



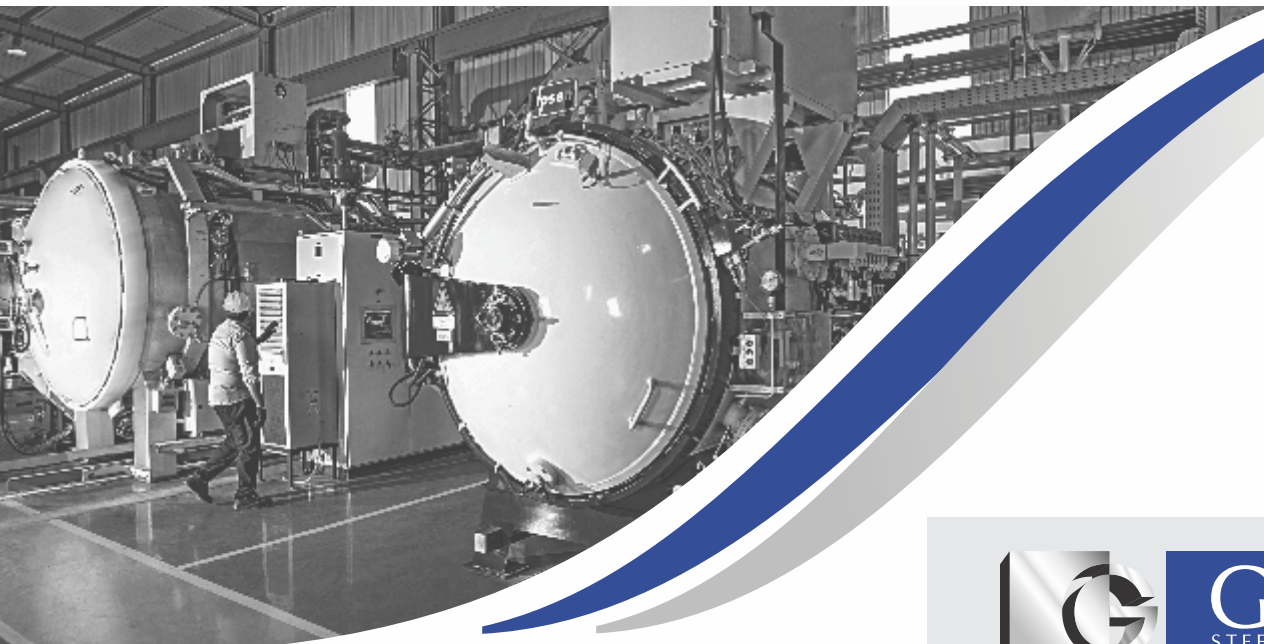
BUILT ON STEEL  
DRIVEN BY ENGINEERING  
TRUSTED GLOBALLY



**GOEL**  
STEEL COMPANY

Special Steels • Engineering Services

TOOL, DIE, MOULD STEELS  
AND ENGINEERING SERVICES



**GOEL**  
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# GOEL STEEL COMPANY

For over **five decades**, **Goel Steel Company** has been a cornerstone of India's special steel and engineering ecosystem. Established in **1973**, the company has evolved into a **trusted, fully integrated solutions provider** for tool, die and mould steels serving industries where **precision, durability, quality and reliability are non-negotiable**.

At Goel Steel Company, technology, infrastructure and experience come together to deliver **consistent performance at scale**.

## A LEGACY BUILT ON TRUST, SCALE AND PERFORMANCE

We began with a singular focus: to supply **high-quality Tool, Die and Mould steels at competitive prices**, supported by dependable service and strong technical understanding. That philosophy has enabled the company to build **long-standing relationships with over 1,000 customers**, many of which have spanned decades.

This legacy is reinforced by:

- Deep metallurgical expertise
- Continuous investment in advanced technology
- A customer-first, solution-oriented approach
- Solid Infrastructure

## INDIA'S ONLY COMPLETE, UNDER-ONE-ROOF SOLUTION

Goel Steel Company is **India's only company** to offer within a single, integrated facility:

- **Tool & Die steel material supply**
- **Precision machining Tool Room**
- **Vacuum heat treatment**
- **Surface treatment**

This unique operating model ensures:

- Constant Input Supply
- Complete process control
- Faster turnaround times
- Reduced dependency on external vendors
- Superior consistency and traceability

For customers, it means **lower risk, tighter tolerances and assured outcomes** and our company proves to be their **End-to-End solution provider for toolings in Engineering**.

# STEEL AND ENGINEERING DIVISION

At Goel Steel Company, continuous investment in world-class infrastructure is central to supporting the evolving needs of modern manufacturing.



7 Strategically  
Located Stock yards



Combined stocking  
capacity of over 5,000 tons



65+ cutting machines  
operating across centers



Designed for speed,  
flexibility & delivery reliability

## SOUTH INDIA

CHENNAI (AMBATTUR, POONAMALLEE)  
SRIPERUMBUDUR (IRRUNGATTUKOTTAI)

## NORTH INDIA

KUNDLI (SONEPAT)

## CENTRAL INDIA

MUMBAI (ANDHERI, NAVI MUMBAI)



Tool Room  
Facility



Heat Treatment  
Infrastructure



Surface Treatment  
Infrastructure

## SERVICE AND COMMITMENT

Built on strong traditional values, Goel Steel Company remains committed to delivering uncompromising quality, dependable service and long term value to every customer. At Goel Steel Company, *Quality is not a department it is a discipline*. Our operations are guided by:



**ETHICAL  
BUSINESS  
PRACTICES**



**STRINGENT  
QUALITY  
STANDARDS**



**RESPONSIVE  
CUSTOMER  
SUPPORT**



**LONG-TERM  
PARTNERSHIP  
MINDSET**



**VALUE  
ADDITION FOR  
CUSTOMERS**

At the heart of Goel Steel Company is a highly skilled, committed and experienced workforce that drives every aspect of its operations. From metallurgists and machinists to quality specialists and service teams, each member plays a critical role in delivering precision, consistency and reliability. This culture of dedication, accountability and continuous improvement enables Goel Steel Company to maintain high standards, meet demanding timelines, and build long-term trust with customers across industries.

# WIDE RANGE OF SPECIAL STEELS – READY FROM STOCK

Goel Steel Company maintains an extensive inventory of **special steels**, sourced from globally reputed producers, covering:

- **HOT WORK TOOL STEELS**

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- **COLD WORK TOOL STEELS**

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- **HIGH-SPEED STEELS**

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- **PLASTIC MOULD STEELS**

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- **ESR / VAR GRADES**

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- **CARBON STEEL AND ALLOY STEEL**

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This strong stocking program enables **rapid response to urgent and high-volume requirements.**

## AUTHORISED STOCKISTS



**DEUTSCHE EDELSTAHLWERKE**

Providing special steel solutions



**Edelstahlwerk Kind & Co.  
GMH GRUPPE**



**GRAPHITE INDIA LIMITED**  
(Powmex Steel Division)

**PROTERIAL, LTD.**



**SēAH Steel**

**sij** | metal  
ravne

## OUR PRODUCT RANGE

### HIGH SPEED STEEL

AISI/ASTM	MATERIAL						
	EN	DIN	JIS	POWMEX	PROTERIAL	NACHI	KIND
M2	5/6/2002	1.3343	SKH51	M2	YXM1	SKH9	-
M35	6/5/2+5%	1.3243	SKH55	M32	YXM4	Hm35	-
M42	2/10/1/8	1.3247	SKH59	M42	YXM42	Hm42	-
ASP30	-	-	-	-	HAP40	FAX38	-
ASP23	-	-	-	-	HAP10	FAX31	-
ASP60	-	-	-	-	HAP72	-	-
ASP52	-	-	-	-	HAP50	-	-
PATENT	-	-	-	-	YXR3	-	-
PATENT	-	-	-	-	YXR7	-	-
PATENT	-	-	-	-	YXR33	-	-
PATENT	-	-	-	-	HAP5R	-	-

### COLD WORK STEEL

AISI/ASTM	MATERIAL						
	EN	DIN	JIS	PROTERIAL	SEAH	RAVNE	KIND
D3	X210Cr12	1.2080	SKD1	-	-	-	-
D2	X 155CrVMoV12.1	1.2379	SKD11	SLD	DUMAC11	1.2379	CH16V
O1	100MnCrW4	1.2510	SKS3	SGT	-	1.2510	-
S1	60WCrV7	1.2550	-	-	-	1.2550	-
A2	1 00CrMoV5-1	1.2363	SKD12	-	-	1.2363	-
8% CR*	-	-	-	SLD-F/SLD10/SLDMAGIC	-	-	PM823ESU
FLAME HARDNING	-	-	-	HMD5	TA23F85	-	-
SPECIAL GRADE*	-	-	-	-	-	-	UH1
SPECIAL GRADE	-	1.2360	-	-	-	2360/WP7V	CR7VL

### HOT WORK STEEL

AISI/ASTM	MATERIAL						
	EN	DIN	JIS	PROTERIAL	SEAH	RAVNE/DEW	KIND
H11-*	X38CrMoV5-1	1.2343	-	-	-	-	USN & USN ESU-
H13(Esr & Non Esr)-*	X40CrMoV5-1	1.2344	SKD61	DACP AND DACV	DUMAC61	1.2344	USD & USD ESU
H10	32CrMoV12-28	1.2365	-	YEMK	-	-	RP
-	32CrMoV12-28	1.2367	-	-	-	1.2367	RPU
L6	56NiCrMoV7	1.2714	SKT4	-	SKT4/SKT4V	1.2714	PWM
PATENT	-	-	-	YXR33	-	-	FTCO
H13-MODIFIED-*	-	-	-	DAC-MAGIC	-	-	TQ1
H11-MODIFIED	-	-	-	DAC1	-	-	HPI/LMF
SPECIAL GRADE	-	-	-	DACX	-	-	CS1/HSF/MT1
SPECIAL GRADE	-	1.2766/1.2767	-	-	-	1.2766/1.2767	-

### PLASTIC MOULD STEEL

AISI/ASTM	MATERIAL							
	En	DIN	JIS	PROTERIAL	SEAH	RAVNE/DEW	SWG	KIND
P20	40CrMnMO7	1.2311	-	HPM7	TP4	1.2311	1.2311	-
P20+Ni	40CrMnNiMO864	1.2738	-	-	TP4M	1.2738	1.2738	-
420	36CrMo17	1.2316	SUS420J	-	-	-	-	CMR
420-*	42Cr13	1.2083	SUS420F	HPM38	SMAT V	1.2083	1.2083	RF
420+S	33Cr516	1.2085	-	HPM77	-	1.2085	-	-
P20+Ni-HH-*	40CrMnNiMO864	1.2738-HH	-	HPMMAGIC	SMAT E-*	-	XPM	-
P21	-	-	-	CENA1	SMAT- F	-	GEST80	-

### ALLOY STEELS

AISI/ASTM	MATERIAL			
	EN	DIN	JIS	SEAH
4340	EN 24	-	-	-
1045/1055	EN43B	CK45/S55C	-	TP1

NOTE \* Comes in ESR AND NON ESR

## OUR STOCKING PROGRAM

GRADE	SIZES					
	ROUNDS (DIA)		WIDTH		THICKNESS	
	MIN	MAX	MIN	MAX	MIN	MAX
1.2085	0	0	20	1050	20	303
1.2316	20	202	50	1050	30	200
1.2363	20	152	25	1010	25	250
1.2367	16	323	50	850	75	355
1.2738	20	708	25	2010	20	650
1.2080/D3	8	620	20	710	13	250
1.2080 ESR/HPM38	16	250	25	1010	15	250
1.2311/SEAH TP4	20	200	50	1450	20	650
1.2343-ESR/KIND-USN ESU	0	0	50	920	50	480
1.2343/H11	25	1140	80	610	25	250
1.2344/H13	6	853	50	1010	13	410
1.2344-ESR/KIND-USD ESU	0	0	25	950	25	520
1.2367-ESR/RPU-ESR	0	0	50	855	50	355
1.2379/D2	6	1230	20	1200	13	400
1.2510/S1/SR4	6.25	265	80	1010	16	110
1.2550/O1/OHNS/SKS3	13	510	25	610	10	200
1.2714/DB6/L6/SKT4	30	1160	100	2000	30	710
1.2738EFFICIENT/SEAH-TP4M	0	0	50	1410	20	650
1.2738HH/XPM/TP4MHH	0	0	50	1600	25	550
1.2766/2767	35	71	25	1500	25	530
1.3243/M35/YXM4	5.5	353	-	-	-	-
1.3247/M-42	6.5	210	0	0	0	0
1.3343/M2/YXM1	5.7	400	8	400	6	150
12360/WP7V	0	0	25	510	25	140
AP60/HAP72	61	81	30	202	30	122
ASP23/HAP10	16	252	25	260	20	50
ASP30/HAP40	4	252	25	305	16	105
ASP52	52	160	0	0	0	0
C45(PLATES)/TP1	-	-	25	2000	6	650
DAC MAGIC	30	555	20	1010	20	500
DAC X	-	-	13	300	13	650
DAC/DAC-P	10	702	13	1010	13	550
DAC-I	0	0	25	920	25	550
DAC-S (ESR)/DAC-V	0	0	20	1010	20	550
EN24	16	860	50	500	13	150
HMD5/TA23F85F	0	0	20	610	20	260
HSF	122	242	0	0	0	0
KIND-UH1	0	0	50	610	20	325
KIND-CR7VL	0	0	50	820	50	310
KIND-CS1 ESR	61	453	50	855	50	355
KIND-HP1	0	0	100	910	65	260
KIND-TQ1	0	0	50	855	50	410
SLD MAGIC	22	510	10	560	10	250
SLD/SKD11	3	1130	10	1010	13	450
SLD10/SLD-F	90	510	30	810	30	250
YEMK	25	202	0	0	0	0
YXR3	30	210	30	410	32	80
YXR33	13	313	50	250	20	100
YXR7	13	110	0	0	0	0

▶ We also have in stock hot work DIN1, 2714/1, 2743/1, 2379 / Cr7V-L rings.

▶ We quote on specific enquiry only. The stocking program is subject to change.

# GOEL SPECIAL STEELS AND ENGINEERING PVT. LTD.

Goel Special Steels and Engineering Pvt. Ltd. an independent arm of the Goel Group, was established to deliver value-added services to our clients. This initiative aligns with our strategic vision to provide comprehensive, end-to-end solutions. Our advanced infrastructure and skilled workforce continuously enhance the value of our products. We confidently state that we are the only company in India offering a complete end-to-end solution under one roof.

The four heads that we classify the engineering services are :

1. Supply of Tool and Die steel

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2. Tool room and Machining Centres

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3. Vacuum Heat Treatment Services

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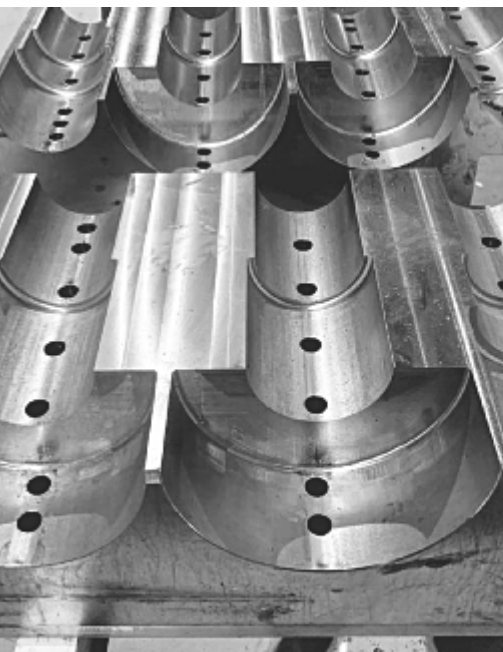
4. Surface Treatment Service of Nitriding / Oxidation / Cryogenic / Subzero treatment.

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Each of the above business units takes pride in adding more to their portfolio each year and we hope that in the near future, we will be able to meet any global standard. We are closely supported in our ventures by our experienced principals from Germany, Japan and South Korea. They monitor our processes, share their expertise and offer better solutions to meet customer demands.

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We wish to be part of the journey that we proudly term as “INDIA SHINING”.



# JOB OR PROFILE SAWING

At Goel Steel Company Job Cutting Services, as per drawing or profile are also provided.

Max. Capacity : 2250 x 1650 mm rectangular section or 1650 mm diameter.  
Handling Capacity : 30 tons of weight  
Storing space : 400,000 Sq.ft

## MACHINING FACILITIES

### 1. DOUBLE COLUMN VMC MILLING MACHINE

MAKE : YCM - NDC 3016B,  
Taiwan (MS 15)  
TRAVEL (X,Y,Z) : 3200 X 1600 X 762  
(Bed to spindle nose 960)  
MAX LOAD : 10 Ton  
ACCURACY : 0.05 MM  
SPINDLE SPEED : 6000 RPM  
ACCESSORY : ANGULAR HEAD

### 2. DOUBLE COLUMN VMC MILLING MACHINE

MAKE : Four star - HCMC 1682, Taiwan  
TRAVEL(X,Y,Z) : 2200 X 1300 X 650/800 mm  
MAX LOAD : 18 Ton  
ACCURACY : 0.05 MM  
SPINDLE SPEED : 10000 RPM  
ACCESSORY : ANGULAR HEAD

### 3. VERTICAL MACHINING CENTRE

MAKE : HARTFORD - HCMC 1682,  
Taiwan (MS 11)  
TRAVEL(X,Y,Z) : 1600 X 820 X 660 mm  
MAX LOAD : 2200 Kg  
ACCURACY : 0.05 MM  
SPINDLE SPEED : 6000 RPM

### 4. VERTICAL MACHINING CENTRE

MAKE : HARTFORD - PRO 800,  
Taiwan (MS 12)  
TRAVEL(X,Y,Z) : 800 X 510 X 630 mm  
MAX LOAD : 500 Kg  
ACCURACY : 0.05 MM  
SPINDLE SPEED : 8000 RPM

### 5. DUPLEX (DPM 1510) MILLING MACHINE (MS 13)

MAKE : WIM - China  
TRAVEL(X,Y,Z) : 950 x 950 x 290 mm  
MAX LOAD : 2 Ton  
ACCURACY : 0.1 MM

### 6. DUPLEX MILLING MACHINE (MS 14)

MAKE : LC 430, China  
TRAVEL(X,Y,Z) : 420 x 420 x 190 MM  
MAX LOAD : 400 Kg  
ACCURACY : 0.05 MM  
SPINDLE SPEED : 630 RPM

### 7. VERTICAL MILLING CENTRE

MAKE : YCM - SUPERMAX (MS 30 )  
TRAVEL(X,Y,Z) : 1350 X 700 X 700 MM  
MAX LOAD : 2 Ton  
ACCURACY : 0.1 MM  
SPINDLE SPEED : 1800 RPM

### 8. VERTICAL MILLING CENTRE

MAKE : BFW  
TRAVEL(X,Y,Z) : 1000X500X500 MM  
MAX LOAD : 600 Kg  
ACCURACY : 0.1 MM  
SPINDLE SPEED : 4000 RPM

### 9. VERTICAL MILLING MACHINE

MAKE : ELGAMILL - Butler (MS 05)  
TRAVEL(X,Y,Z) : 2100 x 950 x 950 mm  
MAX LOAD : 1.5 Ton  
ACCURACY : 0.2 mm  
ACCESSORY : Make Horizontal / Vertical /  
Rotary Table / Super open  
vise, Universal Dividing Head,  
Precision Angle Plate

### 10. SURFACING AND BORING LATHE

MAKE : DEAN SMITH - Grace ,  
UK (MS 04)  
TRAVEL(X,Y,Z) : 500 mm Swing  
MAX LOAD : 250 Kg  
ACCURACY : 0.1 mm

### 11. HEAVY DUTY LATHE

MAKE : NAGAMATHI (MS 03)  
TRAVEL(X,Y,Z) : Dia 350 x 2000 mm LG/  
Over Bed Dia 900 x 350  
mm Long Dap Bed and Face  
Plate Holding  
MAX LOAD : 1 Ton  
ACCURACY : 0.2 mm

### 12. HEAVY DUTY PLANO MILLER

MAKE : KOLLMANN - Russian,  
4 Milling Heads (MS 08)  
TRAVEL(X,Y,Z) : 6000 X 2000 X 2000 mm  
MAX LOAD : 20 Ton  
ACCURACY : 0.2 mm

### 13. HEAVY DUTY PLANO MILLING MACHINE

MAKE : SAGAR (MS 06)  
TRAVEL(X,Y,Z) : 2400 x 1200 x 1500 mm  
MAX LOAD : 5 Ton  
ACCURACY : 0.2 mm  
ACCESSORY : 60 - Deg swiveling with  
side milling head

### 14. VERTICAL MILLING MACHINE

MAKE : BATLIBOI (MS 01)  
TRAVEL(X,Y,Z) : 600 x 315 x 385 mm  
MAX LOAD : 250 Kg  
ACCURACY : 0.2 mm  
ACCESSORY : Make Horizontal / Vertical  
/ Rotary Table / Super  
open vise, Universal  
Dividing Head, Precision  
Angle Plate

### 15. VERTICAL TURRET LATHE

MAKE : SANCO , Russia (MS 07)  
TRAVEL(X,Y,Z) : Dia 1300 x 1000 mm  
MAX LOAD : 1.5 Ton  
ACCURACY : 0.1 mm

### 16. SURFACE GRINDER

MAKE : AVRO (MS 02)  
TRAVEL(X,Y,Z) : 600 x 300 x 280 mm  
MAX LOAD : 250 Kg  
ACCURACY : 0.01 mm  
ACCESSORY : 2 Way Angle vise vertex  
Permanent Magnetic  
chuck

### 17. RADIAL DRILLING MACHINE

MAKE : ENERGY  
TRAVEL(X,Y,Z) : 1000 X 1000 // DIA 36  
MAX LOAD : 1 Ton  
ACCURACY : 0.2 MM  
ACCESSORY : Base Plate Size  
- 1625 x 850 x 190 mm

# VACUUM HEAT TREATMENT

## ENGINEERED FOR PRECISION

Goel Steel Company's vacuum heat treatment division is equipped with modern European-technology furnaces, designed to meet the most demanding metallurgical requirements.

### KEY ADVANTAGES:

- Environment-friendly, pollution-free process
- Bright, clean surfaces with **no oxidation, carburisation or decarburisation**
- Minimal dimensional distortion
- Highly repeatable, computer-controlled cycles
- Full process documentation and traceability

### SUPPORTED PROCESSES:

- Stress Relieving | Vacuum hardening | Vacuum tempering | Vacuum annealing
- Nitriding | Oxidation

### TECHNICAL INFRASTRUCTURE:

- **Vacuum Furnace - IPSEN Turbo Treater** Size: 600 x 600 x 900  
Quenching Pressure @ 12 bar Capacity: 800 kg | Max Temp.: 1250°
- **Vacuum Furnace - ALD Dynatech** Size: 900 x 900 x 1200  
Quenching Pressure @ 12 bar Capacity: 1800 kgs | Max Temp.: 1300°
- **Controlled Atmosphere Tempering Furnace** : 4 Nos.  
Size: 900 x 900 x 1200 Capacity: 1800 kgs | Max Temp.: 750°
- Degreasing Cleaning Machine
- Equotip - Portable Hardness Tester
- Rockwell Hardness Tester
- Brinell Hardness Tester
- Metallurgical Testing Laboratory

This ensures optimized mechanical properties, improved tool life and consistent results across batches.

## PROPERTIES OF ALLOYING ELEMENTS AFTER HEAT TREATMENT

ALLOYING ELEMENT	MECHANICAL PROPERTIES										SOFT MAGNETIC STEELS										
	HARDNESS	STRENGTH	YIELD POINT	ELONGATION	REDUCTION OF AREA	IMPACT VALUE	ELASTICITY	HIGH TEMP. STABILITY	COOLING RATE	CARBIDE -FORMATION	RESISTANCE TO WEAR	FORGEABILITY	MACHINABILITY	SCALING	NITRABILITY	RESISTANCE TO CORROSION	HYSTERESE LOOP	MAX PERMEABILITY	COERCIVE FORCE	REMANENCE	LOSS OF WATT
Silicon	↑	↑	↑↑	↓	?	↓	↑↑↑	↑	↓	↓	↓	↓	↓	↓	↓	↓	↓	↑↑	↓	↓	↓
Manganese at Ferritic Steels	↑	↑	↑	?	?	?	↑	?	↓	?	↑	↓	?	?	↓	↓	↓	↓	↓	↓	↓
Manganese at Austenitic Steels	↓↓↓	↑	↓	↑↑↑	?	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↑	↓	↑
Chromium	↑↑	↑↑	↑↑	↓	↓	↓	↑	↑	↓	↑	↓	↓	↓	↑↑	↑↑↑	↓	↑	↓	↓	↓	↓
Nickel at Austenitic Ferritic steels	↑	↑	↑	?	?	?	↓	↑	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
Nickel at Austenitic CR-Ni Steels	↓	↑	↓	↑↑↑	↑↑	↑↑↑	↓	↑↑↑	↓	↓	↓	↓	↓	↓	↑↑	↓	↓	↓	↓	↓	↓
Aluminium	↓	↓	↓	↓	↓	?	↓	↓	↓	↓	↓	↓	↓	↑↑↑	↓	↓	↑↑	↓	↓	↓	↓↓↓
Tungsten	↑	↑	↑	↓	↓	?	↓	↑↑↑	↓	↑↑	↑↑↑	↓	↓	↓	↓	↓	↓	↑↑	↓	↓	↓
Vanadium	↑	↑	↑	?	?	↑	↑	↑↑↑	↓	↑↑↑	↑	↓	↓	↑	↑	↑	?	?	?	?	?
Cobalt	↑	↑	↑	↓	↓	↓	↓	↑↑	↑↑	↑↑↑	↓	?	?	↑	↑	↑	?	?	?	?	?
Molybdenum	↑	↑	↑	↓	↓	↓	↓	↑↑	↑↑	↑↑↑	↓	?	?	↑	↑	↑	?	?	?	?	↓
Copper	↑	↑	↑↑	?	?	?	↓	↑	↓	↓	↓	?	?	↓	↑	↑	↓	↑	↑	↓	↑
Sulphur	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↑↑	↓	↑↑↑	↓	↑↑
Phosphorus	↑	↑	↑	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↑↑	↓	↑↑↑	↓	↑↑
Carbon	↑↑↑	↑↑↑	↑↑↑	↓	?	↓	↓	↓	↓	↓	↓	↓	↓	↓	?	↑↑	↓	↑↑↑	↓	↓	↑↑

↑ Increase    ↓ Reduction    ? Ca constant    — Not characteristic or unknown    Several Arrows = More intensive effect

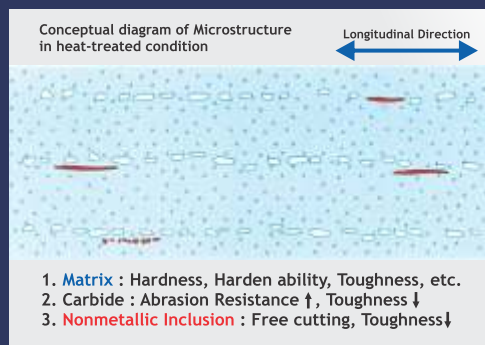
# SURFACE HEAT TREATMENT FOR EXTENDED TOOL LIFE

To further enhance performance, Goel Steel Company offers **advanced surface treatment solutions**, tailored to demanding industrial applications.

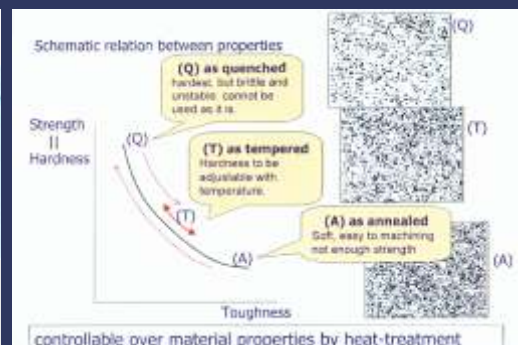
## NITRIDING:

- Increases surface hardness
- Improves wear resistance and fatigue strength
- Enhances corrosion resistance
- Low-temperature process with minimal distortion
- Process uses NH<sub>3</sub> + a Carbon-evolving gas, instead of only NH<sub>3</sub> as in conventional gas nitriding.
- Designed for **IPSEN Patented Nitempering process** Size: 1000 x 1000 x 1300 mm | Weight - 1500 Kgs.
- **IPSEN Gas Nitriding Furnace** Size: 1000 x 1000 x 1300 | Weight - 1500 kgs

### ELEMENTS OF STEEL



### PURPOSE OF HEAT TREATMENT



### FEATURE OF NITRIDING METHOD

		SALT BATH	GAS	PLASMA	SOLID
Method	Temp.	560°C~	about 450°C~	about 400°C~	about 400°C~
	Nitrogen	Salt Bath	NH <sub>3</sub> gas	N <sub>2</sub> gas	NH <sub>3</sub> gas
	Carbon	NaCN, NaCNO	CO, CO <sub>2</sub> gas		CaCN <sub>2</sub> powder
	Sulfur	Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub>	H <sub>2</sub> S gas	H <sub>2</sub> S gas	
	Environment	C	B	A	B
Structure	Freedom	C	A	A	A
	Uniformity	B	A	C	A
Difficult nitriding material for use (SUS304, etc)		Less possible than others	Possible (Soft nitriding, sulphur nitriding)	Possible	Possible

### STRUCTURE & EFFECT OF NITRIDING METHOD

	NITRIDING	SOFT NITRIDING	SULPHON NITRIDING
Sulfur Layer (Adhesion resistance ↑↑) (Anti melt-down ↑↑)	—	—	○
Oxygen Layer (Adhesion resistance ↑) (Anti melt-down ↑)	—	○	○
Nitrogen Layer (Adhesion resistance ↑↑) (Anti melt-down ↑)	○	○	○

Nitriding structure

## OXIDATION:

- Improves corrosion resistance
- Enhances lubrication characteristics
- Ideal for tools requiring controlled friction behaviour

These treatments are especially valuable for **die casting, moulds and high-cycle tooling applications**

## SUBZERO PROCESS:

Subzero treatment is applied to cold work tool steels to enhance their wear resistance and reduce the amount of retained austenite in the material. It also enhances the material's hardness and improves dimensional stability. It is highly recommended for tools where abrasive wear demands are high.

### EQUIPMENT:

Make	- Southern Scientific	Size	- 850*1350*800mm
Weight	- 700 kgs	Operating Temperature	-80°C from ambient
		Controlling Accuracy	- ±1°C

# TOOL STEEL - MATERIAL SELECTION GUIDE

## HIGH SPEED STEELS

AISI/ASTM	MATERIAL							CHEMISTRY								
	EN	DIN	JIS	POWMEX	PROTERIAL	NACHI	KIND	C	Si	Mn	Cr	Mo	V	W	Co	
M2	.6/5/02	1.3343	SKH51	M2	YXM1	SKH9	NA	0.9	0.3	0.3	4.1	5	1.8	6.4		
M35	6/5/2+5%	1.3243	SKH55	M32	YXM4	HM35	NA	0.92	0.35	0.3	4.1	5	1.9	6.4	4.8	
M42	2/10/1/8	1.3247	SKH59	M42	YXM42	HM42	NA	1.1	0.25	0.25	3.9	9.2	1.2	1.4	7.8	
ASP30	6-5-2-8 PM	1.3222 PM	SKH40	NA	HAP40	FAX38	NA	1.4	0.3	0.3	4	5	2.5	6	8	
ASP23	6-5-3 PM	1.3344 PM	NA	NA	HAP10	FAX31	NA	1.4	0.3	0.3	5	6	3.8	3	-	
ASP60	6-7-6-10 PM	1.3241 PM	NA	NA	HAP72	-	NA	2.2	0.3	0.3	4.2	8.3	5	9.5	9.5	
ASP52	-	-	-	-	HAP50	-	NA	1.6	0.3	0.3	4	6	4	8	8	
PATENT	-	-	-	-	HAP5R	-	NA	0.9	-	-	4.3	3	3	2	-	
PATENT	-	-	-	-	YXR3	-	NA	0.6	-	-	4.2	2.9	1.8	-	-	
PATENT	-	-	-	-	YXR7	-	NA	0.8	-	-	4.7	5.5	1.3	1.3	-	
PATENT	-	-	-	-	YXR33	-	FTCO	0.5	-	-	4.2	2	1.2	1.6	1% OR LESS	

## COLD WORK TOOL STEELS

AISI/ASTM	MATERIAL							CHEMISTRY								
	EN	DIN	JIS	PROTERIAL	SEAH	RAVNE	KIND	C	Si	Mn	P	S	Cr	W	Mo	V
D3	X210Cr12	1.2080	SKD1	-	-	-	-	2	0.25	0.45	0.03	0.01	12	-	-	-
D2	X155CrMoV121	1.2379	SKD11	SLD	DUMAC11	1.2379	CHI6V	1.55	0.25	0.35	0.03	0.01	12	-	0.9	0.5-1
O1	100MnCrW4	1.2510	SKS3	SGT	-	1.2510	-	0.95	0.25	1.1	0.03	0.01	0.6	0.6	0.1	-
S1	60WCrV7	1.2550	-	-	-	1.2550	-	0.6	0.6	0.3	0.03	0.01	1.1	2	-	0.2
D6	X165CrMoV12	1.2601	-	-	-	-	-	1.65	0.25	0.45	0.03	0.01	12	0.5	0.6	0.3
A2	100CrMoV5-1	1.2363	SKD12	HPM31	-	1.2363	-	1	0.25	0.55	0.03	0.01	5	-	1	0.15
8% CR	-	-	-	SLD-MAGIC/SLD10	-	OH255	PM823	1	1	0.4	0.03	0.01	8	-	1.5-2.8	0-0.4
FLAME HARDENING	-	-	-	HMD5	TA23F85	-	-	0.7	1	1	-	-	1.2	-	0.2	-
SPECIAL GRADE	-	1.2360	-	SLD-F	-	2360/WP7V	CR7VL	0.47	0.5	0.4	-	-	6-7.5	-	1.35	0.8-1.4

## HOT WORK TOOL STEELS

AISI/ASTM	MATERIAL							CHEMISTRY									
	EN	DIN	JIS	PROTERIAL	SEAH	RAVNE/DEW	KIND	C	Si	Mn	P	S	Cr	W	Mo	Ni	V
H11-*	X38CrMoV5-1	1.2343	SKD6	-	-	-	USN&USNESU	0.38	1.1	0.4	0.03	0.01	5	-	1.25	-	0.45
H13-*	X40CrMoV5-1	1.2344	SKD61	DAC / DACP / DACV	DURAH61	1.2344	USD&USDESU	0.39	1.1	0.4	0.03	0.01	5.2	-	1.4	-	0.95
H10	32CrMoV12-28	1.2365	-	YEMK	-	1.2365	RP	0.4	0.3	0.9	-	-	3.2	CO-1	2.5	0.9	0.6
H10-*	32CrMoV12-28	1.2367	-	DAC10	-	1.2367	RPU	0.38	0.3	0.35	-	-	5	-	3	-	0.6
L6	56NiCrMoV7	1.2714	SKT4	-	SKT4	1.2714	PWM	0.55	0.25	0.8	0.03	0.02	1.2	-	0.4	1.7	0.15
PATENT	-	-	-	YXR33	-	-	FTCO	0.5	-	-	-	-	4.2	1.6	2	CO-1% or less	1.2
H13-MODIFIED-*	-	-	-	DAC-MAGIC	-	-	TQ1	0.36	0.3	4/6	<0.12	<0.003	5.2	-	1.9/2.6	-	55/60
H11-MODIFIED	-	-	-	DACI	-	-	HP1/LMF	0.35	0.2	0.3	0.03	0.01	5.2	-	1.4	-	55+Nb
SPECIAL GRADE	-	-	-	DACX	-	-	CSI/HSF	0.5	0.3	.4	<0.12	<0.003	5.2	-	1.9	-	55+Nb
SPECIAL GRADE	-	-	-	-	-	1.2766/1.2767	-	.35/.45	0.25	.35/.5	-	-	1.35	-	0.3	4	-
SPECIAL GRADE	-	-	-	-	-	-	CRVL/UH1	.42/.46	0.45	.4/.5	-	-	6.5/6.7	-	1.3/1.5	-	0.8

## PLASTIC MOLD STEELS

AISI/ASTM	MATERIAL							CHEMISTRY								
	EN	DIN	JIS	PROTERIAL	RAVNE/DEW	SEAH	SWG	KIND	C	Si	Mn	S	Cr	Mo	Ni	
P20	40CrMnMo7	1.2311	-	HPM7	1.2311	TP4	1.2311	-	0.4	3	1-1.5	0.02	1.9	0.2	-	
P20+Ni	40CrMnNiMo864	1.2738	-	-	1.2738	TP4M	1.2738	-	0.4	0.3	1-1.5	0.02	2	0.2-0.5	0.4-1.1	
420	36CrMo17	1.2316	SUS420J	-	1.2316	X38CrMo16	1.2316	CMR	0.36	0.4	0.65	-	16	1.2	-	
420-*	42Cr13	1.2083	SUS420F	HPM38	1.2083	SMATV	1.2083	RF	0.42	0.4	0.45	-	14	0.6	-	
420+S	33Cr516	1.2085	-	HPM77	1.2085	-	1.2085	-	0.3	0.35	1.8	0.1	16	-	0.6	
P20+Ni+HH-*	40CrMnNiMo864	1.2378-HH	-	HPM Magic	-	SMAT E-*	XPM*	-	0.25	0.3	1.5	-	1.35	0.5	1.1	
P21	-	-	-	CENAV/CENAG	1.2767	SMAT F	-	-	.35/.45	0.25	.35/.50	-	1.4	0.2	4	
H11-*	X38CrMoV5-1	1.2343ESR	SKD6	-	1.2343	SMAT G*	-	USN&USNESU	0.38	1	0.4	<.02	5	1.2	V-.4	
H13-*	X40CrMoV5-1	1.2344	SKD61	DACP & DACV	1.2344	DURAH 61	-	USD&USDESU	0.38	1	0.4	<.02	5	1.2	V-1	

## ALLOY STEELS

AISI/ASTM	MATERIAL				CHEMISTRY									
	EN	DIN	JIS	SEAH	C	Si	Mn	P	S	Cr	W	Mo	Ni	V
4340	EN 24	-	-	-	0.4	0.25	0.65	0.04	0.04	1.5	-	0.37	1.5	-
1045 / 1055	EN 43B / En9	CK45 / C55	-	S45C / S55C	.45/.55	.25/.35	0.8	0.03	0.02	-	-	-	-	-

Note:

\* - Denotes Available in ESR & NON ESR



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APPLICATION	HEAT TREATMENT DETAILS					
	Annealing (Slow Cooling)	Quenchent (Hot Bath)	Quenching	Tempering (Air Cooling)	Annealed (hb)-max	Quenched & (Hrc) Tempered
TAPS, TWIST DRILLS, REAMERS, BROACH TOOLS, COLD WORK TOOLS	800-880	Oil	1200-1240	550-570	255	63
AS M2, HOBS, DRILL REAMERS, MILLING CUTTERS	800-880	Oil	1200-1240	550-570	277	64
TAPS, REAMERS, BROACHING TOOLS, TWIST DRILLS	800-880	Oil	1170-1210	520-590	285	66
CUTTERS, DIES	800-880	Oil or Salt	1180-1210	550-580	269	64-68
HEAVY DUTY WORKING TOOLS AS FINE BLANKING DIES LOWER SPEED CUTTING TOOLS AS TAPS / SUPERIOR TOUGHNESS	800-880	Oil or Salt	1050-1190	550-580	269	58-66
HEAVY DUTY CUTTING TOOLS, DIES / GOOD BALANCE OF TOUGHNESS / WEAR RESISTANCE / PM STEEL	800-880	Oil or Salt	1180-1210	550-580	269	68-70
HIGHER HARDNESS / GOOD WEAR RESISTANCE	800-880	Oil or Salt	1180-1210	550-580	269	66-70
TOUGHEST PM HIGH SPEED STEEL	800-880	Oil or Salt	1120-1160	550-580	269	58-62 HRC
COLD HEADING PUNCH, TRIMMING DIES, COLD FORGING PUNCH & DIE	800-880	Oil or Salt	1130-1170	550-580	241	Min. 57
MATRIX HIGH SPEED STEEL FOR FORGING TOOL AND SUPERIOR STRENGTH & TOUGHNESS	800-880	Oil or Salt	1130-1170	550-580	241	Min. 62
MORE TOUGHNESS IN COLD FORGING	800-880	Oil or Salt	1080-1160	550-580	241	Min. 56

APPLICATION	HEAT TREATMENT DETAILS					
	Annealing (Slow Cooling)	Quenchent (Hot Bath)	Quenching	Tempering (Air Cooling)	Annealed (hb)-max	Quenched & (Hrc) Tempered
DRAWING DIES, BLANKING DIES	830-880	Oil/Air	930-980	150-200	248	61
COLD WORK DIES FOR ROLL FORMING, BLANKING, PUNCHES, ETC.	800-850	Air/Oil	1000-1050	500-530/150-200	248	60
FOR DEEP DRAWING GAUGES	750-780	Oil	800-850	150-200	220	Min. 58
SHEAR BLADES, CUTTING TOOLS FOR HEAVY PLATES ETC.	710-750	Oil	780-820	150-200	225	58
COLD WORK TOOLS FOR ROLLS, BLANKING TOOLS, PUNCHES	830-880	Air/Oil	980-1050	150-200	248	58
BLANKING DIES, ROLLS, STAMPING DIES ETC.	800-850	Air/oil	910-980	150-200	248	61
COLD WORK TOOLS DIES FOR HIGH TENSILE STEELS, SUS, MASS PRODUCTION, ROLLING DIES, THREAD ROLLING DIES	800-850	Air	1010-1040	480-530	248	Min. 58
DRAWING DIES, BLANKING DIES	800-850	Flame Hardening	940-1100	-	-	-
SHEAR BLADES, CUTTING TOOLS FOR HEAVY PLATES ETC.	800-850	Air	1030-1120	480-530	248	58 HRC

APPLICATION	HEAT TREATMENT DETAILS					
	Annealing (Slow Cooling)	Quenchent (Hot Bath)	Quenching	Tempering (Air Cooling)	Annealed (hb)-max	Quenched & (Hrc) Tempered
HOT EXTRUSION TOOLS, TOOLS FOR MANUFACTURE OF SCREWS, NUTS, BOLTS ETC	750-800	Oil/Air	1000-1020	500-600	240	54
DIE CASTING TOOL & EXTRUSION TOOL FOR AL, Zn, Mg, SHEAR BLADE, PLASTIC MOULD ETC	800-850	Oil/Air	1000-1050	500-600	230	52
HOT FORMING (FORGING) DIES, FOR PROCESSING HEAVY METAL.	820-870	Oil	1030-1050	500-600	230	52
HOT FORMING (FORGING) DIES, DIE CATING MOULD, FOR PROCESSING HEAVY METAL.	820-870	Oil	1030-1060	520-700	230	54
HAMMER DIES, PRESS FORGING DIES, SHEAR BLADE ETC (PRE HARDENED ON SUPPLY)	750-800	Oil	850-880	400-650	240	38/42HRC
FOR WARM AND HOT FORGING	800-880	Oil/Salt	1080-1160	550-580	241	Min.54
HIGH TEMPERATURE STRENGTH DIE CASTING / INJECTION MOULDING	800-880	Oil/Salt	1010-1030	550-640	241	Max.52
HIGH-PERFORMANCE DIE CASTING MOULDS & INSERTS ESPECIALLY SUITED FOR LARGE DIE CASTING MOULDS	800-870	Oil/Air	1010-1030	540-680	230	52/54 HRC
HIGH TEMPERATURE STRENGTH DIE CASTING / INJECTION MOULDING	800-880	Oil/Salt	1010-1030	550-640	241	Max.57
DEEP DRAWING / BLADE / BENDING TOOL / PLASTIC MOULD	600-610	Oil/Salt	840-870	200-600	240	Max.56
HOT STAMPING DIES / HOT FORGING / PRESS FORGING	800-880	Oil/Salt	1010-1050	550-640	241	Max.56

APPLICATION	HEAT TREATMENT DETAILS						
	Annealing (Slow Cooling)	Quenchent (Hot Bath)	Quenching	Tempering (Air Cooling)	Annealed (hb)-max	Quenched & (Hrc) Tempered	Supply Condition
MOULD FRAMES, PLASTIC MOULDS <400MM	720-750	Oil/Air	850-880	600-680	240	32	H&T 280-320BHN
LARGE, MEDIUM SIZED MOULDS FOR GENERAL MECHANICAL ENGINEERING AND TOOL MANUFACTURE	720-740	Oil/Air	850-880	710-740	240	32	H&T 280-320BHN
EXCELLENT CORROSION RESISTANCE FOR CHEMICALLY AGGRESSIVE COMPOUNDS	780-820	Oil	1000-1040	600-700	235	32	H&T 280-320BHN
MOULDS FOR CORROSIVE PLASTICS AND THERMO PLASTICS	840-870	Oil	1000-1050	250-570	200	54	ANNEALED
CORROSION RESISTANT MOULDS AND HOLDING BLOCKS / MOULD BASE	750-800	Oil	1000-1050	600-700	200	56	H&T 280-320BHN
LARGE, MEDIUM SIZED MOULDS FOR GENERAL MECHANICAL ENGG. AND TOOL MANUFACTURE	720-740	Oil/Air	850-880	710-740	240	44	H&T 360-400BHN
TRANSPARENT LENS / SMALL MOULD FOR AL / Cr COATED PARTS	600-640	Oil/Air	840-870	200-600	240	54	ANNEALED & HARDENED - 40HRC
PREMIUM LENSE / FIBRE GLASS RESIN	750-800	Oil/Air	1000-1020	500-600	240	48-54	240 BHN
PREMIUM LENSE / FIBRE GLASS RESIN	750-800	Oil/Air	1000-1040	500-600	240	48-54	240 BHN

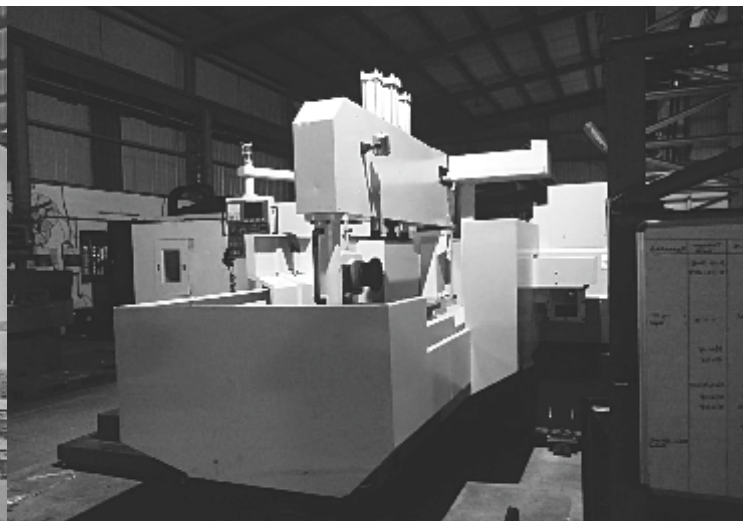
APPLICATION	HEAT TREATMENT DETAILS					
	Annealing (Slow Cooling)	Quenchent (Hot Bath)	Quenching	Tempering (Air Cooling)	Annealed (hb)-max	Quenched & (Hrc) Tempered
USED FOR CONSTRUCTION OF AIRCRAFTS AND HEAVY VEHICLES FOR CRANKSHAFT, GEARSHAFT, CAMSHAFT, PROPELLOR SHAFT ETC.	650-700	Oil	830-850	530-670	220	45-50
GENERAL ENGINEERING MOULD BASE	660-700	Oil/Water	830-860	530-670	220	38-45

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### HIGH SPEED TOOL STEELS

GRADE	TYPICAL ANALYSIS %										REFERENCE SPECIFICATION			APPLICATION	AS DELIVERED MAX HB	HARDENING °C	QUENCHING MEDIUM	TEMPERING TEMPERATURE °C	STANDARD HARDNESS HRC
	C	Si	Mn	Ni	Cr	W	Mo	V	Co	Others	JIS	AISI	W.Nr						
YXM1	0.9	0.3	0.4	-	4.2	6.5	5.0	2.0	-	-	SKH51	M2	1.3343	Drill, Tap, Reamer, Broach, Chase, Metal saw, Cutters, Cold punch, Dies, End Mill, Hob	255	1160-1240	Oil or Salt	550-570	54-66
YXM4	0.9	0.3	0.3	-	4.2	6.5	5.3	1.9	5.0	-	SKH55	M35	1.3243	Hob, Drill, Reamer, Chaser, Cutters, Heading tool for stainless, Endmill, Broach	277	1210-1250	Oil or Salt	560-580	62-67
YXR3	0.6	1.5	0.4	-	4.3	-	2.9	1.8	-	-	-	-	-	Cold heading punch, Trimming dies, Cold forging, Punch & Die, Shearing Blades	241	1130-1170	Oil or Salt	560-590	54-62
YXR33	0.5	0.2	0.5	-	4.2	1.6	2.0	1.2	-	-	-	-	-	Hot, Warm & Cold Forging Dies, Aluminium die casting insert pin, Longer life pin	241	1080-1140	Oil or Salt	550-600	53-58

### POWDER METALLURGY HIGH SPEED TOOL STEELS

HAP10	1.4	0.6	0.3	-	5.0	3.0	6.0	3.8	-	-	-	-	-	Heavy duty working tools as fine blanking dies, Lower speed cutting tools as taps, cutters	269	1120-1190	Oil or Salt	550-580	54-68
HAP40	1.3	0.3	0.4	-	4.2	6.0	5.0	3.1	8.0	-	SKH40	-	-	Fine Blanking dies, Trimming Dies, Cold Working Dies, Cutters, Taps, Broach, Hob	277	1120-1210	Oil or Salt	560-580	54-68
HAP72	2.1	0.4	0.3	-	4.2	9.5	8.3	5.0	9.5	-	-	-	-	Heavy duty cutting tools, Drills, Tap, End Mill, Dies	352	1180-1210	Oil or Salt	560-580	68-71

### COLD WORK TOOL STEELS

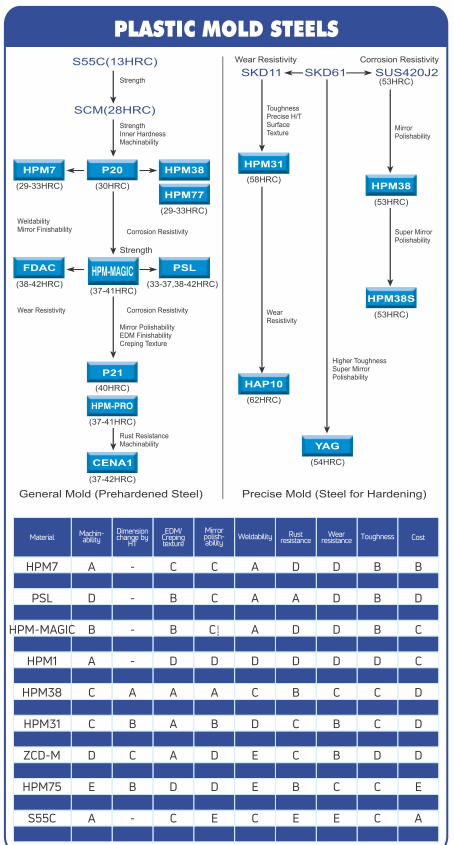
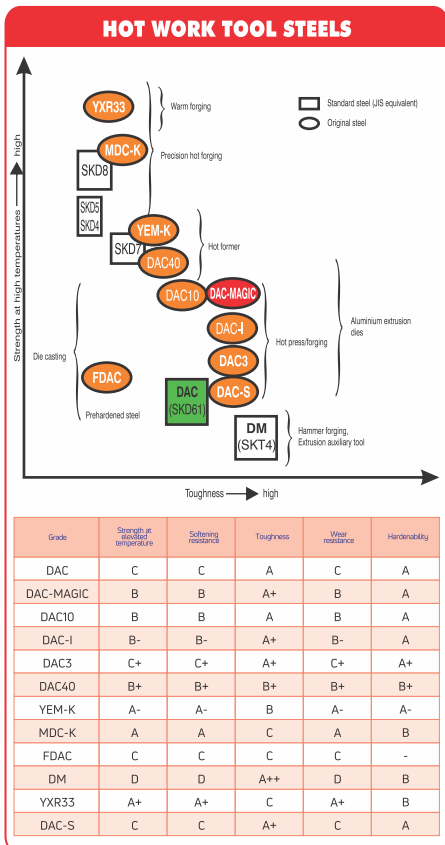
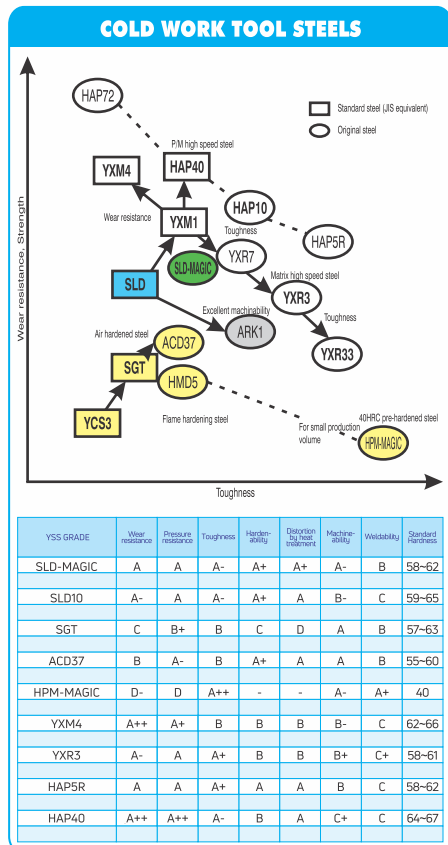
SLD	1.5	0.3	0.4	-	12.0	-	0.9	0.3	-	-	SKD11	D2	1.2379	Cold work dies for general use, forming roll, shear	248	1000-1050	Air	500-530 or 150-200	57-63	
SLD-MAGIC	HIGH PERFORMANCE COLD WORK TOOL STEEL										Free cutting Elements	-	-	-	Cold work dies for high-tensile steels, SUS, mass production and general use	255	1010-1040	Air	480-530 or 150-200	58-62
SGT	1.0	0.3	1.0	-	0.7	0.7	-	-	-	-	SKS3	01	1.251	Punch, dies, gauge for general cold work	217	800-850	Oil	150-00	57-63	
HMD5	0.7	0.1	1.0	-	1.2	-	0.2	-	-	-	-	-	-	Blanking dies Trimming dies	235	Flame hardening 440-1100 °C		55-60		

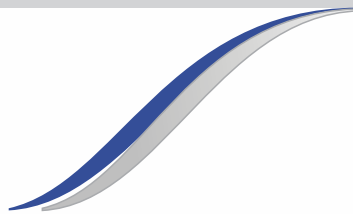
### HOTWORK TOOL STEELS

DAC	0.4	0.1	0.4	-	5.2	-	1.3	0.9	-	-	SKD61	H13	1.2344	General - purpose hot-working tool steel used in a wide range of applications	229	1000-1050	Air (Oil)	550-650	40-51	
DAC-MAGIC	YSS ADVANCED DIE STEEL FOR DIE CASTING										SKD61 Modified	-	-	-	Steel for both, excellent toughness and strength. Improved crack resistance from cooling channel.	229	1010-1020	Air (Oil)	550-640	42-52
DAC-S	0.4	1.0	0.4	-	5.2	-	1.3	0.9	-	-	SKD61	H13	1.2344	Steel for die casting dies which has excellent toughness and complies with NADCA superior H13	229	1000-1050	Air (Oil)	550-650	40-51	
DAC10	0.3	0.3	0.6	-	5.2	-	2.7	0.9	-	-	-	-	-	Steel for both, excellent toughness & strength. Improved crack resistance	229	1000-1030	Oil (Air)	550-650	41-51	
DAC-I	YSS ADVANCED DIE STEEL FOR DIE CASTING										SKD61 Modified	-	-	-	Steel for precision die casting and hot-working press die which has excellent heat crack resistance and wear resistance	241	1000-1030	Oil (Air)	550-650	41-53
YEM-K	0.4	0.3	0.9	0.9	3.4	-	2.5	0.6	-	Other special elements added	SKD7 Modified	-	-	Steel for High Speed Hot Forging such as HATEBUR machine with excellent high temperature strength	229	1000-1050	Oil (Air)	550-650	38-52	
FDAC	0.3	1.0	0.7	-	5.2	-	1.3	0.4	-	S:0.1	SKD61 Free cutting	-	-	Free-cutting hot-working tool steel	HRC 38-42	Prehardened steel		38-42		

### PLASTIC MOLD STEELS

HPM38	0.4	0.4	0.4	-	13.5	-	0.6	-	-	-	SUS420J2 Modified	420 Modified	-	Flame retardant resin, Transparent parts, Rubber	HRC 29-33	1000-1050	Air	200-500	50-55
HPM38 S	0.4	0.4	0.4	-	13.5	-	0.6	-	-	-	-	420 Modified	-	Mold for Super Mirror Polish (Optical Disc/Lens)	HRC 29-33	1000-1050	Air	200-500	50-55
HPM-MAGIC	YSS ADVANCED PLASTIC MOLD STEEL FOR PRECISION MOLDING										-	P20 Group Steel	-	General mass-production mold (Auto parts, OA equipment, Home Electronics)	HRC 37-41	PREHARDENED STEEL			HRC 37-41
HPM-PRO	YSS ADVANCED PLASTIC MOLD STEEL FOR PRECISION MOLDING										-	P21 Group Steel	-	Parts associated with automobile headlamp production, exterior of cellular phone	HRC 37-41				HRC 37-41
CENA1	0.05	1.2	0.5	3	4	-	1	-	-	Cu:0.5, Al:1.0	-	P21 Modified	-	Rust resistant mold with sensitive surface as mirror polishing, Creeping, weldless mold	HRC 37-42				37-42
HPM7	0.15	0.2	1.8	-	1.8	-	0.4	0.1	-	-	-	P20 Modified	-	Mold required good weldability & machinability (Autoparts, Home electronics, House equipment)	HRC 29-33				29-33
HPM77	0.4	0.3	1.8	0.5	15.7	-	-	-	-	S:0.1	-	420 Modified	-	Corrosion resistant mold plates, rubber mold	HRC 29-33				29-33
HPM31	0.9	0.7	0.5	-	7.0	-	1.1	0.4	-	-	-	D2 Modified	-	Wear resistant mold for engineering resin (Gear, Connector, IC)	248	1000-1050	Air	200-550	56-62





## OUR PARTNERS IN STEEL AND TECHNICAL SUPPORT SYSTEM

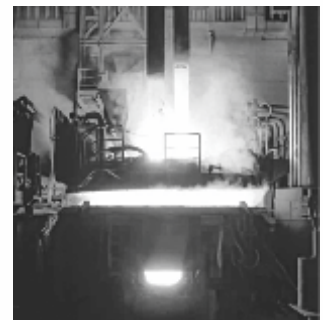
Seah Changwon Integrated Special Steel Company is a merged entity of formerly known Posco speciality steel and Seah Corp. Founded in 1966 under the name of Samyang Speciality Steel Company, it has changed names a few times before acquiring Changwon speciality steel in 1997 (a Posco subsidiary). With a 9000 ton press and state art of rolling facilities, Seah CSS is today South Korea's largest tool supplier. *We are currently sourcing Plastic mold / cold work and hot work tool steels from them.*

COLD WORK TOOL STEEL	_STD11/SKD11 [Equivalent to D2 (ASTM) & WNR1.2379 (DIN)] H-Carbon and H-Chrome Steel provide extra hardness, excellent wear resistance and low dimensional change	Chemical Composition										Applications Applied to tool materials manufactured in a cold state.	Product characteristics High Cleanliness, Exceptional wear resistance, Uniform Microstructure, Uniform hardness, Extra hardness	
		Chemical Composition rate(Wt,%)												
		Grade	C	Si	Mn	P	S	Cr	Mo	V	Others			
SKD11		1.40						11.00	0.80	0.20				
		1.60	0.40	0.60	0.03	0.03	13.00	1.20	0.50					

COLD WORK TOOL STEEL FOR HIGH TENSION STEEL PLATE PROCESSING_TD1	Special elements are added for high tension steel plate processing. It provides extra hardness and wear resistance through O/T heat treatment.	Chemical Composition										Applications Molds for manufacturing materials in cold state (Drawing / Trimming mold for high tension steel	Physical Properties			
		Chemical Composition rate(Wt,%)											Thermal expansion coefficient(X 10 <sup>-6</sup> /°C)	Specific gravity (g/cm3)	Heat conductivity (W/m·K)	Elastic coefficient
		Grade	C	Si	Mn	P	S	Cr	Mo	V	Others					
SKD11		1.60	0.40	0.60	0.03	0.03	13.00	1.20	0.50			11.6(27~100°C)	7.65	26.7	220	
		1.60	0.40	0.60	0.03	0.03	13.00	1.20	0.50			12.7(100~200°C)				
TD1(aim)		1.00	1.00	0.60				8.00	1.30	0.20	ADD					

HOT WORK TOOL STEEL STD61/SKD61 [EQUIVALENT TO H13(ASTM), WNR1.2344 (DIN)]	Tools with extra red hardness and heat crack resistance, used for die casting and extrusion molds.	Chemical Composition										Applications Molds for manufacturing materials in a hot state.	Product characteristics Exceptional toughness and red hardness, Heat crack and wear resistance, Anti-heat treatment transformation, Suitable for hot die casting molds with its high Vanadium content, Suitable for Aluminum and Magnesium Pressing dies.	Physical Properties			
		Chemical Composition rate(Wt,%)												Thermal expansion coefficient(X 10 <sup>-6</sup> /°C)	Specific gravity (g/cm3)	Heat conductivity (W/m·K)	Young's modulus (GPa)
		Grade	C	Si	Mn	P	S	Cr	Mo	V	Others						
SKD61		0.35	0.80	0.25			4.80	1.00	0.80				12.5(25~200°C)	7.8	24(20°C)	205	
		0.42	1.20	0.50	0.03	0.02	5.50	1.50	1.15								

PLASTIC MOLD STEEL _TP1, TP4, TP4M	Steel materials used for molds that are utilized to inject molds.	Chemical Composition												Applications Molds for general merchandise, base materials for precision parts  Car bumper molds, radiator grills, OA equipment, cabinets, back covers of TV's and Pc's, molds for consumer electronics and more  High End Car bumper molds, radiator grills, OA equipment, cabinets, back covers of TV's and Pc's, molds for consumer electronics and more
		Chemical Composition rate(Wt,%)												
		SeAH CSS	JIS	AISI	DIN	C	Si	Mn	P	S	Ni	Cr	Mo	
TP1					0.50									
					0.55	0.35	0.9	0.03	0.02	-	-	-		
TP4	SCM	4140	1.2311	0.26	0.15	0.80				0.90	0.20			
	Improved	Improved	Improved	0.43	0.35	1.15	0.025	0.020	0.45	1.50	0.30			
TP4M	SNCM	P20	1.2738	0.26	0.15	0.8				1.65	0.40			
	Improved	Improved	Improved	0.37	0.35	1.00	0.025	0.020	0.55	2.10	0.50			



HIGH GLOSS PRECISION PLASTIC MOLD STEEL _SMAT1	High gloss precision plastic mold material with high cleanliness and uniform structure	Chemical Composition										Applications - High gloss molds for mobile phone cases, consumer electronics, OA machines, automobile parts (headlamps, fog lights). - High gloss TV front panels and high precision plastics.	Product characteristics Polishability, Impact, Toughness, Machinability, High Cleanliness	Mechanical Properties						
		Chemical Composition rate(Wt,%)												Grade	Yield strength [N/mm2]	Tensile strength [N/mm2]	Elongation [%]	Cross-section reduction[%]	Hardness [HRc]	Impact toughness [J/cm2]
		Grade	C	Si	Mn	Cr	Ni	Al	V	Others										
P21		0.18	0.20	0.20	0.20	3.90	1.05	0.15												
		0.22	0.40	0.40	0.30	4.25	1.25	0.25												
SMAT1 (aim)		0.10	0.30	1.50	0.80	3.00	1.00	Add												

PRECISION PLASTIC WITH EXCELLENT MACHINABILITY_ SMAT E	High gloss precision plastic mold materials that have excellent workability and polishability through special refining and heat treatment technics.	Chemical Composition										Applications Molds for high polishability / gloss injection (i.e.TV panels), molds for precision injection requiring complicated shaping process and rubber molds requiring numerous machine processing operations (electric electronic parts).	Product characteristics Excellent Machinability, Polishability, Impact toughness, High cleanliness	Mechanical Properties						
		Chemical Composition rate(Wt,%)												Grade	Yield strength [N/mm2]	Tensile strength [N/mm2]	Elongation [%]	Cross-section reduction[%]	Hardness [HRc]	Impact toughness [J/cm2]
		Grade	C	Si	Mn	Cr	Mo	Others												
P20		0.28	0.20	0.60	1.40	0.30														
		0.40	0.80	1.00	2.00	0.55														
SMAT E		0.25	0.25	1.50	1.40	0.60	Add													

FLAME HARDENED TOOL STEEL _PST23F85	By utilizing flame, the flame hardened tool is produced through surface hardening heat treatment. This tool steel's hardenability can be increased by adding Cr and Mn. The addition of Si also leads to enhance its hardenability. Furthermore, the portion of the C is a factor to control its hardness.	Chemical Composition							Applications Molds for automobile parts, blanking dies, forming dies, trimming dies and shear blades	Product Characteristics Cost can be saved through flame surface heat treatment, High strength and wear resistance at the surface.
		Chemical Composition rate(Wt,%)								
		Grade	C	Si	Mn	Cr	Mo	Others		
PST23F85		0.80	0.80	0.70	1.80	0.20				
		0.90	1.20	1.10	2.20	0.30				

PRE-HARDENED TOOL STEEL _SKT4(V)	Provided as in the condition of O/T heat treated. Mold machining customer can use material as mold without additional heat treatment.	Chemical Composition								Applications Tools for shaping materials in a hot state.	Product Characteristics Excellent Machinability, Outstanding thermal resistance, Impressive wear resistance, Uniform hardness
		Chemical Composition rate(Wt,%)									
		Grade	C	Si	Mn	Ni	Cr	Mo	V		
SKT4		0.50	0.10	0.60	1.50	0.80	0.35	0.05			
		0.60	0.40	0.90	1.80	1.20	0.55	0.15			
SKT4V*		0.55	0.35	0.80	1.50	1.10	0.33	0.18			





## Edelstahlwerk Kind & Co. GMH GRUPPE



### Premium Quality Tool Steel

KIND & Co. Edelstahlwerk has had more than 115 years of experience in the production, finishing and development of high alloy steels. Committed to our tradition, we have become a medium-sized international company which is still family owned.

Besides a large range of tool and RSH steels, we offer various special steels and also titanium or nickel based alloys. Furthermore, KIND & Co has developed special materials for numerous specific applications.

### Our tradition is the key to our future

Customer-orientation and quality - these are our values that we aspire to every day, with advanced technology and flexible production processes, integrated into a proven quality assurance system.

Our steels are used by all major industries e.g., die casting, plastics, extrusion, pipe technology, drop forging, power generation, aerospace, mechanical engineering, etc.

### Advanced Systems Engineering as a Prerequisite for Maximum Quality

#### • ESR

Advanced Systems Engineering as a Prerequisite for Maximum Quality

In order to repeatedly comply with specific quality requirements in terms of purity, mechanical properties or the potential to produce a high polish, ingots are produced using the ESR process, the maximum ingot weight being 25 tons.

#### • Open die forging

Using 2 hydraulic open die forging presses, the ingots are formed to comply with customers' specifications. Besides classic bar forming, our particular strength lies in the production of complex geometrical shapes such as cans, washers or individual forged parts.

#### • Heat treatment

Producing work-pieces with repeatable quality features takes decades of experience. In this context, the heat treatment parameters play a major role. Thanks to our great flexibility, we are able to meet individual requirements.

### INDUSTRIES

- Die casting • Drop forging • Extrusion
- Glass production • Pipe production
- Plastics technology • Power generation
- Process engineering • Special applications

### PRODUCTS

- Hot forming tool steels
- Cold forming tool steels
- Die steels • Plastic mould steels
- RSH steels • Nickel based alloys
- Special materials




**COMPETENCE IN TOOL STEEL**

## COLD WORK STEEL

Brand Name	AISI JIS	Characteristics	Resistance to Wear	Resistance to Chipping	Resistance to Plastic Deformation	Machinability
CH 16 V	D2 SKD 11	High Cr-alloyed ledeburitic cold-work tool steel with high abrasive wear resistant. Nitridable after special heat treatment				
CH 5M	A2-	Air-hardenable cold-work tool steel with well-balanced combination of wear resistance and toughness				
KL	S1	Oil-hardenable cold-work tool steel with good toughness and cutting properties				
CS1	-	This Cr-Mo-V-alloyed special tool steel, produced by ESSR, is characterized by very high toughness in combination with high hardness				
CR7V-L	-	The composition of this Cr-Mo-V-alloyed tool steel aims at high wear resistance in combination with high toughness				
PM 823	-	Special cold-work tool steel for a wide range of application. PMR 823 combines a very high abrasive wear resistance, outstanding compressive strength, very good tempering resistance & toughness				

## DIE CASTING

Globally-recognized quality for every die casting application

The die casting process is used for mass production of industrial components. The molten material is forced into a prefabricated die at high pressure and speed.

Brand name	Mat.-Nr.	AISI	Application	Toughness	Thermal shock resistance	Comments
CS1*	<b>Premium</b>	-	Applications with highest surface requirements and narrow shape tolerances			Combination of high hardness (up to max. 58 HRC) and good toughness at the same time
HP1*	<b>Premium</b>	-	Die casting inserts with highest mechanical and thermal loads			
TQ1*	<b>Premium</b>	-	High-performance die casting inserts, especially for large-format moulds and structural components			
HTR*	<b>Premium</b>	-	Local areas and small-format die casting inserts that are exposed to high thermal loads, max. hardness 42 HRC			Premium steel with excellent thermal conductivity
HMoD*	1.2889	H19A	Dies for heavy metal casting, highly stressed cores and inserts in the sprue area			Excellent hot strength and high hot wear resistance
RM10Co*	1.2888	-	Short sleeves, brass die casting			Extremely high tempering resistance
RPU**	1.2367	-	Small and medium-sized die casting die inserts			
USD**	1.2344	H13	Wisely applicable hot-work tool steel for thermally highly stressed dies			
USN**	1.2343	H11	Universally applicable hot-work tool steel with balanced properties			

\*only available in ESR-quality \*\*also available in ESR-quality

# DIE FORGING

## High demands - convincing performance - lower unit costs

Die forging is a manufacturing process in which the material to be processed is formed between two halves, or dies. At least one side of the die contains the negative of the shape of the later component.

Brand name	Mat.-Nr.	AISI	Application	Toughness	High-temperature strength	Hot wear resistance	Comments
Cr7V-L	Premium	-	High performance forging dies with high wear requirements.				Ideal for large series.
CS1*	Premium	-	Dies subjected to a combination of intensive wear with simultaneous risk of cracking - as in semi-hot forging and other demanding applications.				Combination of high hardness (up to max. 58 HRC) & good toughness at the same time.
DFA	Premium	-	Dies and inserts with simple engravings and high wear requirements.				
FTCo*	Premium	-	Dies & mandrels for high-speed forging machines, ejectors and semi-hot forging tools & near net shape forging tools.				
GSF	Premium	-	Highly stressed hammer dies, build-up welded press dies, large hammer dies & finishing dies for hydraulic presses, rams and tool holders.				Significant increase in performance compared to 1.2714 in case of cracking
HP1*	Premium	-	Forging of light metals, especially for deep cavities, e.g. chassis parts.				Particularly suitable for forging aluminium
HSF	Premium	-	Tools for mandrels, liners & medium-sized or larger stems in high-speed forging machines, round dies with high requirements for hot wear resistance combined with very good toughness, large product series and high tolerance requirements.				
HTR*	Premium	-	Dies requiring very high tempering resistance, forging of brass.				
LMF	Premium	-	Aluminium forging, forging dies subjected to cracking, finishing dies				Alternative to 1.2343, 1.2343 ESR
Q10	Premium	-	Dies subjected to high impact stress, dies with complex geometry, exposed to high thermal stress with high hot wear				
TQ1*	Premium	-	Medium and large press dies with deep cavity and intensively cooled multi-stage dies.				
PWM	1.2714	~L6	Hammer dies and press saddles.				
PWU	1.2744	-	Hammer dies, jaws on forging machines, moulding press dies.				More efficient alternative to PWM
RP	1.2365	H10	Small press dies, mandrels and dies for high-speed forging machines				
RPCo	1.2885	H10A	Moulding press dies, especially mandrel inserts for copper and copper alloys				
RPU	1.2367	-	Dies or die inserts under forging presses for steel forming				
USD	1.2344	H13	Widely applicable hot-work tool steel for press dies and inserts for steel and light metals				
USN	1.2343	H11	Universal hot-work tool steel for press dies and inserts for steel and light metals				



## DEUTSCHE EDELSTAHLWERKE

Providing special steel solutions



DEW are Part of one the largest tool steel manufacturing group with over 150 years of experience in steel making. They have four sites of manufacturing in Germany. We are proud to be associated with DEW since 2003. One of our most stocked product is from DEW-Germany and we stock most of the products in tool steel which they can make (Grades like DIN 1,3343 / 2343 / 2344 / 2714 / 2311 / 2738 / 2316 / 2085 / 2379 / 2550 / 2367 etc.). We are also qualified to carry on the heat treatment of their tool steels in our engineering unit as evaluated by them.

They have always been our pillar of strength and are most supportive to meet high quality demands of customers and users in India at most competitive prices. Their product range is large and are one of the most respected manufacturers for the most popularly used steel grades. For any further details we request you to visit [www.dew-stahl.com](http://www.dew-stahl.com)

Goel Steel stocks their products in our warehouses in Chennai, Mumbai and Sonapat.



Saarschmiede is over 100 years old company in Volklingen in Germany, with 85 Mn ton pressing and forgings which can weigh upto 150 tons and over 26 mtrs in length. With and ESR plant and wide range of products, they are ideal for high quality custom made steels in various grades.

They specialise in power generation and special engineering equipments. We are with them for their tool steels. We are mainly stock products of 2714/2738/2344 from them. Please visit [www.saarschmiede.com](http://www.saarschmiede.com) for further details on them.



Metal Ravne one of the most versatile companies when it comes to Tool steel products with immense variety of normal and special grades and a very competitive price form a very important and stable part of our product mix. They also have their plate manufacturing company by Name ACRONI.

For sure their products are considered at par with best manufacturers across the globe. We currently stock a big mix of their products in cold work and hot work tool steels. For any further details we request you to visit [www.sij-steel.de](http://www.sij-steel.de)



## THE GOEL STEEL COMPANY ADVANTAGE

Goel Steel Company distinguishes itself through a rare combination of true end-to-end integration, scale, and technical expertise. As India's only company to offer special steel material supply, precision machining, and advanced vacuum heat treatment under one roof, Goel Steel Company delivers unmatched control over quality, timelines, and consistency. This integrated operating model minimizes supply-chain risk, shortens lead times, and ensures reliable metallurgical outcomes for demanding industrial applications.

Backed by over five decades of experience, Goel Steel Company operates one of the industry's most comprehensive infrastructures—featuring heavy-duty machining capabilities, micron-level precision equipment, European-technology vacuum heat treatment systems, and in-house metallurgical testing. A strong and diverse stocking program of global-grade special steels further enables rapid response, scalability, and uninterrupted supply for both standard and critical requirements.

Beyond infrastructure, the Goel Steel Company advantage is built on trust and long-term partnership. With more than 1,000 customers and decades of repeat business, the company is recognized for its disciplined quality systems, transparent practices, and solution-oriented approach. Goel Steel Company is not merely a supplier, but a strategic partner—committed to delivering performance, reliability, and confidence in every engagement.

## POWERING PERFORMANCE. DELIVERING CONFIDENCE.

As industries demand higher precision, longer tool life and faster delivery, Goel Steel Company continues to lead with technology, reliability and scale.

From material to machining to final treatment— **Goel Steel Company is your complete partner in special steels and engineering solutions.**

# QUALITY ASSURANCE AND WARRANTY COMMITMENT

Quality is embedded at every stage of Goel Steel Company's operations.

- Materials supplied strictly as per agreed technical specifications
- Comprehensive inspection and testing protocols
- Warranty assurance on material conformity prior to heat treatment
- Clear accountability and transparent processes

This disciplined approach ensures confidence, consistency and long-term reliability for customers worldwide.



Covering all grades supplied from our stocks

- We warrant to the purchaser the conformity of the material supplied to the technical standards and specification laid down in the contract mutually agreed which form the order specification reconfirmed by the seller.
- The validity of the warranty of specification is unlimited and we stand guarantee for the same and if at any time noticed otherwise we shall undertake to replace the material with all costs of the buyer reimbursed by us.
- Any internal defect should be notified before heat treatment and our warranty for any such defect cease to exist after heat treatment.
- The warranty shall be deemed exclusive also in view of possibly given other guarantees whether written or verbally implied.





**GOEL**  
STEEL COMPANY  
Special Steels • Engineering Services

#### UNIT - I

89 A, MTH Road, Ambattur Industrial Estate,  
Chennai. Tamil Nadu. India. PIN - 600058.  
P : +91 - 98410 21420  
E : info@goelsteel.com

Band saw cutting machines : 14 nos  
M/C Capacity (HXW) : 1150 x 1300

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#### UNIT - II

NH-4, Road, (Opp. Hyundai Motors Company),  
Irungattukottai, Sriperumbudur. Tamil Nadu  
PIN - 602105,  
P : +91 - 98410 17263  
E : admin2@goelsteel.com

Band saw cutting machines : 8 nos  
M/C Capacity (HXW) : 1000/1150 x 2000

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#### UNIT - III

NH-4, Road, (Opp. Hyundai Motors Company),  
Irungattukottai, Sriperumbudur. Tamil Nadu.  
PIN - 602105,  
P : +91 - 91596 34267  
E : unit2@goelsteel.com

Band saw cutting machines : 7 nos  
M/C Capacity (HXW) : 650 x 900

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#### UNIT - IV

Plot No. 27, Phase IV, Sector-57, HSIDC, Kundli  
Sonapat. Haryana. PIN - 131028,  
P : +91 - 98911 64135  
E : salesnorth@goelsteel.com

Band saw cutting machines : 10 nos  
Max. Size : 1000 x 1200

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#### UNIT - V

**KIND SPECIAL STEEL INDIA PVT LTD**  
Plot 17/8 & 17/9, Chemical Zone, Taloja M.I.D.C.,  
Navi Mumbai. Maharashtra. PIN- 410 208  
P : +91 - 98201 70604  
E : saleswest@goelsteel.com

Band saw cutting machines : 10 nos  
Max. Size : 1500 - 1000 MM

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#### UNIT - VI

**GOEL SPECIAL STEELS & ENGINEERING  
PRIVATE LIMITED**  
F8 & F9, 1<sup>st</sup> Cross, 8<sup>th</sup> Main Road,  
Sipcot Industrial Estate, Irungattukottai,  
Sriperumbudur Kancheepuram, Tamil Nadu.  
PIN - 602 117.  
P : +91 - 98412 37335  
E : admin@goelsteel.com

Band saw cutting machines : 8 nos  
Max. Size : 1300 x 1100

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#### UNIT - VII

F56, 3rd Cross, 8th Main Road,  
Sipcot Industrial Estate, Irungattukottai,  
Sriperumbudur, Kancheepuram, Tamil Nadu  
PIN - 602 117  
P : +91 - 98412 37335  
E : unit7@goelsteel.com

Band saw cutting machines : 14 nos  
Max. Size : 2000 x 1600

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[www.goelsteel.com](http://www.goelsteel.com)

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TOOLS, DIES AND SERVICES THAT SPELL  
**PERFECTION**  
AND ARE CREATED TO  
**CARE**  
FOR YOUR INDUSTRIAL PROCESS