Typical workpieces

Planet gears

Bevel pinion gears

Cylindrical gears

Gear Grinding

Grinding Process	Gear Box Types	Workpieces	Gear Modul	Product Name	Abrasive Type	3M Specification	Preferred No. Of Strokes	Performance Description	Typical Machines
Threaded Gear Grinding	light vehicle gears, industrial gears, truck gears, aerospace gear components	helical gear, spur gear, pinion shaft, pinion, planet gear	0.6 - 2.0	3M™ Vitrified Grinding Wheel 22VD	Abral	93NA120 J18VPLF68/602WS1	3	• good material removal rate • low burn risk • best profile quality • best surface finish • best for small modules	• Liebherr • Reishauer • Kapp-Niles • Samputensili • others
			0.6 - 2.0	3M™ Vitrified Grinding Wheel 22VD	Abral	55NA120 J18VPLF77/602W	3	• ideal for Liebherr series as alternative to 3M™ 22VD 93NA-series	
			0.9 - 2.0	3M™ Vitrified Grinding Wheel 92VD	Alumina with Cerpass	93AS120 J18VPLF29/601W	3	• high material removal rate • less dressing cycles	
			1.0 -4.0	3M™ Cubitron™ II Vitrified Grinding Wheel 92VJ	3M™ Precision-Shaped Grain	93DA120/120 J18VPLF29/601W	2	• significantly high material removal rate • significant minimum burn risk • best improvement of cycletimes • ideal for bigger modules	
			1.25 - 6.0	3M™ Vitrified Grinding Wheel 22VD	Abral	93NA80 J18VPLF68/602WS1	3	• good material removal rate • low burn risk • best profile quality • best surface finish • best for small modules	
			1.25 - 6.0	3M™ Vitrified Grinding Wheel 22VD	Abral	55NA80 J18VPLF77/602W	3	• ideal for Liebherr series as alternative to 3M™ 22VD 93NA-series	
			2.0 - 8.0	3M™ Vitrified Grinding Wheel 33VB	Red Alumina	68A80 F9V450XSRP	3	• good for profile quality • good surface finish • ideal for bigger modules • with 3M™ V450 bond • good price/performance value	
			2.0 - 8.0	3M™ Vitrified Grinding Wheel 92VD	Alumina with Cerpass	93AS80 J18VPLF29/601W	3	• high material removal rate • less dressing cycles	
			1.5-10.0	3M™ Cubitron™ II Vitrified Grinding Wheel 92VJ	3M™ Precision-Shaped Grain	93DA80/80 J18VPLF29/601W	2	• significantly high material removal rate • significant minimum burn risk • best improvement of cycletimes • ideal for all module sizes	
Single Rib Grinding	wind power gears, ship/train gears, industrial gears, truck gears, aerospace gear components	planet gear, ring gear, helical gear, spur gear, pinion shaft, pinion	> 1.5	3M™ Vitrified Grinding Wheel 22VD	Abral	55NA80 F15VPH802W		• universal wheel for all hardened workpieces • good performance in Q'_w and V'_w • reduced burn risk • high surface and profile finish	• Hoefler • Gleason-Pfauter • Liebherr • Niles • others
			> 2.0	3M™ Vitrified Grinding Wheel 92VD	3M™ Ceramic Grain	93A60 F15VPH601W		• high material removal rate • high performance in V'_w • standard wheel before 3M™ Cubitron™ II launch	
			> 2.0	3M™ Cubitron™ II Vitrified Grinding Wheel 92VG	3M™ Precision-Shaped Grain	91DA80/80 F15VPH601W		• ideal for Klingelnberg/Hoefler rapid series	
			> 2.0	3M™ Cubitron™ II Vitrified Grinding Wheel 92VJ	3M™ Precision-Shaped Grain	93DA80/80 F15VPH601W		• high material removal rate • high performance in V'_w • usable for machines with low spindle power	
			> 2.0	3M™ Cubitron™ II Vitrified Grinding Wheel 93VL	3M™ Precision-Shaped Grain	99DA54/80 F15VPLF90W		• highest productivity • highest material removal rate • maximum V'_w • lowest burn risc	
Bevel Gear Grinding	light vehicle gears, industrial gears, truck gears, aerospace gear parts	shaft pinion, ring gear		3M™ Vitrified Grinding Wheel 92VD	3M™ Ceramic Grain	93A80 F15VP601W		• universal specification for plunge and generating grinding • high material removal rate • high productivity	- Klingelnberg - Gleason
				3M™ Vitrified Grinding Wheel 92VD	3M™ Ceramic Grain	93A80 H12VP601		• universal specification for automotive applications • high material removal rate • high productivity	
				3M™ Vitrified Grinding Wheel 92VJ	3M™ Precision-Shaped Grain	93DA80/80 H12VP601		• highest productivity for automotive gears • highest material removal rate by strongly reduced dressing infeed	
	industrial gears, truck gears, aerospace gear components			3M™ Vitrified Grinding Wheel 93VL	3M™ Precision-Shaped Grain	99DA80/80 H12VP901		• highest productivity for industrial gears • highest material removal rate by strongly reduced dressing infeed	
			solid	3M™ Vitrified Grinding Wheel 93VL	3M™ Precision-Shaped Grain	99DA80/60 K11VP901		Small diameter grinding wheel for solid material	
			solid	3M™ Vitrified Grinding Wheel 93VL	3M™ Precision-Shaped Grain	99DA120/120 K11VP901		Small diameter grinding wheel for solid material	

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SEAM™
Sustainable European Abrasive Manufacturers

Gear grinding. On the highest level.

As a machine element, the gear wheel is an elementary component of almost all modern machines.

This “wheel equipped with teeth evenly distributed along the circumference” is primarily installed in all types of gearboxes and is needed to make transfers between two rotations or between one rotation and a linear movement (pairing of a gear wheel with a rack). Gear drives represent the largest group amongst gearboxes. They are positive-locking and are consequently slip-free.

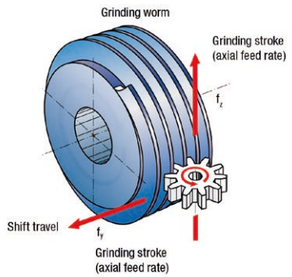
Gear grinding requires high precision throughout the process, and it is important to use the right grinding wheel for the application. The selection of abrasive material and wheel configuration depends on the base alloy, tooth geometry, and size of the production run, among other factors. 3M’s recently expanded abrasives portfolio can help you meet the growing demand for tighter dimensional tolerances and shorter production schedules, even with difficult- to-grind materials.

Our products and services

- Competent application consultants at your production site
- Technical cooperation in order to increase productivity
- Calculation of the total cost
- **Grinding seminars**

Every solution for every application.

Threaded gear grinding
In threaded gear grinding a number of motions occur simultaneously. The worm grinding wheel rotates on its axis while meshing with the gear workpiece which is rotating on its axis. The radial infeed to engage the gear being ground with the wheel is in the x direction. The infeed across the thickness of the gear is up and down in the z direction while the shift travel moves the gear across the full width of the worm wheel in the y direction.



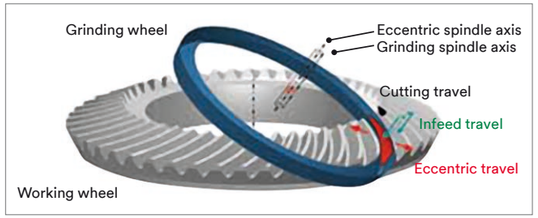
Bevel gear grinding
In bevel gear machining one distinguishes between two types of grinding:

- Generation grinding (discontinuous)



Generation grinding in bevel gear machining is a discontinuous grinding process, machining is done tooth by tooth. The generating movement of grinding wheel and workpiece is coupled. Infeed is done through the grinding wheel before entering the flank. During generation grinding all axes are moved, however, the grinding wheel is not infed in the sense of grinding stock.

- Plunge grinding



Plunge grinding is a discontinuous grinding process, machining is also performed tooth by tooth. Both tooth flanks are machined simultaneously. There is a surface contact between tooth flank and grinding wheel. Due to the plunge movement of the grinding wheel in axis direction, the grit path runs in parallel to the tooth base and the surface structure runs in tooth width direction. Grinding grooves running in parallel to the tooth base emerge. The grinding direction is from ring gear toe at the inner diameter to ring gear heel at the outer diameter, or vice versa. Only ring gears can be produced by means of plunge grinding. Pinions cannot be ground with this process due to their geometry.

- Additional oscillating movement besides main rotation of the grinding wheel
- Grinding spindle is positioned in eccentric bushing, separately driven
- Eccentric value between 0.1 mm and 0.3 mm
- Eccentric speed approx. 200 – 500/min slower than rotational speed of the grinding wheel (value approx. 2,000/min)
- Improved surface in pinion grinding
- When grinding ring gears, the oscillation causes an interruption of the grinding contact, which means better cooling, lower power consumption

Single rib gear grinding
Gear profile grinding is a discontinuous grinding process. Contrary to generation grinding, in profile grinding gap by gap is machined. The grinding wheel profile is absolutely identical with the finished gear profile. Compared to generation grinding, where the profile is “produced” by the generating movement, in profile grinding the profile is generated by the profile form that is integrated in the grinding wheel. Thus a higher profile accuracy can be achieved compared to generation grinding.

