Material Varieties and Applications 1

1.General Steel Materials

Class	Material Code	Use Application	Comment	JIS	Flat Bar	Square Bar	Hexagonal Bar	Round Bar	Steel Plate	Section
Rolled Steel for General Structure	JIS SS400 (AISI 1018 Steel Equivalent)	General machine parts.	Fine Workability and Weldability	JIS G 3101	○	○		○	○	○
Polished Steel Bar (Cold-Drawn)	SS400D	General machine parts.	Excellent Precision and Surface Roughness. Ready for use directly or after slight cutting.	—	○	○	○	○		
Carbon Steel for Machine Structure	1045 Steel	General machine parts.	Fit for Hardening, Tensile strength: 58 kgf/mm^2	JIS G 4051	○	○	○	○	○	
	1049 Steel		Fit for Hardening, Tensile Strength:66 kgf/mm^2							
Carbon Steel	SKS93	Shafts, pins, etc.	For Drill Rod (Round Bar) W1-9 surface-finished after cold drawing. Class 7 (—DG7) =h7 Class 8 (—DG8) =h8 Class 9 (—DG9) =h9	JIS G 4401	○	○		○		
	W1-9				○			○		
	W1-8				○			○	○	
Alloy Tool Steel	01 Tool Steel	Hardening Parts	Deformation due to hardening is much less than that of SK material.	JIS G 4404	○	○		○		
Chrome Molybdenum Steel	4137 Alloy Steel	General machine parts requiring strength. Screws, etc.	4137 Alloy Steel Tensile Strength: 70 kgf/mm^2 Tensile strength after Hardening & tempering: 95 kgf/mm^2 or more. Hardness: HB270 or More After surface Hardening: HRC50 or more.	JIS G 4105	○	○	○	○	○	
	SCM415									
	SCM420									
Sulfuric and Sulfur Compound Free Cutting Steel	SUM21	General machine parts (Free-cutting steel).	Made of carbon steel plus sulfur to enhance machinability.	JIS G 4804		○	○	○		
	12L13		Free-cutting steel containing sulfur and lead.							
	SUM24L									
High-Carbon Chrome Bearing Steel	52100 Bearing Steel	Roller bearings, etc.	Bearing Steel	JIS G 4805				○		
Cold-Rolled Steel Plate	Low Carbon Steel	Covers, cases, etc.	Rolled at a almost normal temperature. High dimensional precision and fair texture. Fine workability. Easy to bend, wring and cut. Fine Weldability.	JIS G 3141					○	
Hot-Rolled Steel Plate	Low Carbon Steel	General machine structural parts.	Plates for general use are 6 mm or less in thickness.	JIS G 3131					○	

2. Stainless Steel Materials

Type	Material Code	Use Application	Comment	Magnetism	JIS	Flat Bar	Square Bar	Hexagonal Bar	Round Bar	Steel Plate	Section
Austenite	303 Stainless Steel	Machine parts requiring antirusting.	18-8 Non-Magnetic, Free-Cutting SUS. More Machinable than 304 Stainless Steel	None *	JIS G 4303～	○			○		
Austenite	304 Stainless Steel	Machine parts requiring antirusting.	Most Versatile Antirusting and Heat-Resisting Steel for General Use	None *		○	○	○	○	○	○
Austenite	316 Stainless Steel	Machine parts requiring antirusting.	More resisting to seawater and other media than 304 Stainless Steel.	None *		○			○	○	
Martensite	440C Stainless Steel	Machine parts requiring antirusting. (Less corrosion resistant than austenite.)	Fit for Hardening	Available					○		
Martensite	410 Stainless Steel	Machine parts requiring antirusting. (Less corrosion resistant than austenite.)	Fit for Hardening Fine Workability	Available					○		

*Martensite exhibits magnetic properties. Machining of Austenite may cause magnetic properties.

<Reference: Corrosion resistance of stainless steel>

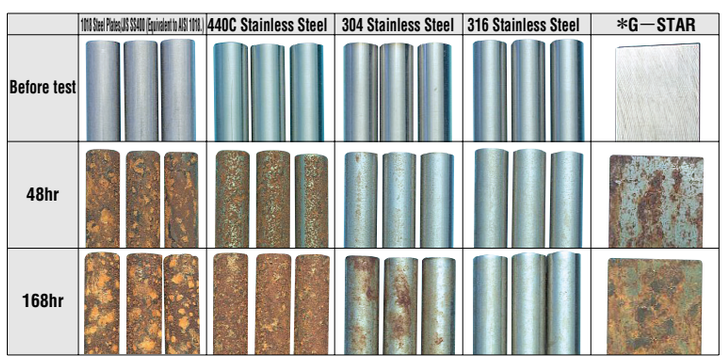
Test method

Conforms to the Cyclic Test Method under JIS H 8502 as a complex corrosion test method.

Test conditions

①Salt water spray test (5% NaCl, 35℃) 2hr
②Drying (60℃) 4hr
③Wet (95% RH, 35℃) 2hr
One cycle takes 8 hr.

Appearance of test piece Before test, 48 hr, 168 hr



*G-STAR is martensite stainless steel (pre-hardened steel) manufactured by the Daido Special Steel Co., Ltd.

3.Aluminum Alloy Materials

Type	Material Code	Use Application	Comment	JIS	Flat Bar	Square Bar	Round Bar	Steel Plate	Section
Al—Cu Alloy	2011 Aluminum	General-Use Strength Members	Free-Cutting Alloy High Workability but less Corrosion Resistance	JIS H 4000			○		
Al—Cu Alloy	2017 Aluminum	General-Use Strength Members	High Strength and Machinability Duralumin		○		○	○	
Al—Mg Alloy	5052 Aluminum	General machine parts Covers, Cases, etc.	Most typical aluminum alloy with medium strength. With high fatigue strength in comparison with its strength and high corrosion resistance to seawater.		○			○	
Al—Mg Alloy	5056 Aluminum	General Machine Parts	High Corrosion Resistance to Seawater. Fine Machined Surface.				○		
Al—Mg—Si Alloy	6061 Aluminum	General Machine Parts	Heat-treated corrosion-resisting alloy. High durability owing to T6 treatment.		○		○		
Al—Mg—Si Alloy	6063 Aluminum	General Machine Parts and Structural Material	Weaker than 6061, but more extrudable. Applicable to complex cross-sections. Good corrosion resistance and surface treatment.		○	○			○
Al—Zn—Mg Alloy	7075 Aluminum	Jigs and Dies	One of the Strongest Aluminum Alloys. Less Corrosion Resistance Extra Super Duralumin.		○				

JIS Acronyms for Non-Ferrous Metal Products

P	Plate, Strip, Disk
PC	Laminate
BE	Extruded Bar
BD	Drawn Bar
W	Drawn Wire
TE	Seamless Extruded Tube
TD	Seamless Drawn Tube

TW	Welded Tube
TWA	Arc-Welded Tube
S	Extruded Section
BR	Riveted Bar
FD	Die-Forged Part
FH	Free-Forged Part

Quality Codes for Aluminum and Aluminum Alloys

Symbol		Definition	Explanation
F		Plain Manufactured Material	Completed as a product, without any order for thermal refining. Extruded or forged material, not thermally refined.
H112		Wrought material, for which certain mechanical properties are guaranteed without the need of hardening.	
O		Brought into the softest state by annealing.	Completely re-crystallized by annealing. A thermally treated alloy should be cooled at a temperature below the annealing temperature to prevent the effect of annealing completely.
H	H1n	Hardened by cold working.	n is a numeral from 1 to 9, representing the degree of hardening. "8" represents hard material, and "4" represents the state halfway (1/2) between 0 and hard material. "2" represents the level halfway between 0 and 1/2 hardness, and "6" the state halfway between 1/2 hardness and hard material.
	H2n	Hardened and then properly softened by heat.	
	H3n	Stabilized after cold working.	
T	T1	Cooled after high-temperature working and then allowed to age naturally.	Quenched at the end of a cold working process and allowed to age and harden at normal temperature. Extruded material is typical material processed in this way. Cold working such as correction may be conducted unless it affects the strength. Used for an alloy such as 6063, for which the effect of quenching can be realized by cooling after hot working (extrusion).
	T3	Allowed to age naturally after solution treatment and cold working.	Cold working is conducted for plates, rods, tubes, etc. to enhance the strength in some cases, and to improve the corrective dimension precision in other cases, with an obvious effect. T361 when cold working is performed to a higher degree than that for T3.
	T351	Allowed to age naturally after solution treatment and cold working.	Cold working is conducted to enhance the strength after solution treatment, and then it is tension processed to give 1.5 to 3% permanent deformation to remove residual tension, and allowed to age naturally.
	T4	Natural aging after solution treatment	Aging is usually completed after exposure to normal temperature for approx. 4 days. In the case of 7N01, however, aging is a longer process. The tensile property upon the elapse of one month is adopted as referential data. The variety that is given T4 treatment by a user under specified conditions is called T42.
	T5	Hardened through artificial aging after high-temperature processing and quenching	Hardened through artificial aging to improve the mechanical properties and stabilize the dimensions. Used for 6063 and other alloys and castings for which quenching can be performed with a noticeable effect, by cooling after high-temperature processing (extrusion).
	T6	Hardened through artificial aging after solution treatment.	Excellent strength can be attained for a thermally treated alloy without cold working in the typical heat treatment process. An item that is given T16 treatment by a user under specified conditions is called T62.
	T61	Wrought material: Hardened through artificial aging after solution treatment by quenching with lukewarm water. Casting: Tempered after Hardening.	Quenched with lukewarm water to prevent distortion due to the main hardening. The conditions for hardening through artificial aging are adjusted to attain strength exceeding that accomplished by regular T6 treatment.
	T7	Stabilized after solution treatment	Overaging surpassing that needed for hardening through artificial aging to attain the maximum strength, in order to adjust special properties somewhat at the expense of strength.
	T73	Overaging after solution treatment.	Overaging after solution treatment to rectify the tendency to crack due to corrosion under stress. Specified in 7075, forgings, of JIS.
	T7352	Overaging after removal of residual stress after solution treatment.	Overaging after removal of residual stress by compression to retain 1% to 5% permanent deformation subsequent to solution treatment, in order to rectify the tendency to crack due to corrosion under stress. Included in free forgings, 7075.
	T8	Hardened through artificial aging after cold working subsequent to solution treatment.	Cold working performed, with a noticeable effect, to improve the mechanical properties or to rectify drawbacks or improve dimension precision. Called T83 when the sectional area is reduced 3% through cold working. Called T86 when the reduction rate is 6%. These procedures are performed to enhance the strength.
	T9	Cold working after hardening through artificial aging subsequent to solution treatment.	Cold working is necessary to enhance the strength.