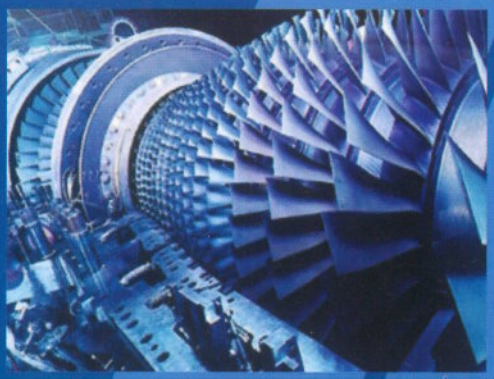
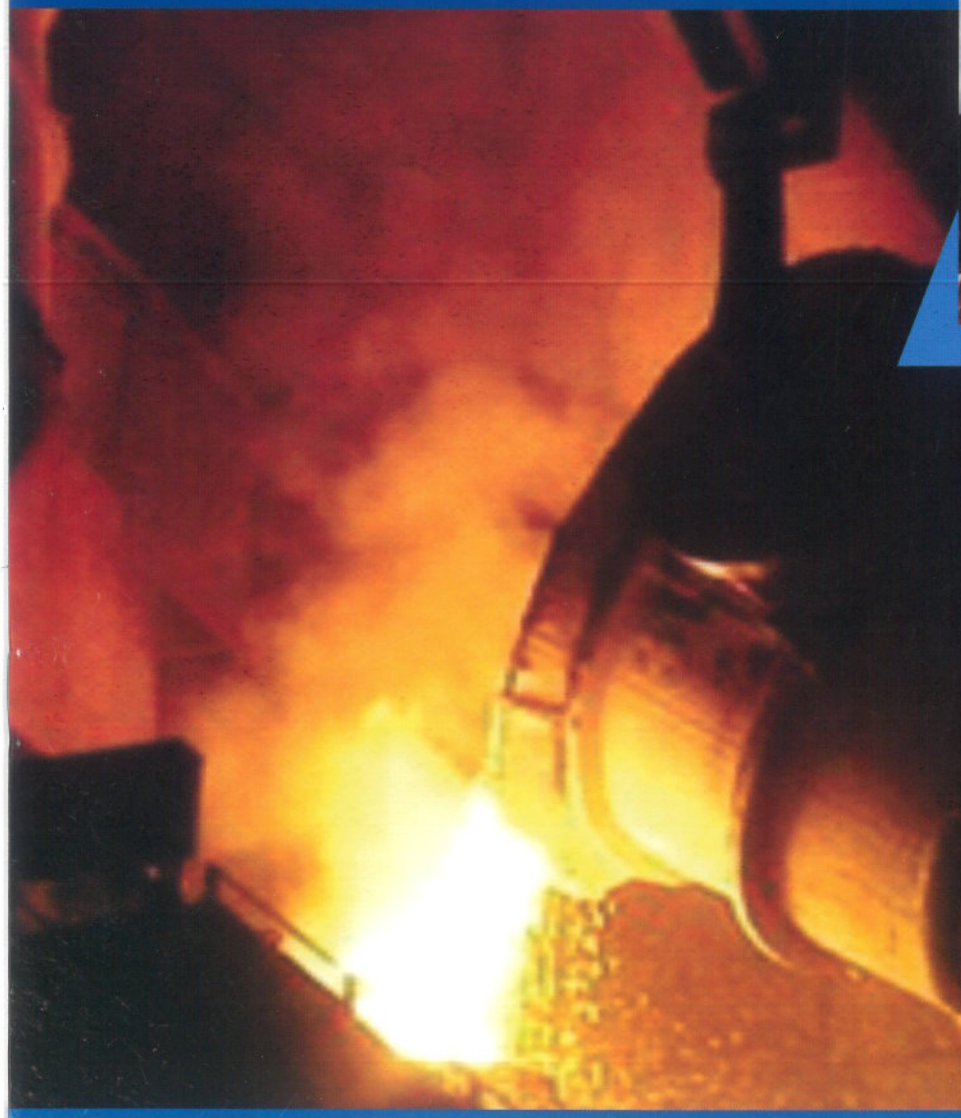
Tool Steels





SUN FLAG STEEL

Tool steels are high quality steels made to controlled chemical composition and processed to develop properties useful for working and shaping of other materials.The carbon content in tool steel may range from as low as 0.1% to as high as more than 1.6%. They are alloyed with elements such as Chromium, Molybdenum, Vanadium Tungsten etc.

At Sunflag Tool Steels are produced through specially designed steel making process via Electric Arc Furnace followed by Ladle Refining and Vacuum Degassing and processed through ESR / VAR for ensuring homogeneous properties &Ultra clean material. Stringent control is practiced during designing of chemical composition and other process parameters during casting, rolling / forging and heat treatment.

Electro Slag Re-melting (ESR)

Vacuum Arc Re-melting (VAR)

Type & application of tool steels:

- Water hardening tool steel(e.g. cold heading, cutting tools, knives, reamers and cutlery etc)
- Shock resisting tool steel (e.g. chisel for hot and cold cutting, chuck jaws, gripper, cold shear, hot shear etc.)
- Cold work tool steel [3 types]
  - ✓ Oil hardening cold work tool steel(thread cutting, die blanking, cold-forming, cold trimming, gauges etc.)
  - ✓ Medium alloy air hardening cold work tool steel (blanking, coining, cold forming, cold swaging, cold trimming tools, gauges etc.)
  - ✓ High carbon, high chromium cold work tool steel(die inserts, cold-forming, cold shaping, thread roll, cold trimming, wire drawing etc.)
- Low alloy special purpose tool steel(forging dies, die casing, file cutting, paper cutter, die bending, blanking and coining etc.)
- Mold tool steel(plastic mold)
- Hot work tool steel (die casting dies, hot extrusion dies, hot forging dies, hot swaging, hot trimming, hot shear, hot gripper etc).
- High Speed Steels (Single point cutting tools, broach insert, tap, drill, reamers, milling cutters, saws)

Aluminum extrusion dies

Hot forging punch/die

Supply Conditions

From Bloom, Ingot or ESR Remelted Ingot

Supply Condition
Forged, Annealed & Proof Machined
Forged & Annealed
Rolled & Annealed
Rolled, Annealed, Peeled & Ground
As Forged
As Rolled

Sizes

Hot Rolled Rounds	15 to 250mm
Forged Rounds	160 to 500mm
Flats / Plates	150mm (T) x 450mm (W)
Peeled & Ground	5 to 100mm
Drawn & Ground	5 to 34mm
Forged Blocks	350(T) x 600 (W) x 5460(L)

Flats / Plates can also be supplied in following Thickness:

12, 14, 16, 28, 32, 35, 40, 42, 48, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100, 110, 120, 130, 140, 150

Grades of Tool Steels

Water-hardening tool steels

AISI	UNS	C	Mn	Si	Cr	Ni	Mo	W	V	Co
W1	T72301	0.70-1.50	0.10-0.40	0.10-0.40	0.15 max	0.20 max	0.10 max	0.15 max	0.10 max	-
W2	T72302	0.85-1.50	0.10-0.40	0.10-0.40	0.15 max	0.20 max	0.10 max	0.15 max	0.15-0.35	-
W3	T72305	1.05-1.15	0.10-0.40	0.10-0.40	0.40-0.60	0.20 max	0.10 max	0.15 max	0.10 max	-

Shock-resisting steels

AISI	UNS	C	Mn	Si	Cr	Ni	Mo	W	V	Co
S1	T41901	0.40-0.55	0.10-0.40	0.15-1.20	1.00-1.80	0.30 max	0.50 max	1.50-3.00	0.15-0.30	-
S2	T41902	0.40-0.55	0.30-0.50	0.90-1.20	-	0.30 max	0.30-0.60	-	0.50 max	-
S5	T41905	0.50-0.65	0.60-1.00	1.75-2.25	0.50 max	-	0.20-1.35	-	0.35 max	-
S6	T41906	0.40-0.50	1.20-1.50	2.00-2.50	1.20-1.50	-	0.30-0.50	-	0.20-0.40	-
S7	T41907	0.45-0.55	0.20-0.90	0.20-1.00	3.00-3.50	-	1.30-1.80	-	0.20-0.30	-

Oil-hardening cold-work steels

AISI	UNS	C	Mn	Si	Cr	Ni	Mo	W	V	Co
O1	T31501	0.85-1.00	1.00-1.40	0.50 max	0.40-0.60	0.30 max	-	0.40-0.60	0.30 max	-
O2	T31502	0.85-0.95	1.40-1.80	0.50 max	0.50 max	0.30 max	0.30 max	-	0.30 max	-
O6	T31506	1.25-1.55	0.30-1.10	0.55-1.50	0.30 max	0.30 max	0.20-0.30	-	-	-
O7	T31507	1.10-1.30	1.00 max	0.60 max	0.35-0.85	0.30 max	0.30 max	1.00-2.00	0.40 max	-

Air-hardening, medium-alloy, cold-work steels

AISI	UNS	C	Mn	Si	Cr	Ni	Mo	W	V	Co
A2	T30102	0.95-1.05	1.00 max	0.50 max	4.75-5.50	0.30 max	0.90-1.40	-	0.15-0.50	-
A3	T30103	1.20-1.30	0.40-0.60	0.50 max	4.75-5.50	0.30 max	0.90-1.40	-	0.80- 1.40	-
A4	T30104	0.95-1.05	1.80-2.20	0.50 max	0.90-2.20	0.30 max	0.90-1.40	-	-	-
A6	T30106	0.65-0.75	1.80-2.50	0.50 max	0.90-1.20	0.30 max	0.90-1.40	-	-	-
A7	T30107	2.00-2.85	0.80 max	0.50 max	5.00-5.75	0.30 max	0.90-1.40	0.50- 1.50	3.90-5.15	-
A8	T30108	0.50-0.60	0.50 max	0.75-1.10	4.75-5.50	0.30 max	1.15-1.65	1.00- 1.50	-	-
A9	T30109	0.45-0.55	0.50 max	0.95-1.15	4.75-5.50	1.25-1.75	1.30-1.80	-	0.80- 1.40	-
A10	T30110	1.25-1.50	1.60-2.10	1.00-1.50	-	1.55-2.05	1.25-1.75	-	-	-

High-carbon, high-chromium, cold-work steels

AISI	UNS	C	Mn	Si	Cr	Ni	Mo	W	V	Co
D2	T30402	1.40-1.60	0.60 max	0.60 max	11.00-13.00	0.30 max	0.70-1.20	-	1.10 max	-
D3	T30403	2.00-2.35	0.60 max	0.60 max	11.00-13.50	0.30 max	-	1.00 max	1.00 max	-
D4	T30404	2.05-2.40	0.60 max	0.60 max	11.00-13.00	0.30 max	0.70-1.20	-	1.00 max	-
D5	T30405	1.40-1.60	0.60 max	0.60 max	11.00-13.00	0.30 max	0.70-1.20	-	1.00 max	2.50-3.50
D7	T30407	2.15-2.50	0.60 max	0.60 max	11.50-13.50	0.30 max	0.70-1.20	-	3.80-4.40	-

Low-alloy special-purpose tool steels

AISI	UNS	C	Mn	Si	Cr	Ni	Mo	W	V	Co
L2	T61202	0.45-1.00	0.10-0.90	0.50 max	0.70-1.20	-	0.25 max	-	0.10-0.30	-
L6	T61206	0.65-0.75	0.25-0.80	0.50 max	0.60-1.20	1.25-2.00	0.50 max	-	0.20-0.30	-

Low-carbon mold steels

AISI	UNS	C	Mn	Si	Cr	Ni	Mo	W	V	Co
P2	T51602	0.10 max	0.10-0.40	0.10-0.40	0.75-1.25	0.10-0.50	0.15-0.40	-	-	-
P3	T51603	0.10 max	0.20-0.60	0.40 max	0.40-0.75	1.00-1.50	-	-	-	-
P4	T51604	0.12 max	0.20-0.60	0.10-0.40	4.00-5.25	-	0.40-1.00	-	-	-
P5	T51605	0.10 max	0.20-0.60	0.40 max	2.00-2.50	0.35 max	-	-	-	-
P6	T51606	0.05-0.15	0.35-0.70	0.10-0.40	1.25-1.75	3.25-3.75	-	-	-	-
P20	T51620	0.28-0.40	0.60-1.00	0.20-0.80	0.40-2.00	-	0.30-0.55	-	-	-
P21	T51621	0.18-0.22	0.20-0.40	0.20-0.40	0.50 max	3.90-4.25	-	-	0.15-0.25	1.05-1.25

Chromium hot-work steels

AISI	UNS	C	Mn	Si	Cr	Ni	Mo	W	V	Co
H10	T20810	0.35-0.45	0.25-0.70	0.80-1.20	3.00-3.75	0.30 max	2.00-3.00	-	0.25-0.75	-
H11	T20811	0.33-0.43	0.20-0.50	0.80-1.20	4.75-5.50	0.30 max	1.10-1.60	-	0.30- 0.60	-
H12	T20812	0.30-0.40	0.20-0.50	0.80-1.20	4.75-5.50	0.30 max	1.25-1.75	1.00- 1.70	0.50 max	-
H13	T20813	0.32-0.45	0.20-0.50	0.80-1.20	4.75-5.50	0.30 max	1.10-1.75	-	0.80- 1.20	-
H14	T20814	0.35-0.45	0.20-0.50	0.80-1.20	4.75-5.50	0.30 max	-	4.00- 5.25	-	-
H19	T20819	0.32-0.45	0.20-0.50	0.20-0.50	4.00-4.75	0.30 max	0.30-0.55	3.75- 4.50	1.75-2.20	4.00-4.50

Tungsten hot-work steels

AISI	UNS	C	Mn	Si	Cr	Ni	Mo	W	V	Co
H21	T20821	0.28-0.36	0.15-0.40	0.15-0.50	3.00-3.75	0.30 max	-	8.50-10.00	0.30-0.60	-
H22	T20822	0.30-0.40	0.15-0.40	0.15-0.40	1.75-3.75	0.30 max	-	10.00-11.75	0.25- 0.50	-
H23	T20823	0.25-0.35	0.15-0.40	0.15-0.60	11.00-12.75	0.30 max	-	11.00-12.75	0.75- 1.25	-
H24	T20824	0.42-0.53	0.15-0.40	0.15-0.40	2.50-3.50	0.30 max	-	14.00-16.00	0.40- 0.60	-
H25	T20825	0.22-0.32	0.15-0.40	0.15-0.40	3.75-4.50	0.30 max	-	14.00-16.00	0.40- 0.60	-
H26	T20826	0.45-0.55	0.15-0.40	0.15-0.40	3.75-4.50	0.30 max	-	17.25-19.00	0.75-1.25	-

Molybdenum hot-work steels

AISI	UNS	C	Mn	Si	Cr	Ni	Mo	W	V	Co
H42	T20842	0.55-0.70	0.15-0.40	-	3.75-4.50	0.30 max	4.50- 5.50	5.50-6.75	1.75-2.20	-

Molybdenum high-speed steels

AISI	UNS	C	Mn	Si	Cr	Ni	Mo	W	V	Co
M1	T11301	0.78-0.88	0.15-0.40	0.20-0.50	3.50-4.00	0.30 max	8.20-9.20	1.40-2.10	1.00-1.35	-
M2	T11302	0.78-0.88; 0.95-1.05	0.15-0.40	0.20-0.45	3.75-4.50	0.30 max	4.50-5.50	5.50-6.75	1.75-2.20	-
M3, class 1	T11313	1.00-1.10	0.15-0.40	0.20-0.45	3.75-4.50	0.30 max	4.75-6.50	5.00-6.75	2.25-2.75	-
M3, class 2	T11323	1.15-1.25	0.15-0.40	0.20-0.45	3.75-4.50	0.30 max	4.75-6.50	5.00-6.75	2.75-3.75	-
M4	T11304	1.25-1.40	0.15-0.40	0.20-0.45	3.75-4.75	0.30 max	4.25-5.50	5.25-6.50	3.75-4.50	-
M7	T11307	0.97-1.05	0.15-0.40	0.20-0.55	3.50-4.00	0.30 max	8.20-9.20	1.40-2.10	1.75-2.25	-
M10	T11310	0.84-0.94; 0.95-1.05	0.10-0.40	0.20-0.45	3.75-4.50	0.30 max	7.75-8.50	-	1.80-2.20	-
M30	T11330	0.75-0.85	0.15-0.40	0.20-0.45	3.50-4.25	0.30 max	7.75-9.00	1.30-2.30	1.00-1.40	4.50-5.50
M33	T11333	0.85-0.92	0.15-0.40	0.15-0.50	3.50-4.00	0.30 max	9.00-10.00	1.30-2.10	1.00-1.35	7.75-8.75
M34	T11334	0.85-0.92	0.15-0.40	0.20-0.45	3.50-4.00	0.30 max	7.75-9.20	1.40-2.10	1.90-2.30	7.75-8.75
M35	T11335	0.82-0.88	0.15-0.40	0.20-0.45	3.75-4.50	0.30 max	4.50-5.50	5.50-6.75	1.75-2.20	4.50-5.50
M36	T11336	0.80-0.90	0.15-0.40	0.20-0.45	3.75-4.50	0.30 max	4.58-5.50	5.50-6.50	1.75-2.25	7.75-8.75
M41	T11341	1.05-1.15	0.20-0.60	0.15-0.50	3.75-4.50	0.30 max	3.25-4.25	6.25-7.00	1.75-2.25	4.75-5.75
M42	T11342	1.05-1.15	0.15-0.40	0.15-0.65	3.50-4.25	0.30 max	9.00-10.00	1.15-1.85	0.95-1.35	7.75-8.75
M43	T11343	1.15-1.25	0.20-0.40	0.15-0.65	3.50-4.25	0.30 max	7.50-8.50	2.25-3.00	1.50-1.75	7.75-8.75
M44	T11344	1.10-1.20	0.20-0.40	0.30-0.55	4.00-4.75	0.30 max	6.00-7.00	5.00-5.75	1.85-2.20	11.00-12.25
M46	T11346	1.22-1.30	0.20-0.40	0.40-0.65	3.70-4.20	0.30 max	8.00-8.50	1.90-2.20	3.00-3.30	7.80-8.80
M47	T11347	1.05-1.15	0.15-0.40	0.20-0.45	3.50-4.00	0.30 max	9.25-10.00	1.30-1.80	1.15-1.35	4.75-5.25
M47	T11348	1.42-1.52	0.15-0.40	0.15-0.40	3.50-4.00	0.30 max	4.75-5.50	9.50-10.50	2.75-3.25	8.00-10.00
M62	T11362	1.25-1.35	0.15-0.40	0.15-0.40	3.50-4.00	0.30 max	10.00-11.00	5.75-6.50	1.80-2.10	-

Tungsten high-speed steels

AISI	UNS	C	Mn	Si	Cr	Ni	Mo	W	V	Co
T1	T12001	0.65-0.80	0.10-0.40	0.20-0.40	3.75-4.50	0.30 max	-	17.25-18.75	0.90-1.30	-
T2	T12002	0.80-0.90	0.20-0.40	0.20-0.40	3.75-4.50	0.30 max	1.0 max	17.50-19.00	1.80-2.40	-
T4	T12004	0.70-0.80	0.10-0.40	0.20-0.40	3.75-4.50	0.30 max	0.40-1.00	17.50- 19.00	0.80-1.20	4.25-5.75
T5	T12005	0.75-0.85	0.20-0.40	0.20-0.40	3.75-5.00	0.30 max	0.50-1.25	17.50-19.00	1.80- 2.40	7.00-9.50
T6	T12006	0.75-0.85	0.20-0.40	0.20-0.40	4.00-4.75	0.30 max	0.40-1.00	18.50-21.00	1.50- 2.10	11.00-13.00
T8	T12008	0.75-0.85	0.20-0.40	0.20-0.40	3.75-4.50	0.30 max	0.40-1.00	13.25-14.75	1.80- 2.40	4.25-5.75
T15	T12015	1.50-1.60	0.15-0.40	0.15-0.40	3.75-5.00	0.30 max	1.00 max	11.75- 13.00	4.50-5.25	4.75-5.25

Intermediate high - speed steels

AISI	UNS	C	Mn	Si	Cr	Ni	Mo	W	V	Co
M50	T11350	0.78-0.88	0.15-0.45	0.20-0.60	3.75-4.50	0.30 max	3.90-4.75	-	0.80- 1.25	-
M52	T11352	0.85-0.95	0.15-0.45	0.20-0.60	3.50-4.30	0.30 max	4.00-4.90	0.75-1.50	1.65- 2.25	-

Testing Facilities at Sunflag Steel

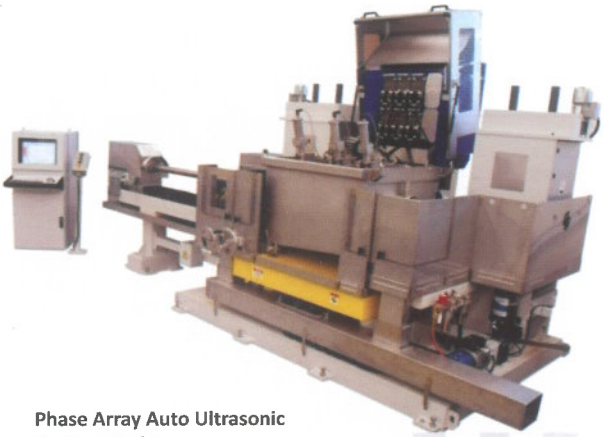
Unique Facilities at Sunflag

Immersion Ultrasonic Testing Machine

Scanning Electron Microscope with EDS

State of the Art Process Technology

Upright Metallurgical Microscope with CLEMEX software



Phase Array Auto Ultrasonic Testing Machine

Magnetic Flux Leakage Testing (MFLT)

Eddy Current Testing for Bar

Eddy Current Testing for Wire Rod

XRF Spectrometer- Anti-mix up Test.

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SUNFLAG STEEL

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ISO 9001 & IATF 16949 Certified by UL DQS
ISO 14001 & ISO 45001 Certified by TUV Nord
AD 2000 Merkblatt WO /PED Certified by TUV Nord

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