

# FIRECHROME H-13

## Hot Work Tool Steel

Precision Marshall's FIRECHROME is an excellent hotwork tool steel, featuring a combination of shock resistance, red hardness and abrasion resistance. It is capable of withstanding rapid cooling and resists premature heat checking. Meets ASTM A-681 and W 2344.

## Typical Analysis

Carbon	.40	Chromium	5.00
Manganese	.40	Vanadium	1.00
Phosphorus	.03 max	Molybdenum	1.20
Sulfur	.03 max	Silicon	1.00

## Applications

Typical applications of FIRECHROME includes cores, diecasting dies, die holder blocks, hot forging dies, hot extrusion dies, hot press dies and hot work punches.

## Annealing

Vacuum furnaces or atmosphere-controlled furnaces should be used when available. If unavailable, tools should be wrapped in stainless foil or packed in a neutral protective compound. Heat uniformly to 1550/1650°F and hold at the annealing temperature for one hour per inch of cross section. Cool in the furnace at a rate not exceeding 50°F per hour down to a temperature of 1000°F, after which a faster rate may be allowed.

## Heat Treating

Vacuum furnaces or protective atmosphere furnaces are recommended to prevent decarburization. Preheat thoroughly to 1450/1500°F and heat to 1800/1875°F, hold 30 minutes at temperature. Pressure quench in vacuum or air cool to 150°F, then temper immediately. If complicated designs or large sections are to be heat treated, an interrupted oil quench to 1000°F may be used.

## Tempering

Double temper one hour per inch of section thickness, two hours minimum per temper. Representative hardness levels after tempering are tabulated below.

Air quenched from 1800°F • Tempered 4 to 6 Hours  
(Section Size — 4" x 4")

### Tempering Temperature (°F)

As quenched

### Rockwell Hardness (RC)

1000	48/50
1050	50/52
1100	47/49
1150	46/48
1200	43/45
	32/34



*The Deluxe Company*

Note: Variations in section size, heating rate, soak time, quench rate and tempering will cause deviations from the above values. Precision Marshall should be consulted for specific applications.

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## EDM

Electro-discharge machining is used in the production of various tooling. This process produces recast, rehardened and retempered layers on the EDM surface. It is recommended that FIRECHROME be stress relieved at 50°F below the final tool tempering temperature, after the EDM process, to temper the rehardened layer produced by EDM.

## Condition

FIRECHROME H-13 is provided completely decarb free and stress relieved.

## Additional Products

### Deluxe Plates

MARSHALLOY MQ®/FM  
MARSHALLOY™ STD 4142  
PRESCO O-1  
AIRTRUE A-2  
DIECRAT A-6  
SUPER 7 MQ® S-7  
ARISTOCRAT D-2  
TRM-2 M-2  
RUETOM SPECIAL 420 ESR

### Ground Flat Stock

PRESCO O-1  
AIRTRUE A-2  
SUPER 7 S-7  
NUTEC 42® 4142  
ARISTOCRAT D-2  
MARSHALLCRAT® LC

### Drill Rod

WATERCRAT W-1  
OILCRAT O-1  
AIRTRUE A-2  
SUPER 7 S-7  
ARISTOCRAT D-2  
TRM-2 M-2  
WATERCRAT W-1 Cold-drawn

## *The Deluxe Company's Guarantee of Quality*

Precision Marshall's conformance to specifications is the highest in the industry. Precision Marshall assumes complete liability for any costs directly relating to a deviation from our published specifications. Any such costs, properly documented, will be reimbursed.

## Chemical Compositions (%) (Typical)

Grade	A.I.S.I.	Carbon	Manganese	Silicon	Phosphorus (max)	Sulfur (max)	Chromium	Vandium	Tungsten	Molybdenum
<b>PRESCO</b>	O-1	.90/1.00	1.00/1.15	.20/.35	.020	.020	.40/.60	.08/.15	.45/.60	-
<b>AIR-TRUE</b>	A-2	.90/1.05	.40/.60	.20/.35	.025	.005	4.90/5.30	.15/.20	-	.90/1.10
<b>SUPER-7</b>	S-7	.48/.53	.50/.70	.20/.40	.025	.003	3.10/3.40	.20/.30	-	1.30/1.60
<b>NUTEC 42</b>	4142	.38/.46	.70/1.00	.15/.30	.035	.040	.80/1.15	.030 Max	-	.15/.25
<b>ARISTOCRAT</b>	D-2	1.50/1.60	.20/.40	.20/.60	.030	.020	11.25/12.00	.80/1.00	-	.70/.80
<b>MARSHALLCRAT</b>	C-1018	.15/.25	.60/.90	-	.040	.050	-	-	-	-
<b>PREMAR 440C</b>	440C	1.05	.40	.40	-	-	17.00	-	-	.40
<b>PREMAR 410</b>	410	.13	.05	.40	-	-	12.00	-	-	-
<b>RUETOM SPECIAL 420 SS</b>	420	.46	.40	.40	-	-	13.00	.30	-	-
<b>FIRECHROME</b>	H-13	.40	.40	1.00	.030	.030	5.00	1.00	-	1.20
<b>WATERCRAT</b>	W-1	.95/1.05	.30/.40	.10/.25	.025	.025	.15 Max	.10 Max	.15 Max	.10 Max

\*C-1018 modified for sizes below 5/32". W-1 is cold drawn, not ground.

## Specifications and Physical Properties

Grade	A.I.S.I.	UNS				Hardness		Machinability
		Designation	S.A.E.	A.S.T.M.	Federal	Brinell	Rockwell	
<b>PRESCO</b>	O-1	T31501	J-437	A-681-07	QQT-570 Rev. C.	177-212	Rb88-95	95
<b>AIR-TRUE</b>	A-2	T30102	J-437	A-681-07	QQT-570 Rev. C.	200-235	Rb93-99	65
<b>SUPER-7</b>	S-7	T41907	J-437	A-681-07	QQT-570 Rev. C.	188-223	Rb90-97	95
<b>NUTEC 42</b>	4142	G41420	-	A-322	-	261-321	Rc26-34	85
<b>ARISTOCRAT</b>	D-2	T30402	J-437	A-681-07	QQT-570 Rev. C.	220-255	Rb97-102	50
<b>MARSHALLCRAT</b>	C-1018	-	-	-	635	168 Max	Rb85 Max	78
<b>PREMAR 440C</b>	440C	-	-	-	-	229-269	Rc21-28	45
<b>PREMAR 410</b>	410	-	-	-	-	217	Rb96	54
<b>RUETOM SPECIAL 420 SS</b>	420	-	-	-	-	255	Rc25	45
<b>FIRECHROME</b>	H-13	-	-	A-681-07	-	230	Rb98	75
<b>WATERCRAT</b>	W-1	T72301	J-437	A-686-79	QQT-580 Rev. C.	200	Rb93	100

\*C-1018 modified.

\*Compared to 1.0% Carbon Tool Steel.

## Tolerances

Thickness.....+/- .001"  
 Thickness (Oversize).....+.010/.015"  
 Thickness (Metric).....+.05mm/-.00  
 Thickness 72" Nutec 4142.....+/- .002  
 Width.....+.000/.005  
 Width (Oversize).....+.010/.015"  
 Width (Metric).....+.2mm/-.0  
 Squares (Regular).....+/- .001"  
 Squares (Oversize).....+.010/.015"  
 \*Widths of more than 50mm are Blanchard ground.

Length 18".....+.125/.250"  
 Length 24".....+.1875/.375"  
 Length 24" Stainless.....+.500/-.000  
 Length 36".....+.250/.500"  
 Length 72" Nutec-42.....+.1.000/-.000  
 Length (Metric).....+5mm/+8mm  
 Squareness Edge......003" per inch  
 Squareness End......004" per inch  
 (Regular and Oversize)

Please Order From:

Clark & Osborne, LLP  
 Industrial Distributor  
 6617 Ferguson Avenue  
 Indianapolis, IN 46240

(317) 255-5668 Phone  
 (317) 253-4486 Fax

sales@clarkandosborne.com  
 www.clarkandosborne.com

Cold Drawn W-1		
Size	Standard Tolerance* (section)	Standard Tolerance (length)
1.000" through 0.750" (largest dim.)	±.0015"	+1/8", -.0"
0.749" through 0.250" (largest dim.)	±.001"	+1/8", -.0"
0.249" and smaller	±.0005"	+1/8", -.0"

\*Closer tolerances than standard can be produced by request.