Ultrafine-grain cemented carbide - EF grade

Line up ... EF01, EF05, EF10, EF20

Ultrafine grain cemented carbide

High hardness, high transverse rupture strength and sharp edge.

Explanation	Ultrafine grain material grade with various hardness range (HRA 90 - 94) . Long life by high wear-resistance.
Note	Ultrafine grain carbide such as EF have physically unresisting against impact or damage by EDM whereas high hardness and transverse rupture strength.
Applications	Mold for electronic component, powder compacting, resin forming, high speed press(Punch, Dies, Bending punch and Die), etc.

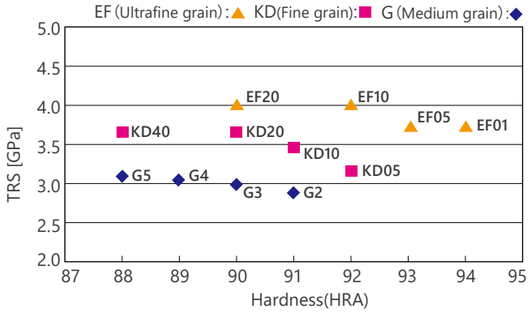
Physical property of EF grade

Our grade	Co content [%]	Density [×10³kg/m³] {g/cm³}	Hardness		TRS [GPa]
			HRA	HV	
EF01	8	14.5	(94.0)*	2000	3.7
EF05	10	14.3	93.0	1900	3.7
EF10	13	14.0	92.0	1750	4.0
EF20	18	13.6	90.0	1480	4.0

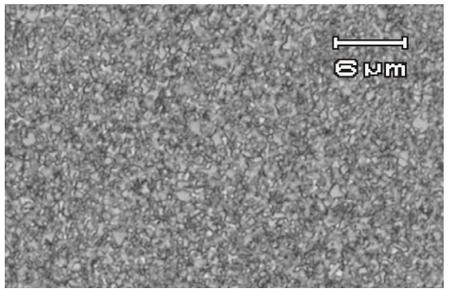
(Typical figures)

Note *The number shows the reduced value from HV.

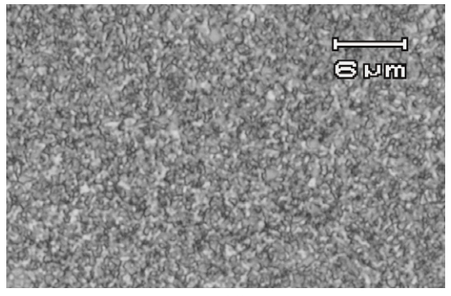
Relation between hardness and TRS



Micrographs of EF grade



EF01



EF10

By metallurgical microscope (×1000)

Non-magnetic and anti-corrosive cemented carbide - KN grade

Line up ... KN10, KN20, KN30, KN40

Non-magnetic and anti-corrosive cemented carbide

Completely free magnetism and magnetization from extraneous effect. Outstanding corrosion-resistance and chemical proof. Excellent oxidation-resistance than general WC-Co cemented carbides.

Explanation	Non-magnetic carbide by binder phase with Ni. Stable corrosion-resistance against various liquid solution and atmospherics by binder phase with Ni.
Applications	Magnetic field forming mold, Tools for magnetic tape, Electronic equipment, Parts for chemical equipment, Mechanical seal, Decorative parts, etc.

Physical property of KN grade

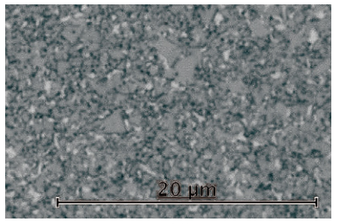
Our grade	WC grain size [μm]	Ni content [%]	Density [×10³kg/m³] {g/cm³}	Hardness HRA	TRS [GPa]	Fracture toughness values [MPa • m^½]	Tensile strength [GPa]	Magnetic permeability [H/m]
KN10	1.0 (less than)	9	14.5	91	3.3	11	1.6	1.27×10^{-6}
KN20	1.0 (less than)	12	14.2	90	3.6	14	1.8	1.27×10^{-6}
KN30	1.0 (less than)	14	13.9	89	3.6	17	1.8	1.27×10^{-6}
KN40	1.0 (less than)	16	13.7	88	3.8	20	1.9	1.27×10^{-6}

*The nearer magnetic permeability is 1.26×10^{-6} H/m, the higher non-magnetic performance is. (Typical figures)

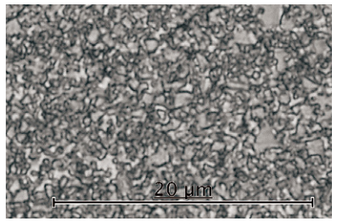
Corrosion-resistance of KN grade (Comparison with G grade)

Our grade	WC grain size [μm]	Co content [%]	Density [×10³kg/m³] {g/cm³}	Decrease in corrosiveness [g/(m² • h)]			
				10% NaOH	10% KOH	10% HCl	10% HNO_3
KN20	1.0 (less than)	12	14.2	0	0.01	0.08	0.01
G2	1.0 - 2.5	6	15.0	0.02	0.01	0.08	7.99
G5	1.0 - 2.5	13	14.3	0.02	0.04	0.09	28.34

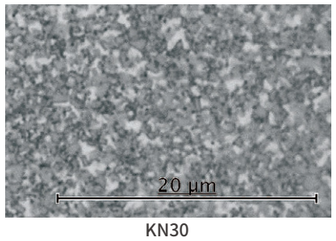
Micrographs of KN grade



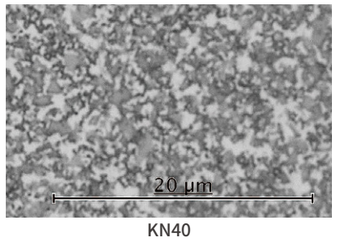
KN10



KN20



KN30



KN40

By metallurgical microscope (×1000)