YAMATO
MACHINE & TOOL

ROLLER BURNISHING TOOLS

DEBURRING TOOLS

MARKING TOOLS

TECHNICAL INFORMATION

Surface operations by “Cold Working” are applied in order to:
• Improve the surface finish,
• Improve the fatigue life,
• Improve the size control.
The basic idea of the methods is plastic deformation of material by applying a relatively small force so that a hardened layer on the surface exists. Roller Burnishing, Shot Peening, LPB (Low Plasticity Burnishing) are such methods.

If relatively small force is applied using a highly polished roller, which has the translation and rotation actions it will follow a path through the metal surface. This case is called Roller Burnishing operation.
The production of ROBUTO® – Roller Burnishing Tool, in Turkey was started in 1985 for inner and external diameters. According to the theoretical basis, today different applications are developed and studied by YAMATO. Special designs are made for the Industry.

ROLLER BURNISHING
The principle of Roller Burnishing is transferring the force applied on a roller to the surface in a certain path. During the rotation action the contact area is so small that hertz type pressure occurs on material surface (like roller bearings). This provides low energy and rolling force requirement. Roller Burnishing a metal surface is only possible with specially designed rollers and mandrel – roller combinations.

Figure-1 presents a pattern diagram of roller burnishing process for a spherical roller. The first contact to the machined surface occurs in Section (A). In section (B) the yield point of the surface is exceeded and plastic deformation takes place. Pressurized depth can be seen here as (D). After the material has been subjected to the maximum compressive strain, in section (C) it begins to elastically relieve (E) through the finishing zone finally leaving with a smooth surface and a compressive residual stress of significant peak value.
The stresses formed on the material during the compression decrease towards the center. These stresses reach approximately 1 mm. below the surface increasing surface hardness as a result.
ROBUTO® tools comprise a mandrel and rollers placed in a slotted cage. This design provides sizing with high dimensional accuracy.ART OF ROLLER BURNISHING

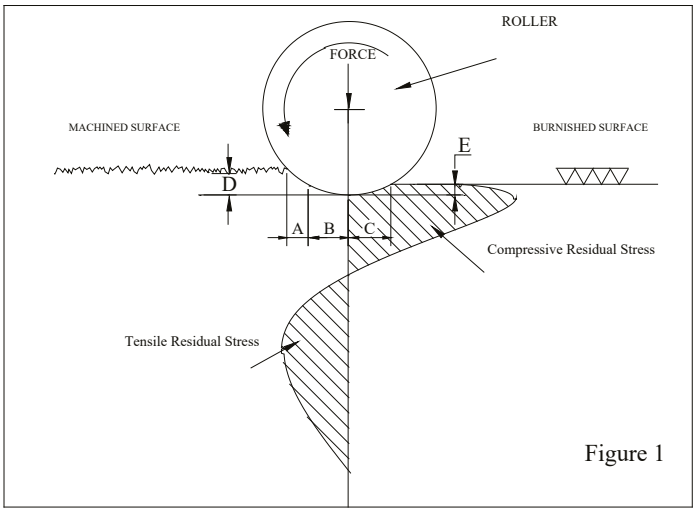


Figure 1

Effects of Roller Burnishing Operation
• Surface roughness of 0.05-0.10µm Ra (ISO N2, N3)
• 0.01 mm or better tolerances
• 30% – 70% increase in Brinell Hardness on surface.
• Up to 300 % increase in resistance to fatigue failure
• Eliminating the factors of stress corrosion cracking
• Increase in corrosion resistance
• Elimination of tool marks, pits, scratches, porosities
• Reduced friction up to 35 %
• Reduced noise level is achieved

Usage area of ROBUTO
• Symmetrical / Semi Symmetrical work pieces
• Internal Cylindrical
• External Cylindrical
• Internal Tapered
• External Tapered
• Circular flat surfaces
• Can be used on all types of machines (drill presses, lathes, machining centers, or any other rotating spindle).
• Work pieces of max. 40 HRC

Advantages of Roller Burnishing against classical methods
• Roller Burnishing is a chipless finishing method different than grinding, honing and lapping.
• Surface roughness value of Roller Burnishing operation is less or equal to these abrasive methods. Even the values are equal; roller burnished surface is smoother than the abraded surface because chip-generating operations leaves sharp projections in the contact plane.
• A workpiece with a diameter of 30 mm. and a length of 100 mm. can be burnished in 10 – 15 seconds.
• No expensive investments are required.
• Mechanical advantages. (Corrosion resistance, increase in surface hardness)
• Faster production at a lower cost. 10,000 – 300,000 pieces can be burnished without any maintenance cost.

TOOL APPLICATION

The diameter adjustment of the tool and the operation parameters to control are easy and flexible. Stock allowance, feed rate and speed are the variables that must be set before starting the operation.

Roller Burnishing does not cause any volume change in the workpiece. But because material is displaced, the diameter will be altered somewhat. In Roller Burnishing of a symmetrical surface profile, the diameter will change at most by the value of the peek - to - valley height. This must be allowed at the preceding machining operation by leaving enough stock to compensate for the dimensional change.

(Table-1) is to give an idea about determining the stock allowance for the workpieces of different diameters.

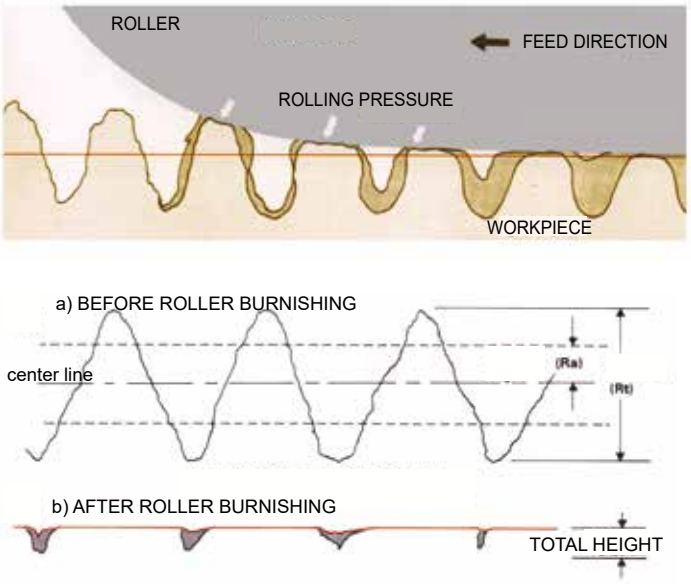
Table-1

Tool Dia (mm.)	Stock Allovance (mm.)
4.5 ~ 7.6	0.005 ~ 0.020
8 ~ 14.5	0.007 ~ 0.025
15 ~ 24	0.015 ~ 0.035
25 ~ 44	0.020 ~ 0.040
45 ~ 74	0.025 ~ 0.045
75 ~ 200	0.030 ~ 0.060

Chipless Finishing & Cold Working

Roller Burnishing operation is a chipless finishing method. By the rolling pressure applied to the workpiece surface, the microscopic peaks flow into the valleys in the surface profile. (Figure-2)

Figure-2



Roller burnishing process cold - works metal surfaces to produce a uniform, dense, low micro surface finish. The fact that ROBUTO (Roller Burnishing Tool) does not remove metal - thus does not produce chips - enables the tool to offer a variety of advantages, most of which are not obtainable with other finishing processes such as reaming, boring, and grinding.

The chipless finishing process, Roller Burnishing cold - works metal under relatively small force. These forces slightly exceeds the yield strength of the material causing a plastic deformation of its surface material. Because the plastic deformation occurs under the recrystallization temperature this process is called cold working.

Minimum Surface Roughness Value (Ra)

In (Table-2), (Ra) values of different materials are listed. (Table 2)

Table-2

MATERIAL	SURFACE ROUGHNESS (Ra) µm.	
	Before Roller Burnishing	After Roller Burnishing
STEEL	2.5 – 5.0	0.05 – 0.15
CAST IRON	1.5 – 2.5	0.35 – 0.50
ALUMINIUM	2.5 – 3.5	0.10 – 0.20
BRASS	2.5 – 3.5	0.10 – 0.20
BRONZE	2.5 – 3.5	0.15 – 0.20

Increase in Resistance to Fatigue Failure

Because fatigue failure damages are instantaneous and causes major harm, preventions are necessary. Metals can get cracked even the forces applied are very small when compared to the yield point. Experience has shown that notches, sharp changes of section and other forms of stress raisers are dangerous to metals in applications involving dynamic forces. Roller Burnishing has an effect of smoothing the profiles of sharp surface imperfections like notches and tool marks. Another and more important point is that the Roller Burnishing reduces the harmfull effects of dynamic forces by forming compressive residual stresses at the surface of workpiece material.

After Roller Burnishing , at a given depth below the surface, the material is elastically deformed and tries to spring back. This gives rise to compressive stresses at the surface and tensile stresses in the elastically deformed zone. This in turn increases the resistance of the material to fatigue failure, because any external forces must first overcome these residual stresses.

These two major effects of roller burnishing (eliminating the surface imperfections and forming compressive residual stresses) improve the resistance to fatigue failure up to 300%.

Increase in surface hardness for different types of materials is shown in

Table-3

Material	DIA.	Stock Amount	INCREASE OF SURFACE HARDNESS			
			Brinell Hardness		Rockwell Hardness	
			(BHN)	%BHN	(HRC)	%HRC
Steel	5 10 25 50	0.012 0.018 0.025 0.050	212 to 286	35	14 to 30	114
Stainless Steel	5 10 25 50	0.012 0.020 0.025 0.040	230 to 400	74	20 to 42	110
Cast Iron	5 10 25 50	0.012 0.015 0.025 0.040	180 to 250	39	6 to 25	315
Aluminium	5 10 25 50	0.015 0.025 0.040 0.040	100 to 120	20	-	-
Bronze	5 10 25 50	0.018 0.025 0.030 0.025	134 to 186	39	-	-

MULTI ROLL
BURNISHING TOOLS

ONE PASS...

Super Finishing
Precision Sizing
Work Hardening
Ra<0.05µm
Rz<1µm

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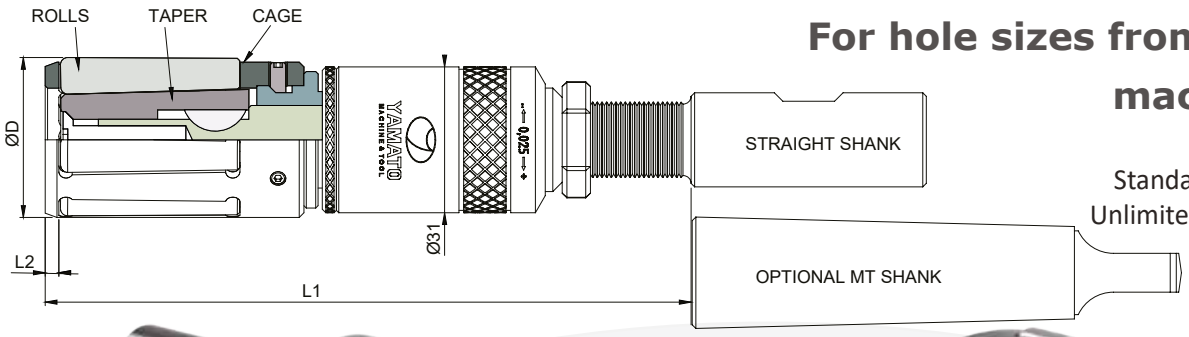
INTERNAL ROBUTO

CPL SERIES

INTERNAL DIAMETER THROUGH HOLE-MF

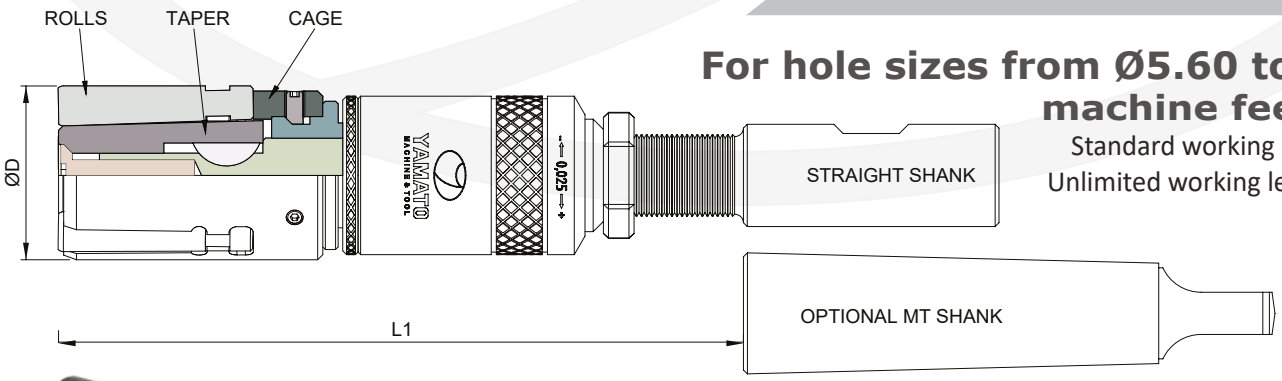


For hole sizes from Ø3 to Ø300mm

machine feeding-MF
self feeding-SF

Standard working lengths up to Ø31
Unlimited working length up from Ø32

INTERNAL DIAMETER BLIND/STEPPED HOLE-BMF



For hole sizes from Ø5.60 to Ø300mm

machine feeding-BMF

Standard working lengths up to Ø31
Unlimited working length up from Ø32

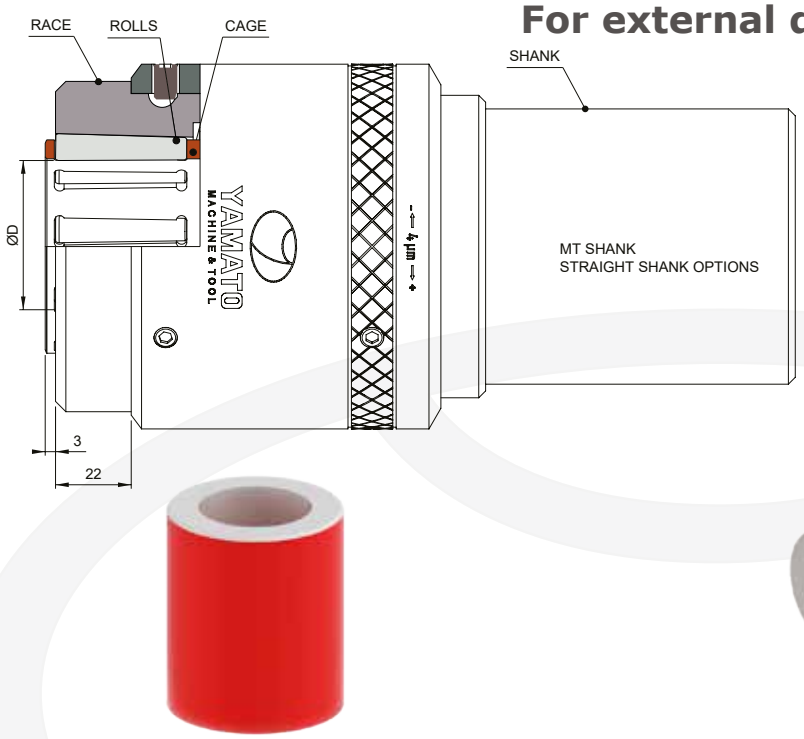
EXTERNAL ROBUTO
MOD SERIES

EXTERNAL DIAMETER
STRAIGHT SHAFT-MF

For external diameters from Ø1.5 to Ø110 mm

machine feeding-MF
self feeding-SF

Unlimited working length with hollow shank

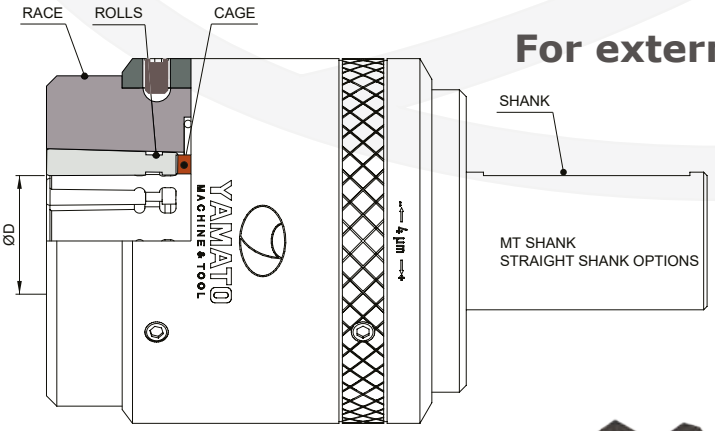


EXTERNAL DIAMETER
STEPPED SHAFT-BMF

For external diameters from Ø1.5 to Ø110 mm

machine feeding-BMF

Unlimited working length with hollow shank



FLAT FACE/ TAPER ROBUTO

MFF/ MIC-MOC SERIES

MFF
FLAT FACE ROBUTO

Flat Face roller burnishing tools are designed to burnish circular faces which are symmetrical with the axis of the workpiece. These surfaces are generally sealing surfaces, and require high quality finishes to control leakage.

MIC-MOC
TAPER ROBUTO

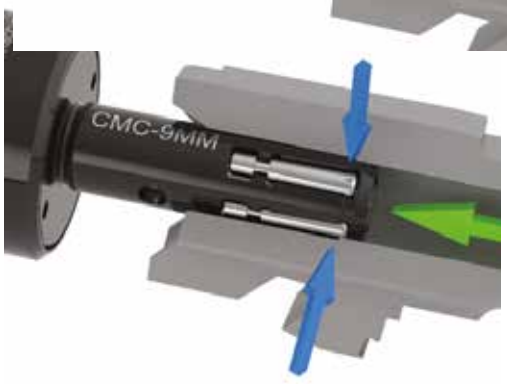
Angular roller burnishing tools are designed to burnish conical sections with uniform tapers which are symmetrical with the axis of the workpiece. These surfaces are generally sealing surfaces, and require high quality finishes to control leakage. Roller burnishing of conical surfaces is much faster and less expensive than grinding and honning, and eliminates problems with embedded abrasive which can wear out the sealing element. Typical sealing surfaces in parts include: face seats, angular or tapered seats of internal or external construction.
YAMATO ROBUTO® Tools are designed with tapered rolls for true planetary rolling action to prevent skidding effect and produce a superior burnished surface.

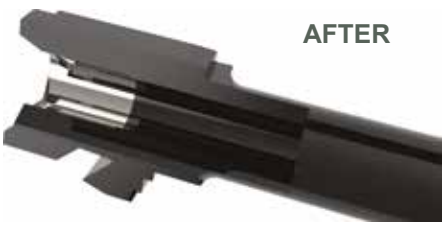
COMPENSATING ROBUTO

CMID SERIES

Entrance of the hole
Taper is out
Tool diameter is large

During the operation
Taper moves back
Tool diameter gets small





CMID tool is suitable for

* Finishing of works with inconsistent pre-burnishing hole diameter.
Since overload can be prevented by automatic diameter adjustment mechanism, the life of tool is extended.
* Slightly tapered workpieces where the standard angular tools can get stuck.
CMID can adjust its diameter automatically during the operation

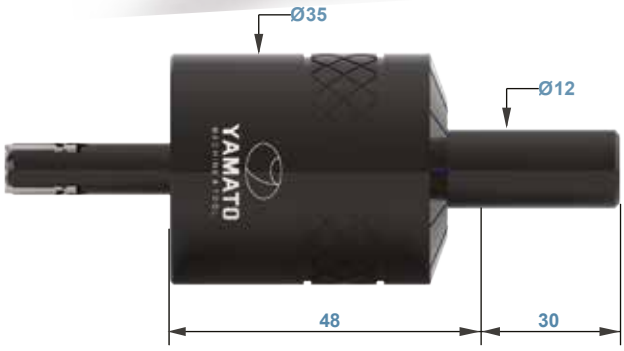
32 Revolver	41 MAG	.17 CAL	6.5x45 Lapua	30 Carabine	308 WIN
9x18 Makarov	40 S&W	.22 MAG	6.5 Grendel	30-30 WIN	338 WIN MAG
9x19	44 MAG	204 Ruger	6.8 REM	300 WIN MAG	338 Lapua MAG
9x21 IMI	45 ACP	5.56mm NATO	270 WIN	300 AAC Blackout	416 Barret
38 Super Auto	45 COLT	22 Hornet	270 Weat. MAG	7.62x39 SAAMI	44 CAL
380 ACP	357 MAG	22 Long Rifle	7mm REM MAG	7.62x51 NATO	458 SOCOM
38 Revolver	380 AUTO	223 REM	7mm-08 REM	303 Savage	470 NITRO
10mm AUTO	500 MAG	243 WIN	284 WIN	303 British	50 BMG

MICRO ROBUTO

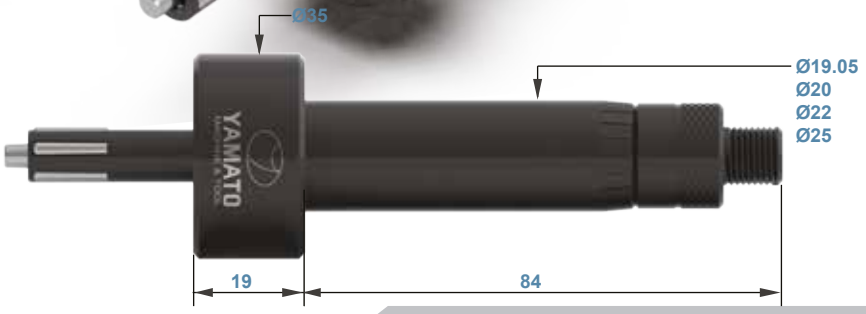
SWISS TYPE

INTERNAL & EXTERNAL ROBUTO

MCPL
Swiss Type Internal Robuto
Ø6 - Ø14.50

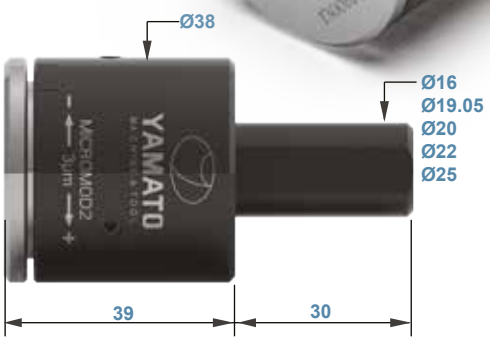


MICROID
Swiss Type Internal Robuto
Ø6 - Ø14.50



MICROID
Swiss Type Internal Robuto
Ø3 - Ø5.50

MICROMOD
Swiss Type External Robuto
Ø1 - Ø14

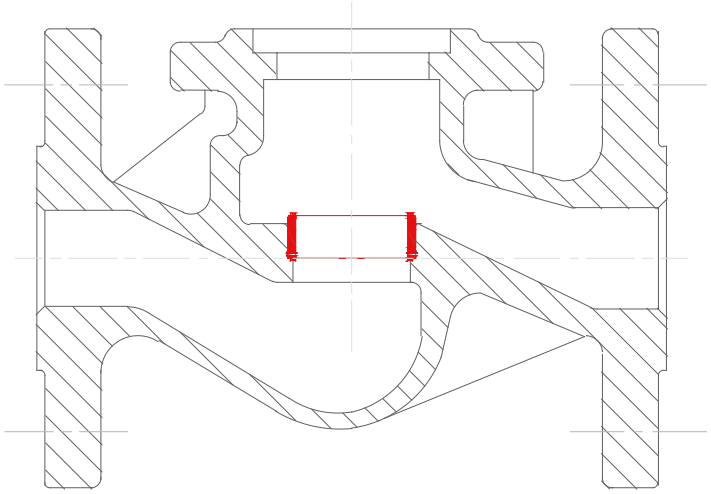


EXPANDER ROBUTO

EPCPL SERIES

EPCPL EXPANDER FOR VALVE SEAT

Seating rings are expanded by using the Valve Seat Expander. During the operation tool rotates and taper inside the tool comes out. This action enlarges the tool diameter and expands seat ring diameter. At the end of the tapers travel expansion is completely round and absolutely tight.
Since valves differ in their series and the seating rings sometimes have somewhat different dimensions, the expansion ranges of the expanders have not been stated. Therefore, we kindly request that you supply us with exact details, including dimensional sketches or drawings, when enquiring or ordering.



SINGLE ROLL
BURNISHING TOOLS

ONE PASS...

Super Finishing
Work Hardening
Ra<0.05µm
Rz<1µm

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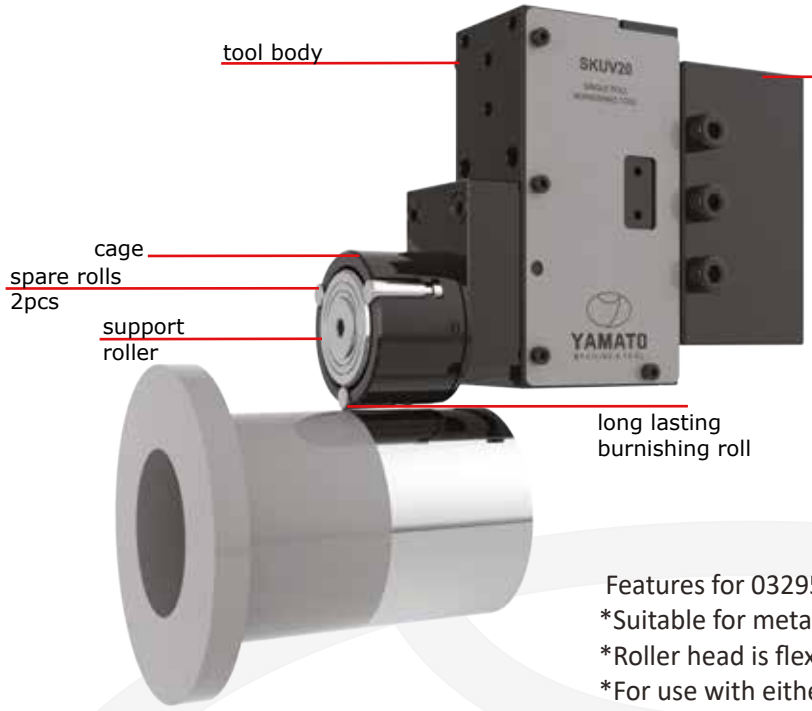
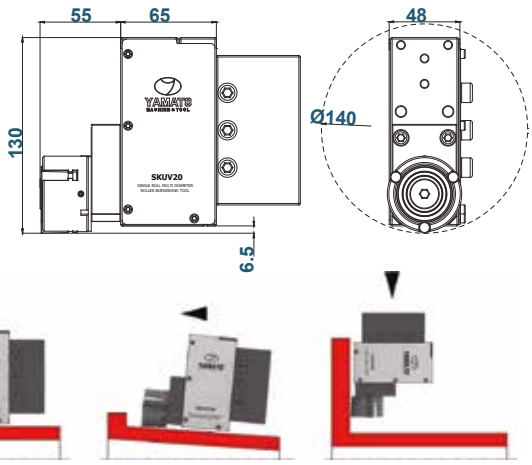
SKUV SERIES

SINGLE ROLL BURNISHING TOOLS

SKUV20-03295-001

FROM TAILSTOCK TO CHUCK (SHORT)



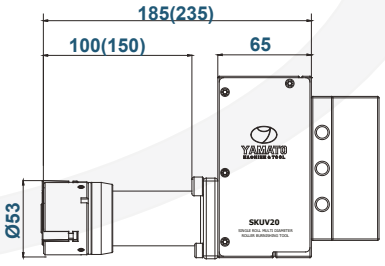


Features for 03295 series

*Suitable for metals (steel,aluminium,cooper etc.max hardness of HRC45)
*Roller head is flexible, because the tool is equipted with spring.
*For use with either CNC controlled or conventional lathes.
*Achievable surface quality min Ra0.02µm.
*Unrestricted roller face for roller burnishing shoulders and other edges.
*Roller can rotate in either direction.

SKUV20-03295-002

FOR HOLES >Ø55mm

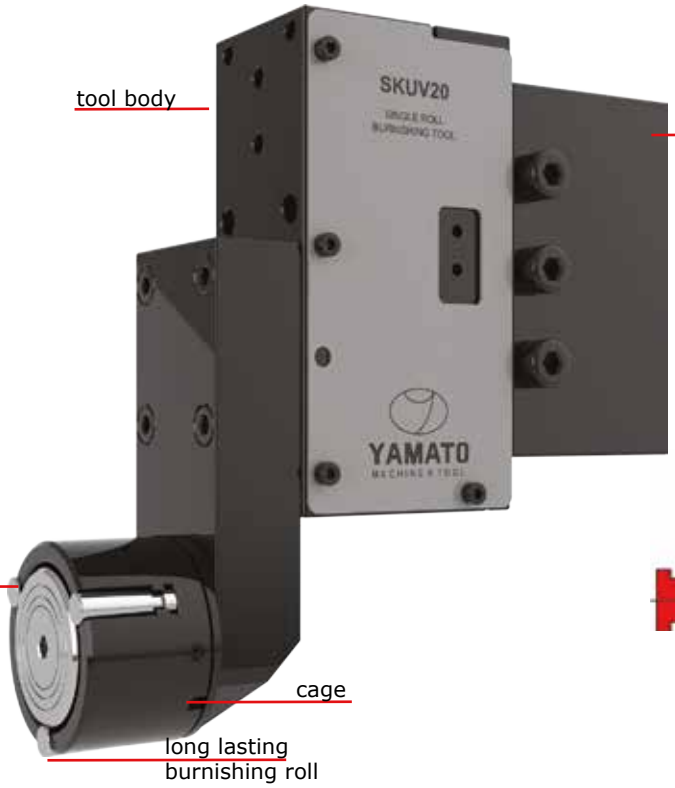


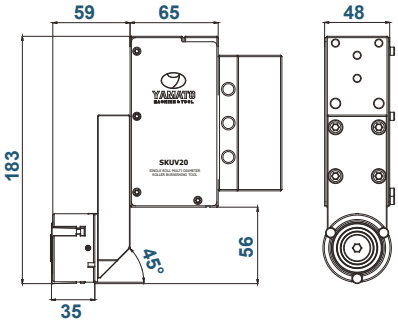
SKUV SERIES

SINGLE ROLL BURNISHING TOOLS

SKUV20-03295-003

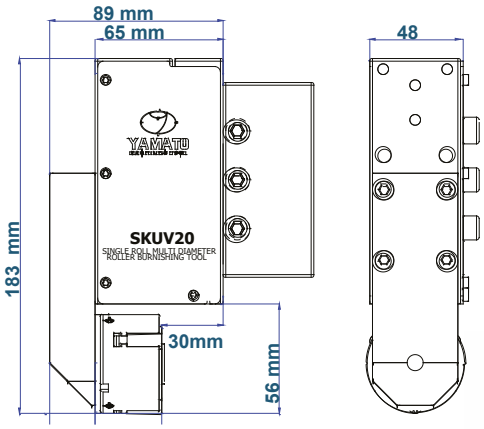
FROM TAILSTOCK TOWARDS CHUCK (LONG)

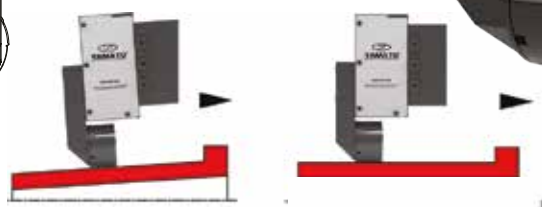




SKUV20-03295-004

FROM CHUCK TOWARDS TAILSTOCK LONG



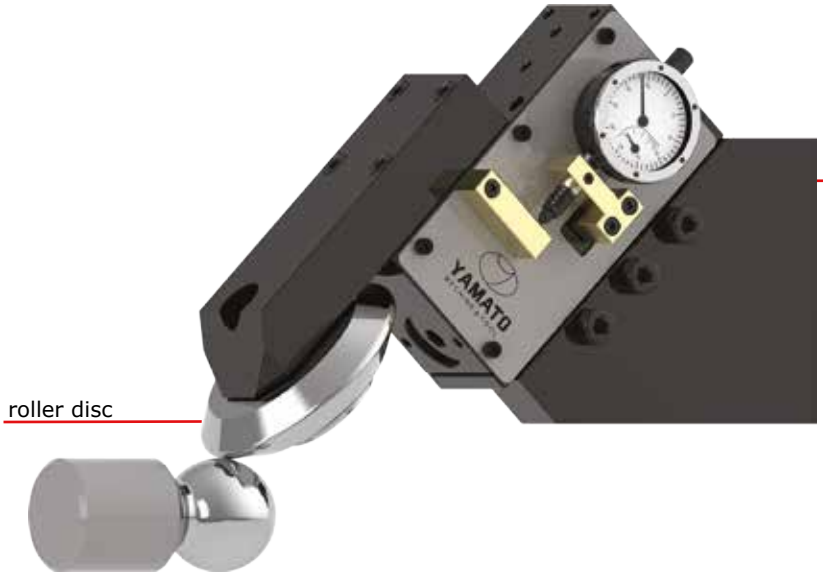


SKUV20-01x

SMALL HOLES & GROOVES

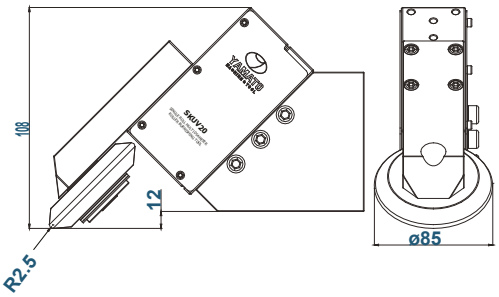
SKUV SERIES
SINGLE ROLL BURNISHING TOOLS

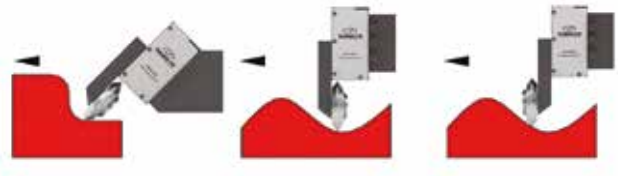
SKUV20-2.5R-0-A45
SINGLE ROLL RADIUS ROBUTO



Features
*Standard radius is R2.5mm
*Roller disc with special radius is available
*Shank with different inclination is available
*Diameter of roller disc is Ø85mm

shank type options
-20x20-25x25 square shank
-90° radial shank
-45° inclined shank
-30° inclined shank





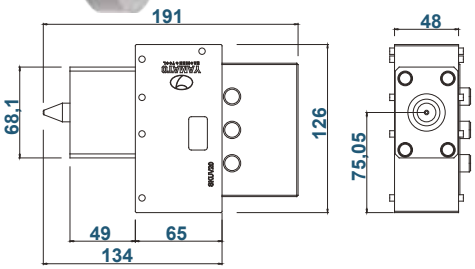
SKUV20-API
GROOVE BURNISHING TOOL

SOLUTIONS FOR COST-EFFECTIVE AND HIGH QUALITY MACHINING OF OIL AND GAS SEAL RING GROOVES

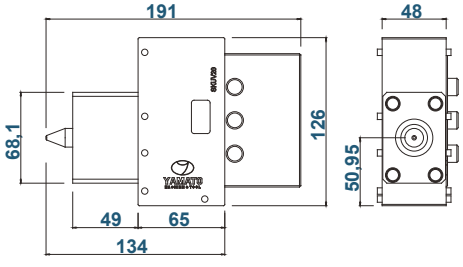
LOW Ra > BETTER SEALING
SURFACE MICRO HARDENING > LONGER LASTING

API TOOL SET- 2 tools one CNC setup, many different API seal ring diameters

UP SIDE OF THE GROOVES



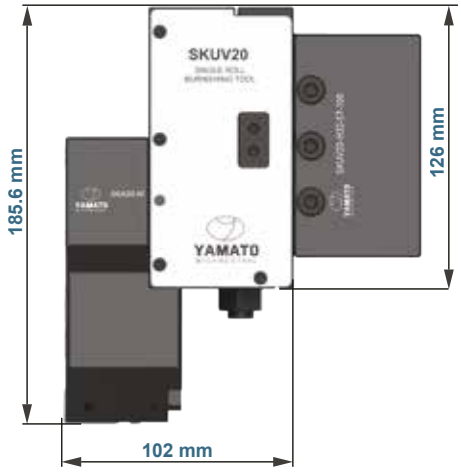
DOWN SIDE OF THE GROOVES

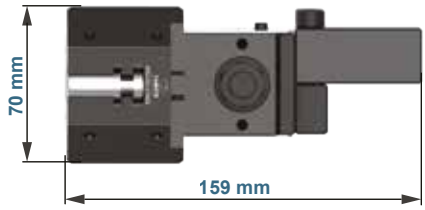


SKUV SERIES

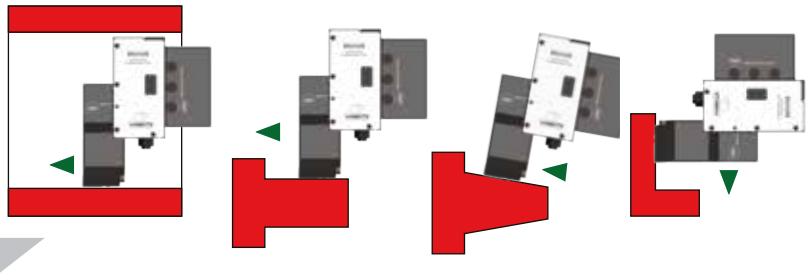
SINGLE ROLL BURNISHING TOOLS

SKUV20-01650





Speed 50 ~ 250 m/min.
Feed 0.1 ~ 1.0 mm/rev.
Max. burnishing force 10 kN



MACHINING EXTERNAL SURFACES
CYLINDRICAL AND TAPERED BORES

SKUV30

DEEP ROLLING ROBUTO

SKUV30 has been engineered for Deep Rolling applica-tions on surfaces and radiuses of highly stressed work-pieces such as

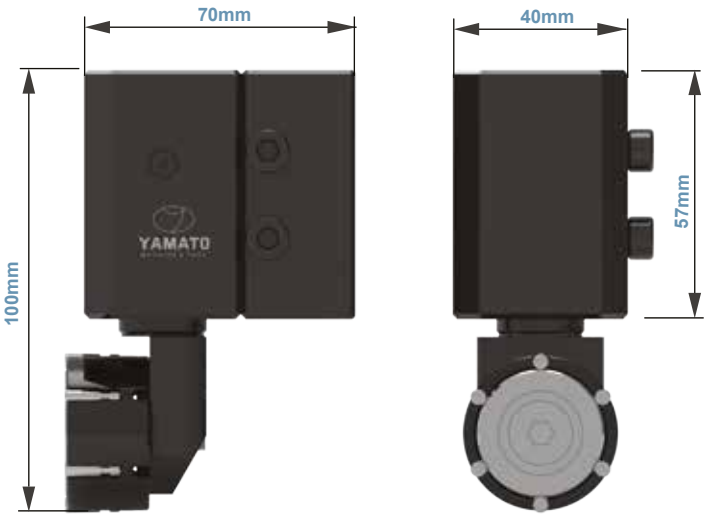
- transport axles,
- train axles,
- transmission shafts,
- propeller shafts,
- turbine shafts, etc.

SKUV30 can apply 10KN of pressure with 90° shank and over 5KN of pressure with 45° inclined shank with an extremely long life and reliability of both the roll and the internal mechanism.

ROLLER BURNISHING TOOLS

SRHV SERIES
SWISS TYPE

SRHV-06148

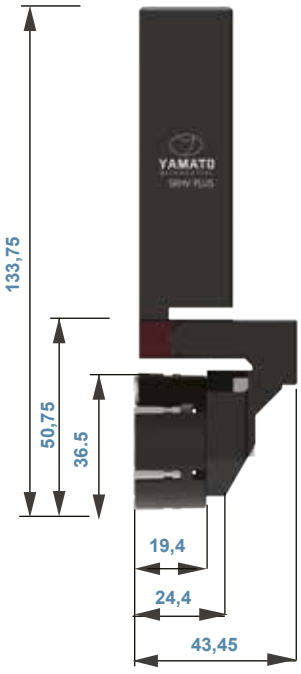


-Compact design for use where limited space is available.
-Designed for, but not limited to, use on Swiss Type Lathes.
-Adjustable for optimum burnishing pressure.
-Low cost replacable burnishing roll.

SRHV-PLUS-06148

shank type options
-12x12-16x16-20x20-25x25 square shank
-90° radial shank
-45° inclined shank
-30° inclined shank

PARALLEL
FLEXIBLE
ROLLER HEAD



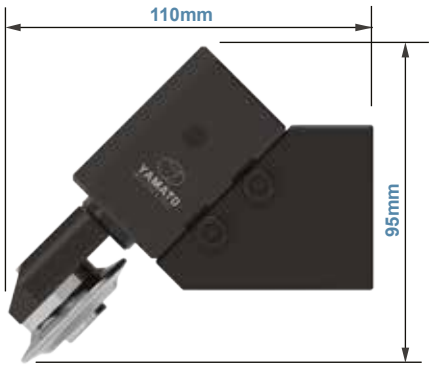
ROLLER BURNISHING TOOLS

SRHV SERIES

SWISS TYPE RADIUS BURNISHING

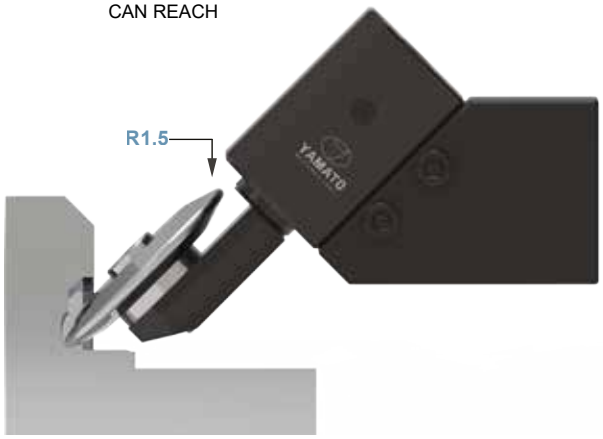
SRHV-1.0R

shank type options
-12x12-16x16-20x20-25x25 square shank
-90° radial shank
-45° inclined shank
-30° inclined shank



SRHV-1.5R-A45

ONLY SPECIALLY DESIGNED YAMATO TOOLS
CAN REACH



SRHV-4W-A45

-Roller disc with special radius is avaliable
-Compact design for use where limited space is available.
-Designed for, but not limited to, use on Swiss Type Lathes.
-Adjustable for optimum burnishing pressure.
-Low cost replacable burnishing roll.

EXTERNAL ANGULAR SURFACES

EXTERNAL GROOVES

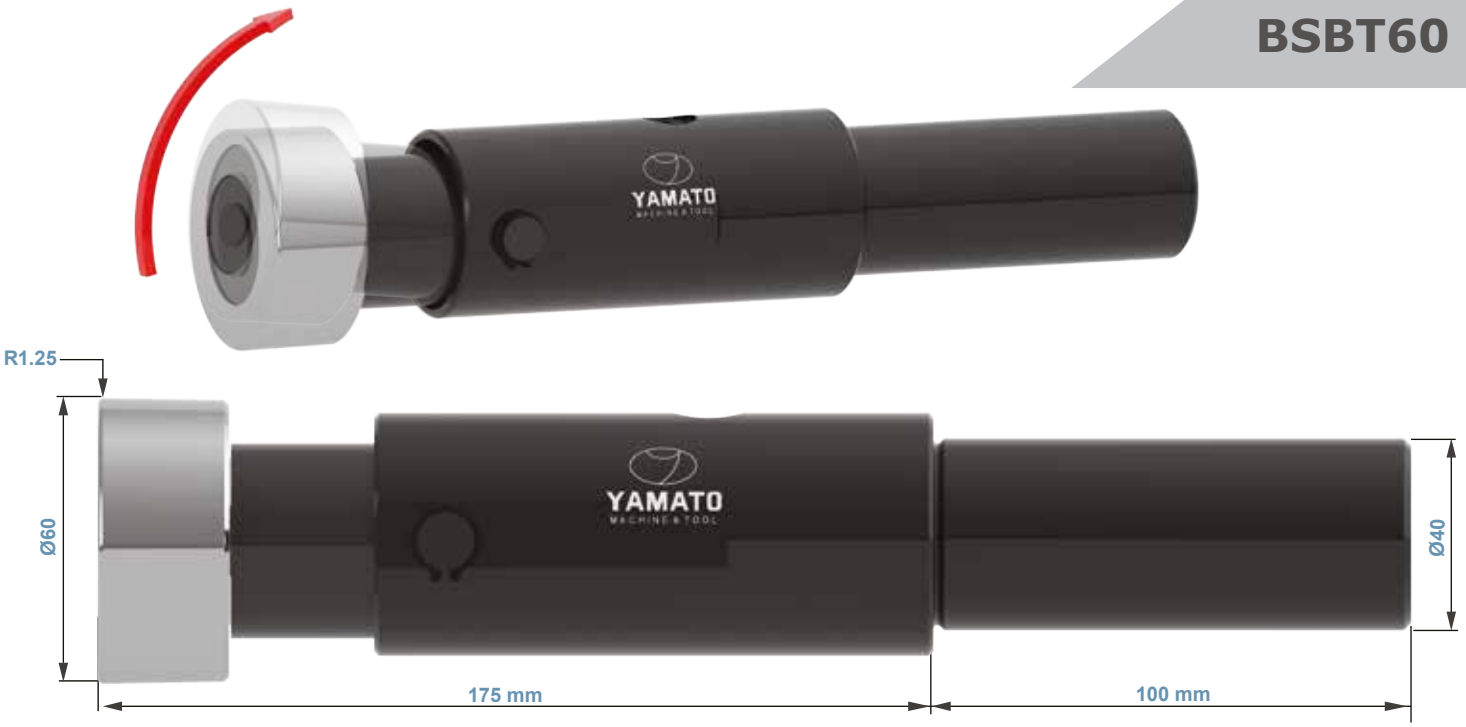
BORING BAR STYLE

BSBT SERIES

BSBT25

BSBT25 CAN FLEX IN BOTH DIRECTIONS
The BSBT25 is a single roll burnishing tool with bidirectional action, this makes it suitable for performing internal and external machining at the same machine setup.
Working feed : 0.05 - 0.30 mm/rev.
Working speed: 50 - 200 m/min.
AVAILABLE WITH WORKING LENGTHS: 150 and 175 mm
AVAILABLE WITH SHANKS: Ø20 and Ø25 mm

BSBT60

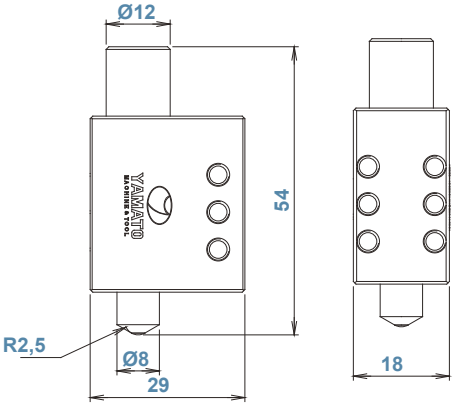


BSBT60 IS A ROBUST TOOL WITH LONG LASTING Ø60 mm ROLL
AVAILABLE WITH WORKING LENGTHS: 175 - 300 - 400 mm
AVAILABLE WITH SHANK: Ø40 mm

DIAMOND ROBUTO

YDB SERIES

YDB EXTERNAL



YDB INTERNAL

FOR LONG HOLES

It must be used with coolant. The obtained finishing depend on many fifferent variables: kind of material, hardness and pre-burnishing surface finishing, working speed and pressure.
Standard YDB is produced in two different styles with attachments to be installed and adapted at many of the common applications, there is also the possibility of customize it on the specific application.
WORKING SPEEDS
Burnishing Speed: 100/250 m/min
Feed: 0.05-0.1mm/giro
Working Pressure:
Continuous cut: 0.02-0.05mm (max 0.1mm)
Interrupted cut: 0.02mm (max 0.05mm)
NOTE it must be used coolant
diamond must not exceed 650°C

DEBURRING TOOLS

COMPENSATING

FLEXIBLE

AXIAL

www.yamatoroll.eu

YABARI

COMPENSATING DEBURRING TOOL

COMPENSATING DEBURRING TOOL FOR UNDEFINED EDGES

SPINDLE SPEED 10.000rpm
ROTATION : CLOCKWISE
FEED : 2000-4000 mm/min

YABARI YABARI-REVERSE

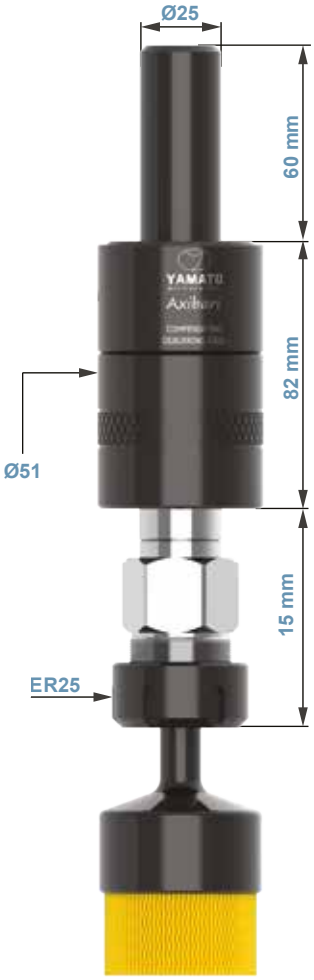
.The holder has a top rated speed of 10.000min^{-1}
.The gripping range of the collet is ø0.6 to ø7mm for ER11.
.Built-in mechanism to contract 10mm in the axial direction.
.YABARI is capable of applying constant pressure of the cutting edge against the surface to deburr.
.YABARI has built-in load adjustment mechanism.

AXIBARI

AXIAL DEFLECTION DEBURRING TOOL

AXIALLY COMPENSATING DEBURRING TOOL FOR BRUSHING

SPINDLE SPEED 6.000rpm
ROTATION : CW & CCW
FEED : 500-4000 mm/min



.The holder has a top rated speed of 6.000min

.The gripping range of the collet is ø1 to ø16mm for ER25.

.Built-in mechanism to contract 15mm in the axial direction.

.AXIBARI is capable of applying constant pressure of the brush against the surface to work.

.AXIBARI allows brushing cycles with less need for corrections on the program to compensate the wear of the brush

.AXIBARI brush wear correction steps doesn't need high precision like using the brush rigid direct on the spindle

.AXIBARI is suitable also for sealing groove polishing with an abrasive stick in place of the brush wherethe groove is too little for a brush

.AXIBARI has built-in load adjustment mechanism.

BARIFLEX

FLEXIBLE DEBURRING TOOL

FLEXIBLE DEBURRING TOOL FOR UNDEFINED EDGES

SPINDLE SPEED 3.000~8.000 rpm
ROTATION : CW / CCW
FEED : 2000-4000 mm/min

- Tool spindle is held in a central position by an adjustable pre-tensioned spring mechanism.
- Tool spindle moves radially when a lateral force is applied because of the undefined edges of the workpiece.
- Deburring force remains constant even with largest spindle deflections. This results to obtain uniform chamfer geometry
- Tool can be used on machining centers, automatic lathes etc.
- Max spindle deflection is 7°. Deflection amount on the burr tip can be up to 20 mm depending on the burr used.

MARKING TOOLS

COOLENT

SCRATCH

AIR

www.yamatoroll.eu

YAMAKI-H

COOLANT DRIVEN - MICRO PERCUSSION

COOLANT DRIVEN NEEDLE

.The hydraulic marking tool works on the principle of dot peening.

.The carbide needle starts to oscillate as soon as the coolant system is activated.

.It makes deeper markings than pneumatic marking tools, because high power-pressurized coolant is used.

.Thanks to the high frequency of strokes generated by the turbine system. inside the tool, the marked text/shape appears as a contunious line.

.All stainless steel body and components.

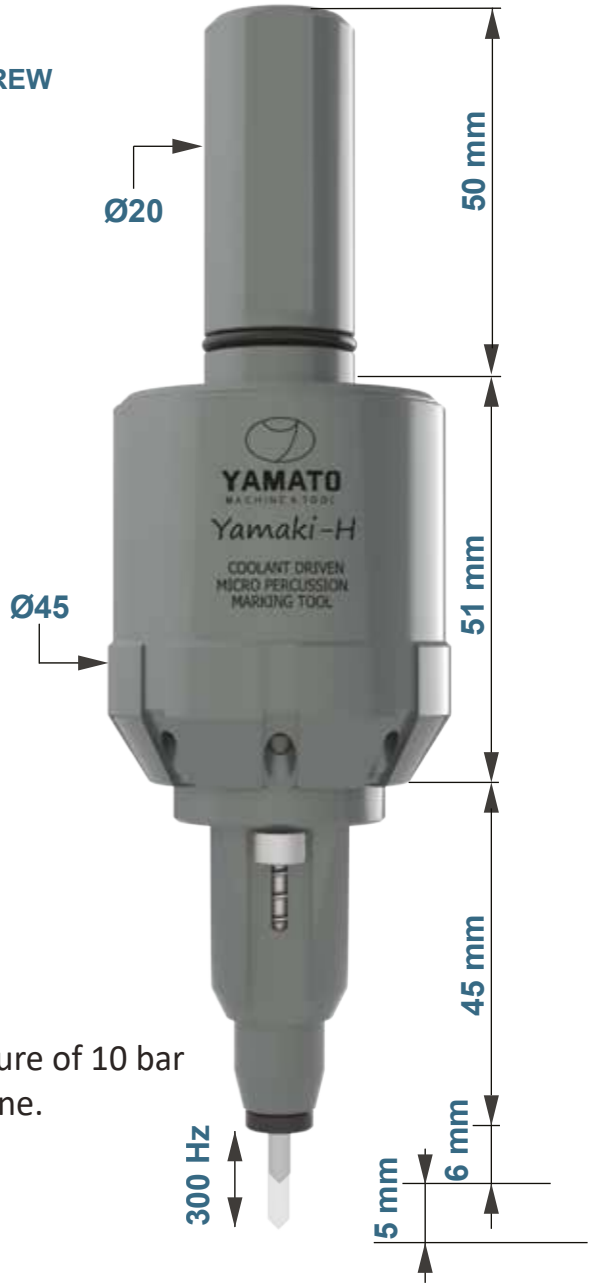
.Tool can be used on machining centres, CNC lathes, etc. (no additional installations required)

.The spindle of the machine does not need to be rotated.

YAMAKI-H

COOLANT DRIVEN - MICRO PERCUSSION

MARKING DEPTH ADJUSTMENT SCREW
CHANGES THE COOLANT PRESSURE



.The marking needle oscillates with min. coolant pressure of 10 bar supplied from the internal cooling system of the machine.
Max. working pressure is 50 bar.

.Marking depth can be adjusted easily by the pressure adjustment screw on the tool.

.Needle has 5 mm axial compensation capability.
Irregular (or curved) surfaces can be marked at the same depth.

.The carbide marking needle is almost wear-free. It can be replaced by the user.

.Marking can be done on all materials up to 62 HRC.

.Feeds more than 5.000 mm/min are possible.

YAMAKI-PEN

SCRATCH MARKING TOOL-S12

SMALLEST MARKING TOOL
12mm SHANK

MARKING DEPTH ADJUSTMENT SCREW
CHANGES THE SPRING PRESSURE

.Integrated, automatic distance compensation up to approx. 6 mm (regular marking depth also of uneven marking surfaces)

.Marking depth individually adjustable via adjusting screw

.Extremely high resistance to wear of the hard metal marking needle needles are simple to replace with just a few manual operations

.Can be used for almost all machinable materials (hardness of marking surface up to approx. 62 HRC)

.Very short marking time

.Feed speed more than 5‘000 mm/min possible

.Extremely high degree of process safety due to single, spring-mounted, pre-tensioned marking needle

.For universal use (Weldon shank shaft with a diameter of 12 mm)

.Use in machining centres, automatic lathes, etc. (no additional installations required)

.Extremely easily adjustable tool (without requiring a needle drive)

.Very compact construction with 12 mm Weldon shank

.Individual rather fine markings of any workpieces with regular, uneven or rough surfaces.

YAMATO
MACHINE & TOOL

www.yamatoroll.eu

TECNIMETAL

Via degli Andreani, 9
40037 Sasso Marconi
(BO) ITALIA

Tel.: +39 051 735744

info@tecnimetal-tm.com
www.yamatoroll.eu