

## 440C - UNS S44004

### MATERIAL DESCRIPTION

440C (UNS designation S44004) is a martensitic 400 series stainless steel and has the highest carbon content from the 400 stainless steel series. With the correct heat treatment, 440C can achieve high strength, hardness and wear resistance with moderate corrosion resistance.

### APPLICABLE SPECIFICATIONS

AMS 5630 (AMS 5618 – Available upon specific request)

ASTM A276 / A276M,

ASTM A484 / A484M,

ASTM A314

1.4125, X105CrMo17

### CHEMICAL ANALYSIS RANGE

ELEMENT	WEIGHT %	ELEMENT	WEIGHT %
C	0.95 – 1.20	Cr	16.00 to 18.00
Si	1.00 Max	Mo	0.75 Max
Mn	1.00 Max	P	0.04 Max
S	0.03 Max		

### RESPONSE TO HEAT TREATMENT (ASTM 276)

Type	Heat Treatment Temperature °F [°C], min	Quenchant	Hardness HRC (min)
440C	1875 (1020)	Air	58

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### HEAT TREATMENT PRACTICE

In order to achieve the optimum properties for this material, it is imperative that the correct heat treatment is carried out in accordance with the following recommendations:

#### Normalising

Normalising is not recommended

#### Annealing

Annealing may be required on material in the as forged condition in order to aid machining prior to hardening and tempering. Annealing should be carried out under vacuum conditions to avoid surface decarburisation.

- Process anneal 675°C - 760°C
- Full anneal 845°C - 900°C
- Hardness achievable: 23/25 HRC

**Note: The material supplied by Intoco is in the annealed condition unless otherwise stated.**

#### Hardening

Hardening should be carried out under vacuum conditions to avoid surface decarburisation and to maintain a clean bright product.

- Preheat 760°C - 800°C
- Austenitise 1010°C - 1065°C
- Nitrogen gas quench 2 - 6 bar overpressure

As quenched hardness 60/62 HRC.

The upper end of the temperature range should be used for larger sections or when maximum corrosion resistance and strength are required.

Similarly, the greater quench pressure should be used in order to maximise these properties.

#### Sub Zero treatment

For minimum retained austenite and maximum dimensional stability, parts should be subzero treated between -70° / -80°C.

This should be carried out immediately after hardening once the parts have reached ambient temperature.

#### Tempering

Tempering should be carried out depending on properties required, in all cases double tempering is recommended.

- 165°C for maximum hardness 60 HRC
- 190°C - 230°C for a combination of hardness & toughness 56/58 HRC
- 350°C for maximum toughness 52/54 HRC

#### Nitriding

To further enhance surface characteristics, post heat treatment nitriding may be carried out on this material. Typical depth achieved being 0.008/0.010“.

**Note This information is provided to further the possibilities to our customers. You must satisfy yourselves that this specification meets the criteria for your products.**