Engineering Your Competitive Edge

KENNAMETAL®
Engineered Products Group

Applications of Kennametal mill rolls

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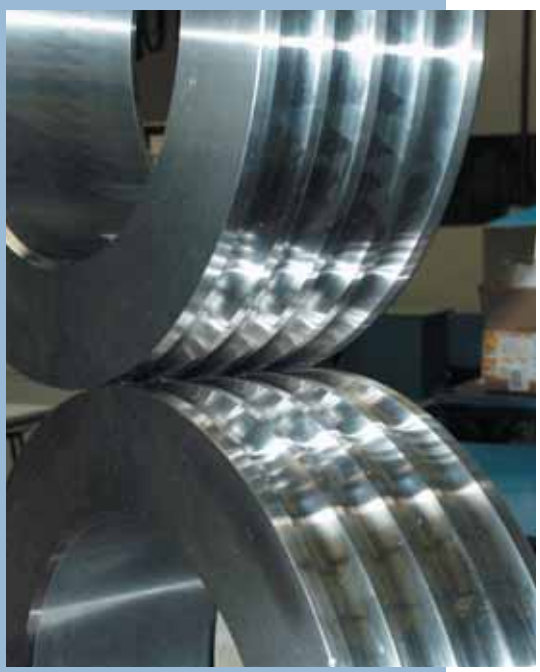
Tungsten carbide is a proven material for many stands in the rolling mill industry. Tungsten carbide grades developed by KENNAMETAL EPG achieve considerably longer tool lives and improved surface quality for rolls in comparision to cast iron rolls or other materials.

KENNAMETAL EPG tungsten carbide ring grades are characterised by good machinability. To a large extent these tungsten carbides may even be mechanically worked after sintering. Thus the tungsten carbide grades containing binding phase of approx. 15 % may be turned with PCD (polycristalline diamant) or CBN (cubic bore nitrit). The powder grain size of approx. 25 µm applied for theses tungsten carbides proved to deliver the best results for years.



These tungsten carbide grades designated as MN1 to MN6 are particularly resistant to impact and shock loading whilst maintaining a good wear resistance and dimensional accuracy. Furthermore the thermal stability and stability in relation to alternating thermal stresses deserves to be emphazised.

KENNAMETAL EPG also offers a new binder phase system of cobalt, nickel and iron for your special requirements relating to corrosion resistance. The special crystal structure of this binding phase system provides an increased resistance to crack propagation. The tougher binder phase permits the use of a larger proportion of wear-protecting tungsten carbide whilst maintaining the same hardness.

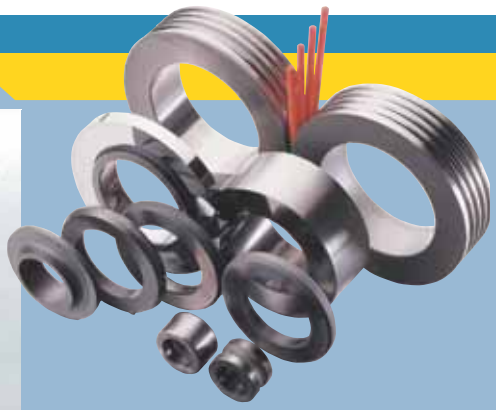
For high corrosion resistance Kennametal EPG has developed the CoNiCr mixed binder grades RCV5 and RCV6.

KENNAMETAL EPG satisfies the special requirements in the field of hot forming by the development of special tungsten carbide grades with a tungsten carbide powder grain size of only 8 µm. To this extent we use binder phase portions from 6 % to 15 %. These grades comprise both, tungsten carbide with pure cobalt as binder phase as well as KENNAMETAL EPG grades containing the corrosion resistant cobalt-nickel-iron binder phase system.

KENNAMETAL EPG manufactures rolls in all above described tungsten carbide grades with dimensions for blanks up to an outside diameter of maximally 630 mm and a height of maximally 400 mm.

KENNAMETAL EPG is able to deliver rolls as pure blanks, rolls with ground inner diameter and flat side or rolls ready calibrated according to your drawing.

Furthermore we like to point out the KENNAMETAL EPG composite rolls fully assembled and equipped with a special clamping system.



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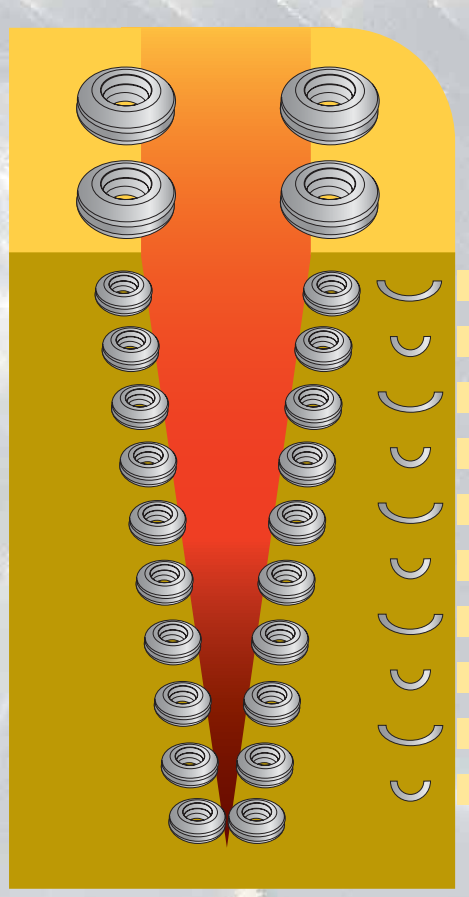
Throughout the rolls market KENNAMETAL EPG is known for short-term delivery and above all delivery on time. The geometrical precision of ground and polished areas also deserves to be emphasized.

KENNAMETAL EPG also offers a remachining service for various applications, especially for polished cold-formed rolls. Besides remachined rolls as much as new rolls satisfy the highest requirements.

KENNAMETAL EPG technical engineers and metallurgists are world-wide at your disposal to provide advice and solutions.

For further information, exceeding the content of this brochure, please contact your KENNAMETAL EPG sales representative.



Recommended application for a 10-stand

MN grade	FN-RCV grades
MN4, MN5, MN6	FN5, FN6 / RCV5, RCV6
MN4, MN5, MN6	FN5, FN6 / RCV5, RCV6
MN3, MN4, MN5	FN4, FN5 / RCV5, RCV6
MN3, MN4, MN5	FN4, FN5 / RCV5, RCV6
MN2, MN3	FN4
MN2, MN3	FN4
MN2, MN3	FN3
MN2, MN3	FN3
MN1, MN04, MN2	FN1
MN1, MN04, MN2	FN1
(for rebars steel, in the last stand MN6)	*(for rebars steel, in the last stand FN6)*

Manufacturing methods

Turning

A great number of KENNAMETAL EPG tungsten carbide grades for rolling mill application can be turned with PCD or CBN. However an interrupted cut should be avoided by all means. Nevertheless a machine designed for hard turning of tungsten carbide is a necessary precondition. This kind of processing permits, subsequent to sintering, a low-cost and fast premachining of flat sides, inner diameters and also the net shaping of the grooves.
A binding phase content of minimally 15 % together with a maximal hardness of approx. 1200 HV30 represents a rough standard for the turnability. Besides the tungsten carbide grain size needs to be taken into account. Too large grains (> 25 µm) can cause a 'chattering' of the cutting edges. Too small grains (< 8 µm) induce an increase of the hardness, even beyond the limit of approx. 1200 HV30.

Grinding

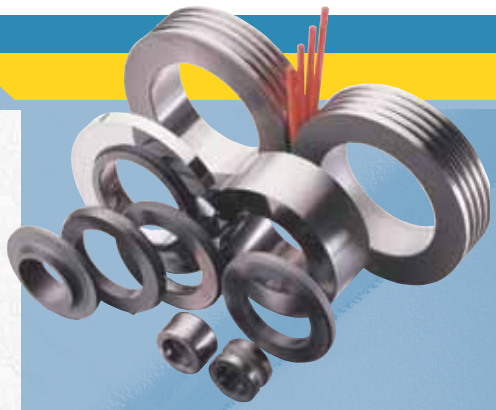
Grinding compared to hard turning results in substantially improved surface quality. This may be of importance in relation to the inner diameter fitting or in work areas with high requirements to the surface quality. But in general terms all non-turnable tungsten carbide grades require grinding in order to attain the geometrical accuracy.

Quality Control

All KENNAMETAL EPG products are carefully controled with state of the art equipment according to latest technological standards, and by highly qualified personnel. Upon customer request the control certificate is sent by attachment to the delivery. All European KENNAMETAL EPG locations are certified according to the DIN ISO 9000 and NET 000-111-QM TE norms. Certification has also been attained by our US roll production plant.

Steel machining

KENNAMETAL EPG is in the position to offer you the treatment of steel axles according to your requirements. This is particularly the case for composite rolls with the mechanical or hydraulic axial clamping system developed by KENNAMETAL EPG. Thereby all system parts are supplied by KENNAMETAL EPG.



Applications of Kennametal rolls

Warm rolling

The warm rolling particularly requires the elevated temperature hardness and dimensional accuracy of tungsten carbide as well as its stability to alternating temperature stress. In this range not just the KENNAMETAL EPG standard MN, FN or RCV roll grades are applicable but also special KENNAMETAL EPG GE-forming grades.

KENNAMETAL EPG offers theses rolls as blanks, rolls in a semi-finished state but also finished and ground (also with several grooves) within short delivery terms.

Cold-rolling

Cold rolls are characterised by pressure resistance in connection with excellent wear properties. These characteristics are closely related to the basic property of tungsten carbide. Tungsten carbide excels in extreme pressure strength up to 6000 N/mm^2.

The wear resistance of tungsten carbide in comparision to cast iron rolls or steel rolls is outstanding. For the cold rolling applications the Kennametal standard grades G and K should be used. For special requirements, Cermet grades are also available.

KENNAMETAL EPG offers rolls as blanks, semi-finished as well as finished and polished, according to your requirements, within short delivery terms.

Forming rolls for seamless tubes

Tube rolls require foremost the tungsten carbide specific pressure resistance, the elevated-temperature hardness and the stability to alternating temperature stress in connection with wear resistance and dimensional accuracy. For this application KENNAMETAL EPG especially developed the tungsten carbide grades MN5 and MN6 and the corrosion resistant grades FN5, FN6, RCV5 and RCV6. These tungsten carbides are suitable for hard-turning and thus for low-cost calibrating.

KENNAMETAL EPG can offer these rolls according to your specific requirements already net shaped and ground at the flat surfaces as well as with a precisely ground inner diameter within short delivery terms.

Applications of Kennametal rolls

Special forming rolls or embossing rolls

KENNAMETAL EPG is also in the position to manufacture nearly all other forming, embossing or flange rolls up to a blank outside diameter of 620 mm according to your specific requirements, in more than 100 tungsten carbide or cermet grades of longstanding proven quality.

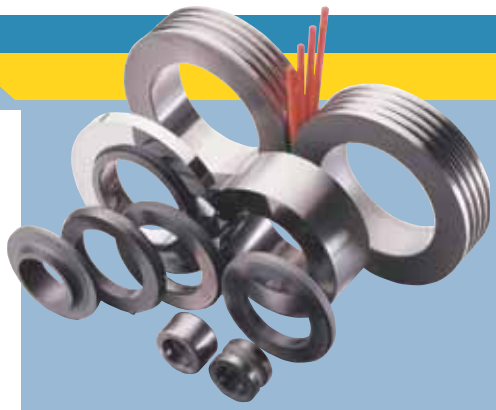
Our process engineers and metallurgists are world-wide at your disposal for further fine-tuning to your specific requirements ready to offer multiple solutions to your problems. Please contact your KENNAMETAL EPG sales representant for further information.

Special requirements when rolling non-ferrous metal - Cermet rolls

All non-ferrous metals show an alloying inclination to the metallic binder phase of tungsten carbides. This so-called "cold-welding" occurs when rolling stock particles are bound to the metal by means of high affinitive adhesion. Build-up shapes up to a critical size are formed. Subsequently the unfavourable geometrical form increases the "adhesion force" within the rolling stock and induces the separation of the plating together with a remainder of tungsten carbide from the roll. Thus the rolling stock and the roll surface are damaged.

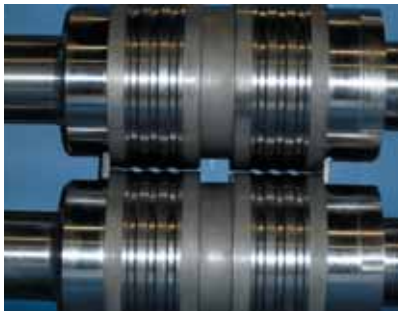
This kind of "cold welding" does not occur with KENNAMETAL EPG cermet grades. Thus the roll life is extended many times over whilst providing a considerably better surface quality. Low-lubrication manufacturing is partially applicable without impairing the roll live or surface quality.

Cermet is also suitable for certain applications as guide rolls, twist rolls and also for form rolls. The low “cold welding” inclination also shows advantages in this context. Moreover the substantially smaller weight of these rolls may be an advantage. The specific density of approx. 5 to 7 g/cm^3 represents only half of the tungsten carbide weight with 12 to 15 g/cm^3.



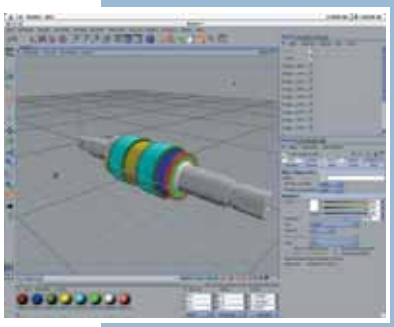
Applications of Kennametal rolls

Composite Rolls



Under the title “Composite Rolls“ , Kennametal EPG offers rolls for warm rolling applications, with a specific clamping mechanism. This mechanism, with the help of hydraulic forces, puts the shaft supporting the rolls in extension, so that , after release, axial forces are applied to the side of the rolls. Consequently, the contact between the components is guaranteed, and the hydraulic sytem can be removed .

This clamping system is simple , can be re-used many times , and is universally applicable. It is proven as an economical unit.



Kennametal EPG offers pre-assembled units, ready to use , as well as components which can be assembled by the users at their own plants.

For more information about these original Kennametal EPG clamping systems , just call your Kennametal sales engineer, or Kennametal EPG´s engineering office which is at your disposal for applications advise.

Kennametal Grades

	BINDER CONTENT (%)	DENSITY (gr/cm³)	HARDNESS (HV30)	BENDING STRENGTH (N/mm²)
GRADES WITH CO BINDER MATRIX				
KF1	6	14,95	1740	>3000
K20	7,6	14,85	1640	>2500
G10	7	14,85	1460	>3000
G13	8,5	14,70	1400	>3000
G20	11	14,40	1310	>3200
G30	15	14,00	1170	>3000
G40	20	13,55	1030	>2700
G55	27	12,95	860	>3000
GE50	13,5	14,15	1100	>2800
GE55	15	14,00	1030	>2800
MN0	6	14,90	1350	>2400
MN04	9,5	14,50	1230	>2800
MN1	13,5	14,15	970	>2400
MN2	15	14,05	950	>2500
MN3	17	13,85	890	>2400
MN4	20	13,55	830	>2300
MN5	25	13,10	730	>2200
MN6	30	12,75	670	>2000
GRADES WITH CO, NI, CR MIXED BINDER MATRIX				
RCV5	11,0	13,05	800	>2600
RCV6	13,2	12,70	670	>2600
GRADES WITH CO, NI, FE MIXED BINDER MATRIX				
FN1	12	14,25	920	>2400
FN3	14	14,05	850	>2400
FN4	17	13,70	750	>2300
FN5	20	13,45	700	>2300
FN6	23	13,15	640	>2200

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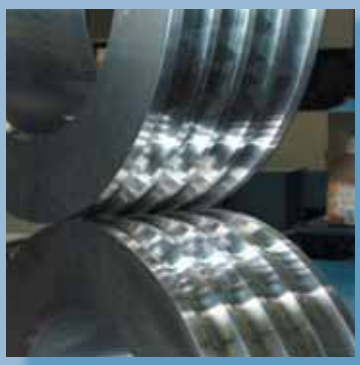

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