LINDQUIST STEELS, INC.
TOOL STEEL SPECIALISTS

TBA42097

TECHNICAL BULLETIN

AISI 420 Stainless Steel *Annealed*

Typical Analysis:	Carbon	Chromium	Mang.	Silicon
	.37	13.00	0.40	0.40

420 Color Code: Blue/Black **420 ESR Color Code: Blue/Pink**

HEAT TREATMENT

FORGING	1900 to 2000°F, stop at 1650°F
NORMALIZING	Do not normalize
ANNEALING	1650°F, furnace-cool; hardness Brinell 223 max
PREHEATING	1300°F, prior to hardening
HARDENING	1750 to 1850°F, quench in oil or air
TEMPERING	400°F for maximum wear; 1100°F for maximum shock

CHARACTERISTICS

MACHINABILITY — 420 in the annealed condition (223 HB max) has a machinability rating of approximately 80 when compared to 1% carbon tool steel which is rated at 100.

INSTRUCTIONS FOR WORKING

HARDENING — This steel must be hardened in order to develop full corrosion-resisting properties. It may be hardened either in air or oil. The steel should be heated slowly to 1750 to 1850°F. Large sections should be preheated thoroughly at approximately 1300°F before transferring to the high-temperature furnace. The parts should be held at the quenching temperature for one half-hour per inch of greatest thickness. If maximum hardness with corrosion resistance is the only requisite, the higher quenching temperature should be employed. Slightly increased ductility can be obtained by using the lower quenching temperature. Quench to a temperature of approximately 150 to 200°F and immediately temper to develop required toughness and mechanical properties. In complex or irregular sections, for less distortion and greater assurance of freedom from cracking, the pieces should be air quenched. If higher hardness is desired and the mold configuration permits, oil quenching may be utilized.

TEMPERING — For most applications, temper at 400°F minimum. Tempering at temperatures up to and including 700°F results in essentially the same hardness and mechanical properties. Avoid tempering above 800°F, since a drop in impact strength and corrosion resistance results. This condition disappears when the tempering temperature is 1100°F or higher, but increases toughness at a sacrifice of hardness.

Specimens 1 in. in diameter were quenched in oil from 1800°F and tempered for two hours at temperatures ranging from 500 to 1300°F. Mechanical properties and hardnesses (results of average values) obtained after each of the tempering treatments are below.

Tempering Temp (°F)	Tensile Strength (psi)	Yield Point (psi)	Elongation in 2 in. (%)	Red. of Area (%)	Brinell Hardness	Equivalent Rockwell C Hardness
400	252,000	221,000	3.0	8.0	514	52
500	250,000	220,000	3.0	8.0	514	52
600	248,000	217,000	3.0	8.0	514	52
700	247,000	213,000	4.0	8.5	514	52
800	246,000	211,000	8.0	13.5	514	52
900	233,000	195,000	9.0	18.0	514	52
1000	212,000	179,000	9.0	23.0	475	50
1100	200,000	170,000	10.0	29.0	388	41
1150	172,000	150,000	11.0	35.0	341	36
1200	160,000	135,000	13.0	40.0	321	34
1250	153,000	125,000	16.0	48.0	311	33
1300	147,000	120,000	18.0	50.5	302	32

These results may be used as a guide in tempering to a desired hardness. However, because 1 in. diameter specimens were used in this test, heavier sections may be several points lower in hardness for a given heat treatment.

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