



EST Tool Steel Pvt Ltd.

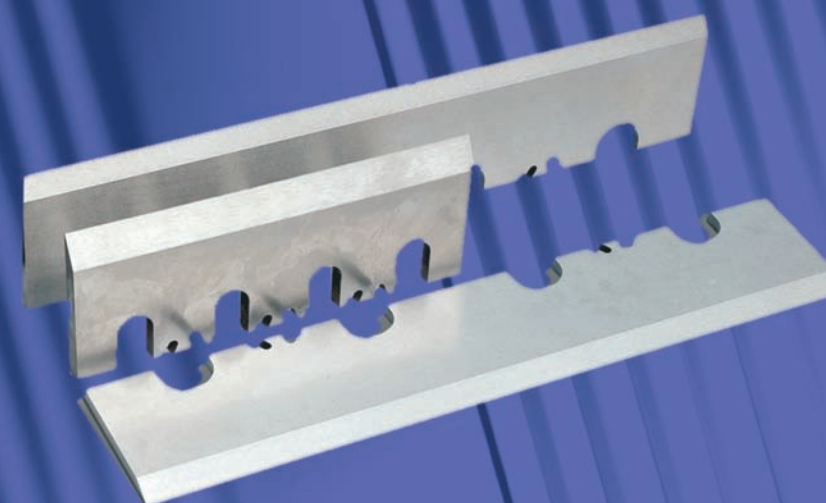
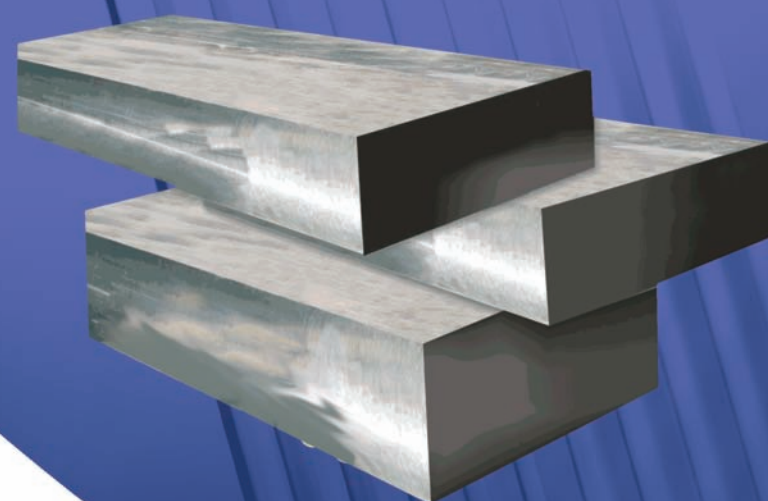
(EST-Magicut Venture)

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EST
一胜特
Tool & Die Materials



www.esttoolsteel.com

Introduction

Zhejiang East Tool & Die Co. Ltd, “**East Tool**” is one of the most prominent Tool & Die Steel manufacturer of special steel in China. **EST Tool Steel Pvt. Ltd.** is an alliance of “**East Tool**” & “**Magicut**” a prominent tool manufacturer of India. EST is managed under their great auspices. Their impressive reputation is only suggestive of the service level EST is committed to achieve but nonetheless inspired to cross. We operate in a highly client centric environment where each opportunity of service is perceived as an opportunity to achieve benchmarks of excellence.

East Tool has exports to 45 countries making it the one of the largest exporter of special steel (particularly in heavy die blocks, milled and ground bars, flat bars and sheets of Tool & Die Steel). It has established offices in America and Germany, strategically located points of sale and Warehouses in India, Turkey, South Korea, Australia and Brazil.

Adhering to the service philosophy of "creating value for the customers" products stamped with EST are significant of the standards of research, development and high quality the company has sworn its allegiance to.

East Tool has established a successful long-term collaborative relationship with scientific research institutes and industrial associations like China Iron & Steel Research Institute, Shanghai JiaoTong University and Zhejiang University. It will be in the fitness of things to state that East Tool has successfully and independently researched and developed high-tech product bagging 10 exclusive patents. East Tool is a permanent member of the China Special Steel Enterprises Association as also being part of the Zhejiang Province hi-tech enterprise earning it the reputation of being amongst the most famous tool & die material companies in China.

East Tool's major manufacturing bases are located in Zhejiang (Jinyun) and Chongqing (Changshou & Zhongxian) with an annual production capacity of 100,000 tons.

The manufacturing bases have the advantage of advanced technology and modern equipments like 25-ton electric arc furnaces (EAF), 25-ton refining furnaces (LF), 25-ton vacuum furnaces (VD/VOD), electro slag remelting (ESR), hydraulic press machine, precision forging machine (GFM) , a varied range of electro-hydraulic hammers and rolling mill machines such as 250, 350, 550 and 850 rolling mills, wire drawing machine, straightening machines, peeling machines, laser cutting machines, lathe, milling machines and various other large-scale machining & processing equipments.

Testing and inspection equipments employed at the bases include direct reading spectrometer , hand-held spectrometer, metallographic microscope, impact testing machine, tensile testing machine, and ultrasonic flaw detector.

State of the art services at the manufacturing bases include pre-hardening, vacuum heat treatment, ion coating, surface nitriding.

East Tool's is mainly involved in the production of high speed steel, cold work steel, plastic mould steel, stainless steel and alloy steel and supply square, round and flat bars, steel sheet, steel strip, heavy die block, tools blanks and other shapes. Additionally, it tailors products to suit customers having special requirements.

Clients, erstwhile and existing, bear testimony to our pledge to dependable and consistent quality services.

EST pursues sustainable development through innovation and creativity to realize the goal of becoming the dominating supplier of Tool & Die materials.

“
Our Business is about Quality, YES. But it's also about Service and Customer Relationships.
”



OUR STRENGTHS

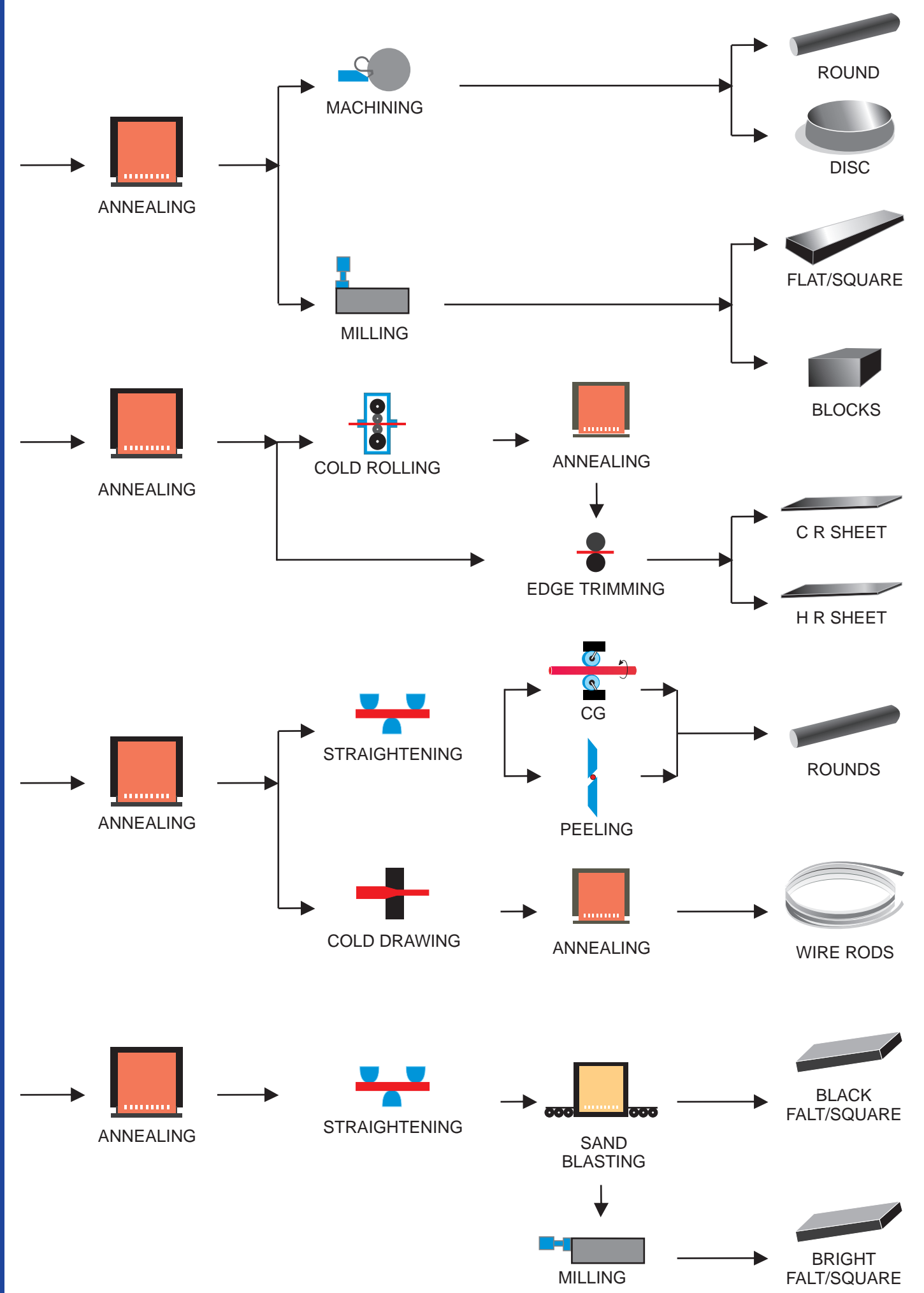
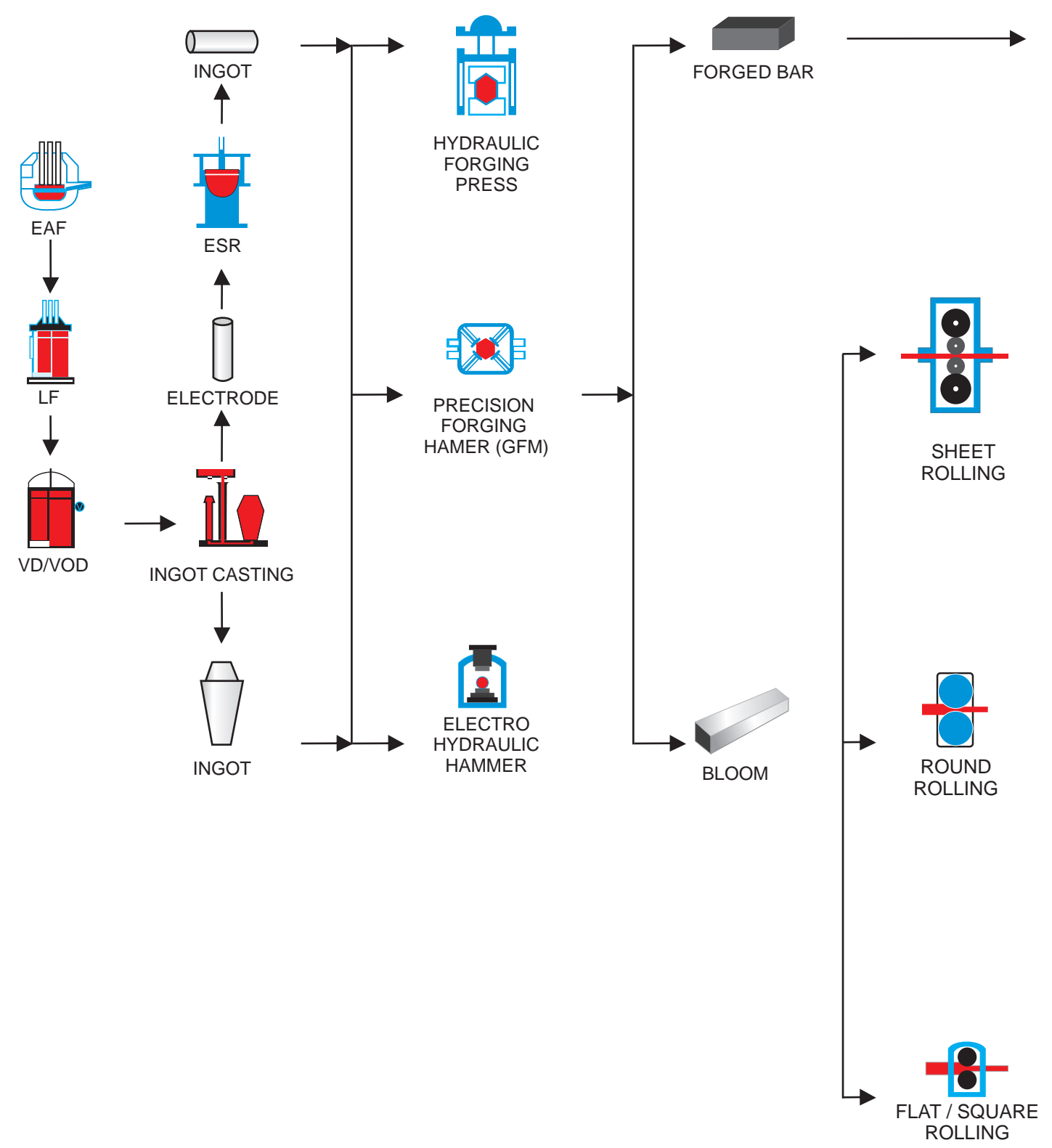
- Ability to stock wide range of grades and sizes.
- Ability to turnaround stock in short time.
- Ability to customize stock as per demand.
- Ability to produce special grades / sizes as per demand.
- Ability to schedule production as per demand.
- Real time information of productions.
- Mills stock backup.

ADVANTAGE TO CUSTOMERS

- Direct supply from producer to user.
- Competitive price.
- Stability in price.
- Assured and timely supply
- Quality Assurance
- Quality consistency
- Adaptability to processing / use of material.
- Technical support from Mill.

“
Our aim is not to get ahead of others, but to get ahead of ourselves, to break our own records, to overcome our failures by our success, to outstrip our yesterday by our today.
”

Production Flow



HIGH SPEED steels have been named to show their ability to resist softening at elevated temperatures therefore maintaining a sharp cutting edge when cuts are heavy and speeds are high. They are the most highly alloyed of all of the tool steel types. They normally contain comparatively large amounts of tungsten or molybdenum, chromium, Cobalt and vanadium, along with carbon.

Two groups are available:

Molybdenum Types and Tungsten Types

THE MOLYBDENUM high speed tool steels contain 3.50 to 9.50% molybdenum. They characteristically contain 4.00% tungsten, and 1.00 to 5.00% vanadium. Carbon is fairly high—0.80 to 1.50%. Applications cover a wide range of cutting tools. Examples include these: twist drills, reamers, milling cutters, lathe and planer tools, cutoff knives, and insert cutter blades.

THE TUNGSTEN high speed tool steels have 12.00 to 20.00% tungsten. They also have substantial amounts of chromium and vanadium, and some have considerable amounts of cobalt. Carbon is high—0.70 to 1.50%, depending on the grade. Tooling uses include bits, drills, reamers, taps, broaches, milling cutters, hobs, punches, and dies.

Characterised by the following properties, among other things:

- Very good wear resistance
- High pressure resistance
- Great toughness

STANDARD STOCK GRADES & COMPARABLE STANDARDS

EST	GB (CHINA)	DIN	ASTM	JIS	OTHER
DF6	W6Mo5Cr4V2	1.3343	M2	SKH51	
DF6Co					
DF6M					
DF18	W18Cr4V	1.3355	T1	SHK2	
DF35	W6Mo5Cr4V2Co5	1.3243	M35	SKH55	
DF42	W2Mo9Cr4VCo8	1.3247	M42	SKH59	

STANDARD STOCK SIZES

PRODUCT	DELIVERY CONDITION AND AVAILABLE DIMENSIONS			
ROUND	COLD DRAWN	CENTERLESS GROUND	PEELED	TURNED
DIAMETER IN MM	2.50 - 12.0	8.5 - 30.0	16 - 75	75 - 205
SQUARE	HOT ROLLED BLACK		FORGED ALL SIDE MILLED	
SIZE IN MM	7.5 X 7.5 - 50.0 X 50.0		55 X 55 - 180 X 180	
FLATS	HOT ROLLED BLACK	HOT ROLLED, 2 EDGE MILLED	FORGED ALL SIDE MILLED	
THICK x WIDTH IN MM	6 - 30 X 20 - 130	13 - 80 X 150 - 410	90 - 130 X 100 - 410	
SHEET	COLD ROLLED		HOT ROLLED	
THICK x WIDTH xLENGTH IN MM	1.0 - 2.5 X 600 - 800 X 1500 - 2000		2.60 - 10 X 600 - 800 X 1500 - 2000	

OTHER GRADES AND SIZES ON REQUEST



EST	DIN	ASTM	CHEMICAL COMPOSITION								PROPERTY	APPLICATION
			C	Si	Mn	Cr	Mo	V	W	Co		
DF6	1.3343	M2	0.86 – 0.94	0.20 - 0.45	0.20 - 0.40	3.75 – 4.50	4.50 – 5.50	1.70 – 2.10	5.50 – 6.70	-	Excellent combination of wear resistance, toughness and hot hardness. Superior compressive strength for deformation resistance, reducing susceptibility to denting and edge rollover.	For all kind of wear resisting tools that bear vibration, Like Lathe tools, Planer tools, Drills, Taps, Reamers, Broaches, Milling cutters, Form cutters, Thread chasers, End mills, Gear cutters
DF35	1.3243	M35	0.87 – 0.95	0.20 - 0.45	0.20 - 0.45	3.75 – 4.50	4.50 – 5.50	1.70 – 2.10	5.50 – 6.70	4.50 – 5.00	Cobalt added M2 high speed steel in which the cobalt addition provides hot hardness. The improved hot hardness makes the steel suitable for machining high-strength and prehardened steels, high-hardness alloys	Twist drills, taps, milling cutters, reamers, broaches, saws, knives, and hobs.
DF42	1.3247	M42	1.05 – 1.15	0.15 - 0.65	0.15 – 0.40	3.50 - 4.25	9.0 - 10.0	0.95 - 1.35	1.15 - 1.85	7.75 - 8.75	A premium cobalt high speed steel with very high hardness and superior hot hardness, excellent wear resistance by virtue of high heat-treated hardness, stay sharp and hard in heavy-duty and high-production cutting applications	For complicated and accurate cutting tools for hard and high speed cutting, twist drills, taps, milling cutters, reamers, broaches, saws, knives, and thread rolling dies.
DF18	1.3355	T1	0.65– 0.75	0.20 - 0.45	0.20 - 0.45	3.75 – 4.50	-	0.90 – 1.30	17.25 – 18.75	-	Tungsten based HSS, Good combination of toughness and red hardness. High resistance to wear and softening. Relatively easy to harden.	Twist drills, screw cutting tools, milling cutters, file cutter's chisels, lathe tools, planer tools, shaving tools.

EST	DIN	ASTM	Density (g/cm3)	HEAT TREATMENT													
				Soft Annealing °C	Annealed Hardness HB	Warm up °C	Preheating Step 1 °C	Preheating Step 2 °C	Hardening From °C	Quenching In	Hardened Hardness HRC	Tempering					
												300 °C	400 °C	500 °C	550 °C	600 °C	650 °C
												HRC	HRC	HRC	HRC	HRC	HRC
DF6	1.3343	M2	8.1	790 - 840	Max. 255	450 – 600	850	1050	1210 - 1230	OIL / AIR Hot Bath 550 °C	63 - 66	61.5	62	65	65	63	57
											540 – 560 x 1 h x 3 Times 63 - 66						
DF35	1.3243	M35	8.1	790 - 840	Max. 265	450 – 600	850	1050	1200 - 1220	OIL / AIR Hot Bath 550 °C	64-66	62	62	64	65	63	56
												540 – 560 x 1 h x 3 Times 64 - 66					
DF42	1.3247	M42	8	790 - 840	Max. 265	450 – 600	850	1050	1170 - 1190	OIL / AIR Hot Bath 550 °C	66-68	60.5	61.5	66	68	64	50
												540 – 560 x 1 h x 3 Times 66 – 68					
DF18	1.3355	T1	8.7	810 - 860	Max. 269	450 – 600	850	1050	1270 - 1290	OIL / AIR Hot Bath 550 °C	63-65	63	62	65	65	63	58
												540 – 560 x 1 h x 3 Times 63 – 65					

Cobaltic And Abrasion Resistant High Speed Steel

Chemical Composition	C	Si	Mn	Cr	W	Mo	V	Co
(Typical analysis %)	0.90	0.38	0.35	4.10	6.00	4.80	1.80	1.40

- Property:**
- Basing on DF6 (M2), EAST TOOL introduced cobaltic high speed steel DF6Co, which has stronger wearlessness, better red hardness, and keep high tenacity.
 - Moderate saturation degree of carbon (keep between M2 and high carbon M2C), improve the workable hardness of DF6Co, and keep the high tenacity of M2 steel.
 - After adding in a right amount of cobalt, DF6Co gets better red hardness. Adding cobalt contributes to stability of carbide and maintenance of fine grain in work, improves the tempering stability of steel and keeps in state of strong wearlessness.

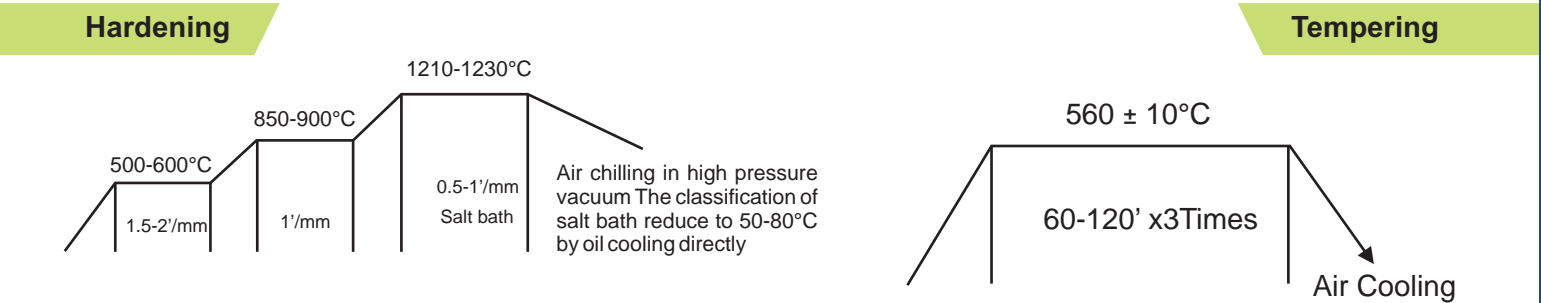
Application:

End mill, Slitting saws, extra hard lathe bit, machine tap, circular saw blades, etc.
When processing stainless steel and titanium alloy, DF6Co has better efficiency than M2

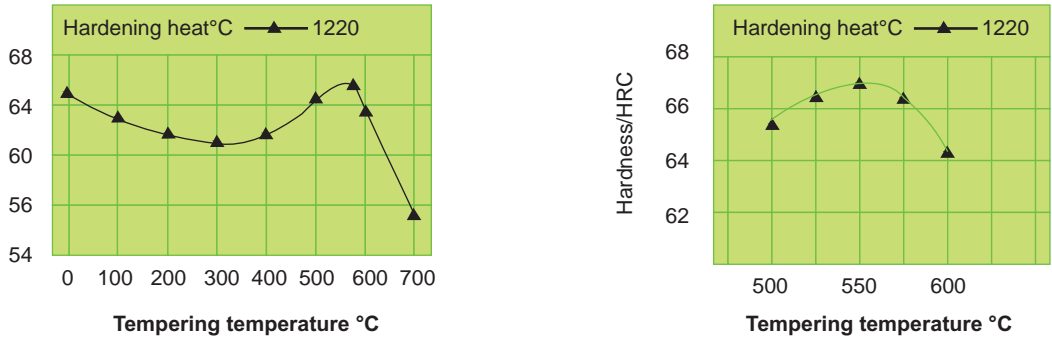
Cutting tool	End mill, side and face cutter	Slitting saws blade	Extra hard lathe bit	Screw Tap	H.S.S. Circular Saw Blade
Workable hardness	65-66	64-66	65-67	64-66	64-66

Steel density 8.16g/cm3

General Method of heat treatment



The curved shape of quenching and tempering hardness



Azotization: Temperature is 40°C lower than tempering temperature, and the specific temperature Is determined by mould design.
Relieving stress: Steel temperature is 15-20°C lower than tempering temperature, keep the temperature for 2 hours and then air cooling.

High Speed Steel With Strong Ductility

Chemical Composition	C	Si	Mn	Cr	W	Mo	V	Co
(Typical analysis %)	0.80	0.38	0.42	5.30	5.00	5.00	1.70	1.00

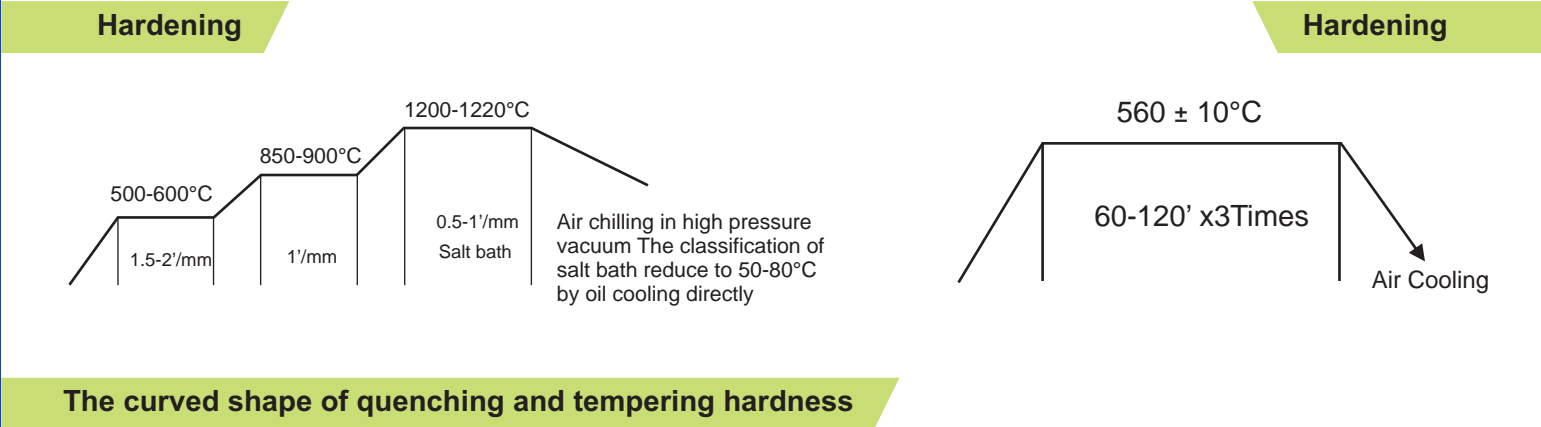
- Property:**
- On the basis of DF6(M2), EAST TOOL developed DF6M, a high speed steel with strong ductility, which improves the ability to resist tipping and rupture.
 - DF6M controls the chemical composition, especially the carbon content and its carbide particle is even and fine. For this reason, DF6M has strong ductility and excellent thermoplasticity.
 - Adding small amount of cobalt in DF6M improve the ability to resist to hot crackability when over loading.
 - Through Electro Slag Remelting (ESR) the composition of DF6M is purified and improved to resist crack and tipping.

Application:

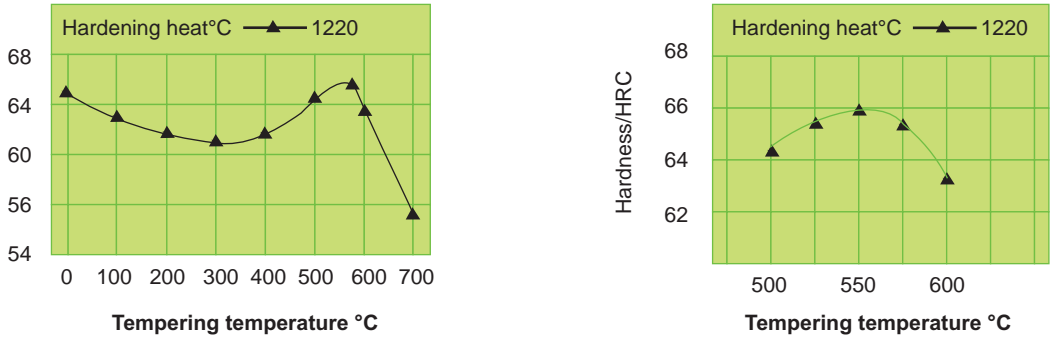
- Be used for tools and dies to resist tipping and stand wear & tear better then M2

Steel density 8.16g/cm3

General Method of heat treatment



The curved shape of quenching and tempering hardness



Azotization: Temperature is 40°C lower than tempering temperature, and the specific temperature Is determined by mould design.
Relieving stress: Steel temperature is 15-20°C lower than tempering temperature, keep the temperature for 2 hours and then air cooling.

COLD WORK steels fall into five groups: water hardening, oil hardening, medium alloy air hardening, high carbon-high chromium and shock resisting. As their name implies, these steels are used in low to medium temperature applications. Highly wear resistant due to the high volume of carbides in the microstructure.

The high carbon and chromium content promotes deep hardening. Hardenability is accentuated by small amounts of tungsten and molybdenum. Dimensional change in hardening is extremely low.

Typical uses are long run blanking, stamping, and cold forming dies; lamination dies; thread rolling dies; trimmer dies; slitters; brick mold liners; Work Rolls.

Characterised by the following properties, among other things:

- Very good wear resistance
- High pressure resistance
- Great toughness

STANDARD STOCK GRADES & COMPARABLE STANDARDS

EST	GB (CHINA)	DIN	ASTM	JIS	OTHER
YTL122	Cr12Mo1V1	1.2379	D2	SKD11	
YTL120	Cr12	1.2080	D3	SKD1	
YTO1	9CrWMn	1.2510	O1	SKS3	
YTL7W	7Cr7WMo2V2Si				
YTL8	Cr8Mo2VSi				Bohler K340
YTL31	9Cr2MoV	1.2327			Bohler K310

STANDARD STOCK SIZES

PRODUCT	DELIVERY CONDITION AND AVAILABLE DIMENSIONS			
ROUND	COLD DRAWN	CENTERLESS GROUND	PEELED	TURNUED
DIAMETER IN MM	2.50 - 12.0	8.5 - 30.0	16 - 75	75 - 410
SQUARE	HOT ROLLED BLACK		FORGED ALL SIDE MILLED	
SIZE IN MM	7.5 X 7.5 - 50.0 X 50.0		55 X 55 - 410 X 410	
FLATS	HOT ROLLED BLACK	HOT ROLLED, 2 EDGE MILLED	FORGED ALL SIDE MILLED	
THICK x WIDTH IN MM	6 - 30 X 20 - 130	13 - 80 X 150 - 410	90 - 405 X 100 - 810	
SHEET	COLD ROLLED		HOT ROLLED	
THICK x WIDTH x LENGTH IN MM	1.0 - 2.5 X 600 - 800 X 1500 - 2000		2.60 - 10 X 600 - 800 X 1500 - 2000	
DISC	400 - 600 MM DIA X 80 - 300 THICK			

OTHER GRADES AND SIZES ON REQUEST



EST	DIN	ASTM	CHEMICAL COMPOSITION										PROPERTY	APPLICATION
			C	Si	Mn	P≤	S≤	Cr	Mo	V	W			
YTL122	1.2379	D2	1.45 - 1.60	0.10 - 0.60	0.20 - 0.60	0.030	0.030	11.0 - 13.0	0.70 - 1.00	0.70 - 1.00	-	-	Ledeburitic High Carbon Chromium steel, excellent wear resistance, good toughness, High hardenability, dimensional stability and high surface hardness	Blanking Dies, Drawing Dies, Forming Rolls, Gauges , Thread Rolling Dies, Slitters, Shear Blades, Punches, Stamping Tools
YTL120	1.2080	D3	1.90 - 2.20	0.10 - 0.60	0.20 - 0.60	0.030	0.030	11.0 - 13.0	-	-	-	-	Ledeburitic High Carbon Chromium steel, very high wear resistance, High hardenability, Virtually no deformation during hardening	Trimming Dies, Blanking Dies for paper, Shear Blades, Woodworking Tools, Profile Rolls ,
YTO1	1.2510	O1	0.90 – 1.05	0.15 – 0.35	1.00 – 1.20	0.030	0.030	0.50 – 0.70	-	0.05 – 0.15	0.50 – 0.70		High resistance to cracking, excellent machinability, small change in shape during heat treatment	Blanking Dies, Stamping Dies, Threading Tools, Working Tools
YTL28 CHIPPER	1.2631 Modified	A8 Modified	0.50	0.90	0.35	0.030	0.030	8.00	1.50	0.40	< 1.75		High wear resistance, strong toughness, small change in shape during heat treatment	wood chipper knives, slitter knives, scrap shears, plastic granulator knives,tire shredding knives, shear blades, planer knives,
YD11	1.2550	S1	0.55 – 0.65	0.70 – 1.00	0.15 – 0.45	0.030	0.030	0.90 – 1.20	-	0.10 – 0.20	1.70 – 2.20		Shock resisting, good toughness with high hardenability	Blanking Dies for Sheet Metal, Trimming Dies, Punches, Ejectors, Shear Blades, pneumatic chisels.
YD17	1.2357	S7	0.45 – 0.55	0.20 – 1.00	0.20 – 0.80	0.030	0.030	3.00 – 3.50	1.30 – 1.80	≤ 0.35	-		Shock resisting, High wear resistance, high hardenability with high toughness.	Impact resisting Tools, Chisels, Hot punching & shearing, forming and perforating dies,
YTL31	1.2327	Bohler K310	0.85 – 1.05	0.25 – 0.45	0.40 – 0.60	0.030	0.030	1.70 – 2.00	0.20 – 0.35	0.05 – 0.20	-		Shell Hardenable, high wear resistance, high hardness	Standards rolls of all diameters for cold rolling, back up rolls, straightening and work rolls

EST	DIN	ASTM	Density (g/cm3)	HEAT TREATMENT										
				Soft Annealing °C	Annealed Hardness HB	Hardening From °C	Quenching In	Hardness After quenching HRC	Tempering					
									100 °C HRC	200 °C HRC	300 °C HRC	400 °C HRC	500 °C HRC	550 °C HRC
YTL122	1.2379	D2	7.70	830 - 870	Max. 245	1010 - 1050	OIL / AIR	62-64	63	61	58	58	56	
YT120	1.2080	D3	7.70	800 - 840	Max. 245	950 - 980	OIL / AIR for thickness up to 30 mm	64 - 65	63	62	59	57	54	44
YTO1	1.2510	O1	7.85	740 - 770	Max. 220	780 - 820	Oil / Hot Bath 180-220 °C	64	64	62	57	53	-	-
YTL28	1.2631 Modified	A8 Modified	7.85	820 - 870	Max. 245	1020 - 1050	OIL /AIR	61	60	57	56	460°C 58	55	-
YD11	1.2550	S1	7.85	710 - 750	Max. 230	910 - 950	Oil / Hot Bath 180-220 °C	62	62	60	57.5	53	-	-
YD17	1.2357	S7	7.75	810 - 850	Max. 230	940 - 980	AIR / OIL	57	-	57	54	53	51	49
YTL31	1.2327	Bohler K310	7.80	710 - 750	Max. 250	710 - 750	Water	62-64	64	180°C 62	56	52	-	-

Cr 8 Wear Resistant Cold Work Steel

Chemical Composition	C	Cr	Mo	W	V	Si
(Typical analysis %)	1.00	8.50	1.70	0.50	0.90	1.00

Based on YTL122 (AISI D2), EAST TOOL introduces Cr8 high-carbon cold-work steel, it has a feature of itself in composition and performance and strength and toughness near to high-speed steels.

Property:

- Carbide segregation is the most important quality target of high carbon ledeburitic steel. Both YTL8 and YTL122 belong to ledeburitic steel, but the carbide of YTL8 is finer and the state of distribution is improved thus YTL8 gets the higher toughness and plasticity.
- YTL8 uses the high-heat tempering to replace the low temperature tempering, which reduces residual stresses, decreases the possibility of angle rupture and craze during the patternmaking and improves the security of linear cutting and grinding.

Unique Characteristics:

- Higher hardness (62-63 HRC) than D2 after heat treatment.
- Twice the toughness of D2 with superior wear resistance.
- Higher fatigue strength than D2.
- Smaller primary carbides than D2 protect the die from chipping and cracking.

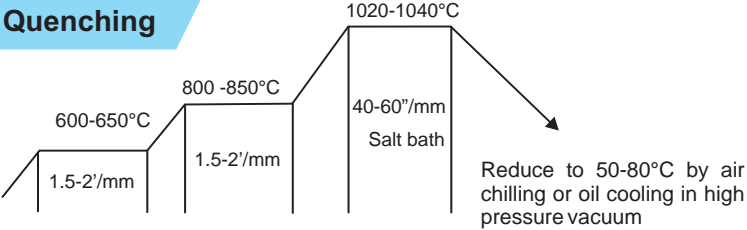
Application:

- Mould that can resist grain-abrasion, mixture abrasion and angle of rupture.
- Mechanical blade (Cold shears), Thread rolling Dies, Drawing die
 - Forming dies, Piercing punch, Dies for cold forging

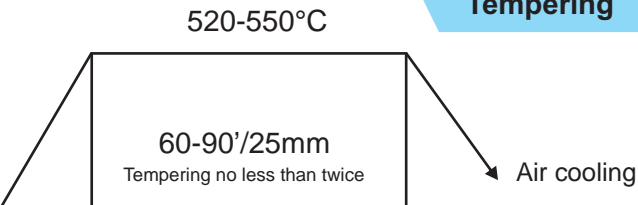
Steel Density 7.84 g/cm3

General method of heat treatment

Quenching

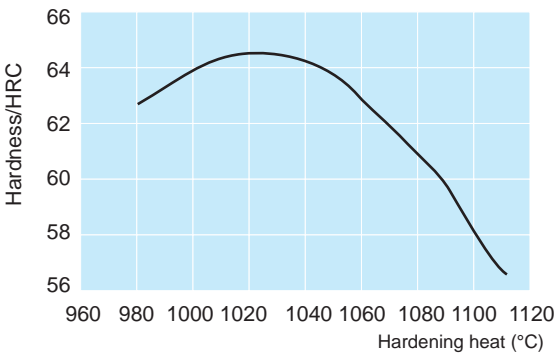


Tempering

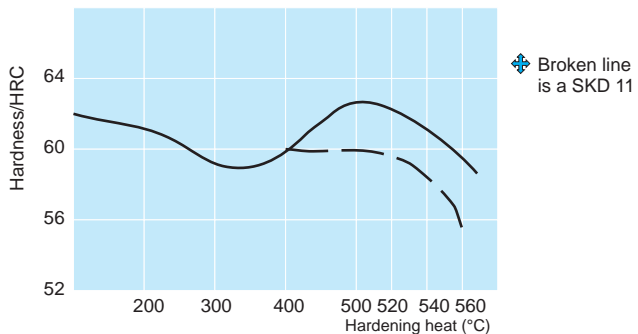


Or using 180-200°C lonneal to treat

The curved shape of quenching hardness



The curved shape of tempering hardness



Cold Work Steel With Obdurability

Chemical Composition	C	Cr	Mo	W	V	Si
(Typical analysis %)	0.74	7.30	1.70	0.50	1.90	1.10

Property:

YTL7W is the second generation of LD Steel introduced by EAST TOOL

- YTL7W has the same high obdurability as LD steel, and YTL7W is good at anti-tipping and anti-rupture.
- Just like LD steel, YTL7W has the same hardness that is greater than or equal to HRC60 during the heat treatment YTL7W has the better wearlessness.
- Just like LD steel, YTL7W can be used in the high-heat tempering and has few residual stresses. Besides YTL7W improves ability to resist angle rupture and craze
- YTL7W has better hot hardness than LD steel and is more suitable to manufacture thin-edge mechanical blade because YTL7W uses tungsten to replace some molybdenum.

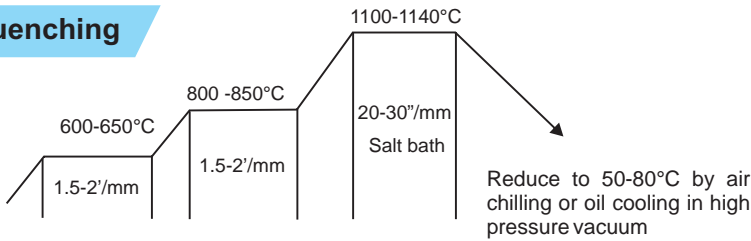
Application:

- Be used to produce drawing die with high ductility toughness, especially slender die.
- Cold-forging and cold-forming mould with strong pressive strength
- Cold shears mechanical blade.

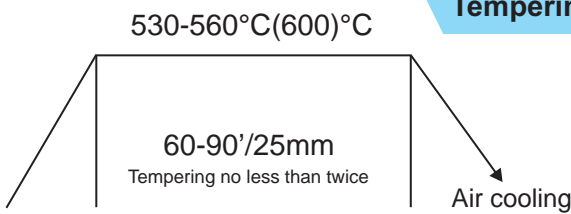
Steel density 7.74g/cm3

General method of heat treatment

Quenching

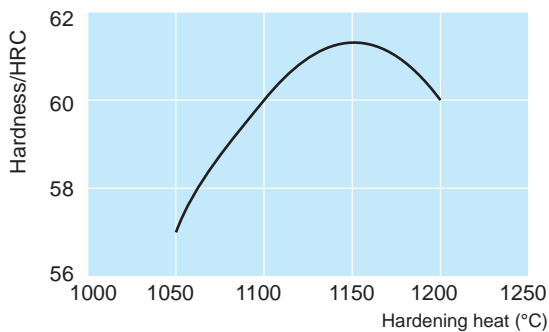


Tempering

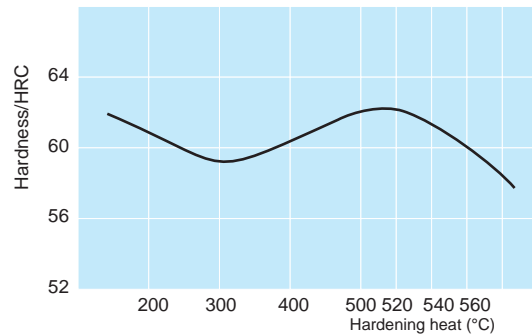


Or using 180-200°C lonneal to treat

The curved shape of quenching hardness



The curved shape of tempering hardness



HOT WORK steels, as their name implies, are used where operating temperatures of the tool may reach levels where resistance to softening, heat checking and shock is important. It has high heat resistance and medium wear resistance, Distortion in hardening is low.

This group of steels is excellent for such uses as die-casting dies, extrusion dies, plastic molding dies, hot forging dies, hot gripper and heading dies, hot mandrels, hot work punches, and hot shear knives.

Characterised by the following properties, among other things:

- Resistance to tempering
- Resistance to thermal shocks
- High-temperature strength
- High-temperature toughness
- High-temperature wear resistance
- High-temperature corrosion resistance

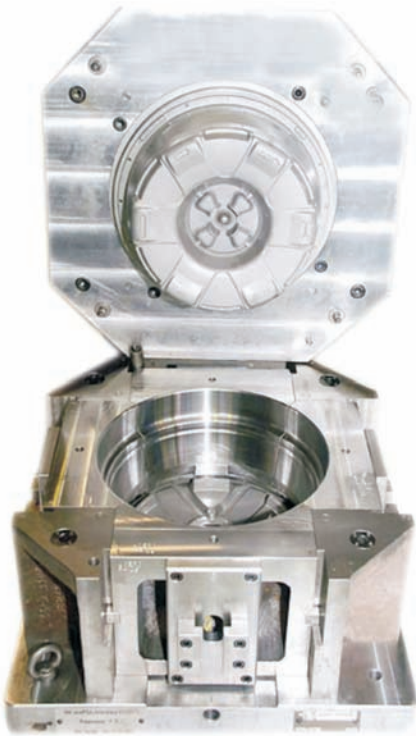
STANDARD STOCK GRADES & COMPARABLE STANDARDS

EST	GB (CHINA)	DIN	ASTM	JIS
YTR5	4Cr5MoSiV1	1.2344	H13	SKD61
YTR18				
YTR50	4Cr5MoSiV	1.2343	H11	SKD6
YTH12	4Cr5MoWSiV	1.2606	H12	SKD62
YTR65	4Cr3Mo3SiV	1.2365	H10	SKD7
YTR2	3Cr2W8V	1.2581	H21	SKD5
YTR3A				

STANDARD STOCK SIZES

PRODUCT	DELIVERY CONDITION AND AVAILABLE DIMENSIONS			
ROUND	COLD DRAWN	CENTERLESS GROUND	PEELED	TURNED
DIAMETER IN MM	2.50 - 12.0	8.5 - 30.0	16 - 75	75 - 610
SQUARE	HOT ROLLED BLACK		FORGED ALL SIDE MILLED	
SIZE IN MM	7.5 X 7.5 - 50.0 X 50.0		55 X 55 - 510 X 510	
FLATS	HOT ROLLED BLACK	HOT ROLLED, 2 EDGE MILLED	FORGED ALL SIDE MILLED	
THICK x WIDTH IN MM	6 - 30 X 20 - 130	13 - 80 X 150 - 410	90 - 405 X 100 - 810	
DISC	400 - 800 MM DIA X 80 - 400 THICK			

OTHER GRADES AND SIZES ON REQUEST



EST	DIN	ASTM	CHEMICAL COMPOSITION										PROPERTY	APPLICATION
			C	Si	Mn	P≤	S≤	Cr	Mo	V	W			
YTR5	1.2344	H13	0.35 – 0.42	0.80 – 1.20	0.25 – 0.50	0.030	0.030	4.80 – 5.50	1.20 – 1.50	0.85 – 1.15	-	High hardenability, excellent wear resistance and hot toughness. Has good thermal shock resistance. (ESR) H13 has greater homogeneity and an exceptionally fine structure, resulting in improved machinability, polishability and high temperature tensile strength.	Pressure die casting tools, extrusion die, forging dies, hot shear blades, stamping dies, plastic molds, Hot work mandrels, ESR H13 is great for aluminium die-casting tools and plastic mold tools requiring a very high polish.	
YTH12	1.2606	H12	0.32 – 0.40	0.90 – 1.20	0.30 – 0.60	0.030	0.030	5.00 – 5.60	1.30 – 1.60	0.15 – 0.40	1.20 – 1.40	Excellent impact toughness. The tungsten content provides better temper resistance, deep-hardening, air-hardening steel that exhibits minimal size change during heat treatment. Good resistance to thermal fatigue cracking	hot punches, die casting dies, forging dies, hot shear blades, hot gripper dies, and extrusion dies.	
YTR50	1.2343	H11	0.33 – 0.41	0.80 – 1.20	0.25 – 0.50	0.030	0.030	4.80 – 5.50	1.10 – 1.50	0.30 – 0.50	-	High hardenability, excellent toughness, good resistance to thermal shock when water cooled in service, minimal size change during heat treatment.	Recommended for hot tooling applications where maximum resistance to cracking is required. Hot punches, die casting dies, forging dies, hot shear blades, hot gripper dies, extrusion dies.	
YTR65	1.2365	H10	0.28 – 0.35	0.10 – 0.40	0.15 – 0.45	0.030	0.030	2.70 – 3.20	2.50 – 3.00	0.40 - 70	-	Excellent resistance to softening at elevated temperature, very resistant to thermal fatigue cracking, and can be water cooled in service	Heavy metal Die-casting tools, Piercing Mandrels, Hot punches, forging dies, hot shear blades,	
YTR2	1.2581	H21	0.25 – 0.35	0.10 – 0.40	0.15 – 0.45	0.030	0.030	2.50 – 3.20	-	0.30 – 0.50	8.50 – 9.50	Exhibits excellent resistance to softening at elevated temperature. Should not be water cooled in service unless the tool includes a continuous flow of internal water cooling. Thermal shock should be avoided	Recommended for difficult hot work tooling applications such as brass extrusion, brass die casting dies, hot punches, forging die inserts.	
YTR6A	1.2714	L6	0.50 – 0.60	0.10 – 0.40	0.60 – 0.90	0.030	0.030	0.80 – 1.20	0.35 – 0.55	0.05 – 0.15	Ni 1.50 – 1.80	High impact toughness and good resistance to softening at elevated temperature, good resistance to thermal shock and thermal fatigue cracking, small dimensional changes during hardening.	Die forging, die casting, extrusion, glass processing, Mandrels, Die holders	

HEAT TREATMENT															
EST	DIN	ASTM	Density (g/cm3)	Soft Annealing °C	Annealed Hardness HB	Hardening From °C	Quenching In	Hardness After quenching HRC	Tempering						
									100 °C	200 °C	300 °C	400 °C	500 °C	550 °C	600 °C
									HRC	HRC	HRC	HRC	HRC	HRC	
YTR5	1.2344	H13	7.80	760 - 800	Max. 235	1010 - 1040	OIL / AIR	56	54	52	51.5	54	56	52.5	48
YTH12	1.2606	H12	7.80	750 - 790	Max. 235	1020 - 1050	OIL / AIR	52-56	53	52	53	55	56	52	47
YTR50	1.2343	H11	7.80	760 - 790	Max. 235	1010 - 1040	OIL / AIR	52-56	53	52	52.5	54.5	56	52	46
YTR65	1.2365	H10	7.90	760 - 790	Max. 235	1030 - 1050	OIL / AIR	52	52	50.5	51	51.5	50	49	46
YTR2	1.2581	H21	8.20	790 - 830	Max. 240	1110 - 1150	OIL	52	52	51	49.5	49.5	51	52	51
YTR6A	1.2714	L6	7.85	650 - 700	Max. 250	OIL 830 - 870	AIR / OIL	58	57	54	52	49	45	43	39
						AIR 860 - 900		56	55	52	50	47	43	40	36

High-Grade Pressure-Casting Die Steel

Chemical Composition	C	Cr	Mo	W	V	Si	S
(Typical analysis %)	0.39	5.30	1.80	0.50	0.90	0.90	0.012

Based on YTR5(H13), EAST TOOL developed YTR18 as a high quality high grade substitute to it.

Property:

- YTR18 has excellent toughness and thermal conductivity, and is good resistant to softening during tempering.
- YTR18 has better high-temperature flexibility and ability to resist thermal fatigue.
- Processed through Electro Slag Remelting (ESR), YTR18 has excellent toughness and ductility in all directions.
- Workable hardness is HRC 46-52.

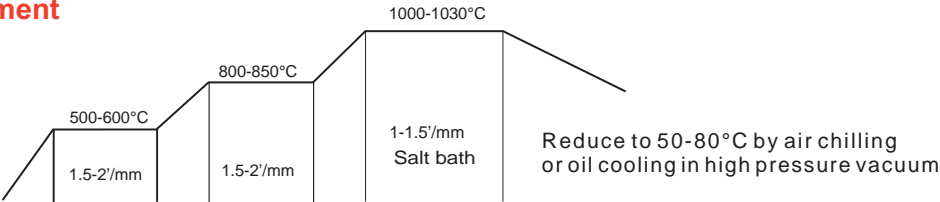
Application:

- Aluminum and Magnesium pressure-casting Die.
- Copper alloy extrusion Die.
- Also suitable for high-grade plastic moulds.

Steel density 7.86g / cm3

General Method of heat treatment

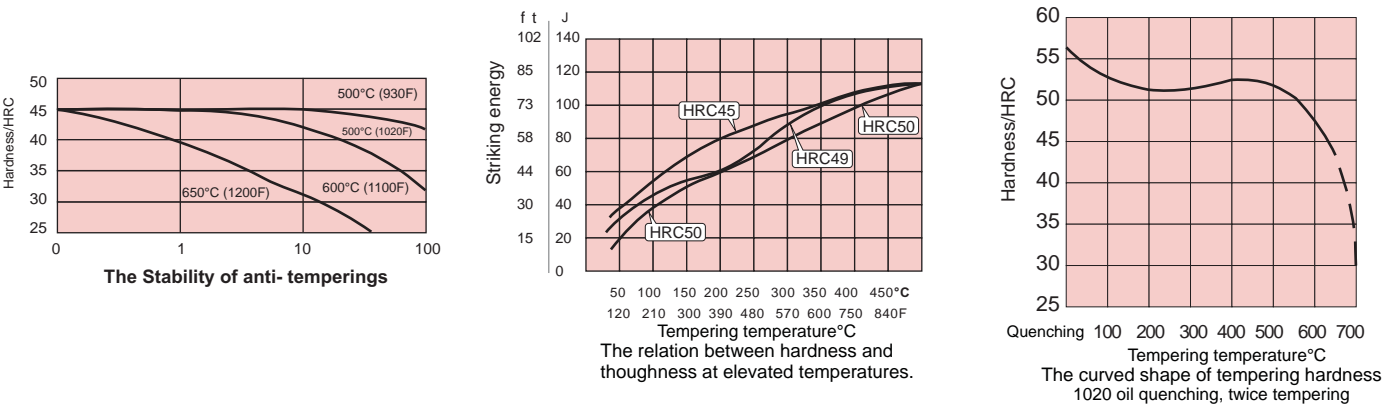
Hardening



Tempering



Relieving stress after hardening or during process, heating-up temperature is 15-20°C lower than tempering temperature



High-Heat And Fatigue Resistant Forging Die Steel

Chemical Composition	C	Si	Mn	Cr	W	Mo	V	Co
(Typical analysis %)	0.40	0.45	0.70	3.40	1.70	1.80	0.90	≤ 1.00

YTR3A is a kind of high-temperature HOT WORK STEEL introduced by EAST TOOL. It is Cobaltic CrMoWV Steel with medium carbon, has excellent red hardness and hot-abrasion resistance. YTR3A also has better ability to resist to thermal fatigue than AISI H21.

Property:

- Has better heat-durability therefore can maintain its property in an environment that surpasses 600°C
- Has excellent ductility and can effectively resist to thermal cracking, which is universal disabled phenomena of HOT WORK STEEL.
- Through Electro Slag Remelting (ESR) molten steel of YTR3A is purified and the composition of YTR3A is tight knit. For this reason, YTR3A can effectively resist to thermal cracking.
- Use of rapid and refined heat treatment technology improve YTR3A ability to resist to thermal cracking.
- Workable hardness is HRC46-52

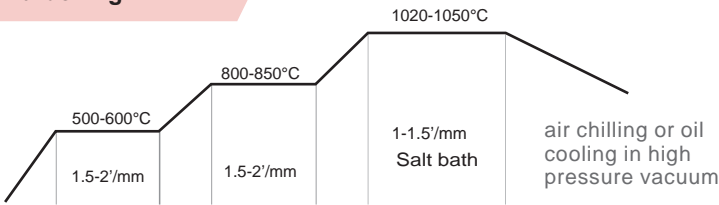
Application:

- Warm forging mold, progressive type automatic forging hot die, hot-sizing Die, etc.

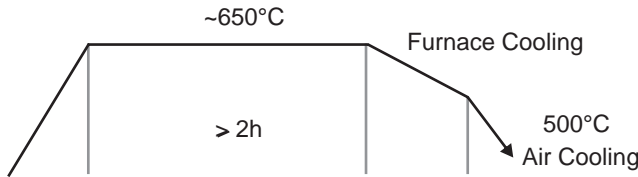
Steel density 7.93 g/cm3

General Method of heat treatment

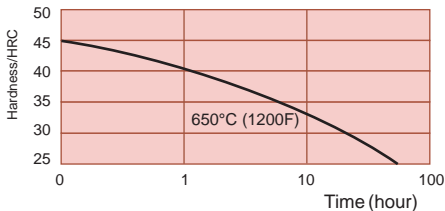
Hardening



Relieving stress (after rough machining, mould ingot must be heat treatment with stress-relief)

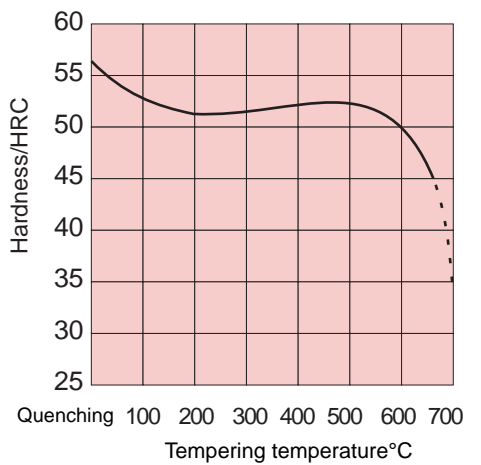
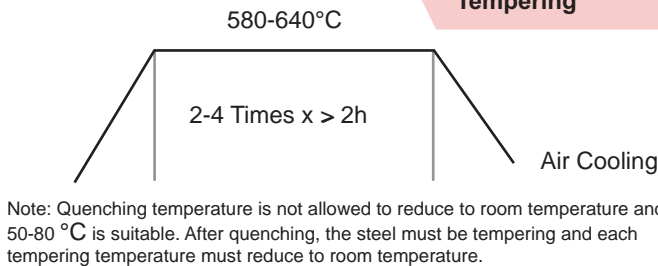


Relieving stress after hardening or during process, heating - up temperature is 15-20°C lower than tempering temperature.



The stability of temperings resistance

Tempering



The curved shape of tempering hardness 1020 oil quenching, twice tempering

MOULD STEELS typically have lower carbon content—0.36 to 0.40% and chromium and nickel are the main alloying elements. These characteristics allow these materials to be polished to an extremely high finish.

These steels are supplied in a variety of pre-hardened conditions. They are primarily used for low temperature die-casting dies and for molds to form plastics.

Characterised by the following properties, among other things:

- Wear resistance
- Polishability
- Machinability
- Toughness and hardness
- Thermal conductivity

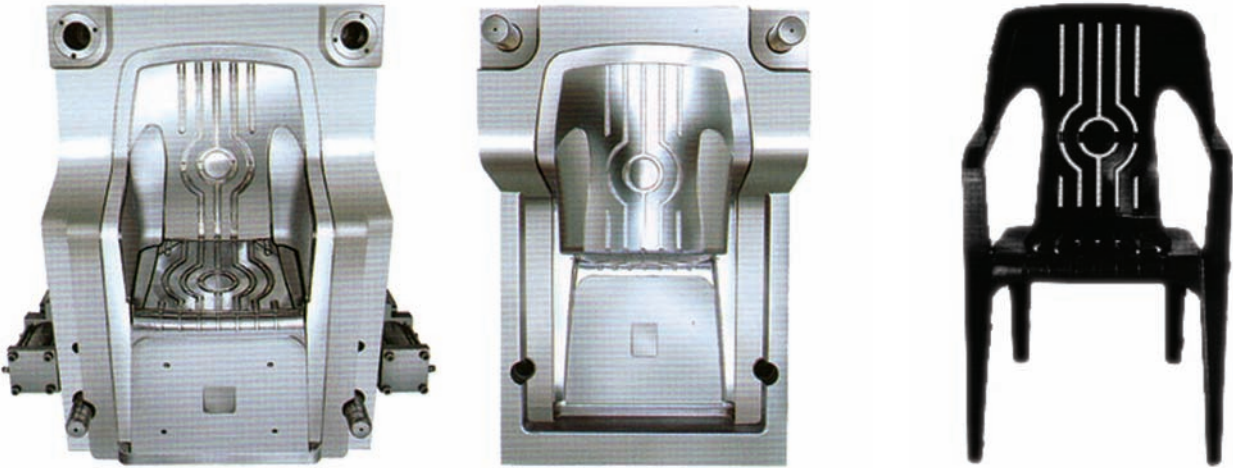
STANDARD STOCK GRADES & COMPARABLE STANDARDS

EST	GB	DIN	ASTM	JIS	OTHER
YTG136	4Cr13	1.2083		SUS420	
YTG173	3Cr17Mo	1.2316			
YTJ20A	3Cr2Mo	1.2311	P20		
YTJ21	3Cr2NiMo	1.2738	P20+Ni		
YTJ80	10Ni3MnCuAl				

STANDARD STOCK SIZES

PRODUCT	DELIVERY CONDITION AND AVAILABLE DIMENSIONS		
ROUND	CENTERLESS GROUND	PEELED	TURND
DIAMETER IN MM	8.5 - 30.0	16 - 75	75 - 710
SQUARE	FORGED / ALL SIDE MILLED		
SIZE IN MM	55 X 55 - 610 X 610		
FLATS	HOT ROLLED BLACK	HOT ROLLED / 2 EDGE MILLED	FORGED / ALL SIDE MILLED
THICK x WIDTH IN MM	6 - 30 X 20 - 130	13 - 100 X 150 - 410	100 - 505 X 100 - 1200

OTHER GRADES AND SIZES ON REQUEST



EST	DIN	ASTM	CHEMICAL COMPOSITION								PROPERTY	APPLICATION	
			C	Si	Mn	P≤	S≤	Cr	Mo	V			Ni
YTG136	1.2083		0.36 – 0.42	≤ 1.0	≤ 1.0	0.030	0.030	12.50 – 14.50		≤ 0.20	(0.60)	supreme polishability, good corrosion resistance, and good wear resistance. material of choice for the manufacture of plastic molding tools that require the highest lens-quality polished finishes	molds for compact disks (CDs), medical laboratory equipment, optical lenses, and other components, which require critical surface finishes.
YTG173	1.2316		0.33 – 0.45	≤ 1.0	≤ 1.50	0.030	0.030	15.5 – 17.5	0.80 – 1.30	-	≤ 1.00	high cleanliness/homogeneity, powerful in resistant to rust and corrosion, good polishability, usually supplied in quenched and tempered condition with a working hardness of approximately 300 HB.	For Mould with strong corrupt resisting used for camera lens. Dies for pressing chemically aggressive compounds
YTJ20A	1.2311	P20	0.35 – 0.45	0.20 – 0.40	1.30 – 1.60	0.030	0.030	1.80 – 2.10	0.15 – 0.25	-	-	Prehardened plastic mold steel, hardness in as-supplied condition 280-320 HB that is characterized by good toughness at moderate strength level good polishability and etching ability, adequate corrosion resistance, and cost efficient machining properties.	Plastic molds, Mold frames for plastic molds and pressure casting dies, Heated recipient casings and tooling and for die casting dies for zinc.
YTJ21	1.2738	P20+Ni	0.35 – 0.45	0.20 – 0.40	1.30 – 1.60	0.030	0.030	1.80 – 2.10	0.15 – 0.35	-	0.90 – 1.20	Prehardened plastic mold steel, hardness in as-supplied condition 280-320 HB The high nickel content (1%) is specially adapted to ensure a perfect homogeneity of structure and hardness through thickness even for very thick blocks, good polishability, adequate corrosion resistance, good machinability.	Large size Plastic Injection and blow moulding dies, mould frame for pressure casting dies, Heated recipient casings

EST	DIN	ASTM	Density (g/cm3)	HEAT TREATMENT												
				Soft Annealing °C	Annealed Hardness HB	Hardening From °C	Quenching In	Hardness After quenching HRC	Tempering							
									100 °C	200 °C	300 °C	400 °C	500 °C	550 °C	600 °C	
YTG136	1.2083		7.75	750 - 800	Max. 235	1000 -1050	Oil , Hot Bath 500-550 °C	54	HRC	53	52	52.5	HRC	50	HRC	45
YTG173	1.2316		7.75	780 -820	Max. 235	1000 - 1040	Oil , Hot Bath 500-550 °C	52	48	47	46	46	47	42		34
									Pre-hardened steel, hardness in as-supplied condition 300-340 HB (HRC 34-38)							
YTJ20A	1.2311	P20	7.80	710 - 740	Max. 235	840 – 870	Oil , Hot Bath 180-220 °C	52	51	50	48	46	42	39		36
									Pre-hardened steel, hardness in as-supplied condition 280-320 HB (HRC 29-35)							
YTJ21	1.2738	P20+Ni	7.80	710 - 740	Max. 235	840 – 870	Oil , Hot Bath 180-220 °C	52	52	51	48.5	46	42	38		33
									Pre-hardened steel, hardness in as-supplied condition 280-320 HB (HRC 29-35)							

High-Grade Ageing Plastic Die Steel

Chemical Composition	C	Si	Mn	P	S	Mo	Ni	Cu	Al
(Typical analysis %)	0.15	0.22	1.80	0.011	0.004	0.30	2.95	1.00	0.90

Property:

- YTJ80 is a precipitation or age-hardened mold steel with a uniform through hardness of approximately 40 HRC.
- Good uniformity of hardness, HRC (+/-) 1-1.5
- Ageing state can be machine worked, and the layer of electro erosion machining can be removed easily.
- Stress relieving not required after machining.
- Good polish. Through Electro Slag Remelting (ESR), molten steel of YTJ80 is pure, and the composition of YTR80 is well-distributed which gives YTJ80 better minute surface.
- Good weldability.

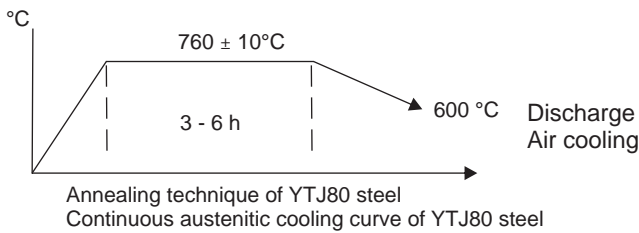
Application:

- Delicate and complicated plastic moulds.
- Specular (transparent) lens molds.
- Plastic mould to manufacture delicate ablation cross-hatching (dermatoglyph) car garnish, office supplies, etc.

Steel density 7.98g/cm3

General method of heat treatment

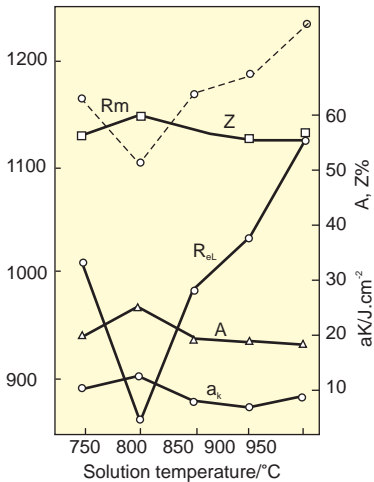
Heat treatment in advance



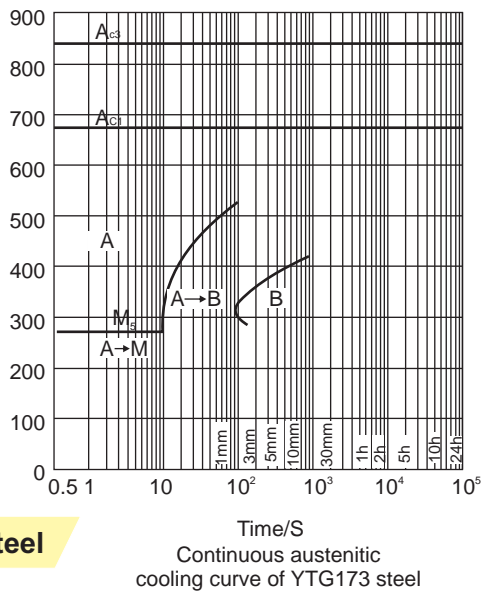
Solution temperature influence the hardness of YTJ80 steel

Solution temperature/°C	780	810	840	870	900	940
Hardness/HRC	30.8	32.4	33.1	32.7	33.1	31.0

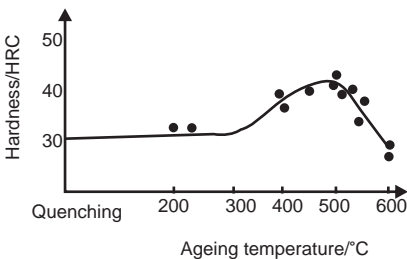
Solution temperature influence the mechanical property of YTJ80 steel



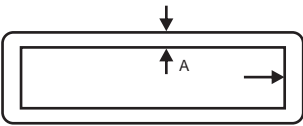
Solution treatment



The hardness of YTJ80 steel after different time aging

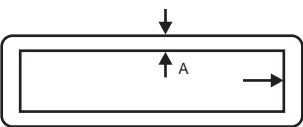


Machining and Decarb Limits



Minimum Allowances For Machining and Maximum Decarburization Limits (Hot Rolled Square and Flat Bars*)

Minimum Allowance Per Side for Machining Prior to Heat Treatment in Inch										
Ordered Thickness Inches	Ordered Width. Inches									
	Over ½ to 1	Over 1 to 2	Over 2 to 3	Over 3 to 4	Over 4 to 5	Over 5 to 6	Over 6 to 7	Over 7 to 8	Over 8 to 9	Over 9
	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.	
0 to ½ incl.	A .025	.030	.035	.040	.045	.050	.055	.060	.060	.060
	B .036	.044	.056	.068	.092	.104	.120	.136	.144	.152
Over ½ to 1, incl.	A .045	.045	.050	.055	.060	.070	.070	.075	.075	.075
	B .045	.052	.064	.080	.104	.120	.136	.160	.160	.160
Over 1 to 2, incl.	A -	.065	.065	.070	.070	.075	.075	.090	.095	.100
	B -	.065	.075	.084	.112	.124	.144	.168	.180	.180
Over 2 to 3, incl.	A -	-	.085	.085	.085	.085	.090	.100	.100	.100
	B -	-	.085	.102	.120	.136	.160	.180	.190	.190
Over 3 to 4, incl.	A -	-	-	.115	.115	.115	.115	.125	.125	.125
	B -	-	-	.115	.127	.140	.180	.190	.190	.190
MAXIMUM DECARBURIZATION LIMITS										
80 Percent of above allowance per side										
*These allowances also applicable to Cold Drawn Bars where cold drawn sizes are available.										



Minimum Allowances For Machining and Maximum Decarburization Limits (Forged Square and Flat Bars)

Minimum Allowance Per Side for Machining Prior to Heat Treatment in Inch									
Ordered Thickness Inches	Ordered Width. Inches								
	Over 2 to 3	Over 3 to 4	Over 4 to 5	Over 5 to 6	Over 6 to 7	Over 7 to 8	Over 8 to 9	Over 9	
	incl.	incl.	incl.	incl.	incl.	incl.	incl.		
Over 1 to 2, incl.	A .090	.090	.100	.110	.115	.125	.140	.150	
	B .100	.108	.124	.148	.172	.200	.200	.200	
Over 2 to 3, incl.	A .120	.120	.125	.130	.135	.150	.160	.175	
	B .120	.130	.140	.148	.172	.200	.200	.200	
Over 3 to 4, incl.	A -	.150	.150	.160	.180	.200	.210	.225	
	B -	.150	.150	.160	.180	.200	.210	.225	
Over 4 to 5, incl.	A -	-	.180	.180	.190	.210	.225	.250	
	B -	-	.180	.180	.190	.210	.225	.250	
Over 5 to 6, incl.	A -	-	-	.210	.225	.225	.250	.250	
	B -	-	-	.210	.225	.225	.250	.250	
Over 6	-	-	-	-	.250	.250	.250	.250	
	-	-	-	-	.250	.250	.250	.250	
MAXIMUM DECARBURIZATION LIMITS									
80 Percent of above allowances per side									

Data shown are typical. and should not be construed as maximum or minimum values for specification or for final design. Data on any particular piece of material may vary from those shown herein.

Effects Of Common Alloying Elements In Steel

By definition, steel is a combination of iron and carbon. Steel is alloyed with various elements to improve physical properties and to produce special properties such as resistance to corrosion or heat. Specific effects of the addition of such elements are outlined below:

Carbon (C) is the most important constituent of steel. It raises tensile strength, hardness, and resistance to wear and abrasion. It lowers ductility and toughness.

Manganese (Mn) is a deoxidizer and degasifier and reacts with sulfur to improve forgeability. It increases tensile strength, hardness, hardenability and resistance to wear. It decreases tendency toward scaling and distortion. It increases the rate of carbon-penetration in carburizing.

Phosphorus (P) increases strength and hardness and improves machinability. However, it adds marked brittleness or cold-shortness to steel.

Sulfur (S) improves machinability in free-cutting steels, but without sufficient manganese it produces brittleness at red heat. It decreases weldability, impact toughness and ductility.

Silicon (Si) is a deoxidizer and degasifier. It increases tensile and yield strength, hardness, forgeability and magnetic permeability.

Chromium (Cr) increases tensile strength, hardness, hardenability, toughness, resistance to wear and abrasion, resistance to corrosion, and scaling at elevated temperatures.

Nickel (Ni) increases strength and hardness without sacrificing ductility and toughness. It also increases resistance to corrosion and scaling at elevated temperatures when introduced in suitable quantities in high-chromium (stainless) steels.

Molybdenum (Mo) increases strength, hardness, hardenability, and toughness, as well as creep resistance and strength at elevated temperatures. It improves machinability and resistance to corrosion and it intensifies the effects of other alloying elements. In hot-work steels and high speed steels, it increases red-hardness properties.

Tungsten (W) increases strength, wear resistance, hardness and toughness. Tungsten steels have superior hot-working and greater cutting efficiency at elevated temperatures.

Vanadium (V) increases strength, hardness, wear resistance and resistance to shock impact. It retards grain growth, permitting higher quenching temperatures. It also enhances the red-hardness properties of high-speed metal cutting tools.

Cobalt (Co) increases strength and hardness and permits higher quenching temperatures and increases the red hardness of high speed steel. It also intensifies the individual effects of other major elements in more complex steels.

Aluminum (Al) is a deoxidizer and degasifier. It retards grain growth and is used to control austenitic grain size. In nitriding steels it aids in producing a uniformly hard and strong nitrided case when used in amounts 1.00% -1.25%.

Recommendation For Tool Designed To Avoid Failure

Tools and machine parts made from tool steels are often subjected to high stress in operation. These parts also have a certain amount of internal stress as a result of their fabrication and heat treatment. When these stresses, either singly or in combination, exceed the strength limits of the steel, cracking, breaking or warping of the part results. Many fully hardened tool steels, particularly highly alloyed types, can withstand relatively high compressive loading, but only limited tensile loading. Tool engineers should seek to minimize tensile stresses through proper design and use of support tooling so as to permit use of the highest performance die steels on crucial components. When required tooling designs must involve significant tensile stresses, then selection of tougher tool steel with reduced wear resistance, most likely one of the shock resisting grades, is advised.

COMMON ERRORS IN TOOL DESIGN

- Use of sharp corners; failure to use fillets or adequate radii.
- Presence of non-uniform sections in tooling causing variation in stress distribution in service as well as variable quenching rates during hardening.
- Use of improper clearance between punch and die edges.
- Tool designs involving excessive unit stresses or overloading during operation. Tools should be redesigned to operate at a lower unit stress.

SENSITIVE TOOLING DESIGNS

If sharp corners and variable sections cannot be avoided in the design of a part the use of an air hardening die steel is essential for greatest safety in hardening. Cracking and/or distortion are more apt to occur on such sensitive sections when liquid quenching is employed during hardening.

PROPER TOOL CLEARANCE

Tool clearance is the distance between adjacent punch and die edges. In general the press load required for a given operation decreases as clearance increases, so tools are more highly stressed with a small degree of punch and die clearance. Enlarging clearance from 5 to 10% of stock thickness usually will improve tool life. Although the finish of the sheared edges of parts may improve with small clearance, tool life will be shortened. Breakage due to misalignment may also result.

While acceptable clearance is often 10% of the stock thickness, this subject is debatable since many variables besides stock thickness influence clearance, including stock material, hardness and surface (scale condition and finish) and the required finish on the shear cut.



25-Ton Electric Arc Furnaces (EAF)



25-Ton Refining Furnaces (LF)



25-Ton Vacuum Furnaces (VOD)



Electro Slag Remelting (ESR)



Heating Furnance



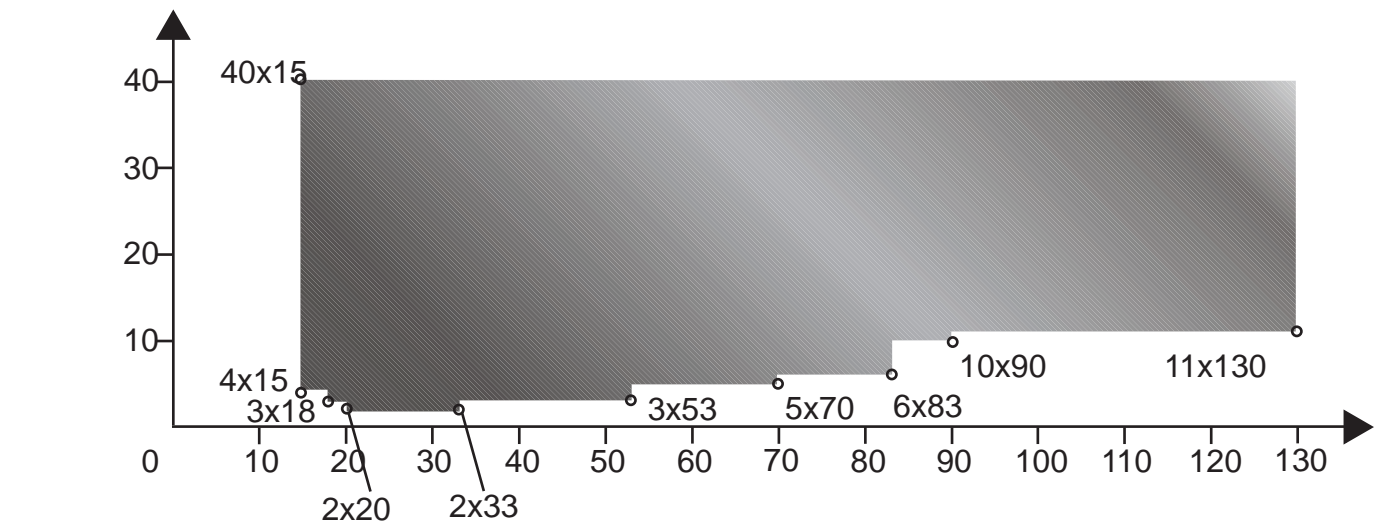
Vacuum Heating Furnace



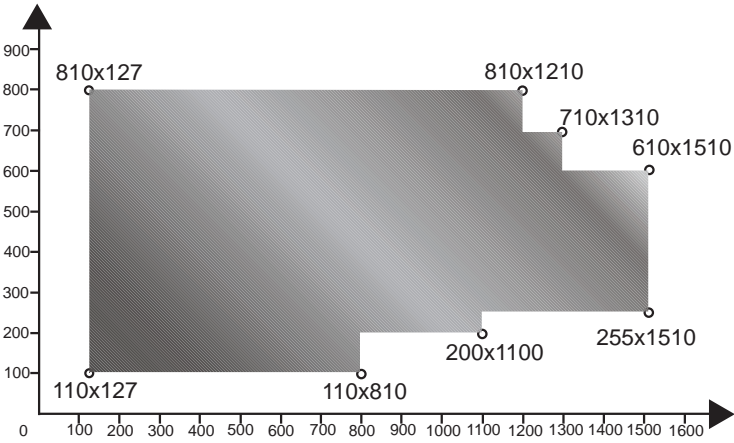
Electro Hydraulic Hammers



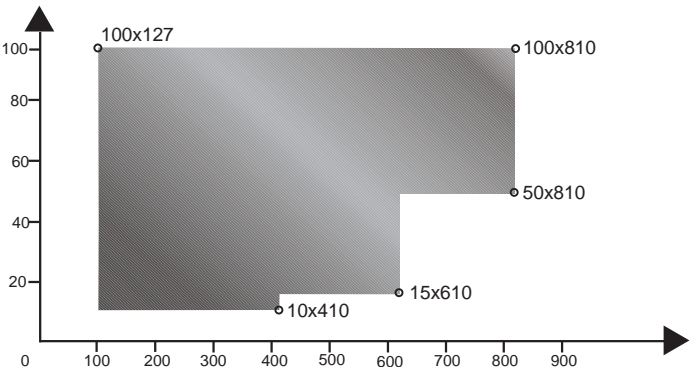
Hydraulic Press Machine



SMALL FLAT BAR (MM)



FORGED FLAT BAR (MM)



WIDE FLAT BAR (MM)

Ø1 - Ø12
cold drawn wire

Ø10 - Ø60
rolled round bar

Ø65 - Ø800
forged round bar

(2-40) x (15-130)
small flat bar

(10-100) x (127-810)
wide flat bar

(110-810) x (127-1510)
forged flat bar

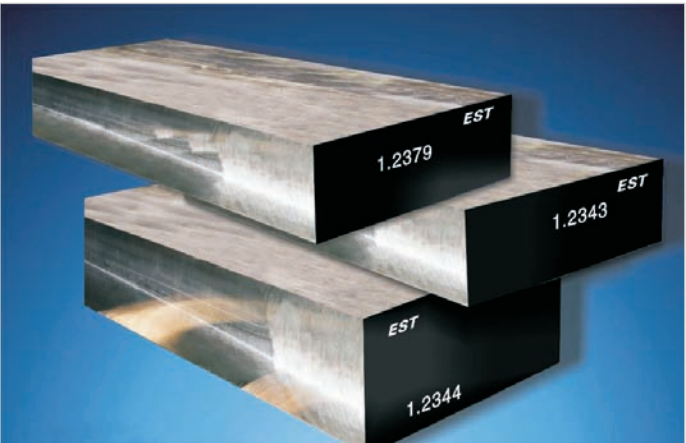
(Ø20 - Ø800)
pre-hardened steel (round bar)

(10-100) x (15-1010)
pre-hardened steel (flat bar)

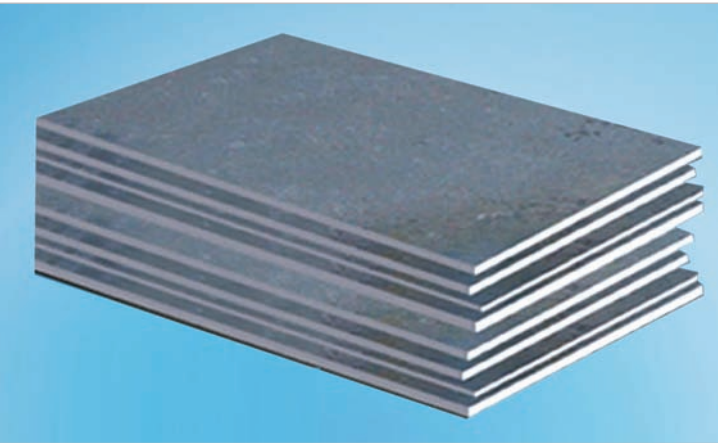
Cold rolled and Hot rolled Sheet

Cold Rolled:
(1.0~2.5) x (600~800) x (1500~2000)

Hot Rolled:
(2.6~10) x (600~800) x (1500~2000)



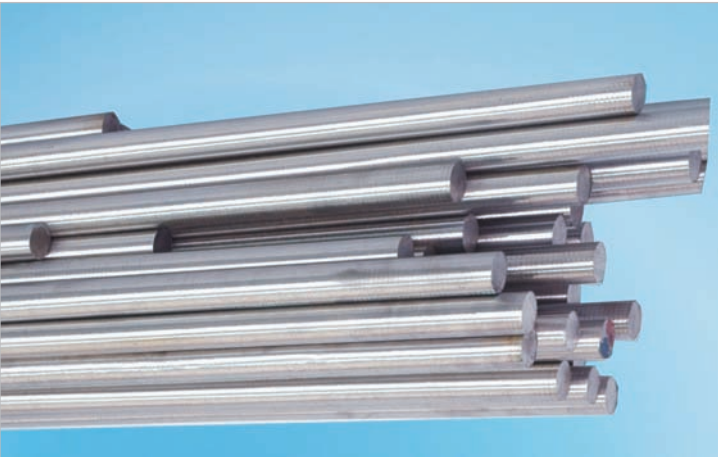
Block



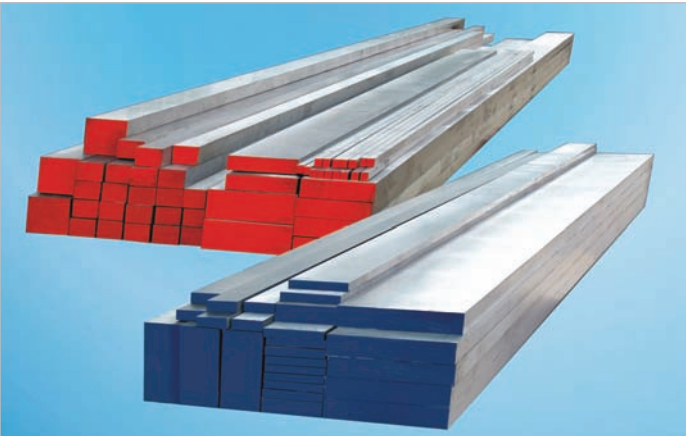
Steel Sheet



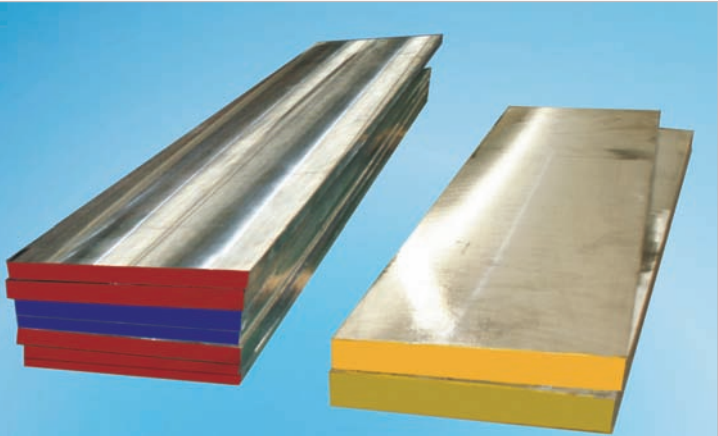
Forged Round Bar



Rolled Round Bar



Hot Rolled Flat Bars



Forged Flat Bars

Note:
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EST Tool Steel Pvt. Ltd.

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Tool & Die Materials



EST Warehouse in Thane

EST Tool Steel Pvt. Ltd.

Mumbai Office: Hercules Estate, Level 1, Bank of Baroda Compound, Ashok Nagar, A. C. Road, Kandivali (East), Mumbai - 400 101. India
Tel : +91 22 2884 6441 • Fax : +91 22 2884 7014 • E-mail: info@esttoolsteel.com • Website: www.esttoolsteel.com

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Tool & Die Materials

Stock Grades

1.2344/H-13, 1.2343/H-11, 1.2581/H-21, 1.2606/H-12,
1.2379/D-2, 1.2080/D-3, 1.2510/O-1,
1.3343/M-2, 1.3243/M-35, 1.3247/M-42,
1.2738/P-20+Ni, 1.2083, 1.2316
1.2550/S-1, 1.2357/S-7, 1.2327/K310, 1.2714/DB-6

Production size range:

Round		
CD	Rolled Peeled	Forged Turned
2mm-8mm	8.5mm-60mm	65mm-850mm

Flats	
Rolled (TXW)	4mm-65mm X 20mm-810mm
Forged (TXW)	70mm-500mm X 70mm-1010mm

Cross Rolled Sheets / Plates	
CR (TXWXL)	1.00mm-2.55mm X 600mm-800mm X 1400mm-2000mm
HR (TXWXL)	2.60mm-8.00mm X 600mm-800mm X 1400mm-2000mm
Plates (TXWXL)	10.0mm-32.0mm X 600mm-800mm X 1400mm-3000mm

Warehouse Equipped with:

Digital hardness testing machine & Ultrasonic testing machine
Various size of Vertical & Horizontal bandsaw machines to cut &
Deliver as per consumer demand

Exemplar of Tool & Die Materials from China

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Tool & Die Materials



Size : 710mm X 710mm



Size : 810mm X 810mm



Size : 450mm X 750mm



Size : 380mm X 380mm



Size : 400mm X 1000mm X 4000mm



EST Service Centre in Thane

EST Tool Steel Pvt. Ltd.

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