The American Society for Testing and Materials is an international standards organization that develops and publishes voluntary conse ASTM A563 Standard specification for carbon and alloy steel nuts.

The ASTM A563 specification covers the chemical and mechanical requirements for carbon and alloy steel nuts used on bolts, studs, and externally threaded fasteners. The charts below address over tapping allowances for hot-dip galvanized nuts, grade marking requirements, and mechanical requirements. For information on suitable nuts for various grades of bolts, visit the Nut Compatibility Chart.

According to the A563 specification, "The requirements for any grade of nut may, at the supplier's option, and with notice to the purchaser, be fulfilled by furnishing nuts of one of the stronger grades specified herein unless such a substitution is barred in the inquiry and purchase order". This is important because some nut grades are not readily available in certain sizes and finishes. Additionally, the specification allows for the substitution of ASTM A194 grade 2H nuts in lieu of A563 grade DH nuts due to the lack of availability of grade DH nuts in nominal sizes 3/4" and larger.

Hot-dip galvanized nuts must be tapped oversize to allow for the added thickness of the zinc on the threads of the externally threaded fastener. These allowances are addressed in the chart below and a more detailed explanation of this issue can be found in the Frequently Asked Questions section of this site.

Various nut styles exist and to some degree are determined by their grade. These styles include hex, heavy hex, square, jam, coupling, and sleeve.nsus technical standards for a wide range of materials, products, systems, and services.

A563 Grades

A	Carbon steel, hex or heavy hex
B	Carbon steel, hex or heavy hex
C	Carbon steel, quenched and tempered, heavy hex
D	Carbon steel, quenched and tempered, heavy hex
DH	Carbon steel, quenched and tempered, heavy hex
C3	Weathering steel, quenched and tempered, heavy hex
DH3	Weathering steel, quenched and tempered, heavy hex

A563 Mechanical Properties

Grade	Style	Size, in.	Proof Load, ksi		Hardness, HBN
			Plain	Galvanized	
A	Hex	1/4 - 1-1/2	**90**	**68**	**116-302**
	Heavy Hex	1/4 - 4	**100**	**75**	**116-302**
B	Heavy Hex	1/4 - 1	**133**	**100**	**121-302**
	Heavy Hex	1-1/8 - 1-1/2	**116**	**87**	**121-302**
C/C3	Heavy Hex	1/4 - 4	**144**	**144**	**143-352**
D	Heavy Hex	1/4 - 4	**150**	**150**	**248-352**
DH/DH3	Heavy Hex	1/4 - 4	**175**	**150**	**248-352**
For UNC, 8UN, 6UN, and Coarse Pitch Threads					

A563 Chemical Properties

Element	Grades O, A, B, C	D**	DH**
Carbon	0.55% max	0.55% max	0.20 - 0.55%
Manganese, min		0.30%	0.60%

Phosphorus, max	0.12%	0.04%	0.04%
Sulfur, max	0.15%*	0.05%	0.05%

* For grades O, A and B a sulfur content of 0.23% max is acceptable with the purchasers approval ** For grades D and DH a sulfur content of 0.05 - 0.15% is acceptable provided the manganese is 1.35% min

Element	Classes for Grade C3*							DH3
	A	B	C	D	E	F	N	
Carbon	0.33 - 0.40%	0.38 - 0.48%	0.15 - 0.25%	0.15 - 0.25%	0.20 - 0.25%	0.20 - 0.25%		0.20 - 0.53%
Manganese	0.90 - 1.20%	0.70 - 0.90%	0.80 - 1.35%	0.40 - 1.20%	0.60 - 1.00%	0.90 - 1.20%		0.40% min
Phosphorus	0.040% max	0.06 - 0.12%	0.035% max	0.040% max	0.040% max	0.040% max	0.07 - 0.15%	0.046% max
Sulfur, max	0.050%	0.050%	0.040%	0.050%	0.040%	0.040%	0.050%	0.050%
Silicon	0.15 - 0.35%	0.30 - 0.50%	0.15 - 0.35%	0.25 - 0.50%	0.15 - 0.35%	0.15 - 0.35%	0.20 - 0.90%	
Copper	0.25 - 0.45%	0.20 - 0.40%	0.20 - 0.50%	0.30 - 0.50%	0.30 - 0.60%	0.20 - 0.40%	0.25 - 0.55%	0.20% min
Nickel	0.25 - 0.45%	0.50 - 0.80%	0.25 - 0.50%	0.50 - 0.80%	0.30 - 0.60%	0.20 - 0.40%	1.00% max	0.20% min**
Chromium	0.45 - 0.65%	0.50 - 0.75%	0.30 - 0.50%	0.50 - 1.00%	0.60 - 0.90%	0.45 - 0.65%	0.30 - 1.25%	0.45% min
Vanadium			0.020% min					
Molybdenum		0.06% max		0.10% max				0.15% min**
Titanium				0.05% max				

* Selection of a class shall be at the option of the manufacturer

** Nickel or Molybdenum may be used.

A563 Grade Identification Markings

Grade Identification Marking	Specification	Material	Nominal Size, In.	Proof Load Stress, ksi	Hardness Rockwell		See Note
					Min	Max	
	ASTM A563 Grade O	Carbon Steel	1/4 - 1-1/2	**69**	**B55**	**C32**	**2,3**
	ASTM A563 Grade A	Carbon Steel	1/4 - 1-1/2	**90**	**B68**	**C32**	**2,3**
	ASTM A563 Grade B	Carbon Steel	1/4 - 1	**120**	**B69**	**C32**	**2,3**
			>1 - 1-1/2	**105**			
	ASTM A563 Grade C	Carbon Steel, may be Quenched and Tempered	1/4 - 4	144	B78	C38	**4**

	ASTM A563 Grade C3	Atmospheric Corrosion Resistant Steel, may be Quenched and Tempered	1/4 - 4	**144**	B78	**38**	**4,6**
	ASTM A563 Grade D	Carbon Steel, may be Quenched and Tempered	1/4 - 4	**150**	B84	C38	**5**
	ASTM A563 Grade DH	Carbon Steel, Quenched and Tempered	1/4 - 4	175	C24	C38	5
	ASTM A563 Grade DH3	Atmospheric Corrosion Resistant Steel, Quenched and Tempered	1/4 - 4	175	C24	C38	**4,6**

NOTES:

1. In addition to the indicated grade marking, all grades, except A563 grades O, A, and B, must be marked for manufacturer identification.
2. Nuts are not required to be marked unless specified by the purchaser. When marked, the identification marking shall be the grade letter O, A, or B.
3. Properties shown are those of nonplated or noncoated coarse thread nuts.
4. Properties shown are those of coarse thread heavy hex nuts.
5. Properties shown are those of coarse thread heavy hex nuts. Other nuts styles and fine threads may apply.
6. The nut manufacturer, at his option, may add other markings to indicate the use of atmospheric corrosion resistant steel.

Inch Fastener Standards. 7th ed. Cleveland: Industrial Fasteners Institute, 2003. n-80-n-81.

Thread Dimensions and Oversizing Allowances

For Nuts: Hot Dipped Galvanized per Specification F2329

Nominal Nut Size, in. and Pitch	Diametral Allowance, in.	Pitch Diameter	
		Min	Max
0.250-20	**0.016**	**0.2335**	**0.2384**
0.312-18	**0.017**	**0.2934**	**0.2987**
0.375-16	**0.017**	**0.3514**	**0.3571**
0.437-14	**0.018**	**0.4091**	**0.4152**

0.500-13	**0.018**	**0.4680**	**0.4745**
0.562-12	**0.020**	**0.5284**	**0.5352**
0.625-11	**0.020**	**0.5860**	**0.5932**
0.750-10	**0.020**	**0.7050**	**0.7127**
0.875-9	**0.022**	**0.8248**	**0.8330**
1.000-8	**0.024**	**0.9428**	**0.9516**
1.125-8	**0.024**	**1.0678**	**1.0768**
1.125-7	**0.024**	**1.0562**	**1.0656**
1.250-8	**0.024**	**1.1928**	**1.2020**
1.250-7	**0.024**	**1.1812**	**1.1908**
1.375-8	**0.027**	**1.3208**	**1.3301**
1.375-6	**0.027**	**1.2937**	**1.3041**
1.500-8	**0.027**	**1.4458**	**1.4553**
1.500 - 6	0.027	**1.4187**	**1.4292**
1.750 - 5	0.050	**1.6701**	**1.6817**
2.000 - 4.5	0.050	1.9057	**1.9181**
2.250 - 4.5	0.050	2.1557	**2.1683**
2.500 - 4	0.050	2.3876	**2.4011**
2.750 - 4	0.050	2.6376	**2.6513**
3.000 - 4	0.050	2.8876	**2.9015**
3.250 - 4	0.050	3.1376	**3.1517**
3.500 - 4	0.050	3.3876	**3.4019**
3.750 - 4	0.050	3.6376	**3.6521**
4.000 - 4	0.050	3.8876	**3.9023**
Inch Fastener Standards. 7th ed. Cleveland: Industrial Fasteners Institute, 2003. B-173.			