

HSS Cutting Tools Properties

GENERAL PURPOSE HIGH SPEED STEELS

Type CHEMICAL COMPOSITION

	Carbon	Tungsten	Molybdenum	Chromium	Vanadium	Hardness	Rockwell C	Term
M1	0.80%	1.5%	8.00%	4.00%	1.00%	63-65		"HSS"
M2	0.85%	6.0%	5.00%	4.00%	1.90%	63-65		"HSS"
M7	1.00%	1.75%	8.75%	4.00%	2.00%	63-65		"HSS"
M50	0.85%	0.10%	4.25%	4.00%	1.00%	63-65		"HSS"

COBALT HIGH SPEED STEELS

Type CHEMICAL COMPOSITION

	Carbon	Tungsten	Molybdenum	Chromium	Vanadium	Cobalt	Hardness	Rockwell C	Term
M35	0.80%	6.00%	5.00%	4.00%	2.00%	5.00%	65-67		5% COBALT
M42	1.10%	1.50%	9.50%	3.75%	1.15%	8.00%	65-67		8% COBALT

TERMS

• M1 "HSS" -

is used for making **drills** that will be used in a wide variety of applications. M1 has some of the increased red-hardness properties of M2, is less susceptible to shock, and has "flex" capabilities generally favored for general purpose work.

• M2 "HSS" -

is the standard material used for **all ICS HSS cutting tools**. M2 has good red-hardness and retains its cutting edge longer than other general purpose high speed steels, not as shock resistant or as flexible as other HSS grades with less tungsten. Generally favored for high production machine work.

• M7 "HSS" -

is used for making heavier **construction drills** that can be used for portable drilling of hard sheet metal alloys. Generally favored for work in Aircraft plants where flexibility and extended drill life are equally important.

• **D2 Tool Steel-**

D2 Steel

Carbon	1.50%
Silicon	0.30%
Molybdenum	0.80%
Manganese	0.50%
Chromium	12.00%
Vanadium	0.90%
Iron	Balance

Hardness D-2 is a tool steel --that is supplied in the annealed or soft condition. This grade must be hardened after machining. After heat treating, the tool steel will attain a hardness of about **RC 62-64**.

Description-

D2 tool steel is an air hardening, high-carbon, high-chromium tool steel possessing extremely high wear resisting properties. It is very deep hardening and is practically free from size change after proper treatment. This tool steel's high chromium content gives it mild corrosion resisting properties in the hardened condition. D2 tool steel is available in the form of DeCarb-Free (DCF) bars. DCF bars have been cold finished in the mill prior to shipment, eliminating the need for bark removal by the tool and die fabricator.

• **Oil Hardening Non Shrinking Die Steel (OHNS)-**

Blanking and stamping dies, Rotary shear blades, Thread cutting tools, Measuring tools, , Wood working tools, Broaches, Chasers.

Ideal type oil-hardened steel which is economical and dependable for gauging, cutting and blanking tools as well as can be relied for hardness and good cutting performance.

Steel Type	Quality	AISI	TYPICAL ANALYSIS IN %									
			C	Si	Mn	Cr	W	V	Co	Mo	Ni	
OHNS Die Steel	OHNS	01	0.95	...	1.00	0.50	0.5	0.10	
	"	02	0.90	0.20	1.90	0.30	...	0.10	
	"	EO300	1.00	0.40	1.00	1.00	...	0.10	...	0.10	...	

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	"	02	0.90	0.20	1.90	0.30	...	0.10		
	"	EO300	1.00	0.40	1.00	1.00	...	0.10	...	0.10	...		

- **Case Hardening Steel**

SAE 8620 Gears, Pinions, Lay shafts, Camshafts, Mining haulage, Cage suspension, Lifting gears. Generally used for parts where direct hardening is preferred. It can also be used as an alternative to EN-35 and EN-36A Steels.

Steel Type	Quality	AISI	TYPICAL ANALYSIS IN %					
			C	Si	Mn	Ni	Cr	Mo
Case Hardening Steel	SAE	8620	0.20	0.30	0.80	0.60	0.50	0.20

Case Hardening Steel(20MnCr5)

Application: For Carburizing and subsequently hardening

Metallurgical Properties:

- Grain Size: Fine grain size - ASTM No. 6-8
- Decarburization & Surface Imperfections: 1 % of size max.
- Microstructure: Pearlite+Ferrite

Mechanical Properties :

Coils, Hot rolled :

Hardness: - 240 BHN max. (56- 62 HRc.)

- **Chemical Composition:- 20MnCr5**

C	Mn	P	S	Si	Cr	Al
0.17 -0.22%	1.10 -1.40%	0.035% max.	0.035% max	0.15 -0.35%	1.00 -1.30%	0.020% min

GRADES: MOLYBDENUM GRADES: M2, M3/2, M4, M35, And M42
: TUNGESTEN GRADES: T1, T4, T5, T15, T42

Characteristic properties HSS GRADES -

- ❖ High wear resistance
- ❖ High retention of hardness and red hardness
- ❖ Excellent toughness

SPEED STEEL CHEMICAL COMPOSITION-

Chemical Composition											
	C	Si	Mn	P	S	Cr	Mo	V	W	Co	Ni
AISI M-2	0.78-0.88	0.20-0.40	0.20-0.40	0.35	0.35	3.75-4.50	4.50-5.50	1.60-2.20	5.50-6.75		
AISI M-35	0.85-0.95	0.00-0.40	0.00-0.40	0.35	0.35	3.75-4.50	4.75-5.25	1.75-2.15	6.00-6.75	4.60-5.20	0.00-0.40
AISI M-42	1.05-1.15	0.15-0.65	0.15-0.40	0.35	0.35	3.50-4.25	9.00-10.00	0.95-1.35	1.15-1.85	7.75-8.75	
AISI T-1	0.65-0.75	0.20-0.40	0.20-0.40	.	.	3.75-4.50	.	0.90-1.30	17.25-18.75		
AISI T-4	0.70-0.80	0.20-0.40	0.20-0.40	.	.	3.75-4.50	0.70-1.00	0.80-1.20	17.25-18.75	4.25-5.75	
AISI T-5	0.75-0.85	0.20-0.40	0.20-0.40	.	.	3.75-4.50	0.70-1.00	1.80-2.40	17.50-19.00	7.00-9.00	
AISI T-42	1.25-1.40	0.00-0.40	0.00-0.40	0.35	0.35	3.75-4.50	2.75-3.50	2.75-3.25	8.50-9.50	9.00-10.00	0.00-0.40