

MIRA ULTRA

THE NEW FORCE IN CONTINUOUS GENERATION GRINDING

- Marked increase in profile retention and tool life
- Improvement in achievable gear quality
- Designed for working speeds of up to 80 m/s
- System solutions using MIRA dressing wheels



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THE NEW FORCE IN CONTINUOUS GENERATION GRINDING

High-performance machines demand new grinding tools

The demands placed on transmissions and their components are increasing all the time. Optimisation of load capacity and reductions in noise level factors are ever more stringent. So far as the hard-fine machining of gears is concerned, the method of continuous generation grinding is the foremost machining process giving the best tooth quality for mid range module gears (between 0.5-9.5). In view of ever more powerful and technologically advanced gear generating grinding machines now available from various manufacturers, it is essential that tool development advances at the same rate. With its new MIRA ULTRA product line, TYROLIT has developed a new generation of worm grinding wheels specifically for continuous generating grinding on high-performance machines (with working speeds up to 80 m/s).

Overcome challenges with MIRA ULTRA

With its MIRA ULTRA product line, TYROLIT has set new commercial and technological standards. The high performance level of these worm grinding wheels is down to the newly developed Ultra bonding matrix together with the appropriate choice of grain and grain size. The highly porous wheel design offers increased profile retention enabling the quality of the gear to be improved with consistent repeatable results, while at the same time increasing the grinding performance.

INNOVATION

- MIRA Ultra bond system
- Highly porous wheel design
- Increased profile retention
- No sintered aluminium oxide
- Able to work up to 80 m/s

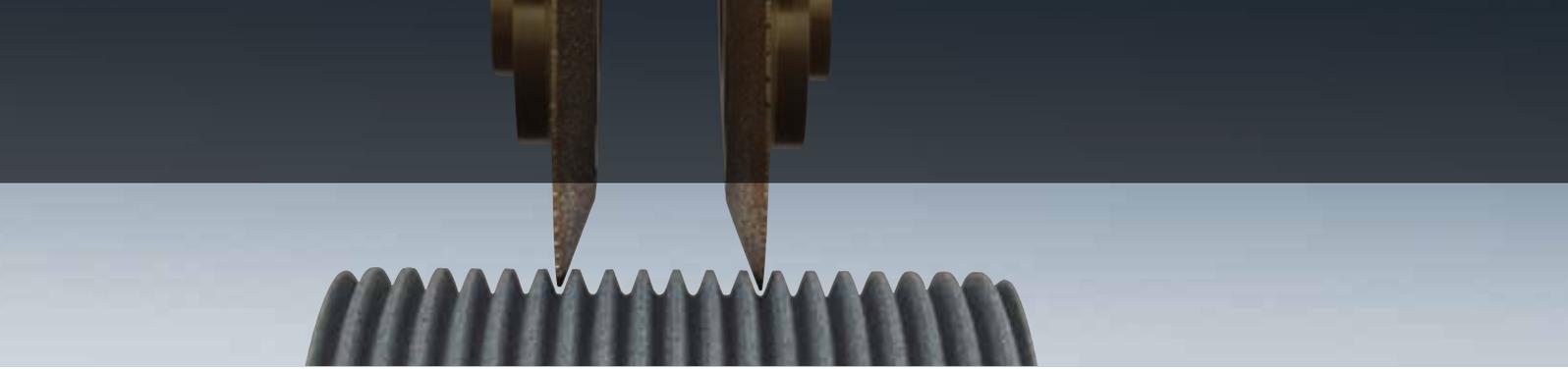


CUSTOMER BENEFITS

- Longer tool life
- Reduced grinding times
- Higher stock removal rates
- Less risk of burning
- Short shift travel
- Faster dressing cycles
- Better gear quality
- Reduced dresser wear
- Fewer tool changes
- Safety
- Lower process costs

Innovation and input improving results and reducing costs.



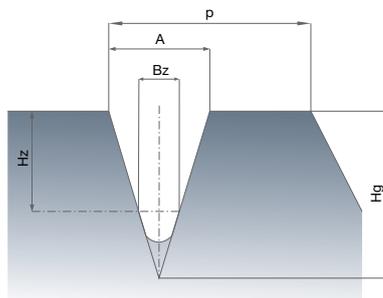


MIRA ULTRA PRECISION PRE-PROFILING REDUCES COSTS

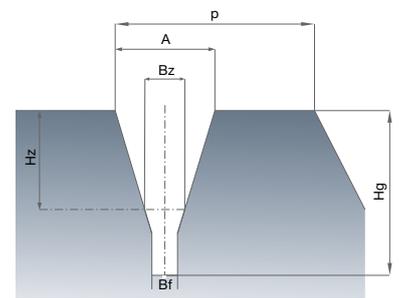
Worm grinding wheels can be supplied unprofiled or precision pre-profiled with one or more starts. Pre-profiling is carried out by module and penetration angle; for special designs, the specific tooth geometry data provided by the customer may be used as well. TYROLIT can also accommodate additional requirements, such as relief in the root of the worm grinding wheel to reduce dressing tool wear.



Worm gear wheel pre-profiling



Pre-profiling with no undercut relief



Pre-profiling with undercut relief

AVAILABLE DIMENSIONS FOR MIRA ULTRA WORM GRINDING WHEELS

An extensive worm grinding wheel stock program that is constantly being adapted to customer requirements guarantees the shortest possible delivery times.

For Reishauer machines:

Diameter	Width	Bore	Cleared for $V_{c_{max}}$
275 mm	125 mm	160 mm	80 m/s
300 mm	125 mm	160 mm	80 m/s
300 mm	145 mm	160 mm	80 m/s

For Kapp machines:

Diameter	Width	Bore	Cleared for $V_{c_{max}}$
250 - 350 mm	80 - 160 mm	100/115 mm	80 m/s

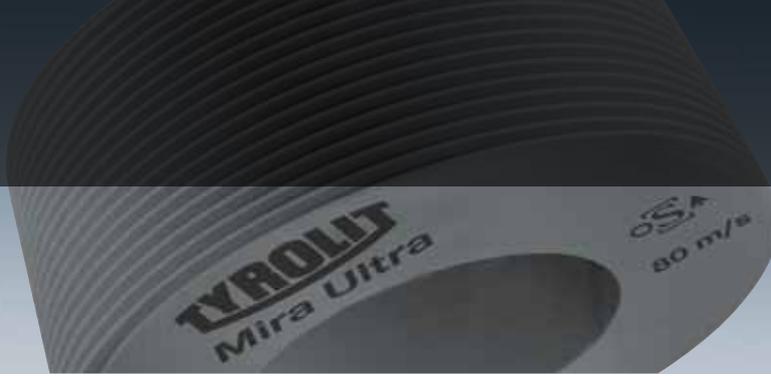
For Liebherr machines:

Diameter	Width	Bore	Cleared for $V_{c_{max}}$
195 - 240 mm	80 - 230 mm	90/110/120 mm	80 m/s

For Samputensili machines:

Diameter	Width	Bore	Cleared for $V_{c_{max}}$
100 - 250 mm	62 - 180 mm	76,2/50,8 mm	80 m/s

$V_{c_{max}}$ = maximum cutting speed [vc]



MIRA ULTRA APPLICATION EXAMPLES

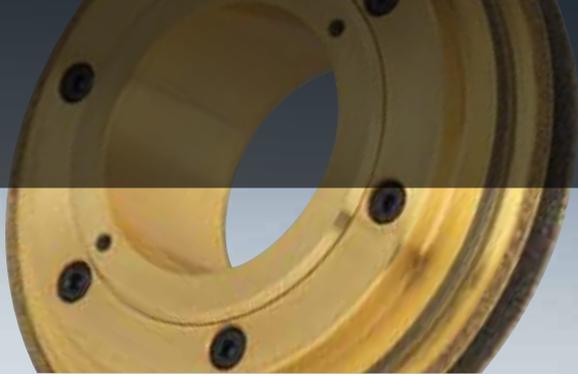


Continuous generation grinding of automobile gears

Workpiece	Module 1,95 mm Number of teeth 51 Width 19 mm Penetration angle 18° Helix angle 29° Hardness 59 - 62 HRC
Machine	High-performance generating gear grinding machine Reishauer RZ150
Cooling lubricant	100% mineral oil
Worm grinding	TYROLIT MIRA ULTRA wheel 275x125x160 mm MU 25A 120 II 12 VB1 4-start design
Dressing system	Dressing unit RP 1 Dressing tool TYROLIT MIRA 1-start diamond composite profile roller
Process data	Cutting speed [vc] Vc= 75 m/s Dressing cycle 47
Grinding time	33 seconds
Results	<p>Grinding time: The grinding time has been reduced from 37 to 33 seconds. (-10 %)</p> <p>Tool life: The tool life of the worm grinding wheel has been increased by 15%.</p> <p>Dressing cycle: The dressing cycle has been retained.</p> <p>Dressing tool: The wheel life of the dressing tool has been increased by 20% by producing a worm grinding wheel without any sintered aluminium oxide.</p> <p>Process stability: The quality of the gear has been improved, as has reproducibility, which means it has been possible to stabilise the C_{mk} values.</p>

Continuous generating grinding of automobile gearing

Work piece	Module 3,5 mm Number of teeth 36 Width 29 mm Penetration angle 17,5° Helix angle Spur gears Hardness 59 - 62 HRC
Machine	High-performance generating gear grinding machine Reishauer RZ400
Cooling lubricant	100% mineral oil
Worm grinding	TYROLIT MIRA ULTRA wheel 300x125x160 mm MU 25A 90 II 9 VB1 3-start design
Dressing system	Dressing unit RP 2 Dressing tool TYROLIT MIRA 1-start diamond composite profile roller
Process data	Cutting speed [vc] Vc= 56 m/s Dressing cycle 19
Grinding time	48 seconds
Results	<p>Grinding time: The grinding time has been reduced from 51 to 48 seconds. (-6 %)</p> <p>Tool life: The tool life of the worm grinding wheel has been increased by 19%.</p> <p>Dressing cycle: The dressing cycle has been increased from 16 to 19 work pieces. (+18 %)</p> <p>Dressing tool: The wheel life of the dressing tool has been increased by 40% by producing a worm grinding wheel without any sintered aluminium oxide.</p> <p>Process stability: The quality of the gear has been improved, as with improved reproducibility, which means it was possible to stabilise the C_{mk} values.</p>



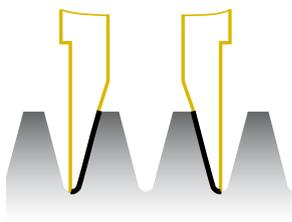
MIRA DIAMOND DRESSING TOOLS

HIGHEST LEVELS OF PRECISION AND PRODUCTIVITY

The high level of product quality achieved by TYROLIT is based on many years of experience and a determination to be innovative. Thanks to the highest levels of manufacturing quality plus optimum and customised tool design, MIRA diamond dressing tools ensure the best gear quality and results that remain reproducible in the long term.

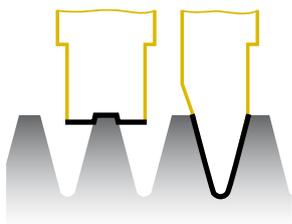
Performance spectrum

- Comprehensive dresser tool program covers all customer requirements
- Individual customer support, optimised tool design and selection
- Implementation of all modifications including tangential transitions
- Highest quality, precision, longevity and first-class operation
- Design with PCD tip reinforcement as option
- Rework, repair service and tool regeneration through replating
- Customised and optimised system solutions with MIRA ULTRA worm grinding wheels
- Our professional gearing application technology - available all over the world



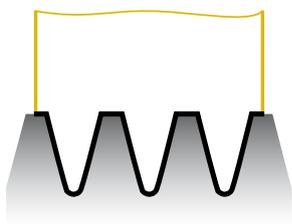
MIRA diamond single cone diamond dressers

The tools are always employed in pairs. They are manufactured using a positive electroplating process. Regeneration of the tool can be carried out by reworking or replating the dressers. These tools are primarily used for small and medium-sized batches and offer users a high degree of flexibility.



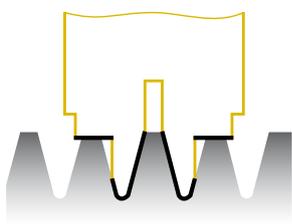
MIRA diamond profile and rounding rollers

The tools can be used in pairs. They are manufactured using a positive electroplating process. Regeneration is carried out by reworking or replating the dressers. These tools are primarily used in the automated manufacture of medium and large-size batches and offer the user a limited amount of flexibility. This tool concept is a good alternative when grinding the root form of the tooth.



MIRA diamond full profile roller

The tools have one or more ribs. They are always produced in a reverse electroplating process. As the gear quality that can be achieved is limited, these tools are mainly used for small modules and only for specific workpieces.



MIRA diamond composite profile roller

The 1-start composite profile rollers are multi-part tools that are delivered assembled and matched precisely to user requirements. They are manufactured using a positive electroplating process. Worn tools can be regenerated by a replating operation. The tools are used in the automated manufacture of medium-sized and large batches. A very high level of productivity is ensured as set-up times are minimised.

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Our **worldwide subsidiary companies** can
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