



MATERIAL

HEAT TREAT / NITRATION

MATERIAL CHARACTERISTICS

Alloy		Chemical Composition										Strength	Toughness	Tempering/Aging		Thermal Conductivity [W/mK]	Cost Factor	Application
														Temperature				
														[°C]				
Low Alloy Steel	4340	Bal.	0.4	0.25	0.7	0.8	1.9	0.3				••	••••••	Tempered	540 (38 HRC)	42	75	Container body / Subliner (34-38 HRC)
		600 (34 HRC)	Plunger tip (32-36 HRC)															
		630 (32 HRC)																
Hot Work Tool Steel	L6 (1.2714)	Bal.	0.55	0.3	0.9	1.1	1.7	0.5	0.1			••'	•••	Tempered	530 (42 HRC)	35	75	Container body (38-42 HRC)
														570 (38 HRC)				
	H-11 (1.2343)	Bal.	0.4	1	0.4	5		1.3	0.4			•••	••'	Tempered	630 (42 HRC)	26	100	Container subliner (38-42 HRC)
														650 (38 HRC)				
	H-13 (1.2344)	Bal.	0.4	1	0.4	5		1.5	1			•••'	••'	Tempered	620 (48 HRC)	24	100	Container liner (46-48 HRC)
															630 (46 HRC)			Container subliner (38-42 HRC)
															650 (42 HRC)			Shot sleeve / Insert (46-48 HRC)
															660 (38 HRC)			Plunger rod
	DieVar	Bal.	0.35	0.2	0.5	5		2.3	0.6			•••'	•••	Tempered	595 (48 HRC)	30	200	Shot sleeve (46-48 HRC)
															605 (46 HRC)			Plunger tip (38-42 HRC)
															620 (42 HRC)			
															640 (38 HRC)			
	E40K	Bal.	0.35	0.3	0.3	5		1.8	0.8			••••	•••'	Tempered	600 (48 HRC)	30	200	Container liner (46-48 HRC)
															620 (46 HRC)			
	1.2367	Bal.	0.37	0.3	0.4	5		3	0.6			••••	•••	Tempered	630 (48 HRC)	30	200	Shot sleeve insert (46-48 HRC)
															640 (46 HRC)			Bore welding
Tuff Temper	Bal.	0.36	0.3	0.4	5		3.8	0.8			•••••	••	Tempered	640 (48 HRC)	30	200	Shot sleeve insert (46-48 HRC)	
														650 (46 HRC)				
Q10	Bal.	0.36	0.25	0.6	5		1.9	0.55			••••	•••	Tempered	610 (48 HRC)	30	200	Container liner (46-48 HRC)	
														620 (46 HRC)				
DAC3	Bal.	0.4	0.3	0.3	5		1.6	0.7			••••	•••	Tempered	600 (48 HRC)	30	200	Container liner (46-48 HRC)	
														620 (46 HRC)				
Super Alloys	IN718	~20				19	52	3		5		•••	••••	Aged	720 (44 HRC)	13	1500	Copper extrusion liner (40-44 HRC)
	A286	~50				15	25	1.3			2.3	••	•••••	Aged	720 (34 HRC)	15	750	Copper extrusion liner
Stainless Steel	M303	Bal.	0.27	0.3	0.65	14.5	0.9	1				••	••••••••	Tempered	540 (40 HRC)	23	300	Plunger holder
														570 (35 HRC)				
Copper Alloys	A-25	1.5 Be, 0.15 Co, 0.15 Ni										•'	•••	Aged	320 (280 HB)	120	2400	Plunger tip
	A-45	2.5 Ni, 0.65 Si										'	••••	Aged	480 (190 HB)	220	1300	Plunger tip body
	A-52	0.55 Be, 1 Co, 1 Ni										•	••••	Aged	480 (260 HB)	240	1800	Plunger tip



Our in-house metallurgist has assembled this chart, which outlines many of the materials used at Castool and by the industries we serve.

We have outlined the chemistry, strength, toughness, critical temperatures, thermal conductivity and cost factor to help make your decision easier.

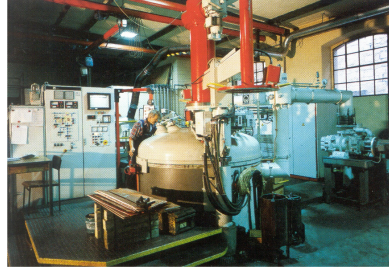
Castool tends to single source most materials whenever possible. Swiss Steel is our main supplier for hot work tool steels, forged products and stainless steel. These include H-13, Tuff-Temper, Con-Duct, 1.2367, 1.2343 etc.

Swiss Steel Group includes Ascometal, Finkl Steel, Steeltec, Deutsche Edelstahlwerke, Ugitech and Swiss Steel.

Schmelzmetall is the exclusive supplier for all Castool's Beryllium-Copper and copper products. All are vacuum forged and heat treated to provide the longest useful life for the industries we serve.

Castool uses these sources in Canada, Thailand, Morocco and Mexico.

STEEL AND COPPER



SCHMELZMETALL

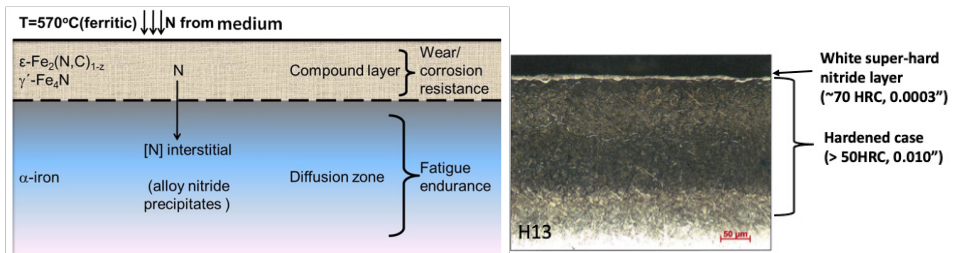


HEAT TREATMENT & NITRATION

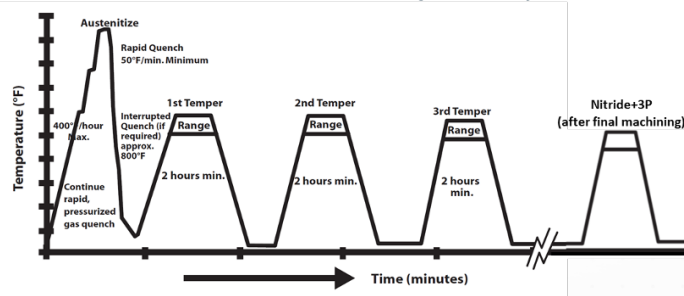
Heat treatment, nitration and other post processes are also very important. Castool has evolved the recipes over the last 50 years to provide long life, balancing wear and ductility. These recipes are the same in Canada, Thailand, Morocco and Mexico.

We vacuum harden and quench all hot work tool steels to give the best possible microstructures. The chemistry and microstructure are examined and saved by our in-house laboratory.

Many of our products also receive post heat treatment process, such as nitration and 3P, which add to wear resistance and extend time to failure.



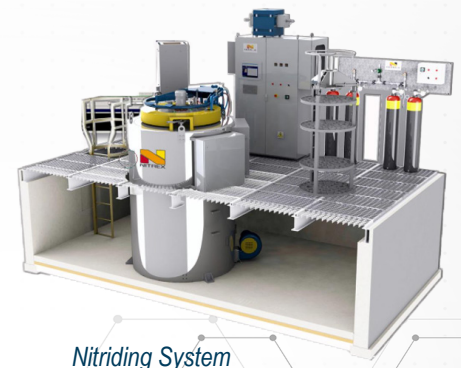
Nitriding and 3P layers



- Vacuum austenizing
- High pressure quench
- Triple temper
- Nitride + 3P



Vacuum Furnace



Nitriding System



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