



COLD FORGING QUALITY STEELS



**SUN FLAG
STEEL**

*BIS Approved
NABL Accredited 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*

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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	Garret Route
	(5.5 mm to 11mm dia)	(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

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.

PROCESS	EQUIPMENT	KEY PROCESS CHARACTERISTICS	EFFECT ON PRODUCT QUALITY
PRIMARY MELTING	EAF WITH EBT AND LOAD CELL ELECTRIC ARC FURNACE WITH ELECTRIC BOTTOM TAPPING AND LOAD CELL	<ul style="list-style-type: none"> • GOOD CARBON BOIL • SLAG FREE TAPPING • LM WEIGHT MONITORING • LIQUID METAL 	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • ARGON PURGING • MICROPROCESSOR BASED FERROALLOY ADDITION SYSTEM • CONTROLLED POWER INPUT 	<ul style="list-style-type: none"> • ACHIEVING FINAL PRODUCT CHEMISTRY WITH HIGH REPETABILITY. • PREDICTABLE ALLOY RECOVERY AND LESS FORMATION OF DEOXIDATION OF PRODUCTS. HIGH BASICITY FOR DEEP DESULPHURISATION AND INCLUSION REMOVAL. FACILITY FOR TRIM ADDITION TO ACHIEVE CLOSE RANGE OF TARGET CHEMISTRY.
DEGASSING	STATIC TANK TYPE VACUUM DEGASSING	<ul style="list-style-type: none"> • HIGH SUCTION CAPACITABILITY TO ACHIEVE VACUUM <1 m bar • ARGON PURGING/RINSING 	<ul style="list-style-type: none"> • 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 CARBENSULPHUR AND ALLUMINIUM	FINE ADJUSTMENT OF C & S & ALLUMINIUM	PRECISE CONTROL OF C, S AND ALUMINIUM.
CASTING	CONTINUOUS CASTER 3 STRANDS WITH AMLC/EMS, SUBMERGED NOZZLE CASTING AND LEVEL 2 AUTOMATION	<ul style="list-style-type: none"> • BASIC REFRACTORIES. • CONTROL ON SUPER HEAT. • CASTING SPEED. • UNIFORM SECONDARY COOLING. • STABLE CASTING 	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • OPTICAL EMISSION SPECTROMETER • GAS ANALYSERS • MACRO TEST • AUTO GRINDING OF SURFACE • MAGNA FLUX ON ROLLED BILLET 	<ul style="list-style-type: none"> • CHEMISTRY, • GAS LEVELS, • INTERNAL AND SURFACE QUALITY AS PER CUSTOMER SPEC 	CONFORMANCE TO CUSTOMER SPECIFICATION.
BAR AND SECTION ROLLING MILL	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • ROLLING TEMPERATURE, CONTROL FURNACE RESIDENCE TIME, • PRIMARY SCALE REMOVAL, • OVAL-ROUND PASS SEQUENCE AND INTERSTAND TENSION CONTROL WITH LOOPERS. • INPUT OUTPUT TEMPERATURE CONTROL, • PLANNED PASS SCHEDULING • HORIZONTAL VERTICAL HORIZONTAL STAND CONFIGURATION IN VRM 	<ul style="list-style-type: none"> • UNIFORM SURFACE APPEARANCE, • CLOSE DIMENSIONAL TOLERANCE, • 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 TOLERANCES OF 1/4 TH OF STANDARD "DIN 1013" WITH MINIMUM SIZE VARIATION ALONG THE LENGTH OF BAR
BLOOMING MILL	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • ROLLING TEMPERATURE, • FURNACE RESIDENCE TIME 	<ul style="list-style-type: none"> • FLEXIBILITY TO ROLL SQUARES AND ROUNDS • FREE FROM HARMFUL SURFACE DEFECTS • DIMENSIONAL CONTROL AS PER TOLERANCE, • PROPER END CUTTING, • GOOD STRAIGHTNESS IN AS ROLLED CONDITION
ALLOY STEEL MILL	<ul style="list-style-type: none"> • PLC CONTROLLED PUSHER TYPE FURNACE, • THREE HIGH ROUGHING STAND, • TWO THREE HI INTERMEDIATE STAND AND • TWO HIGH FINISHING STAND, • HOT SAW FACILITY AND RAKETYPE COOLING BED 	<ul style="list-style-type: none"> • GOOD TEMPERATURE CONTROL, GOOD FINISH QUALITY 	<ul style="list-style-type: none"> • DEFINE ROLL PASS DESIGN, BOX PASSES, • DI & SQ FOLLOWED BY OVAL ROUND SEQUENCE IN INTERMEDIATE AND FINISHING.

**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						