

WHEELOCK, LOVEJOY & CO., INC.

CAMBRIDGE

CHICAGO

CLEVELAND

NEW YORK

HY-TEN "M" TEMPER

ANALYSIS—.65 Carbon, chrome-nickel alloy steel.

QUALITIES.

"M" TEMPER, on account of the great density of the structure, when oil hardened, is especially well suited for parts subjected to heavy wear. It is recommended in place of carbon tool steel for parts where hardness is required to stand severe wear, but where, at the same time, great toughness is desired in order to resist shock, strain and vibration. This alloy steel shows **MUCH GREATER TOUGHNESS FOR THE SAME DEGREE OF HARDNESS** than plain carbon tool steel. Due to the fact that it may be hardened in oil, the danger of cracking and distortion is much less than for most water hardening steels.

"M" TEMPER may be machined quite readily in the annealed condition and is carried in stock in annealed bars only.

TEMPERATURES SUGGESTED FOR HARDENING THIS GRADE.

For small sections, say under 1" thick, heat to 1425/1475 Deg. F. and quench in oil.

For larger sections, quench in oil at 1475/1550 Deg. F.

Remove parts from the quenching bath whenever possible, before they are entirely cold and draw **AT ONCE** to relieve strains. **IT IS IMPORTANT TO SOAK WELL** at the hardening heat and also at the drawing temperature if best results are to be obtained.

It is desirable, especially if the section is complicated, to normalize parts made from "M" TEMPER before hardening, as this helps eliminate distortion and cracking. This may be done by heating to 1525/1575 Deg. F. and cooling in the air.

On many thin sections, where great toughness combined with considerable hardness is desired, very excellent results may often be secured by heating this steel to approximately 1475/1525 Deg. F. and cooling in a blast of air instead of quenching in oil.

AVERAGE PHYSICAL PROPERTIES HEAT-TREATED ($\frac{3}{4}$ " ROUNDS TESTED).

NOTE—Allow for effect of mass on large sections.

Heat	Quench	Draw	Hardness		Tensile Strength	Elastic Limit	Elong. 2"	Reduction Area
			Scler.	Brin.				
ANNEALED	AT 1500° F.		26/34	179/223	95/115,000	55/70,000	16/25%	40/55%
1475° F.	Oil	300/400° F	75/85	534/602	-----	-----	-----	-----
1475	Oil	400/500	70/80	495/578	-----	-----	-----	-----
1475	Oil	800	65	444	230,000	200,000	10	35
1475	Oil	900	57	375	207,000	180,000	13	40
1475	Oil	1000	49	321	183,000	160,000	15	45
1475	Oil	1100	44	286	158,000	143,000	18	50
1475	Oil	1200	39	255	139,000	125,000	21	55
1475	Oil	1300	34	223	125,000	109,000	23	60

COMMON USES (OIL-HARDENED)

Cams	Hot Dies	Swager Rolls	Screw Expanding Driver Bits
Arbors	Pipe Taps	Shear Blades	Expanding Mandrels
Gauges	Ball Races	Blanking Dies	Pipe Cutter Wheels
Sledges	Rivet Sets	Thrust Washers	Pneumatic Machine Parts
Springs	Drift Pins	Spring Collets	High Speed Grinder Spindles
Ratchets	Feed Shells	Roller Bearings	Heavy Duty Slow Speed Rolls
Bushings	Clutch Pins	Scarifier Teeth	Gears requiring great hardness
Clutches	Cutter Wheels	Drop Forging Dies	Chisel Bushings for Pneumatic Hammers

SUITABLE FOR S.A.E. ITEMS.

(NOTE—Comparable physical properties, although different in chemical analysis).

2350 3250 3450 6150

SIZES CARRIED IN WAREHOUSE STOCKS.

HOT-ROLLED ROUNDS $\frac{1}{4}$ " to 10" Inc.
SOME FLAT SIZES.

FORGING BILLETS 5", 8", 10" SQUARES.

DISCS AND FORGINGS CAN ALSO BE FURNISHED PROMPTLY.

HY-TEN "M" TEMPER (Oil Hardening Steel).

BARs OF THIS GRADE ARE PAINTED "WHITE" ON ENDS.