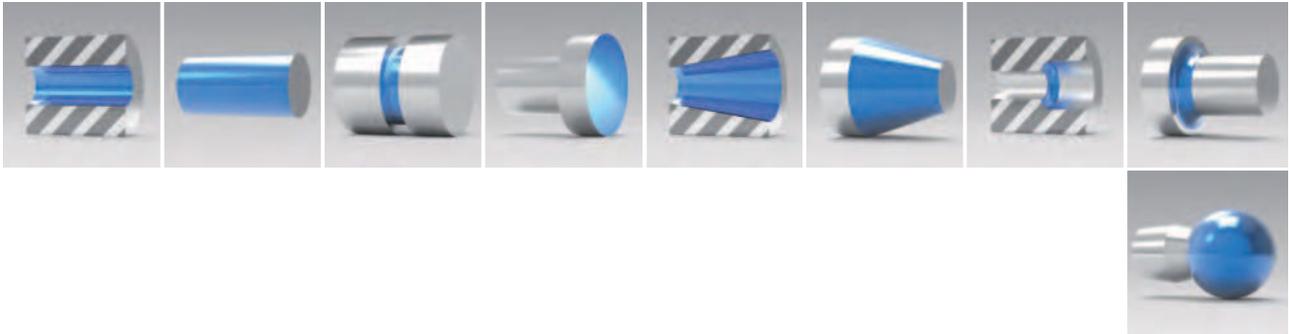


Multi-roller Mechanical Tools



ECOROLL's mechanical tools with multiple rollers are primarily used for roller burnishing. Tool types G, R and RA are used to machine cylindrical bores (both through and blind holes), stepped bores and cylindrical outside diameters. Tool types RP, RK, RKA and RKAK are intended for use with end faces, tapers and ball-shaped areas. The MZG series includes two roller tools, which are mainly used to roller burnish sealing surfaces for shaft seals.

Both internal and external fillets can be deep rolled with tool types RH/RHA.

All of ECOROLL's multiple roller tools feature easy diameter adjustment, high precision performance and reliable function. They can be used on CNC-controlled drilling or milling machines and lathes, machining centers or conventional machine tools. The tools require just minimal lubrication and wear parts are easy to exchange. This simple maintenance and the short work cycle save a significant amount of time.



Type G tool with internal coolant



Machining a connecting rod with a type G tool



Machining a universal joint shaft with a type RA tool

Type G: Machining cylindrical bores up to \varnothing 200 mm



Through holes: \varnothing 4 - 200 mm
Blind holes: \varnothing 6 - 200 mm

Features

- Can be used up to tolerance class IT8 (up to IT9 for thin-walled workpieces).
- Type GE up to tolerance class IT11 for \varnothing of 50 mm and larger.
- Machines all metal materials up to a tensile strength of 1400 N/mm² and a maximum hardness of HRC \leq 45.
- Can achieve a surface quality of $R_z < 1 \mu\text{m}$ / $R_a \leq 0.1 \mu\text{m}$.
- For use on CNC-controlled drilling or milling machines and lathes, machining centers or conventional machine tools.
- Machining with clockwise rotation.
- Optional internal cooling-lubricant supply possible with straight shank, VDI shank, HSK, Capto, or similar shanks.

Advantages

- Reliable function, high degree of accuracy.
- Short cycle time.
- Diameter adjustment is easy and reproducible.
- Requires minimal lubrication (oil or emulsion).
- Tool automatically contracts upon retraction, preventing damage to the roller burnished surface.
- Wear parts are easy to exchange.

Design

- Type G tools consist of a basic tool body and a burnishing head.
- The tool body contains the tool shank as well as the mechanism for the infinitely variable setting of the rolling diameter in increments of 1 μm .
- Tool shanks either with Morse taper or straight shank; special designs by request.
- The burnishing head consists of the cone, cage and rollers.



- Burnishing heads are replaceable within the diameter range. By request, the tools can be equipped with self-feeding capability (recommended only for machines with manual feed (e.g. box column drilling machines)).

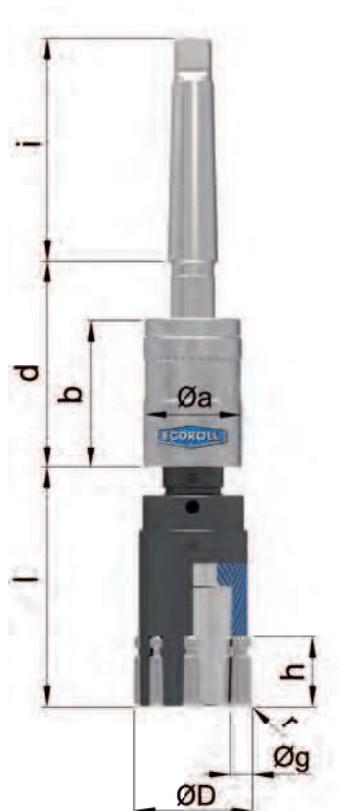
Parameters

- Circumferential speeds up to 250 m/min. possible.
- Feed rate: 0.05 – 0.3 mm/rev. per roller.
- Burnishing length: The dimensions of the tool body allow for unlimited burnishing length if the workpiece diameter is 36 mm or larger. For smaller diameters, tools with standard burnishing lengths are available. Special designs available by request.

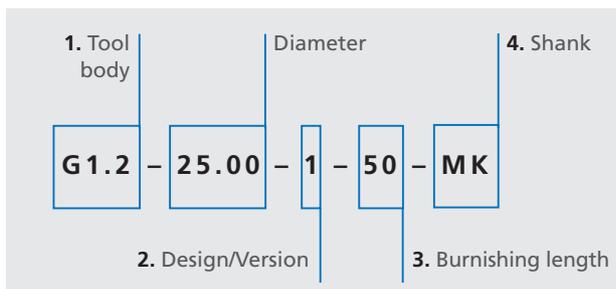
Ordering

The following information is required:

1. Workpiece diameter.
2. Design/Version:
 - 1: For through holes, without self-feeding capability
 - 2: For through holes, with self-feeding capability
 - 3: For blind holes, without self-feeding capability
3. Bore depth = Burnishing length in mm : 50, 100, 150, 200, 250, 300 (others by request).
4. Shank type:
 - MK: Morse taper
 - ZS: Straight shank – in accordance with DIN 1835 B with clamping surface (Weldon)
 - Special shanks, HSK, VDI, Capto available upon request.



The tool designation is generated as follows:



Tool body	Diameter range D	Tool shank: Morse taper or straight shank Ø e x f	a	b	c ¹⁾	d max.	i	l	Burnishing length
G1.1	≥ 4 < 17	MK2 Ø 20h6 x 50	35	52	1.5	70	80	Burnishing length + 8 mm	50
	≥ 17 < 21								
G1.2	≥ 21 < 33	MK2 Ø 20h6 x 50 Ø 25h6 x 56	35	52	2	74	80	89	75
	≥ 33 < 36								
G1.3	≥ 36 < 50								
G2	≥ 50 < 100	MK3 Ø 25h6 x 56	49	68	3	93	99	79	Unlimited
G3	≥ 100 < 201 ²⁾	MK4 Ø 32h6 x 60	71	84	5	110	124	100	

Note: All dimensions are in mm.

¹⁾ No dimension c for blind hole versions.

²⁾ ECOROLL type R roller burnishing tools are suitable for use with workpieces with diameters of 201 mm and larger.

Tool body	Diameter D	Adjustment range	Number of rollers ²⁾	Roller diameter Ø g x h	Roller radius r	Burnishing length
	mm	Through hole Blind hole ¹⁾ - / + mm				
G1.1 Ø ≥ 4 < 21	≥ 4 < 5	- 0.05 / + 0.15	3	1 x 4	0.5	50
	≥ 5 < 6	Blind hole unavailable		1.5 x 6		
	≥ 6 < 8	- 0.05 / + 0.3	4	2 x 6	1	
	≥ 8 < 10	- 0.05 / + 0.1		2 x 10		
	≥ 10 < 11	- 0.05 / + 0.4		3 x 9		
	≥ 11 < 17	- 0.05 / + 0.1				
G1.2 ≥ 21 < 33	≥ 17 < 21	- 0.05 / + 0.6	5	5 x 16	1.5	
	≥ 21 < 25	- 0.05 / + 0.1				
G1.3 ≥ 33 < 50	≥ 25 < 33	- 0.05 / + 0.8 - 0.05 / + 0.1	6	8 x 25	2.5	75
	≥ 33 < 36		8			
	≥ 36 < 38					
G2 ≥ 50 < 100	≥ 38 < 50		12	14 x 35	4	Unlimited
	≥ 50 < 86					
G3 Ø ≥ 100 < 201	≥ 86 < 100		16			
	≥ 100 < 170					
	≥ 170 < 201					

Note: ¹⁾ Depending on the structure of the hole outlet, blind hole tools may allow a larger range of settings than shown in the table.

²⁾ Replace only complete sets of rollers. When ordering replacement rollers, specify through or blind hole.

Type R: Machining cylindrical bores Ø 200 mm and larger



Through holes: Ø 201 – 450 mm
Blind holes: Ø 201 – 450 mm

Features

- Can be used up to tolerance class IT8.
- Machines all metal materials up to a tensile strength of 1400 N/mm² and a maximum hardness of HRC ≤ 45.
- Can achieve a surface quality of R_z ≤ 1 µm / R_a < 0.1 µm).
- For use on CNC-controlled drilling or milling machines and lathes, machining centers or conventional machine tools.
- Machining with clockwise rotation.

Advantages

- Short cycle time.
- Diameter adjustment is infinite and reproducible.
- Requires minimal lubrication (oil or emulsion).
- Tool automatically contracts upon retraction, preventing damage to the roller burnished surface.
- Wear parts are easy to exchange.

Design

- Type R tools consist of a basic tool body and a burnishing head.
- The tool body contains the tool shank as well as the mechanism for the infinitely variable setting of the rolling diameter.
- For machining bores with large ring grooves or cross holes, we offer special roller burnishing tools (type Q), which ensure that interrupted surfaces can be machined (to test feasibility, please send us a drawing of the workpiece).



Parameters

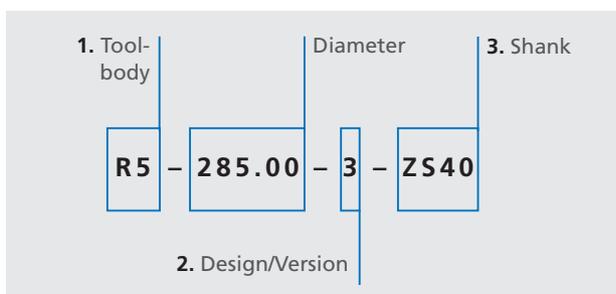
- Circumferential speeds up to 250 m/min. possible.
- Feed rate: 0.10 – 0.4 mm/rev. per roller.

Ordering

The following information is required:

1. Tool body type and workpiece diameter
(see the following table).
2. Design/Version:
1: For through holes
2: For blind holes
3. Shank type:
MK: Morse taper
ZS: Straight shank
Special shanks, HSK, VDI, Capto available upon request.

The tool designation is generated as follows:



Tool body	Diameter D mm	Adjustment range Through hole Blind hole ¹⁾ - / + mm	Tool shank: Morse taper or Straight shank Ø e x f mm	Number of rollers ²⁾	Roller di- ameter Ø g x h	Roller radius r	mm					
							a	b	c	d	i	l
R5	≥ 201 < 255	- 0.05 / + 0.8	MK5 Ø 50 h6 x 80	16	14 x 35 (Blind hole)	4	90	100	5	125	156	134
	≥ 255 < 320	- 0.05 / + 0.1		20								
	≥ 320 < 355			28								
R7	≥ 355 < 455				20 x 45 (Through hole)							
R8	≥ 455											

Note: For Ø 220 mm and larger, all of the tools are available in the through hole version with a segmented cage.

- ¹⁾ Depending on the structure of the hole outlet, blind hole tools may allow a larger range of settings than shown in the table.
- ²⁾ Replace only complete sets of rollers. When ordering replacement rollers, specify through or blind hole.

Type RA: Machining cylindrical texternal surfaces

Diameter: \varnothing 3 – 160 mm



Features

- Can be used up to tolerance class IT8.
- Special version RAP with pressure-controlled expansion is available for tolerances \leq IT11.
- Machines all metal materials up to a tensile strength of 1400 N/mm² and a maximum hardness of HRC \leq 45.
- Can achieve a surface quality of $R_z < 1 \mu\text{m}$ / $R_a \leq 0.1 \mu\text{m}$.
- For use on CNC-controlled drilling or milling machines and lathes, machining centers or conventional machine tools.
- Machining with clockwise rotation.
- Optional internal cooling-lubricant supply possible with straight shank, VDI shank or HSK.

Advantages

- Reliable function, high degree of accuracy.
- Short cycle time.
- Diameter adjustment is easy and reproducible.
- Requires minimal lubrication (oil or emulsion).
- Tool automatically contracts upon retraction, preventing damage to the roller burnished surface.
- Wear parts are easy to exchange.

Design

- Consists of a basic tool body and a burnishing head.
- The tool body contains the tool shank as well as the mechanism for the infinitely variable and reproducible setting of the rolling diameter.
- Morse taper and solid straight shanks for limited burnishing lengths. Perforated straight shanks for unlimited burnishing lengths.
- The burnishing head consists of the outer cone, cage and rollers.
- Burnishing heads are replaceable within the diameter range.



Parameters

- Circumferential speeds up to 250 m/min. possible.
- Feed rate: 0.05 – 0.3 mm/rev. per roller.
- Burnishing length: The burnishing length is limited for versions with standard shanks (see table). For longer workpieces or for unlimited lengths, ECOROLL can provide roller burnishing tools with unlimited burnishing lengths. These tools are equipped with perforated, reinforced and extended straight shanks.

Ordering

The following information is required:

1. Tool body type and workpiece diameter (see the following table).

Note: Although other diameters are often covered by the setting range, tools with diameters and burnishing lengths of any size are available.

2. Design/Version:

3: Without self-feeding capability

4: With self-feeding capability (recommended only for machines with manual feed!)

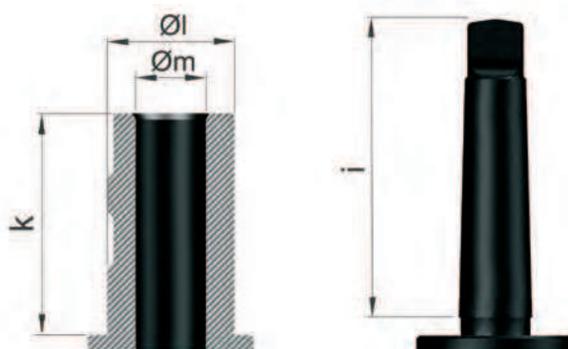
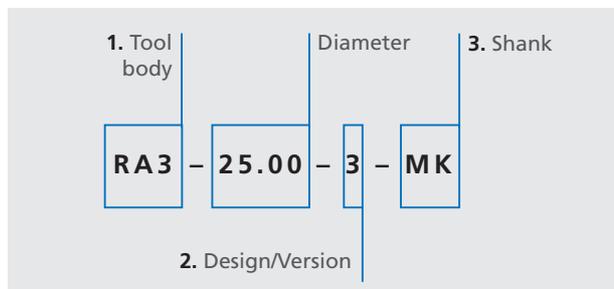
3. Shank type:

MK: Morse taper

ZS: Straight shanks for limited burnishing lengths

ZU: Straight shanks for unlimited burnishing lengths

The tool designation is generated as follows:



Tool body	Diameter D mm	Tool shank: Morse taper or straight shank Ø e x f		a	b	c ¹⁾	d	i
		Solid (mm)	Perforated (mm)					
RA1	≥ 3 < 12	Ø 20 h6 x 50 (MK2)	Ø 25 h6 x 60 x 15	55	45	21	81	80
RA2	≥ 12 < 25	Ø 25 h6 x 56 (MK3)	Ø 40 h6 x 70 x 28	73	65	21	81	99
RA3	≥ 25 < 55	Ø 40 h6 x 70 (MK4)	Ø 80 h6 x 90 x 57	114	105	28	108	124
RA4	≥ 55 < 85		Ø 110 h6 x 110 x 88	152	140			156

Note: ¹⁾ max. Ø with unlimited burnishing length: 145 mm.

Tool body	Diameter D mm	Adjustment range - / + mm	Number of rollers ¹⁾	Roller diameter Ø g x h	Roller radius r	Burnishing length
RA1 Ø ≥ 3 < 12	≥ 3 < 6	- 0.2 / + 0.05	3	5 x 16 S	1.5	85
	≥ 6 < 8	- 0.4 / + 0.1				
	≥ 8 < 12					
RA2 Ø ≥ 12 < 25	≥ 12 < 17	- 0.4 / + 0.1	5	5 x 16 S	1.5	85
	≥ 17 < 25					
RA3 Ø ≥ 25 < 55	≥ 25 < 40	- 0.6 / + 0.1	7	8 x 25 S	2.5	110
	≥ 40 < 55					
RA4 Ø ≥ 55 < 85	≥ 55 < 85	- 0.6 / + 0.1	9	8 x 25 S	2.5	110

Note: Larger Ø by request.

¹⁾ Replace only complete sets of rollers.

Types RP, RK, RKA: Machining non- cylindrical surfaces

End faces, tapers

Features

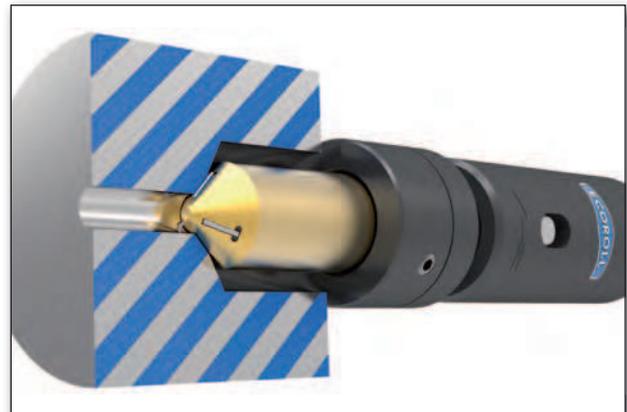
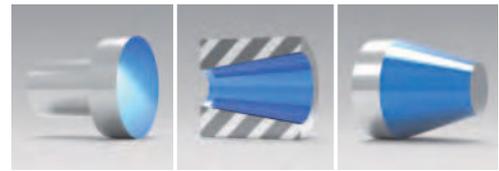
- For roller burnishing many non-cylindrical surfaces such as end faces or tapers (internal and external).
- Tool applies force in the axial direction.
- The burnishing force applied in the axial direction is transferred elastically from the machine to the burnishing head via a disc spring assembly.
- Machines all metal materials up to a tensile strength of 1400 N/mm² and a maximum hardness of HRC ≤ 45.

Advantages

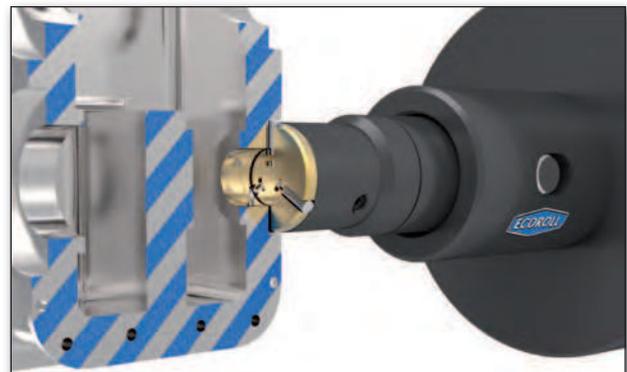
- Reliable function, high degree of accuracy.
- Wide variety of contours and diameter combinations.
- Cost-effective due to an extremely short work cycle.
- Optimized spring characteristic for consistent work result.
- Can be used with almost any type of machine. Depending on the type of machine, either the tool or the workpiece can rotate.
- Tool shanks available for any clamping system.
- Wear parts are easy to exchange.

Design

- Consists of a basic tool body and a burnishing head.
- Tool bodies are available in four different sizes (S1 to S4).
- Tools have Morse tapers, but can also be equipped with straight shanks, shanks in accordance with DIN 69880 (VDI shanks) or shanks for other clamping systems.
- Tool bodies are equipped with disc spring assemblies. The springs are arranged at ECOROLL for optimum performance with the respective machining task.



Roller burnishing an internal taper with type RK

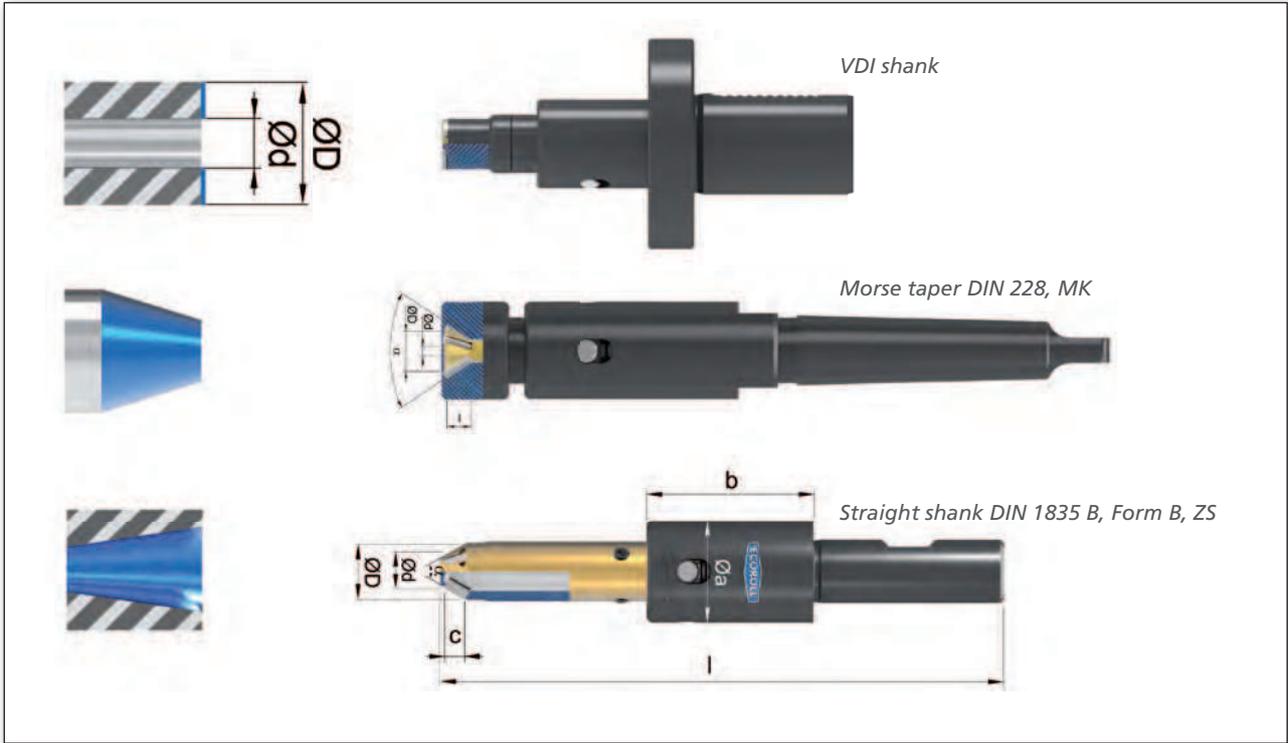


Roller burnishing an end face of a gear housing with type RP

- During production, the burnishing head is specially adapted for the workpiece dimensions and screwed onto the tool body. It determines the tool's type designation.

Parameters

- Circumferential speeds up to 20 m/min.
- Plunge-in process: max. 15 rotations.

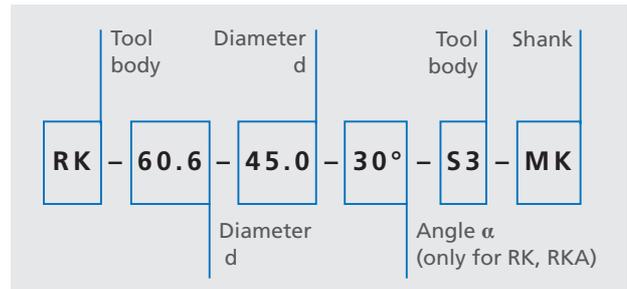


Ordering

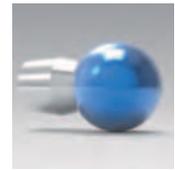
The following information is required:

- Workpiece dimensions and tensile strength (the dimensions of the burnishing heads and selection of the appropriate tool body size depend on the workpiece dimensions and material strength).
- To design the tool correctly, we generally need **workpiece drawings** and the **material designation, tensile strength, yield strength and breaking elongation**. If a drawing cannot be provided, we at least need the dimensions specified for the respective burnishing head and the tensile strength of the workpiece material.

The tool designation is generated as follows:



Type RKAK: Machining balls



Features

- Can only be used with CNC-controlled machines with turrets for driven tools. A driven angle swivel head (fixed or adjustable) is required in addition to the tool.
- Machines all metal materials up to a tensile strength of 1400 N/mm² and a maximum hardness of HRC ≤ 45.
- Starting from a finished surface, the tool can achieve a surface quality of $R_z < 1 \mu\text{m}$ / $R_a \leq 0.1 \mu\text{m}$.
- Process description: The burnishing rollers contact the spherical surface, and in so doing, achieve the recommended burnishing force (F). The feed is generated by the rotation of the workpiece.

Advantages

- Complete processing in one setting.
- Cost-effective due to an short work cycle.
- Changeover and auxiliary process time eliminated.
- No dust or residue.
- Requires minimal lubrication (oil or emulsion).
- Low energy consumption.

Design

- Consists of a compact tool body and a burnishing head.
- The main component of the tool body is the tool shank, the design of which corresponds with the mount in the driven angle head.
- The tool body is equipped with a disc spring assembly. The springs are arranged at ECOROLL for optimum performance with the respective machining task.
- The burnishing head is specially adapted for the workpiece dimensions.



Roller burnishing a ball with type RKAK

Parameters

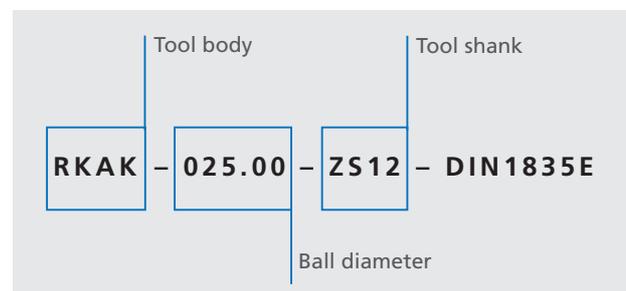
- Circumferential speeds up to 200 m/min. possible.

Ordering

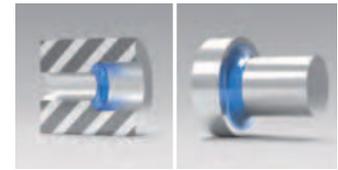
The following information is required:

- Specific ball diameter with component drawing.
- Tool shank specification.

The tool designation is generated as follows:



Types RH, RHA: Deep rolling fillets



RH: Internal machining
RHA: External machining

Features

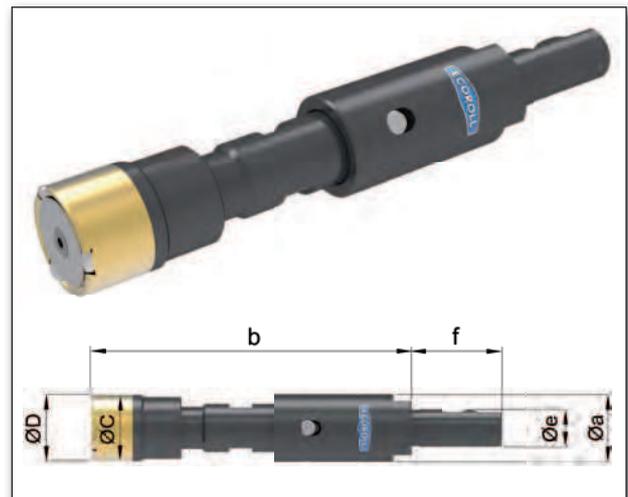
- Deep rolling in a plunge-in process.
- Can be used with conventional or CNC-controlled lathes and machining centers.
- Complete processing in one setting.
- Rotation in either direction.
- Suspended rollers for even force distribution regardless of production tolerances.

Advantages

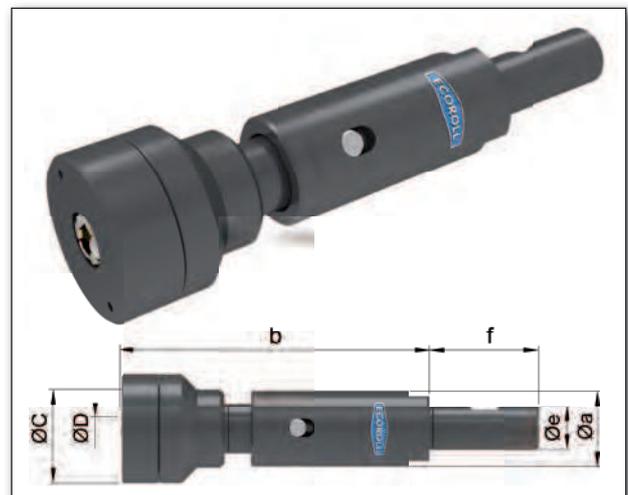
- Induces residual compressive stresses in the edge zone, which increases fatigue strength (especially important during cyclic loading).
- Increases the surface layer's material strength through controlled cold working.
- Generates a smooth surface, which eliminates micro-notches.
- Short work cycle (in one setting right after the cutting process).
- No set up time, just tool change.
- No transport costs.
- Low energy consumption.

Design

- RH and RHA tools consist of a basic tool body and a burnishing head.
- Standard shank: Morse taper or straight shank or any other clamping system by request. Equipped with disc spring assembly. Springs are arranged for optimum performance based on the machining task.
- Tool body: four different sizes available (S1 to S4).
- Burnishing head:
 - Specially adapted for the workpiece dimensions.
 - Screwed onto the tool body.



RH: Internal machining



RHA: External machining

Parameters

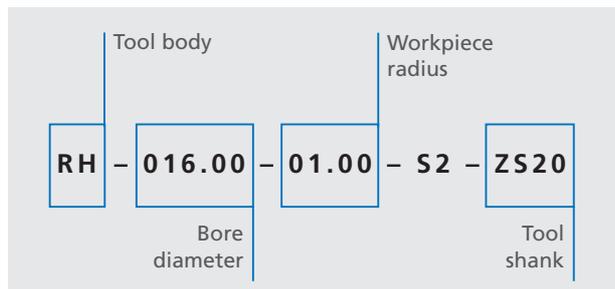
- max. burnishing force: 40 kN.
- max. machining radius: 4.0 mm.
- max. tensile strength: 1400 N/mm².
- min. machining diameter (RH): > 17 mm.
- min. machining diameter (RHA): > 4 mm.

Ordering

The following information is required:

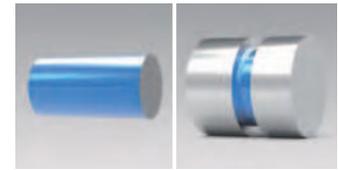
1. Workpiece dimensions
2. Shank type:
 - MK: Morse taper
 - ZS: Straight shank
 - Other clamping system

The tool designation is generated as follows:



Main dimensions (mm)					Shank \varnothing d (mm)
a	b	c	b ₁	x	
26-65	Depending on the workpiece				≥ 25

Type MZG: Machining cylindrical surfaces



Features

- Roller burnishing tools with two rollers.
- Specially designed for roller burnishing in a plunge-in process.
- Roller pressure angle <math>< 180^\circ</math>. No adjustment to roller clearance necessary. The burnishing force is controlled by tool positioning in X.
- Primary application area: Roller burnishing sealing surfaces for shaft seals (MZG01).

Advantages

- Finished surfaces without twisting marks.
- Complete processing in one setting following the cutting process.
- Plunge-in process results in extremely short work cycle.
- Starting with a finished surface, a surface roughness of <math>< 1 \mu\text{m}</math> can be achieved in one pass.

Design

- Roller retainer.
- Tool retainer with clamping shank and disc springs.
- The axial motion of the roller retainer is directly transferred to the dial gauge.

Parameters

- Circumferential speed: 20 m/min.
- Rotations while in contact: 4.



MZG

Ordering

The following information is required:

1. Workpiece and \varnothing .
2. Version.
3. Shank size.

The tool designation is generated as follows:

