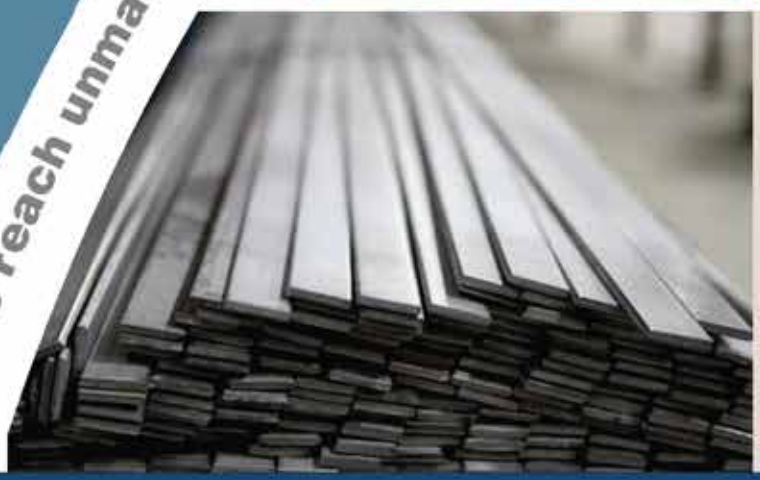
SUNFLAG STEEL

BIS Approved
NABL Accreditated Chem & Mech Labs.
ISO 9001 & IATF16949 Certified by UL DQS
ISO 14001 & OHSAS 18001 Certified by TUV Nord
AD 2000 Merkblatt WO /PED Certified by TUV Nord

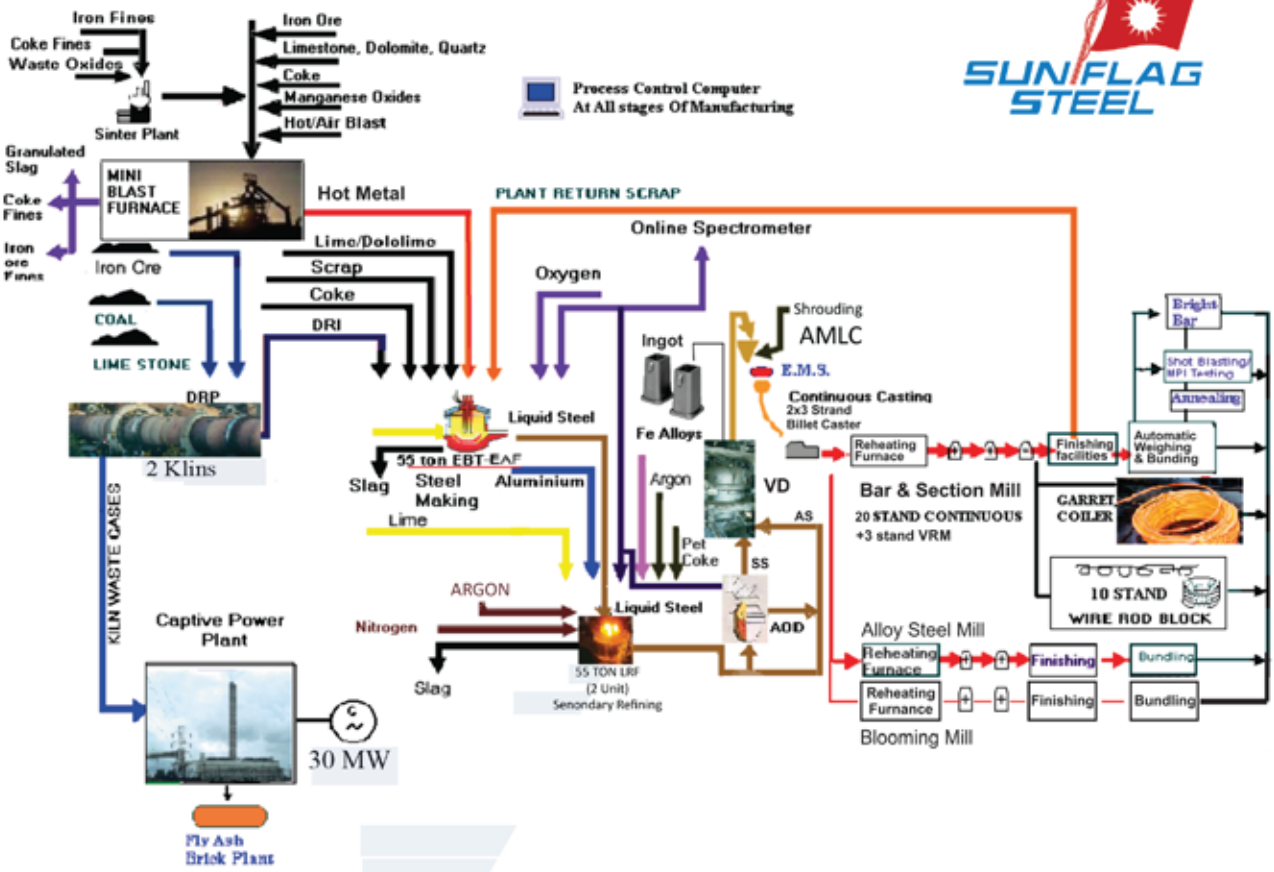
To reach unmatched quality standards, one has to go through fire.



About

A mission and commitment to add qualitative value for enhanced customer satisfaction has been the guiding philosophy at the Sunflag Group which has a major presence in Kenya, Nigeria, Tanzania, Cameroon, Thailand, U.K., Canada & India. The well diversified group has interests in Steel, Synthetic Yarn, Fabric, Garments & Non-woven Textiles. With setting up of the one of most advanced composite steel plant in the world, Sunflag has revolutionized the steel industry in India. This plant has a capacity of producing 5,00,000 tones per annum of high quality rolled products of a varied product mix, including a wide range of Carbon Steels, Alloy Steels, Free Cutting Steels, Spring Steels, Stainless Steels, Bearing Steels, Cold Forging Steels, Engine Valve Steels, Microalloyed Steels & Value Added Steels. Sunflag's clientele includes original equipment manufactures in Automobiles, Railways, Defence, Forging and Bright Bar Industries.

Process Route



DRP : Direct Reduction Plant
DRI : Direct Reduced Iron
EAF : Electric Arc Furnace
EBT : Eccentric Bottom Tapping

LRF : Ladle Refining Furnace
AOD : Argon Oxygen Decarburisation
VD : Vacuum Degassing
EMS : Electro Magnetic Stirrer

AMLC : Auto Mould Level Controller
VRM : Variable Reduction Mill
AS : Alloy Steel
SS : Stainless Steel

For downstream processing of hot rolled bars/coils, the following facilities are available

- **Pickling / Phosphating**
- **Normalising**
- **Spherodize Annealing**
- **Hardening Tempering**
- **Solution Annealing**
- **Bright Bar manufacturing by peeling, drawing & centreless grinding**
- **Wire drawing**

Sunflag Product Range

Ingot size & WT.	Billet/Bloom size	Rolled Product		Bright Bar	
		Shape	Size Range	Type	Size Range
540 x 700 x 1700 - 5T	130 x 130 mm	Straight length rounds	15-350mm dia	Peeled & ground bars	5-100 mm dia
480 x 637 x 1700 - 4.2 T	160 x 160 mm	Straight length Hexagons	15.5-42mm A/F		
402 x 500 x 1700 - 3T	210 x 232 mm	Wire rod rounds	5.5-38mm	Drawn & ground bars	6-34mm dia
323 x 412 x 1700 - 2.7T	240 x 280 mm	Wire rod hexagon	13.5-25.5 A/F		
290 x 445 x 1700 - 1.8T	280 x 320 mm	Round corner squares	40-350mm	Drawn/ SAPPD wires	5 to 30mm
		Flat (Width/Thickness)	50-150/5-34 mm		

Research & Development :

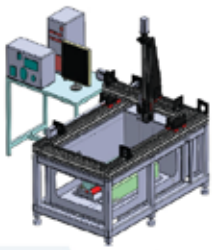
R & D division of Sunflag Iron Steel Co. Ltd plays a pivotal role in retaining and consolidating Sunflags' leadership position in automobile industry.

SEM - EDS

R & D focus on development of new steel grades, process improvement, continous up-gradation of Quality, Customer Satisfaction through customized products matching with their specific requirement.

Sunflag R&D lab is equipped with following state of the art equipment:-

- Scanning Electron Microscope with Energy Dispersive X-Ray Spectroscope (SEM-EDS) of Make - JOEL
- Immersion Ultrasonic Testing Facility of Make- Olympus/Blue Star
- Optical MIcroscope with Automatic Multiaxis Stage Movement and Image Analysis software
- Micro-hardness tester
- Ferritometer



Immersion UT

Online Inspection Facility :

- **Phased Array Auto Ultrasonic Testing**

  Ultrasonic testing unit for round bars (15 to 120 mm size) base on phased array technology. It has great detection sensitivity with high detection repeatability of unique Olympus floating head concept that provides capability to detect defects smaller than SDH 0.5mm

Phased Array Auto UT

- **Magnetic Flux Leakage Testing (MFLT)**

  MFLT (make-Novaflux) is an automated flux leakage inspection system for ferromagnetic round bars (15 to 120mm size) to find longitudinal surface flaws using high energy alternating current magnetic leak fields.

- **Eddy Current Testing (ECT)**

  Eddy current testing is a non destructive testing technique making use of electromagnetic induction to detect and characterize surface and subsurface flaws for bright bars.

MFLT

Product Acceptance :

- GM, Volvo, Ford, Daimler, Tata Motors, Mahindra & Mahindra, Ashok Layland, Eicher Volvo, Force Motor, JCB
- Honda, Nissan, Maruti Suzuki, Hyundai, Fiat, Toyota, Lamborghini
- Bajaj Auto, TVS, HMSI, Yamaha, Hero, Suzuki, Royal Enfield
- Escorts, Jhon Dere, TAFE, Sonalika, New Holland
- Bosch, Sona Koyo, GKN, JTEKT, NHK, Meritor, TRW, Schaefller, NBC, NTN, Sonic ZF, Nexteer, GNA, Graziano Oerlikon, Carraro, Sona BLW, Sundram Fastners, Musashi, Stumpp Schuele, Dana Copr., Denso
- BHEL, L&T, NTPC
- Indian Railways
- Defence (Ordinance Factory)

Competitive Advantage of Sunflag Products

	FACILITIES	PRODUCT STRENGTH
1	Inhouse manufacturing facility for DRI and Pig Iron	Reliable and dependable supplier Consistancy in input material quality
2	100% virgin material in charge mix	Products with very low tramp elements and free from radioactive contamination
3	Steel making through Process control computers	Close chemistry range with high repeatability
4	Vaccum Degassing	Reduction in gas level & improved cleanliness of steel
5	Equipped with Mould Electromagnetic stirrer (EMS)	Improved cleanliness Free from central segregation, piping, central porosity and minimum columnar structure, Enhanced mechanical properties Controlled Hardenability Band
6	100% close casting facility from ladle to tundish and tundish to mould	Cleaner steel due to absence of reoxidation
7	Automatic mould level controller	Ensure high integrity of chill zone in the cast billet / bloom assuring high degree of surface and subsurface soundness
8	Auto mould powder feeder	Improved surface quality of billet
9	Foot EMS	Reduction in carbide segregation in bearing steel
10	Ingot Casting Facility	To produce high alloy steel & rolled product with high reduction ratio
11	Duplex/Triplex process for stainless steel	Very low gas levels in stainless steel
12	Computer control heating and furnace Oxygen atmosphere in walking beam reheating furnace	Uniform temperature in billet,minimum decarburisation in rolled product
13	Sophisticated PLC controlled 20 stand continuous mill with water quenching facility	Good size control for defect free rolling by controlling inter stand tension
14	Danieli make 3 stand VRM	VRM ensures close dimensional tolerence of 1/4 th of standardDIN 1013 or 60% IS 3739 .Assurance of minimum size variation along the length of bar.As per customer's urgency , size changing flexibility helps in minimising changeover time.
15	Danieli make 10 stand block mill facility	Good size control and effective temperature control in finish product and uniform control cooling
16	Cooling bed fully covered for controlled cooling of rolled product	Controlled 'As rolled hardness' and controlled grain size of rolled products
17	Rake type cooling bed	Assured straightness of rolled products
18	Cold shear equipped with mechanical gauge control	Fixed length product
19	Cut length optimization through cooling bed computers	Minimisation of short length generation
20	Marketing offices & stock yard are connected with plant by SAP	Effective monitoring of progress on order execution
21	Sunflag online posting order on website and app	Customer can track order status at any time on app.

QMS Certification and Approvals

The guiding Philosophy in Sunflag Steel is enhancing customer satisfaction through continual improvement. To continuously achieve higher level of performance in these areas sunflag had adopted and effectively implemented various Quality Management system.

QMS Standards Certified	Standard Scope	Certification Body
ISO 9001	Quality Management Systems	UL DQS , Germany
IATF 16949	Global Automotive Quality Management Systems	UL DQS , Germany
ISO 14001	Environment Management Systems	TUV Nord, Germany
OHSAS 18001	Occupational Health & Safety Management Systems	TUV Nord, Germany
AD 2000 - Merkblatt WO / PED	QA System for Material Manufacturer as per Pressure Equipment Directives 97/23/EC & AD 2000 - Merkblatt WO	TUV Nord, Germany
NABL (National Acccreditation Board for Testing & Calibration Laboratoies)	Sunflag Chemical & Mechanical Laboratories certified by NABL.	NABL India

SUNFLAG STEEL

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BEARING STEELS

BEARING STEELS

PROCESS	EQUIPMENT	KEY PROCESS CHARACTERISTICS	EFFECT ON PRODUCT QUALITY
PRIMARY MELTING	EAF WITH EBT AND LOAD CELL ELECTRIC ARE FERVOCE WITH ELECTRIC BOTTOM TAPPING AND LOAD CELL	• GOOD CARBON BOIL • SLAG FREE TAPPING • LM WEIGHT MONITORING • LIQUID METAL	• FREE FROM UNDESIRABLE TRAMP ELEMENTS • LOW TRAMP ELEMENTS DUE TO USE OF OWN VIRGIN • RAW MATERIAL, SUCH AS DRI, PIG IRON. LOW PHOSPHORUS LEVEL TO IMPROVE COLD FORGEABILITY. • LOW N2 LEVEL AT TAPPING STAGE, • CONTROLLED FEO IN SLAG TO ENSURE LOW O2 FOR SUBSEQUENT STEEL REFINING
SECONDARY REFINING	LADLE REFINING FURNACE WITH COMPUTRISED FERROALLY FEEDING SYSTEM	• ARGON PURGING • MICROPROCESSOR BASED FERROALLOY ADDITION SYSTEM • CONTROLLED POWER INPUT	• ACHIEVEING FINAL PRODUCT CHEMISTRY WITH HIGH REPETABILITY. • PREDICTABLE ALLOY RECOVERY AND LESS FORMATION OF DEOXIDATION OF PRODUCTS. HIGH BASICITY FOR DEEP DESUL PHURISATION AND INCLUSION REMOVAL. FACILITY FOR TRIM ADDITION TO ACHIEVE CLOSE RANGE OF TARGET CHEMISTRY.
DEGASSING	STATIC TANK TYPE VACUUM DEGASSING	• HIGH SUCTION CAPACITABILITY TO • ACHIEVE VACUUM <1 m bar • ARGON PURGING/RINSING	• REDUCTION IN DISSOLVE GAS LEVELS O2,N2,H2 • SIGNIFICANT REDUCTION IN SULPHUR LEVEL • COMPLETE HOMOGENISATION OF CHEMISTRY AND TEMPERATURE FOR SMOOTH CASTING.
WIRE INJECTION	3 STRAND WIRE INJECTION EQUIPMENT FOR CARBENSULPHOR AND ALLUMINIUM	FINE ADJUSTMENT OF C & S & ALLUMINIUM	PRECISE CONTROL OF C ,S AND ALUMINIUM.
CASTING	CONTINOUS CASTER 3 STRANDS WITH AMLC/EMS, SUBMERGED NOZZLE CASTING AND LEVEL 2 AUTOMATION	• BASIC REFRACTORIES. • CONTROL ON SUPER HEAT, • CASTING SPEED, • UNIFORM SECONDARY COOLING, • STABLE CASTING	• IMPROVED SURFACE QUALITY OF BLOOMS • NO MACROINCLUSIONS DUE TO CLOSED STREAM CASTING THROUGH AMLC • CAST BLOOM FREE FROM HARMFUL SURFACE AND SUB SURFACES DEFECTS
BILLET INSPECTION	• OPTICAL EMMISSION SPECTROMETER • GAS ANALYSERS • MACRO TEST • AUTO GRINDING OF SURFACE • MAGNA FLUX ON ROLLED BILLET	• CHEMISTRY, • GAS LEVELS , • INTERNAL AND SURFACE QUALITY AS PER CUSTOMER SPEC	CONFORMANCE TO CUSTOMER SPECIFICATION.
BAR AND SECTION ROLLING MILL	• WALKING HEARTH REHEATING FURNACE, • AIR:FUEL RATIO CONTROL, • 24 STDS FIXED PASS LAY OUT WITH 10 STD FINISHING BLOCK OF TUNGSTON CARBIDE ROLL GROOVE, • VARIABLE REDUCTION MILL (VRM) WITH HOUSINGLESS STANDS AND HIGH STIFFNESS	• ROLLING TEMPERATURE, CONTROL FURNACE RESIDENCE TIME, • PRIMARY SCALE REMOVAL, • OVAL-ROUND PASS SEQUENCE AND INTERSTAND TENSION CONTROL WITH LOOPERS. • INPUT OUTPUT TEMERATURE CONTROL, • PLANNED PASS SCHEDULING • HORIZONTAL VERTICAL HORIZONTAL STAND CONFIGURATION IN VRM	• UNIFORM SURFACE APPEARANCE, • CLOSE DIMENSIONAL TOLERENCE, • FREEDOM FROM HARMFUL SURFACE DEFECTS , • COMPACT LAYING OF TURNS LEADING TO COMPACT COILS, • CONTROL ON SURFACE DECARBURISATION. • CAPABILITY TO ROLL ROUND 15-56 MM, COIL 5.5-38MM , HEX 13.3-38 MM AND FLAT IN DIFFERENT SIZES. • DIMENSIONAL TOLERENCES OF 1/4 TH OF STANDARD "DIN 1013" WITH MINIMUM SIZE VARIATION ALONG THE LENGTH OF BAR
BLOOMING MILL	• WALKING HEARTH REHEATING FURNACE, • THERMAL IMAGING CAMERA, • AIR:FUEL RATIO CONTROL, • HYDRAULIC SCALE BREAKER , • 2 HIGH REVERSABLE MILL WITH MECHANISED FEEDING • AUTOSCREWDOWN MECHANISM WITH HOT SAW CONTROLLED COOLING FACILITY	• ROLLING TEMPERATURE, • FURNACE RESIDENCE TIME	• FLEXIBILITY TO ROLL SQUARES AND ROUNDS • FREE FROM HARMFUL SURFACE DEFECTS • DIMENSIONAL CONTROL AS PER TOLERENCE, • PROPER END CUTTING, • GOOD STRAIGHTNESS IN AS ROLLED CONDITION
ALLOY STEEL MILL	• PLC CONTROLLED PUSHER TYPE FURNACE, • THREE HIGH ROUGHING STAND, • TWO THREE HI INTERMEDICATE STAND AND • TWO HIGH FINISHING STAND, • HOT SAW FACILITY AND RAKETYPE COOLING BED	• GOOD TEMPERATURE CONTROL, GOOD FINISH QUALITY	• DEFINE ROLL PASS DESIGN, BOX PASSES, • DI & SQ FOLLOWED BY OVAL ROUND SEQUENCE IN INTERMEDIATE AND FINISHING.

BEARING STEELS

Bearing steels are special class of low alloy steels, typically with 1% carbon and 1.4% chromium. Manganese and Molybdenum are added in certin special cases. These steels find applications in automobiles, railwys, earth moving, defence, aircraft, power generations, compressor and other moving machinery parts. In view of the continious fatigue strain during service, this steel and its components demands high level of precess descipline during manufacturing.

The components for these applications are manufactured either through hot forging route or through spherodised annealing followed by cold forging route. At sunflag all the necessary facilities for manufacturing and testing of bearing steel grades have been established. Various controls are excersised during manufacture, right from selection of raw marerials and ferrow alloys required to meet the stringant quality parameter of various customer.

- Fatigue Life
- Uniform heat treatment response
- Compact ctructure with uniform grain flow and fine grain size imparting high impact toughness

Inspection activities before dispach are designed to address the verification of all the quality requirements of bearing steels any deviation observed during production process and quality testing is recorded and analysed for taking suitable corrective and preventive actions to meet the quality requirements of this critical grade steel

Sizes and condition of supply

No.	Size (mm)	Shape	Condition of supply	Application
1	12 - 60 Dia	Straight Length Round	Stress relief /spheroidised annealed	Forging of rings
2	10 - 56 Dia	Straight Length Round	Peeled and ground bars in spheroidised annealed condition	Machining of racers or cold forging of bars /rollers
3	5.5 - 38 Dia	Wire Rod Roundes	Spheroidised annealed	Machining of racers or cold forging of bars /rollers

International Specifications of Ball Bearing Steels

No.	Country	Grade		Chemistry					
				C	Mn	Si	P	S	Cr
1	U.S.A.	SAE 52100	Min	0.98	0.25	0.15	-	-	1.30
			Max	1.10	0.45	0.30	0.025	0.025	1.60
2	Germany	100Cr6	Min	0.95	0.25	0.15	-	-	1.30
			Max	1.10	0.45	0.30	0.030	0.030	1.60
3	India	103Cr2	Min	0.95	0.25	0.15	-	-	1.40
			Max	1.10	0.45	0.35	0.025	0.025	1.60
4	Japan	SUJ 2	Min	0.95	0.50	0.15	-	-	1.30
			Max	1.10	Max	0.35	0.025	0.025	1.60
5	Britain	EN31	Min	0.90	0.30	0.10	-	-	1.00
			Max	1.20	0.75	0.35	0.050	0.050	1.60

BEARING STEELS

Certification of quality :

Following important quality features are tested and certified on all Bearing Steel Heats made at Sunflag

• Chemistry	Including tramp levels and Titanium
• Gases	O_2, N_2 and H_2
• Macrostructure of bars (internal quality)	As per ASTM E-381 or as specified by the customer
• Dimensional tolerances	As specified by the customer.
• Decarburisation level	Less than 1% of diameter or as specified by the customer
• Surface quality of bar	Checked and certified on 100% basis by pickling process and 100% magnetic particle inspection.
• Non metallic inclusion level	As per ASTM-E-45 (A and B not greater than 1.0, C is 0.0 and D not greater than 0.5)
• Microstructure (Banding)	As per customer specification (As per SEP-1520 DIN Standard Chart)

Any other special testing requirement found desirable by the customer can be satisfied.

SUNFLAG STEEL

COLD FORGING QUALITY STEELS

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Category	SAE / AISI	DIN	IS	EN
Low Carbon & Medium Carbon Grades	1006	-	-	-
	1008	-	-	-
	1010	CK-10	C10	-
	1012	CK-10	C10	EN2A
	1015	CK-15	-	EN32B
	1018	-	C-15Mn75	EN2C
	1020	C-20	C-25Mn75	EN3A
	1025	-	-	-
	1040	-	-	-
	1045	-	-	-
Carbon Manganese	1541	36Mn7	37C15	EN15
Boron Grades	10B21	-	21C10BT	-
	15B25	-	26C10BT	-
	15B41	-	-	-
Crome-Moly	4135	-	-	-
	4140	-	40CR$_4$MO$_3$	EN-19

Wire Rods Rolled Sizes :

Sizes (mm) : 5.5, 6.0, 7.0, 7.5, 8.0, 8.5, 9.0, 9.5, 10,11,12,13,14,15,16, 16.3,17.3,18.5,20,21,22,23,24,25.4,26,27.5,28,30,32,33,34,36, 38 mm dia.

Dimensional Specifications (As rolled)*		
Diameter Range	Ovality	Permissible Tolerance
5.5-9.0 mm	0.2 mm max	± 0.15 mm
10-25 mm	0.3 mm max	± 0.20 mm
26-36 mm	0.4 mm max	±0.30 mm

* In specific cases stricter specifications can be met.

Particulars	Block Route (5.5 mm to 11mm dia)	Garret Route (12 mm to 36 mm dia)
Coil Weight	1500 kgs max	1500 kgs max
Coil Inner Diameter	800 mm	800 mm
Coil Outer Diameter	1200 mm	1500 mm
Coil Height	900 mm	1100 mm
Coiling Direction	Clockwise	Clockwise
Binding	Strap	Strap

SUNFLAG STEEL

COLD FORGING STEEL

Material quality requirements for cold heading steels.

1. Excellent surface quality ensuring zero defect situation so that forged components have no defects.
2. Good control over ovality to ensure smooth forging process.
3. Good control over mechanical properties such as tensile strength and reduction area to ensure proper cold forgeability and productivity.
4. Completely descaled surface to avoid forging defects such as scale pits and resultant surface roughness.
5. Suitable metallurgical structure to ensure proper machinability level.
6. Good and uniform response to heat treatment since the components are always treated in bulk.

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WIRE INJECTION	3 STRAND WIRE INJECTION EQUIPMENT FOR CARBENSULPHOR AND ALLUMINIUM	FINE ADJUSTMENT OF C & S & ALLUMINIUM	PRECISE CONTROL OF C ,S AND ALUMINIUM.
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BILLET INSPECTION	• OPTICAL EMMISSION SPECTROMETER • GAS ANALYSERS • MACRO TEST • AUTO GRINDING OF SURFACE • MAGNA FLUX ON ROLLED BILLET	• CHEMISTRY, • GAS LEVELS , • INTERNAL AND SURFACE QUALITY AS PER CUSTOMER SPEC	CONFORMANCE TO CUSTOMER SPECIFICATION.
BAR AND SECTION ROLLING MILL	• WALKING HEARTH REHEATING FURNACE. • AIR:FUEL RATIO CONTROL, • 24 STDS FIXED PASS LAY OUT WITH 10 STD FINISHING BLOCK OF TUNGSTON CARBIDE ROLL GROOVE, • VARIABLE REDUCTION MILL (VRM) WITH HOUSINGLESS STANDS AND HIGH STIFFNESS	• ROLLING TEMPERATURE, CONTROL FURNACE RESIDENCE TIME, • PRIMARY SCALE REMOVAL, • OVAL-ROUND PASS SEQUENCE AND INTERSTAND TENSION CONTROL WITH LOOPERS. • INPUT OUTPUT TEMERATURE CONTROL. • PLANNED PASS SCHEDULING • HORIZONTAL VERTICAL HORIZONTAL STAND CONFIGURATION IN VRM	• UNIFORM SURFACE APPEARANCE. • CLOSE DIMENSIONAL TOLERENCE. • FREEDOM FROM HARMFUL SURFACE DEFECTS , • COMPACT LAYING OF TURNS LEADING TO COMPACT COILS, • CONTROL ON SURFACE DECARBURISATION. • CAPABILITY TO ROLL ROUND 15-56 MM, COIL 5.5-38MM , HEX 13.3-38 MM AND FLAT IN DIFFERENT SIZES. • DIMENSIONAL TOLERENCES OF 1/4 TH OF STANDARD "DIN 1013" WITH MINIMUM SIZE VARIATION ALONG THE LENGTH OF BAR
BLOOMING MILL	• WALKING HEARTH REHEATING FURNACE. • THERMAL IMAGING CAMERA, • AIR:FUEL RATIO CONTROL, • HYDRAULIC SCALE BREAKER , • 2 HIGH REVERSABLE MILL WITH MECHANISED FEEDING • AUTOSCREWDOWN MECHANISM WITH HOT SAW CONTROLLED COOLING FACILITY	• ROLLING TEMPERATURE, • FURNACE RESIDENCE TIME	• FLEXIBILITY TO ROLL SQUARES AND ROUNDS • FREE FROM HARMFUL SURFACE DEFECTS • DIMENSIONAL CONTROL AS PER TOLERENCE. • PROPER END CUTTING, • GOOD STRAIGHTNESS IN AS ROLLED CONDITION
ALLOY STEEL MILL	• PLC CONTROLLED PUSHER TYPE FURNACE. • THREE HIGH ROUGHING STAND, • TWO THREE HI INTERMEDICATE STAND AND • TWO HIGH FINISHING STAND, • HOT SAW FACILITY AND RAKETYPE COOLING BED	• GOOD TEMPERATURE CONTROL, GOOD FINISH QUALITY	• DEFINE ROLL PASS DESIGN, BOX PASSES. • DI & SQ FOLLOWED BY OVAL ROUND SEQUENCE IN INTERMEDIATE AND FINISHING.

SUNFLAG STEEL

CHEMICAL COMPOSITIONS OF TYPICAL COLD FORGING QUALITY GRADES :

1. CARBON STEELS

Sr.	Grade	C%	Si%	Mn%	S% Max	P% Max	Cr%	B%	Mo%	Pb%	Ni%	Others
1.1	AISI 1006	0.06 Max	0.10 max	0.25-0.40	0.050	0.040						
1.2	AISI 1008	0.10 max	0.10 max	0.30-0.50	0.050	0.040						
1.3	AISI 1010	0.08-0.13	0.10 max	0.30 0.60	0.050	0.040						
1.4	VS 14250	0.10-0.14	0.13 max	0.21-0.45	0.040	0.030						
1.5	VS 13111	0.07-0.11	0.07 max	0.20-0.40	0.040	0.030						
1.6	AISI 1015	0.13-0.18	0.15 max	0.30-0.60	0.050	0.040						
1.7	AISI 1018	0.15-0.20	0.05-0.10	0.60-0.90	0.050	0.040						
1.8	EN1APb	0.08-0.15	0.10 max	0.85-1.15	0.26-0.35	0.040 0.090				0.15-0.35		
1.9	EN1A	0.07-0.15	0.10 max	0.80-1.20	0.20-0.30	0.060						

2. BORON STEELS

Sr.	Grade	C%	Si%	Mn%	S% Max	P% Max	Cr%	B%	Mo%	Pb%	Ni%	Others
2.1	SAE/AISI 10B21	0.18-0.23	0.30 max	0.80-1.10	0.030	0.030	0.10-0.20	0.0005-0.0030				
2.2	AISI 15B25	0.23-0.28	0.30 max	0.90-1.30	0.030	0.030	0.10-0.20	0.0005-0.0030				
2.3	19MnB4M	0.20-0.25	0.15-0.30	0.80-1.10	0.030	0.030	0.30-0.40	0.0008-0.0030				
2.4	SAE/AISI 15B41	0.36-0.44	0.15-0.30	1.35-1.65	0.030	0.030	0.10-0.20	0.0005-0.0030				
2.5	AISI 10B36M	0.34-0.39	0.15-0.30	0.80-1.10	0.030	0.030	0.20-0.40	0.0006-0.0030				
2.6	DIN 36CrB4	0.34-0.38	0.10 max	0.60-0.90	0.015	0.015	0.90-1.20	0.0015-0.005				
2.7	51B37	0.35-0.40	0.20-0.35	0.35-0.45	0.025	0.025	0.95-1.15	0.0005-0.0030	0.040 max		0.10 max	

3. ALLOY STEELS

Sr.	Grade	C%	Si%	Mn%	S% Max	P% Max	Cr%	B%	Mo%	Pb%	Ni%	Others
3.1	SCM 415 H	0.12-0.18	0.15-0.35	0.55-0.90	0.030	0.030	0.85-1.25		0.15-0.35		0.25 max	
3.2	SCM 435	0.32-0.39	0.15-0.30	0.55-0.90	0.030	0.030	0.80-1.25		0.15-0.35		0.25 max	
3.3	AISI 4135	0.33-0.38	0.15-0.30	0.70-0.90	0.040	0.035	0.80-1.10		0.15-0.25		0.25 max	
3.5	AISI 4140	0.38-0.43	0.15-0.30	0.75-1.00	0.040	0.035	0.80-1.10		0.15-0.25			
3.7	AISI 5140	0.38-0.43	0.15-0.30	0.70-0.90	0.040	0.035	0.70-0.90					
3.8	AISI 1541	0.36-0.44	0.15-0.30	1.35-1.65	0.050	0.040						

ENGINE VALVE STEEL

FOR INTAKE AND EXHAUST VALVES OF INTERNAL COMBUSTION ENGINES

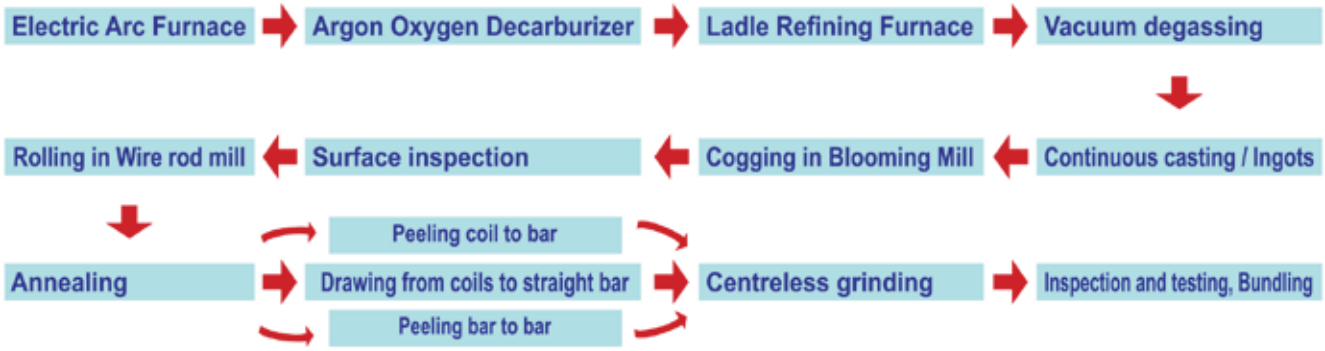
SUNFLAG STEEL

BIS Approved
NABL Accreditated Chem & Mech Labs.
ISO 9001 & IATF16949 Certified by UL DQS
ISO 14001 & OHSAS 18001 Certified by TUV Nord
AD 2000 Merkblatt WO /PED Certified by TUV Nord

Engine Valve Steel

Sunflag Steel is a leader in production of heat resistant steel used for manufacture of Intake and Exhaust valves for Internal Combustion Engines.

Process route for Manufacturing of Valve Steel



Inspection and Testing at Sophisticated Lab

- Inspection and Testing for Surface Quality i,e MPI /ECT/Zyglo
- Internal Soundness Ultrasonic Test
- Dimension, Length
- Hardness, Microstructure, Inclusion, Grain Size

Grades / Standards

EN 10090	SAE	DIN (W No.)	BS	JIS	IS
X45CrSi93	HNV3	1.4718	EN 52	SUH1	X45Cr9Si3
X40CrSiMo10-2	HNV1	1.4731		SUH3	X40Cr11Si2Mo10
X50CrSi 82				SUH-11	X50Cr8Si2
X53CrMnNiN21-9	EV8	1.4871	21-4N	SUH35	X53CrMnNiN219
X55CrMnNiN20-8	EV12	1.4875	21-2N		X55CrMnNiN208
X50CrMnNiNbN219	VA63	1.4882	21-43		X50CrMnNiNbN219
	HEV3		Inconel 751		NiCr15Fe7TiAl

Chemical Composition

Elements	Grades		
	X45CrSi 9-3 (EN 52)	21-4 N	Inconel 751
%C	0.40-0.50	0.48-0.58	0.10 max
%Mn	0.6 max	8.0-10.0	1.0 max
%P	0.04 max	0.05 max	
%S	0.030 max	0.03 max	0.015 max
%Si	2.7-3.3	0.25 max	0.50 max
%Cu	--	--	0.50 max
%Cr	8.0-10.0	20.0-22.0	14.0-17.0
%Ni	0.50 max	3.25-4.50	Balance
%Mo	--	--	--
%V	--	--	--
%N	--	0.35-0.50	--
%Ti	--	--	2.0-2.6
%Al	--	--	0.9-1.5
Fe	--	--	5.0-9.0
%Cb & Ta	--	--	0.70-1.20

Mechanical Properties

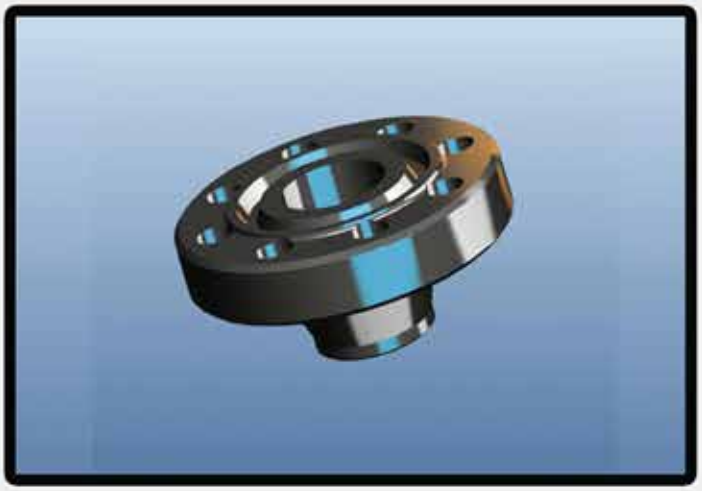
Grade	Test Condition	Yield Strength N/mm2 (Min)	Tensile Strength N/mm2 (Min)	Elongation %(min)	Hardness HRC
EN 52	Annealed				35 Max
EN 52	Hardened & tempered	700	900	14	As per customer specifications
21-4N	Solution Annealed, Ageing	660	882	8	30-40

Supply Conditions

Dimensional Tolerance				
	As Rolled	As Drawn	As Peeled	Centreless Ground
Size Range	Coils - 5.5mm to 15mm Rounds - 15mm to 30mm RCS - 75mm, 80mm & 100mm	5mm to 30mm	5mm to 30mm	5mm to 30mm
Dimention Tolerance	As per IS 3739	5mm to 10mm h11, 10 to 30mm h10,	h11	h9, h11, +0.05/ -0, ± 0.05, +0.20/ -0 or as per requirement
Out of Roundness	As per IS 3739	0.05mm	1/2 dia tol	1/2 dia tol
Straightness	3.00 mm / mtr.	1mm / mtr	1 mm/mtr	1 mm / mtr
Length	4.0 mtrs (Length below 4 mtr can be supplied by offline cutting)	3 to 4 mtr	3 to 4 mtr	3 to 4mtr

REGD OFFICE :
33, Mount Road, Sadar, Nagpur-440001
Contact person :Mr. Alok Sharma
Mobile 07838111734
Email id: alok_sharma@sunflagsteel.com

FORGING QUALITY INGOTS



SUNFLAG STEEL

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ISO 14001 & OHSAS 18001 Certified by TUV Nord
AD 2000 Merkblatt WO /PED Certified by TUV Nord

FORGING QUALITY INGOTS

Grades

- Regularly Carbon, Cr, Cr-MO & Cr-Ni-Mo grades, as per popular Standards like AISI, BS, EN, DIN, GOST, JIS, etc.
- Also against specific TDCs of Customers.

Stainless Steel Grades

- AISI 410, 420 - Majority for export market (indirect).
- X22, X20, X5, X18, X19 - Energy (Turbine Blades)
- AISI 304, 316, 304L - Defence, Aerospace

Other value added Steel Grades

- En36C, En39B, AMS 6418 - Mining / Boring Tools
- En52, 21-4N, SUH 11 - Valve stems
- Din 1.2174, H11, H13 - Die Blocks
- En41B - Screw / Barrels for Injection Moulding M/c.

Rolling Capability

Rolled Products from Ingots	
Straight Length Rounds	
Single Rolling	200 mm to 250 mm Dia.
Double Rolling	50mm to 180 mm Dia.
Round Cornered Squares	
Single Rolling	160 to 340 RCS
Double Rolling	50 to 150 RCS

- Slow cooling pits are available for control cooling of rolled product.
- Sufficient Top (8%) & bottom (2%) discards are given on rolled bars.
- We guarantee a Minimum Reduction ratio of 6:1 for Round products.

FORGING QUALITY INGOTS

Salient Features of Ingots

With modern facilities already existing for refining degassing and continuous casting of steel, SUNFLAG considered it is important to widen the product mix and cater to the needs of specific application segments where ingots are preferred over continuously cast blooms. Accordingly the facilities required for casting of wide end up bottom poured ingots are now installed. Our Facility is capable of producing Steel for Defence, Railways, Tool and Die Steel and forging quality ingots meeting specifications.

Ingot Dimension - Phase 1

Ingots	Ingot Size (mm)	Ingot Weight, MT
SF-1	637X480	4.2
SF-2	500X402	2.7
SF-3	412X323	1.8

Height of all Ingots is 1700 mm.
Heat Size will be about 55 MT.

FORGING QUALITY INGOTS

SUNFLAG STEEL

Unique advantages of Sunflag Ingots

- Homogenized Chemistry within narrow ranges, and VD / AOD treated LM for Ingot Casting.
- Mold powder bags hung in ingots for better surface finish of ingots, about 1.5Kg of powder per ton of LM.
- Argon flushing of trumpet before cast start.
- Argon shrouding of metal flow from Ladle to Trupmpet.
- Bricks & Hot Tops preheated for 24 hrs at 200°C before use.
- Uphil teaming with central trumpet, with high Alumina runner bricks.
- Ingot mold of special design to control micro segregation.
- Ingots dressing before reheating.
- 16 Ingot capacity Soaking with Hyderaulic doors.

SUNFLAG STEEL

BIS Approved
ISO-9001 & ISO/TS-16949 Co.
NABL Accreditated
AD 2000 Merkblatt WO - TUV Nord, Germany

FORGING QUALITY STEELS

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SUNFLAG STEEL

FORGING QUALITY STEELS

Forging Quality Steel

Quality requirements for Forging quality steels

- Close control on chemistry.
- Freedom from harmful internal & surface defects.
- Fine & uniform grain size.
- Dimentional tolerance IS 3739 grade 1.
- High degree of cleanliness

These steels are widely used in automobile, defence, railways and various manufacturing industries.

Some of the popular forging applications are as under

Gears, Axles, Crankshaft, Connecting rod, Pinions, Crown Wheels, Camshafts etc.
Automobile industry is the single largest user of forgings. Forging are generally used in the transmission systems of an automobile, where large forces get transferred between different parts, hence they are of vital importance.

SIZES AND CONDITION OF SUPPLY

Condition of Supply	Shapes	Sizes
1. As rolled	Round	15mm to 350mm
	RCS	50mm to 350mm
2. As rolled & annealed	Round	15mm to 250mm
	RCS	50mm to 350mm

Dimensional Tolerences as per IS 3739 specification

SUNFLAG STEEL

FORGING QUALITY STEELS

PROCESS	EQUIPMENT	KEY PROCESS CHARACTERISTICS	EFFECT ON PRODUCT QUALITY
PRIMARY MELTING	EAF WITH EBT AND LOAD CELL ELECTRIC ARE FERVOCE WITH ELECTRIC BOTTOM TAPPING AND LOAD CELL	• GOOD CARBON BOIL • SLAG FREE TAPPING • LM WEIGHT MONITORING • LIQUID METAL	• FREE FROM UNDESIRABLE TRAMP ELEMENTS • LOW TRAMP ELEMENTS DUE TO USE OF OWN VIRGIN • RAW MATERIAL, SUCH AS DRI, PIG IRON. LOW PHOSPHORUS LEVEL TO IMPROVE COLD FORGEABILITY. • LOW N2 LEVEL AT TAPPING STAGE, • CONTROLLED FEO IN SLAG TO ENSURE LOW O2 FOR SUBSEQUENT STEEL REFINING
SECONDARY REFINING	LADLE REFINING FURNACE WITH COMPUTRISED FERROALLY FEEDING SYSTEM	• ARGON PURGING • MICROPROCESSOR BASED FERROALLOY ADDITION SYSTEM • CONTROLLED POWER INPUT	• ACHIEVEING FINAL PRODUCT CHEMISTRY WITH HIGH REPETABILITY. • PREDICTABLE ALLOY RECOVERY AND LESS FORMATION OF DEOXIDATION OF PRODUCTS. HIGH BASICITY FOR DEEP DESUL PHURISATION AND INCLUSION REMOVAL. FACILITY FOR TRIM ADDITION TO ACHIEVE CLOSE RANGE OF TARGET CHEMISTRY.
DEGASSING	STATIC TANK TYPE VACUUM DEGASSING	• HIGH SUCTION CAPACITABILITY TO • ACHIEVE VACUUM <1 m bar • ARGON PURGING/RINSING	• REDUCTION IN DISSOLVE GAS LEVELS O2,N2,H2 • SIGNIFICANT REDUCTION IN SULPHUR LEVEL • COMPLETE HOMOGENISATION OF CHEMISTRY AND TEMPERATURE FOR SMOOTH CASTING.
WIRE INJECTION	3 STRAND WIRE INJECTION EQUIPMENT FOR CARBENSULPHOR AND ALLUMINIUM	FINE ADJUSTMENT OF C & S & ALLUMINIUM	PRECISE CONTROL OF C ,S AND ALUMINIUM.
CASTING	CONTINOUS CASTER 3 STRANDS WITH AMLC/EMS, SUBMERGED NOZZLE CASTING AND LEVEL 2 AUTOMATION	• BASIC REFRACTORIES. • CONTROL ON SUPER HEAT, • CASTING SPEED, • UNIFORM SECONDARY COOLING, • STABLE CASTING	• IMPROVED SURFACE QUALITY OF BLOOMS • NO MACROINCLUSIONS DUE TO CLOSED STREAM CASTING THROUGH AMLC • CAST BLOOM FREE FROM HARMFUL SURFACE AND SUB SURFACES DEFECTS
BILLET INSPECTION	• OPTICAL EMMISSION SPECTROMETER • GAS ANALYSERS • MACRO TEST • AUTO GRINDING OF SURFACE • MAGNA FLUX ON ROLLED BILLET	• CHEMISTRY, • GAS LEVELS , • INTERNAL AND SURFACE QUALITY AS PER CUSTOMER SPEC	CONFORMANCE TO CUSTOMER SPECIFICATION.
BAR AND SECTION ROLLING MILL	• WALKING HEARTH REHEATING FURNACE, • AIR:FUEL RATIO CONTROL, • 24 STDS FIXED PASS LAY OUT WITH 10 STD FINISHING BLOCK OF TUNGSTON CARBIDE ROLL GROOVE, • VARIABLE REDUCTION MILL (VRM) WITH HOUSINGLESS STANDS AND HIGH STIFFNESS	• ROLLING TEMPERATURE, CONTROL FURNACE RESIDENCE TIME. • PRIMARY SCALE REMOVAL, • OVAL-ROUND PASS SEQUENCE AND INTERSTAND TENSION CONTROL WITH LOOPERS. • INPUT OUTPUT TEMERATURE CONTROL, • PLANNED PASS SCHEDULING • HORIZONTAL VERTICAL HORIZONTAL STAND CONFIGURATION IN VRM	• UNIFORM SURFACE APPEARANCE, • CLOSE DIMENSIONAL TOLERENCE, • FREEDOM FROM HARMFUL SURFACE DEFECTS , • COMPACT LAYING OF TURNS LEADING TO COMPACT COILS, • CONTROL ON SURFACE DECARBURISATION. • CAPABILITY TO ROLL ROUND 15-56 MM, COIL 5.5-38MM , HEX 13.3-38 MM AND FLAT IN DIFFERENT SIZES. • DIMENSIONAL TOLERENCES OF 1/4 TH OF STANDARD "DIN 1013" WITH MINIMUM SIZE VARIATION ALONG THE LENGTH OF BAR
BLOOMING MILL	• WALKING HEARTH REHEATING FURNACE, • THERMAL IMAGING CAMERA, • AIR:FUEL RATIO CONTROL, • HYDRAULIC SCALE BREAKER , • 2 HIGH REVERSABLE MILL WITH MECHANISED FEEDING • AUTOSCREWDOWN MECHANISM WITH HOT SAW CONTROLLED COOLING FACILITY	• ROLLING TEMPERATURE, • FURNACE RESIDENCE TIME	• FLEXIBILITY TO ROLL SQUARES AND ROUNDS • FREE FROM HARMFUL SURFACE DEFECTS • DIMENSIONAL CONTROL AS PER TOLERENCE, • PROPER END CUTTING, • GOOD STRAIGHTNESS IN AS ROLLED CONDITION
ALLOY STEEL MILL	• PLC CONTROLLED PUSHER TYPE FURNACE, • THREE HIGH ROUGHING STAND, • TWO THREE HI INTERMEDICATE STAND AND • TWO HIGH FINISHING STAND, • HOT SAW FACILITY AND RAKETYPE COOLING BED	• GOOD TEMPERATURE CONTROL, GOOD FINISH QUALITY	• DEFINE ROLL PASS DESIGN, BOX PASSES, • DI & SQ FOLLOWED BY OVAL ROUND SEQUENCE IN INTERMEDIATE AND FINISHING.

FORGING QUALITY STEELS

SUNFLAG STEEL

Certification

• Chemistry • Macro Quality • Inclusion • Grain Size • Hardness • Magnaflux
• Microstructure • Anti mixup test.
In addition to these standard tests, following additional tests are performed as per customer requirements.

- UST as per customer req.
- Step down test
- Blue fracture test
- Jominy hardenability test
- Mechanical tests like hardness, tensile test etc. (on heat treated samples)
- Impact test (on heat treated samples)
- Any other special test as per the end use

Typical forging quality steel grades.

Classification	IS	EN	DIN	AISI / SAE	JIS
Plain Carbon	15C8, 35C8 45C8	EN-8, EN-9 EN-32 B	CK-15, CK-30 CK-45, C35 Pb K C15 Pb K, CK-35 CK-60	1015, 1026 1030, 1135, 1040 1045, 1050 1055, 1060, 1080	S43C, S45C S48C, S55C, S35C, S53C
Carbon Manganese	47Mn6, 37Mn6, 37Mn2, 37C15, 20Mn2	EN-14A, EN-14B EN-15, EN-15B	40Mn4, 28Mn6, 27Mn2	1524, 1526, 1541, 1041F	SMn420H, SMn430H SMn433H, SMn435H SMn 443H
Plain Chrome	40Cr1, 50Cr4	EN-18 EN-207	34Cr4, 37Cr4 41Cr4	5120, 5140 5145, 5150 5160	SCr 420H, SCr415
Chrome Manganese	16Mn5Cr4 20Mn5Cr5	-	16MnCr5, 20MnCr5	-	-
Chrome Moly	40Cr1Mo28	EN-19	42CrMo4	4118, 4130, 4135, 4140, 4145, 4150 A182 F12 C1 II	SCM 415H, SCM 420H SCM 435H, SCM 440H
Chrome Nickel	40CrNi6 16Ni3Cr2	EN-36A EN-36B	15CrNi6, 16CrNi4 18CrNi8, 20CrNi4	- -	-
Chrome Nickel Moly	20NiCr2Mo2	EN-353, EN-354, EN-355, EN-36C EN-24, 815H17, 822H17	17CrNiMo6 30CrNiMo3 34CrNiMo6	4340, 8620 8640, 8627 8615, 8617	SNCM220H SNCM420H
Moly-Man	35Mn6Mo3 35 Mn6Mo4	EN-16 EN-17	-	4027H 4037H	-
Ball Bearing	103Cr2	EN-31	100Cr6	SAE52100	SUJ2
Micro Alloyed	38MnSiVS5	-	-	-	-

FREE CUTTING STEEL

SUNFLAG STEEL

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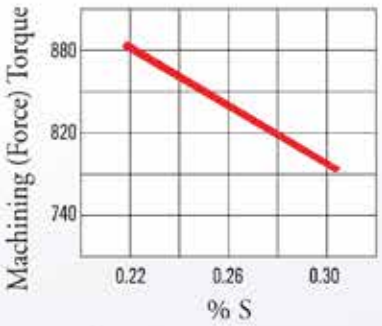
ISO 9001 & IATF 16949 Certified by UL DQS
ISO 14001 & OHSAS 18001 Certified by TUV Nord
AD 2000 Merkblatt WO /PED Certified by TUV Nord

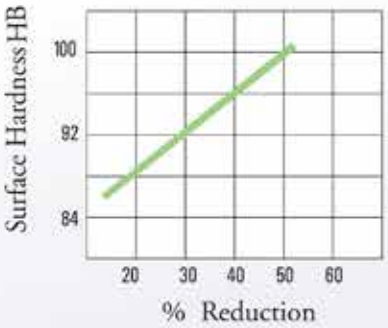
Quality requirement for free cutting steel

- Uniform distribution of MnS
- Hardness
- Microstructure
- Dimentional quality
- Straightness

Typical Co-relation of Machining Parameters with Elemental Levels



Effect of 'S' content on the machining torque.



Free machining steels are generally used after cold processing such as drawing, peeling, grinding etc. The extent of cold work employed in converting black bar of free machining steel into bright bar, decides its surface hardness, which in turn is responsible for its machining performance.

SUNFLAG STEEL

Salient Features of Process

PROCESS	EQUIPMENT	KEY PROCESS CHARACTERISTICS	EFFECT ON PRODUCT QUALITY
PRIMARY MELTING	EAF WITH EBT AND LOAD CELL ELECTRIC ARE FERVOCE WITH ELECTRIC BOTTOM TAPPING AND LOAD CELL	• GOOD CARBON BOIL • SLAG FREE TAPPING • LM WEIGHT MONITORING • LIQUID METAL	• FREE FROM UNDESIRABLE TRAMP ELEMENTS • LOW TRAMP ELEMENTS DUE TO USE OF OWN VIRGIN • RAW MATERIAL, SUCH AS DRI, PIG IRON. LOW PHOSPHORIUS LEVEL TO IMPROVE COLD FORGEABILITY. • LOW N2 LEVEL AT TAPPING STAGE, • CONTROLLED FEO IN SLAG TO ENSURE LOW O2 FOR SUBSEQUENT STEEL REFINING
SECONDARY REFINING	LADLE REFINING FURNACE WITH COMPUTRISED FERROALLY FEEDING SYSTEM	• ARGON PURGING • MICROPROCESSOR BASED FERROALLOY ADDITION SYSTEM • CONTROLLED POWER INPUT	• ACHIEVEING FINAL PRODUCT CHEMISTRY WITH HIGH REPETABILITY. • PREDICTABLE ALLOY RECOVERY AND LESS FORMATION OF DEOXIDATION OF PRODUCTS. HIGH BASICITY FOR DEEP DESUL PHURISATION AND INCLUSION REMOVAL. FACILITY FOR TRIM ADDITION TO ACHIEVE CLOSE RANGE OF TARGET CHEMISTRY.
DEGASSING	STATIC TANK TYPE VACUUM DEGASSING	• HIGH SUCTION CAPACITABILITY TO • ACHIEVE VACUUM <1 m bar • ARGON PURGING/RINSING	• REDUCTION IN DISSOLVE GAS LEVELS O2,N2,H2 • SIGNIFICANT REDUCTION IN SULPHUR LEVEL • COMPLETE HOMOGENISATION OF CHEMISTRY AND TEMPERATURE FOR SMOOTH CASTING.
WIRE INJECTION	3 STRAND WIRE INJECTION EQUIPMENT FOR CARBENSULPHOR AND ALLUMINIUM	FINE ADJUSTMENT OF C & S & ALLUMINIUM	PRECISE CONTROL OF C ,S AND ALUMINIUM.
CASTING	CONTINOUS CASTER 3 STRANDS WITH AMLC/EMS, SUBMERGED NOZZLE CASTING AND LEVEL 2 AUTOMATION	• BASIC REFRACTORIES. • CONTROL ON SUPER HEAT, • CASTING SPEED, • UNIFORM SECONDARY COOLING, • STABLE CASTING	• IMPROVED SURFACE QUALITY OF BLOOMS • NO MACROINCLUSIONS DUE TO CLOSED STREAM CASTING THROUGH AMLC • CAST BLOOM FREE FROM HARMFUL SURFACE AND SUB SURFACES DEFECTS
BILLET INSPECTION	• OPTICAL EMMISSION SPECTROMETER • GAS ANALYSERS • MACRO TEST • AUTO GRINDING OF SURFACE • MAGNA FLUX ON ROLLED BILLET	• CHEMISTRY, • GAS LEVELS , • INTERNAL AND SURFACE QUALITY AS PER CUSTOMER SPEC	CONFORMANCE TO CUSTOMER SPECIFICATION.
BAR AND SECTION ROLLING MILL	• WALKING HEARTH REHEATING FURNACE, • AIR:FUEL RATIO CONTROL, • 24 STDS FIXED PASS LAY OUT WITH 10 STD FINISHING BLOCK OF TUNGSTON CARBIDE ROLL GROOVE, • VARIABLE REDUCTION MILL (VRM) WITH HOUSINGLESS STANDS AND HIGH STIFFNESS	• ROLLING TEMPERATURE, CONTROL FURNACE RESIDENCE TIME, • PRIMARY SCALE REMOVAL, • OVAL-ROUND PASS SEQUENCE AND INTERSTAND TENSION CONTROL WITH LOOPERS. • INPUT OUTPUT TEMERATURE CONTROL, • PLANNED PASS SCHEDULING • HORIZONTAL VERTICAL HORIZONTAL STAND CONFIGURATION IN VRM	• UNIFORM SURFACE APPEARANCE, • CLOSE DIMENSIONAL TOLERENCE, • FREEDOM FROM HARMFUL SURFACE DEFECTS , • COMPACT LAYING OF TURNS LEADING TO COMPACT COILS, • CONTROL ON SURFACE DECARBURISATION. • CAPABILITY TO ROLL ROUND 15-56 MM, COIL 5.5-38MM , HEX 13.3-38 MM AND FLAT IN DIFFERENT SIZES. • DIMENSIONAL TOLERENCES OF 1/4 TH OF STANDARD "DIN 1013" WITH MINIMUM SIZE VARIATION ALONG THE LENGTH OF BAR
BLOOMING MILL	• WALKING HEARTH REHEATING FURNACE, • THERMAL IMAGING CAMERA, • AIR:FUEL RATIO CONTROL, • HYDRAULIC SCALE BREAKER , • 2 HIGH REVERSABLE MILL WITH MECHANISED FEEDING • AUTOSCREWDOWN MECHANISM WITH HOT SAW CONTROLLED COOLING FACILITY	• ROLLING TEMPERATURE, • FURNACE RESIDENCE TIME	• FLEXIBILITY TO ROLL SQUARES AND ROUNDS • FREE FROM HARMFUL SURFACE DEFECTS • DIMENSIONAL CONTROL AS PER TOLERENCE, • PROPER END CUTTING, • GOOD STRAIGHTNESS IN AS ROLLED CONDITION
ALLOY STEEL MILL	• PLC CONTROLLED PUSHER TYPE FURNACE, • THREE HIGH ROUGHING STAND, • TWO THREE HI INTERMEDICATE STAND AND • TWO HIGH FINISHING STAND, • HOT SAW FACILITY AND RAKETYPE COOLING BED	• GOOD TEMPERATURE CONTROL, GOOD FINISH QUALITY	• DEFINE ROLL PASS DESIGN, BOX PASSES, • DI & SQ FOLLOWED BY OVAL ROUND SEQUENCE IN INTERMEDIATE AND FINISHING.

FREE CUTTING STEELS

Certification of quality

- Surface condition : Free from harmful defects.
- Macro etch test - (ASTM-E-381)
- Spark/Spectral test - 100% bars
- As rolled hardness - Free Cutting Steels ≤ 150 BHN
- Inclusion rating - (ASTM - E-45) 2.5 max each - B,C,D
- Micro structure - Sulphide morphology (Aspect ratio)

International Specifications of Free Cutting Steels

Country	Grade	Chemistry						
			C	Mn	Si	P	S	Pb
IS (Indian)	11C10S25	Min	0.08	0.80	-	-	0.20	-
		Max	0.15	1.20	0.10	0.06	0.30	-
BS (British)	220M07	Min	-	0.90	-	-	0.20	-
		Max	0.15	1.30	-	0.07	0.30	-
EN (British)	ENIA-Pb	Min	0.07	0.80	-	0.040	0.26	0.15
		Max	0.15	1.20	0.10	0.090	0.35	0.35
AISI (American)	12L14	Min	-	0.85	-	0.04	0.26	0.15
		Max	0.15	1.15	0.10	0.09	0.35	0.35
JIS (Japanese)	SUM24L	Min	-	0.85	-	0.04	0.26	0.10
		Max	0.15	1.15	0.10	0.09	0.35	0.35
DIN (German)	9SMn28K	Min	-	0.86	-	-	0.24	0.15
		Max	0.16	1.35	0.06	0.11	0.36	0.35
ASTM (American)	1215	Min	-	0.75	-	0.040	0.260	-
		Max	0.09	1.05	-	0.090	0.350	-

International Specifications of Semi Free Cutting Steels

Country	Grade	C	Mn	Si	P	S	Al
DIN (German)	SU1A28	-/0.18	0.70/1.05	-/0.45	-/0.060	0.08/0.15	0.020/0.050
	R10S10U	-/0.18	0.70/1.05	-/0.45	-/0.060	0.08/0.15	0.020/0.050
	45S20U	0.39/0.53	0.66/1.15	0.07/0.33	-/0.065	0.15/0.28	-
SAE (American)	SAE1117	0.14/0.20	1.00/1.30	-	0.040 Max	0.080/0.130	-
	SAE1118	0.14/0.20	1.30/1.60	-	0.040 Max	0.080/0.130	-
	SAE1137	0.32/0.39	1.35/1.65	-	0.040 Max	0.080/0.130	-
	SAE1141	0.37/0.45	1.35/1.65	-	0.040 Max	0.080/0.130	-
	SAE1144	0.40/0.48	1.35/1.65	-	0.040 Max	0.240/0.330	-
EN (British)	EN8M	0.35/0.45	1.00/1.30	0.25 Max	0.060 Max	0.120/0.200	-

Sizes and conditions of Supply

Condition of Supply	Shapes	Sizes
1. Black	Hex	15.5 mm - 38 mm A/F
	Round	5.5 mm - 100 mm dia
	WRD	5.5 mm - 38 mm dia
2. Drawn	Hex	14 mm - 36 mm A/F
	Round	10 mm - 50 mm dia
3. Peeled & Ground	Round	10 mm - 90 mm dia

Industry Serviced by Sunflag's Free Cutting Steels

- Automobile - through manufacture of various machined components
- Auto components and spares manufacturers
- Textile machinery manufacturers
- Engineering Industry - Viz. Manufacturers of machine tools
- Power production industry

The Stainless Sparkle Of Quality

SUNFLAG STEEL

BIS Approved
NABL Accreditated Chem & Mech Labs.
ISO 9001 & IATF16949 Certified by UL DQS
ISO 14001 & OHSAS 18001 Certified by TUV Nord
AD 2000 Merkblatt WO /PED Certified by TUV Nord

Sunflag - The Group

The Sunflag Group founded in 1937 in Kenya is today a diversified global conglomerate, with manufacturing facilities spread across eight countries and business operations in most others, across the globe.

Set up on strong foundations of business ethics and commitment to quality, the USD 600 million group has emerged as a leader and world-best, in its chosen diversified businesses of Steel Products, Textiles, Fashion Garments, Artificial Leather, Agriculture, Agro & Forest based produce, Power Generation, Financing & Project Consultancy. With 20 group companies, the group today employs over 10,000 people.

Sunflag - The Stellar Steel Story

The Group's focus on engineering competencies has seen it emerge as one of the major players in the steel industry.

Sunflag Iron & Steel Company Limited, the Group's flagship company, set up a state-of-the-art integrated steel plant in technical collaboration with Krupp, Mannessmann Demag and Hamburger Stahlwerke, Germany. This is one of the world's most advanced and integrated steel plants located at Bhandara, India, in very close proximity to its raw materials and has a capacity to produce over 5,00,000 tonnes per annum of high quality steel of a varied product mix. using iron ore and non coking coal as basic raw materials.

Sunflag Steel today caters to the demand of various core sector industries like automobiles, railways, defense, agriculture, engineering etc. It is approved as an OEM authorized supplier of high quality steel by major companies in India and overseas, including General Motors, for worldwide supplies of their spring steel requirements.

The varied product mix of specialized steel includes a wide range of Carbon Steels, Alloy Steels, Free Cutting Steels, Spring Steels, Ball Bearing Steels, Micro Alloyed Steel, Valve Steels & Stainless Steel. These are manufactured in strict confirmation to Indian & International standards like, DIN/ SAE/ AISI/ ASTM/ EN, JIS, GOST & BIS.

A 30 MW captive power plant using waste gases and coal-fired burners ensures consistent and quality power supply, as well as cost competitiveness.

tainless Steel

Stainless steel is steel containing 10.5% or more of chromium, which imparts it with corrosion resistant properties, by the formation of an impervious layer of chromium oxide on the surface.

Stainless Steel finds many applications, which include :

- ✦ Construction industry
- ✦ Boiler industry
- ✦ Pumps and Shaft applications
- ✦ Flanges
- ✦ Surgical applications
- ✦ Cutlery
- ✦ Weaving and Knitting Wires
- ✦ High Temperature Corrosion Resistance Chemical and Petrochemical industries
- ✦ Springs etc.

Types of Stainless Steel

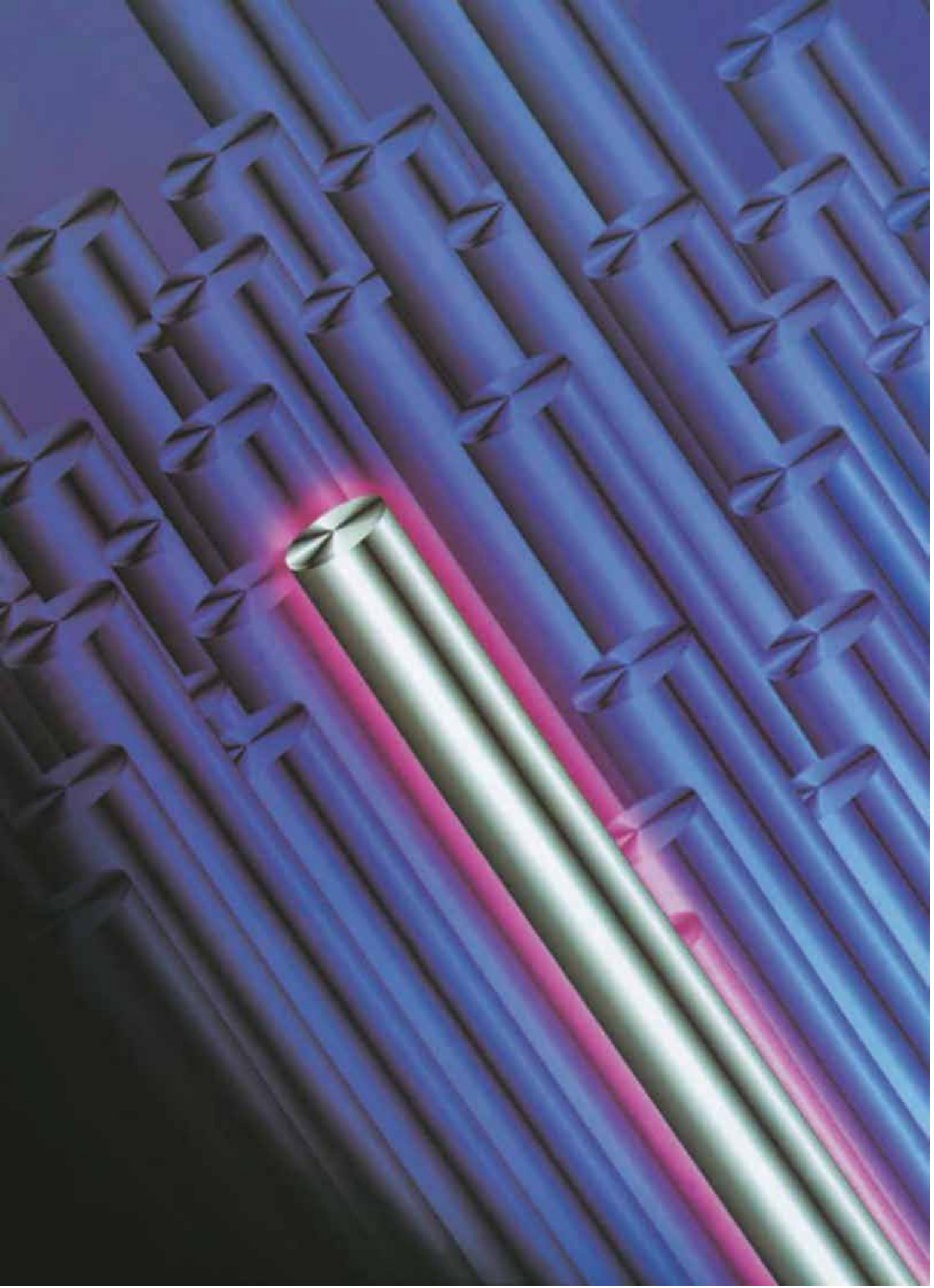
S. No.	Types of SS	Typical Properties	Broad Applications
1.	Martensitic	High Hardness, Strength with corrosion and Wear Resistance	Scissors, Shears, Knives, Forks, Medical Instruments, Boiler and Pumps, Cutlery items.
2.	Austenitic	Corrosion resistance Good ductility	Chemical industries, Utensils, Flat products
3.	Ferritic	Magnetic Properties Corrosion resistance	Cores of Electrical Equipments, Ribbed Bars, Exhaust systems of automobiles
4.	Duplex	Very High Strength	High Pressure pipeline Parts, Chemical Industry equipments, Ribbed bars for special Applications
5.	Precipitation Hardened	High Strength and Corrosion resistance	Petrochemical industry

Stainless Steel Manufactured at Sunflag Steel

Steel Grade	%C	%Mn	%P	%S	%Si	%Cr	%Ni	%Mo	Others
Austenitic Stainless Steels									
AISI 302	0.15 max	2.0 max	0.045 max	0.030 max	1.00 max	17.0-19.0	8.0-10.0	-	N2 - 1000 ppm max
AISI 302HQ	0.03 max	2.0 max	0.045 max	0.030 max	1.00 max	17.0-19.0	8.0-10.0	-	%Cu : 3.0 - 4.0
AISI 303	0.15 max	2.0 max	0.20 max	0.15 min	1.00 max	17.0-19.0	8.0-10.0	-	-
AISI 304	0.08 max	2.0 max	0.045 max	0.030 max	1.00 max	18.0-20.0	8.0-11.0	-	-
AISI 304L	0.03 max	2.0 max	0.045 max	0.030 max	1.00 max	18.0-20.0	8.0-12.0	-	-
AISI 304N	0.08 max	2.0 max	0.045 max	0.030 max	1.00 max	18.0-20.0	8.0-11.0	-	N2 : 1000-1600 ppm
AISI 304LN	0.03 max	2.0 max	0.045 max	0.030 max	1.00 max	18.0-20.0	8.0-11.0	-	N2 : 1000-1600 ppm
AISI 308	0.08 max	2.0 max	0.045 max	0.030 max	1.00 max	19.0-21.0	10.0-12.0	-	-
AISI 308LE	0.025 max	1.50 - 2.00	0.020 max	0.010 max	0.30 - 0.50	19.5-22.0	9.50-11.0	-	N2 - 600 ppm max
AISI 309	0.20 max	2.0 max	0.045 max	0.030 max	1.00 max	22.0-24.0	12.0-15.0	-	-
AISI 310	0.25 max	2.0 max	0.045 max	0.030 max	1.50 max	24.0-26.0	19.0-22.0	-	-
AISI 316	0.08 max	2.0 max	0.045 max	0.030 max	1.00 max	16.0-18.0	10.0-14.0	2.0 - 3.0	-
AISI 316L	0.03 max	2.0 max	0.045 max	0.030 max	1.00 max	16.0-18.0	10.0-14.0	2.0 - 3.0	-
AISI 316Ti	0.08 max	2.0 max	0.045 max	0.030 max	1.00 max	16.0-18.0	10.0-14.0	2.0 - 3.0	Ti : 5x(C+N) - 0.70 % N2 : 1000 ppm max
AISI 316N	0.08 max	2.0 max	0.045 max	0.030 max	1.00 max	16.0-18.0	10.0-14.0	2.0 - 3.0	N2 : 1000-1600 ppm
AISI 316LN	0.03 max	2.0 max	0.045 max	0.030 max	1.00 max	16.0-18.0	10.0-13.0	2.0 - 3.0	N2 : 1000-1600 ppm
AISI 317	0.08 max	2.0 max	0.045 max	0.030 max	1.00 max	18.0-20.0	11.0-15.0	3.0 - 4.0	N2 - 1000 ppm max
AISI 321	0.08 max	2.0 max	0.045 max	0.030 max	1.00 max	17.0-19.0	9.0-12.0	-	Ti : 5x(C+N) - 0.70 %
AISI 347	0.08 max	2.0 max	0.045 max	0.030 max	1.00 max	17.0-19.0	9.0-12.0	-	Cb : 10xC - 1.10 %
AISI 201 (0.30% Ni min)	0.08 - 0.12	8.00 - 9.00	0.080 max	0.015 max	0.40 - 0.60	14.00-14.50	0.30 - 0.35	-	Cu : 1.70 - 2.00% N2 : 1400-1600 ppm Customer preferred Chemistry
AISI 201 (0.40% Ni min)	0.07 - 0.10	8.00 - 9.00	0.080 max	0.015 max	0.40 - 0.60	14.00-14.50	0.40 - 0.45	-	Cu : 1.70 - 2.00% N2 : 1400-1600 ppm Customer preferred Chemistry
AISI 201 (0.70% Ni min)	0.08 - 0.10	8.00 - 9.00	0.080 max	0.015 max	0.40 - 0.60	14.00-14.50	0.70 - 0.75	-	Cu : 1.70 - 2.00% N2 : 1400-1600 ppm Customer preferred Chemistry
AISI 204Cu (1.50% Ni min)	0.07 - 0.10	8.00 - 9.00	0.080 max	0.015 max	0.30 - 0.70	15.00-16.00	1.50 - 1.60	-	Cu : 1.50 - 1.80% N2 : 1400-1600 ppm Customer preferred Chemistry
AISI 204Cu (1.80% Ni min)	0.060 max	6.50 - 8.50	0.060 max	0.010 max	1.0 max	15.50-17.50	1.80 - 2.20	-	Cu : 2.0 - 3.0% N2 : 1400-1600 ppm Customer preferred Chemistry
W.No. 1.4301	0.07 max	2.0 max	0.045 max	0.030 max	1.00 max	17.0-19.5	8.0-10.50	-	N2 - 1100 ppm max
W.No. 1.4306	0.03 max	2.0 max	0.045 max	0.030 max	1.00 max	18.0-20.0	10.0-12.0	-	N2 - 1100 ppm max
W.No. 1.4541	0.08 max	2.0 max	0.045 max	0.030 max	1.00 max	17.0-19.0	9.0-12.0	-	Ti : 5xC - 0.70 %
W.No. 1.4401	0.07 max	2.0 max	0.045 max	0.030 max	1.00 max	16.5-18.5	10.0-13.0	2.0 - 2.50	N2 - 1100 ppm max
W.No. 1.4404	0.03 max	2.0 max	0.045 max	0.030 max	1.00 max	16.5-18.5	10.0-13.0	2.0 - 2.50	N2 - 1100 ppm max
W.No. 1.4571	0.08 max	2.0 max	0.045 max	0.030 max	1.00 max	16.5-18.5	10.5-13.5	2.0 - 2.50	Ti : 5xC - 0.70 %
Martensitic Stainless Steels									
AISI 410	0.15 max	1.0 max	0.040 max	0.030 max	1.00 max	11.5-13.5	-	-	-
AISI 416	0.15 max	1.25 max	0.060 max	0.15 min	1.00 max	12.0-14.0	-	-	-
AISI 414	0.15 max	1.0 max	0.040 max	0.030 max	1.00 max	11.5-13.5	1.25 - 2.50	-	-
AISI 420	0.15 min	1.0 max	0.040 max	0.030 max	1.00 max	12.0-14.0	- -	-	
AISI 431	0.20 max	1.0 max	0.040 max	0.030 max	1.00 max	15.0-17.0	1.25 - 2.50	-	-
W.No.1.4006	0.08 - 0.15	1.50 max	0.040 max	0.030 max	1.00 max	11.5-13.5	-	-	-
W.No.1.4021	0.16 - 0.25	1.50 max	0.040 max	0.030 max	1.00 max	12.0-14.0	-	-	-
W.No.1.4057	0.12 - 0.22	1.50 max	0.040 max	0.030 max	1.00 max	15.0-17.0	1.50 - 2.50	-	-
Ferritic Stainless Steels									
AISI 409(Cb)	0.030 max	1.0 max	0.040 max	0.030 max	1.00 max	10.50-11.75	0.75 - 1.00		Cb : 10x(C+N) - 0.80 %
AISI 430	0.12 max	1.0 max	0.040 max	0.030 max	1.00 max	16.0-18.0	-	-	-
AISI 430L	0.030 max	1.0 max	0.040 max	0.030 max	1.00 max	16.0-18.0	0.50 max	-	N2 : 300 ppm max
AISI 446	0.20 max	1.50 max	0.040 max	0.030 max	1.00 max	23.0-27.0	0.75 max	-	N2 - 2500 ppm max
Precipitation Hardening Stainless Steels									
17 - 4 PH (Type 630)	0.070 max	1.0 max	0.040 max	0.030 max	1.00 max	15.00-17.50	3.0 - 5.0		Cb + Ta : 0.15 - 0.45% %Cu : 3.0 - 5.0
15 - 5 PH (Type XM-12)	0.070 max	1.0 max	0.040 max	0.030 max	1.00 max	14.00-15.50	3.50 - 5.50		Cb + Ta : 0.15 - 0.45% %Cu :2.50 - 4.50
W.No. 1.4542	0.07 max	1.50 max	0.040 max	0.030 max	0.70 max	15.0-17.0	3.0 - 5.0		Nb : 5xC - 0.45 % %Cu : 3.0 - 5.0
Razor Blade Quality	0.62 - 0.67	0.60 - 0.70	0.025 max	0.025 max	0.30 max	13.00-13.50	-	-	-

Steel Grade	%C	%Mn	%P	%S	%Si	%Cu	%Cr	%Ni	%Mo	Others
ER308L	0.000 - 0.025	1.50 - 1.90	0.000 - 0.028	0.000 - 0.010	0.30 - 0.60	0.00 - 0.20	19.50 - 20.00	9.00 - 9.20	0.00 - 0.25	-
308LAWS	0.000 - 0.030	1.50 - 2.00	0.000 - 0.030	0.012 - 0.020	0.30 - 0.60	0.00 - 0.20	19.50 - 20.00	9.00 - 9.20	0.00 - 0.25	-
ER308LSI	0.000 - 0.025	1.50 - 2.00	0.000 - 0.025	0.005 - 0.015	0.65 - 1.00	0.00 - 0.30	19.60 - 20.50	9.00 - 10.00	0.00 - 0.30	-
ER307SI	0.030 - 0.070	6.00 - 6.75	0.000 - 0.030	0.000 - 0.010	0.65 - 0.90	0.00 - 0.30	18.00 - 18.75	8.00 - 8.20	0.00 - 0.30	-
ER316L	0.000 - 0.030	1.50 - 2.5	0.000 - 0.030	0.005 - 0.015	0.30 - 0.60	0.00 - 0.30	18.50 - 19.50	11.00 - 14.00	2.00 - 3.00	-
ER316LSi	0.000 - 0.030	1.00 - 2.5	0.000 - 0.030	0.005 - 0.015	0.65 - 1.00	0.00 - 0.30	18.00 - 20.00	11.00 - 14.00	2.00 - 3.00	-
AISI304H	0.06 - 0.08	1.00 - 1.30	0.000 - 0.035	0.000 - 0.010	0.00 - 0.60	0.00 - 0.40	18.00 - 18.50	8.00 - 8.30	-	-
TP410	0.00 - 0.04	0.00 - 0.75	0.000 - 0.040	0.000 - 0.015	0.00 - 0.75	0.00 - 0.50	12.50 - 13.50	0 - 70	-	-
TP304/304L	0.00 - 0.03	0.00 - 2.00	0.000 - 0.040	0.000 - 0.015	0.00 - 0.75	0.00 - 0.50	18.00 - 19.50	8.20 - 10.50	-	-

Simillar other grades can be produced with different designation & chemistries

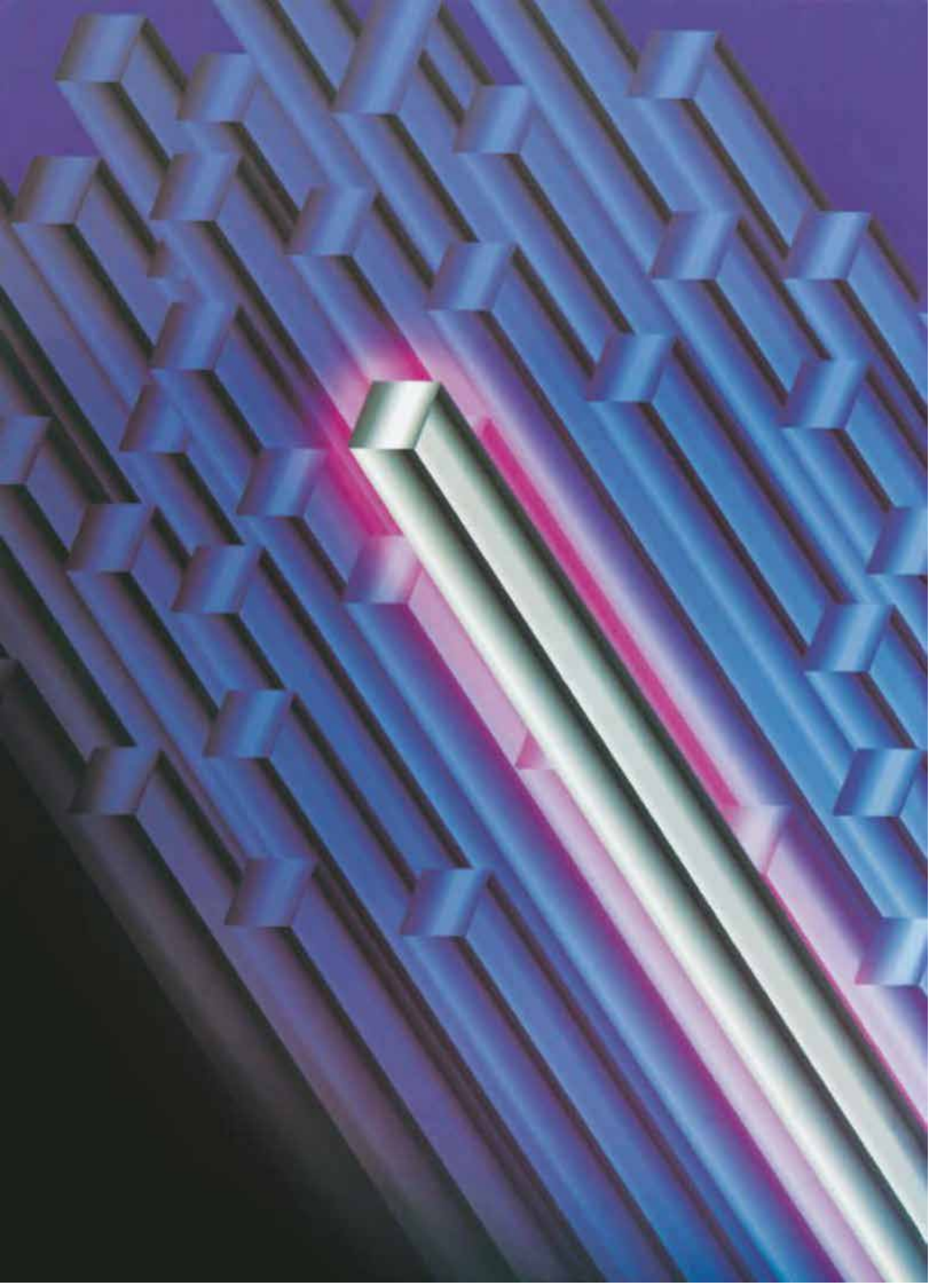


tainless Steel Bright Bars

Cold Drawn and Polished	CD + P
Cold Drawn and Centreless Ground	CD + CG
Rough Turned	RT
Smooth Turned and Polished	ST + P
Smooth Turned & Centreless Ground	ST + CG
Forged and Turned	FT

Bright Bar Capability

Cold Drawn and Polished	4.5 - 32 mm (coil route) 14 - 50 mm (straight bar route)
Cold Drawn and Centreless Ground	10 - 32 mm (coil route) 14 - 50 mm (straight bar route)
Turned Bars	15 - 95 mm
Smooth Turned and Polished	15 - 95 mm
Smooth Turned and Centreless Ground	15 - 95 mm



tainless Steel Billets-As Cast & Rolled

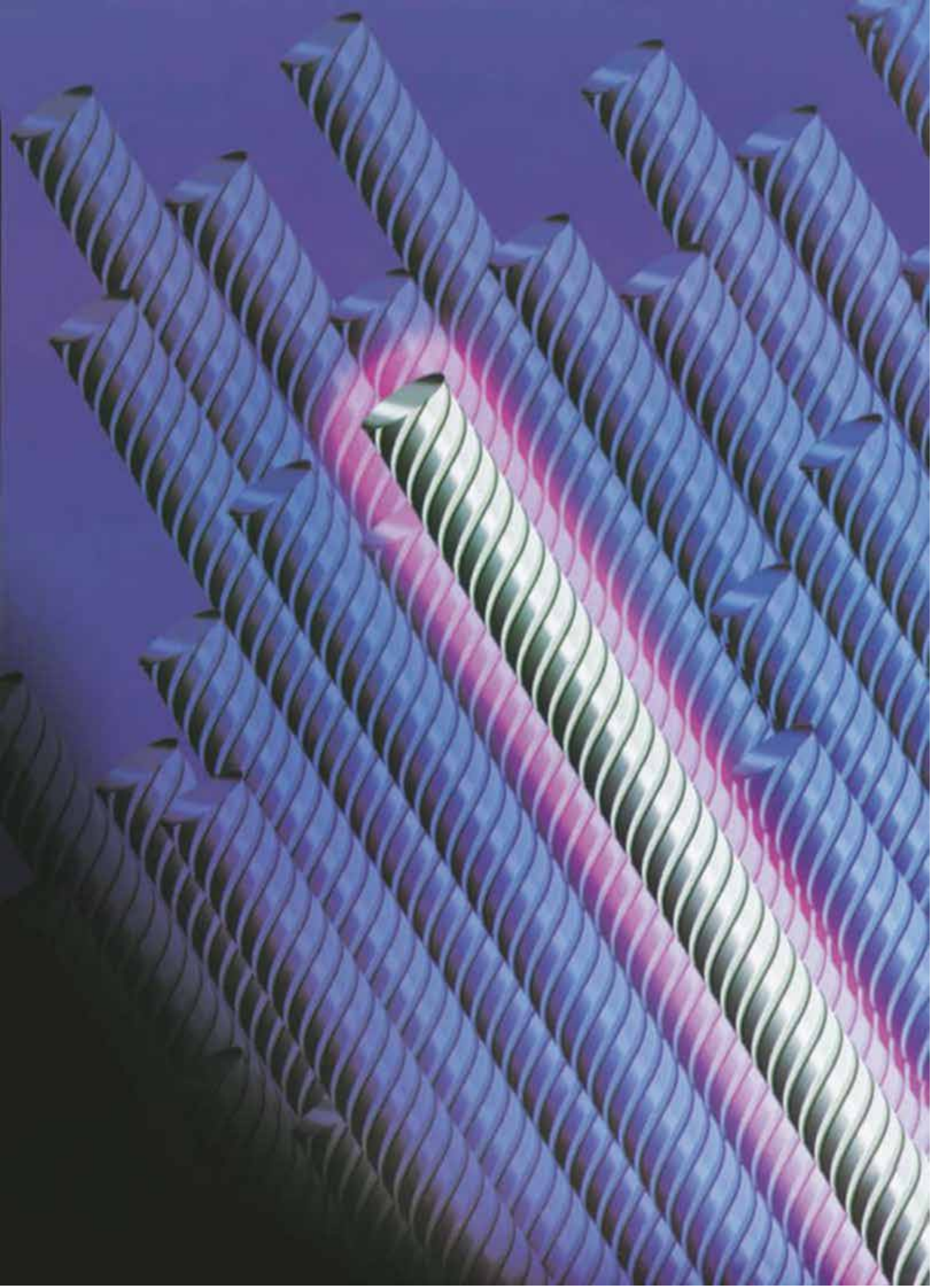
Supply Condition	As Cast
	Spot Ground
	Four Face Ground
	Hot Rolled Annealed and Pickled
As Cast Billet Sizes	130 x 130 mm 160 x 160 mm 180 x 180 mm 210 x 230 mm 240 x 280 mm 280 x 320 mm
Rolled Billet Sizes	50 mm x 50 mm x 6 m 55 mm x 55 mm x 6 m 60 mm x 60 mm x 6 m 63 mm x 63 mm x 6 m 75 mm x 75 mm x 6 m 80 mm x 80 mm x 6 m

Stainless Steel As Cast Billets

As Rolled Straight Length Bars	
Round	15mm to 200mm
Round Cornered Square	50, 55, 60, 63, 75, 80, 95, 98 mm

Stainless Steel As Ingots

Ingot Size (mm)	Wt (MT)
290 X 445 X 1700	1.8 MT
323 X 412 X 1700	2.7 MT
480 X 637 X 1700	4.2 MT



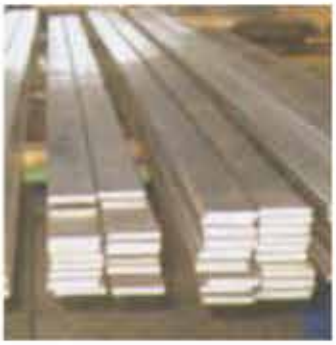
tainless Steel Rebars

Condition	Size Range	Supply Length
As rolled	6, 8, 10 mm	Coils
As rolled and descaled	12 - 32 mm	Straight Length Bars * Length 12 Mtr.

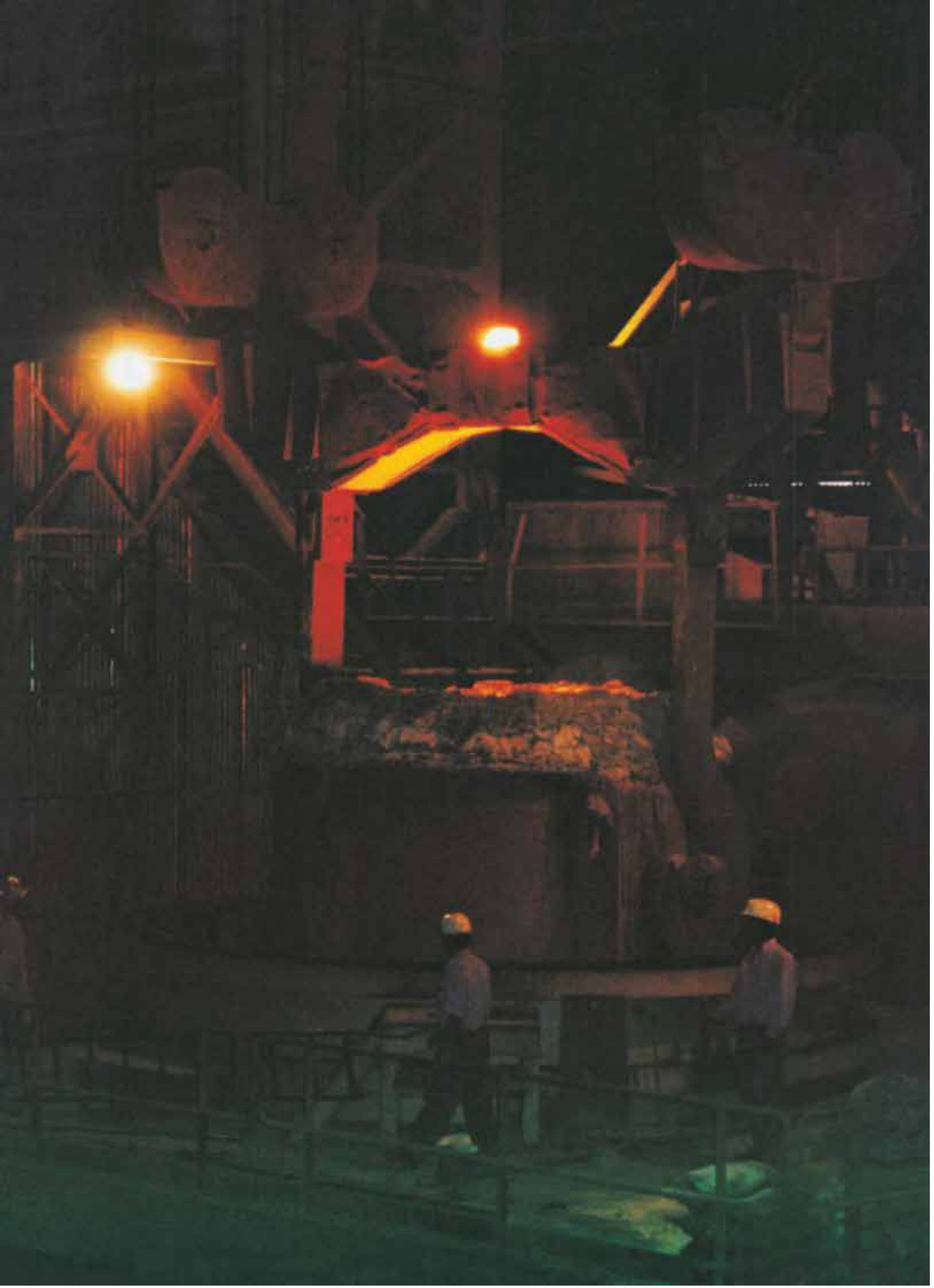
Stainless Steel Wire Rods

Hot Rolled Annealed and Pickled Wire Rods*	
Coil Weight	900 kgs to 1500 Kgs
Coil ID	850 mm min.
Coil OD	1250 mm max.
Size Range	5.5 - 38 mm Dia - Rounds 5.5 13.3 - 27.5 mm A/F-Hexagons

Stainless Steel Round Edge Flat Bars



Width	50 mm minimum
	150 mm maximum
Thickness	5 mm minimum
	28 mm maximum



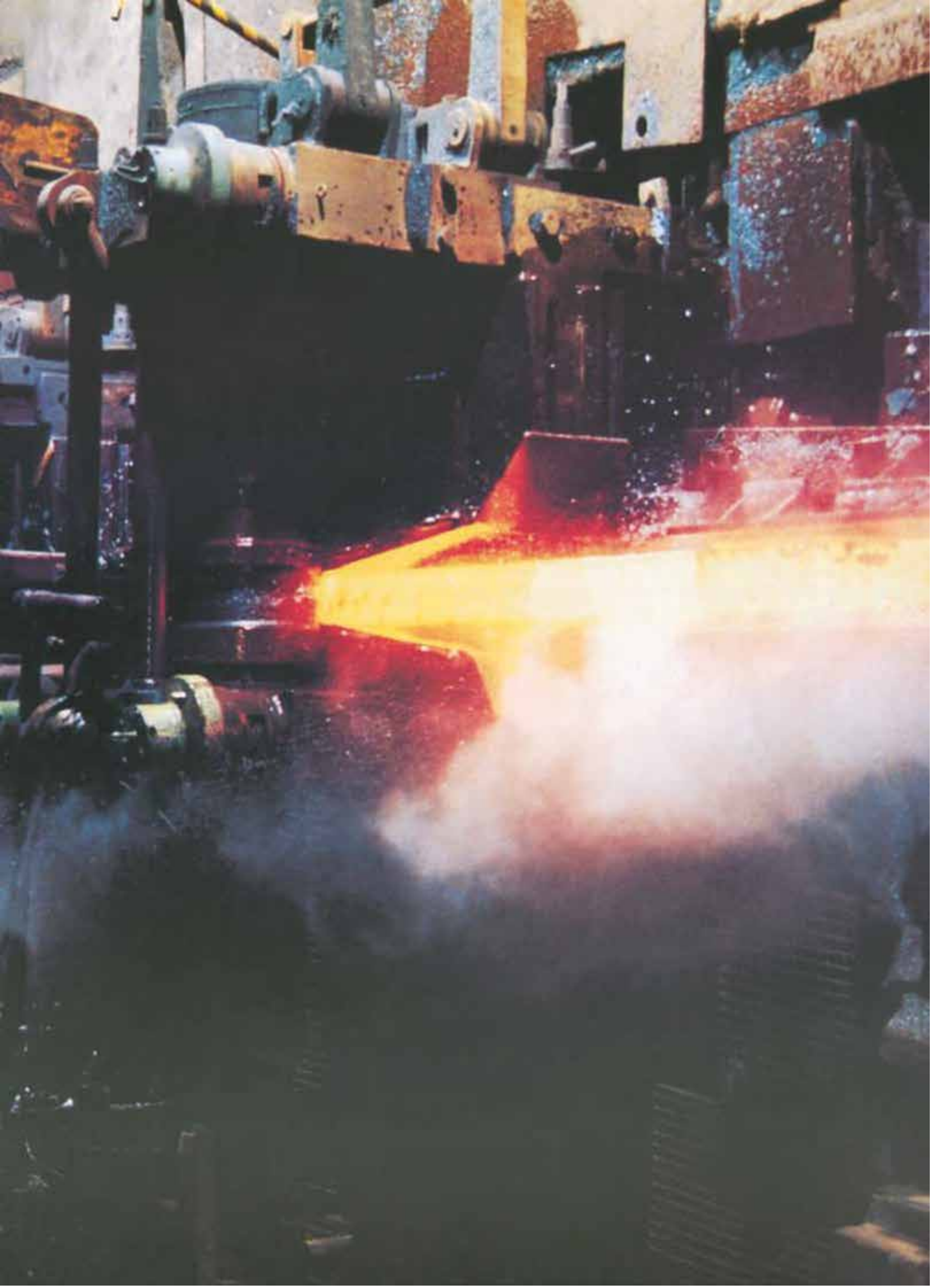
QMS Certification and Approvals

The guiding Philosophy in Sunflag Steel is enhancing customer satisfaction through continual improvemnet.

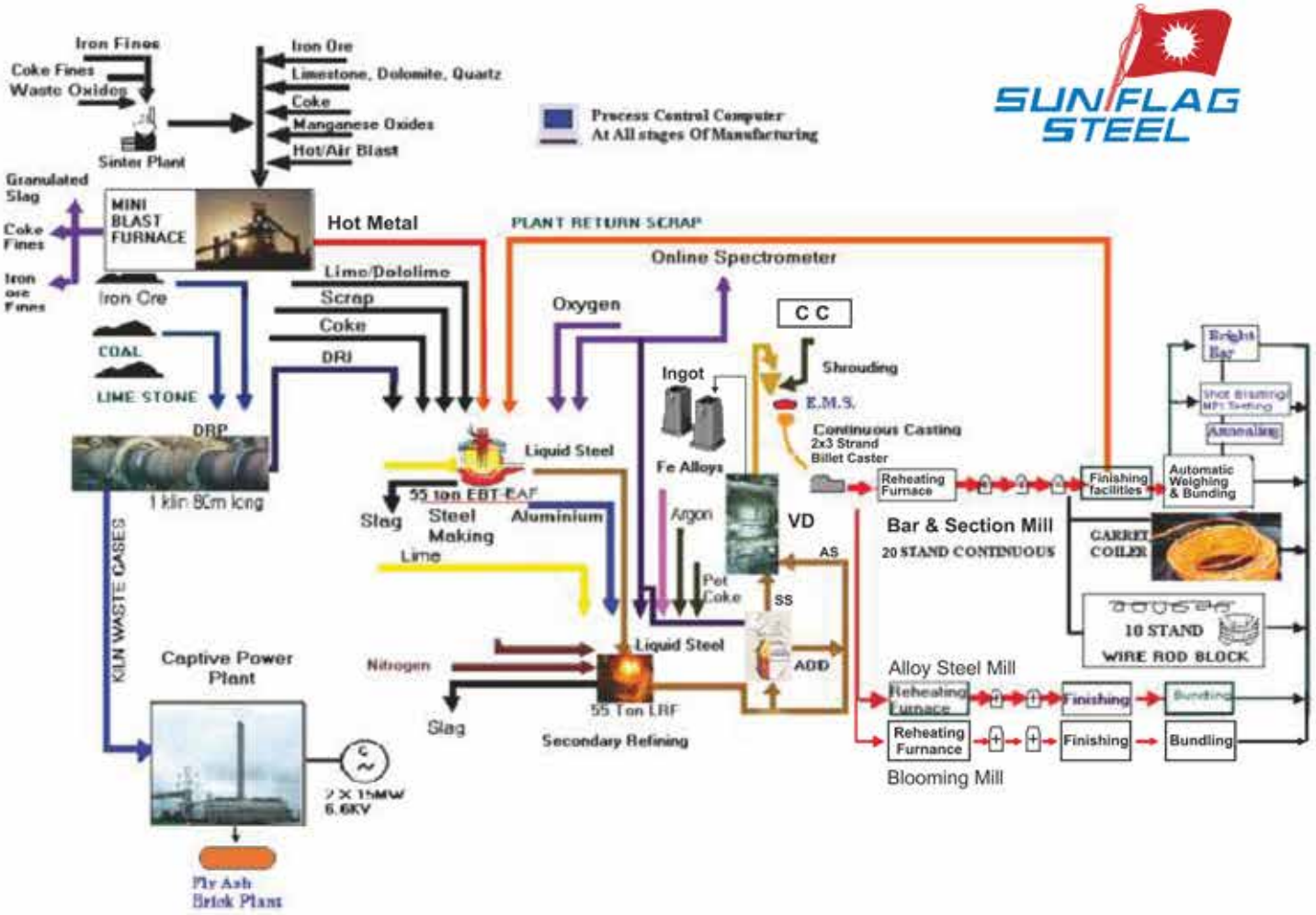
To continuously achieve higher level of performance in these areas sunflag had adopted and effectively

implemented various Quality Management system

QMS system	Scope	Validity	Certification Body
ISO 9001:2008	Complete plant operation	Upto September 2018	UL DQS , Germany
ISO / TS 16949 :2009	Complete plant operation	Upto September 2018	UL DQS , Germany
AD 2000 / MerkblattW0 / PED	Pressure equipment directives	Upto April 2019	TUV Nord, Germany
ISO 14001:2004	Environmental management Certification	Upto September 2018	TUV Nord, Germany
OHSAS 18001 :2007	Occupational Health & Safety Management systems	Upto April 2019	TUV Nord, Germany
NABL certification	Sunflag chemical & mechanical laboratories	Upto August 2018	NABL India



Process Route



DRP : Direct Reduction Plant
DCS : Distributed Control System
LRF : Ladle Refining Furnace
EMS : Electro Magnetic Stirrer

DRI : Direct Reduced Iron
EAF : Electric Arc Furnace
VD : Vacuum Degassing
MCC : Mill Control Computer

SS : Stainless steel
EBT : Eccentric Bottom Tapping
AOD : Argon Oxygen Decarburisation
AS : Alloy Steel

SUNFLAG STEEL

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Magnetic Flux Leakage Testing (MLFT) System

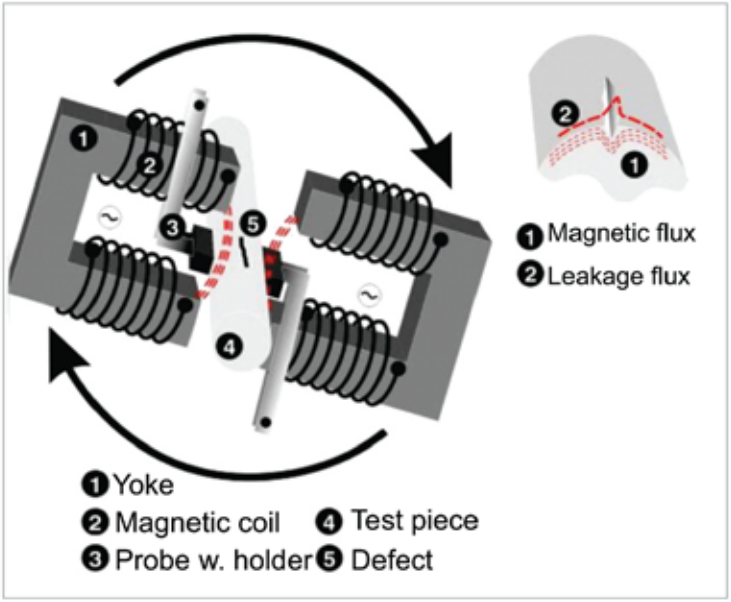
SUNFLAG STEEL

BIS Approved
NABL Accreditated Chem & Mech Labs.
ISO 9001 & IATF 16949 Certified by UL DQS
ISO 14001 & OHSAS 18001 Certified by TUV Nord
AD 2000 Merkblatt WO /PED Certified by TUV Nord

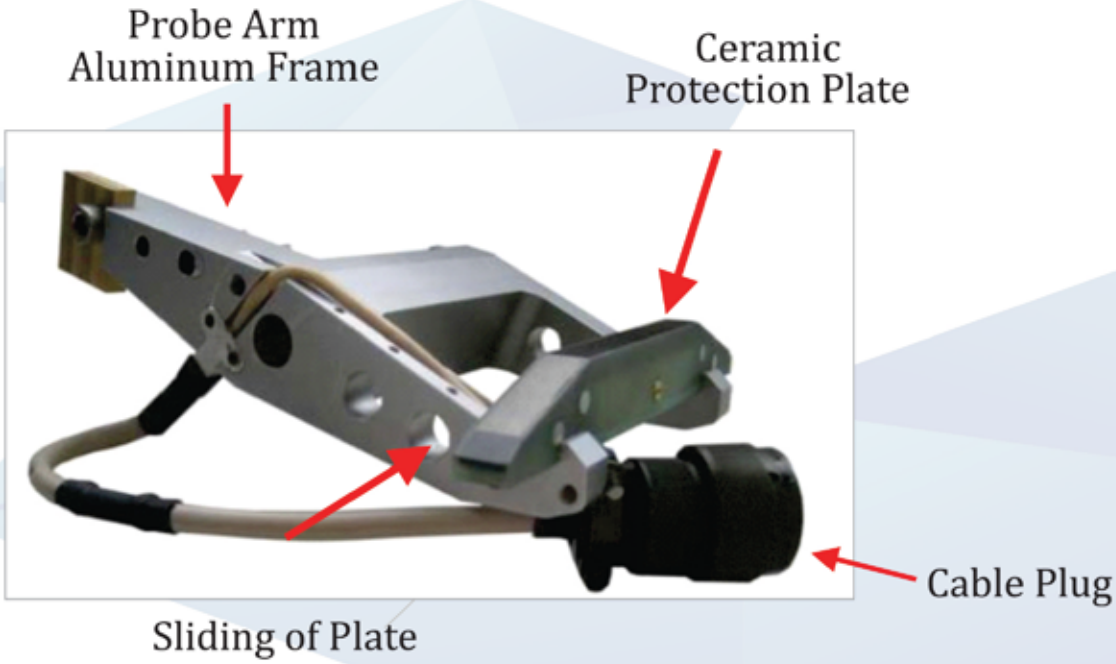
Advantages of Flux leakage testing :

- Highly sensitive test method for the detection of longitudinal defects on steel bars
- No coupling liquid
- Quick to install and easy to operate
- Reliable and reproducible test results
- Automatic marking and sorting of the tested bars
- High production speeds
- Several reporting options

AC flux leakage principle



RFL - Probe Arm



Magnetic Flux Leakage Testing (MFLT)

- Based on automated Flux leakage inspection system.
- Uses high energy A.C. Magnetic Leak fields for detection of longitudinal flaws.
- Real time display of ongoing inspection.
- Fully automated defective marking & sorting of the material.

NOVAFLUX® RFL140

MFLT SALIENT FEATURES

Diameter range	5 to 140 mm
Channels	8
Probes	up to 16
Channel width	5.0 mm
AC Frequency	7 kHz
Rotation	max. 1.800 rpm
Test Speed	up to 2 m/s for 100 % material scanning

Signal transmission by contact less inductive transformer

RFL - Probes

Probe unit with connecting cable 4 or 8 probes per Probe Arm
Channel Width 5 mm

Model	RFL 140
Diameter Range	15 – 140 mm (0.4 – 5.5 Inch)
Material	Round ferromagnetic bright or black steel bars
Max. Inspection Speed	Up to 0.3 ms (9.8 ft / S). Scanning width 100 mm.
Installed Test Heads	2
Number of Probes	16
Number of Test Channel	8
Channel Width	5.0 mm
Magnetizing Frequency	7 KHz
Setup Time Rotating Head	3 Min.
Set-up time with automatic Dimension Adjustment	2.0 Min.
Additional set up time With Inner Roller guide for Small material Diameter	1.5 – 3 Min.
2 Sorting Classes	S0 (good) / S1 (repairable)
Defect Sensitivity	0.20 mm depth & 0.10 mm Width. 20 mm length (for Black Bars)

MICROALLOYED STEELS

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Microalloyed Steels

INTRODUCTION

The use of MICRO ALLOYED STEELS (MAS) originally developed for high strength low alloysteel sheets (HSLA) for automobile bodies has shown steady and significant growth in Long products also for manufacture of forged components. The Indian steel manufacturers as well as forged component manufacturers have adapted themselves to manufacture and use MAS components for AUTO sector.

MAS grades not only helps in avoiding use of costly alloying elements but also eliminates the need for heat treatment of forged components. Plain carbon steels having closely controlled chemistry (to maintain carbon Equivalent) alongwith small additions of microalloying elements such as V, Nb and Ti (to promote Precipitation strengthening) can achieve the desired strength levels after forging without heat treatment. Optimum Sulphur levels are maintained to promote machinability

These steels are covered by EN spec10267 as general spec, which can be fine tuned to meet specific customer requirements

Sunflag melting and refining process has capability to meet close range chemistry with help of controlled addition of Microalloying Elements like V, Nb, Ti and special wire injection facilities for sulphur and aluminium addition.

Nitrogen can also be closely maintained in the range of 100 to 200ppm as specified by customer.

Microalloyed grades being produced

Sr.no.	Grades	End Application
1	C70S6	Fracture splitable connecting rod
2	38MnSiVS5	Crank shaft,Outer ball joint,Inner insert.
3	30MnVS6	Housing shaft and socket
4	SAE 11V41	Yoke
5	SAE 1137V	Transmission components
6	D25M6	Components for Renaults(Export)
7	MT-15	Link application
8	S48CS1V	Crank shaft
9	S45CS1V	Rack bar
10	38MnVS5	Crank shaft
11	40MnSiVS6	Tubular and spherical rails

PHASED ARRAY AUTO ULTRASONIC MACHINE

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Salient Features

Phased Array Technology

Phased Array testing is a specialized type of ultrasonic testing that uses sophisticated multi-element array transducers and powerful instrumentation/ software to steer ultrasonic beams through the test piece and map returning echoes.

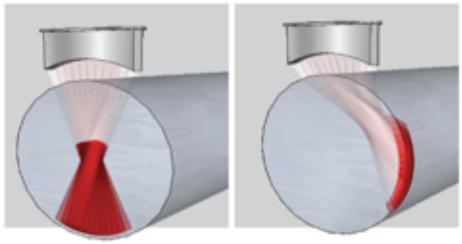
Multi-element PA probe

Quick Scan LT PA

The electronic configuration of the solution for Phased Array inspection is based on the Quick Scan LT PA (16/256 or 32/256) unit.

Phased Array Ultrasound Concept - Round

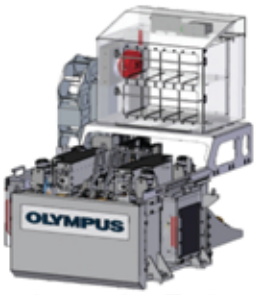
No rotating movement, only electronic scanning is done
Depth focalization for bar volume inspection (LW)
Electronic steering for bar surface inspection (SW)



Longitudinal Wave Shear Wave

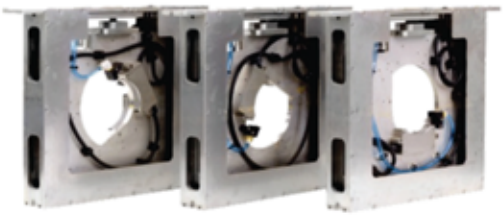
Advanced Floating Head Mechanism

Floating head system is immersed in the UT tank and bar passes through centering devices, which guide the floating head and maintain constant position of probes with respect to bar surface.



Immersion Tank

Floating Head



Probe Cassettes

Phased Array probes are mounted in cassettes with pre-defined mechanical overlap between each of them depending on the diameter of the bar for 360° coverage on round products.

SPECIFICATIONS

- Immersion Tank Type
- Diameter range 15 to 120mm
- Full Bar Volume Inspection

REFERENCE DEFECTS

- SDH (diameter in function of Size Range)

Location (Depth)

SDH 1 – At 50% of nominal diameter
SDH 2 – At 2mm from back wall
SDH 3 – At 5mm from back wall
SDH 4 – At 3mm from back wall

SDH 0.5mm(0.3mm can be guaranteed by extrapolation)

ACCEPTANCE CRITERIA

- FBH (diameter in function of Size Range)

Location (Depth)

FBH 1 - At 40% of nominal diameter
FBH 2 - At 5mm from back wall

FBH 0.7mm up to 60mm diameter
FBH 1.2mm for 60 to 120mm diameter

SPRING STEELS

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AD 2000 Merkblatt WO /PED Certified by TUV Nord

SPRING STEELS

General Features

Spring Steel is used for manufacturing various types of springs and components, for the suspension mechanism in Automobiles and Railways, like :

- Leaf Springs
- Coil Springs
- Stabiliser Bars
- Torsion Bars

A very high degree of quality, reliability and service life is expected in springs which are vital for any automobile or the railways. The spring's capacity to take on static and dynamic load over an extended period of time, depends on the steel that goes into its making.

Sizes and conditions of supply

Condition of supply	Shapes	Sizes
1. Hot Rolled	Flat	50 x 5 mm - 120 x 28 mm
	Round	12 mm - 100 mm dia
2. Drawn	Round	10 mm - 50 mm dia
3. Peeled and Ground	Round	10 mm - 50 mm dia

Edge Radius

Flats can be supplied with an edge radius "R" which is equal to either "T" or "T/2", where "T" is equal to thickness.

General Length

We cater to orders in standard and specific length.
a) Standard length 4 to 6 mtrs with 10% shorts down to 1 mtr.
b) Customer's specific lengths with tolerance +50/-0mm.

Straightness

Bars will have a straightness of 3 mm/mtr (max)

Quality

Surface Condition : On visual inspection, surface is free from harmful defects, eg. crack, lap, fold, scratch, roll/pass marks, pits etc.

Decarburization

	Full	Partial	Total
Flats (upto 80 x 13)	Nil	0.15	0.15 mm (max)
Flats (above 80 x 13)	0.03	0.25	0.28 mm (max)
Hot Rolled Round		0.8% of the size (max)	

Grain size

5-8 (As per ASTM E-112)

As Rolled Hardness

310 BHN (max)

Inclusion Rating

As per IS-4163/ASTM E-45 : THIN : 2.5 A,B,C,D max
: HEAVY : 1.5 A,B,C,D max

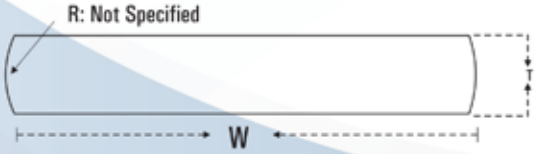
As per JIS G-0555
% dA - 0.15 max
% dB + dC - 0.10 max
% d Tot - 0.20 max

Delivery Conditions

- All bundles tied with wire/strapping at 3/4 places.
- Approx. bundle weight : 2MT. max
- Grade/HT. No. identification : By painted colour code and Heat Number written on each bundle /bar

Standard shapes and sizes of Spring Steel Flat Bars

1. RE Type



The conventional type is of Round Edge (RE) type, having edge radius approximately equivalent to thickness but not specified.

2. FL Type

Feather leaf type Spring Steel flats have edge radius of half of thickness and also have many advantages over RE type in terms of economical and technical aspects. Size - wise edge radius is to be mutually agreed.

Dimensional Tolerances

Flats :

Width Range (mm)	Tolerance (mm) (+/-)			Tolerance (mm)	
	Width (W)	Thickness (T)		Concavity (+max) for	
		< = 10	> 10	T < = 10	T > 10
40-50	0.30	0.15	-	0.15	0.15
51-75	0.50	0.15	0.20	0.15	0.20
76-100	0.70	0.20	0.25	0.20	0.20
101-125	0.90	0.25	0.40	0.30	0.40

Rounds (Hot Rolled) :

Size (mm Dia)		Tolerance (mm)	
Over	Upto & Including	Tolerance (Dia)	Tolerance (Out of Round)
-	12	± 0.18	0.25
12	15	± 0.18	0.25
15	22	± 0.20	0.30
22	25	± 0.24	0.35
25	28	± 0.25	0.40
28	31	± 0.28	0.45
31	34	± 0.30	0.50
34	38	± 0.36	0.60
38	50	± 0.40	0.60
50	64	+ 0.8/-0	0.80
64	80	+ 1.20/-0	0.80
80	89	+ 1.20/-0	0.80
89	100	+ 1.60/-0	1.20

Rounds (Bright Bars) :

Size (mm Dia)		Tolerance on Dia (mm)		
Over	Upto & Including	Cold Drawn	Peeled / Turned	Centreless Ground
-	10	+ 0/- 0.09	---	+ 0/- 0.036
10	18	+ 0/- 0.11	+ 0/- 0.11	+ 0/- 0.043
18	30	+ 0/- 0.13	+ 0/- 0.13	+ 0/- 0.052
30	50	+ 0/- 0.16	+ 0/- 0.16	+ 0/- 0.062

Fatigue Guaranteed Spring Steels

Sunflag Steel, a pioneer in making Spring Steel, has come up with products in this category, which ensure the required fatigue life to springs used in vehicles, in the most demanding situations.

The salient features of these products are :

a) Use of virgin inputs in steel making such as DRI, Pig Iron which are free from undesirable tramp elements.
b) Carefully planned, steel making refining vacuum degassing and casting processes.
c) Well controlled reheating and rolling process.
d) Closely monitored cooling parameters of rolled products.
e) Thorough inspection and testing.
f) Proper packing, stacking and storage for despatch.
g) Wide size range.

SUNFLAG STEEL

SPRING STEELS

Chemical Composition Of Typical Spring Steel of Various International Standards

Grade	CHEMISTRY												
	C	Mn	P	S	Si	Cu	Cr	Ni	Mo	V	Al	B	Nb
DIN													
50CrV4	0.47-0.55	0.70-1.10	0.035 Max	0.035 Max	0.15-0.40	0.25 Max	0.90-1.20	-	-	0.10-0.20	0.040 Max	-	-
51CrMoV4	0.48-0.56	0.70-1.10	0.030 Max	0.030 Max	0.15-0.40	0.25 Max	0.90-1.20	-	0.15-0.25	0.07-0.12	0.040 Max	-	-
51CrV4	0.48-0.55	0.85-1.10	0.020 Max	0.020 Max	0.25-0.40	0.25 Max	0.95-1.20	0.20 Max	0.06 Max	0.10-0.20	0.015-0.040	-	-
51CrV4-Nb	0.50-0.55	0.90-1.10	0.015 Max	0.015 Max	0.15-0.40	0.25 Max	0.95-1.20	0.40 Max	0.06 Max	0.07-0.14	0.015-0.025	-	0.0600
5 Cr4Mo2V	0.48-0.56	0.70-1.10	0.025 Max	0.025 Max	0.15-0.40	-	0.90-1.20	-	0.15-0.25	0.07-0.12	-	-	-
52CrMoV4	0.48-0.56	0.70-1.10	0.015 Max	0.015 Max	0.15-0.40	-	0.90-1.20	-	0.15-0.25	0.07-0.12	-	-	-
55Cr3	0.50-0.60	0.60-0.80	0.035 Max	0.035 Max	0.10-0.35	0.25 Max	0.60-0.80	-	-	-	0.040 Max	-	-
55Si7	0.50-0.60	0.80-1.00	0.025 Max	0.025 Max	1.50-2.00	0.25 Max	0.25 Max	-	-	-	-	-	-
60Si7	0.55-0.65	0.80-1.00	0.025 Max	0.025 Max	1.50-2.00	0.25 Max	0.25 Max	-	-	-	-	-	-
60SiCr7	0.55-0.65	0.70-1.00	0.045 Max	0.045 Max	1.50-1.80	0.25 Max	0.20-0.40	-	-	-	0.40 Max	-	-
65Si7	0.60-0.70	0.80-1.00	0.025 Max	0.025 Max	1.50-2.00	-	0.25 Max	-	-	-	-	-	-
54SiCr6	0.50-0.59	0.50-0.80	0.03 Max	0.030 Max	1.20-1.60		0.50-0.80	-	-				0.1000
BS													
EN45A	0.55-0.65	0.70-1.00	0.050 Max	0.050 Max	1.70-2.00		0.25 Max	-	-			-	–
ASTM						0.25 Max				-	0.040 Max	-	-
SAE5160	0.56-0.64	0.75-1.00	0.035 Max	0.040 Max	0.15-0.30		0.70-0.90	-	-	-		-	-
SAE5160H	0.55-0.65	0.65-1.10	0.035 Max	0.035 Max	0.15-0.30	0.25 Max	0.60-1.00	-	-	-	0.040 Max	-	-
SAE51B60H	0.55-0.65	0.65-1.10	0.035 Max	0.040 Max	0.15-0.30	0.25 Max	0.60-1.00	-	-	-	0.040 Max	0.0005 Min	-
SAE9254	0.51-0.59	0.60-0.80	0.035 Max	0.040 Max	1.20-1.60	0.25 Max	0.60-0.80	-	-	-	0.040 Max	-	-
SAE9261B(M)	0.55-0.65	0.70-1.00	0.050 Max	0.050 Max	1.80-2.20	0.25 Max	0.10-0.25	0.35 Max	0.10 Max	-	0.040 Max	-	-
JIS						0.35 Max			-	0.10 Max	-		
SUP6	0.56-0.64	0.70-1.00	0.035 Max	0.035 Max	1.50-1.80	0.25 Max	0.25 Max	-	-	-	0.040 Max	-	-
SUP7	0.55-0.65	0.70-1.10	0.035 Max	0.035 Max	1.80-2.20	0.25 Max	0.25 Max	-	-	-	0.040 Max	-	-
SUP7C	0.58-0.64	0.80-1.00	0.030 Max	0.030 Max	1.90-2.20	0.25 Max	0.10-0.20	-	-	-	0.040 Max	-	-
SUP7N	0.58-0.63	0.80-1.00	0.035 Max	0.035 Max	1.90-2.20	-	0.10-0.20	-	-	-	-	-	-
SUP9	0.52-0.60	0.65-0.95	0.035Max	0.035Max	0.15-0.35	0.15 Max	0.65-0.95	-	-	-	-	-	–
SUP9A	0.56-0.64	0.65-0.95	0.035 Max	0.035 Max	0.15-0.35	0.25 Max	0.70-1.00	-	-	-	0.040 Max	-	-
SUP9H	0.52-0.60	0.65-0.95	0.035 Max	0.035 Max	0.15-0.35	0.25 Max	0.65-0.95	-	-	-	0.040 Max	-	-
SUP9M	0.55-0.60	0.75-0.90	0.030 Max	0.030 Max	0.15-0.35	0.30 Max	0.75-0.90	-	-	-	0.020 Min	-	-
SUP9N	0.56-0.60	0.80-1.00	0.030 Max	0.030 Max	0.15-0.35	0.25 Max	0.80-1.00	–	-	-	0.040 Max	-	-
SUP11A	0.56-0.64	0.70-1.00	0.035 Max	0.035 Max	0.15-0.35		0.70-1.00	-	-	-		0.0005 Min	-
SUP12	0.51-0.59	0.60-0.90	0.030 Max	0.030 Max	1.20-1.60	0.25 Max	0.60-0.90	-	-	-	0.040 Min	-	-