

MICROFOND BRESCIANA SRL – Commonly used steels for Investment Casting



Chemical composition (%)

Mechanical properties after treatment

Features and applications

Case Hardening	1.0402 1.1151	C20 C22E	0,18 0,24	0,55 max	0,40 0,80				0,035 max	0,035 max		Suggested treatment	R MPa	R (0,2%) MPa	Hardness	Features and applications
Case Hardening	1.5714	16CrNi4	0,13 0,19	0,55 max	0,70 1,00	0,60 1,00	0,80 1,10		0,035 max	0,02 0,04		Quenching and annealing	1030	690	58-64 HRC	High strength and wear resistance, high surface hardness, good machinability (cemented) and heart toughness. Mechanical components subject to rolling and / or friction and excellent toughness: cams, pins, rollers, bearings
Case Hardening		18NiCrMo5	0,15 0,21	0,55 max	0,60 0,90	0,70 1,00	1,20 1,50	0,15 0,25	0,035 max	0,035 max		Case Hardening	1250	980	58-65 HRC	
Heat treatable steel	1.1181	C35	0,32 0,39	0,55 max	0,50 0,80	0,40 max	0,40 max	0,10 max	0,035 max	0,02 0,04		Quenching and annealing	560-730	325-430	180-220 HRB	Good toughness and great machinability. Good weldability
Heat treatable steel	1.7218	25CrMo4	0,22 0,29	0,55 max	0,60 0,90	0,90 1,20		0,15 0,30	0,035 max	0,02 0,04		Quenching and annealing	890-1000	650-800	20-44 HRC	Excellent toughness. Mechanical components under fatigue. Motor industry and gun making. Good weldability of 25CrMo4
Heat treatable steel	1.7220	34CrMo4	0,30 0,37	0,55 max	0,60 0,90	0,90 1,20		0,15 0,30	0,035 max	0,02 0,04		Quenching and annealing	890-1100	690-890	23-49 HRC	
Heat treatable steel	1.0511 1.1186	C40 C40E	0,37 0,44	0,55 max	0,50 0,80				0,035 max	0,035 max		Quenching and annealing	590-750	350-450	185-225 HRB	Higher mech. properties and hardness than C35 but lower toughness.
Heat treatable steel	1.7225	42CrMo4 40CrMo4	0,38 0,45	0,55 max	0,60 0,90	0,90 1,20		0,15 0,30	0,035 max	0,02 0,04		Quenching and annealing	880-1300	690-1060	27-57 HRC	Good performance. High stress components, both static and dynamic shafts, connecting rods, gears, pistons, gaskets. The 39NiCrMo3 requires less precautions in quenching
Heat treatable steel	1.6511	39NiCrMo3 38NiCrMo4	0,34 0,42	0,75 max	0,50 0,80	0,70 1,00	0,70 1,00	0,15 0,25	0,035 max	0,02 0,04		Quenching and annealing	1020	880	31 HRC	
Nitriding steel	1.8515	30CrMo12	0,27 0,34	0,40 0,70	0,75 max	2,70 3,30			0,30 0,40	0,035 max	0,02 0,04	Quenching and annealing	1100	950	34 HRC	Components subject to high specific loads and under fatigue; better resistance to abrasive wear, adhesive and binding compared to quenched and tempered steels (treatment advisable)
Nitriding steel	1.8509	41CrAlMo7	0,38 0,45	0,50 0,70	0,40 0,80	1,50 1,80		0,20 0,35			Al 0,80 1,20	Quenching and annealing	1100	950	34 HRC	
Spring steel	1.8159	50CrV4	0,47 0,55	0,50 max	0,70 1,10	0,90 1,20		0,25 0,40	0,035 max	0,035 max	V 0,10 0,25	Hardening	960-1390	830-1241	30-60 HRC	Components requiring a high elastic limit and fatigue strength without deformation
Softmagnetic	1.0884	FeSi3	0,10 max	2,50 3,00								Annealing	≥ 500	≥ 300	120-160 HV1	High magnetic permeability steel
Austenitic stainless st.	1.4301	AISI 304 ¹	0,08 Max	1,00 max	2,00 max	17,0 19,5	8,00 10,5		0,045 max	0,03 max		Solubilisation	485-585	275-345		Excellent corrosion resistance (304 and 316). Good corrosion resistance at elevated temperatures (316): shipping, food, auto, chemical, petrochemical, pharmaceutical. These teels are not hardenable
Austenitic stainless st.	1.4401	AISI 316 ¹	0,08 max	1,00 max	2,00 max	16,5 18,5	10,0 13,0	2,00 2,50	0,045 max	0,03 max		Solubilisation	485-585	275-345		
Heatproof stainless st.	1.4845	AISI 310	0,25 max	1,50 max	2,00 max	24,0 26,0	19,0 22,0		0,045 max	0,03 max		Solubilisation	415-515	205-275		High corrosion resistance at elevated temperatures
Precipitation hardening	1.4542	AISI 630	0,07 max	0,70 max	1,50 max	15,0 17,0	3,00 5,00		0,045 max	0,03 max	3,00≤Cu ≤5,00 5xCS≤Nb ≤0,45	Solubilisation and hardening	1030-1310	960-1100	34-44 HRC	Combines excellent mechanical performance with good resistance to corrosion. Military and aerospace
Martensitic stainless st.	1.4057	AISI 431	0,12 0,22	1,00 max	1,50 max	15,0 17,0	1,50 2,50		0,045 max	0,03 max		Hardening	750-1100	515-720	20-40 HRC	Low corrosion resistance but excellent mechanical performance. Centrifugal pump shafts and bodies
Martensitic stainless st.	1.4021	AISI 420 A ²	0,16 0,25	1,00 max	1,50 max	12,0 14,0			0,045 max	0,03 max		Hardening	1390-1550	890-1440	30-52 HRC	Low corrosion resistance but excellent mechanical performance. Knives and blades
Martensitic stainless st.	1.4125	AISI 440 C ³	0,96 1,20	1,00 max	1,00 max	16,0 18,0	0,40 0,80		0,045 max	0,03 max		Hardening	750-950	550	40-55 HRC	Low corrosion resistance but excellent mechanical performance. Scissors, scalpels, injectors for engines
Ferritic stainless st.	1.4000	AISI 430	0,08 max	1,00 max	1,00 max	16,0 18,0			0,045 max	0,03 max		Annealing	430	250	195 HRB	Good atmospherical corrosion resistance and good wear resistance
Bearing steel	1.2067	100Cr6	0,92 1,13	0,12 0,38	0,21 0,49	1,35 1,65			0,03 max	0,03 max		Quenching and annealing	1220-1580	960-1240	30-60 HRC	Components subject to wear and abrasion, as well as tension and compression. Fifth wheels, bearings, rollers
Tool steel	1.2080	X210Cr12	1,90 2,20	0,10 0,40	0,15 0,45	11,0 13,0			0,03 max	0,03 max		Quenching and annealing			50-60 HRC	Cold work steel with good wear resistance, good resilient cutting and high hardness

1) Also available in AISI 304L e 316L versions (where "L" stands for low carbon: C<0,03%) 2) Also available in 420 B versions where carbon content is 0.26<C<0.35 and 420C version where carbon is between 0.36<C<0.42 and Chromium is 12.5-<Cr<14.5. 3) Also available in 440 B version (where 0.85<C<0.95 - 17<Cr<19 - 0.9<Ni<1.3 - 0.07<V<0.12) and 440A (where 0.65<C<0.85 - 14<Cr<16).



MICROFOND BRESCIANA SRL – Commonly used steels for MIM (Metal Injection Moulding)

Chemical composition (%)

Mechanical properties after treatment¹

Features and applications

Title	Wr n.	Italian designation	Chemical composition (%)									Mechanical properties after treatment ¹				Features and applications
			C	Si	Mn	Cr	Ni	Mo	P	S	Altri	Suggested treatment	R MPa	R (0,2%) MPa	Hardne ss	
Case Hardening	1.0301	C10	0,15≤	0,40 max	0,30 0,66				0,045 max	0,045 max		Cementazione	450 (≥400)	300 (≥250)	700 HV1	Reasonable mech. properties and good weldability. Low stressed components
Case Hardening	1.6523	8620 (21NiCrMo2)	0,18 0,23			0,40 0,60	0,40 0,70	0,15 0,25				Cementazione, tempra e rinvenimento	(≥650)	(≥400)	58 HRC	High strength and wear resistance, high surface hardness, good machinability (cemented) and heart toughness. Mechanical components subject to rolling and / or friction and excellent toughness: cams, pins, rollers, bearings
Case Hardening		FN02	0,60 0,80				1,90 2,20					Tempra e distensione o cementazione	1550 (≥260)	1400 (≥150)	55 HRC	
Heat treatable steel		FN08	0,60 0,80				7,50 8,50					Tempra e rinvenimento	1350 (700)	1100 (400)	40 HRC	Good performance. High stress components, both static and dynamic shafts, connecting rods, gears, pistons, gaskets. The 42CrMo4 requires less precautions in quenching
Heat treatable steel	1.6565	4340 (40NiCrMo6)	0,35 0,45		0,60 0,90	0,90 1,40	1,40 1,70	0,20 0,30	0,035 max	0,02 0,04		Tempra e rinvenimento	850-1300	680-1240	20-55 HRC	
Heat treatable steel	1.7225	42CrMo4	0,38 0,45			0,90 1,20		0,15 0,30	0,035 max	0,02 0,04		Tempra e rinvenimento	1450 (650)	1250 (400)	45 HRC	
Soft Magnetic	1.0884	FeSi3	0,10 max	2,50 3,00								Ricottura	≥ 500	≥ 300	120-160 HV1	High magnetic permeability steel
Nichel Free Stainless steel		PANACEA	0,08 Max	1,00 max	2,00 max	17,0 19,5	8,00 10,5		0,045 max	0,03 max		Solubilizzato	1000	650		Stainless steel with low nickel content. Suitable for skin contact applications that require low release of nickel
Austenitic stainless st.	1.4404	AISI 316L	0,08 max	1,00 max	2,00 max	16,5 18,5	10,0 13,0	2,00 2,50	0,045 max	0,03 max		Solubilizzato	510	180		Excellent corrosion resistanceGood corrosion resistance at elevated temperatures (316): shipping, food, auto, chemical, petrochemical, pharmaceutical. These teels are not hardenable
Heatproof stainless st.	1.4841	AISI 310	0,20 0,50	1,30 max	1,50 max	24,0 26,0	19,0 22,0		0,045 max	0,03 max	1,20≤Nb ≤1,50	Solubilizzato	(750)	(400)		High corrosion resistance at elevated temperatures
Precipitation hardening	1.4542	AISI 630	0,07 max	1,00 max	1,00 max	15,0 17,5	3,00 5,00		0,045 max	0,03 max	3,00≤Cu ≤5,00 5xCSNb ≤0,45	Solubilizzato e indurito	1100 (950)	950 (550)	38 HRC (20-32 HRC)	Combines excellent mechanical performance with good resistance to corrosion. Military and aerospace
Precipitation hardening	1.4021	AISI 420 A	0,18 0,30	1,00 max	1,00 max	12,0 14,0			0,045 max	0,03 max		Tempra e rinvenimento	1550	1300	48 HRC	Low corrosion resistance but excellent mechanical performance. Knives and blades
Martensitic stainless st.	1.4125	AISI 440 Nb	0,96 1,25	1,00 max	1,00 max	16,0 18,0	0,60 max	0,75 max	0,045 max	0,03 max	2,5≤ Nb ≤3,5	Tempra	750-950	550	60 HRC	Low corrosion resistance but excellent mechanical performance. Scissors, scalpels, injectors for engines
Ferritic stainless st.	1.4016	AISI 430	0,08 max	1,00 max	1,00 max	15,5 17,5			0,045 max	0,03 max		Ricottura	350	250	125 HV10	Good atmospherical corrosion resistance and good wear resistance
Bearing steel	1.3505	100Cr6	0,90 1,05			1,35 1,65						Tempra e distensione	1220-1580	960-1240	30-60 HRC	Components subject to wear and abrasion, as well as tension and compression. Fifth wheels, bearings, rollers
Tool steel	1.3342	AISI M2	0,95 1,05			3,80 4,50		4,50 5,50			5,50≤W ≤6,75 1,75≤ V ≤2,20	Tempra e rinvenimento	(≥ 1200)	(≥ 800)	50-60 HRC	Cold work steel with good wear resistance, good resilient cutting and high hardness

1) Figures in brackets refer to the mechanical properties (approximate) of the components as sintered, without any heat treatment
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