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## ASTM A453 Grade 660 Class C Specification

**ASTM A453 Grade 660 Class C specification** provides a yield strength viz. 85 ksi [585 MPa] respectively for use in high temperature service for bolting components such as Stud bolts, screws, nuts, hex bolts & various other fasteners for pressure vessel and valve flanges. [A453 Grade 660 Class C](#) is oil quenched and double age hardened to achieve superior grain structure as compared to Class A,B & D . [ASTM A453 Grade 660 Class C](#) is produced in various other forms like wire rods, round bars, shafts, castings, forgings, threaded bars, threaded rods, wires, tubings, sheets, plates, welding rods, hex bars, Rivets & Springs. A453 Gr. 660 Cl. C Fasteners are stress rupture tested for 100 Hours at 650°C in finished condition. [ASTM A453 Grade 660 Class C Bolting](#) can be certified under nace provided the hardness is controlled and not over 35HRC.

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## ASTM A453 Grade 660 Class C Properties

### Chemical Composition

Grade	ASTM A453 Grade 660 Class C	
UNS Number	S66286	
Elements	Content, %	Product Analysis Variation, Over or Under, %
Carbon (C)	0.08 max	0.01 over
Manganese (Mn)	2.00 max	0.04
Phosphorus (P)	0.040 max	0.005 over
Sulfur (S)	0.030 max	0.005 over
Silicon (Si)	1.00 max	0.05
Nickel (Ni)	24.0-27.0	0.2
Chromium (Cr)	13.5-16.0	0.2
Molybdenum (Mo)	1.00-1.50	0.05
Titanium (Ti)	1.90-2.35	0.05
Aluminum (Al)	0.35 max	0.05 over
Vanadium (V)	0.10-0.50	0.03
Boron (B)	0.001-0.010	0.0004 under to 0.001 over

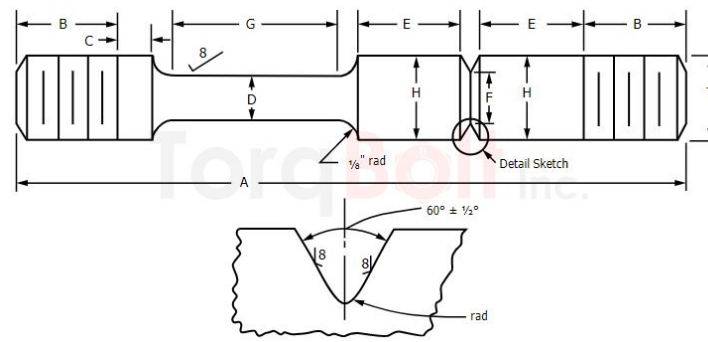
### Mechanical Properties

Grade	ASTM A453/A453M Grade 660	
Class	C	
Tensile Strength, min	ksi	130
	MPa	895
Yield Strength (0.2 % Offset), min	ksi	85
	MPa	585
Elongation in 4× Diam, min, %	15	
Reduction of Area, min, %	18	
Brinell Hardness Number	248-341	
Approximate Rockwell Hardness, B and C	min	24 HRC
	max	37 HRC

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## Stress Rupture Test



Grade	Class	Test Temperature, °F [°C]	Stress, min		Time to Rupture, min, h <sup>A</sup>	Elongation, min, %
			ksi	MPa		
ASTM A453/A453M Grade 660	B	1200 [650]	56	385	100	5

(A) The combination bar specimen shown in Fig. 1 shall be tested continuously at the temperature and at the minimum stress specified or at a greater stress and shall rupture in a time not less than that specified.  
 (A) When it is necessary to heat treat or heat treat and pickle after cold finishing, because of special hardness or mechanical property requirements, the permissible variations are generally double those shown in the table.  
 (B) For size tolerances of sizes over 4 in. [100 mm], the manufacturer should be consulted.

## Heat Treatment

### Annealing & Ageing Cycles

Grade Symbol	Class	Solution Treatment	Hardening Treatment
ASTM A453/A453M Grade 660	C	1800 ± 25 °F [980 ± 14 °C], hold 1 h min, and oil quench	1425 ± 25 °F [775 ± 14 °C] hold 16 h, air cool, followed by 1200 ± 25 °F [650 ± 14 °C] hold 16 h, air cool

(A) Times refer to the minimum time material is required to be at temperature.

### Continuous Heat Treatment Charge Sizes

Diameter, in. [mm]	Weight, lb [kg]
To 1 <sup>3</sup> / <sub>4</sub> [44]	3000 [1400]
Over 1 <sup>3</sup> / <sub>4</sub> [44] to 2 <sup>1</sup> / <sub>2</sub> [63]	6000 [2700]
Over 2 <sup>1</sup> / <sub>2</sub> [63]	12000 [5400]

### Lot / Batch Sizes

Diameter, in. [mm]	Maximum Lot Size, lb [kg]
1 <sup>1</sup> / <sub>2</sub> [38] and under	200 [90]
Over 1 <sup>1</sup> / <sub>2</sub> [38] to 1 <sup>3</sup> / <sub>4</sub> [44], incl	300 [140]
Over 1 <sup>3</sup> / <sub>4</sub> [44] to 2 <sup>1</sup> / <sub>2</sub> [63], incl	600 [270]
Over 2 <sup>1</sup> / <sub>2</sub> [63]	20 pieces

### Marking Requirements

Grade	Marking
ASTM A453/A453M GRADE 660 CLASS C	TB 660C M1/M2/R1/R2

### Bolting Threading Types

Specification	Grade	UNS No.	CLASS	Type			
ASTM A453/A453M	Grade 660	S66286	Class C	M1	M2	R1	R2

## ASTM A453 Grade 660 Class C Product Range

Based on the application & Usage



**BARS / RODS**



**FORGINGS**



**HEAVY HEX NUTS**



**BOLTS**



**HEX BOLTS**



**SOCKET HEAD CAP SCREWS**



**PUSH BOLTS / RODS**



**HEX CAP SCREWS**



**SET SCREWS / GRUB SCREWS**



**WASHERS**



**COUNTERSUNK SCREWS**



**U BOLT**



**STUD BOLTS**



## ASTM A453 Grade 660 Class C Related Keywords

- A453 gr 660 class c
- A453-660 class c
- ASTM A453-660 class c
- ASTM A453 grade 660 class c
- ASTM A453 gr 660 cl c
- ASTM A453 gr 660 c
- ASTM A453 grade 660 c
- A453 660c
- A453 gr 660 c
- A453 gr 660 bolts
- A453 gr 660 class c
- A453 gr 660c bolts
- ASTM A453 660c
- A453 grade 660 bolts
- ASTM A453 gr.660 cl.c
- ASTM A453 grade 660 class c
- ASTM A453 grade 660 c
- ASTM A453 grade 660 bolts
- ASTM A453 grade 660 class c
- SA 453 660 c
- SA 453 gr 660 c
- SA 453 gr 660 class c
- SA 453 grade 660 class c
- SA 453-660 c
- SA 453-660 type c

### Specifications

ASTM A453  
 ASTM A638  
 EN 10269  
 EN 10083-3  
 ISO 3506-5  
 DIN 267

### Surface Treatments

Xylan 1070 / 1014 / 1400 / 1424  
 Xylar 2 / 101  
 SermaGard 1105 / 1280  
 Dacromet 320 / 500  
 TakeCoat 1000 Ceramic  
 Magnigard  
 MolyKote

### Certifications

ISO 9001 - 2015 Certified  
 PED 2014/68/EC  
 API 6A ; API 20E; API 20F  
 NACE MR0175/ISO 15156-2  
 NORSOK M-650  
 DFAR  
 MERKBLATT AD 2000 W2/W7/W10

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SATISFACTION SURVEY



