Mechanical engineering market

GRADES

Special steels

Customized solutions for new requirements

In addition to these conventional steel grades, Ascometal® has developped innovative solutions:

- **Vitac® 3000, Supervitac®:** steels with improved machinability with proven results.
- **Jomasco® :** case-hardening steels with optimized Jominy and enhanced quenchability.
- **Nitrasco® :** nitriding steels, offering even greater abrasion resistance.
- **Metasco® :** steels allowing heat treatment within the hot forging process (bainitic and AFP steels).
- **Ascoroc® :** steels for the mining industry.

	SPECIALTY	EURONORM
Machining grades with high mechanical properties (without heat treatment)	Vitac® D830	44SMn28
	Vitac® D950	44SMn28
Steels with improved machinability	Vitac® 3000	Available for all EN grades with % Al < 1
	Supervitac®	
Case-hardening steels with optimized Jominy and enhanced quenchability	Jomasco®	MnCrMo5
Steels allowing heat treatment within the hot forging process (bainitic and AFP steels)	Metasco® MC	25MnCrSiVB6
	Metasco® 1200	18MnCrSiMoVB6
Nitriding steels	Nitrasco®	30CrMnMoAlV8

Standard steels

Ascometal® offers the whole product range used for the numerous applications of Mechanical Engineering: a complete range of carbon and alloy steels meeting national and international standards.

Non alloy engineering steels, compliant with European standards: NF EN10083-1 and 2, NF EN 10273, NF EN 10025-2 and 3 **and other international standards.**

ALLOYING ELEMENTS	EURONORM	W.-NR.	UK	SPAIN	SWEDEN	USA	JAPAN
C	P250GH	1.0460	070M20		1450	SAE 1020	S20C
	C22	1.0402					S22C
	C35-C35E-C35R	1.0501 1.1180 1.1181	080M36 070M36 40H5	F.1130 C35K	1572 1550	SAE 1035	S35C
	C45-C45E-C45R	1.0503 1.1191 1.1201	080M46 070M46 50M5	F.1140	1672	SAE 1045 SAE 1042 SAE 1043	S45C
	C55-C55E-C55R	1.0535 1.1203 1.1209	070M55 50 EN9	F.1150 C55K	1655	SAE 1055	S55C
	S235JR S235J0 S235J2G3	1.0037 1.0114 1.0116	40C	AE235C	1311 1312	SAE 1009 A284C A284D	SM400B
C-Mn	S355JR S355J0 S355J2G3	1.0045 1.0553 1.0570	50B 50C	AE355B AE355C	2172 2132	SAE 1518 SAE A572 A678GrA A441 A833	SM4901 SS490B

Case-hardening steels: Euronorm 10084. Adapted consistent alloy content analysis to better fit the thermo chemical treatment as well as the in-use conditions. Possibility to optimize alloy content to better withstand machining or forming process (controlled inclusions). Fine grain steels. High inclusion cleanliness grades to improve resistance to fatigue or pitting.

ALLOYING ELEMENTS	EURONORM	W.-NR.	UK	SPAIN	SWEDEN	USA	JAPAN
Cr-Mo	18CrMo4 • 18CrMoS4	1.7243 • 1.7244	708H20	F.1550		SAE 4118	SCM418
	20MoCr4 • 20MoCrS4	1.7321 • 1.7323		F.1523			
Mn-Cr	16MnCr5 • 16MnCrS5	1.7131 • 1.7139	527M17 • 590M17	F.1516	2127	SAE 5115	
	20MnCr5 • 20MnCrS5	1.7147 • 1.7149				SAE 5120	SMnC420H
Ni-Cr	14NiCr11	1.5732		F.1540			
	15NiCr13	1.5752	655M13			SAE 3312	
	16NiCr4 • 16NiCrS4	1.5714 • 1.5715	637M17		2511	SAE 3115	
	17CrNi6-6	1.5918					
	20NiCr4				2512		
Ni-Cr-Mo	16NiCrMo13						
	18CrNiMo7-6	1.6587	820A16				
	18NiCrMo5						
	20NiCrMo2 • 20NiCrMoS2	1.6523 • 1.6526	805M20	F.1522	2506	SAE 8620	
	20NiCrMo7					SAE 4320	

Through and Surface hardening steels: Euronorm: 10083-1 – 10083-2. Mechanical engineering steels for QT. These grades offer good toughness after QT. Good machinability properties can be obtained while optimizing microstructure and inclusion shape.

ALLOYING ELEMENTS	EURONORM	W.-NR.	UK	SPAIN	SWEDEN	USA	JAPAN
Cr-V	51CrV4	1.8159	755A51 • 735A50	F.1430	2230	SAE 6150	SUP10
Cr-Mo	25CrMo4 • 25CrMoS4	1.7218 • 1.7213	708A25 CF510 708M25	F.222	2225	SAE 4130	SCM 420
	40CrMo4					SAE 4140	SCM 420
	42CrMo4 • 42CrMoS4	1.7225	708M40 • 709M40	F.1252	2244	SAE 4140 • SAE 4142	SCM 4404
	50CrMo4	1.7228	708A140 • M50			SAE 4150	
Ni-Cr-Mo	30CrNiMo8	1.6580	823M30				SNCM431
	30NiCrMoV10					SAE 4330V	
	34CrNiMo6	1.6582	817M40		2541	SAE 4340	SNCM447
	36NiCrMo16	1.6773	835M30				
	39NiCrMo3						
	40NiCrMo7	1.6565		F.1272		SAE 4340	SNCM439
	40NiCrMo10	1.6745	826M40				

Nitriding steels: Euronorm 10085 / DIN 17211. Grades suitable for nitriding treatment. The presence of nitride forming elements contributes to the creation of a high surface hardness and/or increases the efficient nitriding depth.

ALLOYING ELEMENTS	EURONORM	W.-NR.	UK	SPAIN	SWEDEN	USA	JAPAN
Cr-Mo / Cr-Mo-V	15CrMoV5-9	1.8521					
	31CrMo12	1.8515	722M24	F.1712	2240		
	31CrMoV9	1.8519		F.1721			
Cr-Al-Mo / Cr-Al-Ni	34CrAlNi7-10	1.8550					
	41CrAlMo7-10	1.8509	905M39	F.1740	2940	Nitriding Steel (135)	SACM 645

High chromium steels: Euronorm 10216-2.

ALLOYING ELEMENTS	EURONORM	W.-NR.	UK	SPAIN	SWEDEN	USA	JAPAN
9% Cr	X11CrMo9-1 X12CrMo9-1	1.7386	9Cr1Mo			A182GrF9 • A213GrT9 • A335GrP9	
	X10CrMoVNb9-1 X12CrMoVNb9-1	1.4903				A182GrF91 • A182GrF92 A213GrT91 • A213GrT92 A335GrP91 • A335GrP92	
13%Cr	X12Cr13	1.4006	410S21	F3401	2302	AISI 410	
	X20Cr13	1.4021	420S29 • 420S37	F.3402	2303	AISI 420	SUS420T1

Tool steels: ISO 4957.

	EURONORM	W.-NR.	UK	SPAIN	SWEDEN	USA	JAPAN
Hot working	28NiCrMoV10	1.2740					
	32CrMoV12.28	1.2365	BH10			AISI H10	SKD7
	X37CrMoV5.1	1.2343	BH11			AISI H11	SKD6
	55NiCrMoV7	1.2714	BH224-S			AISI L6	SKT4
	60MnSiCr4	1.2826					
	X40CrMoV 5.1	1.2344	BH13			AISI H13	SKD61
Moulds	40CrMnMo6	1.2311				AISI P20	
	40CrMnMoS8.6	1.2312					
	40CrMnNiMo8.6-4	1.2738					
Cold working	95MnWCr5	1.2510	B01			AISI O1	
	45NiCrMo16	1.2767					
	90MnCrV8	1.2842	B02			AISI O2	
						AISI S5	
	X50CrMoV3					AISI S7	

Steels for various uses: Euronorm 10273 (pressure purposes, heat resistant...).

ALLOYING ELEMENTS	EURONORM	W.-NR.	UK	SPAIN	SWEDEN	USA	JAPAN
C-Mn	P295GH (18Mn4)	1.0481	224Gr460 • 224Gr490	A47RCI	2102•2103	A/SA350LF2	SPV315/32
		1.0432				A/SA105	
	P355GH (19Mn6)	1.0473	224Gr490	A52RCI	2103		SPV36
	P355NL1	1.0566	224Gr490 • 50EE		2107	A/SA737GrB	
	P355NH	1.565	224Gr490			A/SA662GrC	
Mo	16Mo3	1.5415	1503 • 243B		2912	A/SA204GrA	
Cr-Mo	13CrMo4	1.7335	3059 • 3604 620 • 621		2216	A/SA182GrF11 • A/SA213GrT11 • A/SA335GrP11 • A/SA182GrF12 • A/SA213GrT12 • A/SA335GrP12	SFVAF12
	10CrMo9-10	1.7380	3059 • 3604 622 • 490		2218	A/SA182GrF22 • A/SA213GrT22 • A/SA335GrP22	SCMV4
	12CrMoSi5					A/SA182GrF11 • A/SA213GrT11 • A/SA335GrP11	SCMV4
	X10CrMo5-5					A/SA182GrF5 • A/SA213GrT5 • A/SA335GrP5	
	X10CrMoVNb9-1	1.4903				A/SA182GrF91 • A/SA213GrT91 • A/SA335GrP91	KA-STBA28 KA-STPA28
	X10CrWMoVNb9-2	1.4901				A/SA182GrF92 • A/SA213GrT92 • A/SA335GrP92	KA-STBA29 KA-STPA29

Special steels

Customized solutions
In addition to these conventional steel grades adapted to the customer's particular specifications, **Ascometal®** offers a wide range of **specific products** resulting from state of the art R&D at the cutting edge of innovation:

- **Jomasco®:** case-hardening steels with optimized Jominy and enhanced quenchability;
- **Splitasco® HC/70:** steels for splittable connecting rods;
- **Metasco® MC/1200/BA/BAE/MC2/VBI...:** Steels allowing heat treatment within the hot forging process (bainitic and AFP steels);
- **Vitac®, Supervitac®:** steels with improved machinability.

	SPECIALTY	EURONORM
CASE-HARDENING STEELS WITH OPTIMIZED JOMINY AND ENHANCED QUENCHABILITY	Jomasco®	MnCrMo4/5
	Jomasco® 12	14MnCrMo4
	Jomasco® 15	15MnCrMo5
	Jomasco® 20	21MnCrMo5
	Jomasco® 23	23MnCrMo5
	Jomasco® 23mod	23MnCrMo5mod
STEELS FOR SPLITTABLE CONNECTING RODS	Splitasco®	
Steels for splittable connecting rods with high machinability	Splitasco® 70	C70S6
High grade steels for splittable connecting rods with high machinability	Splitasco® HC	36MnVS4
	Splitasco® HC1	36MnVS4 low S
STEELS SUITABLE FOR HOT FORGE TREATMENT	Metasco®	
High grade bainitic steels with no heat treatment	Metasco® MC	25MnCrSiVB6
	Metasco® MC2	28MnCrSiMoVB6
	Metasco® 1200	18MnCrSiMoVB6
	Metasco® BA	35MnV7
	Metasco® BAE 75	35MnCrV5
Ferrito pearlitic steels with guaranteed characteristics without heat treatment	Metasco® 38	38MnVS6
Steels with guaranteed characteristics without heat treatment with high machinability	Metasco® S1000	43MnV5
	Metasco® S900	38MnV5
	Metasco® U1000	44MnV6Pb
High grade steels for induction surface quenching	Metasco® VBI	40SiCrMoB4
NITRIDING STEELS	Nitrasco®	30CrMnMoAlV8
STEELS WITH IMPROVED MACHINABILITY	Vitac® / Supervitac®	
Steels with guaranteed characteristics without heat treatment with high machinability	Vitac® D830/D950	44SMn28
ADDITIONAL TREATMENTS APPLICABLE TO DIFFERENT GRADES		
Steels with improved machinability	Vitac® BC	
Steels with improved machinability and high cleanliness	Vitac® 3000	
Steels with improved machinability for cutting and high cleanliness	Vitac® TS	

Standard steels

A complete range of carbon and alloy steels meeting national and international standards.

- Through-hardening steels (Cr, Cr Mo, Ni Cr Mo, B)
- Case-hardening steels (16MnCr5 to 30CrMoV9)
- Bearing steels (C55, C70, 100Cr6...)
- Spring steels (55Cr3 to 52SiCrNi5)
- Surface-hardening steels
- Steels for fasteners
- Steels for nitriding, carbonitriding (34CrAlMo5 to 40CrAlMo6-12Pb)
- Micro-alloy steels (38MnSiV5 to 22MnV7)
- Non alloy steel (C15 – C55)
- Resulfurized and/or leaded steels

Standard steels

ALLOYING ELEMENTS	EURONORM	W.-NR.	JAPAN
C	C15	1.1141	S15C
	C40	1.0511	S40C
	C55	1.0535	S55C
Mn	30Mn5	1.1173	SMn24

Steels for quenching

ALLOYING ELEMENTS	EURONORM	W.-NR.	JAPAN
Cr	37CrS4	1.7038	
	41Cr4	1.7035	SCr440H
Cr-Mo	34CrMo4	1.7220	SCM435H
	42CrMo4	1.7225	SCM440H
	50CrMo4	1.7228	
Ni-Cr-Mo	14NiCrMo13-4	1.6657	
	28NiCrMo4	1.6513	
	30NiCrMo16		
	40NiCrMo7		
Cr-Ni-Mo	18CrNiMo7-6	1.6587	
	51CrV4	1.8159	SUP10
B	16MnCrB5	1.7160	
	38MnB5		
	35B3		

Case-hardening steels (as per DIN EN10084 and ISO683-11)

ALLOYING ELEMENTS	EURONORM	W.-NR.	JAPAN
Cr	16MnCr5	1.7131	
	20MnCr5	1.7147	SMnC420H
	27MnCr5		
Cr-Mo	25MoCr4	1.7325	
	25CrMo4	1.7218	SCM420 SCM430
	16CrMo4	1.7242	SCM415
	27CrMo4		
Cr-Mo-V	30CrMoV9	1.7707	

Nitriding steels (as per DIN EN10085 or ISO683-10)

EURONORM	W.-NR.	JAPAN
34CrAlMo5-10	1.8507	
34CrAlNi7-10	1.8550	
40CrAlMo6-12Pb		

Micro-alloy steels

EURONORM	W.-NR.	JAPAN
38MnSiV5	1.5231 1.1303	
38MnV6		
20MnV4		
22MnV7		

ADDITIONAL TREATMENTS APPLICABLE TO DIFFERENT GRADES

Spring steels

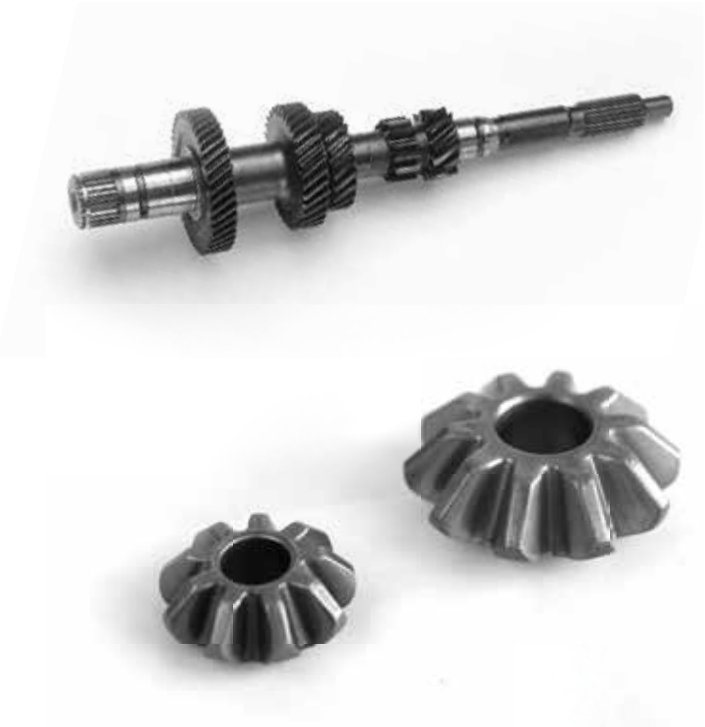
EURONORM	W.-NR.	JAPAN
55Cr3	1.7176	
54SiCr6	1.7102	
54SiCrV6	1.8152	
52SiCrNi5	1.7117	
51CrV4	1.8159	SUP10
61SiCr7	1.7108	

Resulfurized, sulfurized, spheroidized annealed steels

.R

Leaded steels

.Pb



Oil and gas market

GRADES

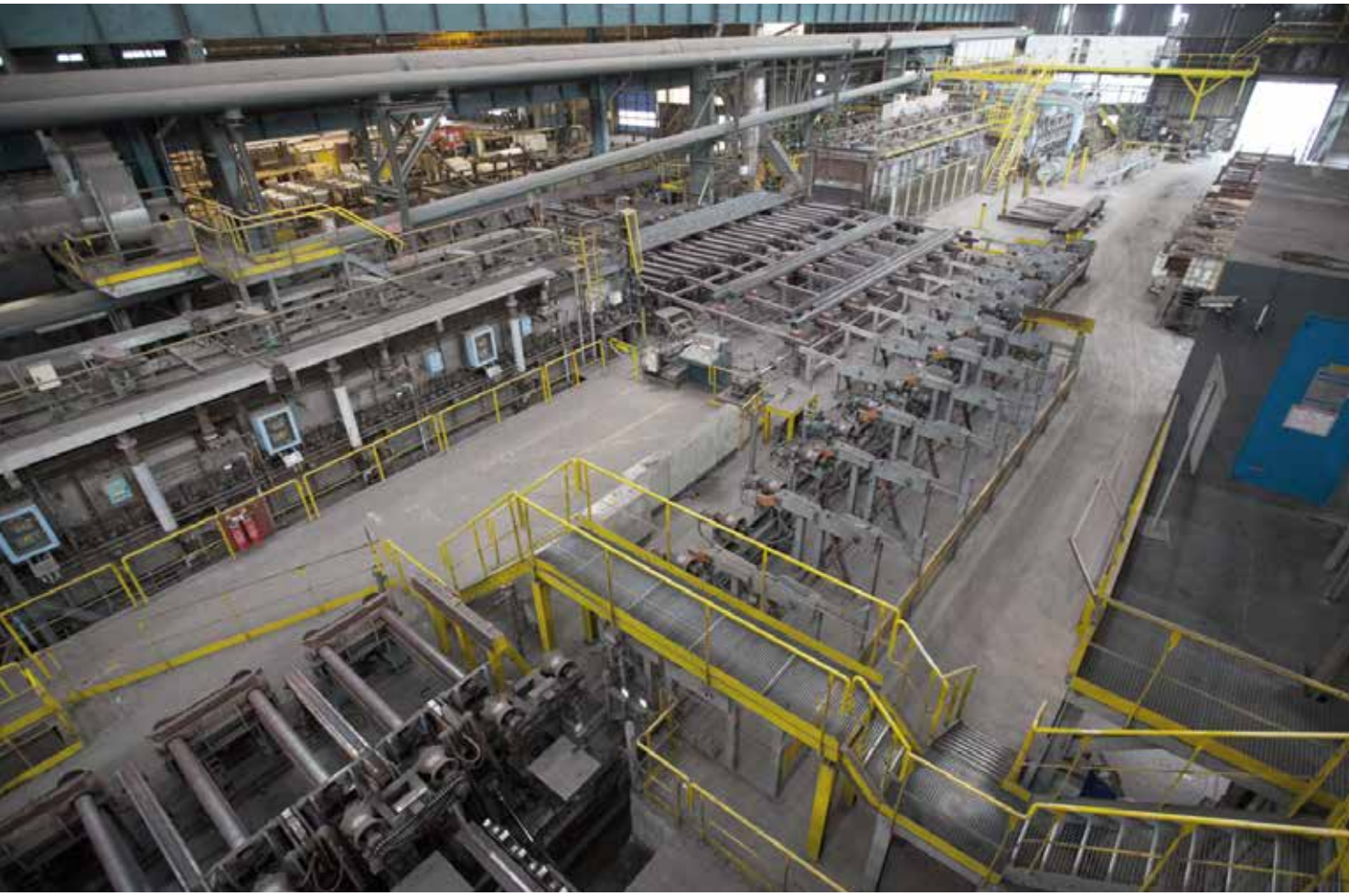
Special steels

Customized solutions

In order to meet increasingly stringent requirements and increasing part reliability and life expectancy, Ascometal® has developped over the years innovative steel solutions: Ascowell® product range for extreme conditions and Jomasco® DB for drill bits.

- **Ascowell® C**
- **Ascowell® TJC**
- **Jomasco® DB**

SPECIALTY	TECHNICAL PROPERTIES
Ascowell® C	Steels for well drilling under sour conditions • NACE 45% SMYS • 110 ksi • Wide dimensional range of products
Ascowell® TJC	Steels for sour service resistant forged tool joints • ≤ 26 HRC • Ready for friction welding • Non fracture stress after 720h in NACE solution, according to TM01-77 > 65% $R_{p0.2}$
Jomasco® DB	Low nickel case-hardening steels with optimized Jominy and enhanced quenchability • Optimized carburizing grade • Low nickel content



Standard steels

Ascometal® also offers the usual product range complying with the relevant standards of the Oil and Gas sector:

AISI 4130/4130 mod
- Mechanical characteristics conforming to API 6A in a large dimensional range
- H_2S variant hardness < 22 HRC
- Good weldability
- Good micro cleanliness

AISI 4140
- Mechanical characteristics conforming to API 7.1 in a large dimensional range
- H_2S variant hardness < 22 HRC
- Good micro cleanliness

AISI 4145H mod
- Good micro cleanliness conforming to AMS 2301
- Good machinability, particularly for drilling

AISI 4340
- A good compromise between strength and toughness
- Excellent macro inclusion cleanliness conforming to AMS 2301 (AMS 2304 on request)

AISI 4330V mod
- Very good strength and toughness
- Excellent macro inclusion cleanliness conforming to AMS 2304

EN30B
- Good resilience toughness at low temperatures
- Excellent macro inclusion cleanliness conforming to AMS 2304

AISI 410/420
- H_2S/CO_2 corrosion resistance
- Excellent macro inclusion cleanliness conforming to AMS 2301
- Mastered δ ferrite content

Grades for the Oil and Gas market (as per API 7.1)

AISI	W.-NR.	EURONORM	UK	SPAIN	SWEDEN	JAPAN
4137	1.7220	34CrMo4	708A30			
4137Hmod						
4140	1.7225	40CrMo4	708M40	F1252	2244	SCM440H
4140H	1.7225	40CrMo4	708M40	F1252	2244	SCM440H
4140mod						
4140Hmod						
4145	1.7225	42CrMo4	708M40	F1252	2244	SCM440H
4145H						
4145Hmod						
4330						
4330Vmod		30NiCrMoV10				
4340	1.6565	40NiCrMo7	817M40			
4340mod						
9313						
	1.6747	30NiCrMo16-6	EN30B			
			835M30			

Grades for the Oil and Gas market (as per API 6A and NACE MR0175 / ISO 15156 if required)

USA	W.-NR.	EURONORM	UK	SPAIN	SWEDEN	JAPAN
AISI 4130	1.7218	25CrMo4	708A25		2225	SCM420
						SCM430
AISI 4130mod						
AISI 8630	1.6545	30NiCrMo2				
AISI 8630mod						
A105	1.0432					
A182 F22	1.7380	10CrMo9-10	622Gr31		2218	SCMV4
A350 LF2	1.0481	18Mn4	224Gr460	A47RCI	2102	SPV315
			244Gr490		2103	SPV32

High chromium grades for drilling and completion (as per API7.1 or API6A and NACE MR0175 / ISO15156 if required)

USA	W.-NR.	EURONORM	UK	SPAIN	SWEDEN	JAPAN
A182F91	1.4903	X10CrMoVNb9-1	9Cr1Mo			
A182F92	1.4901	X10CrWMoVNb9-2				
AISI 410	1.4006	X10Cr13	410S21		2302	
AISI 420	1.4021	X20Cr13	420S29		2303	SUS420J1
AISI 420mod						

Case-hardening grades for drill bits

AISI	W.-NR.	EURONORM	UK	SPAIN	SWEDEN	JAPAN
4815						
9310						
9315	1.5752	15NiCr13	655M13			
4715						
8620	1.6523	20NiCrMo2-2	805A20			SNCM200H

Steel grades for miscellaneous use

USA	W.-NR.	EURONORM	UK	SPAIN	SWEDEN	JAPAN
A350LF2	1.0481	18Mn4	224Gr460	A47RCI	2102	SPV315
			224Gr490		2103	SPV32
A105						
AISI 4330V		30NiCrMoV10				

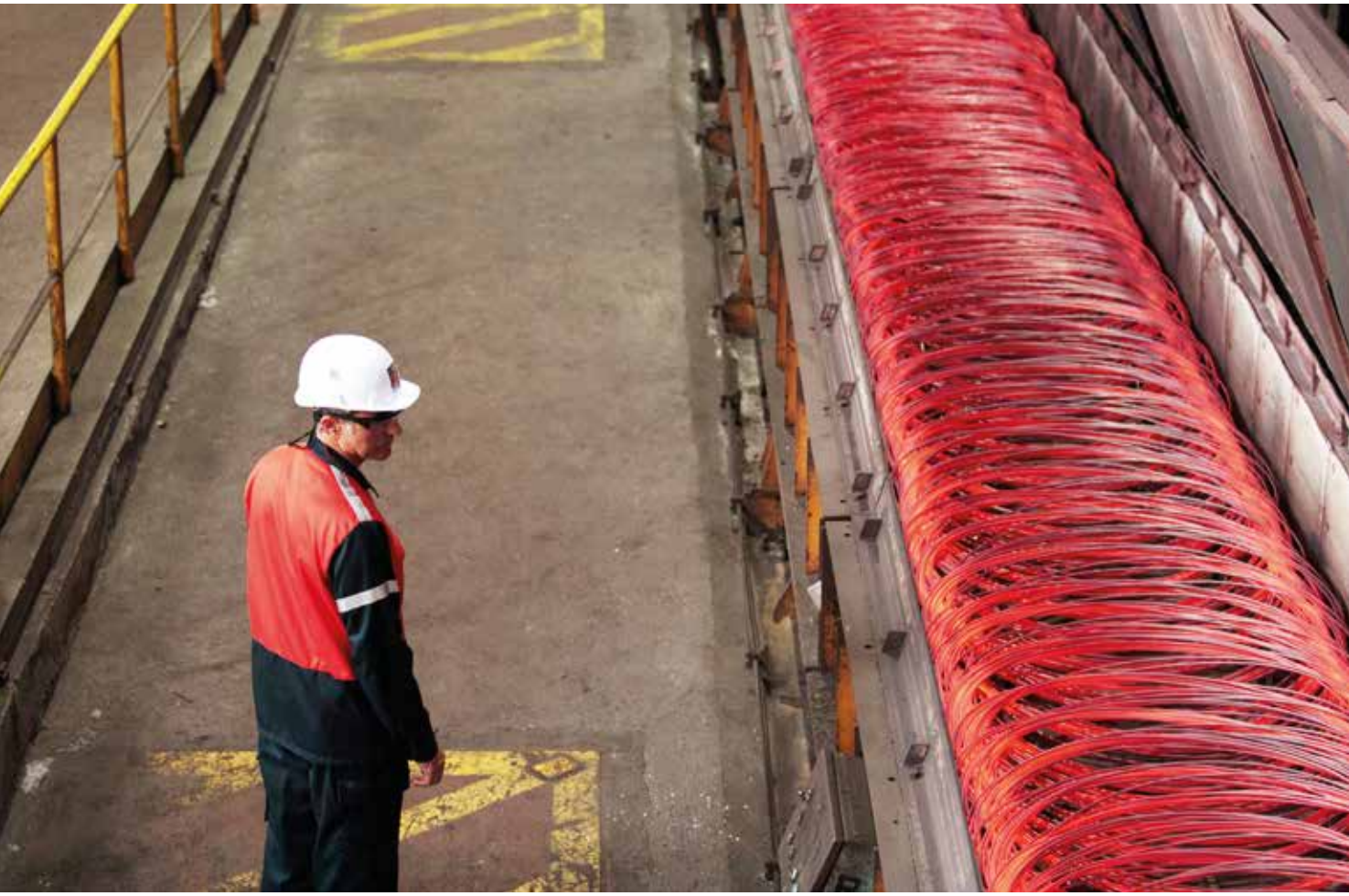
Special steels

Beyond optimized solutions, Ascometal® develops innovative products such as Endurasco®.

Properties
- Excellent inclusion cleanliness
- Usability
- Guaranteed operating properties
- Appropriate analytical scope
- Specific production process

Advantages
- Very good fatigue strength
- Excellent endurance to Hertz pressure stresses
- High-temperature resistance

Benefits
- Low dispersion of results in fatigue, hence allowing a more precise design



Standard steels

Ascometal® offers the whole range of steels complying with the specifications of the various bearings applications.

Through-hardening steels*

W. -NR	EURONORM	EN ISO 683-17	SAE / ASTM	JIS
1.3505	100Cr6	B1	52100	SUJ2
1.3520	100CrMnSi6-4	B3		
1.3537	100CrMo7	B5		SUJ4
1.3536	100CrMo7-3	B6		
1.3538	100CrMo7-4	B7		
1.3539	100CrMnMoSi8-4-6	B8		
	100MnCrSi4-4	B2	A485 Grade 1	SUJ3
	95CrMnSi6-6	B4	A485 Grade 2	
	100CrMnMo5-5-2		A485 Grade 4	

Case-hardening/carbonitriding steels**

W. -NR	EURONORM	EN ISO 683-17	SAE / ASTM	JIS
	17MnCr5	B23		
1.7147	20MnCr5	B24	8319	
	18MnCrMo5		8219	
	20MnCrMo4-2	B27	8019	
	20MnCrNiMo5-3		8119	
1.3531	16CrNiMo6			
1.6587	18CrNiMo7-6	B30		
	18NiCrMo5			
1.3533	18NiCrMo14-6	B31		
1.6523	20NiCrMo2	B28	8620	SNCM220
1.3576	20NiCrMo7	B29	4320H	SNCM420
1.5752	14NiCr14 • 15NiCr13		3311 • 3312	
1.7910	32MnCrMo6-4-3			

Carbon steels for surface quenching*/***

W. -NR	EURONORM	EN ISO 683-17	AISI	JIS
1.1219	C56E2	B40	1055	
1.1244	70Mn4	B42		

*Reduced sulfur content possible.
**Upon request other case-hardening steels with Mn, Cr, Mo.
***Vanadium content possible.