



Metallurgical and Mechanical Requirements for Wheel Nuts

1 Scope

1.1 Material Description. This standard covers material, processing and mechanical requirements for passenger car and truck wheel nuts

1.2 Symbols. Not applicable.

1.3 Applicability. Passenger car and truck wheel nuts.

1.4 Remarks. Not applicable.

2 References

Note: Only the latest approved standards are applicable unless otherwise specified.

2.1 External Standards/Specifications.

ISO 6157-2

2.2 GM Standards/Specifications.

GMW3059

GMW16535

2.3 Additional References. None.

3 Requirements

3.1 Material. Nuts shall be manufactured from carbon steel as shown in Table 1. The use of leaded steel is not permitted.

Table 1: Chemical Composition of Wheel Nut, Weight Percent

Wheel Nut Property Class	Carbon Maximum	Manganese Minimum	Phosphorus Maximum	Sulfur Maximum	Boron Maximum
9	0.58	0.25	0.060	0.150	Not applicable
10	0.58	0.30	0.048	0.058	0.003

3.2 Heat Treatment.

3.2.1 Property Class 9 nuts are supplied in the as-formed condition.

3.2.2 Property Class 10 nuts may be heat treated.

3.3 Proof Load.

3.3.1 Property Class 9 nuts shall conform to the limits shown in Table 2 when tested as described in 3.6.1.

3.3.2 Property Class 10, size M12×1.5 and M14×1.5 nuts, shall conform to the limits shown in Table 3 when tested as described in 3.6.1.

3.3.3 Property Class 10, size M18×1.5, M20×1.5, and M22×1.5, nuts shall conform to the limits shown in Table 4 when tested as described in 3.6.1.

Table 2: Proof Load Specifications – Property Class 9 ^{Note 1}

Thread Size	Proof Load ^{Note 2}		Length of Thread Engagement ^{Note 3}			
			Compression Test		Tension Test	
	kN	lbs	mm	Turns ^{Note 4}	mm	Turns ^{Note 4}
M12×1.5	80.2	18 030	9.0	6.0	10.5	7.0
M14×1.5	114	25 630	11.3	7.5	12.8	8.5
M18×1.5	197	44 290	15.8	10.5	18.0	12.0
M20×1.5	248	55 760	17.3	11.5	20.3	13.5
M22×1.5	303	68 120	19.5	13.0	22.5	15.0

Note 1: Property Class 9 as defined by ASTM.**Note 2:** Based on proof stress of 910 MPa.**Note 3:** Length of thread engagement does not include nut and bolt thread chamfer.**Note 4:** One (1) turn = 360 degrees rotation of the nut on the test bolt. Eliminate bolt and nut thread chamfer by counting turns from the point of initial engagement of bolt and nut threads.Table 3: Proof Load Specifications – Property Class 10, Style 2 ^{Note 1}

Thread Size	Proof Load ^{Note 2}		Length of Thread Engagement ^{Note 3}			
			Compression Test		Tension Test	
	kN	lbs	mm	Turns ^{Note 4}	mm	Turns ^{Note 4}
M12×1.5	92.9	20 880	9.0	6.0	10.5	7.0
M14×1.5	131.9	29 650	11.3	7.5	12.8	8.5

Note 1: Property Class 10 as defined by ISO.**Note 2:** Based on proof stress of 1055 MPa.**Note 3:** Length of thread engagement does not include nut and bolt thread chamfer.**Note 4:** One (1) turn = 360 degrees rotation of the nut on the test bolt. Eliminate bolt and nut thread chamfer by counting turns from the point of initial engagement of bolt and nut threads.Table 4: Proof Load Specifications – Property Class 10, Style 2 ^{Note 1}

Thread Size	Proof Load ^{Note 2}		Length of Thread Engagement ^{Note 3}			
			Compression Test		Tension Test	
	kN	lbs	mm	Turns ^{Note 4}	mm	Turns ^{Note 4}
M18×1.5	232.2	52 200	15.8	10.5	18.0	12.0
M20×1.5	293.8	66 050	17.3	11.5	20.3	13.5
M22×1.5	359.6	80 840	19.5	13.0	22.5	15.0

Note 1: Property Class 10 as defined by ISO.**Note 2:** Based on proof stress of 1080 MPa.**Note 3:** Length of thread engagement does not include nut and bolt thread chamfer.**Note 4:** One (1) turn = 360 degrees rotation of the nut on the test bolt. Eliminate bolt and nut thread chamfer by counting turns from the point of initial engagement of bolt and nut threads.

3.4 Hardness. The hardness requirement is independent of proof load performance and addresses the compatibility of wheel nuts and the wheel. Relative hardness of the bearing surfaces affect nut galling during tightening.