

## Tools for Processing Cylinders

Type SK skiving heads work together with the Type GZ roller burnishing tools to process both seamless and welded precision steel cylinders.

On the first pass, the SK skiving head skives the cylinder; on the second pass the GZ tool roller burnishes the surface. Depending on the cylinder, the process can achieve a diameter tolerance of IT8 or IT9 and a surface finish of  $R_z < 1 \text{ mm}$ .

Most often the tools are used with cylinder processing machine centers or trepanning machines with BTA systems. The quick, cost-effective process is environmentally sensitive as well: no dust, no residue.

### Type SK, SK-R and SK1R skiving heads

- All SK type skiving heads produce surfaces ideal for roller burnishing
- Adjustable knives float radially
- Cutting inserts easy to exchange
- Type SK-R skiving heads come with the RETRAC® system that prevents tool retraction marks
- Type SK1R skiving head for blind holes available upon request



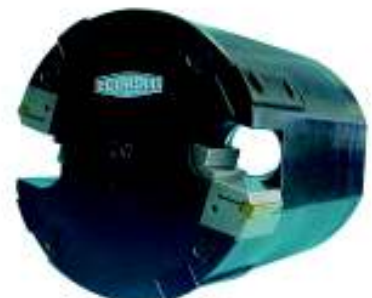
Basic design SK skiving head



Type SK3 skiving head



Type SK3 skiving head, end view



Type SK1R skiving head

## Type GZ roller burnishing tools

Type GZ roller burnishing tools work together with the Type SK skiving heads to process both seamless and welded precision steel cylinders.



Basic design GZ roller burnishing tool



Type GZ roller burnishing tool for use with SK1R skiving head



Basic Type GZ roller burnishing tool

- Applied with cylinder processing machine centers or trepanning machines with BTA systems
- Achieves a diameter tolerance of IT8 or IT9 and a surface finish of  $R_z < 1 \text{ mm}$
- Tool feed in either direction
- Quick, cost-effective work cycle
- Simple diameter adjustment
- Reliable, high precision operation
- Wear parts are easy to exchange
- Roller head automatically collapses at the end of the process, preventing tool retraction marks

## Combined Skive-burnishing Tools

ECOROLL's combined skive-burnishing tools provide a cost-efficient and environmentally sensitive method for machining the inner surfaces of cylinders in just one step. This line of tools includes types RDS and RDO as well as the innovative Omega skiving head system.

The combined skive-burnishing tools are designed to finish seamless or welded cold drawn precision tubes after counter boring (including welded and drawn DOM tubes, seamless cold drawn DIN EN 10305-1 tubes, or hot rolled steel tubes).

The skiving head cuts the tube's inner surface to the exact size and form required, while the roller head burnishes it. This simultaneous skiving and burnishing results in a short overall process time.

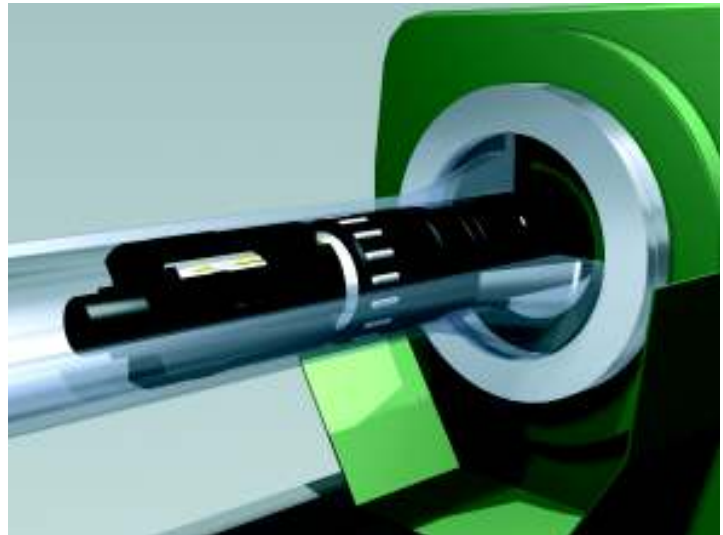
Through cold working, this forming process achieves a large surface contact area, low surface roughness and increased hardness. Thus, in contrast to honed tubes, the burnished cylinder surface has better sliding and wear properties.

ECOROLL skive-burnishing tools can be used with specially designed cylinder processing machines or trepanning machines with BTA boring systems. In addition, these a special versions are available for use with alternative thread connections, including Sierra threads.

**NOTE:** To supply pressure to the tool's unique RETRAC® system, the machine must have a hydraulic line with a quick coupling connection. Adjusting the pressure regulates the burnishing force. When the process is complete and the pressure is released, the skiving knives and the rolling head collapse, and the tool can be retracted without damaging the finished surface.



Type RDS tool



Type RDSE tool

# Type RDS Tool Application: Cylinders, inner surfaces

Diameters 38 – 60 mm

The RDS tool equipped with the RETRAC® system is designed to machine short cylinders up to 6 m long (depending upon the cylinder's diameter and the stiffness of the boring bar). The work cycle is extremely short because skiving and burnishing take place in one pass.

RDS tools feature the following advantages:

- Floating skiving knife with two reversible, high performance cutting inserts
- Knife adjusts easily by replacing the wedges
- Automatic coupling and separation with hydraulic RETRAC® cylinder incorporated in the boring bar
- Manual roller head diameter adjustment
- Patented choke disc concentrates the coolant-lubricant in the chip chambers
- Hydraulic RETRAC® device retracts knife and roller head when the process is finished—prevents damage to the machined workpiece

## Design versions

**NOTE:** To order combined skive-burnishing tools, please consult the table on page 51.

1. **RDS:** standard skive-burnishing tool for diameters 38 – 60 mm
2. **RDSS:** offers increased cutting performance with two skiving knives arranged at a 90° offset
3. **RDSQ:** equipped with extended knives and support pads for skiving cylinders with cross holes
4. **RDSE:** high performance tool with flexible roller head
  - Roller head diameter self-adjusts to compensate for variable cylinder elasticity and diameter tolerances
  - Maintains constant burnishing force for even surface quality
  - Burnishing force adjusted hydraulically with RETRAC® system
  - Adapts easily and with reproducible results to a variety of material strengths and surface condition requirements
  - Unique flex-joint compensates for possible boring bar misalignment

## Type RDO “Omega” Tool Application: Cylinders, inner surfaces

Diameters 60 – 400 mm

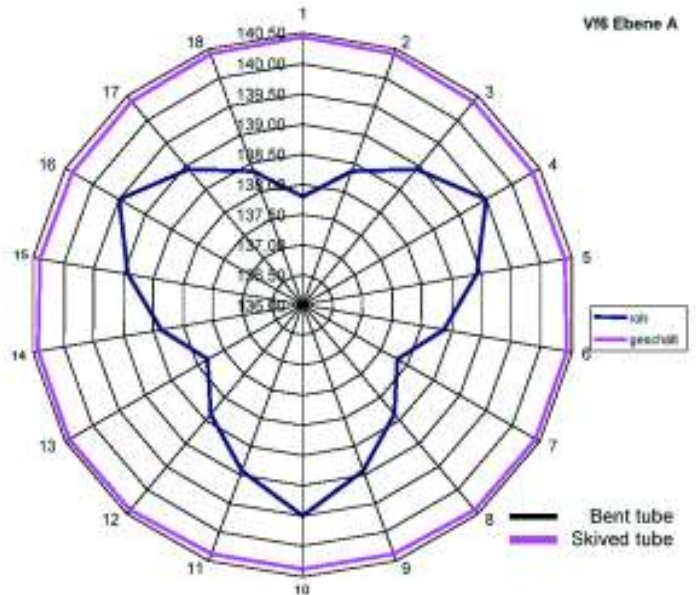
A long-standing problem in this diameter range increases with diameter size: large diameter tubes with relatively low wall thickness exhibit greater irregularities in their circular form due to cold drawing or the straightening process. Conventional skiving heads can correct these irregularities only in certain circumstances. After such a conventional machining process, spiral-shaped waves may appear along the entire length of the cylinder’s inner surface, creating a so-called rippling effect.



Cylinder with rippling problem

The RDO skive-burnishing tools equipped with the Omega skiving head offer an innovative solution to this problem. The following trial demonstrates the tools’ effectiveness.

Cylinder tubes with dimensions 156 mm x 8.5 mm were bent on the in-feed end into a polygonal shape with roughly three sides, in which the diameter varied in a range from 1 – 1.7 mm.



Improving the cylinder’s circular form

### Summary of the trial results:

After bending, the tubes exhibited irregularities in circular form of up to 1.7 mm. After skiving with an RDO tool, the infeed end of the tubes demonstrated a maximum irregularity of just 0.07 mm. At 150 mm from the infeed end (6 mm from the tube’s opposite end) the maximum circular form irregularity measured just 0.02 mm. Positive results in production continue to confirm these trial results.

## “Omega” skiving head

While the Omega skiving head cuts the cylinder’s inner surface to the exact size and form required, the roller head burnishes it. The simultaneous skiving and burnishing process, together with increased cutting performance (cutting speeds up to 300 m per minute and feeds of 3 – 6 mm per revolution), result in substantial cost savings. The Omega skiving head is equipped with two, three or six floating knives arranged to work in concert.



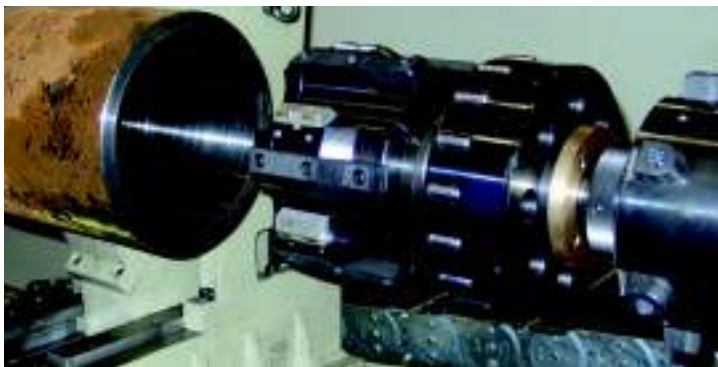
For simple applications with no rippling:

an economical version with **2 knives**



For applications with moderate rippling in a diameter range of 60 – 400 mm:

a version with **2 – 3 knives**



For difficult applications that require substantial form correction in a diameter range of 205 – 400 mm :

a version with **6 knives**

The knives center themselves automatically so that each removes chips of nearly the same thickness regardless of cylinder form deviation. Thus, RDO tools with Omega skiving heads skive the tube clean without removing large amounts of material. This innovative knife arrangement markedly improves the tube’s circular form while preventing the formation of ripples and polygon-shaped bores.

## **“Omega” skiving knife design versions**

*The skiving knives are available in two versions. The standard design, Version M, has two cutting inserts arranged one behind the other. With a cutting insert in front and a support insert behind, Version Q works especially well for cross holes.*

*Converting from Version M to Q is easy: simply replace the cutting insert with a support insert.*

*The support inserts improve the cylinder’s form by:*

- *Guiding the knives at the beginning of the skiving process*
- *Limiting the oscillation of the knives, thereby reducing rippling along the length of the cylinder*
- *Supporting the knives over the cross holes*

*A precisely scaled central adjusting screw makes it possible to adjust the knives even if they are already mounted in the tool. This advantage eliminates the need to pre-adjust the knives (with one exception: now and then the 6-knife Omega skiving head must be pre-adjusted). The only reason for disassembling the knives is to turn them (to expose the other cutting edge) or to exchange them.*

### **Advantages:**

- *Less machine down time due to central adjusting screw*
- *Quicker mounting and disassembly of the skiving knives*

*The skiving head and the rolling head are connected through a new interface. The complete skiving head can be removed by unscrewing two set screws even while the RDO tool is still mounted in the machine.*

### **Advantages:**

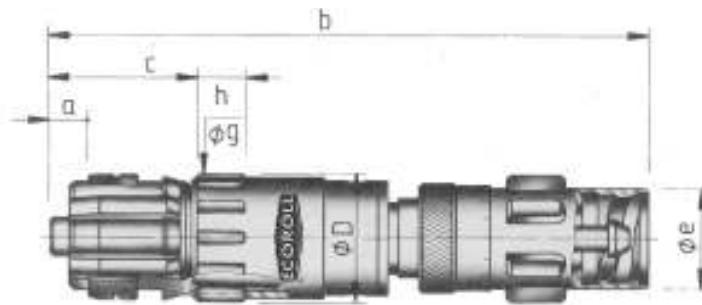
- *Shortens the time needed to exchange the rollers and the cage by 20 minutes*
- *Machine down time reduced even further by exchanging the complete skiving head at once (when cutting edges or guide pads are worn)*

# Combined Skive-burnishing Tools

## Technical Data

**NOTE:**

- The tool retainer is a BTA thread or an S-thread with a compressed air connection.
- For diameters larger than 400 mm it is recommended to skive and roller burnish in separate operations. Separate skiving heads are available in this range to improve circular form and/or machining allowance to less than 3 mm.
- All dimensions in mm



Tool type	Diameter range D	BTA boring bar $\varnothing e$	Skiving knives		Roller head			Main dimensions				
			Range	Cross-section	Range	Number of rollers	Roller $\varnothing g \times h$	a	b	c		
RDS11	$\geq 38 < 44$	33	Nominal $\varnothing \pm 0.04$	20 x 14	-0.05/-0.2	8	6 x 20	12	275	67		
RDS21.1	$\geq 44 < 50$	36		18 x 18	-0.05/+0.3			16	304	86		
RDS21.2	$\geq 50 < 55$ $\geq 55 < 60$	43						12	275	67		
RDSQ11	$\geq 38 < 44$	33	Nominal $\varnothing \pm 0.04$	20 x 18	-0.05/+0.2			12	275	67		
RDSQ21.1	$\geq 44 < 50$	36		18 x 18	-0.05/+0.3			16	304	86		
RDSQ21.2	$\geq 50 < 55$ $\geq 55 < 60$	43						12	275	67		
RDO34.1	$\geq 60 < 70$	47	$\geq 60 < 63$ $\geq 63 < 70$	50 x 17	-0.05/+0.5	12	8 x 25	110	430	200		
RDO34.2	$\geq 70 < 80$ $\geq 80 < 100$	56 68	$\geq 70 < 80$ $\geq 80 < 100$	50 x 18				120	482	207		
RDO44.1	$\geq 100 < 120$	82	$\geq 100 < 120$	60 x 24				121	540	241		
RDO44.2	$\geq 120 < 140$	106	$\geq 120 < 140$					16	125	609	282	
RDO54.1	$\geq 140 < 170$	118	$\geq 140 < 170$	60 x 32				20	14 x 35	125	609	282
RDO54.2	$\geq 170 < 205$	142	$\geq 170 < 205$							136	641	326
RDO64.1	$\geq 205 < 255$ $\geq 255 < 305$	178	$\geq 205 < 255$ $\geq 255 < 305$									
RDO64.2	$\geq 305 < 400$	226	$\geq 305 < 325$ $\geq 325 < 400$									

\* Depends on existing boring bar