

## ASTM A694 F65 – Low Alloy Steel

ASTM A694 Grade F65 is a low alloy steel, usually supplied in the Quench and Tempered condition. It is typified by having moderate strength and impact toughness and is used extensively for the manufacture of flanges and fittings, and applications which require cold temperature service where corrosion resistance is not important.

### Typical Chemical composition

Carbon Equivalent = $C + Mn/6 + (Cr+Mo+V)/5 + Cu+Ni)/15$  Pcm = $C + Si/30 + (Mn+Cu+Cr)/20 + Ni/60 + Mo/15 + V/10 + 5B$	Carbon	0.10 - 0.14%
	Silicon	0.15 - 0.25%
	Manganese	1.25 - 1.40%
	Phosphorous	<0.025%
	Sulphur	<0.003%
	Chromium	0.15%
	Molybdenum	0.15 - 0.20%
	Copper	<0.20%
	Aluminium	0.015 - 0.025%
	Titanium	<0.05%
	Vanadium	0.05 - 0.07%
	Boron	<0.0005%
	Nitrogen	<0.015%
	Carbon Equivalent	<0.43%
	Pcm	<0.24

### Mechanical Property Requirements

Tensile Strength Mpa	Yield (0.2%) MpA	Elongation %	Reduction of Area %	Charpy J -46°C	Hardness HB
>530 (>77KSi)	>450 (65KSi)	>20	>45	>45	152 - 235HB

### Forging

Forging Temperature for this material should be 900 - 1200°C  
Soak times should be kept to a minimum to avoid heavy scaling, but sufficient time should be given to allow centre to achieve furnace temperature.  
After forging pieces should be allowed to cool in still air.

### Heat Treatment

**Normalising** - Heat to 890 - 960°C for a time commensurate with ruling section, Air cool (If Required)

**Hardening** - Heat to 890 - 960°C for a time commensurate with ruling section and quench in Water.

**Tempering** - Re-heat to 540-650°C. Hold for a time commensurate with the ruling section and cool in still in air.

### Machining

ASTM A694 F65 has good to very good machinability, and operations such as sawing, turning, broaching, milling etc can be accomplished satisfactorily using standard machine tool manufacturers recommended speeds and feeds.

### Welding

ASTM A694 F65 is readily weldable by any technique.