHY		27.09.99	
CHD	N.DHANAPAL		27.09.99	
APPD	K.S.RAMAN		27.09.99	

DEPT	SCALE	WEIGHT (KG).	REFERENCE INFORMATIONS	NO. OF ITEMS
VL	NTS	REF TABLE	CAD: F395180	
CODE 320				

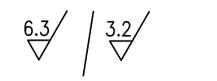
TITLE	CARD CODE	DRAWING NO.	REV
STUD	U 01	3-V-0000-95180	13

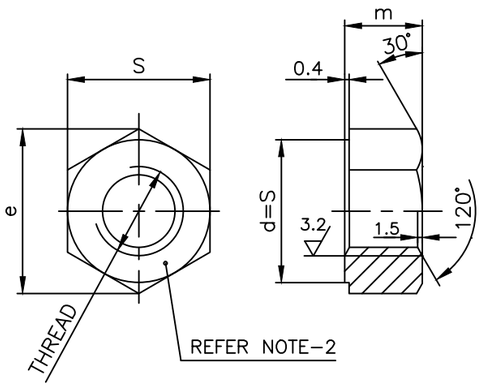
Size A3

ALL DIMENSIONS ARE IN MILLIMETRES. FOR TOLERANCES OF UNTOLERANCED DIMENSIONS DURING MANUFACTURE REFER RELEVANT QCP / QP.

DRAWING NO. 3-V-0000-95178/08

SL. No.	DRAWING No.	COMP. CODE	MATL. SPECN.	S		e		m		THREAD	MATL. MARK	NET WT. (Kg.)
				MAX.	MIN.	MAX.	MIN.	MAX.	MIN.			
01	3.V.M357.95178/03	96 456 484	ASTM A194 Gr.7,HT,CERTIFY	26.97	26.19	31.17	29.85	16.03	14.91	5/8"-11 UNC-2B	Gr.7	0.033
02	3.V.M359.95178/03	96 456 486	ASTM A194 Gr.7,HT,CERTIFY	31.75	30.78	36.65	35.10	19.25	18.03	3/4"-10 UNC-2B	Gr.7	0.076
03	3.V.N301.95178/02	96 456 578	ASTM A194 Gr.7,HT,CERTIFY	22.22	21.59	25.65	24.61	12.80	11.79	1/2"-13 UNC-2B	Gr.7	0.021
04	3.V.N304.95178/02	96 456 579	ASTM A194 Gr.7,HT,CERTIFY	41.28	40.09	47.65	45.62	25.70	24.28	1"-8 UNC-2B	Gr.7	0.165
05	3.V.N309.95178/02	96 456 580	ASTM A194 Gr.7,HT,CERTIFY	46.02	44.60	53.16	50.85	28.93	27.41	1-1/8"-8 UN-2B	Gr.7	0.266
06	3.V.M358.95178/03	96 456 485	ASTM A194 Gr.8,SH,CERTIFY	26.97	26.19	31.17	29.85	16.03	14.91	5/8"-11 UNC-2B	Gr.8	0.033
07	3.V.N363.95178/02	96 456 618	ASTM A194 Gr.8,SH,CERTIFY	22.22	21.59	25.65	24.61	12.80	11.79	1/2"-13 UNC-2B	Gr.8	0.021
08	3.V.M463.95178/02	96 456 654	ASTM A194 Gr.8,SH,CERTIFY	24.00	23.67	--	26.75	14.80	14.10	M16-6H	Gr.8	0.034
09	3.V.B001.95178/02	96 456 656	ASTM A194 Gr.8,SH,CERTIFY	--	19.00	--	21.10	--	10.00	M12-6H	Gr.8	0.018
10	3.V.N204.95178/02	96 456 657	ASTM A194 Gr.8,SH,CERTIFY	31.75	30.78	36.65	35.10	19.25	18.03	3/4"-10 UNC-2B	Gr.8	0.076
11	3.V.NH84.95178/00	96 465 629	ASTM A194 Gr.7,HT,CERTIFY	60.33	58.42	69.65	66.59	38.23	36.40	1-1/2"-8UN-2B	Gr.7	0.52





NOTES:

1. FOR QUALITY REQUIREMENTS REFER LATEST APPLICABLE STANDARD.
2. PUNCH MATERIAL MARK(REFER TABLE) & MAKER'S MARK.

REV	DATE	ALTERED	
08	16.06.14	CHD & APPD	M.RAMESH MS&SSK

SL.No.11 INCLUDED

REV	DATE	ALTERED	
07	20.11.13	CHD & APPD	M.S SSK & KRS

DRAWING CONVERTED INTO AUTOCAD
ASTM A194 Gr.8 WAS AISI 304.
GALVANISING REMOVED FOR Gr.7
DCP:801645

REV	DATE	ALTERED	
06	28.05.01	CHD & APPD	TRR KSR

MATL.SPECN. A194 Gr.4 REVISED TO A194 Gr.7

REFER DCN. CS: 1147

REV	DATE	ALTERED	
05	13.06.96	CHD & APPD	K.P.L AVN

MATL. Gr.8 & Gr.D CHANGED AS SS 304.

REFER CS:DCN:CS: 0585

-	-	-	-	-	-	-	-	-	-
NO OFF	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

RETRACED WITH REV. 07 ON 20.11.2013

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

	NAME	SIGN	DATE	NO.OF VAR.
DRN	K.P.L		13.06.96	
CHD	N.D.P		13.06.96	
APPD	A.V.N		13.06.96	

DEPT	SCALE	WEIGHT (KG).	REFERENCE INFORMATIONS	NO. OF ITEMS
VL	NTS	REF. TABLE	CAD: C395178	
CODE 320				

TITLE	CARD CODE	DRAWING NO.	REV
HEX. NUT	U 01	3-V-0000-95178	08

Size A3

ALL DIMENSIONS ARE IN MILLIMETRES. FOR TOLERANCES OF UNTOLERANCED DIMENSIONS DURING MANUFACTURE REFER RELEVANT QCP / QP.

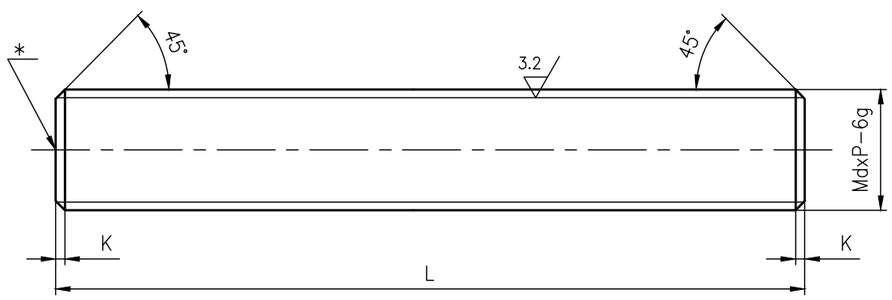
DRAWING NO. 3-V-0000-20729

SL No.	DRAWING No.	COMP. CODE	MATL. SPECN.	DIMENSIONS MDxP-6g	L	K		WT(KG)
01	3-V-0001-20729/02	964524410000	A193 B7, CERTIFY	M30x3	185	3		1.03
02	3-V-0002-20729/02	964524420000		M30x3	280	3		1.55
03	3-V-0003-20729/02	964524430000		M42x3	440	3		4.79
04	3-V-0004-20729/02	964524440000		M48x3	520	3		7.39
05	3-V-0005-20729/02	964526850000		M20x2.5	195	2.5		0.48
06	3-V-0006-20729/02	964527050000		M30x3	270	3		1.49
07	3-V-0007-20729/02	964527260000		M36x3	270	3		2.04
08	3-V-0008-20729/02	964527270000		M36x3	500	3		3.78
09	3-V-0009-20729/02	964527280000		M36x3	310	3		2.34
10	3-V-0010-20729/02	964527290000		M20x2.5	165	2.5		0.52
11	3-V-0011-20729/02	964527300000		M22x2.5	180	2.5		0.54
12	3-V-0012-20729/02	964527310000		M24x3	190	3		0.68
13	3-V-0013-20729/02	964527320000		M24x3	210	3		0.75
14	3-V-0014-20729/02	964527330000		M24x3	250	3		0.89
15	3-V-0015-20729/01	964534230000		M12x1.75	90	2		0.09
16	3-V-0016-20729/01	964534240000		M16x2	125	2		0.20
17	3-V-0017-20729/01	964534250000		M20x2.5	150	2.5		0.47
18	3-V-0018-20729	964651670000		M42x3	220	3		2.4
19	3-V-0019-20729	964660060000		M39x3	480	3		4.5
20	3-V-0020-20729	964653440000		M39x3	240	3		2.2
21	3-V-0021-20729	964653450000		M39x3	280	3		2.6
22	3-V-0022-20729	964654080000		M42x3	340	3		3.5
23	3-V-0023-20729	964655060000		M48x3	300	3		4.20
24	3-V-0024-20729	964654870000		M30	240	3		1.3
25	3-V-0025-20729	964655080000		M33	220	3.5		1.5
26	3-V-0026-20729/02	964524450000	A193 B16, CERTIFY	M30x3	185	3		1.03
27	3-V-0027-20729/02	964524460000		M30x3	280	3		1.55
28	3-V-0028-20729/02	964524470000		M42x3	440	3		4.79
29	3-V-0029-20729/02	964524480000		M48x3	520	3		7.39
30	3-V-0030-20729/02	964526860000		M20x2.5	195	2.5		0.48
31	3-V-0031-20729/02	964527060000		M30x3	270	3		1.49
32	3-V-0032-20729/02	964527340000		M36x3	270	3		2.04
33	3-V-0033-20729/02	964527350000		M36x3	500	3		3.78
34	3-V-0034-20729/02	964527360000		M36x3	310	3		2.34
35	3-V-0035-20729/02	964527370000		M20x2.5	165	2.5		0.52
36	3-V-0036-20729/02	964527380000		M22x2.5	180	2.5		0.54
37	3-V-0037-20729/02	964527390000		M24x3	190	3		0.68
38	3-V-0038-20729/02	964527400000		M24x3	210	3		0.75
39	3-V-0039-20729/02	964527410000		M24x3	250	3		0.89
40	3-V-0040-20729/01	964534260000		M12x1.75	90	2		0.09
41	3-V-0041-20729/01	964534270000		M16x2	125	2		0.20
42	3-V-0042-20729/01	964534280000		M20x2.5	150	2.5		0.47
43	3-V-0043-20729	964651700000		M42x3	220	3		2.4
44	3-V-0044-20729	964660070000		M39x3	480	3		4.5
45	3-V-0045-20729	964652610000		M39x3	240	3		2.2
46	3-V-0046-20729	964652620000		M39x3	280	3		2.6
47	3-V-0047-20729	964654090000		M42x3	340	3		3.5
48	3-V-0048-20729	964654150000		M27x3	180	3		0.8
49	3-V-0049-20729	964655740000		M33	220	3.5		1.5

12.5 3.2

NOTES:-

1. QUALITY REQUIREMENTS SHALL BE AS PER LATEST APPLICABLE QUALITY WORK INSTRUCTION.
* 2. PUNCH MATL.MARK B7 FOR A193-B7 AND B16 FOR A193-B16



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

REV	DATE	ALTERED GANESH	REV	DATE	ALTERED GANESH
13	28.05.13	CHD & APPD K.RAJASEKARAN	12	14.03.13	CHD & APPD M.RAJAKUMAR
	SL. No. 49 INCLUDED.			SL. No. 25 INCLUDED.	

TYPE OF PRODUCT
OR NAME OF
CUSTOMER/PROJECT

BHARAT HEAVY ELECTRICALS LTD.,
UNIT: HIGH PRESSURE BOILER PLANT.
TIRUCHIRAPALLI-620014.
365-121

	NAME	SIGN	DATE	NO.OF VAR.
DRN	V.BAIRAVAN		15.3.04	
CHD	K.RAJASEKARAN		15.3.04	
APPD	M.RAJAKUMAR		15.3.04	

DEPT	SCALE	WEIGHT (KG).	REFERENCE INFORMATIONS	NO. OF ITEMS
VL	NTS	REF. TABLE	CAD REF:-T320729	
CODE 320				

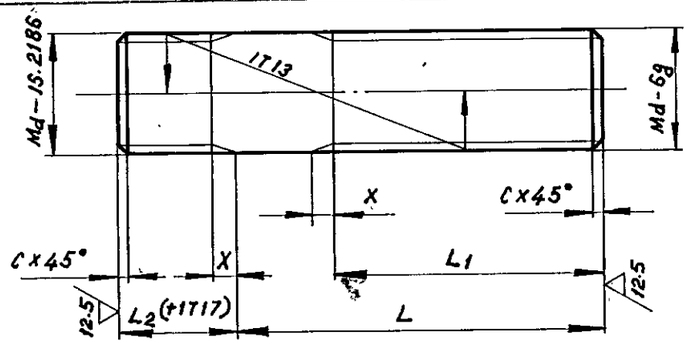
TITLE	CARD CODE	DRAWING NO.	REV
STUD	U 01	3-V-0000-20729	13

Size A3

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

SL. No.	DRAWING No.	MATERIAL DETAILS					GROSS WT. (Kg)	DIMENSIONS							IT13	NET WT. (Kg)	COMP. CODE	SL. No.
		SPECN.	SIZE	CODE	HEAT TREATMENT	SCRAP SORT		L	L_1	L_2 +IT17	X	C	Md					
1	3.V.1134.03661/1	ASTM A193-B7, CERTIFY	ϕ16 x 65	15039115	HARDENED & TEMPERED	20	0.103	45	26	$13^{+1.8}$	3.5	1.5	M10		0.27	0.036	93059516 0000	1
2	3.V.1135.03661/1		ϕ20 x 85	15039084			0.210	55	38	$23^{+2.1}$	5	2	M16		0.27	0.123	93059517 0000	2
3	3.V.1132.03661/1		ϕ25 x 90	15039086			0.347	60	46	$23^{+2.1}$	6	2.5	M20		0.33	0.205	93059518 0000	3
4	3.V.2663.03661/1		ϕ20 x 75	15039084			0.185	46	35	$23^{+2.1}$	5	2	M16		0.27	0.12	93060 255 0000	4
5	3.V.1076.03661		ϕ16 x 80	15039115			0.13	55	35	$20^{+2.1}$	3.5	1.5	M10		0.27	0.05	93060 866 0000	5
6	3.V.1705.03661		ϕ25 x 100	15039086			0.386	70	46	$23^{+2.1}$	6	2.5	M20		0.33	0.21	93060 939 0000	6
7	3.V.5402.03661		ϕ20 x 118	15039084			0.29	85	38	$23^{+2.1}$	5	2	M16		0.27	0.19	93067807 0000	7
8	3.V.2899.03661		ϕ25 x 110	15039086			0.424	75	30	$32^{+2.8}$	6	2.5	M20		0.33	0.26	93100606 0000	8
9	3.V.2956.03661		ϕ16 x 70	15039115			0.11	45	25	$20^{+2.1}$	3.5	1.5	M10		0.27	0.04	93101732 0000	9
10	3.V.2961.03661		ϕ20 x 100	15039084			0.25	70	40	$23^{+2.1}$	5	2	M16		0.27	0.15	93101996 0000	10
11	3.V.P208.03661		ϕ25 x 110	15039086			0.42	65	35	$35^{+2.8}$	6	2.5	M20		0.33	0.25	93102 623 0000	11
12	3.V.B555-03661		ϕ25 x 95	15039086			0.36	50	35	$35^{+2.8}$	6	2.5	M20		0.33	0.21	93103541 0000	12
13	3.V.5142-03661	A193 B16	ϕ32 x 130	15039165			0.82	85	60	$35^{+2.8}$	6	2.5	M27		0.33	0.54	93103719 0000	13
14	3.V.5618-03661	A193-87, CERTIFY	ϕ16 x 95	15039115	HARDENED, TEMPERED	20	0.15	67	25	$20^{+2.1}$	3.5	1.5	M10		0.27	0.05	93166 603 0000	14

6.3 / 12.5



NO. OF PIECES	DESCRIPTION	SEM PRO./SEQ.NO.	INT. MAT. / SEQ. NO.	FINAL MATERIAL	SCRAP SORT	NET wt (kg)	GROSS (wt) kg	DRAWING NO.	ITEM NO

RETRACED WITH REV. No. 10 ON 15.6.95

X01

REV.	DATE	ALTERED CHE & APPD.	REV.	DATE	ALTERED CHE & APPD.	REV.	DATE	ALTERED CHE & APPD.
REV.	DATE	ALTERED CHE & APPD.	REV.	DATE	ALTERED CHE & APPD.	REV.	DATE	ALTERED CHE & APPD.
						ZONE		

BHARAT HEAVY ELECTRICALS LTD.,
BOILER PLANT UNIT, TIRUCHIRAPALLI-14

FIRST ANGLE	SCALE: NTS	DRAWN: R.L.	TOTAL NET wt. (kg):
ALL DIMENSIONS IN MILLIMETRES		CHECKED: R.L.	TYPE:
		APPROVED: M.R.K.	
		DATE: 15.6.95.	NEW/OLD DRG. NO:

TITLE: STUD

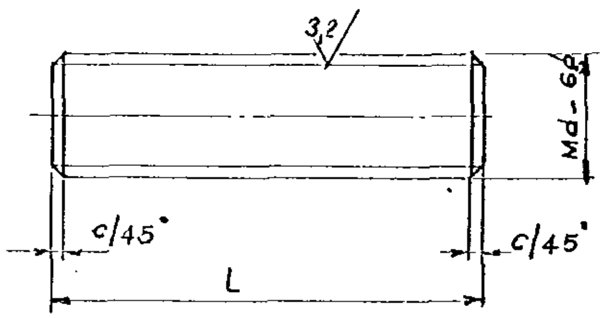
DRAWING NO: 3.V.0000.03661 | REVISION: 10

33-115

Sl. No	DRG. No.	RAW MATERIAL SPECIFICATION	SIZE	CODE No.	WT. (kp)	DIMENSIONS L	Md-6g	c/45°	FINISH WT. (kp)	APPLICABLE TYPE Nos.	Sl. No
1	3-V-S661-09338	ASTM-A-193 B7	BAR. ϕ 20X55	15039084	0.16	50	M16	2	0.09	S661 S665, S666, S964, S998	1
2.	3-V-S833-09338	ASTM-A193 B7	BAR ϕ 12x35	15039091	0.03	30	M8	1	0.01	S833, S834, S835, S836, S837, S838, S839, S840, S841, S842, S843, S844, S845, S846, S847, S848, S849 S850, S851, S852, S853, S854, S865, S865, S867, S868, S869, S860, S861, S862, S863, S864, S870, S882, S883, S884, S885	2
3	3-V-S858-09338	ASTM-A193 B7	BAR ϕ 12x35	15039091	0.03	40	M6	1	0.008	S858, S859	3
4	3-V-N204-09338 93104965 0000		BAR ϕ 12X60	15039091	0.53	55	M8	1	0.02	N204	4
5	3-V-N210-09338 93107 183 0000	ASTM A193 B7	ϕ 10X90	–	0.80	80	M8	1	0.05	2, 3, 4" – 150C & 300C GV	5
6.	3-V-N645-09338 93108 303 0000		ϕ 25X120	–	0.462	110	M20	2	0.27	N645	

12.5 / 3.2

MICROFILMED ON 21.1.89
ROLL 00538 FRAME 4391



ASTM-A193-B7	Q & T	10	– CERTIFY
MATERIAL SPECIFICATION	HEAT TREATMENT	SCRAP SORT	TYPE OF CERTIFICATION

BHARAT HEAVY ELECTRICALS LTD.,
BOILER PLANT UNIT, TIRUCHIRAPALLI-14

FIRST ANGLE | SCALE | DRAWN | CHECKED | APPROVED | DATE 24.1.77 | TOTAL wt. (kg) | TYPE | NEW/OLD DRG. No.

ALL DIMENSIONS IN MILLIMETRES

CAUTION

09-229

TITLE: STUD

DRAWING No. 3-V-S000-09338

REVISION 05

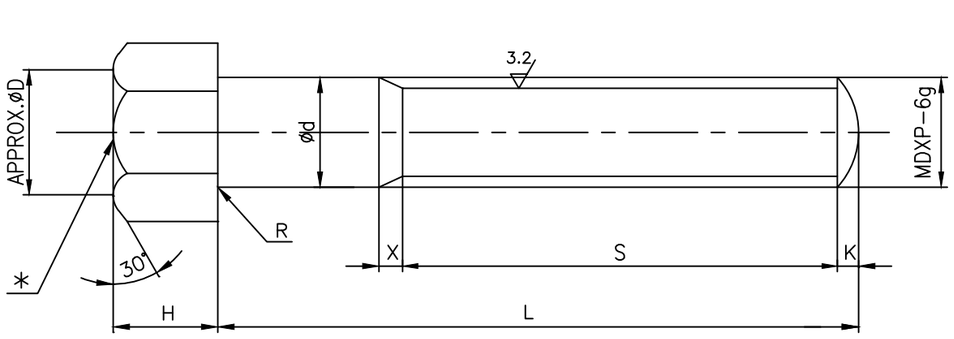
REV	DATE	ALTERATION	ALTD / CHD
06	11-09-97	SL NO. 6 IS INCLUDED	ALTD: N.D. PAL; CHD & APPD
05	18-9-96	SL NO: 05 INCLUDED.	ALTD T.C.; CHD
03	26-3-94	SL. NO 4 IS INCLUDED	ALTERED: N.D. PAL; CHECKED
02	23/4/86	In Sl No: 3 Dimension L INCREASED FROM 30 TO 40	ALTERED; CHED.
01	17.9.77	SL. No. 2 INCLUDED.	ALTERED: N. Dakshinamoorthy; CHECKED

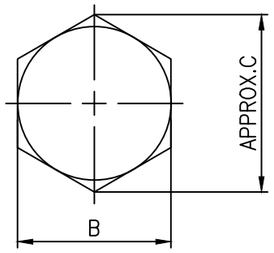
ALL DIMENSIONS ARE IN MILLIMETRES. FOR TOLERANCES OF UNTOLERANCED DIMENSIONS DURING MANUFACTURE REFER RELEVANT QCP / QP.

DRAWING NO. 3-V-0000-25679

12.5 / 3.2

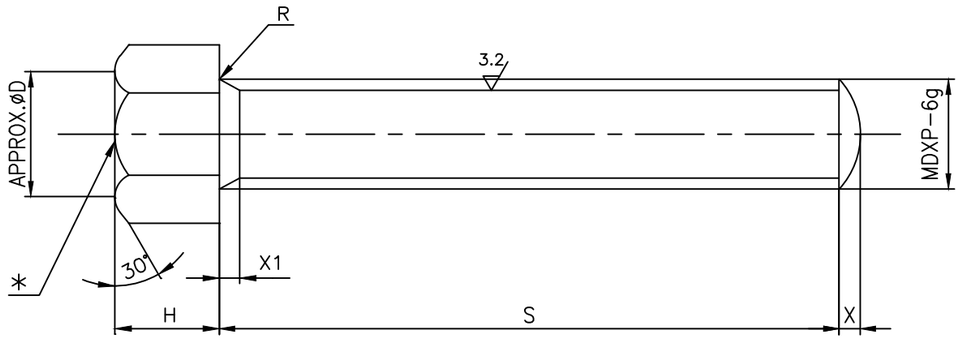
SL No.	DRAWING NO.	COMP. CODE	MATL. SPECN.	DIMENSIONS														NET WT (Kgs)	REMARKS
				MD	P	L	S	H	K	X	X1	R	ød	øD	B	C			
01	3-V-0001-25679	964657700000	ASTM A193 B8M CERTIFY	M16	2	55	55	10	–	4	6	0.6	16	23	24	27.7			0.116	





NOTES:

1. * PUNCH MATERIAL MARK B8M FOR A193 B8M.
2. QUALITY REQUIREMENTS SHALL BE AS PER LATEST TDC.5:164



IN CASE OF FULL THREAD

REV	DATE	ALTERED	D.JEYASRI
01	08.08.17	CHD & APPD	SSK & KRS

DRAWING UPDATED

NO OF	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

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

	NAME	SIGN	DATE	NO.OF VAR.
DRN	R.ANITHA		01.09.16	
CHD	S.SATHEESKUMAR		01.09.16	
APPD	K.RAJASEKARAN		01.09.16	

DEPT	SCALE	WEIGHT (KG).	REFERENCE INFORMATIONS	NO. OF ITEMS
VL	/	–		
CODE 320				

TITLE	CARD CODE	DRAWING NO.	REV
BOLT	U 01	3-V-0000-25679	01

Size A3

STUD BOLTS FOR TEMPERATURE USE

(For medium of Temperature upto 425°C)

1.0 SCOPE

Covers the requirements for Stud Bolts for use in medium of temperature 425°C in the size range M12 to M39x3.

2.0 SPECIFICATION AND REFERENCE STANDARDS

Dimensions and preferred sizes	Fig 1 & 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	Table 1 of this standard
	Tolerance	6g
	Indian Standard	IS 4218 (Part 3, 5 & 6)
Material	Steel according to ASTM A193 - B7 Certified in quenched and tempered condition	
Manufacture	Thread rolling up to M24	
Mechanical Properties	As specified in ASTM A193-B7	
Marking	All studs shall be stamped B7 on any one side	
General requirements	Studs shall comply with TDC:5:164 in respect of requirements not covered in this standard except for cadmium plating.	

2.1 Referred standards (Only current versions are applicable)

IS 1367 Part 2	Technical supply conditions for threaded steel fasteners
IS 1368	Dimensions for ends of parts with external ISO metric threads
IS 4218 Part 3,5 & 6	ISO metric screw threads
ASTM A193	Specification for alloy steel and stainless steel bolting material for high temperature service
TDC:5:164	TDC for alloy steel studs to specification ASTM SA193 Gr B7 / B7m / B16 oil field equipment

3.0 DESIGNATION

A Grade 'A' Stud to this standard of thread size M16 and nominal length 90mm shall be designated as:

3.1 On Drawings

i) Material Specification column	A193 - B7
ii) Description Column	STUD BOLT GR A T425 M16x90
iii) Drawing Number Column	BPS 41117
iv) Material Code column:	4111716090

3.2 Ordering Description

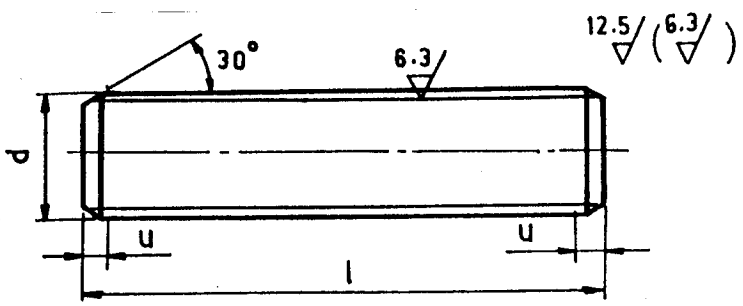
For placing indents, issuing enquiries and on purchase order, Ordering Description given below shall be followed.

Stud M16x90 - BPS: 41117 A - ASTM A193-B7

4.0 ADDITIONAL INFORMATION

4.1 Copies of this standard and TDC:5:164 shall be enclosed along with the purchase order

FIG. 1, DIMENSIONS FOR STUD BOLTS
(All dimensions are in millimetres)



'**u**' according to IS:1368

TABLE 1 PREFERRED LENGTH - SIZE COMBINATION FOR STUD BOLTS
(All dimensions are in millimetres)

Thread Size d	Nominal Length (l)																	
	60	70	80	90	100	110	120	130	140	150	160	170	180	200	225	240	250	280
	Weights																	
M12		62	70.9															
M16				135.9	151.7		183.3										357.1	
M20				221.9			280.9		303									
M24							390.4			496.9			603.4					
(M27)									591.4				770.8					
M30									722.9		832.4							
(M33)													1208.6					
(M39x3)														1875.7				

Note:

1. Preferred lengths are in between the stepped bold lines
2. Weights are given in Kg per 1000 numbers only
3. Sizes in brackets are non-preferred

HEXAGON THIN NUTS, PRODUCT GRADE 'B'

(Product Class 05)

1.0 SCOPE

Covers the requirements of hexagon thin nuts in the size range M33, to M39x3.

2.0 SPECIFICATION AND REFERENCE STANDARDS

Dimensions and preferred sizes	Fig 1 & Table 1 of this standard	
Tolerance	Product grade	B for nuts with d > M16
	Indian Standard	IS: 1367 (Part 2)
Thread	Pitch	Table 1 of this standard
	Tolerance	6H
	Indian Standard	IS 4218 (Part 3, 5 & 6)
Material	Steel	
MechanicalProperties	Property class	05
	Indian Standard	IS: 1367 (Part 6)
Sampling and Acceptability	Indian Standard	IS: 1367 (Part 17)
General requirements	Nuts shall comply with IS: 1364 Part 4 in respect of requirements not covered in this standard.	

2.1 Referred standards (Only current versions are applicable)

IS 1364 (Part 4)	Specification for hexagon head bolts, screws and nuts of product grade A&B
IS 1367 (Part 2,6 & 17)	Technical supply conditions for threaded steel fasteners
IS 4218 (Part 3,5 & 6)	ISO metric screw threads

3.0 DESIGNATION

A Grade 'B' hexagon Thin Nut to this standdad of thread size M39x3 shall be designated as :

3.1 On Drawings

i) Material Specification column	--------
ii) Description Column	HEX THIN NUT GR B M39x3 - 05
iii) Drawing Number Column	BPS 41302
v) Material Code column	4130200039

3.2 Ordering Description

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

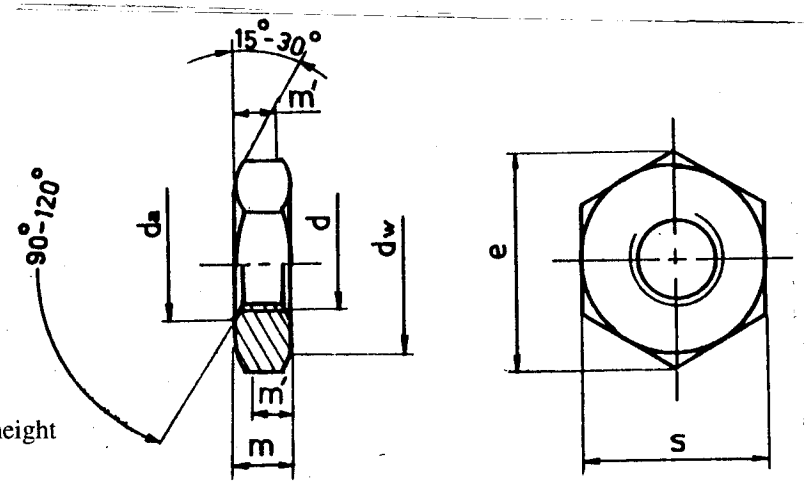
i)HEXAGON THIN NUT M33 BPS: 41302-05 for nuts with d = M33
ii)HEXAGON THIN NUT M39x3 BPS: 41302 for nuts with d >= M36x3

4.0 ADDITIONAL INFORMATION

4.1 The hardness value in Table 4 of IS: 1367 (Part 6) for coarse pitch series shall be applicable for thread sizes >= M36x3

4.2 Copies of this standard shall be enclosed along with purcfase order

FIG 1 DIMENSIONS FOR HEXAGON THIN NUTS
(All dimensions are in millimetres)



m' = Effective guaging height

TABLE 1
(All dimensions are in millimetres)

Thread Size d)	(M33)	M36x3	(M39x3)
P(Pitch)	3.50	3.00	3.00
d_a Min	33.00	36.00	39.00
Max	35.64	38.90	42.10
d_w Min	46.67	51.10	56.00
e Min	55.37	60.79	66.44
m Max	17.00	18.00	20.00
Min	15.90	16.90	18.70
m' Min	12.70	13.50	14.96
s Max	50.00	55.00	60.00
Min	49.00	53.80	58.80
Weight			251.00

NOTE:

1. Sizes in brackets are non-preferred
2. Weights are given in Kg per 1000 numbers only

HEXAGON NUTS, PRODUCT GRADE 'B'

(Property Class 6 & 22H)

1.0 SCOPE

Covers the requirements of hexagon nuts in the size range M27, M33 and above.

2.0 SPECIFICATION AND REFERENCE STANDARDS

Dimensions and preferred sizes	Fig. 1 & Table 1 of this standard	
Tolerance	Product grade	B
	Indian Standard	IS 1367 (Part 2)
Thread	Pitch	Table 1 of this standard
	Tolerance	6H
	Indian Standard	IS 4218 (Part 3, 5 & 6)
Material	Steel	
Mechanical Properties	Property class 6 H for nuts with d <= M39x3 22H for nuts with d > M39x3	
	Indian Standard IS: 1367 (Part 6) for nuts with d <= M39x3 IS: 1367 (Part 7) for nuts with d > M39x3	
Sampling and Acceptability	Indian Standard	IS: 1367 Part 17)
General requirements	Nuts shall comply with IS: 1364 (Part 3) in respect of requirements not covered in this standard.	

2.1 Referred standards (Only current versions are applicable)

IS 1364 Part 3	Specification for Hexagon head bolts & nuts of product grade A&B Part 3 Hexagon nuts.
IS 1367 Part 2,6,7 & 17	Technical supply conditions for threaded steel fasteners
IS 4218 Part 3,5 & 6	ISO metric screw threads
IS 3138	Hexagonal bolts and nuts

3.0 DESIGNATION

A Grade 'B' hexagon nut to this standard of thread size M36x3 shall be designated as :

3.1 On Drawings

i) Material Specification column	-------
ii) Description Column	HEX NUT M36x3-6
iii) Drawing Number Column	BPS 41301
iv) Material Code column:	4130100036

3.2 Ordering Description

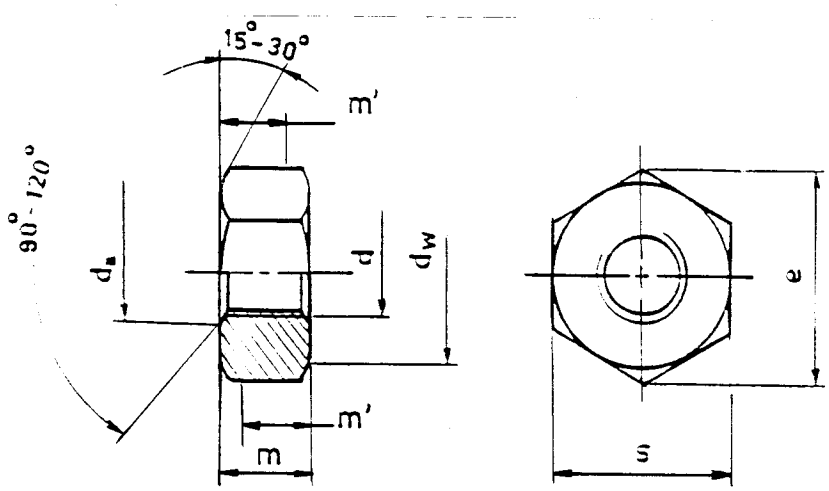
For placing indents, issuing enquiries and on purchase order, Ordering Description given below shall be followed.(Typical examples)

Hex Nut M27 to BPS : 41301 (for nuts with d=M27 & M33)
Hex Nut M36x3 to BPS : 41301 (for nuts with d=M36x3 & M39x3)
Hex Nut M42x3 to BPS : 41301 (for nuts with d=M42x3 & M48x3)

4.0 ADDITIONAL INFORMATION

4.1 The hardness values in Table 4 of IS: 1367 Part 6 (for coarse pitch series) shall be applicable for thread sizes M36x3 and M39x3 also.
4.2 The overall dimensions for thread sizes M42x3 and above are based on IS: 3138.
4.3 Copies of this standard shall be enclosed along with the purchase order.

FIG.1, DIMENSIONS FOR HEXAGON NUTS
(All dimensions are in millimetres)



'm' = Effective gauging height

TABLE 1
(All dimensions are in millimetres)

Thread Size	d_a		d_w	e		m		m'	s		Weight
d	Min	Max	Min	Max	Min	Max	Min	Min	Max	Min	
(M27)					45.20	22.0	20.7		41	40.0	166
(M33)					55.37	26.0	24.74		50	49.0	299
M36x3	36	38.9	51.1		60.79	31.0	29.4	23.52	55	53.8	364
(M39x3)					66.44	31.0	29.4		60	58.8	485
M42x3				75		34.0	33.0		65	63.8	569
M48x3				86.5		38.0	37.0		75	73.8	935

Note:

1. Sizes in brackets are non-preferred
2. Weights are given in Kg per 1000 numbers only

NUTS FOR TEMPERATURE USE

(For medium of temperature upto 425 ° C)

1.0 SCOPE

Covers the requirements of hexagon nuts for use in medium of temperature upto 425 ° C and in the size range M8 to M45x3.

2.0 SPECIFICATION AND REFERENCE STANDARDS

Dimensions and preferred sizes	Fig 1 &Table 1 of this standard	
Tolerance	Product grade	A for nuts with d <= M16 B for nuts with d > M16
	Indian Standard	IS 1367 (Part 2)
Thread	Pitch	Table 1 of this standards
	Tolerance	6H
	Indian Standard	IS 4218 (Part 3, 5 & 6)
Material	Steel to ASTM A 194 2H Certified	
Testing	The finished nut shall satisfy the requirements of hardness, proof load and cone proof load, tests as specified in ASTM A194	
General requirements	Nuts shall comply with TDC:5:166 in respect of requirements not covered in this standard. except for cadmium plating	

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

IS 1367 (Part 2)	Technical supply conditions for threaded steel fasteners
IS 4218 (Part 3,5 & 6)	ISO metric screw threads
TDC:5:166	Carbon steel nuts for OFE & other applications asper A 194 GR 2H/2HM
ASTM A194	Specification for carbon and alloy steel nuts for bolts for high pressure and high temperature service.

3.0 DESIGNATION

A Grade 'A' hexagon nut to this standard of thread size M8 shall be designated as :

3.1 On Drawings

i) Material Specification column	ASTM A 194 - 2H
ii) Description Column	NUT HEX GR A T425 M8
iii) Drawing Number Column	BPS 41319
iv) Material Code column:	4131900008

3.2 Ordering Description

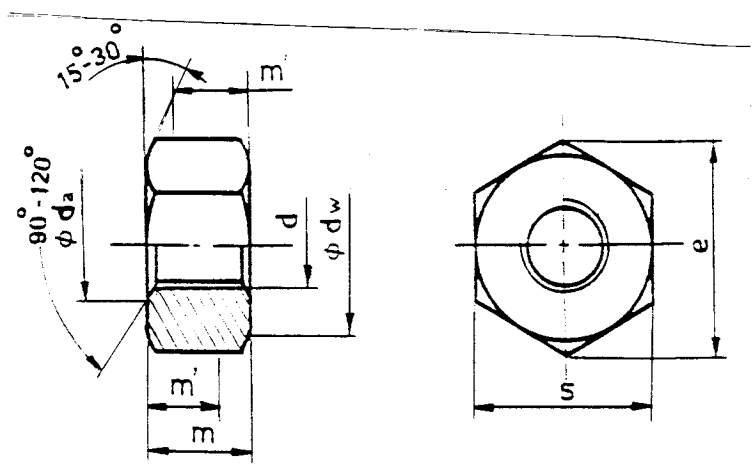
For placing indents, issuing enquiries and on purchase order, Ordering Description given below shall be followed.(Typical exampies)

Hex Nut M8 to BPS : 41319-A-ASTM A194-2H for nuts with d <= M16
Hex Nut M20 to BPS : 41319-B-ASTM A194-2H for nuts with d > M16 and d < M36x3
Hex Nut M36x3 to BPS: 41319-B-ASTM A194-2H for nuts with d >= M36x3

4.0 ADDITIONAL INFORMATION

4.1 Copies of this standard and TDC:5:166 shall be enclosed along with the purchase order.

Figure 1 DIMENSIONS FOR HEXAGON NUTS
(All dimensions are in millimetres)



'**m**' = Effective gauging height

TABLE 1
(All dimensions are in millimetres)

Thread Size	d_a		d_w	e		m		m'	s		Weight
d	Min	Max	Min	Max	Min	Max	Min	Min	Max	Min	
M8	8	8.75	11.6		14.38	8	7.64	6.1	13	12.73	6.0
M10	10	10.80	14.6		17.77	10	9.64	7.7	16	15.73	10.8
M12	12	13.00	16.6		20.03	12	11.57	9.3	18	17.73	16.5
M16	16	17.30	22.5		26.75	17.1	16.40	13.1	24	23.67	33.0
M20	20	21.60	27.7		32.95	20.7	19.40	15.5	30	29.16	64.5
M24	24	25.90	33.2		39.55	24.2	22.90	18.3	36	35.00	110.0
(M27)					45.20	27.6	26.30	21.0	41	40.00	166.0
M30	30	32.40	42.7		50.85	30.7	29.10	23.3	46	45.00	231.0
(M33)					55.37	33	31.40	25.1	50	49.00	299.0
M36x3	36	38.90	51.1		60.79	36.6	35.00	28.6	55	53.80	364.0
(M39x3)					66.44	39	37.40	29.9	60	58.80	485.0
(M45x3)				80.8		45	43.40	34.7	70	68.80	750.0

NOTE :

1. Sizes in brackets are non-preferred.
2. Weights are given in Kg per 1000 numbers only.

Based on IS: 1364 (part 3)

HEXAGON NUTS, PRODUCT GRADE A
(Property Class 8)

1.0 SCOPE:

Covers the requirement 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 & Nuts. (Part 3) of product grade A & B, Part 3 Hexagonal Nuts.

IS: 1367 Technical supply conditions for threaded steel fasteners.

IS: 2614 Method of sampling fasteners.

IS: 4218 ISO metric screw threads.

3.0 DESIGNATION

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

3.1 On Drawings

1) Material Specification column : IS: 1364
2) Description Column : NUT HEX GR A 8–M6
3) Drawing Number column : 4132006000
4) 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:

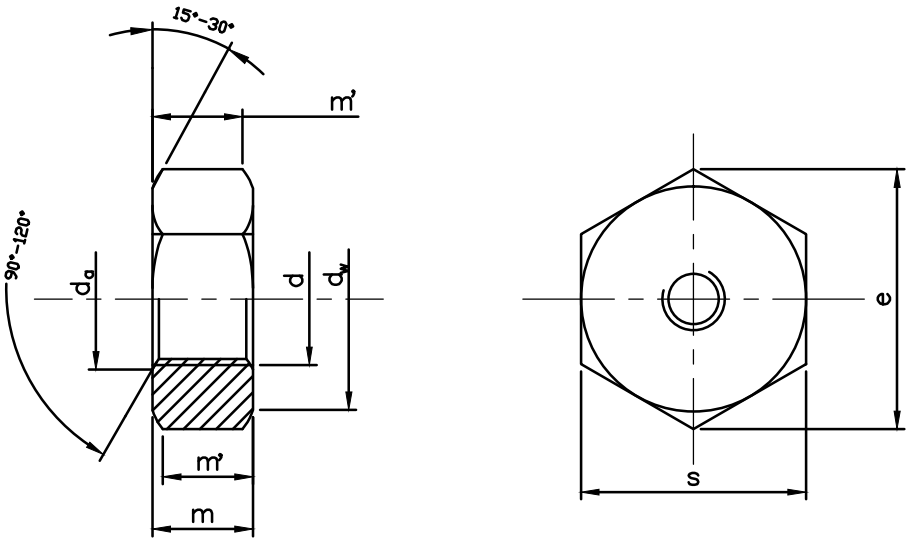
Hex Nut M6 IS: 1364 (part–3) –8

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

TABLE 1 DIMENSIONS FOR HEXAGONAL NUTS



m' = Effective guaging height

(All dimension are in millimeters)

Thread Size d	da		dw	e	m		m'	s		Weight
	Min	Max	Min	Min	Max	Min	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;

1. Weights are given in kg per 1000 numbers only.
2. For stocked sizes refer BPS components booklet.

Based on IS: 1364(part–1)

HEXAGONAL HEAD BOLTS, PRODUCT GRADE A
(property class 8.8)

1.0 SCOPE:

Covers the requirements of Hexagonal Head Bolts 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(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	Bolts shall comply with IS :1364 in respect of requirement not covered in this standards	

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

IS: 1364 (part–1) Specification for hexagon head Bolts,screws and nuts of grade A&B. Part 1 Hexagonal bolts.

IS: 1367 Technical supply conditions for threaded steel fasteners

IS: 2614 Method for sampling of fasteners

IS: 4218 ISO Metric screw threads

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

3.0 DESIGNATION:

A Grade A Hexagon Head Bolt to this standard of thread size M16 and nominal length 60mm shall be designated as:

3.1 On Drawings:

1) material specification column : IS: 1364
2) Description column : BOLT HEX GR A 8.8 M16X60
3) Drawing number column : 4123716060
4) Material code column : 4123716060

3.2 Ordering Description:

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

Hexagon Bolt M16X60 IS: 1364(part-1)-8.8

Revisions			
Rev. No.	Amd. No.	Reaffirmed	Year
Dt.	Dt.		

Prepared	Issued	Dt of 1st Issue
Standards /EDC	Standards /EDC	

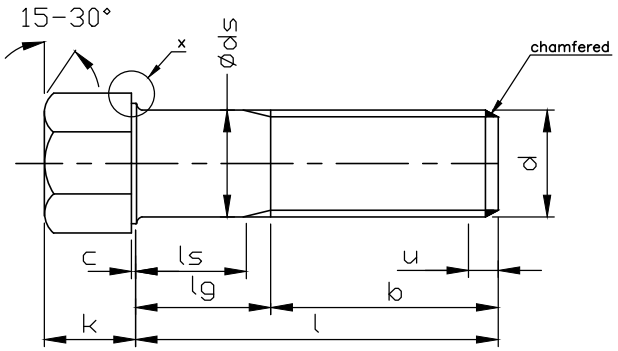
Approved
Engg.Deupt.Manager

PLANT STANDARD

HPBP TIRUCHIRAPALLI

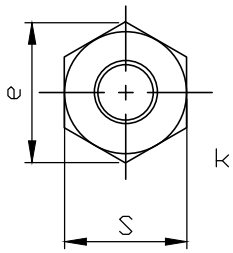
BPS:41237

TABLE 1 DIMENSIONS FOR HEXAGONAL HEAD BOLTS

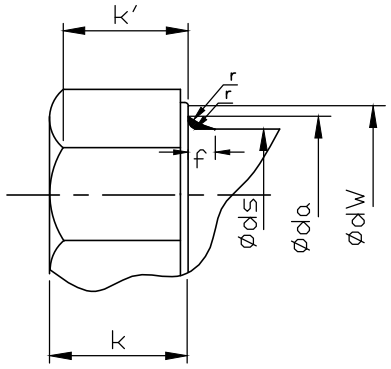


u according to CE of IS:1368 – ' Dimensions of ends of bolts and screws

lg Max=l Nom–b ; ls Min= l Max – 5xpitch



k'=Effective gauging height.



maximum & minimum underhead fillet

(ALL DIMENSIONS ARE IN MILLIMERTERS)

Thread size d	b			C		da	ds		dw Min		e Min		f	k				k'	r	s		
														+		++					Min.	
	1	2	3	Min.	Max.	Max.	Max.	Min.	+	++	+	++	Max.	Min.	Max.	Min.	Max.	Min.	Min.	Max.	+	++
M6	18	–	–	0.15	0.5	6.8	6	5.82	8.9	8.7	11.05	10.89	1.4	3.85	4.15	3.76	4.24	2.63	0.25	10	9.78	9.64
M8	22	28	–	0.15	0.6	9.2	8	7.78	11.6	11.4	14.38	14.20	2	5.15	5.45	5.06	5.54	3.54	0.4	13	12.73	12.57
M10	26	32	–	0.15	0.6	11.2	10	9.78	14.6	14.4	17.77	17.59	2	6.22	6.58	6.11	6.69	4.28	0.4	16	15.73	15.57
M12	30	36	–	0.15	0.6	13.7	12	11.73	16.6	16.4	20.03	19.85	3	7.32	7.68	7.21	7.79	5.05	0.6	18	17.73	17.57
M16	38	44	57	0.2	0.8	17.7	16	15.73	22.5	22	26.75	26.17	3	9.82	10.18	9.71	10.29	6.8	0.6	24	23.67	23.16

1) For Nom length l ≤ 125mm; + for 1 ¯< 10d or 150mm;

2) For Nom length l >125 and ≤ 200mm; ++ for 1 < 10d or 150mm;

3) For Nom length l >200mm

TABLE 2– PREFERRED LENGTH–SIZE COMBINATION FOR HEXAGON HEAD BOLTS

(ALL DIMENSIONS ARE IN MILLIMERTERS)

Length 'l'					Thread size d				
	For 1 ≤ 10 d or 150		For 1 > 10 d or 150		M6	M8	M10	M12	M16
Nom	Min	Max	Min	Max					
20	19.58	20.42							
25	24.58	25.42							
30	29.58	30.42							
35	34.5	35.5	33.75	36.25					
40	39.5	40.5	38.75	41.25					
45	44.5	45.5	43.75	46.25	11.8				
50	49.5	50.5	48.75	51.25				58.7	
55	54.4	55.6	53.5	56.5				63.2	
60	59.4	60.6	58.5	61.5		28.2		67.6	123
65	64.4	65.6	63.5	66.5					
70	69.4	70.6	68.5	71.5			53.6		139
75	74.4	75.6	73.5	76.5		35.6			
80	79.4	80.6	78.5	81.5					155
90	89.3	90.7	88.25	91.75					171
100	99.3	100.7	98.25	101.75					
110	109.3	110.7	108.25	111.75					
120	119.3	120.7	118.25	121.75					
130	129.2	130.8	128	132					
140	139.2	140.8	138	142					
150	149.2	150.8	148	152					
160	159.2	160.8	158	162					
180	179.2	180.8	178	182					
200	199.08	200.92	197.7	202.3		WEIGHTS			
220	219.08	220.92	217.7	222.3					
240	239.08	240.92	237.7	242.3					
260	258.95	261.05	257.4	262.6					
280	278.95	281.05	277.4	282.6					
300	298.95	301.05	297.4	302.6					

NOTE:

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

365–122	**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 ¼" – 20 UNC, ¾" 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 despatced 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)

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. Cl 3.3.3 & 5.3 modified. Rev 04:20.10.96: NDT, Acid pickling added & re-written. Rev 05: 28.04.98: Cl 3 modified to include MPI, certificate modified & Cl 7.4 deleted. Rev 06:15.06.99: Title, Cl 1 to 5 & 7.1 modified. Cl 7.2 changed to Cl 7.3. Cl 7.3 changed to 7.4 and modified. Cl 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: Cl 1.0, 2.0, 3.0, 4.0, 5.0 modified in line with API 6A 21st Ed 2018 Errata 1 and for better clarity.
Rev.09: 19/02/2021: Latest version of the referred Standards/Specifications indicated thoughtout 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 21st Ed 2018 Errata 3 Addendum 1 & API 16C 2nd 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 *21st 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

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* /

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 ≥ 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
- *a. No under sizing is allowed*
- *b. Prior to Xylan and Zinc Coating, Class 2A Gauge to be used for inspection*
- *c. After coating, No Gauge inspection is required*

ii. Nut
- *a. Under sizing is allowed to maximum of 0.2mm in the internal diameter of threads*
- *b. Prior to under sizing, Class 2B Gauge to be used for inspection*
- *c. 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
- *a. Free run of nut over stud to be ensured*
- *b. No play is allowed*
- *c. After free run of nut over stud, Xylan coating should not get peeled off.*

5.0 MARKING & PACKING:

i. 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.

ii. 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

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 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:

a) 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.
b) Apply Cadmium Plating to the specified thickness on specified areas. Thickness shall be measured on 5% of the PO quantity of fasteners.
c) After plating, bake the parts at 175^{0}C to 205^{0}C for a minimum period of 3 hours. The elapsed time between plating and baking shall not exceed 8 hours.
d) Apply a Chromate Conversion coating after plating and baking.

ii. ELECTROPLATING OF ZINC CHROMATE:

a) 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.
b) 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.
c) 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:

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

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

Sl 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 IInd 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.

19/02/2021	19/2/21	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**

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

TC No: Date:

Customer :
TDC No./Rev.:
Product :
Description : (Spec, dia, pitch, length)
Quantity :

PO No./ Amd :
DC No. :
Drg. No./Rev :
Thread Spec. :

Requirement : Records/ Observation

Size of bar - Before machining :
- After machining :

Type of furnace used for hardening :

TDC Clause no.										
	Raw Material mill TC No: TC Date: Melt/Heat Number: *Reduction Ratio:*									
2.0 & 3.0	**a) Heat Treatment Details:** Hardening Temperature: °C; Soaking time: Cooling Medium: Tempering Temperature: °C; Soaking time: Cooling Medium: **b) Additional Tempering for Nuts (after final tempering):** Temperature: °C; Soaking time: Cooling Medium:									
3.0	**a) Product analysis for chemistry**								**Report No & Date:**	
	Spec	C	Mn	P	S	Si	Cr	Mo	V	Ni	Others
	Min.										
	Max.										
	Actual										
	b) Tensile test after H & T and final drying (Finished heat treated condition) – **For Studs/Bolts**									
		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:									
4.0	Visual and dimensional checking as per applicable drawing for studs/bolts & nuts:									
5.0	Punching details (identification): End cap for threaded portion:									
6.0	**a) Type of coating:** Cadmium Plating /Chromate Conversion / Electroplating/ Xylan /Rust preventive coating **(Tick applicable coating)** **Coating thickness/DFT:**									
	b) Tests for Xylan Coating							**Results**		
	c) Pickling Acid: **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		

Note: Additional Sheets may be attached, if required.

बी एच ई एल BHEL

भारत हैवी इलेक्ट्रिकल्स लिमिटेड
(भारत सरकार का उपक्रम)
इंडस्ट्रियल वाल्वस प्लाँट
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 Mechanical testing for nut	Material specification in drg	one sample per heat	Annex 1 of TDC	P	W
			Hardness		10% or 20 nos hardness check at manufacturer end, one sample each type per heat for TPIA or BHEL**			
		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

433, इंडस्ट्रियल काम्पलैक्स, गोइन्दवाल 143423 (जिला अमृतसर) पंजाब 433, Industrial Complex, Goindwal 143423 (Distt. Amritsar) Punja
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Bharat Heavy Electricals Limited
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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	15/03/19	15/03/19
Vikas Kumar Sr. Engr / QM	Samir Shandilya Sr Mgr/ QM &HSE	S R Kenny AGM/QM, HSE, Engg,TEC & SM)
Prepared	Reviewed	Approved

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Bharat Heavy Electricals Limited
(A Govt. of India Undertaking)
Industrial Valves Plant

Standard Quality Assurance Plan for Stainless steel fasteners

BHE:SQAP:SS:01

Dt:12.08.2021

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 (for both stud and nut)	Material specification in drawing/PO	one sample per heat	Chemical Test Report	P	W
		Mechanical Properties	Tensile strength	Material specification in drawing/PO	one sample per heat	Mechanical Test Report	P	W
			Yield strength/Proof Load (for both stud and nut)		one sample per heat			
			Elongation		one sample per heat			
			Reduction of area		one sample per heat			
			Hardness (for both stud and nut)		10% or 20 nos.			
		Dimension	As per drawing, Thread with GO/ NO GO Gauge (for both stud and nut)	Material drg/BPS	10% or 20 nos/type whichever is lower.	Inspection report	P	P

अमनप्रीत सिंह / Amanpreet Singh
उप प्रबंधक / Dy. Manager (QM)
भारत हैवी इलेक्ट्रिकल्स लिमिटेड
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गोईंदवाल साहिब / Goindwal Sahib (Tarn Taran)

Manvir Singh
Sr. Manager (QM)
BHEL, IVP, Goindwal

		Heat Treatment	-------	Material specification in drawing/PO	100%	Heat Treatment Report	P	V
		Visual	Free from burrs, physical damages		100%		P	P
		Marking/Identification	Material grade and supplier name or symbol	As per PO/Drawing/Applicable Standard	10%		P	W
3		Packing	Packed in wooden/cardboard box with layer to layer cushioning material.	As per PO/Drawing/Applicable Standard	10%		P	W

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

- QAP IS PREPARED TO MEET REQUIREMENT OF ASTM 193 & ASTM 194 (Latest Revisions), PLS REFER IT, IN CASE OF AMBIGUITY ARISES.
- TPIA/BHEL MAY INCREASE SAMPLE QTY UP TO 10%.

अमनप्रीत सिंह / Amanpreet Singh उप प्रबंधक / Dy. Manager (QM) भारत हैवी इलेक्ट्रिकल्स लिमिटेड Bharat Heavy Electricals Limited (A Govt. of India Undertaking) इंडस्ट्रियल वाल्वस प्लांट / Industrial Valves Plant गोईंदवाल साहिब / Goindwal Sahib (Tarn Taran)	Manvir Singh Sr. Manager (QM) BHEL, IVP, Goindwal	
Amanpreet Singh Dy. Manager / QM	Manvir Singh Sr Mgr/ QM &BE	S R Kenny AGM/QM & BE
Prepared	Reviewed	Approved