H21 – Technical Data

General Descriptions:

H21 is a hot work tool steel with a good combination of hot hardness, temper resistance and moderate toughness.
H21 is used as an upgrade to standard H13 for high heat applications where toughness is not as critical.

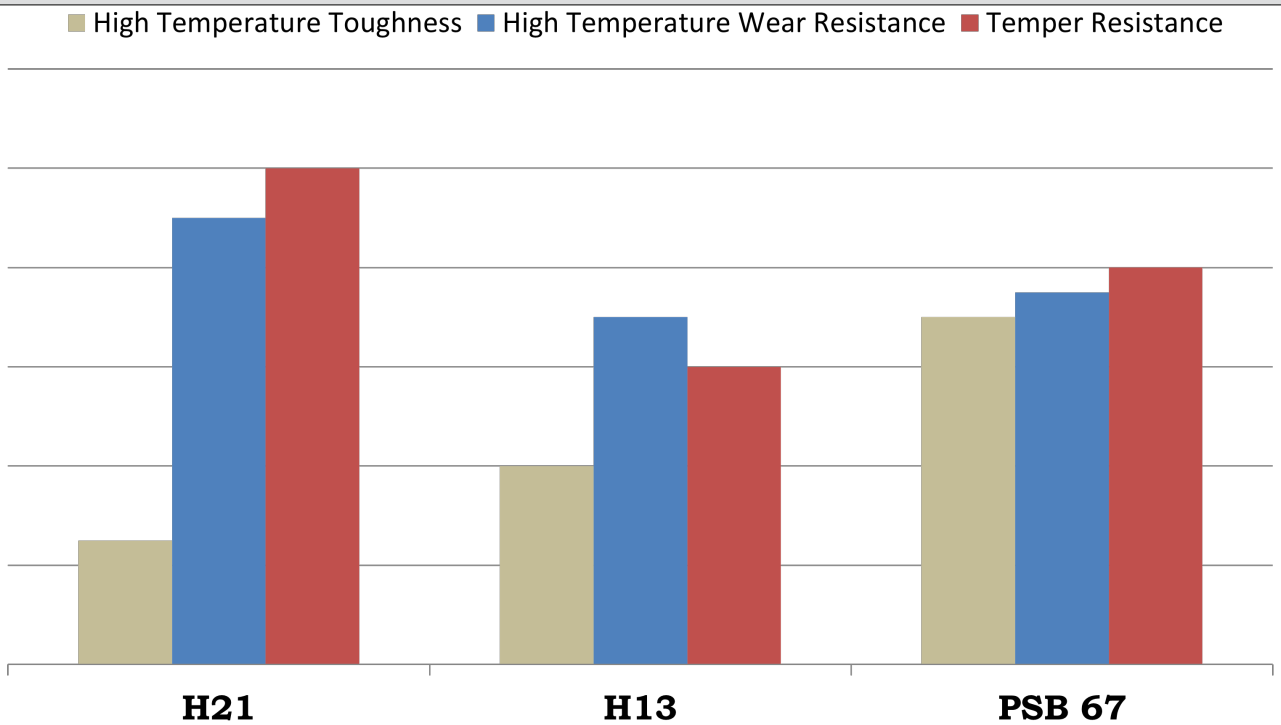
Examples of applications:

Dummy blocks, forging dies, hot upset dies, permanent molds, extrusion tooling, hot punches, hot trim dies.

Chemical Composition

Carbon	Manganese	Silicon	Chromium	Vanadium	Tungsten
0.26-0.36%	0.15-0.40%	0.15-0.50%	3.00-3.75%	0.30-0.60%	8.50-10.00%

Comparison Chart



Typical Heat Treat Response

Tempering Temp °F	Hardening Temp °F & HRC 2050	2150	2250	Toughness, Charpy C-Notch Ft.-lbs
1000	45	47	47	
1050	49	51	51	
1100	50	52	54	7
1150	45	47	49	10
1200	37	40	42	12
1250	30	32	34	15

Surface Treatment

Because of it high tempering temperature (>1000 °F), H21 may be treated by most surface treating processes including conventional and ion nitriding, titanium nitriding, and other coatings or treatments. Nitrided surface hardness will be about 60-62 HRC.

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Heat Treatment

Annealing

Heat to 1600-1650 °F, hold 2 hours at temperature. Cool slowly (50 °F/hour max) to 1200 °F, then air cool to room temperature.
Typical hardness is 207-241 BHN.

Stress Relieving

Annealed material: Heat uniformly to 1200-1250 °F, hold two hours at temperature, cool in still air to room temperature.
Hardened material: Heat uniformly to 25-50 °F below tempering temperature, hold two hours, cool in still air to room temperature.

Hardening

Preheat to 1450-1500 °F, equalize.

High Heat (Austenitizing)

2000-2250 °F hold 2 to 10 minutes at temperature.

Quench

Air or vacuum quench to 125-150°F.

Tempering

1000-1250 °F, hold one hour per inch of thickness (2 hours minimum).
Air cool to room temperature between tempers.
Temper twice.

Physical Properties

Modules of Elasticity	30 x 10^6 psi (207 GPa)	**Density**	0.298 lb/in^3
Annealed Hardness	207-241 BHN	**Machinability**	65% of O1