3 General materials of gauge

Steel

JIS standard's SKS or masterials with mechanical at or above the level of SKS, has all been through stabilization heat treatment.

Ceramics

Basic composition of ceramics is metallic oxide. After a high temperature heat treatment it becomes sintered compact.

- **Zirconia** The stiffest and toughest in ceramic.
- **Alumina** The most commonly used material in ceramic. It has excellent mechanical strength, electric insulation, high frequency loss, thermal conductivity, heat resistance, resist abrasion, and corrosion resistance.

Cemented carbide

Acombination of metallic materials bonded together through sintering.

- High hardness (around 1200HV)
- Young's modulus (hardness value) about three times more than steel.
- Specific gravity about two times more than steel.

Stainless steel

It contains chrome and combined with oxygen in air. The surface forms into a passive film that will prevent rust, therefore, no plating or coasting will be needed for anti-rust.

Properties of materials

	Vickers hardness (HV)	Stiffness (GPa)	Toughness (GPa)	Specific gravity (Water)	Coefficient of thermal expansion (10^{-6} K^{-1})	Thermal conductivity (W/m·K)
Alumina	1800	370	3 ~ 4	3.9	7.2	32
Zirconia	1200	200	7 ~ 8	6.0	10.5	3
Carbide (G2)	1200	620	20	16	5.5	85
Stainless (SUS304)	450	200	210	7	18	41
Steel (SKH)	730 (Hardening)	205	110 ~ 180	7.8	11	76

●Vickers hardness test (HV)

To perform the hardness test, use a quadrangular pyramid shape diamond indenter to press it on the surface of the material.

●Stiffness(GPa)

The properties of the object will not be easily deformed with any external forces such as compression, stroke, twist, etc.

●Toughness(GPa)

The material has a strong stickiness where the properties will not be easily damaged from external forces.

●Specific gravity

The comparison of the mass of an object and the mass of a standard object in same volume.

●Thermal expansion

The rise of temperature increases the length and volume.

●Thermal conduction

Where heat moves from higher temperature to lower temperature in an object.