YOUR PARTNER IN THE BEARING INDUSTRY

Grinding solutions for

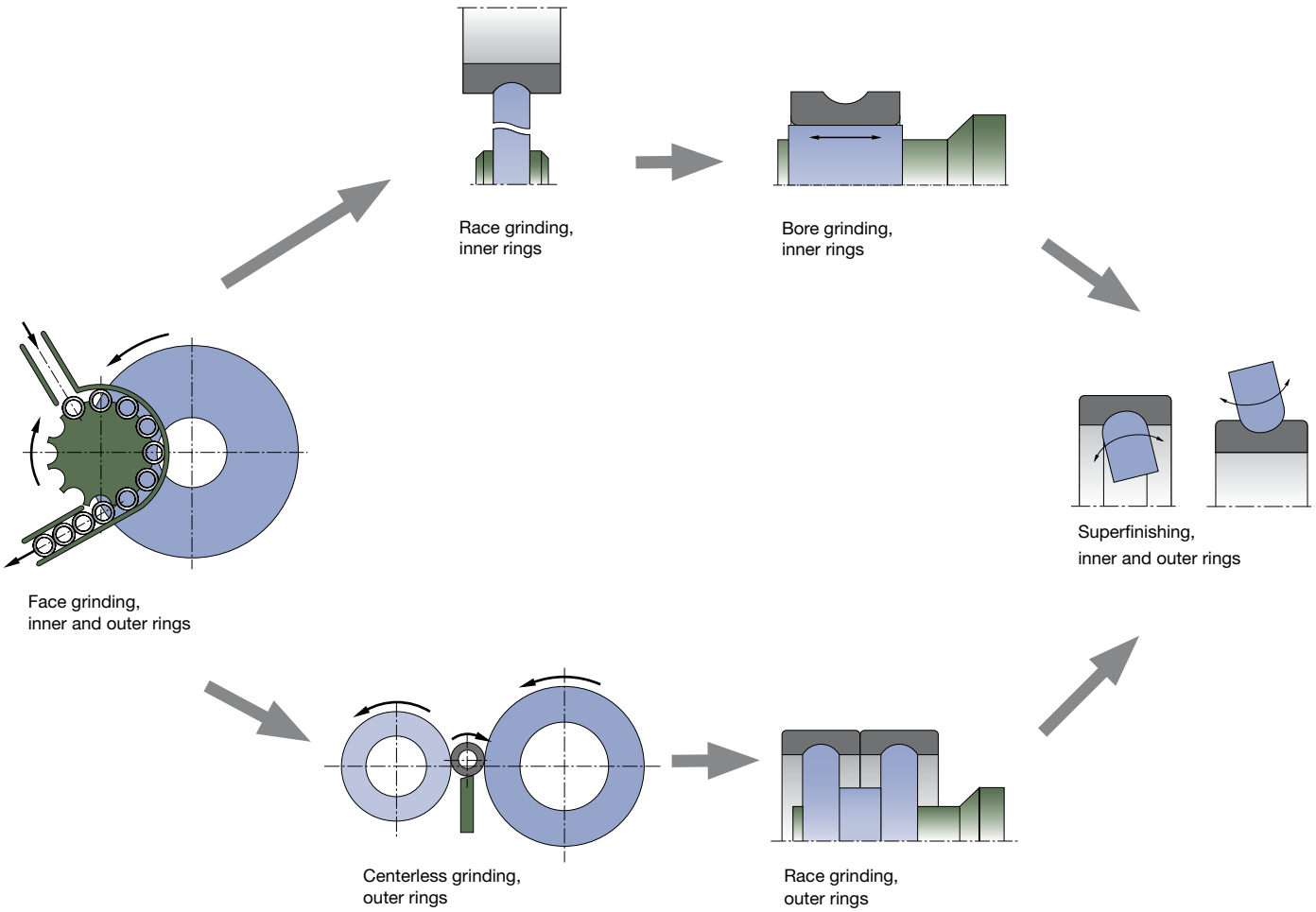
- Bearing rings
- Bearing balls and rollers

TYROLIT

A Company of the SWAROVSKI Group

Radiac Abrasives

BEARING RINGS
TYPICAL GRINDING APPLICATIONS



BEARING TYPES

Ball bearing
BB

Angular contact bearing
ACB

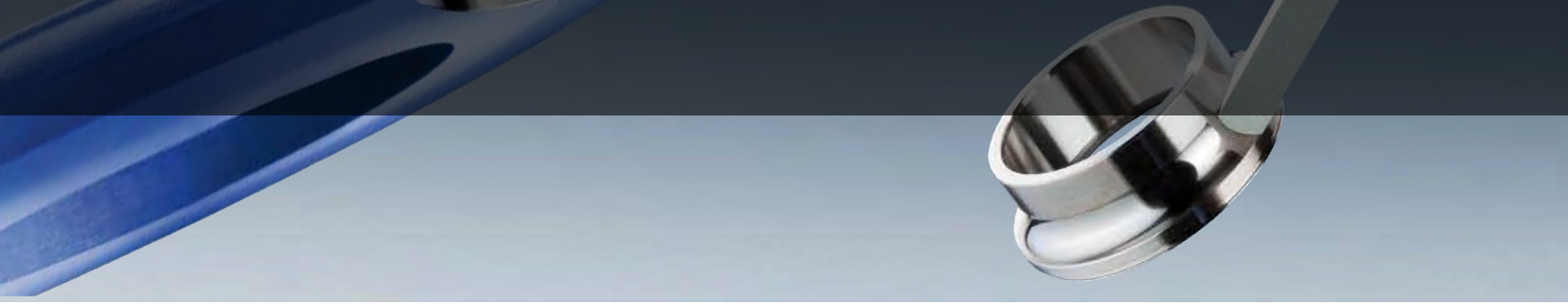
Taper roller bearing
TRB

Cylindrical roller bearing
CRB

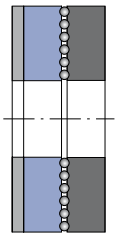
Spherical roller bearing
SRB

Trust bearing
TB

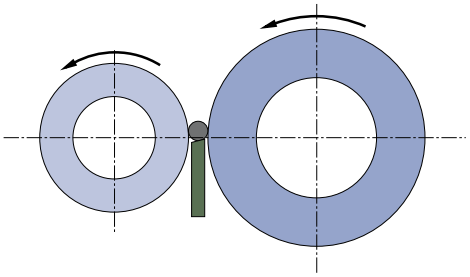
Special types:
- Hub bearings
- Large size bearings
- Miniature bearings



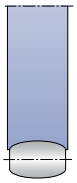
BEARING BALLS AND ROLLERS
TYPICAL GRINDING APPLICATIONS



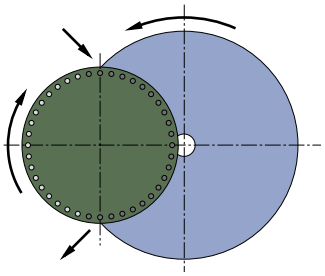
Ball grinding



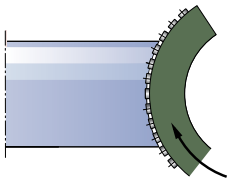
Centerless grinding,
cylindrical and taper rollers



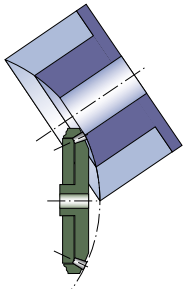
Centerless grinding,
spherical rollers



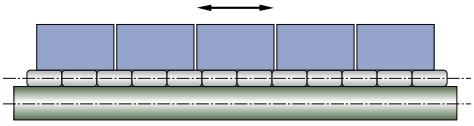
Face grinding,
cylindrical and spherical rollers



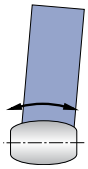
Face grinding,
taper rollers



Face grinding
taper rollers



Superfinishing,
cylindrical and taper rollers



Superfinishing,
spherical rollers

BALL AND ROLLER TYPES

Ball

Taper roller

Spherical roller

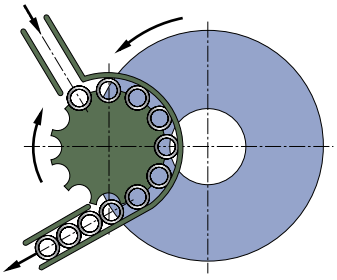
Cylindrical roller

FACE GRINDING
OF INNER AND OUTER RINGS

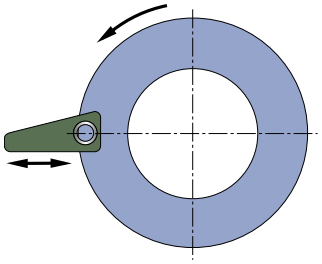
After hardening, inner and outer rings must be ground parallel to final tolerance and finish requirements.

Machine
This is usually done on a double disc grinding machine which offers a very efficient way to produce good quality parts with high output. The rings are either fed in one or more passes by a rotary or straight feeding device or by the plunge grinding principle.

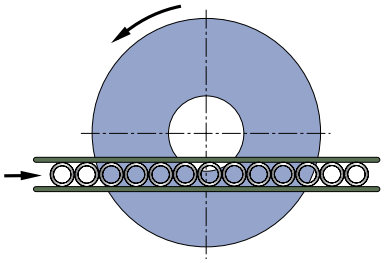
For special requirements, face lapping machines are used generally equipped with vitrified bonded CBN wheels.



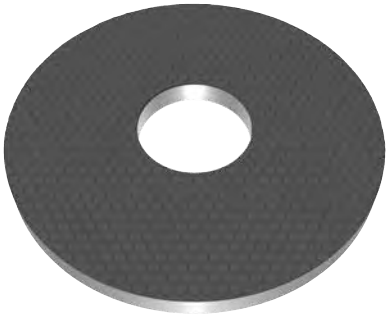
Rotary through-feed



Plunge grinding

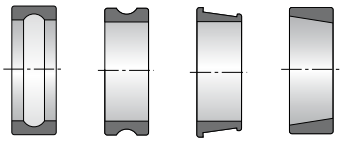


Straight through-feed



Double disc face grinding of rings

Product	Benefits
CENTURIA (A/O resin bonded)	high output, more parts per dress
CENTURIA (Ceramic A/O resin bonded)	increased productivity

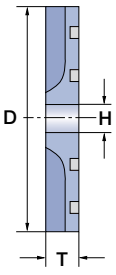


Specials: vitrified bonded wheels, CBN vitrified and resin bonded

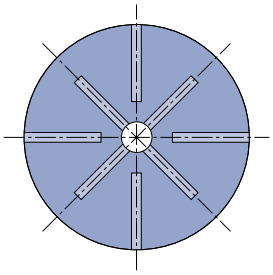
GRINDING WHEELS

Grinding disc type 36ST
Special design:
– Slots, perforation, coolant holes

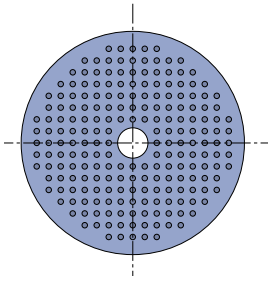
Grinding ring type 37ST



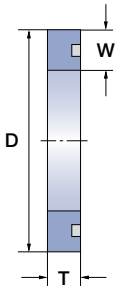
Inner- and outer slots



Perforation



Grinding disc type 36ST

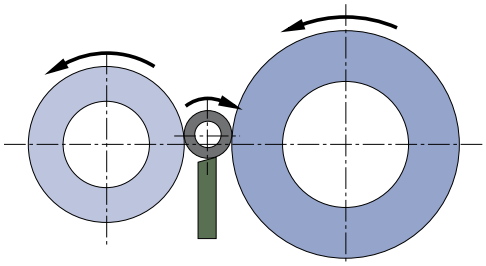


Grinding ring type 37ST

CENTERLESS GRINDING
OF OUTER RINGS AND SHAFTS

This is the next operation after face grinding outer rings. The roundness and wave from the hardening process must be ground to tight tolerances by the centerless grinding process.

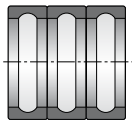
Machine
Centerless through-feed grinders can do this very efficiently. For profiled water pump shafts and large rings centerless plunge grinders are also used.



Regulaing wheel Grinding wheel

Through-feed grinding of rings

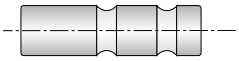
Product	Benefits
A/O vitrified bonded	high through-feed speed, better roundness, low waviness of rings



Specials: wheel set with combination of vitrified and resin bonds

Plunge grinding of bearing shafts

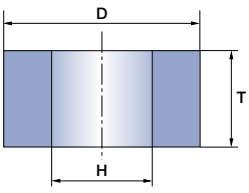
Product	Benefits
A/O vitrified bonded	better profile retention, reduced grinding time



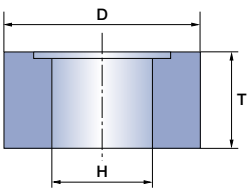
Specials: ceramic A/O vitrified bonded for high demands on productivity

GRINDING WHEELS

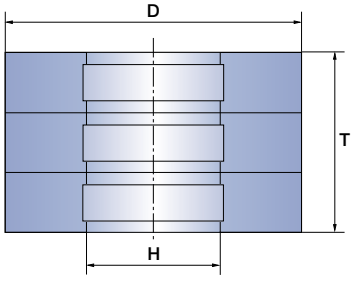
Grinding wheel type 1
Special design:
With recess type 5 or 7
Set grinding wheel made of X-parts



Grinding wheel type 1



Grinding wheel type 5

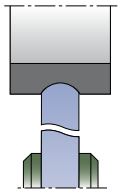


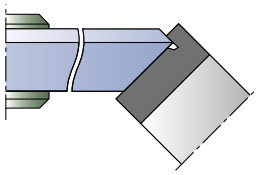
Set grinding wheel (3 parts)

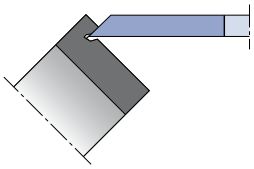
RACE GRINDING
OF INNER AND OUTER RINGS

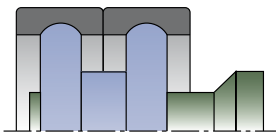
Depending on bearing type, race ways have different profiles which are usually pre-shaped by turning. The race grinding operation has to meet the quality requirements specified for roundness, wave, form and dimensional tolerances.

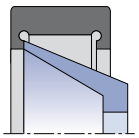
Machine
External and internal grinders are used in Race Grinding. The rings are generally supported by shoes and driven by a magnetic chuck or pressure plate. Different infeed steps (roughing, finishing and spark out) are used for grinding.


Inner ring ball track


Inner ring track and rib

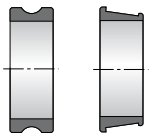

Inner ring rib


Outer ring ball track


Outer ring flange

Inner ring race and rib grinding

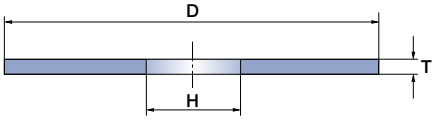
Product	Benefits
CSS-ULTRA (A/O vitrified bonded)	better profile retention, reduced grinding time
CSS-ULTRA (Ceramic A/O vitrified bonded)	increased productivity



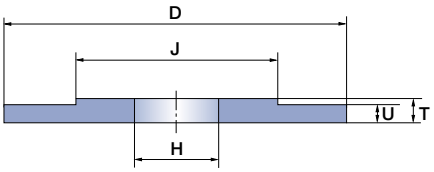
Specials:
- CBN vitrified bonded for steel materials
- Diamond vitrified bonded for ceramic materials
- Elastic bonded wheels for fine surface finish

GRINDING WHEELS

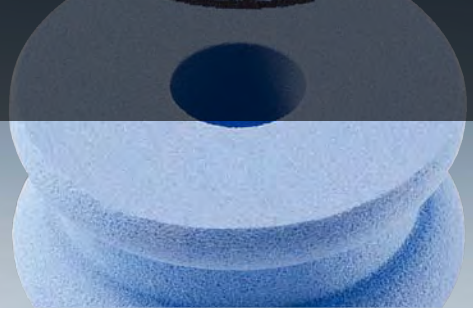
Grinding wheel type 1LB
Special design:
- High speed grinding wheel up to 125 m/s
- All different types of profiles
- Type 38LB, 39LB with thicker core
- Type 5LB with recess



Grinding wheel type 1LB

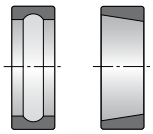


Grinding wheel type 38LB



RACE GRINDING
OF OUTER RINGS

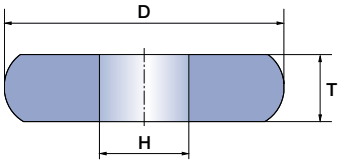
Product	Benefits
A/O vitrified bonded	better profile retention, reduced grinding time
COLUMBIA (Ceramic A/O vitrified bonded)	increased productivity



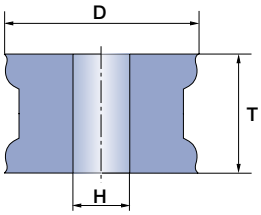
Specials:
- CBN vitrified bonded for steel materials
- Diamond vitrified bonded for ceramic materials
- Elastic bonded wheels for fine surface finish

GRINDING TOOLS

Grinding wheel type 1LB
Special design:
- All different types of profiles

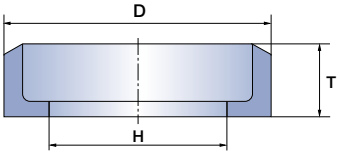


Profile type L



Profile type T

Cup wheel type 6F
Grinding of spherical outer rings



Cup wheel type 6F

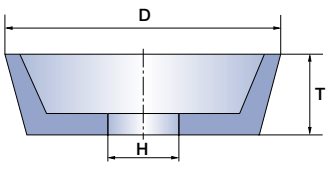
Outer ring flange grinding (CRB)

Product	Benefits
A/O vitrified and resin bonded	better cutting ability, reduced grinding time
Ceramic A/O vitrified and resin bonded	increased productivity

Specials:
- Sulphur impregnation for longer dressing cycles
- CBN resin bonded for steel materials
- Diamond resin bonded for ceramic materials

GRINDING WHEELS

Cup wheel type 11

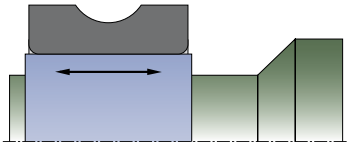


Cup wheel type 11

BORE GRINDING
OF INNER RINGS

The bore grinding operation is done the same way for most bearing types. The bore must be ground concentric and perfectly straight to the profile of the inner ring track.

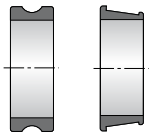
Machine
Internal grinders are used for Bore Grinding. The rings are generally supported by shoes and driven by a magnetic chuck or pressure plate. Different infeed steps (roughing, finishing and spark out) are used with small oscillation.



Bore grinding

Bore grinding of inner rings

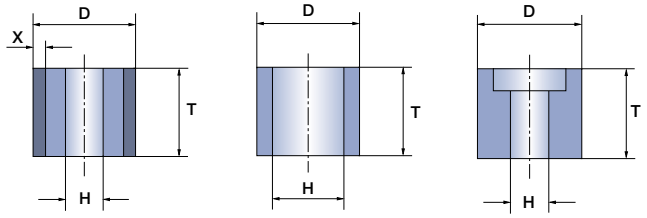
Product	Benefits
A/O vitrified bonded	better profile retention, reduced grinding time
COLUMBIA (Ceramic A/O vitrified bonded)	increased productivity
CBN vitrified bonded	for smaller rings and process optimization



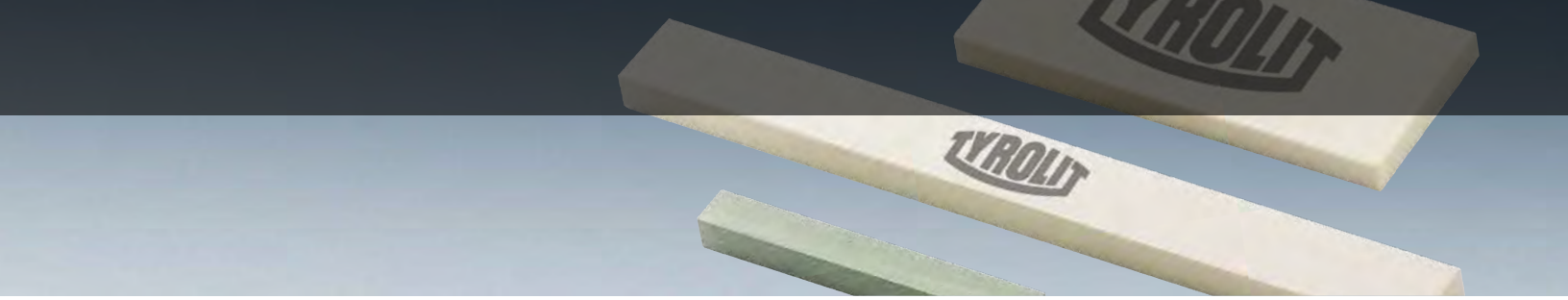
Specials:
- Sulphur impregnation for longer dressing cycles
- Diamond resin bonded for ceramic materials

GRINDING WHEELS

Grinding wheel type 1
Special design:
- Type 5 with recess
- Type 1A8, 1A1 for CBN wheels



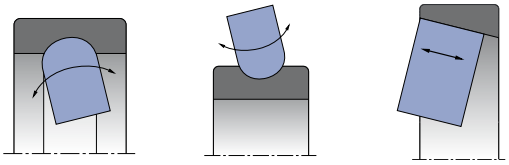
Grinding wheel type 1A1 | Grinding wheel type 1 | Grinding wheel type 5



SUPERFINISHING
OF INNER AND OUTER RINGS

Superfinishing is the final operation for bearing races. All ring characteristics, including roundness, wave, form and surface finish must meet tight tolerances.

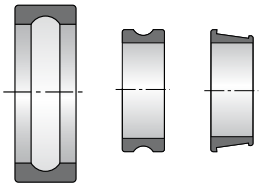
Machine
With superfinishing machines the rings are usually supported and driven by steel rolls. This can be done with one or more stations and steps (roughing and finishing). The stone oscillates across the race.



Outer ring ball track | Inner ring ball track | Outer ring taper roller track

Superfinishing of rings

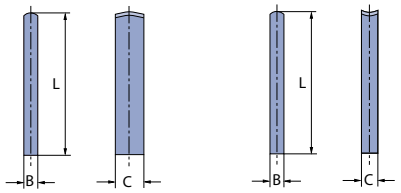
Product	Benefits
A/O vitrified bonded	increased material removal, good surface finish with fine grit size
SIC vitrified bonded	better surface finish
CBN vitrified bonded	long stone life, excellent for small rings or special steel materials



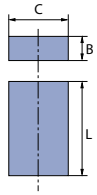
Specials:
- Paraffin or sulphur impregnation for higher material removal rates
- Mixtures of A/O and SIC

GRINDING TOOLS

Superfinishing stone type 54SCH
Special design:
- With profile to match the race
- Stone block type 54SCHP to be cut to size

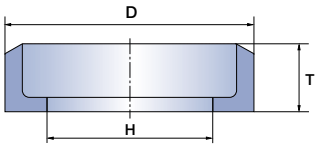


Superfinishing stone type 54SCH

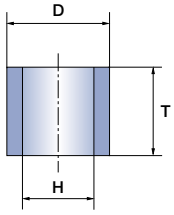


Stone block type 54SCHP

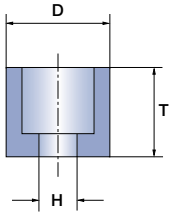
Superfinishing ring type 5420 and cup wheel type 5460, 6F



Cup wheel type 6F



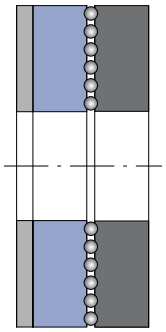
Ring type 5420



Cup wheel type 5460

BALL GRINDING
OF BEARING BALLS

Specifically designed and formulated to withstand the extreme pressures of grinding bearing balls, ball grinding wheels are extremely hard. Available in both vitrified and resin bond systems with aluminum oxide and silicon carbide blends, each specification is tailored to specific customer requirements.



Ball grinding

Machine
Ball grinding is done on specially designed machines with horizontal or vertical axis. The balls are ground between a grooved plate and a grinding wheel. The stationary grooved plate is made of cast steel in different hardnesses depending on the application. The wheel has a section removed where the balls enter and exit the grooves.The grinding wheel spins, while the balls travel through the grooves and are ground to their final dimension.

Rough-grinding of balls (G1)

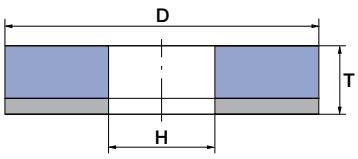
Product	Benefits
Mixture of SIC and A/O vitrified bonded (grit size 80 – 320)	Formulated specifications to fit specific application requirements. Longer wheel life, better profile retention – for various materials – hard and soft. Better cutting ability, shorter grinding time, for bearing and hardened material

Finish-grinding of balls (G2)

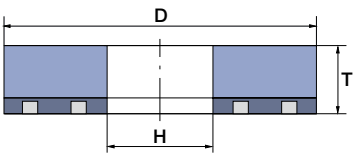
Product	Benefits
Grain combination of SIC and/or A/O resin bonded (grit size 400 – 1200)	Flexible with grain combinations to meet application requirements. Eliminates lapping compound, improves ball grade quality, wheel life, reduces cycle time

GRINDING WHEELS

Grinding wheel type 35
Special design:
– Glued onto steel plate
Type 36ST with inserted nuts



Grinding wheel type 35

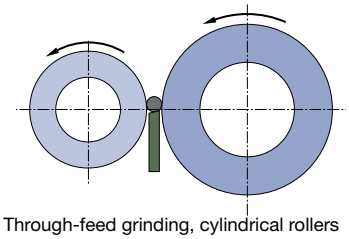


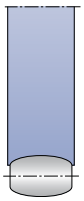
Grinding wheel type 36ST

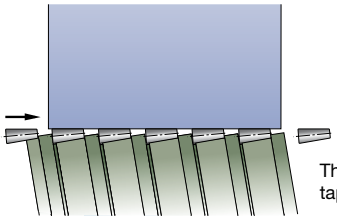
CENTERLESS GRINDING OF ROLLERS

This is the next step after face grinding for cylindrical and spherical rollers (the first step for taper rollers). The roundness and wave from the hardening process are ground to tight tolerances by this process.

Machine
Centerless through-feed grinders are used for cylindrical and taper rollers. Taper rollers are transported by a profiled steel drum as control wheel. For spherical rollers, centerless plunge grinders are used.


Through-feed grinding, cylindrical rollers


Plunge grinding, spherical rollers


Through-feed grinding, taper rollers

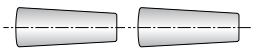
Through-feed grinding of cylindrical rollers

Product	Benefits
A/O and SIC vitrified bonded	high through-feed speed, excellent for rough grinding
A/O resin bonded	good surface finish, excellent for finish grinding

Specials:
- CBN vitrified and resin bonded for steel materials
- Diamond resin bonded for ceramic materials

Through-feed grinding of taper rollers

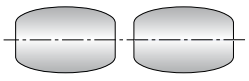
Product	Benefits
A/O elastic bonded	stable through-feed system as compared to the steel control wheel



Specials:
- Resin bonded wheels

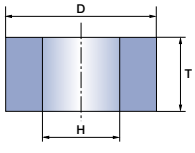
Plunge grinding of spherical rollers

Product	Benefits
A/O vitrified bonded	better profile retention, reduced grinding time
Ceramic A/O vitrified bonded	increased productivity

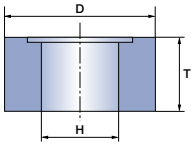


GRINDING WHEELS

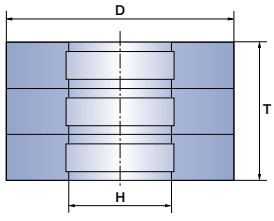
Grinding wheel type 1
Special design:
- With recess type 5 or 7
- Set wheels made of X-parts



Grinding wheel type 1



Grinding wheel type 5

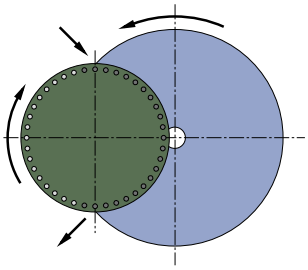


Set grinding wheel (3 parts)

FACE GRINDING
OF CYLINDRICAL AND SPHERICAL ROLLERS

Face grinding is the first operation after hardening. The rollers are ground parallel to final dimension and finish.

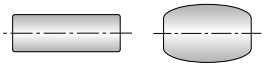
Machine
This is usually done in a double disc grinder in mostly one pass. For larger rollers or small series, grinders with cup wheels or grinding rings are used.



Double disc grinding, cylindrical or spherical rollers

Double disc face grinding of cylindrical and spherical rollers

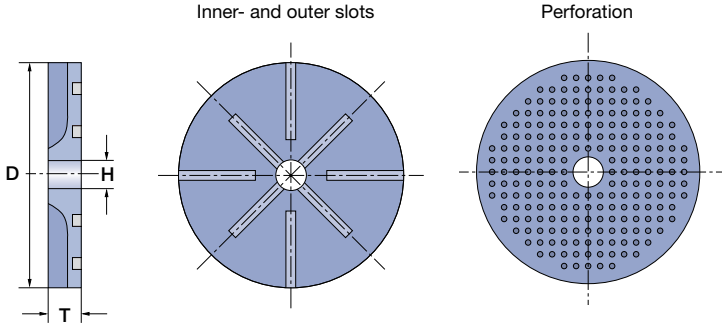
Product	Benefits
CENTURIA (A/O resin bonded)	high output, more parts per dress
CENTURIA (Ceramic A/O resin bonded)	increased productivity



Specials:
- Vitrified bonded wheels
- CBN vitrified and resin bonded

GRINDING WHEELS

Grinding disc type 36ST
Special design:
- Slots, perforation, coolant holes

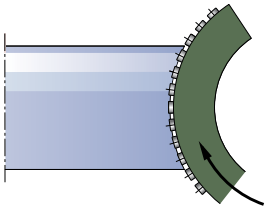


Grinding disc type 36ST

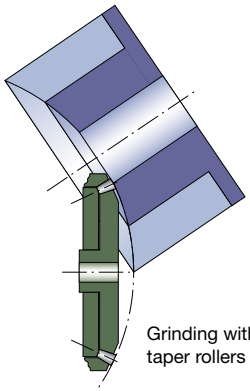
FACE GRINDING
OF TAPER ROLLERS

Face grinding is done after centerless grinding.

Machine
Custom made machinery is used. The grinding tool is a cup wheel, grinding ring or a profiled external grinding wheel.



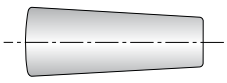
Grinding with profiled external grinding wheel, taper rollers



Grinding with cup wheel, taper rollers

Face grinding of taper rollers

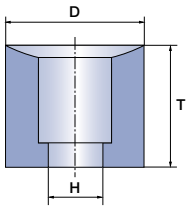
Product	Benefits
A/O resin bonded	high output, good surface finish



Specials:
– Multiple layer wheels for roughing and finishing

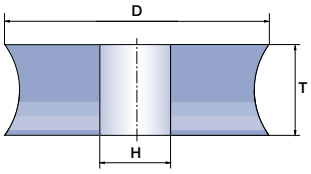
GRINDING WHEELS

Cup wheel type 5ST
Special design:
– Modler type wheel with two layers (rough/finish grinding)



Cup wheel type 5ST

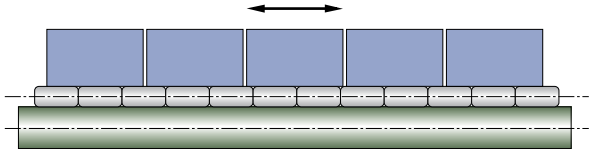
Straight wheel type 1 - S
Special design:
– Sandwich wheel with 2-4 layers (rough/semi-finish/finish grinding)



Straight wheel type 1 - S

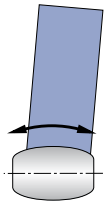
SUPERFINISHING
OF ROLLERS

Superfinishing is the final operation for the OD of the rollers. All roller characteristics including roundness, wave, form and surface finish must meet tight tolerances.



Through-feed superfinishing of cylindrical and taper rollers

Machine
Cylindrical and taper rollers:
These rollers are typically ground using multi-station superfinishing machines. The rollers are usually supported and driven by steel rolls. A set up of different stone plates oscillate on top.

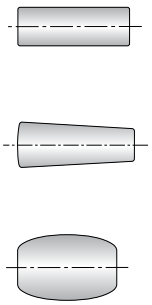


Superfinishing of spherical rollers

Spherical rollers:
These rollers are generally ground using one or two station superfinishing machines. The rollers are usually supported and driven by control wheels. The stone oscillates across the OD.

Superfinishing of rollers on multi-station machine

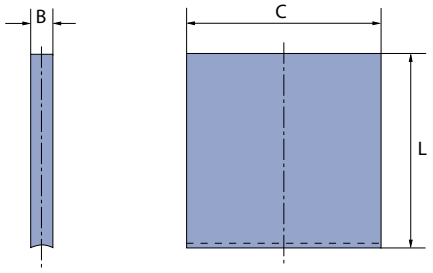
Product	Benefits
A/O vitrified bonded	increased material removal, mainly for the first station(s)
SIC vitrified bonded	better surface quality, mainly for the last station(s)
Mixture of A/O and SIC, vitrified bonded	combines advantage of both (surface finish and material removal)
A/O resin bonded with graphite	for very fine surface finish, mainly for last station of multi-station machines



Specials:
– Paraffin or sulphur impregnation for higher material removal rates

GRINDING TOOLS

Superfinishing stone type 54SCH
Special design:
- With profile to match the roller shape
- Stone blocks type 54SCHP to be cut to size



Superfinishing stone type 54SCH

SOLUTIONS EXPERTISE
APPLICATION ENGINEERING

In addition to top performing products from their partners, successful companies are also looking for engineering expertise and overall process knowledge. Reduction in cost per piece is the objective of every successful grinding application

Simply concentrating on the manufacturing and supply of top quality grinding tools is not enough. Good "software" has to be offered alongside the "hardware". With the wealth of process expertise commanded by our team of application engineers, we are able to provide our customers with sustained solutions in line with today's demanding technical and economic expectations. .

Clarify the task
We place great emphasis on learning our customers' requirements. Application engineering specialists analyze each grinding job in detail. Together with each customer a requirements profile which includes both technological and profitability considerations is then drawn up.

Define the concept
Our team of experienced application engineers defines various approaches to the solution, calling on the additional input from our over 100 Research and Development specialists and as required, our in-house test center.

Realize the solution
The process solution is then taken direct to the customer where it is put into practice on each specific machine. Within the scope of a sustained process optimization, the application engineer sets the mode of operation for the grinding tool, the interaction between machine with the workpiece, material, cooling lubricant and kinematical parameters all working together. All products for the bearing industry are manufactured in our facilities located in both the USA and Austria.

Share the know-how
Our know-how in the field of grinding technology is crucial to each and every customer's success. Sustained results come from the continuous application of the experience on a broad basis. In addition to grinding tools, Radiac Abrasives, Inc. – A Tyrolit Company also offers a series of services to our customers including practice-oriented information, data preparation, training sessions and seminars. Our Bearing Team's broad base of experience coupled with a global presence, customer service expertise and close face-to-face interaction are key to creating a long term partnership with each and every customer.

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