

SHEFFIELD FORGEMASTERS

CAPABILITIES

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SFIL MATERIAL CAPABILITIES

A variety of materials are offered including carbon and low alloy, tool steel and stainless steels. SFIL material is produced with tight chemistry control, adapted from years of technical experience taken from research and metallurgical development, to provide heat-to-heat analysis consistency and unparalleled cleanliness.



Grade sectors include:

- Carbon and low-alloy
- Tool steels
- Stainless steels including, austenitic, martensitic, ferritic and precipitation hardened grades

A full listing of common material grades can be found in Appendix (a)

RD26, SFIL's technical and research division, constantly reviews, maintains and develops material grades to global-standard and customer specifications allowing for constant upgrading of mechanical properties.

Critical supply to nuclear and defence industries includes materials produced to the following standards:

- DGS MS HAS
- DGS MS LAS
- DGS NAS 4
- ASME SECTION III NCA-3800
- RCC-M 1000
- RCC-M 2000
- RCC-M 3000
- Def St 02-833
- Def St 02-834
- Def St 02-835
- Def St 02-838
- Def St 02-780

SFIL MELTING CAPABILITIES

SFIL specialises in the production of round, square and octagonal ingots for use in forging, ring rolling and re-melt electrode production.

The steel is melted using carefully selected high-quality scrap and alloys from a defined supply chain using an electric arc furnace. This gives very low content of residual elements.

Additional refinement is given to molten steel through VAD, VD, VOD and ladle furnace in a protective atmosphere with pre-set controlled and recorded casting speed parameters.

The steel making process is constantly monitored and advanced through RD26, our in house research and development team.



Melting equipment includes:

- 100t EAF (Electric Arc Furnace)
- 105t LF (Ladle Furnace)
- 100t VAD (Vacuum Arc Degassing)
- 90t VOD (Vacuum Oxygen Degassing)

With the ability to:

- Inert gas purge and argon shroud
- Stream de-gas
- Make safe anneal ingot/bar

Ingots produced from 1500 kilos to
285,000 kilos in weight

Casting of steel up to 600,000 kilos



SFIL INGOT PRODUCTION



SFIL has the ability to produce high quality ingots across a variety of sizes and shapes, which is born from years of research and development within casting technology - using high alumina refractory linings and some of the most modern teeming equipment and methods. Each stage within the melting operation is monitored by highly trained technicians and operatives to guarantee a clean steel practice from start to finish.

SFIL is renowned for its super clean steel practices and tight chemistry ranges. The consistency of specific alloy contents for given grades allows customers to achieve repeated heat treated mechanical property results.

Our ingots can be ordered many forms including:

- Rounds
- Rippled
- Octagons
- Multi Fluted

Full range of sizes are seen in Appendix (b) ingot moulds

Ingots can be shortened or lengthened in order to suit most applications and to guarantee maximum yield for specific components.

We are able to produce ingots in many configurations:

- Lengths up to 4,800mm
- Weights from 1.5t to 285t

Simply...

The cleanest steel, the highest quality, the largest range of sizes.

SFIL FORGINGS CAPABILITY

With an unparalleled track record of supplying into industries such as defence, nuclear, power generation and offshore oil and gas, SFIL has the ability, knowledge and equipment to produce some of the largest most complex forgings on the planet. The company's technology and research into forgings has seen numerous industry firsts achieved at the Brightside Lane Heavy Forge, many of which remain unrepeated by our competitors.

Our ability to project manage, design with computer aided simulation, produce and finish-machine components, complements new design technology which is the best in the world. Critical components can be found supplied by SFIL wherever a complex forging solution is required.

Utilising in-house steel making facilities, forging, heat treatment and machining operations on a purpose-built 64 acre site, we can manufacture to the largest of customer requirements.

An outline of our forgings output includes:

- Hollow sleeves with outside diameters from 750mm up to 5,600mm in lengths up to 4,800mm to a maximum weight of 150t
- Rings with outside diameters from 1,000mm up to 5,600mm in lengths up to 2,540mm to a maximum weight of 150t
- Forged discs from 500mm diameter up to 5,588mm diameter
- Step forged shafts from 300mm diameter up to 2,850mm diameter in lengths up to 16,000mm to a maximum weight of 170t
- Blocks with a minimum width of 230mm up to 4,250mm, height up to 1,250mm to a maximum weight of 150t

In low alloy, tool steel and stainless steels, there after offering;

- Heat treatment - both horizontal and vertical
- Rough machining facilities
- Finish machining to tight tolerances
- NDT testing
- Ultrasonic testing
- Chemical & Mechanical testing



SFIL FORGED BAR

The highest quality ingots are forged into a wide array of bar sizes and materials specification including low alloy, tool steels and stainless steels, guaranteeing consolidation through conventional open die forging and upsetting processes.

Forging equipment includes:

- 10,000t open die forging press
- 4,000t open die forging press
- Cold sawing up to 2,000mm diameter
- Horizontal heat treatment up to 22,000mm in length & 5,600mm diameter with a maximum weight of 200t
- Vertical heat treatment up to a maximum weight of 120t

Bars can be produced in the following specifications:

- From 200mm diameter up to 2,850mm diameter
- From 230mm square up to 1,300mm square
- From 230mm wide up to 4,250mm wide x 250mm thick up to 1,250mm thick in lengths up to 10,000mm

Bar can be supplied in the following conditions:

- Black (as forged)
- Honed
- Heat treated
- Step turned
- Turned, ground or milled
- Fully tested to international or customer standards
- Bored
- Ultrasonically tested to international or customer standards



For use within distribution, Forging, Ring Rolling and machining applications.

Material is produced to order or supplied from our extensive stocking facility.

SFIL HEAT TREATMENT FACILITIES

SFIL's ability to anneal, normalise, harden, quench and temper, allows endless combinations of heat treatment - resulting in one of the most comprehensive facilities in the world today. The ability to follow complex heat treatment processes guarantees consistent mechanical properties across the company's range of metals supplied to industry.



Heat treatment equipment includes;

- 16 bogie hearth gas fired furnaces with capacity of 7,600mm wide x 5,000mm high x 17,500mm in length
- 4 top-hat gas fired furnaces with capacity of 3,500mm wide x 2,500mm high x 20,000mm in length
- 2 vertical electric induction furnaces with capacity of 3,700mm diameter in lengths up to 20,000mm
- Full water and oil quenching facilities

All facilities are centrally computer controlled with constant time and temperature monitoring. These systems are regularly put through simulation programs to optimise and advance the treatment process.

SFIL's heat treatment facilities continue to aid the process of our steel production and are also available for use by external organisations.

SFIL MACHINING FACILITIES

At SFIL, some of the largest NC (Numerical Controlled) and CNC (Computerised Numerical Controlled) machines in the world provide capabilities for machining parts up to 400t in weight.

Set across three dedicated machining areas on site, these facilities offer:

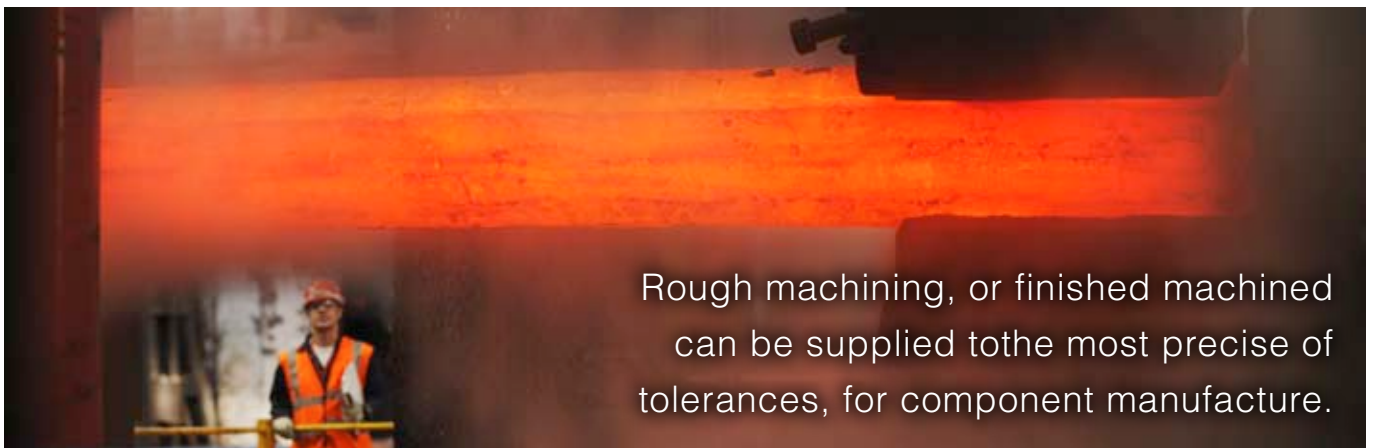
- Milling up to 16,000mm x 7,000mm x 17,000mm
- Boring up to 2,200mm x 20,000mm, trepanning, drilling and honing
- Turning, up to 8,500mm diameter x 20,000mm length
- Finishing and grinding

Processable materials include:

- Carbon steels
- Tool steels
- Stainless steels and duplex steels
- Nickel based steels

Machining centres include:

- Gantry mill
- FB260 CNC milling and boring machines
- Double column CNC vertical milling and boring
- Skoda W225 CNC milling and boring
- Innocenti CNC milling and boring
- VDF deep hole borer and trepanning lathe
- Churchill lathes
- Webster and Bennet vertical borers
- Vertical borers
- Horizontal lathes, borers and grinder
- Delapena honing machine
- Roll grinders



Rough machining, or finished machined can be supplied to the most precise of tolerances, for component manufacture.

SFIL FORGED ROLL CAPABILITIES

As a leading supplier of rolls for use by hot and cold-rolled steel plants throughout the world (both ferrous and nonferrous) SFIL can offer some of the largest rolls within steel production including:

Back up rolls

- Forged and fully machined steel back up rolls from 2t up to 170t
- Back up rolls with a barrel diameter of 2200mm to a maximum length of 20,000mm
- Finish machined and heat treated
- Neck rings and bearing sleeves can be fitted as and when required

Tandem mill rolls

- Forged and fully machined up to 60t
- Finish machined and heat treated

Plate mill rolls

- Forged and fully machined up to 170t
- Finish machined and heat treated

Work rolls

- Forged and fully machined up to 12t
- Heat treated and induction hardened to customer requirements
- Sub-zero cryogenic treatment to maximise hardness
- Reduction of austenite to minimum levels



Rolls are supplied in;

- 3%,4%,5% CrMoV steels in air-melt qualities

After sales re conditioning can be offered, including roll re-hardening, conversion and renovation - allowing for an increase in the expected life of rolls.

SFIL CASTING CAPABILITIES

Castings come in many shapes and sizes, however SFIL has adapted proven skills and technology to innovate some of the most creative designs within the supply chain, supplying heavy duty machinery producers worldwide. The largest castings in the world have consistently been manufactured at the Brightside Lane foundry.

SFIL offers the following castings services:

- Design simulation
- Pattern design and manufacture
- Production of castings up to 350t
- Heat treatment
- Rough machining
- Finished machining
- NDT
- Inspection

Castings are supplied in a range of steels to meet international specifications including:

- Low alloy
- Stainless steels and precipitation hardened steels

Super-clean steel is transferred by ladle into the foundry for pouring into pattern moulds which are manufactured on-site using industry leading materials.

SFIL castings can be found throughout the world in applications such as:

- Civil nuclear power and submarine propulsion components
- Maritime propulsion equipment including struts and steering components
- Nuclear waste cask components
- Structural steel components
- Capital plant
- Press frame cross heads
- Press frames
- Large platens
- Rams for counter blow hammers
- Rolling mill housings
- Valve bodies and pump bodies
- Offshore nodes, mooring systems and lifting points



SFIL PRESSURE VESSELS

SFIL is a leading supplier of pressure vessels used within the petrochemical and oil and gas industries. Pressure vessels have been manufactured for LDPE, HDPE and materials testing. All components are made to print and comprise of proven, safety-critical components.

Blind end vessels:

Manufactured from a solid forging which later in the production process has the bore machined out to a stipulated finished size. The vessel body is enclosed at one end and open at the other, the open end is closed off using an end-cap/door. SFIL's pressure vessels are manufactured to ASME, Sec V –V111 and Chinese A1 codes and regulations.

- Maximum forged weight: 190t

Cylindrical vessels:

The cylindrical vessel body is ID punched, creating a cylinder with both ends open. Both ends are then sealed using either a bolted or screwed head/door construction.

- Maximum forged weight 125t (weight after punching out bore)

Vessel size variations based on heat treatment and hydrotest

- Maximum Dia 90" if vertically treated, 200" horizontally treated.
- Maximum Length 787" if vertically treated, 170" horizontally treated.
- Maximum Length 568" if hydrotest is required.
- Maximum rough machined weight 120t if vertical heat treatment.

Additional

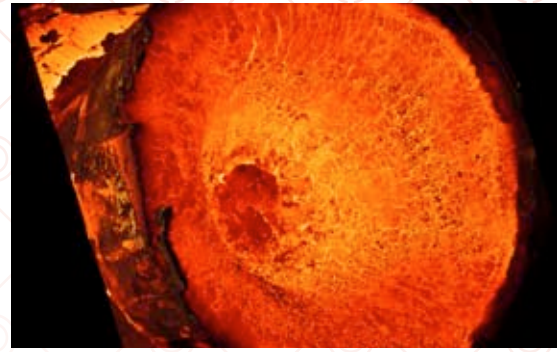
- Material: 3 ½ NiCrMoV
- Assembled on site and pressure tested from 1- 100,000psi
- Working inside volume ranges from 250 – 10675 litres
- Ingot weight 1- 282t

After sales reconditioning of reactor vessels:

- Clean up of excess corrosion build-up
 - Vertical heat treatment
-

SFIL OFFSHORE CASTINGS AND FORGINGS

In an increasingly demanding global market, SFIL realised the need to provide a design and manufacturing capability dedicated to the offshore sector, with particular expertise in high integrity steel castings and forgings.



Design

SFIL provides a unique design service, which combines designing for ease of manufacture, with structural design for both static and fatigue conditions. Since the early days of developing cast nodes, the range of items designed has expanded to include all forms of offshore structural components and lifting points, mooring systems and wye pieces.

Casting solutions

SFIL pioneered the use of structural castings in the offshore industry and has a stronger track record than any competitor in providing fail-safe engineering solutions for the most demanding offshore applications. The flexibility in shape and section thickness that a casting offers can bring innovative solutions to complex assemblies and lifting arrangements.

Forging solutions

The company's particular expertise is in offering engineering solutions that are beyond the range of 'run of the mill' capability. With unequalled experience in large component manufacturing and metallurgy, SFIL can provide expertise to offer unique solutions to the increasingly demanding environmental conditions affecting the offshore oil and gas industry.

Market Sectors

- Fixed Platforms
- Jackets
- Decks
- Floating production and drilling units
- Structural components
- Riser systems
- Mooring/tethering systems
- Tendon systems
- Subsea processing systems
- Wye pieces
- Offshore wind foundations

MATERIALS TESTING AT SFIL



SFIL operates a fully accredited UKAS test house facility with some of the most up to date computerised testing equipment, offering services including:

- Metallographic examination
- Mechanical testing
- Chemical and mechanical research and development
- Flaw material investigation
- Outside test witness
- Non-destructive Testing



Testing equipment includes;

- Zwick/Roell 250Kn tensile testing machine
- Zwick/Roell high-strength 450 Joule Charpy impact machines
- Indentec ZHV 30 micro and macro Vickers hardness testing
- Indentec 4150 AK Rockwell hardness testing
- Newage Brinell hardness testing
- Mitutoya V and U notch Charpy testing projector
- Sarmieke fume cabinet
- Grinding and polishing machines
- Mounting press for micro and macro samples
- Leica x500 microscope with Clemex optical microscope
- Nikon stereo scan microscope
- Jeol scanning electron microscope
- Oxford instruments 80mm EDX detector

All material is tested using certified international standards and released in accordance with both internationally recognised and customer specifications.

RESEARCH AND DEVELOPMENT AT SFIL

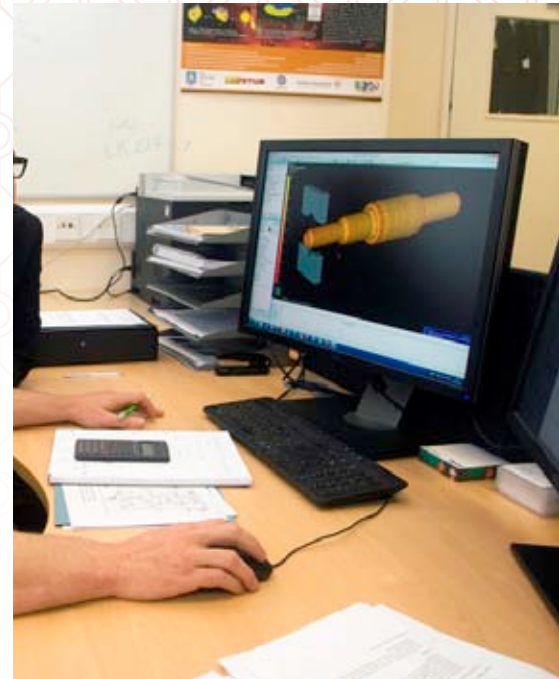
Renowned as one of the most comprehensive research sites in the world, our team of highly qualified engineers offer a technological solution to some of the most pioneering projects.

From start to finish our team can offer solutions within:

- Material thermodynamics, solidification, phase transformations and fluid dynamics
- Experience
- Design and modelling capability
- Production
- Technological advancement

Specifically:

- Modelling and solidification development of castings and ingots to aid mould design, feeding characteristics and elimination of porosity defects
- Modelling of segregation patterns and the evolution of internal stresses
- Modelling and development of quench facilities to optimise the efficiency and uniformity of quenching to optimise mechanical properties
- Induction heating modelling for rolls to ensure uniform sub-surface properties
- Simulation of design parts for complex assemblies
- Material and Microstructure characterisation using scanning electron microscopes and dispersive x-ray detection
- Simulation of forging techniques and tooling to aid forging of complex shapes
- Design and manufacture of ingot mould assemblies to optimise cooling transformations
- Simulation and investigation into austenitisation time for large components
- Stress analysis on heating and cooling rates
- Optimisation of tempering parameters
- Fluid dynamic modelling of air and water systems to determine effectiveness



SFIL EXAMPLES OF PARTS SUPPLIED

SFIL supplies some of the largest parts supplied to industries, including:

- Civil nuclear
- Defence
- Power generation
- Oil and gas
- Steel industry

A few examples are listed below;

- Hydro forgings, including hydro shafts, turbine shafts, crown castings
- Platens
- Rotors
- Motor shafts
- Tube sheets
- Nuclear casks
- Transition cones
- Shells
- Seal housings
- Autoclave reaction vessels
- Pressure vessels
- Riser joints
- Pressurisers
- Steam generators
- Rotor forgings
- Nozzles
- Head lifting brackets
- Shock support cylinders
- NSP
- Actuator brackets
- Domed inserts



SFIL APPROVALS AND ACCREDITATIONS

With a long history of supply to prestigious industries throughout the world, we have proudly gained accreditation from testing authorities and customers alike, some of which are listed below:

-
- ISO 9001:2008
 - American Bureau of Shipping, castings for use in marine applications
 - Asme NPT Class 1, 2 and 3
 - Asme NS Class 1,2 and 3
 - ASME QSC
 - Bureau Veritas, forging ingots up to 300t
 - Bureau Veritas, forgings up to 300t
 - Bureau Veritas, Castings up to 300t
 - Chinese Pressure Vessels A1
 - DNV –OS-B101, castings in stainless and low alloy
 - DNV –OS-B101, forgings in stainless and low alloy
 - Germanischer Lloyds, ingots & forged bars in low alloy and stainless steels
 - HAF 604, Forgings, safety class 1,2 and 3
 - Lloyds Register, Castings, forgings and steel making in Carbon, Low alloy and Stainless steels
 - UKAS 17025, test house facilities
 - Russian Maritime, steel castings
 - Rolls Royce, castings, forgings, machining and heat treatment for nuclear supply
 - TUV Nord, AD2000-Merkblatt WO/TRD 100 and PED 97/23/EC, for forgings and castings
 - ISO 14001:2004
 - OHSAS 18001:2007
 - ASME Section III NCA-3800
 - RCC-M 1000
 - RCC-M 2000
 - RCC-M 3000



APPENDIX A

Sheffield Forgemasters production grades

Werkstoff No.	Germany DIN	U.S.A. AISI/SAE UNS	France AFNOR	Great Britain BS	Italy UNI	Sweden SS	Spain UNE	Japan JIS
Plain Steel, Cast Steel, Free-Machining Steel								
1.0036	USt37-3				FE37BFU			
1.005	St50-2				FE50			SM50YA
1.006	St60-2				FE60-2			SM570
1.007	St70-2				FE70-2			
1.0332	St14	1008		14491CR		1447		
1.0401	C15	1015	CC12	080M15	C15C16	1350	F.111	S15C
1.0402	C22	1020	CC20	050A20	C20C21	1450	F.112	
1.0501	C35	1035	CC35	060A35	C35	1550	F.113	S35C
1.0503	C45	1045	CC45	080M46	C45	1650	F.114	S45C
1.0535	C55	1055		070M55	C55	1655		S55C
1.0601	C60	1060	CC55	080A62	C60			S60C
1.0715	9SMn28	1213	S250	230M07	CF9SMn28	1912	11SMn28	SUM22
1.0718	9SMnPb28	12L3	S250Pb		CF9SMnPb28	1914	11SMnPb28	SUM22L
1.0721	10S20	1108		210M15				
1.1121	Ck10	1010	CC10	040A10		1264		S10C
1.1141	Ck15	1015	XC12	080M15	C16	1370	C15K	S15C
1.1158	Ck25	1025	XC25	070M25	C25			S25C
1.1183	Cf35	1035	XC38TS	060A35	C36	1572		S35C
1.1191	Ck45	1045	XC42	080M46	C45	1672	C45K	S45C
1.1203	Ck55	1055	XC55	070M55	C50		C55K	S55C
1.1213	Cf53	1050	XC48TS	060A52	C53	1674		S50C
1.1221	Ck60	1060	XC60	080A62	C60	1678		S58C
1.1545	C1051, C105W1				C100KU			SK3
1.2311	40CrMnMo7				35CrMo8KU			
1.3501	100Cr2	E50100	100C2					
1.4882	X50CrMnNiNbN219		Z50CMNNb21.09					
1.5415	15Mo3	ASTMA204GrA	15D3	1501-240	16Mo3KW	2912	16Mo3	

APPENDIX A

Werkstoff No.	Germany DIN	U.S.A. AISI/SAE UNS	France AFNOR	Great Britain BS	Italy UNI	Sweden SS	Spain UNE	Japan JIS
Plain Steel, Cast Steel, Free-Machining Steel (Contd.)								
1.5423	16Mo5	4520		1503-245-420	16Mo5		16Mo5	SB450M
1.571	36NiCr6	3135	35NC6	640A35				SNC236
1.5736	36NiCr10	3435	30NC11					SNC631(H)
1.5755	31NiCr14	SNC836	18NC13	653M31				
1.5864	35NiCr18							
1.7223	41CrMo4	4140;4142	42CD4TS	708M40	41CrMo4	2244	42CrMo4	SCM440
1.7225	42CrMo4	4140	42CD4	708M40	42CrMo4	2244	42CrMo4	SCM440(H)
1.7238	49CrMo4							
1.7242	16CrMo 4		18CrMo4			18CrMo4		
1.7262	15CrMo5		12CD4			2216	12CrMo4	SCM415(H)
1.7335	13CrMo4 4	ASTMA182	15CD3.5/4.5	1501-620-Gr27	14CrMo45		14CrMo45	SPVAF12
1.7337	16CrMo 4 4	A387Gr.12Cl.			A18CrMo45KW			
1.7361	32CrMo12		30CD12	722M24	32CrMo12	2240	F.124.A	
1.7362	12CrMo 19 5		Z10CD5.05	3606-625	16CrMo205			
1.738	10CrMo9 10	ASTMA182F.22 SPV		1501-622Gr31;45				
1.7561	42CrV6							
1.7701	51CrMoV4		51CDV4		51CrMoV4			
1.7715	14MoV6 3			1503-660-440			13MoCrV6	
1.7733	24CrMoV55		20CDV6		21CrMoV511			
1.7755	GS-45CrMoV104							
1.807	21CrMoV511				35NiCr9			
1.8159	50CrV4	6150	50CrV4	735A50	50CrV4 , 51CrV4	2230	51CrV4	SUP10
1.8509	41CrAlMo7	SACM645	40CAD6,12	905M39	41CrAlMo7	2940	41CrAlMo7	
1.8523	39CrMoV139			897M39	36CrMoV12			

APPENDIX A

Werkstoff No.	Germany DIN	U.S.A. AISI/SAE UNS	France AFNOR	Great Britain BS	Italy UNI	Sweden SS	Spain UNE	Japan JIS
Low-Alloy Steel, Cast Steel, Free-Machining Steel								
1.2067	100Cr6	L3	Y100C6	BL3			100Cr6	SUJ2
1.221	115CrV3	L2	100C3		107CrV3KU			
1.2241	51CrV4							
1.2419	105WCr6		105WC13		10WCr6, 107WCr5KU	2140	105WCr5	SKS31
1.2542	45WCrV7	S1		BS1	45WCrV8KU	2710	45WCrSi8	
1.255	60WCrV7	S1	55WC20		58WCr9KU	~2710		
1.2713	55NiCrMoV6	L6	55NCDV7				F.520.S	SKH1;SKT4
1.2721	50NiCr13					~2550		
1.2762	75CrMoNiW67							
1.2842	90MnCrV8	O2	90MV8	BO2	88MnV8KU			
1.3505	100Cr6	52100	100C6	534A99	100Cr6	2258		SUJ2
1.5622	14Ni6	ASTMA350LF5	16N6		14Ni6		15Ni6	
1.5732	14NiCr10	3415	14NC11		16NiCr11		15NiCr11	SNC415(H)
1.5752	14NiCr14	3415;3310	12NC15	655M13				SNC815(H)
1.6511	36CrNiMo4	9840	40NCD3	816M40	38NiCrM04(KB)		33NiCrMo4	SNCM447
1.6523	21NiCrMo2	8620	20NCD2	805M20	20NiCrMo2	2506	20NiCrMo2	SNCM220(H)
1.6546	40NiCrMo22	8740		311-TYPE7	40NiCrM02(KB)		40NiCrMo2	SNCM240
1.6582	35CrNiMo6	4340	35NCD6	817M40	35NiCrMo6(KB)	2541		SNCM447
1.6587	17CrNiMo6		18NCD6	820A16			14NiCrMo13	
1.6657	14NiCrMo34			832M13	15NiCrMo13		14NiCrMo131	
1.7033	34Cr4	5132	32C4	530A32		34Cr4(KB)	35Cr4	SCR430(H)
1.6523	21NiCrMo2	8620	20NCD2	805M20	20NiCrMo2	2506	20NiCrMo2	SNCM220(H)
1.6546	40NiCrMo22	8740		311-TYPE7	40NiCrM02(KB)		40NiCrMo2	SNCM240
1.6582	35CrNiMo6	4340	35NCD6	817M40	35NiCrMo6(KB)	2541		SNCM447
1.6587	17CrNiMo6		18NCD6	820A16			14NiCrMo13	
1.6657	14NiCrMo34			832M13	15NiCrMo13		14NiCrMo131	
1.7033	34Cr4	5132	32C4	530A32		34Cr4(KB)	35Cr4	SCR430(H)

APPENDIX A

Werkstoff No.	Germany DIN	U.S.A. AISI/SAE UNS	France AFNOR	Great Britain BS	Italy UNI	Sweden SS	Spain UNE	Japan JIS
High-Alloy Tool Steels								
1.2343	X38CrMoV51	H11	Z38CDV5	BH11	X37CrMoV51KU		X37CrMoV5	SKD6
1.2344	X40CrMoV51	H13	Z40CDV5	BH13	X40CrMoV511KU	2242	X40CrMoV5	SKD61
1.2379	X155CrVMo121	D2	Z160CDV12	BD2	X155CrVMo121KU			SKD11
1.2436	X210CrW12				X215CrW121KU	2312	X210CrW12	SKD2
1.2581	X30WCrV93	H21	Z30WCV9	BH21	X30WCrV93KU		X30WCrV9	SKD5
1.2601	X165CrMoV12				X165CrMoV12KU	2310	X160CrMoV12	
1.2606	X37CrMoW 51	H12	Z35CWDV5	BH12	X35CrMoW05KU		F.537	SKD62
1.5662	X8Ni9	ASTMA353		1501.509; 50	X10Ni9		XBNI09	SL9N53
1.568	12Ni19	2515	Z18N5					
1.3202	S12-1-4-5			BT15	HS12-1-5-5		12-1-5-5	
1.3207	S10-4-3-10		Z130WKCDV	BT42	HS10-4-3-10			SKH57
1.3243	S6-5-2-5	T15	KCV06-05-05-04-02		HS6-5-2-5	2723	6-5-2-5	SKH55
1.3246	S7-4-2-5				HS7-4-2-5	7-4-2-5	M35	
1.3247	S2-10-1-8		Z110D-KCWW09-08-04	BM42	HS2-9-1-8	2-10-1-8	M41	SKH51
1.3249	S2-9-2-8	M42		BM34			2-9-2-8	
1.3343	S6-5-2	M35	Z85WDCV	BM2	HS6-5-2-5	2722		SKH9; SKH51

APPENDIX A

Werkstoff No.	Germany DIN	U.S.A. AISI/SAE UNS	France AFNOR	Great Britain BS	Italy UNI	Sweden SS	Spain UNE	Japan JIS
Stainless Steel, Martensitic & Ferritic								
1.4	X6Cr13	403	Z6C13	403S17	X6Cr3	2301	F.3110	SUS403
1.4001	X6Cr14						F.8401	410S, 429
1.4002	X6CrAl13	405	Z8CA12	405S17	X6CrAl13			SUS405
1.4006	(G-)X10Cr13	SUS410	Z10C13	410S21	X12Cr13	2302	F.3401	SUS410
1.4016	X8Cr17	430	Z8C17	430S15	X8Cr17	2320	F.3113	SUS430
1.4021	X20Cr13	420	Z20C13	420S37	X20Cr13	2303		SUS420J1
1.4027	G-X20Cr14		Z20C13M	420C29				SCS2
1.4086	G-X120Cr29			452C11				
1.4104	X12CrMoS17	430F	Z10CF17	441S29	X10CrS17	2383	F.3117	SUS430F
1.4113	X6CrMo17	434	Z8CD1701	434S17	X8CrMo17	2325		SUS434
1.434	G-X40CrNi274							
1.4417	X2CrNiMoSi195	S31500				2376		
1.472	X20CrMo13							
1.4724	X10CrA113	405	Z10C13	403S17	X10CrA112		F.311	SUS405
1.4742	X10CrA118	430	Z10CAS18	430S15	X8Cr17		F.3113	SUS430
1.4762	X10CrA124	446	Z10CAS24		X16Cr26	2322		SUH446
1.4034	X46Cr13		Z40CM	420S45	X40Cr14	2304	F.3405	
1.4057	X20CrNi17	431	Z6CNi6.02	431S29	X16CrNi16	2321		SUS431

APPENDIX A

Werkstoff No.	Germany DIN	U.S.A. AISI/SAE UNS	France AFNOR	Great Britain BS	Italy UNI	Sweden SS	Spain UNE	Japan JIS
Austenitic Stainless Steel								
1.4301	X5CrNi189	304	Z6CN18.09	304S15	C5CrNi1810	2332	F.3551	SUS304
1.431	X12CrNi177	301	Z12CN17.07	301S21	X2CrNi1807	2331	F.3517	SUS301
1.4311	X2CrNiN1810	304LN	Z2CN18.10	304S62	X2CrNiN1810	2371		SUS304LN
1.4312	G-X10CrNi188		Z10CN18.9M	302C25				
1.435	X5CrNi189	304	Z6CN18.09	304S31	X5CrNi1810	2332/2333	F.3551	
1.4401	X5CrNiMo17122	316	Z6CND17.11	316S16	X5CrNiMo1712	2347	F.3543	SUS316
1.4404	X2CrNiMo1810	316L	Z2CND17.12	316S12	X2CrNiMo1712	2343/2348/2553		SUS316
1.4429	X2CrNiMoN17133	316LN	Z2CND17.13	316S63	X2CrNiMoN1713	2375		SUS316LN
1.4435	X2CrNiMo18143	316L	Z2CND17.12	316S13	X2CrNiMo1712	2353		SCS16
1.4436	X5CrNiMo17133	316	Z6CND18-12-03	316S33	X8CrNiMo1713	2343/2347		SUS316
1.4438	X2CrNiMo18164	317L	Z2CND19.15	317S12	X2CrNiMo1816	2367		SUS317L
1.45	G-X7NiCrMo- CuNb2520		23NCDU25.20M					
1.4541	X10CrNiMoTi1810	321	Z6CNT18.10	321S12	X6CrNiTi1811	2337	F.3553F.3523	SUS321
1.455	X10CrNiNb	347	Z6CNNb18.10	347S17	X6CrNiNb1811	2338	F.3552F.3524	SUS347
1.4552	G-X7CrNiNb189		Z4CNNb19.10M	347C17				
1.4571	X10CrNiMoTi1810	316Ti	Z6NDT17.12	320S17	X6CrNiMoTi1712	2350	F.3535	SUS316Ti
1.4583	X10CrNiMoNb1812	318	Z6CNDN1713B		X6CrNiMoNb			
1.4585	G-X7CrNiMo- CuNb1818				X6CrNiMoTi1712			
1.4828	X15CrNiSi2012	309	Z15CNS20.12	309S24				SUH309

“Our Strength is in our Steel Technology & Expertise”

APPENDIX B

APPROXIMATE INGOT DIMENSIONS

			DIMENSIONS A/FLATS		MAXIMUM			MINIMUM		
			TOP	BOTTOM	CHILL LENGTH	CHILL WEIGHT	TOTAL WEIGHT	CHILL LENGTH	CHILL WEIGHT	TOTAL WEIGHT
						T	T		T	T
FORGING	0	OCT	433	362	1320	1.4	1.53	FULL LENGTH ONLY		
	2	OCT	535	452	1613	2.69	2.84	FULL LENGTH ONLY		
	3	OCT	598	503	1758	3.7	3.95	FULL LENGTH ONLY		
	03X	OCT	587	503	2426	5.24	5.62	1981	4.19	4.6
	4	OCT	669	564	1905	4.83	5.35	FULL LENGTH ONLY		
	5	OCT	706	629	2080	6.55	7.2	1833	5.7	6.38
	6	OCT	904	797	2253	11.19	12.3	1610	7.71	8.84
	42	M/F	1065	966	2286	15.8	17.24	1651	11.11	12.54
	45	M/F	1169	1092	1473	10.57	12.36	1117	7.94	9.68
	47	M/F	1188	1077	2400	20.64	23.1	1784	14.78	17.24
	51	M/F	1325	1201	2591	27.73	31.5	1727	17.86	21.63
	60	M/F	1504	1378	2743	37.05	43.4	2184	28.98	35.33
	68	M/F	1709	1573	2911	50.5	60	2210	37.69	47.38
	68S	M/F	1709	1470	2375	40.37	47.9	1803	29.34	36.8
	72 (VAC)	M/F	1842	1672	3759	75.73	88.55	2692	55.28	67.15
	80S (VAC)	M/F	2008	1767	3048	70.5	85.5	2464	57	73
	82 (VAC)	M/F	2107	1983	3606	93.04	107.56	2032	53.07	71.13
	85 (VAC)	M/F	2155	1938	3302	89.81	108.68	2540	70.8	90.15
97 (VAC)	M/F	2451	2229	3581	128.39	158.93	2769	101.39	131.87	
105 (VAC)	M/F	2652	2550	3937	183.02	223.04	2362	109.66	151.74	
ROUNDS	400	RD	394	394	3480	3.3	3.46	FULL LENGTH ONLY		
	500	RD	493	493	3454	5.09	5.37	FULL LENGTH ONLY		
	600	RD	585	585	3404	7	7.4	3350	6.9	7.36
	695	RD	678	678	3378	9.25	10.1	2972	8.17	9.02
	800	RD	795	795	3378	12.8	14	3073	11.3	12.5
	850/870	RD	832	832	3378	14.48	15.73	3073	12.78	14.03
	900 ±	RD	870	870	3430	15.27	16.7	3073	13.68	15.11
	1080	RD	1073	1073	3327	23.25	25.48	3073	20.83	23.06
	1160	RD	1128	1128	3251	25.06	27.96	2844	21.77	24.67
RIPPLE	1500	MF	1416/50	1416/50	3343	41.2	45.6	3043	37.51	41.91

NOTES: 1. S = Steeply tapered mould, particularly suitable for Stainless steels.