

AISI H13 DATA

AISI H13 is a chromium-molybdenum-vanadium alloyed steel which is characterized by:

- Good resistance to abrasion at both low and high temperatures
- High level of toughness and ductility
- Uniform and high level of machinability and polishability
- Good high-temperature strength and resistance to thermal fatigue
- Excellent through-hardening properties
- Very limited distortion during hardening

Typical analysis %	C	Si	Mn	Cr	Mo	V
	0.39	1.0	0.4	5.3	1.3	0.9
Delivery condition	Soft annealed approx. 185 HB					
Color code	Orange/Violet					

APPLICATIONS

Dies, backers, dieholders, liners, dummy blocks, stems. Severe cold punching, scrap shears, hot shearing, shrink rings (e.g. for hard metal dies), wear resisting parts.

HEAT TREATMENT

SOFT ANNEALING-

Protect the steel and heat through to 1560°F (850°C). Then cool in the furnace at 20°F (10°C) per hour to 1200°F (650°C), then freely in air.

STRESS RELIEVING-

After rough machining the tool should be heated through to 1200°F (650°C), holding time of 2 hours. Cool slowly to 930°F (500°C), then freely in air.

HARDENING-

Preheating temperature: 1100-1560°F (600-850°C)
Austenitizing temperature: 1800-1900°F (980-1030°C) normally 1870°F (1020°C). Protect the part against decarburization and oxidation during hardening.

QUENCHING MEDIA-

Quench as quickly as possible. Cooling must be uniform and rate must be adequate to avoid transformation products; however, risk of excessive distortion and/or quench cracking must be considered.

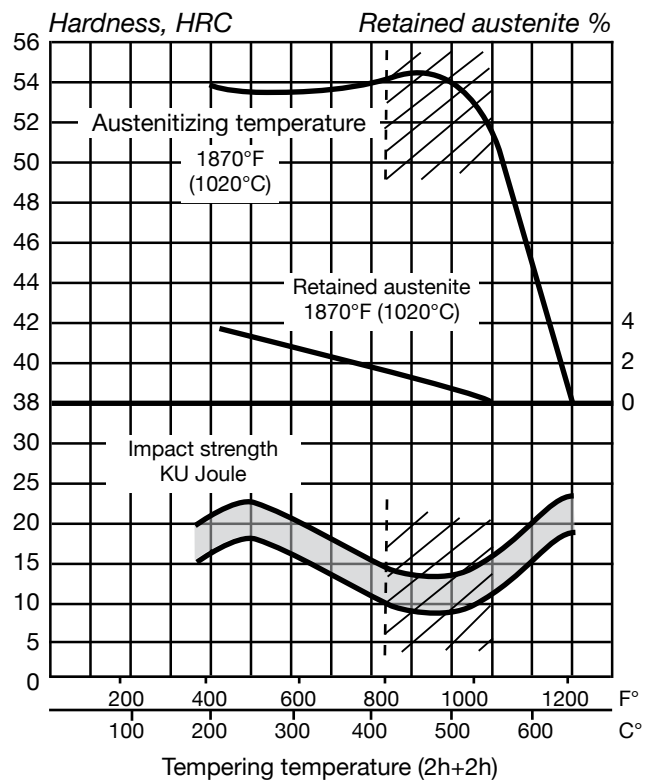
- Circulating air/atmosphere
- Positive gas pressure in vacuum furnace
- Martempering bath or fluidized bed at ~390°F (200°C) or 840-1020°F (450-550°C) for 1-100 minutes, then cool in air
- Warm oil

Note: Temper the tool as soon as its temperature reaches 120-160°F (50-70°C).

TEMPERING-

Choose the tempering temperature according to the hardness required by referencing the tempering graph. Temper twice with intermediate cooling to room temperature. Lowest tempering temperature 360°F (180°C). Holding time at temperature minimum 2 hours. Do not temper in the range 800-1020°F (425-550°C).

TEMPERING GRAPH



Tempering within the range 800-1020°F (425-550°C) is not normally recommended due to the reduction in toughness properties.

MACHINING

MILLING–

• Face and Square Shoulder Milling

Cutting data parameters	Milling with carbide		Milling with HSS
	Rough milling	Fine milling	Fine milling
Cutting speed (V_c) f.p.m. m/min	535-700 160-210	700-930 210-280	115 35
Feed (f_z) inch/tooth mm/tooth	0.008-0.016 0.2-0.4	0.004-0.008 0.1-0.2	-0.004 -0.1
Depth of cut (a_p) inch mm	0.08-0.20 2-5	-0.08 -2	-0.08 -2
Carbide designation US ISO	C5-C6 P20-P40 Coated carbide	C7-C6 P10-P20 Coated carbide or cermet	— —

• End Milling

Cutting data parameters	Type of milling		
	Solid carbide	Carbide indexable insert	High speed steel
Cutting speed (V_c) f.p.m. m/min	235 70	435-600 130-180	115 ¹⁾ 35 ¹⁾
Feed (f_z) inch/tooth mm/tooth	0.001- 0.008 ²⁾ 0.03-0.20 ²⁾	0.003-0.008 ²⁾ 0.08-0.20 ²⁾	0.002-0.014 ²⁾ 0.05-0.35 ²⁾
Carbide designation US ISO	C3, C5 K10, P40	C6-C5 P20-P30	— —

1) For coated HSS end mill $v_c \sim 150$ f.p.m./min. (45 m/min.)

2) Depending on radial depth of cut and cutter diameter.

DRILLING–

• High Speed Steel Twist Drill

Drill diameter		Cutting speed (V_c)		Feed (f)	
inch	mm	f.p.m.	m/min	i.p.r.	mm/r
-3/16	-5	56*	17*	0.003-0.008	0.08-0.20
3/16-3/8	5-10	56*	17*	0.008-0.012	0.20-0.30
3/8-5/8	10-15	56*	17*	0.012-0.014	0.30-0.35
5/8-3/4	15-20	56*	17*	0.014-0.016	0.35-0.40

1) For coated HSS drill $v_c \sim 80$ f.p.m./min. (24 m/min.)

• Carbide Drill

Cutting data parameters	Type of drill		
	Indexable insert	Solid carbide	Brazed carbide ¹⁾
Cutting speed (V_c) f.p.m. m/min	600-635 180-220	265 80	200 60
Feed (f) i.p.r. mm/r	0.001-0.004 ²⁾ 0.03-0.10 ²⁾	0.004-0.01 ²⁾ 0.10-0.25 ²⁾	0.006-0.01 ²⁾ 0.15-0.25 ²⁾

1) Drill with internal cooling channels and brazed carbide tip.

2) Depending on drill diameter.

ELECTRICAL DISCHARGE MACHINING EDM–

If EDM is performed in the hardened and tempered condition, the recast layer should be removed via stoning and/or polishing. If this is not possible, or for an additional safety factor, the tool should be given a subsequent stress temper at 50°F (28°C) below the lowest tempering temperature used during the heat treatment process. Equalize the temperature of the tool from surface to core and soak at the appropriate stress tempering temperature for 2 hours.

GRINDING–

General grinding wheel recommendations for AISI H13 are given below.

• Wheel Selection

Type of grinding	Wheel recommendation	
	Soft Annealed Cond.	Hardened Cond.
Face grinding: straight wheel segments	A46HV A24GV	A46GV A36GV
Cylindrical grind. Internal grinding Profile grinding	A46LV A46JV A100LV	A60JV A60IV A120JV

WELDING–

Good results when welding tool steel can be achieved if proper precautions are taken regarding elevated temperature, joint preparation, choice of consumables and welding procedure.

FURTHER INFORMATION

CANADIAN LOCATIONS–

Kitchener, Ontario +1 (519) 748-5317
Rexdale, Ontario +1 (905) 799-7474

U.S. LOCATIONS–

Auburn, Massachusetts +1 (508) 757-3500
Blaine, Minnesota +1 (763) 585-9020
Cleveland, Ohio +1 (216) 362-8440
Meadville, Pennsylvania +1 (814) 337-6164
Chattanooga, Tennessee +1 (423) 790-7385