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

15/03/19 (Mahajan)   15/03/19 (Samir Ch)   15/03/19 S. R. Kumar

433, इंडस्ट्रियल काम्पलैक्स, गोइन्दवाल 143423 (जिला अमृतसर) पंजाब   433, Industrial Complex, Goindwal 143423 (Distt. Amritsar) Punja
TELE PHONE : 01859-222002, 036, 039, 041, FAX : 01859-222061

भारत हैवी इलेक्ट्रिकल्स लिमिटेड
(भारत सरकार का उपक्रम)
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Bharat Heavy Electricals Limited
(A Govt. of India Undertaking)
Industrial Valves Plant

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

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

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

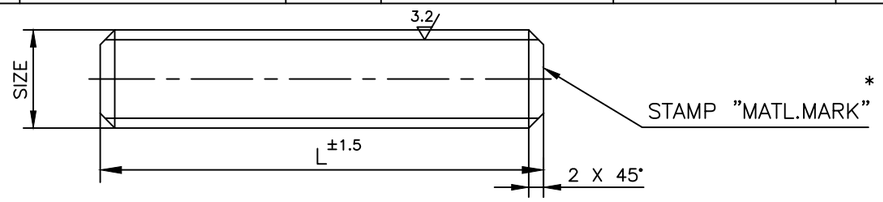
15/03/19	15/03/19	15/03/19
Vikas Kumar Sr. Engr / QM	Samir Shandilya Sr Mgr/ QM &HSE	S R Kenny AGM/QM, HSE, Engg,TEC & SM)
Prepared	Reviewed	Approved

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-0001-23248/02	ASTM A193-B8M CL.2, CERTIFY	96 465 635 0000	1/2"-13UNC-2A	80	0.08	B8MSH
08	3-V-0002-23248/02		96 465 636 0000	5/8"-11UNC-2A	86	0.13	B8MSH
09	3-V-0003-23248/02		96 465 637 0000	5/8"-11UNC-2A	105	0.16	B8MSH
10	3-V-0004-23248/02		96 465 638 0000	5/8"-11UNC-2A	118	0.18	B8MSH
11	3-V-0005-23248/02		96 465 639 0000	3/4"-10UNC-2A	120	0.26	B8MSH
12	3-V-0006-23248/02		96 465 640 0000	3/4"-10UNC-2A	133	0.29	B8MSH
13	3-V-0007-23248/02		96 465 641 0000	7/8"-9UNC-2A	150	0.45	B8MSH
14	3-V-0008-23248/02		96 465 642 0000	1"-8UNC-2A	135	0.53	B8MSH
15	3-V-0009-23248/02		96 465 643 0000	1"-8UNC-2A	158	0.62	B8MSH
16	3-V-0010-23248/02		96 465 644 0000	1"-8UNC-2A	170	0.67	B8MSH
17	3-V-0011-23248/02		96 465 645 0000	1.1/8"-8UN-2A	180	0.90	B8MSH
18	3-V-0012-23248/02		96 465 646 0000	1.1/4"-8UN-2A	215	1.32	B8MSH
19	3-V-0013-23248/02		96 465 647 0000	1.1/4"-8UN-2A	250	1.54	B8MSH
20	3-V-0014-23248/02		96 465 769 0000	7/8"-9UNC-2A	120	0.36	B8MSH
21	3-V-0016-23248/02		96 465 830 0000	1.1/8"-8UN-2A	140	0.87	B8MSH
22	3-V-0015-23248/01		96 465 794 0000	1/2"-13UNC-2A	95	0.09	B8MSH
23	3-V-F933-23248/01		96 465 938 0000	1.1/8"-8UN-2A	220	1.41	B8MSH
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
39	3-V-NL92-23248/01	ASTM A193 Gr.B8M Cl.2, CERTIFY	96 473 027 0000	1.1/4"-8UN-2A	150	0.94	B8MSH
40	3-V-Z135-23248/01		96 473 028 0000	1.1/4"-8UN-2A	180	1.11	B8MSH



NOTE

01. FOR QUALITY REQUIREMENTS: REFER LATEST APPLICABLE PROCEDURE.

DCP No.	ALTD: RPS	APPD: SSK	DCP No.	ALTD: TS	APPD: SSK
–	CHD: MK	DT: 07.03.24	–	CHD: RPS	DT: 07.09.22

REV		REV	
10	MATL. MARK B8MSH WAS B8M.	09	SL. No. 39 & 40 INCLUDED.
ZONE –		ZONE –	

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

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

TYPE OF PRODUCT
OR NAME OF
CUSTOMER/PROJECT

365-191
02.03.2021

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		—
CODE 320				

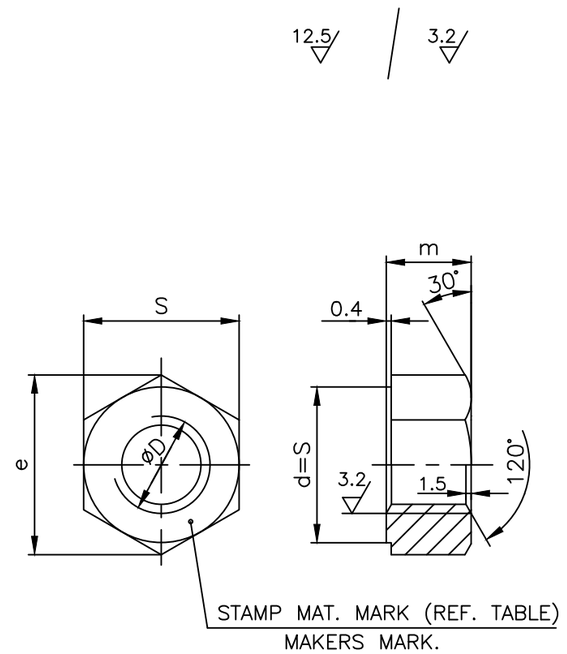
TITLE	CARD CODE	DRAWING NO.	REV
STUD	U 01	3-V-0000-23248	10

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.

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

SL. No. 20 INCLUDED.

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

–	–	–	–	–	–	–	–	–	–
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		23.04.96	
APPD	A.VISWANATHAN		23.04.96	

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

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

CODE 320

Size A3

TP-DG-3-V-0000-22667
CORPORATE DRG ID

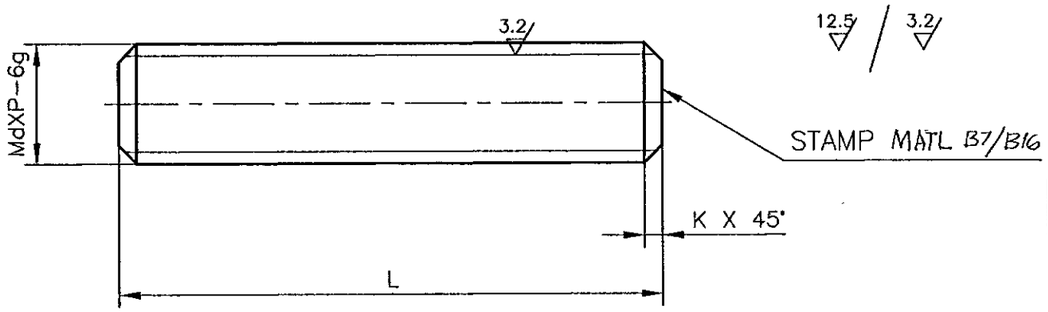
ALL DIMENSIONS ARE IN MILLIMETRES. FOR TOLERANCES OF UNTOLERANCED DIMENSIONS DURING MANUFACTURE REFER RELEVANT QCP / QP.

DRAWING NO.

SL.No	DRAWING No.	MATERIAL SPECN.		MATL. CODE	DIMENSION				WEIGHT IN Kgs.
					Md	P	L	K	
01.	3-V-Z022-22667/00	ASTM A193 B7	QT, CERTIFY	964608300000	M30	3	200	3	1.108
02	3-V-Z029-22667/00	ASTM A193 B16		931178230000	M30	3	200	3	1.108

NOTE

01. FOR QUALITY REQUIREMENTS: REFER LATEST APPLICABLE PROCEDURE.



REV	DATE	ALTERED MPS
01	20.4.2k	CHD & APPD SCS

SL. NO. 02 ADDED

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–	–	–	–	–	–	–	–	–	–
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

XAI

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

	NAME	SIGN	DATE	NO.OF VAR.
DRN	M P S			
CHD	P R K			
APPD	S C S		13.7.99	

DEPT	SCALE	WEIGHT (KG).	REFERENCE INFORMATIONS	NO. OF ITEMS
VL	NTS	REF.TABLE	CAD :Q322667	

CODE 320	TITLE	CARD CODE	DRAWING NO.	REV
	STUD	U 01	3-V-0000-22667	01

Size A3

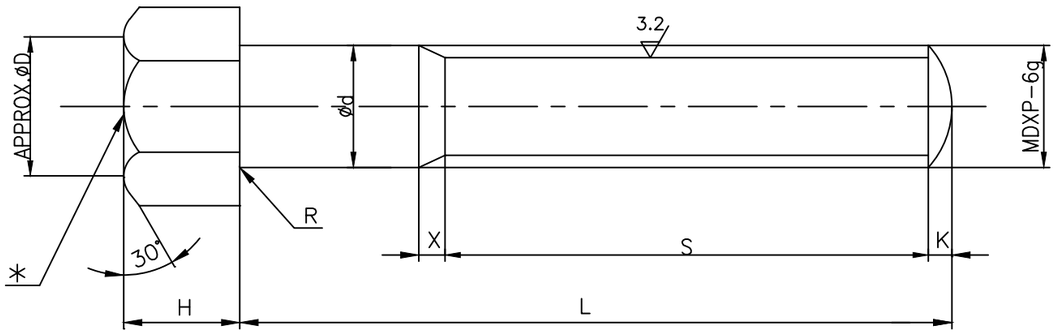
TP-DG-3-V-0000-22667
CORPORATE DRG ID

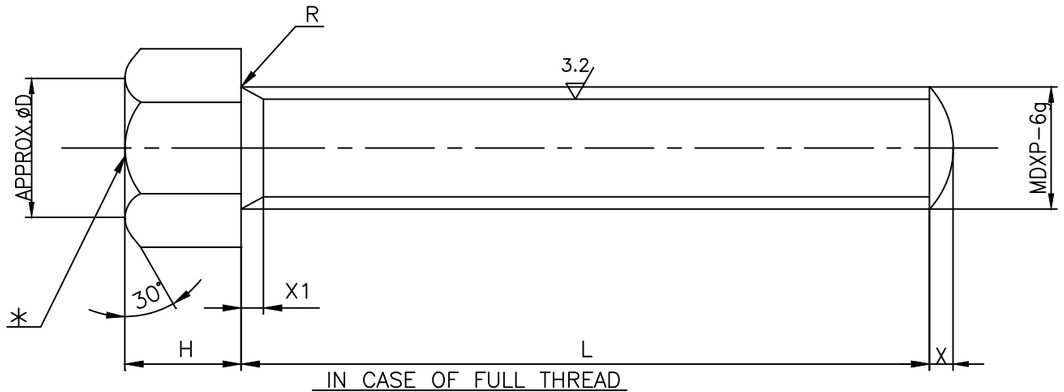
ALL DIMENSIONS ARE IN MILLIMETRES. FOR TOLERANCES OF UNTOLERANCED DIMENSIONS DURING MANUFACTURE REFER RELEVANT QCP / QP.

DRAWING NO. 3-V-0000-20723/8

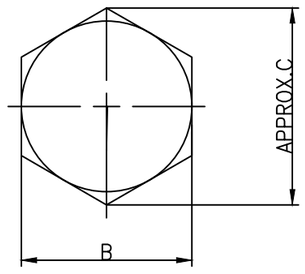
12.5 / 3.2

SL No.	DRAWING NO.	COMP. CODE	MATL. SPECN.	DIMENSIONS													FINISHED WT IN KGS
				Md	P	L	S	H	K	X	X1	R	ød	øD	B	C	
01	3-V-0001-20723/3	964521920000	ASTM A193 B7, CERTIFY	M8	1.25	30	30	5.5	–	2.5	3.5	0.4	8	12.6	13	15	0.02
02	3-V-0002-20723/3	964521930000		M10	1.5	16	16	7	–	3	4.5	0.4	10	16.5	17	19.6	0.02
03	3-V-0003-20723/3	964521940000		M10	1.5	20	20	7	–	3	4.5	0.4	10	16.5	17	19.6	0.02
04	3-V-0004-20723/3	964521950000		M12	1.75	20	20	8	–	3.5	5	0.6	12	18	19	21.9	0.03
05	3-V-0005-20723/3	964521960000		M20	2.5	60	46	13	5	5	–	0.8	20	29	30	34.6	0.23
06	3-V-0006-20723/3	964521970000		M24	3	90	54	15	6	6	–	0.8	24	34	36	41.6	0.45
07	3-V-0007-20723/3	964521980000		M30	3.5	110	66	19	7	7	–	1.0	30	44	46	53.1	0.88
08	3-V-0008-20723/3	964522410000		M16	2	50	38	10	4	4	–	0.6	16	23	24	27.7	0.10
09	3-V-0009-20723/3	964523140000		M20	2.5	55	46	13	5	5	–	0.8	20	29	30	34.6	0.22
10	3-V-0010-20723/2	964533300000		M16	2	90	60	10	4	4	–	0.6	16	23	24	27.7	0.16
11	3-V-0011-20723/2	964568210000		M20	2.5	85	46	13	5	5	–	0.8	20	29	30	34.6	0.31
12	3-V-0012-20723/2	964533560000		M20	2.5	126	70	13	5	5	–	0.8	20	29	30	34.6	0.43
13	3-V-0013-20723/1	964535750000		M30	3.5	120	76	19	7	7	–	1.0	30	44	46	53.1	0.95
14	3-V-0014-20723	964655090000		M16	2	75	38	16	4	4	–	0.6	16	23	24	27.7	0.14
15	3-V-0015-20723	964655100000		M24	3	141	40	15	6	6	–	0.8	24	34	36	41.6	0.64
16	3-V-0016-20723	964655120000		M20	2.5	70	25	14	5	5	–	0.8	20	26	30	34.6	0.27





IN CASE OF FULL THREAD



NOTES:

1. * PUNCH MATERIAL MARK B7 FOR A193-B7.
2. QUALITY REQUIREMENTS SHALL BE AS PER LATEST TDC 5:164.

REDRAWN WITH REV.7 ON 12.04.08

REV	DATE	ALTERED	REV	DATE	ALTERED
8	04.03.13	CHD & APPD M.RAJAKUMAR	7	12.04.08	CHD & APPD KRS & M.R.K
	SL.No.15 AND 16 INCLUDED.			DRAWING CONVERTED AS SOFT COPY	
				DCP No.800813	

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

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	V.BAIRAVAN		12.04.08	
CHD	M.RAJASEKARAN		12.04.08	
APPD	M.RAJAKUMAR		12.04.08	

DEPT	SCALE	WEIGHT (KG).	REFERENCE INFORMATIONS	NO. OF ITEMS
VL	NTS	–	PT-42	
CODE 320				

TITLE	CARD CODE	DRAWING NO.	REV
BOLT	U 01	3-V-0000-20723	8

Size A3

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NUTS FOR TEMPERATURE USE

(For Medium of Temperature Up to 425ºC)

1.0 SCOPE

Covers the requirements of hexagon nuts for use in medium of temperature up to 425ºC & in the size range M8 to M45x3.

2.0 SPECIFICATION AND REFERENCE STANDARDS

Dimensions and Preferred Sizes	Figure 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 standard
	Tolerance	6H
	Indian Standard	IS: 4218 (Part 3), IS14962 (Part 2 & 3)
Material	Steel to ASTM – A194 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 latest version of TDC:5:164 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)	ISO General Purpose Metric Screw Threads
TDC: 5: 164	Carbon & Alloy Steel Fasteners (Studs, Bolts & Nuts) For Valves, Oil Field Equipment (OFE) and Other Applications
ASTM A 194	Specification for Carbon and Alloy Steel Nuts for bolts for High Pressure and High Temperature service.
IS14962 (Part 2 & 3)	ISO General Purpose Metric Screw Threads - Tolerances

3.0 DESIGNATION

A grade - A hexagon nut to this standard of thread size M8 shall be designated as:

3.1 On Drawings:

1) Material specification column: ASTM A 194 – 2H
2) Description column : NUT HEX GR A – T425 M8
3) Drawing number column : BPS 41319
4) Material code column : 4131900008

3.2 Ordering Description

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

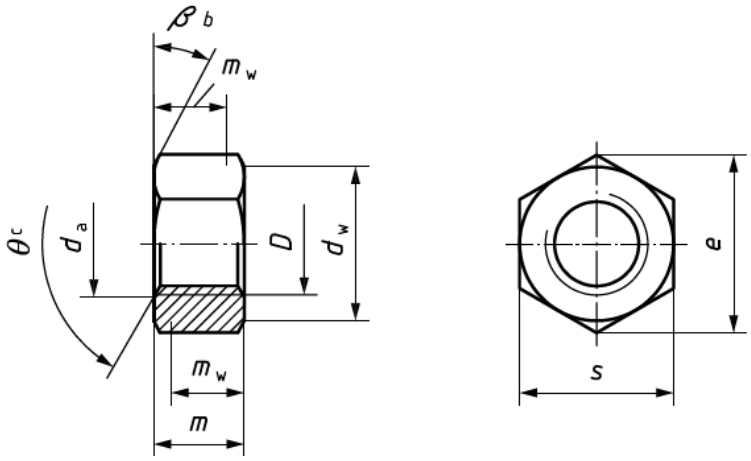
Hex Nut M8 to BPS: 41319-A-ASTM A194-2H for nuts with d <= M16

Hex Nut M20 to BPS: 41319-B-ASTM A194-2H for nuts with d > M16

4.0 ADDITIONAL INFORMATION

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

Figure 1



b $\beta = 15°$ to $30°$.

c $\theta = 90°$ to $120°$.

Table 1

(All dimensions are in millimeters)

Thread Size D	d_a		d_w	e		m		m_w	s		Weight
	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	9.5	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)	27	28.2	38		45.20	27.5	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)	33	35.6	46.6		55.37	33	31.40	25.1	50	49.00	299.0
M36x3	36	38.90	51.1		60.79	36.6	35.00	28.0	55	53.80	364.0
(M39x3)	39	42.1	55.9		66.44	39	37.40	29.9	60	58.80	485.0
(M45x3)	45	48.6	64.7	80.8		45	43.40	34.7	70	68.80	750.0

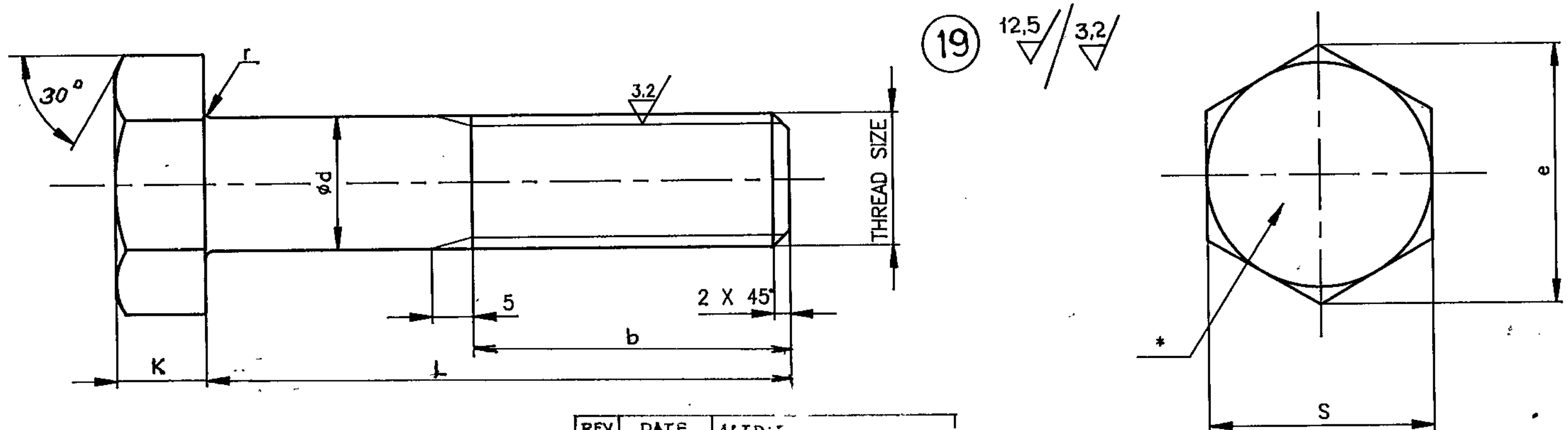
m_w – Wrenching Height

Notes:

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

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

SL. No.	DRAWING No.	MATERIAL CODE	MATL. SPECN	THREAD SIZE	L	ød	b	k	S MAX	S MIN	e MAX	e MIN	r	FINISH Wt. (Kg)	MATL. MARK	SIZE/RATING
01	3-V-N073-06881/04	96 456 260 0000	ASTM A193-B7, HT, CERTIFY	1/2"-13UNC-2A	55	12.7	30	9	22.22	21.59	25.65	24.61	0.75	0.06	B7	2"-150, 2"-300, 3"-150, 3"-300
02	3-V-N033-06881/04	96 456 261 0000		5/8"-11UNC-2A	60	15.875	38	10.7	26.97	26.19	31.17	29.85	1	0.10	B7	4"-150, 4"-300
03	3-V-N001-06881/04	96 456 262 0000		5/8"-11UNC-2A	70	15.875	38	10.7	26.97	26.19	31.17	29.85	1	0.14	B7	6", 8", 10", 12"/150, 6", 8", 10"/300
04	3-V-N224-06881/03	96 456 231 0000		5/8"-11UNC-2A	80	15.875	38	10.7	26.97	26.19	31.17	29.85	1	0.16	B7	20"/150
05	3-V-C329-06881/03	96 456 433 0000		5/8"-11UNC-2A	75	15.875	38	10.7	26.97	26.19	31.17	29.85	1	0.15	B7	4"-C900
06	3-V-N204-06881/03	96 456 450 0000	SA307 Gr. B CERTIFY	3/4"-10UNC-2A	85	19.05	30	12.7	31.75	30.78	36.65	35.10	1	0.27	307-B	6"-C150
07	3-V-N205-06881/03	96 456 451 0000		3/4"-10UNC-2A	90	19.05	35	12.7	31.75	30.78	36.65	35.10	1	0.28	307-B	8"-C150
08	3-V-N207-06881/03	96 456 452 0000		7/8"-9UNC-2A	105	22.225	40	14.7	36.52	35.41	42.16	40.31	1	0.43	307-B	10" & 12"-C150



NOTES:-

1. * PUNCH MATERIAL MARK.
2. FOR QUALITY REQUIREMENTS REFER LATEST APPLICABLE TDC 5:164
3. ~~THIS COMPONENTS SHOULD BE GALVANISED TO A DEPTH OF 8 TO 12 MICRONS~~

REV	DATE	ALTERED	CHD & APPD
07	11.6.99	R.L.	M.R.K

GALVANISING (NOTE 3) ELIMINATED. DCN No. HM 0393

RETRACED WITH REV.07 ON 11.6.99

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

BHARAT HEAVY ELECTRICALS LTD.,
BOILER PLANT UNIT, TIRUCHIRAPALLI-620 014.

	NAME	SIGN	DATE
DRAWN			
CHECKED	R.L		11.6.99
APPROVED	M.R.K.		11/06/99

DEPT.	GRADE OF UNTOL DIM.	FIRST ANGLE	SCALE	WEIGHT (kg)	ITEM No
VL, CODE 340	F/M/C		NTS	REFER TABLE	—

TITLE: HEX. BOLT

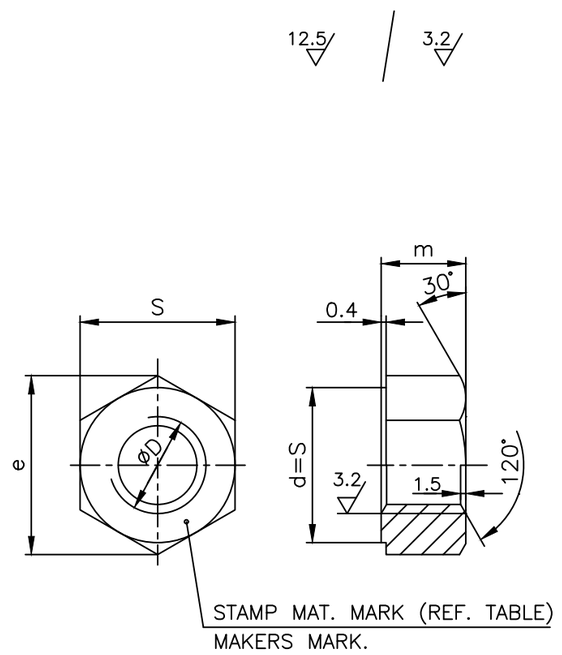
DRG No. 3-V-0000-06881 REVISION 07

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

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.

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–	–	–	–	–	–	–	–	–	–
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

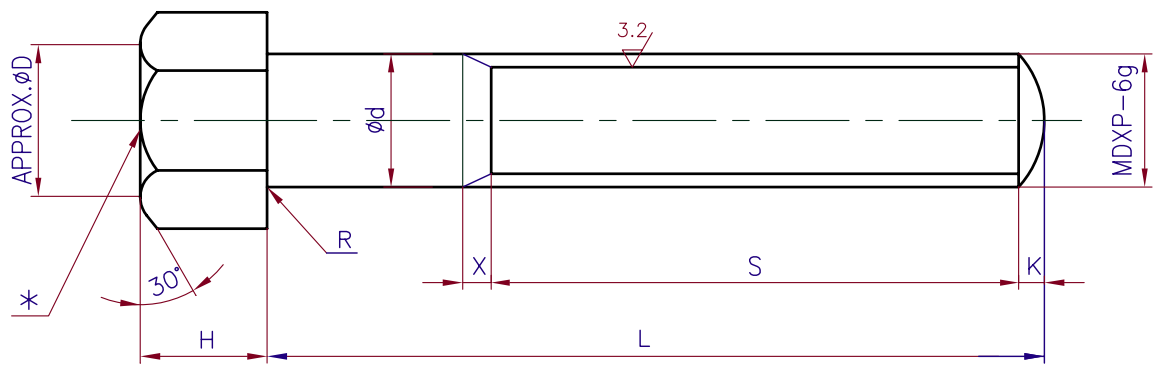
Size A3

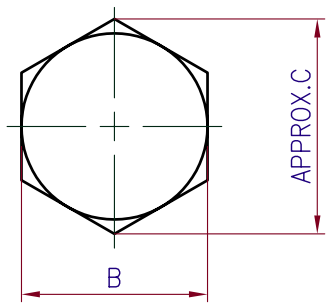
ALL DIMENSIONS ARE IN MILLIMETRES. FOR TOLERANCES OF UNTOLERANCED DIMENSIONS DURING MANUFACTURE REFER RELEVANT QCP / QP.

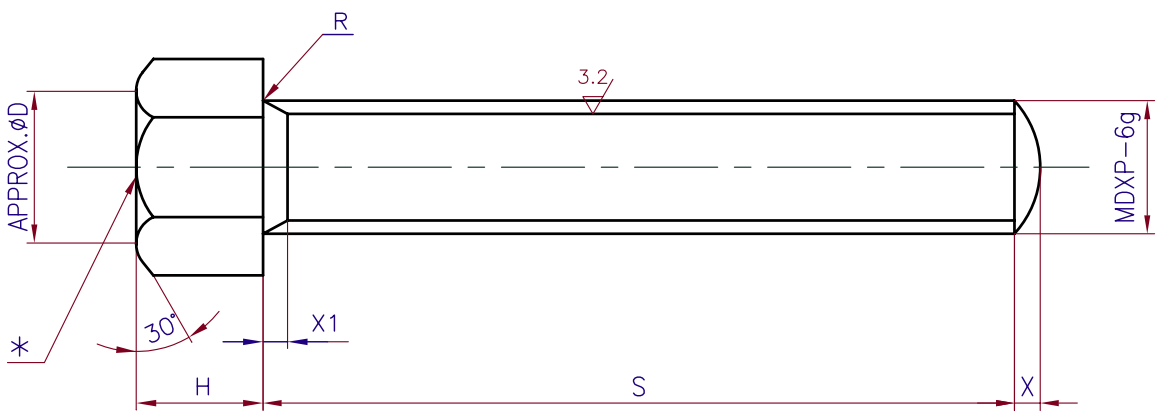
DRAWING NO. 3-V-0000-20728/11

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-0001-20728/02	964524380000	ASTM A193 B7 CERTIFY	M16	2	70	70	10	–	4	6	0.6	16	23	24	27.7			0.14	
02	3-V-0002-20728/02	964524390000		M39	4	120	80	25	4	8	–	1.2	39	57.5	60	69.3			1.73	
03	3-V-0003-20728/02	964524400000		M14	2	120	30	10	2	4	–	0.6	14	20	21	24.2			0.11	
04	3-V-0004-20728/02	964526840000		M5	0.8	25	25	3.5	–	2	2	0.2	5	7	8.3	9.2			0.01	
05	3-V-0005-20728/02	964528590000		M30	3.5	80	45	19	4	7	–	1.0	30	44	46	53.1			0.57	
06	3-V-0006-20728/02	964529810000		M20	2.5	70	50	13	5	5	–	0.8	20	29	30	34.6			0.27	
07	3-V-0007-20728/02	964530600000		M6	1	16	16	4	–	2	3	0.25	6	9.8	10	11.5			0.01	
08	3-V-0008-20728/02	964531710000		M20	2.5	95	40	13	5	5	–	0.8	20	29	30	34.6			0.33	
09	3-V-0009-20728/03	964531720000		M24	3	85	50	15	6	6	–	0.8	24	34	36	41.6			0.40	
10	3-V-0010-20728/02	964605960000		M8	1.25	20	20	5.5	–	2.5	3.75	0.5	8	12.6	13	15.0			0.011	
11	3-V-0011-20728/02	964605970000		M8	1.25	25	25	5.5	–	2.5	3.75	0.5	8	12.6	13	15.0			0.012	
12	3-V-0012-20728/02	964532250000		M24	3	120	60	15	6	6	–	0.8	24	34	36	41.6			0.55	
13	3-V-0013-20728/02	964533230000		M36	4	100	60	23	4	8	–	2	36	53	55	63.5			1.30	
14	3-V-0014-20728/01	964534120000		M16	2	120	70	10	4	4	–	0.6	16	23	24	27.7			0.22	
15	3-V-0015-20728	964535410000		M16	2	20	20	10	–	4	6	0.6	16	23	24	27.7			0.04	
16	3-V-0016-20728	964650030000		M24	3	75	40	15	6	6	–	0.8	24	34	36	41.6			0.34	
17	3-V-0017-20728	964535780000		M20	2.5	110	60	13	5	5	–	0.8	20	29	30	34.6			0.38	
18	3-V-0018-20728	964535900000		M36	4	130	80	23	4	8	–	2	36	53	55	63.5			1.54	







IN CASE OF FULL THREAD

NOTES:

1. * PUNCH MATERIAL MARK B7 FOR A193 B7.
2. QUALITY REQUIREMENTS SHALL BE AS PER LATEST 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 VB
11	27.04.05	CHD & APPD KRS & MRK
		SL. NO.18 INCLUDED.

REV	DATE	ALTERED VB
10	01.02.03	CHD & APPD
		SL. NO.17 INCLUDED.

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TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT

RETRACED WITH REV.10 DATED 01.02.03

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

	NAME	SIGN	DATE	NO.OF VAR.
DRN	V.BAIRAVAN		01.02.03	
CHD	K.RAJASEKARAN		01.02.03	
APPD	M.RAJAKUMAR		01.02.03	

DEPT	SCALE	WEIGHT (KG).	REFERENCE INFORMATIONS	NO. OF ITEMS
VL	/	–	PT-42 CAD REF.3V020728	
CODE 320				

TITLE	CARD CODE	DRAWING NO.	REV
BOLT	U 01	3-V-0000-20728	11

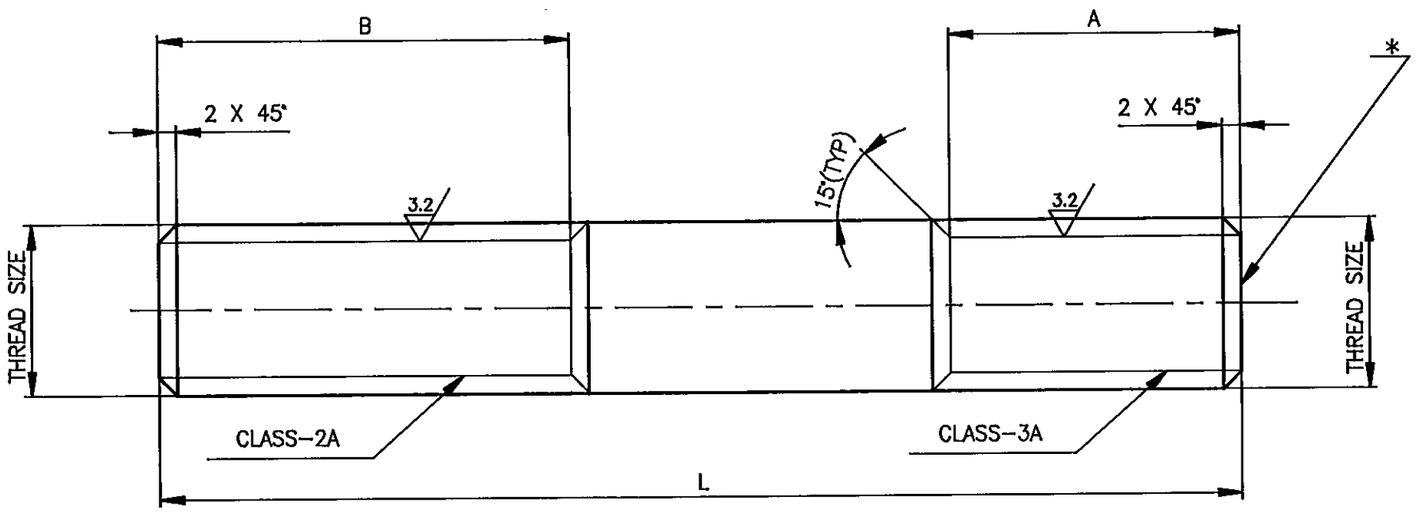
Size A3

TP-DG-3-V-0000-20728
CORPORATE DRG ID

FOR TOL. OF UNTOL. DIMENSIONS DURING MANUFACTURE REFER RELEVANT QCP / QP

ALL DIMENSIONS ARE IN MM

SL. No.	DRAWING No.	MATERIAL CODE	MATERIAL SPECIFICATION	DIMENSIONS					NET WT. (kg)	SIZE/RATING
				THREAD SIZE	L ±1.5	A +1.5 0	B ±1.5			
01	3-V-N105-06884/02	96 456 259 0000	ASTM A193 GR. B7, HT, CERTIFY	5/8"-11UNC	93	23	40		0.13	12"/300C
02	3-V-N435-06884/01	96 456 749 0000		5/8"-11UNC	115	20	50		0.18	14"/300; 16"/300C
03	3-V-N437-06884/01	96 456 750 0000		3/4"-10UNC	140	25	50		0.25	20"/300C
04	3-V-C537-06884/01	96 456 796 0000		5/8"-11UNC	140	23	65		0.22	12"/900C
05	3-V-C538-06884/01	96 456 797 0000		3/4"-10UNC	185	25	80		0.41	20"/900C
06	3-V-N827-06884/01	96453 699 0000		1"-8UNC	(5) 200	30	90		0.8	32"/150C



(21) 12.5 / 3.2

NOTES:-

1. * PUNCH MATERIAL MARK – B7
2. FOR QUALITY REQUIREMENT REFER LATEST APPLICABLE TDC
5:164.
4. ~~3. THIS COMPONENT SHOULD BE GALVANISED TO A DEPTH OF 87/12 MICRON~~

REV.	DATE	ALT. / CHE.& APPD.	REV.	DATE	ALT. / CHE.& APPD.
06	11.11.99	ALT. R.L. CHE.& APPD. M.R.K.	05	16.10.99	ALT. R.L. CHE.& APPD. M.R.K.
IN SL.No.06, DIM. 200 WAS 190. DCN No. HM 0416			SL. No. 06 INCLUDED.		
04	11.6.99	ALT. R.L. CHE.& APPD. M.R.K.	02	29.10.96	ALT. R.L. CHE.& APPD. M.R.K.
GALVANISING (NOTE 3) ELIMINATED DCN No. HM 0393			SL. NOS. 02 & 03 INCLUDED.		
			03	20.3.97	ALT. RL CHE.& APPD. M.R.K.
			SL. NOS. 04 & 05 INCLUDED.		
REV	DATE	ALTERED / CHECKED	ZONE		
01	27/01/95	ALTERED N.D.PAL CHECKED	1. IN NOTE SL.NO.2 CHANGED TO APPLICABLE TDC. 2. NOTE SL.NO.3 IS ADDED. 3. REFER DCN. SLNO:CS:0145		

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

BHARAT HEAVY ELECTRICALS LTD.,
BOILER PLANT UNIT, TIRUCHIRAPALLI-620 014.

	NAME	SIGN	DATE
DRAWN	M.P.S		6/10/92
CHECKED	A.V. NATHAN		9.10.92
APPROVED	S. KUMAR		9/10/92

DEPT.	FIRST ANGLE	SCALE	WEIGHT (kg)	DRESSER DRG No: / DRESSER PART No: / DRESSER SL No:	ITEM No.
VL		NTS			
CODE 340					

TITLE: STUD

DRG No. 3-V-0000-06884

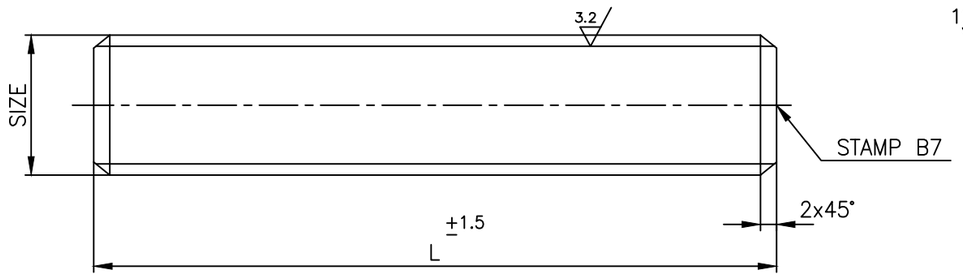
REVISION 06

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

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
32	3-V-NM12-06875		964730530000	1.1/8"-8UN-2A	150	0.76	18"-150



12.5 / 3.2

NOTE:-

FOR QUALITY REQUIREMENTS REFER LATEST APPLICABLE TDC:5:164

DCP No. –	ALTD: TS	APPD: MK
	CHD: RPS	DT: 15.10.24

REV	
15	SL. No. 32 INCLUDED.
ZONE –	

DCP No. –	ALTD: RPS	APPD: KRS
	CHD: SSK	DT: 12.06.19

REV	
14	SL. No. 31 INCLUDED.
ZONE –	

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

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

TYPE OF PRODUCT
OR NAME OF
CUSTOMER/PROJECT

draft on BHEL 365-191 02.03.2021

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

	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	NTS			—
CODE 320				

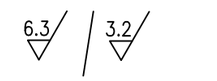
TITLE	CARD CODE	DRAWING NO.	REV
STUD	U 01	3-V-0000-06875	15

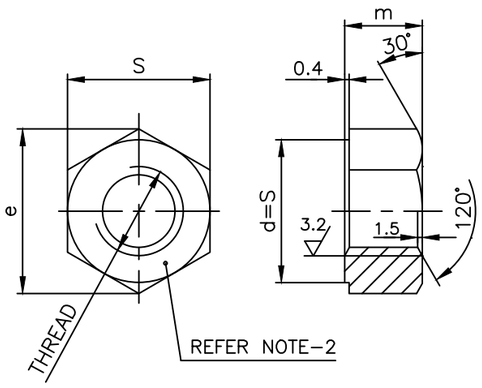
Size A3

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

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

-	-	-	-	-	-	-	-	-	-
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				

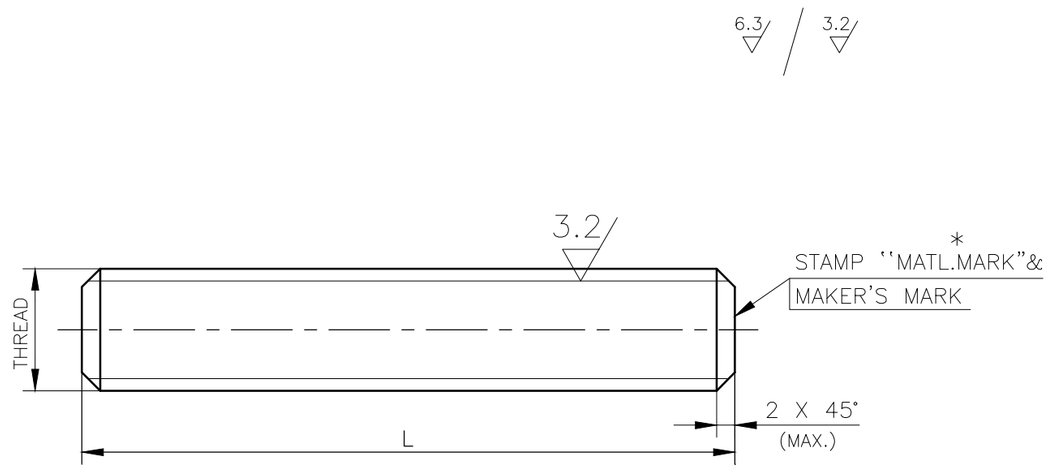
TITLE	CARD CODE	DRAWING NO.	REV
HEX. NUT	U 01	3-V-0000-95178	08

Size A3

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

DRAWING NO. 3-V-0000-95180

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	
13	06.06.16	CHD & APPD	B.AJITH KUMAR MS & KRS

SL.NO: 26 INCLUDED

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

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				

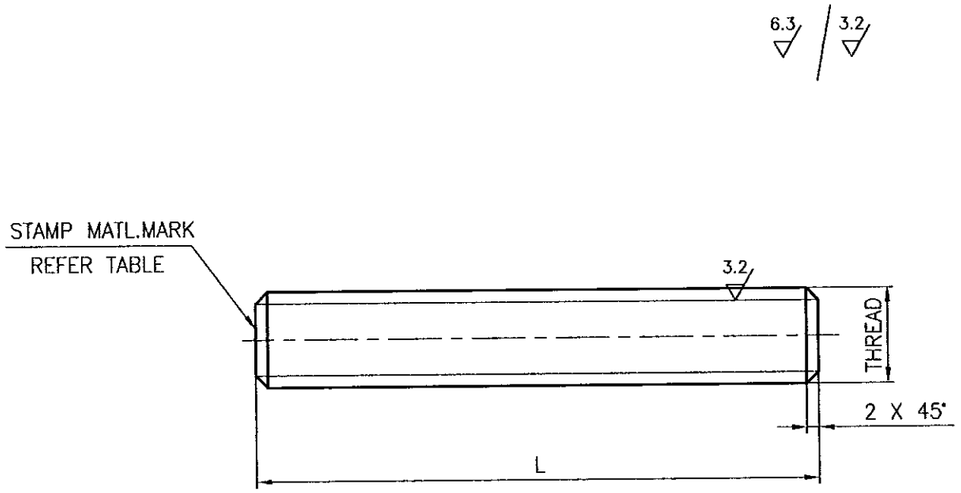
TITLE	CARD CODE	DRAWING NO.	REV
STUD	U 01	3-V-0000-95180	13

Size A3

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

DRAWING NO. 3-V-0000-17140/05

SL No.	DRAWING No.	MATERIAL CODE	MATL. SPECN.	DIMENSIONS THREAD	DIMENSIONS L	MATERIAL MARK	FINISHED WEIGHT(Kgs.)	SIZE/RATING
01.	3-V-N025-17140/02	96 456 378 0000	ASTM A193-B7 HT CERTIFY	5/8"-11UNC-2A	86	B7	0.134	3"/150
02.	3-V-N001-17140/02	96 456 379 0000		5/8"-11UNC-2A	94	B7	0.146	4"/150 , 6"/150
03	3-V-N073-17140/02	96 456 382 0000		1/2"-13UNC-2A	68	B7	0.068	2"/150
04	3-V-N081-17140/02	96 456 383 0000		1/2"-13UNC-2A	80	B7	0.08	2"/300
05	3-V-N009-17140/02	96 456 384 0000		5/8"-11UNC-2A	105	B7	0.164	8"/150,3"/300,4"/300
06	3-V-N017-17140/02	96 456 385 0000		5/8"-11UNC-2A	118	B7	0.184	6"/300
07	3-V-N057-17140/02	96 456 386 0000		3/4"-10UNC-2A	112	B7	0.251	10"/150
08	3-V-N041-17140/02	96 456 387 0000		3/4"-10UNC-2A	120	B7	0.269	12"/150
09	3-V-N089-17140/02	96 456 388 0000		3/4"-10UNC-2A	133	B7	0.298	8"/300
10	3-V-N065-17140/02	96 456 389 0000		1"-8UNC-2A	158	B7	0.629	10"/300
11	3-V-N105-17140/02	96 456 390 0000		$1\frac{1}{8}$"-8UN-2A	180	B7	0.910	12"/300
12	3-V-N106-17140/02	96 456 391 0000		$1\frac{1}{8}$"-8UN-2A	140	B7	0.710	12"/300
13	3-V-5183-17140/02	96 456 437 0000		$1\frac{1}{4}$"-8UN-2A	195	B7	1.23	4"-900C FV
14	3-V-C329-17140/02	96 456 436 0000		$1\frac{1}{8}$"-8UN-2A	205	B7	1.05	4"/900
15	3-V-C538-17140/01	96 456 799 0000		$1\frac{5}{8}$"-8UN-2A	250	B7	2.7	20"/900
16	3-V-T419-17140/01	96 456 825 0000	ASTM A193-B7M, HT,CERTIFY	$1\frac{1}{8}$"-8UN-2A	170	B7M	0.90	3"-900C FV



NOTE

01. FOR QUALITY REQUIREMENTS REFER LATEST APPLICABLE QUALITY PROCEDURE.
02. SUITABLE OIL PRESERVATIVE SHALL BE APPLIED AFTER MANUFACTURE.

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: CS

DRG. RETRACED WITH REV.05 ON 10.06.99

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

	NAME	SIGN	DATE	NO.OF VAR.
DRN	T.R.R.MURTHY	T.R.R.M	10.06.99	
CHD	R.VASANTH		10.06.99	
APPD	K.S.RAMAN		10.06.99	

DEPT	SCALE	WEIGHT (KG).	REFERENCE INFORMATIONS	NO. OF ITEMS
VL	NTS	REF TABLE	CAD:C317140	
CODE 320				

TITLE	CARD CODE	DRAWING NO.	REV
STUD	U 01	3-V-0000-17140	05

REV	DATE	ALTERED
05	10.06.99	CHD & APPD

GALVANISING REMOVED

REFER DCN.CS: 1012

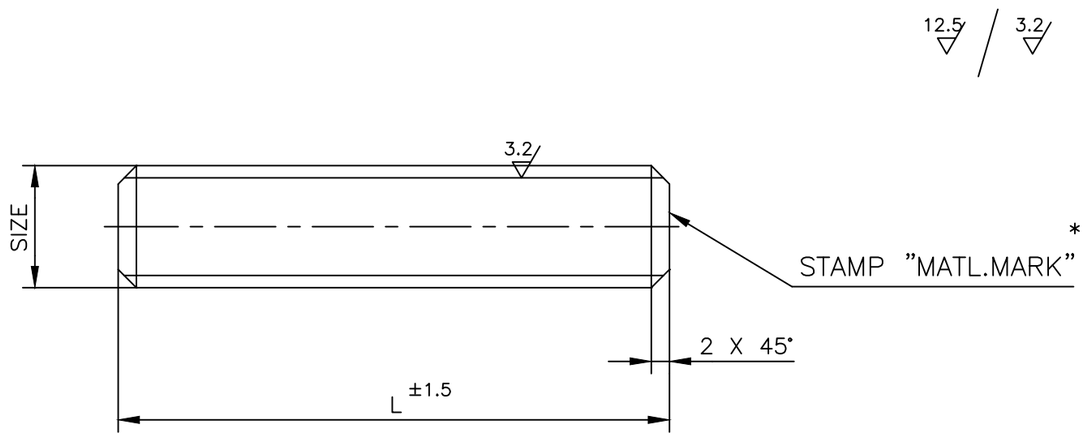
CAUTION: The information on this document is the property of BHARAT HEAVY ELECTRICALS LTD. It must not be used directly or indirectly in any way detrimental to the interest of the company.

Size A3

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

DRAWING NO. 3-V-0000-31170

SL.No	DRAWING No.	MATL. CODE	MATERIAL	SIZE	L	WEIGHT IN Kgs.	MATL.MARK *
01	3-V-0001-31170	96 465 786 0000	ASTM A193 B8MA CERTIFY	1/2"-13UNC-2A	80	0.08	B8MA
02	3-V-0002-31170	96 465 815 0000		5/8"-11UNC-2A	86	0.13	
03	3-V-0003-31170	96 465 797 0000		5/8"-11UNC-2A	105	0.16	
04	3-V-0004-31170	96 465 816 0000		5/8"-11UNC-2A	118	0.18	
05	3-V-0005-31170	96 465 817 0000		3/4"-10UNC-2A	120	0.26	
06	3-V-0006-31170	96 465 818 0000		3/4"-10UNC-2A	133	0.29	
07	3-V-0007-31170	96 465 819 0000		7/8"-9UNC-2A	150	0.45	
08	3-V-0008-31170	96 465 820 0000		7/8"-9UNC-2A	120	0.36	
09	3-V-0009-31170	96 465 804 0000		1"-8UNC-2A	135	0.53	
10	3-V-0010-31170	96 465 821 0000		1"-8UNC-2A	158	0.62	
11	3-V-0011-31170	96 465 822 0000		1"-8UNC-2A	170	0.67	
12	3-V-0012-31170	96 465 801 0000		1 1/8"-8UN-2A	140	0.71	
13	3-V-0013-31170	96 465 823 0000		1 1/8"-8UN-2A	180	0.90	
14	3-V-0014-31170	96 465 824 0000		1 1/4"-8UN-2A	215	1.32	
15	3-V-0015-31170	96 465 825 0000		1 1/4"-8UN-2A	250	1.54	
16	3-V-0016-31170	96 465 881 0000		1 1/4"-8UN-2A	180	0.97	



NOTE

01. FOR QUALITY REQUIREMENTS: REFER LATEST APPLICABLE PROCEDURE.
02. SUITABLE OIL PRESERVATIVE SHALL BE APPLIED.

REV	DATE	ALTERED R.P.SINGH
01	31.08.18	CHD & APPD SSK & KRS
		SL. No. 16 INCLUDED.

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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		23.01.18	
CHD	S.SATHEESKUMAR		23.01.18	
APPD	K.RAJASEKARAN		23.01.18	

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

TITLE	CARD CODE	DRAWING NO.	REV
STUD	U 01	3-V-0000-31170	01

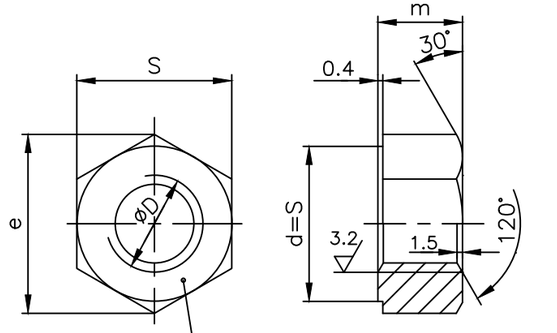
Size A3

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

DRAWING NO. 3-V-0000-31171

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-0001-31171	96 465 787 0000	ASTM A194-B8MA CERTIFY	22.22	21.59	25.65	24.61	12.80	11.79	1/2"-13 UNC -2B	B8MA	0.02
02	3-V-0002-31171	96 465 798 0000		26.97	26.19	31.17	29.85	16.03	14.91	5/8"-11 UNC -2B		0.03
03	3-V-0003-31171	96 465 826 0000		31.75	30.78	36.65	35.10	19.25	18.03	3/4"-10 UNC -2B		0.08
04	3-V-0004-31171	96 465 827 0000		36.52	35.41	42.16	40.37	22.47	21.16	7/8"-9 UNC -2B		0.11
05	3-V-0005-31171	96 465 802 0000		41.28	40.01	47.65	45.62	25.70	24.28	1"-8 UNC -2B		0.17
06	3-V-0006-31171	96 465 803 0000		46.02	44.60	53.16	50.85	29.93	27.41	1 1/8"-8 UN -2B		0.22
07	3-V-0007-31171	96 465 828 0000		50.80	49.23	58.65	56.11	31.78	30.15	1 1/4"-8 UN -2B		0.27

12.5 / 3.2



NOTE:

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

REV	DATE	ALTERED
		CHD & APPD

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

–	–	–	–	–	–	–	–	–	–
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

365-121

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

	NAME	SIGN	DATE	NO.OF VAR.
DRN	R.P.SINGH		23.01.18	
CHD	S.SATHEESKUMAR		23.01.18	
APPD	K.RAJASEKARAN		23.01.18	

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

TITLE	CARD CODE	DRAWING NO.	REV
HEX NUT	U 01	3-V-0000-31171	0

Size A3

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STUD BOLTS FOR TEMPERATURE USE

(For temperatures of medium up to 425°C)

1.0 SCOPE

1.1 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, IS: 14962 Part 2 & 3
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 requirement		Studs shall comply with TDC:5:164 in respect of requirements not covered in this standard except cadmium plating.

2.1 Referred standards (only the relevant parts of the 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	ISO metric screw threads
ASTM-A193	Specification for alloy steel and stainless bolting material for high temperature service.
TDC: 5: 164	TDC for alloy steel studs to specification ASTM A193 Gr B7/B7m/B16 oil field equipment.
S: 14962 (Part 2 & 3)	ISO General Purpose Metric Screw Threads - Tolerances

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:

1) Material specification column: A 193 B-7
2) Description column : STUD BOLT GR A T425 M16x90
3) Drawing number column : BPS 41117
4) Material code column : 4111716090

3.2 Ordering Description

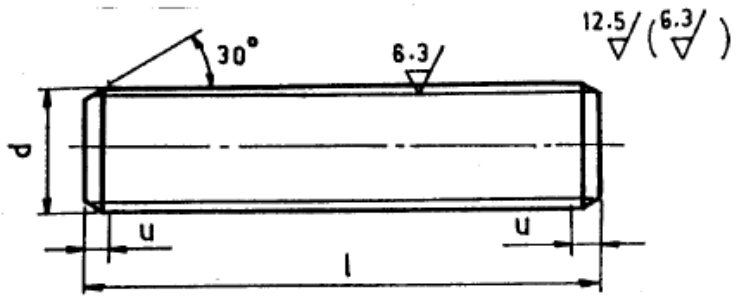
For placing indents, issuing enquiries and on purchase order, the ordering description given below shall be followed.

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

4.0 ADDITIONAL INFORMATION

4.1 Copies of the following 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.

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

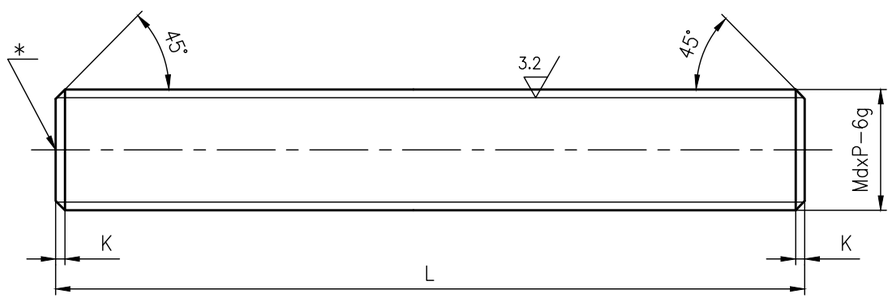
DRAWING NO. 3-V-0000-20729

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.	

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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

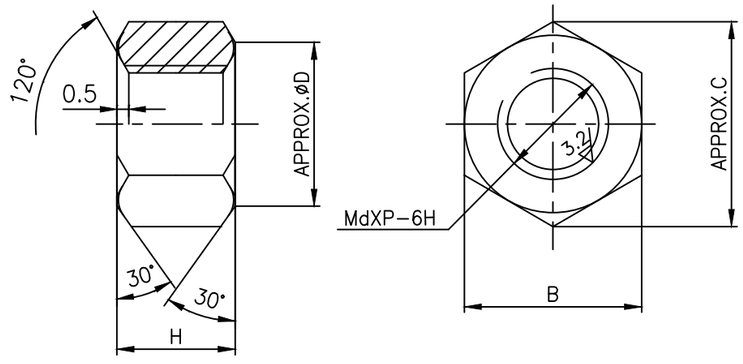
ALL DIMENSIONS ARE IN MILLIMETRES. FOR TOLERANCES OF UNTOLERANCED DIMENSIONS DURING MANUFACTURE REFER RELEVANT QCP / QP.

12.5 / 3.2

DRAWING NO. 3-V-0000-20717

SL. NO.	DRAWING NO.	MATL. SPECN.	COMP.CODE	DIMENSIONS						FINISHED WT(kg)
				Md	P	H	B	C	øD	
01.	3-V-0001-20717	A194-2H, CERTIFY	96 452 160 0000	M22	2.5	18	32	37	31	0.07
02.	3-V-0002-20717		96 452 161 0000	M30	3	24	46	53.1	44	0.21
03.	3-V-0003-20717		96 452 312 0000	M42	3	42	65	75	62	0.29
04.	3-V-0004-20717/1		96 452 450 0000	M39	4	32	60 (6)	65	55	0.24
05.	3-V-0005-20717		96 452 688 0000	M5	0.8	4	8.3	9.2	7	0.01
06.	3-V-0006-20717		96 452 932 0000	M48	3	48	75	86.5	72	0.94
07.	3-V-0007-20717		96 453 057 0000	M52	3	52	80	92.4	77	1.2
08.	3-V-0008-20717		96 460 645 0000	M30	3	30	46	53.1	44	0.23
17.	3-V-0017-20717		96 453 358 0000	M22	2.5	22	32	37	31	0.09
18.	3-V-0018-20717/1		96 466 008 0000	M39	3	39	60 (6)	65	55	0.29
20	3-V-3234-20717		96 465 274 0000	M33	3.5	33	50	57.7	49	0.32

SL. NO.	DRAWING NO.	MATL. SPECN.	COMP.CODE	DIMENSIONS						FINISHED WT(kg)
				Md	P	H	B	C	øD	
09.	3-V-0009-20717/1	A194-Gr.7, CERTIFY	96 452 309 0000	M22	2.5	18	32	37	31	0.07
10.	3-V-0010-20717/1		96 452 310 0000	M30	3	24	46	53.1	44	0.21
11.	3-V-0011-20717/1		96 452 311 0000	M42	3	42	65	75	62	0.29
12.	3-V-0012-20717/1		96 453 058 0000	M52	3	52	80	92.4	77	1.2
13.	3-V-0013-20717/1		96 460 647 0000	M30	3	30	46	53.1	44	0.23
14.	3-V-0014-20717/2		96 453 203 0000	M39	4	32	60 (6)	65	55	0.24
15.	3-V-L793-20717/1		96 460 741 0000	M42	4.5	42	65	75	62	0.29
16.	3-V-0016-20717/1		96 453 357 0000	M22	2.5	22	32	37	31	0.09
19.	3-V-0019-20717/1		96 466 009 0000	M39	3	39	60 (6)	65	55	0.29
21	3-V-3237-20717		96 465 275 0000	M33	3.5	33	50	57.7	49	0.32



NOTES:-

01. LATEST APPLICABLE QUALITY WORK INSTRUCTION SHALL BE FOLLOWED IN ALL RESPECTS.

–	–	–	–	–	–	–	–	–	–
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.

	NAME	SIGN	DATE	NO.OF VAR.
DRN	Y.ARTHUR		17.3.07	
CHD	K.RAJASEKARAN		17.3.07	
APPD	M.RAJAKUMAR		17.3.07	

DEPT	SCALE	WEIGHT (KG).	REFERENCE INFORMATIONS	NO. OF ITEMS
VL	N T S		CAD REF: T320717 PT40	
CODE 320				

TITLE	CARD CODE	DRAWING NO.	REV
NUT	U 01	3-V-0000-20717	06

REV	DATE	ALTERED	REV	DATE	ALTERED
06	04.11.17	R.P.SINGH CHD & APPD SSK & KRS	05	10.05.08	M.SRINIVASAN CHD & APPD K.S.RAMAN

DIMENSIONS 60 WAS 56 FOR M39

DCP NO.802298

SL.NO. 20 & 21 INCLUDED.

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

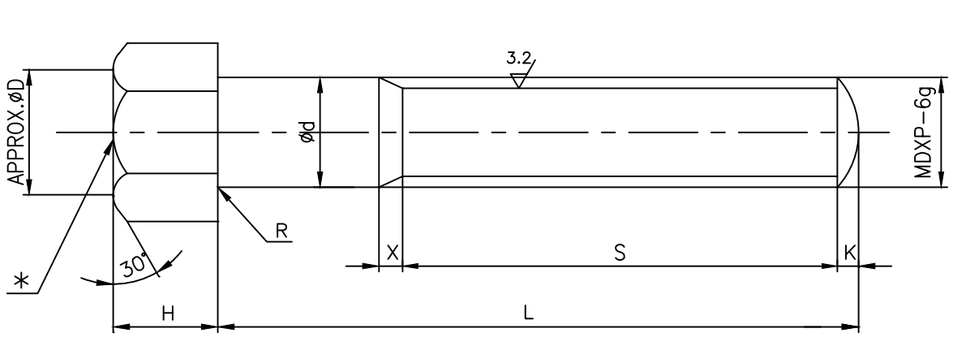
Size A3

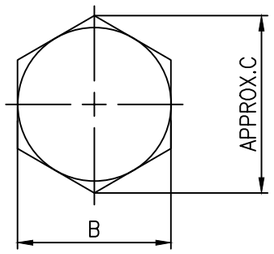
ALL DIMENSIONS ARE IN MILLIMETRES. FOR TOLERANCES OF UNTOLERANCED DIMENSIONS DURING MANUFACTURE REFER RELEVANT QCP / QP.

DRAWING NO. 3-V-0000-25679

12.5 / 3.2

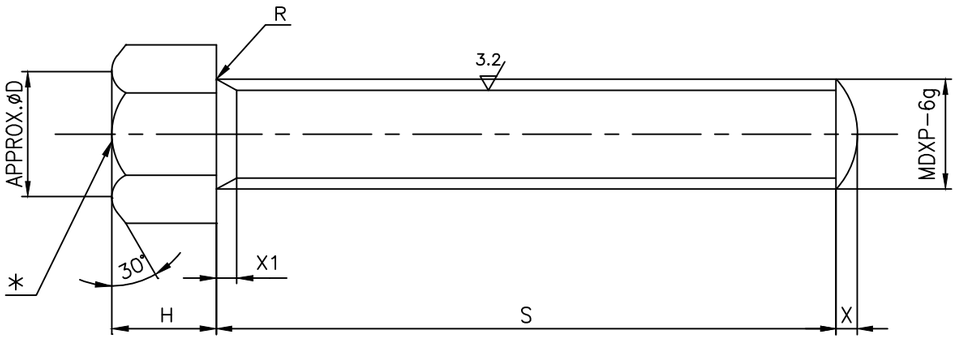
SL No.	DRAWING NO.	COMP. CODE	MATL. SPECN.	DIMENSIONS														NET WT (Kgs)	REMARKS
				MD	P	L	S	H	K	X	X1	R	ød	øD	B	C			
01	3-V-0001-25679	964657700000	ASTM A193 B8M CERTIFY	M16	2	55	55	10	–	4	6	0.6	16	23	24	27.7			0.116	





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 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.

	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

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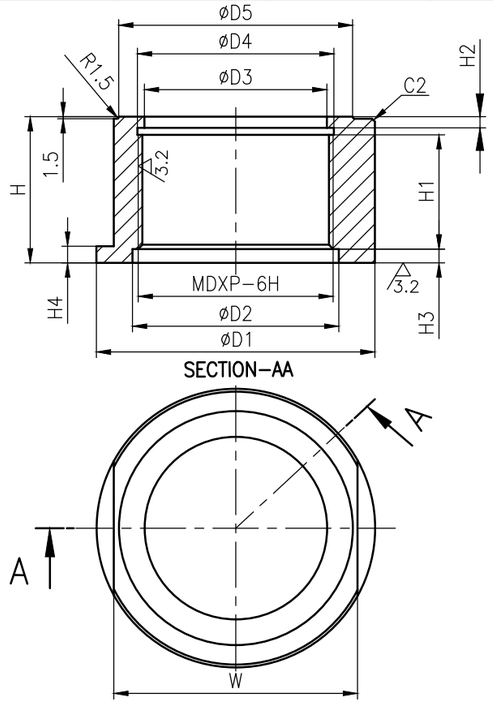
Size A3

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

DRAWING NO. 3-V-0000-22026

SL. No.	DRAWING No.	MATL. SPECN.		COMP. CODE	NET WT(kg)	SCRAP SORT	DIMENSIONS												SIZE/RATING	SUGGESTED SIZE (RAW MATL)	GROSS WT	TOA DRG.NO.
							MDXP-6H	øD1	øD2	øD3	øD4	øD5	H	H1	H2	H3	H4	W				
01	3-V-L802-22026/1	SA105-NR	PRODUCT ATTEST	931140370000	1.51	10	M48 X 3	88	53	41	49	58	50	33	5	7	8	75	12"/150C	ø90 X 57	2.9	4-E46697
02	3-V-Z080-22026	A182 F316 SH		932032770000	1.51	46														ø90 X 57	2.9	
03	3-V-L803-22026/1	SA105-NR		931140380000	2.1	10	M56 X 3	98	61	51	57	70	58	38	6	9	10	85	16"/150C	ø100 X 65	4.0	4-E46698
04	3-V-L804-22026/1			931140390000	5.57	10	M80 X 3	140	85	71	81	95	76	56	6	9	10	120	24"/150C	ø140 X 85	10.3	4-E46702
05	3-V-L805-22026/02	SA182-F22 CL3 NT		931140400000	2.7	20	M64 X 3	110	72	56	65	85	63	43	6	9	10	95	18"/600C	ø110 X 70	5.2	4-E70594
06	3-V-L801-22026/02			931140360000	0.76	20	M36 X 3	68	41	31	37	45	40	23	5	7	0	60	8"/300C	ø70 X 47	1.2	4-E46696
07	3-V-L808-22026/01			931145410000	2.1	20	M56 X 3	98	61	51	57	70	58	38	6	9	10	85	16"/150C	ø100 X 65	4.0	4-E46698
08	3-V-L807-22026/01			931145490000	1.51	20	M48 X 3	88	53	41	49	58	50	33	5	7	8	75	12"/150C	ø90 X 58	2.9	4-E46697
09	3-V-L809-22026/01			931145500000	5.57	20	M80 X 3	140	85	71	81	95	76	56	6	9	10	120	24"/150C	ø140 X 84	10.2	4-E46702
10	3-V-L806-22026	SA105 NR		931145510000	0.76	10	M36 X 3	68	41	31	37	45	40	23	5	7	0	60	8"/300C	ø70 X 47	1.4	4-E46696
11	3-V-L705-22026/01			931148320000	1.69	10	M60 X 3	105	61	51	61	70	60	40	6	9	10	90	20"/150C,300C	ø105 X 67	4.6	4-E46699
12	3-V-L706-22026/02	A182-F22 CL3 NT		931148330000	1.69	20	M60 X 3	105	61	51	61	70	60	40	6	9	10	90	16"/300C	ø105 X 67	4.6	
13	3-V-L751-22026/02			931148340000	7.4	20	M90 X 2	155	96	81	91	105	88	68	6	9	10	135	24"/600C	ø155 X 95	14.1	4-E68415
14	3-V-L793-22026/01			931171810000	9.0	20	M120 X 3	170	128	111	121	135	105	82	8	10	12	155	32"/600C	ø170 X 112	20.0	-
15	3-V-L791-22026/01			931172440000	9.1	20	M120 X 3	180	128	111	121	135	115	92	8	10	12	160	32"/150C	ø180 X 122	24.4	-
16	3-V-L789-22026	A105 NR		931172430000		10																



12.5 / 3.2

NOTE:

01. SHARP CORNERS ARE TO BE ROUNDED OFF.

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

REV	DATE	ALTERED	
08	6.3.14	CHD & APPD	S.S.K&K.R.S

DRAWING No.3-V-Z080-22026 INCLUDED

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TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT

DRAWING REDRAWN ON. 06.03.2014

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

	NAME	SIGN	DATE	NO.OF VAR.
DRN	M.P.S		06.08.92	–
CHD	P.R.K		06.08.92	
APPD	S.K		06.08.92	

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

TITLE	CARD CODE	DRAWING NO.	REV
DISC NUT	U 01	3-V-0000-22026	08

Size A3

TP-DG-2-V-0000-01927
CORPORATE DRG ID

FIRST ANGLE PROJECTION (ALL DIMENSIONS IN MILLIMETRES)

DRAWING NO. 2-V-0000-01927/07

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

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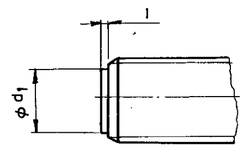
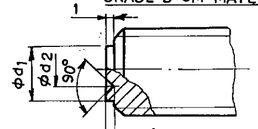
S.NO.	REVISED DRG.NO.	COMP. CODE	RAW MATERIAL DETAILS: MATERIAL SPECIFICATION	SIZE	CODE	WT IN kg: GROSS Wt	NET Wt	Md-6g	d1	L	C	∝ IN DEGREES	ϕd2	STUD SIZE	SCRAP SORT	APPLICABLE TYPE NOS.	REMARKS	S No.
22	2-V-1386-01927	93 058 66 70000	ASTM: A193 Gr. B7	ϕ32 X 145	15039087	0,916	0,629	M27	-	140	3,5	30	-	M27 X 140	20	1386, 1383		22
@ 23	2-V-1450-01927	-	ASTM A193-B 8M	ϕ16 X 80		0.13	0.062	M 12	9	70	2,5	30	6	M12 X 70	46	1450		23
@ 24	2-V-1451-01927	-	ASTM: A193-B 8M	ϕ25 X 120		0.46	0.270	M 20	16	110	3	30	13	M 20 X 110	46	1451, 1452, 1453, 1454		24
(b) 25	2-V-B005-01927/01	93 100 359 0000	ASTM: A193-Gr B7	ϕ40 X 230	15 039 116	2.27	1.66	M36X3	-	220	4	30	-	M36X3-220	20			25
(f) (b) 26	2-V-B006-01927/02	93 100 361 0000	ASTM A193-Gr B7	ϕ40 X ~~270~~ 280	15 039 116	~~2.67~~ 2.76	~~1.96~~ 2.15	M36X3	-	~~260~~ 270	4	30	-	M36X3-~~260~~ 270	20			26
(b) 27	2-V-B007-01927/01	93 100 363 0000	ASTM: A193-Gr-B7	ϕ50 X 330	15 039 197	5.08	2.85	M39X4	-	320	4	30	-	M39X4-320	20			27
(f) (b) 28	2-V-B024-01927/02	93 101 374 0000	ASTM: A193-B 16	~~ϕ40 X 190~~ ϕ32 X 200	~~15 039 167~~ 15 039 165	~~1.26~~ 1.87	~~1.05~~ 0.93	M30X3.5	26	~~190~~ 180	4	30	-	M30X3.5-~~180~~ 190	20			28
(b) 29	2-V-B025-01927/01	93 100 360 0000	ASTM: A193-B16	ϕ40 X 230	15 039 167	2.27	1.66	M36X3	32	220	4	30	-	M36X3-220	20			29
(f) (b) 30	2-V-B026-01927/02	93 100 362 0000	ASTM: A193-B16	ϕ40 X ~~270~~ 280	15 039 167	~~2.67~~ 2.76	~~1.96~~ 2.15	M36X3	32	~~260~~ 270	4	30	-	M36X3-~~260~~ 270	20			30
(b) 31	2-V-B027-01927/01	93 100 364 0000	ASTM: A193-B16	ϕ50 X 330	15 039 169	5.08	2.85	M39X4	35	320	4	30	-	M39X4-320	20			31
(c) 32	2-V-1594-01927	-	ASTM A 193-B7M	ϕ16 X 80		0.13	0.062	M12	-	70	2.5	30	-	M12 X 70	20			32
(c) 33	2-V-1595-01927	-		ϕ20 X 110		0.271	0.157	M16	-	100	2.5	30	-	M16 X 100	20			33
(c) 34	2-V-M226-01927	-		ϕ25 X 130		0.50	0.295	M20	-	120	3.0	30	-	M20 X 120	20			34
(c) 35	2-V-C012-01927	-		ϕ16 X 90		0.142	0.071	M12	-	80	2.5	30	-	M12 X 80	20			35
(c) 36	2-V-C013-01927	-		ϕ20 X 130		0.32	0.189	M16	-	120	2.5	30	-	M16 X 120	20			36
(c) 37	2-V-C016-01927	-		ϕ25 X 140		0.539	0.320	M20	-	130	3.0	30	-	M20 X 130	20			37
(c) 38	2-V-C017-01927	-		ϕ30 X 160		0.887	0.532	M24	-	150	3.5	30	-	M24 X 150	20			38
(d) 39	2-V-B023-01927	93 100 556 0000	ASTM A193-B16	ϕ32 X 160	15 039 165	0.887	0.532	M24		150	3.5	30	-	M24X3-150	20			39
@ 40	2-V-C037-01927	-	ASTM A193-B8M	ϕ20X95		0.234	0.118	M16	-	85	2.5	30	-	M16X 85	46			40
@ 41	2-V-C038-01927	-		ϕ25X135		0.520	0.278	M20	-	125	3.0	30	-	M20X125				41
@ 42	2-V-C040-01927	-		ϕ30X145		0.804	0.440	M24	-	135	3.5	30	-	M24X135				42

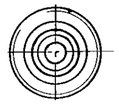
DETAIL-D

① PHYSICAL IDENTIFICATION FOR GRADE B16 MATERIAL

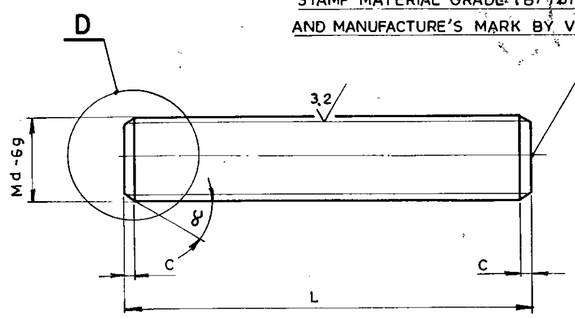


@ ② PHYSICAL IDENTIFICATION FOR GRADE B-8M MATERIAL





NOTES: 1. MAX. HARDNESS SHOULD NOT EXCEED RC22 FOR SL.NOS. 32 TO 38.
2. FOR SL.NOS. 25 TO 31, CADMIUM PLATING TO BE DONE AS PER LATEST APPLICABLE QUALITY PROCEDURE.
STAMP MATERIAL GRADE (B7/B16/B8M) B7M AND MANUFACTURE'S MARK BY VIBRO TOOL



ASTM A193-B7M	QUENCHED & TEMPERED	CERTIFY	22 HRC-MAX
ASTM: A193 B8M	SOLUTION HEATTREATED	CERTIFY	
ASTM: A193 Gr-B7, A193-B16	QUENCHED & TEMPERED	CERTIFY	26 TO 32 HRC
MATERIAL SPECIFICATION	HEAT TREATMENT	TYPE OF CERTIFICATION	HARDNESS

VARIANT NO.	ITEM NO.	DESCRIPTION	STD	DRAWING NO.	ITEM NO. / VAR NO.	MATL CODE / MATL SPEC	A / C	UNIT	UNIT WT / QTY	GS	ZONE

REV.	DATE		
5	14-9-85	ALTD: D.KUMAR / CHKD: S.KUMAR	@ SL.NO. 40, 41, 42 INCLUDED
4	9.5.85	ALTD R.PRAMESWARAN / CHD N.NAGARAJAN	(d) SL.NO.39 INCLUDED
3	18.1.85	ALTD L.R.SAMY / CHD S.KUMAR	(c) SL.NO. FROM 32 TO 38 INCLUDED
2	5-1-84	ALTD R.PRAMESWARAN / CHD N.NAGARAJAN	(b) SL.NO. 25 TO 31 ADDED
01	30.12.83	ALTERED R.P. / CHECKED N.NAGARAJAN	ZONE ④ SL.NO. 23 & 24 ADDED
06	4.8.89	ALTD: L.Rangasamy / CHD: S.Kumar	(f) 1. FOR SL.NO. 26, 28 & 30 'L' DIMENSION INCREASED BY 10 mm. 2. DCN NO. GW/89/0079
07	8.8.98	ALT: R.L. / CHE & APPD: M.R.K.	CADMIUM PLATING INTRODUCED FOR SL.NOS. 25 TO 31. DCN No. HM 0333

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT: REFER DRG.NO. 2-V-0000-01897

Bharat Heavy Electricals Ltd., BOILER PLANT UNIT, TIRUCHIRAPALLI-620 014

	NAME	SIGN	DATE	NO. OF VAR
DRN	B.JAGADEES	AN	1-10-75	
CHD				
APPD				

DEPT VL; CODE 320; SCALE NTS; WEIGHT (kg); REF TO ASSY / OLD DRG; ITEM NO.

TITLE: STUD

CARD CODE: U 01

DRAWING NO.: 2-V-0000-01927

REV: 07

RE-TRACED ON 15.10.86 M. Thamapal

Size A2

TP-DG-2-V-0000-01927
CORPORATE DRG ID

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NUTS FOR HIGH TEMPERATURE USE

(For Medium of Temperature from 525ºC to 565ºC)

1.0 SCOPE

Covers the requirements of Hexagon Nuts for use in medium of temperature from 525ºC to 565ºC & in the size range M10 to M95.

2.0 SPECIFICATION AND REFERENCE STANDARDS

Dimensions and Preferred Sizes	Figure 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 standard
	Tolerance	6H
	Indian Standard	IS: 4218 (Part 3), IS14962 (Part 2 & 3)
Material	Steel to ASTM – A194 Gr 7 Certified in Quenched and Tempered Condition	
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 latest version of TDC:5:164 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)	ISO General Purpose Metric Screw Threads
TDC: 5: 164	Carbon & Alloy Steel Fasteners (Studs, Bolts & Nuts) For Valves, Oil Field Equipment (OFE) and Other Applications
ASTM A 194	Specification for Carbon and Alloy Steel Nuts for bolts for High Pressure and High Temperature service.
IS14962 (Part 2 & 3)	ISO General Purpose Metric Screw Threads - Tolerances

3.0 DESIGNATION

A Grade - A Hexagon Nut to this standard of thread size M10 shall be designated as:

3.1 On Drawings:

1) Material specification column: ASTM A 194 Gr 7
2) Description column : HEX NUT GR7 A T525 - 565 M10
3) Drawing number column : BPS 41324
4) Material code column : 4132400010

3.2 Ordering Description

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

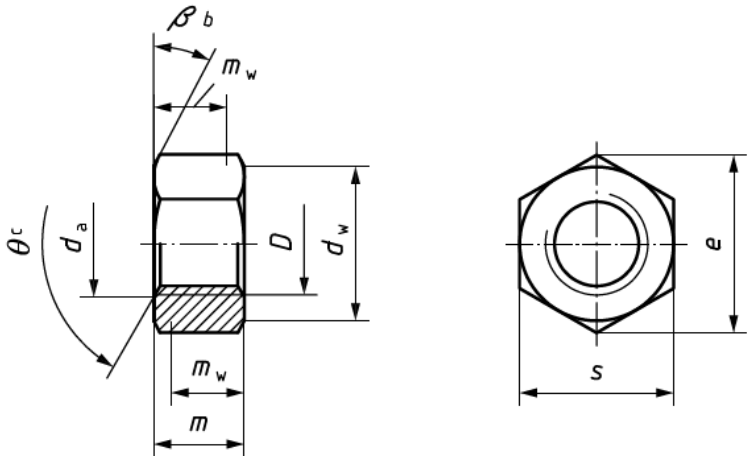
Hex Nut M10 to BPS: 41324-A-ASTM A194 Gr 7 for sizes upto M16

Hex Nut M30 to BPS: 41324-B-ASTM A194 Gr 7 for sizes above M16

4.0 ADDITIONAL INFORMATION

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

Figure 1



b $\beta = 15°$ to $30°$.

c $\theta = 90°$ to $120°$.

Table 1

(All dimensions are in millimeters)

Thread Size D	d_a		d_w	e		m		m_w	s		Weight
	Max	Min	Min	Max	Min	Max	Min	Min	Max	Min	
M10	10.8	10	14.6		17.77	10	9.64	7.7	16	15.73	10.8
M12	13	12	16.6		20.03	12.3	11.9	9.5	18	17.73	16.5
M16	17.3	16	22.5		26.75	17.1	16.4	13.1	24	23.67	33.0
M20	21.6	20	27.7		32.95	20.7	19.4	15.5	30	29.16	64.5
M24	25.9	24	33.3		39.55	24.2	22.9	18.3	36	35	110
(M27)	29.1	27	38		45.2	27.5	26.3	21	41	40	166
M30	32.4	30	42.8		50.85	30.7	29.1	23.3	46	45	231
M36x3	38.9	36	51.1		60.79	36.6	35	28	55	53.8	364
M36x4	38.9	36	51.1		60.79	36.6	35	28	55	53.8	364
M42x4.5	45.4	42	60	75.1	71.3	42	40.4		65	63.1	810
(M48x3)	51.8	48	69.5	86.5	82.6	48	46.4		75	73.1	935
M48x5	51.8	48	69.5	86.5	82.6	48	46.4		75	73.1	1240
M56x4	60.5	56	78.7	98	94.69	56	54.1	43.3	85	83.8	1760
M60x4	64.8	60	83.4	104	99.2	48	46.4	37.1	90	87.8	1625
M64x4	69.1	64	88.2	110	104.86	54	52.1	41.7	95	92.8	2460
(M64x6)	69.1	64	88.2	110	104.86	54	52.1	41.7	95	92.8	2460
M72x4	77.8	72		121		72	70.1		105	103.6	3020
M95x4	102.6	95		190		95	94		164.5	163	12200

m_W – Wrenching Height

Notes:

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

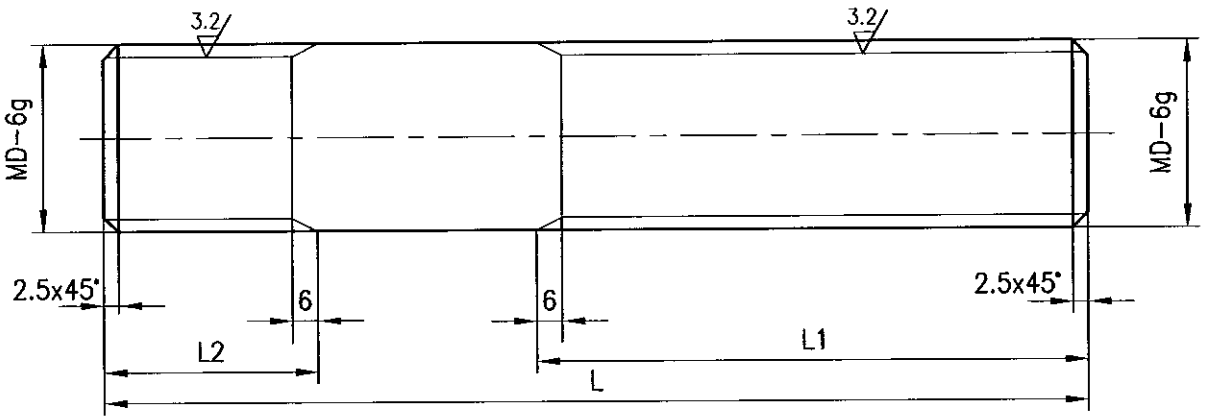
ALL DIMENSIONS ARE IN MILLIMETRES.

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

REV	DATE	ALTERED V.B
4	15.03.04	CHD & APPD M.R.K

SL.No.08 INCLUDED.

12.5 / 3.2



REDRAWN WITH REV.4 ON 15.03.04

SL. No.	COMP. CODE / DRAWING No.	MATL. CODE / SUGGESTED SIZE	MATL SPECN.	SCRAP SORT	NET WT(Kg)	GROSS WT(Kg)	L	L1	L2	MD-6g
08	931301830000	153391390000	SA105, NR CERTIFY	10	1.10	1.70	440	120	20	M20
	4-V-NA06-06800	ø25x450								
07	931097630000	153391390000			0.80	1.20	300	120	20	M20
	4-V-N846-06800	ø25x310								
06	931191430000	153391390000			0.40	1.0	250	50	16	M16
	4-V-W084-06800	ø25x260								
05	931086530000	153391390000			0.50	0.85	210	100	20	M20
	4-V-N722-06800	ø25x220								
04	931055020000	153391390000			0.35	0.60	140	80	20	M20
	4-V-K591-06800	ø25x150								
03	931054810000	153391390000			0.70	1.10	270	120	20	M20
	4-V-N231-06800	ø25x280								
02	931054750000	153391390000			0.94	1.50	380	100	20	M20
	4-V-C434-06800	ø25x390								
01	931051010000	153391390000			0.42	0.72	170	100	20	M20
	4-V-N224-06800	ø25x180								

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

	NAME	SIGN	DATE	NO.OF VAR
DRN	V.BAIRAVAN		15.03.04	
CHD	R.L.NARAYANAN		15.03.04	
APPD	M.RAJAKUMAR		15.03.04	

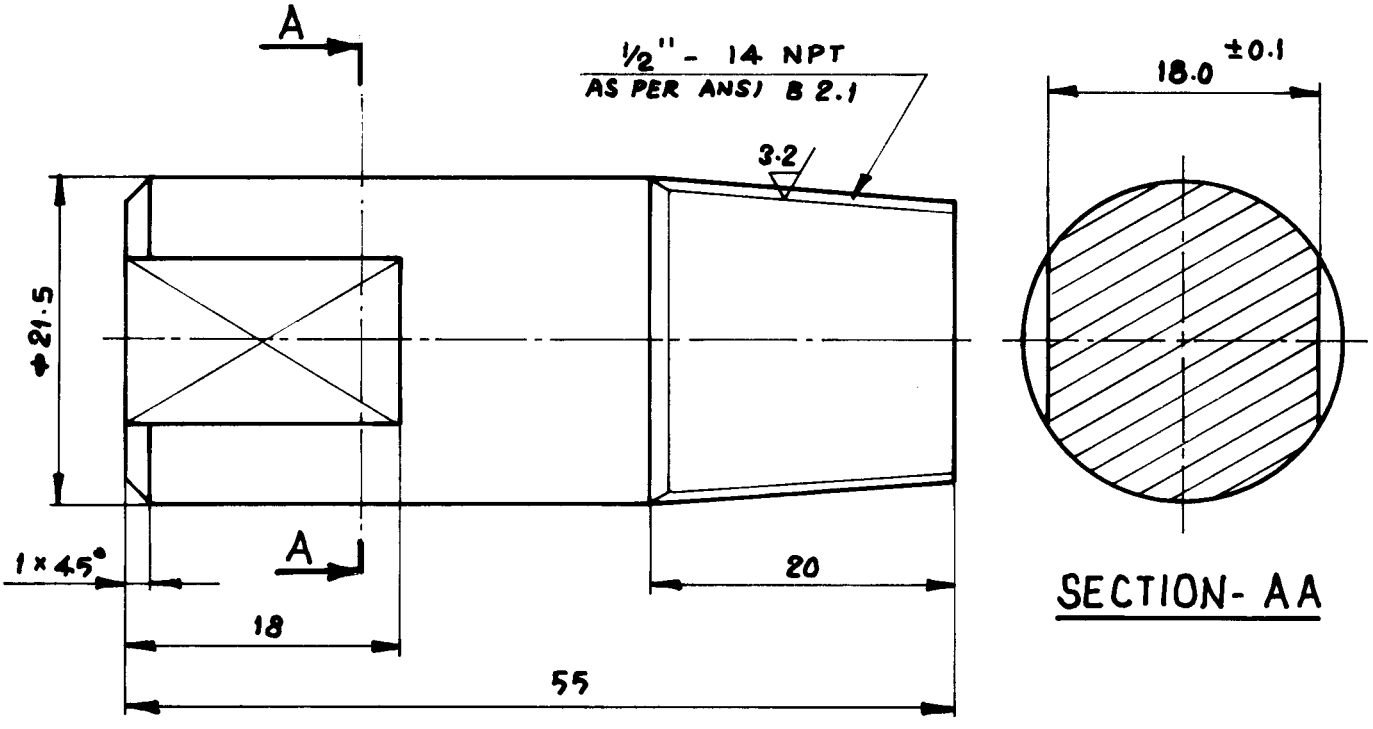
DEPT	SCALE	WEIGHT (KG).	REFERENCE INFORMATIONS	NO. OF ITEMS
VL	N T S		CAD REF. C406800	
CODE 320				

TITLE	CARD CODE	DRAWING NO.	REV
INDICATOR STUD	U 01	4-V-0000-06800	4

Size A4

TP-DG-4-V-M305-06587.
CORPORATE DRG ID

6.3 / 3.2



01	BAR ϕ 22 x 60	15339343	SA 105	NORMALISED	10	0.15	0.18	33166 502 0000 / 4-V-M305-06587
NO. OF PIECES	DESCRIPTION	MATL. CODE	FINAL MATERIAL	HEAT TREATMENT	SCRAP SORT	NET wt (kg)	GROSS wt (kg)	COMPONENT CODE / DRAWING No.

REMARKS

TOTAL NET wt (kg)

SCALE		
	DRAWN	M. Yadav
	CHECKED	
NTS	APPROVED	N. NAGARAJAN.
	STDS. OFFICER	
	DATE	14-11-90

TRANS. COPY NO.

ALTERATIONS	DATE	SIGNATURE	ALTERATION INDEX

TYPE	GROUP	OLD DRG.	NEW DRG

TITLE: PLUG

DRAWING NO.: 4-V-M305-06587

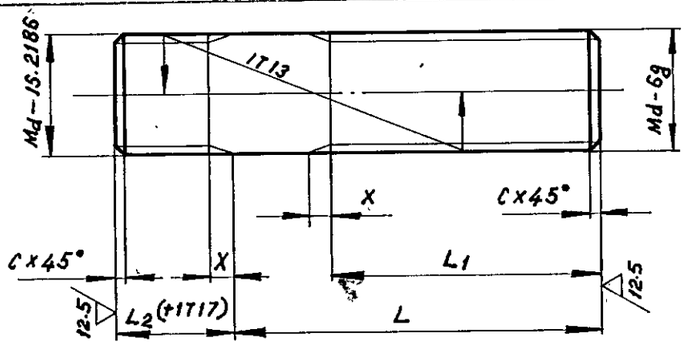
33-116

TP-DG-4-V-M305-06587
CORPORATE DRG ID

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	93102623 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

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

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		

FIRST ANGLE	SCALE NTS	DRAWN	R.L.
		CHECKED	R.L.
ALL DIMENSIONS IN MILLIMETRES		APPROVED	M.R.K.
		DATE	15.6.95

TOTAL NET wt. (kg)
TYPE
NEW/OLD DRG. NO

CAUTION
THE INFORMATION CONTAINED IN THIS DRAWING IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LTD., BOILER PLANT UNIT, TIRUCHY-14 AND SHALL NOT BE USED WITHOUT THEIR EXPRESS WRITTEN PERMISSION IN ANY FORM OR PART THEREOF FOR ANY OTHER PURPOSE THAN FOR WHICH IT IS SENT TO YOU.

33-115

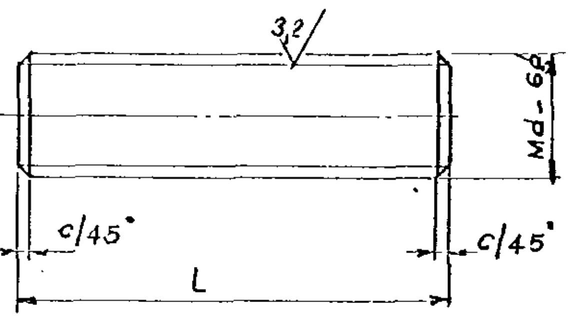
TITLE: STUD

DRAWING NO: 3.V.0000.03661

REVISION: 10

SL.No	DRG. No.	RAW MATERIAL SPECIFICATION	RAW MATERIAL SIZE	RAW MATERIAL CODE No.	RAW MATERIAL WT. (kp)	DIMENSIONS L	DIMENSIONS Md-6g	DIMENSIONS 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, S866, 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		BARφ12X60	15039091	0.53	55	M8	1	0.02	N204	4
5	3-V-N210-09338 / 93 107 183 0000	ASTM A193 B7	φ10X90	-	0.80	80	M8	1	0.05	2, 3, 4" - 150C & 300C GV	5
6.	3-V-N645-09338 / 93108 303 0000		φ25X120	-	0.462	110	M20	2	0.27	N645	

12.5 / 3.2



MICROFILMED ON 21.1.89
ROLL 00598 FRAME 489

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

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

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

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08-229

TITLE: STUD

DRAWING No.: 3-V-S000-09338

REVISION: 05

भारत हैवी इलेक्ट्रिकल्स लिमिटेड
(भारत सरकार का उपक्रम)
इंडस्ट्रियल वाल्वस प्लाँट
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
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

		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

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;
Rev.10: 25/08/2023: Latest version of the referred Standards/Specifications indicated though out TDC;
Rev.11: 23/07/2024: Latest version of the referred Standards/Specifications indicated though out TDC;

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 193-23 /ASTM A 193-*24* Gr B7, B7M & B16.
Nuts - Carbon Steel	:	ASME SA 194-23 /ASTM A 194-*24* Gr 2H & 2HM
Alloy Steel	:	ASME SA 194-23 /ASTM A 194-*24* 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 5* Addendum 3 & API 16C 3rd Ed 2021 Errata 2) and other applications including NACE MR0175 Ed.2021 / ISO 15156 Ed.2020 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 Errata 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 Errata 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 *Errata 5* Addendum 3 Annex M; SAE AMS 2750 Rev.G; 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 E709-21 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 E709-21 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 751-21.

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-*24* including Annex A3, except that testing shall also be in conformance with ASTM E10-*23* or ASTM E18-*24*.

a) For ASME SA 193-23 / ASTM A 193-*24* Gr B7 & B16: Hardness check shall be carried out on finished stud/ bolt as per ASME SA 193-23 / ASTM A 193-*24*, 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 193-23 / ASTM A 193-*24* 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 194-23 / ASTM A 194-*24* Gr 2H, Gr 4, & Gr 7:
Hardness check on finished nuts shall be as per ASME SA 194-23 / ASTM A 194-*24* (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 194-23 / ASTM A 194-*24* Gr 2HM:
Hardness check on 100% of finished nuts shall be carried out as per ASME SA 194-23 /

ASTM A 194-*24*.
Gr 2HM: Hardness: 159 to 235 HBW.

c) **Proof load test shall be done as per ASME SA 194-23 / ASTM A 194-*24* 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 (ºC)	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 194-23 / ASTM A 194-*24* in case of visible surface discontinuities. On such cases Proof load shall be as per ASME SA 194-23 / ASTM A 194-*24*.

vi. <u>NDE:</u>
Magnetic particle inspection shall be carried out as per ASTM E709-21 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 193-23 / ASTM A 193-*24* for studs/bolts and ASME SA 194-23 / ASTM A 194-*24* 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 193-23 / ASTM A 193-*24* for studs/bolts & ASME SA 194-23 / ASTM A 194-*24* 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. Marking for OFE applications: In addition to the above, studs / Bolts / Nuts shall marked with unique heat lot identification and followed by "20E1" for BSL 1. 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 Errata 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 175^0C to 205^0C 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 ºF–425 ºF (191 ºC–218 ºC) 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 D7091-22. 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 D3359-23 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

23/07/24	23/7/24	23/07/2024	23/07/2024	23/07/2024
N Nagamuthu Pandian	Mallemala Sujana Vinod	Venkateswarlu Ala	M Balamurugan	J V V Aruna Kumar
SM/QA	DGM / Valves Engg	SM/RM QC	SM / Valves/Purchase	AGM / QA&BE
Prepared By	**Reviewed By**			**Approved By**

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

TC No: Date:

Customer : PO No./ Amd :
TDC No./Rev.: DC No. :
Product : Drg. No./Rev :
Description : (Spec, dia, pitch, length) Thread Spec. :
Quantity :

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: ^{0}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.