Alloy 718

AMS 5662 vs AMS 5663 vs API 6A

Alloy 718 is a high nickel alloy that can be heat treated for higher strength. Rolled Alloys stocks annealed 718 (AMS 5662) and aged 718 (API 6A). The annealed condition (AMS 5662) is commonly sold for general use in the Aerospace and Oil & Gas industries, and can be heat treated to meet various other conditions. The annealed condition can be aged per AMS 5663 to meet aerospace requirements. When alloy 718 has been aged to meet API 6A and NACE MR0175 requirements, it is sold almost exclusively for oil and gas use.

There is often confusion on which heat treated version is required. When customers/engineers/users write their own specifications that are identical or variations of the standards below, it adds to the level of confusion. Understanding these core specifications will help decide which category of heat treatment is required. If customer specifications are provided please contact either product management or QAOil&Gas@RolledAlloys.com.

Another point to note is that we can heat treat stock material to meet various conditions. For example, all AMS 5662 material is tested at the mill to show it is capable of being aged to meet AMS 5663. With a cost, we can convert our stock to meet AMS 5663 or similar heat treatments. See the back for an example capability test. It is rare to fully convert annealed AMS 5662 bar to meet API 6A.

Chemical Composition, %

	AMS 5662 / AMS 5663		API 6A	
	MIN	MAX	MIN	MAX
Ni	50.0	55.0	50.0	55.0
Cr	17.0	21.0	17.0	21.0
Fe	–	balance	–	balance
Cb + Ta	4.75	5.50**	4.87	5.20
Mo	2.80	3.30	2.80	3.30
Ti	0.65	1.15	0.80	1.15
Al	0.20	0.80	0.40	0.60
C	–	0.08	–	0.045
Co	–	1.00	–	1.00
Mn	–	0.35	–	0.35
Si	–	0.35	–	0.35
P	–	0.015	–	0.010
S	–	0.015	–	0.010
B	–	0.006	–	0.006
Cu	–	0.30	–	0.23
Pb	–	0.0005	–	0.001
Se	–	0.0003	–	0.0005
Bi	–	0.00003	–	0.00005
Ca	–	–	–	0.003*
Mg	–	–	–	0.006*

** Only needs to be reported if intentionally added • ** AMS limits Ta to 0.05% Max*

Stock

	AMS 5596	AMS 5662	AMS 5663	API 6A
Condition	Annealed	Annealed	Aged	Aged
BTS Name	**718** (Short Code "718")	**718** (Short Code "718")	–	**718 NACE** (Short Code "718N")
Product Form	Plate, Sheet	Bar	Bar	Bar
Stock Sizes	0.010" - 2.000"	3/8" - 10"	None	3/4" - 7 1/4"

Mechanical Properties

	AMS 5662*	AMS 5663	API 6A		NACE
Tensile Strength		185 ksi	150 ksi		
Yield Strength		150 ksi	120-145 ksi		
Elongation		12%	20%		
Reduction of Area		15%	35% ≤ 10" dia, 25% > 10" dia		
Charpy Impact - 75°F			<3"	50 ft-lb (L)	
			3"≤ X ≤10"	35 ft-lb (T)	
			>10"	30 ft-lb (T)	
Lateral Expansion			<3"	N/A	
			3"≤X≤10"	0.015" (T)	
			>10"	0.015" (T)	
Hardness	≤29 HRC		32-40 HRC		40 HRC MAX

**AMS 5662 material must be capable of being heat treated to AMS 5663 properties.*

Melt Practice

	AMS 5662	AMS 5663	API 6A
Option 1	VIM+ESR	VIM+ESR	EAF+AOD+VAR+VAR
Option 2			VIM+ESR or EFR
Option 3			VIM + VAR

Heat Treatment

	AMS 5662	AMS 5663	API 6A
Step 1	Anneal 1725-1850°F	Anneal 1725-1850°F	Anneal 1870-1925°F for 1-2.5 hrs
Step 2	Air cool or faster to room temperature	Air cool or faster to room temperature	Cool in air or liquid to room temperature
Step 3		1325-1400°F 8 hrs	1425-1475°F 6-8 hrs
Step 4		Cool rate of 100°F/hr to 1150-1200°F	Air cool or faster
Step 5		Hold 1150-1200°F 8 hrs	
Step 6		Air cool	

Ultrasonic Inspection (UT)

AMS 5662	AMS 5663	API 6A
None	None	ASTM A388

Macroetch Examination

AMS 5662	AMS 5663	API 6A
None	None	ASTM A604 (all 4 classes)

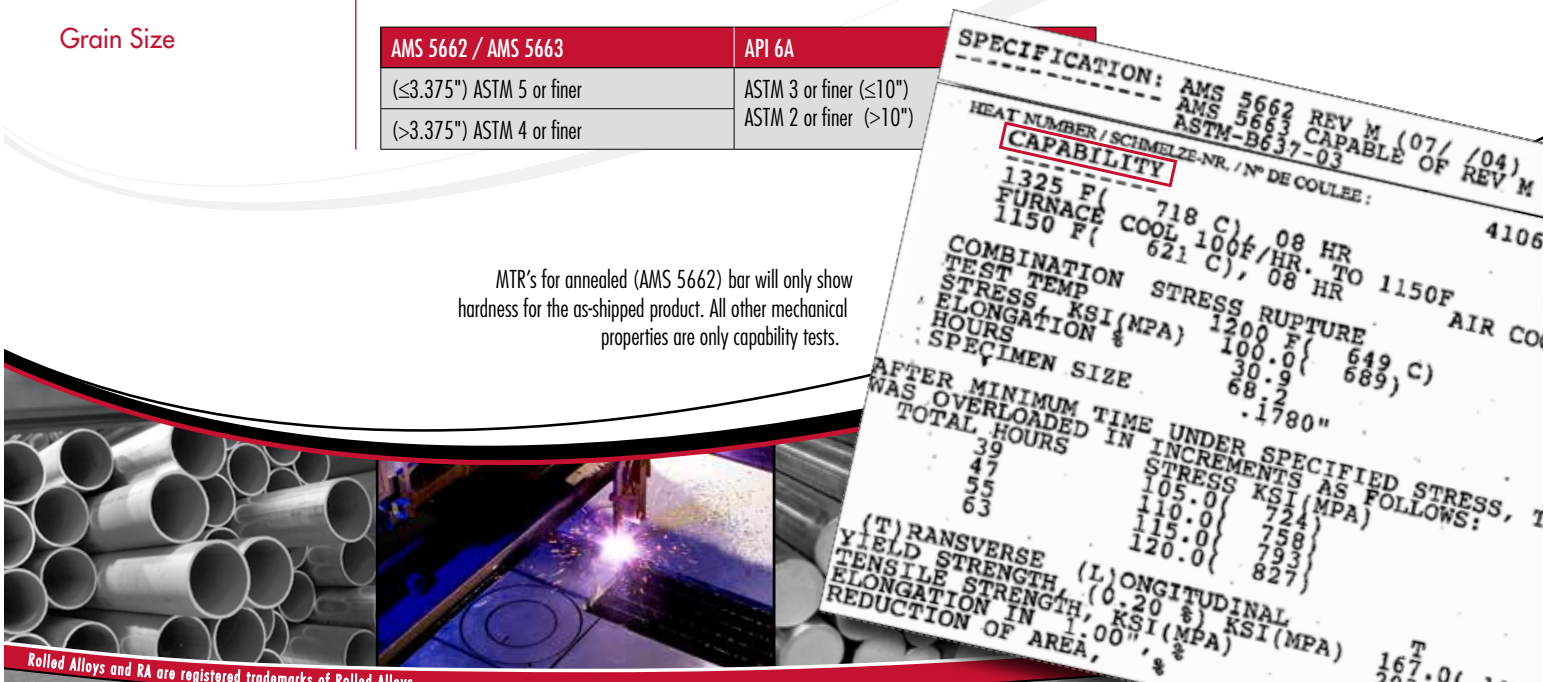
Microetch Examination

AMS 5662	AMS 5663	API 6A
Free of Laves phase	Free of Laves phase	100X and 400X (Free of deleterious phases)

Grain Size

AMS 5662 / AMS 5663	API 6A
(≤3.375") ASTM 5 or finer	ASTM 3 or finer (≤10")
(>3.375") ASTM 4 or finer	ASTM 2 or finer (>10")

MTR's for annealed (AMS 5662) bar will only show hardness for the as-shipped product. All other mechanical properties are only capability tests.



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