

IDENTIFICATION COLOR	NAME	NORMAL CHEMICAL COMPOSITION						HEAT TREATMENT		FEATURES AND APPLICATIONS	INTERNATIONAL EQUIVALENCES			
		C	Si	Mn	Cr	Mo	V	Other	Austenization		Cooling	AISI / SAE	DIN	JIS
	O1	0.95	0.25	1.00	0.60	----	0.10	W = 0.60	790 - 850 °C	Oil or salts	General purpose steel, with good wear resistance and toughness; easy to machine and harden. Used in cutting and punching tools.	O1	1.2510	~ SKS 3
	S7	0.50	0.90	0.60	3.25	1.50	0.20	----	925 - 955 °C	Nitrogen, salts or oil	Steel with high toughness and the best hardenability of the "S" series steels; its main applications are intended for the manufacture of tools for cutting thick sections (> 3 mm) and where fracture is frequent. Used for plastic injection mold cavities. Recommended work hardness between 54 - 56 HRC.	S7	1.2357	Ø
	A2	1.00	0.30	0.60	5.30	1.00	0.20	----	925 - 970 °C	Aire, salts, oil or nitrogen	Good combination of wear resistance and toughness, with good compression resistance; used in cutting and forming tools.	A2	1.2363	~ SKD 12
	D2	1.55	0.30	0.40	11.80	0.80	0.80	----	990 - 1050 °C	Aire, salts, oil or nitrogen	Steel with high resistance to wear and compression, with moderate toughness; widely used in cutting and forming tools. If tools made with this steel tend to fracture or chipping constantly, do not exceed a hardness of 58 HRC.	D2	1.2379	~ SKD 11
	PM 823 ESR	0.85	0.85	0.35	7.70	1.50	2.45	----	1070 - 1090 °C	Nitrogen, salts or oil	ESR technology Steel with excellent toughness, resistance to compression and wear, both abrasive and adhesive. Specially developed to replace applications where common tooling failures are chipping and/or fracture. It is possible to achieve hardness values between 60 to 61 HRC, in addition to being a steel with better performance for metallic coatings of the PVD type, beyond that of D2 steel.	Ø	Ø	Ø
	M2	0.90	0.25	0.30	4.00	5.00	1.80	W = 6.40	1190 - 1230 °C	Oil, salts or nitrogen	High speed steel with excellent wear resistance and moderate toughness, used in material removal cutting tools. Good resistance to tempering.	M2	1.3343	~ SKH 51
	GSF	0.28	0.30	0.70	2.80	0.60	0.40	Ni=1.00	Hardened and tempered 350 - 410 HBN (~ 38 - 44 HRC)		Low alloy steel specially designed for hot steel forging applications, which is characterized by superior toughness and wear resistance compared to AISI L6 and DIN 1.2714 type steels; good machinability and weldability. It can be supplied in different hardness levels, the most common being 38 - 44 HRC. It can be used in plastic injection cavities as a substitute for P20 + Ni (DIN 1.2738), as well as as tool holders or sacrificial tools. Used for the manufacture of mechanical components, being an ideal substitute for 4140T, 4340T, 9840T, among others.	Ø	Ø	Ø
	USD	0.38	1.00	0.40	5.30	1.40	1.00	----	1020 - 1040 °C	Nitrogen, salts or oil	Good toughness and ductility, with good resistance to thermal fatigue and greater hot resistance than AISI H11 steel. It's used in extrusion, forging and die casting processes. Commonly used in plastic injection mold cavities.	H13	1.2344	~ SKD 61
	USN ESR	0.37	1.00	0.40	5.20	1.30	0.40	----	1000 - 1020 °C	Nitrogen, salts or oil	"Premium" quality steel, characterized by its high toughness, with good hot resistance, mainly used in applications of low melting point alloys (aluminum, magnesium and zinc) whether by high, low pressure or gravity casting, especially in large molds. Compliance with NADCA requirements #207-2016.	H11	1.2343	~ SKD 6
	USD ESR	0.38	1.00	0.40	5.30	1.40	1.00	----	1020 - 1040 °C	Nitrogen, salts or oil	"Premium" quality steel, characterized by a very low level of non-metallic inclusions (increases its toughness and ductility) and structural conditions of greater uniformity (isotropic mechanical properties, minimal segregation, better machinability and better response in heat treatment). High performance in hot and warm forging, plastic molding and pressure casting processes (compliance with NADCA #207-2016 requirements).	H13	1.2344	~ SKD 61
	RPU ESR	0.38	0.40	0.40	5.00	2.80	0.60	----	1030 - 1050 °C	Nitrogen, salts or oil	It has high hot strength and resistance to thermal fatigue with very good toughness; susceptible to receiving water cooling during operation. Ideal in extrusion processes of non-ferrous alloys, for example, mandrels for copper tubes and their alloys, as well as their components (dummy blocks, liners, etc.). Likewise, it has good performance in pressure-casting mold components for aluminum alloys.	Ø	1.2367	Ø
	TQ1	0.36	0.30	0.40	5.20	1.90	0.55	----	1010 - 1020 °C	Nitrogen	"Premium" quality steel, intended for applications that demand the greatest toughness and hot resistance in cavities of high and low pressure casting molds, as well as tooling for extrusion processes. Its resistance to thermal fatigue is exceptional, which increases the life time of the tools or components. Compliance with NADCA requirements #207-2016.	Ø	Ø	Ø
	CS1	0.50	0.30	0.40	5.00	1.90	0.55	+ Nb	1030 °C	Nitrogen	CS1 It's a new steel for hot work applications by Kind & Co; was specifically designed for tools with high mechanical demands. It is an evolution of the TQ1; which distinguishes itself by its high levels of hardness and toughness. With its optimized alloying concept, offers excellent heat resistance, outstanding wear resistance and optimal temper resistance. CS1 is in the "Super Clean" quality group, this lends additional toughness and the best conditions for polishing work. Exhibits good dimensional stability in heat treatment and it's use.	Ø	Ø	Ø
	CR7V - L	0.42	0.50	0.40	6.50	1.30	0.80	----	1030 - 1040 °C	Nitrogen, salts or oil	Developed for the manufacture of tooling with high demands for wear resistance, compression resistance, high toughness and elevated heat transfer capacity. The main applications are aimed at hot stamping processes for automotive structural components of martensitic steels, achieving outstanding results with respect to steels of type AISI H13, DIN 1.2367 and 1.2365; likewise, it can be used in forging and hot forming tools. Recommended hardness between 52 to 56 HRC. Susceptible to nitriding and PVD type coatings.	Ø	Ø	Ø
	FTCO	0.53	0.20	0.40	4.00	2.00	1.10	W = 1.50 Co = 0.90	1120 - 1140 °C	Nitrogen	Steel with high hot resistance and exceptional toughness; intended for hot and warm forging applications (precision forging). Recommended hardness of use 52 - 54 HRC.	Ø	Ø	Ø
	HMoD	0.45	0.30	0.40	4.50	3.00	2.00	Co = 4.50	1120 - 1150 °C	Nitrogen, salts or oil	Steel for hot work operations that demand high resistance to elevated temperatures (high resistance to tempering) and maximum resistance to wear. Ideal for applications in extrusion dies of copper and its alloys, components in aluminum casting mold pouring systems (gravity, low and high pressure), hot forming tooling, etc.	Ø	1.2889	Ø
	1.2085	0.32	0.50	0.90	16.00	----	----	Ni = 1.00 S = 0.10	Hardened and tempered 310 - 360 HBN (~ 31 - 36 HRC)		Stainless steel for the manufacture of plastic injection mold holders, with excellent corrosion resistance, good resistance to deformation (marking or indentation) and excellent machinability. It can be used in plastic injection cavities where the surface finish requirements are not extreme. It can be used in the manufacture of mechanical elements or components.	Ø	X33CrS16	Ø
	P20 + Ni	0.40	0.30	1.50	2.00	0.20	----	Ni = 1.00	Hardened and tempered 280 - 325 HBN (~ 28 - 34 HRC)		Developed for cavities and inserts of plastic injection molds, with excellent polishing capacity; with uniform hardness and very good machinability; it can be used as a mechanical component with outstanding results; an alternative to replace AISI 4140T and 9840T steels.	~ P20	1.2738	Ø
	GSF ESR	0.28	0.30	0.70	2.80	0.60	0.40	Ni = 1.00	Hardened and tempered 350 - 410 HBN (~ 38 - 44 HRC)		ESR technology Its toughness is greatly increased compared to GSF No ESR; of good machinability and polishing capacity (Optical Quality); intended for plastic molding cavities as a substitute for P20 + Ni, with better hardenability and wear resistance. It's used in applications of mechanical fastening and transmission elements.	Ø	Ø	Ø
	INOX 420 (RF)	0.42	0.40	0.30	13.00	----	----	----	1010 - 1030 °C	Nitrogen, salts or oil	Stainless steel to be hardened and provide high wear resistance; high machinability and excellent polishing capacity. Ideal for inserts and cavities with surface finish requirements subject to corrosive environments and high humidity conditions.	~ 420	~ 1.2083	~ SUS 420 J2
	303	0.10	0.80	1.50	18.00	----	----	Ni = 9.00 P = 0.15 S ≥ 0.15	Austenitic stainless steels; not hardenable by temper, not magnetic.		Characteristics and applications similar to those described for AISI 304 stainless steel, but with superior machinability (free machining stainless steel) due to the influence of sulfur (S) and manganese (Mn). Low forgeability steel; intended for manufacturing components in high production volume. It can develop a certain degree of magnetism when cold worked (machining, deformation, etc.).	303	1.4305	~ SUS 303
	304	0.06	0.50	1.00	19.00	----	----	Ni = 9.00	Austenitic stainless steels; not hardenable by temper, not magnetic.		Stainless steel with high corrosion resistance. Non-magnetic in annealed condition, but can reach a certain degree when cold worked. Used in the food, pharmaceutical, textile and chemical industries.	304	1.4301	~ SUS 304
	316 L	0.03	0.50	1.00	17.00	2.50	----	Ni = 12.00	Austenitic stainless steels; not hardenable by temper, not magnetic.		Stainless steel with superior corrosion resistance than any other stainless steel; similar to 316, but with the advantage of lower carbon content that reduces the risk of intergranular corrosion when subjected to welding processes. Widely used in the medical, automotive, aeronautical, and food industries. Ideal substitute for 316 as it satisfies its chemical composition.	316L	1.4404	~ SUS 316L
	416	0.12	0.80	1.00	13.00	----	----	S ≥ 0.15	925 - 1010 °C	Oil	Martensitic stainless steel (hardening by quenching and tempering) with high machinability. It is magnetic and has good corrosion resistance. It is normally used in mechanical applications or manufacturing of high production volumes due to its high machinability (free machining stainless steel).	416	1.4005	~ SUS 416
	12L14	0.10	----	1.00	----	----	----	P = 0.07 S = 0.30 Pb = 0.25	Carbonitrided (760 - 870°C); Layer depth 0.08 - 0.25 mm (0.003" - 0.010"); usually temper in oil		Low carbon steel with high machinability (free machining steel), low forgeability, weldability and cold forming; for high volume production of parts and components (screws, nuts, studs, etc.).	12L14	1.0737	~ SUM 22L / ~ SUM 24L
	1018	0.18	0.25	0.80	----	----	----	----	Carburizing at 870 - 955 °C	Reduce to 845 °C and cooling in water.	Low carbon steel with excellent forgeability, good cold formability and very good weldability; susceptible to thermochemical carburizing treatment. Used in the manufacture of screws, bushings, couplings and fastening elements.	1018	1.1141	~ S18C
	1045	0.45	0.25	0.80	----	----	----	----	845 °C	Water or oil	Medium carbon steel with excellent forgeability and medium machinability; easy response to heat treatment; suitable for surface quenching (flame or induction). It is used in the manufacture of mechanical elements. If it is subjected to welding processes subject it to welding processes, take extreme precautions due to the risk of fracture.	1045	1.1191	~ S45C / ~ S48C
	B.H. 1518 M	0.18	0.35	1.30	----	----	0.12	----	Carburizing at 830 - 950 °C	Reduce to 860 °C and cooling in oil	Hollow bar that due to its chemical balance, has good machinability and weldability; ideal for manufacturing high volume parts where a hard surface with a high tenacity core may be required.	~ 1518	EN 10297-1 E355 (1.0580)	Ø
	4140 R	0.40	0.25	0.90	1.00	0.20	----	----	840 - 860 °C	Oil	Cr - Mo steel, with good toughness for machinery parts or mechanical elements; of good forgeability and machinability. Precautions must be taken if it is subjected to welding processes (susceptible to fracture of the welded area).	4140	1.7225	~ SCM 440
	4140 T	0.40	0.25	0.90	1.00	0.20	----	----	Hardened and tempered 247 - 301 HBN (~ 24 - 32 HRC)					
	9840 R	0.40	0.25	0.80	0.85	0.25	----	Ni = 1.0	845 °C	Oil	Cr - Ni - Mo steel for mechanical applications (shafts, gears, crowns, etc.). Its hardenability is higher than 4140 steel (uniformity of hardness from the surface to the core) and with better resistance to mechanical fatigue. Like medium carbon steels, precautions must be taken if it will be subjected to welding processes.	9840	1.6511	Ø
	9840 T	0.40	0.25	0.80	0.85	0.25	----	Ni = 1.0	Hardened and tempered 247 - 301 HBN (~ 24 - 32 HRC)					
	8620	0.20	0.25	0.80	0.50	0.20	----	Ni = 0.60	Carburizing at 870 - 925 °C	Reduce at 845 °C and cooling in oil.	Cr - Ni - Mo steel for thermochemical carburizing treatment; used in applications with high surface wear resistance and core toughness (gears, cams, pinions and automotive components).	8620	1.6523	~ SNC M220
	Pearlitic Iron U3	3.30	2.20	0.60	----	----	----	S = 0.05 P ≤ 0.15	840- 900 °C	Oil	High-strength cast iron, with good wear resistance and susceptible to hardening by quenching and tempering heat treatment. It can be surface tempered by induction or flame. Reduces efficiently noise and vibration of parts made with this type of iron. It is called highly "Perlitic" iron. Used in the manufacture of mechanical parts such as gears, shafts, couplings, covers, pulleys, flow distributors (manifold), etc.	ASTM A48 Clase 40	GC 275 (GC40)	Ø
	Ductil Iron 65 45 12	3.60	2.50	0.20	----	----	----	S = 0.10 P ≤ 0.040	Because its structure is ferritic, it is not feasible to hardening by quenching and tempering.		Iron with maximum machinability, even than any steel. It combines optimal properties of resistance to impact and mechanical fatigue; of good thermal conductivity and magnetic permeability. It has good vibration and noise absorption characteristics. Used in applications of mechanical components of machinery and equipment, as well as in the manufacturing of glass molds.	ASTM A536 Gdo. 65-45-12	SF-400 (SF60)	Ø
	ALCA 5 AA5083	≤0.10	≤ 0.25	----	----	----	≤ 0.40	Mn = 0.80 Mg = 4.50	Properties and features.		Non-Ferrous Alloys High precision machined aluminum, High resistance aluminum and Bronze	AISI / SAE	DIN	JIS
	Aluminum 6061 T651	0.25	≤ 0.25	----	----	----	0.60	Mg = 1.0	Hardening by aging: R.T.: > 42 Ksi; L.E.: > 35 Ksi; % E: 10 %; Hardness: ~ 95 HBN (500 Kg / 10 mm)		Aluminum alloy with medium level mechanical properties. It has high corrosion resistance and good weldability. Aimed at the manufacture of blow molds, thermoforming and vulcanizing rubber; used as a mechanical or structural element in the aeronautical, automotive and metalworking industries.	ASTM B209 B221	3.3211 (AlMg1SiCu)	Ø
	Aluminum 7075 T651	1.60	5.50	----	----	----	≤ 0.40	Mg = 2.5	Hardening by aging: R.T.: > 75 Ksi; L.E.: > 60 Ksi; % E: 5 %; Hardness: ~ 150 HBN (500 Kg / 10 mm)		Aluminum alloy with high mechanical strength and high fatigue resistance. It has good resistance to corrosion. Used as a structural component in the aeronautical, automotive, metalworking industries, and in the manufacture of plastic blow molds.	ASTM B209 B221	3.4365 (AlZnMgCu15)	Ø
	Standard CDA 844	80.0	9.00	7.00	≤ 2.0	2.00	----	----	~ 65 HBN (500 Kg)		It is known as phosphorus bronze, standard or commercial; of good machinability and good mechanical characteristics. It is recommended in light duty and medium speed applications (bushes, bushings, small bearings, etc.).	ASTM B-145 (5A)	1705 CuSn2ZnPb	Ø
	SAE 62 (CDA 90500)	88.0	2.00	≤ 2.0	≤ 2.0	10.00	----	----	~ 80 HBN (500 Kg)		Good machinability and corrosion resistance. Medium hardness and good wear resistance; it's used in mechanical elements subject to high load and low speed conditions (crowns, worm screws, bearings, bushings and rings in applications in steam and gas conduction systems).	ASTM B-143 (1A)	1705 CuSn10Zn	~ H5111 BC3
	SAE 64 (CDA 93700)	80.0	≤ 2.0	10.00	≤ 2.0	10.00	----	----	~ 65 HBN (500 Kg)		Excellent machinability and corrosion resistance with good mechanical strength and high wear resistance, it is used in mechanical elements with high loads and high speed (pumps, impellers, bushings, bearings, gears, etc.).	ASTM B-144 (3A)	1716 CuPb10Sn10	Ø