



PLANT STANDARD

HPBP TIRUCHIRAPPALLI

BPS 41324

Rev. No. 04

PAGE 1 OF 2

NUTS FOR HIGH TEMPERATURE USE

(For medium of temperature from 525°C to 565°C)

1.0 SCOPE

Covers the requirements of hexagon nuts for use in medium of temperature from 525°C to 565°C and in the size M10 to M95x4.

2.0 SPECIFICATION AND REFERENCE STANDARDS

Dimensions and preferred sizes	Fig 1 & Table 1 of this standard	
Tolerance	Product grade	A for nuts with $d \leq M16$ 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
Material	Steel to ASTM A194 Gr 7 certified in quenched and tempered condition	
General requirements	Nuts shall comply with TDS:5:166 in respect of requirements not covered in this standard except for cadmium plating.	

2.1 Referred standards (Only current versions are applicable)

IS 1367: Part 2 Technical supply conditions for threaded steel fasteners

IS 4218: Part 3 ISO metric screw threads

ASTM A194 Specification for carbon and alloy steel nuts for bolts for high pressure and high temperature service

TDS:5:166 Carbon & Alloy Steel Nuts to Specification SA 194 Gr2H/2HM/Gr4/Gr7 for Valves, Oil Field Equipment & other applications.

3.0 DESIGNATION

A Grade 'A' hexagon nut to this standard of thread size M10 shall be designated as:

3.1 On Drawings

- i) Material Specification column ASTM A 194 Gr 7
- ii) Description Column HEX NUT GR A T525 - 565 M10
- iii) Drawing Number Column BPS 41324
- iv) Material Code column: 4132400010

Revision 04
Size M64x6 Added

Approved
STANDARDS SECTION
I.T. SOLUTIONS & SERVICES
HPBP, TIRUCHIRAPPALLI

Rev. No. : 04

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PAGE 2 OF 2

3.2 Ordering Description

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

Hex Nut M10 to BPS : 41324-A-ASTM A 194 Gr 7 for sizes upto M16

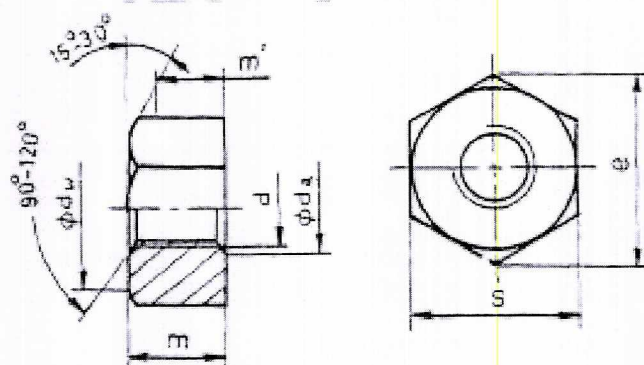
Hex Nut M30 to BPS : 41324-B-ASTM A 194 Gr 7 for sizes M20 to M30

Hex Nut M36x3 to BPS : 41324-C- ASTM A 194 Gr 7 for sizes M36x3 and above

4.0 ADDITIONAL INFORMATION

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

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



'm' = Effective gauging height

TABLE 1 (All dimensions are in millimeters)

Thread size d	d _a		d _w Min	e		m		M' Min	s		Weight
	Min	Max		Max	Min	Max	Min		Max	Min	
M10	10	10.8	14.6		17.77	10	9.64	7.7	16	15.73	10.8
M12	12	13.0	16.6		20.03	12	11.57	9.3	18	17.73	16.5
M16	16	17.3	22.5		26.75	17.1	16.40	13.1	24	23.67	33.0
M20	20	21.6	27.7		32.95	20.7	19.40	15.5	30	29.16	64.5
M24	24	25.9	33.2		39.55	24.2	22.90	18.3	36	35.0	110.0
(M27)					45.20	27.6	26.30	21.0	41	40.0	166.0
M30	30	32.4	42.7		50.85	30.7	29.10	23.3	46	45.0	231.0
M36x3	36	38.9	51.1		60.79	36.6	35.00	28.6	55	53.8	364.0
(M48x3)				86.5		48	46.40	37.1	75	73.8	935.0
M60x4	60	64.8		104		48	47		90	88.6	1625
M72x4	72	77.8		121		72	71		105	103.6	3020
M95x4	95	102.6		190		95	94		164.5	163	12200
M36x4	36	38.9	51.3	60.8	61.02	36	34.40	27.5	55	54	430
M42x4.5	42	45.4	60.8	75.1	72.32	42	40.40	32.3	65	64	810
M48x5	48	51.8	70.3	86.5	83.62	48	46.40	37.1	75	74	1240
M56x4	56	60.5	79.6	98	94.69	56	54.10	43.3	85	83.8	1760
M64x4	64	69.1	88.5	110	105.2	54	52.10	41.7	95	93.1	2460
(M64x6)	64	69.1	88.5	110	105.2	54	52.10	41.7	95	93.3	2460

NOTE:

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

QUALITY ASSURANCE

QA:3.2.1:003:99

Date:09-02-99

Sub: Release of revised TDC:5:166/04 TDC for Carbon & Alloy steel nuts to specn SA 194 Gr 2H/2HM/Gr4/Gr7 for Valves, Oil field equipments & other applications.

Please find enclosed the subject TDC for your official use and record.

(K.Rangachari)
SR.MANAGER/QA

Distribution:

DGM/Valves/Matl Plng/Bldg 6...Sri.R.Prabudoss

DGM/Spares/Matl Plng/Bldg 53..Sri.K.Y.Prabu

DGM/Matl Plng/Bldg 2&4.....Sri.V.Balakrishnan

SM/Purchase/Valves.Bldg 24....Sri.Sam Manohar Nayagam

SM/Purchase/FB/Bldg 24..... Sri.P.Namasivayam

SM/QC (Proc)/Bldg 2&4.....Sri.G.Mathivanan

M/Engg/Valves/Bldg.6.....Sri.K.Nagarajan

Master file

BHEL - Quality Assurance Department. TECHNICAL DELIVERY CONDITION

TDC:5:166 Rev.No.:04 Effective Dt.:13/01/99

Page 1

CARBON & ALLOY STEEL NUTS TO SPECN SA 194 Gr2H/2HM/Gr4/Gr7
for VALVES, OIL FIELD EQUIPMENT & OTHER APPLICATIONS

Revision record:

Rev:00/11.04.90 : First issue

Rev:01/21.06.90 : Editorial corrections

Rev:02/21.04.91 : TC for nuts added

Rev:03/20.10.96 : NDT, Acid pickling added & rewritten

Rev:04/13/01/99 : Studs/bolts changed as nuts in Cl.5,7.1,7.2

1.0 MATERIAL SPECIFICATION - SA 194 Gr2H/Gr2HM/Gr4/Gr7{latest on date of Purchase Order (P.O)}

2.0 GENERAL

This TDC is applicable for API 6A applications including NACE MR-01-75 cl.II & cl.III also.

Shall be manufactured to the relevant drawing and P.O.requirements.

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. If made from round bars, the bars shall be machined to remove 2mm from surface, (ie 4mm in dia) to remove all surface defects. Atleast 10% of the machined bars shall be MT tested to ensure that the surface defects are fully removed.

Nuts shall be heat treated to meet the requirements of SA194 only in a salt bath, or controlled atmosphere furnace. After HT the threads shall be thoroughly cleaned to remove all deposits. When acid pickling is done for cleaning it shall be done as per Cl 7.3.

Cadmium plating as per (Cl 7.1) if specified in drg/P.O. or rust preventive fluid coating as per (Cl 7.2) shall be done.

3.0 CHEMICAL & MECHANICAL PROPERTIES

Mill certificate for chemical composition from steel manufacturer for conformance to the specification heat-wise. Additionally, product analysis shall be done for one piece/heat by the nut manufacturer.

HARDNESS

For SA194 2H, Gr4, & Gr7

Hardness check on finished nut as per SA194, using sampling plan (Cl.7.4). Hardness in the finished nut shall be 24 to 35 HRC or 248 to 352 BHN.

For SA194 Gr2HM:

Hardness check on 100% of nuts. Hardness must be within 159 to 237 BHN.

Proof load test shall be done as per SA194 for all grades.

After final heat treatment, sample nuts shall be heat treated as below and meet the corresponding hardness requirements.

Grade	Temp	Time	Cooling	Hardness at room temp.
2H	540°C	24Hrs	Slow cool	179 BHN (min)
2HM	540°C	-do-	Slow cool	159 BHN (min)
Gr4/Gr7	590°C	-do-	Slow cool	201 BHN (min)

CONE STRIPPING TEST: This test shall be performed as per SA194 in case of visible surface discontinuities. On such cases Proof load shall be as per ASTM A194 (latest std).

4.0 FINAL INSPECTION

All inspection shall be as per drawing and SA194.

The threads shall be checked with calibrated plug gauge in the final heat-treated condition for black variety and in final plated condition for the plated variety.

Visual and Dimensional checks in the finished nuts and their acceptance shall be as per IS 2614 Table-I(latest).

5.0 MARKING & PACKING

Punch/emboss each finished nuts with material grade (2H/2HM/Gr4/Gr7); supplier's emblem.

Punch/emboss Sl.no also in 2HM nuts in addition to the above to co-relate with hardness. In addition, the grade symbol shall be underlined.

Pack in wooden box of convenient size for easy handling & transportation. Mark quantity in each box.

6.0 CERTIFICATION

The manufacturer shall provide TC (ref. page 3) duly countersigned by the Authorised Inspecting Authority nominated by BHEL in P.O. (if specified) along with Raw Material TC from Steel Maker. Manufacturer's TC shall contain P.O.No,heat no., Chem & Mech properties, HT parameters, surface coating with coating thickness, baking details and certify soundness & confirmation to P.O. requirements.

7.0 SPECIAL REQUIREMENTS

7.1 CADMIUM PLATING REQUIREMENTS

Clean the nuts to make it free from rust, grease, oil, scale, etc., before plating.

When pickling is considered essential, it shall be done as per Cl 7.3.

Apply Cadmium Plating to the specified thickness on specified areas.

After plating, Bake the parts at 175 Deg.C to 205 Deg.C for a minimum period of 3 hours. The elapsed time between plating and baking shall not exceed 8 hours.

Apply a Chromate Conversion coating after plating and baking.

7.2 RUST PREVENTIVE COATING REQUIREMENTS

Clean the nuts to make it free from rust, grease, oil, scale, etc., before applying protective coating.

When pickling is considered essential it shall be done as per Cl 7.3.

One coat of rust preventive fluid of any of the following vendors shall be applied.

CHEMICAL**VENDOR**

1. **BONITA-RPF** M/s Bonita Chemicals, 64, Industrial Estate, Nunhai, Agra-282 006.
2. **CHAMPION-RPF** M/s Guardian Chemicals, 8, Rajaji Ind st, West Lake Area, Nungambakkam, Madras-600 034
3. **ECONOL RPF** M/s Process Aids, Bangalore
(non-drying type)
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

7.3 ACID PICKLING

When pickling is considered essential for cleaning, it shall be done using Hydrochloric acid of 5 to 10% acid concentration at 50 deg C with inhibitor.

The concentration and type of inhibitors shall be as recommended by any of the following vendors.

- 1) M/s Agromore Ltd. Bangalore.
- 2) M/s Prosol Corporation, Hyderabad.
- 3) M/s Guardian Anti-corrosives, Madras.
- 4) M/s Mascot Chemicals, Bombay.

After pickling thorough rinsing shall be carried out with water to remove acid residues.

Immediately after pickling, the components shall be dried and baked at 175 to 205 deg C for 3 hours before taking up the next operation.

7.4 SAMPLING PLAN FOR HARDNESS CHECK AFTER HT

The following double sampling plan shall be used. Hardness values shall be 25 to 34 HRC after HT. IS 2500 (Double Sampling) Normal Inspection, Level 2.

No. of Pieces in the lot	Acceptable Quality Level (2.5%)							
	First sample		Acceptance number	Reject numbers	Second sample	Combined sample	Acceptance number	Rejection number
	(n1)	(Ac)	(Rc)	(n2)	(n1+n2)	(Ac)	-	
0 - 500	32	1	4	32	64	4	5	
501 - 1200	50	2	5	50	100	6	7	
1201 - 3200	80	3	7	80	100	8	9	
3201 -10000	125	5	9	125	250	12	13	
10001-35000	200	7	11	200	400	18	19	

Ac:-Acceptance number: Max. no. of defectives allowed in the sample for the acceptance of the lot.

Rc:-Rejection number: Min.no. of defectives in the sample resulting in the lot's rejection.

PROCEDURE FOR OPERATING THIS PLAN : Suppose the lot size is 1,000. From table chose the class, which includes 1,000 viz 501 - 1200. Hence, use the sampling plan given against this class. Take a sample of 50 pieces and test for hardness.

TEST CERTIFICATE FOR NUTS - SAMPLE FORMAT

TC NO:

DATE:

CUSTOMER :

P.O.NO:

Dt:

D.C.NO:

Dt:

Specn :

PRODUCT :
SIZE OF BAR USED:

RAW MATL TC NO:

HEAT NO.:

LOT NO:

QUANTITY:

TDC NO:

DRG NO:

Thread specn:

CHEMICAL COMPOSITION(%) :

C	Si	Mn	P	S	Cr	Ni	Others

HEAT TREATMENT:

<u>HARDENING</u> : TEMP:	Deg.C;	SOAKING TIME:	Minutes;	COOLING MEDIUM:
<u>TEMPERING</u> : TEMP:	Deg.C.	SOAKING TIME:	Minutes;	COOLING MEDIUM:
BAKING TEMP :	Deg.C	BAKING TIME:	Minutess.	

MECHANICAL TESTING:

HARDNESS AFTER HT (MIN & MAX) :	BHNNO OF SAMPLES
HARDNESS AFTER 24 HRS TEMPERING ON SAMPLE NUT :	BHN
PROOF LOAD APPLIED : Kg	
CONE PROOF LOAD TEST :	LOAD APPLIED:

MAGNETIC TESTING (IN PROCESS):

FINAL INSPECTION (VISUAL):

SURFACE COATING :

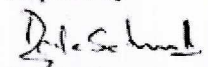
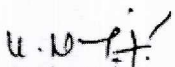
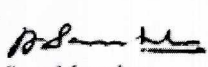
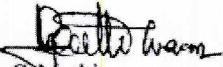
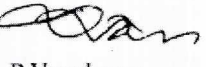

COATING THICKNESS :

Micr

IDENTIFICATION :

It is certified that the above results are correct and the parts are as per specification & P.O. requirements.

Signature
Incharge of Quality

Prepared by		REVIEWED BY			Approved by
					
R. Rajasekar	K. Nagarajan	Sam Monohar Nayagam	G. Mathivanan	P. Vasudevan	K. Rengachari
Qual Assurance	Engg/Valves	Purchase/Valves	Quality Control	Quality assurance	Qual Assurance