4. Copper Alloy Materials

Type	Material Code	Applications	Comment	JIS	Square Bar	Hexagonal Bar	Round Bar	Steel Plate
Brass Plate	C28000 Brass	For Regular Sheet Metal Machining Name Plates and Instrument Panels	Used in high strength and ductile sliding parts. Brass	JIS H 3100				Good
Free-Cutting Brass (Extruded Bar)	C3604 BD Brass (JIS)	General turming bolts screws, nuts, etc.	Good Machinability	JIS H 3250	Good	Good	Good	

5. Cast and Forged Products, Copper Alloy Castings

Type	Material Code	Applications	Comment	JIS
Gray Cast Iron, Class3	Alloy Cast Iron Class No. 30	Cast Machine Parts	–	JIS G 5501
Gray Cast Iron, Class4	Alloy Cast Iron Class No. 35		–	JIS G 5501
Spheroidal Graphite Cast Iron, Class4	JIS-FCD600		–	JIS G 5502
Bronze Casting, Class 6	JIS-BC6	Bearings, sleeves, bushings and general machine parts.	High pressure resistance and abrasion resistance, and good machinability.	JIS H 5111

6. Steel Pipe Materials

Type	Material Code	Applications	Comment	JIS
Carbon Steel Pipe for Ordinary Piping	White Pipe (Zinc Galvanic) SGP Black Pipe (No Plating)	Piping Parts	At ambient temperature(Gas pipe). A is metric specification. B is inch specification.	JIS G 3452
Carbon Steel Pipe for Machine Pressure Service	JIS-STPG370 (JIS STPG38)	Piping Parts	Operation temperature 350˚C. A is metric specification. B is inch specification.	JIS G 3454
Carbon Steel Pipe for Machine Structural Use	JIS-STKM	General Machine Parts Hollow Shafts.	Available for class 11 to class 20.	JIS G 3445
Seamless Brass Pipe (Regular class)	JIS-C22700T	–	Easy Flaring, Bending, Wringing and Plating	JIS H 3300

7. Spring Materials

Type	Material Code	Applications	Allowable Operating Temperature ˚c	JIS
Piano Wire	Spring Steel (ASTM A228) SWP-8	High strength, homogenous cold-drawn wire. For high quality springs and forming.	110	JIS G 3522
Hard Steel Wire	JIS-SWB	Applicable to universal stress. For low priced springs and forming.	110	JIS G 3521
	JIS-SWC	For high quality springs and forming.	110	
Carbon Steel for Spring Oil Tempered Wire Oil Tempered Steel Wire	JIS-SWO-A JIS SWO-B	Hardening and tempered. For general-purpose springs.	120	JIS G 3560
Carbon Steel for Valve-Spring Oil Tempered Wire. Oil Tempered Steel Wire	JIS-SWV	Hardening and tempered. With a fine surface and uniform tensile strength	120	JIS G 3561
Cr-V Steel for Valve-Spring Oil Tempered Steel Wire	JIS-SWOCV-V	Hardening and tempered. Loads and slightly high Temperatures.	220	JIS G 3565
Ci-Cr Steel for Valve-Spring Oil Tempered Steel Wire	JIS-SWOSC-V	Hardening and tempered. Loads and slightly high Temperatures.	245	JIS G 3566
For Springs Stainless Steel Wire	302 Stainless Steel (WPA) (WPB)	For general corrosion and heat resistance Available for magnetic spring.	290	JIS G 4314
	316 Stainless Steel (WPA) (WPB)	Heat Resistance is good. Higher corrosion resistance than SUS302. Available for magnetic spring.	290	
	631 Stainles Steel-WPC	Precipitation hardening after spring processing. High strength and general corrosion resistance. Available for magnetic spring.	340	

Types of Surface Treatment

Name	Vickers Hardness (HV)	Layer Thickness (μm)	Applicable Materials	Example	Purpose, Features	Reference
Zinc Plating	–	3~20	Steel	Thin Plate Wire	·Antirust, low price. ·Poor appearance.	–
Chromate Plating	–	1~2	Steel	Plate Work Bolts and Nuts.	·Antirust, low price. ·Fit for mass production. ·Poor appearance, however, works instead of nickel plating.	–
Bright Chromate	–	1~2	Steel	–		
Trivalent Chromate	–	1~2	Steel	Bolts and Nuts	·Antirust, low price. ·Do not contain hexavalent chrome.	–
Nickel Plating	–	–	Steel Copper Brass	–	·Improvement of corrosion resistance and decoration ·Chrome plating has more corrosion resistance in the atmosphere.	·Copper base plating as appropriate. ·Not applicable to deep indentations.
Class 1 Plating	500	5~20			·Better appearance than Class 3 plating.	·Material…Buff…UPlating…Buff
Class 3 Plating					–	·Material…Plating
Satin Finish Plating	–	–			·Fatigue resistance. ·Minor flaws remain inconspicuous.	·Material…Satin finish…Plating
Electroless Nickel Plating	500	Specifiable	Steel Stainless Steel Copper Aluminum Alloy Glass Plastic	Parts Unsuitable for Nickel Plating.	·Approx.10 times more expensive than nickel plating. ·Easy film thickness control. ·High corrosion resistance, abrasion resistance. ·Give Conductivity to Non-Metals	–
Kanigen Plating	Up to 1000			Parts hardened after Plating.	·Same as the features of electroless nickel plating. ·Can be hardened by heat treatment after plating.	
Chrome Plating	–	–	Steel Copper Brass	–	·Appearance with gloss ·Good corrosion resistance ·Sliding chrome plating surfaces are easy to stick together.	·Nickel base plating as appropriate. ·Not applicable to deep indentations.
Class 1 Plating	500	5~20			·Better appearance than Class 3 plating.	·Material…Buff…UPlating…Buff
Class 3 Plating					–	·Material…Plating
Satin Finish Plating	–	–			·Fatigue resistance. ·Minor flaws remain inconspicuous.	·Material…Satin finish…Plating
Hard Chrome Plating	1000	10~30		Cylinder Liners	·Excellent abrasion resistance. ·More expensive than other chrome plating.	·Material…Plating (Class 3 Plating)
Black Oxide (Blackening)	–	–	Steel	Bolts Nuts Instruments	·Base coating. ·Appearance(with gloss). ·Rusts more easily than Tufftride	·General Black Oxide
Low Temperature Black Chrome Plating	–	1~2	Steel Copper Stainless Steel	Items requiring high precision, items requiring higher corrosion resistance than blackening.	·Long term antirust performance. ·High corrosion resistance. ·Ultra thin film.	·Low-Temperature Preliminary Treatment. No thermal effect on raw material. Parts coupled with plastic matter, rubber, etc.
Anodize Clear	–	3~5	Aluminum Alloy	–	·Corrosion and abrasion resistance. ·No electric conductivity. ·Heat Resistance	·Some anodize pieces are colored through fine holes in the hard, oxidized film formed on the surface.
Anodize Black	–	5~10				

Apparent Colors of Surface Treatment